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# Saturation Foot-Patrol in a High-Violence Area: A Quasi-Experimental Evaluation

*Eric L. Piza and Brian A. O'Hara*

This study incorporates a quasi-experimental design to evaluate a saturation foot-patrol initiative in Newark, NJ. Violent crime was measured for one year prior and during the initiative within the target area, a surrounding catchment area, and two separate control areas. The overall findings provide further support for foot-patrol as a crime prevention tactic. Total street violence as well as the disaggregate categories of murder, shootings, and nondomestic aggravated assault decreased within the target area absent of any displacement effects. However, robbery suffered from substantial levels of both temporal and spatial displacement, showing saturation foot-patrol to have varying impact on different types of street violence. This finding suggests that police should design large-scale foot-patrol initiatives in a manner that does not allow offenders, particularly robbers, to easily gauge the scope of the intervention and identify alternate crime opportunities.

*Keywords* foot patrol; GIS; displacement; police crackdowns; place-based policing

## Introduction

This paper reports the findings from an evaluation of Operation Impact, a saturation foot-patrol initiative in Newark, NJ. On a nightly basis, 12 officers under the supervision of three supervisors patrolled a quarter-square-mile area of

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the city. With Newark's police sectors—averaging approximately 3<sup>2</sup> miles in size—being typically patrolled by two officers, Operation Impact represented a drastic increase in police presence within the target area. The intervention was informed by the extensive crime-and-place literature as well as the strategic philosophy of the Newark Police leadership. Foot-patrols were deployed as a deterrence mechanism through which potential offenders would identify an increased risk of apprehension, a common goal of place-based policing (see Ratcliffe, Taniguchi, Groff, & Wood (2011) for a recent example). Furthermore, proactive enforcement actions enacted by the officers were expected to disrupt street-level disorder and narcotics activity in areas prone to violence, a tactic the Newark Police leadership considered to be effective based on their professional experience.

This study contributes to the place-based policing literature both for the overall success and specific limitations of the intervention. Whereas prior research has found foot-patrol to have little effect on crime, this paper provides a case study of how foot-patrol can generate reductions in serious violence. Findings relative to robbery, however, imply that police officials should design large-scale foot-patrol operations in a manner that minimizes potential offenders' ability to identify alternate crime opportunities. While "displacement doomsters" (Clarke & Eck, 2005, step 12) have wrongly considered situational efforts to unequivocally "shift" rather than "prevent" crime, this study warns that displacement remains a very real threat to geographically focused police operations.

## Review of Relevant Literature

### Place-Based Policing

There is much empirical support for the "crime and place" perspective (Braga & Weisburd, 2010; Eck & Weisburd, 1995). The seminal work of the Chicago School (Burgess, 1928; Park, 1936; Shaw & McKay, 1942) demonstrated the environmental composition of neighborhoods to be more closely associated with high crime rates than resident demographics over three-plus decades in Chicago. With time, and technological advancements, scholars examined crime concentration within micro-environments, such as street segments, block faces, and addresses, further illustrating the influence of place-level factors on crime. Sherman, Gartin, and Buerger (1989) found that 3% of addresses accounted for over 50% of calls for service in Minneapolis over a one-year period. Subsequent evaluations have produced similar findings, with significant clustering being observed in respect to gun violence (Braga, Papachristos, & Hureau, 2010; Ratcliffe & Rengert, 2008; Wells, Wu, & Ye, 2011), robbery (Braga, Hureau, & Papachristos, 2011), burglary (Farrell & Pease, 1993; Johnson & Bowers, 2004), and drug dealing (Weisburd et al., 2006; Weisburd & Green, 1995).

Hot spots have also shown to persist over rather extensive time periods. Weisburd, Bushway, Lum, and Yang (2004) found that for every year over a 14-year period approximately 5% of Seattle's street segments accounted for roughly 50% of the city's reported crime incidents. Similar concentration was found when observations were restricted to juvenile crime; just 86 of Seattle's street segments accounted for one-third of crime incidents in which a juvenile was arrested during the 14-year study period (Weisburd, Morris, & Groff, 2009). Replications of the Seattle research, which incorporated street intersections along with street segments as units of analysis, found firearm assaults (Braga et al., 2010) and robbery (Braga et al., 2011) to be similarly confined to few places in Boston over a 29-year period.

The clustering of crime is explained by opportunity-based theories of criminology. Routine activities considers crime as the result of the spatial and temporal convergence of a motivated offender and likely target in the absence of a capable guardian (Cohen & Felson, 1979). This convergence typically occurs as a result of everyday patterns of activity across the life course. For example, the rise of residential burglary between the 1960s and 1970s was explained by a change in the routine activities of American households. Due to the increased numbers of single-headed households and women in the workforce homes were left empty and unguarded more often than had previously been the case (Cohen & Felson, 1979). Micro-level crime patterns are similarly influenced by the activity of victims and offenders. For example, Wiebe, Anderson, Richmond, Nance, and Branas (2010) found that juvenile gun assault victims in Philadelphia were often victimized during the course of their daily travel patterns. Crime pattern theory adds further perspective. Brantingham and Brantingham (1993) illustrate that offenders discover crime opportunities primarily through their daily travels between home, work, and recreation. Crime commonly occurs around these nodes and the paths traveled between them for reasons of convenience; it is easier to commit crime during the course of daily activity than by making a special journey to do so (Clarke & Eck, 2005). Ratcliffe (2006) argued that the temporal constraints of daily life contribute to the clustering of crime within the confines of an offender's activity space. The presence of hot-spot places, particularly crime "generators" and "attractors," additionally influence micro-level crime concentrations (Brantingham & Brantingham, 1995). The criminogenic influence of crime generators and attractors is well-established. Recently, Bernasco and Block (2011) found that each of the 14 types of crime generators and attractors included in their analysis were associated with increased numbers of robberies within census blocks in Chicago.

The high concentration of crime suggests that focusing efforts at specific places can yield greater gains than the even deployment of personnel throughout a jurisdiction. Indeed, the Minneapolis hot-spots policing experiment (Sherman & Weisburd, 1995) demonstrated the concentration of police patrol within high-crime places to be a more effective strategy than the standard patrol model explored in the Kansas City Preventive Patrol Experiment (Kelling, Pate, Dieckman, & Brown, 1974). This idea has become well established in contem-

porary policing, with crime control tactics commonly directing resources towards high crime places (Weisburd, 2008). Reviews of police practices find geographically focused strategies to have strong evidence of effectiveness (Braga, 2008; Skogan & Frydl, 2004; Weisburd & Eck, 2004) with later occurring randomized, controlled trials providing further support (Braga & Bond, 2008; Ratcliffe et al., 2011; Taylor, Koper, & Woods, 2011).

### Foot-Patrol

As a law enforcement strategy, foot-patrol has been considered both archaic and innovative throughout history. Leaders of the "Professional Era" of American policing considered foot-patrol to be an inefficient use of personnel and promoted the use of motorized patrol. Proponents cited several advantages; automobiles increased the range of patrol officers, enabled officers to quickly respond to incidents, and enabled police to keep pace with criminals who increasingly utilized cars to commit crime (Wilson, 1963). Concurrent improvements in communications technology, specifically telephones and two-way radios, entrenched "rapid response" and preventive patrol via automobiles as the primary function of American police (Kelling & Coles, 1996).

With time, the effectiveness of these strategies would be called into question. A series of studies suggested that preventative patrol (Kelling et al., 1974) and rapid response (Kansas City, Missouri, Police Department, 1977; Spelman & Brown, 1981) had limited impact on crime. Furthermore, many scholars argued that deploying officers in cars unintentionally damaged police-community relations, with residents viewing police as an occupying force who entered neighborhoods strictly for the purpose of enforcing the law (Kelling & Coles, 1996). This was exacerbated with the increase in typical police beat size, made possible by patrol cars, which spread police thinly across a jurisdiction and minimized opportunities for police-citizen contact (Esbensen, 1987).

The community-policing movement regarded foot-patrol as a remedy to these dilemmas, citing that the deployment of foot-patrol officers produced a sense of familiarity and trust amongst police and residents (Kelling & Coles, 1996). Scholars have argued that citizens consider officers on foot to be more approachable and are more likely to consider police as being "there for the neighborhood" when they are observed on walking posts rather than in patrol cars (Cordner, 2010, p. 46). From a law enforcement perspective, this increase in police-citizen familiarity can improve face-to-face communication and culminate in the exchange of important information needed to prevent and solve crime (Trojanowicz, 1984). Early studies lent support to foot-patrol as a community-policing strategy. The Newark Foot-Patrol Experiment found police beats with heightened levels of foot-patrol to have experienced significant improvements in community fear of crime (Kelling, 1981). Similar fear reductions were generated by foot-patrol in Flint (Trojanowicz, 1982) and Baltimore (Cordner, 1986).

Evidence of foot-patrol's crime prevention capability is less convincing. While the Flint program found an 8% crime decrease in experimental areas compared to a city-wide increase, most studies found foot-patrol's crime prevention utility to be negligible. The Newark Foot-patrol Experiment found little effect on crime. A reallocation of Boston's patrol officers, which reassigned 34% of the force to foot-patrol, failed to produce significant crime control or order maintenance benefits (Bowers & Hirsch, 1987). Similarly, Esbensen (1987) as well as Esbensen and Taylor (1984) found little support for foot-patrol as a crime-prevention tool.

The cumulative research led the National Research Council to classify foot-patrol as an approach with "weak to moderate" evidence of effectiveness (Skogan & Frydl, 2004). However, recent evaluations suggest that focused foot-patrol may produce crime prevention benefits in certain contexts. Jones and Tilley (2004) found foot-patrol in a British city center to have reduced robbery compared to a regional and national increase. Furthermore, a randomized, controlled experiment in Philadelphia found foot-patrol to have produced a statistically significant 23% reduction in violent street crime within 60 experimental hot spots relative to the control group (Ratcliffe et al., 2011).

## Displacement

The potential occurrence of displacement is a long-standing criticism of crime-prevention efforts. Support for the displacement perspective was first articulated by Reppetto (1976) who argued that the offender's natural response to prevention is the adjustment of his/her criminal activity in order to evade the intervention. The literature has identified six specific forms of displacement: spatial, temporal, target, tactical, perpetrator, and crime type (Barr & Pease, 1990). Spatial displacement poses a particular threat to place-based placing and is the most common form of displacement measured in evaluations of crime-prevention efforts (Guerette & Bowers, 2009; Hessling, 1994).

The universal acceptance of displacement generated from early criminological theories, which considered the impetus for crime commission to be forces outside of the individual. Under this point of view, social ills such as unemployment, poverty, and inequality make displacement inevitable; a person's choice to offend is predetermined due to society's inherent flaws (Eck, 1993). The rise of "opportunity-based" theories, particularly Rational Choice (Cornish & Clark, 1986), brought about a change in perspective. Under this conceptual framework, displacement is not an automatic result of crime prevention. Since criminal opportunities are not equally spread across time and space, the blocking of one specific crime opportunity does not automatically create another (Felson & Clarke, 1998). Furthermore, offenders may lack the requisite skill set to commit alternate offenses. A drug dealer, for example, may not be readily able to commit robbery and may be more likely to desist from crime all together than attempt to engage in other criminal activity (Cornish &

Clarke, 1987). Given the purposive nature of offending, criminals will decide whether or not to seek alternate targets based on "choice structuring properties" relative to their personal motivations (Cornish & Clarke, 1987). In a particularly profound example, suicide by household gas in Britain was virtually eliminated through the introduction of natural gas and was not followed by displacement to other suicide tactics (Clarke & Mayhew, 1988). While suicide is not normally associated with crime prevention, this finding had significant implications for displacement. As noted by Barr and Pease (1990, p. 284),

Killing oneself is a major decision. Burglary (say) is less so. If the decision to kill oneself is reversed by the in-availability of toxic gas, then the decision to commit burglaries should be even less robust in the face of obstacles.

Research has shown that successful interventions most often do not result in displacement, but when they do, the amount of crime displaced is substantially less than the amount of crime prevented (Barr & Pease, 1990; Eck, 1993; Guerette & Bowers, 2009; Hessling, 1994). At the same time, support exists for diffusion of crime control benefits—the reduction of crimes not directly targeted by the preventive action (Clarke & Weisburd, 1994). Guerette and Bowers (2009) found that in 574 observations, diffusion of benefits occurred in 27% of cases with displacement being observed in 26%, suggesting diffusion of benefits to be about as likely as displacement to occur following a successful crime-prevention effort. For the majority of cases, no displacement or diffusion was observed, mirroring findings of previous reviews (Barr & Pease, 1990; Eck, 1993; Hessling, 1994).

#### Scope of the Current Research: Policing "Places" in Newark, NJ

Newark is the largest city in New Jersey, spanning over 26<sup>2</sup> miles with a population of nearly 280,000 persons, an estimated 11,494 persons per square mile, compared to 1,134 statewide (US Census Bureau, 2012). The city has a long-standing reputation as a tumultuous, dangerous urban environment (Tuttle, 2009), and has particularly struggled with issues of gun violence. Internal police department data indicates that over 84% of murders occurred as a result of a gunshot wound from 2007 through 2010, while roughly half of all robberies involved a firearm. Newark officials consider a great deal of violence to revolve around the illicit narcotics trade. In addition, disorderly situations are considered common contributors to violence. A drunken quarrel may lead to a homicide if a firearm is readily available and a street-corner dice game can provide an adequate target for gun-toting robbers.

In mid-2006, the Newark Police Department underwent a significant change in its overall strategy and mission with the appointment of a new regime. Along with the restructuring of the agency to better provide coverage on nighttime and weekend shifts, the agency committed to a place-based approach in its crime-prevention efforts. Proactive enforcement aimed at street-level disorder

and the illicit narcotics trade became the primary strategy against violence. In June 2008, the Newark Police Department launched Operation Impact, an initiative that epitomized the agency's place-based strategy. On a nightly basis, 12 police officers under the direction of two sergeants and one lieutenant patrolled the target area on foot. The officers and supervisors comprised a special unit dedicated to exclusively patrolling the target area. A select group of officers were assigned to Operation Impact upon graduation from the police academy and remained detailed to the intervention until graduates from the ensuing academy class were selected as their successors. Supervisors were selected based on their levels of experience managing proactive enforcement units, such as "Gangs" or "Narcotics." The design and enforcement strategy of Operation Impact has its roots in a New York Police Department (NYPD) strategy of the same name. In their analysis of the NYPD strategy, Smith and Purtell (2007) found that precincts assigned Impact zones in 2003 "experienced a 24% acceleration in declining murder rates, a more than doubling of the rate of decline in rape ... a 21% boost in the decline of robbery rate and of 23% in assault rate by 2006" compared to the rest of the city (p. 9).

Despite these positive findings, the research design raises some questions, particularly regarding the use of precincts as units of analysis. Given the influence of spatial aggregation on the validity and reliability of place-based evaluations (Weisburd, Morris, & Ready, 2008), the designation of precincts as units of analysis may not accurately measure the effect of police efforts at specific places. While the NYPD implemented Operation Impact in areas most in need of intervention, it is reasonable to believe that certain places not chosen as Impact Zones also experienced high levels of crime. Police Commanders most likely devised strategies and dedicated resources towards these high-crime locales in their precincts. In fact, NYPD officials considered a main benefit of Operation Impact to be that officers assigned to precincts with Impact Zones were "freed up" to address crime problems in other areas of the precinct (Golden & Almo, 2004, p. 10). It is reasonable to believe that police activity outside of the Impact Zones may have contributed to the precinct-wide crime reductions, making the precinct-wide crime declines more reflective of the effect of cumulative police efforts rather than just Operation Impact. Furthermore, a test of geographic displacement and diffusion of benefits is not feasible with aggregate units of analysis. The current evaluation builds upon the approach of Smith and Purtell (2007) by specifying target, catchment, and control areas within a Geographic Information System (GIS), allowing for the exploration of research questions more directly related to the intervention at hand.

## Research Methods and Data

### Target Area Description

An in-depth analysis of the spatial distribution of street violence was conducted to select the target area. The analysis included incidents of murder,

nonfatal shootings, aggravated assault, and robbery occurring over the 36 month period from 1 January 2005 through 31 December 2007.<sup>1</sup> Incidents were weighted based on their seriousness and the recency of their occurrence.<sup>2</sup> This method allows more recent events to have particular relevance in the creation of target areas while accounting for the long-term crime trend. Ratcliffe et al. (2011) utilized a similar temporal weighting approach in their selection of violent crime hot spots in Philadelphia.

The target area sits within Newark's Fourth Precinct. The thoroughfare of South Orange Avenue stretches east to west through the center of the zone. Apartment buildings and assorted business types (e.g. liquor establishments, take-out eateries, and retail establishments) line this main corridor as well as many of the intersecting streets. The eastern portion of the zone contains a large housing complex, New Community Homes, known to be a high-violence drug trafficking area. The complex is comprised of 28 low-rise buildings situated in a perpendicular fashion.<sup>3</sup> This layout creates a "maze-like" network of streets and walkways more easily navigated by occupying drug crews than responding officers, which the Newark Police cited as an impediment to previous efforts to disrupt drug trafficking and related violence in and around the complex.

## Data Sources and Analytical Design

Data for this evaluation was compiled from the Newark Police Department's GIS. Crime incidents from 4 June 2007 through 3 June 2008 comprised the one-year pre-implementation period with 4 June 2008 through 3 June 2009 comprising the one-year implementation period.<sup>4</sup> While Operation Impact lasted approximately two years, severe cuts in the department's budget and personnel caused a steady decline in the scope and dosage of the initiative beginning in the third quarter of 2009. The one-year period represents the time when Operation Impact ran at full strength and is thus the most appropriate study period.

To measure the effect of the intervention, crime incidents were measured within four areas: the target area, a surrounding catchment area, and two different control areas. An area extending approximately one block in each direction from the target area serves as the catchment area. According to Bowers and Johnson (2003), there exists a "displacement gradient" in respect to

1. To better tailor the analysis to the planned strategy, domestic violence incidents occurring indoors as well as fights between students on school property were excluded due to such behavior not being the focus of the intervention.

2. Given limited space, this paper does not discuss the target-area selection process in detail. A report outlining the analysis is available from the primary author upon request.

3. The number of buildings were ascertained through a visual count conducted using aerial imagery from Google Maps ([www.maps.google.com](http://www.maps.google.com)).

4. Similar to the target area selection analysis, incidents not likely to be influenced by the intervention strategy (domestic assaults occurring indoors and student fights on school property) were excluded from the study.

place-based interventions; as the distance from the treatment area increases the likelihood of spatial displacement decreases. The size of the catchment area was thus minimized to reflect the area where offenders would most likely travel in response to blocked crime opportunities in the target area. The one-block parameter was also chosen in an effort to reflect the layout of the target area, which extended a block north and south from South Orange Avenue on its western portion and from 14th avenue on its eastern portion. The catchment area was extended in certain directions to include places the Newark Police believed offenders may relocate to. For example, the area to the south-east contains a low-rise complex police felt provided similar opportunities for crime as the New Community complex. The south-eastern portion of the catchment area was thus extended one block to account for this area. Conversely, the area to the immediate north west of the target area was excluded due to it being a large cemetery.

Observed crime changes in the target area were compared with two separate control areas. The first was the Fourth Precinct minus the target area and surrounding catchment area. This control contains areas unrelated to Operation Impact primarily policed through "standard" law enforcement methods, such as routine patrol, retrospective investigations, and ad hoc narcotics operations. "Zone B," a prospective target area identified during the target selection stage, was selected as the second control area for two reasons. First, it exhibited the second highest violent crime total of the five prospective target areas, making its violent crime problem comparable to that of the Operation Impact grid. Secondly, the geographic layout of Zone B is similar to that of the target area. Large, high-rise apartment buildings line two streets that run north to south through the middle of the zone with a number of commercial establishments appearing on main thoroughfares forming the boundary of the area. These characteristics make Zone B an appropriate near-equivalent comparison for the target area (see Figure 1).

The precinct commander responsible for Zone B designated it a "Narcotic Hot-Spot Zone," mandating motorized patrol officers and plain clothes detectives to enact proactive enforcement actions in the area. While Zone B's place-based strategy is somewhat similar to that of Operation Impact, the initiatives differ vastly in respect to posture and dosage. Operation Impact deployed 12 officers and three supervisors within the quarter-mile target area on a nightly basis. Place-based enforcement did not occur as rigorously within Zone B, with focused patrol and street-level narcotics operations occurring on an intermittent basis. The patrol officers assigned to Zone B's encompassing sector remained the only officers with daily responsibilities in the area.

Separate controls were incorporated to provide added perspective to any observed crime changes in the target area. Operation Impact's intensive foot-patrol approach is compared with tactics specific to the two control areas: intermittent, place-based enforcement in Zone B and "standard" responses to crime in the precinct. Any reductions would need to outperform both control areas to unequivocally validate the strategy.

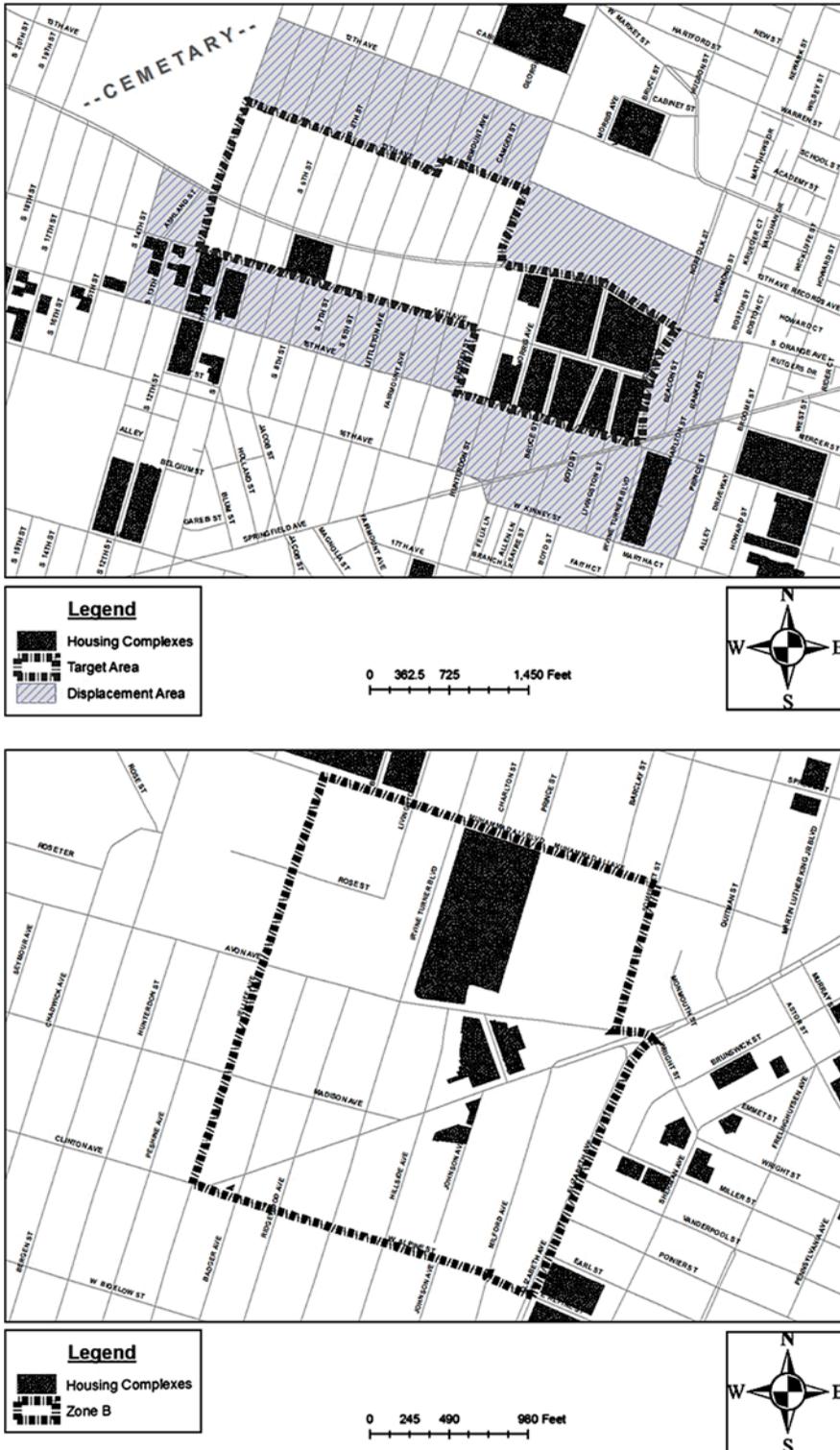


Figure 1 Target, catchment, and the "Zone B" control area.

## Statistical Approach

The effect of the intervention is reported as an odds ratio (OR). As described by Welsh and Farrington (2009, p. 135), the OR indicates the “proportional change in crime in the control area compared with the experimental area.” The OR is calculated via the following formula:

$$OR = (a \times d) / (b \times c)$$

with *a*, *b*, *c*, and *d* designated as follows:<sup>5</sup>

	Pre-intervention crime count	During-intervention crime count
Target area	<i>a</i>	<i>b</i>
Control area	<i>c</i>	<i>d</i>

The obtained value represents the strength and direction of the program impact. An OR > 1 indicates a desirable effect on crime in the target area relative to the control while an OR < 1 indicates an undesirable effect. An OR of 1.3, for example, shows that crime increased 30% in the control area relative to the target area.<sup>6</sup> The statistical significance of each OR was measured through its variance (VOR) and associated 95% confidence interval, which were calculated using the Effect Size Calculator developed by David B. Wilson, available on the Campbell Collaboration website.<sup>7</sup>

ORs were computed for five different outcome measures: overall violence, and the disaggregate categories of murder, robbery, aggravated assault, and shootings. Two OR values were computed for each crime category: one relative to the precinct control area and another relative to Zone B. Efforts were also taken to measure any potential displacement or diffusion of benefits effects. Since the foot-patrol officers were deployed during a fixed 8-h time span within the same area on a nightly basis, both spatial and temporal displacement were measured. Temporal displacement was measured through two additional sets of OR, showing crime level changes during the operational hours between 6 pm and 2 am and the nonoperational hours comprising the remainder of the day. A crime reduction during operational hours coupled with an increase during nonoperational times suggests the presence of temporal displacement. All crime types with a positive, statistically significant OR (which suggests a crime reduction) were included in a subsequent test of spatial displacement.<sup>8</sup> A Weighted Displacement Quotient (WDQ)<sup>9</sup> was calculated for

5. Chart adapted from Welsh and Farrington (2009, p. 135).

6. The inverse of the OR displays the crime difference within the target area. An OR of 1.3 implies that target area crime reduced 23% relative to the control since the inverted value of the OR (1/1.3) is 0.77 (Welsh & Farrington, 2009, p. 135).

7. [http://www.campbellcollaboration.org/resources/effect\\_size\\_input.php](http://www.campbellcollaboration.org/resources/effect_size_input.php).

8. Since displacement and diffusion of benefits are seen as responses to successful prevention efforts, it makes little sense to look for evidence of such in the absence of achieved crime reductions (Clarke & Eck, 2005, step 51).

9. The formula is as follows:  $WDQ = ([Da/Ca] - [Db/Cb]) / ([Ra/Ca] - [Rb/Cb])$  where *D*, *R*, and *C* represent the displacement, response, and control areas, respectively, and “*b*” and “*a*” indicate the period before and after the intervention, respectively.

each such observation using the WDQ Calculator developed by Ratcliffe and Breen (2008). The WDQ is a statistic that compares changes in the target area to those in the control and buffer zones (Bowers & Johnson, 2003) with negative values showing evidence of displacement and positive values implying a diffusion of crime-control benefits.

## Findings

### Officer Enforcement Activity

Before discussing the intervention's effect of crime, it is useful to explore the enforcement activity of the foot-patrol officers. Sherman and Eck (2002) argued that evaluations of crime-prevention programs should aim to measure "exactly what police do—and when they do it" because it allows researchers to "tell the difference between programs that 'do not work,' and programs that simply 'did not happen'" (Sherman & Eck, 2002, p. 302). In regard to successful interventions, measures of enforcement activity can add perspective as to how program effects were achieved. Table 1 displays the overall enforcement actions enacted by Operation Impact.<sup>10</sup> In total, the unit enacted 3,186 enforcement actions: 634 arrests, 1,202 quality of life summonses (QOL), and 1,350 field interrogations (FIs). This averages to more than eight enforcement actions per 8-h tour of duty, with each of the officers averaging approximately one arrest, nearly three QOL summonses, and nearly four FIs per week: a somewhat modest total given the level of crime observed in the target area.

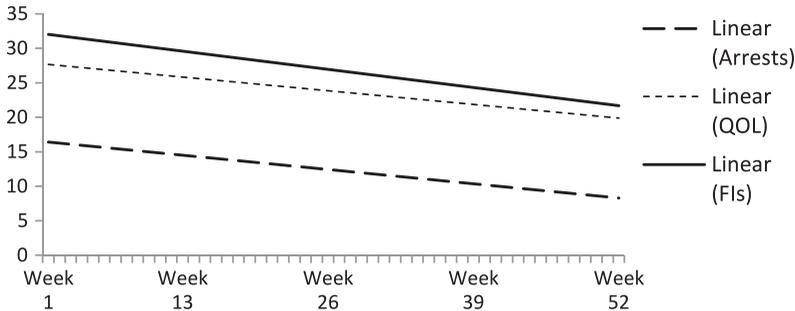
Figure 2 displays the linear trend of the arrests, QOL summonses, and FIs, all of which trended downward over the study period. There are different possible explanations for this decline. For one, a "crackdown decay" may have occurred, where the intervention experienced a "bureaucratic regression to the mean level of effort" (Sherman, 1990, p. 10) resulting in fewer enforcement activities by the officers. Conversely, enforcement activity occurring at the outset of the intervention may have reduced the amount of street-level criminal behavior, such as narcotics activity or disorderly behavior, resulting in fewer crimes for officers to take enforcement actions against. Officer presence, rather than enforcement, may have become the primary prevention mechanism over time.

Unfortunately, the lack of specific data prevents the formulation (and validation) of specific hypotheses regarding the effect of the enforcement activity. Knowing what the arrests and summonses were for, as well as the results of FIs, would have allowed for much greater interpretation. Evaluation of the intervention occurred "*post hoc*," which prevented an in-depth analysis of the officer activity. Therefore, the precise nature and scope of the enforcement

10. The enforcement data were collected from daily Operation Impact after-action reports, which capture the number of enforcement actions enacted during the previous night's tour of duty.

**Table 1** Enforcement actions of the Operation Impact officers

Enforcement actions	Count	Per day	Per officer, per day	Per officer, per week
Arrests	634	1.74	0.15	1.05
QOL summonses	1202	3.29	0.27	1.89
FIs	1350	3.70	0.31	3.72
Total enforcement	3186	8.73	0.73	8.76

**Figure 2** Linear trend lines of Operation Impact arrests, QOL summonses, and FIs.

activity are unknown. The evaluation would have benefitted from researchers being directly involved during the beginning stages of the intervention, when more rigorous measurement and observation of enforcement activities would have been possible.<sup>11</sup>

### Program Effect on Violence

Operation Impact outperformed the precinct control area on all crime measures. Table 2 displays the Odds Ratios for each of the crime types included in the analysis. The OR for overall violence was 1.73, showing a reduction of 42% relative to the surrounding precinct. OR values for the disaggregate crime categories provide further support for the intervention. Shootings (2.61), aggravated assault (2.94), and murder (2.57) each decreased over 60% relative to the precinct. The murder reduction was not statistically significant, which was more likely due to murders occurring too infrequently to achieve statistical power than any inadequacy of the intervention (Eck, 2002, p. 284). In the case of robbery, however, the lack of statistical significance is a reflection of the crime being minimally influenced by the intervention. While the OR of 1.13 suggests a crime reduction, the pre-intervention, and during-intervention robbery counts (47 incidents) were identical.

11. Numerous scholars have advocated for a higher level of integration between police practitioners and researchers (see Braga (2010) for example).

**Table 2** Target area ORs by crime type

<i>Crime category</i>	Relative to precinct control				Relative to Zone B control			
	OR	OR logged	VOR logged	95% CI	OR	OR logged	VOR logged	95% CI
Murder	2.57	0.94	0.72	0.49-13.57	5.25	1.66	1.06	0.70-39.48
Robbery	1.13	0.12	0.12	0.72-1.75	1.03	0.03	0.11	0.55-1.95
Aggravated assault	2.94*	1.08	0.07	1.74-4.98	2.51*	0.92	0.11	1.31-4.81
overall violence	1.73*	0.55	0.03	1.25-2.38	1.58*	0.46	0.05	1.02-2.42
Shootings	2.61*	0.96	0.15	1.23-5.52	1.62	0.48	0.21	0.66-3.96

\* $p < .05$ .

Operation Impact sustains its positive effect when compared to the Zone B control area, albeit to a lesser extent. The program achieved a statistically significant OR of 1.58 for overall violence and a statistically significant OR of 2.51 for aggravated assault, reflecting a decrease of 30 and 61%, respectively. Although shootings' OR of 1.62 did not reach statistical significance, the change within the target area (from 22 to 13) compares favorably to that of Zone B (from 24 to 22). Similar to the precinct comparison, murder's OR (5.25) was not statistically significant and robbery failed to show an improvement.

While the intervention compared favorably to both of the controls, OR values for each crime category except murder were higher when the precinct served as the control area. This concurs with the previous literature. The place-based tactics utilized in Zone B have more evidence of effectiveness than the "standard" police practices primarily utilized in the precinct (Skogan & Frydl, 2004; Weisburd & Eck, 2004). In addition, as a nonequivalent control area (which is much larger than the target area),<sup>12</sup> the precinct control represents a weaker evaluative design than the near-equivalent Zone B. Prior research has demonstrated that weaker designs are more likely to report stronger effect sizes (Weisburd, Lum, & Petrosino, 2001; Welsh, Peel, Farrington, Elffers, & Braga, 2011).

### Displacement and Diffusion of Benefits

To gauge the presence of temporal displacement, crime levels were measured for the operational hours between 6 pm and 2 am and the nonoperational hours comprising the remainder of the day (see Table 3). All crime types decreased during the operational hours. Reductions were sustained during the

12. This issue is discussed further in the "Policy Implications and Conclusion" section.

nonoperational time period for four of the five crime categories, the lone exception being robbery, which increased over 73% from 15 to 26 incidents. While the control areas also experienced robbery increases during the nonoperational hours, the target area's nonoperational robbery increase is substantially larger than the precinct's and more than doubles Zone B's.

The presence of temporal displacement is further highlighted by the ORs (see Table 4). In respect to both control areas, OR's were above one for robbery during operational hours and below one during the remainder of the day (though neither observation was statistically significant). These figures suggest that the robbery reduction achieved while the foot-patrol officers were within the target area may have been negated by off-hour crime increases. This observation was unique to robberies, with all other crime types decreasing during both operational and nonoperational hours in the target area (see Table 5).

The test of spatial displacement included all crime categories with positive, statistically significant ORs to ensure reduction effects strong enough for displacement or diffusion of benefits to be reasonably possible. In all, twelve observations across the three time periods fit this criterion (see Table 5). Five occurred over the 24h period, four during the operational hours, and three during the nonoperational hours. Each observation was of one of the following categories: overall violence (five), aggravated assault (five), or shootings (two).

Of the 12 observations, only the two relative to shootings exhibited positive, but small, WDQ's suggestive of a modest diffusion of benefits effect. The WDQ was zero for aggravated assault relative to the precinct during operational hours, showing neither displacement nor diffusion to be a factor. The four remaining aggravated assault WDQ's (two negative, two positive) were small, suggesting any displacement or diffusion effects to be minimal. WDQ's were negative and larger for overall violence during the 24h and operational periods (relative to both controls). They were well-below one, however, implying that the level of displacement was less than the amount of crime reduced. However, for the nonoperational period, the overall violence WDQ's of  $-.97$  (relative to the precinct) and  $-4.17$  (relative to Zone B) suggest that more crimes were displaced than prevented, an obviously undesirable occurrence which previous research suggests is rare (Clarke & Eck, 2005, step. 51).

A review of the raw crime counts shows that robbery is largely responsible for the spatial displacement. As displayed in Table 6, robbery more than doubled in the catchment area (from 13 to 30) during the nonoperational period. While other crime types also experienced increases, none were as pronounced as robbery. Robbery also showed evidence of spatial displacement during the operational period, with an increase of 58% (from 12 to 19) in the catchment area. While the overall violence reduction in the target area did not dissipate as a result, the spatial displacement of robbery negatively affected crime levels in the catchment area; when robbery is removed from the crime totals, overall violence decreases by one incident (from 18 to 17).

**Table 3** Pre-intervention/during-intervention raw crime counts in the target and control areas by operational and nonoperational time periods

	Target area			Precinct control			Zone B control		
	Pre	Post	%	Pre	Post	%	Pre	Post	%
<i>Operational period</i>									
Murder	2	1	-50	17	9	-47	1	1	0
Robbery	32	21	-34	123	115	-7	15	12	-20
Aggravated assault	39	14	-64	110	110	0	22	21	-5
Overall violence	73	36	-50	250	234	-6	38	34	-11
Shootings	15	7	-53	38	57	+50	12	13	+8
<i>Non operational period</i>									
Murder	5	1	-80	13	13	0	3	5	+67
Robbery	15	26	+73	93	128	+37	16	20	+25
Aggravated assault	26	7	-73	115	104	-10	26	18	-31
Overall violence	46	34	-26	221	245	+11	45	43	-4
Shootings	7	6	-14	32	51	+59	12	10	-17

**Table 4** Target area ORs for the operational and nonoperational time periods

	Relative to precinct control				Relative to Zone B control			
	OR	OR logged	VOR logged	95% CI	OR	OR logged	VOR logged	95% CI
<i>Operational</i>								
Murder	1.06	0.06	1.67	0.08-13.33	2.00	0.69	3.50	0.05-78.25
Robbery	1.42	0.35	0.10	0.78-2.61	1.22	0.20	0.23	0.48-3.11
Aggravated assault	2.79*	1.02	0.12	1.43-5.42	2.66*	0.98	0.19	1.13-6.25
Overall violence	1.90*	0.64	0.05	1.23-2.94	1.81	0.60	0.10	0.98-3.34
Shootings	3.21*	1.17	0.25	1.20-8.62	2.32	0.84	0.37	0.70-7.64
<i>Non operational</i>								
Murder	5.00	1.61	1.35	0.51-48.91	8.33	2.12	1.73	0.63-110.02
Robbery	0.79	-0.23	0.12	0.40-1.58	0.72	-0.33	0.22	0.29-1.80
Aggravated assault	3.36*	1.21	0.20	1.40-8.06	2.57	0.94	0.28	0.92-7.19
Overall violence	1.50*	0.41	0.06	0.93-2.42	1.29*	0.26	0.10	0.70-2.38
Shootings	1.86	0.62	0.36	0.57-6.03	0.97	-0.03	0.49	0.25-3.85

\* $p < .05$ .

### Discussion of Results

Overall, this study offers support for saturation foot-patrol as a violence reduction tool, with the tactic reducing overall incidents of violence as well as the

**Table 5** Weighted displacement quotients

	24-hour period		Operational period		Nonoperational period	
	Precinct control	Zone B control	Precinct control	Zone B control	Precinct control	Zone B control
<i>Crime category</i>						
Murder	NA	NA	NA	NA	NA	NA
Robbery	NA	NA	NA	NA	NA	NA
Aggravated assault	-0.05	-0.167	0.00	-0.03	-0.11	NA
Overall violence	-0.47	-0.525	-0.25	NA	-0.971	-4.173
Shootings	0.18	NA	0.42	NA	NA	NA

Note: NA: WDQ not calculated due to a lack of a statistically significant reduction.

disaggregate categories of murder, shootings, and aggravated assault. These crimes were more effectively addressed in the target area than within either control area, while showing no evidence of substantial spatial or temporal displacement (though the effect was more pronounced when compared to the less-rigorous precinct control area). The composition of the target area may have been susceptible to the foot-patrol tactic. The target area has a mixture of locations conducive to both illicit and legitimate activity that can generate violence, such as drug markets (Harocopos & Hough, 2005), liquor establishments (Block & Block, 1995; Scott & Dedel, 2006), and take out eateries with high-foot traffic, late hours of operation, and low levels of guardianship (Kennedy, Caplan, & Piza, 2011, p. 347). The large number of foot-patrol officers within these environs may have amounted to, what Ratcliffe et al. (2011) refer to as, a “certainty-communicating device” that alerted potential offenders to the heightened risk of apprehension and thus provided the “certainty of punishment” necessary for deterrence (Durlauf & Nagin, 2011). The deterrent effect of the heightened police presence may have been bolstered by the enforcement activity of the unit, which likely served as a reminder of the newfound certainty of punishment in the target area. However, while reviews of both situational crime prevention (Barr & Pease, 1990; Eck, 1993; Guerette & Bowers, 2009; Helsing, 1994) and hot-spots policing (Braga, 2008) have demonstrated displacement to be far from inevitable, the robbery finding serves as a reminder that displacement is a very real threat to prevention efforts. The exclusive displacement of robbery can be explained by factors highlighted in the literature.

Nearby crime opportunities, particularly crime generators and attractors, can provide offenders with readily accessible alternate targets for victimization (Brantingham & Brantingham, 2003). The likelihood of displacement decreases as the offender moves further from a familiar setting. Eck (1993) argued that this “familiarity decay” leads to offenders knowing less about areas outside of their normal activity nodes, explaining why geographic displacement normally does not occur in response to successful prevention

**Table 6** Raw pre/post-crime counts in the catchment area

	Operational period			Nonoperational period			24-hour period		
	Pre	Post	%	Pre	Post	%	Pre	Post	%
<i>Crime category</i>									
Murder	4	3	-25%	1	2	100%	5	5	0%
Robbery	12	19	58%	13	30	131%	25	49	96%
Agg assault	14	14	0%	9	10	11%	23	24	4%
Total	30	36	20%	23	42	83%	53	78	47%
Shootings	9	7	-22%	4	9	125%	13	16	23%

efforts. Weisburd et al. (2006) noted the importance of familiarity in interviews with prostitutes and drug offenders arrested during a place-based initiative in Jersey City. When offenders were asked why they did not relocate their operations elsewhere in response to the increased police coverage, many responded that new areas would be unfamiliar, causing them to have to relearn client populations, criminal competition, and police enforcement patterns, which would have increased the offenders' vulnerability. As one arrested drug dealer offered, "... you really can't deal in areas you aren't living in, it ain't your turf. That's how people get themselves killed" (p. 578).

Offender motivation has also shown to contribute to displacement, with offenders primarily motivated by monetary gains being more likely to seek out alternate crime targets to satisfy their needs (Guerette, Steinius, & McGloin, 2005). In their evaluation of Philadelphia's Operation Safe Streets, Lawton, Taylor, and Luongo (2005) found that violent crime decreased both at and in the immediate vicinity of the targeted street corners, while the reduction of drug crimes was slightly offset by displacement to areas surrounding the intervention sites.<sup>13</sup> Lawton et al. (2005) attributed these findings to the fact that drug dealers are willing to relocate their operations to nearby areas that offer continued contact with their clientele. Since violence is less planned, violent offenders, by contrast, "probably 'tune in' less closely to the immediate surroundings. So, for these potential offenders, simply seeing an officer on location would lead them to generally give that locale a wide berth" (Lawton et al., 2005, p. 448).

In respect to robbery, specific aspects of Operation Impact made it susceptible to the aforementioned displacement threats. The target area sat in a high-crime precinct with alternate crime targets appearing nearby. Within the catchment area, commercial corridors provided a number of vulnerable establishments and pedestrians, while housing complexes containing drug markets provided alternate targets in the form of customers and dealers. Familiarity of offenders was likely similar in catchment and target areas, making the sur-

13. However, the use of an alternate ARIMA model pointed to a slight diffusion of benefits effect (Lawton et al., 2005, p. 442).

rounding area vulnerable to spatial displacement. Furthermore, research has shown robbers to exhibit a unique rationality that simultaneously emphasizes immediate action and caution (Wright & Decker, 1997). Robbery was likely the only crime to be displaced because other offenders lacked the requisite motivation and situational mindset to displace their activity. It is unlikely that a slighted bar patron, for example, would respond to a thwarted opportunity to attack someone in front of the establishment by traveling outside of the target area and attacking a person not involved in the quarrel.

In addition to these geographic and offender characteristics, the specific manner by which the foot-patrol officers were deployed may have contributed to the displacement of robbery. Sherman (1990) demonstrated the effects of police crackdowns to be maximized when tactics are carried out in an intermittent, unpredictable manner. Sherman argued that having "permanent law enforcement priorities may make the risk of punishment too predictable for criminals," and that the periodic shifting of resources across several targets could eliminate this certainty (p. 6). Operation Impact deployed a high number of foot-patrol officers daily to a single location during a fixed time period, which may have created a highly visible, and somewhat predictable, police response.

While research suggests that offenders often overestimate the true coverage of police initiatives due to the limited information at their disposal (Clarke & Weisburd, 1994; Johnson & Payne, 1986), offenders may be able to gauge the scope of police efforts and adjust their actions accordingly in certain cases. Taylor et al. (2011) attributed spatial displacement in response to a hot-spots policing effort in Jacksonville to result from the highly visible nature of the directed patrols and the ability of offenders to recognize the areas that truly carried an increased level of apprehension. In similar fashion, Brisgone (2004) reported several instances where prostitutes adjusted their normal hours of operation to avoid police patrols and crackdowns in Jersey City.

The temporal distribution of robbery incidents within the target area suggests that robbers may have behaved similarly. As shown in Figure 3, robbery spiked between the hours of 6 pm and 2 am, in the year preceding the intervention. During the intervention period, robbery incidents shifted to times not covered by the foot-patrol officers, namely the hours immediately preceding and following the operational tour of duty. This temporal shift suggests that offenders may have adjusted their practices by committing robberies during times that had substantially less police coverage but offered similar opportunities as the operational time period.

### Policy Implications and Conclusion

The findings of this study have specific implications for law enforcement agencies seeking to address violent crime hot spots. While street violence may be effectively addressed through foot-patrol, additional effort may be necessary

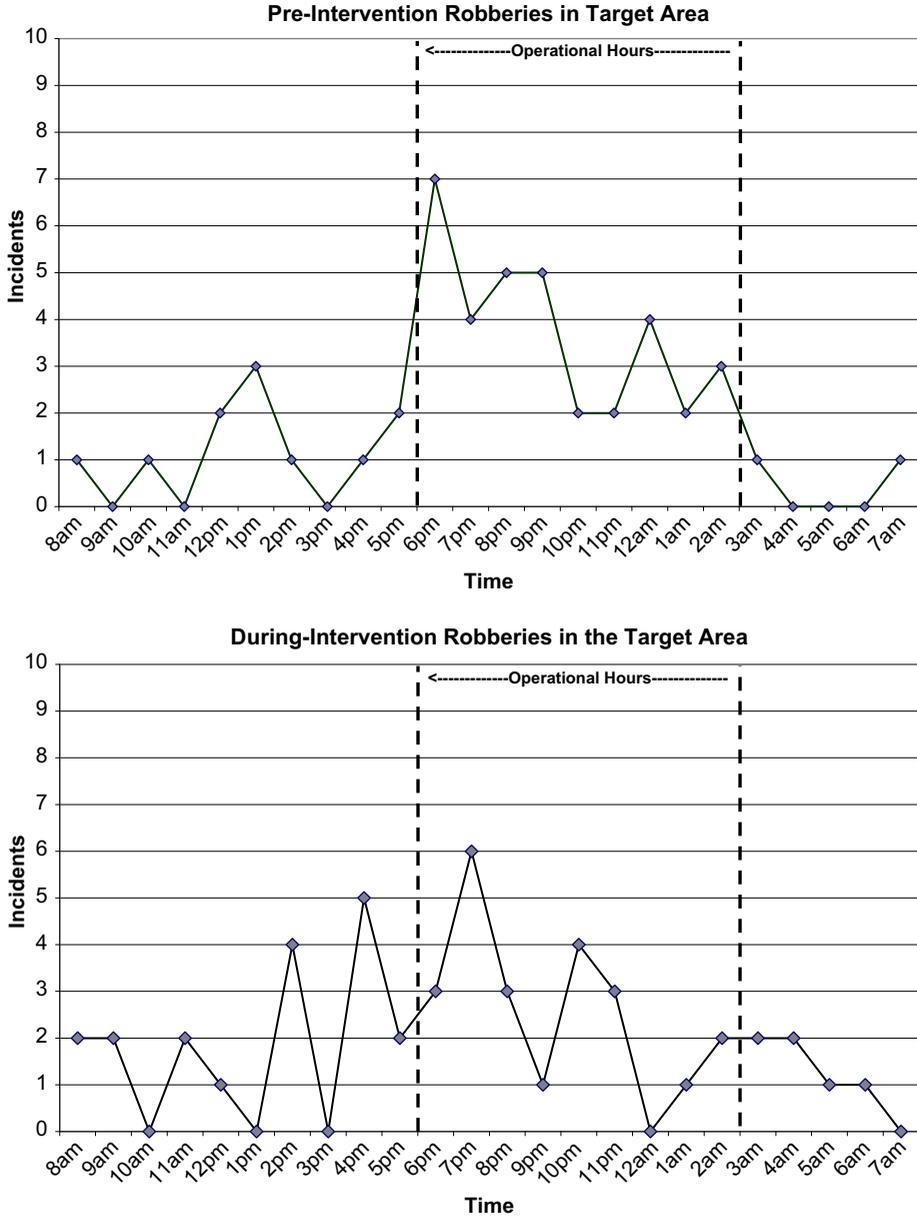


Figure 3 Target area robberies by time of day (pre-and during-intervention periods).

in order to avoid displacement if observed crime patterns include substantial levels of robbery. As previously discussed, Golden and Almo (2004) found that police officials considered a main benefit of NYPD’s Operation Impact to be the new-found ability of precinct commanders to “free up” officers normally deployed within the target area. The current study suggests that a more appropriate approach, at least in high-robbery areas of Newark, may be for police

commanders to bolster the intervention by designing supplemental strategies to complement the foot-patrol efforts instead of making the foot-patrol officers solely responsible for the target area. However, given the limited resources at the disposal of most agencies the commitment of additional manpower to supplement an already resource intensive intervention may not be feasible. Instead, interventions can be designed according to Sherman's (1990) "crackdown-back off" recommendation where law enforcement efforts are rotated amongst numerous hot spots. In addition, the operational times could be fluctuated so that the "start" and "end" times of the operation varied from day-to-day. Such tactics may minimize the likelihood for both temporal and spatial displacement by making potential offenders unaware of precisely when and where they are at an increased risk of apprehension. In addition, by leveraging residual deterrence generated by officer presence and activity, police may be able to achieve crime reductions while minimizing time in hot spots, a more cost-effective approach than the permanent deployment of personnel within a single target area (Koper, 1995, p. 668).

The research methodology suffers from specific flaws that should be mentioned. For one, this study was unable to measure the residual effect of Operation Impact. Research has shown certain place-based interventions to produce initial crime reductions only to have the deterrence effects fade over time (Jang, Lee, & Hoover, in press; Mazerolle, Hurley, & Chamlin, 2002; Sherman, 1990). An attempt to measure this phenomenon was not made in this work due to the imprecise "end date" of Operation Impact. In July of 2009, the Police Department's operational budget was significantly reduced, which led to officers normally assigned to Operation Impact being frequently deployed to core patrol assignments in an attempt to minimize overtime expenditures related to maintaining departmentally mandated levels of patrol coverage. Though precise documentation was unable to be provided, Newark Police leadership stated that Operation Impact patrols were canceled, or ran at less than full strength, on a fairly frequent basis due to officers being temporally assigned to other details. In 2010, the Newark Police Department phased-out Operation Impact in preparation for impending police layoffs.<sup>14</sup> Since the implementation of Operation Impact was sporadic from July 2009 on, and an exact "end date" was not identified, the measurement of residual effects may have reported misleading results regarding program effect. A second limitation relates to the fact that the small number of incidents in the target area compared to the precinct control area may have contributed somewhat to the positive success measures. Decreases in the target area may be more magnified than in the much larger precinct, a fact that may be illustrated by the target area's lessened effect when compared with the similarly sized Zone B. To review, dual control areas were employed in order to twice test the Operation Impact strat-

14. In November 2010, 13% (167 of 1,265) of Newark Police officers were terminated due to the city's fiscal crisis (see Star Ledger, 2010). While the official "end date" of Operation Impact was in November 2010, the original design and dosage of the intervention ceased at an unspecified time well before then.

egy, once to the "business-as-usual" approach predominate in the surrounding precinct and once to the less-intensive place-based tactics occurring in Zone B. While this approach makes sense from a philosophical standpoint, readers are cautioned against ignoring the potential influence of the research design.

Despite these limitations, this paper makes important contributions to the policing literature. This study provides support for foot-patrol as a crime-prevention tool, an important finding since earlier studies have predominately found foot-patrol to reduce fear of crime without producing tangible crime reductions. Furthermore, this study illustrates that displacement remains a very real threat to place-based interventions. In light of these observations, police officials should take caution to design foot-patrol operations—and place-based operations in general—in a manner that maximizes crime reduction while simultaneously minimizing the chance for spatial and temporal displacement.

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