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## FORENSIC GENEALOGY IN THE AGE OF DATA PRIVACY

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### ABSTRACT

Forensic Genealogy, emerged in the 2000s has become an effective criminal investigatory mechanism that has been applied in many unresolved cases to produce crucial leads for further investigation and closure of cases. With its emergence as a significant investigative instrument, it has also raised data privacy concerns over the years and how the emerging forensic technologies somewhere challenge the fundamental of consent and privacy present in the constitutional framework and the Fourth Amendment. This paper shall try to unravel and examine the intersections between forensic technology advancements and privacy rights in context of both Indian and international jurisprudence.

**Keywords:** Forensic Genealogy, DNA, criminal investigation, privacy, forensic science.

### INTRODUCTION

Forensic Genetic Genealogy (FGG) is a forensic technological advancement that combines DNA profiles from crime scenes with available databases to generate adequate and important investigative leads in cases. This works with a combination of both the scientific function and reliability of the DNA evidence and already present databases in the system. Though it has bright potential to solve cold cases and close years pending unresolved cases, it has raised concerns on privacy rights relating to genetic data, family relationships and structure and constitutional provisions protecting privacy of individuals. FGG complements forensic DNA profiling and has helped to resolve long unresolved criminal cases like the case of “Golden State Killer” in 2018, with this case this technique acquired widespread interest and growth due to its scope for prospective expansion in field of criminal investigation.<sup>1</sup> A single sample

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<sup>1</sup> CL Glynn, ‘The Emergence of Forensic Genetic Genealogy’ (2022) 13 Genes 1381, PMC9407302 <https://pmc.ncbi.nlm.nih.gov/articles/PMC9407302/>.

of evidence can have more than one potential matches and by comparing it to available databases, matching with the present DNA profiles in these databases, the experts can extract important information regarding the cases to solve difficult and possibly dead-end leading cases as from boiling down through research family structures can be ruled out, further narrowing down the suspects 'list'.<sup>2</sup> However, this mechanism of tracing down family trees and DNA profiles of the related ones has opened a Pandora Box of consent and privacy concerns for genetic data. In India, Article 21<sup>3</sup> establishes right to privacy as a fundamental right through the landmark case of "*K.S Puttaswamy & Anr. v. Union of India & Ors (2017)*"<sup>4</sup> and provides a foundational framework in addressing data privacy concerns. The question here is does the data under the forensic genealogy methods fall in the ambit of privacy breach under data privacy concerns as per the legislative and legal frameworks or are necessary evils to crack cold cases and dead-end investigations.

### **SCOPE OF FORENSIC GENEALOGY**

Forensic genealogy is a mechanism that uses genetic data available in the current databases along with further techniques to rule out the possible biological relationships, structures and family trees and triangulate possible suspects' genetic identity, unlike the earlier forensic DNA analysis that only relied on direct comparison of the evidence with suspect samples. This mechanism influences non-sex-linked DNA data and SNPs i.e. Single Nucleotide Polymorphisms (SNPs) to identify relationship structures that act as a catalyst for suspect identification and verification of possible linkages in family structures in civil matters like paternity and custody disputes.<sup>5</sup> On a global scale, adoption of this technique and methodology varies by the regulatory framework, legislative environment and acceptance by law and public. In United States, the law agencies progressively employ and use these databases like the GEDmatch with certain restrictions on access of the database or data uploading but the framework still faces a gap regarding genetic privacy and adequate warrant requirements.<sup>6</sup> The practical application of this method in the U.S can very well be seen in the Golden State Killer case, where the investigation team after a stretch of time identified and prosecuted the serial

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<sup>2</sup> Sreelakshmi Raj and Pratima Salunkhe, 'Forensic Genealogy in Solving Age-Old Cases: Review' (IJFMR, Volume 6, Issue 2, March- April 2024)

<sup>3</sup> Constitution of India art 21 (India 1950)

<sup>4</sup> *K.S. Puttaswamy (Privacy-9J.) v. Union of India*, (2017) 10 SCC 1

<sup>5</sup> RA Wickenheiser, 'Forensic genealogy, bioethics and the Golden State Killer case' (2019) 1 *Forensic Science International: Synergy* 114-125

<sup>6</sup> M Sweat, *A Square Double Helix in a Round Hole: Forensic Genetic Genealogy Searches and the Fourth Amendment*, 39 *GA. ST. U. L. REV.* 605 (2023).

killers via public genealogy databases. In this situation, the prosecutors not only just relied on the genetic data matches but also comprehensive genealogical research that resulted in effective data patterns to identify the murderers. Though it amounted as a great achievement but at the same time, significantly called for ponderance over concerns regarding privacy and Fourth amendment provisions that circles around consent and scope of usage of such genetic data, like in the case of *Carpenter v. United States* (2018) the US Supreme Court expressed its views and potential concerns related to data privacy and the need for a more regulated approach<sup>7</sup>. In India, the “Digital Personal Data Protection Act” (DPDPA)<sup>8</sup> has adopted a notice and consent-based structure for the purpose of data privacy and protection and treats genetic data as only a singular category despite of the concept of uniqueness in its characteristics. The DPDP act aimed to offer a proper regulatory approach but failed to aptly and practically offer the aimed nuanced approach as it lacks clear clarification and proper safeguards.<sup>9</sup> The technique can be rendered as an opportunity to expand the scope of forensic sciences in the upcoming advancements but there still exists the persistent gap of data mining and D2C genetic testing.<sup>10</sup> There shall be ethical considerations also in the are of forensic genealogy especially regarding the potential of stigmatization of certain groups or individuals whose DNAs are related through the family patterns and structures and can create a potential risk for social inequalities, biasness, labels such as “murderer blood” or “criminal blood” etc. and without any proper and inclusive interpretation of these genetic databases, the forensics methodology might unknowingly create or renew historical racial and social biases.<sup>11</sup>

## LEGAL INTERSECTIONS AND PRIVACY RIGHTS

The Supreme Court of United States and other federal statutes highlight an ongoing tautness between ways of criminal investigation and privacy of genetic data with legislative alternatives advocating for proper controls and transparency requirements for databases in the advancing field of forensic science.<sup>12</sup> The Fourth Amendment governs regulations regarding the protections against searches and seizures with possibility of breach of privacy including genetic

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<sup>7</sup> Natalie Ram, *Genetic Privacy After Carpenter*, 105 Va. L. Rev. 1357, 1357–1425 (2019), <https://www.jstor.org/stable/26891051>.

<sup>8</sup> Digital Personal Data Protection Act, 2023, Act of Parliament (India)

<sup>9</sup> RK Singh & Vini Singh, ‘Beyond Consent: Ensuring Meaningful Protection of Genetic Data Under India’s Digital Personal Data Protection Act, 2023’ (2025) 46(4) *Journal of Indian Academy of Forensic Medicine*

<sup>10</sup> RA Wickenheiser, ‘Forensic genealogy, bioethics and the Golden State Killer case’ (2019) 1 *Forensic Science International: Synergy* 114-125

<sup>11</sup> M Kopec, *The Evidence and Ethics of Forensic DNA Ancestry Profiling*, 22 *Bioethics* 215, 2014.

<sup>12</sup> M Sweat, *A Square Double Helix in a Round Hole: Forensic Genetic Genealogy Searches and the Fourth Amendment*, 39 GA. ST. U. L. REV. 605 (2023).

data for forensic purposes. The landmark ruling of *Carpenter v. U.S* reflected the need for privacy in realm of digital data that calls for unambiguous rulings, regulatory framework incorporating key elements like consent and warrant requirements and limited and proper use of such genetic databases by law and forensics department.<sup>13</sup>

In Europe, Article 8 of the European Convention on Human Rights is applied by the European Court of Human Rights that gives a structured four-level test that seeks any intervention in privacy of individuals or group of individuals through genetic data to have a legitimate and valid objective that does not violate the principles of democratic society, shall be proportionate and use proper and adequate procedural protection.<sup>14</sup> Nations like Netherlands, Sweden have adopted a different approach by certain legislative restrictions and straightaway suspensions of the genomic data services for forensic operations if taken without due consent or prescribed procedure to clarify its concern regarding privacy risks and incidental exposure of families and relatives during the trial and investigation process. In Sweden, these techniques will only be applicable in cases of severe offences like brutal rape, murder or if it is absolute necessity in case of absence of any leads.<sup>15</sup> In Netherlands, the Forensic institute elaborates on the use of forensic genealogy on legal, technical and ethical prospects, taking consent of the participants before comparison of DNA or genetic profiles.<sup>16</sup>

In India, the aftermath of the *Puttaswamy* judgement brings up an assumption and inclusion of right to privacy as an important and significant part of Article 21<sup>17</sup>. In this case, the judges bench held that privacy rights are impliedly a part of liberty and human dignity, acknowledging the importance of protection of privacy of individual information including their genomic information and can be protected under the constitutional provisions.<sup>18</sup> This decision overturned precedents like *M.P Sharma v. Satish Chandra*<sup>19</sup> and *Kharak Singh v. State of Uttar Pradesh*<sup>20</sup> that declined the right to privacy as a Fundamental and essential right, the court held that any action of the state that tends to or infringes privacy of an individual must qualify the threefold

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<sup>13</sup> Heather Pringle, *DNA and Privacy: The Debate over Forensic Genealogy and Fourth Amendment Rights*, 34 *Harv. J.L. & Tech.* 1 (2019).

<sup>14</sup> European Court of Human Rights, *S. and Marper v. United Kingdom*, App. Nos. 30562/04 and 30566/04 (2008).

<sup>15</sup> Ricky Ansell & Siri Aili Fagerholm, *Legislation for Forensic Investigative Genetic Genealogy in Sweden*, 11 *Forensic Sci. Int.: Synergy* 100637 (2025).

<sup>16</sup> Green Light for the Use of Genealogy DNA Databases, *OREN SCI. INST.* (Sept. 28, 2023), <https://orensicinstitute.nl/news/news/2023/09/28/green-light-for-the-use-of-genealogy-dna-databases>.

<sup>17</sup> Constitution of India art 21 (India 1950)

<sup>18</sup> Justice K.S. Puttaswamy (Retd.) & Anr. v. Union of India & Ors., (2017) 10 SCC 1 (India).

<sup>19</sup> *M.P Sharma v. Satish Chandra* 1954 AIR 300

<sup>20</sup> *Kharak Singh v. State of U.P.*, 1962 SCC OnLine SC 10

test of necessity, legality and basic proportionality, making sure that any kind of privacy breaches occur only in necessary or compelling situations with adequate precautions and protections.<sup>21</sup> Implications that can be drawn from this decision in terms of the methodology of forensic genealogy. DNA testing in India is governed by Section 112 of the Indian Evidence Act, wherein it permits DNA testing and analysis in custody and legitimacy cases to act as a balancing instrument between children's welfare, parental and custodial rights and privacy concerns. The compulsion to collect DNA samples of individuals for evidential purposes raises ethical and constitutional concerns as it comes conflicting with privacy rights provided to the individuals by Article 21. The Indian judiciary has interpreted a midway to reconcile justice with individual autonomy, through which it permits such analysis and conclusion with due and informed consent, proper adherence to procedures prescribed, required safeguards and most importantly judicial supervision and proportionality required in such methods of testing.

### **GAPS, CHALLENGES AND SUGGESTIONS**

The emerging advancements in forensic sciences to aid criminal investigations like that of forensic genealogy raises questions on ethical grounds of informed consent, especially regarding the family and relative data that is used to draw out patterns and narrow out possibilities. In such a scenario, group privacy plays a crucial role in acknowledging collective rights of the individuals who are genetically related to each other and not just individual privacy rights model.<sup>22</sup> There exists a possibility of unauthorized access, risk of database leakages and breaches in system and discriminatory biases based on genomic data results that require nuanced and ethical safeguards to protect the rights of individuals individually as well as collectively. The idea of constructing ethical frameworks in such forensic models is to balance the utilization of these databases proportionally with its impacts and results on individuals and their related family members due its unique and highly sensitive nature as one wrong analysis and report and it can cause all blunder and potential instant stigmatization. One of the major challenges that needs to be addressed across the globe is the collective privacy concerns and ways to balance it out with aiding criminal investigations and creating a more advanced and effective forensic science system. A practical and feasible forensic model in India should be able to address crucial legal and ethical concerns related to data privacy and due consent

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<sup>21</sup> Justice K.S. Puttaswamy (Retd.) & Anr. v. Union of India & Ors., (2017) 10 SCC 1 (India).

<sup>22</sup> Mark A. Rothstein, Group Privacy: New Challenges of Data Protection, 126 J. Law Med. Ethics 322 (2018).

keeping in thought the uniqueness of the genomic data as this data is different in individuals and may vary from distinct family structure to structure as they are somehow genetically related people, highlighting the need to address group or collective privacy issues and a proper clarification on are these collective rights above or beyond criminal investigations or can be ignored in necessary cold or dead-end cases. In India, the Criminal Procedure Identification Act, 2022 governs the framework regarding collection of such data and its further processing, but despite of such regulatory legislative framework there are still gaps in it due to the unanswered questions on the retention of the data and the power over it granted to government agencies like National Crime Records Bureau i.e. NCRB<sup>23</sup>. Genetic data does not resemble personal data entirely as, if leaked or misused it can reveal information not just about a person but the people in his community or family who are related to that person by blood or any genetic traces, which further challenges currently present privacy legislations that imply their focus mainly on individual privacy and consent.<sup>24</sup> Another issue that needs to be addressed along is that of informed consent, in such technical cases it is difficult to ascertain informed consent from individuals or group of individuals as they cannot completely understand the scientific jargons that are most likely to explain potential risks in the future regarding the collection and processing of their genomic data. The current model in the DPDP Act<sup>25</sup> of first notice and then successively consent stands inadequate in the case of forensic genealogy due to its nature and relevance varying from traditionally used forensic approaches. Thus, despite introducing informed consent regulations, some individuals might not understand the seriousness behind it and still authorize access to it.<sup>26</sup>

Though the challenge of conflicting privacy rights and investigation advancement persist, there are certain midway mechanisms and measures that can be adopted on national as well as global scale to somehow balance out this conflict. Gathering and building public trust through efficient and feasible solutions like accountable and transparent legislations and authorities, proper laid down procedures and mechanisms to perform collection and analysis of such

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<sup>23</sup> R. Chandran, *Collection of DNA and the Creation of DNA Databases in India: A Proportionality Analysis on Whether There Is a Violation of Genetic Privacy*, 25 ASIA-PAC. J. HUM. RTS. & L. 282 (2024), <https://doi.org/10.1163/15718158-25030001>.

<sup>24</sup> M. Wallace, A.R. Jackson, J. Gruber & A.D. Thibedeau, *Forensic DNA Databases—Ethical and Legal Standards: A Global Review*, 4 Egyptian J. Forensic Sci. 57 (2014), <https://doi.org/10.1016/j.ejfs.2014.04.002>.

<sup>25</sup> Digital Personal Data Protection Act, 2023, Act of Parliament (India)

<sup>26</sup> Singh, RK, and Vini Singh. "Beyond Consent: Ensuring Meaningful Protection of Genetic Data Under India's Digital Personal Data Protection Act, 2023." *Journal of Indian Academy of Forensic Medicine* (2025). <https://doi.org/10.1177/09710973251328785>.

sensitive information and ensure its safe and secure preservation to protect it from breach and misuse. Reinforcing policies that address the biasness issues and flawed sampling and analysis with strict action against the perpetrators in order to ensure comprehensive governance and possible protection of rights. The use of genetic data can also be restricted exclusively to necessity-based or crucial cold cases that seem unresolvable or vague without it and impose legal supervision to prevent misuse or unlawful use of such sensitive data. The government can also enforce uncompromising and firm regulations and boundaries on usage of such data and mandatory deletion of analytical process after reaching successful conclusion. Strict and advanced data security standards to prevent hacking and security breaches. The forensic genealogical methods can be standardized to ensure uniformity in process and prevent deviations and reduce chances of inaccuracy.

## **CONCLUSION**

Forensic Genetic Genealogy or Forensic Genealogy stands somewhere at a sharp point between right to privacy and advancements in forensic science model in the age of data privacy. Though, these techniques provide key leads and patterns in cold cases that seem to lie on a blocked road without their adequate analysis, the usage of sensitive genetic information opens a trail of concerns regarding individual as well as collective privacy. It can be argued that public good can be placed higher in hierarchy in comparison of rights of individuals, but it is not really fair to trump over collective rights just to offer speedy justice in criminal and missing investigations. To ensure the fulfillment of such gaps present in current regulatory frameworks both nationally and internationally, a balanced approach towards genomic jurisprudence should be taken into account, with proper ethical code of conduct, regulations, properly explained and laid down procedure to ensure uniformity with authority established for authority, responsibility and accountability altogether to prevent misappropriation and misuse of such sensitive and unique data. The individuals should be made aware of the usage and consequence of the data they provide to avoid any future complications and conflicts and there should exist a defined proportionality and extent to which this data shall be operated and put to relevant use. Any other appropriate legal and medical consultations can be brought into light for a more nuanced and comprehensive legislative structure of regulations to address grievances in persuasion of this model and ensure justice and balancing of rights with growth. Such ethical, socially admissible, transparent and accountable regimes that focus on good conscience, public good and value consent of individuals keeping in mind their due right of privacy shall act as forces to ensure protective and ethical standards of criminal investigations via evolving

technology in the field of forensic sciences. A balanced approach can be sought to bring out best of the advancement that have taken place or are going to take place in the future for betterment of criminal justice and investigation mechanisms.

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