



**NIJ**

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## Without a Trace? *Advances in Detecting Trace Evidence*

**DNA Evidence: What Law Enforcement Officers Should Know**

**CCTV: Constant Cameras Track Violators**

**NIJ's Bullet-Resistant Vest Standard Reaches Milestone**

**At-A-Glance**

**Alcohol Control Policies and Violent Crime**

*by Bruce L. Benson, David W. Rasmussen, and Paul R. Zimmerman*

**Binge Drinking in the Northern Plains Tribes**

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**Community Policing, Then and Now**

*by Arlen M. Rosenthal, Lorie A. Fridell, Mark L. Dantzker, Gayle Fisher-Stewart, Pedro J. Saavedra, Tigran Markaryan, and Sadie Bennett*

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## DIRECTOR'S MESSAGE

Today's popular television shows depict amazing but fictional crime scene forensics work. In real life, however, there are equally astounding scientific and technical advances in crime prevention and investigation. The feature articles in this issue of the *NIJ Journal* highlight several scientific breakthroughs to solve crime and to protect the public and law enforcement personnel.

"Without a Trace? Advances in Detecting Trace Evidence" details four cutting-edge methods of extracting information from microscopic particles at a crime scene. These include matching fragments of glass, analyzing a minute layer of chemical residue without destroying the entire sample, and illuminating bodily fluids in broad daylight.

"DNA Evidence: What Law Enforcement Officers Should Know" explains the basics of DNA sample collection and notes some procedures that can enhance the usefulness of such evidence. "CCTV: Constant Cameras Track Violators" provides an overview of the use of closed circuit cameras to monitor public areas. And, "NIJ's Bullet-Resistant Vest Standard Reaches Milestone" celebrates the success of a manufacturing protocol that has saved the lives of thousands of law enforcement personnel.

This issue's "Research At-A-Glance" section contains two articles relating to alcohol and crime. A team of researchers looked into the effect on crime rates of alcohol control policies such as excise taxes and higher legal drinking ages, and found no discernible improvements (at least none yet). Another researcher took a close look at the relationship between binge drinking and crime in a Native American population, the Northern Plains Tribes. Also in this section is a discussion of how mapping technology can help probation and parole officers, and the results of a survey on community policing.

As technology becomes an increasingly important element of every aspect of twenty-first century life, its use by those engaged in criminal activity will undoubtedly increase as well. The Department of Justice remains committed to ensuring that the latest technological advances will always be in the arsenal of those administering criminal justice.



Sarah V. Hart  
Director



BUILDING  
KNOWLEDGE TO  
MEET THE CHALLENGE OF  
CRIME AND JUSTICE

## National Institute of Justice

**Sarah V. Hart**  
Director

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Be sure to visit often—it's updated regularly!



## Without a Trace? *Advances in Detecting Trace Evidence*

**S**hards of glass are found at the scene of a hit and run. It's the same type of glass used to make most standard headlights.

A single hair might belong to a missing woman, but it is coated with conditioner, making microscopic analysis impossible.

Investigators at the site of a plane crash search for minute quantities of explosives in the wreckage.

At the scene of a rape and murder, officers hope to find blood or semen from the assailant.

Currently, law enforcement has no accurate way to match the glass shards or coated hair to known samples, and locating tiny particles of explosive material or body fluids might be difficult or impossible. But all that's about to change, as new and improved techniques for detecting and distinguishing trace

evidence—minute quantities of materials such as blood, chemicals, fibers, glass, hair, plant material, or plastics—are very close to being added to the law enforcement arsenal.

Connecting a person or object to a specific crime scene is often essential to proving guilt or innocence. Developing such a link is frequently based on identifying and comparing trace evidence. Because trace evidence samples can look similar and the environments where they are found are often complex, identifying unique characteristics and establishing a link can be difficult. Older techniques often cannot distinguish such evidence due to these challenges.

New technologies for trace evidence may help eliminate many of these obstacles, allowing more trace evidence to be found and identified. Here are four of the most promising new techniques.

## Distinguishing Glass Evidence

On a small Caribbean island, a witness called the police to report seeing a body on the side of a road. A woman walking home from work shortly after midnight was apparently struck by a vehicle. Her death might have been prevented had the driver stopped to provide medical assistance instead of leaving the scene. The accident became a felony hit and run.

A local constable was called to the scene. Among other items, he recovered nine large pieces of glass that appeared to come from a car headlight.

Eleven days later, local officials identified a suspect. No body fluids were found on the suspect's car, but the front fender showed signs of recent damage: a broken headlight and pieces of glass lodged inside the bumper.

Island police shipped the evidence to the Miami-Dade Police Department Crime Laboratory for analysis. There Dr. José Almirall was working on ways to analyze glass samples using a process called inductively coupled plasma-atomic emission spectroscopy (ICP-AES). He was asked to see if there was a connection between the glass fragments found at the crime scene and the broken glass found on the suspect's car.

Analyzing the elements of glass specimens helps to locate the original source of glass pieces. The elements that make up headlight glass are different from those in other glass products. ICP-AES effectively measures the various elements to distinguish among auto headlights.

Dr. Almirall first used a conventional approach, measuring and comparing the refractive index (RI) properties of the glass recovered from the crime scene with the glass fragments from the suspect's car. The problem with this method—the primary one used by crime labs—is that automobile headlights all have similar refractive indexes,

making it difficult to distinguish among them. Although Dr. Almirall found an RI match, such a match does not weigh heavily as evidence in court when it involves auto headlights.

The lab then put the glass fragments through ICP-AES analysis. A quantitative analysis of the fragments found that the glass pieces recovered from the street and those from the suspect's car were indistinguishable from one another. At a preliminary hearing on the hit-and-run charges, Dr. Almirall testified that the ICP-AES analysis showed strong evidence of an association between the glass fragments. Just days before the trial, the prosecutor and defense reached a plea agreement.

Dr. Almirall, now associate director of the International Forensic Research Institute, recognizes the need for highly discriminating techniques in the analysis of glass evidence. He collaborates with Dr. Douglas Duckworth of Lockheed Martin's Oak Ridge National Laboratory. They have since developed an even better method for analyzing glass elements using a process called inductively coupled plasma-mass spectrometry (ICP-MS).

ICP-MS combines enhanced sensitivity with a multielement capability. This higher level of glass analysis is a valuable tool for distinguishing among all types of glass, including cookware, float glass from windows, headlights, and leaded glass. ICP-MS's high level of sensitivity allows for the analysis of very small fragments.

The two scientists are incorporating the analytical techniques and data generated from ICP-MS into a practical application for the forensic lab. They are developing a large database of trace element concentrations using ICP-MS that will be able to rank the strength of an association between known and questioned glass samples. Research continues on ICP-MS, and its use is encouraged through interlab validation, publication, and training.

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### HOW DOES STATIC SIMS WORK?

Secondary ion mass spectrometry (SIMS) can be divided into two operational types: dynamic and static. The semiconductor industry has used dynamic SIMS for years, mainly for analyzing bulk metals. Static SIMS provides information about organic compounds “adsorbed” onto a surface. (Adsorption is the binding of a substance on the surface of another and is distinguishable from total absorption.)

The principle behind static SIMS is simple: the trace sample is bombarded with a high-energy atom. The term “static” indicates that the degree of surface bombardment is low enough so the chemical composition of the surface is not changed. Intact molecules, their fragments, and atoms are “sputtered” into a gaseous state from the surface. Some fraction of these particles are charged, or ionized, and can then be measured using a mass spectrometric detector. The detected masses help to identify the surface chemistry of the trace evidence. For example, an ion at mass 550 indicates a hair conditioner chemical and is easily differentiated from an ion having a mass of 270, which is derived from heroin.

### Identifying Chemical Composition

Forensic scientists continue to search for new ways to find chemical residues on clothing, fingernail, hair, and skin samples. Such residues may provide a link between a suspect and a chemical weapon or agent.

Many chemicals are designed to endure and to absorb into substances, but detection can still be difficult. Research conducted by scientists at the Idaho National Engineering and Environmental Laboratory (INEEL) focuses on the persistent nature of chemicals. Static secondary ion mass spectrometry (static SIMS) is used to distinguish trace chemicals and residue on various materials. The goal is to find links between suspected sites and possible offenders. Static SIMS may possibly change future methods for detecting chemical residues.

Chemical characterization of trace evidence is not always successful. Conventional analysis attempts to break down the sample into separate chemical entities—simplifying identification, but destroying the sample in the process. With this method, the samples tend to be small and, therefore, analyses are often not precise enough to detect the chemicals involved.

Static SIMS uses a different approach. It identifies the chemical composition of the

surface of extremely small trace evidence samples—as small as 1/10,000 of an inch. This method generates atomic and molecular information from only the top-most molecular layer of the sample, leaving it largely intact for further analyses.

INEEL scientists conducted tests using static SIMS in combination with pattern recognition techniques. They were able to differentiate a wide range of coating samples by manufacturer, and often by specific coating product. Although the samples looked similar, the chemical makeups of their various coatings were considerably different.

Static SIMS shows real potential for distinguishing chemicals in forensic samples well beyond current analytical approaches. This technique differentiates and identifies specific samples of physical trace evidence, including coating materials, fingernail polish, and paint. For example, it provides a wealth of information about chemicals found on hair and fiber samples.

SIMS and related techniques may be used more frequently once small, easy-to-use SIMS instruments are developed. Static SIMS may be applied more widely in the near future as the cost of analysis decreases and the technique becomes simpler to use.



## DETECTING AND ANALYZING CHEMICAL CONTAMINANTS ON HAIR AND FIBER

Idaho National Engineering and Environmental Laboratory (INEEL) researchers did studies using various static secondary ion mass spectrometry (SIMS) instruments. They used ion trap SIMS to distinguish trace hair samples using consumer chemicals as identifiers. Chemicals found in hair conditioning products produce distinctive chemical signatures, allowing the identification of hair samples based on the product used. SIMS is unaffected by the presence of hair dyes, which complicate microscopic techniques.

Scientists typically characterize forensic human hair samples using a microscope. The presence of colorants and chemicals commonly present on human hair defeats this method. SIMS takes advantage of the presence of these chemicals to improve identification.

Static SIMS easily detects illegal drugs such as cocaine and heroin on the surface of single synthetic fiber samples. It can detect environmental contaminants as well—for example, insecticides or pinacolyl methylphosphonic acid, the principal eroding product of the nerve agent Soman (GD). This technique can be used to look for the presence of nerve gas, perhaps in a suspected terrorist attack. INEEL researchers recently used SIMS to assess the erosion of the nerve agent VX on concrete surfaces. Changes in the chemistry of samples exposed over time to VX are key to determining the history of exposure of a particular area or crime scene.

## Collecting and Analyzing Explosives

American Airlines flight 587 left John F. Kennedy International Airport early on November 12, 2001. Shortly after takeoff, the plane crashed into a nearby neighborhood, killing all 260 aboard and 5 people on the ground. Just 2 months after the Nation's worst terrorist attack, the crash triggered fears that another assault had been perpetrated against the United States.

For weeks, the Nation anxiously awaited word on what caused flight 587 to break apart. Months later, investigators still had not found any evidence of an in-flight explosion or fire indicating sabotage. Onsite explosives analysis could have detected bomb residue and quickly reduced fear—had it been available.

Large bombing scenes pose special challenges for detecting and identifying small quantities of explosives residue among large amounts of debris. Dr. Michael Sigman, a

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researcher at Oak Ridge National Laboratory, looks for ways to refine and validate technology that allows rapid analysis of organic explosives at a crime scene.

A new method of collection allows trace evidence to be gathered using dry, durable Teflon® surface wipes. These wipes offer

### WHAT IS THERMAL DESORPTION?

Scientists use thermal desorption to transfer explosives residue from a Teflon® wipe into a special type of tubing called a gas chromatography column. The wipe is heated to well above room temperature. At the higher temperature, the organic explosives become a gas and are gently swept onto the gas chromatography column. The gas chromatography column is at room temperature, so the explosives' vapors condense onto the walls at the entrance to the column for later separation and analysis.

*Portable gas chromatographs or hand-held ion mobility spectrometers, already commercially available, could be adapted to bring dry sampling directly to a crime scene. This portability is needed because environmental factors may speed up sample decomposition.*

several advantages over the many different physical and chemical techniques traditionally used to collect and analyze chemical evidence from blast debris:

- Teflon® is shred resistant, making it a more effective choice for gathering samples of trace evidence from rugged or jagged surfaces than conventional cotton wipes.
- Dry-sampling is preferable in cases where pieces of debris are too large to use solvent extraction methods effectively or to conduct microscopic investigations.
- Teflon® surface wipes can be used for sampling explosives residue from other surfaces, including clothing, hands, and luggage.

One commonly used method of collection involves extracting debris with organic solvents and water. The problem with this method is that it can also extract other substances, such as oils or paint. As a result, the sample must be "cleaned up" before lab analysis can take place. Thus,

samples gathered with organic solvents typically require lab-based processing and all but prevent onsite analysis.

Teflon® wipes offer a better alternative. When an explosion occurs, traces of some chemical components from the explosive device do not dissipate. Some components vaporize and can be found condensed on the debris. Evidence collected using dry-surface wipes is transferred into a special tube called a gas chromatography column by means of thermal desorption for analysis. (See "What Is Thermal Desorption?") This simple method can easily and inexpensively be adapted for use in forensic labs, which generally already have gas chromatographs.

Portable gas chromatographs or hand-held ion mobility spectrometers, already commercially available, could be adapted to bring dry sampling directly to a crime scene. This portability is needed because environmental factors may speed up sample decomposition.

### Locating Body Fluids and Fingerprints

In April 1999, a woman was found dead in the back seat of her car. Albuquerque police suspected a sexual assault. The assailant left the woman's body to decompose in a closed car in the hot New Mexico sun for several days, making it difficult for investigators using conventional methods to locate possible traces of semen.

The investigators turned to Colin Smithpeter, a scientist who worked nearby at Sandia National Laboratories and who had devel-

## USING CLU FLUORESCENCE RATHER THAN CONVENTIONAL FLUORESCENCE

### Semen Stains

The advent of DNA technology and databases has made semen stains found at the scene of a sexual assault the most valuable piece of evidence. The problem is that the semen stains must first be located and sampled.

The conventional method—fluorescence detection—illuminates the crime scene with light from a high-intensity lamp while an investigator views the area through optical filter glasses. This method has a number of drawbacks. Although semen fluoresces, the light it emits is weak compared to surrounding room light, thereby hindering detection. If the crime scene is outdoors, investigators must wait until nightfall to use the technique. If the crime scene is indoors, investigators must turn off all lights and black out the windows to maximize the method's effectiveness. This takes time and effort and increases the possibility that investigators will contaminate the area.

Moreover, when blacking out a room, many other substances besides semen fluoresce, such as food spills and animal urine. In order to complete their search in a reasonable amount of time, investigators often collect all questionable fluorescing materials. Thus, detecting and documenting semen stains become the task of technicians back at the crime lab.

It would be best to photograph potential evidence at the crime scene. However, setting up a camera is time consuming, and investigators often do not have enough time for this step. If the police do photograph evidence at a crime scene, there is no guarantee of any evidentiary value until the film is developed.

The use of a Criminalistics Light-Imaging Unit (CLU) at the crime scene offers significant improvements over conventional approaches. CLU allows investigators to find fluorescing evidence under normal lighting conditions and to easily view and highlight images of suspected evidence at the crime scene. Furthermore, CLU greatly reduces the chances of crime scene contamination.

### Blood Spatter Patterns and Trails

Investigators often reconstruct a crime using blood trails and spatter patterns, both of which are difficult to see on dark surfaces. Police commonly spray the chemical reagent luminol on suspected areas. When luminol encounters blood, it reacts and phosphoresces, giving off a faint glow.

But luminol has a number of limitations. First, blood treated with luminol produces such a faint glow that it is difficult to see and photograph. Investigators must either wait for or create a dark environment to take the needed photos. Second, the reagent occasionally gives false reactions, causing the possible loss of several genetic markers. Third, luminol causes latent and possibly bloody impressions to smear, and it makes some diluted stains unavailable for further analysis. Fourth, luminol is cumbersome and expensive to use on large areas. Visualizing blood trails and spatter patterns through CLU's reflectance-imaging capability will reduce the need for luminol use.

### Fingerprints

CLU's fluorescence reflectance capability may allow fingerprints to be found without pretreatment. Conventional fingerprint detection involves pretreating evidence and using physical and/or chemical development processes. In some cases, these processes are ineffective, require additional illuminating equipment, and involve safety risks.

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oped the Criminalistics Light-Imaging Unit (CLU). This camera is able to uncover the type of evidence needed by police working on cases like this one.

CLU is a multispectral imaging system that uses various colors of light to view the substance or structure being examined. It can locate body fluids at crime scenes under normal lighting conditions. By using a strobe lamp, signal processing, and improved optics, CLU rejects surrounding light and thereby improves both the sensitivity and specificity of the area being viewed. CLU is five times more sensitive than current fluorescing methods.

Smithpeter teamed with Catherine Dickey, a forensic scientist on the Albuquerque police force, to examine the woman's body. Using a conventional blue light and tinted goggles, Dickey searched the body for evidence, but was unable to find any fluorescing traces of semen. Smithpeter used his CLU and found three very small stains on the skin. A lab test showed that one of the stains was dried semen. The evidence was sent to the New Mexico State crime lab for DNA analysis. Although the woman's killer remains at large, investigators now have something tangible on which to build a case.

Smithpeter's camera may be able to detect other types of evidence through a process called reflectance imaging. This technique uses the visible rather than the ultraviolet spectrum of light, allowing for the location and identification of blood evidence on dark surfaces. CLU also can detect untreated fingerprints on transparent, dark, and multicolored surfaces.

The camera's video-recording feature works like a camcorder. This allows investigators to view and record the entire search process. Law enforcement personnel can produce individual images of possible evidence for presentation in court.

Sandia National Laboratories is working to refine the CLU prototype for law enforcement fieldwork. Commercial cameras currently used by local law enforcement do not include the reflectance-imaging capability. Scientists are working on a handheld version of the camera for crime-scene investigators so they can do both fluorescence and reflectance imaging.

### **Benefits for Law Enforcement and the Courts**

Advances in technologies for detecting and distinguishing trace evidence are finding their way to police precincts and forensic labs. These improvements do not guarantee courtroom success, of course, but they do hold great promise for speeding up evidence collection, limiting contamination, and easing analysis. By generating stronger evidence, these more precise forensic tools will benefit every facet of law enforcement.

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## DNA Evidence: What Law Enforcement Officers Should Know

Proper use of DNA (deoxyribonucleic acid) evidence at trial can help to seal a conviction or obtain an acquittal. It is therefore very important that police officers know how to manage crime scenes in order to make sure DNA evidence is collected properly. If such evidence is to be useful in court, law enforcement personnel should employ specific procedures to protect and preserve this sensitive biological material.

### At the Crime Scene

Violent crime scenes often contain a wide variety of biological evidence, most of which can be subjected to DNA testing. Although not always visible to the naked eye, such evidence often is key to solving a crime, obtaining a conviction, or exonerating the falsely accused. For example, during a sexual assault, the perpetrator may leave blood, hair, saliva, semen, and skin cells on the victim's body, clothing, or carpeting or elsewhere at the scene. Scientists compare the collected biological samples against the

DNA of the victim, the suspect, and any other potential suspects who may have had access to the scene. If no suspect exists, a DNA profile from the crime scene can be entered into the Combined DNA Index System (CODIS) to identify a suspect or to link serial crimes. (See "CODIS.")

### Evidence Collection and Preservation

Responding officers and investigators should carry out their work at the crime scene as if it were the only opportunity to preserve and recover physical clues. Keeping DNA evidence untainted until it has been collected and recorded is the most important aspect of managing the evidence.

Proper collection is essential for successful DNA testing. Because prosecution of a case can hinge on the state of the evidence as it was collected, police investigators should take precautions, such as wearing disposable gloves and avoiding touching any other

objects while handling such evidence, to avoid contamination.

Contamination also can take place if someone sneezes or coughs over the evidence or touches his or her hair, nose, or other part of the body and then touches the area containing the sample to be tested. DNA left at a crime scene also is subject to environmental contamination. Exposure to bacteria, heat, light, moisture, and mold can speed up the degradation (or erosion) of DNA. As a result, not all DNA evidence yields usable profiles. (See “Safeguard DNA Evidence and Yourself.”)

Officers should not drink, eat, litter, smoke, or do anything else that might compromise the crime scene. They should remember that valuable DNA evidence may be present even though it is not visible. For example, since evidence could be on a telephone mouth- or earpiece, investigators should use their own police radios instead of a telephone located at the crime scene.

To further avoid compromising evidence, any movement or relocation of potential evidence should be avoided. Officers should move evidence only if it will otherwise be lost or destroyed. In sexual assault cases, it is especially important that officers explain to victims why they should not change clothes, shower, or wash any part of their body after an assault. Depending on the nature of the assault, semen may be found on bedding or clothing, or in the anal, oral, or vaginal region. Saliva found on an area where the victim was bitten or licked may contain valuable DNA. If the victim scratched the assailant, skin cells containing the attacker’s DNA may sometimes be present under the victim’s fingernails. Victims should be referred to a hospital where an exam will be conducted by a physician or sexual assault nurse examiner.

Potential evidence can become contaminated when DNA from another source gets mixed with samples gathered for a specific case. In those situations, laboratory analysts have to request samples from all persons with access to the crime scene, including officers and anyone who had physical

## WHAT IS CODIS?

The Combined DNA Index System (CODIS) is an electronic database of DNA profiles administered through the Federal Bureau of Investigation (FBI). The system lets Federal, State, and local crime labs share and compare DNA profiles. Through CODIS, investigators match DNA from crime scenes with convicted offenders and with other crime scenes using computer software, just as fingerprints are matched through automated fingerprint identification systems.

### CODIS uses two indexes:

- The Convicted Offender Index, which contains profiles of convicted offenders.
- The Forensic Index, which contains DNA profiles from crime scene evidence.

The real strength of CODIS lies in solving no-suspect cases. If DNA evidence entered into CODIS matches someone in the offender index, a warrant can be obtained authorizing the collection of a sample from that offender to test for a match. If the profile match is in the forensic index, the system allows investigators—even in different jurisdictions—to exchange information about their respective cases.

## SAFEGUARD DNA EVIDENCE AND YOURSELF

Biological material may contain hazardous pathogens, such as the hepatitis A virus, which can lead to potentially lethal diseases. At the same time, such material can easily become contaminated. To protect both the integrity of the evidence and the health and safety of law enforcement personnel, officers should:

- Wear gloves and change them often.
- Use disposable instruments or clean them thoroughly before and after handling each sample.
- Avoid touching any area where DNA might exist.
- Avoid talking, sneezing, or coughing over evidence.
- Avoid touching one’s own nose, mouth, and face when collecting and packaging evidence.
- Air-dry evidence thoroughly before packaging.
- Put evidence into new paper bags or envelopes. Do not place evidence in plastic bags or use staples.

possession of the evidence while it was being recovered, processed, and examined.

Maintaining a precise chain of custody of all DNA materials collected for testing is critical,

*Proper use of DNA evidence at trial can help to seal a conviction or obtain an acquittal. It is therefore very important that police officers know how to manage crime scenes in order to make sure DNA evidence is collected properly.*

as it may at some point become an issue in court. (See “Identifying DNA Evidence.”) Every action officers take at a crime scene must be fully documented.

Improvements in analysis and interpretation of physical evidence recovered from crime scenes continue to develop. Properly documented and preserved DNA evidence will be given increased weight in court, so it is extremely important that an officer’s approach to gathering evidence be objective, thorough, and thoughtful.

**Elimination Samples**

The DNA of several individuals may be present at a crime scene. So, officers must ensure that technicians collect the victim’s DNA along with the DNA of anyone else who may have been present at the scene. These “elimination samples” help determine if the evidence is from a suspect or another person. The types of elimination samples to be collected depend on the details of the crime, but they are generally samples of blood or saliva.

**IDENTIFYING DNA EVIDENCE**

<b>Evidence</b>	<b>Possible Location of DNA on the Evidence</b>	<b>Source of DNA</b>
Bandanna, hat, mask	Anywhere (inside or outside)	Dandruff, hair, saliva, sweat
Baseball bat or similar weapon	End, handle	Blood, hair, skin, sweat, tissue
Bite mark	Clothing, skin	Saliva
Blanket, pillow, sheet	Surface area	Blood, hair, saliva, semen, sweat, urine
Bottle, can, glass	Mouthpiece, rim, sides	Saliva, sweat
Cotton swab, facial tissue	Surface area	Blood, ear wax, mucus, semen, sweat
Dirty laundry	Anywhere	Blood, semen, sweat
Envelope, stamp	Licked area	Saliva
Eyeglasses	Ear- or nosepiece, lens	Hair, skin, sweat
Fingernail, partial fingernail	Scrapings	Blood, sweat, tissue
Ligature, tape	Inside/outside surface	Blood, skin, sweat
“Through and through” bullet	Outside surface	Blood, tissue
Toothpick	Tips	Saliva
Used cigarette	Cigarette butt	Saliva
Used condom	Inside/outside surface	Rectal or vaginal cells, semen



For example, in a residential burglary where the suspect may have sipped from a glass of water, DNA samples should be obtained from every person who had access to the crime scene both before and after the burglary. The forensic technician will compare these samples with the saliva found on the glass to determine if the saliva contains probative evidence.

In homicide cases, the victim's DNA should be obtained from the medical examiner at the autopsy, even if the body is badly decomposed. This process may help to identify an unknown victim or to distinguish between the victim's DNA and other DNA found at the crime scene. (See "Thinking Solves Crimes.")

In a rape case, investigators may need to collect and analyze the DNA of every consensual sexual partner the victim had up to 4 days prior to the assault. Testing can eliminate those partners as potential sources of DNA suspected to be from the rapist. A sample should also be taken from the victim. It is important to approach the victim with extreme sensitivity and to explain fully why the request is being made. A qualified victim advocate or forensic nurse examiner can be a great help.

## Evidence Transportation and Storage

When transporting and storing evidence that may contain DNA, the evidence should be kept dry and at room temperature. It should be placed in paper bags or envelopes and then sealed, labeled, and transported in a way that ensures proper identification and documents a precise chain of custody. Plastic bags should not be used because they provide a growth medium for bacteria that may degrade DNA evidence. Direct sunlight, heat, and humidity also harm DNA, so evidence should not be stored in an area that can get hot, such as a room or police car without air conditioning.

Evidence that is properly identified, preserved, and collected can be stored for years without risking extensive degradation, even

## THINKING SOLVES CRIMES

Officers can collect DNA evidence from a wide variety of locations, and their thinking of unlikely places to look for DNA has been the catalyst for solving many cases. Examples of unusual sources of DNA evidence include the following:

- Saliva found on the flap of an envelope containing a threatening letter. The sample was analyzed and the suspect was apprehended.
- Spittle collected from the sidewalk where a suspect in a sexual assault case was under officer surveillance. Following DNA testing, the suspect was charged with the crime.
- Blood collected from a bullet that had passed through an assailant's body and lodged in the wall behind him. The assailant was identified and charged with the crime.

at room temperature. Check with a local forensic laboratory for more information on long-term storage issues.

## DNA Testing

The most common methods of DNA analysis use the polymerase chain reaction (PCR) technique. Polymerase is an enzyme involved in the natural replication, or copying, of genetic material. By helping the replication process along through a series of chemical steps, the PCR process can copy very small amounts of DNA very quickly. PCR amplification can create enough DNA to enable a laboratory analyst to generate a DNA profile, which can then be compared to other profiles. The development of the PCR technique revolutionized the field of DNA testing by improving the success rate for analysis of old, degraded, or very small biological samples.

However, the quality or quantity of the DNA obtained from crime scene evidence may be inadequate to produce usable results, even using the PCR technique. Also, inconclusive results can occur if the sample contains a mixture of DNA from several individuals—for example, a sample taken from a victim of a gang rape. Because the PCR process copies whatever DNA is present in the sample, the contaminating DNA also is copied. Even if the suspect's DNA profile can be found in the evidence, the presence of DNA from other sources may prevent establishing either an

inclusion or exclusion. In such cases, the results will likely be reported as inconclusive.

Thus, the presence of DNA from other sources may prevent the inclusion or exclusion of one individual as the source of DNA. As with all DNA results, inconclusive findings should be interpreted in light of all the other evidence in a case.

## Now and In the Future

DNA technology will continue to evolve. Some anticipated advances in its use include:

**Broader implementation of the CODIS database.** States will continue to enact legislation requiring DNA samples from more offenders, resulting in more crimes being solved and increased cooperation among the States. Procedures for making international matches are expected to be developed—especially with Great Britain, which has a well-developed convicted felon database.

**Increased automated laboratory procedures and use of computerized analysis.** Although these timesaving approaches are not expected to replace human judgments in the final review of data, automation of many of the more routine aspects of analysis is expected to result in significant cost savings.

**Portable devices capable of DNA analysis.** These devices, plus advances in communications technology, may permit DNA evidence to be analyzed closer to the crime scene.

**Remote links to databases and other criminal justice information sources.** Prompt determinations of the DNA profile at the crime scene could speed up identifica-

tion of a suspect or eliminate innocent persons from being considered suspects.

Such forecasts of the future are somewhat uncertain. However, the fact that private laboratories, Federal agencies, and universities are aggressively researching these and other new technologies raises expectations that more sophisticated innovations will be developed.

Even with the latest innovations, DNA testing alone cannot provide absolute answers in every case. The prosecutor, defense counsel, judge, and law enforcement should confer on the need for such testing on a case-by-case basis.

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### For More Information

- Any State or local law enforcement laboratory that conducts DNA analysis should contact the FBI for CODIS software, training, and user support. Visit the CODIS Web site at <http://www.fbi.gov/hq/lab/codis/index1.htm>.
- CD-ROM interactive courses on collecting and preserving DNA evidence (NCJ 182992 Beginning and NCJ 184479 Advanced) are available from the National Criminal Justice Reference Service (NCJRS) at 800-851-3420 or <http://www.ncjrs.org>.
- A brochure entitled *What Every Law Enforcement Officer Should Know About DNA Evidence* (BC 000614) is available on the NCJRS Web site at <http://www.ncjrs.org/nij/DNAbro/intro.html>.
- *Understanding DNA Evidence: A Guide for Victim Service Providers* (BC 000657) is available on the NIJ Web site at [http://www.ojp.usdoj.gov/nij/dna\\_evbro](http://www.ojp.usdoj.gov/nij/dna_evbro).

## ADVANCING JUSTICE THROUGH DNA TECHNOLOGY

The massive demand for DNA analyses in recent years has created a significant backlog of casework samples in crime labs across the country. These delays in processing samples pose substantial barriers to effective law enforcement and deny justice to crime victims and the public. For example, many rape kits and other evidence were thrown away in Los Angeles because investigators believed that the statutes of limitations had passed. NIJ research estimates that the number of rape and homicide cases awaiting DNA testing is approximately 350,000.

On March 11, 2003, Attorney General John Ashcroft announced a 5-year, \$1 billion plan to eliminate the backlog of DNA evidence in crime labs. (See <http://www.ojp.usdoj.gov/nij/dnainitiative/welcome.html>.) If approved by Congress, the program would “not only speed the prosecution of the guilty, but also protect the innocent from wrongful prosecution,” the Attorney General said.

A number of factors contribute to the inability of labs to accept and process casework samples in a timely fashion. For one thing, most State and local crime labs lack sufficient numbers of trained forensic scientists and do not have the money to hire more. Even where funds are available, there is an insufficient pool of qualified forensic scientists to hire. In addition, many State and local crime labs lack the resources and lab space necessary to obtain and use state-of-the-art automated equipment and software that would speed up DNA analyses.

Aside from the backlog of DNA evidence collected through case investigations, there is also a backlog of DNA data from known offenders waiting to be input into searchable databases. Because DNA casework analysis often requires comparisons with offender DNA profiles, the effectiveness of any DNA casework reduction strategy will depend upon up-to-date offender databases. Furthermore, while many States have statutes authorizing the collection of DNA evidence from a variety of convicted offenders, substantial numbers of authorized samples have yet to even be collected, let alone analyzed.

In its report to the Attorney General, NIJ made six recommendations to address these and other backlog issues:

1. Improve the DNA analysis capacity of public crime laboratories.
2. Provide financial assistance to State and local crime labs to help eliminate casework backlogs.
3. Develop funding to eliminate convicted offender database backlogs, and encourage aggressive programs to collect owed samples from convicted offenders.
4. Support training and education for forensic scientists, to increase the pool of available DNA analysts.
5. Provide training and education on the proper collection, preservation, and use of forensic DNA evidence to police officers, prosecutors, defense attorneys, judges, victim service providers, medical personnel, and other criminal justice personnel.
6. Support the development of improved DNA technologies, set up demonstration projects to encourage the increased use of DNA testing, and create a national forensic science commission to help ensure that the latest DNA and other forensic technologies are used to the maximum extent by criminal justice systems.

For more information, visit NIJ's DNA backlog Web page at <http://www.ojp.usdoj.gov/nij/dnabacklog>. Get a free copy of *Report to the Attorney General on Delays in Forensic DNA Analysis*, Washington, DC: U.S. Department of Justice, National Institute of Justice, March 2003 (NCJ 199425), available online at <http://www.ojp.usdoj.gov/nij/pubs-sum/199425.htm> or from NCJRS at 1-800-851-3420.



## CCTV: Constant Cameras Track Violators

The use of closed-circuit television (CCTV) cameras to monitor public spaces is increasing, both in the United States and abroad. The Federal government, and NIJ in particular, has funded research into these systems because of their many security applications in both the domestic and international arenas. In England, CCTV systems have monitored public places for many years, partly due to concerns over terrorism. In Israel, police in the old city of Jerusalem use CCTV to monitor every street in many commercial and religious areas.

Many people are wary about the government watching and recording their movements as they pass through parks, streets, and other public areas. Yet despite the controversy, CCTV use by criminal justice personnel in the United States may be increasing.

Some governmental uses of CCTV technology, particularly in the field of correc-

tions, have sparked little or no controversy. (See "CCTV and Corrections.") But in other venues, CCTV use is raising constitutional and privacy concerns. For now, the most prevalent use of CCTV by law enforcement in the United States is the taping of traffic stops by cameras mounted in police vehicles. But it is starting to be used more broadly, as it is in other countries. How widespread that use becomes ultimately will depend on how Americans weigh the benefits of CCTV surveillance against its intrusiveness.

### CCTV in the United Kingdom

Until recently, cameras were rarely used to monitor public spaces in the United States. Most of the research on the effectiveness of such use has therefore been done in the United Kingdom. A study by the Home Office Police Research Group looked at the effectiveness of CCTV systems in three English town centers—

Birmingham, King's Lynn, and Newcastle.<sup>1</sup> Among the key findings:

- One of the most important benefits of CCTV is personnel efficiency. Cameras can “patrol” multiple areas without putting numerous officers on the beat. CCTV systems can help discover incidents as they occur. This information can be used to either coordinate an effective and appropriate response or to conserve resources by aiding in a determination that no response is necessary.
- CCTV videotapes can be very beneficial. Not only can they lead to prompt identification of a perpetrator, they can also provide valuable clues that can shape the direction of an investigation.
- Analysis of crime data shows that, at least in the short term, the presence of closed-circuit cameras can have a deterrent effect on a variety of offenses, especially property offenses. For example, in the section of Newcastle covered by CCTV, burglaries fell by 56 percent, criminal property damage by 34 percent, and nonmotor-vehicle theft by 11 percent.

However, it should be noted that such reductions in crime can disappear as publicity about and awareness of the cameras fade. In fact, a May 2002 report suggests that the sharpest decreases occurred when the cameras were being installed and public consciousness of them was particularly high—well before the cameras started operating.<sup>2</sup>

## The Pros and Cons

CCTV does have weaknesses—some technical, and some related to camera placement and monitoring. First, systems that are cheaply made or improperly installed have limited value. Cameras can be vandalized or disabled, and standard cameras do not capture images well under poor lighting

## WHAT IS CCTV?

In its simplest form, a closed-circuit television (CCTV) system consists of a video camera, a monitor, and a recorder. Complex, multicamera systems allow images to be viewed sequentially, simultaneously, or on several monitors at once, depending upon the system. CCTV systems can record in black and white or color, and camera positions can be either fixed or varied by remote control to focus on activity in different locations. Zoom lenses allow either a broad view of the monitored area or selected close-ups. In addition, advances in technology enable CCTV cameras to be smaller, to use night vision, and to transmit images over the Internet.

For more information, see “What is Closed-Circuit Television?” at [http://www.securitygateway.com/page.asp?c=facts\\_cctv](http://www.securitygateway.com/page.asp?c=facts_cctv).

## CCTV AND CORRECTIONS

Closed-circuit television (CCTV) cameras have been used in correctional facilities for years. They cut down on the number of officers needed to monitor inmates, allowing just one or two officers to keep watch on large numbers of inmates in widespread sections throughout the facility. Of course, the same privacy concerns are not raised as when cameras are used in public spaces.

New digital technology makes CCTV images even more useful in the field of corrections. Digital images can be scanned and searched in ways not possible with videotape.

Another cost-saving use of CCTV technology in corrections is remote court appearances by inmates. For example, in January 2000, a county criminal court in Waukesha, Wisconsin, used CCTV technology to hold a plea hearing in a drunk driving case.<sup>1</sup> The technology allowed a defendant facing a drunk driving charge to testify from a Tennessee prison, where he was serving a 3½-year term for armed robbery. Using CCTV for this proceeding saved the county sheriff's department more than \$2,000 in airfare and other costs. Documents were transmitted via fax between the out-of-State prison and the county court. The video units used by the court were originally intended for juvenile hearings and mental health commitments.

1. Sink, Lisa, “Waukesha Holds First Criminal Court Proceeding Via Video Camera,” *The Milwaukee Journal Sentinel*, January 22, 2002: 3B.

*CCTV does have weaknesses—some technical, and some related to camera placement and monitoring. CCTV works best in areas with open and plain layouts. Complex areas and layouts make a high degree of camera coverage difficult to obtain.*

conditions, although newer technology can compensate for this.

Second, CCTV works best in areas with open and plain layouts. Complex areas and layouts make a high degree of camera coverage difficult to obtain.

Third, when cameras are used for surveillance, fatigue—both physical and mental—can affect the performance of staff watching the monitors.

Finally, some critics maintain that the cameras mainly record minor offenses, such as public urination, graffiti, and vandalism.

On the other hand, the growth in CCTV installations demonstrates a general consensus that the presence of cameras seems to deter crime. Moreover, so far no one has been able to prove definitively that the use of cameras in one area displaces crime to neighboring areas. (See “Does CCTV Decrease or Relocate Crime?”)

### **The Next Step: Facial Recognition Technology**

New computer technology allows CCTV systems to match recorded faces against a computer database of photos. Such facial recognition systems work in a variety of ways. For example, one system measures the distance between specific points on a face and calculates a numeric value, while another bases its matches on how closely

the face resembles one of a standard set of 128 facial archetypes.<sup>3</sup> Once a match is made that exceeds a user-defined confidence threshold, the system alerts the surveillance staff, who then decide whether to pursue a suspect for further questioning.

Like CCTV technology, current facial recognition technology has shortcomings. Its accuracy varies widely among vendors for different applications. A 2000 Defense Advanced Research Projects Agency (DARPA) study—cosponsored by NIJ, DARPA, and the Defense Department’s Counterdrug Technology Development Program Office—compared several such systems. The study found that “lighting, camera types, background information, aging, and other factors” all affected results.<sup>4</sup> For example, accuracy fell off “dramatically” when a face was viewed at more than 40 degrees off center, so users may need to arrange the system so as to catch people looking nearly straight at the camera. The DARPA report concluded that all the systems studied were far more useful for controlling access to a restricted area than for identifying possible felons in a large crowd.<sup>5</sup> A 2002 study showed a marked improvement in accuracy with a 50 percent reduction in error rates in systems studied as compared to the 2000 results.<sup>6</sup>

Casino operators were among the first to implement facial recognition systems to catch known cheaters. Illinois uses facial recognition technology to verify the identity of people applying for driver’s licenses, and several police departments use it to check the identity of suspects.

Use of facial recognition technology in public areas is not yet readily accepted in the United States, however, as demonstrated by the mixed reaction of residents in Tampa, Florida. People went along when the city installed a facial recognition system to monitor public spaces in Ybor City, a popular downtown district.<sup>7</sup> But, many residents raised concerns when a similar system was used in Tampa during the Super Bowl.

## DOES CCTV DECREASE OR RELOCATE CRIME?

Although the use of closed-circuit television (CCTV) cameras is increasing, researchers are still trying to determine if the cameras decrease overall crime rates. Several studies have looked at whether the targeted crimes were simply displaced to neighboring sites, but so far, no study has been able to prove if CCTV moves crime to other locations or if it really stops crime from occurring in both the targeted and adjacent areas.

In fact, the answers to this question are as numerous as the studies. Some studies have found that crime was displaced, some have determined that neighboring areas also experienced a decline in crime, another identified both of these phenomena, while still others found evidence of neither.

According to a Home Office Police Research Group study that evaluated CCTV systems in Birmingham, King's Lynn, and Newcastle—three English town centers—researchers linked the cameras to both crime displacement and elimination.<sup>1</sup> For example, personal crimes were pushed into nearby areas where there was either partial or no camera coverage, but property crime rates decreased without any signs of displacement.<sup>2</sup> The report listed several additional CCTV studies, which also seemed to provide evidence both for and against displacement.

A more recent Home Office report, *Crime Prevention Effects of Closed-Circuit Television: A Systematic Review*, summarized the findings of 22 British and American CCTV-related studies and could not conclude whether the cameras caused any crime displacement.<sup>3</sup> Not all 22 studies looked at displacement, but of the ones that did, 5 determined that CCTV did indeed displace the targeted crimes to bordering areas, 4 found evidence suggesting a diffusion of benefits, 1 discovered signs of both displacement and diffusion, and 4 uncovered no evidence of either scenario. One researcher found evidence that certain crimes, particularly robberies and residential burglaries, moved to areas not covered by the cameras, in direct contrast to the findings of the Police Research Group study.<sup>4</sup>

In a new effort to understand more fully the effects of CCTV initiatives, the Home Office is funding an evaluation of 17 CCTV systems. The study, which is being conducted by Professor Martin Gill, director of the University of Leicester's Scarman Centre, is looking at several key issues, including whether CCTV cameras do indeed help eliminate crime. The final report is expected in 2004.

1. Brown, Ben, *CCTV in Town Centres: Three Case Studies*, Police Research Group Crime Detection and Prevention Series, Paper 68, 1995. Available at <http://www.homeoffice.gov.uk/prgpubs/fcdps68.pdf>.
2. *Ibid.*, vi.
3. Welsh, Brandon C., and David P. Farrington, *Crime Prevention Effects of Closed-Circuit Television: A Systematic Review*, Home Office Research, Development, and Statistics Directorate, Research Study 252, August 2002. Available at <http://www.homeoffice.gov.uk/rds/pdfs2/hors252.pdf>.
4. Squires, P., *An Evaluation of the Ilford Town Centre CCTV Scheme*, Brighton: Health and Social Policy Research Centre, University of Brighton, 1998: 23.

## FACIAL RECOGNITION TECHNOLOGY IN ENGLAND

London's borough of Newham gained international recognition for its use of Facelt, a facial recognition system developed by Visionics (now Identix Incorporated). Begun in 1997, the system took 18 months to implement. Newham's manager of camera operations credits the system with reducing crime by one-third in the first year.

Signs throughout Newham notify pedestrians about closed-circuit television (CCTV) cameras. Bob Lack, operations manager of the borough's 300-camera system, says that in high-crime areas, a change in mindset occurs over what people view as acceptable behavior, which in turn leads to increased reported crime. Consequently, the Newham program largely targets so-called antisocial behavior, such as graffiti, public urination, and vandalism. In addition, a camera captures the license plate numbers of cars traveling down Newham's busiest street and matches them against a database of stolen vehicles.

According to Lack, only 150 of Newham's 250,000 residents are active, known criminals, and he contends that they are responsible for most of the crime. Lack indicated that the borough's CCTV system focuses on repeat offenders—those who, in his words, “commit so many lower level offenses that their behavior is completely unacceptable.” The public seems satisfied—a recent poll by the borough council found that 93 percent of Newham residents support the system.

Newham's CCTV system connects with facial recognition software. The police give the borough's Council Security Department computerized files with mug shots of repeat offenders—those already convicted and sentenced—and those who police believe commit these types of offenses. The department reviews the database every 12 weeks and deletes offenders who are no longer active criminals.

Lack explained that when the computer matches a face on the street with a mug shot from its files, the public safety operations team that controls the cameras verifies the match and then contacts the Newham police. “What the police do [in response] is their business,” says Lack. He explains that his system is “only aiming at those who are actively infringing on the civil liberties of the honest population and [who are] creating a fear of crime.”

Newham's system differs from others in several ways. For example, the borough has several moveable cameras, which it focuses on “hot spots.” Although Lack

*In Newham, Lack reports a 35-percent reduction in crime since installing the borough's CCTV system. For example, burglaries declined by 72 percent even though the system was not originally intended to target those crimes.*

emphasizes that there is no evidence suggesting that crime is being displaced to neighboring boroughs, he admits that the cameras could conceivably displace crime to areas out of camera range. Therefore, the borough's system allows for changes in camera locale.

In addition, the town council rather than the police operates the system, so beat officers are not taken off patrol to monitor cameras. Although the police provide the mug shots and ID numbers, those running the CCTV system do not know the names of people in the facial recognition database. The council publicizes a telephone number that citizens can call to report suspicious activity; the cameras can then focus on the trouble spot and record activity until police arrive.

In Newham, Lack reports a 35-percent reduction in crime since installing the borough's CCTV system. For example, burglaries declined by 72 percent even though the system was not originally intended to target those crimes. Lack attributes the drop to burglars being “more professional . . . they just don't want to be seen in the area.” The Newham data come from police department records of reported crimes and data from control room logs; outside research has not been done.

One of the system's great successes involved a soccer match between West Ham and Leeds, two rival teams. Although individuals known to disrupt England's sporting events are banned from attending games, they often try to sneak past stadium guards anyway. On the day of this particular match, Leeds police gave the Council Security Department mug shots of 32 known rowdies expected to show up. Game time was 4:00 p.m., and at 1:00 p.m. the control room began monitoring cameras at local subway stops. Within 3 hours, the computer had scanned 4,300 faces exiting the subway and spotted 12 of the targeted individuals among them. The information was given to the police, who prevented the men from entering the stadium. Lack notes that humans alone could not easily have accomplished such a massive task.



## OTHER USES OF CCTV

Use of closed-circuit television (CCTV) cameras has expanded tremendously in the past two decades. According to a Security Industry Association (SIA) report, sales of CCTV systems rose from \$117 million in 1980 to \$807 million in 2000, a six-fold increase.<sup>1</sup> The Association projects continued growth in the coming decade, with an expected rise from \$1.04 billion in 2001 to \$1.63 billion in 2005.<sup>2</sup> The SIA report notes that although commercial users are still the primary purchasers of CCTV systems, governments at all levels are increasingly using CCTV.

### Uses of CCTV include:

**Businesses.** Besides securing businesses from external and internal theft, CCTV systems also can protect businesses from liability. For example, a store that captures teenagers on video horsing around on floors clearly marked “wet” is less likely to be held legally responsible if one of these youths is injured.

**Law enforcement.** A survey conducted by the International Association of Chiefs of Police found that 80 percent of responding police agencies use some form of CCTV.<sup>3</sup> The most common settings for CCTV were in police cars, in interrogation rooms, and at access points to government buildings. Sixty-three percent of the respondents found CCTV useful in conducting investigations, and 54 percent said it was helpful in gathering evidence. Just 20 percent thought that their use of CCTV reduced crime. Significantly, although most police agencies use CCTV, only 53 percent of survey respondents reported having documented CCTV guidelines or policies.

**Courts.** Closed-circuit technology is often used in cases involving young child abuse victims, allowing them to present courtroom testimony without having to appear in the same room as the accused. The practice was approved by the U.S. Supreme Court in *Maryland v. Craig*, 497 U.S. 836 (1990).

1. Security Industry Association, *2001 Security Industry Market Overview*, Alexandria, VA: SIA, 2001: 24.

2. *Ibid.*, 23.

3. International Association of Chiefs of Police (IACP), *The Use of CCTV/Video Cameras in Law Enforcement*, Executive Brief, Alexandria, VA: IACP, May 2001. Available at [http://www.theiacp.org/documents/index.cfm?fuseaction=document&document\\_id=164](http://www.theiacp.org/documents/index.cfm?fuseaction=document&document_id=164).

Proponents of facial recognition systems cite the advantages of such technology. They point out that these systems require less concentration from human staff, making the monitoring process more efficient and freeing employees for other tasks. By allowing small police forces to cover larger areas, facial recognition systems can lead—at least in theory—to a greater number of arrests.

## Privacy Concerns

Privacy advocates are uneasy about using CCTV to monitor public meetings and demonstrations. They cite research showing that some camera operators focus on individuals based on their own prejudices.<sup>8</sup> In addition, some privacy advocates note that unscrupulous camera operators have circulated clips from surveillance cameras

## THE LATEST FINDINGS

The British Home Office has released a meta-analysis study of 18 evaluations of CCTV.<sup>1</sup> Thirteen of the studies were from the United Kingdom and five from North America. The Home Office report reveals much important information about the effectiveness of CCTV in the prevention of crime:

- Generally, CCTV had a small but significant desirable effect. The overall reduction in crime was 4 percent.
- Exactly half of the analyzed studies (nine) showed evidence that CCTV can reduce crime. All of these were conducted in the United Kingdom. The other nine studies, including all five of the North American studies, found no evidence that CCTV reduced crime.
- The most promising data were found in evaluations of CCTV in parking lots. A significant reduction in vehicle crimes—about 41 percent—was seen in lots with CCTV as compared to lots in the control group.
- In studies looking at city centers and public housing, a small but significant average reduction of 2 percent was found in the U.K. studies. In these same settings, however, no effect on crime was found in the North American studies.
- There was conflicting evidence on the effectiveness of CCTV in public transit systems. Two studies found a desirable effect, one found no effect, and one found an undesirable effect on crime. The use of other crime intervention methods—such as special police patrols—in conjunction with CCTV made it difficult to say with certainty that the effects seen were the result of CCTV use.

### The report states:

“Exactly what are the optimal circumstances for effective use of CCTV schemes is not entirely clear at present, and needs to be established by future evaluation research.... Overall, it might be concluded that CCTV reduces crime to a small degree.”

1. Welsh, Brandon C., and David P. Farrington, *Crime Prevention Effects of Closed-Circuit Television: A Systematic Review*, Home Office Research, Development, and Statistics Directorate, Research Study 252, August 2002. Available at <http://www.homeoffice.gov.uk/rds/pdfs2/hors252.pdf>.

and even used the cameras to fulfill their own voyeuristic tendencies. Training programs, clear policies and procedures, personnel background checks, and strict supervision of camera operators can help to mitigate these abuses. Other opponents of CCTV say that camera monitors run afoul of Fourth Amendment guarantees against unreasonable searches and infringe on the right to privacy. However, the courts

generally have ruled that people do not have a reasonable expectation of privacy when in public because their actions are readily observable by others.<sup>9</sup>

Some privacy advocates look at facial recognition technology with greater concern than simple CCTV, contending that it increases the possibility of violations of civil liberties and privacy. Others see it

as having the potential to alleviate some of the concerns about CCTV. By cross-checking faces captured on camera against a database of images of convicted criminals, facial recognition technology may in fact lessen the potential biases of those monitoring the cameras.

## Outlook for the Future

It seems likely that CCTV use will continue to grow, as will the use of CCTV to enforce traffic laws. In July 2002, Virginia Beach, Virginia, began testing CCTV with facial recognition software along the city's ocean-front resort strip.<sup>10</sup> Other cities, including Atlanta, which rejected facial recognition technology because of concerns over its effectiveness, are monitoring the results of systems being used in other places. For its part, NIJ continues to support research into these evolving criminal justice technologies.

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## Notes

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2. Nacro, *To CCTV or Not to CCTV?* Community Safety Practice Briefing, May 2002. Available at <http://www.nacro.org.uk/data/briefings/nacro-2002062800-csps.pdf>.
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8. Davies, Simon, "10 Reasons Why Public CCTV Schemes Are Bad," KDIS online. Available at <http://merlin.legend.org.uk/~brs/cctv/tenreasons.html>.
9. Bickel, Robert D., *Legal Issues Related to Silent Video Surveillance*, Alexandria, VA: Security Industry Association, 1999. Available at [http://www.securitygateway.com/E/E3\\_4.html](http://www.securitygateway.com/E/E3_4.html).
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## NIJ's Bullet-Resistant Vest Standard Reaches Milestone

It is now 30 years since NIJ introduced the first ballistic-resistant body armor standard. Developed in response to a dramatic rise in fatalities among law enforcement officers during the 1960's, the standard truly is a success story. Vests tested and worn in accordance with the standard are credited with saving more than 2,500 lives. Now recognition and acceptance of the standard has grown worldwide, making it *the* performance benchmark for bullet-resistant vests.

### History of the Standard

Prior to 1972, military flack jackets were the only type of personal protection worn by police officers. But flack jackets only protected against shrapnel and bullet fragments—they did nothing to lessen the direct impact of a bullet.

In 1972, NIJ initiated development of a lightweight body armor that officers could wear on duty. The result was NIJ's funding of the production of 5,000 vests made

### WHAT DOES "BULLET-RESISTANT" MEAN?

Unfortunately, there is no such thing as bulletproof armor. Although body armor can provide protection against a significant number of handguns, officers must keep in mind that the armor was selected on the basis of limited threat protection. Additional protection should be worn for SWAT team, hostage rescue, or Special Operations assignments, when officers may be exposed to a weapon threat greater than the protection provided by regular duty armor.

from Kevlar®, a ballistic-resistant fabric. Although the first version of the vest consisted only of square front and back panels with nylon straps, within 6 months this simple design was credited with saving a police officer's life.

## WHAT IS THE STANDARD?

The NIJ bullet-resistant vest standard validates manufacturers' product claims through a performance-based evaluation system. The standard establishes minimum performance levels so that—at the very least—the product should perform as outlined in the standard.

The standard was originally intended to give law enforcement and corrections officials an independent way to test and confirm manufacturers' claims about bullet-resistant body armor. The law enforcement community, however, lacked the budget and expertise to test every body armor product in use. In the early 1970's, NIJ established an independent testing program to ensure that personal body armor met minimum performance levels. Once that program was set up, in 1972, a manufacturer could not label its product as being in compliance until it was tested and approved through the NIJ program.

The NIJ standards development process is cooperative in nature, involving fiber producers, weavers, and manufacturers; law enforcement and corrections personnel; and NIJ.

Production of body armor for law enforcement officers subsequently took off. Currently, more than 90 body armor manufacturers worldwide participate in NIJ's voluntary testing program.

The 1972 ballistic body armor standard has been revised four times. Each revision has made the standard more detailed, addressing increasingly sophisticated technologies, particularly in weaponry and ammunition. The current standard, updated in 2000, upgrades the testing methods for measuring ballistic protection, incorporates current threats from ammunition, and tries to ensure consistent laboratory testing of body armor.

## Purposes of the Standard

**An Educational Process.** Education of the law enforcement community about body armor is an ongoing process, and NIJ's National Law Enforcement and Corrections Technology Center (NLECTC) is a key resource. NLECTC's user-friendly video, *Surviving a Shooting: Your Guide to Personal Body Armor*, explains what body armor is, what it can and cannot protect against, how to select it, and how to wear and care for it properly. The video shows

how NIJ tests and validates body armor and how the Office of Law Enforcement Standards develops its performance levels. An updated publication, *Selection and Application Guide to Police Body Armor*, published by NIJ, explains the selection and use of body armor and discusses common concerns, helps law enforcement and corrections personnel determine the level of protection needed by officers, and details NIJ's recent stab-resistant standard. (See "Stab- and Puncture-Resistant Armor," page 27.)

**A Funding Mechanism.** The Bulletproof Vest Partnership Grant Act of 1998 (BVP) allows most law enforcement and corrections agencies to afford body armor. The Bureau of Justice Assistance and NIJ offer an online application and reimbursement system for law enforcement and corrections agencies seeking BVP funds. The BVP Web page provides a direct link to NLECTC's compliance database as well as to manufacturers and products.

BVP funds can only be used to buy a product that has been tested and approved by NIJ, making it the first law of its kind to tie use of funding under the Act to a product's compliance with a national standard. Agencies

*Vests tested and worn in accordance with the standard are credited with saving more than 2,500 lives. Now recognition and acceptance of the standard has grown worldwide, making it the performance benchmark for bullet-resistant vests.*

## WHAT ARE NIJ STANDARDS AND HOW DO THEY HELP?

### How NIJ Standards Benefit Law Enforcement

NIJ's testing and standards program is crucial to law enforcement and corrections agencies, which typically are not set up to either fund or carry out new product research. By developing the standard, putting the testing program together, and encouraging manufacturers to participate, NIJ is able to provide law enforcement and corrections personnel with clear and concise written information that informs purchasing decisions on personal safety products such as body armor. An online *Consumer Product List* identifies specific models that meet the standard and allows potential purchasers—particularly those on limited budgets—to make wise selections. Online databases present all the test data on each product plus the bottom-line performance results. To access these databases, go to <http://www.justnet.org> and click on the "Testing and Evaluation" link.

The *Product List* and online databases benefit two key groups: (1) the law enforcement and corrections communities, by listing products that have been tested; and (2) the manufacturing community, by establishing a benchmark for products that will meet the needs of potential customers.

The standards can help consumers who may be concerned about the performance of a particular product. Law enforcement and corrections agencies can cite the standards when negotiating with manufacturers for the repair or replacement of their products, or if necessary, when litigating a product's lack of compliance with the standards.

### How NIJ Standards Are Developed

Typically, the standard for ballistic body armor—and other NIJ standards as well—is developed as follows:

- NIJ funds and directs the research, based primarily on input from law enforcement and corrections professionals.
- NIJ's standards-setting body, the Office of Law Enforcement Standards, part of the National Institute of Standards and Technology, buys samples of the equipment, identifies minimum performance factors, evaluates current applicable standards, develops and validates test methodologies and protocols, and produces a voluntary performance standard.
- NIJ alerts the National Law Enforcement and Corrections Technology Center (NLECTC) to set up a testing program to support the new standard.
- NLECTC accredits independent laboratories to perform testing in accord with the standard.
- NLECTC introduces the standard to the manufacturing community and asks that products be submitted for testing under the standard.
- Product samples are sent to NLECTC, where they are inspected to ensure that they meet labeling and workmanship requirements of the current standard. The samples are then tested at independent NIJ-certified laboratories.
- NLECTC provides ongoing oversight of the testing program to ensure that the equipment used in the field is safe and reliable and meets users' needs and requirements.

can cite selected information from NIJ's *Consumer Product List* on their applications for BVP funding.

## The Future of Body Armor

Because advances in weapons and ammunition technology constantly pose new threats, the need for research and development of more effective personal body armor is ongoing. Among the next challenges for ballistic-resistant armor is to produce a lighter weight vest that provides maximum comfort as well as optimal protection.

### Multihit Capability of Ballistic-Resistant Armor.

No current standard exists for a vest that can withstand multiple gun shots within a very small target area. To address this need, NIJ is partnering with the Royal Canadian Mounted Police and Canada's Defense Research Establishment Valcartier to develop a testing protocol and specifications for providing multihit testing capability. A revision of the current standard to include this capability is expected in 3–5 years.

**Life Expectancy of Vests.** Armor is typically worn as an undergarment, and if it is not properly cared for, its ballistic capabilities can significantly degrade. Most manufacturers limit their warranties to 5 years. In response to the concerns of public safety advocates about the life cycle of a vest after its 5-year warranty ends, NIJ, through the Technical Support Working Group, is conducting age-regression studies on ballistic panels exposed to simulated aging to measure their protective capabilities.

**Ballistic Helmets.** In response to law enforcement reports that officers increasingly need to wear ballistic helmets, NIJ is updating its 1981 ballistic helmets standard to take into account more current ammunition threats. This testing program is exploring better ways of measuring the blunt trauma and internal damage to the head from a high-velocity bullet striking a helmet. A draft of the revised standard is expected later this year.

**Ballistic Materials.** A general ballistic materials standard update will cover other types of protective equipment, including blankets,

## STAB- AND PUNCTURE-RESISTANT ARMOR

In September 2000, NIJ published the first national minimum performance requirements for stab- and puncture-resistant body armor. This new standard addresses the danger posed to corrections officers from stab wounds from knives, picks, and prison-made shivs (sharp-edged, pointed weapons). The standard is the result of a 3-year collaboration involving the Office of Law Enforcement Standards, the U.S. Secret Service, and the Police Scientific Development Branch of the United Kingdom, where more officers are attacked with knives than with firearms. To date, more than 120 body armor models comply with the new stab standard.

bunkers, and shields, as well as protected facilities, such as the courts, that use bullet-resistant glass and other ballistic-resistant materials such as reinforced concrete.

### NIJ's Leadership Role

NIJ's technology portfolios, which now include a full range of criminal justice issues, trace their beginnings to the introduction of the bullet-resistant vest standard. In fact, NIJ's leadership role in the field has inspired the agency to partner with other countries to establish similar ballistic-resistant armor standards worldwide. In this way the agency contributes daily to the safety of law enforcement and corrections personnel around the globe.

NCJ 200910

### For More Information

#### Publications

- *Ballistic Resistance of Personal Body Armor, Revision A, NIJ Standard 0101.04*, June 2001. Available at <http://www.nlectc.org/pdffiles/0101.04RevA.pdf>.
- *Stab Resistance of Personal Body Armor, NIJ Standard 0115.00*, September 2000. Available at <http://www.nlectc.org/pdffiles/0115.00.pdf>.

*Although the first version of the vest consisted only of square front and back panels with nylon straps, within 6 months this simple design was credited with saving a police officer's life.*

- *Selection and Application Guide to Personal Body Armor, NIJ Guide 100-01*, November 2001. Available at <http://www.nlectc.org/pdffiles/selectapp2001.pdf>.
- *Bulletproof Vest Partnership Grant Act of 1998*. Available at <http://vests.ojp.gov/resources/index.html>.
- *Bulletproof Vest Partnership Program*, Bureau of Justice Assistance, March 2002 (NCJ 192166).

#### Videotapes

- *Surviving a Shooting: Your Guide to Personal Body Armor*. Available at <http://www.nlectc.org/videos/justnet.html>.

#### Web Sites

- Bulletproof Vest Grant Partnership Program. Available at <http://www.vests.ojp.gov>.
- NLECTC Virtual Library—Personal Protection, <http://www.nlectc.org/virlib/TopicList.asp?intTopicID=36>.



## At-A-Glance: Recent Research Findings

### HOW TO GET AT-A-GLANCE MATERIALS

Materials are available at:

- NIJ's Web site at <http://www.ojp.usdoj.gov/nij>, or
- NCJRS, [puborder@ncjrs.org](mailto:puborder@ncjrs.org), 1-800-851-3420, P.O. Box 6000, Rockville, MD 20849-6000.

The summaries in this section are based on the following:

**RESEARCH IN PROGRESS SEMINARS.** At these seminars, scholars discuss their ongoing research and preliminary findings with an audience of researchers and criminal justice professionals. Sixty-minute VHS videotapes of the Research in Progress seminars are available from the National Criminal Justice Reference Service (NCJRS) at 1-800-851-3420. Videotaped seminars are \$19 (\$24 in Canada and other countries).

**NIJ FINAL REPORTS.** These final submissions from NIJ grantees typically are available from NCJRS through interlibrary loan. In some cases, photocopies may be obtained for a fee. For information about these reports and possible fees, contact NCJRS.

**NIJ PUBLICATIONS.** Some of the information here is summarized from recent NIJ publications, which are available from the NIJ Web site or by contacting NCJRS. Refer to the documents' accession (ACN) or NCJ numbers.



## Alcohol Control Policies and Violent Crime

Bruce L. Benson, David W. Rasmussen, and Paul R. Zimmerman, "The Impact of Alcohol Control Policies on the Incidence of Violent Crime," final report submitted to NIJ, grant number 99-IJ-CX-0041, available from NCJRS (NCJ 191199).

Do public policies that discourage alcohol consumption—such as excise taxes, DUI laws, and increases in the legal drinking age—reduce violence? One study was unable to find evidence to support the effectiveness of these policies as a means of crime reduction. The relationship between alcohol and crime is not one of simple cause and effect, the researchers say. Instead, other factors help link the two, and the researchers recommend that more data be collected on the effect of alcohol control measures in the fight against crime.

### Reducing Consumption

The researchers first looked to see if local efforts to control access to alcohol reduce drinking. They do. For example, communities that have limited the number of bars and restaurants licensed to sell alcohol have successfully reduced the per capita (average per person) consumption of beer and wine. Higher excise taxes on distilled spirits also have lowered liquor consumption.

### Linking Consumption to Crime

The next step was to see if drinking was associated with violent crime. Although this is a difficult question to answer, the researchers did find certain correlations. For example, a significant number of rape reports recorded that the assailant and/or the victim were drinking prior to the crime.

The researchers recognize the temptation to combine these two findings to support the theory that policies to reduce alcohol consumption will reduce crime rates. But the analysis conducted by the researchers led them in a different direction. They describe

### HHS REPORT ON ALCOHOL AND VIOLENCE

A subchapter of the U.S. Department of Health and Human Services' (HHS) June 2000 report on alcohol and health summarizes research on the connection between alcohol and violence.<sup>1</sup> The report explains that such research is often conducted with alcohol control policies in mind:

A key variable in this research is sometimes alcohol availability rather than alcohol consumption. The expectation is that decreased availability might lead to decreased consumption, which might lead in turn to lower rates of violence. Availability is of interest because it is a potential "policy lever" that could be manipulated if a causal relationship between availability and violence rates were firmly established. (p. 54)

The research reviewed supports, in part, the idea that alcohol is not a cause of crime:

Alcohol-related violence is the result of complex interactions between individual and environmental factors that either promote or inhibit violence. (p. 54)

The report also acknowledges that in many studies in which a strong relationship between alcohol and violence appeared clear, that finding weakens with extensive analysis:

[W]hen researchers accounted for a greater number of "control variables" (such as gender, age, social class, criminal status, childhood abuse, and use of other drugs in addition to alcohol), they tended to find that these control variables weakened the strength of the original relationship between violence and alcohol consumption, in some cases to the point of no association. (p. 56)

However, the report goes on to note:

Nevertheless, experimental findings do suggest that, in laboratory settings, alcohol tends to increase aggressive responses in a way that might be interpreted as relatively strong support for a causal effect of alcohol consumption on violence. (p. 55)

Moreover, the HHS report points out that alcohol control policies can produce other positive results that do not involve acts of physical violence. For example, deaths of teens in automobile accidents decreased sharply with the institution of 21 as the legal drinking age. (p. 379)

The report cites research indicating that more study is needed:

[A]lthough research to date shows substantial evidence of an association between alcohol and violence that is consistent with a causal relationship, it will not be possible to state conclusively that alcohol causes violence until further research using a wider array of control variables is conducted. (p. 56)

1. U.S. Department of Health and Human Services, *Special Report to the U.S. Congress on Alcohol and Health*, June 2000.

*Although research to date shows substantial evidence of an association between alcohol and violence that is consistent with a causal relationship, it will not be possible to state conclusively that alcohol causes violence until further research using a wider array of control variables is conducted.*

the apparent relationship between controlling alcohol through local policies and reducing violent crime as “spurious,” or at best questionable.

### Complex Relationship

The relationship between alcohol and crime seems to be much more multidimensional. Drinking alcohol (as a single factor) does not *cause* a person to commit a crime. Additional factors—such as sleep deprivation, a history of alcoholism, psychological disorders, and physical conditions such as temporal lobe dysfunction or hypoglycemia—can play an important role. Any one of these factors in combination with alcohol can affect a person’s thinking or response to a situation or opportunity that may lead to a crime being committed. As another group of researchers put it:

[C]ausal effects come essentially in the form of an alcohol-person-situation interaction. That is, alcohol consumption increases the probability of violent behavior only for some persons in some situations.<sup>1</sup>

It appears unlikely, then, or it is at least still unproven, that any one program aimed at limiting alcohol use can reduce crime overall. The researchers propose, however, that with better collection of data on such things as alcohol shipments and sales, specific links

between particular types of drinking and particular crimes might be demonstrated. Alcohol reduction programs could then be better targeted and might prove more effective in reducing the rates of certain crimes.

### Notes

1. Lipsey, Mark W., David B. Wilson, Mark A. Cohen, and James H. Derson, “Is There a Causal Relationship Between Alcohol Use and Violence? A Synthesis of Evidence,” *Recent Developments in Alcoholism, Volume 13: Alcoholism and Violence*, ed. Marc Galanter, New York: Plenum Press, 1997: 247.

### For more information

- Contact Bruce L. Benson, DeVoe L. Moore and Distinguished Research Professor of Economics, Department of Economics, Florida State University, Tallahassee, FL 32306-2220, 850-644-7094, [bbenson@garnet.acns.fsu.edu](mailto:bbenson@garnet.acns.fsu.edu).
- Contact David W. Rasmussen, Director of the DeVoe L. Moore Center and Professor of Economics, Florida State University, Tallahassee, FL 32306-2220, 850-644-7649, [drassmuss@garnet.acns.fsu.edu](mailto:drassmuss@garnet.acns.fsu.edu).
- Contact Paul R. Zimmerman, Senior Economist, Federal Communication Commission, Washington, DC 20554, [zimmy@att.net](mailto:zimmy@att.net).

## Binge Drinking in the Northern Plains Tribes

*NIJ Research in Progress Seminar, “Pilot Study Regarding the Interrelationship of Alcohol and Drugs and Crime Among Adult American Indians—A Prevalence and Methodological Study,” Philip A. May, grant number 99-MU-MU-0023, available on videotape from NCJRS (NCJ 194096).*

In most tribes, fewer Indian adults drink than do adults in the general U.S. population; however, the pattern of heavy drinking among those who do drink is associated with a great deal of social and medical

pathology. Indeed, severe binge drinking—defined as five or more drinks per day, occasion, or sitting for men and three or more drinks for women—is a major problem among adult American Indians who are arrested in North and South Dakota, where a small number of repeat offenders (17 percent) account for half of all arrests in two tribal police jurisdictions that were studied.

A team of researchers from the University of New Mexico is exploring the interrelationships of alcohol, drugs, and crime among

adult American Indians. Preliminary data were presented June 5, 2002, as part of NIJ's Research in Progress seminar series.

The research suggests that poor performance in school, inadequate education, and low intelligence are common among arrestees; that alcohol-related behavior and crime are highly influenced by one's family; and that arrestees generally do not recognize their own alcohol and drug problems. May believes these findings can be generalized to tribes throughout the Northern Plains.

From August 2000 through February 2002, pilot data were collected in partnership with two tribal police departments in the Dakotas. Data were collected on more than 2,000 arrests, and detailed interviews were completed with 165 adults. Participants were asked about their criminal history, the events preceding arrest (including where alcohol was obtained on the day of the arrest), time spent drinking before the arrest, place of arrest, blood alcohol concentration levels at the time of arrest, and their personal assessment of the degree of their problems with alcohol or drugs. Urine toxicology screens and neuropsychological interviews were also performed.

Eighty-four percent of the arrestees had participated in binge drinking within 30 days of the arrest or offense, with a mean of 5.4 binge drinking occasions during that span. May noted that most studies do not measure the burden repeat offenders place on law enforcement. In this study, these "revolving door" offenders (N=399 or 17 percent) accounted for 47 percent of the arrests.

Researchers also looked at the causes and effects of consumption. Alcohol consumption was highly correlated to family and social environment. Fifty-three percent of arrestees reported alcohol problems within their immediate family; more than one-fourth believed their spouse or partner had an alcohol problem. Arrestees also had low education levels and poor scores on intelligence tests. More than one-third had not complet-

*Researchers also measured the arrestees' perceptions of their drinking problems using the SOCRATES scale, an instrument designed to assess how ready alcohol abusers are to change their behavior. The scale indicated that the arrestees did not recognize the seriousness of their alcohol problems, were not prone to accept labels such as "problem drinker" or "alcoholic," and did not express a desire for change.*

ed the requirements for a high school diploma or a GED. In a subset of 14 subjects who were administered a battery of measures of intellectual functioning, all performed in the low average to average range.

Occasional or frequent violence is often a result of drinking. Three-fourths of the arrestees had been involved in a fight; one-third had physically attacked someone; and 73 percent had experienced a heated argument while drinking. Additional effects reached beyond the time of consumption, with as many as half of the arrestees reporting losing or nearly losing a job due to drinking.

Researchers also measured the arrestees' perceptions of their drinking problems using the SOCRATES scale, an instrument designed to assess how ready alcohol abusers are to change their behavior. The scale indicated that the arrestees did not recognize the seriousness of their alcohol problems, were not prone to accept labels such as "problem drinker" or "alcoholic," and did not express a desire for change.

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#### **For more information**

- Contact Philip A. May, Ph.D., University of New Mexico, 505-925-2308, pmay@unm.edu.

## Using Geographic Analysis in Probation and Parole

*Keith Harries, "Applications of Geographic Analysis in Parole and Probation," final report submitted to NIJ, grant number 99-CE-VX-0005, available from NCJRS (NCJ 191836).*

Police have been using mapping technology and geographic information systems (GIS) software quite productively for several years, but probation and parole agencies have lagged in adopting the technology. The geographic information collected and analyzed by probation and parole personnel has the potential to become an extremely valuable investigative tool to police, who might want to know, for example, the locations of people recently released from prison who have previously been convicted of a certain type of crime.

In a demonstration project to see how probation and parole agencies might use mapping technology, researchers trained a small number of staff at the Maryland Division of Parole and Probation in the use of an off-the-shelf GIS package. The staff in turn trained others and spread the methodology throughout the agency.

The demonstration pointed out that inconsistencies in databases and access protocols, even within subunits of the same agency, can add considerable problems to the data-sharing process. When the stress of introducing new technology is combined with technical difficulties in data sharing, it can be difficult to convince managers of the potential benefits. However, indications are that probation and parole agencies are adopting GIS technologies and that the rate of adoption will likely accelerate as the benefits become more widely recognized.

### How Can GIS Benefit Parole and Probation?

**It can provide descriptive answers.** When the data involve addresses or other "spatial"

components, GIS can answer a number of questions, including:

- Where are the offenders located?
- What does the pattern look like?
- Are there "hot spots" analogous to crime hot spots that demand exceptional allocations of resources?
- Do administrative districts make sense, given the geography of the caseload?
- Where are the negative influences—abandoned buildings, drug markets, liquor licenses, locations where law enforcement officers have been threatened or injured, and substandard housing?
- Where are the positive aspects of a successful life on probation or parole, such as bus routes, daycare facilities, and schools?

Descriptive uses of GIS can be very sophisticated. Databases can be subjected to multilevel inquiries and the results mapped. For example, GIS analysts can plot the location of male offenders between the ages of 25 and 35 currently on probation for violent crimes involving handguns and drugs, who are currently unemployed and who live north of one street and east of another. Another analyst might plot the location of cases assigned to specific officers at particular levels of supervision.

### **It can improve management techniques.**

An array of tools enables staff to calculate information about time, distance, and area. For example, one common issue in agencies concerns the distribution of caseloads among officers. Typically, this is done haphazardly, from a geographic point of view, with new cases assigned to officers with the lightest loads, no matter where the cases are located. This leads to a random spatial distribution of cases for all officers, forcing them to drive all over the city to visit individual clients.

Network analysis in GIS can optimize travel patterns by preparing a route that minimizes travel time or distance and that systematically lists directions. Even better, a GIS program can assign officers to districts, preparing boundaries based on criteria entered by managers. An “equal caseload” criterion, for example, would result in districts of variable size—smaller where cases are more densely concentrated, larger where they are spread apart. Another possibility is the calculation of “centers of gravity” of offender clusters to assist with the optimal location of field offices.

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**For more information**

- Contact Keith Harries, University of Maryland Baltimore County, 410-455-2095, harries@umbc.edu.
- See also Harries, Keith, “Applications of Geographical Analysis in Probation and Parole,” *Perspectives, The Journal of the American Probation and Parole Association* (Fall 2002).



## **Technologies for Public Safety in Critical Incident Response Conference & Exposition**

**September 23–25, 2003  
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**This conference will bring together law enforcement, fire, emergency management professionals, urban search and rescue, and other first responders to observe and discuss the latest tools and technologies that address their needs in responding to critical incidents, such as major industrial accidents, natural disasters, and terrorist attacks.**

**Visit <http://www.nlectc.org/conf/nij2003/nij2003.html> for more conference specifics, contact information, online registration, and additional forms.**

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## Community Policing, Then and Now

Arlen M. Rosenthal, Lorie A. Fridell, Mark L. Dantzker, Gayle Fisher-Stewart, Pedro J. Saavedra, Tigran Markaryan, and Sadie Bennett, "Community Policing: 1997 National Survey Update of Police and Sheriffs' Departments," final report submitted to NIJ, grant number 96-IJ-CX-0045, available from NCJRS (NCJ 187693).

Community policing is one of the most significant trends in policing history, but what impact has it had on police agencies? And how has it changed their perspective?

In the early 1990's, NIJ supported a major survey to determine the extent to which police departments across the country were adopting community policing strategies. Five years later, an update of the survey shows that substantially more agencies are engaged in community policing than before. The findings support the notion that community policing can be regarded as a movement.

The final report from the updated survey is now available on the National Criminal Justice Reference Service (NCJRS) Web site. Among the findings:

- The survey confirms the commonly held belief that police executives continue to place a high premium on community policing. For example, in 1993, 76 percent of the executives said community policing is a highly effective means of providing police services. By 1997, that number had increased to 86 percent.
- Most police executives believe that all organizational personnel should be responsible for implementing community policing—not just patrol officers or community relations staff.
- One-fourth of the police executives in the 1997 survey said community policing

is not suitable for every community. Location, the needs of residents, and the history of the police department with community members are all factors to be considered.

- Larger agencies are more likely to implement community policing than smaller agencies. A huge factor in deciding whether to implement a community policing strategy is the organization's experience with community policing.
- When developing a plan to implement community policing, most police executives rely on the talents of their own personnel rather than on outside resources.
- Municipal agencies implement community policing earlier and at higher rates than sheriffs' departments (61 percent versus 44 percent).

The survey respondents reveal a number of lessons learned while implementing community policing. The lesson most frequently mentioned is that it takes time to prepare for adopting community policing as well as time to implement it. Respondents also recommend that community policing be adopted agencywide rather than by special units only.

The survey report will be of interest to anyone wanting descriptive statistics on community policing. The literature review chapter gives excellent background information on community policing in general.

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### For more information

- Download *Community Policing: 1997 National Survey Update of Police and Sheriffs' Departments* (NCJ 187693) from <http://www.ncjrs.org/pdffiles1/nij/grants/187693.pdf>. The report was produced with funds transferred to NIJ from the Office of Community Oriented Policing Services.

The National Institute of Justice is the research, development, and evaluation agency of the U.S. Department of Justice.

NIJ provides objective, independent, evidence-based knowledge and tools to enhance the administration of justice and public safety.

The National Institute of Justice is a component of the Office of Justice Programs, which also includes the Bureau of Justice Assistance, the Bureau of Justice Statistics, the Office of Juvenile Justice and Delinquency Prevention, and the Office for Victims of Crime.

*Photo Sources: PictureQuest  
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