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# The Use of Familial Dna Searches: a Policy Analysis

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The Use of Familial DNA Searches: A Policy Analysis

by

Caroline O. Moorman

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Criminology

Regis University

December, 2012

The Use of Familial DNA Searches: A Policy Analysis

By

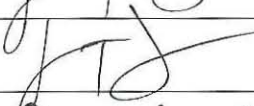
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### Abstract

Many cases go unsolved every day in the United States; some due to a lack of technological advancement in forensic science. When a person is killed, raped, or in danger of physical harm, it is the responsibility of law enforcement and their collaborative agencies to find and apprehend the responsible parties. The use of familial DNA searches in the United States is a relatively new investigative technique. Traditionally, DNA samples found at a crime scene are run through a national Combined DNA Index System (CODIS) to look for possible matches. When a sample does not return a positive hit, investigators are faced with tracking down responsible parties through circumstantial evidence and witness testimony. As technology in forensic science progresses, other ways of creating viable leads have emerged, such as familial DNA testing. Familial testing looks for likely family relationships that share similar DNA to offenders or reference samples already in the CODIS database. Since the implementation and success of such familial DNA software in other countries, four states within the United States have chosen to create and pass legislation to permit a policy that allows for the testing of familial DNA. Most states require multiple stringent criteria to be met in order for a case or cases to qualify for familial DNA testing.

This study examines the published policy of familial DNA searching in four states across the United States in terms of policy implementation, identifies the criterion required to conduct a familial search in each state, and explores the number of successful case closures these states have had due to adopting familial searching software.

Keywords: Familial DNA searches, forensic science, investigative technique, policy analysis

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## **Introduction**

### **A Brief Background of DNA Analysis**

Attempting to locate and apprehend criminals suspected of the most heinous crimes such as rape and murder is a daunting task even for the most advanced law enforcement and investigatory agencies in the United States (Epstein, 2009). With the advent of new technology in the field of forensics, investigative techniques such as fingerprinting and collecting specimens for DNA analysis are aiding investigatory agencies in apprehension of criminals (Gershaw, Schweighardt, Rourke, & Wallace, 2011). With further advance in the processing of DNA, researchers have discovered that it is now possible to identify patterns that suggest a familial link between individuals through analysis of the DNA structures (Greely, Riordan, Garrison, & Mountain, 2006). Through structural comparison, it is now possible to detect a family relationship between microscopic DNA left at a crime scene to the DNA of family members who were previously convicted of a crime and whose DNA has been stored in a Combined DNA Index System (CODIS) (Slooten & Meester, 2012). The CODIS system is a national database of the Federal Bureau of Investigations that houses the DNA records of convicted offenders, arrestees, legal detainees, unidentified human remains, missing persons, relatives of missing persons, and certain investigatory agencies or laboratories that are required to give DNA samples for purposes of exclusion (Federal Bureau of Investigation, 2012).

Familial DNA searching software has recently been implemented for use in state and local investigatory agencies across the United States (Green & Thomas, 1997). There have been several cases of unsolved crimes that have been re-examined with the help of familial DNA searches (Gabel, 2010). In some cases, the searches produced significant familial matches, and



those leads that were generated due to the familial search lead to the criminal offender being apprehended and charged with the crime (Tanaka, 2008).

### **Statement of the Problem and Rationale**

Large metropolitan police departments have been the first to implement the use of familial DNA software in their agencies. While other states debate the constitutionality of familial DNA searches, other states have moved forward and begun using the technology to close cases and identify criminals for future criminal prosecution. For the states that have adopted the use of this new technology, California, Colorado, Texas and Virginia, further analysis of familial DNA search effectiveness needs to be done. If there is a significant closure rate due to this type of DNA searching, it could make it easier for other law enforcement agencies to begin using familial DNA searching software.

### **Purpose of the Study**

The purpose of this study is to examine the policies of successfully implemented familial DNA software and the subsequent familial DNA searches in four states that have written policy regarding this technique. This research will study the process of implementing the policy that allows for the search of familial DNA, the viable leads that familial DNA produces, and the case closure rate due to familial DNA hits in the CODIS system.

### **Analytical Strategy**

This research will study the four states in the United States that have implemented a written policy that permits familial DNA searching and who currently use familial DNA searching software. Many more states within the United States are considering using familial DNA to create viable leads and to close open cases. This research will explore the experience of four states in regards to policy implementation and success in generating viable leads by using

familial DNA searching. Using already existing data of written policy by each state with a current policy, criteria will be evaluated and compared with other states in order to examine the current and future needs for policy development and implementation.

### **Limitations**

There are limitations to the proposed research that evaluates familial DNA searching. This study is designed to explore the experience of four states (California, Colorado, Texas, and Virginia); therefore this research is limited to those jurisdictions and cannot necessarily be applied to other jurisdictions or other populations. This study analyzes information about the use of familial DNA searching that was collected from published policies and newspaper articles. As a result, it lacks the insider detail that may be present in confidential investigator's reports and narratives. The personal report of an investigator is considered to be a product of the workplace that contains sensitive identifying information. There are risks associated with releasing these reports including medical history and contact information; therefore many law enforcement agencies prohibit the release of such records.

### **Review of the Literature**

When a crime has been committed, it is the responsibility of the responding law enforcement agency to investigate. In cases of stranger rape, where the victim does not know the decedent, or homicide cases, it is important for the investigating agency to collect all evidence related to those crimes and come up with an outline of the events. By combining witness testimony with physical evidence, investigators are given a starting point to begin the process of identifying the criminal offender. When investigative leads and repeated witness interviews have come to a dead end, investigators rely on forensic evidence to fill in the gaps in their narrative. Trace evidence, fingerprints, and biological specimens are analyzed in order to confirm or eliminate suspects, or to use that evidence to search for suspects who are yet to be identified.

#### **The Combined DNA Index System (CODIS) and the Advent of Familial DNA Testing**

Forensic science has come a long way since the dawning of DNA technology used in the field of forensics in the United Kingdom the 1980's (Olby, 1994). Deoxyribonucleic Acid (DNA) is a double stranded helix structure that contains the genetic profile of an individual (Olby, 1994). When DNA was first structurally discovered by Francis Crick and James Watson in the 1950's, scientists dreamed of the possibilities that DNA could contribute to the field of science (Dahm, 2008). Not only could geneticists isolate and study genes that are known to cause mutation or hereditary illness, but by studying the specific genetic profile that was as scientifically unique as a fingerprint, scientists could compare samples side by side to confirm or exclude biological specimens for identification matches (Lynch, 2003). DNA replicates itself in a series of short tandem repeats (STR), and in order to confirm DNA matches, at least thirteen loci of STR are needed (DNA Diagnostics Center, 2008).

After years of technological advancement, including the use of computers and the internet, the Federal Bureau of Investigation created a new computerized database that electronically houses the DNA samples of convicted offenders, arrestees, legal detainees, forensic (casework), relatives of missing persons, and unidentified human remains. According to the Federal Bureau of Investigation, this database was implemented after the DNA Identification Act of 1994 was passed that allowed accredited laboratories to submit DNA samples into what we now know as the Combined DNA Index System (CODIS), also known in part as the National DNA Index System (NDIS). Samples collected for CODIS from identified convicted offenders or arrestees are listed under the offender index, whereas samples that are collected from the bodies of unidentified victims or unidentified specimens at crime scenes are listed under the forensic index. Family members who have submitted their DNA in search of missing persons are listed under a reference index.

The CODIS system is now widely accepted as a primary resource when investigating criminal cases to look for matches between the sample already in the index and the sample that is in evidence (Gershaw, Schweighardt, Rourke, & Wallace, 2011). When a sample does not produce results that link the genetic profile of the sample to the genetic profiles in the CODIS system, a separate secondary search for familial DNA can be performed. Although familial searching is not performed at the national level, each state has jurisdiction to decide to test for familial DNA (Federal Bureau of Investigation, 2012). Familial DNA is found by matching a high number of alleles of the sample DNA to alleles present in the database samples. The number of matching alleles will determine whether the match was a moderate or a high stringency result, meaning the likelihood that there is a near genetic match (Morrissey, 2012). A

near genetic match would indicate that the alleles are matching to a parent, sibling or biological offspring (Morrissey, 2012).

### **State Authorities Adopt Familial DNA Searches**

According to a presentation by Denver District Attorney Mitch Morrissey (2012), only a handful of states within the United States currently permit familial DNA searches. California, Colorado, Texas, and Virginia are the only states currently using familial DNA software alongside of standard investigatory techniques and evidence processing. Because familial searches are not performed at a federal level, a type of specialized non-CODIS software is implemented in those jurisdictions that allow familial searches and that software extracts the data from those samples from the CODIS system.

In order for the familial search to be permitted in those states that allow familial DNA searches, the California Department of Justice Bureau of Forensic Science (2008), the Colorado Bureau of Investigation (2009), the Texas Department of Public Safety (2012), and the Commonwealth of Virginia Department of Forensic Science (2011), require the chief law enforcement officer and/or the district attorney must provide written certification of the request to the state investigations bureau that documents the reason for the search. There are certain requirements mandated by each state for a familial DNA search to be performed (i.e. public safety concerns, all leads are exhausted, traditional CODIS search produced no results, the evidence exhibits a full DNA profile, etc.), and the reason for the search must meet at least one, or all listed criteria in the state of Virginia, of the criteria in order for the search to be approved (Commonwealth of Virginia Department of Forensic Science, 2011).

According to the Colorado Bureau of Investigation (2009), after the search is performed and the identity of the sample is revealed, normally with the name, date of birth, and ethnicity,

the investigating agency will seek appropriate sources to probe further into the relationships of that individual, specifically their familial relationships. Investigative agencies can request court records, public records, vital statistic records, previous investigative reports, inmate files and inmate visitor logs from the Department of Corrections, and the Colorado Crime Information Center (CCIC) and National Crime Information Center (NCIC) criminal history records to generate leads.

### **Cases Closed Due to Familial DNA Hits**

A large portion of cases closed through the use of familial DNA searches come from the United Kingdom, largely because the technique of familial DNA searching has been permitted in that country since 2002 (Stokes, 2008). From 2002 to 2004, four cases were successfully closed and three individuals were convicted of rape and murder in the United Kingdom due, in part, to familial DNA searches. One individual was not tried because he had died, but his body was exhumed for DNA analysis (Stokes, 2008). Due to the success of viable leads produced by those previous familial DNA searches, the United Kingdom's Forensic Science Services (FSS) launched "Operation Advance", an investigatory unit that re-examines DNA evidence from cold cases by upgrading old biological specimens and submitting them through the National DNA Database (NDNAD) in the UK. From April 2012 to June 2012, Operation Advance has produced twenty-nine matches to murder, ninety-one matches to rapes and six thousand ninety-four matches to other crime scenes by running specimens through the NDNAD alone (National Police Improvement Agency, 2012). According to the FSS (2012), there are twenty cases of interest that remain unmatched with individuals in the NDNAD. Those twenty cases all involve violent crime where the individual is still considered to be at large and a threat to public safety. The cases are now being run through a deliberate secondary search for familial DNA matches. These cases are

still going through the investigation process of following any viable leads produced by the searches, but with that process in motion, it appears there may be hope for apprehending those criminals in the United Kingdom.

In the United States, familial DNA searches were first permitted in California in 2008, Colorado in 2009, Virginia in 2011, and most recently, Texas in 2012. The state of California's Department of Justice was the first to implement a policy permitting familial DNA searches by analyzing partial DNA matches and a modified CODIS reporting system (Moreau, 2012). Familial DNA was only searched for if the case was considered to be criminal, the DNA had a single source profile, and all investigative leads had been exhausted (California Department of Justice Bureau of Forensic Science, 2008). Familial DNA is searched for on fifteen regions and thirteen chromosomes and ranks the partially matching offenders in order of familial likelihood making the more matches of equal numbers of STR on each region increase the likelihood of a familial match (Miller, 2010). The implementation of this new policy generated many viable leads for the many law enforcement agencies throughout California, and most notably, a lead that led to the capture of the notorious serial killer, Lonnie Franklin Jr. (Miller, 2010). Lonnie, also known as the "Grim Sleeper," was finally caught and convicted of the murder of ten women due to a familial DNA search. His DNA was a partial match to his son, and when Lonnie was located due to that lead, the DNA obtained from Lonnie was a match to a discarded piece of pizza left at one of his crime scenes. This confirmation of identity led to the subsequent connections of his other murders in which he left biological evidence (Miller, 2010).

The state of Colorado followed suit shortly after California. Denver District Attorney, Mitch Morrissey, was a driving force behind implementing familial DNA searching software for the state of Colorado and later to the state of Virginia. Morrissey has researched and presented

over thirty cases of stranger rape and homicide that resulted in successful case closures, suspect identification, and subsequent conviction in cases where familial DNA searching was used in the United Kingdom and New Zealand (Morrissey, 2011). His goal was to bring attention to the success of the other countries policies that permitted familial DNA searching in order to implement applicable policies in the United States for existing state authorities and law enforcement agencies that would correspond with the current CODIS database. Morrissey joined forces with the Denver Police Department Crime Lab Director, Gregg LaBerge, and bought the needed technology to start creating their own non-CODIS software that would rank the offender profiles based on the statistical probability that they are the parents/children or siblings of the evidence sample much like the software implemented in California (Morrissey, 2011). Morrissey implied that the top result in this search would expectedly have a true familial relationship with the evidence sample. The Colorado Bureau of Investigation helped Morrissey put into action a procedural guideline for a familial DNA searching policy (Moreau, 2012). After the implementation of familial DNA searches in Colorado, the Denver Police Department was responsible for catching two criminals, Luis Jamies-Tinajero and Marcus Phillips, due to viable leads produced by familial DNA hits from the blood samples they left at their crime scenes.

District Attorney Mitch Morrissey now helps other jurisdictions who are seeking to bring familial DNA searching procedure and policies into their state by offering free training and software implementation. The state of Virginia now uses the same software as a result of Morrissey's help (Morrissey, 2012). The success of the familial DNA searching policy is yet to be seen in Virginia, but high profile cases such as the slaying of a Virginia Tech student, Morgan Harrington, are first in line to try out the new system (Green, 2011). One case of familial DNA searching in the State of Texas has been done since its policy implementation that aided in



closing one rape and murder case. Texas law enforcement officials hope to close more cold cases across the state (Thurmond, 2012).

### **An Exploration of States Currently Using Familial DNA Searches**

There remains a gap in the literature that explores the experience of large metropolitan law enforcement agencies with the technique of familial DNA searching. Further research is needed to explore the issues that arise from implementing procedural guidelines and policy. Many articles about the success of familial DNA searching are found in regards to states with no official policy in place. Further research is needed to explore how investigatory agencies operate without an approved policy or state statute.

Although the implementation of familial DNA policy is relatively new in the United States, further research is needed to determine the amount of viable leads this technique produces in the cases specific to stranger rape and homicide when all investigatory leads have been exhausted. In addition to establishing the number of viable leads, the success of this searching technique should be analyzed in terms of criminal convictions and case closures. Conducting case studies of two large metropolitan law enforcement agencies for future research, such as the Denver Police Department and the Los Angeles County Sheriff's Department, may aid in further exploring the benefits and challenges of implementing familial DNA searching, as both of those agencies have written and approved policy and procedural guidelines in place.

### **Research Questions**

In this study, a policy analysis will be conducted that examines and compares the published policies of familial DNA searching in four states in the United States. These policies will be evaluated in terms of policy implementation, the criteria required to conduct a familial search in each state, and the number of successful case closures these states have had as a result of familial DNA searches. This research will seek to answer the following questions: 1) What safeguards do these states have in place to ensure that the constitutional and privacy rights of individuals are protected including the criterion they must meet to qualify for a familial DNA search? 2) What successes in case closures has the state had due to the use of familial DNA searching software including viable leads? And if a state has not had any cases to use the implemented software, what are the plans for using this technology in the future?

## **Methodology**

### **Research Design**

The research design used to explore the topic of familial DNA searches in four states within the United States will be a qualitative exploratory study that will examine the policy implemented by each state; California, Colorado, Texas, and Virginia. This study will use non-numerical data in an attempt to interpret a deeper understanding of familial DNA searching policy and its implications. Drawing on how these states have defined these searching policies will allow for better understanding of how policy and procedural guidelines are implemented and what the practical application looks like on a routine basis. Each state's current written policy will be evaluated to discover how each policy is aiding with following familial DNA search hits, and the eventual outcomes that result from this technique. The reason for this research is to fill a gap in the literature as it relates to policy analysis for familial DNA searching, as this technique is relatively new.

### **Data Collection Method**

The data collection method used to obtain information from California, Colorado, Texas, and Virginia's policy for familial DNA searching was a combination of an analysis of previously existing public data published by each state's department of justice. Previously existing data was analyzed from policy documents that outline the procedural requirements of the policy as well as jurisdictionally relevant articles that depict the outcome of cases closed due to the current written policy permitting these searches. Published policy guidelines and statutes relating to familial DNA searches were used in conjunction with content analysis of newspaper articles from the areas of jurisdiction regarding evaluation of familial DNA searching policy's case closure rates

and future plans for the policy. The content analysis component to this research will study the record of policy as well as human communication over this topic through published newsprint, as well as a public presentation given publically by Denver District Attorney, Mitch Morressey, at the Annual CSI Convention given at Regis University in October of 2012 (Babbie, 2010, p. 333).

### **Sampling and Recruitment**

This research will utilize a purposive sample of four states within the United States (California, Colorado, Texas, and Virginia) to analyze current policy that permits the use of familial DNA searches. The sample of newspaper articles used for content analysis was purposive in regards to being jurisdictionally relevant to the states being studied. The four states have been chosen for this research because these are the only states that are permitted to perform familial DNA searches, and some have had success in suspect identification and subsequent criminal prosecution. The use of the in person presentation given by Denver District Attorney Mitch Morressey was attended to gain a better insight into the advent of DNA technology, the problems with policy and software implementation, and what the future of law enforcement investigation may look like. Mr. Morressey has been involved in the implementation of this technique in all four states that currently have a written policy.

### **Measurement**

The research derived from the policy analysis of familial DNA searching in California, Colorado, Texas, and Virginia, will compare similar criterion each state shares in the requirements needed to conduct a familial search. Research derived from jurisdictionally relevant newspaper articles will also be used to explore the effectiveness of the technique of familial DNA searches in terms of suspect identification in case closures. This study examines the

published policy of familial DNA searching in four states across the United States in terms of policy implementation, identifies the criterion required to conduct a familial search in each state, and examines the number of successful case closures these states have had due adopting familial searching software.

## Results

### California

According to the California Department of Justice (2008), in the state of California, a DNA profile of a forensic sample must first be run through the California CODIS system and returned with no positive matches. When the forensic sample is then run through the familial DNA software, the name of the possible relative match may only be released to the investigating law enforcement agency if a certain protocol is followed to ensure the constitutional privacy rights of the individuals who share a partial match. The DNA profile must be a single-source profile with 15 loci noted and the case must be unsolved with all investigative leads exhausted. An agreement must be made by the requesting agency and the prosecutor where both parties promise to continue the investigation if the name of the partial match hit is released, and the Y-STR typing by the submitting agency must match the Y-STR typing collected by the Department of Justice. If the Y-STR typing is a match, then the Department of Justice will attempt to identify non-forensic information about the partial match relating to that person's possible relatives. After viable leads have been produced in terms of family relatives, the Department of Justice will meet with the requesting law enforcement agency, the laboratory processing the samples, and the prosecutor's office to review the discovered information and release the name of the partial match from either the reference database or the offender database. If there is any discrepancy about a reason not to release the name, the Attorney General will make the final decision to release or not to release the name of the partial match.

If an unknown suspect from an unsolved case is believed to be a threat to public safety, a special request for a modified CODIS search can be submitted that will state to the Chief of the Bureau of Forensic Services the reason for the submission and the investigative leads that have

been followed with no success. The same requirements for a traditional familial search as listed above also apply to the special request. In addition to the original submission requirements, the CODIS search conducted by the Department of Justice must result in a manageable number of candidates and each candidate match will be prioritized after a likelihood calculation is done to determine possible relatedness. The same rules for releasing the name of the partial match apply in special requests and traditional familial requests.

The California Department of Justice policy written in 2008 makes note of required conditions of confidentiality of all involved agencies, and their employees. This policy also urges the designees from each agency to limit the number of individuals involved in the investigation from obtaining the released name and information as to limit the chance of information being wrongfully released. The policy also requires that the likelihood match may only be released if the partial match is considered to be a first degree relative; that is, a full blooded sibling or a parent/child relationship. Extensive documentation is required of all collaborating agencies to ensure proper protocol has been followed.

As mentioned previously in the literature review, California has had success in closing multiple cases related to four offenders due to familial DNA searches. All four offenders' cases qualified for familial DNA searches. Of the four offenders, all four were men, three were rapists, and all four were murderers (Morressey, 2011).

### **Colorado**

The Colorado Bureau of Investigation (2009) developed a written policy for familial DNA searching much like that state of California. In order for a case to qualify for a familial DNA search in the state of Colorado, the submission must meet certain criterion. The case must be unsolved with all investigative leads exhausted, and a special request by the chief law

enforcement officer and/or by the district attorney will be made to the Colorado Bureau of Investigation (CBI). When submitting a familial search request to the CBI, the requesting agency must provide a reason that the unsolved case has negative public safety implications and a well-documented case history that outlines that procedures followed for evidence collection and all investigative leads that have been followed without success. In addition to this submission, the requesting agency must agree to adhere to CBI policy and receive CBI approved training in the use of DNA familial search evidence, and the requesting agency must also make a commitment the CBI to investigate the case further once the partial match's name is released. The DNA profile must be a single source profile with all loci noted, a Y-STR sample will be provided for male candidates to be analyzed at CODIS eligible DNA laboratory and upon completion of the analysis, all remaining samples will be returned to the CBI for destruction and subsequent documentation of that destruction, to ensure proper safeguards in regards to privacy concerns.

In order to release information from the CBI to the chief law enforcement officer and the district attorney, it must contain the DNA markers that the sample has in common with the DNA offender profile including the name, date of birth, and ethnicity of each individual. There must be a disclosure statement on the CBI case report that states that the report is for law-enforcement purposes only, and that any misuse of the information is a violation of state and federal law. The CBI also requires that the case report be mailed or hand delivered, but never electronically transmitted to again ensure that privacy rights are protected.

After the names of the candidates are released to the requesting agency, a family tree of male relatives passed through the Y-chromosome will be created and background checks of those individuals will be done to determine relatedness. The state of Colorado goes one step further and details the way in which forensic evidence must be submitted for purposes of



criminal prosecution and procedural steps for contacting possible family members of the offender.

Colorado has had success in closing multiple cases related to two offenders. Both offenders were involved in serial car break-ins and theft, and both offenders' cases qualified for a familial DNA search based on the criteria that both offenders were a threat to public safety (Morressey, 2011).

### **Texas**

The Texas Department of Public Safety created a standard operating procedure for familial DNA searching in the state of Texas in 2012. This policy not only outlines the correct procedure for collecting, submitting, and following generated leads, but this policy also outlines the limitations of the technique of familial DNA testing before stating the rules and restrictions. Limitations include familial searches that produce thousands of hits that prevent the laboratory from processing them all to exploring the possibility that the relative of an offender is not known to the family. This document states that these limitations are listed in this policy to ensure transparency and integrity of all agencies involved in the familial DNA search. This document states that all information obtained in the pursuit of a partial DNA match should only be treated as an investigative lead, not as concrete evidence.

The state of Texas requires that the sample can only qualify for a familial search if it is an unsolved crime with all investigative leads exhausted, and the crime must be a homicide, sexual assault, or other violent crime that has significant public safety concerns. In the state of Texas, property crimes do not qualify for familial DNA searches. The request for a familial search must be made jointly by the investigating agency and the district attorney. The sample must be a single source profile with 13 loci noted, the profile must not be involved in more than two

moderate stringency matches to proceed to further investigation of that sample, and requires the local CODIS laboratory to report their statistical Y-STR matches to the state laboratory after analysis to be passed on to the appropriate prosecutor's office. In Texas, the state CODIS laboratory makes the decision to release the identifying information. The release of information is made in writing and can be mailed, faxed, or hand delivered. If information is determined to be a positive partial match, the report is then prohibited from being sent electronically to protect that individual's right to privacy. This policy also requires that a disclosure statement outlining the use of information for law enforcement purposes only and misuse is a violation of state and federal law.

Texas has had success in closing one case since its implementation in April of 2012. The case qualified for a familial DNA search under the pretense that the offender was a threat to public safety, and that one offender was apprehended on charges of rape and murder of one individual.

### **Virginia**

The Commonwealth of Virginia Department of Forensic Science (2011) developed a policy relating to accepting of cases for performance of familial DNA searching. The document is brief. In the state of Virginia, the request for a familial DNA search must be submitted by the chief law enforcement officer of the investigating agency. The case must be an unsolved violent crime against a person or is a credible threat to public safety. In order to qualify for a familial search, all other investigative leads must be exhausted. The sample must be a single source DNA profile with an exhibited full DNA profile (loci not specified). The director of the Department of Forensic Science (DFS), the DFS biology program manager, the requesting law enforcement officer, the Commonwealth's Attorney for the investigating jurisdiction, and any other personnel

necessary must confer regarding the reason for submission, the contents of the case, the use of any search results. After an agreement is made, the chief law enforcement officer and the district attorney will jointly promise to investigate the case further once potential matches are identified.

To date, the state of Virginia has not used the implemented and approved software, but law enforcement agencies are preparing cold case homicides such as the killing of Virginia Tech student, Morgan Harrington, for familial DNA searching from forensic samples found at that crime scene (Morressey, 2012).

## **Discussion**

### **Implications for Practitioners**

All four states that permit the use of familial DNA searches, documentation of the investigative process and exhaustion of all viable leads is a common component. An unsolved case where a suspect is considered to be a threat to public safety is a special consideration for approved submission of a request for familial searching in all states that have this written policy. California and Colorado have the most extensive and detailed policies that outline the exact protocol for evidence collection and processing. Potentially, the lengthy policy with rigid requirements may pigeon-hole those states into not being able to make exceptions as they present themselves over time. Texas takes a different approach to policy writing that outlines the limitations of the technique while Virginia's policy is possibly too brief and leaves room for errors to be made in collection and processing if a guide for those tasks is not available.

As shown in the results section, California has had the most success in using familial DNA searches. This could possibly be attributed to the fact that the state of California was the first state in the United States to implement and practice this policy. Colorado has had success in fewer cases that include carjacking and theft, but no cases for violent crime. In the state of Texas, the crimes submitted in Colorado for car thefts would not meet the submission criterion because in Texas property crimes are not eligible for familial DNA searches.

This research has shown that the implementation of policy to permit the use of familial DNA searches has been successful in case closures and creating viable leads. The policies in California and Colorado may be more extensive as a result of amendments being made after more cases have been submitted for approval. While Texas and Virginia policies are still in their

infancy, the policies that have been created will set their law enforcement agencies up for successful case closure for future cases. All of the state policies reviewed here have language that attempts to safeguard the individual's rights to privacy and limit the exposure of sensitive information to essential personnel.

### **Direction for Future Research**

The future of forensic science is moving progressively forward with the technique of familial DNA searches to create viable leads for investigative agencies and apprehend the responsible parties for purposes of criminal prosecution. There is a gap in the literature relating to experience of large metropolitan law enforcement agencies with the technique of familial DNA searching. Further research is needed to explore the issues that arise from implementing procedural guidelines and policies for this new technology. Many articles about the success of familial DNA searching have been found in regard to states with no official policy in place. Further research is needed to explore whether there are differences in how investigatory agencies operate between states with formal policies and those that do not have formal state-level policies.

Although the implementation of familial DNA policy is relatively new in the United States, further research is needed to determine the amount of viable leads this technique produces in the cases specific to stranger rape and homicide when all investigatory leads have been exhausted. In addition to establishing the number of viable leads, the success of this searching technique should be analyzed in terms of criminal convictions and case closures. Conducting case studies of law enforcement agencies that use this technique, may aid in further exploring the benefits and challenges of implementing familial DNA searching.

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### **Appendix of Definitions**

#### DNA

Deoxyribonucleic acid is the hereditary material in humans and almost all other organisms.

#### Locus

In the fields of genetics and genetic computation, a locus (plural loci) is the specific location of a gene or DNA sequence on a chromosome.

#### Y-STR

A Y-STR is a short tandem repeat (STR) on the Y-chromosome. Y-STRs are often used in forensics, paternity, and genealogical DNA testing.