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Offender-focused police intervention in residential burglary and theft from vehicle hot spots: a partially blocked randomized control trial

Rachel B. Santos[1] · Roberto G. Santos[1]

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Abstract

Objectives To test an offender-focused police intervention in residential burglary and residential theft from vehicle hot spots and its effect on crime, arrests, and offender recidivism. The intervention was prevention-focused, in which detectives contacted offenders and their families at their homes to discourage criminal activity.

Methods The study was a partially blocked, randomized controlled field experiment in 24 treatment and 24 control hot spots in one suburban city with average crime levels. Negative binomial and ordinary least squares (OLS) regression were used to test the effect of the presence of intervention and its dosage on crime and offender recidivism, and examination of average and standardized treatment effects were conducted.

Results The analyses of the hot spot impact measures did not reveal significant results to indicate that the treatment had an effect on crime or arrest counts, or on repeat arrests of the targeted or non-targeted offenders living in the hot spots. However, the relationships, while not significant, were in a promising direction.

Conclusions The collective findings from all four impact measures suggest that the intervention may have had some influence on the targeted offenders, as well as in the treatment hot spots. So, while the experimental results did not show an impact, they are promising. Limitations include large hot spots, the low case number, low base rates, and inadequate impact measures. Suggestions are provided for police agencies and researchers for implementing preventive offender-focused strategies and conducting studies in suburban cities.

✉ Rachel B. Santos
http://www.radford.edu/content/chbs/home/criminal–justice/staff/dr——rachel–boba–santos.html?cq_ck==1463595283027

Roberto G. Santos
http://www.radford.edu/content/chbs/home/criminal–justice/staff/dr——roberto–santos.html?cq_ck==1463594504107

[1] Department of Criminal Justice, Radford University, P.O. Box 6934, Radford, VA 24142, USA

⊉ Springer

Introduction

Classical criminological research shows that a small number of offenders account for a disproportionate amount of crime (Blumstein et al. 1986). In recent years, police agencies and researchers have sought to develop data-driven methods to identify chronic offenders so that police can implement offender-focused strategies as one of the effective ways to reduce crime (Bureau of Justice Assistance 2012; Jennings 2006; Ratcliffe 2008; Schaible and Sheffield 2012; Telep and Weisburd 2012). Simultaneously, criminologists have concluded that crime reduction strategies that focus on "place" are more effective than those that focus on people (Telep and Weisburd 2012; Weisburd 2015).

Nonetheless, criminology of place research consistently shows that offending is "tightly coupled" to place (Weisburd et al. 2012). Offenders commit crimes relatively close to where they live, and the farther offenders travel from where they live, the less likely they will commit crime (Bernasco and Block 2009; Bernasco and Nieuwbeerta 2005; Hesseling 1992; Rossmo 2000). Yet, there are currently few studies that rigorously examine the effectiveness of offender-focused strategies implemented by police in crime hot spots (Groff et al. 2015).

Consequently, this study is an effort to contribute to both offender-focused and place-based research by testing a prevention-oriented, offender-focused intervention, while also accounting for place. The premise tested here is that, if the offender-focused intervention is implemented for multiple offenders of a particular crime type living in a long-term hot spot of that crime type, there will be a reduction of that crime in the hot spot, since the offenders are likely committing some of their crimes near where they live.

This study attempts to fill another gap in the research by focusing on property crime offenders and hot spots in a suburban environment. Typically, police implement offender-focused strategies for serious, violent offenders living in urban areas (Braga and Weisburd 2012; McGarrell et al. 2010). Also, place-based police research has primarily been conducted in densely populated, high crime urban areas, focused on violent crime or crime generally (Braga et al. 2014; Hinkle et al. 2014). In fact, Hinkle et al. (2014) encourage research in areas other than large urban cities to enhance what we know about the effectiveness of police interventions in different environments.

Weisburd (2010) argues that, when possible, experimental methodology should be used to assess criminal justice interventions, since it is the gold standard of evaluation. While a large number of place-based studies have used random controlled trials (RCT) or quasi-experimental methodologies, there are very few experiments testing the effectiveness of offender-focused police strategies (Abrahamse et al. 1991; Martin and Sherman 1986) and even fewer that test them implemented in hot spots of crime (Groff et al. 2015).

Even though specific offender-focused strategies like focused deterrence (i.e., "pulling levers") show promise according to meta-analyses conducted by Braga and Weisburd (2012), these authors assert that, in order to make more definitive conclusions

about the effectiveness of offender-focused strategies, more experiments need to be conducted (Braga and Weisburd 2014). Therefore, this research utilizes an RCT to test the offender-focused intervention. In summary, this study attempts to fill knowledge gaps in both practice and research by using an RCT to test an offender-focused intervention for non-violent property crime offenders living in property crime hot spots. Furthermore, the city in which the research takes place is a suburban community with a low population density and average levels of crime.[1]

Experimental research of offender-focused police strategies

In recent years, sophisticated methodologies have been developed by researchers, government agencies, and police departments to identify the "worst of the worst" violent offenders, as well as to predict future serious offenders (Bynum and Decker 2006; Jennings 2006; Maryland Governor's Office of Crime Control and Prevention 2013; Smart Policing Initiative 2016b). Even though there have been many evaluations of offender-focused strategies, such as focused deterrence strategies (Braga and Weisburd 2012) and Project Safe Neighborhoods (McGarrell et al. 2010), very few, if any, have used RCT methodology. A comprehensive search of the published research literature reveals only three experiments in the last 25 years.

The first experiment, which took place in 1989 in Phoenix, Arizona, tested warrant service and post-arrest case enhancements (Abrahamse et al. 1991). In the Phoenix Repeat Offender Program (ROP) study, offenders were selected by detectives based on nine criteria: current criminal activity, substance abuse, lifestyle, probation failure, felony convictions in the last 10 years, prior juvenile record, past informant activity, family background, and violent aggressive crimes. Offenders were randomly assigned to treatment or control groups, and, if selected as treatment, their repeat offender status was noted in the state criminal history system and outstanding warrants were served. The subsequent intervention included post-arrest enhanced investigation and prosecution by police detectives and prosecutors who were trained as part of the ROP unit (Abrahamse et al. 1991).

The second experiment was conducted in 1982 in Washington DC, and examined pre-arrest intensive surveillance and warrant service (Martin and Sherman 1986). Offenders were selected if they had outstanding warrants or were considered criminally active. Program officers paired offenders by category (i.e., warrant or criminally active) and flipped a coin to assign one offender to treatment and the other to control. Implemented by 88 designated officers in teams of seven and a sergeant, the intervention consisted of pre-arrest strategies and warrant service. The program began with

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[1] This study was implemented as part of the Bureau of Justice Assistance's (BJA) Smart Policing Initiative (SPI) which funds projects that "seek either to build on the concepts of offender-focused and place-based ("hotspot") policing by replicating evidence-based practices or to encourage exploration of new, unique solutions to public safety problems and criminogenic circumstances" (Smart Policing Initiative 2016a). While this funding created a rare opportunity to conduct an RCT in a suburban environment, the amount of funding available was stretched to perform the prescribed research methodology. Financial considerations meant constraints on the depth of the research methodology, which subsequently affected the depth of the findings. Even so, the unique opportunity and the lessons learned in conducting this study provide insight to both researchers and practitioners.

intensive round-the-clock surveillance, but when the surveillance became unrealistic and unproductive, the squads increased their warrant service, and the officers adjusted their methods for identifying offenders, relying more on requests for assistance and "hot tips" from other police units. Neither the Phoenix nor the Washington DC study measured the impact of the intervention on crime generally or on crime in hot spots, but both showed that the targeted offenders were more likely to be arrested and receive longer sentences.

In 2010 and 2011, Temple University researchers and the Philadelphia, PA Police Department (also a BJA SPI project) implemented an RCT to test three types of police interventions—problem-oriented policing, foot patrol, and offender-focused strategies—in violent crime hot spots (Groff et al. 2015). The researchers identified 81 hot spots through spatial analysis and police commander input. The police commanders assigned hot spots into three groups based on which tactic would be the most appropriate. Using a stratified randomized design with an unequal randomization ratio of 3:1, 20 of 27 hot spots were randomly assigned to groups, resulting in 60 treatment hot spots and 21 controls.

In the 20 hot spots receiving the offender-focused intervention, violent repeat offenders living in the hot spots or offenders suspected of being involved in violent crimes in the hot spots were identified. Unlike the two previous studies, where offenders were randomly assigned to treatment or control groups, in this study, the intervention was implemented for all offenders in treatment areas. The intervention was implemented by a designated tactical operations team who, together with the intelligence analysts, identified and maintained the list of individuals who were thought to be causing the problems in a particular hot spot.

The offender-focused intervention was based on the tenets of intelligence-led policing (Ratcliffe 2008) and focused on pre-arrest intensive surveillance as well as warrant service. The intervention involved contacts with the offenders, including "small talk", serving arrest warrants, regular communication with beat officers, and distribution of the offender list to all patrol officers (Groff et al. 2015: 34). The most frequent tactic used was surveillance of the offenders, followed by aggressive patrol.

The results of the Philadelphia SPI experiment showed that the offender-focused hot spots had 42 % fewer violent crimes and 50 % fewer violent felonies than the offender-focused control areas (Groff et al. 2015). These results were much better than the problem-oriented policing and foot patrol intervention results, which showed no significant difference between the treatment and control areas. The researchers found no evidence of immediate spatial displacement.

Even though there are few experiments, there have been more evaluations of offender-focused strategies implemented by police in hot spots of crime, particularly those using a "focus-deterrence framework" or "pulling-levers policing" (Braga and Weisburd 2012: 325). These interventions target violent gang and drug offenders in high crime areas with a problem-solving approach to increase "risks faced by offenders, while finding new and creative ways of deploying traditional and nontraditional law enforcement tools to do so, such as directly communicating incentives and disincentives to targeted offenders" (Braga and Weisburd 2012: 325). In other words, "focused deterrence strategies seek to change offender behavior by understanding underlying crime-producing dynamics

and conditions that sustain recurring crime problems and by implementing a blended strategy of law enforcement, community mobilization, and social service actions" (Braga and Weisburd 2014: 574).

An important aspect of focused deterrence is the straightforward and overt messages to offenders identifying problematic behavior and the consequences of this behavior. The results of the Campbell Collaboration meta-analysis show that these strategies reduce crime at a significant level (Braga and Weisburd 2012). However, examining a wider body of research on focused deterrence, Braga and Weisburd (2014) argue that more rigorous research should be conducted in order to truly understand the impact of focused deterrence interventions.

The study presented here is situated between the experimental research and the evaluation-based focused deterrence research. It is a partially blocked RCT in which the offender-focused intervention is implemented in hot spots of crime similar to the study by Groff et al. (2015). However, the intervention tested here is more prevention and deterrence oriented. Instead of seeking apprehension or enhanced prosecution, this intervention involves direct communication with offenders and their families about stopping criminal activity and improving their life circumstances (i.e., finding stable employment and improving family relationships). Finally, the study differs from most other offender-focused research by focusing on property crime offenders living in property crime hot spots operating in a suburban city with average levels of crime.

Study background and approach

By combining a place-based approach with an offender-focused intervention using an RCT, the Port St. Lucie, Florida Police Department[2] was able to implement the most rigorous methodology possible, with consideration of budgetary and resource constraints. As Weisburd and his colleagues assert, whenever possible, police evaluation research should look to experimental methodology to achieve the highest level of rigor (Nagin and Weisburd 2013; Weisburd 2010; Weisburd and Hinkle 2012). As Bedford and Mazerolle (2014) argue, not only does an RCT advance the evidence-based policing agenda, but it can also increase the organizational flexibility and learning processes of the police agency itself by, among other things, generating new knowledge. They assert that "new knowledge is potentially disseminated through the organization, and the organization potentially engages in a process of interpretation of this knowledge [which]…can lead to organizational change as a change in the range

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[2] The city of Port St. Lucie, FL has grown significantly over the last 20 years, with a population of about 55,000 in 1990 to over 170,000 in 2014. According to the 2010 census, Port St. Lucie, FL is the ninth largest city in Florida and 140th in the USA. It is the second largest city in Florida and 128th in the US Ain terms of geography at 113.95 square miles. Its UCR Part I Crime Rate per 100,000 in 2014 was 1589, which is lower than the rate for the USA of 2962 (FBI 2016). It is considered a large police agency with 224 authorized sworn positions and 65 civilian employees (November 2015).

of potential organizational behaviour or actual organizational change" (pp. 412–413).[3]

This article presents the quantitative results of the RCT. The primary results of the process evaluation and offender and family interviews that were conducted are mentioned where appropriate, but this article does not fully describe those results, since they are out of the scope of this article and warrant separate publications.[4]

Methodology

The methodology includes four distinct activities that took place to carry out the RCT: (1) hot spot identification, (2) partially blocked random assignment, (3) offender identification and analysis, and (4) intervention implementation.

Hot spot identification

The guiding premise of the intervention is that offenders are more likely to commit crimes relatively close to where they live, and the farther offenders travel from where they live, the less likely they will commit crime (i.e., distance decay) (Bernasco and Block 2009; Bernasco and Nieuwbeerta 2005; Hesseling 1992; Rossmo 2000). Specifically, offenders prefer to commit these crimes in familiar neighborhoods that are easier to move around without being seen as a stranger (Brantingham and Brantingham 1981; Rengert and Wasilchick 2000) and where they have committed crimes before (Bernasco 2010; Bernasco et al. 2015). More specifically, Ackerman and Rossmo (2015) found in their recent study using arrests in Dallas, TX, that the median "residence-to-crime" distance of burglary offenders is 2.5 miles. In their discussion of previous research, they note that most research on residence-to-crime distances has found that offenders' residences are within one mile of their crime locations.

However, crime pattern theory (Brantingham and Brantingham 1981) and research testing the theory suggest that there is a "buffer zone" or "safety zone" around the criminal's residence where he or she refrains from committing crimes, particularly predatory crimes, such as burglary and robbery (Rossmo 2000). While offenders choose to commit crimes in areas where they are comfortable, they choose not to commit crimes too close to their own homes because of the risk of being recognized and caught (Brantingham and Brantingham 1981). As the distance from their own house increases, the number of potential targets also increases (Rossmo 2000). These

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[3] There are many researchers who argue that an experimental methodology is not always the best approach in evaluating a police strategy focused on a crime problem (Knutsson and Tilley 2009). In this study, conducting an experiment did not change the agency's purpose or fundamental goal to implement the offender-focused intervention. However, Knutsson and Tilley (2009) as well as Hinkle et al. (2014) recommend that researchers should use a mixed methods approach, especially in low crime or smaller cities. Notably, the experimental methodology used here was supplemented by a process evaluation and interviews of offenders contacted by the detectives and their families (Santos and Santos 2014).

[4] Those future publications will provide in-depth presentations and analyses of offender–detective interactions, offender and family member interviews, the role of the crime analyst in both the research and the intervention, and the systematic implementation and accountability processes (i.e., process evaluation) within the intervention.

research findings suggest that the size of the offender-focused intervention areas should not be "too far" from the offender's residence, but also not "too close".

The hot spots were identified reflecting on the previous findings from the residence-to-crime research paired with the qualitative makeup of the neighborhoods in this city and the number of reported crimes in the hot spots. Census blocks were combined to create the boundaries of the hot spots, and allowed for the selection of residentially zoned blocks (i.e., commercially zoned census blocks were not included). Census blocks also provided information about population that was useful for the equivalency analysis of the treatment and control group assignments.

In the end, the average size of the 48 identified hot spots was about 0.60 square miles, with an average of around 3200 residents, which is larger than hot spots identified in studies that tested place-based police strategies. In those studies, the research focused on violent crime in hot spots typically defined as a single location, a block face, or a street block (Braga et al. 2014; Weisburd et al. 2012). However, as previously mentioned, it was important to define property crime hot spots large enough to create a buffer around the offenders' homes situated in a suburban area but not larger than the average residence-to-crime distance of offenders.

Clusters of census blocks were merged together so the hot spots were consistent in square mileage and numbers of reported crimes. That is, environmental factors such as interstates, major roadways, canals, lakes, and rivers were used to determine hot spot borders in a way that created informal neighborhoods. The crime analyst's knowledge of the geographic and social environment of the city was important in defining these boundaries. One year of residential burglary and residential theft from vehicle reports (March 1, 2012 to February 28, 2013) were aggregated by census block, and each cluster of blocks (i.e., hot spots) had a least 15 crimes.

Figure 1 shows the final 48 hot spots, which is the maximum number of hot spots that could be identified in the city based on the criteria (i.e., at least 15 crimes, around 0.60 square miles, residential areas, with identifiable boundaries and neighborhoods).

Partially blocked random assignment of hot spots

The hot spots were assigned through a partially blocked randomization design which is recommended by Weisburd and Gill (2014) for experimental studies with fewer than 50 cases. They emphasize that creating blocks for randomization is based on the researcher's knowledge of the data and should seek an equitable distribution of cases based on key attributes.[5]

Since the hot spots were initially selected based on their similar size and population, these variables could not be used to create the blocks. Instead, a rate was used for blocking that considered the study's two key data sources—the crime type impact measure and the type of offender who could be selected for the intervention. A rate was constructed by dividing the number of residential burglaries and residential thefts from vehicle crimes over 12 months by the number of selected offenders living in the hot

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[5] Even though blocking can improve randomization in studies with low sample sizes, Weisburd and Gill (2014) warn against constructing too many blocks, which reduces the degrees of freedom. They also warn against matching cases one to one in pairs (i.e., a fully blocked design) in studies with low sample sizes, as each pair becomes an individual block, which also reduces the degrees of freedom.

spot during that same period of 12 months. The offenders were identified as adults and juveniles who had been arrested for residential burglary or theft from vehicle in the study city and/or in the surrounding county in the previous year, as well as individuals on felony probation.

Arrests of the offenders could have been for crimes anywhere in the jurisdiction and surrounding county, and those on felony probation may have committed their crimes anywhere. Thus, this ratio does not reflect clearances by arrest of the reported crimes since the offender and crime data were not matched to determine if these offenders were arrested for these crimes. The crime per offender rate provides a relative comparison at the hot spot level and serves as an indirect way of estimating offender activity (i.e., hot spots with higher ratios have more crimes per offender and vice versa).

The crimes per offender values ranged from 0.47 to 5.50, with a mean of 1.51, median of 1.21, and a standard deviation of 0.95. The statistics indicate an overall average ratio of three crimes to two offenders and, in most of the hot spots, there were more crimes than offenders. The natural breaks of the distribution resulted in three distinct groupings:

- Low crime per offender rate: range = 0.47 to 1.00; $n = 10$
- Medium crime per offender rate: range = 1.08 to 1.88; $n = 26$
- High crime per offender rate: range = 2.00 to 5.50; $n = 12$

Half of the hot spots in each block were randomly assigned as either treatment or control areas, which resulted in six high crime per offender hot spots, 13 medium crime per offender hot spots, and five low crime per offender hot spots, for a total of 24 in each group. Figure 1 depicts the hot spots within the city's boundaries. Table 1 depicts independent *t*-test results comparing the treatment and control area means of crimes per offender, geographic size, as well as population and housing density obtained from the 2010 census block data. The results show that none of the means is significantly different, providing confidence in the randomization process.

Offender identification and analysis

Similar to the study of Groff et al. (2015), all offenders identified in the treatment areas who met the criteria received the intervention (i.e., "targeted offenders"). Initially, only offenders arrested for residential burglary and theft from vehicle crimes were identified. Upon discussion, the sample was extended to include convicted offenders on active felony probation with a prior burglary arrest and non-violent convicted offenders on felony probation for drug offenses. A meta-analysis by Bennett et al. (2008) indicated that drug users were three to four times more likely than non-drug users to commit burglary as well as other types of crime. Thus, it was thought that these offenders might also be committing the target crime, since they had either done so in the past or may have committed property crime to support their continued drug use and may have a proclivity to do so in the future. Doing this had the added benefit of increasing our offender sample size and strengthening the methodology.

Once the list of offenders was compiled, the analyst verified each individual's home address through official databases. During this process, individuals were removed if they were not living in the treatment areas (i.e., arrest information may have been
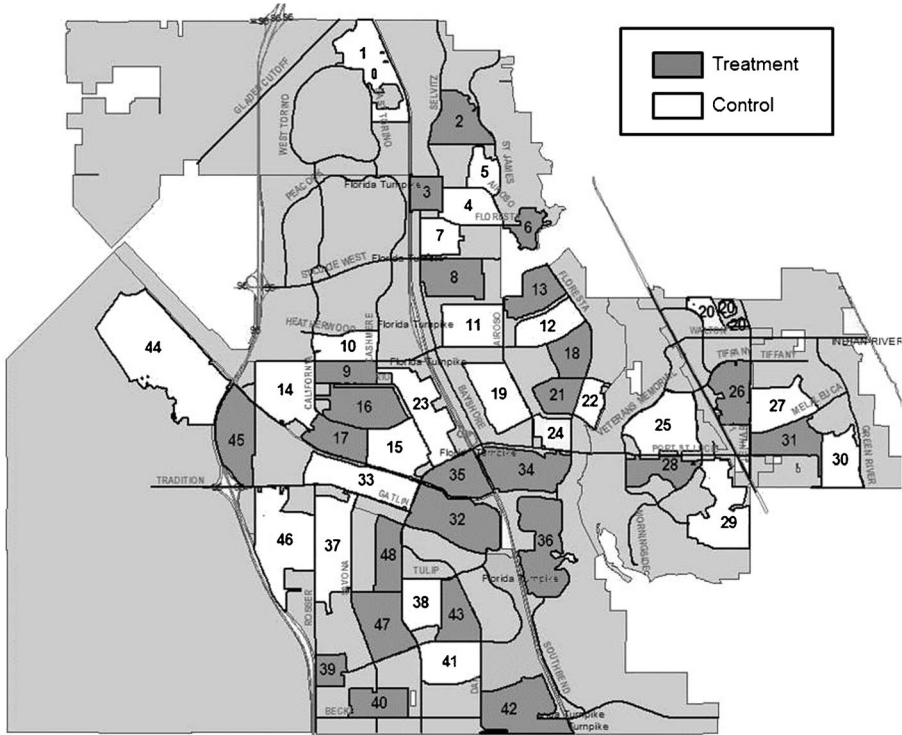
Fig. 1 Map of experimental hot spots

inaccurate) or were incarcerated. As a final confirmation, the program detectives went to each individual's listed home address to check that the person did, in fact, live there. If not, that person was removed from the study, unless he or she lived in another treatment area.

The crime analyst then provided the detectives with a standardized packet of analysis, called a "criminal résumé," which contained a comprehensive criminal and corrections history; any contacts made with the police department, as a victim, a witness, in a call for service, or in a traffic citation; a list of the targeted offender's associates; residence history; credit history; history with city services (e.g., utilities, code enforcement); and social media activity (e.g., Facebook, Twitter, Instagram). The

Table 1 Equivalence analysis of random assignment

	Treatment areas ($n = 24$)		Control areas ($n = 24$)		T-value	Sig.
	Mean	Std. deviation	Mean	Std. deviation		
Crime per offender	1.63	1.16	1.40	0.70	−1.07	0.29
Area (sq. miles)	0.58	0.23	0.73	0.44	−1.43	0.16
Population	3026.58	1068.05	3471.38	1395.98	−1.24	0.22
Housing density	2304.99	1071.67	2350.06	927.48	−0.16	0.88

criminal résumés of all targeted offenders living in a particular hot spot were put together in a "hot spot book," which was updated throughout the study by the crime analyst, who tracked each targeted offender's arrests, residential addresses, and other activity throughout the intervention period.

Importantly, individuals meeting these same criteria were not identified for control areas. Based on the timeline of the grant and limited crime analysis resources, there was not enough time for the crime analyst to select and verify control offenders. Doing this may have compromised the integrity of the control group, since the detectives would have had to verify their residence location, possibly alerting the offenders to extra police attention. Also, carrying out the intervention for 9 months would have required the crime analyst to actively collect real-time data of arrests, corrections status, and other contacts with the criminal justice system for each control offender, which was not possible with the resources available. Conducting an RCT provides many benefits, but one unfortunate consequence of this specific methodology was that it did not allow for a true experimental comparison of offender-level recidivism.

Offender-focused police intervention

In a recent article introducing an evidence rating scale for systematic reviews, Johnson et al. (2015) emphasize that, for research to be meaningful to the real world, not only must researchers examine crime prevention interventions that are realistic and practical, but for replication purposes, they must also try to fully describe how the intervention is carried out as well as its practical rationale. Thus, the first part of the "Results" section provides an analysis of how the intervention was carried out.

The offender-focused intervention implemented was developed by the agency itself based on several important considerations. The first was that property crime hot spots and property crime offenders would be the focus of the intervention, since this city has very low violent crime [i.e., 2498 Part I property crimes and 243 Part I violent crimes in 2014 (FBI 2016)]. As with most suburban cities, residential burglary and residential (not commercial) theft from vehicle were identified as key concerns for crime prevention.

Second, the agency conducts problem solving (Goldstein 1990) and has a system for implementing situational crime prevention (Clarke 1980) responses to its problems (Boba and Santos 2007; Santos 2013). This intervention was based on situational crime prevention concepts, as it sought to influence the offender's perception of risk of being caught (Cornish and Clarke 1986), unlike the previous offender-focused studies that sought to increase the offender's likelihood of arrest and enhanced prosecution. Informed by the problem analysis triangle (Center for Problem-Oriented Policing 2016a) and the idea that handlers have the ability to influence offenders' criminal behavior, the intervention was also directed towards the offender's family members to encourage them to guide the offender away from criminal activity.

Third, the intervention needed to be implemented and sustained with a realistic amount and type of police resources. Most offender-focused strategies require a significant amount of resources and/or individuals with specialized skills and/or training. For example, the Phoenix project had specifically trained ROP detectives and prosecutors (Abrahamse et al. 1991). Thus, this was a test of an intervention that would be implemented with normal police resources and within the scope of

work and responsibility of the two assigned detectives, with no additional training or resources.

The fourth consideration was replication of the intervention. As a BJA SPI project, sustainability was a high priority, since strategies that are found to be effective in the research setting are sometimes not effective, and unsustainable, in a practical setting (Joyce 2012; White 2014). All choices about the implementation were made considering sustainability in this agency and applicability in other agencies, which included identifying hot spots, analyzing offender backgrounds, collecting data, considering the workload of the detectives, and incorporating a system of accountability used to ensure treatment fidelity. Lastly, it was important to the agency and its relationship with the community that the offenders were treated with respect and given the benefit of the doubt in the contact with police personnel. The detectives took a helpful and collaborative approach with offenders as well as their families. Importantly, even though the detectives seemed "nice" at times, they consistently emphasized that the police were aware of offenders' criminal behavior and that it should not continue.

Unlike other offender-focused strategies that interact with offenders on the street (Groff et al. 2015), in jail, in the courtroom (Abrahamse et al. 1991; Martin and Sherman 1986), at the police department, and/or in other public forums (Braga and Weisburd 2012), these offenders were contacted where they lived. The goal was to influence the offenders' perceptions of their risk of being caught committing crimes near where they lived by strengthening formal surveillance and reducing anonymity of the offenders, two important situational crime prevention techniques (Center for Problem-Oriented Policing 2016b). Through the contacts, the offenders understood that the detectives could recognize them, their family, and associates, knew where they lived, would be driving in their neighborhoods, and may visit their homes at unpredictable times. By visiting the offenders in their homes versus other places where family members might not be present, the detectives could interact with family members to encourage them to be more effective handlers by urging the offenders to change their patterns of behavior (Center for Problem-Oriented Policing 2016a).

To carry out the intervention, each of the two detectives was assigned 12 of the 24 treatment areas. In the first interaction with each offender and/or family member, the detectives were not accusative but asked in a friendly way whether the offender had any information about crimes that recently had occurred in the area. After the first contact, the detectives conducted curfew checks on the offenders with correctional sanctions, which was the primary mechanism for regular and legitimate contact with an offender. If there was a curfew violation, the detectives' primary goal was to talk to the offender and/or the family to reinforce the importance of following their probation and doing the right thing. However, the detectives typically did not arrest for the violation or call the probation officer unless it was necessary to reinforce the importance of following their sanctions.

The home visits occurred primarily in the evening and on random days during the week. The detectives wore agency polo shirts with their badges and guns and drove unmarked, but distinguishable, police vehicles. For safety, the two detectives went together to all home visits, which ensured consistency in their discussions and tone of the contacts. Other contacts were made over the phone with offenders, family members, and other criminal justice professionals, such as probation officers, prosecutors, and judges, to discuss the offender's status when applicable.

Length of the study and treatment fidelity

In July 2013, the crime analyst began providing offender hot spot books to the detectives, and all in-depth analysis of each targeted offender was completed by October 2013. The detectives conducted contacts on a regular basis in all 24 treatment hot spots for all targeted offenders from October 2013 to June 2014 (9 months). They were also responsible for implementing all proactive offender-focused contacts by themselves unless they asked for specific assistance from other members of the agency (e.g., patrol, gang unit). If the targeted offender was arrested reactively by the agency or another jurisdiction, the crime analyst informed the detectives and recorded the arrest and any changes in correctional status in the project database. The detectives and the research project coordinator led the intervention and other areas of the agency assisted with contacting targeted offenders only when specifically requested by the program detectives. This maintained experimental fidelity, assuring the intervention was implemented only in the treatment areas and for the targeted offenders.

To ensure the treatment fidelity, weekly accountability meetings of the detectives, the crime analyst, and the research project coordinator were conducted to discuss the nature of the intervention and any issues that arose. As the intervention progressed, the meetings were conducted less often, since the roles and responsibilities became systematic. The intervention, which was relatively small in scope, was implemented without significant impediments. Keeping the project focused in one unit made it much easier to maintain consistency and ensure high standards were sustained.

Results

This section begins with a description of the targeted offenders as well as the nature and number of contacts with detectives. Following that, the definition and descriptive statistics are provided for the four impact measures. Finally, the analysis results from the negative binomial regression, ordinary least squares (OLS) regression, and average and standardized treatment effect are described.

Description of targeted offenders

During the 9-month intervention period, the detectives contacted the 151 targeted offenders a total of 1143 times. Table 2 shows that 70 % of the targeted offenders contacted were white, 27 % were black, and 3 % were Hispanic. Most of the targeted offenders were between 18 and 35 years of age (70 %) and were adults (88 %) and male (88 %).

Description of the intervention

Table 3 shows the measures of central tendency for the number of targeted offenders and individual contacts in the treatment areas, as well as the number of contacts, months of contact, and contacts per month per targeted offender. There was an average of around 47 contacts and six targeted offenders in each hot spot, with 17 of 24 (71 %) hot spots having between three and eight targeted offenders. On average, the detectives

Table 2 Targeted offender characteristics

($n = 151$)	Count (%)
White	105 (70 %)
Black	41 (27 %)
Hispanic	5 (3 %)
Under 18 years	18 (12 %)
18 to 25 years	72 (48 %)
26 to 35 years	34(22 %)
36 and over	27 (18 %)
Male	133 (88 %)
Female	18 (12 %)

contacted each offender between seven and eight times for an average of 5 months, resulting in one to two contacts per month. Some targeted offenders were not contacted each calendar month, but all targeted offenders were contacted throughout the entire 9-month intervention period unless they were incarcerated or moved out of the hot spot.

Table 4 illustrates a breakdown of the initial purpose of the detectives' contacts. The majority (83.46 %) of the contacts was for curfew checks and face-to-face follow-ups at targeted offenders' homes. The difference between these categories is that a curfew check could only be done for targeted offenders with formal sanctions and was done at night or after the curfew time, whereas face-to-face follow-up could be done with any of the targeted offenders at any time.

The face-to-face contacts had the sole purpose of interacting and talking to the targeted offender whether or not they had any sanctions. The detectives, when possible, spoke with family members and used discretion when violating targeted offenders' probation for breaking curfew. Incarceration follow-up consisted of the detectives checking on the targeted offenders' criminal history, correctional status, and possible warrants. Arrests by detectives were contacts in which the detective set out to arrest the targeted offender versus arrests occurring during a contact for another purpose. Unintended contacts included detectives seeing the targeted offender in public, for example, at a grocery store or gas station, and having a conversation.

The results of the contacts are shown in Table 5. It was important to document contacts even when no one was home, since the detectives' presence in the targeted

Table 3 Number of contacts, targeted offenders, and months of contact

	Per hot spot ($n = 24$)		Per targeted offender ($n = 151$)		
	Contacts	Targeted offenders	Contacts	Months of contact	Contacts per month
Minimum	13.00	1.00	1.00	1.00	0.33
Maximum	109.00	13.00	42.00	9.00	6.00
Mean	47.57	6.29	7.57	5.07	1.42
Std. deviation	28.05	3.34	7.14	2.81	0.84
Median	35.50	6.00	6.00	5.00	1.11

Table 4 Initial purpose of detective contact

Type of contact	Frequency	% of total
Curfew check	488	42.69 %
Face-to-face follow-up	466	40.77 %
Incarceration follow-up	182	15.92 %
Unintended	4	0.35 %
Arrest by detectives	3	0.26 %
Total	1143	100.00 %

offenders' neighborhoods could have still influenced the offenders' perception of risk as well as affected other offenders living in the hot spot. For example, an offender may have just not answered the door, or neighbors and friends might have seen the detectives at the door or driving through the hot spot. Table 5 shows that 22.77 % of the detectives' attempts were unsuccessful, but 78.84 % of the contacts were successful interactions with the targeted offender and/or the family members. Lastly, although the detectives set out to make an arrest three times as noted in Table 4, other contacts also resulted in eight additional arrests by the detectives, only six of which were for curfew violations. Thus, out of 488 curfew checks, only 1.22 % resulted in an arrest, which suggests that curfew checks were used as part of the preventative approach and were not punitive.

A concern noted by Sorg et al. (2014) about implementing interventions in hot spots is the adherence to hot spot boundaries. The researchers explained that officers tend to identify their "active" boundaries larger than their delineated boundaries. In this study, because there were two detectives implementing the intervention at the targeted offenders' home addresses that were physically located in the hot spots, it was easy to monitor their activity and there was no reason to go beyond the hot spot boundaries, so this was not considered a large concern for treatment fidelity.

Table 5 Results of detective contacts

Type of contact	Frequency	% of total
No contact made	212	22.77 %
Face-to-face at home	567	60.90 %
Face-to-face family	167	17.94 %
Incarceration follow-up	140	15.04 %
Arrest by other	17	1.83 %
Contact with PO	13	1.40 %
Arrest by detectives	11	1.18 %
Arrest by PD	6	0.64 %
Telephone	5	0.54 %
Face-to-face at work	2	0.21 %
Face-to-face PD	2	0.21 %
Face-to-face hospital	1	0.11 %
Total	931	100.00 %

In summary, the targeted offenders were primarily white men between 18 and 35 years old who had been arrested for committing a burglary or theft from vehicle in the previous year or were on felony probation for drugs or with a previous burglary arrest. The detectives contacted around six offenders in each hot spot and interacted with each offender between one to two times per month over the 9-month intervention period. The detectives were in each hot spot about four to five times per month, which included driving in the neighborhood and/or contacting the offenders or families directly. Finally, the majority of the contacts involved the detectives successfully interacting with the targeted offenders and their family members through face-to-face visits at their homes.

Description of impact measures: crime, recidivism, arrests, and repeat arrests

Four experimental impact measures are used in combination to evaluate the effectiveness of the intervention: (1) the count of residential burglary and theft from vehicle reported crimes in each hot spot (HSCrime), (2) the count of all arrests for each targeted offender (OFFRecidivism), (3) the count of burglary, theft, and drug offense arrests in each hot spot of individuals who live in the hot spots (HSArrests), and (4) the ratio of burglary, theft, and drug offense arrests per individuals arrested who live in the hot spot (HSRepeatArrests). The following is a description of each measure as well as a comparison of the treatment and control areas' means. The goal of the intervention was to impact both hot spot level crime and offender recidivism. To overcome the single measure insufficiencies noted below, conclusions about the intervention's effectiveness come from the findings of all four measures as a collective.

The guiding premise of the intervention was to discourage and deter targeted offenders from committing crime. If the intervention was effective, then the targeted offenders would have desisted from committing crimes generally as well as near where they lived. By targeting multiple offenders who live in high crime hot spots, if the intervention is effective, there should also be a reduction in reported crime in those hot spots. Thus, the first impact measure, HSCrime, examines the amount of crime in the hot spots. The data for this measure were obtained from the agency's records management system (RMS) and are the counts of reported residential burglaries and thefts from vehicles in each hot spot. This measure assesses the effect of the intervention on the entire hot spot and not on individual offenders.

A limitation of HSCrime is that it represents crime reported to the police, not all crimes that occurred, because the National Crime Victimization Survey has shown that property crime is only reported to police about one-third of the time (Truman and Langton 2014). Another limitation is that, because property crimes are rarely (between 10 and 15 %) cleared with arrest (FBI 2016), the crime data do not allow for the unpacking of any effect by offender (i.e., which crimes were committed by the targeted offenders). Lastly, even if an individual targeted offender's criminal activity is deterred, the overall amount of crime may not be lower because offender replacement may occur (Barr and Pease 1990).

Figure 2 is a descriptive chart of HSCrime for both treatment and control areas by month for the pre-test period (October 2012 through June 2013) and the post-test (i.e., "intervention") period (October 2013 to June 2014). As visual inspection shows, both treatment and control areas appear to have less crime in the intervention period.
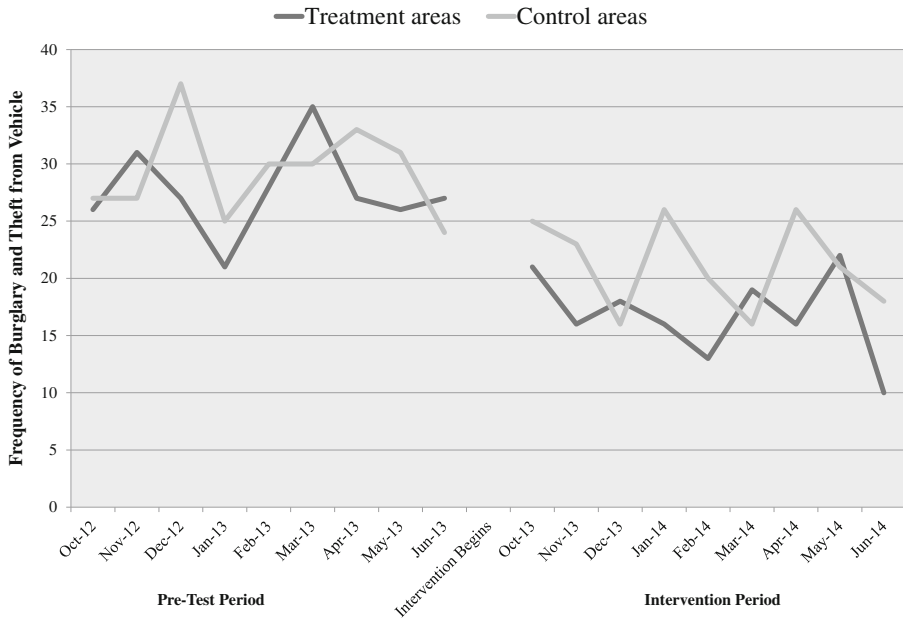
Fig. 2 Burglary and theft from vehicle crime totals by month

The remaining three impact measures come from arrest data, which also has its limitations. In general, arrest data can underestimate offenders' criminal activity because offenders are often not caught or arrested after committing a crime (the crime is not solved). It can overestimate offenders' criminal activity because individuals can be arrested for crimes they are not guilty of committing. To examine whether the targeted offenders were, in fact, deterred from committing crimes, the second measure, OFFRecidivism, is a count of each of the targeted offenders' arrests no matter the type of crime or where the crime/arrest occurred (i.e., all their criminal activity known to the criminal justice system). The targeted offenders' criminal histories were compiled as part of the initial analysis process, and this information provided a count of arrests for the pre-test period. For arrests occurring during the intervention period, the crime analyst tracked and documented all arrests in real time. The obvious limitation of this data is it does not represent the offender's actual criminal activity, only activity they are arrested for. And more generally, as noted in the "Methodology" section, offenders living in the control hot spots were not identified or tracked through the intervention period.

The final two impact measures come from arrest data aggregated by hot spot, not by individual. These measures are not meant to proxy an analysis of treatment and control offenders, but provide a more general look at the impact of the intervention in the hot spots. That is, while the purpose of the intervention was to deter the targeted offenders, it may have also had a secondary impact on individuals who potentially committed property crimes and lived in the treatment areas. The presence of the detectives in the hot spots for home visits and related contacts with multiple offenders' families and friends about the program could have had a prevention effect in the hot spot as a whole.

The first of the two general arrest measures is the count of arrests for burglary, theft, and drug offenses made within the city or the surrounding county by the individuals who reported living within the hot spots at the time of their arrests (HSArrests). Only arrests for burglary, theft, and drug offenses were counted since they are akin to the crime measure and targeted offenders were initially selected based on their arrests and convictions for these types of crimes.

The second measure is the HSArrests measure divided by the number of unique individuals who were named in those arrests (HSRepeatArrests), reflecting the level of repeat arrests of these arrest types of individuals living in the hot spots. For example, if there were 50 arrests of 30 unique individuals within a hot spot, the HSRepeatArrests value would be 1.67 arrests per person. Because the value of the denominator is dependent on the numerator, the ratio can never be lower than one; that is, an individual cannot be counted in either measure if they were not arrested. This is different to the OFFRecidivism measure, in which each individual is tracked throughout the intervention period, whether or not they had subsequent arrests. Also, HSArrests and HSRepeatArrests include arrests of the targeted offenders to ensure that all arrests that meet these criteria are included in the hot spot analysis. However, because there were no control offenders identified, the targeted offender arrests are not disaggregated in the analysis to ensure that the treatment and control hot spots are comparable. This is why these two measures do not replace OFFRecidivism but are examined to determine the impact of the intervention on arrests and on repeat arrests of individuals who live in the hot spots, and not its impact on individual criminal activity.

Table 6 contains the means and standard deviations for the three measures for the hot spot unit of analysis ($N = 48$) and the one measure for the offender unit of analysis ($N = 151$). The means and standard deviations for each measure are shown for the pre-test period (October 2012 through June 2013), which are the baseline values used in the multivariate analyses. The intervention period (October 2013 through June 2014) for each measure is the dependent variable that assesses the intervention's effect.

Table 6 Means and standard deviations of impact measures

	Control areas (n = 24)		Treatment areas (n = 24)		Total (n = 48)	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Unit of analysis: hot spot						
HSCrime: pre-test period	11.00	6.05	10.33	4.10	10.67	5.13
HSCrime: intervention period	8.13	5.40	6.29	4.01	7.21	4.80
HSArrests: pre-test period	4.67	3.45	5.38	3.71	5.02	3.56
HSArrests: intervention period	11.29	8.32	9.58	6.39	10.44	7.39
HSRepeatArrests: pre-test period	0.99	0.33	1.18	0.43	1.08	0.39
HSRepeatArrests: intervention period	1.29	0.50	1.11	0.15	1.20	0.37
Unit of analysis: offender			(n = 151)			
OFFRecidivism: pre-test period	–	–	1.54	1.22	–	–
OFFRecidivism: intervention period	–	–	0.49	0.76	–	–

For the pre-test periods, there was no evidence of statistical differences between the treatment and control areas for any of the measures: HSCrime (t-value = −0.45; SE = 1.49; p = 0.65), HSArrests (t-value = −0.69; SE = 1.03; p = 0.50), or HSRepeatArrests (t-value = −0.19; SE = −1.73; p = 0.09). This suggests that the random assignment created comparable groups of experimental and control conditions.

Importantly, there were significant differences within the treatment and control areas between the pre-test and intervention periods for all but one measure. However, the differences were not all in the same direction. For HSCrime, both the treatment (t-value = 5.77; SE = 0.70; p < 0.00) and control areas (t-value = 2.50; SE = 1.15; p = 0.02) resulted in significantly lower counts of crime, with a reduction of 39 % and 26 %, respectively. In contrast, HSArrests resulted in an increase in arrest counts of 78 % in the treatment areas and 140 % in the control areas, which is significant for both (treatment areas: t-value = −3.34; SE = 1.26; p < 0.00 and control areas: t-value = −4.56; SE = 1.45; p < 0.00). For HSRepeatArrests, the control hot spots resulted in a 30 % increase in arrests per individuals arrested, which was significant (t-value = −2.84; SE = 0.11; p = 0.01). The treatment areas showed a 6 % decrease, which was not significant (t-value = 0.68; SE = 0.10; p = 0.50).

Finally, there were 128 arrests of the 151 targeted offenders in the pre-test period and 69 arrests of these offenders in the intervention period, which was a 46 % reduction. OFFRecidivism shows that there was an average of 1.54 arrests per targeted offender in the pre-test period and 0.49 in the intervention period, which was a 68 % reduction and statistically significant (t-value = 5.66; SE = 0.19; p < 0.00).

Analysis of intervention effectiveness on crime, arrests, repeat arrests, and recidivism

The first two multivariate analyses use negative binomial regression to examine HSCrime and HSArrests. Because these measures are discrete counts instead of rates, the negative binomial regression is the most appropriate (Hilbe 2011), as it has been used for numerous other studies that employ crime counts as the dependent variable (Newton et al. 2014; Santos and Santos 2015; Tompson and Bowers 2013). Both variables' distributions showed skewness and overdispersion, evidenced in their variances (23.02 for HSCrime and 54.59 for HSArrests) being greater than their overall means (7.21 and 10.44, respectively), which also supports using negative binomial regression over other regression methods (Hilbe 2011).

Table 7 shows the results for two models with the intervention period measure of HSCrime as the dependent variable and three predictors—the pre-test period HSCrime, the presence of the intervention (control areas is the reference), and the intervention dosage (i.e., number of contacts per hot spot for 9 months). The difference between the two models is which intervention variable is included.[6]

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[6] Additional variables used in the blocking, such as area, population, and housing density, and a variable that measured the level at which a hot spot shared borders with other treatment or control hot spots were considered but were not included as predictors in these or the subsequent models presented. Because of the low number of cases in the analyses and as shown in Table 1, there were no significant differences between the treatment and control areas for these measures. Even so, models were run including all and many combinations of these variables and revealed that none had any effect on the dependent variables individually or together, so those models are not shown here.

Table 7 Negative binomial regression results: HSCrime

	B	SE	Sig.	IRR	B	SE	Sig.	IRR
Intercept	1.34*	0.38	0.00	3.83	1.32*	0.38	0.00	3.72
HSCrime: pre-test period	0.06*	0.03	0.03	1.07	0.06*	0.03	0.03	1.06
Intervention (reference control)	−0.23	0.31	0.46	0.80	–	–	–	–
Intervention dosage	–	–	–	–	−0.003	0.01	0.58	0.99
Log likelihood	−143.23				−143.35			
AIC	292.46				292.70			
BIC	298.08				298.31			
N	48				48			
df	45				45			

$*p < 0.05$

In both models, the pre-test period measure for HSCrime was a significant predictor of the intervention period measure, showing that the more residential burglary and theft from vehicle crimes there were in the pre-test period, the more crimes there were in the intervention period. The pre-test measure accounts for hot spots with different baseline counts of crimes, so it is not surprising that hot spots with higher levels of crime in the initial 9 months also had higher levels during the intervention period.

The direction of the intervention variables in both models shows that the treatment areas had lower counts of residential burglary and theft from vehicle crimes and that more intervention dosage was related to fewer crimes; however, the predictors were not significant in either model. These results indicate that, when controlling for the pre-test period measure, neither the presence of the intervention nor the intervention dosage had an effect on the number of residential burglaries and residential thefts from vehicles in the hot spots. Comparing the results of both models, the log likelihoods and Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) scores are nearly identical, showing that the models are equivalent, but that overall the models are poor estimates of the dependent variable (Hilbe 2011).

Table 8 shows the results for two similarly constructed models using HSArrests. The pre-test period measure is significantly related to the intervention period measure in the first model and close to significance in the second ($p = 0.06$). While the direction of both intervention variables shows that the treatment areas had lower arrest counts and that more dosage was related to fewer arrests, the predictors were not significant. Thus, when controlling for pre-test period arrest counts, neither the presence of the intervention nor the dosage had an effect on the number of arrests of individuals living in the hot spots. Again, note that these data are not arrests for crimes that occurred in the hot spots but arrests of individuals who live in the hot spots. Similar to the results in Table 7, comparison of the log likelihoods and Akaike Information Criteria (AIC) and Bayesian Information Criteria (BIC) scores shows that they are nearly identical and that they are poor estimates of the dependent variable (Hilbe 2011).

Table 9 shows the results of two OLS regression models using the same predictor variables and the HSRepeatArrests intervention period measure as the dependent

Table 8 Negative binomial regression results: HSArrests

	B	SE	Sig.	IRR	B	SE	Sig.	IRR
Intercept	1.30*	0.32	0.00	6.89	1.93*	0.31	0.00	6.90
HSArrests: pre-test period	0.09*	0.05	0.05	1.10	0.09	0.05	0.06	1.09
Intervention (reference control)	−0.18	0.30	0.55	0.83	–	–	–	–
Intervention dosage	–	–	–	–	−0.004	0.01	0.46	0.99
Log likelihood	−160.64				−160.56			
AIC	327.27				327.11			
BIC	332.89				332.72			
N	48				48			
df	45				45			

*$p < 0.05$

variable. Both models are very weak, with R-squares of 0.07 and 0.06, respectively. While all predictors in both models are in the desired direction, not one is significant.

The first part of the final analysis is a test of differences between the control and treatment areas' average treatment effects (ATT). The ATT is an average of the mathematical difference (i.e., treatment effect) between the pre-test and intervention period values for each hot spot for a particular variable. What is important about the ATT is that it computes the difference between the pre-test and intervention period measures for each hot spot and then averages these numbers, reflecting the relative change for each hot spot over time. Table 10 shows the mean ATT for each measure for treatment and control areas, the difference between the two means, and the results of independent t-tests of the means. The ATT for OFFRecidivism is not shown since there was no ATT for control offenders for comparison.

A negative ATT indicates that the intervention period values were, on average, lower than the pre-test period values, which is the desirable result for each measure. The results for HSCrime show that, while both the treatment and control areas had fewer reported residential burglary and theft from vehicle crimes in the intervention period,

Table 9 OLS regression: HSRepeatArrests

	B	SE	Sig.	Beta	t	B	SE	Sig.	Beta	t
Intercept	1.18*	0.16	0.00	–	7.41	1.14*	0.16	0.00	–	7.13
HSRepeatArrests: pre-test period	0.12	0.14	0.41	0.12	0.83	0.13	0.15	0.39	0.13	0.87
Intervention (reference control)	−0.20	0.11	0.07	−0.27	−1.83	–	–	–	–	–
Intervention dosage	–	–	–	–	–	−0.003	0.002	0.12	−0.25	−1.61
R	0.27					0.29				
R-square	0.07					0.06				
Adj. R-square	0.03					0.02				
F	1.74		0.19			1.36		0.27		
df	47					47				

*$p < 0.05$

Table 10 ATT and standardized treatment effect for hot spot measures

	Control areas (n = 24)		Treatment areas (n = 24)		ATT difference	t	SE	Two-tailed significance	Effect size**
	ATT	Std. deviation	ATT	Std. deviation					
HSCrime	−2.88	5.63	−4.04	3.43	1.16	0.87	1.35	0.39	0.21
HSArrests	6.63	7.11	4.20	6.17	2.43	1.26	1.92	0.22	0.34
HSRepeatArrests	0.31	0.53	−0.07	0.47	0.38*	2.57	0.14	0.01	0.72

*p < 0.05

**Cohen's d=ATT difference/std. dev. control areas

the difference in their treatment effects (1.16) was not significantly different. Taken with the regression results in Table 7, the intervention does not appear to have had an effect on crime.

The results for HSArrests show that the number of arrests increased in both areas. The treatment areas showed a smaller numerical increase (2.43 fewer crimes), but the difference was not significant, so the intervention likely had no influence on arrests. Finally, HSRepeatArrests shows that the arrests per individuals arrested increased by 0.31 in the control areas, and decreased by 0.07 in the treatment areas over time and that the difference is significant at the 0.01 level. So, while the reduction in the treatment areas was minimal, the control areas had a significant increase, which might indicate that the intervention impacted the two areas differently.

Table 10 also illustrates the standardized effect size for each measure. Using the formula for Cohen's d, the difference between the ATT values of the treatment and control areas was divided by the standard deviation of the control areas. This provides a standardized evaluation of the effect size that can be compared across measures and is better than the p-value, which is heavily dependent on sample size. For the Cohen's d, a small effect size is around 0.20, a medium around 0.50, and a large around 0.80 (Sullivan and Feinn 2012). Thus, the results for HSCrime and HSArrests are consistent with the t-test results, since they have a small effect size. HSRepeatArrests has a large effect size, which is consistent with the t-tests results. However, HSRepeatArrests is the most indirect measure of the intervention's potential effect, so the difference could be explained by other factors not examined here.

Discussion and conclusions

Discussion of experimental results

The goal of this project has been to help fill the gap of understanding and evaluating offender-focused police interventions implemented for non-violent, property crime offenders in a typical suburban city with average amounts of crime. Both the research methodology, and the focus of this study on residential burglary and residential theft from vehicle crime and offenders in a suburban city, make it unique. Even though the

findings are not conclusive, they do have implications for researchers and police agencies.

Four impact measures were used to evaluate the effectiveness of the offender-focused intervention because none of the measures was without limitations. Counts of residential burglary and theft from vehicle crimes occurring in the hot spots were examined to determine if the intervention reduced reported crime. Arrests of the targeted offenders were examined to determine the impact of the intervention on their criminal behavior (i.e., recidivism) known to the criminal justice system. And, finally, counts and a rate for arrests of individuals living in the hot spots were used to compare the treatment and control areas to determine if the intervention had an effect on a broader group of offenders living in the hot spots.

At the descriptive level, the four measures show that there was a decrease of reported burglaries and thefts from vehicles in both treatment and control areas. Both treatment and control areas saw similar significant reductions in crime (39 % and 26 %, respectively). The negative binomial results indicate that the treatment areas declined 21 % relative to the control areas, but the difference between the areas was not statistically significant in any of the analyses. There were no control offenders for comparison, but the targeted offenders were arrested significantly less during the intervention period than in the pre-test period—a 68 % reduction.

The arrests counts and ratios collected for each hot spot showed contrasting results. Both control and treatment areas had a large increase in arrest counts during the intervention period—149 % and 78 %, respectively. The control areas also had a significantly higher ratio of arrests per individuals arrested (a 30 % increase), whereas the treatment areas saw a slight but insignificant reduction (6 %).

To conduct a more comprehensive analysis of the impact measures along with intervention variables, four negative binomial models were conducted to examine intervention variables with crime and arrest counts in the hot spots. Two OLS regression models regressed the same independent variables on the arrest ratio variable.

None of the six models revealed significant results to indicate whether the presence of the intervention or the intervention dosage had an effect on crime or arrests. In addition, the goodness of fit measures of the models indicated that they were weak and explained very little of the variance in the dependent variables. In both crime models and the arrest model testing the presence of the intervention, the pre-test period variable was the only significant predictor, indicating that more crime or arrests in the 9 months before the intervention predicted more crime during the intervention period. No variables were significant in the arrest models.

Lastly, while the targeted offender arrest data showed a significant reduction in the number of arrests of the targeted offenders, without a control group of offenders to compare to, these findings cannot be validated. All this being said, taking a step back and looking at the results of the findings from all four measures, two very conservative conclusions suggest that the intervention may have had some influence on the targeted offenders and in the hot spots.

At the individual level, the targeted offenders had fewer arrests as a group during the intervention period than before the intervention, and at the hot spot level, there were significant increases in arrests for burglary, theft, and drug offenses in both treatment and control areas. Also, the targeted offenders' recidivism was lower during the intervention period than before the intervention, where there was either an increase or

no change in the hot spot measure of repeat arrests in control and treatment areas, respectively. Together, these two findings suggest that targeted offenders experienced something different than individuals living in the control hot spots and arrested in the intervention period.

Even further, the average treatment effect for the ratio of hot spot arrests per individuals arrested and its standardized effect indicate a significant and large effect. That is, the treatment areas saw no change in arrests per individuals arrested, while the control areas showed a large increase. This also suggests that something different and potentially positive was influencing arrests of individuals living in the treatment areas. However, it may not have been as positive as what influenced the targeted offenders, since the arrests and the arrests rate did increase.

As noted earlier, the lack of individual level arrest data in the control areas and the limitations of all the data examined individually make it difficult to formulate definite or even moderately strong conclusions. However, taken together, these results favor a positive direction of the intervention in that they show reductions and relatively positive results for residential burglary and theft from vehicle crime, for targeted offenders and for arrests of individuals living in the treatment areas. Thus, they are encouraging, if not conclusive.

Implications for police practice

Perhaps these findings support conclusions made by Telep and Weisburd (2012) that solely concentrating on offenders is not the most effective way for police to reduce crime. In a review of police research and meta-analyses over the last 30 years, Telep and Weisburd argue that "police should be focusing on hot spots policing, POP [problem-oriented policing], focused deterrence approaches, directed patrol to reduce gun crime, using DNA in property crime cases, and efforts to enhance legitimacy" (p. 350). Specifically in reference to hot spots, they assert that a problem-oriented policing approach should be taken that seeks to understand the underlying conditions of crime in the hot spot, so that a tailored intervention focused on long-term impact can be developed that includes a variety of strategies, such as directed patrol, addressing high-risk offenders, and situational crime prevention strategies. Thus, an offender-focused method should be viewed as only one strategy of a more comprehensive approach to effectively reducing crime.

In terms of the nature of this intervention, it was important to this police department and its relationship with the community that the detectives did not take an apprehension approach. That is, rather than conducting surveillance and making arrests, as other offender-focused strategies have done, this intervention was focused on prevention and deterrence. Therefore, the intervention included contacts where the detectives communicated effectively with both the offenders and their families and encouraged them to desist from their criminal activity. The detectives did not focus on tactics that would result in the offenders being brought back into the criminal justice system.

The detectives expressed throughout the project the importance of focusing their contacts on offenders with correctional sanctions. That is, in addition to the detectives having more legal authority to contact offenders with sanctions, they felt more comfortable and physically safer contacting these offenders versus offenders who had been arrested but had no further relationship with the criminal justice system. They stated

that "offenders with curfews opened the door and listened." Police agencies implementing offender-focused interventions currently identify individuals for intervention who are either known offenders with previous arrests or convictions, and/or those individuals who might be involved in criminal activity identified through intelligence (Bynum and Decker 2006; Groff et al. 2015; Jennings 2006; Ratcliffe 2008). This study's results suggest that police should at least prioritize offenders on sanctions, and that a partnership with the division of probation and parole would be important for successful outcomes.

Lastly, the agency has continued to implement this intervention in all residential burglary and residential theft from vehicle hot spots. While the experimental results did not show that the offender-focused intervention achieved an acceptable level of effectiveness based on statistical and research standards, the agency sees the program's suggestive results, practical reduction in crime, and the positive feedback from offender interviews as important and encouraging.[7] These findings, along with the promising results from similar strategies, such as the Philadelphia SPI experiment (Groff et al. 2015), were the basis for that agency sustaining its offender-focused intervention and folding it into its overall crime reduction approach.[8]

Limitations and future research

The findings of this experiment do not support or refute the use of a preventive offender-focused intervention. Thus, a theoretical discussion of the mechanisms of the intervention will not be as informative as a discussion about the limitations of the study and how they can be overcome in future studies. Limitations of the data and methods have been discussed throughout the article where relevant, and this section brings them together in one final discussion that also provides suggestions for future research.

A key limitation is the number of hot spots examined in the study. As noted earlier, the possible highest number of hot spots (i.e., 48 in total) was identified based on size and an adequate baseline of crime. An a priori power analysis (using G*Power 3.0) for a medium effect size using Cohen's (1988) criteria was conducted. With an alpha of 0.05 and power of 0.80, the test indicated that the required sample size would have been 51 for each group. Adjusting the test for a large effect size, the sample required would have been 21 for each group. With a sample size of 24 in each group, the study met the large effect size requirement. While one impact measure (HSRepeatArrests) did have a large effect, unfortunately it was the most indistinct measure of the four, so it is difficult to cite this finding alone as support for implementing this intervention. As

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[7] In short, results of the offenders and family interviews were consistent and powerful. The collective perspective was that the detectives treated them with respect and both their criminal activity and personal relationships were positively impacted. There was no evidence from the interviews that the increased scrutiny by the police generated resentment or apathy towards the police (Santos and Santos 2014).

[8] Notably, the offender-focused intervention is now used in the agency as part of a multi-faceted approach to reduce crime in long-term hot spots as recommended by Telep and Weisburd (2012). High crime hot spots in each of the four patrol districts are selected for the intervention, and the program detectives focus on contacting prioritized offenders, while the patrol and criminal investigation divisions work with the detectives as well as implement hot spots policing, problem solving, and community policing strategies within each hot spot. The offender-focused intervention in hot spots has become one important component of the agency's overall crime reduction approach.

noted, the measures integrated together provide the best understanding of the study results. Unfortunately, the other measures did not meet the large effect size criteria.

One reason for why there were too few hot spots is that their areas were fairly large to accommodate an adequate base rate, and, even then, the base rates were relatively low (i.e., hot spots averaged around 11 crimes in the 9-month pre-test period). As Hinkle et al. (2014) noted, having low base rates in hot spots studies makes it difficult to detect a treatment effect, and, as was found through the power analysis, a large effect size was required to reach adequate power. Assuring adequate power is a major challenge when conducting practical research in places that are not major metropolitan areas with high levels of crime. Hinkle et al. (2014) also recognize the challenges of conducting experiments in cities with low levels of crime, but emphasize that "evaluators should seek to design and implement randomized experimental evaluations when possible, as they produce the most valid and believable evidence on program effectiveness" (p. 229). One of their suggestions is using a mixed method approach, in which qualitative information is collected to enhance the findings or lack of findings in an experiment.

Considering the pressure for randomized trials by the field and funding agencies, we happily took on this challenge. However, our results reinforce the importance of the other methods employed in this research (e.g., qualitative data collection) and the need to value other research methods to understand interventions in places where randomized experiments may not be feasible (e.g., propensity score matching, quasi-experimental designs, qualitative ethnographies), so we can increase our understanding and the generalizability of various types of interventions.

The lack of analysis of spatial displacement can be easily seen as a weakness. However, a significant amount of research has shown that placed-based crime prevention efforts do not generally lead to spatial displacement of crime (Guerette and Bowers 2009), and that spatial displacement rarely occurs completely and is often inconsequential (Barr and Pease 1990; Hesseling 1992). That being said, most long-term hot spots studies examine whether spatial displacement occurs when implementing strategies in hot spots (Braga et al. 2014; Johnson et al. 2014; Telep et al. 2014).

When spatial displacement is examined for micro-level hot spots, researchers typically measure the amount of crime occurring in about a two-block catchment area (Braga et al. 2014; Groff et al. 2015; Weisburd et al. 2012). When spatial displacement is examined around larger geographic areas, a range of different methods are used; for example, several concentric circles around the original hot spot, contiguous police beats, block groups within a half mile (Bowers et al. 2004; Telep et al. 2014). However, in this study, examining spatial displacement was not realistic based on the proximity, number, and size of the hot spots. Many of this study's finalized hot spots shared boundaries, so constructing a two-block, or even larger, catchment area would have resulted in the catchment area of one hot spot overlapping another. Eliminating particular hot spots so that no borders were shared could have been done, but would have reduced the already low number of hot spots tested. Making hot spots smaller could have allowed for a catchment area, but this could not be done because of low base rates and because larger hot spots accounted for offenders' residence-to-crime distances.

So, instead of examining spatial displacement, from the outset the hot spot borders were selected using a major thoroughfare or a canal, assuring that the hot spot

represented a specific neighborhood, so that it would be less likely that an offender would cross over those social or physical barriers (Brantingham and Brantingham 1981). Since the goal of the intervention was also to reduce recidivism, the analysis of each targeted offender's arrest, no matter what type or where the crime occurred, was a measure of whether the targeted offenders continued to commit crimes. While it was not done here, future analysis disaggregating the type of crime offenders commit could allow for the examination of offense displacement (Barr and Pease 1990; Guerette and Bowers 2009; Reppetto 1976).

A final limitation is the lack of a rigorous evaluation of offender recidivism at the individual level. As discussed previously, in-depth analysis of specific offenders living in the control hot spots was not conducted, so it could not be determined whether the reduction in arrests and recidivism of targeted offenders was a direct result of the offender-focused intervention or was occurring for all offenders. Analysis of arrests for individuals living in the hot spots showed significant increases, which was an opposite result to the targeted offender results; however, as noted earlier, this dataset was limited because the unit of analysis was the hot spot and not the offender.

Yet, even if control offender data could have been collected, using arrest data to examine recidivism in a theoretical sense is problematic. In criminal justice research, recidivism is measured as an offender being re-incarcerated because the research is intended to inform criminal justice policy. To truly understand whether an offender has stopped committing crimes around where they live, arrest data are insufficient because they only measure whether they were caught and suspected of a crime, not if they actually committed the crime. For property crime in particular, determining a baseline of criminal activity and subsequent activity would ideally have to rely on offenders reporting their activity, since even if we assume that an arrest means that they are guilty of the crime, as noted earlier, clearance rates for burglaries and thefts range between 10 and 15 % (FBI 2016). This type of data collection is a difficult task, so while crime and arrest data are limited, they are probably the best we have for this type of evaluation.

Conclusion

The results here are somewhat promising and support additional research testing the effectiveness of an offender-focused intervention in property crime long-term hot spots. The challenges of future research identified and highlighted by this study are successfully measuring the impact of the intervention and finding a community that is a good setting (i.e., has enough crime to detect an effect).

Researchers choosing a more appropriate research site might consider some important issues. First, hot spots are a useful unit of analysis for experimental police research. Not only is place important in nearly all crime prevention that police carry out (Weisburd 2015), implementing a police strategy and assessing its impact on crime is more realistic to implement and easier to discern in smaller, more focused areas than across an entire jurisdiction, because the intervention can be carefully controlled and the impact on crime is more easily measurable.

Another, and important, consideration is overcoming the problem of the low base rate of crime in the hot spots because this impacts both the identification of the hot spots at the outset and the ability to test the effect of the intervention. As Hinkle et al. (2014) suggest, researchers might select small towns or suburban sites with more crime,

conduct the study in multiple sites to achieve a larger sample size, or implement the intervention for longer periods.

Another consideration is the level of resources needed to identify and track offenders. It is relatively straightforward to identify, randomize, and track crime and arrests in hot spots, most of which is done through downloads from a police agency's RMS. However, in an offender-focused experiment, the offender's criminal activity is an important measure of the intervention's effectiveness, and the tasks for obtaining there data are much more resource-intensive, both for the official data and the qualitative data. In such a project, there should be enough resources planned to identify, conduct in-depth criminal histories, track them, as well as interview offenders about the impact. The crime analyst will play an important role because access to official data sources will be needed. Improving on this study, researchers might conduct interviews with offenders both before and after the intervention and cover a wide range of topics about both the intervention, the police, the offender's criminal activity, and their perceptions.

In conclusion, even though this study has not resulted in significant research findings, the results are encouraging and have meaningful contributions to both police practice and future research in this area. The study provides insight into implementing a preventative, offender-focused intervention and specific considerations for improving future evaluations of offender-focused strategies implemented in hot spots of suburban cities. Lastly, it provides a successful example and encouragement for police agencies to implement experimental methodology when seeking to evaluate a program.

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Rachel Santos is a professor at Radford University, where she conducts police research and technical assistance in the areas of evidence-based policing, practice-based and experimental research, crime analysis, police/community engagement, and environmental criminology.

Roberto Santos is an assistant professor at Radford University and a retired police commander. He conducts research and technical assistance in areas including, but not limited to, evidence-based policing, police legitimacy, criminal investigations, and experimental/quasi-experimental research.