Title: Sexual Assault Investigations and the Factors that Contribute to a Suspect's Arrest

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Abstract

Purpose: Sexual assault investigations present uniquely challenging circumstances to detectives, and a small proportion result in arrest. Improving sexual assault investigations requires expanding the evidence base and improving understanding of how these investigations unfold and the factors associated with positive case outcomes, including the likelihood that an offender is arrested.

Methodology: We abstracted data on 491 adult sexual assaults investigated by five large and midsized law enforcement agencies to describe the characteristics of sexual assault investigations and to explain the relationships between these characteristics and the likelihood that a suspect is arrested.

Findings: Overall, detectives move swiftly to investigate sexual assaults but tend to miss investigative opportunities that increase the likelihood of an arrest, like locating and processing the crime scene or pursuing interviews with key witnesses and leads. Sexual assaults typically lack physical evidence that can be used to identify and lead to an arrest of a suspected offender; when this evidence is present, the case is more likely to result in an arrest. Delayed reporting of the crime to law enforcement decreases the likelihood of a suspect being arrested, but the mechanisms are unclear.

Originality: Few studies have used a detailed data abstraction process for a large sample of cases from multiple law enforcement agencies to understand sexual assault investigations and their case outcomes. Our results can improve practitioners' and researchers' understanding of sexual assault investigations, including those factors that increase the likelihood of a suspect's arrest.

Keywords: sexual assault; rape; investigations; law enforcement; arrest; evidence

Article classification: Research paper

Introduction

Sexual assault is one of our society's most serious and deep-rooted problems, a crime of violence that imposes unique challenges and special responsibilities on the criminal justice system response. Sexual assault is widespread in the United States: 1 in 5 (19.3%) women and 1 in 71 (1.7%) of men are raped in their lifetimes (Breiding *et al.*, 2014). This crime is also one of the least likely to be reported to law enforcement, with about 34% reported by victims to the police in 2019 (Morgan and Truman, 2020).

Sexual assault investigations are unlike other types of criminal investigations, as they involve complex and highly personal and sensitive topics. Victim engagement, evidence collection and processing, identifying and interviewing suspects and witnesses, and establishing criminal intent—especially in non-stranger cases—are just some of the issues that must be addressed as part of sexual assault investigations, which, compared to other crimes, are less likely to result in arrest. As an example, an analysis of National Incident-Based Reporting System (NIBRS) data for large and midsized law enforcement agencies (LEAs) showed that arrests were made in only about 15% of rape cases in 2016. (analysis conducted by authors).

The trauma of sexual violence can have lasting impacts on survivor mental and physical health and can affect how victims engage with a criminal justice system already burdened with a history of mistreatment (Spohn and Horney, 1992). Some survivors have faced cynicism when they reported their crimes to the police (e.g., Campbell and Fehler-Cabral, 2018, Lonsway, 2010), a form of secondary victimization that can increase distrust among victims and contribute to victim disengagement in the investigative process (Campbell and Raja, 1999, Ahrens, 2006, Campbell, 2008). The acceptance of rape "myths" also affects how cases are pursued by law enforcement, including the likelihood of making an arrest, with studies showing that officers can be influenced by extralegal case characteristics (e.g., victim credibility; victim/offender relationship) (Frazier and Haney, 1996, Tasca *et al.*, 2013).

A moral imperative of our U.S. justice system is that victims receive a consistent, high-quality level of response regardless of where the crime occurs or what agency responds. Sexual assault is widespread and serial offending is a major problem as it often goes undetected or is not linked by the investigative process (Lisak and Miller, 2002, Lovell *et al.*, 2016, Lovell *et al.*, 2017). People who commit sexual assaults commit other crimes (Miethe *et al.*, 2006); intervening earlier in their criminal careers will prevent future crimes. Yet research shows that the effectiveness of investigative units varies considerably across U.S. LEAs (Scott *et al.*, 2019, Wellford, 2018). For example, agencies differ significantly in the proportion of sexual assaults they clear (Groeger *et al.*, 2018). An expanded evidence base in sexual assault investigations could help identify and implement policies and standards of practices that promote excellence and consistency across the field of sexual assault investigations (Police Executive Research Forum, 2018, National Institute of Justice, 2017, Sexual Assault Kit Initiative, 2020). The current study adds to this evidence base.

Assessing the Effectiveness of Sexual Assault Investigations

How an agency measures its response to sexual assault is one of the areas that must be addressed to effectively study and improve the response to these crimes. The Federal Bureau of Investigation's (FBI's) Uniform Crime Reporting (UCR) program establishes guidelines around case closure or "clearance", including "cleared by arrest" and "cleared by exceptional means" (FBI, 2013). However the misapplication of the FBI guidelines, a lack of clarity around definitions, and limited processes for reviewing UCR clearance codes can distort clearance rates for sexual assault cases (Lonsway and Archambault, 2020, Spohn and Tellis, 2014, Yung, 2013). For example, in a review of sexual assault cases from 2005 to 2009 at the Los Angeles Police Department and Los Angeles County Sheriff's Department, researchers found that the agencies incorrectly used the exceptionally cleared designation, particularly when the offender could not be identified or located or when the detective presented the case for prosecution, but prosecutors declined to pursue charge due to insufficient evidence (Spohn and Tellis, 2010, 2014).

Victim engagement throughout the investigative process is crucial and has a direct impact on case outcomes such as the likelihood of suspect arrest and that formal charges will be made. Investigator belief in victim credibility has also been shown to influence whether sexual assault cases move forward for arrest and prosecution (Bouffard, 2000, Campbell *et al.*, 2015). For example, Alderden and Ullman (2012) found that investigators were less likely to pursue charges in sexual assault cases when the victim's statement had inconsistencies. The involvement of drugs or alcohol in sexual assault cases, including reported victim use or impairment, can also influence how detectives view a victim's credibility (Kelley and Campbell, 2013, Morabito *et al.*, 2019). In addition, delayed reporting by victims can impede the investigation process and reduce the likelihood of an arrest (Morabito *et al.*, 2019, Tasca *et al.*, 2013).

Other studies have noted lack of victim cooperation as deterrence to investigators' presenting sexual assault cases to prosecution, thus contributing to low clearance rates (Morabito *et al.*, 2019, Spohn and Tellis, 2018). In a Texas audit of child and adult sexual assault cases from 2014 through 2018, lack of victim cooperation was cited as one of the most common reasons cases did not result in arrest or prosecution. Fear, distrust, or lack of understanding of the criminal justice process, and a feeling that their stories would not be believed, often led to victims' choosing not to participate in the investigation (State of Texas State Auditor, 2020). It is imperative that research continues to develop evidence-based practices in sexual assault investigations aimed at overcoming these challenges.

Forensic Evidence Collection and Processing

The presence and type of physical evidence also influences sexual assault case outcomes (Morabito *et al.*, 2019). However, despite the tremendous utility of forensic evidence—including the value of testing sexual assault kits (SAKs) and the hardship victims endure to provide them—reports from across the country reveal that evidence too frequently goes unused (Campbell *et al.*, 2017, Strom and Hickman, 2010). For instance, Strom *et al.* (Forthcoming)

identified an estimated 300,000 to 400,000 unsubmitted SAKs in the United States from 2014 through 2018. This enormous lag in processing has adverse effects on solving and prosecuting sexual assault crimes and contributes to the national problem of a growing number of untested SAKs. When sexual assault evidence is not submitted to crime laboratories, victims do not receive justice and offenders are not held accountable. Studies suggest that the strength of evidence in sexual assault cases is a major factor in the decision to arrest and charge (Horney and Spohn, 1996, Morabito *et al.*, 2019) This is because investigators and prosecutors use evidence from victim and witness statements and physical evidence to determine how to proceed with arrest and charging (State of Texas State Auditor, 2020). In addition, charges and convictions are more likely when forensic evidence is collected and analyzed (Bouffard, 2000, Higginson *et al.*, 2017). It is important to develop a better understanding of how often forensic and other types of evidence are present in investigations and to quantify their relationships to case outcomes.

Hypotheses in This Study

This study analyzes case-level variables from the case files of sexual assault crimes committed against adult victims to better describe the relationship between investigative effort and case outcomes. These data were collected as part of an evaluation of law enforcement responses to sexual assault cases reported in five U.S. LEAs. We randomly selected a subset of sexual assault case investigative files that involved crimes committed against adults and that met the FBI UCR definition of rape [1]. The investigative case review was conducted by experts with backgrounds in law enforcement sexual assault response, evidence collection and analysis, prosecution, and victim advocacy.

The analysis provides an opportunity for an in-depth examination of actions taken by both patrol officers and sexual assault investigators after the initial report, as well as of the timing and nature of different components of the response—contact with and interviews of the victim, witnesses, and any suspects as well as evidence collection and processing. This study uses measures of the crime and police response to describe common features of these cases and to test claims from the extant literature about the relationship between case and investigation features and the likelihood that a suspect is arrested for the crime. Specifically, the following hypotheses were used to guide the research design across the areas of case evidence, investigative effort, report delay, and victim alcohol or drug use.

Evidence

Hypothesis 1: The type of evidence collected will be related to the likelihood that a sexual assault is cleared by arrest.

Hypothesis 2: Among similar cases, longer time for evidence processing will be negatively associated with the likelihood that a sexual assault results in an arrest.

Hypothesis 3: Among similar cases, a greater number of distinct types of evidence collected will be positively associated with the likelihood that a sexual assault results in an arrest.

Investigative Effort

Hypothesis 4: Among similar cases, an immediate investigative response to sexual assault will increase the likelihood that a case results in an arrest.

Hypothesis 5: Among similar cases, a greater amount of investigative effort applied to the case will be positively associated with the likelihood of an arrest.

Report Delay

Hypothesis 6: Delay in the reporting of a sexual assault to law enforcement will be negatively associated with the likelihood of an arrest.

Hypothesis 7: The negative relationship between report delay and arrest will be explained by a reduction in both the amount of evidence collected and the amount of effort applied by detectives to the case.

Alcohol or Drug Use by Victim

Hypothesis 8: The use of drugs, alcohol, or both by a sexual assault victim will be negatively associated with the likelihood of an arrest.

Hypothesis 9: The negative relationship between victim substance use and arrest will be explained by a reduction in both the amount of evidence collected and the amount of effort applied by detectives to the case.

The next section describes the methods used to test these hypotheses.

Methods

Data

This study draws on data from investigations of 491 sexual assault cases reported to one of five midsized or large, geographically dispersed local LEAs from 2014 through 2019. Each agency had a specialized sex crimes unit responsible for either adult sexual assaults or adult and juvenile sex crimes. Over the years 2017–2020, each agency voluntarily provided researchers with the case files for approximately 100 sexual assault cases reported during the previous 2 years, with sexual assault defined according to the UCR's definition of forcible rape, with victims aged 18 and older. Researchers requested that the cases be randomly selected across the specified time range and provided guidance on how that selection process could be conducted. Agencies then provided the entire case file either in electronic or hard copy form. These case files included information about the incident and detailed officer narratives as well as evidence such as photo line-ups, forensic exam reports, and criminal history reports. They did not include access to physical evidence or audio or video recordings.

Cases were reviewed and coded by a select and diverse group of subject matter experts with expertise and background in law enforcement sexual assault investigations and supervision,

victim advocacy, and criminology. Each reviewer had prior experience with law enforcement investigative and documentation practices. When case aspects were unclear, the coders discussed the case with each other before making coding decisions.

The research team selected over 200 data metrics for coding—key characteristics in the investigation process that did not include personally identifiable information. The main areas captured include victim and suspect demographics; case management variables; victim-investigator interactions; investigative follow-up activities, including case evidence collection and processing; and an overall evaluation of the investigation. To test our hypotheses, we used measures collected across each of the five sites that were not missing values for a high proportion of cases. These measures fall into six substantive groups: case outcomes, case evidence, investigative effort, report delay, victim substance use, and victim and crime measures used as control variables in our analyses.

Measures

This section describes the measures included in each of our variable groupings, starting with the outcome, then the independent variables, and then the control variables. Although our measures are not exhaustive for some constructs, we believe that we have captured key case and investigation characteristics that allow us to adequately test our hypotheses.

Clearance by Arrest. Our primary outcome is whether a suspect was arrested for the incident. We applied the FBI UCR definition of arrest, which states that for an LEA to clear a crime by arrest, it must arrest at least one criminal offender for the crime, charge that person with the commission of the crime, and turn that person over to the court for prosecution (FBI, 2013). Although we also applied the UCR definitions of *clearance by exceptional means* and *unfounded* to measure alternative case outcomes, the study focuses mainly on arrest, for reasons provided in the Case Clearance section.

Evidence. We included several binary measures of the collection of physical, forensic, digital, or person-level evidence in the form of a witness in the case. Specifically, in each case we measured whether detectives collected or had available several distinct types of evidence. The exact measures include whether a witness was present, whether a weapon was recovered during the police response, whether different sources of evidence were collected from the crime scene, whether a police-controlled call was conducted, whether a SAK was collected from the victim, and whether a collected SAK had forensic testing completed. We also measured the number of days between the collection and completed testing of a SAK to examine the speed of evidence processing. Importantly, we did not always separate instances where investigators could have collected evidence but did not from instances where investigators could not have collected evidence. For example, if investigators did not collect fingerprints at the crime scene, this could mean either that fingerprints were present at the crime scene but not collected, or that fingerprints were not present and could therefore not be collected. Our goal with these measures

is to assess the average impact of evidence on arrest likelihood. With the next set of measures, we explore the relationships between investigator actions and the likelihood of arrest.

Investigative Effort. We operationalized investigative effort as a combination of the number of applicable actions taken by investigators and the speed with which these actions are taken. Effort is operationalized as the number of, and swiftness of actions taken by investigators when it was possible for them to take these actions. Specific measures were whether and how quickly a detective was assigned to the case, whether the detective contacted or interviewed the victim; whether a detective interviewed an identified witness, suspect, or both; whether the crime scene was processed; whether a cell phone or social media were investigated; and whether a collected SAK was submitted for forensic testing. Importantly, research shows that characteristics of the agency and investigative unit can impact both levels of investigative effort and the relationships between measures of investigative effort and case clearance (Wellford et al., 2019). To protect the confidentiality of the LEAs who shared their data, we do not conduct within-LEA analyses. We do, however, examine the relationships between measures of investigative effort and our outcome while controlling for the impact of the agency on case outcomes.

Report Delay. There is no well-established definition of what constitutes a "delayed" police report. Although some research has defined a "prompt" report as one made within 24 hours after the assault (Tasca *et al.*, 2013), this time frame seems too brief, especially considering that forensic examinations can often be performed up to 5 days after the assault (National Institute of Justice, 2017). However, that period of time also provides more opportunity for crime scenes to become unusable; witnesses to become unlocatable or to forget important details; and involved parties to delete text, social media, or video evidence. For these reasons, and because some jurisdictions limit the provision of a forensic examination to 72 hours after the assault (National Institute of Justice, 2017), we defined a delayed report as one given more than 3 days after the incident. To gauge the sensitivity of our results to this measure of report delay, we also used a continuous measure of report delay equal to the number of days between the assault and the police report.

Victim Alcohol and Substance Use. Research suggests that victim drug or alcohol use immediately before the assault can hinder an investigation if it obstructs the collection of evidence or if detectives use it to discount the victim's case (Kelley and Campbell, 2013; Morabito et al., 2019; Tasca et al., 2013). To test this, we measured the presence of these elements in the case. Our measures of victim self-reported drug and alcohol use include both voluntary and involuntary use of these substances before the assault.

Victim, Crime, and Agency Controls. To understand how case evidence, investigative effort, report delay, and victim alcohol or substance use relate to case clearance, it is important to control for features of the case that could explain these relationships. In our regression models, we controlled for a set of victim level, incident, and agency measures including victim demographics; the victim and suspect's relationship; the location of the assault; whether the

victim was at risk because of diminished mental capacity, drug use, sex work, or transience; and an agency identifier (ID). For the few cases with more than one sexual assault victim or suspect, we coded the first victim and suspect described in the report.

Data Analysis Plan

This study first describes key characteristics of adult sexual assaults and their investigations and then explains how these characteristics relate to whether a suspect is arrested for the crime. For each of the four areas examined—case evidence, investigative effort, report delay, and victim substance use—we first use summary statistics to describe the prevalence of and variation in these measures before using inferential statistics, including correlation analysis and regression analysis, with complete cases to link these measures to a suspect's arrest. To keep the agencies in our sample anonymous, we do not present agency-specific statistics or analyses. All analyses were conducted using Stata 16.1 and code may be requested from the corresponding author.

Results

Summary statistics for each measure and a count of the number of missing observations for each variable are in Table I. Most of the measures are binary with a value of zero equaling no and a value of one equaling yes. In these cases, the mean value can be interpreted as the proportion of cases with a value of 1. For the continuous measures, because the mean is often not representative of most cases because of extreme upper values (i.e., outliers), we present the median. Each variable has some missing data because either a case file did not include the information, the variable was not applicable, or a coder did not enter a value for another reason. For this reason, for each variable in the table, we note the number of cases not included due to missing data. In the subsections that follow, we interpret relevant summary statistics and examine how selected variables relate to the probability that a suspect is arrested following an investigation.

[Table I about here]

Case Clearance

Table I shows that 25 of the cases were missing a value on arrest status. According to coder comments, the primary reason was that the case file had incomplete records. This could occur if an agency provided only the first half of a case file that described the initial response but not the investigation and outcome of the case. To reduce burden on that participating LEAs, the researchers did not attempt to replace incomplete cases after receiving the data at the start of the project. Although we measured whether a case was marked cleared by exceptional means when a suspect was not arrested, we found that our sample of LEAs misapplied this clearance definition in 69% of these cases by not following the FBI's UCR definition. Therefore, in this research study, we used arrest as an outcome to understand the predictors of case clearance. In these analyses, we dropped cases that were either unfounded or missing an arrest outcome, leaving a

total sample of 446 sexual assault cases (91% of the original sample), in which 104 (23%) resulted in the arrest of a suspect.[2] We did not exclude cases that were (most often mistakenly) cleared by an exceptional means from the analyses. Since these cases did not result in a suspect's arrest, they were coded as 0, not cleared by arrest.

Evidence Collection and Processing

Sexual assault cases are difficult to solve because they often lack the evidence necessary to establish probable cause and make an arrest. Often, sexual assaults occur in private locations without witnesses; even confronted with DNA evidence, a suspect can claim that a victim consented to the sex. In this study, we examined the prevalence of various types of evidence in a multi-agency sample of completed sexual assault cases and tested whether the quantity and type of evidence in a case are linked to whether a suspect is arrested.

Table I shows that sexual assaults often lack evidence. For example, although a SAK was collected in 284 (60%) of 473 cases, 179 (63%) and 86 (30%) of these 284 SAKs were submitted for forensic testing and had forensic testing completed, respectively. Of the 86 SAKs with testing completed, DNA was obtained in 62% of cases and the median number of days between the submission of the SAK to a crime laboratory and the completion of SAK testing was 91 days.[3]

A witness was present in 59% of cases. Of course, witnesses did not always see elements of the crime take place and could not always provide actionable intelligence to law enforcement. Thus, the prevalence of witnesses who provided evidence to move the case forward is likely lower than 59%. Among other types of evidence, relatively common ones included photographs taken and items collected at the crime scene (25% and 20% of cases, respectively). Rarely were fingerprints (5% of cases) or DNA evidence (7% of cases) obtained from the crime scene. A weapon, most often a gun, was used in 15% of cases but recovered in only 4% of cases. Police-controlled calls were conducted in 5% of cases.

To test whether the type and quantity of evidence is related to the likelihood that a suspect is arrested in a sexual assault case, we conducted a series of logistic regression analyses (Table II). In the first set of analyses, we regressed suspect arrest on the presence of various types of evidence before and after controlling for possible confounding factors. In the second set of analyses, we regressed suspect arrest on a measure of the number of unique sources of evidence collected in the case before and after including our controls. In each regression, we excluded unfounded cases and clustered standard errors by agency ID.

[Table II about here]

Results from Model 1 show that recovering a weapon, finding DNA evidence at the crime scene, and taking photographs at the crime scene all increase the likelihood that the investigation results in a suspect's arrest, after controlling for the other evidence types. Even though the crime scene evidence variables were highly correlated, variance inflation factors and an examination of the size of the standard errors suggest that multicollinearity did not affect the regression results.

After we included a set of control variables in the regression (Model 2), the same three evidence measures remained statistically significant. A weapon recovery increases the odds of arrest by 7.9, collecting DNA evidence at the crime scene increases the odds of arrest by 3.8, and taking photographs at the crime scene increases the odds of arrest by 5.3, net the control variables.

Our measure of the number of distinct types of evidence collected ranges from 0 to 7, with a mean of 1.8 and a standard deviation of 1.5. Results from Model 4 show that a one-unit increase in the number of distinct types of evidence collected in a sexual assault investigation is related to an 87% increase in the odds that a suspect is arrested ($p = 0.000$). To better understand this relationship, we estimated the predicted probability and 95% confidence interval of a suspect's arrest at the different values of this measure. The results, shown in Figure 1, demonstrate the positive relationship between the amount of evidence collected and the likelihood that a suspect is arrested, net the effects of potentially confounding variables. With the control variables at their mean values, the predicted probability of a suspect's being arrested when our measure of the quantity of evidence equals zero is 0.08. When this measure equals 4, the predicted probability is 0.48. When this measure equals 7, the predicted probability is 0.83. Although these findings suggest that there is an independent relationship between the amount of evidence in a case and the likelihood of an arrest, the data also demonstrate that, in most cases, more than just evidence is needed to make an arrest. For instance, for cases in the 90th percentile of evidence collected (four or more independent items of distinct evidence), 34 of the 65 cases (52%) resulted in a suspect's arrest.

[Figure 1 about here]

Investigative Effort

Within our sample of agencies, there were instances where investigators could have taken actions that presumably would have furthered the case but for unexplained reason chose not to. During case review, we coded when it would have been beneficial to the investigation to process the crime scene, as victims, suspects, and witnesses sometimes described potentially verifiable events that led to the assault. As another example, although victim-suspect cell phone communications were mentioned in 96 of the case files, cell phone evidence was followed up or investigated in only 81 (84%) of these cases. Likewise, social media communications were mentioned in 62 case files but were investigated in only 32 (52%) of these cases. Finally, of the 284 SAKs that were collected in a forensic examination, only 179 (63%) were submitted to the laboratory for forensic testing. Although many cases may have had a justifiable reason for not submitting the SAK, including the victim's request to not do so, the case files seldom included an explanation for why a collected evidence was not submitted.

In addition to the number of applicable investigative actions taken by detectives, investigative effort can be measured by the time within which an investigation is conducted. Table I shows that in most cases, these investigative steps occurred quickly. Still, in some cases, there was a longer delay. For example, most detectives were assigned to the case the day after the crime was

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reported, but in 10% of cases the detective was assigned 5 or more days after the crime report. In most cases, the detective contacted and interviewed the victim on the same day that the detective was assigned to the case. In 75% of cases, the detective contacted the victim in 1 day or less and interviewed the victim within 4 days. Most suspects were interviewed within a week of the detective's assignment to the case, but the mean was 41 days, and the interquartile range was 26 days. Although we attempted to measure the dates on which the suspect was identified and located by law enforcement, these dates were rarely in the case files. Therefore, we cannot determine to what degree the time lapse in interviewing the suspect is a measure of investigator delay or of the difficulty of identifying and contacting the suspect.

Together, these findings suggest that, on average, investigators acted swiftly, but too often left investigative stones unturned.[4] Next, we examined whether missed investigative opportunities due to a lack of investigator effort decreased the likelihood that a suspect was arrested, net relevant crime and agency factors. To do so, we conducted a multivariable logistic regression analysis with suspect arrest status as the outcome. Table III provides the results of this analysis, including the change in the predicted probability of arrest when each investigative effort variable changes from zero to one, holding all other variables at their mean values.

Table III reveals that interviews of the victim, witness, and suspect all increase the odds of a suspect arrest, net the investigative effort variables and control variables. Interviewing a witness or suspect more than doubled the odds of an arrest; interviewing the victim more than quadrupled the odds. Because high odds ratios can seem to suggest that the odds of arrest are high, we presented predicted probabilities, showing that even when investigators engage in these actions, the likelihood of arrest remains low, on average. When law enforcement processed the crime scene, the probability of arrest increased by 0.21, on average. This result comes after holding all other variables, including the number of days between the crime and police report, at their mean values. Surprisingly, the investigation of a cell phone or social media and the submission of a SAK did not significantly increase the probability of arrest. Given the few cases with delays in detective activity, we did not examine the relationship between the speed of investigator activities and the probability of a suspect's arrest.

[Table III about here]

Report Delay and Investigations

Most sexual assaults that were reported to law enforcement were reported immediately. Although the mean number of days between the crime occurrence and crime report was 99 days, this number is skewed by extreme upper values (i.e., outliers). Sexual assaults were reported to law enforcement within 3 days of the assault in 75% of the cases, and the median number of days between the crime and the crime report was 1 day. The fact that most sexual assaults were promptly reported to law enforcement suggests that report delay cannot explain low sexual assault clearance rates across LEAs. Still, the number of days between the sexual assault and the crime report could be negatively related to the likelihood that a suspect is arrested. One likely

cause of any negative relationship between delay in reporting and the probability of a suspect's arrest is variation in the amount of evidence collected in the case, because, as time elapses, physical, digital, and forensic evidence becomes more difficult to collect and witnesses may become more difficult to locate and may forget details of the event. Another potential explanation of this relationship is investigative effort, because investigators might dedicate less time and energy to delayed reports.

To test these relationships, we regressed suspect arrest on two measures of report delay—one continuous and one discrete—first without and second with control variables (Table IV). In addition to better representing the construct, the discrete measure of report delay greatly reduces the impact of outliers on the variable's relationship to arrest. Therefore, we focus on models 3 and 4 when interpreting our findings. Each regression excluded unfounded crimes and had standard errors that were clustered by agency ID. After estimating the direct effect, we next examined whether measures of the amount of unique evidence types and investigative effort in the case might explain the observed relationship between report delay and suspect arrest (Table V). We did not include the mediating variables in the regressions because many mediators are conditional on other factors—for example, a weapon recovery is conditional on the use of a weapon; a witness interview is conditional on the presence of a witness. These analyses are exploratory and should not be interpreted as tests of causal relationships.

[Tables IV and V about here]

Tables IV and V show that report delay is negatively associated with the likelihood of an arrest and there is not a clear linear decrease in the amount of evidence found or investigator effort shown in a case as the number of days between the crime and report increases from 0 to 5. Model 4 results in Table IV show that a delay in reporting decreases the odds of a suspect arrest by 0.31 times, or 69%. This relationship is statistically significant and net of victim, crime, and agency factors that could otherwise explain the relationship. Clearly, something about a victim's delay in reporting a sexual assault to law enforcement hinders the investigation. Two potential explanations of this relationship, a lack of evidence and investigator indifference, do not appear to explain much of the relationship. Although report delay reduced the amount of evidence on average, reports that were delayed beyond a day or two did not consistently lack key pieces of evidence like a witness or crime scene evidence. Likewise, more-delayed reports did not differ greatly from less-delayed reports in the prevalence of witness or suspect interviews or SAK submissions, although investigators were less likely to process the crime scene or investigate digital evidence. It is possible that the amount of evidence and investigator effort drop off more noticeably after 5 days of delay, but it does not appear that delay up to 5 days after the crime greatly hinders evidence collection or disinterests investigators. In the Discussion section, we consider promising practices that law enforcement can use to reduce the likelihood of delayed reporting and increase their likelihood of a suspect arrest.

Victim Substance Use and Investigations

Another factor that may hinder sexual assault investigations is substance use by the victim during the time surrounding the assault.[5] Almost one-third of the sexual assault victims in our sample were reported to have used alcohol, and 13% were reported to have consumed drugs, before the assault. Some have suggested that law enforcement officers perceive alcohol or drug use by the victim as a risky or even immoral behavior, which might lead detectives to change how they handle their investigative follow-up activities (Schuller and Stewart, 2000; Spohn and Tellis, 2018). Investigators could also look "downstream" by assuming that the substance use will reduce the likelihood of a successful prosecution and conviction, leading them to shift their time toward cases that they perceive to be more likely to result in a conviction (Spohn and Tellis, 2018). Alternatively, if substance use results in memory loss or unconsciousness, victims may provide fewer details about the assault to investigators, which could reduce the amount of evidence that is available to collect and process (State of Texas State Auditor, 2020). Reductions in both the amount of investigator effort and evidence in a case seem likely to decrease the probability that the investigation results in the arrest of a suspect. To test these hypotheses, we first used univariable and multivariable logistic regression analyses to understand whether victim substance use is related to an arrest. These analyses excluded the unfounded cases and had standard errors that were clustered by the agency ID. If there was a significant relationship between victim substance use and suspect arrest, we then explored whether it could be explained by variation in the average amount of evidence found or investigative effort shown across cases.

Although we found a small negative relationship between victim substance use and the likelihood of a suspect's arrest (Table VI), this relationship was not statistically significant. Approximately 40% of cases with no arrest involved victim substance use before the attack, and approximately 30% of cases with an arrest involved victim substance use. Marginal effects calculated without and with control variables show that victim substance use reduced the probability of arrest by 8% and 5%, respectively. Because there is no statistically significant relationship between victim alcohol or drug use and suspect arrest, we did not explore whether the average amount of evidence or investigative effort in a case varied by the victim's use of alcohol or drugs before the assault. Importantly, although we did not find a relationship between a victim's use of alcohol or drugs and the likelihood of an arrest, this case factor may have a greater impact on the likelihood of a suspect's prosecution or conviction (Beichner and Spohn, 2012).

[Table VI about here]

Discussion

Sexual assaults present distinct challenges for criminal investigators, including the ability to support and engage victims throughout the investigation, the availability and application of evidence, detective workload, stress, job satisfaction, and the lack opportunities for specialized

training. Yet, there is limited research that can inform the identification of effective policies and practice in sexual assault investigations and the adoption of minimum standards that can be applied across LEAs. It is important for LEAs, victim advocates, prosecutors, policymakers, and researchers to understand the common characteristics of sexual assaults and their investigations and which factors increase the likelihood of a suspect's arrest so that they can identify ways to improve official responses to these crimes.

The current study analyzes data from a large, multi-agency sample of sexual assault case files (N = 491) to examine and unpack the investigative process, with a focus on examining how factors associated with case characteristics (delays in reporting to the police; victim alcohol or substance use) and investigative process (case evidence; investigative effort) may influence the likelihood of arrest. This study builds on existing research like that of Peterson *et al.* (2010), Schroeder and Elink-Schuurman-Laura (2017), and Morabito *et al.* (2019). Each of these studies analyzed sexual assault cases from multiple agencies to understand the common characteristics of sexual assault investigations and the characteristics that predict a suspect's arrest. Broadly speaking, these studies found that 1) 18%–45% of sexual assaults are cleared by arrest; 2) except for SAKs, many cases lack evidence; and 3) the presence of evidence is positively associated with the likelihood of a suspect's arrest. Although research also suggests that organizational factors impact arrest clearance rates and the relationship between case outcomes and case and investigative factors (Wellford et al., 2019), we did not examine those factors here due to a concern with not identifying the participating LEAs and a lack of cases and space to explore LEA interactions.

Overall, our findings on investigative effort show that detectives are assigned and respond quickly to investigate sexual assaults, with nearly all cases assigned to a detective (94%) and the vast majority in which the victim was formally contacted and interviewed by an investigator (86%). However, notable opportunities for investigative effort were missed, some of which could have increased the likelihood of a suspect's arrest, such as locating and processing the crime scene or attempting to find and interview identified witnesses. These missed opportunities more often relate to investigative effort not a lack evidence, since most sexual assault reports were not delayed and involved a crime scene. Yet, investigators processed crime scenes in only one-third of all cases. Additionally, almost half of victims were acquainted with the person who assaulted them, but cell phone communications were investigated in only 17% of cases. Although in some of these cases there was likely a good reason for investigators to not take these types of actions, case coding revealed a consistency in available opportunities to further an investigation that were not taken by investigators.

Additional findings demonstrate that the sexual assault investigations across the five agencies often lacked the collection of physical evidence. Overall, one-fifth of cases had items collected from the crime scene, which included photographs of the scene, fingerprints or biological evidence collected at the scene, or weapons recovered. A SAK was collected in 60% of cases but only 18% of SAKs had been tested to completion at the time of our data collection. For those

SAK's that were tested, the median number of days between the submission of a SAK for forensic testing and the completion of testing in our sample was 91. This length of time can hinder a detective's ability to use the analysis results throughout the investigative process, which could explain our regression findings that neither the presence of a SAK or its submission for forensic testing were significantly associated with the likelihood of a suspect's arrest. Although we did not find a bivariate relationship between the number of days of SAK testing and the likelihood of arrest among cases with tested SAKs (see Endnote 3), we believe that this finding is due to the long period of testing in most cases.

One of the most prevalent sources of evidence in a case was a witness, with about 6 in 10 of the sampled cases reporting a presence of a witness. However, the presence of a witness in a case was not associated with the likelihood of a suspect arrest. One potential reason for this finding is that a broad set of persons involved in a case can be defined as witnesses, although some of these individuals may not have witnessed the crime or otherwise have new information that can advance an investigation. Results also show that when evidence was present, the odds of an arrest increased. Specifically, each additional type of evidence collected increased the odds of a suspect's arrest by 87%.

A clear opportunity for increasing arrest rates in sexual assault cases is to more consistently collect and process evidence for analysis when it is available. One pathway towards achieving this is through a more consistent pattern of investigative effort across cases, including the coordination and management of evidence. Notably, although all sexual assaults technically involve a crime scene, and most of the assaults were promptly reported, the crime scene was processed only one-third of the time. Similarly, a witness was interviewed in only 35% of cases, even though one or more witnesses were present in 59% of cases. Moreover, interviewing a victim, witness, or suspect, and processing the crime scene, all were found to increase the odds of a suspect's arrest.

Also, potentially valuable cell phone communications or social media data were not routinely collected. For instance, the victim knew the suspect in 83% of the sampled cases, but case files seldom described detectives asking for or looking more closely into cell phone texts, social media, or dating application communications that occurred before or after the assault. Although many cases may have had a justifiable reason for not processing digital evidence or engaging in other investigative actions like submitting a SAK, including the victim's request to not do so, the case files seldom mentioned the reason that a collected SAK was not submitted, or digital evidence was not collected and analyzed.

This study has certain limitations that should be acknowledged and discussed. First, and arguably most importantly, data collection was impeded in some instances by the lack of consistent and clear case file documentation. Although the results suggest that investigators often performed incomplete investigations by not processing a crime scene, not interviewing an available witness, or not submitting a SAK for forensic testing, there could have been justifiable but unrecorded

reasons for not performing these activities. For example, case files rarely described investigators asking victims whether they had cell phone or social media communications with the suspect. Therefore, we could reliably measure whether these types of evidence were investigated but not how often these investigative opportunities were present but not pursued. Case coding was limited to the completeness of the records provided and had to assume that detectives did not investigate a potential source of evidence if an investigation was not documented.

A second study limitation is the coarseness of our measures. For example, research could go beyond our measure of whether a victim or suspect was interviewed by also collecting data that assesses the quality of these interviews. Likewise, future studies could improve our measures of case evidence by collecting details on the results and timing of evidence processing. We also did not analyze characteristics of the detectives assigned to cases or the investigative units and departments in which they work. For example, the demographics and experience levels of individual detectives as well as the types of trainings they have received. These characteristics as well as organizational features likely affect both the frequency with which offenders are arrested in sexual assault cases and the relationships between measures of investigative effort and case outcomes (Wellford *et al.*, 2019). Most research on criminal investigations involves the study of a small number of LEAs. It is essential that future studies increase their sample sizes both to increase the external validity of findings and to analyze the impact of organizational attributes on investigations and their outcomes.

Looking ahead, this study offers several key recommendations for the field. One is for LEAs across the country to adopt consistent, evidence-informed practices for sexual assault investigations that are applied across all cases (Sexual Assault Kit Initiative, 2020). Supervisor oversight is critical to ensure that all opportunities to further an investigation were pursued in a timely fashion and that victims were supported and engaged throughout the entire process. From an investigative effort standpoint, agency leaders should be confident that everything that could be accomplished on a case was carried out including activities related to the initial response and crime scene investigation, evidence management, and interviews with victims, witnesses, and suspects. Developing multidisciplinary approaches that utilize the expertise of victim advocates, sexual assault nurse examiners, forensic analysts, and prosecutors are also highly valuable not only for responding to specific cases but also in conducting case reviews, establishing cross-discipline training programs, and reviewing and strengthening policies and procedures.

A second recommendation is the development and implementation of improved practices for collecting more standardized data on sexual assault investigations, including definitions and criteria for measuring prioritized variables. Documentation by investigators and data quality are issues that also require more attention. For instance, reporting templates that can be used by officers to improve the structure and content of the information contained in case files. In addition, practices that ensure these case files contain accurate and complete supplemental reports on evidence collection, any laboratory submission and analysis results, the role and participation of victim advocates, and prosecutor and police communications and case decision-

making. Like much other research, we found that most cases that were cleared by exceptional means did not meet the FBI's UCR criteria for this clearance designation, which is something a supervisory review would help to prevent. Departments should also mandate that detectives record victim, witness, and suspect interviews since these recordings can be valuable to the conduction and oversight of investigations.

Collectively, we believe a data-driven approach towards assessing sexual assault investigative practices is an ideal opportunity to help bridge the gap between knowledge and practice. LEAs can support their own efforts to engage in evidence-informed practices in sexual assault and other violent crime investigations by committing themselves to a set of research-based recommendations. These practices can include the collection of more robust and standardized data, ensuring consistent reporting to NIBRS, prioritizing the hiring of support personnel including data analysts and victim advocates, the routine auditing of data in case files for completeness and accuracy, ongoing partnerships with qualified research partners, and more.

Notes

[1] The FBI defines rape as "penetration, no matter how slight, of the vagina or anus with any body part or object, or oral penetration by a sex organ of another person, without the consent of the victim" (FBI, 2014).

[2] The exclusion of unfounded cases from our analyses could bias the results if the LEAs were misusing this designation to clear difficult to solve cases. Although research suggests that LEAs do sometimes engage in this practice (Spohn, White, & Tellis, 2014), in our sample of cases only 5% were unfounded, which is not an unusual proportion for adult rape cases (Lisak et al., 2010).

[3] For cases for which SAK testing was completed, a univariable logistic regression showed no significant relationship between suspect arrest and the number of days between the submission of the SAK to a crime laboratory and the completion of forensic testing (OR = 1.00, p = 0.10, N = 75). Although the prompt testing of SAKs may serve other valuable purposes like adequately serving assault victims and encouraging victim cooperation in the investigation and conviction of a suspect, on average for our sample of cases, fewer days of SAK testing did not increase the probability that a sexual assault case ended in a suspect's arrest.

[4] A peer reviewer raised a concern that this statement may be too strong given the challenge of separating a lack of investigative effort from the lack of opportunity to engage in investigative effort. Because of the paucity of details in most police case files, it could be that in instances where investigators did not process the scene or did not investigate digital evidence, there was a valid reason for not engaging in these activities. Additionally, we measured investigative actions but did not always measure whether the actions were applicable. Therefore, although we are limited in proving this claim with hard data, each case coder agreed that based on reading the many case files, there was a consistency in investigators not taking investigative opportunities that were available to them.

[5] Importantly, alcohol and/or substance use by a witness and/or suspect could impact investigations as well, but these details are less often documented in LEA case files and are less often examined in existing research on the correlates of suspect arrest in sexual assault cases.

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Table I. Summary Statistics for All Measures Used in Case Analysis

Variables		Min	Max	Mean (discrete) Median (continuous)	Standard Deviation	Cases Missing Value
Clearance						
	Suspect arrested	0	1	0.22	0.42	25
	Cleared by exceptional means	0	1	0.28	0.45	47
	Unfounded	0	1	0.05	0.21	47
Evidence						
	SAK collected from victim	0	1	0.60	0.49	18
	SAK testing completed	0	1	0.18	0.39	18
	Days between SAK submission and completed testing	4	526	91.00	118.16	416
	Witness present	0	1	0.59	0.49	13
	Weapon recovered	0	1	0.04	0.20	8
	Items collected at crime scene	0	1	0.20	0.40	11
	Photographs taken at crime scene	0	1	0.25	0.43	11
	Fingerprints obtained at crime scene	0	1	0.05	0.21	11
	DNA obtained from crime scene	0	1	0.07	0.25	11
	Confrontation call conducted	0	1	0.05	0.22	39
Investigative effort						
	Detective assigned to case	1	1	1.00	0.00	25
	Days from victim report to detective assignment	0	430	1.00	21.52	25
	Victim contacted by detective	0	1	0.94	0.25	9
	Days from detective assignment to victim contact	0	217	0.00	18.15	52
	Victim interviewed by detective	0	1	0.86	0.35	9

	Days from detective assignment to victim interview	0	733	0.00	65.11	89
	Witness interviewed by detective	0	1	0.35	0.48	13
	Suspect interviewed by detective	0	1	0.31	0.46	9
	Days from detective assignment to suspect interview	0	1170	7.00	124.08	347
	Crime scene processed	0	1	0.32	0.47	5
	Cell phone investigated	0	1	0.17	0.38	16
	Social media investigated	0	1	0.07	0.25	15
	SAK submitted for testing	0	1	0.38	0.49	18
Report delay						
	Number of days between assault and crime report	0	10957	1.00	719.00	18
	Report delayed more than three days	0	1	0.25	0.43	18
Victim-reported substance use						
	Drug use	0	1	0.13	0.34	36
	Alcohol use	0	1	0.30	0.46	34
	Drug and alcohol use	0	1	0.37	0.48	31
Controls						
	Victim and suspect relationship					
	Strangers	0	1	0.17	0.38	30
	Acquaintances	0	1	0.47	0.50	30
	Current intimate partners	0	1	0.15	0.36	30
	Ex-intimate partners	0	1	0.10	0.30	30
	Family members	0	1	0.04	0.20	30
	Other relationship	0	1	0.07	0.25	30
	Location of assault					
	Outdoors	0	1	0.10	0.29	19
	At victim or victim and suspect shared residence or business	0	1	0.32	0.47	19

	At suspect residence or business	0	1	0.26	0.44	19
	In vehicle	0	1	0.11	0.32	19
	At other residence or hotel	0	1	0.13	0.34	19
	At other business	0	1	0.03	0.18	19
	At other location	0	1	0.05	0.22	19
	Victim characteristics					
	Female	0	1	0.96	0.20	11
	White	0	1	0.48	0.50	32
	Black	0	1	0.42	0.49	32
	Hispanic	0	1	0.07	0.25	32
	Other race/ethnicity	0	1	0.03	0.17	32
	Age	13 [a]	94	29.62	11.24	5
	At risk because of diminished mental capacity, drug abuse, sex work, or transience	0	1	0.21	0.41	0 [b]

Notes. SAK, sexual assault kit.

[a] Although the researchers requested adult sexual assault cases, 25 of the cases involved a victim under the age of 18.

[b] Missing values were recoded to zero, because this item was often skipped when victim was not at risk.

Table II. Relationships Between Evidence Type and Quantity and Suspect Arrest

Measures of Evidence	Odds Ratio	Standard Error	*p*-value	N
Model 1 – Evidence Variables Only				
SAK collected	0.667	0.285	0.343	429
Witness present	1.470	0.454	0.212	429
Weapon recovered	6.479	3.529	0.001	429
DNA obtained from crime scene	3.695	1.425	0.001	429
Items collected from crime scene	0.807	0.243	0.477	429
Photographs taken at crime scene	4.614	0.545	0.000	429
Fingerprints obtained from crime scene	1.241	0.786	0.733	429
Model 2 – With Control Variables[a]				
SAK collected	0.765	0.352	0.560	376
Witness present	1.625	0.595	0.185	376
Weapon recovered	7.852	4.052	0.000	376
DNA obtained from crime scene	3.845	1.528	0.001	376
Items collected from crime scene	0.647	0.244	0.248	376
Photographs taken at crime scene	5.327	0.825	0.000	376
Fingerprints obtained from crime scene	2.083	2.050	0.456	376
Model 3 – Bivariate Relationship				
Number of distinct types of evidence collected[b]	1.730	0.083	0.000	429
Model 4 – With Control Variables[a]				
Number of distinct types of evidence collected[b]	1.866	0.157	0.000	376

Notes. SAK, sexual assault kit.
[a] The control variables include the agency ID, the victim-offender relationship, the location of the assault, the victim's age and race, and whether the victim was a member of an at-risk group.
[b] Evidence includes the dichotomous measures of a SAK collected, witness present, weapon recovered, DNA evidence found at crime scene, items collected at crime scene, photographs taken at crime scene, and fingerprints obtained at crime scene.

Table III. Logistic Regression of Suspect Arrest on Investigative Effort Variables, Net of Control Variables

Measures of Investigative Effort	Predicted Probability of Arrest When Equal to Zero	Predicted Probability of Arrest When Equal to One	Odds Ratio	Standard Error	p-Value	N
Victim interview	0.028	0.120	4.724	1.567	0.000	372
Witness interview	0.074	0.160	2.361	0.728	0.005	372
Suspect interview	0.075	0.167	2.477	0.725	0.002	372
Crime scene processed	0.058	0.270	5.952	1.938	0.000	372
Cell phone or social media investigated	0.093	0.123	1.357	0.317	0.191	372
SAK submitted for forensic testing	0.100	0.098	0.977	0.699	0.974	372

Notes. The control variables include the agency ID, the number of days between the sexual assault and the crime report, the victim-offender relationship, the location of the assault, the victim's age and race, and whether the victim was a member of an at-risk group. SAK, sexual assault kit.

Table IV. Relationship Between Report Delay and Suspect Arrest

Measures of Report Delay	Odds Ratio	Standard Error	*p*-Value	N
Model 1 – Bivariate Relationship				
Number of days between assault and crime report	0.996	0.001	0.003	438
Model 2 – With Control Variables[a]				
Number of days between assault and crime report	0.996	0.002	0.008	386
Model 3 – Bivariate Relationship				
Report delayed more than 3 days	0.365	0.097	0.000	438
Model 4 – With Control Variables[a]				
Report delayed more than 3 days	0.310	0.102	0.000	386

[a] The control variables include the agency ID, the victim-offender relationship, the location of the assault, the victim's age and race, and whether the victim was a member of an at-risk group.

Table V. Amount of Evidence and Investigator Effort, by Days Crime Report Delayed

Measures	Reported on same day (N = 223)	Reported 1 day later (N = 84)	Reported 2 days later (N = 32)	Reported 3 days later (N = 17)	Reported 4 days later (N = 13)	Reported 5 days later (N = 9)
Evidentiary factors						
Percent of cases with SAK collected	76%	76%	71%	59%	31%	44%
Percent of cases with a witness	60%	63%	68%	47%	61%	33%
Percent weapons recovered in weapon-involved crimes	40%	27%	0%	0%	0%	0%
Percent evidence collected from crime scene when crime scene processed	91%	82%	75%	N/A	100%	100%
Mean number of distinct types of evidence collected[a]	2.3	2.1	1.6	1.1	1.4	0.9
Investigator effort						
Percent of cases with a witness with a witness interview	63%	54%	48%	63%	50%	100%
Percent of cases with a suspect interview	31%	30%	41%	35%	8%	22%

Percent of crime scenes processed	46%	34%	13%	0%	31%	11%
Percent of social media involved cases with social media investigated	58%	57%	33%	0%	0%	N/A
Percent of cell phone involved cases with cell phone investigated	48%	33%	38%	0%	0%	50%
Percent of collected SAKs submitted for testing	62%	69%	64%	70%	0%	75%

Notes. SAK, sexual assault kit.

[a] Evidence includes the dichotomous measures of a SAK collected, witness present, weapon recovered, DNA evidence found at crime scene, items collected at crime scene, photographs taken at crime scene, and fingerprints obtained at crime scene.

Table VI. Relationship Between Victim Substance Use and Suspect Arrest

Measures of Victim Substance Use	Odds Ratio	Standard Error	*p*-Value	N
Model 1 – Bivariate Relationship				
Victim alcohol or drug use	0.645	0.277	0.307	422
Model 2 – With Control Variables[a]				
Victim alcohol or drug use	0.731	0.334	0.494	369

[a] The control variables include the agency ID, the number of days between the assault and crime report, the victim-offender relationship, the location of the assault, the victim's age and race, and whether the victim was a member of an at-risk group.

Figure 1. Predicted probability and 95% confidence interval of suspect arrest at values of the number of distinct types of evidence collected, with control variables centered at their means