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Study of Familial DNA Searching Policies and Practices

Case Study Brief Series



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Key Terminology

CODIS: The Combined DNA Index System is software designed by the FBI to facilitate the sharing and searching of DNA profiles within and between jurisdictions across the country. CODIS has national (NDIS), state (SDIS), and local (LDIS) levels.

Familial DNA Searching: A deliberate search of a DNA database using specialized software (separate from CODIS) to detect and statistically rank a list of potential candidates in the DNA database who may be close biological relatives (e.g., parent, child, sibling) to the unknown individual contributing the evidence DNA profile, combined with lineage testing to help confirm or refute biological relatedness.

Partial Matching: A moderate stringency search of a DNA database using the routine search parameters within CODIS that results in one or more partial matches between single-source and non-degraded DNA profiles that share at least one allele at each locus, indicating a potential familial relationship between the known individual in the DNA database and the unknown individual contributing the evidence DNA profile.

Disclosing or proceeding with a partial match would be to use information learned through partial matching in an investigation.

Lineage Testing: Additional genetic testing, such as Y-STR and mtDNA analysis, used to help confirm or refute biological relatedness between the known individual in the DNA database and the unknown individual contributing the evidence DNA. Y-STR analysis is the examination of STR patterns specific to the Y-Chromosome that is used to determine paternally derived relatedness among DNA profiles, whereas mtDNA is found in the mitochondria of cells and is used to determine maternally derived relatedness.

In recent years, jurisdictions across the United States have expressed a growing interest in the use of familial DNA searching (FDS) to aid criminal investigations. To date, much of the information available regarding FDS stems from anecdotal accounts and scholarly arguments about the various constitutional, ethical, and practical implications of its use posed by various stakeholders, but the field has conducted little rigorous research on the practice (beyond laboratory validation studies). To begin to fill these knowledge gaps and help provide information on this emerging practice, ICF, with support from the National Institute of Justice, conducted a multi-phase study on FDS policies and practices in the United States. This study had multiple components, including two expert roundtables, a literature and policy scan of practice, a national survey of CODIS laboratories, cost modeling, and a series of state case studies.

This series of briefs highlights key findings from these case studies, describing the history, policies, practices, technology, and perceptions of FDS among each of four states. ICF, in partnership with NIJ, selected the following states for inclusion in the case studies after reviewing literature, state policies, and survey responses about FDS practices: Colorado, California, Wisconsin, and Maryland. The table below shares some of the selection factors for each state, along with details about the number and types of interviews conducted. Across the sites, ICF conducted interviews with 56 participants representing diverse fields of expertise and perspectives related to FDS, as well as representatives from both the local and state jurisdictional levels. This brief series provides profiles on each of the four case studies and concludes with some lessons learned across the study sites.

For more information about this brief or study, contact Michael.Field@icf.com or Sara.Debus-Sherrill@icf.com.



Case Study Characteristics

State	Reason for Selection	Total # of Interviewees	Interview Types
Colorado	Colorado was the first state to begin using FDS and is a recognized leader in its promotion and spread across the country. They have developed their own software for conducting FDS which they share with multiple states, making this software one of the leading tools for using FDS in the U.S. The state has publicly available policies in place regarding FDS, and they have wider eligibility criteria than other states. FDS is used at the state- and local-level. Survey data indicated that Colorado may use FDS with an arrestee database, which is also unique.	16	State crime lab Local crime lab Police Prosecution Defense Judicial Victim advocate Policy staff
California	California was also an early adopter of FDS and has successfully solved multiple cases using this tool, including some high-profile cases. California has a statewide policy and also developed their own software for conducting FDS. California has some unique practices such as the institution of an interdisciplinary committee to approve the use of FDS in individual cases, as well as conducting records research prior to release of the profile name to investigators.	18	State crime lab Local crime lab Police Prosecution Judicial Civil liberties attorney Victim advocate Policy staff
Wisconsin	Wisconsin recently began using FDS in 2014, utilizing the software developed by Denver. Although they have only used FDS for a couple of years, they have experienced multiple successes. Their case study shares information about the earlier stages of implementation and how a pilot may be helpful for this process. <i>Note: Wisconsin does not have crime labs under the authority of local agencies; therefore ICF only interviewed state crime lab personnel.</i>	15	State crime lab Police Prosecution Defense Judicial Victim advocate Wrongful conviction attorney
Maryland	Maryland is the only state to have legislation that explicitly bans the use of FDS. <i>Note: Because Maryland does not perform FDS, there are fewer interviews since less information was needed about variations in FDS policy and practices.</i>	7	State crime lab Prosecution Defense Victim advocate Civil liberties attorney Policy-maker





Colorado



State Characteristics (2016):

State Population: 5,540,545

SDIS Size: ~380,000 (convicted & arrestee)

Year of Implementation: 2007

Governing Policy: Colorado Bureau of Investigation
DNA Familial Search Policy

Software Used: Denver Familial DNA Searching
Software

Databases Searched: SDIS Convicted Offender &
Arrestee, Denver LDIS

Introduction

Colorado was the first state to begin using familial DNA searching (FDS), and Colorado's FDS policy serves as a model for similar agency policies across the country. Stakeholders in Colorado are among the strongest advocates for the use of FDS nationwide and regularly host trainings and webinars on the practice. Additionally, FDS software developed by stakeholders in Colorado is freely shared with interested states and currently used in at least six other states that conduct FDS.

History

While Colorado officially began its policy of conducting FDS in 2009, the process of getting there began a decade earlier, in 1999. The Denver Police Department (PD) began providing funds to the Denver PD Crime Laboratory to use new DNA analysis methods to retest and reanalyze DNA from cold cases. Rising from the success of this program, the department partnered with the Denver District Attorney's (DA's) Office in 2003 on an integrated cold case project reworking old evidence with new ballistic, DNA, and fingerprinting techniques. The Denver PD Crime Lab quickly began generating new DNA profiles and CODIS hits, and this program continues today (as the Denver Cold Case Project).

Soon after the cold case project began, analysts in the Denver PD Crime Lab identified partial matches in three cases in the National DNA Index System (NDIS). All three profiles were partial matches with offenders from other states, so the lab was not able to identify the offenders without reaching out to those states. Before doing so, however, the Denver PD Crime Lab compared the partially matched profiles using PopStats, a section of the CODIS software that calculates basic kinship statistics, and found statistical support that the out-of-state offenders might be relatives of the contributors to Denver's evidence profiles.¹ The Denver PD Crime Lab reached out to the other states to obtain the offenders' identities and was met with confusion as to whether or not this was allowed. The lab conferred with the FBI, which shortly thereafter came out with a policy on partial matches indicating that states may review them on a case-by-case basis and determine whether to release offender identities or not.

¹ PopStats uses different statistics from FDS (e.g., estimated match or estimated kinship vs. FDS' likelihood ratios) and is calculated based on 1-to-1 matches between two profiles; it is not built to search a profile (or multiple profiles) against a large database of profiles.



Although working with the other states in these three cases did not yield any suspects due to the partial matches not turning out to be true familial relationships, the experience led the Denver PD Crime Lab and Denver DA's Office to think about how to better use genetic information in DNA profiles to identify suspects. In the mid-2000s, the United Kingdom (UK) was a leading innovator in the use of DNA to solve crimes and had the largest DNA database in the world. In 2006, the Denver DA, a Denver PD Division Chief, and the Director of the Denver PD Crime Lab traveled to the UK where a forensic science director in the Home Office showed them around the Forensic Science Service (FSS) laboratory in Birmingham and different law enforcement agencies across the country, demonstrating various forensic practices including FDS.

Upon returning to Colorado, they investigated FDS software options, including the FSS software, and ultimately concluded that the available options were too expensive or inadequate for their needs. The Director of the Denver PD Crime Lab decided the best option would be to create their own software program. In 2007, a pilot research project began. The Director began collaborating with a physicist who was working for the Denver DA's Office, and, within four months, they created a working FDS program inside Microsoft Excel. They validated and pilot tested the software using the state database and found that it worked, though it was slow. These pilot searches did turn up candidate relatives, serving as proof of concept, but those cases had already been adjudicated.

The Denver PD Crime Lab and Denver DA's Office took the results of the 2007-2008 pilot to the Colorado Bureau of Investigation (CBI) to encourage the use of FDS in Colorado. CBI agreed on the condition that the Colorado Attorney General write a policy on its use. Over the course of 2009, CBI, the Colorado Department of Public Safety, the Governor's office, Denver PD, and Denver DA worked together to draft the first FDS policy in the US (see *Policy* section below).

Many of Colorado's first familial searches involved running all their unsolved forensic unknowns against the offender database, and the CBI policy was constructed with this sort of large-scale search in mind. After the first few searches, however, CBI decided that the information gained from those searches was not worth the resources expended. Denver followed a similar path when they found that law enforcement agencies did not proceed with all aided cases for varying reasons. In some instances law enforcement deemed cases not significant enough to devote the additional resources to; in others the statutes of limitation had expired or witnesses were no longer available. CBI and Denver both decided to shift their focus to a case-by-case approach to match the resources spent on FDS to the needs and priorities of law enforcement agencies.

In 2010, the Denver PD Crime Lab recoded its FDS Excel tool into a standalone program that is currently used in Colorado to conduct FDS (see *Software* section below), and they are currently working on updating the software to be web-based with additional features. Today, the Denver PD Crime Lab and Denver DA's Office regularly educate other jurisdictions about FDS' potential as a forensic tool. They share information through a page on the Denver DA's website dedicated to familial DNA searching; national webinars; individual outreach visits to other jurisdictions; hosting others to visit their lab; and presentations at conferences, trainings, or other forums. They also have made their 2010 software available at no-cost to other jurisdictions and continue to consult and provide technical assistance to states and jurisdictions interested in FDS.

FDS Cases

Two laboratories in the state, CBI and the Denver PD Crime Lab, currently conduct FDS. Through 2016, CBI has conducted six familial searches with the SDIS database of statute offenders (which includes convicted offenders and arrestees), including a large-scale search of all their forensic unknowns at the start of the program and five individual searches for specific cases. Each individual search identified



potential familial associations, but Y-STR testing did not support familial relationships. CBI did identify and pass on potential female associations in each case, however.² To date, these five cases are still under investigation. The large-scale search of forensic unknowns, which took place in 2009, successfully identified a suspect in one case, but the victim ultimately refused to cooperate with the prosecution or investigation. CBI no longer performs large-scale searches.

Also through 2016, the Denver PD Crime Lab has run ten familial searches, a combination of single case searches and large-scale forensic unknown searches (in total covering over 1,000 cases). These searches were conducted using offender and arrestee profiles from Colorado's SDIS databases and/or from Denver's LDIS. Across all 10 searches, 250 CODIS profiles continued on to Y-STR lineage testing, while 4 female associations were passed directly on to law enforcement (since they cannot undergo lineage testing). Twenty-two of the Y-STR tests found confirmed associations, and, of those, one case progressed to court where the defendant pled guilty to the charge (see sidebar). The majority of other cases did not progress due to statutes of limitation or the case having already been solved by other means by the time the FDS results were returned.

Across both labs, case types included: homicide, rape/sexual assault, and aggravated assault for individual case searches and all case types for the large-scale search of all forensic unknowns.

Software

The current version of the software used in Colorado was developed in 2010 when a Denver PD Crime Lab employee recoded their FDS Excel tool into a standalone program using Visual Basic with an SQL backend. Initial development and validation for the Denver lab took about 12 months, while validation for CBI took about 2 months. Throughout the development of this software (and continuing today) the

“And our initial software was very clunky and very, very time consuming, but it worked... That was a moment right there, it was an exciting moment. It's like flying a paper airplane for the first time and then you turn into a jumbo-jet.”

Denver PD Crime Lab tested, retested, and tweaked the software. Colorado shares this program with other interested states (six as of publication) who can install the software which should be usable within an hour. These states can adjust specific thresholds and parameters in the software, as well as alter the program code to meet their specific searching needs.

The user begins a search by loading the profile data from both the crime scene evidence sample and the CODIS database into the software (profile data from CODIS can be easily exported by authorized staff). Once all the profile data has been loaded into the separate FDS software program, a

LUIS JAIMES-TINAJERO

Denver Police found blood at the scenes of two car break-ins in February 2008, but a search of CODIS found no DNA matches. During the Denver PD Crime Lab's pilot testing of its FDS software (which used all unknown forensic samples, including property crimes, to assist in validating the software), six potential family members were found for the unidentified DNA samples from the break-ins. Y-STR testing excluded five of those candidates, pointing towards the remaining CODIS profile as the perpetrator's family member. After further investigation, police obtained a court order for a DNA sample from Luis Jaimes-Tinajero, the brother of the sixth candidate, and his DNA matched the blood samples found at the break-ins. In September 2008, Jaimes-Tinajero pled guilty to one count of criminal trespass and received a two-year probation sentence.

² Colorado does not conduct lineage testing on female profiles. This would require the use of mtDNA analysis, which compares genomic regions in the mitochondria (instead of the nucleus). Very few labs across the country (and none in Colorado) have the ability to conduct mtDNA analysis.

familial search can be run in a matter of seconds. The software calculates the likelihood ratios (indicating the number of times more likely the profiles are related than not) for all profiles in the database broken down by familial relation type (parent-child, sibling, and half-sibling) and race (African-American, Caucasian, Hispanic, and all), producing 12 total likelihood ratios per profile across these categories. The software cannot conclusively state the race or type of family relationship; instead it is providing the likelihood statistics by these different categories (e.g., *if* the suspect is Caucasian and a brother of the individual in the database, the likelihood of relatedness is X; *if* the suspect is Hispanic and a child of the individual in the database, the likelihood of relatedness is Y). The user can set a threshold for the minimum likelihood ratio they want the software to return; the Denver PD Crime Lab uses a threshold of 1,000:1 while CBI does not set a minimum.

The software produces an Excel table displaying the top selected candidate profiles, including the 12 likelihood ratios for each of the displayed profiles. The likelihood ratios can then be sorted to show the largest likelihood ratio across the 12 categories of race and family relationship type. Colorado uses this greatest likelihood ratio statistic to make decisions on which candidate profiles should proceed to Y-STR lineage testing to further test and support family relatedness. The lab shared that close family relationships (e.g., parent/child, sibling) typically have likelihood ratios above 200,000:1. In an example search with one real pair of relatives, the highest likelihood ratio was 60,168,412:1, while the next 20 highest (all non-related profiles) ranged from 1,554:1 to 102:1.

In 2012, the Denver PD Crime Lab applied for a grant to transform the program into a cloud-based web tool. Much of the development of this version focused on encryption and security since it runs on the internet as opposed to a secured laboratory computer. The speed of this online version, according to those involved in its development, is solely limited by how fast of an internet connection the lab has and how quickly it can upload profiles to the program. The program is based on similar calculations as the 2010 software, but it allows for varying numbers of DNA profile loci to accommodate changing standards.³ The software also produces more visuals to help interpret the search findings. The new software is still being refined, but the Denver PD Crime Lab expects to begin using it in 2017. The lab has not yet decided whether it will be available for free to other labs.

Policy

Colorado has no specific legislation around FDS that expressly allows or prohibits its use. Familial DNA searching in Colorado was initially⁴ governed by the “Colorado Bureau of Investigation DNA Familial Search Policy” (publicly available at http://www.denverda.org/DNA_Documents/Policies/CO%20FS%20Policy.pdf). CBI developed this policy in-house, which was then reviewed and approved by the Attorney General’s office, and subsequently put into effect on October 22, 2009. Although CBI developed this policy with special consideration for issues of privacy and constitutionality, one interviewee wished that more input had been solicited from legislators or other interest groups during the development stages.

The policy defines familial DNA searching as “a deliberate search for biologically-related relatives of a contributor of an evidentiary profile conducted with specialized (non-CODIS) software designed for this purpose.” CBI made sure to point out in the policy that FDS was not prohibited and acknowledged privacy concerns related to searches, including potential family issues that may arise when contacting relatives. The policy goes on to detail the procedures all familial searches in Colorado must follow from the initial request through investigation (see *FDS Process* section below).

³ At one point 13 loci were required for inclusion into CODIS, before changing to 15, and currently CODIS is moving to 20 loci.

⁴ In February of 2017, CBI incorporated its FDS policy into their “Biological Science Submission Guidelines.” This policy does not detail specific procedures to the level the previous policy did, but it defines FDS and notes eligibility criteria and that the practice requires specialized testing and reviews due to privacy considerations

FDS Process

Request and Eligibility

Familial searches in Colorado originate from two places: (1) analysts within the lab identify cases they think are good candidates for FDS and go to their lab director requesting permission for a search or (2) a law enforcement agency comes to the lab and requests FDS be done on a case. In either situation, the case must meet several criteria before moving forward with an actual familial search.

The case must have already undergone a traditional CODIS search and returned no matches, and the lab must be satisfied that law enforcement has exhausted all other investigative leads. The crime scene DNA profile must meet certain quality criteria: it must be a full autosomal profile and, in the case of males, have a full Y-STR profile. The lab also reviews the case to ensure it is a compelling case to justify the expenditure of familial searching resources. This determination may consider factors such as the case's public safety implications, the age of the case, and the types of evidence available. Colorado's FDS policy contains no specific restrictions regarding crime type, and interviewees recalled conducting FDS on cases ranging from property crime to homicide.

"I don't know if we would deny on a particular offense. My philosophy is if there's a detective who is working a case whole-heartedly and has a desire to try to solve, that's our role then to try to support him in that process... It's come to us, talk to us, and see what you got."

In cases where law enforcement comes to the lab requesting FDS, representatives of the lab meet with the requester in-person to review the case and explain the familial search process. This meeting also includes some introductory information about DNA, how inheritance works, and how to interpret FDS results. At the end of this meeting, the investigator signs a form indicating their understanding and promising to continue with the case if FDS generates a lead. Crime lab and law enforcement representatives in Colorado both emphasized the importance of this last step- both actors committing to and taking ownership of the case and ensuring they will make the best use of each other's expended time and energy.

Lastly, once the case has moved to the point where the lab and law enforcement are committed to moving forward with the case, they will bring the prosecutor on board and ensure all parties are willing to pursue the case if FDS generates a lead. Ultimately, the final decision on whether or not to proceed with a familial search is made by the crime lab director.

Familial Search and Lineage Testing

While CBI manages Colorado's SDIS database and runs their familial searches against this database, the Denver PD Crime Lab only has access to their much smaller local database. In most cases, rather than conducting FDS with this smaller database (approximately 2% the size of the state database), analysts from Denver export their case(s) of interest onto a USB flash drive and physically go to the CBI lab to conduct the search with the state offender database.

Once the search is completed, the analyst will review the results and determine which, if any, profiles should undergo Y-STR testing based on the strength of the likelihood ratio statistics for each candidate profile. This determination will be made based on a combination of several factors including the profile's placement on the ranked list (i.e., top 10, top 40, top 100), the likelihood ratios (i.e., 15 profiles all around 45,000 or 2 profiles above 1 million before a steep drop-off), and the time and resources the lab has and is willing to expend on the case.

Any candidate male profiles the lab chooses to move forward with then undergo Y-STR lineage testing to provide further support for true relatedness.⁵ If none of the profiles are a Y-STR match with the crime scene sample, the analyst may circle back to the ranked list of candidates to see if they want to pursue more or they may stop. Female profiles do not undergo this step as they do not contain a Y chromosome. Neither CBI nor the Denver PD Crime Lab have the capability to conduct mitochondrial DNA searches, so female candidates found in the familial search move straight to the next step. Any potential relative (male or female) also undergoes a series of administrative checks on the analysis and reporting to ensure all DNA analysis and interpretation work was done correctly, and the CODIS profile samples are reprocessed before any identifying information is released to investigators.

Release of Information to Investigator

Before the identity of the potential relative is released to law enforcement, the investigator must undergo an informal training on FDS covering a basic understanding of what FDS is and what the results mean (see *Training* section below). Crime lab analysts emphasize that any name released to law enforcement is that of someone *potentially related to the suspect* and not of anyone *directly involved in the crime* being investigated. Those involved in FDS in Colorado see this as a key to protecting the privacy of relatives.

Once an investigator has been trained, the lab releases the identity of the relative in the CODIS offender database, again stressing that this is *not* the person who committed the crime, and gives the investigator clues as to the type of family relationship (e.g., parent-child, sibling) based on the FDS results (again, this cannot be concluded with certainty, but higher likelihood ratios for certain relationship types may indicate the most probable relationship). This meeting typically occurs in-person, compared to a normal CODIS match where the results are e-mailed to investigators. All crime lab interviewees also stressed the importance of following-up with police on the release of identification, noting that it helped build trust for future work. In cases where no potential male relatives are identified through lineage testing, the lab will send a memo to law enforcement which notes that the search was conducted with no confirmed male relatives and may share information about potential female relatives who could not be confirmed or excluded based on lineage testing. A victim advocate also discussed the importance of informing victims about the use of FDS, explaining that justice professionals would follow similar protocols to those used for new investigative activity on cold cases.

Investigation and Collection of a Confirmation DNA Sample

Investigators' typical first step involves building a family tree to try to identify a suspect. They review law enforcement databases (e.g., National Crime Information Center, Colorado Crime Information Center, etc.), school records, and social networks like Facebook or Twitter, among other sources, for information. Investigators also use their knowledge of the community and the family involved to build this tree. Based on the information from the crime lab, the investigator knows what the most likely relation is between the potential relative and the offender (e.g., father-son, sibling). One example given by an interviewee was that the crime lab might tell an investigator the crime scene sample came from a brother of the relative identified through FDS. After constructing the family tree, the investigator could find that the potential relative had three brothers, but only one lived locally and was likely to have committed the crime in question. The investigator then knows to focus their attention on this suspect.

Once the investigator is confident they have identified a suspect who committed the crime in question, they need to collect a new DNA confirmation sample from the suspect to compare against the crime scene DNA sample in order to confirm or refute an exact DNA match. Investigators can collect the confirmation sample through three means: by court order, consensually, or surreptitiously. To get a court order, the

⁵ A Y-STR match strongly supports a familial relationship, as Y-STR lineage testing compares alleles that are identical among paternally related males but highly varied among the larger population. However, it is not an iron-clad confirmation of relatedness as the alleles may mutate (though their mutation rate is very low) or two unrelated individuals may share a common male ancestor hundreds or thousands of years ago.

investigator goes to a judge to get a warrant to compel the collection of a DNA sample from the suspect. These warrants are issued on probable cause, and multiple interviewees cited FDS as a much stronger source of probable cause than many other types of evidence. A consensual collection would be simply asking the suspect to give a DNA sample, without compelling them to do so as with a court order. The last method, surreptitious collection, would be to collect a sample of the suspect's DNA without their knowledge or consent (e.g., from discarded silverware at a restaurant). Which method investigators employ depends on the facts of the case.

Court/Trial

“The first time people would have to... bring in scientists to show that even though it's not direct DNA it's familial DNA, that it's still scientifically credible and is valid and should be allowed and admissible evidence in court... Once that's done a couple times, the other prosecutors would have to jump through minimal hoops to get it done.”

While Colorado has not had any FDS cases go to trial or any motions on it litigated, interviewees spoke to the hypothetical situation of a case getting to that point. All stakeholders were confident that FDS cases would be treated like cases with a regular CODIS DNA match or any other scientific evidence. This is because the FDS results would be treated as an investigative lead, whereas the exact match between the confirmation sample and crime scene sample would be the evidence used to adjudicate the case. Because it would be new, however, interviewees conjectured that early FDS cases might require pretrial hearings on the

admissibility of DNA evidence arrived at through FDS. Notably, one judge ruling to admit FDS evidence would not bind other judges to the same ruling. A case would need to be appealed, and an appellate court would need to rule on it for the decision to be binding.

Once FDS evidence is allowed, stakeholders were less clear of the role it would play during the trial. One interviewee noted that it would not come up at all as it is simply an investigative lead that helped police arrive at the suspect and has nothing to do with the trial. One stakeholder with a legal background noted that while the defense bar prefers to keep CODIS out of trials so the jury does not think of the defendant as a convicted felon, they were unclear as to how the defense would prefer to treat someone's relative being in the database. Another posited that FDS might come into play to lend further weight to the DNA comparison sample match. Ultimately, the treatment of FDS at trial is untested in Colorado, but these perspectives demonstrate some of the considerations for this stage.

Training

“We don't want to make it a special thing that people fear... This is another tool that we can use.”

For Lab Staff

As part of implementing FDS, both CBI and the Denver PD Crime Lab had to train lab staff on how to conduct familial searches. CBI made training on Y-STR analysis and familial searching standard for all casework staff to ensure everyone is comfortable with the processes and confident in their ability to turn to it. In the Denver lab, only a few analysts are trained in the logistics of conducting FDS, though all of them are trained in conducting Y-STR analysis. Training in both of the labs heavily stresses the logistics of performing FDS, the meaning of the search and resulting information, and principles of relatedness, while some staff are also taught the math behind the calculations.

For Police

Training of investigators in FDS is considered essential in Colorado and a requirement before initiation of a search. Beyond the education and training offered by CBI and the Denver PD Crime Lab as part of these requirements for individual cases (see above for more detail), most trainings on FDS in Colorado have



been conducted by the Denver DA's Office. An estimated 30 homicide and sexual assault investigators have been trained on FDS in a sit-down, classroom setting by the Denver DA's Office. This formal training covers the case requirements to be considered for FDS, privacy considerations regarding family members, background information on CODIS, the meaning of a Y-STR analysis, information on how to construct a family tree to find a suspect, and how to collect DNA for a confirmation sample. This training occurred more regularly at the start of the program.

“The underlying theme is, ‘this is not an identification.’ That is the biggest part. You are not to act as if this is an identification. This is saying that we believe, with this level of certainty, that there is someone who is related to a person who matches within this... We’re not going to run out and say that this person did it, because they didn’t.”

Stakeholders also noted less formal ‘trainings’ sometimes occurred when an investigator at a law enforcement agency contacted the Denver DA's office saying they had an FDS result they needed help with. In these cases a trainer would go out to the agency and work through the case with them. Background information on FDS and any science behind the practice are left out of this training, which mainly consists of working through the case together to assemble a family tree and ultimately identify a suspect. One law enforcement representative did say that general awareness of familial DNA in Colorado was low and expressed a desire for more education on the practice to let prosecutors and investigators know that it exists and can be used as an investigative tool.

For Judges/Attorneys

Colorado has not held any formal trainings on FDS for judges or attorneys, though CBI has held meetings with DAs across the state that included familiarizing them with the practice. Interviewees did not expect any formal training for judges to be required. One interviewee stated that judges often have to oversee cases involving diverse types of scientific evidence which may be of varying familiarity to the judge, learning on the job, and that FDS would probably be treated similarly. They also noted that many criminal judges have some knowledge of DNA due to their backgrounds as prosecutors or defense attorneys, so they may quickly grasp the concept of FDS.

Collaboration

Between Agencies

Familial DNA searching in Colorado arose naturally as an extension of the Denver Cold Case Project. This helped ensure buy-in from the key players involved in that project: labs, police, and prosecutors.

“If you send back communication as an investigator, back to the lab and give them an outcome of what happened, you’re not necessarily doing anything so much for that case, but you’re building a bond and a relationship for the future ones, because they know you actually care, and they feel a little bit more buy-in.”

These actors constantly communicate and work together and have an established working relationship. Interviewees from all three groups consistently cited this relationship and the pre-existing trust between them as an enormous reason Colorado's FDS adoption moved so fluidly. Interviewees stated the lab must believe that police and prosecutors will put the work they do to good use, law enforcement must have faith in the lab's credibility and listen to what prosecutors say they need for a case, and prosecutors need to trust that law enforcement has done its job and proceed with charging the case. Specifically on FDS cases, these three entities work together from the beginning of the search and stay in communication through the entire



process to ensure this bond remains strong. The strong leadership and collaboration from the outset between the Denver PD Crime Lab and Denver DA's Office especially helped propel FDS beyond the local level.

Between States

The Denver PD Crime Lab has spoken with agencies in other states about cross-state familial searches, but, to date, they have been unable to collaborate with other states in this way. As of publication, they have shared their FDS software with six other states (Illinois, New York, Utah, Virginia, Wisconsin, and Wyoming) and one county in California. Representatives from Colorado law enforcement agencies, laboratories, and District Attorneys' offices have also gone to four other states (and Canada) to train jurisdictions on the FDS process.

Several interviewees expressed interest in developing the ability to conduct FDS regionally, not just within Colorado. These stakeholders noted that crime does not have state borders. Offenders may cross state lines, and families may move across the country. They argued that while a regional search capability would be useful for Colorado and its neighbors, it would be especially beneficial along the East Coast where states are smaller, much more densely packed, and easier to move across.

Challenges and Concerns

Familial DNA searching has its share of critics, and as the earliest adopter of FDS in the United States, Colorado has often been the first to encounter these controversies. When asked what concerns were raised around the implementation of Colorado's FDS policy, stakeholders noted that no large opposition was brought forth in Colorado but that some did question whether it violated peoples' privacy rights or protections under the Constitution. One interviewee expressed concern over how police would act once they had received FDS results from the lab and thought any challenge would come from investigators violating procedure as opposed to the forensic technique itself. Stakeholders were optimistic they had adequate protections in place, asserting that investigators go slower and are more methodical on FDS cases than other cases. They also noted that family privacy should not be compromised because there is no reason for the investigator to contact the family.

However, one interviewee expressed concerns with Colorado's policy itself, calling it a "fox guarding the henhouse scenario." This individual desired more concrete language in the policy and greater judicial oversight throughout the process and expressed doubt whether any FDS request had been or would ever be denied. Some stakeholders also cited a general suspicion of law enforcement, distrust of technology, and fear of DNA surveillance among legislators and the general public as a potential challenge. Some were skeptical that a legislative measure allowing FDS would pass in Colorado due to these reasons.

"My mission is to do justice. I'm always looking to be more efficient... So long as you don't interfere with constitutional rights. That's where it gets interesting, doing it in a way where society is comfortable."

"You have proponents, you have opponents, you have some that are waiting to see. Most are waiting to see. But it's like anything else in the world, right? New technology, you're going to have early adopters, you're going to have those that wait, and you're going to have those that are skeptical."

Lastly, a small number of stakeholders had questions about the accuracy of the searches and expressed varying levels of confidence in the software. A lab interviewee noted the possibility for false negatives, that half-siblings with different fathers would not match on Y-STR tests even though they are closely related. Another noted concerns over quality control testing and validation of the software through the course of its development, though the individual also



said that it had improved over time while another noted that an external auditor approved the state lab's validation of the software. An interviewee also wondered whether a legal challenge could be raised in court over the software's accuracy.

Costs

Like any service or investigative tool, FDS does have costs associated with it. The most commonly cited cost in Colorado was time, a very limited resource in busy police departments and crime labs, many of whom across the country have large backlogs of DNA profiles. Some stakeholders asserted FDS cases could take up to four or five times as long as a normal case for crime lab analysts to work on. One interviewee said, "It is more expensive, hugely more time-consuming for those analysts, and you've got soft costs involved..." Another crime lab employee argued that the familial search itself took very little time, but any follow-up Y-STR testing and interaction with investigators could prove time-consuming.

"There are a lot of people who are the victims of burglaries who do not feel safe for a long, long time. And so, trying to bring some resolution to them... Or the sex assault victim? To where you can turn around and go, 'Yeah, we believed you and what happened to you was wrong.' Put a price tag on that one for me."

The other major cost cited across the board is that of scientific supplies needed to perform Y-STR tests. These Y-STR tests are not conducted in normal CODIS match cases and represent an additional cost for reagents and testing kits. Some lab employees argued that all labs should be, and many are, moving toward regularly performing Y-STR testing on all DNA profiles, which would limit their additional cost impact in FDS.

Another potential cost associated with FDS is the software required to perform a search. Colorado developed their software in-house, which took numerous labor hours (the equivalent of about 1.5-2 months of a full-time staff member's time). Colorado currently offers their FDS program for free to any interested jurisdiction, but stakeholders were unclear if this will always be the case.

Benefits

"I think it's an incredible investigative tool... Particularly if you're talking cold cases or public safety cases where your traditional investigative leads are not yielding a suspect and you have an ongoing victimization that's occurring. It's worth its weight in gold."

While Colorado has only witnessed one plea agreement as a result of the use of FDS so far, stakeholders are extremely optimistic about its potential to help. They see FDS as a useful investigative tool to provide leads and ultimately solve cases. Multiple stakeholders cited its potential to prevent future crimes by catching offenders, saving the community money by closing cases, and helping find justice for victims and their families. One interviewee said, "I think that it's important, too, that you can tell victims that you're not just sitting around waiting for a

DNA match, for the guy to get into the database. That you are trying things." Stakeholders also posited future applications for FDS that are not currently being used. Multiple interviewees thought it could be used as exculpatory evidence, helping clear suspects in cases just as easily as identifying suspects.

Needs

Stakeholders identified several practical and technical needs within the state related to FDS. Some wanted the FDS software to have a higher reliability and stronger statistical proof for familial relationships.



Others cited additional resources, from time to money. Several lab employees referred to various aspects of lineage testing, noting they wanted to make Y-STR testing on all male profiles standard practice or expressing desire for the development of a similar test for female profiles, such as X-STR testing. One interviewee also thought an easily searchable, cross-state database of vital statistics would aid investigators in constructing family trees.

Lastly, stakeholders across agencies commonly expressed a strong desire to solve a big case in Colorado using FDS.

They thought this would aid the cause of FDS by allowing many of the discussed potential benefits to be realized as actual benefits and demonstrate the capability of the practice.

“We’re not going to say, ‘we’re not going to do this because we haven’t had hits.’ CODIS would never have gotten as big as it has if people had that viewpoint... We haven’t had a positive result, but it doesn’t bring us down.”

Conclusion

As the first state to use FDS and a strong advocate for its use nationwide, Colorado represents an important case study for better understanding the primary benefits and challenges of FDS and serves as a guide for those states thinking of adopting the practice. Some of the highlighted benefits, challenges, and lessons learned identified by key stakeholders are discussed in the *Cross-Site Lessons Learned* section, found at the end of this series of case study briefs.





California



State Characteristics (2016):

State Population: 39,250,017

SDIS Size: ~2.6 million (convicted & arrestee)

Year of Implementation: 2008

Governing Policy: California Department of Justice
DNA Partial Match Policy

Software Used: California Department of Justice
Ratiometer

Database(s) Searched: SDIS Convicted Offender
Database

Introduction

California began conducting familial DNA searching (FDS) in 2008, when the California Attorney General's (AG's) Office passed a statewide policy governing the use of the practice. The state has developed its own software to conduct FDS and has formed a Familial Search Committee to oversee the use of FDS and the release of results. California first performed FDS in October 2008 on the now infamous Grim Sleeper serial killer case. Since then, California has experienced multiple successes identifying serious offenders using this forensic technique.

History

The California Department of Justice's (CA DOJ) Familial Search Program began amid a growing national interest in partial matching. In 2007, the FBI enacted a policy permitting states to share interstate moderate stringency matches (or partial matches). As a result of this policy change, stakeholders in California began to more seriously consider how partial matches could aid investigators in their cases. Interviewees explained that because of the state's large database of samples, CODIS is insufficient in identifying relatedness between DNA samples based on a partial match. This, coupled with the new understanding of the potential benefits of disclosing partial matches, led to an interest in conducting FDS, which the state lab began researching and learning more about. In order to garner support, proponents of FDS, including at least one with strong connections to FDS advocates in Colorado, began conducting trainings and giving presentations across the state to local district attorney's (DA) offices and law enforcement agencies.

"Because we knew there was the potential for identifying relatives in big databases we looked for a way to do it more accurately and expeditiously, and that's how we got started."

California's state DNA laboratory, the CA DOJ Jan Bashinski DNA Laboratory, developed its own software to conduct FDS. Before presenting the software to the AG, the Jan Bashinski lab thoroughly validated their software and procedure for conducting FDS. The AG approved the lab's proposed protocols for conducting FDS, including the Committee structure and function, the set criteria for conducting a search, and the procedural checklist to use for each case.



In 2008, the AG's Office disseminated a policy memo to all California law enforcement agencies and DA's offices on the use of FDS. The memo specified the conditions law enforcement needed to meet in order to request FDS on their case, eligibility criteria for conducting FDS, and steps for initiating and proceeding with a familial search (see *Policy* section below). In addition to the validity of the software and procedure for conducting FDS, the AG's Office vetted the legality of the practice. The memo addressed common legal and ethical concerns related to FDS, ultimately concluding that the practice was an appropriate way to aid selected serious investigations. At the end of this extensive scientific validation and legal review process, California enacted the guiding administrative policy, subsequently creating the Familial Search Program.

Once FDS was approved for use, California began performing it in select cases approved by the Committee. From the outset, California ran cases on an individual basis (searches for a specific case) as opposed to in batches (searching across multiple cases as Colorado did in the beginning of their implementation). One of California's first familial searches helped solve a high-profile serial murder case dating back to 1985 (*see sidebar*). Since then, California has successfully identified suspects in a number of cases using FDS.

FDS Cases

In California, only the state lab performs FDS. Through 2016, California has conducted familial searching on 162 cases across the state (all individual case searches). Of those cases, seven have had confirmed familial associations, and four of those have resulted in convictions. To date, no cases have experienced pre-trial motions or other legal challenges contesting the use of FDS.

Per state policy, CA DOJ will only conduct FDS on cases that have already gone through a CODIS search and where investigators have exhausted all other leads. Therefore, most of the cases that have involved a familial search have been cold cases ranging in age from just a few months to decades old. At the local level, some law enforcement stakeholders shared the number of cases they have requested a familial search for, which varied from a handful of cases to making numerous requests for cold cases. The types of crimes for these 162 cases included: homicide, rape/sexual assault, and robbery.

The Grim Sleeper

Lonnie David Franklin, Jr. is a serial killer responsible for at least 11 murders and one attempted murder in Los Angeles from 1985 to 2007. A 14-year pause in his crimes from 1988 to 2002 earned him the nickname, "the Grim Sleeper." The LAPD cold case unit reexamined the murders in 2007 as part of *NIJ's Solving Cold Cases with DNA* program. After a CODIS search found no hits, California performed a familial search in 2008, also to no avail. Eighteen months later, the state lab ran a second familial search with several hundred thousand new offender profiles in the database. An association was made to Franklin's son, who was in the DNA database for a felony weapons conviction. After further investigation, detectives surreptitiously collected a piece of discarded pizza with Franklin's DNA, and matched that sample to DNA found at multiple crime scenes. The LAPD arrested Franklin in July 2010, and in 2016 he was convicted of ten counts of murder and sentenced to death.

Jeremy Delaunay

In 2014, in Vacaville, CA, Jeremy Delaunay sexually assaulted a woman along a bike path. DNA obtained from the victim's rape kit did not match any samples in CODIS. After exhausting all investigative leads, Vacaville police submitted a request for FDS to CA DOJ. The Jan Bashinski lab conducted an FDS search and identified a possible relative in the state database. Further investigation by CA DOJ suggested Delaunay may be the perpetrator, and, with this information, Vacaville police investigated Delaunay and surreptitiously collected a DNA sample. CA DOJ confirmed this sample as a match to the DNA from the rape kit. Vacaville police then obtained a search warrant for Delaunay's DNA and, once that sample was also confirmed as a match, arrested Delaunay. He pled guilty to rape and was sentenced to six years in prison.

Software

In order to conduct FDS, the Jan Bashinski lab developed specialized software named the “Ratiometer.” An external technical consultant and lab staff developed the software as a standalone application outside of CODIS. The lab conducted an estimated 100 test searches involving autosomal STR and Y-STR profiles from simulated test families. Stakeholders noted that creating the software was a major undertaking, but one that was necessary to fully vet it and ensure it was effective for the lab’s intended purposes.

The Ratiometer calculates kinship likelihood ratios for a given DNA crime scene profile with the profiles from the state’s database. Similar to the software described for Colorado, the Ratiometer software generates 12 kinship indices that establish statistical likelihoods that the provider of the crime scene DNA sample is a relative of an offender in the state’s database (see previous Colorado case study for more information about likelihood ratios). The software produces ranked lists based on the 12 kinship indices that show offender profiles with kinship indices above an established threshold. Similar to the Colorado software, these lists are broken down by familial relation type (parent-child, sibling) and race (African-American, Caucasian, and Hispanic). The lab runs the search for both 13 and 15 loci (approximately 300,000 samples in the state database only contain 13 loci from before the state moved to a 15-loci standard.) Only the most highly ranked profiles (up to 200 profiles) are selected for Y-STR typing to further test for relatedness.

Policy

California has no legislation specifying the use of FDS. Instead, it has a statewide policy permitting both the use of FDS and partial matching (publicly available at http://ag.ca.gov/cms_attachments/press/pdfs/n1548_08-bfs-01.pdf). However, the Jan Bashinski lab rarely proceeds with partial matches identified through routine CODIS searches since they find FDS to be more accurate.

“I think California’s program should be a model for states who want to implement familial searching.”

The FDS policy, drafted by forensic DNA scientists and deputy attorneys general in CA DOJ and subsequently approved by the AG’s Office, defines FDS as “a search of CA SDIS (CAL-DNA) for the purpose of attempting to identify a putative perpetrator of a crime by comparing a forensic unknown profile with offender profile(s) that may be from a genetic relative.” Per state policy, the profile is searched only against convicted offender profiles in the state database; no arrestee samples are included. The policy also includes descriptions of the familial search process, confidentiality protections, and how to share results (both when the search results in a potential family association and those instances when it does not). The policy emphasizes that FDS should only be used in cases where there are no further investigative leads to pursue and details the essential criteria a law enforcement agency must comply with prior to requesting a familial search on a case (e.g., having a complete Y-STR profile of the crime scene evidence). Finally, the policy outlines the steps for initiating a request and the local investigative agencies’ responsibility for costs incurred.

FDS Process

The DOJ Committee

The CA DOJ Familial Search Committee coordinates the FDS process across the state. Seven members comprise this independent committee, including Jan Bashinski lab staff, Deputy Attorney General, state prosecutor, and state and local-level investigators. CA DOJ created the Committee to review all requests made to the state lab to conduct FDS through the lens of the state’s policy. Because California has put a strong emphasis on ensuring each familial search upholds the standards of the state policy and does not



infringe on any individual rights, the Committee is intimately involved in every step of the search process. During the course of an FDS case, the Committee may convene multiple times in order to vote on certain criteria or review information. The Committee and its members are dedicated to ensuring FDS is done judiciously and that all key players are kept informed throughout the process. Committee meetings are held in-person at the Jan Bashinski lab and the majority of committee members, regardless of where they reside, participate in the meeting in-person. Members said they worked well together and did not point to any barriers or challenges when convening to vote on a component of the familial search process. A significant feature of the Committee is that every member must be in agreement before a stage of the familial search process can proceed. Therefore having a positive, collaborative relationship aids the group in making decisions and moving the process forward.

“It’s a little laborious, but I think the committee is an important component. We have a lot of really smart people with different perspectives and having that oversight is very useful. It speaks to how carefully we do it, which is important.”

Request and Eligibility

The familial search process for a case starts with an initial written request from a local investigative agency to the director of the Jan Bashinski lab. Familial searches are 100% agency driven; only at the request of an investigative agency will a case be considered by the Committee. The director of the Jan Bashinski lab will convene a meeting of the Committee to discuss the case and vote on whether all criteria are met for conducting a familial search. The policy states that the case must have a “critical public safety implication” and that all investigative leads must be exhausted. Additionally, the Committee will review the evidence to ensure the sample meets the requirements (e.g., there is a full DNA profile with 15 loci, the lab has already completed Y-STR testing on the crime scene sample). New and old cases are eligible for FDS, but all cases must meet the eligibility requirements outlined by state policy.

The investigative agency, prosecuting agency, and chair of the Committee must sign a submitted memorandum of understanding (MOU) before the Committee can convene to review the request. This MOU affirms that the case is in compliance with state FDS guidelines, both the law enforcement and prosecution agencies will pursue any leads resulting from the search, and the prosecutor will be engaged with the process by coordinating with law enforcement and participating in meetings related to the familial search. Finally, the MOU outlines CA DOJ’s role and their procedure for conducting FDS.

Familial Search and Lineage Testing

Prior to conducting a familial search, the Jan Bashinski lab will first conduct a standard CODIS search. Although a standard CODIS search should have already been done for the case prior to being approved for FDS, a search is done again because the lab has found that sometimes cases get a hit in CODIS at this stage (possibly due to new offender profiles being added since the last CODIS search), forfeiting the need for a familial search. If the case does not get a hit in CODIS, the case proceeds through the familial search process. A CODIS administrator who is trained on FDS will run the search with convicted offender samples from SDIS. Once the software produces the ranked list of candidate family profiles, the laboratory staff will remove any duplicate DNA samples in these lists, confirm that the sample is truly from a convicted offender (as opposed to an arrestee), and set aside any samples that are female (as female profile cannot undergo Y-STR analysis). The Jan Bashinski lab will then run Y-STR testing on the remaining samples (see Colorado case study for more information about Y-STR analysis).

Additional Non-Genetic Research Prior to Release of Identity

California’s policy states that if the two Y-STR profiles match, the CA DOJ Bureau of Investigation (BI) will conduct a review of non-genetic information. The BI’s activities are completely independent of any



requesting agency investigation and intended to support or dispel the hypothesis that the individual identified is related to the perpetrator. The nature of the investigation is non-invasive- the BI utilizes various databases, such as DMV, birth, and property ownership records to conduct their research.

As mentioned previously, female offenders in the database cannot undergo Y-STR testing since they do not have a Y chromosome. Because the Jan Bashinski lab does not have the capability to do lineage testing with female profiles, their policy forbids the release of information on a female family candidate through the familial search alone. In order for female candidates identified during the familial search to progress to the next stage of FDS, CA DOJ must collect additional information to support the hypothesis that this person is related to the contributor of the crime scene DNA. The BI will research all likely female candidates, and if they cannot identify additional supporting information, the identities of female candidates from the database will not be released to the requesting law enforcement agency.

Release of Information to Investigator

Once the BI has conducted their research, the Committee re-convenes to review the search results and accompanying non-genetic supporting information to determine whether the identity of the CODIS profile will be released to the local investigative agency. Any final decision, although usually made and implemented by the Committee, is left up to the AG's Office (e.g., if a consensus is not made among committee members).

If the Committee decides to release the identity of the potential family member in CODIS, the Committee and BI will hold an in-person meeting with the requesting police agency, DA's office, and crime laboratory. The information is written up in a formal, structured memo explaining the search results and the Jan Bashinski lab's process for obtaining the results. The memo emphasizes that there is a "reasonable probability" that the person identified is a relative of the individual who committed the crime being investigated and explains the genetic basis for this conclusion. During the meeting the BI also shares the information they found during their review of non-genetic information. Interviewees emphasized the importance of the educational component of this meeting including detailing how a familial search is performed and what the results convey. The Committee reminds the investigative agency of the caveats associated with the release of the information, particularly that the Committee is providing the investigative agency with the name of a person related to the perpetrator, *not* the name of the perpetrator. Legal and privacy concerns (e.g., privacy expectations of family members during course of the investigation) are also reviewed and addressed as needed before the name of the familial relation is released.

"Everything is tightly controlled, they don't release names until their t's are crossed and their i's are dotted and they are certain that there may be some type of familial relationship."

Most frequently in California's experience, the Y-STR testing results in no matches between convicted offender profiles and the crime scene sample. In this situation, the Committee sends a letter explicitly explaining that no match was found but that the Jan Bashinski lab will continue to do a routine search, on an annual basis, since new offender profiles continue to be added to the state database.

Investigation and Collection of a Confirmation DNA Sample

Once the local investigator receives the name of the potential relative (and possible suspect if that could be deduced from the BI's research through public records), the investigation typically follows standard procedures, as reported by interviewees. The investigating agency will collect a DNA confirmation sample from the suspect to directly compare against the crime scene DNA sample. This will confirm or refute an exact DNA match. Generally, this sample is collected surreptitiously in California FDS cases. One interviewee explained that by only using surreptitious samples to confirm a match, investigators are protecting family members' privacy. To date, no known cases had warrants requested for the confirmatory DNA sample based on a familial search lead.

“When you do it through a surreptitious sample it takes all the wind out of that argument that you are invading this family's privacy. If you never contact any of the family members until the arrest is made, that's pretty clean.”

Court/Trial

California has had multiple FDS cases (four at the time of reporting) proceed through the court process. In these instances, FDS was not explicitly brought up as evidence at court, nor was it raised during pre-trial motions to contest the legality of the practice. Interviewees generally expressed confidence that an FDS

“Because we're certainly not [mentioning] that in court, because then the next question is, 'well what's the database made up of?' 'Oh, convicted felons,' which is obviously prejudicial to the defendant. So even with regular DNA hits we're only allowed to mention that the investigation led to the defendant.”

case would be treated like a regular CODIS DNA match case and that the use of FDS would not likely be raised in court. Interviewees explained that FDS is just another investigative tool for law enforcement and, as with any other tool, is not explicitly brought up in court unless the defense raises it as an issue (most likely during pre-trial motions). Interviewees also argued that FDS cases are no different than any other case dealing with DNA and do not raise any unique 4th Amendment questions compared to traditional DNA cases. One interviewee, however, did hypothesize that if FDS becomes more commonplace, there might be a case one day that challenges the practice, and courts would have to determine the constitutionality of FDS.

Training

For Lab Staff

All Jan Bashinski lab staff receive some training on FDS through a short module as part of a larger forensic DNA typing class. This training is offered annually, and laboratory staff take it at least once during their tenure. Additionally, anyone who works with CODIS may also receive some training on FDS through trainings on more general DNA topics. For instance, the California Criminalistics Institute (CCI) offers a class on the mathematical and statistical genetics of kinship that includes a discussion of FDS. Only a handful of personnel receive training on Y-STR typing and are experienced in the full extent of the familial search process. Laboratory staff emphasized the “learning on the job” nature of their work. CODIS operators and anyone who conducts searches develop the necessary skills by reviewing policies and procedures documents, shadowing experienced staff, and receiving mentorship and supervision from colleagues.



Local laboratories do not receive any formal training on FDS. One interviewee explained that this training is not required or necessary because the local laboratories are not doing the searches or other statistical analyses.

For Police

Both the Jan Bashinski lab and CA DOJ have put effort into educating law enforcement. Lab staff involved in FDS have gone to some law enforcement agencies to train personnel on this topic. These trainings introduce the state's FDS program and delve into the specific protocols and procedures for requesting a familial search and how to meet all the requirements outlined in the policy. Police may also receive information about FDS as part of the lab's general database trainings offered to law enforcement. Additionally, law enforcement may receive some training on FDS through their Peace Officer Standards and Training classes or trainings hosted by CCI. Although these trainings are not FDS-specific, if they are on the topic of DNA, interviewees believed they were likely to cover family searching to some extent. Finally, some of the most important education efforts occur during the in-person meeting the Committee holds with the requesting agency once they are ready to release identifying information from the search (described above).

For Judges/Attorneys

Judges and attorneys are also limited to broader trainings on DNA that may include content on FDS. CA DOJ offers a training once a year to judges on DNA and legal issues, so attendees receive some training on FDS at this time. One interviewee explained that judges do not need specialized training on FDS because they are already trained on DNA and would understand any legal issues related to FDS. The stakeholder explained, "There's nothing needed; in a sense this is pretty standard 4th Amendment stuff, reasonable search and seizure... That's what judges do, they just apply the law to different sets of facts they've never thought about before."

Attorneys only receive formal training on FDS through a training held by the California DA's Association on forensic science. Though this training is offered annually, attorneys typically only attend when they are first starting out in their career or when they have their first case related to DNA. As one DA shared, a small subset of prosecutors have expertise in DNA in California. This community has a strong relationship, they serve on various forensic science working groups and, at these meetings, FDS is often brought up as an option for local prosecutors looking for additional ways to solve their cases.

Collaboration

Between Agencies

The consensus among interviewees was that all agencies involved in the familial search process worked well together and that working relationships between different agencies are strong and productive. A contributing factor to this, as some interviewees shared, is that the start of any potential familial search rests on the assumption of interagency cooperation. Additionally, interviewees explained that a familial search has the potential to be a fruitful tool for investigative agencies and can foster a sense of collaboration. Stakeholders did not cite any barriers to collaboration during their interviews but instead spoke to several contributing factors that facilitate strong collaboration, including a solid understanding of the policy and procedures for FDS and a successful stream of communication between the investigative agency, local laboratory, and local DA's office. One local level laboratory shared that having routine meetings with local

"Everyone is just happy to have resolution, because these are cases where you haven't had a hit in years. You thought it was hopeless and then you have a new lead. People are motivated to go to the meetings."



investigators on cold cases helps strengthen relationships. The laboratory uses these meetings to give any updates they have on cold case searches they've done, as well as review cold cases and discuss potential ways to solve them- such as by proposing FDS as an investigative tool. Through these meetings, the laboratory and law enforcement agency have routine communication and a shared vision of how to solve cold cases, which keeps the momentum going and fosters collaboration.

Between States

To date, California has not been involved in inter-state familial searches. Interviewees said that inter-state collaboration may be useful if there's a connection between the states (e.g., they are part of the same region). However, looking at the national level, multiple interviewees stated that running FDS against a national database is currently impractical and should not be considered at this time. Interviewees gave reasons for this, including that most traditional CODIS hits happen within the same state and there may be logistical obstacles to pursuing interstate FDS leads. One interviewee said that having more genetic markers used across the county would be essential before moving to conducting FDS on a national database.

Challenges and Concerns

Overall, interviewed stakeholders did not have many challenges to note. They shared that CA DOJ's intensive effort in developing and refining their policy- which addresses privacy concerns, weighs costs and benefits, and ensures FDS is understood by stakeholders and therefore used properly- helped the state to avoid many challenges or controversies with the practice. The majority of interviewees acknowledged that some individuals may have

privacy concerns, but these interviewees perceived the benefits of FDS and the policy created by CA DOJ to outweigh potential concerns. Interviewees also felt that the legality of the tool was supported.

One interviewee in particular, though, did raise privacy issues related to FDS. The interviewee expressed concern with using DNA databases to investigate people whose DNA is not in the database, wondering whether using a family member's DNA to investigate someone else is a violation of people's right to privacy. The interviewee also brought up concerns related to racial disparities. Through FDS, they argued, the same types of populations will continue to be arrested while other populations that commit offenses, but may be treated differently in the criminal justice system, remain below the radar. Another fear was that the investigative lead produced by FDS may lead to wrongful convictions through false confessions of innocent individuals being investigated or through DNA erroneously linked to a crime scene (e.g., the DNA was there for other reasons or was improperly handled by police or lab staff). This interviewee did not believe this was necessarily unique to FDS cases but that it was a possible collateral consequence anytime an innocent person was being investigated.

"It's sort of a dramatic feedback loop of people who come from rough circumstances whose family members have been arrested are themselves much more likely to get in trouble... and that's not good for our society, to keep reinforcing historical disparities."

"...from my perspective, at least, there has been quite a bit of thought put into this in California. I think there are more than adequate and sufficient safeguards built into our policies here."

Stakeholders also shared that the use of FDS is currently limited to a very small number of cases in California. This view was echoed across different fields, including prosecutors, law enforcement, and laboratory staff. Most local-level interviewees shared that they had only requested FDS on a handful of cases. Only one individual said they had requested FDS on "many, many cases." Stakeholders noted that of these requests put in, very few result in a familial match and consequently, an investigative lead. While



stakeholders acknowledged the need to limit FDS to only the most severe cases because of its cost, they stated they hoped to see the practices expanded to more cases in the future. Another person discussed a challenge to expanding FDS to labs nationwide. This interviewee believed that many labs will not consider FDS at this point because they do not have the ability to perform Y-STR testing, a required step in the FDS process.

Costs

Stakeholders spoke to both tangible and intangible costs related to FDS. The Y-STR kits for multiple profiles can cost up to \$20,000 per search. Stakeholders explained that the cost of running the initial Y-STR testing can cost up to a few hundred dollars per profile. The costs are even greater for familial searches that identify a potential relative. Lab staff shared that in those cases, an additional estimated \$5,000 in costs is expended in continuing with the search process (e.g., re-testing, laboratory staff labor and BI labor). Stakeholders indicated that the cost in California is so high partly due to the size of their offender database. They are running a search on an offender database of almost 2 million profiles, a number significantly larger than any other state.

Stakeholders spoke to another significant cost: personnel time. The Jan Bashinski lab staff and Bureau of Investigation staff all dedicate time to conducting a search. To request a familial search or pursue one if there is a match, local investigators, laboratories, and DA's offices can incur additional costs related to the case, although it's unclear how many of these would occur with any high-priority investigative lead. As one interviewee explained, "Once we get the information, everyone works overtime to get the confirmation sample. So however many law enforcement officers you need to follow these people around. Then there's the lab doing overtime waiting for the sample to come in." Additionally, local entities incur travel costs for attending in-person meetings with the state FDS committee.

Creating the software was also costly. An interviewee estimated that developing the software cost nearly half a million dollars when accounting for personnel hours spent (estimated to be at least 3,000 personnel hours), the number of test samples run, and the amount of time spent fully validating the software.

Benefits

Interviewees overwhelmingly praised the role of CA DOJ in making FDS a successful and effective process. While FDS may have associated costs and concerns, many interviewees emphasized the many checks and balances CA DOJ implemented to protect the rights of people. They explained that focusing on only the most severe cases is a benefit of the program, and that CA DOJ has addressed privacy concerns through their written policy and through the Committee structure. Interviewees also stated that

"You're saving a number of victims from being victimized. You're saving the resources that law enforcement dedicates to investigate crimes, medical costs, all kinds of resources... Not to say anything of the incalculable trauma to a victim- you can't put money on that."

disclosing the information to a limited number of people and clearly explaining that the information FDS produces is an investigative lead, not the confirmed perpetrator of the crime, helps to ensure the program's success.

Most stakeholders explained their perception of the benefit of FDS with a common refrain: "it is another tool in the toolbox." FDS is an additional investigative tool law enforcement can use to potentially solve a case, catch an offender, save a victim, or prevent future victimization. Interviewees remarked upon the nature of the cases FDS is used on- severe cases, often with multiple victims. Another interviewee noted that in serial offense cases, FDS could be

"There's fiscal challenges if the expectation becomes to do it frequently. But I honestly think with the way the technology is going and the development of rapid DNA and other technologies, Y-STR will become quicker and less expensive."



preventing numerous future victimizations, even "15, 16, 17 victims from a horrendous type of crime" - all of which would ultimately also need investigation resources if left unsolved.

“you’re saving a number of victims from being victimized. You’re saving the resources that law enforcement dedicates to investigate crimes, medical costs, all kinds of resources that go to investigating. Let’s just say one rape case, one rape case costs a lot of money. Now to say nothing of the... [JP’s phone rang] the incalculable charge of the trauma to a victim, you can’t put money on that. You’re saving victims from those experiences.”

Needs

When asked if they or their organization have any additional needs related to the FDS process, some stakeholders mentioned the need for more resources – a need that points to the costs associated with FDS and with investigating cold cases generally. Other stakeholders conveyed the wish for more training. Some interviewees said more training was needed for all stakeholders involved, while others cited specific entities that needed training, such as judges or attorneys working on wrongful convictions. One interviewee explained that law enforcement needed more training because they perceived only “high-level detectives” to be aware of FDS. This, compounded by high turnover within law enforcement, means the majority of law enforcement personnel may be unaware of the availability of FDS. This interviewee proposed CA DOJ create an outreach program aimed at training and engaging law enforcement.

One interviewee expressed a desire for legislation on FDS, believing that, through legislation, the practice of FDS could become more widely available within the criminal justice system and that more awareness of the practice may increase its use by other entities. Another point of interest was the use of FDS for exoneration purposes. The interviewee suggested that FDS could be a key tool in solving cold cases with wrongful convictions.

“I think it would be helpful if they passed legislation to make it more available to anybody in the criminal justice system. As long as they go through a process that’s equitable it should be available to everybody. Which it’s not.”

Stakeholders across agencies mentioned the need for advancements in technology and a better understanding of the benefits of FDS. As some interviewees explained, with more understanding of the benefits of FDS as an investigative tool, it could be expanded to more types of cases. Additionally, because California has an offender database of almost 2 million samples, the Jan Bashinski lab is looking into ways to better discriminate levels and extent of relatedness between all the samples. Moving from 15 loci to 21 loci could help increase the sensitivity of searches. Currently, the Jan Bashinski lab is validating the use of 21 loci in anticipation of implementing this in the future.

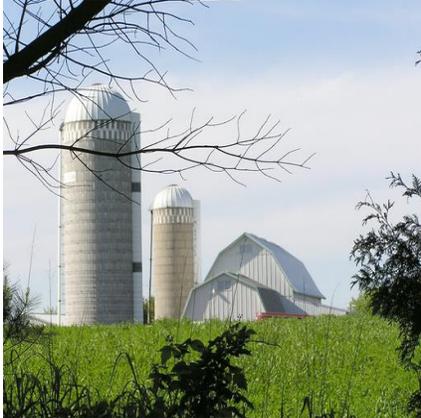
Conclusion

California’s familial search program has been carefully constructed to balance the benefit of gaining a new investigative lead with protections of people’s right to privacy. Some unique practices intended to support this goal include the use of an independent committee which approves progression of a case at multiple stages of the FDS process, conducting records research prior to release of information and using this non-genetic information in the decision-making process of whether to release the identity of the profile, and more stringent eligibility criteria. California has had the benefit of multiple familial search successes, including some very high-profile cases. This has led many advocates of FDS to point to California’s successes as an example of its potential. Some of the highlighted benefits, challenges, and lessons learned identified by key stakeholders are discussed in the *Cross-Site Lessons Learned* section, found at the end of this series of case study briefs.





Wisconsin



State Characteristics (2016):

State Population: 5,778,708

SDIS Size: ~234,000 (convicted & arrestee)

Year of Implementation: 2014

Governing Policy: Currently under development

Software Used: Denver Familial DNA Searching Software

Databases Searched: SDIS Convicted Offender and Arrestee

Introduction

Wisconsin started using familial DNA searching (FDS) in 2013 and, as of early 2017, is in its pilot stage. Wisconsin has built off of the lessons of other states and successfully identified suspects in multiple cases since beginning to use this technique. Wisconsin is continuing to evolve their FDS practice while in pilot, and the state plans to move out of pilot program mode once its policies and procedures are fully tested and finalized.

History

A state prosecutor first raised interest in FDS in Wisconsin in 2009. That year, the Milwaukee area experienced a series of homicides, and the prosecutor sent a request to conduct a familial search to the Division of Law Enforcement Services (DLES), the division that oversees the Crime Laboratory Bureau within the Wisconsin Department of Justice. At the time, the state lab did not have the software capabilities to conduct familial searches, so they were unable to meet this prosecutor's request; however, this brought the forensic technique to their attention.

In 2011, the state lab explored available FDS software options, ultimately choosing to use free software developed by the Denver Crime Lab. In 2013, the state lab began researching publically available FDS policies from other states and assembled a validation team. During this time, Wisconsin was investigating a series of sexual assaults that helped bolster Department of Justice support for the adoption of FDS.

"Don't try to go at it alone. Reach out to people. They will help you in any way they can."

The validation process took the state lab almost a year to complete and used simulated DNA profiles with the state's existing offender database. During this time, the lab had some staffing turnover which caused delays in validation. As of 2016, Wisconsin still considers itself in pilot mode and is still refining its FDS policy and has yet to make it public.



FDS Cases

In Wisconsin, only the state lab performs FDS. Wisconsin conducted its first familial search in 2014. During the pilot program and through 2016, Wisconsin conducted 17 searches on 16 different cases (one case required two separate searches). This included both individual case searches and searches on a batch of cases. In all cases, FDS returned the names of potential family associations for the lab to conduct lineage testing on. Of those 16 searches, 4 resulted in successful Y-STR matches. Three of those cases led to convictions, one through a guilty plea and two through jury trials. The types of cases included: rape/sexual assault and homicide.

Software

In 2011, Wisconsin selected Denver's FDS software for its pilot program, as it was provided free of charge. The cost factor was particularly appealing since the state was piloting FDS and still determining whether it would work with the state crime lab. The lab began using the Denver software with its default settings (e.g., parameters such as the statistical threshold cutoffs for match likelihood ratios), but through the validation process the lab decided to adjust the statistical thresholds. The state lab determined their own statistical thresholds using scientific literature that described specific statistical thresholds for certain types of relationships, such as a paternity index or a sibling index. Due to the flexibility of the software, Wisconsin was able to evolve and customize the technology for their needs. (See the Colorado case study for more information about the software.)

Policy

Currently, Wisconsin has no legislation governing the use of FDS. The state lab operates under an administrative policy it developed and modeled from other publicly available policies, including California, Colorado, Texas, and Virginia. This policy was approved by the DLES, with involvement and approval from the Attorney General. Since Wisconsin is still in a pilot, they have not yet made the policy publicly available.

FDS Process

Request and Eligibility

Currently, the state lab conducts all familial searching in Wisconsin. For a case to be eligible for FDS, it must be an unsolved violent crime and pose a significant public safety threat. The crime scene DNA profile must also be a full autosomal male profile with the core CODIS loci present. The lab would prefer familial searching to be initiated by external submitting agencies rather than through internal lab requests.

ANTOINE DEVON PETTIS

In 2014, Antoine Devon Pettis entered the home of an elderly woman in Milwaukee, WI and sexually assaulted her. Two months later, FDS led the Milwaukee Police to Pettis after testing of DNA left at the crime scene revealed a possible male relative in the state database. Police already had Pettis' DNA on file from a paternity case the previous year, found it was a perfect match to the crime scene sample, and arrested Pettis. Pettis pled guilty in 2015 and was sentenced to 30 years in prison with an additional 15 years of extended supervision.

CHARLES BANNISTER

Charles Bannister is a serial rapist who sexually assaulted, kidnapped, and robbed three women in Green Bay and Milwaukee, WI in 2012 and 2013. DNA collected from the rape kit did not match any offenders in the state database, and the state crime lab offered to run FDS on the case. The familial search identified a man believed to be the offender's father and led police to Bannister who, at the time, was in police custody in Minneapolis, MN for a similar crime. Because he was in custody and already owed a DNA sample for his involvement in the Minneapolis crime, the state was able to obtain his DNA sample without an additional warrant. Bannister's DNA proved to be a match for the rape kit samples. In Milwaukee, Bannister pled guilty in 2016 and was sentenced to 25 years in prison with 15 years extended supervision. He is currently awaiting trial in Green Bay.



However, during the pilot, the lab is doing outreach to law enforcement agencies on eligible cases to see if they are interested in doing a familial search. This is a temporary process until law enforcement agencies in Wisconsin become more familiar with FDS and Wisconsin transitions out of pilot mode.

The lab requires written requests from law enforcement agencies to ensure that the agency commits to the process, as FDS is a time consuming and costly technique. Additionally, the request needs to be joined by a prosecutor as reassurance to the lab that they will move forward with investigation and potential prosecution should individuals be identified through FDS.

Once the lab receives the request, it moves the case forward to the lab's internal familial searching committee for review. This committee is made up of approximately 8-9 individuals within the lab who review requests for FDS and determine whether or not the cases are eligible. Members of the familial search committee include both forensic scientists and lab administrators, including the State CODIS Administrator, the Technical DNA Unit Leader, DNA supervisors, the Lab Manager, and senior-level Administrators. The committee meets quarterly, or as needed, to determine which requests to approve and determine priority.

As of December 2016, the lab had not received any requests that they considered ineligible for FDS. However, this is partially due to the fact that the lab is doing outreach to agencies when they see eligible candidates for FDS, supplying the majority of cases being reviewed during the pilot stage. Once a request is approved by the lab's familial searching committee, the request moves up to the DLES Administrator who gives final approval to proceed or not.

After a request receives approval from the DLES Administrator, the lab sets up an initial in-person meeting with the requesting agency. At this meeting, which may include prosecutors in addition to the requesting agency (prosecutors are invited but not required to attend), the analysts who will run the familial search educate attendees about FDS. This meeting includes a PowerPoint presentation explaining a brief history of FDS in Wisconsin, the difference between autosomal DNA and Y-STR, how inheritance works, and how FDS differs from a normal DNA match.

Familial Search and Lineage Testing

In Wisconsin, familial searching is conducted with profiles from the CODIS convicted offender and arrestee indices. After the initial meeting between the requesting agency and the state lab, the lab conducts the familial search. Y-STR testing is done immediately after the familial search for all males that are above a set likelihood ratio threshold. The lab uses 96 well plates with robotics and has the capability to do about 80 samples at one time. The lab will typically move forward with about 100 unique samples. Wisconsin does not use additional statistical or manual calculations beyond the original software search and the Y-STR lineage testing. The lab currently has no way to perform lineage testing for females. The entire process, as described, typically takes between one to two weeks.

Release of Information to Investigator

When the lab receives the results from the familial search and lineage testing, it convenes a second meeting, typically over the phone, with the requesting agency. Analysts explained that this second meeting serves as an additional opportunity for the lab to answer questions about FDS, continue education, and explain the results of their search.

"We don't just give them the report. It's a meeting, and we sit down and we discuss everything with them to make sure they really understand what the results mean and what a familial search actually does."

The report presented to the requesting agency describes the database and profile used for the search, along with disclaimers about familial searching in general, explaining that the person listed may or may not be a biological relative, so that it is clear that more investigative work is needed before a relationship can be confirmed. Then, the report provides the search



results, listing individuals who had a consistent Y-STR match followed by those who were inconclusive, or had one or two inconsistencies. Next, the lab shares males that they did not have enough biological sample left to confirm using Y-STR. Previously, the lab also shared potential female profile contributors (who cannot undergo lineage testing). However, they recently changed their process to only report on female potential relatives if the lab found no Y-STR matches among other male candidate profiles and if the potential female candidates have reached a specified statistical cutoff threshold on the likelihood ratio. The number of potential female candidates is also capped at one or two names as the lab has found that a more consolidated list is most helpful to law enforcement. Profiles eliminated by Y-STR analysis are not included in the report.

“And I think when we’re stressing [these disclaimers], we recognize different people learn different ways so we’re making sure it’s in our presentation, we’re verbally stating it, and it’s in black and white on the report.”

During both the pre-search meeting and the follow-up meeting, analysts strongly emphasize the fact that the names they provide in the report are not direct or conclusive matches. One of the most important facts that the crime lab wants to make sure investigators know is that the list of names should only serve as an investigative lead and that detectives need to investigate the names to determine who their actual suspect is. Under Wisconsin’s current policy, in cases where the lab finds no results after a familial search, the requesting agency is allowed to submit a request for a second search after twelve months.

Investigation and Collection of a Confirmation DNA Sample

Once law enforcement receives the investigative lead from the crime lab, they begin their work building a family tree and narrowing down suspects. The crime lab recommends that detectives reach out to their local fusion center⁶ for assistance in developing a suspect’s family tree. However, the extent to which law enforcement is partnering with these entities is unclear. Police officers may also work directly with family members in their investigation. Police will usually try to work with the most distant relatives first, because those family members are typically more willing to share honest information about family history. Although distrust of police exists in parts of Wisconsin, law enforcement said that most people are willing to help. Using these different resources, police will work to eliminate those who are least likely to be involved in the crime to narrow down their list.

Depending on the case, law enforcement will most likely try to get consent or a warrant in order to obtain DNA swabs for a confirmation sample. Some interviewees believed that in order to get a warrant in Wisconsin, law enforcement would need additional evidence to support their search warrant request besides the familial match alone. If DNA is not voluntarily provided, law enforcement will have to investigate and collect further evidence to support their search warrant request. While law enforcement does not want suspects to know that they are being investigated, the prosecution explained that DNA samples are rarely, if ever, collected surreptitiously in order to help ensure that the evidence cannot be disputed at trial later.

Court/Trial

Although FDS is fairly new in Wisconsin, the state has had multiple cases successfully solved through the use of the practice. At least three suspects have been convicted after being identified through FDS. Two suspects pled guilty and another was found guilty by jury trial. According to one interviewee, the use of FDS never came up in trial for these cases. Since FDS was used only as an investigative lead, the case was always supported with additional evidence (e.g., the exact confirmation DNA match obtained after the FDS search), making it unnecessary to discuss FDS in court. One stakeholder mentioned that DNA

⁶ Fusion centers are multidisciplinary intelligence centers that bring together public and private stakeholders to collaborate on gathering, analyzing, and disseminating information to fight crime and terrorism.

expert testimony is typically not something that maintains the attention of juries so bringing up the use of FDS would more likely draw focus away from the trial at hand.

From the judicial perspective, one interviewee involved in an FDS case was not even aware that FDS was used in the case as an investigative lead. Once the charges are filed, and unless either the defense or prosecution raises the use of FDS- likely during pretrial motions- at no point would the judge learn about the use of this technique in court.

Training

For Lab Staff

The state lab was not aware of any ongoing trainings in Wisconsin related to FDS specifically for lab staff. The lab does not require any additional training for analysts to conduct FDS since DNA staff are already trained on how to use the technology.

For Police

Wisconsin worked heavily to include education of law enforcement as part of their FDS process. The crime lab found that the educational component of their process has been very beneficial, both for them and to inform the requesting agencies they are working with. Initial meetings tend to take place in-person, as analysts find it beneficial for both parties to meet face-to-face. Familial searching is a complex, scientific process, and analysts find it more helpful to explain in-person so they can read the reaction of their audience to ensure that everyone is understanding the process. Additionally, these structured educational meetings help the lab forge relationships with agencies to better facilitate communication. The crime lab noted that communication is a key component in successfully developing a new program, especially if that program provides a service. Though law enforcement interviewees found these lab trainings helpful, they also mentioned that it would be beneficial to learn more about the criteria for submitting FDS cases, talk about privacy issues, and provide training on how law enforcement officers can better communicate with family members of possible suspects. Interviewees noted that, at this point in time during the pilot, most awareness of FDS is spread through word of mouth or lab outreach.

“I think there needs to be some training, some very thorough training on how to conduct those investigations with sensitivity.”

For Judges/Attorneys

Interviewed attorneys and judges reported that no trainings were available for them on FDS (unless prosecutors were involved in the initial education meeting during the request process). In many cases, unless judges are involved in issuing a search warrant or the defense or prosecution mentions the use of familial searching during trial, judges may never even be aware that FDS is involved in a case.

Collaboration

Between Agencies

In typical FDS cases, the DAs, law enforcement, and state lab are the agencies that collaborate and coordinate the most, particularly the police and the crime lab. Stakeholders cite trust and communication as key factors that contribute to successful collaborations, as a great deal of labor is involved in performing these resource-intensive familial searches.



Between States

Wisconsin has not conducted any interstate familial DNA searches; however, agencies within the state have asked about the possibility of doing so once Wisconsin completes its pilot program. One interviewee did say they thought it would be beneficial for familial DNA searches to occur with neighboring states and nearby jurisdictions in the future.

Although Wisconsin has not worked directly on any FDS cases across states, it has collaborated with states in other ways. As they were looking into FDS and developing their own processes, Wisconsin sought advice and feedback from states already utilizing FDS for help. According to interviewees, these states were very open to sharing information. Interviewees felt that collaboration with out-of-state agencies is essential to help states learn how to implement FDS most effectively. With the help of other agencies, Wisconsin was able to gather literature about FDS and review established policies and practices for FDS before deciding how it wanted to implement and grow the process to fit the needs of Wisconsin.

“And typically by the time we’re getting to familial searching, you’re grasping at straws, you don’t have any investigative leads, you’ve run out of any sort of information that can point you in the right direction. By that time [the investigators] are so invested in the case, and for the [lab staff] to just listen to them and understand what they’re going through, really means a lot I think to our agencies.”

Challenges and Concerns

As a result of the success that FDS has had in Wisconsin, most stakeholders easily recognized the benefits of the technique, yet, they also noted several things states using FDS should consider to ensure proper procedures are followed. Lab representatives were not aware of any controversies in building Wisconsin’s program, but they did note that a concern with using FDS is that it may be seen as an invasion of privacy depending on how investigations are conducted. To help with that concern, the state lab holds at least two educational meetings with requesting agencies as part of their FDS process to ensure that investigators are well informed before they are handed the search results.

Another reason why Wisconsin has been so methodical throughout their pilot program is to make sure that they are creating proper policies and following the most effective procedures to protect both citizens and the agencies conducting searches. With FDS being such a new technique, states have a limited amount of information they can refer to when considering its use, making validation and piloting that much more important to the process.

With FDS having specific eligibility requirements and being such a costly procedure, one challenge mentioned by an interviewee is that it is unlikely to be used in all cases, and victims may question why certain available tools are not being used for their cases. Female-contributing profiles, partial profiles, and samples with insufficient amounts of DNA were also reported challenges. In cases where the suspect is a female, the crime lab does not have the capability to conduct a lineage testing technique equivalent to Y-STR testing. When the lab only has a partial DNA profile or insufficient DNA to go through the process of additional amplification and lineage testing, which can particularly occur with cold cases, it is unable to perform FDS. The lab also stated that running cases in batches could present an issue for cases that are more urgent and cannot wait to “batch” cases together.

When it comes to reporting, lab representatives also noted some concerns about education. FDS is a complicated process to explain and understand, especially for those who are not as familiar with the science behind it. One interviewee also shared that the possibility exists that people who are related may not show up as related and vice versa (false negatives and false positives). Law enforcement mentioned challenges in knowing how to conduct interviews with individuals identified through FDS. For instance,



“Thereby in a cyclical way, they are reinforcing and expanding the disproportional reach of racial impact of the system, even though it’s not motivated by racial animus.”

one concern raised was uncertainty in knowing how to question relatives in a way that would reveal the most information about family history while not causing the family member to stop the conversation.

Another stakeholder addressed additional concerns related to potentially exacerbating racial and socioeconomic biases in the criminal justice system. This stakeholder explained that because certain racial and socioeconomic groups are

overrepresented in criminal DNA databases, and FDS searches profiles which are already in CODIS, the results of familial searches will tend to primarily identify people within those groups. Another stated concern is the potential for wrongful convictions. An interviewee noted that once a person becomes a suspect, they can be put in an eyewitness identification procedure that may lead to a false identification and ultimately the possibility of a wrongful conviction. With the follow-up steps in FDS cases, however, law enforcement must provide the crime lab with the suspect’s DNA sample so that they can run a confirmation match to support the initial familial match, so this should help prevent wrongful convictions.

Accessibility was also mentioned as another challenge with FDS. One stakeholder mentioned that the defense is at a disadvantage when it comes to FDS, and DNA use in general, because they do not have free access to the state crime lab, DNA analysts, or even the evidence to send off to a private lab for testing at their own expense. Though the use of DNA and familial searching can be helpful in criminal proceedings, the accessibility to utilize these tools is limited.

Costs

Since the Denver software was free, the crime lab did not note any additional expenses associated with the technical aspects of FDS. Additionally, all of the crime lab staff was already using automation and Y-STR analysis, so the lab did not experience any costs related to training.

Other expenses that several stakeholders pointed to are the additional labor and support that is required to conduct FDS and help with the investigation after the results are received. The crime lab stated that familial searches require larger processing on the backend. With a normal DNA hit, the lab is only processing one simple sample for confirmation, but with FDS the lab may be working with up to 100 samples. One significant contributor of these extra costs is the Y-STR testing, which is only done for familial searches and is not part of routine processing on all offender samples.

Law enforcement similarly echoed the need for additional labor to work on FDS cases. In some familial cases, the search results may include individuals who no longer live in the jurisdiction or investigators may need to talk to extended family members located across the country. One detective did mention that, although they could collaborate with agencies located in the same jurisdiction as the person of interest, they were concerned about how things are done and they prefer to conduct interviews and investigations themselves to ensure proper protocols are followed given the sensitivity of FDS cases.

Currently, FDS is only used in cases that meet a certain set of requirements. As awareness of familial searching increases and the practice expands, interviewees noted that the resource issues may change. Considering that FDS is an expensive process, stakeholders said they would need additional funding to use this technique in more cases.

Benefits

Wisconsin has already witnessed early successes as a result of FDS. Many interviewees credited FDS with helping solve cases when law enforcement had exhausted all other investigative leads. In the cases where FDS successfully identified a relative in CODIS, the crimes were violent, sometimes serial cases,



“I think it’s great any time we can provide answers to victims’ families and to the community ...To know that we are doing everything we can in a case... You’re taking some pretty dangerous people off the streets, and I think that sense of security for the community is important.”

and posed a major threat to public safety, leaving investigators in a position where they needed to apprehend the suspect immediately to prevent future crimes.

Interviewees also felt that FDS has the ability to bring justice to victims and their families. For some victims, it is important to know that all measures have been exhausted, and if states have the ability to use FDS, it is another opportunity to solve a case. FDS serves as another tool for law enforcement when no other options are available. In addition to helping solve cases, one stakeholder also mentioned that FDS could also be used to exonerate those who may have been falsely convicted.

Needs

Two needs expressed by multiple stakeholders were more training on FDS and additional funding and resources to be able to successfully conduct searches. Interviewees also recognized strong communication and collaboration as key ingredients for familial searching, noting that other states considering using FDS will need to ensure both for success.

While the crime lab conducts training with agencies that have cases accepted for FDS, interviewees expressed a need for more training and educational opportunities for other agencies and stakeholders involved in the justice system. One shared training need was helping defense attorneys understand the process and results of FDS. Since the technique is complex, one interviewee suggested that more in-depth training would be beneficial for separate agencies (i.e. law enforcement, defense, prosecution, judges, etc.). With familial searching being so new, another interviewee said, most people only know about familial searching due to word of mouth, the media, and crime lab outreach and that more training and education will increase stakeholder awareness and understanding of the process.

Lab representatives and law enforcement both brought up the need for additional labor and resources. With additional staff, the investigative work could be divided across a team as opposed to when only one or two detectives are working a case and the process and time it takes to find and talk to people can be much longer.

“I think we’re very fortunate that we had a lot of success in the beginning, because it really got everybody excited. Especially for the serial cases, to be able to have some resolution and closure for the victims in those cases. Just makes you feel good about what you’re doing.”

Conclusion

Wisconsin has been able to incorporate much of what other states using FDS are doing while also customizing the practice to their specific needs based on their pilot experience. The state has experienced several successful identifications and convictions using FDS in a short period of time. Some of the highlighted benefits, challenges, and lessons learned identified by key stakeholders are discussed in the *Cross-Site Lessons Learned* section, found at the end of this series of case study briefs.





Maryland



State Characteristics (2016):

State Population: 6,016,447

SDIS Size: ~154,000 (convicted & arrestee)

Year of Ban: 2008

Governing Policy: Md. Public Safety Code Ann. § 2-506(d)

Introduction

Maryland is the only state with legislation on familial DNA searching (FDS) and the first to ban the practice statewide.⁷ Stakeholders in Maryland obtained this ban by citing particular concerns with FDS related to racial justice and 4th Amendment privacy rights and have continued to speak out against the spread of FDS across the country.

History

Maryland's decision to ban FDS grew out of legislative attempts to expand DNA collection to arrestees. In January 2008, the Governor's Office proposed that the state begin collecting DNA samples from individuals arrested for violent crimes and burglaries and upload those profiles into the state CODIS DNA database. This proposal would make Maryland the 12th state to start collecting DNA samples from arrestees. Previous attempts at expanding the DNA database in Maryland had failed, but, with the Governor's support, the database expansion was formally proposed as Senate Bill (SB) 211.

"The bill was controversial from beginning to end, with all associated tensions."

The bill immediately faced strong opposition from the Maryland Office of the Public Defender and American Civil Liberties Union of Maryland. They sought to defeat the bill entirely, but, facing a bill with strong backing by the Governor's office, also searched for ways to mitigate their concerns and potential abuses by attaching additional provisions to the bill. These provisions, counterpoints to the database expansion, included a total ban on FDS in the state. Concurrently, the Legislative Black Caucus of Maryland saw the controversy surrounding SB 211 and formed a workgroup to examine it. These three organizations were joined by the Baltimore Branch of the NAACP, the Innocence Project, and the Maryland National Organization for Women to form a coalition opposing SB 211. These groups brought their own concerns and priorities to the coalition, differing in which

⁷ While Maryland is the only state with legislation banning FDS, the city of Washington, D.C. also passed legislation banning the practice in 2009.



“We wanted to proactively address [familial DNA searching] because we knew that in the future it could potentially be a problem.”

constraints they found most important, but they all banded together to support a series of amendments to SB 211 limiting the impact of the expansion of the DNA database.

The coalition worked to narrow the list of offenses for which arrestee DNA may be collected and introduced a limitation that arrestees’ DNA could only be analyzed and uploaded to the state database after arraignment in a Maryland Circuit

Court. They also added a provision that the DNA sample would be automatically expunged from the database if the charge was lowered to an ineligible offense, the arrestee was not convicted, the conviction was reversed, or if the individual was granted an unconditional pardon. Other additions included expanding the use of DNA for exoneration purposes and addressing the backlog of untested rape kits Maryland crime labs. A ban on FDS was only one of these many provisions added to the bill. Members of the coalition wanted to guarantee certain protections to both individuals being arrested and their family members and prepare for the future. As one interviewee stated, “We knew how it *could* be used, we didn’t know how it *would* be used.”

The Legislative Black Caucus of Maryland led the legislative effort to add these provisions to SB 211. At first they faced strong pushback, noting that the bill’s supporters were reluctant to address criticism. Eventually, the Legislative Black Caucus was able to negotiate with the Governor’s Office and members of the Maryland Senate Judicial Proceedings Committee over amendments to SB 211 that would allow them to support the bill. Negotiations went back and forth over every proposed addition, including the ban on FDS, but in the end most of the amendments were added without much issue. One interviewee asserted, “I also believe that they knew that the bill wasn’t going to move at all without those amendments.” Another insisted that many legislators believed in the concerns being raised and thought the proposed protections were important, though they also noted that politics itself played as large a role in the debate as the substance of the policy.

The role the Maryland State Police (keepers of the state DNA database) and the larger forensic science community in Maryland played in the debate is unclear. Some interviewees contend that these stakeholders were active participants in the debate and that, while they did not approve of the provision banning FDS, they favored the bill overall. Others stated that these stakeholders had no role in the debate and were not consulted in its development. One interviewee said, “There was no debate. The decision was made without... the forensic science field in Maryland even knowing it was up for debate.”

In April, both the Maryland House and Senate passed SB 211 with the ban on FDS included. The next month, the Attorney General of Maryland notified the governor of their approval of the constitutionality of the bill, and Governor Martin O’Malley signed the bill into law. Maryland’s collection of DNA from arrestees would later be challenged in front of the U.S. Supreme Court in *Maryland v. King* (2013), and, in a 5 to 4 decision, the court upheld the constitutionality of the practice.

“They wanted the bill and we wanted to protect peoples’ rights. And so we thought that the compromise achieved those goals.”

Policy

Maryland’s Public Safety Code states, “A person may not perform a search of the statewide DNA data base for the purpose of identification of an offender in connection with a crime for which the offender may be a biological relative of the individual from whom the DNA sample was acquired” (MD Pub Safety Code § 2-506). The Maryland State Police have interpreted this law as a ban on both FDS and partial matching. No other publicly available administrative policies in Maryland address the issue beyond the law itself.



Challenges and Concerns with FDS

When Maryland passed SB 211, banning FDS in the state, law enforcement agencies in the U.S. were just beginning to consider using FDS. The broader criminal justice community weighed various benefits and drawbacks of the practice, and stakeholders in Maryland considered these when deciding to ban FDS. When discussing the reasons they wanted a ban on FDS, interviewees cited a number of concerns. One was the manner in which law enforcement collected and stored DNA. One interviewee noted that law enforcement had promised a firewall between the biological sample and the DNA profile in the database when creating databases, and that going back to the biological sample for additional information (particularly the Y-STR profile) for FDS was a breach of that promise. Another interviewee expressed concern with scientific validity due to law enforcement's potential improper handling of DNA evidence, including collection, analysis, and storage.

"[FDS was] just percolating up to people's awareness, in a way that was troubling to a lot of people who are paying attention to that issue."

Stakeholders discussed the corrosive effect of stigma and the implications of an individual, family, and community being associated with a law enforcement DNA database in general. They worried that being labelled "criminal" would ultimately lead to a self-reinforcing feedback loop where an individual internalizes the label and ultimately embraces criminality. One interviewee in favor of the ban spoke dubiously about how some proponents of FDS said it could help with exoneration; they asserted that FDS is an investigative tool and that just because it points to one person does not mean it is exonerating everyone else. Two concerns stood out prominently from the others, though, and were mentioned by nearly all interviewees: racial justice concerns and Fourth Amendment privacy concerns.

Racial Justice

Perhaps the most common concern voiced by stakeholders in Maryland was the impact FDS would have on people of color. Multiple stakeholders stated that arrest, prosecution, and conviction rates in Maryland were racially skewed, and nearly all interviewees noted that, in much of Maryland, the criminal justice system is seen as biased along the lines of race and class. These stakeholders expressed concerns that FDS

"It felt a lot like a way to bring... our African-American population under a kind of genetic surveillance that was already viewing that population as somehow problematic."

would amplify these biases and extend the reach of the system in minority and low-income communities. One interviewee stated that FDS would create, "a self-reinforcing picture of who's involved in crime in our country." Another noted that due to the vast overrepresentation in the state DNA database of the black population in places like Baltimore, the majority of the city's black population could be subject to a hit from an FDS search. They viewed the genetic oversight of the majority of a racial group as an overreach on the part of law enforcement.

Stakeholders cited the poor relationship between law enforcement and minority communities in Maryland as a reason why racial justice became such a large concern surrounding FDS for this particular state. One interviewee said, "You kind of understand why the issue of race came up. It comes up in Maryland."

While racial bias in law enforcement was not as widely discussed at the national level in 2008 as it has been in recent years, interviewees stated that people in Baltimore and across Maryland were absolutely sensitive to these problems. An interviewee in favor of FDS said the ban owed more to the climate of mistrust of law enforcement in Maryland than to concerns with the science or the practice itself.

"I think it's a very real concern in communities where law enforcement may be viewed more as an invading army than as champions of public safety."



Interviewees noted pushback against the ban on the basis of racial justice, though. Proponents of FDS argued that DNA is race neutral, there are no alleles for certain races, and thus there should be limited racial justice objections. In response, other interviewees noted that places without such poor law enforcement-community relationships may have trouble understanding the concerns around racial bias, though they thought that this may be changing due to current law enforcement controversies in the U.S.

Fourth Amendment and Privacy

The other main concern in Maryland around FDS was a potential violation of citizens' Fourth Amendment privacy rights. The U.S. Supreme Court has determined that offenders have surrendered some portion of their privacy right by voluntarily participating in criminal activity and may have their DNA stored in CODIS for the purposes of genetic identification. Family members of those offenders have not given up their rights, argued some interviewees in Maryland, and should not be subject to any such oversight. One interviewee claimed that this was a concern as far back as 1991 and the creation of CODIS, and that the software was explicitly designed to make identifying relatives difficult. Some stakeholders in favor of the ban viewed FDS as a search of the genetic information of relatives of offenders in the DNA database, a search without warrant or even individualized suspicion.

“What we don’t want, what we should not do as a society, is make assumptions about people based on who they are related to or who they are potentially related to.”

Interviewees were also concerned with the more general privacy implications of FDS as well. They noted that using FDS expands the net of those subject to intrusion by law enforcement and that entire families become, by default, implicated in criminal activity. They argued that family members of offenders could be questioned when no evidence points to them other than a potential familial relationship, an undue burden on citizens. Two interviewees also pointed out that we do not know what the future holds or how law enforcement may use or exploit familial connections identified through FDS in the future and wanted to prevent unforeseen misuses. As with racial justice, though, the ban on FDS faced pushback on the issue of Fourth Amendment and privacy concerns. National advocates for FDS, for example, argue that DNA profiles stored in CODIS contain no personal identifying or medical information, that they only contain junk DNA, and thus no privacy interest are implicated.

Challenges and Concerns with the Ban

Interviewees also noted some drawbacks to the passage of SB 211 and the ban of FDS. One interviewee believed that while the expansion of the database to include arrestees has been productive, the loss of the opportunity to conduct FDS has resulted in “potential cases that could be solved that will not be.” This interviewee noted that while FDS could remove offenders from the streets and prevent future crimes, it must be balanced with people’s privacy rights and that Maryland has decided to err in the direction of privacy. Another interviewee also remarked that states that develop and adopt their own protocols are able to do so with a high level of structure and quality assurance that alleviate civil liberty concerns. This individual thought that the Governor’s team for SB 211 was trying to pass the bill no matter what and that the ban on FDS was simply a “political handshake.”

“Any policy is going to be imperfect at the edges, but we’re looking for the policy that’s going to balance all the considerations in the best way possible.”

Other stakeholders expressed doubts as to whether Maryland has experienced any drawbacks as a result of banning FDS. One interviewee said they have not heard any complaints from law enforcement or prosecutors about the lack of FDS hindering their investigations or prosecutions. Another had heard some complaints, but that they were no stronger than, “‘it’s what we want to do,’ and ‘it allows our law enforcement to have the widest possible reach.’” One



interviewee pointed out that, at the time the ban passed, there had been no major FDS successes in the United States, so there were no strong efficacy arguments for FDS to be made at that point.

Needs

Stakeholders identified some future needs and concerns within Maryland related to the ban of FDS. The first of these is a need for better transparency regarding forensic DNA use. SB 211 did contain several provisions related to transparency: it called for annual reports covering DNA-related expenses, the racial demographics of individuals whose DNA is collected under the law, the number of samples collected due to the law, any lab policies designed to prevent unlawful uses of the database, and an analysis of investigations aided by DNA. An interviewee who spoke about these provisions was unsure if these requirements or the enforcement of the ban were being followed, however.

Another concern among interviewees was the expanding use of DNA databanking in general. With the increased sensitivity and lower cost of DNA testing, they noted that local law enforcement agencies can maintain their own DNA databases much more easily and with less regulation. Interviewees were unsure whether those databases would be subject to the same ban on FDS, which applies specifically to the state DNA database as currently written. Additionally, those local databases would not be subject to the same auto-expungement rules regarding DNA samples as the state database. Another interviewee was also concerned with the trend toward FDS nationwide. This individual was unsure about how Maryland's DNA samples in the FBI's national databank would be treated if the FBI started allowing FDS and believed that a memorandum of understanding between Maryland and the FBI would be needed to ensure Maryland's samples are not used in FDS.

Conclusion

As the only state with legislation on FDS and first state to ban its use, Maryland represents an important case study for better understanding the arguments against FDS and implications of such a ban. Maryland serves as a guide for those states concerned with the practice who may want to limit its use. Some of the highlighted benefits, challenges, and lessons learned identified by key stakeholders are discussed in the *Cross-Site Lessons Learned* section, found at the end of this series of case study briefs.



Cross-Site Lessons Learned

Each of the four states studied in this project illustrate a number of lessons that may be useful for other states or communities considering whether or not to use FDS and, if they would like to do so, how to implement it effectively within their jurisdiction. Below are highlighted lessons aggregated across the four case studies:

1. *Program Design and Initial Implementation.* A number of things helped facilitate initial implementation of FDS in the states studied. When constructing policies, program designers found it helpful to look to earlier pioneers in the practice, whether abroad or domestically, observing procedures and practices, reviewing written policies, and using software developed by other states. All four selected states also had passionate, key players who helped propel decisions and action related to FDS- whether in favor or against the practice. Notably, many of these same individuals have joined national efforts to expand or prevent FDS use across the country. The states using FDS also had two different models of launching their programs: (1) beginning with a pilot period to test and revise their policies and procedures prior to publishing an official policy or (2) having a vetted policy in place prior to beginning the practice. Interviewees praised both approaches; some felt the pilot period was extremely helpful in adjusting and refining their procedures, while others felt carefully creating a formal written policy first before any searches were undertaken was important.
2. *Policy Development.* Regardless of whether a policy was for or against FDS, stakeholders in all states felt that having a clear, transparent, and comprehensive policy was essential. Stakeholders in California, Colorado, and Wisconsin reiterated that carefully anticipating and addressing potential concerns by building safeguards into the policy and ensuring the policy was legally vetted and approved through high levels of a chain of command could help avoid challenges in the future. Some interviewees desired wider involvement of stakeholders in the development of both administrative policies allowing FDS and legislation banning the practice, though. Interviewees had differing opinions on whether guidelines should be laid out in an administrative policy versus legislation, but they generally agreed that legislation has more potential roadblocks and challenges to enactment.
3. *Collaboration and Communication.* Stakeholders commonly praised other agencies, remarking upon the strong relationships between organizational leaders and crediting the history of positive working relationships with building a foundation for new collaborative endeavors. Interviewees often cited collaboration and communication as key to building new programs and policies, enhancing buy-in, easing implementation, and ensuring sustainability. Interviewees also cited these same ingredients as vital for the successful advancement of individual FDS cases, and collaboration is structurally built into the request process in these states (e.g., requiring MOU to be signed by multiple agencies). In terms of banning FDS, collaboration was equally important. The opponents of FDS in Maryland formed a strong, multi-disciplinary coalition to help achieve their legislative goals and build arguments against FDS using multiple lenses.
4. *Training and Education.* The education and awareness around FDS offered in these three states is a mix of formal trainings and informal education. Lab staff typically learn about FDS on the job. For individual cases, labs in all three states where FDS is performed hold in-person case meetings with local investigating agencies (and often prosecutors) to more fully educate and communicate with police about DNA and heredity, FDS as a scientific tool, and how to interpret results. These meetings vary in formality, and are held either at the time of request, the point of releasing information, or both time points. Regardless, stakeholders perceive these in-person educational efforts as vital in ensuring that the results of FDS are understood correctly and that the investigation can proceed with the necessary cautions and protections in place. Beyond individual cases, education around FDS is occurring on a wider scale through some venues (e.g., conferences, outreach trainings to a select

number of jurisdictions), although judges and defense attorneys do not typically receive training. Some interviewees desired more training and felt that awareness of FDS could be improved.

5. Practice models vary across states, and the range of practices highlights states' different decisions when it comes to balancing the power of FDS as an investigative tool with privacy protections or other constraints.
 - a. *Eligibility.* Eligibility restrictions typically include criteria for the quality of the DNA sample, that investigators have exhausted all leads, and that the case must exhibit a compelling threat to public safety. Interviewees had differences in philosophy about whether the tool should be restricted to certain types of crimes, though. Limiting eligibility reduces the potential of FDS to be effective in a wider range of cases, but may help with public or stakeholder comfort levels.
 - b. *Approval Structure.* States also have different models of approval with approvals by lab directors at the time of request, an internal lab committee at the time of request, or an independent committee that provides approvals at multiple stages in the process. Other states and communities should consider what type of approval process will work best for them, how independent they want this entity to be, which decision points will require approval, and what types of stakeholders should be involved in this process.
 - c. *Scope of Search.* States vary in whether they include convicted offender or arrestee profiles in their searches (versus restricting the search to only convicted offenders), or even using local jurisdiction databases which also include suspect profiles. Searching a wider scope of profiles has the potential to generate more investigative leads but could raise more concerns from opponents.
 - d. *Sharing Information.* States have varying requirements regarding sharing the results of familial searches with local law enforcement agencies, especially in terms of how they handle female profiles that cannot undergo Y-STR testing, male profiles with insufficient DNA to conduct Y-STR analysis, and profiles with inconclusive Y-STR tests. One state performs additional records research at the state level and will not release the identities of profiles (especially female profiles) to local law enforcement if this research does not bolster support for family relatedness to the perpetrator. In the two remaining states, reviews of non-genetic information such as public records and drawing conclusions based on this information is left to the local investigating agency.
 - e. *Investigation and Collection of a Confirmation DNA Sample.* All three states using FDS require a new DNA sample to be collected from the suspect for a confirmatory match against the crime scene sample. This ensures that the eventual adjudication will be based on an exact DNA match, rather than the familial search results, which are used only as an investigative lead. The states vary, however, on their preferences for how to collect this sample. Stakeholders in one state preferred the use of a warrant or consensual DNA collection to reduce the chance of future evidence disputes at trial, while another expressed a preference for surreptitious collection, as they felt it allows for more family privacy since families would not be confronted with a police investigation unless the confirmation sample had identified the offender.
6. Whether a state is interested in adopting, growing, or limiting FDS, it should carefully consider a number of concerns and challenges associated with the practice. Stakeholders in all states referenced some of these concerns, although the interviewees in Maryland were more vocal about the practice's drawbacks. Below are some of the main concerns discussed by stakeholders in the case studies.
 - a. *Privacy.* Privacy concerns related to FDS often center on the Fourth Amendment's protections against unreasonable searches and seizures. Some critics question whether the genetic privacy interests surrendered by offenders in CODIS should extend to their family members. Other privacy related concerns include fears about a widening net of intrusive law enforcement

practices and “genetic surveillance”, the potential for investigating innocent family members as FDS searches do not result in a single confirmed suspect, and the potential for future abuse of the practice by law enforcement. FDS advocates counter-argue that the practice has been legally vetted and that investigating innocent individuals happens in other types of cases. Ultimately, agencies contemplating FDS should carefully consider these privacy concerns in consultation with legal advisors to ensure that they understand these arguments and that, if they decide to proceed with FDS, the practice is implemented in a way that fully addresses these legal concerns.

- a. *Disproportionate racial impacts.* Another primary concern is the potential for increasing current racial bias in the criminal justice system. This concern is based on the argument that CODIS reflects inherent structural biases in the criminal justice system and therefore includes a disproportionate number of certain racial minorities. Consequently, if we leverage CODIS as a tool of investigation, we will amplify these biases by continuing to search within these same populations as opposed to a wider pool of people. This may be particularly problematic in communities with challenged police-community relations. Proponents of FDS argue that the search itself is race neutral; therefore, FDS should not be abandoned due to trends happening elsewhere in the criminal justice system. While arguments on both sides of this debate are factually correct, each state or community will have to decide for itself if the investigative potential of FDS justifies the risk of amplifying existing criminal justice system biases.
- b. *Wrongful convictions.* The literature sometimes discusses the risk of a wrongful conviction given that the FDS technology is not 100% accurate. However, the use of a confirmation DNA sample mostly alleviates this concern. Some interviewees still cautioned that FDS could still lead to wrongful convictions through more indirect routes, such as false confessions when questioning innocent family members or mishandling of DNA evidence.
- c. *Legal challenges.* No legal challenges have occurred in the four case study states- even those states where cases have progressed fully through conviction and sentencing. Occasionally, an interviewee mentioned that there might be the potential for a legal challenge in the future (possibly due more to how an investigation was handled as opposed to the technology itself), but most interviewed stakeholders had confidence in the legality of the technique.
- d. *Resources.* Familial searching is time-consuming and resource-intensive according to stakeholders. The familial search itself is quick and cheap (*if* you are using free software; development of new software was estimated to take between 10-75 weeks of full-time-equivalent work). However, additional costs come into play with Y-STR testing (which has extra reagent/chemistry costs and labor hours of lab staff) and investigative time (particularly records searches and building family trees). In addition, training and time/travel costs for attending in-person education meetings are another expected cost factor.
- e. *Technology barriers.* Y-STR testing is highly accurate and helps to narrow down a large list of male familial candidates to, typically, one single profile (or none if there are no relationships). A large number of labs across the country do not have the capability to perform Y-STR testing, which is a barrier to further expansion of FDS. Moreover, the equivalent for female familial candidates- mitochondrial DNA testing- is rarely used in U.S. crime labs, leaving labs with the difficult decision of whether to ignore all female CODIS profiles that come up in a search (and potentially miss an important investigative lead), or instead share a list of multiple untested potential females relatives (possibly sending police on a wild goose chase to investigate families that may not actually be related to the perpetrator in question). Software capabilities were rarely raised by stakeholders; however, a couple interviewees did question whether potential software refinements could improve accuracy or more reliably detect additional types of relationships in the future.

In Closing

States and communities contemplating the use of FDS have a number of considerations to carefully think through. Many involve balancing the demands of adequate legal and ethical protections, public expectations (both fears of “genetic surveillance” as well as pressures to use the tool in more cases), available resources, and the usefulness and effectiveness of this investigative tool. As can be seen from these state case studies, stakeholders perceive a number of significant benefits including solving very serious and/or serial crimes, increasing public safety, and being able to assure victims or their family members that everything in the investigative toolkit was tried. However, some concerns need to be carefully considered when implementing this practice- as with any tool that expands law enforcement’s reach. The interviews conducted demonstrate that all four states have been thoughtful in thinking through these issues.

When considering the future of FDS, it seems likely that the practice will continue to expand, at least in those states already using FDS, as more local agencies become aware of it or as victims and the public begin to expect its use. As the practice “scales up” beyond piloting and more limited implementation, states will need to consider how to best allocate resources for this tool, whether and how eligibility or approval processes will be impacted, and whether inter-state FDS is practical. Continued consideration of the concerns listed above will be critical to expansion efforts to ensure that as the practice grows, it preserves appropriate protections alongside this growth. Jurisdictions should also consider how they may use FDS for other purposes, such as helping to overturn wrongful convictions.

Finally, it is important to note that FDS is a relatively new practice, and its potential impacts (as well as any possible collateral consequences) will be better understood as more cases undergo this technique in the future. We hope that, in the meantime, these case studies can serve to share helpful information for those wanting to learn more about how FDS works in practice and how other states have navigated these complex decisions.

