



# *Smart Policing Initiative Final Report*

Submitted by:

Jerry Ratcliffe

Elizabeth Groff

Cory Haberman

Evan Sorg

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## Contents

Introduction .....	5
<b>The Smart Policing Initiative experimental results</b> .....	7
Selecting target areas .....	7
What did the officers do? .....	7
When did each initiative take place? .....	8
What research activities took place? .....	8
How were the results analyzed? .....	8
What was the result of the experiment? .....	9
How do we explain the results? .....	9
<b>Wave 1 Police Officer Survey Full Results</b> .....	10
Summary .....	10
Most effective and ineffective strategies .....	11
Crime strategy effectiveness.....	12
The strategy for the Philadelphia Police .....	13
How the officers feel about the community.....	14
How the officers feel about their job.....	15
About the officers .....	16
About the survey.....	16
<b>Wave 2 Police Officer Survey Full Results</b> .....	17
Most effective and ineffective strategies .....	17
The strategy for the Philadelphia Police .....	18
How the officers feel about the community.....	19
<b>Community Survey Response Summary</b> .....	20
Summary .....	20
The survey.....	21
Opinions of Neighborhood and Officers who work it.....	23
Opinions of The PPD’s Effectiveness.....	24
About the respondents .....	25
About the survey.....	25
<b>Appendix 1: Journal article submitted for publication</b> .....	26
Does What Police Do at Hot Spots Matter?: The Philadelphia Policing Strategy Experiment.....	26
Abstract.....	26



Theoretical basis for hot spots policing .....	27
Evidence of the effectiveness of police efforts at hot spots.....	28
Foot patrol .....	29
Problem oriented policing .....	29
Offender focus strategy .....	30
Experimental Design .....	31
Background to the <City> policing strategies experiment.....	31
Selection of hot spot areas for random assignment.....	31
Treatment provided to target areas .....	33
Foot Patrol .....	33
Study period.....	34
Analysis .....	34
Outcome Measures.....	35
Modeling strategy .....	36
Results.....	36
All violent crime .....	36
Violent felonies .....	37
Pedestrian stops.....	37
Automobile stops.....	37
Narcotics crime .....	37
Displacement .....	37
Limitations .....	39
Discussion.....	39
Focusing on offenders in hot spots reduced violent crime .....	40
Problem-solving and foot patrol failed to reduce violent crime .....	41
Differences in the volume of officer activity by type of intervention .....	42
Implications for Research .....	43
Conclusion.....	44
Figures.....	51
References .....	53
Notes.....	60
<b>Appendix 2: Journal article submitted for publication.....</b>	<b>62</b>
Citizens’ reactions to hot spots policing: Experimental impacts on perceptions of crime, disorder, fear and police.....	62



Abstract.....62

Introduction .....63

Support for hot spots policing .....63

Critiques of hot spots policing .....64

The Current State of Knowledge.....66

The current study.....67

Results of treatments on crime measures.....68

The Survey Component.....68

Results.....71

Discussion.....73

Conclusion.....75



## Introduction

This report documents the experimental results from the Temple University sub-contractual part of the Smart Policing Initiative funding awarded the City of Philadelphia. This project was supported by Grant No. 2009-DG-BX-K021 awarded by the Bureau of Justice Assistance.

The project centered on a randomized field experiment. The study was designed and conducted as part of a continuing research-practitioner partnership with the Philadelphia Police Department. The Police Commissioner and management team were actively involved in the planning of the experiment so that the experimental design would more closely approximate how hot spots policing would occur naturally in a large urban police department. As the Commissioner wrote in the city's crime fighting strategy;

In today's economy, we must be smart and judicious about allocating police resources. Saturation patrol is not an informed solution to preventing or reducing a rising crime problem. We must understand *what* works, *how* it works, *when* it works, and *where* it works. The answers to these questions provide the foundation for "evidence-based" policing strategies.

First, violent crime hotspots were delineated using spatial statistics. Violent crime point data were accessed from the city's 2009 incident database. Violent crime was defined as homicide, robbery, aggravated assault and misdemeanor assault. Two different local measures for detecting spatial association and concentration were applied: Local Indicator of Spatial Association (LISA) and Hierarchical Nearest Neighbor Clustering (HNN). Full details of the analysis strategy are found in the chapters that follow.

A total of 81 mutually-exclusive target areas were identified, allowing 21 of these to be used as controls. Senior police commanders (District Captains) were asked to use their operational knowledge to delineate the final boundaries of deployment areas and to identify which type of intervention should be applied in each. They were asked to identify 27 areas suitable for foot patrol, 27 areas that would benefit from problem-solving and 27 areas where police would focus enforcement on violent repeat offenders. Police commanders drew deployment areas around the hot spots identified by the LISA and HNN analyses taking into consideration the street network and environmental features. The 81 deployment areas were then displayed on a new map. In subsequent meetings with the Regional Operations Commanders, the deployment areas' boundaries were revised to balance police operations with research priorities (e.g., achieving geographic separation of the target areas to allow for examination of displacement/diffusion effects). The final 81 hot spots were small, containing an average of 3 miles of streets and 23.5 intersections.

The 81 hot spot deployment areas were stratified into three groups prior to randomization based on their pretest score on treatment suitability as qualitatively evaluated by police department commanders. Random assignment using a random number generator was performed separately for each stratum of 27 areas resulting in 20 areas being assigned to treatment and 7 to control. The three experimental areas were targeted for at least three months with, problem-oriented policing, offender-focused activity, or foot patrol.

The report that follows documents the experimental results of the study, a pre-post survey of officers involved in the experiment, and a pre-post survey of residents in the experimental areas.



The document that follows is formatted in the following way.

- The results of the experiment on crime outcomes
- Survey results from the first wave of officer surveys
- Survey results from the second wave of officer surveys
- Summary survey results from the community surveys
- Appendix 1 has the draft academic paper on the experimental results
- Appendix 2 has the draft academic paper on the community survey results

## The Smart Policing Initiative experimental results

In 2010, the Philadelphia Police Department and researchers from Temple University's Center for Security and Crime Science set out to test the effectiveness of three policing strategies; foot patrol, problem-solving, and an offender-focused strategy. This chapter reports on the findings from this experiment. The crime reduction numbers tell a story with some successes, but interviews and research from the field identify where some strategies could be implemented better in the future.

Problem-oriented policing and intelligence-led policing are two common themes in the current vocabulary of American policing. Recently, with the findings from the Philadelphia Foot Patrol Experiment, there has also been renewed interest in foot patrol.

Philadelphia Police and researchers from Temple University, with support from the Bureau of Justice Assistance, set out in the summer of 2010 to better understand the impact of these strategies, and specifically answer where and when they were most effective as tactics to reduce violent crime.

### Selecting target areas

Violent crime incidents for 2009 were analyzed using an innovative two-stage statistical process to identify hotspot clusters of violent crime across the city. Clusters were required to have a minimum number of five violent felonies (homicide, aggravated assault and robbery) and 15 violent crimes (violent felonies and misdemeanor assault).

These violence hotspot areas were mapped and presented to police command staff. Regional Operations Commanders worked with District Captains to identify 27 areas suitable for foot patrol, 27 for problem-solving, and 27 where police would focus enforcement on violent repeat offenders. A random selection process was applied so that 20 areas of each type were selected for additional police activity, and seven of each area would receive the normal police response.

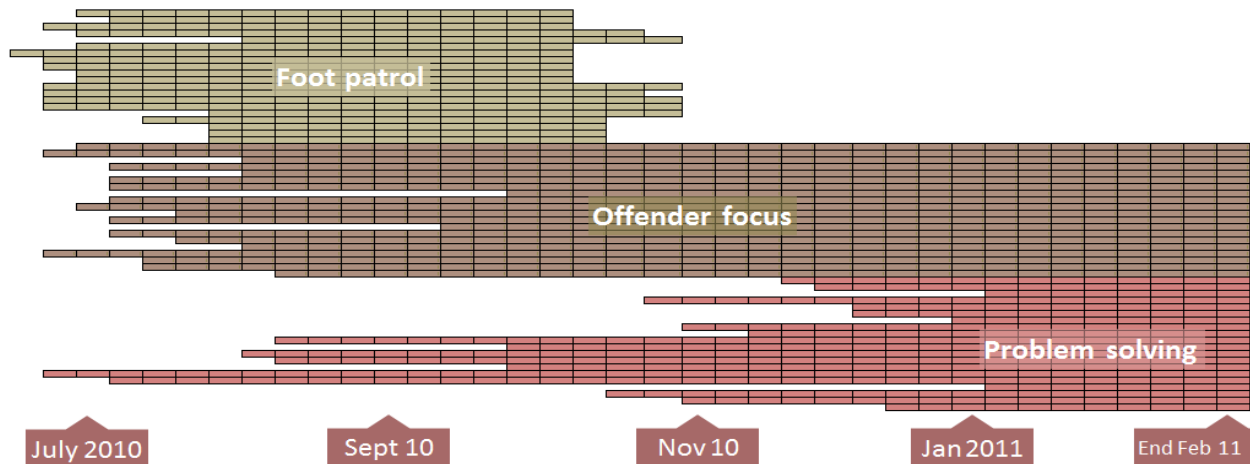


*Officers Fred and Cortes chat with a local resident in a park undergoing renovation in the 26<sup>th</sup> District.*

### What did the officers do?

There was considerable variation in foot patrol activity as the operational tactics were left to District Captains. Foot patrol officers usually (though not in one case) worked in pairs and were volunteers. Shift times varied by area, though there was a common aim of reducing violent crime and targeting the times of foot patrol to coincide with the periods of greatest violence. The general pattern was two officers, for 8 hours a day, five days a week.

Problem-oriented policing was conducted by district officers in collaboration with members of the community and the support of personnel from police headquarters from the PPD2020 team. Local initiatives to address the causes of violence varied across districts as problems were unique to each area.



*Figure 1. The timeframe of the Smart Policing Initiative experiment.  
 Each block represents one week, and each row represents one of the target sites.*

Repeat, violent offenders were identified by criminal intelligence officers and district personnel and details were passed on to command staff at the district level. The role of focusing enforcement activities on the identified individuals generally fell to officers assigned to a unit of officers out of the normal shift pattern in each district who are tasked at the discretion of the District Captain.

### When did each initiative take place?

With PPD's successful experiences with foot patrol in 2009, foot patrol sites were operational very quickly. The problem-solving and offender-focus sites required more organization and training, and so did not start until later in the experiment. The chart above shows weeks (vertical lines) from July 2010 thru February 2011. Foot patrol ran for about 16-18 weeks, while offender focus strategies ran from summer 2010 until February 28<sup>th</sup> 2011. Problem-solving activities took even more time to commence, starting with most sites starting in the late fall and also continuing until February 28<sup>th</sup>, 2011.

### What research activities took place?

The Temple University research team completed two community surveys (pre/post) as well as two surveys of PPD officers (some of whom were involved in the Smart Policing Initiative). Community surveys asked about perceived crime problems, as well as attitudes to policing and police strategies. Police surveys asked about attitudes to community collaboration, the role of evidence-based policies, and tactics that police should adopt.

Researchers also conducted fieldwork, spent time on the street with officers, interviewed foot patrol officers, attended problem-solving meetings, attended offender-focus briefings, and worked alongside headquarters personnel to understand the program implementation.

### How were the results analyzed?

We employed repeated measures multilevel modeling using contrast coding to analyze the results. Repeated measures multilevel models describe changes in an outcome measured at multiple time points for a given unit of analysis – ideal for this type of complex problem. We also controlled for trends over time and temperature (as violence is known to increase as it gets warmer). A more detailed paper is available from the research team.





### What was the result of the experiment?

Offender focus areas were successful in reducing all violent crimes by 22% compared to the equivalent control areas. These violent incidents included homicide, robbery, and assaults - both aggravated and misdemeanor. The offender focus sites were even more effective on violent felonies reducing them by 31% compared to the equivalent control areas.

The foot patrol areas were not successful in reducing violence during the experimental period, nor were the problem-solving areas.

### How do we explain the results?

The offender focus area results show that by focusing on a number of key offenders in the violent crime hotspots, officers were able to reduce crime significantly. Current programs where criminal intelligence liaison officers are assigned to districts will help with this, as will the ongoing program to train certain officers in key districts as analysis coordinators.

With foot patrol, we were unable to replicate the successful foot patrol findings from the Philadelphia Foot Patrol Experiment of 2009. There are potentially two significant differences. First, each foot patrol area in 2009 used twice as many officers, i.e. four per beat, in two shifts, rather than the current experiment staffing of two officers per beat in one shift.

Second, the officers in the current experiment were not necessarily as proactive as the rookies from 2009. Pedestrian stops increased around 5% in this experiment, while in 2009 pedestrian stops during the Philadelphia Foot Patrol Experiment increased 64%.

It may be that the officers in the current experiment were more focused on community liaison, were called away for other duties more often, or were less enthusiastic about conducting pedestrian stops.

A further consideration is that the mechanism to identify crime hot spots did differ slightly from the 2009 Philadelphia Foot Patrol Experiment.

With regard to problem-solving, fieldwork and surveys showed that at least eight of the problem-solving areas switched to a focus on property crime or quality of life issues during the experiment. One site was also the focal point of the Kensington Strangler investigation. This switch, documented in a few cases but possibly extending to others, may explain the lack of overall significant reduction in violent crime in the problem-solving areas.

Furthermore, the evaluation literature is clear that it can take some time to generate crime reduction benefits from problem-solving areas. Problem-oriented policing has a long history of successful violence reduction projects, but it is often time consuming and projects can take many months or even years to demonstrate effectiveness.



## Wave 1 Police Officer Survey Full Results

### Summary

Police officers support a combination of collaboration with city agencies along with stiffer enforcement and penalties for repeat offenders. They are generally positive about their jobs and work environment, and see benefit in the traditional role of mobile (car and bicycle) patrol.

This survey of 117 PPD officers found support for both partnering with city agencies to solve crime problems as well as increasing the arrest rate and sentence length for repeat offenders. The provision of social support services, and working with residents to clean up graffiti and other neighborhood blight were seen as ineffective crime control strategies. There was strong support for general patrol and the benefits of increased police visibility through car and bike patrols as the way forward for Philadelphia. Officers felt that the community had a better understanding of what was happening than patrolling officers (nearly 70% agree/strongly agree), but there was also widespread support for the social service component of police work, with over 75% of officers agreeing or strongly agreeing that ‘assisting citizens can be as important as enforcing the law’. On the whole, officers felt quite positively about their job. While there were some concerns about changes at work, 75% liked the kinds of work (agree/strongly agree) and found it had variety, and 65% agreed or strongly agreed that their work was valued by supervisors.

Surveys were distributed to various districts throughout the city at the beginning of the Smart Policing Initiative. The survey gauged officers’ opinions about Philadelphia communities, PPD’s policies and practices, as well as their judgments of how to best carry out their jobs. There were 66 questions (including demographic questions). Most followed a 5-point scale where officers could respond how strongly they agreed or disagreed with a statement or how effective or ineffective they believed a policing strategy. We also asked officers to select the top five most effective and ineffective policing strategies. There were 117 respondents, of whom 72% gave their rank as police officers. 66% had at least some college experience, and at least 81% were on patrol or 5 squad. More details later in this summary.



### Most effective and ineffective strategies

Officers were given the option of selecting five strategies that they considered most effective, and five that they considered to be the most ineffective. Included below is the percentage number of respondents for each category as well as the overall number (the total number of respondents is shown in parenthesis). The top four most effective and ineffective strategies are highlighted.



Strategy	Most Effective	Most Ineffective	Neither
a. Partner with other city agencies to solve problems	49% (57)	15% (18)	36% (42)
b. Work with residents and other city agencies to get trash cleaned up and graffiti removed	14% (16)	47% (55)	39% (46)
c. Improve relationships with the community	30% (35)	15% (17)	56% (65)
d. Increase arrests	37% (43)	15% (17)	49% (57)
e. Increase car stops	16% (19)	27% (31)	57% (67)
f. Increase stop and frisks	37% (43)	14% (16)	50% (58)
g. Strictly enforce minor offenses	25% (29)	31% (36)	45% (51)
h. Increase street lighting in high crime areas	20% (23)	22% (26)	58% (68)
i. Work with residents and other city agencies to board up abandoned buildings	20% (23)	34% (40)	46% (54)
j. Partner with the community to identify problems contributing to violence	25% (29)	30% (34)	46% (54)
k. Identify and monitor repeat offenders	41% (48)	12% (14)	47% (55)
l. Provide repeat offenders with city service agency support	11% (13)	60% (70)	29% (34)
m. Increase sentence length for repeat offenders	73% (85)	8% (9)	20% (22)
n. Increase police visibility through expanded use of motor patrol vehicles in high crime areas	37% (43)	9% (10)	55% (64)
o. Increase police visibility through expanded use of bicycle patrol in high crime neighborhoods	39% (45)	6% (7)	56% (65)
p. Increase police visibility though expanded use of foot patrols in high crime neighborhoods	23% (27)	34% (40)	43% (50)
q. Deployment to specific locations based on up-to-date crime analysis and statistics	36% (42)	13% (15)	51% (60)
r. Increase the use of confidential informants	21% (25)	33% (38)	46% (54)
s. Increase enforcement operations% (e.g. operation pressure point)	36% (42)	17% (20)	47% (55)
t. Increase the use of CCTV cameras in high crime areas	32% (37)	21% (25)	47% (55)



### Crime strategy effectiveness

Officers were asked to rate how effective each of the following strategies were. The responses were on a 5-point Likert scale, with the options being very ineffective, ineffective, neutral, effective and very effective. Most common responses are highlighted in bold.

Strategy	Very Ineffective	Ineffective	Neutral	Effective	Very Effective
1. Partner with other city agencies to solve problems	4% (5)	3% (3)	22% (26)	<b>50% (59)</b>	16% (19)
2. Work with residents and other city agencies to get trash cleaned up and graffiti removed	8% (9)	22% (26)	<b>32% (37)</b>	28% (33)	6% (7)
3. Improve relationships with the community	3% (3)	9% (10)	26% (30)	<b>35% (41)</b>	15% (17)
4. Increase arrests	0% (0)	7% (8)	24% (28)	<b>33% (38)</b>	27% (31)
5. Increase car stops	0% (0)	15% (17)	27% (32)	<b>33% (38)</b>	21% (25)
6. Increase stop and frisks	1% (1)	8% (9)	30% (34)	<b>32% (37)</b>	27% (31)
7. Strictly enforce minor offenses	5% (6)	11% (13)	31% (36)	<b>35% (41)</b>	15% (17)
8. Increase street lighting in high crime areas	5% (5)	14% (13)	24% (23)	<b>37% (35)</b>	16% (15)
9. Work with residents and other city agencies to board up abandoned buildings	3% (4)	16% (19)	27% (31)	<b>39% (45)</b>	12% (14)
10. Partner with the community to identify problems contributing to violence	3% (4)	15% (17)	30% (35)	<b>31% (36)</b>	15% (18)
11. Identify and monitor repeat offenders	2% (2)	6% (7)	19% (22)	<b>35% (41)</b>	33% (38)
12. Provide repeat offenders with city service agency support	21% (24)	<b>29% (34)</b>	<b>29% (34)</b>	8% (9)	9% (10)
13. Increase sentence length for repeat offenders	3% (3)	2% (2)	6% (7)	23% (27)	<b>61% (71)</b>
14. Increase police visibility through expanded use of motor patrol vehicles in high crime areas	0% (0)	0% (0)	15% (18)	<b>40% (47)</b>	39% (46)
15. Increase police visibility through expanded use of bicycle patrol in high crime neighborhoods	0% (0)	3% (4)	19% (22)	34% (40)	<b>39% (45)</b>
16. Increase police visibility through expanded use of foot patrols in high crime neighborhoods	2% (2)	17% (20)	21% (25)	<b>34% (40)</b>	21% (25)
17. Deployment to specific locations based on up-to-date crime analysis and statistics	1% (1)	5% (6)	21% (24)	<b>33% (39)</b>	14% (16)
18. Increase the use of confidential informants	5% (6)	15% (18)	21% (25)	<b>23% (27)</b>	8% (9)
19. Increase enforcement operations% (e.g. Operation Pressure Point)	3% (3)	8% (9)	19% (22)	<b>26% (30)</b>	19% (22)
20. Increase the use of CCTV cameras in high crime areas	2% (2)	14% (16)	17% (20)	<b>37% (32)</b>	14% (16)



### The strategy for the Philadelphia Police

Officers were asked to respond to how they felt the PPD should move forward in fighting violent crime, as well as questions concerning the effectiveness of the PPD and its officers. The responses were on a 5-point Likert scale, with the options being strongly disagree, disagree, neutral, agree, and strongly agree. The most common response is highlighted.

Strategy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. The PPD should spend more time getting to know minority communities	12% (14)	27% (31)	<b>39% (45)</b>	15% (18)	4% (5)
22. The PPD should spend more time explaining crime prevention techniques to the community	2% (2)	17% (20)	33% (38)	<b>37% (43)</b>	9% (10)
23. The PPD should allocate more resources to respond to calls for service	0% (0)	4% (5)	28% (33)	<b>40% (47)</b>	23% (27)
24. The PPD should spend more time checking abandoned buildings and residences from criminal activity	5% (6)	16% (19)	<b>34% (40)</b>	32% (37)	9% (10)
25. The PPD should spend more time working with academic researchers in order to solve problems	27% (31)	<b>27% (32)</b>	<b>27% (32)</b>	11% (13)	3% (4)
26. General patrol is effective in reducing crime	1% (1)	11% (13)	20% (23)	<b>44% (52)</b>	21% (24)
27. Rapid response to calls for service is effective in reducing crime	0% (0)	12% (14)	28% (33)	<b>37% (43)</b>	20% (23)
28. General patrol is cost effective; that is, it gives the public its money's worth	2% (2)	18% (21)	<b>39% (46)</b>	25% (29)	12% (14)
29. Patrol officers have the skills and ability to collect information on their beats	3% (3)	9% (11)	17% (20)	<b>43% (50)</b>	24% (28)
30. Patrol officers effectively use their knowledge of activities going on in their beat to reduce crime	1% (1)	9% (10)	25% (29)	<b>40% (47)</b>	22% (26)



### How the officers feel about the community

Officers were asked to respond to questions concerning how they felt about the communities they serve. The questions were on a 5-point Likert scale, with the options being strongly disagree, disagree, neutral, agree and strongly agree. The most common response is highlighted.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
31. Citizens notice when special initiatives are introduced in their communities	6% (7)	25% (29)	17% (20)	<b>37% (43)</b>	10% (12)
32. Citizens know more about what goes on in their neighborhoods than the officers that patrol there	3% (3)	8% (9)	18% (21)	<b>44% (52)</b>	22% (26)
33. Police officers should make frequent informal contacts with the people in their beat	0% (0)	1% (1)	18% (21)	<b>55% (64)</b>	21% (24)
34. If the PPD can reduce violent crime, the relationship between the community in my patrol area and the PPD will improve	4% (5)	15% (18)	26% (30)	<b>39% (45)</b>	11% (13)
35. Improving the relationship between the PPD and the community is a priority of mine	4% (5)	6% (7)	27% (32)	<b>38% (44)</b>	18% (21)
36. The community in my patrol area is appreciative of my presence	9% (11)	9% (11)	<b>37% (43)</b>	27% (31)	13% (15)
37. Police officers should work with the citizens to try and solve problems in their beat	3% (3)	4% (4)	20% (19)	<b>55% (52)</b>	14% (13)
38. The presence of motor patrol cars reduces citizens' fear of crime more effectively than do foot patrols	3% (3)	27% (20)	<b>27% (32)</b>	<b>27% (32)</b>	20% (24)
39. Reducing violent crime is the most important thing to citizens in my patrol area	2% (2)	15% (18)	24% (28)	<b>39% (46)</b>	14% (16)
40. The public satisfaction with the PPD is declining	4% (5)	15% (17)	27% (31)	<b>35% (41)</b>	14% (16)
41. Crime is increasing in the area I patrol	6% (7)	22% (26)	<b>34% (40)</b>	27% (31)	5% (6)
42. Assisting citizens can be as important as enforcing the law	2% (2)	3% (3)	14% (16)	<b>52% (61)</b>	25% (29)



### How the officers feel about their job

Officers were asked to respond to questions concerning their opinions of the PPD and their job within the PPD. Questions were on a 5-point Likert scale, with the response options being strongly disagree, disagree, neutral, agree and strongly agree. The most common response is highlighted.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
43. The amount of work I am expected to do makes it difficult for me to do my job well.	10% (12)	<b>27% (32)</b>	22% (26)	24% (28)	9% (11)
44. The police department is a good organization to work for	4% (5)	14% (16)	18% (21)	<b>44% (52)</b>	17% (20)
45. I look forward to changes at work	3% (4)	10% (12)	<b>36% (35)</b>	<b>36% (34)</b>	14% (13)
46. My position in the department is very important	3% (3)	7% (8)	26% (30)	<b>35% (40)</b>	28% (33)
47. I like the kinds of work I do very much	3% (3)	3% (4)	16% (19)	<b>44% (51)</b>	31% (36)
48. I have little control over what I do in my job	9% (11)	<b>39% (45)</b>	21% (25)	18% (21)	9% (11)
49. I have enough discretion in my job to make effective decisions	4% (5)	6% (7)	17% (20)	<b>51% (60)</b>	19% (22)
50. My job assignment requires me to do many different things at work using a variety of my skills and talents	2% (2)	4% (5)	17% (20)	<b>50% (59)</b>	23% (27)
51. My work is valued by my supervisors	2% (2)	8% (9)	21% (25)	<b>46% (54)</b>	19% (22)
52. If I have a suggestion for improving my job in some way, it is easy for me to communicate ideas to management	9% (11)	18% (21)	28% (33)	<b>27% (32)</b>	13% (15)
53. My role in the PPD is precisely defined	4% (5)	15% (17)	30% (35)	<b>42% (49)</b>	6% (7)
54. I like the employees I work with a great deal	1% (1)	3% (3)	31% (36)	<b>44% (51)</b>	19% (22)
55. PPD employees are dedicated to providing the citizens of Philadelphia with high quality police services	3% (3)	10% (12)	<b>41% (48)</b>	32% (37)	11% (13)
56. A sense of unity characterizes this department	12% (14)	24% (28)	<b>38% (44)</b>	17% (20)	5% (6)
57. My present job assignment requires a lot of cooperative work with other people	2% (2)	3% (4)	24% (28)	<b>50% (59)</b>	17% (20)
58. The information I need to perform my job is effectively communicated to me	5% (15)	15% (18)	30% (35)	<b>38% (44)</b>	7% (8)
59. Meetings and/or roll call are used effectively to support communication within the department	5% (6)	15% (17)	33% (38)	<b>35% (41)</b>	10% (12)
60. I understand the PPD's overall direction for the future	9% (11)	24% (28)	<b>33% (38)</b>	26% (30)	4% (5)



### About the officers

Of the 117 respondents, 84 (72%) were at the rank of Police Officer, nine (8%) were Sergeants, 16 (14%) were Lieutenants and three (3%) were Captains. Four (3%) respondents did not list their rank.

19 (16%) had one to two years on the job, 21 (18%) had three to five years on the job, 25 (21%) had six to 10 years on the job, 24 (21%) had 11 to 16 years on the job, seven (6%) had 17 to 20 years on the job and 16 (14%) had over 20 years on the job.

35 (30%) had a high school diploma or GED, 33 (28%) had some college, one (1%) had a professional degree, 15 (13%) had an associate's degree, 24 (21%) had a bachelors degree and four (3%) had a masters degree.

70 (60%) of the respondents reported being on patrol, 25 (21%) were members of 5-squad, 10 (9%) were on foot or bicycle patrol and two (1%) reported being on the 7-squad. Eleven (9%) of the respondents did not list their assignment.

51 (44%) were not part of the SMART policing initiative, 14 (12%) were performing foot patrols, 24 (21%) were involved with problem solving, nine (8%) were working in an offender focused area, and nine (7%) reported that they did not know what their assignment was.

### About the survey

This document shows the results of a pre-operation survey distributed to police officers that the PPD felt were likely to be involved in the Smart Policing Initiative operation. The survey was distributed internally to about 200 officers via PPD Headquarters. Responses were collated by District Commanders and forwarded to the Research and Planning Unit at PPD Headquarters. The completed survey forms were delivered to Temple University where the research team compiled the responses.





## Wave 2 Police Officer Survey Full Results

### Most effective and ineffective strategies

Officers were asked to rate how effective each of the following strategies were. The responses were on a 5-point Likert scale, with the options being very ineffective, ineffective, neutral, effective and very effective. Most common responses for the wave 2 survey are highlighted in bold.

The percentage change from wave 1 to wave 2 is in parenthesis.

% in wave 2

**40(+12)**

% change from wave 1 to wave 2

Therefore in the example to the right, 40% selected this response, an increase of 12%.

As the example is shaded, this is the most popular response (in this wave).

Strategy	Very Ineffective	Ineffective	Neutral	Effective	Very Effective
1. Partner with other city agencies to solve problems	3.6(-0.9)	6.3(+3.6)	<b>33.9(+10.7)</b>	33(-19.7)	23.2(+6.2)
2. Work with residents and other city agencies to get trash cleaned up and graffiti removed	8.1(+0.1)	24.3(+1.1)	<b>35.1(+2.1)</b>	19.8(-9.7)	12.9(+6.3)
3. Improve relationships with the community	1.9(-1.1)	13(+3.1)	30.6(+0.9)	<b>31.5(-9.1)</b>	23.1(+6.3)
4. Increase arrests	5.4(+5.4)	6.3(-0.9)	<b>32.1(+6.9)</b>	28.6(-10.1)	27.7(-1.1)
5. Increase car stops	3.6(+3.6)	9.9(-5.3)	<b>45(+16.4)</b>	22.5(-11.4)	18.9(-3.4)
6. Increase stop and frisks	4.5(+3.6)	9(+1)	<b>35.1(+4.7)</b>	27.9(-5.1)	23.4(-4.3)
7. Strictly enforce minor offenses	7.2(+1.9)	22.5(+11.1)	<b>26.1(-5.8)</b>	25.2(-11.1)	18.9(+3.9)
8. Increase street lighting in high crime areas	4.4(-1)	8.8(-3.8)	26.5(+1.3)	<b>36.3(-0.6)</b>	23.9(+4.1)
9. Work with residents and other city agencies to board up abandoned buildings	1.8(-1.7)	19.3(+2.5)	24.8(-2.6)	<b>40.4(+0.6)</b>	13.8(+1.4)
10. Partner with the community to identify problems contributing to violence	4.5(+0.9)	9.8(-5.7)	<b>39.3(+7.5)</b>	25(-7.7)	21.4(+5)
11. Identify and monitor repeat offenders	0.9(-0.9)	8.1(+1.7)	18.9(-1.1)	34.2(-3.1)	<b>37.8(+3.3)</b>
12. Provide repeat offenders with city service agency support	16.2(-5.4)	<b>35.1(+4.5)</b>	22.5(-8.1)	16.2(+8.1)	9.9(+0.9)
13. Increase sentence length for repeat offenders	5.3(+2.6)	3.5(+1.7)	11.4(+5)	14.9(-9.6)	<b>64.9(+0.4)</b>
14. Increase police visibility through expanded use of motor patrol vehicles in high crime areas	2.7(+2.7)	2.7(+2.7)	12.5(-3.7)	33.9(-8.4)	<b>48.2(+6.8)</b>
15. Increase police visibility through expanded use of bicycle patrol in high crime neighborhoods	3.5(+3.5)	5.3(+1.7)	25.7(-5.9)	27.4(-8.6)	<b>38.1(-2.4)</b>
16. Increase police visibility though expanded use of foot patrols in high crime neighborhoods	11.5(+9.7)	16.8(-1.1)	25.7(+3.4)	22(-13.6)	<b>23.9(+1.6)</b>
17. Deployment to specific locations based on up-to-date crime analysis and statistics	14.6(+3.4)	3.7(-3.3)	26.9(+1)	<b>41.7(-3.6)</b>	23.1(+4.5)



18. Increase the use of confidential informants	3.8(-3.2)	17(-4.2)	<b>43.4(+14)</b>	23.6(-8.2)	12.3(+1.7)
19. Increase enforcement operations (e.g. Operation Pressure Point)	1.9(-1.6)	10.2(-0.3)	<b>31.5(+5.9)</b>	25(-9.9)	<b>31.5(+5.9)</b>
20. Increase the use of CCTV cameras	6.4(+4.1)	10.9(-7.7)	<b>28.2(+4.9)</b>	<b>28.2(-9)</b>	26.4(+7.8)

### The strategy for the Philadelphia Police

Officers were asked to respond to how they felt the PPD should move forward in fighting violent crime, as well as questions concerning the effectiveness of the PPD and its officers. The responses were on a 5-point Likert scale, with the options being strongly disagree, disagree, neutral, agree, and strongly agree. The most common responses for the wave 2 survey are highlighted in bold. The percentage change from wave 1 to wave 2 is in parentheses.

Strategy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. The PPD should spend more time getting to know minority communities	14.2(+1.8)	22.1(-5.3)	<b>36.3(-3.5)</b>	18.6(+7.6)	8.8(+4.4)
22. The PPD should spend more time explaining crime prevention techniques to the community	8.8(+0.7)	15.9(-1.8)	29.2(-4.4)	<b>37.2(-0.9)</b>	8.8(0)
23. The PPD should allocate more resources to respond to calls for service	1.8(+1.8)	5.4(+0.9)	<b>41.4(+11.9)</b>	37.8(-4.2)	13.5(-10.6)
24. The PPD should spend more time checking abandoned buildings and residences for criminal activity	3.5(-1.9)	14.2(-2.8)	<b>42.5(+6.8)</b>	33.6(+0.6)	6.2(-2.7)
25. The PPD should spend more time working with academic researchers in order to solve problems	23.4(-4.3)	28.8(+0.8)	<b>30.6(+2)</b>	10.8(-0.8)	4.9(+2.7)
26. General patrol is effective in reducing crime	0.9(0)	10.5(-1)	16.7(-3.7)	<b>51.8(+5.8)</b>	20.2(-1)
27. Rapid response to calls for service is effective in reducing crime	0.9(+0.9)	14(+1.6)	27.2(-2)	<b>43(+4.9)</b>	14.9(-5.5)
28. General patrol is cost effective; that is, it gives the public its money's worth	1.8(0)	15.9(-7.6)	<b>35.4(-5.7)</b>	31.9(+6)	15(+2.5)
29. Patrol officers have the skills and ability to collect information on their beats	0.9(-1.8)	8.8(-1)	26.3(+8.4)	<b>40.4(-4.2)</b>	23.7(-1.3)
30. Patrol officers effectively use their knowledge of activities going on in their beat to reduce crime	0(0)	9.6(+0.8)	27.2(+1.5)	<b>42.1(+0.5)</b>	21.1(-1.9)



### How the officers feel about the community

Officers were asked to respond to questions concerning how they felt about the communities they serve. The questions were on a 5-point Likert scale, with the options being strongly disagree, disagree, neutral, agree and strongly agree. The most common response for wave 2 is highlighted in bold. The percentage change from wave 1 to wave 2 is in parentheses.

Question	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
31. Citizens notice when special initiatives are introduced in their communities	2.7(-3.6)	24.8(-1.3)	31.9(+13.9)	<b>32.7(-6)</b>	8(-2.8)
32. Citizens know more about what goes on in their neighborhoods than the officers that patrol there	2.7(0)	8(-0.1)	18.6(-0.3)	<b>36.3(-10.5)</b>	34.5(+11.1)
33. Police officers should make frequent informal contacts with the people in their beat	0.9(+0.9)	5.3(+14.4)	<b>61.1(+10.1)</b>	44.2(-14)	20.4(-1.4)
34. If the PPD can reduce violent crime, the relationship between the community in my patrol area and the PPD will improve	2.6(-1.9)	9.6(-6.6)	33.3(+6.3)	<b>37.7(-2.8)</b>	16.7(+5)
35. Improving the relationship between the PPD and the community is a priority of mine	2.6(-2)	7(+0.6)	32.5(3.1)	<b>40.4(0)</b>	17.5(-1.9)
36. The community in my patrol area is appreciative of my presence	6.3(-3.6)	15.2(+5.3)	<b>33(-5.7)</b>	30.4(+2.5)	15.2(-1.7)
37. Police officers should work with the citizens to try and solve problems in their beat	0.9(-2.8)	6.1(+0.5)	28.1(+5.9)	<b>47.4(-8.6)</b>	17.5(+4.5)
38. The presence of motor patrol cars reduces citizens' fear of crime more effectively than do foot patrols	0.9(-1.8)	17.5(-0.5)	<b>31.6(+2.8)</b>	26.3(-2.5)	23.7(+2.1)
39. Reducing violent crime is the most important thing to citizens in my patrol area	0(-1.8)	9.7(-6.7)	30.1(+4.6)	<b>31.9(-9.9)</b>	28.3(+13.8)
40. The public satisfaction with the PPD is declining	2.6(-1.8)	14(-1.5)	<b>38.6(+10.4)</b>	28.9(-8.4)	15.8(+1.3)
41. Crime is increasing in the area I patrol	4.5(-1.9)	18.2(-5.4)	<b>39.1(+2.7)</b>	30.9(+2.7)	7.3(+1.8)
42. Assisting citizens can be as important as enforcing the law	0.9(-0.9)	7(+4.3)	24.6(+27.2)	<b>48.2(-5.4)</b>	19.3(-6.8)



## Community Survey Response Summary

### Summary

Residents in the SMART Policing Initiative deployment areas generally recognize that violence and drugs are a problem within their neighborhood. Residents also agreed that working with the PPD is needed in order to address problems in their neighborhood. Finally, residents were generally neutral when answering questions regarding police-community relations.

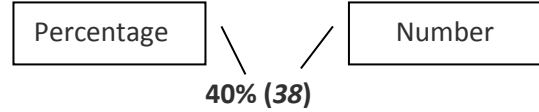
Survey responses were provided by 630 Philadelphia households within the *SMART Policing Initiative* deployment areas. The survey sought residents' opinions on the state of problems within their neighborhood, perception of their own neighborhood, and how they perceive the Philadelphia Police Department. Residents generally agreed that disorder issues such as abandoned houses, excessive noise, and litter were a problem in their neighborhoods. Respondents also commonly noted that drug dealing and violence were problems within their neighborhoods. On the other hand, only 26% (155) of responding Philadelphians disagreed with the statement "I feel safe walking the streets of my neighborhood during the day" with this percentage changing to roughly 39% (236) of respondents when the statement changes to "I feel safe walking the streets of my neighborhood after dark." Most respondents agreed that "the police should spend more time working with community member and groups to solve problems" and 40% (134) of respondents noted that the police are currently working with community members and groups to solve problems.

Surveys were mailed to a probability sample of households within the *Smart Policing Initiative* deployment areas at the beginning of the operation. These areas were selected for their disproportionately high volume of violent crime. There were 53 questions (including demographic questions). Most followed a 5-point scale where residents could respond how much of a problem certain policing issues were in their neighborhood and how strongly they agreed or disagreed with a statement about police-community relations or the effectiveness of the PPD. A total of 630 residents returned completed surveys.



**The survey**  
**Neighborhood Problems**

Citizens were asked to rate how problematic potential policing issues are in their neighborhood. The responses were on a 5-point Likert scale, with the options ranging from a big problem to not a problem. Most common responses are highlighted in bold.



Problem	Percentage					Number
	Big Problem		Somewhat of a Problem		Not a Problem	
1. Abandoned cars in the streets or alleys	11% (69)	7% (43)	24% (146)	20% (121)	<b>38% (231)</b>	
2. Abandoned houses or other empty buildings	<b>34% (202)</b>	11% (67)	25% (150)	11% (66)	20% (118)	
3. Excessive noise, such as barking dogs, loud parties and loud car stereos	<b>31% (185)</b>	12% (71)	25% (148)	15% (87)	17% (102)	
4. Trash, junk or litter on the streets, sidewalks or in vacant lots	<b>47% (288)</b>	15% (92)	20% (120)	8% (46)	11% (66)	
5. The vandalism of homes, buildings, or properties, such as breaking windows or graffiti	24% (143)	13% (80)	<b>25% (146)</b>	17% (102)	21% (125)	
6. People or landlords allowing their property to become run down	<b>30% (185)</b>	14% (87)	27% (164)	11% (70)	17% (106)	
7. Homeless people or vagrants	15% (88)	6% (37)	19% (114)	20% (119)	<b>39% (229)</b>	
8. Teenagers hanging out or causing disturbances	<b>34% (209)</b>	13% (77)	22% (134)	15% (92)	16% (100)	
9. Truancy; that is, kids not being in school during school hours when they should be	23% (135)	13% (77)	21% (124)	16% (95)	<b>28% (167)</b>	
10. Teenagers using drugs or alcohol	<b>40% (240)</b>	12% (74)	17% (104)	15% (91)	16% (97)	
11. People being robbed, beaten-up, or mugged on the streets	<b>29% (171)</b>	11% (64)	27% (161)	16% (96)	18% (107)	
12. People being killed	<b>39% (239)</b>	10% (58)	17% (105)	16% (95)	18% (112)	
13. People being threatened with guns	<b>33% (198)</b>	11% (63)	21% (125)	16% (94)	20% (118)	
14. People being sexually assaulted	20% (117)	10% (61)	20% (117)	20% (119)	<b>31% (184)</b>	
15. People being threatened with knives or other weapons (not including guns)	<b>24% (145)</b>	10% (60)	<b>24% (143)</b>	19% (111)	<b>24% (142)</b>	



Problem	Big Problem		Somewhat of a Problem		Not a Problem
16. People being the victims of violent crime	<b>33% (200)</b>	14% (82)	24% (146)	14% (85)	15% (92)
17. Shootings and violence by gangs	<b>30% (180)</b>	9% (56)	19% (115)	16% (94)	26% (160)
18. People breaking into other people's homes	25% (148)	14% (87)	<b>26% (156)</b>	17% (104)	18% (109)
19. People breaking into or stealing cars	22% (130)	16% (94)	<b>26% (156)</b>	19% (113)	19% (113)
20. Drug dealing on the street	<b>59% (350)</b>	10% (61)	14% (85)	8% (50)	9% (51)
21. Drug dealing from houses or other buildings	<b>49% (297)</b>	13% (81)	17% (100)	9% (55)	12% (1)
22. The streets being too dark at night	<b>31% (190)</b>	15% (94)	21% (128)	14% (86)	18% (111)
23. The lack of members in your community interested in crime prevention activities	<b>46% (277)</b>	12% (75)	25% (151)	9% (53)	9% (53)
24. The police not being responsive to the concerns of citizens in your neighborhood	<b>29% (176)</b>	12% (75)	25% (151)	16% (98)	17% (105)



### Opinions of Neighborhood and Officers who work it

Residents were asked to respond to how they felt about their neighborhood and police officers that work in their neighborhood. The responses were on a 5-point Likert scale, with the options being strongly disagree, disagree, neutral, agree, and strongly agree. The most common response is highlighted.

Strategy	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
25. I feel safe walking the streets of my neighborhood during the day	14% (84)	12% (71)	25% (153)	32% (193)	18% (111)
26. I feel safe walking the streets of my neighborhood after dark	30% (180)	9% (56)	19% (115)	16% (94)	26% (160)
27. I feel safe taking the bus or trolley at night	39% (239)	25% (152)	24% (144)	9% (55)	3% (18)
28. I feel safe taking the bus or trolley during the daytime	11% (65)	10% (63)	28% (175)	34% (209)	17% (184)
29. I feel safe taking the subway at night	55% (335)	20% (123)	16% (98)	5% (30)	4% (24)
30. I feel safe taking the subway during the daytime	11% (67)	15% (92)	35% (212)	27% (166)	12% (74)
31. I feels safe driving my car through Philadelphia (If you do not drive, you may skip this question)	7% (29)	13% (56)	34% (144)	33% (143)	13% (57)
32. The police should spend more time working with community members and groups to solve problems	5% (31)	2% (13)	20% (118)	35% (208)	38% (222)
33. The police should spend more time than they already do investigating serious crimes, serious criminals, and suspicious people	5% (32)	3% (19)	21% (131)	34% (208)	36% (222)
34. The police should give more tickets for even minor law violations	11% (66)	18% (108)	27% (163)	23% (139)	21% (128)
35. Officers seem content staying in their patrol cars rather than interacting with citizens	6% (35)	12% (70)	21% (126)	34% (208)	28% (169)
36. Citizens and police officers work together to solve problems	16% (92)	19% (113)	26% (153)	22% (127)	18% (107)
37. The officers in this city are usually intimidating	10% (63)	23% (141)	35% (215)	18% (107)	14% (85)
38. The police do not make enough contact with citizens	4% (25)	8% (50)	26% (158)	36% (213)	26% (154)



Police-community relations	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
39. In general, Philadelphia police officers treat all citizens equally according to the law	24% (145)	24% (144)	28% (171)	17% (101)	9% (52)
40. The police in this city are usually courteous	12% (70)	16% (97)	35% (212)	28% (170)	8% (50)
41. The police are fair when dealing with people	13% (82)	21% (128)	40% (245)	19% (119)	7% (40)
42. The police stop too many people on the street without good reason	18% (109)	29% (175)	34% (203)	10% (60)	10% (58)
43. Philadelphia Police officers are usually honest	15% (90)	15% (89)	42% (259)	23% (139)	6% (34)
44. Most police officers in my neighborhood use only the amount of force necessary to accomplish their tasks	10% (61)	17% (86)	41% (254)	25% (155)	9% (58)

### Opinions of The PPD's Effectiveness

Residents were asked to respond to how well they believed the PPD was doing in addressing problems in their neighborhood. The responses were on a 5-point Likert scale, with the options being very poor, poor, fair, good, and very good. The most common response is highlighted.

Police Effectiveness	Very Poor	Poor	Fair	Good	Very Good
45. How good are the police doing in dealing with the problems that really concern people in your neighborhood	15% (89)	21% (129)	41% (248)	19% (119)	4% (27)
46. How good a job are the police doing in keeping order on the streets and sidewalks	12% (75)	17% (100)	43% (261)	22% (136)	6% (34)
47. How would you rate the job the police are doing in reducing violent crimes such as assault, rape, robbery, and homicide	12% (74)	16% (97)	43% (258)	23% (139)	6% (35)
48. How would you rate the job the police are doing in reducing non-violent crimes such as burglary, auto theft, and theft from vehicles	12% (74)	18% (108)	49% (295)	17% (102)	4% (26)
49. How good a job are the police doing in solving crimes once they occur	10% (59)	18% (109)	46% (273)	21% (126)	4% (26)





50. How good a job are the police doing in preventing crime in your neighborhood

15% (93)	19% (112)	41% (251)	20% (118)	5% (32)
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### About the respondents

Of the 630 respondents, 409 (65%) were female, 200 (32%) were males, with 3 residents classifying themselves as another gender, and 18 (3%) respondents did not list their gender.

264 (42%) were 55 years or older, 96 (15%) were between 50-54 years old, 144 (23%) were between the ages of 35 and 49 years old, 51 (8%) reported being 30-34 years old, 41 (7%) 25-29 years old, 20 (3%) were between 19 and 24 years old, and only 1 respondent reported being 18 or under. Thirteen (2%) respondents did not indicate their age.

318 (52%) of the respondents reported being African-American, 183 (29%) were Caucasian, 59 (9%) residents reported being Hispanic, 35 (6%) reported being Pacific Islander or Asian, and 12 (2%) reported being of another race. Twenty-three (4%) respondents did not list their race.

237 (38%) had a high school diploma or GED, 143 (23%) had some college, 28 (4%) had a professional degree, 52 (8%) had an associate’s degree, 87 (4%) had a bachelors degree, 39 (6%) had a masters degree, 7 had a law degree (J.D.) and 5 respondents reported possessing a doctoral degree. Thirty-six (6%) respondents did not report their education level.

39 (6%) of respondents reported having had contact with the PPD within the last week, 90 (14%) citizens had had contact with the PPD within the last month, 168 (27%) were in contact with a member of PPD within the past year, 191 (30%) respondents most recent contact with the PPD was over a year ago, and 121 (19%) reported that they had never had contact with an employee of the PPD. Twenty-one (3%) respondents did record whether or not they had ever been in contact with a member of the PPD.

### About the survey

This document shows the results of a pre-operation community survey distributed to a probability sample of households in one of the Smart Policing Initiative deployment areas. The survey was mailed to 7420 households and 630 households (8.5% response rate) mailed usable responses back to Temple University where the research team compiled the responses. Row percentages may not total 100 exactly due to rounding.

## Appendix 1: Journal article submitted for publication

### Does What Police Do at Hot Spots Matter?: The Philadelphia Policing Strategy Experiment

Elizabeth R. Groff, PhD<sup>1\*</sup>  
Jerry H. Ratcliffe, PhD<sup>1</sup>  
Cory P. Haberman, MS<sup>1</sup>  
Evan T. Sorg, MA<sup>1</sup>  
Nola Joyce, MA<sup>2</sup>

<sup>1</sup>Temple University  
Department of Criminal Justice  
Center for Security and Crime Science  
<sup>2</sup>Philadelphia Police Department

\*Signifies corresponding author

Preliminary results from the Philadelphia Smart Policing Experiment were presented at the 2011 American Society of Criminology's annual meeting in Washington, DC and the 2012 Academy of Criminal Justice Sciences annual meeting in New York City. The authors would like to thank Ralph Taylor for comments on earlier drafts of this paper. The authors would also like to thank Philadelphia Police Commissioner Charles Ramsey for his continued support for research and Deputy Commissioners Nola Joyce, Richard Ross, Kevin Bethel, and Tommy Wright as well as project analyst Anthony D'Abruzzo and the PPD2020 team for their extensive hard work and support to make this study happen.

#### Abstract

Research evidence supports the effectiveness of certain policing strategies at reducing violent crime. The strongest evidence exists for approaches which are proactive, use specific strategies, focus on small places or groups of people in small places, and develop specific solutions using careful analysis of local problems and conditions. This article documents the design and implementation of a randomized control trial to test three types of policing strategies: offender-focus, problem-oriented policing, and foot patrol. A total of 81 experimental places were identified from the highest violent crime areas in Philadelphia (27 of each policing strategy). Within each strategy, 20 places were randomly assigned to receive treatment and seven places to be controls. Offender focus sites experienced a 22 percent reduction in violent crime and a 31 percent reduction in violent felonies as compared to their control places. Problem-oriented policing and foot patrol did not reduce violent crime or violent felonies. Potential reasons for these outcomes are discussed in the contexts of dosage, implementation, and hot spot stability over time.

*While the evidence on the effectiveness of hot spots policing is persuasive, there still remains the question of what specifically police officers should be doing at hot spots to most effectively reduce crime. (Telep and Weisburd 2011: 6)*



Researchers have demonstrated that crime is concentrated in particular micro-level places such as street segments (Weisburd et al. 2004) and addresses (Sherman, Gartin, and Buerger 1989; Pierce, Spaar, and Briggs 1986) and that crime often varies from street to street (Sherman, Gartin, and Buerger 1989; Pierce, Spaar, and Briggs 1986; Groff, Weisburd, and Morris 2009). Concentrations of crime at particular places, commonly termed ‘hot spots’, is now a widely recognized phenomenon (Eck et al. 2005). Hot spots are defined as clusters of addresses or street segments (Block and Block 1995; Sherman and Weisburd 1995) that together represent an above average concentration of crime (Eck et al. 2005).

Advances in data availability and information systems have enabled police practitioners to routinely and precisely identify where their biggest crime problems are located (Sherman 1997; Eck and Weisburd 1995). In 2007, more than half of all police agencies serving 50,000 or more residents used computers to identify crime hot spots (Reaves 2010). This combination of concentration and variation provides the evidential basis for moving from random patrol and instead focusing police resources on high crime places (Sherman 1997). One related approach to addressing crime problems has become widely known as hot spots policing (Braga 2001; Weisburd and Braga 2003). Braga summarizes the popularity of hot spots for police attention by noting “[t]he appeal of focusing limited resources on a small number of high-activity crime places is straightforward. If we can prevent crime at hot spot locations, then we might be able to reduce total crime” (2008: 7).

Cumulative evidence suggests that concentrating police resources at small areas can reduce crime (Braga 2005, 2007, 2008; Sherman 1997; Lum, Koper, and Telep 2011); however, the tested interventions have used a variety of strategies including directed patrol, foot patrol, problem-oriented policing and offender focus. As Telep and Weisburd note in the quote above, little is known about which types of policing strategies are best suited for policing small areas. Evaluations comparing multiple strategies using robust experimental designs are even scarcer (for exceptions see Taylor, Koper, and Woods 2011; Braga and Bond 2008). More work is needed to extend those efforts using equally rigorous methods. This study extends previous work by using a randomized control trial implemented in <City, State> to compare the implementation of three popular policing strategies (foot patrol, offender-focus, and problem-oriented policing) at 60 violent crime hot spots with 21 control hot spots.

### Theoretical basis for hot spots policing

Several theories offer plausible explanations for the concentration of crime at place and provide a foundation for why concentrating police efforts at small, high crime places would reduce crime more effectively than unfocused patrol strategies. Deterrence theory holds that crime occurs where the perceived risk of committing a crime is lower than the perceived reward from it (Beccaria 1764, translated 1963; Bentham 1948 [1789]). The presence of police officers is assumed to influence the risk-reward calculus of would-be criminals ensuring the perceived risk of being caught and punished outweighs the potential benefits of committing a crime. In this way, police create an “unremitting watch” (Shearing 1996: 74) through which the risk associated with crime is increased. In focused areas, it is more likely officers’ presence will be noticed and perceived as a deterrent.

Routine activity theory (Cohen and Felson 1979; Felson 1987) and crime pattern theory (Brantingham and Brantingham 1991 [1981]; Brantingham and Brantingham 1993) explain why crime is more likely to occur at certain places and times than others. Crime occurs where motivated offenders and suitable targets come together in place *and* time in the absence of capable guardians. The characteristics of places interact with, and structure, the routine activities of individuals. In this way, the characteristics of places are directly responsible for the combinations of offenders, targets, and guardians present at



certain places and times. Policing strategies designed to either increase the level of guardianship at places through police presence or improved informal social control or to alter the built environment are intended to change the risk-reward structure of criminal decision-making and in doing so reduce crime.

### Evidence of the effectiveness of police efforts at hot spots

Support for concentrating police attention on small areas to reduce crime is increasing (Braga 2005, 2007, 2008; Sherman 1997; Lum, Koper, and Telep 2011). The National Research Council Committee to Review Research on Police Policy and Practices concluded “studies that focused police resources on crime hot spots provide the strongest collective evidence of police effectiveness that is now available” (2004: 250). Specifically, the literature contains examples of directed patrol (Sherman et al. 1995; Sherman and Rogan 1995; Crank et al. 2010; Caeti 1999), fixed patrol presence (Lawton, Taylor, and Luongo 2005), foot patrol (Ratcliffe et al. 2011), order maintenance (Weisburd and Green 1995; Caeti 1999; Braga and Bond 2008), gun enforcement (Sherman and Rogan 1995), and problem-oriented policing (Mazzerolle, Price, and Roehl 2000; Hinkle and Weisburd 2008; Sherman, Buerger, and Gartin 1989; Caeti 1999; Braga and Bond 2008; Beccaria 1764, translated 1963; Braga et al. 1999)<sup>i</sup>; however, the *comparative* effectiveness of policing strategies at hot spots is only now beginning to be explored.

We uncovered only two studies comparing different policing strategies employed at hot spots within an experimental framework. The earliest was a randomized control trial evaluating the implementation of different types of problem-oriented policing strategies at 17 treatment hot spots in Lowell, Massachusetts over a one year time period (Braga and Bond 2008). Although the focus of the experiment was on “policing disorder” using POP, there were a mix of activities undertaken including situational crime prevention (e.g. addressing problems with abandoned buildings and vacant lots), social service oriented actions (e.g., increasing recreational opportunities for juveniles), and aggressive order maintenance enforcement (e.g., dispersing crowds and making arrests for disorderly conduct). Overall reductions in treatment versus control places were found for robbery, non-domestic assault, and burglary incidents. A mediation analysis suggested that situational strategies produced the largest decreases in disorder followed by misdemeanor arrests.

The most recent research effort conducted a head-to-head test of directed patrol and problem-oriented policing strategies at violent crime hot spots in Jacksonville, Florida (Taylor, Koper, and Woods 2011). Researchers randomly assigned 83 hot spots to either a directed patrol (n=21), problem-oriented policing (n=22) or control (n = 40) (which received routine levels of patrol) category. The experiment ran for 90 days and the hot spots received treatment seven days a week. Problem-oriented policing hot spots were addressed by a group of supervisors, officers and crime analysts. Contrary to prior research, directed patrol produced only non-significant reductions in crime or calls for service during and after the intervention. Problem-oriented policing hot spots achieved a significant reduction in street crime.

In addition to these formal evaluations of hot spot strategies, the Police Executive Research Forum (PERF) recently surveyed 176 police agencies and identified 18 types of hot spot strategies used by practitioners; they also asked how frequently they use the strategies and which they perceive to be most effective (Police Executive Research Forum 2008).<sup>ii</sup> The PERF study showed that practitioners vary their policing strategy depending on the type of hotspot. The results suggest they do this based on a perception that different strategies are effective for different types of problem. The PERF survey indicates police practitioners are employing a wide variety of strategies to target specific crime problems in hot spots. This study extends scholarly research while taking into account practitioner perceptions of ‘what works’ at hot spots.

Findings from the Philadelphia Foot Patrol Experiment (Ratcliffe, Taniguchi, Groff and Wood 2011) have stimulated renewed interest in foot patrol. Accordingly, this study undertakes a head-to-head



comparison of three different policing strategies over the same general period using an experimental design: (1) foot patrol, (2) problem-oriented policing (POP) and (4) offender focus. The next sections describe the three policing strategies in terms of their theoretical and empirical potential for crime reduction when employed at small, high crime areas.

### Foot patrol

Foot patrol was the original policing strategy used in London, England (Klockars 1985). Deterrence theory provides the rationale for why foot patrol might reduce crime (Beccaria 1764, translated 1963; Bentham 1948 [1789]). As stated earlier, deterrence is achieved through an increase in the perceived certainty of apprehension. More than for car patrol officers, the effectiveness of foot patrol relies on offenders' perception that officers are not only watching but also more likely to recognize perpetrators from their interactions in the neighborhood.

Research into the effectiveness of foot patrol during the 1970s – 1990s found that it improved citizens' feelings of safety and citizen-police relations but did not reduce crime. The Newark Foot Patrol Experiment, among the best-known evaluations of foot patrol (Police Foundation 1981), found no significant differences among treatment and control beats for reported crime or official arrests. However, treatment beat residents were significantly more likely to report decreases in *perceived* crime than control beat residents. Similar findings were reported from subsequent studies of foot patrol regardless of whether the outcome was crime incidents (Esbensen and Taylor 1984; Bowers and Hirsch 1987) or calls for service (Pate 1989; Cordner 1991).

Two studies that used the same methodology to identify hot spots found significant violent crime reductions after implementing foot patrol. In Philadelphia, a randomized experiment reported hot spots with foot patrol experienced violent crime reductions of 23 percent (Ratcliffe et al. 2011). In Newark, a quasi-experimental study reported foot patrol reduced overall violence by 30 percent (Piza and O'Hara 2012).

### Problem oriented policing

Problem-oriented policing (Goldstein 1990) represents a shift from the traditional reactive stance characterized by answering calls for service and random patrol to a proactive approach that emphasizes identifying and solving problems. A problem is defined as "a reoccurring set of similar events, harmful to members of the community, that members of the public expect the local police to address" (Eck 2006). Problem-oriented policing (POP) requires police organizations to move beyond law enforcement and consider elements of harm to the community as potential problems that police can solve. In addition, POP emphasizes the use of non-law enforcement solutions as well as traditional responses to crime problems. This requires police to form partnerships with other local government agencies, as well as non-profit and faith-based organizations to solve problems rather than relying solely on traditional responses.

POP basically asks police officers to conduct applied science (scanning, analysis, response and assessment) in pursuit of improved quality of life (Eck 2006). This can be challenging for police officers who have not traditionally been trained for or tasked with obtaining a deep understanding of problems. As a result, problem-solving is sometimes described as "shallow" and tends to be weighted toward traditional law enforcement responses (Braga and Bond 2008). Even so, initiatives using problem solving have often achieved measurable crime reductions (see reviews by Braga 2002; Weisburd and Eck 2004; Weisburd et al. 2010; National Research Council Committee to Review Research on Police Policy and Practices 2004; Sherman and Eck 2002).

In summarizing the research evidence, several prominent researchers suggest POP principles when applied at focused places have the greatest success at reducing crime (Weisburd and Eck 2004; Clarke



and Eck 2005). In fact, they find the strongest evidence for the effectiveness of POP when applied at hot spots (Weisburd et al. 2008). The vast majority of evaluations of POP implementations, however, tend to suffer from weak designs (Weisburd et al. 2008; Weisburd and Eck 2004). In studies where POP is applied at hot spots, it is critical that other focused policing take place at hot spots for comparison. Without such controls it is difficult to disentangle whether it is the application of POP, the focus on small areas, or a combination of the two that underlies the observed crime reductions (Weisburd et al. 2008; Weisburd and Eck 2004). A finding of the relative value of POP vs. other strategies would help answer that question (see Eck 2003 for discussion of when experimental designs are (in)appropriate for evaluating POP).

### Offender focus strategy

Focusing on offenders has deep roots in policing. The earliest models of policing were formed for the sole purpose of capturing offenders after the commission of a crime (Klockars, 1985). Seminal criminological research demonstrating that a small percentage of offenders are responsible for most crime (Wolfgang, Figlio, and Sellin 1972) has fostered the idea that focusing on the most prolific offenders can have a substantial impact on crime rates (Ratcliffe 2008). After all, “[i]f a few individuals are responsible for most crime or disorder, then removing them should reduce crime” (Clarke and Eck 2005, Step 3). Offender focus is an important part of an intelligence-led policing framework (see Ratcliffe 2008). The potential importance of targeting specific offenders was recently highlighted in a report by the National Research Council Committee to Review Research on Police Policy and Practices (National Research Council Committee to Review Research on Police Policy and Practices 2004). In another publication, Sherman noted:

Like directed patrol, proactive (police-initiated) arrests concentrate police resources on a narrow set of high-risk targets. The hypothesis is that a high certainty of arrest for a narrowly defined set of offenses or offenders will accomplish more than low arrest certainty for a broad range of targets (Sherman 1997).

Therefore, as with foot patrol, offender focus strategies primarily rely on deterrence theory. In other words, the underlying assumption is two-fold. First, increasing the certainty of arrest for a small group of identified offenders will discourage both the targeted individuals and others who hear about the arrests from committing additional crimes. Of course, incarcerating prolific offenders is likely to have some incapacitative effects on crime rates as well (Blumstein, Cohen, and Nagin 1978). Second, even if the targeted offenders are not arrested, the extra police attention received by both targets and their associates may make it too risky to continue their criminal activity. The extra attention also makes it riskier for non-targets to operate in a particular area.

The evidence for the crime reduction value of offender focus strategies is promising, but the authors could find no studies evaluating offender focus strategies deployed in micro-level hot spots. Assessments of city-wide repeat offender units in Washington, D.C. and Phoenix (Arizona) found that offenders targeted by the repeat offender units were more likely to be arrested and receive longer custodial sentences than offenders targeted with standard police practices; however, the evaluations did not measure the units’ impact on overall crime rates (Abrahmse et al. 1991; Martin and Sherman 1986).

Using the above literature as a guide, the following study evaluates three different strategies, foot patrol, POP, and offender focus policing, at high violent crime places in one city. The goal is to discover



which particular strategies are effective for reducing violent crime reductions when deployed in small, high violent crime areas in a large, urban police department.

## Experimental Design

### Background to the <City> policing strategies experiment

The study was designed and conducted as part of a continuing research-practitioner partnership with the <City Police Department>. The Police Commissioner and management team were actively involved in the planning of the experiment so that the experimental design would more closely approximate how hot spots policing would occur naturally in a large urban police department. Indeed, as the passage below demonstrates, the mission of the department is consistent with research-practitioner collaborations.

In today's economy, we must be smart and judicious about allocating police resources. Saturation patrol is not an informed solution to preventing or reducing a rising crime problem. We must understand *what* works, *how* it works, *when* it works, and *where* it works. The answers to these questions provide the foundation for "evidence-based" policing strategies (citation suppressed).

Philadelphia is located in the northeastern part of the United States. The <City Police Department> is the <X> largest in the US with more than <X> officers. They patrol an area of roughly <X> square miles. Despite steady reductions over the past few years, violent crime remains a serious issue with 19,163 violent crimes in 2009.

### Selection of hot spot areas for random assignment

After lengthy discussions, police executives felt they could commit resources to adequately address 60 treatment areas (20 per intervention type). Using the process outlined below, a total of 81 mutually-exclusive target areas were identified, allowing 21 of these to be used as controls. Identification of these areas followed a multistep process. First, violent crime hotspots were delineated using spatial statistics. Violent crime point data were accessed from the <City Police Department>'s 2009 incident database. Violent crime was defined as homicide, robbery, aggravated assault and misdemeanor assault (see Table 1).<sup>iii</sup> Two different local measures for detecting spatial association and concentration were applied: Local Indicator of Spatial Association (LISA) and Hierarchical Nearest Neighbor Clustering (HNN).<sup>iv</sup>

In order to conduct the LISA analysis, the violent crime data were aggregated to a Thiessen polygon network centered on Philadelphia street intersections (n=21,572).<sup>v</sup> Before aggregating the violent crime data to these 'street corner' geographies, the violent crime counts were weighted to reflect the police department's focus on serious violent street crime. Determining crime seriousness is a contentious issue that has received the focus of prominent researchers (Blumstein 1974; Sellin and Wolfgang 1964). However, aside from the fact that homicide and gun-related crime results in the loss of life, homicide and gun-related crime is a political issue that receives extensive media coverage in Philadelphia (Crank 2003). Therefore, in Philadelphia, like most other large US cities, there is considerable pressure to reduce gun violence (Crank 2003). Accordingly, the <City Police Department>'s primary focus is on reducing gun-related violence, so homicides and incidents involving the threat of deadly force, including armed street robbery of persons, car-jackings, and aggravated assaults, were given a weight of 2. The remaining violent crime categories, unarmed robbery and simple (misdemeanor) assault were given a weight of 1. The weight assigned to each crime type is listed in Table 1. The LISA analysis identified 818



street corners with high violent crime counts adjacent to at least one other street corner with a high violent crime count.<sup>vi</sup>

Hierarchical Nearest Neighbor clustering (HNN) was then used as a secondary test in identifying micro-level violent crime hot spots.<sup>vii</sup> HNN is a useful alternative to the LISA analysis because it is not restricted to boundaries of the underlying geography, but rather the shape of a HNN hot spot will follow the actual shape of the point data. The HNN analysis was performed on a subset of the violent crime events involving the use or threat of lethal force: 1) homicide; 2) armed robbery (either person or carjacking); and 3) aggravated assault. Robberies that did not include the use of a deadly weapon and simple assaults were excluded from this portion of the analysis so that the identified hot spots would represent the most serious violent crime hot spots. Again, these crimes are the primary focus of <City Police Department> executive commanders when determining the organization's crime fighting strategy and reflects what the focus of any hot spots policing strategy in Philadelphia would encompass. A total of 167 first order micro-level hot spots of violent crime using lethal force were identified. The results of the LISA and HNN analyses were then drawn on a large-format map and presented to police command staff.

<Insert Table 1 about here>

To reflect as closely as possible the actual work flow of a hot spots policing initiative and to increase buy-in for the study, the second step was to identify deployment areas and then assign each to an intervention strategy. Senior police commanders (District Captains) were asked to use their operational knowledge to delineate the final boundaries of deployment areas and to identify which type of intervention should be applied in each. They were asked to identify 27 areas suitable for foot patrol, 27 areas that would benefit from problem-solving and 27 areas where police would focus enforcement on violent repeat offenders. Police commanders drew deployment areas around the hot spots identified by the LISA and HNN analyses taking into consideration the street network and environmental features. The 81 deployment areas were then displayed on a new map. In subsequent meetings with the <police department's> Regional Operations Commanders, the deployment areas' boundaries were revised to balance police operations with research priorities (e.g., achieving geographic separation of the target areas to allow for examination of displacement/diffusion effects).<sup>viii</sup> The final 81 hot spots were small, containing an average of 3 miles of streets and 23.5 intersections.<sup>ix</sup>

Consistent with other cities, crime in general and violence in particular are concentrated in a small proportion of the city's area. In 2010, the 81 hot spots accounted for about 2.5% (3.57 square miles) of the land area but roughly 19% of violent street felonies (2411 out of 12519). Clearly, applying resources to high crime places is a viable strategy for reducing violence in Philadelphia but the question of which actions police should take to address those places remained an open one.

The 81 hot spot deployment areas were stratified into three groups prior to randomization based on their pretest score on treatment suitability as qualitatively evaluated by police department commanders. Random assignment using a random number generator (Shadish, Cook, and Campbell 2002 p.304-305) was performed separately for each stratum of 27 areas resulting in 20 areas being assigned to treatment and 7 to control (Figure 1). The District Captains responsible for implementing the treatment conditions did not participate in the final delineation of the deployment areas and the control area locations were withheld from them. The control areas represent the normal levels of policing for a violent crime area during the experiment.

<Insert **Figure 1** here>





Even though we were limited by <agency> resource constraints to 20 treatment sites for each treatment type, we conducted an a priori power analysis to determine the power of the experimental design (Faul et al. 2007). Using a two-tailed test, with an  $\alpha$  level of .10, 60 cases in the treatment group and 21 cases in the control group had a power of greater than 80 percent when the effect size was large (<.80). Power was low when the effect size was small (.20) or medium (.50). Low power is a common problem among place-based experiments (Boruch et al. 2004).

### Treatment provided to target areas

In order to provide the best representation of what hot spots policing strategies would look like under normal conditions within a large urban police department, researcher involvement in the implementation phase of the experiment was minimal, and interviews were only conducted with officers post-implementation.

#### Foot Patrol

Each District Captain was given discretion to determine how foot patrol would be implemented within their assigned deployment areas as long as each target area was patrolled a minimum of 8 hours a day, 5 days a week, for 12 weeks. District Captains determined how many officers would patrol, which days and times officers would patrol, and other operational decisions. In all but one target area, officers patrolled in pairs and worked one shift, 5 days a week. The timing of the patrol varied based on crime problems as determined by the Captain and shift times.<sup>x</sup> In about half of the areas (9 out of 20) officers were volunteers and the rest were chosen by their immediate supervisors. Officers with varying years of service were used to patrol the 20 deployment areas in the present study. This was in contrast to the <City Patrol Experiment> where rookie officers were assigned foot patrol (citation suppressed).

#### Problem Solving

The tenets of problem-oriented policing (POP) introduced by Goldstein (1979, 1990) and a modified SARA process (Clarke and Eck 2005) framed the work conducted in the problem solving areas. Problem-oriented policing was conducted by teams of district officers in collaboration with community members and the support of personnel from police headquarters. Since POP was still relatively new at Philadelphia PD, all members of the problem solving teams attended a one-day POP training class which introduced the theoretical foundation of POP, described the SARA/problem solving process, and provided the trainees with examples of problem solving in practice. Class instructors were <police department officers> who were then assigned to mentor specific target areas (e.g., aid with problem identification and response development). The problem solving teams and mentors met periodically during the implementation of problem solving to discuss the team's efforts and modify the problem solving strategy as needed. The Captain overseeing each problem solving area was required to submit and continuously update "Action plans" documenting the strategy and progress in each area.<sup>xi</sup> Specific actions taken at each site varied with the problem identified.

#### Offender Focus

The tenets of intelligence-led policing framed the offender focus (OF) strategy (see Ratcliffe 2008). The focus was on identifying the repeat violent offenders who either lived in the target area or were suspected of being involved in violent crimes there. Offenders qualified for the initiative if they had a history of violent offenses (homicide, aggravated assault, robbery, or weapons possession) and were strongly suspected to be involved in a criminal lifestyle (i.e., drug dealing, gang membership, etc.). The offender focus component was introduced during a meeting with <City Police Department> executive police commanders, university researchers, district personnel assigned to implementing the strategy, and the police department's Central Intelligence Unit (CIU). A member of the police department's CIU



was assigned to each target area to maintain a list of repeat violent offenders. The offender focus team members were drawn from the agency's tactical operations officers, and tasked by the District Captain. Importantly, they were not assigned to take radio calls. OF team members and patrol officers made frequent contact with these prolific offenders using a variety of strategies; for example, making small talk with a known offender or serving arrest warrants for a recently committed offense. In addition to briefing patrol officers in the district about the initiative and distributing lists of the offenders in the initiative, OF team members in some districts used flat-screen televisions in their roll-call rooms to display photos and other intelligence gathered on these prolific offenders.

### Study period

The experiment was designed to have the interventions start simultaneously at the beginning of June and conclude in August so as to address the spike in crime that occurs during the summer months. Each intervention ran for a minimum of twelve weeks and a maximum of twenty four weeks at any single target area. Foot patrol was the easiest to implement and most foot patrol sites were quickly operational. The offender-focus sites required more organization and training, and so they did not start until slightly later in the experiment. Furthermore, there was considerable within-group variation in start dates. POP sites took the greatest amount of training and mentoring to get underway. This, coupled with the inherent difficulty of learning problem-solving, meant the problem-solving sites did not see any significant activity until later in the year than the other two types of policing strategies. Figure 1 shows start and stop times by intervention and week (vertical lines) from July 2010 to February 2011. Foot patrol ran for about 16-18 weeks, while offender focus strategies ran from summer 2010 into 2011. Problem-solving activities took time to commence, and continued into 2011. The timeline for both offender focus and POP was extended to give the interventions time to be implemented. Offender focus and POP concluded in February 2011. The staggered starting times both within and among groups of treatment sites created challenges for the analysis which are discussed in the next section.

<Insert **Figure 2** about here>

### **Analysis**

Since treatment was taking place at different times, repeated measures multilevel modeling using contrast coding is used to evaluate the effectiveness of the foot patrol, problem solving, and offender focus strategies during the experiment.<sup>xii</sup> Repeated measures multilevel models describe changes in an outcome measured at multiple time points for a given unit of analysis. The level one model is specified using time-varying covariates to describe within unit changes. Here, bi-weekly output/outcome counts are nested within treatment and control areas. Level-one parameters and the intercept can then be specified as random effects and predicted using level two variables. Time-varying predictors are entered at level one to determine if any differences in expected bi-weekly output or outcome counts can be attributed to the three experimental policing strategies after controlling for linear and quadratic time and temperature. The level two model describes between unit differences (Raudenbush and Bryk 2002).

Repeated measures multilevel models help address issues previously outlined by making time the unit of analysis at level one and allowing for the modeling of time-varying covariates. Contrast coding provides researchers the flexibility to create variables that test specific comparisons across multiple groups (McClendon 1994). Therefore, in the present study we are able to develop a treatment variable for each policing strategy using a contrast coding scheme based around four groups: (1) treatment areas for a respective strategy during treatment times, (2) control areas for a respective strategy during treatment times, (3) both treatment and control areas for a respective strategy during non-treatment times, and (4) the treatment and control areas for the other two strategies during all times.



Using repeated measures multilevel models and having the ability to specify time-varying contrast coded variables that simply “turn on” treatment over short time periods means that the output/outcome measures in the treatment areas are being compared to output/outcome measures in control areas during the same times. Modeling linear and quadratic time at level one then controls for any “natural” changes in output/outcome measures across the sample (i.e., short-term history). Entering temperature at level-one controls for the influence of seasonality/temperature possibly introduced by the varying start and stop dates both within and between treatments (Sorg et al. in press; Sorg and Taylor 2011).

### Outcome Measures

We examine two separate violent crime measures as our outcomes; all violent crime and violent street-felonies. The outcome all violent crime includes: a) homicides, b) robberies, c) aggravated assaults, and d) simple (non-felony) assaults; however, the violent street-felonies outcome excludes simple assaults. All outcomes are measured as bi-weekly counts for each experimental and control area, and are sourced from incident data from the <city PD> incident database. The data were aggregated to the experimental areas in ArcGIS using simple spatial joins and bi-weekly counts were then computed for each time period using the incidents’ date of occurrences and the bounding dates for each bi-weekly observation. The bi-weekly time series is discussed further below. In order to avoid an increased likelihood of making a Type I error, we use a Bonferroni correction for two outcomes to adjust the traditional .05 statistical significance threshold to .025 (p-value/number of outcomes; .05/2) (Tamhane 2009).

In addition to the violence dependent variables, we also seek to illuminate our findings by examining three measures of police outputs: narcotics crimes (both possession and distribution), pedestrian stops, and vehicle stops. All three outputs are largely police-initiated actions, and are generally perceived as indicators of officer-generated outputs in large urban police departments. For example, in large urban areas narcotics and violence often co-exist and any police focus on violence would likely also manifest as an increase in narcotics arrests. Similarly, field investigations (both pedestrian and car stops) provide a measure of the change in police-citizen enforcement-related contacts and numbers. These can often be used by police departments as an indication that they are ‘doing something’ about a problem, and externally provide a sign of police presence and action.<sup>xiii</sup> Again, we use a Bonferroni correction for three outputs to adjust the traditional .05 statistical significance threshold to .017 (p-value/number of outcomes; .05/3).

It was not possible to separate crime incidents handled or actions performed by officers in the experiment from non-experimental officers, so all crime incidents and actions taken by police are included in the outcome and output measures. Descriptive statistics for both outcome and output variables are provided in Table 3.

<Insert Table 3 about here>

Time varying variables are included at level one, and include linear time, quadratic time, average temperature, and variables for each of the three treatment strategies. A total of 37 bi-weekly observations are included in the model for each of the 81 experimental areas, thus the linear time effect ranges from 0 to 36. Time 0 starts on March 15, 2010, and the time series includes 6 bi-weekly observations (84 days or roughly 90 days) before foot patrol implementation began. Given that a number of experimental areas overlap with areas from the <Study removed> and were patrolled until the end of September 2009, starting the time series on March 15, 2010 provides a sufficient lag to ensure our time series does not include any potential confounding effects from the <Study removed> <Citation Suppressed>. Time 36 concluded on August 14, 2011 or 24 weeks/6 months after the



experiment ended on February 27, 2011. Overall, the linear time effect describes the overall crime trend across all experimental areas during the observed time series (i.e., addressing whether the outcome variable was generally increasing or decreasing). Additionally, quadratic time (time x time) ranges from 0 to 1296 and controls for the potential that any increasing/decreasing trend in the outcome variable over time began to accelerate during the evaluation. To control for seasonality effects, a variable capturing the average temperature during each bi-weekly time slot was also entered into the level one model. The temperature data were collected from an online weather archive (Underground 2011).<sup>xiv</sup>

Treatment was measured with three contrast coded variables. For the foot patrol contrast all foot patrol areas were coded “+0.5” during the bi-weekly time periods in which foot patrol was implemented and “0” for all other bi-weekly time periods. Conversely, the seven foot patrol control areas were coded “-0.5” during the implementation dates and “0” for all other time periods. All other areas (offender focus and problem solving treatment and control areas) were coded “0” for these time periods. The same coding scheme was applied for the problem solving and offender focus areas in the proper combination. Thus, the three treatment variables create contrasts “between the subset of groups with positive codes and the subset of groups with negative codes” (McClendon 1994: 219), or specifically stated, they respectively test how the bi-weekly expected crime count within the treatment areas of each specific strategy deviates from the bi-weekly crime count only in the control areas that were originally assigned that specific treatment type when all other variables in the model are held constant.

### Modeling strategy

The following repeated measures two level models were estimated for each output or outcome. Model 1 included linear time, quadratic time, and average temperature entered at level one (all effects grand-mean centered) with the intercept freed to vary across experimental areas. In Model 2, the three treatment contrast variables were entered uncentered and the linear time, quadratic time, and average temperature effects were controlled for. Finally, all level one predictors were added in model 3, the full model. All models are specified using an over dispersed Poisson distribution and an exposure variable of geographic area in square miles. It is important to point out that our interest is in the final models, the most stringent test of the treatment effects; however, the substantive results (i.e., the direction and relative size of the predictors and standard errors) of the earlier models were compared across all models to ensure that all relationships remained consistent and no obvious signs of misspecification were present in the final model. We only display the full models’ results in the tables below.<sup>xv</sup>

## Results

This section describes the findings related to each type of patrol strategy applied at violent crime hot spots. The randomized experimental design rules out the threat of systematic differences between treatment and control groups and allows researchers to assume any differences in outcome are the result of the treatment provided. Results for the two outcome measures (all violent crime and violent felonies) are discussed first and followed by results for our three output measures (pedestrian investigations, automobile investigations, and narcotics).

### All violent crime

Results for the final model using all violent crime as the outcome variable are shown in Table 4. The full model shows that violent crime hot spots receiving the offender focus strategy had expected violent crime counts that were approximately 22 percent less than the violent crime counts observed in the offender focus control areas during the bi-weekly time periods the offender focus strategy was implemented ( $\beta = -0.243$ ;  $ERR = 0.784$ ;  $p < 0.025$ ). The foot patrol and problem solving treatment effects



were statistically insignificant. The summer time spike in violence typically seen in Philadelphia is demonstrated by the significant effect of bi-weekly temperature where each 10 degree increase over the average bi-weekly temperature results in a corresponding 6 percent increase in the expected count of violent crime during a given bi-weekly time period ( $\beta = 0.006$ ; ERR = 1.006;  $p < 0.025$ ).<sup>xvi</sup>

<Insert Table 4 about here>

### Violent felonies

The full model for the violent felonies outcome variable is displayed in the second half of Table 4. A significant treatment effect is again found for the offender focus strategy. The expected violent felony counts for offender focus areas are approximately 31 percent lower than the expected violent felony counts observed in the offender focus controls areas during the bi-weekly time periods the offender focus strategy was implemented ( $\beta = -0.371$ ; ERR = 0.690 ;  $p < 0.025$ ). The problem solving treatment effect is again statistically insignificant. The foot patrol treatment effect is also insignificant at the Bonferroni corrected p-value of .025.<sup>xvii</sup> The expected violent felonies count is increased by roughly 7 percent for each 10 degree increase in the average bi-weekly temperature ( $\beta = 0.007$ ; ERR = 1.007;  $p < 0.025$ ).

### Pedestrian stops

The three policing strategies did not impact expected bi-weekly pedestrian stop counts during the treatment period (top half of Table 5). The significant quadratic time effect reveals that pedestrian stops were decreasing at an accelerated rate across all experimental areas later in the evaluation period ( $\beta = -0.0004$ ; ERR = 0.9996;  $p < 0.017$ ). Expected bi-weekly pedestrian stop counts across all areas were significantly increased by about 2 percent for every 10 degree increase over the average bi-weekly temperature during the time series ( $\beta = 0.002$ ; ERR = 1.002;  $p < 0.017$ ).

<Insert Table 5 about here>

### Automobile stops

Expected counts of automobile stops were significantly lower in the problem solving treatment areas relative to the 7 problems solving control areas during implementation (top-right of Table 5). Specifically, the differences in expected counts of automobile stops between problem solving areas and problem solving control areas were 13 percent during the problem solving treatment phase ( $\beta = -0.138$ ; ERR = 0.871;  $p < 0.017$ ). Expected bi-weekly automobile stop counts were lower during warmer bi-weekly time periods with each 10 degree increase above the average bi-weekly temperature resulting in about a 3 percent decrease ( $\beta = -0.003$ ; ERR = 0.997;  $p < 0.017$ ).

### Narcotics crime

None of the treatments significantly impacted bi-weekly expected counts of narcotics dealing and possession incidents (bottom half of Table 5). Overall, the significant linear time effect indicates that expected narcotics counts were decreasing by approximately 2 percent for each additional time period after the mid-point of our time series ( $\beta = -0.017$ ; ERR = 0.98;  $p < 0.17$ ).<sup>xviii</sup> Both quadratic time and temperature are statistically significant at the traditional 0.05 p-value, but not the more stringent Bonferroni corrected p-value of .017 for our three output measures.<sup>xix</sup>

### Displacement

Although crime displacement can occur in many forms (Eck 1993; Reppetto 1976), immediate spatial displacement is one of the most frequent criticisms against hot spots policing initiatives (Rosenbaum 2006). Recent empirical evidence, however, suggests that immediate spatial displacement



is unlikely and a diffusion of crime control benefits is more likely to be uncovered during hot spots policing initiatives (Weisburd et al. 2006; Guerette and Bowers 2009). Because at least some immediate spatial displacement is not unheard of <cite suppressed>, we evaluated immediate spatial displacement using Bowers and Johnson’s (2003) Weighted Displacement Quotient (WDQ) measure.

The WDQ equation/algorithm requires crime counts from three separate areas, treatment locations (denoted “A”), buffer displacement locations (denoted “B”), and control areas (denoted “C”), both before (denoted “t<sub>0</sub>”) and during (denoted “t<sub>1</sub>”) the crime prevention initiative. It follows that if geographic displacement occurred then crime in (A) would have decreased and crime in (B) would have increased relative to (C) during the treatment period. Conversely, if the initiative’s crime control benefits diffused into the immediately adjacent areas then crime in both (A) and (B) would have decreased relative to (C) during the treatment period. The WDQ is expressed mathematically as:

$$WDQ = \frac{Bt_1/Ct_1 - Bt_0/Ct_0}{At_1/Ct_1 - At_0/Ct_0} = \frac{\text{Buffer Displacement}}{\text{Treatment Success}} \quad (1)$$

This quotient can be interpreted in terms of the success of the intervention as well as whether displacement or a diffusion of benefits occurred (Bowers and Johnson, 2003: 286).

Due to the theoretical process underpinning crime displacement, a WDQ can only be computed when an initiative produces a measureable crime reduction/prevention benefit (Bowers and Johnson 2003), therefore we only examine displacement/diffusion of benefits for the offender focus treatment areas on the all violent crime and violent felonies outcomes. We use the same 20 offender focus areas (A) and the 7 control areas (C) from the repeated measures multi-level models, and 20 buffer areas (B) developed specifically for the WDQ analysis. The 20 buffer areas were developed by three researchers performing systematic social observations of the 81 experimental areas during the summer of 2010 (the treatment period). Given the precedent established in the hot spots policing evaluation literature (Weisburd and Green 1995; Braga and Bond 2008; Weisburd et al. 2006; Braga et al. 1999), the field researchers were instructed to create buffer areas extending roughly two blocks in all directions from each treatment area’s perimeter. The researchers were then permitted to alter the displacement areas’ boundaries by considering features of the local environment. For example, if a public transportation line, highway, or body of water made it impossible that crime could be displaced within the two-block guideline area then the displacement area would have been created to reflect the restrictions of the urban backcloth.

The pre-treatment period (t<sub>0</sub>) is the ninety days prior to the implementation of the offender focus strategy in each area. Recall, the treatment period (t<sub>1</sub>) varies across the offender focus treatment areas (A), but the buffer areas (B) received the same treatment period as their respective treatment area. The treatment period is uniform across the seven control areas (C); spanning from the first and last implementation dates of all 20 offender focus areas (21 June 2010 to 27 February 2011).<sup>xx</sup>

During the 90 day pre-treatment period (t<sub>0</sub>), the counts for the all violent crimes outcome across the offender focus -treatment (A), -buffer (B), and -control (C) areas were 268 (At<sub>0</sub>), 380 (Bt<sub>0</sub>), and 98 (Ct<sub>0</sub>) respectively. For the treatment period (t<sub>1</sub>) the offender focus- treatment (A), -buffer (B), and -control (C) areas recorded counts of 522 (At<sub>1</sub>), 713 (Bt<sub>1</sub>), and 260 (Ct<sub>1</sub>) on the all violent crimes outcome, respectively. These values are reflected in the WDQ equation below:

$$WDQ = \frac{713/260 - 380/98}{522/260 - 268/98} = \frac{-1.135}{-0.727} = 1.56 \quad (2)$$



The success measure of -0.727 indicates that violent crime in the offender focus treatment areas increased during the treatment period, but the amount of violent crime in the control areas increased even more. The buffer displacement measure of -1.135 indicates that crime also decreased in the buffer areas during the initiative in comparison to the controls. Standard interpretation of the overall WDQ of 1.56 suggests a diffusion of crime control benefits to the offender focus buffer areas. It is also possible that, given the nature of the treatment, focusing on prolific offenders, spillover of the treatment into the displacement areas occurred and generated the crime reduction. Regardless, there was no evidence of immediate spatial displacement. The overall WDQ for violent felonies was 1.33 indicating a similar pattern of displacement-related results for violent felonies.<sup>xxi</sup>

## Limitations

This experiment is an important contribution to our knowledge about what types of strategies reduce violent crime in hot spots, however, our commitment to conducting a field experiment that accurately reflected how hot spot policing would be implemented in a large, urban police agency resulted in three potential weaknesses in the design. First, because crime places tend to be concentrated in certain areas, the hot spots also tend to be clustered. This clustering translated into 8 study hot spots being located adjacent to one another and 12 within one block of each other (see Figure 1). The proximity of treatment places to one another and to control places opens up the possibility of displacement and diffusion of benefits from one to another. If control sites received a diffusion of benefits and experienced violent crime reductions from being near an offender focus site, it would be harder to identify a specific treatment effect. While previous studies have noted this issue (Weisburd and Green 1995; Weisburd et al. 2006), more research is needed to determine the likely displacement distance from focused enforcement so that realistic displacement areas can be drawn (Brantingham and Brantingham 2003).

Second, because commanders helped to identify the sites that would undergo future randomization into either treatment or control, they likely were able to recall the locations of the control sites and the type of policing strategy they had suggested. Although it is unrealistic to expect they did not remember the hot spot areas that were placed in the control condition, it is also unlikely that, after staffing the sites selected to receive treatment, they had additional resources to spare; however, if commanders did focus on the control areas and successfully reduced crime by doing so, it would be harder to detect a treatment effect if one occurred.

Third, conducting place-based experiments is challenging. It had always been difficult to balance the operational needs of law enforcement agencies with the rigors of randomized experiments; but the recent increases in violent crime coupled with severe budget constraints have increased the challenges. Even with the support of the Police Commissioner and active participation in the design of the experiment by a group of other high ranking personnel, the reality of personnel shortages made put commanders in the difficult position of juggling immediate demands via citizen calls for service with the experiment's emphasis on proactive policing. Line personnel charged with answering radio calls rightly prioritize those demands over problem solving activities. These challenges are not unique to the Philadelphia police department. Thus the outcomes from this experiment more accurately reflect the likely gain from implementing these policing strategies in a typical large, urban police department experiencing significant resource constraints.

## Discussion

An increasing number of studies have demonstrated the effectiveness of hot spots policing strategies for reducing crime; however, there has been relatively little attention paid to the types of strategies police employ in hot spots (see Braga and Bond 2008; Taylor, Koper, and Woods 2011 for exceptions). Here



we examined the effectiveness of three police strategies – problem-solving (PS), foot patrol (FP) and offender focus (OF), at reducing violent crime in hot spots. The offender focus sites produced significant decreases in crime, with decreases in 22 percent for all violence, and 31 percent for violent felonies. We found no experimental evidence of immediate spatial displacement around the offender focus sites. This section discusses the study’s findings and suggests critical avenues for future research.

### Focusing on offenders in hot spots reduced violent crime

As compared to control areas, when police focused on offenders causing problems in hot spots they were able to reduce violent crime by 22% and violent felonies by 31%. Theoretically, the offender focus strategy is based on the criminological axiom that a small percentage of offenders are responsible for a disproportionate amount of crime (Esbensen et al. 2010; Wolfgang, Figlio, and Sellin 1972); however, there are several possible practical explanations for the success of the offender focus (OF) treatment as well.

Focusing on repeat offenders is a traditional policing strategy (Weisburd and Eck 2004). After the appropriate offenders were identified, officers did not require any new training to learn the skills necessary to focus on prolific offenders. It is likely that the police personnel were simply the most comfortable implementing this strategy because it was familiar to them. In addition, focusing on repeat offenders enjoys widespread support in both the department and community. Separate surveys of officers and the community within the hot spot areas showed both groups supported the notion of focusing on repeat violent offenders <citation suppressed>. Therefore, not only is the offender focus strategy familiar to police officers, it also a strategy that is met with a lot of enthusiasm by Philadelphia police officers. This familiarity and enthusiasm was further supported by an organizational infrastructure that provided a strong foundation for action. Intelligence officers had already been assigned to high crime districts as part of the department’s overall crime reduction strategy. In addition, OF officers were selected from the districts’ tactical operations squads. These ‘five-squad’ officers were used to taking on special operations and have an organizational reputation for being proactive officers who make a lot of stops and arrests. Five-squad officers also had no responsibility for answering radio calls, so they had the ability to give the people and places extra attention.

Beyond immediate crime reduction, OF policing has several potential ancillary benefits. First, a carefully implemented OF strategy can be less intrusive for law abiding citizens. By focusing on specific people that are suspected or known to be involved in illegal and/or violent activity, police can avoid broad-based increases in pedestrian and automobile stops which disproportionately affect those living in impoverished, minority neighborhoods. The fact there were no significant differences in the numbers of pedestrian or car stops or narcotics incidents lends support to the interpretation that OF enables police officers to be more judicious with their field investigations. Second, an add-on benefit of stopping the “right” people instead of a wide cross-section of people is that such a strategy makes it more likely that the community will perceive police actions as procedurally just (Tyler 2003). When community members perceive that police actions are fair, they are more likely to be more satisfied with/have confidence in police services, follow the law, and help police fight crime (Tyler 1988; Tyler 2004; Reisig and Lloyd 2009; Taylor and Lawton in press).

Many focused policing efforts are criticized for simply moving crime around. A weighted displacement quotient indicated no immediate spatial displacement from the OF target areas as compared to controls. At the same time, it was impossible to determine whether the initiative produced a diffusion of benefits which reduced crime in the surrounding area or whether a treatment spillover effect was at work. The nature of the intervention offers one explanation for the lack of immediate spatial displacement of crime. A focus on the people who cause problems at a place naturally takes a more targeted view of the





crime problem. If we assume the prolific offenders identified as targets by intelligence officers are operating in that particular hot spot area because it is particularly amenable to crime, then it is likely that places immediately adjacent to the hot spot may not have those attributes or the total package of attributes. In addition, if arrests are made as a result of focused efforts, those arrested will be off the streets for a period of time (i.e., incapacitated) and thus unable to contribute to an increased crime problem in adjacent areas.

In combination then, these findings support the potential effectiveness of focusing on chronic offenders in hot spots for reducing violent crime. With careful implementation, crime reductions can occur without the massive increases in pedestrian and car stops that tend to produce many arrests and subsequently flood local jails, the court system, and ultimately the prison system (see Goldkamp and Vilcica 2008 for a discussion of the potential side effects of hot spots policing). In a recent paper, Durlauf and Nagin (2011) argue that hot spot policing can be used to alter the risk-reward calculus of offending by increasing the certainty of detection. They hypothesize that strategically shifting resources from prisons to police to conduct hot spots policing can simultaneously produce crime reductions while reducing prison populations. Ultimately, the authors call for more research that investigates which specific strategies should be implemented. <City's> experience with OF policing provides initial empirical support for their argument. Not only could increasing resources to focus on prolific offenders in hot spots be effective, but the strategy's narrow focus on prolific offenders would avoid large increases in cases in the prison population.

#### Problem-solving and foot patrol failed to reduce violent crime

We had hypothesized both problem-solving (PS) and foot patrol (FP) would reduce violent crime as compared to their respective control sites but neither revealed statistically significant results. What can explain these findings? Turning to the PS sites first, PS was still relatively new in < City> and the officers assigned to work on the project were drawn from patrol. Even after being assigned to the initiative, they were still responsible for answering radio calls. Thus, similar to the implementation in most departments, problem-solving activity was conducted in down-time between other duties. The result was that even with the additional support of a mentor at headquarters, PS teams undertook relatively 'shallow' analyses. This reflects the situation many agencies experience when shifting from a reactive to a proactive, PS paradigm (Bullock, Erol, and Tilley 2006). Especially in this era of reduced policing strength, radio calls keep coming and there are fewer resources to answer them. In addition, fieldwork and fidelity surveys showed that at least eight of the problem-solving areas switched to a focus on nonviolent crime and/or quality of life issues during the experiment. At least four sites focused on narcotics in addition to a specific violent or nonviolent crime problem. Another site was located in the territory of the 'Kensington Strangler'; a serial rapist and killer who was active during the study period (Rawlins 2011). In the end, almost a half of the PS sites did not implement PS targeting violent crime problems and contrary to previous studies we failed to find a crime reduction for even the 'shallow' problem solving that did take place in our analysis.

In the case of FP, the sites in this experiment had several differences from the way they were implemented during a previous, more successful violence reduction program, in Philadelphia. One difference was in the experience level of the officers. This experiment involved placing veteran officers rather than rookies in the hot spot areas. As indicated by our failure to find any significant increases in our output measures, the veterans were less aggressive in their enforcement than the rookies from the <City foot patrol experiment> who increased pedestrian and vehicle stops by 64 and 7 percent respectively and narcotics incidents by 15 percent <citation suppressed>. As a group, rookie officers are likely to be more enthusiastic to start making the difference they joined the job to make and as a result be more aggressive in their enforcement activities. Furthermore, unlike the veteran officers here, the



rookie officers also received specific foot patrol training. More experienced officers may generate less activity as their professional experience allows them to be more judicious about whether or not to conduct field investigations. Veteran officers may also have less interest in dealing with minor drug cases or simply perceive foot patrol as a 'punishment' and choose not to generate activity (Moskos 2008).

Another potentially significant difference between the earlier experiment and this one was in the dosage level. FP officers in this experiment spent only half the amount of time in a hot spot in comparison to the <study name suppressed> (i.e., one shift instead of the two shifts per day). One of the officers walked alone rather than in a pair which may have affected the types of activities the officer was willing to undertake. It could be that there is a threshold of foot patrol presence required to make a difference. Or that potential offenders are able to adapt more easily when only one shift of officers is present on any given day. The timing of the dosage was also different. In eight of the sites officers worked exclusively during the day shift rather than the busier late afternoon/early evening shift.

Finally, the average size of the FP areas in this experiment was 61% larger than in the successful 2009 experiment (0.049 square miles versus 0.031 square miles respectively) <citation suppressed>. In the present study, the foot beats were made slightly larger in response to officers' feedback that smaller foot beats did not provide enough activity over time and resulted in boredom, but it might be that foot patrol is only effective when concentrated in very small areas.

These differences suggest the need for more research to discover the appropriate amount of foot patrol presence to achieve a crime reduction. Experiments such as one just completed in Sacramento, CA (conducted with car rather than foot patrol) which found 15 minutes of officer presence was sufficient to achieve a significant crime reduction are needed for FP (Telep, Mitchell, and Weisburd 2012). Overall, our findings highlight the need to quantify more precisely what the officers are doing while on FP and how that relates to crime reduction (i.e., to identify the specific mechanisms underlying crime reductions).

#### Differences in the volume of officer activity by type of intervention

One explanation for a decrease in violent crime, or the lack thereof, might be found in the strategies' implementation. One measurable aspect of implementation was the type and amount of enforcement activity being generated by officers in the small, high crime places. Examining these activities might also provide clues to changes in the types of activities undertaken by officers working in the target areas. Of course, we expected there might be differences in the tactics employed across the three strategies depending on the specific crime problem at the hot spots. Foot patrol officers have limited mobility and thus it is easier for them to use pedestrian stops as an investigation tool. In Philadelphia, the low speed limits and narrow streets make it possible for foot patrol officers to successfully make car stops. Thus it would have been possible to see increases in the number of pedestrian and car stops as compared to the control sites. The integration of FP into the environment also makes it easy for them to see, hear and smell what is happening around them without the interference of a car. This makes them more likely to notice narcotics offenses and be in a position to address them. As a result, foot patrol has the potential to increase narcotics enforcement activity as well. However, our results showed no statistically significant differences between foot patrol treatment and control sites for our output measures. As mentioned above, it could be that aggressive pedestrian and car stops as well as narcotics enforcement are important components to foot patrol for reducing violent crime <citation suppressed>.

In the case of PS sites, measures of officer output could move in either direction depending on the focus of the PS initiative and that would only be known after an in-depth analysis of recent crime was done. We hypothesized a number of scenarios. First, the analysis of the problem may not have called for any



of the three output measures as an appropriate response. In this case, we would expect no change in output related to the implementation of PS which is what our results showed. Second, the response might have included increasing pedestrian stops, car stops, or narcotics enforcement but the plan may not have been successfully translated into action by the line officers assigned to the PS site. If this was the case, there would be no significant change in the output measures related to the plan. Third, a subset of the tactics might have been called for by the response to the problem analysis and the PS officers might have tried to achieve increases in these outcomes but they may not have had enough personnel or enough discretionary time to be successful in achieving significant increases. Here, once again, there would be no significant change in the output measures. There could also be a significant decline in the use of a tactic that had previously been heavily relied upon but was now not relevant in the context of the new response or if the officers responsible for carrying out the response no longer had enough time to conduct the tactic due to their new experimental duties. The models indicated for PS sites there was a significant decrease in automobile stops between treatment and control hot spots but no significant difference in pedestrian stops or narcotics incidents. The latter scenario may explain why automobile stops decreased without significant increases in other output measures.

Like the PS sites, we thought it was plausible for the changes in the output measures for OF sites to reflect the type of problems being created by the targeted offenders at particular places and the tactics chosen to respond to those problems. Given the active role that narcotics play in many violent crime problems, if many of the OF sites prolific offenders were involved in narcotics, than the numbers of recorded narcotics incidents might be significantly higher in the treatment areas. If the problem people were known to carry weapons there might be more pedestrian and car stops to uncover weapons. However, there were no statistically significant differences in any of the output measures for the OF sites. As stressed before, our failure to uncover significance differences on the output measures between the OF and control areas likely reflects the strategy's very narrow focus on only the most prolific violent offenders and demonstrates the ability of an OF strategy to reduce crime while not significantly impacting law abiding citizens.

### Implications for Research

Our research reveals several important implications for future evaluations of specific policing strategies in violent crime hot spots. First, the preceding discussion illustrates that it is not only what strategy is chosen but also how it is implemented. Most place-based experiments have focused on the dosage received as evidenced by time spent in hot spots. The thorny issues surrounding measuring police dosage in terms of vigor or fidelity (i.e., consistency of treatment design with treatment implementation) have received far less attention (Sherman and Weisburd 1995). Studies that have attempted to measure actions taken by police at hot spots have sometimes relied on police data (citations suppressed; Telep, Mitchell, and Weisburd 2012). Only one study applied a rigorous qualitative methodology to capture the types of actions undertaken under a problem-oriented policing strategy (Braga and Bond 2008). It is now possible to build computer applications that can be used by officers to organize their work while at the same time acting as detailed data collection devices for researchers. Additional research combining qualitative research methods with these types of advancements in technology may prove the most informative (see Esbensen et al. 2011 for a multi-method framework for program evaluation).

Second, although violent crime is consistently concentrated at a relatively small number of places, it does not seem to be stable at small places over short time periods of weeks or months. In almost half of the problem solving sites, after looking at recent crime figures, police officers reported violence was not the biggest problem, but rather property crime or quality of life offenses. Thus hot spots of violent crime identified using violent crime for the previous year may not appear as hot when viewed through the lens of the preceding ninety days. Related to experimental design, this means that hot spot analyses



using the previous one to three years to identify reliably high violent crime places may need to be supplemented with analyses of more recent crime fluctuations over the previous ninety days to ensure the candidates for hot spots are still violent. Overall, more research is needed to better understand and quantify the short term temporal stability of crime hot spots in order to most accurately choose areas for hot spot policing.

## Conclusion

This research was undertaken to explore the question of which policing strategies work in small, violent crime hot spots (Taylor, Koper, and Woods 2011; Telep and Weisburd 2011). We tested three different strategies, foot patrol, offender focus and problem solving. We found hot spots implementing an offender focus strategy achieved a 24 percent reduction in violent crime and a 31 percent reduction in violent felonies as compared to their control areas. The effectiveness of a hot spot policing strategy that focuses on the people who are causing the problems in hot spots suggests the application of intelligence-led policing strategies might be fruitful at micro-level places. In addition, our results indicate that by focusing police efforts on the 'problem people' associated with the 'problem places', police can achieve significant crime reductions while avoiding negative community perceptions of their actions. Additional research is needed that more precisely measures what police officers do while in the community if we are to understand why some crime reduction strategies succeed and others fail.

*Table 1: 2009 Violent crimes used to delineate deployment areas*

Violent (UCR Codes)	Crime	HNN Lethal Index	LISA Weight	Citywide Total	Citywide Total Geocoded	Citywide Geocoding Hit-Rate
Homicide (111-116)		Yes	x2	270	266	98.52%
Armed (300-304)	Robbery	Yes	x2	3,611	3,556	98.48%
Armed Robbery Vehicle (388-398)		Yes	x2	198	192	96.97%
Aggravated Assault (411-414)		Yes	x2	5,418	5,349	98.73%
Unarmed (305-308)	Robbery	No	x1	2,797	2,754	98.46%
Unarmed Robbery Vehicle (399)		No	x1	85	84	98.82%
Misdemeanor Assault (801)		No	x1	6,515	6,437	98.80%
Total		-----	-----	18,894	18,638	98.64%

Source: Philadelphia Police Department Incident Database

*Table 2: Deployment area geographic characteristics descriptive statistics*

	Area (Sq. Miles)				Street network length (Miles)				Street intersection count			
	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.	Min	Max	Mean	St. Dev.
Foot patrol areas (n=20)	0.013	0.124	0.049	0.026	1.30	5.38	3.21	1.07	7	44	25.3	10.34
Problem solving areas (n=20)	0.004	0.103	0.034	0.027	0.99	4.89	2.52	1.18	5	39	18.7	10.69
Offender focus areas (n=20)	0.010	0.239	0.056	0.048	1.22	12.23	3.63	2.48	8	102	28.25	21.81
All control areas (n=21)	0.012	0.086	0.037	0.018	1.01	4.27	2.72	0.84	6	36	21.81	7.47
Foot patrol control areas (n=7)	0.023	0.086	0.043	0.021	1.64	4.27	2.84	0.79	15	31	22.43	5.90
Problem solving control areas (n=7)	0.013	0.059	0.040	0.013	1.54	3.93	2.95	0.77	10	32	23	6.91
Offender focus control areas (n=7)	0.012	0.053	0.029	0.015	1.01	3.48	2.37	0.83	6	36	20	8.94
All areas (n=81)	0.004	0.239	0.044	0.033	0.99	12.27	3.02	1.59	5	102	23.49	14.11



*Table 3: Deployment area bi-weekly dependent variables descriptive statistics*

	All Violent Crime						Violent Felonies					
	Min	Max	Mean	Median	Var.	S.D	Min	Max	Mean	Median	Var.	S.D
Foot patrol areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	10	2.25	2.00	3.68	1.92	0	9	1.37	1.00	2.18	1.48
Problem solving areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	9	1.44	1.00	2.35	1.53	0	6	0.82	0.00	1.15	1.07
Offender focus areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	15	1.80	1.00	4.24	2.06	0	12	1.07	1.00	2.19	1.48
Foot patrol control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	12	1.63	1.00	2.33	1.53	0	11	1.01	1.00	1.61	1.27
Problem solving control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	8	1.69	1.00	2.59	1.61	0	6	0.91	1.00	1.33	1.15
Offender focus control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	7	2.05	2.00	2.91	1.71	0	6	1.26	1.00	1.31	1.27
All areas (n <sub>1</sub> =81; n <sub>2</sub> =2997)	0	15	1.82	1.00	3.30	1.82	0	12	1.08	1.00	1.80	1.34
	Pedestrian Stops						Automobile Stops					
	Min	Max	Mean	Median	Var.	S.D	Min	Max	Mean	Median	Var.	S.D
Foot patrol areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	248	32.50	22.00	1034.12	32.16	0	76	19.49	16.00	206.51	14.37
Problem solving areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	122	18.76	13.00	347.29	18.64	0	103	13.96	10.00	206.12	14.36
Offender focus areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	144	20.47	15.00	375.46	19.38	0	98	15.66	11.00	241.38	15.54
Foot patrol control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	52	14.17	13.00	89.99	9.49	0	37	10.42	9.00	50.81	7.13
Problem solving control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	2	107	23.91	20.00	245.51	15.67	1	57	15.79	13.00	121.07	11.00
Offender focus control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	137	28.17	26.00	654.93	25.59	0	66	16.92	16.00	233.79	15.29
All areas (n <sub>1</sub> =81; n <sub>2</sub> =2997)	0	248	23.43	17.00	555.88	23.58	0	103	15.85	12.00	203.07	14.25
	Narcotics											
	Min	Max	Mean	Median	Var.	S.D.						
Foot patrol areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	25	2.47	1.00	13.65	3.70						
Problem solving areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	6	0.79	0.00	1.35	1.16						
Offender focus areas (n <sub>1</sub> =20; n <sub>2</sub> =740)	0	11	1.22	1.00	2.25	1.50						
Foot patrol control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	7	0.94	0.00	1.99	1.41						
Problem solving control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	9	1.52	1.00	2.24	1.50						
Offender focus control areas (n <sub>1</sub> =7; n <sub>2</sub> =259)	0	19	2.92	2.00	13.35	3.65						
All areas (n <sub>1</sub> =81; n <sub>2</sub> =2997)	0	25	1.57	1.00	6.34	2.52						

Notes: (n<sub>1</sub>=number of deployment areas; n<sub>2</sub>=number of bi-weekly observations across all areas). Source: Philadelphia Police Department Incident Database.



Table 4: Multilevel count model results: Violent crime outcome variables

	All Violent Crime Full Model					Violent Felonies Full Model				
	$\beta$	St. Err.	ERR	C.I.	T-ratio	$\beta$	St. Err.	ERR	C.I.	T-ratio
Intercept	3.922	0.068	50.506	44.10 - 57.85	57.41*	3.395	0.072	29.813	25.83 - 34.42	46.97*
Linear Time	0.004	0.005	1.004	0.99 - 1.02	0.79	0.011	0.007	1.012	1.00 - 1.03	1.57
Quadratic Time	0.000	0.000	1.000	1.00 - 1.00	-1.17	0.000	0.000	1.000	1.00 - 1.00	-1.49
Temperature	0.006	0.001	1.006	1.00 - 1.01	6.50*	0.007	0.001	1.007	1.00 - 1.01	5.62*
Foot Patrol	0.043	0.079	1.044	0.90 - 1.22	0.55	0.256	0.132	1.291	1.00 - 1.67	1.93
Offender Focus	-0.243	0.087	0.784	0.66 - 0.93	-2.81*	-0.371	0.116	0.690	0.55 - 0.87	-3.20*
Problem Solving	0.088	0.098	1.092	0.90 - 1.32	0.90	0.103	0.125	1.109	0.87 - 1.42	0.83
Variance Components	St. Dev.	Var. Comp.	df	Chi-square	P-value	St. Dev.	Var. Comp.	df	Chi-square	P-value
Intercept, R0	0.498	0.248	80	1315.83	0.000	0.538	0.290	80	863.04	0.000
level-1, E	1.09	1.18				1.10	1.22			

Notes: \*p < .025, Bonferroni corrected p-value based on two outcomes; Outcomes are bi-weekly counts with models specified as Poisson distributions with over dispersion and an exposure variable of area (Sq. Mi). Linear time, Quadratic time, and Avg. bi-weekly temperature are grand mean centered. The foot patrol, problem solving, and offender focused variables are contrast coded variables with the 7 control areas originally assigned the particular treatment area coded as the referent. Sources: Philadelphia Police Department Incident Database; www.weatherunderground.com.





*Table 5: Multilevel count model results: Pedestrian stops, Automobile stops, and Narcotics output variables*

	Pedestrian Stops Full Model					Automobile Stops Full Model				
	$\beta$	St. Err.	ERR	C.I.	T-ratio	$\beta$	St. Err.	ERR	C.I.	T-ratio
Intercept	6.448	0.087	631.253	531.39 - 749.88	74.40*	6.078	0.080	436.136	371.72 - 511.71	75.57*
Linear Time	0.001	0.006	1.001	0.989 - 1.013	0.12	-0.006	0.003	0.994	0.988 - 1.001	-1.73
Quadratic Time	-0.0004	0.0002	0.9996	0.999 - 1.000	-2.68*	0.00002	0.00008	1.00002	1.000 - 1.000	0.23
Temperature	0.002	0.001	1.002	1.001 - 1.004	2.69*	-0.003	0.001	0.997	0.996 - 0.998	-5.15*
Foot Patrol	0.048	0.105	1.050	0.854 - 1.290	0.46	-0.112	0.067	0.894	0.784 - 1.021	-1.65
Offender Focus	-0.088	0.076	0.916	0.788 - 1.064	-1.15	-0.055	0.057	0.947	0.846 - 1.059	-0.96
Problem Solving	0.058	0.089	1.060	0.890 - 1.263	0.65	-0.138	0.052	0.871	0.787 - 0.965	-2.63*
Variance	St. Dev.	Var.	df	Chi-square	P-value	St. Dev.	Var.	df	Chi-square	P-value
Intercept, R0	0.789	0.623	80	10433.54	0.000	0.766	0.587	80	11357.18	0.000
level-1, E	2.051	4.206				1.424	2.029			

Narcotics Full Model					
	$\beta$	St. Err.	ERR	C.I.	T-ratio
Intercept	3.846	0.187	46.793	32.29 - 67.82	20.59*
Linear Time	-0.017	0.007	0.983	0.970 - 0.996	-2.49*
Quadratic Time	0.000	0.000	1.000	1.000 - 1.001	1.98
Temperature	-0.002	0.001	0.998	0.996 - 1.000	-2.17
Foot Patrol	0.021	0.172	1.021	0.728 - 1.430	0.12
Offender Focus	0.125	0.117	1.134	0.901 - 1.426	1.07
Problem Solving	-0.110	0.065	0.896	0.789 - 1.017	-1.70
Variance	St. Dev.	Var.	df	Chi-square	P-value
Intercept, R0	1.020	1.040	80	6987.34	0.000
level-1, E	1.101	1.213			

Notes: \*  $p < .017$ , Bonferroni corrected p-value based on three outputs; Outputs are bi-weekly counts with models specified as Poisson distributions with over dispersion and an exposure variable of area (Sq. Mi). Linear time, Quadratic time, and Avg. bi-weekly temperature are grand mean centered. The foot patrol, problem solving, and offender focused variables are contrast coded variables with the 7 control areas originally assigned the particular treatment area coded as the referent. Sources: Philadelphia Police Department Incident Database; [www.weatherunderground.com](http://www.weatherunderground.com).



*Table 6: Pretreatment crime in hot spots areas (90 days)*

		Foot Patrol		Offender Focus		Problem Solving	
		Treatment	Control	Treatment	Control	Treatment	Control
All Violent	Min	2	2	3	4	2	3
	Max	33	17	50	29	20	22
	Median	11.5	13	9.5	13	10	13
	Mean	14.35	11	13.4	14	10.35	10.86
	S.D.	7.6	6.03	11.18	8.21	6.02	7.06
Violent Felonies	Min	2	1	1	3	1	1
	Max	23	13	33	18	13	11
	Median	7	7	6	7	6	6
	Mean	8.5	7.14	8.2	7.86	5.9	5.43
	S.D.	5.01	4.14	7.91	4.74	3.4	3.82

Figures

Figure 1 Map of Philadelphia and experimental areas by type

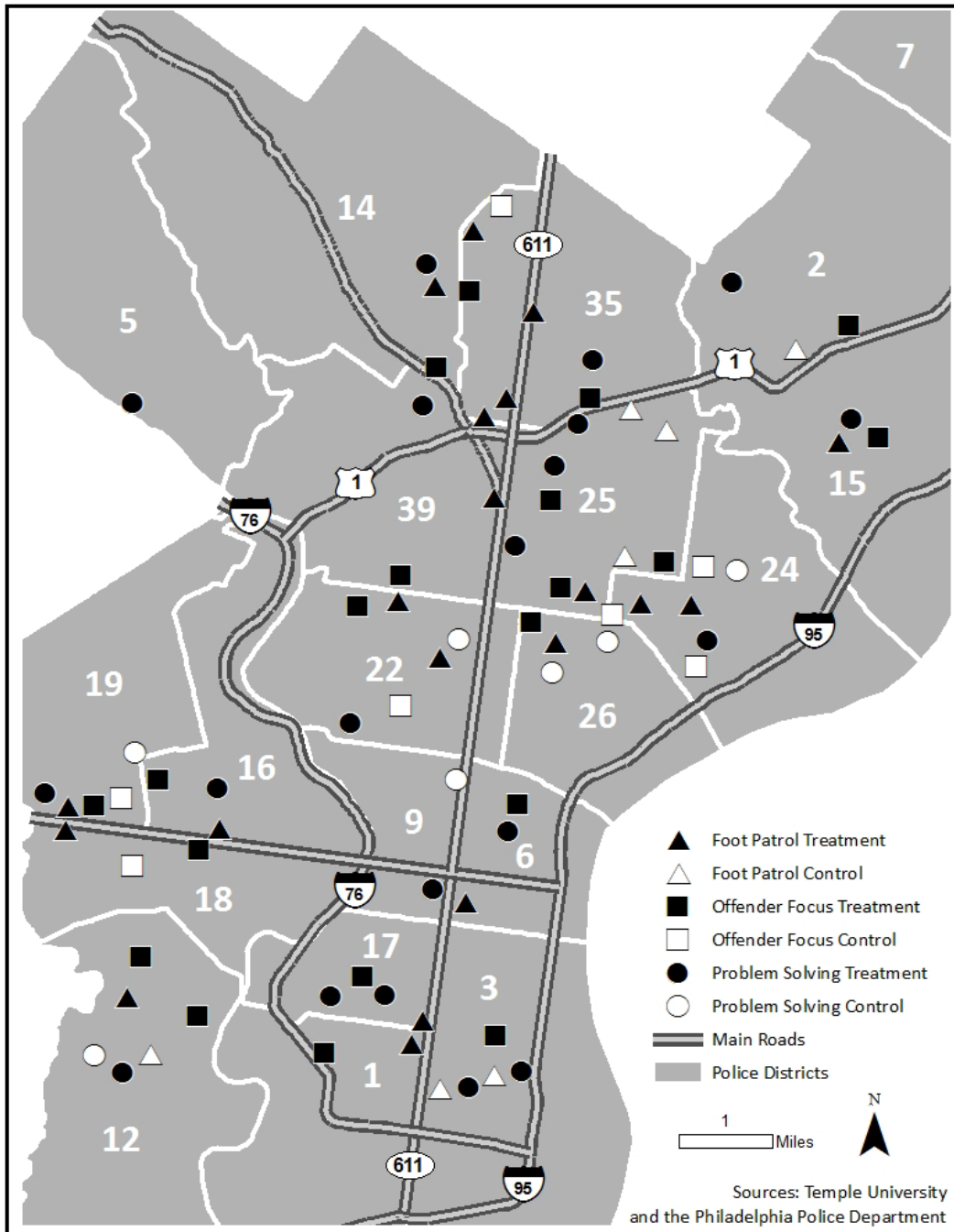
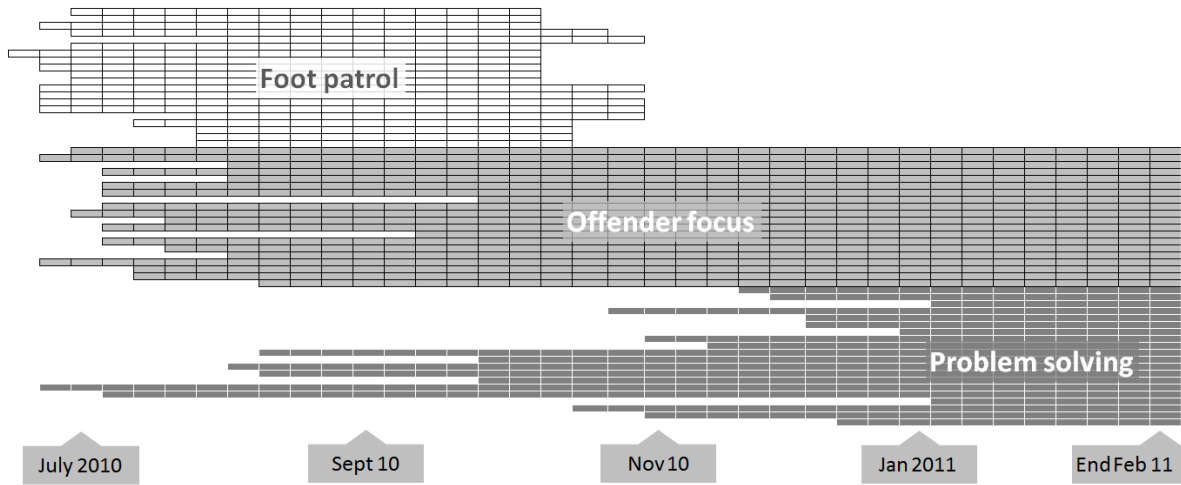




Figure 2: Implementation periods by type of policing strategy and week





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## Notes

<sup>1</sup> There are several comprehensive reviews of studies at hot addresses as well as hot spot areas (Sherman 1997)

<sup>2</sup> Police chiefs ranked 18 different strategies according to the effectiveness in hot spots.

<sup>3</sup> Crime was extracted using Uniform Crime Report (UCR) classification codes. The police department automated system achieves geocoding hit rates in excess of 98 percent, so the data are suitable for spatial data analysis (Ratcliffe 2004)

<sup>4</sup> A Global Moran's  $I$  statistic was computed in the computer program GeoDA to establish that violent crime in Philadelphia was in fact significantly clustered. Significant spatial autocorrelation was found (Moran's  $I=.1430$ ;  $p=.001$  with 999 permutations) and supported using a LISA analysis to identify micro-level violent crime hot spots.

<sup>5</sup> A Thiessen polygon is a unique geometric unit that is drawn so that every point within a given Thiessen polygon will be closer to the centroid of that polygon than any other polygon in the network (Chainey and Ratcliffe 2005) In other words, drawing a Thiessen polygon network using street intersections as the polygon centroid means that when crime point-data are overlaid on the Thiessen network, each crime event within a given polygon is closer to one street corner than any other intersection in the city.

<sup>6</sup> The LISA was run in GeoDa 9.5i and used a first-order queen spatial weights matrix to establish spatial relationships.

<sup>7</sup> The HNN clustering routine was from CrimeStat v3.2. The output of a HNN analysis includes hot spots at different orders. First-order clusters are created by grouping events that have nearest neighbor distances shorter than would be expected under the assumption of complete spatial randomness. The number of events included in each cluster depends on the minimum number of points specified by the user. The minimum number events for each hot spot were set at 10, and the hot spots were specified to be delineated as convex hulls.

<sup>8</sup> Following Braga and colleagues (Braga and Bond 2008; Braga et al. 1999) as well as (citation suppressed) we used adjusted police officer input to maintain separation between sites whenever possible and take into account environmental features.

<sup>9</sup> Mann-Whitney U tests between the treatment and control areas by intervention type for the geographic characteristics described in Table 2 confirmed there were no statistically significant differences in geographic size across treatment and control areas.

<sup>10</sup> The specific start and end times varied by target area and reflected the crime patterns. Generally, eight of the sites worked during the day shift (between 7am and 6pm), nine worked the evening shift (between 4pm and 2am) and three alternated between day and night shifts weekly.

<sup>11</sup> The 'Action plans' were a reporting form that was already being used within the <City Police Department> to guide problem solving. The form is structured to follow the SARA process and requires a detailed description of the problem, documentation of responses (including naming those responsible for carrying out tasks), and periodic evaluations of outcomes.

<sup>12</sup> Repeated measures multilevel models have been used to evaluate non-experimental (Rosenfeld, Fornango, and Baumer 2005; Corsaro and McGarrell 2009) as well as experimental designs (Raudenbush and Bryk 2002; Bryk and Raudenbush 1987).

<sup>13</sup> We recognize that field investigations are likely more relevant indicators of police action for the foot patrol and offender focus areas than the problem solving areas where non-traditional police responses were emphasized.

<sup>14</sup> Per the advice of Raudenbush and Bryk (2002; p. 182) linear time and quadratic time are grand mean centered to avoid multi-collinearity in the model. Centering variables in MLMs changes the interpretations of model parameters, but does not the numerical stability of model



estimation (Raudenbush and Bryk, 2002, p. 32). The temperature effect is also grand mean centered and is interpreted as an increase above the average temperature observed for all 37 bi-weekly time periods. The contrast coded treatment effects were not centered.

<sup>15</sup> In additional models the three contrast coded treatment variables were also specified with random slopes (separately), but were not found to vary significantly across the level two units.

<sup>16</sup> All models are specified with an over-dispersed Poisson probability distribution, thus the  $\beta$  coefficients are difficult to interpret given they have been logarithmically transformed due to the Poisson model's log-linking function. Therefore, we interpret the event rate ratios (ERR). Multiplying the difference between the ERR and 1 by 100 results in a percent that can be interpreted as a percentage increase or decrease in the expected count of the outcome variable where negative values signify decreases and positive numbers signify increases. For simplicity of interpretation, we report the impact of a 10 degree increase above the average temperature. (Bryk and Raudenbush 1987; Raudenbush and Bryk 2002)

<sup>17</sup> When compared to controls areas, violent crime hot spots receiving foot patrol had expected violent felonies counts that were roughly 29 percent greater during the implementation of foot patrol ( $\beta = 0.256$  ; ERR = 1.291;  $p < 0.05$ ). Since the effect is not significant at the Bonferroni corrected p-value ( $p < .025$ ), it possibly reflects a false significance (Tamhane 2009, p. 126).

<sup>18</sup> Linear and quadratic time are grand mean centered, so a value of zero on these two variables represents the mid-point of the time series and each 1-unit increase is representative of the time periods beyond the mid-point.

<sup>19</sup> The quadratic time effect would suggest that the decrease in expected narcotics bi-weekly counts started to slow down later in the time series ( $\beta = -0.0004$ ; ERR = 1.0004;  $p < 0.05$ ); whereas, the temperature effect suggests bi-weekly narcotics counts decreased by 2 percent for each 10 degree increase above the average temperature during the evaluation period ( $\beta = -0.002$ ; ERR = 0.998;  $p < 0.05$ ).

<sup>20</sup> The WDQ calculations were performed using (Ratcliffe 2008) Spatial Evaluation of Police Tactics in Context. An Excel spreadsheet is available to download at <http://jratcliffe.net/ware/wdq.htm>.

<sup>21</sup> To save space the calculations are shown here. The counts for the violent felonies outcome across the offender focus- treatment (A), -buffer (B), and -control areas (C) during the 90 day pre-treatment period ( $t_0$ ) were 164 ( $At_0$ ), 215 ( $Bt_0$ ), and 55 ( $Ct_0$ ), respectively. For the treatment period ( $t_1$ ), the offender focus- treatment (A), -buffer (B), and -control areas (C) recorded counts of 304 ( $At_1$ ), 395 ( $Bt_1$ ), and 164 ( $Ct_1$ ) on the violent felonies outcome. The full WDQ equation is shown below:

$$WDQ = \frac{395/164 - 215/55}{304/164 - 164/55} = \frac{-1.501}{-1.128} = 1.33$$

## Appendix 2: Journal article submitted for publication

### Citizens' reactions to hot spots policing: Experimental impacts on perceptions of crime, disorder, fear and police

Jerry H. Ratcliffe, Elizabeth R. Groff, Evan T. Sorg, and Cory P. Haberman

Department of Criminal Justice, Temple University  
Center for Security and Crime Science, Temple University

#### Abstract

*Objectives:* To explore whether the use of foot patrol, problem solving and offender-focused policing at violent crime hot spots negatively impacted the community's perceptions of crime and disorder, fear of crime, police legitimacy, and satisfaction with police.

*Methods:* We report on a repeated cross-sectional survey that was mailed before and after the deployment of concentrated police interventions in 60 small areas of Philadelphia, PA. 81 violent crime hot spots were randomly allocated to either one of three treatments (20 each), or to a control assignment (21). Impacts on the community were analyzed via factorial ANOVA models for each of the dependent variables, which included a term for treatment type, wave of survey and the interaction between treatment type and wave of survey.

*Results:* The ANOVA models measuring changes in community opinions from pre- to post-intervention uncovered no statistically significant changes on any of the dependent variables, irrespective of the treatment type. Even though one experimental treatment condition (offender focus) reported statistically significant crime reduction, the police activity that generated the crime reduction did not noticeably change community perceptions of crime and disorder, fear of crime, police legitimacy, and satisfaction with police.

*Conclusions:* The results do not support the hypotheses of critics who suggest that hot spots policing has the potential to negatively impact the community. It appears that, as implemented in Philadelphia, none of the policing tactics had measurable changes in resident perception within the communities that were targeted. Using ANOVA analyses, we fail to find sufficient evidence to confirm or discredit the potential of hot spots policing backfire effects.

#### Keywords

Hot spots policing, foot patrol, problem solving, offender focus, community survey, police legitimacy, fear of crime, disorder



## Introduction

In recent years there have been at least two significant policy statements offered by prominent scholars involving hot spots policing. Mastrofski, Weisburd and Braga (2010) argued that hot spots policing is sufficiently supported by scientific evidence to justify a major program of implementation and evaluation. They call on the National Institute of Justice to fund this program, which, they surmise, would “fundamentally restructure urban policing” (p. 251). Likewise, Durlauf and Nagin (2011) argue that crime, levels of incarceration and corrections costs can all be reduced if policy makers shift resources away from corrections and imprisonment and into policing. The authors suggest that a shift away from “severity-based policies” (i.e. increased prison sentences, mandatory minimum sentences etc.) to “certainty-based policies” (such as hot spots policing) is justified considering the growing body of evidence supporting the effectiveness of hot spots policing in reducing crime, and the lack of such support for initiatives focused on increasing the severity of punishment. Simply put, there is considerable evidence that hot spots policing is an effective method for addressing crime and disorder (Braga 2007, 2005).

The solid evidential foundation of crime reduction notwithstanding, there remains a number of critiques against hot spots policing. These concerns include the possibility that hot spots policing might (1) increase perceptions of crime and disorder; (2) increase fear of crime; and (3) reduce perceptions of police legitimacy and satisfaction with police. In light of the recent attention given to hot spots policing and the high profile calls for increases in funding and implementation, these concerns are not trivial and deserve further consideration.

In this article we empirically assess concerns over the possible “backfire effects” (Weisburd et al. 2011) whereby communities where a hot spots policing operation has been conducted have experienced one or more of these negative outcomes. This article reports on the results of a mail-based pre/post intervention community survey administered as part of an experimental evaluation testing the impacts of three policing strategies, across 60 crime hot spots in the City of Philadelphia. The three strategies were (1) foot patrol; (2) offender-focused strategies; and (3) problem solving tactics, with 21 control areas (Groff, Ratcliffe, Haberman and Sorg, unpublished). The results add to the evidence regarding the circumstantial effects on the community of hot spots policing.

## Support for hot spots policing

Since the 1990’s, support for focusing police resources in small, high crime locations, or “hot spots”, has been steadily increasing. Hot spots policing, the idea that police could most efficiently reduce crime if efforts were concentrated in the highest crime locations, is rooted in Sherman, Gartin and Buerger’s (1989) seminal finding that only 3 percent of addresses in Minneapolis (MN) accounted for nearly 50 percent of the calls for police services. Sherman and Weisburd (1995) would later test the merits of increasing hot spot patrols, finding that relative to 55 control locations, the police presence in 55 hot spots produced significant reductions in calls for service, by 6 to 13 percent. Their finding that police could be effective when their efforts were geographically focused provided an alternative interpretation to the findings of police ineffectiveness when deployed using a random vehicle patrol pattern (Kelling et al. 1974). Koper (1995) showed that when police patrolled a crime hotspot for about 15 minutes, they significantly increased the effectiveness of the crime reduction effects of patrol. The patrols in



this example were vehicle-based, though occasionally officers did exit their vehicles and walk in the local area.

A recent randomized, controlled trial in Philadelphia demonstrated that police could be effective in reducing crime when deployed permanently on foot in small, high violent crime places. Ratcliffe, Taniguchi, Groff and Wood (2011) report that in the summer of 2009, 240 recent police academy graduates patrolling about 16 hours per day for five days a week were successful in reducing violence by 23 percent in 60 targeted hot spots, relative to 60 controls. These findings were contrary to existing research indicating that foot patrol had no measureable impact on crime (Kelling 1981; Pate 1986). Once again, the key seemed to be patrolling in small, concentrated high crime areas.

Besides evaluations of more traditional tactics such as vehicle or foot patrol, more innovative strategies have been the subject of hot spots evaluations. For example, Braga and Bond (2008) found that problem-oriented policing which focused on physical and social disorder reduced crime by a statistically significant 19.8 percent in treatment locations relative to controls. Disaggregating the crime data, the authors detected statistically significant reductions in various crime categories in treatment areas: robbery by about 42 percent, non-domestic assault by 34 percent and burglary by 36 percent. In addition to the reductions in crime, Braga and Bond (2008) also note that both social and physical disorder was significantly reduced. Analysis of their social observation data revealed a decline in social disorder in 82 percent of the treatment locations, and a decline in physical disorder in 77 percent of the treatment locations. Taylor, Koper and Woods (2011) directly compared two strategies (directed-saturation patrol and problem-oriented policing) to control areas across 83 violent crime hot spots in Jacksonville, Florida. After 90 days of experimental conditions, the results showed that during the intervention period neither intervention demonstrated statistically significant crime reductions (though the saturation patrol area did show no-significant reductions in crime); however, the problem-oriented policing areas showed a 33 percent reduction in crime in the 90 days post-intervention, which Taylor *et al* suggest may have been due to the relatively short intervention period and the time necessary for POP interventions to take hold. Post-intervention displacement was measured, which the authors attribute to an increased sensitivity to the intervention of residents in nearby areas, culminating in increased crime reporting.

Overall, for all hot spots policing strategies, the evidence certainly suggests it is effective for addressing crime problems of various types (Braga 2005; 2007; Telep and Weisburd, 2012).

### Critiques of hot spots policing

Despite growing evidence that hot spots policing is effective (or maybe because of its success) a number of criticisms of hot spots policing have been raised. These concerns are diverse, and include concerns over the potential for crime displacement, the sustainability of treatment effects and the narrow and predictable police responses (Rosenbaum 2006). We focus here on the claims that hot spots policing could induce “backfire effects” (Weisburd et al. 2011) in the communities policed. We explore three potential ways in which critics claim hot spots policing could potentially backfire, by (1) increasing perceptions of crime and disorder; (2) increasing fear of crime; and (3) reducing perceptions of police legitimacy and satisfaction with police. The following sections elaborate each of the concerns about hot spots policing and related them to the backfire effects noted by Weisburd and colleagues.

#### *Fear of crime and perceptions of crime and disorder*





The claims that hot spots policing could increase fear of crime are rooted in the idea that sudden increases in police activity will communicate to residents that crime and/or disorder has increased in their neighborhood, and manifest as a more fearful public. Rosenbaum (2006) argues that simply being labeled a crime hot spot will cause residents to perceive their neighborhood more negatively and result in increases in fear within these communities. To date, only one published study supports the link between increased police presence at hot spots and fear of crime. Hinkle and Weisburd (2008) found that residents living within blocks subjected to disorder or 'broken windows' policing were more fearful of crime than those living on blocks that were not (however, limitations of this work are noted below). Therefore if the critique of hot spots policing is correct, increases in the perceived level of crime, disorder and/or fear of crime could have an overall negative impact on the community and impede attaining long-term crime control. Weisburd et al. (2011) point out that if these critiques are theoretically sound then the expected mechanism would produce resident withdrawal, declines in social control and, ultimately, more crime.

On the other hand, if police address visible signs of crime or social and physical disorder to the extent that the community is cognizant of these reductions, the perceived level of crime and disorder could decline, fear of crime could be reduced, social control could increase and a decline in future crime trajectories might occur. Furthermore, given empirical studies suggest crime hot spots tend to be chronic problems (Weisburd et al. 2004; Braga, Hureau, and Papachristos 2011), it is also possible residents of crime hot spots are already aware of the high levels of crime in their community prior to the police increasing resources or labeling a particular area as a 'hot spot'. In this scenario, engaging in hot spots policing will either decrease or not significantly impact perceptions of crime and disorder/fear of crime<sup>1</sup>. To date, there is insufficient evidence to support either of these hypotheses.

#### *Police legitimacy and satisfaction with police services*

Another critique of hot spots policing is that it will cause a decline in police-community relations or perceptions of police legitimacy (Kochel 2011; Rosenbaum 2006). This could be problematic because hot spot policing is likely to take place in neighborhoods where perceptions of police legitimacy and satisfaction with police are already quite low (Sampson and Bartusch 1998). If police legitimacy and satisfaction are weakened, the ability of hot spots policing to affect long-term crime reductions is questionable (Weisburd et al. 2011). Public support is strategically vital for police in order to effectively control crime. In cities such as Philadelphia, which is infamous for a street code of 'no snitching,' or not cooperating with police investigations (see Anderson 2000), and decreases in police legitimacy run the risk of increasing this already pervasive attitude. As a result, citizens could become less likely to cooperate with police and/or more likely to question the ability of police to protect them should they choose to cooperate.

In contrast to these claims, there is evidence that communities welcome increased police patrols. For example, Shaw (1995) reports that citizens in locations targeted during the Kansas City gun experiment (Sherman and Rogan 1995) supported the increased police presence. Furthermore, Chermak, McGarrell and Weiss (2001) find that aggressive traffic enforcement by police did not cause citizens to feel harassed. To the contrary, they reported being significantly more supportive of police and more likely to report that the police work well with the neighborhood. In sum, it would be a serious cause for concern if critics are correct about the possibility of backfire effects; however, some evidence exists that these critiques may be overstated.



## The Current State of Knowledge

In light of the recent policy suggestions concerning hot spots policing, understanding whether there is merit to the speculation by critics concerning backfire effects of hot spots policing is especially germane to policy makers and practitioners. Shaw (1995) measured changes in the perceptions of community members living within a target and comparison beat which were studied during the quasi-experimental Kansas City Gun study (Sherman and Rogan 1995). The target beat saw reductions in gun crime by 49 percent, correlated with an increase in gun seizures by 65 percent. In contrast, the comparison beat saw a slight decline in gun seizures and a slight increase in gun crimes during the study period. Contrary to the claims of critics, Shaw (1995) reports that residents in the targeted beat supported the increased police activity, and, as measured by pre-and post-intervention community surveys, perceived a better quality of life in the beat after the experiment.

The Braga and Bond (2008) experiment mentioned above interviewed a select group of key community members following a problem-solving effort in Lowell (MA) (Braga and Bond 2009). Residents perceived a decline in physical and social disorder due to the intervention, yet no statistically significant differences in fear of crime or perceptions of police. Generalizing results from these interviews, however, is difficult because interviewees were chosen because they were especially likely to have interacted with police. Nevertheless, no support for the fears of critics was found through their analysis. Hinkle and Weisburd (2008) found that people living in the target areas of the Weisburd et al. (2006) Newark (NJ) displacement study were more fearful of crime than those residents living in areas not targeted. They conclude that this could represent a potential backfire effect as hypothesized by Rosenbaum (2006) and Kochel (2011); however, as noted by Weisburd et al. (2011), this was based on a correlational design and the targeted location did in fact have higher levels of crime than the comparison area.

The Weisburd et al. (2011) study mentioned above is the only evaluation to date which explicitly measured how hot spots policing affected a random sample of residents residing in targeted areas under an experimental design. In their work, street segments across three California cities were subjected to an additional three hour per week dosage of social and physical disorder-based policing for about 8 months. Review of police logs indicated that over the study period, police addressed 2,025 social and 1,293 physical disorder problems. Street block residents were surveyed before and following the treatment period and asked questions relating to their fear of crime/perceived risk, perceptions of police legitimacy, collective efficacy and perceptions of crime and disorder. Results indicated that residents did not report any statistically significant changes in their opinions on any of the measures. In this, the only direct examination into the backfire effects of hot spots policing, increasing disorder-based policing in hot spots had little impact on residents and, importantly, did not result in any of the concerns expressed by critics such as Rosenbaum (2006) or Kochel (2011) as discussed above.

In sum, there is currently little evidence which suggests that hot spots policing has backfired as suggested by critics; however, the number of studies incorporating both an experimental design into the original intervention as well as interviews to determine the community impact is small. Furthermore the low base levels of recorded crime in the Weisburd et al. (2011) experimental areas and low dosage of policing applied (only 3 additional hours of patrol per week) make it difficult to assess whether these outcomes would transfer to an urbanized, higher crime area, and when a greater dosage of policing is applied.



### The current study

The current analysis is part of an experimental intervention designed to test the crime reduction benefits of three crime reduction tactics; (1) foot patrol; (2) offender-focused strategies; and (3) problem solving tactics. The focus of the experiment was to achieve reductions in violent crime, defined here as homicide, robbery, aggravated assault and misdemeanor assault. We embedded a pre-post intervention survey into the design to explore the possible backfire effects of hot spots policing.

#### *Site Identification*

We followed a multi-step process in identifying the experimental sites. Crime data were first extracted from the Philadelphia Police Department's (PPD) 2009 incident database; this database contains records of all crime occurring in the city and are automatically geocoded at a hit rate in excess of 98 percent, well above acceptable levels (Ratcliffe, 2004). Calculation of a Global Moran's  $I$  confirmed a statistically significant clustering of violent crime (Moran's  $I = 0.143$ ;  $p = .001$  with 999 permutations). We used two different techniques to identify the higher violent crime hot spots, a Local Indicator of Spatial Association (LISA) and a Hierarchical Nearest Neighbor Clustering (HNN). The LISA analysis<sup>2</sup>, performed on a Thiessen polygon network drawn around every street intersection in the city, identified 818 street intersections that were adjacent to at least one other high crime corner, and the HNN analysis performed on violent crime events involving the use or threat of lethal force delineated 167 first order clusters<sup>3</sup>. A map depicting both types of hot spots was created and given to PPD leadership. Captains and Regional Operations Commanders used their professional experience and operational knowledge to identify the 81 places (27 for each treatment type) on which to focus and which type of intervention should be applied. Of the 27 areas assigned to each treatment type, randomization was used to assign seven areas to a control category. In other words, randomization occurred within the three blocks of 27 areas for each treatment tactic. This resulted in 20 foot patrol, 20 offender-focused, and 20 problem-solving areas, with a further 21 areas designated as controls (7 per treatment condition).

#### *Treatments*

To simulate how these treatments would be implemented under normal circumstances, and with little researcher involvement, district level commanders were given quite a bit of latitude in carrying out the interventions. Specific details about the treatments are explained below, and we point readers to Groff, Ratcliffe, Haberman and Sorg (unpublished) for a more detailed overview of the experimental design and evaluation.

#### Foot Patrol

The only direction given to district level personnel from police headquarters was that the foot beats had to be staffed for twelve weeks at an 8 hour per day, 5 day per week dosage. The first beats were implemented on 15<sup>th</sup> June 2010 and the last beat to conclude was removed on 31<sup>st</sup> October 2010. A post intervention debriefing found that in all but one of the beats officers patrolled in pairs, and the majority of officers assigned to work the beats were deemed by their supervisors to be good candidates (11 out of 20); the other 9 were staffed by officers who volunteered for the job. Officers also reported changing the hours they worked the beats in response to their perception of changes in crime patterns. Some officers reported implementing problem-oriented responses such as clearing trash from alleyways or parks where



guns were previously hidden, while others partook in more traditional response such as making arrests and performing field stops. Overall, there appeared to be variation in the activities of officers based on the expectations of their supervisors, their personal views on how to best respond, the local context and the perceived problems afflicting their beats.

### Offender-Focused

The offender focused treatment followed the tenets of Intelligence-led policing (Ratcliffe 2008). District commanders and personnel were tasked with partnering with the PPD criminal intelligence unit to generate a list of active, repeat violent offenders that operated or lived within the delineated treatment beats. The officers who carried out this treatment were given autonomy in how ‘focusing’ on these offenders would be carried out. Activities included simply talking to these offenders, performing field interrogations and serving criminal warrants. The first offender- focused policing site began working on 20<sup>th</sup> June 2010 and all sites concluded on 27<sup>th</sup> February 2011.

### Problem Solving

Since problem solving activities tend to be undertaken informally at the district level within the PPD, the structured and specific nature of problem solving undertaken during the experiment diverged from standard operating procedures at the district level. Officers were also required to attend a one-day training session on the tenets of problem solving introducing officers to the basics of problem-oriented policing (Goldstein 1990) and the SARA process (Clarke and Eck 2003; Eck and Spelman 1987). It therefore took some time to organize, train and begin implementing the problem-solving treatments. The first problem solving site went into effect on 24<sup>th</sup> September 2010 and the last site to conclude did so on 30<sup>th</sup> December 2010. The activities that were undertaken varied widely, with some reflecting more traditional tactics such as increasing patrols and similar activities which could reasonably be classified as “shallow” (Braga and Bond 2008). Others were more comprehensive in nature, such as building partnerships with local political officials and business owners in order to address social and physical disorder. For example, in one site officers worked with owners of a problem motel to implement ID requirements, and in another site they met with bar owners to coordinate crime prevention work. Further tactics included installing solar powered garbage receptacles, arranging neighborhood clean-ups or posting ‘no loitering’ signs which allowed officers to stop and question those in violation of this ordinance.

### Results of treatments on crime measures

Of the three treatment types, offender-focused policing was the only tactic to produce statistically significant reductions; in violent felonies by 31 percent ( $p < .025$ ), and across all violent crime by roughly 22 percent ( $p < .025$ ) - relative to the seven control areas. Neither the foot patrol nor problem-solving treatment produced statistically significant crime reductions during the intervention, relative to control locations which received ‘business as usual’ policing.

### The Survey Component

We created a 59 question survey to measure 7 constructs: satisfaction with police, perceptions of violent crime, perceptions of property crime, perceptions of physical disorder, perceptions of social disorder, fear of crime and perceptions of police legitimacy. Questions were gauged via Likert scales which either asked respondents about their level of agreement



(‘strongly disagree’ to ‘strongly agree’), their opinions about the extent of various problems afflicting their neighborhoods (‘big problem’ to ‘not at all a problem’) or their opinions of the police department’s response to crime and disorder related problems (‘very poor’ to ‘very good’). We also collected demographic information. The mail-based survey followed a repeated cross-sectional design and was administered in two waves, one prior to implementing the experiment, and one upon conclusion of the interventions. Surveys were sent to the same set of addresses in both waves, but respondents were not necessarily the same for each wave.

### *Sampling*

We did not have the resources to survey each household and business within the target areas so we drew a sample. The sampling frame comprised of a list of all taxable properties in the city, and was provided by the Philadelphia Police Department. A geographic information system (GIS) was used to identify which properties fell within the 81 experimental areas (n=43,389) used in the experiment. Cluster-based random sampling was used within each of the four experimental groups to draw the sample. We mailed surveys to 1,860 foot patrol area addresses, 1,830 problem-solving area address, 1,830 offender-focused area addresses and 1,855 control area addresses during both waves<sup>3</sup>.

For the pre-intervention mailing, 628 total surveys were returned (157 problem solving, 152 offender focused, 160 foot patrol and 159 control location surveys). The post-intervention mailing produced a total of 647 surveys (162 problem solving, 160 offender focused, 148 foot patrol and 177 control location surveys). The response rate for both waves was about 9 percent. From the onset of the experiment we recognized that drawing our sample from all known taxed properties in each area could be potentially problematic because of the high number of vacant properties noted during field observations completed at each site prior to implementing the treatments<sup>5</sup>. Since properties could be vacant and taxed, it is highly likely that our household population is much lower than we projected and was a contributing factor to the low response rate. Further, the locations targeted represented high crime, low income locations, making them less likely to participate in surveys for a variety of reasons (Weiss and Bailar 2002).

Non-response bias in survey research is widely problematic. In and of itself, however, non-response does not necessarily indicate that nonresponse bias exists (Rogelberg and Luong 1998) and survey methodologists find that higher response rates do not necessarily imply lower levels of nonresponse bias (Schouten, Cobben, and Bethlehem 2009; Groves and Peytcheva 2008). Non-response rates themselves are, in fact, a poor predictor of non-response bias (Groves and Peytcheva 2008). It is necessary to assess the extent of non-response bias in survey research, regardless of response rate (Rogelberg and Luong, 1998). We assessed the extent to which our survey respondents were different from the general population using an archival approach (Rogelberg et al. 2003) and comparing demographic information we collected from the surveys with the demographic information from the 2010 decennial census.

### **<Table 1 about here>**

We used areal weighting techniques<sup>6</sup> (Downey 2006) to aggregate census data to the treatment and control hot spots and estimate population characteristics of the experimental areas. We then compared the distributions of race, gender and educational attainment of the survey respondents to those living within the hot spots as reported in the 2010 census (see Table 1). Whites and individuals with higher levels of education were slightly more likely to respond



relative to the entire population, a problem often encountered during survey research (Rogelberg and Luong 1998). Older females also tended to be slightly overrepresented relative to the entire population; however, since our survey was addressed to the head of the household this is to be expected as the target locations were high crime, low-income urban neighborhoods where older females tend to be head of the home (Anderson 2000). Based on these comparisons, we are confident that the sample of respondents is a close approximation to the actual population. Overall, we find no evidence of systematic non-response bias.

### *Outcomes*

We created measures to gauge the seven constructs using additive scales based on individual survey responses: perceptions of violent crime, satisfaction with police services, perceptions of property crime, perceptions of physical disorder, perceptions of social disorder, fear of crime and perceptions of police legitimacy. Where respondents failed to answer a question on the survey, data were imputed using multiple imputation methods<sup>7</sup>.

The *perception of violent crime* scale includes responses to five questions concerning how big of a problem respondents rated the question being, ranging from 'not a problem' to 'big problem'. Higher scores represent less of a perceived problem. The five questions asked how big of a problem was people (1) "being robbed, beaten up or mugged" (2) "people being killed" (3) "people being the victim of violent crime" (4) "people being victimized by gangs" (5) "people being threatened with guns" and (6) "people being threatened with knives or other weapons (not including guns)". This construct had a high degree of reliability for both waves of the survey (pre-intervention Cronbach's  $\alpha = 0.943$ ; post-intervention Cronbach's  $\alpha = 0.950$ )<sup>8</sup>.

The *satisfaction with police services* scale consists of five questions about the perceived quality of police services residents were receiving in their neighborhood. Respondents were given the choice of responding along a scale ranging from 'very poor' to 'very good'. Higher scores are equivalent to a better rating of police. The six questions asked how good the police are (1) "doing dealing with problems that really concern people of the neighborhood" (2) "keeping order on the streets and sidewalks" (3) "reducing violent crime" (4) "reducing non-violent crime" and (5) "preventing crime in the neighborhood". The pre- and post-intervention scales were both highly reliable (pre-intervention Cronbach's  $\alpha = 0.899$ ; post-intervention Cronbach's  $\alpha = 0.897$ ).

Resident's *perceptions of property crime* were gauged by the responses to three questions. Respondents were asked to rate how big of a problem in the neighborhood the following crimes were: (1) "people breaking into the homes of others" (2) "people breaking into or stealing cars" and (3) "the vandalism of homes, buildings or properties". Higher scores represent a lesser degree of concern over property crime. With a pre- and post- intervention Cronbach's alpha of 0.821 and 0.815, respectively, the construct was sufficiently reliable.

The *perceptions of physical disorder* scale consisted of three questions which asked residents to gauge how big of a problem the following things were in their neighborhood: (1) "abandoned cars in the streets and alleys" (2) "abandoned houses or other empty buildings" and (3) "trash junk and litter on the street or sidewalk". Higher scores are equivalent to a lesser perceived level of physical disorder. This scale also demonstrated sufficient reliability, with a pre-intervention Cronbach's alpha of 0.682 and a post-intervention Cronbach's alpha of 0.701.

The *perceptions of social disorder* scale included seven questions which asked residents to rate how big of a problem the following things were in their neighborhood: (1) "excessive



noise” (2) “homeless people or vagrants” (3) “ teens hanging out and causing disturbances” (4) “drug dealing on the street” and (5) “drug dealing from houses or other buildings”, (6) “people or landlords allowing their properties to become run down” and (7) “truancy”. As with physical disorder, higher scores on the social disorder scale represent a lesser perceived level of social disorder. Both the pre- and post- intervention scales were deemed reliable (pre-intervention Cronbach’s  $\alpha = 0.843$ ; post-intervention Cronbach’s  $\alpha = 0.852$ ).

The *fear of crime* scale includes resident responses to their level of agreement with two questions: (1) “I feel safe walking in my neighborhood during the daytime” and (2) “I feel safe walking in my neighborhood after dark”. Respondents noted their level of agreement with the two statements, which ranged from ‘strongly disagree’ to ‘strongly agree’, with higher scores representing a higher degree of feeling safe. The scale was found to be sufficiently reliable (pre-intervention Cronbach’s  $\alpha = 0.708$ ; post-intervention Cronbach’s  $\alpha = 0.712$ ).

Finally, the *perceptions of police legitimacy*<sup>2</sup> scale asked respondents to gauge their level of agreement ranging from ‘strongly disagree’ to ‘strongly agree’, to five statements related to police legitimacy: (1) “the police in this city are usually courteous” (2) “the police in this city are usually honest” (3) “the police in this city are usually fair” (4) “the police in this city use only the amount of force necessary to accomplish their tasks” and (5) “Philadelphia police treat all people equally according to the law”. Higher scores reflect a greater perception of police legitimacy. Both the pre- and post- intervention scales were highly reliable (pre-intervention Cronbach’s  $\alpha = 0.842$ ; post-intervention Cronbach’s  $\alpha = 0.834$ ). Table 2 reports the survey items and reliability estimates for all scales.

<Table 2 about here>

## Results

Given the level of measurement of the dependent variable and the independent variables, and the number of levels in our treatment type variable (4), we report the results of factorial ANOVA models measuring mean changes in each dependent variable in each of the treatment locations from the pre- to post-intervention time period. The models contain a term for treatment type, wave of survey and the interaction between the treatment type and wave of survey. Results are reported in Tables 3 – 9.

### *Satisfaction with Police*

As reported in table 3, the difference in the mean scores of respondents’ reported satisfaction with police from pre- to post-intervention were marginal and did not reach conventional levels of statistical significance. The problem-solving locations saw a modest increase in mean levels of satisfaction with police while the foot patrol and offender focused locations saw modest declines in the reported mean level of satisfaction with police services. Thus we find no evidence to support hot spots policing changes citizen satisfaction with police.

<Table 3 about here>



### *Perceptions of Violent Crime*

The ANOVA model measuring change in the levels of perceptions of violent crime is reported in table 4. We find no support for criticisms voiced by Rosenbaum (2006) or Kochel (2011). As with the previous model, the treatment by wave interaction is non-significant, suggesting that none of the locations saw statistically significant changes in the mean log of perceived violent crime. Our results indicate that none of the three tactics caused neighborhood residents to perceive an increase in the level of violent crime.

**<Table 4 about here>**

### *Perceptions of Property Crime*

As reported in table Five, the treatment by wave interaction for pre- to post-intervention perceptions of property crime yields an insignificant p-value. The problem solving sites saw a marginal decrease in the perceived levels of property crime while all other sites saw minor increases in perceptions of property crime from the pre- to post- intervention period. As with violent crime, it appears that none of the tactics influenced resident perceptions of property crime in any meaningful fashion. At the same time, we again find no support for the hypothesis that hot spots policing could decrease residents' perceptions of property crime.

**<Table 5 about here>**

### *Perceptions of Physical Disorder*

Table Six reports the results measuring changes in respondents' perceptions of physical disorder from before to after the intervention. Critics suspect that hot spots policing might increase residents' perceptions of the level of physical disorder due to increased police activity. However, we again uncover no statistically significant changes in the dependent variable. Although there are differences in the direction of the coefficients based on treatment type, the magnitudes of these differences do not approach conventional levels of statistical significance. We again find no support for charges that hot spots policing could result in this 'backfire effect'. As carried out in Philadelphia, none of the hot spots tactics resulted in meaningful changes in resident perceptions of physical disorder.

**<Table 6 about here>**

### *Perceptions of Social Disorder*

The ANOVA modeling changes in the levels of social disorder is reported in table Seven. We again fail to find meaningful differences from pre- to post-intervention across the treatment sites. All coefficients are in the positive direction suggesting very modest increases in the mean reported level of social disorder; however, none approached conventional levels of statistical significance. As with the other criticisms of hot spots policing, we find no support for the contention that hot spots policing runs the risk of increasing residents' perceptions of social disorder.

**<Table 7 about here>**





### *Fear of crime*

Table Eight suggests that as delivered across the city of Philadelphia, none of the treatments produced meaningful changes in respondents' reported fear of crime. The problem solving and foot patrol sights had slight decreases in the mean reported fear of crime following the interventions while the offender focused sites reported a very minor increase. Again, however, the level of change reported was not statistically significant for any of the treatments. Critics suggest that concentrating police resources in crime hot spots runs the risk of increasing fear of crime. We find no support for the suggestion that simply being labeled a hot spot can increase resident's fear of crime, nor do our findings suggest that the increased police activity conveyed to residents that crime had increased and resulted in increased fear

**<Table 8 about here>**

### *Perceptions of Police Legitimacy*

Table Nine reports the ANOVA testing differences in the reported perception of police legitimacy from before to after the intervention. As with the other dependent variables, the change from before to after the interventions did not yield a statistically significant p-value. Considering the importance of communities in assisting the police in addressing crime, if hot spots policing were to negatively impact the legitimacy of police, the positive short-term impacts of hot spots policing might be offset by longer-term increases due to a decline in perceived legitimacy. Our findings, however, suggest that, as practiced in Philadelphia, none of the treatments caused such changes to occur.

**<Table 9 about here>**

## **Discussion**

As the use of hot spots policing by practitioners has increased it has been accompanied by hypothesized concerns about potential 'backfire effects' from concentrated dosages of police activity. These include the potential to increase perceptions of crime and disorder, increase citizen fear of crime, and decrease perceptions of police legitimacy and general satisfaction with police services. In relation to a randomized control experiment testing patrol strategies at hot spots, our survey found no support for these 'backfire' hypotheses. It appears that residents living within the violent crime hot spots targeted during the experiment were on average either unaware of or unaffected by the increased police activities being carried out in their neighborhoods.

While this could be interpreted as good news, at the same time, the failure of any of the strategies (even the one which reduced violent crime), to improve the resident's perceptions of police is disappointing. Although the offender-focused treatment reduced violent crime by 22 percent and violent felonies by 31 percent relative to the seven offender-focus control areas, public perception of crime may only be loosely-coupled to the actual crime rate and other factors may more directly impact perceptions of risk. In the same vein, public perception of the police may not be directly tied to the crime rate or police effectiveness in combatting violence. After all, respondents were not more likely to perceive the Philadelphia police as more legitimate, report being more satisfied with their services, or be less fearful of crime.



The focused nature of the offender strategy made it likely that the general public was not aware that the police were working with increased vigor in their neighborhoods. The PPD officers involved in the experiment partnered with the criminal intelligence division to identify and target prolific offenders that were active in the treatment sites. Although officers served warrants and stopped to question alleged offenders, their activities generally did not consist of increased patrols or high visibility enforcement. So for the offender-focused treatment, it's possible that the community was simply not cognizant of the activities that the PPD were carrying out.

This could be potentially problematic for the ability of police to address levels of police legitimacy directly through operational tactics. The police rely on the public in a variety of ways, from reporting crime to providing information during the investigation of crime. In Philadelphia, and especially in poor, crime-ridden sections of the city, citizens are dissuaded from cooperating with the police for various reasons. A culture of no snitching is pervasive, and even citizens wishing to cooperate with police or provide information may be hesitant to do so for fear of retaliation. Retaliation, the act of harm inflicted on another person in return for being wronged oneself (Jacobs 2000), is believed to be prevalent in the poorer areas of the city, where the combination of drugs, lack of mobility and gang-like connections makes retaliation difficult to escape. Across Philadelphia, about half the people who are shot are done so within two blocks of their home address (Ratcliffe and Rengert 2008).

The city does not have a reputation for a strong and effective criminal justice system, and jail space is at a premium. It may be that offender-focused arrests can inhibit criminal activity in the short term, yet the constraints of the criminal justice system mean that offenders are back on the streets quickly enough that the community does not perceive any benefit. To improve police legitimacy through offender targeting may require as much focus on prosecutions and custodial sentences so that the community not only sees their worst offenders removed from the streets, but also removed from the community for an extended period.

We might expect the different tactics that the PPD employed to affect the community in different ways. In particular, we find it curious that the foot patrol did not positively influence the residents in neighborhoods targeted, regardless of the non-significant findings related to crime. Foot patrol has a history of being considered a "proactive, non-threatening, community-oriented approach to local policing" (Wakefield 2007, : 343), and previous evaluations have demonstrated that foot patrol was successful in improving citizens' opinions of police and reducing fear of crime even though crime was not reduced (Cordner 1986). Qualitative field researchers working during the Philadelphia Foot Patrol Experiment (Ratcliffe et al. 2011; Wood et al. in press) reported, at least anecdotally, a very positive community reaction to the increased foot patrols during the summer of 2009; many businesses and residents supported the PPD's adoption of foot policing. Why did we not see positive changes in resident's perceptions in the foot patrol locations? One possible explanation is the extent to which foot patrols have been used in Philadelphia since the foot patrol experiment. In discussing this topic with district commanders, many reported continuing to utilize foot patrols as part of an overall crime reduction strategy. Since many of the sites during the current experiment were near locations targeted during the Philadelphia Foot Patrol Experiment, foot patrol could simply have lost its novelty: perhaps the public were simply more accustomed to having officers patrol on foot. It is also possible that the reduction in dosage, or some impact of the shift from using trained rookies during the 2009 experiment to using older officers during this experiment, were sufficient to negate any improvements in community perception.



It is a little less surprising that problem solving tactics did not change community members' views. Since the problem solving techniques followed the tenets of problem-oriented policing as outlined by Goldstein (1979, 1990), the tactics generally did not involve much engagement from the wider community, but rather focused on some particularly active community members. The PPD analyzed the problems occurring in their respective beats and developed responses based on these analyses, and contact was directed to explicit community leaders who work with the police frequently, or to specific members of the community related to particular problem being addressed. Although in some cases more traditional tactics were employed, such as increased patrols or stop and frisks, it is likely that the community-wide dosage was not sufficient to cause any measurable changes in the survey responses.

### *Limitations*

First, our study is not a panel design. Although we sent surveys to the same addresses during each wave, confidentiality concerns limited our ability to track surveys at the individual level. In other words, different members of the same household could have completed the survey at each wave, or different households responded from wave 1 to wave 2. In addition, again due to human subjects protections the surveys were also not tracked at the area level. Therefore, our results represent changes, or lack thereof, across pre/post samples across a large geography (20 areas per treatment type/21 areas for controls). In future, the use of telephone based surveys and the ability to more easily conceal respondents' identity (see Weisburd et al., 2011) should be used in order to draw conclusions about changes within individuals or hot spots. Data collected at the hot spot level could be used to test how differences in dosage or successful treatment impact residents' perceptions and opinions.

The low response rate of our survey is a limitation. We went to great lengths to explore and mitigate the issue of non-response bias, but even so, we cannot rule out the possibility that some factor we did not measure did introduce bias into our sample. In addition, although we found no negative impacts on the community, the failure to find positive impacts in neighborhoods where the foot patrols were conducted contradicts previous literature (Cordner, 1986). It is possible that the adoption of foot patrols by the PPD as a general crime fighting strategy masked the potential to pick up positive changes since the community may be used to foot patrolling. Future work should of course attempt to replicate these analyses not only for foot patrol, but also for all of the tested tactics in different cities.

### **Conclusion**

In light of recent calls by criminological scholars to shift resources from imprisonment to policing, and for increased funding, implementation and evaluation of hot spots policing, understanding any possible backfire effects is especially relevant to policy makers and practitioners. Our study found no support for any perceived backfire effects, which on the surface is a good result. We find no support for the argument that hot spots policing will negatively impact communities. Results indicate that the changes in the responses of citizens to questions gauging their fear of crime, perceptions of police legitimacy and satisfaction with police and perceptions of crime and disorder were marginal and not statistically significant. This suggests that a variety of police tactics do not necessarily automatically impact the community negatively, and the absence of deleterious survey findings does provide some quantitative support for the anecdotal impressions from the foot patrol research of the Philadelphia Foot Patrol Experiment that proactive policing is not necessarily perceived as harmful.



A deeper reading of the survey does however raise some challenges for police leadership. The battle in a democracy is not just to reduce crime, but also to retain and grow the perception of police legitimacy. Even when police were able to reduce violent crime by over 20 percent and violent felonies by over 30 percent, there were no noticeable bumps in positive perceptions of police, their legitimacy, or the crime rate. So the good work conducted in Philadelphia was not necessarily perceived that way in a significant rate by the residents, though at least it was not perceived negatively either. And here lies the challenge for police leadership. Good policing, as defined by the police through crime reduction, may not easily translate to good policing as defined by the community. There are various avenues for further research in this area before the coupling of hot spots policing, crime reduction, and perceptions of the police and the neighborhood are fully understood.



*Table 1. Comparison of survey respondents to actual populations by type of area.*

Variable	CO	CO	FP	FP	OF	OF	PS	PS
	<i>Survey</i>	<i>Census</i>	<i>Survey</i>	<i>Census</i>	<i>Survey</i>	<i>Census</i>	<i>Survey</i>	<i>Census</i>
% Male	31.8%	47.2%	33.8%	46.1%	27.6%	45.7%	32.4%	47.6%
% Female	66.0%	52.8%	65.1%	53.9%	69.6%	54.3%	63.8%	52.4%
% White	38.5%	29.1%	23.9%	19.9%	14.6%	16.7%	32.8%	29.3%
% Black	33.5%	50.4%	56.3%	65.6%	66.5%	68.3%	47.3%	56.6%
% Hispanic	18.0%	30.3%	9.0%	17.5%	10.6%	20.4%	9.0%	15.5%
% H.S. Diploma	25.6%	36.7%	27.9%	38.7%	23.5%	35.6%	20.4%	38.6%
% A.A. Degree	34.3%	20.9%	34.5%	21.8%	34.0%	22.3%	40.2%	20.5%
% ≥ B.A. Degree	25.2%	9.1%	23.5%	11.9%	19.0%	10.2%	24.9%	18.2%
% 18-29	12.4%	16.7%	11.4%	18.4%	11.7%	16.7%	10.4%	19.2%
% 30-49	36.9%	25.9%	25.6%	24.5%	26.3%	24.4%	32.0%	26.4%
% ≥ 50	49.6%	24.9%	61.5%	27.3%	61.1%	26.4%	55.8%	26.7%

Notes: CO= control, FP= foot patrol, OF= offender focused and PS= problem solving. Areal weighting techniques were used to estimate hot spot area populations using data from the 2010 census.

<b><u>Satisfaction with Police Services</u></b>	Pre-Intervention $\alpha = 0.899$
How good...	Post-Intervention $\alpha = 0.897$
(1) <i>...are the police dealing with problems that really concern people of the neighborhood</i>	
(2) <i>...a job are the police doing keeping order on the streets/sidewalks</i>	
(3) <i>...a job are the police doing in reducing violent crime</i>	
(4) <i>...a job are the police doing in reducing non-violent crime</i>	
(5) <i>...a job are the police doing preventing crime in your neighborhood</i>	

Table 2. Constructs and Survey Items.



<p><b><u>Perceptions of Violent Crime</u></b></p> <p>How big of a problem (in your neighborhood) is...</p> <ul style="list-style-type: none"> <li>(1) <i>...people being robbed, beaten-up, or mugged on the streets</i></li> <li>(2) <i>...people being killed</i></li> <li>(3) <i>...people being the victims of violent crime</i></li> <li>(4) <i>...shootings and violence by gangs</i></li> <li>(5) <i>...people being threatened with knives or other weapons</i></li> <li>(6) <i>...people being threatened with guns</i></li> </ul>	<p>Pre-Intervention <math>\alpha = 0.943</math></p> <p>Post-Intervention <math>\alpha = 0.950</math></p>
<p><b><u>Perceptions of Property Crime</u></b></p> <p>How big of a problem (in your neighborhood) is...</p> <ul style="list-style-type: none"> <li>(1) <i>...people breaking into other people's homes</i></li> <li>(2) <i>...people breaking into or stealing cars</i></li> <li>(3) <i>...the vandalism of homes, buildings, or properties, such as breaking windows or graffiti</i></li> </ul>	<p>Pre-Intervention <math>\alpha = 0.821</math></p> <p>Post-Intervention <math>\alpha = 0.815</math></p>
<p><b><u>Perceptions of Physical Disorder</u></b></p> <p>How big of a problem (in your neighborhood) is...</p> <ul style="list-style-type: none"> <li>(1) <i>...abandoned cars in the streets/alleys</i></li> <li>(2) <i>...abandoned houses or other empty buildings in the area</i></li> <li>(3) <i>...trash, junk, or litter on the streets, sidewalks, or in vacant lots</i></li> </ul>	<p>Pre-Intervention <math>\alpha = 0.682</math></p> <p>Post-Intervention <math>\alpha = 0.701</math></p>
<p><b><u>Perceptions of Social Disorder</u></b></p> <p>How big of a problem (in your neighborhood) is...</p> <ul style="list-style-type: none"> <li>(1) <i>...excessive noise, such as barking dogs, loud parties, and loud car stereos</i></li> <li>(2) <i>...homeless people or vagrants</i></li> <li>(3) <i>...teenagers hanging out or causing disturbances</i></li> <li>(4) <i>...drug dealing on the street</i></li> <li>(5) <i>...drug dealing from houses or other buildings</i></li> <li>(6) <i>...people or landlords allowing their properties to become run down</i></li> <li>(7) <i>...Truancy; that is, kids not being in school when they should be</i></li> </ul>	<p>Pre-Intervention <math>\alpha = 0.843</math></p> <p>Post-Intervention <math>\alpha = 0.852</math></p>



<p><b><u>Fear of Crime</u></b></p> <p>(1) <i>I feel safe walking the streets of my neighborhood during the day</i></p> <p>(2) <i>I feel safe walking the streets of my neighborhood after dark</i></p>	<p>Pre-Intervention <math>\alpha = 0.708</math></p> <p>Post-Intervention <math>\alpha = 0.712</math></p>
<p><b><u>Perceptions of Police Legitimacy</u></b></p> <p>(1) <i>The police in this city are usually courteous</i></p> <p>(2) <i>The police are fair when dealing with people</i></p> <p>(3) <i>Philadelphia Police officers are usually honest</i></p> <p>(4) <i>Most police officers in my neighborhood use only the amount of force necessary to accomplish their tasks</i></p> <p>(5) <i>In General, Philadelphia police treat all people equally according to the law</i></p>	<p>Pre-Intervention <math>\alpha = 0.842</math></p> <p>Post-Intervention <math>\alpha = 0.834</math></p>



Table 3. Satisfaction with Police—mean change in reported level of satisfaction with police services from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	0.699	0.634
Foot Patrol	-0.145	0.641
Offender Focused	-0.059	0.637
Control	0.266	0.612

**ANOVA Results**

Source	Type 3 sums of squares	<i>df</i>	<i>F</i>	Partial Sq.	eta. Sq.	Sig.
Corrected Model	122.690	7	568.099	0.007		0.271
Intercept	378595.827	1	383973.31	0.824		0.000
Wave	11.685	1	130.252	0.001		0.571
Treatment	73.765	3	0.790	0.002		0.124
Treatment x Wave	35.911	3	282.710	0.003		0.226
Error	39430.596	1267				
Total	419258.800	1275				
Corrected Total	39553.286	1274				

R<sup>2</sup>=.004 (Adjusted R<sup>2</sup>=.002)

Notes: Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations.





Table 4. Perceptions of Violent Crime—mean change in perceived level of violent crime from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	0.129	0.060
Foot Patrol	-0.046	0.061
Offender Focused	0.051	0.061
Control	0.012	0.059

ANOVA Results

Source	Type 3 sums of squares	df	F	Partial eta. Sq.	Sig.
Corrected Model	2.211	7	1.093	0.006	0.366
Intercept	9448.561	1	32698.761	0.963	0.000
Wave	0.426	1	1.475	0.001	0.226
Treatment	0.505	3	0.582	0.001	0.628
Treatment x Wave	1.282	3	1.479	0.003	0.220
Error	366.113	1267	1.093		
Total	9846.542	1275			
Corrected Total	368.324	1274			

R<sup>2</sup>=.006 (Adjusted R<sup>2</sup>=.001)

Notes: \* p >.05 \*\*p >0.1. Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations. Dependent variable is log transformed.



Table 5. Perceptions of Property Crime—mean change in perceived level of property crime from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	0.562	0.421
Foot Patrol	-0.158	0.423
Offender Focused	-0.226	0.422
Control	-0.229	0.409

ANOVA Results

Source	Type 3 sums of squares	df	F	Partial eta. Sq.	Sig.
Corrected Model	110.831	7	1.163	0.006	0.326
Intercept	99402.277	1	7302.273	0.852	0.000
Wave	0.091	1	0.007	0.000	0.950
Treatment	76.095	3	1.863	0.004	0.136
Treatment x Wave	36.216	3	0.887	0.002	0.454
Error	17247.516	1267			
Total	116952.200	1275			
Corrected Total	17358.347	1274			

R<sup>2</sup>=.006 (Adjusted R<sup>2</sup>=.001)

Notes: \* p >.05 \*\*p >0.1. Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations.



Table 6. Perceptions of Physical Disorder—mean change in perceived level physical disorder from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	-0.024	0.050
Foot Patrol	0.028	0.051
Offender Focused	-0.025	0.051
Control	-0.083	0.049

ANOVA Results

Source	Type 3 sums of squares	df	F	Partial eta. Sq.	Sig.
Corrected Model	1.195	7	0.867	0.005	0.533
Intercept	5343.587	1	27147.679	0.955	0.000
Wave	0.216	1	1.098	0.001	0.298
Treatment	0.476	3	0.806	0.002	0.495
Treatment x Wave	0.507	3	0.859	0.002	0.463
Error	249.400	1267			
Total	5604.739	1275			
Corrected Total	250.595	1274			

R<sup>2</sup>=.005 (Adjusted R<sup>2</sup>=.001)

Notes: \* p >.05 \*\*p >0.1. Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations. Dependent variable is log transformed.



Table 7. Perceptions of Social Disorder—mean change in perceived level social disorder from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	1.024	0.840
Foot Patrol	0.695	0.854
Offender Focused	0.511	0.847
Control	0.585	0.818

ANOVA Results

Source	Type 3 sums of squares	<i>df</i>	<i>F</i>	Partial eta. Sq.	Sig.
Corrected Model	432.233	7	0.867	0.005	0.533
Intercept	482961.901	1	27147.679	0.955	0.000
Wave	157.920	1	1.098	0.001	0.298
Treatment	251.583	3	1.518	0.002	0.495
Treatment x Wave	14.028	3	0.859	0.002	0.463
Error	69972.996	1267			
Total	555438.800	1275			
Corrected Total	70405.229	1274			

R<sup>2</sup>=.006 (Adjusted R<sup>2</sup>=.001)

Notes: \* p >.05 \*\*p >0.1. Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations.



Table 8. Feelings of safety—mean change in reported feelings of safety from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	-0.436	0.250
Foot Patrol	-0.006	0.250
Offender Focused	0.011	0.248
Control	0.026	0.239

ANOVA Results

Source	Type 3 sums of squares	<i>df</i>	<i>F</i>	Partial eta. Sq.	Sig.
Corrected Model	39.468	7	1.185	0.007	0.312
Intercept	38413.454	1	8075.785	0.864	0.000
Wave	4.376	1	0.919	0.001	0.341
Treatment	24.472	3	1.714	0.003	0.167
Treatment x Wave	11.024	3	0.772	0.002	0.517
Error	6026.687	1267			
Total	44590.000	1275			
Corrected Total	6066.155	1274			

R<sup>2</sup>=.006 (Adjusted R<sup>2</sup>=.001)

Notes: \*  $p > .05$  \*\* $p > 0.1$ . Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations.



Table 9. Police Legitimacy—mean change in reported perceptions of police legitimacy from pre- to post-intervention by treatment type

Area	Mean Change	Standard Error
Problem Solving	0.618	0.517
Foot Patrol	-0.366	0.526
Offender Focused	-0.566	0.540
Control	-0.154	0.496

ANOVA Results

Source	Type 3 sums of squares	<i>df</i>	<i>F</i>	Partial eta. Sq.	Sig.
Corrected Model	250.631	7	1.762	0.010	0.093
Intercept	268637.051	1	13219.652	0.913	0.000
Wave	5.320	1	0.261	0.000	0.652
Treatment	176.268	3	2.892	0.006	0.037
Treatment x Wave	65.876	3	1.080	0.003	0.373
Error	25747.166	1267			
Total	295469.400	1275			
Corrected Total	25997.797	1274			

R<sup>2</sup>=.010 (Adjusted R<sup>2</sup>=.004)

Notes: \* p >.05 \*\*p >0.1. Missing data imputed using multiple imputation methods. Results are pooled estimates resulting from 5 imputations.



## Notes

<sup>1</sup> We note that labeling an area as “high crime” may result in legal side effects (Ferguson, 2011).

<sup>2</sup>The LISA analysis was performed using a first order queen spatial weights matrix. To reflect the focus on violent crime, homicide and incidents involving the threat of deadly force were given a weight of 2 and (relatively) less serious crimes of unarmed robbery and misdemeanor assault were given a weight of 1.

<sup>3</sup> HNN analyses are useful in that they are not bounded by geographic units (here Thiessen polygon’s) but rather follow the shape of the data. First-order clusters include events that have nearest neighbor distances shorter than expected based on complete spatial randomness. The minimum number of events for each hot spot was set at 10.

<sup>4</sup>These numbers are based on the total number of taxable properties within each cluster, a 95 percent confidence level, and 5 percent confidence interval to determine sample size for each cluster and an anticipated 20 percent response rate for poor, urban neighborhoods (Temple University Institute of Survey Research, 2009).

<sup>5</sup> Field researchers visited each site and completed a structured observation form which measured a number of site characteristics such as the level of social and physical disorder, quality of housing and land use. As part of this form, field observers estimated on a 4 point scale the prevalence of vacant lots and buildings, where 1 was an indication of a very high amount of vacant land use, and 4 was an indication of very low numbers of vacant land. High was considered having over 50% of the streets in the beat to have at least one vacant lot or over 25 percent of the streets having had over half of their lots vacant. A beat was listed as medium when over 25 percent of the streets had at least one vacant lot, and classified as low when an area had no vacant lots or only a few vacant lots interspersed in the area. The mean response across the areas was 2.47, an average between high and medium.

<sup>6</sup> This was done by determining the percentage of geographic area the experimental areas covered within each overlapping census tract, multiplying each census variable by the percentage of overlapping geographic area, and summing across census tracts variables for each experimental area.

<sup>7</sup> None of the variables included in the scales had greater than 10 percent of the responses missing. Overall, 71.7 percent of the surveys had complete data, and separate-variance *t* tests suggested that the data were missing at random. Further examination into missingness revealed a nonmonotone pattern; therefore, data were imputed with a fully conditional specification using Markov Chain Monte Carlo methods. Variables were constrained to conform to the Likert scales that were employed in the survey. The scales and results reflect the pooled estimates of five imputations (see Rubin 1987).

<sup>8</sup>The Levine’s test of equality of variances was found to be statistically significant when this dependent variable was modeled, suggesting that there was not homogeneity of variance across groups. Because this is an assumption of ANOVA, the variable was log transformed using the natural log. This was also the case for the perceptions of physical disorder variable which was also log transformed.

<sup>9</sup>Some of the survey items could also be considered an indicator for procedural justice (Tyler 2003).



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<sup>i</sup> There are several comprehensive reviews of studies at hot addresses as well as hot spot areas (Sherman 1997)

<sup>ii</sup> Police chiefs ranked 18 different strategies according to the effectiveness in hot spots.

<sup>iii</sup> Crime was extracted using Uniform Crime Report (UCR) classification codes. The police department automated system achieves geocoding hit rates in excess of 98 percent, so the data are suitable for spatial data analysis (Ratcliffe 2004)

<sup>iv</sup> A Global Moran's *I* statistic was computed in the computer program GeoDA to establish that violent crime in <City> was in fact significantly clustered. Significant spatial autocorrelation was found (Moran's  $I = .1430$ ;  $p = .001$  with 999 permutations) and supported using a LISA analysis to identify micro-level violent crime hot spots.

<sup>v</sup> A Thiessen polygon is a unique geometric unit that is drawn so that every point within a given Thiessen polygon will be closer to the centroid of that polygon than any other polygon in the network (Chainey and Ratcliffe 2005) In other words, drawing a Thiessen polygon network using street intersections as the polygon centroid means that when crime point-data are overlaid on the Thiessen network, each crime event within a given polygon is closer to one street corner than any other intersection in the city.

<sup>vi</sup> The LISA was run in GeoDa 9.5i and used a first-order queen spatial weights matrix to establish spatial relationships.

<sup>vii</sup> The HNN clustering routine was from CrimeStat v3.2. The output of a HNN analysis includes hot spots at different orders. First-order clusters are created by grouping events that have nearest neighbor distances shorter than would be expected under the assumption of complete spatial randomness. The number of events included in each cluster depends on the minimum number of points specified by the user. The minimum number events for each hot spot were set at 10, and the hot spots were specified to be delineated as convex hulls.

<sup>viii</sup> Following Braga and colleagues (Braga and Bond 2008; Braga et al. 1999) as well as (citation suppressed) we used adjusted police officer input to maintain separation between sites whenever possible and take into account environmental features.

<sup>ix</sup> Mann-Whitney U tests between the treatment and control areas by intervention type for the geographic characteristics described in Table 2 confirmed there were no statistically significant differences in geographic size across treatment and control areas.

<sup>x</sup> The specific start and end times varied by target area and reflected the crime patterns. Generally, eight of the sites worked during the day shift (between 7am and 6pm), nine worked the evening shift (between 4pm and 2am) and three alternated between day and night shifts weekly.

<sup>xi</sup> The 'Action plans' were a reporting form that was already being used within the <City Police Department> to guide problem solving. The form is structured to follow the SARA process and requires a detailed description of the problem, documentation of responses (including naming those responsible for carrying out tasks), and periodic evaluations of outcomes.

<sup>xii</sup> Repeated measures multilevel models have been used to evaluate non-experimental (Rosenfeld, Fornango, and Baumer 2005; Corsaro and McGarrell 2009) as well as experimental designs (Raudenbush and Bryk 2002; Bryk and Raudenbush 1987).

<sup>xiii</sup> We recognize that field investigations are likely more relevant indicators of police action for the foot patrol and offender focus areas than the problem solving areas where non-traditional police responses were emphasized.

<sup>xiv</sup> Per the advice of Raudenbush and Bryk (2002; p. 182) linear time and quadratic time are grand mean centered to avoid multi-collinearity in the model. Centering variables in MLMs changes the interpretations of model parameters, but does not the numerical stability of model estimation (Raudenbush and Bryk, 2002, p. 32). The temperature effect is also grand mean centered and is interpreted as an increase above the average temperature observed for all 37 bi-weekly time periods. The contrast coded treatment effects were not centered.



<sup>xv</sup> In additional models the three contrast coded treatment variables were also specified with random slopes (separately), but were not found to vary significantly across the level two units.

<sup>xvi</sup> All models are specified with an over-dispersed Poisson probability distribution, thus the  $\beta$  coefficients are difficult to interpret given they have been logarithmically transformed due to the Poisson model's log-linking function. Therefore, we interpret the event rate ratios (ERR). Multiplying the difference between the ERR and 1 by 100 results in a percent that can be interpreted as a percentage increase or decrease in the expected count of the outcome variable where negative values signify decreases and positive numbers signify increases. For simplicity of interpretation, we report the impact of a 10 degree increase above the average temperature. (Bryk and Raudenbush 1987; Raudenbush and Bryk 2002)

<sup>xvii</sup> When compared to controls areas, violent crime hot spots receiving foot patrol had expected violent felonies counts that were roughly 29 percent greater during the implementation of foot patrol ( $\beta = 0.256$ ;  $ERR = 1.291$ ;  $p < 0.05$ ). Since the effect is not significant at the Bonferroni corrected p-value ( $p < .025$ ), it possibly reflects a false significance (Tamhane 2009, p. 126).

<sup>xviii</sup> Linear and quadratic time are grand mean centered, so a value of zero on these two variables represents the mid-point of the time series and each 1-unit increase is representative of the time periods beyond the mid-point.

<sup>xix</sup> The quadratic time effect would suggest that the decrease in expected narcotics bi-weekly counts started to slow down later in the time series ( $\beta = -0.0004$ ;  $ERR = 1.0004$ ;  $p < 0.05$ ); whereas, the temperature effect suggests bi-weekly narcotics counts decreased by 2 percent for each 10 degree increase above the average temperature during the evaluation period ( $\beta = -0.002$ ;  $ERR = 0.998$ ;  $p < 0.05$ ).

<sup>xx</sup> The WDQ calculations were performed using (Ratcliffe 2008) Spatial Evaluation of Police Tactics in Context. An Excel spreadsheet is available to download at <http://jratcliffe.net/ware/wdq.htm>.

<sup>xxi</sup> To save space the calculations are shown here. The counts for the violent felonies outcome across the offender focus- treatment (A), -buffer (B), and -control areas (C) during the 90 day pre-treatment period ( $t_0$ ) were 164 ( $At_0$ ), 215 ( $Bt_0$ ), and 55 ( $Ct_0$ ), respectively. For the treatment period ( $t_1$ ), the offender focus-treatment (A), -buffer (B), and -control areas (C) recorded counts of 304 ( $At_1$ ), 395 ( $Bt_1$ ), and 164 ( $Ct_1$ ) on the violent felonies outcome. The full WDQ equation is shown below:

$$WDQ = \frac{395/164 - 215/55}{304/164 - 164/55} = \frac{-1.501}{-1.128} = 1.33$$