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Ethnic Inferencing: The Unanswered Question of S and Marper v. United Kingdom

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ETHNIC INFERENCING: THE UNANSWERED QUESTION OF S AND MARPER V. UNITED KINGDOM

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I. INTRODUCTION

Over forty years after the Golden State Killer[1] claimed his first victim, he was apprehended when Joseph James DeAngelo was charged with eight counts of first-degree murder.[2] In the days after DeAngelo was apprehended, the public learned of the many techniques investigators used to apprehend the infamous serial killer.[3] One of the tactics investigators relied on was familial searching.[4] First, investigators uploaded the DNA profile generated from a crime scene DNA sample (suspected to be the Golden State Killer's DNA) into the genealogy website, GEDmatch.[5] Using GEDmatch, police identified a number of DeAngelo's close relatives who had submitted their DNA to the open source website.[6] The list of DeAngelo's relatives narrowed the suspect pool for investigators and eventually, they were able to identify DeAngelo as the suspected Golden State

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[1] The Golden State Killer, also known as the East Area Rapist, was a notorious serial killer and rapist. He was suspected of having committed fifty rapes and twelve killings in California during the 1970s and 1980s. *See* Don Thompson & Brian Melley, *Ex-policeman charged with decades-old serial killings*, ASSOCIATED PRESS, Apr. 26, 2018, https://apnews.com/2e26c4d39a6f45578794dcc4e2accd2f (describing the history and capture of the Golden State Killer).

[2] *Id.*

[3] Ryan Lillis, Dale Kasler, Anita Chabria & Sam Stanton, *'Open Source' genealogy site provided missing DNA link to East Area Rapist, investigator says*, SACRAMENTO BEE, Apr. 28, 2018, https://www.sacbee.com/news/local/crime/article209987599.html.

[4] *Id.*

[5] GEDmatch is a Florida-based, open source, genealogy website. Open-source software makes the source code for a website or program available for everyone to see or use. GEDmatch allows users to upload DNA files obtained from commercial genealogy companies such as AncestryDNA or 23andMe. The site provides software that allows users to find family members who have also uploaded their DNA files. *See id.* Thomas Goetz, *Open Source Everywhere,* WIRED, Nov. 1, 2003, https://www.wired.com/2003/11/opensource/ (describing open-source technology), *see also* Sarah Zhang, *How a Tiny Website Became the Police's Go-To Genealogy Database,* THE ATLANTIC, June 1, 2018, https://www.theatlantic.com/science/archive/2018/06/gedmatch-police-genealogy-database/561695/ (describing how GEDmatch is used in the process of familial searching).

[6] Heather Murphy, *She Helped Crack the Golden State Killer Case. Here's What She's Going to Do Next*, N.Y. TIMES, Aug. 29, 2018, https://www.nytimes.com/2018/08/29/science/barbara-rae-venter-gsk.html.

Killer and charge him with the murders believed to have been committed by the infamous serial killer.[7]

The Golden State Killer case brought familial searching—used to identify family members of a suspect when the suspect himself cannot be identified[8]—to the national forefront.[9] Although undeniably helpful to the Golden State Killer case, familial searching raises serious concerns for any individual who has ever submitted his or her DNA to a genealogy website.[10] As the amount of individuals submitting their DNA to genealogy websites increases, the likelihood of an innocent person becoming a suspect of a crime simply because they are distantly related to the actual perpetrator, increases as well.[11] In fact, in the Golden State Killer case, investigators followed two leads before they focused their attention on DeAngelo.[12] The privacy concerns that were raised after familial searching gained national attention are emblematic of the questions that should be raised every time a new DNA technique is developed and used in the criminal justice system. Whether it is low

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[7] *Id.*

[8] Benjamin Oreskes, et al., *False starts in search for Golden State Killer reveal pitfalls of DNA testing*, LA TIMES, May 4, 2018, http://www.latimes.com/local/lanow/la-me-ln-golden-state-killer-dna-20180504-story.html#.

[9] *See id.* (noting the controversy and the privacy issues raised by the Golden State Killer case and familial searching).

[10] *See* Samuel D. Hodge Jr., *Current Controversies in the Use of DNA in Forensic Investigations*, 48 U. BALT. L. REV. 39, 52 (2018) (noting the Fourth Amendment concerns familial searching raises, the disproportionate impact that familial searching could have on minorities, and the lack of regulation regarding familial searching).

[11] *See* Yaniv Erlich et al., *Identity inference of genomic data using long-range familial searches,* SCIENCE, Oct. 11, 2018, http://science.sciencemag.org/content/early/2018/10/10/science.aau4832/tab-pdf (estimating that sixty percent of individuals of European descent have a third cousin or closer relative that has submitted their DNA to a genealogy website).

[12] Based on a rare genetic marker found in the suspect's profile, investigators initially focused on two different men, one from Oregon and one from California, both were ruled out as suspects based on their full DNA profile. *See* Oreskes et al., *supra* note 8.

copy number DNA testing,[13] "Twin Testing,"[14] or—the subject of this comment—ethnic inferencing,[15] new DNA techniques should be fully analyzed not only to confirm their validity, but also to investigate the privacy issues implicated by their use.

Ethnic inferencing is a statistical process used to predict the "ethnic appearance" of an unidentified person to whom a DNA sample belongs.[16] The European Court of Human Rights ("EC") first noted the United Kingdom's use of this technique in *S & Marper v. United Kingdom*.[17] If investigators collect an unknown DNA sample from a crime scene, they can use this statistical process to speculate what the suspect's ethnic appearance is.[18] In other words, this data is

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[13] "Low copy number (LCN) typing . . . refers to the analysis of a sample that contains less than 200 [picograms] of DNA." A picogram is one trillionth of a gram. *See* Bruce Budlowe, Arthur J. Eisenburg & Angela van Daal, *Validity of Low Copy Number Typing and Applications to Forensic Science,* 50 CROAT. MED. J. 207, 207 (2009)(criticizing the validity of LCN DNA typing). *See also* United States v. Morgan, 675 Fed. Appx. 53, 55-56 (2d Cir. 2017)(summary order) (affirming admission of LCN DNA testing, while noting that it is supported by weaker evidence of reliability than traditional DNA testing).

[14] "Twin Testing" differentiates between identical twins' DNA by looking at epigenetic changes, which are mutations to a person's DNA that occur during their lifetime due to differences in their lifestyle. *See* Jessica Hamzelou, *Police Can Now Tell Identical Twins Apart – Just Melt Their DNA,* NEWSCIENTIST, Apr. 24, 2015, https://www.newscientist.com/article/dn27411-police-can-now-tell-identical-twins-apart-just-melt-their-dna/. *See also* Danny McDonald, *Man found guilty of kidnapping, raping two women in Boston 13 years ago*, BOSTON GLOBE, Jan. 13, 2018, https://www.bostonglobe.com/metro/2018/01/12/man-found-guilty-kidnapping-raping-two-women-boston-years-ago/ehUV2SqL5k4XuhSzdKweeN/story.html, (describing a trial judge's decision to exclude evidence of a test purporting to differentiate between DNA samples from identical twins.).

[15] *See* S and Marper v. United Kingdom, App. No. 30562/04, 30566/04, 48 Eur. H.R. Rep. 1169, 1180 (2009) (describing the practice of ethnic inferencing in NDNAD, the United Kingdom's national DNA database).

[16] *Id.*

[17] *Id.*

[18] *See e.g.* Hannah McKee, *Science Behind the Crime*, SUNDAY SUN-TIMES, Apr. 24, 2016, at 30 (describing how investigators used ethnic inferencing to determine that the suspect who killed a taxi driver in New Zealand was likely Asian, leading police to narrow their suspect pool and eventually apprehend the killer, a Chinese man.) *See also* Eugene Hoshiko, *Chinese Man Apologizes For Killing NZ Driver,* SAN DIEGO UNION-TRIB., Nov. 17, 2018,

used to narrow down the suspect pool of a particular investigation to individuals of only the ethnicity that is generated from the retrieved DNA sample.[19] The population statistics for ethnic inferencing are produced when investigators take a DNA sample from a suspect and make their own subjective interpretation of that individual's ethnicity.[20] When the suspect's DNA profile is uploaded to the DNA database, the subjective interpretation of ethnicity is also linked to the individual's DNA profile.[21] Ethnic inferencing threatens individuals' right to privacy; while the subjective interpretations of ethnicity that the technique necessitates raise concerns about its validity.

First, because ethnic inferencing requires investigators to assume a person's race based on predetermined racial classifications, ethnic inferencing may be inaccurate, prejudicial, and may perpetuate incorrect notions about race.[22] Ethnic inferencing's foundation—relying on subjective determinations about a person's race—also prompts questions concerning the technique's validity. Second, ethnic inferencing violates the European Convention on Human Rights ("ECHR"). *S and Marper v. United Kingdom* condemned the United Kingdom's practice of permanently retaining non-convicted individuals' DNA samples.[23] *S and Marper v. United Kingdom* clarifies that member states[24] do not have unlimited discretion when using their

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https://www.sandiegouniontribune.com/sdut-chinese-man-apologizes-for-killing-nz-driver-2011aug01-story.html.

19 NUFFIELD COUNCIL ON BIOETHICS, THE FORENSIC USE OF BIOINFORMATION: ETHICAL ISSUES, 80 (2007) http://nuffieldbioethics.org/wp-content/uploads/The-forensic-use-of-bioinformation-ethical-issues.pdf [hereinafter NUFFIELD REPORT].

20 *Id.*

21 *Id.*

22 *See id.* at 80-81 ("[A]pparent ethnicity may not be well predicted[.] . . . [T]he classification of people into seven 'ethnic appearances' may seem closer to racist ideas than a genetic understanding of ethnicity[.] . . . [ethnic inferencing] may also reinforce existing prejudices about the likely perpetrators of crime[.]").

23 *See* S and Marper, 48 Eur. H.R. Rep. at 1202 (invalidating the United Kingdom's DNA retention framework).

24 A member state is "a country that belongs to a political, economic, or trade organization such as the European Union". Cambridge Dictionary, https://dictionary.cambridge.org/us/dictionary/english/member-state (last visited Feb. 7, 2019). In this case, the member states are the countries that make up the Council of Europe, all of which must ratify the European Convention on Human

DNA databases.[25] Just as permanently retaining DNA samples in certain scenarios is impermissible, ethnic inferencing is also an impermissible use of personal data,[26] and thus violates Article 8 of the "ECHR".[27] Finally, ethnic inferencing violates Article 14 of the ECHR.[28] Article 14 prohibits discrimination that is linked to another right secured by the Convention.[29] In other words, under Article 14 of the ECHR, it is not necessary to establish that the any other article of the Convention has been violated. A petitioner only has to prove that the State's action comes within the realm of another Article of the Convention, and that the petitioner has experienced discrimination based on one of the classifications listed within Article 14.[30] Ethnic inferencing invokes an Article 8 privacy concern and has a discriminatory effect against racial minorities; this violates Article 14 in conjunction with Article 8 of the ECHR.[31] In light of the substandard validity of ethnic inferencing, as well as Article 8 and Article 14 ECHR

Rights. The European Court of Human Right's decisions are therefore binding on all of the members of the Council of Europe. *See generally,* European Convention for the Protection of Human Rights and Fundamental Freedoms, Nov. 4, 1950, 213 U.N.T.S. 211 (discussing the purpose and the applicability of the Convention to the Council of Europe's member states in the preamble) [hereinafter Convention].

25 *See* S and Marper, 48 Eur. H.R. Rep. at 1202 (invalidating permanent retention of non-convicted individuals' DNA samples).

26 *See id.* at 1191 ("The court observes, nonetheless, that the [DNA] profiles contain substantial amounts of unique personal data.").

27 *See* Convention, *supra* note 24, at art. 8 ("Everyone has the right to respect for his private and family life, his home and his correspondence. [. . .] There shall be no interference by a public authority with the exercise of this right except as in accordance with the law and is necessary in a democratic society . . . ").

28 *Id.* at art. 14 ("The enjoyment of the rights and freedoms set forth in this Convention shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or status.").

29 *Id.*

30 *Article 14 | Anti-discrimination*, UK HUMAN RIGHTS BLOG, https://ukhumanrightsblog.com/incorporated-rights/articles-index/article-14/. *See eg.,* Abdulaziz, Cabales, and Balkandali v. United Kingdom, App. Nos. 9214/80, 9473/81, 9474/81, 7 Eur. H.R. Rep. 471, 498-503 (1985) (finding that although Article 8 on its own had not been violated, Article 14—when taken in conjunction with Article 8—had been violated).

31 Convention, *supra* note 24, at art. 8, 14.

violations, the United Kingdom should discontinue its use of ethnic inferencing as an investigatory tool.

II. HISTORY OF DNA ANALYSIS

Ethnic inferencing is just one of many techniques developed through DNA technology. As a part of DNA technology ethnic inferencing is best understood within that context. The technique's context within DNA analysis provides insight into why ethnic inferencing is more problematic compared to other types of DNA analysis.

A. General Overview of DNA Analysis

DNA analysis and profiling—the process by which a "DNA fingerprint" is developed from a sample to be compared to other samples or known individuals[32]—are among the most powerful tools a prosecutor may use. After its introduction into the courts, DNA evidence quickly became the "Gold Standard" of forensic evidence.[33] The supremacy of DNA evidence derives from its discriminating power: that is, its ability to differentiate between individuals.[34] With a properly preserved sample, the random match probability—the probability that a random individual from the population would have the same DNA profile and, therefore, match the sample—could reach the order of hundreds of billions.[35] Even though DNA profiling relies on complex biochemistry and biology, the basic principles are relatively simple to understand.

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[32] Karen Norrgard, *Forensics, DNA Fingerprinting, and CODIS,* 1 NATURE EDUC. 35, 35 (2008).

[33] Channon Hodge, *The Shifting Science of DNA in the Courtroom*, CNN, June 9, 2017, https://www.cnn.com/2017/06/09/health/dna-technology-forensic-evidence/index.html.

[34] *See* James Randerson, *What DNA Can Tell US,* THE GUARDIAN, Apr. 26, 2008, https://www.theguardian.com/science/2008/apr/27/genetics.cancer ("there are repeated sections of DNA that vary considerably between individuals).

[35] S. Panneerchelvam & M.N. Norazmi, *Forensic DNA Profiling and Database*, 10 MALAYSIAN J. OF MED. SCI. 20, 22 (2003).

A DNA profile relies on Short Tandem Repeats ("STRs") in order to differentiate between individuals.[36] A DNA strand is made up of four different base pairs—Adenine ("A"), Thymine ("T"), Guanine ("G"), and Cytosine ("C")—that repeat in different combinations to form genes.[37] STRs are areas of a DNA strand where the same base pairs repeat in the same order for a certain length along the DNA strand.[38] STRs do not code for any known genes and the length of the STR (how many times the base pair repeats) is different between individuals, more so than other areas of the DNA strand.[39] These two qualities are useful for two reasons. First, the areas tested do not reveal any potentially prejudicial characteristics of the suspect.[40] Second, these qualities allow for differentiation between individuals.[41] Figure One depicts an example of what a typical DNA profile using STRs looks like.

Repeat	Mouth [Sample]
TPOX	7, 11
D3S1358	15, 19
D5S818	10, 14
FGA	18, 23
CSF1PO	12, 13
D7S820	9, 9

36 *Id.* at 21.

37 *Id.* at 20.

38 *See id.* at 21 ("[T]he STR loci are differentiated by the number of copies of the repeat sequence within each of the STR locus.").

39 *Id.*

40 *Id.* at 20.

41 *Id.* at 21 ("[T]he likelihood that a single individual has an identical STR profile . . . with another individual taken at random in the population [is] extremely rare.").

D8S1179	12, 12
TH01	9, 9
vWA	16, 16
D13S317	10, 13
D16S539	10, 10
D18S51	12, 13
D21S11	28, 30
AMEL	Male

Figure One: Example of a standard STR profile.[42]

The letters and numbers in the first column are the names of the different loci—areas of DNA[43]—where STRs occur.[44] The second column represents the length of the different STRs.[45] The two numbers listed represent each individual's two alleles—different versions of the same DNA sequence[46]—for each STR. One allele is inherited from each parent. [47] Once an examiner has a completed profile, he or she can determine the probability that a random individual from the population has the same DNA profile.[48] Each allele

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42 Recreated from, Jonathan Jerry, *The Interrogation of Mr. DNA, Part 3 of 3: Detection*, CRACKED SCIENCE, Sept. 26, 2013, https://crackedscience.com/2013/09/26/the-interrogation-of-mr-dna-part-3-of-3-detection/.

43 NATIONAL CANCER INSTITUTE, NCI DICTIONARY OF TERMS, accessed Nov. 18, 2018 ("[A locus is t]he physical site or location of a specific gene on a chromosome.") [hereinafter NCI DICTIONARY].

44 Jerry, *supra* note 42.

45 *Id.*

46 NCI DICTIONARY, *supra* note 43 ("[An allele is o]ne of two or more DNA sequences occurring at a particular gene locus.").

47 Panneerchelvam & Norazmi, *supra* note 35, at 22.

48 *Id.* at 22.

at the different loci, that is, each different version of a gene at the different locations along the DNA strand, is relatively common, usually occurring in one to ten percent of the population.[49] The differentiating power of DNA profiles come from the multiplication of all the probabilities of each STR across multiple loci.[50]

Different DNA databases test anywhere from ten to fifteen different loci.[51] Depending on how many loci the database uses in conjunction with other factors, such as the quality of the sample, a DNA profile can generate a 'match' to the suspect.[52] The random match probability for the sample is developed from multiplying the probabilities of each STR across all of the loci.[53] This means that the random match probability for the entire profile could be as high as one in one hundred billion.[54] Because DNA evidence is so powerful in its ability to differentiate between individuals, it is often used as evidence in court to prove the guilt or innocence of a suspect.[55] With match probabilities as high as one in one hundred billion, judges and juries are likely to give DNA evidence substantial weight[56]; therefore, DNA evidence must be analyzed carefully anytime it is used.

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[49] *Id.*

[50] *Id.*

[51] *See* John Butler, *Genetics and Genomics of Core Short Tandem Repeat Loci Used in Human Identity Testing,* 51 J. FORENSIC SCI. 253, 253 (2006). *See also* Butler, *Short Tandem Repeat Typing Technologies Used in Human Identity Testing,* 43 BIOTECHNIQUES (SUPPLEMENT TO VOL. 43) ii, ii (2007).

[52] *See* NATIONAL INSTITUTE OF JUSTICE, DNA EVIDENCE BASICS: POSSIBLE RESULTS FROM TESTING, Aug. 9, 2012 ("The term 'match' is commonly used when the test results are consistent with the results from a known individual.").

[53] Panneerchelvam & Norazmi, *supra* note 35, at 23.

[54] *Id.*

[55] *See* Naomi Elster, *How Forensic DNA Evidence Can Lead to Wrongful Convictions*, JSTOR DAILY, Dec. 6, 2017, https://daily.jstor.org/forensic-dna-evidence-can-lead-wrongful-convictions/ (noting the prominence that DNA evidence has in criminal investigations.).

[56] *See id.* ("[M]ost people have unrealistic perceptions of the meaning of scientific evidence, especially when it comes to DNA, which can lead to miscarriages of justice.").

B. DNA Analysis in the United Kingdom

The United Kingdom has influenced the development and evolution of DNA analysis since the technology's inception.[57] Modern DNA evidence was first used in a criminal case in 1987, in the United Kingdom.[58] The year before, a young girl, Dawn Ashworth, disappeared while walking home in Narborough, Leicestershire.[59] Within a few short days, police located Dawn's body, determined she had been raped and murdered, and had their first suspect, Richard Buckland, in custody.[60] Buckland confessed to killing Dawn, but denied involvement in another murder that police suspected was connected to Dawn's murder.[61] Because the police doubted Buckland's guilt and suspected that a serial killer was involved, police approached geneticist Alec Jeffreys to perform the first modern DNA test[62] used in a criminal case.[63] The test confirmed what investigators feared: the DNA found at the crime scene did not match Buckland's.[64]

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[57] Alec Jeffrey discovered the forensic applications of DNA profiling while researching at the University of Leicester. The first national DNA database was established in the United Kingdom and the first successful familial search took place in the United Kingdom. Lutz Roewer, *DNA Fingerprinting in Forensics, Past, Present, Future*, 4 INVESTIGATIVE GENETICS 1, 1, 4 (2013).

[58] Ian Cobain, *Killer Breakthrough – the Day DNA Evidence First Nailed a Murderer*, THE GUARDIAN, June 7, 2016, https://www.theguardian.com/uk-news/2016/jun/07/killer-dna-evidence-genetic-profiling-criminal-investigation.

[59] *Id.*

[60] *Id.*

[61] *Id.*

[62] A modern DNA test uses the process described *infra* section II(A). *See* Roewer, *supra* note 57, at 1 (describing Alec Jeffrey's discovery). In the past, forensic scientists used blood typing or similar analyses to aid in criminal investigations. Blood typing is only able to differentiate between people based on their blood type. *See* Corey Harbison, *AO Blood Type Identification and Forensic Science (1900-1960),* THE EMBRYO PROJECT ENCYCLOPEDIA (Jun. 2, 2016), https://embryo.asu.edu/pages/abo-blood-type-identification-and-forensic-science-1900-1960.

[63] *See* Cobain, *supra* note 58 (noting Jeffreys had already been using his test in British courts to assist in cases where children were being denied British citizenship to prove that they were children of British citizens).

[64] *Id.*

With a potential serial killer at large, the police took extraordinary measures. Over the next month, the police tested the DNA of almost 1,000 men in the Narborough neighborhood without finding a match.[65] By the time eight months has passed, police had tested 5,500 men.[66] Nevertheless, the police still had not found a match. The police expanded their search and, eventually focused on Colin Pitchfork, whose DNA was a match.[67] The police found Dawn's killer.[68] This case, the very first of its kind, foreshadowed the power and risks of DNA technology. While Pitchfork's apprehension demonstrates DNA evidence's power to exonerate the innocent and convict the guilty with almost complete certainty, this case also reveals how police can use the power of DNA profiling to coerce an entire village to submit DNA samples.

Since Pitchfork's case in 1987, the United Kingdom has continued to play an influential role in the development of DNA technology. In 1995 the United Kingdom launched the first national forensic DNA database in the world.[69] The National DNA Database ("NDNAD") was the first of many DNA databases, many of which have continuously expanded in size over the years.[70] The usefulness of DNA databases relies on the assumption that individuals who have been convicted of a crime in the past, or individuals with a criminal history, are more likely to commit crimes in the future.[71] Some DNA

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65 *Id.*

66 *Id.*

67 *Id.*

68 *See id.* (Colin Pitchfork " . . . pl[ed] guilty to two counts of murder, two of rape, two of indecent assault and one count of conspiring to pervert the course of justice. . . . [Pitchfork] was sentenced to life imprisonment, . . . ").

69 *See* David Skinner, *'The NDNAD Has No Ability in Itself to be Discriminatory': Ethnicity and the Governance of the UK National DNA Database*, 47 SOCIOLOGY 976, 978 (2013). *See also* NATIONAL DNA DATABASE STRATEGY BOARD, ANNUAL REPORT 2016/17, (2018).

70 *See* Hellen Wallace, *The UK National DNA Database: Balancing Crime Detection, Human Rights and Privacy*, 7 SCI. AND SOC'Y (SPECIAL ISSUE) S26, S26 (2006) (describing the United Kingdom's "DNA Expansion Programme," which could expand the NDNAD to include twenty-five percent of the adult male population in the United Kingdom). *See also* John Butler, ADVANCED TOPICS IN FORENSIC DNA TYPING: METHODOLOGY 214 (Elsevier Academic Press 3d ed. 2012) (describing the expansion of CODIS, the United States' DNA database).

71 Cobain, *supra* note 58.

databases are limited to convicted individuals and active suspects, these DNA databases have a limit to the number of profiles that can be included.[72] However, other databases do not have these limitations so they do not have the same limits to the number of profiles that may be included. Initially, the NDNAD only contained samples from those convicted of violent offenses, sexual offenses or burglaries.[73] However, since the NDNAD's inception, the United Kingdom has undertaken the DNA Expansion Programme,[74] which was intended to increase the size of the database and include "virtually the entire active criminal population," including non-convicted individuals.[75]

The theory behind the expansion of the databases is that the more samples the databases include, the higher the likelihood is that an unknown suspect's DNA will be in the system.[76] Through a series of legislative enactments,[77] the NDNAD was expanded to include any individual charged with a recordable offense,[78] anyone acquitted of a recordable offense, and anyone suspected of having committed a recordable offense.[79] Today, due to this expansion, the United Kingdom possesses the largest DNA database in the world, with just

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[72] *See* Butler, *supra* note 70, at 219 (comparing all national DNA databases; of the fifty-four countries that have national DNA databases, forty-four retain profiles from convicted offenders, and forty-eight retain samples from suspects and arrestees).

[73] Wallace, *supra* note 70, at S26.

[74] HOME OFFICE, PRIME MINISTER HAILS HI-TECH DRIVE AGAINST CRIME (2000).

[75] Wallace, *supra* note 70 (quoting HOME OFFICE, PRIME MINISTER HAILS HI-TECH DRIVE AGAINST CRIME (2000)).

[76] *See* BUTLER, *supra* note 70, at 213 ("These databases are effective because a majority of crimes are committed by repeat offenders.").

[77] As part of the DNA Expansion Programme, a series of laws were enacted that gradually expanded which profiles could be uploaded to the NDNAD. HOME OFFICE, DNA EXPANSION PROGRAMME 2000-2005: REPORTING ACHIEVEMENT FORENSIC SCIENCE AND PATHOLOGY UNIT 3 (2005).

[78] "Recordable offenses" refers to offenses that are entered in the Police National Computer, a police database in the United Kingdom. All offenses where a term of imprisonment may be set, as well as a number of other offenses specified by regulations, are recordable. Sunita Mason, *A Common Sense Approach – A review of the Criminal Records Regime in England and Wales – Report on Phase 2*, HOME OFFICE, Nov. 30, 2011.

[79] Wallace, *supra* note 70, at S26-S27.

over eight percent of its citizens in the database.[80] The DNA Expansion Programme continued to increase the size of the NDNAD, reaching its peak with the policy challenged and ultimately struck down by *S and Marper v. United Kingdom*. The policy permitted the permanent retention of all DNA samples in the database, including samples from individuals who had never been convicted of a crime.[81]

C. S and Marper v. United Kingdom and its Aftermath

The two applicants[82] in *S and Marper* were two individuals whose DNA had been permanently retained in NDNAD, even though they had never been convicted of a crime.[83] The first applicant, S—whose real name was not used because he was a minor at the time he was apprehended—was arrested and charged with attempted robbery.[84] Even though S was acquitted of the charge, his DNA was permanently retained in the NDNAD.[85] The second applicant, Marper, was charged with harassing his partner; however, because the two later reconciled, the charges were dropped.[86] Nevertheless, like S, Marper's DNA profile was also permanently retained in the NDNAD.[87] Both applicants requested that their profiles be removed from the database, and both requests were denied.[88] The applicants appealed to the European Court of Human rights to hear their case. The European Court of Human Rights[89] ("EC") accepted the case to determine

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80 Aaron Opoku Amanankwaa & Carole McCartney, *The UK DNA Database: Implementation of the Protection of Freedoms Act of 2012*, 284 FORENSIC SCI INT'L 117, 118 (2018) (noting that there are 6,112,274 known samples and 575,923 crime scene samples in NDNAD).

81 *See* S and Marper, 48 Eur. H.R. Rep. at 1169.

82 The European Convention on Human Rights allows citizens of the member states to apply for relief if one of their rights set out in the Convention has been violated, after exhausting all domestic remedies. Convention, *supra* note 24, at art 34, 35.

83 *See* S and Marper, 48 Eur. H.R. Rep at 1169.

84 *Id.* at 1172.

85 *Id.* at 1173.

86 *Id.* at 1172-73.

87 *Id.*

88 *Id.* at 1173.

89 The EC is a court established by the European Convention of Human Rights. The EC hears cases from individual parties who allege that a member state

whether the permanent retention of DNA samples of acquitted persons violated Article 8 of the European Convention on Human Rights ("ECHR").[90]

Article 8 of the ECHR protects individuals' right to privacy.[91] In *S and Marper*, the applicants maintained that the retention of their DNA samples, DNA profiles, and fingerprints was an ongoing interference with their right to privacy that was not supported by a sufficient state interest.[92] The EC found that the use of DNA databases to combat crime and apprehend criminals is indeed a legitimate state interest.[93] However, the EC went on to conclude:

> [T]he Court finds that the blanket and indiscriminate nature of the powers of retention of the fingerprints, cellular samples and DNA profiles of persons suspected but not convicted of offences, as applied in the case of the present applicants, fails to strike a fair balance between the competing public and private interests and that the respondent State has overstepped any acceptable margin of appreciation in this regard. Accordingly, the retention at issue constitutes a disproportionate interference with the applicants' right to respect for private life and cannot be regarded as necessary in a democratic society.[94]

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has violated a right secured by the Convention. Convention, *supra* note 24 at art. 34, 35.

90 *See* S and Marper, 48 Eur. H.R. Rep. at 1187; *see also* Convention, *supra* note 24, at art. 8.

91 *See* Convention, *supra* note 24, at art. 8 ("(1) Everyone has a right to respect for his private and family life, his home and his correspondence. (2) There shall be no interference by a public authority with the exercise of this right except as such as in accordance with the law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or for the protection of the rights and freedoms of others.").

92 *See* S and Marper, 48 Eur. H.R. Rep. at 1187-88.

93 *See id.* at 1195-97 (noting that as of September 30, 2015, the NDNAD had 181,000 profiles from non-convicted individuals. Of these, 8,251 were later matched with a crime scene sample.).

94 *Id.* at 1202.

In other words, the EC found that even though the retention of DNA samples did facilitate legitimate police work, the retention of innocent individuals' DNA samples was not proportionate to the interreference with their right to privacy. In line with this decision, the EC ruled that the permanent retention of DNA samples from acquitted suspects violates Article 8 of the ECHR.[95]

Since *S and Marper*, the United Kingdom has only taken minimal steps to correct its DNA retention policy. The current DNA retention regime generally allows preserving innocent individuals' DNA samples for a maximum of three years after concluding an investigation.[96] Although the current DNA retention regime minimizes the longer-lasting effects of permanent retention, innocent individuals' DNA profiles are still in the NDNAD for at least three years.[97] Additionally, investigators may petition to have a DNA profile retained for longer than three years.[98]Although the United Kingdom has taken steps away from the permanent retention of non-convicted individuals' DNA profiles, the United Kingdom still allows convicted individuals' DNA profiles to be permanently kept in the NDNAD. In 2020, the ECtHR held that permanently retaining DNA samples of persons convicted of a recordable offense without the possibility of review and without regard to the seriousness of the offense does violate Article 8 of the ECHR.[99] However, again the court failed provide specific guidance on what DNA retention policies would be allowable. Thus, *S and Marper* and subsequent cases have failed to answer which DNA retention policies are permissible and which are not.

In essence, the EC only invalidated the specific practice challenged in *S and Marper*: the permanent retention of non-convicted individuals' DNA profiles. The EC did not set any particular guidelines for what DNA retention and DNA database policies violate Article 8

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95 *Id.*

96 Amanakwaa & McCartney, *supra* note 80, at 119 (comparing the United Kingdom's different DNA retention regimes).

97 *Id.*

98 *Id.*

99 *See* Gaughran v. United Kingdom, App. No. 45245/15 (2020) http://hudoc.echr.coe.int/eng?i=001-200817 (finding a violation of Art. 8 of the ECHR).

of the ECHR.[100] In theory, the United Kingdom could have changed its DNA retention policy to permit retaining DNA profiles of acquitted persons for more than twenty-five years after their acquittal, which the EC noted was the practice in France.[101]

The EC also discussed several practices used in various DNA databases,[102] but likewise provided no guidance as to whether those practices violate individuals' right to privacy.[103] The EC noted that the information in NDNAD is accessible by over fifty non-police bodies, such as researches and private companies.[104] One of these non-police bodies, the Schengen Information System, is used by over thirty countries for national security purposes.[105] Most importantly, the EC flagged, but did not analyze, the ethnic inferencing technique used by investigators in conjunction with the NDNAD.[106]

D. Ethnic Inferencing

Ethnic inferencing uses the DNA profiling process[107] in order to make a prediction about the ethnic appearance of an individual.[108] It is similar to the process used in familial searching,[109] except that it is much broader in scope; connecting individuals based on ethnicity rather than on familial relationships. This specific DNA profiling process is based on the research by the now defunct Forensic Science

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100 *See generally* S and Marper, 48 Eur. H.R. Rep. at 1206 (invalidating the challenged retention policy but failing to give further guidance).

101 *See id.* at 1184 (surveying different EU member states' DNA retention policies noting that, "[i]n France[,] DNA profiles can be retained for [twenty-five] years after acquittal or discharge[.]"). *See also* Gaughran v. Northern Ireland [2015] (UKSC) 29 [Annex B] (comparing DNA retention policies, the longest retention policy being Lithuania's, which allows for inclusion in the DNA database for one hundred years or ten years after the acquitted person dies).

102 *See* S and Marper, 48 Eur. H. R. Rep at 1179-80, 1193.

103 *See id.*

104 *See id.*

105 European Commission, Questions and Answers Schengen Information System (SIS II), Apr. 9, 2013, http://europa.eu/rapid/press-release_MEMO-13-309_en.htm.

106 *See* S and Marper, 48 Eur. H.R. Rep. at 1180.

107 *See infra*, section II(A).

108 NUFFIELD REPORT, *supra* note 19, at 80.

109 *See infra*, section I.

Service.[110] The science behind ethnic inferencing is rather intuitive. The different alleles of STRs occur in different frequencies across different ethnic groups.[111] Thus, when random match probabilities are calculated, they are calculated for the population at large, as well as for several subpopulations.[112] Figure 2 exemplifies how this would be reported.

Estimated Population Proportions for the Genotype of the Profile from Semen Recovered in the Study	
Caucasian	1 in 3 billion
Afro-Caribbean	1 in 83 billion
Indian sub-continent	1 in 4 billion
Southeast Asian	1 in 35 billion
Middle Eastern	1 in 9 billion

Figure 2: Report of random match probabilities for different sub-populations.[113]

From the random match probability calculation for different subpopulations, analysts can determine the likelihood ratio[114] for the sample coming from an individual from one population over

[110] The Forensic Science Service ("FSS") was the former government-sponsored forensic science laboratory that provided forensic services to England and Wales. The FSS closed in 2012 due to funding issues. Forensic testing in the United Kingdom is now performed by private agencies or by the police agencies themselves. Paul Rincon, *'Higher Cost' of Forensic Science Service Closure,* BBC NEWS, Jan. 30, 2013, https://www.bbc.com/news/science-environment-21251162.

[111] Alex Lowe et al., *Inferring Ethnic Origin by Means of an STR profile*, 119 FORENSIC SCI. INT'L 17, 17 (2001).

[112] *Id.* at 21.

[113] Recreated from *Id.*

[114] *See* COMMITTEE ON DNA FORENSIC SCIENCE, THE EVALUATION OF FORENSIC DNA EVIDENCE (National Research Council 1996) ("The [likelihood ratio] is the ratio of the probability of a match if the DNA in the evidence sample and that from the suspect came from the same person to the probability of a match if they came from different persons.").

another.[115] To illustrate, in the example from Figure two, the likelihood ratio for Afro-Caribbean ethnicity to Caucasian ethnicity is twenty-eight, which means that the sample is twenty-eight times more likely to come from an Afro-Caribbean individual than from a Caucasian individual.[116] Thus, using ethnic inferencing, investigators may limit their search to Afro-Caribbean people. This study laid the foundation for ethnic inferencing to be used in the United Kingdom.

The research to develop ethnic inferencing relied on a sample of data from the NDNAD in 1996.[117] Since then, the NDNAD has significantly expanded in size.[118] In order for the ethnic inferencing technique to function on an ongoing basis, two steps must be taken. First, when police retrieve a sample from a suspect, the officer must make a subjective determination of the suspect's appearance based on seven pre-selected categories:[119] Asian; Black; Chinese, Japanese or Southeast Asian; Middle Easter, White Northern European; White Southern European; and unknown.[120] The same categories are used when investigators request that an ethnic inference be made for an unknown sample.[121] After an ethnic inference is made, the investigator can then focus his or her efforts on suspects of that ethnicity.[122] NDNAD also allows private companies and academic researchers to use ethnic inferencing data to conduct research.[123] Although ethnic

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115 Lowe et. al, *supra* note 111, at 21.

116 *Id.*

117 *Id.* at 17.

118 *See* Wallace, *supra* note 70 (noting that the NDNAD could expand to include twenty-five percent of the United Kingdom's adult male population and seven percent of the adult female population). *See also* NATIONAL DNA DATABASE STRATEGY BOARD, ANNUAL REPORT 2013-14 6 (2014) (demonstrating the growth of the NDNAD through several tables).

119 NUFFIELD REPORT, *supra* note 19, at 80.

120 *See* NATIONAL DNA DATABASE STRATEGY BOARD, NDNAD STATISTICS, AS OF 30TH SEPTEMBER 2018 (2018) (hereinafter NDNAD STATISTICS) ("The ethnic appearance data is based on the judgment of the police officers taking that samples as to which of seven broad ethnic appearance categories they consider the individuals to belong.").

121 NUFFIELD REPORT, *supra* note 19, at 80.

122 Lowe et. al, *supra* note 111, at 20.

123 NUFFIELD REPORT supra note 19, at 81.

inferencing may help investigators narrow down their suspect pool, the process raises many concerns.

In addition to the privacy concerns that are implicated by any use of DNA technology, such as familial searching, ethnic inferencing is problematic for a number of additional reasons. First, the technique relies on many assumptions about race that are not necessarily true, thus raising questions about the technique's validity.[124] The classifications used do not correlate to those used in population genetics research, nor do they necessarily correlate with a person's self-identified ethnicity.[125] Ethnicity is not a binary question; a person can have multiple ethnicities and, therefore, many people simply do not fit into one of the pre-selected categories.[126] Additionally, ethnicity may not be discernible in every case.[127]

Second, the ethnic inferencing may lead to prejudicial ideas about minorities. Through the use of DNA dragnets,[128] minorities may become overrepresented in DNA databases.[129] Overrepresentation may lead to the assumption that certain minorities are more likely to commit crimes than others. Third, the use of ethnic inferencing can cause investigators to develop "tunnel vision."[130] By focusing in on individuals of one ethnicity, investigators can miss clues that would otherwise lead to the actual perpetrator.[131]

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124 *Id.*

125 *Id.* at 80-81.

126 *Id.* at 81.

127 *See id.* at 81 ("Ethnicity is often only loosely linked to actual appearance.").

128 A DNA dragnet is a technique used by investigators to collect DNA from a large number of people at once. For example, the police used a DNA dragnet in the Colin Pitchfork case, *infra* section II(B), to collect DNA samples from the entire village. *See* Mildred Cho & Pamela Sankar, *Forensic Genetics and Ethical, Legal, and Social Implications Beyond the Clinic*, 36 NATURE GENETICS (Supplement) 1, 6 (2004) (describing DNA dragnets).

129 *See* S and Marper, 48 Eur. H.R. Rep. at 1180.

130 NUFFIELD REPORT, *supra* note 19, at 81.

131 *See* Carole McCartney, *The DNA Expansion Programme and Criminal Investigation,* 46 BRIT. J. CRIMINOLOGY 175, 185 (2006) ("There tends to be a reliance on forensic evidence in terms of once you have it other avenues aren't followed up.").

Finally, ethnic inferencing violates Article 8 and Article 14 of the ECHR.[132] The retention of ethnic data with a suspect's DNA profile is an impermissible invasion of individuals' private affairs.[133] The right to privacy[134] encompasses a person's DNA profile.[135] Ethnic inferencing increases the privacy invasion by including personal information about an individual's ethnicity with their DNA profile. Like the permanent retention policy struck down by *S and Marper*, ethnic inferencing is also an unjustifiable interference with individuals' right to privacy.

Further, Article 14 of the ECHR states that "[t]he enjoyment of the rights and freedoms set forth in this convention shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or status."[136] The EC has interpreted this to mean that Article 14 does not require another Article violation.[137] Instead the challenged practice must come within the realm of another Article of the convention.[138] Therefore, in the case of ethnic inferencing, even if the technique does not explicitly violate Article 8 of the ECHR, if it comes within the realm of the right to private life, it invokes Article 14 of the ECHR.[139] For the reasons discussed above, ethnic inferencing discriminates against minorities, and thus also violates Article 14.[140]

Ethnic inferencing, as an investigatory technique, lacks validity, discriminates against minorities, and violates Article 8 and Article 14

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132 *See* Convention, *supra* note 24, at art. 8, 14.

133 *Id.* at art. 8.

134 *See infra* section II(C).

135 *See* S and Marper, 48 Eur. H.R. Rep. at 1189 ("The mere storing of data relating to the private life of an individual amounts to an interference within the meaning of art.8.").

136 Convention, *supra* note 24, at art. 14.

137 Abdulaziz, Cabales, and Balkandali, 7 Eur. H.R. Rep.at 499.

138 *See id.* ("Article 14 . . . complements the other substantive portions of the Convention and Protocols . . . [T]he application of Article 14 . . . does not necessarily presuppose a breach of those provisions[.] . . . The facts at issue [must] fall within the ambit of one of more of the [other provisions.]").

139 Convention, *supra* note 24, at art. 14.

140 *Id.*

of the ECHR. Ethnic inferencing already may not be used for evidentiary purposes in criminal prosecutions;[141] in light of all of the issues discussed, the United Kingdom should take the additional step to exclude the use of the technique for investigatory purposes as well.

III. ETHNIC INFERENCING'S FOUNDATION, PREJUDICIAL EFFECT AND INVASION INTO INDIVIDUAL'S PRIVATE LIFE RAISE SERIOUS CONCERNS

Although ethnic inferencing can be a useful investigative tool, the questions concerning its validity, the effect it has on minorities, and its context within the European Convention on Human Rights should be carefully analyzed. A full analysis of these questions reveals that the minimal investigative value that ethnic inferencing provides is outweighed by its invasion into individuals' privacy and its prejudicial effect on minorities.

A. Ethnic Inferencing Relies on Studies and Ideas about Race that Have Not Been Properly Validated

Although the United Kingdom has a relaxed approach to admitting scientific evidence in courts,[142] scientific evidence—that is, evidence that is outside of a lay individual's knowledge—must still have sufficient proof of reliability.[143] Although ethnic inferencing is already excluded from use in criminal prosecutions,[144] questions about its validity and reliability remain. A method is valid only if it relies on sound scientific principles.[145] On the other hand a method is reliable

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141 NUFFIELD REPORT, *supra* note 19, at 81 (citing NATIONAL DNA DATABASE, THE NATIONAL DNA DATABASE ANNUAL REPORT, 2004-2005, 35 (2006)).

142 *See* Éadaoin O'Brien et al., *Science in the Court: Pitfalls, Challenges, and Solutions*, 370 PHIL. TRANSACTIONS ROYAL SOC'Y B 1, 2 (2015) (describing the English and Welsh approach to expert evidence as *laissez-faire*).

143 *Id.* at 3 (describing the challenges to crafting a rule concerning reliability).

144 NUFFIELD REPORT, *supra* note 19, at 81 (citing NATIONAL DNA DATABASE, THE NATIONAL DNA DATABASE ANNUAL REPORT, 2004-2005, 35 (2006)).

145 *See* Bert Black, *A Unified Theory of Scientific Evidence,* 56 Fordham L. Rev. 595, 597 (1988) (explaining the difference between validity and reliability).

only if it reaches a specified degree of accuracy, meaning the method returns the "correct" result a specified amount of times.[146] Both the validity and reliability of ethnic inferencing are questionable. First, the ethnic categories used by the NDNAD do not correspond with the classifications used in population genetics.[147] Second, an individual may be a member of different ethnicities and may not actually identify with the ethnicity assigned by the investigator.[148] Finally, investigators may misidentify an individual's ethnicity or may not be able to discern one in every case.[149] These questions about the principles underlying ethnic inferencing suggest that ethnic inferencing is not valid nor reliable and, as such, should not be used by investigators.

1. Ethnic Inferencing is Not Supported by Proper Validity within the Population Genetics Field

Population genetics is a subset of biology and genetics research.[150] Specifically, population geneticists study populations of organisms, including humans, in order to see how different genes are distributed throughout a population.[151] Ethnic inferencing relies on theories of population genetics, specifically, that the STRs used in DNA profiling occur with different frequencies across populations. [152] However, despite relying on principles of population genetics, ethnic inferencing uses different ethnic categories than population geneticists use.[153] In the United Kingdom, the NDNAD uses the following categories: White Northern European; Black; Asian; White South European; Middle Eastern; and Chinese, Japanese, or Southeast Asian.[154] However, population geneticists disagree whether races can be broken down into categories and, if so, what the categories are. For example, in 2002 a study conducted by Noah Rosenburg (and other researchers) identified five subcategories of the human population:

146 *Id.*

147 NUFFIELD REPORT, *supra* note 19, at 81.

148 *Id.* at 80-81.

149 *Id.*

150 Brian Charlesworth, *What Use is Population Genetics?*, 200 GENETICS 667, 667 (2015).

151 *Id.*

152 Lowe et. al, *supra* note 111, at 17.

153 NUFFIELD REPORT, *supra* note 19, at 81.

154 NDNAD STATISTICS, *supra* note 120.

Africa; Europe, the Middle East, and South/Central Asia; East Asia; Oceania; and American.[155] Not only do these not correspond to the subpopulations used in the NDNAD, but population geneticists continue to debate whether human populations can even be separated into subpopulations.[156] Ethnic inferencing relies on this subpopulation research but because population geneticists have not yet reached a consensus, ethnic inferencing's scientific foundation is questionable. Therefore, ethnic inferencing cannot be properly validated.

2. Ethnic Inferencing is Not Sufficiently Reliable to be Used in Investigations

Even if ethnic inferencing were properly validated, the technique is also insufficiently reliable to be used during investigations. Ethnic inferencing has two factors that threaten its reliability. First, ethnicity is a nebulous term, as many refer to it as a spectrum and one person could belong to multiple ethnicities.[157] Second, ethnic inferencing requires investigators to assume what an individual's ethnicity is.[158] Both of these factors undermine ethnic inferencing's reliability.

Ethnicity and race have had a complicated history from slavery,[159] to eugenics,[160] to the modern day notion that race is a social

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155 Noah A. Rosenburg et. al, *Genetic Structure of Human Populations,* 298 SCIENCE 2381, 2382 (2002).

156 Reanne Frank, *Back with a Vengeance: the Reemergence of a Biological Conceptualization of Race in Research on Race/Ethnic Disparities in Health*, POPULATION ASSOCIATION OF AMERICA ANNUAL MEETING (2006) (arguing that the subcategories "discovered" are highly dependent on research design).

157 NUFFIELD REPORT, *supra* note 19, at 81.

158 *Id.* at 80.

159 Slavery in Britain mostly occurred in British colonies, not on the British mainland. Slavery was abolished in 1833 by the Slavery Abolition Act. David Olosoga, *The History of British Slave Ownership has been Buried: Now its Scale can be Revealed,* THE GUARDIAN, Jul. 11, 2015, https://www.theguardian.com/world/2015/jul/12/british-history-slavery-buried-scale-revealed.

160 'Eugenics' was coined by a British man, Francis Galton, to describe the idea of social Darwinism that some races were inherently inferior to others. This idea was later adopted by Hitler and the Nazi party. Victoria Brignell, *The Eugenics*

construct.[161] Today there is a clear understanding that race and ethnicity occur on a spectrum.[162] In other words, although some Asian and European individuals, for example, may be genetically distinct, at the edges of populations the genetic difference may be minimal or non-existent.[163] This complicates ethnic inferencing because an individual could have one ethnic appearance but a different genetic appearance.[164] This undermines the reliability of ethnic inferencing because if an ethnic inference is made in this scenario, it may be incorrect. Likewise, investigators who incorrectly label an individual to an ethnic category undermine the technique's reliability.

Ethnic inferencing also requires investigators to make their own subjective determinations about an individual's race.[165] These subjective determinations may often be incorrect.[166] This could lead to both "tunnel vision" and to decreased reliability of results.[167] As discussed in Section II(D), ethnic inferencing requires investigators to input their subjective determination of a suspect's ethnicity with the suspect's DNA profile. This data is in turn used to generate the population statistics required for ethnic inferencing.[168] When these subjective determinations are wrong, they increase the uncertainty in the ethnic inference.

The lack of consensus among population geneticists undermines ethnic inferencing's validity. The nature of ethnicity itself and the impossibility of correctly determining a suspect's ethnicity with one hundred percent certainty both undermine ethnic inferencing's

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Movement Britain Wants to Forget, NEWSTATESMAN (Dec. 9, 2010), https://www.newstatesman.com/society/2010/12/british-eugenics-disabled.

161 Natalie Quan, Note, *Black and White or Red All Over? The Impropriety of Using Crime Scene DNA to Construct Racial Profiles of Suspects*, 84 S. CAL. L. REV. 1403, 1423 (2011).

162 Morris W. Foster & Richard R. Sharp, *Race Ethnicity and Genomics: Social Classifications as Proxies of Biological Heterogeneity,* 12 GENOME RES. 844, 844 (2002) (tracing the dominant ideas about race and ethnicity over time).

163 *Id.* at 845.

164 NUFFIELD REPORT, *supra* note 19, at 81.

165 *Id.*

166 Cho & Sankar, *supra* note 128, at 5.

167 NUFFIELD REPORT, *supra* note 19, at 81.

168 Lowe et. al, *supra* note 111.

reliability. Both the lack of validity and the lack of reliability suggest that ethnic inferencing should not be used as an investigative tool.

B. Ethnic Inferencing Has a Prejudicial Effect on Minorities

Although ethnic inferencing can be used to narrow down the suspect pool to any ethnicity, it burdens minorities more than the rest of the population for two reasons.[169] First, ethnic inferencing promotes DNA dragnetting which disproportionately affects minorities.[170] Second, because minorities are overrepresented in DNA databases, ethnic inferencing can perpetuate incorrect and stereotypical ideas about the criminal disposition of minorities.[171]

A DNA dragnet is a technique often used when investigators do not have any leads in a particular case.[172] A DNA dragnet, like the one that eventually identified Colin Pitchfork,[173] generally involves gathering DNA samples from a large population in the hopes that the suspect will submit a sample.[174] Because DNA dragnets do not rely on an individualized suspicion, they are voluntary.[175] However, DNA dragnets are criticized because they infringe on civil liberties, as individuals are often faced with the choice of submitting a DNA sample or becoming a suspect.[176] As Barry Scheck, the director of the Innocence Project, has noted, "[i]t's inherently coercive when a policemen comes to your door and says, 'Give us sample of your blood and if you don't give it to us, you're a suspect.'"[177] Thus, individuals may not actually have a choice whether to submit a DNA sample.

DNA dragnets have a more serious implication when ethnic inferencing is employed. When an ethnic inference is made,

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169 *See* S and Marper, 48 Eur. H.R. Rep. at 1180.

170 Mark A. Rothstein & Meghan K. Talbott, *Symposium Article—Part I: The Expanding Use of DNA in Law Enforcement: What Role for Privacy?*, 34 J.L. MED. ETHICS 153, 156 (2006).

171 NUFFIELD REPORT, *supra* note 19, at 81.

172 *See* Cho & Sankar, *supra* note 128, at 6 (describing DNA dragnets).

173 *See infra* section (II)(B).

174 Cho & Sankar, *supra* note 128, at 6.

175 *Id.*

176 *Id.*

177 *Id.*

investigators focus their attention on individuals of a specific ethnicity.[178] For example, if an ethnic inference tells an investigator that the likely ethnicity of the suspect is Middle Eastern, investigators will only focus on Middle Eastern individuals. If a DNA dragnet is employed, the investigator would only take samples from Middle Eastern individuals. DNA dragnets in combination with ethnic inferencing lead to ethnic minorities becoming overrepresented in the NDNAD.[179]

The latest statistics on the NDNAD reflect this overrepresentation.[180] The proportion of individuals in the NDNAD by ethnic appearance is as follows: White Northern European: 75.55%; Unknown: 7.97%; Black: 7.56%; Asian: 5.26%; White South European: 2.22%; Middle Eastern: 0.81%; and Chinese, Japanese, or South East Asian: 0.62%.[181] Absent DNA profiles from arrestees, if DNA dragnets and ethnic inferencing applied to all ethnicities equally, it would be expected that the amount of individuals in the NDNAD of each ethnicity would be proportional to the population at large. However, this is not the case in the United Kingdom. According to a 2011 census, the population of the United Kingdom is 87.2% white, 3% black/African/Caribbean/black British, 2.3% Asian/Asian British: Indian, 1.9 percent Asian/Asian British: Pakistani, 2 percent mixed, and 3.7% other.[182] Although these categories used by the census and the categories used by the NDNAD are not identical, it is clear that White individuals are underrepresented in the NDNAD and most other ethnicities are overrepresented in the NDNAD. White individuals constitute 87.2% of the British population but only 75.55% of samples on the NDNAD, an over ten percent difference.[183] Meanwhile, black individuals constitute just three percent of the British

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178 NUFFIELD REPORT, *supra* note 19, at 81.

179 S and Marper, 48 Eur. H.R. Rep. at 1180.

180 NDNAD STATISTICS, *supra* note 120.

181 *Id.*

182 OFFICE FOR NATIONAL STATISTICS: 2011 CENSUS, ETHNIC GROUP, LOCAL AUTHORITIES IN THE UNITED KINGDOM, Oct. 11, 2013 [Hereinafter: 2011 CENSUS]

183 *See id.* (recording the percentage of white individuals in the United Kingdom.). *See also* NDNAD STATISTICS, *supra* note 120 (recording the percentage of white individuals' DNA samples in the NDNAD.).

population but account for 7.56% of the samples on the NDNAD. From these examples alone, it is clear that white individuals are underrepresented in the NDNAD and black individuals are overrepresented.

The disparity between different ethnicities in the NDNAD occurs because an ethnic inference which indicates that the suspect is White or European is not particularly helpful to investigators. Although a "white" ethnic inference may help to eliminate some suspects, the inference does not help to narrow down the suspect pool by any meaningful amount. Because the majority of the British population is White or European[184], an ethnic inference that indicates the suspect is white does not help to eliminate any appreciable number of suspects.[185] Thus, ethnic inferencing is generally only helpful when the suspect is a member of a minority.

The overrepresentation of minorities in the NDNAD has two implications. First, it shows that ethnic inferencing disproportionately effects minorities[186], as discussed above. The second implication, and perhaps the more concerning of the two, is that overrepresentation in the NDNAD can lead to incorrect generalizations about race.[187] Because minorities are overrepresented in the NDNAD, it can lead the public to infer that minorities have a greater propensity towards crime than the rest of the population.[188] Without understanding DNA dragnets or the retention of innocent individuals' DNA profiles, this generalization perpetuates incorrect and prejudicial ideas about race. In addition to the legal implications of ethnic inferencing, investigators should consider the ethical implications of contributing to the

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184 2011 Census, *supra* note 182.

185 *See e.g.,* Amade M'Charek, *Silent Witness, Articulate Collective: DNA Evidence and the Inference of Visible Traits*, 22 BIOETHICS 519, 525 (describing a case in the Netherlands in which ethnic inferencing was used. The community suspected that a murder was perpetrated by a group of asylum seekers. Ethnic inferencing ruled out the asylum seekers as suspects, but investigators were unable to make any more use of the ethnic inference as the inferred ethnicity of the suspect was North-Western European, so the majority of the population could not be ruled out).

186 NUFFIELD REPORT, *supra* note 19, at 81.

187 *Id.*

188 *Id.*

overrepresentation of minorities in the NDNAD and the prejudicial stereotypes it encourages.

C. Ethnic Inferencing Violates the European Convention on Human Rights

The European Convention on Human Rights contains a number of articles which the member states must abide by.[189] The signatories to the ECHR are the members of the Council of Europe, a separate body from the European Union.[190] The United Kingdom at the conclusion of Brexit, will have left the European Union, but not the Council of Europe. Additionally, the United Kingdom has incorporated the ECHR into domestic law through the Human Rights Act. Although the fate of the United Kingdom post-Brexit it still unclear,[191] the United Kingdom will still have to abide by the articles of the ECHR. Thus, ethnic inferencing, which violates both Article 8 and Article 14 of the ECHR, must be discontinued as an investigatory technique.

1. Ethnic Inferencing Violates Article 8 of the European Convention on Human Rights

Article 8 of the ECHR protects individuals' right to privacy.[192] Article 8 states:

> (1) Everyone has the right to respect for his private and family life, his home and his correspondence. (2) There shall be no interference by a public authority with the exercise of this right except as in accordance with the

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189 Convention, *supra* note 24.

190 Steven Greer, *Implications of Brexit for the European Convention on Human Rights*, E-INTERNATIONAL RELATIONS (Jul. 27, 2017), https://www.e-ir.info/2017/07/27/implications-of-brexit-for-the-european-convention-on-human-rights/.

191 *See* Amy Davidson Sorkin, *Brexit Is Postponed, But Chaos Still Remains*, THE NEW YORKER, Mar. 22, 2019, https://www.newyorker.com/news/daily-comment/brexit-is-postponed-but-chaos-still-reigns (describing one of the postponements of Brexit and the uncertainty about the future of the United Kingdom).

192 Convention, *supra* note 24, at art. 8.

> law and is necessary in a democratic society in the interests of national security, public safety or the economic well-being of the country, for the prevention of disorder or crime, for the protection of health or morals, or the protection of the rights and freedoms of others.[193]

The EC has already held that the permanent retention of innocent individuals' DNA profiles violates Article 8 of the Convention.[194] The decision in *S and Marper* clarifies that member states do not have unlimited discretion in how they use their DNA databases. Although the EC has yet to address ethnic inferencing, the EC should examine it in light of *S and Marper v. United Kingdom,* and find that it violates Article 8 of the ECHR.

Ethnic inferencing invokes the same interference with private life invoked by *S and Marper*.[195] Both the permanent retention policy struck down by the EC in *S and Marper* and ethnic inferencing rely on the retention of DNA profiles.[196] Ethnic inferencing relies on these same retention policies with the added concern that ethnic data is linked to an individual's DNA profile in the NDNAD.[197] *S and Marper* clearly held that the retention of DNA samples was an interference with the right to private life.[198] Because ethnic inferencing interferes with the right to private life, the only other question is whether ethnic inferencing is justified.

Article 8 of the ECHR allows for an interference with the right to a private life if the interference is *necessary* to fulfill one of the enumerated goals.[199] The state must overcome a high bar to

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193 *Id.*

194 *See* S and Marper, 48 Eur. H.R. Rep. at 1202, *see also infra* section II(C).

195 *Id.* at 1178-79.

196 *Id.*

197 *Id.* at 1180.

198 *See id.* at 1191 ("[T]he retention of both cellular DNA samples and DNA profiles discloses an interference with the applicants' right to respect for their private lives,").

199 Convention, *supra* note 24, at art. 8.

demonstrate that the challenged interference is necessary.[200] For example, in *S and Marper*, the government provided evidence that the permanent retention of innocent individuals' DNA profiles had resulted in a number of prosecutions of individuals whose DNA would not have been in the NDNAD if the permanent retention policy had not been in place.[201] However, despite proof that the permanent retention policy had helped to prosecute individuals who otherwise might have gotten away, the EC ruled that the interference was not necessary to promote the public safety interest.[202] Therefore, the state must show more than a minimal investigatory use to prove that the invasion into private life is necessary.

Ethnic inferencing only has a minimal investigatory function.[203] Unlike DNA profiling analysis, ethnic inferencing cannot be used at a criminal trial.[204] Unlike a DNA profile which can point investigators to a specific suspect if his or her DNA profile matches the sample, ethnic inferencing only narrows down the suspect pool.[205] Finally, ethnic inferences are rarely made.[206] However, each ethnic inference has a disproportionate impact, it allows for a DNA dragnet to be used to obtain samples from hundreds or even thousands of people.[207] Based on ethnic inferencing's minimal investigative use, compounded with its increased interference with the right to private

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200 *See* S and Marper, 48 Eur. H.R. Rep. at 1198 ("[T]he intrinsically private character of [DNA information] calls for the Court to exercise careful scrutiny of any state measure authorizing its retention and use . . . ").

201 *Id.* at 1195.

202 *See id.* at 1202 (holding that the permanent retention of DNA samples failed to strike a fair and proportionate balance between public interests and the right to privacy). *See also* Gaughran v. United Kingdom, App. No. 45245/15 (2020) http://hudoc.echr.coe.int/eng?i=001-200817 (finding that permanently retaining even convicted individuals DNA profiles could fail to strike a fair and proportionate balance between public interests and the right to privacy).

203 *See infra* section III(B).

204 NUFFIELD REPORT, *supra* note 19, at 81.

205 *Id.* at 80.

206 *See* Bert-Jaap Koops & Maurice Schellekens, *Forensic DNA Phenotyping: Regulatory Issues,* 9 Colum. Sci. & Tech. L. Rev. 158, 172-73 (2008) (noting ethnic inferencing's use in a case in 2004).

207 *See e.g.* Cobain, *supra* note 58 (noting over 5,000 DNA samples were taken in Colin Pitchfork's case).

life, this technique is unnecessary in the interests of public safety and therefore violates Article 8 of the ECHR.

2. Ethnic Inferencing Violates Article 14 of the European Convention on Human Rights

Even if ethnic inferencing does not violate Article 8, ethnic inferencing does violate Article 14 of the ECHR. Article 14 of the ECHR protects individuals from discrimination by member states of the ECHR.[208] Article 14 states: "The enjoyments of the rights and freedoms set forth in this Convention shall be secured without discrimination on any ground such as sex, race, colour, language, religion, political or other opinion, national or social origin, association with a national minority, property, birth or other status."[209] Article 14 is sometimes referred to as a parasitic right.[210] In other words, the violation must be attached to some other violation of the ECHR in order to come in to force.[211] However, another Article of the EC does not itself have to be violated in order for Article 14 to be violated.[212]

For example, the EC addressed Article 14 in the case *Abdulaziz, Cabales, and Balkandali v. United Kingdom*.[213] The petitioners in this case were three female lawful permanent residents of the United Kingdom.[214] The petitioners had requested permission under the United Kingdom's immigration laws for their spouses to join them in the United Kingdom, however, all three requests were denied.[215] The petitioners appealed the ruling on Article 8 grounds (interference with the right to private life) and Article 14 grounds.[216] Although the court ruled that the denial did not violate Article 8, it did rule that the denial

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208 Convention, *supra* note 24, at art. 14.

209 *Id.*

210 *See Article 14 | Anti-discrimination*, *supra* note 30 (summarizing EC Article 14 case law).

211 *Id.*

212 *See e.g.,* Abdulaziz, Cabales, and Balkandali, 7 Eur. H.R. Rep. at 498, 503 (finding that although Article 8 had not been violated, Article 14 when taken in conjunction with Article 8 had been violated.).

213 *See generally id.*

214 *Id.* at 473.

215 *Id.*

216 *Id.*

came within the realm of the right to private life.[217] The court went on to find that the denial violated Article 14 in conjunction with Article 8.[218] As the court stated,

> "Article 14 . . . complements the other substantive portions of the Convention and Protocols.. . . . [T]he application of Article 14 . . . does not necessarily presuppose a breach of those provisions[.] . . . The facts at issue [must] fall within the ambit of one of more of the [other provisions]".[219]

Thus, although the petitioners' Article 8 claim failed, the EC found that the United Kingdom had violated Article 8 in conjunction with Article 14.[220]

Likewise, ethnic inferencing violates Article 14 in conjunction with Article 8. A difference in treatment is discriminatory if "there is not a reasonable relationship of proportionality between the means employed and the aim sought to be realized."[221] Ethnic inferencing's goal is to apprehend criminals.[222] However, the disproportionate impact ethnic inferencing has on minorities is not proportional to its minimal investigative value. Because ethnic inferencing discriminates against minorities and invokes an Article 8 privacy concern, the technique violates Article 14 the European Convention on Human Rights.

IV. CONCLUSION

After the Golden State Killer was arrested and the world became acquainted with familial searching, many had mixed emotions. Familial searching was useful because it helped to capture a notorious serial killer. However it also invoked privacy concerns that many—

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217 *Id.* at 497-98.
218 *Id.* at 503.
219 *Id.* at 499.
220 *Id.* at 502.
221 *Id.* at 499 (internal citations omitted).
222 NUFFIELD REPORT, *supra* note 19, at 80.

even those who have submitted their DNA to a genealogy website[223]—had not considered. Familial searching and the Golden State Killer case may be one of the most infamous of the DNA analysis techniques that have been developed recently, but it is far from the only one. The public should make themselves aware of and scrutinize every DNA analysis technique.

Ethnic inferencing involves many of the same privacy concerns that familial searching does. It has the potential to connect innocent individuals to a crime. Ethnic inferencing is potentially even more concerning. Where familial searching connects innocent individuals to crimes based on family relationships; ethnic inferencing connects innocent individuals to crime scenes simply based on their ethnicity.

Ethnic inferencing is extremely problematic. The technique relies on questionable validity because of the ongoing debate within the population genetics field. Ethnic inferencing is only minimally useful in investigations and can often be unreliable because it requires a number of subjective determinations to be made by investigators. Ethnic inferencing also interferes with the right to private life in violation of Article 8 of the ECHR as an interference that is not necessary in a democratic society. Ethnic inferencing also perpetuates prejudicial ideas about minorities and discriminates based on race in violation of Article 14 of the ECHR. In light these concerns, ethnic inferencing should be discontinued as a practice in the United Kingdom.

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223 *See* Stuart Leavenworth, *Don't Want the Police to Find You Through a DNA Database? It May Already Be Too Late.,* MCCLATCHY DC BUREAU (Aug. 28, 2018), https://www.mcclatchydc.com/news/nation-world/national/article217037455.html ("Ariel Deray, a Florida lawyer familiar with DNA cases, said that many consumers submit their genetic information to GEDmatch and other sites with little awareness that third parties, including the police, might seek to access it.").