An international consideration of a standards-based approach to forensic genetic genealogy

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ABSTRACT

Forensic genetic genealogy has moved into limited operational use in the United States, and received international attention following the arrest of a suspect alleged to be the notorious 'Golden State Killer'. The interest in this emerging area has seen the development of online courses to train investigators to pursue forensic genetic genealogy leads and the emergence of service providers marketing directly to law enforcement. Forensic genetic genealogy is an intelligence capability and can draw on existing intelligence doctrine. The power of genetic genealogy requires consideration of relevant standards, national or international. The development of these standards requires close consideration of public trust and privacy issues, including the application of the *General Data Protection Regulation* in Europe and constitutional issues in countries such as the United States. It also requires a consideration of potential regulatory mechanisms and options.

1. Introduction

Genetic genealogy presents significant opportunities for law enforcement to identify suspects in cases where neither the individual nor close relatives' DNA profiles are held on law enforcement databases [1]. Application of the technique does raise privacy concerns and issues around consent of donors. Policy ownership of this area is fragmented in many countries and internationally.

There remain challenges to the adoption of genetic genealogy for law enforcement purposes. The *General Data Protection Regulation*[1] faces emerging challenges with Big Data [2], and genetic analysis coupled with law enforcement application could create additional complexities. The technique appears valid under current judicial interpretation of the US Fourth Amendment, although the technique is yet to be challenged in court [3,4].

Forensic genetic genealogy, and other forensic genomic capabilities, sit within an intelligence paradigm [5,6]. The information they provide to investigators is not intended to be used as evidence, but rather as an investigative lead to narrow the suspect pool.

Application of this technique presents a number of privacy challenges. Apart from its ability to establish or disprove parentage and challenge notions of biogeographical ancestry [7], the technique has an international and cross-border element. The technique requires collection of significant genetic data from the putative sample which, despite precautions, might be subject a data spill or unauthorised access. Creating a repository of crime scene genealogy samples also re-enlivens the debate about potential analysis using techniques such as behaviour genetics [8]. Finally, there remain significant challenges around the consent of donors and challenges around deceased individuals who have previously uploaded genetic profiles [4].

2. Discussion

2.1. A policing or a forensic tool?

Use of genetic genealogy for law enforcement purposes is reliant on a combination of genetic and investigative analysis. The tool, like many others, is dependent on context and serves as information feeding into the intelligence process.

Intelligence can be defined as 'the collection, processing, integration, evaluation, analysis and interpretation of available information concerning … areas of actual or potential operation' [9]. Information about a possible genetic relationship between the putative donor of a crime scene sample and one or more publicly available genetic profiles is a form of intelligence collection. There are many steps required, in combining disparate datasets, before forming a hypothesis of identity.

Even the direct identification of the suspect from an online genealogy database – i.e. the return of a possible 'twin'– requires further investigative and forensic steps to verify both the integrity of the data and of the original crime scene sample. The investigative component increases the more remote the relationship between the uploaded crime scene profile and the genetic relations [10].

The intelligence cycle also requires that other forms of law enforcement information be assessed, through evaluation and analysis phases [6], before there

is a justification for using police resources to either covertly obtain a further DNA sample, or to execute an arrest.

Genetic analysis can itself be complex, particularly when the technique is applied to cold cases or degraded samples, which may contain mixed or partial genetic profiles [11,12]. In its forensic application, this brings in a data analytics component, manipulating raw genetic data into a compatible format for the required computational analysis.

The investigative component further draws on two distinct skillsets: police investigation and expert genealogy. Both have their own distinct doctrines or frameworks.

- In Australia, the Australian Government Investigation Standards provides a broad framework for managing investigations and for the training of investigators, including quality assurance processes, within Federal Government agencies [13].
- Genealogists have developed standards for best practice in research, and codes of ethics at the national level [14,15].

2.2. Bringing the approaches together

The policy ownership of this new capability is fragmented in most countries. In Australia, responsibility for privacy rests with the Office of the Australian Information Commissioner as well as certain State Government privacy agencies [16]. Other stakeholders include the National Association of Testing Authorities, with its role in overseeing forensic laboratory accreditation, and the National Institute of Forensic Sciences Australia and New Zealand.

In the United Kingdom, agencies with oversight include the Forensic Science Regulator, the Information Commissioner's Office and the Office of the Biometrics Commissioner. In the United States, the National Institute of Standards and Technology recognises the Scientific Working Group on DNA Analysis Methods as a key body for new forensic DNA developments.

Developing an agreed standards-based approach for the use of forensic genetic genealogy will need to draw from and de-conflict with a number of existing established protocols and standards used in forensic science and related industries, such as ISO 9001 2015, ISO/IEC 17025, ISO/IEC 17043:2010 and ISO/DIS 18385.2.

A standard could assist in codifying privacy and ethical obligations concerning genetic testing [17,18] as well as providing guidance in the context of proportionality and trust.

2.3. Regulatory options

Standards could form part of a regulatory regime for forensic genetic genealogy or broader forensic genomic capabilities. This could occur by either incorporating the agreed standards, procedures or operational limitations into legislative instruments, or by codifying certain restrictions through existing legislation such as the *General Data Protection Regulation* in the European Union.

Benefits of a legislative approach enforceability for both government and commercial providers and providing certainty for individuals who have consented to use of genetic data by online providers. A disadvantage to any regulatory approach is that a tendency to be too prescriptive could lead to the framework becoming outdated over time. Technological advances frequently outpace legislative reform in many countries.

2.4. Offences for improper use

Forensic genetic genealogy is a capability that is open to all. A standards-based approach, whether adopted voluntarily or as part of existing or new regulatory frameworks, would apply to law enforcement use of genealogy techniques. However, there is a potential for the technique to give rise to new forms of criminality.

Ney et al. wrote about the potential for individuals to take existing genetic data, 'edit' the computer's representation of that genome and develop 'synthetic cousins' [19]. This could result in the uploading of fake profiles into online genealogy databases. Coupled with fake family tree records, this could be used to create entirely fictitious families grounded in supposedly valid genetic samples.

In considering how to govern the use of forensic genetic genealogy, consideration now needs to be given to whether the misuse of genomic data, with the intent to commit fraud, is already captured by existing offences or whether new criminal laws need to be enacted.

3. Conclusion

Forensic genetic genealogy has quickly developed as a useful tool for investigators. The ability to use these techniques varies between jurisdictions, depending on public policy and interpretation of current privacy laws. It can be anticipated that there will be a strong public interest in police exploiting this technique to identify suspects, particularly for serious or violent crimes [20]. Equally, without an appropriate standards-based approach, bringing together investigative, intelligence, genealogical and forensic frameworks, there is the potential for a wider community backlash in police exploiting genetic genealogy, a field which several commentators have described as being the 'wild west' of privacy and public and health policy [21,22].

Declaration of Competing Interest

Nil.

References

[1] C. Phillips, The Golden State Killer investigation and the nascent field of forensic genealogy, Forensic Sci. Int. Genet. 36 (2018) 186–188.

[2] V. Mayer-Schönberger, Y. Padova, Regime change? Enabling big data through Europe's new data protection regulation, Columbia Sci. Technol. Law. Rev. 17 (2016) 315–402.

[3] N. Ram, C.J. Guerrini, A.L. McGuire, Genealogy databases and the future of criminal investigation, ScienceMag 360 (2018) 1078–1079.

[4] D. Syndercombe Court, Forensic genealogy: some serious concerns, Forensic Sci. Int. Genet. 36 (2018) 203–204.

[5] O. Ribaux, B.T. Wright, Expanding forensic science through forensic intelligence, Sci. Justice 54 (2014) 494–501.

[6] A. Ross, Elements of a forensic intelligence model, Aust. J. Forensic Sci. 47 (2015) 8–15.

[7] P. Morrison, Patt Morrison asks: Rachel Dolezal on racial fluidity and her changing identity, Los Angeles Times, Mar 8, 2017.

[8] D.H. Kaye, Behavioral genetics research and criminal DNA databases, Law Contemp. Probl. 69 (2006) 259–299.

[9] W.E. Gortney, Department of Defense dictionary of military and associated terms, Joint Chiefs of Staff Washington United States, 2016.

[10] N. Scudder, D. McNevin, S.F. Kelty, C. Funk, S.J. Walsh, J. Robertson, Policy and regulatory implications of the new frontier of forensic genomics: direct-to-consumer genetic data and genealogy records, Curr. Issues Crim. Justice 31 (2019) 194–216.

[11] E.M. Greytak, C. Moore, S.L. Armentrout, Genetic genealogy for cold case and active investigations, Forensic Sci. Int. (2019).

[12] D. Kennett, Using online genealogy databases in missing persons cases and to develop suspect leads in violent crimes, Forensic Sci. Int. (2019).

[13] Commonwealth of Australia, Australian Government Investigation Standards, Heads of Commonwealth Operational Law Enforcement Agencies, 2011.

[14] Board for Certification of Genealogists, Genealogy Standards, fiftieth anniversary edn, Ancestry, Nashville, TN, 2014.

[15] Australasian Association of Genealogists and Record Agents Inc, Code of Ethics, http://www.aagra.asn.au/code-of-ethics/, 2015.

[16] Office of the Australian Information Commissioner, Australian Privacy Principles Guidelines, 2015.

[17] S.-L. Wee, China uses DNA to track its people, with the help of American expertise, New York Times, Feb 21, 2019.

[18] R. Lessig, M. Rothschild, International standards in cases of mass disaster victim identification (DVI), Forensic Sci. Med. Pathol. 8 (2012) 197–199.

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[1] (EU) 2016/679

[19] P.M. Ney, L. Ceze, T. Kohno, Computer Security Risks of Distant Relative Matching in Consumer Genetic Databases, arXiv, 2018 arXiv:1810.02895.

[20] R. Williams, M. Wienroth, Social and ethical aspects of Forensic Genetics: a critical review, Forensic Sci. Rev. 29 (2017) 145–169.

[21] T. May, Sociogenetic risks — ancestry DNA testing, third-party identity, and protection of privacy, N. Engl. J. Med. 379 (2018) 410–412.

[22] A. Vaughan, Home DNA-testing firm will let users block FBI access to their data, New Scientist, Mar 13, 2019.