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The Role and Impact of Forensic Evidence in the Criminal Justice System

Final Report

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Chapter 1

Role and Impact of Forensic Evidence

Introduction

This report provides the results of a major study conducted by the Institute for Law and Justice, Inc. (ILJ) to determine the role and impact of forensic evidence in the investigation of crimes and prosecution of defendants. The National Institute of Justice (NIJ) awarded the project to ILJ in 2006 through a competitive solicitation.[1] As stated in the solicitation, the key objectives of the study were:

- Estimate the percentage of crime scenes from which one or more types of forensic evidence are collected.
- Describe and catalog the kinds of forensic evidence collected at crime scenes.
- Track the use and attrition of forensic evidence in the criminal justice system from crime scenes through laboratory analysis, and then through subsequent criminal justice processes.
- Identify which forms of forensic evidence contribute most frequently to successful case outcomes.

A related issue highlighted in the solicitation was the need to expand the definition of *successful case outcome* beyond identifying a suspect or successfully prosecuting a defendant (e.g., guilty verdict, plea agreement, etc.). ILJ addressed this issue through measures such as the number and percent of positive identifications through fingerprints, the successful matching of firearm evidence (e.g., matching spent projectiles to handguns), the elimination of suspects through DNA profiles, and other measures.

In its response to the solicitation, ILJ proposed longitudinal studies in Miami-Dade County, Florida; San Diego, California; and a third site to be determined during the first few months of the project. The selected site was Denver, Colorado. The study called for tracking cases and forensic evidence through local criminal justice processes for five offenses: homicide, sexual assault, aggravated assault, robbery, and burglary. Moreover, it was anticipated that we

[1] NIJ awarded a parallel study to the California State University, Los Angeles under the direction of Drs. Joseph Peterson and Ira Sommers.

would be able to merge records from case management systems in the police departments, crime labs, and district attorneys' offices. The result would be a complete picture of a large number of cases from crime report to final disposition of defendants.

As it turned out, it was not possible to merge databases as originally envisioned. For example, at the time of data collection in Denver, Colorado, the key systems—police records management system, crime lab information system, district attorney's case management system, and court systems—did not include a common field that allowed for automatically linking records. In San Diego, through the efforts of the analyst in the district attorney's office, it was possible to link records of defendants to police information. However, the crime lab information system could not be linked. As described in Chapters 2 and 3, sampling plans had to be developed for these two sites to obtain the necessary information for the study.

Through extensive data collection efforts, we were able to obtain detailed information on 4,049 offenses in Denver and 3,207 offenses in San Diego. For these cases, there were 509 cleared cases in Denver (585 arrestees) and 1,442 cleared cases in San Diego (1,733 arrestees). Demographic data were collected on victims and arrestees. Data on forensic evidence collected at the scenes included DNA material, latent prints, firearms evidence, trace evidence, and others. Through crime lab reports, we were able to determine the number of cases in which requests for analysis were made and the number of cases in which probative evidence was obtained by forensic analysis. Information on defendants included the filed charge, final charge, final disposition, and number of prior convictions.

As part of the studies in Denver and San Diego, ILJ personnel interviewed investigators and district attorneys on the role of forensic evidence in their decisions on cases. We also identified several cases in which forensic evidence clearly played an important role in identifying the offender or assisting in the prosecution. Chapter 5 provides summaries of a few cases along these lines.

Problems on linking databases also arose in Miami-Dade County, Florida, with the additional complication that information on unsolved cases was not forthcoming because of privacy concerns. As an alternative, a more restricted study was conducted at this site focusing on an experiment that had been underway by the crime lab on processing DNA evidence from no-suspect, unsolved property crimes. The purpose of the study was to determine whether faster

processing of DNA evidence would increase arrest rates for these offenses. Chapter 4 provides an analysis of the experiment.

A final task in the project was to conduct a survey of police departments to develop a better understanding of the organizational and personnel arrangements for collection of forensic evidence. ILJ proposed this study because of the lack of information in this area. The study was conducted through a contract to the National Clearinghouse for Science, Technology and the Law (NCSTL). The NCSTL staff was successful in contacting 75 police departments with questions on organizational placement of evidence collection units, responsibilities at crime scenes, personnel composition of crime scene units, and other related areas. Chapter 6 provides the survey results.

The following section is a literature review that lays additional foundation for the conduct of this study. As seen throughout the remaining chapters, the aim has been to provide information in areas that have not received sufficient research attention in the past.

Literature Review

Use of Forensic Evidence

The collection of forensic evidence and the application of forensic sciences have become essential to criminal investigations and prosecutions. Forensic evidence fulfills several roles in criminal investigations (Fisher, 2004):

- Prove a crime has been committed or establish key elements of a crime.
- Place the suspect in contact with the victim or with the crime scene.
- Establish the identity of persons associated with a crime.
- Exonerate the innocent.
- Corroborate a victim's testimony.
- Assist in establishing the facts of what occurred.

Police personnel devote many hours to the collection and analysis of forensic evidence, starting with the crime scene and continuing through the entire investigation. Prosecutors prefer cases where forensic evidence provides the "smoking gun" that proves guilt beyond a reasonable doubt. Many jurors expect forensic evidence to be presented and failure to present forensic analysis plants doubt in their minds. Courts have made physical evidence more important

through decisions that limit the authority of police reliance on statements and confessions by defendants.

Forensic Databases

One of the main reasons for the focus of forensic evidence in solving crimes is the emergence of local, state, and national database systems with forensic information. In 1975, the FBI introduced its Automated Fingerprint Identification System (AFIS), installing 10-print card readers for computerized print matching in many police departments. The FBI now maintains the Integrated Automated Fingerprint Identification System (IAFIS), a nationwide fingerprint and criminal history system. In addition, states and local jurisdictions maintain their own AFIS systems, which have become vital to criminal investigations by matching fingerprints, palm prints, and latent prints from crime scenes and suspects against these databases.

A more recent advancement is the establishment of the FBI Laboratory's Combined DNA Index System (CODIS). CODIS has been implemented as a distributed database with three hierarchical levels—local, state, and national. The National DNA Index System (NDIS) became operational in October 1998 and contains more than 8 million offender profiles and over 3 million forensic profiles. The national system has produced more than 118,000 hits. The largest majority of DNA profiles originate from local systems (LDIS systems) maintained by crime labs. Eligible DNA profiles are submitted to the state (SDIS) system and, in turn, to the national system (NDIS). The tiered approach allows state and local agencies to operate their databases according to their specific legal requirements.

The National Integrated Ballistic Information Network (NIBIN) system is an emerging system currently under the auspices of the Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF). Participating agencies use Integrated Ballistic Integrated Systems (IBIS) to obtain digital images of markings from spent ammunition recovered from a crime scene or a crime gun test fire. These images can then be compared against earlier NIBIN entries to link crime scenes or to link firearms to specific scenes. Additional investigative leads are the result from "hits" with the NIBIN system.

Because the NIBIN system is relatively new, it did not play a significant part in ILJ's study. In general, ILJ collected data on offenses that occurred in 2005-2007, and during that time period, the participating crime labs were just beginning to submit significant amounts of

digitized images into the NIBIN system. Since that time, the crime lab directors have indicated that the NIBIN system has provided many hits that have linked crime scenes and offenders.

Previous Studies of Forensic Evidence

Numerous books and articles have been written on how forensic evidence has led to the arrest and prosecution of offenders (Block, 1969; Corwin, 2003; Evans, 1996; Lee, 2002; Lee & Tirnady, 2003; Platt, 2003; Ragle, 2002; Ramsland, 2001; Ramsland, 2004; Snow, 2005). All these publications describe individual cases in which forensic evidence was essential to their eventual solution. These publications are filled with interesting anecdotes, such as the first offender who was identified through fingerprints (for stealing billiard balls in 1902) and the thief identified because he left his fingerprints on an FBI bulletin when he robbed an agent's house (Platt, 2003; Ragle, 2002).

In addition to print media, several television programs—most notably, the *CSI* series with its spinoffs—have captured the imagination of the public. In these shows, cases are presented, forensic evidence collected, analyses completed, and arrests made within a short span of an hour. These shows have created the *CSI effect* on the public's perceptions about how crime investigations are conducted and the role of forensic evidence. On the positive side, the *CSI* series has drawn attention to the importance of crime labs at the national, state, and local levels, while on the negative side, it creates an illusion that forensic analysis has virtually unlimited capabilities and is quickly accomplished.

Putting publications and television aside, NIJ's solicitation correctly identified that fundamental information about forensic evidence remains unknown:

- What types of forensic evidence are found at crime scenes?
- How many crime scenes have forensic evidence?
- What items of evidence do investigators ask to be analyzed and how often are requests made?
- What are the results of the analysis?
- How do the results impact on investigations and prosecutions?

An early study (Eck, 1983), based on data from four jurisdictions, concluded that patrol officers collected forensic evidence in only about 10 percent of burglary cases. The percentage may be higher now because of increased attention to the potential of DNA analysis from

burglary cases. In addition, NIJ conducted a major study on the use of DNA evidence in property crimes showing that this type of evidence can have a significant effect on investigations (Roman et al., 2008).

Another study (Peterson, Ryan, Houlden, & Mihajlovic, 1987) of particular importance to ILJ's study directly addressed the uses of forensic evidence in the adjudication of felony cases. That study made the following observations based on data collected in four cities (Peoria, Illinois; Chicago, Illinois; Kansas City, Missouri; and Oakland, California):

- Firearms, bloodstains, fingerprints, hair, and semen were the leading categories of scientific evidence examined in felony prosecutions.
- Scientific evidence makes little difference in prosecutors' decisions to charge defendants.
- Scientific evidence makes little difference in the determination of guilt or innocence of charged defendants.
- Forensic science reports and testimony have their greatest impact at the time of sentencing, when convicted defendants are more likely to go to prison and for longer periods of time where scientific evidence is presented.

Our approach was influenced by the Peterson et al. (1987) study with an emphasis on data collected at selected sites to analyze victim characteristics, offender characteristics, forensic evidence, and prosecutorial outcomes.

Types of Forensic Evidence

Several forensic authorities (Fisher, 2004; Gardner, 2004; Lee, Palmbach, & Miller, 2004; Ragle, 2002) have developed typologies for forensic evidence. These typologies cover the variety of forensic evidence collected at crime scenes: fingerprints, impression evidence, hair, fiber, firearms, biological evidence, drug evidence, and entomological evidence. Based on Fisher (2004) and Lee, Palmbach, & Miller (2004) and in conjunction with the parallel study by Peterson and Sommers, the following classification framework was employed in ILJ's study:

- **Biological Evidence**: The two most common types of biological evidence are *blood* and *saliva*. Blood evidence comes in the form of *wet blood* (e.g., a tube of blood from an autopsy) or *swabs* of bloodstains collected at crime scenes. Buccal swabs are the most common way of collecting saliva evidence, usually from a victim or suspect. Other types of biological evidence include *seminal stains*, *urine*, and *perspiration*. In each case, the aim is to provide sufficient samples of biological evidence to allow DNA profiling.

- **Weapons Evidence**: Weapons evidence consists of *firearms* (handguns, rifles, assault weapons, etc.), *ammunition* (e.g., spent casings, fired projectiles, bullet fragments, and unfired bullets), *gunshot residue (GSR)* tests, and knives. The purpose of a GSR kit is to determine whether an individual was close to a firearm at time of discharge.
- **Fingerprint Evidence**: Fingerprint evidence will be divided into complete *10-prints* (fingerprints are available for both hands and palms as in the case of fingerprinting a victim or suspect) and *latent prints* (only partial prints of one or more fingers are available, usually through a powdering technique on physical evidence such as a weapon or vehicle).
- **Drug Evidence**: Drug evidence includes *drugs* (e.g., marijuana, cocaine, methamphetamine, and others), and *drug paraphernalia* (pipes, spoons, etc.) found at a scene.
- **Impressions Evidence**: Impressions evidence includes *shoeprint impressions*, *tire tracks*, and *tool marks*.
- **Trace Evidence**: Trace evidence is a generic term for small, sometimes microscopic, material. It covers a wide variety of evidence, including fibers, hair, building materials (asbestos, paint, etc.), cigarettes, tobacco, glass, and others.
- **Natural/Synthetic Materials**: Natural and synthetic materials include clothing, bed and bath material, carpet cuttings, metal objects, plastic, and paper.
- **Generic Objects**: Generic objects include vehicles, bicycles, containers, doors, wood, and concrete.
- **Electronic/Printed Data**; Electronic and printed data include documents and electronics (computers, cell phones, etc.).
- **Other Items**: Other items are a catchall category for evidence that does not fit in any of the above categories.

This typology for classifying forensic evidence proved beneficial in ILJ's study. For the most part, forensic evidence collected at crime scenes was easy to classify into the correct categories. As seen in Chapters 2 and 3, there were major differences by crime type in the types of forensic evidence.

Probative Value of Forensic Evidence

In law, evidence has probative value if it is sufficiently useful to prove something in a trial (Garner, 2004). Thus, testimonial evidence (i.e., testimony by a witness under oath) that is not probative is immaterial and not admissible or will be stricken from the record by defense's objections. Similarly, the analysis of forensic evidence must be relevant to have probative value; it must establish evidentiary facts to be beneficial. For example, a latent print has probative

value when, for example, a hit is obtained through AFIS identifying a person of interest, the latent print matches the fingerprints of someone from the scene, or the latent print excludes someone from the scene (i.e., the latent print does not match a suspect believed to have been at the scene). Similarly a DNA profile from evidence collected at the scene has probative value when, for example, it matches the DNA profile of a suspect, a CODIS hit is obtained, or the profile excludes someone from the scene (i.e., the DNA profile does not match a suspect believed to have been at the scene). Scenarios for firearms evidence, drug evidence, and other evidence can be developed to establish whether an item of forensic evidence has probative value. Probative evidence is a reasonable measure of the utility of forensic evidence in investigations and prosecution.

Even though an item of forensic evidence has probative value, it may not be good news for an investigator or prosecutor because it does not fit their theory of the crime. The DNA profile may not match the suspect, thereby exonerating the suspect from the crime. A latent print can match a suspect but further investigation may reveal that the suspect can explain why the prints were at the scene and give proof that he or she was not at the scene when the crime occurred. Nevertheless, the forensic evidence has probative value because evidentiary facts have been established.

In summary, past research on forensic evidence was beneficial in informing the research design and analytical methods for ILJ's study. The study builds on the past research and moves in the direction of filling gaps in the research for this important area.

Chapter 2

Forensic Evidence in Denver, Colorado

Introduction

This chapter provides an analysis of forensic evidence from serious crimes (homicides, sexual assaults, aggravated assaults, robberies, and burglaries) that occurred in the city of Denver in 2005 and 2006. The analysis includes an examination of evidence collected at crime scenes and evidence analyzed by the police department's crime lab as well as the impact of the evidence on the investigation and adjudication of crimes.

The next section of the chapter gives background information on the city of Denver and its criminal justice system with an emphasis on the police department and district attorney's office. Subsequent sections then describe ILJ's approach to taking samples of offenses from 2005 and 2006, descriptions of victim and offender characteristics from the sampled offenses, forensic evidence collected and analyzed, case outcomes, and dispositions of defendants. The overarching aims of the chapter are to describe the flow of evidence through investigation and adjudication, and the impact that forensic evidence has on final dispositions.

Background

The city of Denver is the capital and most populous city of Colorado. The United States Census Bureau estimated that the population of Denver was 598,707 in 2008, an increase of approximately 18 percent over the 2000 population. It is the 24th most populous city in the United States. The metropolitan area had an estimated 2008 population of 2,506,626 and ranked as the 21st most population metropolitan statistics area. According to the 2005-2007 American Community Survey conducted by the Census Bureau, white Americans made up 72.4 percent of Denver's population. Hispanics and Latinos made up 34.2 percent, and African Americans were 9.9 percent of Denver's population. The age distribution in the city was approximately 22.0 percent under the age of 18, 10.7 percent from 18 to 24 years of age, 36.1 percent from 25 to 44 years, 20.0 percent from 45 to 64 years, and 11.3 percent who were 65 years of age or older.

The city has a strong mayor/weak city council form of government that includes a 13-member council and an auditor. The council is elected from 11 districts with two at-large members and is responsible for passing and changing all laws, resolutions, and ordinances for the city.

In 2006, the Denver Police Department consisted of 1,539 sworn personnel headed by the chief of police, two deputy chiefs, and four division chiefs (patrol, criminal investigations, special operations, and technical support).[2] The city is divided into six patrol districts with a commander in charge of each district. The criminal investigation division includes the crimes against persons bureau, pattern crimes bureau, crime laboratory bureau, vice/drug control, and support bureau. Exhibit 2-1 shows the crime statistics for the five offenses of ILJ's study from 2004 – 2007.

Exhibit 2- 1: Violent Crimes in Denver, 2004-2007

Crime Type	2004	2005	2006	2007
Homicide	91	61	55	50
Sexual Assault	242	348	370	350
Aggravated Assault	2,564	2,221	2,235	1,855
Robbery	1,548	1,439	1,282	1,106
Burglary	7,449	7,360	6,529	5,825

The crime figures show a relatively steady decrease in crime over these years. As described in the next section, ILJ sampled homicides, sexual assaults, aggravated assaults, and robberies primarily from 2005, and burglaries from 2006.

Our study was especially dependent on information provided by the department's crime laboratory. The civilian director of the crime lab organized the lab into four units. Two units were crime scene units responsible for the collection of forensic evidence at crime scenes, with each unit consisting of a sergeant and six police investigators. Another unit processed latent prints and firearms and the fourth unit in the lab performed DNA, firearms, and trace evidence analysis. Each unit was supervised by a police sergeant. In total, the lab had approximately 20 forensic analysts in the two units.

[2] The information in this section is from *Denver Police Department 2006 Annual Report*.

At the time of ILJ's study, the crime lab was just starting to participate in the national program known as NIBIN (National Integrated Ballistic Information Network), a program administered by the Bureau of Alcohol, Tobacco, Firearms and Explosives. The system allows forensic analysts to enter digital images of markings from spent ammunition for comparison with images in the system from other crime scenes. A match indicates that the two crimes involved the same firearm. As seen later in this report, our analysis showed virtually no hits from the NIBIN system for Denver because the system was just starting to be employed. Conversations with the crime lab director indicate that hits have increased substantially since 2007.

The Denver District Attorney's Office was another key agency participating in this research project. The office consists of approximately 75 attorney and 125 support staff. The District Attorney for the office has a national reputation for his advocacy on the application of DNA analysis in the criminal justice system. Within the office, the District Court Division handles all felonies except for those assigned to specialized units, such as the Family Violence Unit or Gang Unit. Attorneys from the District Court Division processed virtually all the defendants in ILJ's study.

Finally, the Colorado Judicial Branch has responsibility for the District Courts in Colorado. In total, the branch has more than 300 judges and 3,500 support staff members spread across the state in 22 judicial districts. The city of Denver is in the 2nd Judicial District, which had 15 judges at the time of ILJ's study.

Sampling Plan

Data collection in Denver proved to be a major challenge because the relevant databases in the police department and district attorney's office did not link with each other and did not share a common field that could connect related records. The police department maintains a records management system with data on all major crimes reported to the police. The department's crime lab had a commercial laboratory information system (B.E.A.S.T.) in which forensic analysts entered the results from analysis performed on evidence from crime scenes. The lab reporting process included manual entry of the crime report number along with analytical results. Several management reports are included in the B.E.A.S.T. system. However, because it is a proprietary system, there was limited capability to access the data directly to create files that might be merged with crime data.

The district attorney's office also has a management information system for support to the attorneys on cases accepted by the office. The system includes the crime report number assigned by the police department and a unique case identifier created by the system for easier access by attorneys. The system tracks the progress of cases and serves as a management tool for supervisors to monitor the caseloads of attorneys. As a proprietary system, however, it was not possible to select records for merging with crime data from the police department.

Because of these problems, ILJ made the decision to take a large sample of cases and obtain the needed data for this project by making queries into the available systems. After reviewing crime statistics, the final sampling plan was to code all homicides and sexual assaults over a 12-month period and a random sample of assaults, robberies, and burglaries over a 12-month period. The sampling percentages are approximately 38 percent for assaults, 27 percent for robberies, and 35 percent for burglaries. The starting points for these three categories were crime listings from which cases were randomly selected. The assaults and robberies were sampled from 2005 and the burglaries from 2006. The reason for sampling burglaries from 2006 was because of Denver's participation in another NIJ-funded project aimed at the use of DNA in property crimes.[3]

After selecting a crime, the police system was queried to obtain basic data about the offense such as time of occurrence and victim demographics (age, race, sex). Inquiries were then made into the district attorney's system to determine whether an arrest had been made. Data obtained from the district attorney's system included offender characteristics, case disposition, and sentence imposed. Finally, the crime lab's system was accessed for information on evidence collected and the results of analysis by forensic analysts.

For purposes of this research project, ILJ developed an Access database to capture information about each case. Personnel from the key agencies in Denver and San Diego assisted in the development of the database. The database included tables to capture basic case information (case number, date of occurrence, etc.), victim demographics, arrestee demographics, final case disposition, and details on forensic evidence. For forensic evidence, individual tables captured data on DNA, latent prints, firearms, drugs, and other forensic

[3] The DNA project in Denver was very successful and results can be found in the evaluation funded by NIJ (Roman et al., 2008).

evidence. In general, the tables for each type of forensic evidence summarized the results of analysis performed by forensic analysts in the police department's crime lab.

As indicated by this description, data collection was a very time consuming activity. To accomplish the data collection, ILJ contracted with the district attorney's office for the services of an experienced analyst. The analyst had access to the data systems in the police department and the district attorney's office. He was assisted by another analyst on a part-time basis who had assisted in the collection of data for the NIJ project on DNA evidence with no-suspect property crimes. The data collection process took over nine months for completion.

Victim and Offender Characteristics

Exhibits 2-2 and 2-3 provide basic statistics on victims and offenders in the completed dataset. Our final database consisted of 67 homicides (71 victims), 323 sexual assaults (330 victims), 727 assaults (843 victims), 352 robberies (390 victims), and 2,580 burglaries (498 business burglaries and 2,082 residential burglaries). From these cases, there are a total of 585 arrestees (from 509 cases). The clearance rates ranged from 6.7 percent for burglaries to 73.1 percent for homicides. In total, 66 persons were arrested for homicide, 55 for sexual assault, 209 for assault, 42 for robbery, and 213 for burglary. Other key characteristics of victims and arrestees are as follows:

- Characteristics of victims:
  - Of the 71 homicide victims, there were 21 females (29.6 percent) and 50 males (70.4 percent). In total, there were 31 white victims (43.7 percent), 22 African-Americans (31.0 percent), and 18 Hispanic (25.4 percent). The average age of homicide victims was 30.7 years and about two-thirds of the victims were between 17 and 35 year of age.
  - All 323 sexual assault victims were females of which 62.4 percent were white, 22.4 percent Hispanic, and 13.9 percent African-American. The average age of sexual assault victims was 25.6 years.
  - Aggravated assault and robbery victims were predominantly male (61.9 percent and 67.4 percent, respectively).
  - Of the assault victims, 38.4 percent were white, 34.2 percent Hispanic, and 22.9 percent African-American.
  - The majority of robbery victims were white (53.1 percent), followed by Hispanic (27.5 percent), and African-American (15.8 percent).
- Characteristics of arrestees:

- Arrestees for homicide were predominantly male (83.3 percent). About half the homicide arrestees were between 18 and 25 years of age with an average age of 28.2 years. Of the arrestees for homicide, 45.5 percent were white, 33.3 percent African-American, and 21.2 percent Hispanic.
- All sexual assault arrestees were male and had an average age of 32 years (median age was 33 years). Of the total, 41.8 percent were white, 29.1 percent African-American, and 25.5 percent Hispanic.
- About 83 percent of the arrestees for robbery were males. Robbery arrestees consisted of 42.9 percent Hispanic, 28.6 percent white, and 28.6 percent African-American.
- Burglary arrestees were also predominantly male (90.8 percent) with an average age of 28.2 years.

Exhibit 2- 2: Victim Characteristics – Denver, Colorado

			Female		Male	
Crime Type	Cases	Victims	Number	Percent	Number	Percent
Homicide	67	71	21	29.6	50	70.4
Sexual assault	323	330	330	100.0	0	0.0
Aggravated assault	727	843	321	38.1	522	61.9
Robbery	352	390	127	32.6	263	67.4
Burglary	2,580	2,580	N/A	N/A	N/A	N/A
Total	4,049	4,214				

	White		Hispanic		African-American		Other	
Crime Type	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homicide	31	43.7	18	25.4	22	31.0	0	0.0
Sexual assault	206	62.4	74	22.4	46	13.9	4	1.3
Aggravated assault	320	38.4	285	34.2	191	22.9	37	4.5
Robbery	205	53.1	106	27.5	61	15.8	14	3.7

Crime Type	Victim's Age	
	Mean	Std. Dev.
Homicide	30.7	14.0
Sexual assault	25.6	10.7
Aggravated assault	30.7	13.9
Robbery	35.0	15.7

Exhibit 2- 3: Characteristics of Arrestees – Denver, Colorado

			Female		Male	
Crime Type	Clearances	Arrestees	Number	Percent	Number	Percent
Homicide	49	66	11	16.7	55	83.3
Sexual assault	54	55	0	0.0	55	100.0
Aggravated assault	198	209	31	14.8	178	85.2
Robbery	35	42	7	16.7	35	83.3
Burglary	173	213	19	9.2	188	90.8
Total	509	585				

	White		Hispanic		African-American		Other	
Crime Type	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homicide	30	45.5	14	21.2	22	33.3	0	0.0
Sexual assault	23	41.8	14	25.5	16	29.1	2	3.6
Aggravated assault	62	29.7	90	43.1	50	23.9	7	3.3
Robbery	12	28.6	18	42.9	12	28.6	0	0.0
Burglary	61	31.1	80	40.8	54	27.6	1	0.5

	Arrestee's Age	
Crime Type	Mean (Years)	Standard Deviation
Homicide	28.2	12.9
Sexual assault	32.0	9.0
Aggravated assault	30.1	11.4
Robbery	27.1	8.9
Burglary	28.2	12.5

Forensic Evidence Collected on Cases

The primary study objectives were to determine what forensic evidence is collected, what gets analyzed, and what the impact of the evidence is on case outcomes. This section summarizes the forensic evidence collected in the sampled cases, and the following two sections discuss the analysis and impact of forensic evidence.

Exhibits 2-4 and 2-5 on the following pages provide information on the number and percentage of cases in which different types of forensic evidence were obtained. Forensic evidence is divided into 10 categories (see Chapter 1 for specific definitions of these categories) in Exhibit 2-4 with subcategories shown in Exhibit 2-5.

The importance of these exhibits is that they show the wide range of cases in which forensic evidence is collected. For example, Exhibit 2-4 shows that some type of forensic evidence is obtained in 95.5 percent of the homicides and 52 percent of the sexual assault cases. However, only 5.1 percent of the assault cases had forensic evidence (usually weapons evidence) and only 7.4 percent of the robberies (usually latent prints). With burglaries, 15.7 percent of the cases had forensic evidence, partially due to the emphasis placed on this crime category as a result of the department's participation in the NIJ-funded experimental project on the use of DNA evidence in property crimes.

The types of forensic evidence also varied substantially depending on the type of offense:

- 74.6 percent of the homicides and 50.2 percent of the sexual assaults had biological evidence, but this type of evidence was found in less than five percent of the other types of offenses.
- Weapons evidence was obtained in 74.6 percent of the homicides, but less than three percent for the other offenses.
- Latent prints were taken in 41.8 percent of the homicides and 12.2 of the burglaries, but less than 10 percent for the other offenses.

The breakdown in Exhibit 2-5 provides more detailed information on specific types of forensic evidence in the Denver cases. Key results from this exhibit are:

- Almost 75 percent of homicides had biological and weapons evidence. Half of the sexual assaults had biological evidence but weapons were rarely collected in these cases (1.4 percent).

- For homicides, firearms evidence includes handguns in 31.3 percent of cases and other types of firearms (usually rifles) in 9.1 percent. Ammunition includes shell casings (46.3 percent of cases), spent projectiles (40.3 percent), bullet fragments (34.3 percent), and live cartridges (28.4 percent).
- Sexual assault kits were administered in 44.3 percent of these cases.
- Latent prints were found by crime scene investigators at 41.8 percent of homicides, 8.7 percent of sexual assaults, 1.2 percent of assaults, 6.0 percent of robberies and 12.1 percent of burglaries.
- Drug evidence is rarely obtained in cases. About 10 percent of the homicide cases had drug evidence, compared to less than .3 percent for the other offenses.
- Only 6.0 percent of the homicide cases had shoeprint impressions and only one case had tire tracks.

Results from these exhibits raise questions about the presence of forensic evidence at crime scenes. Homicides and sexual assaults are the two most serious offenses investigated by police, and there is an emphasis on obtaining forensic evidence whenever these offenses occur. For aggravated assaults, robberies, and burglaries, the amount of forensic evidence drops off substantially. The question is whether there was, in fact, no forensic evidence at these scenes or whether the evidence existed but was not collected. In Chapter 7 (Conclusions and Recommendations), we list this topic as an area in need of research.

Exhibit 2- 4: Summary of Forensic Evidence Collected in Denver Cases

	Homicide (n=67)		Sexual Assault (n=323)		Aggravated Assault (n=727)		Robbery (n=352)		Burglary (n=2,580)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Biological evidence	50	74.6	162	50.2	15	2.1	9	2.6	114	4.4
Weapons evidence	50	74.6	4	1.2	21	2.9	10	2.8	6	0.2
Latent prints	28	41.8	28	8.7	9	1.2	21	6.0	315	12.2
Drug evidence	7	10.4	0	0.0	1	0.1	1	0.3	1	0.0
Impressions evidence	4	6.0	3	0.9	0	0.0	0	0.0	27	1.0
Trace evidence	20	29.9	14	4.3	5	0.7	3	0.9	32	1.2
Natural/Synthetic materials	41	61.2	72	22.3	11	1.5	7	2.0	49	1.9
Generic object	14	20.9	8	2.5	2	0.3	2	0.6	23	0.9
Electronic/Printed data	13	19.4	3	0.9	2	0.3	1	0.3	5	0.2
Other Items	5	7.5	3	0.9	1	0.1	0	0.0	8	0.3
At least 1 type of forensic evidence collected	64	95.5	168	52.0	37	5.1	26	7.4	405	15.7

Exhibit 2- 5: Forensic Evidence Collected in Denver Cases

	Homicide (n=67)		Sexual Assault (n=323)		Aggravated Assault (n=727)		Robbery (n=352)		Burglary (n=2,580)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Biological evidence										
Swabs	50	74.6	40	12.4	14	1.9	8	2.3	113	4.4
Buccal swabs	11	16.4	42	13.0	1	0.1	0	0.0	5	0.2
Sexual assault kits	0	0.0	143	44.3	0	0.0	0	0.0	0	0.0
Semen	0	0.0	2	0.6	0	0.0	0	0.0	0	0.0
Other biological material	2	3.0	9	2.8	0	0.0	1	0.3	2	0.1
Weapons evidence										
Handguns	21	31.3	0	0.0	7	1.0	3	0.9	0	0.0
Other firearms	6	9.1	0	0.0	1	0.1	0	0.0	0	0.0
Shell casings	31	46.3	0	0.0	8	1.1	4	1.1	1	0.0
Bullet fragments	23	34.3	0	0.0	5	0.7	1	0.3	0	0.0
Spent projectiles	27	40.3	0	0.0	8	1.1	3	0.9	0	0.0
Live cartridges	19	28.4	0	0.0	7	1.0	1	0.3	0	0.0
Magazines	6	9.0	0	0.0	0	0.0	0	0.0	0	0.0
GSR kits	30	4.5	0	0.0	4	0.6	1	0.3	1	0.0
Knives	10	14.9	4	1.2	3	0.4	4	1.1	4	0.2
Other weapons	2	3.0	0	0.0	0	0.0	0	0.0	0	0.0
Latent prints										
By CSI on scene	28	41.8	28	8.7	9	1.2	21	6.0	311	12.1
By lab	12	17.9	0	0.0	0	0.0	0	0.0	0	0.0
Drug evidence										
Illegal drugs	7	10.4	0	0.0	1	0.1	1	0.3	1	0.0
Drug paraphernalia	1	1.5	0	0.0	1	0.1	1	0.3	0	0.0
Impressions evidence										
Shoeprint impressions	4	6.0	1	0.3	0	0.0	0	0.0	23	0.9
Tire tracks	1	1.5	0	0.0	0	0.0	0	0.0	1	0.0
Tools/Marks	0	0.0	2	0.6	0	0.0	0	0.0	4	0.2
Trace evidence										
Fire igniter	0	0.0	0	0.0	2	0.3	0	0.0	0	0.0
Glass	3	4.5	1	0.3	3	0.4	0	0.0	7	0.3

Exhibit 2- 5: Forensic Evidence Collected in Denver Cases

	Homicide (n=67)		Sexual Assault (n=323)		Aggravated Assault (n=727)		Robbery (n=352)		Burglary (n=2,580)	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Paint	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
Cigarettes/cigars	5	7.5	3	0.9	0	0.0	0	0.0	17	0.7
Tape	0	0.0	2	0.6	0	0.0	2	0.6	0	0.0
Fibers	6	9.0	4	1.2	0	0.0	2	0.6	1	0.0
Hair	12	17.9	6	1.9	0	0.0	2	0.6	7	0.3
Natural/Synthetic Materials										
Bindings	1	1.5	0	0.0	0	0.0	0	0.0	0	0.0
Clothing	33	49.3	66	20.4	8	1.1	5	1.4	30	1.2
Cloth	5	7.5	0	0.0	1	0.1	0	0.0	1	0.0
Bed/Bath Material	4	6.0	10	3.1	1	0.1	0	0.0	0	0.0
Carpet	1	1.5	0	0.0	0	0.0	0	0.0	0	0.0
Metal objects	2	3.0	3	0.9	0	0.0	1	0.3	4	0.2
Plastic	4	6.0	1	0.3	1	0.1	0	0.0	9	0.3
Paper	3	4.5	2	0.6	0	0.0	1	0.3	9	0.3
Rubber	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
Generic Objects										
Vehicle/bicycle	6	9.0	3	0.9	0	0.0	1	0.3	0	0.0
Container	7	10.4	5	1.5	2	0.3	1	0.3	21	0.8
Door	0	0.0	0	0.0	0	0.0	0	0.0	1	0.0
Wood	2	3.0	0	0.0	0	0.0	0	0.0	1	0.0
Concrete	1	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Electronic/Printed Data										
Documents	3	4.5	1	0.3	0	0.0	1	0.3	0	0.0
Electronics	11	16.4	2	0.6	2	0.3	0	0.0	5	0.2
Other Items	5	7.5	3	0.9	1	0.1	0	0.0	8	0.3

Forensic Analysis of Evidence

DNA Analysis

The next question addressed in the study is the determination of what evidence gets analyzed and the results of the forensic analysis. To answer this question, ILJ coded detailed information on what happens with evidence collected at crime scenes. It may be, for example, that nothing happens because investigators never request analysis to be performed by the lab. If requests are made, forensic analysts in the crime lab may determine that analysis is not possible for several reasons—latent print is not useable, insufficient biological material for a DNA profile, damaged casings, and other reasons.

Exhibits 2-6, 2-7 and 2-8 provide a detailed flow of DNA evidence from collection to final analysis results for homicides, sexual assaults, and burglaries. Process flows for DNA analysis in aggravated assault and robbery cases were not developed because of the lower number of cases with DNA evidence. Less than three percent of assault cases (see Exhibit 2-4) had DNA samples (20 samples from 15 cases), and only three DNA profiles (two cases) were eventually developed from these samples. Similarly, for robberies, eight samples of DNA evidence were obtained from eight cases (2.3 percent of robberies), from which two DNA profiles were eventually developed.

From the three exhibits on the following pages, several overall conclusions can be drawn:

- Investigators requested analysis in over half the homicide cases with DNA evidence and over 80 percent of the sexual assaults and burglaries.
- From cases with analysis, DNA profiles were obtained in almost 80 percent of the homicides, 52 percent of the sexual assaults, and 85 percent of the burglaries. In general, DNA profiles were not obtained in the other cases because of an insufficient amount of DNA material for developing profiles.
- Matches between two or more DNA profiles were obtained in 36 percent of the homicide cases with DNA evidence, 32 percent of sexual assaults, and 12 percent of burglaries.
- Exclusions (i.e., the DNA profile from one item of evidence did not match the DNA profile from another item) were obtained in 22 percent of the homicide cases with DNA evidence, 14 percent of sexual assaults, and five percent of burglaries.

- Six CODIS hits were obtained from the DNA profiles from sexual assaults and 21 hits from burglaries. Of particular importance are the five SDIS offender hits for closed sexual assaults and 15 SDIS offender hits in closed burglary cases.

In summary, the exhibits show the importance of DNA analysis in many homicides, sexual assault, and burglary cases. The matches between DNA profiles are importance because they frequently tie a suspect to the scene (e.g., the DNA profile of blood from the scene matches the DNA profile of a suspect). Exclusions are also important because they may exonerate a suspect because, for example, no link between a suspect and the crime scene has been determined. Finally, the offender hits from the state system (SDIS) may identify the offender in a case.

Exhibit 2- 6: DNA Analysis for Homicide Cases in Denver

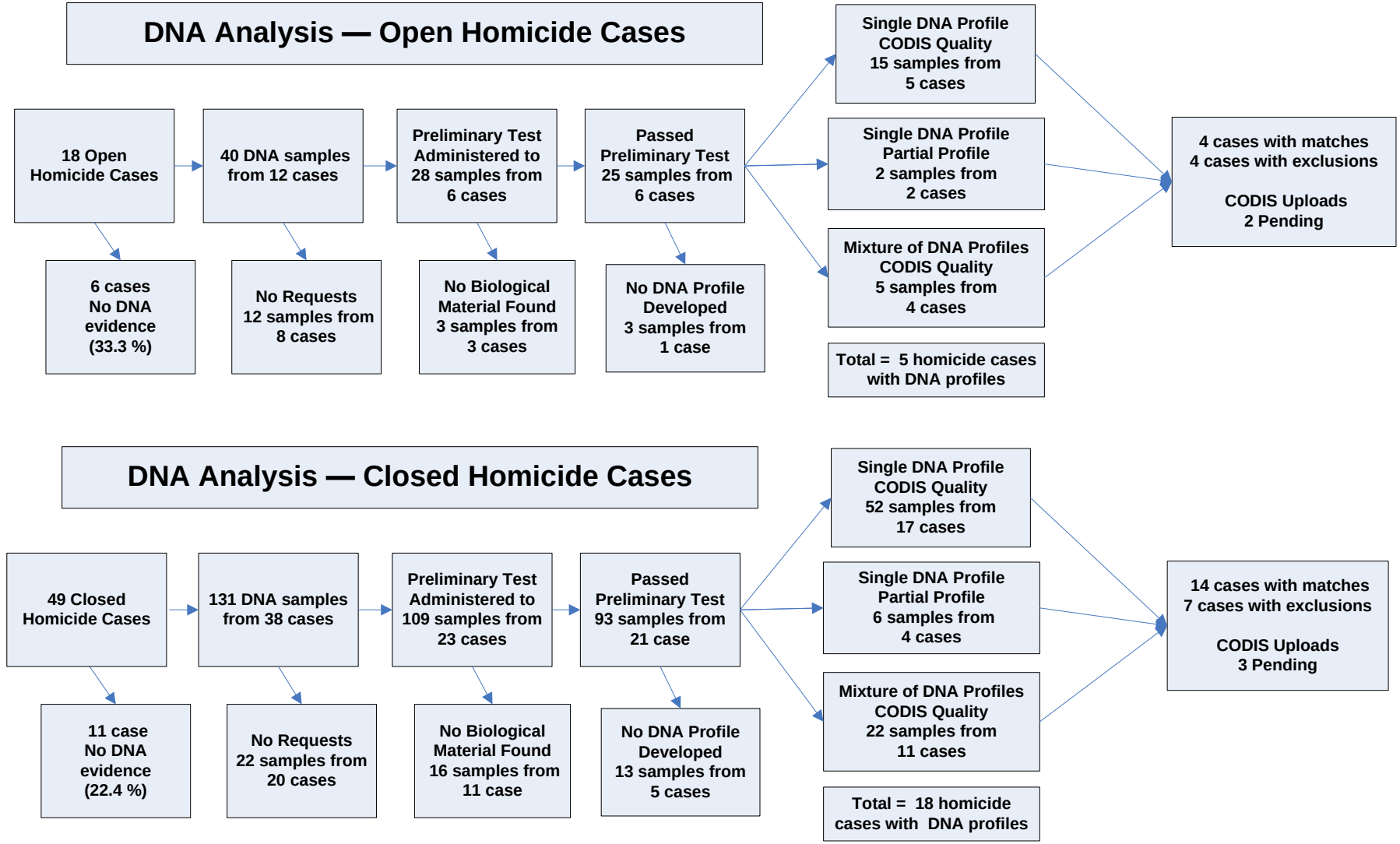


Exhibit 2- 7: DNA Analysis for Sexual Assault Cases in Denver

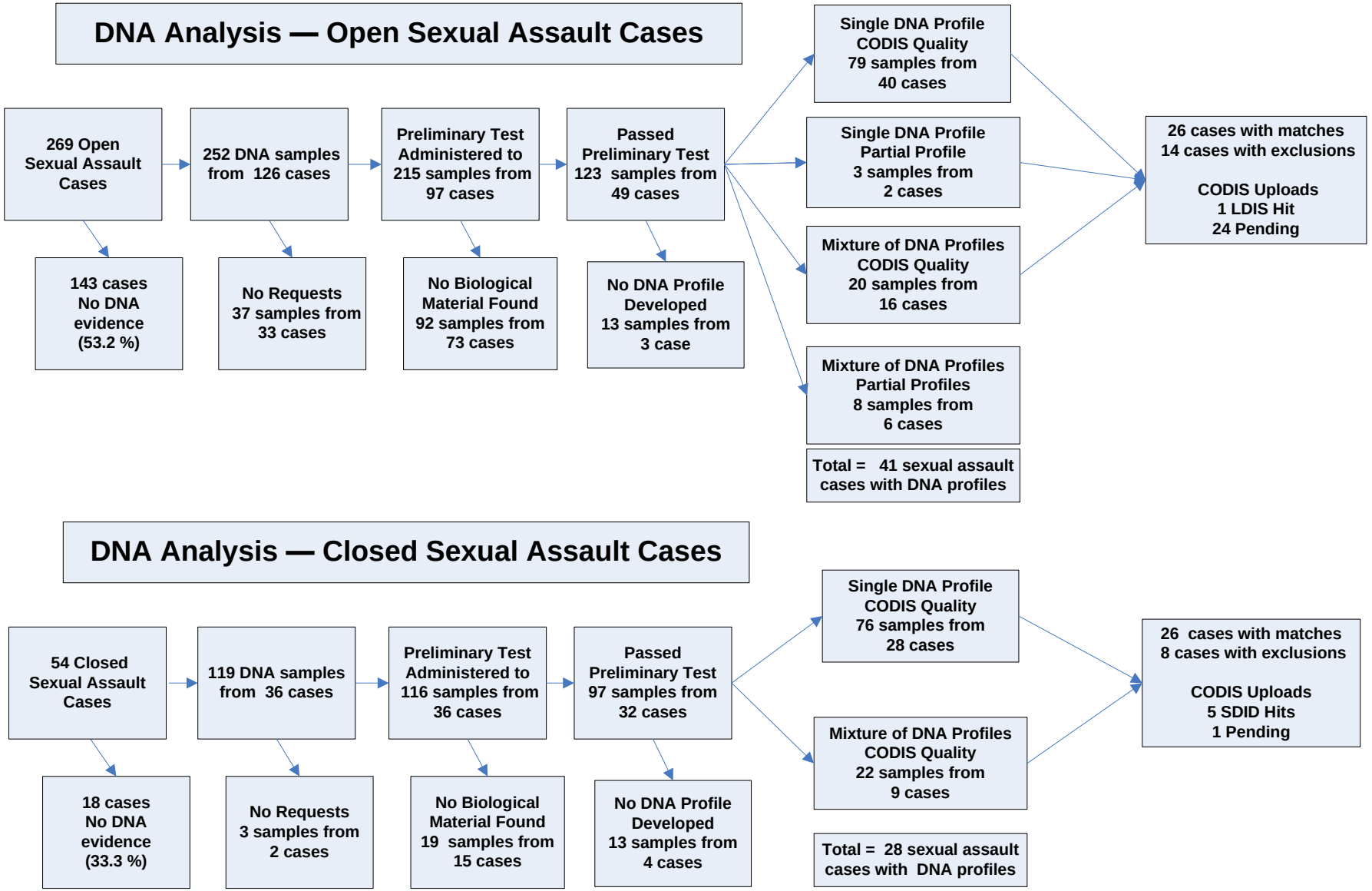
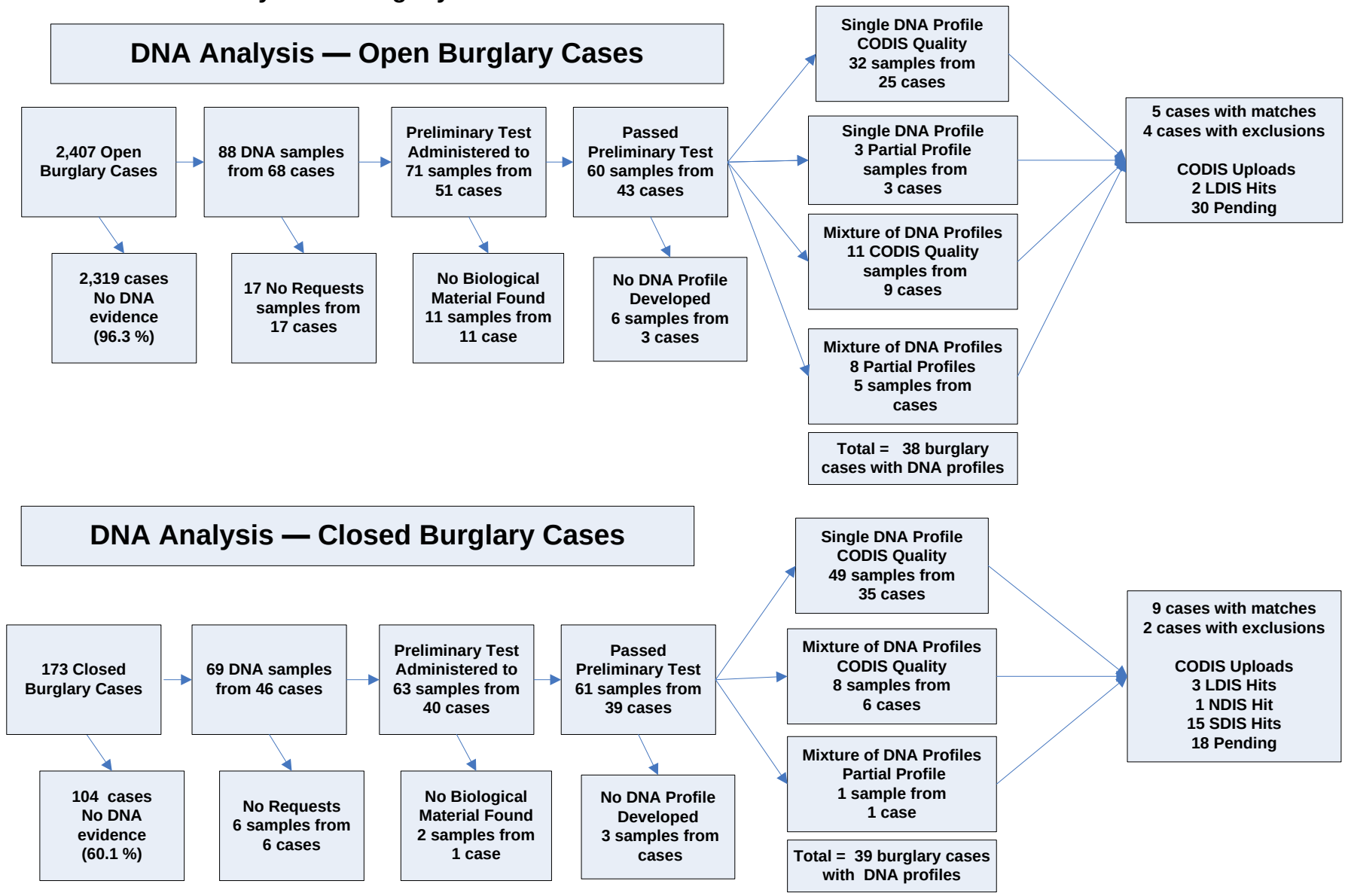


Exhibit 2- 8: DNA Analysis for Burglary Cases in Denver



Latent Print Analysis

Exhibits 2-9 and 2-10 provide results for the analysis of latent prints for homicides and burglaries from the sampled cases in Denver.[4] Results from the other three types of offenses were too small to warrant the development of process flows. For example, only 9 assault cases (1.2 percent) had latent prints as evidence. The 12 latent prints from these cases resulted in 3 AFIS quality prints, from which one match was made and one AFIS hit was obtained. Robbery cases had a higher percentage of latent prints with 31 prints obtained from 21 cases (6.0 percent of cases). Examiners identified 11 prints of AFIS quality from this group from which one match was made and one AFIS hit was obtained.

For homicides and burglaries, the main results from the two exhibits are as follows:

- Investigators requested analysis in almost all homicides with latent prints and 84 percent of burglaries.
- For cases with analysis, AFIS quality prints were obtained in 67 percent of the homicides and 81 percent of the burglaries.[5]
- Useable prints were obtained in 19 percent of the homicides and 17 percent of the burglaries.
- Matches between two or more latent prints were obtained in about one-third of the homicides and seven percent of the burglaries.
- Exclusions were found in about one-third of the homicides and eight percent of the burglaries.
- Five AFIS hits were made in homicides and 26 AFIS hits in burglaries.

As with DNA evidence, the matches and exclusions from latent prints were of probative value in these homicides and burglaries. The AFIS hits were beneficial in the cases by provides important leads for investigators.

[4] We use the term *latent prints* to include partial fingerprints and palm prints for ease of presentation.

[5] Useable quality means that the latent print did not have sufficient detail for entry into AFIS, but has enough detail to be compared to other evidence.

Exhibit 2- 9: Latent Print Analysis for Homicide Cases in Denver

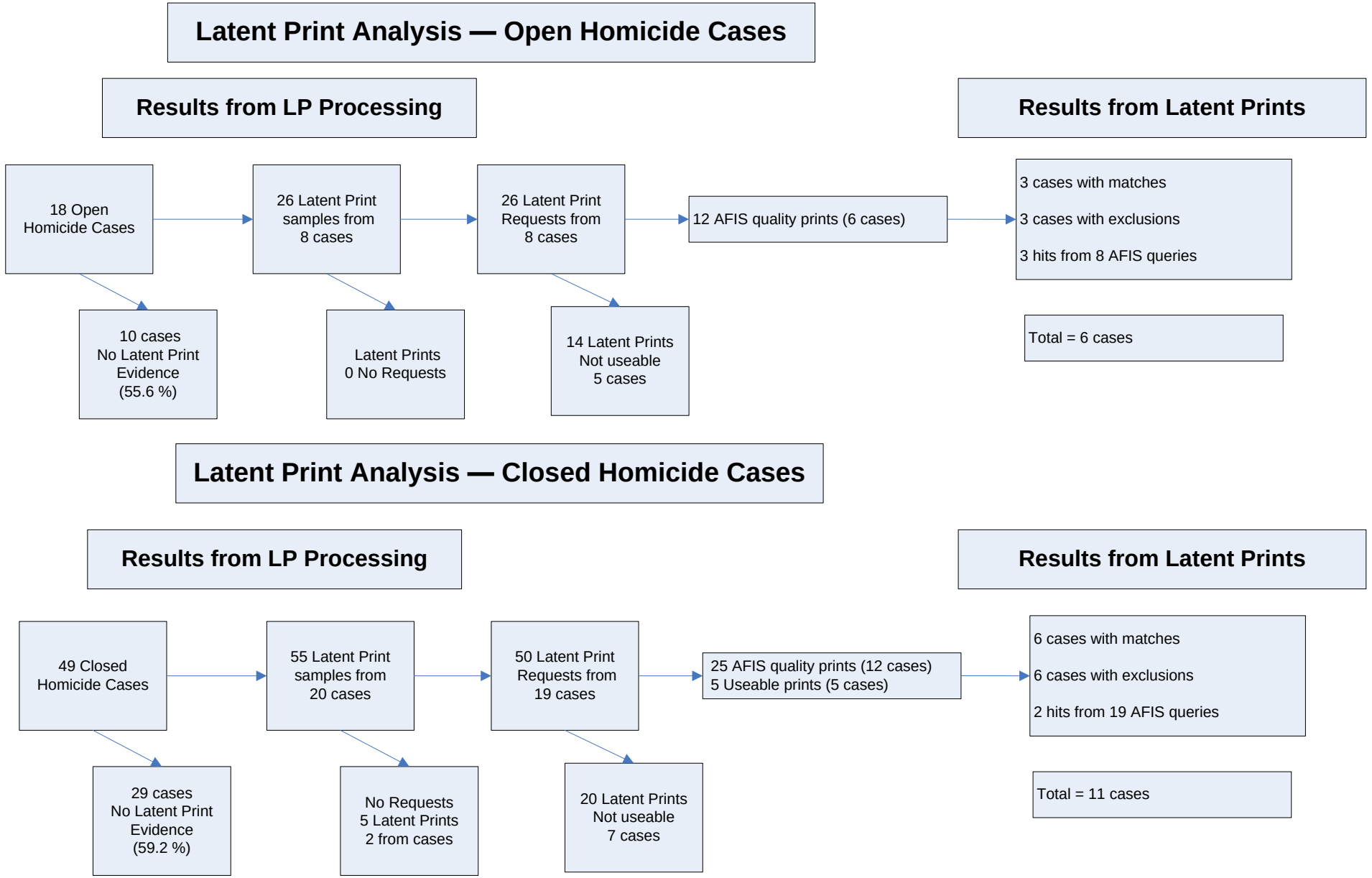
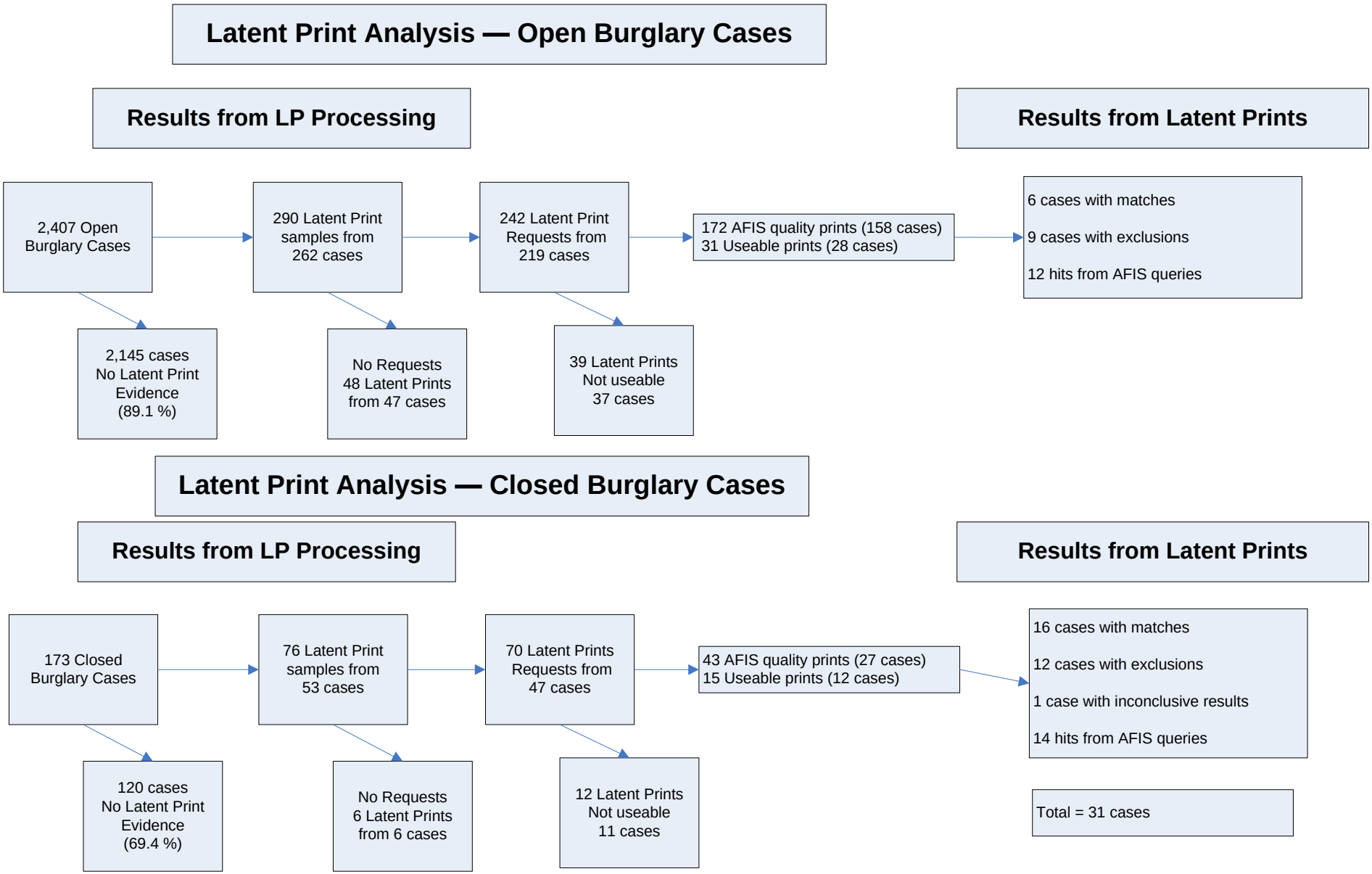


Exhibit 2- 10: Latent Print Analysis for Burglary Cases in Denver



Analysis of Firearms Evidence

The amount of firearms evidence varied considerably depending on crime type. On the one hand, 41 of the 67 homicide cases had some type of firearms evidence. In fact, these cases usually had a considerable amount of firearms evidence due to the fact that firearms are the weapon of choice in the majority of Denver's homicides. At the other extreme, we found no firearms evidence in any of the sexual assault cases, although we did document four knives as weapons. With aggravated assaults, 15 cases (6.6 percent) had firearms evidence, six robberies had firearms evidence, and only one burglary included firearms evidence.

Exhibit 2-11 gives the following key results for analysis of firearms evidence in homicide cases:

- Requests were made for analysis of the evidence in 35 homicides (38 percent of cases with firearms evidence).
- The type of ammunition was identified in 25 cases (71 percent of analysis requests).
- Matches were made between bullets and firearms in 11 cases (31 percent).
- Matches were made between firearms evidence in 24 cases (69 percent).
- Positive GSR results were found in seven closed cases and negative results in seven cases (20 percent).

Similar results were obtained from the analysis of assault cases, although the number of cases is much smaller. Of the 15 cases, requests were made to conduct analysis on nine cases involving 31 items of evidence. As with homicides, these items included bullet fragments, GSR kits, firearms, spent casings, and spent projectiles. Final results for the aggravated assault cases were:

- The type of ammunition was identified in one closed case.
- Matches were made between bullets and firearms in two closed cases.
- Matches were made between firearms evidence in two closed cases and one open case.
- Positive GSR results were found in two closed cases and negative results in two open cases.

Evidence from the robbery and burglary cases provided a few forensic results. One robbery case and one burglary case had GSR kits that tested positive. In the robbery cases, there

were three matches between firearms and bullets, along with two matches between items in one of the robberies.

Exhibit 2- 11: Firearms Analysis for Homicide Cases in Denver

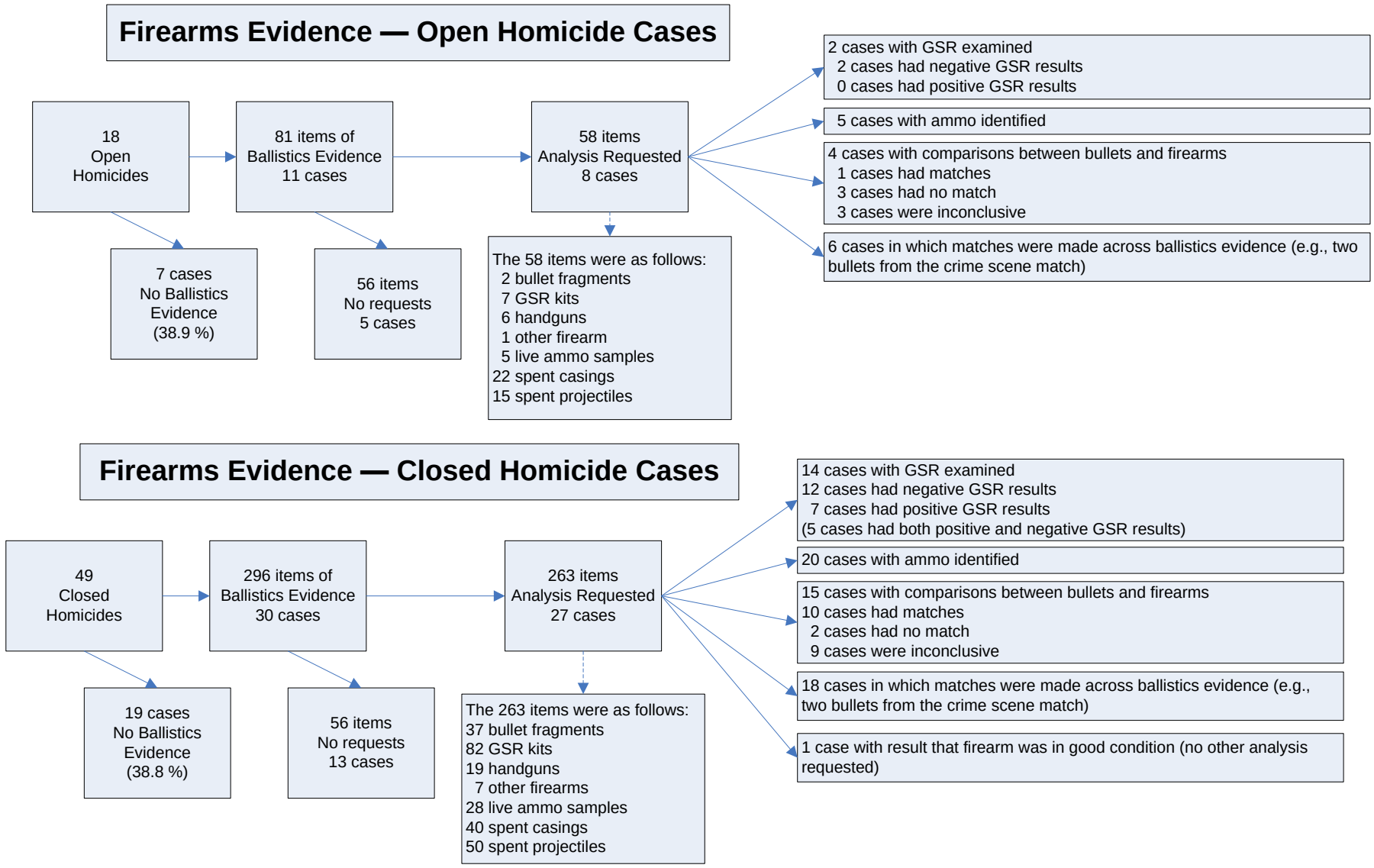
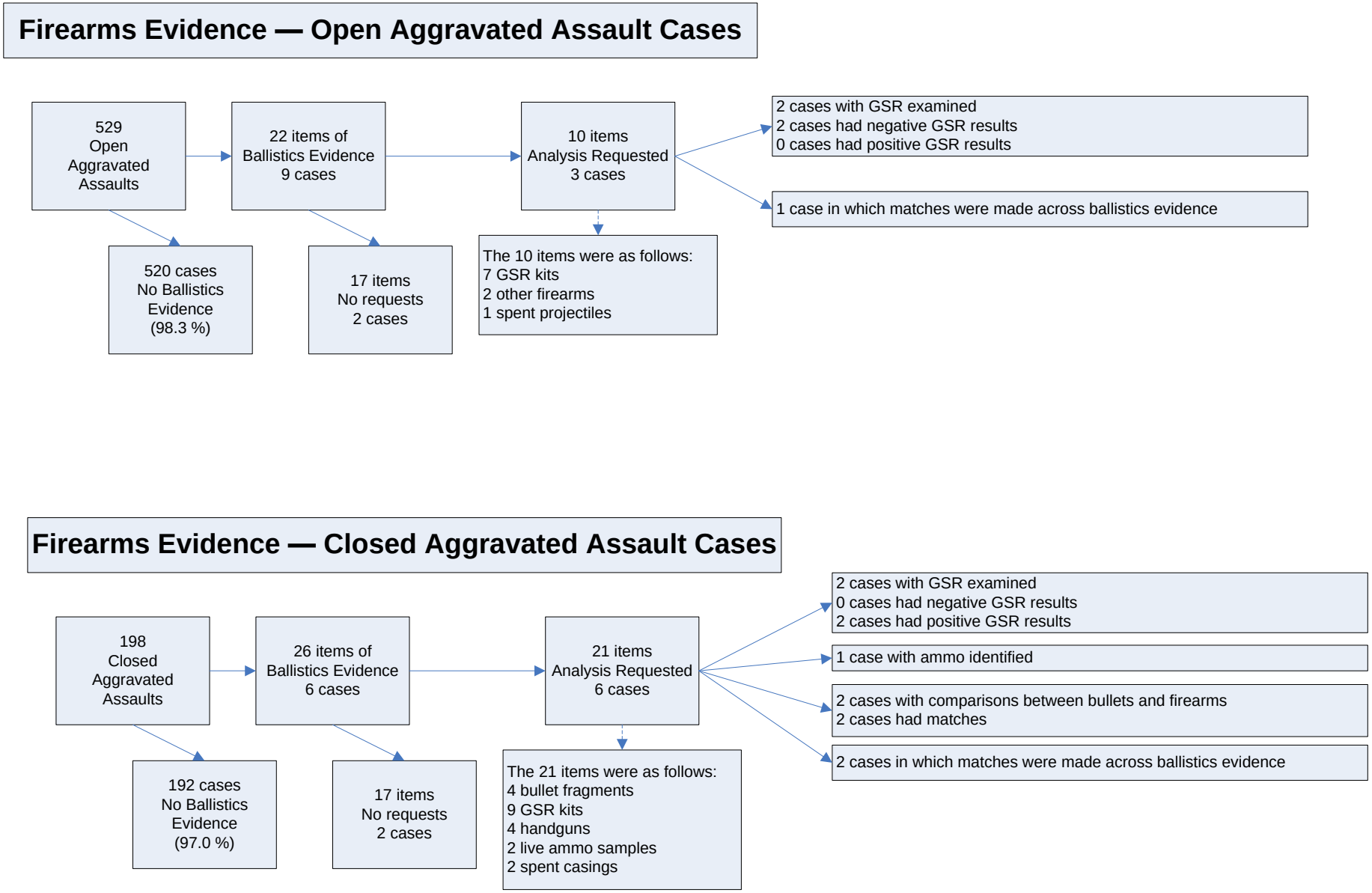


Exhibit 2- 12: Firearms Analysis for Aggravated Assault Cases in Denver



Analysis of Other Evidence

While DNA, latent prints, and firearms evidence predominate what is analyzed in crime cases, a variety of other evidence may be collected and analyzed. As an example, our analysis showed that shoe prints were collected in 18 cases. Requests were made for analysis in four of these cases with the following results:

- In one homicide case, analysis showed that two different persons had left shoe prints at the scene.
- In a sexual assault case, matches were made between some of the 45 shoe impressions from the scene against the shoes of both the victim and suspect.
- In a burglary case, the shoes of two suspects were recovered. One suspect's shoes were excluded from shoe prints found at the scene while the other suspect's shoes could have left the shoe prints.
- In another burglary case, a shoe print from the scene was compared to the suspect's shoes with the conclusion that the print could have been made by the suspect's shoe.

Interestingly, only six cases had drugs as part of the evidence with cocaine found in almost every instance.

Thirty-three cases had other types of evidence, such as glass, tape, cell phones, and hair, analyzed by forensic analysts in the lab. Examples of results from this evidence include:

- Hairs removed from the duct tape at the scene are consistent with the hairs from the victim's head.
- Glass found in the baseball bat is consistent with glass from the crime scene.
- Wood and white paint were found in the bullet fragments.

Clearances

The purpose of this section is to discuss the outcomes of cases in the database and the role that forensic analysis played in those outcomes. Our starting point is a review of the clearance rates for the five offenses as reflected in our samples of cases. We then discuss the importance of time to arrest as related to forensic analysis. The point of this discussion is that analysis can take place at any time during the investigation and prosecution of a case. That is, forensic analysts may perform analysis during an investigation and after the arrest of a suspect. Analysis prior to arrest may lead to the identification of an offender, while analysis after an arrest supports the actions of an investigator and assists in preparing the case for prosecution.

This section concludes with information on final dispositions of arrestees such as dismissals of the cases by prosecutors and judges, pleas to initial or reduced charges, and outcomes of jury trials.

Based on Exhibits 2-2 and 2-3, the overall clearance rates for the cases in our database are shown in Exhibit 2-13. These clearances rates differ from the department's official statistics for several reasons. First, they do not include clearances during the data collection period for prior cases and they do not include clearances after the cutoff date for data collection. In short, they are clearances for our cohort of sampled cases by the end of the data collection period.

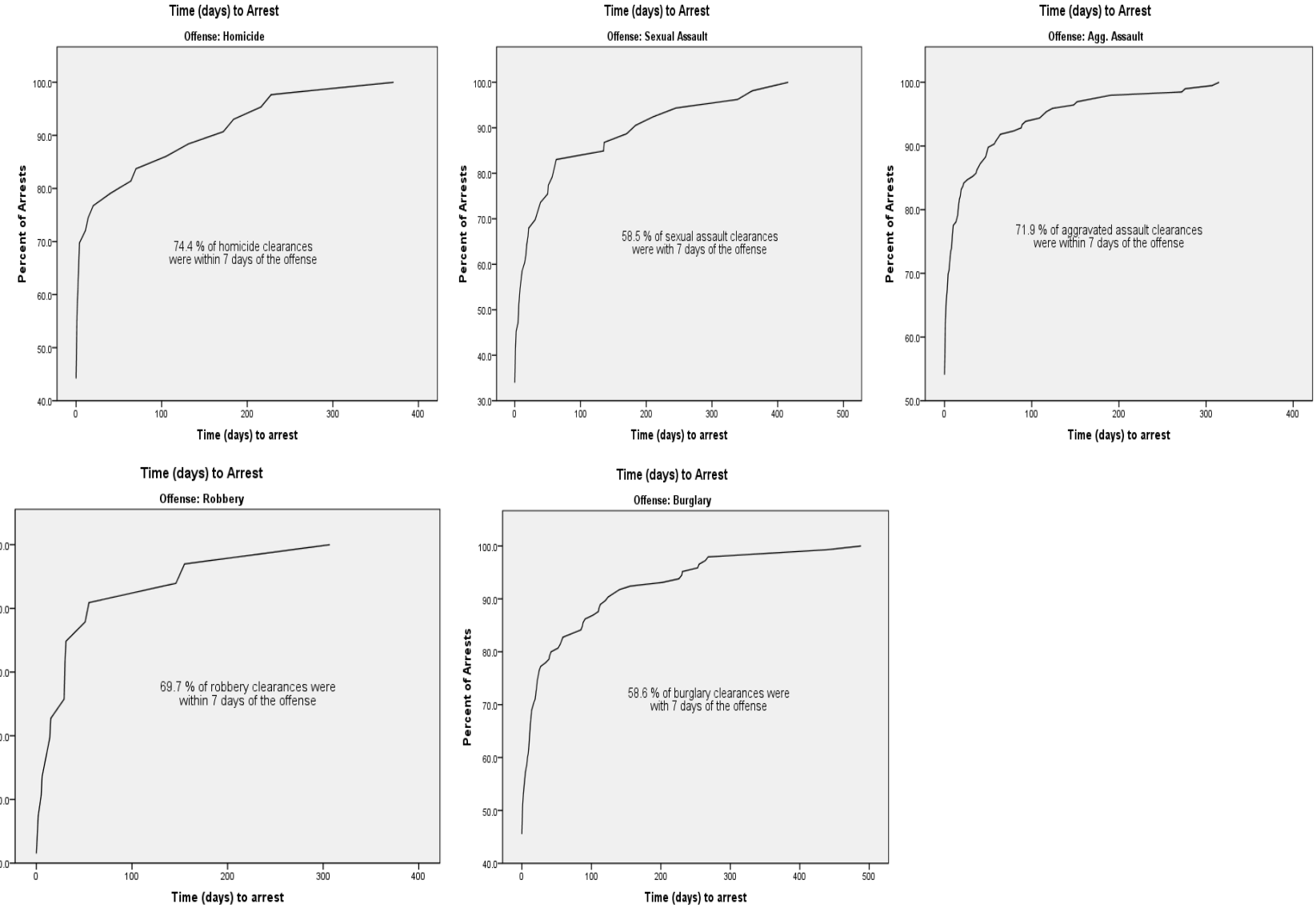
Exhibit 2- 13: Case Clearances in Denver

Crime Type	Cases	Clearances	Clearance Rate
Homicide	67	49	73.1 %
Sexual assault	323	54	16.7 %
Aggravated assault	727	198	27.2 %
Robbery	352	35	9.9 %
Burglary	2,580	173	3.9 %

The clearance rates differ considerably based on the type of offense. Homicides have the highest clearance rate of 73.1 percent, while burglaries have the lowest rate at 3.9 percent. The low clearance rate for burglaries is typical for this type of offense, which generally has a lack of witnesses and forensic evidence.

One of the interesting features of clearances relevant to the current study is the elapsed time between offense and arrest, usually referred to as the time to clearance. Exhibit 2-14 on the following page gives graphs that summarize arrest times for the five offenses. The graphs have the same general shape indicating that a high percentage of arrests are made within a few days while others take much longer before an arrest is made. With the available data, we determined that 74.4 percent of homicide arrests were made within seven days (in fact, 44.2 percent were on the same days as the homicide), 58.5 percent of the arrests for sexual assaults, 71.9 percent of the arrests for assaults, 69.7 percent of the arrests for robberies, and 58.6 percent of the arrests for burglaries.

Exhibit 2- 14: Time Between Offense and Arrest



An arrest made within a week usually indicates that the offender was quickly identified or that intensive investigative efforts resulted in the identification of the offender. Longer elapsed times mean that the investigation was more difficult either because a large number of leads needed to be considered or that investigators needed to conduct extensive interviews to determine the identity of the offender. In some cases, investigators may stop investigating a case when all leads have been exhausted only to pick up the investigation at a later date because of additional information, including the possibility that forensic analysis provided new leads in the case.

Probative Evidence in Open and Closed Cases

As discussed in Chapter 1, an item of evidence has probative value if it establishes a fact that could be introduced at trial. Examples include latent print hits through AFIS, a match of a DNA profile from the scene with a suspect, and a match between spent projectiles and a firearm. An exclusion, such as a DNA profile from a scene that does not match a suspect, is also probative. Examples of forensic analysis that do not result in probative evidence include the conclusion that a latent print is not useable or that there is insufficient DNA material to develop a profile.

Exhibits 2-15 to 2-17 summarize the number of open and closed cases in which forensic analysts had evidence of probative value. As an example, the first line in Exhibit 2-15 for open homicide cases shows that the crime lab found probative evidence in 13 cases, which is 81.3 percent of the 16 open cases with evidence.[6] The percentages vary considerable for open cases depending on the type of crime. The lowest percentage is for aggravated assault in which only one case out of the 23 open cases had probative evidence.

For closed cases, our objective was to compare probative evidence before and after arrest. The comparison was possible because the dates for the lab reports had been coded into the database and the arrest date was available from the file on defendants. We could therefore determine whether a forensic test took place before or after arrest. Tests performed prior to arrest are aimed at assisting investigators in moving toward an eventual arrest, while tests after arrest assist in prosecution.

[6] The denominators for the percentages in these tables are the number of open or closed cases with forensic evidence.

Exhibit 2- 15: Probative Evidence for Open Cases in Denver

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
Open Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=16)	13	81.3	4	6	7	1	3
Sexual Assault (n=130)	31	23.8	31	1	0	0	0
Aggravated Assault (n=23)	3	13.0	0	1	2	0	0
Robbery (n=18)	3	16.7	1	3	0	0	1
Burglary (n=318)	32	10.1	9	22	1	0	1

Exhibit 2- 16: Probative Evidence Before Arrest in Denver

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
CBA Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=48)	7	14.6	1	2	6	2	1
Sexual Assault (n=38)	6	15.0	4	2	0	0	0
Aggravated Assault (n=14)	0	0.0	0	0	0	0	0
Robbery (n=8)	1	12.5	1	0	0	0	0
Burglary (n=78)	19	24.4	9	10	0	0	1

Exhibit 2- 17: Probative Evidence After Arrest in Denver

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
CBA Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=48)	32	66.7	16	10	18	2	2
Sexual Assault (n=38)	25	65.8	25	4	0	0	1
Aggravated Assault (n=14)	6	42.9	1	1	4	0	0
Robbery (n=8)	2	25.0	0	0	2	0	0
Burglary (n=78)	23	29.5	10	14	0	0	1

From Exhibit 2-16, we see that the amount of probative evidence prior to arrest is relatively low for all five types of crime. The highest is with burglary in which the crime lab established probative evidence in 19 of 78 cases (24.4 percent). With aggravated assaults, none of the 14 cases had probative evidence established prior to arrest.

Exhibit 2-17 shows an increase in the number of cases with probative evidence established after arrest. For homicides and sexual assaults, the crime lab established probative evidence in 66.7 and 65.8 percent of the closed cases, respectively. For burglaries, the percentage is 29.5 percent. Only six of the aggravated assaults and two of the robberies had probative evidence after arrest.

Exploring the differences in probative evidence between open and closed cases was beyond the scope of this project and could be the subject of another research project (see Chapter 7 for research recommendations). Several conjectures could be made. The reasons for the low percentage of probative evidence prior to arrest may be because arrests are made in a relatively short period of time, as reflected in Exhibit 2-14. If an arrest is made on the day of the offense, as occurs in many homicides, forensic analysis would not have been completed or even requested. With an arrest, there is an opportunity for analysis because the suspect can be fingerprinted and a buccal swab taken for DNA analysis. Investigators can then make requests for analysis for the purpose of linking the suspect to the crime. Finally, an investigator may request analysis for an open case, especially a homicide, because all investigative leads have been exhausted and the offender has not been identified. The investigator may then turn to the crime lab to assist in identifying the offender through a CODIS or AFIS query.

Dispositions of Defendants

Dispositions

With the data collected in this project, we were able to compare the dispositions of the cases in which evidence was collected against cases with no evidence. Exhibits 2-18 through 2-22 summarize the case dispositions for the five offenses. Starting with homicide cases, Exhibit 2-18 shows that evidence was collected in 63 of the 67 homicides, and that investigators closed 47 of the 63 homicides for a clearance rate of 74.6 percent for cases with evidence. Investigators closed two of the four cases without evidence. One of the anomalies in the data is that six of the closed cases were murder/suicides in which both the victim and offender died. These are

classified as "exceptional clearances" according to FBI Uniform Crime Classification guidelines. Homicide investigators investigate these cases to establish the circumstances under which the incident occurred and the cases may become more complicated when the offender commits suicide at a different location. Evidence was collected in five of the six murder/suicides.

Excluding the murder/suicide cases and one case in which the defendant was deemed mentally incompetent, Exhibit 2-18 gives the dispositions on 57 defendant filings with the district attorney's office. Dispositions for these defendants included 2 found not guilty by trial, 17 guilty at trial, 3 guilty pleas as charged, and 35 pleas to reduced charges. A measure of success for the district attorney's office is that 55 of the 57 defendants received some type of guilty verdict (96.5 percent). Comparisons with homicides without evidence are not reasonable because there were only four such cases with two closures and two remaining open cases. One of the closed cases was a murder/suicide and the other resulted in the defendant found guilty at trial.

Exhibit 2-18 shows that forensic analysis may have contributed significantly to the outcomes of the cases with evidence. The exhibit indicates whether the case had probative evidence available to the prosecutor. Within the limitations of this study, it is not possible to determine exactly how the probative evidence assisted in each case because interviews with investigators and prosecutors were not possible on every case. However, support for forensic analysis is clearly indicated in Exhibit 2-18 by the fact that 32 of the 55 convictions (58.2 percent) had probative evidence.

Exhibit 2-19 gives the results for the dispositions of defendants in sexual assault cases. Highlights from this exhibit are as follows:

- Investigators solved 38 of the 165 cases with forensic evidence for a closure rate of 23.0 percent, compared to solving 16 of the 158 cases without forensic evidence for a closure rate of 10.1 percent.
- Based on these closure rates, the odds of closing a case with forensic evidence are about 2.7 times higher than the odds of closing a case with no forensic evidence.
- The conviction rate was 67.6 percent for cases with evidence (25 of 37 defendants) compared to 46.7 percent for cases without evidence (seven of 15 defendants).
- The odds of conviction for cases with forensic evidence are about 1.8 times the odds without forensic evidence.

- Of the 25 convictions, 20 cases had probative evidence.

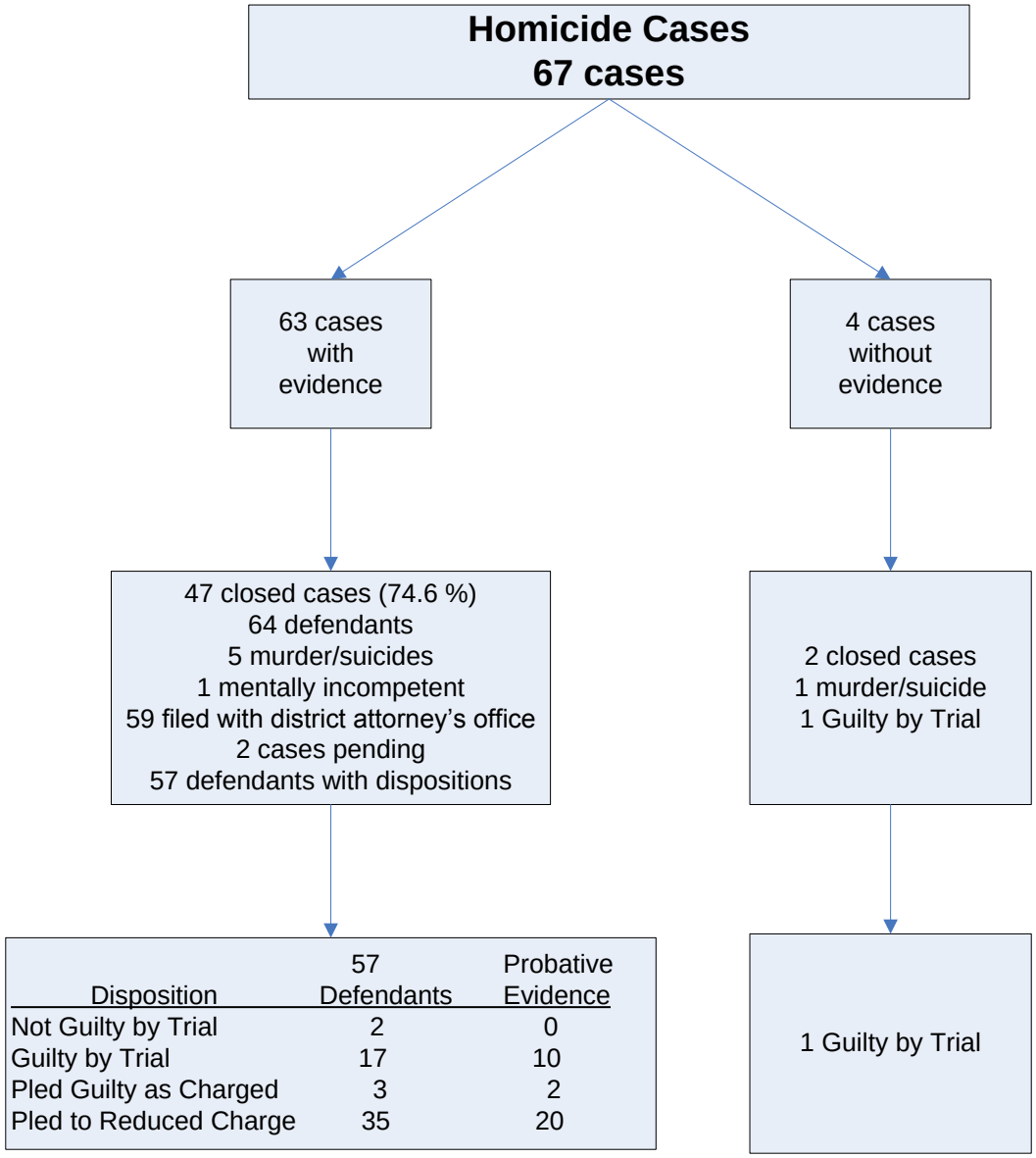
As discussed throughout this chapter, we have fewer cases with evidence for assault and robbery offenses (see Exhibits 2-19 and 2-20). Of the 727 assault cases, 32 cases had forensic evidence and 692 cases did not have forensic evidence. Thirteen of the 32 cases with evidence were closed for a clearance rate of 40.6 percent, compared to 185 closed cases without evidence for a clearance rate of 26.6 percent. The odds of closing an assault case with evidence are therefore 1.9 times the odds of closing a case without evidence. For the 15 defendants in the cases with evidence, only one case was dismissed. The other cases resulted in 10 pleas to reduced charges, three pleas as charged, and one guilty verdict by trial for a conviction rate of 93.3 percent. For the 191 defendants in cases without evidence, there were 34 dismissals and three found not guilty at trial. The convictions consisted of 10 defendants found guilty at trial, 42 pled guilty as charged, and 102 pled to reduced charges, for a conviction rate of 80.6 percent.

For the 352 robberies, there were 26 cases with evidence and 326 cases without evidence, with closure rates of 30.8 percent and 8.3 percent, respectively. The odds of closing a robbery case with evidence are therefore almost five times the odds of closing a robbery without evidence. For the eight defendants in cases with evidence, only one was dismissed. One case resulted in a plea as charged and seven cases in pleas to reduced charges for a conviction rate of 88.9 percent. For the 31 defendants in cases without evidence, there were five dismissals. Convictions included two guilty at trial, four pleas as charged, and 20 pleas to reduced charges for an overall conviction rate of 83.9 percent.

Of the 2,580 burglary cases (see Exhibit 2-22), 400 cases had forensic evidence and 2,180 cases did not have forensic evidence. The comparisons between these groups of cases are as follows:

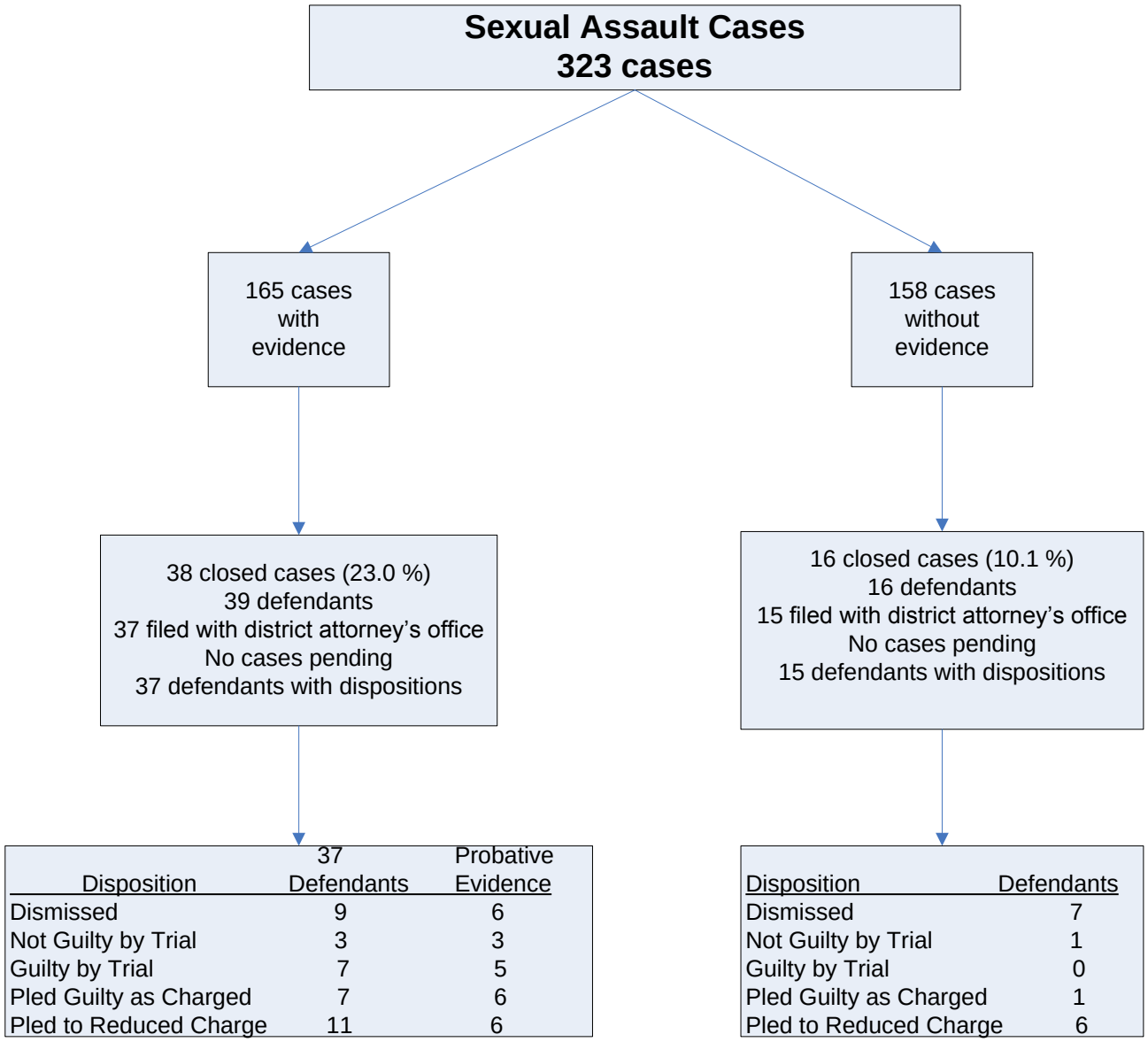
- Investigators closed 87 of the 400 cases with evidence (21.8 percent closure rate) and 86 cases without evidence (3.9 percent closure rate).
- The odds of closing a burglary case with evidence are about 6.8 times the odds of closing a case without evidence.
- There were 11 "John Doe" closed cases in which DNA profiles were entered into the CODIS system but the offender had not been identified.
- The conviction rate for cases with forensic evidence was 91.7 percent compared to 87.7 percent for cases without evidence. Based on a statistical proportions test, the difference is not statistically significant.

Exhibit 2- 18: Case Dispositions for Homicides in Denver



Disposition	57 Defendants	Probative Evidence
Not Guilty by Trial	2	0
Guilty by Trial	17	10
Pled Guilty as Charged	3	2
Pled to Reduced Charge	35	20

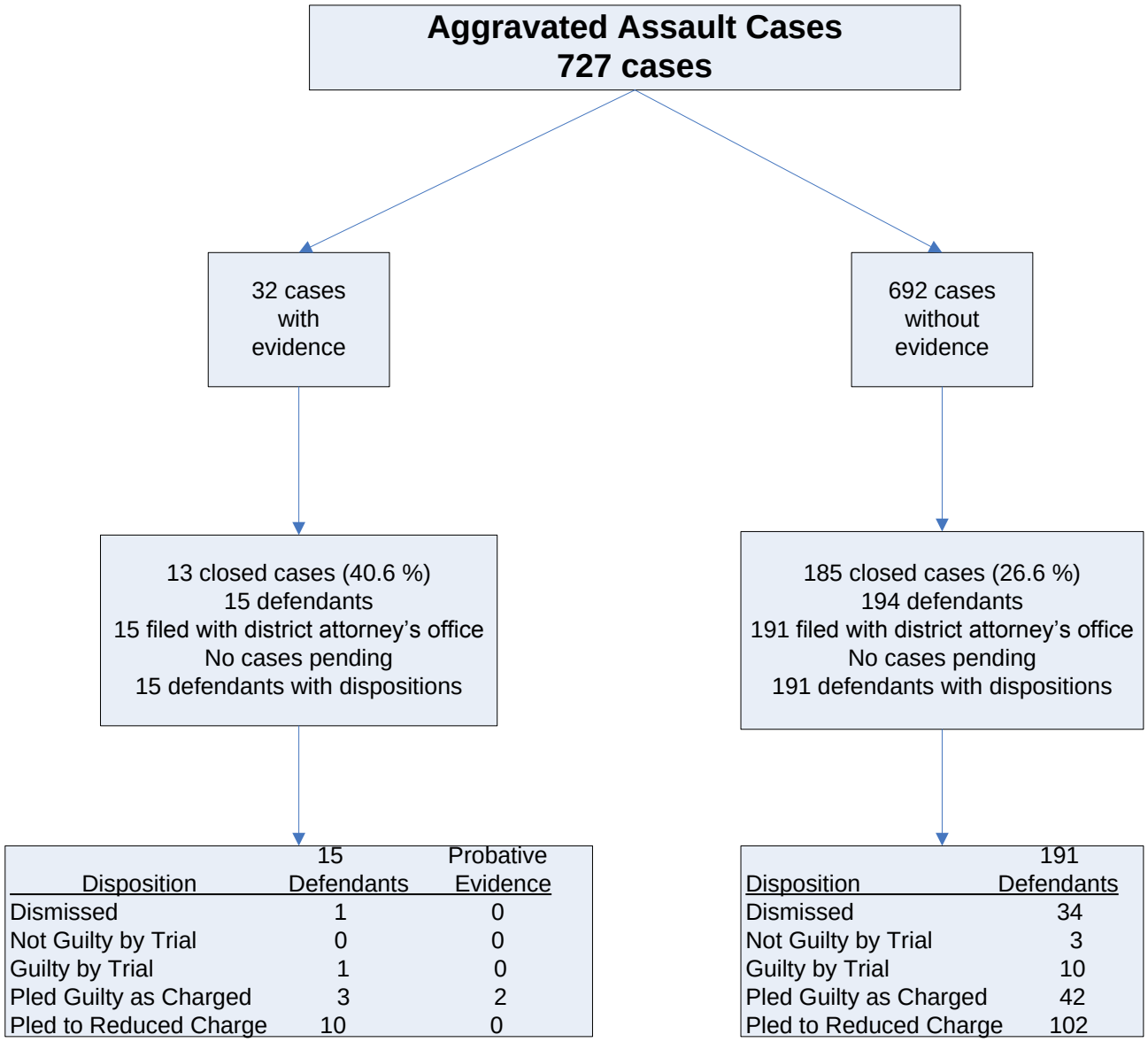
Exhibit 2- 19: Case Dispositions for Sexual Assaults in Denver



Disposition	37 Defendants	Probative Evidence
Dismissed	9	6
Not Guilty by Trial	3	3
Guilty by Trial	7	5
Pled Guilty as Charged	7	6
Pled to Reduced Charge	11	6

Disposition	Defendants
Dismissed	7
Not Guilty by Trial	1
Guilty by Trial	0
Pled Guilty as Charged	1
Pled to Reduced Charge	6

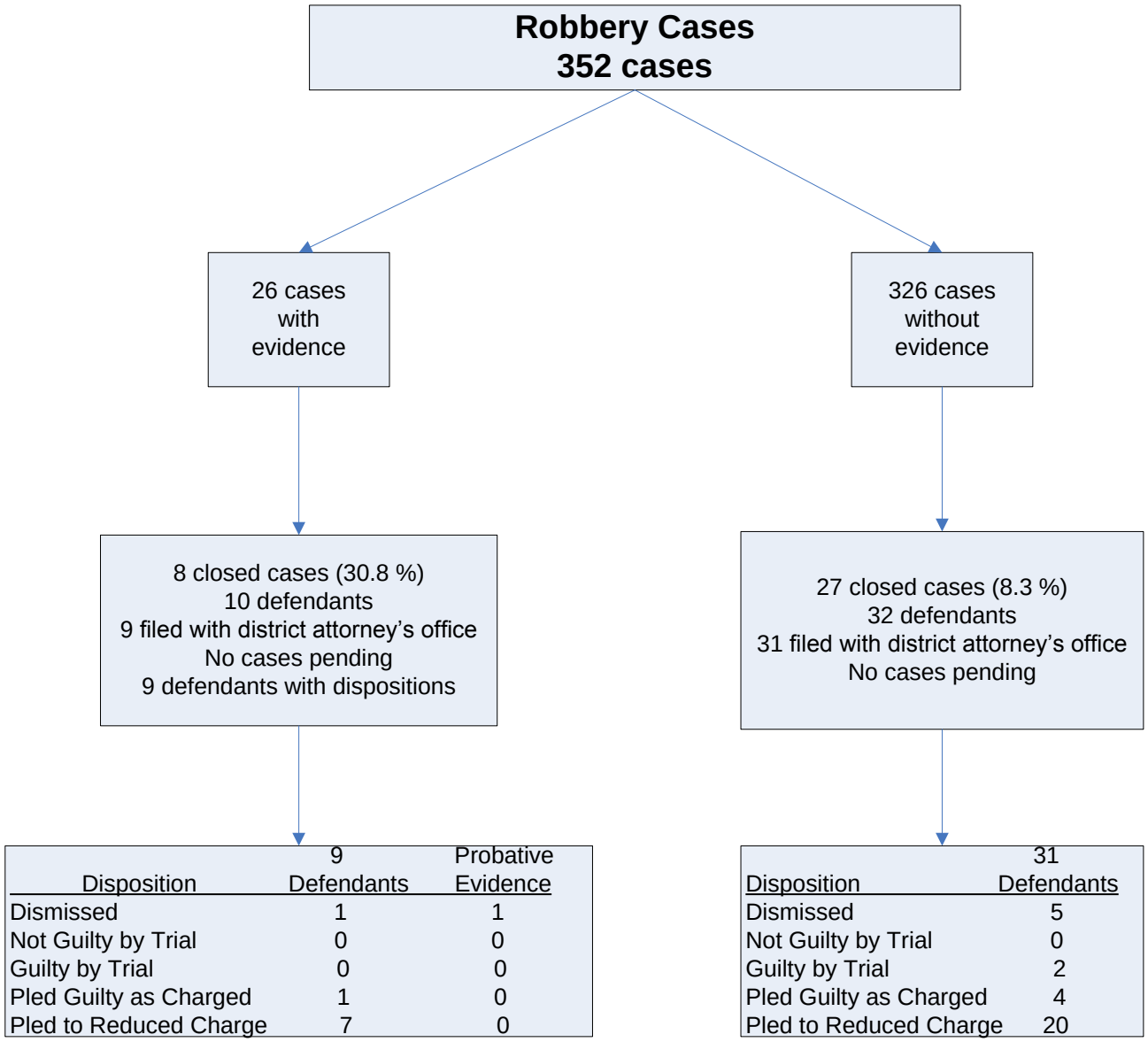
Exhibit 2- 20: Case Dispositions for Aggravated Assaults in Denver



Disposition	15 Defendants	Probative Evidence
Dismissed	1	0
Not Guilty by Trial	0	0
Guilty by Trial	1	0
Pled Guilty as Charged	3	2
Pled to Reduced Charge	10	0

Disposition	191 Defendants
Dismissed	34
Not Guilty by Trial	3
Guilty by Trial	10
Pled Guilty as Charged	42
Pled to Reduced Charge	102

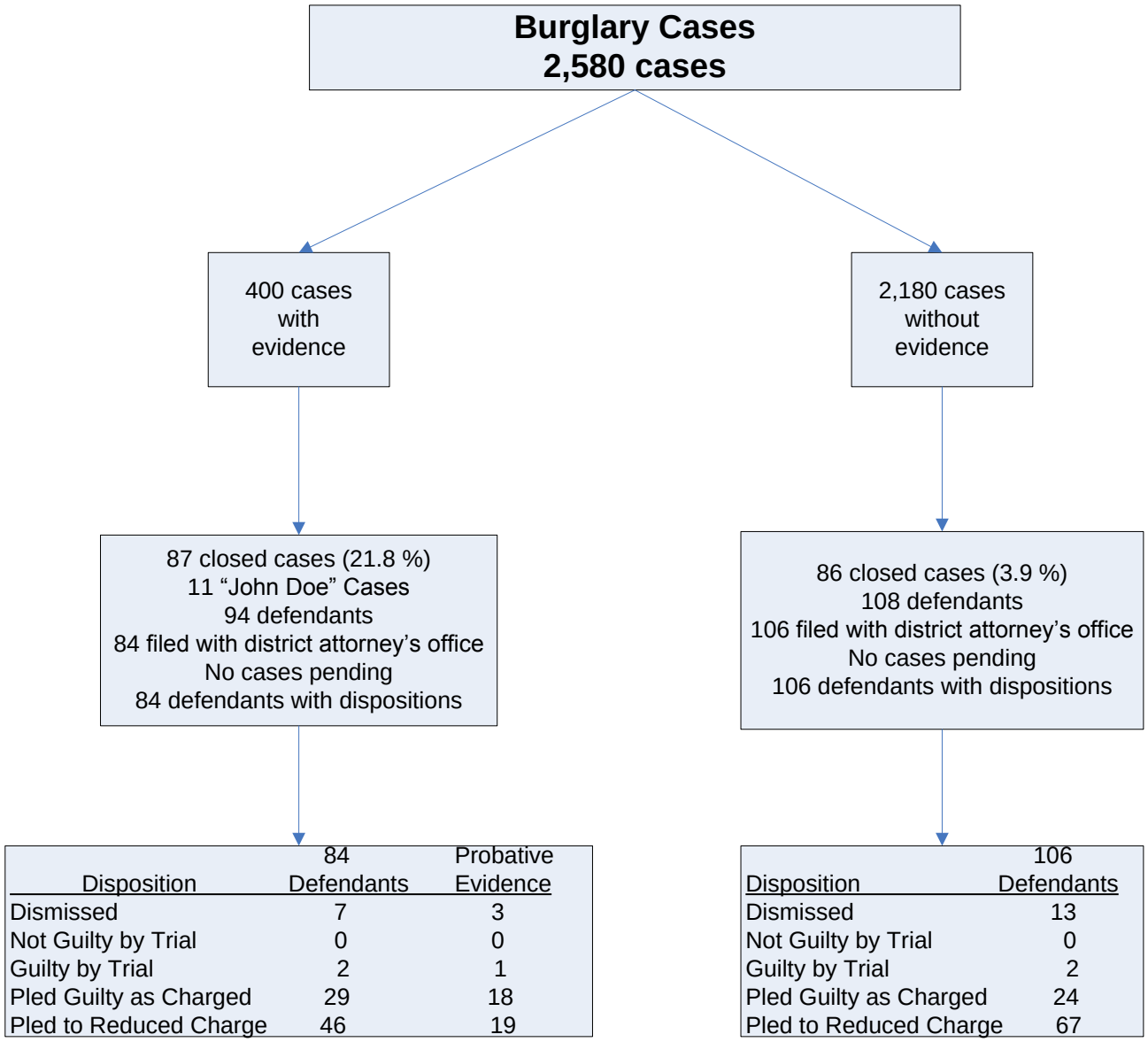
Exhibit 2- 21: Case Dispositions for Robberies in Denver



Disposition	9 Defendants	Probative Evidence
Dismissed	1	1
Not Guilty by Trial	0	0
Guilty by Trial	0	0
Pled Guilty as Charged	1	0
Pled to Reduced Charge	7	0

Disposition	31 Defendants
Dismissed	5
Not Guilty by Trial	0
Guilty by Trial	2
Pled Guilty as Charged	4
Pled to Reduced Charge	20

Exhibit 2- 22: Case Dispositions for Burglaries in Denver



Disposition	84 Defendants	Probative Evidence
Dismissed	7	3
Not Guilty by Trial	0	0
Guilty by Trial	2	1
Pled Guilty as Charged	29	18
Pled to Reduced Charge	46	19

Disposition	106 Defendants
Dismissed	13
Not Guilty by Trial	0
Guilty by Trial	2
Pled Guilty as Charged	24
Pled to Reduced Charge	67

Sentences

ILJ collected information on prison sentences for guilty (guilty by trial or pled guilty) defendants in the database. A total of seven homicide defendants and seven sexual assault defendants received life sentences. All of those sexual assault cases had probative evidence as did five of the seven homicide defendants.

Exhibit 2-23 summarizes the sentences imposed on guilty defendants other than those who received life sentences. Robbery defendants are not included in the exhibit because of the small number of defendants. The exhibit shows major differences between cases with no probative evidence and those with probative evidence. For example, the average sentence for homicide defendants without probative evidence was 14.0 years compared to 24.7 years for those with probative evidence. The greatest difference is with defendants accused of sexual assaults. Defendants without probative evidence had average sentences of 1.4 years and defendants with probative evidence had average sentences of 11.7 years. Major differences are also reflected with the other two categories of aggravated assault and burglary defendants.

Exhibit 2- 23: Prison Sentences for Guilty Defendants in Denver

Offense	No Probative Evidence	Probative Evidence
Homicide	14.0	24.7
Sexual Assaults	1.4	11.7
Aggravated Assault	2.0	7.6
Burglary	1.6	5.6

NOTE: Figures are number of years in the sentence.

These results need to be approached carefully because the existence of probative evidence is not directly linked to the sentences imposed on guilty defendants. Sentencing guidelines and other factors may be the primary basis for many sentences. However, prosecutors may be more likely to move forward with more severe charges and longer sentences when probative evidence is involved in a case.

Conclusions

The examination of over 4,000 offenses in Denver offers several major conclusions on the use of forensic evidence in investigation and prosecution. One of the surprising results is the relatively low number of aggravated assaults, robberies, and burglaries where forensic evidence is collected. While evidence is collected in 95.5 percent of homicides and over half the sexual assaults, less than 16 percent of the other three categories had forensic evidence. As stated earlier in this chapter, the question is whether no forensic evidence actually existed at these crime scenes or whether evidence was there but not collected.

Another important result from Denver is that forensic evidence may be collected but never analyzed, and as a corollary, analysis by the crime lab may not result in evidence of probative value. For example, investigators requested analysis of DNA evidence in 29 of the 50 cases having this type of evidence, and the crime lab developed DNA profiles in 23 of the 29 requested cases. A similar pattern was found with DNA evidence from sexual assaults and burglaries. With sexual assaults, investigators requested analysis of DNA evidence in 133 of the 162 cases, and the crime lab developed DNA profiles in 69 cases. With burglaries, requests were made in 91 of the 114 cases, and DNA profiles were established in 77 cases.

Similar patterns can be found with the analysis of latent prints and firearms evidence. That is, investigators do not request analysis of every item of evidence and analysis by crime lab personnel does not always provide results in evidence of probative value. Several reasons can be given for these results. On requests, investigators and prosecutors may not need the crime lab to perform the analysis in order to adjudicate the case, especially when the suspect confesses to the crime. On analysis, the forensic evidence may not be of sufficient quality to establish results—insufficient material for developing a DNA profile, smudged latent prints, crushed projectiles, and other reason. These factors influence the role of forensic evidence in investigations and prosecutions.

For this study, we examined whether forensic analysts found evidence of probative value in open and closed cases. We found that 10.1 percent of the open burglary cases had probative evidence, primarily from latent prints. About 80 percent of the open homicides had evidence of probative value, with a mixture of sources (DNA evidence, latent prints, and firearms), and about 25 percent of sexual assaults had evidence of probative value, almost entirely from DNA

evidence. The fact that these cases remained open indicates that evidence of probative value does not always lead to arrests. Reasons could be that the suspect in a match cannot be located, the probative evidence excluded a suspect, or the evidence was not sufficient by itself to affect an arrest.

With closed cases, the analysis of forensic evidence can take place before and/or after arrest. For closed burglaries, about 24.4 percent of the cases had probative evidence established prior to arrest, compared to 29.5 percent after arrest. With homicides and sexual assaults, about 15 percent had probative evidence established prior to arrest compared to about 65 percent after arrest. None of the aggravated assaults had probative evidence established prior to arrest, and only about 13 percent of the robberies. For all five offense categories, there was more probative evidence established after arrest than before arrest. With an arrest, investigators have an opportunity to obtain fingerprints and DNA evidence (buccal swab) from the suspect for submission to the crime lab for comparison with other evidence. The results may support the arrest and assist in prosecution.

We calculated the odds of closing cases with evidence against cases without evidence. For sexual assaults, the odds of closing a case with evidence are 2.7 times the odds of closing a case with no evidence. The odds are 1.9 in favor of evidence in aggravated assaults, almost 5.0 with robberies, and 6.8 with burglaries. Odds were not calculated for homicides because almost all those cases have evidence. In line with these results, we found evidence of probative value in the majority of dispositions. Looking at defendants with guilty dispositions, evidence of probative value was present in the majority of homicide, sexual assault, and burglary cases, but not in aggravated assault and robbery cases.

Finally, probative evidence is associated with longer sentences. This result is especially true with sexual assaults as shown by the fact that defendants with probative evidence received an average sentence of 11.7 years, compared to 1.4 years for defendants without probative evidence. As previously stated, this result needs to be approached with caution because of other factors that influence sentences, especially sentencing guidelines.

Chapter 3

Forensic Evidence in San Diego, California

Introduction

The data collection and analysis for San Diego, California proceeded along the same lines as Denver, Colorado with one important difference. In San Diego, we were able to merge arrest and crime data with the result that we obtained a larger sample of closed cases than would have occurred with simple random sampling. More information on the sampling procedure is provided later in this chapter. The following section describes the city of San Diego, its police department, and the department's crime lab. Subsequent sections summarize characteristics of victims and offenders, forensic evidence collected on cases, analysis of evidence, and dispositions of defendants.

Background

San Diego Police Department

San Diego County, with 3.2 million residents, is the fifth most populated county in the United States. Covering 4,200 square miles, the county has 18 incorporated cities, ranging in population from 4,500 residents in Del Mar to 1.3 million residents in the city of San Diego. San Diego covers 342 square miles and adjoins 11 of the 17 other cities and Mexico. The demographic breakdown of the city is 45 percent white, 28 percent Hispanic, 16 percent Asian and Pacific Islander, and 7 percent African-American. The median age is 35 years and the median household income is $50,025.

The San Diego Police Department (SDPD) has nine area commands (with 19 service areas and 122 neighborhoods) and a headquarters that has centralized investigations and administrative divisions. With 1,900 sworn officers and 800 civilians, the SDPD provides patrol, traffic, investigative, record keeping, laboratory, and support services. About 340 positions are in investigations and 1,500 in patrol operations. In 2007, the SDPD dispatched 625,320 citizen calls for services, made 14,512 felony arrests and 32,779 misdemeanor arrests. The clearance

rates for FBI index crimes were 48.5 percent for violent crimes and 9.7 percent for property crimes.

Exhibit 3-1 shows the crime statistics for the five offenses of ILJ's study for 2004-2008.[7] Total crimes were about 14,000 each year with some variations by type of crime. Aggravated assaults showed a steady decrease while robberies and burglaries increased. It should be noted that the sexual assault cases in this study fall into the 'rape' category for UCR. For the purposes of this report, these will be referenced by the broader category of sexual assaults.

Exhibit 3- 1: Crimes in San Diego, 2004-2008

Crime Type	2004	2005	2006	2007	2008
Homicide	62	51	68	58	55
Sexual assault	373	376	348	296	376
Aggravated assault	4,689	4,314	3,811	3,882	3,597
Robbery	1,650	1,862	2,164	2,095	2,019
Burglary	7,305	7,462	7,746	7,679	7,743

The SDPD has different reporting and investigative procedures according to the type of crime. Its Telephone Report unit takes the initial report by telephone for property crimes when there is no evidence to be collected at the scene. For other property crimes, the responding patrol officer takes the report and may collect evidence at the scene. Evidence is submitted to the Property Room and then to the crime lab if analysis is requested. All reports, including descriptions of evidence, are forwarded to the area's investigative unit where a sergeant reviews the reports and determines assignment to a detective or designates the case as "no required contact" based on the amount and type of evidence and suspect information.

With violent crimes, the department's Criminal Records Management System (CRMS) determines the appropriate routing based on a number of factors including type of crime, domestic violence indicator, and others. If none of the factors is present, the case is routed to the area station for follow-up investigation. Commercial and residential robberies are sent to the Robbery Unit, while street robberies are routed to the area stations. Sexual assaults are assigned

[7] Crime statistics can be found at http://www.sandiego.gov/police/stats/index.shtml, accessed on April 16, 2010.

to the Sex Crimes investigative unit, while other assaults are investigated by personnel in the area stations.

The department's CRMS system includes information on all crimes reported to the police, including whether evidence was collected and whether arrests were made by investigators. In addition, the San Diego Police Department participates in the Automated Regional Justice Information System (ARJIS), which contains crime data from police departments in the geographical area around the city. As discussed later, ILJ obtained crime information from these two systems for the study.

Forensic Science Section

The Forensic Science Section of the SDPD is comprised of 68 civilian positions and holds accreditation by the American Society of Crime Lab Directors. Units within the section include Field Services, Forensic Biology/DNA, Latent Prints, Firearms, Trace Evidence, Question Documents, Forensic Alcohol and Narcotics, and Polygraph.[8] Field Services specialists respond to all homicides, questionable deaths, officer-involved shootings, and other scenes at the request of investigators. Their primary job is to photograph the scene and collect evidence, and they may testify at trials on their activities.

Forensic biology experts analyze physiological fluids, bone, tissue, and hair. Examinations usually involve the identification of the materials (blood, semen, etc.) and DNA analysis to establish profiles. DNA profiles are submitted to CODIS for possible identification. In California, convicted felons and felony arrests are entered into the state's SDIS database, which is part of the national CODIS system. The Latent Prints Unit analyzes evidence from crime scenes and enters latent print data into an Automated Latent Print System (ALPS) computer to locate matching impressions. Criminalists from the Firearms Unit examine firearms for operability and compare fired projectiles and cartridge cases from scenes to test-fired ammunition. They also make determinations of firing distances. The Trace Evidence Unit examines several types of evidence including hair, fibers, glass, paint, soil, headlamps, shoe and tire impressions, arson debris, explosives, wood, and gunshot residue (GSR) from persons and property. Materials are identified and compared with standards to determine whether they share a common origin.

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[8] See http://www.sandiego.gov/police/stats/index.shtml, accessed on April 16, 2010.

When an arrest is made, the officer or investigator submits documentation to the City Attorney for misdemeanor arrests or the District Attorney for felony arrests. The documentation usually includes the "statement of case" and all relevant reports such as victim and witness statements, search warrants, gang involvements, and suspect's criminal history.

District Attorney's Office

The District Attorney's office, which prosecutes cases for the entire county, has divisions in the Hall of Justice (downtown San Diego), three area branches (North County, East County, and South Bay), and a Juvenile Branch. The office has approximately 1,000 employees, consisting of 325 deputy district attorneys and 130 sworn investigators. Countywide, the office receives about 29,000 felonies and over 28,000 misdemeanors annually. In 2007, trials were held for over 500 felony defendants and over 200 misdemeanor defendants. The felony trial conviction rate was 90 percent.

The usual procedure for prosecution is along the following lines. A Deputy District Attorney reviews the case and decides whether to reject the case, re-direct it to another agency (City Attorney or U.S. Attorney), or accept the case for prosecution. If the case is accepted, the defendant is arraigned and may plead guilty at this point. Otherwise, the next event is a Pretrial Readiness Conference, which is followed, if necessary, by a Preliminary Examination Hearing and trial.

Forensic evidence may play an important role in the determination by a deputy district attorney to accept the case and requests for additional forensic testing may be made by the deputy district attorney as the case proceeds through adjudication. Deputy district attorneys are guided by the Forensic Evidence manual published by the California District Attorney's Association in 1999 that covers a wide variety of topics from the types of evidence to preparation and presentation of evidence at trials.[9]

The District Attorney's office maintains a Case Management System that proved invaluable during the course of this study. It provided information on defendants for the five crime types in this study including demographic data (age, race, sex), initial charge, final charge, final disposition, prior convictions, and sentences imposed (jail, prison, and probation time). Through the case number from the police department, it was possible to merge defendant data

[9] See http://cdaa.org/pubs/manualpubs.htm accessed on April 16, 2010.

with the other data collected for this study. The result is a complete picture of a case from occurrence to final disposition.

Sampling Plan

The offenses included in this study for San Diego were homicides, sexual assaults, aggravated assaults, robberies, and burglaries. ILJ included all 116 homicide cases that occurred in 2005 and 2006, and all 377 sexual assault cases from 2005. The reason for including two years of homicides was to increase the number of cases to assure meaningful analysis. Of the homicide cases, police investigators solved 70 cases for a clearance rate of 60.3 percent. With sexual assaults, there were 165 clearances for a clearance rate of 43.8 percent.

For the other three crime categories, ILJ developed samples from crimes that occurred during 2005. Prior to taking the samples, we were able to merge crime data from ARJIS with arrest data from the department's CRMS system. The crime data included indications on whether evidence had been collected at the scene. By merging the two systems we increased the number of cases in which arrests were made and evidence collected. With assaults, we randomly sampled 1,184 cases of which 627 cases had forensic evidence. For robberies, the sample was 735 cases of which 322 cases had evidence, and for burglaries, we have 795 cases of which 460 cases had evidence.

The oversampling procedure proved beneficial to the study because it provided a larger number of cases with evidence than would have been resulted from a random sample. For example, analysis of robberies from the CRMS system indicated that less than 10 percent had evidence. A random sample of robberies would have resulted in a much smaller number of cases with evidence. Some results presented later in this chapter are weighted estimates based on the sampling procedure. The development of weighted estimates allows direct comparisons with results from Denver.

The Access database developed in Denver was modified for use in the San Diego data collection effort. It included tables to capture basic case information (case number, date of occurrence, etc.), victim demographics, arrestee demographics, final case disposition, and details on forensic evidence. Most of the information was available from the merged databases, and was automatically imported into the Access database. The most time consuming aspect of data

collection was forensic information from the department's crime lab. This part of the data collection was a manual process in which files were retrieved based on the police department's case number. Information on forensic evidence and subsequent analysis was then obtained from the files.

Victim and Offender Characteristics

Exhibits 3-2 and 3-3 contain basic statistics on victims and offenders in the completed dataset. Key characteristics from the exhibits are the following:

- Homicide
  - Homicide victims and arrestees were predominantly male (78.7 percent and 89.7 percent, respectively).
  - The predominant race categories for homicide victims were Hispanic (41.1 percent), African-American (31.5 percent), and white (17.7 percent). Arrestees charged with homicides followed a slightly different pattern: 38.7 percent were African-American, 37.7 percent were Hispanic, and 12.3 percent were white.
  - The average age of homicide victims was 30.4 years old, compared to 25.8 years old for arrestees.
- Sexual assault
  - Sexual assault victims were white (49.7 percent), followed by Hispanic (25.5 percent), African-American (16.7 percent), and Asian (6.7 percent). Arrestees were predominantly white (37.7 percent), followed by African-American (30.2 percent), Hispanic (24.5 percent), and Asian (4.7 percent).
  - The average of these victims was 25.9 years, with about two-thirds under the age of 25 years. On average, arrestees were older (29.5 years).
- Aggravated assault
  - In total, 68.4 percent of assault victims were male. Arrestees for assaults had a higher percentage of males at 81.9 percent
  - The distributions by race were similar for victims and arrestees. A total of 36.5 percent of victims were white and 34.7 percent of arrestees were white. Hispanics comprised 32.2 percent of victims and 33.5 percent of arrestees, and African-Americans comprised 22.3 percent of victims and 22.4 percent of arrestees.
  - Victims of assaults were older than arrestees on average (32.1 years compared to 29.5 years).

- Robbery
  - Robbery victims were predominantly male (67.8 percent) as were arrestees (90.2 percent).
  - Robbery victims were predominantly Hispanic (37.3 percent), white (37.1 percent), and African-American (17.7 percent). Arrestees followed a different pattern with African-American (40.6 percent), Hispanic (31.3 percent), and white (19.7 percent).
  - Robbery victims averaged 31.0 years old. Arrestees were younger at 25.7 years.
- Burglary
  - Burglary arrestees were 79.6 percent male and 20.4 percent female.
  - By race, 37.8 percent of arrestees were white, 28.7 percent Hispanic, and 22.9 percent African-American.
  - The average age for burglary arrestees was 26.7 years.

Exhibit 3- 2: Victim Characteristics – San Diego, California

			Female		Male	
Crime Type	Cases	Victims	Number	Percent	Number	Percent
Homicide	116	124	26	21.3	96	78.7
Sexual assault	377	379	376	99.2	3	0.8
Aggravated assault	1,184	1,325	416	31.6	900	68.4
Robbery	735	746	165	32.2	348	67.8
Burglary	795	795	N/A	N/A	N/A	N/A
Total	3,207	3,369				

	White		Hispanic		African-American		Asian		Other	
Crime Type	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homicide	22	17.7	51	41.1	39	31.5	10	8.1	2	1.6
Sexual assault	185	49.7	95	25.5	62	16.7	25	6.7	5	1.3
Aggravated assault	473	36.5	417	32.2	289	22.3	77	5.9	40	3.1
Robbery	189	37.1	190	37.3	90	17.7	28	5.5	12	2.4

	Victim's Age	
Crime Type	Average (Years)	Standard Deviation
Homicide	30.4	15.8
Sexual assault	25.9	11.3
Aggravated assault	32.1	12.9
Robbery	31.0	15.0

Exhibit 3- 3: Characteristics of Arrestees – San Diego, California

			Female		Male	
Crime Type	Clearances	Arrestees	Number	Percent	Number	Percent
Homicide	70	107	11	10.3	96	89.7
Sexual assault	165	178	0	0.0	178	100.0
Aggravated assault	451	509	92	18.1	417	81.9
Robbery	372	482	47	9.8	435	90.2
Burglary	384	457	93	20.4	364	79.6
Total	1,442	1,733	243	14.6	1,490	85.2

	White		Hispanic		African-American		Asian		Other	
Crime Type	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Homicide	13	12.3	40	37.7	41	38.7	8	7.5	4	3.8
Sexual assault	40	37.7	26	24.5	32	30.2	5	4.7	3	2.8
Aggravated assault	174	34.7	168	33.5	112	22.4	38	7.6	9	1.8
Robbery	91	19.7	145	31.3	188	40.6	29	6.3	10	2.2
Burglary	167	37.8	127	28.7	101	22.9	40	9.0	7	1.6

	Arrestee's Age	
Crime Type	Average	Standard Deviation
Homicide	25.8	10.9
Sexual assault	29.5	9.6
Aggravated assault	29.5	10.9
Robbery	25.7	10.3
Burglary	26.7	10.4

Note: The race and age were unknown for 71 sexual assault arrestees.

Forensic Evidence Collected on Cases

Exhibits 3-4 and 3-5 summarize the types of forensic evidence collected on San Diego's cases. Exhibit 3-4 divides evidence into 10 categories and Exhibit 3-5 shows additional details for subcategories. The results for assaults, robberies, and burglaries have been weighted based on the sampling scheme. Use of the weights ensures that the totals agree with the number of reported offenses.[10]

The bottom line of Exhibit 3-4 gives the number of cases in which any type of forensic evidence was collected. The range is significant. Evidence is collected in only about 18 percent of assaults compared to 95 percent of the homicides. Almost 70 percent of sexual assault cases had evidence (primarily sexual assault kits). With robberies, the percent of cases with evidence is 26.8 percent and with burglaries, it is 29.3 percent of cases.

Other key results from Exhibit 3-4 are:

- As in Denver, there is considerable variation by offense category in the types of evidence collected. For example, biological evidence was obtained in 93.1 percent of the homicides and 60.7 percent of sexual assaults (usually from sexual assault kits), compared to less than five percent of assaults, robberies, and burglaries.
- Weapons evidence was obtained in 82.8 percent of the homicides, but less than 10 percent in the other offenses. In fact, firearms evidence was not obtained in any of the sexual assaults.
- Latent prints were obtained in almost half the homicides and about 16 percent of the burglaries. Less than ten percent of the other offenses had latent prints.

Exhibit 3-5 gives further details on the type of evidence collected:

- For homicides, DNA evidence was usually swabs of DNA material (such as blood) or buccal swabs from suspects.
- Handguns as evidence were obtained in 22.4 percent of homicides and other firearms in 12.9 percent of homicides.
- Suspected illegal drugs were obtained in 22.4 percent of the homicides but less than one percent of the other types of offenses.

[10] The 4,314 aggravated assaults for 2005 in Exhibit 3-1 include felony and misdemeanor assaults. ILJ's study is only for the 2,468 felony assaults that occurred in 2005.

Exhibit 3- 4: Summary of Forensic Evidence Collected in San Diego Cases

	Homicide (n=116)		Sexual Assault (n=377)		Aggravated Assault (n=2,468)[1]		Robbery (n=1,878)[1]		Burglary (n=7,462)[1]	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Biological evidence	108	93.1	229	60.7	79	3.2	77	4.1	133	1.8
Weapons evidence	96	82.8	1	0.3	255	10.3	65	3.5	58	0.8
Latent prints	56	48.3	3	0.8	12	0.5	136	7.2	1,176	15.8
Drug evidence	34	29.3	2	0.5	24	1.0	23	1.2	21	0.3
Impressions evidence	20	17.2	1	0.3	20	0.8	32	1.7	397	5.3
Trace evidence	72	62.1	12	3.2	39	1.6	18	1.0	63	0.8
Natural/Synthetic materials	107	92.2	106	28.1	156	6.3	123	6.5	222	3.0
Generic object	16	13.8	3	0.8	67	2.7	36	1.9	126	1.7
Electronic/Printed data	46	39.7	4	1.1	27	1.1	197	10.5	535	7.2
Other Items	10	8.6	8	2.1	33	1.3	81	4.3	241	3.2
At least 1 type of forensic evidence collected	111	95.7	263	69.8	454	18.4	503	26.8	2,185	29.3

[1] Entries in these columns are weighted values.

Exhibit 3- 5: Forensic Evidence Collected in San Diego Cases

	Homicide (n=116)		Sexual Assault (n=377)		Aggravated Assault (n=2,468)[1]		Robbery (n=1878)[1]		Burglary (n=7,462)[1]	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Biological evidence										
Swabs	98	84.5	215	57.0	61	2.5	58	3.1	116	1.6
Buccal swabs	84	72.4	79	21.0	36	1.5	33	1.8	40	0.5
Sexual assault kits	2	1.7	207	54.9	2	0.1	0	0.0	0	0.0
Semen	0	0.0	2	0.5	0	0.0	0	0.0	0	0.0
Other biological material	88	75.9	18	4.8	0	0.0	1	0.1	0	0.0
Weapons evidence										
Handguns	26	22.4	0	0.0	19	0.8	12	0.6	7	0.1
Other firearms	15	12.9	0	0.0	16	0.6	14	0.7	9	0.1
Shell casings	46	39.7	0	0.0	26	1.1	11	0.6	0	0.0
Bullet fragments	33	28.4	0	0.0	8	0.3	0	0.0	0	0.0
Spent projectiles	63	54.3	0	0.0	24	1.0	0	0.0	0	0.0
Live cartridges	23	19.8	0	0.0	3	0.1	5	0.3	0	0.0
Magazines	2	1.7	0	0.0	2	0.1	5	0.3	2	0.0
GSR kits	36	31.0	0	0.0	15	0.6	1	0.1	0	0.0
Knives	31	26.7	1	0.3	136	5.5	24	1.3	42	0.6
Other weapons	0	0.0	0	0.0	46	1.9	5	0.3	0	0.0
Latent prints										
Latent prints	56	48.3	3	0.8	12	0.5	136	7.2	1,176	15.8
Drug evidence										
Illegal drugs	26	22.4	0	0.0	11	0.4	15	0.8	12	0.2
Drug paraphernalia	14	12.1	2	0.5	18	0.7	11	0.6	15	0.2
Impressions evidence										
Shoeprint impressions	5	4.3	0	0.0	0	0.0	3	0.2	49	0.7
Tire tracks	2	1.7	0	0.0	0	0.0	0	0.0	0	0.0
Tools/Marks	15	12.9	1	0.3	20	0.8	30	1.6	349	4.7
Trace evidence										
Fire igniter	0	0.0	0	0.0	2	0.1	4	0.2	0	0.0
Soil/Dirt	2	1.7	0	0.0	18	0.7	0	0.0	23	0.3
Glass	1	0.9	0	0.0	10	0.4	3	0.2	2	0.0

Exhibit 3- 5: Forensic Evidence Collected in San Diego Cases

	Homicide (n=116)		Sexual Assault (n=377)		Aggravated Assault (n=2,468)[1]		Robbery (n=1878)[1]		Burglary (n=7,462)[1]	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Paint	4	3.4	0	0.0	1	0.0	0	0.0	0	0.0
Cigarettes/cigars	38	32.8	4	1.1	1	0.0	6	0.3	33	0.4
Tape	2	1.7	0	0.0	0	0.0	3	0.2	3	0.0
Fibers	8	6.9	0	0.0	6	0.2	0	0.0	0	0.0
Hair	56	48.3	9	2.4	1	0.0	3	0.2	2	0.0
Natural/Synthetic Materials										
Bindings	1	0.9	0	0.0	0	0.0	2	0.1	0	0.0
Clothing	107	92.2	92	24.4	154	6.2	121	6.4	204	2.7
Bed/Bath Material	12	10.3	28	7.4	1	0.0	0	0.0	16	0.2
Carpet	1	0.9	1	0.3	0	0.0	0	0.0	2	0.0
Metal objects	3	2.6	0	0.0	1	0.0	0	0.0	0	0.0
Generic Objects										
Vehicle/bicycle	1	0.9	1	0.3	7	0.3	14	0.7	44	0.6
Container	13	11.2	2	0.5	36	1.5	18	1.0	68	0.9
Floor	1	0.9	0	0.0	0	0.0	0	0.0	0	0.0
Door	1	0.9	0	0.0	0	0.0	0	0.0	0	0.0
Furniture	0	0.0	0	0.0	5	0.2	1	0.1	9	0.1
Wood	3	2.6	0	0.0	11	0.4	3	0.2	0	0.0
Concrete	0	0.0	0	0.0	11	0.4	0	0.0	5	0.1
Electronic/Printed Data										
Documents	43	37.1	0	0.0	9	0.4	48	2.6	322	4.3
Electronics	13	11.2	4	1.1	17	0.7	157	8.4	232	3.1
Computer	0	0.0	0	0.0	1	0.0	0	0.0	12	0.2
Other Items	10	8.6	8	2.1	44	3.7	52	7.1	241	3.2

[1] Entries in these columns are weighted values.

Forensic Analysis of Evidence

As a first step in determining how evidence benefits investigations, ILJ staff coded detailed information on the processing of evidence through the department's crime lab. The usual procedure is that the lead investigator requests analysis of specific items of evidence, and the request is given to the appropriate forensic analysts in the lab for completion. If no request is made, the lab takes no action with the evidence. Even with a request, forensic analysts may determine that analysis is not possible—a latent print is not useable, shell casings are damaged, insufficient biological material exists for a DNA profile, and other reasons. In short, as the analysis proceeds in the crime lab, some evidence will have no value while other evidence will provide beneficial results for an investigation.

In the following sections, we describe the general processing steps for the different types of forensic evidence. For this analysis, we compare forensic evidence for open and closed cases.[11] By taking a close look, we are able to provide information on how many cases have analytical results of probative value for investigations.

DNA Analysis

Exhibits 3-6 through 3-10 provide detailed flows of DNA evidence from collection to final analysis. As with the exhibits for Denver, the top portion of each figure gives the flow for open cases and the bottom portion for closed cases. Highlights from these exhibits are as follows:

- Investigators requested DNA analysis in over two-thirds of all cases with DNA evidence. Requests were highest with robberies at 91.7 percent
- From cases with analysis, DNA profiles were obtained in over 80 percent of all cases, ranging from 79.l3 percent for sexual assaults to 98.1 percent for robberies.
- Matches between two or more DNA profiles were obtained in more than 30 percent of the cases, ranging from 25.0 percent for robberies to 33.3 percent for homicides.
- Exclusions were obtained in over 20 percent of the cases, ranging from 10.2 percent of the burglaries to 31.5 percent of homicides.

[11] An *open* case is a case in which the offender has not been identified and arrested. There are two types of closed cases. *Closed by arrest* means that a physical arrest was made in the case. An exceptional clearance is a closure in which the perpetrator is known but is not arrested for a variety of reasons. These cases include offenders who are already in prison, offenders who were killed during the course of the offense, and other circumstances.

- Over 100 CODIS hits were made in these cases. Thirty-six hits were from robbery cases and twenty-six from burglaries.

As with Denver, the exhibits show the importance of DNA analysis in many cases. The importance of the CODIS system is also reflected in this analysis. Without the CODIS system, many of these cases would not have been solved.

Exhibit 3- 6: DNA Analysis for Homicide Cases in San Diego

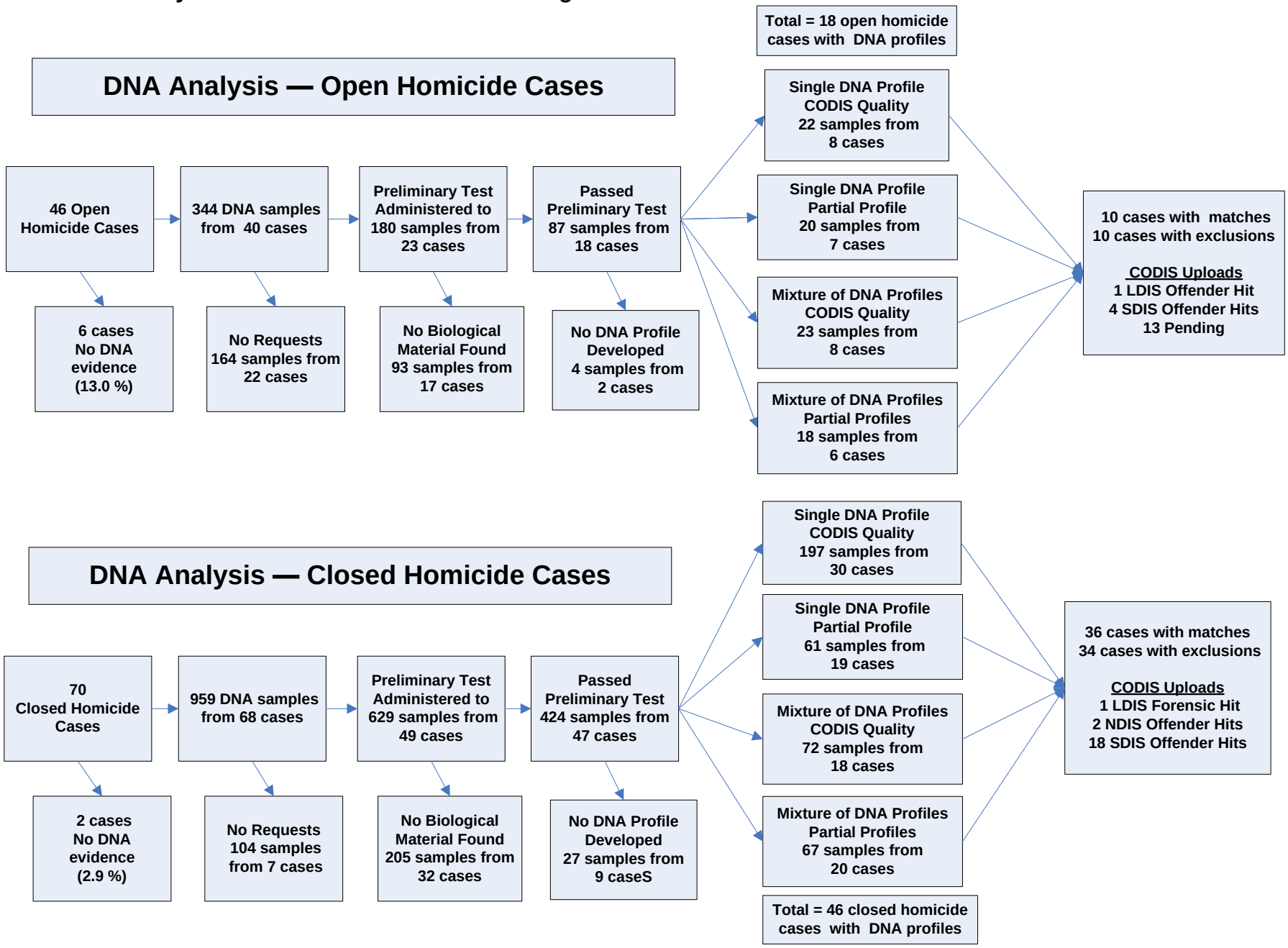


Exhibit 3- 7: DNA Analysis for Sexual Assault Cases in San Diego

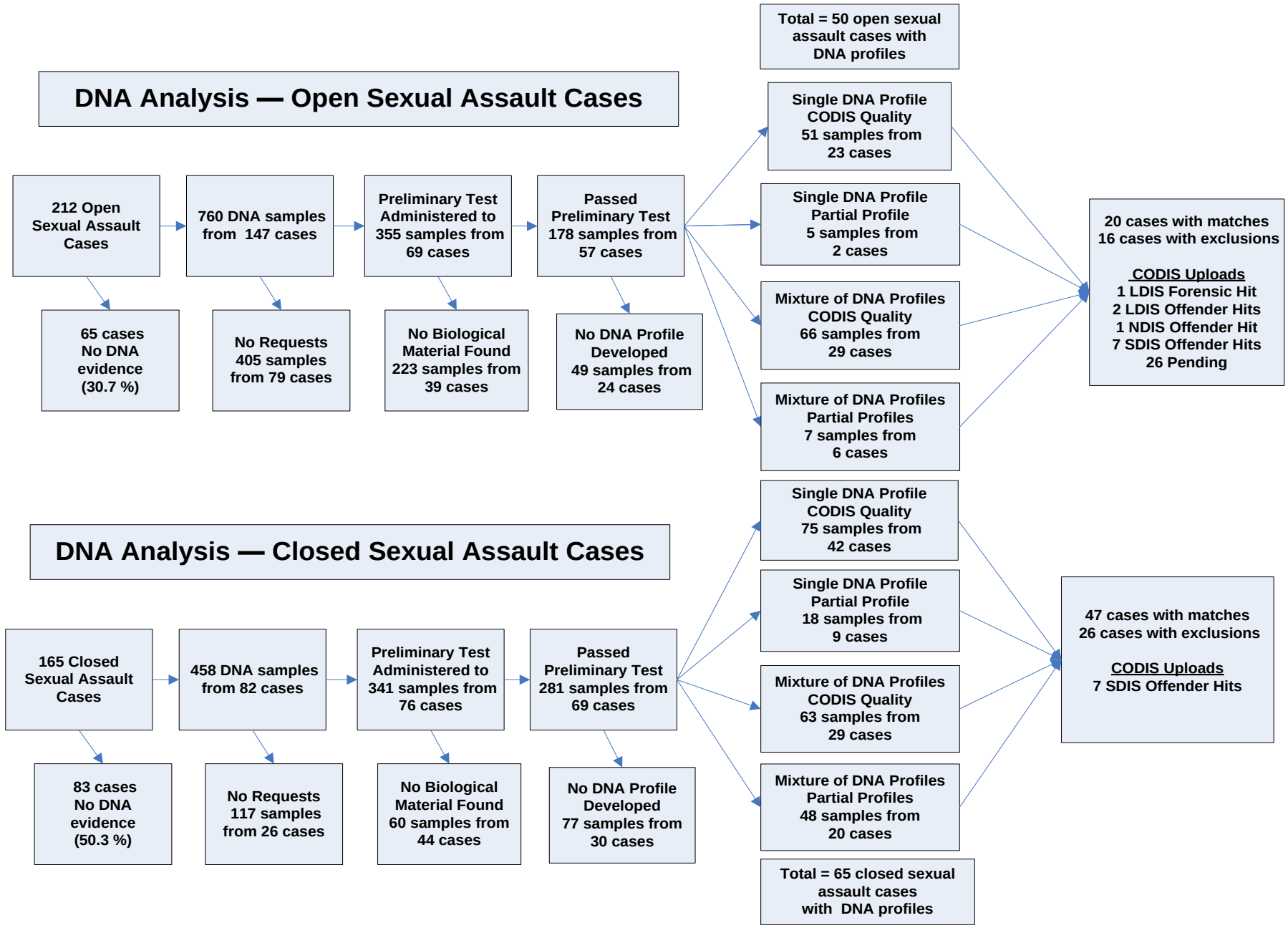


Exhibit 3- 8: DNA Analysis for Aggravated Assault Cases in San Diego

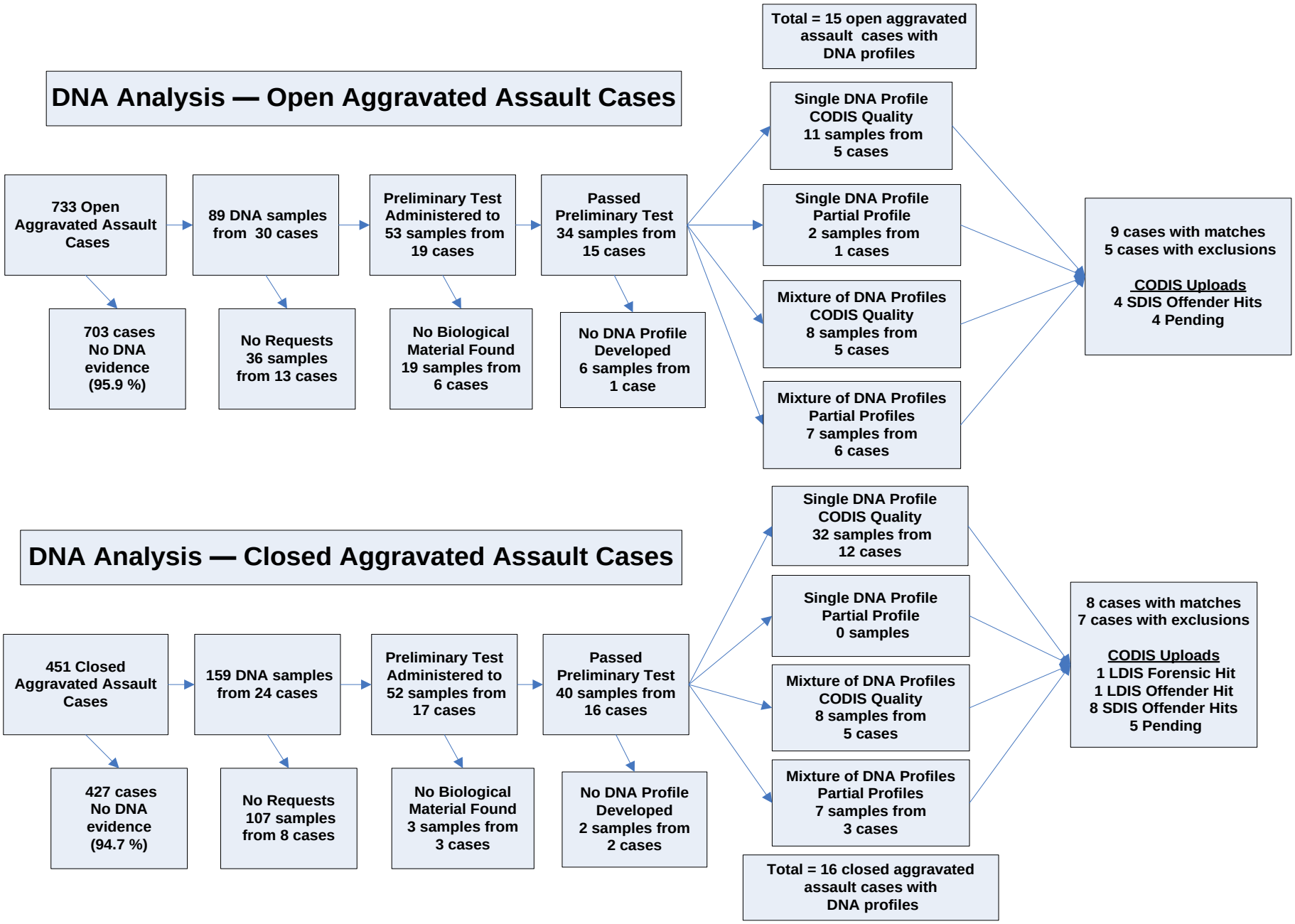


Exhibit 3- 9: DNA Analysis for Robbery Cases in San Diego

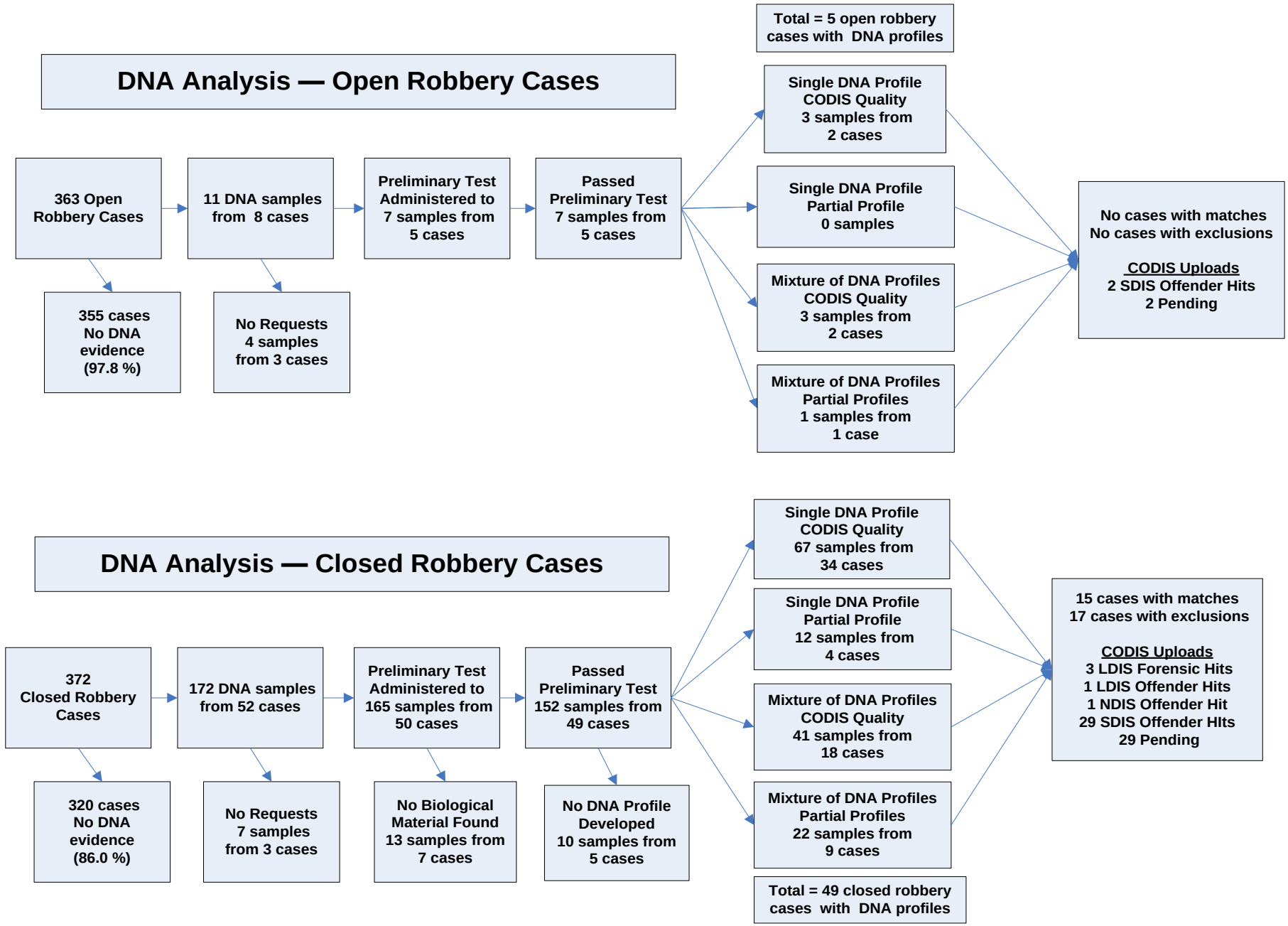
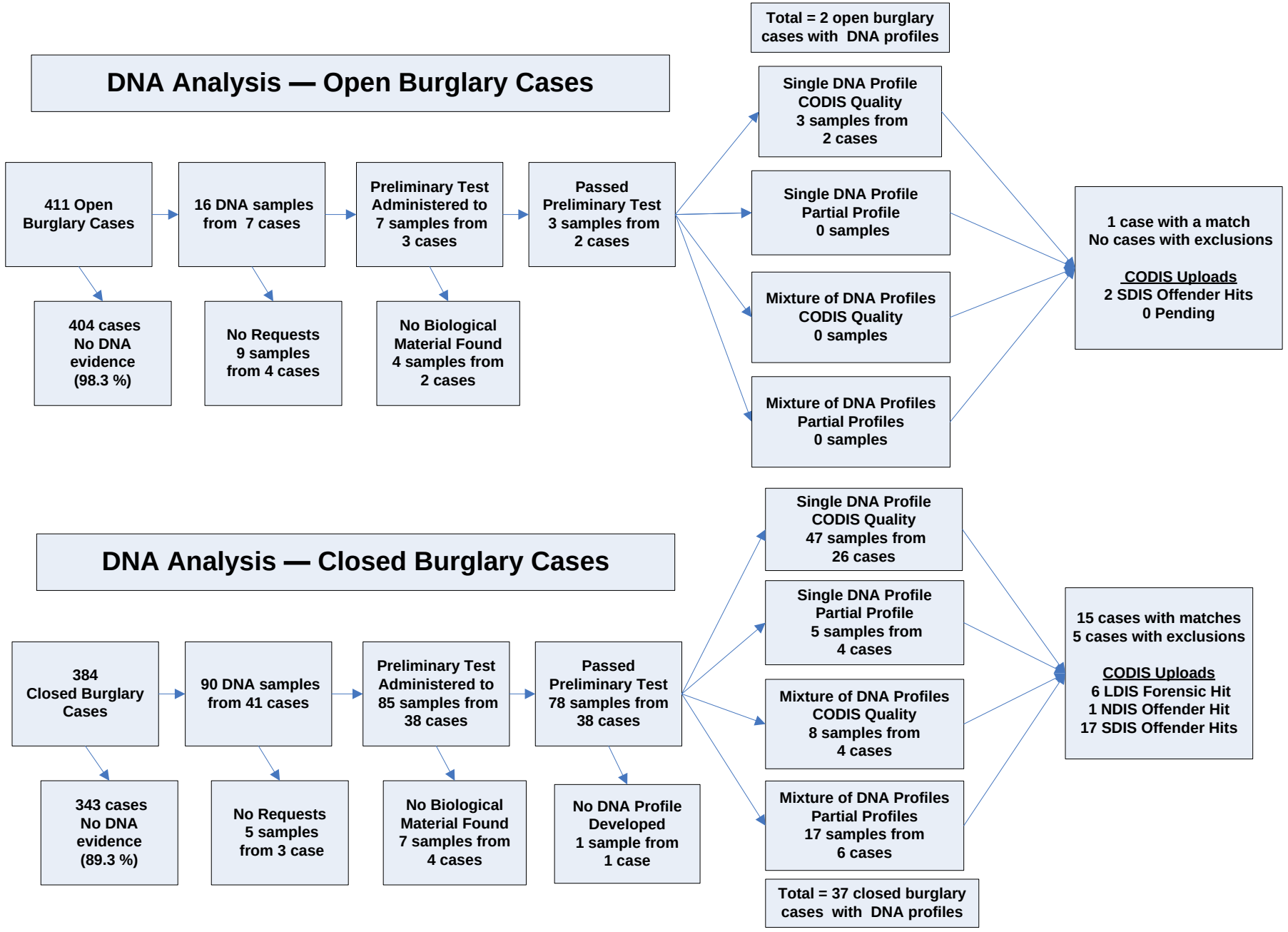


Exhibit 3- 10: DNA Analysis for Burglary Cases in San Diego



Latent Print Analysis

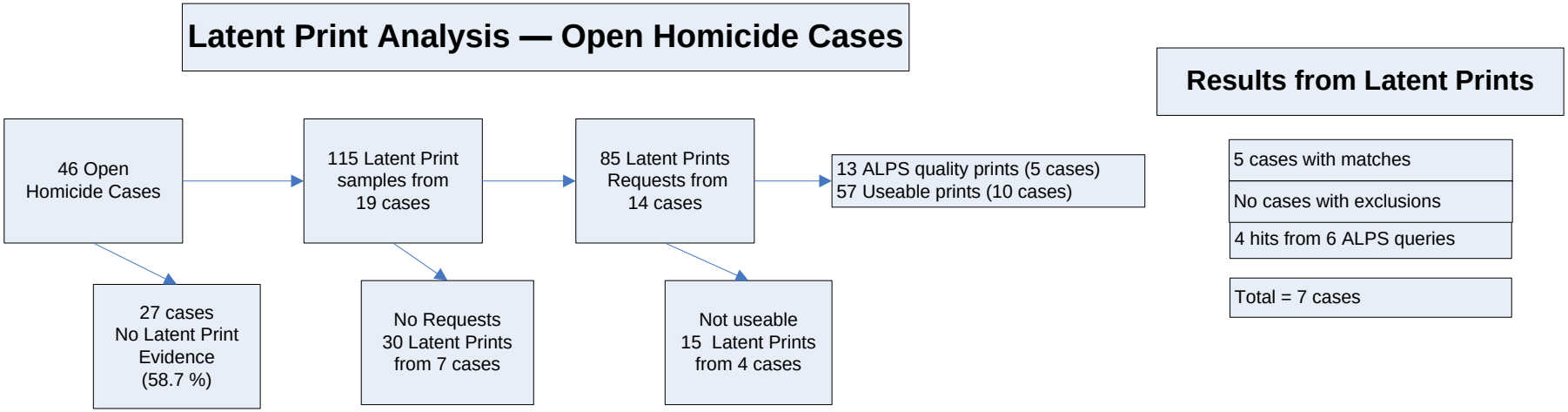
Latent print analysis can also provide important information during an investigation. They are usually obtained from the crime scene and then either compared to each other or entered into an automated fingerprint identification system, called ALPS in San Diego, for matches against known offenders. Of course, not every latent print has sufficient quality to be submitted to ALPS or compared to other latent prints. On the other hand, latent prints entered into ALPS are checked for matches as more offenders are added to the system.

ILJ's analysis of sexual assaults, assaults, and robberies showed that latent prints are collected in only a few cases. They were obtained in only three of the 377 sexual assaults, 11 of the 1,184 assaults, and 40 of the 735 robberies. The combined results for the three crime categories were matches in four cases, exclusions in three cases, and two hits from the ALPS system.

Exhibits 3-11 and 3-12 give results for homicides and burglaries. Key results from these figures are as follows:

- Latent print analysis was requested in 76.8 percent of the homicides but less than half the burglaries. For open burglaries, requests were made in 33.9 percent of cases.
- For cases with analysis, ALPS quality prints were obtained in 18.6 percent of the homicide cases and 58.3 percent of burglaries.
- Useable quality prints were found in 83.7 percent of the homicides and 29.2 percent of burglaries.
- Matches between two or more latent prints were obtained in 28.6 percent of the homicides and 7.7 percent of the burglaries.
- Exclusions were obtained in 12.5 percent of the homicides and 4.8 percent of the burglaries.
- Four ALPS hits were made in homicide cases and 30 ALPS hits in burglary cases.

Exhibit 3- 11: Latent Print Analysis for Homicide Cases in San Diego



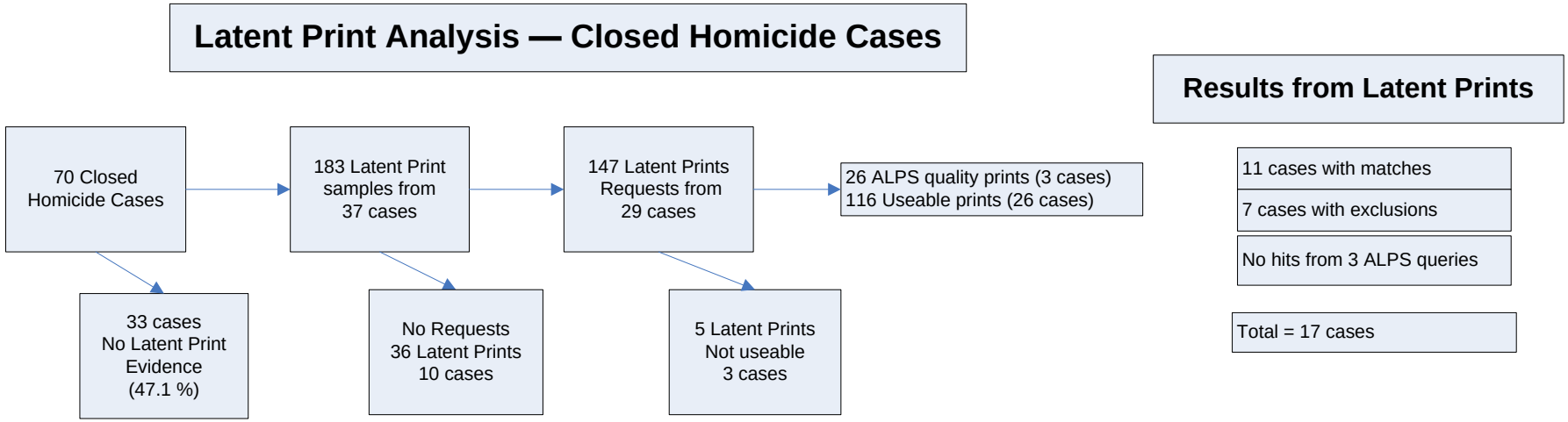
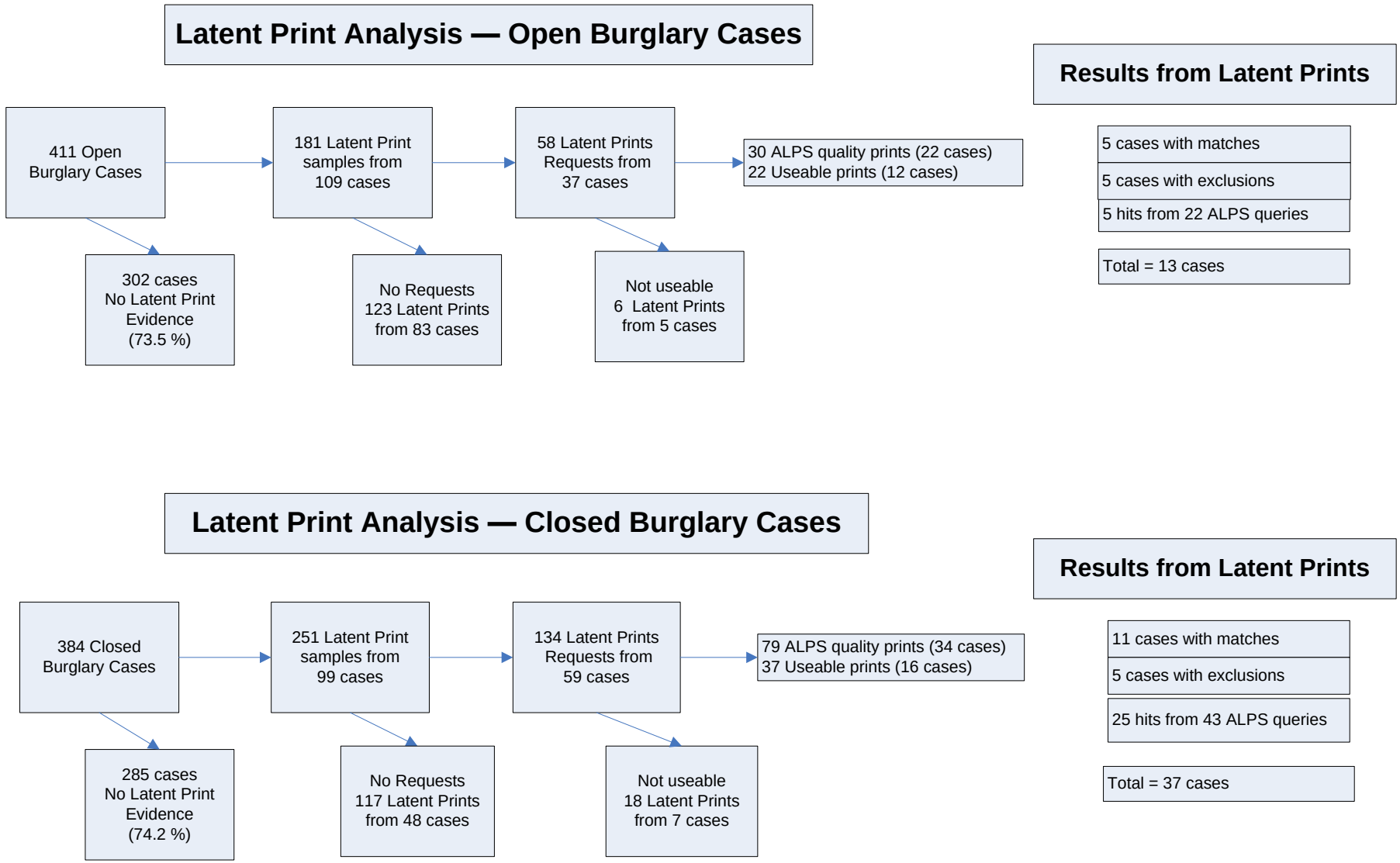


Exhibit 3- 12: Latent Print Analysis for Burglary Cases in San Diego



Analysis of Firearms Evidence

Firearms evidence includes handguns, shotguns, shell casings, bullet fragments, spent projectiles, live cartridges, magazines, and GSR kits. Exhibit 3-5 provided the frequencies with which these different types of firearms evidence appeared as evidence in the sampled offenses from San Diego. As seen in that exhibit, there is considerable variation by type of offense. Firearms evidence was collected in 79 homicide cases (68.1 percent) and 141 assault cases (11.9 percent). No firearms evidence was found in sexual assault cases, and was rarely obtained in robbery and burglary cases.

Exhibit 3-13 summarizes the analysis of firearms evidence for open and closed homicide cases. Interestingly, there is a higher percentage of firearms evidence in cases that remain open than in closed cases. Thirty-eight of the 46 open cases (82.6 percent) had firearms evidence compared to 41 of the 70 closed cases (58.6 percent). Of the 38 open cases with firearms evidence, investigators requested analysis in 23 cases. Results from these 23 cases include the following:

- GSR kits were examined in three cases with no positive results.
- The type of ammunition was identified in 10 cases.
- Matches between firearms and bullets were obtained in six cases, no matches in seven cases, and one case was inconclusive.
- There were eight cases in which two or more bullets were identified as coming from the same firearm.

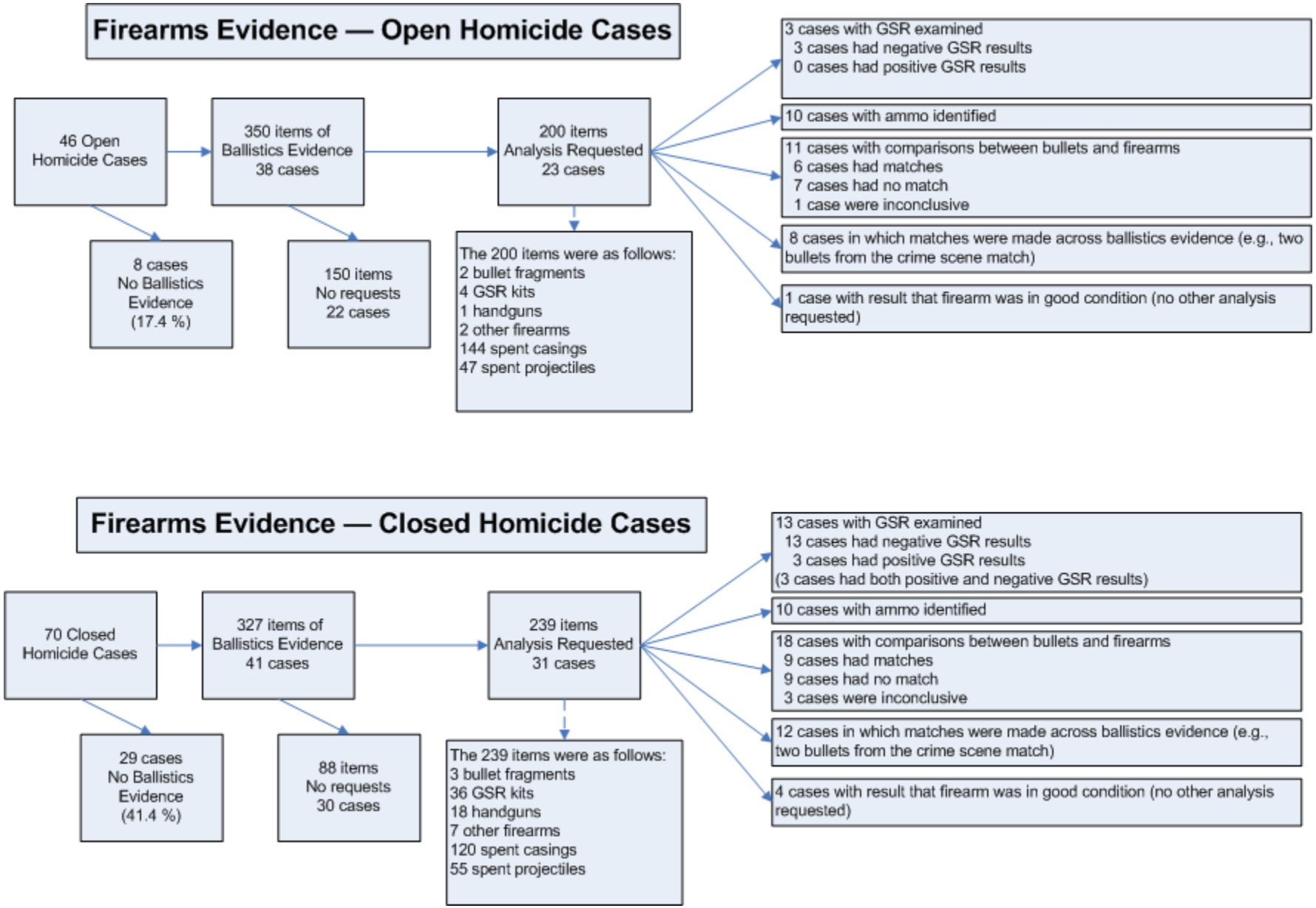
From evidence in the 41 closed cases, requests were made for analysis in 31 cases with the following results:

- GSR kits were examined in 13 cases. In three cases, at least one GSR kit tested positive and in all 13 cases, at least one GSR kit tested negative.
- The type of ammunition was identified in 10 cases.
- Matches between firearms and bullets were obtained in nine cases, no matches in nine cases, and three cases were inconclusive.
- There were 12 cases in which two or more bullets were identified as coming from the same firearm.

With assault cases, firearms evidence was collected in a total of 141 cases of which 115 cases remained open and 26 cases were closed. Even though evidence was collected, the number of requests for analysis was relatively small. We found requests for analysis in only 25 of the

open cases (21.7 percent) and four of the closed cases (15.4 percent). The reason for the lack of requests may be due to the specific type of evidence that was obtained. For example, firearms were obtained in only five open cases and in none of the closed cases. The predominant type of evidence was spent projectiles and casings in 20 open cases and three closed cases. Positive GSR tests were found in only two cases, and matches between bullets and firearms were obtained in only five cases.

Exhibit 3- 13: Firearms Analysis for Homicide Cases in San Diego



Analysis of Other Evidence

Other evidence was collected and analyzed in these cases from San Diego. For example, illegal drugs were obtained in 26 cases covering 13 homicides, three sexual assaults, one assault, two robberies, and seven burglaries. Cocaine, marijuana, and methamphetamine were the types of drugs found in these cases. Arrests were made in 21 of the 26 cases.

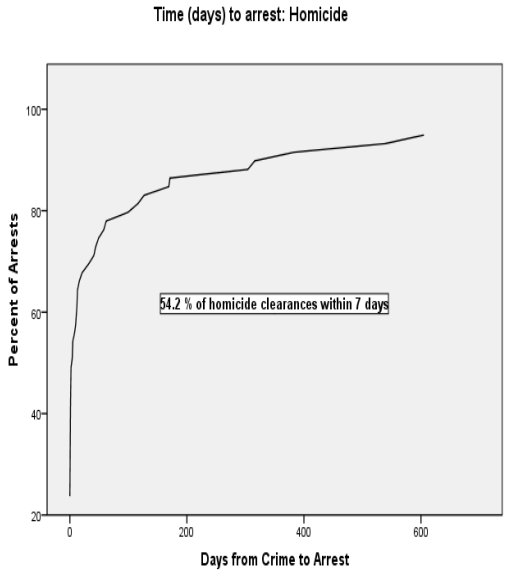
Other types of analysis included two cases with forensic analysis of computers, 11 cases with document analysis (handwriting and counterfeit documents), four cases with splatter analysis, five cases with trajectory analysis (determines the angle of a shot), and eight cases with shoeprint comparisons. Results from these various types of analysis were mixed. In seven of the cases with shoeprints, the results were that the shoeprint did not match other evidence or the comparisons were inconclusive. Similarly, the majority of the cases with document analysis resulted in inconclusive results. On the other hand, the trajectory analysis completed in five homicide cases was beneficial to the prosecution of these cases.

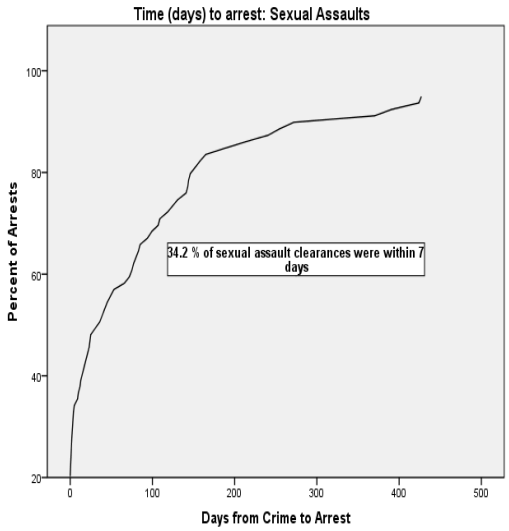
Clearances

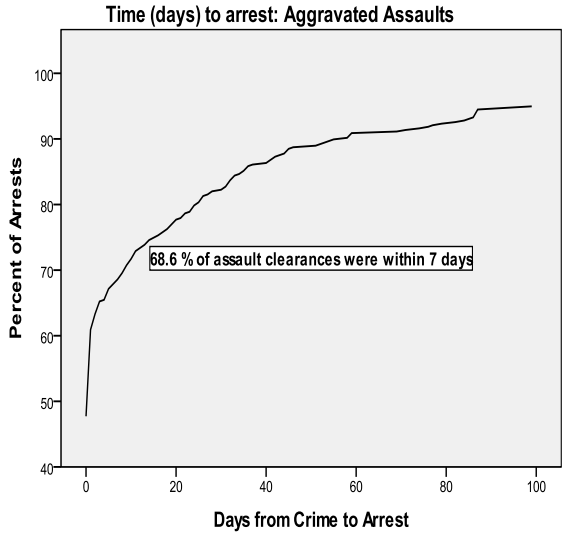
On the following page is a series of graphs summarizing the number of days between an offense and arrest, usually referred to as the time to clearance. The graph for homicides shows, for example, that 54.2 percent of the homicide arrests were made within seven days. Arrests for sexual assaults generally take longer with only 34.2 percent of arrests taking place within seven days. For the other three crime categories, the percentages for arrests within seven days are relatively high, with 68.6 percent for assaults, 75.1 percent for robberies, and 66.9 percent for burglaries.

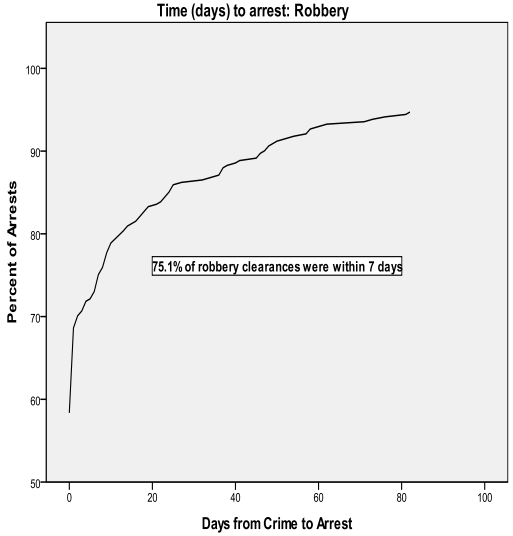
Relatively short clearance times indicate either that the suspect was quickly identified or that intense investigative activities resulted in the identification of a suspect. On the other hand, long clearance times indicate that the investigation was more difficult perhaps because many leads had to be followed and numerous interviews needed to be conducted. As discussed in the following section, there is a relationship between the timing of forensic analysis and clearance times.

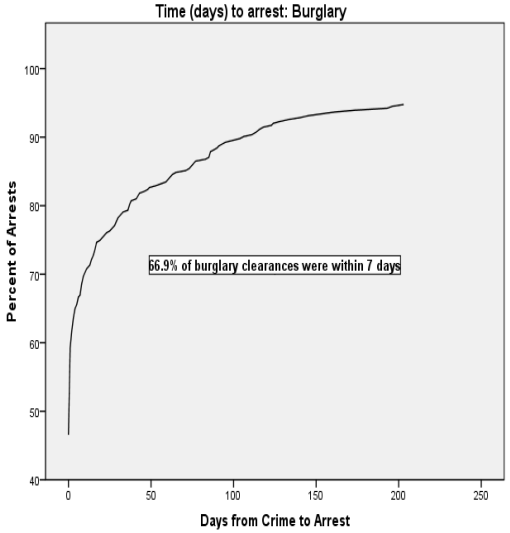
Exhibit 3- 14: Time Between Crime and Arrest in San Diego











Probative Evidence in Open and Closed Cases

As discussed in Chapter 1, an item of evidence has probative value if it establishes a fact that could be introduced at trial. Examples include latent print hits through AFIS, a match of a DNA profile from the scene with a suspect, and a match between spent projectiles and a firearm. An exclusion, such as a DNA profile from a scene that does not match a suspect, is also probative.

Exhibits 3-15 to 3-17 summarize the finding of probative evidence in open and closed cases. As an example, the first line in Exhibit 3-15 for open homicide cases shows that the crime lab found probative evidence in 30 cases, which is 83.3 percent of the 36 open cases with evidence.[12] For the other four categories, the percent of open cases with probative evidence range from 34.6 percent for burglaries to 75.0 percent for aggravated assaults. Even though these percentages are relatively high, the cases remained open by the end of data collection for this project. Several reasons can be given on why these cases were not closed—suspects could not be located, AFIS and CODIS hits had not yet occurred, and others.

For closed cases, our objective was to compare the number of forensic tests before and after arrest. The comparison was possible because the dates for the lab reports had been coded into the database and the arrest date was available in the defendant file. We could therefore determine whether a forensic test took place before or after arrest. Tests performed prior to arrest are aimed at assisting investigators in moving toward an eventual arrest, while tests after arrest assist in prosecution.

Prior to arrest, the percentages of cases with probative evidence ranged from 28.0 percent for robberies to 37.3 percent for burglaries (see Exhibit 3-16). The percentages after arrest have greater variation, ranging from 28.4 percent for burglaries to 86.3 percent for homicides.

These tables also indicate the types of evidence that are most likely to be probative. From an overall viewpoint, DNA evidence dominates in providing probative results. This was especially true with sexual assault cases. For homicides, firearms evidence was also important in

[12] The denominators for overall percentages are the number of open or closed cases with forensic evidence. Another candidate for the denominators is the total number of open or closed cases. These totals were not selected for the calculation because they would include cases in which no evidence had even been collected.

giving probative results. Latent prints were beneficial in burglary cases and in a significant number of homicides after arrest.

Exhibit 3- 15: Probative Evidence for Open Cases in San Diego

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
Open Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=36)	30	83.3	12	7	22	2	9
Sexual Assault (n=72)	33	45.8	33	0	0	0	0
Aggravated Assault (n=44)	33	75.0	11	0	24	0	0
Robbery (n=27)	11	40.7	2	7	0	0	3
Burglary (n=52)	18	34.6	2	16	0	0	0

Exhibit 3- 16: Probative Evidence Before Arrest in San Diego

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
CBA Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=51)	19	37.2	15	4	13	1	2
Sexual Assault (n=70)	24	34.3	23	0	0	1	1
Aggravated Assault (n=14)	5	35.7	4	0	1	0	0
Robbery (n=50)	14	28.0	10	1	1	0	2
Burglary (n=102)	38	37.3	12	26	0	0	1

Exhibit 3- 17: Probative Evidence After Arrest in San Diego

	Overall		Probative DNA	Probative Latent Prints	Probative Firearms	Probative Drugs	Probative Other
CBA Cases with Evidence	Number	Percent	Number	Number	Number	Number	Number
Homicide (n=51)	44	86.3	34	15	19	7	14
Sexual Assault (n=70)	26	37.1	26	0	0	0	1
Aggravated Assault (n=14)	10	71.4	7	1	3	1	1
Robbery (n=50)	19	38.0	15	4	0	0	4
Burglary (n=102)	29	28.4	13	15	0	0	1

Dispositions of Defendants

Dispositions

The purpose of this section is to summarize the dispositions of defendants and relate these dispositions to the availability of forensic evidence in the case. In Exhibit 3-18 on homicides, it can be seen that 111 of the 116 homicide cases had some type of evidence collected during the case. Of the 111 cases with evidence, there were 70 closed cases for a closure rate of 63.1 percent. Within these defendants are three murder/suicides and two defendants deemed incompetent to stand trial.

Filings with the prosecutor's office were made for 87 defendants and complete dispositions were available for 74 defendants by the end of ILJ's data collection period (13 defendants had not been completely adjudicated). Dismissals were made on only two of the 74 defendants. Four defendants were found not guilty at trial and 22 were found guilty at trial. A total of 17 defendants pled guilty to homicide charges initially filed by the prosecutor and 29 defendants pled guilty to reduced charges (primarily voluntary manslaughter). In total, guilty dispositions accounted for 68 of the 74 defendants (91.9 percent). The exhibit also shows that probative evidence was obtained for 61 of the 68 guilty defendants (89.7 percent).

Exhibit 3-19 provides the results for sexual assault cases. Of the 377 cases, 263 cases had forensic evidence and 86 of these cases were closed (32.7 percent closure rate). In total, prosecutors filed on 43 defendants, with 37 guilty verdicts. The 114 sexual assault cases without evidence include 71 cases that were exceptionally closed. These were cases in which there was no evidence and the victim did not want to prosecute. Consequently, the offender, while known to the police, was either not arrested or the arrest was not carried forward to the district attorney for prosecution.

Comparing the closure rates for cases with and without evidence gives strong credence to the value of evidence in sexual assault cases. Cases with evidence had a closed by arrest rate of 32.7 percent compared to 7.0 percent for cases without evidence. Therefore, the odds of closure by arrest for cases with evidence are about 4.7 times the odds of closure without evidence.

Results for the other three categories have been weighted in order to provide better comparisons of cases with and without evidence. In Exhibit 3-20, the weighted results show a

clearance rate of 61.9 percent for the 454 cases with evidence. For the 2,014 cases without evidence, the clearance rate is 58.8 percent.[13] Even though the clearances rates are close, there is a statistically significant difference between the rates for cases with evidence as compared to cases without evidence.

For the 159 filings of defendants in cases with forensic evidence, only six were dismissed and only one was found not guilty at trial. A total of 103 defendants pled guilty as charged, 43 pled guilty to a reduced charge, and 6 were found guilty at trial. The amount of probative evidence was minimal in these cases with only nine cases having such evidence.

Exhibits 3-21 and 3-22 show results for robberies and burglaries. The total numbers of cases and clearance statistics have been weighted in the same way as for assaults. A total of 1,878 robberies and 7,462 burglaries are included in the exhibits. For robberies, we have 503 cases with evidence and a closure rate of 48.9 percent, compared to a total of 1,375 cases without evidence and a closure rate of 27.5 percent. Therefore, the rate of closure for robberies with evidence is 1.8 times the closure rate for robberies without evidence. For burglaries, there are 2,185 cases with evidence and a closure rate of 21.8 percent, compared to 2,577 cases without evidence and a closure rate of 10.0 percent. The rate of closure for cases with evidence is therefore about 2.2 times that of the closure rate for cases without evidence.[14]

The bottom portions of these two exhibits provide information on the disposition of defendants from our sampled cases. For robberies, we have dispositions for 258 defendants in cases with evidence and 224 defendants in cases without evidence. Of the 258 defendants, there were 19 "John Doe" cases and 39 cases not filed with the district attorney's office. For the 200 filings, 91.4 percent resulted in guilty dispositions. It is also noted that 23.3 percent of those with guilty verdicts had probative evidence (42 out of 180 cases). For defendants without evidence, there were 224 defendants of which 44 cases were dismissed. In total, 91.1 percent of the defendants resulted in a guilty disposition—a result virtually identical to defendants in cases with evidence.

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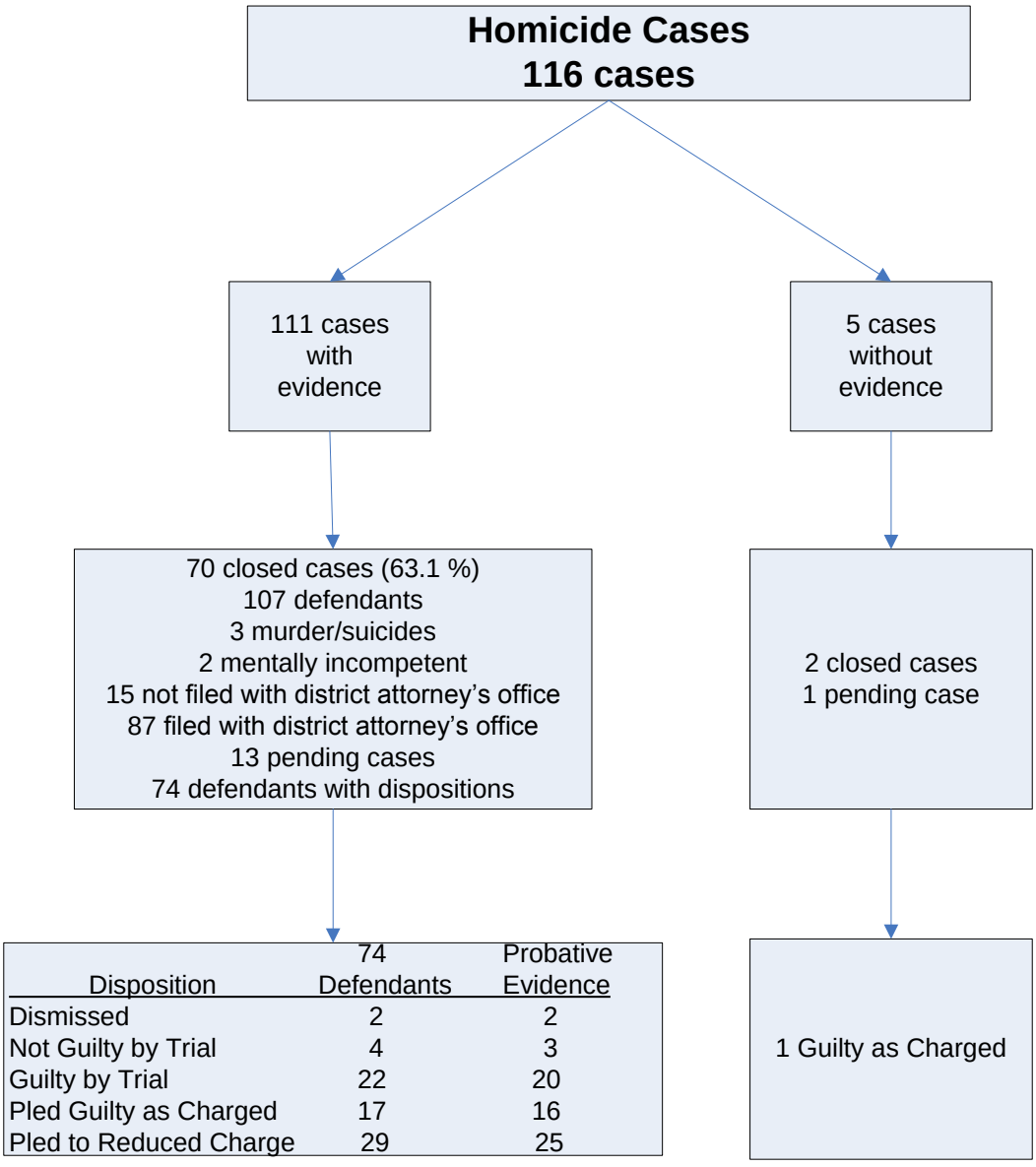
[13] The department's officially published clearance rate was 59.8 percent for aggravated assaults during 2005, which is very close to the rate of 59.4 percent obtained in this study.

[14] The officially published clearances rate were 34.1 percent for robberies and 13.7 percent for burglaries. Both rates are very close to the figures obtained in this study.

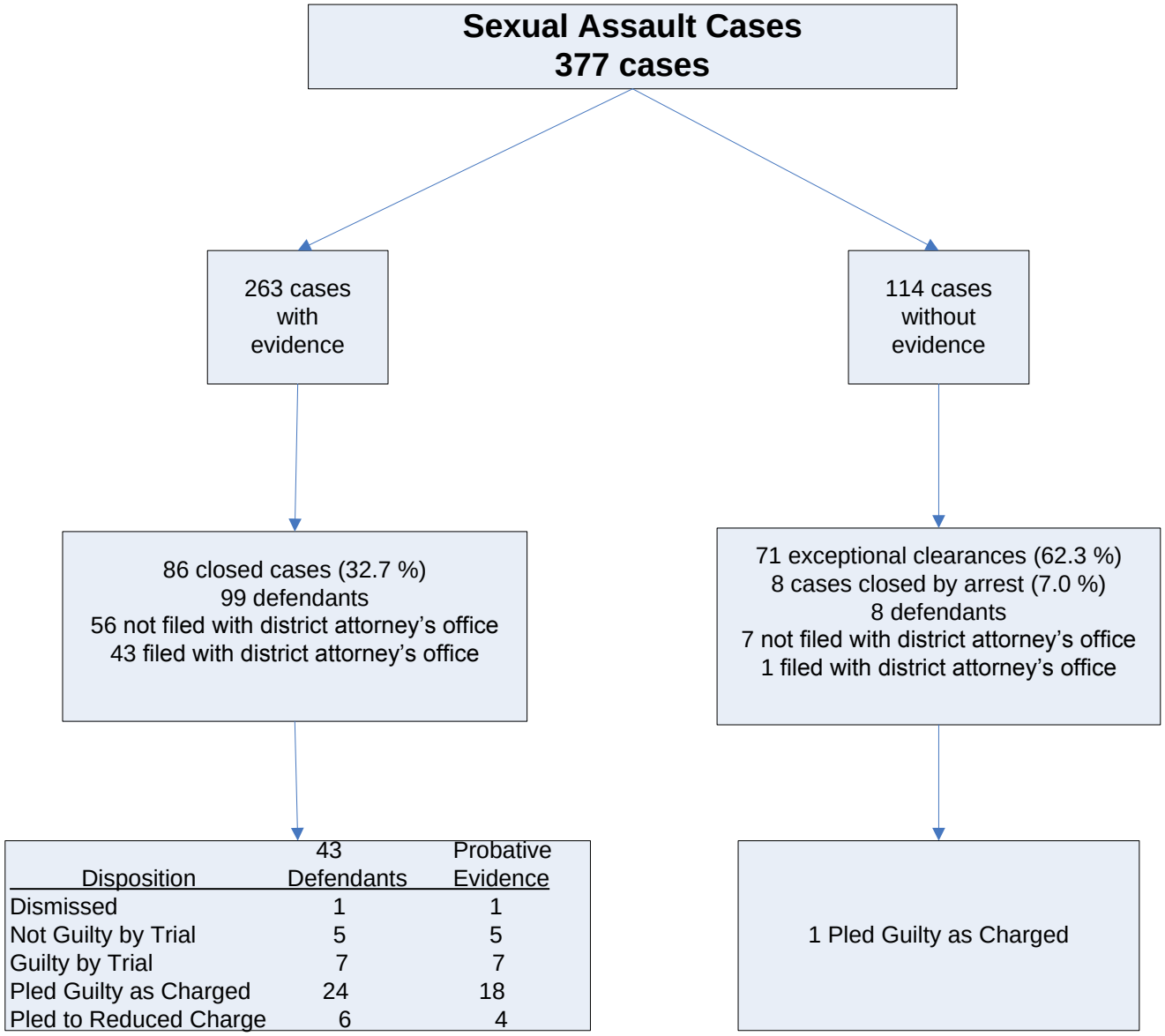
A similar picture emerges with defendants accused of burglaries. For burglaries with evidence, there were 330 defendants in our sample. Of that total, there were 15 "John Doe" cases and 52 cases not filed. For the 258 defendants with dispositions, 92.2 percent of the dispositions had guilty verdicts. A total of 73 of these cases had probative evidence (30.7 percent). For the 127 defendants in cases without evidence, 26 cases were not filed with the district attorney's office. For the 99 defendants with dispositions, 82.8 percent of the defendants had guilty verdicts.

Exhibit 3- 18: Case Dispositions for Homicides in San Diego



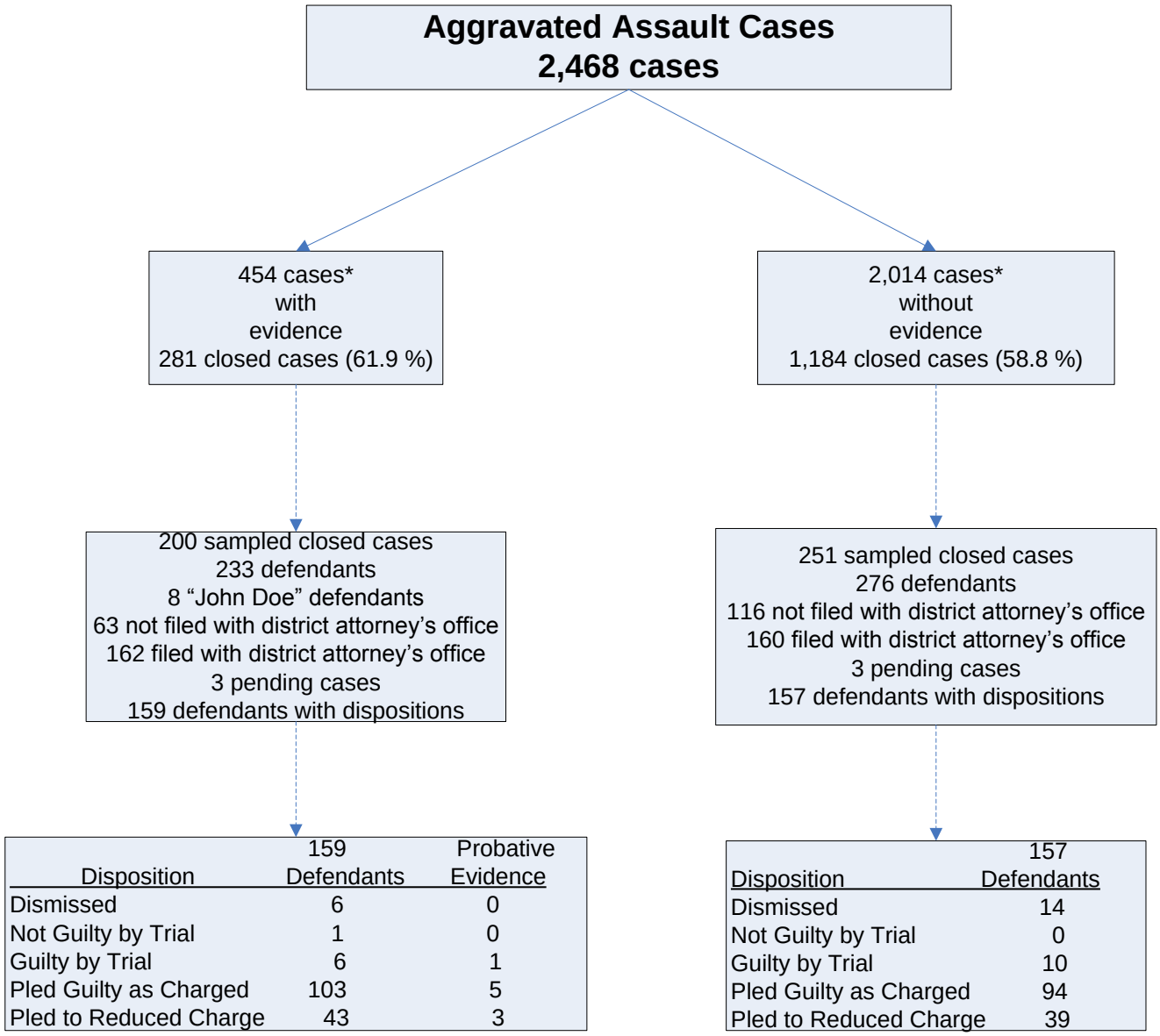
Disposition	74 Defendants	Probative Evidence
Dismissed	2	2
Not Guilty by Trial	4	3
Guilty by Trial	22	20
Pled Guilty as Charged	17	16
Pled to Reduced Charge	29	25

Exhibit 3- 19: Case Dispositions for Sexual Assaults in San Diego



Disposition	43 Defendants	Probative Evidence
Dismissed	1	1
Not Guilty by Trial	5	5
Guilty by Trial	7	7
Pled Guilty as Charged	24	18
Pled to Reduced Charge	6	4

Exhibit 3- 20: Case Dispositions for Aggravated Assaults in San Diego

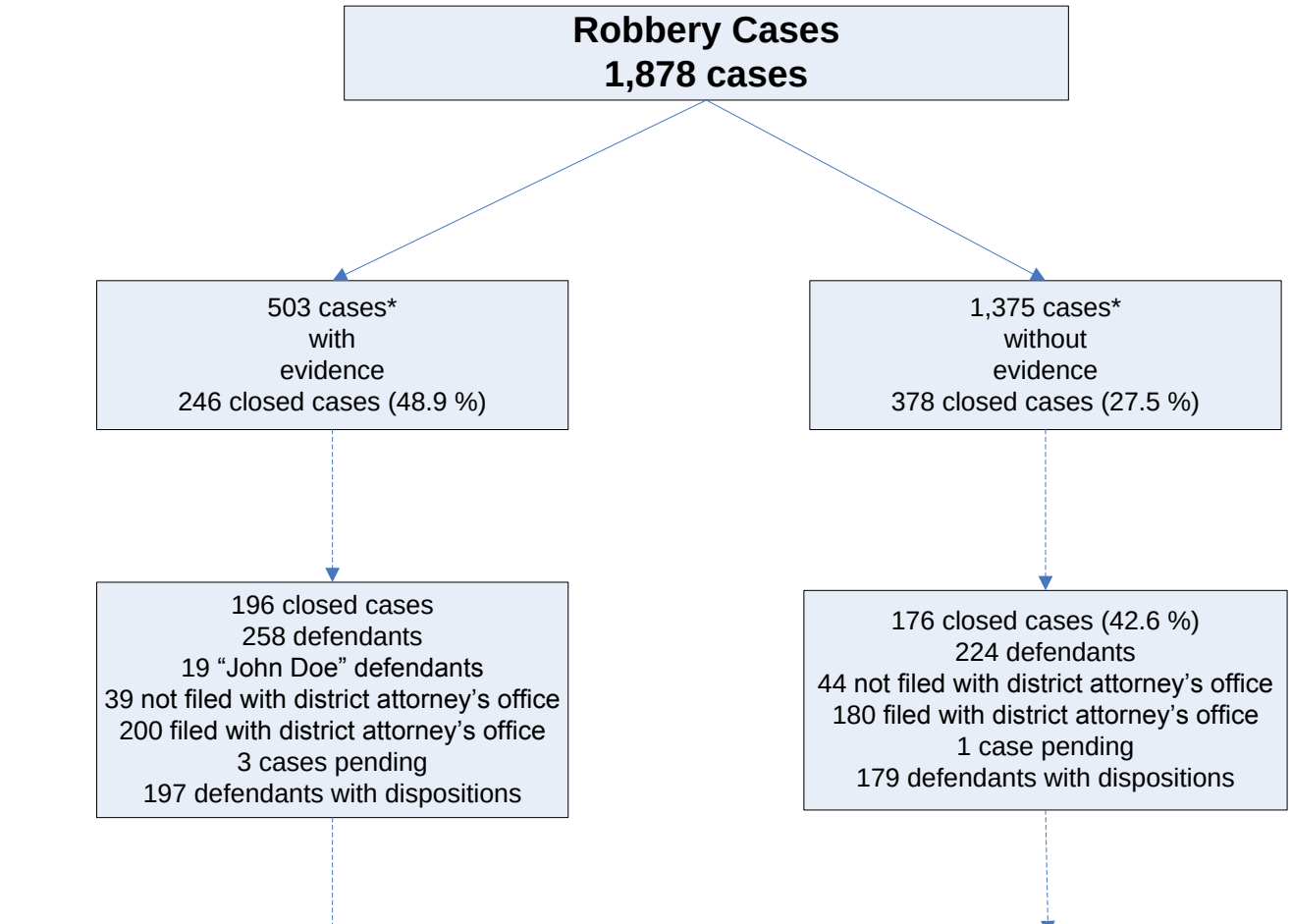


Disposition	159 Defendants	Probative Evidence
Dismissed	6	0
Not Guilty by Trial	1	0
Guilty by Trial	6	1
Pled Guilty as Charged	103	5
Pled to Reduced Charge	43	3

Disposition	157 Defendants
Dismissed	14
Not Guilty by Trial	0
Guilty by Trial	10
Pled Guilty as Charged	94
Pled to Reduced Charge	39

* Entries in these boxes are weighted values.

Exhibit 3- 21: Case Dispositions for Robberies in San Diego

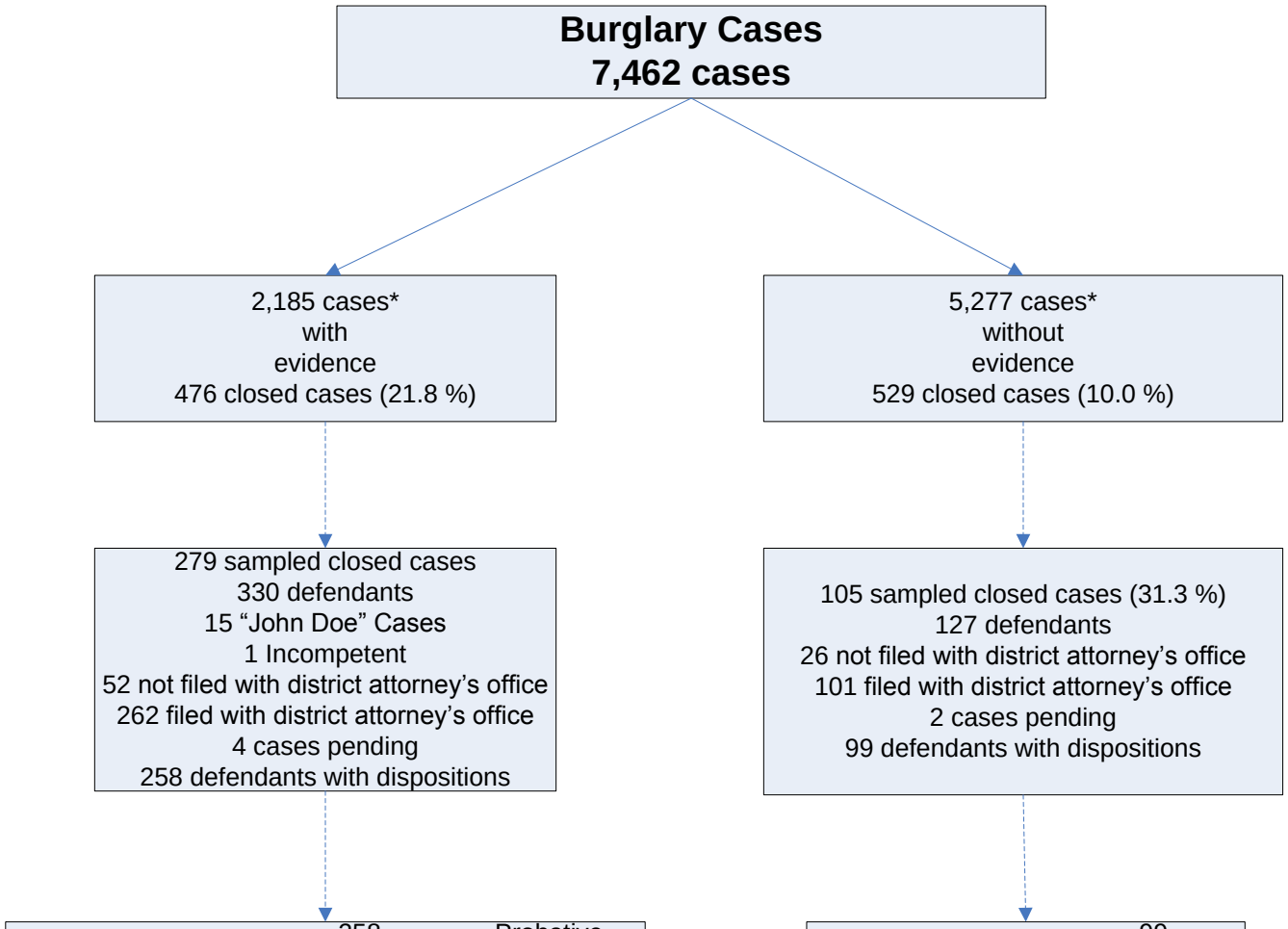


Disposition	197 Defendants	Probative Evidence
Dismissed	17	6
Not Guilty by Trial	0	0
Guilty by Trial	15	9
Pled Guilty as Charged	141	30
Pled to Reduced Charge	24	3

Disposition	179 Defendants
Dismissed	15
Not Guilty by Trial	1
Guilty by Trial	6
Pled Guilty as Charged	139
Pled to Reduced Charge	18

* Entries in these boxes are weighted values.

Exhibit 3- 22: Case Dispositions for Burglaries in San Diego



Disposition	258 Defendants	Probative Evidence
Dismissed	20	6
Not Guilty by Trial	0	0
Guilty by Trial	7	3
Pled Guilty as Charged	197	62
Pled to Reduced Charge	34	8

Disposition	99 Defendants
Dismissed	17
Not Guilty by Trial	0
Guilty by Trial	1
Pled Guilty as Charged	65
Pled to Reduced Charge	16

* Entries in these boxes are weighted values.

Sentences

Our final analysis was on whether there were indications that evidence had an influence on the sentences received by defendants. Our database includes 14 homicide defendants who received life sentences (life without parole). All but one of these cases had probative evidence. Five of the 14 defendants pled guilty and nine defendants were found guilty at trial.

Exhibit 3-23 summarizes the sentences imposed on guilty defendants other than those who received life sentences. The exhibit combines defendants who were found guilty at trial, pled guilty to filed charges, or pled guilty to reduced charges. The clear indication is that defendants generally receive longer sentences when there is probative evidence in the case. For example, with homicide defendants who did not receive life sentences, the average prison terms imposed was 15.5 years for cases without probative evidence and 23.9 years for those with probative evidence, a difference of over eight years. With sexual assault cases, the difference is more pronounced. Defendants in cases without probative evidence received sentences of 3.3 years on average, compared to 17.0 years for those with probative evidence.

Exhibit 3- 23: Prison Sentences for Guilty Defendants in San Diego

Offense	No Probative Evidence	Probative Evidence
Homicide	15.5	23.9
Sexual Assaults	3.3	17.0
Aggravated Assault	5.3	4.8
Robbery	5.7	13.0
Burglary	5.1	6.1

NOTE: Figures are number of years in the sentence.

With aggravated assaults, this trend in favor of probative evidence does not continue. The imposed sentences are 5.3 years for those without probative evidence and 4.8 years for those with probative evidence. However, with robbery and burglary, probative evidence does appear to be important. For robbery, the average sentence imposed was 5.7 years for those without probative evidence and 13.0 years for those with probative evidence. With burglary, the averages are 5.1 years and 6.1 years, respectively.

Of course, the existence of probative evidence is not directly linked to the sentences imposed on guilty defendants. What appears to happen with these cases is that with probative evidence, prosecutors may be more likely to move forward with the most severe charges possible and ask for the longest sentences. Probative evidence provides a stronger basis for prosecutorial actions.

Conclusions

In San Diego, we collected data on 3,207 offenses through a combination of a complete census of homicides and sexual assaults in selected years and a stratified random sample of aggravated assaults, robberies, and burglaries. From the analysis, we were able to make several conclusions on the collection and use of forensic evidence. With regard to evidence collection, forensic evidence was collected in almost all the homicide cases in San Diego, and for the other four crimes, the percentages were 69.8 percent for sexual assaults, 18.4 percent for aggravated assaults, 26.8 percent for robberies, and 29.3 percent for burglaries. These latter three categories are higher than found in Denver but still relatively low in comparison to the number of offenses. The differences are probably due to differences in investigative procedures and the availability of personnel for evidence collection.

Investigators in San Diego made requests for DNA analysis in the majority of cases with DNA evidence, ranging from requests for analysis in 63.3 percent of the sexual assaults to 91.7 percent of the sampled robberies. The crime lab obtained DNA profiles in more than 80 percent of cases with requests.

Our analysis in San Diego showed that latent prints were obtained in very few sexual assaults, aggravated assaults, and robberies. They were obtained in a total of 54 cases in these categories, and the combined results were matches in four cases, exclusions in three cases, and

two hits from the ALPS system. For homicides, requests were made in 76.8 percent of the cases and for burglaries, in 46.1 percent of cases. For homicides, the analysis resulted in 16 cases with matches, seven cases with exclusions, and four hits from the ALPS system. The results for burglaries were 16 cases with matches, 10 cases with exclusions, and 30 hits from the ALPS system.

As with latent prints, our analysis showed that firearms evidence was rarely collected in robbery and burglary cases, and no firearms evidence was obtained in sexual assault cases. With assault cases, firearms evidence was collected in a total of 141 sampled cases, but requests were made in only 25 of these cases. The predominant type of evidence was spent projectiles and cases. Positive GSR tests were found in only two cases, and matches between bullets and firearms in five cases.

With homicides, firearms evidence was obtained in about two-thirds of the cases. Results from the analysis the firearms evidence was substantial:

- 16 cases with negative GSR results and three cases with positive results.
- 20 cases with ammo identified
- 15 cases with matches between bullets and firearms, 16 cases with no matches, and four inconclusive results
- 20 cases with matches across ballistics evidence (e.g., two bullets from the crime scene matched)

We also determined the number of cases in our sample having forensic evidence of probative value. For open cases with evidence, the percentage of cases with probative value ranged from 34.6 percent for burglaries to 83.3 percent for homicides. For homicides and aggravated assaults, the probative evidence came primarily from DNA and firearms evidence. For sexual assaults, DNA evidence was the main source, and for robberies and burglaries, latent prints provided probative evidence. As in Denver, the fact that these cases remained open indicates that evidence of probative value does not always lead to arrests.

For closed homicides, our analysis showed that 37.2 percent had probative evidence prior to arrest and 86.3 percent after arrest. Sexual assaults had about the same percentage both before and after arrest, while there was a larger difference for aggravated assaults from 35.7 percent with probative evidence before arrest and 71.4 percent after arrest (although the number of cases

is low). With robberies with percentages are 28.0 percent before arrest and 38.0 after arrest, and for burglaries, the figures are 37.3 percent before arrest and 28.4 percent after arrest.

The case dispositions were determined for the cases in San Diego with an emphasis on the odds of closing cases with evidence and the number of guilty dispositions with probative evidence. For sexual assault cases, the odds of closure by arrest for cases with evidence were about 4.7 times the odds of closure for cases without evidence. For aggravated assaults, the odds were about even since 61.9 percent of the cases with evidence were closed and 58.8 percent of the cases without evidence were closed. For robberies, the rate of closure with evidence was 1.8 times the rate of closure without evidence, and for burglaries the odds are 2.2 favoring cases with evidence.

For defendant filings in cases with evidence, guilty dispositions were obtained in 91.9 percent of homicide cases and 86.0 percent of sexual assault cases. Comparisons cannot be made against cases without evidence because there is only one homicide case and one sexual assault case in this category. For aggravated assault and robbery cases, guilty dispositions were obtained in over 90 percent of the cases regardless of whether evidence was in the case. For burglaries, 92.2 percent of the cases with evidence had guilty dispositions compared to 82.8 percent of the cases without dispositions.

Finally, the data on sentences indicates that, with the exception of aggravated assaults, probative evidence is associated with increased sentence lengths. The result is especially true for sexual assaults where the average sentence of defendants with probative evidence was 17.0 years, compared to 3.3 years for those without probative evidence. As we have indicated, this result needs to be approached with caution because the existence of probative evidence is not directly linked to sentences imposed on guilty defendants. Instead, prosecutors may be more likely to move forward with the most severe charges possible and ask for longer sentences when probative evidence is involved in the case. Probative evidence supports the stronger basis for prosecutorial actions.

Chapter 4

Improving Clearance Rates for Property Crimes Through Faster Processing of DNA Evidence

Background

This chapter provides the results of an experiment in the Miami-Dade Police Department (MDPD) to determine whether clearance rates for no-suspect property crimes could be improved through faster processing of DNA evidence. No-suspect property crimes are primarily burglaries and robberies for which no arrests have been made. The burglaries may be either residential or commercial, with the common feature that there are no witnesses to the offense. In fact, many of the burglaries occurred when no one was in the premise at the time of the offense. With robberies, the victim may be unable to describe the offender or can give only a general description. By their nature, no-suspect property crimes are difficult to solve due to the lack of witnesses and no immediate identification of suspects.

At some scenes, however, the offender may leave biological evidence that could be analyzed to develop a DNA profile. For example, a crime scene investigator may find blood on a broken window through which the offender entered the premise. The crime scene investigator can then collect the evidence and submit it to the lab for analysis. A successful scenario is that the lab develops a DNA profile, enters the profile into CODIS, and obtains a hit on a known offender. The information is then forwarded to an investigator for follow-up activities that lead to the arrest of the perpetrator.

As implied by this scenario, success depends on the availability of forensic analysts in a crime lab for analyzing DNA evidence from property crimes. It is frequently the case, however, that the forensic analysts are fully occupied with evidence from more serious crimes, such as sexual assaults and homicides, leaving no time for evidence from routine property crimes. The MDPD's crime lab had encountered this situation for many years; while they continued to collect and store biological evidence from property crimes, they did not have time for analysis.

To overcome this problem, the crime lab had received grants from the National Institute of Justice to outsource the development of DNA profiles to a private laboratory. While the outsourcing was successful in reducing the backlog and developing profiles, the department's

experience was that the process took a considerable amount of time. Problems encountered during these grants centered on the amount of time required to prepare the evidence for submission to the private lab, the turnaround time for analysis by the lab, and the time required by the crime lab to check the results from the private lab. In the experiment described in this chapter, the processing of DNA evidence from no-suspect property crimes continued to be outsourced, but steps were taken to reduce the processing time.

The overarching objective was to identify and arrest the offenders in these cases, and it was conjectured that decreasing the time to analyze DNA evidence would result in more arrests for these offenses. With longer processing times, the likelihood is greater than offenders are more difficult to locate and that victims no longer want to press charges.

Crime Laboratory Bureau, Miami-Dade Police Department

The Crime Laboratory Bureau within the Miami-Dade Police Department is a full-service lab providing scientific and technical support to the department and to the law enforcement agencies in 35 incorporated municipalities in the county including the cities of Miami and Miami Beach. The bureau, which employs over 60 forensic analysts and support staff, is organized into three major sections: Analytical, Forensic Biology, and Forensic Identification. The Analytical Section is primarily responsible for analyzing and identifying illicit, controlled, and legend drug materials confiscated by local law enforcement officers and federal agents operating within the county.[15] The Forensic Identification Section has three units. The Central Evidence Reception Facility is responsible for the intake, tracking, and safekeeping of all evidence that enters the lab (approximately 25,000 cases per year). The Firearms Testing Unit is responsible for test firing and computer entry of all routine auto-loading firearms impounded into the lab. The Firearm and Toolmark Unit analyzes various firearms and firearm evidence in order to identify which firearms were involved in a shooting.

The Forensic Biology Section of the lab examines biological materials collected at crime scenes in the county. Over the last few years, the section has grown from 12 full-time scientists to 21 scientists with responsibilities for identifying different types of biological evidence and conducting DNA analysis. The section processes evidence from over 2,500 cases each year.

[15] Legend drugs are those substances that, according to State and Federal Law, require a prescription.

Design of Experiment

Fast Track Cases

In September 2006, the Commander of the MDPD's Crime Laboratory Bureau approached representatives of NIJ about their interest in supporting a project on reducing processing time for development of DNA profiles from evidence collected in no-suspect property crimes. The objectives of the experiment were to determine whether processing times could be reduced and whether the reductions would, in fact, lead to increased clearances for the offenses.

The discussions between the crime lab commander and NIJ representatives were fortuitous because of a separate grant that NIJ had awarded to the Marshall University Forensic Science Center (MUFSC) in Huntington, West Virginia. The MUFSC had received funding to participate as a partner laboratory in the Forensic Resource Network, which offers assistance to public crime laboratories for testing new approaches to criminal investigations. After a series of meetings, the MUFSC and the MDPD agreed to a Memorandum of Understanding in which the MUFSC offered to process samples and develop DNA profiles at no cost to the MDPD. Moreover, they developed procedures to significantly reduce the overall time for processing DNA evidence.

In February 2007, the crime lab began submitting samples to MUFSC on a monthly basis from recent no-suspect property crimes. For example, the samples sent in February 2007 were from offenses committed in January 2007. Similarly, samples sent in March 2007 were from offenses committed in February 2007, and this cycle continued through July 2008. MUFSC gave priority to these samples, usually providing the results back to the crime lab in four to five weeks. Cases submitted under this arrangement were called "Fast Track" cases for the purposes of the experiment. As of the cutoff date for this report, the lab had submitted 602 samples from Fast Track cases that occurred between January 2007 and June 2008.

Comparison Cases

Based on this arrangement, ILJ was requested to conduct an analysis of these cases as part of this project on the use of forensic evidence. Results are presented later in this chapter and are based on comparisons with two other sets of no-suspect property offenses for which DNA evidence had been analyzed. The first comparison set, known as the "Bode cases," are from an NIJ grant awarded to the MDPD in 2003 for reducing the backlog of DNA evidence that had

accumulated from property crimes. Under this grant, the crime lab contracted with Bode Technology Group, Inc., in Springfield, Virginia, to analyze DNA evidence from 582 property crimes. Outsourcing to a private lab was a welcome relief because the workloads of forensic analysts in the crime lab had not allowed time for developing DNA profiles from these samples. Offenses in the Bode sample occurred over a 13-month period from January 2005 through January 2006. Forensic analysts at the Bode Technology Group, Inc. analyzed the biological evidence from these 582 cases and sent results back to the crime lab on a regular basis. Crime lab personnel reviewed the results and submitted qualifying DNA profiles to CODIS.

The grant that provided services by the Bode Technology Group, Inc. ended in mid-2006. At that time, the crime lab still had heavy workload demands from violent crimes and was unable to analyze DNA evidence from routine property offenses. Nevertheless, they continued to store DNA evidence from these crime scenes in anticipation that they could develop profiles at a later date. A provision of the Memorandum of Understanding with MUFSC provided the opportunity for analysis of the accumulated evidence. Under the agreement, the crime lab provided DNA evidence to the MUFSC in January 2007 from 237 no-suspect property crimes that occurred between January and July 2006. Due to the age of these cases, the agreement was that the MUFSC would process the samples whenever forensic analysts in their lab had available time. For the analysis in this chapter, we refer to these as the "Slow Track" cases to distinguish them from the Bode and Fast Track samples.

In summary, this chapter provides an analysis on the outcomes from three sets of no-suspect property crimes:

- Bode cases: 582 property crimes from January 2005 – January 2006.
- Slow Track cases: 237 property crimes from January – July 2006.
- Fast Track cases: 602 property crimes from January 2007 – July 2008.

The Fast Track cases are the primary focus because the objective was to analyze the DNA evidence from these cases as quickly as possible. Of course, the overarching objective was to solve cases, and the expectation was for a higher clearance rate from the Fast Track cases than from the Bode and Slow Track cases.

Sources of DNA Profiles

Analysis of the sources for DNA evidence provides additional background on its role in no-suspect property crimes. Exhibit 4-1 is a summary indicating the sources for the three sets of cases. Swabs of biological material from the scene are the most common source with about one-third of samples obtained in this manner, followed by clothing (18.9 percent), tools (12.4 percent), and bottles and cans (10.4 percent).

Exhibit 4-2 shows the likelihood that a DNA profile is actually obtained from the evidence collected at the scenes. A useable DNA profile may not be obtained because the evidence is not biological material as initially believed, there is insufficient biological material for development of a profile, a mixture of DNA profiles is obtained that cannot be entered into CODIS, and other reasons. For the samples collected in this experiment, the two most likely sources to produce DNA profiles are swabs and cigarettes/cigars. In total, 95.0 percent of the swabs and 81.1 percent of the cigarettes/cigars provided useable DNA profiles. At the other extreme, only 15.3 percent of samples from tools and 30.3 percent of the swabs from doors, windows, cars provided useable DNA samples. Overall, the percent of cases with DNA profiles was 58.8 percent for the Bode samples, 51.5 percent for the Slow Track samples, and 59.1 percent for the Fast Track samples.

Exhibits 4-1 and 4-2 show a few differences across the three sets of data. For example, the distribution of sources for the Bode cases shows a higher percent in the "Other" category (23.4 percent) than for the Slow Track (7.2 percent) and Fast Track cases (6.1 percent). Further, the clothing category for the Bode cases accounts for 26.1 percent of the cases, as compared to 11.0 percent for the Slow Track and 15.1 percent for the Fast Track cases. Differences in the distributions for obtaining DNA profiles are also present with the percentages for the Bode cases higher in each category except for swabs of biological evidence.

Exhibit 4- 1: Sources of DNA Evidence

	Bode Cases		Slow Track Cases		Fast Track Cases		All Cases	
Source	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Swabs of biological material	137	23.5	88	37.1	251	41.7	476	33.5
Clothing	152	26.1	26	11.0	91	15.1	269	18.9
Tools	51	8.8	45	19.0	80	13.3	176	12.4
Bottles/cans	49	8.4	33	13.9	66	11.0	148	10.4
Door, window, car	26	4.5	28	11.8	55	9.1	109	7.7
Cigarettes/cigars	31	5.3	0	0.0	22	3.7	53	3.7
Other	136	23.4	17	7.2	37	6.1	109	7.7
Total	582	100.0	237	100.0	602	100.0	1,421	100.0

Exhibit 4- 2: DNA Profiles Developed by Source

	Bode Cases		Slow Track Cases		Fast Track Cases		All Cases	
Source	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Swabs of biological material	130	94.9	81	92.0	241	96.0	452	95.0
Clothing	64	42.1	7	26.9	29	31.9	100	37.2
Tools	9	17.6	8	17.8	10	12.5	27	15.3
Bottles/cans	33	67.3	17	51.5	38	57.6	88	59.5
Door, window, car	16	61.5	6	21.4	11	20.0	33	30.3
Cigarettes/cigars	26	83.9	0	0.0	17	77.3	43	81.1
Other	64	47.1	3	17.6	10	27.0	77	40.5
Total	342	58.8	122	51.5	356	59.1	820	57.7

We also found differences in the types of offenses comprising the three sets of data (Exhibit 4-3). Overall, burglaries and robberies accounted for over 90 percent of the cases in all three groups. However, burglaries accounted for 70.1 percent of the cases in the Bode group, compared to 81.9 percent in the Slow Track group, and 91.4 percent in the Fast Track group.

Exhibit 4- 3: Types of Cases

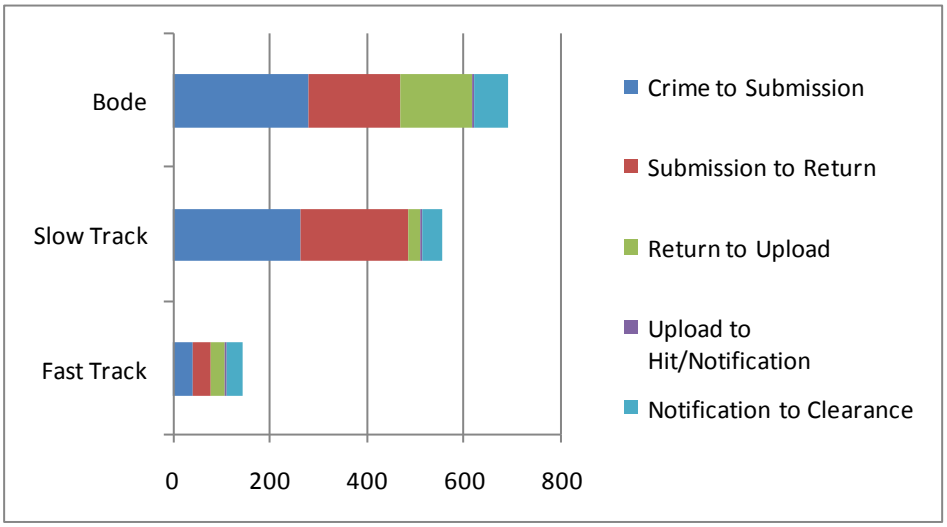
	Bode Cases		Slow Track Cases		Fast Track Cases	
Offense	Number	Percent	Number	Percent	Number	Percent
Burglary	408	70.1	194	81.9	550	91.4
Robbery	131	22.5	34	14.3	40	6.6
Other offense	43	7.4	9	6.6	12	2.0
Total	582	100.0	237	100.0	602	100.0

Processing Times

In the MDPD's process, the steps for success from crime commission to arrest are (1) collection of DNA evidence and submission to the outsourced lab, (2) analysis by the lab with results back to the crime lab, (3) review by the crime lab and uploading of DNA profiles to CODIS, (4) notification to investigators whenever hits from CODIS occur, and (5) follow-up activities by investigators. The elapsed time for each step may be days, weeks, or even months. For example, forensic analysts in the crime lab must find the time to package the evidence for submission to the outsourced lab. In turn, forensic analysts at the outsourced lab may have other priorities before finding time for analyzing the evidence from the crime lab. After receiving results from the outsourced lab, personnel at the crime lab must carefully check the results and identify the DNA profiles that could be submitted to CODIS.

One of the objectives for the experiment was to reduce the elapsed time needed to process DNA evidence and obtain profiles. The process for the Fast Track cases was intentionally set up to minimize the time required for each processing steps. Exhibit 4-4 compares elapsed times across the three groups. The time between crime occurrence and upload of a DNA profile into CODIS for Fast Track cases was 106 days. For these samples, the time between crime occurrence and submission to MUFSC averaged 43 days, the turnaround time back to the crime lab averaged 35 days, and the time for checking the results and upload of qualified DNA profiles was 28 days.

Exhibit 4- 4: Average Processing Times



NOTE: Averages are the median number of days for each step.

The longer elapsed times from crime to submission were expected to be longer for the Bode and Slow Track cases. With the Bode cases, there was a lengthy time between the crime occurrence and submission to Bode Technology Group, Inc. due to delays in getting a contract established and the fact that DNA evidence had been accumulating prior to the grant. A similar situation existed for the Slow Track cases because these DNA samples accumulated before the opportunity arose to submit them to MUFSC.

On the other hand, the crime lab's experiences with the Bode Technology Group, Inc. illustrate a typical problem with outsourcing analysis of DNA evidence. The contract did not include a provision for completing the analysis within a specified time. Forensic analysts at the Bode Technology Group, Inc. processed the DNA samples as time allowed, and these samples were not necessarily a high priority within the private lab. The turnaround time was 191 days for the Bode cases. After the crime lab received the results, a shortage of qualified personnel prevented an immediate review of the results, and as a consequence, the time for reviewing the results from Bode averaged 147 days. In total, it could easily be more than a year between crime occurrence and uploading a DNA profile to CODIS.

The elapsed times after submission of a DNA profile to CODIS are relatively fast. In many instances, a hit from CODIS occurs within a day because the DNA profile of a known offender is already in the database. When a hit occurs, crime lab personnel perform additional

tasks to obtain the case number and the known offender's name—a process that may involve calls to other police departments for information.

Case Clearance Statistics

Exhibit 4-5 provides clearance statistics (clearances by arrests and exceptional clearances) for the three sets of data.[16] Based on the number of CODIS hits, the clearance rates by arrest are 22.6 percent for the Bode cases (41 arrests out of 181 CODIS hits), 33.8 percent for the Slow Track cases, and 26.5 percent for the Fast Track cases. For exceptional clearances, the rates are 7.2 percent, 4.2 percent, and 2.9 percent, respectively.[17] Combining both categories results in overall clearance rates of 29.8 percent for the Bode cases, 38.0 percent for the Slow Track cases, and 29.4 percent for the Fast Track cases.

Exhibit 4- 5: Case Clearance Statistics

Category	Bode Cases	Slow Track Cases	Fast Track Cases
Number of cases	582	237	602
Number of DNA profiles in CODIS	342	122	356
Percent	58.8	51.5	59.1
CODIS Hits	181	71	170
Percent	52.9	58.2	47.8
Analysis of Hits			
Cleared by arrest	41	24	45
Percent (of CODIS hits)	22.6	33.8	26.5
Exceptional clearances	13	3	5
Percent (of CODIS hits)	7.2	4.2	2.9
Total clearances	54	27	50
Percent (of CODIS hits)	29.8	38.0	29.4

[16] These statistics are as of the cutoff date of January 31, 2009 for data collection.

[17] The MDPD's designation for an exceptional clearance is in agreement with the FBI's definition under the Uniform Crime Reporting guidelines. Examples of exceptional clearances include the death of an offender, the victim's refusal to cooperate with prosecution after the offender has been identified, or the denial of an extradition because the offender committed a crime in another jurisdiction and is being prosecuted for that offense.

The results from Exhibit 4-5 show the utility of analyzing DNA evidence for property offenses. The offenses in these datasets were unlikely to be solved in the future due to the lack of witnesses and reliable leads for investigators to follow. In fact, the crime lab's tracking system recorded only 19 clearances resulting from investigations of these cases not having CODIS hits for a clearance rate of less than two percent.

On the other hand, the clearance rate for the Fast Track cases was not significantly higher than the Bode and Slow Track cases. In fact, the Slow Track cases outperformed the other two groups in clearances by arrest and overall clearance rates.

Conclusions

As judged by the case clearance statistics, the results of the experiment are disappointing. The total clearance rate for the Fast Track cases at 29.4 percent was virtually the same as the Bode Cases at 29.8 percent and less than the Slow Track cases at 38.0 percent. However, the experiment provides important insights into the processing of DNA evidence for no-suspect cases. First, the overall clearance rate for property crimes in the police department was 10 to 12 percent during the years of the experiment. The clearance rates for all three groups are three times higher than the overall clearance rate. The result is even more impressive given that these cases are the most difficult to solve due to the lack of witnesses. All investigative leads had been exhausted from these cases prior to the DNA analysis and it was only through the analysis that arrests and clearances were obtained.

A second point is that even the Fast Track cases had long processing times. As reflected in Exhibit 4-4, the average time from crime occurrence to upload of a DNA profile into CODIS was 106 days. The experiment shows that (1) analysis of the DNA evidence is the important step to take, (2) higher clearance rates can be obtained by conducting the analysis, and (3) the length of time for the analysis does not significantly impact the final clearance results.

A corollary is that the experiment does not answer the question on how much higher the clearance rates would be if the processing times were significantly reduced to a few days or a few hours. The technology for developing DNA profiles is improving each year and much shorter processing times are a realistic goal. Further experimentation with shorter processing times is warranted on the basis of this experiment.

Chapter 5

Case Studies

Use of Forensic Evidence

While previous chapters assessed the role of forensic evidence in investigations from a quantitative viewpoint, this chapter is a qualitative review of cases in which forensic evidence was instrumental in either identifying suspects or assisting in prosecution. The qualitative review provides a contextual framework on the link between forensic evidence and investigations. As a starting point for this review, ILJ staff selected over 50 cases from our databases in which forensic evidence had been collected and analyzed. Offenses ranged in seriousness from no-suspect garage burglaries to homicides. We reviewed reports (in paper and electronic format) available on these cases from the police departments, crime labs, and prosecutors' offices. For additional details about a case, we interviewed key personnel (police officers, investigators, crime lab personnel, and prosecutors) in the agencies. The approach of collecting information and interviewing personnel across agencies provided a complete and detailed picture of each case.

Case Studies

Rival Gangs Homicide

This case resulted from a confrontation near a popular night club between two rival gangs in which shots were fired between gang members. A member of one of the gangs was shot in the stomach and subsequently died at the hospital. Police officers patrolling near the scene heard shots and immediately responded to the area. They noticed a man running from the scene with a handgun. As police officers pursued the suspect on foot, he threw the handgun over a security fence into a construction site. Officers eventually caught and arrested the suspect, and were able to retrieve the handgun from the construction site. Police found a second handgun in the area where the shooting took place.

Accounts by witnesses varied considerably on what had occurred at the scene. One witness stated that he did not get a good look at the suspect but knew that he had not been in the club because he was not wearing "club clothes." Another witness, who stated he saw the

shooting, was unable to identify the shooter in a curbside lineup, and another witness stated that he observed a man fire a gun twice before running away but could not provide a detailed description. Police interviewed several others at the scene but none was able to identify the shooter.

Firearms analysis played a key role in the subsequent investigation. Crime lab personnel were able to show that a copper jacketed projectile and two lead fragments recovered during autopsy were fired by the handgun thrown into the construction site by the suspect. Further, a forensic specialist had administered a gunshot residue (GSR) kit on his hands after his arrest on the evening of the shooting. Analysis of a gunshot residue (GSR) kit found one particle unique to gunshot residue from his hands. Finally, DNA analysis concluded that he was a contributor to a mixture of DNA material found on the handgun from the construction site.

Faced with the results of the forensic analysis, the suspect pled guilty to voluntary manslaughter and possession of a firearm by a felon. He was sentenced to 21 years in prison.

Serial Sexual Assaults

The suspect arrested for the assaults in this case had been previously convicted and sentenced to prison for two sexual assaults on children in the 1980s. He was paroled in December 2004 after serving his entire sentence without treatment. Immediately upon release he traveled to Denver and started reoffending by going on a rampage of six sexual assaults at four locations within a one week period.

In the first case, on a Friday afternoon, he broke into a pet food and supply store where he robbed and raped the store clerk, a woman in her twenties. He was armed with a knife and cut the victim's hand in the course of the assault. That same afternoon, while still carrying a knife, he raped a woman after breaking into her house and also stole her wallet. On the next evening around 7:30 p.m., the suspect broke into a large home where a grandmother was watching three children whose parents were traveling out of the country. He took the grandmother to the basement, tied her up and raped her, and then brought two of the children (eleven year old twin girls) downstairs and raped each of them in a location where the grandmother could hear but not see the assaults. She was able to untie herself and run outside to the adjacent park for help.

On the following Tuesday, the police department crime lab put a team on 24 hour detail to develop a DNA profile from evidence collected at the crime scenes. The team developed a

profile the next day, which matched two cases in the state CODIS database—a rape of a woman and a sexual assault on a young boy in a neighboring county. In that case, investigators had actually interviewed the suspect but let him go after the interview. The police chief and district attorney appealed for help in apprehending the suspect.

Two days later, in the same general location as the earlier assaults, a woman was found wandering outside of an apartment building with a severe head injury. She was the manager of the apartment building and in the course of checking on an abandoned apartment, she had walked in on the suspect who was sexually assaulting a woman he had kidnapped earlier and had been holding there all day. He beat the apartment manager with a two by four piece of wood and then fled with the sexual assault victim in the apartment manager's car. Since her cell phone was in the car, police were able to track the car using global positioning technology, and the suspect was apprehended by local police in a mountain town 150 miles away.

In interviews with investigators, he confessed to all the crimes and supplied detectives with detailed information about how he committed them, items he had stolen and where he had discarded them, as well as the location of the discarded weapons used in each crime. This information led detectives to many items of evidence, including a knife and a victim's wallet, which were located exactly where he had directed them.

DNA evidence was collected from all the victims except two—the woman who was assaulted with a piece of wood and one of the twin girls. Six cases were connected through DNA evidence. Over 80 criminal counts were filed against the suspect, including sexual assault, sexual assault on a child, kidnapping, and attempted murder. He pled guilty to all counts and received the maximum sentences, consecutive when possible, which totaled more than 1,319 years. He also pled guilty to all charges in the two cases in neighboring Arapahoe County, where he was sentenced to an additional 200 years.

In conclusion, forensic evidence was responsible for the suspect's arrest and also led to his guilty plea to all the charges against him. This case also had far reaching implications for investigative procedures and protocols in Denver.

Burglary and Sexual Assault

The suspect in this case removed the window screen from the victim's apartment and retrieved a knife from the kitchen. The victim woke up as the suspect got into bed with her.

When she started to scream, he put his hand over her mouth and told her to be quite or he would kill her. During the ensuing struggle, she bit his finger causing him to flee the house. Crime scene investigators found his blood on the kitchen stove and kitchen floor. Forensic analysts developed a DNA profile from the blood and stored it in the department's local CODIS database (LDIS). No matches were made through the SDIS and NDIS systems.

Approximately ten months, investigators made an arrest on a warrant from Ithaca, New York, where the arrestee was wanted for a series of residential burglaries and sexual assaults.[18] Because of the nature of the arrest, police obtained a saliva sample and crime lab personnel developed a DNA profile from the sample. Upon entering the profile into the LDIS database, a hit was made against the profile from the blood found in the victim's kitchen. The suspect subsequently admitted to entering the victim's apartment and, in fact, he stated that he had tried unsuccessfully to enter other apartments in the area.

He entered into a plea bargain in which the prosecutor charged him with intent to commit a felony and burglary. He was sentenced to six years in prison and also faced charges for crimes in New York.

This case illustrates the value of LDIS databases maintained by crime labs in police departments. The suspect did not have a criminal history that required submission of a DNA sample for entry into CODIS. Therefore, the DNA profile from blood in the victim's kitchen did not result in a match when uploaded into CODIS. However, the profile was stored in the department's LDIS database. The arrest on the outstanding warrant from New York resulted in a sample from the suspect that matched the profile in the LDIS database.

Vehicular Homicide 1

This case involved a couple who were very good friends. They became intoxicated one evening while drinking together in several bars in Denver. They decided that he would drive them home in her vehicle. While driving her vehicle, he failed to negotiate a turn, flipping the car over, and his friend was ejected and killed on impact. He was found at the scene in the driver's seat with his torso slumped over toward the passenger side of the car.

[18] The nationally syndicated television show, *America's Most Wanted*, had dubbed this individual the "College Town Creeper" for numerous crimes he had committed in New York.

As the case progressed, he mounted a defense that he was not, in fact, driving the car at the time of the crash. Instead, he stated that his friend was driving the car, that she was thrown from it when the car flipped over, and that he was tossed to the driver's side slumped toward the passenger's seat. At that point the district attorney suggested that the crime lab test the driver's side airbag for biological material. The testing recovered biological material from which a DNA profile was extracted. The profile matched the suspect and therefore demonstrated that he was the driver responsible for the crash.

Once the forensic report was disclosed, he pled guilty to the charge. Because the victim's mother's was sympathetic to the defendant, he received a suspended sentence of eight years.

Vehicular Homicide 2

The suspects in this case stole a car after an evening of partying in the city. As they were driving on a highway, they became involved in a road rage incident with another driver who was on his way to a baseball game. One of the suspects, the driver of the car, shot at the other driver and then quickly drove away. While fleeing the scene, the vehicle crashed into an elderly couple, killing the woman and seriously injuring her husband. The couple ran from the scene and broke into a house where they were hiding when apprehended by police.

The dilemma in this case was that neither suspect would admit to driving the car and the driver at whom they had shot was unable to identify the driver. To assist in identifying the driver, the police department's crime lab developed DNA profiles from blood on the windshield from the crash. Subsequent comparisons with DNA profiles from the two suspects identified one of them as sitting in the driver's side of the vehicle. Confronted with these results, both pled guilty and the driver was sentenced to 45 years in prison.

Without the DNA evidence identifying the driver, the prosecution of this case was in doubt. The comparisons of the DNA profiles were the key items of evidence in securing guilty pleas from the suspects.

Garage Burglary

In this case, the victim reported that someone entered his garage by prying a side door open and then raising the roll-up door. He removed several items including a mountain bike, duffel bag, and several sports figurines in original boxes. The figurines were collector items valued at $10,350. He left on the mountain bike with the stolen items.

Investigators recovered a cigarette butt on the garage floor. The victim stated that he did not smoke and did not know the origin of the cigarette. The cigarette butt was submitted to the department's crime lab for DNA analysis. At this time, the crime lab had a backlog of cases with DNA analysis and was giving priority to evidence from violent crimes. It was eleven months before the lab completed the analysis, which resulted in a DNA profile from saliva on the cigarette butt. Upon entering the profile into CODIS, they quickly obtained a match. Investigators determined that the person identified through CODIS had two prior convictions for burglary and was currently in prison. Even though in prison, investigators arrested and charged him with the garage burglary. He subsequently had four years added to his prison sentence.

This case is a good example of the role that biological evidence can play in no-suspect property crimes. This arrest would not have occurred without the development of the DNA profile from the cigarette butt found in the garage.

Armed Robbery

In this case, four armed males wearing dark hooded sweatshirts entered an Old Navy store and demanded that the manager take them to the back of the store to open the safe. After opening the safe, the store manager transferred money from the safe into a bag that one of the men was carrying. The manager ordered the manager to open the drop safes at the available cash registers. After emptying these safes, the gunmen fled from the store in different directions. Because the robbery took place during business hours, there were several witnesses who saw the men run from the store. They were able to provide police with information on the general direction that the men fled. Police detained one suspect (Suspect 1) at a construction site near the store with a handgun and work gloves next to him. Police located a second suspect (Suspect 2) in the store's parking lot, and they found clothing and a revolver in the lot. Witnesses made positive identifications of the two suspects.

Forensic analysts at the police crime lab were able to develop DNA profiles from material on the pile of clothing found in the parking lot and concluded that it matched Suspect 2's profile. DNA profiles were obtained from work gloves found near Suspect 1. Forensic analysts determined that both suspects were contributors to these profiles. Suspect 2 pled guilty to robbery and assault with a firearm. Because he had no prior record, he received a relatively short sentence of three years in prison. Even though other DNA profiles were obtained and

submitted to CODIS, police were never able to identify the other two robbers and none of the money stolen from the store was recovered.

Suspect 1 went to trial eighteen months later. Witnesses at the ten-day trial included store employees, witnesses who saw the gunmen leave the store, police officers, and forensic analysts. A primary issue brought by defense counsel was that the witnesses were not consistent with their recollections of the defendants and what they were wearing at the time of the robbery.

With regard to the forensic evidence, a latent prints expert from the crime lab testified that he was unable to life prints from the firearms. One firearm had no prints on it and the other had partial prints that could not be analyzed further. A firearms expert testified that the firearms were operable but no shots were fired during the robbery. The forensic analyst for DNA analysis testified that Suspect 1 was a possible contributor to DNA evidence found on a sweatshirt at the construction site. He also testified that the gloves belonging to Suspect 1 had DNA from both suspects.

Suspect 1 testified on his own behalf and claimed that he was not involved in the robbery and did not know Suspect 2. He stated he was in the parking lot of the store to buy marijuana and ran to the construction site when he saw police cars arrive at the scene. He admitted to owning the gun found near where he was hiding. While stating that he did not know Suspect 2, he offered no explanation on how the DNA evidence was found on his work gloves. The jury found Suspect 1 guilty of robbery, assault with a semiautomatic firearm, and possession of a firearm by a felon. He was sentenced to 37 years in prison.

The forensic evidence played a major role in the prosecutor's trial of Suspect 1. By the time the trial took place, many witnesses had forgotten what the suspects looked like and were unable to identify the suspects with certainty. While there was circumstantial evidence linking the defendant to the robbery, the forensic evidence linked the two defendants together. This result was significant because the two defendants continued to deny that they knew each other.

Conclusions

These cases illustrate many of the results discussed in previous chapters but also highlight the different ways in which forensic analysis can assist in cases. For example, the value of analysis after arrest is clear from these cases. In the first case involving rival gangs,

firearms analysis matched a projectile and lead fragment to a handgun thrown away by the suspect as he was fleeing the scene. In the first vehicular homicide case, DNA analysis was instrumental in determining the driver of the vehicle. The offender's version stating that his friend was the driver was refuted and he pled guilty. In the second vehicular homicide case, DNA analysis identified the driver after both suspects denied driving the vehicle. Prosecution had been stymied in both cases because drivers had not been identified. In total, six of the seven cases had forensic analysis after arrest.

The value of the CODIS system is also illustrated in three cases in which hits were made. In the garage burglary, an SDIS hit from CODIS identified the offender who had two prior convictions and was in prison at the time of the hit. The case involving burglary and sexual assault shows the value of LDIS databases. The offender was eventually identified through a match in this local database. These are both no-suspect cases that likely would have not been solved with the CODIS system.

The final case on armed robbery illustrates the fact that matches are not always between a suspect and evidence from the scene. In this case, forensic analysis linked the two suspects together by showing that the gloves had DNA material from both suspects. The result was important for two reasons. First, the suspects continued to deny knowing each other but could not explain how both had DNA material in the gloves. Second, by the time the trial took place, witnesses were unable to identify the suspects with certainty. Prosecution therefore depended on the crime lab results to build the case.

Chapter 6

Evidence Collection Survey of Police Departments

Conduct of the Survey

While a considerable amount of information in known about the staffing and activities of crime labs (e.g., Cabby & Cobb (2004), Durose (2008), Evans (1966), Gallop & Stockdale (2004); Weedn (2006)), the literature is scarce on the organizational arrangements and staffing for collection of forensic evidence. To fill this void, ILJ conducted a survey of selected law enforcement agencies to address several issues concerning collection of evidence from crime scenes. We were particularly interested in determining the composition of crime scene units, where they are placed organizationally, what responsibilities they have at crime scenes, and the extent to which others (patrol officers, detectives, etc.) collect forensic evidence. This chapter provides the results of our survey.

The starting point was the 2005 census of publicly funded crime labs conducted by the Bureau of Justice Statistics. From the survey, ILJ identified 96 full-service crime labs that reported they also had units for collecting evidence from crime scenes.[19] ILJ decided that a telephone survey would be the most appropriate means of contacting personnel in these labs and contracted with the National Clearinghouse for Science, Technology and the Law (NCSTL) to provide staff for conducting the survey. The NCSTL is nationally known for sharing information about forensic science among crime lab personnel, legal professionals, law enforcement officials, and others.[20] Their participation was beneficial in enhancing the amount and quality of information obtained in this survey.

A total of 75 crime labs provided information for a response rate of 78.1 percent of full-service labs. Of the non-respondents, seven stated that they no longer have crime scene units and the remaining 14 crime labs were not responsive to our telephone calls after several attempts.

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[19] Full-service labs were defined as labs that conducted forensic analysis of biological evidence, latent prints, and firearms.

[20] For more information about NCSTL, see www.ncstl.org .

Survey Results

Personnel Assigned to Crime Scene Units

An initial question on the survey asked about the types of personnel (sworn, civilian, etc.) assigned to crime scene units. It was anticipated that crime scene units might consist of mixtures of different types of personnel, and the results in Exhibit 6-1 reflect that assumption. The numbers in the exhibit exceed 75 surveys responses because some agencies assign more than one type of personnel to collect evidence at crime scenes. In total, 24 units included sworn investigators and 30 units had other sworn personnel (usually patrol officers). Civilian personnel were employed in 49 units and other types of personnel (e.g., criminalists) were assigned in eight units. Further examination showed that 29 crime scene units employed civilian personnel exclusively and six units had sworn investigators exclusively.

Exhibit 6- 1: Types of Personnel in Crime Scene Units

Personnel	Number of Crime Scene Units (n=75)	Percent
Sworn investigators	24	32.0
Other sworn personnel	30	40.0
Civilians	49	65.3
Other personnel	8	10.7

A question on organizational placement of crime scene units showed that 37 units were in criminal investigations, 14 units in technical services, 6 units in field operations, 2 units in administrative services and 16 units in other sections of the agency (e.g., crime laboratory section).

The 75 crime scene units had an average of 13.3 personnel assigned for collection of evidence at crime scenes. However, the average varied considerably depending on the organizational location of the unit. Units in criminal investigations averaged 10.2 personnel compared to 16.1 personnel for units in technical services, and 19.0 personnel for units in field operations.

Responsibilities of Crime Scene Units

Two questions on the survey focused on the types of crimes at which crime scene units might be assigned and their specific responsibilities at the scenes. As seen in Exhibit 6-2,

virtually all the units collect evidence at homicides and sexual assaults. Assignments are less frequent for other types of crimes with 69 units collecting evidence at aggravated assaults, 66 units at robberies, 64 units at burglaries, and 57 units at auto thefts.

Exhibit 6- 2: Responsibilities for Crime Scene Units

Crime Type	Number (n=75)	Percent
Homicides	73	97.3
Sexual assaults	72	96.0
Aggravated assaults	69	92.0
Robberies	66	88.0
Burglaries	64	85.3
Auto thefts	57	76.0
Unit Responsibilities	Number	Percent
Photograph scene	74	98.7
Video scene	46	61.3
Collect biological evidence	74	98.7
Collect latent prints	74	98.7
Collect firearms evidence	75	100.0
Collect trace evidence	74	98.7
Document blood spatters	69	92.0
Conduct GSR tests	66	88.0

The largest majority of respondents also stated that personnel from crime scene units could be called to collect evidence at many other types of incidents. These included suicides, narcotics, larcenies, graffiti, and vandalism. Department policies varied on when the crime scene units might be called and generally depended on the discretion of investigators and patrol officers at the scene.

With regard to scene responsibilities, the responses show that almost all units photograph scenes but only 46 units (61.3 percent) have responsibilities for video documentation. Collection of biological evidence, latent prints, firearms evidence, and trace evidence are accomplished by nearly all the crime scene units. Fewer units have responsibilities for documenting blood spatters and conducting gunshot residue (GSR) tests.

Evidence Collection by Investigators and Patrol Officers

In addition to crime scene units, investigators and patrol officers may have responsibilities for evidence collection under departmental policy in some agencies. Exhibit 6-3 provides survey results on the crime types and responsibilities for these personnel. It shows, for

example, that investigators may collect evidence from homicide scenes in 27 agencies (36.0 percent) as compared to collection by patrol officers in 9 agencies (12.0 percent). About half the

Exhibit 6- 3: Responsibilities for Investigators and Patrol Officers (n=75 agencies)

	Investigators		Patrol Officers	
Crime Type	Number	Percent	Number	Percent
Homicides	27	36.0	9	12.0
Sexual assaults	38	50.7	30	40.0
Aggravated assaults	31	41.3	37	43.9
Robberies	36	48.0	43	57.3
Burglaries	37	49.3	55	73.3
Auto thefts	35	46.7	53	70.7
Unit Responsibilities	Number	Percent	Number	Percent
Photograph scene	42	56.0	48	64.0
Video scene	22	29.3	9	12.0
Collect biological evidence	30	40.0	30	40.0
Collect latent prints	27	36.0	47	62.7
Collect firearms evidence	30	40.0	40	53.3
Collect trace evidence	24	32.0	23	30.7
Document blood spatters	13	17.3	8	10.7
Conduct GSR tests	21	28.0	18	24.0

agencies provide for evidence collection by investigators in robberies, burglaries, and auto thefts. A clear trend in the exhibit is greater responsibilities for patrol officers with property crimes. Fifty-five agencies (73.3 percent) allow patrol officers to collect evidence at burglaries and 53 agencies (70.7 percent) from auto theft scenes.

As seen in the bottom portion of the exhibit, the majority of agencies have policies for investigators to photograph scenes and 35 to 40 percent of the agencies have policies for collection of biological evidence, latent prints, and firearms evidence by investigators. With patrol officers, 48 agencies (64.0 percent) have policies for photographing scenes. Forty-seven agencies (62.7 percent) have procedures for patrol officers to collect latent prints from scenes and 40 agencies (53.3 percent) allow officers to collect firearms evidence. For both investigators and patrol officers, fewer than 20 percent of the agencies have policies for documentation of blood spatter, probably because of the training requirements for this activity.

Several respondents made additional comments about collection of evidence by patrol officers. In many agencies, patrol officers collect evidence for "any minor crime," "misdemeanors," "anything involving fingerprints," "property damage," and others.

Evidence Collection by Specialists

The survey asked respondents whether their agencies had crime scene evidence specialists who specifically responded to violent crimes (homicides, sexual assaults, aggravated assaults, and robberies). A total of 34 respondents (45.3 percent) stated their agencies had these specialists for violent crimes, especially for evidence collection at homicides. The responsibilities for these specialists included the complete list of possibilities (photograph scene, collect biological evidence, latent prints, firearms, etc.) with the single exception that video documentation was done in only 24 agencies.

Summary of Survey Results

With regard to the 75 surveyed agencies with crime scene units, there was no consistency on personnel, organizational placement, and size of the unit. Some units have entirely sworn personnel; others have entirely civilian personnel; and still others have combinations. Crime scene units may also be located in different organizational sections (e.g., field operations, investigations, technical services). The size of the units varied considerably with 25 agencies having fewer than eight personnel in their crime scene units and 17 agencies having more than 20 personnel. The organizational placement appears to influence the number of assigned personnel to crime scene units.

Further analysis showed that patrol officers and investigators also collected evidence in 47 agencies (62.7 percent) in addition to the activities of the crime scene units. In only seven agencies (9.3 percent) did crime scene units have exclusive responsibilities for evidence collection. The general tendency was for patrol officers and investigators to have greater responsibilities for evidence collection in agencies with smaller crime scene units.

The largest majority of crime scene units were assigned evidence collection at major crime types; the exception was assignment to auto thefts in which 57 units (76.0 percent) had responsibility. Activities at the scene for virtually all the units covered the complete list of possible evidence collection—photograph scene, collect biological evidence, latent prints, firearms, etc.—with the exception of capturing the scene in video (only 46 agencies).

Departmental policies provided for patrol officers to collect evidence at major scenes in 64 agencies (85.3 percent) and for investigators in 51 agencies (68.0 percent). The results show

some variation in responsibilities. For example, department policies in 27 agencies (36.0 percent) provide for investigators to collect evidence from homicide scenes while only 9 agencies (12.0 percent) have such a policy for patrol officers. In about 70 percent of the agencies, however, patrol officers can collect evidence for the crimes of burglary and auto theft.

Finally, a total of 34 respondents (45.3 percent) stated that their agencies had specialists for violent crimes (homicides, sexual assaults, aggravated assaults, and robberies). Specialists covered the full range of collection activities although fewer agencies conducted video documentation.

Chapter 7

Conclusions and Recommendations

This project offered an opportunity to determine the roles of forensic evidence from collection to final disposition of defendants. Project results included details on the analysis of forensic evidence, use of the analysis in investigations and prosecution, and summaries of specific cases in which forensic evidence was especially important. Throughout the study, we identified several potential areas for future research. These areas are summarized in this chapter in the form of questions that could be addressed through additional research.

1. Why do aggravated assaults, robberies, and burglaries have relatively low cases with forensic evidence?

In Denver, only about 15 percent of burglaries, seven percent of robberies, and five percent of aggravated assaults had forensic evidence. In San Diego, the percentages never exceeded 30 percent for any of these offenses. As discussed in Chapters 2 and 3, there are two possible explanations. The first is that the forensic evidence may not, in fact, exist at the scene. That is, the perpetrator did not leave DNA material, latent prints, firearms, or other forensic evidence at the scene. The second explanation is that evidence may have been present but evidence technicians may not have been dispatched to the scene. A field test would be beneficial to explore these two possibilities.

It should be noted, however, that even if forensic evidence is available and collected at more scenes, analysis may not be worthwhile. Research in this area should include cost benefit and cost effectiveness analysis.

2. To what extent is unanalyzed evidence of benefit in investigation and prosecution of cases?

Our study emphasized the roles that analysis of forensic evidence played in the investigation and prosecution of cases. Within the limitations of our study, it was not possible to determine how investigators used evidence that had been collected but not analyzed. The use of this evidence may be significant as judged by the fact that cases with evidence had higher clearance rates than those without evidence. As an example, the recovery of a firearm at the

scene may allow investigators to locate the owner of the firearm, which may lead to identification of the offender. Such a sequence of events does not involve forensic analysis.

The metrics presented in this report (e.g., matches and exclusions) provide a good measure of the benefits of forensic analysis. However, they are incomplete because they do not include how investigators use evidence as in the firearms example. The metrics therefore underestimate the role of evidence. A more detailed analysis of cases with evidence would provide better measures on the role of evidence.

3. Would more requests from investigators for analysis result in higher clearance rates?

Our analysis in Denver and San Diego showed that investigators do not make requests for forensic analysis in many open cases. In San Diego, for example, investigators did not make requests for analysis of DNA material in about one-third of the open aggravated assaults with this type of evidence. There are several reasons that requests may not be made including problems with backlogs in the crime lab, policies on what types of analysis can be requested, and beliefs by investigators that no probative results would be obtained.

The question is open on whether more requests would be beneficial. More research would be beneficial in this area and, as in the previous conclusion, should include cost benefit and cost effectiveness analysis.

4. To what extent is the NIBIN system contributing the investigations and prosecutions.

Our analysis showed that the CODIS and AFIS systems are important to investigators and prosecutors in many cases. For the period of our data collection, the police departments had just started to enter ballistics information into the NIBIN system, and therefore this system played virtually no role in the cases we analyzed.

Based on our analysis and anecdotal information, the CODIS, AFIS, and NIBIN systems are especially beneficial in unsolved, no-suspect cases, especially property crimes. In this regard, research on all three systems, rather than only the NIBIN system, may be beneficial.

5. What is the utility of forensic analysis after arrest?

One of the surprising results from this study was the fact that more forensic analysis occurred after arrests than before arrests. One reason for this result is because some arrests are made within a few hours of the offense and the requests for analysis therefore start after arrest.

Another reason may be that prosecutors make requests (through the investigators) for forensic analysis as part of the adjudication process. Additional research in this area would be beneficial in developing a complete picture on the role of forensic analysis.

6. Would faster analysis of forensic evidence increase its value in investigations.

With regard to DNA analysis, our assessment of the "speedy" program in Miami-Dade County (see Chapter 4) concluded that their shortened time for DNA analysis did not have a significant impact on clearances. The problem with the program was that outsourcing the analysis to a private lab still resulted in lengthy delays for analyzing DNA evidence to the point of submission of profiles into CODIS.

The technology for conducting forensic analysis is improving and the time required for analysis can be expected to decline considerably in the coming years. This progress does not, however, solve the personnel problems that many crime labs face in hiring and keeping forensic analysts. While a daunting task, the combination of adequate staffing levels and improved technologies can result in faster analysis of forensic evidence, which in turn will lead to more clearances for all types of crimes.

7. Organizational placement, personnel, and unit sizes differ considerably across the country for evidence collection.

Based on ILJ's survey of 75 agencies, there is no consistency on personnel, organizational placement, and unit size for evidence collection. No research has been conducted on whether the variety of arrangements makes any difference in the quality and quantity of forensic evidence collected at crime scenes. Are units with entirely sworn personnel more efficient in evidence collection? Is it better to have these units in investigations, in field operations, or under the direction of the crime lab? To what extent should patrol officers collect evidence at property crimes? How effective are units that specialize in evidence collection for violent crimes?

One approach for conducting research in this area would be to perform a survey with a much larger number of police departments. The departments could then be categorized into groups based on factors such as organizational placement, types of personnel, size of unit for evidence collection and others. Representative agencies from each group could then be studied

with the aim of measuring their efficiency and effectiveness. Results from this study would be beneficial to other police departments on the most advantageous arrangement for evidence collection.

8. What is the relationship between probative evidence and longer prison sentences for guilty defendants.

As shown in Exhibit 3-23 for San Diego, homicide defendants with no probative evidence received an average sentence of 15.5 years compared to 23.9 years for those with probative evidence. With sexual assaults, the difference is 3.3 years for defendants with no probative evidence compared to 17.0 years for those with probative evidence. For the sexual assaults, the probative evidence is usually a DNA profile from the sexual assault kit that matches the defendant.

Of course, the longer sentences are not directly related to probative evidence because judges are not taking evidence into consideration for sentencing. The most likely reason for the difference is that prosecutors file higher (more severe) charges against defendants where probative evidence exists because the evidence makes for a convincing case. The higher charges have longer sentences based on the sentencing guidelines that guide judges.

9. ILJ's experiences in this project highlight the need for integration of police department's records systems, crime lab information systems, and prosecutor's systems at the local level.

The data collection effort proved particularly difficult in this study because of the lack of integration between systems. When we started the project, our belief was that we would be able to analyze virtually all the cases during a given year by linking systems. This belief was built, in part, on the experiences of the principal investigator in a similar study of homicides in Phoenix, Arizona. However, for this project, the belief that systems could be linked proved to be naïve.

In Denver, the key systems from which data were gathered were the (1) police records management system, (2) crime lab information management system, (3) district attorney's system, (4) district court system, and (5) a state court information system. As it turns out, none of the systems "talked" to each other. For this reason, it was necessary for us to take a sample of

cases from three categories (aggravated assaults, robberies, and burglaries) as trying to code a full year of offenses would have proven much too costly.

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