

The efficacy of foot patrol in violent places

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Published online: 11 August 2016

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Abstract

Objectives This study examines the effectiveness of foot patrol in violent micro-places. A large urban police department deployed foot patrol in micro-places (hot spots) for a period of 90 days for two shifts each day. Our objective is to determine whether this activity impacted violent crime in these hot spots and whether spatial displacement of crime occurred.

Methods Eight eligible foot beat locations were set by examining crime rates for previous years in order to identify micro-places of high criminal activity. We employed a quasi-experimental design comparing the four treatment to the four control areas, estimating panel-specific autoregressive models for 30 weeks prior to and 40 weeks after the treatment.

Results Time series models revealed statistically significant reductions in violent crime in the micro-places receiving foot patrol treatment, while no such reductions were observed in the control areas. The deterrent effect, however, was short and dissipated

Electronic supplementary material The online version of this article (doi:10.1007/s11292-016-9271-1) contains supplementary material, which is available to authorized users.

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quickly. Control areas did not experience any crime prevention benefit during this time period. No evidence of crime displacement to spatially contiguous areas was detected. *Conclusions* This contributes to the growing body of knowledge that focused police strategies within hot spots impact violent crime. Specifically, the implementation of foot patrol in high crime hot spots led to measurable reductions in aggravated assaults and robberies, without displacing crime to contiguous areas.

Keywords Foot patrol · Violent crime · Policing

Introduction

For decades, the primary method of delivering police services has been random motor vehicle patrol. A complementary method for delivering those services is foot patrol, in which officers are assigned to certain areas where they “walk the beat.” A 2007 survey indicated that 55 % of police organizations were regularly using foot patrols, with larger police departments using it even more often (Reaves 2010), and about 80 % of cities with populations between 250,000 and 999,999 used foot patrol. Early evaluations have often found foot patrols to have a beneficial impact on subjective outcomes, such as citizen satisfaction with the police and fear of crime (Police Foundation 1981; Trojanowicz and Banas 1985), but there is a lack of consensus about its direct impact on measurable outcomes related to crime rates, suggesting that any crime prevention benefit of foot patrol may be short-lived (Cordner 1994). Foot patrol requires a significant investment of personnel hours, and beats must be much smaller than those served by motor patrol, which calls into question the efficiency of foot patrol as a crime prevention strategy. The current study contributes to this line of inquiry by examining the impact of foot patrol activities as a form of situational crime prevention within hot spot micro-places that exhibit a disproportionately high level of serious crime.

Two comprehensive evaluations in the 1980s showed that, although foot patrols may have resulted in slight reductions in crime, their primary effect has been to reduce citizen fear of crime and to shift the nature of police–citizen interactions toward more positive, nonadversarial exchanges. The Newark Foot Patrol Experiment (Police Foundation 1981) examined foot patrol in Newark and 28 other cities, and while no statistically significant changes in crime were observed, analysis revealed improved perceptions of safety and livability, along with enhanced satisfaction with the police. The Neighborhood Foot Patrol, reporting on the Flint study (Trojanowicz 1982; Trojanowicz and Banas 1985), found increases in positive reception of the program and in confidence in police services in patrolled areas. Evaluations elsewhere, however, have found nonsignificant crime prevention benefits (Bowers and Hirsch 1987; Cordner 1994). This may have relegated foot patrol from being a useful policing strategy to, at best, being a supplemental public safety intervention and/or merely a public relations tool.

Recent examinations of the effectiveness of foot patrol have demonstrated some crime prevention benefit when implementing the strategy within smaller geographic areas. In Newark, the deployment of foot patrol led to significant declines in violent crime during foot patrol activities. Foot patrol contributed to a 30 % reduction in overall violent crime counts in the area, but it was noted that

robberies were being significantly displaced to surrounding catchment areas (Piza and O'Hara 2014). The Philadelphia Police Department (PPD) identified micro-places within the city that were considered hot spots for violent crime, particularly for homicides, aggravated assaults, and outdoor robberies. An experimental design was employed, assigning half of the areas to foot patrol, with the other half serving as control or comparison areas. Violent crime in the targeted foot patrol areas declined by 23 %, while no measurable change was observed in the control areas, even when possible spatial displacement was taken into account, and foot patrol treatment still netted a reduction of 53 violent crimes. But it appeared that the initial deterrence benefit of foot patrol decays rapidly, highlighting the importance of identifying optimal treatment dosage and duration. Sorg et al. (2013) examined several phases of the PPD project and noted that the deterrent effects decayed during the project period. This highlights the importance of identifying the appropriate dosage and duration level for the highest return on personnel investment. Support for further exploring crime prevention and deterrence decay can be found within the research on police crackdowns. The observations of Sherman (1990) and Scott (2003) on the influence of crackdowns on serious criminal activity is suggestive that crime prevention benefits may decay even during treatment. Therefore, additional attention is deserved in the examination of the effectiveness of this micro-place approach.

The current study examined the objective impact of a foot patrol experiment in Kansas City, Missouri, by using a quasi-experimental design to examine the effectiveness of the program on violent crime and the possible displacement or diffusion of benefits.

Methods

The Kansas City Foot Patrol Project sought to reproduce the strategy implemented by the Philadelphia Foot Patrol Experiment, which initiated foot patrols in micro-places for the purpose of deterring violent crime, specifically, aggravated assaults and robberies. The Kansas City Police Department (KCPD) staff and university research partners identified target (experimental) and control areas for the foot patrol beats, selecting them based on weighted violent crime data. Staff identified 20 areas that were comprised of residences and businesses that showed potential for the strategy by mapping citywide offenses and calls for service for the three previous years, did not exceed a total of 1.5 linear miles of roadways, and did not overlap. Profiles for each of the areas were created and included density maps using kernel density smoothing highlighted block-level offenses.

A nonequivalent control group design using individual matching was used. The matching procedure involved a small number of individuals (e.g., patrol divisions commanders, the project manager, the Deputy Chief, a sergeant from Planning and Research, and two members of the university research team) who convened to review those reports and select the final target areas. The group scrutinized each of the potential targets with the aim of narrowing the list of candidate areas to eight: four in which foot patrols would be deployed and four to serve as their control (or comparison) areas where no foot patrol officers were deployed.

A quasi-experimental design was used to examine the impact of foot patrol on violent crime. KCPD staff members were reluctant to randomize selection of the treatment and control areas. Police commanders selected a treatment area and then research staff would identify a comparable, matching control area. At the conclusion of the meeting, all materials on the foot beats were collected in an attempt to maintain greater control over the number of individuals who knew the locations and boundaries of the treatment and nontreatment areas. Commanders reassured the research group that, although others might be aware that control areas existed, they would have no knowledge of their exact locations. This was vital to the integrity of the project.

Foot beats were defined as 1.3 to 1.5 miles of surface streets. In addition to examining the impact of implementation on violent offenses in the treatment areas, it is important to examine whether crime is displaced to contiguous geographic areas (see Eck 1993; Gabor 1990; Guerette and Bowers 2009). Catchment (or displacement) areas were assigned about 650 feet (roughly two blocks) from the target areas. This enabled the research team to determine whether displacement of crime or diffusion of benefits was occurring there, and this aided in correcting shortcomings that were identified in foundational foot patrol studies.

Description of treatment

Rookie officers were assigned to eight-hour foot patrol shifts. Officers were informed that foot patrol would be their initial assignment. This assignment would last approximately 90 days, after which time they would be given other permanent patrol assignments. During the academy training that immediately preceded their foot patrol assignment, the officers participated in a four-hour orientation to become familiar with the program's goals. Command staff presented the rationale and strategic plan for foot patrols and provided directions and parameters regarding the foot patrol assignment. Officers would be assigned to specific areas for the 90-day intervention period, and they would engage in foot patrol for the majority of their shifts. They were not to engage in foot patrol beyond the proscribed boundaries. They could only respond to unassigned 911 calls for backup for others assigned within their respective areas. Officers were not specifically directed to engage in a particular strategy while on foot patrol (e.g., problem-oriented policing, enhanced presence, communicating with residents or business owners, pedestrian stops) and, therefore, enjoyed considerable discretion in their day-to-day undertakings. Therefore, our focus is on examining the dosage of foot patrol presence rather than the content of what officers were specifically doing (e.g., Ratcliffe et al. 2013).

Foot patrol beats were operational five days a week, Tuesday through Saturday, 10:00 a.m. to 11:00 p.m. (coinciding with the highest crime and calls for service times of the day), with two shifts overlapping in order to deploy officers continuously during these periods. Over the 90-day treatment period (August 1, 2011 through October 31, 2011), the officers performed 8192 personnel hours of foot patrol.

Data

For the current study, violent crimes between January 1, 2011 and July 31, 2012 were examined and extracted directly from the KCPD records management system. Of the

87,395 reported offenses, data on 3776 aggravated assaults and 2584 robberies were used for this analysis; aggravated assaults and robberies were selected as the foot patrols' targeted violent crime. Of those, 975 offenses were reported from the combined targeted treatment, control, and catchment areas. Using official police data is a potential limitation, since not all incidents of the type being studied may be reported to the police. There is no reason to believe that under-reporting of offenses would be different across the target or control areas or across time; therefore, random error makes meaningful comparisons still possible.

There were four micro-place target areas and four micro-place control areas identified for the study, and a total of three types of areas were defined: treatment, control, and treatment catchment. Data obtained from police records consisted of 83 weeks of crimes known to the police for the period January 1, 2011 to July 31, 2012: the 30 weeks before treatment (T_0), the 13 weeks during treatment (T_1), and the 40 weeks following treatment (T_2) (Table 1). The data were organized by two-week time periods for time-series modeling.

It was hypothesized that foot patrol would correspond with a decrease in the number of violent crimes in the targeted areas, compared with the number of those offenses in those areas prior to implementing foot patrol. The dependent variable was operationalized as the average number of aggravated assaults and robberies within each foot beat, and these means were compared across the time periods T_0 (pre-treatment), T_1 (during treatment), and T_2 (post-treatment). We expected changes in violent crime to be abrupt, immediate, and correspond with the initiation of foot patrol. Additionally, a deeper analysis was conducted to determine the temporal impact within the implementation phase to determine whether any effect was sustained throughout implementation or whether treatment decay occurred. Independent of this, we conducted similar analyses for the control area and expected nonsignificant changes in violent crime. Finally, violent crime trends over the same period were examined in the catchment areas to investigate displacement. Increases in crime in the catchment areas would be indicative of displacement, decreases in crime would indicate diffusion of benefits, and no observed change would indicate neither.

Analysis

Panel-specific autoregressive models were constructed to examine whether differences in the number (counts) of violent crimes during the treatment period were observed when compared to the control areas. Models were estimated to detect crime displacement to spatially contiguous areas. Additionally, an examination of treatment integrity

Table 1 Biweekly observations by time period

Code	Period	Time period	Biweekly observations (no.)
T_0	Pre-treatment	Jan. 1, 2011 – Jul. 31, 2011	15
T_1	Treatment	Aug. 1, 2011 – Oct. 31, 2011	7
T_2	Post-treatment	Nov. 1, 2011 – Jul. 31, 2012	20

was conducted, and bivariate analyses consisting of repeated measures one-tailed directional t -tests were selected due to multiple measurements that were taken for each area, between three different time periods. These are reported in greater detail in the online [Technical Appendix](#).

Figure 1 presents a visual depiction of the biweekly estimate of aggravated assaults and robberies for the four target and four control areas for the time periods before (T_0), during (T_1), and after (T_2) treatment. Visual inspections in crime trends in the target areas revealed that, although the T_1 period had a lower incidence of violent crime, the greatest decline appeared to be in the initial weeks of foot patrol. A sharp dip in the average number of reported aggravated assaults and robberies at the implementation of the treatment (biweek 16) was observed, followed by a rise in offenses. To explore this observation more fully, the treatment periods were disaggregated to early treatment and late treatment in order to detect whether treatment effects observed in the initial analysis were a function of specific times within the foot patrol deployment, as noted in the observations of Sherman (1990) and Scott (2003) on the influence of crackdowns on serious criminal activity, and consistent with the observation of Sorg et al. (2013) about deterrence decay within foot patrol.

Time series estimates were made for a treatment effect in the foot beats relative to their control counterparts controlling for trends in the data, as well as to determine whether harmful displacement occurred. In order to do this, we examined crime counts per biweek for all target and control groups over time by estimating panel-specific autoregressive models of order 1 (PSAR(1)) to explore differences in the number of violent crimes during the treatment implementation compared to times when foot patrol was not implemented. The model is specified by:

$$Y_{it} = \mu + \alpha_i + \rho_i Y_{i,t-1} + X_{it}^T \beta + \varepsilon_{it},$$

where μ represents an overall expected number of crimes in any period without regard to treatment area or the stage of the study, α_i is a coefficient corresponding to an

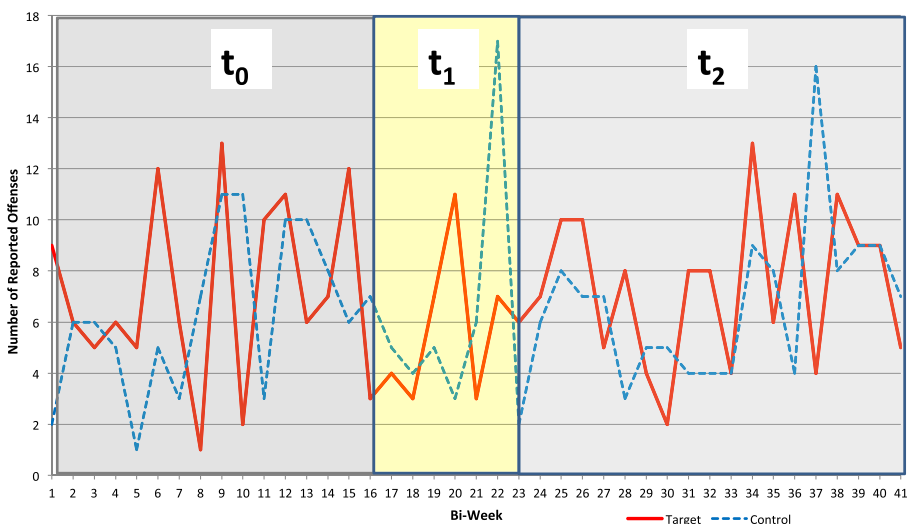


Fig. 1 Violent crime in target and control areas

expected change in the number of crimes in area i without regard to the phase of the study, ρ_i is an area-specific autocorrelation coefficient, X_{it} is a design vector that indicates whether the study is in the pre-implementation, implementation, or post-implementation stage, β is a vector of coefficients that indicate the expected change in the number of crimes based on the stage of the study, and ε_{it} are a set of uncorrelated, normally distributed error terms with a mean of 0. This model improves upon the typical t -test procedures by incorporating a dependence on time among the observations (Lee and Yu 2010). Estimation of this more sophisticated panel design time-series model that simultaneously examines treatment and control areas over time provides a more robust estimate of the effect of foot patrol.

The full foot patrol implementation did not have a statistically significant impact on the number of crimes in each area when examining the entire seven biweek implementation phase. The estimates and corresponding p -values from this model are presented in Table 2. The high p -values indicate that foot patrol had no significant effect on the expected number of violent crimes, and that this did not change after the treatment period ended. The coefficients indicate that, during the treatment period, we expected a decrease of 0.251 in the number of crimes in each area from before the implementation, and after implementation, the expected number of crimes in each area is only 0.084 less than the expected value prior to implementation.

The same model was estimated to detect displacement in the surrounding catchment areas using the same set of predictors, a pair of indicators for whether the treatment was in its implementation, or the observation was after the treatment, which was also used for the catchment areas. The results provided in Table 2 indicate that there was no significant change in catchment area violent crime during the treatment period (0.008; $p > 0.05$); however, a statistically significant decrease was observed in the post-treatment period (-0.610 ; $p < 0.05$).

A subsequent analysis was estimated to examine foot patrol dosage as defined by treatment time. The foot patrol implementation period was split into two time frames, where one time frame was the first 30 days and the other was the final 45 days of implementation. Here, the model indicates that there was a statistically significant impact on the number of violent crimes observed in the early phase of implementation (-1.129 ; $p < 0.001$), but no such effect is observed in the later part of the implementation. This is a strong indication that the effectiveness of foot patrol decreases *during* the implementation of foot patrol, and that the implementation is far more effective in

Table 2 Summary of the results of panel-specific autoregressive (PSAR(1)) estimates

	Target and control areas ^a		Catchment areas ^b	
	Coefficient ^c (s.e.)	p -Value	Coefficient ^c (s.e.)	p -Value
Intercept	1.731		1.983	
Treatment (T ₁)	-0.252 (0.250)	0.424	0.008 (0.378)	0.983
Post-treatment (T ₂)	-0.084 (0.188)	0.632	-0.610 (0.300)	0.043

^a Number of panels: 8, $n = 336$

^b Number of panels: 4, $n = 168$

^c Expected change in number of violent crimes per area

Table 3 Summary of the results of PSAR(1) estimates split into two time frames

	Target and control areas ^a		Catchment areas ^b	
	Coefficient ^c (s.e.)	<i>p</i> -Value	Coefficient ^c (s.e.)	<i>p</i> -Value
Intercept	1.711		1.990	
Treatment (first 30 days)	-1.129 (0.415)	0.001	0.061 (0.488)	0.900
Treatment (last 45 days)	-0.016 (0.370)	0.966	-0.029 (0.460)	0.950
Post-treatment (T_2)	-0.092 (0.174)	0.442	-0.615 (0.301)	0.0424

^a Number of panels: 8, $n = 336$

^b Number of panels: 4, $n = 168$

^c Expected change in number of violent crimes per area

the early phases than in the later stage. In other words, foot beats experienced an increase in crime at a certain point while the treatment was still being implemented. The results are summarized in Table 3.

Finally, we estimated a model to detect changes in violent crime in the catchment areas during the first 30 days and the final 45 days. We conclude that violent crime reductions in the target areas were realized without simultaneous displacement to the geographically contiguous catchment areas.

Conclusion and discussion

This study contributes to a growing body of research indicating that place-based, focused, proactive policing strategies can significantly reduce crime without harmful displacement. Using a nonequivalent control group and a quasi-experimental design with individual matching, eight areas were selected, with four being assigned as treatment areas and the other four being used as control areas. When the implementation period ended, an examination of violent crime revealed statistically significant reductions in crime in the micro-places receiving foot patrol treatment, although the deterrent effect quickly decayed. There is no evidence of violent crime displacement to spatially contiguous areas; in fact, there is some tenuous indication of diffusion of benefits given the significant reduction in violence in the catchment areas around the treatment areas post-implementation.

This quasi-experimental study contributes to our understanding of the effectiveness of foot patrol on violent crime in particular (and contributes to the body of knowledge on hot spot policing strategies in general), but it is important to identify several limitations of the current study. First, the foot patrol project lasted 90 days. It is unclear what the crime prevention benefits would be if these strategies were extended or made a permanent cornerstone of policing in this city. Yet, the evidence presented here suggests that crime reduction was greatest after the initial implementation of foot patrol, dissipating quickly during the project. Understanding the crime prevention benefits of foot patrol as a permanent assignment within hot spots would be beneficial for police managers interested in implementing similar strategies.

Second, as noted earlier, we did not examine the content or quality of policing strategies; rather, we focused on whether the existence of foot patrol yielded a measurable impact on violent crime. Previous research has noted that different strategies employed by officers at hot spots (e.g., offender-focused policing, problem-oriented policing) generates different results (Groff et. al. 2013). Examination of activity logs, offense reports, and nonsystematic observations provided some information on these activities; even so, we are only able to speak of the context in generalities. Officers were not specifically directed to engage in problem-oriented policing, initiate community contacts, make pedestrian stops, etc., thereby enjoying considerable discretion. We speculate that this lack of concrete direction may be common among the 80 % of police departments that reported engaging in foot patrol. But while we are able to draw some conclusions based on foot patrol dosage, we note that further understanding of what activities officers were specifically engaged in would be beneficial.

Third, this study lacked randomization and suffered from small sample sizes. Randomization of experimental conditions would have greatly enhanced the generalizability and validity of the study; however, stakeholders affiliated with the project expressed reluctance in giving up control and independence over foot beat selection. Their desire to implement foot patrol in particular areas of their patrol division outweighed their desire to implement a stronger research design. Also, the selection of the four foot beats to the experimental condition was a function of personnel and staffing levels. Rookie officers were assigned to the foot beat assignment, and it was imperative to have officers work in pairs while covering two shifts per day. The academy class of 24 could only accommodate a treatment size of four foot beats. Therefore, the research and evaluation of this initiative was, in part, influenced by practical limitations, and resulted in methodological compromise. This remains a challenge in action research, and as Greene (2010) has commented, “police agencies might want to know about the effectiveness of a particular strategy, but might be less willing to let researchers impose ‘experimental conditions’ on the assessments” (p. 123).

During the initial phases of the study, foot patrols operating in the experimental area micro-places resulted in statistically significant declines in violent crime as measured by rates of aggravated assault and robbery. The treatment effect quickly decayed, and a rebound or increase in violent crime was reported during the latter half of the project, even though foot patrol was still being deployed. None of those trends were observed in the control areas, further suggesting that the foot patrol stimulus resulted in measurable short-term decreases in aggravated assaults and robberies. This suggests that crime prevention benefits are realized shortly after an initial increase of police presence. Those results also indicated that aggravated assaults and robberies increased later in the treatment phase, which suggests that the crime prevention benefit was relatively short-lived, and that the decay occurred despite the continuation of the treatment.

Several broad conclusions and policy implications could be drawn from our analyses. First, evidence showed that foot patrol in hot spots yielded a short-term reduction in violent crime. Initial analyses comparing the pre-treatment period with the treatment period revealed that violent crime in foot beat areas had declined by 26.4 % ($p < 0.05$). In summary: (1) no prolonged crime prevention benefits were observed in foot beats and (2) evidence suggested crime prevention decay, even during treatment. During the latter part of the treatment period, violent crime rates rebounded in the foot beat areas, doubling from the initial early-treatment low point during the latter eight weeks of

treatment. Violent crime rates had already returned to pre-treatment levels while foot patrols were still deployed. The results presented here indicate that any treatment benefit is relatively short-lived, which is consistent with previous observations (Sherman 1990; Scott 2003; Sorg et al. 2013). The results show a nonlinear impact of foot patrol, in that the immediate deterrent benefit produced by the initial treatment soon dissipated. This initial crime prevention benefit is promising, and the current study adds to previous contemporary research demonstrating that foot patrol, when strategically assigned to micro-place hot spots, even as currently practiced, can have a violent crime prevention benefit, albeit for a relatively short time period.

Second, the above benefits can be realized without threat of spatial displacement. Any incidence of migration of violent crime to contiguous areas in the current study was statistically nonsignificant. Although spatial displacement remains a threat for situational crime prevention and place-based policing strategies, no evidence was found to suggest that implementation of foot patrol had significantly displaced violent crime to contiguous areas.

The results presented here suggest that duration is a useful dimension for understanding the impact of policing strategies. Foot patrol is expensive; it requires the dedication of a significant number of personnel to a relatively small location. In an era of shrinking police budgets, that reality may discourage policy makers from implementing foot patrol within their jurisdictions. The results presented here, however, suggest that foot patrol need not (and should not) be implemented for the long term, but, rather, may be usefully implemented for relatively short periods. In fact, our results indicate that the effectiveness of foot patrol in micro-places is greatest during the first six weeks of treatment, and then diminishes.

Should policy makers elect to implement similar strategies in their jurisdictions, then the findings here suggest that it would be advisable to rotate foot beats regularly, similar to the “back-off” strategy suggested for implementing crackdowns. Using foot patrol in violent crime micro-places for short periods and rotating the locations appears to be the most efficient use of the treatment (Piza and O’Hara 2014; Sorg et al. 2013). The ideal dosage level for foot patrol in micro-places remains unclear; however, the results presented here indicate that the duration should not exceed six weeks. Identification of the appropriate dosage level will yield both effective and efficient crime prevention benefits.

Acknowledgments This project was funded by the Bureau of Justice Assistance’s Smart Policing Initiative program (2011-DB-BX-0016). The points of view expressed within this report are those of the authors and do not necessarily represent the official position or policies of the Bureau of Justice Assistance or Kansas City Police Department.

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