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# The Evidence-Based Policing Matrix

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**Abstract** The next phase of evidence-based policing requires both scholars and practitioners to move from lists of specific studies about "what works" to using that information strategically. This requires developing generalizations or principles on the nature of effective police strategies and translating the field of police evaluation research into digestible forms that can be used to alter police tactics, strategies, accountability systems, and training. In this article, we present a tool intended for such use: the Evidence-Based Policing Matrix. The Matrix is a consistently updated, research-to-practice translation tool that categorizes and visually bins all experimental and quasi-experimental research on police and crime reduction into intersections between three common dimensions of crime prevention—the nature of the target, the extent to which the strategy is proactive or reactive, and the specificity or generality of the strategy. Our mapping and visualization of 97 police evaluation studies conducted through December 31, 2009, indicate that proactive, place-based, and specific policing approaches appear much more promising in reducing crime than individual-based, reactive, and general ones. We conclude by discussing how the Matrix can be used to guide future research and facilitate the adoption of evidence-based policing.

**Keywords** Evidence-based policing · Effectiveness · Matrix · Evaluation · Experiments · Hot spots policing

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## Introduction

Following the work of the President's Commission on Law Enforcement and the Administration of Justice (1967), researchers have produced a large body of scholarship on a wide range of policing topics. This body of literature, recently reviewed by a special committee of the National Research Council (NRC) (2004), has covered numerous issues, including police organization, management, strategies, personnel, discretion, accountability, and patrol practices, to mention only a few. In recent years, there has been a growing interest in synthesizing lessons from this body of research, particularly with respect to police effectiveness in controlling crime. Prominent reviews of research on this topic have produced conclusions about the effectiveness of several specific policing interventions (e.g., hot spots policing) as well as some broad overviews about the utility of general approaches (e.g., community-oriented policing, crackdowns, and problem solving).

To date, however, there have been few attempts to develop generalizations or principles about the nature of effective police strategies or to quantify differences in the effectiveness of broad categories of police strategies. For example, are place-based strategies more or less effective than offender-based strategies? Are there additional distinctions that we can make regarding the relative success of strategies targeting particular types of places and people? At the same time, what characteristics are common to successful strategies such as hot spots policing and "pulling levers" against gang violence? Further, to what degree are strategies more effective when they are proactive and focused—two qualities that are generally thought to enhance the efficacy of police interventions? How do these strategic dimensions interact to influence police effectiveness? Finally, how might these insights guide the development and/or selection of police strategies across different problems and contexts? Police scholars have not often made such generalizations, which may be one reason that police research has arguably had relatively little impact on the practice of policing (Bayley 1998; Lum 2009).

In this paper, we attempt to extend and refine generalizations about effective police crime prevention strategies in three ways. First, we compile and analyze the most comprehensive collection to date of methodologically rigorous evaluation studies in policing. In total, this collection includes 97 experimental and quasi-experimental evaluations conducted through the end of 2009.[1] Second, we create a unique classification system for each study based on three very common dimensions of crime prevention strategies: the nature and type of target, the degree to which the strategy is reactive or proactive, and the strategy's level of focus. We then "map" these 97 studies into a three-dimensional matrix—which we refer to as the "Evidence-Based Policing Matrix" (from here on, "the Matrix")—that illustrates the distribution of evaluations and effective practices along these three dimensions. Third, we conduct quantitative comparisons of outcomes across groups of studies classified along our strategic dimensions.

This categorization and visualization of evaluation studies, coupled with our quantitative analyses of outcomes, reveals a number of insights into the commonalities of effective police strategies that are not revealed as conspicuously

[1] Our online tool allows us to update this collection every year.

from other reviews. In sum, we find that police strategies are more effective when they are place-based, proactive, and focused. Quantitatively, the most notable contrast is that between offender-based and place-based approaches; while a range of general, focused, and proactive strategies have been effective when targeted on places, results have been much more mixed for evaluations of offender-based strategies irrespective of the extent to which they are focused or proactive. Conclusions about the effectiveness of placed-based, proactive strategies—and particularly the relative effectiveness of targeting different types of places (like neighborhoods and smaller "micro places")—must be tempered to some degree based on the strength of the research designs used in place-based studies. However, this finding is compelling given that many police strategies tend to gravitate toward offender-based, reactive approaches.

We conclude by discussing how our Matrix might be used to guide the formulation and selection of strategies in policing as well as the development of an agenda for future policing research (our discussion complements Lum's (2009) *Ideas in American Policing* lecture on how the Matrix can be used by practitioners for purposes of assessment, training, deployment, and management). We also consider how the Matrix can be used as a practice-oriented research translation tool that may better facilitate the adoption of evidence-based policing and evidence-based funding.

## Synthesizing research evidence for use in practice

In 1998, Lawrence Sherman advocated for "evidence-based policing," arguing that "police practices should be based on scientific evidence about what works best" (Sherman 1998: 2). Like other police researchers and innovative police chiefs at the time, Sherman believed that information from systematic or scientific research, as well as rigorous crime analysis, should be regularly used and generated by the police to make both strategic and tactical decisions. At the core of this belief are a number of tenets: that science can be embedded into practice; that evaluations must be believable, valid, and useful to policing; and that there is some mechanism by which such evaluation findings can be translated into everyday decision making.

As interest in evidence-based crime policy has grown, police scholars have made a number of efforts to facilitate its adoption through syntheses of research on police and crime reduction, with an emphasis on research of higher methodological quality. The most recent and influential of these efforts have come from three sources.[2] The first was the 1997 University of Maryland report to Congress, conducted by Sherman and his colleagues on "What Works, What Doesn't, and What's Promising" in crime prevention (a project to which the first author of this article contributed). This was later updated in a 2002 volume, *Evidence-Based Crime Prevention* (Sherman et al. 2002). Sherman and his colleagues reviewed over 600 studies on a wide range of crime prevention programs and graded each study according to a

[2] Earlier reviews of police research included Clarke and Hough's (1980) compilation of papers on police effectiveness, a series of reviews by Sherman (1983, 1986, 1990, 1992), and a special issue of *Crime and Justice: A Review of Research* (Tonry and Morris 1992).

"Scientific Methods Scale" (Farrington et al. 2002: 18). They judged programs as working if they were supported by at least two studies of high methodological quality (i.e., experiments and rigorous quasi-experiments) and the preponderance of all remaining studies. They judged programs as promising if they were supported by at least one rigorous study and the preponderance of less rigorous studies. Programs were categorized as not working if there were at least two methodologically rigorous studies showing ineffectiveness and a preponderance of evidence showing ineffectiveness in other studies. Sherman et al.'s contention was that more scientifically rigorous studies should be given more weight in guiding practice; consequently, these studies were emphasized in recommendations about "what works" in policing and other criminal justice arenas.

The second set of efforts has been promoted by the Campbell Collaboration, specifically its Crime and Justice Coordinating Group, which sponsors systematic reviews of research across multiple areas of criminal justice (see Farrington and Petrosino 2001). The collaboration was established in 2000, mirroring efforts of the Cochrane Collaboration, which examines evaluations in the medical arena. Campbell reviews, which have included both narrative reviews and meta-analyses, focus on high-quality experimental and quasi-experimental studies. Like Cochrane reviews, Campbell reviews also center on specific interventions within a field. For example, systematic reviews of law enforcement strategies have examined hot spots policing (Braga 2007), problem-oriented policing (Weisburd et al. 2008b), neighborhood watch (Bennett et al. 2008), suppression of gun carrying (Koper and Mayo-Wilson 2006), counter-terrorism measures (Lum et al. 2006), drug enforcement (Mazerolle et al. 2007), and second responder programs for family abuse (Davis et al. 2008).

The third was a recent report by the National Research Council (NRC) on *Fairness and Effectiveness in Policing* (NRC 2004). For this report, the NRC's Committee to Review Research on Police Policy and Practices, chaired by Wesley Skogan and Kathleen Frydl, brought together a number of senior police scholars[3] to assess the state of police research in a range of areas covering crime prevention effectiveness as well as organizational and cultural dimensions of policing. In terms of assessing research on the "effectiveness of police activities in reducing crime, disorder and fear" (Chapter 6 of the report, which later became Weisburd and Eck 2004), the committee issued strong conclusions about specific policing strategies (e.g., hot spots policing) and also provided, as discussed shortly, a conceptual framework highlighting some dimensions of police strategies that are associated with effectiveness.

In total, these efforts have produced a number of recommendations and conclusions about police crime prevention strategies. Four key points noted by the NRC (2004: 246–247; see also Weisburd and Eck 2004), which have also been echoed in other key reviews, are that: (1) the standard model of policing that emphasizes random patrol, rapid response to calls for service, follow-up investigations by detectives, and unfocused enforcement efforts has not been effective in

[3] The committee included Wesley Skogan, David H. Bayley, Lawrence Bobo, Ruth Davis, John Eck, David A. Klinger, Janet Lauritsen, Tracey Maclin, Stephen D. Mastrofski, Tracey L. Meares, Mark H. Moore, Ruth Peterson, Elaine B. Sharp, Lawrence Sherman, Samuel Walker, David Weisburd, and Robert Worden.

reducing crime (see also Sherman 1997; Sherman and Eck 2002); (2) some of the strategies falling under the umbrella of community policing have been effective in reducing crime, disorder, or fear of crime, while others have not (see also Bennett et al. 2008; Sherman 1997; Sherman and Eck 2002); (3) police strategies that are more focused and tailored to specific types of crimes, criminals, and places are more effective (see also Braga 2007; Koper and Mayo-Wilson 2006; Mazerolle et al. 2007; Weisburd et al. 2008a, b); and (4) problem-oriented policing, a strategy involving systematic analysis of crime and disorder problems and the development of tailored solutions (Goldstein 1979), is effective (see also Weisburd et al. 2008a, b, 2010). Among focused policing strategies, hot spots policing—i.e., patrol, problem-solving, and/or other interventions focused on small areas or specific places of crime concentration—has proven particularly effective in several rigorous outcome interventions (Braga 2007). In the judgment of NRC, the research on hot spots policing constitutes the "...strongest collective evidence of police effectiveness that is now available" (NRC 2004: 250). Strategies judged as ineffective include, among others, arrests of juveniles for minor offenses, community policing without a clear focus on risk factors, and arresting unemployed suspects in misdemeanor domestic violence cases (NRC 2004; Sherman 1997).

Notwithstanding these advancements, there are still gaps in both our knowledge about police crime prevention efforts and how such knowledge can or should inform the implementation of effective strategies. Many police crime prevention strategies have yet to be evaluated rigorously. Ambiguities also remain in the existing evidence, in particular, the question of *why* some types of strategies tend to work better. With respect to hot spots policing, for example, it is not clear what types of strategies—directed patrol, situational crime prevention, nuisance abatement, or other forms of problem solving—work best for policing hot spots generally or for policing particular types of hot spots. And while hot spots policing appears effective in its own right, is it more effective than strategies focused on individual offenders, problematic groups, or larger places like neighborhoods? If so, can we quantify those differences? In other words, how does the likelihood of a successful outcome compare across these types of interventions? And most important to practitioners, how can we move beyond lists of effective and ineffective strategies evaluated in isolation in order to draw generalizations about effective policing approaches and apply those generalizations across different jurisdictions, settings, policing units, and crime types?

As these questions suggest, deriving more strategic principles from existing police research may help to better translate the research reflected in these past reviews. Weisburd and Eck's (2004) recent work for the NRC reflects the start of such an effort. Building on Sherman and Eck's review (2002), Weisburd and Eck developed a two-dimensional typology of police practices. One dimension, the *diversity of approaches*, represents the content of the practices employed. Strategies that rely primarily on traditional law enforcement are low on this dimension, while strategies involving multi-faceted, multi-agency enforcement and prevention efforts, for example, rank more highly. The other dimension, *level of focus*, represents the extent to which police focus or target their efforts. Strategies that are more general and applied uniformly across places or offenders would be ranked low on this dimension (Weisburd and Eck 2004: 45). Weisburd and Eck argue that strategies with a high level of focus (e.g., hot spots and problem-oriented policing) are

particularly effective, while those that are less focused (e.g., reactive patrol, community policing) are not promising for reducing crime and disorder.

Weisburd and Eck's synthesis reflects an important step towards identifying strategic commonalities of evaluated interventions. However, we need more specific and wider-ranging generalizations from the literature that coincide with the organizational structure and vernacular of policing if the utility of the evidence is to be made more obvious. Indeed, although existing research syntheses have facilitated the adoption of evidence-based policing to some extent by focusing on specific tactics and strategies, research has generally had no more than a modest impact on police practices (Bayley 1998). Furthermore, U.S. police agencies and their international counterparts are well known for *not* using evidence-based practices in everyday patrol and investigations. The best example of this is the general failure of police agencies to feature place-based strategies—i.e., hot spots policing, despite the strong evidence of its efficacy and the spatial distribution of crime (NRC 2004; Weisburd 2008; Weisburd et al. 2004).[4] Police also continue to make widespread use of other strategies that researchers consider ineffective, such as the DARE program (Drug Abuse Resistance Education), reactive arrests, rapid response to 911 calls, and gun buybacks.

Many of the causes for this are organizational, related to the stubborn and slow-changing nature of police culture, tradition, and practices (Bayley 1994; Mastrofski 1999; O'Neill et al. 2007; Sherman 1984, 1998). Yet as Lum (2009) asserts, the next step in moving toward evidence-based policing is to build on existing evidence, systematic reviews, and research infrastructures to create translation tools for conveying that evidence to police practitioners. Translation tools highlighting general principles of police effectiveness that can be applied across a range of conditions and problems may be more useful to practitioners than lists of specific strategies that are effective or ineffective. For researchers, such translation tools may also illuminate useful generalizations about why particular prevention efforts are valuable and what areas of research are needed. Toward this end, we created the Evidence-Based Policing Matrix, an online translation tool, from which we attempt to derive more general principles about the types of police interventions that work through a unique categorization and "binning" of all available experimental and quasi-experimental police evaluation research studies. Such categorization allows us to glean new insights from the breadth of experimental and quasi-experimental literature about why certain strategies may work better than others, and what areas of policing present high demand for more information.

## The Evidence-Based Policing Matrix

The Matrix originally emerged from work by Lum and Koper (forthcoming[5]), who initially conceptualized it to discuss how crime prevention might be applied to

[4] Although many agencies claim to be doing hot spots policing (Police Executive Research Forum 2008; Weisburd and Lum 2005), much of what they term hot spots policing appears to be consistent with more traditional beat- and neighborhood-based strategies (Koper 2008).

[5] This book chapter was accepted for publication in 2008 by the editors, but the main volume has been delayed.

counterterrorism. Inspired by Rosenberg and Knox's (2005) three-dimensional grid for conceptualizing childhood well-being and youth violence prevention, they created a Crime Prevention Matrix to map evaluated criminal justice interventions according to their common strategic and tactical characteristics. They reasoned that mapping these interventions into the Matrix according to shared dimensions might reveal clusters of positive evaluations in intersecting dimensions. In turn, these clusters might illustrate general characteristics of effective programs that might not be apparent from systematic reviews or meta-analyses of particular interventions or from narrative reviews of wide-ranging criminal justice interventions. Such three-dimensional mapping, in turn, could be useful in developing and selecting interventions (in the case of that discussion, counterterrorism interventions) that might prove more fruitful in terms of preventative results.

With this conceptualization as a base, we then used police evaluation research to further refine the Matrix, which we display in Fig. 1. We also invite readers to visit our online interactive version of the Matrix.[6] The Matrix is defined by three dimensions that can be applied to all evaluation research: the target of the intervention (X-axis), the level of focus or specificity of the prevention mechanisms (Y-axis), and a reactive to highly proactive continuum (Z-axis) indicating the level of proactivity of the intervention. We label this figure the "Crime Prevention Matrix" to indicate that it can be used for all types of interventions; one could imagine, in addition to an Evidence-Based Policing Matrix, that it could also be used as a corrections and treatment Matrix, a juvenile justice Matrix, or even Matrices for court practices and sentencing, perhaps with different dimensional categories.

The creation of the three dimensions and their categories was done purposefully and empirically, and additional matrices should also take this approach. First, we sought to use the most common dimensions of police crime prevention efforts, as identified from research as well as the authors' extensive experiences working with and in police agencies, to ensure that police-recognized vernacular would be employed.[7] While the literature provided us with initial guidance on the three dimensions, we also examined all of the studies we collected (using methods described below) to see if they could be described by each of the three dimensions, a process that also helped us determine categories within the dimensions.

## Target of the intervention

For the X-axis, we use the type and scope of the target of an intervention, which indicates who or what is being targeted. Targets of policing interventions may range from individuals to larger social aggregations of individuals and the smaller and larger spaces they occupy, up to the jurisdiction, nation, or even global level. These are the most common targets for which police agencies organize and discuss their strategies. The "Individual" slab would include interventions that intend to deter

[6] The Matrix is available online at http://gemini.gmu.edu/cebcp/matrix.html.

[7] We drew on contemporary and foundational research describing the range of police activities, including the special *Crime and Justice: A Review of Research* volume on policing (Tonry and Morris 1992) and, in particular, Reiss's (1992) description of police organization, as well as Sherman's (1995) review of the police role in *Crime* (Wilson and Petersilia 1995). More recent volumes were also consulted, such as Weisburd and Braga (2006), as well as the systematic reviews and police literature reviews mentioned above.

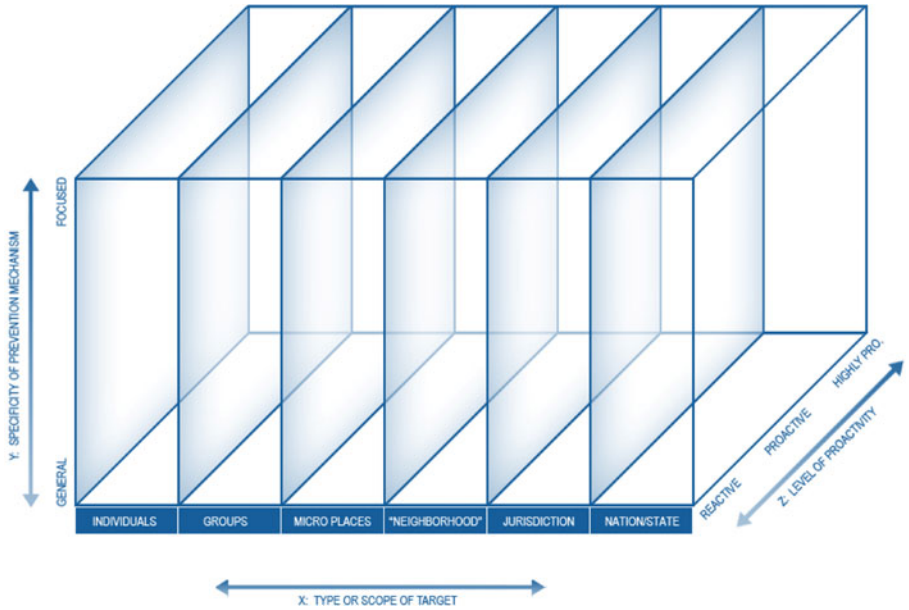


**Fig. 1** The Crime Prevention Matrix

individuals generally or that target specific categories of persons, such as repeat offenders (e.g., Martin and Sherman 1986), potential juvenile drug users (e.g., Rosenbaum et al. 1994), or those who commit domestic/intimate partner violence (e.g., Sherman and Berk 1984). Strategies that focus on people offending in tandem, such as gangs or co-offenders, would be categorized into the "Groups" slab (e.g., pulling levers interventions to combat gang violence—e.g., Braga et al. 2001).

Next, we move toward larger social aggregations—places. Places can be described by size, from smaller or "micro" places, to larger geographic units. Micro-place interventions target very specific geographic locations such as a block, street segment, address, or cluster of blocks (see Eck and Weisburd 1995; Weisburd 2002; Weisburd et al. 2009). Interventions such as hot spot policing (e.g., Sherman and Weisburd 1995), problem-oriented policing focused on drug markets (e.g., Weisburd and Green 1995), and the use of civil remedies at problem addresses (e.g., Mazerolle et al. 2000), are common micro-place-based interventions. Larger and more amorphous places can include neighborhoods, census tracts, communities, and police boundaries (beats, sectors, districts) within a jurisdiction. Programs such as neighborhood watch (e.g., Bennett 1990), community policing, problem solving (e.g., Skogan et al. 1995), and foot patrol (e.g., Trojanowicz 1986) are often implemented in these types of areas.

While the vast majority of police agencies in the United States are confined by municipal boundaries, interventions can be city-, county-, or parish-wide, or even span across regions and states. These interventions are often much more general in nature. Studies of such interventions could include, for example, evaluating police enforcement of a city-wide ban on gun carrying (e.g. Villaveces et al. 2000) or studying the effects of a new jurisdiction-wide arrest policy. An even larger geographic aggregation is the nation/state, which is a politically distinct geopolitical area with laws and a criminal justice system that often determine sentencing and

corrections of offenders. For example, mandatory sentencing schemes or state laws prohibiting certain types of gun purchases might be classified here. Conceivably, one might evaluate efforts by federal law enforcement agencies or homeland security efforts intended to protect the nation at large.

### Level of focus

The Y-axis represents a second common dimension by which crime prevention strategies are often classified—the level of specificity of an intervention and its goals, from general to focused (Weisburd and Eck 2004). Characterizing crime prevention tactics on their degree of specificity is common and has been discussed by a number of scholars (e.g., Erickson and Gibbs 1975; Sherman and Berk 1984; Stafford and Warr 1993). Theoretically, this axis should be viewed as a continuum, since many tactics share both general and specific deterrent goals (see Sherman 1990), and divisions can be murky. But for simplicity, we characterize studies as "general" or "focused," noting that the level of specificity of an intervention is an empirical matter. Tactics that are more general in their prevention mechanisms may include increasing patrol presence in a neighborhood (e.g., Kelling et al. 1974), zero tolerance, and crackdown approaches that are not specifically focused (e.g., Reiss 1985; Smith 2001), or DARE programs given to all seventh-grade students (e.g., Rosenbaum et al. 1994). Even hot spot policing interventions might be considered "general" (despite their focus on a specific place), if police are simply increasing patrol presence at hot spots and not targeting any person or group or carrying out a special operation or problem-solving scheme to reduce a certain type of crime (e.g., Sherman and Weisburd 1995).

Crime prevention interventions become more focused when they are tailored to specific types of problems or involve more tailored prevention tactics. These might involve, as Weisburd and Eck (2004) describe, the coordination of multiple agencies that handle different aspects of a particular problem, and they target specific mechanisms that produce crime. Specific programs might include using nuisance abatement laws to reduce drug dealing on a street block (e.g., Mazerolle et al. 2000); using specific prosecution schemes against those who are caught selling drugs and armed with a weapon (e.g., Abrahamse et al. 1991); employing the "pulling levers" approach against gang activity, which involves a combination of specific deterrence-related interventions (see Braga et al. 2001, 2008; McGarrell et al. 2006); or targeting specific risk factors for juvenile crime (e.g. Weisburd et al. 2008a). Hot spot policing might be more specific when a particular program is applied—for example, a hot spot approach specifically targeting stolen cars by running license plates along a quarter-mile stretch of a high-risk road (Taylor et al. 2010).

### Reactivity and proactivity

Finally, the Z-axis represents the level of reactivity or proactivity that an intervention exhibits. We categorize an intervention along this dimension using a three-point scale that reflects both the timing with which a program is implemented relative to a criminal event and also the time horizon for the program's effects (e.g., long- versus short-term). In the mostly reactive realm of this scale are interventions that "strengthen the reaction" of the police and target the crime after or while it is occurring. Often, these are considered

"traditional" approaches to policing and include mainstays such as reactive arrests, follow-up investigations, and other tactics that target crimes and suspects after the fact. Common examples are mandatory arrests for domestic violence (see Sherman and Berk 1984), repeat offender targeting (see Martin and Sherman 1986), second responder programs for family abuse (Davis et al. 2007), or even zero tolerance if it is just reducing the discretion to arrest across a city. We also include random "preventive" beat patrol (whether in a vehicle or on foot) in this categorization (see Kelling et al. 1974), since assigning an officer to a beat has the intention of deterrence but is done primarily to ensure that all areas are covered for quick response to calls for service.

The proactive to highly proactive categorizations reflect those interventions that use analysis of previous incidents to prevent future crimes. Proactive strategies include interventions to reduce a recent crime flare up or to deter a crime most likely to happen tomorrow, such as crackdowns on particular high-crime areas (e.g., Lawton et al. 2005; Sherman and Weisburd 1995). Proactive strategies have a temporal aspect that is immediate and short-lived. Highly proactive strategies, in contrast, focus on early risk factors and long-term prevention. Such programs include gang-resistance education programs (e.g., Esbensen 2002), drug resistance programs (e.g., DARE), some problem-oriented policing interventions (e.g., Braga et al. 1999; Mazerolle et al. 2000), and after-school programs for juveniles.

## Dimensional overlap and flexibility

The categories within each dimension are meant to be flexible and fluid, and there may be overlap between dimensions. For example, it is possible that individual-based interventions are more "specific" by the nature of the type of target, but this is not always the case. General deterrent strategies commonly focus on individuals but are general in nature. Similarly, micro-place strategies might also be viewed as more specific, given that the targets themselves were smaller units of larger aggregates. To overcome this issue, we defined specificity to mean the specificity of the mechanism of the intervention rather than the target. So, for example, hot spot patrol at a micro-place (e.g., a street block or corner) is not considered a focused intervention unless the activities the police conducted at those locations, or the problem specified, were more defined than deterrent patrol. Examples might include officers initiating nuisance abatement proceedings for a problem place or setting up a roadblock to find drunk drivers. Overall, given past literature and our studies, we felt these to be the most common ways that interventions in policing (and crime prevention more generally) could be described.[8] By placing rigorous research studies into the Matrix according to how these dimensions describe them, we might then begin to see clustering of studies at certain intersecting dimensions, giving us a better understanding of the general characteristics of tactics that seem more promising.

[8] Indeed, there are other dimensions that could be used. For example, law and society scholars might be interested in a "constitutionality" continuum, which provides a measure of high- and low-constitutionality controversy. A "Herbert Packer" continuum might be added (see Packer 1964), which could be characterized as a continuum between individual rights and community rights/crime control. Mastrofski might add a "legitimacy" continuum (see Mastrofski 1999), which ranks interventions according to how much they might challenge the legitimacy of an agency (see also Tyler 2004). However, for our purposes here, these three dimensions represent the most commonly shared descriptives for policing.

## Data and methods for placing studies into the Matrix

### Study inclusion criteria and search method

To map evaluations of police interventions into the Matrix, we used two criteria, one methodological and the other outcome-based. In terms of methodological requirements, we only included studies that were at least moderately scientifically rigorous—specifically, randomized controlled experiments or quasi-experiments using matched comparison groups or multivariate controls. To assess methodological rigor, we were guided by the Scientific Methods Scale (SMS) designed by Sherman et al. for the University of Maryland's "What Works" report (discussed earlier) and updated in Sherman et al. (2002). In the Maryland Report, studies were assigned a value ranging from 1 to 5 based on the rigor of the evaluation methods used. For the Matrix, we only included policing studies that received an SMS score of 3 or higher. A score of "3," which we label as "moderately" rigorous, corresponds to studies having a "separate comparison group present but non-randomly constituted; extensive information provided on pre-treatment equivalence of groups; [and] obvious group differences on important variables."[9] For our purposes, we included studies only if the comparison group was the same type of unit as the intervention group (e.g., a police beat if the target area is a police beat). Additionally, the study had to meet at least one of the following criteria: (1) comparison group was well-matched, (2) use of multivariate controls, or (3) use of rigorous time series analysis.

Generally, Farrington and colleagues (2002) describe a score of "4" as studies with "separate comparison group present; extensive information provided on pre-treatment equivalence of groups; [and] only minor group differences evident." For policing studies in particular, Sherman and Eck (2002: 301) elaborate a "4" as "before-and-after large sample comparisons of treated and untreated groups." Thus, a non-randomized study with 20 treatment police beats and 20 comparison beats would be a 4 on the SMS scale, while an intervention in just one beat with a comparison beat would be scored a 3. We were guided by both of these definitions, but all studies that we coded as 4s were non-randomized individual-based studies with carefully matched comparison groups or place-based studies with multiple treatment places and multiple comparison places. We term these studies rigorous. Finally, a "5" was considered highly rigorous and included randomized experiments in which differences between groups were not greater than expected by chance, and the units for random assignment matched the units of analysis.

Our decision to include studies with moderate methodological rigor was for practical reasons. The goal of the Matrix is to serve as a translation tool for police to use scientific evidence to guide practice. While compromising on rigor is certainly never a goal in scientific analysis, the general knowledge gleaned from moderately rigorous studies may be valuable to police in generating tactics of at least reasonable effect. However, recognizing this, we also provide Matrix mappings in which these studies are excluded as a comparison between areas of the Matrix we are more

[9] See the "Code Book for Methodological Rigor and Effect Size Computation" at the end of the Appendix of the Maryland Report for these descriptions.

certain about (in terms of outcome effectiveness). Additionally, for those studies that appeared in Sherman and colleagues' (1997, 2002) reviews, we were initially guided by the score given. We then reassessed the score if we found disagreement based on our review of the full text of the study. Then, we conducted our own assessment of the scientific rigor of studies published between Sherman and colleagues' (2002) review and December 2009 in order to create the most updated review of police evaluations.[10]

In addition to the methodological cutoff, we also set criteria that studies had to focus on interventions that were primarily police interventions (even though other agencies might be involved) and had to include crime or disorder as a measured outcome. Excluded studies, for instance, include community crime prevention programs that used police consultation at the outset but involved little or no police involvement in the actual program (e.g., Rosenbaum et al. 1986). We also excluded studies that only measured fear of crime as an outcome. While we do not think fear of crime is unimportant for police to focus on, we wanted to include only interventions that had some type of crime, disorder, or victimization measure in order to generate a Matrix that could be most useful for police in reducing crime. However, one could imagine additional Matrices that focus on other outcomes important in policing, such as fear of crime or police legitimacy.

To find these studies, we began with existing reviews of police literature, including the Maryland report and its update, existing systematic reviews on policing, and the NRC (2004) report. We also searched numerous library databases and as well as the websites of several professional and government organizations.[11] We located 97 studies published as of December 31, 2009, that met the methodological and substantive criteria for inclusion. Sixty-two studies (64%) were of moderate quality, 12 (12%) were rigorous, and 23 (24%) were randomized controlled experiments.

## Mapping studies into the Matrix

We mapped the selected studies into the Matrix along the three dimensions using a consensus strategy. Each study was initially coded separately by two of the three authors.[12] If the reviewers did not code the study consistently, the remaining author would also code the study, followed by group discussion to reach consensus. We encourage readers to view the Matrix, located online at http://gemini.gmu.edu/cebcp/matrix.html. This online interactive tool allows both researchers and practitioners to freely access and view the entire field of quasi-experimental and experimental policing research, including how these studies were coded and mapped into the Matrix. This transparency also allows for further suggestions about including studies we may have missed, or for authors to suggest alternatives about study coding or mapping. The Evidence-Based Policing Matrix is displayed in its entirety in Fig. 2. This visual mapping of the Matrix is not meant to be precise; dots are spread out only to aid with

[10] The Matrix will be updated yearly with new studies that fit these qualifications. The entire coding of each study is available with the Matrix tool to maximize both transparency and discussion about study placement.

[11] These databases included Criminological Abstracts, Criminal Justice Periodicals, Criminal Justice Periodical Index, National Criminal Justice Research Service, Dissertation Abstracts, and Google Scholar. We consulted publications from NIJ, the Police Foundation, the Police Executive Research Forum, the Office of Community Oriented Policing Services, and the Center for Problem-Oriented Policing. We plan to re-search these databases on a regular basis to update the Matrix with new studies.

[12] The studies were divided equally so that each author initially coded two-thirds of the studies.

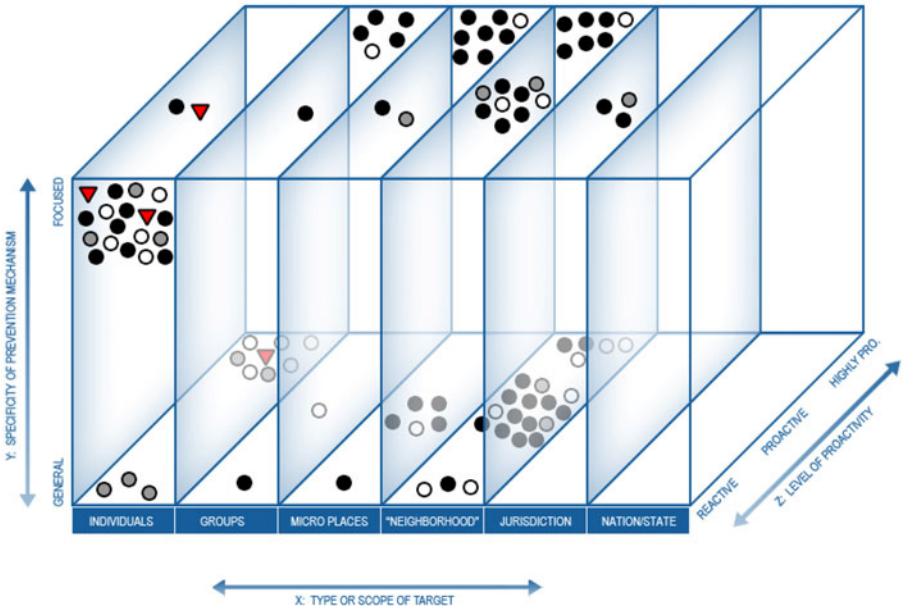


**Fig. 2** The matrix mapped with 97 police intervention studies

visual presentation and are not statements about the relative proactivity or specificity of an intervention.

Additionally, we also present shape and color codes for each study to indicate the direction and statistical significance of the findings of the study. The codes are:

- ▼ *Statistically significant backfire effect* (upside-down triangle)[13] – indicates the outcome of the study was statistically significant, but in the opposite direction of the hypothesis. This would be considered a "harmful" intervention (see Weisburd et al. 2001), where an intervention significantly increased offending in some individuals or crime in some areas.
- ○ *Non-significant effect* (white dot) – indicates the intervention did not lead to any statistically significant effect. Although some might interpret colloquially that the intervention "did not work," Weisburd et al. (2003a) point out that such terminology is inaccurate. Statistical insignificance only states that, for this particular study, we cannot conclude that the null hypothesis of "no difference" is false.
- ◯ *Mixed effects* (gray dot) – indicates there were multiple primary outcomes in the study, at least one of which showed positive effects and at least one of which showed non-significant or backfire effects. Mixed effects might also include studies in which outcomes were only positive for a certain subgroup of targeted offenders or places. Although many studies have both significant and non-significant findings, we coded a study as having mixed results only when the authors emphasized the mixed nature of the findings. Examples might include arrest for domestic violence deterring employed but not unemployed suspects

[13] This symbol appears red in color on the website.

(see Sherman et al. 1992); restorative justice reducing recidivism for violent crime but not property crime (see Sherman et al. 2000); or crack house raids reducing crime but only for a 12-day period (see Sherman and Rogan 1995).

- *Significant effects* (black dot) – indicates that the intervention led to a statistically significant effect in reducing crime or criminality. Mapping the studies in this way allows the viewer to obtain five pieces of information about an intervention in a single visualization. The first four come from the single symbol itself: the intervention's target, specificity, proactivity, and effectiveness. However, the Matrix is interesting not simply because of its display of single studies or these four characteristics. The fifth piece of information results from the relative position of dots to each other, resulting in clusters of evaluated interventions at intersecting dimensions.

## Results

### Visual patterns

The clustering of studies that materializes from this mapping is a powerful visual. In particular, clustering of effective studies, or *realms of effectiveness,* circled in Fig. 3, facilitates generalization (and thus, translation) from the wide range of diverse policing research to the three-dimensional description of that realm. For example, four of the five realms of effectiveness involve interventions that are at least moderately proactive and/or that focus on places. In terms of interventions that target micro-places, those with greater focus and proactivity tend to fare well, although a

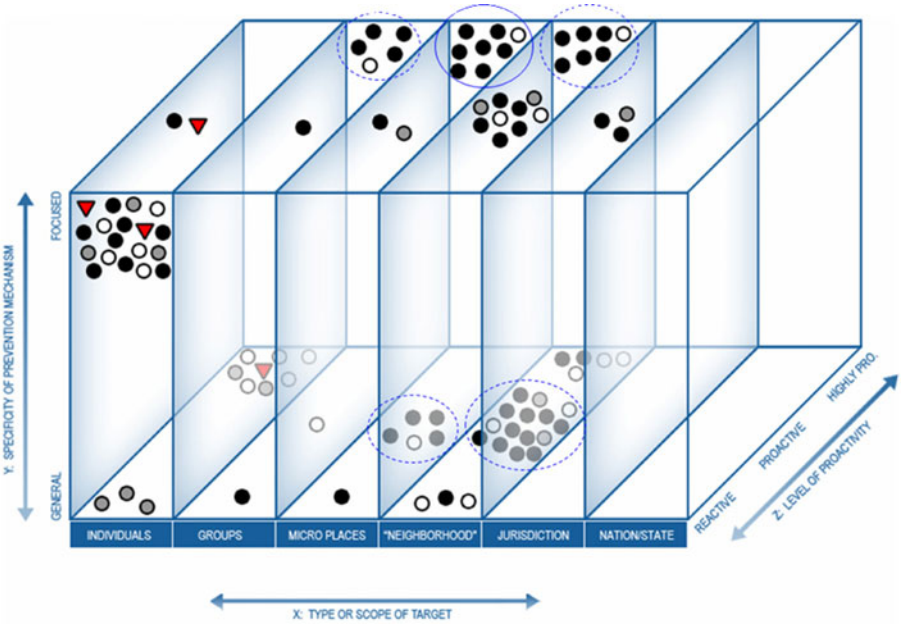


**Fig. 3** Realms of effectiveness

small realm of effectiveness is also found in more general, proactive intersections (e.g., general hot spot deterrent patrols).

While there is also much evidence that has been generated at the neighborhood level, as will be discussed below, the majority of these studies are of only moderate methodological quality compared to those in the micro-place slab. The overall weaker scientific strength of studies in this cluster is denoted by a broken-lined circle in Fig. 3. Effective studies in this realm focus on a variety of police tactics, ranging from more general community policing (e.g., Connell et al. 2008) and order maintenance strategies (e.g., Reiss 1985) to more focused strategies, such as door-to-door visits to gain intelligence and increase property marking (Laycock 1991) and using street closures to reduce gang crime (Lasley 1996). This broad range of interventions more generally reflects the typical organization of police agencies into precincts or beats, making it logical that many interventions would correspond to the "Neighborhood" realm. A further realm of effectiveness emerged in the Group slab, although we know much less about these interventions than about interventions targeting individuals. The research that does exist seems to indicate that highly proactive and specific tactics such as the "pulling levers" approach (see Braga et al. 2008; Kennedy 2009) are promising.

The Matrix also shows us what single studies do not. For example, notice the first "slab" of studies mapped in the "Individuals" area. This grouping indicates to police agencies that when they use strategies focused on individuals, the evidence often shows mixed, non-significant, and sometimes backfiring results. The Matrix also shows that many of these individual-based strategies are reactive—a quality that has been recognized by both police practitioners and researchers as being less effective in fighting crime. About half of these studies focus on responses to domestic violence (either arrest or second responder programs), and while some of these studies show significant positive results (e.g., Sherman and Berk 1984), the evidence on police responses to domestic violence is overall quite mixed, with 2 of these 12 studies showing mixed results, 4 showing non-significant results, and 2 finding backfire effects. Even those individual approaches that are more proactive show mixed or ineffective results (DARE is one example). Although there are some studies in this slab that point to beneficial results (particularly when interventions are more focused), this particular region of the Matrix generally suggests that targeting individuals may be less effective than focusing on other types of targets. However, these realms are where the vast majority of police activity occurs (e.g., response to 911 and reactive arrests, investigations, and offender targeting).

## Statistical comparisons across dimensions

To better quantify patterns in this visualization, we provide both descriptive and bivariate statistics. Table 1 shows the breakdown of the studies by dimension, outcome, and methodological rigor. While many policing evaluation studies examined individual-based interventions (32.0%), neighborhood-based studies constitute the largest group (40.2%). Slightly more than half of the studies (56.7%) examined focused interventions, and over 70% evaluated interventions that were at least moderately proactive. This place-based, focused, and proactive bias within the more rigorous evaluation literature in policing is not coincidental, nor does it reflect the reality of police practice, which we know is remarkably individual-based, reactive, and general in nature. Rather, these overall tendencies in the research reflect the

**Table 1** Frequencies for characteristics of the 97 studies by dimensions

| **X-axis (Target)** | *n* | % | **Outcome** | *n* | % |
|---|---|---|---|---|---|
| Individuals | 31 | 32.0 | Mixed results | 14 | 14.4 |
| Groups | 8 | 8.2 | Non-significant results | 24 | 24.7 |
| Micro-places | 16 | 16.5 | Significant backfire | 4 | 4.1 |
| Neighborhoods | 39 | 40.2 | Significant success | 55 | 56.7 |
| Jurisdictions | 3 | 3.1 | Total | 97 | 100.0 |
| Total | 97 | 100.0 | | | |
| **Y-axis (Specificity/focus)** | *n* | % | **Methodological rigor** | *n* | % |
| General | 42 | 43.3 | Moderately rigorous ("3") | 62 | 63.9 |
| Focused | 55 | 56.7 | Rigorous ("4") | 12 | 12.4 |
| Total | 97 | 100.0 | Randomized experiment ("5") | 23 | 23.7 |
| | | | Total | 97 | 100.0 |
| **Z-axis (Proactivity)** | *n* | % | | | |
| Mostly reactive | 26 | 26.8 | | | |
| Proactive | 38 | 39.2 | | | |
| Highly proactive | 33 | 34.0 | | | |
| Total | 97 | 100.0 | | | |

innovations of scholars and police practitioners who have tried to push the field forward through these evaluations.

The dominance of moderately rigorous and also successful studies in the Matrix deserves some attention so that statistically significant findings are not over-emphasized. In particular, the cross-tabulation in Table 2 shows the distribution of studies by SMS method score (3, 4, or 5) and whether the studied evidence clearly indicated a statistically significant successful outcome. A significant relationship emerges, indicating that as studies become more methodologically rigorous, they are less likely to show clear significant success. This provides specific and updated support from the policing literature for Weisburd et al's (2001) finding that, as studies increase in methodological rigor, they are less likely to find positive results.

This tendency becomes even more visually obvious when comparing mappings of moderately rigorous studies of SMS=3 (Fig. 4a) versus more rigorous quasi-experimental and experimental designs of SMS=4 or 5 (Fig. 4b). Notice that many

**Table 2** Cross-tabulation of SMS method score versus study results

| | SMS method score | | |
|---|---|---|---|
| | 3 | 4 | 5 |
| Sig. success | 43 (69.4%) | 4 (33.3%) | 8 (34.8%) |
| Any other result | 19 (30.6%) | 8 (66.7%) | 15 (65.2%) |
| Column total | 62 (100%) | 12 (100%) | 23 (100%) |

$\chi^2 = 11.213$, $p = .004$

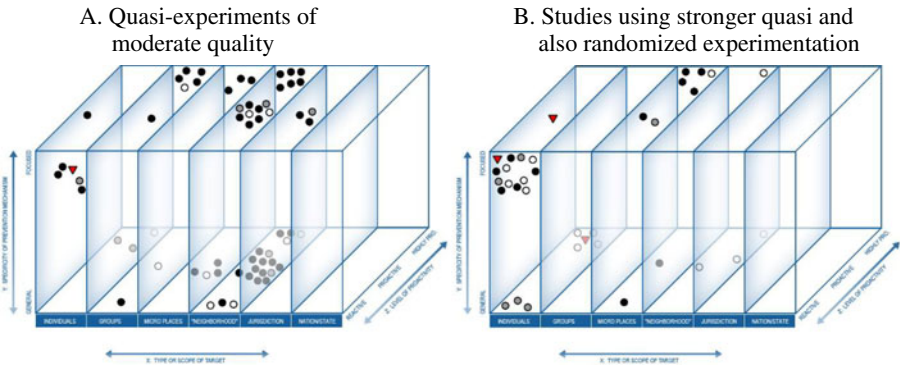


**Fig. 4** Comparisons of studies in the Matrix of moderate and strong methods. **a** Quasi-experiments of moderate quality. **b** Studies using stronger quasi and also randomized experimentation

studies that showed statistically significant positive outcomes (especially in the neighborhood slab) disappear when a stronger methodological cutoff point is employed. Also visually striking is that more interventions targeting individuals appear in Fig. 4b. This indicates that we know with fairly good certainty that individual-level, reactive strategies in policing do not produce clearly positive results.

But what might be said of intersecting dimensions and the likelihood that studies of a certain method, outcome, or type might fall into them? In Table 3, we present cross-tabulations examining the relationship between each of our three axes and study results. We have dichotomized each variable to better display the overall trends in our data. For the X-axis, we collapsed the individual and group categories into one "person-based" category and combined the micro-place and neighborhood categories into one "place-based" category. (The three jurisdiction-level studies were excluded from this analysis.) For results, we again examine whether a study resulted in a statistically significant success or not.

The cross-tabulation shows a highly significant difference in results between the two X-axis general categories represented in the Matrix—person versus place-based. More than two-thirds (69.1%) of place-based studies showed significant crime and disorder reductions in contrast to 38.5% of person-based interventions, a relative difference of 79% ($\chi^2$=8.705, $p$<.01). This reinforces quantitatively our finding that realms of effectiveness were generally found in the place-based slabs of the Matrix.[14] In examining the Y-axis, focused interventions are 34% more likely to find a statistically significant effect than general interventions (63.6 to 47.6%), although this finding is not statistically significant ($\chi^2$=2.489, $p$>.10). This lends support to Weisburd and Eck's (2004) contention that focused interventions are more effective in reducing crime and disorder. Finally, we combined the proactive and highly proactive Z-axis categories to compare proactive to reactive studies. The cross tabulation shows a marginally significant difference between the two categories, with proactive interventions being 47% more likely to reduce crime (62.0 to 42.3%;$\chi^2$=2.997, $p$<.10).

[14] Removing the neighborhood-based studies, which are generally weaker methodologically, would further strengthen the basis for this generalization.

**Table 3** Cross tabulations of X, Y, and Z axes versus study results

| | X-axis | | Y-axis | | Z-axis | |
|---|---|---|---|---|---|---|
| | Person-based | Place-based | General | Focused | Reactive | Proactive |
| Sig. success | 15 (38.5%) | 38 (69.1%) | 20 (47.6%) | 35 (63.6%) | 11 (42.3%) | 44 (62.0%) |
| Any other result | 24 (61.5%) | 17 (30.9%) | 22 (52.4%) | 20 (36.4%) | 15 (57.7%) | 27 (38.0%) |
| Column total | 39 (100%) | 55 (100%) | 42 (100%) | 55 (100%) | 26 (100%) | 71 (100%) |

$\chi^2$ X-axis=8.705; $p$=.003

$\chi^2$ Y-axis=2.489; $p$=.115

$\chi^2$ Z-axis=2.997; $p$=.083

## Using the Matrix to advance evidence-based research, practice, and funding

In general, these results demonstrate quantitatively the relevance of the realms of effectiveness we identified in Fig. 3. Proactive, focused, place-based interventions are more likely to reduce crime and disorder than strategies concentrating on individuals, or those that are reactive and/or general in nature. And, when only looking at the highest-quality studies, this finding is even more pronounced. Among place-based strategies, interventions targeting micro-places appear to be particularly effective based on the highest quality evidence. The visualization of effective interventions at these intersecting dimensions helps illuminate why some interventions are more effective than others by revealing broad patterns in the characteristics, or strategic dimensions, of successful interventions. This study provides a first attempt to identify and quantify the strength of these realms and to provide researchers and police with statements about "what works" at a level of generalization higher than that of programmatic assessments.

We organized the research in this way because of our interest in developing a translation tool that would make the field of police evaluation research meaningful to practitioners. Hence, we did not restrict ourselves to selecting only those studies that involved randomized controlled experiments, although we do include in our tool the ability to examine only those studies that use more highly rigorous evaluation methods. We also recognize criticisms of vote counting in research syntheses (e.g., Wilson 2001) and do not suggest that a count of studies in a particular area of the Matrix provides definitive conclusions about "what works" in policing. Rather, this approach allows us to develop some initial generalizations about the state of policing research and the types of strategies that appear most effective. At the same time, it presents the research in a way that is more accessible and translatable for both researchers and practitioners. In future work, researchers might apply meta-analytic techniques to quantify effects from strategies falling into different areas of the Matrix more precisely. Researchers might also create similar matrices for studies assessing different types of policing outcomes (e.g., police legitimacy, use of force, discretion).

Through this generalization, the results of our Matrix, as well as the tool itself, have numerous implications for research and practice. Most obviously, the results can guide police agencies in the assessment and selection of strategies. As one example, we can consider how the Matrix might inform the development and

application of strategies to combat auto theft. While an agency might use traditional method—such as lookout lists of recently stolen vehicles, general patrol and random license plate checks, reactive investigation of auto thefts, and/or the use of decoy vehicles—the Matrix suggests approaches that are more fruitful. Given the evidence for the efficacy of place-based approaches to policing, an agency might direct its crime analysts to identify micro-hot spots of stolen and recovered vehicles. The agency might then focus directed patrol and the use of license plate reader devices on these hot spots (e.g., Taylor et al. 2010). Or, if agencies wish to address violent co-offenders or gangs, a general, more reactive policing approach may be less effective than examples found in the more highly proactive, specific portion of the Matrix. And yet another example: police leadership that wishes to transition its first and second line supervisors toward a more evidence-based approach might incorporate the Matrix into its promotions process. After training a force on "what works" and also in using the Matrix, supervisors' tactical portfolios might be mapped within the Matrix to determine the alignment of that portfolio with the evidence. A similar exercise could be carried out to assess a unit, a police chief, an agency more generally, or even for any one of these entities to assess themselves. Lum (2009) and the Matrix web site outline in detail how agencies might use the Matrix to inform primary sectors of policing, including (1) tactical and strategic development of crime reduction interventions in different units; (2) promotions, assessment, and accountability systems; (3) managerial and leadership arenas such as Compstat; (4) recruit training and in-service; and (5) crime analysis, research, and planning.

In addition, the Matrix can provide guidance to practitioners, researchers, and funders of research as to what types of evaluations are needed and useful. First, it enables us to see where researchers have amassed the most and the highest-quality evidence in terms of programmatic dimensions that are meaningful to practitioners. For example, the policing of gangs is a high-priority issue for police, yet very little strong evaluation research exists in the "groups" slab of the Matrix to meet this demand for evaluation. Second, it facilitates strategic assessment of approaches that are central to current innovations and police reform. The significant differences between the effectiveness of strategies along the key dimensions of the Matrix (e.g., place-based versus individual-based approaches) highlight the potential efficacy of different strategies and point to areas where research can make the most impact. Further, by illustrating the interactions between key strategic dimensions of police interventions, the Matrix can reveal more about the types of focused or proactive approaches that work best and the types of targets for which they are most beneficial. In turn, these intersecting dimensions can provide the skeletal base for the creation of strategies at various levels of policing.

Additionally, organizational tools like the Matrix can also be used as a "common ground" for conversations between researchers, police practitioners, and funding agencies when collaborating to evaluate, study, and ultimately reduce crime. In many ways, the Matrix builds on officer "experience" by connecting to officers with familiar vernacular. For example, a police agency may be interested in testing certain types of interventions, such as crackdowns on gangs or illegal gun carrying. The researcher, however, may be interested in improving the quantity of high-quality evaluations in the proactive place-based regions of the Matrix, or in conducting more rigorous experiments of neighborhood-level policing. In this scenario, the Matrix

could be used to elicit discussion and negotiation between the researcher and the police agency in a way that keeps the agency grounded in evidence-based regions but that does not divorce the police researcher from the real needs of the police agency. Solutions might thus include a quasi-experimental study testing pulling-levers approaches in multiple gang territories, or perhaps a randomized repeated measures study of crackdowns on gun carrying in high-risk patrol beats.

Further, agencies funding research and/or programs—such the National Institute of Justice, the Bureau of Justice Assistance, and the Office of Community Oriented Policing Services (COPS)—could potentially use tools like the Matrix to fund high-quality research and interventions in strategic ways that facilitate evidence-based practice. Such agencies might give priority, for example, to "low-risk" funding that would support increasing the quality of programs and research in intersections and realms of the Matrix where studies have already shown promising results. "Medium risk" funding might support research in areas of the Matrix where there has been little or no research but that are closer to more promising realms. For example, studies of group interventions that are only moderately proactive or that focus on known groups of offenders may fit here. Finally, "high risk" programs and research would fall within domains of the Matrix that have shown little promise or even backfire effects. In this way, our Matrix and similar tools could be used to facilitate evidence-based *funding* as well as evidence-based practice.

Finally, while speculative, we believe that this visualization of the research evidence may serve as a particularly effective tool with which to translate research for practitioners and other non-technical audiences, a goal that cannot be divorced from the intensions of evaluation. Scholarly assessments of research, both narrative and quantitative, are no doubt important and essential, but visualization and, further, experiential application of that visualization can be key approaches to learning, as education researchers have discovered (Clark et al. 2005; Mayer 2003). The Matrix also addresses key dimensions of knowledge utilization identified in literature on scientific dissemination (National Center for the Dissemination of Disability Research 1996; Nutley et al. 2007). More specifically, research is more likely to be used in practice when it is timely, accessible, and user-friendly, and when it is packaged attractively, all of which the Matrix accomplishes.

Of course, the Matrix is far from being the cure-all to institutionalizing scientific research and evidence into police practice. But, efforts like this may represent the "next step" in translating scientific evidence into practice and institutionalizing evidence-based policing. Indeed, there are major and well-known cultural, ideological, political, financial, and practical barriers in policing that regularly block change, science, innovation, new ideas, evidence, and systematic information at every turn (Lum 2009; Sherman 1984, 1998; Weisburd et al. 2003b; Willis et al. 2007). Incorporating evidence into practice requires not only building upon the already-existing infrastructure for evidence-based approaches, but also creating a stronger capacity in agencies to implement effective interventions and to maintain the practice of evidence-based policing. Practical changes must occur within police agencies for evidence-based policing to be used, including drastically increasing the number and skill sets of crime analysts and more freely interacting with academic and evaluation researchers. At the same time, researchers can perhaps facilitate these changes through scientific assessment and translation of the sort that we have presented here.

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