Street-Level Drug Law Enforcement: A Meta-Analytic Review

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STREET-LEVEL DRUG LAW ENFORCEMENT:
A META-ANALYTIC REVIEW

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ABSTRACT

Background:
An atmosphere of ineffectiveness regarding the ability of police to address crime problems in general and street-level drug problems in particular prevailed in the 1980s. Law enforcement tactics in the 1980s were typically reactive, unfocused and generally failed to disrupt street-level drug market activity. Development of focused proactive policing strategies during the 1990s, such as problem-oriented policing and partnerships with third parties, led to a renewed faith in the capacity of the police to efficaciously deal with street-level drug problems.

Objectives:
To utilize meta-analytic procedures to assess the relative effectiveness of police-led drug law enforcement interventions. Specifically, we examined the relative effectiveness of a number of policing approaches, including problem-oriented policing, community-wide policing, and hotspots policing compared to the standard, reactive mode of drug law enforcement that dominated police practice until the 1990s.

Search Strategy:
We identified relevant studies using a guided, iterative search process utilizing appropriate keyword searches of major databases from various disciplines. In addition, we hand searched key journals in the law enforcement literature, trawled discipline relevant websites, consulted key researchers, postgraduate students, and criminal justice librarians, and cross-checked the reference list of each identified study.

Selection Criteria:
We restricted our meta-analysis to interventions initiated, managed and/or implemented by the police to reduce or prevent *illicit* drug use, drug dealing and associated problems at drug dealing places. We investigated the impact of these interventions on a number of outcome variables, including drug outcomes using drug-related calls for service and reported offenses, as well as reported offenses and calls for service outcomes for non-drug specific outcomes such as property crime, violent offences, and disorder. The review imposed no time restrictions (i.e. publication year) and we included unpublished literature (i.e. dissertations, reports, etc) and non-English language studies. Included studies all needed, at a minimum, a pre-test/post-test, comparison group design. Our review included quasi-experimental designs given the lack of methodologically sound evaluations in this area.

Data Collection & Analysis:
We used meta-analytic techniques to investigate the effectiveness of various drug law enforcement approaches on the outcome variables of interest. Specifically, we used the odds ratio to assess pre-test to post-test intervention effects, using a random effects model. We analysed separately the effect of drug law enforcement on each of the outcomes of interest.

Main Results:
Our results show that problem-oriented and community-wide policing approaches are more effective at reducing drug calls for service and drug incidents than law enforcement approaches that target drug hotspots. We also find that problem-oriented

policing is more effective than community-wide policing in dealing with both drug-related and total calls for service. But the simple tactic of geographically focusing law enforcement resources on drug hotspots is a marked improvement over the deployment of "standard" law enforcement tactics (such as preventive patrols) that are geographically unfocused.

In regards to non-drug outcomes, community-wide policing approaches tend to reduce disorder-related activity more than law enforcement-only activities that target drug hotspots. Hotspots approaches aimed at disrupting street-level drug market have a more desirable impact on person (e.g. street assaults) and property crime (motor vehicle theft) outcomes than problem-oriented or community-wide policing approaches.

Reviewer's Conclusions:
Our results reveal that geographically targeted problem-oriented policing interventions, involving cooperative partnerships between police and third parties, tend to be more effective at disrupting street-level drug markets than policing efforts that involve partnerships but are spread across a community. Yet our results suggest that both problem-oriented policing and community-wide partnerships are more effective at disrupting street level drug markets than traditional, law enforcement-only interventions, whether they are focused on hotspots or not. Our results suggest that rather than simply increasing police presence or intervention (e.g. arrests) at drug hotspots, street-level drug law enforcement should (1) focus on forging productive partnerships with third parties, (2) target drug hotspots rather than spreading intervention efforts across neighborhoods, and (3) make efforts to alter the underlying criminogenic conditions that exist in places with street-level drug market problems.

BACKGROUND

Drug law enforcement is a central feature of drug policies throughout the world. In 2002, over 50 percent of the total U.S. federal expenditure on the control of illegal drugs was spent on domestic law enforcement. Similarly, in Australia, the Federal Government's illicit drug control plan provides significant resources for law enforcement worth more than $210 million, or 41 per cent of the total funds allocated (Howard, 2000; Moore, 2005). The proportion of expenditure on drug law enforcement is much higher in the UK: in the late 1990s about 75 percent of the drug misuse budget in the UK was spent on law enforcement (Royal College of Psychiatrists, 2000).

Caulkins (2002) outlines a number of key factors that shape the reasons why drug law enforcement has been, and continues to be, a primary component of national drug policies. First, police can adapt and respond quickly to local drug problems; second, law enforcement efforts can be tailored to specific types of drug problems; third, policy makers believe that drug law enforcement can reduce supply, either by increasing the risk of sanctions to the sellers (thereby increasing prices) or by increasing the risk of sanctions to users, thereby reducing the likelihood of initiation. Police throughout the world use a range of strategies to respond quickly to emerging drug problems with the aim of reducing supply. Some street-level drug law enforcement tactics include crackdowns, raids, buy-busts, third party policing, and problem-oriented policing.

Our paper presents a meta-analysis of studies evaluating street-level drug law enforcement interventions. In our paper we utilize Weisburd and Eck's (2004) conceptual classification of generic law enforcement tactics to compare and contrast

four drug law enforcement approaches: (1) community-wide policing activities that involve partnerships with non-police agencies and use a wide array of diverse interventions targeted at relatively large areas, such as across entire communities or neighborhoods; (2) problem-oriented policing activities that are geographically targeted at drug hotspots, involve partnerships with non-police agencies, and use a wide array of interventions; (3) hotspots policing that uses traditional police tactics such as crackdowns and raids but are geographically focused on drug hotspots; and finally, (4) standard, traditional approaches to drug law enforcement that are geographically unfocused and rely principally on law enforcement resources (e.g. routine preventive patrols, arrests) [1].

Our paper examines evaluations of these different approaches to street-level drug law enforcement to determine the most effective approach for reducing drug and related crime problems. We ask whether or not Weisburd and Eck's (2004) general conclusions about law enforcement effectiveness are found when we apply the conceptual model to specifically review drug law enforcement approaches. We begin by comparing and contrasting the various police-led approaches for disrupting street-level drug markets and then we describe our search strategy and inclusion/exclusion criteria. Our meta-analytic approach is explained, followed by presentation of our results and a discussion of the policy implications and limitations of our research.

<div align="center">**STREET-LEVEL DRUG LAW ENFORCEMENT**</div>

In 1979, Gary Cordner noted that "police patrol work includes two principal components: one is reactive… and one is proactive*"* (1979, p.59). Traditional, reactive police work was typically described as being unfocused and involving patrol

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[1] The evaluations uncovered in our review generally used one of either community, problem or hotspots policing compared against the standard, unfocussed approach to drug law enforcement. An exception is the Weisburd and Green (1995) study that compared the hotspots policing using traditional enforcement strategies only versus hotspots policing using the problem-oriented policing approach.

officers responding to calls for service. Proactive police work typically referred to self-initiated activities during uncommitted patrol time. The conceptual distinction between proactive and reactive police work remained a dominant way to differentiate much of what the police do for many years. But the proactive/reactive distinction became increasingly wanting in efforts to distinguish the differences between the growing array of police interventions that began to flourish during the "Community Era" of policing in the late 1980s and 1990s (see Kelling & Moore, 1988). By 2000, the National Research Council (NRC) of the National Academy of Sciences convened a special committee of police experts to harness what we know works (and what we know doesn't) in policing (see Skogan, 2004; Skogan & Frydl, 2004). One outcome from the NRC deliberations was a much-needed new conceptualization of police approaches to crime control (see Weisburd and Eck, 2004). Weisburd and Eck (2004), in their narrative review of the relative effectiveness of different approaches to law enforcement, developed a typology of approaches highlighting two dichotomies: one relating to the *diversity of approaches* employed, and the other the *focus of the approach* (see Figure 1).

Figure 1: Typology of Policing Approaches (from Weisburd and Eck, 2004).
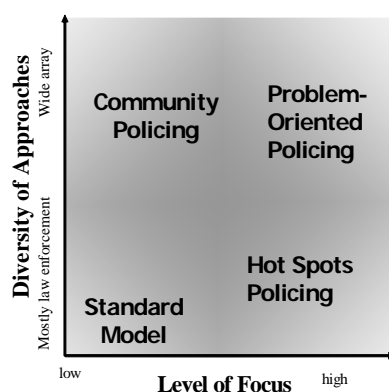
The first conceptual dimension identified by Weisburd and Eck (2004) is the "Level of Focus" ranging from crime control tactics that are unfocused (i.e. tactics that cover large geographic areas that neither focused on repeat offenders or repeat victims) to those tactics that are highly focused (i.e. tactics that target hotspots of crime, repeat offenders, repeat victims, repeat callers to the police). The second dimension identified in Weisburd and Eck's (2004) conceptual model is the degree to which police-led crime control tactics involve a wide array of intervention approaches, involving partnerships with non-police entities.

The "standard model" of policing (see Figure 1) dominated street-level police practice until the 1980s. The approach involves unfocused strategies, relying typically on traditional law enforcement practices and including tactics such as rapid response to calls for service, routine patrol throughout a community or increasing the number of police officers across a jurisdiction. Weisburd and Eck (2004) note that there is little empirical support for this generic, traditional approach to policing.

During the 1980s and into the 1990s, there was an innovative shift in policing strategies that saw the development of new approaches to law enforcement including directed patrols at crime hotspots, community policing and problem-oriented policing. Hotspots policing strategies, like the standard model, consist predominately of law enforcement tactics, however the hotspots approach is strategically focused at reducing problems in small places (hotspots) with high concentrations of crime. In their review of the law enforcement literature, Weisburd and Eck (2004) argue that hotspots policing is an approach with strong empirical support for reducing crime and disorder problems.

A variety of tactics identified as either "community policing" or "problem-oriented policing" represents the contemporary shift towards multi-agency collaboration in dealing with crime problems. These approaches use a wide array of intervention approaches that typically involve partnerships with non-police agencies. The vertical axis on Figure 1 clearly differentiates community and problem-oriented policing practice from law enforcement-only approaches. The further distinction that Weisburd and Eck (2004) draw between the two partnership approaches (community versus problem-oriented) is the *level of focus*. Community-wide policing interventions typically adopt a broad multi-agency approach, paying little attention to targeting repeat offenders, repeat victims or geographic concentrations of crime in a given jurisdiction. By contrast, problem-oriented policing typically use partnership approaches that focus resources to concentrations of a problem: either concentrations of problem people (victims, offenders or callers) or concentrations of problem places (i.e. those geographic locations, identified as hotspots of crime, which generate a disproportionate amount of a community's problems). Interventions aimed at improving police-citizen relationships in a neighborhood, such as the "Weed and Seed" program, is an example of a community-wide policing initiatives. Problem-oriented policing tactics involve careful analysis of the underlying criminogenic factors that lead to crime problems, development and implementation of tailored responses and then the use of an assessment feedback loop to determine whether or not the interventions reduced the problems. Problem-oriented policing can be geographically focused, it can be focused on problem individuals, and the approach typically involves the forging of partnerships. According to Weisburd and Eck (2004), while community-wide policing approaches have been shown to reduce fear of crime among the community, the evidence for its impact on crime and disorder is less than

consistent. On the other hand, there is a consistent and growing body of empirical support for the effectiveness of problem-oriented policing approaches in reducing crime, disorder and fear.

OBJECTIVES

Our meta-analytic review of street-level drug law enforcement adopts Weisburd and Eck's (2004) conceptual model that has been used to describe law enforcement approaches to crime control in general. In our study, we seek to empirically determine the types of approaches to drug law enforcement that are most effective at disrupting street-level drug markets. We use drug outcomes and related categories of crime (such as disorder, property and person) to assess the impact of different types of police-led approaches to street-level drug market activity.

SEARCH STRATEGY

We identified relevant studies using a guided, iterative process utilizing appropriate keyword searches of major databases from a number of disciplines including criminology and the law, politics and government, psychology and behavioural science, education, and health[2, 3]. In addition to databases available through Griffith University (Australia), Phyllis Schultze, the librarian at Rutgers University searched online US databases (e.g., Catalog of U. S. Government

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[2] These databases cover published and unpublished material, and unpublished studies. A number of databases (Applied Social Science Index and Abstracts (ASSIA), Acompline (Greater London Authority), Planex (IDOX plc), SOLIS (German), and Inside Web) were not accessed due to financial constraints of the project.

[3] Keywords included drug, police/ing, law enforcement, hot-spots, problem-oriented, community policing, third-party, intelligence-led, drug control, civil remedies, nuisance abatement, undercover drug buy/operation, sting, crackdown, raid, buy-bust, drug sweep, closedown, interdiction, directed patrols, substance use/misuse/abuse, drug free zones, prevention, zero tolerance, dealing, street-level market, open-air drug market, drug market, trafficking, neighbourhood renewal, expiation notice, crop eradication/substitution, arrest referral, diversion, cautioning, supply/demand/harm reduction, reduction, rave, party drug, neighbourhood enhancement, neighbourhood revitalisation, situational crime prevention, crime prevention through environmental design. Where appropriate, truncation was used and/or spelling was altered (e.g. neighbourhood/neighborhood, revitalisation/revitalization).

Publications (CGP); International Bibliography of the Social Sciences; PolicyFile) to obtain studies that were not accessible in Australia. We hand searched the reference lists of all retrieved meta-analyses, systematic reviews, and literature reviews of drug law enforcement to find additional, relevant evaluation studies and we hand searched key journals in the area of law enforcement to identify recently published relevant articles. We used similar search phrases employed in the database searches (see footnote 3) to retrieve relevant studies from a number of relevant Internet sites (e.g., Home Office, COPS, AIC, BJA, the POP Centre). Consultation with Phyllis Schultze of Rutgers Library and contact with key drug law enforcement researchers and postgraduate students, aided the retrieval of unpublished literature ensuring the review was as comprehensive as possible.

The search process was iterative, beginning with broad search terms such as "police & drug" before moving onto more complex search terms. While this process returned a large number of hits in the early stages of the searches (with many articles being irrelevant), it was deemed to be the most comprehensive approach. Where applicable, we used database thesauri to indicate additional relevant search terms.

SELECTION CRITERIA

Our meta-analysis includes interventions initiated, managed and/or implemented by police to reduce or prevent *illicit* drug use, drug dealing and the associated problems at drug dealing places[4]. We excluded judicial, correctional and treatment interventions or anti-drug strategies run exclusively by non-police personnel (e.g., customs, army). We included interventions that targeted, at least in part, illicit drugs

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[4] It was decided to *not* include police-led school-based drug education programs (such as Project DARE). For a review of these programs see Soole, Mazerolle & Rombouts (2005). We also did not include police interventions aimed at individuals, such as arrest referral. Our decision to exclude these types of people-oriented interventions (as opposed to place-oriented interventions) was that the settings, circumstances and outcome measures for these interventions were generally quite different to the outcome measures and circumstances of the enforcement efforts aimed at places (communities or hotspots).

(e.g., heroin, cocaine/crack, methamphetamine, cannabis). We did not include

evaluations of strategies targeting illegal use or sale of licit substances such as

alcohol, tobacco, or solvents (e.g., "black market" operations) or those studies that

evaluated illicit use or trafficking of prescription drugs. The review was not restricted

to a specific time period. Included studies comprised published and unpublished

works (e.g., journal articles, theses/dissertations, reports, books, conference papers).

We obtained relevant studies written in languages other than English[5]. Given the

limited number of methodologically sound studies identified during the retrieval stage

of the project, our meta-analysis search for evaluations was not restricted to

randomized, controlled studies or studies that matched treatment and control groups

statistically. However, quasi-experimental studies were required to have pre-post,

comparison group designs to be eligible for inclusion in our meta-analysis.

In total, we identified 167 studies from our search methodology. We were able to

retrieve 155 studies evaluating 132 separate interventions[6]. Of these, we identified

just 14 studies that met our search criteria for inclusion in the meta-analytic review of

street-level drug law enforcement. That is, studies were only included in the meta-

analytic review if they (a) targeted street-level drug problems (as opposed to law

enforcement interventions that were aimed at property or person categories of crime

and we did not include drug interventions by the police that targeted wholesale,

manufacture or importation problems); (b) were police-led interventions (as opposed

to those interventions led by customs agencies or treatment providers); (c) used

outcome measures that reported changes in the number of calls or offenses reported at

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[5] We note a bias in our data towards U.S. research, despite our attempts to include studies from other parts of the world. This bias is, we suggest, a result of considerably more investment in the U.S. for higher quality law enforcement evaluations (with treatment and control groups) than investments made in this type of research elsewhere.
[6] We provide a narrative review of the entire population of the 132 studies retrieved in Mazerolle, Soole and Rombouts (forthcomimg). An annotated bibliography of the 132 studies is included in Mazerolle, Soole and Rombouts (2005).

"places" rather than self-reported drug use by individual people (i.e. this criteria excluded studies that evaluated arrest referral programs); (d) utilised pre-post, comparison group designs; and (e) contained sufficient data for the calculation of an effect size[7].

Coding study characteristics

Design, sample, setting, and intervention particulars were coded for each study as well as a summary of the main findings and any limitations or considerations regarding the study. Two research assistants conducted the searches, retrieved relevant studies and double coded the studies. Eligibility assessment was based initially on careful examination of article abstracts. When sufficient information to determine eligibility of the study was not provided, the full text was retrieved. To resolve discrepancies regarding eligibility the two researchers consulted with each other and with the project leader.

Appendix A outlines the study and design characteristics of the evaluations included in our meta-analyses. Four studies evaluated hotspots policing interventions, five evaluated problem-oriented policing approaches, and five evaluated community-wide policing initiatives. Our included studies were either technical reports (42.9%) or refereed journal articles (42.9%). Adhering to the criteria outlined earlier, all studies included in the meta-analytic review utilised pre-post, comparison group designs. We note that in all but the Weisburd and Green (1995) evaluation, the comparison group received the standard, unfocused model of policing including routine patrols, surveillances and arrests. By contrast, the Weisburd and Green (1995) study represented a test between hotspots policing using traditional law enforcement approaches (e.g. directed patrols) versus the stepwise scanning, analysis, response and

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[7] While 14 studies were included in the meta-analysis, Sviridoff, et al (1992) contributed two independent treatment-comparison contrasts, bringing the total number of treatment-comparison contrasts to 15.

assessment approach of problem-oriented policing geographically targeted at street-level drug markets. Less than a quarter of studies ($n = 3$; 21.4%) randomly assigned drug markets to control and experimental conditions, and an additional three studies (21.4%) used statistical matching when choosing comparison areas[8]. The majority of studies ($n = 9$; 64.3%) had post-test measurement periods that occurred between 12 and 23 months after commencement of the intervention[9]. Five studies (35.7%) had post-test measurements within a year of the implementation date. Equal numbers of studies had post-test measurement periods that occurred during the course of the intervention as those with official post-test follow-up periods. Interestingly, of the five studies with short-term post-test measurement periods (e.g. less than 12 months), four evaluated relatively short-term programs (e.g. three to six months in duration). Finally, the majority of studies (85.8%) had equivalent pre- and post-test measurement periods[10].

DATA ANALYSIS

The Meta-Analytic Approach

Meta-analytic techniques synthesize research findings from a wide range of studies that use similar outcome variables to assess whether or not an intervention works. We used a meta-analytic approach to compute effect sizes from the evaluation studies and we compared research findings from multiple studies using the odds ratio (see below) as our common metric (see Lipsey & Wilson, 2001). Our meta-analysis

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[8] In Giacomazzi (1995) comparison sites were matched to experimental sites on size, population and land use. They also shared similar features such as a major transit centre, concentration of older, residential areas, large transient population, similar numbers of taverns and clubs, and numbers of social service programs. While the sites had comparable pre-intervention rates of burglary and rape, the comparison site had lower pre-intervention rates of drug arrests and robberies.

[9] All except one of these studies had a 12-month follow-up. Three studies also had a 24-month follow-up period, in addition to the 12-month follow-up period.

[10] The two studies with non-equivalent pre-post measurement periods both had longer post-test measurement periods. Thus, the effectiveness of the program would have been underestimated if anything. Analyses involving these studies were run with and without the inclusion of these studies. There were no statistical differences between analyses and thus the inclusion of these studies is not assumed to have a negative impact on the results.

investigates the impact of a variety of street-level drug law enforcement strategies on a number of outcome variables. Studies were first divided into one of three categories based on policing approach: (a) hotspots policing (e.g., raids, crackdowns, buy-bust operations); (b) problem-oriented policing (e.g., drug nuisance abatement, civil remedies); or (c) community-wide policing (e.g., Weed and Seed). Weisburd and Eck's (2004) fourth category of policing – the standard model – is included in our study as the comparison group[11] (for an exception, see Weisburd & Green (1995) who include hotspots policing with traditional enforcement only as the comparison to hotspots policing using a problem-oriented policing approach).

To measure the impact of the various approaches to drug law enforcement our analysis sought to investigate the effect of the evaluated intervention on reported offense rates and calls for service[12, 13]. Offense rates and calls for service outcomes were further divided into (a) drug related, (b) social disorder related, (c) offenses and calls for service about incidents against the person[14], and (d) property crime related[15]. Separate meta-analyses were conducted for each outcome category where two or more effect sizes from independent studies existed.

Past research (see Wilson, Gottfredson, & Najaka, 2001) has found, by modeling statistical dependency, that valuable information can be attained by relaxing the

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[11] The use of the standard model as the typical control group intervention in our meta-analysis means that our control areas are likely to show an effect. Our tests, therefore, are not about police-led interventions that aim to disrupt drug market activity versus no intervention, but rather a test of different types of police-led interventions compared to the standard police approach.

[12] Arrest rates were excluded as an outcome measure given the ambiguity associated with assessing the impact of an intervention from such a measure. Specifically, some interventions are developed with the aim of increasing arrests while others seek to decrease arrests. Further, some interventions will seek to initially increase rates of arrest before an expectant decline.

[13] In the present meta-analysis it was decided a reduction in an outcome (calls for service, offenses) would represent intervention success. This is not to be accepted without caution however (see Mazerolle et al, 2000), and it has been noted previously that: "determining which direction of the change actually is an indicator of program success is problematic" (Giacomazzi, 1995, p.279).

[14] Offenses against the person included both violent offenses (e.g. assaults, robbery, murder, etc) as well as sexual offenses (e.g. rape, attempted rape, sexual assault, etc).

[15] Occasionally for each of these outcomes, individual effect sizes from studies were combined (eg. for one study the effect sizes for reported assault, robbery and sex crime offenses were combined to calculate an overall offenses against the person effect size for that study).

assumption of independence so independent treatment groups sharing a common

comparison group can be evaluated separately, rather than attempting to collate

findings from multiple treatment-comparison contrasts to obtain a single effect size

from a study. Given the dearth of high quality evaluations in the area of drug law

enforcement, we used the treatment-comparison contrast as the unit of analysis for the

current meta-analysis rather than adhering to the standard approach where an

individual study participant contributes data to one effect size per meta-analysis only

so as not to violate the assumption of independence[16] (Lipsey & Wilson, 2001).

Calculation of intervention effects

There is a tendency for the law enforcement evaluation studies identified in our

search to report incident data for two groups, the intervention and comparison groups,

at pre- and post-intervention periods. Consequently, the odds ratio effect size was the

effect size of choice for the current meta-analysis[17]. It should be noted however that

the application of the odds ratio in this meta-analysis is atypical. Generally, the odds

ratio allows for a comparison between the intervention and comparison groups in

terms of the change in the relative odds of an outcome using independent observations

(e.g., likelihood of an event versus the likelihood of a non-event) occurring as a result

of the implementation of an intervention (Lipsey & Wilson, 2001). As applied here,

the odds ratio is used to assess the differential rate of an outcome (e.g., offense or

calls for service) in experimental and comparison areas following an intervention,

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[16] One exception was a study (Sviridoff et al., 1992) that was included in the current meta-analysis evaluating the effect of an intervention (TNT) in two independent police beats compared to a common comparison beat. While these two treatment-comparison contrasts shared a common comparison group the intervention groups were independent.

[17] The standardised mean difference effect size (*d*) was not used given the tendency for law enforcement evaluations to *not* report standardised scores (standard deviations or standard errors, etc) - necessary pieces of information if *d* is to be calculated. Furthermore, according to Lipsey and Wilson (2001), conversions of *d* to odds-ratios are generally unreliable and thus studies for which *d* could be calculated, but odds-ratios could not, were excluded. Importantly, there were only a small number of studies that would have been excluded on this premise, and these studies would have been excluded anyway because they did not have pre-intervention data or did not have a comparison group.

relative to the rate of the outcome prior to the implementation of the intervention in those areas. As such, the odds ratio was calculated using the following formula:

$$OR \ = \ \frac{f_{post\ c}\ /\ f_{pre\ c}}{f_{post\ e}\ /\ f_{pre\ e}}$$

Where: f represents the frequencies of the experimental or comparison groups (denoted by the subscript e and c, respectively), at pre- and post-intervention

The odds ratio is centered around one, with values between zero and one suggesting a negative intervention effect, 1 indicative of no intervention impact, and values larger than one indicative of a positive intervention effect[18] (Lipsey & Wilson, 2001).

Typically, if the 95% confidence interval around the odds ratio does not contain one, the effect is statistically significant at the 0.05 level. However, due to the fact that our atypical odds ratio violates the assumption of independence (i.e. including the before and after for each group), the formula for the calculation of the standard error of the odds ratio cannot be applied with confidence. Consequently, the resultant confidence intervals and p-values for significance testing also may not be accurate as it cannot be claimed with certainty that our data conform to a Poisson distribution. Based on advice from the Campbell Collaboration "Method's Editor" and reviewers of this paper (David Wilson, personal correspondence, March 9, 2007), we decided to *not* focus our interpretation of our results on significance testing. Instead we established an "odds ratio benchmark" against which to judge our obtained effect

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[18] A positive odds-ratio can be obtained in a number of ways including: (a) a change in the outcome variable in the desired direction in the experimental group and a change in the outcome variable in an undesired direction in the comparison group; (b) a change in the outcome variable in the desired direction in the experimental group that is greater than a change in outcome variable in the desired direction in the comparison group; or, (c) a change in the outcome variable in an undesired direction in the experimental group that is *not* as great as a change in the outcome variable in an undesired direction in the comparison group. The inverse is true for negative effects.

sizes. This was done by running a series of simulations using the typical sample sizes from the studies included in our meta-analyses. Essentially, these simulations demonstrated that, while controlling for the behaviour of the control areas, an odds ratio effect size of 1.15 was indicative of "practical" significance[19]. Our obtained odds ratio effect sizes were therefore compared against this benchmark when assessing their importance.

Random Effects Model

The meta-analyses were conducted using a random effects model. The random effects model calculates variance considering both between study variance and within study variance, whereas only within study variance is used to compute variance under the fixed effects model. If no between-study variability exists the computations from the fixed and random effects models will not differ. The random effects model was chosen for a number of reasons. First, the random effects model is a more conservative estimate of variance and reduces the likelihood of overestimating the effect of an intervention. The confidence intervals computed using the random effects model are generally wider, and the resulting *p*-value is therefore less likely to be significant. Second, random differences between the studies were hypothesized, and thus the fixed effects model would have served to underestimate the variance, and in turn overestimate the effect. Finally, the fixed effects model is not considered to be reliable when only a small number of effect sizes contribute to the meta-analysis, as was the case in the current study (Song, Sheldon, Sutton, Abrams, & Jones, 2001).

Moderator Analysis

The analog-to-the analysis of variance method (see Lipsey & Wilson, 2001) was used to investigate the effects of a number of variables hypothesized to moderate the

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[19] In our forest plots we present confidence intervals around each of our obtained effect sizes while cautioning the reader that these may not be accurate.

impact of drug law enforcement interventions on the outcome variables. This approach compares the effect size distributions corresponding to different levels of a given (categorical) moderator variable. The moderator analysis therefore allowed a more systematic evaluation of those variables that may have influenced the obtained effect sizes. Of particular interest was the effect of policing approach. That is, our key question to answer was whether or not hotspots, community-wide and problem-oriented policing initiatives had differential impacts on drug, crime and disorder outcomes. Other moderator variables examined included intervention implementation year[20], publication type[21], study design[22], length of follow-up period[23], and methodological rigor.

Methodological Rigor

We coded methodological rigor of the included studies based on the design of the study (e.g. random assignment, versus statistical matching, versus non-equivalent quasi-experiment), but also taking into account design "flaws" such as non-equivalence of pre and post test measurement periods. Our methodological rigor scale was adapted from Health Canada's (2004) review of treatment and rehabilitation interventions for driving while impaired offenders (see below).

Ranking	Characteristics
5	Randomised experimental design (groups comparable at pre-intervention)
4	Randomised experimental design (noticeable differences between groups at pre-intervention)

[20] Intervention implementation year refers to the first year the intervention began operating and was coded as being implemented either (a) prior to 1990, (b) between 1990 and 1994, or (c) between 1995 and 1999. None of the evaluated interventions began implementation from 2000 onwards.
[21] Publication type was split into two categories: (a) peer reviewed journal article or (b) other – included six reports, one book chapter, and a dissertation.
[22] Study design was split into three categories: (a) random assignment, (b) matched comparison, or (c) non-equivalent comparison.
[23] Length of follow-up period was split into two categories: (a) short-term outcomes (less than one year) and (b) long-term outcomes (one year to 23 months).

| 3 | Matched comparison quasi-experimental design (groups comparable at pre-intervention) |

| 2 | Matched comparison quasi-experimental design (noticeable differences between groups at pre-intervention) |

| 1 | Non-equivalent comparison, quasi-experimental design (groups comparable at pre-intervention) |

| 0 | Non-equivalent comparison, quasi-experimental design (noticeable differences between groups at pre-intervention) |

All studies were assessed based on this six-point scale. In addition, each study was examined for methodological flaws such as when the post-intervention measurement occurred while the intervention was still being implemented in the targeted area/s or if the post-intervention period was longer than the pre-intervention period leading to an underestimate of the impact of the intervention. We deducted a half a point from the scale score for each methodological shortcoming such that the methodological rigor scale leading to a final rigor range from 5 to -1 with intervals of 0.5, where 5 is the highest quality and –1 is the lowest quality.

Table 1 below displays the rank order to summarize the results of the methodological quality ratings for each of the included studies.

Table 1: Rank Order of Methodological Quality Ratings for Studies Included in the Meta-analyses.

Study	Quality Rating
Sherman & Rogan (1995)	5
Weisburd & Green (1995)	5
Mazerolle, Price & Roehl (2000)	5
Fritsch, Caeti & Taylor (1999)	3
Higgins & Coldren (2000)	2
Giacomazzi (1995)	2
Clarke & Bichler-Robertson (1998)	1
Harris & O'Connell (1994)	1
Sviridoff, Sadd, Curtis & Grinc (1992)	1
McElroy, Cosgrove, & Sadd (1990)	1
Smith (2001)	0.5

CFPC (1999)	0
Koper (1993)	0
Green (1996)	-0.5

As can be noted from Table 1, only three of the 14 studies received the highest methodological quality rating while the majority of studies received ratings of two or lower. Generally, this demonstrates a poor level of study quality for this group of evaluation studies.

The computer program "Comprehensive Meta-Analysis – Version 1.0.25" (Borenstein & Rothstein, 1999) was used to calculate odds ratio effect sizes and 95% CI's, and to conduct the analog to the analysis of variance tests.

MAIN RESULTS

Description of included studies

Hotspots policing

We included four studies in the meta-analysis that evaluated police efforts to disrupt street-level drug market activity using policing interventions targeting drug hotspots. In Kansas City, specialized police squads raided suspected crackhouses, securing and searching premises, detaining persons and seizing illegal goods such as drugs, weapons and stolen property. The raids were intentionally forceful and highly visible to surrounding residents to act as a deterrent (Sherman & Rogan, 1995). Similarly, Operation Blitz to Bloom, in Richmond, Virginia, involved police crackdowns focused specifically on an area with high rates of drug crime and disorder (Smith, 2001). Sviridoff, Sadd, Curtis and Grinc (1992) evaluated New York City's Tactical Narcotics Teams (TNT) that involved buy-bust operations followed by street sweeps in an effort to reduce drug activity at the street level. Finally, the anti-gang initiative, conducted in Dallas, Texas, and evaluated by Fritsch and colleagues (1999) sought to reduce street-level drug activity by instigating saturation patrol, aggressive

curfew and truancy enforcement, as well as buy-bust operations and warrant servicing in high drug dealing places. The methodological quality ratings for hotspot studies varied from 0.5 to 5 ($M = 2.38$).

Community-wide policing

A total of five evaluations of community-wide policing interventions aimed at street-level drug market activity provided sufficient data to be included in the current meta-analysis. The interventions categorized as "community-wide policing" all emphasized collaboration between police and partnerships within the community and they all focused drug law enforcement efforts at a broader neighborhood level (rather than at drug hotspots). The community-wide policing initiatives sought to improve police-citizen relationships, build neighborhood cohesion and increase contact with citizens to build trust and rapport. The programs established partnerships where non-police service providers and community members worked with police to develop, instigate and maintain drug law enforcement activities. In our meta-analytic review we included the Maryland Project, a community-oriented policing and drug prevention intervention implemented in two Maryland neighborhoods (see Koper, 1993), the Des Moines Weed and Seed program (Child and Family Policy Center, 1999), the Eastside Substance Abuse Awareness Program in Wilmington, Delaware (Harris & O'Connell, 1994), Project ROAR (Reclaiming Our Area Residences) in Spokane, Washington (Giacomazzi, 1995), and the Community Patrol Officer Program (CPOP) in New York City (McElroy, Cosgrove, & Sadd, 1990). The community-wide policing studies possessed the lowest methodological quality ratings, ranging from zero to two ($M = 0.8$).

Problem-oriented policing

We included five evaluations of problem-oriented policing initiatives in the current meta-analysis. These programs are characterized by police efforts to analyse the specifics of the drug problem and its associated nuisances in discrete places (e.g., incivilities, disorder, violence, fear of crime on street corners, in parks) and multi-agency collaboration (e.g., third party partnerships with regulators and community members). The problem-oriented policing interventions included in our meta-analytic review were all geographically focused on drug hotspots. The Jersey City Drug Markets Experiment (see Weisburd & Green, 1995) was one of five cities involved in the National Institute of Justice funded Drug Market Analysis Program. The Jersey City drug law enforcement intervention involved systematic identification of drug markets using a custom-built Geographic Information System (GIS). The intervention involved police forging partnerships with city inspectors, businesses, and citizens to close down problem places in the first instance, followed by crackdowns and saturation patrol in the drug hotspots. Attempts were made to "maintain the crime control gains" following the closedown/crackdown effort.

Oakland's Beat Health Program, including Specialised Multi-Agency Response Teams (SMART), is included in our review as an example of a problem-oriented policing approach to drug law enforcement. The Beat Health intervention involved police officers systematically identifying addresses with repeat calls for service, attempting to establish cooperative relationships with residents and businesses of problem locations, and making suggestions to aid improvement in the quality of problem sites (e.g., improving security, rectifying blight and disorder problems, contacting the appropriate city agencies regarding fire, safety, and other codes). The SMART response, a central feature of the Beat Health Program, involved the police working closely with "third parties" (such as city inspectors) to clean up the physical

conditions of the target sites (e.g., boarding up vacant buildings, getting rid of pests, and cleaning up rubbish) and issuing code violations where appropriate (see Green, 1996; Mazerolle, Roehl, & Kadleck, 1998; Mazerolle, Price, & Roehl, 2000).

Other problem-oriented policing evaluations included a drug nuisance abatement program in San Diego (see Clarke & Bichler-Robertson, 1998) and the Municipal Drug and Gang Enforcement (MDGE) program in Chicago (Higgins & Coldren, 2000) that involved police putting pressure on slumlords to clean up their properties. The police threatened arrests, organized for inspectors to cite fire and code violations, and used State laws to abate properties that were not cleaned up. Overall, two of the studies examining problem-oriented policing received methodological quality ratings of five while the mean quality rating for the problem-oriented policing studies was 2.5.

Our study seeks to systematically examine the relative effectiveness of the hotspots, community-wide and problem-oriented policing approaches compared to the standard approach to drug law enforcement using meta-analytic techniques. Our study used the highest quality studies available in the literature to answer our central research questions.

Meta-analysis results

A total of ten analyses were conducted assessing the impact of drug law enforcement on reported offenses and calls for service data for drug, violent, and property crime, social disorder, and total aggregated offenses and calls for service. In the first section of our results we present the overall impact of drug law enforcement interventions on the range of drug, crime and disorder outcomes and the specific effect of the various policing approaches on these outcomes. We present a series of tables reporting the study, the type of policing approach evaluated, the effect sizes,

upper and lower confidence levels, as well as the forest plots depicting the effect size

results.

As discussed previously, we do *not* focus our discussion on the results of our

significance tests of individual and mean effect sizes. Rather, we assess the various

effect sizes by comparing them to our odds ratio benchmark of 1.15 (see above). Our

emphasis is therefore primarily on the practical significance of our findings such that

effect sizes exceeding 1.15 are considered to constitute positive impacts and less than

1.15 are not considered to be of practical benefit.

The first meta-analysis examined the effect of the interventions on drug offenses.

As Table 2 (below) shows, the overall effect of the evaluated drug law enforcement

interventions on drug offenses exceeded our benchmark (OR=1.53). There was

significant heterogeneity between the three studies ($Q = 45.95$, $df = 2$, $p < .0001$). Both

the problem-oriented and community-wide policing interventions (rigor was 2 and 0,

respectively) showed positive impacts on drug offenses (OR=2.44 and OR=1.85

respectively), while the hotspots policing intervention (3 on the rigor scale) reported a

negative intervention effect (OR=0.87).

Table 2. Meta-analysis results of the impact of drug law enforcement interventions on drug offenses (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Community	CFPC (1999)	365 / 633	672 / 1583	1.85	1.53	2.22	.00	
Hot-spots	Fritsch, et al (1999)	1037 / 2322	637 / 1327	.87	.76	1.00	.05	
Problem-oriented	Higgins & Coldren (2000)	123 / 158	36 / 61	2.44	1.30	4.60	.01	
Combined (3)		1525 / 3113	1345 / 2971	1.53	.75	3.13	.25	

Four studies evaluated the impact of drug law enforcement on drug-related calls

for service (see Table 3). The results show an overall positive impact (OR=1.33).

Again the studies were significantly heterogenous ($Q = 29.73$, $df = 4$, $p < .0001$).

Problem-oriented policing initiatives (rigor scores were 5, 5, and -0.5) were found to

have a substantial impact on drug-related calls (OR=1.44 overall or OR=1.49 for the two studies with rigor scores of 5) while the single study evaluating the community policing approach (rigor was 1) failed to show a positive effect against our benchmark (OR=1.10) [24].

Table 3. Meta-analysis results of the impact of drug law enforcement interventions on drug-related calls for service (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Community	Harris & O-Connell (1994)	243 / 677	285 / 847	1.10	.89	1.36	.36	
Community (1)		**243 / 677**	**285 / 847**	**1.10**	**.89**	**1.36**	**.36**	
Problem-oriented	Weisburd & Green (1995)	611 / 1077	519 / 1043	1.32	1.12	1.57	.00	
Problem-oriented	Mazerolle, et al (2000)	383 / 739	581 / 1478	1.66	1.39	1.98	.00	
Problem-oriented	Green (1996)	28 / 55	807 / 1705	1.15	.67	1.97	.60	
Problem-oriented (3)		**1022 / 1871**	**1907 / 4226**	**1.44**	**1.16**	**1.77**	**.00**	
Combined (4)		**1265 / 2548**	**2192 / 5073**	**1.33**	**1.07**	**1.65**	**.01**	

As Table 4 (below) shows, there were no substantial impacts on offenses against the person observed, either overall (OR=1.06), for hotspots policing was (OR=1.06, rigor scores were 1, 5, and 3), community-wide policing approaches (OR=1.06, rigor scores were 1, 2, and 0), or for the single problem-oriented intervention evaluation (OR=1.14, rigor score was 2). We note, however, that two studies that examined hotspots policing possessed odds ratios exceeding our benchmark, suggesting a small, but desirable impact of police efforts that target drug hotspots on offenses against the person (e.g. assaults, robberies and the like).

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[24] No studies evaluating hotspots policing interventions were included in this particular meta-analysis.

Table 4. Meta-analysis results of the impact of drug law enforcement interventions on offenses against the person (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue
Community	McElroy, et al (1990)	40330 / 81696	36408 / 77034	1.09	1.07	1.11	.00
Community	Giacomazzi (1995)	25 / 59	18 / 33	.61	.26	1.45	.26
Community	CFPC (1999)	183 / 350	839 / 1555	.94	.74	1.18	.57
Community (3)		40538 / 82105	37265 / 78622	1.06	.96	1.16	.23
Hot-spots	Sviridoff, et al (1992) (70th)	609 / 1308	586 / 1192	.90	.77	1.05	.19
Hot-spots	Sviridoff, et al (1992) (67th)	753 / 1462	591 / 1241	1.17	1.00	1.36	.04
Hot-spots	Sherman & Rogan (1995)	121 / 209	96 / 189	1.33	.90	1.98	.16
Hot-spots	Fritsch, et al (1999)	4133 / 9091	3242 / 7308	1.05	.98	1.11	.16
Hot-spots (4)		5616 / 12070	4515 / 9930	1.06	.94	1.19	.38
Problem-oriented	Higgins & Coldren (2000)	150 / 283	616 / 1236	1.14	.88	1.47	.34
Problem-oriented (1)		150 / 283	616 / 1236	1.14	.88	1.47	.34
Combined (8)		46304 / 94458	42396 / 89788	1.06	1.00	1.12	.05

Table 5 demonstrates that the combined interventions did not have a substantial impact on calls for service related to offenses against the person (OR=0.97). Problem-oriented policing interventions aimed at disrupting street-level drug markets did not, as a group, demonstrate a positive impact (OR=0.97, rigor scores were both 5) on calls to the police about matters such as fights and robberies; however, the single hot-spots policing intervention evaluation had a positive impact on this outcome measure (OR=1.19, rigor was 5)[25] (see Table 5).

Table 5. Meta-analysis results of the impact of drug law enforcement interventions on calls for service related to offenses against the person (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue
Hot-spots	Sherman & Rogan (1995)	103 / 182	89 / 170	1.19	.78	1.81	.42
Hot-spots (1)		103 / 182	89 / 170	1.19	.78	1.81	.42
Problem-oriented	Weisburd & Green (1995)	2039 / 4136	2056 / 4085	.96	.88	1.05	.35
Problem-oriented	Mazerolle, et al (2000)	742 / 1462	766 / 1496	.98	.85	1.13	.81
Problem-oriented (2)		2781 / 5598	2822 / 5581	.97	.90	1.04	.35
Combined (3)		2884 / 5780	2911 / 5751	.97	.90	1.05	.44

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[25] No studies evaluating community-wide policing interventions were included in this particular meta-analysis.

A total of seven evaluations assessed the impact of drug law enforcement interventions on property offenses (see Table 6). Not unexpectedly, our results suggest that drug law enforcement interventions that target street-level drug markets do not seem to have a desirable impact on property offenses (OR=1.02). While the impact of hotspots policing was in the undesirable direction (OR=1.00, rigor was 1, 5 and 3) and community-wide policing was not found to have a positive impact (OR=1.02, rigor was 1 and 2), the effect of the single evaluation of a problem-oriented approach found a positive result on property offenses that exceeded our benchmark (OR=1.20, rigor was 2). There was significant heterogeneity between the hotspots policing evaluations ($Q = 8.71$, $df = 3$, $p < .05$), suggesting variability in their effectiveness on property crimes.

Table 6. Meta-analysis results of the impact of drug law enforcement interventions on property offenses (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Community	McElroy, et al (1990)	65268 / 130425	61457 / 124172	1.02	1.01	1.04	.01	
Community	Giacomazzi (1995)	8 / 25	9 / 28	.99	.31	3.15	.99	
Community (2)		65276 / 130450	61466 / 124200	1.02	1.01	1.04	.01	
Hot-spots	Sviridoff, et al (1992) (70th)	697 / 1362	591 / 1063	.84	.71	.98	.03	
Hot-spots	Sviridoff, et al (1992) (67th)	644 / 1209	569 / 1155	1.17	1.00	1.38	.05	
Hot-spots	Sherman & Rogan (1995)	105 / 195	109 / 199	.96	.65	1.43	.85	
Hot-spots	Fritsch, et al (1999)	7489 / 15593	7998 / 16813	1.02	.98	1.06	.41	
Hot-spots (4)		8935 / 18359	9267 / 19230	1.00	.87	1.14	.99	
Problem-oriented	Higgins & Coldren (2000)	252 / 468	1038 / 2109	1.20	.98	1.47	.07	
Problem-oriented (1)		252 / 468	1038 / 2109	1.20	.98	1.47	.07	
Combined (7)		74463 / 149277	71771 / 145539	1.02	.97	1.08	.34	

Table 7 demonstrates a lack of positive impact of the combined interventions on property crime related calls for service (OR=0.94) and there were no observable positive effects of the problem-oriented policing interventions (OR=0.92 rigor was

both 5). However, the single hotspots evaluation was found to exceed our benchmark

(OR=1.23, rigor was 5).[26]

Table 7. Meta-analysis results of the impact of drug law enforcement interventions on property crime related calls for service (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Hot-spots	Sherman & Rogan (1995)	115 / 185	99 / 173	1.23	.80	1.87	.34	
Hot-spots (1)		**115 / 185**	**99 / 173**	**1.23**	**.80**	**1.87**	**.34**	
Problem-oriented	Weisburd & Green (1995)	811 / 1556	1056 / 1948	.92	.80	1.05	.22	
Problem-oriented	Mazerolle, et al (2000)	535 / 1028	571 / 1060	.93	.78	1.10	.40	
Problem-oriented (2)		**1346 / 2584**	**1627 / 3008**	**.92**	**.83**	**1.03**	**.14**	
Combined (3)		**1461 / 2769**	**1726 / 3181**	**.94**	**.85**	**1.04**	**.23**	

Only two studies evaluated the impact of drug law enforcement on disorder

offenses (see Table 8), collectively exceeding our benchmark (OR=1.18). There was

significant heterogeneity between these two studies ($Q = 8.2$, $df = 1$, $p < .01$). The

community-wide policing approach found a positive effect (OR=1.36, rigor was 0)

while the hotspots policing approach failed to find any such effect (OR=1.05, rigor

was 3).[27]

Table 8. Meta-analysis results of the impact of drug law enforcement interventions on disorder offenses (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Community	CFPC (1999)	508 / 767	4570 / 7729	1.36	1.16	1.59	.00	
Hot-spots	Fritsch, et al (1999)	2417 / 4439	2628 / 4932	1.05	.97	1.14	.26	
Combined (2)		**2925 / 5206**	**7198 / 12661**	**1.18**	**.88**	**1.60**	**.27**	

Using our odds ratio benchmark approach to interpreting our findings, we found

no overall impact of drug law enforcement on disorder related calls for service

(OR=1.05) (see Table 9). The problem-oriented policing evaluations did not reveal an

overall desirable impact on disorder calls for service (OR=1.05, rigor was both 5) and

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[26] No studies evaluating community-wide policing interventions were included in this particular meta-analysis.

[27] No studies evaluating problem-oriented policing interventions were included in this particular meta-analysis.

the single study evaluating a hotspots policing intervention also did not reach our

odds ratio benchmark (OR=1.05, rigor was 5).[28]

**Table 9. Meta-analysis results of the impact of drug law enforcement
interventions on disorder related calls for service (by policing approach).**

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Hot-spots	Sherman & Rogan (1995)	644 / 1225	649 / 1265	1.05	.90	1.23	.53	
Hot-spots (1)		**644 / 1225**	**649 / 1265**	**1.05**	**.90**	**1.23**	**.53**	
Problem-oriented	Weisburd & Green (1995)	3257 / 6770	3559 / 7829	1.11	1.04	1.19	.00	
Problem-oriented	Mazerolle, et al (2000)	2541 / 5116	2721 / 5452	.99	.92	1.07	.80	
Problem-oriented (2)		**5798 / 11886**	**6280 / 13281**	**1.05**	**.91**	**1.21**	**.49**	
Combined (3)		**6442 / 13111**	**6929 / 14546**	**1.05**	**.96**	**1.15**	**.29**	

Table 10 shows no overall positive impact of drug law enforcement on total

offenses (OR=1.09). There was significant heterogeneity between the five studies (Q

$= 21.78$, $df = 4$, $p < .001$). While no substantial effect was found overall for

community-wide policing approaches (OR=1.12, rigor was 0, 0 and 2), a positive

impact was found for one of the community-wide policing studies (OR=1.19, rigor

was 0). The combined effect of the hotspot studies was not found to have a substantial

impact (OR=1.04, rigor was 5 and 3), yet one hot-spots study was found to make a

positive impact (OR=1.18, rigor was 5).[29]

**Table 10. Meta-analysis results of the impact of drug law enforcement
interventions on total offenses (by policing approach).**

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue	0.1 0.2 0.5 1 2 5 10
Community	Koper (1993)	61 / 123	579 / 1121	.92	.63	1.34	.66	
Community	Giacomazzi (1995)	33 / 84	27 / 61	.81	.42	1.59	.55	
Community	CFPC (1999)	3947 / 6853	30960 / 58122	1.19	1.13	1.25	.00	
Community (3)		**4041 / 7060**	**31566 / 59304**	**1.12**	**.94**	**1.32**	**.21**	
Hot-spots	Sherman & Rogan (1995)	248 / 436	212 / 402	1.18	.90	1.55	.23	
Hot-spots	Fritsch, et al (1999)	14422 / 29862	14449 / 30531	1.04	1.01	1.07	.02	
Hot-spots (2)		**14670 / 30298**	**14661 / 30933**	**1.04**	**1.01**	**1.08**	**.01**	
Combined (5)		**18711 / 37358**	**46227 / 90237**	**1.09**	**.97**	**1.23**	**.14**	

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[28] No studies evaluating community-wide policing interventions were included in this particular meta-analysis.

[29] No studies evaluating problem-oriented policing interventions were included in this particular meta-analysis.

The impact of drug law enforcement interventions on total calls for service was somewhat more positive. There were positive impacts overall (OR=1.18), as well as for problem-oriented policing interventions (OR=1.81, rigor was 5, 5 and 1) while the single community-wide policing initiative failed to exceed our benchmark (OR=1.02, rigor was 1). No substantial impact was observed for the hotspots policing evaluations (OR=1.04, rigor was 0.5 and 5) (see Table 11). We also note that there was significant heterogeneity overall ($Q = 143.89$, $df = 5$, $p < .0001$) and among the problem-oriented policing evaluations ($Q = 131.61$, $df = 2$, $p < .0001$).

Table 11. Meta-analysis results of the impact of drug law enforcement interventions on total calls for service (by policing approach).

PolicingApproach	Citation	Treated	Control	Effect	Lower	Upper	PValue
Community	McElroy, et al (1990)	1673251 / 3409624	1520996 / 3131014	1.02	1.02	1.02	.00
Community (1)		1673251 / 3409624	1520996 / 3131014	1.02	1.02	1.02	.00
Hot-spots	Smith (2001)	849 / 1886	4178 / 9287	1.00	.91	1.11	.98
Hot-spots	Sherman & Rogan (1995)	1059 / 1924	1037 / 1966	1.10	.97	1.24	.15
Hot-spots (2)		1908 / 3810	5215 / 11253	1.04	.95	1.14	.41
Problem-oriented	Weisburd & Green (1995)	6718 / 13539	7190 / 14905	1.06	1.01	1.11	.02
Problem-oriented	Mazerolle, et al (2000)	4201 / 8345	4639 / 9486	1.06	1.00	1.12	.06
Problem-oriented	Clarke & Bichler Robertson (1998)	450 / 579	102 / 294	6.57	4.82	8.95	.00
Problem-oriented (3)		11369 / 22463	11931 / 24685	1.81	1.21	2.72	.00
Combined (6)		1686528 / 3435897	1538142 / 3166952	1.18	1.07	1.29	.00

Moderator analysis results

Of interest in the current meta-analysis was the moderating impact of policing approach across a number of different outcome measures. For drug offenses, we observed a number of differences between the intervention types, even though only a single evaluation of each policing approach could be included. Both the community-wide ($M = 1.85$) and the problem-oriented ($M = 2.44$) policing interventions tended to produce better results than the hotspots policing intervention ($M = 0.87$). There was no difference between the community-wide policing and problem-oriented policing

evaluations when we examined drug offenses as the outcome measure of performance. For drug-related calls for service, by contrast, the three problem-oriented policing intervention evaluations produced more effective results ($M = 1.08$) compared to the single community-wide policing evaluation ($M = 1.02$).

Problem-oriented policing approaches were more effective ($M = 1.08$) in addressing total calls for police service when compared to the community-wide policing approach ($M = 1.02$), however no differences were observed between the problem-oriented and hotspot approaches nor the community-wide and hotspot approaches. We did not have the data to include an evaluation of a problem-oriented policing intervention in either the disorder offenses or total offenses meta-analyses. Thus, the analysis of the impact of policing approach on effect size for these categories of outcome measure concerns only community-wide and hotspots policing. In both cases the community-wide policing interventions produced more positive effects. No differences were observed for disorder related calls, offenses against the person and calls for offenses against the person, nor for property related offenses and calls.

Some of the study design characteristics contributed to differences between the observed effects. Non-equivalent comparison designs produced greater impacts than designs utilising random assignment or matched comparison sites for drug offenses ($M = 1.89$), disorder offenses ($M = 1.36$) and total offenses ($M = 1.19$). Greater effects on drug-related calls for service were associated with random assignment ($M = 1.48$). Similarly, matched comparison sites produced more positive effects on total calls for service ($M = 6.57$). Studies with higher methodological quality (rigor scores between 3.5 and 5) produced larger effect sizes for drug-related calls for service only ($M = 1.48$). Lower methodological quality (rigor scores between –0.5 and 1), however,

produced larger effect sizes for drug offenses ($M = 1.85$), disorder offenses ($M = 1.36$), total offenses ($M = 1.19$), as well as total calls for service ($M = 1.02$). Mid-range methodological quality (rigor scores between 1.5 and 3) produced larger effect sizes in total calls for service only ($M = 6.57$).

There was little evidence of an effect of length of follow-up period with only one meaningful finding across eight outcome variables with available data: greater effect sizes for disorder-related calls for service were reported amongst studies with shorter follow-up periods (less than 12 months) ($M = 1.10$).

We also examined other moderator variables to decipher the factors that contributed to the meta-analytic results. Year of intervention implementation was found to have little impact on the results. Of the eight outcomes where a moderator analysis of this variable was possible[30], intervention implementation year was an important moderator on only two: total calls for service (M (pre 1990) $= 1.02$; M (1990-1994) $= 1.10$) and disorder related calls for service (M (1990-1994) $= 1.10$) and this impact was inconsistent. Our findings show that interventions implemented at a later date appear less successful on total calls for service, yet more successful when the outcome measure is disorder calls for service. The evidence regarding the impact of publication type was also inconsistent. A moderator effect was observed for five of seven outcomes. Greater effect sizes were reported studies appearing in reports, theses, dissertations or book chapters, compared to peer reviewed publications for property offences ($M = 1.02$), person offenses ($M = 1.08$), drug offenses ($M = 1.89$), disorder offenses ($M = 1.36$) and total offenses ($M = 1.18$). Studies appearing in peer

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[30] The effect of the following moderator variables could not be investigated for the following outcomes due to a lack of variability of studies included in the meta-analyses: implementation year (drug offenses, disorder offenses), publication type (calls for service related to offenses against the person, property calls for service, disorder calls for service), equivalence of the comparison area (calls for service related to offenses against the person, property calls for service, disorder calls for service), length of the post-test period (drug offenses, disorder offenses), and methodological rigor (calls for service related to offenses against the person, property calls for service, disorder calls for service).

reviewed journal articles reported better results for drug-related calls for service(M = 1.48) and total calls for service (M = 1.08).

Summary of the meta-analysis and moderator analysis

In summary, of the ten meta-analyses conducted, drug law enforcement interventions were found to have a desirable impact of practical significance on drug-related calls for service, offenses against the person, and total calls for service. As we had hypothesized, we found a differential impact of the various policing approaches on drug problems. Problem-oriented policing was found to have a positive impact above our odds ratio benchmark on total calls for service, drug-related calls for service, as well as a positive effect on drug offenses as an outcome. Community-wide policing was associated with positive findings for drug and disorder offenses and for total calls for service, however only one study existed for each of those outcome categories. A desirable effect was also found for property offenses, however this finding seems to have been driven by the large frequencies reported in the McElroy et al. (1990) evaluation (see Table 7). The hotspots policing approach showed a desirable outcome for total offenses and property calls for service. Again, the significance of this finding seems to have been driven by a single study that reported large frequencies (Fritsch et al., 1999) (see Table 11).

Our moderator analysis found some important factors to help tease out the nuances of our meta-analytic results. Specifically, while there seems to be no discernable differences between drug law enforcement approaches in dealing with problems associated with offenses against the person or property crime, it appears that problem-oriented policing approaches are effective at dealing with drug offenses, drug-related calls for service, and overall total offenses. Community-wide policing

too showed some promise in dealing with drug, disorder, and total offenses, as well as total calls for service.

LIMITATIONS

There are a number of limitations to our meta-analytic review of street-level drug law enforcement. First, there was considerable variation in the interventions being compared. Interventions were grouped as being community-wide policing (e.g. partnerships that target neighborhood drug market problems), problem-oriented policing (e.g. partnerships with "third parties" that are geographically focused), or hotspots policing (such as crackdowns, raids, buy-bust operations that are geographically focused) compared to the standard, law enforcement model of policing (see Weisburd & Eck, 2004). While these groupings are certainly logical from a conceptual standpoint, they are perhaps less than suitable from an analytic point of view. Specifically, there was some variation in the characteristics of the different interventions classified under the same heading.

A second limitation was the specificity of the interventions included in the meta-analysis. Included interventions were required to be drug-specific and the meta-analysis therefore excluded studies evaluating generic law enforcement interventions that, while not specifically designed to target drugs, may have produced positive results on drug related outcomes. It is conceivable that generic police interventions that target an array of crime problems, such as property crime, disorder and violent offenses, could possibly reduce the concomitant street-level drug market problems. Our review, however, opted to exclude these generic law enforcement evaluations given their lack of specificity in addressing drug market activity.

Third, a major problem with most law enforcement evaluations is identifying what reflects a positive or successful intervention effect (see Giacomazzi, 1995; Mazerolle

et al., 2000). That is, does an increase or decrease in arrests, signify effectiveness of a specific drug law enforcement intervention? Does a drop in calls for service represent a decline in problems? This debate is very much open to interpretation and depends on intervention and design particulars. For example, an intervention may seek to increase police-citizen rapport and trust and thus, an increase in calls for service and subsequent arrests could indeed be indicative of success (see Mazerolle et al., 2000). Conversely, more reactive interventions are generally evaluated as effective when there are reductions in rates of arrest and calls for service; however this is largely dependent on the post-test evaluation period. One might reasonably expect that rates of arrests and calls for service are likely to increase dramatically during and immediately following the interventions implementation and to be followed then by a gradual decline in rates. Thus, it is very problematic, from an analytic perspective, to evaluate the effectiveness of law enforcement interventions that confound intervention and post-intervention periods. Our review, therefore, did not examine the impact of the intervention on arrest outcomes and we used outcomes measures that differentiated intervention periods from the outcome periods.

Fourth, our meta-analytic review backed away from discussing the results of the significance tests and opted to use a simulated benchmark of the odds ratio to guide our interpretation and discussion of the results. We did this because of the dearth of high quality studies in the law enforcement literature and due to the likely inaccuracies of the standard errors generated from our unusual application of the odds ratio that raise questions as to the validity of the meta-analytic results.

Fifth, there was extreme between-study heterogeneity amongst studies included in the current meta-analysis that may have impacted on the calculation of the odds ratios and affected comparisons and interpretations made. For example, there was variation

in the equivalence of comparison groups (e.g., some studies used random assignment, others matched comparisons, and others non-equivalent comparisons; some extremely non-equivalent such as citywide); and variation in pre-test and post-test intervention measurement period lengths (e.g., studies had pre-post periods ranging from 30 days to 2 yrs). While the high degree of between-study heterogeneity does not prevent one from conducting a meta-analysis the results of the meta-analysis must be evaluated in terms of the weaknesses and limitations that exist.

Sixth, while the effects on drug and disorder offenses appear to be genuine, there are limitations associated with making conclusions regarding the effectiveness of an approach based on a single study. Further, the analyses for both total offenses and total calls for service appear heavily driven by a single study with large frequencies used to calculate the odds ratio. This problem is akin to the issue of sample size and power. Indeed, this was most certainly the case for total calls where only one community-wide policing intervention was included. For total offenses, three interventions were evaluated, two of which revealed negative impact. As stated, the fixed effects model, on which the moderator analysis is based, does not handle analyses with a small number of studies well.

Similar issues of sample size limit the ability to draw strong conclusions from the impact of the other moderator variables examined. Again, the small number of studies included as well as a small number of studies with odds ratios based on large frequency data appears to have driven the results. Taken in the context of these limitations, there appeared to be no impact of intervention implementation year or publication type, and only limited support for the conclusion that studies with less rigorous designs produce greater effect sizes.

Finally, our study was unable to uncover data to answer a number of important public policy questions: what types of strategies work best for what types of drug problems (crack, heroin, methamphetamine etc)? What types of strategies work best for what types of places (commercial, residential, public housing, low income)? The between-study variations and small number of studies included in the meta-analysis prevented us from conducting further analysis. Obviously, this deficit stems from a general dearth of quality in the drug law enforcement evaluation literature.

REVIEWER'S CONCLUSIONS

Over the last ten years, prominent scholars have studied and reviewed the effectiveness of generic law enforcement interventions (Braga, 2001; Poyner, 1993; Sherman, Gottfredson, MacKenzie, Eck, Reuter, & Bushway, 1997; Weisburd & Eck, 2004). These narrative reviews show that focused, partnership-type law enforcement interventions that use a wide range of approaches are generally far more effective responses to ongoing crime problems than unfocused efforts relying entirely on law enforcement resources (Weisburd & Eck, 2004). Indeed, Weisburd and Eck (2004) conclude that problem-oriented policing (using a diversity of approaches) is the most effective way to deal with street-level crime problems and that policing the hotspots of crime by directing law enforcement resources to target hotspots is a marked improvement over community-wide interventions. Weisburd and Eck (2004) suggest that community-oriented interventions come third to problem-oriented and hotspots policing interventions and that the standard, unfocused, law enforcement-only approach come a distant last.

Our meta-analytic review provides a robust, empirical examination of the general conclusions drawn from these literature reviews as applied to police methods to

disrupt street-level drug markets. Our meta-analytic review of a limited selection of the highest quality studies evaluating street-level drug law enforcement interventions generally supports the findings of these earlier reviews of generic law enforcement approaches, with some interesting variations and insights. Despite the limitations of available data, our review is suggestive that geographically-focused, problem-oriented policing that uses a partnership approach to disrupt street-level drug market activity is an enhancement over community-wide policing approaches that use partnerships to reduce drug and disorder problems across neighborhoods plagued with drug problems. But in our review, we find that *either* type of partnership approach (community-wide or problem-oriented) is likely to be more effective at reducing drug problems than law enforcement-only efforts that target drug hotspots. Unlike the findings in reviews of generic law enforcement interventions, the evidence uncovered in our study suggests that multi-agency, problem-oriented and community-wide policing approaches that seek to disrupt street-level drug market problems are likely to be a more productive approach to reducing drug problems than directed law enforcement tactics focused on hotspots. That is, our meta-analytic review of drug law enforcement suggests that community-wide policing efforts that utilize partnerships and build better police-citizen relationships are likely to be a more effective approach to tackling drug problems in a community than simply an enforcement-only approach to policing drug hotspots. This is an important finding that differs somewhat to the reviews of generic law enforcement intervention effectiveness.

Our findings are consistent with Mason and Bucke's (2002) narrative review of English language studies that examined interventions aimed at local drug markets. Indeed, Mason and Bucke (2002) found that third party policing interventions (see Mazerolle & Ransley, 2006) involving drug nuisance abatement and civil remedies

were the most effective strategies for attempting to disrupt drug dealing from residential or commercial properties, with raids and community based policing interventions being partially effective.

Several policy implications emerge from our research. First, our study suggests that police need to consider the underlying criminogenic conditions that support street-level drug market activity. Given our generally positive findings about the problem-oriented policing approach, it would seem that careful analysis of the problem, in a manner consistent with the "Analysis" component of the SARA approach to problem-oriented policing, can help police determine the most appropriate partners (health and safety inspectors, residents, truant officers, building code inspectors) and choose appropriate responses that are most likely to reduce the opportunities for the street drug trade to flourish. Utilization of Geographic Information Systems and data from a wide variety of sources will certainly increase the capacity of police to understand the variability of street drug markets, even within relatively small geographic areas (see Eck, 1994).

Second, our results show that the use of law enforcement-only resources (as used in hotspots policing and the "standard" model – see Weisburd & Eck, 2004) are the less likely to reduce street-level drug market problems than police-led interventions that utilize partnerships with non-police third parties. Programs that have common elements (e.g., SMART inspections that are part of the Beat Health Program) but draw on a range of potential third party partners and can thus be applied differently in different settings, are more likely to succeed than law enforcement-only programs (like raids) that are applied in a more universal manner across a range of different places. It appears, therefore, that Weisburd and Eck's (2004) conclusions about the

value of police utilizing a variety of approaches holds true for police-led efforts to disrupt street-level drug markets.

Third, our study differs, however from Weisburd and Eck's (2004) conclusion that it is the level of focus (the horizontal axis continuum in their two dimensional categorization model) that is the main factor that differentiates success from failure. Our review, by contrast, suggests that it is the vertical axis (i.e. the axis that describes a continuum of "diversity of approaches") that differentiates success in the specific case of street-level drug market interventions. We propose that it is the diversity of approaches, as evidenced through the array of partnerships that the police form with third parties, which will help the police to leverage additional resources to deal with drug market problems. Moreover, our review suggests that these partnerships and diversity of approaches are more effective than police reliance on law enforcement-only resources regardless of whether the partnership interventions are spread out across a community or geographically targeted at a drug hotspot.

Finally, our research highlights the dearth of high quality evaluations of drug law enforcement interventions. Given that national budgets dedicate more than half of their drug policy funds towards law enforcement (the rest being made up of treatment, prevention and harm reduction spending), we argue for more careful investment in funding towards what we think to be best practice in drug law enforcement. Based on our meta-analysis, we suggest that policy makers need to invest in problem-oriented policing that involve partnerships and are focused on drug hotspots, commit funds to evaluate these best-practice initiatives and build a more comprehensive evidence base. But not only do policy makers need to invest in building a better evidence base to understand the types of enforcement approaches that are most effective, but they also need evidence to guide them as to what works to target what types of markets.

Appendix A. Characteristics of studies included in the analyses.

Study Characteristics	Hot-Spots Policing (n = 4)	Problem-Oriented Policing (n = 5)	Community Policing (n = 5)	All Meta-Analysis Studies (n = 14)
	n of studies (%)			
Publication Type				
Refereed Journal	3 (75%)	3 (60%)	---	6 (42.9%)
Report	1 (25%)	1 (20%)	4 (80%)	6 (42.9%)
Thesis/Dissertation	---	---	1 (20%)	1 (7.1%)
Book Chapter	---	1 (20%)	---	1 (7.1%)
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)
Implementation Year				
Pre-1990	---	2 (40%)	2 (40%)	4 (28.6%)
1990-1994	2 (50%)	2 (40%)	2 (40%)	6 (42.9%)
1995-1999	2 (50%)	1 (20%)	1 (20%)	4 (28.6%)
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)
Design Characteristics				
Random Assignment				
Yes	1 (25%)	2 (40%)	---	3 (21.4%)
No	3 (75%)	3 (60%)	5 (100%)	11 (78.6%)
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)
Study Design				
Random assignment	1 (25%)	2 (40%)	---	3 (21.4%)
Matched	1 (25%)	1 (20%)	1 (20%)	3 (21.4%)
Non-equivalent	2 (50%)	2 (40%)	4 (80%)	8 (57.1%)
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)
Length of Post Intervention Period				
> 12 months	3 (75%)	1 (20%)	1 (20%)	5 (35.7%)
12-23 months	1 (25%)	4 (80%)	4 (80%)	9 (64.3%)
< 24 months		1 (20%)[a]	2 (40%)[a]	3 (21.4%)[a]
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)
Equivalent Pre-Post Intervention Periods				
Yes	3 (75%)	4 (80%)	5 (100%)	12 (85.8%)
No	1 (25%)	1 (20%)		2 (14.2%)
Total	4 (100%)	5 (100%)	5 (100%)	14 (100%)

[a] Total percentages to not add to 100 due to two studies having multiple post-test periods.

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