Effective police investigative practices: an evidence-assessment of the research

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Abstract
Purpose – Detective work is a mainstay of modern law enforcement, but its effectiveness has been much less evaluated than patrol work. To explore what is known about effective investigative practices and to identify evidence gaps, the authors assess the current state of empirical research on investigations.
Design/methodology/approach – The authors assess the empirical research about the effectiveness of criminal investigations and detective work in resolving cases and improving clearance rates.
Findings – The authors’ analysis of the literature produced 80 studies that focus on seven categories of investigations research, which include the impact that case and situational factors, demographic and neighborhood dynamics, organizational policies and practices, investigative effort, technology, patrol officers and community members have on case resolution. The authors’ assessment shows that evaluation research examining the effectiveness of various investigative activities is rare. However, the broader empirical literature indicates that a combination of organizational policies, investigative effort and certain technologies can be promising in improving investigative outcomes even in cases deemed less solvable.
Research limitations/implications – From an evidence-based perspective, this review emphasizes the need for greater transparency, evaluation and accountability of investigative activities given the resources and importance afforded to criminal investigations.
Originality/value – This review is currently the most up-to-date review of the state of the research on what is known about effective investigative practices.

Keywords Investigations, Detective, Evidence-based policing, Review, Effectiveness

Paper type Literature review

Introduction
Criminal investigations and detective work are mainstays of modern law enforcement and often epitomize police work. In public folklore, investigators are portrayed as the elites of police agencies; a belief generated not only by their depiction in television and movies but also by the status afforded to detectives within police departments (Bayley, 1994). The pervasiveness of this activity in US policing is showcased in the most recent Law Enforcement and Administrative Management Statistics (LEMAS) survey available (2016) [1]. Surveyed agencies with 100 or more officers reported, on average, that approximately 75% of their sworn officers were officially capable of carrying out investigative duties, with 27% of those specifically assigned to do so. For agencies with fewer than 100 officers, these proportions were 79 and 13%, respectively. These statistics suggest that law enforcement agencies spend a significant portion of their budgets on investigative activities, whether those activities occur within a specialized detective’s unit or amongst officers carrying out investigative activities in their regular patrol duties.

Despite the resources and importance given to law enforcement investigations, investigative activities have been much less researched and evaluated (Braga et al., 2011; Worrall, 2016) and are often not the target of police reform efforts. For example, the two significant research reviews on police activities by the National Academies of Sciences focus

This evidence-assessment was funded by a grant from Arnold Ventures.
almost exclusively on patrol activities, not detective work (see National Academies of Sciences, 2018; National Research Council, 2004). The reasons for this situation are many, but most likely, investigative efforts remain hidden from both the public and researchers’ views, as they are often carried out in specialized units that are difficult to observe and study (Fassin, 2013). This state of affairs in research leaves us knowing little about the realities of detective work and the impacts of particular investigative activities and techniques on case outcomes. Such activities include the use of forensic, surveillance, information or crime analytic technologies; the development and interviewing of witnesses or suspects; investigative processes, policies and organizational requirements of investigations; the gathering of evidence or case review; or the collaboration efforts between patrol officers, investigators and other units.

Adding to this lack of information about investigations is the fact that crime resolution rates in the US remain consistently low. We note that there are different definitions of what crime “resolution” or “clearance” might encompass (see discussions by Baughman, 2020; Bottomley and Pease, 1986; Federal Bureau of Investigation, 2017; Greene, 2007), and some agencies inconsistently classify crimes as cleared (see, e.g. Spohn and Tellis, 2010). However, even when using more inclusive definitions of “clearance,” many crimes in the US go unresolved. For example, official estimates of crime clearance by the Federal Bureau of Investigation’s Uniform Crime Reporting program in 2019 (which defines clearances as crimes resolved by arrest or by exceptional means [2]) indicate that of the 1.2 million violent crimes reported to the police, 54.5% were never cleared. Clearance rates are even more abysmal for property crimes. Of the 6.9 million property crimes in 2019, 82.8% were not cleared. Further, these average clearance rates have remained remarkably stable (and in the case of homicides have declined) for many decades (Braga et al., 2011; Lum et al., 2018; Scott et al., 2019; Vovak, 2016; Wellford and Cronin, 2000). This stability of low clearance rates for many crimes has persisted despite many recent advances in criminal forensics, crime analysis, and surveillance and investigative technologies.

This lack of knowledge about what types of investigative practices are effective in clearing crime combined with the realities of low clearance rates is a challenge in an era pushing for more evidence-based approaches, accountability, transparency, cost-effectiveness and reform in policing. To explore what is known about effective investigative practices and to identify evidence-gaps, we assess the current state of empirical research on investigations and crime clearance. For this review, we use the term “criminal investigations,” “detective work” or “investigative activity” to refer to those actions that go beyond the initial response and investigation of a crime by a responding patrol officer to a 911 call to include additional resources given to resolving a crime, including assigning a detective to the case [3]. Our review continues to highlight the scarcity of evaluation research on investigative activities.

**Trends in investigative research**

The dearth of evaluations of investigative activity does not mean that researchers have not studied investigations or crime clearance. Deterrence scholars have long tried to examine the relationship between arrest/clearance rates and crime over time (see reviews in Durlauf and Nagin, 2011; Nagin, 1998; 2013; Vovak, 2016). As these scholars have pointed out, such studies struggle methodologically with establishing a causal relationship between crime and crime clearance, particularly encountering concerns of endogeneity and causal confounding. These studies also do not examine the specific investigative activities that contribute to an arrest or crime clearance.

More related to our task, researchers have regularly studied the characteristics of investigative cases (usually for homicide) and how these characteristics contribute to the
probability of a case being resolved. Commonly referred to as “solvability factors,” these are elements of crimes that are believed to be outside of an investigator’s control and that make offenses more or less likely to be resolved. Solvability factors may include the victim or suspect’s race, gender or age; the suspect’s relationship to the victim; the type of weapons used; evidence that is left at the scene; or the presence of a witness. Wellford et al. (2019) argue that the focus on solvability factors in research on investigations is not arbitrary. In one of the earliest empirical studies on investigations conducted for the RAND Corporation, Greenwood, Petersilia, Chaiken and colleagues (see Chaiken, 1975; Chaiken et al., 1977; Greenwood and Petersilia, 1975; Greenwood et al., 1975) noted that solvability factors are essential to case clearance, and perhaps much more so than an investigator’s efforts or actions. From these findings, the RAND researchers noted that investigators spent more time on post-arrest case processing than on investigating crimes. They provocatively concluded that solvability factors and uniformed patrol officers seemed more important to case resolution than investigative work. From their conclusions, they suggested that perhaps resources should be shifted away from investigations to patrol work (Chaiken et al., 1977).

For decades, the RAND conclusions – that solvability factors were more important than investigative effort – were widely relied upon (see discussions by Bayley, 1994; Eck, 1983; 1992; Wellford et al., 2019). As Wellford et al. (2019) argue, this belief impacted the focus of investigations research and also permeated police practices, leading many agencies to regularly practice solvability triaging. Solvability triaging involves an initial review of the characteristics of crimes to determine if they have enough elements that increase their probability of being solved. If a supervisor or other administrator feels the case does not have enough solvability factors, the case may be put aside for no further follow-up or investigation. In their case studies of eight agencies, Lum et al. (2018) found that it was common for agencies to practice solvability triaging for robberies (see, also, Scherer, 2019), burglaries and even aggravated assaults with weapons. However, recent research has challenged the idea that investigative practices, actions and organizational efforts beyond solvability triaging do not matter to solving crimes. For example, in their review of homicide research, Wellford et al. (2019) found eleven studies out of 46 (not counting their study), which examined investigative efforts in homicide investigations. The journalistic account by Leovy (2015) of homicide investigators in Los Angeles also qualitatively supports the idea that investigative effort does matter and may level the playing field when it comes to possible disparities in solvability factors across cases.

For this review, we extend the search of investigative research to all types of crimes (although research on homicide is still dominant in the literature). We also broadly define “empirical” as any research study that uses either quantitative or qualitative evidence (or sometimes both) to draw conclusions from data or observations about police investigations and their effects on outcomes related to case resolution and clearance (clearance as defined by the researcher). While we tried to be as inclusive as possible given the uncertainty in what we might find, we did exclude opinions, theoretical discussions, or general descriptions of investigations or detective work from this review. We also exclude studies only examining the relationship between crime rates and clearance or arrest rates and studies that focus only on court outcomes (i.e. studies that only look at conviction or prosecution rates). We searched across multiple databases, including EbscoHost, SOCindex, JSTOR and HeinOnline, for published research. Google Scholar and ProQuest Dissertations and Theses were also used to access grey literature, including reports, monographs and unpublished dissertations. The list of search terms used to search for eligible articles to include in this review can be found in Appendix 1.

Using this comprehensive search strategy, we found 80 studies on investigations conducted from 1975 to 2020. Empirical research on investigations has grown exponentially, as with other policing research. Before 2000, we found only ten studies, but from 2000–2010
discovered 27 studies and 43 additional studies from 2011–2020. Up through the early 2000s, research on investigations generally focused on case-related solvability factors. However, in the 2010s, some research began focusing on the mechanics of investigations and how case clearance rates could be improved. The majority (57.5%) of research studies on investigations continues to focus on homicides. However, 42.5% of the studies did examine other types of crimes (for example, seven studies examined burglary case resolution, seven studies analyzed assault or robbery cases, and two studies have looked at domestic violence investigations).

The vast majority of these studies use correlational or descriptive methods (92.5%). Six studies use experimental or quasi-experimental outcome evaluation methods to evaluate particular investigative interventions.

We organized studies into seven research categories that emerged organically (Table 1). (Note that the same studies may be counted in more than one category). The citations of all studies for each category are shown in Appendix 2.

As Table 1 shows, the largest category of studies focuses on the correlation between crime elements (e.g. solvability factors) and case clearance (Category 1). An additional twelve studies examined whether investigative clearances vary across demographics, geographies, or groups (Category 2). There has also been an interest in examining the link between police organizational characteristics and case clearance (Category 3). Although smaller, there has been a growing interest in studying the impact that investigative efforts and technologies have on clearance rates and case outcomes (Categories 4 and 5, respectively). Additionally, eight studies have examined the role that community members might play in criminal investigations (Category 7). Four studies have empirically examined the role of patrol officers in investigations (Category 6).

We emphasize that the categories in Table 1 reflect the way most studies of investigations have been conducted. Unlike the Wellford et al. (2019) or Braga and Dusseault (2018), for example, studies of investigations have not examined the intersection between investigative effort, organizational factors (using multi-agency studies), and case factors as initially

<table>
<thead>
<tr>
<th>Description</th>
<th>Number of studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1: case and situational factors (&quot;solvability factors&quot;) including characteristics about victims and suspects, situational elements of crimes, weapons used, witnesses present, evidence collected, etc.</td>
<td>36</td>
</tr>
<tr>
<td>Category 2: Research on variations in investigations and clearance rates across space, time, and groups. Such studies might include analyses of differences or disparities in clearance rates across geographic places or amongst various gender, racial, ethnic, age, or other demographic categorizations</td>
<td>12</td>
</tr>
<tr>
<td>Category 3: Studies that examine police agency organizational characteristics or factors that may contribute to case clearance, including staffing, resources, investigative organization, workload, accountability, training, etc.</td>
<td>25</td>
</tr>
<tr>
<td>Category 4: Studies that examine or estimate investigative effort and its impact on case resolution, such as the amount of time or effort devoted to developing witnesses, encouraging victims to provide statements, collecting and processing evidence, and other case-development activities</td>
<td>16</td>
</tr>
<tr>
<td>Category 5: Studies evaluating the impact that technologies have on investigations and investigative case clearances, including forensic technologies (e.g. DNA testing and ballistics imaging), crime analysis and information technologies, and surveillance technologies (e.g. body-worn cameras, license plate readers, closed-circuit televisions, gunshot detection systems, etc.)</td>
<td>17</td>
</tr>
<tr>
<td>Category 6: Studies that examine the role of patrol officers in investigations</td>
<td>4</td>
</tr>
<tr>
<td>Category 7: Studies that examine the role that citizens or community engagement and cooperation play in investigations</td>
<td>8</td>
</tr>
</tbody>
</table>

Table 1. Categories of investigative research and number of studies found
suggested by the RAND researchers. Instead, studies tend to focus on a specific category of research. However, as Wellford et al. (2019) emphasize, more studies that use multi-agency case studies to examine the interactions between case factors, investigative effort and organizational aspects are needed to advance this area. We discuss this issue in greater detail in our discussion.

**Category 1: case and situational factors that contribute to crime clearance**

As aforementioned, the majority of research on investigations does not focus on investigative activity, but instead on examining the correlation between case characteristics, situational, or social factors of crimes and their clearance or resolution. This first category describes studies that examine whether case clearance is correlated with case factors such as whether a relationship between the victim and offender exists, the age, sex, race or lifestyle of the victim and offender, types of weapons used, and situational factors of the case (e.g. location, motives, witnesses, evidence collected). Although not directly examining investigative activity, we include these studies in our analysis because they are so frequently analyzed against clearance-related outcomes and because they often contribute to agency practices of solvability triaging. From 1975 to 2020, we found 36 studies of this type, almost all of which examine homicide cases. To study this relationship, researchers often use correlational or descriptive analysis to examine data from computerized records management systems or other national databases like the FBI’s Supplementary Homicide Reports, the National Incident-Based Reporting System (NIBRS), or from other computerized data from agencies. Some studies, however, have coded information from individual investigative case files, which can provide more clues about the origins of case characteristics and situational factors (as well as investigative effort). Most studies examine cases from a single agency located in large jurisdictions.

As this is a large research area, we organize findings from these studies into Table 2 by common case characteristics analyzed (only significant findings are displayed; see Appendix 2 for a complete list of studies in this category). We note that this review only gives an overall landscape of this research and is not meant to be a systematic review or meta-analysis of this literature. Although there are variations across findings, Table 2 shows some themes from this research. For example, crimes are more likely to be resolved if victims or offenders are female rather than male (no research examined other gender identities). Very young victims (below age 10) and teenage victims (11–17) are also more likely to have their cases resolved than older victims, with those aged 20–29 often having the lowest chances of their cases being cleared. Case resolution is also more likely when victims and offenders have some kind of relationship, and relatedly if the crime was emotionally motivated. Some studies show that race may influence case clearance, but the causal reasons behind these findings are murky (more on this in the next section). For example, most studies indicate that homicides where victims and offenders are both white are more likely to be cleared than incidents in which either the suspect or victim are not white. However, others have found that the suspect or victim’s race is insignificant in predicting clearances (see Alexander, 2012; Riedel and Rinehart, 2012; Roberts and Lyons, 2011).

Situational aspects of crime events also contribute to their likelihood of resolution. Cases seem less likely to be solved when they involve concomitant felonies (related felonies occurring at the same time) or that have multiple offenders involved. The probability of case resolution also declines for crimes that occur outdoors (although findings are mixed when comparing residential versus non-residential areas), that involve single victims, or that occur at night. Violent crimes committed with firearms are less solvable, while weapons that require closer contact between victims and offenders (and perhaps that leave more evidence at the scene) are associated with higher clearance rates. For example, aggravated sexual assault or rape cases where a weapon is used or where the victim suffers collateral injury are more likely
If the case had this characteristic | The study found that the likelihood of clearance will
--- | ---
Offender is male (as opposed to female) | Decrease: Mouzos and Muller (2001), Taylor et al. (2009)
Victim is young (teens, 11–17) | Increase: Hawk (2015), Lee (2005), Regoeczi et al. (2008), Roberts (2007)
Victim is young adult (18–25 years) | Increase: Hawk (2015)
Victim is elderly | Decrease: Lee (2005), Litwin (2004), Mouzos and Muller (2001), Regoeczi et al. (2000)
Offender is older | Increase: Braga et al. (2019), Jarvis and Regoeczi (2009)
Victim and offender know each other\textsuperscript{a} | Increase: Hawk (2015), Lee (2005), Morabito et al. (2019), Roberts (2007), Spohn and Tellis (2012)
Victim and offender are strangers\textsuperscript{a} | Decrease: Lee (2005), Mouzos and Muller (2001), Ousey and Lee (2010), Roberts (2014)
Victim is a person of color (as opposed to white) | Increase: Morabito et al. (2019), Regoeczi et al. (2000)
Offender is white | Increase: Jarvis and Regoeczi (2009), Roberts and Lyons (2009) (for incidents that are not homicide), Taylor et al. (2009)
| Decrease: Roberts and Lyons (2009)
Concomitant felonies involved | Increase: Regoeczi et al. (2008), Roberts (2014)
Multiple offenders involved (as opposed to single offender) | Decrease: Mouzos and Muller (2001)
Location of crime – nonresidential areas as opposed to residential areas | Increase: Wellford and Cronin (1999)
Only one victim involved | Decrease: Lee (2005), Mouzos and Muller (2001)
Crime occurs during night (as opposed to day) | Decrease: Hawk (2015)

\textsuperscript{a} Concomitant felonies involved

\textsuperscript{b} Only one victim involved

\textsuperscript{c} Crime occurs during night (as opposed to day)

\textsuperscript{d} Location of crime – nonresidential areas as opposed to residential areas

\textsuperscript{e} Crime occurs outdoors (as opposed to indoors)

\textsuperscript{f} Multiple offenders involved (as opposed to single offender)

\textsuperscript{g} Victim is a person of color (as opposed to white)

\textsuperscript{h} Victim and offender know each other

\textsuperscript{i} Victim and offender are strangers

\textsuperscript{j} Offender is older

\textsuperscript{k} Offender is white

\textsuperscript{l} Concomitant felonies involved

\textsuperscript{m} Multiple offenders involved (as opposed to single offender)

\textsuperscript{n} Crime occurs outdoors (as opposed to indoors)

\textsuperscript{o} Location of crime – nonresidential areas as opposed to residential areas

\textsuperscript{p} Only one victim involved

\textsuperscript{q} Crime occurs during night (as opposed to day)
to result in arrest than cases where neither of those factors is present (Spohn and Tellis, 2012). Studies of non-homicide crimes have also flagged other situational factors that may matter to crime resolution. For instance, Coupe et al. (2000) find that the chances of catching burglars increases if a burglar is still at the scene, if the burglar spends a long time at the scene, or if more than one burglar was involved.

Studies in Category 1 have also examined how forensic elements of cases impact case clearances and have yielded mixed results. Some of these findings overlap with studies about investigative effort and organizational policies in later sections below, as the collection of evidence for specific crimes may also depend on the availability and commitment of personnel to find, collect and process evidence. As Table 2 shows, some studies find that evidence at the scene, such as fingerprints or other forensic evidence, can increase crime clearances if collected and tested. In one of the rare experimental studies on investigations, Roman et al. (2009) find that DNA evidence is five times as likely to result in identifying a suspect than is fingerprint evidence, leading to more arrests and prosecutions of suspects. Additionally, for sexual assault cases, finding evidence at the scene or having evidence provided by a victim significantly increases the probability of arresting the suspect (Morabito et al., 2019).

Some studies indicate that cases are less likely to be resolved when victims are involved in a deviant lifestyle (although one study shows the opposite). However, more research is needed to understand these findings. For example, victim participation in deviant lifestyles may increase the amount of time or effort for a detective to investigate a crime. However, deviant lifestyles could also influence decisions made at prosecution or during court processes and not at the arrest stage (not shown here). Additional clues about deviant lifestyles are found in studies that examine whether homicides are drug or gang-related, which are more challenging to solve than other types of homicides.

<table>
<thead>
<tr>
<th>If the case had this characteristic</th>
<th>The study found that the likelihood of clearance will</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forensic evidence collected and tested</td>
<td>Increase: Braga et al. (2019), Cook et al. (2019), McEwen and Regoecri (2015), Morabito et al. (2019), Mouzos and Muller (2001), Roman et al. (2009)</td>
</tr>
<tr>
<td>Victim has deviant lifestyle</td>
<td>Increase: Roberts (2007)</td>
</tr>
<tr>
<td>Unknown circumstances</td>
<td>Decrease: Litwin (2004), Regoecri et al. (2008)</td>
</tr>
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Note(s): “We do not combine these rows into a single category (i.e. “victim and offender know each other” given the way these studies examine these elements)”

Table 2.
It is unclear from these studies how case characteristics in Table 2 influence or interact with investigative effort or organizational policies and practices. For example, an investigator’s effort may mediate the effects that a victim’s characteristics, lifestyle, the presence of forensic evidence have on case resolution. At first glance, some cases that may seem unsolvable could be resolved if an agency still required it to be investigated or if certain investigative resources or efforts were applied. We discuss this more in Categories 3 and 4 below.

**Category 2: studies examining variations in clearance rates across space, time and groups**

Case and situational factors that contribute to solvability may also reflect the broader social, demographic and geographic context in which crimes occur. Recent news coverage has suggested that communities of color may suffer from lower crime clearance rates, especially for homicide (Lopez, 2015; Mitchell, 2019; WNYC, 2018). However, the reasons sometimes alluded to in the media for these differences (i.e. that this is due to implicit bias, devaluation, or lack of effort by police agencies and detectives for different demographic groups) are not as clear in the research.

We found 12 studies that explore the relationship between characteristics of places, times and groups with clearance rates (listed in Appendix 2). Like studies in Category 1, these studies primarily use correlational and regression models to analyze these relationships. For example, Paré et al. (2007) find that crimes are more likely to be cleared in smaller communities relative to larger ones and communities with higher poverty levels. As community size increases, crime clearances for property, violent and misdemeanor crimes decrease. In contrast, population stability has been linked to higher crime clearance rates (see Borg and Parker, 2001; Ousey and Lee, 2010; Roth, 2017, 2018).

Others have focused on how macro-level demographic changes influencing crime clearances. For example, Gilbert (1983) argued that the decline in homicide clearance rates in San Diego, California, from 1970 to 1980 might be linked to an increase in homicides involving Hispanic and Black suspects and the growth of the Hispanic population in San Diego at that time. Similarly, Litwin and Xu (2007) find declines in homicide clearances in Chicago from 1966 to 1995 coincided with increases in Black and Latino homicide victims during that same period. Such studies also suggest that declines in homicide clearance over time may be due to increases in the proportion of homicides that involve firearms, gangs, or drugs, all of which have lower clearance rates (Litwin and Xu, 2007; Trussler, 2010), although the linkage with specific groups is not clearly made in these studies. Ousey and Lee (2010) argue that within-city increases in immigration also are associated with lower clearance rates, noting that “whether due to language barriers, stereotyping and ethnic profiling, or perceived injustices associated with the US attempts to control illegal immigration, there is good reason to believe that immigration may contribute to greater distrust of the police and an increased unwillingness of citizens to assist in criminal investigations” (p. 147). However, Mancik et al. (2018) find that immigrant concentration within neighborhoods and neighborhood-level legal cynicism are both unrelated to homicide clearance rates. Instead, they find that residential stability and economic disadvantage are associated with decreases in neighborhood-level homicide clearance rates. Overall, these studies leave us with more questions than answers about the causal links between demographic trends over time and clearance rates.

Others have hypothesized that variations in the racial composition of neighborhoods may be linked to differences in clearance rates across these places. However, it is unclear whether this is due to police apathy, neighborhood characteristics, aspects of cases or some interaction of all three. Roth (2017), for example, finds that areas with higher proportions of non-white residents are associated with lower case clearances for burglary, vehicle theft and other thefts. Vaughn (2020) also finds that homicides, robberies and assaults committed in places
with predominantly Black residents are less likely to be cleared. However, Vaughn notes that this relationship’s effect size is small and argues that more nuanced dynamics are at play. Specifically, she discovered that a victim’s race moderates case solvability factors and crime clearance. In particular, witnesses may especially matter to cases that involve Black victims, and she makes a case for more detective effort in developing witnesses for crimes involving Black victims. Similarly, Regoezzi and Jarvis (2011) find that concentrated disadvantage and residential instability do not directly impact case clearances. However, neighborhood context (i.e. socioeconomic conditions, neighborhood sentiment toward police, neighborhood disorder) may influence witness involvement in cases (see also Litwin and Xu, 2007, although they find that victim and situational characteristics have relatively more impact than neighborhood context).

Overall, while there seems to be some indication that clearance rates are worse in communities of color or places with high levels of concentrated disadvantage, the totality of research does not clearly explain why this is so. Much more research is needed to determine whether organizational functioning, investigative effort, investigator biases or aspects of cases themselves mediate the impact that racial composition, socioeconomic status or demographic changes seem to have on crime clearance.

**Category 3: organizational factors that contribute to case clearance**

Although clearance rates are low on average for most crime categories in the US, recent research has shown that clearance rates differ substantially across jurisdictions, with some of these differences persisting over long periods. Worrall (2016), Vovak (2016), Lum et al. (2016) and Scott et al. (2019) have used group-based trajectory modeling approaches to examine long-term trends of case clearances for a variety of crimes in different agencies. Collectively, their research indicates that some agencies are consistently better (or worse) at clearing crimes than others, suggesting that stable national averages of low crime clearance rates may mask agency differences [4].

We found 25 studies that explore organizational factors that contribute to crime clearance, such as agency size, officer and detective workload, investigative processes, investigative spending, the presence of policies and procedures related to investigations, and incident response time. The RAND Corporation studies were some of the earliest comprehensive empirical studies of organizational factors. Greenwood and Petersilia (1975) examined differences in training, staffing, workload and unit organization across multiple agencies and found that these organizational characteristics have little impact on crime, arrest or clearance rates. Later studies conducted correlative analyses of large samples of agencies against public information from LEMAS or other data about agency characteristics. For example, Cloniger and Sartorius (1979) and Cordner (1989) did not find that agencies with more officers or that hire more officers were associated with higher clearance rates. However, Hsu (2007), looking at the 100 largest agencies in the US, found that having more officers in agencies with exceptionally low homicide clearance rates could benefit those agencies with regard to clearing crimes. More recently, using the results of their trajectory analyses, both Worrall (2016) and Scott et al. (2019) did not find organizational factors were consistently connected to crime clearance trends. Worrall (2016) found that spending per investigator is only marginally and positively associated with violent clearance trends and does not significantly matter for clearance rates more generally. Scott et al. (2019) developed “descriptive profiles” using multiple years of LEMAS data to examine whether organizational factors such as officers per population, budget per crime level, use of computers for crime analysis and investigations, or the proportion of officers assigned to investigations, predicted an agency’s long-term clearance rate trends different types of crime. They also did not find that these organizational factors were consistently related to an agency’s crime clearance trends.
Regarding investigative resources more specifically, case studies have found that detectives perceive that having adequate resources for investigations is linked to increased clearances (Lum et al., 2018; Mouzos and Muller, 2001). Some of these perceptions have borne out in analyses. Greenwood and Petersilia (1975) discovered that having more trained analysts and using technology to process physical and forensic evidence rather than doing so by hand can increase suspect identifications. They also added that investing in investigative strike forces can increase arrest rates for targeted offenses. Wellford and Cronin (1999) and Wellford et al. (2019) also note that agencies where more officers and investigators were assigned to specific cases have better case clearance rates. Carter (2013) has found that staffing, numbers of patrol officers and overtime budgets were associated with increased crime clearances for the agencies he studied. Moreover, Coupe (2016) notes that it may be the timing of investigative resources that matters, finding that clearance rates increase when resources are used more efficiently earlier in the investigative process (i.e. within days of a report rather than months). Coupe also notes that significant resource inputs (i.e. more time spent, more investigators assigned to the case) raised detection rates for a third of the “most solvable” burglary cases that he examined.

Case clearances may also be influenced by investigator workload. For example, if investigators are overworked or have too many cases to deal with, their job performance could decline. Some studies have found the impact of investigator workload on clearance rates to be generally negative (Hawk, 2015; Marché, 1994; Wellford and Cronin, 1999), although others have not found a significant relationship (Keel et al., 2009; Paré et al., 2007; Puckett and Lundman, 2003). However, in a recent analysis using the National Incident-Based Reporting System (NIBRS) and LEMAS data, Roberts and Roberts (2016) examined both long-term workload and short-term workload fluctuations of agencies and also found a negative relationship between workload and clearance rates for multiple crime types.

In addition to resources, staffing and workload, agencies have questioned the wisdom of centralizing investigative functions (having single units handle specific crimes across a jurisdiction) or decentralizing them across geography or sub-jurisdictions. In the RAND studies, Greenwood et al. (1975) found that how police investigations are organized within departments does not impact crime, arrests, or clearances. On the other hand, McCluskey et al. (2014) have found that police agencies that centralize robbery investigations have higher robbery clearance rates. However, the scarcity of research on this topic does not lead to definitive conclusions.

Investigative policies and procedures of organizations may also matter to case clearances. Studies have found that agencies with higher clearance rates tend to have more formal and specialized training, management oversight, accountability mechanisms and performance metrics for investigations (Keel et al., 2009; Lum et al., 2018; Wellford et al., 2019). Studies also suggest that agencies with higher clearance rates tend to assign cases to investigators rather than triage them (Lum et al., 2018); use cold case units, case screenings, team policing and task force approaches (Lee, 2020); have good working relationships between patrol officers, investigators and forensics units (Carter and Carter, 2016; Lum et al., 2018; Wellford et al., 2019); emphasize clearance rates as performance measures (Lee, 2020; Lum et al., 2018); and formally prompt investigators to seek out witnesses and provide witness protection programs (Keel et al., 2009). In contrast, agencies that do not process or secure physical evidence well, or maintain good cooperation between police and forensics units, have lower clearance rates (Maguire et al., 2010). Overall, Wellford et al.’s (2019) “organizational best practices score” (p. 40) which incorporated 13 practices from high-performing agencies regarding investigative clearance, was significantly associated with successful homicide case resolution.

Studies have rarely evaluated changes in organizational practices and how those changes impact clearance rates. One exception is Braga and Dusseault (2018), who used a quasi-
Experimental approach to analyze how expanding the capacity of the homicide unit and enhancing the training of detectives could increase clearance rates. Overall, the research on the impact of organizational factors is more optimistic than the conclusions of the early RAND studies and has tried to focus more on investigative aspects rather than general organizational characteristics. Research indicates that specific policies, practices and targeted resource allocation related to investigative work can enhance investigators’ ability to resolve crimes. In contrast, more general organizational characteristics such as overall agency budget or officer workload do not seem to influence clearance rates. More robust and specific evaluation research on agency policies and practices related to investigations and more longitudinal case studies are needed to advance this area.

Category 4: studies that examine the impact of investigative effort on crime clearance

Investigative effort encompasses those actions taken by investigators to resolve cases, which may be prompted by organizational policies and practices discussed above. These may be efforts to develop witnesses, encourage victims to testify, search for suspects, or gather additional evidence. The RAND studies provided some of the earliest holistic empirical and national analyses of investigative effort across multiple agencies. Following a nationwide survey, researchers conducted in-depth case studies of investigative units in 25 selected agencies. As already mentioned, the RAND studies asserted that patrol efforts and solvability factors, not investigative efforts, appeared more responsible for cases being cleared. Recent research, however, offers contrasting views.

We found 16 studies that explored the impact of investigative effort on crime clearances. In a rare quasi-experimental outcome evaluation of investigative effort, Braga and Dusseault (2018) tested an intervention used by the Boston, Massachusetts police department to improve homicide clearance rates. In addition to making organizational changes noted in Category 3, above, the intervention sought to increase and structure investigative efforts related to developing cooperative witnesses, collecting more physical evidence from the homicide scene, conducting more forensic testing, and prompting other investigative actions. Braga and Dusseault found this initiative increased investigative effort, which, in turn, improved homicide clearances by 23%. Additional data analysis by Braga et al. (2019) revealed that the intervention significantly increased homicide clearances due to the application of enhanced resources by detectives that improved crime scene results (e.g. more physical and forensic evidence collected, more witness interviews, more tests run). The improvement of crime scene processing also allowed for additional actions by detectives, such as follow-up interviews, forensic testing, and video and phone call analysis. Similarly, Cook et al. (2019) also using a quasi-experimental design, found that gun homicides are cleared more than twice as frequently as gun assaults because more investigative effort is given to homicide cases.

Other studies have also found positive links between investigative effort and case resolution. Wellford and Cronin (1999) discovered that the amount of time and money spent on a case, the quickness in the initial response by detectives to the crime scene (see also Mouzos and Muller, 2001), the use of technology, the processing of evidence, the effort made developing witnesses (see also Carter, 2013; Maguire et al., 2010), and detectives seeking out warrants (see also Alexander, 2012) were all positively related to cases being resolved. Investigator experience, which may be linked to investigative effort, has also been found by Marché (1994) to be slightly positively related to homicide clearances. Sometimes just the effort in running forensic tests can matter, as Roman et al. (2009) show with their experimental evaluation of the positive impact of DNA processing on burglary cases. More generally, Higgenson et al.’s (2017) systematic review also finds that the collection and testing
of DNA evidence can help secure convictions in court (though they do not significantly impact other court outcomes like charges laid, prosecution, plea bargaining and sentence length). Of course, these forensic efforts also depend on organizational policies, the availability of forensic resources, and the presence of evidence itself in the case.

Positive effects of detective efforts on case resolution may be mitigated by case or situational factors, such as whether offenders are known (Fallik, 2017) or even the characteristics of victims and the presence of witnesses (Vaughn, 2020). At the same time, certain types of cases may be less responsive to detective effort. Armstrong et al. (2013) note that gang-related homicides take more time and resources to clear because of the greater difficulty for investigators to establish links between offenders and victims, the higher likelihood of firearms being used, or the higher likelihood that witnesses will not cooperate (see also Braga et al., 2019).

These studies suggest that it is not just solvability factors that lead to a case being resolved, but potentially a combination of case characteristics, organizational policies and aspects, and investigative effort. Such a research model for investigations was proposed (although not fully attempted) by the RAND study authors. In an attempt to examine this intersectionality, Wellford et al. (2019) analyzed 242 homicide cases across seven jurisdictions to determine the relative impacts of organizational factors, investigative effort and case characteristics on the resolution of homicide cases. Their findings continue to challenge previous beliefs that detective work matters less than solvability factors and reinforces the interaction between elements of cases and investigative work. Using data gathered from an eight-agency case study (see Lum et al., 2018), they combined 13 organizational best practices from high-performing agencies into a score reflecting organizational aspects of investigations. These included investigations oversight, information sharing, relationships, leadership, supervision, performance measures and resourcing. They then included this score in testing additional factors that contributed to homicide case resolution across seven agencies (some high and some low performing), including several measures of investigative effort (e.g. investigative response, supervisors present, physical evidence collected, investigative follow-up, crime scene activities, and use of specialized units and technologies) and case solvability factors. Wellford et al. find that even when controlling for solvability factors and organizational best practices, certain investigative efforts improved homicide case clearances. These investigative practices included stronger efforts to obtain witness cooperation, allocating more agency personnel to a homicide scene (including more investigators), and sending investigative supervisors to homicide scenes.

In sum, investigative effort and organizational policies related to improving that effort (training, resources, policies, adhering to specified practices) appear to matter in clearing crimes. However, much more evaluation and multi-agency case study research are needed to more reliably determine which efforts matter most to resolving cases, under what organizational conditions, and what types of investigative innovations might help improve clearance rates. At the same time, investigative effort is difficult to conceptualize and measure (as noted by Braga et al., 2019), which is why proxy measures, such as the amount of time spent on an investigation, the number of witnesses spoken to, or the number of pieces of evidence collected are often used. These measures may not adequately gauge the quality of the effort an investigator makes to resolve a case and also need greater development. It is also unclear what combinations and sequences of detective efforts and techniques contribute best to crime resolution.

**Category 5: studies that examine the impact of technologies on investigative outcomes**

Part of investigative effort as well as organizational resources applied to investigations can involve the use of technology to facilitate investigations. Interestingly, however, despite a
large technology boom in policing and investigations over the last 4 decades in the US, crime clearance rates have remained relatively stable over this time. We found 17 studies that assess the impact of technology on crime clearances. Findings from these studies are mixed. Forensic technology is a case in point. The RAND studies suggested that increasing agency evidence and case processing capabilities with technology can increase crime clearances (see Greenwood and Petersilia, 1975). More recent research finds that DNA evidence and testing leads to more suspects being identified and arrested, more cases being accepted for prosecution, and more cases cleared, especially related to homicide or burglary (see Dunsmuir et al., 2008; McEwen and Regoeczi, 2015; Roman et al., 2009). Homicides with other physical forensic evidence, such as knives, clothing and gunshot residue, are also more likely to be cleared (McEwen and Regoeczi, 2015). However, others have found that DNA evidence and testing did not always result in more cases being cleared (see Dunsmuir et al., 2008; Abrahams et al., 2011). Interestingly, Schroeder and White (2009) found that DNA evidence collection and processing increased the time to clearance for homicides and decreased the likelihood that cases would be cleared.

Some surveillance technologies have been positively linked to improving crime clearance, but only in limited ways and depending on how they are used in investigations. For example, studies have found that CCTV systems may help to solve burglaries (Coupe and Kaur, 2005) and other crimes (see Ashby, 2017), although investigative benefits may be limited by the viewshed of the cameras (see Robin et al., 2020). New video technologies such as body-worn cameras may also increase the detection of suspects and clearance of cases (see Ellis et al., 2015; Lum et al., 2019; Morrow et al., 2016). Koper and Lum (2019) find that license plate readers have modest positive impacts on case clearances for auto-theft and robbery but that large numbers of license plate readers are required to create those modest impacts. They also argue that license plate readers may have to be combined with other technologies (like CCTV) and policies that prompt more systematic use by detectives and officers to create these effects (also see Taylor et al., 2012).

Information technology accessibility and use appear to be positively associated with case clearances. While the exact mechanisms of this relationship are still vague, some suggest that it is due to the increased speed at which investigators can receive, process and use information (Ioiimo and Arnoson, 2003; Wellford and Cronin, 1999). For example, Ioiimo and Arnoson (2003) find that the implementation of mobile field computing results in significant increases in general crime clearances. Computer checks on suspects are associated with higher case clearance rates (Schroeder and White, 2009), as is the use of computers to carry out firearms checks or background checks (Wellford and Cronin, 1999). Computer use and owning an automatic fingerprint identification system have also improved clearances for homicide cases (Hsu, 2007; Lee, 2020). Fox and Farrington (2015; see also 2012) created burglary profiles by statistically relating patterns from police data to better identify suspects. They then experimentally tested this analytic approach and found it could increase arrest rates for burglary investigations. Mastrobuoni (2020) also found that a predictive information technology system that uses crime data to synthesize information about crimes (in their case, robberies) facilitates the identification and apprehension of suspects. Other studies have produced more pessimistic assessments of different information technologies on investigative outcomes (see Koper et al., 2015; Nunn, 1993). Some scholars have not found a correlation between an agency’s use of information technologies and crime clearance rates (see, e.g. Garicano and Heaton, 2010; Hekim et al., 2013), although these studies did not look specifically at investigator use of information technologies and case clearance, or use the types of analyses carried out by Fox and Farrington.

Overall, certain technologies may positively impact case clearances depending on how they are used in investigations. However, more specific evaluation research is needed to determine when technologies are most effective during the course of an investigation, how
they can be optimized for improving case resolution, and to what extent they mediate the effects of investigator effort, organizational aspects, or case characteristics on crime clearance.

Category 6: studies that examine the role of patrol officers in investigations
Patrol officers contribute to investigations and crime clearances in several ways. They are often the first to respond to crime scenes and, as the RAND study notes, play a crucial role in securing evidence and canvassing the area for victims, suspects, and witnesses. The role of patrol officers in contributing to crime clearance is still mostly unknown, and we found only four studies in this review that explore the role of patrol officers in crime clearances. The RAND survey of 153 police departments revealed that in 42% of responding departments, patrol officers conduct some or all of the duties that would traditionally be performed by investigators (Chaiken, 1975). Additionally, more than half of all serious reported crime did not seem to require much attention from investigators; Greenwood and Petersilia (1975) note that many crime clearances are produced by patrol officers making arrests when they arrive on the scene.

Bloch and Bell (1976) also investigated the effects of a patrol strategy known as the Rochester System on crime clearances. The Rochester System involved coordinated patrol teams that prioritized arrests, identify and apply resources to the most “solvable” cases, and strengthen cooperation between patrol officers and investigators. These teams were much more likely to make arrests for burglary, robbery, and larceny and do so on-scene than officers who were not on coordinated teams. The Bloch and Bell study emphasized that not only could patrol officers make a difference in crime clearances, but their cooperation with investigators in a team environment can significantly increase crime clearances.

Some studies do not focus on patrol officers specifically but report findings pertaining to officer response times and crime clearance more generally. Coupe et al. (2000), for example, find that faster police response time to burglaries leads to higher clearance rates because of the increased likelihood of catching burglars in the act. For crime generally, Blanes i Vidal and Kirchmaier (2018) find that a 10% increase in response time to 911 calls leads to a 4.7% point decrease in the likelihood of crime clearance. These studies partially challenge previous research that found that rapid response may not be effective in improving the probability of arrest of suspects (Spelman and Brown, 1981; see review by Sherman and Eck, 2002), although more analysis is needed. Again, these studies do not directly speak to why faster response may improve investigative outcomes beyond the possibility of apprehending offenders at the scene.

Category 7: studies that examine the role of citizens and community engagement in investigations
Another understudied area in investigations research is the roles of citizens and community engagement in crime clearance. We found eight studies in this review that explore how community members and their engagement with the police impact crime clearance rates. These often multi-agency case studies have mixed findings and do not identify the mechanism that could explain this relationship. For example, both Carter and Carter (2016) and Lum et al. (2018) find that investigators and leaders of agencies who believe their agencies have good relationships with their communities tend to have higher clearance rates. This may be because better relationships may prompt greater community trust in the police, making people more likely to report crimes or cooperate as witnesses (see discussions by Boateng, 2018; Kwak et al., 2019). As Armstrong et al. (2013) and Decker (1995) note, when witnesses are present and cooperative, the probability of resolving homicide cases increases [5].
However, Kingshott and Meesig (2019) find that agencies with community policing attributes as measured by LEMAS have lower crime clearance rates [6]. The authors suggest that this finding may be due to time management issues related to implementing community policing (i.e. spending more time on community policing initiatives than on investigations) that may impact clearances in agencies that use community policing strategies (Kingshott and Meesig, 2019). Mancik et al. (2018) find that collective efficacy and social cohesion are significantly related to higher homicide clearance rates at the neighborhood level.

However, most of this research is speculative, and the link between community engagement by investigators and case resolution remains unclear. It is much less likely for investigative divisions of agencies to have direct interaction with community groups or have community-oriented programs or activities that directly engage the community for purposes of crime resolution (and evaluations of these programs are nonexistent). What community engagement entails within the context of criminal investigations is also much vaguer than what it might entail in, for example, problem-solving activities of patrol officers.

**Conclusion**

Research on investigations has come a long way since the RAND studies of the 1970s, which leads us to believe that crime characteristics are only one part of the equation of how crimes can be solved. More studies have found that investigative effort, organizational aspects and technologies can improve investigative outcomes and clearance rates. As noted above, newer research findings suggest that investigations-specific organizational policies focused on strengthening the capacity and accountability of investigative work, applying targeted resources to investigations, and increasing investigative effort in developing witnesses, evidence and responding to crime scenes could improve an agency’s ability to affect clearance rates. Surveillance technologies like CCTV, license plate readers and body-worn cameras may also be helpful to improving investigative outcomes. However, the success of these technologies depends on their quantity, implementation, and legitimacy with the public.

Four critical points about the research on investigations emerge from this review. First, much of the research on investigations focuses on characteristics and situational aspects of (often homicidal) crimes. This research is valuable on its face, and we are not discounting it. However, this research could better inform studies of investigative work and effectiveness by pushing for more understanding of whether these factors might influence investigator decision making or how investigative efforts or organizational policies might mitigate, strengthen or weaken the impact of such factors on the clearance of crime. Understanding how case characteristics also reduce the possibility of a case being investigated at all is an important part of this equation.

Second, there is a dearth of outcome evaluations that more rigorously examine the impact that specific investigative activities, organizational changes, community-based programs, or technologies have on investigative outcomes (or the interaction between these factors). This hinders criminology’s ability to provide evidence-based feedback to agencies interested in identifying weaknesses in their investigative practices (see Lum and Koper, 2017). Third, and related to the second, is the need for better measures of investigative activity, processes, policies, resources, and outcomes to gain a better understanding of exactly how and in what ways these factors contribute to case resolution.

The fourth point brings us back full circle to the RAND studies. As Wellford et al. (2019) discussed, the RAND studies set forth a research model for investigations that promoted deciphering the interrelationship between case elements, investigative efforts (and technologies), and organizational policies, practices, and characteristics. Although we categorize and discuss these separately, more studies are needed that examine these factors together. This will require large multi-agency case studies combined with evaluation components to determine the conditions and investigative activities that can improve the effective police investigative practices.
ability for agencies and communities to resolve crimes. This may also require rethinking what “successful resolution” of crime cases means. While research often defines crime resolution as the apprehension of the offender, successfully resolving crimes may also mean bringing restoration to victims or increasing the legitimacy of the police, which are outcomes that are rarely – if ever – examined in this literature. Additionally, some studies have called for reimagining the detective role in policing towards more preventative, problem-solving or even community-oriented paradigms (see Braga and Dusseault, 2018; Braga et al., 2011; Eck and Rossmo, 2019). This call for reimagining detective work also relies on building the research evidence-base of police investigations and testing new investigative activities and programs.

Greater transparency and access between police agency investigative units and researchers will also be needed to address these many research and practice needs. Agencies could also proactively improve this transparency by having both officers and investigators document their daily activities more consistently. While police agencies are comfortable with recording elements of crime in computerized databases, daily efforts of police officers and detectives, especially when it comes to specific actions and other proactive activities, are much less frequently tracked (Lum et al., 2020). Nevertheless, this tracking is essential for both evaluation and reform (Sherman, 2013). For example, investigators may access license plate reader or body-worn camera data to help solve a crime. However, if no leads are found, they may not record these efforts, making it hard for researchers to later determine to what extent plate readers assisted in the investigations. They may attempt to locate and interview dozens of individuals but may only record information from those witnesses that gave them viable information. However, this effort to find and develop witnesses may be a critical factor in resolving cases. Investigators may (or may not) work with community members, other police officers and members of specialized units to develop cases, all of which may be central to their ability to resolve crimes. However, it is difficult for agencies or researchers to determine whether these activities are effective in clearing cases without knowing about these efforts.

Our evidence-assessment is not meant to be a systematic review or meta-analysis of this literature [7]. Instead, by being inclusive of various topics and methods, we hoped to provide a landscape of the state of the research to date. However, we also note that this assessment is limited to research written in English, studies accessible in either article or report format, and likely includes many studies that could be improved in terms of data used, measures developed, or methods used. These limitations and our review strongly suggest that much more research on investigative activities is needed to strengthen police agencies’ ability to improve crime resolution and victim restoration. As with crime prevention, crime resolution is likely the result of a combination of, and interaction between, case elements and situational characteristics, investigative effort, organizational policies and technologies. More studies that examine the interaction of these elements rather than these elements in isolation are needed.

Notes
3. Although in some agencies, patrol officers may also take on specialized investigative duties.
4. Taylor et al. (2009) also find that police agencies in the northeastern US are 20% more likely to clear crimes than those in the southern states.
5. Relatedly, studies of police violence indicate people are less likely to call the police after a police-involved death of a citizen (Desmond et al., 2016).

6. The authors use LEMAS questions regarding community policing plans, use of SARA models, problem-solving activities being included in officer performance evaluations, problem-solving partnerships in communities, and meeting with and/or having problem solving partnerships with business groups, religious groups, school groups, neighborhood groups or youth groups to gauge community policing in agencies.

7. An anonymous reviewer suggested the need for meta-analysis in this area. While that may be a possibility, many more subcategories (especially in Category 1, 3, 4 and 5 may have to be developed so that meaningful and comparable effect sizes could be calculated. Meta-analysis may also unnecessarily restrict included studies, especially case studies, which have become important to examining the intersection between case elements, organizational aspects, and investigative effort.

References


Spohn, C. and Tellis, K. (2012), Policing and Prosecuting Sexual Assault in Los Angeles City and County: A Collaborative Study in Partnership with the Los Angeles Police Department, the Los Angeles County Sheriff’s Department, and the Los Angeles County District Attorney’s Office, U.S. Department of Justice, Washington, DC.


Appendix 1

List of search terms

“police investigations”
“crime rates”
“crime investigations”
“crime clearances”
“police AND crime clearances”
“police AND crime rates”
“police AND clearances”
“police investigation clearance”
“crime investigation clearance”
“case clearance”
“police AND clearance rates”
“police AND crime rates”
“detective case closure analysis”
“police detective analysis”
“police detective evaluation”
“police detective arrest rate”
“police detective case closure”
“police case closure”
“police case resolution”
“detective case solving”
“detective case resolution”
“police arrest rate evaluation”
“police arrest rate analysis”
“police case closure rate”
“law enforcement case closure”
“crime case closure evaluation”
“crime case closure analysis”
“detective crime case closure”

Effective police investigative practices
### Table A1

Citations associated with each category of investigative research from Table 1

<table>
<thead>
<tr>
<th>Category number and description</th>
<th>Citations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 4: Studies that examine or estimate investigative effort and its impact on case resolution, such as the amount of time or effort devoted to developing witnesses, encouraging victims to provide statements, collecting and processing evidence, and other case-development activities</td>
<td>Alexander (2012), Armstrong et al. (2013), Braga and Dusseault (2018), Braga et al. (2019), Carter (2013), Cloniger and Sartorius (1979), Cook et al. (2019), Coupe (2016), Fallik (2017), Greenwood and Petersilia (1975), Maguire et al. (2010), Marché (1994), McChuskey et al. (2014), Mouzos and Muller (2001), Wellford and Cronin (1999), Wellford et al. (2019)</td>
</tr>
<tr>
<td>Category 5: Studies evaluating the impact that technologies have on investigations and investigative case clearances, including forensic technologies (e.g. DNA testing and ballistics imaging), crime analysis and information technologies, and surveillance technologies (e.g. body-worn cameras, license plate readers, closed-circuit televisions, gunshot detection systems, etc.)</td>
<td>Abrahams et al. (2011), Ashby (2017), Coupe and Kaur (2005), Dunsuir et al. (2008), Ellis et al. (2015), Fox and Farrington (2015), Greenwood and Petersilia (1975), Ioino and Aronson (2003), Koper et al. (2015), Koper and Lum (2019), Mastrobuoni (2020), McEwen and Regoeczi (2015), Morrow et al. (2016), Nunn (1993), Robin et al. (2020), Roman et al. (2009), Schroeder and White (2009)</td>
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<th>Category number and description</th>
<th>Citations</th>
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<tr>
<td>Category 6: Studies that examine the role of patrol officers in investigations</td>
<td>Blanes i Vidal and Kirchmaier (2018), Bloch and Bell (1976), Coupe et al. (2000), Greenwood and Petersilia (1975) (also Chaiken, 1975 from the same RAND studies)</td>
</tr>
</tbody>
</table>

**Effective police investigative practices**

**Table A1.**

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