

Plain language guide

# Forensic DNA analysis in cases of sexual violence



Queensland  
Government

## Content warning

This guide contains reference to sexual violence and may be distressing to some readers.

## Acknowledgements

### First Nations acknowledgement

We proudly acknowledge First Nations communities in Queensland and their ongoing strength in practising the world's oldest living culture. We acknowledge the Traditional Owners of the lands and waters on which we live, work, learn and play, and pay our respects to their Elders past and present.

We acknowledge the ongoing leadership role of First Nations communities in addressing domestic, family, and sexual violence. We join with First Nations people to eliminate violence from all communities.

### Acknowledgement of victim-survivors of sexual violence

We acknowledge and pay our respects to those people who have been impacted by sexual violence and recognise their resilience and courage. They remain at the forefront of our work and reform efforts.

### Other acknowledgements

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## Acronyms, abbreviations, and definitions

<b>ACIC</b>	Australian Criminal Intelligence Commission.
<b>Allele</b>	One of the many variations of a DNA sequence that can exist at a particular locus (region of DNA).
<b>Azoospermic</b>	Semen lacking spermatozoa.
<b>Chromosome</b>	A thread-like structure of nucleic acids and protein found in the nucleus (the central structure) of most living cells, carrying genetic information in the form of genes.
<b>CCK</b>	Clothing collection kit.
<b>CRK</b>	Contamination reduction kit.
<b>Differential extraction</b>	A DNA extraction process that attempts to separate DNA found in sperm cells from DNA derived from other biological sources/material.
<b>EEK</b>	Early evidence collection kit.
<b>Evidentiary sample</b>	A sample of biological material taken from a crime scene or an item of interest in a case.
<b>FMEK</b>	Forensic medical examination kit.
<b>Fraction one / Spermatozoa fraction</b>	One of two fractions produced from the differential extraction process (see 'differential extraction'). Fraction one typically contains DNA derived from sperm cells. However, as complete separation of the different cell types is not always achieved, this fraction may contain DNA derived from other biological sources/material.
<b>Fraction two / Epithelial fraction</b>	One of two fractions produced from the differential extraction process (see 'differential extraction'). Fraction two typically contains DNA derived from cells other than sperm. However, as complete separation of the different cell types is not always achieved, this fraction may also contain DNA from sperm cells.
<b>Loci (singular: locus)</b>	Regions of the DNA that are targeted for analysis which comprise of specific DNA sequences, known as short tandem repeats or STRs.
<b>Mixed DNA profile</b>	DNA profile that appears to originate from a sample containing biological material from more than one person.
<b>NCIDD</b>	National Criminal Investigation DNA Database.
<b>PPRA</b>	Police Powers and Responsibilities Act 2000.
<b>Reference sample</b>	A sample of biological material taken from a known person of interest in a case.
<b>Semen/seminal fluid</b>	Biological fluid produced by male reproductive organs containing sperm cells, biological secretions, and antibodies.
<b>Single-source DNA profile</b>	A DNA profile that is obtained from a sample containing biological material from one person.
<b>Spermatozoa</b>	Also referred to as 'sperm' or 'sperm cells'. Reproductive cells produced that carry genetic material from a genetically male individual. Spermatozoa are mobile and a fully intact spermatozoa is characterised by a round head and long body.
<b>Trace DNA</b>	DNA samples in which the biological source of the DNA has not been tested for and therefore the likely biological origin remains unknown. Trace DNA samples are often taken from a surface based on information received from investigators or from surfaces where it is anticipated that biological material may be present (for example, the collar of a shirt for DNA originating from the wearer). Thus, sampling is typically carried out in the absence of any visible deposits of biological material on the target surface.
<b>TOX</b>	Toxicology kit.

# Plain language guide

## Purpose

The Queensland Government is committed to implementing the recommendations of the Women's Safety and Justice Taskforce Hear Her Voice – Report 2 ('HHV Report 2'). The Plain Language Guide – Forensic DNA analysis in cases of sexual violence ('the Guide') addresses Recommendation 41 of the HHV Report 2. The recommendation requires Queensland Health, in consultation with the Chief Justice, Chief Judge and Chief Magistrate, Department of Justice and Attorney-General, Queensland Police Service and legal stakeholders, to develop a clear, transparent plain language guide on the collection, use and interpretation of forensic analysis of DNA samples in sexual violence.

This Guide is publicly available and includes definitions for key scientific and statistical terms, data and information commonly contained in forensic DNA analysis results. It also includes plain English explanations of the forensic analysis processes commonly involved in the investigation of sexual assault. The Guide will be regularly updated to assist justice stakeholders, including legal practitioners and judicial officers, to understand and critically analyse forensic evidence.

Investigation of sexual assault can also involve additional types of testing, such as forensic toxicology and forensic chemical analysis of trace material. However, for ease of understanding, the Guide focuses on forensic DNA and associated biological screening. It does not detail other forms of forensic testing.

## Audience

The Guide provides information for justice stakeholders and government agencies who respond to presentations or disclosures of sexual assault or child sexual abuse. Specifically, this is relevant to Queensland Police Service (QPS), Queensland Health (QH), Department of Justice and Attorney-General (DJAG), and Office of the Director of Public Prosecutions (ODPP). The Guide is available to other Queensland Government agencies and the non-government services sector to help them understand the roles each of those agencies plays.

While other agencies may have a role in supporting people who have experienced sexual assault or child sexual abuse, the Guide is written for those who have a specific role in the immediate response. It is hoped the Guide will help inform how they link and work with other agencies in that role.

## Governance and review

The government agencies responsible for delivering services to victim-survivors of sexual violence are accountable for their activities in accordance with relevant legislation, whole-of-government policy, and internal departmental procedures.

The Guide is underpinned by these policies and procedures and will be reviewed annually by a select steering committee of key stakeholders. The annual review will take into consideration feedback from key agencies, system reforms, and any changes to relevant legislation.



## Key terminology

### Please note

The following definitions may be distressing to some readers.

### Sexual assault

“An act of a sexual nature carried out against a person’s will through the use of physical force, or intimidation or coercion, including any attempts to do this. This includes rape, attempted rape, aggravated sexual assault (assault with a weapon), indecent assault, penetration by objects, forced sexual activity that did not end in penetration, and attempts to force a person into sexual activity.” (Australian Bureau of Statistics, 2023).

<https://www.abs.gov.au/statistics/people/crime-and-justice/sexual-violence/latest-release#definition-of-sexual-violence>

### Sexual violence

The National Plan to End Violence against Women and Children 2022–2032 defines sexual violence as “sexual activity that happens where consent is not freely given or obtained, is withdrawn or the person is unable to consent.” (Department of Social Services, 2022).

The term ‘sexual violence’ as used throughout this guide is intended to include all acts of sexual violence, including sexual assault, adult sexual abuse, and child sexual abuse.

<https://www.dss.gov.au/ending-violence>

### Child sexual abuse

‘Child sexual abuse’ is any act that exposes a child or young person (under the age of 18 years) to, or involves a child or young person in, sexual activities that: they do not understand; they do not or cannot consent to; are not accepted by the community; are unlawful. (Australian Bureau of Statistics, 2023).

<https://www.abs.gov.au/methodologies/personal-safety-australia-methodology/2021-22#glossary>

### Victim-survivor

The term ‘victim-survivor’ is used to describe a person who has experienced sexual violence. It is acknowledged that some people who have experienced sexual violence may prefer to be referred to as victim, or survivor, or both, depending on the context. Many victims may go on to identify as ‘survivors’ as they move towards physical and emotional healing. ‘Victim-survivor’ is used in this context to encompass the broad range of experiences and perspectives of people who have experienced sexual violence.



# Role of key government agencies

The Guide recognises that each government agency has an essential and complementary role to ensure that people have access to effective, timely and appropriate information, support, care, and treatment following a sexual assault.

In addition to this Guide, roles of key government agencies in responding to children, young people and adults who have experienced sexual assault or child sexual abuse more broadly can be found in the Queensland Government Interagency guidelines for responding to children, young people and adults who have experienced sexual assault or child sexual abuse.

## Forensic Science Queensland

Forensic Science Queensland's (FSQ) strategic purpose is to provide high-quality, timely and innovative forensic services supporting the integrity of the justice system and the Queensland community. Located in Coopers Plains in Brisbane, FSQ operates specialised forensic biology and forensic chemistry functions, supporting the criminal justice and coronial systems in Queensland. FSQ also provides services to Queensland Health, other Queensland Government agencies, and the private sector. Principal government clients include Queensland Police Service (QPS) and Coroners Court of Queensland.

Chemistry and biology scientists provide expert impartial scientific advice through the provision of formal statements, reports, and evidence in court.

On 1 July 2024, FSQ transitioned from the Department of Health to the Department of Justice and Attorney-General (DJAG).



## Forensic chemistry

Forensic chemistry provides analytical and expert advisory services principally to QPS in the areas of:

- illicit drug analysis, which involves analysing both known and emerging novel drugs
- clandestine drug laboratory investigation, which involves attending crime scenes, and analysing exhibits to provide expert opinion to the courts; and
- trace evidence examinations, which covers oil spill investigations, lubricant analysis, explosives, and analysis of food and beverages suspected to contain stupefying or drink-spiking agents and fibres, which are often associated with serious crimes such as sexual assault and murder.



## Forensic biology

Forensic biology provides analytical and advisory services in biological evidence recovery, DNA analysis and result interpretation, providing expert advice and evidence. In general:

- The Evidence Recovery team conducts examinations of exhibits, biological material screening and recovery of samples for further testing.
- The Analytical Team conducts DNA analysis, including interpretation of samples submitted.
- The Case Management Team conducts DNA profile interpretation and reporting and provides expert evidence.

## Queensland Health Forensic and Scientific Services

Queensland Health Forensic and Scientific Services (QHFSS) provides a range of scientific services including specialised forensic services such as toxicology, and expert advice to QPS and Coroners Court of Queensland. QHFSS Property Point receives forensic exhibits on behalf of all QHFSS forensic sections and FSQ.

## Queensland Health Hospital and Health Services

On 17 November 2023, Queensland's Health Minister issued a [Ministerial Direction](#) implementing a 'Crisis Care Plan' into Hospital and Health Services (HHS), ensuring victims of sexual assault are seen by medical professionals within 10 minutes of disclosing and presenting at one of the listed emergency departments.

QH HHSs provide 24-hour access to clinical and psychosocial care and forensic examinations (including Collect and STORE examinations). Clinical services are provided by forensic physicians, medical officers, trained forensic and sexual assault nurses, and social workers at public hospitals.

The extent and nature of this care varies across HHSs in accordance with local procedures and resources. Whilst the definition of a child is a person under the age of 18 years, QH has several age distinctions relevant to responding to the health needs of children and young people who have experienced sexual abuse/assault:

- For children and young people under 14 years of age, medical examinations for sexual assault must be performed by a medical officer or nurse with appropriate paediatric skills, including child protection and/or sexual assault medical examination training or skills.
- For young people aged 14-16 years who present initially to a paediatric facility, assessment will be made on a case-by-case basis as to the best facility to meet the young person's needs. This may mean that the young person is referred to a service that provides care to persons aged 14 years and above for a holistic assessment, including medical examination.

Clinicians performing forensic examinations have a dual role: (1) providing medical care; and (2) collecting forensic evidence for court. A forensic examination is distinct from a health care examination, and this difference has important implications for patient confidentiality and consent that needs to be explained to the patient.

Forensic medical examinations and the collection of forensic evidence using forensic medical examination kits (FMEKs),

toxicology kits (TOXs) and clothing collection kits (CCKs) is performed by appropriately trained clinicians within a medical environment. The following categories of clinicians can legally perform forensic examinations in cases of alleged sexual assault in Queensland:

1. Forensic Physicians (FPs)
2. Forensic Nurse Examiners (FNEs)
3. Government Medical Officers (GMOs)
4. Sexual Assault Nurse Examiners (SANEs)
5. Medical Officers who have received training in forensic examinations; and
6. Senior Medical Officers (SMOs) who access the Expert Advice Phone Service.
7. Paediatricians with specific child protection training are required to examine children aged 14 years and younger.

## Queensland Police Service

The QPS frequently accompany victim-survivors to emergency departments for medical and forensic examinations. If a patient chooses to have a forensic examination, QPS are involved in the 'Collect and ANALYSE' option of the sampling process (see section 'Option 1').

During the investigative process, QPS may also collect, examine, and sample items that are connected to a sexual assault, such as bed sheets and clothing, and perform screening tests to indicate the biological material type/s present and collect samples from those materials. This includes detecting the potential presence of blood and seminal fluid. Like FSQ, the screening tests utilised by QPS are not confirmatory. Samples collected by QPS are submitted to FSQ for further examination, such as saliva screening, microscopy to confirm the presence of sperm cells, and for DNA analysis.



## Department of Justice and Attorney-General

The Office of the Director of Public Prosecutions (ODPP), the Office of the Public Guardian (OPG), Victim Assist Queensland (VAQ), Queensland Courts and Women's Safety, Victims and Community Support (WSVCS) fall within the responsibilities of DJAG.

### Office of the Director of Public Prosecutions

The Office of the Director of Public Prosecutions (ODPP) represents the Crown in criminal proceedings against persons accused of committing serious criminal offences, including sexual assault and sexual abuse. Criminal proceedings include:

- the committal hearing, before a Magistrate in Brisbane Central, Ipswich and Southport Magistrates Courts. In other centres, this hearing is conducted by prosecutors within QPS.
- trials before a judge alone or a judge and jury
- sentencing hearing before a judge
- any appeals arising from the trial or sentence.

In addition to prosecuting matters in court, the ODPP is responsible for:

- assisting victim-survivors by providing information about the progress of a prosecution, the victim-survivor's role as a witness, and how the victim-survivor can inform the court of the impact of the crime by providing a victim impact statement
- giving victim-survivors reasons for decisions made in relation to proceedings which directly affect them
- taking into account the wishes of a victim-survivor who does not wish to proceed with a prosecution for any reason
- providing information about the availability of other resources and processes that may assist victim-survivors
- requesting that the court give sexual assault or sexual abuse matters appropriate priority
- ensuring the victim-survivor has minimal contact with or exposure to the offender during court proceedings or in the court building
- liaising with other relevant agencies to assist the victim-survivor and family members to understand the legal and procedural issues which may impact them.

## Queensland Courts

For further information, refer to the Supreme and District Courts Criminal Directions Benchbook at: <https://www.courts.qld.gov.au/court-users/practitioners/benchbooks/supreme-and-district-courts-benchbook>

## The facts about sexual violence in Australia

**Almost 2.8 million Australians** have experienced **sexual violence** since the age of 15.

Source: Australian Bureau of Statistics. 2023. Personal Safety, Australia 2021–22, Australian Government, Canberra.

**In 2022, 32,146 people** reported **sexual assault** to police, up 3% on the previous year. Of these, **84% were women (26,967)**.

Source: Australian Bureau of Statistics. 2023. Recorded Crime – Victims, Australia.

**One in 5 Australian women** has experienced **sexual violence** since age of 15 (22%).

Source: Australian Bureau of Statistics. 2023. Personal Safety, Australia 2021–22, Australian Government, Canberra.

**More than a third (36%)** of all **sexual assaults** were domestic and family violence-related (11,676 victims).

Source: Australian Bureau of Statistics. 2023. Recorded Crime – Victims, Australian Government, Canberra.

**One in 3 girls, and almost one in 5 boys** experience child sexual abuse. For **78%** of children who experienced child sexual abuse, it happened more than once.

Source: Australian Child Maltreatment Study, 2023. National prevalence of child maltreatment in Australia. Available at: <https://www.acms.au/findings/>

**In Queensland, 7,431** victims of sexual assault were recorded in 2022 (up 8% from the previous year): **86% were female (6,415 victims)** and **65% knew the offender (4,804 victims)**.

Source: Australian Bureau of Statistics. 2023. Personal Safety, Australia 2021–22, Australian Government, Canberra.

**479,900 women** have experienced **sexual violence** since age 15.

Source: Australian Bureau of Statistics. 2023. Personal Safety, Australia 2021–22, Australian Government, Canberra.

**12.5%** of all reported victims of sexual assaults in Queensland in 2022 were First Nations people.

Source: Queensland Police Service. 2023. Maps and statistics, Queensland Government. Viewed on 18 April 2023, [www.police.qld.gov.au/maps-and-statistics](http://www.police.qld.gov.au/maps-and-statistics)

**First Nations women** are **3.5 times more likely** to experience **sexual violence** than non-Indigenous women.

Source: Australian Bureau of Statistics. 2017. Personal Safety, Australia 2016, Australian Government, Canberra.

Figure 1: Sexual Violence Media Guide, Department of Justice and Attorney-General.

## Forensic medical examinations

Sexual assault is a legal finding and not a medical diagnosis. The purpose of the forensic medical examination is to aid the investigation of a criminal matter, but in isolation, it often cannot prove or disprove if an assault has occurred. Examination findings and biological evidence (DNA and toxicology) may provide corroborative evidence to support a version of events.

The collection of forensic evidence is time-sensitive, with the quality of evidence reducing over time due to DNA retention losses, drug elimination rates and injury healing. Ideally, a forensic medical examination is performed within 72 hours

(3 days) for allegations of penile-vaginal penetration, although it can be performed up to 5-7 days later (and sometimes even longer in exceptional circumstances).

The decision to collect DNA samples should be made in consultation with the clinician involved and should consider the history and timeframe of the reported sexual assault. This is especially relevant in children younger than 14 years old where there is a delayed disclosure, or the reported offence is unlikely to yield even trace DNA. In Queensland, samples are collected using a forensic medical examination kit (FMEK).

## Forensic medical examination kits



**Figure 2:** Forensic Medical Examination Kit (FMEK).

On 31 July 2023, in response to Recommendation 36 of the HHV Report 2 and Recommendations 86, 87, 88, 94 and 97 of the Commission of Inquiry into Forensic DNA Testing in Queensland Final Report, Queensland Health rolled out the new:

- forensic medical examination kit (FMEK)
- forensic medical examination record (FMER)
- clothing collection kit (CCK)
- toxicology kit (TOX) and associated contamination reduction kit (CRK).

The FMEK, TOX and CRK have been benchmarked with interstate counterparts, and the CCK is the first of its kind within an Australian jurisdiction. The suite of kits facilitates the best practice, trauma-informed collection of forensic samples in sexual assault cases.

The new FMEK contains the required forensic DNA-grade consumables for clinicians to collect evidence and a reference sample via mouth swab from consenting victim-survivors during a forensic examination. The FMEK containing all biological samples collected from the victim-survivor is then submitted to FSQ for forensic analysis.

The new CCK is used to collect external clothing worn by the victim-survivor, and the TOX is used to collect blood and urine for cases of suspected drug-facilitated sexual assault.

If the matter is being reported to police, the FMEK, and/or any CCK or TOX collected will be handed to police officers at the end of the forensic examination. If the victim-survivor is not ready to or unsure whether they will proceed with a formal complaint, the FMEK and any CCK and/or TOX collected will be labelled 'Collect and STORE' and transferred by Queensland Health to QHFS Property Point for storage on behalf of FSQ.

The 'Collect and STORE' FMEK will be held for 24 months post-forensic examination and only analysed if the victim-survivor decides to progress with a formal complaint within that timeframe. Only when a formal complaint is made will QPS become involved in 'Collect and STORE' cases. Further information on 'Collect and ANALYSE' and 'Collect and STORE' FMEKs can be found in the 'Forensic Evidence Collection' section below.

## Forensic examination options available to victim-survivors

### Option 1. Examination for forensic evidence collection – Collect and ANALYSE

This option initiates QPS involvement and is the appropriate forensic medical examination option for any victim-survivor who discloses sexual assault and is clear about choosing police involvement. This option provides the victim-survivor with the best chance of recovering evidence and progressing it for testing that may assist with an immediate police investigation, and prosecution. QPS takes carriage of these kits after collection and delivers FMEKs to QHFSS Property Point for FSQ analysis.

‘Collect and ANALYSE’ FMEK examination details, testing results and any other information provided may form the basis of a report to police/courts and other investigating agencies.

Any information provided will be stored securely by Queensland Health and kept in accordance with their policies and Queensland legislation. Any information provided may be viewed by other Queensland Health forensic staff for the purposes of peer review.

### Option 2. Examination for forensic evidence collection prior to police involvement – Collect and STORE

This option is available to victim-survivors who disclose sexual assault and consent to evidence collection but require more time to decide whether they want to pursue a police investigation involving the QPS, and prosecution.

This option provides the best chance of recovering and preserving evidence so that if a choice is made to involve the police later, this evidence can be tested, and the results made available in the subsequent police investigation and prosecution.

This option recovers evidence and stores/preserves it to support a police investigation in the future if, or when, the victim-survivor decides to pursue. FSQ or FSS will only perform forensic testing on a Collect and STORE kit if a victim-survivor decides to make a formal police complaint relating to the sexual assault. There will be no release of information or evidence to police other than in exceptional circumstances where Queensland legislation requires it (e.g. subpoena, warrant, mandatory reporting to Child Safety, etc.).

Collect and STORE kits are collected using the same clinical process and type of kit (FMEK) and stored under the same storage conditions as a ‘Collect and ANALYSE’ kit to ensure all victim-survivors considering or unsure whether to lodge a formal police complaint have access to quality evidence collection.

Collect and STORE kits are sent to QHFSS Property Point by Queensland Health, without any QPS involvement, and kept for up to 24 months. At the conclusion of the 24-month storage period, the Collect and STORE kits will be destroyed if the victim-survivor has not reported the incident to the QPS.

Collect and STORE is not an option for children aged younger than 14 years old. All FMEK collected for children under 14 will be processed as part of a QPS investigation.

### Option 3. No forensic examination

This option is always available to adult victim-survivors who disclose sexual assault, however, there are significant longer-term limitations associated with this option that should be clearly explained to the victim-survivor.

Victim-survivors who choose not to undergo forensic examination will receive medical care and be offered counselling support and referrals to other health and support services. Victim-survivors can choose to report the assault to police later but delays in reporting a sexual assault can significantly impact the ability to obtain forensic samples.

If the timeframe between presentation, the reported incident and subsequent forensic medical examination is greater than 5-7 days, the recovery of any biological evidence that may assist with an investigation is extremely unlikely.

### Option 4. Alternative reporting options (can be completed anonymously)

There are alternative reporting options (ARO) available on the QPS website which can be completed anonymously. Information reported through ARO may help police with other cases or may be considered if a victim-survivor chooses to make a formal complaint at a later time.

<https://www.police.qld.gov.au/units/victims-of-crime/support-for-victims-of-crime/adult-sexual-assault>

### Paediatric examinations

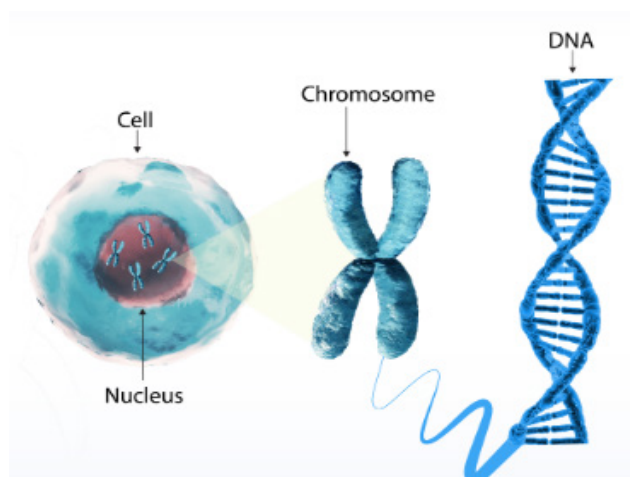
For children under 14 years old, and where an examination with an FMEK is performed, all matters must be reported to the QPS Child Protection and Investigation Unit (CPIU) for further investigation.

A mandatory report to Child Safety may need to be considered in some circumstances, with further discussion of the case with the local HHS Child Protection Advisor or Child Protection Liaison Officer recommended to assist decision making around this process.

# Understanding DNA

DNA stands for deoxyribonucleic acid, which is material located within the cells of humans and other organisms. DNA is comprised of millions of molecular building blocks, known as bases, arranged in pairs, and strung together on a sugar phosphate backbone. This forms the familiar twisted ladder shape of DNA, the double helix.

Characteristics such as blood type and physical traits are determined by particular sequences of information in a person's DNA. DNA is inherited equally from a person's biological parents and remains the same throughout a person's life.



Nearly every cell in a person's body has the same DNA, with the exception of sexual reproductive cells which contain half the amount of DNA found in other cells. DNA can be recovered from persons, items and/or the environment when a person sheds cells or deposits DNA through actions such as touching, spitting, bleeding, or sweating on an item or person or during sexual activity. Biological fluids such as blood, semen and saliva generally contain higher amounts of DNA than the DNA left behind from touch contact, however, it is possible to shed and deposit DNA even during brief touch contact. How readily a person sheds their DNA differs from individual to individual and varies throughout the day.

## What is a DNA Profile?

All people share 99.5% of the same DNA with the remaining 0.5% different between individuals. Areas of a person's DNA where these differences occur are targeted in forensic DNA analysis to generate a DNA profile.

A person's entire DNA sequence is assumed to be unique to that individual (except for identical siblings), however, due to size and complexity, forensic DNA analysis does not examine the entire DNA sequence. Instead, forensic DNA analysis targets specific regions of DNA called loci (singular locus), where short DNA sequences repeat with the number of times a sequence repeats at a locus, as this is highly variable between individuals.

The number of times a specific DNA sequence repeats at a locus (DNA region) is referred to as an allele (for example, a '12' allele signifies that the DNA sequence repeats 12 times. A '16' allele signifies that the DNA sequence repeats 16 times). At each locus, a person has 2 alleles, one inherited from their biological mother and the other from their biological father. The 2 alleles may be the same (for example, 12, 12), referred to as homozygous, or different (for example, 12, 16), referred to as heterozygous. An allele pair at a locus is known as a person's genotype for that locus.

The frequency of each different type of allele can be measured within a population, to give an indication of how often 2 unrelated people would share the same allele(s)/genotype. If only a single locus was considered, there would be many people that would show the same genotype by chance.

Therefore, forensic DNA analysis uses many different loci in combination to increase the ability to differentiate between individuals. Within Australia, 20 specific loci are used as a standard set, in addition to a locus that indicates the genetic sex of an individual. The genotype at all DNA loci analysed is referred to as an individual's DNA profile.

## What is the role of DNA evidence in a sexual assault case?

During a sexual assault, DNA may be deposited in the form of biological substances such as semen, saliva, or blood as well as from skin and other cells through contact. During a forensic medical examination, internal and external surfaces of the body and items may be examined and sampled and sent to FSQ for forensic biological testing and DNA analysis.

The presence or absence of DNA evidence in a sexual assault case can greatly impact the outcome of criminal proceedings. However, DNA is not always considered conclusive proof of a rape or sexual assault. The presence of DNA can provide support that sexual contact occurred but does not speak to the matter of consent. Of note, DNA evidence can also support innocence.

## What is the role of biological screening in a sexual assault?

Biological screening refers to the application of a forensic test that reacts with certain chemicals to indicate whether a specific biological fluid/cell type may or may not be present on/in a sample or item. An FMEK will usually contain swabs taken from the body, and may contain microscopy slides, oral rinse, underwear, and other small items dependent on the specific details of the incident.

Once an FMEK or other exhibit arrives at FSQ for testing, a case managing scientist in collaboration with the Forensic Biology Evidence Recovery Unit will review the case information and items/samples collected to devise a case-specific examination strategy. The examination strategy will include which screening tests will be applied to different samples based on the sampling location and the supplied case specifics.

FSQ receives information collected by clinicians during the forensic medical examination that includes:

- details of the incident including type of penetration and other contact
- number of people involved
- whether consensual sexual intercourse has occurred within the 7 days prior, including type of activity and individuals involved
- details of clothing collected/sampled, including whether it was worn pre, during and/or after the incident and whether it has been washed
- details of activities post-incident, including whether the victim-survivor has urinated, eaten, bathed or showered.

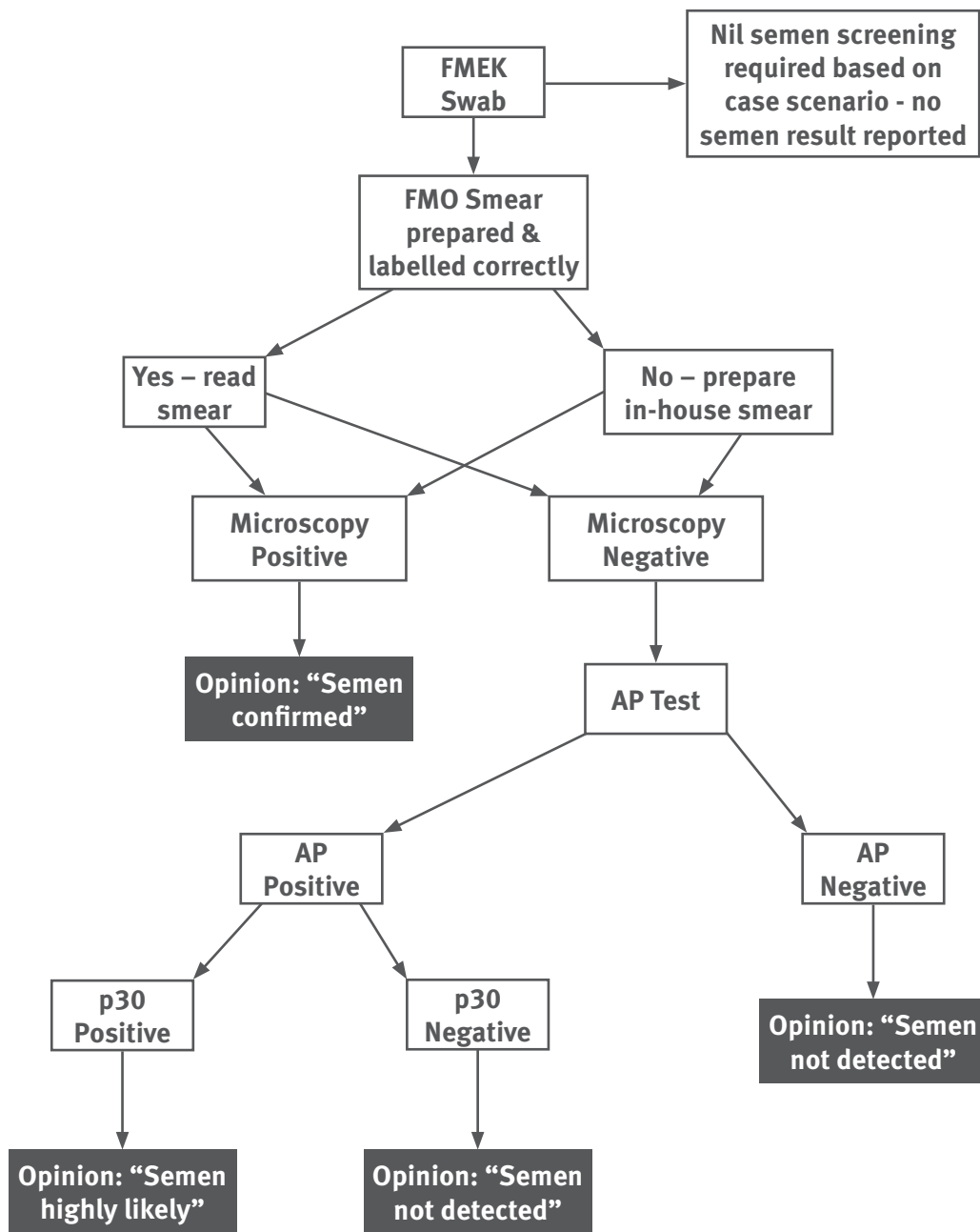
In sexual assault cases, the presence of certain biological fluid/cell types in evidentiary samples may or may not support specifics of the sexual assault allegation. For example, if the allegation is vaginal/penile penetration with ejaculation, the finding of semen or sperm cells on samples taken from a victim-survivor's vagina may be highly probative to the case. In cases involving solely digital penetration, testing for semen may not be required as it is not involved in the allegation.

Some biological tests are used for screening only and cannot conclusively say that a sample contains a specific biological substance. The positive identification of sperm cells is a notable exception. The microscopic identification of spermatozoa, performed at FSQ, is considered a confirmatory test. Other biological tests, such as the tests for blood, saliva and the other chemicals contained within semen are known to produce an indication of a positive test result for substances other than blood, saliva, or semen, producing what is referred to as a 'false-positive' result.

FSQ has developed publicly available annexures for these biological substance types. These detail the biological testing performed at FSQ, including the testing process, validation data and testing limitations.

For more information, please refer to the following FSQ Annexures, available by request from FSQ: [ceo\\_fsq@health.qld.gov.au](mailto:ceo_fsq@health.qld.gov.au)

- Foundations of DNA Profiling and Interpretation – PowerPlex® 21
- Foundations of the Screening for Blood
- Foundations of the Screening for Saliva
- Foundations of the Screening for Semen



**Figure 3:** Testing regime for the detection of semen on FMEK swabs. Other opinions may be provided based on case circumstances and testing results, which will be detailed in the statement and case notes.

# DNA profile generation

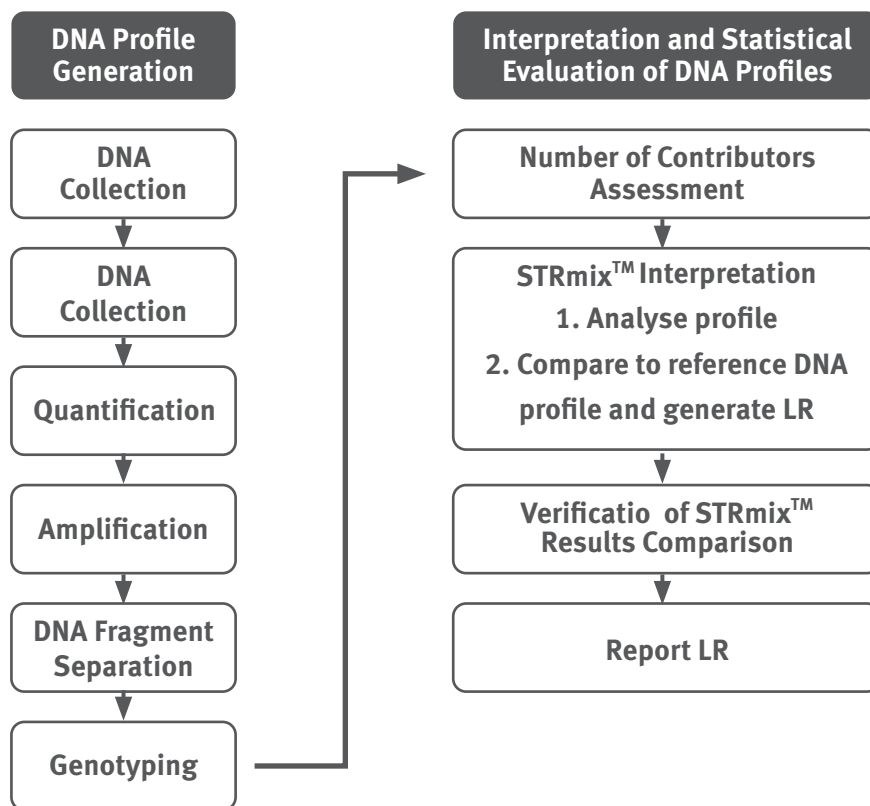
Biological material that is recovered from FMEK samples or from an item can be subjected to DNA analysis. The DNA analysis process is composed of the following steps:

1. Extraction: isolation of DNA from other material in the sample.
2. Quantification: measurement of the amount of DNA in the extracted sample.
3. Amplification: targeting and copying of the DNA sequences of interest to generate sufficient material to detect and visualise the alleles present.
4. DNA fragment separation: separation of alleles according to size.
5. Genotyping: specialised software translates the DNA fragment separation into a visual representation known as an electropherogram (EPG). The EPG is read and checked by 2 forensic scientists to obtain the final DNA profile.

After the DNA profile has been generated, it is interpreted by an FSQ case managing scientist to assess the number of contributors.

The number of contributors is an estimate of the number of individual persons that have donated DNA to the observed DNA profile. A single-source DNA profile is one that can be explained by one contributor (person) donating their DNA. This observed DNA profile is then compared to DNA profiles generated in the same way from reference samples taken from known individuals or Persons of Interest (POIs), to investigate the possible source of the DNA. The evidence is evaluated using a statistical calculation known as a Likelihood Ratio (LR).

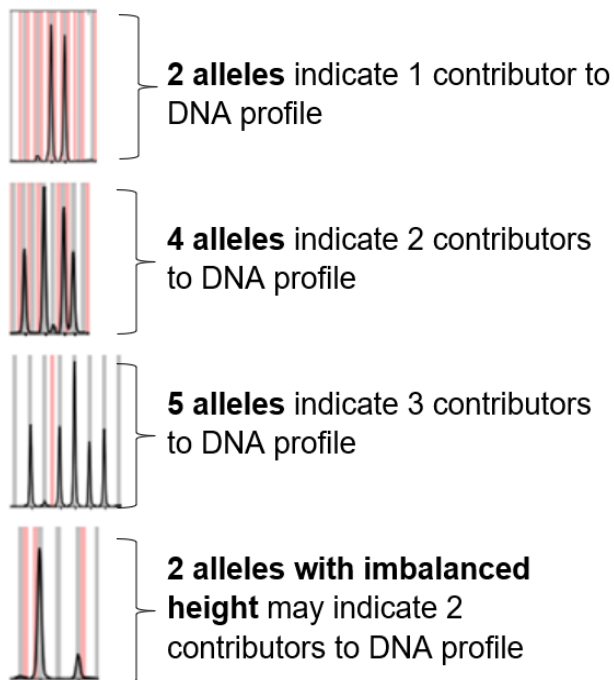
The resulting LR will indicate if the evidence does or does not support the contribution of the POI, or if the POI can be excluded. If the alleles from the POI are not present in the crime scene profile, and their absence cannot be reasonably explained, then the person will be excluded as being a contributor to the DNA.



**Figure 4:** Overview of the process for DNA profile generation and statistical evaluation.



## Evaluation of DNA profiles



Once a DNA profile has been generated, an FSQ case managing scientist will interpret and statistically evaluate the DNA profile with the aid of computer software.

The FSQ case managing scientist first examines the DNA profile to estimate the number of individuals that may have contributed their DNA. The FSQ case managing scientist excludes non-allelic peaks known as artefacts from the interpretation and estimates the number of individuals or number of contributors (NOC), by examining the number and heights of alleles present at each locus.

Each person contributes 2 alleles, in approximately equal amounts. If the person has inherited the same type of allele from each parent, it will appear as a single peak as the 2 alleles are 'stacked' on top of each other. Therefore, the observation of one or 2 alleles at a locus in a profile suggests one person contributed to the DNA, 3 or 4 alleles indicates the presence of 2 contributors, and 5 or 6 alleles indicates 3 contributors, and so on. (Figure 5).

Figure 5: Demonstration of number of contributor assessments based on number and height of alleles present.

### Reference samples defined as the/an assumed contributor

If the FSQ case managing scientist believes that a person's DNA can be reasonably expected to be present given the case circumstances and/or sample type, this person can be defined as the/an assumed contributor of DNA in a sample. This assumption can be based on sample type, case information and the profile itself. For example, a person may be considered an assumed contributor to the DNA in sample taken from them (such as a swab of their skin) or from clothing worn by them.

Where it is proposed that a person is the assumed source of a single-source DNA profile, comparison of this profile to another reference sample is not performed. When calculating a LR for a mixed DNA profile, the assumed contributor is included in both alternative propositions.

### Relevant population

In performing an LR calculation, population sample data is used to estimate how common the alleles detected in the evidentiary DNA profile are expected to be in a particular population. Different populations have different frequencies of alleles and population data is grouped according to self-declared ethnicity. By default, a population stratified LR that considers the Australian Caucasian, Australian Aboriginal, and Australian Asian subpopulations is reported.

## Population database(s)

These databases represent the most common subpopulation groups in Queensland.

Subpopulation Group	Database/s used	Number of profiles
European/Caucasian	Australian Caucasian (the default population database)	1707
East and Southeast Asia (China, Vietnam, Philippines)	Australian Asia	990
Australian Aboriginal	Australian Aboriginal (self-declared)	1427

Table 1: Subpopulation group database/s used number of profiles.

## Y-STR Testing

Y-STR testing focuses on the Y chromosome.

Biological males have both an X and a Y chromosome. Biological females do not have a Y chromosome, rather, they have 2 copies of the X chromosome.

The Y chromosome is passed down from biological father to biological son and is not passed down to biological daughters. Therefore, all biologically related males in a paternal lineage will share the same Y chromosome. A Y-STR profile is therefore not unique, but it will show paternal linkage between males. It is therefore useful in missing persons, paternity and unidentified human remains cases to establish familial linkages.

Y-STR testing can also isolate male DNA in a sample containing a mixture of male and female DNA and is therefore useful in sexual assault investigations where male and female DNA mixtures are common. It is particularly useful when dealing with mixtures with a much larger quantity of female DNA. For example, a vaginal swab of a FMEK or a fingernail scraping from a female with a suspected male offender.

Targeting areas specifically on the Y chromosome avoids amplifying any female DNA and may produce a profile from the potentially smaller number of male cells present. In the absence of DNA profile results from samples, FSQ forensic scientists will review the results to determine if a sample is a candidate for Y-STR analysis.

If standard DNA testing has not produced probative results for a case, the FSQ case managing scientist may submit specific FMEK samples for Y-STR testing.

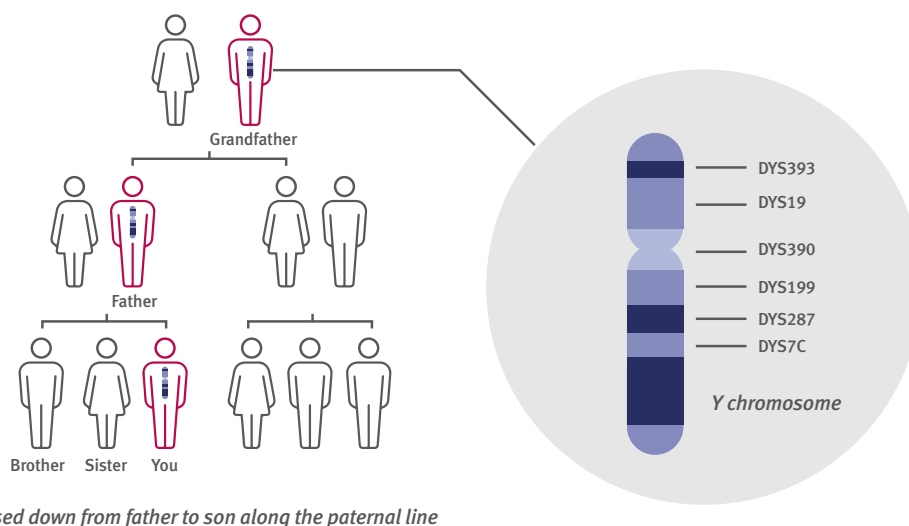


Figure 6: FMEK samples for Y-STR testing. Sourced from Did You Know DNA.

## Reporting

Sample results are provided by FSQ Forensic Biology to the QPS via the laboratory information system, the Forensic Register. Information about the sample, any biological material that may be assumed or confirmed to be present, and the DNA profile obtained (including the number of contributors determined and used in the interpretation) is reported. Additionally, whether POIs associated to the case are excluded, not excluded, or defined as an assumed contributor, and the statistical weighting in the form of the LR are reported. For a statement of witness, the results of the interpretation and statistical evaluation will be reported as per the table below. In addition, the table details the propositions considered when evaluating the evidence. The LR calculated (or the default LR) indicates under which proposition the evidence is more likely to occur.

Using the example in Table 2 below:

“The LR is 100 billion, in favour of the first proposition. That is, the DNA evidence is estimated to be 100 billion times more likely to occur if the DNA originated from Person A, than if it originated from an unknown, and unrelated, person from the Australian population.”

Unless otherwise stated, the LR is a population stratified calculation using the Australian Caucasian, Australian Aboriginal and Australian Asian subpopulation datasets.

Sample description	DNA profile description	Person	Propositions/interpretation	Statistical weighting
710000001 High vaginal swab	<b>Fraction One:</b> Single-source DNA profile*	GREY	GREY is excluded	
		BROWN	1. BROWN is the contributor of the DNA 2. BROWN is not the contributor of the DNA	The DNA evidence is <b>greater than 100 billion</b> times more likely if BROWN <b>is</b> the contributor.
	<b>Fraction Two:</b> Single-source DNA profile	GREY	GREY is the assumed contributor of the DNA	

**Table 2:** Item 1: High vaginal swab.

## Biological exhibit and data storage

After a crime scene/evidence DNA sample has been processed, any remaining portion of the sample and extracted DNA not consumed by the testing process, is retained by FSQ Forensic Biology indefinitely in frozen secure storage. The remaining components of whole item exhibits, including FMEKs, are securely returned to the QPS.

Reference samples are retained in secure storage, with the destruction requirements legislated in the Queensland Police Powers and Responsibilities Act 2000 (PPRA). As per section 490 of the PPRA, a DNA sample taken from a person suspected of having committed an indictable offence must be destroyed within a reasonably practicable time after one year post the person's arrest if:

- charges are dropped/do not progress,
- the person is found not guilty; or
- a proceeding for the indictable offence is not started within one year after the sample is taken.

The 2024 amendment to the PPRA allows for modified extended retention times for suspect reference samples collected between 1 January 2007 until 13 June 2025.

Electronic records, including biological screening and DNA profiling results are contained securely within the FR and only accessible by authorised personnel.

### The National Criminal Investigation DNA Database

DNA is a powerful investigative tool as an individual's DNA profile is comparable to a fingerprint. DNA evidence collected from a crime scene can be linked to a suspect or can eliminate a suspect from suspicion. During an offence, such as sexual assault, biological evidence such as hair, skin cells, semen, or blood can be left on the victim's body or other parts of the crime scene.

In addition, a DNA profile from crime scene evidence can be entered onto the Australian National Criminal Investigation DNA Database (NCIDD) to search against and potentially establish links to known offenders and samples from other crime scenes. NCIDD, hosted by the Australian Criminal Intelligence Commission (ACIC), holds more than 1.7 million DNA profiles, including profiles of known serious offenders and unknown profiles obtained from crime scene samples.

All Australian jurisdictions contribute to the NCIDD through uploading DNA profiles from a crime scene sample and adding all lawfully and appropriately obtained DNA profiles from reference samples of suspects, offenders and other person categories allowed under relevant legislation.

**The DNA profiles collected from victims, including victim-survivors of sexual assault and sexual violence, are not uploaded to NCIDD.**

Once a crime scene profile is uploaded to NCIDD, it is automatically compared to all other suspect/offender DNA profiles and all other crime scene profiles on the database. This comparison will continue to occur each time a new person or crime scene profile is added to NCIDD. Links to people or other crime scene samples can occur at any time, creating new investigative leads.

The availability of reference samples also permits the interpretation of partial profiles that have insufficient alleles for comparison to NCIDD.

### How long is DNA kept on the database?

For offences punishable by life imprisonment, DNA profiles are retained indefinitely. For minor offences with lesser penalties, the retention period is generally 10 years. However, amendments to the legislation have allowed for extensions of these periods under specific circumstances.



## Further information, advice, and assistance

- Forensic Science Queensland – Annexure Foundations of DNA Profiling and Interpretation – PowerPlex® 21
- Forensic Science Queensland – Annexure Foundations of the Detection of Semen
- Queensland Government Interagency Guidelines for responding to children, young people and adults who have experienced sexual assault or child sexual abuse
- Queensland Government response to Hear Her Voice – Report Two – Women and girls’ experiences across the criminal justice system
- QPS Sexual Violence Response Strategy 2023-2025
- Forensic medical examination for adults and adolescents 14 years and over
- Sexual violence media guide, Department of Justice and Attorney-General

## Legislation

Legislation relevant to and defining sexual assault or child sexual abuse includes, but is not limited to:

- Human Rights Act 2019
- Mental Health Act 2016
- Public Guardian Act 2014
- Aboriginal and Torres Strait Islander Peoples Recognition (Sunset Extension) Act 2015
- Domestic and Family Violence Protection Act 2012
- Hospital and Health Boards Act 2011
- Victims of Crime Assistance Act 2009
- Public Health Act 2005
- Police Powers and Responsibilities Act 2000
- Guardianship and Administration Act 2000
- Child Protection Act 1999
- Criminal Law (Sexual Offences) Act 1978
- Evidence Act 1977

## Policies and guidance documents

Relevant policies and guidance documents include, but are not limited to:

- Prevent. Support. Believe. Queensland’s Framework to Address Sexual Violence
- Final Report of the Commission of Inquiry into Forensic DNA Testing in Queensland
- Final Report of the Commission of Inquiry to Examine DNA Project 13 concerns
- Queensland Government Domestic and Family Violence Prevention Strategy 2016-2026
- Domestic and Family Violence: Information Sharing Guidelines

## References

Australian Bureau of Statistics (2023) Personal Safety, Australia methodology. Available online: <https://www.abs.gov.au/methodologies/personal-safety-australia-methodology/2021-22#glossary> [Accessed 07/03/2024].

Australian Bureau of Statistics (2023) Sexual Violence. Available online: <https://www.abs.gov.au/statistics/people/crime-and-justice/sexual-violence/latest-release#definition-of-sexual-violence> [Accessed 13/03/2024].

Department of Social Services (2022) The National Plan to End Violence against Women and Children 2022-2032. Available online: <https://www.dss.gov.au/ending-violence> [Accessed 01/04/2024].

Did you know DNA (year). Available online: [www.didyouknowdna.com/ancestry/y-dna-str-testing-forensics-relationships-genealogy-testing/](http://www.didyouknowdna.com/ancestry/y-dna-str-testing-forensics-relationships-genealogy-testing/) [Accessed 12/9/2023].

Table 1. Bright, J., et al. (2014) Australian population data for the twenty Promega PowerPlex 21 short tandem repeat loci. *Australian Journal of Forensic Sciences* 46(4), 442-446.

Table 2. Forensic Science Queensland – mock example only.

## Key contact information

### Forensic Science Queensland and Forensic and Scientific Services

#### Client Services and Liaison

Email: [forensics@health.qld.gov.au](mailto:forensics@health.qld.gov.au)

#### Forensic Property Point

Phone: 1800 000 377 (Monday-Friday 8am-5pm)

Fax: +61 7 3096 2977

#### Postal address

PO Box 594

Archerfield QLD 4108

#### Location

39 Kessels Road, Coopers Plains QLD 4108

<https://www.health.qld.gov.au/public-health/forensic-and-scientific-services/forensic-services>

### Forensic Medicine Queensland

**Email:** [ForensicPhysician@health.qld.gov.au](mailto:ForensicPhysician@health.qld.gov.au)

**Phone:** +61 7 3722 1321

**Fax:** +61 7 3722 1320

**24/7 Expert Advice Phone Service:** +61 7 3722 1321

Please contact for advice on forensic medical examinations regarding:

- the use of forensic evidence collection kits (FMEK)
- sampling decisions
- packaging and storage of exhibits
- any other forensic medicine concerns.

#### Location

51 Herschel St, Brisbane QLD 4000

Plain language guide

# Forensic DNA analysis in cases of sexual violence



Queensland  
Government