DNA Solves Property Crimes (But Are We Ready for That?)

by Nancy Ritter

Results of an experiment using DNA to solve property crimes are in: collecting biological evidence at burglary scenes works.

The study — funded by the National Institute of Justice (NIJ) and evaluated by the Urban Institute — compared burglary investigations that used only traditional police practices to burglary investigations in which DNA evidence was *also* collected and analyzed. The study revealed that, when DNA was added to traditional property crime investigations:

- More than twice as many suspects were identified.
- Twice as many suspects were arrested.
- More than twice as many cases were accepted for prosecution.

The DNA Field Experiment also found that suspects were five times as likely to be identified through DNA evidence than through fingerprints; blood evidence was more effective in solving property crimes than other biological evidence, particularly evidence from items that were handled or touched by the suspect; and evidence collected by forensic technicians was no more likely to result in a suspect being identified than evidence collected by patrol officers.

Another significant finding of the unprecedented experiment — conducted in Orange County, Calif.; Los Angeles; Denver; Phoenix; and Topeka, Kan. — was that suspects identified by DNA had at least twice as many prior felony arrests and convictions as those identified through traditional burglary investigation.

The results of the DNA Field Experiment have the potential to turn a significant component of our criminal justice system on its head. The implications are that dramatic.

Consider that there were 2,183,746 burglaries reported to the police in 2006.[1] Only 12 percent of the cases were solved.[2]

We also know that many, many burglaries are not reported to the police; according to the National Crime Victimization Survey, only half of the burglaries committed in the U.S. in 2006 were reported to police.[3]

The results of NIJ's Field Experiment would seem, therefore, to be very good news. But there is something lurking behind the good news.

Policy decisions. Big policy decisions.

As we increasingly come to understand the potential of DNA to solve property crimes, the demands to use this highly effective tool could overwhelm our criminal justice system. Although the DNA Field Experiment showed that benefits are clear and dramatic, some of the big-picture policy questions are confounding:

- How will our nation's crime laboratories process the increase in evidence?
- Are we willing to hire more prosecutors and public defenders to handle an increased volume of cases?
- How can we ensure that using DNA to solve burglaries will not pull investigative resources away from *other* criminal investigations, such as sex crimes in which consent is the issue, robbery and domestic violence?
- If we solve the police and crime lab issues, do we need to revisit sentencing guidelines — or are we ready to build more jails and prisons to handle an influx of property crime offenders?

"There is a criminal justice revolution coming," said John Roman, a senior research associate in the Urban Institute's Justice Policy Center and the primary author of the evaluation. "We need to have these discussions now, so we don't have to have them on the run."

What Inspired the Study?

Throughout the 1980s and 1990s, DNA gained acceptance in our scientific and legal communities. Today, most Americans know that DNA is used to identify, confirm or exonerate suspects in violent crimes, such as homicide and sexual assault. In the past five years, however, there has been growing interest in expanding the capacity of police agencies and crime laboratories to collect and analyze DNA evidence in high-volume crimes, such as commercial and residential burglary and theft from automobiles. Interest in using DNA to solve property crimes is driven by high recidivism rates among burglars and dramatic improvements in the technology itself.

The results of the DNA Field Experiment have the potential to turn a significant component of our criminal justice system on its head.

NIJ launched the DNA Field Experiment to test successes that were being experienced in places like Dade County, Fla., New York City and the United Kingdom in solving property crimes using DNA evidence. NIJ also wanted to determine how cost-effective it is to use DNA in property crime investigations and whether processing DNA evidence in property crimes actually leads to more arrests and prosecutions.

How Was the Money Spent?

Because the five study sites had different goals, it is important to keep in mind — especially when looking at the results from the individual sites — that NIJ's overall mission was to examine a variety of ways in which DNA evidence can be used to solve property crimes.

Although some "best practices" may be gleaned from the study — particularly when outcomes are gauged against costs — the project was not designed to determine best practices; rather, it was designed to investigate different *approaches* in using DNA as an investigative tool to solve property crimes.

In Denver — a city of 550,000 where 7,500 property crimes are committed annually — officials sought to increase the collection

of blood or other bodily fluids with the expectation that more suspects would be identified, arrested and prosecuted.

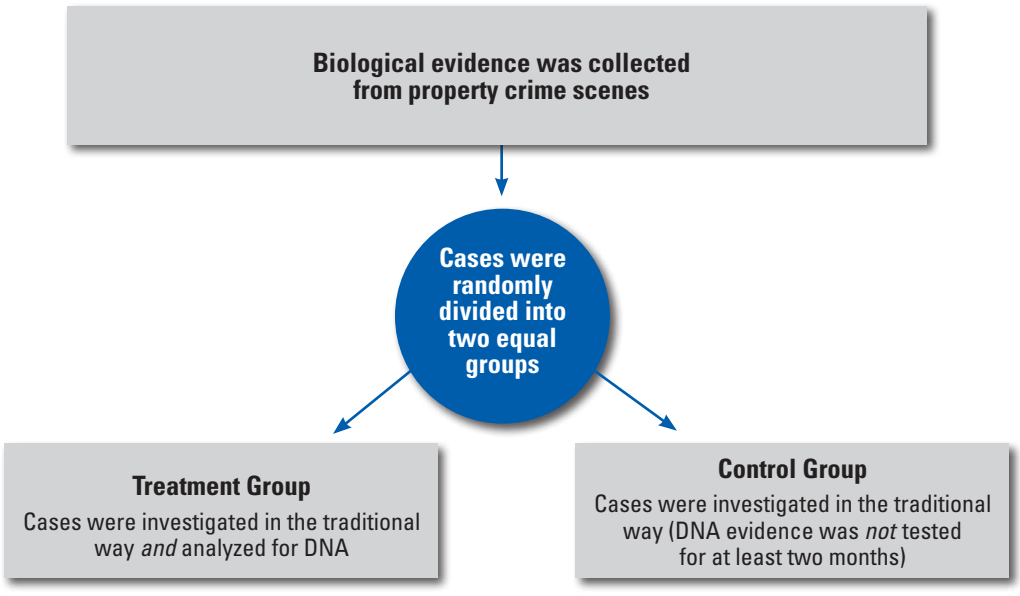
In Orange County, on the other hand, law enforcement had been using DNA evidence to solve residential and commercial burglaries for some time; therefore, officials in the South Patrol Operations Division (serving 500,000 residents who experience approximately 950 residential burglaries annually) decided to use NIJ funds to test the probative nature of so-called "touch" samples — exploring the types of DNA profiles that could be obtained from a variety of nontraditional sources of potential biological evidence, such as computer cords, jewelry boxes and door handles.

In Los Angeles, funding was used in a different — but equally interesting — way. Although authorities in the Valley Bureau (which serves more than 1.2 million people and experiences approximately 34 percent of the city's residential burglaries) saw the project as an opportunity to test DNA in high-volume property crimes, a large backlog of homicide and sexual assault evidence meant that the only viable option was to use the NIJ grant to pay for outsourcing the DNA analysis.

Before the DNA Field Experiment, the Phoenix Police Department had experienced some success using DNA evidence to solve property crimes; therefore, authorities in the two precincts in which the experiment was performed (Desert Horizon, with 400,000 residents, and Maryvale, with 265,000 residents) decided to use the funds to expand their ability to collect and process DNA in these cases.

And finally, in Topeka — where approximately 2,700 property crimes are committed annually — the goal was two-fold: to determine whether patrol officers could effectively collect high-quality biological evidence from crime scenes and to investigate the hypothesis that touch samples were less likely to yield Combined DNA Index System (CODIS)-uploadable profiles and, therefore, should be a lower collection priority.[4]

How Did the DNA Field Experiment Work?



How Did the DNA Field Experiment Work?

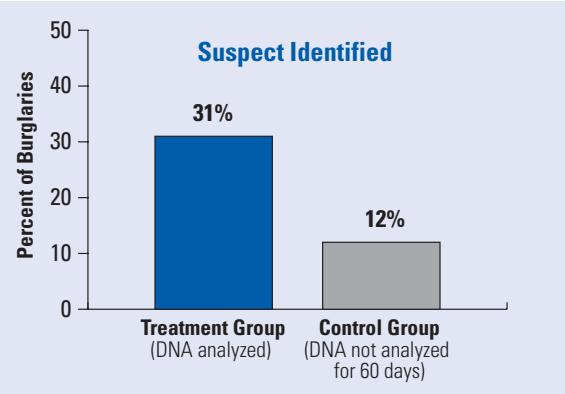
From November 2005 to July 2007, each of the five jurisdictions collected biological samples — evidence thought to contain human cells in the form of hair, tissue, bones, teeth, blood or other bodily fluids — from 500 property crime scenes.[5] Researchers at the Urban Institute then randomly divided the cases into two equal groups: the "treatment" cases and the "control" cases.

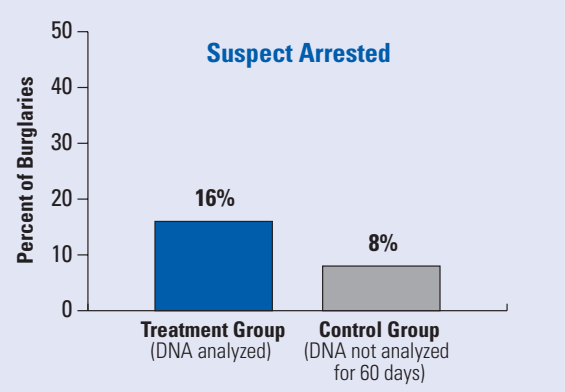
In the treatment group, cases were investigated in the traditional way *and* the evidence was analyzed for DNA. If DNA was found, it was run through CODIS, and, if it resulted in a "hit," follow-up was conducted. In the control group, cases were investigated in the traditional way and evidence was not analyzed for DNA for at least two months. The police were *not* told if a case was in the treatment or the control group; therefore, officers pursued traditional burglary investigations in both groups. The only difference in how the cases were handled (during the first two months post-burglary) was whether DNA analysis was performed on the evidence.

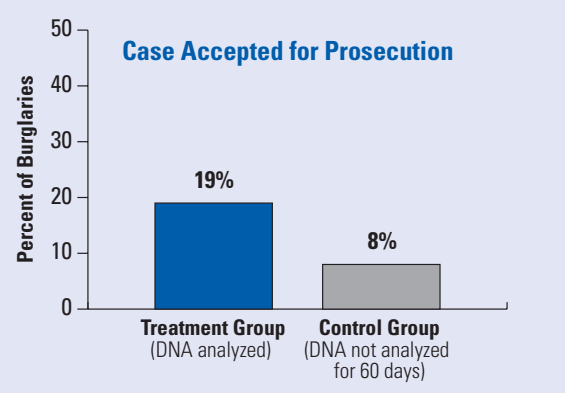
Here is an overview of cases from all the sites: 57 percent of the crime scenes were residential burglaries, 29 percent were commercial burglaries and 13 percent were thefts from automobiles. Nearly 70 percent of the points of entry were through doors or windows; in 17 percent of the cases, the property was unlocked. The most common items stolen were electronics (38 percent), jewelry (13 percent) and cash or a cash substitute (11 percent); in 9 percent of the cases, nothing was stolen.

As can be seen in the graphs to the right, across all the sites, a suspect was identified in 31 percent of the treatment group cases (in which DNA evidence was collected and analyzed).[6] In the control group (in which DNA evidence was collected but *not* tested for at least two months), a suspect was identified in only 12 percent of the cases.[7] In the DNA-tested group, police arrested a suspect in 16 percent of the cases. In the non-DNA-tested group, they arrested a suspect in only 8 percent of the cases.

Suspects Identified, Arrested and Prosecuted in All Sites







Cost-Effectiveness of DNA Case Processing

	Denver*	Topeka	Phoenix	Los Angeles	Orange County	All Sites†
Per suspect identified	$1,466	$1,244	$6,170	$8,147	$4,822	$4,502
Per arrest	$3,679	$5,223	$27,378	$10,319	$19,287	$14,169
Per case accepted for prosecution	$1,903	$4,178	$10,785	$12,899	n/a	$6,169

* Denver's costs are highlighted because officials there used assumed "best practices" in the field experiment; other jurisdictions (with mature crime labs and similar leadership commitments) could likely experience similar results.

† Weighted average.

How Much More Does DNA Evidence Cost?

In its evaluation of the DNA Field Experiment, the Urban Institute used what is called "cost-effectiveness analysis" to calculate the cost of labor and supplies in the treatment (DNA-tested) cases. First, the researchers calculated the cost of six separate stages of DNA analysis: preliminary testing, generation of a profile, CODIS entry, case verification,[8] investigation and post-arrest. Then they determined the costs (for labs and police departments) based on three outcomes:

- Was a suspect identified?
- Was an arrest made?
- Was the case accepted for prosecution?

The costs are reported as the *additional* cost of processing a case with DNA evidence, over and above the cost of using traditional burglary investigative procedures. "Processing a case" covered from the time the evidence was delivered to the local lab until the case concluded, including suspect identification, apprehension and arrest if the case progressed that far.

The full report contains in-depth analyses of the costs from each of the test sites, but here is the bottom line.[9] On average — across the five test sites — using DNA to solve a property crime cost an additional:

- $1,400 to collect and process DNA evidence.
- $4,502 to identify a suspect (who would not otherwise have been identified).
- $14,169 to arrest a suspect (who would not otherwise have been arrested).

It is important to recognize these numbers for what they are: true averages. The costs were very different across the five sites for a number of reasons, including whether the lab work was done in-house or outsourced; the wages of forensic scientists, police officers and detectives; nonlabor costs; and the number of samples analyzed. The cost also depended on the quality of the DNA evidence collected and whether or not a profile — and then a CODIS match — was obtained.

The table on this page highlights Denver for a reason. Officials in Denver chose to use NIJ's Field Experiment to maximize results (that is, to increase the number of suspects identified and arrested). To do this, they used assumed best practices in evidence collection, fine-tuned coordination among the agencies, and aggressively arrested and prosecuted suspects. It is reasonable to expect that other jurisdictions with mature crime labs — and similar protocols and leadership commitment — would experience results most like those in Denver.

"One of the main reasons for Denver's success was the involvement of top leadership throughout the project," Roman said.

Again, it should be kept in mind that these are the *additional* costs — on top of the

TRAINING FOR DNA EVIDENCE COLLECTION FROM BURGLARIES

The DNA Field Experiment found that officers who were adequately trained did as well as more specialized forensic personnel in identifying and collecting probative evidence. But how much does it cost to teach officers to collect biological evidence?

Although the Urban Institute's evaluation did not systematically examine the additional DNA training that jurisdictions provided to evidence collectors, the training appeared to be more or less the same in all five test sites: a day or two of officer (or other evidence collector) time, plus the cost of the trainers.

"Training appeared to be most effective when it was ongoing," said John Roman, senior research associate at the Urban Institute's Justice Policy Center. "Therefore, jurisdictions that want to begin using DNA evidence to solve property crimes would have to include such costs in any cost-benefit analysis."

Phoenix, one of the five test sites in the NIJ study, offers an example: 80 officers and detectives from the participating burglary divisions attended a one-day classroom course taught by forensic scientists from the department's crime lab. Training consisted of several hours on how to identify, collect and preserve DNA evidence and several hours on testifying in court. At the end of the training, officers were given kits containing the tools for DNA evidence collection. They were also given laminated cards on collection procedures, including information that could be given to property crime victims on preserving evidence before it is collected by authorities. Urban estimated that the cost of the training (labor and materials) in Phoenix was $26,000 or about $100 for each of the 250 cases in the DNA-tested group.

To help its state and local partners reduce training costs, NIJ created a training tool — available online — to help investigators and crime scene specialists learn how to identify, secure, document and preserve blood, hair, urine, saliva, skin cells and other biological evidence at property crime scenes. A section on evidence collection covers procedures, equipment, control and reference evidence samples, evidence marking and packaging, and chain of custody. The course also offers a bird's-eye view of the Combined DNA Index System and how it helps solve crimes. **To access the training, go to http://www.dna.gov/training/property-crime.**

cost of traditional burglary investigations — of using DNA to identify, arrest and prosecute burglars who otherwise would not have been caught. Also, it is important to note costs that were *not* included in the study. Training personnel to identify and collect biological material and transporting evidence to the crime lab were not included because cases were randomly assigned to either the treatment or the control group *after* those activities occurred. Needless to say, these costs would be important to policymakers who are considering funding the use of DNA evidence to solve property crimes in their jurisdictions. (See sidebar, "Training for DNA Evidence Collection From Burglaries," on this page.)

It is also important to note that the study did not allow researchers to identify the *percentage* of property crime scenes that actually contained DNA evidence. We therefore do not know how effective various types of evidence collectors and search protocols are in *locating* DNA evidence at a property crime scene. This is important in a cost-benefit analysis because, if the number of scenes with biological evidence is small, DNA profiles would be rare, making the average cost to obtain a profile high.

And, perhaps most noteworthy for policymakers who consider a cost-benefit analysis: If more property crime offenders

THE NEXT STEP: COMPLETING THE COST-BENEFIT ANALYSIS

The National Institute of Justice is taking the next step to determine whether collecting forensic evidence at property crime scenes is worthwhile given the costs involved.

Because data collection in the first DNA Field Experiment ended in July 2007, the outcomes of many cases — including the number of suspects identified, arrested and prosecuted — could not be included in the cost-benefit analysis performed by the Urban Institute. Although the cost figures reported in the main story — both averages and broken down by the five field sites — offer an important starting point for policymakers who want to consider whether DNA is cost-effective in solving high-volume property crimes, they do not include crucial information about the consequences of arrest, trial and incarceration.

Therefore, the Urban Institute is now looking at the final disposition of cases in the original DNA Field Experiment: the 1,079 cases in the "treatment group" (that tested DNA evidence) and the 1,081 cases in the "control group" (that did not test DNA evidence for at least 60 days).

To do this, researchers will estimate the cost of adjudicating the cases and, by looking at the sentences handed down, will also calculate costs of incarceration or supervision. In addition, they will use various models to predict the number — and type — of crimes "averted" by the burglars' incarceration. These "averted crimes" will then be monetized and compared to the costs of using DNA to identify, arrest, charge, convict and incarcerate the property crime offenders; this, effectively, could be considered the benefit (or "savings") to society of crimes that would have been committed had the offender not been sent to prison.

Results of the study are expected next summer.

are arrested and incarcerated, states will have to pay substantial additional costs to incarcerate or monitor them on probation. On the other hand, of course, if such offenders are incarcerated, there may be substantial benefits to the community if there is less crime. (See sidebar, "The Next Step: Completing the Cost-Benefit Analysis," on this page.)

Does DNA Catch More *Dangerous* Criminals?

One finding of the NIJ study could be considered particularly stunning, depending on how one regards the context: Suspects who were identified using DNA evidence had significantly more serious criminal histories than those identified through traditional property crime investigations. Suspects identified through DNA had an average of 5.6 prior felony arrests (compared to 1.7 prior felony arrests for suspects identified through traditional investigation) and 2.9 prior felony convictions (compared to 0.9 felony convictions for those identified through traditional investigation).

Does this mean that using DNA to investigate property crimes actually catches more dangerous criminals?

Although DNA does nab burglars with more serious rap sheets, this may be because most law enforcement agencies currently enter only convicted felons into CODIS. If states move to include additional offenses in CODIS — for example, felony arrestees or even all arrestees — this phenomenon (of DNA identifying property crime suspects with more felony arrests and convictions) may decrease.

Another important thing to keep in mind when interpreting these results: Given the short period during which this study was

conducted (less than two years), many arrest records were not yet available when data collection ended; at that time, criminal histories were available for only 43 percent of the suspects who were identified and only 64 percent of suspects who were arrested.

Lessons Learned in Evidence Collection

By the end of the DNA Field Experiment, the Urban Institute had a rich database from which to draw conclusions: 1,800 samples from 1,074 property crime scenes. Here are some of the findings that have significant implications for police departments considering the use of DNA evidence to solve property crimes:

- There was no evidence that DNA collected by crime scene technicians was more likely to yield a DNA profile (or subsequent CODIS match) than evidence collected by police officers or detectives.
- Blood and saliva samples were much more likely to yield usable DNA profiles than samples of cells taken from touched or handled items.
- Collecting a whole item (rather than swabbing the item for DNA) increased the likelihood of obtaining a DNA profile; swabbed items were 30 percent less likely to yield a profile.
- Crime scenes in which the property was unlocked (and therefore did not require the suspect to break a window or pry open a door) were less likely to yield a probative sample.

Three Key Words: Communication, Communication, Communication

Using DNA as a tool to solve property crimes is not as simple as adding two or three protocols to a police department's standard operating procedures. Implementing a soup-to-nuts system like that designed for NIJ's Field Experiment requires constant communication. To be successful, the use of DNA evidence to solve property crimes requires a level of collaboration among police, crime laboratories and prosecutors that is not routine in many jurisdictions.

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Put simply, communication is key.

Police officers must be trained to identify and collect biological evidence. (See page 13, "DNA Training Resources.") Senior management must communicate its commitment so officers and detectives clearly understand that collecting DNA evidence at property crime scenes is a priority.

The crime lab must communicate with the police department. The DNA Field Experiment demonstrated how important it is for the lab to give feedback to officers on the effectiveness of their evidence collection, letting them know about attributes of evidence with a higher probability of suspect identification — offering additional training, if necessary, in a way that does not stigmatize the officers about their prior work — and making sure they are told when evidence that they have collected yields a CODIS hit.

And, needless to say, the crime lab must be capable of processing evidence quickly enough so law enforcement's investigation of the case is not compromised.

Prosecutors must notify the police and crime labs about case outcomes. Prosecutors also need to work with police and lab personnel so that they are comfortable testifying at trial, if necessary.

As Roman put it: "Evidence from this study suggests that profound changes in the way police, prosecutors and crime laboratories interact are required to efficiently use DNA in property crime investigations."

Could crimes that can have a demonstrably higher closure rate, such as property crimes, take attention and resources away from crimes that are not aided by DNA, such as sex crimes in which consent is the issue, domestic violence, robbery and drug offenses?

Where to From Here: Policy Considerations

Underlying what police departments, crime labs and district attorneys think about using the powerful tool of DNA to solve property crimes is, of course, how American citizens would regard the societal ramifications. NIJ's Field Experiment showed clear and compelling results: there is no doubt that many, many burglars who are not currently identified by traditional investigations could be identified using DNA. However, expanding the use of DNA to solve property crimes has major policy implications.

Consider this: In 2006, more than 109,000 murders and rapes (the two crimes that now consistently use DNA evidence) were reported to police in the U.S.[10] That same year, there were more than 2 million burglaries, many of which were likely committed by repeat offenders. Other crimes for which DNA might be an investigative tool (theft from auto and motor vehicle theft) account for millions of additional crimes. Without a financial commitment to support all the key players — police, labs, the courts, corrections and possible legislative changes — making DNA the norm in property crime investigations could overwhelm our criminal justice system.

Collecting DNA in property crimes will increase the number of suspects that detectives need to track down and arrest; a few of the jurisdictions in the DNA Field Experiment had problems because of detective caseload and the need to obtain confirmation samples. Collecting DNA in property crimes also will increase the number of prosecutions, which means that district attorneys and public defenders must be able to handle more cases. It is clear from the DNA Field Experiment that police and prosecutorial leadership must be committed to following up on CODIS hits.

As noted earlier, one of the findings of the NIJ study is that forensic technicians were no more effective than patrol officers in collecting biological evidence that yielded CODIS-uploadable evidence. Needless to say, using patrol officers as investigators searching for biological evidence — in addition to their mandate to ensure public safety — has major implications. If using DNA evidence to solve property crimes becomes the norm, law enforcement officials will have to answer some important questions:

- How much training in DNA evidence identification and collection should patrol officers receive?
- Should that training occur in police academies, and how much of an additional investment would this require?
- Or, should communities focus on training additional forensic technicians to aid collection — or even train civilian volunteers?
- What are the implications of additional time-on-scene that would be required for police officers?
- How would prioritization of calls for service be affected?

The Most Significant Hurdle?

Perhaps the most significant hurdle in using DNA to solve property crimes is how to reduce the backlog of evidence that currently needs to be analyzed in our nation's crime labs. Expanding the analysis of biological evidence to include high-volume property crimes would, of course, create an even greater backlog. In the NIJ study, existing backlogs were a barrier to expanding the use of DNA, and the two sites that experienced the highest costs — Los Angeles and

Phoenix — were those that outsourced their lab work.

Questions would have to be answered to determine how quickly crime laboratories could be equipped to meet an increased demand for DNA processing. For example:

- What additional investment would be needed to expand laboratory capacity?
- What types of capital investments in new technology would be required?
- Should jurisdictions increase their in-house laboratory capacity or outsource to private labs?[11]

Laws and sentencing guidelines might also have to be reconsidered. In jurisdictions in which a CODIS match is not sufficient grounds for an arrest warrant, for example, police have to obtain a search warrant to get a confirmation sample if the suspect is unwilling to provide it voluntarily. Sentencing guidelines for property crimes vary from jurisdiction to jurisdiction, which, of course, affects any cost-benefit analysis that incorporates prison and probation costs.

Put simply, using DNA works, but it costs. If the experience in the United Kingdom is a guide, the demand for additional DNA collection and testing will likely increase over time. But because DNA-led investigations are more costly than business-as-usual, the public — and the policymakers who allocate public resources — will have to perform a societal cost-benefit analysis, especially considering the millions of property crimes committed in this country every year. If police catch more offenders, states may have to pay substantial additional costs to incarcerate or monitor them; that may — or may not — yield substantial benefits to the community in reduced crime.

The cost benefits of collecting, processing and using DNA evidence to solve property crimes seem clear ... nearly as clear as the potential ramifications. Concerns have been expressed, for example, about the possible effect investigating high-volume property crimes could have on the investigation and prosecution of *other* crimes. Could crimes that can have a demonstrably higher closure rate, such as property crimes, take attention and resources away from crimes that are *not* aided by DNA, such as sex crimes in which consent is the issue, domestic violence, robbery and drug offenses?

As jurisdictions increasingly face budget shortfalls, what trade-offs are citizens — and policymakers, on their behalf — willing to make?

Let the debate begin.

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About the Author

Nancy Ritter is the editor of the *NIJ Journal*. She has 30 years of experience in the criminal and civil justice field, including as an award-winning legal journalist.

For More Information

- Roman, J.K., S. Reid, J. Reid, A. Chalfin, W. Adams, and C. Knight, *The DNA Field Experiment: Cost-Effectiveness Analysis of the Use of DNA in the Investigation of High-Volume Crimes,* final report submitted to the National Institute of Justice, U.S. Department of Justice, Washington, DC: April 2008 (NCJ 222318), available at http://www.ncjrs.gov/pdffiles1/nij/grants/222318.pdf.

Notes

1. 2006 Uniform Crime Report, "Burglary," *2006 Crime in the United States,* Washington, DC: U.S. Department of Justice, Federal Bureau of Investigation, available at http://www.fbi.gov/ucr/cius2006/data/table_01.html.
2. 2006 Uniform Crime Report, "Clearances," *2006 Crime in the United States,* Washington, DC: U.S. Department of Justice, Federal Bureau of Investigation, available at http://www.fbi.gov/ucr/cius2006/offenses/clearances/index.html#figure.
3. Rand, M., and S. Catalano, *Criminal Victimization, 2006,* Bureau of Justice Statistics Bulletin, Washington, DC: U.S.

Department of Justice, Bureau of Justice Statistics: 5, available at http://www.ojp.usdoj.gov/bjs/pub/pdf/cv06.pdf.

4. CODIS is an umbrella term referring to all federal, state and local DNA index systems that search DNA profiles from crime scenes against DNA profiles from known and unknown persons. Managed by the FBI, the National DNA Index System contains databases of: (1) profiles from crime scenes, (2) profiles from convicted offenders and, depending on the state, arrestees, (3) unidentified human remains, (4) missing persons and (5) relatives of missing persons.

5. The cases were the *first* 500 cases in the jurisdiction in which biological material was found at the crime scene after the project started; that is, they were not "selected." Topeka and Los Angeles did not hit the 500-case mark; Topeka finished with 260 cases and Los Angeles with 391 cases.

6. Technically, a CODIS match does not identify a suspect; that is, individuals who are identified through a match to a CODIS profile do not immediately become suspects — rather, they are individuals who must be further investigated to determine if they could be the offender. In the NIJ study, only matches in which investigators identified a person as a suspect were reported; for simplicity, therefore, the study refers to a CODIS match as identifying a suspect.

7. This percentage is very close to the FBI's estimate that 12.7 percent of burglary cases are cleared through traditional evidence.

8. Case verification occurs when a CODIS hit matches an offender in the state's DNA database; it does not apply to forensic matches.

9. With only five sites in the study — and with variations in how the experiment was conducted — caution should be used when trying to compare cross-site results. In Denver and Phoenix, for example, nearly all DNA profiles were uploaded into CODIS; in Orange County, however, where they collected a substantial amount of touch evidence at commercial burglaries, only 41 percent of cases were uploaded (which revealed the difficulty in obtaining probative samples from these sources). Orange County also had the lowest rate of CODIS hits; anecdotal evidence suggests that this may have been due to a higher percentage of juvenile offenders. Topeka had the highest CODIS hit rate but the lowest rate of suspect identification via a CODIS hit. The greatest variation across the sites was the proportion of identified suspects who were arrested. Denver — which encouraged aggressive follow-up investigation — arrested 86 percent of known suspects. On the other hand, Topeka arrested only 23.8 percent; this is likely due to Kansas' policy that a CODIS hit is not considered sufficient for an arrest warrant. Across all five sites, if an arrest was made, the case was accepted for prosecution 90 percent of the time.

10. 2006 Uniform Crime Report, "Violent Crime," *2006 Crime in the United States,* Washington, DC: U.S. Department of Justice, Federal Bureau of Investigation, available at http://www.fbi.gov/ucr/cius2006/offenses/violent_crime.

11. Only costs associated with processing an individual case were included in the study; the fixed costs of operating a police agency or a crime laboratory were not included. Although the NIJ study found that outsourcing is more expensive than in-house processing, the study did not consider major fixed costs of purchasing robotics and other technology. The study, therefore, reflects the costs to a police department with a mature crime lab; the cost to set up a crime lab or to begin collecting DNA for the first time would be substantially higher.