

# The Science of Change: Familial Searches And Y-STR DNA

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## I. INTRODUCTION

On January 1<sup>st</sup>, 2007, Los Angeles Police Department (LAPD) detectives received another devastating call. Janecia Peters, a twenty-five-year-old mother, had been found shot to death and dumped in a trash bin.<sup>1</sup> She was the serial killer's tenth victim.<sup>2</sup> Dubbed the "Grim Sleeper" for his alleged thirteen-year hiatus from killing, police knew the perpetrator murdered at least ten young women over a twenty-two year period from 1985 to 2007.<sup>3</sup> The murderer followed a distinct modus operandi of shooting women at point-blank range in his car. Most of the bodies had been discovered in abandoned alleyways or dumpsters, and DNA swabbed off each victim's body matched a single perpetrator.<sup>4</sup>

A 2008 profile search of this DNA evidence produced negative results.<sup>5</sup> The killer's DNA was not in the FBI-maintained Combined DNA Index System (CODIS), crushing hopes of an investigatory lead. Eighteen months later, police conducted another profile search, this time using a new technique called Y-chromosomal short tandem repeat (Y-STR) testing. The test, which "analyzes the variation on the male (Y) chromosome in nuclear DNA," produced a hit.<sup>6</sup> A convicted felon shared the killer's Y-STR profile, meaning he was a patrilineal male relative (i.e. father, son, uncle, cousin) of the Grim Sleeper.

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<sup>1</sup> Christine Pelisek, *LAPD Working to Identify 35 Possible 'Grim Sleeper' Serial Killer Victims*, PEOPLE CRIME (Dec. 23, 2016, 1:33 PM), <http://people.com/crime/lapd-working-to-identify-35-possible-grim-sleeper-victims/>.

<sup>2</sup> *Id.*

<sup>3</sup> Ana Garcia, *Inside the LAPD's 'Grim Sleeper' serial killer investigation*, CRIME WATCH DAILY, (Oct. 21, 2016, 11:38 AM), <https://crimewatchdaily.com/2016/10/21/inside-the-lapds-grim-sleeper-serial-killer-investigation/>; *Victims of the Grim Sleeper*, CNN (Feb. 15, 2016, 10:39 PM), <https://www.cnn.com/2016/02/15/us/gallery/grim-sleeper-victims/index.html>.

<sup>4</sup> Garcia, *supra* note 3.

<sup>5</sup> Seth Augenstein, *Suspected Serial Killer 'Grim Sleeper' Defense Targets Ballistics Evidence*, FORENSIC MAGAZINE (Apr. 27, 2016, 12:55 PM), <http://www.forensicmag.com/article/2016/04/suspected-serial-killer-grim-sleeper-defense-targets-ballistics-evidence>.

<sup>6</sup> JANE MOIRA TAUPIN, *USING FORENSIC DNA EVIDENCE AT TRIAL: A CASE STUDY APPROACH* 138 (CRC Press, 2016).

Police quickly identified the convict's father, Lonnie Franklin Jr., as a possible suspect. While Franklin had never been arrested, his son's DNA was in CODIS due to a 2009 felony weapons charge.<sup>7</sup> After conducting an undercover operation to obtain Franklin's DNA, police confirmed his involvement in the murders. Franklin's DNA matched the DNA found on each victim. He was arrested in 2010, and sentenced to death on August 10<sup>th</sup>, 2016.<sup>8</sup> Today, investigators suspect Franklin may be responsible for the deaths of at least 25 women.<sup>9</sup> Without the advent of Y-STR testing, it is possible Franklin would still be at large.

This case is a testament to the potential of familial DNA searches using Y-STR technology.<sup>10</sup> However, the use of Y-STR DNA searching is contested. First conceived in 1992, Y-STR profiling did not reach the U.S. criminal justice system until the U.S. Scientific Working Group on DNA Analysis Methods (SWGDM) released testing kits in 2003.<sup>11</sup> Described as an "especially hard-won method," Y-STR DNA testing is useful in narrowing investigations by identifying either the suspect himself or the suspect's biological male relatives.<sup>12</sup> Notably, the DNA Identification Act of 1994 is silent regarding the legality of familial searching.<sup>13</sup> Perhaps hesitant to employ familial searching without express congressional approval, the FBI states that "routine familial searching at the national level is not

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<sup>7</sup> *Id.* at 154.

<sup>8</sup> Judgment of Death Commitment Order at 4, *California v. Franklin, Jr.*, 2016 WL 4417064 (Cal. Super. Ct. 2016) (No. BA 382700).

<sup>9</sup> Marisa Gerber & James Queally, *The 'Grim Sleeper' is sentenced to death for string of murders*, L.A. TIMES (Aug. 10, 2016, 3:35 PM), <http://www.latimes.com/local/lanow/la-me-grim-sleeper-sentencing-20160810-snap-story.html>.

<sup>10</sup> Y-STR DNA testing is one, but not the only type of familial searching available to law enforcement. Similar to Y-STR DNA, mitochondrial DNA (mtDNA) passes from generation to generation through the maternal line. JOHN M. BUTLER, FUNDAMENTALS OF FORENSIC DNA TYPING 363 (Academic Press, 2010). Consequently, mtDNA can also serve as a "lineage marker" for forensic investigations. *Id.* Butler notes that mtDNA is particularly useful for identifying the source of highly degraded forensic samples, such as bone, teeth, and hair. *Id.* at 375.

While not formally considered "familial searching," standard (non-Y chromosome) STR DNA analysis can also implicate family members through partial matches. In fact, relatives other than identical twins can exhibit matching DNA profiles across numerous loci. Dan E. Krane & Simon Ford, *Essential Elements of a Critical Review of DNA Evidence*, in FORENSIC SCIENCE REFORM PROTECTING THE INNOCENT 211 (Wendy J. Koen & C. Michael Bowers eds., 2017). For example, a 2005 study found that on average one out of every 154,000 pairs of siblings in North America match DNA profiles across 13 STR loci (the standard number of loci analyzed in STR testing). *Id.* at 214–215.

<sup>11</sup> J. M. Butler, *Recent Developments in Y-Short Tandem Repeat and Y-Single Nucleotide Polymorphism Analysis*, 15 FORENSIC SCI. REV. 91, 93 (2003).

<sup>12</sup> Lutz Roewer, *The Y-Chromosome Haplotype Reference Database (YHRD)—Publicly Available Reference and Research Datasets for the Forensic Interpretation of Y-Chromosome STR Profiles*, in HANDBOOK OF FORENSIC GENETICS: BIODIVERSITY AND HEREDITY IN CIVIL AND CRIMINAL INVESTIGATION 231 (Antonio Amorim & Bruce Budowle eds., 2016).

<sup>13</sup> DNA Identification Act of 1994, 34 U.S.C. § 12591-12593 (2017).

recommended at this time.”<sup>14</sup> As a result, the legal rules governing familial searching in the U.S. are driven by a “patchwork of state law, state and local regulation, and even internal laboratory policies.”<sup>15</sup> Legal scholars Nessa Lynch and Liz Campbell argue these variations in U.S. law make it nearly “impossible to formulate a precise legal picture.”<sup>16</sup> While some states (such as California and Colorado) endorse familial searching, others (including Maryland and the District of Columbia) ban the practice.<sup>17</sup> Caught in the middle of the debate, the majority of states lack clear rules either authorizing or forbidding familial searches.<sup>18</sup>

This note will argue in favor of the admissibility of Y-STR DNA evidence. Like any new technology, Y-STR DNA testing will face rigorous challenges before it can achieve widespread acceptance in the forensic science community. However, state courts have consistently held that Y-STR testing is reliable, relevant, and not unfairly prejudicial. Moreover, the expansion of DNA databases and New York’s recent acceptance of familial DNA searching suggests the investigatory method is gaining traction in the U.S. criminal justice system. If implemented with clear procedural safeguards, the benefits of Y-STR DNA testing will outweigh its costs. This note proposes legislation for the admissibility of familial Y-STR DNA searching. A formal law-making approach would mitigate constitutional concerns, while simultaneously taking advantage of Y-STR DNA’s evidentiary potential.

Part I discusses the arguments in favor and against Y-STR DNA testing, including its potential impact on exonerations and miscarriages of justice. In Part II, this note analyzes potential barriers to admissibility, including: Federal Rule of Evidence (Rule) 702 (i.e., the *Daubert/Frye* standard), Rule 403’s bar to unfairly prejudicial evidence, and the Fourth Amendment prohibition on unreasonable searches. Part III considers current state and federal policies regarding familial searching and Y-STR DNA. In addition, Part III details a proposed blueprint for future state legislation regarding the admissibility of familial searching and Y-STR DNA evidence.

## II. ARGUMENTS FOR AND AGAINST Y-STR

Y-STR DNA testing poses great benefits and challenges. Not only can the technology aid criminal investigations and solve cold cases, it also has the potential to exonerate the wrongfully condemned. On the other hand, positive identifications

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<sup>14</sup> Federal Bureau of Investigation (FBI), *Combined DNA Index System (CODIS)*, <https://www.fbi.gov/services/laboratory/biometric-analysis/codis> (last visited Jan. 14, 2018 5:45 PM).

<sup>15</sup> NESSA LYNCH & LIZ CAMPBELL, *THE COLLECTION AND RETENTION OF DNA FROM SUSPECTS IN NEW ZEALAND* 230 (Victoria University Press, 2015). Nessa Lynch is faculty of law at Victoria University of Wellington. Liz Campbell is faculty of law at the University of Edinburgh.

<sup>16</sup> *Id.*

<sup>17</sup> ERIN E. MURPHY, *INSIDE THE CELL: THE DARK SIDE OF FORENSIC DNA* 198 (Nation Books, 2015).

<sup>18</sup> *Id.*

are not guaranteed, genetic testing raises privacy concerns, existing legal barriers could stymie widespread acceptance, and errors can result in the miscarriage of justice.

#### A. *The Case for Y-STR*

Proponents of Y-STR testing point to success stories such as the location of the Grim Sleeper, the identification of Santa Cruz rapist Elvis Lorenzo Garcia, and the recent apprehension of suspected child-molester Justin Christian in Cleveland.<sup>19</sup> These cases, while noteworthy, are not anomalies. In March 2017, defendant Jeffery Netherton pleaded guilty to four counts of aggravated rape in Tennessee after prosecutors established his guilt using Y-STR DNA.<sup>20</sup> According to District Attorney General Bryant Dunaway, “[l]ast year, Jeffery Netherton was tried before a jury for these charges. The jury didn’t reach a verdict at the time, in part, because prosecutors didn’t have the benefit of what is called Y-STR DNA testing.”<sup>21</sup> Familial searching solved another cold case in December 2017, when Texas police used a discarded cigarette to link Byron Lloyd Collins to the sexual assault and murder of a fifty-year-old woman.<sup>22</sup>

Furthermore, the Grim Sleeper is not the only infamous serial killer to be identified using Y-STR DNA. The Boston Police Department used Y-STR DNA testing to confirm the identity of the so-called “Boston Strangler” in 2013.<sup>23</sup> Never convicted of the Boston Strangler killings, Albert DeSalvo was stabbed to death in prison in 1973 by fellow inmates while serving a life sentence for unrelated rape charges.<sup>24</sup> Nearly fifty years later, Boston authorities found a match between Y-STR DNA recovered on one of the Boston Strangler’s victims and DeSalvo’s nephew.<sup>25</sup> Police exhumed DeSalvo’s body and used standard (non-Y chromosomal) STR DNA analysis to verify the killer’s identity—at an accuracy

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<sup>19</sup> Michael Chamberlain, *Familial DNA Searching: A Proponent’s Perspective*, 27 CRIM. JUST. 18, 28–29 (2012); Press Release from Dave Yost, Ohio Att’y Gen., *First-Ever Familial DNA Search in Ohio Leads to Arrest of Man Accused of Attacking Kids*, OHIO ATT’Y GEN. NEWS RELEASES (Dec. 5, 2016), <http://www.ohioattorneygeneral.gov/Media/News-Releases/December-2016/First-Ever-Familial-DNA-Search-in-Ohio-Leads-to-Ar>.

<sup>20</sup> Tracey Hackett, *Man pleads guilty to aggravated rape in light of new DNA evidence*, HERALD-CITIZEN (Mar. 21, 2017), <http://herald-citizen.com/stories/man-pleads-guilty-to-aggravated-rape-in-light-of-new-dna-evidence,20330>.

<sup>21</sup> *Id.*

<sup>22</sup> Nakia Cooper, *‘All pieces of puzzle fell together’: Familial DNA helps crack case of woman murdered on Mother’s Day, police say*, THE CW 39 HOUSTON (Dec. 27, 2017, 11:38 AM), <http://cw39.com/2017/12/27/all-pieces-of-puzzle-fell-together-familial-dna-helps-crack-case-of-woman-murdered-on-mothers-day-police-say/>.

<sup>23</sup> Philip Bulman, *Solving Cold Cases with DNA: The Boston Strangler Case*, NATIONAL INSTITUTE OF JUSTICE (Mar. 4, 2014), <https://www.nij.gov/journals/273/pages/boston-strangler.aspx>.

<sup>24</sup> *Id.*

<sup>25</sup> *Id.*

level of one in 220 billion.<sup>26</sup> Authorities believe DeSalvo raped and murdered at least eleven women during his lifetime.<sup>27</sup>

Used effectively, Y-STR familial searching can solve cold cases.<sup>28</sup> With estimates of 256,000 unsolved U.S. homicide cases since 1980, law enforcement is fighting an uphill battle to hunt down violent criminals.<sup>29</sup> Sadly, police efforts are falling short. America's clearance rate (i.e., the number of homicides solved) has dropped from approximately 90% in 1964 to approximately 64% in 2012.<sup>30</sup> The Rape, Abuse & Incest National Network (RAINN) reports that out of every 1,000 rapes, 995 perpetrators will walk free.<sup>31</sup> In the words of forensic scientist and Y-STR advocate Dr. Jack Ballantyne, the Associate Director for Forensic Research at the National Center for Forensic Science, "[w]e have to make a good faith effort . . . to make sure every victim, who is victim of a sexual assault, gets some closure."<sup>32</sup> If Y-STR DNA could solve even a fraction of these forgotten cases, more victims would receive answers and fewer perpetrators would remain at large.

Just as Y-STR DNA testing has the potential to increase arrest and conviction rates, it also has the power to exonerate innocent men. The exclusionary aspect of DNA statistical analysis allows forensic scientists to exclude non-matching Y-chromosome profiles from suspicion. Like standard STR analysis, Y-STR interpretation is based on exclusion rates. When comparing Y-STR DNA to a crime scene sample or database profile, there are three possible results: (1) *exclusion* "because the Y-STR profiles are different and could not have originated from the same source," (2) *inconclusive* where the statistical results are too ambiguous to draw a conclusion, or (3) *failure to exclude* because the profiles likely originated from the same source or a patrilineal male relative.<sup>33</sup> Exclusion is the most conclusive finding. If the allele profiles do not match, the Y-STR DNA did not originate from the same source. In contrast, "positive" results (i.e., failure to exclude) are more problematic. While matching profiles may indicate the Y-STR DNA originated from the same source, the genetic similarities between the samples could be attributed to mutation, paternal relatives, or even a random match.<sup>34</sup>

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<sup>26</sup> *Id.*

<sup>27</sup> *Id.*

<sup>28</sup> *Id.*

<sup>29</sup> Thomas Hargrove, *Why We Exist*, MURDER ACCOUNTABILITY PROJECT, <http://www.murderdata.org/p/about.html> (last visited Jan. 27, 2018).

<sup>30</sup> *Getting away with murder*, THE ECONOMIST (July 4, 2015), <https://www.economist.com/news/united-states/21656725-police-fail-make-arrest-more-third-nations-killings-getting-away>.

<sup>31</sup> *The Criminal Justice System: Statistics*, RAINN, <https://www.rainn.org/statistics/criminal-justice-system> (last visited Jan. 27, 2018).

<sup>32</sup> Jack Ballantyne, *Forensic labs should use Y-STR analysis in sexual assault cases (HIDS 2015)*, THERMOFISHER SCIENTIFIC, <https://www.thermofisher.com/us/en/home/industrial/forensics/human-identification/forensic-dna-analysis/pcr-amplification-forensic-dna-profiling/y-str-analysis.html> (last visited Jan. 27, 2018).

<sup>33</sup> JOHN M. BUTLER, FUNDAMENTALS OF FORENSIC DNA TYPING 373 (Academic Press, 2010).

<sup>34</sup> *Id.*

Several foreign jurisdictions have taken advantage of Y-STR DNA's exclusionary characteristics by relying on profiles to eliminate suspects and exonerate wrongfully convicted men. In one of the first cases to employ Y-STR DNA technology, Germany exonerated a convicted rapist in the early 1990s using alleles from the Y-chromosome.<sup>35</sup> Polish authorities used Y-STR DNA collected from semen stains to eliminate 421 suspects in the rape of 14 women and the murder of another.<sup>36</sup> Japanese police utilized Y-STR DNA in 2008 to exonerate a man convicted of murdering a four-year-old girl.<sup>37</sup> The suspect was released after spending nineteen years in prison for a crime he did not commit.<sup>38</sup>

Given the relatively modest usage of Y-STR testing in the U.S. criminal justice system,<sup>39</sup> its true effect on wrongful convictions is unknown. However, recent exonerations suggest post-conviction Y-STR DNA testing is becoming more prevalent in the U.S. One study of 194 DNA-related exonerations concluded that Y-STR DNA was responsible for overturning 16% of the analyzed wrongful convictions.<sup>40</sup> Compared to other types of DNA analysis, Y-STR testing was the second most successful at uncovering errors (standard STR analysis won, accounting for 70% of analyzed exonerations).<sup>41</sup> For example, in May 2010, the Ohio Innocence Project relied on Y-STR testing to free Raymond Towler.<sup>42</sup> After receiving a life sentence for allegedly raping an eleven-year-old girl and assaulting her twelve-year-old male cousin, Towler sought a DNA test to prove his innocence.<sup>43</sup> Y-STR DNA evidence collected from the female victim's underwear excluded Towler as the perpetrator.<sup>44</sup> At the age of fifty-two, Towler walked out of

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<sup>35</sup> FIONA BROOKMAN ET AL, *THE HANDBOOK OF HOMICIDE* 553 (Fiona Brookman et al. eds., Wiley Blackwell, 2017).

<sup>36</sup> TAUPIN, *supra* note 6, at 140–141.

<sup>37</sup> *Id.* at 141–142.

<sup>38</sup> *Id.* Importantly, Y-STR DNA testing can be conducted using very old samples.

<sup>39</sup> It is unclear how frequently foreign countries use forensic Y-STR DNA testing in comparison to the U.S. However, forensic scientist John Butler reports the use of Y-STR DNA “has been much more widespread in Europe than the United States.” JOHN M. BUTLER, *ADVANCED TOPICS IN FORENSIC DNA TYPING: METHODOLOGY* 390 (Academic Press, 2012). Lynch and Campbell claim that England and Wales have historically employed familial searching by “retaining and continuously searching samples taken from all criminal suspects.” NESSA LYNCH & LIZ CAMPBELL, *THE COLLECTION AND RETENTION OF DNA FROM SUSPECTS IN NEW ZEALAND* 234 (Victoria University Press, 2015).

<sup>40</sup> Greg Hampikian et al., *The Genetics of Innocence: Analysis of 194 U.S. DNA Exonerations*, 12 ANN. REV. OF GENOMICS AND HUM. GENETICS 97, 97 (2011).

<sup>41</sup> *Id.*

<sup>42</sup> *Raymond Towler: Other Ohio Cases with Mistake Witness Identifications*, THE INNOCENCE PROJECT, Feb. 15, 2018, <https://www.law.umich.edu/special/exoneration/Pages/casedetail.aspx?caseid=3696>.

<sup>43</sup> *Id.*

<sup>44</sup> *Id.*

prison and received \$2.5 million in compensation from the state of Ohio.<sup>45</sup> He spent twenty-eight years in prison.<sup>46</sup>

Similarly, Virginia employed Y-STR DNA testing to exonerate Sherman Brown in 2016.<sup>47</sup> Brown was originally sentenced to death after being convicted of murdering a four-year-old boy and raping his mother in 1969.<sup>48</sup> Eventually, the court resentenced Brown to life in prison.<sup>49</sup> Nearly 40 years later, the Innocence Project reviewed Brown's case and pushed for DNA testing.<sup>50</sup> The unidentified Y-STR DNA found on the female victim's vaginal swab excluded Brown, paving the way for his exoneration.<sup>51</sup> In Brown's words, "I was still numb to the fact that I was really going to be killed . . . I've been confined since then."<sup>52</sup> Now at the age of sixty-nine, Brown expresses gratitude that he was not executed for a crime he never committed.<sup>53</sup>

Kenneth Ireland, another wrongfully-convicted prisoner, expressed similar gratitude for the DNA evidence that secured his own exoneration.<sup>54</sup> According to Ireland, "[w]hen the crime happened, DNA was the stuff of science fiction . . . It was this fairy-tale stuff that people talked about."<sup>55</sup> Ireland got his miracle in 2009, when Connecticut's Division of Public Defender Services excluded him from the DNA collected in the rape and murder of a thirty-year-old woman.<sup>56</sup> When asked if he would consent to the DNA testing, Ireland replied, "[a]bsolutely, I've got nothing else to lose."<sup>57</sup>

Success stories aside, not everyone takes Ireland's optimistic view of exoneration-focused Y-STR testing. Concerns about scientific efficacy, unfair prejudice, and compromised privacy remain. Scientific limitations of Y-STR analysis and biased defense attorneys (i.e., "unfairly prejudiced" in favor of exoneration) could affect the accuracy of overturned convictions. Finally, exoneration-focused Y-STR testing has the potential to implicate new defendants by dragging additional families (and private family information) into police

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<sup>45</sup> *Id.*

<sup>46</sup> *Id.*

<sup>47</sup> Frank Green, *Lawyers Say DNA Testing Proves Innocence of Man in Prison for more than 46 Years for Killing of 4-year-old Va. Boy*, RICHMOND TIMES-DISPATCH, Oct. 18, 2016, <http://www.richmond.com/news/lawyers-say-dna-testing-proves-innocence-of-man-inprison/article/9607eae1-5ad1-5619-8d5e-76ee1d50fbbe.html>.

<sup>48</sup> *Id.*

<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> *Id.*

<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> See JOEL COHEN, *BROKEN SCALES: REFLECTIONS ON INJUSTICE* 89–91 (Am. Bar Ass'n, 2017).

<sup>55</sup> *Id.* at 89.

<sup>56</sup> *Id.* at 74–76.

<sup>57</sup> *Id.* at 90.

investigations. Yet Y-STR DNA's potential to free innocent men is promising. The Innocence Project reports the average exoneree spends fourteen years in prison.<sup>58</sup> If approached cautiously, an expansion of Y-STR DNA testing could prevent (or at least reduce) the staggering consequences of wrongful conviction.

### B. *The Case Against Y-STR*

Despite its promise, opponents contend familial searching (and Y-STR DNA testing in particular) is laden with low success rates, privacy concerns, and possible constitutional barriers. Outspoken critic and New York University law professor Erin Murphy suggests that anecdotal evidence from familial searching in the U.S. reflects a 10% success rate (i.e., arrest or conviction).<sup>59</sup> Other estimates, while higher, are not awe-inspiring. As of January 2015, the National Institute of Justice reported that twenty-three of ninety familial searches in Denver identified a true biological relative of the offender—a success rate of approximately 25.6%.<sup>60</sup> A similar analysis revealed a success rate of 39% in California and 21% in the United Kingdom.<sup>61</sup> The FBI notes that “CODIS matches, in general, have very low efficiency in locating true relatives in offender databases” due to the increasing likelihood that unrelated individuals will share the same alleles at multiple loci in large DNA databases.<sup>62</sup> In other words, as the size of the database increases, more unrelated (or very distantly related) individuals will share the same or similar DNA profile. Such mistaken genetic correlations can promote “dead-end leads” and result in poor resource management.<sup>63</sup>

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<sup>58</sup> *DNA Exonerations in the United States*, THE INNOCENCE PROJECT (Feb. 17, 2018), <https://www.innocenceproject.org/dna-exonerations-in-the-united-states/>.

<sup>59</sup> MURPHY, *supra* note 17, at 212.

<sup>60</sup> Angie Ambers, *Familial DNA Searching: Current Approaches*, NAT. INST. OF JUST., 20 (2015), [https://www.academia.edu/26994102/Familial\\_DNA\\_Searching\\_Current\\_Approaches](https://www.academia.edu/26994102/Familial_DNA_Searching_Current_Approaches).

<sup>61</sup> *Id.* at 20–21.

<sup>62</sup> *Frequently Asked Questions on CODIS and NDIS*, FED. BUREAU OF INVESTIGATION, <https://www.fbi.gov/services/laboratory/biometric-analysis/codis/codis-and-ndis-fact-sheet> (last visited Feb. 3, 2018). While the FBI has an explicit policy against “familial searching,” FBI forensic scientists do use “partial matches” to identify biological relatives of DNA sources. *Id.* According to the FBI, a partial match is the “spontaneous product of a routine database search where a candidate offender profile is not identical to the forensic profile but because of similarity in the number of alleles shared between the forensic profile and the candidate profile, the offender may be a close biological relative of the source.” *Id.* In contrast, familial searching is defined as an “intentional or deliberate search” for the “purpose of potentially identifying close biological relatives of the unknown forensic sample.” *Id.*

As suggested by Sheldon Krinsky (Professor of Urban and Environmental Policy at Tufts University) and Tania Simoncelli (Senior Advisor to the Director of the Broad Institute of MIT and Harvard), the FBI's distinction between familial searching and partial matches “seems tenuous.” SHELTON KRINSKY & TANIA SIMONCELLI, *GENETIC JUSTICE: DNA DATA BANKS, CRIMINAL INVESTIGATIONS, AND CIVIL LIBERTIES* 76 (Colum. U. Press, 2012). The end result of both a familial search and a partial match is the same: “seek out family members of that individual.” *Id.*

<sup>63</sup> MURPHY, *supra* note 17, at 212.

Efficacy rates aside, other detractors voice trepidations over privacy. Patient education writer Jessica Cerretani points out that familial searching, like Y-STR DNA analysis, can place “criminals’ relatives under genetic surveillance—possibly tracked for life and subjected to police harassment—simply because their close family member, whose DNA is on record, may have committed a crime.”<sup>64</sup> George Washington University law professor Jeffrey Rosen echoes Cerretani’s concerns, equating familial searching with the English common law doctrine of “corruption of the blood.”<sup>65</sup> Under the doctrine, which was largely rejected in Article III of the U.S. Constitution, the descendants of a felon could not inherit his title or estate.<sup>66</sup> Rosen argues familial searching similarly “punishes” family members for the crimes of their blood relatives by exposing them to unwarranted genetic profiling.<sup>67</sup> If not deprived of property per se, family members of individuals with DNA in CODIS may be contacted by the police, asked to provide a DNA sample, or pressured into confessing to a crime they did not commit.<sup>68</sup>

Moreover, familial searching could conceivably expose private or otherwise unknown family information, such as “paternity, incest, immigration eligibility, human immunodeficiency virus (HIV) status, or fertility.”<sup>69</sup> Government misuse of this sensitive data has the potential to facilitate coercion, embarrass involved parties, and ultimately tear families apart. As director of the Massachusetts State Police Crime Lab, Guy Vallaro, comments, “California has done a very thorough job of ensuring that [it has] all the quality measures in place for familial searching. But that takes a lot of time and money.”<sup>70</sup> In reality, some states likely lack the necessary determination and economic resources to implement effective and corruption-free Y-STR DNA analysis. Without careful observance of legislative mandates and criminal procedure, the technology has the potential to do more harm than good.

Finally, several legal scholars contend that familial searching raises Fourth Amendment concerns. While no U.S. court has yet ruled on the constitutionality of familial searching, a successful challenge is plausible. The Fourth Amendment, which protects individuals from unreasonable searches and seizures, could be invoked on two grounds: (1) whether the use of Y-STR DNA constitutes a search, and (2) whether that search is reasonable.<sup>71</sup> According to the U.S. Supreme Court, the collection of physical biological material for forensic purposes is a search under

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<sup>64</sup> Jessica Cerretani, *Familial DNA Searches Might Harm Innocent People*, DNA DATABASES: AT ISSUE CIVIL LIBERTIES 74 (Stefan Kiesbye ed., Greenhaven Press, 2012).

<sup>65</sup> KRIMSKY & SIMONCELLI, *supra* note 62, at 83.

<sup>66</sup> *Id.*; *See also* U.S. Const. art. III, § 3 (“The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood, or forfeiture except during the life of the person attainted”).

<sup>67</sup> *Id.*

<sup>68</sup> *Id.*

<sup>69</sup> *Id.* at 86.

<sup>70</sup> Cerretani, *supra* note 64, at 71.

<sup>71</sup> U.S. Const. amend. IV.

the Fourth Amendment.<sup>72</sup> However, whether subsequent testing and analysis of that sample constitutes a search is less clear.<sup>73</sup> Even if considered a search, the reasonableness of using collected Y-STR DNA is up for debate. In balancing an individual's right to be free from unreasonable searches against the government's interest in preserving public safety, Y-STR DNA critics argue familial searching casts arbitrary suspicion on potentially innocent family members.<sup>74</sup> Due to racial disparities in the criminal justice system, "familial searches will more profoundly impact communities of color."<sup>75</sup> Black individuals are incarcerated at a rate of 5.1 times that of white individuals, meaning that Y-STR DNA testing is more likely to implicate black families than white ones.<sup>76</sup>

These concerns over scientific efficacy, prejudice, and privacy will be addressed below. While Y-STR testing places a unique twist on standard STR testing, it is not a fundamentally new or unprecedented science. As Dr. Ballantyne states, "[t]he technology that is used for Y-STRs is the same basic technology we have for autosomals [analysis on a non-sex chromosome, i.e., standard STR analysis]. Labs have that technology. It is a standard, relatively straightforward way of doing genotyping, or in this case we call it haplotyping."<sup>77</sup> Given its foundation in standard STR analysis, Y-STR testing can (and should) be considered in relation to existing defendant-friendly legal protections. The Federal Rules of Evidence, the U.S. Constitution, and state legislation act as safeguards to ensure criminal defendants are not convicted on error-ridden, prejudicial, or unconstitutional DNA evidence.

However, caution is warranted. Like many technologies, Y-STR analysis has the capacity to facilitate miscarriages of justice. Despite its bullet-proof depiction on American TV shows, forensic science is far from failsafe. In fact, some forms of previously accepted forensic technology have been recently discredited. For example, the FBI formally acknowledged systematic error in its microscopic hair analysis in 2015, condemning a practice that has driven the agency's forensic investigations since 1989.<sup>78</sup> Described as a "mass disaster" for the U.S. criminal justice system, the FBI's flawed analysis stemmed from unwritten and scientifically

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<sup>72</sup> *Skinner v. Ry. Labor Execs. Ass'n*, 489 U.S. 602, 603 (1989).

<sup>73</sup> Joyce Kim et al., *Policy Implications for Familial Searching*, 2 INVESTIGATIVE GENETICS 1, 5 (2011).

<sup>74</sup> Erin E. Murphy, *Relative Doubt: Familial Searches of DNA Databases*, 109 MICH. L. REV. 291, 305 (2010).

<sup>75</sup> MURPHY, *supra* note 17, at 207.

<sup>76</sup> ASHLEY NELLIS, THE SENTENCING PROJECT, THE COLOR OF JUSTICE: RACIAL AND ETHNIC DISPARITY IN STATE PRISONS 4 (2016).

<sup>77</sup> Ballantyne, *supra* note 32.

<sup>78</sup> Spencer S. Hsu, *FBI admits flaws in hair analysis over decades*, THE WASHINGTON POST (Apr. 18, 2015), [https://www.washingtonpost.com/local/crime/fbi-overstated-forensic-hair-matches-in-nearly-all-criminal-trials-for-decades/2015/04/18/39c8d8c6-e515-11e4-b510-962fcfab310\\_story.html?utm\\_term=.736a1d17ac31](https://www.washingtonpost.com/local/crime/fbi-overstated-forensic-hair-matches-in-nearly-all-criminal-trials-for-decades/2015/04/18/39c8d8c6-e515-11e4-b510-962fcfab310_story.html?utm_term=.736a1d17ac31).

erroneous laboratory practices.<sup>79</sup> Even worse, FBI experts frequently relied on “incomplete or misleading statistics” at trial.<sup>80</sup> As a result, FBI examiners gave inaccurate testimony at 257 of the 268 reviewed trials (95%).<sup>81</sup>

Y-STR DNA analysis poses similar risks. Human error, coincidental matches, and even unexplained results can ruin lives. Although DNA has “been hailed as a savior” to criminal investigation, it should not be touted as smoking-gun evidence.<sup>82</sup> University of California Irvine professor William Thompson became skeptical of DNA evidence as early as the 1980s.<sup>83</sup> According to Thompson, “[t]he technology had been accepted by the public as a silver bullet,” but he “happened to believe that it wasn’t.”<sup>84</sup> Thompson’s intuition was right. After reviewing trial DNA evidence from a 1999 Houston rape case, he concluded that Houston lab technicians “were routinely misinterpreting even the most basic samples.”<sup>85</sup> A re-test of male DNA evidence exonerated twenty-year-old Josiah Sutton, who served four years in prison due to gross incompetence in the Houston crime lab.<sup>86</sup> Upon his release, Sutton reflected that “[g]oing to prison, for [him], was like seeing [his] death before it happens.”<sup>87</sup>

Other innocent defendants have fallen victim to coincidental matches—another harrowing reminder of DNA’s limitations. For example, Chen Long-Qi lived as a convicted rapist for five years before Taiwanese authorities uncovered an error in the Y-STR DNA testing used to prove his alleged guilt.<sup>88</sup> Even though Chen’s Y-STR profile “matched” the perpetrator’s profile at seventeen alleles, he was innocent.<sup>89</sup> Chen’s damning Y-STR profile was the result of a statistical anomaly—a coincidental match across the number of tested alleles.<sup>90</sup>

Because each human possesses his or her own unique genetic code, coincidental DNA matches are unusual. Forensic mathematician Charles Brenner estimates that the probability of two randomly-selected males exhibiting a Y-chromosome match is approximately one in 8,800 among Caucasians.<sup>91</sup> A coincidental match

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<sup>79</sup> *Id.*

<sup>80</sup> *Id.*

<sup>81</sup> *Id.*

<sup>82</sup> MURPHY, *supra* note 17, at ix.

<sup>83</sup> Matthew Shaer, *The False Promise of DNA Testing*, THE ATLANTIC (June 2016), <https://www.theatlantic.com/magazine/archive/2016/06/a-reasonable-doubt/480747/>.

<sup>84</sup> *Id.*

<sup>85</sup> *Id.*

<sup>86</sup> *Id.*

<sup>87</sup> *Id.*

<sup>88</sup> Kristen V. Brown, *When Bad DNA Tests Lead to False Convictions*, GIZMODO (Sept. 25, 2017), <https://gizmodo.com/when-bad-dna-tests-lead-to-false-convictions-1797915655>.

<sup>89</sup> *Id.*

<sup>90</sup> *Id.*

<sup>91</sup> Charles H. Brenner, *Understanding Y haplotype matching probability*, FORENSIC SCI. INT’L: GENETICS 233, 234 (2014).

probability may be higher for certain ethnicities. For example, Brenner estimates one in 3,300 randomly-selected Chinese men will have identical Y-STR profiles across the analyzed number of alleles.<sup>92</sup> Accordingly, the odds of a coincidental Y-STR match are low, but feasible. Y-STR DNA evidence, like all DNA evidence, is merely a “statistical probability of coincidence.”<sup>93</sup>

Furthermore, laboratory errors can exacerbate the chances of a coincidental match. In Chen’s case, the collected crime sample contained Y-chromosomal DNA from multiple men.<sup>94</sup> When lab analysts examine DNA from multiple people they must attempt to separate out allele markers from each individual source.<sup>95</sup> Unfortunately, the process is both difficult and risky. With multiple people’s DNA in the pool, a few allele markers from each person may be accidentally combined to produce a coincidental match.<sup>96</sup> After reviewing Chen’s case, Boise State University professor Greg Hampikian concluded the existence of an intermixed sample raised the probability of a coincidental Y-STR match in Chen’s case to one in 741.<sup>97</sup> In a city of twenty-three million people, thousands of men (other than Chen) could have produced a match.<sup>98</sup> If forensic examiners had refrained from testing the mixed Y-STR DNA, it is possible Chen’s false conviction would have been avoided.<sup>99</sup>

It is worth noting that an unknown number of DNA errors go unnoticed—or are blatantly concealed. Murphy contends that reported cases of DNA “mix-ups, transfer, or contamination” are limited to circumstances where suspects can prove their innocence.<sup>100</sup> Unless defense attorneys are willing to review old cases, hunt for forensic errors, and (ideally) catch the correct criminal, most wrongfully-convicted men have no recourse. Finally, there is some anecdotal evidence to

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<sup>92</sup> *Id.*

<sup>93</sup> Laurie Meyers, *The problem with DNA*, 38 MONITOR ON PSYCHOL. 52, 52 (2007).

<sup>94</sup> Brown, *supra* note 88.

<sup>95</sup> Meyers, *supra* note 93.

<sup>96</sup> *Id.*

<sup>97</sup> Brown, *supra* note 88.

<sup>98</sup> *Id.*

<sup>99</sup> *Id.* DNA expert and Wright State University professor Dan Krane argues that Chen’s false positive was likely the product of the mixed Y-STR sample. *Id.* According to Krane, “[t]here is no accepted, reliable way of attaching a statistical weight to a mixed YSTR DNA test. As soon as you see it’s mixed, you have to throw up your hands.” *Id.*

In an interview regarding the Chen case, Associate Director of the University of North Texas Center for Human Identification Michael Coble stressed that DNA results must be approached with caution. *Id.* He warned against snap forensic judgements, stating that “[o]ften times any DNA evidence gets the seal of approval, but it’s really the interpretation that matters.” *Id.* Hampikian agreed, remarking “[t]he way that we rely on tests has to be reevaluated constantly. We are making mistakes today and we won’t know about them for a long time.” *Id.*

<sup>100</sup> MURPHY, *supra* note 17, at 57–58.

suggest the “intentional planting of DNA” is not a mere fiction of crime thrillers.<sup>101</sup> Thompson argues that easy access to random DNA (i.e., cigarettes, drinking glasses, ball caps, etc.) combined with extensive DNA databases, raises the risk of false incriminations through framing. In Thompson’s own words, “[t]he ability of criminals to neutralize or evade crime control technologies has been a persistent theme.”<sup>102</sup> As researchers develop new DNA methodologies to solve crime, perpetrators evolve to thwart them.

Given the narrative and normative evidence discussed above, this note will now consider the legality of admitting Y-STR DNA evidence in court.

### III. ADMISSIBILITY OF Y-STR

As referenced *supra*, existing law could hinder widespread acceptance of Y-STR DNA evidence. Part III will analyze the admissibility of Y-STR DNA evidence under Federal Rule of Evidence (Rule) 702, Rule 403, and the Fourth Amendment of the U.S. Constitution.

#### A. *Is the Science Strong? Y-STR DNA and Rule 702*

Under Rule 702, a trial judge may exclude expert scientific testimony if the evidence lacks reliability or relevance.<sup>103</sup> This two-prong standard, adopted in *Daubert v. Merrell Dow Pharmaceuticals*, utilizes a totality of the circumstances test to determine whether each prong is satisfied.<sup>104</sup> Elements include: (1) whether the science can (or has been) tested, (2) whether the science has undergone peer review, (3) the known or potential rate of error, and (4) whether the science is generally accepted in the relevant scientific community.<sup>105</sup> The “test of reliability is ‘flexible,’ and *Daubert*’s list of specific factors neither necessarily nor exclusively applies to all experts or in every case.”<sup>106</sup> Consequently, the court must balance the reliability of each piece of evidence on a case-by-case basis.

Although Rule 702 superseded the “general acceptance” test under *Frye v. United States*, “general acceptance” is still a controlling factor in many cases.<sup>107</sup> In *Frye*, the Court of Appeals of the District of Columbia Circuit held that a scientific principle must cross the line from “experimental” to “well-recognized” in its

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<sup>101</sup> William C. Thompson, *The Potential for Error in Forensic DNA Testing (and How That Complicates the Use of DNA Databases for Criminal Identification)*, COUNCIL FOR RESPONSIBLE GENETICS (August 12, 2008), <http://www.councilforresponsiblegenetics.org/pageDocuments/H4T5EOYUZI.pdf>.

<sup>102</sup> *Id.*

<sup>103</sup> *Daubert v. Merrell Dow Pharm.*, 509 U.S. 579, 595 (1993).

<sup>104</sup> *Id.* at 594–595.

<sup>105</sup> *Id.* at 593–594.

<sup>106</sup> *Kuhmo Tire Co., Ltd. v. Carmichael*, 526 U.S. 137, 141 (1999).

<sup>107</sup> *Id.* at 594.

particular field to gain general acceptance.<sup>108</sup> A new discovery, however remarkable, will not be admitted until it has attained “standing and scientific recognition” across authorities in the relevant science, trade, or art.<sup>109</sup> Since the Federal Rules of Evidence only apply in federal courts, state courts are free to adopt their own standards. Some jurisdictions, including California, New York, New Jersey, and the District of Columbia have refused to adopt the *Daubert* standard—instead relying on *Frye*’s general acceptance test.<sup>110</sup> Because state approaches vary, this note will refer to state evidentiary rules on reliability and relevance collectively as the “*Daubert/Frye* standard.”

Not surprisingly, criminal defendants have challenged the admissibility of general Y-STR profiling under the *Daubert/Frye* standard (as opposed to familial Y-STR searching, which has yet to be challenged in court). As a relatively new area of science, Y-STR profiling is potentially vulnerable to a lack of testing, peer review, and general acceptance. Although the method is particularly advantageous in certain circumstances (i.e. traces of male DNA can be recovered from an overwhelmingly female DNA sample—rape, bite marks, skin underneath fingernails, etc.), Y-STR testing has significant limitations.<sup>111</sup> Because the Y-chromosome is the smallest in the human genome, Y-STR testing lacks the discriminatory capacity of standard STR analysis.<sup>112</sup> In normal STR testing, analysts examine short lengths of DNA in at least thirteen core locations (loci) along an individual’s twenty-two pairs of autosomal chromosomes.<sup>113</sup> In contrast, DNA expert John Butler notes that only seven core loci on a single chromosome are routinely analyzed in Y-STR testing.<sup>114</sup>

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<sup>108</sup> *Frye v. United States*, 293 F. 1013, 1014 (D.C. Cir. 1923).

<sup>109</sup> *Id.*

<sup>110</sup> Bruce Kaufman, *States Slow to Adopt Daubert Evidence Rule*, BNA (Apr. 27, 2016), <https://www.bna.com/states-slow-adopt-n57982070384/>.

<sup>111</sup> Kaye N. Ballantyne & Manfred Kayser, *Additional Y-STRs in Forensics: Why, Which, and When*, in FORENSIC DNA ANALYSIS: CURRENT PRACTICES AND EMERGING TECHNOLOGIES 222 (Jaiprakash G. Shewhale ed., 2014).

<sup>112</sup> Sibite Hadi, *Analysis of Rapidly Mutating Y Chromosome Short Tandem Repeats (RM y-STRs)*, in FORENSIC DNA TYPING PROTOCOLS 201-202 (William Goodwin ed., 2d ed. 2016).

<sup>113</sup> TAUPIN, *supra* note 6, at 46.

<sup>114</sup> BUTLER, *supra* note 33, at 369. In 2000, only 20 Y-STR loci were known to exist on the Y-chromosome. John M. Butler et al., *Addressing Y-Chromosome Short Tandem Repeat Allele Nomenclature*, 4(2) J. OF GENETIC GENEALOGY 125, 125 (Fall 2008). Today, at least 400 Y-STR loci have been identified on the Y-chromosome. Erin K. Hansen & Jack Ballantyne, *An Ultra-High Discrimination Y Chromosome Short Tandem Repeat Multiplex DNA Typing System*, 2 PLOS ONE 1, 1 (Aug. 2007). Notably, Hansen and Ballantyne indicate that a number of commercially available Y-STR kits test between twelve and seventeen loci for forensic casework (Promega’s PowerPlex® Y and Applied Biosystems’ AmpFISTR® Yfiler®). *Id.* In addition, Butler himself notes that, as of 2014, at least one Y-STR database was generating match frequencies based on twelve to twenty-seven Y-STR loci. John M. Butler, *The Future of Forensic DNA Analysis*, PHIL. TRANSACTIONS OF THE ROYAL SOC’Y OF LONDON, Aug. 2015, at 1, 4. This expansion in analyzed loci suggests that Y-STR DNA match statistics will improve in the future—increasing the reliability and relevance of the technology.

Expanded-loci Y-STR analysis is already being implemented. Taiwanese authorities conducted Y-STR analysis at 17 loci in a 2017 rape case. Greg Hampikian et al., *Case report: Coincidental*

With fewer statistics, an individual's Y-STR profile is less complete than an STR profile.

Furthermore, because the Y-chromosome is passed down from father to son unchanged, "all members of the same paternal lineage have the same Y-STR profile."<sup>115</sup> While this genetic consistency (barring mutation) lends itself to familial searching, the relatively low number of Y-STR profiles in the world weakens Y-STR frequency statistics. In other words, instead of generating loci statistics of one in one billion (STR), Y-STR testing generally yields statistics closer to one in several thousand.<sup>116</sup> Furthermore, because only males have Y-chromosomes, Y-STR testing is only useful in cases of male suspects.<sup>117</sup> If a female is suspected, the method loses all efficacy.<sup>118</sup>

Finally, Y-STR nomenclature is often confusing to judges, attorneys, jurors, and even forensic scientists.<sup>119</sup> Due to the relatively quick emergence of Y-STR DNA testing across multiple disciplines (e.g., forensics, genealogy, and anthropology), laboratories assigned different names to the same allele markers.<sup>120</sup> It was not until 2006 that the International Society for Forensic Genetics (ISFG) DNA Commission undertook an investigation of Y-STR allele nomenclature.<sup>121</sup> The ISFG concluded that many of the widely-used Y-STR names were "not ideal," but cautioned against additional renaming.<sup>122</sup> In its official statement, the ISFG stated: "[t]o avoid further confusion due to nomenclature changes, the nomenclature of widely[-]used Y-STRs should not be altered, even if the present guidelines are not followed."<sup>123</sup> To resolve some of the existing frustration and ambiguity, the authors of the report recommended that Y-STR testing laboratories follow the National Institute of Standards and Technology's (NIST) Standard Reference Manual's guidelines and collaborate to ensure consistent usage.<sup>124</sup>

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*inclusion in a 17-locus Y-STR mixture, wrongful conviction and exoneration*, FORENSIC SCI. INT'L: GENETICS, Aug. 2017, at 1. Sadly, the analyzed sample contained DNA from multiple men, skewing match statistics and resulting in a wrongful conviction. *Id.* For a more detailed analysis of the Chen case, see Part II's discussion on the case against Y-STR.

<sup>115</sup> U.S. Dept. of Just., Nat'l Inst. of Just. *DNA for the Defense Bar*. (NCJ 237975). Washington, D.C.: Office of Justice Programs, 2012.

<sup>116</sup> Cassie L. Johnson, M.S. and Rick W. Staub, Ph.D., *10 Tips for Testifying to Y-STR Results*, APPLIED BIOSYSTEMS (Apr. 2009), <https://www.thermofisher.com/content/dam/LifeTech/Documents/PDFs/Y-STR/Forensic-News-apr-2009-10-Tips.pdf>.

<sup>117</sup> TAUPIN, *supra* note 6, at 137.

<sup>118</sup> *Id.*

<sup>119</sup> RON C. MICHAELIS ET AL., *A LITIGATOR'S GUIDE TO DNA* 200-201 (2008).

<sup>120</sup> Butler et al., *supra* note 114, at 145.

<sup>121</sup> *Id.* at 131.

<sup>122</sup> *Id.*

<sup>123</sup> *Id.*

<sup>124</sup> *Id.* at 145.

Notwithstanding Rule 702 (i.e. *Daubert/Frye*) evidentiary concerns, state courts have consistently held that Y-STR DNA is both reliable and relevant to the fact finder. In *State v. Calleia*, the government sought to admit Y-STR evidence which indicated the defendant (husband) could not be excluded as a donor of the skin cells recovered from under the victim's (wife) fingernails.<sup>125</sup> The defendant moved to exclude the evidence, arguing that Y-STR analysis had not "reached a level of development and acceptability within the relevant scientific community . . . to be deemed sufficiently reliable."<sup>126</sup> The Superior Court of New Jersey, applying the *Frye* standard, denied the defendant's motion. Relying on expert testimony, authoritative scientific writings, and the prior admissibility of Y-STR DNA in other states and Canada, the court concluded Y-STR profiling is generally accepted in the forensic science community.<sup>127</sup>

Citing language from *State v. Calleia*, Illinois also upheld the "general acceptance" of Y-STR evidence under *Frye*. In *People v. Zapata*, police found Y-STR DNA in a rape victim's underwear.<sup>128</sup> The Appellate Court of Illinois reviewed admissibility under a plain-error standard, which permits reversal where "clear or obvious error occurred, and the error is so serious that it affected the fairness of the defendant's trial."<sup>129</sup> When considering the first prong (i.e., whether the trial court made a clear error in admitting the Y-STR DNA evidence), the court held that no error occurred because Y-STR profiling has gained general acceptance.<sup>130</sup> In *People v. Stevey*, the California Court of Appeals agreed, stating that general acceptance of Y-STR DNA has "never been challenged or questioned by members of the scientific community."<sup>131</sup>

Similarly, in *People v. Tunis*, the Colorado Court of Appeals held that Y-STR evidence satisfies the *Daubert* reliability and relevance prongs.<sup>132</sup> Y-STR testing was used to identify the assailant in a sexual assault, satisfying the relevance prong. Moreover, the evidence met the state's "reliability" factors: (1) whether the scientific principle is reasonably reliable, and (2) whether the witness is qualified.<sup>133</sup> The Y-STR profile was reliable because it utilized generally accepted scientific methods, and relied on exclusion statistics used in other laboratories, fields, and

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<sup>125</sup> *State v. Calleia*, 997 A.2d 1051, 1059 (N.J. Super. Ct. App. Div. 2010).

<sup>126</sup> *Id.*

<sup>127</sup> *Id.* at 1064.

<sup>128</sup> *People v. Zapata*, 8 N.E.3d 1188, 1189 (Ill. App. Ct. 2014).

<sup>129</sup> *Id.* at 1191.

<sup>130</sup> *Id.* at 1194.

<sup>131</sup> *People v. Stevey*, 209 Cal. App. 4th 1400, 1414 (Cal. Ct. App. 2012).

<sup>132</sup> *People v. Tunis*, 318 P. 3d 524, 527 (Colo. App. Ct. 2012).

<sup>133</sup> *Id.*

jurisdictions.<sup>134</sup> Moreover, the witness was reliable because she had training and experience with Y-STR testing, and had previously testified as an expert witness.<sup>135</sup>

Newer cases have reached the same conclusion. In the 2017 case *Commonwealth v. Jacoby*, the Supreme Court of Pennsylvania upheld the reliability of Y-STR DNA testing as a matter of first impression.<sup>136</sup> According to the defendant, Y-STR databases are not sufficiently large enough to generate reliable results.<sup>137</sup> Yet during a dialogue with the trial court, defense counsel admitted “the technique [Y-STR testing] is the same” as widely-established STR analysis.<sup>138</sup> The court concluded that the defendant’s argument was “predicated upon the weight that should be assigned to the Y-STR DNA evidence, and not upon the novelty of the database process itself.”<sup>139</sup> Because the probative value of evidence is to be determined by the jury, the court held that the trial court did not abuse its discretion in denying the defendant’s pretrial motion for a *Frye* hearing regarding the admissibility of Y-STR DNA.<sup>140</sup>

Courts in both Michigan and Wyoming have also upheld the scientific reliability and relevance of Y-STR DNA. In *Bean v. State*, the parties stipulated before a Wyoming trial court that a *Daubert* hearing was unnecessary to determine the scientific reliability of Y-STR DNA.<sup>141</sup> Both sides agreed that “DNA analysis, including the [Y-STR] method, is accepted science, which produces reliable results, assuming reliable data is used in the testing process.”<sup>142</sup> The Court of Appeals of Michigan reached a similar conclusion in *People v. Bieri*, stating that the “defendant has not cited any evidence that indicates that this method of [Y-STR DNA] testing is not scientifically reliable.”<sup>143</sup>

Given the consistent application of Rule 702 (*Daubert/Frye* standard) to general Y-STR testing across multiple state courts, it is unlikely states will exclude familial Y-STR searching on scientific grounds in the future. However, it is worth noting that at least one federal court has found Y-STR DNA evidence inadmissible under Rule 702. In *United States v. Kooswatewa*, the U.S. District Court for the District of Arizona barred Y-STR DNA evidence in a sexual assault case on the Hopi reservation.<sup>144</sup> The defendant did not “contend that Y-STR DNA analysis or the

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<sup>134</sup> *Id.* at 529.

<sup>135</sup> *Id.* at 528.

<sup>136</sup> *Commonwealth v. Jacoby*, 170 A.3d 1065, 1095 (Pa. 2017).

<sup>137</sup> *Id.*

<sup>138</sup> *Id.*

<sup>139</sup> *Id.* at 1094.

<sup>140</sup> *Id.* at 1094–1095.

<sup>141</sup> *Bean v. State*, 373 P.3d 372, 380 (Wyo. 2016).

<sup>142</sup> *Id.*

<sup>143</sup> *People v. Bieri*, No. 332376, 2017 WL 3316953, at \*5 (Mich. Ct. App. Aug. 3, 2017).

<sup>144</sup> *United States v. Kootswatewa*, No. CR-15-08034, 2016 WL 808663, \*1, \*3–\*4 (D. Ariz. March 2, 2016).

counting method are generally unreliable under *Daubert*.”<sup>145</sup> Instead, the defendant argued the government’s relied-upon Y-STR database improperly pooled tribal DNA into a single “Native American category”—inflating match statistics.<sup>146</sup> Because the Y-STR match statistic had an extremely low discriminatory capacity of one in thirty-five, the court concluded the evidence lacked sufficient reliability under Rule 702.<sup>147</sup>

*Kooswatewa* can be distinguished from the pro-admissibility state cases discussed above based on its facts. An exclusion statistic of one in thirty-five is very poor for any type of forensic DNA evidence. According to Applied Biosystems (the company which provided the Y-STR database in *Kooswatewa*), Y-STR testing typically produces match statistics of one in several thousand.<sup>148</sup> Moreover, because the defendant’s profile was compared to the pooled DNA of Native American men from many different tribes, the exclusion statistic may be inaccurate.<sup>149</sup> Defense expert and forensic mathematician Charles H. Brenner argues that “pooling Native Americans into a single genetic classification could manufacture diversity, thereby inflating random match probabilities to make the DNA profile appear rarer than [sic] it might actually be.”<sup>150</sup> It is possible that one in twenty . . . or even one in ten men living on the Hopi Reservation would have matched the crime-scene Y-STR profile across the analyzed alleles.<sup>151</sup> Given this dilemma of population substructure on the Hopi Reservation, the court found that the Y-STR DNA evidence was not premised on “sufficient facts or data” to meet Rule 702’s reliability standards.<sup>152</sup>

*Kooswatewa* is a valid demonstration of Y-STR DNA’s limitations. While generally accepted and reliable, Y-STR DNA analysis is not appropriate evidence in every case or forum. Federal courts may be more prone to population substructure issues (i.e., Native American defendants living on genetically-homogeneous reservations) than state courts. In addition, certain Y-STR samples may produce unusually non-discriminatory match statistics. In these cases, courts are wise to exclude the Y-STR evidence under Rule 702. The Federal Rules of Evidence give courts discretion for this very reason. If the reliability or relevance of specific Y-STR DNA evidence seems strained in a particular case, then the court can invoke the *Daubert/Frye* standard to prevent the jury from seeing it. Furthermore, if a state is concerned about the scientific efficacy of Y-STR DNA, the legislature could draft

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<sup>145</sup> *Id.* at \*3.

<sup>146</sup> *Id.*

<sup>147</sup> *Id.* at \*4.

<sup>148</sup> Cassie L. Johnson & Rick W. Staub, *10 Tips for Testifying to Y-STR Results*; APPLIED BIOSYSTEMS (Apr. 2009), <https://www.thermofisher.com/content/dam/LifeTech/Documents/PDFs/Y-STR/Forensic-News-apr2009-10-Tips.pdf>.

<sup>149</sup> *United States v. Kootswatewa*, No. CR-15-08034, 2016 WL 808663, \*3–\*4 (D. Ariz. March 2, 2016).

<sup>150</sup> *Id.*

<sup>151</sup> *Id.*

<sup>152</sup> *Id.* at \*2.

a statute which imposes additional relevance and reliability standards beyond *Daubert/Frye*. For example, the statute could exclude Y-STR DNA match statistics which are less discriminatory than one in 300, one in 500, or even one in 700.

A normative glance at Y-STR DNA's scientific capabilities suggests the method is reliable, and getting better. As acknowledged by numerous forensic experts and courts, the science behind Y-STR DNA testing is simply an expansion of existing STR analysis to the Y-chromosome. Neither the Y-STR testing process, nor the interpretation of match statistics is novel. Rather, Y-STR DNA analysis is an innovative way of applying old technology to newly-identified alleles. If interpreted accurately and admitted in consideration of Rule 702's constraints, Y-STR DNA has the potential to reliably advance investigations and reverse errors.

### B. *Unfairly Prejudicial? Y-STR DNA and Rule 403*

The general Y-STR testing process has also withstood Rule 403 challenges. Rule 403 excludes evidence when the risk of unfair prejudice substantially outweighs its probative value.<sup>153</sup> In *People v. Robinson*, the court denied the defendant's motion to suppress Y-STR DNA under California Evidence Code section 352 (i.e., California's version of Rule 403).<sup>154</sup> While the defendant argued the evidence was unfairly prejudicial because its complexity would mislead the jury, the court disagreed.<sup>155</sup> The Y-STR DNA (recovered from a baseball cap found at the crime scene) was only a small piece of the government's argument—and therefore unlikely to sway the jury.<sup>156</sup> Furthermore, because counsel accurately presented the significance of the Y-STR DNA (i.e., that it can only exclude possible donors), the court concluded the evidence's probative value was not substantially outweighed by the risk of unfair prejudice.<sup>157</sup>

The Supreme Court of Michigan reached the same conclusion in *People v. Wood*.<sup>158</sup> When the government sought to admit Y-STR evidence from the victim's scarf and fingernail clippings, the defendant raised both Rule 702 and Rule 403 challenges.<sup>159</sup> After establishing the evidence met the *Daubert* standard, the court dismissed the defendant's Rule 403 argument.<sup>160</sup> Because both experts clearly explained the limitations of the Y-STR evidence (i.e., that the test cannot uniquely

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<sup>153</sup> FED. R. EVID. 403.

<sup>154</sup> *People v. Robinson*, No. B198592, 2009 WL 2517556, at \*1, \*11 (Cal. App. Ct. Aug. 19, 2009).

<sup>155</sup> *Id.*

<sup>156</sup> *Id.* at \*12.

<sup>157</sup> *Id.* at \*11–12.

<sup>158</sup> *People v. Wood*, 307 Mich. App. 485, 516 (Mich. Ct. App. 2014).

<sup>159</sup> *Id.* at 506–507.

<sup>160</sup> *Id.* at 514–515.

identify a male DNA donor), any danger of confusion or unfair prejudice did not substantially outweigh the probative value of the Y-STR profile.<sup>161</sup>

Similarly, in *Commonwealth v. Lally*, the Supreme Court of Massachusetts rejected the defendant's argument that the government's reliance on "counting method" Y-STR statistics was deceptive.<sup>162</sup> According to the defendant, the counting method (providing exclusionary statistics such as one in one thousand) "would be misleading without the confidence interval correction."<sup>163</sup> Unlike exclusionary statistics, confidence intervals adjust Y-STR match results to artificially account for sampling errors and coincidental matches.<sup>164</sup> The court acknowledged that confidence intervals are more favorable to the defendant, but held that "count" evidence is unlikely to mislead the jury into concluding Y-STR evidence can exclude all other possible contributors.<sup>165</sup> Because experts provided the necessary context for Y-STR DNA, the evidence was not unfairly prejudicial.<sup>166</sup>

Surprisingly, the Supreme Court of Utah upheld the non-prejudicial nature of Y-STR DNA under less concrete facts in *State v. Maestas*.<sup>167</sup> The defendant challenged Y-STR evidence on Rule 403 grounds, contending the "jury was unduly impressed" after the prosecution stated his Y-STR DNA "matched" the crime scene sample.<sup>168</sup> The court disagreed, concluding the jury was fully capable of lending the Y-STR evidence proper weight.<sup>169</sup> Although the prosecution referred to the defendant's DNA "matching" the sample numerous times, an expert clarified that a "match" only meant that the defendant could not be excluded as a possible contributor.<sup>170</sup> Because the jurors heard this testimony, the court reasoned the evidence was not unfairly prejudicial and that the jury could arrive at a clear understanding of Y-STR evidence.<sup>171</sup>

Finally, in *People v. Pike*, the Appellate Court of Illinois held that any "CSI Effect," or popular romanticization of DNA evidence, did not cause the jury to improperly weigh Y-STR evidence.<sup>172</sup> The defendant moved to suppress Y-STR DNA collected from a handgun, arguing the influence of pop culture unfairly prejudiced the jury in favor of DNA statistics.<sup>173</sup> The court rejected the defendant's

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<sup>161</sup> *Id.* at 515–516.

<sup>162</sup> *Commonwealth v. Lally*, 46 N.E.3d 41, 50–51 (Mass. 2016).

<sup>163</sup> *Id.* at 50.

<sup>164</sup> *Id.*

<sup>165</sup> *Id.* at 53.

<sup>166</sup> *Id.*

<sup>167</sup> *State v. Maestas*, 299 P.3d 892, 934 (Utah 2012).

<sup>168</sup> *Id.*

<sup>169</sup> *Id.*

<sup>170</sup> *Id.*

<sup>171</sup> *Id.*

<sup>172</sup> *People v. Pike*, 53 N.E.3d 147, 171 (Ill. App. Ct. 2016).

<sup>173</sup> *Id.* at 160–161.

Rule 403 argument, calling the assumption “completely unfounded,” “patronizing,” and “dangerous” because it reflected a lack of trust in juries.<sup>174</sup> Moreover, the court noted that “statistical probability calculations have been part of our judicial system for quite some time now.”<sup>175</sup> According to the court, there was no need to “resurrect” a Rule 403 argument that failed years ago when standard STR evidence was originally admitted.<sup>176</sup>

If presented accurately, Y-STR DNA evidence is not inherently prejudicial. Just like standard STR analysis, Y-STR evidence is premised on exclusionary match statistics. Also, just like STR evidence, Y-STR DNA requires a thorough explanation before the jury. As the Appellate Court of Illinois noted in *People v. Pike*, statistics have been a part of jury trials for decades (and perhaps even centuries).<sup>177</sup> True, forensic match probabilities are complex and not always intuitive. However, the same could be said for hair fiber, gunshot residue, fingerprint, handwriting, and shoe impression analysis. No single forensic discipline is free of ambiguity or potential manipulation. Consequently, courts use Rule 403 as a barrier to misleading evidence in specific cases where Y-STR DNA is used or described improperly.

Furthermore, existing case law indicates the general Y-STR testing process is not unfairly prejudicial—suggesting any evidence collected through familial Y-STR searches will also pass the Rule 403 barrier. When investigators utilize “general” Y-STR DNA testing, the defendant has already been identified. Forensic examiners collect DNA directly from the defendant and then compare his Y-chromosome markers to those found at the crime scene. A Y-STR DNA databank is used only to generate match probabilities. In contrast, “familial” Y-STR DNA testing is employed when police are attempting to identify a suspect. Investigators compare the crime-scene sample to Y-STR profiles in a DNA database in the hope of producing a “hit.” Again, the database is used to produce match statistics.

The relatively minor distinction between “general” and “familial” Y-STR DNA testing does not affect the Rule 403 analysis. As demonstrated by the cases above, Rule 403 challenges stem from concerns over complicated match statistics and the “CSI Effect.” Both general and familial Y-STR testing utilize match statistics to determine the probability that an individual with a matching profile was indeed the crime-scene contributor. Without these probabilities, jury members could not properly weigh the probative value of Y-STR DNA evidence. Because general and familial Y-STR testing rely on the same exclusionary science, it is highly unlikely courts will find familial Y-STR match statistics unfairly prejudicial when general match statistics have been consistently admitted.

Moreover, if real, the “CSI Effect” has no more influence over familial Y-STR testing than general Y-STR analysis. The phenomenon is premised on juror

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<sup>174</sup> *Id.* at 175.

<sup>175</sup> *Id.* at 174.

<sup>176</sup> *Id.*

<sup>177</sup> *Id.*

romanticization of DNA evidence—all DNA evidence. How investigators arrived at the particular profile match has no bearing on whether jury members will improperly weigh the evidence. Accordingly, it is unlikely a Rule 403 “CSI Effect” challenge will prevail in a case involving familial Y-STR testing, when the same argument has been rejected in relation to general Y-STR testing.

### C. *The Rise of DNA Databases: the Fourth Amendment Question*

Notwithstanding the reliability, relevance, or fairness of the general Y-STR testing process, critics of familial Y-STR searches argue that probing DNA databases for potential relatives violates the Fourth Amendment protection against unreasonable searches. No court has yet assessed the constitutionality of familial DNA searches, but critic Erin Murphy points out that biological sample testing constitutes a Fourth Amendment “search.”<sup>178</sup> In *Skinner v. Railway Labor*, the U.S. Supreme Court held that collecting and testing urine samples constitutes a “search” because individuals have a reasonable expectation of privacy in their medical information and bodily functions.<sup>179</sup> Y-STR DNA could be considered a biological sample. Krinsky and Simoncelli argue that familial DNA searches constitute Fourth Amendment “searches.”<sup>180</sup> Noting that such practices will inevitably reveal “family secrets” (i.e. paternity, genetic illness, involvement with the criminal justice system, etc.),<sup>181</sup> these scholars believe familial DNA testing intrudes on reasonable expectations of privacy.

In addition, critics argue familial DNA “searches” are unreasonable. Murphy contends familial DNA searches unreasonably “hinge upon the arbitrariness of casting suspicion on offender relatives.”<sup>182</sup> She cites *Poolaw v. Marcantel*, where the Tenth Circuit determined an individual’s familial relationship with a suspect does not (on its own) establish probable cause for a search.<sup>183</sup> Moreover, other experts claim familial DNA searches unreasonably target ethnic minorities or larger-than-average families. Alluding to racial disparities in the criminal justice system, Daniel Grimm states “a Hispanic defendant will, on average, lead investigators to more biological relatives.”<sup>184</sup>

Grimm is not alone. Maryland banned familial searching at the same time it expanded its DNA database collection to arrestees of serious crimes<sup>185</sup> (the same

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<sup>178</sup> Murphy, *supra* note 74, at 335.

<sup>179</sup> *Skinner v. Ry. Labor Exec. Ass’n*, 489 U.S. 602, 603 (1989).

<sup>180</sup> SHELDON KRIMSKY & TANIA SIMONCELLI, *GENETIC JUSTICE: DNA DATA BANKS, CRIMINAL INVESTIGATIONS, AND CIVIL LIBERTIES* 86 (Colum. Univ. Press 2012).

<sup>181</sup> *Id.*

<sup>182</sup> Murphy, *supra* note 74, at 336.

<sup>183</sup> *Poolaw v. Marcantel*, 565 F.3d 721, 734 (10th Cir. 2009).

<sup>184</sup> KRIMSKY & SIMONCELLI, *supra* note 180, at 87.

<sup>185</sup> Joyce Kim et al., *Policy implications for familial searching*, 2 *INVESTIGATIVE GENETICS* 1, 6 (2011).

legislation which prompted litigation in *Maryland v. King*.<sup>186</sup> Because a disproportionate number of racial minorities were routinely arrested for violent crimes, legislators felt familial searching would “focus law enforcement efforts on a large group of people who are primarily defined by their race.”<sup>187</sup> According to Stephen Mercer, chief attorney for the Forensics Division of the Maryland Office of the Public Defender, “[familial searching] heralded an era of unwanted genetic surveillance that just wasn’t reasonable. Why should I forfeit my rights just because a family member chooses to commit a crime?”<sup>188</sup> D.C. followed suit, convinced that Mercer’s argument held weight.<sup>189</sup>

However, these constitutional arguments are unlikely to prevail. First, existing case law indicates familial DNA database searches do not implicate the Fourth Amendment. In *Johnson v. Quander*, the D.C. Circuit held that “accessing the records stored in the CODIS database is not a ‘search’ for Fourth Amendment purposes.”<sup>190</sup> While swabbing an individual’s cheek for Y-STR DNA triggers the Fourth Amendment, simply searching a database does not.

True, familial searching is more likely to work if a larger number of the suspect’s relatives are in CODIS, and as Penn State University law professor David Kaye admits, “[t]here are a relatively large number of minorities in the database.”<sup>191</sup> Yet Kaye argues “disparate impact is simply not a violation of the equal protection clause.”<sup>192</sup> From a policy perspective, familial searching has the concerning potential to implicate a disproportionate percentage of African Americans and Hispanics, but the practice is likely constitutional. The mere fact that a suspect has relatives in the criminal justice system should not shield him or her from discovery. Assuming the police have probable cause, no individual should be immune from investigation and arrest on account of his or her race, family members, or (in the case of Y-STR DNA testing) number of paternal male relatives. The criminal justice system operates for the purpose of preventing crimes and catching criminals. Legal and accurate methods should not be discarded simply because they increase police efficiency.

Second, the concept of subjecting relatives to unreasonable or arbitrary “genetic surveillance” is misleading. The U.S. has no universal DNA databank. Babies are not subject to DNA-collecting cheek swabs upon birth. Neither are adults required to submit DNA samples with their employment background checks. DNA database expansion aside, the government may not arbitrarily force an individual to forfeit his

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<sup>186</sup> *Maryland v. King*, 569 U.S. 435 (2013).

<sup>187</sup> Kim et al., *supra* note 185.

<sup>188</sup> David Kaye et al., *Family Feud: The Familial DNA Search Controversy Continues*, FORENSIC MAGAZINE (Sept. 23, 2011, 8:44 AM), <https://www.forensicmag.com/article/2011/09/family-feud-familial-dna-search-controversy-continues>.

<sup>189</sup> *Id.*

<sup>190</sup> *Johnson v. Quander*, 440 F.3d. 489, 498 (D.C. Cir. 2006).

<sup>191</sup> Kaye et al., *supra* note 188.

<sup>192</sup> *Id.*

or her DNA profile without running afoul of the Fourth Amendment. Consequently, police cannot access an “innocent” family member’s genetic code unless his or her DNA was already collected by law enforcement and entered into CODIS or another DNA database.<sup>193</sup> If investigators produce a match using Y-STR DNA familial searching, they must use process of elimination to determine whether the implicated individual is a suspect or a relative. If a suspect, that person’s DNA was previously collected in accordance with the Fourth Amendment (i.e., arrest, felony conviction, or crime-scene sample). If a relative, the suspect must be identified and swabbed (with probable cause). Regardless, the DNA collection only occurred because it constituted a reasonable search under the Fourth Amendment.

In reality, forensic DNA database collection is relatively limited. Local laboratories only provide CODIS with DNA profiles “taken from arrestees, convicted offenders, and forensic evidence found at crime scenes.”<sup>194</sup> According to the Supreme Court in *Maryland v. King*, taking a cheek swab from an arrestee who was detained under probable cause of committing a serious offense is a reasonable search under the Fourth Amendment.<sup>195</sup> At the time of the opinion, all fifty states required DNA collection from felony convicts and twenty-eight states permitted DNA collection from some (or all) arrestees.<sup>196</sup> Therefore, it is highly unlikely CODIS would contain an individual’s DNA unless that person had been convicted of a felony, or had submitted to routine booking procedures following an arrest.

Considering arrestees are innocent until proven guilty, having one’s DNA entered into CODIS is not necessarily indicative of wrongdoing. However, submitting to mandatory DNA collection is not a common experience for law-abiding citizens. The vast majority of U.S. citizens will never have their genetic profiles collected and placed in a forensic DNA database. Ironically, many critics argue against familial DNA searches for this very reason. Murphy categorizes familial DNA searches as low-value because they rarely produce hits, pointing out that the method fails in California roughly nine times out of ten.<sup>197</sup> Indeed, without a relative’s DNA already in the system, a familial search is useless. But if a familial search produces a hit, the acquisition of the implicated relative’s DNA has already passed Fourth Amendment scrutiny—reducing the “genetic surveillance” argument to mere rhetoric.

Third, “unreasonableness” arguments are less applicable in the Y-STR context. Due to the genetic inheritance of identical Y-chromosomes, Y-STR DNA testing inherently blurs the line between “general” and “familial” searching. As mentioned in Section B, police use “general” Y-STR DNA testing when they have already

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<sup>193</sup> Chamberlain, *supra* note 19, at 26.

<sup>194</sup> *Maryland v. King*, 569 U.S. 435, 445 (2013).

<sup>195</sup> *Id.* at 465–466.

<sup>196</sup> *Id.* at 445.

<sup>197</sup> Erin E. Murphy, *Familial DNA Searches: The Opposing Viewpoint*, 27 CRIM. JUST. 1, 4 n.1 (2012).

found the defendant.<sup>198</sup> On the other hand, police use “familial” Y-STR DNA testing when they are trying to identify a suspect. According to Murphy, familial DNA searching “refers generally to the idea of looking in a DNA database not for the person who left the crime scene sample, but rather for a relative of that individual.”<sup>199</sup> While this characterization may be appropriate for standard STR analysis, it does not accurately apply to Y-STR DNA testing.

With STR analysis, a familial search equals an intentional or inadvertent attempt to retrieve “near misses or ‘partial matches’” from a DNA databank.<sup>200</sup> A partial match of allele markers suggests the individual could be a blood relative of the suspect. But with Y-STR DNA testing, a partial match cannot implicate either the defendant or a family member. All males in the same paternal line possess *exactly* the same Y-chromosome, so finding a crime-scene sample’s partial match actually excludes that person (and that person’s paternal male relatives). In other words, investigators never seek a partial match when utilizing Y-STR testing.

Moreover, even if investigators get a “hit” when conducting Y-STR DNA analysis, they do not know whether the matching profile belongs to the suspect or the suspect’s paternal male relatives. As a result, there is no feasible way to intentionally single-out family members with Y-STR testing. Each time forensic examiners undertake “familial” Y-STR DNA testing they are simply seeking matching Y-chromosome markers—which ideally belong to the suspect himself.

Because Y-STR DNA analysis cannot differentiate a “suspect” from a “relative,” law enforcement officers cannot target an individual’s family members to glean incriminatory DNA evidence. Rather, investigators must employ classic investigatory techniques to uncover the suspect, such as alibis, line-ups, and sketches. Other non-DNA forensic methods may include crime-scene reconstruction, ballistic analysis, photographs, skid mark analysis, trace chemical evidence, fingerprinting, toxicology, autopsy, and witness statements. In a sense, Y-STR DNA only narrows the field. A hit is a lead, not a slam dunk. To use Y-STR DNA testing effectively, police must build cases carefully—assembling corroborating evidence from multiple sources.

Finally, the court-sanctioned expansion of DNA databases in recent years weighs in favor of the constitutionality of familial Y-STR searches. In *Haskell v. Harris*, the Ninth Circuit upheld the constitutionality of California’s DNA and Forensic Identification Database and Data Bank Act (DNA Act).<sup>201</sup> The court determined the DNA Act, which required police to collect DNA samples from all adults arrested for felonies, did not violate the Fourth Amendment. Although compulsory DNA collection raised legitimate privacy questions, the court concluded the *de minimis* physical intrusion, reduced expectation of privacy pursuant to arrest,

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<sup>198</sup> See *People v. Robinson*, No. B198592, 2009 WL 2517556, at \*1, \*11 (Cal. App. Ct. Aug. 19, 2009).

<sup>199</sup> Murphy, *supra* note 74, at 297.

<sup>200</sup> *Id.*

<sup>201</sup> *Haskell v. Harris*, 669 F.3d. 1049, 1051 (9th Cir. 2012).

existing legal protections (i.e. probable cause), and potential for DNA databases to solve future/past crimes outweighed privacy concerns.<sup>202</sup> This “green-light” for employing DNA databases as an investigatory method suggests the court would not prohibit familial Y-STR searching on constitutional grounds. Envisioned as a crime-solving tool, the use of DNA databases should not be limited to mere collection and retention.

#### IV. MOVING FORWARD: NEXT STEPS FOR STATES

Given the life-saving potential of Y-STR DNA testing, states should adopt legislation to codify its admissibility. Although only ten states utilized familial DNA search technology prior to 2017, a growing number of states are enacting permissive statutory schemes or signaling their acceptance of the practice.<sup>203</sup> Moreover, the vast majority have yet to address the issue. Only two jurisdictions, Maryland and the District of Columbia have enacted legislation banning familial searches.<sup>204</sup> Thus, most states could benefit from the careful adoption of pro-YSTR DNA search legislation in the future.

This section proposes a statutory scheme which could be utilized as a drafting blueprint for states considering familial DNA search legislation. My goal in creating this proposal was to devise a sufficiently workable and protective statute. While Y-STR DNA is a powerful tool, it should be approached with caution. It is also worth noting that this recommended legislation includes several provisions specific to Y-STR DNA. My focus on Y-STR DNA over other types of familial search DNA (i.e.,

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<sup>202</sup> *Id.* at 1065.

<sup>203</sup> California, Colorado, Florida, Michigan, Texas, Utah, Virginia, Wisconsin, Wyoming, and Ohio endorsed familial DNA searching prior to 2017. Seth Augenstein, *Familial Searching, Used in 10 States and Counting, Solves the Unsolvables*, FORENSIC MAGAZINE (Dec. 8, 2016, 12:55 PM), <https://www.forensicmag.com/news/2016/12/familial-searching-used-10-states-and-counting-solves-unsolvable>; Anthony M. DeStefano, *State Panel of DNA Experts Approve Familial Searching in NY*, NEWSDAY (Mar. 27, 2017, 5:11 PM), <http://www.newsday.com/news/region-state/state-panel-of-dna-experts-approve-of-familal-searching-in-n-y-1.13321976>.

Familial Y-STR searching (in particular) enjoyed rising public support in New York after Police Commissioner James O’Neill and Queens District Attorney Richard Brown advocated for permission to use the science in the rape and murder investigation of jogger Karina Vetrano. The case proved to be a powerful impetus when, in 2017, the DNA Subcommittee of the New York State Commission on Forensic Science unanimously approved familial match DNA searches. Leonard Greene, *Familial DNA testing in New York endorsed by expert panel*, NEW YORK DAILY NEWS (Mar. 27, 2017), <http://www.nydailynews.com/new-york/familial-dna-testing-new-york-endorsed-expert-panel-article-1.3010760>.

Arizona will likely follow suit, having just employed familial DNA searching to solve the rape and murder of Allison Feldman in April 2018. James Rainey, *Familial DNA puts elusive killers behind bars. But only 12 states use it*, NBC NEWS (Apr. 28, 2018, 6:00 AM), <https://www.nbcnews.com/news/us-news/familial-dna-puts-elusive-killers-behind-bars-only-12-states-n869711>.

<sup>204</sup> Murphy, *supra* note 74, at 5.

mitochondrial, STR, etc.) was intentional, owing to this note's emphasis on the benefits of Y-STR DNA.

Proposed Legislation: Familial DNA Searches

(a) Authorization: When STR DNA analysis does not generate a match between a forensic DNA sample and a profile in the state DNA databank, a familial search may be performed. To perform a familial search, the following case requirements must be met:

- (1) The forensic DNA sample must be associated with:
    - (i) a felony offense; or
    - (ii) a violent felony offense; or
    - (iii) a crime presenting a significant threat to public safety.
  - (2) The investigating law enforcement officer and the prosecutor must certify that:
    - (i) reasonable investigative efforts have already been taken in the case; or
    - (ii) exigent circumstances warrant a familial search
  - (3) The forensic DNA profile must:
    - (i) be from a single source; or
    - (ii) be a deduced profile from a mixture.
  - (4) The forensic DNA profile must meet the specific requirements of the utilized familial search method (e.g., Y-STR DNA testing).
  - (5) The results of the familial search shall only be used as an investigative lead.
- (b) Application: The law enforcement officer and the prosecutor (hereinafter “the requestors”) must request a familial DNA search through an application to the state division or office of criminal justice services.

- (1) Upon receipt of an application:
  - (i) the division will confirm that the requestors have certified that the case requirements in paragraph (a) of this section have been satisfied.
  - (2) The commissioner of the state division or office of criminal justice services shall review all completed applications.
    - (i) If, upon review and evaluation of such application, the commissioner determines that any of the case and/or any of the sample requirements are not satisfied, the division shall notify the requestors, in writing, that a familial search cannot be performed and identify the requirements not satisfied.
    - (ii) If, upon review and evaluation of such application, the commissioner determines that all of the case and sample requirements have been satisfied, the law enforcement agency, the district attorney, the director of the state crime laboratory, and the commissioner must execute a memorandum of understanding detailing the role of each organization in the familial search.
  - (3) Upon receipt of the memorandum of understanding described in subparagraph (b)(2)(ii), the state crime laboratory will:
    - (i) use validated software to perform a familial search of the DNA databank;
    - (ii) perform Y-STR testing on the crime scene sample(s) if the requirements in section (c) are met; and
    - (iii) if appropriate, ensure additional familial testing is performed on the crime scene sample, provided there is sufficient forensic DNA sample available for testing.

(c) Y-Chromosome Analysis: Y-STR DNA testing may be conducted if the following requirements are satisfied:

- (1) The forensic Y-STR DNA sample must:
  - (i) be from a single male source; or
  - (ii) be from a single male source and one or more female sources.
- (2) The forensic Y-STR DNA sample must contain at least 7 loci, which were identified in accordance with NDIS Operating Procedures.
- (3) The results of the Y-STR DNA testing are provided in writing, with the following provisions:
  - (i) the information may be used for investigatory law enforcement purposes only;
  - (ii) the information is not a definitive statement of a biological identity or relationship; and
  - (iii) the release of DNA profiles to non-law enforcement personnel is a violation of state law.

(d) Admissibility: Y-STR DNA testing results may only be admitted into state court if the following requirements are satisfied:

- (1) The results meet state evidentiary standards; and
- (2) The prosecutor presents the results with an exclusion statistic; and
- (3) The exclusion statistic has a discriminatory capacity of 1 in 500 or higher.

The basis of this proposed legislation is New York's familial search statute, 9 CRR-NY § 6192.3.<sup>205</sup> I chose this framework for three reasons. First, the New York Senate passed its bill in 2017—making it one of the most recent states to confront the challenges of familial DNA search legislation.<sup>206</sup> Second, even among states which have embraced Y-STR DNA testing, very little formal familial DNA search legislation exists.<sup>207</sup> For example, Colorado, California, and Wisconsin have developed state policies governing the use of Y-STR DNA technology.<sup>208</sup> Yet none of these states have developed a statute or regulation expressly permitting its use.<sup>209</sup> Thus, New York boasts one of the few examples available. Third, New York's legislation clearly accounts for the technical difficulties of accurate Y-STR DNA testing. For example, 9 CRR-NY § 6192.3 requires that a forensic Y-STR DNA sample be either: (1) from a single male source, or (2) from a single male source and one or more female sources.<sup>210</sup> This provision guards against miscarriages of justice,

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<sup>205</sup> 9 CRR-NY §6192.3 (2018).

<sup>206</sup> Phil Boyle, *Senate Passes Familial DNA Search Legislation*, THE NEW YORK STATE SENATE (Feb. 6, 2017), <https://www.nysenate.gov/newsroom/press-releases/phil-boyle/senate-passes-familial-dna-search-legislation>.

<sup>207</sup> Michael B. Field et al., *Study of Familial DNA Searching Policies and Practices: Case Study Brief Series*, NAT'L CRIM. JUST. REFERENCE SERV. (2017), <https://www.ncjrs.gov/pdffiles1/nij/grants/251081.pdf>.

<sup>208</sup> *Id.*

<sup>209</sup> *Id.*

<sup>210</sup> 9 CRR-NY §6192.3 (2018).

such as the wrongful conviction of Chen Long-Qi after law enforcement relied on a DNA sample from multiple male sources.<sup>211</sup>

My proposal begins with an authorization provision in Section (a). Inspired by a similar section in New York's familial DNA statute, the language prevents law enforcement entities from utilizing familial search technology before they attempt an STR DNA analysis. As discussed *supra*, forensic scientists generally analyze STR DNA samples at thirteen core loci on twenty-two pairs of chromosomes, rather than the minimum of seven loci on a single chromosome in Y-STR DNA testing.<sup>212</sup> Accordingly, STR DNA analysis typically generates more discriminating exclusionary match statistics than its Y-chromosome equivalent. To ensure the most probative evidence is presented, law enforcement officers should attempt STR DNA testing first, before resorting to Y-STR DNA testing.

Subsections (1) and (2) of Section (a) implement similar safeguards. First, law enforcement entities should only use familial searching in connection with felony offenses or threats to public safety. Because familial search infrastructure is still developing, success is no guarantee. Moreover, depending on the match statistic, the probative value of a hit could be too minimal to ensure an accurate conviction. Therefore, familial search resources are best utilized in serious criminal investigations where the potential benefits outweigh the risks of failure. Second, Subsection (2) ensures that prosecutors and law enforcement officers rely on traditional investigative methods before resorting to familial search technology. As suggested in this note, Y-STR DNA testing can be a powerful tool. However, witness interviews, line-ups, suspect sketches, and crime scene photo analysis can be equally effective and more cost affordable. Consequently, Y-STR DNA testing should only be employed under the right conditions.

Section (b) requires law enforcement entities and prosecutors to jointly apply for state permission to utilize Y-STR or other familial DNA testing. I relied on California's Memorandum of Understanding: Familial Search Protocol, as well as 9 CRR-NY § 6192.3, when developing this section.<sup>213</sup> The proposed application process ensures that government officials meet all necessary case requirements before pursuing familial DNA testing. Although Section (a) already specifies the authorization restrictions, it does not provide an oversight process to check any potential government overreach. This provision does so. In addition, Section (b)'s memorandum of understanding requirement guards against miscommunication between agencies. If each government entity (i.e., investigating agency, prosecuting agency, and state crime laboratory) is fully apprised of its familial DNA search obligations, the chance of human error decreases.

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<sup>211</sup> Brown, *supra* note 88.

<sup>212</sup> TAUPIN, *supra* note 6, at 46; BUTLER, *supra* note 33, at 363.

<sup>213</sup> Memorandum of Understanding from the California Department of Justice's DNA Data Bank Program, *Familial Search Protocol* (June 14, 2011), <https://oag.ca.gov/sites/all/files/agweb/pdfs/bfs/fsc-mou-06142011.pdf>; 9 CRR-NY §6192.3 (2018).

Section (c) discusses testing parameters specific to Y-STR DNA testing. In doing so, the provision accounts for a number of concerns expressed by familial search critics. For instance, Section (c)(2) guarantees that forensic scientists will not attempt Y-STR DNA testing on a sample with fewer than seven loci. To do otherwise would permit compromised and potentially inaccurate suspect identifications. Although this subsection does not combat the CODIS racial disparities feared by Maryland legislators, it does encourage sufficiently discriminating match statistics—decreasing the likelihood of false hits within minority communities. Section (c) also requires the results of any Y-STR DNA testing be provided in writing, ensuring that law enforcement and forensic science entities reduce inaccuracies through good recordkeeping.

Finally, Section (c)(3) is inspired by the Colorado Bureau of Investigation DNA Familial Search Policy.<sup>214</sup> The provision precludes law enforcement from using Y-STR DNA testing for anything other than investigatory leads. By prohibiting the disclosure of any genetic information uncovered by the Y-STR DNA testing process, the section ensures that results will not be used to prove (or disprove) biological relationships. In addition, the provision combats privacy concerns identified by Maryland legislators.<sup>215</sup> By limiting results to law enforcement uses, Section (c) protects individuals from the public exposure of personal health data or paternity information.

Section (d) provides for the admission of Y-STR DNA search results in state court if certain conditions are met. Notably, the provision only addresses state court admissibility. Despite the investigatory potential of familial Y-STR searches, it may not be practical for all jurisdictions. For instance, federal courts and the FBI appear hesitant to employ the method. Although Y-STR DNA is included in CODIS, the FBI only uses Y-chromosome profiling in missing persons cases.<sup>216</sup> Furthermore, the FBI maintains that familial searching, narrowly defined as “an intentional or deliberate search of the database . . . for the purpose of potentially identifying close biological relatives,” is not performed at the National DNA Index System (NDIS).<sup>217</sup> The FBI’s anti-familial search policy largely reflects its investigatory priorities. In contrast to the state courts, the federal system prosecutes relatively few sexual assault cases, meaning Y-STR DNA is less useful. Furthermore, familial Y-STR searches at the national level would likely produce a staggering number of leads.<sup>218</sup>

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<sup>214</sup> Colorado Bureau of Investigation, *DNA Familial Search Policy* (Oct. 22, 2009), <http://www.dnaresource.com/documents/ColoradoPolicy.pdf>.

<sup>215</sup> Two interviewees in a Maryland familial DNA case study “pointed out that we do not know what the future holds or how law enforcement may use or exploit familial connections identified through FDS [familial DNA searches] in the future and wanted to prevent unforeseen misuses.” Field et al., *supra* note 207, at 35.

<sup>216</sup> FED.BUREAU OF INVESTIGATION, *supra* note 62.

<sup>217</sup> *Id.*

<sup>218</sup> A national DNA search would utilize NDIS. The distinction between CODIS and NDIS can be confusing. According to the FBI, CODIS is a “generic term used to describe the FBI’s program of support for criminal justice DNA databases as well as the software used to run these databases.”

Because whole families can possess the same Y-chromosome, one Y-STR database search via NDIS could generate hundreds of hits.

Subsections (1), (2), and (3) protect defendants from improper usage. First, the Y-STR DNA evidence must meet court evidentiary standards—guaranteeing that the state equivalents of Rules 403 and 702 are honored. Second, the prosecutor is required to present all Y-STR DNA evidence in the form of exclusionary match statistics, allowing the jury to weigh the probative value of the hit. Finally, the proposed legislation mandates that all exclusionary statistics have a discriminatory capacity of one in 500 or higher. As noted *supra*, match statistics of one in several thousand are typical for Y-STR DNA testing.<sup>219</sup> However, in small or isolated communities with reduced gene flow (i.e., population substructure), otherwise useful match statistics may be less discriminating. In these instances, an exclusionary statistic below one in one thousand might be sufficiently probative to assist the fact-finder.

Population substructure aside, the U.S. District Court for the District Court of Arizona held that a match statistic of one in thirty-five is not discriminatory enough to meet the *Daubert/Frye* standard.<sup>220</sup> I agree. At such a weak exclusionary rate, any given room could contain three or four men with a matching Y-STR profile. A minimum exclusionary rate of one in 500 splits the difference, accounting for disproportionately high allele frequencies in smaller communities while avoiding false identifications. Admittedly, this cut-off is somewhat arbitrary. When drafting their own legislation, states can increase or decrease their minimum exclusionary rates to make Y-STR DNA standards more or less stringent. In addition, states may consider the relative impact of gene flow in their respective territories when establishing minimum exclusionary rates. For instance, a less populated state like North Dakota may run a higher risk of population substructure than a very populated state like California. While such decisions may require careful research, this proposal serves as a starting point for states interested in expanding their available DNA technology.

#### IV. THE FUTURE OF FAMILIAL Y-STR SEARCHES

Like all innovative forensic methods, familial Y-STR DNA searching will face an uphill battle before it can attain commonplace usage. Yet the method is undoubtedly gaining traction. Court acceptance of Y-STR DNA's scientific reliability, high-profile success stories, and legislative support indicate the practice

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*Frequently Asked Questions on CODIS and NDIS*, FED. BUREAU OF INVESTIGATION (FBI), <https://www.fbi.gov/services/laboratory/biometric-analysis/codis/codis-and-ndis-fact-sheet> (last visited Apr. 30, 2019). In other words, CODIS broadly refers to the FBI's DNA software, which can be used at the local, state, or national level. NDIS is one part of CODIS, "the national level—containing the DNA profiles contributed by federal, state, and local participating forensic laboratories." *Id.*

<sup>219</sup> Johnson & Staub, *supra* note 116.

<sup>220</sup> *United States v. Kootswatwa*, No. CR-15-08034, 2016 WL 808663, \*4 (D. Ariz. March 2, 2016).

will be acknowledged as a legitimate investigatory method in the future. Existing Fourth Amendment law suggests the technique is constitutional. Moreover, the acceptance of familial DNA search technology in eleven states paves the way for other jurisdictions to expressly permit the method.

As Arizona Director of Public Safety Frank Milstead states, familial DNA testing is “probably one of the biggest [forensic] advancements in our lifetimes. With this technology, we can bring years of frustration to an end.”<sup>221</sup> For police, familial Y-STR DNA has the potential to save precious time and close cases. For victims and their families, the benefits of familial Y-STR DNA are profound. Harley Feldman, father of victim Allison Feldman, is now championing the technology to state officials and crime laboratories. In his own words, “[i]t’s for Allison. I hope [familial DNA] provides some relief to other families, like it has done with us.”<sup>222</sup> Instead of ignoring advances in DNA technology, the U.S. criminal justice system should embrace this new application of existing resources. The rewards could be tremendous.

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<sup>221</sup> Rainey, *supra* note 203.

<sup>222</sup> *Id.*