Recommendations for Improving the Use of Direct-To-Consumer Genetic Testing Databases in Law Enforcement Investigations

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Executive Summary: Prisoners are some of the most vulnerable populations in our society today, often relinquishing to the state everything from medical autonomy to family support. In a system where wrongful convictions are not unheard of, it is critical that we preserve the civil rights of investigative subjects wherever possible. Law enforcement agencies in the United States have increasingly begun using direct-to-consumer recreational genetic databases as a tool to enable forensic investigations. These commercial genetic testing companies analyze polymorphisms in DNA to isolate genealogical information, medical data, and other traits. Traditionally, law enforcement has been restricted to the use of matching repeating sequences in non-coding sections of DNA. However, through services like GEDMatch, law enforcement has gained access to single nucleotide polymorphism (SNP) markers from upwards of 25 million consumers throughout the world. This rapidly developing technology must be regulated to ensure that consumers, as well as blood relatives of consumers, are not unfairly targeted by investigations. With studies indicating that DNA is typically reported as the single most important piece of evidence to jurors, it is in the best interests of policymakers to ensure that the DNA data is both accurate and used fairly. First, we will provide a background of the technology and regulation of direct-to-consumer (DTC) genetic testing databases in law enforcement. Second, we propose a mechanism by which states might legislate the appropriate use of these databases by law enforcement by limiting access and enforcing a double-blind system. This paper lays out the background and policy proposal for a requirement of direct-to-consumer genetic testing companies to communicate the possibility and type of information shared with law enforcement, and a framework by which policymakers can ensure unbiased and minimally intrusive use by law enforcement.

I. Introduction

In 2018, a team of local law enforcement and federal investigators arrested Joseph James DeAngelo, infamously known as the "Golden State Killer". DeAngelo was eventually convicted in 2020 of dozens of rapes and murders spanning four decades. For years, the identity of the Golden State Killer remained unknown, until law enforcement's partnership with a private citizen "genetic genealogist" led them to a database of private, direct-to-consumer genetic testing services (St. John 2020). Despite having no DNA samples entered into law enforcement-managed databases, DeAngelo was eventually identified, prosecuted, and convicted based on the familial DNA matches that had been uploaded through these services (St. John 2020).

As it often does, groundbreaking technology led to remarkable results by bringing a dangerous criminal to justice and bringing closure to desperate families. There is, however, a flip side– as developments in science and technology tend to outpace the legal system, the resulting regulatory vacuum may give rise to situations where the benefit is not so clear-cut. Increasing the power of law enforcement through a greater library of genetic information can jeopardize the civil rights of the very people it is designed to protect. This is particularly salient given the United Nations Educational, Scientific, and Cultural Organization International Declaration on Human Genetic Data regarding the safekeeping of genetic information as a human right (UNESCO 2003). Following the global push to protect genetic information, the United States codified their stance with the Genetic Nondiscrimination Act of 2008 (GINA). Under the umbrella of protected genetic information, GINA includes an individual's genetic tests, the genetic tests of that individual's family members, and information about any disease or disorder in the family member of an individual. While US employers have been restricted from accessing employees' direct health information since the Americans with Disabilities Act (ADA) of 1990, an astounding amount of health information can be captured from non-medical DNA tests and family medical history of inherited diseases. GINA closed that workaround by prohibiting employers from not only discriminating on the basis of genetic information, but from acquiring any of this information for anything outside of a handful of approved purposes (EEOC 2008). The primary purpose of this is to prevent discrimination on the basis of disease or disability; however, genetic information can be far more revelatory that just the disease one is testing for. For example, many genetic diseases are predominantly associated with particular ethnic groups. Therefore, a DNA revealing a polymorphism associated with Sickle-Cell Anemia has a high likelihood of coming from an African-American individual, just as one with a polymorphism revealing Tay-Sachs disease has likely been taken from someone of Ashkenazi descent. Likewise, there is an ever-increasing number of heritable traits, diseases, and disorders that can now be associated with specific polymorphisms.

There is no federal equivalent of GINA for law enforcement, yet the information that can be ascertained by genetic information remains the same. In most jurisdictions, an unknown sample of DNA from a crime scene can be analyzed for any number of polymorphisms. If a genetic test of the unknown suspect sample reflected the polymorphisms associated with Sickle-Cell Disease, and an investigator without a strong background in understanding the nuances of genetic testing and heritable diseases may subconsciously or deliberately restrict the search to only African-American suspects. Aside from the clear investigative detriments, this could easily exacerbate the existing racial bias in policing– yet this is the kind of information that is readily available to law enforcement through DTC genetic information databases. As another example, a database may reveal a suspect or victim has a polymorphism associated with Huntington's disease, an autosomal recessive disorder that typically does not present symptoms until later in life but can cause rapid degeneration and eventually death. An investigator might reasonably be able to conclude that many of the suspect's family members likely have the same disease, which can be a clear invasion of privacy. Contrasted with traditional techniques of forensic DNA analysis, the methods used by these databases reveal genetic information that falls more squarely in line with the accepted definitions of protected information (EEOC 2008).

Forensic use of direct-to-consumer (DTC) genetic testing companies also brings up issues of quality control. A direct-to-consumer product is one that can be purchased from the manufacturer directly by the consumer, without a moderating intermediary. The last decade has been fraught with regulatory battles between federal agencies and these private genetic testing companies, with instances of questionable Clinical Laboratory Improvement Amendments (CLIA) adherence, arising from a disagreement between classification as recreational products versus diagnostic medical devices (De Groot 2021). Relying on proprietary databases and privately-managed laboratories instead of quality-assured laboratories may leave law enforcement open to accusations of using unreliable investigative and legal tools (Hanson, n.d.). This is of significant concern due to the fact that jurors are more likely to weigh DNA evidence, possibly at the exclusion of other evidence, most heavily in criminal proceedings (Schweitzer 2018). Though likely well meaning, the average juror often does not understand the intricacies of DNA and testing, and are frequently led into a false sense of security regarding the potential shortfalls and limitations of DNA evidence (Schwietzer 2018).

II. Traditional forensic use of DNA

By design, law enforcement uses DNA in such a way that limits how much information can be recovered (Hanson, n.d.) in order to control access to genetic information and preserve the rights of the subject. Autosomal nuclear DNA samples (or other types of DNA, though less likely) are taken as forensic evidence. Then, in one of the designated laboratories certified by the FBI's Quality Assurance Standard, twenty known locations along the sequence of the DNA, each known as a locus, are identified and logged (Hanson, n.d.). These sequences are known as short tandem repeats (STRs). Unlike the polymorphisms associated with different diseases and traits, these are noncoding sequences of DNA, not known to be translated and expressed in standard human cells (De Groot 2019). Each of these STRs are based around a standard pattern of just a few nucleotides–typically represented by the first letter of their name to be either A, T, G, or C–found in all humans. However, the number of times that the pattern is repeated will vary between individuals. In other words, one particular sequence at one particular locus may be repeated three times in every DNA sample provided by one individual, but nine times in every DNA sample provided by another individual. In a standard forensic DNA analysis, twenty-two known loci are identified and the number of times that the sequence repeats is recorded. The chances of two individuals having the same number of repeats at any given locus ranges anywhere from 1% to 10% (Department of Justice 2012). By multiplying the probabilities, the chances of any two individuals having the same number of repeats at more than one locus drops dramatically. Therefore, law enforcement uses the standard of identifying a "DNA match" as having the same number of repeats for at least 13 of the 22 loci. The chances of two unrelated individuals having an identical number of repeats at 13 loci is upwards of one in one billion (Department of Justice 2012). Because of this, STR analysis is considered an extremely valuable tool for law enforcement to compare two samples of DNA to assess whether they originated from the same individual.

Depending on the jurisdiction and the circumstances under which the DNA sample was acquired, a forensic laboratory may save the profile– that is, a record of the number of repeats at each locus– to a local or national database. This allows the comparison of a single DNA sample to a library of existing samples acquired previously. The database that is most frequently used is the FBI Combined DNA Index System (CODIS). This is a general name for the aggregation of several different databases run by separate jurisdictions, all of which have their own criteria for inclusion.

As a note, the United States Armed Forces maintains a separate database of servicemembers, as well as select other smaller government-run agencies (DPAA, n.d.). The DNA sample itself is not retained by the system, nor is any information about the DNA outside of the number of repeats at each of these 22 loci. When a sample is considered a match to a profile in CODIS, a separate technician is then responsible for verifying that the DNA test sample was obtained legally and under circumstances that would warrant DNA collection (Hanson, n.d.). Only after this testing is the identity of the person who provided the test sample given to investigators who provided the evidence sample (Hanson, n.d.).

III. Commercial genetic testing

DTC genetic testing is a recreational tool that relies on the voluntary collection of genetic material from consumers in order to identify characteristics like ancestral ethnic origin, markers for genetic disease, and to identify familial relationships between other users of the service(De Groot 2018). Contrary to forensic STR analysis of noncoding regions, these databases are often focused on identifying anywhere upward of 600,000 known single-nucleotide polymorphisms (SNPs). These are specific unique sequences of nucleotides that are found at known loci along a human genome (De Groot 2018). These SNPs provide a host of information about the provider of the DNA sample; characterizing SNPs can provide strong indicators of anything from ethnic origin to propensity and markers for certain congenital diseases (Covolo 2015). DTC genetic testing companies have been around for almost two decades, but still vary wildly in terms of privacy policies and data acquisition practices.

Since its founding in 2006, 23andMe, a biotechnology and DTC genetic testing company, has sold a laboratory-based test wherein consumers directly order test kits from the company and then return it back to the company for analysis (23andMe 2022). It is one of a few of a class of DTC genetic testing companies that have considerably expanded their scope in the last few years from simple ancestry and familial relationship testing to pseudo-diagnostic tools and markers for diseases and disorders (Rochman 2012). The process by which 23andMe provides results begins with sample collection. This starts with the customer returning the mail-order test that contains a saliva sample. Using a proprietary version of the Illumina Global Screening Array (23andMe 2022), 23andMe identifies key STRs. This protocol involves the extraction of whole DNA from the cells in the saliva. The Illumina Global Screening Array chip identifies the target STR regions in the DNA. Each of these two- to six-nucleotide regions of DNA are repeated a specific number of times that is generally unique to the individual and the individual's relatives.

One of the testing types that most DTC genetic testing companies purport to provide is an ancestry test (23andMe 2022). To do so, the company tests autosomal DNA and the X-chromosome to deliver results on 956,000 different SNPs. In order to complete ancestry testing, the analyst records SNPs among different samples and determines how much of these segments overlap. The larger the segment in common, the closer the likely familial relationship is (Brown 2019). This is in contrast to the mechanism of linking DNA samples used in forensic investigations, wherein the sequences analyzed are noncoding and not associated with any particular phenotype (De Groot 2018).

Unlike law enforcement using STRs, these companies have the option of storing all the data from a consumer's DNA sample. This includes polymorphisms and any analysis done for ancestry or diagnostic purposes. In recent years, law enforcement has begun accessing these databases through different means. This includes working directly with these companies, particularly some that are set up for this specific purpose, as well as seizing data via search warrants, and obtaining this data through false user profiles by posing as consumers (De Groot 2018).

IV. Stakeholders

This section discusses four major stakeholders in the use of genetic databases for law enforcement purposes. These stakeholders– genetic testing companies, consumers, relatives of consumers, and law enforcement, are all strongly affected by regulation of these practices.

i. DTC genetic testing companies

DTC genetic testing companies operate in a regulatory loophole. While companies like 23andMe offer genetic counseling as an additional service, the purpose of all of these companies is explicitly declared to be "recreational." As such, DTC genetic tests are not considered medical devices or services (De Groot 2018). However, despite disclaimers, these companies continue to purport testing that goes beyond genealogy. Evidence of that can be seen in the type of testing alone-- while most companies are not fully transparent about the exact polymorphisms tested, the testing goes far beyond simple matching of STRs, which would only be useful in detecting similarities between genomes, to identifying a broad swath of polymorphisms that can indicate with fairly high certainty anything from race to probability of developing certain cancers (Covolo 2015).

Until 2013, 23andMe made the claim that ancestry tests are a recreational product, and its popular use has shown as much. Where the company took a step into regulated territory was when they increased their marketing tactics to emphasize their product's health screening tools, demonstrating clearly that 23andMe was now an in-vitro diagnostic device (IVD). These are more rigorously regulated by the FDA than tests that provide primarily entertainment value, or "low risk general wellness tests" (FDA 2018).

As a regulated IVD, a DTC genetic testing company must operate under a stricter set of guidelines. These guidelines are determined by the classification of the device. Low risk devices, or class I devices, are generally exempt from premarket approval (Sarata 2014). However, the FDA determined that disease probability screening based on genetic analysis does not fall under a class I designation because a false negative or positive may cause direct harm to a patient due to their subsequent lifestyle changes (Gutierrez 2010). This increased regulation may actually provide a framework for legislation surrounding its use with law enforcement. Because an increasing number of these services, like 23andMe, are now classified as medical devices, there is a stricter burden on the company to safeguard the genetic information as medical information.

ii. Consumers

Consumers of recreational DTC genetic testing voluntarily provide samples of DNA, typically through saliva, to the company. At a fee, the company then submits the sample to an internal or outside contracted laboratory for sequencing and identification, and then provides interpreted results back to the consumer (Covolo 2015). Depending on the company, consumers may also have the option of discussing their results with a genetic counselor provided by the company (Covolo 2015). Most importantly, these consumers have voluntarily provided their DNA sample with the understanding—and expectation—that it will be used to extrapolate information about themselves as an individual. However, with the exception of the addition of some recent disclaimers by companies like GEDMatch (GEDMatch n.d.), information about privacy and authorization to share with law enforcement is strikingly inaccessible.

A concern is that the use of DTC genetic testing services for medical purposes may lead consumers to infer that their participation is tantamount to being a patient at a medical practice. However, the analysts and employees of these companies are not medical providers and are not bound by HIPAA or any other medical privacy laws. Therefore, consumers may not know that their genetic information can be legally shared, sold, or used by law enforcement. The collection of DNA by law enforcement without the consent of a subject is typically restricted to a few circumstances, dependent on jurisdiction. However, it can be argued that many of these consumers are not knowingly furnishing their DNA to law enforcement any more than they would be by having their blood drawn by their medical provider.

iii. Relatives of consumers

When a consumer submits a sample to a DTC genetic database, the database identifies potential relatives of the consumer (De Groot 2018). These potential relatives are also consenting consumers who have submitted their own samples for the same reason. However, all genetic relatives of consumers have a higher likelihood of their DNA being identified through a familial match against the ever-growing database of DTC genetic testing companies. This was the case with Joseph James DeAngelo, who never furnished a DNA sample to any agency but, through surreptitious sample, was nonetheless identified through familial matches.

Currently, with the law enforcement CODIS database, private citizens with no prior qualifying felonies or military service history have a reasonable expectation that their DNA is not accessible to the government or the general public. For example, a private citizen may inadvertently leave a strand of hair at the scene of a crime that they may or may not have been involved with. With traditional use of CODIS, this person could not be identified through DNA alone as their sample would not be present; rather, investigators would use other tools to identify a person and would then be required to take a DNA sample and compare it to the DNA found at the scene. With full unfettered access to DTC genetic genealogy databases, however, investigators could take the unknown sample found at the crime scene, upload the sample, and identify potential relatives (St. John 2020). Investigators could then run background investigations on these relatives, and identify potential suspects through the list of relatives. These relatives, who may or may not have been involved in a crime and who at no point voluntarily provided their genetic material to the government or private companies, are now identifiable through the genetic material of someone closely genetically related to them (St. John 2020).

iv. Law enforcement

Law enforcement is traditionally limited to the use of only a few central databases. These databases compare the character of STRs at 20 different loci, with a match of at least 10 of those loci considered to be acceptable to identify as a potential match. With these databases, law enforcement is limited only to matching with a database primarily made of persons previously convicted of a felony, military service members, and a handful of others (Hanson 2018). However, with DTC DNA databases, a broader database of potential relatives is now accessible. It was hypothesized in 2018 that roughly 60% of white Americans could be identified using genetic genealogy from DTC genetic databases, with the number likely being far higher today (Wickenheiser 2022). While genetic genealogy cannot link directly to every subject, uploading an unknown profile has a high probability of identifying a "close relative." The proximity of this relative can be estimated by the services; for example, the unknown sample can be identified to be a "likely sibling" of a contributing consumer. Law enforcement can then find all the known siblings of this individual and conduct a narrower investigation to identify the subject in question.

V. Current policies

The current policies directly regulating the use of DTC genetic testing for use outside of individual recreational purposes are currently fairly limited. The ones discussed here cover issues such as quality control, protections covered by constitutional amendments, and a bill that might serve as a case study for larger regulations.

i. Quality control

When law enforcement collects DNA samples for STR sequencing, whether from a person legally obligated based on state mandates following a felony conviction, or an unknown sample obtained as evidence in a criminal proceeding, the laboratories available are highly controlled. Laboratories authorized to conduct this type of sequencing are required to adhere to the FBI Quality Assurance Standards (QAS) (Hanson, n.d.). DTC genetic testing companies, on the other hand, are recreational companies that are not mandated to provide medical information unless, like 23andMe, they are required to register as an IVD. As a result, there is no governing or oversight organization that requires quality control or provides inspections (Covolo 2015). While law enforcement would typically verify the DNA match with their local forensic laboratory using STR analysis, the potential for wasted time and resources can add up on an already overburdened system.

ii. Fourth Amendment

Law enforcement use of DTC genetic genealogy has yet to be directly challenged in the United States Supreme Court, but recent cases suggest it may be on the horizon. A commonly-cited concern of law enforcement access to genetic information is the Fourth Amendment to the United States Constitution (Lynch 2021). The Fourth Amendment protects citizens from seizure of personal property without a warrant, which has been interpreted by the US House of Representatives to include genetic information (EEOC 2008), as well as by case law in Maryland, Iowa, and California. In *California v. Greenwood,* the California supreme court upheld the decision that the warrantless seizure of property that was deemed to be abandoned (i.e., trash) is admissible in court (Greenwood 1988). In *Raynor v. Maryland,* the petitioner argues that inadvertently discarded skin cells left by a subject that was questioned at the police station was lawfully collected by law enforcement following the subject's release only because the discarded genetic material constituted "abandoned property," as in *Greenwood*. In April 2021, *Iowa State v. Burns* reiterated the concerns of *Raynor v. Maryland.* In both of these cases, the petitioner argues that the private and permanent nature of DNA separates it from other property (Lynch 2021; Raynor 2014).

While the Supreme Court ruled in favor of law enforcement, this case is hardly enough to provide legal precedent in the face of rapidly developing technologies (Raynor 2014). Similarly, in 2018, law enforcement re-opened a case from 1979 and uploaded a profile of DNA acquired from the original case to GEDMatch, a database that aggregates profiles from the common DTC genetic testing companies. This DNA, which did not match any samples in CODIS, was identified via a relative match in GEDMatch. The subject was surveilled, a surreptitious DNA sample acquired, and the subject was arrested and convicted for the original crime (Lynch 2021). However, no current laws or policies exist to prevent law enforcement from using these "false profiles" to gain demographic information about an unknown subject. Under the pretense of trying to get information about a subject, investigators have the ability to extrapolate information like skin, hair, and eye color. While this may be an investigative tool, the possibility for abuse or misuse is grave enough that it should not be ignored.

iii. Maryland House Bill 240

In May of 2021, Maryland became the first state to pass a bill regulating law enforcement's use of DTC genetic databases. The bill, HB240, contains a number of key features; first, collection of DNA via uploading to a DTC genetic testing database requires a court order, or warrant. Second, HB240 prevents the collection of certain genetic information—law enforcement cannot use the genetic material to extrapolate characteristics of an unknown subject such as race. Third, informed consent is required where reasonably available—that is, anyone whose DNA is to be compared to an unknown sample must be informed that they are the subject of an investigation

(Maryland 2021). Fourth, a warrant can only be granted where there is a reasonable expectation that the sample itself in the DTC genetic testing database was provided by the subject itself, not a relative (Maryland 2021). Fifth, the use of genetic genealogy is limited to the investigation of violent felonies such as rape, assault, and homicide (Maryland 2021).

VI. Proposed forensic science policies.

In the interest of maintaining a just and effective legal system in the face of new genetic technology that furthers forensic investigative tools, states may consider adopting regulatory policies to act as a watchdog of law enforcement and DTC genetic testing companies. The intention is that these policies would not impede forensic science in any meaningful way, but would protect consumers and subjects of investigation from intrusion upon their civil liberties.

i. Regulation of law enforcement

The first component of this policy is regarding regulations on law enforcement to be implemented at the local and state levels. Policies could be introduced limiting law enforcement's use of DTC genetic genealogy databases in a genealogical context only, using a double-blind testing process. First, this tool is only to be authorized in cases of serious felonies such as sexual assault and homicide. Just as many police departments have restricted saving the DNA profiles of those in custody to only those who have been convicted of a felony, the value of the intrusion on a person's genetic information must be balanced against the risk to society.

Investigators should hand off DNA samples to a forensic laboratory, where a laboratory scientist would upload the profile to the database of choice under a "law enforcement" type profile, which would only allow a genealogical search. Any analysis of traits, diseases, or other markers would be excluded. An example of this type of alternate profile option can be seen with GEDMatch, which recently rolled out a "Research" option that excludes genealogical searches and is designed for genetic research (GEDMatch n.d). Law enforcement would not be authorized to upload samples directly under a fake profile, precluding them from getting additional demographic and medical data from the sample. Furthermore, this entire process could require a warrant or signed court order. The laboratory would then receive any potential familial matches, and provide a report to the investigators of the case.

ii. Regulation of DTC genetic testing companies

A second policy focus could be on directly restricting DTC genetic testing companies. Companies carrying out DTC genetic testing should be required to ensure laboratories are certified by a governing body with regard to both CLIA adherence as well as privacy policies in line with protecting genetic information. While pressure from the United States Congress has called for companies to review and share privacy policies identifying the use and distribution of genetic information, this particular policy proposal does not seek to dictate the management of these companies. Rather, this policy is designed to have as limited impact as possible on the DTC genetic testing market. DTC genetic testing companies would, however, be required to more clearly display to consumers that their data is not legally protected as confidential in law enforcement investigations, and that their data may be stored and possibly shared. Regular governmental audits should ensure that companies are adhering to their posted policy, whatever that policy may be.

VII. Impact analysis of proposed policy: law enforcement.

The policy recommendations presented above are based loosely around Maryland HB240, but with a number of key differences. The primary difference is the involvement of a genetic testing company that is a separate entity from law enforcement. A possible criticism of law enforcement using this private database might be that use of genetic information for purposes outside of that which the consumer purchased from the service violates standards of informed consent. Recreational DTC genetic databases are not medical services, however, nor is law enforcement required to obtain informed consent from a subject prior to an investigation. A judge, the approving authority of a warrant and court order, is empowered by the courts to stand as a proxy representative for the public when determining the need for a search or seizure—not the subject of the search or seizure. The burden lies on the judge and the justice system to make a determination via a warrant that the risk to the individual's civil liberties is outweighed by the risk to the public with regards to the crime being investigated. Because law enforcement is restricted only to genealogical data, the privacy of the subject is still being preserved as much as possible.

The second primary impact of this policy is the involvement of "third parties," that is, persons unrelated to the investigation. This includes consumers who are not party to any crime that was committed, but may be relatives of a suspect or victim. This was seen in the DeAngelo case, where the suspect was identified through a blood relative that had no association with the crime but had used a DTC genetic testing service for ancestry purposes. While the consumers that are not involved in the crime do have a reasonable expectation of privacy surrounding their genetic information, they voluntarily surrendered their genetic information to a private company (Brown 2019). It is recommended, however, that DTC genetic testing companies update their consumer privacy policies and disclosures to reflect this possibility to potential customers.

Another "third party" that has a stake in these types of investigations are the blood relatives of DTC genetic testing consumers. These people did not voluntarily provide DNA samples and may have a vested interest in maintaining the privacy of their genetic information. However, private citizens do not have the right to unconditional privacy during a law enforcement investigation if a judge has deemed the search important enough to the conduct of the investigation (Brown 2019). In fact, it is not uncommon for material witnesses to be searched and compelled to testify under a subpoena. In the case of DNA, a genetic relative may be considered tantamount to a material witness. With a policy in place such as the one proposed, the privacy of genetic information would be maintained throughout the investigation and afterward.

By strictly limiting the data available to law enforcement, this policy would attempt to eliminate bias in genetic testing. Much like traditional law enforcement DNA testing, genetic information can only be used to identify people. By requiring a double-blind system similar to that already in place, possible racial, ethnic, and medical characteristics cannot be obtained (Brown 2019). Additionally, by allowing the introduction of these databases, overall bias may be effectively reduced in cases involving DNA evidence. This is because CODIS contains a higher percentage of minority DNA samples as compared to the percentage of minorities in the general population. DTC genetic testing databases, however, are overwhelmingly filled by a majority of white Americans of northern European descent (Brown 2019).

A possible hurdle to implementation is the increased bureaucratic load placed on law enforcement agencies. Adding requirements for special profiles to be uploaded may cause delays in investigations. However, implementing such a policy will likely also remove questionable practices that would lead to costly appeals in the future.

While this policy attempts to regulate only law enforcement use, quality control is a major concern in the conduct of criminal investigations. Law enforcement is held to an extremely high standard of proof (Hanson n.d.), and the use of a DTC genetic genealogy database is irresponsible to the public and to the legal system if the laboratory used for testing is later discovered to be unreliable. The FBI QAS has remained the standard for laboratory testing in criminal investigations and should be mandated in DTC genetic testing companies. Not only does this protect the due process, but this protects consumers as well, who may make life decisions based on the information they get from these databases.

VIII. Conclusion

Overall, this position paper outlines the constraints and limitations of law enforcement in the use of DTC genetic testing databases to enable due process, expand the reach of investigative tools, and protect the public interest. As a tool for law enforcement, this policy pursues the least intrusive impact possible on private enterprise while maintaining standards and requiring best practices be maintained. Currently, use of genetic databases is a largely unregulated tool for law enforcement and is steeped in public controversy. While open and unrestricted access may be a tempting mechanism for criminal investigators, working carefully with tighter regulations prevents an avenue for destructive appeals that could provide legal precedent to overturn justified convictions. This policy balances the need for the investigative process with individual rights to privacy and security so as to secure and maintain critical public support.

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