

Developing a Forensic DNA Legislative Framework & Policy for Africa

Dr Aaron Amankwaa

Assistant Professor in Forensic Science

Department of Applied Sciences

Northumbria University

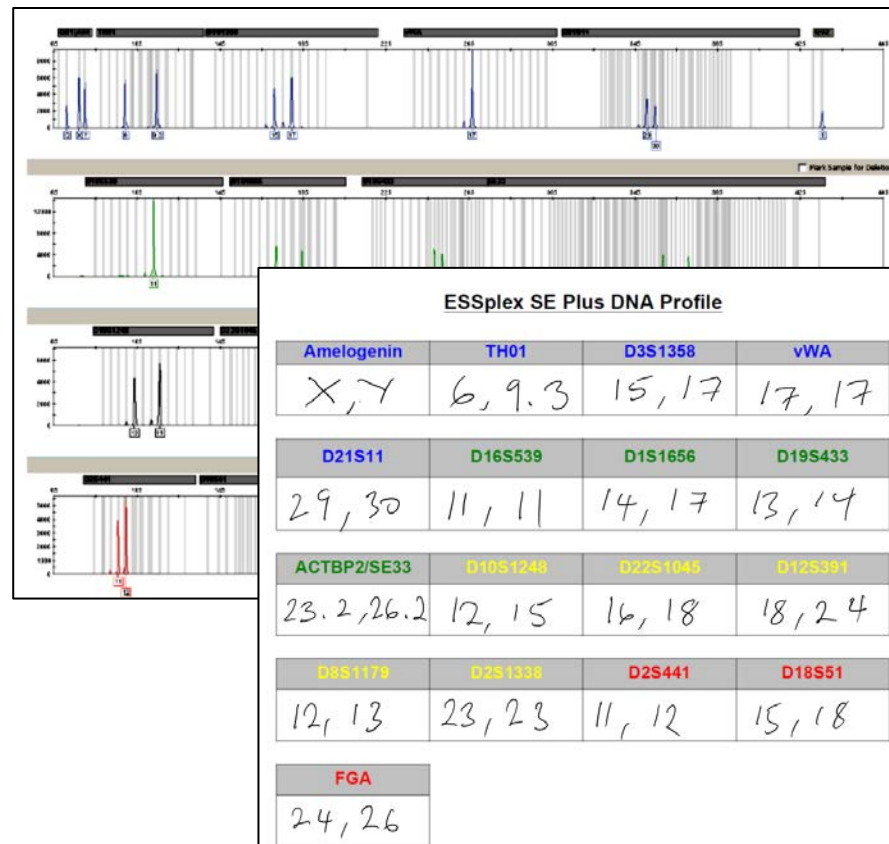
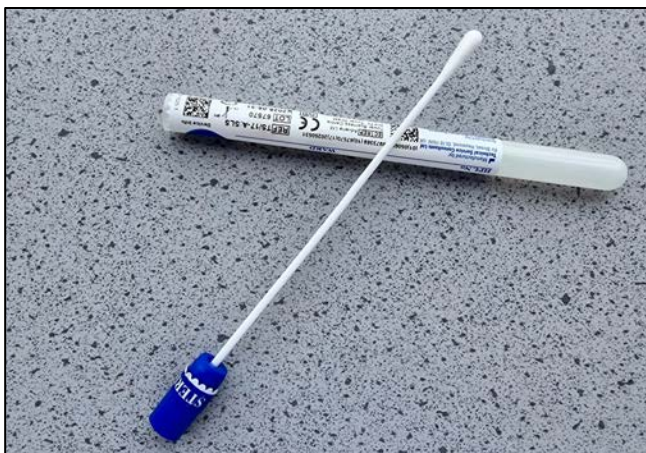
aaron.o.amankwaa@northumbria.ac.uk



Overview

1. Describe forensic DNA, DNA databases and the value of forensic DNA in criminal investigations
2. Discuss the status of the use of forensic DNA/databases in Africa and globally
3. Describe the importance of harmonisation of DNA analysis/databases – transnational exchange of DNA data
4. Using the UK NDNAD as a case example, discuss the impact/effectiveness of DNA evidence to all recorded crime
5. Discuss why it is important to regulate the use of forensic DNA
6. Describe a model for the development of a regulatory framework for forensic DNA analysis in Africa

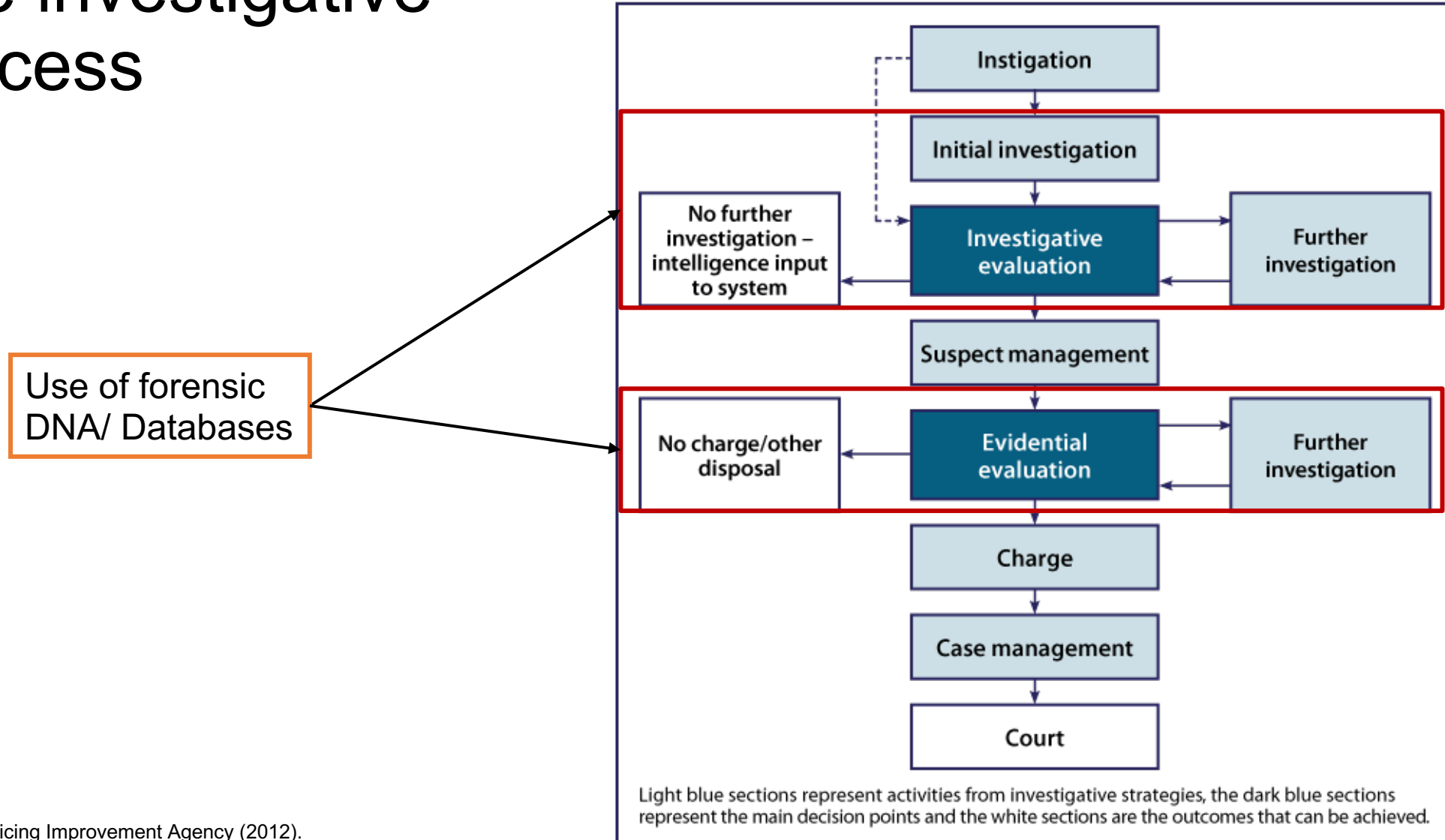
Introduction: Forensic DNA (STR) Profile



Introduction: Intelligence DNA Databases

- Electronic/physical archive of forensic information/material
- Distinction between a database and databank
- Automated or semi-automated forensic comparisons
- Establishing unknown links
 - Reference vs questioned
 - Reference vs reference
 - Questioned vs questioned
- Provides intelligence

The investigative process



National Policing Improvement Agency (2012).

Introduction: NDNAD Case Study

- 1997 burglaries
- 1988 rape
 - 27 year old woman
- Cold Case Review
 - Cleveland & North Yorkshire Major Investigation Team
 - Semen from victim's skirt
 - DNA 17 profile loaded in NDNAD
- NDNAD hit in 2017
 - Andrew Pennington
- Jailed for 10 years in 2018



<https://www.bbc.co.uk/news/uk-england-york-north-yorkshire-43487340>

DNA Profiling in Africa



- [Publicly available information](#) indicates about **1.3M** forensic DNA profiles held in the region
 - Botswana: >3800
 - Egypt: >4,162
 - Ghana: >1,193
 - Namibia: >1866
 - **South Africa: >1,240,168**
 - Tunisia: >17,070

National forensic DNA databases



Continent/region	Country	Number
Africa	Algeria, Botswana, Egypt, Morocco, Mauritius, Namibia, South Africa, Sudan, Tunisia.	9
Asia	Bahrain, China , Indonesia, Iran, Israel, Jordan, Japan, Kuwait, Lebanon, Malaysia, Qatar, Saudi Arabia, Singapore, South Korea, Syria, United Arab Emirates, Uzbekistan.	17
Europe	Albania, Austria, Azerbaijan, Belarus, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Russia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom .	40
North/South America	Argentina, Brazil, Canada, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Honduras, Jamaica, Panama, Peru, St Lucia, United States of America , Uruguay.	15
Australasia	Australia, New Zealand.	2
Total		83

Amankwaa, A. O. (2018); FGPI. (2017, December 18); INTERPOL. (2019)

Transnational Exchange of DNA Data


- The EU Prüm Framework
 - Network of separate national databases of member countries
 - DNA, fingerprints & vehicle registration information
- Prüm Treaty signed by
 - Austria, Belgium, France, Germany, Luxembourg, the Netherlands, and Spain on 27 May 2005
- Adopted into EU legislation in 2008
 - Requires all member states to create a database that can be accessed by other member countries.
- More than 7 million subject profiles and 1 million scene profiles

FORENSIC SCIENCES RESEARCH
2020, VOL. 5, NO. 1, 8–14
<https://doi.org/10.1080/20961790.2019.1565651>



Taylor & Francis
Taylor & Francis Group

REVIEW OPEN ACCESS [Check for updates](#)

Trends in forensic DNA database: transnational exchange of DNA data

Aaron Opoku Amankwaa 

Science and Justice Research Interest Group, School of Law, Northumbria University, Newcastle Upon Tyne, UK

ABSTRACT

The transnational exchange of forensic DNA data has become a modern trend in fighting cross-border crime, terrorism and illegal immigration. Forensic DNA data allow the police to identify, eliminate or link individuals associated with a crime. Additionally, different crime scenes can be linked via the DNA profile to identify serial offenders or determine crime patterns. Approaches to the transnational exchange of DNA data can be categorized into four: (1) creation of an international DNA database, (2) linked or networked national DNA databases, (3) request-based exchange of data, and (4) a combination of these. Most countries operate the combination system of data exchange. This paper briefly introduces the different approaches in the transnational sharing of forensic DNA data, the legislative and operational framework, pattern of data exchange and participating states, and policy challenges associated with data sharing. Generally, most DNA exchange systems are modelled as the European Union Prüm regime. This operates under two stages: hit/no-hit query and further information sharing. The scope of the data exchange is governed by individual national legislation that determines the type of information that can be shared and the national authority responsible for the system. Though DNA data exchange has been instrumental in resolving serious crimes such as gang and serial rape, and armed robbery, adequate information about their overall effectiveness and efficiency is lacking. Further, operational, legal and ethical challenges including issues of privacy and proportionality appear to limit the full potential of the DNA data exchange system.

ARTICLE HISTORY

Received 13 July 2018
Accepted 2 January 2019

KEYWORDS

Forensic DNA exchange; Prüm; forensic DNA legislation; genetic privacy; proportionality; social security

NDNAD Case Study

- 20th April 2018: importation from Netherlands to Dover
 - six firearms concealed in car; ammunition individually wrapped in brown tape
- 1st September 2018: importation from Holland to Immingham
 - led to the seizure of ten Heckler and Koch P2000 semi-automatic firearms and approximately 250 rounds of live compatible ammunition.
- Analysis of DNA taken from the weapons and packaging
 - identification of two brothers; Daniel Burdett present at both scenes and Richard Burdett at one.
 - Both were in Holland, with Daniel being on the run for 5 years.
- European Arrest Warrants:
 - Richard Burdett & Daniel Burdett arrested and returned to the UK
- Both found guilty after trial in September 2021
 - 25 years for Daniel Burdett and 18 years for Richard Burdett
- Further DNA links were made via Prüm DNA exchange to France and the Netherlands

Liverpool fugitive jailed after Christmas Day meal arrest

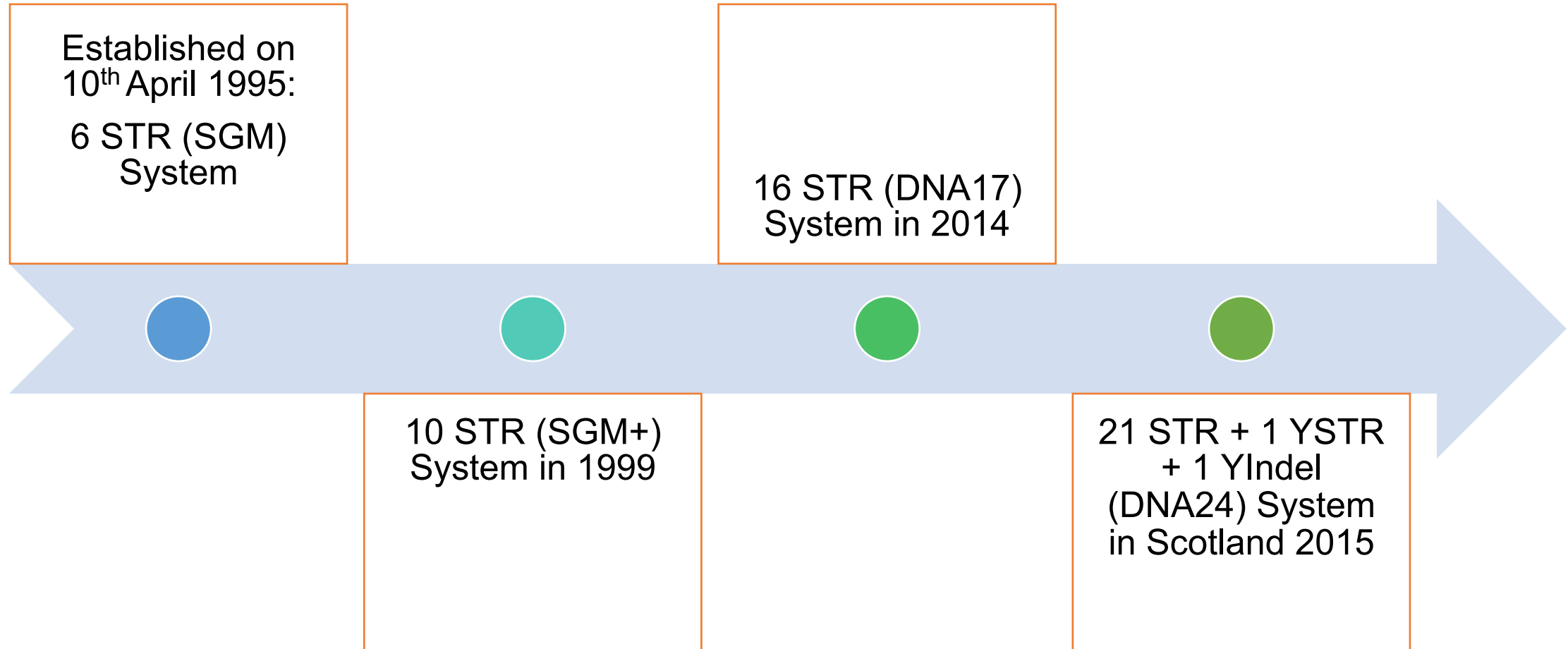
© 22 September 2021



Daniel (left) and Richard Burdett were described as "dangerous criminals"



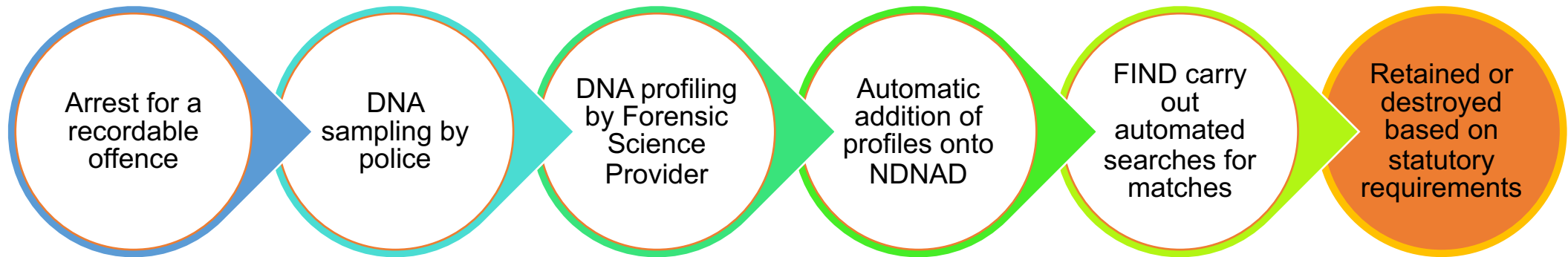
Forensic DNA Databasing in UK



Core Loci

United Kingdom NDNAD core loci	United States core loci (CODIS)	European standard set loci	Interpol standard set loci
Amelogenin	Amelogenin	Amelogenin	Amelogenin
TH01	TH01	TH01	TH01
D3S1358	D3S1358	D3S1358	D3S1358
vWA	vWA	vWA	vWA
D21S11	D21S11	D21S11	D21S11
D8S1179	D8S1179	D8S1179	D8S1179
D18S51	D18S51	D18S51	D18S51
FGA	FGA	FGA	FGA
D10S1248	D10S1248	D10S1248	
D22S1045	D22S1045	D22S1045	
D12S391	D12S391	D12S391	
D2S441	D2S441	D2S441	
D1S1656	D1S1656	D1S1656	
D19S433	D19S433	D19S433	
D16S539	D16S539	D16S539	
D2S1338	D2S1338	D2S1338	
SE33	CSF1PO	SE33	
	D7S820		
	D13S317		
	TPOX		
	D5S818		

Inclusion criteria – reference profile



Inclusion criteria – crime scene profile



National DNA Database (NDNAD)

>9% of the UK
population

Data source: all UK
forces

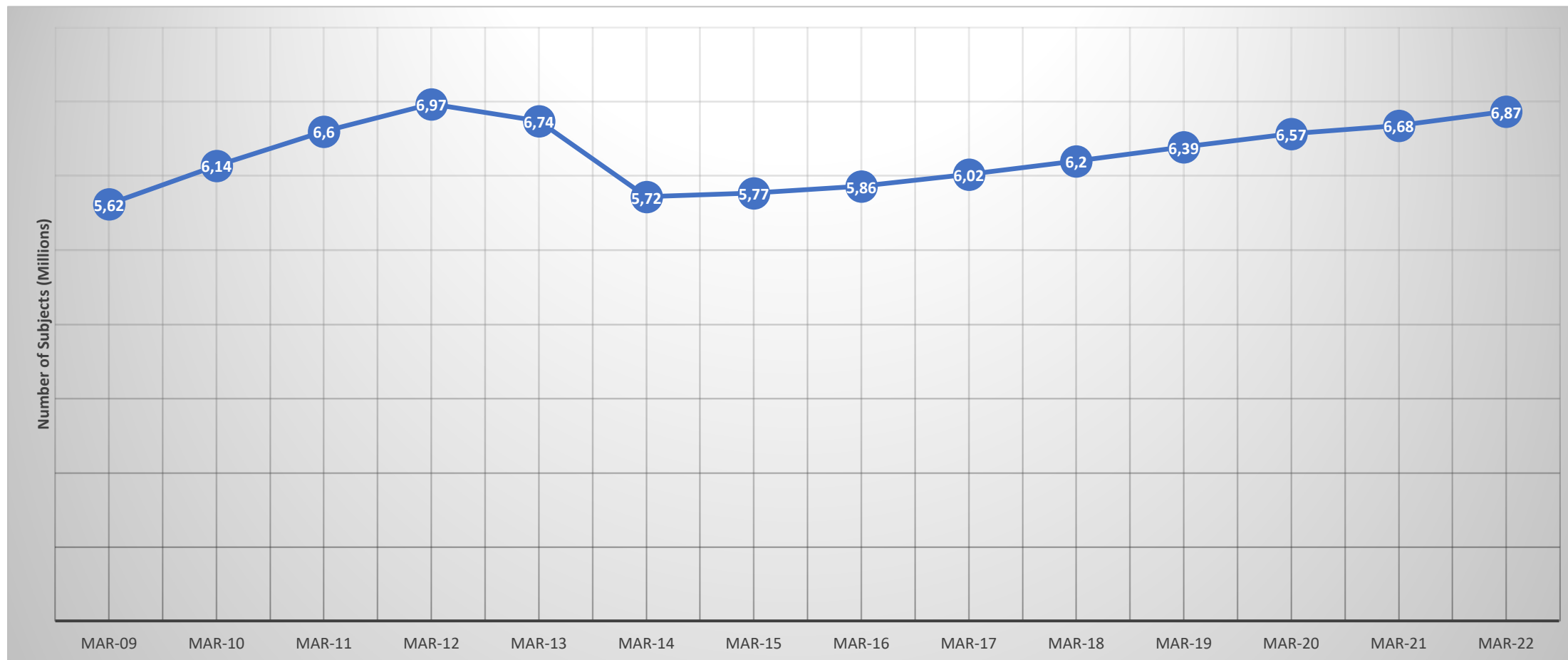
~7M subject profiles
~5.9M individuals
4,381 Volunteers

670,817 crime scene
profiles

~776,488 matches*
(04/2001 – 03/2022)
64.8% match rate

Crime resolution: **<1%**

Growth of NDNAD Subject profiles

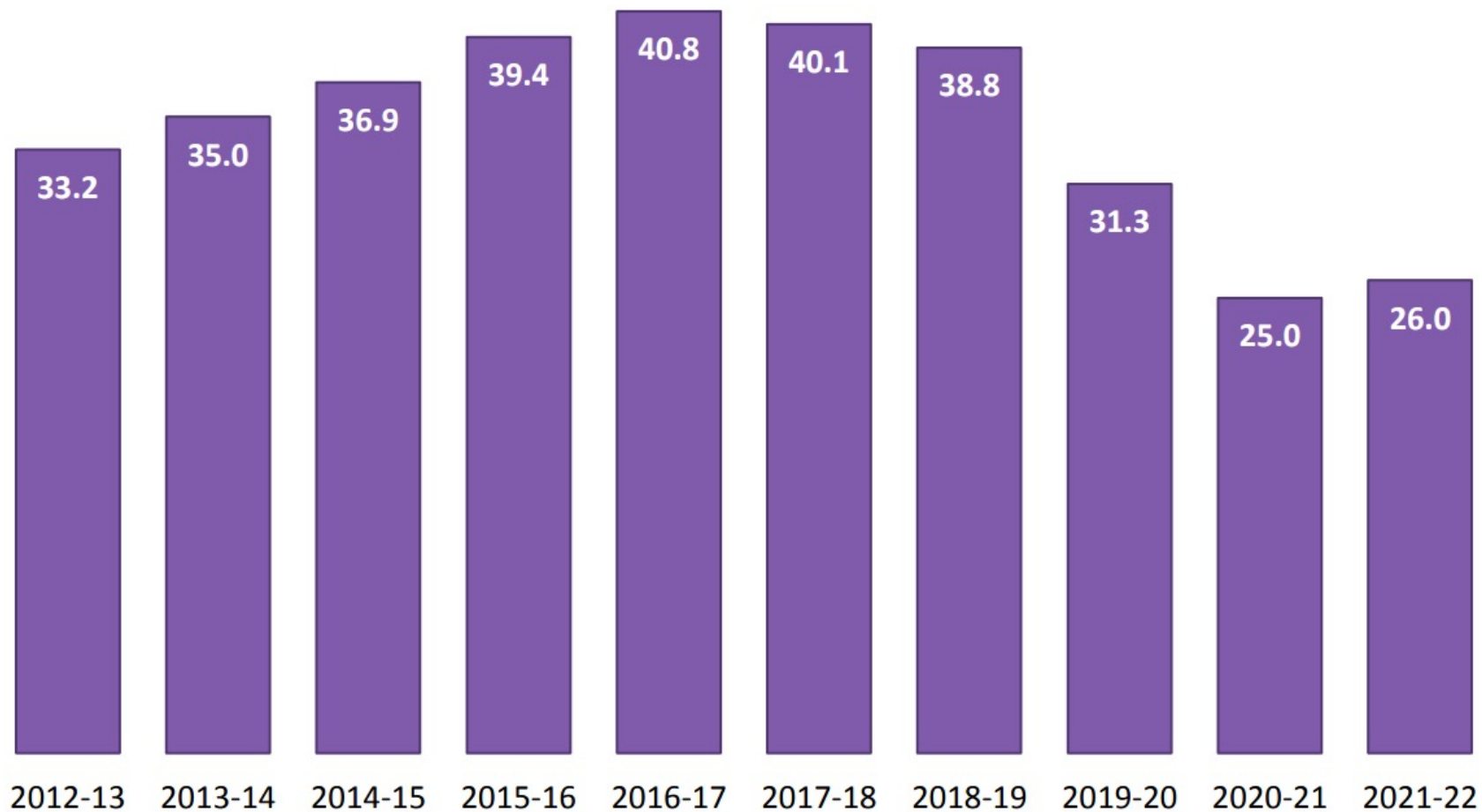


FIND Strategy Board (2023)

Number of subject profiles loaded per year (in thousands)



Scene profiles loaded per year (in thousands)



Number of matches 2021/22

- Routine subject-to-crime scene matches: **22,477**
- Crime scene-to-crime scene: **1,052**
- Non-routine partial matches: **4,375**
- About **221,531** crime scene profiles are yet to match a subject profile

Crime	Matches
Burglary (including aggravated)	8,472
Vehicle crime	3,409
Criminal damage	1,529
Violent crime	1,593
Drugs	2,108
Robbery	990
Theft	397
Rape	550
Homicide (including attempted) and manslaughter	644
Traffic (including fatal)	505
Firearms	134
Other sexual offences	644
Arson and fire investigations	473
Fraud	57
Public order	100
Abduction and kidnapping	168
Blackmail	10
Explosives	3
Other ⁵²	1,149
TOTAL	22,477

FIND Strategy Board (2023)

Impact & Limitations

- Scene attendance
- Recovery of Biological material
- DNA yield
- **Probative value of DNA**
 - Alternative tools
 - Circumstantial evidence

	All Crimes	Theft of Vehicles	Domestic Burglaries	Rapes	Homicides
Total police recorded crime	3,775,365	80,058	189,951	34,402	1,265
Crime scenes examined	11% (416,715)	28.7% (23,009)	80.3% (152,444)	19.8% (6,818)	96.9% (1,226)
No. which yielded DNA	2.4% (89,149)	11.3% (9,084)	13.3% (25,210)	7.8% (2,679)	63.5% (803)
No. DNA submitted for analysis	1.8% (68,055)	8.1% (6,519)	10.1% (19,368)	6.4% (2,201)	38.7% (490)
No. loaded onto database	0.5% (22,584)	2.3% (1,862)	3.4% (6,438)	1.1% (387)	10.4% (132)
No. linked to outcome	0.3% (11,378)	0.9% (759)	1.4% (2,589)	0.6% (215)	8.4% (108)

Wiles (2017)

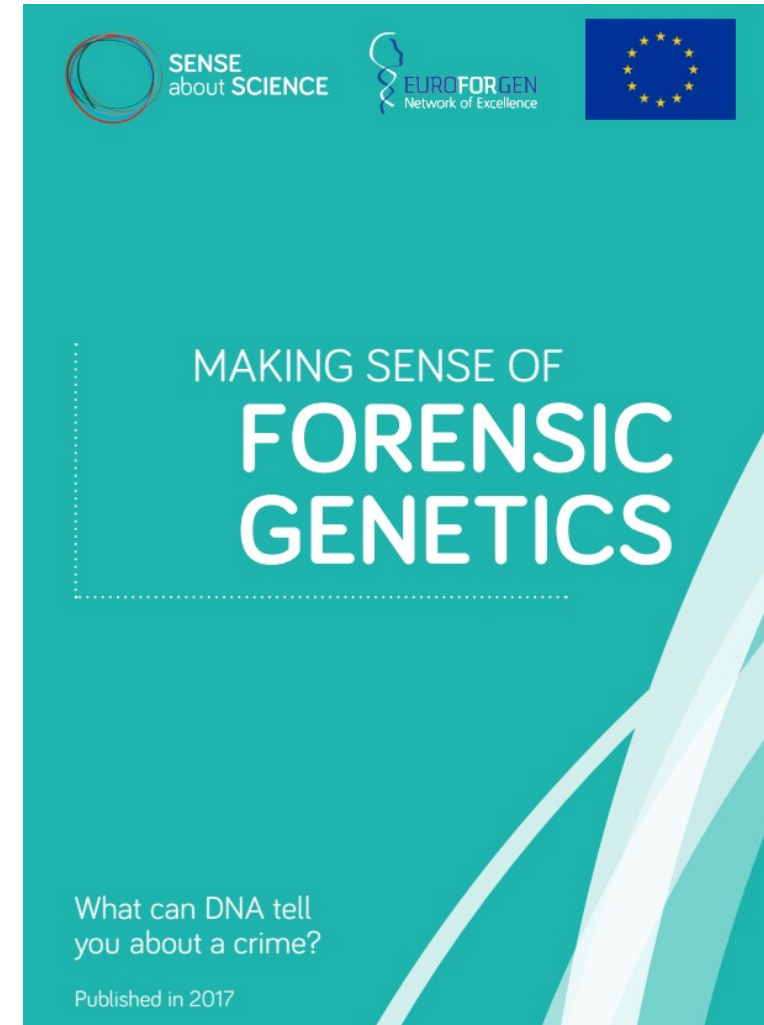
Advantages & Limitations

- Advantages
 - identification of unknown suspects
 - identification of linked offences through stain-to-stain matches
 - for criminal career research to understand the behaviour of known or unknown serial offenders and to study crime patterns
- Disadvantages/Limitations
 - Databases are not comprehensive
 - success of the NDNAD is largely based on the addition of relevant/quality incident/scene DNA
 - DNA database matches are not always probative

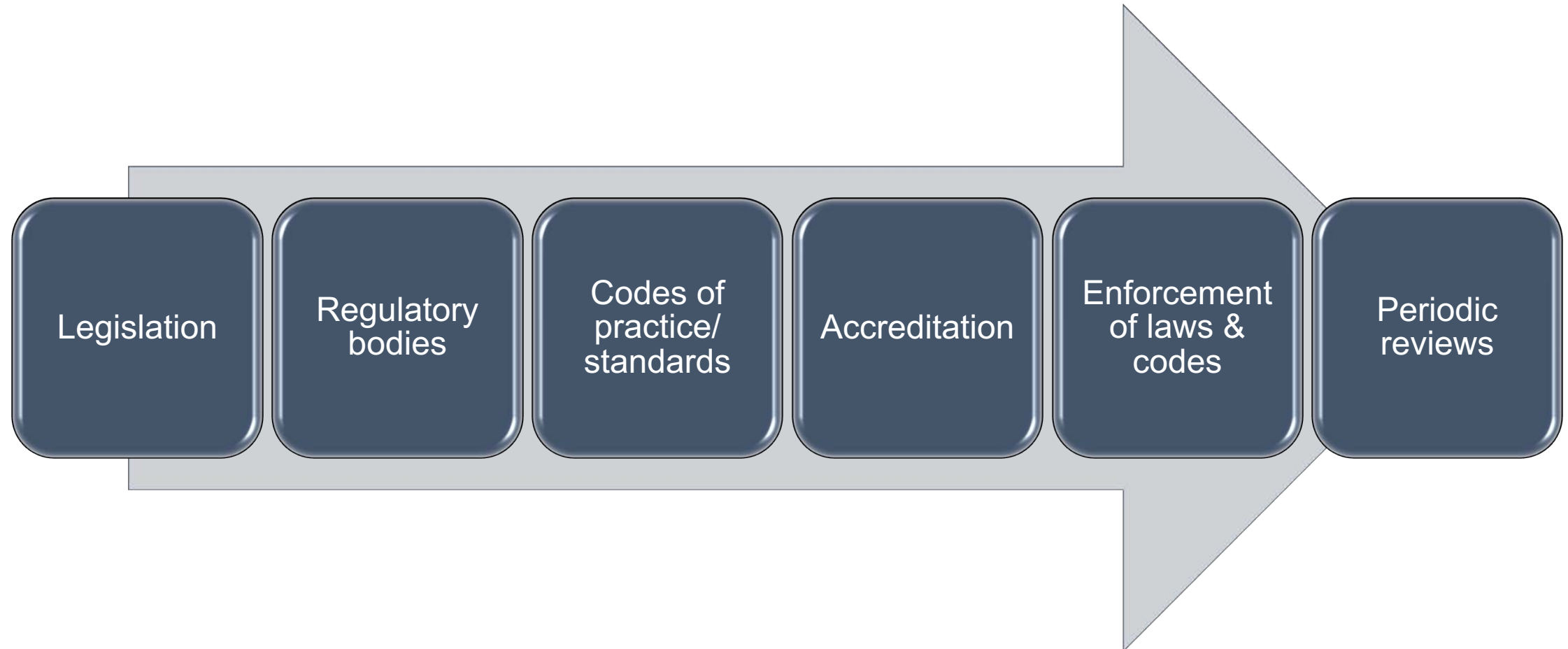
Regulation of Forensic DNA Profiling & Databases

Why regulate DNA Profiling & NDNAD? & How?

- **Adventitious matches**
 - Raymond Easton case 1999
- Transfer & Persistence
- Public security concerns
- Probative value of DNA
- Article 8 rights - Privacy issues
- “Genetic exceptionalism” of DNA
- Familial searching
- Function creep



Why regulate the NDNAD? & How? (2)



Regulation Ethos/ Principles



genes



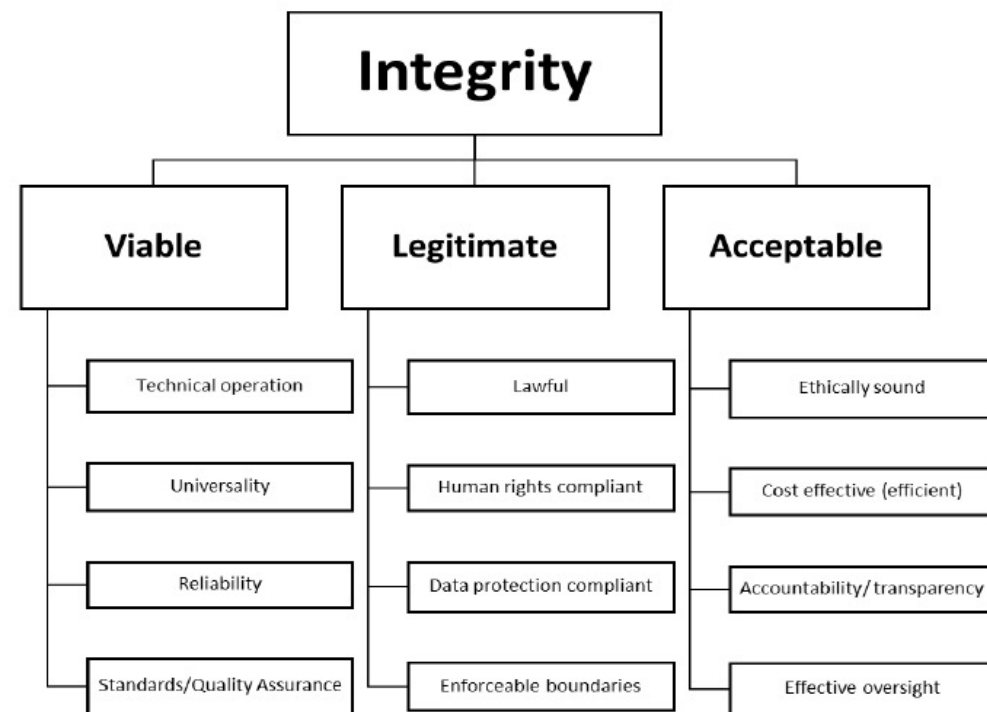
Article

Integrity, Trustworthiness, and Effectiveness: Towards an Ethos for Forensic Genetics

Matthias Wienroth ^{1,*}, Aaron Opoku Amankwaa ² and Carole McCartney ³

¹ Centre for Crime and Policing, Northumbria University, Newcastle upon Tyne NE1 8ST, UK
² Department of Applied Sciences, Northumbria University, Newcastle upon Tyne NE1 8ST, UK
³ Leicester Law School, Leicester University, Leicester LE1 7RH, UK
 * Correspondence: matthias.wienroth@northumbria.ac.uk

Abstract: Forensic genetics comes under critical scrutiny when developments challenge previously accepted legal, ethical, social, and other boundaries. Forensic geneticists continue to build a knowledge culture within a community of practice that acknowledges ethical standards of conduct in both research and the societal application of forensic genetics. As the community further cements and extends its societal role, and in that process often pushing at ethical and legal boundaries, it requires a strong, resilient, and responsive ethos that, in setting clear parameters for conduct, fosters the field's sense of purpose. While supra-national declarations and human rights protections, coupled with local regulations, provide some parameters for practice, and discipline-specific guidance has refined an agenda for forensic genetics research and application, this maturing field needs to now define its core principles. This contribution proposes the values of integrity, trustworthiness, and effectiveness as a foundational triptych for a bespoke forensic genetics ethos to ensure the augmentation of developments that range from a purely science-oriented to a wider societally relevant knowledge culture.



Biometric Legislation

Restrictive regime (1995-2001)

- *Criminal Justice & Public Order Act 1994 (CJPOA)*
- *R v Weir [2000] EWCA Crim 43*

Expansive regime (2001-2013)

- *Criminal Justice & Police Act 2001 (CJPA)*
- *Criminal Justice Act 2003 (CJA)*
- *S & Marper v the UK [2008] ECHR 1581*

Semi-restrictive regime (2013-)

- *Protection of Freedoms Act 2012 (PoFA)*
- *Gaughran v the United Kingdom [2020] ECHR 144*

Biometric Database Governance/ Regulation UK Model

- Home Office – since 2012
 - Forensic Information Database Service (FINDS)
- [Forensic Information Databases \(FIND\) Strategy Board](#)
- [Commissioner for the retention & use of Biometric Material](#)
- [Forensic Science Regulator](#)
- [Biometrics & Forensic Ethics Group \(BFEG\)](#)
- [Scottish Biometrics Commissioner](#)

Conclusion

- Forensic DNA Profiling and databases provide intelligence to support investigations
- However, without an appropriate legislative framework and policy, an innocent person may go to jail, or a true offender may not be convicted
- Need to regulate DNA profiling and databases due to civil liberty concerns and issues associated with the integrity of the intelligence/evidence and the limitations of DNA evidence.

References

- Amankwaa, A. O. (2018). Forensic DNA retention: Public perspective studies in the United Kingdom and around the world. *Science & Justice*, 58(6), 455–464. <https://doi.org/10.1016/j.scijus.2018.05.002>
- Bacci, N., Steyn, M., Briers, N., (2021). Performance of forensic facial comparison by morphological analysis across optimal and suboptimal CCTV settings. *Science & Justice* 61, 743–754. <https://doi.org/10.1016/j.scijus.2021.09.003>
- FIND Strategy Board. (2023). Forensic Information Databases Strategy Board Annual Report 2021-22. Forensic Information Database Strategy Board. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1158430/Forensic_Information_Databases_Strategy_Board_Annual_Report_2021-22_Web_Accessible_002_.pdf
- FGPI. (2022). DNA Policy Info by Country. Forensic Genetics Policy Initiative. http://dnapolicyinitiative.org/wiki/index.php?title=Main_Page
- FISWG (2018). Facial Image Comparison Feature List for Morphological Analysis. Facial Identification Scientific Working Group.
- Fraser JC, Williams R, editors. Handbook of forensic science. Cullompton, Devon: Willan Pub; 2009.
- HMIC. (2013). Making the connections: A thematic inspection of police force compliance with the Memorandum of Understanding between the National Ballistics Intelligence Service and police forces. Her Majesty's Inspectorate of Constabulary.
- Home Office. (2017). Review of the Use and Retention of Custody Images. Home Office. <https://www.gov.uk/government/publications/custody-images-review-of-their-use-and-retention>
- INTERPOL. (2019). INTERPOL Global DNA Profiling Survey Results 2019. INTERPOL.
- National Policing Improvement Agency. (2012). Practice Advice on Core Investigative Doctrine (2nd ed.). ACPO NPIA.
- Wiles, P. (2017). Annual Report 2016: Commissioner for the Retention and Use of Biometric Material. Office of the Biometrics Commissioner.

Questions?

Follow my research:



https://twitter.com/aaron_amankwaa



Forensic Biometrics

983 followers • 1 following

<https://www.facebook.com/formetrics/>