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Volume I
Evaluation of the Phoenix Homicide Clearance Project

Final Report

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Phoenix Homicide Clearance Project

Introduction

This report prepared by the Institute for Law and Justice, Inc. (ILJ) provides the results of an evaluation of the Homicide Clearance Project in the Phoenix, Arizona, Police Department. In 2004, the department received a grant from the Bureau of Justice Assistance providing support for the assignment of four crime scene specialists directly to the department's Homicide Unit. Responsibilities of the crime scene specialists were to collect evidence at homicide scenes, prepare scene reports, develop scene diagrams, and other supportive activities. Prior to the project, homicide investigators were responsible for evidence collection, which reduced the time they could devote to investigations. The primary objective of the Homicide Clearance Project was to improve homicide clearance rates by increasing investigative time through the addition of the four crime scene specialists.

ILJ evaluated the Homicide Clearance Project under a grant provided by the National Institute of Justice. As described in this report, the evaluation consisted of process and impact assessments of the project. Because of the excellent cooperation of the Phoenix Police Department, ILJ expanded the evaluation to conduct research on several other aspects of homicide investigations, including an analysis of investigative procedures for closed cases, a summary of obstacles faced in solving open cases, a comparison of homicide characteristics in Phoenix with other research studies, a detailed breakdown of evidence collected at homicide scenes, and a review of the role of forensic evidence in homicide investigations and trials.

Transfers of the four crime scene specialists were effective on July 1, 2004. The crime scene specialists were assigned to two of the four investigative squads within the homicide unit. They began on-the-job training immediately upon their transfers by accompanying investigators to scenes and observing the collection and storage of evidence. The training proceeded quickly because they were familiar with homicide scenes and because they generally knew departmental procedures from their years of experience in the crime laboratory. By September 2004, the

crime scene specialists were able to handle homicide scenes with minimal supervision from investigators, and they had learned how to prepare scene reports documenting the evidence.

Prior to the grant, the role of crime scene specialists was limited to photographs and latent prints. Investigators were responsible for evidence collection. Investigators marked each item of evidence, placed the evidence in appropriate evidence containers, transported the evidence to headquarters, and turned the evidence over to the property room. They later prepared scene reports that described the evidence collection process and provided details on each item of evidence collected (type of evidence, description, exact location, etc.). Assignment of crime scene specialists to the unit was seen as a way to relieve a considerable amount of workload from investigators.

The decision to assign the four crime scene specialists to two of the four squads provided an opportunity to compare performance between the two pairs of squads. As with other investigative units, the primary performance measure was homicide clearance rates—the percentage of cases that homicide investigators solve. The hypothesis was that the squads with crime scene specialists would do better than the other squads compared against their performance prior to the grant project. In theory, investigators in the experimental squads would have more time for investigations, which in turn would lead to higher clearance rates. The comparison squads would continue to operate as in the past with investigators having responsibility for evidence collection and with crime scene specialists assigned to take photographs and dust for latent prints.

With the Homicide Clearance Project, the Phoenix Police Department was also testing whether crime scene specialists could work effectively within the environment of the homicide unit. It was the department's first test for assigning civilian personnel from the crime laboratory to an investigative unit. The crime scene specialists reported to supervisory personnel who headed the experimental squads. The department also wanted to be sure that the four crime scene specialists were capable of preparing the same quality of scene reports that homicide investigators produced. The evaluation addressed both these objectives.

During the course of the evaluation, ILJ staff coded information from all homicides that occurred during the 12-month period prior to the transfers (July 1, 2003 – June 30, 2004), referred to as the *baseline period*, and a 10-month period starting September 1, 2004, referred to

as the *test period*. In total, our database consisted of baseline information on 195 cases (209 victims) and test period information on 167 cases (183 victims). The follow-up period for cases was a minimum of 18 months. Information obtained for the evaluation included case status (open/closed), demographics of victims and arrestees, evidence collected, and prosecutorial outcome. In addition, the department provided crime laboratory reports on evidence analyzed from all cases during the baseline and test periods. Case outcomes were obtained from the Maricopa County Superior Court's online system that provides information on plea arrangements, trials, and sentences, as well as summaries (court minutes) of each court appearance of a defendant.[1] Finally, ILJ analyzed trial transcripts for defendants accused of 1st or 2nd degree murder to determine the role of forensic evidence at trials.

Historical Perspective

Phoenix Demographics

Phoenix, Arizona is located in the center of the state on the Salt River, and is about 230 miles from the Mexican border. It is the capital of the state and the seat of Maricopa County. The city has experienced considerable growth during its history, with a particularly large growth spurt starting in the 1990's and continuing into the 2000's. According to U.S. Census figures, the population increased from 988,800 in 1990 to 1,321,000 in 2000, an increase of 33.6 percent over the 10-year period. The U.S. Census estimated the 2006 population to be 1,575,000 residents, an increase of 19.2 percent since the 2000 census.

The 2000 census showed that 34.1 percent of the city's population was of Hispanic or Latino origin,[2] and that the city was about equally divided between males and females. The average (median) age was 30.7 years, with 28.9 percent of the population under 18 years of age.[3] The increase in Hispanic population in the Phoenix area has been significant. Census figures show that between 1990 and 2000, the Hispanic population in the city's Statistical Metropolitan

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1 See www.superiorcourt.maricopa.gov.

2 With census data, Hispanics may be of any race and are therefore included in applicable race categories.

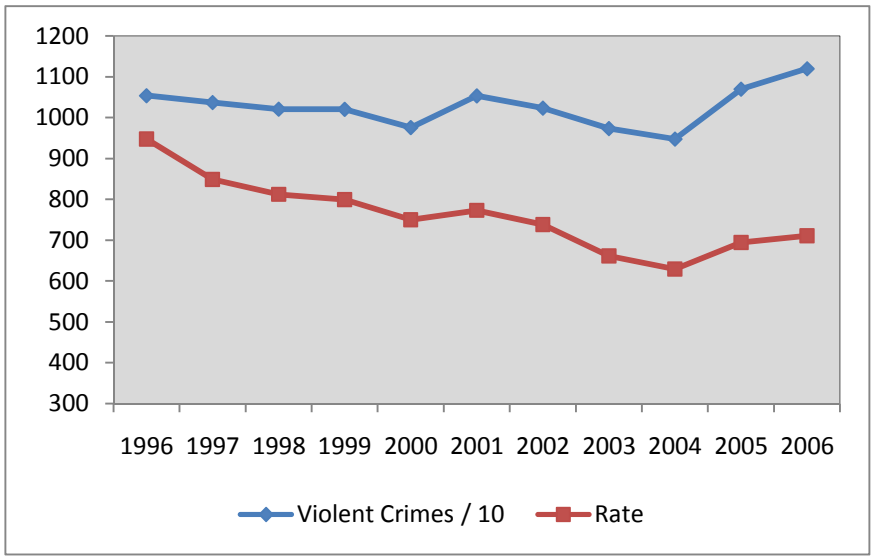
3 The changes in Phoenix reflect similar changes throughout the state of Arizona. The state's population increased 40.0 percent between 1990 and 2000, and its estimated population of 6,166,000 persons in 2006 is a 20.2 percent increase since the last census. According to 2006 census estimates, the state is about 29.2 percent Hispanic, and, like Phoenix, is about equally divided between males and females.

Area (SMA) went from 345,498 to 817,012—an increase of 136 percent. The non-Hispanic population increased about 37 percent (from 1,776,603 to 2,434,864).

Crime Statistics

Crime in Phoenix has increased along with the population growth, albeit at a slower pace. As seen in Exhibit 1-1, the *number* of violent crimes stayed relatively constant over the 11-year period between 1996 and 2006, averaging about 10,200 per year. On the other hand, the *rate* of violent crimes per 100,000 residents steadily decreased from a high of 947.3 in 1996 to 629.3 in 2004, and increasing to 710.8 in 2006.

Exhibit 1- 1: Phoenix Part I Violent Crimes, 1996-2006

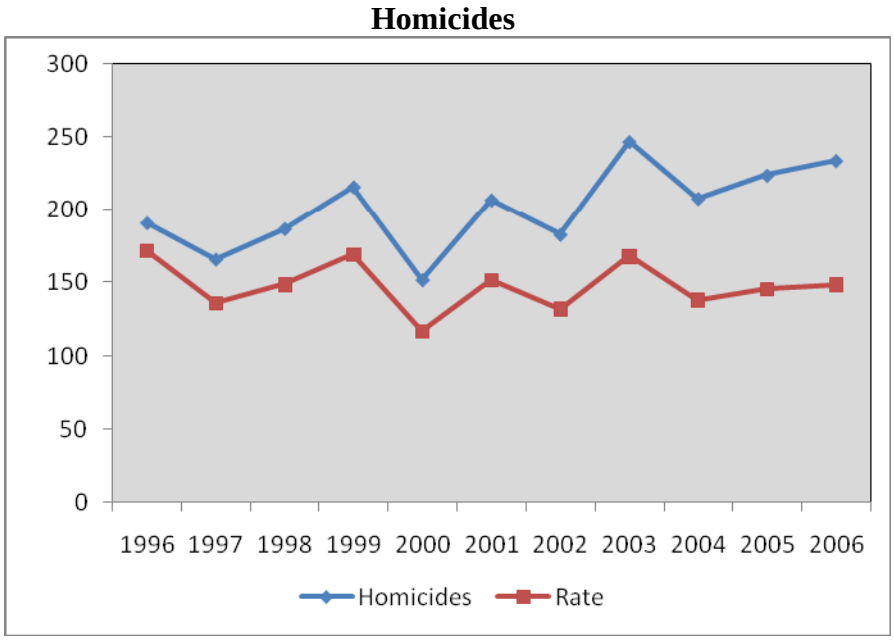


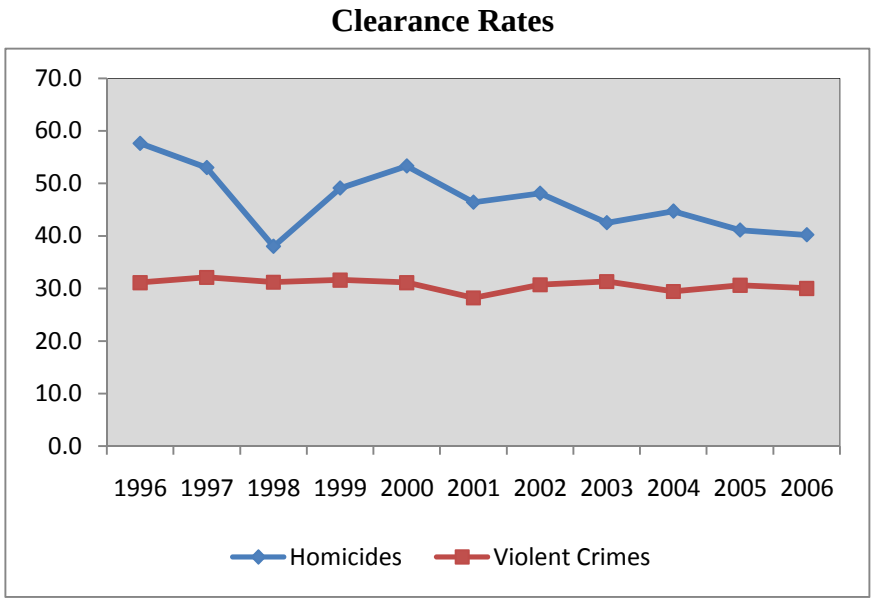
Source: Phoenix Police Department UCR Violent Crimes History
Violent crimes include homicides, sexual assaults, aggravated assaults, and robberies.

NOTE: The number of violent crimes has been divided by 10 in this exhibit for easier comparison with the rate of violent crimes.

Exhibit 1-2 indicates that homicides stayed steady until 2000 and increased over the next six years. The increase from 152 homicides in 2000 to 234 homicides in 2006 represents a significant change of 53.9 percent. However, the bottom line in the exhibit for homicides reflects the fact that the homicide rate has stayed constant over the 11 years at an average of 148 homicides per million residents. From a national perspective, the homicide rate in Phoenix is

Exhibit 1- 2: Homicides and Clearances in Phoenix, 1996-2005





Source: Phoenix Police Department UCR Violent Crimes History

slightly higher than the rate of 116 for cities with more than one million residents; however, the rate is much higher than for the state of Arizona at 75 and the overall national rate of 56 homicides per million residents.

The bottom portion of Exhibit 1-2 gives clearance rates for violent crimes and for homicides. For violent crimes, clearance rates remained steady over the 11-year period, averaging around 31 percent per year. Clearance rates for homicides show a generally declining picture starting at 57.6 percent in 1996 and decreasing to 40.2 percent in 2006. The three years encompassing the Phoenix Clearance Project (2003-2005) had clearance rates below 45 percent—a subject explored in greater depth later in this evaluation report.

In summary, the Phoenix Homicide Clearance Project arrived at an opportune time for the department. Homicides were increasing, while clearance rates were decreasing. Assignment of crime scene specialists to the homicide unit was expected to relieve investigator workload with the expectation that clearances for the two experimental squads would improve.

Overview of the Report

The audiences for this evaluation report include supervisory personnel in homicide investigations, homicide investigators, crime laboratory personnel, researchers, and evaluators. The report is divided into three volumes. This volume describes the department's Homicide Clearance Project with concluding chapters on results from the process and impact evaluations. Volume II provides additional research conducted on homicides in Phoenix. Based on data collected for the evaluation, it contains chapters on comparisons of characteristics of homicides in Phoenix with other studies, a detailed description of evidence collected at homicide scenes, an analysis of closed cases, and a review of prosecutorial outcomes. Volume III is devoted to the role of forensic evidence in trials for defendants accused of 1st or 2nd degree murder. The volume includes a description of the court process in Maricopa County and an analysis of forensic evidence presented at trials.

The remainder of this volume is organized as follows.

Chapter 2: Literature Review

This chapter provides background on the nature of homicide investigations, prior research in homicide investigations, types of forensic evidence associated with homicides, and the role of forensic evidence in investigations and prosecution. The literature reviewed in this project is limited to studies that played a role in the development of ILJ's evaluation approach.

Chapter 3: Organizational Structure for Homicide Investigations

This chapter provides information on the organization of the Phoenix Police Department with an emphasis on investigations of homicide. A description is provided of the Investigations Division and Laboratory Service Bureau. The protocol for investigation of homicides is then described.

Chapter 4: Evaluation Design

Based on the two previous chapters on literature review and investigative process, this chapter details ILJ's evaluation design. As discussed in this chapter, the evaluation consists of a process and impact evaluation. The process evaluation assesses how well the project was implemented and how well it operated during the course of the experiment, while the impact evaluation focuses on the net effects of the project. Because the design is a quasi-experimental, this chapter also discusses threats to the evaluation with analyses of how these threats have been minimized.

Chapter 5: Process Evaluation

Topics addressed in the process evaluation include the selection and training of the four crime scene specialists, how the experiment was conducted, an analysis of scene activities by the crime scene specialists, and selected performance measures comparing scene activities of investigators and crime scene specialists.

Chapter 6: Impact Evaluation

This chapter provides an evaluation of the impact of the Homicide Clearance Project on homicide clearance rates and other key performance measures. It includes descriptions of specific cases in which the crime scene specialists play important supporting roles in the

investigations. Results of a survey of homicide investigators are provided in the chapter to support the assignment of crime scene specialists to the unit, and results of an assessment of the quality of scene reports are provided.

Chapter 7: Conclusions

The final chapter of the report summarizes what has been learned by the evaluation of the Homicide Clearance Project. It includes suggestions for future research.

Chapter 2

Literature Review

Introduction

Before developing its evaluation design, ILJ reviewed a considerable amount of literature on homicide investigations, evidence collection, forensic analysis, prosecution, and related topics. This chapter highlights the research reports, journal articles, and other publications that ILJ found beneficial in developing the framework for the evaluation.

Homicide Investigations

Numerous books and guides are available on the general topic of criminal investigations (Burstein, 1999; Gilbert, 2000; Swanson, Chamelin, & Territo, 2003), on the specialization of homicide investigation (Baden & Hennessee, 1990; Eliopulos, 2003; Geberth, 2002; Randall, 1997), and on techniques of crime scene investigations (Fisher, 2002; James & Nordby, 2004; Lee, 2002; Platt, 2003a). Publications on criminal investigations provide information on how to conduct investigations on property crimes (e.g., burglary, auto theft, and arson) and crimes against persons (e.g., homicide, sex offenses, and assaults). They generally emphasize the procedural aspects of investigations, while publications on homicide investigation focus on approaches for different types of homicides that an investigator faces, such as drug-motivated homicides, deaths of children, gang-related homicides, and others. The importance of the medical examiner in determining the cause of death and providing insights into how an incident may have occurred are a particular emphasis in these publications.

Publications devoted to crime scene investigations describe specific techniques that crime scene specialists and forensic scientists employ. They include techniques for gathering impressions (latent fingerprints, tool marks, tire marks, and bite marks), forensic biology evidence (blood, semen, saliva, and hair), trace evidence (paint, glass, and fibers), and weapons evidence (firearms, knives, casings, and projectiles). In addition, they provide guidelines on the preparation of scene documentation through photographs, scene diagrams, and supplemental

reports. Finally, preservation of evidence and chain of custody are major considerations in these publications.

This literature emphasizes that a crime scene investigation should be a methodical, systematic, and orderly process. The apparently simple task of establishing and protecting the boundaries of a crime scene turns out to be one of the most difficult (Ramsland, 2001), with setting up inner and outer perimeters as a common approach (Dempsey, 2003). Taking command at a homicide scene requires the coordinated efforts of the first responding patrol officer and responding investigators (usually the first investigator on the scene).

As illustrated in Exhibit 2-1, patrol officers and investigators have specific roles to play at the scene. Responsibilities of responding investigators assume that a crime scene specialist is present to assist at the scene. Investigators can then devote the maximum amount of time to on-scene activities, such as interviewing witnesses, making assignments to other investigators, and coordinating with other personnel at the scene (patrol officers, medical examiner, and emergency medical technicians). In addition, overlapping responsibilities can exist between patrol officers and investigators; for example, investigators may ask officers to search for weapons, interview neighbors, and assist in getting information from bystanders.

Exhibit 2- 1: Homicide Scene Command Responsibilities

Patrol Officer	Responding Investigators
1. Record exact time of arrival. 2. Enter immediate scene carefully. 3. Check for survivors and render first aid. 4. Secure and define the entire homicide scene. 5. Isolate a perimeter with barriers. 6. Isolate witnesses and remove others from immediate area. 7. Request backup, as needed.	1. Record exact time of arrival. 2. Interview witnesses. 3. Canvass the area. 4. Interview first officer and other police at the scene. 5. Record names, addresses, and telephone numbers of bystanders. 6. Arrange transport of witnesses to headquarters, as needed.

NIJ's publications on crime scene investigation (Dempsey, 2003; Technical Working Group on Crime Scene Investigation, 2000) give a good overview of tasks to be completed for collection and submission of evidence. The tasks include:

- Maintain scene security throughout processing and until the scene is released.

- Document the collection of evidence by recording its location at the scene, data of collection, and who collected it.
- Collect each item identified as evidence.
- Establish chain of custody.
- Obtain standard/reference samples from the scene.
- Obtain control samples.
- Identify and secure evidence in containers at the crime scene.
- Document the condition of firearms/weapons prior to transporting them.
- Transport and submit evidence items for secure storage.

In summary, patrol officers, investigators, crime scene specialists, forensic scientists, and medical examiners contribute to successful investigative outcomes.

Homicide Clearances

Factors Affecting Clearances

Several researchers have conducted studies on the relationship between homicide clearances and a variety of victim, incident, and situational characteristics. A consistent finding is that the likelihood of clearances increases for cases involving younger victims (Addington, 2006; Alderden & Lavery, 2007; Lee, 2005; Litwin, 2004; Mouzos & Muller, 2001; Puckett & Lundman, 2003; Regoeczi, Kennedy, & Silverman, 2000; Wolfgang, 1958), cases with female victims (Addington, 2004; Lee, 2005; Regoeczi et al., 2000) and homicides occurring inside a premise (Addington, 2006; Alderden & Lavery, 2007; Litwin, 2004; Mouzos & Muller, 2001; Wellford & Cronin, 1999; Wolfgang, 1958).

The influence of victim's race on clearances has received mixed reviews by researchers. Two studies (Alderden & Lavery, 2007; Lee, 2005) found higher clearance rates when victims were white, while other studies (Litwin, 2004; Puckett & Lundman, 2003; Roberts, 2007; Wellford & Cronin, 1999) found no differences in clearance rates between races. A longitudinal study (Litwin & Xu, 2007) across three decades determined a trend in which cases with Latino and African-American victims were less likely to be cleared in the most recent decade (1986-1995).

Other studies focused on relationships between the organization of investigations and case outcomes (Chaiken, Greenwood, & Petersilia, 1977; Eck, 1992; Greenwood & Petersilia, 1975; Puckett & Lundman, 2003). Results from the Chaiken, et al. (1977) study included two important findings. First, homicide clearances are unrelated to investigator experience, and second, clearance rates decrease as caseloads increase.

Wellford and Cronin (1999) examined 798 homicides from four large cities during 1994 and 1995. In total, 589 (74 percent) cases had been solved and 209 (26 percent) were unsolved at the time of the data collection. A total of 215 factors related to the characteristics of the case and its investigation were examined to determine their relationship to the status of the case (solved or unsolved). Through an extensive bivariate analysis, they identified 22 variables that contributed to the successful closure of homicides. One of these factors was that the first officer on the scene notifies the homicide unit, medical examiner's office, and crime lab. However, this factor was not found to be significant in their multivariate analysis. In that analysis, 13 variables were identified as significant in closing a case (Wellford & Cronin, 1999):

Factors Within Police Control

- A body chart of the victim was prepared.
- A computer check on the decedent was conducted.
- A computer check on the suspect was conducted.
- A computer check on a witness was conducted.
- The local Criminal Justice Information System (CJIS) was used for computer checks.
- Friends and acquaintances of the victim were interviewed.
- Neighbors of the victim were interviewed.
- Three or more detectives were assigned to the case.

Factors Outside Police Control

- The race of the offender
- A witness at the crime scene provided valuable information.
- The location of the homicide was private.
- An eyewitness observed the homicide.
- The homicide was not drug-related.

Note that none of the factors, with the possible exception of a body chart, is related directly to the activities of a crime scene specialist at the scene. Moreover, Wellford and Cronin

(1999) concluded that physical evidence collected at the scene was the most important reason in closing a case in only 1.9 percent of the cases across the four cities.

The Decline in Homicide Clearance Rates

Several research studies have attempted to identify reasons for the decline in clearance rates for homicides over the last 20 years. According to statistics from the FBI's Uniform Crime Reports, clearance rates have decreased from 72.1 percent in 1980 to 67.4 percent in 1990 and to 60.7 percent in 2006.

The IACP Murder Summit (1995) concluded that the decline in clearances was due to an increase in stranger-to-stranger homicides, gang-related homicides, drug-related homicides, and handgun availability. Varano, et. al (2004) conducted a study that differentiated between peripheral drug homicides and drug-motivated homicides. Peripheral drug homicides were those in which drugs were present at the scene or were being used by the victim or offender but were not the central causal feature of the event. Drug-motivated homicides were those in which the sale or use of drugs was the primary cause. They found that variables indicative of risky lifestyles (e.g., victim's prior evidence of drug abuse or prior arrest for drug offenses) were significant predictors of the two types of drug homicides.

More recent research (Cardarelli & Cavanaugh, 1992; Riedel & Rinehart, 1994) has offered reasons for the recent declines in homicide clearances. These are generally categorized as follows (Wellford & Cronin, 1999):

- **Changes in the nature of homicide**: In recent years, more stranger-to-stranger homicides have occurred with fewer crimes of passion between family members or close acquaintances.
- **Change in the nature of police resources**: Police resources in recent years have been stretched, with the result that fewer resources can be devoted to police investigations.
- **Changes in bystander behavior**: The willingness of citizens to cooperate with police may have decreased. Fearing retaliation, bystanders are less likely to act as witnesses.

Litwin and Xu (2007) examined the decrease in clearance rates in Chicago from 1966 to 1995. They examined differences across three 10-year time periods (1966-1975, 1976-1985, and

1986-1995) and concluded that victim's race and firearm usage accounted for some of the decrease in homicide clearance rates. In particular, they found that

> Dramatic increases in the number and proportion of homicides involving African American or Latino victims are some of the most important changes in homicide events that may explain the overall decline. Cases with either African American or Latino victims have a significant negative relationship with clearances in the most recent time period and a weaker, or no, relationship in the first two periods. Furthermore, firearm use in homicides increases 13.6% from the first to the third time periods and has a strong negative relationship with clearances in the most recent time period. (p. 110).

Whodunits and Self-solving Homicides

Several studies (Innes, 2003; Puckett & Lundman, 2003; Simon, 1991) have differentiated between *whodunits* and *self-solvers*. A *whodunit* is a genuine mystery in which the identification of the offender will require a substantial amount of time and effort (e.g., a body found in an alley with no identification), while in a *self-solving* or *dunker* homicide the offender is easily identified (e.g., a husband who calls the police after killing his wife).

Innes (2003) describes the differences as follows:

> The ideal type self-solvers are those cases where the suspect calls the police to the scene, where they then confess to the crime, and where there are substantial amounts of forensic evidence, as well as witnesses of some kind who can confirm elements of the suspect's story. Basically then, the necessary evidence is presented to the police during their preliminary investigation. At the other extreme is the 'pure' whodunit model, which would be typified by those cases where there is little or no forensic evidence available and there are no witnesses to the crime. In such situations, the police could not definitively interpret the situation so as to establish a clear sense of what had taken place and who was likely to have been involved.

He classifies the 20 cases in his study along a continuum between these two extremes and examines differences in investigative activities from one type to another.

Puckett & Lundman (2003) examined 802 homicide cases occurring in Columbus, Ohio between 1984 and 1992. They identified 187 "dunker clearances" consisting of 16 exceptional clearances due to the suicide by the person responsible for the homicide and 171 cases in which an arrest took place on the same day as the homicide. Characteristics of the remaining 615

"whodunit" cases (both open and closed) were compared against complete set of 802 homicide cases. With these definitions, cases more likely to be solved were those with victims under 14 years of age, domestic homicides, felony homicides, fights/arguments, and involuntary manslaughter. Whodunits occurring in integrated census tracts and predominantly black census tracts were less likely to result in arrest.

Time to Clearance

Other studies (Lee, 2005; Regoeczi & Jarvis, 2005; Roberts, 2007) have looked at the elapsed time between the start of an investigation and arrest of a suspect. With 1998 data from the national NIBRS system, Regoeczi & Jarvis (2005) determined that about 55 percent of homicides were cleared within seven days and about 62 percent within a month. Factors affecting the time to clearance were found in a logistic regression model to be whether the victim was a juvenile, whether the homicide took place outside, and whether the incident involved an argument between parties. Lee (2005) found in her examination of homicides committed in Los Angeles County between 1990 and 1994 that homicides were cleared quicker when (1) the victim was white, female, and under 20 years of age, (2) the case was handled by the Los Angeles Police Department or Los Angeles Sheriff's Department, and (3) the amount of media attention (stories in the *Los Angeles Times*) given to a case was extensive.

An analysis of homicides in Washington, D.C., (Groff & McEwen, 2006) found significant differences in the elapsed time to clearance depending on the underlying motives of homicides. Based on a three-year sample of 248 closures, ILJ found that the median time between homicide and closure was 30.5 days. However, most homicides with domestic violence were solved on the day of the occurrence, while gang-related homicides had a median elapsed time of 208 days. Between these extremes were medians of 21 days for homicides due to arguments, 115 days for drug-related homicides, 50 days for retaliation homicides, and 49 days for homicides with robberies. These differences reflect the time that investigations sometimes take to follow all leads and obtain the evidence needed for an arrest and conviction.

Prosecution of Offenders

The study by Wellford and Cronin (1999) did not look at the relationship between their identified contributors to the eventual prosecution of arrested suspects. As with virtually all other studies, they defined a case as cleared when the police department determined there was

sufficient evidence that the arrested person committed the offense. Determinations by the prosecutor to move forward with the case and results of the prosecution were not included in their analysis.

Using data from prosecutors' files in a sample of 33 counties, Baumer, Messner, and Felson (2000) found that homicides of disreputable or stigmatized victims tend to be treated more leniently by the criminal justice system. In addition, they found that the effects of victim characteristics are stronger in jury proceedings than in bench proceedings, and that the influence of a victim's race on the disposition of murder cases is related to the racial composition of the county. A more recent exploratory study (Riedel & Boulahanis, 2007) looked at exceptional clearances using data from Chicago from 1988 through 1995. The researchers analyzed arrests in which the prosecution declined to prosecute. Based on bivariate and logit analysis, they concluded that cases not prosecuted were primarily domestic altercations or other types of altercations.

Forensic Evidence

For purposes of this evaluation report, we view *evidence* as anything that can be submitted in a court of law to serve as proof of an alleged matter or act under investigation before it. Evidence can be divided into two broad categories: (1) testimonial evidence and (2) physical, or forensic, evidence. *Testimonial evidence* takes the form of statements made under oath, usually in response to questioning. *Forensic evidence* is any type of evidence that has shape, size, and dimension to it (Fisher, 2004). Forensic evidence can be as large as a building or as tiny as a fiber. Predominant forms of evidence in criminal cases are fingerprints, latent prints, bloodstains, drugs, drug paraphernalia, shoe prints, vehicles, dust, dirt, cigarettes, hair, firearms, spent projectiles, clothing, glass, and many others. Forensic science is the analysis of forensic evidence, and includes disciplines such as toxicology, ballistics, fingerprint analysis, document analysis, DNA characterizations, computer forensics, entomology, and others.

The collection of forensic evidence and the application of forensic sciences have become essential to criminal investigations. Fisher (2004) describes several roles that forensic evidence plays in criminal investigations:

- 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.
- Accelerate the process since suspects confronted with physical evidence (or results from its analysis) may make admissions or even confess.
- Establish the facts of what happened, as forensic evidence may be more reliable than eyewitnesses.

In short, forensic evidence is an integral part of the criminal justice process, especially as it relates to homicide investigations. 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. Jurors expect forensic evidence to be presented in homicide cases, 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 made by defendants.

The field of forensic science has come a long way since the Chinese used fingerprints as early as the 700's to establish the identity of documents and clay sculptures (Platt, 2003b). In 1975, the FBI introduced its Automated Fingerprint Identification System (AFIS), installing 10-print card readers for computerized print matching. The FBI now maintains the Integrated Automated Fingerprint Identification System (IAFIS), a nationwide fingerprint and criminal history system. The Arizona Automated Fingerprint Identification System (AZAFIS) is maintained by the Arizona Department of Public Safety. Its database contains approximately 3 million fingerprint cards of persons arrested by law enforcement agencies within the state. Agencies can search electronically against the database with automated fingerprint and latent fingerprint identifications. After searches have been made against the AZAFIS database, they are automatically submitted electronically to the IAFIS to be searched against the national fingerprint database.

One of the earliest studies of criminal investigative process (Greenwood & Petersilia, 1975) made two conclusions that still appear to be true today in regard to forensic evidence. The first was that more forensic evidence is collected at scenes than can be productively processed.

Their belief was that more resources should be devoted to increasing the processing capabilities of a department as a way of increasing clearance rates. The second conclusion was that latent prints rarely provide the only basis for identifying a suspect. Using comparisons among fingerprint identification sections in four participating departments, they found that between four and nine percent of all latent prints are eventually matched with a suspect's prints.

A more recent advancement has been 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 5 million convicted offender profiles. Databases for DNA profiles are developed at the local (LDIS), state (SDIS), and national (NDIS) level with different criteria for collected at each level. The tiered approach allows state and local agencies to operate their databases according to their specific legal requirements. The FBI's key performance measure for CODIS is the number of "investigations aided." Their statistics show that as of April 2006, CODIS has had 32,500 hits assisting in 34,100 investigations. Their measure of success is of interest because it focuses on the establishment of an evidentiary fact, rather than on whether the match led to arrest and conviction.

A somewhat pessimistic view of DNA databases (Tracy & Morgan, 2000) concluded that DNA databases would not be greatly successful in increasing the extent to which police solve the vast majority of serious crimes. One of their reasons for the conclusion was that law enforcement already solved the majority of murders, rapes, and aggravated assaults. Interestingly, since the publication of that article, clearance rates have decreased for these offenses so that DNA databases may become increasingly important. That is, it could be concluded from their argument that as clearance rates decrease, the importance of DNA databases increases. Their second argument was that property crime scenes were not likely to have DNA evidence for analysis with the result that the DNA databases would not be beneficial in solving these crimes. To an extent, their conclusions have proved to be correct, although with advances in the DNA field, more DNA evidence may be collected and analyzed from property crime scenes. Analysis of DNA evidence from property crimes increasingly is leading to arrests and clearances (National Institute of Justice, 2006).

Forensic evidence is not without its controversies and problems. Fingerprint identification has recently been challenged as a "law-made science" that has not been scientifically validated (Cole, 2006). Media attention has been brought to the issue after the false arrest of Brandon Mayfield for a bombing in Madrid, Spain. A latent print found at the scene was incorrectly matched to Mr. Mayfield. He was released after two weeks of questioning, and the FBI subsequently issued an official apology for the misidentification. His release took place after police in Spain correctly matched the latent print to an Algerian national, Ouhnane Daoud.

A problem with use of CODIS is that many states have a backlog of biological samples (usually saliva samples) from convicted felons that have not been processed for DNA characterizations and entered into CODIS. In fact, NIJ has played an important role in the President's DNA initiative, *Advancing Justice Through DNA Technology*, which is a planned five-year, $1 billion commitment to improve the nation's capacity to use DNA evidence.

Many books and articles have been written on how forensic evidence has led to the arrest and prosecution of criminals (Block, 1969; Corwin, 2003; Evans, 1996; Lee, 2002; Lee & Tirnady, 2003; Platt, 2003b; Ragle, 2002; Ramsland, 2001; Snow, 2005). Virtually all these publications describe individual cases in which forensic evidence was essential to their eventual solutions. So it is that we read about the first man in the world whose fingerprints led to his conviction (for stealing billiard balls in 1902), the thief who was identified because he left his fingerprints on an FBI bulletin when he robbed an agent's house, and the latent print that identified a killer through an AFIS match (Platt, 2003b; Ragle, 2002).

We learn how DNA analysis is solving cases through DNA characterizations from small samples of blood, saliva, hair, and semen (Lee & Tirnady, 2003). Offenders are identified through matches in CODIS or when their DNA profiles match profiles from an item of forensic evidence at a scene. Equally important, we know that DNA analysis can prove the innocence of a suspect by showing two DNA profiles do not match, and as previously mentioned, we know that DNA can exonerate people who have been wrongly imprisoned (Connors, Lundregan, Miller, & McEwen, 1996).

In addition to printed media, several television programs—most notably, the *CSI* series with its spin-offs—have captured the imagination of the public. In these shows, cases are presented, forensic evidence is collected, analyses are completed, and arrests are made all within

the short span of an hour. The 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 effect has drawn attention to the importance of crime laboratories at the national, state, and local levels. On the negative side, it creates an illusion that forensic analysis has virtually unlimited capabilities and is quickly accomplished.

In June 2005, the Maricopa County Attorney's Office conducted a survey of 102 prosecutors with jury trial experience (Maricopa County Attorney's Office, 2005). They were asked about their experiences with jurors seeking irrefutable physical and scientific evidence and their perceptions of a possible "CSI effect" among juries. The study found a significant CSI influence in Maricopa County juries:

- 38 percent of prosecutors believed they had at least one trial which resulted in either an acquittal or hung jury when forensic evidence was not available to corroborate testimony that should have been sufficient by itself to sustain a conviction.
- 74 percent of Maricopa County prosecutors maintained they have prosecuted a case in which the jury "expected to be presented with scientific evidence."
- When both scientific and non-scientific evidence existed, 45 percent of prosecutors felt "the jury focused so much on presented scientific evidence that they paid to little attention to unscientific evidence" such as witnesses and police testimony.
- One attorney observed, "Jurors always want fingerprints or some sort of scientific evidence to convict even with a full confession."
- 52 percent of prosecutors have engaged in plea negotiations in which they felt the defendant may have received a more lenient plea offer because of anticipated problems with the CSI effect if the case were to be presented to a jury.
- 90 percent of surveyed prosecutors explain to juries why police might not collect the kind of evidence depicted in television shows. Seventy-five percent try to have fingerprint or other expert witnesses available to counter the effects on juror perceptions created by forensic crime television shows.

Putting books, articles, and CSI aside, the criminal justice literature does not include extensive studies on forensic evidence. Information is not readily available on how much forensic evidence is collected at different types of crime scenes and how many crime scenes produce forensic evidence.

A study conducted in the mid-1980s (Peterson, Ryan, Houlden, & Mihajlovic, 1987) did address the relationships of forensic evidence to the adjudication of felony cases. That study made the following observations:

- 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.

Their study was conducted in four cities (Peoria, Illinois; Chicago, Illinois; Kansas City, Missouri; and Oakland, California).

Types of Forensic Evidence

Several forensic experts (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. A typical typology, based on Fisher (2004) and Lee, Palmbach, & Miller (2004), is as follows:

- **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).
- **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 biological 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.
- **Firearms Evidence**: Firearms evidence consists of *firearms* (handguns, rifles, assault weapons, etc.), *ammunition* (e.g., spent casings, fired projectiles, bullet fragments, and unfired bullets), and *gunshot residue (GSR)* tests. The purpose of

a GSR kit is to determine whether an individual was close to a firearm at time of discharge.

- **Drug Evidence**: Drug evidence includes *drugs* (e.g., marijuana, cocaine, methamphetamine, and others), and *drug paraphernalia* (pipes, spoons, etc.) found at a scene.
- **Clothing**: Articles of clothing frequently become evidence in a case, especially with violent crimes. Experts differ on how clothing is classified, sometimes listing clothing as trace evidence and sometimes as "objects" from a scene. We are listing it separately as a type of evidence because of its frequency in violent crimes, but it should be noted that clothing is sometimes the source of biological and trace evidence.
- **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.
- **Other Evidence**: Other evidence is a catch-all category for evidence that does not fit any of the above categories. Typical examples are beer bottles, cell phones, blankets, questioned documents, and flammable fluids.

Sources of Forensic Evidence

Lee, et. al (2004) define a *primary scene* as the location where the criminal act occurred and any subsequent scenes as *secondary scenes*. For homicides, the primary scene is where the homicide took place, while secondary scenes include autopsies, hospitals, vehicles, residences, and many others. With some homicides, the location where the victim is found dead is not the location where the homicide occurred. For example, a person may be killed in his or her home, and the body dumped in an isolated spot. Lee, et. al (2004) would consider the location where the body was found as a secondary scene. In some cases, the primary scene may never be determined.

The designation of primary and secondary scenes is important in our evaluation of the Phoenix Homicide Clearance Project because forensic evidence accumulates from different locations as an investigation progresses. Crime scene specialists are called to collect forensic evidence from hospitals, vehicles, residences, and other locations during an investigation. Forensic analysis of evidence from secondary scenes can be important in advancing an investigation.

The distinction between primary and secondary scenes brings forth the need to differentiate between *scene* evidence and *case* evidence. Scene evidence refers to the forensic

evidence collected at a specific scene, regardless of whether the scene is a primary or secondary scene. Case evidence refers to the collective set of forensic evidence collected at all primary and secondary scenes in a case.

Probative Value of Forensic Evidence

In law, evidence has probative value if it tends to prove something (Garner, 2004). Thus, testimony that is not probative (does not prove anything) is immaterial and not admissible or will be stricken from the record if objected to by opposing counsel. Similarly, items of forensic evidence with analysis must prove something of relevance. Forensic evidence must establish evidentiary facts to be beneficial.

A latent print has probative value when (1) a "hit" is obtained through AFIS, thereby identifying a person of interest or (2) the latent print matches the fingerprints of someone from the scene. Similarly, a bullet has probative value if it is found to have been fired from a firearm recovered from a suspect's residence. Exhibit 2-2 provides additional examples of outcomes that have probative value. Items of forensic evidence with probative value provide successful evidence outcomes on cases.

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

It should be noted that the potential outcomes in Exhibit 2-2 reflect both the *collection* and the *analysis* of forensic evidence. Improper collection of items of evidence can lead to a result of no probative value even with the best efforts of forensic scientists. The role of crime scene specialists in careful collection of evidence has not received much attention in research studies. On the other hand, proper handling and analysis of forensic evidence must be accomplished in order to produce results of probative value. Forensic scientists play a major role in ensuring that evidence is properly analyzed.

Exhibit 2- 2: Potential Outcomes for Collection and Analysis of Forensic Evidence

Result Has Probative Value	No Probative Value
Latent Prints	
- Latent prints entered into AFIS with positive identification to (person's name)	- Latent print is not of sufficient quality for analysis.
- Latent print from Item A matches the fingerprint of (person's name)	- Latent print was entered into AFIS with negative result.
Ballistics (firearms, casings, spent projectiles, GSR)	
- Bullet is of a weight, caliber, and construction normally found in (weapon type) ammunition.	- Casing was damaged and could not be analyzed.
- The set of casings were entirely consistent with having been fired in the same firearm.	- Firearm was not operational and could not be fired.
- Casing information was entered into NIBIN with positive identification.	- Bullet had too many fragments to be analyzed.
- Particles containing lead, a component known to be indicative of GSR, was detected by the GSR kit.	- GSR kit was incorrectly administered.
- No smokeless gunpowder was detected.	
Drug Analysis	
- Partially burned hand-rolled cigarette contains marijuana in usable condition.	- Insufficient quantity of drug was present to perform analysis.
- Cocaine base residue was identified on the item.	- Drugs were damaged during transport.
- Methamphetamine residue was identified on the item.	
- No dangerous drugs or narcotic drugs were indicated on the item.	
DNA Analysis	
- The DNA profile was entered into CODIS with positive identification to (person's name).	- No DNA material was detected on the item of evidence.
- The DNA profile from Item A matches the DNA profile from Item B at amelogenin and 13 STR loci.	- There is insufficient sample for DNA analysis.
- A partial mixed profile was obtained from the item of evidence, with the following results ….	- A DNA characterization could not be developed.
- DNA results from the item were consistent with a female. No results or inconclusive results were obtained at the 13 STR loci.	- DNA profile was entered into CODIS with negative result.

Conclusions

The literature and past research on homicide investigations had a major impact on the evaluation design for the Homicide Clearance Project. Books on criminal investigations and especially on homicide investigations provided insight into how investigators proceed in the difficult task of solving homicides. Techniques for collecting evidence are covered in these general books on homicide investigations. Further, there are several books specifically devoted to evidence collection at crime scenes with chapters on homicide scenes. These books provided a basis for coding different types of evidence for the purposes of the evaluation.

Past research on homicide clearances was instructive for the evaluation in identifying key variables that related to successful clearances. These variables include victim demographics (age, race, and sex), availability of witnesses, incident location, and others. Studies on self-solvers and whodunits formed the basis for data collection on the circumstances surrounding the arrest of suspects during the Homicide Clearance Project. As described in this report, it was beneficial to expand to three categories (immediate arrest, quick action, and whodunits) for increased insight into clearances.

Time to clearance in this evaluation was determined by recording the time that the investigation started and the time of arrest. In this regard, the details provided in the supplemental reports were especially beneficial. The reports always included the time that the department's communication center received the first call about the homicide. The date and time of this call were recorded as the start of the investigation. In most cases, this time was a good approximation of when the homicide actually occurred; however, there are several cases in which the incident occurred hours, days, or even months before the first call to police.

A supplemental report is completed whenever an arrest for homicide is made. The supplemental report always included the date and time of the arrest, and this information was recorded for purposes of the evaluation. Time to clearance was then calculated as the elapsed time between the start of the investigation and time of arrest. As a technical point, the time of the first arrest was recorded for cases with multiple arrests.

Based on the available literature on forensic evidence, the evaluation design provided for the collection of details on evidence from homicide scenes and results from subsequent laboratory analysis of evidence. Information on evidence collected at the primary scene and all secondary scenes was included in the data collection for the evaluation. The role of forensic evidence is discussed later in this report.

Chapter 3

Organizational Structure for Homicide Investigations

Phoenix Police Department Organization

The Phoenix Police Department's 2,600 sworn personnel and 700 civilian personnel are divided into nine divisions headed by commanders reporting to an executive assistant police chief, who reports to the chief of police. The divisions within the department are:

- Patrol Operations South Division
- Patrol Operations North Division
- Patrol Support Division
- Investigations Division
- Technical Services Division
- Homeland Security Division
- Administrative Support Division
- Professional Standards Division
- Management Services Division

Approximately 70 percent of the sworn personnel are assigned to patrol operations, which are divided geographically into six precincts. Assistant chiefs head the Patrol Operations South and North divisions. The Patrol Support Division consists of the Traffic Bureau, Tactical Support Bureau, and Police Reserve Bureau. The Technical Services Division includes the Laboratory Services Bureau, Records and Identification Bureau, Communications Bureau, and Computer Services Bureau.

Investigations Division

The Investigations Division has four bureaus—Violent Crimes, Family Investigations, Drug Enforcement, and Property Crimes—with a commander heading each bureau. The Family Investigations Bureau is responsible for investigations of domestic violence, missing persons, adult sex crimes, and crimes against children. The Drug Enforcement Bureau has 16 sections for handling drug-related crimes ranging from dismantling methamphetamine operations to investigations of high intensity drug trafficking. It also includes the Repeat Offender Program aimed at identifying individuals who are likely to recommit a felony. Seven details comprise the Property Crimes Bureau: Auto Theft, North and South Investigations, Street Crimes, Document Crimes, Pawnshop and Metal Theft, and Special Projects.

Violent Crimes Bureau

The Violent Crimes Bureau (VCB) has separate investigative units for homicides, assaults, and robberies, all of which are supported by a unit of night detectives. The VCB includes a court liaison unit and a Gun Enforcement Squad. The Homicide Unit is headed by a lieutenant, and, at the start of this study, was divided into four squads, each headed by a sergeant, with each squad having five to seven detectives. Two support personnel assist with report preparation, family notifications, and a variety of other duties for the unit. As previously mentioned, the four crime scene specialists were assigned to two squads in July 2004, bringing the total complement to four sergeants, 34 investigators, four crime scene specialists, and two support personnel.

The four squads are not assigned to specific geographic areas but instead respond to homicides wherever they occur in the city. Investigators generally work from 7 a.m. to 3 p.m., Monday through Friday. Each day, a squad is designated to be available for any homicides that occur during the day (normal work hours and off-duty hours), and squads are designated for coverage on Saturday and Sunday. Because homicides frequently take place during weekends or early morning hours, it is not unusual for investigators to be called at home to report to a homicide scene.

Night detectives within the bureau are responsible for investigating violent crimes that occur primarily during the busy evening and early morning hours (6 p.m. – 4 a.m.) on days with historically higher numbers of crimes (primarily weekends). The unit consists of two sergeants and seven investigators. Night detectives respond to homicide scenes occurring during their work hours and may be assigned for the complete investigation of the homicide, especially when an arrest is made on scene. The usual procedure is that night detectives may assist with the initial investigation at the scene with follow-up responsibility for the case assigned to an investigator in the Homicide Unit.

Another important unit within the VCB is the International Crime Apprehension Team (ICAT), consisting of a sergeant, five detectives, and a police assistant. ICAT assists investigators on murder cases involving suspects from Mexico who have fled the United States to avoid prosecution. Working with the Maricopa County Attorney's Office and the State Attorney General's Office, the unit presents cases to the Federal Prosecutors Office in Mexico

for prosecution under Article IV of the Mexican Penal Code. Article IV provides for prosecution and punishment of a Mexican suspect in the Republic of Mexico if the suspect meets the following criteria: (1) an arrest warrant exists for the suspect; (2) the suspect is in Mexico; (3) the suspect has never been tried for the crime; and (4) the crime to be charged is a crime in both countries. The ICAT unit has helped the Homicide Unit with locating suspects in Mexico and encouraging their arrest and prosecution by Mexican police officials.

Laboratory Service Bureau

The Laboratory Service Bureau plays an important role in the investigation of homicides in Phoenix. The bureau has additional significance for this evaluation because evidence collected by investigators and crime scene specialists may eventually be analyzed by latent print examiners and forensic scientists. The bureau consists of over 100 professional staff divided into eight specialized sections: Evidence Processing, Latent Prints, Crime Scene Response, Forensic Biology, Controlled Substances, Question Documents and Trace, Toxicology, and Firearms. The lab has been certified by the American Society of Crime Lab Directors (ASCLD), a national organization that has established rigorous standards for laboratory procedures.

Primary responsibilities for the sections are as follows:[4]

- **Crime Scene Response Section**: Crime scene specialists assigned to the section photograph crime scenes, as well as identify, collect, and preserve physical evidence that may be present at the scene (with the exception of homicide scenes).
- **Latent Prints**: The Latent Print Processing Section consists of evidence technicians and latent print examiners who perform examinations on physical evidence submitted from crime scenes and recover latent prints from glass, plastic, paper, metals, and other surfaces. Latent print examiners evaluate latent prints submitted by field officers and crime scene specialists from crime scenes. The Latent Print Comparative Section performs comparisons between latent prints and known latent prints from individuals. They take advantage of the Arizona Automated Fingerprint Identification System (AZAFIS).
- **Firearms Section**: This section examines firearms, ammunition, and related evidence. Examinations include comparisons of fired bullets and cartridge casings to suspect weapons, function testing firearms, bullet and casing examinations to determine weapon types, muzzle-to-target distance determinations, and gunshot residue analysis.

[4] See http://phoenix.gov/POLICE/lab1.html.

- **Comparative Analysis Section**: This section analyzes and compares physical evidence, normally microscopic in size, that has been transferred from one item or person to another. Evidence often consists of hairs, fibers, paint chips, glass fragments, and similar items.
- **Toxicology Section**: The toxicology section is responsible for blood alcohol determinations, testing of toxic vapors, and identification of drugs, poisons, and other substances in bodily fluids.
- **Evidence Processing Section**: This section prepares evidence for analysis and determines whether additional analysis can be performed. It includes the determination of whether sufficient DNA material is available from an item of evidence for subsequent DNA profiles.
- **Forensic Biology Section:** This section has primary responsibility for development of DNA profiles and comparison of profiles to known standards. The type of material typically examined includes blood, semen, and saliva. The lab is linked to CODIS.

Homicide Investigation Process

The Phoenix Police Department has established a formal protocol for homicide investigations. With most homicides, patrol officers are the initial responders. Several calls about a homicide may be received by call takers in the communications bureau through its 9-1-1 emergency number. These are true emergency calls with travel time by patrol units averaging less than five minutes from the time of the call to arrival of officers at the scene. Responding patrol officers will immediately notify their field sergeant if they determine that a person has been killed or badly injured. The field sergeant, in turn, notifies the VCB front desk (staffed 24 hours a day), which then calls the appropriate homicide sergeant to respond with investigators to the scene. Crime scene specialists are also notified to respond to the scene; in addition, a prosecutor from the Maricopa County Attorney's Office is notified and frequently shows up. In most instances, investigators and crime scene specialists arrive between one and two hours after the initial call.

Paramedics from the Phoenix Fire Department are dispatched to the majority of homicide scenes in the city. Their rapid response is important because a victim may still be alive when 9-1-1 calls are received by the police department for response. The procedures for dispatching paramedics have been in place for many years. While no definitive study has been conducted, it can reasonably be concluded that many lives have been saved by their actions.

Patrol supervisors and officers have important responsibilities at a homicide scene. Duties of patrol officers, as directed by their supervisors, include the following:

- Identify any other victims who have been killed or injured.
- Secure the scene.
- Separate witnesses to avoid communication between them.
- List all persons present at the scene.
- Search for evidence (shell casings, weapons, etc.)
- Canvass the neighborhood to identify other witnesses.
- Obtain initial information from witnesses on what occurred.

In short, patrol supervisors and officers conduct a preliminary investigation of the incident that has taken place. They may call for deployment of a helicopter, K-9 officers with their dogs, and other department resources. The K-9 dogs will work with their handlers to track scents in the area with the aim of finding suspects. A department helicopter will search the area for suspects with the aid of strong search lights or trail a suspicious vehicle leaving the area. At many scenes, patrol officers may identify a suspect and make an arrest. In these instances, minimal contact and conversation is made with a suspect until a homicide unit investigator appears on scene.

After the investigative team and crime scene specialists arrive, a briefing is held, usually conducted by the patrol field sergeant. Until the briefing, the field sergeant is in charge and no one, including investigators, can enter the scene area or conduct interviews without the field sergeant's permission. The briefing provides investigators and crime scene specialists with what is known at that time about the circumstances of the incident, victim identification, known information about suspects, names of witnesses, and results from any searches or other activities by patrol officers. At the completion of the briefing, the scene is turned over to the investigative team. Patrol officers will remain to provide security making sure that no one enters the scene area and responding to questions from neighbors and other passersby. Generally, six or more patrol officers are positioned around the perimeter, with additional officers needed at larger scenes.

After the investigative team takes responsibility for the scene, the squad sergeant selects one investigator as the *case agent* and another investigator as the *scene agent*. These are

important assignments because the case agent will have primary responsibility for investigating the case to its conclusion, with the aim of arresting suspects and closing a case. The scene agent is responsible for collecting evidence at the scene, impounding the evidence at the department's property room, and preparing the scene report along with crime scene diagrams. For the experimental squads during the project's test period, the squad sergeant designated a crime scene specialist as the scene agent. Other investigators are assigned as needed to assist the case and scene agents.

Activities of homicide investigators during these initial hours include interviews with witnesses and suspects; preparation of search warrants for residences, businesses, and vehicles (as needed to comply with search and seizure laws); and identification of physical evidence at the scene. Investigators may spend many hours on these activities, especially when there are many witnesses to interview.

The general rule for scene agents is to collect all items of physical evidence that may be relevant to the investigation. Scene agents are encouraged to err on the side of collecting too much physical evidence rather than not enough. As discussed later in this report, a large amount of evidence is collected at homicide scenes, but case agents may request only a small portion of the evidence to be analyzed by forensic scientists.

Most homicide scenes require at least three investigators and a crime scene specialist to complete the scene investigation. A thorough search of the homicide scene must be made to identify and mark each item of physical evidence. The search may take several hours when, for example, the homicide occurred outside at night (a second search the next day during daylight hours may be necessary). Measurements from a point of origin to each item of evidence are taken to develop an accurate crime scene diagram.

Of particular importance in this project is that the follow-up activities of a homicide investigation can result in the assistance of crime scene specialists in many other situations. For example, investigators may obtain a search warrant on a suspect's residence, and a crime scene specialist will accompany investigators to collect and document evidence. Similarly, crime scene specialists assist in processing vehicles belonging to victims and suspects. These vehicles are usually towed to the department's impound lot for storage and evidence processing. Investigators may also ask crime scene specialists to photograph suspects at headquarters and

victims at hospitals. Finally, crime scene specialists will frequently testify in court on their evidence collection activities—what items of evidence were collected and how were they collected.

Chapter 4

Evaluation Design

Evaluation Topics

The Homicide Clearance Project had a primary objective of increasing clearance rates by assigning four crime scene specialists to relieve investigators of their evidence collection responsibilities. As a way of addressing the degree to which the project achieved this objective, ILJ developed several questions for the evaluation:

- Were the four crime scene specialists adequately trained to collect evidence at homicide scenes?
- What activities did the crime scene specialists perform at homicide scenes?
- How much investigative time was recovered because of the efforts of the crime scene specialists?
- Was the assignment of four crime scene specialists enough to have an impact on clearance rates?
- Did the crime scene specialists perform as well at homicide scenes as their scene agent counterparts in the comparison squads?
- Were case agents satisfied with the performance of the crime scene specialists?
- What were the organizational considerations for assigning crime scene specialists directly to the homicide unit?
- Was there an improvement in clearance rates in the experimental squads in relation to the comparison squads?

Answering these questions requires both a *process* and *impact* evaluation (Rossi, Freeman, & Lipsey, 2004; Shadish, Cook, & Campbell, 2002; Wholey, Hatry, & Newcomer, 2004). A process evaluation addresses issues about how well a project was implemented and how well it continued to function during an experiment. A process evaluation is a necessary precursor to an impact evaluation. A precondition for impact is that an intervention is actually implemented in a manner that could plausibly affect the intended objectives. Information about the quality and quantity of services provides information for incorporation with findings on what impacts resulted. An impact evaluation addresses the net effects of an intervention with the aim of determining whether a project attained its desired outcomes. Most impact evaluations involve

comparisons between results attained by those receiving an intervention against the results of those who continued to operate as in the past.

As discussed in the following section, the framework for the process and impact evaluations was to consider the Homicide Clearance Project as a quasi-experimental design consisting of experimental and comparison groups with baseline and test time periods. The design is more rigorous than other approaches, such as one-group designs and posttest designs, but not as strong as experiments in which subjects or cases are assigned randomly to experimental or comparison conditions. We argue in the next section that (1) the approach implemented in Phoenix closely approximates a randomization process because of the project's organizational arrangements and (2) a true experimental design would have been operationally impossible.

Quasi-Experimental Design

Design Considerations

Because of the assignment of the four crime scene specialists to two of the four investigative squads, an opportunity existed to consider the project as a natural experiment. In fact, the department's grant application envisioned such an approach in stating that the performance of the two squads with crime scene specialists would be compared with the other two squads, including comparisons of performance during the prior year. As far as the department was concerned, the main criterion for performance was clearance rate for homicides. With the additional personnel, the two squads with crime scene specialists should have better clearance rates than the other two squads, after taking their past performance on clearance rates into account.

Evaluators ideally want field tests where randomization determines whether a "subject" or "case" is assigned to the experimental or comparison group. If implemented correctly, random assignment creates two groups of subjects that are probabilistically similar to each other on average (Shadish et al., 2002). Any outcome differences (e.g., clearance rates) observed between the two groups are then likely to be due to the intervention, not to differences between groups that existed at the start of the study. Randomized experiments are held in such high

esteem that in a research area such as medicine the randomized experiment is often referred to as the "gold standard" for treatment outcome research.

The major drawback of randomized experiments is that they are costly and difficult to implement. The Homicide Clearance Project is an example of an experiment that for practical purposes could not be a randomized experiment. Randomization would have meant that a crime scene specialist would be assigned or not assigned to a case through a randomization process, such as flipping a coin with one side meaning a crime scene specialist is assigned and the other side meaning that an investigator would be designated as the scene agent to handle the evidence collection throughout the case. The four crime scene specialists would have been assigned on a case-by-case basis through a randomization procedure.

Two major problems would likely have resulted from a randomization process in the Phoenix Homicide Clearance project. The first is that a crime scene specialist would have a different supervisor depending on which squad was assigned to a case. There would have been no consistency of supervision for the crime scene specialist, which would have been in opposition to the department's desire to determine whether crime scene specialists could be successfully blended into the homicide unit. A more significant problem is that the interactions between crime scene specialists and investigators at crime scenes and the camaraderie that develops over time would have been more difficult under a randomization procedure. As described later in this report, several investigators in the experimental squads established good working relationships at scenes with crime scene specialists, and those relationships frequently resulted in efficient crime scene investigations.

Exhibit 4-1 depicts the quasi-experimental design that formed the basis for the evaluation of the Phoenix Homicide Clearance Project. In this exhibit, X represents the assignment of the four crime scene specialists to the experimental squads; O_1 represents observations about the comparison squads during the 12-month baseline period (July 1, 2003 – June 30, 2004); O_2 represents observations of the comparison squads during the test period (September 1, 2004 – June 30, 2005); O_3 represents observations of the experimental squads during the baseline period; and O_4 represents observations of the experimental squads during the test period.

Exhibit 4- 1: Quasi-experimental Design for Phoenix Homicide Clearance Project

Investigative Unit	Baseline Period	Intervention	Test Period
Comparison Squads	O_1		O_2
Experimental Squads	O_3	X	O_4

The primary outcome measure is, of course, the clearance rate for cases during the baseline and test periods. The clearance rate for the two groups of squads is determined for the baseline period, and then compared with their clearance rates during the test period. The expectation is that for cases during the test period, the experimental squads will do better than the comparison squads, after taking into account the performance of the two groups of squads during the baseline period.

Exhibit 4-2 shows the number of cases and victims for the four-cell design. In this exhibit, the experimental squads are the two squads that received the four crime scene specialists starting in July 2004, while the comparison squads continued to operate as in the past without the crime scene specialists. The comparison squads include two investigative squads in the homicide unit and night detectives. Night detectives were case agents in fewer than five percent of the total cases but are included as part of the comparison squads because they continued to operate as in the past with investigators designated as scene investigators.

Exhibit 4- 2: Evaluation Design—Pre/Post Experiment/Comparison Design

Investigative Unit	Baseline Period July 1, 2003 – June 30, 2004	Test Period September 1, 2004 – June 30, 2005
Comparison Squads	97 cases — 104 victims	84 cases — 90 victims
Experimental Squads	98 cases — 105 victims	83 cases — 93 victims
Total	195 cases — 209 victims	167 cases — 183 victims

In total, the evaluation included 362 cases with 392 victims (some cases had multiple victims) for the 22-month period. The baseline period has a higher number of cases and victims because it covers a 12-month period, while the test period was 10 months. With each period, the caseloads of the experimental and comparison squads are almost identical. During the baseline period, the two experimental squads handled 98 cases and 105 victims, while the comparison squads had 97 cases and 104 victims. During the test period, the experimental squads were assigned 83 cases with 93 victims, and the comparison squads had 84 cases and 90 victims.

Exhibit 4-2 does not include police shootings, which were intentionally excluded from the evaluation. For UCR statistics, shootings by police officers that result in the death of an individual are classified as homicides and receive a full investigation. In Phoenix, these cases are, in fact, assigned to the homicide unit for investigation. They almost always result in an exception clearance, meaning that the shooting was justified and no arrests will be made.

Validity

Validity has to do with the reality of conclusions from an evaluation (Weiss, 1998). Valid findings reflect the way things actually are as a result of a field experiment. As an aid to development of an experimental design, two kinds of validity need to be understood (Campbell & Stanley, 1966). *Internal validity* refers to the causal link between independent variables (e.g., attributes of cases and intervention of crime scene specialists in Phoenix) and dependent variables (e.g., clearance rate). Internal validity is concerned with whether an intervention is, in fact, responsible for observed effects, rather than external conditions, artifacts of the methodology, or extraneous factors. The relationship between project inputs and observed outcomes needs to be *causal* in order to have validity. *External validity* refers to whether the findings of one evaluation can be generalized to apply to other situations of a similar type. It asks whether a causal relationship holds over variations present in other settings.

Shadish, et al. (2002) describes several threats to internal validity. These threats focus on determining whether there are other reasons to think that a result made from an evaluation could have occurred in the absence of an intervention. Their typology of threats to internal validity includes the following (with wording changed to fit the Phoenix Homicide Clearance Project):

- **Selection**: Systematic differences of changes in case characteristics could cause the observed effect on outcomes.

- **History**: Changes in the organizational or procedural environment could produce changes in the outcomes.
- **Maturation**: Naturally occurring changes over time could impact outcomes.
- **Attrition**: Elimination of cases under consideration could change outcome measures.
- **Instrumentation**: The definition of an outcome measure may change over time, resulting in the measurement of different outcomes.

For the most part, these threats are not of significant relevance to inferences that might arise from the evaluation of the Phoenix Homicide Clearance Project. For example, attrition is not a concern because the homicide unit investigates all homicide cases. All cases remain in the determination of the outcome measures. Further, instrumentation is not a problem because the definition of the outcome measure—clearances of homicides—remained the same throughout the evaluation.

The next section of this chapter provides analysis to show that the designs of the project and evaluation served to minimize any threats to internal validity. The analysis shows that, in total, case characteristics did not change over time between the experimental and comparison groups and that no significant organizational, procedural, or personnel changes occurred that might have influenced experimental results.

Threats exist for external validity as well as internal validity. External validity concerns inferences about the extent to which a causal relationship is applicable to other settings. For example, assuming that the Phoenix Homicide Clearance Project is successful, a natural question might be whether the assignment of crime scene specialists to other investigative units, such as sexual assault units or property crime units, would have similar beneficial results. Another question might be whether the results would be different in another city: that is, are the results transferable to other police departments?

In this evaluation, no attempt was made to try to extend the results of the evaluation to other settings. As it stands, the evaluation aimed to determine the value of crime scene specialists in one type of investigation (homicides) in one city (Phoenix). Readers of this evaluation will have to decide for themselves whether similar results could be obtainable in different settings.

Equivalence of Case Characteristics

Quasi-experimental designs try to achieve the ideal of randomized experiments by having equivalence of cases between experimental and comparison units. In practical terms for this evaluation, it is desirable that cases handled by the two groups of squads over the two time periods have similar characteristics. Assuming that cases have similar characteristics, there will be greater confidence in conclusions about the effects of assigning crime scene specialists to the experimental squads. Put another way, differences in case characteristics could be an explanation for differences in outcomes, which could result in less reliability about the impact of the crime scene specialists.

Spatial Distribution

One reason for optimism about equivalent cases was that the four investigative squads were not assigned to specific geographic areas of the city but instead handled cases wherever they occurred. A squad might investigate a homicide in the south end of the city on one day and in the north end of the city on the next day. To determine whether assignments did take place throughout the city, two maps (see Exhibits 4-3 and 4-4) of homicide locations were produced.[5] Exhibit 4-3 is a two-color map (comparison and experimental squads) showing all locations for homicide victims. While there are spatial concentrations, there are no discernible patterns to indicate that squads concentrated in a specific area of the city.

Exhibit 4-4 is a more detailed breakdown of homicide locations into baseline and test periods for the two groups of squads. The locations in this exhibit can be tested through spatial statistics to determine if there are differences in the geographic patterns of homicides investigated by the comparison and experimental investigative squads. For this purpose, we used a spatial statistic called the cross-*K*, or bivariate-*K* statistic, which is a distance-based measure that characterizes a spatial pattern (Bailey & Gatrell, 1995; Rowlingson & Diggle, 1993).

Two tests with the cross-*K* statistic were conducted. The first test compared the spatial pattern of homicides investigated by the comparison squads versus the experimental squads during the baseline period, and the second test compared the locations during the test period.

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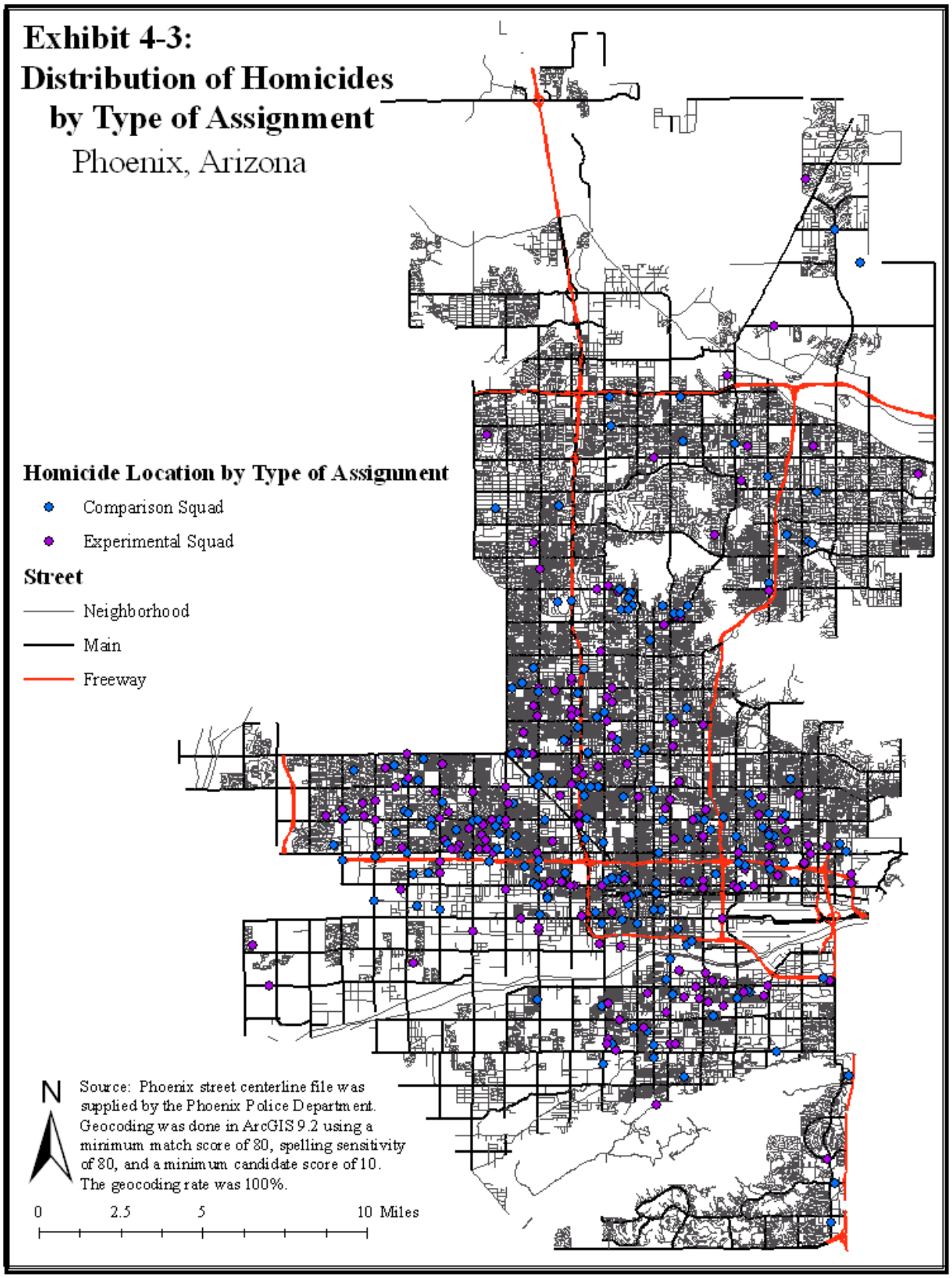
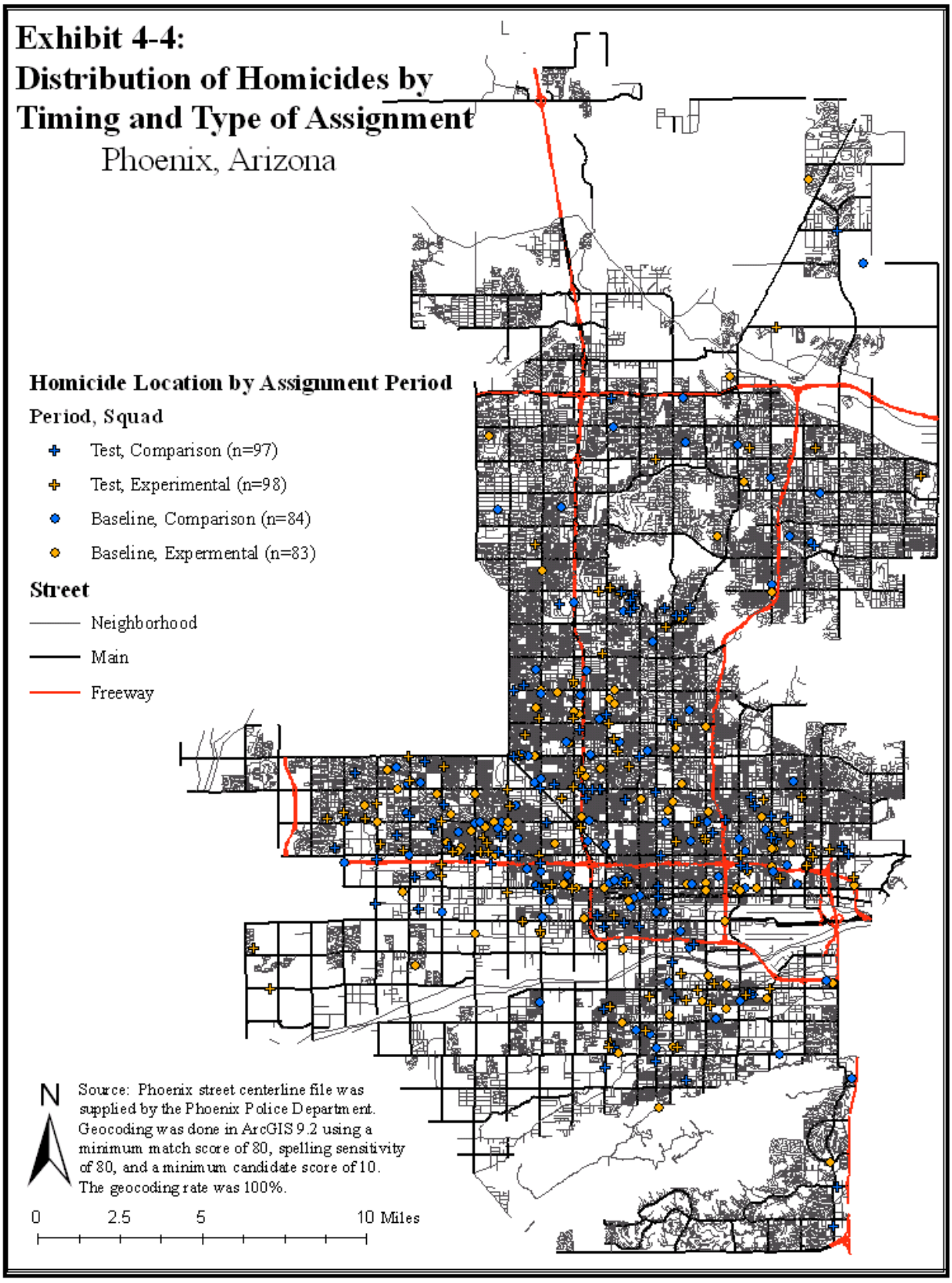
[5] The author is grateful for the assistance of Dr. Elizabeth Groff in creating these maps and conducting spatial analysis with the cross-K distance measure.





The cross-*K* statistic is calculated to test whether two groups of points (homicide locations in this application) are spatially independent of each other. With our test, spatial independence could be interpreted as saying that the homicides handled by the experimental squads differed in a spatial distribution sense from those handled by the comparison squads. As it turns out, the cross-*K* statistics for the baseline period and for the test period showed that the two patterns were not independent of each other. In spatial statistical terms, the distances between homicides handled by the comparison and experiment squads were shorter than would be expected under an assumption of independence. Thus, geographic bias in the cases investigated by the comparison squads and those investigated by the experimental squads in either period was rejected.

Victim Characteristics

Several chi-square tests were conducted to determine whether there were any significant changes in the characteristics of victims across the two groups of squads and two time periods. Exhibit 4-5 shows victim characteristics with percentage breakdowns by sex, race, weapon involved (firearm/other weapon), location (inside/outside), and motives across the two groups of squads and time periods. Within each category, a chi-square value is calculated to determine any statistically significant differences. For example, the distribution by victim's sex across the two time periods and investigative groups forms a 2 by 4 matrix, and the chi-square value for this matrix was found to be 1.6, which is not statistically significant at the .10 level. The distributions by race, ethnicity, weapon, and location similarly were found not to be statistically significant. For motives, only retaliation was found to show a difference (at the .05 level). For the age variable, a one-way analysis of variance was performed and the resulting F-statistic was not statistically significant at the .10 level.

Other chi-square tests were made by collapsing the data in Exhibit 4-5 across investigative unit, for example, by conducting a test on sex (male/female) versus investigative unit (comparison squads/experimental squads), thereby eliminating the time periods. Collapsing in this manner ignores the test that was conducted and determines whether there were significant changes in the characteristics of victims handled by the two groups of investigative units. This set of 12 chi-square tests did not result in any significant chi-square values at the .10 level.

Exhibit 4- 5: Victim Characteristics

Victim Characteristic	Baseline Period: Comparison Squads (n=104)	Baseline Period: Experimental Squads (n=105)	Test Period: Comparison Squads (n=90)	Test Period: Experimental Squads (n=93)	Chi-Square
Sex					
Male	87 (83.7)	93 (88.6)	78 (86.7)	83 (89.2)	1.6
Female	17 (16.3)	12 (11.4)	12 (13.3)	10 (10.8)	
Race					
White	81 (77.9)	88 (83.8)	79 (87.7)	82 (88.2)	6.9
African-American	18 (17.3)	15 (14.3)	8 (8.9)	10 (10.8)	
Other	5 (4.8)	2 (1.9)	3 (3.3)	1 (1.1)	
Ethnicity					
Hispanic	55 (52.9)	69 (65.7)	58 (64.4)	60 (64.5)	4.7
Non-Hispanic	49 (47.1)	36 (34.3)	32 (35.6)	33 (33.5)	
Weapon					
Firearm	83 (79.8)	86 (81.9)	65 (72.2)	80 (86.0)	5.6
Other weapon	21 (20.2)	19 (18.1)	25 (27.8)	13 (14.0)	
Location					
Inside	32 (30.8)	34 (32.4)	38 (42.2)	31 (33.3)	3.2
Outside	72 (69.2)	71 (67.6)	52 (57.8)	62 (66.7)	
Motives					
Arguments	63 (60.6)	66 (62.9)	50 (55.6)	50 (53.8)	2.2
Drug-related	17 (16.3)	16 (15.2)	20 (22.2)	24 (25.8)	4.6
Robbery	13 (12.5)	12 (11.4)	16 (17.8)	18 (19.4)	3.5
Domestic Violence	13 (12.5)	11 (10.5)	13 (14.4)	7 (7.5)	2.4
Retaliation	7 (6.7)	10 (9.5)	16 (17.8)	6 (6.5)	7.9**
Gang-related	7 (6.7)	7 (6.7)	4 (4.4)	10 (10.8)	2.9
Immigration-related	7 (6.7)	7 (6.7)	5 (5.6)	4 (4.3)	0.7
Other motives	16 (15.4)	13 (12.4)	14 (15.6)	19 (20.4)	2.4
Age	32.8	30.9	33.0	30.1	F=1.1

** Significant at the .05 level.
NOTE: More than one motive could be chosen for a victim.

Similarly, we conducted another set of 12 chi-square tests by collapsing across time period, thereby ignoring investigative units. Again, none of the tests resulted in a significant chi-square value, indicating no changes in victim characteristics from the baseline to the test period.

Changes in Investigators

Changeover of investigative personnel within the homicide unit was another potential threat to the experiment. As it turned out, investigative personnel were relatively stable during the entire experiment. At the start of the experiment, 26 investigators were assigned to the four investigative squads, with 13 investigators in the experimental squads and 13 investigators in the comparison squads. Five investigators made up the night detective unit, three investigators were assigned to the International Crime Apprehension Team (ICAT), and three others were assigned to a specialized cold case squad. The average time of investigators in the department was about 14 years and the average time of their assignments to the homicide unit was over five years.

During the test period, one investigator from an experimental squad retired, and three investigators from the comparison squads left the unit (two transfers and one retirement). The four investigators were replaced by new detectives. The night detective squad was increased by one investigator, and the ICAT team was reduced by two investigators. The cold case squad stayed the same size. It is not believed that the transfers and retirements had a significant impact on the experiment in regard to overall caseload and clearances. While all four investigators were seasoned veterans, they were not assigned new cases as they neared their time to leave the unit. The other changes in assignments to the night detective squad and ICAT team were relatively minor because they primarily played support roles to investigators.

In summary, 22 of the 26 investigators stayed in their assignments during the entire course of the project. The consistency of assignment provides additional validity to the evaluation results.

Expansion of the Evaluation

Because of the excellent cooperation of the Phoenix Police Department and the quality of information from their data systems, we were able to expand the evaluation into areas not directly related to the evaluation questions listed above. The expansion was fortuitous because it was realized early in the evaluation that while recovery of time for more investigative effort is

logically advantageous, clearance of a homicide is dependent on many other factors—citizen cooperation, use of informants, cooperation of other jurisdictions, and in some cases, pure luck. Moreover, in recent years, only limited research has been conducted into the qualitative nature of homicides and their investigation. By contrast, as more research has concentrated on quantitative links between case characteristics (victim demographics, circumstances, weapons involved, etc.) and eventual case outcome.

As described in Chapter 2, past research on the role of forensic analysis has addressed the relationships with the eventual adjudication of felony cases including homicides. Access to information at the Phoenix Police Department provided an opportunity to extend that type of analysis to describe the types of evidence actually collected at homicide scenes and the process by which decisions are made on evidence that should receive forensic analysis attention. The result is a better picture of the role of forensic analysis in homicide investigations. As described in the next section, the Superior Court of Maricopa County maintains a publicly accessible web-based system that allows for the tracking of felony cases through the court system and to the final adjudicatory outcome. As a result, it was easy to obtain information on case dispositions for cases in our two-year study.

Questions that were addressed beyond the basic evaluation included the following:

- What evidence was analyzed by the department's crime laboratory?
- How much time did different types of analyses (latent prints, ballistics, DNA, etc.) require on the part of latent print examiners and forensic scientists in the lab?
- What was the probative value of the evidence that received lab attention?
- How do victim characteristics relate to outcome (open/closed) and to the length of time to arrest?
- Are there subsets of closed cases with identifiable characteristics?
- What were the prosecutorial and court outcomes of closed cases?
- Why has the clearance rate for homicides in Phoenix decreased in recent years?
- What is the impact of forensic evidence at trials?

With a few exceptions, we analyzed all cases to answer these questions, rather than differentiating between experimental/comparison groups and baseline/test periods. This change was permissible because the questions move beyond the role that crime scene specialists play in

homicide investigations. The result is that we were able to provide greater insight into the nature of homicide investigations and the role of forensic evidence.

Use of Case Examples

During the course of the evaluation, we had opportunities to meet with investigators and crime scene specialists to discuss specific cases. Those discussions, coupled with other information available from supplemental reports, provided more insight into the evidence collection process and the role that crime scene specialists can play in investigations. In this report, several examples have been included to illustrate the contributions that crime scene specialists made to investigations.

Specific cases discussed in Chapter 5 and 6 illustrate the activities of crime scene specialists at the initial crime scene (primary scene) and subsequent scenes (secondary scenes) during the course of an investigation. Other cases form the basis for the discussions in the other two volumes to this report. In Volume II, Chapters 1 and 2 are on clearances and open cases. For Volume II, our reading of cases led to a formulation of different types of closures. Specific cases are described to illustrate the difficulties that investigators face in trying to solve some cases. Another chapter in Volume II provides information on the role that analysis of forensic evidence plays in investigations and prosecutions. It includes summaries of cases that show the direct relationship of investigations to forensic analysis.

The case examples in this report do not attempt to provide a complete description of the entire investigation process. Investigations can become very complicated when there are many witnesses to interview, numerous leads to follow, and extensive amounts of physical evidence to consider. Indeed, investigations can take months, or even years, to complete. Many details are omitted in the case examples for this report because the objective is to illustrate different aspects of an investigation.

Data Sources for Evaluation

PACE System

Within the department, two sources of information were especially beneficial to the evaluation: supplemental investigative reports and crime laboratory reports. The supplemental

reports are stored in department's records management system, called PACE, which is accessed by patrol officers, investigators, crime scene specialists, latent print examiners, forensic scientists, and others for preparation of original and supplemental reports about an investigation. Homicide cases reviewed for the evaluation averaged about 50 supplements per case. Examples of the type of supplements during a homicide investigation include the following:

- Each patrol officer at the initial scene prepares a supplemental report documenting his or her observations and activities at the scene (e.g., found victims, searched for evidence, identified witnesses, secured scene, arrested offenders, transported witnesses, etc.)
- Each homicide investigator prepares a supplemental report on his or her role at the initial scene and activities (e.g., conducted interviews, assisted with scene investigation, identified evidence, prepared search warrant, etc.).
- The case investigator prepares supplements, as needed, during the course of the investigation documenting all follow-up activities (e.g., results of telephone calls, summaries of witness interviews, requests to the crime lab for analysis of evidence, arrests of offenders, etc.).
- The scene investigator prepares a scene report that describes the physical environment of the area where the victim was found.
- The scene investigator prepares a report listing each item of evidence that was located at the scene along with measurements indicating exactly where each item was found; a separate crime scene diagram is prepared with the Visio software package.
- Latent print examiners and forensic scientists enter supplemental reports summarizing the results of the analysis of evidence (e.g., DNA profile comparisons, latent print results, ballistics tests, etc.).

Supplemental reports are reviewed and approved by supervisors prior to official acceptance into the system.

The first report for a homicide case in PACE is referred to as the "original" report because it contains basic descriptions of the circumstances surrounding the homicide, witnesses at the scene, victim information, vehicle descriptions, suspect descriptions, and related information. Interestingly, the original report may be prepared days or weeks after the incident and, as a result, many of the original reports provide information on steps taken during the initial investigations, sometimes leading to arrests. As indicated above, supplemental reports in PACE are prepared by other investigators working on the case, scene agents, lab personnel, patrol

officers, and others with involvement either at the initial scene or during the subsequent investigation.

The principal investigator for the evaluation coded information from the PACE system for all 362 cases for the baseline and test periods. An Access database was developed for data entry purposes with four key tables—case, victim, suspect, and evidence information. Exhibit 4-6 summarizes the data that were obtained from the PACE system (with the exception that the exhibit includes court disposition information obtained from Superior Court). To ensure privacy, each case was assigned an "ILJ number" rather than coding the department's case number (DR Number). Names of victims and suspects were not maintained in the system, although demographic characteristics were recorded. All information was stored at ILJ's office in Alexandria, Virginia, on a secure computer system.

LIMS System

The second primary source of information for the evaluation was from the crime laboratory's Laboratory Information Management System (LIMS). LIMS contains detailed information on the results of analysis of forensic evidence conducted by personnel in the crime laboratory. With regard to homicides, the key areas of laboratory analysis are:

- Entry of latent prints into the state's AZAFIS (Arizona Automated Fingerprint Identification System) with the aim of making positive identifications of victims, suspects, and witnesses.
- Analysis of firearm casings to determine the types of firearms that may have been the source.
- Analysis of firearms to determine whether they may have been the weapon in a homicide.
- Analysis of gunshot residue (GSR) to determine whether a person was near a firearm when it was discharged.
- Development and comparison of DNA profiles.

Exhibit 4- 6: Information Obtained from PACE System

Case Information	
ILJ Case Number Date and time investigation started Location where investigation started Beat and grid of location Date and time of first arrest Number of persons killed and injured Case and scene agent	Number of scene assistants at initial scene Number of patrol officers at initial scene Number of investigative supervisors Number of patrol supervisors Number of case supplements Case summary

Victim Information	
Victim's age, race, ethnicity, and sex Indicator for victim killed/injured Indicator for transport to hospital	Indicators for 15 motives (all that apply) Indicator on inside/outside

Suspect Information	
Suspect's age, race, ethnicity, and sex Relationship with each victim (intimate, acquaintance, stranger)	From Superior Court system: Charges and dispositions (plea, guilty by trial, not guilty by trial, etc.) Sentence length

Evidence Information	
Date evidence collected Type of scene (homicide scene, vehicle, residence, business, etc.) Scene agent Supplement number of evidence collection <u>Weapons Evidence</u> Number of firearms Number of casings found Number of spent projectiles Number of live cartridges Indicator for bullet fragments recovered Number of GSR tests taken Number of knives taken <u>Fingerprint Evidence</u> Number of 10-prints obtained Number of latent print cards obtained	<u>Biological Evidence</u> Blood (e.g., vial of blood) Number of buccal swabs taken Number of swabs with possible bloodstains <u>Drug Evidence</u> Indicator on suspected illegal drugs found Indicator on drug paraphernalia obtained <u>Impressions Evidence</u> Indicator on tire track impressions taken Number of shoeprint impressions taken Number of EDPL impressions <u>Trace Evidence</u> Indicators for fibers, hair, cigarettes, and glass <u>Other Evidence</u> Indicator that clothing was collected Lists of other items collected

Several preliminary activities must be conducted before the above analyses can be performed. For example, latent prints collected by crime scene specialists in the field must be examined to determine that they have sufficient quality for AZAFIS submission. As discussed later in this report, a high percentage of prints do not meet submission criteria. A similar situation exists with DNA analysis where determinations have to be made that an item of forensic evidence has sufficient nuclear material for development of a DNA profile. Many items of evidence either do not have any nuclear material for analysis or do not have sufficient material for DNA analysis.

For the evaluation, the department provided ILJ with all the lab reports from LIMS for the homicide cases under review. These reports were needed because there is no link between PACE and LIMS, and investigators do not have direct access to LIMS because it for crime lab personnel only. In theory, crime lab personnel are instructed to either copy their LIMS reports into PACE for access by homicide investigators or provide a summary of results as PACE supplemental reports. The procedure is not always followed because lab personnel sometimes become too busy and fail to enter the results into PACE. As a result, ILJ's access to the LIMS reports greatly enhanced the evaluation and provided an opportunity to analyze the contribution of forensic analysis to case investigations.

In addition to these key sources, ILJ staff had access to investigators and supervisors within the homicide unit. Discussions with them were beneficial to the evaluation in understanding the process for conducting investigations and the difficulties investigators face during their investigations. Approximately six months into the evaluation, we conducted a survey of investigators in the homicide unit to determine their satisfaction with crime scene specialists. Questions on the survey varied depending on whether the responding investigator was in an experimental or comparison squad. Chapter 6 provides the results of the survey.

Superior Court System

The Superior Court in Maricopa County maintains a web site accessible by citizens to obtain information on court proceedings for a specific case.[6] The system maintains information on civil, criminal, family court, and probate cases. Our interest was with the criminal case portion of the system for tracking defendants as their adjudications proceeded. Access to the

criminal portion of the system is obtained by entering either a defendant's full name or the defendant's initials and date of birth. For a defendant, the system shows summaries (minutes) for each court appearance. For example, information on a continuance includes the reasons for a continuance and the scheduled date of the next court proceeding. The Superior Court developed the system as a way for interested parties (victims, victim's relatives, friends, etc.) to determine the status of a case and the date of the next court proceeding without having to contact the court by telephone.

For purposes of the evaluation, the system was especially useful in tracking defendants in each homicide case and obtaining information on final disposition for each charge against a defendant. For defendants who pled guilty or were found guilty by a jury trial, the system provides the length of sentence by charge and the starting date of the incarceration. Information about a defendant's outcome was added to what had been obtained from the police department, as shown in Exhibit 4-6.

Conclusions

In evaluative research terminology, the evaluation of the Phoenix Homicide Clearance Project is a baseline/test, experimental/comparison quasi-experimental design. The intervention was the assignment of four crime scene specialists to two homicide investigative squads (experimental squads) in July 2004. The other two squads (comparison squads) continued to operate as in the past with investigators assigned as scene agents for evidence collection. After two months of on-the-job training, the crime scene specialists were assigned as scene agents with primary responsibility for evidence collection, and the test period lasted a total of 10 months (September 2004 – June 2005). Information was collected from all homicide investigations that took place for the 12-month period prior to the assignment of the crime scene specialists (July 2003 – June 2004).

In total, the evaluation is based on the investigation of 362 cases with 392 victims. Cases were evenly divided between experimental and comparison squads, and between baseline and test periods. No biases were found in the geographic distribution of assignments. Furthermore, with one exception, no statistically significant changes were found in several key characteristics

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[6] See www.superiorcourt.maricopa.gov.

(victim demographics, motives, etc.) between cases handled by experimental and comparison squads or between cases handled during the baseline and test periods.

While a few changes occurred in investigative personnel due to transfers and retirements, the core investigative staff in the homicide unit remained stable. Twenty-two of the 26 investigators assigned to the squads were with the homicide unit during the entire project.

Evaluation of the Phoenix Homicide Clearance Project focused on the activities of the crime scene specialists at crime scenes, amount of time recovered by investigators as a result of the crime scene specialists' efforts, cost efficiencies of the crime scene specialists, organizational considerations, and, most importantly, clearance rates of the experimental squads in relation to the comparison squads.

Cooperation of the Phoenix Police Department was excellent throughout the evaluation effort. Access was provided to supplemental reports for all homicide cases investigated during the baseline and test periods. The department's PACE system was the source of information on the activities of the crime scene specialists, evidence collected at crime scenes, and other information of relevance to the evaluation. The department provided forensic analysis reports from LIMS for all cases, which provided insight into the types of evidence that gets analyzed and the potential impacts of the analysis on investigations. Finally, the on-line system maintained by Maricopa County's Superior Court was the source of information about the outcomes of defendants who had been arrested for homicide. In summary, the evaluation is based on a complete picture from the start of investigation to prosecutorial outcome.

Because of the cooperation from the department and quality of available information, the evaluation was expanded to several related issues on the investigation of homicides in Phoenix. These issues included determinations of the probative value of evidence, victim characteristics related to outcome (open/closed), length of time to arrest, and others. The results provide greater insight into how homicide investigations can be improved.

Chapter 5

Process Evaluation

This chapter on process evaluation analyzes the level of effort put into the project, while the next chapter shows the results of that effort. Two overarching questions are addressed in this chapter:

- How was the project developed and implemented?
- Did the project operate as intended?

The first question is critical to justify continuance or changes in the procedures for assigning crime scene specialists to process crime scenes. Answering the second question builds confidence that any improvements in impact measures are a result of the activities of the crime scene specialists during the test period.

We describe the development of the project in terms of (1) caseload and clearance rates prior to the project, (2) selection and transfer of the four crime scene specialists, (3) training provided to the crime scene specialists, and (4) a review of their involvement at scenes. The last part of the chapter provides an analysis of the changes in the number of personnel who processed scenes for evidence, the types of evidence collected, and an estimate of time recovered due to assignment of the crime scene specialists to collect evidence.

Project Development

Project Background

Chapter 1 presented statistics on the increases in Phoenix's homicides starting in 2000 and the concomitant decrease in clearance rates. In 2003, the city set a new record with 247 homicides, compared with an average of 187 homicides per year for the prior five years. The clearance rate for 2003 was 42.5 percent, a decrease from 47.0 percent for the prior five years. The combination created alarm among managers at the police department, the media, and the public.

At the same time, the number of investigators in the homicide unit stayed relatively constant for several years, even though the caseload clearly was increasing and clearance rates

decreasing. Because other units in the department were facing similar personnel shortages, commanders in the investigative bureau were finding it difficult to get approval for increases to their authorized strengths. For many years, investigators in the homicide unit had been responsible for collecting evidence at homicide scenes, submitting the evidence to the property and evidence section, preparing reports to document the evidence, and other activities related to evidence. Crime scene specialists were responsible for taking photographs at homicide scenes and obtaining latent prints, but played no role in the actual collection and processing of physical evidence. Homicide supervisors recognized that activities surrounding the collection and processing of evidence were taking valuable time away from investigations, especially during the initial stages when the chances of apprehending suspects are high.

To address the staffing shortage, the police department decided to submit a grant application to the Bureau of Justice Assistance for the Phoenix Homicide Clearance Project. The grant application viewed the project as a partnership between the Laboratory Services Bureau and the Violent Crimes Bureau to develop and implement a Crime Scene Response Unit within the homicide unit. As stated in the grant application,

> Four crime scene specialists will be trained by existing homicide investigators to take over the responsibilities of crime scene detectives. The roles and responsibilities of the crime scene specialists after completion of the training include crime scene photography, evidence collection, evidence impounding, and evidence processing. Crime scene diagramming, report writing, and later court testimony will also be included in the crime scene specialists' responsibilities.

The Bureau of Justice Assistance awarded the grant in September 2003, with an expected start date of February 2004. Delays in selecting the four crime scene specialists pushed the start date to July 1, 2004, when the four crime scene specialists were transferred to the homicide unit reporting to two of the four investigative squads.

At the start of the project, the homicide unit was located on the third floor of headquarters. Investigators were in offices in one wing of the floor and the four crime scene specialists were across the hall sharing a large office. The physical arrangement created a few communication problems between investigators and crime scene specialists but not enough to affect the performance of the crime scene specialists during the test period. At the start of the study, plans were underway by the department to move all staff in the violent crime bureau to the

second floor after renovation of that floor was completed. The move took place in early 2006 with all staff, including crime scene specialists, assigned to small cubicles on the second floor. An advantage of the move was that the crime scene specialists for the homicide unit had cubicles located in the middle of those for investigators, which facilitated communication about cases.

Selection and Training of Crime Scene Specialists

Selection was made from the crime scene specialists in the department's crime laboratory. Each crime scene specialist had at least three years on the department and considerable experience in processing crime scenes other than homicides. They had taken photographs and obtained latent prints at more homicides than any of the other crime scene specialists in the lab. Indeed, their interest and experience at homicide scenes made them leading candidates for the positions.

The organizational decision to transfer the crime scene specialists away from the crime lab caused concern with crime lab supervisors even though the decision was part of the grant submission. The lab lost four experienced crime scene specialists and had no direct control over them after their assignment to the homicide unit.

One of the repercussions of the transfers was that the four crime scene specialists had limited access to LIMS, the lab's management information system, in which crime scene specialists record their scene activities (number of photos taken, latent prints, etc.). Only personnel assigned to the lab were allowed access to LIMS and the fact that the crime scene specialists were no longer organizationally under the lab precluded their access. On the other hand, the contents of LIMS reports on crime scene activities were by policy supposed to be copied by crime scene specialists into the PACE system for access by investigators. The resolution for the four crime scene specialists in the homicide unit was to enter their activities in PACE rather than LIMS.

Formal training for the four crime scene specialists consisted of a one-week specialized course and another training session offered by the Arizona Homicide Investigators Association. The most important training was simply on-the-job training with homicide investigators. Several sworn investigators had gained considerable expertise in processing crime scenes during their years with the homicide unit; indeed, a few investigators had lower investigative caseloads because they specialized in crime scenes. These investigators were especially effective in

training the crime scene specialists on how to process a homicide scene. The crime scene specialists obviously had an advantage for assisting investigators at homicides because of their previous experiences in the crime lab and their knowledge of department procedures. As a result, they required less training than a newly hired employee would have needed.

In addition to the actual homicide scene investigation, two major areas of internal training were the operation of the PACE system and the preparation of crime scene diagrams with Visio software. Two of the crime scene specialists learned how to enter reports and create diagrams in a relatively short period of time, but the other two encountered considerable difficulties because of limited experience with computers. One of these crime scene specialists was a retired state patrol officer who did not have exposure to computers during his time with the state agency, and the other was retired from private industry from a position that did not require computers. Preparing reports in PACE and creating Visio diagrams were problems they did not completely overcome during their time with the project.

The months of July and August 2004 were devoted to on-the-job training as described above. The date of September 1, 2004, was therefore set as the starting date for the test period of the evaluation. By that date, all four crime scene specialists assigned to the experimental squads were processing scenes with minimal supervision from investigators. The aim during the test period was to have two crime scene specialists at each scene working as a team, thereby relieving two investigators from these activities. This aim was not always accomplished because of the unavailability of crime scene specialists for dispatch to some scenes. As a result, an investigator might assist a crime scene specialist in some activities such as measurements, identification of evidence, and even collection of evidence.

Scene Activities

The following is an abbreviated description of the activities of a crime scene specialist assigned to an experimental squad in processing a crime scene. This description is based on interviews with crime scene specialists and personal observations at scenes. Their activities do not differ in any substantial way from those of an investigator assigned as a scene agent in the comparison squads.

As described in Chapter 3, officers and supervisors from patrol are usually the first responders to homicide scenes. By department procedure, a patrol supervisor is in charge of the

scene until a briefing is held and the scene is turned over to investigators. The briefing takes place after homicides investigators and crime scene specialists have arrived on scene. The patrol supervisor provides information at the briefing on what patrol officers have determined during their preliminary investigation. The information usually includes circumstances of the homicide, victim's name, names of witnesses, and related information that might be of value to investigators.

After the briefing, the crime scene specialist walks the area to get a general picture of the scene and starts to identify physical evidence that will be photographed and collected. For an outside scene, the crime scene specialist looks for casings on the ground and pavement, and stray bullets lodged in nearby vehicles, homes, or other structures. As one crime scene specialist stated, "The aim is to tell a story about what happened at the scene." Photography of the general area is usually the first activity; it includes panoramic views, photographs of street signs, landmarks, and other features of the area. At night, photographs are taken in available natural light and again with floodlights set up by the crime scene specialist to show more details of the area.

The next activity is identification and labeling of each item of physical evidence that will be collected. Evidence markers with sequential numbers are placed by the items of evidence and the crime scene specialist then photographs each item. Photographing the scene is a time consuming activity, and other crime scene specialists may be assigned to assist with photographs.

Scene measurements are the next step in the process. A point of origin is first determined and the crime scene specialist uses a measuring wheel to determine distances from the point of origin to each item of evidence. All measurements will become part of the scene diagram and report prepared by the crime scene specialist for the PACE system.

Depending on the scene, several other collection activities may take place. Surfaces may be powdered for latent prints and bio swabs may be applied to bloodstained areas for potential analysis in the crime lab. Shoeprint impressions may be obtained including the shoeprints of fire and police personnel for elimination purposes. An Electrostatic Dust Print Lifter (EDPL) may be used at indoor scenes for development of footprint impressions on paper.

All physical evidence collected at a scene is placed by the crime scene specialist in appropriate containers, such as small plastic bags, and then into larger paper evidence bags. A form printed on the outside of a bag allows a crime scene specialist to record the case number and descriptive information about the bag's contents. The crime scene specialist then transports the bags to headquarters and impounds the evidence in the property and evidence room.

Scene and Diagram Reports

The final step in the process is the preparation of a report for entry into the PACE system. A typical scene report will contain a description of the general geographic area, specifics on the location of the victim, lighting conditions, descriptions of evidence, and measurements for all items of evidence. Scene reports average about ten pages in length and include a list of all items of evidence collected. Crime scene specialists prepare reports with the aid of screens in the PACE system developed specifically for recording descriptions of evidence.

Finally, at the time of the evaluation, crime scene specialists prepared diagrams of scenes with the aid of Visio software, a popular Microsoft Office program for creating diagrams. With most scenes, several diagrams may be prepared. For example, for outside scenes, one diagram may show the general area the location of the victim with identification of geographic landmarks, vehicles in the area, and other information. A second diagram adds measurements of street widths, sidewalk widths, and other descriptors, while a third diagram shows the exact location of each item of evidence with numbers or letters corresponding to photographs taken at the scene.

During the test period, the four crime scene specialists accompanied investigators to assist in the processing of secondary scenes. In each instance, the crime scene specialist achieved the aims of the project by relieving an investigator from participation in the evidence collection. More information on these scenes is provided later in this chapter.

Conduct of the Experiment

The test proceeded according to plan from September 1, 2004 to mid-January 2005. In January 2005, one of the crime scene specialists suffered an off-duty injury to his arm and shoulder. For the remainder of the test, he was either unable to work or was on limited duty, which meant he was unavailable for processing crime scenes. This crime scene specialist was

therefore available for 4.5 of the 10 test months. Fortunately, the other three crime scene specialists were with the test for the entire ten-month period and, as described below, were able to handle almost all the scenes assigned to the experimental squads. A way of summarizing the time of the crime scene specialists during the test period is to say that they provided 34.5 staff months of available personnel time over the ten-month test period. These staff months amount to 86.3 percent of the desired level for the experiment.

Analysis of Scene Activities

To determine whether the test operated as planned, information was gathered from supplemental reports in PACE on all personnel who collected physical evidence and took photographs at each scene. Analysis of this information provides insight into the extent to which the presence of the crime scene specialists resulted in the desired effect of relieving investigators of evidence collection responsibilities to devote to case investigation.

An initial finding was the identification of six cases in which there was no primary scene from which to obtain evidence. Two examples illustrate how this phenomenon can occur. In one case, several days elapsed between when the victim was injured and the time he reported to a hospital for assistance. This victim died in the hospital due to his injuries; however, he was never able to inform hospital personnel and homicide investigators about the location and circumstances that caused his injuries. In another case, unknown persons took the victim of a shooting to the hospital and left without talking to anyone. Circumstances surrounding the victim's injuries were never determined. None of these six cases was in the 83 cases handled by the experimental squads during the test period.

Personnel at Primary Scenes

One of the changes due to the project was the number of different crime scene specialists who were involved in some way with processing homicide scenes. For the baseline period, the assignment of a crime scene specialist to a crime scene was random in the sense that whoever was on duty at the time of the call could be assigned to take photographs and obtain latent prints from a scene. A review of these assignments indicated that 18 different crime scene specialists assisted in some way with the 195 cases in the baseline period. In our interviews with investigators, they provided anecdotal information on perceived inconsistencies with the services

of crime scene specialists from the crime lab. As an example, in one case, a surveillance tape showed a suspect running through a parking lot and touching several vehicles as he ran. However, the crime scene specialist assigned to the scene did not recover any latent print cards from the vehicles in the parking lot. Other complaints were about the amount of time that investigators had to spend with some crime scene specialists at the crime scenes to instruct them on what should be photographed.

For experimental squads during the test period, having the same four crime scene specialists at the scenes resulted in immediate improvements. With a few exceptions described below, these crime scene specialists processed all scenes associated with the cases assigned to these investigators. The reduction from 18 to four crime scene specialists improved consistency of operations between investigators and crime scene specialists.

Scenes Processed by Crime Scene Specialists

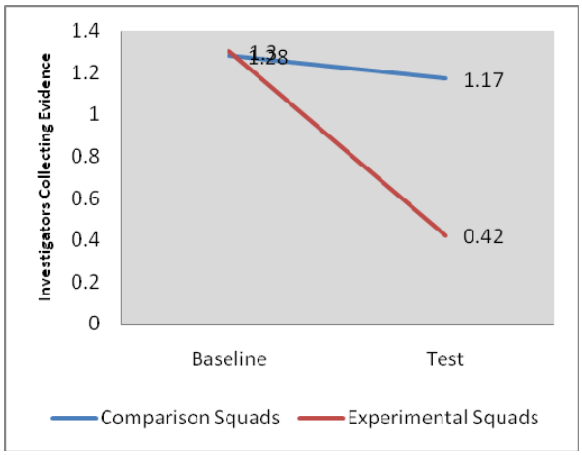
The first step in the analysis was to determine whether the four crime scene specialists did in fact process all 83 primary scenes during the test period. The PACE system should contain a scene report prepared by the crime scene specialist on what was done at the scene. Review of the PACE reports showed that the crime scene specialists collectively processed 75 (90.4 percent) of the 83 cases with the remaining eight cases handled by investigators assigned as scene agents. Of the other eight cases, four were during the same week in February 2005, a few weeks after the injury to one of the crime scene specialists. The other three crime scene specialists were in a training class or had regular days off when these four cases occurred, and were therefore unavailable for dispatch to these scenes. The four other cases were scattered over the 10 months and sworn investigators processed the scenes for evidence.

Number of Personnel at Scenes

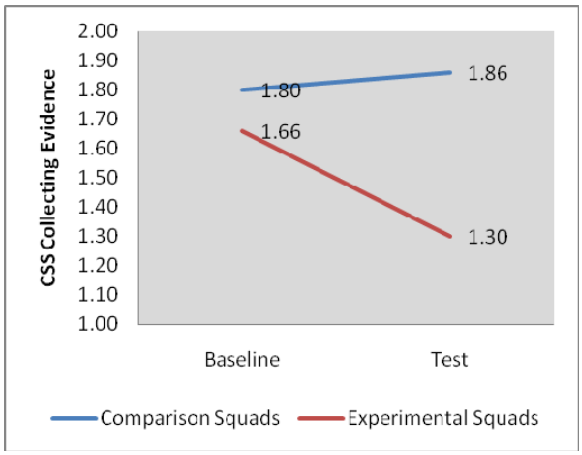
Even though the crime scene specialists were at almost all primary scenes, it was still conceivable that investigative time was not recovered. Investigators might still have to join with crime scene specialists to collect evidence, thereby negating the advantage intended by the experiment. To determine whether this circumstance was the case, we analyzed evidence records from the PACE system to determine the number of investigators and crime scene specialists at the 356 primary scenes. Exhibit 5-1 gives the results and clearly shows that the test

Exhibit 5- 1: Personnel at Scenes

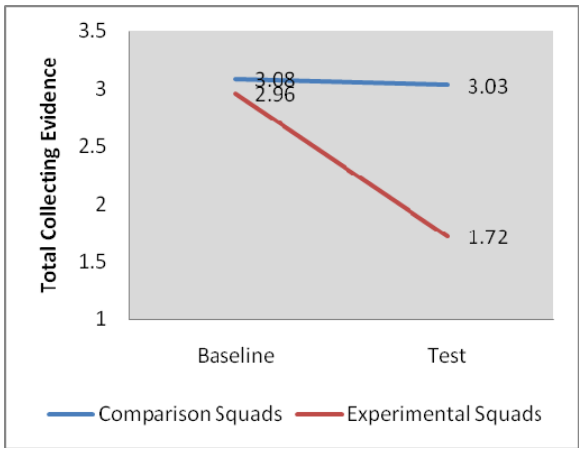
Average Number of Investigators Collecting Evidence at Primary Scenes



Average Number of Crime Scene Specialists Collecting Evidence at Primary Scenes



Total Number of Personnel Collecting Evidence at Primary Scenes



operated as planned. During the baseline period, the comparison and experimental squads had almost the same number of investigators collecting evidence at scenes with an average of 1.29 investigators per scene. During the test period, the average for the comparison squads dropped slightly to 1.17 investigators, but for the experimental squads, the average decreased significantly to 0.42 investigators.

For crime scene specialists, the average number for the comparison squads showed virtually no change, from 1.80 to 1.86 between the baseline and test periods. The experimental squads showed a decrease from 1.66 to 1.30 between the two periods. The decrease was due to the assignment of the four crime scene specialists to the experimental squads with the understanding that they would handle all evidence collection activities at their assigned scenes. As shown at the bottom of Exhibit 5-1, the test resulted in a decrease in total personnel who collected evidence at scenes. During the baseline period, the average number of total personnel was 3.08 for the comparison squads and 2.96 for the experimental squads. For the test period, the total for the comparison squads showed virtually no decrease, while the experimental squads decreased to 1.72 total personnel. These figures reflect the aims of the project in relieving investigators of evidence collection activities for the experimental squads during the test period.

We performed an analysis of variance (ANOVA) on the data from Exhibit 5-1 with post hoc comparisons to determine statistically significant results. Exhibit 5-2 shows the results of the ANOVA, which confirm the conclusions from the previous exhibit. Comparisons against the experimental squads during the test period show statistically significant decreases, while other comparisons are not statistically significant. The conclusion is that the operations of the experimental squads during the test period differed from their operations during the baseline period, and differed from the comparison squads during the baseline and test periods.

Exhibit 5- 2: ANOVA on Personnel at Primary Scenes

Investigators

Source	df	Sum of Squares	Mean Square	F-value
Between groups	3	45.2	15.06	34.1***
Within groups	352	155.4	0.44	
Total	355	200.6		

Crime Scene Specialists

Source	df	Sum of Squares	Mean Square	F-value
Between groups	3	13.9	4.64	4.43***
Within groups	352	369.0	1.05	
Total	355	382.9		

Investigators

	Experimental Squads Baseline Period		Comparison Squads Test Period		Experimental Squads Test Period	
Source	Diff (s.e.)	Sig.	Diff (s.e.)	Sig.	Diff (s.e.)	Sig.
Comparison Squads / Baseline Period	-.02 (.10)	.83	.11 (.10)	.28	.86 (.10)	.00***
Experimental Squads / Baseline Period			.13 (.10)	.20	.88 (.10)	.00***
Comparison Squads / Test Period					.75 (.10)	.00***

Crime Scene Specialists

	Experimental Squads Baseline Period		Comparison Squads Test Period		Experimental Squads Test Period	
Source	Diff (s.e.)	Sig.	Diff (s.e.)	Sig.	Diff (s.e.)	Sig.
Comparison Squads / Baseline Period	.15 (.15)	.32	-.06 (.15)	.69	.46 (.15)	.00***
Experimental Squads / Baseline Period			-.21 (.15)	.18	.32 (.15)	.04**
Comparison Squads / Test Period					.53 (.16)	.00***

** Significant at .05 level
*** Significant at .01 level

Evidence from Primary Scenes

In this section, we summarize the types of physical evidence that the crime scene specialists collected at the primary scenes during the test period and assess whether there were any discernible differences in evidence collection as compared with the efforts of the investigators in the comparison squads. As further background to this section, our observations at homicide scenes support the conclusions in this section showing that crime scene specialists were taking the place of investigators in collection of evidence.

Supplemental reports from the PACE system were the source of information on items of evidence collected at primary scenes. These supplemental reports listed each specific item of evidence from the scenes. For purposes of this section, we classified the different types of evidence into six general categories:

- **Fingerprint evidence:** Latent prints and 10-prints obtained at scenes.
- **Biological evidence**: Swabs of bloodstains, buccal swabs, and other biological items.
- **Weapons evidence**: Firearms, casings, spent projectiles, GSR tests, and knives.
- **Drug evidence:** Suspected illegal drugs and drug paraphernalia.
- **Trace evidence:** Hair, fibers, cigarettes, tape, paint, and other small items.
- **Impressions evidence:** Impressions of tire tracks, footprints, and other impressions from scenes.

Exhibit 5-3 shows the percentage of primary scenes at which evidence was found for these categories. The main conclusion from the table is that the collection activities for the crime scene specialists during the test period do not differ significantly from the other periods.

Exhibit 5- 3: Percent of Cases by Evidence Category from Primary Scenes

Source	Biological Evidence (C=.06) Baseline Period	Biological Evidence (C=.06) Test Period	Fingerprint Evidence (C=.41) Baseline Period	Fingerprint Evidence (C=.41) Test Period
Comparison Squads	48.5 %	48.8 %	28.9 %	31.0 %
Experimental Squads	52.0 %	54.2 %	36.7 %	41.0 %
	Weapons Evidence (C=.24)		**Drug Evidence (C=1.52)**	
Comparison Squads	74.2 %	71.4 %	23.7 %	25.0 %
Experimental Squads	73.5 %	80.7 %	22.4 %	32.5 %
	Trace Evidence (C=2.70)		**Impressions Evidence (C=1.59)**	
Comparison Squads*	24.7 %	38.1 %	20.6 %	17.9 %
Experimental Squads	26.5 %	28.9 %	23.5 %	15.7 %

* Change from the baseline to the test period for the comparison squad was statistically significant at the .10 level ($\chi^2 = 3.54$).

From a statistical viewpoint, we analyzed the results in Exhibit 5-3 in two ways. One approach was to apply chi-square tests individually to the comparison and experimental squads across the two periods. For example, with the biological evidence, the results for the comparison squads from baseline to test periods creates a 2 X 2 table, with a resulting chi-square value of 0.66, which is not statistically significant. Of the 12 tables analyzed in this manner, only the increase for trace evidence from 25.0 to 39.5 percent is statistically significant ($\chi^2 = 3.16$, significant at the .10 level). Our conclusion from the chi-square tests is that the collection activities of the crime scene specialists did not differ significantly from the comparison squads with the single possible exception of trace evidence.

The second approach is Cochran's *standardized difference* (Cochran, 1954; Fleiss, 1973; Radhakrishna, 1965; Yates, 1955) analysis that takes advantage of results from both the experimental and comparison squads. The result of his approach is the calculation of what is known as *Cochran's C statistic*, which has a chi-square distribution. The value of Cochran's statistic can then be tested for the significance of the mean standardized difference across groups

(with one degree of freedom). Exhibit 5-3 shows the value of Cochran's statistic for the six different types of evidence. None of the values is significant at the .05 level. Our conclusion from this analysis is that, based on the changes between the baseline and test periods, there is no difference between the collection efforts of the experimental and comparison squads.

Specific Scene Activities

As another indication of level of effort, we selected three specific types of scene activities to review—number of photographs, number of firearm casings found, and number of latent lifts obtained. We selected these activities because they represent higher levels of effort on the part of crime scene specialists and investigators at scenes. The top portion of Exhibit 5-4 gives the percentage of primary scenes at which these activities were performed and the bottom portion shows the average (median) number of activities. For shell casings, the exhibit indicates that during the test period the crime scene specialists found an average (median) of 5.0 casings at 66.3 percent of the primary scenes during the test period—a result that compares favorably with the other groupings. Similarly, the crime scene specialists obtained latent lifts during the test period at 41.0 percent of the primary scenes with an average of 6.5 lifts per scene. In this instance, the percentage of scenes is higher than the other groups and the average number of latent lifts is in line with the other groups. From a statistical viewpoint, median tests on the three areas in the exhibit (photos taken, firearm casings, and latent lifts) yielded no statistically significant differences. The exhibit shows, however, that the number of photographs taken by the crime scene specialists in the experimental squads increased 28.1 percent (from 194.0 to 248.5 photographs), as compared with an increase of 22.7 percent (from 222.5 to 273.0 photographs) for the comparison squads.

Evidence from Secondary Scenes

Crime scene specialists assigned to the experimental squads were active in assisting with several secondary scenes during the test period. Secondary scenes include autopsies, residences, vehicles, hospitals, and others. Their evidence collection at many of these scenes represented additional time recovered for investigators to devote directly to case investigation.

Crime scene specialists attended 36 autopsies during the test period. Evidence collected at these autopsies included vials of blood, bullet fragments, shell casings, drugs, cigarettes, tape, documents, and clothing. They assisted in processing eight vehicles at the department's

impound lot that had been seized during the course of investigations. All vehicles were associated with suspects in cases; the crime scene specialists photographed these vehicles and

Exhibit 5- 4: Selected Activities at Primary Scenes

Percent of Primary Scenes

Investigative Unit	Shell Casings		Latent Lifts		Photographs	
	Baseline Period	Test Period	Baseline Period	Test Period	Baseline Period	Test Period
Comparison Squads	52.6	47.6	25.8	28.6	100.0	100.0
Experimental Squads	53.1	66.3	29.6	41.0	100.0	100.0

Average Number of Activities (Medians)

Investigative Unit	Shell Casings		Latent Lifts		Photographs	
	Baseline Period	Test Period	Baseline Period	Test Period	Baseline Period	Test Period
Comparison Squads	3.0	4.0	4.0	6.5	222.5	273.0
Experimental Squads	4.0	5.0	7.0	6.5	194.0	248.5

NOTE: Median values are more representative of the average because of skewness in the data.

obtained latent lifts. They also collected drug paraphernalia, cigarettes, and documents during their processing. Crime scene specialists made 10 visits to hospitals to photograph victims and gather clothing as evidence. They assisted in searches of nine residences where they took photographs and assisted in gathering evidence. Finally, they took photographs of suspects at headquarters (21 cases) and went to the FSC for photographs and fingerprints of almost all the victims during the test period.

Some of the activities—photographs and latent prints—do not represent time recovery for investigators because crime scene specialists would be assigned as normal procedure. However, their activities at autopsies and hospitals clearly saved time for investigators, as did some of the activities with vehicles.

Case Example

A case from the test period illustrates the involvement that crime scene specialists had in supporting investigations. In this case, a neighbor found the victim dead in his house from multiple stab wounds. His vehicle was missing from the garage. Two crime scene specialists processed the scene taking photographs and gathering evidence. In total, they obtained 22 swabs of bloodstains, strands of hair, two cigarette butts, drug paraphernalia (glass tube with residue), documents, clothing, and a variety of other items (briefcase, beer bottles, blankets, sample of green carpet, telephone with red stains, etc.). One of the crime scene specialists took elimination shoeprints from four officers who were at the scene. Two days later, the same crime scene specialist attended the autopsy of the victim where he obtained a tube of blood, fingernail clippings, and clothing.

On the next day, the case agent received a call from a credit card company stating that someone purchased merchandise at several locations in the metropolitan area with the victim's credit cards. In addition, the case agent identified a possible suspect—a friend of the victim—through interviews with associates of the victim. Investigators arrested the suspect two days into the investigation and he subsequently confessed to the murder. An investigator and a crime scene specialist obtained evidence from the suspect's home at the time of arrest. The crime scene specialist assisted with the collection of evidence and took over 200 photographs. On the day after the arrest, she took another 144 photographs of evidence at the request of an investigator. At the same time, the other crime scene specialist processed the victim's vehicle, which had been recovered during the arrest. He obtained three swabs of possible bloodstains, 13 latents, and other items (cell phone, beer bottles, water bottle, backpack, etc.).

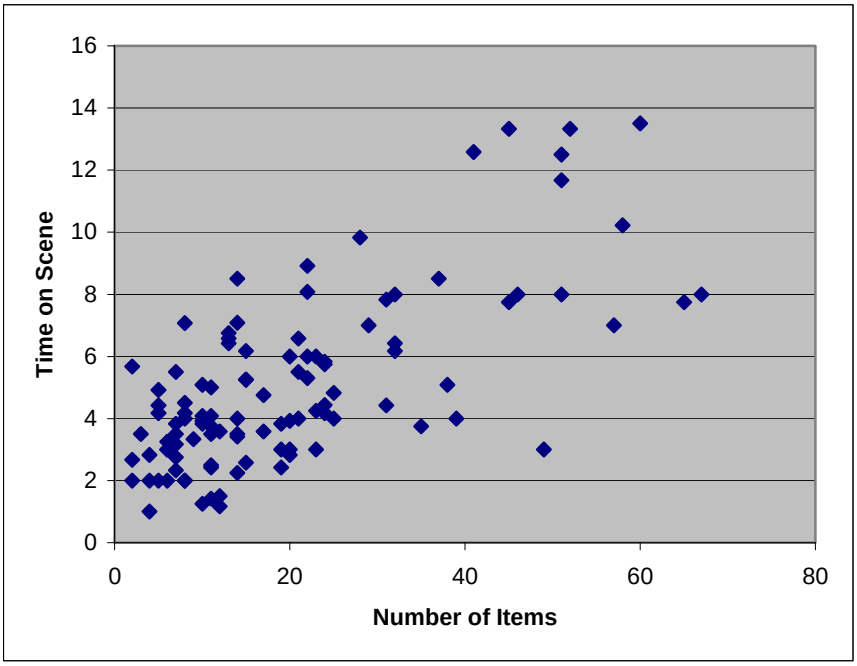
This example illustrates an important point about consistency of effort throughout a case. The two crime scene specialists who processed the initial scene continued their involvement in the case. Their familiarity with the case informed their subsequent evidence collection at the suspect's residence and victim's vehicle.

Time Recovered by Crime Scene Specialists

Another area of interest for the process evaluation was the amount of time recovered for investigators by having crime scene specialists at the primary scenes to collect evidence. As a starting point, we reviewed scene reports prepared by investigators during the baseline period and by the investigators in the comparison squads during the test period. We found that they provided starting and ending times on scene in 108 supplemental reports representing about 50 percent of the total cases. For these scene reports, the average time at primary scenes was 5 hours, 11 minutes (standard deviation of 2 hours, 53 minutes).

Exhibit 5-5 relates the elapsed time at primary scenes to the number of items of evidence collected for the 108 scenes. The correlation between the two variables is .72. A regression equation (not shown in the exhibit) is a reasonable fit to the data.

Exhibit 5- 5: Items of Evidence and Time at Primary Scenes



Regression Line: Time (hours) = 2.70 + .115 * Items

Time at the scene is only a portion of the total time required for processing evidence. Interviews with investigators and crime scene specialists indicated that it takes two hours to transport evidence to headquarters and impound the evidence at the property and evidence unit.

Within a few days, the scene report and diagrams is prepared, which requires six to eight hours according to investigators. In total, 16 hours per case is a reasonable estimate of the amount of recovered investigative time due to crime scene specialists collecting evidence at the primary scenes.

Unfortunately, few supplemental reports on secondary scenes included starting and ending times. Based on a review of the available information, the average time for processing a vehicle is about 2.5 hours, and the average time for a residence about 4.5 hours. These averages were judged to be approximately correct through interviews with crime scene specialists and investigators although they pointed out that a considerable range exists depending on the scene. As with primary scenes, crime scene specialists prepared reports for PACE describing the circumstances of the activities and listing the items of evidence. According to crime scene specialists, these reports also required six to eight hours.

In total, we estimated that investigators recovered about 24 hours of investigative time because of the four crime scene specialists assigned to the homicide unit. An important point about recovered time is that it occurs at crucial junctures in the investigation. Intense investigative effort is required during the first few days after a homicide, and any time recovered during this period is especially important for increasing the chances of finding suspects. The discussion in Chapter 7 expands this point by showing that arrests for homicides usually occur within the first two weeks of investigation.

Conclusions

Our conclusion from the process evaluation is that the Phoenix Homicide Clearance Project was implemented and operated as planned for the experiment. This conclusion is based on several results as provided in the above sections. Four crime scene specialists were transferred to the homicide unit in July 2004 and assigned to two of the four investigative squads. After two months of primarily on-the-job training, they were able to process scenes with minimal supervision from investigators. Three of the four crime scene specialists were with the experiment for its entire duration of 10 months; one crime scene specialist was with the experiment for 4.5 months because of an injury. As documented in this chapter, the other three crime scene specialists were able to handle homicide scenes where he would have assigned. It is

not believed that his absence created any significant problems with the conduct of the experiment.

A review of PACE reports showed that the four crime scene specialists collectively processed 75 (90.5 percent) of the 83 cases that occurred during the test period. Four of the other eight cases occurred during the same week of February 2005, a few weeks after the injury to one of the crime scene specialists, when the other crime scene specialists were also unavailable. For these eight cases, investigators from the experimental squads collected physical evidence and crime scene specialists from the crime lab were dispatched to take photographs and obtain latent prints.

During the baseline period, 18 different crime scene specialists from the crime lab assisted in some way with the 195 cases that occurred during this period. In contrast, with the exceptions just given, the four crime scene specialists processed all scenes associated with these cases. The reduction from 18 to 4 crime scene specialists improved consistency of operations between investigators and crime scene specialists.

Another indicator that the experiment operated as planned is that the total number of personnel who collected physical evidence at scenes dropped for the experimental squads during the test period. The average number of investigators for the experimental squads decreased from 1.29 during the baseline period to 0.42 investigators during the test period. Total personnel, including crime scene specialists, dropped from 2.96 during the baseline period to 1.76 during the test period.

We conducted analysis on the types of evidence collected at homicide scenes with the aim of showing that there had been no discernible drop-off of effort at the primary scenes. In addition, no differences were found in key performance indicators—number of photos taken, shell casings found, and latent lifts obtained.

Total time saved per case was estimated to be approximately 24 hours. This estimate includes time at the primary scene, secondary scenes, preparation of scene reports, and development of Visio scene diagrams. An important point is that the recovered time for investigators occurred at critical points of the investigation—either at the start of an investigation or later in an investigation when an arrest was imminent. Saving time at these key junctures could be important to the successful resolution of a case.

Chapter 6

Impact Evaluation

Introduction

The purpose of this chapter is to assess whether the assignment of the four crime scene specialists to the homicide unit produced the intended results. As previously discussed, the expected outcome was that the clearance rate for the experimental squads would be better than the comparison squads as judged against their performance during the previous year. Two other areas were determined to be important in judging the success of the project: acceptance of crime scene specialists within the homicide unit and preparation of scene reports including diagrams. Supervisors in the homicide unit did not believe that the project would be a long-term success unless the crime scene specialists were able to "fit in" with investigators on a day-to-day basis. Scene reports prepared by the four crime scene specialists needed to be as comprehensive and detailed as those prepared by investigators with several more years of experience. Scene reports are an important part of an investigation because they describe where the victim was found and list the forensic evidence collected by the crime scene specialists. Moreover, crime scene specialists may have to testify at trials on the contents of the reports.

In this chapter, we provide the analysis of case clearances with three different approaches. The first is an assessment of all clearances (cleared by arrest and exceptional clearances) for the cases during the baseline and test periods. A second assessment looks only at clearances by arrest, and a final assessment is a more detailed breakdown of clearances based on degree of difficulty in solving a case. We describe specific cases to indicate how the activities of the crime scene specialists contributed to increasing investigative time. These additional views of clearances are important because of the project's focus on providing more investigative time for finding suspects.

As part of the evaluation, ILJ conducted a survey of investigators from the comparison and experimental squads to determine their levels of satisfaction with the crime scene specialists. This chapter provides an analysis of the survey. Finally, we reviewed 50 crime scene reports to

compare the quality of reports prepared by the four crime scene specialists with those prepared by investigators. Results of the reviews are provided in this chapter.

In addition to ILJ's evaluation, the Phoenix Police Department was carefully monitoring the project to determine what steps to take after the completion of the grant. Their conclusion was that the assignment of crime scene specialists to the homicide unit was beneficial, and after the conclusion of the grant, they increased the number of crime scene specialists for the homicide unit. Information on the increase and associated organizational changes are presented in this chapter.

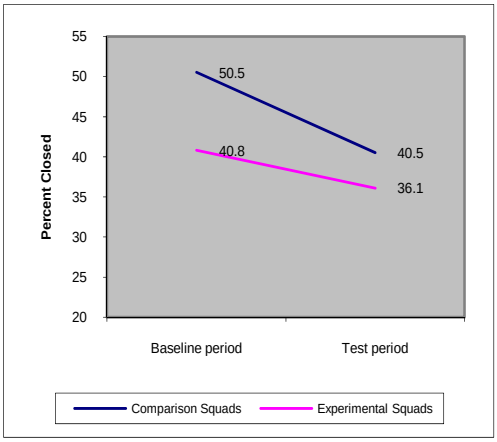
Clearance Rates

Exhibit 6-1 shows the clearance rates for the time periods of the project calculated as both case clearance and victim clearance rates. Overall, the results are not favorable for the department as a whole because the clearance rates dropped between the baseline and test periods. However, the drop was not as much for the experimental squads as for the comparison squads, which is a positive result for the assignment of the crime scene specialists to the experimental squads. For the comparison squads, the case clearance rate dropped from 50.5 percent during the baseline period to 40.5 percent during the test period, a decrease of 10 percentage points. For the experimental squads, the case clearance rate shows a drop of 4.7 percentage points, from 40.8 percent during the baseline period to 36.1 percent during the test period. From the viewpoint of case clearances, the experimental squads performed better than the comparisons squads in relation to the prior year.

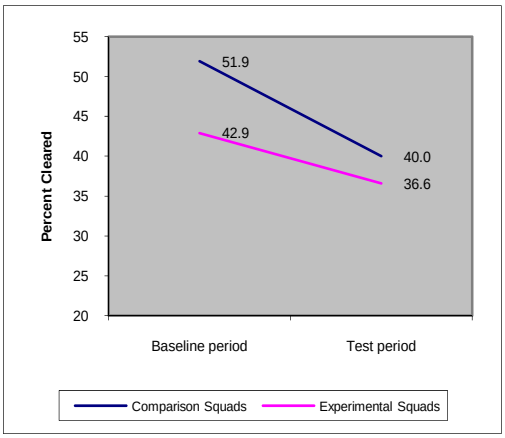
The victim clearance rate takes into account that some cases have multiple victims. Standard reporting procedures for the Uniform Crime Report are to report clearance rates based on number of victims, rather than number of cases. For the comparison squads, the victim clearance rate dropped from 51.9 percent to 40.0 percent, a decrease of almost 12 percentage points. With the experimental squads, the change is 6.3 percentage points, from 42.9 percent to 36.6 percent. Again, the experimental squads performed better in a relative sense than the comparison squads.

Exhibit 6- 1: Overall Clearance Rates

Case Clearance Rates



Victim Clearance Rates



As in the previous chapter, we performed two types of statistical analysis on the results form Exhibit 6-1. The first was to calculate chi-square values for the comparison and experimental squads separately across the baseline and test periods. For case clearances, the chi-square values are 1.83 for the comparison squads and 0.41 for the experimental squads; neither chi-square value is significant at the .10 level. For victim clearances, the chi-square values are 2.76 for the comparison squads (significant at the .10 level), and 0.82 for the experimental squads, which was not significant. The second statistical approach was to calculate Cochran's C,

which was calculated to be 2.01 for case clearances (not significant) and 3.29 for victim clearances (significant at the .10 level).

From the viewpoint of the police department, the results in Exhibit 6-1 are favorable to the project, even though the clearance rates decreased during the test period. The department wanted to see if the experimental squads did better on clearance rates than the comparison squads in relation to the prior year. The results indicate that the experimental squads did better in the sense that their decreases in clearance rates based on either cases or victims were less than the comparison squads. The statistically significant change in victim clearances supports this conclusion. One interpretation of the results in Exhibit 6-1 is that without the assignment of the crime scene specialists, the clearance rates for the experimental squads could have dropped several more percentage points during the test period.

One important caveat about the results in Exhibit 6-1 is that they are lower than the official clearance statistics from the department. There are two reasons for the lower percentages. First, our database does not include police shootings. The conclusion for every police shooting during our study was that the police were justified in their actions, and as a result, these cases were exceptionally cleared. A second reason that the clearance rates are lower is that this study does not including arrests during the project for cases prior to the start of the baseline period (July 1, 2003). Our study looks at the investigative results of homicides occurring during the baseline and test period. Police shootings and clearances for cases in prior years are included in clearance statistics provided to the FBI's Uniform Crime Reporting system.

Of course, the results were discouraging to the department because it wanted to reverse the trend of lower clearance rates from recent years. A more favorable result would have been increases in clearance rates for both the comparison and experimental squads with the experimental squads increasing to a much larger rate than the comparison squads. That was not the case. In Volume II, we explore several internal and external factors that may account for the continued drop in clearance rates.

To lend greater credence to the evaluation results, information was gathered and analyzed from other sources in a triangulation approach to determine whether other analyses would be consistent with the changes in the clearance rates. Support was found in four areas:

- Analysis of the types of clearances obtained by the comparison and experimental squads during the test period.
- Review of cases in which the crime scene specialists played a role in the evidence collection and their interactions with investigators.
- Survey of investigators on their satisfaction with crime scene specialists assigned to the homicide unit.
- Decisions by the Phoenix Police Department to increase the number of crime scene specialists assigned to the Homicide Unit.

Results from each of these are discussed in the following sections.

Types of Clearances

Cleared by Arrest

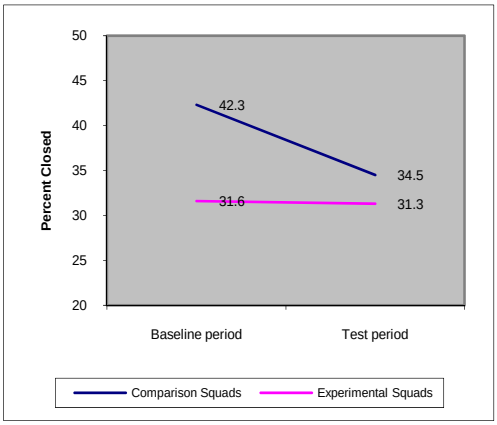
According to the guidelines of the FBI's Uniform Crime Reporting system, cases can be cleared in two different ways—cleared by arrest and exceptional clearances. A case is cleared by arrest when a suspect is arrested by police and charged by prosecutors. An exceptional clearance occurs when there is probable reason for arresting an individual but circumstances prevent the arrest. Common reasons for an exceptional clearance are (1) the offender commits suicide during the incident, (2) the suspect is killed during the incident either by the police or someone else, and (3) the suspect is incarcerated on an unrelated charge (after the homicide), thereby preventing arrest for the homicide. The Phoenix Police Department follows these guidelines in determining whether a case can be exceptionally cleared.

With regard to the Phoenix Homicide Clearance Project, clearances by arrests may be a better performance measure than measures that include exceptional clearances. Clearances by arrest require more investigative time than most exceptional clearances.[7] Exhibit 6-2 gives clearance statistics on cases cleared by arrest. Results in the exhibit are favorable to the experimental squads compared with the comparison squads. The case clearance rate for the comparison squads dropped from 42.3 percent during the baseline period to 34.5 percent during the test period, a decrease of almost eight percentage points. There was virtually no change in the case clearance rates for the experimental period—31.6 percent during the baseline period and 31.3 percent during the test period.

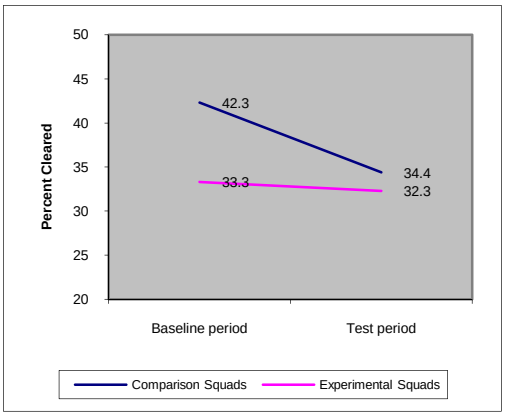
[7] Most exceptional clearances for the cases in our database were either murder-suicide cases or cases in which the suspect was killed as part of an incident. These required less investigative time than other cases.

Exhibit 6- 2: Cleared by Arrest Rates

Case Clearances by Arrest



Victim Clearances by Arrest



The patterns for victim clearance are similar for both groups. The comparison squads cleared 42.3 percent of their cases by arrest during the baseline period and 34.4 percent during the test period. For the experimental squads, the change was negligible, from 33.3 percent to 32.3 percent. However, our statistical analysis did not identify any significant changes in either case or victim clearances by arrest. None of the chi-square values was significant and the Cochran C values were not significant.

Types of Arrests

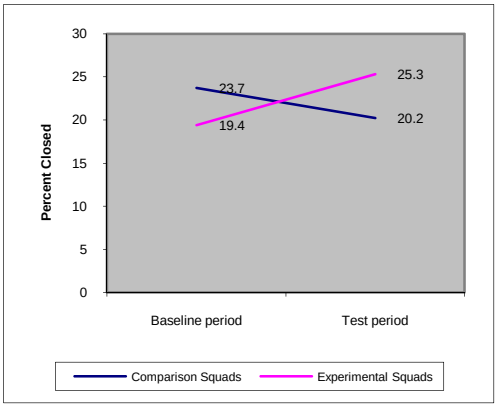
A more in-depth review of cleared cases showed that some cases require considerably more time to identify suspects than other cases. The fourth chapter of Volume II examines this issue in detail as a way of understanding the types of cases that investigators are able to clear and the amount of effort required for identification and arrest of suspects. As described in that chapter, we divided the case clearances into three categories: *immediate arrest cases*, *quick action cases*, and *whodunits*. Immediate arrest cases are those in which a suspect is immediately identified and an arrest is quickly made (usually at the scene or within a few blocks of the scene). An example of an immediate arrest case is one in which a person calls the police to report that he or she killed someone, usually a spouse or other relative. Quick action cases are those in which a suspect is not immediately identified or the whereabouts of a suspect is not immediately evident when investigators arrive on scene. However, action by the police results in the arrest of a suspect, usually within a few days. Volume II provides examples of quick action cases showing that the intense activities of investigators during the first few hours and days after an incident are important to the identification of suspects. In whodunit cases, the final category of cleared cases, it may require extensive amounts of investigative effort to identify and arrest suspects. In these cases, it may take weeks, months, or even years to make an arrest. They are the most difficult cases for homicide investigators.

As discussed in Chapter 5, the assignment of the four crime scene specialists to the experimental squads resulted in additional time for investigators to spend on cases. Further, the additional time was recovered at critical junctures of an investigation. It could therefore be conjectured that the experimental squads should have higher percentages of quick action and whodunit arrests. That is, the additional time should contribute to the solution of these types of clearances, rather than to immediate arrest cases.

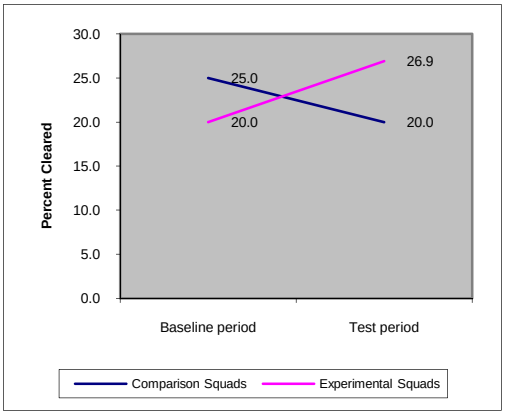
Exhibit 6-3 supports this conjecture for the experimental squads by looking at the contribution of quick action and whodunit arrests to the overall clearance rates. For example, during the baseline period, 19.4 percent of the cases for the experimental squads were by quick action and whodunit arrests and that percentage increased to 25.3 percent during the test

Exhibit 6- 3: Quick Action and Whodunit Arrests

Case Clearances due to Quick Action and Whodunit Arrests



Victim Clearances due to Quick Action and Whodunit Arrests



period. By contrast, the percentages decreased for the experimental squads, from 23.7 percent to 20.2 percent. As shown in the bottom graph of Exhibit 6-3, similar changes occurred with victim clearances. For the experimental squads, the percent of victims cleared by quick action and whodunit arrests increased from 20.0 during the baseline period to 26.9 percent during the test period, while the experimental squads had a decrease from 25.0 percent to 20.0 percent.

Review of Specific Cases

As with the previous analysis on closures by arrest, however, our statistical analysis did not identify any significant changes in either case or victim clearances by arrest. None of the chi-square values was significant and the Cochran C values were not significant. Two cases are described in this section in which crime scene specialists were especially active in assisting investigators. Both cases resulted in the arrests of suspects after considerable effort by investigators over an extended period. It is not asserted that the suspects would have avoided arrest if the crime scene specialists had not been supporting the investigations. However, it is clear from reviewing the cases that the crime scene specialists allowed investigators to devote more time to investigations.

In the first case, the victim was found dead in his residence by a friend who had arrived at the house and found the front door wide open and saw the victim on the floor. After checking for a pulse, he exited the house and immediately called the police. The victim had sustained several gunshot wounds. Two laptop computers, a cell phone, and money were missing from the residence, and the letters 'CBF' (Crime Blood Family) had been painted in blue on the living room wall.

The crime scene specialist assigned as the scene agent collected 25 items from the residence along with six latent prints. The next day, he attended the autopsy of the victim, obtained evidence from the autopsy (including bullet projectiles and fragments), and prepared an autopsy report. Within a few days, he had completed a 10-page scene report with Visio diagrams of the crime scene and made several requests to the crime lab for analysis of evidence. In the meantime, the case agent and other investigators interviewed several friends and relatives of the victim. Their break in the case came two days after the homicide through an interview of a suspect in an unrelated robbery case. Three suspects for the homicide were identified as a result of this interview. Through considerable effort by the case agent and other investigators, the three suspects were arrested three days later, making a total time of about five days from incident to arrest. The crime scene specialist relieved the investigators of about 24 hours of effort during this time.

In the second incident, two victims were apparently killed over a drug dispute. The incident took place at the residence of Victim 2 at about 8:30 p.m. The girlfriend of Victim 1

had just arrived there by car and had been introduced to a third person who had been talking to the two victims. From the conversations, she believed that the third person was a friend of both victims and that they may have been conducting a drug transaction. The third person walked back to his car and appeared to be leaving; instead, he produced a firearm and shot Victim 1 and Victim 2. He then fled in his vehicle.

The crime scene specialist assigned to this case spent about four hours at the scene collecting 20 pieces of evidence, photographing the scene, and taking measurements. The next day, with the assistance of another crime scene specialist, he fingerprinted both victims at the Forensic Science Center; and on the following day, he attended the autopsies of both victims and collected additional evidence. He then prepared a 10-page scene report and autopsy reports on both victims. Approximately one week later, the crime scene specialist wrote another report for PACE detailing the measurements of evidence recovered at the scene.

In the meantime, the case agent and other investigators had conducted interviews with the family and friends of the two victims. Four days after the incident, the case agent received a call from the girlfriend of Victim 1. She relayed that she had received a call in which the caller stated that a mutual acquaintance had talked about killing the two victims. With the assistance of another investigator, who had been investigating this same person on a different homicide, the case agent obtained a picture of the suspect from police files and created a line-up of photographs to show to the girlfriend of Victim 1. From the line-up, she was able to identify the suspect. Investigators began a search for the suspect and were able to make an arrest 10 days later. His vehicle matched the description given by the girlfriend of Victim 1 and other witnesses at the scene. The crime scene specialist processed the vehicle for evidence and obtained three latent lift cards.

Both these examples illustrate how crime scene specialists can provide investigators additional time for investigative activities. The examples also indicate that the project was working as intended and support the other analysis on impact changes in regard to quick action and whodunit cases.

Survey of Investigators

Approximately six months into the experiment, ILJ conducted a survey of investigators in the experimental and comparison squads to determine their levels of satisfaction with crime scene specialists. Questions to investigators in the experimental squads differed from those to the comparison squads because of the differences in activities by crime scene specialists. Investigators in experimental squads were asked about how the crime scene specialists were performing in collecting evidence and preparing reports, while investigators in comparison squads were asked only about levels of satisfaction with photographing of scenes and capabilities of crime scene specialists to work on their own at homicide scenes. Surveys were provided to the investigators with envelopes for mailing their responses directly back to ILJ's office. They were assured of anonymity for all ratings and comments that they provided, and did not have to provide their names. We received a total of 11 surveys from investigators in the experimental squads and 10 surveys from investigators in the comparison squads for an overall response rate of about 85 percent.

Exhibit 6-4 gives the results of the surveys of investigators in the experimental squad. Overall, they are favorable for the project with high rating for the capabilities of the four crime scene specialists to collect evidence in a quality manner (overall average score of 8.6 out of 10) and to measure a scene (score of 8.3). On a question about their capabilities to collect all the necessary evidence at a homicide scene, the average score was 7.4 out of a possible 10. The lowest average scores were for their abilities to work at a scene without supervision (score of 6.7) and preparation of reports for the PACE system (score of 6.7); however, even these scores are above average.

Some investigators in the experimental squads had problems in answering the survey questions because of their perceptions that two of the four crime scene specialists were making outstanding progress while two others were having considerable difficulties. We have already commented that two of the crime scene specialists did not have computer backgrounds and were having problems in preparing scene reports and Visio diagrams of scenes. The lower score on report writing is a reflection of the difficulties that these two individuals were experiencing.

Exhibit 6- 4: Survey of Investigators in Experimental Squads

Question	Average Response
1. On a scale of 1 to 10 (with 10 as excellent) how would you rate the capabilities of the four crime scene specialists to collect evidence in a quality manner?	8.6
2. On a scale of 1 to 10, how would you rate their capabilities to collect all the necessary evidence at a homicide scene?	7.4
3. On a scale of 1 to 10, how you would rate the capabilities of the crime scene specialists to work on their own at a homicide scene?	6.7
4. On a scale of 1 to 10, how would you rate their capabilities in measuring a scene?	8.3
5. On a scale of 1 to 10, how would you rate their report writing skills?	6.7

A reflection of the range of capabilities is shown in the following written comments by a few respondents:

- "Crime scene specialists are not all at the same level—difficult to rate"
- "One of the crime scene specialists really shines, two are getting there, and one is not useful."
- "There is a huge difference between the four crime scene specialists. Two are really good, but one is struggling. The fourth is getting better and has the ability to become better with more oversight."

Several investigators commented on benefits of crime scene specialists to the unit:

- " [Even with the differences in capabilities of the four crime scene specialists], I really do like this program and believe it is a huge asset to our office."
- "The crime scene specialists are an excellent addition to the unit. They save detectives a lot of time; however, they need more training."
- "The crime scene specialists are a valuable resource and tremendous time saver. I feel free to conduct other aspects of the investigation when they are present. Some crime scene specialists are more adept at their jobs than others."

The need for additional training for the crime scene specialists was a theme of many comments from investigators. Suggested training topics included basic crime scene reconstruction, crime scene management, blood spatter analysis, court testimony, trace evidence detection and collection, and report writing.

On the two questions for investigators in the comparison squads, general satisfaction with the crime scene specialists was also noted. An average score of 6.5 (out of a 10) was obtained on the question about the capabilities of the crime scene specialists to work on their own at a homicide scene. On the capabilities of crime scene specialists to take quality photographs at homicide scenes, an overall average of 8.2 was found. These scores are in line with those for the crime scene specialists in the experimental squads for these two measures. Comments from these investigators included the following:

- "They are professional and helpful."
- "Courteous and very professional."
- "They are willing to learn and don't mind teaching others."
- "Some are able to work alone; others require supervision."
- "We often have to wait for a crime scene specialist on nights and weekends."

A comparison of the responses between the two groups of investigators would indicate that the collection of evidence and saving time at the scene as the primary benefits of having crime scene specialists assigned to the homicide unit.

Quality of Scene Reports

As stated in the introduction, scene reports are another important area for the impact evaluation. Scene reports are prepared by the assigned scene agent and entered as supplemental reports into the PACE system. They are the official record for describing the scene and for providing information on where forensic evidence was found. As with other supplemental reports, they are discoverable by defense attorneys upon request in a case.

The first section of a scene report describes weather conditions, entrances into the area, locations of parking areas, lighting conditions, location of other police vehicles, traffic lanes, businesses in the area, and other information. A second section is more specific in describing where the victim was found and provides details about the surrounding area. For a scene inside a premise, this section might, for example, indicate the room in which the victim was found, the victim's position, and a description of the room. For a victim found inside a vehicle, the section would include a description of the vehicle, location of the vehicle, where the victim was located (front passenger seat, driver's seat, etc.), and other information. The final section of a scene

report documents the locations of all forensic evidence that has been collected. A reference point is given (e.g., northwest corner of the room) followed by a list of the items and their exact location from the reference point (e.g., 3'2" south, 12'4" east).

To judge the quality of scene reports, we randomly selected 25 reports prepared by investigators during the test period and 25 reports prepared by crime scene specialists during the test period. Two researchers from ILJ's staff were then trained on how to assess a scene report on the three sections just described. They were asked to rate each section on a four-point Likert scale from 1 (poor) to 4 (excellent). Prior to their reviews, the names of the report writers were removed and the two groups of reports were merged together in random order. The reviews were therefore a blind test for the raters because they did not know who had prepared the reports and they reviewed the reports in random order. Analysis of the final scores from the two researchers indicated relatively high inter-rater reliability as judged by Cronbach's alphas, which were calculated to be .84 for initial scene description, .85 for scene description, and .79 for description of evidence collected and measurements.

Exhibit 6-5 provides results of t-test on comparing the average scores for the three areas. The results are favorable to the preparation of reports by the crime scene specialists. Their average scores are significantly higher for the sections on initial observations and evidence descriptions and measurements. On the section for scene description, the averages are very close and are not significantly different from a statistical viewpoint.

Several reasons can be given for the outcomes of the review. The most obvious is that the four crime scene specialists are dedicated to evidence collection and preparation of scene reports. On average, their reports were longer and more detailed than reports prepared by investigators (10 pages for reports by crime scene specialists compared with five pages by investigators). Consistency is more difficult with investigators because they prepare scene reports less often than the crime scene specialists. Seventeen different investigators prepared the 25 randomly selected reports for this analysis.

Exhibit 6- 5: Quality of Scene Reports

	Initial Observations	
Investigative Unit	**Average Score**	**t-value**
Comparison Squads	2.36	1.93**
Experimental Squads	3.00	
	Scene Description	
Investigative Unit	**Average Score**	**t-value**
Comparison Squads	2.56	0.58
Experimental Squads	2.76	
	Evidence Description / Measurements	
Investigative Unit	**Average Score**	**t-value**
Comparison Squads	2.73	2.16**
Experimental Squads	3.39	

** Significant at the .05 level.

In summary, based on our analysis, the crime scene specialists are doing better than investigators in documenting their initial observations and in their descriptions of evidence with detailed measurements. The average score of the crime scene specialists on scene descriptions was lower than the other two areas and only slightly higher than the score for the investigators. This may indicate an area for improvement.

Organizational Changes

At the end of the experiment, the department conducted its own assessment of the project in the homicide unit. With regard to the crime scene specialists, one had already transferred out of the unit because of his off-duty injury. Two others were judged as doing excellent work for the unit but the fourth crime scene specialist was still performing below expectations. It was decided that this individual would be transferred back to the crime lab.

The most significant change was that the department expanded the program by assigning six more crime scene specialists to the homicide unit for a total of eight specialists. Two crime scene specialists were assigned to each squad. Interestingly, the suggestion for two crime scene specialists per squad had been written on several surveys by investigators in the experimental squads. The assignment of two crime scene specialists per squad solved a problem discussed in Chapter 5 on process evaluation. Many scenes require two people for identification of evidence and taking measurements. Some scenes for the experimental squads were handled by a combination of one crime scene specialist and one investigator. In order to achieve what the department wanted from the project, two crime scene specialists are needed so that all investigators are relieved from evidence collection and available for investigative activities. Having a squad of eight crime scene specialists was a major step towards this objective.

Another organizational change was that a crime lab supervisor was assigned to oversee the activities of the eight crime scene specialists assigned to the homicide unit. In essence, what this change meant was that the crime scene specialists were now organizationally under the crime lab but assigned to assist investigators in the homicide unit. The eight crime scene specialists and supervisor were given cubicles in the homicide unit in the middle of the cubicles for the homicide investigators. The physical arrangement benefited communication among investigators and crime scene specialists during the course of an investigation.

The decision to place the crime scene specialists and supervisor back under the crime lab solved several problems that had been growing as the experiment progressed. One of these problems was access of the crime scene specialists to LIMS, the crime lab's information system, in which activities of crime scene specialists are recorded. Only crime lab personnel were allowed access to LIMS and access by the four crime scene specialists had been limited during the experiment because they were organizationally under the homicide unit. Another problem was that the crime lab had been moving toward the development of performance measures for crime scene specialists as part of the department's overall "balanced scorecard" approach. This is a management system adopted by many private businesses to clarify their vision and strategy and translate them into actions. The crime lab's aim was to have performance measures for all crime scene specialists, including those assigned to the homicide unit. However, achieving that aim was difficult without having organizational authority over all crime scene specialists.

The commander of the homicide unit made efforts to improve coordination and communication with crime lab personnel to make these organizational arrangements effective. A disadvantage of the new arrangement is that he no longer has direct control over the crime scene specialists assigned to the homicide unit. Conflicts occurred when the crime lab supervisor made arrangements for an activity, such as training, for one or more crime scene specialists, while the commander of the homicide unit needed them for another assignment. As time proceeds, these problems are becoming alleviated. The commander of the homicide unit also established weekly meetings with supervisors of the forensic analysis units in the crime lab to discuss particular cases and how to prioritize the analysis. The role of crime scene specialists is sometimes a topic at these meetings.

Another concern mentioned by squad supervisors was the training of new homicide investigators. In the past, when investigators were assigned to the unit, their first duties were as scene agents, rather than as case agents. It was believed that the experience they gained in how to handle a scene helped them to become good case investigators. The squad supervisor stated that this practice needs to be continued even though crime scene specialists are responsible for homicide scenes. That is, new investigators should still be required to start their homicide investigative careers by assisting at crime scenes with evidence collection.

In summary, the conclusion of the Phoenix Police Department is that the experiment improved evidence collection and allowed homicide investigators to concentrate on investigative activities. Based on interviews with supervisors, the assignment of eight crime scene specialists to homicide cases is proving beneficial to the homicide unit and the organizational arrangements for the crime scene specialists are satisfactory.

Statistical Power

Statistical power is defined as the probability that a study will reject the null hypothesis when it is in fact false (Cohen, 1988; Lipsey, 1990). It is statistically related to a Type II error in statistical inference (failure to reject the null hypothesis when it is false) as "1 – P(Type II error)." In general, the power of a statistical test is dependent on the selected significance level, the sample size (related to the reliability of the sample results), and the effect size (a measure of

the difference between the actual parameters in the population and those hypothesized in the null hypothesis).

The downside of the experiment and the statistical tests is that the number of cases and the effect sizes are not enough to produce high statistical power. Based on tables in Cohen (1988), the statistical power is on the order of .25, which is considered "small" statistical power. In this evaluation, the effect size is based on the difference between clearance rates of the two squads during the baseline period. That difference was .097 percentage points for all clearances and .106 percentage points for clearances by arrest. While that difference may appear to be substantial at face value, it is not enough to produce high statistical power. The same can be concluded about the sample size during the test period, a total of 167 cases, which again may appear to be a relatively large number of cases, but is not enough to produce high statistical power, especially given the basis for the effect sizes.

Conclusions

The impact evaluation shows that the Homicide Clearance Project had limited success in achieving the objectives of the department. The greatest disappointment is that the clearance rates did not increase from the previous year but instead decreased for both the comparison and experimental squads. On the other hand, the evaluation design shows the importance of having two groups of squads from which to draw comparative results. The experimental squads did better in the sense that their decreases were not as great as those of the comparison squads. As reflected in Exhibit 6-1, the change in victim clearance rates was from 51.9 percent to 40.4 percent for the comparison squads (a drop of almost 12 percentage points) compared with a change from 42.9 percent to 36.6 percent for the experimental squads (a drop of 6.3 percentage points). Additional supportive evidence for the project is indicated by looking at clearances by arrests (Exhibit 6-2). The victim clearance rate for the experimental squads stayed virtually the same between the two periods (33.3 and 32.3 percent, respectively), while the cleared by arrest rate for the comparison squads decreased significantly from 42.3 percent to 34.4 percent.

It was further indicated through the evaluation analysis that time saved by the crime scene specialists occurred at critical times during investigations, which may explain the positive results for the project on quick action and whodunit arrests. As shown in Exhibit 6-3, the victim

clearance rates for these cases increased for the experimental squads (from 20.0 percent during the baseline period to 26.9 percent during the test period), while the comparison squads decreased (25.0 percent during the baseline period and 20.0 percent during the test period).

Two areas in which the project showed success were the acceptance of the crime scene specialists by investigators in the homicide unit and the quality of reports prepared by the crime scene specialists. Our survey of investigators indicated acceptance of the crime scene specialists with many positive remarks about their capabilities. Remarks from investigators also indicated that the crime scene specialists still needed additional training and experience. Our comparisons of scene reports prepared by the crime scene specialists and by investigators indicated that the crime scene specialists were producing good reports in the areas of initial observations and evidence description/measurements. No significant differences were found on scene descriptions between reports by the crime scene specialists and reports by investigators.

Strong indicators for success of the project are indicated by the department's decision to increase the number of crime scene specialists assigned to the homicide unit. Eight crime scene specialists are assigned to the homicide unit with two crime scene specialists for each of the four squads. Assignment of a supervisor for the unit of eight crime scene specialists and placing the unit organizationally under the crime lab has alleviated problems that had been lingering throughout the test period. The new organizational arrangement is a compromise that should provide overall benefits to the department.

From an evaluation viewpoint, the most significant problem in the impact analysis is that the statistical results have low statistical power because of small sample sizes. It is primarily because of the low statistical power that the evaluation has focused on analyses of other indicators to determine whether the assignment of the four crime scene specialists had the desired effects. The drawback of looking only at statistical power as an indicator of reliability of results is that it does not take other supportive analyses into account. Statistical power focuses only on the reliability of statistical tests. Low statistical power does, however, mean that further testing is needed either through replications of the project in other departments or through continued analysis by the Phoenix Police Department.

Chapter 7

Conclusions

Homicide Clearance Project

In July 2004, four crime scene specialists were transferred from the department's Laboratory Service Bureau to the homicide unit in the Violent Crimes Bureau. They were assigned to two of the four homicide investigative squads. The transfers were part of a grant project awarded to the Phoenix Police Department to improve homicide clearance rates. Prior to the grant, homicide investigators were responsible for collecting and handling evidence. Assignment of four crime scene specialists to the unit was seen as a way to relieve a considerable amount of workload from investigators.

The four crime scene specialists immediately began on-the-job training by accompanying investigators to homicides scenes and assisting in the collection of evidence. The training proceeded quickly because the crime scene specialists were already familiar with department procedures. While assigned to the crime laboratory, they had been assigned to homicide scenes to take photographs and dust for latent prints. By September 2004, the crime scene specialists were able to handle scenes with minimal assistance from investigators.

Evaluation Design

Assignment of the crime scene specialists to two of the four homicide investigative squads provided an opportunity to conduct an evaluation as a quasi-experimental design. That is, the performance of the two squads with crime scene specialists (experimental squads) could be compared with the performance of the other two squads (comparison squads). The hypothesis was that the experimental squads would have better performance than the comparisons squads, especially as measured by homicide clearance rate.

During the course of the evaluation, ILJ staff coded information from all homicides that occurred during the 12-month period prior to the transfers (July 1, 2003 – June 30, 2004), referred to as the *baseline period*, and a 10-month period starting September 1, 2004, referred to as the *test period*. In total, the baseline period had 195 cases (209 victims) and the test period

had 167 cases (183 victims). During these two periods, the assignment of cases was virtually the same for the comparison and experimental squads. For the baseline period, the comparison squads were assigned 97 cases (104 victims) and the experimental squads were assigned 98 cases (105 victims). For the test period, the comparison squads were assigned 84 cases (90 victims) and the experimental squads were assigned 83 cases (93 victims).

ILJ conducted both a process and impact evaluation. The aim of the process evaluation was to determine how the project proceeded during the test period and whether it operated as originally intended. The impact evaluation assessed whether the assignment of the four crime scene specialists produced the intended results.

Process Evaluation

The conclusion of the process evaluation was that the project was implemented and operated as envisioned by the department. Key indicators for the conclusions are as follows (Chapter 5, *Process Evaluation*, provides more detailed results):

- Three of the four crime scene specialists were with the experiment for its entire duration of 10 months; one crime scene specialist was injured in an off-duty accident and was with the test period for 4.5 months. The other three crime scene specialists were able to handle the increased workload without affecting the test.
- The crime scene specialists collectively processed 75 (90.5 percent) of the 83 cases that were assigned to the experimental squads during the test period. They were unavailable for the other cases because of training and regular days off.
- Time saved per case by assigning crime scene specialists to evidence collection was approximately 24 hours. The recovered time was at critical periods of the investigation, either at the start of an investigation or later during an investigation when an arrest was imminent.
- No significant differences were found in the activities of the crime scene specialists at homicide scenes compared with the activities of investigators in the comparison squads.

Several other results were beneficial to the evaluation of the project. For example, the organizational arrangement within the homicide unit is that the four investigative squads are assigned homicides as they occur throughout the city. That is, the squads are not assigned to specific geographical areas. The advantage for the evaluation design was that there were no differences found in the overall spatial pattern of homicides assigned to the comparison and experimental squads. Further, virtually no differences were found in victim characteristics

between squads and project periods. Finally, the investigative personnel in the squads stayed relatively constant throughout the project period. While there were a few changes due to transfers and retirements, the core investigative staff remained the same. Twenty-two of the 26 investigators assigned to the squads were with the homicide unit during the entire project

Impact Evaluation

The expected outcome of the Homicide Clearance Project was that the clearance rate for the experimental squads would be better than the comparison squads as judged against their performance during the previous year. Two other areas were determined to be important in judging the success of the project: acceptance of crime scene specialists within the homicide unit and preparation of scene reports with diagrams.

For the evaluation, case clearances were reviewed with three different approaches. First, an assessment of all clearances (cleared by arrest and exceptional clearances) was made for cases during the baseline and test periods. Second, only those cases cleared by arrest were analyzed. Third, a more detailed breakdown of clearances based on degree of difficulty in solving a case was developed.[8]

Key results from the impact evaluation were as follows (see Chapter 6, *Impact Evaluation*, for additional impact results):

- The overall clearance rates decreased for both the experimental and comparison squads; however, the decrease for the experimental squads was less than the comparison squads:
  - For the experimental squads, the case clearance rate decreased almost five percentage points, from 40.8 percent during the baseline period to 36.1 percent for cases during the test period. For the comparison squads, the decrease was 10 percentage points, from 50.5 percent to 40.5 percent. These decreases were not statistically significantly based on chi-square tests and calculation of Cochran's C statistic.
  - For victim clearance rate, which is the usual approach for reporting clearances, the experimental squads decreased 6.3 percentage points, from 42.9 percent clearance rate during the baseline period to 36.6 percent during

[8] The clearance rates developed during the evaluation are lower than the official statistics of the Phoenix Police Department for two reasons. First, the evaluation did not include police shootings. These are investigated by the homicide unit and almost always result in a determination of exceptional clearances. Second, the evaluation does not include clearances for cases prior to the baseline period; instead, the evaluation is based on clearances of cases occurring during the project periods (with a cutoff date of November 2006).

the test period. The comparison squads showed a decrease of almost 12 percentage points, from 51.9 percent during the baseline period to 40.0 percent during the test period. The chi-square value for the change with the comparison squads was statistically significant (at the .10 level), but the value for the experimental squads was not significantly different. Cochran's C value was also statistically significant for the victim clearances.

- Similar results were found for rates based on clearances by arrest (omitting exceptional clearances). That is, the experimental squads had better performance statistics on clearances by arrest than the comparison squads. However, none of the changes were statistically significant:
  - For the experimental squads, the case clearance rate based on arrests showed virtually no change, from 31.6 percent during the baseline period to 31.3 percent during the test period. The comparison squads showed a 7.8 percentage point change, from 42.3 percent to 34.5 percent.
  - With victim clearances by arrest, the experimental squads had a 33.3 percent clearance rate during the baseline period and 32.3 percent during the test period. The comparison squads showed a decrease from 42.3 percent to 34.4 percent, almost eight percentage points.
- The experimental squads also did better on quick action and whodunit cases than the comparison squads:
  - Case clearance rates for quick action and whodunit cases increased for the experimental squads from 19.4 percent during the baseline period to 25.3 percent during the test period. For the comparison squads, the change was from 23.7 percent during the baseline period to 20.2 percent during the test period.
  - Victim clearance rates increased from 20.0 percent to 26.9 percent for the experimental squads, while the comparison squads decreased from 25.0 percent to 20.0 percent.
- A survey of investigators in the experimental squads provided favorable results with high ratings for the capabilities of the four crime scene specialists to collect evidence (average of 8.6 out of possible 10) and to take measurements of a scene (score of 8.3). The average score was 7.4 on a question about their capabilities to collect all the necessary evidence at a scene. The lowest scores were for their abilities to work at a scene without supervision (score of 6.7) and report preparation within the PACE system (score of 6.7).
- ILJ evaluated scene reports with ratings made in the areas of descriptions of initial observations, scene descriptions, and description/ measurement of evidence. Fifty reports were rated in these categories using a four-point Likert scale from 1 (Poor) to 4 (Excellent). Reports from the crime scene specialists assigned to the experimental squads were judged to be better in regard to initial observations (3.00 average rating for the experimental squads and 2.36 for the comparison squads). Similarly, reports by the crime scene specialists were judged to be better in the area of description and measurements of evidence (3.39 compared with

2.73). Average scores for scene description were about the same for comparison and experimental squads (2.56 and 2.76).

In summary, the Homicide Clearance Project was determined to be a limited success. The clearance rate for the experimental squads stayed virtually the same while the case clearance rate for the comparison squads decreased eight percentage points. Moreover, the experimental squads did better with quick action and whodunit cases, which was hypothesized to be the result of increased attention from investigators who had been relieved of their duties on evidence collection.

At the end of the test period, the department conducted its own assessment of the project. As a result, the department expanded the program to eight crime scene specialists in the homicide unit, with two specialists per squad.

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