How Can Embedded Criminologists, Police Pracademics, and Crime Analysts Help Increase Police-Led Program Evaluations? A Survey of Authors Cited in the Evidence-Based Policing Matrix

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Abstract:

Evidence-based policing emphasizes the evaluation of interventions to create a catalog of effective programs and practices. Program evaluation has primarily been considered the purview of academic researchers, with police agencies typically uninvolved in the evaluation of their own interventions. Scholars have recently advocated for police to take more ownership over program evaluation, often arguing for an increased role of three primary entities: embedded criminologists, police pracademics, and crime analysts. While an emerging body of literature has explored these entities individually, research has yet to explore the unique contributions each can make to police-led science. The current study is a survey of scholars who authored or co-authored one or more studies included in the Evidence-Based Policing Matrix. The authors explore four distinct research questions pertaining to police-led science. Findings suggest that embedded criminologists, police pracademics, and crime analysts may each have a unique role to play in promoting police-led science.

Keywords:
evidence-based policing; program evaluation; survey research; embedded criminologists; police pracademics; crime analysts

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Introduction

Evidence-based policing has emerged as a central concept for law enforcement agencies tasked with controlling crime as well as government entities tasked with administering public budgets (Lum & Koper, 2017). Rigorous evaluation is paramount within this paradigm in order to ensure that the scientific knowledge on program effect achieves the highest possible quality. Program evaluation has traditionally been considered the responsibility of academic researchers, with police agencies typically uninvolved in the evaluation of their own practices Recently, however, scholars have advocated for police to take more ownership over the process of knowledge generation generally (Huey & Mitchell, 2016; Sparrow, 2011) and program evaluation specifically (Piza & Feng, 2017). Proponents of such reform have identified three primary entities who can help police increase their in-house capacity for program evaluation: embedded criminologists, police pracademics, and crime analysts. While an emerging body of literature has explored these entities individually, research has yet to compare these entities with one another across effective program evaluation and evidence-based policing skillsets. It is additionally important for research to acknowledge that these actors can potentially contribute unique, and important, skills to the process of program evaluation.

The current study contributes to the literature through a survey of scholars who authored or co-authored one or more studies included in the Evidence-Based Policing Matrix,[1] a research-to-practice translation tool developed by Lum, Koper, & Telep (2011) (also see chapter 3 in Lum & Koper, 2017). Findings indicate that embedded criminologists, police pracademics, and crime analysts may each have a unique role to play in promoting police-led science. Our paper

[1] see: https://cebcp.org/evidence-based-policing/the-matrix/

concludes with a discussion of the policy implications of the study findings. We begin with a review of the relevant literature that informs our research questions.

Review of Relevant Literature

Evidence-based Policing and Police-Led Science

Over forty years ago, Goldstein (1979: 239) noted that the policing profession had arrived at "a plateau at which the highest objective to which they aspire is administrative competence" and that strong pressures may force police to reconsider this perspective. According to Goldstein (1979), these headwinds were easily identified and self-evident: budgetary constraints, a consumerist orientation toward government, questions about the effectiveness of public service organizations, and, importantly, increasing integration of rigorous science as a tool of service quality control. The pressures Goldstein referred to are no longer new but remain in force. Scholars have noted *managerialization* and the paradigm of *new public management* as dominant trends within both policing and the public sector more generally, wherein political leaders and public constituencies expect public service agencies to demonstrate success (Newman & Clarke, 1994; Terpstra & Trommel, 2009).

Introducing science into the policy-making arena requires a process scholars have come to refer to as research translation, or the institutionalization of research into policy and practice (Laub, 2012; Lum & Koper, 2017). Drawing upon the "knowledge to action" approach from the medical field, Santos & Santos (2019) described the translation of policing research as occurring across four phases: 1) research and evaluation, 2) synthesis and dissemination, 3) implementation and evaluation, and 4) institutionalization and stability. Program evaluation plays a crucial role in both phase 1 and phase 3, focusing on the generation of knowledge on effective police practices both generally in the field as well as specifically within a given agency.

Research translation has become a central concern of policing scholars since the emergence of the evidence-based policing movement (Sherman, 1998). Evidence-based policing aims to integrate two different worlds – that of practice and of academia – though emphasizing the use of research in policymaking. Such integration produces knowledge in one of two ways (Nonaka, 1994; Posner, 2009). One is through internal knowledge *externalization*, whereby practitioner-held, agency-specific knowledge is transmitted to academics and disseminated in the larger pool of general knowledge. The second is general knowledge *internalization*, operating in the reverse direction where academics draw from generalizable knowledge to inform the narrower, specific actions of practitioners.

The internalization approach is the more common practice. At present, most evaluations of police initiatives are conducted by outside academics who apply the skills and techniques of acquiring generalized knowledge to assess specific police programs. The development of a robust literature reporting the effect of various contemporary policing practices (Welsh, 2019) is a testament to such a scientific approach. However, knowledge developed through externalization may not be readily accessible to policy makers. Scholarly journals can be financially inaccessible due to subscription requirements and scholarship may be linguistically inaccessible due to an overreliance on jargon, among still other obstacles (Panda, 2014). A second barrier to the internalization model relates to process, as policy makers oftentimes need to make operational decisions within a short time frame at odds with the careful, slow-moving process of traditional research (Sparrow, 2011).

In the case where situated knowledge is the evaluation's purpose, externalization – drawing from particularized experience to produce knowledge that can then inform general principles – may prove a more workable model. Prior works have argued that police personnel

can conduct evaluations in-house (Evans & Kebbell, 2012; Huey & Mitchell, 2016; Piza & Feng, 2017). A benefit of this approach is that the evaluators are already a part of the police apparatus, giving them entrée to contextual information unlikely to be obtained by outside researchers. Moreover, they are used to communicating technical information to organizational leaders in an actionable manner.

In the context of evidence-based policing, the concepts of externalization and internalization are relevant in considering Sherman's (2011) perspectives on the competing models of science-led policing and police-led science. Science-led policing has been the dominant paradigm arguably since policing's professional era, starting in the mid 1900s (Sherman, 2011: 531). In this model, scientists primarily set the research agenda and disseminate knowledge through published reports. The job of translating research to practice is thought to fall to those not directly involved in the research process. There are some inherent limitations to the internalization of knowledge that is central in science-led policing. As previously mentioned, scientists commit themselves to a slow-moving process that requires sufficient and adequate data to complete and applies a high burden of proof, all of which produce rigorous scholarship but may disqualify attempts at answering pressing practitioner questions in a timely manner (Panda, 2014; Posner, 2009; Sparrow, 2011; Weisburd & Neyroud, 2011). Additionally, because generalizable knowledge is the coup de grâce of scientific inquiry, researchers are often less skilled at insight readily applicable to the specific problems that face practitioners.

For such reasons, Sherman (2011) advocates for a paradigm of police-led science, which embraces a process of knowledge externalization (Nonaka, 1994; Posner, 2009). Police-led science puts police officers at the forefront of evidence-generation, with police agencies empowering their officers to develop and test research questions and disseminate findings throughout the field.

Sherman (2011) argues that such a process more closely resembles the evidence-based medicine model, with many physicians having been scientists who conducted their own research. Research led by police can provide particular benefits when organized around the three "Ts" of targeting, testing, and tracking crime problems and resulting interventions meant to minimize harm (Sherman, 2013). In short, a model of police-led science better leverages the process of externalization: drawing from particularized experience to produce knowledge that can then inform general principles.

Embedded Criminologists, Police Pracademics, and Crime Analysts as Vehicles for Police-Led Science

It is important to recognize different forms of expertise that jointly can provide benefits to program evaluations by presenting holistic views of program effect. Cognitive psychology literature refers to one kind of ability as *adaptive expertise* and another as *routine expertise* (Barnett & Koslowski, 2002; Hatano & Inagaki, 1986). The routine expert's work is "routine" not in that it is uncomplicated, but in that whatever the level of complication the task is familiar and consistent over time. Evaluating programs to assess effectiveness is a difficult task, but one that typically requires the application of sophisticated skills selected from an existent repertoire of competencies. In the context of program evaluation, routine expertise pertains to the technical skills needs to conduct sufficiently rigorous tests of police practices. Adaptive experts are distinguished by two additional skills. First, they have the ability to transfer knowledge from one arena to another, cross-pollinating one body of knowledge with innovation in another through skillful translation. A second, capacity is the ability to draw upon general understandings of the world to imagine novel ways of solving problems. Presumably, this requires not only an in-depth knowledge of a certain subject area, but also its place in relation to others. In the context of

program evaluation, adaptive expertise pertains to practical skills necessary to navigate the practitioner environment when conducting applied research and translating research evidence.

Policing scholars have recently advocated for the incorporation of three entities to increase the in-house capacity of police to conduct rigorous program evaluations: embedded criminologists, police pracademics, and crime analysts. Within the 4-phase translation process described by Santos & Santos (2019), these entities can greatly assist the evaluation process. Phase 1 (research and evaluation) and phase 3 (implementation and evaluation) rely greatly on collaborations between police and outside academic researchers, which are notoriously difficult to establish and maintain (Tompson, Belur, Morris, & Tuffin, 2017). Successfully integrating embedded criminologists, police pracademics, and crime analysts may facilitate the process by allowing police to maintain control of the research process. Embedded criminologists, police pracademics, and crime analysts can further support a paradigm shift towards evidence-based policing by creating the type of internal, full-time capacity necessary for supporting research translation (Santos & Santos, 2019: 598).

Given Sherman's (1998; 2011) vision involved sworn police officers conducting research, police pracademics most directly align with the model of police-led science. Panda (2014) defines a pracademic as one who is both an active academic and active in practice, classifying them as either practitioners first (prioritizing practice over academia), academics, or the "balanced inquirer" interested in both simultaneously. The rise of pracademics in policing has been documented recently, and advocated as a model for improving evidence-based policing (Huey & Mitchell, 2016). Pracademics have connections to practice that give them insight into the motivations and concerns of policymakers, as well as practitioner language, enabling them to reduce the barriers that make external academics less effective at reaching agency leaders.

Pracademics have a high level of adaptive knowledge that could help expand the scope of program evaluations and facilitate the dissemination of knowledge. However, pracademics are also trained and operate within academia, fully understanding the values and indicia of success necessary to receive the imprimatur of scholarly expertise. In this sense, pracademics may also develop routine expertise, especially if afforded the opportunity to conduct research as a normal part of their functions.

Crime analysts are police department staff members who systemically analyze data to provide information to police commanders about crime, calls for service, policy activity, and other factors of interest, all for the purpose of making policing more efficient and effective (Bruce, 2017). Crime analysis products are commonly referenced by police leaders and mid-managers to understand the nature and scope of crime problems when designing evidence-based police practices (Santos, 2014). Similar to police pracademics, crime analysts are already a part of the police apparatus, giving them entrée to contextual information unlikely to be obtained by outside researchers. They work with a sense of urgency and time-boundedness characteristic of practitioners across fields (Evans & Kebbell, 2012; Piza & Feng, 2017). Moreover, they are used to communicating technical information to organizational leaders, operational point persons and policymakers in a actionable manner. The common job functions and characteristics of crime analysts reflect the type of adaptive expertise highlighted by cognitive psychologists (Barnett & Koslowski, 2002; Hatano & Inagaki, 1986).

Embedded criminologists are outside academic researchers who take an active role in the day-to-day routine of police agencies, typically spending at least a portion of their time on-site at the agency. While university employees, embedded criminologists are more beholden to the internal needs and demands of police than outside research partners. The scholar can then bring

general criminological knowledge to bear on specific questions of interest to an agency, with that information communicated in-person, instead of through the confines of scholarly journal pages, and in a more timely manner. Regular exposure to the inner workings of the agency can assimilate the criminologist into the police culture, potentially assisting in the translation of research findings to police personnel (Tompson, Belur, Morris, & Tuffin, 2017: 186). Braga & Davis (2014) argue that a longer-term evaluation relationship between an embedded criminologist and a police department could be structured such that it addresses the challenges inherent in a predominately science-led policing paradigm. This type of arrangement likely hinges on a number of factors outside of the control of the police, such as the academic's host institution granting leave, the academic having the professional flexibility to explore problems important to the police, and the availability of funds to acquire the academic's time from the host institution (Piza & Feng, 2017). Nonetheless, embedded criminologists likely provide a number of unique benefits, namely the participation of rigorously trained, scientifically objective scholars in day-to-day policing functions (Braga, 2013).

Literature Review Summary and Scope of the Current Study

Recent scholarship has presented convincing arguments for moving police to the forefront of the research process. As such, it is not our goal to convince readers of the benefits of police-led science. Our aim is to explore the relative strengths of three entities that can increase police in-house evaluation capacities: embedded criminologists, police pracademics, and crime analysts. Given that program evaluation requires methodological and statistical proficiency, these entities likely differ in terms of general skillset. Furthermore, given the multi-faceted nature of program evaluation , certain entities may be more adept at contributing to specific aspects of program evaluation than others. On a more practical level, embedded criminologists, police pracademics,

and crime analysts may differ in terms of the ease to which police agencies can incorporate them in ongoing research activities. We explore these issues through a survey of scholars who authored or co-authored one or more studies included in the Evidence-Based Policing Matrix. Given their experience conducting rigorous evaluations of police practices, the Matrix study authors are uniquely positioned to offer insight into the manners by which embedded criminologists, police pracademics, and crime analysts can contribute to police-led science.

Methods

Our survey instrument included 20 combined open and closed questions.[2] The survey asked about the respondent's background in working with police, police department's receptivity to research, potential barriers to police research, and the ease of incorporation/relative skillsets of embedded criminologists, police pracademics, and crime analysts. The survey took approximately 15 minutes to complete according to pre-testing.

We collected a purposive sample of authors who have published rigorous evaluations of police interventions, as included in the Evidence Based Policing Matrix. The Matrix included 344 unique authors across 165 studies published between 1970 and 2016 at the time we conducted this research. Obtaining the contact information for the study authors involved an extensive process. We first obtained each study and manually collected the individual affiliations of all authors from the title page. For modern studies, this most often included email addresses for the primary author. To update author information as necessary we first cross referenced our list of authors with the member directory of the American Society of Criminology (ASC), the primary professional organization of the discipline. For all authors not listed in the ASC member directory, we then searched Google scholar and the broader Google search engine for any

[2] The survey instrument is available at https://www.dropbox.com/s/zeri2qohi8hjzbo/EBP_Survey_FINAL.pdf?dl=0

updated institutional affiliation and contact information. We located active email addresses for 146 of the 344 (42.4%) study authors.[3]

The lead author sent a personalized email to each of the identified individuals inviting them to complete the survey. Two batch email reminders were sent to the entire sample following this initial contact. The emails were sent about 4 weeks apart.[4] The research team received responses from 83 of the 146 of the authors with active email addresses, for a response rate of nearly 57%. This rate is higher than the standard response research for web-based research in policing (Carter & Grommon, 2017) with a number of recent policing studies achieving response rates in the mid 20% range (for an oveview of such studies, see the *survey administration* section of Pickett & Nix, 2019).[5]

The respondents primarily represented a group of university faculty members (80.7%) with doctoral degrees (93.9%). They have held their degrees on average for 17.8 years and worked in the field 17.5 years. A majority of respondents (63.8%) conduct most or virtually all of their research in direct partnership with police. 21.7% of respondents had prior work as a sworn police officer and 10.8% were previously civilian police employees. A majority reported

[3] Messages sent to 5 email addresses bounced back to us after we sent the survey. These were not counted in our tally of active email addresses (N=146). The lead author of the current study, who was an author on 6 studies included in the Matrix, was excluded from the survey as to not introduce any potential bias in the responses.

[4] This email recruitment process occurred over two distinct periods. We first started in April 2017 after collecting author emails. In November 2017, George Mason University updated the EBP matrix, adding 20 new studies. At that time, we gathered the contact information for the new study authors and reached out to those who were not included in the original collection of studies.

[5] We acknowledge that while the 83 responses represent approximately 57% of the authors whose current information we obtained, the responses account for only about 24% of the 344 authors listed in the Evidence-Based Policing Matrix. The majority of authors we were not able to locate were associated with much older studies and/or only authored a single study in the matrix. Therefore, we believe that the 146 authors whose information we obtained represent the most currently active authors in the matrix, which gives them significant insight into the issues our survey sought to measure. Nonetheless, even if compared against the overall number of study authors (344), our 83 responses comprise a response rate (~24%) that is commensurate with recent policing surveys (see Pickett & Nix, 2019).

working on research projects involving embedded criminologists (58.8%) or pracademics (68.8%), with almost all (97.5%) working on research projects involving crime analysts.

Analytic Approach

Our study explored three research questions. For each research question, a Kruskal-Wallis test for differences between means was utilized over the more common ANOVA test due to non-normality within each dependent variable (McKnight, 2010).

RQ 1: What are the most damaging factors to successfully evaluating police practices? We asked respondents to rank the following factors on a Likert scale ranging from 1 (not at all damaging) to 5 (very damaging): lack of support from police leadership; lack of support from mid-level police supervisors; lack of police personnel proficient in research; political pressure for police to promote image of success; existing support for ineffective police practices; competing goals and incentive structures of academics and police, and; lack of available research funding. We consider this question a general measure of contextual police-led science factors. For example, respondents highly ranking *lack of police personnel proficient in research* would suggest that embedded criminologists may be seen as best positioned to advance police-led science. *Competing goals and incentive structures of academics and practitioners* ranking high on the Likert scale would indicate that embedded criminologists may not be compatible with the daily needs of police.

RQ 2: How easily can the typical police agency incorporate each party into their program evaluation activities? We asked respondents to rank embedded criminologists, police pracademics, and crime analysts on a Likert scale ranging from 1 (not at all easily) to 5 (very easily). This question can shed light on the issues related to engaging these different entities in police-led science.

RQ 3: How capable is each party able to conduct a range of program evaluation tasks?

We asked respondents to rank the following factors on a Likert scale ranging from 1 (not at all capable) to 5 (very capable): designing experiment and rigorous quasi-experiments; ensuring sufficient statistical power for the analysis; measuring treatment fidelity/contamination; conducting process evaluations of program outputs, conducting statistical analysis of program outcomes, and; explaining research findings to practitioner audiences. The factors were including in the survey given their importance in the program evaluation process. We conducted an exploratory factor analysis on the six research tasks to test for an underlying relationship between what are commonly conceived of as independent unique tasks. Our goal was to achieve parsimony by collapsing the distinct aspects into one or more grouping factors so that the concept of research could be more succinctly defined. Two sets of Kruskal-Wallis tests were then calculated for each of the identified unique factors one for the entire sample and one for respondents who reported previously working with embedded criminologists, pracademics, and/or crime analysts. We did this for the purpose of determining whether exposure to these entities affected respondent perceptions.

To add nuance to the findings of the RQ 3 analysis, we coded open ended responses to questions asking respondents to explain the rationale behind their Likert scores for embedded criminologists, police practitioners, and crime analysts. We sought to shed light on the factors influencing respondent perceptions of these entities. We manually coded the open ended responses according to a ground theory approach (Strauss & Corbin, 1990), following the methodology of recent policing survey research (Lum, Koper, & Willis, 2017). We first read through the open ended responses to gain an understating of their context. We then considered the relevant literature to determine the precise themes our codes should cover.

We included 6 separate themes. *Expertise: adaptive* and *Expertise: routine* measure the types of practical and technical abilities associated with these skillsets (Barnett & Koslowski, 2002; Hatano & Inagaki, 1986). *Role in agency* refers to the expected day-to-day functions within a police agency. *Standing* refers to the perceived status or reputation within the police profession. *Training* refers formal academic or technical education in program evaluation activities.[6] *Transparency* refers to the ability to conduct research and present research findings in an independent manner free from bias.

After assigning themes, we then coded each response according to whether the theme was framed in a positive of negative manner. To give a common example from the data, a response stating a party received adequate program evaluation training would be coded as a *training* theme with a *positive* connotation. Conversely, respondents reporting their belief that a party received inadequate program evaluation training would result in a theme of *training* with a *negative* connotation. We conducted all coding in QSR NVivo version 12.

Results

The two most damaging factors to police research reported by respondents were a lack of support from leadership (4.40) and mid-level managers (4.13). The two least damaging factors were lack of police personnel proficient in research (3.00) and competing goals and incentive structures of academics and police (3.23). Differences in means were statistically significant ($p<0.001$) (see Table 1a). We feel these findings support each of the parties involved in police-led science. Police employees (i.e. pracademics and crime analysts) may be viable candidates to lead program evaluations given that respondents don't consider proficient research personnel to be

[6] At the outset, we assumed the routine expertise theme would capture respondent perceptions of program evaluation training. It became clear during the initial review of responses that respondents considered previous training as distinct from the routine expertise acquired during repeated application of research skills, leading us to include the additional theme of *training*.

lacking within police departments. The relative lack of concern regarding incompatible goals and incentives of police and academics suggests embedded criminologists also represent a viable option to enhance police-led science.

Embedded criminologists scored lowest on the ease of incorporation measure (2.59), which is perhaps unsurprising given the challenges police agencies face when trying to integrate outside academics within their day-to-day functions (Braga, 2016). Police pracademics and crime analysts, who are already employees of the agency, are likely more easily leveraged by police. Crime analysts (4.27) were considered as easier to incorporate into police program evaluation activities than pracademics (3.46). These differences were statistically significant (p<0.001) (see Table 1b).

Table 1. Kruskal Wallis Test for Factors Damaging to Research (a) and Ease of Incorporation (b)

(a)	
Factors	**Mean**
Lack of leadership support	4.40
Lack of mid-level supervisor support	4.13
Existing support for ineffective practices	3.57
Lack of funding	3.55
Political pressure to promote image of "success"	3.27
Competing goals and incentive structures of academics and police	3.23
Lack of police personnel proficient in research	3.00
p.<0.001	
d.f. = 6	

(b)	
Researcher	**Mean**
Crime analyst	4.27
Police pracademic	3.46
Embedded criminologist	2.59
p.<0.001	
d.f.=2	

The factor analysis identified one research and evaluation factor with a high eigen value of 3.86 (see Table 2). Five items (designing experiments and rigorous quasi experiments, ensuring sufficient statistical power, measuring treatment fidelity, conducting statistical analysis of program outcomes, and conducting process evaluations) exhibited high correlations and low uniqueness scores in this factor. These factors measure unique facets of the same construct, which we term *research and evaluation skills*. A new variable reflecting the group's ability to conduct research and evaluation was generated from the mean score of these five factors. The one distinct factor, *explaining research findings to practitioner audiences*, was left as standalone construct since it did not load with the other items. This factor speaks directly to research translation, which prior studies have considered a necessary component for further developing evidence-based policing (Lum & Koper, 2017; Santos & Santos, 2019). As such, it is conceptually appropriate to consider *explaining research findings to practitioner audiences* separately from *research and evaluation skills.*

Table 2: Factor Analysis of Research and Evaluation Skill Sets

Skill sets	Mean	Uniqueness
Designing studies	0.87	0.22
Ensuring sufficient statistical power	0.90	0.11
Treatment Fidelity	0.89	0.19
Statistical Analysis	0.88	0.22
Process Evaluation	0.79	0.30
Explaining Findings	0.34	0.71

Eigen value=3.86

Findings indicate that embedded criminologist had the strongest ability (4.24), in terms of overall research and evaluations skills. Police pracademics scored next highest (3.44) while crime analysts scored the lowest (2.86). We conducted follow up analysis considering, for each type of researcher, only respondents who had experience working with the specific entity. The

results were not qualitatively different from those of the test conducted on the overall sample (see Table 3a). In terms of perceived ability to explain the results of research studies to practitioner audiences (see Table 3b), pracademics were ranked highest by the respondents (4.28). Embedded criminologists (3.44) and crime analysts (3.43) exhibited similar values. We again conducted a follow-up analysis including only those respondents who reported working with at least 1 of the researcher types. Unlike the test of research and evaluation skills, respondents with experience working with these entities did influence results. Police pracademics ranked highest on this scale (4.16), but were now followed by crime analysts (3.42) then embedded criminologists (3.33).

Table 3: Kruskal Wallis Test for Ability to Conduct Research and Evaluation (a) Ability to Explain Results (b)

(a)		
Researcher	**Mean**	**Mean (worked with)**
Embedded criminologist	4.24	4.22
Police pracademic	3.47	3.49
Crime analyst	2.86	2.83
p.<0.001		
d.f.=2		

(b)		
Researcher	**Mean**	**Mean (worked with)**
Police pracademic	4.28	4.16
Embedded criminologist	3.44	3.33
Crime analyst	3.43	3.42
p.<0.001		
d.f.=2		

Table 4 presents the findings of the qualitative coding of the open-ended explanation of the Likert scores assigned for the test of research question 3. Each section (embedded criminologists, police pracademics, crime analysts) is color coded so that the most commonly

recorded themes/frames are shaded in black with the shade color lightening as the theme/frame decreased in frequency. It should be noted that there were more themes coded than respondents as multiple themes were oftentimes observed within single responses. There are unequal codes across sections as some respondents gave vague comments not conductive to coding for some entities (e.g. “Embedded Criminologists are the best option”) and rather in-depth comments for other entities (e.g. “Pracademics typically receive adequate academic training and are able to translate research for police leaders, but are often limited in their research capacity because of their other responsibilities at the police agency.”).

We coded 58 themes for embedded criminologists. The majority of themes (34) identified training in a positive frame, suggesting respondents perceived embedded criminologists as adequately prepared to conduct program evaluation. The second and third most common responses for embedded criminologists identified adaptive expertise (n=10) and agency standing (n=6) in negative frames. This suggests that, despite the academic credentials of embedded criminologists, some respondents have skepticism about their ability to drive internal change within police agencies. However, we should note that overall positive frames nearly double the negative frames, indicating most respondents looked favorably on embedded criminologists.

We coded 78 themes for police pracademics. The most common theme (n=19) was routine expertise in a negative frame, indicating police pracademics may lack technical evaluation skills. This perceived deficiency is counterbalanced by respondents universally describing police pracademic adaptive expertise in a positive frame. This suggests that police pracademics can be a driving force in research translation. Training in a positive frame was observed second most frequently. Considering this alongside the routine expertise findings, respondents seem to consider police pracademics as recipients of adequate program evaluation

training who have not received sufficient opportunities to hone their technical skills through frequent application.

We coded 88 themes for crime analysts. The most common theme (n=27) was training in a negative frame (n=27), which stands in contrast to both embedded criminologists and police pracademics, whom the respondents considered positively within the training theme. The second most common theme (n=17) was routine expertise in a negative frame, though respondents did not universally look negatively upon the routine expertise of crime analysts. Twelve positive frames were observed for the routine expertise theme. Interestingly, a higher proportion of crime analysts are viewed as having adequate technical expertise than police pracademics. The role of crime analysts as potential drivers of research translation are dampened by role clarity (n=9) and standing (n=12) being universally and predominately associated with negative frames, respectively. This suggests that crime analysts suffer from role conflicts (e.g. their job functions require too many non-evaluation functions) and may not have sufficient agency status to drive police-led science.

Table 4: Qualitative Coding of Open-Ended Responses to Ability to Conduct and Explain Research

	Embedded Criminologists		Police Pracademics		Crime Analysts	
Themes	**Positive**	**Negative**	**Positive**	**Negative**	**Positive**	**Negative**
Expertise: adaptive	2	10	12	0	2	3
Expertise: routine	0	1	4	19	12	17
Role in agency	0	0	0	4	0	9
Standing	2	6	7	3	1	12
Training	34	2	17	8	3	27
Transparency	1	0	0	4	1	4

Discussion and Conclusion

The survey respondents, who can be considered among the leading contemporary police scholars, provided insight that can be consulted as the field continues to move towards a model of police-led science. The results identify the lack of support from leadership and mid-level managers as the most damaging factors to research, that crime analysts are most easily incorporated into police departments to conduct research, that embedded criminologists are the most qualified to conduct overall research work with police departments, and that pracademics are best at explaining the results of the work.

Considered holistically, the disparate findings of our survey suggest that embedded criminologists, police pracademics, and crime analysts each have an important, distinct role to play in police-led science. Crime analysts can play a more central role in program evaluation activities of the police than what has previously been observed given their perceived ease of incorporation. Piza & Feng (2017) found that crime analysts reported dedicating a small proportion of their time to program evaluation as compared to other analytical tasks. However, given their proficiency with data management and analysis, crime analysts can be a driving force in program evaluation. This is especially the case given that the type of data analysts collect, clean, and manage for other purposes (e.g. tactical/strategic analysis, Compstat reports, etc.) can also be used for the purpose of evaluating programs and practices.

Given the low ranking of crime analysts on the *research and evaluation skills* scale, another entity may be better positioned to take the primary lead on designing and implementing the evaluation. This approach advances the recommendation of Piza & Feng (2017) to align the work of academic researchers and crime analysts within an action research framework in order to expose crime analysts to various aspects of program evaluation and further develop their

program evaluation skills. While Piza & Feng (2017) conceptualized the academic researchers in such partnerships as coming from outside of the police agency, embedded criminologists can easily serve this role. Police pracademics also rated fairly highly on the research and evaluation skills scale (3.47), suggesting they are well positioned to take the lead role on program evaluations when agencies are unable to bring in embedded criminologists. Given that partnerships between crime analysts, practitioners, and academic researchers have been advocated as a way to support problem analysis functions in policing (Braga & Tucker, 2019), we feel that they hold promise for program evaluation purposes as well.

Of course, another potential avenue is for police agencies to directly increase the evaluation capacity of their crime analysis units. A recent survey of crime found that program evaluation was, by far, the crime analysis skill for which respondents received the least amount of training (Piza & Feng, 2017). As such, there seems ample opportunity for police agencies to dedicate additional resources towards this critical function. This is especially the case given that, as a pre-existing entity, crime analysis units are more easily leveraged by police than police pracademics or embedded criminologists, as indicated by the current study findings. Training crime analysts may be less costly than training police pracademics. Crime analysts commonly have proficiency in a range of analytical skillsets, oftentimes receiving formal training in these techniques (Piza & Feng, 2017). Adding program evaluation to the analyst skillset may only require attendance at a series of training seminars. Police pracademics, conversely, typically receive their analytical skills though graduate-level academic training (Huey & Mitchell, 2016). It may be more cost-effective for police to invest in making existing crime analysts proficient in program evaluation than giving police officers the necessary academic training to make the transition into pracademics.

Police agencies may have more access to cost-effective training opportunities for their crime analysts than ever before. As one example, the National Institute of Justice (NIJ) established the Law Enforcement Advancing Data and Science (LEADS) program in 2014 to provide resources (free of charge) for police officers to conduct original research, attend training, and present at conferences (Cordner, 2019). The LEADS program recently opened up participation to civilian crime analysts, affording analysts the opportunity to develop similar research skills as police officers who attend the program. In further considering crime analyst training opportunities, we echo Piza & Feng's (2017) recommendation for the International Association of Crime Analysts (IACA) to offer program evaluation as a training course. IACA readily offers low-cost in-person and online training courses on a range of crime analysis techniques, including crime mapping, Microsoft excel pivot tables, and tactical analysis. Adding program evaluation to the course catalog would help the further development of police-led science. This would also benefit the IACA, as adding program evaluation to the standard crime analysis skill set may provide analysts with more opportunities for professional advancement. However, this would likely require a re-imagining of the crime analysis function, as analysts' taking on program evaluation responsibilities may be inhibited by their current role conflicts, as reported in our qualitative results.

Findings of our survey suggest that police agencies may already be well positioned to engage in research translation. While the full sample ranked embedded criminologists (3.44) and crime analysts (3.43) as virtually even on the research translation scale, respondents who reported working with these entities ranked crime analysts slightly higher (3.42) than embedded criminologists (3.33). In other words, police already have the in-house capacity to translate research evidence to law enforcement personnel both within their agency as well as the

profession at large. In working together on research translation activities, pracademics may also help bolster the work of crime analysts by championing the crime analysis role within the agency and bringing important insights in framing inquires and interpreting results (Braga, 2016). This is important as the organizational hierarchy of police agencies often does not readily acknowledge the importance of crime analysts due to their common status as civilian staff (Santos & Taylor, 2014). Through being championed by police pracademics, crime analysts may enjoy a newfound status that enables them to become more engrained in police-led program evaluation efforts, as well as evidence-based policing more generally.

At this point, we find it important to acknowledge respondent perceptions of factors damaging to police research. Of the 7 factors presented in this question, respondents ranked lack of support from police leadership and lack of support from police-mid managers as the most damaging. This echoes research on evidence-based policing generally, which shows that police practice too often operates with little-to-no consideration of scientific research evidence (Braga & Schnell, 2013; Sherman, 2015). It may take a change in police culture for police-led science to fully develop. As mentioned prior, police culture typically takes little notice and gives low status to civilian staff such as crime analysts (Santos & Taylor, 2014). Police officers who embrace evidence-based policing, such as pracademics, often encounter opposition form their colleagues who have supported standard police practices throughout their careers (Sherman, 2015). This all operates within a culture where police leaders are commonly unfamiliar with the concept of evidence-based policing (Lum & Koper, 2017) and officers mistakenly equate evidence-based policing as synonymous to removing police officers from the street (Huey, Blaskovits, Bennell, Kalyal, & Walker, 2019). Sherman (2015) described such police commitment to standard

practices and skepticism towards the value of research as a "smothering paradigm" that inhibits the development of evidence-based policing.

To overcome the aforementioned issues, agencies need a powerful advocate (Sherman, 2015) or evidence champion (May, Hunter, & Hough, 2017) to fully embrace evidence-based policing. Given police executives oftentimes determine their agency's commitment to and institutionalization of evidence-based policing (Santos & Santos, 2019) police leaders need to embrace the role and communicate the importance of embedded criminologists, police pracademics, and crime analysts to adequately implement police-led science. We should note that such support goes above and beyond the public levels of support needed to generally engage in evidence-based policing. If a commitment to science is necessary for police to consult the evidence base when making policy decisions, it is likely even more important in convincing police to dedicate departmental resources to program evaluation (Piza & Feng, 2017: 358). The presence of capable in-house program evaluators and research translators should not be considered as a guarantee of police-led science taking hold. Barriers surfacing from a lack of enthusiasm on part of police leadership should be addressed in order to maximize the potential for police-led science.

Despite these implications, the current study suffers from some limitations we should articulate. As discussed earlier, obtaining respondent email addresses proved challenging. We only obtained contact information for 146 of 344 authors included in the Evidence-Based Policing Matrix, many of whom authored more recent studies. While the contemporary nature of the identified authors likely makes them highly knowledgeable of the current study topic, identifying a larger proportion of study authors may have altered certain results. We further acknowledge that the Evidence-Based Policing Matrix is only one of a number of open-access

websites meant to synthesize the results of crime prevention research. Including others, such as the University of Queensland's Global Policing Database (Higginson et al., 2015; Mazerolle et al., 2017), as an additional source of potential respondents may have broadened our sample. Additionally, given that scholars from the United States predominately comprise the Evidence-Based Policing Matrix, it is possible that the educational background of the police pracademics and crime analysts these authors worked with may differ than what is found in other countries. As such, the Global Policing Database may have added some important international context in judging the evaluation capacity of police pracademics and crime analysts. However, due to resource constraints, we chose to exclusively focus on the Evidence-Based Policing Matrix in this study. Future surveys should also include more than authors of evaluation research articles, as important insights can be gained from police personnel intimately involved in the consumption and translation of research evidence. As an example, members of various Societies of Evidence-Based Policing (e.g. American, Australian, Canadian, etc.) and NIJ LEADS Scholars may provide important insight on methods for empowering police-led science. Results of such research would provide insight on how to better support police-led science.

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