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## Attention Felons: Evaluating Project Safe Neighborhoods in Chicago

Andrew V. Papachristos  
andrew.papachristos@yale.edu

Tracey L. Meares  
t-meares@uchicago.edu

Jeffrey Fagan  
Columbia Law School, jfagan@law.columbia.edu

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***Attention Felons: Evaluating Project Safe Neighborhoods  
in Chicago***

*ANDREW V. PAPACHRISTOS  
University of Chicago - Department of Sociology*

*TRACEY L. MEARES  
University of Chicago Law School*

*JEFFREY FAGAN  
Columbia Law School*

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# Attention Felons: Evaluating Project Safe Neighborhoods in Chicago

*Andrew V. Papachristos, Tracey L. Meares, and Jeffrey Fagan\**

This research uses a quasi-experimental design to evaluate the impact of Project Safe Neighborhood (PSN) initiatives on neighborhood level crime rates in Chicago. Four interventions are analyzed: (1) increased federal prosecutions for convicted felons carrying or using guns, (2) the length of sentences associated with federal prosecutions, (3) supply-side firearm policing activities, and (4) social marketing of deterrence and social norms messages through justice-style offender notification meetings. Using individual growth curve models and propensity scores to adjust for non-random group assignment of neighborhoods, our findings suggest that several PSN interventions are associated with greater declines of homicide in the treatment neighborhoods compared to the control neighborhoods. The largest effect is associated with the offender notification meetings that stress individual deterrence, normative change in offender behavior, and increasing views on legitimacy and procedural justice. Possible competing hypotheses and directions for individual-level analysis are also discussed.

Driving down interstate I90, Julien passed a billboard just before exit 14B that read: "Stop Bringing Guns to Chicago or Go Directly to Jail." Julien had seen the sign before. In fact, it startled him enough to change his normal routine. Typically, Julien took a Greyhound bus when transporting the illegally purchased guns he sold. This time, however, he borrowed a car from a friend. During a phone conversation taped by federal prosecutors, Julien remarked to a gun customer:

And there was a big ass sign when we was coming last time that said, it said, 'Do not bring guns into Chicago.' ... I swear to God, G. It was a big ass sign. I don't know if they did it for us or whatever, G. It is a big ass sign, G, coming from Indiana ... So what I'm a do, is a, I'm a try to find a ride, man.

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\* Address correspondence to Andrew V. Papachristos, Department of Sociology, University of Massachusetts, Amherst, MA, 01003-9277. Or via email: [papachristos@soc.umass.edu](mailto:papachristos@soc.umass.edu). Papachristos is Assistant Professor of Sociology, University of Massachusetts; Meares is Professor of Law at Yale Law School; Fagan is Professor of Law and Public Health at Columbia Law School. The authors would like to thank the members of Chicago's PSN taskforce for all their assistance these past several years. Data was provided by the Chicago Police Department and the Illinois Department of Corrections. The opinions expressed here are those of the authors and in no way reflect those of the PSN taskforce members, the City of Chicago, the Chicago Police Department, the Illinois Department of Corrections, of the Bureau of Alcohol Tobacco, Firearms, and Explosives.

Unfortunately for Julien, his alternative plan did not work out. Julien, along with three co-conspirators, plead guilty to conspiring to sell guns to Chicago gang members.

The billboard was posted by Chicago's Project Safe Neighborhoods (PSN) program, a federally-funded initiative designed to bring federal, state, and local law enforcement together with researchers and community agencies to devise context-specific strategies for reducing gun violence. In Chicago, this has animated a community-level mobilization of social and legal institutions to stop the onset and spread of gun violence in targeted high-crime neighborhoods. Chicago PSN focuses on three broad goals: (1) reduce demand among young gun offenders, (2) reduce supply by identifying and intervening in illegal gun markets, and (3) prevent onset of gun violence. Both the demand reduction and prevention strategies rely on a combination of efforts to increase the perceived costs of illegal gun trafficking and gun use, and to alter the social norms and preferences within the social networks of young gang members and other adolescents involved in gun violence. The latter strategy includes efforts to change the perceived legitimacy of law and legal institutions while simultaneously changing the perceived likelihood and costs of punishment.

This study uses a quasi-experimental design to assess the impact of four of Chicago's PSN strategies—increased federal prosecutions for convicted felons carrying or using guns, lengthy sentences associated with federal prosecutions, supply-side firearm policing that increased the rate of gun seizures, and social marketing of the deterrence and social norms messages through offender notification meetings. The results are promising: homicide rates in the targeted neighborhoods decreased more than 35 percent in the two years after the program started.

In this paper, we first provide the legislative and programmatic background of the PSN program. A description of Chicago's specific PSN strategies comes next. We then turn to an explanation of gun violence and gun markets in Chicago to set the stage for a discussion of the theoretical foundations of strategies developed to address Chicago's gun crime problems. The paper concludes with a preliminary evaluation and discussion of Chicago PSN to date along with a discussion of next steps in the research.

### **POLICY CASCADES AND ANTECEDENTS OF PROJECT SAFE NEIGHBORHOODS**

Chicago's PSN initiative is part of a nationwide PSN program that establishes a "comprehensive and strategic approach to reducing gun crime."<sup>1</sup> Congress allocated more than 1.1 billion dollars among the 94 federal court districts throughout the nation specifically to develop PSN strategies to fit within local legal contexts. In each district, an interagency taskforce overseen by the United States Attorney and comprised of local, state and federal law enforcement agencies was directed to assess the main factors driving gun crime in their jurisdiction and then to devise *context-specific* strategies to address each area's "gun problem." Notably, according to national program dictates, each district taskforce was urged to network with community partners and researchers in addition to law enforcement agencies.

One way to understand the impetus behind the national PSN initiative is to situate it within the literature on behavioral economics. At the national level, PSN is the result

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<sup>1</sup> According to its mission statement: "The goal is to take a hard line against gun criminals through *every available means* in an effort to make our streets and communities safer. Project Safe Neighborhoods seeks to achieve heightened coordination among federal, state, and local law enforcement, with an emphasis on tactical intelligence gathering, more aggressive prosecutions, and enhanced accountability through performance measures." <http://www.psn.gov/>.

of a “policy cascade”<sup>2</sup> in which the public discourse around a particular problem, in this case gun violence, intersects with a salient policy initiative against the background of a political landscape that is receptive to the widespread promotion of the relevant policy initiative. PSN thus resulted from public discourse of the “gun problem” amidst a tough-on-crime political backdrop. In this discourse, there were two salient policy precursors to PSN: Boston’s Project Ceasefire and Richmond’s Project Exile, each of which was created in a political landscape receptive to tough demand-side punishment of gun offenders.

Operation Ceasefire was a problem-oriented policing intervention focused on reducing youth homicide and gun violence in Boston (see, Braga et al. 2001).<sup>3</sup> Project Exile was started as a collaborative effort to prosecute federally all felon-in-possession, drug/gun, and domestic/gun cases.<sup>4</sup> Both programs were highly touted in the media. The drop in youth homicides in Boston was so dramatic that it came to be known in the popular press as the “Boston Miracle.”<sup>5</sup> In Richmond, political pundits claimed that the federal prosecution efforts were responsible for a 40 percent reduction in gun homicides

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<sup>2</sup> Here we mean to borrow a page from Timur Kuran and Cass Sunstein (1998).

<sup>3</sup> A multi-agency working group analyzed police intelligence and determined that approximately 1,300 gang members (less than 1 percent of the youth population under 24) were responsible for 60 percent of all juvenile homicides in Boston and that most of these homicides occurred in a geographically concentrated inter-gang retaliations. To counteract the violence, the working group created a “pulling levers” strategy that concentrated intervention and deterrence efforts law enforcement and community outreach workers directly on those gangs and gang members responsible for gun violence. In a series of meetings with different gangs, the Boston group told offenders of their targeted enforcement efforts and made it clear that should a violent episode occur, they would “pull every lever” available to come down hard on the gang itself, apprehend the offenders, and prosecute accordingly.

<sup>4</sup> Project Exile efforts also included enhanced training for law enforcement and community organizations and a media campaign touting the “get tough on gun crime” message – a message based clearly on deterrence.

<sup>5</sup> Boston’s crime reduction was termed a “miracle” for two reasons: youth gun homicide deaths were eliminated for nearly two years, and the coordinated efforts of religious leaders and the police overcame what Boston’s leaders called the “municipal dysfunction” that paralyzed other cities (*Boston Globe*, 1997; Patterson and Winship, 1999; Schweitzer and Latour, 2001)

from 1997 to 1998 (Raphel and Ludwig 2003). Given the emphasis of both programs on targeting the people who use guns and delivering muscular legal responses, and the current political setting in which such crime policy promotion typically yields election payoffs (Beale 1997), the stage was set for the nationwide expansion of PSN.

Approximately \$ 600 million were specifically directed towards supply side strategies such as increased background checks, enhanced computer tracking systems, and inter-agency gun trafficking teams (Braga, Cook and Kennedy 2003). Meanwhile, \$ 405 million were allocated towards demand side strategies such as gun-lock programs, school-based education programs, and media campaigns *as well as* demand side law enforcement strategies such as hiring new federal prosecutors and supporting local and state law directed policing efforts.<sup>6</sup>

Scholars who study what we have referred to as “policy cascades” caution, however, that policy generated in this way can be undesirable or even counterproductive (Kuran and Sunstein, 1998, p. 742). While Kuran and Sunstein discuss risk regulation generally, Richard Lempert (1984) has made a similar point with reference to a policy initiative in the criminal context – mandatory arrest as a response to domestic assaults. Lempert praises the Sherman and Berk (1984) study that drew so much media attention at the time by explaining its strong merit as a social science study. But, he notes that the work clearly led to the premature and possibly unwarranted adoption of either mandatory arrest policies or substantial increases in the levels of domestic violence arrests in several jurisdictions. Lempert highlights the real risks of negative consequences that follow generalizing from a single (even very well done) investigation. He notes, “[t]he general

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<sup>6</sup> More specifically, \$130 million was funneled towards non-law enforcement issues, \$126 million towards the hiring of federal prosecutors, and \$ 280 million towards state, local, and community initiatives (Ludwig 2004).

point is that the effects of an intervention may depend on the characteristics of the system in which it is embedded” (Lempert 1984, p. 507).<sup>7</sup>

Indeed, it is not at all clear that one can confidently conclude that Ceasefire and Exile demonstrate the kind of results that would justify replication in other jurisdictions. Nor was it clear which aspects of these programs (if any) were susceptible to replication at all. Evaluations of Operation Ceasefire in Boston found a 40 percent reduction in youth homicides as well as a reduction in shots-fired calls, and gun assault incidents (Braga et al. 2001; Piehl et al. 2003).<sup>8</sup> However, several other researchers whom have re-examined crime data from Boston cast doubt on some of these initial findings (Levitt 2003; Ludwig 2004; Rosenfeld, Fornango and Baumer 2005). These studies cite several limitations in the Boston evaluation. First, the data are inherently “noisy.” The overall low numbers of homicide in Boston, an unusually high pre-intervention homicide rate, and several other violence reduction strategies running concurrently with Ceasefire make it difficult to attribute the observed decline to any particular intervention. In particular, the pre-intervention spike in homicides suggests that the observed decline might be nothing more than regression towards the mean or simply part of the secular nation-wide declining crime trend (Ludwig 2004). Second, the evaluation of Ceasefire lacked any real experimental design or variable(s) that captured their activities and systematically compared them to trends in similarly situated comparison cities or neighborhoods

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<sup>7</sup> The reaction to the youth gun violence epidemic in the early 1990s provides another example of a legal mobilization gone awry. Nearly every state in the U.S. passed laws to increase the number of youths transferred to criminal court (Feld 1996; Torbert and al. 1996; Zimring 1999), investing heavily in deterrence to control youth crime (Singer 1996). But these laws had negative consequences in many states, compromising rather than safeguarding public safety (Bishop 2000; Fagan 2002; Fagan, Kupchik and Liberman 2003).

<sup>8</sup> The drop in homicides, Ceasefire’s architects argued, was significantly larger than the decrease in homicide rates in other U.S. cities. Based on this evidence as well as time-series breaks, they conclude that targeted programs were responsible.



Even considering these weaknesses, the evaluation of Boston's strategy appears stronger than that of perhaps the more direct forbearer of PSN, Project Exile. While there was no formal evaluation of Project Exile, Raphael and Ludwig (2003) conducted an analysis to assess any differences in the observed crime drop relative to Richmond's own long-term trends and similar trends in other cities (also, Ludwig 2004). Their findings suggest that the observed decline in homicide rates was merely a regression towards the mean. In fact, the homicide rate in Richmond *increased* by 40 percent in 1996-1997, the year prior to Exile's start. Furthermore, using a difference-in-difference analysis of over-time rates in Richmond and other cities suggest that much of the impressive decline can be almost entirely explained by the large increase in the mid-1990's. But a recent analysis by Rosenfeld and colleagues (2005) contradicts Raphael and Ludwig. Using hierarchical linear models with panel designs that compare homicide rates over an extended period of time across a sample of large U.S. cities, Rosenfeld et al. find that the decline in the homicide rate in Richmond was significantly greater during the Exile intervention period.

Such divergent findings in Boston and Richmond underscore the paucity of systematic program evaluation, especially those of experimental design, and should serve as a warning (or at least a point of ambiguity) of a program's "success." Furthermore, the political nature of such programs often undermines the necessary logical and statistical conditions for a reliable test of causal effects (e.g., Berk 2005). Yet, despite the lack of consistent results, the Project Exile model was nonetheless urged upon every federal district in the United States regardless of the particular violence context in the relevant city, and millions were earmarked to support it. Moreover, both Exile and Ceasefire were

promoted as national models and generously funded well after homicide rates, including youth homicide rates, had begun to steadily decline across the nation's large cities in the mid-1990s.

These stories suggest that we should perhaps be skeptical of a program such as PSN. But there are two important characteristics of the Chicago PSN project that leave room for optimism that useful policy can grow out of such a cascade. First, the target problem for PSN policy in Chicago, gun violence, is likely not plagued by the kind of availability error that Kuran and Sunstein worry about in their work. Although the scale of the gun violence problem in Chicago has diminished significantly from the levels of a decade ago, it remains a serious problem.<sup>9</sup> Second, a key element of the national PSN strategy is to encourage local PSN taskforces to engage a research partner in order to enhance the link between policy initiatives and results. The idea behind this strategy element has become common in medicine where “evidence-based practices” are well-known (Weisburd, et al. 2003). Importantly, the PSN researcher role differs from the more common *laissez faire* approach to program evaluation in that the PSN research partner is expected to actively use available data and research both to help guide program efforts as well as to evaluate program effectiveness as opposed to simply evaluating the policy intervention after the fact.<sup>10</sup>

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<sup>9</sup> In 2002, for example, Chicago had a homicide rate of 22.2 per 100,000, the fifth highest per capita rate in the country. New York and Los Angeles, cities more than twice the size of Chicago, had rates of 7.3 and 17.8, respectively.

<sup>10</sup> The research partner's funding came from a separate pool of money to ensure that no contamination occurred—i.e. that the results the research provided, whether positive or negative, would not influence results or performance.

## CHICAGO PSN STRATEGIES

The engine driving Chicago's PSN initiative is a multiagency taskforce that includes members from law enforcement and local community agencies. Participating members include representatives from: the Chicago Police Department, the Cook County State's Attorney's Office, the Illinois Department of Correction, the Cook County Department of Probation, the United States' Attorney's Office for the Northern District of Illinois, the City of Chicago Corporation Counsel, the Chicago Alternative Policing Strategy, the Chicago Crime Commission, and more than 12 community-based organizations. Since May of 2002, representatives of each agency and organization have met on a monthly basis to devise gun violence reduction strategies for the two police districts with the highest rates of gun violence described below. The strategies settled upon by the taskforce are both coordinated and collaborative.

FIGURE 1 shows that Chicago's PSN strategy consists not of a single initiative but of three dimensions with multiple programs. The top portion of FIGURE 1 depicts a simplified model of offending; the bottom half of the figure shows the theoretical design of PSN and its point of intersection with the hypothesized offending process. On the top far left of the figure is the total population of the target areas which consists mainly of law abiding citizens (non-shaded area) and only a small portion of persons with prior contact with the criminal justice system (hereafter, simply offenders).

### **[Figure 1 about here]**

The majority of Chicago's PSN programming occurs in the first program area, the community-level, *prior* to any criminal act. These include: community outreach and media campaigns, school based programs, and various programs specifically geared

towards known gun offenders. The second and third programming areas rely on law enforcement strategies focused on supply-side firearm policing as well as multi-agency case review and prosecutorial decisions. As a set of coordinated responses to gun violence, these strategies draw upon multiple theoretical frameworks. The obvious frameworks include deterrence and incapacitation, echoing Project Exile and Boston Ceasefire. However, as we will demonstrate, models of social ecology and psychological theories of procedural justice also are expressed in Chicago's PSN strategies.

In the present analysis, we focus on four of the PSN initiatives: offender notification meetings, federal prosecutions, federal prison sentences, and multi-agency gun recoveries. The first initiative constitutes the taskforce's major community effort while the others represent coordinated law enforcement efforts. We focus here upon a brief description of these strategies.

*Offender Notification Forums* (henceforth, simply forums) are Chicago PSN's most unique intervention, and the one that is most directly consistent with its goals of changing the normative perceptions of gun crime by the offending population.<sup>11</sup> The forums began in January of 2003 and are presently held twice a month. Offenders with a history of gun violence and gang participation who were recently assigned to parole or probation are requested to attend a forum hosted by the PSN taskforce. The forums are designed to stress to offenders the *consequences* should they choose to pick up a gun and

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<sup>11</sup> We should point out here that the forums are supported by another strategy on the list above: Offender Notification Letters. All offenders released from the Illinois Department of Corrections now receive a letter from the PSN taskforce which informs them that, as a felon, he or she is not permitted to own or possess a firearm or ammunition and any violation could result in federal prosecution with increased sentences. After the offender reads the letter, they are asked to, but not required to, sign the letter in acknowledgement of understanding. Signing the letter is *not* a condition of parolee or release and the individual may choose *not* to sign. As of August 2003, all persons presently on parolee or released from prison have seen and/or signed the notification letter.

the *choices* they have to make to ensure that they do not re-offend. These one-hour forums have three segments.

The first segment of the forum contains a strict law enforcement message. For the first 15 to 20 minutes, representatives from local, state, and federal law enforcement agencies discuss the PSN enforcement efforts in the target areas. Law enforcement personnel emphasize that the levels of violence in the target communities warrant a collaborative enforcement effort by local *and* federal agencies. In addition to highlighting gun laws specific to ex-offenders, including minimum sentences, conviction rates, etc., presenters speak candidly of the directed law enforcement efforts in the area and the likelihood of ex-offenders being either a victim or perpetrator in other acts of violence. Law enforcement officials also promote high-profile cases featuring offenders from the neighborhood that many in the audience may well know and who has been convicted through PSN enforcement methods.

The second segment of the forum entails a 15 minute discussion with an ex-offender from the community who works with local intervention programs. The speaker uses personal experience describing *how* he managed to stay out of jail and away from guns. The ex-offender is usually an older, former gang-leader who has turned away from crime and who now works as a street-intervention worker. His message stresses the seriousness of the current levels of violence in the community, the problem of intra-racial violence, the troubles offenders face when looking for work, and the seriousness of the PSN enforcement efforts.

The final segment of the forum stresses the *choices* that offenders can make in order to avoid re-offending. For the final 30 to 40 minutes, a series of speakers from

various agencies in the community discuss their programs and what offenders need to do to enroll or participate. Programs include substance abuse assistance, temporary shelter, job training, mentorship and union training, education and GED courses, and behavior counseling. Often several local employers attend and actual tell offenders the necessary steps to gain employment with their respective firms. Various literature, flyers, and business cards are given to the attendees in order to contact—free of charge—any of the services that were discussed.<sup>12</sup> At the forum’s conclusion, all of the presenters talk and interact with the attendees, often staying late into the night in discussion or counseling.

The other interventions of interest in this analysis are federal prosecutions and gun recoveries. These efforts flow from the work of multi-agency gun teams and collaborative case review by federal and state agents. PSN multi-agency gun teams consist of agents from the Chicago Police Department, ATF, the Cook County States Attorney’s Office, the United States Attorney’s Office, and the City of Chicago’s Department of Drug and Gang House Enforcement. The goal of the team is to use all of focus all of its available resources on gun crime in the target areas. The gun team’s role is to investigate cases surrounding gun trafficking, use, and sales in the target areas. In addition to investigations, the gun team also conducts gun seizures and serves warrants on pending cases involving firearms.

To implement the collaborative case review process, the PSN taskforce charged local and federal prosecutors to meet on a bi-weekly basis to review *every* gun case in the city of Chicago to determine at which level (state or federal) the case could potentially

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<sup>12</sup> Perhaps more importantly, the service providers attempted to make direct links with the offenders by giving them exact information for job registration, starting classes, etc. One employer, for example, would tell attendees when his next paid training classes began (usually the very same week) and offered modest transportation compensation. In short, these efforts did not simply regurgitate information offenders have heard before, but instead attempted to make a direct link to viable employment and service options.

receive the longest prison sentence. The point of this review is to identify cases involving (a) an offender with a previous history of gun violence (b) within the target area, and (c) accompanying severe or aggravating circumstances are set aside for *federal prosecution*. Cases deemed inappropriate for federal prosecution are prosecuted in the state system, and PSN taskforce members stress to the presiding judge the PSN campaign to crack down on gun offenders in the target areas.<sup>13</sup>

### **THEORETICAL FRAMEWORKS AND PSN POLICY APPROACHES**

Chicago created a hybrid PSN program that combined the price-theory deterrence model of Exile, in which lengthy prison sentences for felon gun carrying would be actively pursued by federal authorities in a geographically targeted manner, with the Boston focus on selective targeting of a specified high-risk population of known gun offenders. Long federal sentences served in prisons far from home, theoretically, should incapacitate targeted offenders in order to reduce their lethality in high-crime police districts. A key question, of course, is the extent of the potential impact of this program element given that any incapacitation effect from the program would have to exist over and above the incapacitative effect existing in the ordinary course flowing from the state prosecution baseline (Levitt 2003).

The deterrence prong of PSN predicts that severe federal sentences, along with an increased certainty of federal punishment, should alter a gun carrying felon's rational assessment of the legal risks of gun offending so to specifically deter him from that act. As a general matter, effective deterrence strategies stress the severity, certainty, and

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<sup>13</sup> Obviously, the federal prosecution component is relevant to both the community media campaign and the offender-specific campaign in that these campaigns often highlight a notable federal case.

swiftness of the sanction (e.g., Tittle and Rowe 1974; Zimring and Hawkins 1973; Nagin, 1998). Federal gun sentences are often more severe than parallel state sanctions for the same gun offense. Moreover, the thrust of PSN law enforcement strategy is to increase the number of such federal prosecutions – at least against offenders in the target districts. This approach increases the certainty of punishment.<sup>14</sup> Forums also are relevant to deterrence in that they make salient to the targeted group information regarding the increased number of federal prosecutions and lengthy federal sentences, or what some have considered to be the “missing link” in deterrence research (Kleck et al. 2005).

Whether or not an approach targeting crime-prone individuals is successful depends a great deal upon whether these individuals will be deterred by the threat of sanctions. Wright et al. (2004) summarize four different deterrence perspectives that address this question. The first perspective is the classic deterrence model that deems individual criminality is irrelevant to the effectiveness of a threat of legal sanction. According to this familiar theory, individuals seek to maximize utility and partake in some hedonistic calculus of the ends and means of committing a crime. From this rational-actor perspective, increasing penalties associated with a crime *ipso facto* increases the cost of the crime and decreases the likelihood that an individual will choose to commit a crime. According to such logic, the threat of punishment affects everyone equally.

A second perspective is drawn from self-control theories (Gottfredson and Hirschi 1990; Wilson and Hernstein 1985) and predicts that law enforcement strategies are *less*

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<sup>14</sup> It is not obvious whether any PSN strategy specifically address the swiftness of punishment. Anecdotally we are aware the state gun prosecutions in Chicago have in the past been commonly continued by defense attorneys for months melting into years in some cases. Federal judges, we are told, do not usually tolerate such lax practices.



likely to deter those more prone to commit crimes because their impulsive, risk-taking, and present-oriented nature inures them to the threat of sanctions (Becker 1968; Nagin and Paternoster 1994; Nagin and Pogoarsky 2001; Wright et al. 2004). Self-control theorists believe that crime-prone individuals are more impulsive and interested in immediate gratification than other people are. In other words, they do not respond as a rational actor with a normal discount rate; these offenders may discount or postpone costs in favor of the present value of crime. If this is true, then deterrence strategies like Chicago's PSN approach should be *less* effective in deterring crime among hardened offenders as compared to so-called law abiders whom self-control theorists expect to be rational actors whose behavior conforms to the classical model.

A third perspective is the converse of the second—increasing the costs of crime will have a *greater* effect on those who are crime-prone than those who are not (Silberman 1976; Tittle 1980; Toby 1964). The reason is that individuals who are strongly tied to conventional norms simply are not affected by sanction threats. In this account, it is the law abiders who are, in a sense, immune to the threat of sanction, but not because they are impulsive and without self-control; rather, it is because law-abiders are highly unlikely to offend in the first place due to their internalized commitment to compliance. The threat of crime, then, is a cost only to those who are actively engaged in an offending or criminal lifestyle, whom this perspective's adherents hypothesize are rational actors.<sup>15</sup> Because the criminally prone potentially will be subject to legal sanctions, they pay closer attention to the costs of doing crime, assuming that they have

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<sup>15</sup> Wright et al. (2004) offer a clever metaphor of this perspective: "A restaurant owner can sell more prime rib by lowering its price, but not to vegetarian patrons. The price of prime rib here represents the situational inducement toward ordering meat, but vegetarianism represents a predisposition away from it, and thus the effect of meat pricing significantly varies by level of meat eating" (pg. 184).

access to information about higher potential costs with no offset from higher potential crime payoffs. For everyone else, such matters are irrelevant.

A final perspective combines the previous two by suggesting that the effect of threats varies in an inverted “U”-shaped pattern of disposition towards crime. At either end of the curve are those highly socialized into pro-social norms *or* those highly socialized into criminality (such as professional thieves) and increasing the costs of sanctions is unlikely to effectively deter criminal behavior of either of these groups. However, those located along the middle section of the curve, those who are neither strongly tied to conformity or crime potentially respond to legal threats. Zimring and Hawkins (1973) call members of this group “marginal offenders” because their criminality is wavering and plastic.

Chicago’s PSN strategies are consistent with the theory in which strategy promoters expect offenders who attend an offender notification meeting and who may be subject to federal prosecution to desist from gun offending as a result of the intervention. However, the empirical research relevant to the classification of offending populations according to the perspectives laid out above is not clear. Qualitative research on active offenders shows support on both extremes. On the one hand, several important studies demonstrate that offenders, and even “professional” criminals, often act irrationally, without planning, and with complete disregard for the legal consequences (Fenny 1986; Shover 1996; Wright and Decker 1994). For example, Decker and Wright (1994) found that more than two-thirds of professional burglars in St. Louis simply never thought about the fact of getting caught. On the other hand, qualitative research also shows that at least some offenders modify their behavior for the fear of getting caught and attempt to

minimize their risk accordingly (Cusson and Pinsonneault 1986; Decker, Wright and Logie 1993; Piquero and Rengert 1999; Walsh 1986). Ludwig (2004), for example, cites data from an on-going multi-methods study of gun markets in Chicago that drug dealing gang members dissuade the presence of firearms near drug spots because of the negative attention it draws from police.<sup>16</sup>

More specifically relating to gun violence, these findings and others by Levitt (2002) and Wright and Rossi (1985) show that at least *some* proportion of gun offenders act rationally when it comes to weighing the threats of sanction against the costs and returns of crime and attempt to minimize their risks of being caught accordingly (also, Cook, Molliconi and Cole 1995; Wright et al. 2004). That is, increasing the severity and potentially the certainty of sanctions at least changes behaviors of some criminal prone individuals and (quite possibly) affects the normative expectations of gun use by raising the costs. Indeed, the opening vignette to this paper demonstrates an effort by an offender to change his behavior in order to avoid sanction.

Another theoretical framework is important to evaluation of PSN strategies. While deterrence theories assume that individuals complying with the law because they fear the consequences of failing to do so, norm-based theories grounded in social psychology of compliance connect voluntary compliance with the law to the fact that individuals believe the law is “just” or because they believe that the authority enforcing the law has the right to do so (Tyler 1990). Their belief in the fairness of legal norms and procedures – and the underlying moral bases of law – creates a sense of obligation to cooperate with legal actors and comply with legal norms. These factors are considered

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<sup>16</sup> Moreover, Ludwig notes that police actively engage an informal gun deterrence strategy with gang members by letting them know that while drug dealing may be quasi-acceptable from the normative standpoint of the community, gun violence is *not*.

normative because individuals respond to them differently from the way they respond to rewards and punishments. In contrast to the individual who complies with the law because she is responding to externally imposed punishments, the individual who complies for normative reasons does so because she feels an *internal* obligation. It is “the suggest[ion] that citizens will voluntarily act against their self-interest [that] is the key to the social value of normative influences.” (Tyler 1990, p. 24).

The architecture of the offender notification meetings makes these theories relevant. While deterrence theory emphasizes the fact that the law enforcement message is conveyed to recently paroled gun offenders, norm-based theories of compliance emphasize both the content of the message conveyed to attendees in its entirety (the law enforcement message, the ex-offender transition, and the community organization message) and the context in which the message is conveyed..

Consider context first. The forums are held in a neutral and pleasant location, typically a public building in a local park. In fact, PSN taskforce members specifically rejected law enforcement facilities as a setting for the forums. Additionally, the room in which the forum takes place is set up in an egalitarian “roundtable” style. Chairs are set up in a square, and there is no podium for speakers so that *all* participants are set on a level plane.

Now consider the content of the message. All three components of the message matter to the procedural justice account. If only deterrence were important, then the subsequent messages would be irrelevant. Yet, the PSN taskforce members believe – a belief consistent with theory – that each message component is necessary to emphasize

the agency of the individuals in question who are capable of choosing appropriate paths in life.

These features of the forums find resonance in psychologist Tom Tyler's work developing a process-based model of regulation (Tyler 2003). The process-based model of regulation argues that whether or not people comply with the law as a general matter or in specific instances – say, in particular encounters with law enforcement officials – is powerfully determined by people's subjective judgments about the fairness of the procedures through which the police and the courts exercise their authority. This model of compliance is explicitly psychological. That is, while it is true that people can be compelled to obey laws and rules through the use of threats by government authorities, it is also true that government authorities can gain the cooperation of the people with whom they deal through “buy-in” (Tyler, 2003, p. 286). Importantly, threats do not usually lead to “buy-in.” What does? Treating people with respect and dignity.

While there are no examples in the literature that are exactly analogous to the offender notification forums, two studies are relevant. One study by Paternoster and his colleagues (1997) focuses upon men who dealt with police because of domestic violence calls. Paternoster et al. demonstrate that when police regularly treated such arrestees with courtesy, such as not handcuffing them in front of the victim, those arrestees were more likely than those who were not so treated to view police as legitimate. Moreover, the arrestees treated with respect demonstrated lower recidivism rates for domestic violence than those who were not so treated.

Another study may be more familiar than the former. The Re-Integrative and Shaming Experiments (RISE) in Canberra deliberately trade on the value of a different

sort of architecture from the more typical formal court processing in order to address criminal incidents. RISE features restorative justice conferences in which “[a] problem [is placed] in the centre of the circle rather than putting the criminal at the centre of the criminal justice system” (Braithwaite 1999) The participants in the conference typically include the young offender and his or her family and supporters, a police officer, the victim, and a youth advocate. The participants sit in a circle and the discussion proceeds by first having the offender speak, then the victim, and finally reaching a disposition through consensus. No lawyers are allowed.

It is important to note the lack of physical hierarchical structure in the restorative justice conference. Sentences are not imposed by state officials sitting above everyone else and controlling the show. Instead all of the participants sit on the same plane facing one another. The state official typically participating – a police officer – has no special role of power, but rather sits in the circle just as everyone else. And, it is the group together (including the offender), not the state’s representative alone, who work out the disposition. Finally, in contrast to the traditional sentence, which relies on threat of coercion to insure that an offender carries out a sentence (revocation of probation, for example), restorative justice imposes sentences that the offender herself agrees to and thinks is fair.

Studies of various restorative justice programs reveal many successes. There are extremely consistent reports of victim satisfaction with restorative justice experiences and offenders have been found to respond to restorative justice programs because they perceive them as just (Braithwaite 1999). There are also a limited number of studies indicating that restorative justice processing is associated with lower reoffending levels

when participants are compared to those in control groups, but more work must be done to verify this effect (Ibid.). Still, the work done so far provocatively suggests that procedural justice mechanisms could be at play in Chicago.

Finally, and briefly, the theoretical framework most pertinent to the effect of multi-agency gun seizures on crime is simply the expected effect of a reduction in the supply of guns. If one believes that a ready supply of guns contributes to the homicide rate by insuring that those who are prone to violence have ready access to a very lethal technology, then one might expect that removing this opportunity would reduce crime or at least the lethality of it. Reduction of the lethality of crime would take place because, in the face of a restricted supply of very effective technology such as guns, violence-prone individuals are likely to substitute a gun for a less lethal instrument such as a knife or fists. In this account there are fewer homicides but very possibly no fewer violent events. Note, however, if normative change occurs as a result of the forums, then the kinds of displacement to less lethal implements we describe here would likely *not* take place.

## **RESEARCH DESIGN**

### **Design**

Because political and logistic factors hindered the establishment of a true randomized experiment, we designed this research as a quasi-experimental panel model measuring treatment effects and using a near-equivalent control group (Shadish, Cook and Campbell 2002). Treatment and control districts were selected non-randomly from the city's 25 police districts based mainly on the concentration of homicide and gun

violence. Two adjacent police districts were selected as PSN treatment districts and two others were used as near-equivalent control groups.<sup>17</sup>

The units of analysis are 54 police beats, each approximately one-square mile and with approximately 7,600 residents. Police beats, which generally coincide with residents' perception of a "neighborhood," are ecologically bounded by major intersections, highways, and parks. TABLE 1 summarizes basic crime and social indicators of the treatment and control districts, with summary statistics computed for the beats within the treatment and control areas. FIGURE 2 displays the geographic distribution of gun seizures and homicides in 2002 in the entire city, the year in which PSN began, and illustrates the concentration of gun violence in the study districts.

**[Table 1 & Figure 2 about here]**

The PSN group consists of a cluster 24 police beats on the West-Side of Chicago. Shown in FIGURE 2, this area has the highest concentration of homicide and gun recoveries in the city. Not surprisingly, homicides and gun recoveries are statistically and spatially correlated, signaling the non-random distribution of violence and gun crime in Chicago (Moran's  $I = .378$ ).<sup>18</sup> The homicide rate (75.5) and gang-related homicide

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<sup>17</sup> Analyses presented here were also conducted using the median neighborhoods and the entire city as a control group. Doing so had little effect on the direction, magnitude, and significance of the parameter estimates vis-à-vis other variables in the model. In fact, parameter estimates were actually *larger* under these conditions. The control groups used in the present analysis, therefore, provide the most conservative estimates and also satisfy the basic conditions of the research design described below.

<sup>18</sup> For Moran's  $I_i$  the aggregate homicide and gun recovery rates for each beat and its adjacent beats are compared to the overall mean. Moreover, each individual police beat is assigned a value of  $I_i$ , commonly called the "Local Moran's  $I$ ," and is measured as:

$$I_i = \left( \frac{z_i}{s^2} \right) \sum_j w_{ij} z_j$$

Where  $z_i$  represents the difference in value between the target beat and the mean;  $z_j$  represents the difference in the value between each neighboring police beat and the mean;  $w_{ij}$  represents the spatial matrix of the geographic proximity of all police beats, and  $s^2$  is the variance. A large positive value for Moran's  $I_i$



(13.8) rate in this area are three times the city average (TABLE 1). The PSN area has the highest per capita gun recovery rate in the city (620.8 per 100,000). It also has a long history of gang violence and is the birthplace of a large conglomerate of African-American gangs, the Almighty Vice Lord Nation (Dawley 1973; Knox and Papachristos 2002). The area is predominately African American (97 percent) with rates of poverty (35 percent), public assistance (17 percent), and single mother households (24 percent) more than twice those of other areas of the city.

Politically, the PSN treatment area was selected precisely because it was the “worst” area of the city. The limited resources of the program prohibited a city-wide intervention and, thus, the PSN Taskforce decided to go “where the problem is.” And while the data generally support this political view, it meant that the random assignment of districts within the city or beats within the PSN area was not possible. As such, we selected control districts that (a) could roughly approximate the high homicide, gun violence, and social/demographic patterns of the PSN areas, but (b) were geographically and socially separated from the treatment area to avoid contamination.

We selected a cluster of 30 police beats in two contiguous police districts on the South-Side of the city, areas with social and crime indicators comparable to the PSN treatment group. TABLE 1 shows that crime rates in the control beats in 2002 were lower than the PSN treatment area, but control group homicide rates were more than twice the city average. In part, these lower rates are a function of the larger and slightly more diverse population. Still, the area’s social and demographic characteristics are similar to

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indicates that the target beat is surrounded by beats with similar values (either high or low), while a negative value indicates that the beat is surrounded by beats with dissimilar values. The same interpretation applies for the global Moran’s I: values greater than zero indicate clustering (similar values found in geographic proximity), while values lower than zero indicate dispersion. See, Anselin (1995) for a review of this and other measures of spatial association.

those of the PSN treatment group: the area is predominately African American (80 percent) with rates of poverty (33 percent), public assistance (14 percent), and single mother households (18 percent) that far exceeds city averages.

To rule out the possibility that any observed effect was simply regression towards the mean in crime rates, we also ensured (a) that neither group was in the midst of a unique upswing in their homicide rate and (b) that the relationship between the two areas was historically stable. FIGURE 3 shows the annual homicide rates for the treatment and control groups and the city totals *without* these groups from 1982 to 2004. Throughout this 22 year period, the treatment group has the highest levels of homicide in the city; the control group has the second highest. The distance and ranking of these two groups within all police districts in the city are fairly stable over the time period. They both follow the same trajectory: a rise from 1982 to the mid-1990's, an overall decline from 1993, slight peak in 2002, and then another decline towards 2005.<sup>19</sup> The city's other police districts follow a similar trend but the total numbers fall dramatically when these groups are removed from the overall total. This suggests that the trends in both the treatment and control groups, in large part, drive the overall homicide numbers in Chicago.

**[Figure 3 about here]**

More importantly, the PSN and control areas are geographically and ecologically distinct. Although not shown in the map, two major expressways and a cluster of Hispanic neighborhoods separate these two areas of the city. No direct public

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<sup>19</sup> It is important to note that the scale of this figure (years) makes it look as though the drop in the PSN districts occurs directly after the intervention districts. Monthly and quarterly data—as seen below—allows for a more precise timing of this drop. The observation period in the analysis encompasses both the rise and subsequent fall during this time period.

transportation lines exist between these areas—one would have to take multiple trains or buses—and it takes more than forty minutes to travel by car in light traffic conditions. Moreover, there is also a qualitative distinction between the “West-Side” and “South-Side” insofar as they constitute a parochialism with some distinct tradition within the larger community context, each with its own unique social institutions (e.g., Hunter 1985). Given the highly isolated nature of many impoverished African-American inner-city neighborhoods (e.g., Wilson 1987), we anticipate that the social interactions between these areas that might contribute to the contamination of our research design are minimal.

The PSN and control areas are also ecologically and socially distinct along dimensions of criminal and gang activity. Prior research shows that the vast majority of criminal activity generally occurs within walking distance of the victim’s residence suggesting that, like politics, most crime is local (Hesseling 1992; Roncek and Maier 1991). Although recent research suggest interaction among criminal activities of adjacent neighborhoods—such as activities from high-traffic drug areas—may affect crime patterns in adjacent neighborhoods (Cohen et al. 1998; Cohen and Tita 1999; Morenoff, Sampson and Raudenbush 2001), the geographic and ecological barriers between the treatment and control groups suggest that such contamination would be minimal. Also, there is a distinct cleavage between the gangs operating within the two areas. The PSN area is the birthplace of the Vice Lords, while the control area is the birthplace of another conglomerate of African-American gangs, the Black Gangster Disciple Nation (Papachristos 2001). These gang Nations are similar in their history, organizational form, and levels of criminal activity, but are culturally and socially distinct. The Disciples

“run” the South-Side largely without interference from the Vice Lords, but the Vice Lords are responsible for much of the gang activity on the West-Side.

Furthermore, there is very little interaction among community-level PSN actors in these areas. The treatment and control districts are distinct units for all law enforcement agents involved with PSN. Certainly, members of the PSN taskforce are drawn from these two different areas; however, interaction occurs mainly among individuals in upper-level management roles. On the ground, parole and police officers are geographically assigned, but the assignments are self-contained and do not overlap between the south and west sides of the City. With the exception of specialized tactical units, police and parole officers rarely—if at all—have any formal or work-related contact with officers in other areas in the city.

After selecting the assignment groups, we established a panel model of police beats of the entire city. Data were collected for the 72 month period from January 1999 to December 2004 and collapsed to 24 quarter time periods for analysis. Data come from multiple sources including the Chicago Police Department, ATF, and the Illinois Department of Corrections. In the next sections, we describe the outcome, control, and dosage measures.

### ***Dependent Variables***

To assess the impact of PSN interventions, we use measures of lethal and non-lethal criminal violence: homicides and aggravated batteries and assaults.<sup>20</sup> Given PSN’s

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<sup>20</sup> 720 ILCS 5/12-2 Aggravated Assault. 720 ILCS 5/12-3 Aggravated Battery. Assaults are those crimes in which a person engages in conduct which places another in reasonable apprehension of receiving a battery. Aggravated assaults are committed with a weapon such as a gun. In contrast, a battery is committed when a person engages in conduct that actually harms another.

explicit focus to reduce gun violence and, more specifically, gun homicide, we estimate treatment impacts on beat-level gun and total homicide rates. Homicide totals were computed from incident level police records geocoded to the beat-level by the address of the incident. In addition to total rates, we also disaggregate by whether a firearm used in the homicide and whether the homicide was gang-related. Following the logic of PSN, we hypothesize that gun homicide and total homicide rates will be lower over time in the PSN areas, and the differences are related both to the main effects of the program and to the dosages of each program component. The log of the beat-level homicide rate is used to improve model fit and account for any non-linearity (Singer and Willet 2003).

The beat-level, firearm-involved aggravated assault and aggravated battery arrest rates are also used as an outcome. These data are created from incident-level police records that were geocoded to the police beat. Again, we hypothesize a negative relationship between these outcomes and PSN dosage variables. The log of aggravated assaults and aggravated batteries are used to improve model fit.

### ***Neighborhood Social Indicators***

To control for differences in the social structural composition of PSN and control areas, we used variables taken from the 2000 Census. Following a rich body of research (e.g., Fagan and Davies 2004; Morenoff, Sampson and Raudenbush 2001; Sampson, Raudenbush and Earls 1997), we used principle components factor analysis to reduce 12 census variables to three factors. TABLE 2 shows that the three factors reflect ecological dimensions commonly associated with homicide: Social Deprivation, Immigration, and

Residential Stability.<sup>21</sup> Based on previous research, we hypothesize that the Social Deprivation and Residential Stability factors to be positively associated with homicide and violence, and Concentrated Immigration to be negatively associated with these outcomes. Given the spatial concentration of both crime and poverty in the same Chicago neighborhoods, as well as the city’s history of high levels of racial residential segregation, we also anticipate these factors to be highly correlated with homicide and, therefore, with selection as a PSN district, a matter we address below.

**[Table 2 about here]**

### ***PSN Measures***

Six measures of PSN intervention reflect the program design: a dummy variable indicating group assignment, the percentage of gun offenders in the areas who have attended a notification meeting, the number of federal prosecutions, the person-month sentences of federal prosecutions, the number of ATF gun seizures, and a composite index of each of these measures. The dummy variable is a simple measure of group assignment. The other measures reflect specific program dimensions.

*Notification Meetings.* This variable captures a saturation effect associated with disseminating information about the severity, certainty, and likelihood of PSN interventions among the population most at risk of being a victim of or committing a gun crime—known gun offenders in the treatment group. The measure is a proxy for the spread of information through offender networks functioning as information markets sharing ideas and norms. It is calculated as a raw percentage of the number of offenders

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<sup>21</sup> The factor loadings of Census variables at the police beat are remarkably similar to the similar factors created at the “neighborhood” level found in other Chicago research (Morenoff, Sampson and Raudenbush 2001; Papachristos and Kirk 2006; Sampson, Morenoff and Earls 1999).

who have attended the forum out of the total number of gun offenders on parole within the target area; monthly adjustments were made to the denominator to account for recidivism and re-entry back into the area. This variable is logged to improve model fit.

This intervention was limited to offenders within the PSN area. It began in January 2003 and reached its maximum (47 percent) at the end of the data collection period in December 2004.<sup>22</sup> Parolees were randomly selected to attend a forum based on three conditions: (1) residence in the PSN area; (2) having had at least one weapons related offense in their conviction history; and (3) having been released from prison in the prior nine months. Parolees were invited by a letter mailed to their residence and a follow-up call from their parolee officer. And, although participation was *not* mandatory, attendance was nearly 98 percent. Those who missed a forum often came to the next available meeting. Meetings were held bimonthly. We hypothesize that increasing the percentage of offenders in the target areas who have attended a forum should have a negative relationship on the outcome variables.

*Federal Prosecutions.* Increased federal prosecutions for firearm cases operationalize the deterrence component of PSN, and, following the example of Richmond's Project Exile, were one of its central initiatives. Whereas the forums were designed to communicate a general deterrent threat, the reality of prosecutions served as a manifestation of that threat. The deterrent effect of increased rates of prosecution with the expectation of long and harsh punishment terms should have a negative affect on crime rates. Although cases from the PSN districts were given priority for this

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<sup>22</sup> This intervention was later expanded to other areas in the city but that does affect the present data, and is currently being considered as part of our on-going research.

intervention, federal prosecutions were not limited to the treatment area. Accordingly, the distributions were skewed, and we use the logged total number of prosecutions per police beat as an indicator of the increased activity in this PSN domain over the observation period.

*Length of Federal Sentences.* Federal prison sentences are expected to have both incapacitation and deterrence effects. Incapacitation is theorized to reduce crime by keeping off the streets those offenders most likely to commit further gun violence and, by doing so, *ipso facto* reduce future gun crime rates. Because gun homicide in Chicago is disproportionately committed by those with prior violent convictions, this dimension of PSN strategy should reduce homicide and non-lethal violence by removing those most responsible for these crimes.

These effects should be amplified by the differences between federal and state/local prison terms. Federal sentencing guidelines for firearm crimes generally yield longer sentences, the term may be carried out in prisons far from an offender's home, and there is no possibility of federal parole. The deterrent effects of these sentences were broadcast to the general public in various PSN publicity efforts (billboards, radio advertisements, etc.) and to those with the highest propensity for gun violence via potential gun offenders at the PSN forums. Accordingly, we used the actual prison sentences of those convicted in PSN cases as a measure of its incapacitative effects. We measure this intervention as the log of person-month sentences at the beat level. Similar to the prosecution variable, this variable is *not* limited to the treatment group.



Gun Seizures. We measure the supply-side strategies of PSN as the number of ATF gun seizures per police beat per quarter. As seen in FIGURE 2, ATF gun seizures are spread throughout the city but the treatment and control areas consistently report the highest number of gun recoveries. Given the increased attention to gun trafficking and gun crimes in the PSN districts, it is reasonable to expect that the number of recoveries in the treatment group would continue to be high and possibly increase. As such, we hypothesize that as gun seizures increases, levels of violence should decrease.

Index of PSN Components. Theoretically, as seen in FIGURE 1, each of the PSN components was designed to work together. For example, speakers at the parolee forums used PSN prosecutions and ATF gun trafficking cases as colorful illustrations of the consequences gun offending in the target area. To capture the cumulative effects of the PSN components, we created an additive index of PSN components based on where a police beat falls on the quintile of each of the previous intervention measures for each calendar quarter. The index can theoretically range from zero to twenty, but no beat has a score less than three since all of the interventions except the parolee forums extend beyond the treatment areas. This is especially true for gun recoveries, as seen in FIGURE 2. FIGURE 4 displays the distribution of this index. The right-hand skew on this variable in the treatment group reflects presence of the parolee forums and the increased attention from prosecutions and firearm recoveries in the treatment area. On average, a PSN beat had an index score of 9.0 while the control beats had an average score of 6.6 ; a simple one-tailed t-test confirms that the difference is statistically significant ( $t = -13.06$  ,  $p =$

0.000). The log of this index is used as a predictor and is hypothesized to have a negative effect on all outcome variables.

**[Figure 4 about here]**

## **Analysis**

We estimate models of beat-level change during the 72 month period that is associated with the PSN interventions, controlling for social indicators, spatial autocorrelation, and the probability (propensity) of group assignment. Analysis proceeds in two-stages. First, we use propensity scores to assess the probability of group assignment in order to allay some of the problems of non-random group assignment (see, for example, Berk, Li and Hickman 2005; Rosenbaum and Rubin 1983). Second, we develop individual growth curve models using mixed effects regressions to detect the influence of the various PSN measures on crime and violence rates over time.

### *Predicting Treatment Assignment*

The non-random assignment to the treatment group can potentially undermine necessary assumptions needed to make causal arguments in experimental research, a problem common in observation studies (see, Berk 2003). Following Berk (Berk, Li and Hickman 2005) and others (Bang and Robins 2005; Indurkha, Mitra and Schrag 2006; Rosenbaum and Rubin 1983), we use propensity scores to adjust for this problem. In short, propensity scores are the estimated probability of membership in each of the treatment groups that account for confounding variables between the outcome of interest (homicide) and the selection of treatment groups. For example, we know that the social

factors described above are highly correlated with both homicide rates *and* selection as a PSN treatment group—i.e., PSN districts were selected precisely *because of* their high homicide levels and they also tend to be the poorer, more socially isolated, etc. However, there is no reason *ex ante* to suspect that the PSN districts are more amenable to the PSN intervention than are the control districts. Hence, there is no risk of confounding of selection factors and outcomes, making these sampling conditions appropriate for adjustments using propensity scores (Bang and Robins 2005; Rosenbaum and Rubin 1983).

Adding such control variables *and* the PSN treatment variables into the same equation thus produces high levels of collinearity between variables that undermine the parameter estimates and their respective p-values. The use of propensity scores corrects for this by producing an adjusted treatment score that accounts for factors that are correlated both with homicide rates and with the assignment of beats to treatment or control groups. Essentially, the propensity score is an estimate of the probability that an observed entity would undergo treatment. We estimate propensity scores as the predicted values from a separate logistic regression equation regressing the dummy PSN variable on the three neighborhood structure characteristics and a spatial lag term of 1999-2000 baseline homicide counts. TABLE 3 presents the results.

**[Table 3 about here]**

TABLE 3 shows that the probability of being in the treatment groups is highly correlated with the three factor scores plus the measure of spatial autocorrelation.<sup>23</sup> On average, the PSN beats are less disadvantaged but more stable than the comparison

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<sup>23</sup> Furthermore, and consistent with the notion of propensity scores, the coefficients in this model are remarkably similar to those predicting homicide in Chicago (Morenoff, Sampson and Raudenbush 2001; Papachristos and Kirk 2006).

groups—i.e., they represent highly immobile and relatively poor segments of the city’s population. The Immigration variable is significant and negative because both the treatment and control groups are predominately African American. The strong and significant spatial parameter effect accounts for obvious clustering of high-homicide beats, a matter we discuss in the next section (see discussion below).

Following Bang and Robins (2005), we use the *inverse* probability of treatment as the propensity score for the PSN group, and the inverse of one minus the probability for the control group (pg. 965) as the main treatment variable in the estimation models to adjust for collinearity between treatment assignment and the factors that predict treatment assignment.<sup>24</sup> To test for balance among the covariates after making the propensity score adjustment, we use a two-way ANOVA which includes the main effects for propensity score tercile and PSN treatment (treatment vs. control) (Indurkha, Mitra, Schrag 2006).<sup>25</sup> The final column in Table 3 lists the p-value for a simple F-test of whether or not the predictor influenced group assignment *after* controlling for propensity score adjustments in the ANOVA. Table 3 shows that the covariates that might influence treatment selection are no longer significantly different when adjusted for the revised propensity scores (i.e.,  $p > .05$ ). In other words, the probability of the covariates selecting treatment is indeed balanced between the groups.

### *Spatial Autocorrelation*

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<sup>24</sup> Models using the unadjusted probabilities yield the same results, and are available from the authors upon request.

<sup>25</sup> Terciles were constructed for purposes of checking balance among covariates only, not for any other empirical or analytic purposes. We use terciles for this comparison due to the total number of neighborhoods in the sample. Divisions into smaller units would produce cell sizes too small for meaningful or reliable analyses.

Spatial autocorrelation is the tendency of observations in one spatial unit, in this case police beats, to be highly correlated with observations in adjacent units, due to their shared proximity to causal factors which themselves may be spatially correlated (e.g., Anselin 1995). Our propensity score adjustments take into account the spatial dependence of aggregate homicide rates. In the present study, we analyze at spatially aggregated rates of violence, and interventions that are themselves spatially allocated. However, very little research on propensity scores considers how subjects and observations might be spatially dependent. In our study, the “subjects” – police beats – not only are spatially clustered, but also share some of the “moving parts” of the causal story of both the dependent variable and of the intervention. That is, the boundaries between units often are artificial divisions, and these edge problems can mask the diffuse effects of factors such as illegal markets in guns and drugs, or social networks of offenders or gang members, whose influences spread across broad areas including census tract or police beat borders. Accordingly, achieving balance on this dimension is especially important.

Imagine, for example, that Persons 1 and 2 live nearby to one another in adjacent neighborhoods A and B, and may have a longstanding dispute and start shooting at each other, but the presumed causes of their behaviors are – in a formal model – segregated into distinct areas by the artificial administrative boundary between their neighborhoods. Likewise, Persons 3 and 4 may both fall under the neighborhood risk influences of neighborhood B, but by living at opposite ends of this boundary, both persons might also be influenced by things going also in yet other neighborhoods that themselves are quite different social, physical and economic spaces. So, *propensity* is not as straightforward

in spatially clustered and interdependent units of analysis as it would be in studies where comparing individuals who are sampled and observed independently. In this study, the balance in the spatial autocorrelation covariate between the spatial units suggests that the reciprocal and mutual influences of neighborhood spaces are balanced across different levels of propensity (or risk).

### *Growth Curve Models*

We developed individual growth curve models to estimate the effects of PSN interventions on beat-level change over the observation period. Models were estimated using linear mixed models that contain both fixed and random effects (Gelman 2005; Rabe-Hesketh and Skrondal 2005; Raudenbush and Bryk 2002; Singer and Willet 2003; Snijders and Bosker 1999).<sup>26</sup> We use a two-level model that predicts *within* beat trajectories at level 1 and *between* beat variation in trajectories at level 2 using the predicted level 1 intercepts and slopes as outcomes. Models were estimated predicting each outcome from the PSN main effect (propensity score) and the several separate PSN component variables. In all models, we treat time as both a random and fixed effect to explain the time effects as well as change over time (Singer and Willet 2003).<sup>27</sup> Furthermore, with the exception of the PSN dummy variable, all of the predictors are time variant and, thus, also experience change over time; to capture this, we also include interactions of each variable with time. REML methods are used to develop linear

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<sup>26</sup> We tested several additional linear and non-linear models as well as various transformations of the time variable (see, APPENDIX). No notable changes occurred in the direction, significance, or magnitude of the coefficients vis-à-vis other model parameters. Therefore, we felt that the linear models used here adequately and parsimoniously represent the data.

<sup>27</sup> Additionally, we tested alternative transformations of time (see, APPENDIX, TABLE A2). We found no evidence suggesting that the quadratic of time was necessary in the models once we had logged the outcome variables and some of the predictor variables (Singer and Willet 2003).

parameter estimates that depend on an autoregressive covariance structure rather than on the fixed effects.

The general composite two-level model follows the form:

$$(1) \quad Y_{ij} = [\gamma_{00} + \gamma_{10}TIME + \gamma_{01}PropensityScore + \gamma_{11}(PropensityScore * TIME) + \gamma_{02}PSN + \gamma_{21}(PSN * TIME)] + [\zeta_{0i} + \zeta_{1i}TIME + \varepsilon_{ij}] ,$$

where Propensity Score represents the predicted values from the logit model in TABLE 3 and PSN represents the various PSN dosage variables described above. The cross-level interactions with TIME identify whether the effects of TIME differ by levels of the theoretical predictors—i.e., whether the PSN variables are, in fact, associated with a decrease in the outcome variables over the observation period. A treatment effect of the PSN variables would be captured by negative and statistically significant parameter estimates on these time varying predictors.

## RESULTS

Overall, the treatment districts experienced a 37 percent drop in quarterly homicide rates during the observation period. The average quarterly homicide rate decreases to 24.2 per quarter after PSN compared to 38.2 before PSN (one-sided t-test,  $t = 4.18$ ,  $p = .000$ ). FIGURE 5 shows the aggregate monthly homicide rates in the treatment area before and after the start of the PSN prosecutions and offender notification meetings. Although a modest decline begins around June of 2002, a steep decline in monthly rates begins just after the start of the PSN forums in January 2003 and continuing to the present.

**[Figure 5 about here]**

During the same time period, the city as a whole and the control districts also experienced a decline in homicide, though it was less pronounced. FIGURE 6 compares the smoothed trendlines for the treatment and control groups as well as the overall city rates and the city excluding the PSN and control districts. The trendlines show that although the rates decline for all groups over this time period, the treatment groups experience the steepest decline. This figure also shows that the control group experiences a slight but non-significant increase in homicide rates towards the end of the data collection period rising from 23.6 to 25.1 (one-sided t-test,  $t = -.51$ ,  $p = .698$ ).

**[Figure 6 about here]**

An examination of overall declining homicide trends suggests that the rates in the treatment areas fell faster than the rates in the comparison group. However, such a visual examination captures neither the variation within and between police beats nor the impact of any of the substantive predictor variables. The growth curve models estimate individual trajectories for each of the police beats in the assignments groups and then assess the effects of the various parameters on the variation in individual growth trajectories. TABLE 4 summarizes the effects of the time-varying PSN dosage variables on the outcome measures, controlling for the propensity scores described earlier. We focus on and report the coefficients for the interactions of each PSN variable with time to identify the effects of PSN on the rate or slope of change over time. In each specification, we include the predicted value of the PSN dummy variable (i.e., the beat's propensity score), and then successively test the effects of the PSN measure in combination with its various components. Thus, each cell in TABLE 4 represents the



time-varying parameter estimate of the PSN (row) variable of interest on the separate outcome measures (column).

**[Table 4 about here]**

The first row of TABLE 4 shows a negative and statistically significant effect of the PSN dummy variable (the predicted value the PSN dummy, adjusted for the neighborhood covariates) on homicides ( $\beta = -0.124$ ,  $p = 0.000$ ), gun homicides ( $\beta = -0.134$ ,  $p = 0.000$ ), a modest effect on aggravated assaults and batteries ( $\beta = -0.016$ ,  $p = 0.042$ ), but a non-significant effect on gang homicides ( $\beta = -0.032$ ,  $p = 0.248$ ). The exponentiated coefficient for total homicides is 0.883, suggesting that PSN produces declines in the quarterly homicide rate and gang homicide rate of a police beat in the PSN areas by approximately 12 percent.

TABLE 4 also shows that the strongest PSN dimension associated with declining beat-level homicide rates is the percent of offenders in a beat who attend a forum ( $\beta = -0.146$ ,  $p = 0.003$ ). This suggests that increasing the percentage of offenders in the beat who have attended a meeting by 1 percent is associated with an approximately 13 percent decrease in the beat-level log homicide rate. The association also holds for declining gun homicide ( $\beta = -0.162$ ,  $p = 0.001$ ) and gang-related homicide ( $\beta = -0.133$ ,  $p = 0.034$ ) but is not significant for aggravated assaults and batteries ( $\beta = 0.007$ ,  $p = 0.550$ ). Consistent with PSN's mission, the largest effect size of this parameter is also on gun homicides.

The number of ATF gun seizures is negatively associated with *gun* homicides ( $\beta = -0.006$ ,  $p = 0.005$ ), but is modestly significantly associated with overall homicides at the most lax 0.10 level ( $\beta = -0.004$ ,  $p = 0.090$ ). While the coefficients may appear small, recall that this is measure *per gun* and that Chicago recovers more weapons than

any other city in the country (ATF 2000).<sup>28</sup> Translating this coefficient into a per gun percentage suggests that the log gun homicide rate decreases by approximately 2 percent for every ten guns recovered in a beat. Put another way, the log gun homicide rate decreases by about 18 percent for every 100 guns recovered.

Like gun seizures, the number of federal prosecutions is also associated with small decrease in the log homicide rate ( $\beta = -0.019$ ,  $p = 0.030$ ). This dimension is also marginally associated with gun homicides ( $\beta = -0.018$ ,  $p = 0.033$ ) and gang homicides ( $\beta = -0.011$ ,  $p = 0.078$ ) at the relaxed significance level ( $p < .10$ ). Unlike gun seizures, however, the number of federal prosecutions is relatively low vis-à-vis the total number of gun offenses.<sup>29</sup> To date, 265 PSN cases have been convicted, sentenced, or plead. While the overall influence of this dimension is probably low relative to the other PSN dimensions, the overall infusion of prosecutions into the target areas is also small relative to guns recovered or offenders reached via the forums. Moreover, while the number of prosecutions in the assignment groups has a small effect on declining homicide trajectories, we find no significant incapacitation effect associated with number of person-months received in from federal prosecutions on any of the outcome variables.

Finally, the last row in TABLE 4 shows that a negative and statistically significant relationship between the cumulative index of components with homicide ( $\beta = -0.072$ ,  $p = 0.000$ ) and gun homicide ( $\beta = -0.134$ ,  $p = 0.002$ ). This suggests that those beats in the higher quintiles of the dosage variables experience greater decreases in homicide rates and, to a greater degree, gun homicide rates. *Unilaterally increasing the PSN dosage by,*

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<sup>28</sup> Between 1995 and 2002, for example, the Chicago Police Department recovered an average of 14,000 guns per year (Annual Reports, selected years).

<sup>29</sup> In the present data, for example, there is a 12:1 ratio of gun seizures to gun homicides compared to a .04:1 ratio of federal prosecutions to gun homicides.

say, holding more forums, increasing the prosecutions, or recovering more weapons is associated with such a decrease. The magnitude of the coefficients in TABLE 4 suggests that largest of these effects comes from the forums. At the same time, we observed no effects of PSN on aggravated battery and assaults ( $\beta = 0.009$ ,  $p = 0.347$ ). Battery and assault are higher rate offenses, and perhaps the population involved is more heterogeneous with less exposure to the PSN individual-level interventions such as the forums or prosecutions. The narrow effects of PSN on homicides and gun violence confirm the validity of its specific theoretical focus as an apparently effective strategy to reduce gun violence.

## DISCUSSION

We find that beat-level homicide rates dropped faster in the PSN beats compared to the control group after controlling for factors commonly associated with homicide and the non-random method of group assignment. FIGURE 7 summarizes this relationship showing the fitted values and 95-percent confident intervals around the parameter estimates from the two-level models regressing the beat level log homicide rate on the propensity scores predicting group assignment and the percentage of offenders attending a parolee forum. As seen in FIGURE 7, the PSN beats experience a greater rate of change over the observation period bringing them to homicide levels similar to those of the control group. In contrast, the control beats demonstrate only a modest decline in the quarterly log homicide rate after controlling for between group differences.

**[Figure 7 about here]**

Consistent with our hypotheses and the working assumptions of the PSN taskforce, multi-level analysis suggests that four of the five substantive predictors as well as the index of components are negatively associated with the homicide. Individually, the percentage of gun offenders in a beat who have attended a PSN forum appears to have the largest effect of all the PSN indicators, particularly on gang-related homicides. The only variable not to have a significant effect was the person-month sentence received from federal PSN prosecutions. None of the PSN variables were associated with a decline in arrest for aggravated assaults or aggravated batteries. This might signal the limited effect of PSN on crimes other than homicide, and may reflect the heterogeneity of the risk pool of individuals and situations where non-lethal assaults are more likely to occur. The narrow focus of the PSN efforts may not reach this broader group of would-be offenders. Of course, it might also be that for crimes other than homicides, arrest records better reflect police activity than crime trends per se.<sup>30</sup>

### ***Model Adequacy***

We selected a growth-curve modeling approach because of its theoretical consistency with what we know about neighborhood crime rates as well as the success of such models in predicting individual change over time in a variety of empirical settings (Gelman 2005; Raudenbush and Bryk 2002; Singer and Willet 2003; Snijders and Bosker 1999). That is, prior research has shown that neighborhoods can and often do have different trajectories with respect to crime rates—some neighborhoods experience

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<sup>30</sup> It should be noted, however, that clearance rates of arrests relative to reported incidents for these variables has been consistently around 40 percent (Chicago Police Department Annual Reports, selected years). If police activity had increased—i.e., police began making more arrests for these crimes—one might expect clearance rates to also increase during this period, which they did not.

dramatic fluctuations in crime rates while others remain relatively stable. Similarly, one might reasonably expect that not all neighborhoods would be influenced to the same degree by various law enforcement interventions. Moreover, some neighborhoods have naturally high intercepts—i.e., they have historically higher crime rates. Unlike standard OLS or other fixed-effects models, the growth-curve strategy allows for each neighborhood to have its own unique intercept and growth rate and, thus, theoretically capturing more variation than other potential analytic strategies. The fact that our findings hold under functional forms—including fixed effects OLS methods—supports the robustness of our findings.

However, like other regression methods, multilevel models are vulnerable to outliers as well as violations to basic regression assumptions. With respects to the first issue, we reran our analyses removing five neighborhoods with the highest beginning crime rate (intercepts) under the working hypotheses that these areas would be the most likely to experience a decline over the observation period. TABLE 5 shows the parameter estimates for our previous models of gun homicide rates on the PSN propensity score and offender forum variable with and without potential outlying neighborhoods. TABLE 5 shows that our results hold even when considering potential outlying neighborhoods, thus supporting the robustness of our findings.<sup>31</sup>

**[TABLE 5 about here]**

Regression diagnostics of multilevel models are more complicated than other models as estimated level-two residuals are inevitably confounded with the estimated level-one residuals (see, Snijders and Bosker 1999). Snijders (see, Snijders and Bosker

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<sup>31</sup> Moreover, and consistent with the use of propensity scores in such research designs, note that the propensity scores balance out the effects of pure treatment assignment.

1999), Gelman (Gelman 2005; Park, Gelman and Bafumi 2004), and others (Singer and Willet 2003) suggest the use of empirical Bayes residuals as a check of normality and distribution assumptions. As such, FIGURE 8 plots the standardized Bayes residuals against the quartiles of the normal distribution. The observed residuals closely follow the normal distribution with some slight variation at either extreme. Those cases at the extreme include neighborhoods experiencing the greatest rates of change during the observation period. Again, as seen in TABLE 5, our results hold when such outliers are considered.

**[Figure 8 about here]**

#### *Alternative Explanations: Operation Ceasefire*

The results lend considerable support for the influence of PSN on declining crime rates in the PSN districts as compared to the control districts. An alternative explanation, however, might suggest that other activities within the PSN areas—such as other police activities, major social or political changes, or other crime and community strategies—may also be responsible for the observed trends. Indeed, two other obvious interventions occurred within the same time period—the use of police surveillance cameras and a street-level intervention component of the Chicago Project for Violence Prevention (a.k.a., Operation Ceasefire).<sup>32</sup> While the detailed analysis of each of these interventions is beyond the scope of this paper and data availability of the authors, it is significant to note that the overall message of both of these interventions intertwine with PSN.<sup>33</sup>

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<sup>32</sup> The Chicago “Operation Ceasefire” is organizationally distinct from the Boston program of the same name, although the two share a penchant for street-level interventions.

On the one hand, surveillance cameras, like the message delivered at the forums, support the notion of increased enforcement of violent crime. While in the forums, offenders repeatedly hear that they are being “targeted” for enforcement, surveillance cameras clearly reinforce such a message. Since the Chicago Police Department plays a visible and active role in PSN, cameras thus seem to reinforce the PSN message—it might be irrelevant that offenders do not know that PSN and the cameras are not necessarily part of the same political program.<sup>34</sup> On the other hand, Operation Ceasefire has not only been an active participant in the PSN forums but they also serve as a direct link to services that PSN tries to provide to offenders. Operation Ceasefire is specifically charged with working with the ex-offender and gang population (see, [www.Ceasefirechicago.org](http://www.Ceasefirechicago.org)).

However, two findings suggest that the results presented here more closely coincide with the PSN program or at least imply some additive effect between PSN and other initiatives in the treatment areas—the timing of the decline and preliminary analysis of Operation Ceasefire areas. First, the observed decline in the treatment area occurs *after* the commencement of the offender forums in January 2003. The surveillance cameras went up in August 2003, after the beginning of the observed decline. Operation Ceasefire began its street-worker component in 1999 and homicide rates actually

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<sup>33</sup> Presently, data on the location and dates of the police surveillance cameras has not been made available. Data on Operation Ceasefire can be gleaned from the organizations annual reports (Chicago Project for Violence Prevention2005) and the organization’s internal evaluations (Chicago Project for Violence Prevention2006). Additionally, the lead author has met several times with the Ceasefire research staff. However, the organization is only now, ten years after its inception, undergoing a process of external evaluation.

<sup>34</sup> Other police initiatives during this time may have had a similar additive effect on neighborhood crime indicators; for a list of such programs, see Rosenbaum and Stephens (2005). As a broad evaluation of such increased police activity, analysis similar to those presented above were also conducted using firearm related arrests as a control for police activity. Arrest rates were non-significant and did not affect the PSN coefficients.

*increased* after the commencement of the program, thus violating a basic principle of experimental logic that the effect must always follow the treatment (Shadish, Cook, and Campbell 2002). In these regards, the cameras may provide an additive effect to PSN whereas PSN may actually be adding to the reported “success” of Operation Ceasefire.

Second, many of the geographic areas where Operation Ceasefire operates are *within* the PSN boundaries—50 percent of the PSN beats also include Operation Ceasefire Operate efforts. After controlling for the social, demographic, and PSN factors, no statistically significant effect in the declining homicide rates during the observation period can be attributable purely to the presence of Operation Ceasefire in the PSN treatment area. Using the basic two-level model described above, TABLE 6 lists the summary of Operation Ceasefire and PSN Effects controlling for the three neighborhood structural factors and the spatial lag of homicide. Like the PSN variable, the Operation Ceasefire variable is constructed as a dummy variable for each of the police beats in which Ceasefire was operating as of 2005 (1 = treatment , 0 = control). An alternative dummy coding scheme for Ceasefire is also used that is time-varying and indicates whether or not the program was “fully implemented” in the specified area and the time at which the intervention occurred (Chicago Project for Violence Prevention, 2006). An interaction term between PSN and Ceasefire is also used. TABLE 6 displays the time variant coefficients in a series of additive models in which the PSN dummy variable and interaction terms are added to a simple beat-level analysis of Operation Ceasefire.

**[Table 6 about here]**

Model 1 in TABLE 6 shows no statistically significant association between the dummy Operation Ceasefire variable with homicide ( $\beta = 0.011$  ,  $p = 0.824$ ) after



controlling for the social structure and spatial lag variables. The addition of the PSN dummy variable ( $\beta = -0.091$ ,  $p = 0.008$ ) in Model 2 yields a nearly identical negative coefficient as it does in the models without the Ceasefire variable (compare with row one in TABLE 4). The addition of interaction term In Model 3 also shows no statistical significance ( $\beta = -0.101$ ,  $p = 0.205$ ), although it does slightly diminish the parameter estimate of the PSN dummy variable. Similar results are found when using the “fully implemented” Ceasefire time varying variable in Models 4 and 5.

Future research on PSN and similar socio-legal and ecologically designed interventions should consider additional competing hypotheses, modeling strategies, and the competition among multiple causal factors that are not only entangled with one another but that are endogenous with the test conditions. Like Berk et al. (2005), we encourage careful analysis of such endogeneity and caution in the dangers of observational studies that risk violating such assumptions.

## CONCLUSIONS

The Chicago PSN taskforce translated the national PSN agenda into several strategies aimed at reducing gun homicides in the areas of the city experiencing the highest levels of gun violence. The taskforce crafted multiple supply- and demand-side strategies, focusing heavily on those individuals most likely to be involved in firearm violence—the ex-offender population with criminal history containing a gun offense. In accordance with the Chicago objective, our analysis suggests that the PSN target areas did indeed experience a significant decline in homicides at a faster rate than similar control areas or the city as a whole. We therefore believe that PSN efforts are at least

partial responsible for this decline. In this regard, the policy cascade initiated by Boston's Operation Ceasefire and Richmond's Project Exile appears to have led to some effective gun reduction strategies in Chicago.

However, while the aggregate models explored here speak to the association between various program dimensions and the observed crime trends, they do not speak to the *mechanisms* behind them. For example, the multilevel models imply that much of the observed homicide decline should be attributed to the offender forums, but it is not clear from the aggregate data exactly *what* aspect of the forum appears to be associated with the drop in crime. Is the effect flowing from the distribution of the law enforcement message? Does the format of the meeting matter? Perhaps the information regarding community supports makes the difference? Or, perhaps the forum attendees are inspired by the "testimony" of the ex-offender who has turned his life around. Maybe the effect is driven by the multiple messages delivered at the forums and supported by the other PSN efforts. Individual-level data on the offenders themselves is needed to answer such questions.

A two-pronged follow-up strategy will be used to address such questions. First, we are presently in the process of analyzing recidivism data on all offenders who have attended the forums and similar gun offenders in the rest of the city. Preliminary analysis suggests that gun offenders in the PSN districts are less likely to re-offend using a gun, but the data is heavily censored as most attendees have not been out of prison for much longer than 2 years. Namely, it is difficult to make any definite conclusions at this time because there are so few "failures." By January 2006, the first cohort of forum attendees

will have been “on the streets” for a full three years, thus presenting a better opportunity to explore how such individual behaviors affect the larger patterns observed here.

Second, we are in the process of data collection on a survey with known gun offenders in the PSN and control areas focusing specifically on how the social networks of offenders influence (a) patterns of gun offending, (b) perceptions of authority and legitimacy, (c) operations of illicit gun markets, and (d) the overlap of pro-social and deviant networks.

One of the main goals of PSN was to alter the structures of such networks by altering normative perceptions of gun use and spreading information about its potential consequences. Program initiatives such as the forums and school based programs are specifically geared towards this end. The diffusion of the PSN message through offender forums might be utilizing the tight network of interaction and communication among offenders, especially gangs (Kennedy, Braga and Piehl 1997; McGloin 2005; Papachristos 2006), and phenomenon commonly found in the diffusion of information in a market (e.g., Balkin 1998; Burt 1987; Valente 1995). Because those actively involved in using, buying, or otherwise involved with guns possess the most knowledge of the problem, we intend on collecting primary data on such matters directly from offenders.

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TABLE 1. Social and Crime Indicators

	<b>City (All Beats) (N = 281)</b>		<b>Control Beats (N = 30)</b>		<b>PSN Beats (N = 24)</b>	
<b><i>Crime Measures</i></b>						
2002 Homicide Rate per 100,000 (total)	22.3 (648)		49.6 (102)		75.5 (115)	
2002 Gang-Related Homicide Rate per 100,000 (total)	4.5 (133)		7.8 (16)		13.8 (21)	
2002 Aggravated Assault & Aggravated Battery Arrest Rate per 100,000 (total)	862.2 (25005)		1851.9 (3812)		2005.4 (3053)	
2002 Average ATF Gun Seizure Rate per 100,000	215.6 (6252)		438.2 (902)		620.8 (945)	
<b><i>Control Variables</i></b>						
	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>	<b>Mean</b>	<b>SD</b>
% Households w/ Public Assistance	0.100	0.075	0.143	0.064	0.175	0.047
% High School Graduates > 25 years-old	0.699	0.157	0.566	0.1	0.599	0.048
% Non-White	0.655	0.317	0.806	0.229	0.973	0.026
% Youth (ages 15 to 25)	0.158	0.063	0.203	0.027	0.214	0.017
% Households Linguistically Isolated	0.090	0.104	0.095	0.123	0.013	0.021
% Renter	0.594	0.199	0.59	0.122	0.676	0.081
% Foreign Born	0.169	0.165	0.154	0.189	0.021	0.024
% Household with Female Head	0.133	0.097	0.181	0.071	0.244	0.04
% Same Residence in Last 5 Years	0.545	0.127	0.601	0.071	0.625	0.042
% Below Poverty Level	0.237	0.141	0.325	0.099	0.345	0.075
% In Labor Force	0.594	0.099	0.517	0.056	0.516	0.055
Total Population	2,895,700		257,057		155,128	

TABLE 2. Factor Loadings of Neighborhood Structural Variables

	<b>Factor Loadings</b>
<b><i>Deprivation</i></b>	
% Households with Public Assistance	0.77
% High School Graduates	0.80
% Non-White	0.77
% Youth	0.93
% Female Headed Households	0.76
Median Household Income	0.49
% Below Poverty Line	0.67
% In Labor Force	
<b><i>Immigrant Concentration</i></b>	
% Households Linguistically Isolated	0.95
% Foreign Born	0.95
<b><i>Residential Stability</i></b>	
% Renter	0.92
% In House Same Year	0.57
Total Population	0.59

TABLE 3. Propensity Score Analysis of Being in PSN Treatment Group on Social and Spatial Factors

	Logit Coeff.	P- Value	P(F) by Tercile after Propensity Score Adjustment
Deprivation	-1.46 (0.252)	0.000	0.151
Concentrated Disadvantage	-1.90 (0.202)	0.000	0.099
Residential Stability	1.21 (0.150)	0.000	0.255
Spatial Lag (Local Moran's I)	1.68 (0.151)	0.000	0.156

TABLE 4. Summary of PSN Effects by Components and Crime Index (Slopes, Exp(B), Standard Errors, and p-values), 1999 to 2004.<sup>a</sup>

<b>PSN Predictor</b>		<b>Homicides (logged)</b>	<b>Gun Homicides (logged)</b>	<b>Gang Homicides (logged)</b>	<b>Aggravated Battery (logged)</b>
<b>PSN (Dummy)</b>	Coeff	-0.124	-0.134	-0.032	-0.016
	Exp(B)	0.883	0.874	0.968	0.974
	SE	0.032	0.032	0.022	0.007
	p-value	0.000	0.000	0.248	0.042
<b>Percent Offenders Attend Forum (logged)</b>	Coeff	-0.146	-0.162	-0.133	0.007
	Exp(B)	0.864	0.850	0.875	1.007
	SE	0.049	0.048	0.034	0.012
	p-value	0.003	0.001	0.000	0.550
<b>Number of ATF Seizures</b>	Coeff	-0.004	-0.006	-0.000	0.001
	Exp(B)	0.996	0.994	1.000	1.001
	SE	0.002	0.002	0.002	0.001
	p-value	0.090	0.005	0.910	0.237
<b>Prosecutions (logged)</b>	Coeff	-0.019	-0.018	-0.011	0.001
	Exp(B)	0.981	0.982	0.989	1.001
	SE	0.009	0.009	0.006	0.002
	p-value	0.030	0.033	0.078	0.747
<b>Person-Month Sentences (logged)</b>	Coeff	-0.001	-0.001	0.002	-0.001
	Exp(B)	0.999	0.999	1.002	0.999
	SE	0.001	0.006	0.005	0.002
	p-value	0.430	0.911	0.654	0.430
<b>Index of Components (logged)</b>	Coeff	-0.072	-0.134	-0.027	0.009
	Exp(B)	0.931	0.875	0.973	1.009
	SE	0.017	0.043	0.030	0.011
	p-value	0.000	0.002	0.367	0.347

<sup>a</sup> PSN measure is inverse logit of predicted probability or propensity score estimated in model shown in Table 3.

TABLE 5. Multi-level Random Intercept Models of Gun Homicide Rate (logged) with and without five beats with highest intercepts. (Coefficients, (Standard Errors in Parentheses))

<b>Fixed Effects</b>	<b>All Beats</b>	<b>Outliers Removed</b>
<b>P(PSN)</b>	0.052 (0.213)	0.039 (0.231)
<b>Time * P(PSN)</b>	0.011 (0015)	0.005 (0.016)
<b>Log(forum)</b>	2.87** (1.09)	2.81** (1.14)
<b>Time * Log(forum)</b>	-0.150** (0.051)	-0.145** (0.053)
<b>Time</b>	-0.748*** (0.235)	-0.713** (0.0245)
<b>constant</b>	11.65	11.31

\*\*\* p = .001

\*\* p = .01



TABLE 6. Summary of Operation Ceasefire and PSN Effects on Log Homicide Rate (Slopes, Exp(B), Standard Errors, and p-values), 1999 to 2004

		<b>Model 1</b>	<b>Model 2</b>	<b>Model 3</b>	<b>Model 4</b>	<b>Model 5</b>
Operation Ceasefire (dummy)	Coeff	0.011	0.026	0.094		
	Exp(B)	1.011	1.026	1.099		
	SE	0.045	0.045	1.161		
	p-value	0.824	0.563	0.778		
Operation Ceasefire - Fully Implemented (dummy)	Coeff				-0.051	-0.013
	Exp(B)				0.950	0.987
	SE				0.073	1.176
	p-value				0.493	0.616
PSN (dummy)	Coeff		<i>-0.091</i>	<i>-0.078</i>		<i>-0.089</i>
	Exp(B)		<i>0.913</i>	<i>0.925</i>		<i>0.915</i>
	SE		<i>0.034</i>	<i>0.036</i>		<i>0.034</i>
	p-value		<i>0.008</i>	<i>0.034</i>		<i>0.011</i>
PSN * Operation Ceasefire	Coeff			-0.101		
	Exp(B)			0.904		
	SE			0.098		
	p-value			0.305		
BIC		7183.355	7193.756	7208.332	7182.601	7194.421

FIGURE 1. Structure of Major PSN Strategies and Relation to Offending Process

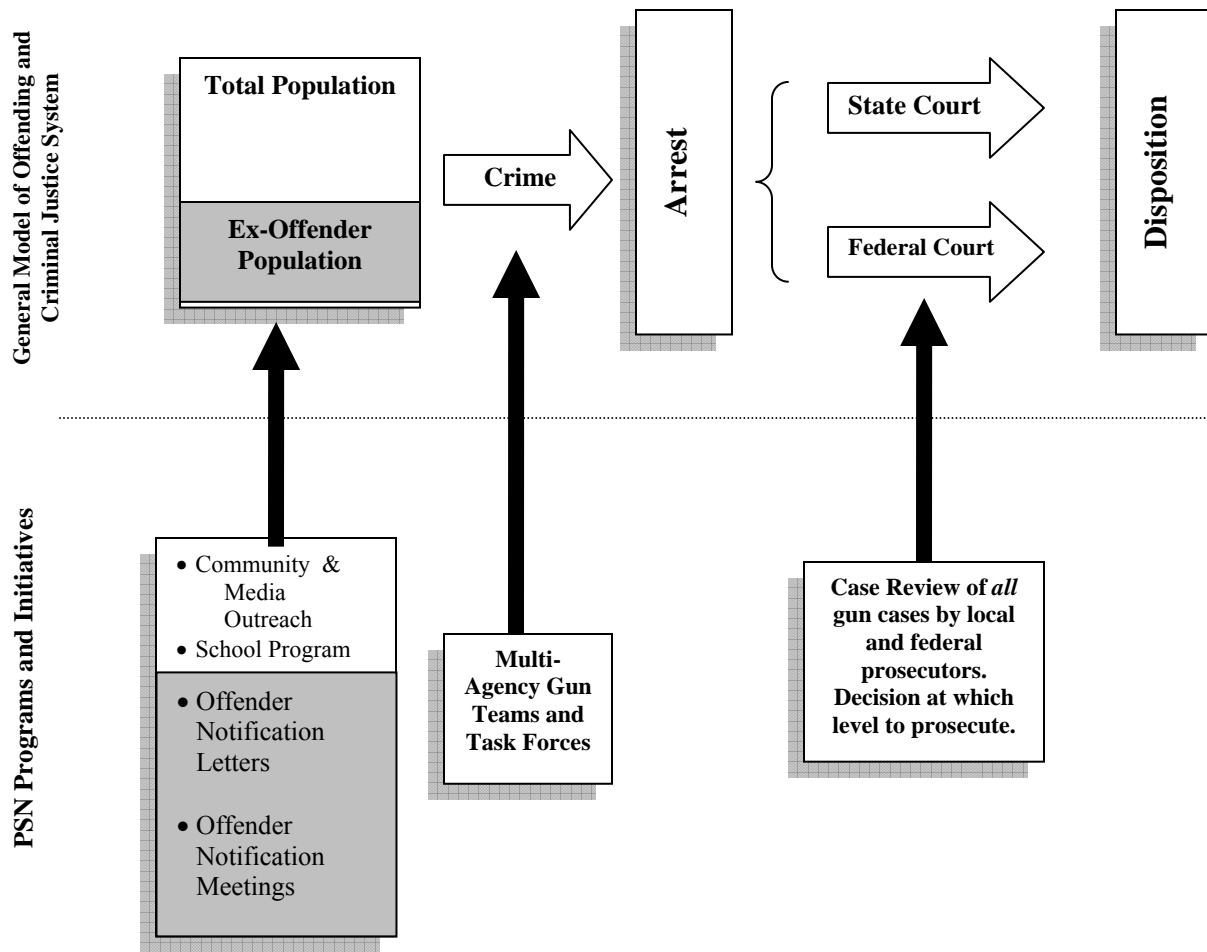


FIGURE 2. ATF Gun Seizures and Homicides in Chicago, 2002

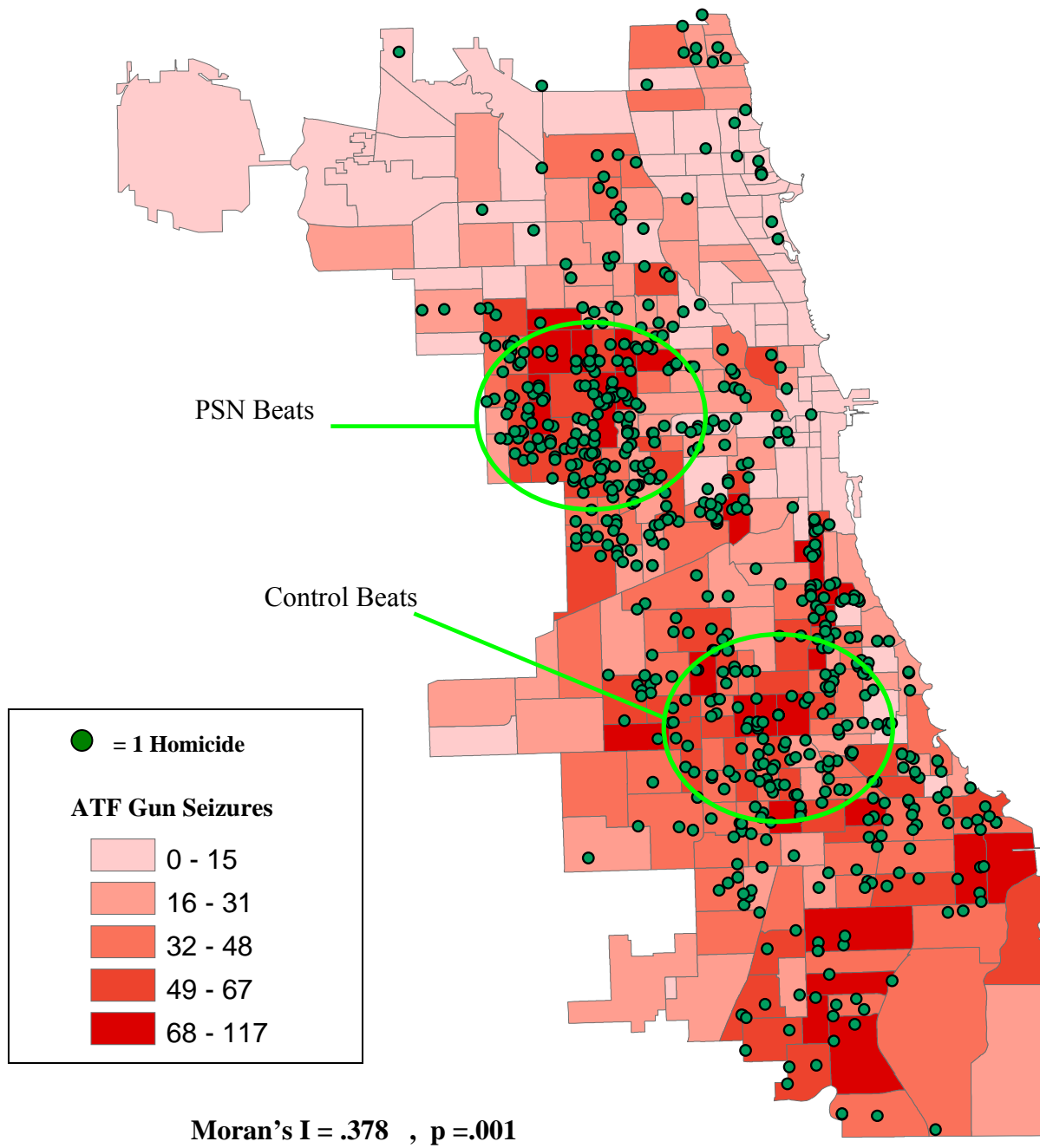


FIGURE 3. Annual Homicide Rates by Assignment Group, 1982 to 2004

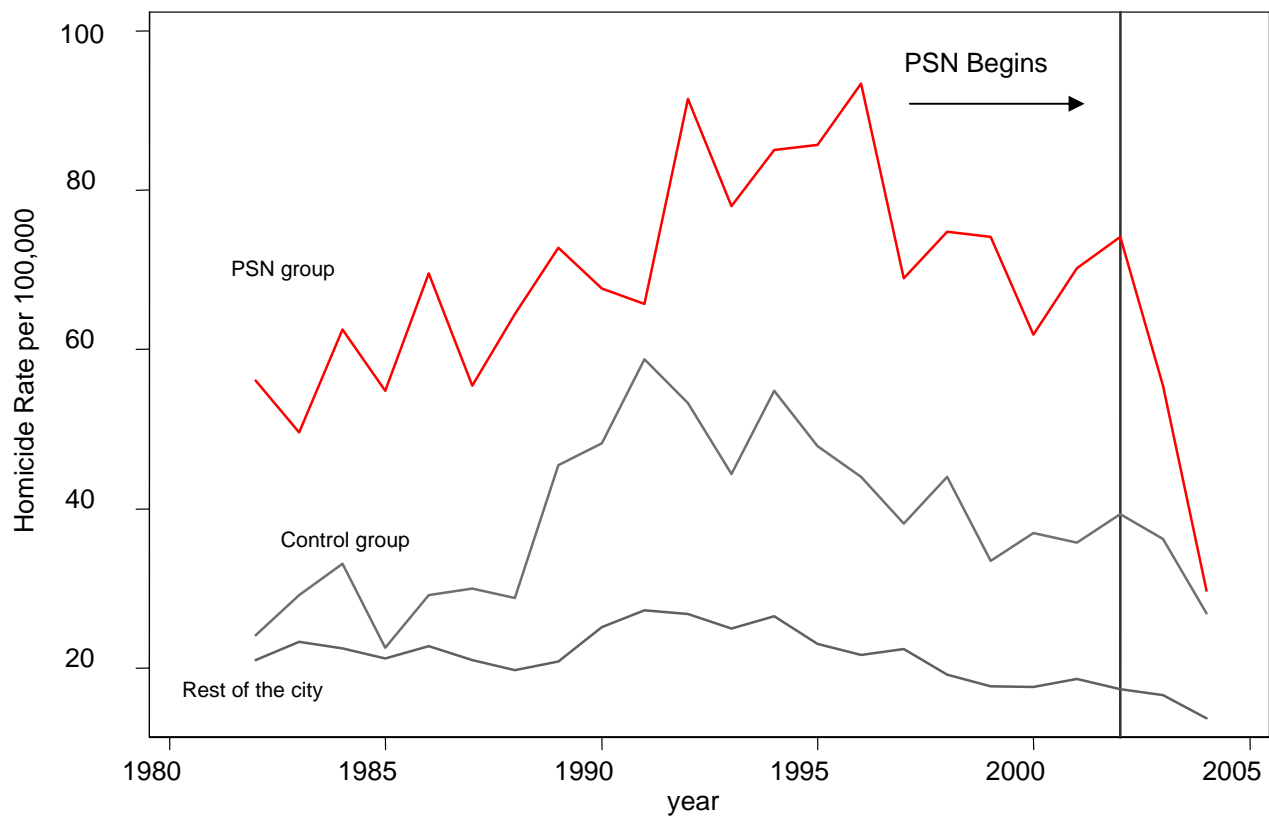


FIGURE 4. Distribution of Index of PSN Components by Group Assignment

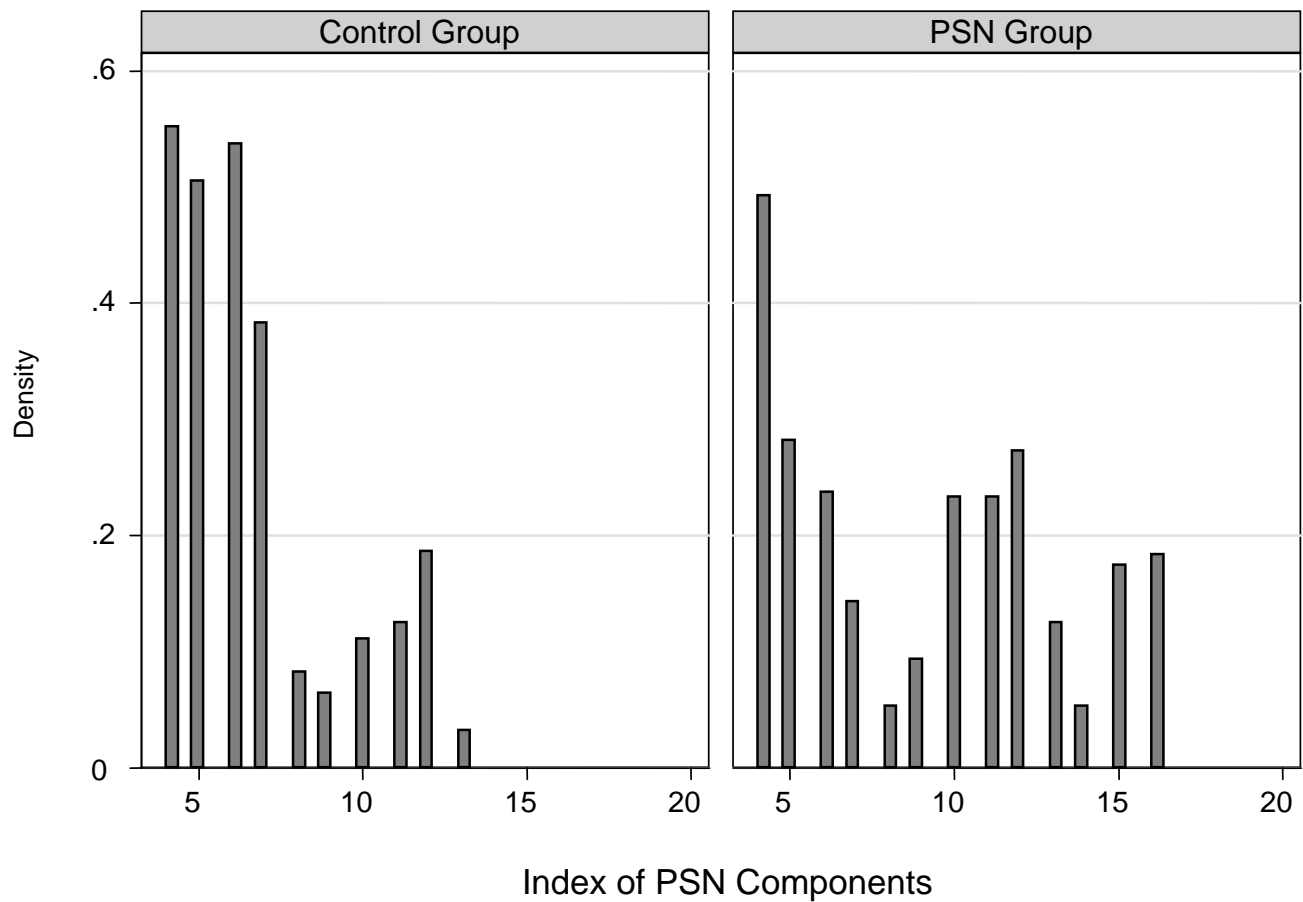


FIGURE 5. Monthly Homicide Rate in PSN Treatment Group, 1999 to 2004

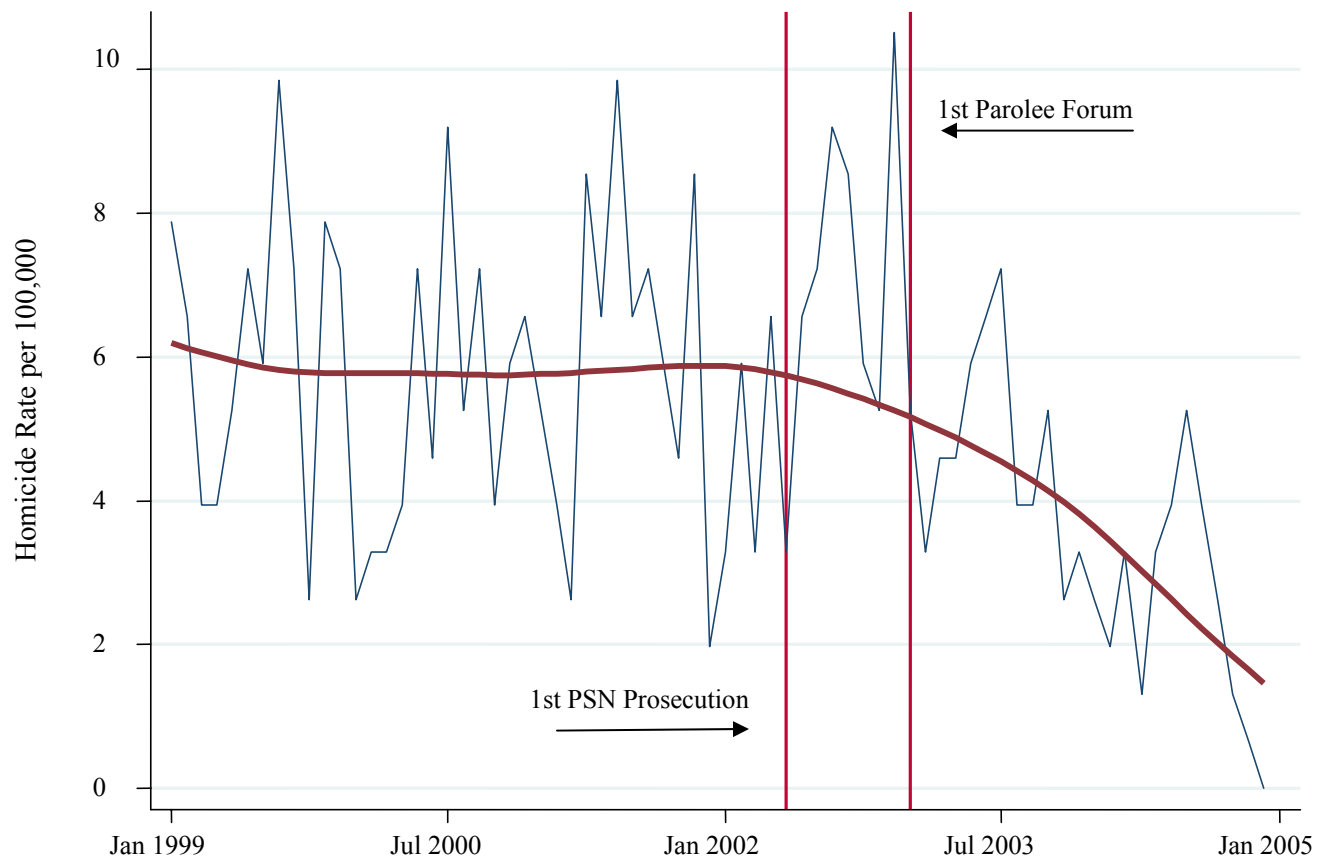


FIGURE 6. Smoothed Quarterly Homicide Rates by PSN Group Assignment, 1999 to 2004

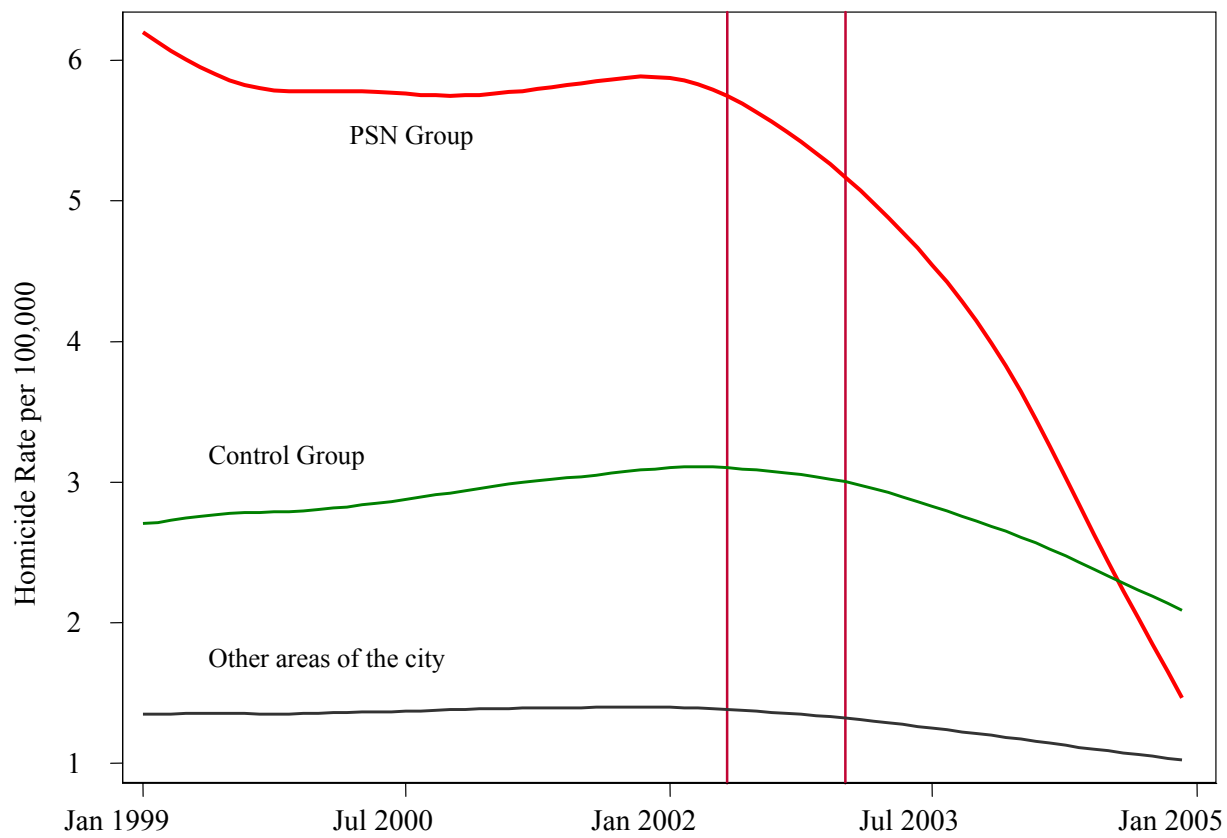


FIGURE 7. Fitted Linear Growth Curves of Homicide Rate (logged) on Predicted PSN Propensity Scores and Percent of Offenders Who attended Forum (logged) (95 Percent Confident Intervals)

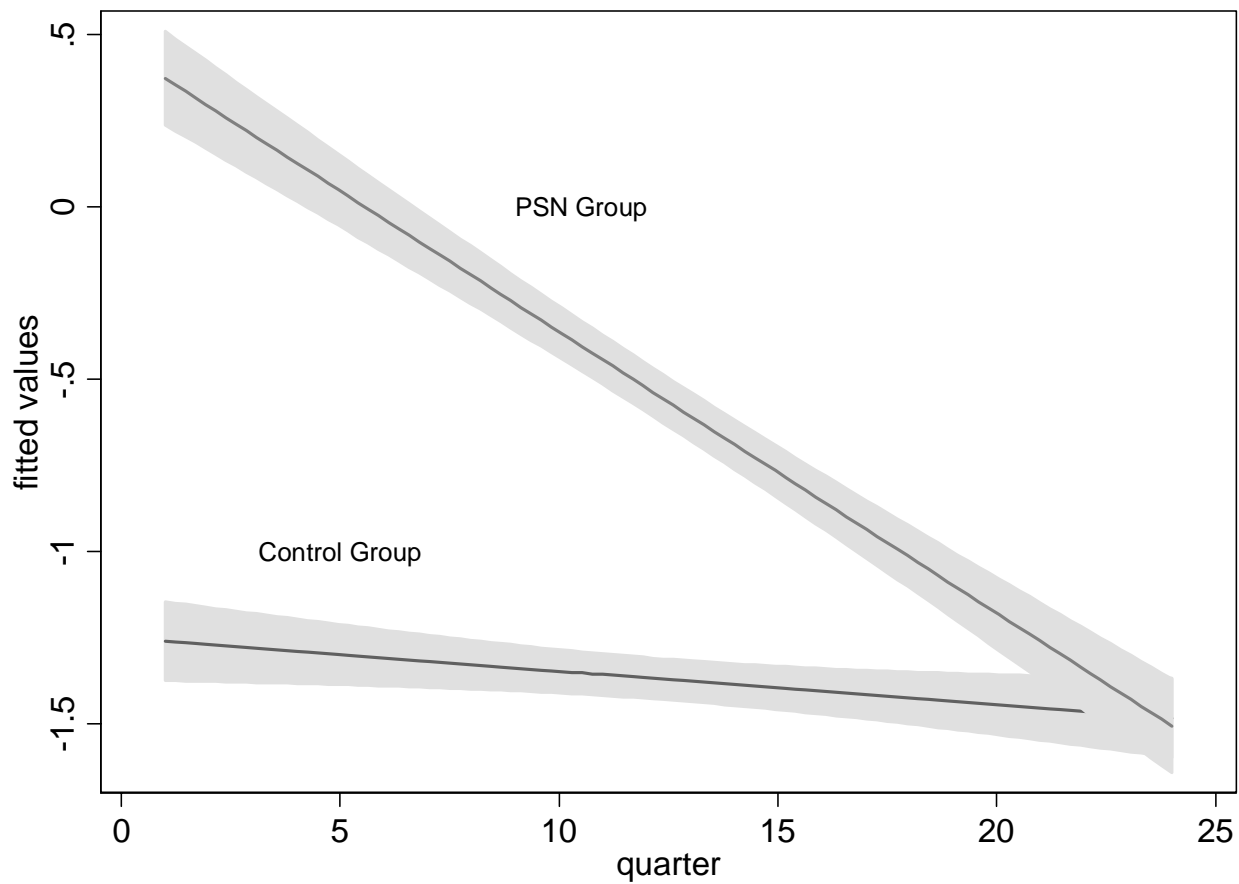
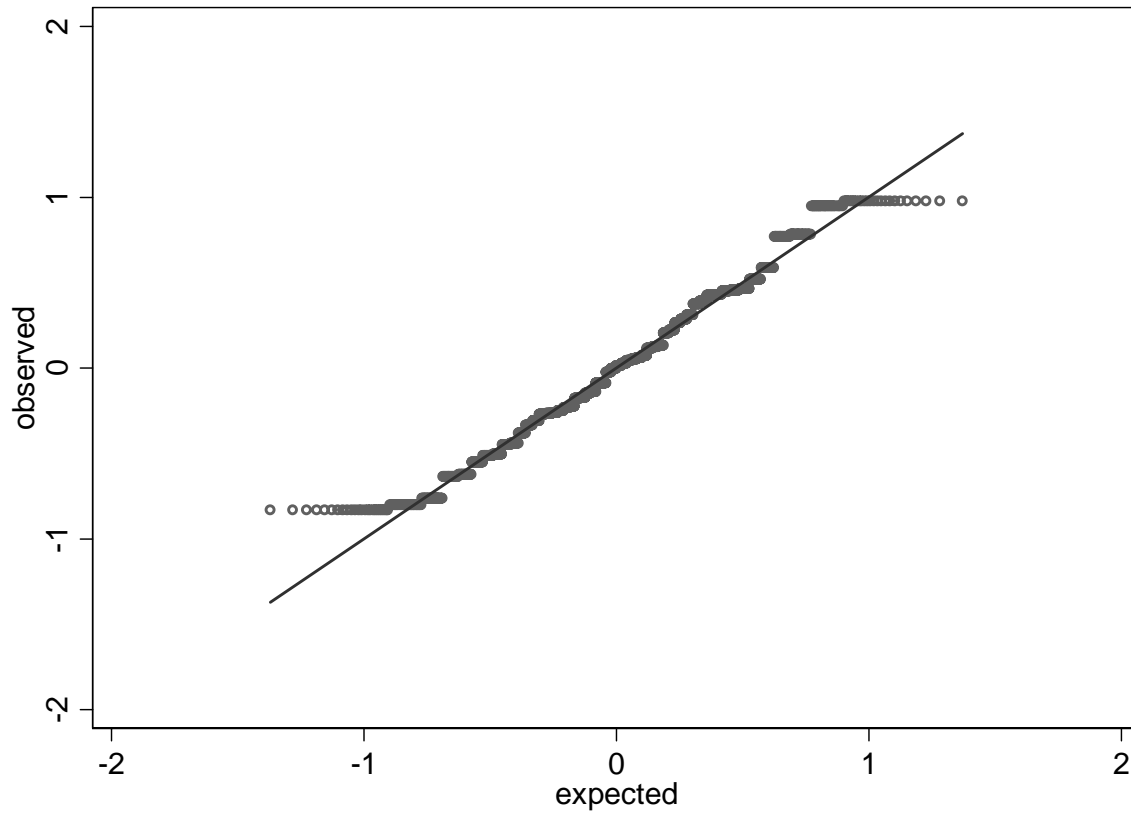




FIGURE 8. Normal probability of standardized Empirical Bayes Residuals



## APPENDIX

TABLE A1. Alternate Models of Homicide Rate (logged) on Propensity Scores and Percent Offenders Attend Forum (logged). (Coefficients, (Standard Errors in Parentheses))

<b>Fixed Effects</b>	<b>Fixed Effects Regression, with Robust Standard Errors</b>	<b>Poisson Regression, with Random Effects</b>	<b>Mixed Effects Model, Random Intercept</b>	<b>Mixed Effects Model, Random Intercept and Random Coefficients</b>
<b>P(PSN)</b>	7.54*** (1.60)	2.07*** (0.538)	7.49*** (1.72)	7.48*** (1.70)
<b>Time * P(PSN)</b>	-0.123 (0.113)	-0.027 (0.035)	-0.105 (0.118)	-0.103 (0.120)
<b>Log(forum)</b>	2.78** (1.01)	0.891** (0.352)	2.69** (1.05)	2.70** (1.06)
<b>Time * Log(forum)</b>	-0.146** (0.042)	-0.055** (0.016)	-0.144** (0.049)	-0.144** (0.049)
<b>Time</b>	-0.688*** (0.215)	-0.229** (0.078)	-0.678** (0.227)	-0.680** (0.227)
<b>constant</b>	11.53	3.63	11.10	11.11

<sup>a</sup> Outcome in this model is total homicide count

\*\*\* p = .001

\*\* p = .01

TABLE A2. Multi-level random intercept models of Gun Homicide Rate (logged) with different formulations of “time” variable. (Coefficients, (Standard Errors in Parentheses))

Fixed Effects	(1)	(2)
<b>P(PSN)</b>	7.49*** (1.72)	7.67*** (1.72)
<b>Time * P(PSN)</b>	-0.105 (0.118)	-0.128 (0.118)
<b>Log(forum)</b>	2.69** (1.05)	2.27* (1.09)
<b>Time * Log(forum)</b>	-.0144** (0.049)	-0.120* (0.051)
<b>Time</b>	-0.678** (0.227)	-0.467 <sup>+</sup> (0.265)
<b>Time * Time</b>		-0.004 (0.002)
<b>constant</b>	11.10	8.72

\*\*\* p = .001

\*\* p = .01

\* p = .05

+ p = .10

TABLE A3. Multi-level Random Intercept Models of Gun Homicide Rate (logged) with and without five outlying beats with highest intercepts. (Coefficients, (Standard Errors in Parentheses))

<b>Fixed Effects</b>	<b>All Beats</b>	<b>Outliers Removed</b>
<b>P(PSN)</b>	6.92*** (1.75)	7.43*** (1.91)
<b>Time * P(PSN)</b>	-0.065 (0.117)	-0.097 (0.126)
<b>Log(forum)</b>	3.04** (1.06)	2.65** (1.11)
<b>Time * Log(forum)</b>	-0.161** (0.049)	-0.140** (0.051)
<b>Time</b>	-0.743*** (0.226)	-0.646** (0.239)
<b>constant</b>	12.01	10.21

\*\*\* p = .001

\*\* p = .01