



forensic science ireland

**Annual
Report
2021**

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Excellence Through People 1000:2017



Foreword

It is my pleasure to give this foreword to FSI's Annual Report and present FSI's contributions and achievements over the past year.

Firstly, I would like to thank all of the staff at FSI for your contributions to FSI and the impact you have had on the criminal justice system over the course of 2021. As an essential service FSI have remained open throughout all stages of Covid-19 restrictions, with the key objective of providing a sustainable service while keeping our staff safe. I am very proud of how our staff and our organisation maintained all services throughout the year, despite the personal and organisational impact of the pandemic and associated restrictions. I want to sincerely thank all our staff for your continued support and commitment to FSI during a challenging year for us all.

The commitment, resilience and professionalism of our staff has helped FSI deliver another year of strong contribution and impact to the criminal justice system.

FSI reported on almost 24,000 forensic investigations over the course of 2021 - an increase of 85% over a 3-year period. This increase is due to the dramatic growth in DNA services provided over the period (increased by 54%), growth in the number of drugs reports issued (increased by 35%) and the integration of Fingerprint and Documents & Handwriting investigations into FSI from the Garda National Technical Bureau in December 2019.

Case submissions into FSI increased by 55% between 2021 and 2018. While exceptional circumstances lead to a surge in submissions in 2020, submissions remained above pre-pandemic levels throughout 2021. The mix and complexity in our case work has become more and more challenging and the need to stay current in the latest scientific developments has never been greater.

Our staff have responded by playing an active role in international forensic networks and working groups over the year and we have developed new capabilities as a result. We have developed and validated processes for Next Generation Sequencing (NGS) which is already having an impact in identifying Missing Persons. Our 'Intelligence Services', supporting European cooperation for criminal investigations and border control, have grown over the course of the year. FSI is now exchanging DNA data with 11 countries under the Prüm Decision, after connecting with Germany, France and Malta in 2021. There have been 900 DNA matches since FSI first started exchanging this data in October 2019. FSI has been processing Sirene requests since the system went live in March 2021. In addition, FSI Completed drug quantification reports (drug content) to An Garda Síochána and other stakeholders for Cocaine, Amphetamine and Diamorphine in 2021.

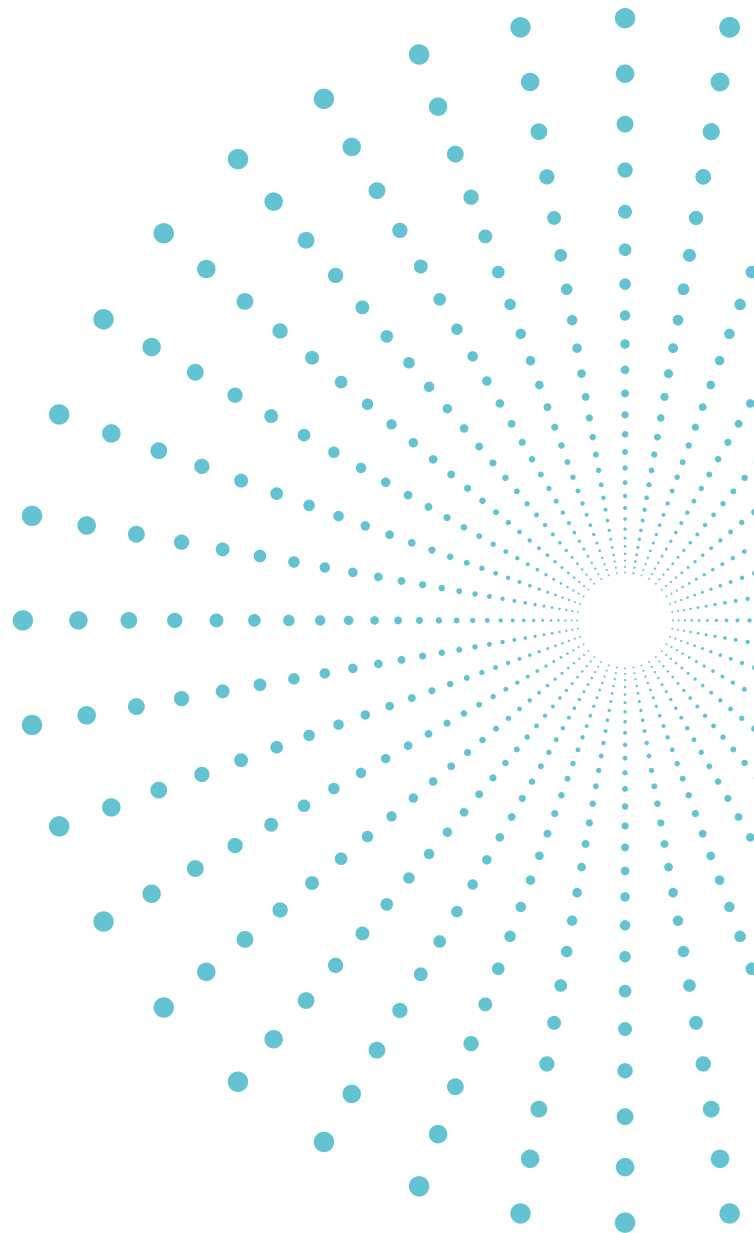
This continued growth in services can only be sustained with the appropriate investment in staff, accommodation and technology.

The progress in construction of FSI's purpose built forensic facility at the Backweston Science Campus is very encouraging. The building is on-schedule for completion in Summer 2022 and will create avenues to grow and expand forensic services for the state. We very much look forward to transitioning to this facility later this year. We are appreciative of the capital investment being made in this facility, as well as the increased funding in 2022 for new instrumentation and transition costs. A significant body of work is underway to plan the transition while maintaining forensic services. Sustained investment in ICT over the next 2 years will be crucial so that FSI can make the most of this new facility. It is also noted that very recent Institutional Burials Bill places significant additional responsibility on FSI to support a DNA identification programme and manage the associated DNA Databases. This work could only be supported with the move to appropriate accommodation.

FSI has a lot to look forward to in 2022! We look forward to realising the benefits from a modern fit-for-purpose building and to growing our contribution and impact in the criminal justice sector.



Chris Enright
Director General FSI



Introduction

Forensic Science Ireland is an associated office of the Department of Justice and Equality. We work together to deliver, to best international standards, comprehensive scientific analysis, independent expert opinion, advice and training to support the Irish Criminal Justice system. Originally known as the Forensic Science Laboratory, FSI was established in 1975 to provide a scientific service to the Criminal Justice System by analysing samples submitted from crime scenes and providing expert evidence in criminal trials. In June 2014, President Higgins extended our scope when he signed into law the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014. Under this act, FSI is named as the custodian of that database and our name was changed from Forensic Science Laboratory to Forensic Science Ireland to recognise this broader remit.

In December 2019, the responsibility for the Fingerprints and Documents and Handwriting services transferred from the Garda National Technical Bureau to Forensic Science Ireland. This consolidates most laboratory-based forensic work under Forensic Science Ireland. FSI currently has 200 staff, including seconded Garda members, scientists and analysts trained in forensic testing and reporting techniques, supported by administration professionals.

FSI is currently based in Garda Headquarters in the Phoenix Park but the construction of a new fit-for-purpose building on the scientific campus at Backweston, Celbridge is well underway, with an expected completion of Summer 2022. The transition to this new facility will be completed on a phased basis as soon as possible afterwards.

FSI is a founding member of the European Network of Forensic Science Institutes (ENFSI), as well as the Association of Forensic Service Providers (AFSP). These organisations are focused on developing and sharing best international forensic practices and research within its members. Our staff are active on all the relevant ENFSI and AFSP working groups. This international engagement is important in ensuring that expert evidence presented is grounded in the most recent scientific research and best international practice.

FSI is accredited according to ISO17025 (2017) and holds a Gold Excellence through People certification.

Who Are We and What We Do

Our Management Team



Director General
Chris Enright



Director of
Physical Analysis
Dr. Dyan Daly



Director of DNA
Dr. Geraldine O'Donnell



Director of Science &
Development
Dr. Martina McBride



Director of
Corporate Services
Dr. Dorothy Ramsbottom



Director of
Chemical Analysis
Dr. Yvonne Kavanagh

Our Staff

Forensic Science Ireland is a knowledge-based organisation and the expertise of our staff is its most valuable attribute. Since December 2019, 25 Garda members as well as a number of Garda staff seconded to FSI to support the Fingerprints and Documents and Handwriting services. They have brought a wealth of experience and expertise within their fields that is very much appreciated by FSI. Both of these services now have a blend of expert Garda members and scientific staff recruited by FSI within the teams. FSI currently

has 200 staff, including the seconded staff. We have recruited a number of new scientific, analytical, and administrative staff over the last year to meet the demands of current and new services in Chemical, DNA and Physical Analysis. Forensic science analysis and interpretation are always evolving and consequently FSI places a significant emphasis on ongoing education and development. This is vital in ensuring that the Justice System has the benefit of international best practice.

Our Services

FSI contributes to both the investigation of crime and the judiciary process within the Irish Justice System. In broad terms, forensic investigations involve the examination of items recovered from crime scenes and the use of various techniques to investigate links between suspects and victims, and between suspects and scenes. This is underpinned by an objective evaluation of context and scientific facts, frequently leading to the elimination of suspects from investigations. There are few major criminal trials that do not feature some contribution from FSI.

The area of most sustained growth is DNA, which is also the discipline of greatest recent developments. In the DNA area, DNA profiles are generated from submitted items and compared with DNA profiles obtained from suspects to assist the investigation of crimes ranging from burglaries to sexual assaults and murder. Blood Pattern Analysis (BPA) and the examination of damage to clothing is also carried out. Since the establishment of the National DNA Database, the DNA department plays a key role in managing the Database in accordance with the legislation as well as quality and security best practices. This department reports on matches between individual crime stains and suspects as well as cluster matches. This offers on-going intelligence to An Garda Síochána in the investigation of crime. In accordance with the Forensic Evidence and DNA Database, FSI's policies and practices relating to the DNA Database are overseen by an independent DNA Database Oversight Committee. Since 2019, FSI is exchanging DNA profiles with other European countries through the Prüm Treaty. This treaty allows for the automated anonymous comparison of profiles among participating countries and enables fast information exchange for intelligence purposes.

The analysis of materials thought to contravene the Misuse of Drugs Acts constitute the highest number of submissions to FSI and are supported by the Chemical Analysis department. Case submissions vary widely in size, drug mix and complexity. These cases can involve new psychoactive substances as well as new presentations (such as jellies) that pose particular analytical challenges. The drugs team have influenced legislation through the identification and characterisation of drugs in the market place. This team also quantifies drug purity levels in the market and provides trend information to stakeholders in An Garda Síochána as well as the Department of Health. In addition to drugs submissions, toxicology samples associated with sexual assault cases are analysed and evaluated.

The Physical Analysis area is the most recently formed department in FSI. This department was formed to take advantage of the overlaps between disciplines moving from the Garda National Technical Bureau (GNTB) and disciplines that existed previously within FSI. This department includes the Fingerprints and Documents & Handwriting disciplines that integrated into FSI over the course of 2019. It also includes a diverse range of examinations where trace evidence recovered from scenes or suspects (e.g. glass, paint, fibres, firearm residue) is compared to reference samples. Physical or digital tachographs and marks/impressions are also examined e.g. footwear or tyre impressions left at crime scenes or manufacturing marks on plastic bags. Debris samples from suspicious fires are analysed for accelerants (e.g. petrol), offensive sprays (such as pepper spray) are evaluated and suspect materials are also analysed for explosives within this department.

The majority of cases for analysis at FSI are submitted by An Garda Síochána, but material is also received from Garda Síochána Ombudsman Commission (GSOC), Customs & Excise, and Military Police. Cases are accepted by FSI reception/case intake staff who ensure that items are safely and securely stored or passed directly to a scientist depending on the situation. In either situation, the chain of custody is carefully recorded.

In addition to analysing samples in the laboratory, staff from FSI provide professional advice and training on the appropriate samples to be taken from crime scenes and individuals and, in some circumstances, attend crime scenes. We also operate an out-of-hours service for situations where investigating Gardaí need access to time-critical analysis or when it is necessary to visit crime scenes, or suspected clandestine drug laboratories.

We liaise directly with the Garda on investigations where we identify there is probative evidential value rather than where scientific findings would not help progress the investigation.

Staff provide expert testimony in criminal trials. There is the potential for this to occur in all cases, but some areas of work are more likely to result in court cases than others. Attendance at court can involve robust defence of scientific findings and/or an outline of routine processes related to continuity or laboratory procedures.

STRATEGIC PILLARS

This annual report is organised under six main headings, corresponding to the strategic themes identified in FSI's strategic plan 2019 – 2022.

1

Service Development and Growth

This section focuses on how we are improving the capacity of services we are delivering today and how we are increasing the breadth of services in support of the justice system in Ireland. This section also includes a report on the DNA Database and Prüm DNA exchange.

2

Science Technology and Innovation

This section focuses on how the organisation is progressing our application of science and technology, innovating to maximise the impact of forensic science and maintaining our standing within the international forensic community.

3

Partnership and Integration

This section focuses on how we are strengthening relationships within the criminal justice system and beyond, to maximise FSI's contribution to society.

4

Quality Systems

This section focuses on how we maintain a robust quality-focused forensic science service and operate to the very best international practices.

5

Fit-for-purpose Environment

This section outlines progress in transitioning to a new fit-for-purpose facility at the Backweston scientific campus and how we manage risk in the intervening period.

6

Excellence through People

This section focuses on how we build an inclusive and integrated team within FSI that helps us collectively achieve our mission.



Case Study 1

Multiple evidence types help secure conviction of a suspect in Fatal hit and run of a Deliveroo employee

Thiago Osorio Ferreira Cortes, a Deliveroo employee was cycling along Northwall Quay when he was hit by a vehicle and fatally injured. The vehicle fled the scene. A Ford Focus car was found abandoned with damage to the windscreen, roof and bodywork. It was technically examined to recover trace evidence to help determine if it was the offending vehicle. Thiago Cortes' clothing was examined for damage, paint and glass. His clothing also provided source fibres that could be looked for in any recovered vehicle.

Glass fragments matching the outer pane of the windscreen of the Ford Focus car were recovered on the clothing of Thiago Cortes as was blue effect paint matching the paint from the passenger wing of the Ford Focus.

Fibres matching Thiago's jacket and red T-Shirt were found when fragments of the broken windscreen were examined.

The steering wheel and handbrake controls of the recovered car were swabbed and DNA profiled to help determine the likely driver of the vehicle. Several items were recovered from the interior including a packet of cigarettes with highly patterned packaging. During examination for the presence of finger marks, it became clear that conventional methods were inadequate to capture the details of the fingerprint against the patterned background. A sophisticated new digital imaging system was used and it produced sufficient detail to identify the recovered mark. The DNA profile obtained from the steering wheel and the fingerprint from the cigarette box were from the same source.

A nominated suspect was identified and tracksuit bottoms and top believed to worn at the time of the fatal hit and run were recovered and examined. Glass fragments matching the inner pane of the windscreen were found. The DNA profile and fingerprints from the car matched this nominated suspect's.

At the trial, the suspect pleaded guilty to dangerous driving causing death and was sentenced to two years detention.

Case Study 2

Discovery of a dismembered body

The head and clothing of the deceased were discarded in separate plastic bags. A roll of black plastic bags was found in the bathroom of a property the suspect was living in and a second roll was recovered from the suspect's work place.

These bags were examined to establish whether or not the bag containing the head and clothing came from the same roll as the bags recovered from the bathroom of the suspect's house or workplace.

A comparison of the bags from the body and the clothes with those from the bathroom of the suspect found that they corresponded in relation to their physical appearance and their overall construction, including the heat seals, "extrusion" pattern and some small pigment flaws. These findings offered very strong support for the proposition that the bags came from the same roll found in the bathroom, rather than they did not come from this roll.

The bags from the suspect's workplace were compared to the bags from the suspects bathroom and although there was some correspondence in the construction and physical appearance, the findings offered very strong support that the roll of bags from the bathroom of the suspect's house did not come from the same manufacturing batch as the roll of bags from the workplace rather than they did.

A fingerprint matching the suspects' was obtained from the plastic bag containing the clothing of the deceased.

A pair of bloodstained shoes discarded by the suspect were retrieved from a bin. The DNA profile of the bloodstaining matched that of the deceased.

The suspect who fled the jurisdiction was arrested on foot of a European Arrest Warrant.



Case Study 3

Shooting of Clifford Power

Shortly after 2pm on December 23, 2019, Clifford Power was shot a number of times at close range by a person wearing a Hugo Boss-branded tracksuit top. Two bullet casings were recovered from the scene.

CCTV footage showed a man wearing a Hugo Boss branded clothing entering the Eight-to-Eight shop where, using a €50 note, he bought a bottle of Innocent Orange Juice, a Muller Corner yoghurt and a packet of cigarettes.

Following the shooting, a witness, who was out walking his dog that afternoon, said he observed rubbish thrown over a fence and into an area of rough ground. A navy “Hugo Boss” tracksuit was recovered in a plastic bag.

During a search of an apartment that same day, an orange juice bottle and yoghurt pot matching those bought earlier in the Eight-to-Eight were confiscated. Matching DNA profiles were obtained from the spoon in the yoghurt pot and collar and cuffs of the discarded “Hugo Boss” jumper. In addition, blood from the €50 note in the shop and a fingerprint from the orange bottle were all identified as coming from the same source. The DNA profile from the Hugo Boss top, spoon and the €50 note and the fingerprint matched Gavin Ryan’s.

Firearm residue was identified on the “Hugo Boss” top and it contained the same range of elements as the residue from the spent bullet casings retrieved from the scene of the shooting.

Gavin Ryan was found guilty to the shooting of Clifford Power and sentenced to 13 ½ years imprisonment.

Case Study 4

Double killing and the disposal of the bodies in the river Bandon in November 2011

John Forrester, a father of four, was killed following a jealous row with Ciprian Grozavu and Catherine O'Connor over his former girlfriend. John Forrester's body was recovered from the River Bandon strangled, battered and bound. A cardigan belt was found wrapped around his feet. It was similar to the one missing from Catherine O'Connor's cardigan.

Just 24 hours later a second man Jonathan Duke, also a neighbour in the same flat complex, was visiting both accused when he observed bloodstaining in the apartment and became aware of the killing of Mr Forrester the day before. Duke's body was also tied with a flex and recovered from the River Bandon.

Catherine O'Connor pleaded guilty and was convicted of the murder of her former boyfriend and neighbour in 2011. Ciprian Grozavu was also convicted of the murder of John Forrester. Both Catherine O'Connor and Ciprian Grozavu were convicted of Mr Duke's murder following a trial.

Ciprian Grozavu appealed the murder conviction of Jonathan Duke and the Court of Appeal quashed it and ordered a retrial. During the retrial, evidence was given in respect of bloodied plantar marks made by the right bare foot of Mr Grozavu.

The bloodied footmarks were on a wooden floor inside the hall and inside the apartment where the killing took place. The identification of plantar marks is rare but has the same significance as finger and palm print evidence with respect to uniqueness and persistence.

The blood on the plantar marks matched that of the deceased Mr. Duke.

Mr. Grozavu was acquitted of murder upon direction of the judge but was convicted of two counts of impeding the investigation and disposing of the body. He was sentenced to eight years for disposing of the body and a concurrent sentence of six years for helping Catherine O'Connor remove the body from the scene.



Case Study 5

Novel synthetic cannabinoids detected in Ireland in 2021

Synthetic cannabinoids are a class of designer drug molecules that bind to the same receptors to which cannabinoids (THC and CBD) in cannabis plants attach. Typically synthetic cannabinoids are sprayed onto plant matter and are usually smoked. Reported user negative effects include palpitations, paranoia, intense anxiety, nausea, vomiting, confusion, poor coordination, and seizures. There have also been reports of a strong compulsion to re-dose, withdrawal symptoms and persistent cravings. There have been several deaths linked to synthetic cannabinoids worldwide.

In 2021 Forensic Science Ireland detected five new synthetic cannabinoids in exhibits seized by An Garda Síochana. Each of these synthetic cannabinoids was present on plant material in an attempt to appear as if they were cannabis. The synthetic cannabinoids are ADB-BUTINACA, MDMB-4en-PINACA, 5F-EDMB-PICA, CUMYL-5F-P7AICA and 5F-MDMB-PICA. Forensic Science Ireland reports all new compound detections via the National and European Early Warning networks (EWET and EMCDDA).

Case Study 6

Drug Concealments detected in Ireland in 2021

Drug concealments are not a new phenomenon in the drug trafficking world. There are standard concealments that Forensic Science Ireland (FSI) encounter on a regular basis, the most common of these is called 'body packing', which is the internal concealment of illegal substances inside the alimentary tract. We have also previously seen concealments within common household items, tools, toiletries and even embedded into clothing. As law enforcement become better at gathering intelligence and detecting drug smuggling activities, so too do methods in which to conceal drugs. In 2021, FSI saw an array of methods of drug concealment that were more inventive and sophisticated in nature than previously seen.

For example, in October 2021, 2.6 kilograms of methamphetamine powder was detected which had been found embedded within ten plastic sheeting panels. Also in October, 5.2 kilograms of MDMA powder was detected, which had been hidden under an internal plastic layer of two tool boxes. In August 2021, Revenue Officers at Rosslare Europort seized approximately 88 kilograms of a product which was discovered concealed in machinery being carried on a low-loader, using X-ray scanners and detector dogs. The product which was in 88 packages was submitted to FSI for analysis and later confirmed as being powder containing diamorphine with an estimated street value of €12.3 million.

The most sophisticated concealment by far in 2021 was the high profile shipment of coal that arrived in to Dublin port in July. This was a concealment that was more complex in nature than anything witnessed before. The shipment comprised of two containers which held over 1000 bags of coal in total. Within these bags the cocaine was not visible to the naked eye, or simply encased in a shell of charcoal, but incorporated into a chemical matrix of charcoal. This cocaine/charcoal mixture was previously prepared by drug traffickers by a lengthy chemical process and moulded into shapes that would make it visually impossible to distinguish from the unaltered product. This masked cocaine cannot be detected using the standard field tests employed by customs officials. However, on this occasion X-Ray scanning was successfully used as an indicative result for the presence of cocaine, samples of which were then sent to FSI for confirmatory analysis. FSI did not have to deviate from the standard operating procedures that are in place for the qualitative analysis of this seizure. Remarkably, cocaine was easily detectable using standard sample prep methodologies and the routine accredited GCMS methods that are used in FSI for analysing drugs in seized materials.

It is clear from our own reports that concealments have become more complex in nature. According to Drug Enforcement Administration (DEA) reporting, at least three different masking methods are known to drug trafficking organisations throughout Columbia, including concealments in plastic, coffee grounds and ink cartridges. Therefore more seizures of this nature can be expected in the future for the drug section in FSI.



A hand wearing a yellow nitrile glove holds a glass test tube containing a red liquid. The background is dark blue. At the bottom, there is a pink, textured fabric. The text 'Service Development and Growth' is overlaid in a bold, teal font.

Service Development and Growth

1

Service Development and Growth

Since March 2020 the Covid-19 pandemic imposed significant restrictions on how FSI went about its business in the workplace. FSI is predominantly a laboratory-based service and much of the work requires presence within the laboratory workplace. Remote working, supported by secure remote technology, has been used during the pandemic for case reporting, checking and some other non-laboratory activities and has helped the organisation maintain services over this period. Our staff have continued to adapt extremely well to the challenges and have delivered an uninterrupted sustained service throughout all stages of the pandemic. The level of service delivery and growth outlined below would not have been possible without the selfless commitment of FSI staff throughout 2021.

FSI completed a number of refurbishment projects over the course of 2021 to increase available laboratory and office accommodation. This has allowed us to increase capacity over the course of the year and add some additional staff to the organisation

Service Delivery

Case submissions into FSI have increased by 55% compared to 2018. This is driven mainly by the growth in demand for drugs analysis, DNA services and the integration of fingerprint services into FSI. Submissions in 2021 were lower than 2020, due to some of the unique circumstances of the initial Covid restrictions, but are higher than the preceding years. Case submission trends are summarised in Table 1 below. The complexity and variety of case requests continues to grow across all services. For example, FSI received and reported on 102 Body identifications/Missing Person Investigations in 2021, compared to 80 in 2020. The range in presentation of suspected drugs (including jellies, gels and sweets) adds to the complexity of drugs analysis techniques. New sampling and analysis techniques are continuously required to address the variety in case submissions.

Service	2018	2019	2020	2021	% Growth (2018 - 2021)
Drugs and Toxicology Cases	9,577	10,480	13,184	11,747	23%
DNA (including Sexual Assault Cases)	6,190	7,367	8,028	7,043	14%
Fingerprint Cases	-	-	6,072	5,478	-
Chemistry Cases	821	899	849	787	-4%
Document & Handwriting Cases	-	-	783	621	-
Biometrics - DNA	11,045	16,185	15,515	14,117	28%
Biometrics - Fingerprints	-	-	7,928	8,177	-
Total Cases Submitted (excludes biometric samples)	16,588	18,746	28,916	25,676	55%

Table 1: Case Submissions Into FSI (Demand).

Biometric Samples are DNA or Fingerprint samples of individuals submitted to FSI

Table 2 summarises the number of cases reported on during 2021. FSI reported on 23,854 cases during the year – an increase of 85% compared to 2018 levels. The number of drugs and toxicology cases reported in 2021 (10,440) was 35% higher than 2018 and 29% higher than 2020. This included 5,440 offences under Section 3 of the Misuse of Drugs Act. While 5,000 complex drugs and toxicology cases were reported, this fell short of our 6,000 target set at the beginning of the year, as the completion of additional drugs laboratory space and the recruitment of new staff were delayed until the 2nd half of 2021. This increase in drugs analysis capacity has been in place since Q4 2021 and continues in 2022.

Service	2018	2019	2020	2021	Change vs 2018
Drugs and Toxicology Cases	7,717 Total (4,845 complex, 2,872 Section 3)	9,667 Total (5,555 complex, 4,112 Section 3)	8,106 Total (5,267 Complex, 2,839 Section 3)	10,440 Total (5,000 Complex, 5,440 Section 3)	35%
DNA Cases (including Sexual Assault)	4,500	5,860	7,237	6,954	54%
Fingerprint Cases	-	-	5,601	5,222	-
Chemistry Cases	675	555	581	572	-15%
Document & Handwriting Cases	-	-	514	666	-
Biometrics - DNA	11,045	16,185	15,515	13,541	23%
Biometrics - Fingerprints	-	-	8,434	8,077	-
Total Cases Reported (excludes biometric samples)	12,892	16,082	22,039	23,854	85%

Table 2: Cases Reported by FSI in 2021

Types of Drug Analysed in 2021

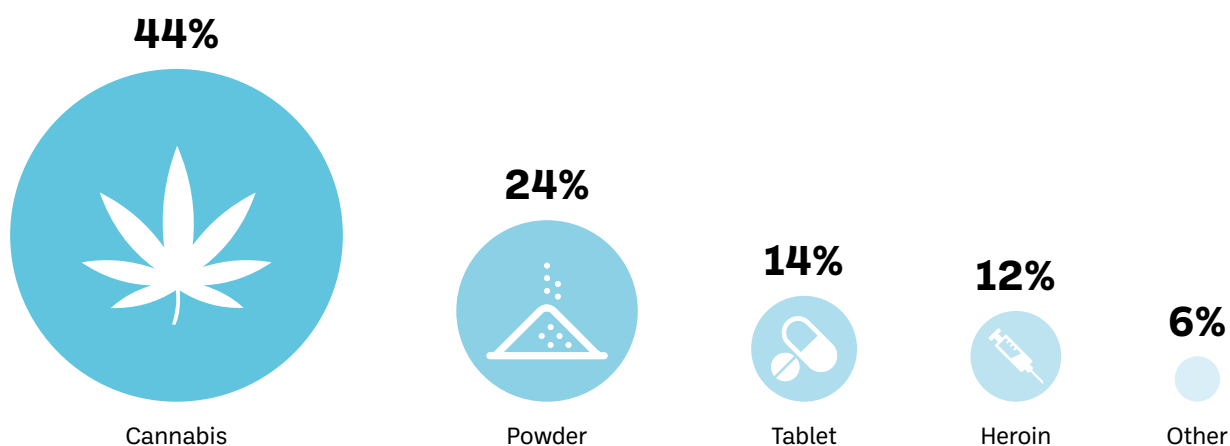


Figure 1: Types of Drug Analysed in 2021

Drug Quantification Trends 2016-2020

Quantification data is produced for intelligence purposes for cocaine, diamorphine (heroin), and amphetamine. Cocaine and diamorphine were the second and third most commonly seized drugs, respectively, in 2020. Commonly identified adulterants are also identified. Two distinct levels of seizure are analysed for quantification of cocaine and diamorphine: street level and importation level. Street level samples are defined as those submitted from seizures less than 30 g, primarily between 25 -30 grams while importation level samples are defined as those submitted from seizures over 500 g. For amphetamine, all seizures over 25 g are quantified.

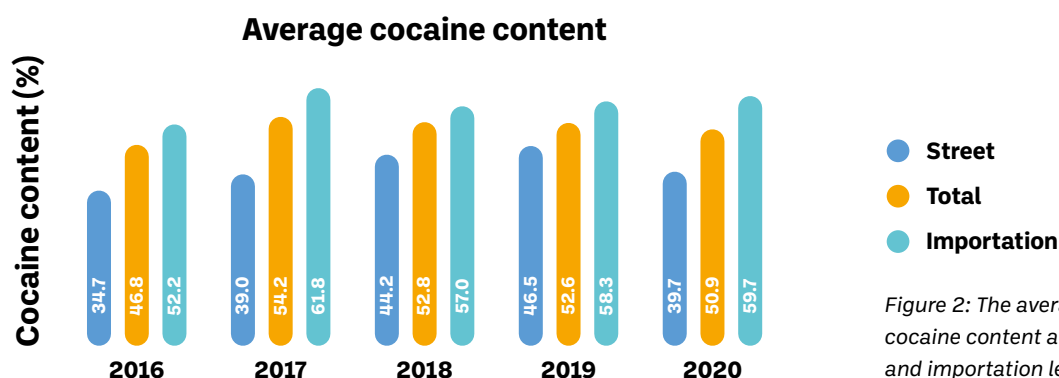


Figure 2: The average cocaine content at street and importation level

Cocaine

Cocaine was the most commonly seized stimulant in Ireland across the period examined and the second most commonly identified compound after cannabis. In 2020, 35% of all drugs cases analysed in FSI contained cocaine. Figure 2 illustrates the annual average cocaine content with a decrease at street level noted for 2020 – this is the first decrease over the 5 year period examined. The importation level content is consistently higher than the average at street level. Of the three analytes examined, cocaine demonstrates the widest variety in adulterants. Benzocaine is the most commonly detected adulterant across 4 of the 5 years examined followed by levamisole. The largest cocaine seizure in 2020 was 61.9kg in Dublin in July 2020.

“2020 showed the first decrease in street level cocaine in 5 years”

Amphetamine

Amphetamine is the second most commonly encountered phenethylamine in Ireland, after MDMA. Between 2016 and 2020 the annual average amphetamine content has remained broadly consistent with an average content of 7.6% (range 6.7-9.4%). Caffeine remains the most commonly detected adulterant in amphetamine seizures, detected in 93.9% of submitted quantification samples in 2020. The largest amphetamine seizure during this five-year time period examined was 16.4 kilograms, seized in Carlow in April 2019. Across the five year period examined, two cases of liquid amphetamine were also analysed, in 2016 and 2020. Both results were significantly higher than the average amphetamine content across the time period, 40% and 67.7% respectively.

“2020 showed the lowest street level diamorphine in 5 years”

Diamorphine (heroin)

Diamorphine is a semi-synthetic product produced by the acetylation of morphine, which occurs as a natural product in opium. The drug is controlled in the Republic of Ireland. Diamorphine is the most commonly encountered opioid in Ireland and throughout the EU and was the fourth most commonly identified compound in FSI in 2020. In 2020, 12% of all drug cases analysed in FSI contained diamorphine. 2020 saw a departure from previous trends with importation level content increasing while street level content decreased to the lowest value seen across the 5 year period examined. The largest seizure in 2020 was 18.7kg seized by GND0CB in August 2020.

Chemistry, Documents and Physical Methods Cases

The broad variety of Chemistry and Documents and Physical Methods cases analysed is represented in Figures 3 and 4. Each discipline represents a unique speciality and field of expertise.

Chemistry Cases Reported in 2021

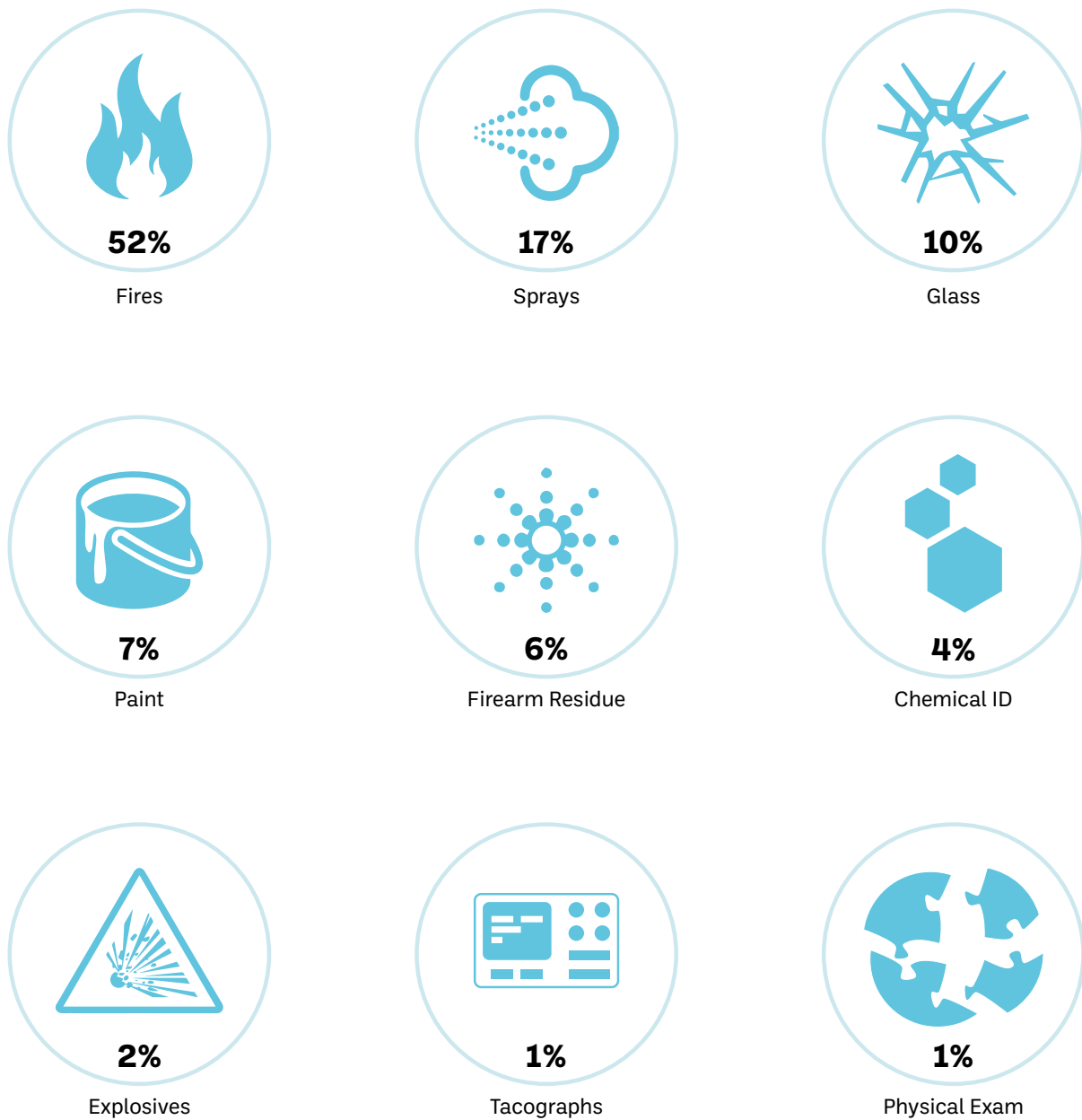


Figure 3: Types of chemistry cases reported in 2021

Documents and Physical Methods Cases Reported in 2021

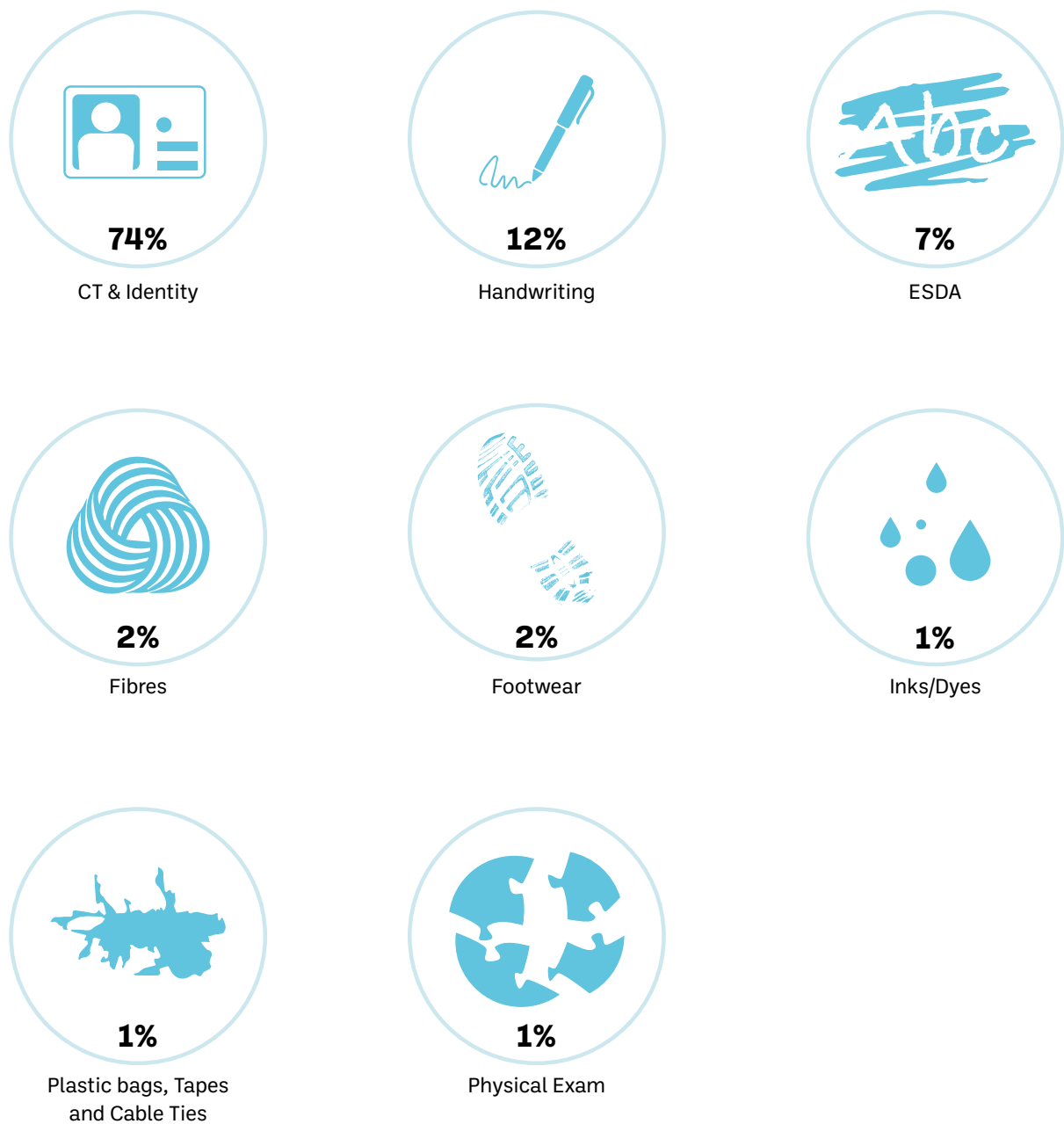
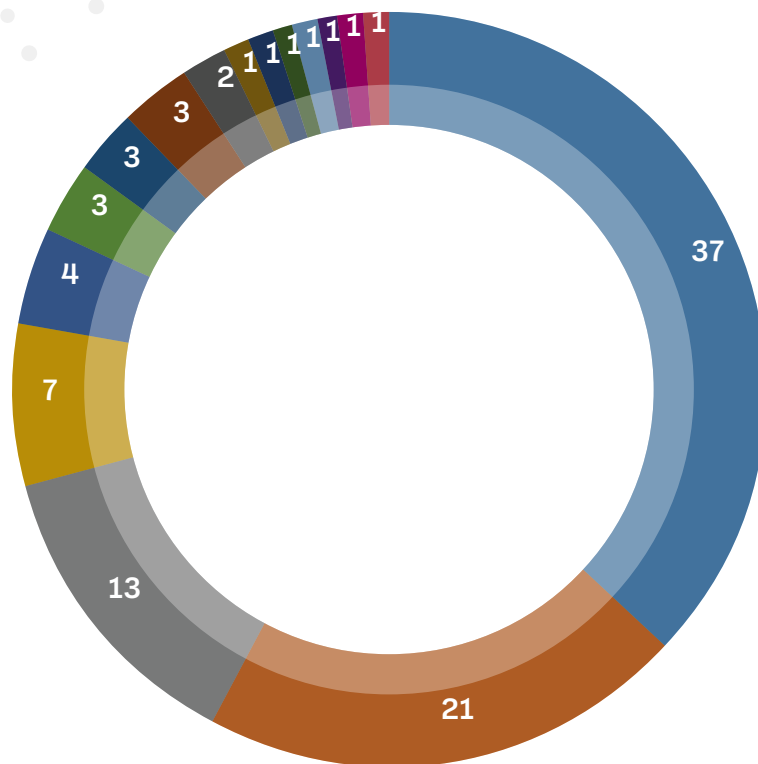


Figure 4: Types of Documents and Physical Methods cases reported in 2021

Fingerprints



Burglary	37%
Robbery/Theft/ Unlawful taking	21%
Drugs	13%
Criminal/Malicious Damage	7%
Fire Arms/Explosives	4%
Assault	3%
Hit and Run/traffic accidents	3%
Attempted murder/Suspicious death/Death	3%
Aggravated Burglary	2%
Fires	1%
Fraud	1%
Sexual Assault	1%
Public Order offences	1%
Endangerment/False Imprisonment/Hijacking	1%
Other *	1%
Threats/Domestics	1%

Figure 5 represents the broad range of investigations supported by the Fingerprint section over the course of 2021. This includes for example, recovering a fingerprint mark from drugs packaging, from firearms and murder investigations.

The fingerprint section has been processing Sirene requests since the system went live in March 2021, with weekly traffic average at 850 requests per week

Figure 5: Fingerprint Investigations in 2021

DNA Cases

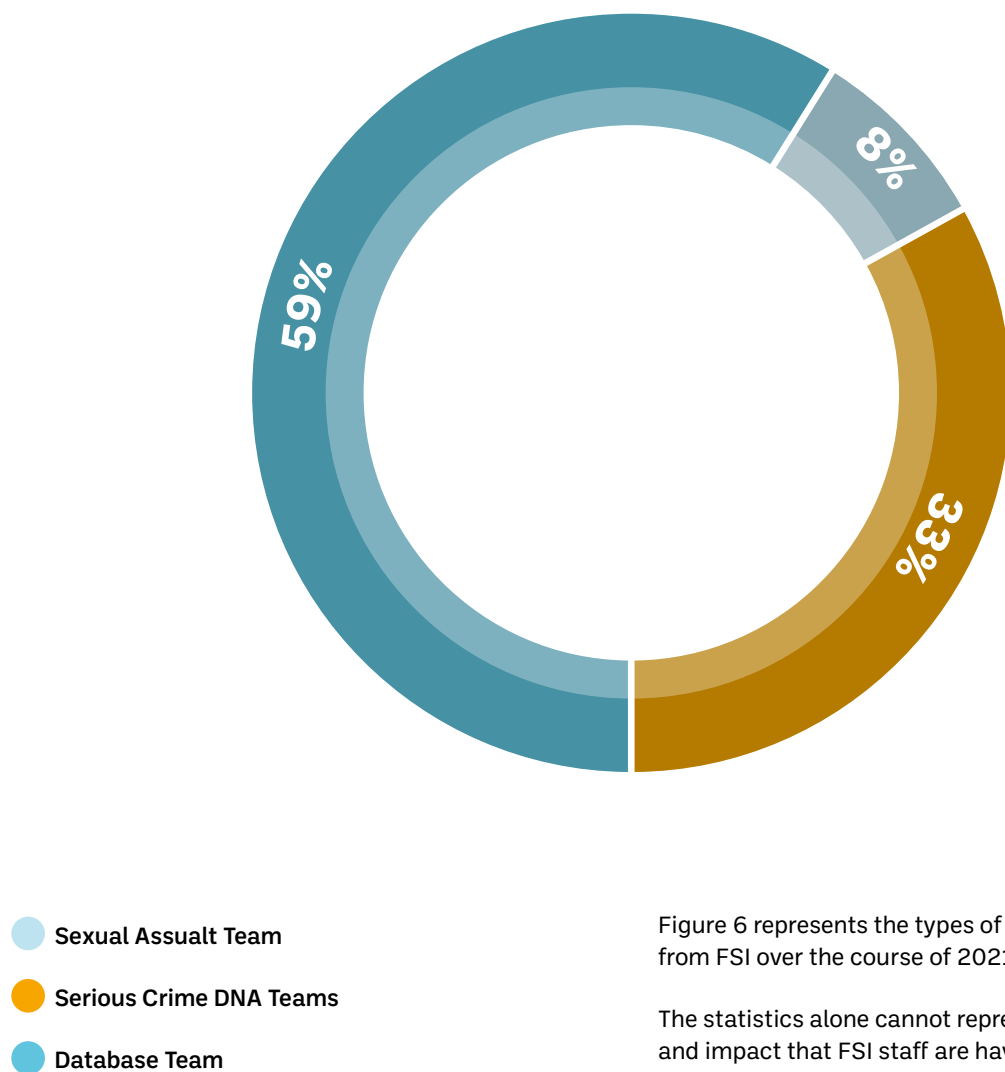


Figure 6: DNA Cases Reported in 2021

Figure 6 represents the types of DNA cases reported from FSI over the course of 2021.

The statistics alone cannot represent the contribution and impact that FSI staff are having on the justice system in Ireland. Forensic evidence from FSI was used extensively in Garda investigations and court cases in many murders, serious assaults, sexual assaults, drug seizures and other offences associated with gangland and organised crime throughout 2021.

Contribution to Cold Case and Missing Person investigations

In 2021 FSI reopened investigations into fifteen Cold Cases in conjunction with the Serious Crime Review Team of An Garda Síochána. These crimes ranged from the year 1985 up to 2016 and consisted of serious crimes including five sexual assaults.

Working in conjunction with the Missing Persons Unit of An Garda Síochána and using DNA profiling and relationship testing, FSI was able to assist in the identification of thirteen unidentified human remains in 2021.

In September 2021 Forensic Science Ireland received a DNA profile from an unidentified human remains recovered in the UK in January 2020 via the Garda Interpol channel. A positive identification was made by comparison of this DNA profile with three members of a Missing Person's family housed on the Irish Missing Persons database. The man had been missing since November 1999 and his car had been found abandoned in Howth in County Dublin.

The exchange of DNA profiles via Interpol has led to numerous successful identifications including a case where remains, which were believed to be that of a Romanian National Llie Cristian Stanganciu were found in an abandoned house in County Clare in September 2020. A profile from his mother was sent to FSI via Interpol and this resulted in a positive identification.

Another case was that of Gheorghe Virvara who was last seen in December 2020 and remains were recovered from a beach in Wales. A DNA profile was generated at FSI from a surrogate sample from his toothbrush which resulted in a positive identification of the remains.

Sean Bond was missing since December 2017 after he had left home on foot. Human remains were found in a nearby forest in May of 2021. His relatives had submitted their DNA samples for upload to the Missing persons Database in 2018 and a positive identification was made by comparison with the deceased's mother.

In 2021 other identifications include Terry Byrne who was missing from his home since February 2020 and remains were found along a railway track and Barry Coughlan missing since 2004 and remains were found in a car in the sea near the pier at Crosshaven. In both cases identifications were made after comparison with reference samples from family members.

Service Flexibility

The system to facilitate an Out of Hours service continued in 2021. Each scientist carries an on-call phone for a week at a time and a smaller group are available to attend scenes or to carry out necessary urgent laboratory work. This service is provided by a panel of 34 scientists with two scientists being called in to the laboratory for out of hours services, for capacity and health and safety reasons. This service was availed of on 32 occasions over the course of 2021 – covering the full gamut of case types. FSI attended 3 crime scenes to provide specialist knowledge, particularly for Blood Pattern Analysis (BPA) in murder investigations.

Court Cases

A percentage of the cases examined by FSI result in court attendances each year. Frequently these cases relate to reports issued in earlier years. Staff from FSI attended court as expert witnesses on 104 occasions in 2021 (compared to 50 in 2020 and 108 in 2019). The number of occasions expert testimony was presented in court for each discipline is tabulated in Table 3.

Team	Number of court appearances 2021
DNA – (Excluding Sexual Assaults Cases)	45
DNA – (Sexual Assault Cases)	17
Chemistry	13
Drugs	11
Toxicology	8
Fingerprints	5
Documents and Handwriting	3
Administrative	2

Table 3: Expert Evidence in Court (2021)

Thirteen of the court appearances in 2021 were virtual. This is a facility that was put in place during Covid restrictions but that we hope to see continue and grow in the coming years.

Visits from Defence Scientists

Scientists employed by the defence visited FSI on 24 occasions in 2021, compared with 14 occasions in 2020 and 27 in 2019. Of these, 14 related to DNA cases, 7 related to drugs cases, 2 related to fingerprint cases and 1 related to a chemistry case. On several other occasions, FSI supported defence requests by providing scanned copies of case files for review. This approach was particularly helpful there were restrictions on travel from outside the State due to Covid-19.

Benchmarking

Throughout 2021, FSI engaged in formal and informal benchmarking on several aspects of service delivery with members of the Association of Forensic Science Practitioners (AFSP). These are laboratories, public and private, providing forensic services around the UK and Ireland. This included demand trends, operational responses to Covid-19 and health and safety measures.

DNA Database

This section is a report on the operation of the DNA Database in 2021, in compliance with the Criminal Justice (Forensic Evidence and DNA Database System) Act 2014.

The DNA Database commenced operation on the 20th November 2015 and is one of the most important crime fighting tools within the State.

Using the database, information is supplied to the Gardaí about links between people and unsolved crimes. These crimes have ranged from burglary/ criminal damage to crimes against the person, sexual assaults and suspicious deaths. The power of the database as an investigative tool is that it is providing Gardaí with investigative leads in previously unsolved serious crimes. The database can replace more traditional and time consuming police investigative methods and provide more focus to a criminal investigation. It is now also possible to retain samples from relatives of missing persons to aid in the investigation of unknown remains.

Overall 2021 saw an increase in the volume of Database records, as well as an increase in the impact and effectiveness of the system.



Number of DNA profiles on the National DNA Database

Figure 7 displays the overall growth in the National DNA Database since 2015

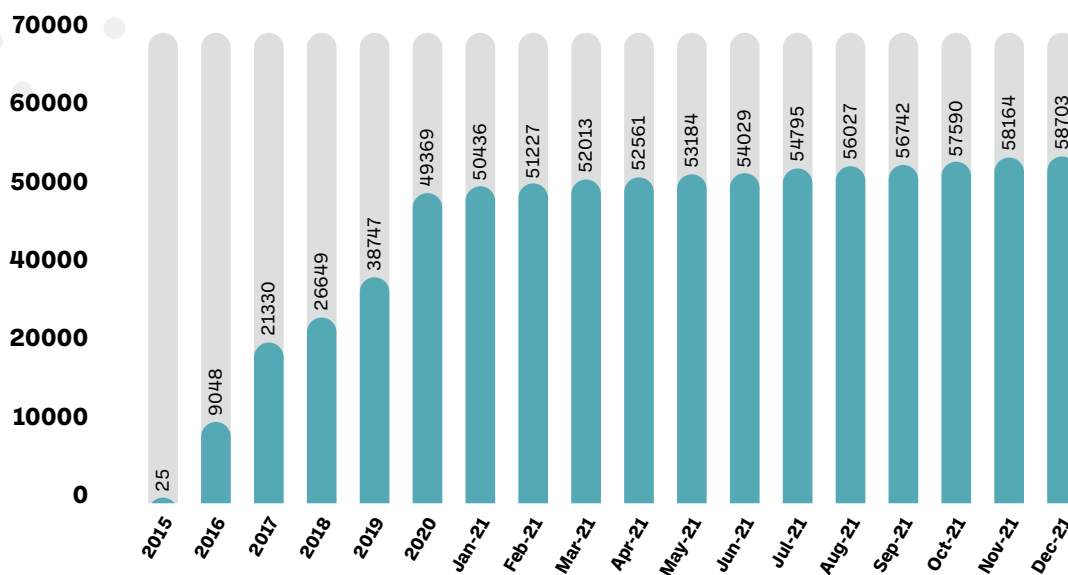


Figure 7: Total numbers of individual profiles (person or crime stain) on the database displaying overall growth since 2015. Increase of profiles in 2021:9,334

Profiles on the DNA Database System by Index

Figure 8 shows the numbers of DNA profiles held in the four indices of the National DNA Database at the end of December 2021



Figure 8: DNA Database System by Index

Breakdown of profiles on the DNA database system by Index

Reference Index – Includes the Suspect Known, Convicted Offender and Section 28 Volunteer specimen categories

Crime stain Index – Includes the Forensic Unknown and Forensic Mixture specimen categories

Elimination Index – Includes FSI, Garda, Garda CSI, GSOC and S44 Prescribed Person specimen categories

Identification Index – Includes profiles from missing person, unidentified human remains and relatives

Number of persons' profiles on the DNA Database System

Figure 9 shows the number of profiles from persons on the DNA Database from the date of commencement to end of December 2021. This figure takes account of the significant numbers of DNA profiles from persons destroyed in compliance with part 10 of the Criminal Justice Act 2014 over this period (as illustrated in figure 12).

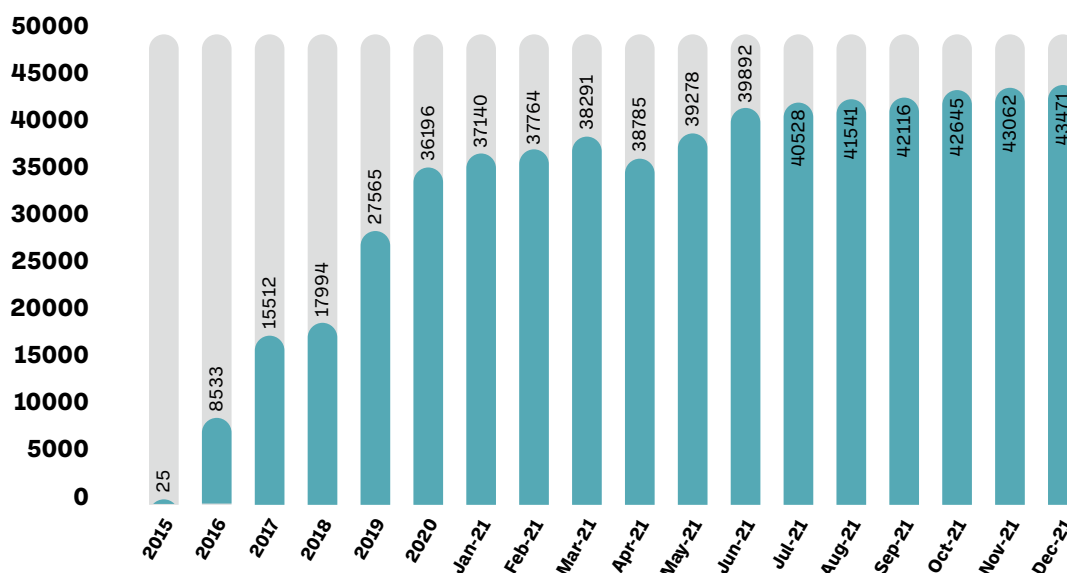


Figure 9: Increase in Profiles on Reference Index

Number of unsolved crime stains added to the DNA Database System

Since the commencement of the Database 9,727 unsolved crime stains were added to the crime stain index (as of the end of December 2021), with 1,390 crime stains added in 2021 (Figure 10).

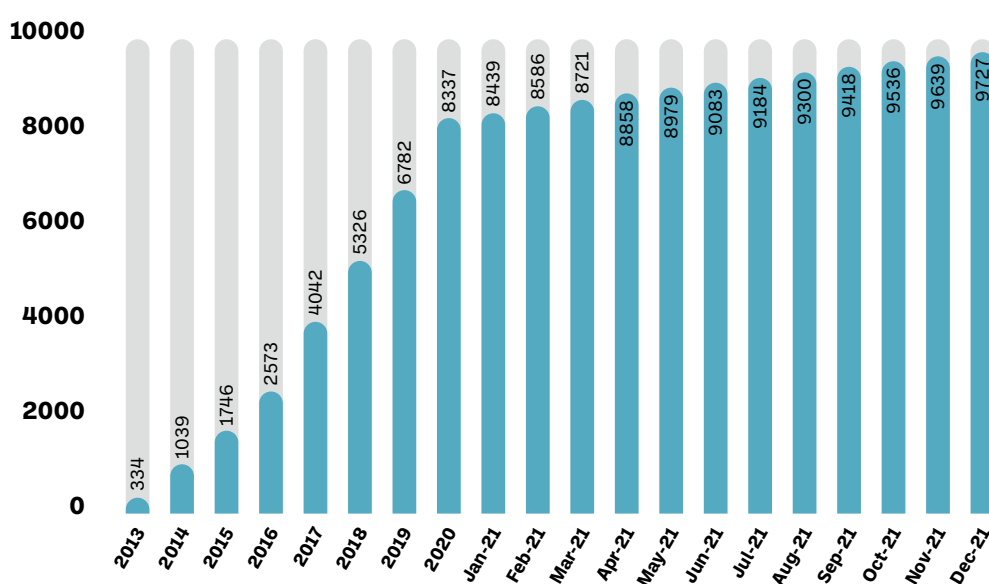


Figure 10: Cumulative number of crime stains uploaded to the Database to the end of 2021

Sample destruction and profiles removal from the DNA Database System

Figure 11 shows the number of samples destroyed since commencement of the DNA database (64,409 samples destroyed up to 31st December 2021, 11,402 samples destroyed in 2021), while Figure 12 shows the number of profiles removed since commencement of the DNA database (28,947 profiles removed up to 31st December 2021, 5,671 profiles removed in 2021).

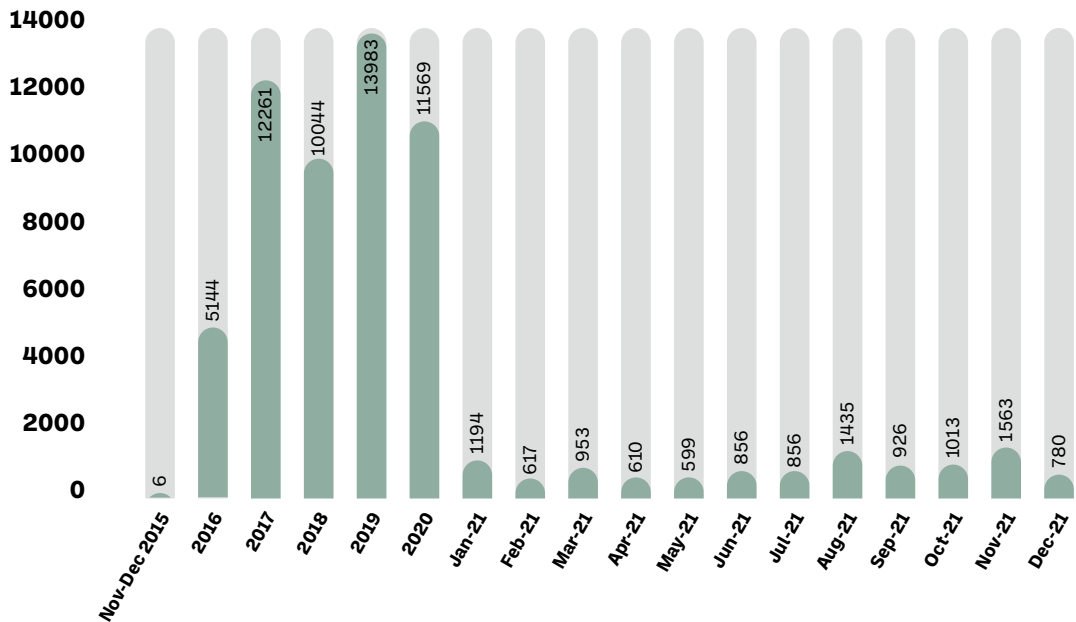


Figure 11: DNA Sample Destruction

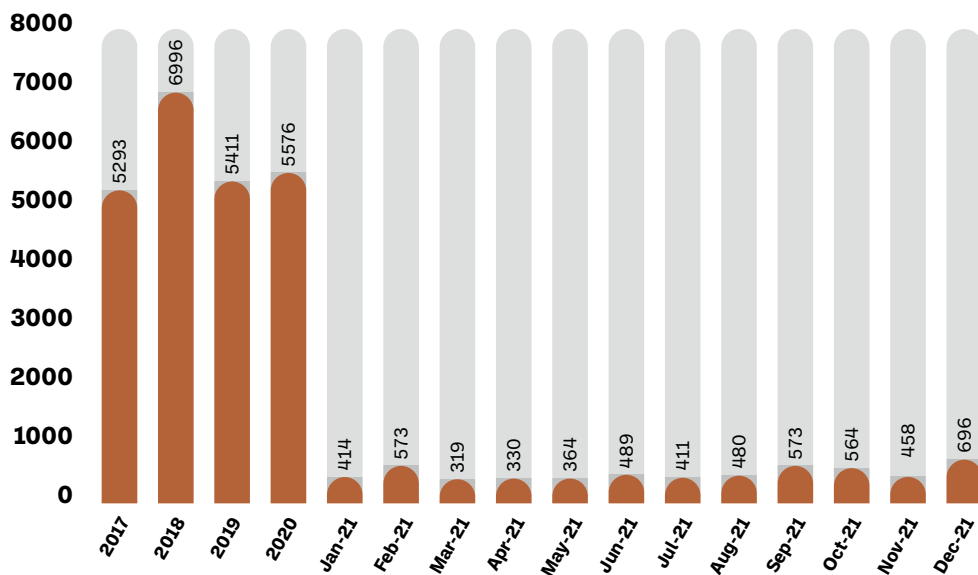


Figure 12: DNA Profile Removal

Investigative links:

Two potential matches can occur when an additional profile is added to the Database – a crime stain can match another crime stain suggesting a link between crimes or the crime stain can match to a person suggesting a link between the person and the crime. Overall, the DNA Database identified 759 hits in 2021, which assisted 920 cases. The types of hits are detailed below:

(a) Persons linked to crime stains

There were 715 person-to-stain matches in 2021- 498 of these were person to single case matches providing assistance to 480 investigations while in 217 cases the person was linked to multiple case matches providing assistance to 341 investigations. In total 821 cases have been aided. The details of the cases involving person to stain matches is available on Figure 13.

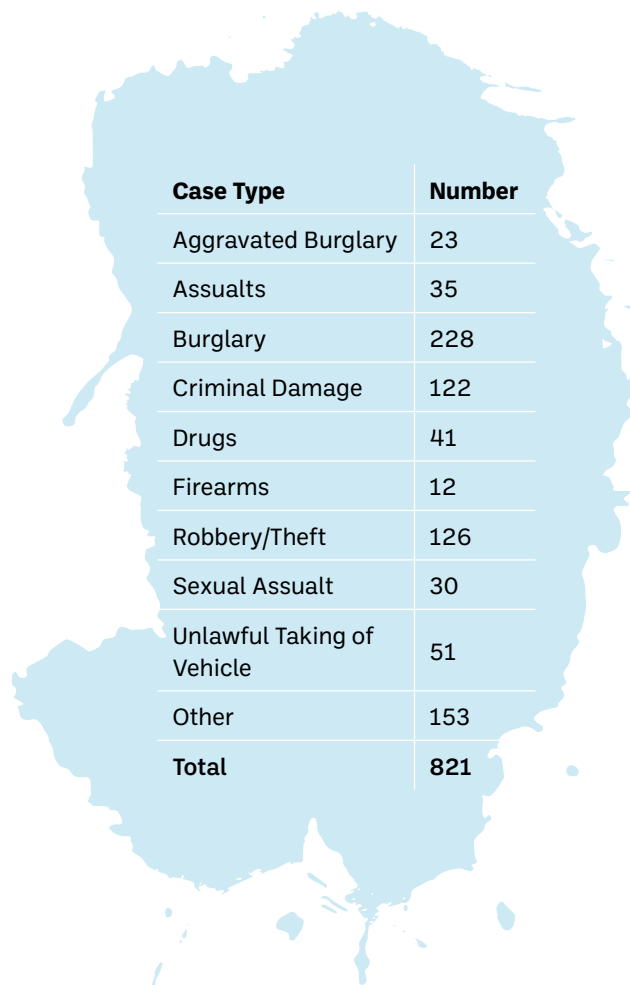


Figure 13: Person to Stain matches [Types of investigations and the number of each involved in 2021]

(b) Crime scene samples linked to other crime scene samples

This type of match occurred 44 times in 2021. In 39 such cases, a case-to-case match was reported while in the other 5 cases, there were clusters of cases associated with each other. Overall, this resulted in 99 investigative links ('hits') between unsolved crime stains - see Figure 14 below

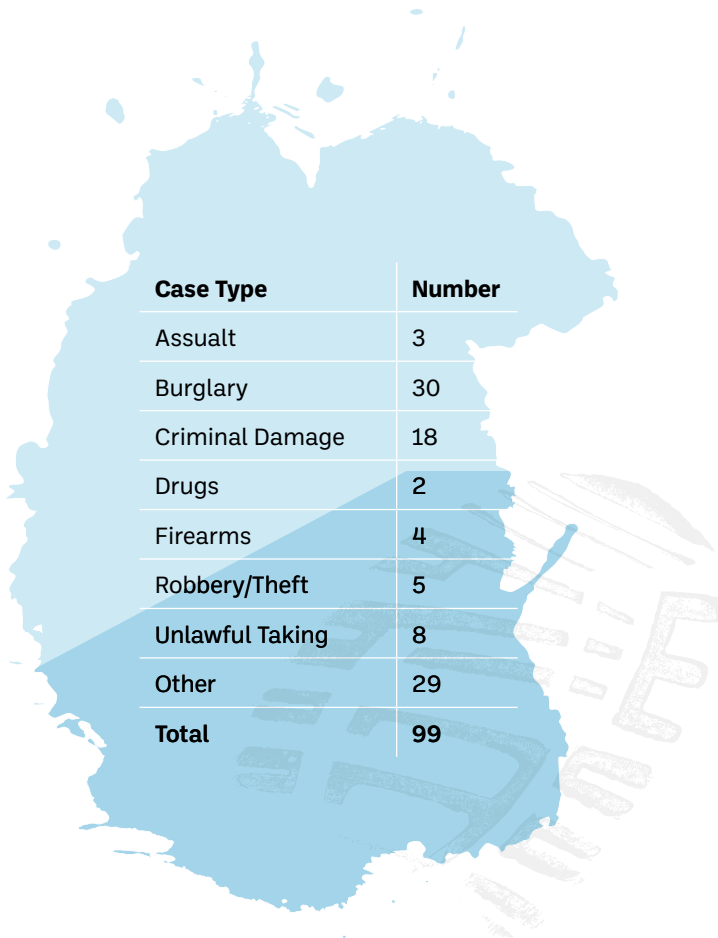
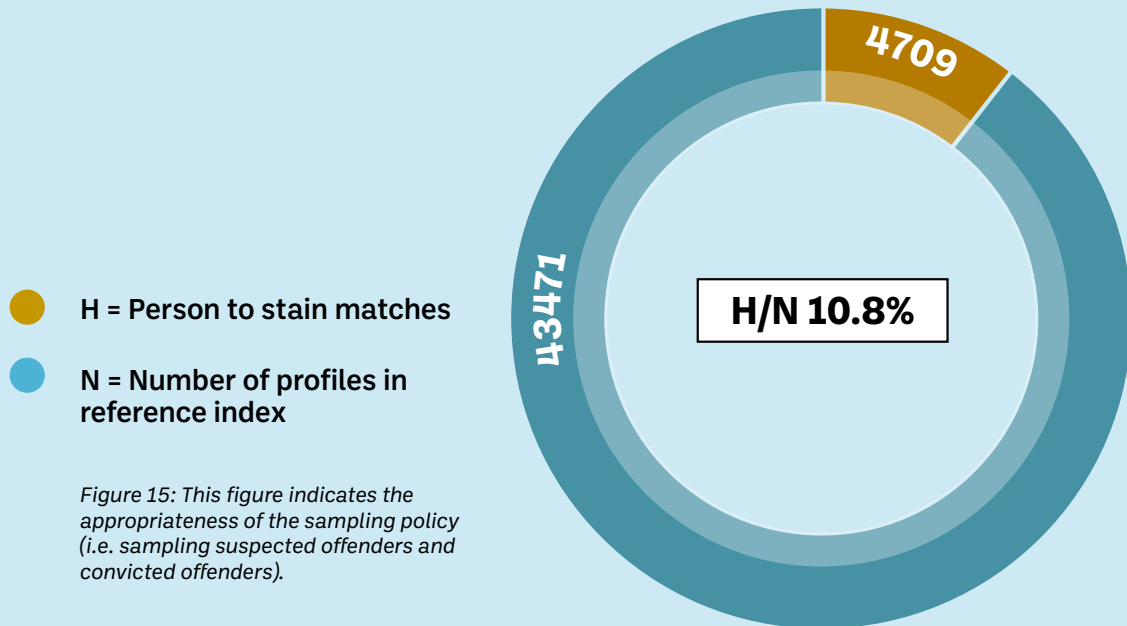


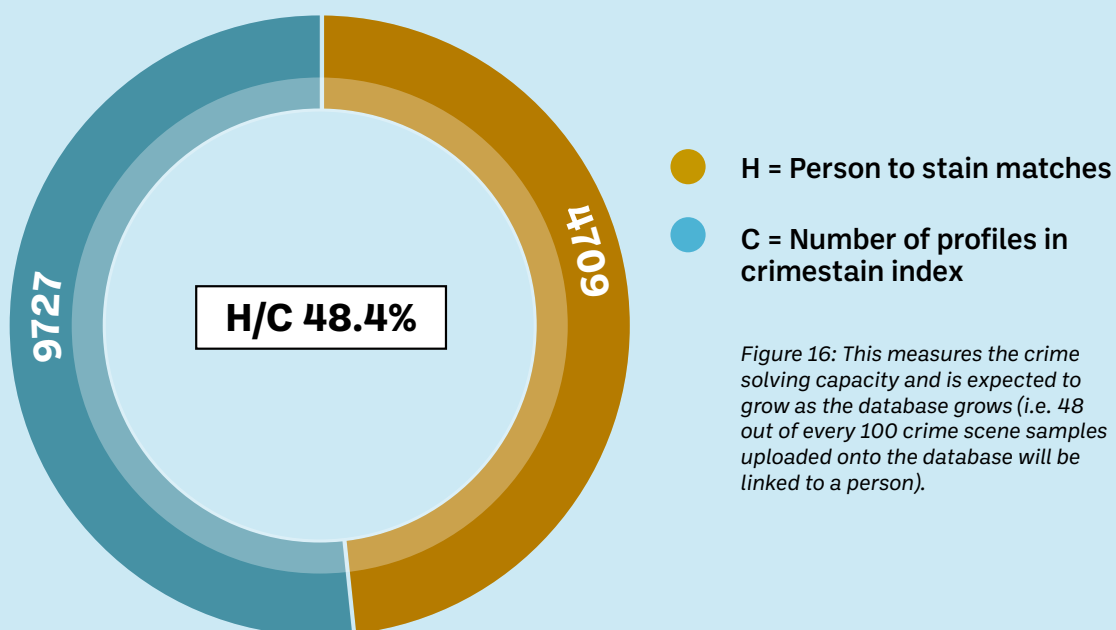
Figure 14: Stain to Stain matches [Types of investigations and the number of each involved in 2021]

Metrics used internationally to assess the effectiveness of databases are available in Figures 15 and 16. These figures were as of the end of December 2021.

H/N: The Number of Person to Stain Matches Relative to the Number of Persons Included in the Database



H/C: The Number of Person to Stain Matches Relative to the Number of Stains Included in the Database



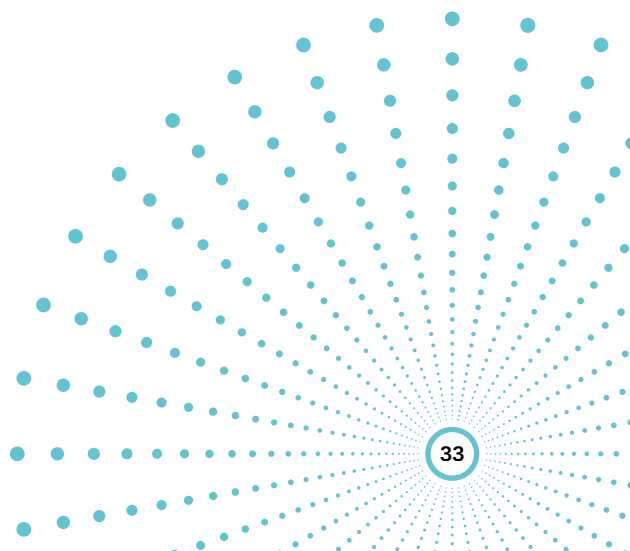
Prüm Treaty

The Prüm treaty includes cross-border cooperation by means of exchanging judicial and police information and by providing mutual assistance. With regards to the exchange of information, each European member state has to make its DNA database available to other Member States for automated searches on a hit/no hit basis. After a match, personal data and case information are exchanged between countries by existing mutual legal assistance procedures (police or judicial).

On the 2nd of October 2019, FSI began live exchange of DNA data and at the end of 2021 was exchanging data with eleven Member States. Figure 17 shows the match results obtained between the Irish DNA database and the DNA databases of the eleven Member States.

Prüm Match Statistics 2021			
	Irish Crime Stain to Prüm person	Prüm Crime Stain to Person on Irish Database	Prüm Crime Stain to Ireland Crime Stain
Austria	22	15	3
Latvia	1	1	0
Netherlands	15	10	6
United Kingdom	411	173	33
Slovakia	1	2	0
Poland	4	4	1
Sweden	2	12	1
Estonia	0	0	0
Malta	0	0	0
Germany	12	68	9
France	16	52	3
Total	484	337	56

Figure 17: Prüm Match Statistics





Case Study 7

False Imprisonment and Assault of Kevin Lunney at Drumbrade Co. Cavan in September 2019

Kevin Lunney was abducted from his home in Co. Fermanagh. He was falsely imprisoned, assaulted and then released in Co. Cavan.

A Scientist attended a scene at Drumbrade in Co. Cavan to conduct a forensic examination. Following an examination of a horse box at the scene, blood matching Kevin Lunney was found.

A Renault Kangoo van found at a different location, was also examined and blood was found in the interior of the van which matched Mr. Lunney.

These significant findings allowed the investigators to link the van and horse box to the assault of Kevin Lunney.

Items were also seized from a number of properties in Cavan and Dublin 3 for examination and DNA profiling.

In June 2021, Darren Redmond, Alan O'Brien, Alan Harte and Luke O'Reilly went on trial at the Special Criminal Court in relation to this case. Two Forensic Scientists gave evidence during the trial.

Darren Redmond, Alan O'Brien and Alan Harte were found guilty of falsely imprisoning and intentionally causing serious harm to Mr. Lunney at Drumbrade, Co. Cavan.

Luke O'Reilly was found not guilty in connection with the kidnap and assault of Kevin Lunney.

Case Study 8

Murder of John Lowe in Portlaw, Co. Waterford on the 13th of December 2018

On the 15th of December 2018, a scientist attended the scene of the murder of John Lowe in a house in Portlaw, Co. Waterford to assist with Bloodstain Pattern Analysis (BPA) and in the selection of samples for subsequent examination and DNA analysis in the Laboratory.

Mr. Lowe had received multiple blows to the head and died from his injuries. During the scene examination, significant bloodstain patterns were observed and their source subsequently identified by DNA profiling. This allowed the scientist to provide an expert opinion as to the activities that occurred in the house to create these bloodstain patterns.

Items of clothing taken from the Person of Interest, Stephen Keane, in the case were also examined and blood found was identified by DNA profiling.

In May 2021, the forensic scientist gave evidence in the trial of Stephen Keane at the Central Criminal Court in Waterford. Stephen Kean was found guilty of Murder.



Case Study 9

Prüm cluster match to person on the Austrian Database results in a conviction to two Irish sexual assault cases in 2021

Matching male DNA profiles were obtained from semen found in two sexual assault cases.

The first case is an alleged sexual assault, which occurred in February 2016 where a male unknown to the injured party assaulted her in the back of a car. Semen was found on her intimate swabs and the male profile obtained was uploaded and searched on the Irish DNA Database system. There was no match on the DNA Database System at the time of searching.

The second case is an alleged sexual assault, which occurred in February 2019 where it is alleged that a Taxi driver assaulted the injured party. Again semen was found on her swabs and a male profile was obtained and uploaded onto the Irish DNA Database system. A match was obtained to the DNA profile obtained from the swabs in the first case from 2016. The profile did not match any person on the Irish DNA Database.

Subsequently following the initial exchange of DNA profiles with Austria under Prüm in 2019 there was a cluster match with the unknown male profile from both cases matching a person on the Austrian DNA Database.

The individual was arrested by An Garda Síochána and Section 13 FTA evidential reference samples were submitted from the person for both cases in March 2020. Evidential statements were then issued by FSI for both cases, with the match from the semen to the individual reported.

There was a trial in October 2021, where both Forensic Scientists involved in the two cases gave evidence and the accused was found guilty.



Case Study 10

Alleged sexual assault on 4th of July 2021

An unknown male broke into an elderly ladies home, where he allegedly sexually assaulted her. Upon exiting the property the suspect cut himself and bled at the scene. The suspect admitted to breaking into the home but said he had no contact with the injured party.

The clothing from the victim and suspect were submitted for examination together with sample(s) of blood taken from the scene. Damage (force and pulling) was observed on the undergarments from the injured party. The suspect's clothing was examined and blood was found that matched the injured party on the front of his jacket. The blood taken from the scene matched that of the suspect. The suspect plead guilty to aggravated burglary and sexual assault and received a sentence of 8 years imprisonment.





Science, Technology and Innovation

2

Science, Technology and Innovation

FSI recognises that robust Information Technology platforms and systems is one of the cornerstones for consistent operational performance as well as innovation. A key focus for us in 2021 was to introduce some new IT systems that improve the efficiency and effectiveness of FSI and would provide a stable basis for a start-up at the Backweston site. Some good progress has been made but a lot of important project work remains over the next 12 months.



A project to upgrade the Automated Fingerprint Identification System (AFIS) started in 2021 and is due for completion this year. This upgrade includes the most recent search/match algorithms, allowing faster and more accurate searching and comparison of suspect marks with latent marks recovered from crime scenes, as well as hardware and user workstation upgrades. It will allow FSI to expand and provide a more efficient fingerprint laboratory service. This project has been co-funded by An Garda Síochána and the Department of Justice. In addition, a project was initiated to conduct technology, market, policy and benchmarking analysis that will inform a longer-term AFIS replacement. This is a cross-sectoral multi-agency evaluation that will help shape future investments in next generation AFIS systems. It's very encouraging that this combination of near-term improvements and longer-term strategic developments are happening in parallel.

Progress was also made in the integration of data systems within FSI. A new system was developed and implemented to track Biometric Reference Numbers (BRNs) of fingerprint records submitted by An Garda Síochána through FSI's Laboratory Information Management System (LIMS). This system is being extended to include DNA records in 2022. This system allows for a more efficient administration of records across the life cycle of these biometrics.

Work was also initiated to integrate FSI with the Criminal Justice Operational Hub. This platform allows for different bodies within the justice sector to exchange data automatically under the appropriate data governance agreements. Scoping work has commenced on exchanging information from the Court Services with FSI so that cases can be prioritised more efficiently.

Some other projects have progressed at a slower pace and will need further work over the next 12 months. A project to simplify and consolidate FSI's primary IT operating platform is underway and will be accompanied by a full hardware refresh. This project is now due to be completed before the Backweston transition. A new system to capture, store and compare DNA data generated by FSI's automated DNA instruments has started development work but will be delayed until the end of 2022/early 2023.

The automation of processes and effective integration of data will enable FSI to be more efficient with its services and more effective within the criminal justice system –this will remain a key focus for FSI in the coming years.

Our staff have continued to push the boundaries with available technologies and introduce them into forensic practice over the course of 2021.

A Next Generation Sequencing (NGS) Instrument was commissioned and validated for use. FSI's DNA Team have developed methods for generating Mitochondrial DNA profiles. This work could prove to be very useful in light of anticipated work following the Institutional Burials legislation. We will continue to invest in the capabilities that NGS offers as it has the potential to assist in Missing Person or Cold Case investigations where DNA samples are often degraded.

A new Liquid Chromatography Mass Spectrometry (LCMS) has been commissioned and validated for use and extends the range of analytes that can be assessed in different forms. New Gas Chromatography (GC) instrumentation was also procured and commissioned in 2021. Once validated, this will become a key instrument for drugs analysis service at the Backweston site.

Additional instruments have been procured and commissioned for fingerprint mark visualisation and for the analysis of firearm residue. This will provide some much needed capability and resilience to these services.

FSI staff are active in all AFPS and ENFSI working groups. This is necessary so that we keep abreast of and contribute to best practice development in the forensic community.

Last year FSI participated in a European funding submission to advance the European knowledge-base and competencies in many forensic science disciplines entitled - **Competency Education Research Testing Accreditation and Innovation in Forensic Science (CERTAIN-FORS)**. This submission was successful and FSI is now actively contributing to this research agenda.



Publications:

The following papers were authored or co-authored by staff in FSI over the course of the year.

- 1** An evaluation of the SIRCHIE Nark®II Presumptive Drug Testing (PDT) kit for the identification of Methylenedioxymethamphetamine (MDMA) and Methylamphetamine (MA) in casework samples at Forensic Science Ireland.
Mr. Robert Kennedy, Dr. Gavin McLaughlin, Dr. Shane O'Malley, Dr. David Casey.

- 2** "Quantification Summary 2016-2019".
Cocaine, diamorphine and amphetamine quants.
The Chemical Analysis Department, FSI

- 3** Drug Data 2019, Chemical Analysis Department,
Contact: Dr Shane O'Malley
email: somalley@fsi.gov.ie
Tel: +353 (0)1 666 1926

- 4** Benzodiazepines and other medications 2019,
Chemical Analysis Department,
Contact: Dr Shane O'Malley
email: somalley@fsi.gov.ie
Tel: +353 (0)1 666 1926

- 5** The prevalence and persistence of saliva in vehicles.
Forensic Science International: Genetics,
Volume 53, 2021,102530.
Patrick Kelly and Edward Connolly

- 6** Irish drug quantification trends for cocaine,
diamorphine and amphetamine 2016-2019.
Drugnet Issue 77.
Sarah Hanniffy and Yvonne Kavanagh.

- 7** Amphetamine Quantification Report 2020 (Internal Publication)
Sarah Hanniffy, Dr. Rachel Fagan, Anita Mc Hugh-Moran, Rachel Moran.

- 8** An unusual detection of 2-amino-3-(2-chlorobenzoyl)-5-ethylthiophene and 2-methylamino-5-chlorobenzophenone in illicit yellow etizolam tablets marked "5617" seized in the Republic of Ireland.
Drug Test Anal. 2021;1-8.
[wileyonlinelibrary.com/journal/dta](https://www.wileyonlinelibrary.com/journal/dta)
Carol Downey¹, Audrey O'Donnell¹, Gavin McLaughlin¹, Geraldine O'Neill¹, John O'Brien², Pierce V. Kavanagh³





Partnership and Integration

3

Partnership and Integration

This section focuses on how we are strengthening relationships and improving FSI's integration within the criminal justice system and beyond.

A big focus for FSI in 2021 was to address the significant gap between drugs analysis capacity and demand. While a big component of this work focused on increasing FSI's laboratory analysis capacity, FSI worked across the justice sector on initiatives to make the best use of capacity available. FSI and An Garda Síochána piloted a scheme of direct communication between Garda Court Presenters and the FSI Drugs analysis team regarding drugs hearing dates, to improve the communication processes and prioritisation of analysis. The insights from this pilot have been positive to date and this scheme will be expanded further in 2022. FSI also developed a Presumptive Drug Test (PDT) training and certification scheme through remote learning, with 230 Garda members now certified in its use. A PDT can be done by a trained Garda member in a Garda station for some drug substances detected under Section 3 of the Misuse of Drugs Act – this can divert some Section cases away from FSI, allowing it to focus on other cases. There has also been positive engagement with the Judiciary over the course of the year, with training planned on drugs analysis in general and PDT in particular. Legislative changes that acknowledge the scientific robustness and broad prevalence of PDTs have also been advanced throughout the year and its expected that these will be enacted in 2022.


FSI has been a key advocate of extending the Adult Caution Scheme to Section 3 drugs offences. This occurred in December 2020 and diverted over 1,000 cannabis/cannabis resin cases from FSI, as well as providing other benefits in efficiency across the criminal justice sector.

These efforts have demonstrated that by integrating knowledge across the justice sector and participating in joint problem-solving some significant benefits in efficiency and effectiveness can occur. FSI participated in the development of the first Strategic Sectoral Plan to identify and deliver more of these improvements. FSI staff contributed to the development of the strategy and are playing a key role in working groups to implement changes over the next 3 years.

FSI engaged extensively with the Department of Children, Equality, Disability, Integration and Youth (DCEDIY) throughout 2021 in relation to the drafting of the Institutional Burials Bill. This legislation confers significant responsibility on FSI for providing an Identification Programme, and associated databases, in support of Institutional Burials such as the Tuam Mother and Baby Home. The scope of ICT, operational and scientific work ahead of FSI will be very significant.

FSI continued its partnership with Forensic Science Northern Ireland (FSNI) over the course of the year. This has been a very supportive and productive partnership over the past year, with active knowledge sharing and support. A 2-year plan for cooperation on case support and sharing of expertise was developed in 2021 and is now underway.





Quality Systems

4

Quality Systems

It is imperative that FSI maintains a robust quality system so that all our stakeholders have confidence in our services and our findings.

FSI maintained its accreditation to the ISO-17025 (2017) standard and added to the scope of its accreditation in 2021. Our compliance to this standard was assessed from detailed reviews of our quality system, management systems, operating procedures and validation reports across all our forensic disciplines during the year.

The extensions to the scope of FSI's accredited services include –

- Damage opinion evidence
- Addition of inorganic oxidisers, components of explosives (using IC, FTIR, SEM/EDX) to flexible scope.
- Addition of THC to Flexible scope for drugs analysis.
- Expert evaluative opinion for Paint
- New DNA instrumentation (Hamilton Starlet)
- Fingerprint mark enhancement techniques - Solvent Black 3 and Powder Suspension
- Refurbished laboratory spaces

Our successful accreditation and continuous extensions to the scope of our accreditation each year, are underpinned by a robust quality system that is embraced by all our staff. Over the course of 2021 FSI participated in 47 audits that assessed all aspects of FSI's management systems, including Quality Management audits, vertical audits, witness audits, extension to scope audits and training audits. FSI also participated in 54 collaborative/proficiency trials in 2021. These trials are designed by European forensic laboratories and 3rd party companies with a view to continuously assessing and calibrating proficiency levels in forensic disciplines across Europe. FSI completed all scheduled trials in 2021 and assists in the design of some European trials so that our proficiency is highly regarded among our European peers.



Fit-For-Purpose Environment

5

Fit-for-purpose Environment

FSI has two primary goals with regards to our work environment – transition to a new fit-for-purpose building at Backweston and manage the risks to our staff and services in the meantime.

While Covid-19 presented very significant challenges within our current work environment, the progress in the construction of our new facility is very encouraging.



Great credit is due to all our staff for the manner in which we have maintained uninterrupted services over the year while keeping each other safe. We maintained several protocols, including social distancing, occupancy limits, face coverings, cleaning protocols and contact tracking and introduced new ones (including antigen testing) to limit and manage the risk to our staff in a very constrained setting. Our sustained service throughout the year would not have been possible without the dedication and commitment of our staff. During 2021 we also refurbished a number of laboratory and office spaces to maximise the available space for forensic case work. This has allowed us to increase capacity of some forensic services and has created some space for the recruitment of new staff in advance of the transition.

The progress in the construction of our new building, which is being managed by the Office of Public Works, has been very positive. This is a major capital project within the Justice sector and a very significant investment in the future of forensic services in Ireland.

There are very unique requirements and specifications for the building. Firstly, the search rooms in the building, necessary for the recovery of trace evidence from exhibits, must comply with ISO 14644. This is a cleanroom standard (often used in advanced semiconductor manufacturing) that specifies the controlled environment required for search room work. The facility also needs to accommodate the growing diversity and volume of forensic services that FSI supports – including fingerprint recovery and comparison work and documents & handwriting assessments which recently transferred from the Garda National Technical Bureau. It also supports new capabilities and services within Chemical, Physical and DNA Analysis that will benefit the criminal justice system – including Next Generation Sequencing (for Missing Person investigations). The facility must also comply with the most recent Building Control Regulations (2014) and the 2018 European Performance of Buildings Directive Requirements, including the Nearly Zero Energy Buildings (NZEB) requirement (with natural ventilation and energy efficient systems). Finally, the facility as well as our systems, ICT technology and operational procedures must support the ISO-17025 standard, which is the cornerstone of FSI's accredited services.

FSI's transfer to this facility, scheduled to commence from September/October of this year will be a significant transition for our staff and our services and mark the end of an era at our current facilities at Garda Headquarters in the Phoenix Park. The construction of the building is expected to be substantially complete during the Summer of 2022. This will be followed by facility validation, fit-out, installation and commissioning of instrumentation and extensive validation and accreditation of our forensic processes. FSI is planning a phased transition of services to Backweston while maintaining services at our current facility. FSI's plan is that we issue our first accredited forensic reports from the new laboratory by the end of 2022. The phased transition is expected to be completed by the Summer of 2023.

Finalising the layout and design of the new building and planning the transition to this new facility has been a priority for FSI staff throughout 2021. A cross-functional transition team has been in place to make decisions around the layout and design of laboratory, office spaces, shared & collaborative spaces and define the necessary protocols to make the most of the new facility. This is a very significant transition for all our staff – it's the end of an era in many ways and the start of a new journey in a new facility. We'll look forward to the grand opening and issuing our first forensic case report from our new facility later this year.

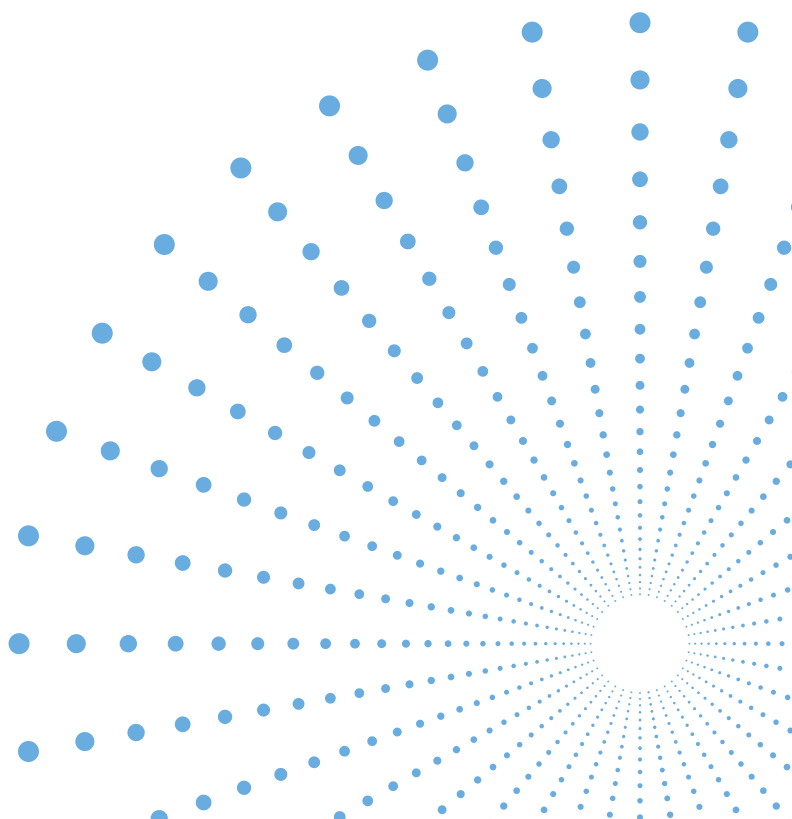




Figure 18: Drawing of the completed building (Courtesy of OPW)



Figure 19: Recent aerial photo, showing progress of construction works



Excellence through People



6

Excellence through People

The goals of this strategic theme are to build an inclusive, integrated team within FSI that focuses on continuously improving our services and to promote an open, collaborative and respectful climate across the organisation.

While Covid has continued to limit our progress in some ways, particularly with face-face training and integration events, we have been able to progress the learning and development of staff over the course of the year. We have been able to access learning and development programmes remotely that would have been inaccessible before. FSI engaged with a number of external providers to design custom-made courses for FSI in Management, Interviewing skills, internal auditing and courtroom skills. We are also supporting longer-term training with two of our staff doing M.Sc.'s on the topic of Drugs in waste water and others doing post graduate diplomas in various subjects. We provide study leave in keeping with departmental circulars.

Staff can avail of a number of other learning and development formats such as conferences. In 2021 most conferences were deferred or moved on-line. The on-line conferences gave us the opportunity for more people to attend as it is much more time and cost effective. For example 16 people attended a Chartered Society of Forensic Sciences conference in October; we would normally only send 3 or 4 people to this.

FSI has an active Staff Development Group and a social committee focused on developing our staff professionally, creating a healthy work environment and working through changes collectively. We conducted several staff engagement sessions and staff surveys over the course of the last year on Covid-19 practices, the new facility in Backweston and on communications within the lab. This has been especially important over the past year given the unique challenges and uncertainties our staff have faced, coupled with the challenges of providing an essential service.

Our Transition team who are made up of a cross section of laboratory staff continue to have input into the new building in Backweston. They meet regularly to discuss issues such as restaurant facilities, transport and office environment within the new facility as well as addressing technical issues. It is important that all staff have a mechanism of expressing their views on the transition.

Our Well-Being group organised three group sessions with a psychotherapist/counsellor who talked about coping mechanisms during Covid. We also organised two talks with a bereavement counsellor from the Irish Hospice Foundation which staff found very helpful. We engaged Inspire Wellbeing to train 16 peer supporters for people to approach if they needed advice or guidance to other support services. We also provided subscriptions to the Headspace App for all FSI employees and sourced a number of wellbeing books for our library.

Towards the end of this year we organised a socially distanced ceremony to present 7 FSI staff and 6 seconded Gardaí with a gift to recognise 25 years' service in FSI and in the Gardaí respectively.

FSI also participates in the 'Excellence Through People' programme (managed by the National Standards Authority of Ireland) and this year maintained its Gold accreditation with improvements registered in all areas audited. We took part in the Civil service Employee engagement survey (CSEES) and our results compared favourably to the general civil service in most areas and internally we also have improved when compared to our results from the last CSEES survey.

Twenty new staff joined the laboratory in 2021. Covid-19 health guidelines have presented particular challenges to the more organic integration of staff into our work environment. This integration and connectedness is crucial for staff and FSI alike and we are happy that recently we have been able to interact more freely and develop our organisation together.

Corporate Governance

1. Performance Delivery Agreement

A core element of the Governance relationship between the Department of Justice and Forensic Science Ireland is an annual Performance Delivery Agreement (PDA). A summary of how FSI has performed to the PDA for 2021 is outlined below.

FSI's PDA contains quantitative targets relating to forensic services and other targets. These are represented in Figures 20 and 21 below, respectively.

Output area or initiative	Metric	Associated Strategic Objective ¹	2021 Target	2021 Performance
Integration of GNTB Services	Number of Technical Bureau cases or Match Requests assisted by FSI staff	³ 6.1	4000	4624
Chemical analysis	Number of complex drugs/toxicology cases reported	⁴ 1.2	6000	5000 ⁵
DNA - Identifications	Number of missing person case investigations or body identifications	1.2	80	102
DNA – Information sharing	Number of Member States with active Prüm connectivity & exchange	⁶ 1.5	10	11
Case reports under Service Level Agreement between FSI and An Garda Síochána	Total FSI cases reported	⁷ 1.3	20,000	23,854

Figure 20: Quantitative Targets

1 From FSI Strategic Plan 2019 - 2022.

2 FVL, AFIS, Documents and Handwriting Cases and Fingerprint QC checks conducted by FSI scientists.

3 Strategic Plan 6.1: Effectively integrate the laboratory-based disciplines of the Garda National Technical Bureau into FSI.

4 Strategic Plan 1.2: Increase the capacity of services offered today, through a focus on instrumentation, automation, process improvement, productivity and staffing.

5 Includes 150 Toxicology cases; 4850 Section 15/15A/17 Drugs cases.

6 Strategic Plan 1.5: Expand number of member states with active Prüm connectivity and exchange to all participating countries.

7 Strategic Goal 1.3: Maximise the impact and effectiveness of resources to the Justice System and to society.

The target of 6,000 complex drugs and toxicology reports was not achieved in 2021. This target assumed the refurbishment and fit-out of drugs laboratory spaces as well as the recruitment of additional staff would occur early in 2021. The completion of refurbishments was delayed until Summer 2021 and full recruitment until Q4 2021. The other targets tabulated above were exceeded in 2021

Output area or initiative	Target	Associated Strategic Objective	Outcome
Develop a cohesive transition plan for Backweston that integrates workflows, layout, staffing and service delivery plans.	Transition plan drafted and key elements aligned with stakeholders by end Q4.	Fit-for-purpose environment	This target was partially achieved in 2021. Layout complete, some workflows to be refined. Funding provided for staffing but some delays in recruitment. Service delivery plans reflected in 2022 Service Level Agreement.
Stabilise and improve ICT systems within FSI, by developing a new operating model (with MOU, SLA) and progressing some key improvement projects. This includes domain collapse, AFIS stabilisation, new Hamilton App.	Project milestones met throughout 2021, including MOU and domain collapse completed by Q3.	Science Technology and Innovation	This target was partially achieved in 2021. A new MOU on the ICT support model was developed and agreed. The AFIS stabilisation project started in 2021 and is scheduled for completion for 2022. There have been significant delays in the domain collapse and Hamilton App projects. Further details are available in Section 2 of this annual report ('Science, Technology & Innovation')
Maintain accreditation to ISO:2017 17025 Quality Standard in a dynamic environment.	Successful interim accreditation assessments	Quality Systems	This target was fully achieved in 2021. FSI has maintained accreditation for all services and has extended the scope of accreditation for some. Further details are available in Section 4 of this Annual Report ('Quality Systems').

Figure 21: Other Targets

2. Code of Practice

FSI confirms its compliance with the relevant requirements of the Code of Practice for the Governance of State Bodies. In particular, FSI confirms that:

1 The Oversight Agreement for 2021 has been reached with the Department of Justice and that, as a non-statutory body without a Board, FSI is compliant with the relevant requirements of the Code of Practice for the Governance of State Bodies.

2 FSI is adhering to the relevant aspects of the Public Spending Code.

3 FSI has implemented a risk management system which identifies and reports key risks and the management actions being taken to address and, to the extent possible, to mitigate those risks. A risk register is in place which identifies the key risks facing FSI and these have been identified, evaluated and graded according to their significance. The principal risks identified for FSI in 2021, and associated mitigation strategies are summarised below.

a Inadequate space for receipt and storage of exhibits, staff accommodation and laboratory work. Some improvements were made in 2021 to accommodate more staff but with some trade-offs. This was exacerbated by the Covid-19 pandemic and associated restrictions in 2021.

b Contamination risks based on building/facility design are being mitigated through contamination control and workflow processes. The new building design offers a robust mitigation of this risk.

c Demand and capacity are not matched across multiple disciplines within FSI, risking incomplete, erroneous or late reporting of cases for court. Although there are plans to increase capacity, but demand and submissions are increasing at a faster rate. This risk is being managed currently through a prioritisation process agreed with An Garda Síochána and reflected in the Service Level Agreement between both organisations.

d Instability of ICT systems, including Automated Fingerprint Identification System (AFIS) will lead to reduced productivity and may lead to service disruptions. To mitigate these risks, a roadmap of ICT improvements has been defined, including the stabilisation of the AFIS system.

3. Statement of Internal Control

Scope of Responsibility

On behalf of Forensic Science Ireland, I acknowledge responsibility for ensuring that an effective system of internal control is maintained and operated. This responsibility takes account of the requirements of the Code of Practice for the Governance of State Bodies (2016).

Purpose of the System of Internal Control

The system of internal control is designed to manage risk to a tolerable level rather than to eliminate it. The system can therefore only provide reasonable and not absolute assurance that assets are safeguarded, transactions are authorised and properly recorded and that material errors or irregularities are either prevented or detected in a timely way. The system of internal control, which accords with guidance issued by the Department of Public Expenditure and Reform has been in place in Forensic Science Ireland for the year ended 31 December 2021.

Capacity to Handle Risk

Forensic Science Ireland reports on all audit matters to the Audit Committee in the Department of Justice. Forensic Science Ireland's senior management team acts as the Risk Committee for the body. Senior managers from Forensic Science Ireland completed a risk register in 2021 and shared the findings with the Department of Justice. The Internal Audit Unit of the Department of Justice carry out audits on financial and other controls in Forensic Science Ireland. The most recent audit, conducted in Q1 of 2022 provided positive assurance on the effectiveness of controls in place in FSI during 2021. Forensic Science Ireland's senior management team has developed a risk management policy which sets out its risk appetite, the risk management processes in place and details the roles and responsibilities of staff in relation to risk. The policy has been issued to all staff who are expected to work within Forensic Science Ireland's risk management policies, to alert management on emerging risks and control weaknesses and assume responsibility for risks and controls within their own area of work.

Risk and Control Framework

Forensic Science Ireland has implemented a risk management system which identifies and reports key risks and the management actions being taken to address and, to the extent possible, to mitigate those risks. A risk register is in place which identifies the key risks facing Forensic Science Ireland and these have been identified, evaluated and graded according to their significance. The register is reviewed and updated by the senior management team on a quarterly basis. The outcome of these assessments is used to plan and allocate resources to ensure risks are managed to an acceptable level. The risk register details the controls and actions needed to mitigate risks and responsibility for operation of controls assigned to specific staff.

I confirm that a control environment containing the following elements is in place:

- procedures for all key business processes have been documented;
- financial responsibilities have been assigned at management level with corresponding accountability;
- there is an appropriate budgeting system with an annual budget which is kept under review by senior management;
- there are systems aimed at ensuring the security of the information and communication technology systems, The ICT division of the Department of Justice provide Forensic Science Ireland with some ICT services. They have provided an assurance statement outlining the control processes in place;
- there are systems in place to safeguard Forensic Science Ireland's assets. Control procedures over grant funding to outside agencies ensure adequate control over approval of grants and monitoring and review of grantees to ensure grant funding has been applied for the purpose intended;
- The National Shared Services Office provide Human Resource and Payroll Shared services. The National Shared Services Office provide an annual assurance over the services provided. They are audited under the ISAE 3402 certification processes.

Ongoing Monitoring and Review

Formal procedures have been established for monitoring control processes and control deficiencies are communicated to those responsible for taking corrective action and to management, where relevant, in a timely way. I confirm that the following ongoing monitoring systems are in place:

- Key risks and related controls have been identified and processes have been put in place to monitor the operation of those key controls and report any identified deficiencies;
- An audit of financial and other controls is carried out by the Department of Justice Internal Audit Unit every 2 years;

- Reporting arrangements have been established at all levels where responsibility for financial management has been assigned; and
- There are regular reviews by senior management of periodic and annual performance and financial reports which indicate performance against budgets/forecasts.

Procurement

I confirm that Forensic Science Ireland has procedures in place to ensure compliance with current procurement rules and guidelines and that during 2021 Forensic Science Ireland complied with those procedures.

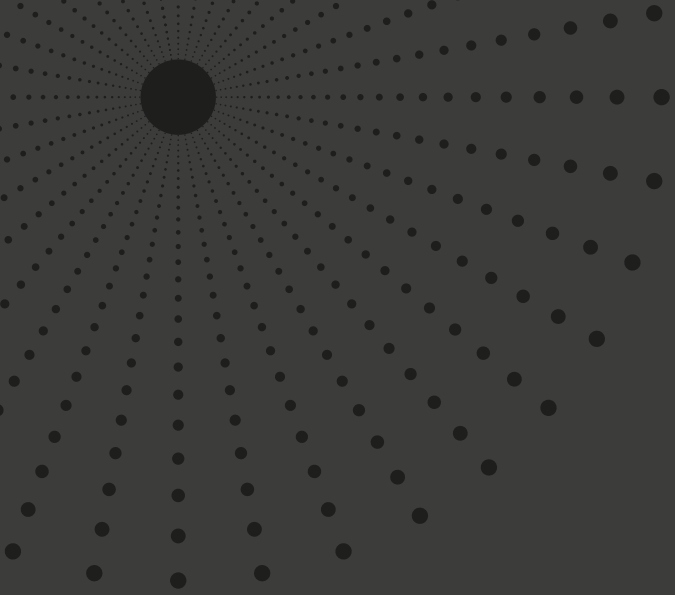
Review of Effectiveness

I confirm that Forensic Science Ireland has procedures in place to monitor the effectiveness of its risk management and control procedures.

Forensic Science Ireland's monitoring and review of the effectiveness of the system of internal financial control is informed by the work of the internal and external auditors, the Audit Committee, and the senior management team. The senior management within Forensic Science Ireland is responsible for the development and maintenance of the internal financial control framework. I confirm that Forensic Science Ireland conducted an annual review of the effectiveness of the internal controls for 2021. It should be noted that this extended beyond financial controls and examined ICT controls, management practices and other governance processes


Internal Control Issues


No weaknesses in internal control were identified in relation to 2021 that require disclosure in the financial statements.



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