

Universal forensic DNA databases: Balancing the costs and benefits

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Abstract

The article considers the potential costs and benefits from the implementation of a universal forensic DNA database in Australia. In particular, it considers the impact that a database of this type would have on current issues associated with the use of DNA evidence in criminal investigation and prosecution, along with the relevant individual rights considerations. The article discusses the potential impact such a database would have on privacy rights, and balances these impacts against possible benefits, such as making investigations more targeted and efficient. The development of a database of this type is also discussed in light of the development of DNA and other biometric databases in Australia and other jurisdictions around the world.

Keywords

DNA evidence, DNA database, universal forensic DNA database, individual rights, criminal procedure, privacy, forensic evidence

This article examines DNA databases, focusing on Australia, but also drawing on examples from the United Kingdom and the United States. The article discusses the potential impact of universal forensic DNA databases – databases of the entire population – as a possible future development in the criminal justice system. The paper considers privacy rights, drawing on examples from other forms of biometric information held by law enforcement. These are discussed in light of potential benefits such a database may bring for obtaining evidence, identifying suspects and presenting evidence at trial. While a universal forensic DNA database (universal database) in Australia may seem somewhat radical and unlikely to be implemented at present, in the context of the current expansion in the use of other forms of biometric identification by the Australian Government, could be implemented at some point in the future. Considering its potential impact from a range of

perspectives, and drawing on perspectives from around the world, provides insights into a possible significant future development in the criminal justice system.

DNA databases

A DNA database is a collection of DNA profiles and associated information used to identify suspects in criminal investigations. A national DNA database of convicted offenders' profiles has been operational in Australia since April 2001.¹ The National Criminal Investigation DNA Database (NCIDD) was established with an amendment to the *Crimes Act 1914* (Cth) to enable inter-jurisdictional sharing of DNA profiles. It holds DNA profiles and information used to identify the individuals from whom they were derived.²

The NCIDD, initially operated by the CrimTrac Agency, and since 2016, by the Australian Criminal

¹Marcus Smith and Monique Mann, 'Recent Developments in DNA Evidence' (2015) 506 *Trends and Issues in Crime and Criminal Justice* 1.

²A table in section 23YDAF of the *Crimes Act* describes which categories of DNA profiles (suspects, convicted offenders etc) are permitted to be matched with other categories of DNA profiles held on the database.

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Intelligence Commission (ACIC), has operated since 2001. Its implementation followed the increasing use of DNA evidence in the 1990s in Australia and around the world. The NCIDD continues to expand and now holds more than 800,000 DNA profiles. In 2014–2015, the database expanded by 80,000 profiles, identified 30,000 hits from crime scenes to individuals, and established more than 25,000 matches from crime scenes to crime scenes. The NCIDD is used by police in all Australian jurisdictions to upload profiles and conduct searches.³

The NCIDD holds fewer profiles compared to the national DNA databases in the United Kingdom (UK) and the United States (US), where the populations are significantly larger. The US National DNA Index System (NDIS) contains approximately 13 million convicted offender profiles and 800,000 crime scene profiles.⁴ The United Kingdom's National DNA Database (NDNAD) contains approximately 6 million offender profiles and 600,000 crime scene samples and is the largest database in the world as a proportion of total population.⁵

Case law in the United Kingdom provides some context for the higher proportion of DNA profiles retained in that jurisdiction. The 2008 decision of the European Court of Human Rights (ECHR) in the case *S and Marper v United Kingdom* had a significant impact on government policy and legislation relating to DNA databases in the United Kingdom.⁶ In the *Marper* case, *S* (the first applicant), was an 11-year-old child arrested for the attempted theft of a bike, but was later acquitted, while *Marper* (the second applicant) was charged with the harassment of his partner, but also acquitted. Despite the absence of a conviction, their fingerprints and DNA profiles were retained indefinitely on the National DNA Database. The European Court of Human Rights ruled that permanent retention of fingerprint and DNA profiles of people who were unconvicted violated Article 8 of the European Convention of Human Rights (ECHR).⁷ The *Crime and Security Act 2010* (UK), which was enacted in response to this decision, stipulated that biometric data can only be retained for three years where a

person is charged with, but not convicted of, a criminal offence.

Around the time of the decision of the ECHR in *Marper*, government policy on the scope of DNA databases was widely debated in the UK, including whether a universal database of the entire population might be a more equitable option than permanently retaining the DNA profiles of suspects.⁸ In 2007, a senior judge, Lord Justice Stephen Sedley, argued that a universal database should be implemented on the basis that it was arbitrary and unfair that those who happened to have been in contact with the police had their DNA permanently retained, even if they had not committed a crime, while also highlighting the fact that more people would be convicted of crimes if everyone's DNA profile was included in a national database.⁹ The pioneer of forensic DNA profiling, Sir Alec Jeffreys, also advocated for a universal database around this time, proposing that it be created using DNA obtained from newborn babies.¹⁰

Universal forensic DNA databases

While the prospect of the entire population submitting to DNA testing may seem extreme and summon fears of government surveillance, in the context of recent developments concerning metadata and facial recognition, privacy implications may not be more significant than recently implemented data collection regimes.¹¹ A recently introduced facial recognition database includes everyone that holds a passport or drivers licence.¹² This database can be integrated with CCTV systems and potentially track individuals movements through public places in real time. Metadata can reveal who an individual communicates with and where they are whenever they are carrying a mobile phone.

The merits of establishing universal databases have been discussed in the literature and debated in a number of countries around the world over the past 15 years. Proponents assert that universal databases would significantly enhance the investigation and prosecution of crime and are fairer than the current approach because they treat all citizens equally.¹³

³Australian Criminal Intelligence Commission, *National Criminal Investigation DNA Database* <https://www.acic.gov.au/our-services/biometric-matching/national-criminal-investigation-dna-database>.

⁴US Federal Bureau of Investigation, *CODIS-NDIS Statistics* (December 2017) <http://www.fbi.gov/about-us/lab/biometric-analysis/codis/ndis-statistics>.

⁵United Kingdom Home Office, *National DNA Database Statistics* (18 January 2018) <https://www.gov.uk/government/statistics/national-dna-database-statistics>.

⁶*S and Marper v United Kingdom* [2008] ECHR 1581, 125.

⁷*S and Marper v United Kingdom* [2008] ECHR 1581, 125. The ECHR is a treaty established to protect human rights and fundamental freedoms in Europe. Article 8 deals with the right to respect for private and family life. It states that (1) everyone has the right to respect for his private and family life, his home and his correspondence and (2) that there shall be no interference by a public authority with the exercise of this right except such as is 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.

⁸Amitai Etzioni, *Privacy in a Cyber Age: Policy and Practice* (Palgrave, 2015) 159.

⁹*Ibid.*

¹⁰Frances Gibb, 'The DNA Scientist Who Made Individuals of Us All', *The Times* (London), 6 December 2005. This historical discussion of advancements in the development of DNA databases set the scene for a discussion of universal databases. For a more critical discussion, see, eg, Carole McCartney, 'DNA and Identification' in *The Routledge Handbook of Technology, Crime and Justice* (Routledge, 2016).

¹¹See, eg, Monique Mann and Marcus Smith, 'Automated Facial Recognition Technology: Recent Developments and Regulatory Options' (2017) 40 *University of New South Wales Law Journal* 121.

¹²*Ibid.*

¹³David Kaye and Michael Smith, 'DNA Identification Databases: Legality, Legitimacy, and the Case for Population Wide Coverage' (2003) 3 *Wisconsin Law Review* 413.

Conversely, others have highlighted the considerable cost that would be associated with creating the database and argue that it is not justifiable to include individuals who have not committed a crime.¹⁴

Public opinion of universal databases has been assessed in surveys in a number of countries. In Portugal, a survey of the general public published in 2014 found that 46 per cent of respondents would accept the inclusion of their DNA profile in the national database, and 23 per cent would refuse (with approximately 30 per cent undecided).¹⁵ A survey undertaken in Wales published in 2010, found that 60 per cent of participants supported a universal database.¹⁶ However, a New Zealand survey published in 2009 found that only 23 per cent supported a universal database.¹⁷ It appears that the opinions of the general public in a number of countries around the world on universal databases vary significantly. A survey of the Australian public on the topic would be an interesting addition to the literature.

Criminal investigation

A universal database could enable police to investigate and prosecute crime more efficiently and also provide a deterrent effect. Offenders who are arrested and convicted for the first time are unlikely to be included in the existing databases. It is possible that such offenders could have committed many crimes prior to being apprehended. A universal database could potentially prevent a number of these crimes from being committed by assisting to identify and convict criminals earlier.

A universal database has the potential to reduce instances of minority ethnic groups being targeted by police in criminal investigations, and accusations of racism and harassment. An individual would be under suspicion due to a match on the database rather than a witness statement alleging the offender was from a particular ethnic background. Where it was relevant to an investigation, it could provide greater justification for suspecting an individual of involvement in a crime and improve relations between police and minority groups.¹⁸

In the first use of DNA profiling technology – the 'Pitchfork case' in Leicestershire, United Kingdom – police undertook a mass screening of the entire male population of the town, identifying Pitchfork when it was apparent that he had asked another man to provide a sample on his behalf.¹⁹ Observing the behaviour of

those asked to provide a sample in a mass screening can be as important to the investigation as the technology of DNA profiling itself, as inferences can be drawn about the response of some individuals to this request.

Gans has argued that conducting 'DNA request surveillance' in mass screenings of a large number of volunteers, potentially infringes the privilege against self-incrimination 'because it forces individuals who are reluctant to undergo DNA profile surveillance to reveal that reluctance to investigators'.²⁰ On this argument, while purporting to be a consensual, voluntary process, mass screenings place the individual in a situation in which even by refusing to participate they are providing information to police and forced to participate against their will.²¹ As will be discussed in the next section, universal databases could contribute to addressing current individual rights issues associated with the collection of DNA evidence, such as this, and help to ensure that all members of society are treated equally in criminal investigations.

Benefits of a universal database

A universal database could facilitate comparison of the DNA profiles of all the individuals within a crime scene sample in minutes, saving a significant amount of resources and time in carrying out investigations. A universal database could allow police to screen a crime scene sample against the entire population, which could enhance investigative capacity and efficiency. It may reduce the need for police to request that an individual provide a sample in light of a specific crime and observe their behavioural response. An alternative perspective on this may be that creating a universal database actually breaches the privilege against self-incrimination. However, where the requirement to be included in the database applies equally to all citizens, no individual would be disadvantaged in relation to any other.²²

Issues that have arisen in cases where DNA evidence is relevant include matters such as whether the evidence was lawfully obtained, whether untested samples may be significant, whether the chain of custody was maintained and whether the suspects' samples could have been mislabelled or cross-contaminated during collection, storage or transportation.²³ A universal database would allow the DNA profiles of relevant persons to be known and excluded from crime scene samples where appropriate.

¹⁴Arnold Loewy, 'A Proposal for the Universal Collection of DNA' (2015) 48 *Texas Tech Law Review* 261.

¹⁵Helena Machado and Susana Silva, 'Would You Accept Having Your DNA Profile Inserted in the National Forensic DNA Database? Why? Results of a Questionnaire Applied in Portugal' (2014) 8 *Forensic Science International: Genetics* 132.

¹⁶Rebecca Stackhouse, 'Avoiding the Usual Suspects: Young People's Views of the National DNA Database' (2010) 29 *New Genetics and Society* 149.

¹⁷Cate Curtis, 'Public Perceptions and Expectations of the Forensic Use of DNA: Results of a Preliminary Study' (2009) 29 *Bulletin of Science, Technology and Society* 313.

¹⁸Kaye and Smith, above n 13.

¹⁹Joseph Wambaugh, *The Blooding* (Bantam, 1995). A 'mass screening' involves taking a biological sample and constructing DNA profiles of a group of people (such as all males over 16 years of age) in a specific geographical area.

²⁰Jeremy Gans, 'Something to Hide: DNA, Surveillance and Self-Incrimination' (2001) 13 *Current Issues in Criminal Justice* 168, 168.

²¹*Ibid* 181–2.

²²Decisions would need to be made about the inclusion of non-citizens and temporary visa holders in the database. While it is common for facial images and fingerprint data to be retained for most visa holders, DNA profiles would be more controversial, particularly for short-term visa holders such as tourists.

²³Marcus Smith, *DNA Evidence in the Australian Legal System* (LexisNexis, 2015) 108.

While it is already best practice to use exclusionary databases for investigators and laboratory staff, comparing samples against a universal database would be a far more comprehensive approach that could improve the accuracy of DNA profiling results. Further, a universal database may result in a reduced volume of testing that would be required in a specific investigation. It would establish a standard that could potentially be used to help ensure that laboratory work undertaken in response to a specific crime was accurate, by ruling out innocent and coincidental matches, and narrowing the investigation. Mistakes that occurred in analysing crime scene samples could also be identified and resolved more efficiently. It is logical that the more DNA profiles that a crime scene sample is compared with, the greater the opportunity for identifying errors and contamination. A universal database provides a comprehensive point of reference from this perspective, as well as the potential for reduced testing because of the large number of reference DNA profiles it offers. It is well established that inaccurate forensic evidence contributes to wrongful conviction in Australia.²⁴ A universal database could play a role in correcting some of these by significantly increasing the number of DNA profiles available to be compared with DNA profiles obtained from crime scenes.

A universal database may also assist investigations into missing persons and mass disasters. It would be a valuable resource, for example, in an airline crash involving multiple fatalities where unidentified bodies are found. Family members would not need to submit to DNA testing, remains from the disaster scene could be checked against the universal database and the time required to identify bodies would be reduced.



Criminal prosecution

When a match is found between an accused's sample and the sample found at the crime scene, it is presented at trial by an expert witness in terms of the probability that another individual selected from a population at random would have the same DNA profile. It is calculated using databases of allele frequency from a sample group of several hundred individuals randomly selected from the population.²⁵ While DNA evidence has been found to significantly increase the likelihood of obtaining a conviction at trial, research interviewing real jurors and conducting jury simulations has raised questions about jurors understanding and application of the science presented at trial.²⁶ While criminal prosecutors, defence lawyers and judges gain experience with these issues over time, jurors do not have prior training or experience in the field and are required to integrate this information with other evidence and decide the outcome of complex cases.²⁷

A universal database may begin to reduce some of the complexity associated with presenting DNA evidence at trial. If for instance, a database of all Australian residents existed, the prosecution may also be able to describe the DNA match in terms of the accused being the only other person in the country with the same DNA profile as the suspect sample obtained from the crime scene. At trial, the prosecution could also describe the evidence to a jury in terms of a match established in the universal database of the population. However, it should be acknowledged that a universal database would be founded on the same underlying science and statistics of DNA evidence. Issues such as contamination, transference and jurors placing too much reliance on scientific evidence would still require management.²⁸

Presenting evidence of a match on the universal database could add additional context beyond the current approach where statements are made by expert witnesses to the effect that it is billions of times more likely that the DNA originated with the accused than a randomly selected member of the population.²⁹ Statistics would remain an underlying aspect of comparing DNA profiles, and, while the potential for it may be reduced, there will always remain the possibility of human error in the evidence collection or testing process.

Rather than stating a match probability in terms of its expected frequency in the entire human population, a universal database could allow the prosecution to inform court that there is only one individual in the population with the same DNA profile (unless they

²⁴Rachel Dioso-Villa et al, 'Investigation to Exoneration: A Systemic Review of Wrongful Conviction in Australia' (2016) 28(2) *Current Issues in Criminal Justice* 157.

²⁵Smith, above n 23, 22.

²⁶Mark Findlay and Julia Grix, 'Challenging Forensic Evidence? Observations on the use of DNA in Certain Criminal Trials' (2003) 14 *Current Issues in Criminal Justice* 283.

²⁷Jane Goodman-Delahunty and Lindsay Hewson, 'Enhancing Fairness in DNA Jury Trials' (2010) 392 *Trends and Issues in Crime and Criminal Justice* 1.

²⁸The convictions in cases such as *R v Jama* (Unreported, Supreme Court of Victoria, Court of Appeal, 2009) and *Fitzgerald v R* [2014] HCA 28 highlight the need to always consider DNA evidence in the context of all of the available evidence in a case and to view it with some degree of scepticism.

²⁹*Forbes v The Queen* [2010] HCATrans 120.

have an identical twin). In an extremely unlikely case of more than one individual having the same DNA profile, it would be possible for investigators to exclude others, for example, by establishing where they were when the crime was committed. These issues would likely be identified in the process of compiling the database. Cross-referencing genetic relatives within the database would provide a means of validating the accuracy of the DNA profiles it contains (although this would have ethical issues, relating to paternity). A universal database match would allow DNA evidence to be presented without reference to statistically calculated match probabilities that are too large to be meaningful in the context of a criminal trial.

Individual rights considerations

The prospect of being included in a DNA database would be confronting for many, particularly those who had no prior contact with police. A key concern that could be raised in response to DNA database expansion is the vast and increasing amount of information that can be derived from an individual's genome and the potential for this to be used by governments or other entities in a manner that would compromise personal privacy. It would clearly be important for an appropriate legislative framework to be implemented in association with a universal database to restrict access to, and use of, information held in the database to purposes directly relevant to criminal investigation. As discussed in the first part of this article, forensic procedures legislation regulates permissible database matching and the use of information derived from it. Ryan argues that a risk of universal databases is that they may be used in the future by government for purposes that are not currently envisaged.³⁰ However, DNA profiles do not contain any meaningful information about an individual apart from a capacity to identify them. A universal database (of the type discussed here) would not require biological material to be retained after collecting a DNA profile, or for any other types of genetic analysis to be conducted, and would be founded on legal principles developed for DNA evidence over the past 30 years.

It has also been suggested that a universal database may place the entire population under suspicion and amount to a government surveilling its citizens.³¹ However, if the entire population of a jurisdiction were included in the universal database, individuals would fall under suspicion only when a match occurred. A wide range of personal information is currently held by government. When an individual applies for a driver's license at the motor vehicle registry, a photograph and physical description are recorded, along with relevant medical

history. The tax office holds a wide range of personal information about individuals for the purpose of administering its functions. The information in these databases is regulated by privacy principles but is available to be used in the course of law enforcement investigations where necessary.³² Creating DNA profiles would be a significant step forward from the types of data that are collected by government, and DNA evidence carries significant weight in criminal trials. A strict legal framework would therefore be required to govern how it would be stored and used.

Conclusion

Universal databases have been discussed in academic literature over the past 15 years and have been publicly debated in the UK. Universal databases are considered by some to compromise individual rights; however, they may be relatively less invasive than recent developments in the retention of metadata and biometric information.

The prospect of the entire population of a country, such as Australia, being required to have their DNA profile included in a national database is an entirely theoretical prospect at this point in time. Examining the potential impact of universal databases provides an alternative perspective on current issues associated with DNA evidence in the Australian criminal justice system. Such a database could potentially enhance the investigative capacity of police, enabling suspects to be identified more quickly, reduce the amount of laboratory testing that would be required in response to a specific crime, and improve the presentation of DNA evidence in court. However, benefits must be weighed against the potentially significant infringement of privacy rights, the privilege against self-incrimination and the potential for such a database to be misused. Such a database may seem radical at this point in time, however, given the continuing expansion in the retention of biometric information, if one looks far enough ahead, it may be inevitable.

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³⁰Meghan Ryan, 'The Privacy, Probability, and Political Pitfalls of Universal DNA Collection' (2017) 20 *SMU Science and Technology Law Review* 3, 13.

³¹Nuffield Council on Bioethics, *The Forensic use of Bioinformation: Ethical Issues* (September 2007) <http://nuffieldbioethics.org/wp-content/uploads/The-forensic-use-of-bioinformation-ethical-issues.pdf>.

³²Kaye and Smith, above n 13.