DNA in the Criminal Justice System: A Congressional Research Service Report* (*From the Future)
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ABSTRACT

Recent bills have allocated federal funding to states and localities as an incentive to adopt handheld genome sequencing devices, smooth the ongoing transition from older forensic typing methods to “next generation sequencing” (NGS), and facilitate law enforcement access to medical and recreational DNA databases. At the request of legislators considering these bills, the Congressional Research Service has prepared the below summary of DNA practices as it relates to criminal justice.

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Erin Murphy is a Professor at NYU School of Law. She is grateful to Dean Jennifer Mnookin and to the participants in the UCLA Program on Understanding Law, Science, and Evidence (PULSE) conference in the spring of 2016, who inspired this fun thought exercise and provided helpful feedback on an earlier draft. Thanks is also due to the Filomen D'Agostino and Max E. Greenberg Research Fund for supporting this work. A word of warning: Fictional facts and citations are peppered throughout this Essay, which purports to be a document written in 2030 rather than 2016. Citation format of fictional sources has been modified to minimize confusion with actual authorities, but readers should exercise caution in using this document as an accurate statement of existing conditions.
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INTRODUCTION

As we approach the fortieth anniversary of the national forensic DNA database system, which went online in 1990, debates continue to arise over law enforcement’s use of genetic information. A series of bills proposed in the U.S. Congress and in state legislatures have raised new questions about the availability of handheld genome sequencing devices, the ongoing transition from older methods to newer, more invasive methods of genetic testing, and growing access by law enforcement to medical and recreational DNA databases. The Congressional Research Service has prepared the below summary of the history and current uses of genetic information, as of the year 2030, as it relates to criminal justice. Part II traces the development of forensic DNA practices, from their inception through today. Part III addresses the current state of the law as regards DNA collection, database searches, and testing, and it highlights some present controversies. Part III closes with thoughts about current debates that have yet to be fully settled.

I. BACKGROUND

DNA testing gained public salience at the end of the twentieth century, when two prominent efforts involving DNA testing methods captivated national attention: the Human Genome Project and the use of DNA in the criminal justice system.1 Suddenly it seemed that DNA technology might be the answer to some of humankind’s most pressing problems.

Starting in the 1990s, criminal justice actors began using DNA testing methods in order to identify suspects. As the first DNA cases percolated through the criminal justice system, it became increasingly clear that DNA was a game changer: It could establish guilt for offenses that might have otherwise slipped through the cracks of justice, and rectify wrongful convictions enabled by

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faulty evidence or corrupt investigations. The DNA tests used during this period were all particularly suited to criminal justice aims, the goals of which were to keep costs low, respect privacy, and produce highly individualized results as rapidly as possible.\(^2\)

Impressed with these early results, the federal government rapidly built an infrastructure of DNA databases. Relying at first on a standard DNA profile that examined thirteen places on the genome—later expanded to twenty—the Federal Bureau of Investigation established a national DNA database, which became operational in 1998.\(^3\) This database—often referred to as CODIS, for the Combined DNA Index System—for its software program—included several discrete categories of profiles, including an unsolved crime scene sample (or forensic) index and indices for convicted persons, arrested persons, unidentified remains, missing persons, and relatives of missing persons. At that time, submission of samples occurred via ordinary mail and, per federal statute, the testing had to be done in a certified forensic lab. By May of 2016, CODIS contained roughly fifteen million known person profiles and seven hundred thousand forensic profiles.\(^4\) By searching unsolved crime scene samples against known person profiles, which was typically done automatically twice a week, investigators could make matches that might help net elusive offenders.\(^5\)

Concurrent with criminal justice efforts to harness the individualizing power of DNA testing, clinical researchers embarked on a separate line of research to unlock the secrets of the genome for medical purposes. In the 1990s, a race began to sequence the three billion base pairs of nucleotides that make up the human genome. By 2001, a joint statement announced the first rough draft,\(^6\) assembled by two distinct teams—one public and one private—at an estimated cost in the billions.\(^7\) Not long after, scientists announced that they had sequenced a full

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5. See supra note 3, at 109.
7. See **$1,000 Genome, Wikipedia**, https://en.wikipedia.org/wiki/$1,000_genome [https://perma.cc/Q97F-SDHA].
single human genome, discerning the order and variation in the letters that make up the genomic strand.8

Shortly thereafter, a cottage industry of recreational, “direct-to-consumer” (DTC) DNA testing emerged.9 Businesses like 23andMe offered, in exchange for a reasonable sum, to test a DNA sample and provide personalized reports on a range of genetic conditions, from genes associated with serious health disorders to those addressing issues as frivolous as hair loss or a preference for sweet or salty foods.10 Other organizations provided platforms to share genetic information, giving adoptees and amateur genealogists the means of sharing information and discovering long lost familial associations.11

In sum, as early as the turn of the millennium, it seemed that the human genome could improve human health, solve crime, locate long lost relatives, and cure the human error that plagued the criminal justice system.

But there was also fear of a dark side of genetic knowledge. Stories about misuse of genetic information circulated among segments of the population, even as large numbers of people freely submitted DNA samples for recreational or exploratory genetic testing. What if employers or insurance companies viewed genetic information as useful for discriminating among applicants? In 2000, then-President Clinton signed an executive order prohibiting workplace discrimination on the basis of genetic information.12 Three years later, within months of the announcement of the sequencing of the genome, the Senate unanimously passed the Genetic Information Nondiscrimination Act, which was signed into law in May 2008.13

But this flurry of concern quickly withered. Notwithstanding the lack of wider protection for genetic privacy and loopholes in existing protections, throughout the 2010s, the public expressed little additional concern about the risks posed by government or for-profit genetic testing.

A. Different Tracks: Medical vs. Forensic

In part, this lack of attention was understandable. Technological and digital impediments to sharing genetic information across recreational, medical, and criminal justice lines meant that such boundaries were rarely broached, and thus privacy risks materialized only sporadically. During the early decades of DNA testing, medical, recreational, and forensic testing were on very different tracks. Indeed, apart from the very earliest days, when the community of DNA researchers was so small that there was significant overlap among the academic, clinical, and forensic fields, the two different landscapes of genetics—clinical and medical testing/research versus forensic testing/research—developed fairly strong lines of separation. Several differences bolstered this divide.

Most importantly, the needs of the two communities were different. Medical research targeted regions of the genome that worked—the genes that might predispose a person to disease, physical traits, or even behaviors. In contrast, forensic researchers sought regions of the genome that did nothing—that had no expressive value. This focus on “junk” was driven partly by a desire to protect privacy, and partly by a desire to find genetic regions with as much variation as possible, so that a person who matched crime scene evidence could be readily distinguished from all the other people in the population who might also share that characteristic. A single gene that simply toggles “on” or “off” for a particular disease would do little to identify one person from another; the population would divide into two very large camps of “on” or “off.” But a genetic region that showed wide variation among individuals could provide highly discriminating information; a match between a crime scene sample and a suspect, in that case, would strongly support the conclusion that the suspect left the sample. In short, while medical researchers sought answers to questions like “is this the breast cancer gene?”, forensic researchers sought regions of the genome that offered as much meaningless variation as possible.\(^{14}\)

Consistent with their different needs, each community also generally relied on different kinds of DNA testing techniques. Medical researchers tended to care about sequences, similar to the scientists involved in the Human Genome Project. They sought the precise make-up of the genome in the form of the nucleotides (the “GACT” letters). In contrast, by the 2000s, the technique adopted for forensic DNA testing was a method known as “short tandem repeat” (STR) testing.\(^{15}\) STR methods did not examine sequences, but rather focused only on

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\(^{14}\) See MURPHY, supra note 3, at 6–7.

\(^{15}\) See id. at 7–9.
counting the number of times certain established sequences repeated at thirteen (later twenty) known regions on the genome. In order to find these repeats, forensic scientists used different instruments, chemical testing kits, and statistical measurements than those used in the clinical or medical context.\footnote{See id. at 6–7, 10–13, 85–91.}

The preference for STRs in the forensic community also emerged in part as a response to privacy concerns. Medical testing, by its very nature, was extremely intrusive. But at least in the clinical context, incidental findings such as the non-paternity of a supposed biological parent or an unexpected predisposition to serious disease could be managed, given the intimate relationship between a doctor or genetic counselor and a patient, including statutory protections for privacy. By focusing on regions of the genome with no known associations, law enforcement scientists created little risk of exposing a person to uncomfortable or unwelcome information. That is not to say that there was no such risk: Testing still revealed sex at birth, ancestry, and familial relatedness—which might in some cases implicate privacy concerns. But targeting STRs, and noncoding (that is, nonoperative) STRs at that, rather than actual genetic sequences, helped assuage some concerns regarding privacy.

Lastly, these separate tracks of testing emerged in part out of necessity. At the time that forensic DNA databases were established and forensic testing became widespread, the costs associated with sequence (as opposed to STR) tests was prohibitive. Recall that the early race to decode a single genome ran a tab in the billions—a fraction of that represented an unrealistic sum even for the most serious cases. While sequencing methods were essential for clinical knowledge, and thus justified high expenses, they were not indispensable for forensic purposes.

In addition, forensic testing presented special needs and challenges. Testing methods had to work quickly and be capable of resolving difficult samples. Because medical samples (as well as known person forensic samples) are taken in controlled conditions, they rarely suffer from insults or elements that would challenge a test’s capacity. In contrast, crime scene samples are taken in field conditions. They are often of low quantity or quality, and the number and characteristics of the contributors is unknown.\footnote{Id. at 18–28.} What is more, investigators could not wait years for a single sample, given the high volume of criminal cases and rights to a speedy trial. In order to prove truly useful, forensic methods had to be both highly sensitive and capable of rapid processing in large volumes.
In sum, forensic and medical testing diverged significantly in the earliest days of DNA testing. And as a result, in the early decades of DNA testing, there was very little crossover between the two fields. The funding sources for DNA research differed, with the National Institutes of Justice funding forensic-related applications, while the National Institutes of Health, industry, and other common medical funders (such as nonprofits and foundations) underwrote medical research. DNA databases created for medical versus forensic purposes did not cross-communicate. Indeed, the forensic databases contained profiles that had little bearing on medical or clinical knowledge, and the slow pace of digitalization of medical records in the United States meant that genetic information acquired in clinical cases rarely reposed in a centralized database of any kind. To the extent that some such information existed—for example, in databases operated by private recreational testers (like 23andMe)—the stored profiles tended to contain genetic information of a kind and in a form that did not readily compare to the classic forensic test. Finally, even the personnel and equipment for genetic testing differed. Forensic labs were equipped with instrumentation and consumables intended to type STRs, whereas different machinery was required to do sequencing. In sum, even if medical or clinical researchers wanted to coordinate with law enforcement and forensic efforts, significant practical impediments prevented them from doing so at a large scale.

B. The Tracks Merge

As explained, the benefits of STR methods in the forensic context included relative speed, lower cost, ease of use, privacy-protectiveness, and discriminatory power. STR methods, however, suffered from several defects. Most importantly, as a result of technical aspects of STR testing, it was not uncommon to lose valuable information when a sample was in any way compromised, such as when the sample suffered an insult (like exposure to heat or light), was part of a convoluted mixture, or was present in only low quantities.\(^\text{18}\) The method used to discern the STRs, known as capillary electrophoreses, also suffered from inherent limitations. That led forensic investigators to pursue more sensitive forms of testing, including tests that examined sequence variations that might be able to recover useful information in cases in which STR methods returned null or minimally probative findings.\(^\text{19}\)

\(^{18}\) See id. at 19–28.
In addition, STR loci—having been chosen precisely because they lacked any identifying data—provided little help in ascertaining physical characteristics of suspects or revealing detailed ancestry or relatedness information. Some private companies emerged to fill the gaps, offering DNA testing that could provide a genetically constructed mug shot, of sorts, of a suspect whose DNA did not match in a database. But such services incurred additional costs, and they were not part of the standard DNA results sought by forensic laboratories or stored in law enforcement databases. The growing use of a method of searching known as familial searches, which used a stored profile in the DNA database as a lead to find a person not in the database already, also heightened the desirability of expanding databases to include more information, particularly from the Y chromosome, beyond the standard forensic suite.

Relying on a limited region of the genome also led to conflicts over how reliable estimates of identity should be considered. Because investigators did not examine the entire genome, the probative value of a DNA match was always expressed in terms of probabilities that were readily challenged by defense attorneys, and often difficult for lay persons to grasp. As DNA databases grew exponentially, particularly after a critical Supreme Court ruling in 2013 that approved compulsory testing of arrestees (discussed below), the need magnified for methods with greater discriminatory power that would avoid coincidental matches.

Finally, and arguably most importantly, the cost of sequencing methods began to come down. Driven in part by the needs of the research and medical community, which demanded that whole genome sequencing (WGS) be cost feasible in order to support hyperindividualized delivery of predictive and curative medicine, new methods for rapidly acquiring DNA sequences (as opposed to STRs) from a sample emerged. Whereas sequencing costed roughly $100 million per genome in 2001, by January 2015, the benchmark of the $1,000 sequence had been achieved. Indeed, at least one commercial vendor offered WGS along with interpretation for just under that price. The declining cost curve for whole genome sequencing dramatically defied even predictions according to Moore’s Law (a theory of exponential growth).

20. See MURPHY, supra note 3, at 225.
21. See id. at 231.
22. See id. at 225.
A major pivot occurred in 2008, with the introduction of next generation sequencing (NGS) or high-throughput sequencing, a technical breakthrough that enabled scientists to discern DNA sequences more efficiently and less expensively than earlier methods. NGS proved superior to STR methods in several respects. First, these methods could glean more information from a single test (for example, hundreds of loci in a single reaction), an efficiency gain of great value to backlogged crime labs. Second, NGS methods handled degraded and complex samples with great sensitivity, providing reliable results in cases that would not have produced productive findings using older methods. Importantly, NGS could also interface with existing forensic DNA databases, because tests could include both results for the established twenty-loci forensic profile, as well as additional genetic information that enhanced discriminatory power (for example, genetic information from patrilineal or matrilineal descended DNA, DNA connected to physical or ancestral traits, or single nucleotide polymorphisms with high rates of discriminatory power). As a result, NGS methods became attractive to law enforcement to surmount the quality and quantity challenges presented by forensic samples, and these methods performed with greater accuracy and speed than traditional STR methods.

To be sure, NGS differed from the WGS touted by the medical community. NGS focused on only portions, rather than the entirety, of a person's genomic sequence. But it served as a monumental break from STR methods. Unsurprisingly, during this period of transition, privacy advocates raised several objections to the move from STR typing to NGS in the law enforcement or forensic context. First, they decried efforts by law enforcement to shift from a neutral informational platform for DNA testing (STRs) to information-rich and sensitive approaches that typed actual sequences, some of which might prove significant for medical reasons. Second, advocates noted that the technological incompatibility between medical and law enforcement DNA testing methods had served as a practical firewall that prevented law enforcement from exploiting databases created for recreational, research, or clinical purposes. In adopting NGS, however, that line would continue to evaporate as forensic laboratories now had the equipment and training to undertake the same kind of genetic sequencing as performed in other contexts, even if they typically restricted their sequencing efforts to law-enforcement approved regions of the genome. What is more, privacy advocates feared that the increasingly falling costs of WGS, along

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with the trend toward digitalizing medical records and the burgeoning recreational genetics industry, would result in the creation of large medical/recreational DNA databases. That in turn would place pressure on law enforcement to conduct genetic tests (even, perhaps, whole genome sequencing tests) that allowed those databases to be mined for law enforcement purposes. Given privacy concerns with a fully permeable genetic system, advocates vigorously protested any move from “junk” STRs to information-rich NGS.

C. Convergence

Notwithstanding the calls for privacy and defendants’ rights, by the early 2020s, a convergence between forensic and clinical testing of DNA was well underway. By 2021, NGS had largely replaced STR typing as the predominant method for forensic DNA testing, and the national DNA databases expanded to record profiles of genomic regions that revealed familial relatedness and ancestry. It also became routine to process serious unsolved crimes for phenotypic traits—that is, testing forensic samples to determine physical characteristics and make up a predictive mugshot image.

By the mid-2020s, the cost of whole genome sequencing had fallen to $180 per sample. Secretary of Health and Human Services, Suzan Delbene, oversaw an extension of the national health care program, still colloquially known as “Obamacare,” that standardized testing of every individual’s entire genome for inclusion in their medical record. There were also bills percolating in Congress to conduct WGS on DNA samples collected from newborns, pursuant to state and federal screening programs previously targeted at identifying serious, treatable genetic conditions. Resistance from privacy advocates, however, prevented passage of proposed legislation. Nevertheless, after beloved California Congresswoman, Kylie Jenner, announced that she had lost twenty-six pounds on a customized diet developed from a WGS-specialist, a populist surge in WGS testing occurred. By 2025, 48 percent of the population had undergone WGS analysis and those medical files contained those persons’ entire genomic code.

Furthermore, these genomic results were more readily accessible and searchable than ever. As a result of the Health Records Access (HeRA) Act, which promoted the digitalization of medical records and was signed by President Clinton in 2019, whole genome sequences collected in the medical context became part of the digital record of the patient. Although primarily intended for medical and clinical purposes, these digital records quickly became a target of law enforcement warrants, and, as discussed below, some judges granted
permission for trawls of such records for the genomes of persons suspected of serious crimes, arguing that targeted searches “only revealed the identity of matching, and thus guilty, people.”  

Finally, during this same period, sequencing technology became more sophisticated and more efficient. By the end of 2029, handheld sequencing devices roughly the size of a clipboard could return DNA results in eighteen minutes. Armed with this information, forensic laboratories began pressing to expand NGS methods to include greater regions of the genome, and proposals emerged to allow WGS for forensic purposes.

II. STATE OF THE LAW

To understand the evolution of legal constraints on DNA testing, it is useful first to delineate between suspicion-based and suspicionless testing practices. At no point in the history of DNA has there been any significant resistance to suspicion-based DNA testing for noncoding identifying information. That is, it has long been agreed that law enforcement may collect a DNA sample from a person identified through other evidence as a suspect in a crime, and compare that person’s DNA profile to inculpatory material left at a crime scene.

Rather, the pressing legal questions have surrounded the compulsory suspicionless collection of DNA from specified classes of individuals, and the storage and searching of profiles in large DNA databases. Specifically, as regards this kind of suspicionless use of DNA profiles, there are three general subcategories into which the legal disputes have fallen: the compulsory collection of DNA from categorical groups of persons; the retention and search of genetic information in DNA databases; and the kinds of information that may be permissibly gleaned from a DNA sample.

Figure 1 provides a summary of the most pertinent issues, which will each be addressed in turn.

27. State v. Lochte, 389 So.3d 52, 63 (Fla. 2024).
28. In the early 2010s, DNA testing speeds were largely inhibited by the polymerase chain reaction (PCR) amplification process, which took a considerable amount of time. But by the 2020s, amplification times reduced to less than ten minutes, and it was separation and detection that posed greater technological challenges. See Butler, supra note 19, at 5 (noting that the fastest speeds for a fifteen-locus test, in 2014, were just less than an hour). In 2024, however, those challenges were surmounted by a team of scientists later awarded a Nobel Prize. The cost of rapid testing also plummeted, allowing its widespread adoption in the 2020s.

29. See generally Murphy, supra note 3, at 155–59, 228.
FIGURE 1.

**Suspicion-Based Testing**
- DNA sampling and comparison of an identified suspect to material associated with a specific case

**Suspicionless Testing**
- Legality of compulsory, suspicionless DNA sampling
  - of convicted persons
  - of arrested persons
  - of suspects persons
  - of special categories of persons (e.g., DMV applicants)
  - of all persons
- DNA-database related issues
  - Searching profiles to confirm identity
  - Searching profiles to directly match known persons to crime scenes, or crime scenes to other crime scenes
  - Searching profiles to find leads (e.g., via “familial” searches)
- Legality of forms of DNA testing
  - STR “junk” loci
  - Y-STR/surname or other familial linked loci
  - Typically nonprivate identifying characteristics (e.g., sex, height, eye, hair)
  - Private identifying characteristics (e.g., medical conditions)
  - Private predictive characteristics (e.g., propensity to violence, sexual deviance)

A. Compulsory Collection and Rapid Testing

Any legal history of DNA testing for forensic purposes must begin with *Maryland v. King*, the 2013 watershed case in which the Supreme Court upheld the constitutionality of compulsory, suspicionless sampling of DNA from an arrested person. In a 5-4 opinion, Justice Kennedy declared that the government held a legitimate interest in knowing “who has been arrested and who is being tried,” beyond “just his name or social security number.” Accordingly, police could justifiably take a buccal swab from an arrested individual, and then at some later point test it for a DNA profile that could then be compared to databases.

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32. *Id.*
The scope of permissible search included not just a check of known profiles to confirm asserted identity, but also a search in forensic databases that might match to unsolved crimes.

With the benefit of nearly two decades of hindsight, Justice Scalia’s dissenting opinion proves prescient. As explicitly observed by later inferior courts, the *King* reasoning offered no grounds on which to distinguish arrestees from large classes of other persons, and thus opened the door to the “construction of . . . a genetic panopticon.”

The initial steps toward widescale DNA testing occurred in the late 2010s, with the emergence of rapid DNA typing machines that were compact, portable, and operable with the single press of a button. The practice involves taking a swab, and doing a one-touch self-automated analysis, which then transmits the data instantly and checks it against a known person database, as well as an unsolved crimes and open warrant database. Law enforcement officers quickly turned to these portable devices to verify identity in a wide array of circumstances.

Initially, legal and technical hurdles prevented immediate adoption. The legislation creating the federal DNA database required that testing must be done within an accredited laboratory by qualified personnel in order to be included in the national DNA database. This mandate precluded widespread adoption of rapid DNA testing machines, as they were operated in police precincts (rather than accredited laboratories) and by police personnel (rather than qualified DNA technicians). But the Federal Bureau of Investigation, with the help of the Department of Justice, lobbied for an amendment that would enable seamless integration with the national database system. After years of stalling, at the end of 2016, just as the 114th Congress moved to adjourn, H.R. 320—the Rapid DNA Act of 2015—was hastily passed and signed into law.

But even with the new legislation, technical obstacles persisted well into the late 2010s. First, the rapid DNA typing machines initially proved far more fallible than human testing. Although typing of known samples has a very low error rate when performed manually, the accuracy rate of automated systems hovered between 88 and 92 percent. And the success rate remained at this level into the early 2020s. Thus, for a period of time, errors were not uncommon. One high profile case, which drew tremendous attention to the issue, involved the erroneous attribution of a string of unsolved murders to Harry Styles, a former pop star known for his saccharine love songs, who was tested in connection with an arrest

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33. *Id.* at 1989 (Scalia, J., dissenting).
for public exposure in Hawaii. After ten days in jail, Styles’s defense counsel 
proved that the profile generated by the rapid machine was erroneous, and he was 
released.

Second, these machines initially interfaced poorly with the national database 
with which they now could lawfully communicate. At the time of their initial 
adoption, the national DNA database (nicknamed CODIS) still required a 
painstaking and lengthy U.S. Mail submission process for new profiles. Searches 
and uploads did not take place in real time but, instead, occurred twice weekly. In 
addition, access to the database was rigidly controlled. Rules required that the 
database remain under lock and key, and that a designated CODIS administrator 
screen all requests for access.

In order to maximize the utility of one-touch machines, the entire database 
framework needed adjustment. Database administrators had to develop software 
and systems that could accommodate automatic uploads from precinct-based de-

vices (while still controlling for quality), and then conduct instantaneous searches 
against both the known and unsolved crime indices. This technical challenge 
proved formidable, and it was not until the early-to-mid-2020s that the machines 
gained widespread use. During that period, however, testing times reduced 
significantly—a typical machine produced results from as many as fifty sam-

ples in twenty-eight to thirty-five minutes, down from ninety minutes in the 
late 2010s. By 2027, a Bureau of Justice Statistics Report indicated that 86 
percent of all arrested persons in the United States had a DNA sample taken 
and instantaneously tested as a routine part of the booking process.

Notwithstanding these challenges, the advent of handheld microchip-based 
rapid typing machines has propelled the embrace of DNA testing as the primary 
means by which a person authenticates their identity. In light of the ease with 
which even sophisticated identification papers are fabricated, the difficulty of as-

certaining identity for populations who may lack government documentation 
(such as migrants and refugees), and the imprecision of fingerprinting, genetic 
testing has emerged as the identification method of choice. Police began routine-
ly engaging in what became known as “stop and spit”—spot checks of people on 
the street akin to “stop and frisk,” but with the purpose of obtaining a DNA sam-
ple. “Swab and go” also entered the cultural lexicon, as police routinely sought 
DNA samples from individuals stopped for minor traffic infractions, many of 
which critics challenged as pretextual.

These samples, most of which were ineligible for inclusion in the national 
database, instead were placed in so-called rogue databases that sprouted up across 
the nation. SmallPond, a private company offering database services that were
interoperable among jurisdictions, became the de facto provider of a wide array of services in the shadow database market—a 7 billion dollar market. In fact, three states effectively opted out of the national database system, having converted to the more flexible SmallPond provider during the period in which rapid DNA machines were not fully integrated with the federal database, in part due to intractable delays in the procurement process. Those jurisdictions continued to run searches in the national database, but stated the preference for a private provider as buttressed by the high rate of intra-jurisdictional crime and the total freedom offered by SmallPond (which imposed no restrictions on the quality of the testing facility, the nature of samples, or the kind of search permitted, as did the FBI).

Law enforcement lauded these advances as critical to the success of their mission. Exoneration projects also tentatively endorsed expansive DNA testing, as the explosion in known profiles helped bolster the claims of those wrongly convicted. The DNA of vulnerable populations like sex workers and young children was even collected voluntarily in the event of a later need for identification. At the same time, however, civil libertarians and racial justice activists decried the expansive use of DNA as a further incursion on genetic privacy and personal autonomy. Indeed, with the development of handheld typing techniques, the size of the legal index, which holds consent-based and other samples lawfully procured but not under a compulsory collection law, in the national DNA database outstripped that of the samples collected by compulsion in the conviction and arrested person indices.

Generally speaking, however, courts have embraced each new development. Although the U.S. Supreme Court neglected to rule directly on the constitutionality of many of these practices, circuit courts and state supreme courts have widely upheld them. For instance, in State v. Helix, the Supreme Court of Arizona approved compulsory DNA sampling from persons issued a summons, but not placed under immediate arrest. That case involved a man ticketed for walking a dog without a proper tag. Quoting the Supreme Court in Maryland v. King, the Arizona court noted that it is “a common occurrence that ‘[p]eople detained for minor offenses can turn out to be the most devious and dangerous criminals.’” The court went on to reason that the intrusion from

35. See Murphy, supra note 3, at 186-87.
37. 135 P.3d 212 (Ariz. 2025).
DNA sampling was slight, and that it simply represented a modern day version of fingerprinting. Indeed, the court argued that:

If anything, Helix benefited from the availability of contemporary identification methods such as DNA typing. Without an assurance that Helix’s identity could be definitively established, officers might have elected to subject him to the far more intrusive act of formal arrest and police booking at the station. Instead, Officer O’Brien was able to briefly detain Helix, sample his DNA and check it against the state database using a rapid identifier in her squad car, and then—assured that he posed no threat—release him with only a summons to appear. Helix should be thankful for, rather than protest, the officer’s use of DNA testing in this case.40

“Stop and spit” and “Swab and go” have likewise been endorsed by courts, which rely in large part on the 2016 dicta in Maryland v. King, as well as the holding in 2026 Georgia v. Watson41 case in the Supreme Court that approved collection of DNA from a driver lawfully stopped for traffic violations. In an oft-quoted passage in Watson, the Court reasoned:

Given that law enforcement has long been authorized to obtain the name and biographical information of the driver, the use of DNA to merely confirm the accuracy and completeness of that information poses no meaningful intrusion on liberty under the Fourth Amendment. A driver who wishes to protect his or her genetic identity can always choose to avail himself or herself of alternative means of transportation or, more simply, abide by the traffic laws.42

In the wake of that case, two circuit courts have likewise upheld the collection of genetic information from passengers in the vehicle, citing to the previously referenced language in the Maryland v. King case about the importance of law enforcement knowing the identity of potentially dangerous persons during a stop. Neither Watson nor King gave much notice to the added dimension of checking open warrants or unsolved crimes; the Watson Court summarily concluded that: “Respondent argues that checking the genetic information against an unsolved crimes database exceeds the lawful bounds of merely confirming identity, and constitutes a suspicionless search. This contention is without merit. See Maryland v. King.”

40. Id. at 219.
41. 587 U.S. 232 (2026).
42. Id. at 249.
Interestingly, there remain some states that continue to hold out against expansive sampling practices. For instance, in *State v. Medina*—as early as 2014, the Vermont Supreme Court held felony arrestee sampling unconstitutional. Distinguishing cases that likened DNA testing to fingerprinting, the justices refused to "equate a procedure that takes a visible image of the surface of the skin of a finger with the capture of intimate bodily fluids, even if the method of doing so is speedy and painless." The court also noted that "the real functionality, and statutory purpose, is to solve open criminal cases or ones that may occur in the future," which was at odds with a constitutional order that permitted suspicion-based intrusions only. Vermont is not alone. In the early 2020s, the Supreme Courts of Washington and Montana both struck down arrestee statutes citing their state constitutions. And New York legislators have continuously rebuffed efforts to expand the state’s broad convicted-person DNA collection statute to those merely arrested for crimes, even at the expense of federal funds offered as an incentive to states who would create arrestee databases.

These resistant states, particularly New York with its large and diverse population, have provided an interesting counterpart for empiricists seeking to ascertain the benefits of broad DNA testing policies. For instance, in 2019, in response to pressure from victim advocacy groups and political adversaries who cited a litany of supposed preventable crimes committed by arrested persons who went undetected until conviction, the Governor of New York gave a speech charting the course of the state’s future investment in DNA policy. The Governor’s remarks included a passage that directly addressed expansive DNA testing:

> There are those who tell us that the only way to solve crime is to spend money on the latest gadget and machine, and then to troll the streets swabbing the mouths of our people. But you know who is telling us that? The lobbyists who represent the industries that make those machines, and who stand to pocket billions from their adoption. And the fearmongers who refuse to look at the data that shows that convicted offender databases provide the same security at a fraction of the personal and financial cost. But I don’t work for the lobbyists and the fearmongers. I stand for crime victims, not corporate executives; for crime-solving, not wasteful spending. That is why today I’m announcing a plan to take the hundreds of millions of dollars it would

43. 102 A.3d 661 (Vt. 2014).
44. Id. at 664.
45. See WASH. CONST. art. I, § 7 (“No person shall be disturbed in his private affairs, or his home invaded, without authority of law.”); MONT. CONST. art. II, § 10 (“The right of individual privacy is essential to the well being of a free society and shall not be infringed without the showing of a compelling state interest.”).
cost to give every squad car a rapid typing machine and instead spending where it actually counts: in hiring and supporting the CSIs and forensic scientists who actually collect and analyze evidence from crime scenes. A database may hold the DNA profile of every citizen in our state, but as we learned from the rape kit debacle in the mid 2010s, it won’t solve a single crime if there are not people out there collecting and testing evidence from crime scenes.

In keeping with this announcement, the state criminal justice agencies allocated limited funds to place a handful of instant typing machines into four regional testing centers throughout the state, which were then entrusted with all known individual sampling, but spent the bulk of its resources shoring up personnel and technical support for crime scene evidence collection and processing.

Although it is difficult to compare across states, due to a wide range of differences among DNA-related policies, thus far New York’s position has proved well-founded. States such as Florida, which sunk enormous costs into outfitting every squad car with instant DNA-testing machines, have failed to concomitantly invest in collection and testing of DNA from crime scenes. As a result, although a large fraction of the Florida population is currently represented in the state database (an estimated 67 percent of the adult male population), the state’s match rate has actually declined over time and there is a high percentage of unsolved cases in which forensic evidence was either never collected or never tested. In contrast, New York’s all-convicted offender DNA collection policy has resulted in a much smaller known person database (roughly 7 percent of the adult male population), but the number of crime scene samples has ballooned. As a result, the state’s match rate—the rate at which a known DNA profile is associated with an unsolved crime—has likewiseexploded, far surpassing that of Florida and other similarly-sized states, and the collection and testing rate for all index crimes surpasses 78 percent.

Nevertheless, New York’s chosen course has not been without criticism. For instance, in 2023, it was revealed that a serial rapist stalking Buffalo from 2020–22 had, in 2018, been arrested for a sex offense for which he was acquitted. Pro-collection politicians charged that, had the state had an arrestee law in place, the defendant’s sample would have been collected and matched to several unsolved cases, possibly preventing the future offenses. Apart from pointing out that such trade-offs were an inevitable part of the calculus that lawmakers must make when enacting potentially intrusive laws, some privacy advocates observed that neighboring states with broad arrestee collection practices suffered from tremendous backlogs and poor training and support for forensic examiners, and
thus similar missed opportunities occurred even in states that embraced broad collection policies. For instance, a high profile case in Louisiana revealed that an offender whose DNA was collected and sent to a database via a squad car instant typing machine in 2026 nonetheless failed to match to three separate home invasion and homicide cases from the three years prior. Although the known sample was instantly typed and databased, the lack of resources for processing the crime scene samples, which require individual analyst attention, meant that those cases stalled large backlogs notwithstanding the known offender’s profile awaiting match.

There has been a significant grassroots backlash against instantaneous DNA collection and testing practices, exemplified by a movement known as DN-NAY! Although widening collection policies consistently generated opposition from privacy advocacy groups and those generally opposed to expansive law enforcement practices, DN-NAY! specifically critiques collection policies that they say “biologize” inequitable police practices aimed at low income areas and communities of color. For instance, a series of cases in Texas involved police targeting persons suspected of possible immigration violations for minor traffic infractions, which then justified obtaining and uploading a DNA profile to check for open immigration warrants or other offenses. The same types of complaints have arisen in connection with “stop and spit” incidents, as described earlier.

Finally, there also arose specific complaints in connection with malfunctions by the machinery that led to wrongful detentions. A precinct in Missouri, for instance, failed to calibrate its rapid typing machine properly, leading to a series of erroneous decisions to release and hold alleged suspects. In one particularly notorious case, a state senator in Ohio who was stopped for a possible drunk driving offense was purportedly linked to a series of child sexual assaults. After he was held without bond for eight days, his lawyers revealed proof that the typing machine had erred. Furor then arose when law enforcement authorities dismissed the episode as “unfortunate” but failed to disclose the error to others arrested around the same time, or retest possibly affected samples. Nonetheless, although these cases have led to increasing support for dialing back DNA policies, thus far they have only deepened the rift between those who view broadscale DNA testing as an unmitigated good, and those who believe it upsets the constitutional balance between the individual and the state.
B. DNA Database Search Policies

As with compulsory collection laws, controversy has swirled around the extent to which limits should be placed on the searches authorized in DNA databases. In *Maryland v. King*, the Supreme Court effectively elided the distinction between the use of DNA databases to confirm identity and their use to solve past crimes, finding both constitutional. Nevertheless, several states adopted self-imposed limits, either through legislative action or judicial decree, that differentiated between those two activities. This became known as the bifurcated approach. For instance, although South Carolina authorizes compulsory collection of DNA from arrestees, the State Supreme Court (citing the state constitution’s privacy provision), held in 2021 that such profiles could only be compared against the known person index as a means of confirming identity. Once a person was convicted, the profile could then be compared with profiles held in the unsolved forensic index.

In addition, states have varied in their policies around collection. Initially, several states limited collection by, for instance, requiring that a judicial officer affirm probable cause before taking or testing a sample, providing for automatic expungement for cases later resulting in a dismissal or acquittal, or limiting eligible charges to serious offenses. But as the technology advanced, such limits quickly eroded. The opinion of the Utah Supreme Court is illustrative. In *State v. Phelon*, the court upheld a law amending the arrestee collection laws to allow for testing by a police officer, at the time of the encounter (rather than after a probable cause hearing). The law also shifted the burden to an eligible individual (such as an arrestee whose case was dismissed) to file a petition for expungement, even though evidence showed that the state averaged eight months in disposing of such petitions, and often declined or ordered them to be resubmitted for trivial administrative reasons. The court first noted that the U.S. Supreme Court in *Maryland v. King* did not seem to hinge its holding on any conditions of this kind, and added that no such limits had historically been imposed on “fingerprinting, the functional equivalent of DNA testing.” Indeed, Phelon is representative of most arrestee collection opinions, which follow the U.S. Supreme Court’s lead in failing to differentiate among DNA database indices or to impose procedural constraints on the collection of DNA from arrestees.

A more fertile area of legal debate surrounds the use of particular database search methods that have engendered some controversy. The most controversial

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46. 2023 UT 139, 188 P.3d 62.
47. Id. at 144 (citing Erin Murphy, *License, Registration, Cheek Swab: DNA Testing and the Divided Court*, 127 HARV. L. REV. 161, 168-69 (2013)).
approaches involve three methods: familial searching, solved-case trawls, and the reliance on nongovernment databases for DNA match purposes.

Controversies around familial searches, well documented in the scholarly literature, abated somewhat in the 2020s as DNA databases continued to expand, and the need to resort to less precise, near-miss methods diminished. Nonetheless, with the adoption of additional loci to the standard DNA profile in the late 2010s, familial searches became strikingly more efficient. One of the new loci traces male patrilineal descent, and thus made familial searches in large databases far more effective.

Oddly, notwithstanding two decades of experience engaging in familial searches, no court has ruled on the legality of the practice. The courts to which the question has been most squarely presented have uniformly held that all parties involved lack standing: Specifically, the known person in the database cannot claim a harm, as they simply serve as a pivot to another party, whereas the persons found through a link cannot claim that their genetic information has been abused in any way.

The second controversial practice concerns solved-case trawls. Most common in jurisdictions with limited compulsory collection laws, this practice involves taking a DNA sample from a case that has been solved through other evidence and uploading it to the unsolved crime scene samples database, so as to effectively introduce a known person’s profile into the database when it would otherwise be unavailable. Thus, for instance, in a jurisdiction that forbids collection of DNA from convicted or arrested misdemeanants, a lab analyst might choose to upload a DNA sample associated with a solved misdemeanor sex offense in the hopes that the profile would match to another unsolved crime. Because the identity of the perpetrator is known in the solved case, the analyst thus accomplishes indirectly (through solved crime scene samples) what cannot be done directly (through compulsory collection of a DNA sample from the individual).

Courts have disagreed about the legality of this practice. Some have upheld it, pointing to the practical difficulty of assessing “precisely when a case has been solved,” or choosing instead to leave it to the legislature to prohibit such behavior. Other courts have found the practice unsavory, noting that it “subverts the

48. See generally MURPHY, supra note 3, at 189–214 (citing sources and summarizing debate).
49. See, e.g., People v. Sledge, 190 Cal. Rptr. 3d 534, 559 (Cal. Ct. App. 2021) (“Sledge cannot assert a violation of his own Fourth Amendment rights, because any illicit search—assuming the state’s familial search was in fact illicit—affected his sister’s expectation of genetic privacy, not his own.”).
50. See MURPHY, supra note 3, at 138–52 (detailing instances of solved-case uploads and discussing the pervasiveness of the problem).
legislative judgment as to the proper scope of DNA profiling” and constitutes an “end-run around restrictions put in place after balancing competing interests.”\textsuperscript{52} Those courts, however, often uphold the specific matches found on a good faith theory—that although introduction of the solved case sample violated the law, the match was made with good faith and thus the resulting evidence should not be excluded. Subsequent matches, however, are unlikely to receive the same lenient treatment.\textsuperscript{53}

The third novel approach to DNA database searches marks the most significant, and growing, area of concern. Specifically, in an increasing number of cases, law enforcement has turned to private and nongovernmental DNA databases to find suspects when government databases lack a match. This resort to DNA data created and stored for purposes other than law enforcement has heightened concerns about abuse of genetic information, and underscored the limitations of current law in regulating genetic information.

The watershed moment occurred in 2015, when a detective in Idaho confronted a cold case that refused to go away. Since the 1996 murder of Angie Raye Dodge, neither law enforcement nor the victim’s mother had been satisfied with the outcome in the case.\textsuperscript{54} Although prosecutors won conviction of a man named Christopher Tapp for the killing, Tapp failed to match the sole DNA sample found at the scene. Lawyers for Tapp, supported by the victim’s mother, fought for his innocence and for continued pursuit of the person who had left the DNA sample, whom they believed to be the sole perpetrator. When law enforcement DNA databases provided no leads, a detective assigned to the case had a clever idea. A company called Sorenson Genetics offered an online database of DNA profiles that were publicly searchable. The detective commissioned Sorenson to test the crime scene evidence for its markers, and a search revealed a close match.

Speculating that it might belong to a relative of the suspect, the detective obtained a warrant to reveal the identity of the donor. That person, they learned, was an older man from Clinton, Mississippi. But, as it turned out, that man’s son had ties to the very area in Idaho where Dodge had been killed. What is more, the son was within two years of her age, and his name—Mike—matched a name

\textsuperscript{52} State v. Barlow, 132 P.2d 445 (Cal. 2014) (likening the practice to the technique of eliciting an un-Mirandized confession, and then giving Miranda warnings to elicit a second confession, held unconstitutional in Missouri v. Seibert, 542 U.S. 600 (2004)).

\textsuperscript{53} Id. at 467 (“Although this case presents a close call, we find that the actions of the analysts, while unquestionably aimed at deliberately subverting the rules regarding uploading of DNA profiles, were ultimately taken in good faith belief that they were exploiting a ‘loophole’ rather than contravening a dictate. Accordingly, the good faith exception to the exclusionary rule applies, and Barlow’s motion for suppression was properly denied.”).

\textsuperscript{54} See Murphy, supra note 3, at 198–203.
Tapp had given during an interrogation in the case. He also made horror films, including one that had a plot that loosely matched the Dodge killing. Convinced they had found their man, investigators obtained a warrant and approached him at his current residence in New Orleans. They brought him in for questioning and took a DNA sample. But a month later the trail again went cold: The DNA was not a match.

The incident garnered national news attention, and Sorenson withdrew its database from the public domain. But it quietly alerted investigators to a possibility that they had not yet fully considered: putting the enormous genetic repositories collected by private companies to use in service of law enforcement. In 2016, Ancestry.com boasted more than two million persons in its DNA database, which it declared “the World’s Largest Consumer DNA Database.”55 Direct-to-consumer genetic testing companies also held large repositories; consumer testing company 23andMe held genetic information for over one million persons.56 By the late 2020s, a plethora of direct-to-consumer genetic testing companies, offering an array of services, emerged.

After a brief spell in the 2010s, during which the Federal Drug Administration (FDA) attempted to clamp down on such services, industry lobbyists managed to secure passage of the Genetic Right to Know Act. The Act not only withdrew the FDA’s regulatory power over DTC genetic testing companies, but also introduced a subsidy intended to encourage individuals to seek out such testing. Passage was supported by an unlikely coalition of antiregulatory Republican and Libertarian members as well as what had come to be called the “crystals caucus”—a group of far left members of Congress who tended to vote against any kind of medical or health funding establishment and in favor of naturopathic or consumer-directed care. As a result of the Act’s passage, millions of individuals sought genetic testing, and all that information remained in the possession of those companies. After several years of bankruptcies, mergers, and restructurings, in 2022, only two companies owned all the individually named testing services, Genetic and GeneCo.

In 2024, a scandal emerged involving one of those companies: Genetic. It emerged that Genetic routinely cooperated with law enforcement, providing access to its databases so long as police did not report publicly on their compliance. The cooperation came to light after a whistleblower disclosed documents in the wake of the public downfall of a popular mayor whose electoral challenger,


the police chief, had used Geneticon contacts to determine that the mayor was transgender—something she had not publicly disclosed. According to the released material, police would routinely contact Geneticon to compare unsolved crime samples with their databases, and then provide any identifying matches to police. Police in turn surreptitiously collected confirmatory samples from the suspects, and then either devised a ruse to undertake public collection, or created plausible stories to explain how those samples became of interest. Thus Geneticon's role never surfaced. Outraged, consumers withdrew their support from the company, which closed in early 2025. It sold all of its genetic assets to its rival, GeneCo, which now operates the single largest repository of private genetic information in the world.

At the present time, the rules shrouding law enforcement access to GeneCo's database, as well as to the medical records slowly consolidating in the digital space pursuant to the passage of HeRA, remain hazy. On a significant number of occasions involving high profile terrorism, homicide, or rape cases, law enforcement has successfully gained access to GeneCo databases to conduct DNA searches. It seems, however, that in routine cases, GeneCo has required that police obtain a warrant with probable cause, unless it is a rare instance of a courtesy release. Standards surrounding the legality of both kinds of disclosure have not yet been fully adjudicated in the courts. In addition, although many researchers have cited GeneCo as the source of data, the precise nature and scope of those disclosures are yet undetermined.

C. Types of Testing

The final area of legal uncertainty in forensic DNA testing concerns the types of tests to which samples may be subjected. As explained above, during the early ascendance of DNA testing, the type of testing focused on STRs, or short tandem repeat segments of the genome. Although testing for sex was a routine part of forensic analysis, as well as general projections about ancestry, genetic tests otherwise did not look at identifying characteristics of any kind. Forensic testing also specifically shied away from ascertaining the actual sequence of genetic code that made up any region of the genome. These limitations were perceived by early courts as essential to safeguard the privacy of individuals, which in turn justified acceptance of broad compulsory DNA testing.

In the late 2010s, that principled line between identifying and non-identifying information began to erode from all directions. First, a series of court opinions accepted familial searches as legitimate uses of DNA databases.
Although these cases concerned a search method and not a kind of test, they laid the foundation for using genetic testing to reveal more intimate information.

That is, courts upholding familial searches tended to rely on three lines of reasoning, and those three lines later provided the foundation for authorizing more intrusive forms of DNA testing. First, courts identified the privacy intrusion of gleaning familial connections through DNA tests as minimal. Second, they endorsed the practice of returning to a sample collected under one legal regime, and subjecting it to further tests without any additional legislative or judicial approval. For instance, a sample collected by compulsion pursuant to a law that authorized only testing of thirteen loci for STR information could lawfully be retested for new genetic data, such as Y-chromosome STR data showing patrilineal relatedness. By endorsing the concept that law enforcement itself dictated the proper scope and kind of DNA testing, rather than courts or legislatures, they effectively wrote police a blank check to engage in any kind of testing they deemed worthwhile, at very little risk of peril.

Third, courts failed to make meaningful distinctions among the kinds of information revealed by genetic testing. Even though the information gleaned from familial search practices became more intimate as time wore on, courts never drew the line forbidding these greater intrusions. For instance, initially the Y-STR information was used only to establish that the unsolved sample and the familial lead in fact shared a common relative. But as search and typing practices became more sophisticated, investigators were able to discern from genetic typing the probable surname and physical appearance of the donor of a DNA sample. Coupled with an emerging acceptance of the use of phenotypic testing (or the creation of images known as genetic mug shots, based on DNA data), the line between testing for expressive and non-expressive genetic traits further dissipated. The chain of reasoning for courts upholding testing for a variety of medical and physical traits traced easily from the early STR methods that routinely ascertained sex and ancestry, through familial methods that identified surname and biological relatedness, up through sequence identification systems that predicted physical appearance, medical conditions, and even certain behavioral propensities.

These transitions were greatly enabled by the shift in default forensic DNA typing systems from the STR-based methods of the 2000–20 period to the sequencing (NGS) methods commonly in use today. The first major case stemmed from a case involving twins in Boston.57 In order to distinguish between the two, analysts switched to sequencing methods. After the court denied the defense’s

57. See Murphy, infra note 3, at 243–45.
motion to exclude the tests as unreliable under *Daubert v. Merrell Dow Pharmaceuticals, Inc.*, and NGS secured the defendant’s conviction, sequencing methods gained new life. Sporadic admissibility hearings under both *Daubert* and *Frye v. United States* followed, but by the mid-2020s most major jurisdictions had either switched entirely to NGS systems or had the capacity to conduct NGS testing in high-priority cases. Only one court had held the method scientifically unsound and excluded the evidence, but that court was later overturned on appeal. Oddly, the legal posture of the cases—which started as admissibility hearings to gauge evidentiary reliability, which was not really in question after the early years—overshadowed the true concern, which was the threat to privacy represented by switching to sequencing technology. By the time the American Civil Liberties Union (ACLU) mounted a civil challenge to the practice, the method had already been accepted in a significant number of cases. In addition, that suit, which ultimately failed, had to overcome a series of legal hurdles, since the decision to test using NGS methods was made informally by state authorities rather than in any legal edict.

The recent announcement in 2028 that researchers had identified what they believe to be the so-called violence gene has yet again raised the stakes on genetic testing. Just last year, a new company called RiskAvert began selling to states and localities a modified risk instrument that incorporated both behavioral and genetic findings. The instrument, which the company claims was validated extensively although it refuses to produce specific studies, consists of a genetic test for the violence gene that is scored alongside a twenty-seven-question instrument designed to segregate high, medium, and low risk offenders. So far, it has been met with a warm response in the law enforcement community, which has been looking for alternatives to the crude instruments in place for bail, preventive detention, and corrections-related determinations. In November 2029, Maricopa County began a pilot program involving judges on bail setting and high-felony calendars. The study, conducted with academic researchers and funding in part by the National Institute of Justice and by Roche’s Genetics division, which developed the assay, aims to determine whether identification of high propensity offenders through genetic testing, neuroimaging, and a risk-assessment instrument meaningfully affects recidivism rates.

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59. 293 F. 1013 (D.C. Cir. 1923).
III. FUTURE DIRECTIONS AND PENDING LEGISLATION

As genetic knowledge continues to grow, and technology and instrumentation improves, law enforcement continues to confront important questions surrounding privacy and the proper scope of government access to a person’s genetic material. This final section identifies the issues of greatest salience today, whether due to popular attention, pending legislation, or imminent scientific breakthroughs.

A. Racial Justice

Racial and social justice activists have expressed concern that DNA testing methods are deployed selectively by the state and reflect disparate and discriminatory patterns of enforcement that then play out as genetic surveillance of certain vulnerable populations. They have also criticized the use of genetically based risk instruments, noting the lack of attention given to racial diversity in academic studies that purport to identify such propensities, and challenges the assertion that the violence gene finding adequately accounts for environmental influences on behavior.

The law enforcement community continues to refuse any outside access to DNA databases, apart from a few police-approved researchers, and thus many questions about those databases remain unanswered. For instance, there is still no national estimate of the racial or ethnic composition of the eighty-three million DNA profiles currently held in DNA databases. Given an uptick in stops, however, of both pedestrians and drivers in poor communities and communities of color, it is conjectured that two-thirds of all adult men of color, regardless of criminal history, currently have a profile in a DNA database or are findable through a familial search.\(^{60}\) Minority leaders have also sounded an alarm about rising rhetoric that frames social problems, such as poverty and discrimination, in biological terms.

B. Moving From NGS to WGS

As jurisdictions fully embrace NGS sequence systems, which examine snippets of the DNA sequence on the genome, the possibility of using the same instrumentation to conduct whole genome sequencing arises. The privacy concerns around such practices, as well as the technological mismatch

\(^{60}\) Genetic Jim Crow, FORENSIC GENETICS POLICY INITIATIVE, dnpolicyinitiative.org (last visited June 7, 2025).
between forensic and clinical testing systems, historically prevented inquiries into regions of the genome more directly associated with any expression. But as those firewalls have slowly eroded, both technologically and through the widespread acceptance of methods like familial searches, phenotypic testing, and ancestry testing, the sense of urgency about maintaining a sharp divide between forensic and clinical applications has waned.

The law enforcement community itself has expressed division on the utility of WGS. Some law enforcement agents, most prominently the Attorney General of California, have opined that the relative benefit of WGS outweighs the costs and efficiency concerns. They note that conclusive proof of identity is fully established by existing NGS systems, and the added value of WGS is minimal given that the remainder of the genome presents less variability, and the practice raises graver privacy concerns. Skeptics further note that several of the variations (known as SNPs, or single-nucleotide polymorphisms) previously incorporated into forensic systems had to be revised when it was learned that they were involved in a propensity for erectile dysfunction, and a political backlash ensued.

But others, such as the Governor of Colorado, have expressed greater interest. The strongest argument is that engaging in WGS would directly open channels from law enforcement to a wide array of extant private DNA databases. For instance, voluntary databases such as those held by consumer genetic testing companies, the new medical digital records repositories created by HeRA, and credit and licensing entities (which started in 2028 to use DNA in place of fingerprints to verify identity), would all be available to search for law enforcement purposes. Some private companies, concerned about the harm to their business from exposure to law enforcement, have indicated they would only comply with court orders to conduct searches or reveal information. But others, such as credit rating agencies, have indicated willingness to conduct such searches for a fee.

Debates over the use of private DNA databases for law enforcement purposes, and the inequitable racial impact of DNA profiling practices, have also reignited calls for a universal DNA database. In 2027, Pennsylvania Attorney General David Kaye, in a speech to the American Bar Association, noted in passing that:

DNA is now such a part of every aspect of our lives—the way that we identify ourselves when interacting socially, professionally, or with the government—that we can no longer thrust our heads in the sand and pretend as though our genetic information is ours alone. A more sensible system, a fairer system, a more racially and socially just system, would harness the power and potential of DNA from all persons responsibly and for the benefit of all. That’s why I support the President’s call for the Genetic Equality Act, which would support
state-level DNA databases into which all newborn samples would be deposited, safeguarded, and used to better the health and welfare of all persons.

Constitutional scholars questioned the legality of the proposed act, which has yet to be formally introduced in Congress, but the District Attorney Association and Police Chief Associations have expressed strong support. General opposition has arisen from civil rights and civil liberties groups, but one prominent racial justice advocate called it a “bold step forward,” calling opposition to a universal database a “joke.” The advocate continued: “We already have a universal database; it’s just universal to specific populations—namely, people of color. If it is constitutional for those groups, then everyone ought to submit to the same kind of genetic transparency that my community has endured for years.”

C. Increasing Collection Rates

Even as the stockpiles of known person profiles grow, the continued problem of low rates of collection of DNA from crime scenes has repeatedly surfaced as one of the chief obstacles to maximizing the utility of DNA technologies. In the late 2000s, collection rates for major offenses (other than rape and homicide) hovered around 20–30 percent. The rates at which collected DNA was referred for testing and then actually tested were even lower. As a result, even though the DNA database now contains the genetic profiles of nearly a third of the adult population, the database of crime scene samples had not yet reached one million. Given that there are over a million violent crimes a year and the figure represents the cumulative number of samples collected since the database began, that represents only about 3 percent of all violent crimes and roughly .5 percent of unsolved crimes.

Collection rates have continued to lag behind targets for numerous reasons. First and foremost, in most jurisdictions, resources and funding have continued to target expansions in methods suited to known person typing, and largely served those goals. Expenses for instrumentation (such as rapid typing machines, which work best on high quality known samples, rather than low quality crime scene samples) have outstripped more durable funding costs such as personnel or infrastructure. In addition, research dollars—both public and private—have largely targeted known person database expansion, rather than efforts to improve

61. MURPHY, supra note 3, at 268-69.
62. Id. at 268.
the success rate of collection from difficult surfaces, processing backlogs, or methods of testing challenging samples.

Although collection rates have fallen below aspirational targets, however, processing rates are at an all time high. According to a 2027 study of five major jurisdictions, roughly 98 percent of biological material collected from homicide scenes is processed for DNA evidence, 44 percent of that collected from burglary scenes, and 38 percent of that for major property offense scenes. Since the 2010s, when the failure to process sexual assault kits garnered major political attention, sexual assault processing rates have likewise skyrocketed, approaching 100 percent in some jurisdictions.

Interestingly, empirical scholars have shown a strong correlation between jurisdictions that have embarked on aggressive compulsory collection laws, thereby devoting scarce resources to that kind of testing, and those with lower crime scene collection rates and slower processing times. As a result, in 2027, Vice President Kamala Harris undertook a major initiative to offer federal support for the collection and processing of such evidence, shepherding passage of the SURVIVR (Science Used Rigorously and Vigorously for Victim’s Rights) Act. The Act diverted federal funds to jurisdictions who adopted aggressive policies toward DNA collection and testing for crimes of violence. It has yet to be determined whether those efforts will markedly change the picture of forensic DNA practice across the country.

D. Challenges of Conviction Integrity

Finally, it is important to note that increased reliance on DNA testing to prove identity and guilt have not alleviated the recurrent problems of wrongful conviction. Lack of funding and support for indigent defense services has led to both individual and systemic problems stemming from reliance on faulty DNA findings that went unchallenged in the courts. For instance, in a case from Nebraska, a man charged with homicide was convicted, notwithstanding strong evidence of innocence, because DNA placed him at the scene of the crime. It was later learned through video footage and investigation that the DNA was attributable to a chance encounter he had with the actual perpetrator, who was a stranger he had accidentally bumped into at a coffee shop hours before the offense, during which his DNA had inadvertently transferred to the perpetrator’s hands, and then on to the victim. In a series of cases from Louisiana, it was also revealed that a bug in the probabilistic software used by analysts to compute
the likelihood of a match had resulted in the erroneous attribution of guilt to nearly eighteen defendants at trial, and countless others who had taken pleas based on the evidence. When the error was caught, it became apparent that almost none of the attorneys had challenged the DNA findings. One attorney had petitioned the court for greater discovery regarding the source code and assumptions underlying the software, but that request had been (as typically was the case) denied. That parish is still undertaking the painstaking process of reviewing and reopening cases.

Finally, the pervasiveness of DNA testing as a means of establishing identity, even in the private sector among employers, for instance, has led some persons to choose to go off the genetic grid. DN-NAY! has also engaged in acts of public protest. For instance, these individuals like to stage what have come to be known as “confounds,” in which they spray or disseminate fabricated DNA as a form of protesting against the “Genetic State.” Several participants have been arrested for obstruction of justice and tampering with evidence when caught spraying genetic mash-ups at active crime scenes. As a result, controlling the genetic integrity of the crime scene has become a more significant tissue. There has also developed an underground black market in such genetic mixtures, and prosecutors report an increasing trend of gang members and other associates in organized crime using such methods to cover their tracks. One prosecutor even warned that emerging medical technologies, such as one method known as “CRISPR,” which allows selective editing of the genome, might be deployed as a countermeasure to mask identity. But for now, tactics of this kind remain farfetched.

64. See generally Heidi Ledford, CRISPR: Gene Editing Is Just the Beginning, 531 Nature 156 (2016).