

**Police Research, Officer Surveys, and Response Rates**

forthcoming in *Policing & Society*

doi: [10.1080/10439463.2017.1394300](https://doi.org/10.1080/10439463.2017.1394300)

(Accepted October 16, 2017)

Justin Nix\*

University of Nebraska at Omaha

Justin T. Pickett

University at Albany, SUNY

Hyunin Baek

University of Louisville

Geoffrey P. Alpert

University of South Carolina & Griffith University

\* Corresponding author. School of Criminology and Criminal Justice, University of Nebraska at Omaha, 6001 Dodge Street 218 CPACS, Omaha, NE 68182. Email: [jnix@unomaha.edu](mailto:jnix@unomaha.edu), phone: 1-402-554-6157. ORCID: 0000-0002-3812-8590. Twitter: @jnixy.

*Authors' note:* This is the authors' postprint (CC-BY-NC-ND 4.0). Final version published in *Policing & Society*, vol. 29, issue 5. The authors would like to thank John MacDonald, Kyle McLean, and two anonymous reviewers for their helpful comments on an earlier draft.

## **Police Research, Officer Surveys, and Response Rates**

### *Abstract*

In recent years, policing scholars have increasingly used survey methods to gain insight into officers' attitudes and behaviors. Yet, surprisingly, methodological research analyzing surveys of police officers is rare. We analyzed the extent and correlates of response rates in police surveys, providing insights about the survey design features and study characteristics associated with higher rates of officer participation. We examined the response rates to 497 police surveys reported in 390 articles published in 15 journals from 2008 to 2017. Findings included the following: (1) the average response rate was 64%, but there was a great deal of variation, (2) in-person surveys achieved substantially higher response rates, (3) inviting a greater number of officers to participate in surveys was associated with lower response rates, and (4) response rates have declined over time (though primarily among surveys not administered in-person). We recommend minimally acceptable reporting standards and discuss avenues for future research.

**Keywords:** policing; law enforcement; survey research; response rates; unit nonresponse

## **Police Research, Officer Surveys, and Response Rates**

Over the fifty-year history of police research, the characteristics of the researchers involved (e.g., ‘inside insiders’ versus ‘outside outsiders’), their agendas (e.g., supportive versus critical), and the methods used have varied considerably (Brown 1996, Reiner 2000, Thomas 2014). One constant has been the enormous formal and informal challenges to gaining access to police officers for research purposes (Reiner 2000). Until recently, the majority of police research was ethnographic using participant observation (Reiner 2000, Squires 2016). However, growing interest in evidence-based policing, new administrative models (e.g., organizational justice), and police use of force has motivated a larger number of quantitative studies, which increasingly have involved surveys of police officers (Martin and Tong 2016). Additionally, mounting concerns about increased police-civilian tensions in countries like the United States and the potential for de-policing (Nix, Wolfe, *et al.* 2017, Shjarback *et al.* 2017, Weitzer 2015) have rendered survey research examining officers’ attitudes, fears, and behaviors even more important (e.g., Morin *et al.* 2017).

Unfortunately, methodological research analyzing surveys of police officers is rare. As a consequence, the guidance available to researchers seeking to conduct police surveys is shockingly thin and often inconsistent. In turn, the strategies, norms, and best practices for designing, conducting, and evaluating police surveys remain unclear. Although the broader literature on survey research methods is a useful starting place (e.g., Babbie 1992, Dillman *et al.* 2014, Groves *et al.* 2009), there are unique difficulties to surveying police officers. These include, but are not limited to, the target population being close-knit and especially distrustful of outsiders, and the necessity of obtaining (and maintaining) formal approval from police supervisors (and often multiple supervisors and union representatives) (Reiner 2000, Skogan 2015).

Given the many barriers to surveying police officers, it would be reasonable to expect relatively low response rates in police surveys. This is important because researchers, reviewers, and editors often rely on response rates to estimate the quality of data from surveys (Byrne 2000, Peytchev 2013). Carley-Baxter *et al.* (2009) surveyed journal editors from several disciplines and found that nearly 90% said survey response rates were either somewhat or very important in publication decisions. What, then, is the minimally acceptable response rate for a survey of police officers? Likewise, what survey design features are associated with higher response rates in police surveys?

Regrettably, research methods texts in criminal justice provide inconsistent (and incorrect) information about response rates in general, and virtually no guidance about surveying police officers specifically. For example, Maxfield and Babbie (2014, p. 247) state that ‘a response rate of at least 50 percent is adequate for analysis and reporting,’ Jennings and Reingle (2014, p. 67) argue that ‘60 percent is considered minimally acceptable,’ but Bachman and Schutt (2014, p. 216) assert that ‘even a 70% response rate is not much more than minimally acceptable.’ Skogan (2015) partnered with a professional survey research organization to conduct a rigorous computer-assisted self-administered survey of police officers in Chicago. To increase participation, they prenotified officers about the survey, excluded questions about highly sensitive topics, enlisted the help of numerous insiders (e.g., the Chief of police and district commanders), and had survey ‘sales representatives’ answer questions about the survey at roll calls. Yet, the survey still achieved a response rate of only 25 percent. Are the resultant data from Skogan’s (2015) police survey of sufficient quality for analysis and reporting?

The objective of the current study is to start an informed discussion about police survey research. Our focus is on response rates in surveys of police officers. We begin by reviewing the

broader literature on survey response and scholarship on the unique barriers to police research. Next, we examine the response rates to 497 police surveys reported in 390 articles published in 15 journals from January 2008 to March 2017. Our analysis examines the extent and correlates of survey response, providing insights about the survey design factors associated with higher response rates in police surveys.

### **Consequences of Survey Nonresponse**

Although universally agreed upon definitions and reporting standards remain elusive (Smith 2002), the response rate in a survey is normally defined as the percentage of the eligible (or potentially eligible, when eligibility is unknown) sample members who complete the questionnaire (although the definition of what constitutes a ‘completed interview’ can vary) (AAPOR 2016, Groves *et al.* 2009). Nonresponse occurs when researchers fail to contact all sampled respondents (noncontacts), or when they are unable to elicit cooperation from all of those individuals who are contacted (refusals) (Dillman *et al.* 2002). Response rates in surveys are important because nonresponse poses two serious problems for research.

The first problem created by survey nonresponse is reduced sample size and/or greater research costs. The lower the response rate, the smaller the final sample of respondents, unless additional time and resources are devoted to increasing the sample size. In turn, a smaller sample size results in greater sampling error and lower statistical power, which reduces the precision of resultant survey estimates and increases the risk of Type 2 errors (false negatives) (Cohen 1992). Because statistical power is inversely related to sample size, even when findings are statistically significant, there is a greater risk of making Type S (sign) and M (magnitude) errors in studies with smaller samples (Gelman and Carlin 2014). Thus, lower response rates, by reducing sample size, can make it harder to reject the null hypothesis when effects exist, and, when the null

hypothesis is rejected, render it more difficult (or even impossible) to accurately estimate the direction and size of those effects.

The second problem—or *potential* problem—created by survey nonresponse is nonresponse bias (Peytchev 2013). Nonresponse bias occurs when the propensity to respond (P) is correlated with survey variables (Y) (Groves 2006, Groves and Peytcheva 2008). When P is correlated with Y, the magnitude of nonresponse bias will be a function of the strength of that correlation and the amount of nonresponse (average P in the target population) (Bethlehem 2002). However, regardless of the response rate, survey estimates will be unbiased if Y is independent of P (zero covariance), or if Y and P are associated only because of common causes (Z) and statistical adjustments are used to control for Z (zero covariance, controlling for Z) (Groves *et al.* 2009, pp. 191-192). Nonresponse is ‘nonignorable’ when there is a direct causal relation between Y and P—that is, when Y causes P (Groves *et al.* 2009). An example would be if support for body-worn cameras affected response behavior in a survey designed to estimate officers’ support for body-worn cameras.

### **Previous Studies of Survey Response Rates**

Although there is no prior research on response rates in policing studies, there is a large literature on response rates to surveys in general (Groves *et al.* 2002, Peytchev 2013). Researchers have examined the extent, correlates, and outcomes of survey nonresponse. Groves and Peytcheva (2008) examined response rates from 59 surveys, and found that they ranged from 28% to 86%, with an average of 64%.<sup>1</sup> Macias *et al.* (2008) examined the response rates of 565 surveys published in 46 different communication-related journals between 1990 and 2002. They found that the average response rate was 50.5%. Analyzing 308 survey administrations in the

---

<sup>1</sup> Groves and Peytcheva (2008) reported *non*response rates. The figures we report are the inverse of the nonresponse rates they reported.

field of counseling and clinical psychology, Van Horn and colleagues (2009) found an average response rate of 49.6%. Holbrook *et al.* (2008) investigated response rates in 114 random-digit-dial (RDD) telephone surveys, which were conducted between 1996 and 2005 by either government contractor survey research firms or news organizations, and found that they ranged from 4% to 70%, with an average of 30%.

Studies have also documented long-term declines in response rates to many different types of surveys (Curtin *et al.* 2005, Kohut *et al.* 2012). The decline in response rate occurred across surveys with different sponsors (e.g., government versus private sponsorship) and across modes of administration (e.g., in-person versus telephone) (Brick and Williams 2013, Groves *et al.* 2009). For example, over the past few decades, the initial rate of nonresponse has nearly doubled in the Current Population Survey, and more than doubled in the National Crime Victimization Survey (Tourangeau and Plewes 2013). The typical response rate in Pew Research telephone surveys fell from 36% in 1996 to just 9% in recent years (Keeter *et al.* 2017). Unfortunately, it remains unclear whether a similar decline in response rates has occurred in surveys of police officers.

Unsurprisingly, given declines in response rates, another growing area of research is examining the consequences of survey nonresponse for nonresponse bias. Several studies have focused specifically on telephone surveys. For example, scholars have assessed whether the representativeness of telephone surveys has declined over time with declines in response rates (Curtin *et al.* 2000, Keeter *et al.* 2017, Kohut *et al.* 2012). The general finding has been that despite achieving much lower response rates now, compared to previous time periods, telephone surveys continue to provide very accurate prevalence estimates (Dutwin and Buskirk 2017). Keeter *et al.* (2017, p. 1), for example, found ‘that the bias introduced into survey data by current

levels of participation is limited in scope.’ Other studies have explored whether taking extra steps to increase response rates in telephone surveys reduces nonresponse bias. In one experiment, Keeter *et al.* (2000) achieved similar estimates from a rigorous telephone survey that achieved a 61% response rate and a standard telephone survey that achieved only a 36% response rate. Finally, Holbrook *et al.* (2008, p. 527) compared estimates from 114 telephone surveys that exhibited great variation in response rates, and found that ‘response rates were positively associated with demographic representativeness, but only very weakly.’

Researchers have also investigated the relationship between response rates and nonresponse bias in surveys generally, regardless of the mode of administration. To illustrate, Yeager *et al.* (2012, p. 730) compared estimates from several surveys—probability surveys administered via the Internet or telephone, and nonprobability surveys administered via the Internet—with varying response rates and found that ‘remarkably, higher response rates were associated with *lower* accuracy of the surveys’ (emphasis added). This was true regardless of administration mode. Peytcheva and Groves (2009, p. 198) reported a similar finding: ‘as [the] nonresponse rate goes down, bias goes up! Such a counter-intuitive finding has been demonstrated with the 1998 Dutch integrated Survey on Household Living conditions (POLS) – the increase in response rate from 47% to 60% over a month resulted in larger biases in key survey statistics.’ This can occur when efforts to increase participation only do so among those types of sampled individuals who are already more likely to participate—thus increasing differences between responders and nonresponders. In the largest study to date, Groves and Peytcheva (2008, p. 174) meta-analyzed 59 methodological studies examining nonresponse bias, and found that the response rate was ‘a poor predictor of the absolute relative nonresponse bias ... if a naïve OLS regression line were fit to the scatterplot, the  $R^2$  would be 0.04.’



Nonetheless, virtually all studies of nonresponse bias have consistently found that large nonresponse biases often exist (Amaya and Presser 2017, Groves and Peytcheva 2008). Why then is the response rate of a survey, which certainly increases the risk of nonresponse bias (Groves *et al.* 2009), a weak predictor of nonresponse bias in estimates? The explanation is that nonresponse bias varies primarily within surveys, across different estimates, rather than between surveys (Peytchev 2013). Specifically, nonresponse bias occurs when the propensity to respond (P) is correlated with the survey variable of interest (Y), either because the survey variable affects the propensity to respond ( $Y \rightarrow P$ ), or because there are other variables (Z) that are common causes of both ( $P \leftarrow Z \rightarrow Y$ ) and are uncontrolled (Groves *et al.* 2009). For this reason, there may be large a nonresponse bias in the estimate for one variable within a survey, but not for another. Additionally, although limited, the evidence to date suggests that nonresponse bias tends to be much larger in univariate estimates than multivariate findings (Amaya and Presser 2017, Heggstad *et al.* 2015, Lepkowski and Cooper 2002, Martikainen *et al.* 2007).

There is a sizable literature on the factors influencing the propensity to respond to surveys in general (Groves *et al.* 2002), and in some specific types of criminal justice surveys, such as inmate surveys (Pickett *et al.* 2014). Unfortunately, we are unaware of any previous research exploring whether similar factors influence response rates specifically in police surveys. For our purposes, the most relevant research is that exploring how survey design characteristics influence response rates. Prior studies have found that response rates vary significantly across different administration modes. In general, response rates tend to be highest in face-to-face surveys, lowest in Web surveys, with telephone and mail surveys falling in the middle (Groves *et al.* 2009, Tourangeau and Plewes 2013). For example, in the field of communication, Macias *et al.* (2008, p. 86) found that average response rates varied by mode, as follows: face-to-face, 79%;

telephone, 61%; mail, 42%; and email, 30%. Shih and Fan's (2009) meta-analysis found that response rates were about 11 percentage points lower in Web versus mail surveys. Manfreda *et al.* (2008) reported similar findings.

Peak (1990) argued that a 'personal touch' can improve response rates for mail surveys (e.g., postage stamp appeal, personalized cover letters, and high-quality paper; see also Babbie 1992). Research has also demonstrated that prenotification, increased contact attempts, survey sponsorship, and incentives increase response rates (Dillman *et al.* 2014, Groves *et al.* 2009). Government- and university-sponsored surveys achieve significantly higher response rates than surveys with other sponsors (Edwards *et al.* 2002, Groves and Couper 1998, Heberlein and Baumgartner 1978). There is strong evidence that incentives increase response rates in all modes, but the effect depends on the type and amount of the incentive (Singer 2002). Specifically, pre-paid incentives outperform promised or lottery incentives, monetary incentives outperform non-monetary incentives (e.g., gifts), and larger incentives outperform smaller incentives, but they do so at a declining rate (Church 1993, Singer and Ye 2013). Again, and unfortunately, there is little evidence about whether these same factors influence response rates in surveys of police officers.

### **Considerations in Surveying the Police**

Researchers face a number of unique challenges when surveying police officers – the first of which is gaining access to the officers (Reiner 2000, Skogan 2015). Besides often requiring permission from the agency head just to administer the survey, the researcher might also need a key officer, such as a respected sergeant or lieutenant, to help distribute (or encourage participating in) the survey (Skogan 2015). Officers are asked frequently to complete surveys and often suffer from survey fatigue. Thus, having an 'insider' help encourage participation can be beneficial. Likewise, another important consideration is whether the researcher has

administrative or union approval. While administrative approval may be required simply to gain access to the officers, it may be seen by line-level officers as a reason *not* to respond. On the other hand, union or bargaining unit approval might enhance response rates.

Researchers must also carefully consider their desired sampling frame. Depending on the nature of the survey, they may wish to target all employees, strictly sworn employees, or perhaps only certain ranks, units, or divisions. For example, if a researcher sets out to survey all sworn officers in-person via roll call meetings, he must bear in mind that a significant portion of the sampling frame could be absent on any given day due to court, vacation, sick leave, or special assignments (Skogan 2015). In our own experience administering police surveys, as many as 1 in 4 officers could be absent from any given roll call meeting because of sick leave, administrative leave, special assignment, or other reasons.

Finally, researchers must take added precaution to ensure anonymity in order to increase participation – as well as honesty among those who do participate. This is especially important if the survey pertains to sensitive topics such as police use of force or misconduct. Simply requesting information about years on the job, gender, race, and rank, for example, might turn some officers away who fear sharing that information could compromise their anonymity. For example, a female Lieutenant with 16 years of service in Division ‘A’ could easily be identified if there are only one or two officers who fit those demographics. Of course, even if such information is not requested by the researcher, some officers may still be skeptical that their identities will remain anonymous. Overall, then, there are many details researchers must consider when surveying police officers.

### **The Current Study**

Prior research finds significant differences in response rates to surveys, depending on the target population (Anseel *et al.* 2010, Heberlein and Baumgartner 1978, Van Horn *et al.* 2009). As important, studies have shown that the effect of survey design features on response rates varies across target populations (Anseel *et al.* 2010). Previous studies also suggest that certain strategies for increasing response rates may work best with particular target populations (Groves *et al.* 2000, Pickett *et al.* 2014). The above scholarship thus raises questions about whether findings about survey response rates in general population surveys will generalize to surveys of police officers. As important, it is currently unclear what the ‘typical’ response rate is in police surveys, whether they have declined over time, or whether they vary by mode or other survey design characteristics. The current study posed the following research questions:

1. What is the average response rate for police surveys published in the field of criminology and criminal justice?
2. Do police survey response rates vary substantially from journal to journal, by journal type, or journal impact?
3. Have police survey response rates fluctuated over time?
4. What police survey design features are associated with higher response rates?

## **Methods**

### ***Data Collection***

Data collection occurred from March to May of 2017. The first step was to identify the journals to include in our sample. From the American Society of Criminology’s Division of Policing website ([www.ascpolicing.org](http://www.ascpolicing.org)), we identified eight policing journals:

1. *European Journal of Policing Studies*
2. *International Journal of Police Science & Management*
3. *Journal of Police and Criminal Psychology*
4. *Policing: An International Journal*

5. *Police Practice & Research*
6. *Police Quarterly*
7. *Policing: A Journal of Police and Practice*
8. *Policing & Society*

We also wanted to include a selection of criminology journals with broader foci in our sample.

Using Thomson Reuters' 2015 Journal Citation Reports, we selected the following eight journals listed under 'Criminology and Penology':

1. *British Journal of Criminology*
2. *Crime & Delinquency*
3. *Criminal Justice and Behavior*
4. *Criminology*
5. *Journal of Criminal Justice*
6. *Journal of Research in Crime and Delinquency*
7. *Journal of Quantitative Criminology*
8. *Justice Quarterly*

These eight generalist journals were selected because they are regarded as among the most prestigious journals (Sorenson 2009), are widely read by the field, and publish manuscripts focusing on a variety of criminology and criminal justice-related topics beyond policing. In total, we initially identified 16 journals to scan in order to construct our dataset. However, we could not get online access to *European Journal of Policing*, which has published four volumes to date. As such, our sample included seven policing journals and eight criminology journals.

### ***Coding Procedure***

Next, two members of our research team visited each journal's website and scanned every published article (including those available online first) dating back nine years, to 2008. For policing journals, we downloaded every article and scanned the abstracts and/or methods sections in order to determine whether a survey of police officers was involved. Once we determined whether or not each article included one or more police officer surveys, we then

scanned the text for a response rate. This process resulted in the identification of 497 unique surveys, published in 390 articles between January 2008 and March 2017.<sup>2</sup>

It is important to note that for 43 surveys (about 10 percent of the sample), we calculated the response rate on our own, using other information provided by the authors (e.g., dividing the number of responses by the known sampling frame). We were unable to surmise the response rate for 77 surveys (roughly 15 percent of the sample; see Table 1). Thus, the response rate was not immediately apparent for approximately 25 percent of the surveys in our sample. Moreover, our search revealed zero police surveys published in *Journal of Quantitative Criminology* or *Journal of Research in Crime and Delinquency* (JRCD) during this timeframe. We are not sure whether this surprising finding reflects a lack of relevant submissions by authors or the publication decisions at these specific journals. For example, from personal experience, we know that a previous editor of JRCD—who coauthored the research textbook suggesting that a 50% or higher response rate is required for analysis and reporting (Maxfield and Babbie 2014) — sometimes explicitly pointed to a low response as a primary reason for rejecting or even desk rejecting (without external review) submissions analyzing survey data.

## Results

The average response rate for police officer surveys published in the aforementioned journals over this nine-year period was 64.3 percent. As expected, there was a great deal of variation: response rates ranged from a low of 5.2 percent to a high of 100 percent (standard deviation: 25.9). The mean response rate across the seven policing journals ranged from a low of 54.4 percent (*Policing: A Journal of Policy and Practice*) to a high of 66.6 percent (*Policing: An International Journal*). The mean response rate across our selection of eight criminology

---

<sup>2</sup> Note that some articles involved multiple surveys (e.g., Gaub *et al.* 2016). In these instances, we treated each survey as a separate case in our dataset.

journals ranged from a low of 66.2 percent (*Crime & Delinquency*) to a high of 95.1 percent (*Criminology*; though note this is based on 2 surveys). Table 1 provides a breakdown of response rates by each individual journal. As a general observation, most of these average response rates barely meet the ‘minimum acceptable’ response rate standards outlined in criminal justice research textbooks (Bachman and Schutt 2014, Jennings and Reingle 2014, Maxfield and Babbie 2014). Further, a large proportion of the police surveys published in leading journals—up to half in some journals—fail to meet these standards, achieving response rates as low as 5.2 percent. At this point, it bears emphasizing that in contrast to the advice in the research method textbooks in our field, leading survey methodologists stress that there is no valid cutoff point for considering a response rate acceptable (Groves 2006, Peytchev 2013).

[Table 1 about here]

### ***Survey Design and Study Covariates Expected to Predict Response Rate***

#### *Survey Year*

Research has demonstrated that survey response rates have diminished over time (Curtin *et al.* 2005, Kohut *et al.* 2012). As such, we documented when each survey was administered, based on the timing of the end of data collection. Initially, we could only determine when the data were collected for 333 of the 497 surveys in our sample (67 percent). To be clear, the implication is that this key survey design information was not reported in approximately one-third of published police surveys. We sent emails to the corresponding authors of the articles that contained the remaining 164 surveys, and were ultimately able to ascertain the data collection period for an additional 117 surveys (bringing our total to 450, or roughly 90 percent of our sample). We used this information to create a variable, *Survey Year*, which ranged from 1996 to 2016. In cases where data collection spanned multiple years (e.g., December 2014 to March

2015), we coded the year when data collection stopped. Table 2 provides descriptive statistics for this variable and all others used in subsequent multivariate analyses. At a bivariate level, there was a significant negative correlation between survey year and response rate ( $r = -.22, p < .001$ ), indicating that response rates in police surveys have declined over time. This relationship is shown in Figure 1, which plots response rates by survey year.

[Table 2 about here]

[Figure 1 about here]

### *Mode*

Based on prior research, we expect that surveys administered in-person receive, on average, higher response rates than surveys administered by mail, phone, or internet (Groves *et al.* 2009, Tourangeau and Plewes 2013). We therefore documented the mode of administration for 421 surveys as indicated by the article's author(s). Again, it is noteworthy that 76 surveys (roughly 15 percent of our sample) were published without providing clear indication of how they were administered. This is vital survey design information; mode of administration is itself associated with nonresponse bias (Groves and Peytcheva 2008). Among those where information was provided, face-to-face surveys were common. Figure 2 presents the breakdown by survey mode: 47.5 percent were administered at police headquarters, during roll calls, or at training classes. Roughly 25 percent of surveys were web-based, and the remaining 27 percent were collected through the mail or by phone. We therefore created a dichotomous variable, *In-person*, coded 1 if the survey was administered face-to-face and 0 otherwise. A small number of cases ( $n=13$ ; 3 percent) involved the use of multiple modes of administration. These were coded 1 since a portion of the desired sample had responded to the survey in-person. At a bivariate level,



surveys administered in-person achieved significantly higher response rates than those administered by other means ( $t = 13.907$ ,  $p < .001$ ).

[Figure 2 about here]

### *Number of Invitations Sent*

It is feasible that inviting a greater number of officers to take a survey could produce a lower response rate by: 1) increasing the complexity of survey administration protocol, 2) reducing the amount of time and resources that researchers must devote to recruiting each individual sample member, and/or 3) requiring approval from and/or the involvement of a greater number of police administrators. For example, it is undoubtedly easier to obtain a 100 percent response rate when the number of officers invited to take the survey is 10 at one agency versus 100 or 1,000 at multiple agencies. Thus, police researchers may face a tradeoff between increasing sample heterogeneity (e.g., by surveying multiple agencies) or maximizing response rates. Accordingly, we documented the number of invitations whenever it was provided by the authors. A total of 364 surveys (73% of our sample) included this information. We used the information to create a continuous variable – *Invitations* – which initially ranged from 10 to 83,550 (median = 350). Because a small number of surveys involved an extremely high number of invitations, we top-coded at the 95<sup>th</sup> percentile (Barnett and Lewis 1994).<sup>3</sup> At a bivariate level, number of invitations was inversely correlated with response rate ( $r = -.40$ ,  $p < .01$ ) – such that greater numbers of invitations were associated with lower response rates.

### *Funding*

---

<sup>3</sup> Top coding is a common strategy in our field for reducing the influence of outliers (e.g., Anwar and Loughran 2011, Slocum *et al.* 2013). However, substantively identical results were obtained when models were estimated without top coding and using robust regression.

As noted, government- or university-sponsored research typically yields higher survey response rates than non-sponsored research (Edwards *et al.* 2002, Groves and Couper 1998, Heberlein and Baumgartner 1978). Additionally, funded studies likely have greater resources that can be devoted to data collection and converting initial nonrespondents. Unfortunately, virtually none of the published studies provided information about whether a specific sponsor was listed in the questionnaire for respondents. We therefore focused on funding. We checked the ‘Acknowledgements’ section of each article, or for articles without such a section, scanned for mention of any of the following terms: ‘grant,’ ‘fund,’ ‘award,’ and ‘sponsored.’ A total of 127 surveys (approximately 25 percent) reported receiving some sort of grant or scholarship funding. We therefore created a dummy variable – *funded* – coded 1 if the authors mentioned their research was supported by funding and 0 otherwise. However, at a bivariate level, funded and non-funded surveys did not significantly differ in terms of response rates ( $t = 0.877$ ,  $p = .38$ ).

### *Location*

We also examined whether officers working in the United States might be more or less inclined to respond to surveys than officers working elsewhere. We created a dummy variable – *US Sample* – coded 1 if the survey was administered to US police officers and 0 otherwise. Approximately 51 percent of the surveys in our sample were administered to U.S. police officers. At a bivariate level, surveys with U.S. police officers did not significantly differ in terms of response rate from surveys of police officers employed elsewhere ( $t = 1.216$ ,  $p = .22$ ).

### *Incentives*

We attempted to code for whether or not researchers offered any sort of incentive to take their surveys, as the evidence suggests incentives increase response rates (Singer 2002). To do so, we scanned articles for mention of any of the following terms: ‘incentive,’ ‘dollar,’

‘compensate,’ and ‘offer.’ However, surprisingly, this methodology revealed that virtually none of the articles in our sample included any information about whether incentives were used. Again, then, it appears that key survey design information is often omitted from publications using police survey data. Nonetheless, if we make the conservative assumption that all articles which used incentives reported doing so, we found that 12 surveys (2.4 percent of the sample) included an incentive (e.g., gift cards, coffee and donuts, t-shirts). Nine of these 12 surveys reported a response rate. Those 9 surveys achieved an average response rate of 59.2 percent, which is lower, surprisingly, than the average response rates in surveys not reporting incentives. At the same time, given the very small sample size and ambiguousness of reported survey design information, this result should clearly be interpreted with considerable caution.

#### *Journal Type*

A cursory glance at Table 1 suggested that surveys published in criminology journals might have, on average, higher response rates than surveys published in policing journals. Perhaps the general criminology journals have a higher informal standard for what constitutes an acceptable response rate. There may also be differences in the rigorousness of studies published in specialty versus generalist journals. Or, it could be that more established researchers – who have more connections to police executives – typically achieve better response rates and therefore submit their research to these journals rather than policing-specific journals. To consider these possibilities, we created a dummy variable, *Crim Journal*, coded 1 if the survey was published in one of the criminology journals and 0 if it was published in one of the policing journals. At a bivariate level, surveys published in the generalist criminology journals achieved significantly higher response rates than those published in the policing journals ( $t = 2.085$ ,  $p = .04$ ).

### *Impact Factor*

We further noted that the criminology journals had higher impact factors according to Thomson Reuters' 2015 Journal Citation Reports – each of these journals ranked in the top 22 out of 57 journals indexed under 'Criminology and Penology.' Conversely, only one policing journal cracked the top 30 (*Policing & Society*, ranked 15<sup>th</sup>). Similar to the above discussion, impact factor may be related to response rates, such that researchers who achieve poor response rates may shy away from submitting to higher impact journals due to fear of being rejected. Or there may tend to be differences, on average, in the methodological expertise and/or rigorousness of authors who tend to publish in low versus high-impact journals. As such, we sought to include some sort of measure of the journal's impact – but four of our seven policing journals were not indexed as of 2015. Accordingly, we turned to Sorenson (2009), which provides an alternative measure of journal impact factor for all but two of the journals in our sample – *British Journal of Criminology* and *Policing: A Journal of Policy and Practice*. To impute a value for surveys published in *British Journal of Criminology*, we found four journals that Sorenson (2009) *did* score which had similar impact factors (within 0.1 point) according to the 2015 Journal Citation Reports, and used those journals' average Sorenson score.<sup>4</sup> *Policing: A Journal of Policy and Practice* was not included in Sorenson (2009) nor the 2015 Journal Citation Reports. We assigned this journal a score of 0. *Sorenson* ranges from 0 to 1.21 with a mean of 0.12. At a bivariate level, *Sorenson* was positively and significantly correlated with response rate ( $r = .12, p = .02$ ).<sup>5</sup>

---

<sup>4</sup> The four journals were *Policing & Society*, *Journal of Criminal Law & Criminology*, *Journal of Interpersonal Violence*, and *Youth Violence and Juvenile Justice*. The resulting formula used to impute a Sorenson score for *British Journal of Criminology* was  $(0 + .09 + .09 + .03)/4 = .05$ .

<sup>5</sup> While we include a measure of each journal's impact factor in our analyses, we recognize the limitations of such metrics (Baker 2015). Perhaps we need to revise our concept of 'impact.' Currently, it refers to who cites which paper, and in which journal. This means that impact operationally measures our willingness to cite each other, and is

### *Multivariate Analysis*

Table 3 presents the results of an ordinary least squares (OLS) equation that regressed our dependent variable *response rate* onto each of the seven covariates.<sup>6</sup> The model as a whole was statistically significant ( $F = 31.86$ ,  $p < .001$ ) and explained roughly 42 percent of the observed variation in response rates. Three variables were significantly associated with the outcome: *survey year*, *in-person*, and *invitations*. Survey year was negatively associated with response rate. The point estimate ( $b = -.532$ ,  $p < .05$ ) suggests that with each passing year, response rates in our sample declined by approximately 0.5 percentage points. In-person administration ( $b = 24.046$ ,  $p < .01$ ) was strongly related to response rate, such that surveys administered face-to-face yielded, on average, a 24 percentage points higher response rate than surveys administered online, through the mail, or over the phone. Finally, the point estimate for the number of invitations sent was negative and statistically significant ( $b = -.010$ ,  $p < .01$ ). Researchers who invited a greater number of officers to take their survey typically achieved a lower response rate. That is, for every additional 100 officers invited to take the survey, response rate declined by approximately 1 percentage point. The regression model additionally suggests that funding, journal type, and journal impact were not significantly associated with response rate. Furthermore, surveys administered to police in the United States did not yield significantly higher or lower response rates than surveys administered elsewhere.

[Table 3 about here]

Finally, we ran an additional OLS regression model whereby we considered whether the effect of survey year on response rate was moderated by administration mode. It is feasible that

---

influenced by how often the journal is published, and how often it publishes articles in a particular field, among other factors. Currently, it is not a measure of impact on the world that is being studied.

<sup>6</sup> We used robust standard errors in order to account for heteroskedastic error terms (Hayes and Cai 2007).

noncontacts and refusals – both of which are related hydraulically to response rate – have increased particularly among mail, telephone, and e-mail surveys due to growing difficulties in reaching people when they are at home and high levels of advertisements and spam. For example, according to Kaspersky Lab (n.d.), spam has comprised between 52 and 71 percent of all emails over the last three years. Likewise, a survey invitation received via mail/email is easier to overlook or mistake for spam, especially if the recipient does not recognize the sender (see Vehovar *et al.* 2002). By contrast, in-person surveys administered in police agencies (e.g., at roll calls) would likely be less impacted by these problems. To consider whether administration mode moderated the effect of survey year on response rate, we included in the model an interaction term: *in-person\*survey year*. The point estimate was statistically significant ( $b = 1.182$ ,  $p = .04$ , 95% CI = [.053, 2.310]), which suggests that administration mode indeed moderated the effect of survey year on response rate. Figure 3 graphically depicts the interaction effect (full regression results available upon request). Inspection of the Figure reveals that the decline in response rates over time appears primarily to be restricted to surveys administered via mail, phone, and the Internet. Face-to-face survey response rates, on the other hand, remained relatively stable over this period. With these results in mind, we now turn to a discussion of the implications of our study.

[Figure 3 about here]

### **Discussion and Conclusion**

Police surveys are vital to enhancing our understanding of officers' attitudes, beliefs, customs, and ultimately, behaviors – perhaps more than ever given the current climate of distrust between citizens and police in the United States (Weitzer 2015). Though not very common a half-century ago, there has been an explosion of survey-based police research over the last few

decades. These studies have provided valuable insight about a wide variety of topics, including officer stress (Duxbury *et al.* 2015, Shane 2010), police culture (Ingram *et al.* 2013), the Ferguson effect (Nix and Pickett 2017, Wolfe and Nix 2016), body-worn cameras (Gaub *et al.* 2016, Jennings *et al.* 2014), utilization of research (Rojek *et al.* 2012, Telep 2017) and perceptions of citizens (Nix, Pickett, *et al.* 2017, Pickett and Ryon 2017) among others. Yet, given the increased utilization of survey methods for police researchers, it is somewhat surprising that research analyzing police survey methods is nonexistent.

As a result, we have no idea what should be considered a ‘good’ or even ‘acceptable’ response rate for a police survey. Our ability to identify best practices in terms of administering surveys to police samples has likewise been impeded by this dearth of research. Policing scholars typically use Dillman *et al.* (2014) as a guide, but findings such as those may not be directly applicable to police surveys, which come with a unique set of challenges (e.g., being granted ‘access’ to the officers, cynicism and distrust of researchers, and/or fear of the survey not being truly anonymous). The present study uncovered the average response rates for police surveys published in fifteen peer-reviewed journals over the last nine years – 64%. It is important to understand that this figure is affected by survey design features. Furthermore, we demonstrated empirically what factors are associated with higher response rates. We arrived at three key findings which warrant further discussion.

First, surveys administered in-person fared much better in terms of response rates than surveys administered through the mail, over the phone, or on the Internet. The average response rate to surveys administered in-person was 79.4 percent – versus just 48.6 percent for surveys distributed via other means. Even after controlling for other potentially important covariates in our multivariate models, face-to-face administration remained strongly associated with higher

response rates. Although less convenient and perhaps more time-consuming (e.g., requiring attending numerous roll-call meetings spread out over several days), researchers should be aware that the return on investment will likely make it worth their while.

Second, we observed that response rates are declining over time – a finding that was restricted to surveys administered via mail, phone, or Internet. There are two plausible explanations for this finding. Research suggests that non-contacts and refusals have increased over the last few decades – both of which reduce response rates. Non-face-to-face surveys, in particular, have seen an increase in non-contacts and refusals (Peytchev 2013). Also, Internet surveys typically achieve lower response rates than other non-face-to-face administration modes (e.g., mail, phone) – and these have become far more widespread in recent years. That in-person police surveys have not concurrently experienced a significant decline in response rates is promising, and it reiterates the appeal of surveying officers face-to-face.

Third, there was a significant inverse relationship between number of invitations sent and response rate. Our regression model demonstrated that each additional 100 officers invited to take a survey corresponded with about a one percent decline in response rate. Researchers undoubtedly want samples large enough to analyze statistically – but they may ultimately face a tradeoff between sample size and response rate. Larger sample sizes are important for increasing statistical power. Additionally, most police surveys are conducted with nonprobability samples. However, when relying on nonprobability samples, greater sample heterogeneity (e.g., recruiting officers from different agencies) is critical for reducing sampling bias and increasing generalizability of findings (Blair *et al.* 2014, Shadish *et al.* 2002). As Blair and colleagues (2014, p. 101) explain, in nonprobability samples, ‘measures of relationships should be resistant to sample bias as long as the sample is diverse but not necessarily if the sample is restricted.’



Therefore, it would likely be a mistake to restrict sampling for a police survey to a single agency, rather than multiple agencies in different areas, simply in hopes of maximizing the response rate.

Equally important as our findings, a number of non-findings were also worth noting. We were surprised at some of the difficulties we encountered while coding the articles in our sample. One hundred and twenty (24%) of our 497 surveys did not include readily apparent response rates. We were able to calculate the response rate for 43 of these surveys – but this left us with 77 surveys for which the response rate was unknown or unclear. Importantly, in some cases the authors noted that it was not possible to determine a response rate given their sampling strategy (e.g., requesting participation through email and asking participants to forward the email to colleagues). Other important methodological details were also commonly missing. One out of every three surveys failed to mention when the data were collected. One out of every four surveys did not indicate how many officers were invited to participate. And for approximately one out of every seven surveys, it was unclear how the survey was administered (i.e., whether in-person or by some other method). Finally, 12 of the 497 surveys in our sample involved an incentive of some sort – but while a few studies explicitly mentioned *not* offering any incentive, the overwhelming majority simply did not say.

It is important to note that our findings related to underreporting of certain survey design features are consistent with other areas of criminal justice research. Perry *et al.* (2010, p. 245), for example, evaluated the reporting transparency of experimental crime and justice studies and found that ‘reporting was poor on methods of randomization, outcome measures, statistical analyses, and study findings.’ Nevertheless, we find it troubling that such basic survey design information was so often left out of published articles. As such, we provide what we believe should be the minimally acceptable set of reporting standards below:

1. When the data were collected (from start to finish)
2. How/where the survey was administered
3. Whether incentives were offered
4. Whether/how many follow-ups there were
5. The size of the sampling frame
6. The number of officers invited to participate
7. What officers were told the survey was about
8. The number of surveys returned
9. The number of surveys excluded from subsequent analyses and the reason(s) why
10. The response rate – being clear about the numerator and denominator

Providing these details will better permit readers to assess the strengths and weaknesses of the survey methodology, and in turn, the results of the study.

Our study is not without its own limitations. We only looked at nine years of publications, and although this resulted in a sample of nearly 500 surveys collected over a twenty-year period, it is still only a fragment of all relevant publications. Relatedly, we only scanned fifteen peer-reviewed journals, which means we did not code studies published in dozens of other journals, or unpublished studies (including theses and dissertations). To this point, it is possible that the response rates in our sample are overestimates of response rates in the population of police surveys due to selection bias (i.e., researchers may be less likely to write up their studies when they achieve low response rates). We were furthermore limited to exploring the relationship between response rate and only a few general survey design characteristics, in part because, as we have noted, reporting was often incomplete. However, in the case of police surveys there are several other unique design issues that may be relevant and offer promising directions for future research. For instance, who is administering the survey – an agency, professional association, union representatives, or just curious academics? We captured whether the surveys were funded or not, but it may be more important to note who physically distributes the surveys (or whose name is on the cover letter). Another detail worth considering is

how the survey is presented to officers (i.e., what it is about). Is it possible that officers are less willing to respond to surveys that pertain to sensitive topics such as use of force or misconduct? Or alternatively, they may be more willing to respond to a survey that is about a topic they personally care about. Future studies would do well to investigate these possibilities, assuming reporting standards improve.

Another limitation of our study is that we restricted our analysis to response rates of police surveys. Future studies might consider going beyond our analysis by comparing, for example, police response rates to civilian response rates to surveys about the police. Perhaps there may be meaningful differences over time, across various administration modes, or even across journals. We furthermore did not assess response *quality* (e.g., satisficing, speeding, item nonresponse). Stylistic responding (e.g., response acquiescence) is common in surveys and reduces data quality (Pickett and Baker 2014). Likewise, even in surveys with high response rates, item nonresponse reduces analytic sample size and can bias findings. Future studies should thus consider what survey design features are associated with different measures of response quality. For example, Medway and Tourangeau (2015) found that \$5 incentives significantly decreased item nonresponse in telephone surveys. In the context of police surveys, it seems especially relevant to consider whether factors such as union sponsorship, the promise of anonymity, and/or the survey topic are related to reductions in, for example, acquiescent responding, speeding through the survey, and/or failing attention checks. Even when anonymity is promised, officers are often skeptical that their identities will not be revealed when answering demographic questions (especially those working for small departments). Research that can shed light on these issues would be a welcomed addition to the literature.

We conclude by reiterating that although our analysis indicated that the average response rate among police surveys published in the last decade was approximately 64 percent, there was an enormous amount of variation, with some published studies realizing a response rate under 10 percent. Yet, it bears repeating that research has demonstrated that low response rates are typically only weakly related to non-response bias. As such, a low response rate on its own is no reason to dismiss the findings of a survey. Given the weight of the evidence (Groves and Peytcheva 2008), the burden should be on manuscript referees to state why they believe a low response rate is suggestive of non-response bias. That is, referees should be required to identify explicitly patterns of over- or under-representation on some variable that is known to be related to the outcome. At the same time, it is incumbent upon researchers to be completely transparent about their survey methodology so that referees and readers can have a better idea *why* a response rate may be low – or high. It is our hope that the analyses we have presented will spark continued interest in police survey methodology, as police surveys are so important to our understanding of the profession.

## References

- Amaya, A. and Presser, S., 2017. Nonresponse bias for univariate and multivariate estimates of social activities and roles. *Public Opinion Quarterly*, 81(1), 1-36.
- American Association for Public Opinion Research, 2016. *Standard definitions: Final dispositions of case codes and outcome rates for surveys*. Available online at: [http://www.aapor.org/AAPOR\\_Main/media/publications/Standard-Definitions20169theditionfinal.pdf](http://www.aapor.org/AAPOR_Main/media/publications/Standard-Definitions20169theditionfinal.pdf).
- Anseel, F., Lievens, F., Schollaert, E., and Choragwicka, B., 2010. Response rates in organizational science, 1995-2008: A meta-analytic review and guidelines for survey researchers. *Journal of Business and Psychology*, 25(3), 335-349.
- Anwar, S. and Loughran, T. A., 2011. Testing a bayesian learning theory of deterrence among serious juvenile offenders. *Criminology*, 49(3), 667-698.
- Babbie, E., 1992. *The practice of social research*. New York: Macmillan.
- Bachman, R. D. and Schutt, R. K., 2014. *The practice of research in criminology and criminal justice (5<sup>th</sup> edition)*. Thousand Oaks, CA: Sage.
- Baker, T., 2015. An evaluation of journal impact factors: A case study of the top three journals ranked in criminology and penology. *The Criminologist*, 40, 5-10.
- Barnett, V. and Lewis, T., 1994. *Outliers in statistical data (3<sup>rd</sup> Ed.)*. New York, NY: Wiley.
- Bethlehem, J. G., 2002. Weighting nonresponse adjustments based on auxiliary information. In Robert M. Groves, Don A. Dillman, John L. Eltinge, and Roderick J. A. Little, eds. *Survey nonresponse*. New York, NY: Wiley.
- Blair, J., Czaja, R. F., and Blair, E. A., 2014. *Designing surveys: A guide to decisions and procedures (3<sup>rd</sup> edition)*. Thousand Oaks, CA: Sage.
- Brick, J. M. and Williams, D., 2013. Exploring rising nonresponse rates in cross sectional surveys. *The ANNALS of the American Academy of Political and Social Science*, 645(1), 36-59.
- Brown, J., 1996. Police research: Some critical issues. In Frank Leishman, Barry Loveday, and Stephen P. Savage, eds. *Core issues in policing*. Harlow, UK: Longman Group Ltd.
- Byrne, D. W., 2000. Common reasons for rejecting manuscripts at medical journals: A survey of editors and peer reviewers. *Science Editor*, 23(2), 39-44.

- Carley-Baxter, L. R., *et al.*, 2009. Does response rate matter? Journal editors' use of survey quality measures in manuscript publication decisions. *Survey Practice*, 2. Retrieved from <http://www.surveypractice.org/index.php/SurveyPractice/article/view/192/html>.
- Church, A. H., 1993. Estimating the effect of incentives on mail survey response rates: A meta-analysis. *Public Opinion Quarterly*, 57(1), 62-79.
- Cohen, J., 1988. *Statistical power analysis for the behavioral sciences* (2<sup>nd</sup> edition). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Curtin, R., Presser, S., and Singer, E., 2000. The effects of telephone response rate changes on the index of consumer sentiment. *Public Opinion Quarterly*, 64(4), 413-428.
- Curtin, R., Presser, S., and Singer, E., 2005. Changes in telephone survey nonresponse over the past quarter century. *Public Opinion Quarterly*, 69(1), 87-89.
- Dillman, D. A., Eltinge, J. L., Groves, R. M., and Little, R. J. A., 2002. Survey nonresponse in design, data collection, and analysis. In Robert M. Groves, Don A. Dillman, John L. Eltinge, and Roderick J. A. Little, eds. *Survey nonresponse*. New York, NY: Wiley.
- Dillman, D. A., Smyth, J. D., and Christian, L. M., 2014. *Internet, phone, mail, and mixed-mode surveys: The tailored design method* (4<sup>th</sup> edition). Hoboken, NJ: Wiley.
- Dutwin, D., and Buskirk, T. D., 2017. Apples to oranges or gala versus golden delicious? Comparing data quality of nonprobability Internet samples to low response rate probability samples. *Public Opinion Quarterly*, 81(S1), 213-238.
- Duxbury, L., Higgins, C., and Halinski, M., 2015. Identifying the antecedents of work-role overload in police organizations. *Criminal Justice and Behavior*, 42(4), 361-381.
- Edwards, P., *et al.*, 2002. Increasing response rates to postal questionnaires: Systematic review. *British Medical Journal*, 324, 1-9.
- Gaub, J. E., *et al.*, 2016. Officer perceptions of body-worn cameras before and after deployment: A study of three departments. *Police Quarterly*, 19(3), 275-302.
- Gelman, A. and Carlin, J., 2014. Beyond power calculations: Assessing Type S (sign) and Type M (magnitude) errors. *Perspectives on Psychological Science*, 9(6), 641-651.
- Groves, R. M., 2006. Nonresponse rates and nonresponse bias in household surveys. *Public Opinion Quarterly*, 70, 646-675.
- Groves, R. M. and Couper, M. P., 1998. *Nonresponse in household interview surveys*. New York, NY: John Wiley.

- Groves, R. M. and Peytcheva, E., 2008. The impact of nonresponse rates on nonresponse bias. *Public Opinion Quarterly*, 72(2), 167-189.
- Groves, R. M., Singer, E., and Corning, A., 2000. Leverage-saliency theory of survey participation: Description and an illustration. *Public Opinion Quarterly*, 64(3), 299-308.
- Groves, R. M., Dillman, D. A., Eltinge, J. L., and Little, R J. A., 2002. *Survey nonresponse*. New York, NY: Wiley.
- Groves, R. M., *et al.*, 2009. *Survey methodology* (2<sup>nd</sup> ed.). Hoboken, NY: Wiley.
- Hayes, A. F. and Cai, L., 2007. Using heteroscedasticity-consistent standard error estimators in OLS regression: An introduction and software implementation. *Behavior Research Methods*, 39(4), 709-722.
- Heggestad, E. D., Rogelberg, A., Goh, A., and Oswald, F. L., 2015. Considering the effects of nonresponse on correlations between surveyed variables: A simulation study to provide context to evaluate survey results. *Journal of Personnel Psychology*, 14(2), 91-103.
- Herberlein, T. A. and Baumgartner, R., 1978. Factors affecting response rates to mailed questionnaires: A quantitative analysis of the published literature. *American Sociological Review*, 43, 447-462.
- Holbrook, A. L., Krosnick, J. A., and Pfent, A., 2008. The causes and consequences of response rates in surveys by the news media and government contractor survey research firms. In James M. Lepkowski, *et al.*, eds. *Advances in telephone survey methodology*. New York, NY: Wiley.
- Ingram, J. R., Paoline, E. A., and Terrill, W., 2013. A multilevel framework for understanding police culture: The role of the workgroup. *Criminology*, 51(2), 365-397.
- Jennings, W. G. and Reingle, J. M., 2014. *Criminological and criminal justice research methods*. Frederick, MD: Wolters Kluwer Law & Business.
- Jennings, W. G., Fridell, L. A., and Lynch, M. D., 2014. Cops and cameras: Officer perceptions of the use of body-worn cameras in law enforcement. *Journal of Criminal Justice*, 42(6), 549-556.
- Kaspersky Lab., n.d. Global spam volume as percentage of total e-mail traffic from January 2014 to March 2017, by month. In *Statista - The statistics portal*. Retrieved June 3, 2017, from <https://www.statista.com/statistics/420391/spam-email-traffic-share/>.
- Keeter, *et al.*, 2000. Consequences of reducing nonresponse in a national telephone survey. *Public Opinion Quarterly*, 64(2), 125-148.

- Keeter, S., Hatley, N., Kennedy, C., and Lau, A., 2017, May 15. *What Low Response Rates Mean for Telephone Surveys: Telephone Polls Still Provide Accurate Data on a Wide Range of Social, Demographic and Political Variables, but Some Weaknesses Persist*. Washington, D.C.: Pew Research Center. Retrieved from <http://www.pewresearch.org/2017/05/15/what-low-response-rates-mean-for-telephone-surveys/>
- Kohut, A., et al., 2012. *Assessing the Representativeness of Public Opinion Surveys*. Washington, D.C.: The Pew Research Center for the People and Press. Retrieved from <http://www.people-press.org/2012/05/15/assessing-the-representativeness-of-public-opinion-surveys/>
- Lepkowski, J. M. and Couper, M. P., 2002. Nonresponse in the second wave of longitudinal household surveys. In Robert M. Groves, Don A. Dillman, John L. Eltinge, and Roderick J. A. Little, eds. *Survey nonresponse*. New York, NY: Wiley.
- Macias, W., Springton, J. K., Weaver, R. A. L., and Neustifter, B., 2008. A 13-year content analysis of survey methodology in communication related journals. *Journal of Current Issues & Research in Advertising*, 30(1), 79-94.
- Manfreda, K. L., et al., 2008. Web surveys versus other survey modes: A meta-analysis comparing response rates. *Journal of the Market Research Society*, 50(1), 79-104.
- Martin, D. and Tong, S., 2016. Conclusion: Challenges and changes in policing research. In Mark Brunger, Stephen Tong, and Denis Martin, eds. *Introduction to policing research: Taking lessons from practice*. New York, NY: Routledge.
- Martikainen, P., Laaksonen, M., Piha, K., and Lallukka, T., 2007. Does survey non-response bias the association between occupational social class and health? *Scandinavian Journal of Public Health*, 35(2), 212-215.
- Maxfield, M. G. and Babbie, E. R., 2014. *Research methods for criminal justice and criminology* (7<sup>th</sup> edition). Stamford, CT: Cengage Learning.
- Medway, R. L. and Tourangeau, R., 2015. Response quality in telephone surveys: Do prepaid cash incentives make a difference? *Public Opinion Quarterly*, 79(2), 524-543.
- Morin, R., Parker, K., Stepler, R., and Mercer, A., 2017, January 11. *Behind the Badge: Amid protests and calls for reform, how police view their jobs, key issues and recent fatal encounters between blacks and police*. Washington, D.C.: The Pew Research Center. Retrieved from <http://www.pewsocialtrends.org/2017/01/11/behind-the-badge/>
- Nix, J. and Pickett, J. T., 2017. Third-person perceptions, hostile media effects, and policing: Developing a theoretical framework for assessing the Ferguson Effect. *Journal of Criminal Justice*, 51, 24-33. doi: 10.1016/j.jcrimjus.2017.05.016.



- Nix, J., Pickett, J. T., Wolfe, S. E., and Campbell, B. A., 2017. Demeanor, race, and police perceptions of procedural justice: Evidence from two randomized experiments. *Justice Quarterly*. Advance online publication. doi: 10.1080/07418825.2017.1334808.
- Nix, J., Wolfe, S. E., and Campbell, B. A., 2017. Command-level police officers' perceptions of the 'war on cops' and de-policing. *Justice Quarterly*. Advance online publication. doi: 10.1080/07418825.2017.1338743.
- Peak, K., 1990. A research note on successful criminal justice survey research: A 'personal touch' model for enhancing rates of return. *Criminal Justice Policy Review*, 4(3), 268-277.
- Perry, A. E., Weisburd, D., and Hewitt, C., 2010. Are criminologists describing randomized controlled trials in ways that allow us to assess them? Findings from a sample of crime and justice trials. *Journal of Experimental Criminology*, 6, 245-262.
- Peytchev, A., 2013. Consequences of survey nonresponse. *The ANNALS of the American Academy of Political and Social Science*, 645(1), 88-111.
- Peytcheva, E. and Gorves, R. M., 2009. Using variation in response rates of demographic subgroups as evidence of nonresponse bias in survey estimates. *Journal of Official Statistics*, 25(2), 193-201.
- Pickett, J. T. and Baker, T., 2014. The Pragmatic American: Empirical reality or methodological artifact? *Criminology*, 52, 195-222.
- Pickett, J. T. and Ryon, S. B., 2017. Procedurally just cooperation: Explaining support for due process reforms in policing. *Journal of Criminal Justice*, 48, 9-20.
- Pickett, J. T., et al., 2014. Superficial survey choice: An experimental test of a potential method for increasing response rates and response quality in correctional surveys. *Journal of Quantitative Criminology*, 30(2), 265-284.
- Reiner, R., 2000. Police research. In Roy D. King and Emma Wincup, eds. *Doing research on crime and justice*. New York, NY: Oxford University Press.
- Rojek, J., Alpert, G., and Smith, H., 2012. The utilization of research by the police. *Police Practice & Research*, 13(4), 329-341.
- Shadish, W. R., Cook, T. D., and Campbell, D. T., 2002. *Experimental and quasi-experimental designs for generalized causal inference*. Belmont, CA: Wadsworth.
- Shane, J. M., 2010. Organizational stressors and police performance. *Journal of Criminal Justice*, 38(4), 807-818.

- Shih, T. H. and Fan, X., 2009. Comparing response rates in e-mail and paper surveys: A meta-analysis. *Educational Research Review*, 4(1), 26-40.
- Shjarback, J. A., Pyrooz, D. C., Wolfe, S. E., and Decker, S. H., 2017. De-policing and crime in the wake of Ferguson: Racialized changes in the quantity and quality of policing among Missouri police departments. *Journal of Criminal Justice*, 50, 42-52.
- Singer, E., 2002. The use of incentives to reduce nonresponse in household surveys. In Groves, R. M., Dillman, D. A., Eltinge, J. L., and Little, R. J. A., eds. *Survey nonresponse*. New York: Wiley.
- Singer, E. and Ye, C., 2013. The use and effects of incentives in surveys. *The ANNALS of the American Academy of Political and Social Science*, 645(1), 112-141.
- Skogan, W. G., 2015. Surveying police officers. In Michale D. Maltz and Stephen K. Rice, eds. *Envisioning criminology: Researchers on research as a process of discovery*. New York, NY: Springer.
- Slocum, L. A., Rengifo, A. F., Choi, T., and Herrmann, C. R., 2013. The elusive relationship between community organizations and crime: An assessment across disadvantaged areas of the south Bronx. *Criminology*, 51, 167-216.
- Smith, T. W., 2002. Developing nonresponse standards. In Robert M. Groves, Don A. Dillman, John L. Eltinge, and Roderick J. A. Little, eds. *Survey nonresponse*. New York, NY: Wiley.
- Squires, P., 2016. Beyond contrasting traditions in policing research? In Mark Brunger, Stephen Tong, and Denis Martin, eds. *Introduction to policing research: Taking lessons from practice*. New York, NY: Routledge.
- Sorenson, J. R., 2009. An assessment of the relative impact of criminal justice and criminology journals. *Journal of Criminal Justice*, 37(5), 505-511.
- Telep, C. W., 2017. Police officer receptivity to research and evidence-based policing: Examining variability within and across agencies. *Crime & Delinquency*, 63(8), 976-999. doi: 10.1177/0011128716642253.
- Thomas, G., 2014. Research on policing: Insights from the literature. *The Police Journal*, 87(1), 5-16.
- Tourangeau, R. and Plewes, T. J., 2013. *Nonresponse in social science surveys: A research agenda*. Washington, D.C.: National Academies Press.
- Van Horn, P. S., Green, K. E., and Martinussen, M., 2009. Survey response rates and survey administration in counseling and clinical psychology a meta-analysis. *Educational and Psychological Measurement*, 69(3), 389-403.

Vehovar, V., Batagelj, Z., Lozar, K., and Zaletel, M., 2002. Nonresponse in web surveys. In R. M. Groves, D. A. Dillman, J. L. Eltinge, and R. J. Little, eds. *Survey nonresponse* (pp. 229–242). New York: Wiley & Sons.

Weitzer, R., 2015. American policing under fire: Misconduct and reform. *Society*, 52(5), 475-480.

Wolfe, S. E. and Nix, J., 2016. The alleged ‘Ferguson Effect’ and police willingness to engage in community partnership. *Law and Human Behavior*, 40(1), 1-10. doi: 10.1037/lhb0000164.

Yeager, D. S., *et al.*, 2011. Comparing the accuracy of RDD telephone surveys and internet surveys conducted with probability and non-probability samples. *Public Opinion Quarterly*, 75(4), 709-747.

Police survey response rates by journal, 2008 – 2017.<sup>a</sup>

	N	N that report RR	Mean RR	St. Dev.	Min	Max
<b>Policing Journals</b>						
International Journal of Police Science & Management	59	45	60.6	26.7	6.3	100.0
Journal of Police and Criminal Psychology	48	30	65.4	20.6	6.5	100.0
Police Practice & Research	67	56	64.8	24.9	5.9	100.0
Police Quarterly	67	61	66.0	22.4	12.4	98.3
Policing: A Journal of Policy and Practice	29	20	54.4	31.9	14.2	100.0
Policing: An International Journal	107	102	66.6	26.4	7.3	100.0
Policing & Society	56	50	56.1	26.1	7.3	100.0
<b>Criminology Journals</b>						
British Journal of Criminology	6	5	74.0	26.5	30.0	95.0
Crime & Delinquency	11	11	66.2	26.9	33.2	98.0
Criminal Justice and Behavior	16	12	71.8	29.8	21.3	98.4
Criminology	2	2	95.1	2.9	93.0	97.1
Journal of Criminal Justice	25	22	70.0	29.2	5.2	98.0
Journal of Quantitative Criminology	0	—	—	—	—	—
Journal of Research in Crime and Delinquency	0	—	—	—	—	—
Justice Quarterly	4	4	71.3	19.0	48.2	88.5
<b>Total/Average</b>	<b>497</b>	<b>420</b>	<b>64.3</b>	<b>25.9</b>	<b>5.2</b>	<b>100.0</b>

<sup>a</sup> As of March 2017.

Table 2. Descriptive statistics.

Variable	N	Mean	S.D.	Min	Max
Response Rate	420	64.293	25.881	5.200	100
Survey Year	450	2008	4.266	1996	2016
In-person	421	.475	—	0	1
Invitations	364	644.225	699.030	10	2,574
Funded	497	.256	—	0	1
US Sample	497	.507	—	0	1
Incentive	497	.024	—	0	1
Crim Journal	497	.129	—	0	1
Sorenson	497	.122	.180	0	1.210

Table 3. OLS regression model predicting response rate.

Variable	Response Rate				
	<i>b</i>	Robust SE	95% CI		$\beta$
Survey Year	-.532*	.265	-1.054,	-.011	-.096
In-person	24.046**	2.661	18.807,	29.286	.467
Invitations	-.010**	.002	-.014,	-.005	-.261
Funded	.123	2.723	-5.238,	5.484	.002
US Sample	-.688	2.720	-6.042,	4.666	-.013
Crim Journal	5.373	3.715	-1.940,	12.686	.078
Sorenson	5.522	7.207	-8.668,	19.711	.042
<i>N</i>			279		
<i>R</i> <sup>2</sup>			.423		
<i>F</i> -test			31.86***		

Entries are unstandardized partial regression coefficients (*b*), robust standard errors (SE), 95% confidence intervals (CI), and standardized partial regression coefficients ( $\beta$ ). \*\*  $p < .01$ ; \*  $p < .05$

Figure 1. Response rates by survey year, 1996 – 2016 (N = 450).

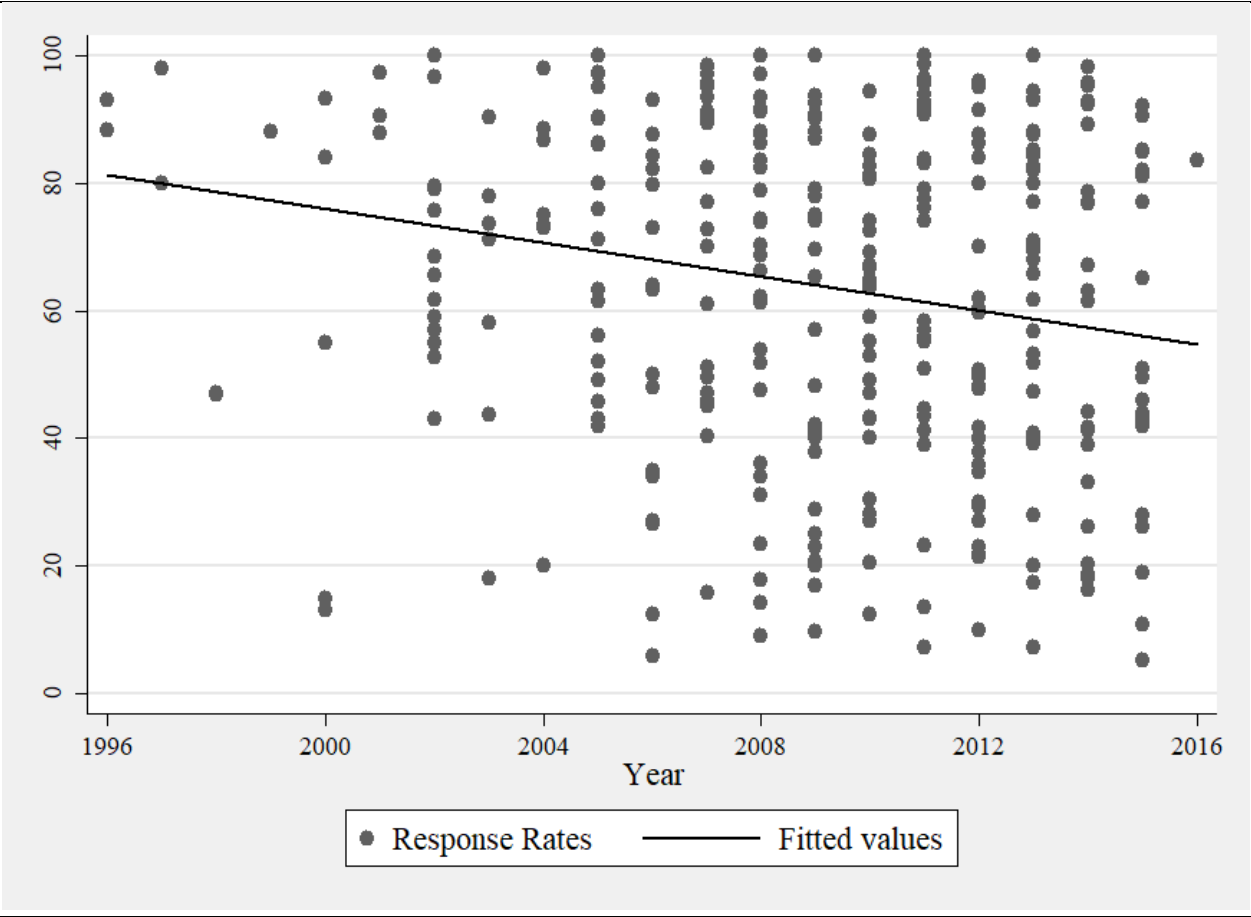


Figure 2. Administration modes (N = 421).

---

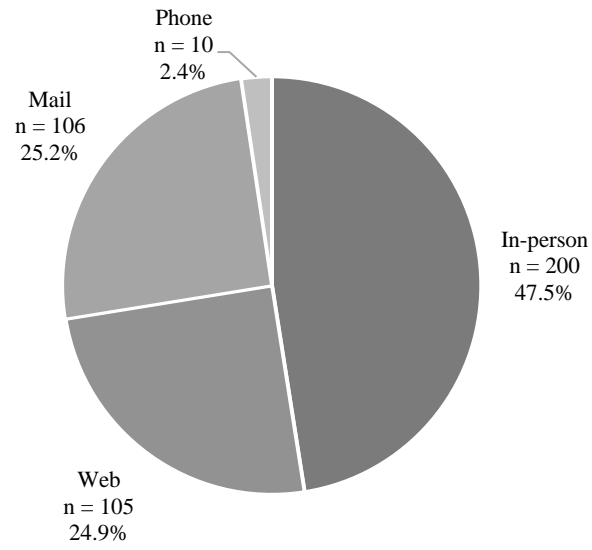
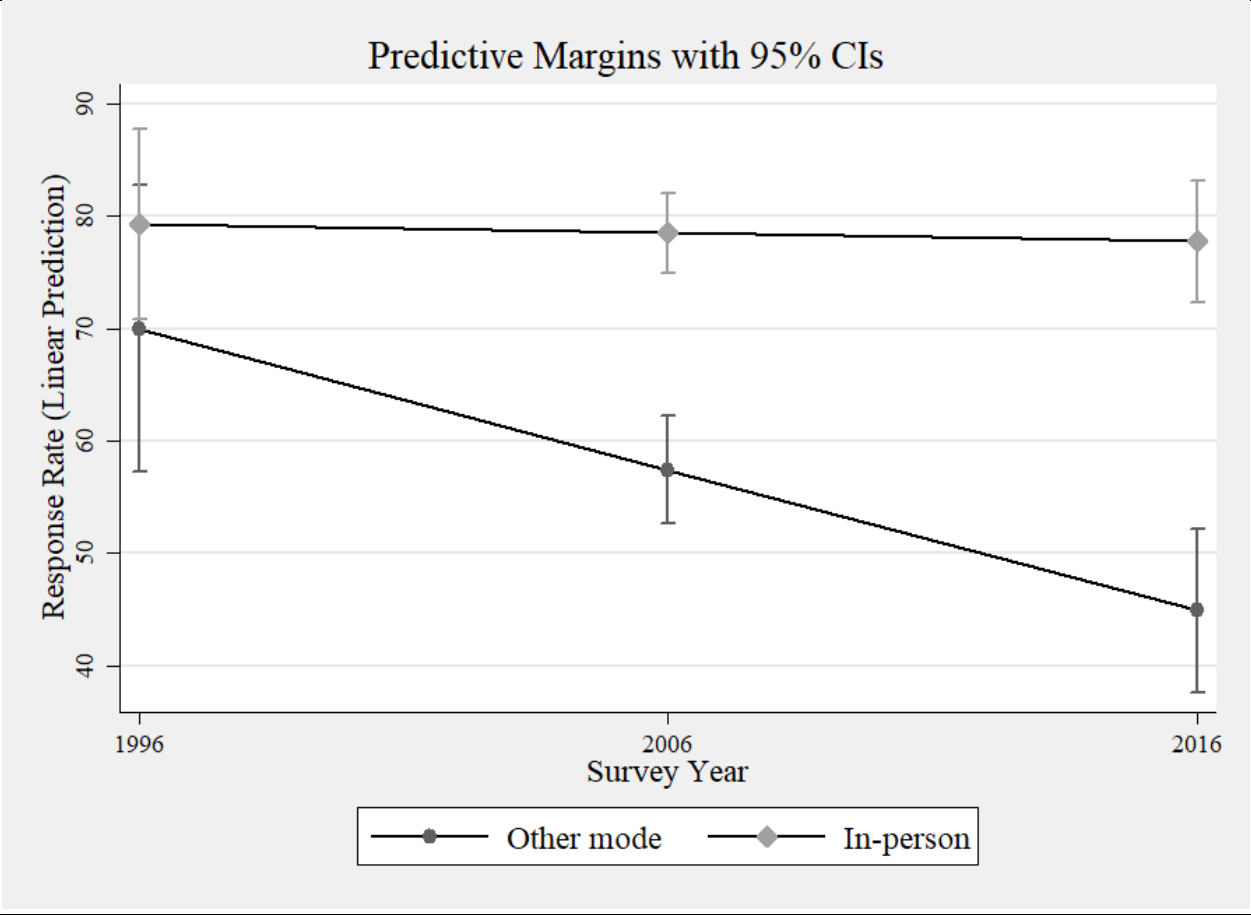




Figure 3. Interaction effect of administration mode and survey year on response rate.



## Appendix: Studies Included in the Sample

### **Criminology Journals**

#### *British Journal of Criminology*

Lum 2009  
Bradford and Quinton 2014  
Chu and Abdulla 2014  
Jonathan-Zamir and Harpaz 2014  
Brown 2016

#### *Crime & Delinquency*

Sobol *et al.* 2013  
Chu and Sun 2014  
Uluturk *et al.* 2014  
Nix 2017a  
Nix 2017b  
Telep 2017

#### *Criminal Justice and Behavior*

Gershon *et al.* 2009  
Adams and Buck 2010  
Godfredson *et al.* 2010  
Sleath and Bull 2012  
Gau *et al.* 2013  
Terrill and Paoline 2013  
Allisey *et al.* 2014  
Gracia *et al.* 2014  
Duxbury *et al.* 2015  
Donner *et al.* 2016  
Johnson and LaFrance 2016  
Karaffa and Koch 2016  
Smith *et al.* 2016  
Wolfe and Nix 2017

#### *Criminology*

Ingram *et al.* 2013  
Markowitz and Watson 2015

#### *Journal of Criminal Justice*

Morash *et al.* 2008  
Sun *et al.* 2008  
De Angelis and Kupchik 2009  
Miller *et al.* 2009  
Gerber *et al.* 2010  
Kim *et al.* 2010  
Schafer 2010  
Shane 2010  
Sobol 2010  
Sun *et al.* 2010  
Sun and Chu 2010  
White *et al.* 2010  
Moon and Jonson 2012

Ingram and Terrill 2014

Jennings *et al.* 2014  
Jennings *et al.* 2015  
Nix and Wolfe 2016  
Hine and Murphy 2017  
Pickett and Ryon 2017

#### *Justice Quarterly*

Zalman *et al.* 2008  
Eterno *et al.* 2016  
Johnson and Dai 2016  
Nix and Wolfe 2017

### **Policing Journals**

#### *International Journal of Police*

#### *Science & Management*

Addis and Stephens 2008  
Foley *et al.* 2008  
Jamel *et al.* 2008  
Parker and Sarre 2008  
Phillips 2008  
Stephens and Pugmire 2008  
Wilson *et al.* 2008  
Aremu 2009  
Ozel *et al.* 2009  
Srivastava 2009  
Wu *et al.* 2009  
Andreescu and Vito 2010  
Archbold *et al.* 2010  
Chown 2010  
Eterno and Silverman 2010  
Gotschalk and Gudmundsen 2010  
LaFrance and Allen 2010  
LaFrance and Placide 2010  
Marcum *et al.* 2010  
Phillips *et al.* 2010  
Vito and Higgins 2010  
Wright 2010  
Burrell and Bull 2011  
Glomseth *et al.* 2011  
Hassell *et al.* 2011  
Julseth *et al.* 2011  
LaFrance 2011  
Leino *et al.* 2011  
Pagon *et al.* 2011  
Powell and Tomy 2011  
Zengin *et al.* 2011  
Fekjaer and Halrynjo 2012

LaFrance 2012

Lagestad 2012  
Pinizzotto *et al.* 2012  
Can *et al.* 2013  
Khruakham and Lee 2013  
Tewksbury and Mustaine 2013  
Lagestad and Tillaar 2014  
Natarajan 2014  
Wixson *et al.* 2014  
Fekjaer and Strype 2015  
Karagoz *et al.* 2015  
Lambert and Steinke 2015  
Tewksbury and Copenhaver 2015  
Bhowmick and Mulla 2016  
Coon 2016  
Kumarasamy *et al.* 2016  
Lambert *et al.* 2016  
Olugbemi and Bolaji 2016  
Tewksbury and Copenhaver 2016  
Wang and Leather 2016

#### *Journal of Police and Criminal Psychology*

Carlan and Nored 2008  
Lindsay and Shelley 2009  
Matsch *et al.* 2009  
Payne and Guastaferro 2009  
Prochniak 2009  
Blandino *et al.* 2010  
Dorta *et al.* 2010  
Ghazinour *et al.* 2010  
Johnson *et al.* 2010  
Prati and Pietrantonio 2010  
Carlan *et al.* 2011  
Hogan *et al.* 2011  
Rooy *et al.* 2011  
Ali *et al.* 2012  
Hyland *et al.* 2012  
Sachau *et al.* 2012  
Clark-Miller and Brady 2013  
Chopko *et al.* 2014  
Smith and Bull 2014  
Johnson 2015  
Sarapin and Sparks 2015  
Arnten *et al.* 2016  
Brady 2016  
Brown and Daus 2016

- Can *et al.* 2016  
Chaplin and Shaw 2016  
Ellrich 2016  
Fyhn *et al.* 2016  
Hansson *et al.* 2016  
Jo and Lamb 2016  
Johnson 2016  
Padyab *et al.* 2016  
Roach *et al.* 2016  
Rogers *et al.* 2016  
Singh 2016  
Thornton and Herndon 2016  
Walsh *et al.* 2016  
White *et al.* 2016  
Young 2016  
Arble *et al.* 2017  
Carter *et al.* 2017  
Johnsen *et al.* 2017  
Patry *et al.* 2017  
Schaveling *et al.* 2017
- Police Practice & Research*  
Coleman 2008  
Jollevet II 2008  
Mon and Chu 2008  
Rosenberg *et al.* 2008  
Sever *et al.* 2008  
Steinheider and Wuestewald 2008  
Sun and Chu 2008  
Aremu and Lawal 2009  
Yim and Schafer 2009  
Buker 2010  
Frantzen 2010  
Gul *et al.* 2010  
Phillips 2010  
Correia and Jenks 2011  
Lasley *et al.* 2011  
Oschwald *et al.* 2011  
Perrott and Kelloway 2011  
Senjo 2011  
Bissett *et al.* 2012  
Chapman 2012  
Coon and Travis III 2012  
Grubb and Bennett 2012  
Rojek *et al.* 2012  
Steinheider *et al.* 2012  
Backteman-Erlanson *et al.* 2013  
Kankaanranta 2013  
Martin *et al.* 2013  
Shane 2013
- Skogan 2013  
Balmer *et al.* 2014  
Muftic and Collins 2014  
Pizio 2014  
Sundstrom and Wolming 2014  
Vuorensyrja 2014  
Howes and Goodman-Delahunty 2015  
Lobnikar and Meško 2015  
Oxburgh *et al.* 2015  
Phillips 2015  
Heffren and Hausdorf 2016  
Kelly and Hassett-Walker 2016  
McCarty and Lawrence 2016  
Schnobrich-Davis 2016  
Violanti *et al.* 2016  
Wolfe *et al.* 2016  
Back *et al.* 2017  
Johnson and Hunter 2017  
Kula 2017  
Lambert *et al.* 2017  
Steyn 2017  
Vito *et al.* 2017  
Wain *et al.* 2017
- Police Quarterly*  
Culhane *et al.* 2008  
Lindsay 2008  
Lord and Friday 2008  
Lyons *et al.* 2008  
Peak *et al.* 2008  
Zhao *et al.* 2008  
Carlan and Lewis 2009  
Chaiyavej and Morash 2009  
Colvin 2009  
Crank and Giacomazzi 2009  
Hassell and Brandl 2009  
Schafer *et al.* 2009  
Kenney *et al.* 2010  
Rydberg and Terrill 2010  
Schaible and Gecas 2010  
Tankebe 2010  
Thomas *et al.* 2010  
Cordner and Cordner 2011  
Stewart 2011  
Stroshine and Brandl 2011  
Darroch and Mazerolle 2012  
Ivkovic *et al.* 2012  
McCarty and Skogan 2012  
Rojek *et al.* 2012
- Terrill and Paoline 2012  
Wentz and Archbold 2012  
Chermak *et al.* 2013  
Kim *et al.* 2013  
Lonsway *et al.* 2013  
Farrell 2014  
Haynes and Giblin 2014  
Menard and Arter 2014  
Ross and Wright 2014  
Telep and Lum 2014  
Bates *et al.* 2015  
Bell *et al.* 2015  
Davis *et al.* 2015  
Mumford *et al.* 2015  
Rhodes 2015  
Blumberg *et al.* 2016  
Brinser and King 2016  
Carter 2016  
Gaub *et al.* 2016  
Morrow *et al.* 2016  
Schaible and Six 2016  
Kim *et al.* 2017  
Van Craen and Skogan 2017
- Policing: An International Journal*  
Huang and Cao 2008  
Liederbach *et al.* 2008  
Lindsay *et al.* 2008  
Nikels and Verma 2008  
Schafer and Martinell 2008  
Somvadee and Morash 2008  
Sun and Triplett 2008  
Talaga and Tucci 2008  
Aremu *et al.* 2009  
Gorenak and Gorenak 2009  
Ivkovich 2009  
Johnson 2009  
Kury *et al.* 2009  
Noblet *et al.* 2009  
Sun *et al.* 2009  
Cohen and Shamai 2010  
Ivkovich and Shelly 2010  
Lee *et al.* 2010  
Ralston and Chadwick 2010  
Sobol 2010  
Cheong and Yun 2011  
Dodge *et al.* 2011  
Lee and Moon 2011  
Lee and Lee 2011  
Nalla and Kang 2011

Salo and Allwood 2011  
 Vuorensyrja and Malkia 2011  
 Blumenstein *et al.* 2012  
 Bossler and Holt 2012  
 Crow *et al.* 2012  
 Davis 2012  
 Hill *et al.* 2012  
 Houdmont *et al.* 2012  
 Hsieh *et al.* 2012  
 Ivkovich and Kang 2012  
 Kai-ting 2012  
 Lee and Jang 2012  
 Phillips and Sobol 2012  
 Yang *et al.* 2012  
 Ivkovich and Sauerma 2013  
 Ivkovich and Khechumyan 2013  
 Kim *et al.* 2013  
 Maccary 2013  
 Meyer *et al.* 2013  
 Phillips and Terrell-Orr 2013  
 Staines 2013  
 Yun *et al.* 2013  
 Alderden and Skogan 2014  
 Basinska *et al.* 2014  
 Chen *et al.* 2014  
 Chu and Tsao 2014  
 Fekjær 2014  
 Indrayanto *et al.* 2014  
 Ingram *et al.* 2014  
 Lee and Yun 2014  
 Ratcliffe *et al.* 2014  
 Sarver and Miller 2014  
 Swid 2014  
 Tyagi and Dhar 2014  
 Annell *et al.* 2015  
 Bouranta *et al.* 2015  
 Chrusciel *et al.* 2015  
 Colvin 2015  
 Cuvelier *et al.* 2015  
 Davies and Dawson 2015  
 Davis *et al.* 2015  
 Donnelly *et al.* 2015  
 Garcia-Buades *et al.* 2015  
 Gardiner 2015  
 Guclu and Can 2015  
 Hansen *et al.* 2015  
 Masal 2015  
 Shingh and Nayak 2015  
 Tiesman *et al.* 2015  
 Can *et al.* 2016  
 Chen 2016  
 Donner *et al.* 2016  
 Eadens *et al.* 2016  
 Ellrich 2016  
 Gelderen and Bik 2016  
 Hickman *et al.* 2016  
 Johnson and Hansen 2016  
 Ivkovic, Habarfeld, *et al.* 2016  
 Ivkovic, Mraovic, *et al.* 2016  
 Ivkovic and Sauerma 2016  
 Lim and Sloan 2016  
 Lobnikar *et al.* 2016  
 Messing *et al.* 2016  
 Pelfrey and Keener 2016  
 Shernock 2016  
 Sun *et al.* 2016  
 Vallmur 2016  
*Policing & Society*  
 Alain and Gregoire 2008  
 Ivkovic and Shelley 2008  
 Strobl and Sung 2009  
 Abrahamsen and Strype 2010  
 Craig *et al.* 2010  
 Den Heyer 2010  
 Mawby 2010  
 Mitchell *et al.* 2010  
 Millen and Stephens 2011  
 Parsons *et al.* 2011  
 Tankebe 2011  
 Herrington and Pope 2014  
 Carter and Grommon 2015  
 Carter and Phillips 2015  
 Darroch and Mazerolle 2015  
 Dormaels 2015  
 Herrington 2015  
 Ivkovic and Sauerma 2015  
 Jones and Williams 2015  
 Davies and Dawson 2016  
 Ellrich 2016  
 Fleischmann *et al.* 2016  
 Matusiak 2016  
 Miles-Johnson *et al.* 2016  
 Nalla *et al.* 2016  
 Noppe 2016  
 Ratcliffe 2016  
 Robinson *et al.* 2016  
 Rotenberg *et al.* 2016  
 Terpstra 2016  
 Westmarland and Rowe 2016  
 Fildes *et al.* 2017  
 Kidrowski *et al.* 2017  
*Policing: A Journal of Policy and Practice*  
 Marcum *et al.* 2011  
 Herrington 2012  
 Millen and Stephens 2012  
 Oehme *et al.* 2012  
 Hobson *et al.* 2013  
 Lauritz *et al.* 2013  
 Walsh *et al.* 2013  
 Koper *et al.* 2014  
 Korre *et al.* 2014  
 Young *et al.* 2014  
 Can *et al.* 2015  
 Guilfoyle 2015  
 Hesketh *et al.* 2015  
 Jones 2015  
 Smith and Greene 2015  
 Boag-Munroe *et al.* 2016  
 Hesketh *et al.* 2016  
 McLeod and Herrington 2016  
 Phelps *et al.* 2016  
 Telep and Winegar 2016  
 Tyagi and Dhar 2016