



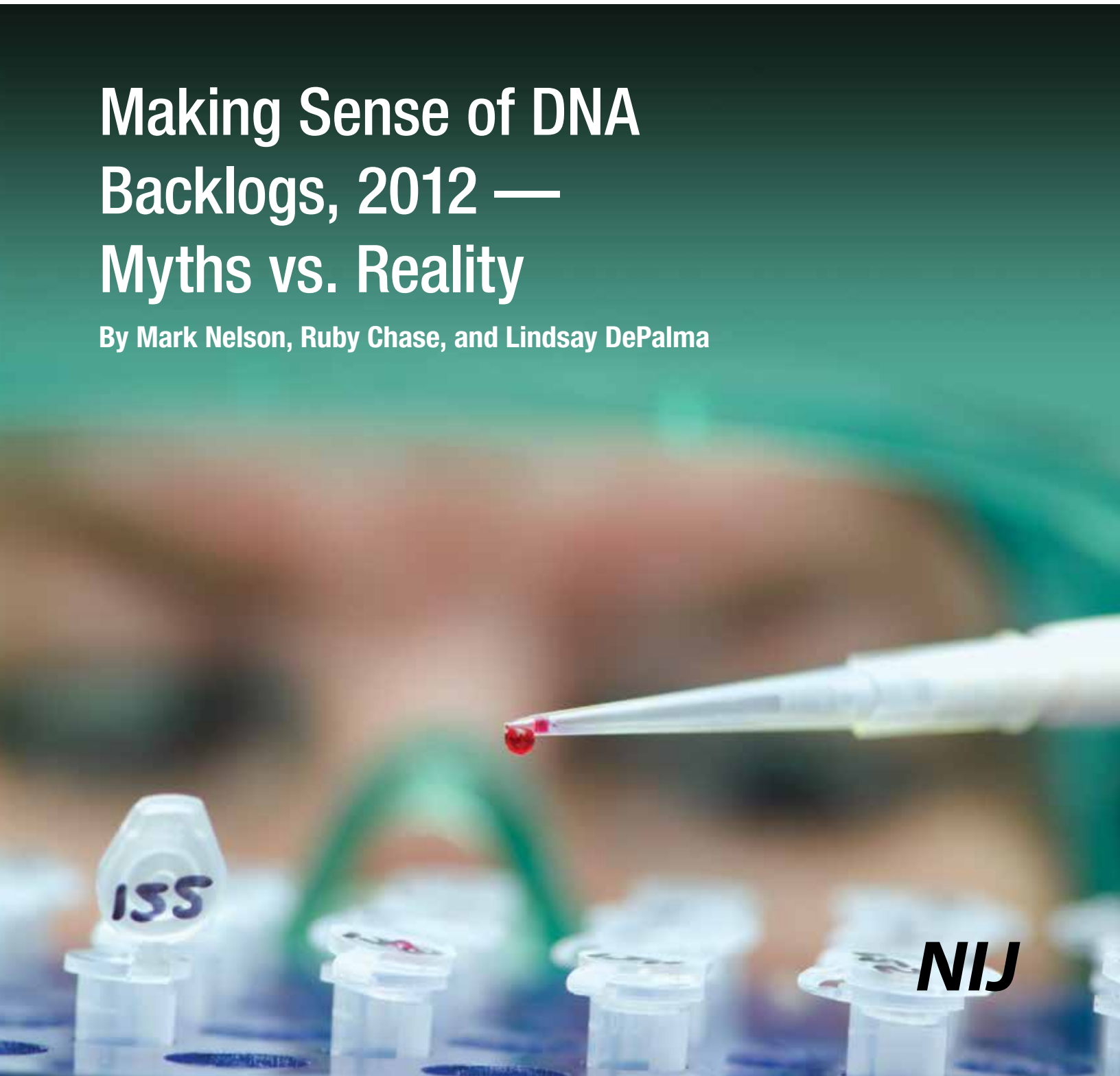
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NATIONAL INSTITUTE OF JUSTICE

SPECIAL REPORT

Making Sense of DNA Backlogs, 2012 — Myths vs. Reality

By Mark Nelson, Ruby Chase, and Lindsay DePalma



NIJ

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Findings and conclusions of the research reported here are those of the authors and do not necessarily reflect the official position or policies of the U.S. Department of Justice.

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About This Report

This special report provides an update on the status of DNA backlogs in the United States, as last reported in *Making Sense of DNA Backlogs, 2010 — Myths vs. Reality* (NCJ 232197).¹ When the National Institute of Justice (NIJ) published that report, there was no standard definition of “backlog.” Laboratories defined the term in various ways before 2011. To clarify the meaning and introduce a uniform definition, NIJ required laboratories that received federal funds to define a backlogged case as one that had not been closed by a final report within 30 days after receipt of the evidence in the laboratory. NIJ further required laboratories to define a backlogged DNA database sample from convicted offenders and arrestees as one that had not been tested and uploaded to the Combined DNA Index System (CODIS) within 30 days of receipt of the sample in the laboratory. The data in this report use this standard definition.

This update shows that:

- Laboratory capacity continues to grow due to increasing automation, hiring of more personnel, use of overtime and improved testing procedures and methods. The federal government supports these activities through NIJ’s DNA Backlog Reduction Program.
- Laboratories processed 10 percent more forensic DNA cases in 2011 than in 2009.
- DNA backlogs nevertheless continued to increase because the demand for forensic DNA casework services in 2011 increased by 16.4 percent over 2009 demands, which continues to outpace the nation’s capacity to work DNA cases.
- Although 52.2 percent fewer database samples from convicted offenders and arrestees were completed in 2011 than in 2009, new demand to test and upload database samples dropped 51.2 percent, so the overall workload decreased 46.3 percent from 2009 levels.
- Hiring additional DNA analysts, retaining trained personnel, automating work processes, implementing new technologies and altering business practices offer potential solutions to reducing DNA backlogs.

MAKING SENSE OF DNA BACKLOGS, 2012 — MYTHS VS. REALITY

By Mark Nelson, Ruby Chase, and Lindsay DePalma

When NIJ published *Making Sense of DNA Backlogs, 2010 — Myths vs. Reality*, the backlog of untested DNA samples in the nation's crime laboratories was making headlines. Laboratories were processing more cases than ever before and reporting great increases in their capacity (efforts supported by awards from the National Institute of Justice). Despite the expanded capacity, however, laboratories could not keep up with the growing demand for their services. Recognition of the value of DNA evidence was growing exponentially, and more evidence than ever before was being collected and submitted to laboratories.

Like previous editions of *Making Sense*, this report is based on data collected from more than 120 public laboratories that receive NIJ grants. It provides a more complete and accurate picture of DNA backlogs than the previous editions because (1) all laboratories now report data using the same definition of the term "backlog," and (2) it includes cases and database submissions closed by administrative means, not only those closed through analysis.

Forensic cases and DNA samples from convicted offenders and arrestees (called a database sample) can be closed by one of several administrative means. In a forensic case, for example, an administrative closure can occur when a suspect pleads guilty before the evidence is analyzed or when the victim declines to press charges. A sample for a convicted offender or arrestee can be closed by administrative means when the sample turns out to be a duplicate of one that is already in the database.

Backlog data for forensic cases in 2011

Forensic cases require analysis of evidence from a criminal offense currently under investigation that is submitted to the crime laboratory. These cases contain evidence from the crime scene, as well as reference samples from the victim and suspect, if available.

Backlogs are not static. They vary from day to day. Exhibit 1 provides a snapshot of the backlogged DNA cases at the beginning and end of 2011.

Of the cases pending analysis in laboratories on Jan. 1, 2011, approximately 18 percent had been there for fewer than 30 days and therefore were not classified as backlogged. On Dec. 31, 2011, 14.7 percent of the pending cases were similarly not considered backlogged.

In 2011, the backlogs reported on Jan. 1 and Dec. 31 were smaller than the backlogs reported on those dates in 2009, but it is difficult to determine if a trend is occurring because of the lack of a uniform definition for backlog. Until 2011, when NIJ standardized the definition of a backlogged case, many laboratories used their own definitions, some defining any case that had not been analyzed as a backlogged case.

Exhibit 1. DNA case backlogs: Jan 1 and Dec 31, 2011

	Number of cases
DNA cases more than 30 days old (backlogged) on Jan 1	83,603
DNA cases less than 30 days old on Jan 1	18,244
Total	101,847
DNA cases more than 30 days old (backlogged) on Dec 31	91,323
DNA cases less than 30 days old on Dec 31	15,751
Total	107,074

Source: Data provided directly to NIJ by laboratories that receive awards under NIJ's DNA Backlog Reduction Program.

Demand for forensic cases and capacity for service continued to grow in 2011

In 2011, the nation's laboratories received 241,575 cases for DNA testing, a 16.4-percent increase from 2009. The total number of cases to be worked in 2011 was 343,422 (see exhibit 2).

The nation's laboratories closed 248,085 cases in 2011, approximately 10 percent more than in 2009 (excluding those closed by administrative means) (see exhibit 3).

Exhibit 2. Total DNA case workload, 2011

	Number of cases
DNA cases pending analysis on Jan 1	101,847
New DNA cases received in 2011	241,575
Total	343,422

The trend noted in previous editions of *Making Sense* is continuing: Backlogs continue to exist at high levels because the demand for DNA casework continues to outpace increased capacity. Until the capacity of the laboratories (i.e., the supply) exceeds the demand for their services, backlogs will not decrease.

Exhibit 3. Capacity of DNA laboratories

	Number of cases
DNA cases completed in 2011	216,946
DNA cases closed by administrative means in 2011	31,139
Total	248,085

Effect of property crime cases on DNA backlogs

Approximately 38 percent of DNA requests received in 2011 were from property crimes. Exhibit 4 shows that crime laboratories continue to make violent crimes a higher priority than property crimes (i.e., the turnaround time for violent crimes is shorter than for property crimes).

Exhibit 4. Turnaround time for violent crimes vs. property crimes

	Number of days
Average turnaround time for violent crimes	106
Average turnaround time for property crimes	154

Backlogs of convicted offender and arrestee samples

All states collect DNA samples from convicted offenders, and many states now collect DNA samples from people who have been arrested for but not convicted of certain crimes. DNA samples collected from convicted offenders and arrestees are referred to as “DNA database samples.” The DNA profiles generated from these database samples are uploaded to CODIS (see sidebar “What Is CODIS?”) in laboratories that have a DNA database operation. Usually (but not always), these database laboratories are housed in state crime laboratories. The profiles in CODIS can provide investigative leads in cases where there is no known suspect when profiles from these database samples match profiles uploaded from forensic cases.

These database samples are separate from forensic cases. A laboratory’s workload of DNA database samples is in addition to its workload from criminal cases. Exhibit 5 shows that laboratories had a significantly smaller backlog of DNA database samples at the end of 2011 than at the beginning of 2011. This is a result of two factors: (1) the demand for DNA database testing decreased and (2) a significant percentage of requests were closed administratively (e.g., duplicate submissions, sample submissions from nonqualifying offenses²) (see exhibits 6 and 7).

Exhibit 5. DNA database sample backlogs: Jan 1 and Dec 31, 2011

	Number of samples
DNA database samples more than 30 days old on Jan 1	187,034
DNA database samples less than 30 days old on Jan 1	48,953
Total	235,987
DNA database samples more than 30 days old on Dec 31	
	113,531
DNA database samples less than 30 days old on Dec 31	39,961
Total	153,492

Exhibit 6. DNA database samples to be completed in 2011

	Number of samples
DNA database samples pending analysis on Jan 1	235,987
New DNA database sample requests received in 2011	682,576
Total	918,563

Exhibit 7. Capacity of DNA database

	Number of samples
DNA database samples completed in 2011	711,060
DNA database samples closed by administrative means in 2011	82,397
Total	793,457

Of the DNA database sample requests completed in 2011, 10.4 percent were closed administratively because they were duplicates of a prior submission, they were for nonqualifying offenses, or for other reasons (see exhibit 7).

Although 52.2 percent fewer database samples were completed in 2011 than in 2009, new demand to test and upload database samples dropped 51.2 percent, so the overall workload decreased 46.3 percent from 2009 levels.

What Is CODIS?

The FBI's Combined DNA Index System (CODIS) is a software platform that blends forensic science and computer technology.

CODIS has multiple levels at which DNA profiles can be stored and searched: local (for city and county DNA laboratories), state and national. Data stored at the national level are found in the National DNA Index System (NDIS). At this level, a DNA profile from a crime scene sample (also known as a forensic unknown) can be searched against offender profiles nationwide to solve cases across state lines.

DNA analysts use CODIS to search DNA profiles obtained from crime scene evidence against DNA profiles from other crime scenes and from convicted offenders and arrestees. CODIS generates leads for investigators when a match is obtained. For example, if the DNA profile from a crime scene matches a sample taken from another crime scene, the cases may be linked in a forensic "hit." If the crime scene sample matches a convicted offender or arrestee sample, an offender hit is obtained. Hits give investigating officers valuable information that helps them focus their investigation appropriately.

As of April 2013, NDIS contained more than 10.3 million offender profiles, more than 1.4 million arrestee profiles, and 487,200 forensic profiles from crime scene samples. The result has been more than 207,800 hits, aiding more than 199,200 investigations nationwide.

In contrast, as of June 30, 2009, the FBI reported that more than 7 million offender profiles and 272,000 forensic profiles from crime scene samples had been uploaded to NDIS. The result was more than 93,000 hits, aiding more than 91,000 investigations nationwide.

In other words, in roughly the past four years, the number of offender profiles uploaded to NDIS increased by 40 percent, forensic sample profiles increased by 44 percent, and CODIS hits increased by 55 percent.

Learn more about CODIS at the FBI's website, <http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics>.

Putting casework backlogs in context: A tale of two laboratories

Context is important when examining data on backlogs. The example discussed in this section illustrates the danger of looking only at the number of backlogged cases without the proper context.

Exhibit 8 compares actual backlog data from two laboratories, Lab A and Lab B. Looking only at the numbers and without considering other factors, it appears that Lab B has a serious issue with forensic DNA casework backlogs; its backlog is more than five times greater than that of Lab A.

Exhibit 8. Backlogs of Lab A and Lab B

	Lab A	Lab B
Backlog (Dec 31, 2011)	188 cases	1,062 cases
Percentage of national backlog	0.22%	1.27%

However, examining the backlog issue in the context of turnaround time and productivity yields a different conclusion.³ Exhibit 9 shows that Lab B, which has a backlog more than five times greater than that of Lab A, is completing cases more than three times faster than Lab A and is 11 times more productive than Lab A.

Exhibit 9. Turnaround time and productivity of Lab A and Lab B

	Lab A	Lab B
Turnaround time	265 days	57 days
Productivity (samples analyzed/analyst/month)	5 samples	57 samples

Although Lab B has many more backlogged cases, it can process more samples in less time than Lab A. There are also other factors to consider. Lab B is a large state laboratory with a much higher caseload demand than Lab A, which is a small county laboratory with a relatively small caseload demand. Therefore, backlogs must be considered in the context of each laboratory’s capacity, size and workload.

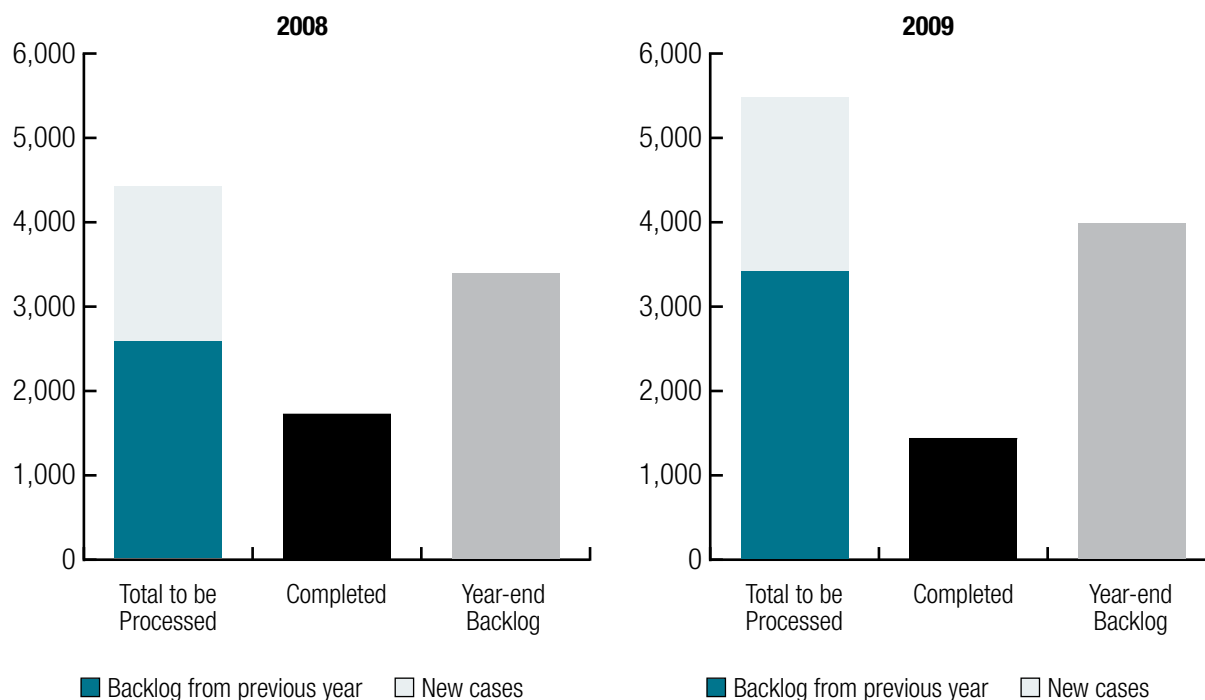
NIJ offers grantees the option to use DNA Backlog Reduction Program funds to both reduce backlogs in the short term and build their capacity to process more cases in the long term. Lab B completed a major automation project that allowed many labor-intensive steps in the analysis of DNA to be completed by robotic instruments; this increased productivity by enabling staff to process many samples at once rather than manually working a few samples at a time. Automation also allows the staff to work on other activities while the samples are being processed by the robotic instruments.

Performance measures help reveal and pinpoint problems

Laboratories that receive DNA Backlog Reduction Program grants are required to collect and report performance measures for turnaround time, productivity and backlogs. Laboratory managers can use these data to review their laboratory’s relative productivity, troubleshoot problems and find the best solutions.

Shortly after *Making Sense of DNA Backlogs, 2010 — Myths vs. Reality* was published, a laboratory manager contacted NIJ to say that he plotted his laboratory’s data and found that the laboratory’s capacity was decreasing (see exhibit 10). In 2009, the laboratory received approximately the same number of new cases as in 2008, but processed fewer cases.

Exhibit 10. Casework trends: One laboratory's supply, demand and backlog



On further review of the data, the information on productivity (i.e., turnaround time, samples analyzed per analyst) showed that this laboratory was on the low end of the national productivity scale. One reason for the low productivity score was a change in the way sexual assault cases were screened. In 2009, DNA analysts began screening sexual assault cases for semen. In 2008, a separate unit performed that task. This shows that when DNA analysts performed the additional work, it reduced the number of cases they were able to analyze.

Challenges to DNA backlog reduction

One of the greatest challenges laboratories face is to hire and retain sufficient analysts to work the ever-increasing demand for DNA services. However, although this plays a role in expanding capacity to reduce backlogs, many other business practices also play a major role (as illustrated by the example above in which additional case-screening functions took DNA analysts away from the task of processing DNA).

The “Putting casework backlogs in context: A tale of two laboratories” section of this report illustrates that the larger, highly automated laboratory boosted its productivity. Laboratory managers should consider current productivity levels when determining whether to hire additional analysts. Laboratories with higher productivity levels per analyst can expect to process more cases per hire than those with lower productivity levels.

Another factor that may drive the demand for DNA testing is the increase in submissions of sexual assault cases that have been kept in police custody for years and are now being sent to crime laboratories because of public awareness and new laws that require testing in all cases of sexual assault.

Solutions to increasing efficiency

There are many ways to increase laboratory efficiency, such as improved business practices, improved technology, automation, and hiring new personnel. Other laboratories report increased efficiencies in the following ways:

- Divide the laboratory's DNA/biology section into teams — one that only screens evidence for biological fluids and one that only processes DNA samples.
- Hire DNA technicians to perform routine tasks (such as reagent preparation, quality control measures and evidence handling) so analysts can dedicate more time to casework analysis.
- Process DNA samples in an assembly-line fashion or by batching samples from several cases to be tested at the same time.

Advances in technology and testing procedures also help increase efficiencies. New software innovations called “expert” systems decrease the amount of time that analysts spend unscrambling DNA from multiple donors. These systems are deployed in many laboratories and have proven successful.

NIJ-sponsored research and development awards are also producing results that help analysts interpret complex data in sexual assault cases. One example is the use of enzymes during extraction of mixtures of semen and other body fluids. The enzymes digest DNA that is not protected by a sperm cell membrane, leaving only the DNA from the person who deposited the sperm.

In another promising development, some laboratories are adopting process improvement techniques such as “Lean Six Sigma,” which identifies bottlenecks, improves workflow and provides an assessment plan to implement solutions to these types of problems. The Louisiana State Police Crime Laboratory (LSPCL) significantly increased productivity and reduced backlogs using the Lean Six Sigma approach. It applied a multifaceted technique that increased productivity 280 percent, decreased backlogs 85 percent, and increased DNA requests completed per month 68 percent since 2008. For more information, read LSPCL's final technical report at <https://www.ncjrs.gov/pdffiles1/nij/grants/235190.pdf>.

NIJ is accomplishing its mission to make America safer by helping laboratories use federal funding to build capacity, providing short-term support for backlog reduction, and providing support to develop innovative technologies and tools for DNA laboratories. As more DNA profiles from cases and database samples are added to CODIS, a larger pool of DNA profiles can be searched for matches (or “hits”), leading to reduced victimization through earlier identification and apprehension of criminals.

Notes

1. Nelson, Mark, *Making Sense of DNA Backlogs, 2010 — Myths vs. Reality*, Special Report, Washington, D.C.: U.S. Department of Justice, National Institute of Justice, February 2011, NCJ 232197.
2. Statutes that govern the collection of DNA samples from convicted offenders and arrestees generally specify for which offenses samples can be collected. These offenses are designated as “qualifying offenses.” Offenses for which convicted offenders and arrestees cannot be required to provide DNA samples are designated as “nonqualifying offenses.”
3. Turnaround time is the average number of days from the date a laboratory receives a case to the date it issues a final report on the case. Productivity is measured as the average number of DNA samples analyzed by each analyst per month.

An Overview of DNA Activities at NIJ

Solving Cold Cases With DNA

Applying new DNA analysis techniques to evidence in cold cases has the potential to garner new leads where none existed before. For more information on NIJ's support of this effort, visit <http://nij.gov/topics/forensics/investigations/cold-case/>.

Missing Persons

NIJ has funded the collection and analysis of DNA from cases involving missing persons and unidentified remains, and supports laboratories that perform this type of work. For more information on this program, visit <http://nij.gov/topics/forensics/investigations/missing-persons/pages/welcome.aspx>.

In 2007, NIJ launched the National Missing and Unidentified Persons System (NamUs). NamUs is the first national online repository designed to help medical examiners and coroners share information about missing persons and the unidentified dead. For more information on this program or to search for a missing person, visit <http://www.namus.gov>.

Post-Conviction Testing

Since the advent of forensic DNA analysis, a number of people convicted of crimes have been subsequently exonerated through DNA analysis of crime scene evidence that was not tested at the time of trial. To learn more about NIJ's efforts to support post-conviction testing, visit <http://nij.gov/topics/justice-system/wrongful-convictions/pages/welcome.aspx>.

Research and Development

NIJ leverages the increasing knowledge in fields such as molecular biology, genetics and biotechnology, and directs it toward the development of highly discriminating, reliable, cost-effective and rapid forensic DNA testing methods. As a result, NIJ has developed technologies that have:

- Increased the success rate of the analysis of samples (such as skeletal remains) that are degraded, damaged, limited in quantity or otherwise compromised.
- Improved the examination of sexual assault evidence.
- Miniaturized the DNA testing process and made it field portable.

For more information on NIJ's DNA Research and Development Portfolio, visit <http://nij.gov/topics/forensics/evidence/dna/research/pages/welcome.aspx>.

Search. Match. Solve.

NamUs: National Missing and Unidentified Persons System

NamUs is the nation's first online repository for missing persons and unidentified decedents records. The system is two databases:

Missing Persons Database

- Anyone — law enforcement and the loved ones of a missing person — can add a case; cases go through a verification process before they are posted.
- Anyone can search the database.
- Resources include geo-mapping technology to locate police and medical examiner offices and links to state clearinghouses, Attorneys General offices and state laws.

www.findthemissing.org

Unidentified Decedents Database

- Anyone can search the database using factors such as unique physical characteristics (tattoos, scars, implants), dental information, clothing and forensics data.
- Only medical examiners and coroners can enter cases.

www.identifyus.org

www.NamUs.gov

NamUs is funded by the National Institute of Justice in a partnership with the National Forensic Science Technology Center.

What You Can Do

- Raise awareness within your agency or your community about NamUs and its resources.
- Encourage your state missing persons clearinghouse to use NamUs to help solve cases.
- Encourage medical examiners and coroners to enter their cases at www.identifyus.org.

Watch a six-minute video:

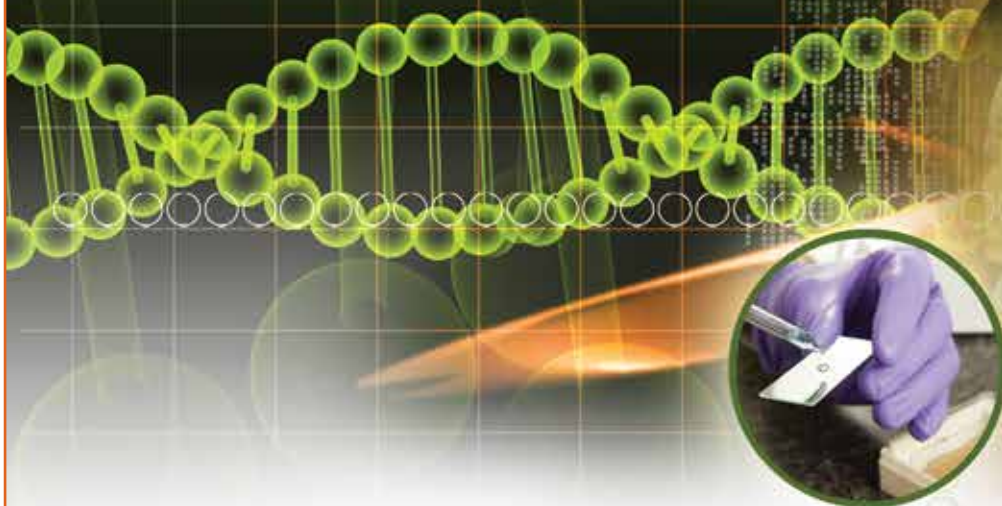
NamUs Behind the Scenes: How It Works, Why It Matters

www.findthemissing.org/homes/how_it_works_video



ADVANCING CRIMINAL JUSTICE THROUGH FORENSIC SCIENCE

NIJ uses a holistic, evidence-based approach



The National Institute of Justice (NIJ) administers public funds to ensure that our nation's criminal justice system makes the best use of DNA and other forensic sciences.

NIJ's work is grounded in a holistic, evidence-based, three-step approach that builds the capacity of crime laboratories to solve crimes and improve public safety through the use of DNA and other cutting-edge forensic tools and technologies:

Step 1: Research and Development—Create cheaper, faster and more effective forensic technologies through research and development.

Step 2: Implementation—Help agencies put new technologies to work by providing technology transfer, training and communications. Implementing new technologies builds the capacity of the nation's crime laboratories to analyze more samples and help reduce backlogs.

Step 3: Test and Evaluate—Ensure that forensic technologies and programs work in the field by testing and evaluating them. This step is crucial to ensuring that new and more efficient forensic technologies and processes work as intended.

**Learn more at NIJ.gov
by conducting a
keyword search:**

- Backlog Reduction
- Solving Cold Cases
- Coverdell Forensic Science Improvement
- Forensic Training
- Untested Evidence in Sexual Assault Cases

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