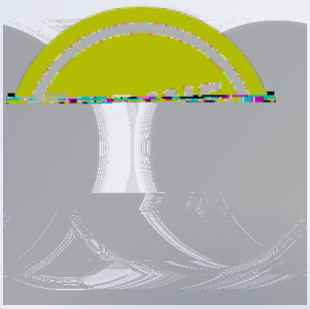
Proactive Police Response in Property Crime Micro-time Hot Spots: Results from a Partially- loc e lin Ran om Controlle rial

Rachel B. Santos & Roberto G. Santos



Journal of Quantitative Criminology

ISSN 0748-4518

J Quant Criminol
DOI 10.1007/s10940-020-09456-8

Springer

Journal of Quantitative Criminology
https://doi.org/10.1007/s10940-020-09456-8

Published online: 21 April 2020

Introduction

A comprehensive review of the research testing proactive policing strategies published by the National Academic of Sciences has recently concluded that place-based strategies are e ective in reducing crime (Weisburd and Majmundaar 2018). The evidence suggests that these strategies produce short-term crime-reduction e ects without spatial displacement and generate di usion of benefits into immediately adjacent areas (Weisburd and Majmundaar 2018). Importantly, most of the studies on which these conclusions are based test strategies implemented in long-term, stable concentrations of crime (Braga et al. 2019).

In practice, police have identified and responded to short-term spatial concentrations of crime as part of their crime reduction e orts for many decades (Austin et al. 1973; Gallager et al. 2017; O'Shea and Nicholls 2003; Santos 2017). Yet, there are few studies that examine police response in short-term crime clusters (Braga et al. 2019), which are referred to here as micro-time hot spots. The National Academy of Sciences committee recognizes this gap and emphasizes the need to examine real-world application of proactive policing strategies that are place-based (Weisburd and Majmundaar 2018). The Society of Prevention Research (SPR), which lays out standards for prevention research more generally, also endorses studies conducted in real-world conditions because they can help set the stage for later implementation and sustainability of e ective interventions on a broader scale (Gottfredson et al.

on the opposite side of the street (Bowers and Johnson 2005), most near repeat burglaries occur within 7 days of the original burglary (Sagovsky and Johnson 2007), and roughly

Identi□cation of Micro-time Hot Spots

For the duration of the experiment, the same two crime analysts used minimum criteria

quasi-experiment's analyses ranged from medium to large—.57 for the theft from vehicle analysis and .77 for the residential burglary analysis (Santos and Santos 2015b, c). Using these estimates as a guide and to increase the power of the current study, we chose the more restrictive requirement and computed the required sample size for a medium e ect size (.50). Thus, for a *t* test of two independent groups with a medium e ect size, the software recommended a sample of 88 per group or a total of 176 cases.

The standard practice of the department was to identify micro-time hot spots with residential burglary, residential theft from vehicle or a combination of both. Thus, all micro-time hot spots that included either or both of these crimes were considered for randomization. This helped to achieve the goal of testing the department's routine practices as well as shortened the time it would take to obtain the minimum sample required.

In practice, there are two distinct types of micro-time hot spots. A "spree" micro-time hot spot is a group of proximate crimes that occur in a very short time period (e.g., within a 24-h period) (Santos 2017). An "ongoing" micro-time hot spot is a group of proximate crimes that occur oracer20(alda)271(y)13(s wit)-8(h a r)2(es)8(ting per)-19(iodbe).9(w)18(en, t)-8(epoendedthmvn(tingfutuar)2(e r)2(lauted(cr)-19(ime,e sf bo)8(t)-8(t types w)18(er)2.1(e coa)TJ0 Tw(- 2017-

hot spots as they had always done, not knowing that some were not being distributed for response.[8]

- Suspicious Person/Vehicle Stops: During patrol, a suspicious person or vehicle was contacted.
- Tra c Stops: During patrol, a vehicle was stopped for a tra c violation.
- Crime Opportunity Cards: During patrol, a vulnerable vehicle or home was identified and a crime opportunity card was left behind.
- Citizen Contacts: During patrol or by detectives, contact with citizens or known o enders occurred.
- Arrests: During patrol or by detectives, arrest was made related to the micro-time hot spot.

In terms of treatment fidelity and accountability, the intranet system was used to facilitate real-time communication among the divisions about the analysis, responses, and status of the micro-time hot spot. Supervisors, managers, and command sta used the system to assign the bulletins to patrol supervisors and detectives, to ensure responses were carried out appropriately, and to close down responses based on department criteria. Lastly, the software has a mechanism for aggregate reporting that was used by managers to report what was done for each micro-time hot spot in weekly and monthly crime reduction accountability meetings.

Measures of E□ectiveness

After a micro-time hot spot was identified, the crime analysts tracked subsequent related crimes in both treatment and control micro-time hot spots by using the same methodology they used for identification. For treatment micro-time hot spots, when another crime was identified, an updated bulletin was posted to the intranet system and responses were mandated for an additional 14 days. The crime analysts continually tracked each micro-time hot spot until there were no additional crimes within 14 days of the last crime and within a .40-mile radius. Once these criteria were met, patrol response was shut down and considered resolved by the department. For research purposes, the crime analysts tracked related crimes that occurred within the .40-mile maximum as well as a .20-mile bu er for 90 days. This information was collected to assess the residual e ect of the treatment. In addition, the .20-mile bu er was used both to ensure that none of the micro-time hot spots overlapped spatially within a 90-day period as well as to analyze spatial displacement.

Four time periods are used to measure the e ect of the treatment on additional crime in the micro-time hot spots. Normally, a bulletin took around a day to publish and responses started the same day for a minimum of 14 days. So, to determine the immediate impact of the response, the first time period considers crimes occurring within 15 days of bulletin publication. In addition, the average response time period was 19 days with a standard deviation of around 8 days, so the second time period measures crimes occurring within 30 days of bulletin publication. To measure residual impact (Sherman 1990), the third and fourth time periods consider crimes occurring within 60 and 90 days of bulletin publication.

Characteristics of Micro-time Hot Spots and Equivalency Tests

Our a priori power analysis required 176 cases. In the 24 months of the experiment, there were a total of 217 micro-time hot spots identified and randomly assigned. In terms of the partial blocking, 71 were spree micro-time hot spots and 146 were ongoing micro-time hot spots. Trickle-flow randomization and responses occurred from June 2013 to July 2015 with 106 micro-time hot spots occurring in the first 12 months and 111 in the second

Table 1 Tests of equivalence in treatment and control groups

All	Treatment N = 114		Control N = 103		*T* value	Sig.
	Mean	SD	Mean	SD	(*df* = 215)	
Initial crime count	2.73	0.79	2.75	0.92	0.168	0.866
Time span	4.74	4.20	4.94	4.21	0.359	0.720
Radius	0.20	0.12	0.20	0.12	0.286	0.775
Spree	Treatment N = 39		Control N = 32		*T* value	Sig.
	Mean	SD	Mean	SD	(*df* = 69)	
Initial crime count	2.67	0.70	2.66	0.94	− 0.054	0.957
Time span	0.77	0.43	0.78	0.42	0.119	0.906
Radius	0.16	0.12	0.16	0.12	0.153	0.879
Ongoing	Treatment N = 75		Control N = 71		*T* value	Sig.
	Mean	SD	Mean	SD	(*df* = 144)	
Initial crime count	2.76	0.84	2.79	0.91	0.199	0.843
Time span	6.80	3.77	6.82	3.78	0.027	0.978
Radius	0.22	0.11	0.22	0.11	0.107	0.915

12 months. There were 105 theft from vehicle micro-time hot spots, 25 burglary micro-time hot spots, and 67 micro-time hot spots that included both crimes.

Descriptive statistics for all 217 micro-time hot spots indicate they ranged from 2 to 6 crimes that occurred between 0 and 14 days which met the department's minimum criteria for identification. The average number of crimes is similar for spree (2.66) and ongoing (2.77) micro-time hot spots. However, the time span is much shorter for sprees (.77 days versus 6.81 days) since sprees happen on the same day or overnight. The average radius is also slightly smaller for sprees (.16 versus .22) since, by definition, they happen in a much closer geographic proximity.

To ensure randomization was successful, independent *t* tests of crime count, time span, and radius were conducted for the two groups and within blocks. Table 1 shows that while there were slightly more treatment micro-time hot spots, there are similar proportions of spree and ongoing micro-time hot spots in each group. That is, for example, sprees made up 34% of the treatment group (i.e., 39 of 114) and 31% of the control group (i.e., 32 of 103). The *t* test results show that none of the equivalency measures is significantly di erent between the groups or within blocks. The medians and standard deviations are similar as well. Thus, the randomization was successful and yielded two comparable groups of micro-time hot spots with similar proportions of spree and ongoing micro-time hot spots.

Description of Response and Dosage

There is a wide range of research on the e ects of directed patrol in long-term hot spots (Braga et al. 2019). Most of the research treats response as a presence/absence condition and assumes an intention to treat (Haberman 2016; Hoover et al. 2016; Gro et al. 2015; Telep et al. 2014a). Police scholars emphasize that, for research to be meaningful

Table 3 Descriptives of response activities

N = 114	Count per micro-time hot spot		Minutes per response	
	Mean	SD	Mean	SD
Patrol no results	71.81	35.48	21.49	2.76
FI stops	3.32	4.43	20.52	6.08
Susp. per./veh. stops	2.82	5.02	16.30	5.40
Tra c stops	2.93	4.28	23.24	5.92
Citizen contacts	11.94	13.30	16.10	4.12
Crime opp. cards	2.92	5.03	12.70	3.67
Arrests	0.72	1.40	41.55	6.74

Figure 1 illustrates the breakdown of response activities by total time spent for all 114 treatment micro-time hot spots. The overwhelming majority of the response time (80%) was spent on directed patrol with no suspicious activity. Contacts with citizens or o enders constituted 9% of the response time, and each of the remaining categories made up 1–3% of the total time.

Table 3 breaks down the response activities by the average number of responses per micro-time hot spot and the average length of each activity. Thus, of an average of 96 responses implemented, about 72 were patrol responses with no suspicious activity; 12 were citizen contacts; 3 were field intelligence stops; 3 were suspicious person or vehicle stops; 3 were tra c stops, and around 1 was an arrest. The average length of a directed patrol response with no suspicious activity was around 21 min. FI stops took about the same amount of time at 20 min. Suspicious person and vehicle stops took about 16 min each, but tra c stops and arrests took somewhat longer at 23 and 41 min, respectively. The least amount of time was spent on crime opportunity cards (13 min), which is expected since no contact was made with an individual.

Where most hot spots policing studies measure dosage in counts and time, these statistics provide insight to the nature of the activities that were carried out systematically for 2 years. Importantly, the majority of response time is spent conducting 20 min directed patrols in the micro-time hot spot area.[9]

Tests of E□ectiveness: Related Crime After 15, 30, 60, and 90 days

Tests of proactive policing responses in long-term hot spots assume that the initial amount of crime in the hot spot is the baseline against which e ectiveness of the response is measured. In contrast, the micro-time hot spot is a short-term flare up, so the amount of crime at initial identification cannot be a baseline measure for how much subsequent crime might occur. Consequently, a pre/post analysis or di erences-in-di erence analysis is not

[9] Note that the time spent by detectives investigating each micro-time hot spot and linking them through evidence, arrests, or property is not included here, because that is di cult to measure and is more reactive to the nature of the information and evidence available for each micro-time hot spot.

appropriate, so our analysis focuses only on the di erences between the groups after the bulletin was published.

We use a combination of straightforward statistics to assess the impact of the response. Independent *t* tests are used to compare the means of the two groups for each of the time periods to determine whether the di erences are significant and not due to chance. We also examine the standardized e ect (Cohen's *d*) in order to understand the relative magnitude of any di erences that are found (Sullivan and Feinn 2012). Since our measures indicate the exact number of crimes that occurred, attention to the absolute e ect provides a real world interpretation of our findings (Sullivan and Feinn 2012).

Table 4 shows the results for the cumulative crime counts 15 days, 30 days, 60 days, and 90 days after the bulletin was published. The *t* tests of the means show that the treatment group has significantly lower crime for each measure below the .001 level. Because these time periods are cumulative, the crime counts increase as the time periods become longer. The absolute e ects also increase with the exception of crime at 90 days. That is, the treatment group has 1.50 fewer crimes in 15 days, which increases to 2.43 in 30 days, increases again to 2.56 in 60 days, but lowers to 2.49 in 90 days. The absolute e ect percent is simply the percent di erence between the two groups' means and provides a relative di erence statistic since the crime counts are lower in shorter time periods. Thus, the largest absolute percent di erence is seen in the first 15 days with the treatment group having 79% fewer crimes than the control group.

The standardized e ect (Cohen's *d*) is computed by dividing absolute e ect by the pooled standard deviation (of both groups together) and provides a standardized measure of e ect. Table 4 shows that the e ect sizes for all four cumulative time periods are over .94, which are large according to Cohen (1988) since they are over .80. The largest e ect of 1.30 is for the 30 day time period, with the 15 day period next with 1.15, followed by 60 days with 1.10, and 90 days with .94.

To dissect the impact within time periods, Table 5 shows the same statistics for each distinct (non-cumulative) time period. The results for the first 15 days are the same as in Table 4 and are significant. The *t* tests also show a significant di erence between the groups in days 16–30 with an absolute e ect of .93 fewer crimes. Notably, 79% less crime occurred in the treatment group in the first 15 days, and 67% less crime within days 16–30. The standardized e ect results show that the first 15 days and days 16–30 have large e ects at 1.15 and .83, respectively. Finally, 17% less crime occurred in the treatment group within days 31–60, but 11% more crime occurred in days 61–90. However, neither of these di erences is significant, and the e ect sizes are very small, .15 and − .08, respectively.

Taking both Tables 4 and 5 together, the results indicate that while the largest e ect occurs at 30 days (1.30), it is the first 15 days after the bulletin is published that accounts for more of the impact (79% less crime and 1.15 Cohen's *d*) than the second 15 days (67% less crime and .83 Cohen's *d*). Also, the large e ect sizes seen in all four cumulative time periods in Table 4 are due to the first two 15-day periods since there are no significant difference between the groups after 30 days, as shown in Table 5.

An analysis of spatial displacement was conducted by considering the number of related crimes that occurred in a .20-mile catchment area around the .40-mile maximum radius for up to 90 days after the bulletin was published. An analysis was done on each of the eight time periods presented in Tables 4 and 5. The absolute crime counts in each were very low, so a statistical comparison by groups was not appropriate. For transparency purposes, there were 5 related crimes that occurred in 4 of the 103 control micro-time hot spots (3.9%) and 7 related crimes in 5 of 114 treatment micro-time hot spots (4.3%). These values are both extremely low and similar in nature, so we conclude that there was no spatial displacement

Table 5 Means, standard deviations, *t*

as a result of the police response which is consistent with findings from most hot spots policing studies (Telep et al. 2014b).

Summary of Results

The treatment tested here is a micro-time hot spots crime reduction strategy in which o cers were required to conduct directed patrol as many times as possible during their uncommitted time for a minimum of 14 days. O cers were directed to spend 10–20 min at a time actively patrolling. Over the 2 year experimental period, the department responded to 114 micro-time hot spots with an average of around five 20-min responses (1 h, 40 min) per day for 19 days. Overall, 80% of the o cers' time was spent patrolling the micro-time hot spots without encountering suspicious activity or making contacts.

Independent *t*

Gro ER, Ratcli e JH, Haberman CP, Sorg ET, Joyce NM, Taylor RB (2015) Does what police do at hot spots matter? The Philadelphia policing tactics experiment. Criminology 53:23–53
Haberman CP (2016) A view inside the ''Black Box'' of hot spots policing from a sample of police commanders. Police Q 19:488–517
Hoover L, Wells W, Zhang Y, Ren L, Zhao J (2016) Houston enhanced action patrol: examining the e ects of di erential deployment lengths with a switched replication design. Justice Q 33:538–563
Johnson D (2013) The space/time behaviour of dwelling burglars: finding near repeat patterns in serial o ender data. Appl Geogr 4:139–146
Johnson SD, Summers L, Pease K (2007) Vehicle crime: communicating spatial and temporal patterns. Jill Dando Institute of Crime Science, London
Johnson SD, Lab S, Bowers KJ (2008) Stable and fluid hot spots of crime: di erentiation and identification. Built Environ 34:32–46
Johnson SD, Summers L, Pease K (2009) O enders as forager: a direct test of the boost account of victimization. J Quant Criminol 25:181–200
Johnson SD, Tilley N, Bowers KJ (2015) Introducing EMMIE: an evidence rating scale to encourage mixed-method crime prevention synthesis reviews. J Exp Criminol 11:459–473
McLaughlin LM, Johnson SD, Bowers KJ, Birks DJ, Pease K (2007) Police perceptions of the long- and shortterm spatial distribution of residential burglary. Int J Police Sci Manag 9:99–111
National Institute of Justice (2018) Program profile: tactical police responses to micro-time hot spots for thefts from vehicles and residential burglaries (Port St. Lucie, Florida). Profile posted on November 13, 2018 to https://www.crimesolutions.gov/ProgramDetails.aspx?ID=626
O'Shea TC, Nicholls K (2003) Police crime analysis: a survey of U.S. police departments with 100 or more sworn personnel. Police Pract Res 4:233–250
Ratcli e JH (2009) Near repeat calculator (version 1.3). Temple University, Philadelphia
Sagovsky A, Johnson SD (2007) When does repeat burglary victimisation occur? Aust N Z J Criminol 40:1–26
Santos RG (2013) A quasi-experimental test and examination of police e ectiveness in residential burglary and theft from vehicle micro-time hot spots. Dissertation. Nova Southeastern University
Santos RB (2017) Crime analysis with crime mapping. Sage Publications, Thousand Oaks
Santos RB, Santos RG (2015a) Examination of police dosage in residential burglary and theft from vehicle micro-time hots spots. Crime Sci 4:1–12
Santos RG, Santos RB (2015b) An ex post facto evaluation of tactical police response in residential theft from vehicle micro-time hot spots. J Quant Criminol 31:679–698
Santos RG, Santos RB (2015c) Practice-based research: ex post facto evaluation of evidence-based police practices implemented in residential burglary micro-time hot spots. Eval Rev 39:451–479
Santos RG, Santos RB (2020) Stratified policing: an organizational model for proactive crime reduction. Rowman & Littlefield, Landham
Santos RB, Taylor B (2014) The integration of crime analysis into police patrol work: results from a national survey of law enforcement. Policing 37:501–520
Sherman LW (1990) Police crackdowns: initial and residual deterrence. Crime Justice 12:1–48
Sherman LW, Rogan D (1995) Deterrent e ects of police raids on crack houses: a randomized controlled experiment. Justice Q 12:755–782
Sullivan GM, Feinn R (2012) Using e ect size—or why the P value is not enough. J Grad Med Educ 4:279–282
Telep CW, Mitchell RJ, Weisburd DL (2014a) How much time should the police spend at crime hot spots? Answers from a police agency directed randomized field trial in Sacramento. Calif Justice Q 31:905–933
Telep CW, Weisburd D, Gill CE, Vitter Z, Teichman D (2014b) Displacement of crime and di usion of crime control benefits in large-scale geographic areas: a systematic review. J Exp Criminol 10:515–548
Wain N, Ariel B (2014) Tracking of police patrol. Policing 8:274–283
Weisburd D, Gill C (2014) Block randomized trials at places: rethinking the limitations of small N experiments. J Quant Criminol 30:97–112
Weisburd D, Majmundaar MK (eds) (2018) Proactive policing: e ects on crime and communities. The National Academies Press, Washington DC
Weisburd D, Gro ER, Yang S-M (2012) The criminology of place: street segments and our understanding of the crime problem. Oxford University Press, New York