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Why Dna Databasing Is Good for Maryland — A DNA Analyst's Perspective

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WHY DNA DATABASING IS GOOD FOR MARYLAND – A DNA ANALYST'S PERSPECTIVE

By Rana Santos*

I. INTRODUCTION

The very first criminal case using DNA as evidence identifying a perpetrator was in 1987 in the United Kingdom.[1] It is interesting to note that this first case involved both an exoneration of a wrongfully accused individual who confessed to one of the murders, and the conviction of the individual identified as leaving semen on the victims' bodies and who attempted to evade the lawful collection of his DNA for comparative purposes.[2] In the twenty-five years since that case, thousands of cases have been solved through the use of DNA evidence.[3] Forensic DNA analysis continues to be used today to protect the innocent, through exoneration and post-conviction testing, as well as to implicate the guilty and corroborate other circumstantial evidence in criminal proceedings.[4] A powerful tool in the process is the creation, maintenance, and use of a DNA database.[5]

Conducting DNA profiling for inclusion in DNA databases is another essential function of most forensic laboratories that participate in DNA testing.[6] Using various indexes, or categories of sample profiles, matches between cases and between classes of offenders are created via the common language spoken by these

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1. *See* Suzanne Elvidge, *Forensic Cases: Colin Pitchfork, First Exoneration Through DNA*, EXPLORE FORENSICS (Dec. 7, 2012), http://www.exploreforensics.co.uk/forenisc-cases-colin-pitchfork-first-exoneration-through-dna.html.
2. *See* Philip H. Witt, Book Review, 33 J. PSYCHIATRY & L. 103, 103–04 (2005); *Alec Jeffreys and the Pitchfork Murder Case: The Origins of DNA Profiling*, U.S. NAT'L LIBRARY MEDICINE, https://www.nlm.nih.gov/visibleproofs/galleries/cases/jeffreys.html (last updated July 17, 2012).
3. *See CODIS-NDIS Statistics*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics (last visited May 31, 2013).
4. *See Postconviction Testing and Wrongful Convictions*, NAT'L INST. JUSTICE, http://www.nij.gov/topics/forensics/postconviction/welcome.htm (last modified Oct. 2, 2012).
5. *See* NAT'L INST. OF JUSTICE, U.S. DEP'T OF JUSTICE, USING DNA TO SOLVE COLD CASES 9 (2002), *available at* http://www.ncjrs.gov/pdffiles1/nij/194197.pdf.
6. *See id.* at 4.

laboratories.[7] Without this ability to communicate with one another, important information that has the potential to implicate the guilty or exonerate the innocent could be lost.[8]

Virtually all forensic laboratories in the United States test at least the core genetic locations required by the Combined DNA Index System (CODIS).[9] These locations are commonly referred to as the CODIS 13 or the CODIS Core Loci.[10] These mutually agreed upon chromosomal locations allow laboratories to share DNA data and generate meaningful and weighted matches.[11] These matches in turn can create investigative leads for cases that may otherwise have gone "cold."[12] Frequently, these links are created between a convicted felon and an unknown DNA profile from an open investigation.[13] Forensic laboratories have been creating these associations through CODIS for nearly twenty years.[14] Established by an act of Congress in 1994 through the DNA Identification Act, the CODIS database has grown over the years into one which now contains over 11 million profiles, the largest in the world.[15]

The State of Maryland has participated in CODIS for many years through a system of jurisdictional laboratories maintaining Local DNA Index Systems (LDIS).[16] These LDIS laboratories upload allowable indexes to the State DNA Index System (SDIS), which in turn uploads allowable indexes and profiles to the National DNA Index System (NDIS).[17] These three levels comprise the pyramidal

7. *See Frequently Asked Questions (FAQs) on the CODIS Program and the National DNA Index System*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis-and-ndis-fact-sheet (last visited May 31, 2013) [hereinafter *FAQs on the CODIS Program*].
8. *See* NAT'L INST. JUSTICE, *supra* note 5, at 17.
9. *See FAQs on the CODIS Program*, *supra* note 7.
10. *See id.*
11. *See id.*
12. *See Cold Case Investigations and Forensic DNA*, NAT'L INST. JUSTICE, http://nij.gov/topics/forensics/investigations/cold-case/#overview (last updated July 16, 2012); Paul E. Tracy & Vincent Morgan, *Big Brother and His Science Kit: DNA Databases for 21st Century Crime Control?*, 90 J. CRIM L. & CRIMINOLOGY 635, 644 & n.40 (2000).
13. *See id.* at 644.
14. *See* Erin Murphy, *The New Forensics: Criminal Justice, False Certainty, and the Second Generation of Scientific Evidence*, 95 CALIF. L. REV. 721, 738–40 (2007).
15. Tracy & Morgan, *supra* note 12, at 640–41; *CODIS-NDIS Statistics*, *supra* note 3.
16. *DNA Statistics*, GOVERNOR'S OFFICE CRIME CONTROL & PREVENTION, http://www.goccp.maryland.gov/dna/statistics.php (last visited May 31, 2013); Murphy, *supra* note 14, at 739.
17. Murphy, *supra* note 14, at 739.

CODIS database in many states, including Maryland.[18] The Maryland state level database began in 1994 and now contains over 105,000 profiles.[19]

Participation in the various levels of CODIS requires compliance with a nationally accepted set of standards known as the Federal Bureau of Investigation Quality Assurance Standards (FBI QAS).[20] Versions of these standards exist for both casework and databasing laboratories.[21] CODIS-participating forensic laboratories must be audited on the basis of these standards every year, with at least one annual inspection being performed by an independent audit team every other year.[22] The standards are rigorous and focus on good laboratory practice specifically in the realm of DNA analysis.[23] Chain of custody, proper evidence handling, documentation methods, training requirements, and protection of DNA data are examples of categories that are assessed and require compliance.[24]

In addition to the FBI Quality Assurance Standards many forensic DNA laboratories are accredited by bodies, such as the American Society of Crime Laboratory Directors/Laboratory Accreditation Board (ASCLD/LAB) or Forensic Quality Services (FQS).[25] These accrediting bodies have additional, more stringent criteria for quality and integrity.[26] These criteria often focus on the laboratory's

18. *DNA Statistics*, *supra* note 16; Murphy, *supra* note 14, at 739.
19. *History of Maryland's DNA Database*, GOVERNOR'S OFFICE CRIME CONTROL & PREVENTION, http://www.goccp.maryland.gov/dna/maryland-database.php (last updated Mar. 1, 2013); *DNA Statistics*, *supra* note 16.
20. *Quality Assurance Standards for Forensic DNA Testing Laboratories*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/qas_testlabs (last visited May 31, 2013).
21. *Id.*; *Quality Assurance Standards for Convicted Offender DNA Databasing Laboratories*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/lab/forensic-science-communications/fsc/july2000/codispre.htm/codis1a.htm (last visited May 31, 2013).
22. *Quality Assurance Standards for Forensic DNA Testing Laboratories*, *supra* note 20; *Quality Assurance Standards for Convicted Offender DNA Databasing Laboratories*, *supra* note 21.
23. *See Quality Assurance Standards for Forensic DNA Testing Laboratories*, *supra* note 20.
24. *Id.* at 9–17, 21, 26–27.
25. *See* JOHN M. BUTLER, FUNDAMENTALS OF FORENSIC DNA TYPING 297 (2010); *Welcome*, AM. SOC'Y CRIME LABORATORY DIRECTORS LABORATORY ACCREDITATION BOARD, http://www.ascld-lab.org/ (last visited May 31, 2013).
26. *See* MAX M. HOUCK & JAY A. SIEGEL, FUNDAMENTALS OF FORENSIC SCIENCE 17 (2d ed. 2010); *Accreditation Programs*, AM. SOC'Y CRIME LAB. DIRS. LAB. ACCREDITATION BD., http://www.ascld-lab.org/acreditation-programs/ (last visited May 31, 2013).

management systems, responsiveness to customer needs, and transparency.[27] Some laboratories have even been accredited applying an international standard[28] to demonstrate even greater levels of quality and reliability.[29] States, including Maryland, may have additional licensure requirements for forensic laboratories through governmental agencies such as the Department of Health and Mental Hygiene.[30] The degree of governmental and voluntary oversight is high for forensic DNA labs across the nation, and as a result, customers should be confident in testing results and the data integrity necessary to perform analyses and participate in CODIS.

II. BRIEF BACKGROUND OF FORENSIC DNA ANALYSIS

In modern day DNA analysis, for database purposes, a sample is collected from an individual under the provisions of a state's laws or via a search warrant issued by a judge.[31] Currently, Maryland law permits DNA collection from all convicted felons and those individuals arrested for certain types of crimes, namely the commission or attempted commission of violent crimes and burglary.[32] These samples are submitted to the lab under proper chain of custody rules and carried through a series of laboratory

27. *See* BUTLER, *supra* note 25, at 294, 297.

28. *See* HOUCK & SIEGEL, *supra* note 26, at 18; *e.g.*, *Program Overview: 2010 Edition: An ISO/IEC 17025 Program of Accreditation*, ASCLD/LAB-INTERNATIONAL (May 13, 2012), *available at* http://www.ascld-lab.org/documents/AL-PD-3041.pdf.

29. The International Organization for Standardization (ISO) has established the requirements for international accreditation. *See International Standard ISO/IEC 17025*, SABA (2005), *available at* http://www.saba.org.ir/saba_content/media/image/2011/04/1821_orig.pdf.

30. *See Forensic Laboratories*, MD. DEP'T HEALTH & MENTAL HYGIENE, http://dhmh.maryland.gov/ohcq/ForLabs/default.aspx (last visited May 31, 2013).

31. The National Conference of State Legislatures (NCSL) maintains an online database of state laws in all fifty states governing the collection and databasing of DNA samples. *See DNA Laws Database*, NAT'L CONFERENCE OF STATE LEGISLATURES, http://www.ncsl.org/issues-research/justice/dna-laws-database.aspx (last visited May 31, 2013).

32. The provision permitting DNA collection from convicted felons remains good law. *See* MD. CODE ANN., PUB. SAFETY § 2-504(a)(1) (LexisNexis 2011). The provision permitting DNA samples to be collected from arrestees was declared unconstitutional by the Maryland Court of Appeals in 2012, but that decision was reversed—and the law's constitutionality upheld—by the United States Supreme Court in recent months. *See* MD. CODE ANN., PUB. SAFETY § 2-504(a)(3) (LexisNexis 2011); King v. State, 425 Md. 550, 561, 42 A.3d 549, 555–56 (2012), *stay granted*, 133 S. Ct. 1 (2012), *cert. granted*, 133 S. Ct. 594 (2012), *rev'd*, Maryland v. King, 133 S. Ct. 1958 (2013).

procedures to extract the DNA from the collected cells.[33] The sample is purified, quantified, amplified for detection, and analyzed to generate a plot of various peaks, which is then translated into an accessible, easy-to-read table.[34] The result is a DNA profile.[35]

A DNA profile is comprised of the data from various locations (loci) on chromosomes found in nucleated cells in the body.[36] Each nucleated cell in an individual's body contains all of the genetic information of the individual being tested.[37] Forensic laboratories test the same chromosomal locations so that they can interact meaningfully with one another and share information.[38] The DNA profile is the numerical representation of the peaks found on the plot generated from extracted DNA.[39] It can be read simply as, "At place A, data set B was found." These data sets differ from person to person due to the principles of heredity and recombination.[40] It is these unique differences, or polymorphisms, that make an individual's profile distinctive and allow forensic DNA analysts to include for comparison an individual as a contributor to a specific sample.[41] What is critically important is the qualifier, "*for comparison.*" Without another profile generated from a crime scene evidence sample or sexual assault examination, the summation of numbers on the table is as meaningful as knowing the baseball scores of the day without knowing which teams played.

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33. *See* MD. CODE REGS. 29.05.01.04 (2011) (outlining the regulations governing the collection, chain of custody, and laboratory transfer of DNA samples taken by the Maryland State Police).
34. *See generally* DEAN FRAGA ET AL., *Real-Time PCR*, *in* CURRENT PROTOCOLS: ESSENTIAL LABORATORY TECHNIQUES 10.3.17–10.3.19 (2008), *available at* http://onlinelibrary.wiley.com/doi/10.1002/9780470089941.et1003s00/full (explaining amplification, quantification, and the need for a pure sample).
35. *See DNA Evidence: Basics of Analyzing*, NAT'L INST. OF JUSTICE, http://www.nij.gov/topics/forensics/evidence/dna/basics/analyzing.htm#basicsteps (last visited May 31, 2013).
36. BUTLER, *supra* note 25, at 19.
37. *Id.*
38. *See id.* at 154.
39. *See SWGDAM Interpretation Guidelines for Autosomal STR Typing by Forensic DNA Testing Laboratories*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/aboutus/lab/biometric-analysis/codis/swgdam-interpretation-guidelines (last visited May 31, 2013).
40. BUTLER, *supra* note 25, at 31.
41. Francis S. Collins et al., *A DNA Polymorphism Discovery Resource for Research on Human Genetic Variation*, 8 GENOME RES. 1229, 1229 (1998).

Most DNA analysts have heard concerns about access to an individual's physical information through DNA data.[42] But a *forensic* DNA profile cannot reveal information about your health status, your propensity to disease, or your physical appearance any more than your Social Security Number can. It is merely a collection of numbers used for comparative purposes from which no other health or physiological inference—other than gender—can be made.[43] One significant difference between a forensic DNA profile and a Social Security Number is that a DNA profile, when comprised of the current CODIS Core Loci, contains up to twenty-six numbers to help in identification, whereas a Social Security Number contains only nine.[44] From this example, it is easy to see that the greater the set of numbers—or in the case of DNA analysis, results at a chromosomal location—used to demonstrate an association between two things, the stronger the association. Scientists prefer that data associations be very strong, so that they may confidently make conclusions within a reasonable degree of scientific certainty.[45] But the core identification of an individual works in the same way as her unique Social Security Number.[46]

So what happens to the sample after the profile is generated? Maryland law currently states that items of evidence containing DNA evidence must be kept at least through the completion of a sentence.[47] This means that the buccal swab or blood card recovered from the individual as a reference for comparison is stored in a secure location either inside of the laboratory performing the analytical work, or in the custody of the law enforcement agency responsible for retaining the evidence.[48] Full documentation of the chain of custody applies to

42. *See, e.g.*, TANIA SIMONCELLI & SHELDON KRIMSKY, AM. CONSTITUTION SOC'Y, A NEW ERA OF DNA COLLECTIONS: AT WHAT COST TO CIVIL LIBERTIES? 1–2 (2007), *available at* http://www.acslaw.org/sites/default/files/Simoncelli_Krimsky_-_DNA_ Collection _Civil_Liberties.pdf (arguing that use of new DNA collection techniques violates reasonable privacy expectations).

43. Jules Epstein, *"Genetic Surveillance"—The* Bogeyman *Response to Familial DNA Investigations*, 2009 U. ILL. J.L. TECH. & POL'Y 141, 143 (2009).

44. Carolyn R. Hill et al., *Characterization of 26 MiniSTR Loci for Improved Analysis of Degraded DNA Samples*, 53 J. FORENSIC SCI. 73, 73 (2008).

45. *Cf.* Young v. State, 388 Md. 99, 119–20, 879 A.2d 44, 56 (1995) (noting that the current methods of DNA analysis make the likelihood of a random match so remote that it is possible to determine and to conclude with reasonable scientific certainty that a match exists between a sample and an individual).

46. *Cf. id.* at 122–23, 879 A.2d at 57–58 (determining that a PCR/STR test along thirteen loci produces a sufficiently small random match probability to make admissible expert testimony of uniqueness).

47. MD. CODE ANN., CRIM. PROC. § 8-201(j)(2) (LexisNexis 2008).

48. *See id.* § 8-201(k)(5).

each and every sample analyzed and retained in criminal proceedings.[49] Often, the evidence handling process is fully electronic with an audit trail.[50] But even a laboratory using paper chains of custody must keep detailed records of who had any item and when.[51] Any inspector, auditor, or assessor who walks through the doors of a forensic DNA laboratory will immediately want to see the chain of custody process. Deviations from the rules or failure to comply with the rules will result in documented non-conformances or corrective action requests.[52] In addition to these measures, forensic DNA laboratories must demonstrate to their auditing and accrediting bodies full compliance with the security of their facilities and of their DNA data.[53]

While these precautions are designed to demonstrate the laboratory's commitment to the integrity of the item, possible misuse of the DNA sample has been suggested at trial and in the media.[54] A skeptic may ask, "What if an unethical analyst took a piece of my blood card and used it to find out my health status, my racial background, or my hair color? What is preventing my genetic information from being misappropriated and used against me even if my reference sample is lawfully collected?"

The actions required of an unethical analyst to conduct such testing for these unauthorized and illegal activities are highly traceable and easily discovered. Not only would the analyst have to surreptitiously purchase thousands of dollars of highly specialized and easily traceable reagents to analyze just one sample, but the analyst also would have to reconfigure her laboratory's instrumentation to perform different analytical functions typically not performed in

49. *See* MD. CODE REGS. 29.05.01.04(N) (2012).
50. *See id.* 29.05.01.07(A).
51. *See id.* 29.05.01.04(N).
52. AM. SOC'Y OF CRIME LAB. DIR./LAB. ACCREDITATION BD., ASCLD/LAB-INTERNATIONAL PROGRAM OVERVIEW 2010 EDITION 14–15 (May 13, 2012), *available at* http://www.ascld-lab.org/documents/AL-PD-3041.pdf.
53. AM. SOC'Y OF CRIME LAB. DIR./LAB. ACCREDITATION BD., THE FBI QUALITY ASSURANCE STANDARDS AUDIT FOR FORENSIC DNA TESTING LABORATORIES, STANDARDS 6.1.1, 7.1.4 (effective Sept. 1, 2011), *available at* http://www.ascld-lab.org/documents/legacy_overview.pdf and http://www.ascld-lab.org/documents/AL-X-012-08262011.doc.
54. *See, e.g.*, Elizabeth E. Joh, *DNA Theft: Recognizing the Crime of Nonconsensual Genetic Collection and Testing*, 91 B.U. L. REV. 665, 679 (2011) (articulating the concern that DNA theft could result in the disclosure of certain health conditions).

forensic DNA laboratories.[55] In addition to this, the analyst would have to create or purchase analytical software to analyze the resultant data and conduct all of these activities after hours without notice.[56] In the more extreme scenario of a clandestine off-site laboratory setting, the analyst would have to create or be a part of the unauthorized lab, which would require all of the above mentioned reagents and software in addition to the purchase of six-figure, highly traceable instrumentation.[57] The mere suspicion of untoward action on the part of an unethical analyst would be easily revealed and difficult to conceal in either scenario.

Forensic DNA analysis has been compared to the rapid evolution of computer technology.[58] How many remember taking typing class on a typewriter? How many recall how amazing and exciting was the arrival of computers in schools? Cell phones, tablets, and laptops are now ubiquitous and permanently affixed to our hands. Even more amazing is the high level of cultural acceptance of these little devices into our most intimate lives. We share more information *voluntarily* as a society using the various forms of social media, and *unwittingly* when we click on advertisements or visit our favorite shopping site than anything a forensic DNA profile could *ever* reveal about us.[59] We trust that vendors and search engines will not spy on us or collect our data without our permission and despite hearing of misuse time and time again, we continue to have faith in internet sites, online purchases, and social networks.[60] Strangely, our discomfort with the idea of someone looking at a tiny portion of our overall genetic profile in a highly regulated and controlled setting is greater than our trepidation about sharing personal information on Facebook or Twitter, or even simply going online to buy a toothbrush.

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55. *See generally DNA Evidence: Basics of Analyzing*, NAT'L INST. OF JUSTICE, http://www.nij.gov/topics/forensics/evidence/dna/basics/analyzing.htm (last visited May 31, 2013) (describing the overall complexity of DNA analysis).

56. *See generally id.* (describing the overall complexity of DNA analysis).

57. *Price List for Selected Equipment, Supplies and Reagents Required for MLVA*, PULSENET INTERNATIONAL, http://www.pulsenetinternational.org/assets/PulseNet/uploads/mlva/MLVA_equipmentsupplies.pdf (last visited May 31, 2013) (providing an example of a price list for a new 3130xl genetic analyzer).

58. BUTLER, *supra* note 25, at 15.

59. KATHLEEN ANN RUANE, CONG. RESEARCH. SERV., RL34693, PRIVACY LAW AND ONLINE ADVERTISING: LEGAL ANALYSIS OF DATA GATHERING BY ONLINE ADVERTISERS SUCH AS DOUBLE CLICK AND NEBUAD 3 (2008).

60. *See id.*

III. DNA DATABASING IN MARYLAND

The practice of maintaining a DNA database has been ongoing in Maryland for nearly twenty years.[61] Recognizing that sexually motivated offenders are often repeat offenders, the database began in 1994 by requiring all sexual offenders to provide a DNA sample for inclusion in the state database.[62] The first criminal case in the United States to use DNA evidence was in 1987 and was a sexually motivated crime.[63] The federal government recognized, through the DNA Identification Act, that DNA evidence is a valuable tool in the arsenal of criminal investigations, particularly those that are sexually motivated.[64] A mere seven years later, many states in the nation, including Maryland, enacted their own specific legislation authorizing databasing of specific offenders and evidence item profiles.[65] Many of these state databases began with sexual offenders.[66]

As the successes of linking cases or identifying potential suspect matches grew from using the database, the database itself began to expand.[67] In 1999, Maryland's law was extended to include convicted offenders of violent crimes.[68] This new category authorized the state to collect DNA reference samples from any individual convicted of a violent crime and maintain those samples in the SDIS database.[69] This opened the door for links to criminal offenders for crimes beyond those that were sexual in nature, including assaults, shootings, and homicides.[70] To this day, the theory is that violent offenders are repeat offenders and the rate of DNA matches demonstrates the accuracy of that thinking. If one looks at the national trend of convicted offender match rates—the number of times an individual convicted of a violent crime later

61. *History of Maryland's DNA Database*, *supra* note 19.
62. *Id.*
63. EDWARD CONNORS ET AL., CONVICTED BY JURIES, EXONERATED BY SCIENCE: CASE STUDIES IN THE USE OF DNA EVIDENCE TO ESTABLISH INNOCENCE AFTER TRIAL 4 (1996).
64. 42 U.S.C. § 14135a (2006).
65. MD. CODE ANN., PUB. SAFETY § 2-502 (LexisNexis 2011).
66. Aaron P. Stevens, Note, *Arresting Crime: Expanding the Scope of DNA Databases in America*, 79 TEX. L. REV. 921, 946 (2001).
67. MD. CODE ANN., PUB. SAFETY § 2-504 (LexisNexis 2011).
68. 1999 Md. Laws 2996–98.
69. *Id.*
70. *Id.*

matches a profile generated in another crime[71]—one can see that rates have dramatically increased as the number of total entries has increased.[72] For example, in the year 2000, the database housed approximately 441,000 offender profiles, which were compared through the database to the approximately 21,000 forensic casework sample profiles uploaded from participating laboratories across the nation.[73] That year, there were 731 convicted offender matches to the forensic casework sample profiles.[74] A rate of three and one-half percent of the forensic casework profiles matched to a convicted offender in the database at that time.[75] Comparatively, in 2012 the database housed approximately 10 million offenders, which were compared through the database to the approximately 437,000 forensic casework sample profiles uploaded from participating laboratories across the nation.[76] That year, there were approximately 153,000 convicted offender/arrestee matches to the forensic casework sample profiles.[77] A rate of thirty-five percent of the forensic casework profiles matched to a convicted offender/arrestee in the database.[78] As the number of offenders and other qualifiers such as arrestees increases, the number of comparisons increases, and the number of investigations that were aided by DNA increases as well. These matches all represent database hits.[79] Without the database, many of these crimes would remain open and unsolved.

In 2002, the law again was expanded to include all felony convictions, as well as certain types of misdemeanor crimes.[80] This permitted the collection of DNA primarily from individuals who were convicted of burglary and breaking and entering crimes, and current statistics show that burglary is the leading category of

71. NATHAN JAMES, CONG. RESEARCH SERV., R41800, DNA TESTING IN CRIMINAL JUSTICE: BACKGROUND, CURRENT LAW, GRANTS, AND ISSUES 6 tbl.1 (2012), *available at* http://www.fas.org/sgp/crs/misc/R41800.pdf; *CODIS Brochure*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/codis_brochure (last visited May 31, 2013).

72. *See* JAMES, *supra* note 71, at 6 tbl.1; *CODIS Brochure*, *supra* note 71.

73. JAMES, *supra* note 71, at 6 tbl.1; *CODIS Brochure*, *supra* note 71.

74. JAMES, *supra* note 71, at 6 tbl.1; *CODIS Brochure*, *supra* note 71.

75. JAMES, *supra* note 71, at 6 tbl.1 (731 ÷ 21,000 x 100% = 3.5%).

76. *Id.*; *CODIS Brochure*, *supra* note 71.

77. JAMES, *supra* note 71, at 6 tbl.1; *CODIS Brochure*, *supra* note 71.

78. JAMES, *supra* note 71, at 6 tbl.1 (153,000 ÷ 437,000 x 100% = 35%).

79. Specifically, these hits are from CODIS-NDIS, which is the database that generated the statistics. *See CODIS-NDIS Statistics*, *supra* note 3.

80. 2002 Md. Laws 3715–17; *see* MD. CODE ANN., CRIM. LAW §§ 6-205, 6-206 (LexisNexis 2012) (defining fourth degree burglary and breaking and entering of the rogue and vagabond variety as misdemeanor crimes, respectively).

convicted offender hits and arrests.[81] This category is particularly exciting as it not only identifies individuals who are habitual burglars, but also has the power to prevent a repeat offender from graduating to more serious violent crimes like stalking, voyeurism, and rape.[82] A study in Denver demonstrated that, when a police organization focuses its efforts heavily on the testing of DNA evidence in property crimes, which typically results in a hit rate greater than that of any other crime type, other violent crimes decrease as well.[83] In Denver, they have been able to calculate that when a burglary case contains DNA evidence, the sentence, if the suspect is found guilty, is nearly ten times as long, with the average jail sentence jumping from 1.4 years to fourteen years.[84] Similarly, in property crime cases containing DNA evidence, the rate of prosecution is greater than forty percent.[85] This represents an eight-fold increase over national averages for property crime case prosecution without DNA evidence.[86] If studies that show that habitual burglars commit hundreds of crimes a year are accurate, placing just one of these individuals behind bars for the longer sentence could prevent over 2,000 burglaries.[87] The statistics from Maryland are similar.[88] Of the convicted offender hits, the largest combined category leading to an arrest since 2007 is burglary/theft.[89] This combined category represents nearly fifty percent of all arrests made from convicted offender matches.[90] Logically, including

81. *DNA Statistics*, *supra* note 16.
82. JAMES, *supra* note 71, at 8 n.55.
83. *See Denver DNA Burglary Project*, DENVER DIST. ATTORNEY'S OFFICE, http://www.denverda.org/dna/Denver_DNA_Burglary_Project.htm (last visited May 31, 2013); CITY OF DENVER, 2007 DENVER NEIGHBORHOOD STATISTICAL CRIME REPORT (unpublished report) *available at* http://www.denvergov.org/Portals/ 720/ documents/statistics/2007archives/2007_Analysis.pdf; CITY OF DENVER, 2006 DENVER NEIGHBORHOOD STATISTICAL CRIME REPORT (unpublished report), *available at* http://www.denvergov.org/Portals/720/documents/statistics/2006archives/ 2006 Analysis.pdf.
84. *Denver DNA Burglary Project*, *supra* note 83.
85. *Id.*
86. *Id.*
87. SIMON ASHIKHMIN ET AL., DENVER DIST. ATTORNEY'S OFFICE, *Effectiveness and Cost Efficiency of DNA Evidence in Volume Crime Denver Colorado Site Summary*, at 6, *available at* http://www.denverda.org/DNA_Documents/DNABurgrCostEfficiency Reserch1.pdf.
88. *DNA Statistics*, *supra* note 16.
89. *Id.*
90. *Id.* The total number of burglary and theft hits since March 2007 is 229 out of 452 or 50.7%.

individuals already previously convicted of burglary increases the likelihood of matches, especially to their preferred category of crime.

As of January 1, 2009, Maryland's DNA law was further extended to include those individuals *arrested* for crimes of violence and burglaries.[91] This allows the state to collect samples from those individuals who not only are convicted, but also from those who are simply arrested for crimes or attempted crimes of violence and burglary for inclusion in the database.[92] As of February 2013, there have been a total of 225 arrestee hits with seventy-three arrests resulting from these hits.[93] These hits represent matches to profiles generated from evidence found on crime scenes.[94] Interestingly, these hits represent eight percent of the total number of hits in the Maryland database.[95] The data for 2012 alone shows thirty-eight arrestee hits and 337 case-to-case or convicted offender matches, which is eleven percent of the total for the year.[96]

Maryland is not the only state to enact arrestee collection. At the moment, twenty-eight states and the federal government allow for arrestee collections.[97] The exact language for each of the states' legislation on qualifying offenses and requirements for expungement and retention vary.[98] There have been challenges in many courts questioning the constitutionality of these laws, resulting in decisions both in favor of and against these collections.[99] The challenge brought regarding the constitutionality of Maryland's DNA collection law has now been resolved by the United States Supreme Court, which has upheld the constitutionality of the Maryland law.[100] It should be acknowledged that the country is moving toward a greater

91. MD. CODE ANN., PUB. SAFETY § 2-504(a)(3) (LexisNexis 2011).
92. *Id.*
93. *DNA Statistics*, *supra* note 16.
94. *See History of Maryland's DNA Databases*, *supra* note 19.
95. *DNA Statistics*, *supra* note 16.
96. *Id.*
97. *DNA Sample Collection from Arrestees*, NAT'L INST. JUSTICE (Dec. 7, 2012), http://nij.gov/topics/forensics/evidence/dna/collection-from-arrestees.htm.
98. *See id.* (identifying differences between states' laws).
99. *Compare* United States v. Mitchell, 652 F.3d 387, 390 (3rd Cir. 2001), United States v. Fricosu, 844 F. Supp. 2d 1201, 1206 (D. Colo. 2012), United States v. Pool, 645 F. Supp. 2d 903, 906, 917 (E.D. Cal. 2009), *and* Anderson v. Virginia, 650 S.E.2d 702, 704–05 (Va. 2007), *with* Mario v. Kaipio, 281 P.3d 476, 483 (Ariz. 2012), *and In re* Welfare of C.T.L., 722 N.W.2d 484, 492 (Minn. Ct. App. 2006).
100. King v. State, 425 Md. 550, 555, 42 A.3d 549, 552 (2012), *stay granted*, 133 S. Ct. 1 (2012), *cert. granted*, 133 S. Ct. 594 (2012), *rev'd*, Maryland v. King, 133 S. Ct. 1958 (2013).

acceptance of the use of the DNA data as its strength and significance become more evident to citizens and legislators alike.

The success stories for convicted offender matches are abundant.[101] As states around the country begin enacting legislation allowing for arrestee collections, the corresponding success stories begin to trickle in.[102] Louisiana was the first state to enact legislation in 1997, followed by four more states over the years leading up to 2005.[103] The federal government enacted the DNA Fingerprint Act in 2005,[104] and since that time twenty-three additional states have enacted arrestee legislation.[105] Recently, a long distance tractor trailer operator was arrested for assault and for holding a minor girl against her will.[106] He was arrested in a state with an arrestee provision in its DNA collection laws.[107] The sample was analyzed, entered into the state's DNA database, and subsequently matched to a ten-year-old cold case involving the unsolved rape of a fourteen-year-old girl.[108] That case would still be open if the offender was arrested in a state without an arrestee clause.[109]

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101. *See Why Pass the DNA Law?*, DNA SAVES (2013), http://www.dnasaves.org/dna_law.php (recounting the successes of Virginia and California).

102. *See id.*

103. *DNA Sample Collection from Arrestees*, *supra* note 97.

104. DNA Fingerprint Act of 2005, Pub. L. No. 109-162, Title X, 119 Stat. 2960 (2006).

105. *DNA Sample Collection from Arrestees*, *supra* note 97.

106. Doug Page, *New State Law on DNA Leads to Arrest in 10-year-old Rape*, SPRINGFIELDNEWSSUN.COM (Nov. 14, 2011, 3:46 PM), http://www.springfieldnewssun.com/news/news/crime-law/new-state-law-on-dna-leads-to-arrest-in-10-year--1/nMxFK/.

107. Julie Samuels et al., *Collecting DNA From Arrestees: Implementation Lessons*, NAT'L INST. JUSTICE, http://www.nij.gov/journals/270/arrestee-dna.htm (last visited May 31, 2013).

108. *See* Page, *supra* note 106; Samuels et al., *supra* note 107 (explaining that the Ohio DNA collection statute allowed law enforcement to match a new sample to one obtained in a cold case in order to make an arrest).

109. *See* Jessica Heffner, *DNA Samples Lead to Arrest of Criminal Suspects*, DAYTONDAILYNEWS.COM (Feb. 15, 2012), http://www.daytondailynews.com/news/news/local/dna-samples-lead-to-arrest-of-criminal-suspects/nMysZ ("Had officers had to wait until after a conviction to test the sample . . . law enforcement may have never 'connected the dots.'").

IV. DNA COLLECTION AT ARREST IS *NOT* AN INVASION OF PRIVACY OR AN UNREASONABLE SEARCH

Privacy is defined as "the quality or state of being apart from company or observation."[110] One of the challenges to the collection of DNA samples at arrest is that it is perceived by many as an unwarranted invasion of an individual's right to privacy.[111] The legal challenges to and constitutional aspects of privacy are not the purpose of this commentary. It is instead to demonstrate that the collection of DNA at arrest, from a scientific perspective, does not violate this basic human expectation. A citizen has an idea, under the above definition, that she will be able to go about her life discreetly and without undue interruption or disruption from individuals or the government.[112] This, in its simplest form, is reasonable. But one does not have a right to expect a sphere of silence and anonymity when moving about in the world.[113] A certain level of privacy is rational; complete isolation is not. Being required to submit a sample of DNA upon arrest does not violate your privacy any more than giving your fingerprints when applying for a job, giving your Social Security Number when applying for financial aid, or giving blood to the Red Cross in an act of charity. A DNA analyst will know no more about you from your reference sample than any of the recipients of the above information you have given freely without question. Your profile, used in comparison to DNA profiles generated using identical methodology from casework samples, contains only enough information to complete the comparison and nothing more.[114] As discussed previously, the profile is protected on many levels inside of the organization and as dictated by national, regional, and/or local

110. MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 988 (11th ed. 2004).

111. *See* Sarah B. Berson, *Debating DNA Collection*, NAT'L INST. JUSTICE, http://www.nij.gov/journals/264/debating-DNA.htm (last visited May 31, 2013) (explaining that there exists concern that collecting DNA prior to conviction violates Fourth Amendment privacy guarantees).

112. *See* BLACK'S LAW DICTIONARY 658 (9th ed. 2009).

113. *See* Thomas B. Kearns, Note, *Technology and the Right to Privacy: The Convergence of Surveillance and Information Privacy Concerns*, 7 WM. & MARY BILL RTS. J. 975, 979 (1999).

114. Justin A. Alfano, Note, *Look What* Katz *Leaves Out: Why DNA Collection Challenges the Scope of the Fourth Amendment*, 33 HOFSTRA L. REV. 1017, 1032 (2005); *see also* John M. Butler, *Genetics and Genomics of Core STR Loci Used in Human Identity Testing*, NAT'L INST. STANDARDS & TECH., http://www.cstl.nist.gov/div831/strbase/pub_pres/Butler_coreSTRloci_JFS_Mar2006.pdf (last visited May 31, 2013).

regulations.[115] The reasonable expectation of privacy when conducting forensic DNA analysis is therefore upheld, and the time of collection has nothing—scientifically speaking—to do with the invasion or violation of this expectation.[116]

Another challenge is the assertion that the collection of DNA at arrest is an unreasonable search and violates the Fourth Amendment to the U.S. Constitution.[117] Again, we examine this requirement as a scientific principle, not from a legal perspective. Procedurally, collections of DNA reference samples at arrest are completed by swabbing the right and left sides of an individual's oral cavity with a cotton swab.[118] Some collections may involve blood draws or finger pricks, but the majority of collections are done by buccal (oral) swabs.[119] Collecting buccal swabs is quicker and easier than rolling fingerprints on a ten-print card.[120] Two sterile cotton swabs are inserted in the mouth, rubbed gently on the sides of the cheeks, and removed.[121] Unreasonable is defined as "exceeding the bounds of reason or moderation."[122] From a strictly technical viewpoint, swabbing the inside of the mouth is reasonable for the collection of DNA evidence. By inference and in this context, the surgical removal of skin or other piece of tissue from the body could be considered unreasonable.

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115. John D. Biancamano, Note, *Arresting DNA: The Evolving Nature of DNA Collection Statutes and their Fourth Amendment Justifications*, 70 OHIO ST. L.J. 619, 625–26 (2009).

116. Kimberly A. Polanco, Note, *Constitutional Law—The Fourth Amendment Challenge to DNA Sampling of Arrestees Pursuant to the Justice For All Act of 2004: A Proposed Modification to the Traditional Fourth Amendment Test of Reasonableness*, 27 U. ARK. LITTLE ROCK L. REV. 483, 523–24 (2005).

117. Jacqueline K. S. Lew, Note, *The Next Step in DNA Databank Expansion? The Constitutionality of DNA Sampling of Former Arrestees*, 57 HASTINGS L.J. 199, 199–200 (2005).

118. Sgt. Stewart Mosher, *Oral Swab Collection for DNA and PCR Analysis*, FDIAI NEWSL. (Fla. Div. of the Int'l Ass'n for Ident., Miami Springs, FL.), Jan.–Mar. 1999, at 2, 22, *available at* http://www.fdiai.org/Newsletter%20Archives/Newsletters/January1999/Jan1999mosher.pdf.

119. Memorandum, Eric H. Holder, U.S. Att'y Gen., Dep't of Just., DNA Sample Collection from Federal Arrestees and Defendants (Nov. 2010), *available at* http://www.justice.gov/ag/ag-memo-dna-collection111810.pdf. The FBI provides swabs for collection. *Id.*

120. *Compare* Mosher, *supra* note 118, *with Recording Legible Fingerprints*, FED. BUREAU OF INVESTIGATION, http://www.fbi.gov/about-us/cjis/fingerprints_biometrics/recording-legible-fingerprints/takingfps (last visited May 31, 2013).

121. Mosher, *supra* note 118.

122. MERRIAM-WEBSTER'S COLLEGIATE DICTIONARY 1371 (11th ed. 2003).

When considering the invasion of privacy and unreasonable search challenges to the policy of DNA collection upon arrest, one could make a comparison to the collection of fingerprints *at arrest*. The data generated from a fingerprint may be more easily abused. With the advent of scanning technology and the frequency with which one voluntarily submits fingerprint records for non-criminal activities, the likelihood of abuse is far greater because the infrastructure to do so already exists in the larger community.[123] Similarly, one could argue that fingertips smeared with black ink from a pad on which hundreds of other people have pressed their ten digits is more unreasonable and uncomfortable than rubbing a sterile swab inside of one's mouth. Why should our level of comfort with submitting to fingerprint-taking be greater than submitting a DNA swab? Perhaps the familiarity and ordinariness of fingerprinting gives us the illusion of greater comfort, and thus the solution is to provide the general public with greater exposure to DNA technology.

V. FAMILIAL SEARCHING

One of the more disturbing arguments that have been asserted regarding DNA databasing is that a laboratory, by lawfully having access to your forensic DNA profile, can determine who you are related to and seek out your family members for investigative purposes.[124] Familial searching, in point of fact, is illegal in Maryland.[125] Even if it were not, familial searching is *not* trolling a database looking for potential relatives in order to provide a list of candidates for police investigators to interview.[126] Rather, it is a deliberate search performed only after all other searches have failed to yield a result, which involves searching for first order relatives, such as siblings, parents, or children. It is important to note that the family member must already be in the database in order to generate information about a familial relationship.[127]

123. *See, e.g.*, Connie Llanos, *LAUSD to Use Fingerprint Scans for School Lunches*, L.A. DAILY NEWS (Oct. 2, 2010, 4:53 PM), http://www.dailynews.com/breakingnews/ci_16235711.

124. *An Introduction to Familial DNA Searching*, GLOBAL JUST. INFO. SHARING INITIATIVE (Apr. 2012), http://www.denverda.org/DNA_Documents/Familial_DNA/An%20Introduction%20to%20Familial%20DNA%20Searching%20Issues%20for%20Consideration_compliant0.pdf.

125. MD. CODE ANN., PUB. SAFETY § 2-506(d) (LexisNexis 2011).

126. *An Introduction to Familial DNA Searching*, *supra* note 124.

127. *Id.*

Only four states in the United States allow familial searching by law, although other states implement it pursuant to lab policy.[128] Maryland and the District of Columbia have laws prohibiting its use in any situation.[129] Familial searching also has been conducted in 200 cases in the United Kingdom since 2003.[130] The decision to conduct a familial search is a thoughtful process. In the United Kingdom, the procedure is documented, approved through legal channels, and involves extensive levels of training on the part of the analysts conducting the search, the police investigators, and the court system.[131] Often, a task force or triage is conducted to determine the necessity to perform the search and the search is not performed until it is approved by committee.[132] An analyst cannot sit at a database computer and perform a search, print out a list of possible relatives, and give it to an investigator.[133] All familial matches, if the search is performed, must then pass several tests not based on genetic information alone before any attempt to reach out to those relatives, who have been preliminarily identified, is ever made.[134]

The suggestion that a family member identified using a familial search will be harassed or investigated in order to gather information about the criminal activity of relatives is inflammatory and irresponsible. It is simply not the case, and in the State of Maryland—where it is prohibited by law—not allowed.[135] Expanding a database to include arrestee samples also is not relevant to the topic because the database does not make a distinction based on the time of collection. Any sample in a database, if the

128. *Familial Searching*, FED. BUREAU INVESTIGATION, http://www.fbi.gov/about-us/lab/biometric-analysis/codis/familial-searching (last visited May 31, 2013).

129. MD. CODE ANN., PUB. SAFETY § 2-506(d) (LexisNexis 2011); D.C. CODE § 22-4151(b) (Supp. 2012).

130. *Familial Searching*, *supra* note 128.

131. *See id.*

132. *See generally* Erica Haimes, *Social and Ethical Issues in the Use of Familial Searching in Forensic Investigations: Insights from Family and Kinship Studies*, 34 J.L. MED. & ETHICS 263, 272 (2006) (discussing UK's awareness of familial searching impact on human rights).

133. *See generally* Robin Williams & Paul Johnson, *Inclusiveness, Effectiveness and Intrusivness: Issues in the Developing Uses of DNA Profiling in Support of Criminal Investigations*, 33 J.L. MED. & ETHICS 545, 547 (2005) (discussing restrictions on "speculative searching" of databases).

134. Erica Solange Deray, Note, *The Double-Helix Double-Edged Sword: Comparing DNA Retention Policies of the United States and the United Kingdom*, 44 VAND. J. TRANSNAT'L L. 745, 752 (2011).

135. *Familial Searching*, *supra* note 128.

jurisdiction allows familial searching, is available for the search.[136] Including additional categories of offenses or allowing for arrestee samples to be added to a database does not make a familial search more likely or more probable than it already was.

VI. CONCLUSION: WHY THE DATABASE SHOULD BE EXPANDED

From a purely scientific point of view, more data is better. Drawing conclusions from small sets of data increases the likelihood that something has been missed, overlooked, or declined to be considered.[137] Excluding data is limiting.[138] When a crime is committed, there is a perpetrator. From the perspective of providing service to the citizens in the region and being as scientifically precise as possible, excluding data sets means all possible outcomes are perhaps not being explored. In the context of a scientific endeavor, gathering as much information as possible and practicable is prudent and beneficial to the results of the analysis.[139] Having an expanded DNA database, filled with profiles of eligible and lawfully collected samples, benefits a laboratory's ability to arrive at conclusions, rather than leaving a sample as "unknown." As stated previously, the national database contains over 400,000 "unknowns" in the forensic index.[140] Our goal as forensic DNA scientists, police agencies, and policy makers should be to decrease, or ideally, eliminate those unknowns, prevent future criminal activity, and provide answers to the citizens we serve.[141] One powerful way to do this is by continuing to expand the DNA database to include the DNA profiles of arrestees.

Continuing to add DNA profiles to forensic DNA databases across the nation will lead to lower levels of crime through prevention, lower costs for enforcement, and safer neighborhoods. Using illogical rationale to prevent collections and limit the size and scope of these databases increases the likelihood of higher crime rates and

136. *See* Erin Murphy, *Relative Doubt: Familial Searches of DNA Databases*, 109 MICH. L. REV. 291, 297 (2010).

137. *See, e.g.*, *How Many Data Points are Enough?*, THE DEP'T OF PHYSICS AT ILL. STATE UNIV., http://www.phy.ilstu.edu/slh/How_Many_Data_Points.pdf (last visited May 31, 2013).

138. *See id.*

139. *See id.*

140. *See CODIS-NDIS Statistics*, *supra* note 3.

141. *See* Allison F. Tilton, Note, *Expectation of Privacy? How the Circuits View Post-Conviction Extractions of DNA: An Examination of "Special Needs" and "General Balancing,"* 34 NEW ENG. J. ON CRIM & CIV. CONFINEMENT 193, 197–98 (2008).

lower case closure rates. In terms of societal benefit, having the tools necessary to prevent crime and identify those who commit crime through objective evidence is a goal all should agree is worth accomplishing.