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FORENSIC EVIDENCE AND CRIMINAL JUSTICE OUTCOMES IN A STATEWIDE SAMPLE OF SEXUAL ASSAULT CASES

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Executive Summary

Sexual assault is a heinous crime that as much as a quarter of women nationally experience in their lifetime. Not only do victims suffer the terror and degradation of the assault, but they are further at risk of injury and a range of difficulties with mental health and functioning. Survivors are also at risk of re-victimization from informal and professional responses that question their credibility and in effect blame them for the assault. Only a small proportion of sexual assaults are prosecuted;   only a subset of assaults are reported to police, only a portion of those cases reported to police result in arrest, and only small percentage of those arrested are ultimately prosecuted.   When prosecution does ensue, enormous demands are placed on victims; they must testify in court about the traumatic events of the crime and face assaults on their credibility both in and outside the courtroom.

In this difficult context, investigative methods that increase evidence against assailants while decreasing the burden on victims are especially important, and advances in the technology and expertise of collecting and analyzing injury and forensic evidence offer promise. Victims undergo difficult forensic medical examinations with the hope of contributing evidence that can help bring assailants to justice. The research community has a responsibility to develop a better understanding of how this information is used and actually relates to criminal justice actions. This study explores the role of injury evidence and forensic evidence in sexual assault cases using data from medical providers, crime laboratories and police. The study:

- Examines the frequency of injury and biological evidence in sexual assault cases;
- Identifies case factors associated with the presence of injury and biological evidence;

- Analyzes how often biological evidence is processed prior to versus after arrest;
- Explores how injury and biological evidence as well as other factors are related to arrest; and
- Examines results for key comparisons thought to be salient for forensic evidence: Sexual Assault Nurse Examiners vs. other medical examiners; strangers vs. known suspects; child victims vs. adults and adolescents.

Literature Review

Frequency of Injury and Biological Evidence

Variability across studies suggests that there are no typical rates of injury and biological evidence across samples. Across 27 studies we found, the unweighted mean percentage of sexual assault cases with non-genital injury was 58%, but the rate ranged from 14% to 90%. Across 33 studies, the unweighted mean rate for genital injuries was 39%, but the rate ranged from 9% to 72%. The mean rate across 12 studies for finding sperm or semen was 30% but again this was quite variable. Only three studies reported rates of DNA evidence, with DNA matches to suspect ranging from 14% to 47% of cases.

Predictors of Injury and Biological Evidence

Studies have found several predictors of non-genital injury in sexual assault cases, including severe violence, use of a weapon, shorter time span between assault and examination (before healing had progressed), and victim substance abuse (Sommers, et al., 2006; Sugar, Fine & Eckert, 2004). Depending on the study, genital injury findings were more likely when there was physical or verbal resistance, when there was rectal penetration, when there were non-genital injuries, when victims were post-menopausal and when the examination took place within 24 hours of the assault (Muram, et al., 1992; Ramin et al., 1992; Sachs & Chu, 2002; Sugar, et al., 2004). Studies have found that genital injuries were more likely to be identified in white victims than in African American victims (Cartwright, 1987; Coker, Wales & Johnson, 1998; Sommers, et al., 2006), presumably because examiners had more difficult identifying injuries with darker skin. Research on predictors of biological evidence has focused on time since assault. Willot and Allard (1982; also, Allard, 1997) found that the probability of finding sperm from vaginal swabs declined substantially after 24 hours, and Gingras et al. (2009) found the probability of finding DNA evidence dropped dramatically two days after the assault.

SANE Impact

Campbell, Patterson, and Lichty's (2005) review concludes that examinations by SANE nurses are more complete than those conducted by other medical providers in the collection of specimens, documentation of evidence, properly sealing and labeling evidence, and maintaining chain of custody. Crandell and Helitzer (2003) found that police officers were significantly more likely to make an arrest, prosecutors were more likely charge suspects, and convictions were more likely to be secured following the implementation of SANE. In Nugent-Borakove et al. (2006), communities with a combination of SANE and Sexual Assault Response Team programs had an increased likelihood of identification and arrest of suspects, charging, and conviction. Campbell et al. (2008) found that implementation of a SANE program was associated with greater progression in the criminal justice system. However, we have not found other research that looks specifically at the effect of SANEs on the production of biological and injury evidence.

Predictors of Unfounding and Arrest

If police investigating a report of sexual assault proceed with the intention of making an arrest, the case is considered founded. On the other hand, they may *unfound* the case, which officially means they determine that a crime has not been committed, but this determination is also sometimes used when police believe that further action is futile (Spohn, White & Tellis, 2014). Not surprisingly, victim recanting is a factor in unfounding as is physical evidence (Spohn, et al., 2014). Many predictors of unfounding are indicators of what has been seen by many as “legitimate” or “real” rape (Estrich, 1987): suspect use of a weapon; victim injury; physical resistance to the attack; witnesses to the crime; suspect being a stranger; and suspect being in custody (Alderden & Ullmann, 2012; Frazier & Haney, 1996; Kerstetter, 1990; Spohn, White & Tellis, 2014). Other factors predicting unfounding mostly relate to victims’ credibility: victim substance abuse and mental health, history of false complaints, questions about victims character or reputation, discrepancies in victims’ statements and unwillingness to prosecute. Predictors of arrest or referral to prosecutors or filing criminal charges have been somewhat similar: arrest was more likely when the victim knew the suspect and had a prior relationship (and thus could be identified), when suspects had a weapon, when the suspect committed other crimes along with the sexual assault, when there was evidence of physical assault, when the assault took place outdoors, and when suspects had a prior conviction (Bouffard, 2000; DuMont & Myhr, 2000; Horney &Spohn, 1996; LaFree, 1981). Arrest was also more likely when victims’ were willing to prosecute, demonstrated no misconduct at the time of incident, reported promptly (Horney &Spohn, 1996; LaFree, 1981), underwent a forensic medical examination (Bouffard, 2000); when victims resisted the assault and were cooperative with police (Alderden & Ullman,

2012) and when victims were younger (DuMont & Myhr, 2000).

Injury Evidence and Criminal Justice Actions

Numerous studies have examined the relationship between injury evidence and criminal justice outcomes (see Alderden & Ullmann, 2012; Dumont & White, 2007; Ingemann-Hansen, Brink, Sabroe, Sorenson & Charles, 2008; Jewkes, et al., 2009). Some studies find that this relationship is statistically significant, while most do not. Most studies have found no relationship between biological evidence and criminal justice outcomes, but many of these predate the advent of DNA technology. Campbell et al. (Campbell, Patterson, Bybee & Dworkin, 2009) found that presence of DNA was significantly related to greater progress in the criminal justice system, but there was no information on when DNA was collected and could have an impact on arrest. Johnson et al. (Johnson, Peterson, Sommers & Baskin, 2012) found that the arrest preceded the examination of physical evidence (including biological evidence) in most cases, and therefore could not have been a factor in the decision in arrest. Tasca and colleagues (Tasca, Rodriguez, Spohn & Koss, 2013) found that DNA evidence was a significant predictor of suspect identification and arrest, but it is likely that this effect was merely a consequence of the victim's decision to have a medical examination, which was not measured. Tasca et al.'s interpretation was that "… officers responded most strongly to the promise of what DNA could reveal and not on actual findings that allowed them to identify or confirm the identity of a suspect." (p. 1170).

In sum, researchers have conducted only a relatively small number of rigorous studies on injury and biological evidence, on the impact of SANE, and on the investigation and prosecution of sexual assault. Only one study has captured the timing of crime laboratory analysis and criminal justice actions, which is critical to understanding the impact of biological evidence. The current study measures timing and make a unique contribution by examining the relationship of biological evidence separately for cases in which crime laboratory analysis follows arrest, and therefore logically cannot have a causal effect on it, and cases in which arrest follows crime laboratory analysis, which may therefore have a causal effect on this criminal justice decision.

Methods

This study merged data from three sources: a) the Massachusetts Provider Sexual Crime Report (PSCR) database, consisting of reports that medical providers throughout the state who conduct forensic medical examinations following sexual assault are required to fax to the Research and Policy Analysis Division of the state Executive Office of Public Safety and Security (EOPSS); b) forensic evidence data abstracted for the study from the two crime laboratories serving the state; and c) data on founding, arrests and criminal charges from 142 different police agencies across the state, including municipal, campus and state law enforcement agencies. A random sample of cases from 2008 through 2010 was drawn from the PSCR database. Data on victim, perpetrator and assault characteristics were downloaded from the PSCR database. Project research assistants working at the two crime laboratories in the state (Massachusetts State Police and Boston Police) coded data from documentation forms included in the standardized Massachusetts Sexual Assault Evidence Collection Kit (MSAECK) completed by medical examiners on the sample cases. Data coded from the kits detailed both non-genital and genital injuries found by examiners. The research assistants also coded the police incident number and the findings of crime laboratory analysis from crime laboratory reports.

Unfounding, arrest, and charging data were then solicited from the 145 police agencies represented in the sample and 97.9% of agencies responded with data. Analysis data files were created by merging the data file from the PSCR database with the data files created by the research assistants at the crime laboratories and the criminal justice data files created from the police agency submissions using a unique case identifier. The final sample consisted of 528 cases of sexual assault involving victims 12 years and older and 36 cases of sexual assault involving victims less than 12 years of age. Each of the cases in the final SPSS data sets represents individual victims and the associated data related to their sexual assaults from the PSCR database, crime laboratory files, and police data.

Major Findings

In Massachusetts, adult medical forensic medical examination kits are generally used with patients 12 years and older, while pediatric medical forensic evidence kits are typically used with patients under 12 years of age. Our results below are presented separately for adult and adolescent cases and child cases because of the differences between these evidence kits.

Sample and Assault Characteristics of Adult Cases

- Victims were overwhelmingly female (95.8%) and primarily White non-Hispanic (68.4%).
- Most victims (57.4%) knew the assailant.
- A little over one-third (35.1%) experienced physical force, and nearly 40% of victims also reported being restrained or held down by their assailants.
- Over three quarters (78.6%) of victims reported completed vaginal, anal, or oral penetration.

Injury Characteristics of Adult Cases

- About 53% of victims had documented non-genital injuries. Non-genital injuries included bruises, contusions, lacerations, fractures, bites, or burns. Common locations of documented non-genital injuries on victims were the legs (26.4%), arms (24.0%), backs (14.5%), necks (14.1%), faces (11.7%), or knees (10.9%).

- Also, 35.4% of victims had documented genital injuries. Genital injuries included genital bleeding, swelling, redness, abrasions, tearing, or other injuries to the genital structures. The most common genital injury type was genital redness (27.1%), followed by other injuries to genital structures (13.8%), genital swelling (12.9%) and genital abrasions (12.9%). The most common specific female genital injuries recorded were injuries to the vagina (12.1%) posterior fourchette (11.5%), labia minora (10.9%), and cervix (10.1%).

- Assailant use of force, weapon use, chemical incapacitation and more than one assailant were associated with more non-genital injuries in both bivariate and multivariable analyses.

- Completed penetration, however, was associated with fewer non-genital injuries, perhaps reflecting situations in which victims had prevented penetration, but at the cost of an injury.

- The odds that the medical examiner would document a genital injury increased three fold when Sexual Assault Nurse Examiners (SANEs) conducted the forensic medical examination compared to other medical provider. Genital injuries were also more commonly found when a speculum was used in the forensic medical examination (47.2% versus 31.4%), and, at a statistical trend level, when assailants used physical force.

Biological Evidence in Adult Cases

- Of the cases in which laboratory testing was completed and reported to police and prosecutors, 84.6% had biological evidence (65.3% of the entire sample). The most common type of biological evidence found was semen (45.8%).

- Semen was significantly more likely in cases in which external genital swabbing, vaginal swabbing, or perianal swabbing and additional swabbing were completed. Semen was more likely to be found with younger adolescent and adult victims than older. The odds of finding semen decreased by 51.9% when the forensic medical examination occurred beyond 24 hours of the assault.

- SANEs and non-SANEs did not differ significantly on finding biological evidence, even though SANEs were less likely to do head hair combing and pubic hair combing, perhaps because they were able to recognize situations in which these steps were not necessary.

- Forty-one percent of those cases with biological evidence had a DNA profile generated, and another 4.1% had pending analyses.

- Once a DNA profile is extracted, it can be compared to DNA samples obtained from the identified suspects in the case and can be entered into the FBI's Combined DNA Index System (CODIS) database. Voluntarily or under court order, suspects identified in the case may submit a biological sample (most commonly a buccal swab) that will allow the crime laboratory to compare the DNA sample provided by the suspect to the DNA profile generated from evidence in the case. Using CODIS, DNA profiles can also be compared to DNA from other investigations and to DNA obtained from convicted offenders.

- In those cases in which the crime laboratories were able to generate a DNA profile, the DNA:

    - matched the DNA sample obtained from the identified suspect in 40 cases (28.2% of cases with a DNA profile), either because there was no suspect sample or because the samples did not match

    - matched a convicted offender in the CODIS database in 23 cases (16.2%)

    - matched the DNA profile in CODIS from another case in 10 cases (7.0%).

- It is important to note that the DNA match and hit rates noted above are impacted by several factors and should not be used to infer that rape kit testing is not worthwhile. Whether DNA is ultimately linked to identified suspects and in CODIS may be a byproduct of police investigator or prosecutor decisions to seek DNA testing of rape kit or the suspect. In some cases, such as when suspects confess, DNA testing, which costs time and resources, may no longer be considered essential.

Timing of Evidence in Adult Cases

- Two-thirds of victims had forensic medical examinations within 18 hours of the assault, nearly one-quarter were examined after 24 hours had passed, and 94% within 72 hours of the assault

- Arrests typically occurred within one week of the incident; 81.3% arrests occurred within 7 days. Many arrests occurred the same day or within one day.

- Nearly half of the kits arrived at the crime laboratory within 7 days of the forensic medical examination, and 85% within 30 days of the forensic medical examination.

- Reporting of crime laboratory results occurred within 120 days of arrival to the lab for 88.6% of all kits, and within 30 days for 35.4% of cases. The median was 43 days.

- Arrests typically occurred before forensic evidence reports were reported by the crime laboratory to police agencies; 91.5% of arrests occurred before crime laboratory analysis and 8.5% after crime laboratory analysis (11 cases).

- When arrests occurred before forensic evidence was available, arrests were nevertheless associated with a greater likelihood of finding biological evidence, particularly the finding of semen, probably because of third variables associated both with biological evidence and arrest

Adult Cases in which Forensic Evidence Reporting Preceded Arrest

- Only 11 cases were found in which the laboratory analysis results were reported to police prior to the arrest. These eleven cases were examined more closely to explore the association between biological evidence and arrest when biological evidence came first or contemporaneously with arrest. These 11 cases represent 2.1% of the final sample (N=528) and 8.5% of arrests (n=130).

- The relationship between the victim and suspect varied in these 11 cases and only 4 involved strangers.

- Nine of these cases had specimens that tested positive for semen.

- Eight cases had a DNA profile generated. The rate of DNA profile generation in these cases (80.0%) was significantly higher than for other arrests (39.3%) and non-arrests (41.6%).

- When there was a DNA profile, the odds of an arrest following crime laboratory analysis versus no arrest were 8.14 greater than without a DNA profile.

- Five of these cases had a DNA profile that matched an identified suspect in the case, which yielded a significantly higher rate (55.6%) than in other arrest cases (19.6%) and in non-arrest cases (7.5%).

- When there was a DNA match to an identified suspect, the odds of an arrest following crime laboratory analysis versus no arrest were 15.5 times greater than without a DNA match to the suspect.

- In three of these cases the DNA profile matched another case in CODIS. This was a significantly higher rate (30%) than in other arrest cases (2%) and non-arrests (3%)

- When there was a DNA match to another case in CODIS, the odds of an arrest following crime laboratory analysis versus no arrest were 14.97 times greater than without a DNA match to another case in CODIS.

- In 8 of these 11 cases, the arrest took place 2 months or more after the assault and in 5 of these cases, the arrest took place more than five months after the assault. CODIS hits were significantly more frequent in these 5 cases than in earlier arrests, and there was a trend toward DNA matches to the suspect being more frequent as well.

Unfounding and Arrest in Adult Cases

- According to the Federal Bureau of Investigations' Uniform Crime Reporting guidelines, police agencies may unfound cases if the evidence indicates that the report is baseless or false. A baseless report is one in which there is not enough evidence to support the conclusion that the incident meets the legal definition of a crime. A false report is one in which police officers do not find enough evidence to support the conclusion that a crime occurred (NSVRC, 2012). Cases that are unfounded are generally not further investigated and will not result in arrest. It is important to note that this study did not examine whether the unfounded classification was appropriate, nor does the unfounded classification necessarily indicate a crime did not occur. Rather, it reflects police investigators' determinations that the case either did not meet the legal definition of a crime (baseless report) or that evidence did not exist to support a crime occurred or evidence exists that suggests no crime occurred (false report).

- About one third of cases reported to police were unfounded by police investigators. In 7.2%, data were missing or the case was never reported to the police by the victim. Thus, only 315 cases (59.7%) of the original 528 cases were determined as "legitimate" crimes by police investigators; that is, the case was not unfounded.

- Of these 315 incidents, 130 cases (41.2% of all founded incidents) resulted in arrest. The percentage increases slightly when summons are included; 147 cases (46.7% of all founded incidents) resulted in arrest or summons.

- The odds of a case being unfounded by police investigators decreased by 37.4% if physical force had been documented during the forensic medical examination, while penetration was associated with a 37.4% decrease in unfounding. Examination more than 24 hours after the assault was associated with unfounded at a trend level.

- The odds of arrest when the suspect was an intimate partner were nearly four times the odds when suspects were strangers, and double when the suspect was an acquaintance.

- The odds of arrest doubled when the victim had genital injuries documented during the forensic medical examination.

- The odds of arrest decreased by 62.2% if the forensic medical examination occurred after 24 hours of the incident.

Analysis of Child Cases

- A little over half of the 36 child cases (55.6%) involved children 5 years of age or younger and 30.6% involved male victims.

- Thirty-eight percent of child victims had forensic medical examinations the same day as the assault, but nearly one-quarter were examined after 48 hours had passed.

- Twenty-eight percent of child victims had at least one non-genital injury documented during the forensic medical examination. Nineteen percent had at least one genital injury documented. These rates were significantly less than in adult cases (genital injury difference a statistical trend).
- No child cases were reported as unfounded by police investigators and 44.4% resulted in arrest. Child cases were significantly less likely than adult cases to be unfounded, but there was no difference in arrest rates for child and adult founded cases.
- Arrests in child cases occurred relatively soon after the assault and typically before laboratory results were available; 36% occurred the same day as the assault, 64% within 7 days of the assault and 86% within 30 days of the assault.
- Biological evidence was found in 55.6% of child cases. The most common biological evidence found was other biological materials (30.6%), followed by saliva (22.2%), blood (16.7%), and semen (13.9%).
- Six child cases had a DNA profile generated. These six cases represented 30% of the cases in which biological evidence was found, but only 16.7% of all child cases. Half of those child cases in which a DNA profile was generated had a DNA match to the identified suspect in the case. There were no matches of a DNA profile to another case or convicted offender in CODIS.
- Child and adult cases did not differ significantly on DNA profile generation.
- There was no relationship between biological evidence and arrest in child cases.

Interpretation of Major Findings

Differences between Types of Examiners

SANEs' greater likelihood of finding genital injuries and of doing perianal and genital swabs are likely an effect of their greater training and experience with genital examinations. The lack of difference between SANEs and non-SANEs on biological evidence may simply reflect the fact that both SANE and non-SANE had high rates of swabbing and other evidence collection.

Determining the impact of SANE on criminal justice outcomes in Massachusetts is challenging because analysis of this impact is confounded with differences in communities and populations between the 27 hospitals served by the Massachusetts SANE Program and other hospitals. Note that SANEs were more likely to identify genital injuries, which may assist police officers in documenting evidence needed to meet probable cause standards. It is also important to recognize that SANE involvement in the case could directly impact other decisions beyond those investigated here.

Documented Injury

The percentages of victims with genital injuries and with non-genital injuries were close to the averages reported in prior research. One should not conclude that the results are "typical," because rates across studies are so variable that it is unreasonable to conclude that there is a representative mean. It is consistent with previous research and not surprising that multiple assailants were associated with non-genital injury (at a trend level) and that offender use of force was associated with both genital and non-genital injury. Injuries may have been more likely when speculums were used because of the tendency to use them in cases in which there is penetration and complaints of discomfort, and therefore plausibly a greater likelihood of injury. In addition, the speculum allows for improved visualization of genital structures and may thereby increase the likelihood of finding any injuries that have occurred.

Biological Evidence

The finding of biological evidence in 65.3% of the full sample or 84.6% of those with laboratory analysis was higher than the average rate in the literature of 30%, but studies have been few and results quite variable. The fact that our study only included cases with forensic medical examinations which were reported to police (with a few exceptions) may have increased the chances of finding biological evidence. Our DNA match rate was much lower than that reported in the few studies examining DNA evidence, but here again differences in sampling may explain this discrepancy. It is possible, for example, that in other studies, comparison biological samples from suspects were more likely to be available. The finding that several swabbing variables (external genital, vaginal, perianal and additional swabbing) were related to semen being found is likely to be an indication that taking extra steps to base evidence collection on patient history has an important impact on the yield in biological evidence. This needs to be confirmed by more controlled research. Consistent with prior findings, delays in forensic medical examinations resulted in decreased odds of finding semen, as biological evidence degrades over time.

Unfounding and Arrest Decisions

It is important to note that our sample is not representative of all sexual assault cases reported to police, and the unfounded rate may over- or underestimate the actual statewide unfounding rate for sexual assault. Our study only included cases with forensic medical examinations, and may include a higher number of events that, upon police investigation, are considered baseless. There may be cases, for example, in which individuals are uncertain whether they were assaulted during a drug or alcohol-altered state, and they seek a forensic medical examination to assess the possibility of sexual assault. Note also that any comparison of unfounded rates across communities would need to take into account differences in the characteristics of cases reported between communities. It is important to note that this study did not examine whether the unfounded classification was appropriate, nor does the unfounded classification necessarily indicate a crime did not occur. Rather, it reflects police investigators' determinations that the case either did not meet the legal definition of a crime (baseless report) or that evidence did not exist to support a crime occurred or evidence exists that suggests no crime occurred (false report).

Unfounding was more likely in cases in which no penetration and no physical force were reported, which is consistent with results from prior surveys of law enforcement personnel. The unfounded rate may also be associated with the legal criteria of rape and sexual assault in Massachusetts, which include language defining rape in terms of penetration and indecent assault and battery in terms of physical contact. We also found that cases were more likely to be unfounded when forensic medical examinations occurred more than 24 hours after the incident occurred. Delays may be perceived by law enforcement officers as reducing the likelihood of obtaining evidence to corroborate and support victim claims, which officers may believe is needed to substantiate victim statements and secure criminal charges. Delays in reporting may also be viewed by police investigators as indicative of victims who may have ulterior motives for filing police reports, such as covering for illicit sexual affairs, regret, or revenge.

Loss of consciousness was also associated with unfounded cases. There are two plausible reasons for this relationship. Victims who lose consciousness because of intoxication, and fear they may have been sexually assaulted, may seek medical attention and report the events to police. Forensic medical examinations in these cases may in turn reveal no evidence of assault (Kelly, 2010). In such cases, the report may be classified as baseless if investigators find no additional evidence indicating an assault occurred. Police may also associate victim intoxication and drug use with false reports. The finding that police were more likely to make arrests in cases involving known offenders has been found in several previous studies, and follows from the frequent difficulty of identifying assailants who are strangers. Consistent with past research, the effect of injuries and timely reporting on arrests may be due to police perceptions of both increased possibility of evidence and increased legitimacy.

Biological Evidence is Not a Factor in Most Arrests

The finding that the vast majority of arrests took place before crime laboratory analysis is consistent with Johnson et al.'s (2012) study of Los Angeles and several jurisdictions in Indiana. The percentage of cases in which crime laboratory analysis was conducted prior to arrests was somewhat higher in this study (8.5%) than in Johnson et al. (1.6%), because Johnson et al. included in their calculation cases without forensic medical examinations, which were not included in our sample. Although research in additional jurisdictions is needed, the fact that the number of cases in which forensic evidence could play a role in the arrest decision is so low across disparate jurisdictions in the two studies suggests that this may be a general phenomenon.

The timing of crime laboratory reports in relation to the timing of arrest makes it clear that biological evidence is not influencing decisions in the vast majority of arrests, though it appears that it may be quite influential in the small minority of cases in which crime laboratory analysis either precedes or is contemporaneous with arrest. This is likely a by-product of how quickly arrests were occurring after the assault and not reflective of delays in laboratory analysis and reporting. There has been widespread concern over backlogs of unanalyzed rape kits sitting in crime laboratories (see, e.g., Rape Abuse & Incest National Network, 2009) and delays in laboratory analyses and findings and the impact this has on arrests. For our sample, this was not the case. In the vast majority of cases, forensic analyses were reported to the police within 120 days of the kit arriving at the crime laboratory (the median time was 43 days).

When arrests occurred first, arrest was nevertheless significantly correlated with finding of biological evidence. Although for the vast majority of our cases forensic evidence did not directly influence arrest decision making *per se*, the collection of the rape kit may present an opportunity for law enforcement to document additional, potentially corroborating evidence during the investigation that impacts later processing decisions.

Arrests Following Crime Laboratory Analysis

The 11 cases in which crime laboratory results were available prior to arrest were substantially more likely than other arrests and non-arrests to have a DNA profile generation, a DNA match to an identified suspect, and a DNA match to another case in CODIS. Correspondingly, these DNA outcomes were related to dramatically greater odds of arrest following crime laboratory analysis compared to the odds of no arrest. This suggests that DNA played a role in making these arrests, though we do not have data on whether it was used in the investigation and, if so, how.

The most recognized use of DNA in sexual assaults is to identify unknown suspects. Forensic evidence in non-stranger cases, however, may still be valuable because it assists police investigators in documenting sexual contact (Johnson et al., 2012), particularly in cases in which the suspect denies sexual contact. Among these 11 cases, the suspect-victim relationship varied, suggesting that DNA may have served different purposes in this sample and not just identification of suspects.

Recommendations for Future Research

While injury evidence and biological evidence may have a substantial impact on criminal justice outcomes, this impact appears to occur in relatively few cases and thus research solely using broad case databases will remain limited. Below are several suggestions for productive future research that takes into account this reality.

Better Designed Sampling. In future studies, sampling could be designed to increase the number of cases in which biological evidence has an opportunity to influence arrest decisions. Samples could be limited to cases in which no arrest was made before a crime laboratory analysis took place. Among other methods, researchers could use a case control study design, sampling cases in which arrests were made following crime laboratory analysis and a matched comparison group of cases with no arrest. Since the number of cases in which crime laboratory analysis precedes arrest is likely to be very small in any one sample, such studies should include a number of jurisdictions and sample cases over multiple years. The sample sizes need not be extremely large if effect sizes for biological evidence are big, as they were when we analyzed the relationship between DNA variables and arrest after crime laboratory analysis.

Special Methods for Low Probability, High Impact Events. Probative injury evidence and biological evidence could be considered as low probability, high impact events. Future research should use statistical and mathematical models for uncommon events that have been used successfully in other fields such as risk analysis.

Recording of Relevant Case Reasoning and Actions. Future research should code specific reasoning or actions by police and prosecutors related to biological evidence. Coders should record whether there is a need to identify the perpetrator or to corroborate the victims' account in the face of counter-claims by the assailant; whether laboratory analysis is done routinely per policy or in response to a specific police or prosecutor request; and whether and when specimens were taken from the suspect as well as from the victim; and whether biological evidence spurred investigative and prosecutorial actions such as search warrants or subpoenas.

Case Studies. Effective systems of collecting and transmitting forensic evidence may have an impact on the criminal justice system above and beyond what can be measured in individual cases. If it becomes known that hospitals, police, crime laboratories and prosecutors do a good job of collecting, communicating and using forensic evidence, this may have a general effect on defendants and their defense counsel. For example, perpetrators may be less likely to claim lack of sexual contact if they know that DNA evidence is likely to be forthcoming. Likewise they may be more likely to construct a defense claiming consensual rough sex if they know victims have received a forensic medical examination. Researchers could interview medical examiners, police, crime laboratory professionals, prosecutors, and judges to learn about standards for injury evidence and biological evidence; when these forms of evidence are collected, analyzed and used effectively; when obstacles impede their use; and the process by which this evidence has an impact.

Chapter 1

Introduction

Sexual assault is a heinous crime that as much as a quarter of women nationally experience in their lifetime (see e.g., Campbell, 2008). It harms survivors in myriad ways. In addition to the terror and risk of injury during the assault, many sexual assault victims experience considerable distress afterwards, including elevated fear, anxiety and depression (George et al., 1992; Kilpatrick et al., 1987; Wyatt, 1992; Ullman & Brecklin, 2002). Victims of sexual assaults also report experiencing anger, lowered self-esteem, feelings of guilt, loss of interest in sexual relationships, and trouble sleeping (George et al., 1992; Sorenson & Siegel, 1992). They are at risk for post-traumatic stress disorder and a range of other enduring mental health problems (Campbell & Wasco, 2005). Often they experience revictimization from skeptics, including professionals, questioning their credibility and in effect blaming them for the assault (Ullman & Filipas, 2001).

Despite its heinousness and the seriousness of its impact on victims, only small proportions of sexual assaults are prosecuted. The criminal justice system is widely described as a funnel, with fewer and fewer cases progressing at each subsequent stage of the criminal justice system (Siegel & Worrall, 2014). This funneling effect has a substantial effect on sexual assault cases: only a subset of assaults are reported to police, only a portion of those cases reported to police result in arrest, and of those arrested only a percentage are accepted for prosecuted (Alderden, 2008; Gregory & Lees, 1996). When cases are prosecuted, enormous demands are placed on victims; they must testify in court about the traumatic events of the crime and face assaults on their credibility in the courtroom (Matoesian, 1995, 1997).

Efforts to increase the effectiveness of investigation and prosecution of sexual assault are especially important in this context. Victims undergo difficult forensic medical examinations with the hope of contributing evidence that can help bring assailants to justice, yet little research has examined the contribution of this evidence to criminal justice outcomes. The fact that new protocols, new technology, and new specialized staff have developed in this area in recent decades makes the need for research even more urgent. Given the enormous emotional risks victims take to undergo forensic medical examinations and the substantial investment of resources to provide quality forensic medical examinations, the research community has a responsibility to develop a better understanding of how injury evidence and biological evidence are used and actually relate to making arrests, filing criminal charges, and prosecuting cases.

By *injury evidence* we refer both to non-genital and genital injury findings from forensic medical examinations following sexual assault; injury findings may serve as evidence in the investigation and prosecution of sexual assault. By *biological evidence,* we are referring to evidence gained from crime laboratory analysis in a sexual assault case, which can include findings of biological products (chiefly semen, blood, amylase [an enzyme of saliva], and hair) as well as DNA profiles and DNA matches to a suspect or an individual in the FBI's Combined DNA Index System (CODIS) database. Most specimens providing biological evidence come from forensic medical examinations, although they can also come from clothes, bed sheets or other objects collected at the crime scene. We are using the term *biological evidence* rather than the other commonly used terms *forensic evidence* or *physical evidence. Forensic evidence* sometimes refers in the literature solely to biological evidence, but sometimes to both biological evidence and other evidence that could be forensically analyzed, such as fingerprints; we want to make sure to distinguish between the two. *Physical evidence* includes biological evidence but can also include objects or findings at the crime scene that are beyond the scope of our research, which focuses specifically on evidence collected through forensic medical examinations.

The purpose of the research is to develop knowledge about injury evidence and biological evidence in sexual assault cases and assess their role in making arrests. We had originally intended to examine the relationship of these forms of evidence to filing criminal charges as well, but we found that a large majority of arrests in our sample, based in Massachusetts, were followed by filing of criminal charges at an arraignment hearing in District Court by the next business day; therefore this variable did not have substantial independent significance from arrest. The research has three goals. One is to provide a more detailed description of injury evidence and biological evidence in sexual assault cases, including their timing relative to arrests. A second goal is to examine the relationship of forensic evidence to arrests. A third goal is to examine injury evidence and biological evidence in certain types of cases in which it may have greater impact (with stranger suspects, child cases, and when SANE nurses conduct the forensic medical examination). Five research questions, which follow from the three research goals, guided the study:

Question 1. What is the frequency of different types of injury evidence and biological evidence in a state population of sexual assault cases?

Question 2. What case factors are associated with the presence of injury evidence and biological evidence?

Question 3. How often is biological evidence processed prior to arrest versus after an arrest?

Question 4. Are injury and biological evidence related to the likelihood that arrests are made, after controlling for other variables affecting arrest?

Question 5. Do results differ by key subgroups: stranger vs. known assailants, Sexual Assault

Nurse Examiner cases versus those of other medical providers, adult and adolescent victims vs. child victims?

Working with Massachusetts samples of 528 adult and adolescent sexual assault cases and 36 child cases from 2008 to 2010, this study combines data from three sources: a) a statewide data base of medical provider reports of forensic medical examinations conducted in sexual assault cases, b) reports from the two crime laboratories that conduct all the analyses of specimens from sexual assault cases in the state, and c) case status data solicited by this project from 142 different police agencies in the state on unfounding, arrests, and filing of criminal charges.

In the next chapter, Chapter 2, we review the literature relevant to the research questions, including research on injury evidence, biological evidence, the impact of SANE, case unfounding, arrest, and the relationship between injury and biological evidence and criminal justice actions. Also in this chapter we identify in more detail the gaps in research. Chapter 3 discusses the methods used in this research. Since every aspect of the response to sexual assault varies by jurisdiction; and jurisdictional differences can have an important impact on forensic medical examinations, evidence collection and analysis, and criminal justice actions; Chapter 4 describes the Massachusetts system of response to sexual assault. Chapter 5 discusses study results. Chapter 6 discusses the implications of the results for understanding the criminal justice response to sexual assault and the role of injury evidence and biological evidence in investigations and arrests. Chapter 7 provides a conclusion and recommendations for further research.

Chapter 2

Literature Review

Practice and research literature have developed over more than 30 years to describe best practice in conducting forensic medical examinations, to examine the criminal justice response to sexual assault, and to explore the connection of injury evidence and biological evidence to criminal justice actions. Although most work we have found has been done in the United States, a number of foreign countries are represented, mostly in the developed world. Almost all empirical studies are, like the current study, retrospective studies examining case records. In this chapter we describe forensic medical examinations, discuss the potential importance of injury and biological evidence, and present basic information about Sexual Assault Nurse Examiners--professionals specially trained to conduct forensic medical examinations in sexual assault cases. We then review studies that have examined the frequency of injury evidence and biological evidence, identified predictors of injury, looked at factors underlying unfounding and arrest, tested the impact of Sexual Assault Nurse Examiner (SANE), and assessed the relationship between injury and biological evidence and criminal justice actions.

Sexual Assault Forensic Medical Examinations

Sexual assault victims have a unique place within the criminal justice system because they are often the sole witnesses to their crimes (Martin, 2005) and their bodies are crime scenes (Campbell et al., 2012). Thus, sexual assault victims are often the primary evidentiary source. In essence, these victims carry on their bodies evidence that can be used to corroborate their allegations and identify suspects.

Much of this evidence is collected and documented when victims seek medical treatment, typically at hospital emergency departments. When victims arrive, they are presented with the opportunity to have a sexual assault forensic medical examination. Most jurisdictions have a protocol for medical personnel to assemble a sexual assault forensic evidence kit in conjunction with conducting a forensic medical examination, and these kits provide most of the forensic evidence in sexual assault cases (Peterson, et al., 2010). Completed forensic evidence kits, sometimes referred to as rape kits, include samples taken from the victim's body and/or belongings that can provide biological or other physical evidence left by the assailant, as well as documentation of the forensic medical examination and any injuries identified. National standards relating to forensic medical examinations have been developed and widely disseminated to improve the collection and preservation of forensic evidence as well as the medical care of sexual assault victims (see Office on Violence Against Women, 2013 for current protocols), although variations in examination protocols used still exist. Most protocols include the following: written consent for the forensic medical examination; detailed description of the alleged assault; victim medical history related to allergies, pregnancy status and menstrual cycle; examination for external trauma or tenderness; examination of internal genital areas for injuries; swabbing for biological materials; collection of foreign matter and trace evidence; hair combing; fingernail scrapings; victim blood samples; and collection of torn or stained clothing (Ledray, 2001). Historically it was recommended that evidence be collected within 72 hours of the assault, because biological evidence, such as the presence of sperm, dissipates with time (Ledray, 2001) or as a result of victim behavior (e.g., showering, washing of clothes), but this has been expanded to up to five days or one week following research indicating that finding of DNA evidence can occur even after these extended time periods (Office on Violence Against Women, 2013). Sexual assault victims are often told to refrain from showering, using the restroom, changing clothes or engaging in other behaviors in an effort to preserve any possible biological evidence (NCVC, 2008)

Medical providers use forensic medical evidence kits to collect various types of biological evidence. Swabs of the external body and genital areas, mouth, hair combings, and fingernail scrapings are collected for the purposes of analyzing these samples to identify any biological evidence left by assailants, such as blood, hairs, semen, or saliva. Blood samples are taken from victims to identify their blood type and DNA and, when indicated, to test for the presence of drugs or alcohol. Genital swabbing is a particularly valuable source of biological evidence and the type of swabbing protocol is associated with differences in the positive identification of sperm (Morgan, 2008). In most states, including Massachusetts, victims can have the kit done and decide independently whether to report the assault to the police. If they report, kits will typically be transported to a designated crime laboratory by police officers. If victims do not report, kits will be saved by hospitals, police agencies or crime laboratories, and are available for analysis if victims later decide to report.

Injury Evidence

Medical professionals conducting the forensic medical examination will systematically assess victims for both non-genital and genital injuries. Expert examiners will use the information obtained from the patient medical forensic history to develop hypotheses about injuries that may be present and to guide the medical assessment, interventions, and sample collection. An essential part of the examination is photographic and written documentation of genital and/or non-genital injuries that may be present. This documentation helps guide treatment. Additionally it can help police and prosecutors corroborate victim allegations and can be used to prove aggravating circumstances, a legal designation for cases involving serious victim injury. Serious victim injury may also indicate to police officers and prosecutors the seriousness of the case, which may prompt greater investment by these practitioners in holding the suspect accountable.

In Massachusetts, it is standard practice to photograph non-genital injuries, but not genital injuries (Massachusetts Sexual Assault Nurse Examiner Program, 2010). This practice does not conform to current national standards involving the forensic photography of genital injuries as those protocols recommend the use of photography to document all injuries to victims' anatomies involved in the assault (Office on Violence Against Women, 2013). In Massachusetts, SANE examiners do not photograph genital injuries because, in the Massachusetts SANE Program's judgment, using genital photographs as evidence in a court case invades victims' privacy. The program believes that the examiner's description of the injury and depiction on a body diagram are sufficient for evidentiary purposes.

Although injuries can be powerful indicators of sexual assault, there are limitations on injury as a source of evidence. Many victims of sexual assault never present with injuries (Dumont & White, 2007; Sommers et al., 2012). Injuries can occur during consensual sex (Jones, Rossman, Hartman and Alexander, 2003; McLean, Roberts, White and Paul, 2011), and so may not necessarily in themselves indicate rape. In fact, some experts have expressed concern that improved technologies for identifying subtle injuries can result in an overemphasis on injury identification, despite the reality that it is difficult to determine whether microscopic injuries were definitively caused by the assault (Sommers et al., 2012).

Biological Evidence

Biological evidence from suspects is derived by crime laboratories from specimens collected from both victims and suspects. Victim specimens most commonly come from swabs collected during the forensic medical examination, but can also be obtained from victim clothing and possessions (e.g., bed sheets). Biological evidence may help corroborate victim descriptions of the assault; help link suspects to victims (particularly in non-stranger cases). Crime laboratory analysis of specimens can reveal traces of assailants' semen, blood, saliva, hair and other biological products, which can be used to help identify suspects as well as provide evidence of sexual contact. One particular focus of forensic analysis in sexual assault victimization involving male perpetrators is to identify sperm or sperm fluids because such evidence confirms sexual contact. Such evidence may be important in cases involving children (in which a claim of consent is no defense), as well as cases in which the suspect denies sexual contact. Biological evidence from fingernail scrapings, other blood evidence left by the perpetrator, and genital swabs containing sperm or sperm fluids can be used to develop a DNA profile. Often prosecutors and/or police also seek samples from suspects to compare with specimens from the victim's forensic medical examination or, less commonly, from a crime scene investigation. Suspect comparison samples can be provided voluntarily (e.g., the suspect agrees to be swabbed), by court order, or, much more rarely, from suspects' biological products found during the investigation (e.g., saliva on a drinking glass, blood on a piece of furniture).

Analytic techniques used to extract DNA have advanced in recent years, allowing scientists to extract DNA profiles from small amounts of trace evidence (Burg et al., 2011). DNA profiles can then be entered to the Combined DNA Index System, or CODIS, for possible identification of unknown suspects or comparison to biological specimens from known suspects or offenders. CODIS is a national DNA database maintained by the Federal Bureau of Investigation. It contains two indices: the Convicted Offender Index and the Forensic Index. The Convicted Offender Index contains DNA profiles of persons convicted of violent crimes. The Forensic Index contains DNA profiles generated from crime scenes, including those DNA profiles obtained from evidence gathered during forensic medical examinations of sexual assault victims (Telsavarra & Arrigo, 2006). DNA profiles submitted to CODIS are compared to these two indexes for potential suspect identification. Although submission of a DNA profile in known suspect cases may not always be helpful in identifying the suspect in that particular case, it could detect a pattern of sexual violence (e.g., other sexual assault cases in which the suspect's DNA was present) or help clear other cases in which that particular suspect was involved but his/her identity was unknown.

Sexual Assault Nurse Examiners (SANEs)

SANE programs enhance the potential of forensic evidence collection because these programs supply specially trained nurses to provide optimal medical care and to conduct effective forensic medical examinations to maximize evidentiary value and support prosecution. The creation of SANE programs was guided by two primary missions: to improve forensic evidence collection and to improve patient care (Paterson et al., 2006). These programs were intended to bridge the gap between medical service, psychological care, and the emotional needs of victims on one hand and the investigatory needs of the criminal justice system on the other hand. Martin (2005), who refers to hospitals and their staff as reluctant partners in the criminal justice response to sexual assault, suggests that the framework surrounding what medical personnel do—that is, treat injuries and illnesses—conflicts with the legal requirements that dictate medical personnel act as forensic evidence collectors and expert witnesses in sexual assault cases. Such legal demands are traditionally the purview of law enforcement agencies. The result has often been that victims were further traumatized when seeking medical assistance. Referred to as the "second rape," victims would experience delays in emergency rooms, incomplete medical care and negative comments or reactions by medical personnel (Campbell, 2008).

The creation of SANE programs across the nation attests to the potential importance of the investigatory value of sexual assault victims and the need for specially trained nurses who can care for traumatized patients and collect forensic evidence. The number of SANE programs has increased rapidly in recent decades, with a reported 450 programs nationally as of 2005 (Campbell, Patterson & Lichty, 2005). SANE programs are organized differently, but most maintain an on-call team of practitioners who are available 24/7 to travel to emergency departments or other community-based facilities when sexual assault victims present (Ledray, 1999; Little, 2001). SANEs are reported to substantially improve care for sexual assault victims, because of SANEs' understanding of, experience with, and effective response to victims' traumatic experience (see, e.g., Littel, 2001). This improved care can result in greater willingness of victims to participate in the criminal justice system (Crandall and Helitzer, 2003). SANEs are trained to be experts at collecting information and specimens needed for detecting forensic evidence, and are conscientious and skilled at preserving and maintaining chain of custody of forensic evidence. SANEs are trained in assessing and using medical forensic histories to guide the evidentiary collection process. This allows them to determine which specimens to obtain based on that history, rather than approaching exams in a "one-size-fits-all" approach. This nuanced approach can reduce the intrusiveness and burden of the forensic medical examination for the victim. In addition, SANEs are experienced in providing examination findings, expert opinions and providing testimony to support criminal justice proceedings. In contrast, emergency department physicians are often not trained in how to effectively respond to sexual assault victims. Emergency department physicians may delay responding to victims because their cases are not seen as medical emergencies and require a substantial time commitment during the forensic medical examination (especially for inexperienced examiners) (Littel, 2001). Additionally, emergency department physicians may also not want to conduct forensic medical examinations, over concerns that they will be required to testify at court regarding the examination findings. Physicians may feel unprepared to testify and may perceive preparing for and providing testimony as taking valuable time away from their medical practice (Martin, 2005).

Frequency of Injuries and Biological Evidence

To understand better the nature of sexual assault, the results of forensic medical examinations, and potential evidence from the forensic medical examination, it is worth exploring the frequency of both non-genital injury and genital injury in sexual assault cases. We conducted a quantitative review of studies of sexual assault cases in which there was a forensic medical examination, drawing from Dumont and White's (2007) and Sommers et al. (2012) reviews and our own review of more recent literature. We analyzed non-genital injury rate across

27 studies and genital injury rate across 33 studies (see Table 2.1). The overall unweighted mean percentage of cases with non-genital injury was 58% (median = 54%), but the most striking finding from this analysis was the variability in this rate. The rate ranged from 14% to 90%, the standard deviation was 21%, the 95% confidence interval was from 50% to 66%, and there was at least one study in each interval of 10 percentage points between the minimum and maximum (e.g., 14%, 23%, 32%, 48%, 57%, 68%, 79%, 88%, and 90%). The mean and median rate for genital injuries was 39%. The variability on genital injury was again considerable. The rate ranged from 9% to 72%, the standard deviation was 19%, the 95% confidence interval was from 32% to 45%, and there was at least one study in each interval of 10 percentage points between the minimum and maximum (e.g., 9%, 16%, 24%, 35%, 45%, 54%, 64%, and 72%).

Most studies found non-genital injury in a majority of cases in the sample and genital injury in a meaningful proportion of cases, but the substantial variability across samples makes it difficult to make any confident generalizations. It is beyond the scope of the current report to explore the reasons for the considerable variability in these rates. One source of variation are specialized samples in some of the studies (e.g., post-menopausal women, adolescents, men), but there was considerable variation within more general samples as well. Possible additional explanations for differences in rates might include variations across communities in the population of individuals who get forensic medical examinations and report to police; differences in examination procedures; and variability in documentation and research methods. We did not find statistically significant differences based on whether all cases in the sample were reported to police and based on year of the study. Future research should assess more thoroughly the reasons for such variability in forensic medical examination results, ideally using meta-analytic methods.

Table 2.1 Non-Genital and Genital Injury Rates across Studies

Citation	Year	Non-Genital Injury Rate	Genital Injury Rate
Helweg-Larsen	1985	.68	
Tintinalli & Hoelzer	1985	.32	.19
Olusanya et al.	1986	.23	.16
McCauley et al.	1987		.58
Goodyear-Smith	1989	.64	.41
Penttila & Karhumen	1990	.90	.18
Rambow, Adkinson, Frost, & Peterson	1992	.50	.09
Slaughter & Brown	1992	.87	.55
Schei, Muus, & Moen	1995	.50	.14
Bowyer & Dalton	1997		.27
Slaughter et al.	1997	.58	.68
Lindsay	1998	.49	.67
Biggs et al.	1998		.46
Lenahan et al.	1998	.76	.53
McGregor, Le, Marion, & Wiebe	1999	.89	.24
DuMont & Parnis	2000	.79	.30
Adams, Girardin, & Faugno	2001		.64
McGregor, DuMont, & Myhr	2002	.88	.42
Gray-Eurom, Seaberg, & Wears	2002	.57	.35
Wiley, Sugar, Fine, & Eckert	2003	.48	.16
Jones et al.	2003	.46	.72
Palmer et al.	2004	.46	.22
Sugar, Fine, & Eckert	2004	.52	.20
Reis et al.	2004	.14	
Hilden et al.	2005		.32
Anderson, McLain & Rivi	2006		.30
Sommers et al.	2006	.51	.45
White & McLean	2006	.53	.54
Ingeman-Hansen, Brink, Sorenson & Charles	2008	.78	.19
Drocton et al.	2008		.50
Jewkes et al.	2009	.23	.22
Jones et al.	2009		.64
Maguire et al.	2009	.61	.39
Sturgiss et al.	2010	.54	.39
Janish et al.	2010	.70	.62

Twelve of these studies also report the rate of finding sperm and/or semen. The mean rate for finding sperm or semen was 30% (median=31%), but again this was quite variable. The standard deviation was 17%, the 95% confidence interval was from 20% to 41%, the rate ranged from 9% to 59%, and there was at least one study in each interval of 10 percentage points from the minimum and maximum (e.g., 9%, 17%, 22%, 31%, 46%, and 53%). Once more it is beyond the scope of this report to explore this fully, but variation across communities in the population who receive forensic medical examinations and report to police and differences in crime laboratory procedures are factors that should be explored in future research.

Reports of other types of biological evidence have been sparse. DuMont et al. (2000) found seminal and/or saliva stains in 21% of cases (DuMont & Parnis, 2000 found similar results in a sample that overlaps with DuMont et al., 2000). Tasca et al. (2013) found that forensic evidence was available in 31% in their sample of cases reported to police, but did not specify types of forensic evidence. We found only three studies that reported rates of DNA evidence, since most studies predated the use of DNA in these cases. The results vary, which further underlines the uncertainty about expected results and the need for further research. Ingemann-Hansen et al. (2008) reported a positive DNA match in 14% of cases, while Campbell et al. (2009) found positive DNA result in 47% of cases. Gingras et al. (2009) found the alleged assailant's DNA profile in 32% of kits tested in their laboratory. However, their sample combined adult, adolescent and child cases and they neither reported results separately for children and adolescents and adults nor provided the age distribution of the sample, so it is difficult to infer how much their findings apply to adolescents and adults. This is particularly problematic given that they found that child cases were significantly less likely to have DNA profiles.

Predictors of Injuries and Biological Evidence

Several studies have looked at predictors of injury in sexual assault cases. Findings from these studies help illuminate the circumstances leading to injury findings in a forensic medical examination, suggest which victims are at greatest risk for injury, and provide clues on possible explanations for the differences between research samples on injury rates. Not surprisingly, several characteristics of the assault have been identified as predictors of injuries. Time to the forensic medical examination is a factor, since healing over time makes injuries less detectable. Sugar, Fine and Eckert (2004) found non-genital injury findings were more likely when victims were hit or kicked or a weapon was used, when strangulation was attempted, when the assault took place outdoors, and when there was victim substance abuse. Sommers et al. (2006) found that weapon use and brief time between assault and examination increased the likelihood of a head injury finding. Depending on the study, genital injury findings were more likely when there was physical or verbal resistance, when there was rectal penetration, when there were non-genital injuries, and when the forensic medical examination took place within 24 hours of the assault (Sachs & Chu, 2002; Sugar, et al., 2004). Crane (2006) pooled non-genital and genital injuries, and found that an injury finding was more likely with weapon use, multiple perpetrators, less time from the assault to the examination, and having an evidence kit done.

The age and race of the victim have each been predictors of injury in two or more studies (Sommer, et al., 2006). Age is relevant because genital tissue is impacted by hormones, such as estrogen, which can alter the elasticity of the tissues, making some victims more vulnerable to injury. Race is relevant because examiners may have a more difficult time identifying injuries when victims have darker skin. Ramin et al. (1992) found that non-genital injuries were more likely to be found in victims aged 14 to 49 than in older victims. On the other hand, Ramin et al. and Muram et al. (1992) found that postmenopausal women (over 50 and over 55 respectively) were more likely to have genital injury findings than younger women. Sommer et al. (2006), however, found no age effect. Several studies have found that genital injuries were more likely to be identified in white victims than in African American victims (Cartwright, 1987; Coker, Wales & Johnson, 1998; Sommers, et al., 2006).

Though a number of the studies discussed above have reported frequency of biological evidence, mostly sperm/semen, few studies have examined what factors lead to the finding of biological evidence. The factor that has been a focus of study is time since assault. Willot and Allard (1982; also, Allard, 1997) found that the probability of finding sperm from vaginal swabs declined substantially after 24 hours. Gingras et al. (2009) found DNA in 32% of cases tested, but the probability of finding DNA evidence from vaginal swabs dropped to 8% when specimens were taken more than three days after the assault. Rates of DNA from anal and skin swabs dropped dramatically the second day after the assault. There appeared to be little relationship between presence of acid phosphatase, an indicator of seminal fluid, and DNA evidence. Obtaining what Gingras et al. call a “good quality DNA profile” (p. 139) was substantially less likely in child than in adolescent and adult cases.

SANE Impact

One potentially key factor in the quality and effectiveness of the forensic medical response to sexual assault is who conducts the forensic medical examination. Many communities have developed Sexual Assault Nurse Examiner (SANE) programs nationally to increase both the quality of care and of evidence collection. As we discuss in Chapter 4, SANE is particularly strong in Massachusetts, where there is a centrally managed program serving 27 hospitals in the state and conducting about two-thirds of forensic medical examinations of adults and adolescents in the state.

Several studies have evaluated SANEs' impact on the quality of forensic medical examinations, and a few have examined the impact of SANE programs on criminal justice actions and outcomes. However, we have not found research that looks specifically at the effect of SANEs related to improved findings of injury identification and biological evidence, and few that explore the processes by which SANE might have an impact on the criminal justice system. Campbell, Patterson, and Lichty's (2005) literature review concludes that SANE nurses are more complete than other medical providers in the collection of specimens, documentation of evidence, properly sealing and labeling evidence, and maintaining chain of custody (see also Sievers, Murphy, and Miller, 2003). But these authors did not report any studies about differences between SANE and non-SANE providers on injury evidence and biological evidence, and they note that few rigorous studies have empirically tested whether SANE forensic medical examinations have an impact on criminal justice outcomes. The few studies that have examined differences between SANE and non-SANE cases on criminal justice outcomes have generally shown results that favor SANE. Crandell and Helitzer (2003) examined the response to sexual assault and criminal justice outcomes pre- and post-introduction of SANE in Albuquerque, NM.

They found that police officers were significantly more likely to make an arrest, prosecutors were more likely to charge suspects, and convictions were more likely to be secured following the implementation of SANE. Nugent-Borakove and colleagues (Nugent-Borakove, Fanflik, et al., 2006) explored criminal justice outcomes of SANE and non-SANE cases in three communities, two of which had a combination of SANE and Sexual Abuse Response Team (SART) programs. SARTs are multidisciplinary teams of law enforcement professionals, victim advocates and health providers who support and guide victims in the criminal justice system. Nugent-Borakove and colleagues found that the SANE/SART forensic medical examination was associated with an increased likelihood of identification and arrest of suspects, charging, and conviction. Campbell et al.'s. (2008) analysis of a community pre- and post- SANE implementation reported that the SANE program was associated with increases in cases progressing through the criminal justice system. Namely, cases with SANE examiners were more likely to be referred for prosecution and result in plea bargains or trials, and improved evidence collected by SANE examiners was a significant predictor of case progression.

Criminal Justice Response to Sexual Assault

Evidence collected in the forensic medical examination may aid police investigations and can be used to prosecute defendants in these cases. A commonly understood reality, however, is that the criminal justice system's response to sexual victimization is limited. As noted, there is a high attrition rate in the criminal justice response to sexual assault cases, particularly in early processing stages. In fact, attrition in cases begins even before the criminal justice system is involved. It has been estimated that less than 40% of sexual assault cases are ever reported to the police (Rennison, 2002). Many reasons exist for why sexual victimization is never reported to police, including victim interpretations of whether their experiences constitute a sexual assault and victim confidence and trust in the criminal justice system. If reported, police officers must first determine whether a crime occurred. Officially, unfounding is a decision by police that insufficient evidence exists to determine that a crime occurred (Spohn & Tellis, 2012). According to Uniform Crime Reports (UCR) guidelines set forth by the Federal Bureau of Investigations, police agencies may unfound cases if the evidence indicates that the report is baseless or false. A baseless report is one in which there is not enough evidence to support the conclusion that the incident meets the legal definition of a crime. A false report is one in which police officers do not find enough evidence to support the conclusion that a crime occurred (NSVRC, 2012). Cases that are unfounded are generally not investigated further and will not result in arrest. It is the first point in which progression through the various stages of the criminal justice process (i.e., investigation, arrest, charging, trial, conviction, and sentencing) may be halted. Unfounded cases are not officially documented in the UCR numbers made public by the FBI. Thus, these incidents disappear from any official documentation of reported crime. Of particular concern are instances in which police investigators unfound cases because of perceptions that the allegations are false. Rigorous studies have coded reports from case files by examining the range of evidence in thoroughly investigated cases, and have found a false reporting prevalence of between 2 and 10 percent (Lisak, Gardinier, Nicksa and Cote, 2010). However, some jurisdictions have documented unfounded rates that are significantly higher than the national averages; at least one jurisdiction had unfounded rates that were five times higher than the national average (Police Executive Research Form, 2010).

Those cases that are not unfounded are investigated further and may result in arrest. Here again, researchers have noted significant attrition in the number of cases moving past the arrest stage. Examination of the ratio between the yearly national forcible rape reporting rates and arrest rates indicate that there has been an overall decline in the percentage of reported rapes that have resulted in arrest since the 1970s. In comparison, a similar decline was not noted in the ratio of reported violent crimes and arrest; that ratio has remained relatively similar over the years (Lonsway & Archambault, 2012). High unfounded rates and declining arrests indicate that challenges continue to exist in the handling of sexual assault cases, making the examination of the predictors of unfounding and arrest important.

Predictors of Cases being Unfounded

Although unfounding is supposed to occur only when the investigation indicates no crime because it is determined to be false or baseless, several studies suggest that police, in part influenced by an eye on their department's clearance rate, may unfound cases that are difficult to investigate, have ambiguous evidence, or have allegations that are difficult to prove (Spohn & Tellis, 2012). Martin (2005) suggests that blame of or bias against the victim may affect unfounding decisions as well. Police unfounding may be a key step contributing to attrition and the funnel effect.

Empirical research on unfounding in sexual assault cases is sparse. In a 36 year old study (Law Enforcement Assistance Administration, 1977, cited by Spohn & Tellis, 2012), police who were surveyed reported that the two factors that predicted whether a sexual assault case was founded or unfounded were proof of penetration and suspect use of physical force, indicators of what has been seen by many as "legitimate" or "real" rape (Estrich, 1987). Many critics like

Estrich have argued victims can experience rape and harm even without elements of real rape, but so-called “rape myths” persist nevertheless. Kerstetter’s (1990) analysis of case data found that the victim’s willingness to prosecute, physical resistance to the attack, suspect use of a weapon and suspect being in custody were the most important predictors of founding in stranger cases. In cases with known assailants, significant predictors again included suspects being in custody; but also injury and the absence of factors affecting victim credibility such as substance use, mental illness or history of false complaints. Alderden and Ullman (2012) tested multiple predictors of unfounding, referral to prosecutors and filing criminal charges. Cases were more likely to be unfounded when there were discrepancies in victims’ statements and more likely to be referred to prosecutors when victims were willing to pursue the case. More recently, Spohn, White and Tellis (2014) found that while victim recanting was by far the most significant predictor of unfounding, other variables associated with unfounding included questions about the victim’s character or reputation, victim’s mental health, victim injury, whether the victim reported being assaulted by a stranger versus intimate partner, and availability of physical evidence. Frazier and Haney (1996) did not study unfounding *per se*, but examined predictors of whether police questioned or did not question suspects, one indication of police finding the allegation credible. Strangers were more likely to be questioned than alleged assailants known to the victim, and questioning was more likely with evidence of penetration and victim injury and with witnesses to the crime.

Predictors of Arrest and Criminal Charges

There is a paucity of research on police and prosecutor actions in sexual assault cases, but a few studies have identified predictors of arrest and filing criminal charges (Spohn & Trellis, 2012). Not surprisingly, the victim's knowledge of the suspect is important. Bouffard (2000) and LaFree (1981) found arrest was more likely when victims' knew and could identify the perpetrator and Bouffard when the suspect and victim had a prior relationship. The nature of the assault and the circumstances surrounding it has an impact. Arrest was more likely when suspects had a weapon (Bouffard, 2000; LaFree, 1981); when the suspect committed other crimes along with the sexual assault, and when the assault took place outdoors (Bouffard, 2000). The victims' behavior also plays a role. Arrest was more likely when victims' were willing to prosecute, demonstrated no misconduct at the time of incident, and reported promptly (LaFree, 1981); when victims underwent a forensic medical examination (Bouffard, 2000); and when victims resisted the assault and were cooperative with police (Alderden & Ullman, 2012). Paradoxically, Alderden and Ullman (2012) also found that arrest was more likely when victims had discrepancies in their statement; the authors think this was the effect of the added questioning police engage in when an arrest is made. Bachman (1998) did not find significant predictors of arrest, but the limited statistical power of her sample of 88 cases suggests that her analysis did not provide an adequate test. DuMont and Myhr's (2000) Canadian study looked at evidentiary and victim behavior predictors of police filing criminal charges in a population of women (age 15 and older) served at a sexual assault care center. Filing charges was more likely with younger victims, when the victim knew the assailant, when victims resisted, and when there were witnesses. Horney and Spohn (1996) tested predictors of police referral of sexual assault cases to prosecutors. Physical evidence of assault and suspect prior conviction were significant predictors; the only victim characteristics that significantly related to referral to prosecutors was delay in reporting (a negative effect), though victim age, morals questioned, risk-taking and resisting the attack were tested.

Injury Evidence and Criminal Justice Actions

Numerous studies in a number of different countries have examined the relationship between injury evidence and criminal justice outcomes over a span of 34 years. The results overall are decidedly mixed. Some studies find that this relationship is statistically significant, while most do not. What further complicates drawing a conclusion from this literature is the fact that studies vary considerably in methodology, and the vast majority if not all studies suffer from noticeable limitations.

DuMont and White (2007) were commissioned by the World Health Organization to review the literature on the use and effects of medico-legal evidence in sexual assault cases. In addition to surveying the literature on the nature of medico-legal services and the sociocultural conditions surrounding the use of medico-legal evidence, these authors reviewed 48 different studies of the relationship of physical and biological evidence to criminal justice outcomes. All studies were retrospective and involved data abstraction from case records. Across this literature, 13 studies were conducted specifically to assess the relationship of medico-legal evidence to legal outcomes; 31 studies produced results for evidence variables in the context of analysis of multiple predictors of legal outcomes, including evidence variables; and 5 studies, which were not very rigorous, had a single yes-no variable measuring availability of medico-legal evidence.

DuMont and White (2007) examined outcomes for physical injury, genital injury and biological evidence, which involved different subgroups of studies because of differences in measurement. The legal outcomes examined varied across studies, and included arrests, filing of criminal charges, dismissing charges, going to trial, conviction, conviction at trial, and imprisonment (several studies examined more than one of these outcomes). Although the most frequent country involved was the United States, studies were also conducted in Australia, Brazil, Canada, Denmark, Finland, Norway, South Africa, and the United Kingdom. Out of 39 studies examining physical injury, 17 (43.6%) found that one or more of these outcomes was significantly more likely when there was evidence of physical injury. Four of 14 studies (28.6%) found a significant relationship of genital injury to the likelihood of legal outcomes. Kingsnorth, MacIntosh, and Wentworth (1999) also found a relationship between victim injuries and decisions to prosecute, however, when separate logistic regression models were run for strangers and non-stranger cases the authors noted that injury was only a significant predictor of decision to prosecute in non-stranger cases. This suggests that presence of injury may be weighed more heavily by prosecutors in "he said, she said" cases because prosecutors perceive it will be more difficult to prove lack of consent (e.g., acquaintance rape, intimate partner rape, date rape) in these cases. Spohn and Holleran (2001) similarly found that victim injuries were associated with decisions to charge in intimate partner cases, but not acquaintance and stranger cases.

Several studies not covered by the DuMont and White (2007) and Sommers et al. (2012) reviews have also examined the relationship of injury to criminal justice outcomes. Ingemann-Hansen and colleagues (Ingemann-Hansen, Brink, Sabroe, Sorenson & Charles, 2008) found no relationship of bodily injury or genital injury to conviction in a sample of Danish cases reported to police from 1999 to 2004. However, ambiguities in the methodology and the amount of missing data make interpretation of this study difficult. In Jewkes et al.'s (2009) South African sample of 1,547 cases, injury was not related to a trial commencing, but both genital and non-genital injury predicted the accused being found guilty. Alderden and Ullman (2012) reported that the odds of criminal charges increased nearly nine fold when victim injuries were noted in police records.

Biological Evidence and Criminal Justice Outcomes

A number of studies have also examined the relationship of biological evidence and criminal justice outcomes over more than three decades. Early studies found no significant relationship of biological evidence to legal outcomes. Some more recent studies have found significant effects, but these findings should not necessarily be interpreted as a causal effect of biological evidence, as we discuss below.

DuMont and White (2007) cite 12 empirical studies that examined the association between finding sperm and/or semen and legal outcomes—none of these found a statistically significant relationship. Two of these studies also tested the association between finding saliva and legal outcomes, and found no significant effects. One Australian study they cite, Briody (2002), found one significant effect for DNA evidence: in a subsample of cases that went to trial, a jury decision to convict was more likely when there was DNA evidence. However, in the larger sample, DNA evidence was not significantly associated with cases reaching court (when seriousness of offense was statistically controlled), nor with defendants pleading guilty.

In other studies in DuMont and White (2007) review, biological evidence is included in composite evidence variables, making it difficult to assess its unique effect. The review cites a series of publications by Spohn and colleagues that examined how legal outcomes were related to a composite physical evidence variable, among other factors (this series also includes Beichner and Spohn's 2012 study, which post-dates the DuMont and White review). These publications present results from multiple analyses of cases from five different samples; Detroit 1970-1984, Detroit 1989, Kansas City 1996-1998, Philadelphia, 1996-1998, Miami 1997; different publications used different ones of these samples or combinations of these samples. The composite variable was based on the finding of one or more of several different forms of physical evidence, which included semen and hair, but also included other forms of physical evidence such as fingerprints, blood stains, clothing, bedding, and skin. Physical evidence was significantly related to criminal justice outcomes in some studies (Beichner & Spohn, 2012; Spohn & Holleran, 2001), but not in others (Spears & Spohn, 1996; 1997; Spohn & Horney, 1993, 1996; Spohn & Spears, 1996). Beichner and Spohn (2005; see also Spohn, Beichner & Davis-Frenzel, 2001) found significant effects of physical evidence on filing charges in Kansas City but not Miami. In Horney and Spohn (1996; see also Spears & Spohn, 1996), the effect depended on the specific criminal justice outcome: physical evidence was significantly related to referring a case to the prosecutor and depth of case processing (an ordinal measure of the degree to which the criminal justice system took action, from closed by police at one end to guilty plea or verdict at the other end). But physical evidence in Horney and Spohn (1996) was not significantly related to identifying suspects, filing criminal charges, fully prosecuting a case, and obtaining a conviction. Lievore's (2004, 2005) study also used a composite *additional evidence* variable that included DNA but also fingerprints, eyewitness accounts, objects found at the defendant's home or crime scene, video footage of the defendant with the victim, statements made by the defendant to other people, and telephone records by the defendant to other people. Additional evidence did not predict progression of the case.

Ingemann-Hansen and colleagues' (2008) Danish study examined the relationship between injury and biological evidence on one hand and convictions on the other hand in subsamples of cases with female victims in which criminal charges had been filed. Neither sperm seen in a microscope, nor sperm detected by the laboratory, nor positive DNA match was significantly related to conviction. However, ambiguities in the methodology, the amount of missing data (which affects the statistical power of significance tests), and the inclusion of non-laboratory tested cases in the analysis of DNA effect all make interpretation of this study difficult.

Campbell and colleagues (Campbell, Patterson, Bybee & Dworkin, 2009) examined the relationship of biological evidence and multiple other relevant variables to criminal justice outcomes in a sample of 137 cases served by a Sexual Assault Nurse Examiner (SANE) program in a Midwest county from 1999 to 2005. The sample was selected to include only cases that were investigated by the police, had completed SANE forensic medical examinations, and had crime laboratory analyses of DNA. Campbell et al. computed ordinal regression models to explain criminal justice outcome. A dependent variable was constructed using the following ordinally arrayed categories representing ever greater progress through the criminal justice system: 1) not referred by the police for prosecution; 2) referred to the prosecutor but not warranted for prosecution; 3) warranted by the prosecutor but later dropped or acquitted; and 4) guilty plea or conviction. The researchers coded whether there were positive DNA results as well as a range of different injury variables. In the regression model, presence of DNA was significantly related to greater progress in the criminal justice system. In Jewkes et al.'s (2009) South African sample, DNA was not significantly related to a guilty determination; Jewkes attributes the lack of effect to the nascent state of using DNA in the country.

Peterson and colleagues (Peterson, Sommers, Baskin & Johnson, 2010; see also Peterson, Hickman, Strom, & Johnson, 2013) cataloged biological evidence across a range of crimes and examined its use in the criminal justice system. Part of their work focused on sexual assault (see Johnson, Peterson, Sommers & Baskin, 2012). Johnson et al. tracked a random sample of 602 sexual assault cases reported in 2003 across five jurisdictions (Los Angeles and four cities in Indiana: Indianapolis, Evansville, Fort Wayne and South Bend). Note that Sommers and Baskin (2011) also published results on sexual assault from these data, but they did so independently of the principal investigator and using an incomplete sample, and the validity of their analysis has been criticized by the principal investigator and other investigators on the project (Peterson, Hickman, Strom & Johnson, 2013). In Peterson et al.'s (2010) analysis, victims received medical care in 68.3% of cases and a forensic evidence kit was collected in 51.3% of cases. Biological evidence was collected in 322 cases (53.8% of the sample). Evidence kits were completed in 96% of these cases. In some cases, biological evidence was found apart from the kit in items found at the location of the crime (e.g., on a towel). However, only 194 kits (32.2% of the sample) were submitted to crime laboratories and only 89 kits (14.8% of the sample) were examined by the laboratories. Crime laboratories identified semen, blood or saliva in 42 cases, which was 47.2% of cases examined but only 7.0% of the sample. Nine cases had DNA profiles that were entered in the FBI's Combined DNA Index System (CODIS), which led to the identification of the suspect in four cases (4% of examined cases and 0.7% of the entire sample).

Incidents were reported to police after 7.6 days on average, and the mean time from incident to arrest was 53.1 days. In a logistic regression analysis examining the relationship of multiple variables to arrest in sexual assault cases, the odds of arrest were 2.51 times greater when there was crime scene evidence (which included kit evidence in 80.5% of cases) and 1.63 times greater when there was lab-examined evidence. However, the arrest preceded the examination of physical evidence in 98.4% of the cases in which there was both crime scene evidence and an arrest. Because of this chronology, Johnson et al.'s (2012) results should not be interpreted as a causal effect of biological evidence on arrest. Johnson et al. suggest that the relationship between crime scene evidence and arrest may be a function of the victim's willingness to undergo an examination, which may make it more likely that police will pursue an investigation and in turn make an arrest. Alderden (2008) and Bouffard (2000) had a similar finding and interpretation in their empirical studies. In other multivariable logistic regression analyses conducted by Peterson et al., crime scene evidence was not significantly related to referral to prosecutors, filing criminal charges or obtaining convictions, although case attrition limited the number of cases sent to prosecutors, which may have negatively affected statistical power.

Nesvold, Ormstad and Friis (2011) studied police requests for evidence from forensic medical examinations conducted at a Norwegian sexual assault center. Police requested the medical examiner's report in 84% of cases, but requested crime laboratory analysis in only 51% of cases in which specimens were available. In 27 of the requested cases, the alleged assailant denied sexual contact, but their claim was contradicted by the evidence from the examination in 9 of those cases (33%); yet there were 15 cases in which the alleged assailant denied sexual contact but information was not requested by the police. Both requesting a report and an analysis were more likely when rape was alleged (versus a lesser sexual offense) and when the case occurred in January through September (before yearly funds allocated for forensic services had been depleted). Requesting a report was also less likely when the victim had an addiction problem. Requesting a crime laboratory analysis was also more likely when the alleged assault took place somewhere (e.g., outdoors, in a car) other than the victim or assailant's domicile, and when victims were between 16 and 19 (versus older). The major theme in the authors' interpretation of the results was lost opportunity: they noted that suspect denial of sexual contact was not always compared to medical evidence; allegations were sometimes not designated as rape but were still serious and deserving of police follow-up; some victims who had a substance problem or were older than 19 were unjustly seen as undeserving or not credible; and many cases were not followed up because of a shortage of funding.

Tasca and colleagues (Tasca, Rodriguez, Spohn & Koss, 2013) examined predictors of suspect identification and arrest in sexual assault cases reported to police. Biological evidence was a significant predictor of both outcomes. However, Tasca et al.'s sample included both victims who had received a forensic medical examination and those who did not, and did not include occurrence of a forensic medical examination as a predictor in the analyses of suspect identification and arrests. As noted, victims choosing to undergo a forensic medical examination can be an influential factor in its own right (Alderden, 2008; Bouffard, 2000). Thus, in Tasca et al.'s study, the presence of biological evidence was confounded with the decision to have a forensic medical examination, and the significant effects of biological evidence could potentially be explained by the latter variable. Increasing the likelihood of this is the strong possibility that arrest preceded biological evidence in most cases in which they co-occurred, as Peterson et al. (2010) found. Tasca et al. recognize the possibility that the statistical effects for biological evidence might not represent a straightforward causal effect on criminal justice outcomes.

Regarding suspect identification, they wrote "Availability of forensic evidence was the second strongest predictor of suspect identification, yet narratives [qualitative data culled from cases records] revealed that officers responded most strongly to the promise of what DNA could reveal and not on actual findings that allowed them to identify or confirm the identity of a suspect. Potentially, officers assumed that if they found the suspect, the future analysis of the DNA evidence would strengthen the case." (p. 1170). Likewise, stating that forensic analysis took too much time to impact most arrests, Tasca et al. interpreted the relationship of biological evidence and arrest as a reflection of officers' knowledge that, with specimens taken at a forensic medical examination, biological evidence may be forthcoming if they arrested a suspect.

Limitations of Previous Research.

The existing research reviewed here has several limitations. As DuMont and White (2007) point out, almost all studies have involved retrospective reviews of police, prosecutor and/or medical records. Data collection for these records has not been conducted for research purposes and is subject to limitations in the availability, completeness and validity of data that are common in such records. Because standardized methods for defining and measuring injury evidence, biological evidence and criminal justice actions do not exist across American jurisdictions, much less across countries, it is likely that one explanation for the considerable variability in results across samples is differences in measurement.

Sample size is another limitation (see DuMont and White, 2007). A number of studies begin with a limited sample size, particularly limited for the multi-variable logistic regression analyses that many authors undertake to assess multiple predictors of criminal justice outcomes.

Even when studies begin with large sample sizes, there is considerable attrition in the number of cases available for analyses of criminal justice outcomes because of the now familiar “funnel” effect: large proportions of cases that come to the attention to professionals fall away at each progressive step in the criminal justice system. Many victims do not report to police; many cases reported to police are not founded, result in arrest or referred to prosecutors, and many cases referred to prosecutors are not criminally charged or are dismissed. Many studies therefore lack statistical power for assessing the effects of injury and biological evidence on criminal justice outcomes, particularly in reference to outcomes that occur later in the process such as conviction, conviction at trial and sentencing.

Studies are often limited in what variables are accessible for analysis. Both practice knowledge and research suggest that criminal justice actions in sexual assault cases may be related both to legal factors (e.g., the nature of the assault and the availability of different forms of evidence) and extra-legal factors (e.g., the characteristics and behaviors of victims, police and prosecutors), and that these factors may have a bearing at several different points in the criminal justice process. Yet few studies include a comprehensive range of variables measuring both legal and extra-legal factors and study a range of criminal justice outcomes. A number of studies analyze the relationship between evidence and conviction, but do not include the criminal justice actions that must precede conviction: arrests, filing criminal charges, and plea decisions. This presents some ambiguity for interpreting significant predictors of conviction in these studies, because one does not know when in the process these significant effects really take place and therefore our understanding of what causes the relationship of these variables to conviction is limited.

Peterson et al.'s research and, more indirectly, Tasca et al.'s (2013) research, suggest another previously unrecognized major limitation. Most studies examining the relationship of injury and biological evidence with criminal justice outcomes do not capture the date at which evidence became available and the date of criminal justice events. But, as Peterson et al. and Tasca et al. have found, criminal justice events like unfounding and arrest often precede the availability of biological evidence. It seems reasonable to suppose additionally that their relationship in time to injury evidence may be uncertain, as arrests may take place before or after forensic medical examinations. Any criminal justice action short of conviction could precede the production of biological evidence. Because of crime laboratories' workload and the amount of time analysis takes, many criminal justice actions and events short of conviction could easily take place before crime laboratory analysis can be completed, including not only the police actions such as founding and arrest but prosecutorial actions such as filing criminal charges, dismissing cases and obtaining guilty pleas.

Because of the timing issue, the causal relationship underlying association between biological evidence and criminal justice actions is usually unclear. If there is a statistically significant association between biological evidence and any criminal justice action or event, it could be because biological evidence helps enable the criminal justice action or event. But the causal direction could also be reversed—a given criminal justice action could lead police or prosecutors to ask for a forensic analysis that might not otherwise take place. For example, prosecutors could request a forensic analysis once they decide to file criminal charges with the aim of obtaining additional evidence that they could use in plea negotiations or at trial. In that case, there might be a statistically significant association between biological evidence and filing criminal charges simply because kits in cases with criminal charges were more likely to be tested.

Also, third variables could lead both to an increased likelihood of biological evidence and an increased likelihood of criminal justice actions, creating an association between the two variables that is not causal. If victims report events involving physical contact and potential exchange of body products, such as penetration, ejaculation, oral contact, scratching, biting and so forth; this might increase both the likelihood that police would make an arrest and prosecutors would file charges, and the likelihood that crime laboratories would find biological evidence and retrieve DNA. When these events do not occur, both arrests and biological evidence would be less likely. If victims identify and produce objects involved in the sexual assault such as bed sheets and clothes, the additional concrete information these offer may make arrest more likely and also provide a source of biological evidence when taken by police and analyzed by crime laboratories.

Conclusion

Researchers have conducted only a relatively small number of studies on injury and biological evidence, on the impact of SANE, and on the investigation and prosecution of sexual assault. Much remains to be learned. Almost all studies are retrospective case record reviews, subject to the limitations of that methodology, and there has been little or no standardization of measurement methods.

Although a number of studies report rates of both non-genital and genital injury from sexual assault, these rates are so variable across studies that probably the only safe conclusion one can draw is that programs providing forensic medical examinations to sexual assault victims differ substantially on this variable. This could be a function of the different populations they serve, different examiners and examination methods they use, and different ways of measuring and counting injuries. Not surprisingly, the probability of an injury is related to the assailant's level of physical aggression, but some evidence also suggests the probability of finding injury depends on age and race. The race effects are troubling, because there is no reason to expect that people of color are less likely to suffer injury when sexually assaulted. It is more likely that medical professionals are less likely to detect certain kinds of injuries in people of color.

Research on biological evidence is also sparse, particularly on DNA, though one study has shown that rates of DNA are lower in children and with more time elapsed since the assault. Although research on the impact of SANEs is limited, some studies suggest SANEs improve the quality of examinations and facilitate criminal justice actions and outcomes, but we have not found research that looks specifically at the effect of SANEs on identification of injury evidence and collection of biological evidence. Empirical research on unfounding in sexual assault cases is very sparse. Studies have found that penetration, physical force, suspect use of a weapon, and victim resistance—indicators of what skeptics have term "legitimate rape" —predict founding versus unfounding. Arrest and filing criminal charges are also more likely with the presence of "legitimate rape" factors as well as when victims know assailants; some but not all studies have found that factor related to victims' credibility also play a role. The victim's willingness to prosecute is a factor in founding, arrest and criminal charging. Some studies but not all have found that presence of injury predicts criminal justice actions, but finding sperm has not been found to be significantly related to criminal justice outcomes. The effect of DNA evidence is mostly unstudied, but one Australian study found that it was significantly related to conviction by jury but not to prior steps in the criminal justice process, and one American study found that it was related to greater progress in the criminal justice system.

One important recent observation in a multi-jurisdiction study was that arrests precede crime laboratory analysis in the vast majority of cases in which arrests were made. This raises questions about the extent to which biological evidence causes criminal justice actions, or criminal justice actions cause biological evidence (by influencing which cases get tested), or third variables explain both. Peterson and Johnson's research (Johnson et al., 2012; Peterson et al., 2010) highlights the importance of measuring timing in future studies and of thinking carefully about causal effect.

The current study contributes to the research literature in several of the domains discussed in this chapter. It thoroughly measures timing of assaults, examinations, case unfounding, and arrest. It adds to the knowledge on frequency of injury and biological evidence, including DNA. Along with testing factors overall that predict which cases were unfounded and which resulted in arrest, it examines how both injury and biological evidence are related to these criminal justice actions. Unlike previous studies, however, it analyses the relationship separately for cases in which crime laboratory analysis follows arrest, and therefore logically cannot have a causal effect on it, and cases in which arrest follows crime laboratory analysis, which may therefore have a causal effect on arrest.

Chapter 3

Methods

This study merged data from three sources: a) an existing Massachusetts database of reports by medical providers who conducted forensic medical examinations following sexual assault; b) forensic evidence data abstracted for the study from the two crime laboratories serving the Commonwealth; and c) data on unfounding, arrests and criminal charges provided for the study by 142 different police agencies (including municipal, campus and state law enforcement) across the state. Below we describe these data sources and the methods used to sample, collect and manage data from them. We also describe the data analysis conducted.

Data Sources

Provider Sexual Crime Report Database. The Provider Sexual Crime Report (PSCR) is a standard form that every medical provider in Massachusetts evaluating a sexual assault victim is required to complete and then fax or mail to the Research and Policy Analysis Division (RPAD) of the state's Executive Office of Public Safety and Security (EOPSS). Slightly different versions of the PSCR have been developed for adult and pediatric (victim under age 12) cases. Copies of the adult and pediatric PSCRs are in Appendix A (the PSCR has been modified slightly over the years; the version most commonly represented in this study's data set is presented in the appendix and other versions are among the files archived for this project in the National Criminal Justice Data Archive). The PSCR is completed for every sexual assault patient seen by providers and provides substantial information about the patient and assault (see below). Providers complete additional forms (Forms 2B 3, 4A, 4B, 5A and 5B) with information gained from interviewing and examining the patient (see below). Copies of these additional forms are in Appendix B. All these forms are included in the evidence kit, but only the PSCR (Form 2A and a parallel form for pediatric cases) is faxed to OGR and included in the PSCR database.

The Research and Policy Analysis Division of the Office of Grants and Research maintains the PSCR database and uses PSCR data for a variety of research purposes (see Massachusetts Executive Office Public Safety and Security, 2006, 2008a,b,c,d; 2012; Munar, 2011). The database includes data on every PSCR case seen in Massachusetts from August 15, 1999 to the present and is ongoing. As of October 2013, the database contained more than 14,000 records of sexual assaults. The PSCR database provided the population of cases from which the study sample was selected, and also provided data on the variables on Form 2A that were merged with other data to form the analysis data files.

Massachusetts Sexual Assault Evidence Kits (MSAECK). A considerable amount of data for this project came from documentation included in the Massachusetts Sexual Assault Evidence Kit. This standardized kit is required to be completed by all Massachusetts medical examiners completing forensic medical examinations conducted within 120 hours of the assault. The kit involves a 20-step protocol of specimen collection, evidence protection and documentation designed to provide a comprehensive assessment of sexual assault, and includes standardized sets of documents and materials. The standardized materials in the MSAECK include: known blood sample, saliva sample, vaginal swabs and smears, external genital swabs, anorectal swabs and smears, perianal swabs, and oral swabs and smears. In addition to the PSCR, the kit includes a standard set of forms (described below) that are completed by the medical provider who conducted the forensic medical examination. These provide information gained from interviewing and examining the patient. Our project case abstractors abstracted data from these forms at the crime laboratories.

Appendices A and B include all the standardized forms that were completed by the medical providers who conducted the forensic medical examinations and that were used in this research (some standardized forms that providers complete were not used in this research and are not included in the appendices). Most of the data for this project came from these forms. Data from the PSCR, Form 2A, were extracted from the PSCR database. Project case abstractors abstracted data from the remaining forms at the crime laboratories, where the forms for a case were stored in the evidence kit for that case.

The PSCR, Form 2A, contains:

- Victim demographic information;
- Date, time and location of assault and forensic medical examination;
- Number of assailants and their relationship to the victim;
- Weapons and force used, if any;
- What sexual acts were perpetrated and related information (e.g., ejaculation, condom use);
- Whether the victim sustained an injury resulting in bleeding;
- Whether reports were made to police and other authorities (e.g., child protective services) at the time of the examination;
- Information on kit completion and the name of the police department notified for kit pick up and the date and time of notification.

A pediatric version of Form 2A for victims under age 12 includes less information.

Form 2B contains:

- Pertinent recent relevant health history (e.g., recent gynecological procedures, menstruation, contraception use);
- Patient's recent evidence related actions (e.g., showering, changing clothes, brushing teeth);
- Descriptive information on weapons and force used;
- More detail on sexual acts (e.g., location of ejaculation, oral contact);

Form 3 is a brief written narrative of the patient's account of the incident, using the patient's words, in quotes, whenever possible.

Form 4 includes:

- Body, mouth and genital diagrams on which the examiners records injuries found and other relevant findings from the examination;
- The type and number of photographs taken by the examiner.

Form 5A documents:

- Which of 19 different female and male genital structures, if any, were injured (e.g., labia minor, cervix, penis) and what type of injuries they sustained (e.g., laceration, swelling);
- Other genital findings (e.g., anal spasms);
- Examination aids that were used in the genital examination (e.g., speculum, medscope).

Prior to 2006, Form 5A did not include a duplicate sheet that was included in the evidence kit sent to the crime laboratories (personal communication, J. Meunier-Sham, March 21, 2014). The single sheet had to stay in the patient's medical record at the hospital. Some hospitals were still using kits in 2008 through 2010 that they had received earlier, and so no data were available on results of genital examinations for these cases.

Form 5B documents completion of 18 different steps of evidence collection, from obtaining patients' informed consent to clothing collection to taking swabs and hair combings in different locations.

Form 6 documents a set of aftercare instructions to be reviewed with patients prior to discharge.

Crime Laboratory Analysis and Report. Police transport the MSAECK to one of two different crime laboratories. Boston kits are transported to the Boston Police Crime Laboratory and kits from the rest of the state are transported to the Massachusetts State Police Crime Laboratory in Sudbury, MA. When victims do not report to police, the kit is still taken to the crime laboratory with the possibility of analyzing the kit if the victim changes his or her mind and decides to report to police. For kits sent to the crime laboratory, analysis is performed that allows crime laboratory personnel to report on whether positive evidence is found for blood, semen and saliva. DNA analysis is often conducted as well, and in crime laboratory reports, crime laboratory personnel document whether a) an offender DNA profile was generated, b) the DNA profile matched a suspect, and c) the DNA profile matched an entry in the FBI's Combined DNA Index System (CODIS), a national database of DNA collected from other crime scenes and convicted violent offenders.

Data from the State Police Crime Laboratory files were entered by a project research assistant who visited the laboratory regularly to code data. Data from the Boston Police Crime Laboratory were entered by a laboratory staff member who put in overtime hours as a research assistant to the project, funded by a project contract. A spreadsheet was created both in SPSS format (for the project research assistant who worked at the State Police Laboratory, who knew SPSS and had the software) and Excel format (for the Boston laboratory staff member, who had Excel and not SPSS). Excel files were converted into SPSS format in the process of creating the analysis data files. To code data, the research assistants at the laboratories used PSCR Forms 2A through 5B described above and the crime laboratory reports for each case. Appendix C lists the variables coded at the crime laboratories.

Police Data. Initially, the research project sought data on arrest and criminal charges from two electronic crime incident databases. Most municipalities in the Commonwealth periodically submit crime incident data to the Crime Reporting Unit (CRU) of the Massachusetts State Police. The CRU is the contact point between state, local, and campus police departments and the FBI. The CRU is charged with the responsibility of collecting, maintaining, analyzing, and reporting crime data for the Commonwealth. The CRU compiles these data in the state's National Incident-Based Reporting System (NIBRS) database, uses these data in statewide analyses and submits the data to the FBI as part of the FBI's national crime reporting program. The Boston Police Department maintains its own crime incident database.

Challenges arose for the project with each of the crime incident databases. The Boston crime incident database did not include the arrest and criminal charges data the project needed. As an alternative, staff from the Sexual Assault Unit of the Boston Police Department entered these data on a supplementary data sheet (see Appendix D). The Massachusetts NIBRS database had the required data fields, but there were problems with the reliability of the data. Using the police case identifying number as a common variable, Massachusetts NIBRS data were merged with the PSCR/crime laboratory data set, and initial analyses were conducted to examine the distributions of the NIBRS variables. This analysis revealed an arrest rate substantially lower than the reported national arrest rates for sexual assault. This provoked concern about the reliability of the state's NIBRS data for our purposes. The research team contacted several Massachusetts police agencies to find out more about the process of submitting data to NIBRS and its implications for the validity of arrest data. The research team learned that agencies typically were reporting data at one point at time in the case, usually early. Agencies did not typically update NIBRS data later, even though arrests may have taken place after the data were submitted to the statewide NIBRS program. Moreover, some agencies were unsure about whether arrests from their agencies were even being recorded in NIBRS; the default for data that have not been entered is that a 'no' is recorded in the arrest field.

Given the concern about the reliability of the NIBRS arrest data, the research team initiated an alternative method for collecting data on arrest and criminal charges for non-Boston law enforcement agencies. Using Microsoft Access with the sample data set, the research team created individualized data entry sheets for all 144 non-Boston police agencies represented in the sample (data entry for Boston is discussed above), with the incident numbers of each agency's cases in the sample listed.   The Research and Policy Analysis Division (RPAD) of the Office of Grants and Research of the Executive Office of Public Safety and Security then mailed paper copies of these data sheets to the police chiefs in each of these departments along with a cover letter explaining the study and asking for the police chiefs' help (see Appendix E for the cover letter and an example of an individualized data sheet). The police chiefs were asked to complete the form (most delegated it to an appropriate staff member) and mail or fax it back to RPAD, who entered the data into an Access data file. The research team's contact information was provided if technical assistance was needed, and several police departments did call for assistance. Police departments who did not respond to the original request sent by U.S. mail were emailed a request with the data entry sheet file attached. Police departments who did not respond to either U.S. mail or email received a telephone request by research team members. Data collection from police departments was carried out over an approximately 10 week period in spring-summer 2013. Out of the 144 police agencies contacted, 141 (97.9%) responded.

Steps in Data Collection and Creation of the Analysis Data File

Sampling Procedure. The study sample was derived from the PSCR Database. A retrospective sampling frame was used: sexual assault forensic medical examinations from 2008 through 2010 (N = 3,530). This sampling frame was chosen to be recent enough to reflect the most current procedures and documentation used in Massachusetts, but also distant enough in time to allow an ample period to capture the criminal justice response to the assault. The 3,530 cases were exported to a data file in Statistical Package for Social Services (SPSS) format for random sampling and analysis.

The initial random sample included both cases in which the victim decided to report to police and cases in which the victim decided not to report (27.1% of the original sample no report to police was indicated). It quickly became clear, however, that almost all cases in the sample that were not reported to police did not have evidence kits that were sent to the crime laboratories. The value for the research of keeping cases that had not been reported to the police was therefore limited. In addition, some cases could not be included because the PSCR was missing the evidence kit number, which was needed to track the case at the crime laboratories. Subsequently, additional cases were randomly sampled to create a sufficiently large sample that met the following criteria: a) the evidence kit number was known, and b) cases had been reported to police. A power analysis was conducted to determine the required sample size for logistic regression using the method outlined by Hsieh, Bloch, & Larsen (1998). The analysis focused on estimating the number of cases needed for testing the effect of forensic evidence on filing criminal charges, since that would be the smallest analysis data set among those we will be using. The analysis indicated that a minimum target sample size was 436.[1] The final sample

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[1] We estimated the number of cases with arrests we would need for a logistic regression with statistical power of .80 (the standard in the behavioral sciences; for example, see Cohen, 1992) at α=.05. We first estimated effect size by estimating the odds ratio comparing the odds of criminal charges being filed in cases with forensic evidence to the odds of criminal charges being filed in cases without forensic evidence—the larger the odds ratio, the smaller the sample size needed to estimate it. Since we lacked previous research that was adequately comparable for estimating effect size, we chose an effect size that we felt was plausible given anecdotal reports and that was meaningful for actually having a practical impact on outcomes. We estimated an odds ratio of 3.0, which corresponds to a value of .20 on Cohen's (1988) effect size measure *w*. This conservative estimate is just under what Cohen (1992) describes as "an effect likely to be visible to the naked eye of a careful observer", which "approximates the average size of observed effects in various fields." (p. 156). If we estimate further that a) forensic evidence is available in about 30% of cases (a percentage close to that found by a Massachusetts Sexual Abuse Nurse Examiner program review of state crime lab cases; see Massachusetts SANE, 2008), b) about 30.4% of cases with arrests have criminal charges filed (from Alderden & Ullman, 2012) and c) the squared multiple correlation coefficient of all the covariates in the logistic regression model is .10 (a moderate amount of multicollinearity), then the estimated N for arrest cases needed from Hsieh et al.'s formula = 141. Given that about 72% of cases with PSCRs are reported to police (Massachusetts EOPSS, 2008c) and that about 45% of sexual assault cases investigated by police lead to arrests (Peterson, et al., 2010), the actual number of PSCR cases we would need for 141 arrest cases = 141 /(.72 * .45) = 436. This number of 436 then is the minimum target sample size.

included 711 cases or 20.1% of the sampling frame. This sample size is large enough to provide statistical power meeting or exceeding 80% for all the statistical analyses conducted for the study (see Cohen, 1988; Hsieh, Bloch, & Larsen, 1998).

The first step in data collection was the creation of a PSCR data file for sampled cases, which was extracted from the PSCR database by RPAD staff. From this data file, a list of all evidence kit numbers was made and provided to the project research assistants working in each crime laboratory. With the assistance of other crime laboratory staff, the research assistants then located the evidence kits for each evidence kit number in the sample. The research assistants then entered data directly into computerized data files from the standardized forms and crime laboratory reports accompanying each evidence kit. Among the data entered from the crime laboratories was the police incident number for the case. As described above, these incident numbers were then entered into individualized data sheets sent to police departments, except in Boston, where Boston police staff entered data directly into an Excel spread sheet. Analysis data files were created by merging a) the data file from the PSCR database with b) the data files created by the research assistants at the crime laboratories and c) the criminal justice data files that were created by the Boston Police Department and by RPAD from the paper or fax submissions of the other police departments. The data files were then posted on a password secured shared drive at Saint Xavier University and data cleaning and analysis were conducted using that shared drive by research team members at Saint Xavier University (Dr. Megan Alderden), the University of Illinois at Urbana-Champaign (Dr. Theodore Cross), RPAD (Ms. Lisa Sampson and Ms. Brittany Peters), and Fisher College (Mr. Alex Wagner).

Interrater Reliability Study

An interrater reliability study was conducted to assess the reliability of the procedures for coding data from Forms 3 through 5B that medical providers complete following a forensic medical examination. Injury variables from Forms 3 through 5B are the only variables that require judgment from the data abstractors. Data abstractors have to judge, for example, how many injuries to a given body part should be coded from a body map completed by the medical professional who conducted the forensic medical exam. The research team developed a manual for coding cases, and the principal investigator and one of the data abstractors carried out an interrater reliability study on these for 26 cases that were not included in the research sample. The other data abstractor was not available to participate in the interrater reliability study. These two members of the research team independently coded 25 variables for each of the 26 cases. Interrater reliability coefficients were calculated. The results are presented in Table 3.1.

As the table shows, the interrater reliability coefficients were generally high, .80 or higher, indicating substantial interrater agreement (corrected for chance). This suggests substantial reliability for the coding scheme. For those variables for which reliability coefficients could be calculated, the lowest reliability coefficient was .59, which still indicates a reasonable level of reliability. There are several variables for which a reliability coefficient could not be calculated because they occurred rarely. The reliability of coding of these variables should be considered unproven. Overall the interrater reliability study provides us with confidence that the method using to code data from the crime labs was reliable.

Table 3.1: Interrater Reliability Scores by Variable

Variable	Statistic	Reliability Coefficient
Number of Scalp Injuries	ICC[1]	1.00
Number of Face Injuries	ICC	1.00
Number of Neck Injuries	ICC	1.00
Number of Mouth Injuries	ICC	No cases scored “yes”; coefficient could not be calculated
Number of Breast Injuries	ICC	1.00
Number of Abdomen Injuries	ICC	1.00
Number of Chest Injuries	ICC	1.00
Number of Back Injuries	ICC	.63
Number of Arm Injuries	ICC	.96
Number of Hand Injuries	ICC	.80
Number of Knee Injuries	ICC	.93
Number of Leg Injuries	ICC	.99
Number of Feet Injuries	ICC	.61
Foreign materials on the body	Cohen’s kappa	No cases scored “yes” for one of the raters; coefficient could not be calculated
Number of non-genital injuries	ICC	.99
Size of largest non-genital injury (in cm)	ICC	.87
Size of largest genital injury (in cm)	ICC	1.0
Loss of consciousness	Cohen’s kappa	.59
Patient in ICU	Cohen’s kappa	No cases scored “yes”; coefficient could not be calculated
Pattern injury or bite mark	Cohen’s kappa	No cases scored “yes”; coefficient could not be calculated
Fracture	Cohen’s kappa	No cases scored “yes”; coefficient could not be calculated
Incise wound	Cohen’s kappa	No cases scored “yes”; coefficient could not be calculated
Puncture wound	Cohen’s kappa	No cases scored “yes” for one of the raters; coefficient could not be calculated
Genital bleeding	Cohen’s kappa	1.0
Serious genital injury (tearing, incise wound and/or laceration)	Cohen’s kappa	.89

Note. [1] Intraclass correlation coefficient.

Data Analysis

Data analysis focused primarily on the frequency of injury and forensic evidence, the timing of actions in response to sexual assault, and predictors of founding and arrest. The categories of data analysis conducted are discussed below.

Sampling Adequacy. To assess the adequacy of the random sampling and how well the sample represented the relevant population, cross-tabulations with Pearson χ^2 tests were conducted comparing case characteristics for sampled cases and for police-reported cases in the PSCR database that were not sampled, looking at differences in case characteristics.

Case Characteristics. Frequency distributions and descriptive statistics were computed on victim, assailant, assault, and examination characteristics. In addition, analyses were conducted to compare case characteristics for three key sets of subgroups in the sample: 1) cases with known assailants and stranger assailants, and 2) cases in which Sexual Assault Nurse Examiners (SANEs) conducted the forensic medical examination and cases in which other medical providers (primarily emergency department physicians) conducted them, and 3) adult and adolescent cases (victim age 12 and older) and child cases.

Injuries and Forensic Evidence. Analyses examined the frequency of genital examination data being available and crime laboratory testing of evidence kits, and which variables predicted these outcomes. Analyses also calculated the frequency of a range of different genital and non-genital injuries, examining both the specific type of injury (abrasion, redness, swelling etc.) and the location of injuries on the body and in genital areas. Analyses also examined the frequency of different types of biological evidence and of DNA outcomes.

Additional analysis examined which case characteristics predicted injury findings and forensic evidence findings, and how SANE and other medical providers differed on injury and forensic evidence.

For the multivariable logistic regression models, which were used to examine which factors predicted injury and forensic evidence findings, we used a multi-step process in which we first examined the relationship between the independent variables and the dependent variables. This process was used to ensure proper modeling of the data by paring down the number of variables included in the final models. Those identified as significant at the bivariate level were maintained for the multivariable model. We then examined the relationship between the independent variables to identify whether any independent variables were highly correlated, which would produce issues with multicollinearity in the multivariable models. Finally, we then ran multivariable models, beginning with the models of the independent variables that were significant at the bivariate level and were not highly correlated. Additional models were sometimes calculated that included variables that were theoretically important but were not significant at the bivariate level, to determine whether their inclusion was warranted. Unless specified in the report, these additional models were not significantly different from the first models conducted (i.e., the relationships between the independent and dependent variables did not change) or were not a good fit for the data based on the goodness-of-fit statistics.

Timing of Forensic Evidence. A descriptive analysis was conducted on the timing of producing forensic evidence, involving four key dates: the date of arrest, the date the sexual assault kit was collected, the date the crime laboratory reported results to the police, and the date the crime laboratory reported results to the district attorney's office. These analyses looked at distribution of time spans and the percentages of cases in which arrests took place before and after sexual assault evidence kits were analyzed by the crime laboratories.

Unfounded Cases and Arrests. Analysis examined how frequently police unfounded cases and made arrests. Multivariable logistic regression analyses were also conducted to examine which variables predicted case unfounding and which predicted arrest. Predictor variables included victim characteristics, assault characteristics, timing variables, and forensic medical examination results. Because of its complexity, the relationship between forensic evidence and arrest was examined separately, as discussed below. For the multivariable logistic regression models, we used a multi-step process in which we first examined the relationship between the independent variables and the dependent variables. This process was used to ensure proper modeling of the data by paring down the number of variables included in the final models. Those identified as significant at the bivariate level were maintained for the multivariable model. We then examined the relationship between the independent variables to identify whether any independent variable were highly correlated, which would produce issues with multicollinearity in the multivariable models. Finally, we then ran multivariable models, beginning with the models of the independent variables that were significant at the bivariate level and where not highly correlated. Additional models were sometimes calculated that included variables that were theoretically important but were not significant at the bivariate level to determine whether their inclusion was warranted. Unless specified in the report, these additional models were not significantly different from the first models conducted (i.e., the relationships between the independent and dependent variables did not change) or were not a good fit for the data based on the goodness-of-fit statistics.

Injuries and Forensic Evidence and Arrests. Analysis examined relationships of injuries identified in the forensic medical examination and forensic evidence identified by the crime laboratories on one hand and arrests on the other hand.

Chapter 4

The Massachusetts System of Response to Sexual Assault

This chapter provides an overview of the medical and criminal justice processes in Massachusetts that govern how forensic medical evidence is collected as well as the manner in which criminal cases are pursued by police and prosecutors. Massachusetts has developed a statewide system of conducting forensic medical examinations for adult and adolescent sexual assault patients who present acutely to emergency rooms. Understanding the Massachusetts system is an important part of the context for interpreting the empirical findings of this study. One key source of information for this chapter is the *Massachusetts Sexual Assault Nurse Examiner Program Protocol* (2010), a manual written by Massachusetts (MA) SANE to guide health professionals in the state conducting acute forensic medical examinations following sexual assault.[2] Additional information was drawn from interviewing key Massachusetts professionals.

Massachusetts SANE Program

As of this writing the MA SANE Program is the only program in the country that has a state line item appropriation to fund a centrally managed statewide service delivery (Meunier-Sham, Cross & Zuniga, 2013). The MA SANE Program Protocol (Massachusetts SANE program, 2010) provides background information on MA SANE. Out of 68 acute care hospitals in Massachusetts, 27 have been designated by the MA Department of Public Health (MDPH) as MA Adult/Adolescent SANE sites and there is one Pediatric SANE Emergency Response in the

[2] Individuals interested in obtaining a copy of this protocol may do so by contacting the MA SANE Program at: MA Department of Public Health, 250 Washington Street-4th Floor, Boston, MA 02108 or by phone at 617-624-6072.

Northeast Region of the state. A staff of approximately 100 Registered Nurses (RNs), Nurse Practitioners (NPs), Nurse Mid-Wives (NMW) and 1 Physician (MD), all women, serve as MA Adult/Adolescent SANEs. The state is divided into six regions and a group of regionally-based nurses cover an “on-call” schedule to ensure that there is a SANE available to provide an acute response on a 24/7, 365 basis. Hospitals were chosen to become MDPH-designated SANE sites based on both patient volume and geographic need. Previous data show that SANEs conduct approximately 70% of the acute examinations performed in the state and 83% of acute examinations performed in Boston (Massachusetts SANE Program, 2010). One MA SANE site (Lawrence General Hospital - LGH) currently provides the state’s only Pediatric SANE Emergency response; LGH SANEs have been trained to care for patients of all ages. Additional pediatric SANEs work in children’s advocacy centers in the state, though not an emergency basis.

All MA DPH-designated SANE hospitals must meet a set of conditions for the SANE examination space. These include sufficient space to conduct the interview and examination, adequate counter space for evidence collection, supplies, and documentation; locked cabinets to provide secure storage for forensic cameras and other forensic equipment; and locked cabinets for patient medical records; and/or encryption code and other security for electronic records. The hospital must also have the following set of designated equipment available: a locked refrigerated safe to preserve evidence collected, a speculum light source, a locked SANE Cart to hold supplies, a Wood’s lamp (which uses ultraviolet light to enhance examination of the skin), a digital camera, and a DVD recorder/burner. In addition, a range of medical supplies are required for the examination to facilitate patient care, evidence collection and patient comfort. Most are standard in emergency departments (e.g., blood tubes, examination gowns), but specific supplies of note include toxicology kits, pregnancy test supplies, biohazard bags, and small, medium and large specula. MA SANE also works to maintain a high level of care in non-SANE hospitals through training it provides, and through its leadership in the development of protocols and the Massachusetts Sexual Assault Evidence Collection Kit (MSAECK) and the Massachusetts Pediatric Evidence Collection Kit (MA PEDI KIT) (see below).

Massachusetts Sexual Assault Evidence Collection Kit (MSAECK)

Through its Sexual Assault Evidence Collection Program, the Massachusetts Executive Office of Public Safety and Security (EOPSS) provides all hospital emergency departments and one college emergency health facility with the MSAECK (Massachusetts EOPSS, 2014). The MSAECK is used for sexual assault patients, ages 12 years and older, when an assault has occurred within 5 days of the patient's presentation to the emergency department. The MSAECK is a boxed, sealed kit containing a copy of the protocol, all the medical equipment necessary to collect specimens, and standardized forms to document information (these forms supplied most of the data for the present study, through both the Provider Sexual Crime Report database and the coding of kit documentation carried out by project research assistants). Each kit has a unique ID number that is used to label the documentation and each envelope in which specimens are placed, and is also given to the patient (Boston Area Rape Crisis Center, 2013). Advising EOPSS on the development, revision and use of the kit is an Advisory Board with representation from MA SANE, the State Police and Boston crime laboratories, the Massachusetts District Attorney's Association, the Massachusetts Department of Public Health, a rape crisis center and a senior sexual assault prosecutor from one of the district attorneys' offices in the state. The Sexual

Assault Evidence Collection Program also supplies a toxicology kit to test for the presence of substances if there is a suspicion that victims were drugged as part of the sexual assault.

The Massachusetts Pediatric Sexual Assault Evidence Collection Kit (MA PEDI Kit)

Massachusetts EOPSS also funds and distributes the MA PEDI Kit to all of the Commonwealth's emergency departments (see Meunier-Sham, Cross & Zuniga, 2013). The MA PEDI Kit is used for forensic evidence collection for children aged 11 years and younger when there is a disclosure or significant concern for sexual assault/abuse within a 3 day period of the ED presentation. The MA PEDI Kit is a "first of its kind" child friendly kit that was developed on the principles of "do no harm." There are no painful or invasive procedures included in the kit, and clinicians are guided in best practices to maintain the integrity of a future forensic interview by limited questioning about the assault in the emergency department setting. MA PEDI Kit instructions guide clinicians to a) obtain a history from the child's guardian, b) use only Who, What, Where, When follow-up questions if the child makes a spontaneous disclosure, c) complete as many steps of forensic evidence collection as possible if the child is cooperative, d) document exam findings according to the clinician's level of expertise, and e) refer the child to a child sexual abuse expert for a follow-up examination. The MA SANE Program also developed and distributed a training DVD to support and reinforce training for ED clinicians in the use of the MA PEDI Kit. With the exception of the one Pediatric SANE site in MA, the majority of MA PEDI Kits are collected by emergency clinicians in the state's 67 other hospitals. If a child presents with an acute assault to one of the state's Children's Advocacy Centers (CAC), staffed by an Advanced Practice Pediatric SANE, a Pediatric SANE will complete the MA PEDI Kit. The vast majority of children receiving CAC-based Pediatric SANE services, however, have abuse of a chronic nature and do not meet the criteria for forensic evidence collection. An analysis of 283 cases by Cross, Meunier-Sham and Moore (2012) revealed that forensic evidence recovery using the MA PEDI Kit was comparable when the kit was used by an expert or non-expert sexual abuse clinician. This is most probably related to the kit's design, assisted by a complementary training video and other education and training provided by the MA SANE Program to emergency department clinicians state-wide.

Massachusetts SANE Protocol

Adult/adolescent sexual assault victims who have been assaulted in the 120 hours before presenting to the Emergency Department are eligible for MA SANE services. Upon determining a patient's eligibility for the SANE program, hospital staff will escort the survivor to a private room, assign a nurse liaison, inform the Attending Physician, and, after medically clearing the victim, contact "on-call" MA SANE and the local Rape Crisis Center (RCC). Assessment for injuries takes precedence over evidence collection. Hospital medical staff will carefully assess any abdominal pain, head injury, cervical spine injury, psychosis and/or suicidal ideation before contacting SANE and the Rape Crisis Center (RCC). MA SANE will obtain baseline information by telephone before arriving at the Emergency Department. Both the SANE and rape crisis counselor will arrive at the Emergency Department (ED) within an hour of the page.

The MA SANE Protocol guides clinicians to ask the survivor not to undress or wash prior to SANE's arrival, in order to preserve evidence that is on their body. Additionally, the survivor should be instructed not to consume any food or drink until after evidence collection has taken place. Often the patient's primary nurse acts as a liaison to ensure that the patient clinical needs such diagnostic testing, medication administration and laboratory testing is coordinated because the MA SANE is not an employee of the many EDs she responds to. Upon her arrival, the SANE will introduce herself and explain what options are available to the patient: evidence collection, toxicology, emergency prophylaxis and police reporting. The SANE will obtain informed consent to complete the examination and provide medical treatment, and will also file any necessary mandatory reports. Upon her arrival, the rape crisis counselor will explain her role, which is to provide information and support to survivors during the exam process. Rape crisis counselors have privilege with the survivor, allowing the counselor to maintain confidentiality even in the face of subpoena. Exceptions are suicidal or homicidal ideation, which are then reported to the hospital staff. Rape crisis counselors do not communicate with the police and are not present when the survivor speaks with the police. Rape crisis counselors can connect survivors with community support services, legal services and safety planning upon hospital discharge.

Consent. In order to complete the forensic medical examination, it is necessary that SANE obtain informed consent from the survivor. Minors aged 12 years and older are able to consent to the evidence collection kit, emergency contraception and sexually transmitted infection (STI) prophylaxis without the consent of their parents. Intellectually disabled adults and mentally ill adults may require extra time and explanation in order to obtain informed consent. Consent begins with an explanation of the evidence collection kit and its purpose: head-to-toe examination and assessment for injury, collection of evidence, and documentation of the report of the assault in the survivor's own words and documentation of injuries. Survivors are informed of their right to decline any part of the kit and stop at any point, and are told that consent to the kit does not mean the survivor is consenting to the involvement of the criminal justice system. Survivors are not required to report to the police to complete an evidence collection kit. Completed evidence collection kits are stored at the crime laboratories for a minimum of six months; the survivor can decide to report their assault to law enforcement at any time during this period. The survivor may also submit a written request to extend this time period. Survivors who are awake, oriented to person, place and time, and have been declared medically cleared can consent to the forensic medical examination. Laboratory results indicating the survivor's blood alcohol level or absence of drugs are not required in order to proceed.

The examination begins after the survivor signs the written consent. The SANE obtains a history of the assault from the patient to guide the physical exam and forensic evidence collection. The SANE documents the survivor's physical appearance and injuries using both the body map included in the evidence collection kit and a digital camera. The SANE will then collect control swabs using sterile water—these will be compared to the swabs used to collect evidence in order to account for the effects of the water used. If the survivor reports periods of unconsciousness, amnesia or a confused state with suspicion of sexual assault, or amnesia or a confused state with no reported consumption of mind-altering substances, or suspicions that s/he was drugged, the SANE may have the nurse liaison collect a blood and urine sample for toxicology testing. Toxicology testing is only conducted within 96 hours of the assault. If the survivor reported the assault to the police, s/he can obtain the toxicology kit results directly from the police in 6-8 weeks. If the survivor does not report to the police, s/he may obtain the toxicology kit results from the Toxicology Hotline in 6-8 weeks. Toxicology testing is completed in coordination with the collection of blood for the survivor's DNA and baseline laboratory testing. Oral swabs and smears are taken if an oral assault has occurred within the last 24 hours. If the victim reports scratching the assailant's skin, the assailant's clothing, or immediate surroundings, fingernail scrapings are collected. The SANE nurse then collects any visible foreign material on the survivor and the survivor's clothing and collects articles of clothing if deemed appropriate. Thereafter, the SANE documents any bite marks, measuring and documenting the wounds. Any bite marks are swabbed for potential forensic evidence. If the history of the incident suggests its value, the SANE will conduct head hair combing and/or pubic hair combing to obtain any foreign hairs or debris that might be present. If the survivor indicates that there was a genital assault within 120 hours, the external genital areas will be swabbed for evidence collection. If the assault involved vaginal contact within the last 120 hours, a limited pelvic examination is conducted and vaginal swabs are obtained for evidence. Perianal swabs are collected if the patient reports any anorectal or vaginal assault within the past 120 hours. Anorectal swabs and smears will be collected if an anal assault occurred within the last 24 hours.

Non-genital injuries are documented via digital photography. The SANE will begin by taking a photograph of a white piece of paper indicating the kit number; the SANE's printed name, signature and certification number; and the date and time of the exam. Photographs will be transferred to DVD and stored with the medical records at the designated SANE site only to be released upon subpoena. MA SANE's policy is not to take photographs of genital injuries, because it is felt that the costs to the survivor's privacy of having such photographs in the criminal justice system, including court, outweigh the benefits. The SANE program documents genital injuries on anatomical body maps contained within the MSAECK.

During the examination, survivors will be assessed for their exposure to HIV and sexually transmitted diseases. The SANE Protocol does not recommend routine testing for Sexually Transmitted Infections (STI) but does provide prophylaxis treatment. Additionally, if the survivor is deemed to be at higher risk for HIV, medication for post-exposure prophylaxis will be administered, and the survivor will be given a follow-up referral with an Infectious Disease physician or clinic to monitor treatment. HIV PEP is indicated when there are multiple assailants; a known HIV infected assailant; known exposures of the survivor to ejaculate or blood; vaginal and/or anal assault; or any disruption in the skin integrity of the vaginal, anal or oral mucosa.   Prior to administration of HIV PEP, the hospital will perform a baseline complete blood count (CBC) and liver function test (LFTs). Following a negative baseline pregnancy test, the survivor will also be offered progestin-only emergency contraception to prevent an assault-related pregnancy. A Hepatitis B vaccine may also be administered if a patient has not previously completed a Hepatitis B immunization series.

During discharge, hospital staff will assess the emotional and safety needs of the survivor and make the appropriate community and medical referrals. The survivor will be advised of the necessary medical follow-up regarding pregnancy testing, Hepatitis B medication, and HIV antibody testing. Finally, SANEs will call the corresponding police agency and inform them that the evidence collection kit is ready for pick up—see section below on evidence transport and chain of custody. All medical providers, SANE and non-SANE, are then required to complete the Massachusetts' Provider Sexual Crime Report (see Chapter 3), and fax the PSCR to the corresponding police agency and the Research and Policy Analysis Division of EOPSS, where the data are added to the PSCR database (see Chapter 3). In cases in which the survivor is under 18, a child abuse report must be filed with the Department of Children and Family (DCF).

Additionally, appropriate reports must be filed in cases of Elder Abuse and Disabled Persons Abuse.

It should be noted that the MA SANE protocol (Massachusetts SANE, 2010) includes a disclaimer about the limitations of the evidentiary examination:

> SANEs do not determine whether or not a sexual assault has occurred, but rather document the patient's complaint, note any signs and symptoms of trauma, and collect and document evidence from the patient. It is left to the criminal justice system to determine the legal significance of the evidence gathered by the SANE (p. 15).

Other Medical Examiners

Other medical professionals conduct acute sexual assault forensic medical examinations in about 30% of cases. Most often, these professionals are conducting the examinations because the patient presents to an emergency department in a non-SANE designated hospital. Occasionally SANEs are not able to conduct an examination in a SANE-designated hospital because of multiple cases presenting at the same time or other circumstances. Most often the medical professionals are emergency department physicians without any specialized training in sexual assault. Some children are seen acutely by one of five pediatricians specializing in child abuse in the state, working in a handful of different hospitals.

In these cases, the designated personnel follow the protocol created by the MA SANE program. After meeting with triage personnel, survivors are prioritized as Level 2 patients and assigned a primary care nurse. Survivors are informed of their options to complete a kit within the 120-hour window, offered both HIV and STI prophylaxis, and are tested for Hepatitis B. The hospital should contact the local rape crisis center and request the presence of a medical advocate/ rape crisis counselor, whose role is to support the survivor. The medical provider is guided by their general medical training on assessing possible injuries. Some providers may also have participated in trainings on the use of the MSAECK conducted by the MA SANE program. The provider also follows instructions in the kit for collecting specimens. Procedures for the PSCR, evidence transport and chain of custody, and mandatory reporting are the same for SANE and non-SANE providers.

Evidence Transport and Chain of Custody.

In the guidelines included in the evidence kit, the medical provider is instructed to call the police in the city or town in which the assault occurred to arrange for transfer of evidence, and to record when evidence is secured in the hospital's chain of custody" log. While waiting for the police, the evidence collection kit and accompanying items are stored in a locked refrigerator in a secured area. When the police officer arrives to obtain the kit, chain of custody documentation is completed on both the kit and on a chain of custody log at the time of transfer. Timely pick-up of the kit by the police is expected as is timely transport to the crime laboratories. Evidence kits completed for assaults that occurred in Boston are transported to the Boston Police Department Crime Laboratory and all other kits are transported to the Massachusetts State Police Crime Laboratory in Maynard, a small community 24 miles northwest of Boston. If there is no kit pick-up after 12 to 24 hours, the emergency department administrator is instructed to call the police department to arrange again for pick-up.

Massachusetts Crime Laboratories

The crime laboratories analyze evidence kits for which a police report has been made, and store kits for which there was no report to police. Stored kits are analyzed later if a report to police is made sometime after the forensic medical examination. As soon as kits are submitted to the crime laboratories, they are entered into a Laboratory Information Management System (LIMS) for the state police laboratory and a specially designed Boston database for the Boston Police Crime Laboratory. Entry into this electronic management system initiates the laboratory's chain of custody for the kit. Each item collected in the investigation is tracked, including individual items included in the kit (e.g., the individual swabs) and other items that may be collected in the investigation (e.g., bed sheets). Sexual Assault Examination Kits are assigned to the Criminalistics Unit for processing to determine if biological material is present (e.g., blood, sperm cells etc.). Additionally, the analysts assigned to the Criminalistics Unit will evaluate the amount of biological material present in order to determine how much will be required for DNA analysis. The defendant's defense team is entitled to 50% of biological material, unless the laboratory determines that biological material is too limited (i.e., quantity limited [QLIM]) to be split in half and allow two separate valid analyses. If the biological material is deemed quantity limited, the laboratory will notify the district attorney's office, and the defendant's defense team will have the opportunity to arrange for their own forensic specialist to be present and witness the laboratory's analysis.

If cases are unreported and blood has been collected for the kit, the blood will be swatched onto FTA paper (FTA is a registered trademark that stands for fast technology for analysis of nucleic acids) to preserve it for later DNA analysis should the victim decide later to report. The criminalist will then contact the district attorney's office on reported cases to determine how they would like to proceed. The Boston Police Crime Laboratory works with Suffolk County District Attorney's Office while the Massachusetts State Police Crime

Laboratory works with the other 10 district attorneys' office in the Commonwealth. If a kit is submitted as a reported sexual assault, testing will be conducted (see results in Chapter 5). If the victim has had consensual sex with an innocent partner around the time of the sexual assault, the DA's office will ask the innocent partner voluntarily to submit a DNA sample for testing, so the crime laboratory can distinguish their DNA from the assailant's. The DNA testing of biological evidence identified from the kit will proceed only after there has been a good faith effort to obtain a biological sample from the consensual partner. In rare cases, the need for the innocent party's specimen can present an insurmountable obstacle: if the innocent partner refuses to submit a specimen and the suspect is unknown, there is no way then to use DNA analysis to try to identify the suspect. The DNA profile may still be uploaded into the CODIS database after the good faith effort is made.

Kits are tested in order of being sent to the laboratory, unless the police or district attorney report a safety concern that indicates that the testing of a certain kit should be expedited. The crime laboratory follows a specified order in testing the contents of kits, with successive steps taken only if previous steps do not yield probative evidence. First, swabs collected in the forensic medical examination are tested by a criminalist. If probative results are obtained from the swabs, further steps are unnecessary and not taken, unless specific case details necessitate further analysis. If swabs are not probative, testing will be done on smears made on a glass side from specimens. If neither swabs nor smears yield probative evidence, head and pubic hair combings, fingernail scrapings and foreign material collections will be tested if the case history suggests they may be probative. A fourth step if previous steps do not yield probative evidence can be to test objects obtained in the investigation (e.g., underpants, condom).

Testing for sperm and semen is done. If the case history from the kit documentation indicates ejaculation or penile contact, the criminalist will attempt to extract sperm from biological specimens. If this does not yield probative evidence, a semenogelin test will be done to test for semen. Items collected in the investigation will be screened for the possibility of blood, and if the case history suggests it would be probative, testing will be done for human blood. If the case history indicates, criminalists will also test for amylase, an enzyme of saliva. Biological products will also be retained for DNA testing. If the case history indicates a possible drug facilitated sexual assault, then a toxicology kit is collected during the forensic medical examination and included with the forensic evidence kit, and a laboratory toxicologist will conduct the analysis of the toxicology kit. Unreported kits have priority for toxicology testing because the victim's knowledge about whether they were under the influence of substances may affect their decision to report.

If biological products are found in materials from the kit and the investigation, a DNA specialist then tests for DNA. The DNA specialist typically starts with the vaginal swab, since any DNA found there would be most probative because it would indicate penetration. Items with greater potential probative value are analyzed before items with less potential probative value. The D.A.'s Office will also seek a biological specimen from known suspects for a comparison sample, typically a swab of the inside of the suspect's cheek. Many suspects who are asked provide specimens voluntarily, but for others the D.A. can seek a court order to compel the suspect to provide a specimen. DNA testing is conducted on the comparison sample and results (match or no match) are communicated to the district attorney.

In rare cases, a DNA analysis can be conducted on a so-called investigative sample collected by a detective during the investigation from an object on which a suspect left a biological trace (e.g., a cup). A DNA analysis is done on this investigative specimen and a comparison made from DNA from the kit or crime scene. A match from an investigative specimen is not evidence that can be presented in court, but instead an investigative lead that can provide probable cause to compel a court ordered DNA sample.

For specimens that meet certain quality criteria, the CODIS Administrator (a specifically trained DNA Supervisor/Analyst) will upload and search the CODIS database at the state level for a match to the DNA in each case. If applicable, the CODIS Administrator will upload the DNA profile to the national level in order for the profile to be searched nationally. The national level is monitored by the FBI and should there be a match, they will notify the state CODIS Administrator. Quality criteria are set for entering data into CODIS to protect against generating erroneous matches in CODIS. Complex DNA mixtures including DNA from multiple people, for example, may not be suitable for searches. CODIS hits can match assailants to biological evidence from other criminal cases or can match to known offenders or arrestees, who are required by statutes in many states to submit specimens for DNA analysis. In some cases, a CODIS hit can be a key step in apprehending a serial rapist. If there is a CODIS hit, the original saliva card used to obtain the DNA profile that was used to populate CODIS is pulled and the analysis is repeated to ensure that the profile in CODIS matches the profile from the card. Once this three step verification process is completed, the DA’s office is contacted. However, a CODIS hit is an investigative lead and not evidence that can be presented in court. It is used to establish probable cause for the DA’s Office to seek a new DNA specimen from the suspect –

the DNA profile obtained from this specimen is the one that will be used to conduct a comparative analysis of the DNA profile obtained from the kit item.

Unfounding, Arrest and Arraignment

Participation in the criminal justice system generally begins when a victim or other witness reports the sexual assault to police. In some instances, police reporting may occur in conjunction with the forensic medical examination; victims may go to hospitals seeking medical treatment and examination at the same time they also seek to report the assault to police. Forensic medical examinations may also occur well before police reporting, as adult victims have the choice to submit to a forensic medical examination but not officially report the assault to police or delay reporting. Victims may also report the assault to police without a forensic medical examination, and in these cases police officers may request that victims subsequently complete a forensic medical examination.

Once a report to police has been made, police officers must first establish whether enough evidence exists that a crime occurred. This is sometimes referred to as the unfounded decision. According to Uniform Crime Reports (UCR) guidelines set forth by the Federal Bureau of Investigations, police agencies may unfound cases if the evidence indicates that the report is baseless or false. A baseless report is one in which there is not enough evidence to support the conclusion that the incident meets the legal definition of a crime. A false report is one in which police officers do not find enough evidence to support the conclusion that a crime occurred (NSVRC, 2012). As discussed in Chapter 1, however, police may also unfound cases that are difficult to investigate, have ambiguous evidence, or have allegations that are difficult to prove (Spohn & Tellis, 2012). Cases that are unfounded are generally not further investigated and will not result in arrest. Those cases that are not unfounded are then further investigated and when appropriate may result in arrest. Police may make an arrest any time they have probable cause that a suspect has committed a crime. Police may make arrests based on the victims' complaints and other case facts well before there has been time for a laboratory analysis of specimens collected during the forensic medical examination. It is also possible, however, that police may feel the findings from the crime laboratory analyses are needed to support a finding of probable cause in court, or they may need crime laboratory results to identify the suspect.

Defendants who are arrested are scheduled for an arraignment hearing in District Court on the day of arrest or, if that is not possible, by the earliest possible time on the next business day. In a large majority of cases in Massachusetts, arrests lead to arraignment on the same charges, but in rare cases, prosecutors will decide not to pursue criminal charges if they believe that the arrest is not warranted, the case is not prosecutable, or the interests of justice would not be served by prosecution (for example, if the case involves two sexually active 15 year olds who have consensual sex, prosecutors may decide not to proceed even though a crime technically has been committed). If prosecutors decide not to pursue the case at this point, they can ask the police to withdraw the complaint, ask the court not to arraign, or ask for a deferral of arraignment for a specified time period (e.g., two weeks). Defendants are entitled to an arraignment hearing, although some defendants may decide it is in their interest for arraignment to be canceled or deferred. At any point following arraignment, prosecutors can also choose to dismiss a case by filing a *nolle prosequi* (Latin for "we shall no longer prosecute").

If prosecutors choose to pursue the case in Superior Court, the court that mostly handles serious felony cases, they must present the case to a grand jury, which issues an indictment if probable cause is established. The defendant can be held for up to 30 days following arraignment without court review. If prosecutors are not ready to present the case to the grand jury within this time period (which is typical), the next step could be a probable cause hearing. These, however, are seldom held any more. The probable cause hearing is a holdover from a time when grand juries were convened for short periods once a year. The probable cause hearing was designed to "bind" the case over to grand jury, so that the defendant would not be waiting for months in custody for grand jury without any judicial review of the arrest. Currently grand juries are convened continuously throughout the year, so there is little need to "bind" the case over. Prosecutors consider the probable cause hearing to be unnecessary, wasteful of time and resources, and often detrimental to their case. Provided that they are persuaded that prosecutors are moving the case toward indictment in good faith, judges will frequently issue an extension of the probable cause hearing and allow prosecutors more time to prepare the case for grand jury. These extensions often are given for 30, 60 or 90 days; beyond 90 days judges tend to be skeptical that a defendant is being treated fairly and that giving prosecutors more time is justified. In those cases, prosecutors must make a strong argument for why cases are so complicated that they require this additional time (personnel communication, D. Deakin, November 1, 2013).

Although prosecution in most cases starts with an arrest, prosecutors may take a case to grand jury at any time, even, in some cases, when there has not been an arrest. Sometimes when police communicate the facts of the case to prosecutors before an arrest is considered, the prosecutor will decide that the absence of a public safety or flight risk make an arrest unnecessary as a prelude to prosecution. For instance, the prosecutor may decide that in a case in which a mother left her infant in a hot automobile and the child died of hyperthermia, there is no need for an arrest because the mother is not a public safety or flight risk.

Crimes that are not taken to grand jury can be prosecuted as complaints in District Court, the court that handles misdemeanor complaints. Typically complaints result from an arraignment following an arrest, but police sometimes seek a complaint accompanied by a summons to appear for arraignment instead of an arrest. A private citizen can also petition the court to issue a complaint against another citizen. In cases of misdemeanors not committed in the presence of the complaining officer and petitions for complaints by private citizen, the target of the complaint is entitled to a hearing before a clerk/magistrate at which the complainant must show cause as to why a complaint should be issued. In rare cases of complaints sought by police, a court clerk will hold a clerk hearing even in a felony case, if the clerk assesses that additional information should be gathered to decide whether an a criminal complaint is warranted.

Chapter 5

Results

The total adult and adolescent sample consisted of 528 sexual assault victims aged 12 years or older who were examined using adult forensic medical examination kits in which the PSCR data as well as the crime laboratory data were available. We also had another 42 cases involving children under the age of 12 who were examined using pediatric forensic medical examination kits. Unless noted otherwise, the percentages reported below exclude cases with missing data, which primarily occurred when genital examination data were missing or when evidence kits had not been analyzed by the crime laboratory.

Characteristics of Cases with Adult Forensic Medical Examinations

Victim Characteristics. Table 5.1 presents the demographic characteristics of these victims. Victim ages ranged between 12 years and 90 years of age at the time of the incident, with the largest percentage of victims being between 19 and 25 years old. Almost all victims were female, and over two-thirds were white non-Hispanic. Hispanic victims accounted for the next largest percentage, under one fifth.

Assault Characteristics. Table 5.2 provides data on assault characteristics. Most of the victims in the final sample were assaulted by someone known to them; half by an acquaintance, less than one-sixth by an intimate partner or ex-partner, and 2.9% by a parent or relative. Most of the incidents involved one suspect and occurred inside. A little over one-third of victims experienced some type of physical force. Common types of force included pushing, grabbing, pulling hair, and hitting. About 12% of victims were choked by their assailants. Nearly

Table 5.1: Victim Characteristics Documented during the Forensic Medical Examination (N=528).

Victim Characteristics	*f*	Valid Percent[a]	Percent Full Sample
Age			
12 to 14 years	32	6.1%	6.1%
15 to 18 years	104	19.7%	19.7%
19 to 25 years	184	34.8%	34.8%
26 to 35 years	103	19.5%	19.5%
26 to 45 years	57	10.8%	10.8%
46 to 55 years	40	7.6%	7.6%
56 years and older	8	1.5%	1.5%
Gender			
Male	22	4.2%	4.2%
Female	503	95.8%	95.3%
Race/Ethnicity			
White, Non-Hispanic	355	68.4%	67.2%
Black, Non-Hispanic	48	9.2%	9.1%
Hispanic	90	17.3%	17.0%
Other[b]	26	5.0%	4.9%

a. Excludes cases with missing data.
b. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern

40% of victims also reported being restrained or held down by assailants during the assault, and 8.2% of victims experienced assaults in which it was suspected that chemicals, such as date-rape drugs, may have been used to incapacitate them. Over one-fifth of victims reported losing consciousness at some point during the incident. Only about 11% victims reported that weapons were used during the assault. The most common weapon was a knife or sharp instrument.

Completed penetration was common: over three-quarters of victims reported completed vaginal, anal, and/or oral penetration. The most common was vaginal penetration (67.3%), followed by oral (28.5%) and anal (15.1%). Over one-fifth of victims reported being forced to complete a sexual act on assailants. A large majority of suspects did not use a condom (89.1%). Only about one-third of victims (30.9%) reported that they believed the suspect ejaculated.

Table 5.2: Assault Characteristics Documented during the Forensic Medical Examination (N=528).

Assault Characteristics	***f***	**Valid Percent[a]**	**Percent Full Sample**
Victim-Suspect Relationship			
Stranger	143	32.1%	27.1%
Acquaintance/date	227	50.9%	43.0%
Parent/relative	13	2.9%	2.5%
Intimate partner/ex-partner	63	14.1%	11.9%
Location			
Inside	409	80.2%	77.5%
Outside	76	14.9%	14.4%
Other	25	4.9%	4.7%
Number of Suspects			
One	405	86.2%	76.7%
Two or more	65	13.8%	12.3%
Verbal Threats	123	26.7%	23.3%
Physical Force[b]	162	35.1%	30.7%
Choking	57	12.4%	10.8%
Bites	40	8.7%	7.6%
Hitting	74	16.1%	14.0%
Burns	< 5	--	--
Other[c]	136	29.5%	25.8%
Restraints/Held Down	188	39.7%	35.6%
Chemical Used to Incapacitate	38	8.2%	7.2%
Weapon Used[bd]	49	10.6%	9.3%
Gun	14	3.0%	2.7%
Knife/Sharp Object	33	7.2%	6.3%
Blunt Object	5	1.1%	0.9%
Penetration[b]	378	78.6%	71.6%
Vagina	332	67.3%	62.9%
Anus	77	15.1%	14.6%
Mouth	144	28.5%	27.3%
Act by Victim on Suspect	99	21.9%	18.8%
Condom Used	57	10.9%	10.8%
Suspect Ejaculated	162	30.9%	30.7%
Loss of Consciousness	111	21.7%	21.0%

a. Excludes cases with missing data.
b. Some victims reported more than one type of physical force, weapon used, or penetration location.
c. Most common types of other force reported were pushing, grabbing, pulling hair, dragging, and throwing the victim.
d. Less than 5 cases included other weapons not listed. These were included in the total weapon used.

Examination Characteristics. Table 5.3 provides information on examination characteristics. Forensic medical examinations of the victims in the sample usually occurred relatively soon after the alleged incidents. More than a third of victims were examined within 6 hours of the assault and two thirds within 18 hours. But nearly one-quarter were examined after 24 hours had passed, a time period that research indicates forensic medical examinations may yield significantly less forensic evidence (Christian, Lavelle, DeJong et al., 2000). Nearly all of the victims had completed rape kits and over a quarter had a toxicology kit completed during the examination. SANE trained nurses examined a little over two-thirds of the victims in the sample.

Genital examination data were available for 70% of victims. The biggest reason genital examination data were missing for the other 30% is that, prior to 2006, the form recording genital examination data did not include a duplicate sheet that was included in the evidence kit sent to the crime laboratories, as mentioned above. In addition, in a small percentage of cases, genital examinations are not conducted because of the history of the assault, for example, if there was no genital contact. There was no relationship between having genital examination data and patient age, sex, race, relationship to perpetrator, experience of force in the assault, or type of examiner. The only variable we found that was significantly related to presence of genital examination data was victims' report about penetration. The proportion was 70.7% to 73.6% for victims who reported that they were unsure if there was penetration, victims who reported that penetration was attempted but not completed, and victims who reported that there was definitely penetration. In the small proportion of cases (7.3% of the sample) in which patients reported no penetration, 31.6% or 12 cases had genital examination data. Because a) genital examination data were primarily missing because of differences in documentation by year, b) we have no reason to expect differences by year in results and, c) having missing genital examination data was not systematically related to almost every variable we tested, we decided that it was reasonable to

treat

Table 5.3: Forensic Medical Examination Characteristics (N=528).

Examination Characteristics	***f***	**Valid Percent[a]**	**Percent Full Sample**
Time from Incident to Medical Exam			
6 hours or less	158	35.0%	29.9%
7 to 12 hours	86	19.0%	16.3%
13 to 18 hours	56	12.4%	10.6%
19 to 24 hours	44	9.7%	8.3%
More than 24 hours	108	23.9%	20.5%
Rape kit completed	504	98.6%	95.5%
Toxicology kit completed	100	25.9%	18.9%
SANE completed kit	349	69.8%	66.1%
Photos taken of non-genital injuries	71	13.9%	13.4%
Genital examination conducted	369	69.9%	69.9%
Genital examination method[b]			
Direct visualization	357	97.5%	67.6%
Speculum used	284	80.2%	53.8%
Medscope used	< 5	--	--
Anoscopic used	< 5	--	--
Control swab	378	97.7%	71.6%
Known blood sample taken	353	91.9%	66.9%
Oral swabs and smears	214	55.7%	40.5%
Fingernail scrapings	231	60.3%	43.8%
Foreign material collected	95	24.9%	18.0%
Clothing taken	221	57.6%	41.9%
Underwear worn at time of assault taken	172	45.3%	32.6%
Underwear worn after assault taken	104	27.5%	19.7%
Bite marks recorded	35	9.0%	6.6%
Head hair combings	297	76.3%	56.3%
Pubic hair combings	160	41.3%	30.3%
External genital swab	344	89.1%	65.2%
Vaginal swabs and smears	332	86.5%	62.9%
Perianal swabs	312	81.5%	59.1%
Anorectal swabs and smears	150	39.2%	28.4%
Additional swabs	168	44.0%	31.8%

a. Excludes cases with missing data.
b. Some examinations involved more than one method.

missing genital examination data as missing at random and we excluded these cases from analyses involving genital examination data.

Direct visualization of the victim was an examination method used in almost every case, followed by speculum use in four-fifths of cases. Common types of evidence collected in a large majority of cases included control swabbing, taking blood samples from the victims, external genital swabbing, vaginal swabbing and smears, perianal swabbing, and head hair combings. Also common but less so were fingernail scrapings, oral swabbing and smears, additional swabbings, pubic hair combings, anorectal swabbing and smears, and collection of foreign materials. These latter percentages are somewhat lower because these procedures would not be done with certain types of assaults reported by victims, or because the examiner did not judge that the benefits of these procedures outweighed the costs. For instance, examiners may not complete oral swabbing and smears if victims do not report oral penetration, and pubic hair combing may not be done if the history suggests that the probability of obtaining evidence from this uncomfortable procedure is low.

Injury Characteristics. Table 5.4 provides data on the injuries documented during the forensic medical examinations. Over half of victims had documented non-genital injuries, while just over one-third had documented genital injuries. Although over half had documented non-genital injuries, only 13.9% of victims had photographs taken of those injuries.[3] Non-genital injuries included bruises, contusions, lacerations, fractures, bites, or burns. Common locations of documented non-genital injuries on victims were the legs (26.4%), arms (24.0%), backs (14.5%),

[3] Massachusetts SANE protocol proscribes photographing of genital injuries; see Chapter 4.

necks (14.1%), faces (11.7%), or knees (10.9%). Genital injuries included genital bleeding, swelling, redness, abrasions, tearing, or other injuries to the genital structures. The most common

Table 5.4: Victim Injury Characteristics (N=528).

Injury Characteristics	**Frequency**	**Valid Percent**	**Percent of Total Sample**
Non-genital injuries[a]	270	52.7%	51.1%
Scalp	18	3.5%	3.4%
Face	60	11.7%	11.4%
Neck	72	14.1%	13.6%
Mouth	15	2.9%	2.8%
Breast	38	7.4%	7.2%
Abdomen	33	6.4%	6.3%
Chest	22	4.3%	4.2%
Back	74	14.5%	14.0%
Arms	123	24.0%	23.3%
Hands	42	8.2%	8.0%
Knees	56	10.9%	10.6%
Legs	135	26.4%	25.6%
Feet	18	3.5%	3.4%
Pattern injury or bite mark	23	4.5%	4.4%
Incise wound	12	2.3%	2.3%
Genital injuries[a]	182	35.4%	34.5%
Serious genital injury[b]	48	9.3%	9.1%
Genital bleeding	29	5.6%	5.5%
Genital swelling	49	12.9%	9.3%
Genital redness	103	27.1%	19.5%
Genital abrasions	49	12.9%	9.3%
Genital tearing	32	8.4%	6.1%
Other injuries to genital structures	52	13.8%	9.8%

a. Some victims had more than one injury noted. b. Coded if there were one or more of the following genital injuries: tearing, incise wound, puncture wound and/or laceration

genital injury type documented during the examination was genital redness in over one-fifth of cases, followed distantly by other injuries to genital structures[4], genital swelling and genital

[4] These reflect injuries other than swelling, redness, abrasion, or tearing of the genital structures.

abrasions.

Biological Evidence Results. About two-thirds of all cases in the sample had biological evidence (see Table 5.5). This percentage includes victims with missing data, usually missing because laboratory testing was not done in a given case. When missing data are excluded, the percentage increases dramatically to 84.6% of victims. The most common type of biological evidence found was semen (45.8%). Crime laboratory technicians were able to generate a DNA profile from the biological evidence found in 41.2% of the cases, or 26.9% of the full sample. When only looking at those cases in which a DNA profile was generated, we found that in 28.2% of the cases the DNA profile generated matched an identified suspect in the case. Less frequent were matches through CODIS. Of those cases in which a DNA profile was generated, 7.0% percent matched another case in CODIS and 16.2% matched a convicted offender's DNA in CODIS. When considering the full sample, the percentages of cases in which there was DNA matching to identified suspects, DNA matching to other cases through CODIS or DNA matching to convicted offenders through CODIS dropped to 7.6%, 1.9%, and 4.4% respectively. The results of the crime laboratory analysis were reported to police or prosecutors overseeing the case over three-quarters of the time.

Table 5.5: Biological Evidence Results (N=528).

Evidence Results	*f*	Valid Percent	Percent Full Sample
Biological evidence found[a]	345	84.6%	65.3%
Blood	110	27.0%	20.8%
Saliva	139	34.1%	26.3%
Semen	242	59.3%	45.8%
Other biological materials	147	38.4%	27.8%
DNA profile generated	142	41.2%[b]	26.9%
DNA match to suspect	40	28.2%[c]	7.6%
DNA match in CODIS - another case	10	7.0%[c]	1.9%

DNA match in CODIS - convicted offender	23	16.2%[c]	4.4%
Lab reported results to police or prosecutor	404	76.5%	76.5%

a. Forensic analysis may have resulted in more than one type of biological evidence found.

b. Valid percentage reflects only those cases in which biological evidence was found.

c. Valid percentage reflects only those cases in which a DNA profile was generated.

Comparison of Stranger and Non-Stranger Cases

One goal of this research was to explore differences in criminal justice case outcomes by victim-suspect relationship. It was hypothesized that forensic evidence may be especially salient in stranger cases because of its potential to assist with identification of the suspect. Because other differences between stranger and known assailant cases might confound the comparison of these two groups on injury and biological evidence, bivariate comparisons were conducted on differences between stranger and known assailant cases on types of victims and assaults and on examination characteristics, as well as on crime laboratory outcomes.

Bivariate Findings. The only notable difference on victim characteristics was gender (see Table 5.6); a slightly higher percentage of stranger than known suspect cases involved male victims (χ^2 [1, 444] = 7.32, p = .007). Known suspect cases were significantly more likely to occur inside as compared to non-stranger cases (χ^2 [2, 436] = 32.35, p < .001), but less likely to involve a weapon (χ^2 [1, 391] = 13.82, p < .001) (see Table 5.7). Victims assaulted by known assailants were less likely to report suspect condom use as compared to victims assaulted by strangers (χ^2 [2, 443] = 8.05, p = .018). Victims of strangers were more likely than victims of known assailants to report performing a sex act on the suspect or not knowing if they had performed a sex act on the suspect (χ^2 [2, 387] = 7.14, p = .028). The mean number of hours between assault and examination was nine hours greater for known assailants compared to strangers (F [1, 398] = 7.95; p = .005) (Table 5.8). This delay in reporting explains the differences that existed between stranger and non-stranger cases in whether the examiners collected the underwear worn during the assault. A significantly higher percentage of victims assaulted by known persons had the underwear they were wearing after the assault taken as evidence (χ^2 [1, 323] = 6.13; p = .013).

Table 5.6: Comparison of Victim Characteristics in Stranger and Non-stranger Cases.

	Stranger		**Non-stranger**	
Victim Characteristics	*f*	**%**	*f*	**%**
Age (years)	M = 27; SD = 10.5		M = 26; SD = 11	
Gender**				
Male	11	7.7%	7	2.3%
Female	131	92.3%	295	97.7%
Race/Ethnicity				
White, Non-Hispanic	94	66.7%	200	66.9%
Black, Non-Hispanic	17	12.1%	27	9.0%
Hispanic	24	17.0%	55	18.4%
Other[a]	6	4.3%	17	5.7%

a. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern
* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.7: Comparison of Assault Characteristics in Stranger and Non-Stranger Cases.

	Stranger		**Known assailant**	
Assault Characteristics	***f***	**%**	***f***	**%**
Number of Suspects				
One	114	83.8%	267	88.7%
Two or more	22	16.2%	34	11.3%
Location***				
Inside	89	64.5%	261	87.6%
Outside	39	28.3%	27	9.1%

Other	10	7.2%	10	3.4%
Verbal Threats	41	31.8%	74	28.2%
Physical Force	55	42.6%	95	36.3%
Restraints/Held Down	55	41.7%	121	45.3%
Chemical Used to Incapacitate	12	9.3%	17	6.5%
Weapon Used***	25	19.4%	18	6.9%
Penetration	110	85.3%	239	84.5%
Act by Victim on Suspect*				
No	57	47.9%	167	62.3%
Yes	34	28.6%	58	21.6%
Unsure	28	23.5%	43	16.0%
Condom Used*				
No	66	46.5%	183	60.8%
Yes	20	14.1%	32	10.6%
Unsure	56	39.4%	86	28.6%
Suspect Ejaculated	43	30.1%	106	35.2%
Loss of Consciousness	28	20.0%	50	17.1%

* p ≤ .05; ** p ≤ .01; *** p ≤ .001.

Table 5.8: Comparison of Examination Characteristics in Stranger and Non-stranger Cases.

	Stranger		**Non Stranger**	
Examination Characteristics	***f***	**%**	***f***	**%**
Time from Incident to Medical Exam (hours)**	M = 15; SD = 21.5		M = 24; SD = 31.0	
Toxicology Kit Completed	26	24.5%	50	22.2%
SANE Completed Kit	93	69.4%	200	69.2%
Photos taken of non-genital injuries	20	14.5%	38	12.9%
Exam method				

Direct Visualization[+]	94	94.9%	213	98.6%
Speculum Used	75	82.4%	172	80.4%
Known blood sample taken	97	92.4%	206	92.0%
Oral swabs and smears*	69	65.1%	114	51.1%
Fingernail scrapings	59	55.7%	131	59.0%
Foreign material collected	29	27.6%	52	23.4%
Clothing taken	67	63.8%	127	56.7%
Underwear worn at time of assault taken	54	52.4%	99	44.6%
Underwear worn after assault taken*	20	19.6%	73	33.0%
Bite marks recorded	9	8.4%	22	9.7%
Head hair combings	82	76.6%	170	75.2%
Public hair combings	41	38.7%	97	43.1%
External genital swab	92	86.0%	202	90.2%
Vaginal swabs and smears[+]	87	82.1%	198	88.8%
Perianal swabs	85	80.2%	181	81.5%
Anorectal swabs and smears	44	41.5%	81	36.7%
Additional swabs	50	47.2%	106	48.0%

[+] $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Greater time between assault and examination was likely to be related to victims changing their clothing, including changing from the underwear worn at the time of the assault. A separate variable documented whether the underwear worn at the time of the assault was taken as evidence during the examination; no significant differences were noted there. Finally, victims assaulted by strangers were significantly more likely to have oral swab and smears completed as compared to victims assaulted by non-strangers (χ^2 [1, 329] = 5.68, *p* = .017), which is consistent with the victims of strangers being more likely to perform sex acts on the suspect, most likely oral sex.

Victims of strangers and known assailants did not differ on documented injuries (Table 5.9). This contrasts with past research that indicates that injuries are more likely in stranger cases than known assailant cases (Kilpatrick, Edmunds, & Seymour, 1992). Cases involving strangers were significantly more likely to have a DNA profile generated (χ^2 [1, 427] = 9.08, *p* = .003). No other differences on crime laboratory results were noted, including whether the DNA profile resulted in a match with the suspect or a match in CODIS (Table 5.10).

Table 5.9: Comparison of Victim Injury Characteristics in Stranger and Non-stranger Cases.

	Stranger		**Non Stranger**	
Injury Characteristics	***f***	**%**	***f***	**%**
Non-genital injuries	78	55.7%	144	49.3%
Pattern injury or bite mark	9	6.4%	11	3.7%
Genital injuries	48	34.3%	109	37.1%
Serious genital injury	14	10.0%	28	9.5%
Genital bleeding	8	5.7%	17	5.8%
Genital swelling	16	15.7%	28	12.6%
Genital redness	29	28.2%	62	27.9%
Genital abrasions	13	12.7%	28	12.6%
Genital tearing	10	9.8%	17	7.7%
Other injuries to genital structures	13	12.7%	28	12.7%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.10: Comparison of Crime Laboratory Findings in Stranger and Non-stranger Cases.

	Stranger		Non Stranger	
Evidence Results	*f*	**%**	*f*	**%**
Biological evidence found	100	84.7%	192	85.7%
Blood	28	23.7%	61	27.2%
Saliva	40	33.9%	83	37.1%
Semen	76	64.4%	134	59.8%
Other biological materials	43	39.4%	74	34.9%
DNA profile generated**	52	38.5%	71	24.3%
DNA match to suspect	13	10.0%	23	8.4%
DNA match in CODIS - another case	< 5	--	5	1.7%
DNA match in CODIS - convicted offender	6	4.7%	13	4.5%
Lab reported results to police or prosecutor+	116	81.1%	222	73.3%

+ $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Examinations Completed by Non-SANE and SANE Trained Practitioners

Bivariate analyses examined differences between SANE and non-SANE cases in types of victims and assaults as well as examination characteristics and forensic outcomes because these differences may impact criminal justice outcomes.

Bivariate Findings. Victim race-ethnicity was significantly associated with medical examiner type; minority victims—black, Hispanic, or other—were significantly more likely than white, non-Hispanic victims to have a forensic medical examination completed by a SANE (see Table 5.11) (χ^2 [3, 491] = 20.98, p < .001). This likely reflects the presence of SANE programs in hospitals that serve higher percentages of minority clients. SANEs were significantly more likely to document that the victim reported being restrained or held down during the assault incident (χ^2 [1, 435] = 6.34, p = .01) (see Table 5.12), and that the victim may have been chemically incapacitated, whether by mace or drug (χ^2 [1, 435] = 4.34, p = .04). SANE and non-

SANE practitioners differed in the frequency of several examination activities (see Table 5.13).

Table 5.11: Comparison of Victim Characteristics by Medical Examiner Type.

	Non-SANE		SANE	
Victim Characteristics	*f*	%	*f*	%
Age (years)	M = 27; SD = 11.8		M = 26; SD = 11.1	
Gender				
Female	146	96.7%	332	96.0%
Male	5	3.3%	14	4.0%
Race/Ethnicity***				
White, Non-Hispanic	123	81.5%	208	61.2%
Black, Non-Hispanic	9	6.0%	38	11.2%
Hispanic	17	11.3%	70	20.6%
Other[a]	2	1.3%	24	7.1%

a. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern
* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.12: Comparison of Case Characteristics by Medical Examiner Type.

	Non-SANE		SANE	
Case Characteristics	*f*	**%**	*f*	**%**
Victim - Suspect Relationship				
Stranger	41	31.5%	93	31.7%
Non-stranger	89	68.5%	200	68.3%
Number of Suspects				
One	116	84.7%	267	87.0%
Two or more	21	15.3%	40	13.0%
Location				
Inside	116	78.4%	273	81.0%
Outside	23	15.5%	50	14.8%
Other	9	6.1%	14	4.2%
Verbal Threats	34	27.0%	76	24.6%
Physical Force	43	34.1%	107	34.6%
Restraints/Held Down*	12	9.5%	60	19.4%
Chemical Used to Incapacitate*	5	4.0%	31	10.0%
Weapon Used	9	7.1%	36	11.7%
Penetration	109	78.4%	246	77.6%
Act by Victim on Suspect				
No	69	56.1%	170	55.2%

Yes	28	22.8%	65	21.1%
Unsure	26	21.1%	73	23.7%
Condom Used				
No	84	56.0%	172	50.0%
Yes	11	7.3%	43	12.5%
Unsure	55	36.7%	129	37.5%
Suspect Ejaculated	52	35.1%	102	29.3%
Loss of Consciousness	27	18.8%	83	24.5%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.13: Comparison of Examination Characteristics by Medical Examiner Type.

	Non-SANE		**SANE**	
Examination Characteristics	*f*	**%**	*f*	**%**
Time from incident to medical exam (hours)	M = 20; SD = 26.1		M = 21; SD = 28.4	
Toxicology kit completed*	38	35.2%	59	22.7%
Photos taken of non-genital injuries^{+}	15	10.3%	56	16.5%
Exam method				
Direct visualization	100	100.0%	239	96.4%
Speculum used	81	81.8%	191	79.9%
Known blood sample taken*	92	86.8%	246	94.6%
Oral swabs and smears	63	58.9%	140	54.3%
Fingernail scrapings	63	58.9%	158	61.5%
Foreign material collected	32	30.2%	57	22.2%
Clothing taken**	74	69.8%	138	53.3%
Underwear worn at time of assault taken	46	43.4%	116	45.5%
Underwear worn after assault taken^{+}	36	33.3%	62	24.7%
Bite marks recorded	7	6.4%	28	10.7%
Head hair combings***	96	88.1%	189	72.4%
Pubic hair combings***	68	63.0%	87	33.5%
External genital swab	101	92.7%	225	87.2%
Vaginal swabs and smears	97	89.0%	219	85.5%
Perianal swabs*	82	75.2%	214	83.9%
Anorectal swabs and smears	44	40.4%	98	38.4%
Additional swabs***	29	27.1%	134	52.3%

$^{+}$ $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Non-SANE practitioners were significantly more likely than their SANE counterparts to complete a toxicology kit (χ^2 [1, 368] = 6.14, *p* = .01), collect victim clothing (χ^2 [1, 365] = 8.44, *p* = .004), complete head hair combings (χ^2 [1, 370] = 10.66, *p* = .001), and complete pubic hair combings (χ^2 [1, 368] = 27.24, *p* < .001). Other activities were more common for SANE examiners. SANE examinations were more likely to include a known blood sample compared to non-SANE examinations (χ^2 [1, 366] = 6.52, *p* = .01). SANEs also completed certain types of swabbing at a higher frequency than non-SANEs. SANEs did perianal swabbing in nearly 84% of examinations compared to 75.2% of examinations by non-SANEs (χ^2 [1, 364] = 3.80, *p* = .05), and SANEs did additional swabbing in 52.3% of examinations compared to only 27.1% of examinations by non-SANEs (χ^2 [1, 363] = 19.43, *p* < .001).

SANE and non-SANE examiners did not differ on finding non-genital injuries, but differed significantly on finding genital injuries (see Table 5.14). Almost 41% of examinations completed by SANEs had genital injuries documented compared to only 24.0% of examinations completed by non-SANEs (χ^2 [1, 486] = 12.71, *p* < .001). SANEs were also more likely than non-SANEs to

document serious genital injuries (χ^2 [1, 486] = 7.39, *p* = 01). Specific forms of injury found more often by SANEs than non-SANEs were genital redness (χ^2 [1, 362] = 6.97, *p* = .01), and genital tearing (χ^2 [1, 362] = 6.73, p = .01).

No differences, however, were noted for whether the crime laboratory identified biological evidence in cases handled by non-SANEs and SANEs (see Table 5.15). Both groups were just as likely to have completed examinations in which biological evidence was found by the laboratory and just as likely to have a DNA profile generated from biological evidence collected.

Table 5.14: Comparison of Injury Characteristics Documented by Medical Examiner Type.

Injury Characteristics	Non-SANE *f*	Non-SANE %	SANE *f*	SANE %
Non-genital Injuries	82	56.2%	179	53.0%
Pattern injury or bite mark	5	3.4%	17	5.0%
Genital injuries***	35	24.0%	139	40.9%
Serious genital injury**	6	4.1%	41	12.1%
Genital bleeding	6	4.1%	21	6.2%
Genital swelling+	8	7.3%	36	14.3%
Genital redness**	19	17.4%	78	30.8%
Genital abrasions	10	9.1%	38	15.1%
Genital tearing**	3	2.8%	28	11.1%
Other injuries to genital structures*	8	7.3%	41	16.3%

+ $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.15: Comparison of Crime Laboratory Findings by Medical Examiner Type.

Evidence Results	Non-SANE *f*	Non-SANE %	SANE *f*	SANE %
Biological evidence found	96	85.7%	226	84.0%
Blood	27	24.1%	72	26.8%
Saliva	40	35.7%	90	33.5%
Semen	70	62.5%	162	60.2%
Other biological materials	48	44.4%	94	37.9%
DNA profile generated	35	24.6%	99	29.4%
DNA match to suspect	9	6.5%	28	8.9%
DNA match in CODIS - another case	<5	--	8	2.4%
DNA match in CODIS – convicted offender	5	3.5%	16	4.0%
Lab reported results to police or prosecutor	111	73.5%	266	76.2%

+ $p \leq .10$; * $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Documentation of Victim Injuries

In sexual assault cases, documented injury may reflect the severity of the assault and may be viewed by police and prosecutors as critical to providing proof that an assault occurred. As discussed in Chapter 2, some past research has found that victim injury is associated with various case outcomes, including whether police officers question and charge suspects (Frazier & Haney,

1996) and prosecutors approve felony charges (Alderden & Ullman, 2012; Beichner & Spohn, 2005). This section of the report discusses the types of injuries recorded during the forensic medical examination.

Two different types of injuries are documented during a forensic medical examination: non-genital and genital. Medical personnel completing the forensic medical examinations indicate injuries by displaying them on the human body diagram provided on the examination form. The diagrams listed on the form include the full-body back and front, head, mouth, and the male and female genital areas (see Form 4 of the Massachusetts Sexual Assault Evidence Kit; Appendix B). In addition to locating injuries on the body map, examiners also list the injuries, document their size and type (e.g., contusions, lacerations), and indicate whether injuries were photographed.

Genital Injuries. Table 5.16 presents the rates at which different types of genital injuries were documented by the medical professional conducting the examination. Genital injuries to victims were noted in about one-third of the total sample. The most common specific female genital injuries recorded were injuries to the vagina (12.1%) posterior fourchette (11.5%), labia minora (10.9%), and cervix (10.1%). Some females had more than one documented genital injury. For the 22 male victims in the sample, only two genital injuries were noted: one to a victim's penis, and one to a victim's perineum. Injuries to the anus were uncommon in both sexes: less than 3% of victims had such injuries recorded.

Crosstabulations and associated Pearson χ^2 tests were conducted to identify case factors associated with recorded genital injuries, besides victim-suspect relationship and type of examiner (their relationship to genital injuries was discussed above). Case factors examined include victim race/ethnicity; number of assailants; whether physical force, restraint, chemicals, or weapons were used during the assault; whether penetration occurred; whether a speculum was used during the exam (female only); and the time, measured in hours, from assault to examination. Victim race/ethnicity was examined because past research has documented that victims with darker skin may be less likely to have their genital injuries identified (Sommers, 2007). Number of assailants and the amount of force and restraint used during the assault were examined because each increases aggressive contact with the victim and thus could increase the likelihood of sustaining an injury. Chemical incapacitation could result in fewer injuries because the victim cannot resist, as could attacks with a weapon because of victim compliance out of fear. Alternatively, use of chemical or a weapon could indicate an assailant more likely to act brutally and cause injuries.   Delays in reporting the assault may decrease injury identification as injuries may have already healed with delays.

Table 5.16: Documented Genital Injury Characteristics.

Injury Location	***f***	**% of Sample[a]**
Female genital injury		
Labia majora	27	5.4%
Perineum	27	5.4%
Clitoris	19	3.8%
Labia minora	55	10.9%
Periurethral tissue	23	4.6%
Hymen	36	7.2%
Posterior fourchette	58	11.5%
Fossa navicularis	43	8.5%
Vagina	61	12.1%
Cervix	51	10.1%
Other female genital injury	5	1.0%
Female and male genital injury		
Perianal skin	12	2.3%
Anal verge/folds/rugae	12	2.3%
Anal tone	2	0.4%
Buttocks	10	1.9%

a. Sample size for the female injury percentages were based on 503 females in the sample.

Sample size for the female and male anus injuries were based on the total sample of 528. Percentages for male injuries were not included due to low frequencies.

In these bivariate analyses, only use of a speculum was significantly associated with more documented female genital injuries (χ^2 [1, 354] = 5.65, p = .017). Of note, there was also a trend toward a relationship between report of use of physical force by the suspect and genital injury. As expected, physical force was associated with more documented genital injuries (χ^2 [1, 447] = 3.05, p = .081).

A multivariable logistic regression model was conducted to control for potential confounding relationships among the independent variables and to identify the variables with strongest relationship to genital injury. The sample used was restricted to females to examine more closely the independent effects of use of speculum and examiner type, and because male victims assaults accounted for few cases and few documented injuries. Included in the model were three variables—speculum use (no, yes), examiner type (SANE, non-SANE) and physical force used (no, yes). The overall model was significant (χ^2 [3, 297] = 26.4, $p < .001$) and the Hosmer and Lemeshow goodness of fit test indicated a good fit (χ^2 [5, 297] = .219, p = .999). Of the variables examined, having a SANE trained practitioner complete the exam was the most influential factor (Table 5.17). SANE involvement increased the odds of genital injury documentation by three fold even after controlling for the other variables. Use of a speculum was also independently associated with injury identification, and the moderate relationship between genital injury and physical force was maintained.

Non-Genital Injuries. The rate of non-genital injury was 52.9%. The number of injuries sustained by victims ranged from one injury to 87 separately documented injuries, but most victims typically had between one to eight separate injuries noted. The most frequent location of non-genital injuries sustained by victims was the legs (26.4%), followed by the arms (24.0%), back (14.5%), neck (14.1%), face (11.7%), and knees (10.9%). As with genital injuries, some victims experienced several injuries to multiple body parts. About 14% of the victims had photographs taken of their injuries.

Table 5.17: Factors Associated with Finding of Genital Injury

Predictor	*B*	*SE*	*p*	OR
Speculum (0=yes, 1=no)	-.88	.33	.008	.414
SANE trained (0=no, 1=yes)	1.13	.29	.000	3.08
Physical force	.49	.26	.058	1.64

χ^2 = 25.44, df = 3, $p \leq .001$
-2LL = 382.45, Nagelkerke R^2 = .114
Hosmer and Lemeshow χ^2 = .219, df = 5, p = .999

$^+$ p ≤ .10; * p ≤ .05; ** p ≤ .01; *** p ≤ .001.

Crosstabulations with Pearson χ^2 tests were constructed to identify case factors significantly associated with recorded non-genital injuries (in addition to victim-suspect relationship and type of examiner, discussed above). The case factors included victim race/ethnicity; number of assailants; whether physical force, restraint, chemicals, or weapons were used during the assault; whether penetration occurred; whether a SANE trained professional completed the examination; and the time, measured in hours, from assault to examination. These variables were examined for the same reasons noted for the genital injuries.

Race of the victim, number of assailants, physical force, and chemical incapacitation were related to non-genital injuries at the bivariate level. Whites and individuals identified as other race were significantly more likely to have non-genital injuries identified as compared to victims identified as Black or Hispanic (χ^2 [3, 503] = 9.15, p = .027). Having two or more assailants was also associated with a greater likelihood of non-genital injuries as compared to be assaulted by one individual (χ^2 [1, 455] = 3.97, p = .046) as was being chemically incapacitated (χ^2 [1, 445] = 3.84, p = .050). Victims who experienced physical force were also more likely than their counterparts to have non-genital injuries noted (χ^2 [1, 445] = 27.7, p < .001).

Variables significant at the bivariate level were then entered into a multivariable logistic regression model. The model was significant and review of the goodness-of-fit test indicates the data were a good fit for the model (Table 5.18). Victim race no longer was significant at the multivariable level. It was moderately related to chemical incapacitation and that may account for this change. Physical force and chemical incapacitation were still significantly associated with non-genital injuries; victims who experienced physical force or chemical incapacitation were over three times more likely to be injured. Number of assailants was now only a statistical trend, with more assailants increasing the likelihood of injuries.

Table 5.18: Factors Associated with Finding of Non-genital Injury

Predictor	*B*	*SE*	*p*	OR
Black (White)	-.572	.38	.130	
Hispanic (White)	-.371	.30	.215	
Other (White)	.338	.48	.480	
Chemical incapacitation	1.13	.46	.013	3.10
Two or more assailants	.582	.32	.070	1.79
Physical force	1.20	.23	.000	3.31

χ^2 = 25.44, df = 3, $p \leq .001$
-2LL = 382.45, Nagelkerke R^2 = .114
Hosmer and Lemeshow χ^2 = .219, df = 5, p = .999

Analysis of Biological Evidence

We were able to document that the crime laboratory tested the contents of the medical forensic medical examination kit in 408 cases (77.3%) of the original 528 cases included in the sample. The results of laboratory tests are documented by the crime laboratory analysts in criminalistic reports submitted to police and prosecutors. A copy of the criminalistic report is maintained at the crime laboratory, which we used to document case laboratory testing and results. In 44.2% of the 120 cases in which no laboratory tests were available we were able to document why there was no criminalistic report. The most common reason noted for no criminalistic report was that the case did not move forward (66.0%), followed by notation that the victim was uncooperative (15.1%), the victim declined to press charges or did not want to pursue the case (5.7%) or the case was unfounded (3.8%).

Cases involving strangers were slightly more likely to have a criminalistics report to police or prosecutors noted in the laboratory file (χ^2 [1, 446] = 3.26; p = .071). These findings suggest that police investigators and/or prosecutors may be more likely to seek DNA profiling in stranger cases, in order to help identify suspects, and it may be less important in cases in which suspects were known. Cases with crime laboratory analysis did not differ significantly from cases without crime laboratory analysis on victim age, sex, race, experience of force in the assault, and presence of a genital examination. Examinations conducted by SANEs and non-SANEs did not differ in the frequency of crime laboratory analysis. Crime laboratory analysis was substantially more likely when cases were not unfounded (χ^2 [1, 490] = 65.96; $p < .001$) and when arrests were made (χ^2 [1, 314] = 7.22; p =.007).

Of the cases in which laboratory testing was completed and reported to police and prosecutors (n=408), 84.6% had biological evidence identified. Semen was the most common type of biological evidence found (59.3%), followed by saliva (34.1%) and blood (27.0%). Body swabs were the most frequent sources of positive biological evidence (63.9%). As indicated in Table 5.19, semen was significantly more likely to be found in cases in which external genital swabbing, vaginal swabbing, or perianal swabbing was completed during the forensic medical examination. Additional swabbing was also moderately associated with semen being found. Thus, elements of the kit, particularly body and genital swabs, were important in generating biological evidence. As mentioned above, no differences were found by examiner type; cases handled by non-SANE trained medical providers were just as likely to produce biological evidence as those completed by SANEs.

Forty-one percent of those cases with biological evidence had a DNA profile generated. Another 4.1% of cases had pending analyses. The DNA from the cases in which the laboratory was able to successfully generate a DNA profile (n=142) matched the suspect in 40 cases (28.2%), matched a convicted offender in CODIS in 23 cases (16.2%), and matched the DNA profile in CODIS from another case in 10 cases (7.0%). DNA evidence has the potential to identify suspects in sexual assault cases, and therefore may be particularly useful in cases in which the suspects are strangers. Positive lab results for amylase and semen were correlated with a DNA profile being generated. Both were positively and significantly correlated with a DNA profile finding, although the relationship between DNA profile and positive semen finding was stronger (r = .45) than for amylase (r = .12). A finding of amylase was also significantly correlated with positive finding of semen (r = .19). Finding evidence of blood was not associated with saliva, semen, or DNA profiling.

Table 5.19: Types of Evidence Associated with Finding of Semen

	No Semen Found		Semen Found	
Type of Swab	*f*	**%**	*f*	**%**
External genital swabs**				
No	20	64.5%	11	35.5%
Yes	104	38.5%	166	61.5%
Vaginal swabs**				
No	25	59.5%	17	40.5%
Yes	98	38.1%	159	61.9%
Perianal swabs**				
No	30	58.8%	21	41.2%
Yes	93	37.7%	154	62.3%
Anorectal swabs				
No	75	42.1%	103	57.9%
Yes	46	38.3%	74	61.7%
Additional swabs^{+}				
No	73	45.6%	87	54.4%
Yes	49	35.3%	90	64.7%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Additional multivariable analyses were conducted to learn more about what types of victim, case, and forensic medical examination factors were associated with the positive finding of semen. We focused on semen because of its high correlation to DNA profile production and because the presence of semen may further support victim reports of sexual contact. Bivariate analyses indicated that four variables were significantly related to the finding of semen: younger age, penetration, no condom use, and the forensic medical examination occurring within 24 hours of the assault. Victim age, penetration and forensic medical examination were then entered into a stepwise logistic regression model, followed by external swabbing and additional swabbing. Condom use was excluded from the analysis due to its relatively high correlation with penetration, and vaginal swabbing and perianal swabbing were excluded from the analysis due to their high correlation with external genital swabbing. Table 5.20 provides the final full model: no significant changes occurred in the stepwise logistic regression model after entering the swabbing variables. Victim age and timing of the exam remained significant in the final model. Younger victims were significantly more likely to have semen found as were individuals whose exams occurred within 24 hours of the assault. The odds of finding semen decreased 11% when there was a five age year difference between victims, 21% when there was a 10 year age difference, 30% when there was a 15 year age difference, and 38% when there was a 20 year age difference between victims The odds decreased by more than half when the exam occurred beyond 24 hours of the assault. There was no independent relationship between penetration and the finding of semen after controlling for the influence of age and the timing of the exam. Both external swabbing and additional swabbing were significantly associated with finding of semen in the multivariable equation. External swabbing was associated with a 3.1 increase in the odds of finding semen, while additional swabbing was associated with a 1.7 increase in the odds of finding semen.

Table 5.20: Factors Associated with Finding of Semen during Forensic Analysis[a]

Predictor	*B*	*SE*	*p*	OR
Age (years)	-.024	.01	.038	.977
Penetration	.284	.311	.361	
Exam after 24 hours of assault	-.732	.332	.027	.481
External genital swabbing	1.12	.432	.010	3.06
Additional genital swabbing	.535	.277	.053	1.708

$\chi^2 = 20.30$, df = 5, $p < .001$
-2LL = 314.16, Nagelkerke $R^2 = .106$

Hosmer and Lemeshow $\chi^2 = 11.80$, df = 8, $p = .160$

Timing of Assault, Arrest, and Biological Evidence Collection and Analysis

Examining the timing of evidence is important in determining the extent to which biological evidence results could influence police arrest decisions. If biological evidence results are reported after an arrest is made, one can conclude that the biological results did not impact the decision to arrest in that case.

The first point in time analyzed was the number of hours between the assault and the forensic medical examination. As shown in Figure 5.1, 50.4% of the victims had a medical forensic medical exam within 12 hours of the assault, and 94% had an exam within 72 hours of the assault. Thus, in cases in which forensic medical exams were completed, almost all occurred within the 72 hour time period, the recommended examination window according to national standards during the time period examined (2008 – 2010). Nearly half of the kits arrived at the crime laboratory within 7 days of the examination, and 85% of the kits arrived within 30 days of the examination. Reporting of the crime laboratory results generally occurred within 120 days of arrival to the lab (88.6% of all kits), with 35.4% of cases the laboratory results being reported within 30 days of arrival to the lab.

The relationship between the timing of evidence and the timing of arrest clearly indicates that most arrests preceded forensic evidence analysis. As Figure 5.2 indicates, 37.4% of arrests occurred the same day of the incident and 81.3% occurred within 7 days of the assault. In fact, 92.7% of cases had an arrest within 60 days of the incident. Indeed, when the time and dates of the assault, arrest, and biological evidence collection and analysis are examined collectively, the results of forensic analyses were available for the vast majority of arrests only after the arrest took place. In only 8 cases did the arrest follow forensic results being reported to police. An additional three cases had arrests only a day or two before the crime laboratory report, and thus it is reasonable to infer in these cases that results of the forensic analyses were likely known prior to the arrest, although not quite yet officially reported. These 11 cases represent 2.1% of the final sample (N=528) and 8.5% of arrests (n=130). When looking at these 11 cases, we see that most of the arrests in these cases occurred well after a week of the assault. As noted, 81.3% of arrests occurred within one week, or 7 days, of the assault. In these cases, only 2.0% had laboratory results available to investigators. In arrests that occurred after 7 days of the assault, 39.1% of the cases had laboratory results prior to the arrest.

Figure 5.1: Percent of Cases by Time Periods

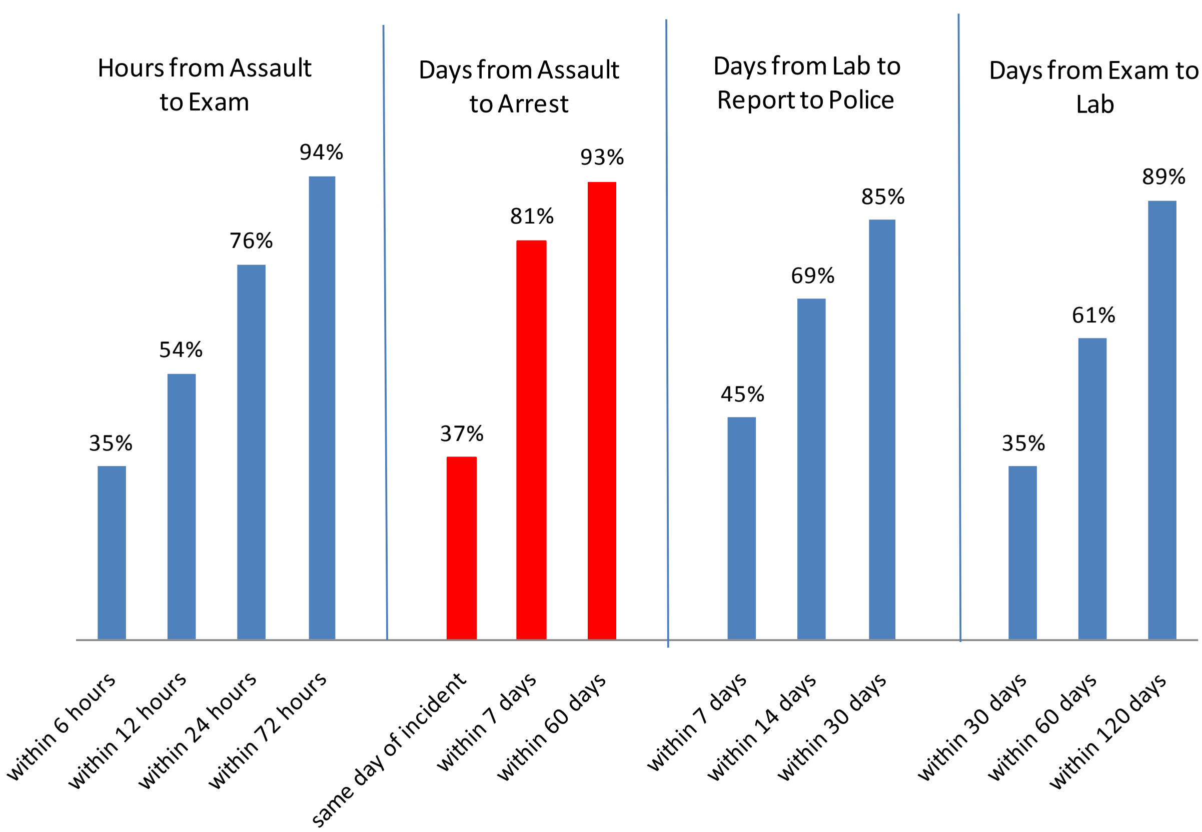
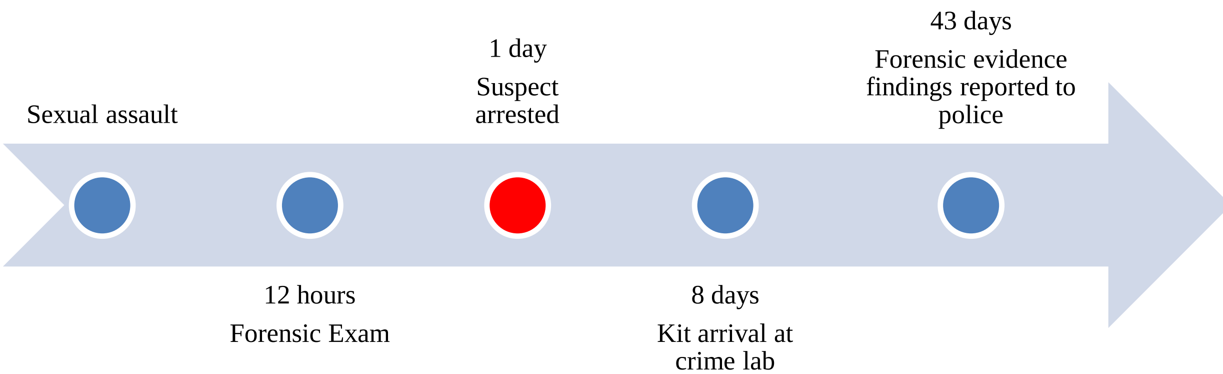


Figure 5.2. Median Times from Assault to Reporting of Laboratory Results



The results of tests for biological evidence cannot possibly influence arrests that occur beforehand, nor is it possible for an arrest magically to cause a finding of biological evidence that would otherwise not have occurred (in the subsample used in this analysis, all kits had been tested). Nevertheless, we were still interested in the relationship between arrest and laboratory analyses in these cases, because a relationship between the two variables in this circumstance must be a result of one or more third variables associated with both arrest and biological evidence. Understanding variables that might indirectly link biological evidence with arrest is useful information for developing a full understanding of the role of biological evidence in sexual assault cases. Results are presented separately below for cases in which arrest preceded forensic evidence reporting and those in which forensic evidence reporting preceded arrest.

Cases in which Arrest Preceded Forensic Evidence Reporting. The analyses in this section only included arrest cases if the arrest preceded forensic evidence reporting, which was true for the vast majority of cases. These arrest cases were significantly more likely than cases without arrest to have biological evidence (93.0% versus 72.4%, respectively; χ^2 [1, 278] = 18.64, p < .001), despite the fact that it is logically impossible that the biological evidence caused the arrest or vice versa. Multivariable analyses were conducted to assess the relationship of victim, case and exam characteristics and arrest with biological evidence in these cases. Again, we focused on the finding of semen because it was the most common type of biological evidence noted in the forensic analyses, it was more strongly correlated with the DNA profile generation than other types of biological evidence, and semen may provide corroboration that sexual contact occurred. The five predictor variables that were significantly related to finding semen (see above) were included along with the variable indicating arrest being made (see Table 5.21). Even controlling for these five predictor variables, there was a moderately significant relationship between arrest and finding of biological evidence. The odds of finding biological evidence in cases increased nearly two-fold when an arrest was made, though this relationship was not quite statistically significant, with a p value of .07.

Table 5.21: Factors Associated with Finding Biological Evidence.

Predictor	*B*	*SE*	*P*	OR
Age (years)	-.019	.014	.159	
Penetration	.339	.404	.401	
Exam after 24 hours of assault	-.760	.408	.063	.468
External genital swabbing	1.18	.522	.024	3.25
Additional genital swabbing	.643	.342	.060	1.90
Arrest made	.620	.347	.074	1.86

χ^2 = 22.38, df = 6, p < .001
-2LL = 213.41, Nagelkerke R^2 = .161
Hosmer and Lemeshow χ^2 = 4.56, df = 8, p = .804

Cases in which Forensic Evidence Reporting Preceded Arrest. Across the 11 cases in which arrests were made after the crime laboratory report or only a day or two before, 10 had biological evidence found. In 7 of these 10 cases, body swabs were the source of the biological evidence and 9 of these 10 cases had specimens that tested positive for semen. Eight cases had a DNA profile generated. The rate of DNA profile generation in these cases (80.0%) was significantly higher than for other arrests (39.3%) and non-arrests (41.6%) (χ^2 [2, 284] = 9.93, p < .007). When there was a DNA profile, the odds of an arrest following crime laboratory analysis versus no arrest were 8.14 greater than without a DNA profile.

Five of the 11 cases had a DNA profile that matched the suspect, which was a significantly higher rate (55.6%) than in other arrest cases (19.6%) and non-arrests (7.5%) (χ^2 [2, 262] = 21.76, p < .001; in one case the match results were still pending). When there was a DNA match to the suspect, the odds of an arrest following crime laboratory analysis versus no arrest were 15.5 times greater than without a DNA match to the suspect.

In three cases the DNA profile matched another case in CODIS; two of these cases involved strangers and one involved an acquaintance. Again this was a significantly higher rate (30%) than in other arrest cases (2%) and non-arrests (3%) (Monte Carlo p=.003). When there was a DNA match to another case in CODIS, the odds of an arrest following crime laboratory analysis versus no arrest were 14.97 times greater than without a DNA match to another case in CODIS. To rule out the possibility that lower rates of DNA were simply a function of crime laboratory reports not being done in non-arrest cases, we compared rates on these DNA variables for arrests following crime laboratory analysis to rates for non-arrests, but limiting the sample to cases with a crime laboratory report. There were still higher rates for arrests following crime laboratory analysis for all three DNA variables, and the differences were statistically significant.

Two of the 11 cases also had a DNA profile that matched a convicted offender in CODIS. While this represented a rate higher than in other arrest and non-arrest cases, this difference was not statistically significant given the small number of cases in the laboratory analysis after arrest category. Interestingly, evidence of saliva was actually significantly more common when arrests took place before crime laboratory analysis (52.8%) than in the 11 cases of later arrest (27.0%) or in non-arrest cases (27.0%) (χ^2 [2, 280] = 20.16, $p < .001$).

When examining these 11 cases by victim-suspect relationship, it was found that two cases involved intimate partners, three involved an acquaintance, four involved strangers, and two had unknown relationships, so these cases did not cluster within any particular type of victim-suspect relationship. When examining the two intimate partner cases more closely, we found that both of those cases involved victims 15 years of age or younger.

Availability of Biological Evidence by Number of Months between Assault and Arrest

Given the results on timing of laboratory results and arrests, and the frequency of DNA evidence when laboratory results were available prior to arrest, we examined further the relationship between timing of arrest and the availability of biological evidence and DNA findings. Tables 5.22 through 5.30 depict the relationship of biological evidence and DNA variables with timing of arrest. These figures array arrests in the sample by the time that had elapsed since the assault, and note for each case whether different types of biological evidence were available before the arrest, afterwards or not at all. These tables clearly show that the vast majority of arrests were made quickly, more than half within one day of the assault. Given that the median time between assault and crime laboratory report to police equaled 53 days, arrests that were made quickly overwhelmingly relied on other evidence and were not influenced by biological evidence. Crime laboratory findings of biological evidence were available prior to arrest for only 3 out of the 105 arrests made within one month of the assault (2.9%).

In 7 of 10 cases in which biological evidence was available before arrest, the arrest took place 2 months or more after the assault; and in 5 of these cases, the arrest took place more than five months after the assault. Because Figures 5.22 to Figure 5.30 suggest high rates of biological evidence for arrests more than five months after the assault, we constructed crosstabulations comparing rates of biological evidence for these 5 arrests to the remaining arrests made earlier. Because of the small number of cases in this group, we used Monte Carlo exact tests rather than Pearson χ^2 tests to test statistical significance. Arrests made 5 months or more after the arrest were significantly more likely than other arrests to have CODIS hits to DNA from another case (p=.026) and to DNA from a convicted offender (p=.04). These arrests also had a higher rate of DNA matches to suspects than other arrests, but the exact test only neared statistical significance (p=.067).

Case Outcomes: Unfounding and Arrest

During the course of an investigation, police officers determine whether a crime occurred. If officers determine that the reported incident is false or baseless, the case is officially unfounded. Only in cases that are not unfounded—that is, the case is founded—can an arrest occur. In Massachusetts, a summons may also be sought instead of an arrest. In these cases, an individual is notified, or summoned, to appear in court. A summons may be sought by a citizen as well as by law enforcement officials.

Table 5.22

Biological Evidence Available by Number of Months between Assault and Arrest
(n=118 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
Biological Evidence Available Before Arrest	x x x (3 to 17 days)		x	x		x	x		x		x	1096 days x →
Biological Evidence Available After Arrest	xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx (38 arrests made the same day; 21 arrests after one day)	x x x	x	x								
No Biological Evidence	x x xx xx			x								

Note. Each x represents one arrest.

Table 5.23

Evidence of Blood by Number of Months between Assault and Arrest (n=118 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
Evidence of Blood Before Arrest									x		x	1096 days x →
Evidence of Blood After Arrest	XX XXX XXX XXX XXX XXX XXX XXX XXX XXX ← 8 arrests made the same day; 5 arrests made after one day	x x	x									
No Evidence of Blood	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx ← 34 arrests made the same day; 16 arrests made after one day	x		x x x		x	x					

Note. Each x represents one arrest

Table 5.24

Evidence of Saliva by Number of Months between Assault and Arrest (n=118 arrests)

	Months Between Assault and Arrest										
	< 1	1	2	3	4	5	6	7	8	9	10
Evidence of Saliva Before Arrest				x			x				
Evidence of Saliva After Arrest	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx xxx xxx xxx xxx	← 20 arrests made the same day 13 arrests after one day x	x								
No Evidence of Saliva	xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx	← 22 arrests made the same day 8 arrests after one day x x	x	x x		x			x		x

1096 days ↙ x →

Note. Each x represents one arrest

Table 5.25

Evidence of Semen Available by Number of Months between Assault and Arrest
(n=118 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
Evidence of Semen Available Before Arrest	x x x (3 to 17 days)		x			x	x		x			1096 days x →
Evidence of Semen After Arrest	xx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx (32 arrests made the same day; 19 arrests after one day)	x x	x	x								
No Biological Evidence	xx xx xx xx xx xx xx xx xx xx xx xx xx xx (10 arrests made the same day; 2 arrests after one day)	x		x x								

Note. Each x represents one arrest.

Table 5.26

Evidence of Other Biological Materials by Number of Months between Assault and Arrest
(n=115 arrests)

	Months Between Assault and Arrest										
	< 1	1	2	3	4	5	6	7	8	9	10
Evidence of Other Bio Materials Before Arrest	x (3 days)		x								x
Evidence of Other Bio Materials After Arrest	x xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx (15 arrests made the same day; 6 arrests made after one day)	x x	x	x							
No Evidence of Other Bio Materials	xx xx xx xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx (26 arrests made the same day; 15 arrests made after one day)	x		x x		x	x			x	

Note. Each x represents one arrest

Table 5.27

DNA Profile Generated by Number of Months between Assault and Arrest (n=112 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
DNA Profile Before Arrest	x x x			x		x	x		x			x (1096 days)
DNA Profile After Arrest	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	x										
No DNA Profile Generated	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx	x		x							x	

DNA Profile Before Arrest, < 1 month: 3 to 17 days

DNA Profile Before Arrest, beyond 10 months: 1096 days

DNA Profile After Arrest, < 1 month: 20 arrests made the same day; 7 arrests made after one day

No DNA Profile Generated, < 1 month: 21 arrests made the same day; 14 arrests made after one day

Note. Each x represents one arrest

Table 5.28

DNA Match to Suspect by Number of Months between Assault and Arrest (n=102 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
DNA Match Before Arrest	x x	← 3 to 17 days					x		x			1096 days x →
DNA Match After Arrest	x xx xx xx xx xx xx xx xx	← 11 arrests made the same day 2 arrests made after one day										
No DNA Match	x xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx xx	← 28 arrests made the same day 14 arrests made after one day xx		x		x					x	

Note. Each x represents one arrest.

Table 5.29

CODIS Hit to Another Case by Number of Months between Assault and Arrest (n=102 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
CODIS Hit Before Arrest	x ← 17 days							x				1096 days x →
CODIS Hit After Arrest	xx											
No CODIS Hit to Another Case	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx ← 41 arrests made the same day 17 arrests made after one day	x x x	x	x x		x			x		x	

Note. Each x represents one arrest.

Table 5.30

CODIS Hit to a Convicted Offender by Number of Months between Assault and Arrest (n=102 arrests)

	Months Between Assault and Arrest											
	< 1	1	2	3	4	5	6	7	8	9	10	
CODIS Hit Before Arrest									x			1096 days x →
CODIS Hit After Arrest	x x x x x											
No CODIS Hit to Another Case	xx xx xx xx xx xx xx xx xx xx xx xx xx xx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx	x x x	x	x x		x	x				x	

39 arrests made the same day

17 arrests made after one day

Note. Each x represents one arrest.

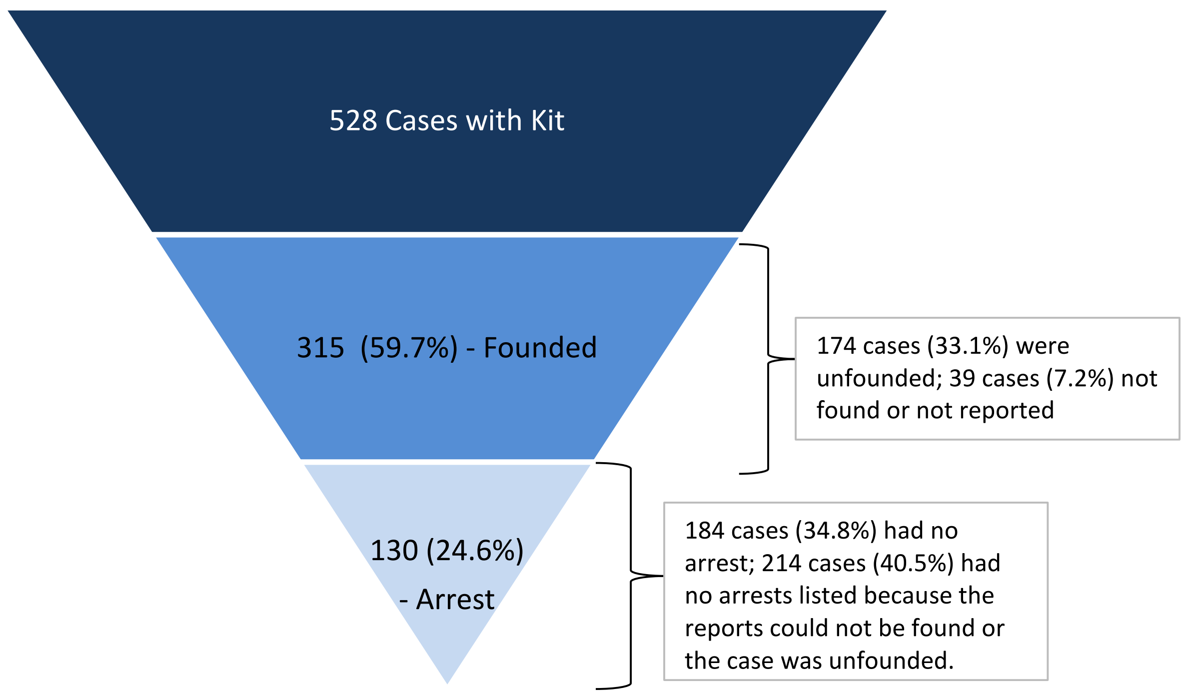
Figure 5.3 illustrates the attrition rate of the original 528 cases involving persons 12 years and older. As shown, 33.1% of the cases reported to the police were unfounded; in other words, the cases were determined to be false or baseless. Another 7.2% were not located by the law enforcement agencies contacted, often due to missing or invalid report identification numbers collected at the crime laboratory, or because the case was never reported to the police by the victim.[5] Thus, only 315 cases (59.7%) of the original 528 cases were determined as legitimate crimes according to the police investigators; that is, the case was not unfounded. Of these 315 incidents, 130 cases (24.6% of all founded incidents) resulted in arrest. The percentage increases slightly when summons are included; 147 cases (27.8% of all founded incidents) resulted in arrest or summons.

In Massachusetts, defendants who are arrested are brought before the District Court, typically the same day of arrest, and in a large majority of cases, suspects are charged at this time. Of the 130 cases involving arrest, 94 (72%) resulted in charges. In 20 cases (15.4% of arrests), the police department did not indicate whether court charges were obtained. Follow-up calls were attempted with agencies that had arrests, but no charges documented. Not all responded to our follow-up calls, but some that did indicated that they were unable to confirm that charges were obtained. Discussions with police officials during the follow-up calls offered researchers the opportunity to ask about arrest and charging more generally. Although not representative of all police agencies, those police officials who did talk with researchers

[5] Although we sampled cases reported to police, the documentation that the case was reported to police was based on victim disclosure to the examining medical provider. In some cases victims may have reported to the medical examiner that he/she intended to report the case to police, but later did not do so.

indicated that it was their general impression that charges typically followed arrest. This was further confirmed through discussions with prosecutors. Therefore, in the sections that follow we focus on unfounding and arrest because charging likely followed arrest.

Figure 5.3: Case Attrition Rate



Characteristics Associated with Unfounding. Bivariate analyses were conducted to examine whether there were statistically significant associations between the victim, assault and injury characteristics on one hand and unfounding on the other hand. The relationship between forensic evidence and unfounded was not examined because in the vast majority of cases the results of the forensic analyses, if they were done, were reported after the case was unfounded.

Across the variables examined, gender, physical force, penetration, sexual act performed by the victim, condom use, loss of consciousness, and timeliness of the forensic medical examination were significantly associated with unfounding at the $p \leq .05$ level. As noted in Table

5.31, more than one-third of cases involving females were unfounded by police officers. No cases involving male victims were unfounded (χ^2 [1, 487] = 11.59, $p < .001$). Cases in which physical force was reported were less likely to be unfounded (χ^2 [1, 428] = 6.05, $p = .014$), as were cases involving penetration (χ^2 [1, 490] = 5.18, $p = .023$). In contrast, cases in which the victim completed a sexual act on the suspect or was unsure that such an act occurred were more likely to be unfounded than cases with no sexual act by the victim on the suspect (χ^2 [2, 421] = 7.44, $p = .024$). Similarly, if the victim reported the suspect had used a condom or was unsure if the suspect had, the case was more likely to be unfounded (χ^2 [2, 485] = 11.83, $p = .003$). Cases in which the victim had lost consciousness (χ^2 [1, 305] = 8.62, $p = .003$) were also more unlikely to be unfounded (see Table 5.32). Cases with genital or non-genital injuries did not differ on unfounding from cases without those injuries (see Table 5.33). Timing of the exam mattered; cases in which the exam was completed within 24 hours were significantly less likely to be unfounded (χ^2 [1, 420] = 4.30, $p = .038$).

Table 5.31. Comparison of Victim Characteristics by Unfounding Decision

	Unfounded		Founded	
Victim Characteristics	*f*	%	*f*	%
Age (years)	M = 27; SD = 12		M = 26; SD = 11	
Gender***				
Male	0	0.0%	20	100.0%
Female	174	37.3%	293	62.7%
Race/Ethnicity				
White, Non-Hispanic	128	38.7%	203	61.3%
Black, Non-Hispanic	15	31.9%	32	68.1%
Hispanic	21	26.3%	59	73.8%
Other[a]	8	34.8%	15	65.2%

a. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern
* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Multivariable logistic regression models were conducted to identify which factors predicted whether cases were unfounded. Prior to finalizing the regression models, several steps were taken to protect against multicollinearity and small counts of cases in certain categories. Although gender was significantly related at the bivariate level to unfounding, with none of the 20 cases involving males being unfounded, gender could not be included in multivariable models because a zero cell count leads to matrix singularity, rendering accurate statistical estimation impossible. Additionally, several of the independent variables were highly correlated. Specifically, penetration was significantly and moderately to strongly correlated with condom use (χ^2 [2, 477] = 143.41, $p < .001$; $V = .548$), loss of consciousness (χ^2 [1, 467] = 120.72, $p < .001$; $\phi = .548$), and sexual acts performed by the victim (χ^2 [2, 417] = 168.23, $p < .001$; $V = .635$). Thus only penetration among these variables was included in the final model.

Table 5.32: Comparison of Case Characteristics by Unfounding Decision

Case Characteristics	Unfounded		Founded	
	f	%	*f*	%
Victim - Suspect Relationship				
Stranger	48	34.5%	91	65.5%
Acquaintance/date/relative	68	31.3%	149	68.7%
Intimate partner/ex-intimate partner	19	31.7%	41	68.3%
Number of Suspects				
One	119	31.8%	255	68.2%
Two or more	26	41.9%	36	58.1%
Location				
Inside	133	35.2%	245	64.8%
Outside	24	33.8%	47	66.2%
Other	11	45.8%	13	54.2%
Verbal Threats				
No	118	37.5%	197	62.5%
Yes	37	32.7%	76	67.3%
Physical Force*				
No	112	40.4%	165	59.6%
Yes	43	28.5%	108	71.5%
Restraints/Held Down				
No	128	36.3%	225	63.7%
Yes	27	36.0%	48	64.0%
Chemical Used to Incapacitate				
No	140	35.6%	253	64.4%
Yes	15	42.9%	20	57.1%
Weapon Used				
No	140	36.7%	241	63.3%
Yes	15	31.9%	32	68.1%
Penetration*				
No	59	43.7%	76	56.3%
Yes	116	32.7%	239	67.3%
Act by Victim on Suspect*				
No	72	30.9%	161	69.1%
Yes	40	42.1%	55	57.9%
Unsure	42	45.2%	51	54.8%
Condom Used**				
No	72	28.7%	179	71.3%
Yes	21	38.2%	34	61.8%
Unsure	80	44.7%	99	55.3%
Loss of Consciousness**				
No	120	32.2%	253	67.8%
Yes	48	48.0%	52	52.0%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Table 5.33: Comparison of Injury Characteristics by Unfounding Decision

	Unfounded		Founded	
Injury Characteristics	*f*	%	*f*	%
Non-genital Injuries				
No	79	35.0%	147	65.0%
Yes	89	35.7%	160	64.3%
Genital injuries				
No	110	35.7%	198	64.3%
Yes	59	35.1%	109	64.9%
Serious genital injury				
No	155	36.0%	275	64.0%
Yes	14	30.4%	32	69.6%
Time between assault and exam*				
Within 24 hours	111	34.0%	215	66.0%
Beyond 24 hours	43	45.7%	51	54.3%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Three variables therefore remained in the final logistic regression model: time between assault and examination, penetration and physical force. The final model was significant (χ^2 [3, 370] = 16.45, *p* = .001), and the Hosmer and Lemeshow goodness of fit test indicates the model was a good fit (χ^2 [4, 370] = .7.35, p = .119). The odds of a case being unfounded decreased by 37.4% if physical force had been documented during the forensic medical examination, while penetration was associated with a significant 47.3% decrease in unfounding. Although now only a statistical trend (p = .060), delay in reporting (i.e., examination more than 24 hours after the assault) was associated with increased odds of unfounding (see Table 5.34).

Table 5.34: Predictors of Unfounding (n=370).

Predictor	*B*	*SE*	*p*	OR
Penetration	-.64	.25	.011	.527
Physical force used	-.47	.24	.046	.626
Exam after 24 hours of assault	.48	.26	.060	1.62
χ^2 = 16.45, df = 3, p = .001				
-2LL = 473.36, Nagelkerke R^2 = .059				
Hosmer and Lemeshow χ^2 = 7.35, df = 4, p = .119				

Characteristics Associated with Arrest. Bivariate analyses were conducted to examine which victim and assault characteristics were significantly associated with arrest. Across the variables examined, gender, victim-suspect relationship, number of suspects, verbal threats, penetration, acts by victim on suspect, and condom use were associated with arrest at α = .05 (see Table 5.35 and Table 5.36). Statistical trends were found for loss of consciousness and genital injuries. As noted in Table 5.35, male victims were significantly less likely to have their cases result in arrest (χ^2 [1, 348] = 3.10, p = .079).

Table 5.35: Comparison of Victim Characteristics by Arrest Decision

	No Arrest		Arrest	
Victim Characteristics	*f*	%	*f*	%
Age (years)	M = 27; SD 11		M = 25; SD = 11	
Gender*				
Male	16	80.0%	4	20.0%
Female	166	56.8%	126	43.2%
Race/Ethnicity				
White, Non-Hispanic	120	59.1%	83	40.9%
Black, Non-Hispanic	19	59.4%	13	40.6%
Hispanic	30	51.7%	28	48.3%
Other[a]	11	73.3%	4	26.7%

a. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern

* p ≤ .05; ** p ≤ .01; *** p ≤ .001.

Table 5.36: Comparison of Case Characteristics by Arrest Decision

Case Characteristics	No Arrest		Arrest	
	f	%	*f*	%
Victim - Suspect Relationship***				
Stranger	65	71.4%	26	28.6%
Acquaintance/date/relative	80	53.7%	69	46.3%
Intimate partner/ex-intimate partner	13	32.5%	27	67.5%
Number of Suspects*				
One	135	53.1%	119	46.9%
Two or more	27	75.0%	9	25.0%
Location+				
Inside	136	55.7%	108	44.3%
Outside	34	72.3%	13	27.7%
Other	8	61.5%	5	38.5%
Verbal Threats*				
No	120	61.2%	76	38.8%
Yes	36	47.4%	40	52.6%
Physical Force				
No	100	61.0%	64	39.0%
Yes	56	51.9%	52	48.1%
Restraints/Held Down				
No	127	56.7%	97	43.3%
Yes	29	60.4%	19	39.6%
Chemical Used to Incapacitate				
No	138	57.5%	102	42.5%
Yes	18	56.3%	14	43.8%
Weapon Used				
No	138	57.5%	102	42.5%
Yes	18	56.3%	14	43.8%
Penetration***				
No	58	77.3%	17	22.7%
Yes	126	52.7%	113	47.3%
Act by Victim on Suspect*				
No	87	54.0%	74	46.0%
Yes	29	52.7%	26	47.3%
Unsure	37	74.0%	13	26.0%
Condom Used***				
No	87	48.6%	92	51.4%
Yes	21	61.8%	13	38.2%
Unsure	73	74.5%	25	25.5%
Loss of Consciousness+				

No	145	57.3%	108	42.7%
Yes	36	70.6%	15	29.4%

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$.

Arrests were more likely to occur when the cases involved someone known to the victim (χ^2 [2, 280] = 18.10, $p < .001$), only one suspect (χ^2 [1, 290] = 6.11, $p = .013$), verbal threats to the victim (χ^2 [1, 272] = 4.23, $p = .038$), and penetration (χ^2 [1, 314] = 14.26, $p < .001$). Arrests were less likely to occur if the victim was unsure if he/she completed sexual acts on the suspect (χ^2 [2, 266] = 6.87, $p = .032$) or if a condom was used (χ^2 [2, 311] = 17.64, $p < .001$) (Table 5.36).

Bivariate analyses also examined which injury findings were significantly associated with arrest. Genital injury was associated with arrest at a statistical trend level, while timing of the assault to examination was significantly associated with arrest (see Table 5.37). Cases in which the victim submitted to a forensic medical examination within 24 hours of the assault were more likely to result in arrest than cases in which the exam took place after 24 hours had passed (χ^2 [1, 266] = 6.12, $p = .013$).

Table 5.37: Comparison of Injury Characteristics by Arrest Decision

	No Arrest		Arrest	
Injury Characteristics	*f*	**%**	*f*	**%**
Non-genital Injuries				
No	88	60.3%	58	39.7%
Yes	94	58.8%	66	41.3%
Genital injuries[+]				
No	125	63.1%	73	36.9%
Yes	57	52.8%	51	47.2%
Serious genital injury				
No	160	58.4%	114	41.6%

Yes	22	68.8%	10	31.3%
Time between assault and exam*				
Within 24 hours	115	53.5%	100	46.5%
Beyond 24 hours	37	72.5%	14	27.5%

$^{+}p<.10$,* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

Multivariable logistic regression models were calculated to identify which factors predicted arrest. Prior to finalizing the regression models, several analyses were undertaken to assess multicollinearity. Again, penetration was significantly and moderately associated with acts by the victim on the assailant (χ^2 [2, 453] = 131.49, *p* < .001; *V* = .539), condom use (χ^2 [2, 522] = 125.53, *p* < .001; *V* = .490), loss of consciousness (*r* = -43). Penetration was also significantly, albeit weakly, associated with verbal threats (*r* = .27). Several additional analyses were completed to examine the impact of retaining both penetration and verbal threats in the final model. These analyses suggested that verbal threats should be retained in the final model but not penetration because of its correlation to verbal threats and marginally significant relationship with other variables in the model.

In addition to concerns associated with multicollinearity, some researchers have argued for the need to account for sampling bias associated with multistage analyses. Specifically, some researchers have argued that the Heckman's "hazard rate" should be included in subsequent models to account for biases that may result from the elimination of cases as prior stages in case processing (for example see Johnson et al., 2012). Others, however, have argued that the hazard rate as first developed by Heckman may not necessarily be appropriate for models of multistage analyses generally and binary dependent variables specifically (Bushway et al., 2007). In this study, some degree of sampling bias could result from cases being excluded due to unfounding, which could affect our ability to correctly model predictors of arrest and make inferences about the original population being studied (i.e., cases with forensic medical examinations reported to police). To address this issue, we examined two models. The first model excluded unfounded cases. The second model included all cases regardless of whether the case was unfounded. Comparisons of these models revealed negligible differences, and because of this Model 1 is presented below. Footnotes are provided to identify discrepancies between the models.

Table 5.38 provides the multivariable logistic regression results for Model 1, predictors of arrest excluding unfounded cases. The model was significant and the Hosmer and Lemeshow goodness-of-fit test indicates the data are a good fit. Across the variables included in the model, three variables were significant at α=.05: victim-suspect relationship; timing of the forensic medical examination, and genital injury. The odds of arrest of when the suspect was an intimate partner were nearly four times the odds when suspects were strangers, and double when the suspect was an acquaintance. The odds of arrest also doubled when the victim had genital injuries documented during the forensic medical examination. The odds of arrest decreased by 62.2% if the examination occurred more than 24 hours after the incident.[6]

Table 5.38: Predictors of Arrest, Excluding Unfounded Cases (n=202).

Predictor	*B*	*SE*	*p*	OR
Acquaintance (Stranger)	.762	.37	.016	2.14
Intimate partner (Stranger)	1.43	.51	.041	4.18
Two or more assailants	-.825	.54	.124	
Verbal threats	.409	.34	.232	

[6] Similar to Model 1, timing of the medical examination mattered as did the victim suspect relationship. The relationship between genital injuries and arrest, however, was no longer significant in this model while the number of assailants was significant.

Assault occurred indoors	.581	.40	.146	
Exam after 24 hours of assault	-.974	.42	.020	.38
Genital injury	.770	.33	.018	2.16

$\chi^2 = 31.95$, df = 7, $p < .001$
-2LL = 248.89, Nagelkerke $R^2 = .194$
Hosmer and Lemeshow $\chi^2 = 5.46$, df = 8, $p = .708$

Characteristics Associated with Unfounding and Arrest by Victim-Suspect Relationship. As noted, one goal of the study was to examine whether the factors explaining unfounding and arrest differed in stranger and known assailant cases. We hypothesized that the explanatory factors would differ. For instance, police may feel that corroborative evidence, such as presence of injuries and reports of physical force, is more important in cases in which the suspect and victim know each other or have a current or previous sexual relationship. Separate multivariable logistic regression models were constructed for stranger and known assailant cases. The results from these partial models were then compared using the test of equality of coefficients to identify significant differences in the coefficients across the models. The analyses revealed no significant differences (results not shown). Thus it is reasonable to conclude that predictors of arrest found above apply about equally in stranger and known assailant cases

Analysis of Pediatric Cases

In Massachusetts, a separate forensic evidence kit is used for cases involving pediatric cases (Meunier-Sham, Cross, & Zuniga, 2013). Typically this includes cases involving victims under the age of 12, although in some instances pediatric forensic medical examination kits may be used with older youth. As indicated previously, we were interested in examining whether forensic evidence was impactful in child cases. Investigations involving child victims are more complicated, particularly when the victim's age limits the victim's ability to fully verbalize what occurred. Injury and biological evidence collected during a forensic medical examination may further bolster or corroborate other evidence documented during the investigation and may increase the chances of arrest and successful prosecution.

In total, our sample produced 36 cases involving children 12 years and younger who had a pediatric forensic medical examination completed. A little over half of these cases (55.6%) involved children 5 years of age or younger. Male children accounted for 30.6% of the pediatric sample. Thirty-six percent of the sample was identified as white, non-Hispanic; 13.9% was identified as black, non-Hispanic; 30.6% was identified as Hispanic; and 11.1% was categorized as some other race (Table 5.39).

Table 5.39: Characteristics of Cases with a Pediatric Forensic Medical Examination (n=36)

Victim Characteristics	**Frequency**	**Valid Percent**	**Percent of Total Sample**
Age			
0 to 5 years	20	55.6%	55.6%
6 to 12 years	16	44.4%	44.4%
Gender			
Male	11	30.6%	30.6%
Female	25	69.4%	69.4%
Race/Ethnicity			
White, Non-Hispanic	13	39.4%	36.1%
Black, Non-Hispanic	5	15.2%	13.9%
Hispanic	11	33.3%	30.6%
Other[a]	4	12.1%	11.1%

a. Includes Asian/Pacific Islander, Native American Indian, Cape Verdean, Multi-racial, Middle Eastern

Table 5.40 provides data on injuries documented, forensic evidence found, and arrest rate for child cases. Twenty-eight percent of the victims had at least one non-genital injury documented during the forensic medical examination. Nineteen percent had at least one genital injury documented. Forensic analysis of the evidence collected during the forensic medical examination kit revealed biological evidence in a little over half of the sample. The most common biological evidence found was other biological materials (30.6%), followed by saliva (22.2%), blood (16.7%), and semen (13.9%). Other types of biological materials include substances other than blood, saliva, and semen, most often hairs and skin. The most common type of other biological evidence noted was human hairs, followed by "skin-like debris." Six cases had a DNA profile generated. These six cases represented 30% of the pediatric cases in which biological evidence was found, but only 16.7% of all cases. Half of those cases in which a DNA profile was generated had a DNA match to the suspect. There were no matches of a DNA profile to another case or convicted offender in CODIS.

Table 5.40: Frequency of Non-Genital and Genital Injury, Biological Evidence and Case Outcome in Pediatric Cases (n=36)

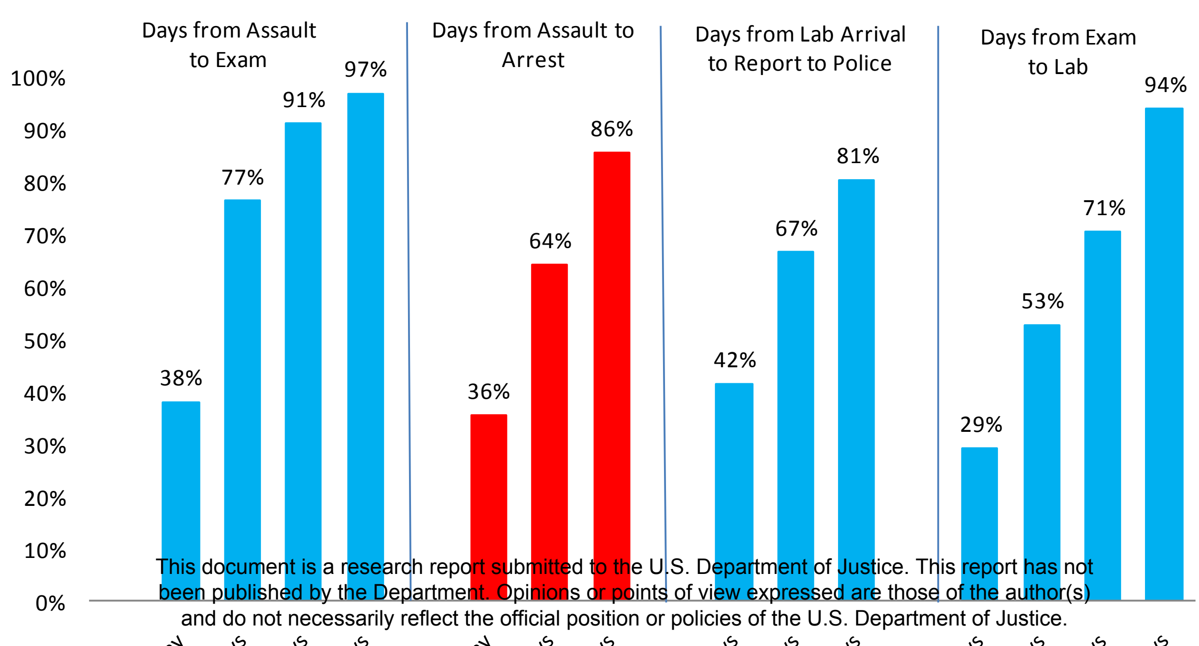
Characteristics	**Frequency**	**Valid Percent**	**Percent of Total Sample**
Non-genital injuries			
No	23	69.7%	63.9%
Yes	10	30.3%	27.8%
Genital injuries			
No	26	78.8%	72.2%
Yes	7	21.2%	19.4%
Biological evidence found[a]	20	57.1%	55.6%
Blood	6	17.1%	16.7%
Saliva	8	22.9%	22.2%
Semen	5	14.3%	13.9%
Other biological materials	11	31.4%	30.6%
DNA profile generated	6	30.0%	16.7%
DNA match to suspect	3	15.0%	8.3%
DNA match in CODIS - another case	0	0.0%	0.0%
DNA match in CODIS - convicted offender	0	0.0%	0.0%

Lab reported results to police or prosecutor	34	97.1%	94.4%
Case outcome			
No arrest	13	40.6%	36.1%
Arrest	16	50.0%	44.4%

In terms of case outcomes, police agencies reported arrests in 44.4% of the 36 cases in our final sample (Table 5.40). In four cases the status is unknown because the police agency handling the case did not respond to our solicitation for case information. In another three cases, there was no police investigation because the police agency reported that there was no indication of a police report being made. No cases were listed as being unfounded.

We also examined timing of evidence in relation to police arrest decisions to determine whether the crime laboratory reported the forensic analysis results prior to police decisions to arrest. Similar to the adult cases, we found relatively quick turnarounds in terms of when the forensic medical examination occurred, when the kits got to the lab, and when the laboratories were reporting the results back to police investigators (Figure 5.4). Also similar to adult cases we found that in nearly all of the cases the arrests preceded forensic findings, indicating that forensic evidence findings could not have impacted decisions to arrest (Figure 5.5).

Figure 5.4. Percentage of Cases by Time Periods for Pediatric Cases



Unlike adult cases, however, there was no relationship between the finding of biological evidence and arrest. In adult cases, although the relationship between biological evidence and arrest could not be causal because evidence was typically only available after the arrest, arrests were correlated with the finding of biological evidence (albeit the relationship was only moderately significant). This was not true in cases involving pediatric forensic medical examinations. Biological evidence was found in 47.4% of cases that did not result in arrest and 52.6% of cases with arrest (χ^2 [1, 32] = .130, p = .719).

Figure 5.5: Median Time from Assault to Reporting of Laboratory Results for Pediatric Cases

Additional comparisons were made to identify instances in which differences existed between the child and adult cases in terms of injury identification, biological evidence and DNA profile generation, and arrest (Table 5.41). Child cases were significantly less likely than cases involving older victims to have non-genital injuries noted during the examination (χ^2 [1, 545] = 6.36, p = .012). Similar findings were noted for genital injuries, although the relationship between type of victim and genital injury was only a statistical trend; 35.6% of adult cases had genital injures noted compared to only 21.7% of child cases (χ^2 [1, 547] = 2.83, p = .092).

Table 5.41. Injury, Biological Evidence, and Case Outcomes for Pediatric Cases versus Adult Cases

	Child Cases		Adult Cases	
Characteristics	*f*	%	*f*	%
Non-genital injuries*	10	30.3%	271	52.9%
Genital injuries	7	21.2%	183	35.6%
Biological evidence found***	20	57.1%	345	84.6%
Blood	6	17.1%	110	27.0%
Saliva	8	22.9%	139	34.1%
Semen***	5	14.3%	242	59.3%
DNA profile generated	6	16.7%	142	28.0%
Arrest (unfounding excluded)	16	55.2%	130	41.1%
Arrest (unfounding included)***	16	55.2%	130	26.6%

* p < .05; ** p < .01; *** p < .001.

Biological evidence was also more likely in adult than child cases, with 84.6% of adult cases having biological evidence found, compared to only 57.1% of child cases (χ^2 [1, 443]= 16.70, p < .001). No differences were noted in whether blood, amylase, or other biological evidence was found. Differences, however, were noted in terms of the finding of semen. A significantly higher percentage of adult cases had semen identified during laboratory analyses as compared to child cases (χ^2 [1, 443] = 26.50, p < .001). Despite differences in finding of semen, no significant differences were noted in terms of DNA profile generation between child and adult cases.

There were no cases involving children in which the police department reported unfounding the case. In contrast, 33.1% of adult cases in our total adult sample were later unfounded by police. There were no differences in likelihood of arrest when unfounded cases are excluded from the analysis; adult cases were just as likely to result in arrest as were child cases. When unfounding is not excluded, however, the arrest rate for adult decreases to 26.6% of the sample, significantly lower than 55.2% arrest rate for child cases (χ^2 [1, 518]= 11.053, p = .001).

Chapter 6

Discussion

Considerable knowledge and sophisticated technology have been developed about how to collect and analyze physical and forensic evidence in sexual assault cases, but surprisingly little is known about how this evidence is used and how it relates to criminal justice outcomes. This study aims to help fill this gap by examining data from forensic medical examinations, crime laboratory analysis, and police activity in a statewide sample of sexual assault cases in Massachusetts. Like past studies our study too was based on retrospective case record reviews, and therefore is subject to the limitations of that methodology. However, the current study contributes to the research literature in several ways. Unlike most studies, it thoroughly measures timing of assault, examination, and forensic findings and both whether cases were unfounded and arrests were made. It adds to the knowledge on frequency of injury and biological evidence, including DNA. Along with testing factors overall that predict which cases were unfounded and which resulted in arrest, it examines how both injury and biological evidence are related to these criminal justice actions as well as whether SANE examiner involvement is related. Our study also analyses the relationship separately for cases in which crime laboratory analysis follows arrest and cases in which crime laboratory analysis precedes arrest, something not previously done in prior research.

Injury Documentation and the Biological Evidence

Forensic medical examinations present the opportunity to gather two important pieces of evidence: documentation of genital and non-genital injuries and biological specimens. Documentation of victim injuries—genital and non-genital—through photographs or written documentation can help police and prosecutors corroborate victim allegations and can be used to prove aggravating circumstances, a legal designation for cases involving serious victim injury. Serious victim injury may also indicate to police officers and prosecutors the seriousness of the case, which may prompt greater desire on the part of these practitioners to hold the suspect accountable. Swabbing of the external body and genital areas and mouth, hair combings, and fingernail scrapings are collected for the purposes of analyzing these samples to document sexual contact and to potentially identify any biological evidence left by assailants, such as blood, hairs, semen, or saliva. An analysis that reveals the presence of blood of the victim may also be useful in building a case. Biological evidence from fingernail scrapings, other blood evidence left by the perpetrator, and genital swabs containing sperm or sperm fluids can be used to develop a DNA profile of the suspect, which now can be obtained from even small amounts of biological evidence (Burg et al., 2011).

Our study found a non-genital injury rate and genital injury rate consistent with prior research. About 51% of victims in our sample had documented non-genital injuries and 34.5% had documented genital injuries. The averages reported in prior research are 58% and 39%, respectively. Caution should be taken, however, when drawing conclusions about whether the injury rates for our sample are reflective of those documented in the larger literature. As noted in the literature review, studies have varied greatly in the non-genital and genital injury rates reported, making it difficult to ascertain a true injury rate in sexual assault cases. Our own sampling methodology likely affected the rates reported here. We began with cases with forensic medical examinations and further refined our sample to those reported to police. This likely produced an elevated injury rate because one of the main purposes of the examinations is to document injuries, one of the reasons victims may present to hospitals is for injury treatment, and victims who choose to report their assaults to police may do so because they sustained injury, something noted in the literature (Rennison, 2002). While some previous research has found that examiners have been less likely to identify genital injuries among survivors of color (Sommers, 2007), our study found that this was true for non-genital injuries. This is concerning, because we can think of no reason why survivors of color would be less likely actually to have non-genital injuries. Further research is needed to study the process of injury identification among those with darker skins, and more widespread implementation of enhanced training on examining survivors of color may be needed as well.

Our study tended to have higher rates of biological evidence than other studies, although again the substantial variation across studies means that there is no typical number. Higher rates in our study may again be a function of our sampling methodology, since our sample only includes cases reported to police that had a forensic medical examination. Forensic medical examinations increase the chances of finding semen and other biological evidence, which can be used to generate DNA profiles. Forty-six percent of cases in our sample had semen identified, which is higher than the average rate of 30% in other studies, but the rate found here is well within the range in previous studies. Saliva, blood and other biological materials (primarily hair) were each found in more than 20% of the sample. We have no basis for comparison for them, however, because, to the best of our knowledge, these forms of evidence have not been reported in previous studies of sexual assault. Altogether, biological evidence was found in 65.3% of cases included in our final sample; this is substantially higher than in Tasca et al.'s (2013) study, but only 31% of cases in that study had been reported to police, and cases in that study had not necessarily had a forensic medical examination.

Although 26.9% of our sample had DNA profiles generated, DNA matching to suspects, other cases, or convicted offenders was infrequently noted in the laboratory files. The DNA match rate was much lower than that reported in two studies examining DNA evidence (e.g., Gingras et al., 2009; Ingemann-Hansen et al., 2008), but here again differences in sampling may explain this discrepancy. One question that we cannot answer is the extent to which comparison samples for matching were available in our study and in previous studies.

Our findings and discussions with practitioners indicate that laboratory findings may be influenced by other decisions made by law enforcement personnel. Whether DNA is linked to identified suspects in the case or to a profile in CODIS may be a byproduct of police investigator or prosecutor decisions to seek DNA testing of rape kit or the suspect. The crime laboratory may inventory the rape kit, but may not conduct forensic analyses if police officials unfound the case or decide not to move forward with arrest and charging. In some cases, such as when suspects confess, DNA testing may no longer be considered necessary, and time and money is saved by not doing it. Unfortunately, our data are limited on when or why police and prosecutors declined DNA testing of the rape kit. Anecdotal evidence obtained through discussions with crime laboratory personnel and text documentation as to why some cases had less recorded evidence than others (as noted by the data extractors) supports the conclusion that DNA testing is another part of the investigatory process influenced by police and prosecutor decisions.

Our findings on predictors of non-genital and genital injuries were generally consistent with prior research. Not surprisingly, being assaulted by more than one assailant and reported physical force were associated with more non-genital injuries; this is consistent with Sugar, Fine and Eckert (2004) and Crane (2006). Speculum use and having a SANE trained medical provider conduct the forensic medical examination were associated with higher rates of genital injury documentation with female victims. Physical force was also moderately associated with genital injuries. Although, we did not find any results reported in previous studies for physical force *per se*, the result for physical force is not unlike previous research findings that genital injury is related to physical resistance (Sachs & Chu, 2002) and injuries overall are related to assailant weapon use (Crane, 2006).

Together, our findings indicate that characteristics of the forensic medical examination as well as the nature of the assault are important for explaining whether injuries are documented by the medical examiner. Medical examiners may have been more likely to find injuries when speculums were used because of the tendency to use them in cases in which there is penetration and complaints of discomfort, and therefore plausibly a greater likelihood of injury. In addition, the speculum allows for improved visualization of genital structures and may thereby increase the likelihood of finding any injuries that have occurred. Having a SANE trained medical provider complete the exam was the strongest predictor of genital injury being reported. The relationship between examination characteristics and finding of genital injuries highlights the importance of proper training and expertise in detecting genital injuries, particularly since prior research and our own findings (see below) indicate that documentation of genital injuries is associated with arrest decisions. A significant part of SANE training involves learning about genital injuries associated with sexual assaults, how to use victim assault descriptions to guide examination for genital injuries, and how to use equipment and positioning to aid examination.

SANEs' experience conducting examinations also likely impacts their proficiency at injury identification; the lack of training and experience of non-SANE trained medical providers may simply result in their overlooking genital injuries.

Few assault characteristics were associated with the finding of semen at the bivariate level, and those characteristics that were associated with laboratory finding of semen were no longer significant predictors once response factors—timing of examination, characteristics of the examination, and arrest—were included in the statistical model. Consistent with prior findings, delays in examinations resulted in decreased odds of finding semen during laboratory analysis (Gingras et al., 2009). We also found that external genital swabbing and additional genital swabbing were associated with the finding of semen.

These findings again point to the importance of how the forensic medical examination is conducted. SANE trained medical providers were significantly more likely than non-SANE trained providers to complete additional genital swabbing. Conversations with SANE trained medical providers indicated that they conduct additional swabbing based on information they gathered from victim during the course of the forensic medical examination. The SANE program in Massachusetts stresses the importance of listening to victim accounts of the assault to guide evidence collection. Even though additional swabbing was associated with a greater likelihood of finding semen and SANEs were more likely to use additional swabs, SANE providers did not find biological evidence in a significantly higher proportion of cases. However, any SANE versus non-SANE comparison in Massachusetts is limited by the fact that SANE and non-SANE examiners work in entirely different hospitals and therefore type of provider is confounded with geographic location and consequent differences in patient population.

Predictors of Case Unfounding

The unfounding decision includes two distinct considerations. In the first consideration, police officials must determine whether the incident as reported meets the state's legal definition of a sexual crime. As noted elsewhere, according to Uniform Crime Reports (UCR) guidelines set forth by the Federal Bureau of Investigations, police agencies may unfound cases if the evidence indicates that the report is baseless or false. A baseless report is one in which there is not enough evidence to support the conclusion that the incident meets the legal definition of a crime. A false report is one in which police officers do not find enough evidence to support the conclusion that a crime occurred (NSVRC, 2012).

High unfounding rates of sexual assault cases have been a particular concern for victims, victim advocates and law enforcement officials alike. In a document published by the Police Executive Research Forum in 2012 titled *Improving the Police Response to Sexual Assault*, the authors note that there has been widespread concern over the high rates at which sexual assaults have been unfounded by police agencies. In 2010, for instance, Baltimore made national news when the *Baltimore Sun* revealed that the unfounding rate for rape in the city was five times higher than the national unfounding rate for that offense type (PERF, 2012). Similarly high rates have also been documented for other jurisdictions. Specific concern exists around the high rate of unfounding for false reporting. Researchers have noted a preoccupation with false reporting in sexual assault cases by law enforcement personnel (Lisak, Gardinier, Nicksa and Cote, 2010). Yet rigorous studies have coded reports from case files by examining the range of evidence in thoroughly investigated cases, and have found a false reporting prevalence of between 2 to 10 percent (Lisak, et al. 2010).

According to the FBI's Uniform Crime Reporting (UCR) program, unfounding should simply reflect police officers' belief that a crime did not occur (i.e., the allegation is either baseless or false). Researchers, however, have noted that these decisions may be influenced by officer perception of victim motivations as well as their perception of likely decisions at later processing decision points (PERF, 2012). For instance, officers may unfound case because they believe prosecutorial charging is unlikely (PERF, 2012) despite the fact that unfounding in such cases would not conform to UCR guidelines.

Our data revealed a 33.1% unfounding rate for our sample. It is important to note that the sample is not representative of all sexual assault cases reported to police in the Commonwealth of Massachusetts, and therefore, our sample's unfounded rate may over- or underestimate the actual statewide unfounded rate for sexual assault. Our study began with cases in which a medical forensic medical examination kit was documented in the state's PSCR database. The sample excludes cases in which medical treatment and examinations were not completed and may include a higher number of events that, upon police investigation, are considered baseless. There may be cases, for example, in which individuals are uncertain whether they were assaulted during a drug or alcohol-altered state, and they seek a forensic medical examination to assess the possibility of sexual assault. Note also that any comparison of unfounded rates across communities would need to take into account differences in the characteristics of cases reported between communities. Victims in one geographic area may be more willing to report sexual assaults that do not match the stereotype of "real rape", but this might have the effect of increasing the unfounded rate. It is important to note that the decision to unfound does not mean that a crime did not actually occur; there may be instances, for example, in which a crime did occur, but no evidence existed. Further research is needed on unfounding and how it relates to the characteristics of reported cases in different communities.

Examining the factors associated with unfounding in our sample suggests some patterns in decision-making. In our sample, unfounding was more likely in cases in which no penetration and no physical force was reported, which is consistent with results from prior surveys of law enforcement personnel (Spohn and Tellis, 2012). The unfounding rate may be influenced by factors associated with the legal criteria of rape and sexual assault in Massachusetts, particularly the legal definition of rape. Under Massachusetts law, rape is defined as "the penetration of any bodily orifice by any part of the body, or by an object, performed against the victim's will, without consent, and with the threat of or actual use of force (p. 8)," while indecent assault and battery is defined as "when the offender, without the victim's consent, intentionally has physical contact of a sexual nature with the victim (p. 8)" (EOPSS, 2009). Indecent assault and battery includes the "intentional, indecent touching of a part of the body commonly thought private, such as the buttocks, genitals, or (in the case of a female victim) the breasts" (personal communication, D. Deakin, January 31, 2014). Our finding that cases were more likely to be unfounded when the victim did not report penetration or physical force appears to reflect to some extent the legal requirements of the crime of rape under Massachusetts law.

We also found that cases were more likely to be unfounded when victims delayed forensic medical examinations (i.e., examinations occurred 24 hours after the incident occurred). There is no legal standard requiring that victims report within 24 hours of the assault. Delays, however, may be perceived by law enforcement officers as reducing the likelihood of obtaining evidence to corroborate and support victim claims, which officers may believe is needed to substantiate victim statements and secure criminal charges (PERF, 2012). Delays in reporting may also be viewed by police investigators as indicative of victims who may have ulterior motives for filing police reports (Jordan, 2004), such as covering for illicit sexual affairs, regret, or revenge.

We also found that unfounding was more likely when victims reported losing consciousness at some point during the incident. Our data do not speak to exactly why victims lost consciousness, but alcohol or drug intoxication is likely. Medical personnel completing the PSCR form will document on the examination forms that the victim lost consciousness if the victim reports losing consciousness because of intoxication (personal communication C. Re, January 30, 2014). There are two plausible reasons for the unfounding of these cases. Information may be gained during the investigation that indicates a sexual assault did not occur. For instance, victims who lose consciousness and fear they may have been sexually assaulted may seek medical attention and report the events to police. Forensic medical examinations may in turn reveal no evidence of assault (Kelly, 2010). In such cases, the report may be classified as baseless if investigators find no additional evidence indicating an assault occurred. Police may also associate victim intoxication and drug use with false reports. Jordan (2004) found that 72% of cases involving victims who were drunk at the time of offense were regarded as false or possibly false by police. Although drug and alcohol use alone may have not been the only factor that led officers to question the validity of a report in Jordan’s study, concerns expressed by police officials in cases involving victim intoxication centered on victim credibility and whether victims had ulterior motives for filing police reports. Unfortunately, the data collected for this project cannot speak specifically to why the relationship between loss of consciousness and unfounding exists.

Our data suggest that unfounding decisions may be influenced by factors that reflect police officers’ assessment of whether the case meets the legal definition of rape, which would be consistent with the UCR guidelines. The data, however, cannot speak to whether cases could have been classified as indecent assault and battery, which does not require penetration or physical force according to Massachusetts law. In essence, we cannot be sure if the agencies sampled were following UCR guidelines. Because analysis of typical case data cannot discern the decision-making process underlying unfounding, we strongly recommend a more detailed study of unfounding decisions using content analysis and qualitative methods to explore what is happening in these cases and to determine whether agencies are unfounding cases consistent with UCR standards. Although we relied on the UCR definition of unfounded when collecting data from the police agencies surveyed, we did not explicitly ask agencies to provide a description of the guidelines agencies require investigators to use when making unfounding decisions. Some agencies provided brief text justifications for the outcome of the case. These text justifications, however, were too brief and inconsistent to draw any clear conclusions about how the agencies determined that a case was unfounded.

Predictors of Arrest

Cases that are determined to be neither baseless nor false are investigated further and, when probable cause exists, may result in arrest. Probable cause requires that police investigators collect evidence sufficient for a reasonable person to conclude that a crime occurred and the accused committed the offense. Evidence alone, however, may not be the only factor influencing police decisions. Police investigators may have enough evidence to support probable cause, but may choose not to make an arrest despite being able to identify and locate the suspect (Spohn & Tellis, 2012). Extralegal factors, such as how soon after the assault the victim reported the incident, victim credibility, and victim and suspect characteristics, may also factor into police arrest decisions (Alderden & Ullman, 2012; Bouffard, 2000; DuMont and Myhr, 2000; Horney and Spohn, 1996; LaFree, 1981).

In a multivariable logistic regression analysis of founded cases with women victims, we identified four significant predictors of arrest: victim-suspect relationship, penetration, reporting within 24 hours, and genital injury. The variables sexual acts by victim, condom use, verbal threats, and loss of consciousness were also associated with arrests in bivariate analyses, but were not included in the logistic regression because of their correlation with penetration. Arrests were also significantly more likely with male victims, but the number of male victims was too small to allow us to include this variable in the logistic regression analysis or to explore it further.

The finding that police were more likely to make arrests in cases involving known offenders is consistent with previous studies (Alderden, 2008; Bouffard, 2000; Lafree, 1989), and follows from the frequent difficulty of identifying assailants who are strangers. Although it is easier to arrest known assailants, previous research has shown that these cases are often less likely to be prosecuted (Alderden, 2008). Penetration could be a significant predictor because Massachusetts law defines rape in terms of penetration and because of its possible association with concepts of what constitutes "real rape" (see Estrich, 1987). The presence of a genital injury could provide officers with corroborating evidence of victim statements, but may also be perceived by officers as supporting why this case is legitimate, thus, worthy of arrest and prosecution. However, it is not clear how often in Massachusetts officers seek and receive information from the forensic medical examination; as we discuss in more detail below, injury could also be related to arrest because it is correlated with other predictors of arrest. The examination of a victim within 24 hours of the assault may indicate to officers that evidence is likely contained in the kit and that the victim is being truthful.

Crime Laboratory Evidence is Not a Factor in Most Arrests

The finding that over three-fourths of arrests were made within 5 days of the assault, well before crime laboratory analysis could normally be done, makes it clear that the vast majority of arrests are based on what evidence is quickly available, and at that point the crime laboratories are not a factor. Nevertheless, biological evidence may be quite influential in the small minority of cases in which crime laboratory analysis either precedes or is contemporaneous with arrest (see below). The lack of influence of biological evidence in most arrest decision-making in our sample appeared to be a byproduct of how quickly arrests were occurring after the assault, and not reflective of delays in laboratory analysis and reporting. Indeed, most arrests were made even before crime laboratories had received forensic evidence kits. There has been widespread concern over backlogs of unanalyzed rape kits and delays in laboratory analyses and findings (see e.g., Rape Abuse & Incest National Network, 2009). For our sample, this was not the case. In the vast majority of cases the crime laboratory had reported forensic analyses back to the police within 120 days of the kit arriving at the crime laboratory (the median time was 43 days). Although there was relatively quick return of forensic evidence results in the majority of cases, it often occurred well after the arrest and may therefore also have not influenced prosecutorial charging of suspects, which must typically occur within 24 to 72 hours of the arrest. In some cases, an arrest that occurs quickly and without the added benefit of forensic evidence results may result in prosecutors declining to charge suspects due to the lack of evidence needed to meet reasonable doubt standards (Lonsway & Archambault, 2012).

The finding that the vast majority of arrests took place before crime laboratory analysis is consistent with Johnson's et al.'s (2012) finding from Los Angeles and four Indiana jurisdictions. Although research in additional jurisdictions is needed, the fact that the number of cases in which forensic evidence could play a role in the arrest decision is so low across disparate jurisdictions in the two studies suggests that this may be a general phenomenon. The 8.5% of arrests in which crime laboratory analysis preceded the arrest may seem like a small percentage, but it is substantially higher than the 1.6% found by Johnson et al.'s (2012) study of sexual assault. This is probably attributable to the fact that all cases in the present study sample had forensic evidence kits, compared to only 51.3% of cases in Johnson et al.'s study, and the fact that many kits in Johnson et al. were not submitted to or examined by crime laboratories.

Despite the fact that there is no plausible causal relationship between arrest and the results of crime laboratory testing when arrest comes first, we examined the statistical association all the same. This could alert us to the possibility that third variables might be creating a statistical association between biological evidence and arrest, which might be an important consideration both for understanding the connection of biological evidence to other aspects of the investigation and for interpreting studies like Campbell et al. (2009) and Tasca et al. (2013) that have found significant relationships between biological evidence and criminal justice outcomes. When we compared cases in which arrest preceded crime laboratory analysis with those cases with no arrest, cases with arrest were significantly more likely to have biological evidence, controlling for age, penetration, time between assault and exam, and external and additional genital swabbing. This relationship, however, only held for cases involving persons 12 years and older who were examined using the adult forensic medical examination kit. No relationship was noted between case arrest outcomes and finding of biological evidence in child cases.

We can think of several plausible explanations for this relationship for adult and adolescent cases. Certain types of case facts may at the same time increase the likelihood of arrests and the likelihood of biological evidence. The suspect being a known assailant, for instance, was associated with less reported suspect condom use (and therefore greater likelihood of leaving semen) and a greater likelihood of arrest. Some biological evidence may be visible to the police investigator even as they start to investigate, for example, blood or semen stains on clothing or bed sheets. Victims' supplying objects like clothing or bed sheets may increase the likelihood of finding biological evidence and also serve both as physical evidence in themselves and demonstrate victims' investment in the investigation. Other evidence such as witness accounts or fingerprints that could help lead to arrest may also be more likely when there is biological evidence.

DNA Associated with Arrests Following Crime Laboratory Analysis

We examined the data in the 11 cases in which arrests followed crime laboratory analysis to assess the possible role of forensic evidence. We were limited, however, in that our data do not permit us to assess whether and how any forensic evidence is used in decision-making. These 11 cases were significantly more likely than other arrests and non-arrests to have a DNA profile generated, to have a DNA match to the DNA of the identified suspect, and to have a DNA match to another case in CODIS. These results were statistically significant despite the small n of these cases. Strikingly, the odds of arrest following crime laboratory analysis versus no arrest were over 8 times greater when there was a DNA profile than without a DNA profile. The odds ratios for two DNA variables were almost twice as large as this: over 15 times greater odds of arrest following crime laboratory analysis when there was a DNA match to the identified suspect and nearly 14 greater odds of a DNA match another case in CODIS. The likelihood of an arrest following crime laboratory analysis is small, but much greater with DNA evidence than without it. We see two possible explanations for this, both of which could be operative depending on the case. In some cases, DNA could provide the key information necessary to make the arrest. In other cases, detectives could have developed probable cause by assembling an array of evidence through persistent police work, and as a part of their conscientious effort obtained DNA to strengthen the case as well. Either way, DNA may play an important role in arrests when arrests are not made quickly. We think it unlikely that odd ratios this large would result in these cases from a spurious connection between DNA and arrest due to third variables.

Our data are limited for understanding the processes by which DNA evidence is used and arrests are made. Nevertheless, several characteristics of these cases are suggestive of the role that DNA may have played. For these 11 cases, the median number of days between assault and arrest was 98 days, so evidence available at the time of the assault was likely not sufficient to lead to arrest. In several of the cases, the arrest was made well after the assault but close in time to the crime laboratory analysis, which raises the possibility that DNA evidence helped spur action. In other cases, the arrest was made well after both the assault and the crime laboratory analysis. Perhaps in these cases, DNA was just one part of assembling an array of evidence before arrests were made. We are left with a clear impression of a strong role of DNA in these cases but only fragments about what happened in the investigation. Clearly research is needed that samples these types of cases in greater number and obtains from police and prosecutors greater detail about the role biological evidence, particularly DNA, played in the investigation and prosecution.

Differences between Stranger and Non-Stranger Cases

There were no differences between stranger and known suspect cases in finding of biological evidence or semen. We did, however, find that stranger cases were significantly more likely to have a DNA profile generated; DNA profile was generated in 36.9% of stranger cases and 23.7% in known suspect cases. DNA profiling presents an opportunity to identify potential suspects, and therefore may be less critical in non-stranger cases because victims can already identify their perpetrators. On the other hand, the difference between cases in DNA profiling, while statistically significant, is not huge—clearly there is an investment in obtaining DNA results for many cases with known suspects. Notably, in the 11 cases in which laboratory analysis preceded arrest, there were both stranger and known suspect cases with DNA profiling, DNA match to suspect, and DNA hits in CODIS. Johnson's et al. (2012) data led those authors to suggest prioritizing DNA analysis in the following way: first, stranger assailant cases; second, cases in which acquaintance suspects deny sexual contact with the victim; and third, cases in which acquaintance suspects who claim the sexual contact was consensual. While we understand this recommendation reflects the current state of research knowledge, we think that more data are needed on the relative utility of DNA in different cases and the priority different cases should have. Note that Johnson et al. (2012) also recommend that cases with children, young adolescents, and compromised victims should also be prioritized, which we also agree with.

Male victims were more likely to report being assaulted by strangers. It has long been acknowledged that women are frequently victimized by individuals known to them (see Berzofsky, Krebs, Langton, et al., 2013), who may take advantage of the victim's trust. The dynamic of taking advantage of an existing relationship to commit sexual assault may not apply as much to men. It is not surprising that stranger assaults were also more likely to occur outdoors and involve a weapon, since strangers are not likely to have easy access to victims indoors and do not have the kind of relationships with victims that would make it easier to perpetrate sexual assault using less force. Victims assaulted by strangers were also more likely to seek medical attention sooner after the incident. There are likely many reasons why victims of non-stranger assaults may delay medical attention. These include the uncertainty as to whether they want the assault documented and potentially reported to police, shame and embarrassment associated with being assaulted by someone they knew or trusted, denial or self-blame, fear of being not believed, and fear of retaliation.

In terms of case decision making, we found that victim-suspect relationship was not associated with the decision to unfound a case, but was significantly linked to arrest, with arrests more likely in known assailant cases. We also did not find that different case characteristics influenced the arrest decision for stranger and non-stranger cases. One goal of the study was to examine whether there were significant differences in predictors for unfounding and arrest by victim-suspect relationship. No differences, however, were noted, suggesting that police decision making does not vary dramatically by whether the case being investigated involves strangers or known persons.

Differences between Types of Examiners

Another goal of the research project was to explore the impact of SANE involvement in sexual assault case evidence collection. Massachusetts presents an excellent opportunity to explore the effect of SANE because of its centrally managed statewide service delivery and centralized data that allow comparison of large samples of SANE and non-SANE cases. The challenge is that efforts to promote quality care statewide blur some of the distinctions between SANE and non-SANE that are sharper in other communities. Moreover, any SANE/non-SANE comparison is complicated by the fact that this difference is completely confounded with geographic location, because SANEs only practice in 27 SANE-designated hospitals and not others. The SANE hospitals are more likely to be in urban areas and serve higher proportions of disadvantaged and minority patients.

SANEs were significantly more likely to document genital injuries during the forensic medical examination and were more likely to complete perianal swabbing and additional genital swabbing. SANEs are specially trained on the best methods for identifying genital injuries. This includes victim positioning and use of medical equipment to aid visual detection. As noted, conversations with SANE trained medical providers indicated that they conduct additional swabbing based on information they gathered from victim during the course of the forensic medical examination. We also found that SANEs were less likely than non-SANE trained medical providers to collect clothing and conduct head and pubic hair combings. These differences in evidence collection—additional swabbing and less frequent collection of clothes and hairs supports the idea that SANEs do not use a "one-size-fits-all" approach when conducting the forensic medical examination, but rather are assessing and using medical forensic histories to guide the evidentiary collection process. In fact, the SANE program in Massachusetts stresses the importance of listening to victim accounts of the assault to guide evidence collection. Therefore, many practicing SANEs in Massachusetts do not collect hair combings unless during the course of the examination they determine that doing so would yield meaningful forensic evidence. The finding that SANEs were less likely to collect clothing than non-SANEs may also indicate the use of forensic history when determining evidence collection by SANEs. Perhaps there are circumstances in which non-SANE practitioners are taking clothing unnecessarily, when the case history does not indicate its utility. Or this may result may reflect the differences between SANE and non-SANE hospitals and the populations they serve. The criminalist who heads the state police crime laboratory reported to us that the evidence kits completed by SANEs are much better prepared than those completed by non-SANEs (personal communication, K. Sullivan, March 7, 2014), though our research methods using secondary data may not have been sensitive enough to detect this difference.

Despite some differences in forensic evidence collection, we did not find that examinations conducted by SANES were more likely to yield biological evidence. This lack of difference may simply reflect that high rates of swabbing and other evidence collection, such as the collecting of clothing, hairs, and other evidence, were being completed by both non-SANE and SANE trained medical providers.   The sexual assault professional community, with substantial leadership from the SANE program, has worked hard to maximize the quality of all examinations in the Commonwealth, despite the fact that resource limitations mean that not every patient can see a SANE. Massachusetts has developed a statewide protocol and evidence kit, and the Massachusetts SANE program has conducted trainings on forensic medical examinations in non-SANE hospitals, though it is not clear how many emergency department physicians attend. The irony is that in investing in these actions, Massachusetts SANE may have helped to mitigate the differences that would show its program to advantage. Note that it may be reasonable to conclude that these results vindicate SANE's policy on using discretion in what evidence collection procedures they use, since SANEs obtained similar rates of biological evidence despite lower rates of a few evidence collection procedures.

We also did not find a significant direct effect for medical examiner type on arrest, despite the finding that SANEs were more likely to identify genital injuries and arrests were more likely in cases with genital injuries. The lack of a direct effect on arrest is somewhat contradictory to other studies that have found SANE involvement in cases impacts police charging activities (Crandall & Helitzer, 2003). Several factors must be considered in interpreting this lack of difference. Again, efforts to promote quality examinations by both SANE and non-SANEs may have reduced any differences between the two on outcomes. Also, delivery of SANE services is confounded by geographic location, each with different police departments, which may obscure effects of SANE on outcomes. Third, there may be differences between the patient population served by SANE and non-SANE practitioners, including differences that could not be measured in our research.

It is important to note that SANE involvement in the case could directly impact other decisions beyond those studied here. For instance, research indicates that SANE involvement is associated with increased police investigatory activities (Campbell et al., 2012), something this study could not examine. SANE training is also intended to enhance nurses' abilities to provide expert witness testimony in court, and research has found that SANE involvement increases conviction rates and sentence length (Crandall & Helitzer, 2003). Again, these later processing points are beyond our current study's scope, but will be explored by the current research team in an upcoming National Institute of Justice study.

Chapter 7

Conclusion and Recommendations for Future Research

Injury evidence and biological evidence have the potential to have a major impact on criminal justice outcomes in sexual assault cases. Injuries, particularly serious injuries, can potentially undercut defendants' claims that sexual intercourse was consensual. DNA evidence can help identify assailants when they are unknown or their identity is ambiguous, and can undercut defendants' credibility if they deny sexual contact. Our results suggest that injury evidence and biological evidence may have an impact on arrest. The odds of an arrest were significantly greater when there was a genital injury and the odds of an arrest following crime laboratory analysis were much greater when there was a DNA profile, a DNA match to the suspect and/or a DNA match to another case in CODIS. However, the vast majority of arrests take place before crime laboratory analysis can be completed, so the impact of DNA, while potentially powerful, directly affects a small number of arrests.

The small number of cases in which injury evidence and biological evidence appear to have an impact on arrest is a major limitation of using probability samples from populations of sexual assault cases presenting for forensic medical examinations or reported to police. The vast majority of arrests were made before biological evidence was available. While injury evidence from the examination was available sooner, and while there was a correlation between this evidence and arrest, it is not clear whether timing of the examination made it possible for it to influence the arrest decision, or whether the level of communication between medical provider and police was substantial enough for injury found in the forensic medical examination to be a factor above and beyond what officers learn directly from the victim.

Consideration of case flow further suggests limitations in how often injury evidence and forensic evidence have an impact on criminal justice outcomes in a population of cases in which victims have had forensic medical examinations. Of course, injury evidence and biological evidence have no criminal justice impact in the majority of cases in which no arrests are made. In many arrests, there is no injury evidence or biological evidence. Even when there is a devastating psychological effect, many victims are not physically injured or receive minor injuries. In many cases, no biological products attributable to the assailant are found, and when found, biological products do not always yield a DNA profile or match to an assailant.

Time between assault and arrest was substantially related to whether a crime laboratory report was available prior to arrest and thus could have affected the arrest decision. About four-fifths of arrests took place within one week of the assault and in only 2% of these were crime laboratory results available, but in the one-fifth of arrests that took place after one week from the assault, 39% had crime laboratory results. As we have seen, when crime laboratory results were available before the arrest, DNA results were more likely. Thus the conditional probability of the crime laboratory potentially having an impact on arrests was fairly sizable in the minority of cases in which arrest had not been made within one week after the assault. Given the possibility that incoming cases may make it more difficult for police to invest time in investigations if an arrest is not made expeditiously, then the crime laboratory evidence may be a factor in breathing life into what could become a cold case or supporting an arrest in an otherwise weak case.

Future studies are needed that use different methodologies better attuned to the reality of the role of biological evidence in sexual assault cases. Below we outline four methodological choices we think are necessary for new research in this area.

Better Designed Sampling. The current study as well as Johnson et al. (2012) and others used broad samples defined by forensic medical examination or reporting to police or both. Crime laboratory results preceded arrests in only small numbers of cases, making it difficult to assess the effect of biological evidence on arrest. One serious consequence is that such small numbers render it impossible to construct multivariable statistical models that could assess the effect of forensic evidence while taking other variables into account. In future studies, sampling could be designed to increase the number of cases in which biological evidence has an opportunity to influence arrest decisions. Samples could be limited to cases in which no arrest was made before a crime laboratory analysis took place. Among other methods, researchers could use a case control study design, sampling cases in which arrests were made following crime laboratory analysis and a matched comparison group of cases with no arrest. Propensity score matching methods (see, e.g., Rosenbaum & Rubin, 1983) could be used to match cases on victim, assailant, assault and response characteristics.

Since the number of cases in which crime laboratory analysis precedes arrest is likely to be very small in any one sample, as it was in Johnson et al. (2012) as well as the current study, such studies should include a number of jurisdictions and sample cases over multiple years. The sample sizes need not be extremely large if effect sizes for biological evidence are big, as they were when we analyzed the relationship between DNA variables and arrest after crime laboratory analysis. To save on time and research funds, the number of non-arrests included in the sample per research site could be limited in order to free resources for including more sites.

Special Methods for Low Probability, High Impact Events. It may be useful to think about probative injury evidence and biological evidence as low probability, high impact events. Research on low probability, high impact events has been conducted in other fields such as risk analysis, (see, e.g., Bussiere & Fratscher, 2008; Heimann & Glickman, 1987; Shu, et al., 2010), mainly in reference to disasters or crises with a low probability of occurring but catastrophic consequences, but not to the best of our knowledge in criminology. Research on such events requires methods that are adapted to the small subgroups of cases in which these events occur, and may require special mathematical and statistical models. It is beyond our scope and expertise to make concrete suggestions about what these models might look like for studying the impact of injury evidence and biological evidence, but we urge policy makers and funders to seek input from experts experienced in developing statistical and mathematical models for uncommon events.

Recording of Relevant Case Circumstances. Our findings also point to the need for a more comprehensive understanding of how forensic evidence plays a role in particular types of cases, consistent with Johnson et al.'s (2012) recommendation. Anecdotal evidence suggests that there are specific circumstances in which injury evidence and biological evidence can play a critical role. Injury evidence may be influential when injuries are perceived to be serious and are beyond what one may expect during consensual sex. In some cases, DNA evidence can help identify a suspect who could not otherwise be identified. Biological evidence may also play a large role when it corroborates victims' accounts of the assault in cases in which suspects deny sexual contact. Given other case circumstances, biological evidence may play little or no role; for example, corroboration of sexual contact may be moot if the suspect admits intercourse with the victim but claims it was consensual. Yet, even in these cases DNA evidence may prove important. DNA evidence in date rape cases in which the suspect is known and the suspect acknowledges sexual contact occurred may not be important for identification purposes or documentation of sexual contact. But what if the suspect has committed similar offenses against multiple victims? A DNA profile submitted to CODIS could be used to link multiple cases together and identify the suspect as a repeat rapist. Such evidence could be particularly valuable to the police investigation, and may increase the chances of arrest, charging, and prosecution in cases that on their own are difficult to prove. Moreover, identification and prosecution of serial rapists has greater potential to reduce the incidence of sexual victimization and improve public safety. Studies of repeat rapists indicate that these individuals account for a large number of sexual victimizations (as well as other crimes). One study found that 120 individual rape offenders had committed over 1,225 incidents of interpersonal violence, 483 of which met the definition of rape and another 53 which met the definition of sexual assault (Lisak, 2002). Repeat rapists were engage in particularly high rates of offending; 76 individuals were identified as repeat rapists and these individuals reported committing 439 of the 483 rapes documented. Thus, a small group of individuals had committed a large amount of sexual violence.

However, much research in this area does not examine the role of biological evidence in subsets of cases in which it is likely to be effective, nor are case circumstances recorded in data collection in sufficient specificity to identify specific situations in which biological evidence is effective or ineffective. Nor have researchers coded any specific reasoning or actions by police and prosecutors related to biological evidence. Future research should code police and prosecutor records in sufficient detail to identify the investigative needs biological evidence addresses and the process by which it is used. Coders should record whether there is a need to identify the perpetrator or to corroborate the victims' account in the face of counter-claims by the assailant. Also recorded should be the reason testing was done, whether it done routinely per policy or in response to a specific police or prosecutor request. Research should examine whether and when specimens were taken from the suspect as well as from the victim. The date of any request for analysis should be recorded as well, so researchers can assess the timing of seeking biological evidence relative to the timing of arrest. Data should be collected on investigative and prosecutorial actions such as search warrants or subpoenas that were spurred by findings of biological evidence, including whether biological evidence linking multiple sexual assault cases impacted practitioner activities and decisions.

Case Studies of Systems. Criminal justice outcomes are arrived at through a complex system of decision-making by many actors, including victims, perpetrators, police, assistant district attorneys, defense counsel, judges and juries. There may be larger effects of injury and biological evidence collection procedures on this system that cannot be measured easily in individual cases. For example, assailants' knowledge that effective systems are in place to collect injury evidence and biological evidence may affect their decision-making well before these types of evidence become available in their cases. For example, perpetrators may be less likely to claim lack of sexual contact and more likely to claim consent if they know that DNA evidence may be forthcoming (personal communication, D. Deakin, November 1, 2013). Likewise they may be more likely to construct a defense claiming consensual rough sex if they know victims have received a forensic medical examination. Judges and juries may expect prosecutors to present DNA evidence in trials and judge the prosecution accordingly even if DNA evidence is not necessarily probative in a given case. Analyzing case data cannot reveal such systemic effects.

Case studies of jurisdictions that use qualitative as well as quantitative methods are needed. Researchers could interview medical examiners, police, crime laboratory professionals, prosecutors, and judges to learn more about what the standards and norms are for injury evidence and biological evidence; when these forms of evidence are collected, analyzed and used effectively; when there are obstacles and unrealized potential; and the process by which these forms of evidence have an impact. Existing research suggests jurisdictions differ in important ways on how they process injury evidence and biological evidence, and how they handle investigations, arrests, filing criminal charges and exercising prosecutorial discretion. For example, the current study suggests that a greater proportion of forensic evidence kits were analyzed in Massachusetts than in the jurisdictions studied by Johnson et al. (2012). The current study also suggests that prosecutorial discretion is involved somewhat later in the process than in other jurisdictions, and this may affect the impact of biological evidence on the decision to file criminal charges. Case studies could further explore how these jurisdictional differences affect the collection, analysis and use of injury evidence and biological evidence. It is also important that the timing of evidence and case decision making be more consistently collected and considered when examining how cases are being processed through the criminal justice system.

Here too, jurisdictional differences need to be considered and documented to allow for cross-jurisdiction comparisons, and to promote a greater understanding of how cases proceed, the barriers to their progression and how the local political environment plays a role. For instance, jurisdictions that report quicker arrests may appear more successful in addressing sexual victimization than jurisdictions with greater lags between reporting and arrest, but these quick arrests may be at the expense of having additional evidence and more thorough investigations that may strengthen the case and increase the likelihood of prosecution (Lonsway and Archambault, 2012). On the other hand, some research indicates that delays in arrest and referral for prosecution may decrease the likelihood that prosecutors will pursue cases (Rosay, Wood, Rivera, Postle, and TePas, 2011). Collection of data on the timing of events, including when investigation activities occur, evidence becomes available, and case status decisions are made, could help inform what is happening in sexual assault cases and can be used to improve police investigations and procedures.

Prospects for Future Research. A great deal has been learned in recent years about the role of injury evidence and biological evidence in the criminal justice system, just as there is increased training and professionalization of medical providers (e.g., SANEs) conducting examinations, the potential of DNA testing has been expanding, and there are more calls for more rapid, complete and equitable use of rape kits. Most of the research to date on injury evidence and biological evidence has been limited in rigor; moreover, measurement of these forms of evidence in many studies has been a small component of many larger studies, without a great claim on researchers' attention. The theory of the effect of biological evidence is not complicated and the effects may be large in the right samples. A small number of well-crafted, focused studies with optimal samples and measurement may have a decisive effect in assessing and understanding the impact of injury evidence and biological evidence.

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Appendix A

Provider Sexual Crime Report Form-Adult and Child Versions

INFORMATION PERTAINING TO ASSAULT & KIT TRACKING FORM

FORM 2A
FAX FORM 2A ONLY

PROVIDER SEXUAL CRIME REPORT

Per MGL C.112, S. 12A 1/2

K

A. PATIENT/VICTIM INFORMATION *Name, address and other identifying information should not be written on this anonymous form.*

1. Age: ____ 2. Gender: ☐ Female ☐ Male
3. Race: ☐ White (non-Hisp.) ☐ Hispanic ☐ Black (non-Hisp.) ☐ Asian/Pac. Isl. ☐ Other: ________
4. Date of Assault (e.g., 01/01/2000): ________ 5. Approx. Time of Assault: ________ ☐ AM ☐ PM
6. City/Town of Assault: ________ State: ________ Neighborhood: ________
7. Specific surroundings at time of Assault:
   ☐ House/Apartment ☐ Outdoors ☐ Dormitory ☐ Hotel/Motel ☐ Other ________ ☐ Unsure
   Correctional Facility (Check One): ☐ Prison ☐ Jail ☐ DYS
8. Date of hospital exam (e.g., 01/01/2000): ________ 9. Time of hospital exam: ________ ☐ AM ☐ PM
10. Hospital providing service: ________
11. Exam completed by a Sexual Assault Nurse Examiner (SANE)? ☐ Yes ☐ No

Affix kit number label here on both white and yellow copies.

B. ASSAILANT(S) INFORMATION *Did the patient/victim voluntarily report any of the following relationships with the assailant(s)?*

12. Total number of assailants: ________ Unsure: ☐
13. Assailant(s) relationship to patient/victim and gender of assailant (m/f) *(If >1 assailant, designate relationship of each).*

	# Male	# Female		# Male	# Female
☐ Parent/ Step-parent	___	___	☐ Boy/ girlfriend	___	___
☐ Spouse/ live-in partner	___	___	☐ Ex-boy/ girlfriend	___	___
☐ Ex-Spouse/ live-in partner	___	___	☐ Date	___	___
☐ Parent's live-in partner	___	___	☐ Acquaintance	___	___
☐ Other relative	___	___	☐ Friend	___	___
☐ Stranger	___	___	☐ Unknown	___	___
			☐ Other (specify): ___		___

C. WEAPONS/ FORCE USED *(Check all that apply as per patient report and/or physical findings).*

14. ☐ Unknown ☐ Bites ☐ Gun ☐ Restraints
    ☐ Verbal threats ☐ Hitting ☐ Knife ☐ Chemical(s)
    ☐ Choking ☐ Burns ☐ Blunt Object ☐ Other weapons Describe: ________
    ☐ Other physical force Describe:

D. ACTS DESCRIBED BY THE PATIENT/VICTIM:

Was there penetration, however slight, of:

15. Vagina ☐ No ☐ Unsure ☐ Attempt ☐ Yes BY ☐ Penis ☐ Finger ☐ Tongue ☐ Object/Other: ____
16. Anus ☐ No ☐ Unsure ☐ Attempt ☐ Yes BY ☐ Penis ☐ Finger ☐ Tongue ☐ Object/Other: ____
17. Mouth ☐ No ☐ Unsure ☐ Attempt ☐ Yes BY ☐ Penis ☐ Finger ☐ Tongue ☐ Object/Other: ____
18. During the assault, were acts performed by the patient/victim upon the assailant(s)? ☐ YES ☐ NO ☐ UNSURE
    If yes, specify: ________
19. Did ejaculation occur? ☐ YES ☐ NO ☐ UNSURE
20. Did assailant(s) use a condom? ☐ YES ☐ NO ☐ UNSURE
21. Any injuries to patient/victim resulting in bleeding? ☐ YES ☐ NO ☐ UNSURE
    If yes, specify: ________
22. Any injuries to assailant(s) resulting in bleeding? ☐ YES ☐ NO ☐ UNSURE
    If yes, specify: ________

E. CASE STATUS AT TIME OF THE EXAM

23a. Evidence Collection Kit completed? ☐ Yes ☐ No
23b. Toxicology Kit completed? ☐ Yes ☐ No
24. Reported to police? ☐ Yes ☐ No *If yes, specify police dept.:* ________
25. DSS Involved? ☐ Yes ☐ No *If yes, describe status:* ________
26. Restraining order in place before assault? ☐ Yes ☐ No *If yes, date and court location:* ________
27. Restraining order filed after assault? ☐ Yes ☐ No *If yes, date and court location:* ________

F. MANDATORY REPORTING (Check all that apply):

28. 19A Elder Abuse Report ☐ Yes ☐ No
29. 51A Child Abuse Report ☐ Yes ☐ No
30. 19C Disabled Persons Report ☐ Yes ☐ No
31. 12A Weapon Report ☐ Yes ☐ No
32. 70E Emergency Contraception Administered ☐ Yes ☐ No

G. KIT TRACKING INFORMATION

33. Name of Police Department notified for pick up and transport of Evidence: ________
34. Date notified: ________ Time notified: ________

FAX this report to: **Massachusetts Executive Office of Public Safety-Research and Policy Analysis Unit**
FAX : 617-725-0260 AND: Local public safety authority

RETAIN WHITE COPY OF FORM 2A AND 2B FOR HOSPITAL RECORDS — RETURN YELLOW COPY OF FORM 2A AND 2B TO STEP 1 ENVELOPE

MASSACHUSETTS PROVIDER SEXUAL CRIME REPORT FOR PEDIATRIC ASSAULTS/ABUSE (< 12 Years of Age)

Per MGL C.112, S. 12A 1/2

A. PATIENT/VICTIM INFORMATION

Patient's name, address and/or other identifying information should not be written on this form.

1. Date of Birth: _______ / _______ / _______
2. Gender: ☐ Female ☐ Male
3. Race: ☐ White (non-Hisp.) ☐ Black (non-Hisp.) ☐ Hispanic ☐ Asian/Pac. Isl. ☐ Other: __________
4. Date of Assault (e.g., 01/01/2007): _______ / _______ / _______
5. Approx. Time of Assault: ____________ ☐ AM ☐ PM ☐ Unknown
6. City/Town of Assault: ______________________
7. State: _________
8. Neighborhood: ____________________________
9. Facility where exam was performed: ____________________ Hospital ____________ CAC
10. Date and time of exam: _______ / _______ / _______ ______ ☐ AM ☐ PM

B. CASE STATUS/MANDATORY REPORTING AT TIME OF EXAM (Check all that apply):

11. Evidence Collection Kit completed? ☐ YES ☐ NO
12. Toxicology testing completed? ☐ YES ☐ NO
13. Reported to police? ☐ YES ☐ NO
14. 51A filed? ☐ YES Date and Time of filing: __________ ________
15. Weapon Report? ☐ YES ☐ NO

Please affix kit # label here

For Completion by SANE staff only:

Form completed by: ☐ Pedi SANE ☐ Adult/Adolescent SANE

Was disclosure made ☐ YES ☐ NO Disclosure made to ____________________

Relationship of perpetrator to child ______________________________

Nature of assault ☐ Acute ☐ Chronic

Mail or FAX this report to: Massachusetts Executive Office of Public Safety
Statistical Analysis Center
One Ashburton Place, Suite 2110
Boston, MA 02108
FAX (617) 727-5356

Appendix B

Massachusetts Sexual Assault Evidence Kit Forms Used in this Study

FORM 2B
DO NOT FAX THIS PAGE

INFORMATION PERTAINING TO ASSAULT

Commonwealth of Massachusetts Sexual Assault Evidence Collection Kit

Affix kit number label here
on both white and yellow copies.

A. PERTINENT/ RECENT HEALTH HISTORY:

Has the patient undergone recent medical or gynecological procedures or treatments which may affect physical findings or evidence collection? ☐ Yes ☐ No

If yes, describe: ____

Patient menstruating at the time of assault? ☐ Yes ☐ No Currently? ☐ Yes ☐ No

Patient's tampon or sanitary napkin to be included in kit? ☐ Yes ☐ No

Has the patient had consensual sexual intercourse in the past 120 hours/5 days? ☐ Yes ☐ No

If yes, specify the number of hours since consensual intercourse ended: ____

Has the patient used any type of contraception in the past 24 hours? ☐ Yes ☐ No

If yes, specify type: ____

B. SINCE THE TIME OF THE ASSAULT HAS THE PATIENT:

a. Changed clothes? ☐ Yes ☐ No	b. Bathed / showered? ☐ Yes ☐ No	c. Washed off? ☐ Yes ☐ No
d. Brushed teeth? ☐ Yes ☐ No	e. Used mouthwash? ☐ Yes ☐ No	f. Taken in fluid? ☐ Yes ☐ No
g. Vomited? ☐ Yes ☐ No	h. Smoked cigarettes? ☐ Yes ☐ No	i. Urinated? ☐ Yes ☐ No
j. Douched? ☐ Yes ☐ No	k. Defecated? ☐ Yes ☐ No	l. Used enema? ☐ Yes ☐ No
m. Brushed/ washed hair? ☐ Yes ☐ No		

C. WEAPONS/ FORCE USED: *(Check all that apply as per patient report and/or physical findings; describe the incident and/or body part involved.)*

☐ Verbal threats Describe: ____	☐ Choking Describe: ____
☐ Bites Describe: ____	☐ Hitting Describe: ____
☐ Burns Describe: ____	☐ Gun Describe: ____
☐ Knife Describe: ____	☐ Blunt object Describe: ____
☐ Restraints Describe: ____	☐ Chemical(s) Describe: ____
☐ Other weapons Describe: ____	☐ Other physical force Describe: ____

D. ACTS DESCRIBED BY THE PATIENT/VICTIM:

Did ejaculation occur?

- Vaginally? ☐ Yes ☐ No ☐ Unsure
- Anally? ☐ Yes ☐ No ☐ Unsure
- Orally? ☐ Yes ☐ No ☐ Unsure
- Externally? ☐ Yes ☐ No ☐ Unsure

If externally, where?

- ☐ On the patient's body. Where? ____
- ☐ On an object. What object? Where? ____
- ☐ Other: ____
- ☐ Unsure

Did assailant(s) use any substance as lubrication (saliva is considered lubrication)? ☐ YES ☐ NO ☐ UNSURE

If yes, specify: ____

Did assailant(s) kiss, lick, spit or make other oral contact with the patient/victim? ☐ YES ☐ NO ☐ UNSURE

If yes, describe location: ____

Did assailant(s) touch the patient/victim with bare hands or fingers? ☐ YES ☐ NO ☐ UNSURE

If yes, describe location: ____

Type of emergency contraception given: ____ dosage: ____

Were there any children present during the assault? ☐ Yes ☐ No ☐ Unsure

If yes, describe the relationship to the patient: ____

Interpreter used? ☐ Yes ☐ No Language: ____ Name of Interpreter: ____

Printed name of medical provider or S.A.N.E. ____

Signature of medical provider or S.A.N.E. ____

If applicable, certified number of the S.A.N.E. ____ Date ___ / ___ / ___

REV. FORM2B

FORM 4
Commonwealth of Massachusetts
Sexual Assault Evidence Collection Kit

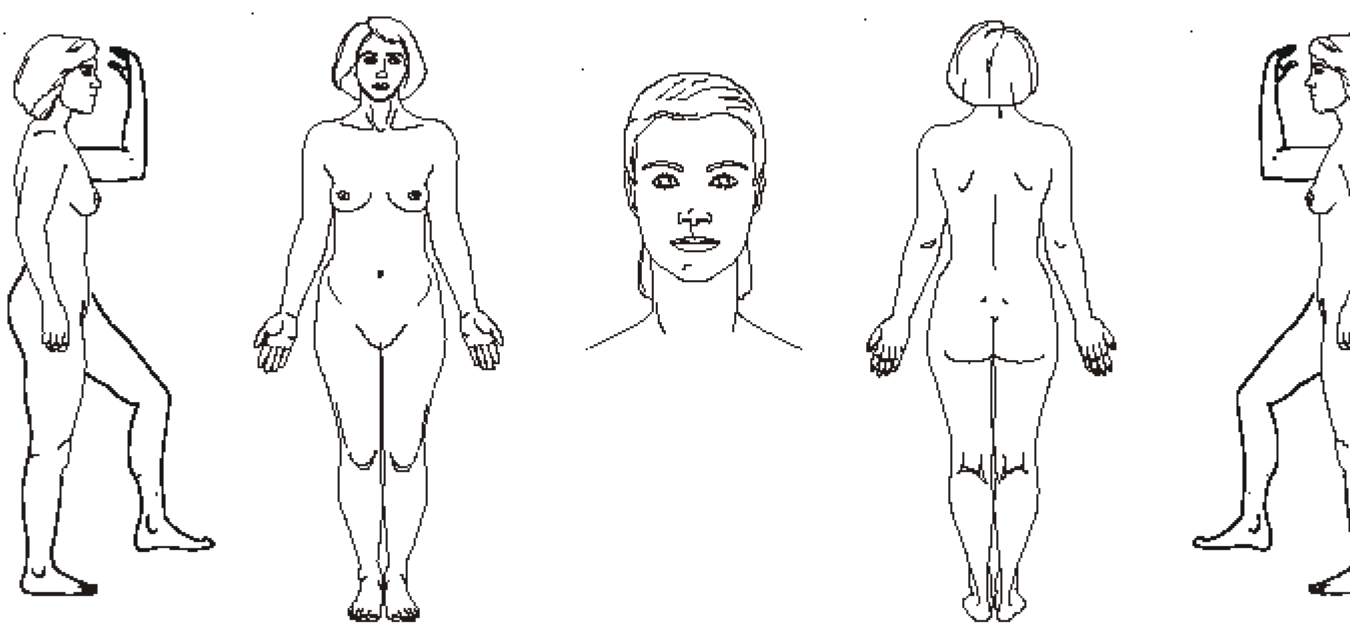
PHYSICAL APPEARANCE/WOU
DOCUMENTATI

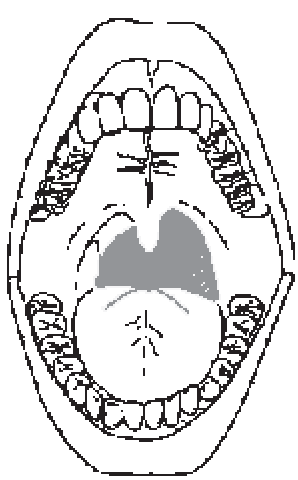
Record the patient's general physical appearance and demeanor:

____
____
____
____
____
____

Record injuries and findings on diagrams: erythema, abrasions, bruises (detail shape), contusions, induration, lacerations, fractures, bites, burns and stains or foreign materials on the body. Record size and appearance of injuries. Note areas of swelling and patient's indications of tenderness.

Affix kit number label here on both white and yellow copies





PHOTOGRAPHS COMPLETED & ENCLOSED IN HOSPITAL RECORD
Do not include in Sexual Assault Evidence Collection Kit

Total # of pictures taken during evidence collection ______

#of Photos Taken	Numbered Area	Body Part	Instrument (Please circle one)	close W/Ruler	close W/O Ruler	medium	long-ra
				(Choose the range description(s) that correspond to the numbered are			
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐
______	______	______	Medscope/ Polaroid	☐	☐	☐	☐

FORM 5A
Commonwealth of Massachusetts
Sexual Assault Evidence Collection Kit

PHYSICAL EXAMINATION

Affix kit number label here
on both white and yellow copies.

FEMALE	WNL	Swelling	Redness	Abrasion	Tearing	Other
Labia majora						
Perineum						
Clitoris						
Female Circumcision: ☐ Yes ☐ No						
Labia minora						
Periurethral tissue/ urethral meatus						
Periurethral tissue (vestibule)						
Hymen						
Posterior fourchette						
Fossa navicularis						
Vagina						
Cervix						
Other						

MALE	WNL	Swelling	Redness	Abrasion	Tearing	Other
Penis						
Circumcised ☐ Yes ☐ No						
Urethral meatus						
Perineum						
Scrotum						
Testes						

FEMALE/MALE ANUS	WNL	Swelling	Redness	Abrasion	Tearing	Other
Buttocks						
Perianal skin						
Anal verge/ folds/rugae						
Tone	WNL	ABN	Describe			

Anal spasm ☐ Yes ☐ No
Anal laxity ☐ Yes ☐ No
Note presence of stool in rectal ampulla ☐ Yes ☐ No
Method of exam for anal tone: (discretion of examiner) ☐ Observation ☐ Digital Exam

EXAM POSITION USED
☐ Lithotomy ☐ Other (specify): ____________

EXAM POSITION USED
☐ Lithotomy ☐ Other (specify): ____________
Is the patient pregnant? ☐ YES ☐ NO No. Weeks: ________
Date of last menstrual period: _____ / _____ / _____

EXAM INFORMATION

GENITAL EXAM DONE WITH	YES	NO	N/A	Provider Initials
Direct visualization				
Speculum Exam				
Medscope Exam				
Anoscopic Exam				

Further Description of other injuries, if necessary:

Printed Name of medical provider or S.A.N.E. **Signature of medical provider or S.A.N.E.** Date ____/____/____

If applicable, print additional medical provider name/title Signature Portion of exam done Date ____/____/____

RETAIN WHITE COPY OF FORM 5A AND 5B FOR HOSPITAL RECORDS RETURN YELLOW COPY OF FORM 5A AND 5B TO STEP 1 ENVELOPE

FORM 5B
Commonwealth of Massachusetts
Sexual Assault Evidence Collection Kit

EVIDENCE COLLECTED INVENTORY LIST

Affix kit number label here
on both white and yellow copies.

Date: ________ **Hospital:** ____________________

Please indicate which pieces of evidence you collected by checking appropriate boxes below. If No, please complete N/I as not indicated or P/D as patient declines.

Name of Medical Provider/SANE: ____________________

Signature of Medical Provider/SANE: ____________________

Step Number	Description of Evidence Collected	YES	NO	N/I Not Indicated	P/D Patient Declines
Step 1	Consent Form and Reports	☐	☐	☐	☐
Step 2	Control Swabs	☐	☐	☐	☐
Step 3	Toxicology Testing	☐	☐	☐	☐
Step 4	Known Blood Sample	☐	☐	☐	☐
Step 5	Oral Swabs and Smears	☐	☐	☐	☐
Step 6	Fingernail Scrapings	☐	☐	☐	☐
Step 7 (A) & (B)	Foreign Material Collection	☐	☐	☐	☐
Step 8	Clothing (See below for list)	☐	☐	☐	☐
Underwear should be stored in kit	Underwear worn at time of assault	☐	☐	☐	☐
	Underwear worn after assault	☐	☐	☐	☐
Step 9	Bite Marks	☐	☐	☐	☐
Step 10	Head Hair Combings	☐	☐	☐	☐
Step 11	Pubic Hair Combings	☐	☐	☐	☐
Step 12	External Genital Swabs	☐	☐	☐	☐
Step 13	Vaginal Swabs and Smear	☐	☐	☐	☐
Step 14	Perianal Swabs	☐	☐	☐	☐
Step 15	Anorectal Swabs and Smears	☐	☐	☐	☐
Step 16	Additional Swabs	☐	☐	☐	☐
Step 17	Completion of SAEC Forms	☐	☐	☐	☐
Step 18	Mandatory Provider Sexual Crime Report Completed	☐	☐	☐	☐
Clothing (Transport Bag)	Contents in Evidence Transport Bag	☐	☐	☐	☐
	Coat	☐	☐	☐	☐
	Hat	☐	☐	☐	☐
	Shirt/Blouse	☐	☐	☐	☐
	Sweater	☐	☐	☐	☐
	Pants	☐	☐	☐	☐
	Skirt	☐	☐	☐	☐
	Dress	☐	☐	☐	☐
	Bra	☐	☐	☐	☐
	Stockings	☐	☐	☐	☐
	Shoes	☐	☐	☐	☐
	Other	☐	☐	☐	☐
	Other	☐	☐	☐	☐

RETAIN WHITE COPY OF FORM 5A AND 5B FOR HOSPITAL RECORDS RETURN YELLOW COPY OF FORM 5A AND 5B TO STEP 1 ENVELOPE

Appendix C

List of Variables for Data Collected from Crime Laboratories

1. Incident occurred in Massachusetts
2. Identified as a sexual assault
3. Evidence Kit Number
4. Kit at crime lab
5. Were all forms included in the case file?
6. Which forms were missing?
7. ORI number
8. Incident number
9. Internal Case Number if Different from Incident Number
10. Lab Case #
11. Name of investigating agency
12. Was incident reported to police by time of exam (according to SANE forms)?
13. Injuries on scalp
14. Injuries on face
15. Injuries on neck
16. Injuries on mouth
17. Injuries on breast
18. Injuries on abdomen
19. Injuries on chest
20. Injuries on back
21. Injuries on arms
22. Injuries on hands
23. Injuries on knees
24. Injuries on legs
25. Injury on feet
26. Foreign materials on the body (Form 4)
27. Number of non-genital injuries
28. Size of largest non-genital injury (in cm)
29. Size of largest genital injury (in cm)
30. Loss of consciousness
31. Patient in ICU
32. Pattern injury or bite mark
33. Fracture
34. Incise wound
35. Puncture wound
36. Genital bleeding
37. Serious genital injury
38. Total number of photographs taken during evidence collection
39. Number of close photographs with ruler
40. Number of close photographs without ruler
41. Number of medium photographs

42. Number of long-range photographs
43. Labia majora injury
44. Perineum injury
45. Clitoris injury
46. Labia minora injury
47. Periurethral tissue/urethral meatus
48. Periurethral tissue (vestibule)
49. Hymen injury
50. Posterior fourchette injury
51. Fossa navicularis injury
52. Vagina injury
53. Cervix injury
54. Other female genital injury
55. Penis injury
56. Urethral meatus
57. Perineum male injury
58. Scrotum injury
59. Testes injury
60. Buttocks injury
61. Perianal skin injury
62. Anal verge/folds/rugae injury
63. Anal tone injury
64. Anal spasm
65. Anal laxity
66. Number of genital structures with swelling
67. Number of genital structures with redness
68. Number of genital structures with abrasion
69. Number of genital structures with tearing
70. Number of structures with other injury
71. Direct visualization used as exam method
72. Speculum exam used as exam method
73. Medscope exam used as exam method
74. Anoscopic exam used as exam method
75. Control swabs used
76. Toxicology testing done
77. Known blood sample taken
78. Oral swabs and smears done
79. Fingernail scrapings taken
80. Foreign material collected
81. Clothing taken
82. Underwear worn at time of assault taken
83. Underwear worn after the assault taken
84. Bite marks recorded
85. Head hair combings taken
86. Pubic hair combings taken

87. External genital swabs used
88. Vaginal swabs and smear used
89. Perianal swabs used
90. Anorectal swabs and smears used
91. Additional swabs used
92. Date evidence kit collected
93. Date evidence kit sent to crime lab
94. Date evidence kit arrived at crime lab
95. Date of lab report to police
96. Date of lab report to prosecutors
97. Positive evidence – blood
98. Positive evidence – saliva
99. Positive evidence – semen
100. Positive evidence – other biological
101. If positive evidence -- other biological evidence, specify
102. Positive evidence – other
103. If positive evidence -- other, specify
104. Body swabs a source of evidence
105. Clothes a source of evidence
106. Other source of evidence
107. If other source of evidence, specify
108. DNA profile generated
109. DNA match to suspect
110. DNA match to CODIS—another case
111. DNA match to CODIS—convicted offender
112. Lab reported to police or prosecutor

Appendix D

Police Case Outcome Data Collection Form—Boston cases

1. **Was an arrest made in this case?**

0.........no
1.........yes

2. Date of arrest

__/__/__ (MM/DD/YR)

2. What was the prosecutor's office decision concerning the prosecution of this case?

1.____ case accepted for prosecution
2.____ case diverted
3.____ case declined
4.____ other decision (SPECIFY:______________________________)
98.___ information missing for this case

3. What specific action did the prosecutor take in this case?

1.____ case was carried forward
2.____ case was transferred
3.____ case was dismissed
4.____ other action (SPECIFY:___________________________________)
5.____ case is pending
98.___ information missing for this case

4. Were criminal charges filed against any alleged offender in this case?

0.____ no
1.____ yes
98.___ information missing for this case

5. Date criminal charges filed

__/__/__ (MM/DD/YR)

6. Did this case go to criminal court or are court proceedings pending?

1.____ yes, went to court
2.____ court proceedings are pending
3.____ no
98.___ information missing for this case

7. How did the alleged offender plead in this case?

1.____ guilty
2.____ not guilty, goes to trial
3.____ guilty/plea bargain
4.____ Alford plea

5. ____ diversion
6. ____ other (SPECIFY: ________________________)
98.___ information missing for this case

8. If this case went to trial, what was the outcome of the trial?
1.____ acquitted
2. ____ dismissed with prejudice
3. ____ directed verdict
4. ____ convicted at trial
5.____ mistrial, dismissed with prejudice
6.____ charges dropped
7.____ other (SPECIFY:____)
8.____ unknown, case is pending
98.___ information missing for this case

2. Date of disposition
__/__/__ (MM/DD/YR)

Appendix E

Police Case Outcome Data Collection Documents—non-Boston cases

The Commonwealth of Massachusetts
Executive Office of Public Safety and Security

Office of Grants & Research
Ten Park Plaza, Suite 3720
Boston, Massachusetts 02116
Tel: 617-725-3301
Fax: 617-725-0260
617-725-0267
www.mass.gov/eopss

Deval L. Patrick
Governor

Andrea J. Cabral
Secretary

Ellen J. Frank
Executive Director

June 28, 2013

Chief XXX
XXX Police Department
Address1
City, MA Zip

Dear Chief XXX:

I am requesting your assistance in obtaining information on a sample of sexual assault cases reported to your department that were also reported by medical providers to the Executive Office of Public Safety and Security (EOPSS) as required by law via a *Provider Sexual Crime Report (PSCR) Form*.

EOPSS is partnering with the University of Illinois on a study funded by the National Institute of Justice looking at the relationship between injury and forensic evidence in sexual assault cases and the filing of criminal charges and arrest. Medical examination and crime laboratory data have already been collected on more than 600 sexual assault cases in the Commonwealth.

For this study, we have linked PSCR and forensic data with criminal incident data reported to the Crime Reporting Unit of the Massachusetts State Police and Boston Police however some of the information was missing or not reported which leads to a substantial underestimate of the criminal justice response to sexual assault in Massachusetts.

Enclosed is a table with police incident numbers and the corresponding dates of assault, if known. This information will help identify the assault in your jurisdiction for which we are seeking additional data. Please complete the table by providing the information below for each incident:

- Was the case founded?
- Was there an arrest for the incident; if so, arrest charge(s) and date?
- Were criminal charges filed; if so, specific charge(s) and date?

Please send the complete data table by July 12th via one of the following:

Fax: Attention Brittany Peters at 617-725-0260

Mail: Brittany Peters
Research and Policy Analysis Division
Office of Grants and Research
10 Park Plaza, Suite 3720
Boston, MA 02116

We hope that this request is not unduly burdensome. Obtaining and analyzing these data will allow us to fulfill our commitment to the National Institute of Justice to complete the first statewide study on the use and impact of injury and forensic evidence in sexual assault cases. If you have any questions, please feel free to contact me at 617-725-3306.

Thank you for your assistance.

Sincerely,

Lisa Sampson, Director
Research and Policy Analysis Division
Office of Grants and Research, EOPSS

Enclosure.

Police Case Outcome Data Collection Form—non-Boston cases

Incident /Case Number	Assault Date:	Case Founded: Y/N	Arrest: Y/N	If arrested, applicable MGL statute(s):	If arrested, specific offense names(s)	Date of arrest:	Criminal charges filed Y/N:	If charged, applicable MGL Statute(s)	If charged, specific offense(s) name:	Date charges filed:

Additional comments/clarifications relate to case outcomes—e.g., exceptional clearances, summons. Please be sure to identify the case referring to: