

A multifaceted, multijurisdictional, multiagency, and multidisciplinary approach to investigating unidentified and missing persons cases in Australia

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ARTICLE INFO

Keywords:

Missing persons
Unidentified human remains
National DNA program
Multidisciplinary forensic approach
Human identification
Biometric databases

ABSTRACT

Currently, there are approximately 750 unidentified human remains and 2500 long-term missing persons in Australia. The Australian Federal Police National DNA Program for Unidentified and Missing Persons (Program) is using a multifaceted, multijurisdictional, multiagency, and multidisciplinary approach in a dedicated effort to identify these unknown deceased persons, scientifically link them to known missing persons, and provide answers to their families. The nationally coordinated Program provides its police, forensic, and coronial stakeholders with a suite of contemporary forensic technologies, databases, and experts to forensically examine the skeletonised remains and recover post-mortem data for comparison to the available ante-mortem data for each missing person. Through a number of physical and virtual public outreach activities, families with missing relatives have been encouraged to provide vital ante-mortem forensic information, records, and samples to aid the identification process. To date, this unique Program has assisted to resolve a number of unidentified and missing persons cases from both historical and contemporary contexts, using a combination of genetic and non-genetic techniques, and local and national databases. The centralisation of Program capabilities, expertise, and resources to conduct this type of unique and challenging casework is proving to be the most effective and efficient way to generate investigative leads, identify human remains, and resolve long-term missing persons cases in Australia.

1. Introduction

The Australian Federal Police (AFP) National DNA Program for Unidentified and Missing Persons (Program) commenced in July 2020 and is funded by proceeds of crime until December 2023. This Australian-first initiative reflects international best practice guidelines for the establishment of national DNA identification programs for missing persons [1–3] and models other exemplar international DNA-led identification efforts such as the International Commission on Missing Persons [4].

The latest national case audit recorded approximately 750 unidentified human remains (UHR) and 2500 long-term missing persons (LTMP) cases in Australia as of July 2022 (Fig. 1), and the availability of post-mortem (PM) or ante-mortem (AM) data for each case. The case review process also identified opportunities for Program assistance to aid these investigations. The objective of this multifaceted, multi-jurisdictional, multiagency, and multidisciplinary Program is to use

centralised and contemporary forensic technologies, databases, experts, and stakeholder engagement activities to generate and/or link PM and AM data in a dedicated effort to identify these nameless individuals and provide their families with answers.

2. Forensic capabilities

Following completion of a Program-wide privacy impact assessment, the Program introduced multiple forensic human identification technologies to the AFP, leveraged existing AFP expertise, and partnered with external service providers for other specialist capabilities. The Program's suite of forensic tools includes forensic anthropology, forensic odontology, radiocarbon dating, isotope analysis, autosomal short tandem repeat (aSTR) testing, Y-chromosome STR (Y-STR) testing, mitochondrial DNA (mtDNA) testing, species identification, biogeographical ancestry (BGA) and externally visible characteristics (EVCs) estimation, forensic investigative genetic genealogy (FIGG), and

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<https://doi.org/10.1016/j.fsigss.2022.09.020>

Received 20 September 2022; Accepted 27 September 2022

Available online 28 September 2022

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craniofacial reconstruction (CFR).

3. Biometric databases

The Program utilises a number of national and international law enforcement databases to link UHR and LTMP cases, including the:

- National Missing Persons and Victim System (NMPVS) – for national searches of UHR and LTMP case or forensic (e.g. dental) data
- National Criminal Investigation DNA Database (NCIDD) – for national direct searches of UHR and LTMP aSTR profiles
- NCIDD-Integrated Forensic Analysis (NIFA) – for national kinship searches of UHR and relatives of LTMP aSTR (and Y-STR and mtDNA) profiles
- INTERPOL DNA Database – for international direct searches of UHR and LTMP aSTR profiles
- I-Familia – for international kinship searches of UHR and relatives of LTMP aSTR (and Y-STR and mtDNA) profiles

Reference, private, and public DNA databases are also utilised for lineage (e.g. EMPOP, YHRD), BGA (e.g. Snipper) and EVCs (e.g. HirisPlex-S) estimation, and FIGG (e.g. GEDmatch PRO™, FamilyTreeDNA).

4. Specialist facilities

DNA testing is primarily performed in the Program’s specialist DNA laboratory at the AFP Forensics Facility by a team of dedicated forensic biologists, where a medium-throughput, all-inclusive, and enhanced DNA testing workflow has been validated to improve the quality and quantity of genetic information recovered from skeletonised remains. Other forms of forensic testing are performed in-house at the AFP (e.g. CFR) or outsourced to Australian (e.g. radiocarbon dating) and overseas (e.g. FIGG) forensic laboratories. Various forensic specialists have also been engaged to support different Program activities (e.g. Forensic Odontologist, Forensic Genomics Specialist).

Program staff and postgraduate students are also conducting research at the Australian Facility for Taphonomic Experimental Research to validate and/or optimise new forensic techniques or kits on donated human bodies, or derived samples, before implementing them at the AFP and applying them to UHR casework (e.g. CFR, ForenSeq™ Kintelligence Kit).

5. Family & public engagement

A family engagement and public communication strategy using traditional and social media, podcasts, public seminars, and online resources was implemented to appeal to LTMP families to report missing family members and participate in the Program. An online *Missing Person Details Form* was designed to collect vital information about each LTMP from families to support the police and forensic investigation (e.g. physical, residency, ancestry, health, lifestyle information), with 60 forms being received since it launched in June 2022. The Program also facilitates the provision of LTMP family reference samples and collection of LTMP personal effects, medical and dental records, genealogy charts, and photographs, by connecting families with State and Territory police, providing additional forensic experts and/or funding to prioritise the collection and upload of AM data (e.g. dental records), and public calls to action.

6. Legislation, policy & education

The Program is assisting to drive legislative reform, develop national policies, and educate stakeholders on best practice to improve the national and international comparisons of biometric data for UHR-LTMP investigations through a number of initiatives:

- Seeking to amend the *Crimes Act 1914* (Cth) to include a ‘Missing Persons Relatives’ index and permit searching of foreign UHR, LTMP, and LTMP relative’s DNA profiles on the NCIDD and NIFA
- Designing a model consent form for LTMP relatives to ensure informed consent is sought for their DNA to be used by the AFP, subjected to all relevant modes of DNA testing, and searched on national and international law enforcement DNA databases
- Devising and delivering targeted training programs and procedural guides for NMPVS users
- Revising the *Australia New Zealand Missing Persons Policy* (2020) [5] and promoting best practice guidelines in relevant fora based on Program learnings
- Publishing information about the Program’s DNA testing and database procedures on its website (<https://www.missingpersons.gov.au/support/national-dna-program-unidentified-and-missing-persons>) so LTMP relatives and the public understand how their (and UHR and LTMP) DNA will be used for identification purposes

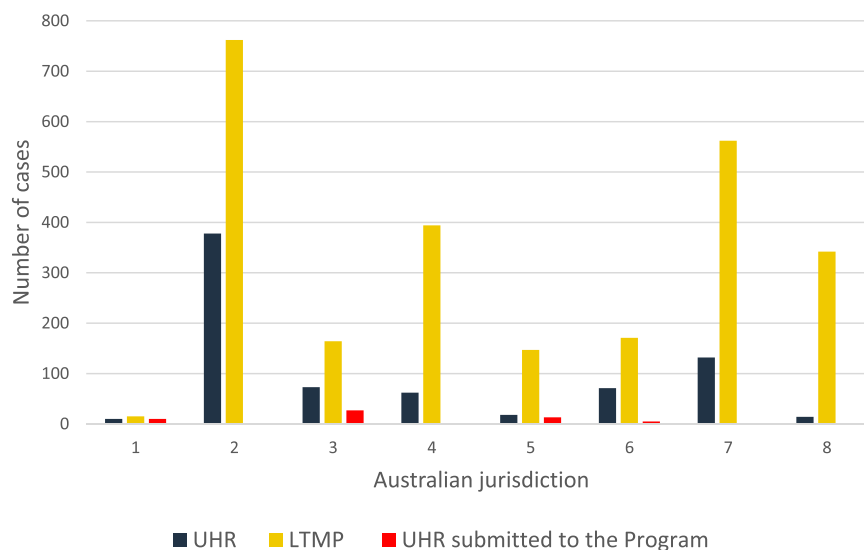


Fig. 1. The number of unidentified human remains (UHR), long-term missing persons (LTMP), and UHR cases submitted to the National DNA Program for Unidentified and Missing Persons per Australian jurisdiction (as of July 2022).

7. Program progress to date

The number of NMPVS records has increased by 148 for UHR (total records: 834) and 737 for LTMP (total records: 2787) since the Program commenced, and existing records have been populated with newly sourced dental records where available. The number of NCIDD DNA profiles has increased by 10 for UHR (total profiles: 208) and 74 for LTMP direct reference samples (total profiles: 510) since the Program commenced. The collection and processing of LTMP family reference samples for the NIFA is ongoing, following the launch of the kinship searching functionality in March 2021. Further work is required to align the data in the various national databases with active cases.

The Program has received 56 UHR cases from five (out of eight) police jurisdictions to date (Fig. 1). The UHR have been, or are in the process of being, subjected to one or more forms of forensic testing, including forensic anthropology (10 cases), radiocarbon dating (14 cases), and DNA testing (36 cases). The modes of DNA testing have primarily included aSTR (21 cases) and Y-STR testing (18 cases), with a small number of cases subjected to BGA/EVCs estimation (1 case), species identification (1 case), and FIGG (2 cases).

The use of anthropological examination, radiocarbon dating, and species identification has assisted to identify a number of UHR not suitable for further forensic testing (e.g. ancestral, anatomical, non-human specimens). So far, an NMPVS dental record search has resulted in one cross-jurisdictional UHR-LTMP match and DNA profiles recovered from UHR have resulted in six matches to LTMP locally, contributing important evidence for coronial investigations. Additionally, the Program recovered Y-STR evidence to assist the Royal Australian Navy identify the Second World War ‘Unknown Sailor’.

8. Conclusion

The Program’s activities have enabled the triaging of UHR of coronial significance and resolution of both historical and contemporary UHR cases by applying a multidisciplinary forensic approach using a combination of genetic and non-genetic techniques. Additionally, the multifaceted nature of the Program has contributed to innovatively addressing PM and AM data deficiencies to benefit investigations, using new facilities, techniques, databases, and family outreach campaigns.

However, more identifications will be obtained by: increased participation in the Program; continued population of national databases; greater utilisation of international law enforcement, private, and public DNA databases; championing of new forensic capabilities; removal of legislative barriers hampering national and international biometric data searching; development of policies and procedures to achieve national standardisation of forensic practices for UHR-LTMP investigations; and exhuming interred UHR.

In the absence of an identification, other forms of forensic testing will continue to provide investigative leads including estimating the UHR’s year of birth and death, residence and travel history, ancestral origin, hair and eye colour, facial appearance, and genetic relatives.

The success of the Program has centred on forging collaborative partnerships with: police, coronial, forensic, and intelligence agencies across Australia; national and international forensic experts in government, university, and private laboratories; and families of LTMP who are integral to this identification effort.

In the lead up to this proceeds of crime funded Program ending in December 2023, the author will continue to advocate for this unique, dedicated, and advanced human remains identification capability to be embedded permanently as the *Australian Centre for Forensic Human Identification* to assist with the effective and efficient identification of missing and deceased Australians into the future.

Role of the funding source

The National DNA Program for Unidentified and Missing Persons received funding from the Criminal Assets Account under the *Proceeds of Crime Act 2002* (Cth).

Conflict of interest statement

None.

Acknowledgments

I would like to thank:

- the Australian Department of Home Affairs for funding.
- the AFP National DNA Program for Unidentified and Missing Persons, National Missing Persons Coordination Centre, and Forensics members who have contributed to the establishment, operations, and administration of the Program.
- our State, Territory, and Commonwealth police, forensic, coronial, and intelligence agency partners.
- our Australian and overseas government, university, and private laboratory partners.
- families of missing persons.

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