END-TO-END FORENSIC IDENTIFICATION PROCESS PROJECT

Volume Crime

REPORT

Australia New Zealand Policing Advisory Agency
National Institute of Forensic Science
(ANZPAA NIFS)

This report has been produced for the ANZPAA Board and written by Senior Sergeant First Class Cheryl Brown APM, South Australia Police

It shows the aggregate findings and key recommendations arising from the national End-to-End Forensic Identification Process Project conducted across the six states and two territories of Australia.

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Foreword by Alastair Ross

In March 2010, the ANZPAA Board gave approval to *'review the end-to-end forensic processes and develop a national framework for efficient crime scene analysis'*. Following some initial ground work, South Australia Police agreed to second Senior Sergeant First Class Cheryl Brown to the project as the full time Project Officer and this was of significant benefit.

The project was based on the Scientific Work Improvement Model (SWIM Report) conducted in the UK with the key aim to identify bottlenecks and inefficiencies across the end-to-end process and to make recommendations as to how these might be addressed. To this end, the study benchmarked current forensic processes and performance from which the recommendations contained in this report were made.

The study was limited in that it concentrated only on burglary offences and on samples collected for DNA and fingerprint analysis. However, all jurisdictions participated and data was collected for over 8,000 cases nationally. This provided a wealth of data for analysis and some significant results. The project is very much about learning from the best performers and how this learning might be implemented across all jurisdictions. This has the potential to improve efficiency at each stage of the forensic process and result in a more rapid response to criminal investigations.

The report makes recommendations for further aspects of the study to be considered by the Board.

I acknowledge the work conducted by Senior Sergeant First Class Cheryl Brown and the statistical analysis conducted by Ms Robyn Attewell and Professor Michael McFadden which was supported by the Australian Federal Police.

I have pleasure in submitting the report to the Board for consideration.

Executive Summary

During 2011 ANZPAA NIFS, working in partnership with the eight Australian police agencies and a number of relevant DNA Laboratories, conducted a study into the performance of participating sites with regards to the end-to-end processing of volume crime. The study titled 'End-to-End Forensic Identification Process Project' aimed to benchmark current performance specifically for the crime type of burglary and evidence types of fingerprints and DNA. End-to-end processing was defined in this project as the time from the report of a crime through to the arrest of an offender. The process was broken into five distinct stages: attendance, submission, analysis, identification and investigation. This report provides an overview of the project, its findings and recommendations.

Based on data collected from 17sites across Australia for more than 8,000 burglaries reported over a five month period, this study has established that:

- higher arrest rates were achieved for cases where crime scene investigators (CSI) attended and forensic evidence was collected.
- there is wide variation between state jurisdictions across each stage of the forensic process, both in terms of success and lead times.
- 70 percent of burglaries reported to police were attended by CSI with a median response time of 4 hours and a median time spent at the scene of 30 minutes.
- regional areas had higher attendance rates and longer scene examination times than metropolitan areas.
- there was more fingerprint evidence collected compared with DNA (28% vs. 10%). However, there was a higher arrest rate based on DNA identification than fingerprint identifications (50% vs. 37%).
- identification rates were the same for both fingerprints and DNA (23%), although when metropolitan and regional data is compared, it becomes apparent that regional areas achieved higher identification rates through fingerprints.
- at each stage of the end-to-end process, lead times were shorter for fingerprint evidence than DNA evidence, which resulted in a median overall end-to-end process time of 19 days for arrests based on fingerprint identifications compared with 49 days for arrests based on DNA identifications only.
- overall when considered together forensic evidence achieves an end-to-end process time of 29 days.
- analysis and identification lead times tended to be shorter in metropolitan areas than regional areas, particularly with regards to DNA. The longest lead times were for the last stage of the process from identification to arrest.

From consideration of data from a stage by stage basis, there was no consistent evidence to suggest that strong performance at one stage of the process resulted in strong performance for another stage of the process or that there was a link between stages with regards to performance (i.e. for a site that performs well with regards to number of scenes attended does not link to high performance with regards to arrest rates). There was statistically significant variation across the jurisdictions, even in the latter stages where there was less data available to analyse, indicating a potential scope for improvement across all stages of the forensic process. However, as each police agency operates under different legislation and internal

practices vary, it is understood that different strategies may be required in each jurisdiction to improve performance in processing burglary cases.

Table A: Success rates and lead times across the five stages of the forensic process aggregated from 8,179 reported burglary cases in 17 sites across Australia, 2011.

Stage	Success rate*		Lead time (median)	
	Fingerprint	DNA	Fingerprint	DNA
Attendance	70%		4 hrs (and 30 minutes at scene)	
Submission	28%	10%	Same day	5 days
Analysis	100%	98%	1 day	3 days
Identification	23%	23%	Same day	15 days
Arrest	37%	50%	11 days	20 days
End-to-end	2%	1%	19 days	49 days

*success refers to progression to the next stage

Crime Scene Attendance

- 70 percent of burglaries reported were attended by CSI, with statistical variation between the jurisdictions (44% to 83%) and by location (68% to 74%).
- While the attendance lead time nationally is 4 hours, there is statistical variation between jurisdictions (1 hour to 14 hours) but no variation by location.

Evidence Submission

- In 28 percent of scenes attended, fingerprint evidence is collected, with statistical variation between the jurisdictions (17% to 55%) and in 10 percent DNA evidence is collected, again with statistical variation between the jurisdictions (2% to 64%).
- Submission of fingerprint evidence is largely electronic for Australian police agencies and as such, fingerprints are submitted within 24 hours on a consistent basis, a fact that is supported by the fingerprint submission lead time data of same day for this study. The site with the shortest lead time for submission of fingerprint evidence utilises remote image transmission from crime scene to fingerprint bureau.
- Statistical variation still existed between the jurisdictions for submission of fingerprint evidence (0 to 6 days).
- The submission of DNA evidence across the sites surveyed is a manual process requiring physical transportation to the laboratory. As one would expect, where CSI work from the same location as the DNA laboratory, the DNA submission lead time is the shortest.
- The national lead time for submission of DNA evidence is 5 days with statistical variation between jurisdictions (0 to 13 days).

Analysis of Evidence

- In 100 percent of cases, fingerprint evidence submitted for analysis was analysed, yet with statistical variation between the jurisdictions (97% to 100%).
- In 98 percent of cases, DNA evidence submitted for analysis was analysed with statistical variation between the jurisdictions (82% to 98%).

- DNA has longer lead times than fingerprints at the analysis stage particularly for regional sites (3 days as opposed to 1 day).
- Cases with evidence more likely to result in an identification may be prioritised and as such have shorter analysis times. This fact may go towards explaining the shorter lead times for metropolitan DNA cases.
- Overall, 87 percent of fingerprint evidence analysed resulted in a print suitable for upload to the National Automated Fingerprint Identification System (NAFIS) database, compared to only 42 percent of DNA evidence being found suitable for upload to the National Criminal Investigation DNA Database (NCIDD).

Identification

- The overall identification rate for both fingerprints and DNA was 23 percent but there was statistical variation between the jurisdictions with greater variation observed for DNA (fingerprints 10% - 35% and DNA 5% to 53%).;
- There are higher identification rates in fingerprints at regional sites as opposed to metropolitan sites, but no difference for DNA by location.;
- There are significantly longer lead times for DNA identification than for fingerprints. The quality assurance process for DNA identifications may go towards explaining this trend.

Investigation

- For cases in which identification of an offender was made from fingerprint evidence, 37percent resulted in the arrest of the offender. Comparatively, for cases in which identification was made from DNA evidence, 50 percent resulted in an arrest.
- There is significant variation for arrest rates between jurisdictions, with more variation for DNA identifications than for fingerprint identifications (fingerprints 22% to 63% and DNA 21% to 71%).;
- There is no difference by location for both identification rate and lead times.;
- There are longer lead times for DNA based arrests than for fingerprint based arrests and significant differences between jurisdictions for both DNA and fingerprint based arrests (fingerprints 8 to 38 days and DNA 5 to 123 days).;
- The lead time for investigation (i.e. the time from identification to arrest) was longer than the lead time for all other stages put together.

Other Factors

- Jurisdictions with mature NAFIS and NCIDD databases had a greater ability to identify a suspect through the analysis of forensic evidence.;
- Jurisdictions with low rates of identification should consider expanding the scope of law enforcement procedures and legislation to increase the number of reference samples uploaded into the NAFIS and NCIDD databases.

Future Recommendations

This project has not only provided an appreciation of the forensic performance within Australia but has provided an indication of the scope of evaluation that could be carried out.

The project team has made a number of recommendations, including conducting jurisdictional based workshops to examine the findings of this study in detail, identify where improvements could be made and post making changes, conduct a second snapshot study to determine if the changes had a positive impact on performance for the end-to-end forensic process.

Introduction

Background

Although police investigations have traditionally been considered a single process that commences with the report of a crime and ends in the arrest of a suspect, it is in fact possible to consider the process in a number of distinct stages. Each of these stages is performed by a range of personnel performing specific duties, including those performed by general and specialist police officers and scientists.

Property crime has a significant impact on society due to the level of invasiveness of the crime and the effect on the lives of victims (1). Home and business burglaries drastically reduce personal security, peace of mind, and well-being, and the psychological and emotional cost to the victims and potential victims may be much higher than the dollar value. The societal cost of property crime is often underestimated by only evaluating the property value and conversely, the benefit to society in solving volume crime is probably immeasurable.

High property crime rates reflect the low risk of being caught and the relative ease for criminals to commit this type of crime (1). It has been estimated that an average of 38 burglaries are committed per burglar per year and a prolific burglar can commit up to 242 per year. A habitual burglar is an opportunistic criminal who commits not only burglaries but all other types of property crimes including theft of motor vehicles and larcenies (1&9).

It is clear that expediency in the investigation of these crimes and action against these criminals is the key to having a significant impact on the crime rate. Delays in identification and investigation means offenders are likely to be committing further offences during that time. This is little consolation for a victim when it is realised that if the DNA samples had been processed more quickly, the offence committed against them may not have occurred (9).

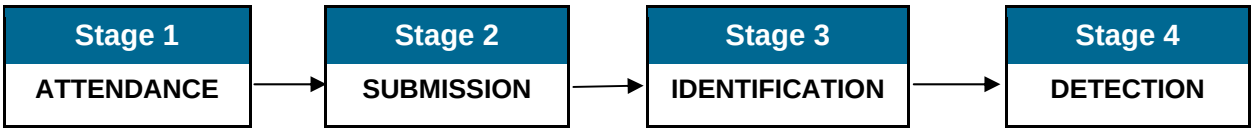
There have been a range of studies performed internationally to evaluate the effectiveness of forensic evidence in an investigation and the associated cost benefits. These reports, particularly from the United Kingdom (UK) Scientific Work Improvement Model (SWIM) report (2), have clearly highlighted the variation of performance at the organisational, work group and individual level. There is anecdotal evidence that the same is true in Australia and as such a need was identified to capture and study relevant data and develop models that would lead to more uniform and improved performance.

The key message from the SWIM report was the need to identify significant leakage points in the process and that systems should be developed to capture and compare relevant data and learn from top performers. The Australia New Zealand Policing Advisory Agency National Institute of Forensic Science (ANZPAA NIFS) End-to-End Forensic Identification Process Project has sought to benchmark current forensic business processes and identify optimal performance to apply as a national model by identifying areas for improvement.

United Kingdom Scientific Work Improvement Model (SWIM)

During 2002 and 2003, the Police Standards Unit piloted a simulation-enabled performance improvement approach for forensic science in Derbyshire Constabulary. The project made recommendations that when implemented, led to increased forensic identification and detection and reduced the end-to-end lead time for forensic led detections (2). The work identified a direct correlation between the time taken from crime occurrence to forensic led detection (lead time) and crime levels. Reducing the lead time can reduce the level of crime. The swiftness of identifying suspects undoubtedly contributed to these forces' overall efforts to reduce crime (2).

The SWIM program of work was developed to replicate the above pilot study and provide a mechanism for implementing performance improvement recommendations to police forces across the UK. The program was the most comprehensive ever performed, running over a two-year period and involving forty-one forces looking at the police and scientific functions in England and Wales. The program focused on the attendance at burglary and motor vehicle theft offences, involving the recovery of DNA and fingerprints and their subsequent use in investigations. The SWIM Report examined four main stages to this process and evaluated the lag time between each of the phases and the success of the case to move through to the next stage.



At each stage, the result was calculated as the proportion of transactions that were transferred to the next stage (2). The lead time was calculated, for each crime report as the earliest activity date at each forensic process stage (2). The success rate was calculated as the percentage of cases that successfully moved to the next stage. The SWIM Report collected data over a 12 month period.

The SWIM Report made 21 common recommendations and 346 force specific recommendations for improvement at all stages of the forensic process.

Denver Colorado Study

In 2004, Denver applied for federal funding to evaluate the effectiveness and cost of DNA technology on high volume crimes such as burglary, auto theft and theft from motor vehicles (1). This study was primarily focused on evaluating the effectiveness of DNA in property crimes and the cost efficiencies realised.

During the target period, 6,538 burglaries were committed in the City and Country of Denver. 400 of these burglaries contained potential biological evidence and were selected for the study as DNA testing was performed as part of the investigation and prosecution of the cases. All 400 cases were analysed, resulting in 340 DNA profiles being obtained and uploaded into the Combined DNA Index System (CODIS DNA database). At the time of publication, the work resulted in 199 CODIS hits. 172 cases were accepted by the Denver District Attorney's Office for prosecution, from which 77 cases were based on CODIS offender hit identification (of

these, 40 were habitual offenders with more than three prior felony convictions) and 53 on new offenders identified only by DNA profiles developed from the evidence left at the crime scene. Only 24 percent of these cases were filed for prosecution based on detection by traditional investigation, yet over 76 percent were filed based on the DNA analysis. The 40 habitual offenders were only arrested due to the DNA evidence located and combined, if not arrested these offenders would have committed an estimated 9,680 crimes within that year.

The study found that aggressive use of advanced DNA forensics in investigation and prosecution resulted in a pronounced reversal in property crimes compared to similar metropolitan areas in the United States, demonstrating the effectiveness of this approach (1). The study went on to demonstrate that much harsher sentences in DNA CODIS hit burglary cases were given to high volume, habitual offenders whose criminal activity had a higher impact on society.

The study further reported that a total of 491 burglaries committed in 2006 files were accepted for prosecution (both traditional based investigations and DNA based investigations). 130 of these cases were based exclusively on the results of DNA analysis of evidence. The rate of prosecution for cases with traditional investigation and no biological evidence was 5.9 percent. The rate of prosecution for burglaries with some type of biological evidence was 32.5 percent, which is an almost 5.5 fold increase in the rate of case prosecution.

The study further conducted a cost benefit analysis and found that the return on investment for every dollar spent with this approach was estimated to be $90 with an actual two year savings to the citizens and the city of Denver of more than $5 million in police costs and $36.8 million in property loss.

The Denver Colorado study recommended an expansion of DNA science in high volume crimes based on the high success rate for prosecution and the value for money return on investment.

New Zealand – Waikato District and Environmental Science and Research: Forensic (ESR Forensic) DNA Project 2010

New Zealand (NZ) Police also reviewed the SWIM Report and as such established the Forensic Work Improvement National System ‘FORWINS’ to act as a robust case management system designed to capture, monitor and report on all aspects of forensic investigations. At the time of this project, due to IT limitations, ‘FORWINS’ had not realised its full potential.

In mid-2010, the Waikato Police District in association with ESR Forensic ran a 3 month trial designed to monitor the implementation of quicker turn-around times by ESR Forensic and police for DNA submissions from volume crime scenes. The evaluation was based on the capability of ESR Forensic to implement a 5 working day turn around on volume crime submissions.

17 weeks of data was collected providing information to assess the value of the forensic submissions being made in terms of their likelihood to produce a profile and the value of those links to investigators. Data were also collected relating to the type of crime scene samples

submitted by the Waikato Police District to the ESR Forensic for the purpose of assessing the return on investment.

As a result of the 2010 Waikato DNA Project, there has been a stark improvement in turn-around times by ESR Forensic which significantly increased the value of the forensic results to Police. The prioritising of District volume crime DNA collection and submission and the actioning of forensic identifications has made a significant contribution to volume crime reduction.

The Waikato Project concluded and recommended:

- ESR Forensic Volume Crime Laboratory averaged 5.4 days turnaround time from receipt to result in the laboratory for 78 percent of Waikato submissions over the 3 month trial period, improving significantly on the previous 4 week turn around.
- ESR Forensic has a new contract with New Zealand Police requiring 80 percent of submissions to the Volume Crime Laboratory to be completed in 5 working days, which was demonstrated as achievable through the trial period.
- An increased focus on the importance of the timeliness of DNA sample submissions in the Waikato Police District has seen a reduction in the submission lag from an average of approximately twenty days to six days.
- By ensuring attendance within the same day as a crime is reported, Scenes of Crime Officers (SOCO) were able to see the added value of their forensic results and the effect of their timely response on the current crime environment.
- Investigators identified the benefits of working with rapid identifications both in the potential to recover property and to prevent future offending. Identifying current 'hot' offenders and then applying a targeted approach saw gains in disrupting and influencing the current crime patterns.
- Recommendation of funding and prioritisation for 'FORWINS' and the development of a robust system for the collection and monitoring of forensic data.

The End-To-End Forensic Identification Process Project

Approach

The End-to-End Forensic Identification Process Project (referred to hereafter as the 'End-to-End Project') was developed with a commitment to foster efficiency, effectiveness, continuous improvement and innovation as per the Australia and New Zealand Policing Directions.

The End-to-End Project is a reflection of all four Australia New Zealand Policing Directions (2008-2011), with a strong focus on the community and developing an approach to crime reduction and community safety through operational interoperability between jurisdictions, police agencies and partners (12).

In May 2010, the End-to-End Project was endorsed by the ANZPAA Board. The project was managed and supported by ANZPAA NIFS and consequently was established as an ANZPAA

NIFS Strategic Priority to *'review end-to-end forensic processes and develop a national framework for efficient crime scene analysis'*.

The key objectives were to develop a framework to capture and compare data, to develop a simple performance management model and to develop a national model for the end-to-end forensic process that would provide for maximum efficiency and effectiveness.

Australia 2010 – 2011

	Population	% total Population	Burglaries	% total Burglaries	Burglary rate/100,000
Australia	22,620,600	100%	209,410	100%	925
New South Wales	7,303,700	32%	57,550	27.5%	787
Victoria	5,624,100	25%	44,600	21.3%	793
Queensland	4,580,700	20%	43,024	20.5%	939
Western Australia	2,346,400	10%	35,547	17.0%	1514
South Australia	1,657,000	7.3%	17,577	8.4%	1060
Tasmania	510,600	2.3%	3,802	1.8%	744
Australia Capital Territory	365,400	1.6%	3,464	1.7%	948
Northern Territory	230,200	1.0%	3,846	1.9%	1670

Australian Bureau Statistics March 2012
Police Annual Reports 2010-2011

In November 2010, a small project team was established that consisted of Assistant Commissioner Julian Slater, National Manager Forensic and Data Centres, Australian Federal Police (AFP) as the Senior Project User, Mr Alastair Ross, Director ANZPAA NIFS as the Project Executive and Senior Sergeant First Class Cheryl Brown of South Australia Police as the full time ANZPAA NIFS Project Officer.

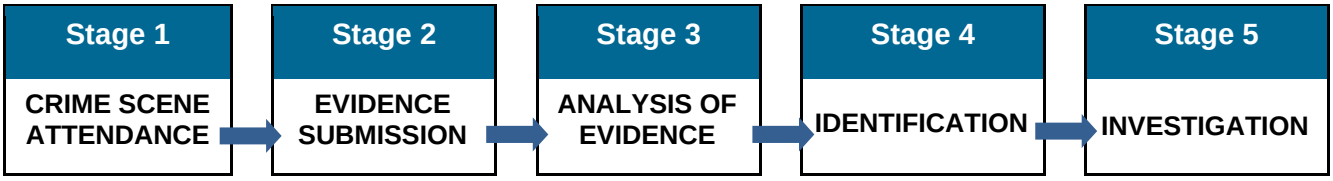
The nature of the project was such that expertise in data analysis was required and the project team was expanded to include Professor Michael McFadden of McFadden Consultancy and Ms Robyn Attewell, Coordinator Performance Analysis, AFP.

Project Scope

The project was originally formulated to follow the methodology applied in the SWIM Report, utilising the same four phases, the same evidence types (DNA and fingerprints), the same crime types (burglaries and motor vehicle theft) and the same measures (lead time and success rate). After further evaluation, however, it was decided to limit the crime type to burglary related offences. This did not overly restrict the scope of the conclusions and made the data collection more straightforward.

Unlike the UK, Australia had not conducted any other national studies of this nature, therefore it was anticipated that there would be significant challenges, particularly with respect to efficient, uniform data collection. Keeping to one crime type would reduce the impact on the officers collecting and collating the data. Burglaries include residential and non-residential premises and represent a significant proportion of the volume crime reported to police each year.

The project team agreed to implement the basic methodology of the SWIM Report and incorporate an additional analysis stage. The performance measures at each stage are described briefly below.



A reference guide to all relevant terminology used within the project (e.g. identification and investigation) is located in Appendix 1.

Lead Time (Duration)

Lead time refers to the time interval between each stage. This was determined through the collection of date/time entries for defined points within the five stages. The project could then measure the time taken for a case to move from one stage to another and ultimately the total time taken to move from the beginning of stage 1 to the end of stage 5.

Success Rate (Proportion)

The success rate measures the progress of a case to the next stage. This was determined by the recording of the date/time entry for the next stage. The only variant was at stage 5 where further descriptors were applied to describe the different possible outcomes for the case.

The unit of observation for this study was a case, not an offender. Two or more arrests based on forensic evidence from one burglary scene were only counted as one successful unit or case as the focus was only on the success of the case, not the number of arrests. This was another point of difference from the SWIM methodology.

Stages

Stage 1: Crime Scene Attendance

This stage relates purely to the response by police personnel to the crime scene.

Stage 1 data relates to the time when a crime was reported, the crime scene examination start time and the crime scene examination end time. From this data the project team is able to determine the following three measures.

Attendance Time

The time lapse between the report of the crime and scene attendance by CSI.

The purpose of this measure is to determine the typical lag time between the victim reporting the crime to the police and CSI attending. The time/date entry for the report of a crime was primarily sourced from business service areas within each police agency to ensure correspondence with corporate reporting data.

Overall Scene Attendance

The proportion of scenes attended by CSI.

Police jurisdictions have differing policy in regard to responding to volume crime, therefore, while attendance at all crimes would be preferable, it is not always deemed feasible. The project endeavoured to evaluate whether increased attendance rate had any significant effect on evidence recovery and the overall success of the investigation.

CSI Time at the Scene

The time spent at a scene by CSI.

This measure determines the optimal time required at a crime scene for the most efficient and effective collection of evidence that maximises success rates through all stages of the process. Good quality evidence collection is required to ensure successful analysis, identification and investigation. Having an appreciation of the average time spent at a volume crime scene can assist jurisdictions in resource planning.

Stage 2: Evidence Submission

From stage 2 onwards, the data is separated into fingerprint evidence and DNA evidence. This stage contains data identifying the collection of DNA and/or fingerprints and the date/time entry for submission to the DNA laboratory or fingerprint bureau. For five jurisdictions, the DNA analysis is conducted by a laboratory external to the police and consequently the collation of data from stage 2 onwards required coordination between two organisations.

Submission Lead time

The time lapse between the fingerprint and DNA evidence being collected at the scene and the time it is submitted to the DNA laboratory or fingerprint bureau.

The date/time entry relates to the time the laboratory or bureau records the case as having been received as opposed to the time when the CSI may send the evidence. There may be a lag time in relation to the submission, but this lag time is not calculated separately as it is included in the time that the CSI has control of the evidence.

Collection Rate

The proportion of scenes attended from which fingerprints or DNA are collected and subsequently submitted for analysis.

While not all evidence collected is submitted, the majority of cases where evidence is collected, it was submitted for analysis.

Stage 3: Analysis of Evidence

Stage 3 includes the date and time that analysis of the evidence was commenced and whether the evidence was suitable for upload on the NAFIS or NCIDD.

Both databases have a national standard for upload, which provides the project with a perspective on the suitability of the evidence for analysis. However, each jurisdiction can analyse and conduct comparisons with internal databases or records, outside of the requirements for NAFIS and NCIDD. Therefore identification may still occur even if the evidence is not suitable for upload according to the national standard.

Analysis Lead time

The time lapse between the time the case file was received for analysis and the time the analysis was commenced.

In some jurisdictions the time the case file was received for analysis is also considered the time the analysis was commenced.

Analysis Rate

The proportion of cases that contained evidence that was analysed.

Suitability Rate

The proportion of cases that contained evidence of a standard suitable for upload to a national database.

Stage 4: Identification

Stage 4 relates to the identification of a suspect from the evidence analysed. The identification might occur as a result of a search on the national database or it may result from a direct comparison between the evidence and a suspect.

Stage 4 contains two date/time entries, one referring to the date/time when the identification was made and the second referring to date/time when the identification was forwarded to the investigating officer (IO). The purpose of the two entries was to allow for an evaluation of the time lapse between the achievement of identification and the transmission of that information for investigation.

Identification Lead time

The time lapse between the analysis commencing and the time identification is achieved;

Identification Rate

The proportion of cases that were analysed that resulted in at least one identification.

Stage 5: Investigation

Stage 5 relates to the investigation of a case file pertinent to the identification of a suspect through the forensic process. It is acknowledged that in many cases a suspect may be arrested prior to the commencement or completion of the forensic analysis as a result of normal investigative procedures or as a result of witness involvement. Furthermore, unlike the other stages, an investigator has to physically locate the suspect to take action that is recorded in this stage.

A large range of actions could be taken against a person identified through the forensic process therefore four action types were identified; Charged, Not Charged, Eliminated and No Action. In many cases a person identified through the forensic process can ultimately be eliminated from the investigation as they may be the victim or complainant with legitimate reasons for their fingerprints or DNA being at the scene. Only data indicating the arrest of a suspect subsequent to the identification was included in this analysis.

The ability of jurisdictions to measure this stage was the most problematic of all, as primarily the personnel collating the data were from forensic areas and their ability to source data from the investigative areas was limited.

Arrest Lead Time

Time lapse between the identification was achieved and the time the nominated suspect was arrested or charged.

Arrest Rate

The proportion of cases where identification is achieved and the nominated suspect was arrested or charged..

Stage 1 – Stage 5: End-to-End Performance

Analysis has also been carried out on the overall performance from the report of the crime to the arrest of the suspect as opposed to the stage by stage analysis. This is represented in the overall forensic performance section of the Findings.

The Study

In December 2010 the project officer through a formal letter of request, approached the Senior Managers Australia New Zealand Forensic Laboratories (SMANZFL) requesting participation in the project. All police jurisdictions and their respective DNA laboratories advised of their willingness to participate.

Participating Agencies

It was the intention of the project team to collate data from policing areas around Australia to provide a national forensic performance perspective. The police jurisdictions were asked to nominate a regional and a metropolitan police area from which to collect data. A comparison between the lead time and success rate for regional areas compared to metropolitan areas was considered a valuable aspect of the project.

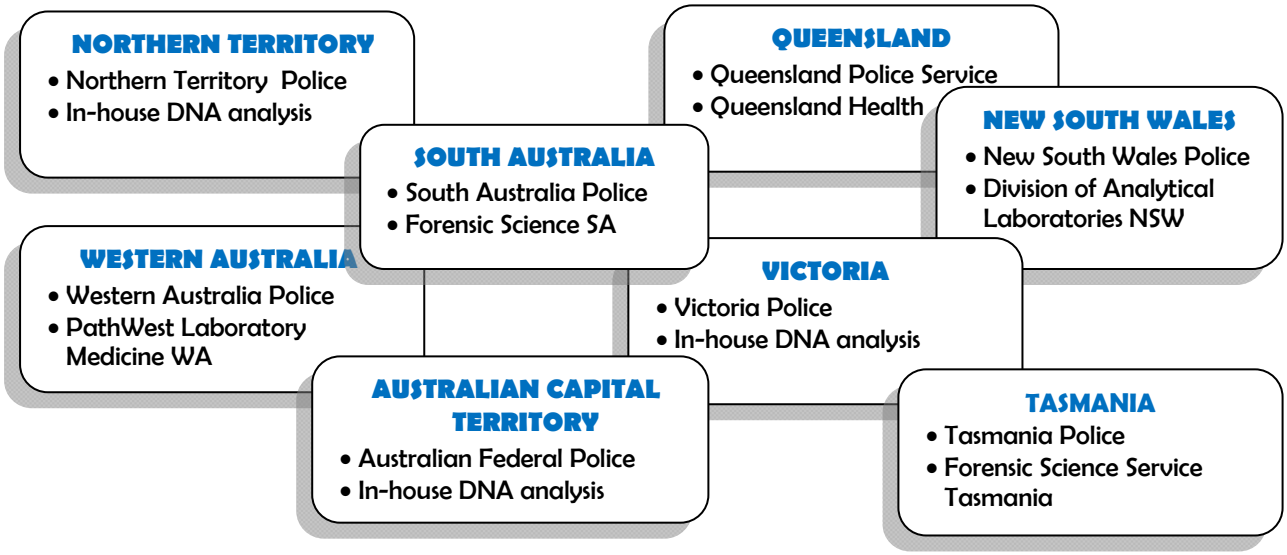
Seventeen policing areas across Australia participated in the End-to-End Forensic Identification Process Project. Of the 17 policing areas, 10 were metropolitan and seven were regional areas. Some jurisdictions utilised police boundaries and provided data from police districts or area commands, whereas some agencies narrowed the field to a defined geographical area.

The population size for the areas ranged from 20,000 in some regional areas to over 340,000 for the largest of the metropolitan sites. This was reflected in the data provided for the respective areas. Likewise the key industries were equally variant including agricultural or residential areas.

All sites had at least one 24 hour police station providing general policing, investigations, criminal justice and crime scene investigation and most contained additional multiple police stations with limited operating hours. Further demographics are located in Appendix 2.

Participating jurisdictions were a combination of police and external forensic laboratories. Fingerprint analysis in all cases is conducted within the police organisations surveyed, whereas in the majority of states the DNA analysis is conducted by an external DNA analysis provider.

The study does not distinguish the external and internal DNA laboratories with regard to performance, as the performance of the DNA laboratory is inclusive of the entire performance for that state or territory.



Contact Officers

Every organisation was requested to nominate a contact officer. In some states there was a contact officer for the police and a contact officer for the external laboratory.

The contact officer performed the following duties:-

- act as a conduit between the organisation and the ANZPAA NIFS Project Officer;
- provide guidance and direction to the participating sites in their state/territory; and
- oversee the collation of the data and completion of the spread-sheet for return to the ANZPAA NIFS Project Officer.

The collation of the data over the data collection period was a significant undertaking by the contact officers who required the assistance of other personnel from a range of areas within their agencies, including business services, Information, Science & Technology (IS&T), fingerprint bureau, DNA laboratory, quality assurance, records management and detectives/investigators.

Data Collection Methodology

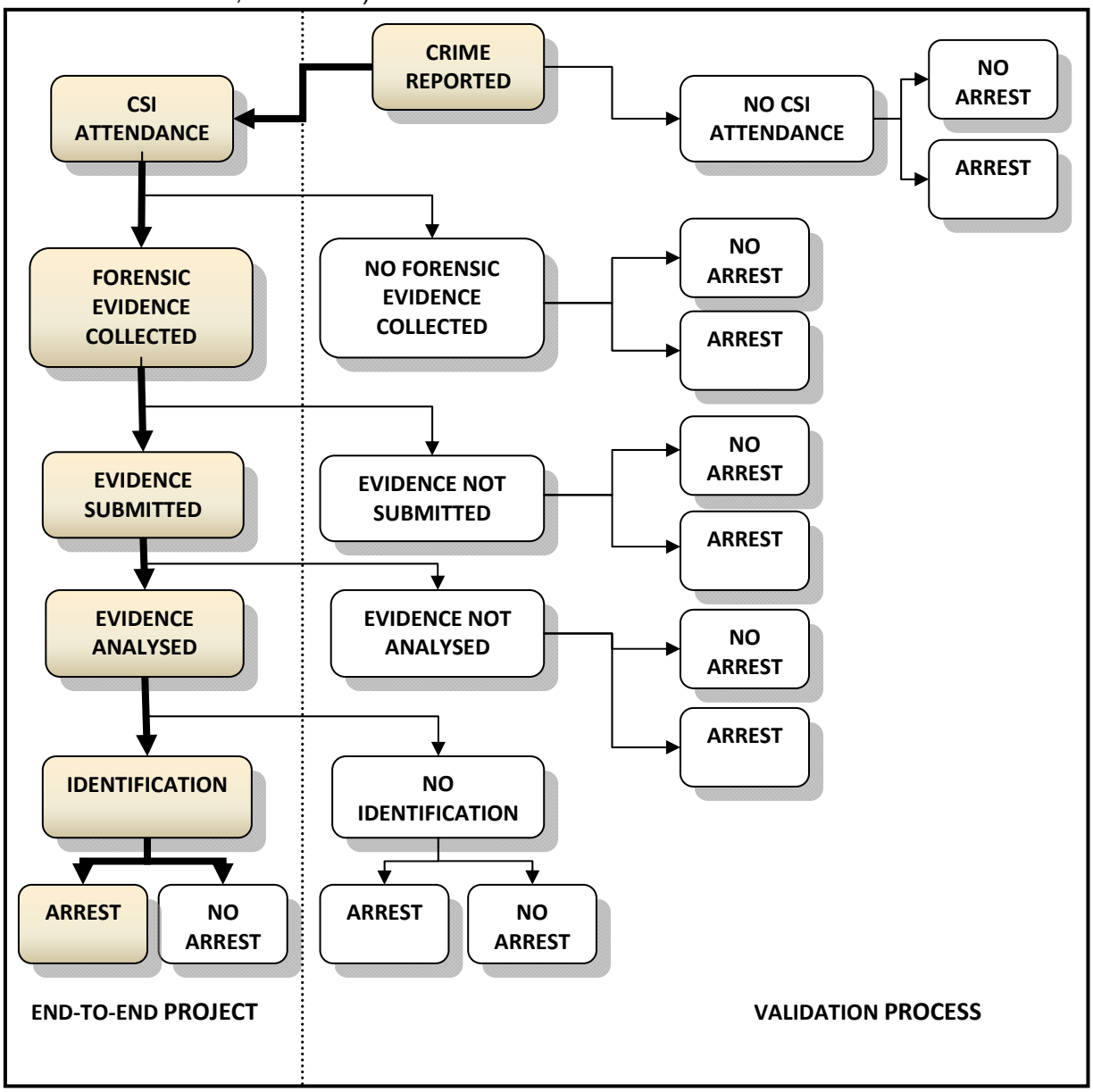
In March 2011 letters were sent to the Commissioners requesting approval for the release of data.

The project collected unit record data at the individual crime level. This enabled both aggregation and statistical modelling.

The additional benefit of having unit data was the potential to make further comparisons on the performance of the individual CSI and to identify trends in the scene examination, evidence collection and submission for each case. Cases were recorded across an Excel spread-sheet requiring date/time entries (dd/mm/yyyy h:min) and information on the success or otherwise of the progress of the case regarding fingerprint and DNA evidence.

Where necessary, comments were added to each stage to explain any anomalies or deviations from the project requirements and to identify at which stage the case was finalised. Data recorded as arrested or charged on the spread-sheet will be referred to as arrested in the Findings.

As per the flow chart, the End-to-End Project only followed up cases through to arrest where there was success at each stage. In a sub-sample of data known as the validation sub-set. all cases were followed up including those for which no forensic evidence was collected (2,418 cases from total of 8,179 cases).



Spread-sheet

A spread-sheet template was created for the purpose of collating the data on a monthly basis. The spread-sheet template is attached as Appendix 3. The spread-sheet contained specific date/time entry requirements that coincided with specific points in the end-to-end process and there was a separate sheet for each participating site within each jurisdiction.

It was the responsibility of the police contact officer to coordinate the collection and collation of the data on the spread-sheet for return to the ANZPAA NIFS Project Officer by the 10th of each month. The data for the month was reviewed by the ANZPAA NIFS Project Officer and anomalies were forwarded to the submitting jurisdiction for resolution.

Each month's data was added to the end of the spread-sheet resulting in a single spread-sheet for each site from the beginning to the end of the data collection period.

Each case was identified through a unique case identifier applied by each jurisdiction. This was later converted to a Project Case ID for the purposes of ensuring the anonymity of each case.

Data Collection Period

The data collection period was originally planned for 1 May 2011 – 31 October 2011. In July 2011 it was decided to close the data set regarding new cases at 30 September and concentrate on following up the 8,179 cases already reported. Follow up continued to 31 January 2012. There were 35 cases that were still ongoing investigations at 31 January, 2012. The final data collection thus spanned a 9 month period and included cases reported in a five month period with follow-up ranging from four months to eight months.

While the data collection was not without its difficulties and was for a shorter period of time than the UK SWIM Report, the data collated was far more comprehensive than that collected for the UK SWIM Report or the NZ Waikato Project.

Analysis Methodology

Data quality

Data quality checks were automated where possible. For example, computer code was written to provide lists of cases with:

- invalid dates and times;
- inconsistencies in time and date sequences across and within stages;
- unexpected missing fields based on information in earlier stages.

It was not feasible to follow up all issues identified. Queries were sent to the jurisdictions for the largest discrepancies and outliers and the database was corrected based on the responses received. In some cases, apparent discrepancies reflected variations in

administrative practices rather than incorrect data entry (for example, lack of exact times, report times after attendance or zero lead times).

Overall, the level of issues was low. For example, 2% of cases had negative or zero lead times for attendance. However, quality varied by site. (See Appendix Data Tables). In particular, lead times in the later stages could at best be calculated on dates only, not times, since some sites (particularly in Jurisdictions C and G) could not supply time data.

There are limitations around the data collected and the methodology applied. The data collected is only across five months and from sites nominated by jurisdictions as opposed to being selected by the project team. This resulted in each state being represented but in an uneven capacity with the majority of data being sourced from metropolitan sites (81%). To obtain a perspective on whether the project was a true national representation, state wide figures were obtained on crime reported and crime attended for the same crime type and reporting period.

The data collection was manually intensive and in most jurisdictions there was little alignment between police and forensic data management systems. This was further exacerbated by the need to collect data from DNA laboratories external to police and from investigative areas of policing.

For most organisations a case could not be tracked through all five stages on one information management system or utilising one central case record system.

Stage 5 data was the most problematic and this was expected from the outset of the project. While four general categories were created, the range of activities that could be performed at investigation was more complex and often did not seem to comply with the categories identified for the project. Additionally, the contact officers were from within forensic areas and in some instances were not aware of how to obtain the stage 5 data from the general or investigative police information management systems. This stage required a manually intensive searching mechanism.

The organisations that were better able to manage the data collection primarily utilised a forensic case management system networked to a police management system. See text box on Forensic Register, a Forensic Case Management System produced by Queensland Police Service (Forensic Services Branch).

The analysis revealed that the CSI were inclined to report the scene examination start and scene examination end times in rounded blocks of 10,15 and 20 minutes.

Data quality tables have been provided in the Appendix Data Tables.

Descriptive statistics

Success rates at each stage and lead times between stages were summarised for each:

- site.
- jurisdiction (aggregating across forensic sites for that State or Territory).
- location (aggregating across all regional sites and across all metropolitan sites).

- overall/national (aggregating across all 17 sites).

The precision in the estimates of success rates (i.e. the percentage of cases progressing to the next stage) was measured by 95% confidence intervals for proportions. The precision decreases from ±1% at Stage 1 to ±5% at Stage 5 overall for arrests due to fingerprint evidence and to ±8% for the corresponding DNA data. This is due to the attrition of data across stages and the smaller rates of DNA collection leading to smaller sample sizes in the later stages of the forensic process.

The lead time data follow particularly skewed distributions. For this reason lead times are summarised using medians rather than means and illustrated with box and whisker plots. The boxes show the 25th, 50th (median) and 75th percentiles and the whiskers show the range (excluding outliers).

Statistical testing

Success rates are compared between jurisdictions and across metropolitan and regional locations using chi-square tests. The corresponding lead time comparisons are performed using non-parametric tests (Mann Whitney and Kruskal Wallis tests).

A series of logistic regression models were fitted to identify factors associated with progression to successive stages of the forensic process. This was to identify whether, for example, shorter lead times or the characteristics of different sites and jurisdictions (such as high attendance rates, or high evidence submission rates) were associated with subsequent success (i.e. higher rates of identification or arrest after identification).

Validation subset

In a small number of sites (four), all cases were followed up regarding final clearance, not just those for which the crime scene was attended and evidence collected. This is referred to as the validation subset. This allows an overall arrest rate to be estimated and for comparisons to be made between clearance rates for cases with forensic evidence and those without.

FORENSIC REGISTER

The Forensic Register is a software application developed by the Queensland Police Forensic Services Branch in 2003 to satisfy the requirements of Australian Standard ISO 17025 and Supplementary Requirements for Accreditation in Forensic Sciences. Moreover there was a need to rationalise many of the separate registers and indices in use by forensic personnel into one system to allow the effective transfer and sharing of information. Additionally the application has been deployed for remote data entry providing a 'paperless' case file solution at the scene of crime.

The Forensic Register application has been licensed at no cost to a number of law enforcement agencies namely Tasmania Police, South Australia Police, Western Australia Police and the Northern Territory Police (installation in progress).

In Queensland the Forensic Register solution integrates seamlessly for real time exchange of information with the Queensland Police Records Information Management Exchange (QPRIME) for reporting and property management from the scene of a crime or disaster. It also offers inter departmental integration with Queensland Health Forensic Scientific Services (AUSLAB) and integration with CRIMTRAC for the National Criminal Investigation DNA Database (NCIDD) and National Automated Fingerprint Identification System (NAFIS) for rapid suspect identification.

The Forensic Register allows for the collection of all forensic case, evidence, examination and scientific information including multimedia elements such as digital images and diagrams into one database. It includes monitoring and management of workflow through a range of highly effective reporting, performance and quality assurance aids.

The Forensic Register records and manages via barcode identification all exhibits under a common case identifier. This allows for exhibit and case records to be shared by all forensic disciplines and interdepartmental laboratories, eliminating repetitive data entry and allows for real time reporting of forensic examinations, identifications and subsequent forensic intelligence reporting and charting.

The Forensic Register (Electronic Case Management & Mobile Data) provided the mechanism for end-to-end performance improvement and was critical in the Queensland DNA and Fingerprint Improvement Strategies.

Courtesy of Troy O'Malley, Queensland Police Service, Forensic Services Branch

Findings

The End-to-End Forensic Identification Process Project has to a certain extent benchmarked current forensic process performance standards, in many cases for the first time in Australia. Many jurisdictions have existing performance measures in place but have not been in a position to benchmark their performance on a 'national' basis, noting of course the limitations of the data collected in this study with regards to timeframe of the study and representative nature of data.

The findings are a summary of actual data from recent cases that have occurred within Australia and with some follow on work could provide an opportunity to learn from top performers across all stages of the forensic process.

In the following charts, the identification of individual jurisdictions and/or sites has been removed. Each jurisdiction participating in the End-to-End Project has been provided with their own performance information relative to the overall results. The reference codes shown on the graphs have been applied by the project team and are unique to this report.

The findings have been produced in the following categories:

- Data Overview Nationally.
- Results by Stages.
- Overall Forensic Performance;

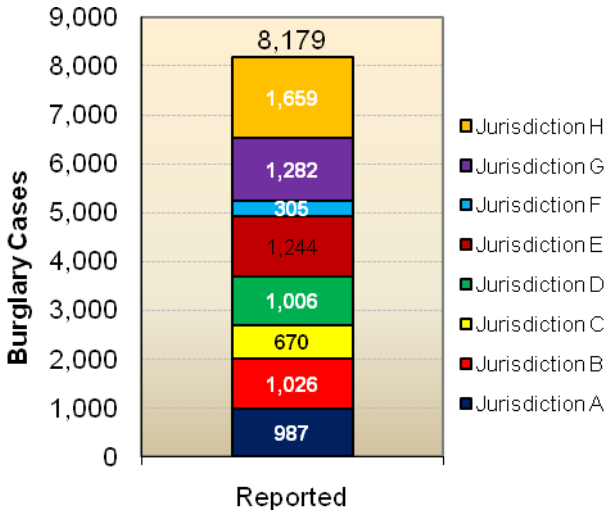
and refer to the two main measures being the lead time and success measures.

Analysis is provided on the national performance, the jurisdictional performance, metropolitan and regional areas, DNA and fingerprint data individually and combined. Each graph is followed by key points and an interpretation.

Appendix Data Tables from which the analysis was drawn have been provided with this report.

Data Overview Nationally

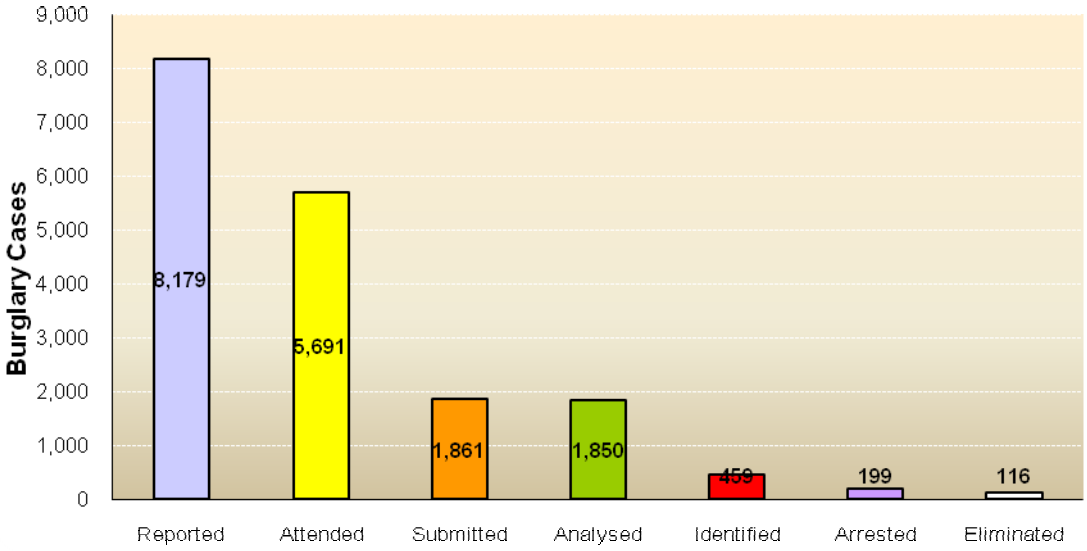
Figure 1: Distribution of Data



Key Points:

- 8,179 burglary cases were reported in the five month period in 2011.
- 17 sites (10 metro, 7 regional).
- 43 cases reported per day (metro sites).
- 10 cases reported per day (regional sites).
- Each State/Territory is represented.
- The majority of cases are in metropolitan locations (81%).

Figure 2: Attrition of Cases across Stages of the Forensic Process



Stage	Reported	Attended	Submitted	Analysed	Identified	Arrested	Eliminated
Cases	8,179	5,691	1,861	1,850	459	199	116
Per 100 reported	100	70	23	23	6	2.4	1.4
Per 100 attended		100	33	33	8	3.5	2.0

Key points:

- There is attrition at all stages of the process.
- Arrests prior to forensic identification or arrest at the scene are excluded.
- 33 percent of cases for which CSI attend the scene have forensic evidence collected.
- Almost 25 percent of forensic evidence analysed results in an identification.
- 2.4 arrests are linked to forensic evidence out of 100 reported burglary cases.
- There is an additional 1.4 elimination per 100 reported burglary cases.
- 3.5 arrests are linked to forensic evidence out of 100 attended burglary cases.

Figure 3: Attrition of Cases across Stages of the Forensic Process: By Jurisdiction

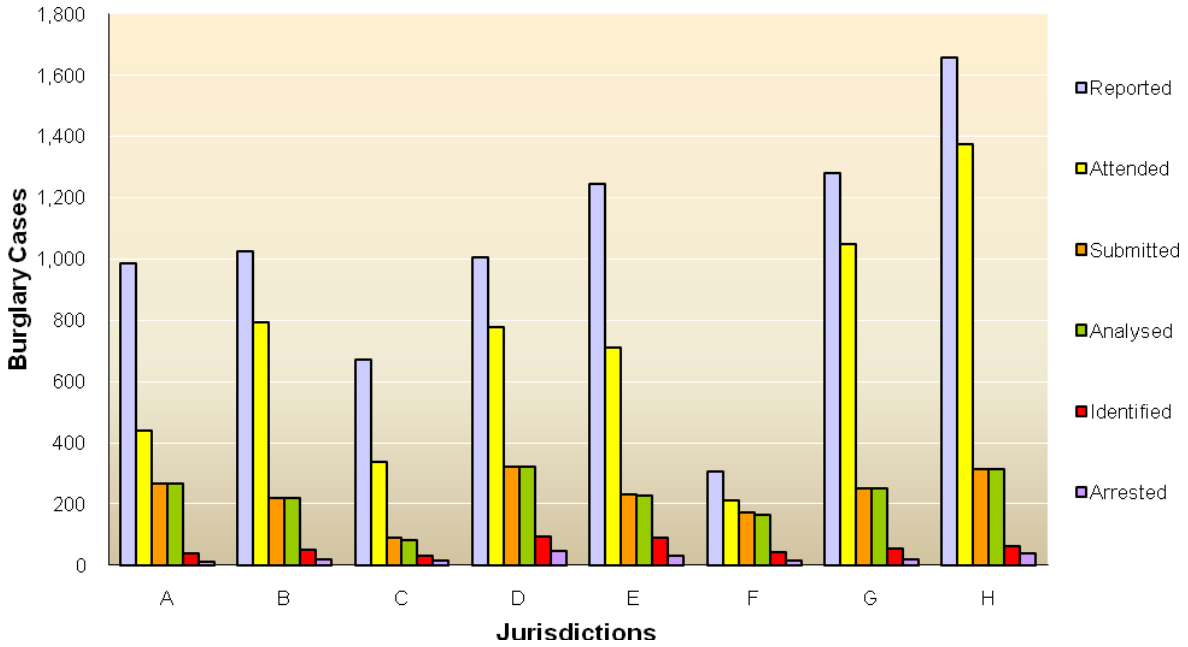


Figure 3.1: Attrition of Fingerprint Cases

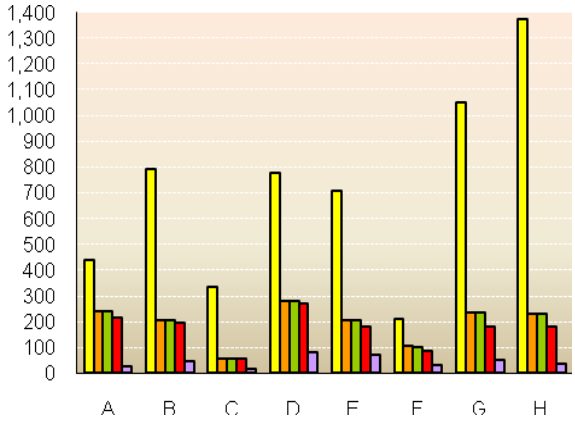
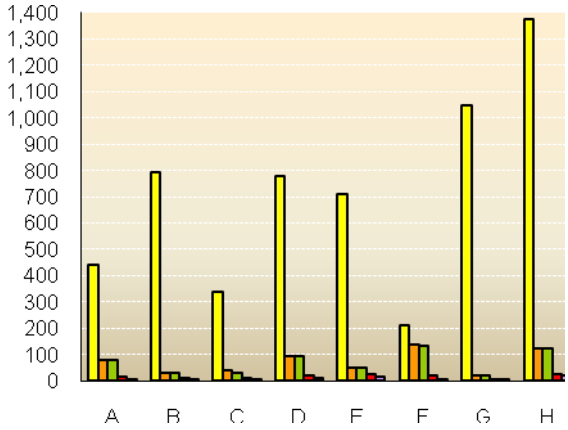


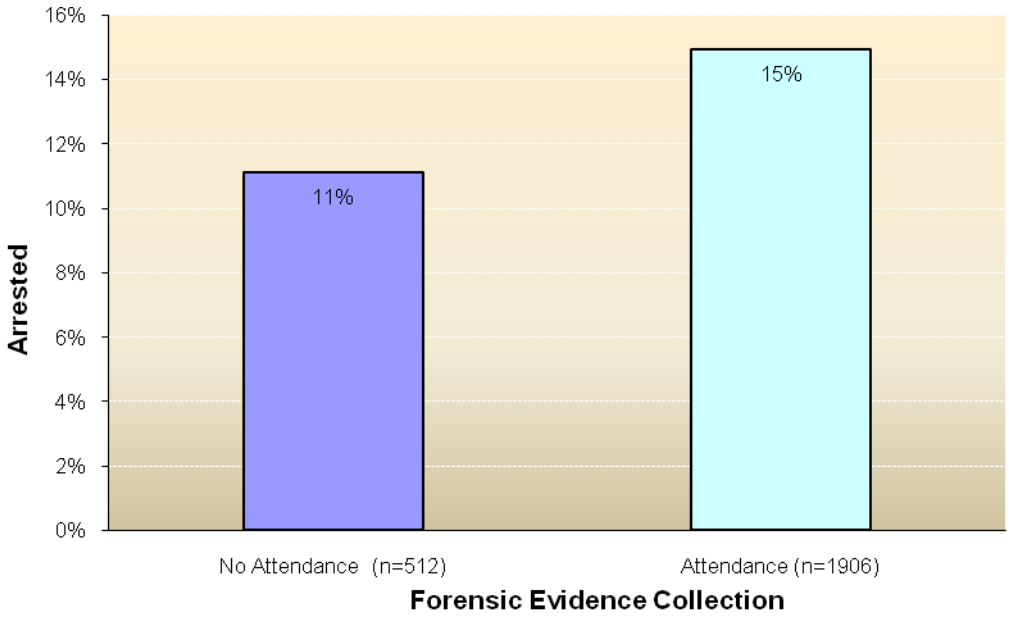
Figure 3.2: Attrition of DNA Cases



Key Points:

- Attrition is at different rates in different stages across different jurisdictions.
- Overall DNA collection rate is lower than fingerprints (10% as opposed to 28%).
- Refer to Table 1 below and Appendix Tables for further details.

Figure 4: Validation Data: Overall Arrest Rates: Reported

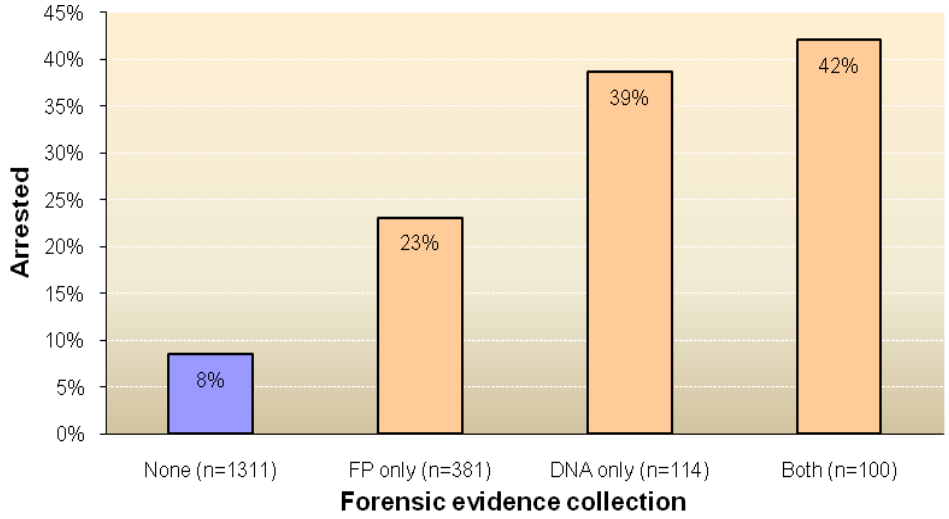


Validation subset. Note: statistically significant differences p=.03

Key Points:

- There is a higher overall arrest rate when CSI attend the scene than for cases where there was no CSI attendance.

Figure 5: Validation Data: Overall Arrest Rates: Attended



Validation subset. Note: statistically significant differences p<0.001

Key Points:

- Where forensic evidence is collected there is a higher overall arrest rate than cases where no forensic evidence is collected.

Results by Stage

Table 1

	Stage 1 Attendance		Stage 2 Evidence Submission		Stage 3 Analysis		Stage 4 Identification		Stage 5 Investigation	
Success Rate			FP	DNA	FP	DNA	FP	DNA	FP	DNA
Description	Attended / Reported		Submitted to Lab / Attended		Analysed / Submitted to Lab		Identification / Analysed		Arrest/ ID	
Cases	5691/8179		1569/5691	581/5691	1564/1569	571/581	362/1564	134/571	135/362	67/134
National mean	70%		28%	10%	100%	98%	23%	23%	37%	50%
95% CI	69%-70%		26%-29%	10%-11%	100-100%	97%-99%	21%-25%	20%-27%	32%-42%	42%-58%
Lowest, highest	44%, 83%		17%, 55%	2%, 64%	97%,100%	82%, 98%	10%,35%	5%, 53%	22%, 63%	21%,71%
Metro, Regional	68%, 74%		28%, 27%	10%, 10%	100%,99%	92%, 98%	21, 30%	24%, 23%	39%, 32%	53%, 37%
Significance										
by jurisdiction	***		***	***	***	***	***	***	*	*
by location	***		NS	NS	NS	NS	***	NS	NS	NS
Lead Time										
Description	Attendance lead time	At scene	Days from attendance to submission to lab		Days from receipt to analysis		Days from analysis to ID		Days from ID to arrest	
Units	hrs	min	d	d	d	d	d	d	d	d
National mean	11	38	2	8	3	14	4	21	23	29
Lowest, highest	5,19	29,58	0, 8	0, 21	0, 15	0, 49	0, 13	4, 42	11, 40	10, 123
Metro, Regional	10, 14	37, 44	1, 3	8, 10	3, 4	12, 24	4, 4	18, 34	22, 28	26, 43
National median	4	30	0	5	1	3	0	15	11	20
Lowest, highest	1,14	21,50	0, 6	0, 13	0, 11	0, 57	0, 12	4, 32	8, 38	5, 123
Metro, Regional	4, 4	30, 30	0, 1	5, 5	1, 1	3, 9	0, 0	15, 16	11, 14	20, 45
Cases	5621	4896	1567	581	1564	571	362	132	135	67
Significance										
by jurisdiction	***	***	***	***	***	***	***	***	***	***
by location	NS	***	***	*	NS	***	NS	NS	NS	NS

Notes:

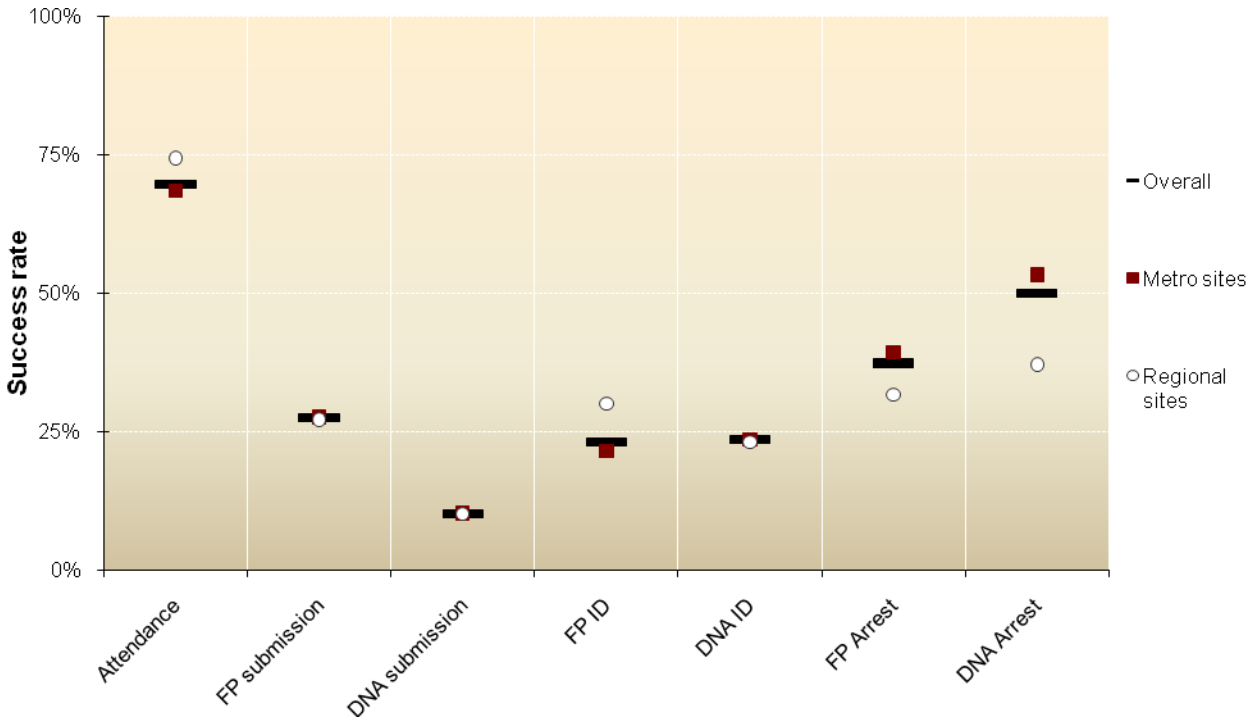
- The national mean is the overall mean across all sites in the study.
- Lowest, highest are the lowest and highest aggregated means across each of the 8 jurisdictions.
- Statistical significance denoted by *(***=p<.001;**=p<.01;*=p<.05;NS=p≥.05 considered not statistically significant).

Key Points:

- This table provides success rate and lead times across each stage of the forensic process. It also shows the variation in the measures across jurisdictions and across locations.
- Statistical testing shows significant differences for all measures across jurisdictions.
- Metropolitan and regional results generally show differences in the early stages.
- These results will be discussed in greater detail in subsequent sections.
- 95% confidence intervals around the national success rates shows that the precision of the estimates is greater in the earlier stages as the data decreases with the attrition. For example the width of the 95% confidence interval for stage 1 is 1% and for stage 5 is 8%. Note also the precision is higher for fingerprint results than DNA for the same reason.
- Refer to Appendix Data Tables for data relevant to each Jurisdiction.

Success

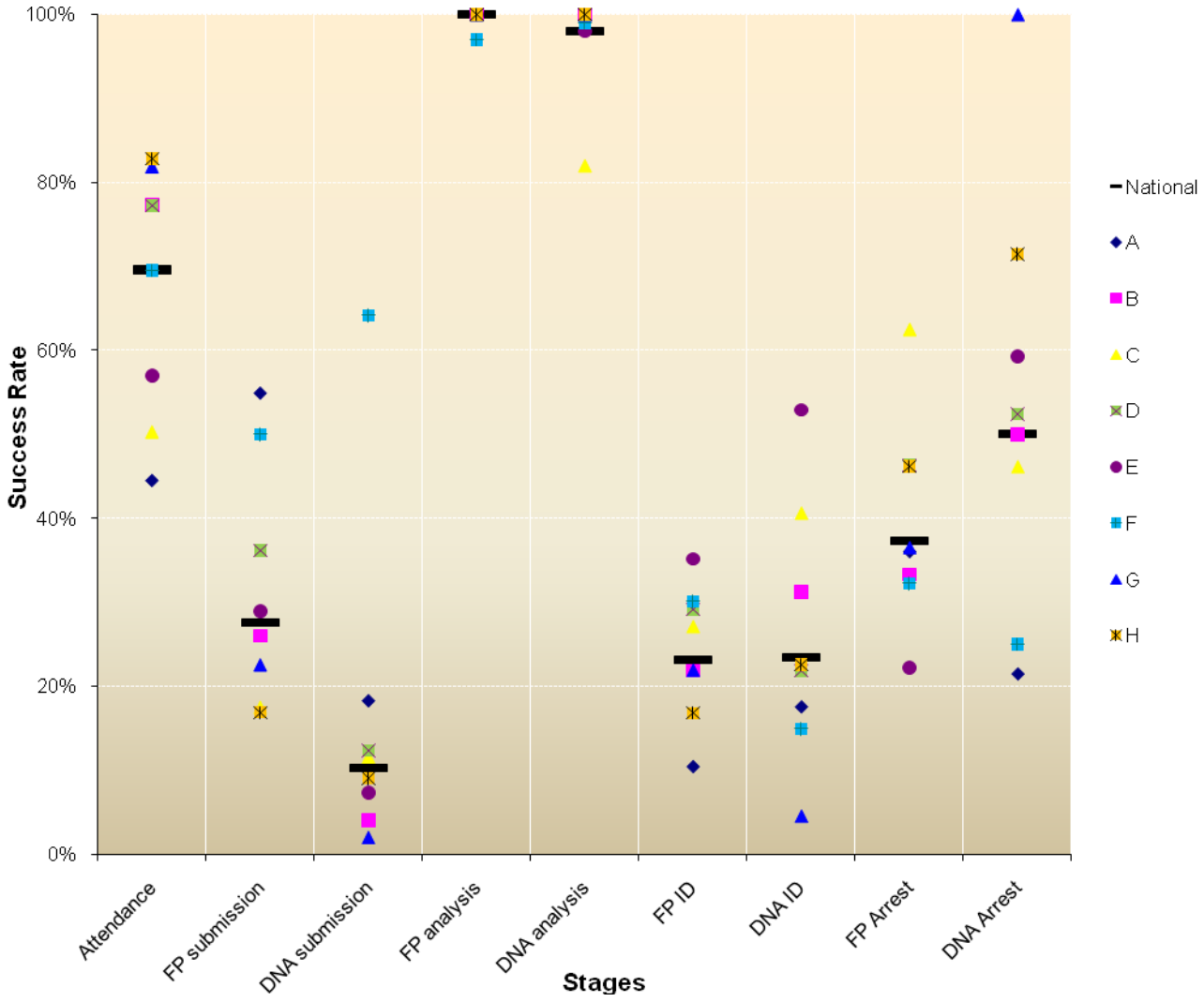
Figure 6: Success by Stage: By Location



Key Points:

- The results by location are mixed across the stages.
- The only differences that are statistically significant are the higher attendance rates for regional sites and higher fingerprint identification rate for regional sites.
- Refer to Table 1.

Figure 7: Success by Stage: By Jurisdiction with National



Key Points:

- Note the accuracy of the jurisdictional estimates in the later stages is less than the earlier stages.
- The extreme attrition of DNA for Jurisdiction G has resulted in only 1 case for stage 5.
- Refer to Table 1.

Stage 1 (Attendance)

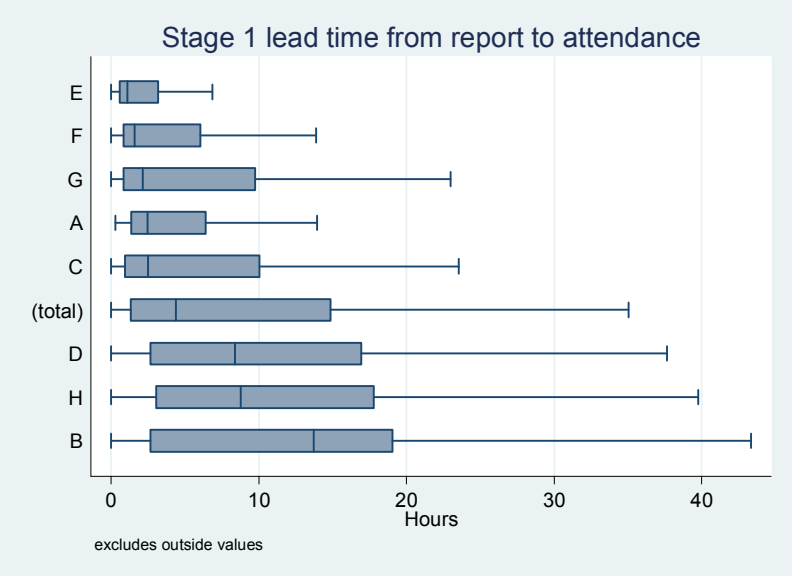
Table 2

	Stage 1 Attendance	
Success rate		
Description	Attended/Reported	
Cases	5691/8179	
National mean	70%	
95% CI	69%-70%	
Lowest, highest	44%, 83%	
Metro, Regional	68%, 74%	
Significance by jurisdiction	***	
by location	***	
Lead Time		
Description	Attendance lead time	At scene
Units	hrs	min
National mean	11	38
Lowest, highest	5,19	29,58
Metro, Regional	10, 14	37, 44
National median	4	30
Lowest, highest	1,14	21,50
Metro, Regional	4, 4	30, 30
Cases	5621	4896
Significance by jurisdiction	***	***
by location	NS	***

Key Points:

- Overall 70% of burglary cases reported are attended by CSI. There is statistically significant variation across the jurisdictions and by location.
- There is a higher attendance rate in regional areas. The mean lead time is 11 hours but the median lead time of four hours better reflects the performance.
- There are statistically significant differences in the response times between jurisdictions but not by locations.
- There is a median of 30 minutes for time spent at the scene. There are statistically significant differences between the times across jurisdictions and by location. The difference by location is illustrated in the next figure.

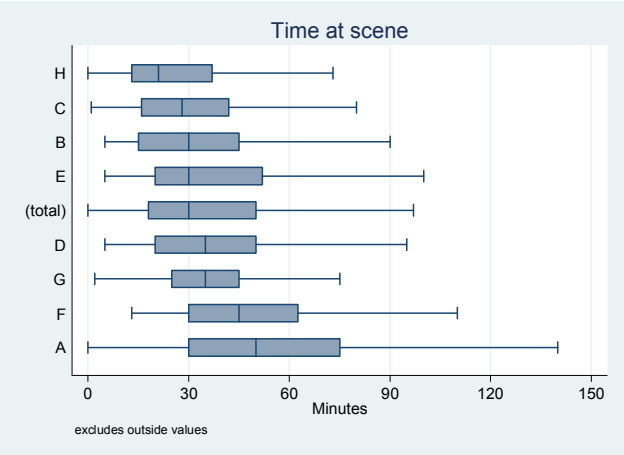
Figure 8: Attendance Lead times: By Jurisdiction with National (Median)



Key Points:

- Median lead time varies from 1 hour to 14 hours.

Figure 9: Time at the Scene: By Jurisdiction

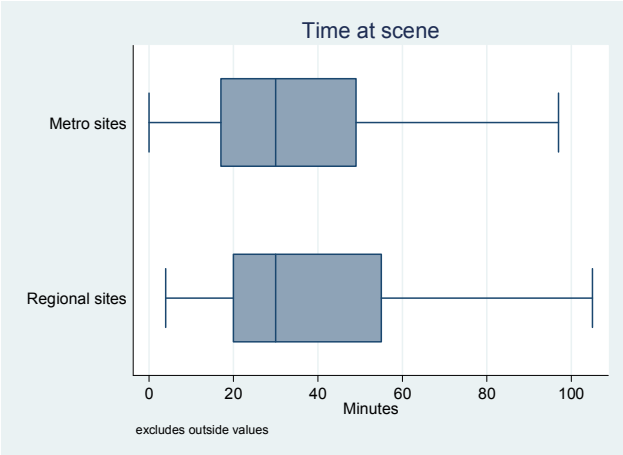


Note: scale different between figure 9 & 10

Key points:

- the median time at the scene ranges from 21 minutes to 50 minutes with the national median of 30 minutes.

Figure 10: Time at the Scene: By Location



Key points:

- longer times spent in regional sites.

Stage 2 (Submission)

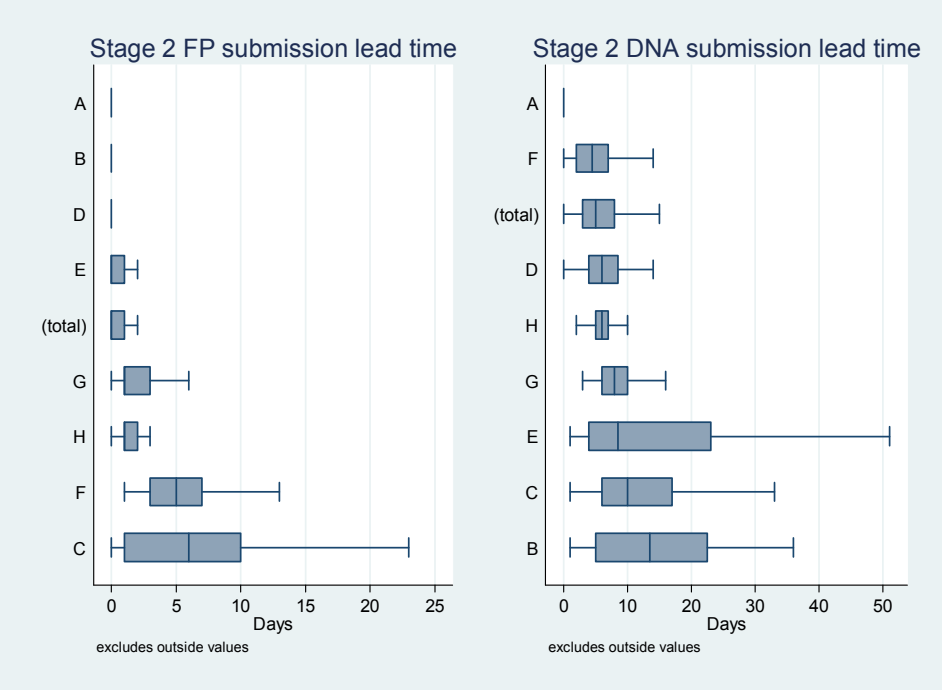
Table 3

	Stage 2 Evidence submission	
Success rate	FP	DNA
Description	Submitted to Lab / Attended	
Cases	1569/5691	581/5691
National mean	28%	10%
95% CI	26%-29%	10%-11%
Lowest, highest	17%, 55%	2%, 64%
Metro, Regional	28%, 27%	10%, 10%
Significance		
by jurisdiction	***	***
by location	NS	NS
Lead Time		
Description	Days from attendance to submission to Lab	
Units	d	d
National mean	2	8
Lowest, highest	0, 8	0, 21
Metro, Regional	1, 3	8, 10
National median	0	5
Lowest, highest	0, 6	0, 13
Metro, Regional	0, 1	5, 5
Cases	1567	581
Significance		
by jurisdiction	***	***
by location	***	*

Key Points:

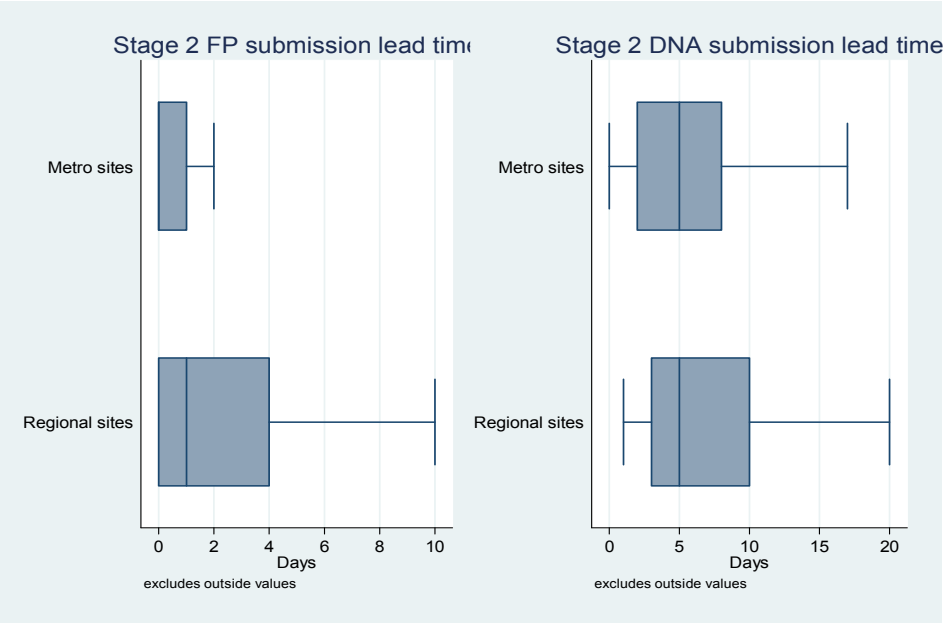
- Note that zero lead time indicates submission on same day as attended.
- Fingerprint evidence was submitted in 28% of cases where CSI attended.
- This varied from 17% to 55% across jurisdictions.
- The jurisdictions with the highest attendance rate did not necessarily have the highest fingerprint submission rate or highest DNA submission rate. Refer to Figure 7.
- Fingerprints have a substantially shorter submission lead time than DNA.
- There is no difference in the submission rate by location.
- The submission rate was lower for DNA (10%) with a large variation across the jurisdictions but not by location.
- Jurisdiction F has over three times the DNA submission rate of the next highest jurisdiction, but this is due to different procedures at the time data was collected.

Figure 11: Submission Lead time: By Jurisdiction with National (Median)



Note: scale different between two plots

Figure 12: Submission Lead time: By Location (Fingerprints and DNA)



Note: scale different between two plots

Key Points:

- These plots illustrate the longer lead times for DNA than fingerprints, longer lead times in regional areas and substantial variation by jurisdiction.

Stage 3 (Analysis)

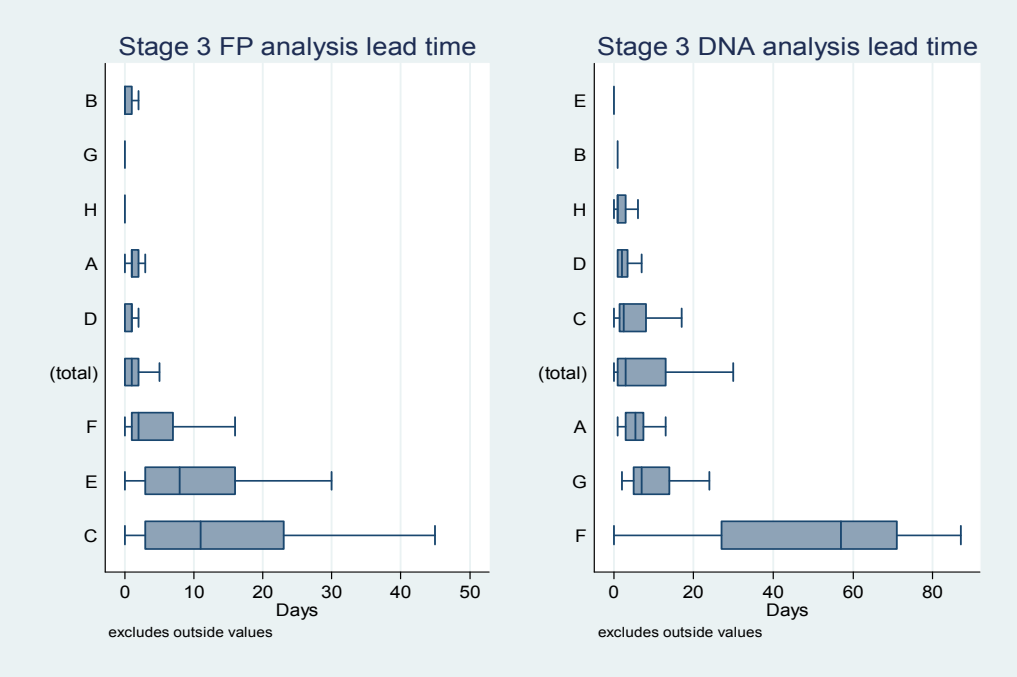
Table 4

	Stage 3 Analysis		Stage 3 Analysis (FP & DNA Suitability)	
Success rate	FP	DNA	FP	DNA
Description	Analysed / Submitted to Lab		Suitable for upload to NAFIS database / Submitted to Lab	Suitable for upload to NCIDD database / Submitted to Lab
Cases	1564/1569	571/581	1367 / 1569	241/ 581
National mean	100%	98%	87%	42%
95% CI	100-100%	97%-99%		
Lowest, highest	97%,100%	82%, 98%	76%, 96%	26%, 78%
Metro, Regional	100%,99%	92%, 98%	87%, 89%	42%, 41%
Significance				
by jurisdiction	***	***	***	***
by location	NS	NS	NS	NS
Lead Time				
Description	Days from receipt to analysis		As per left column	
Units	d	d		
National mean	3	14		
Lowest, highest	0, 15	0, 49		
Metro, Regional	3, 4	12, 24		
National median	1	3		
Lowest, highest	0, 11	0, 57		
Metro, Regional	1, 1	3, 9		
Cases	1564	571		
Significance				
by jurisdiction	***	***		
by location	NS	***		

Key Points:

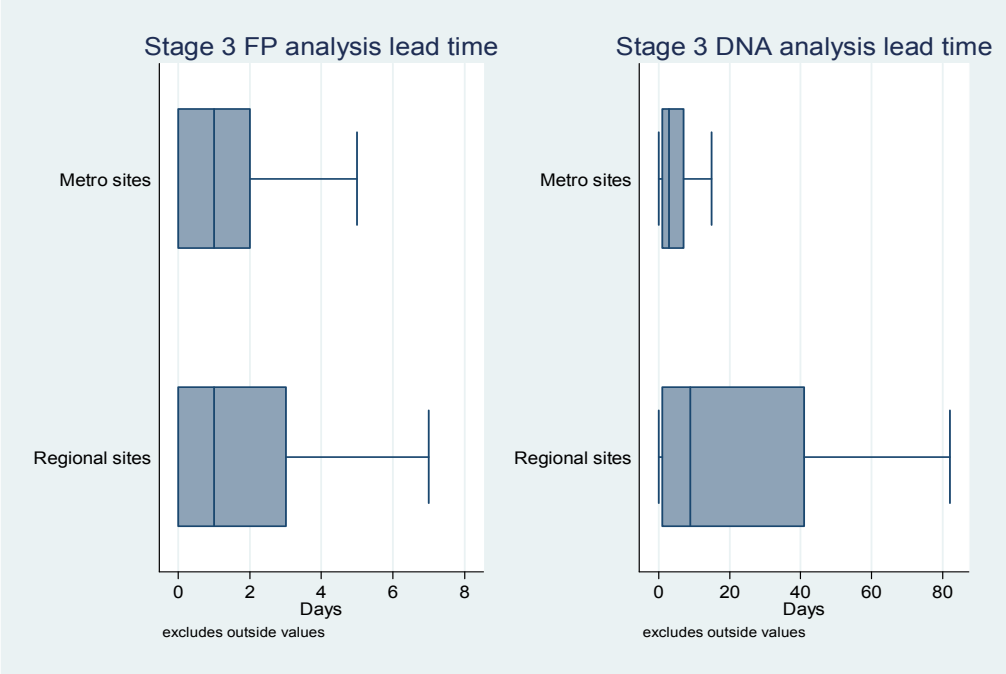
- Virtually all fingerprint evidence is analysed. This is the case in all except one jurisdiction.
- Overall 98% of DNA evidence is analysed.
- There is some variation by jurisdiction.
- Fingerprints have a shorter analysis lead time than DNA (median 1 vs. 3 days).
- There is significant variation across jurisdictions in lead time for both fingerprints and DNA.
- The ranking is different between fingerprints and DNA.

Figure 13: Analysis Lead time: By Jurisdiction with National (Median)



Note: Scale different between the two plots

Figure 14: Analysis Lead time: By Location (Fingerprints and DNA)

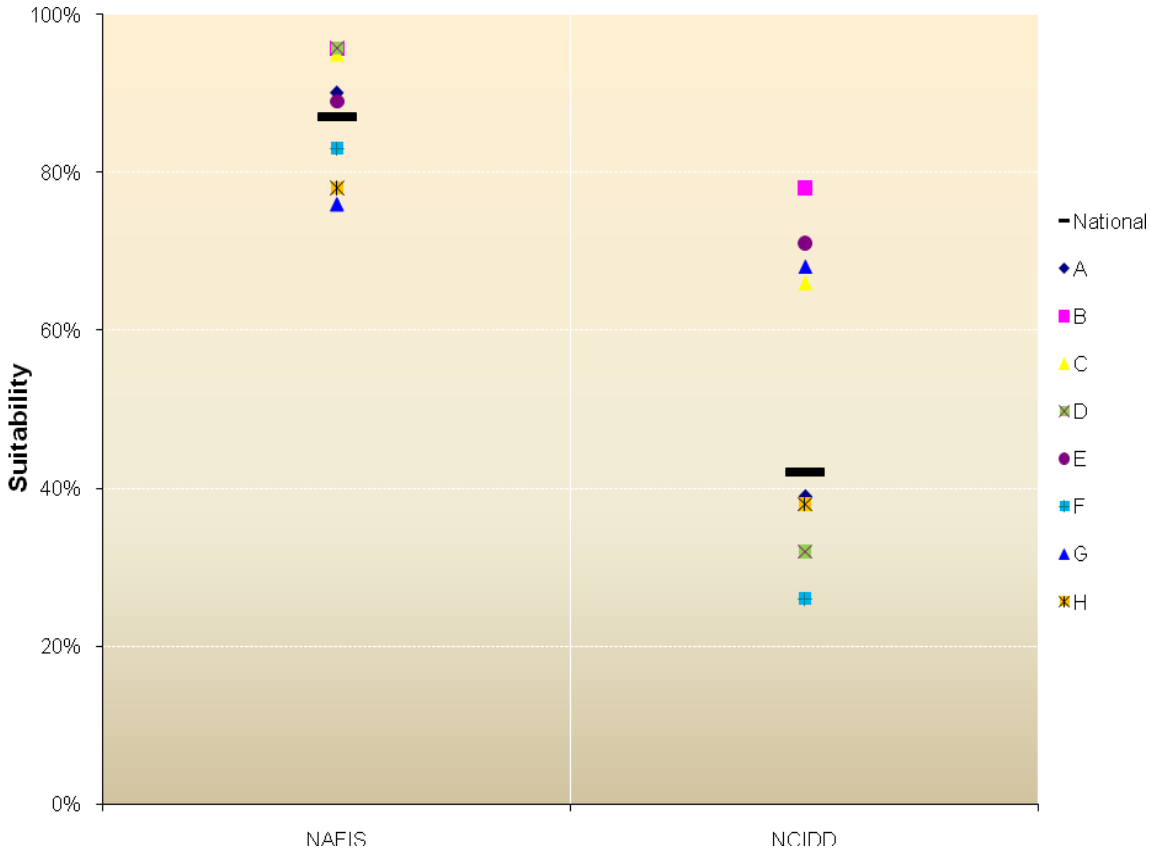


Note: Scale different between the two plots

Key Points:

- There is no significant difference by location for fingerprint analysis lead time but there is a longer DNA lead time for regional sites.

Figure 15: Success: Profile Suitability for upload to Databases



Key Points:

- Overall the percentage of cases with a profile suitable for upload to the NAFIS database is 87% and the corresponding percentage of cases with a profile suitable for upload to the NCIDD database is 42%.
- There is significant variation across jurisdictions in these percentages but no difference by location.
- There is a greater variation in DNA than in fingerprints.
- Some of the DNA variation may be due to the interpretation of database suitability by the contact officers during the data collection period.

Stage 4 (Identification)

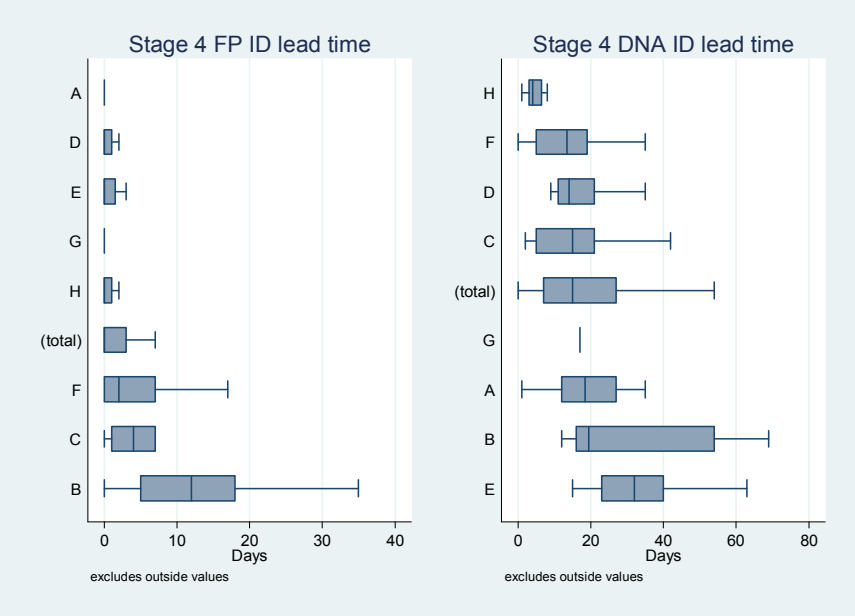
Table 5

	Stage 4 Identification	
Success rate	FP	DNA
Description	Identification / Analysed	
Cases	362/1564	134/571
National mean	23%	23%
95% CI	21%-25%	20%-27%
Lowest, highest	10%,35%	5%, 53%
Metro, Regional	21, 30%	24%, 23%
Significance		
by jurisdiction	***	***
by location	***	NS
Lead Time		
Description	Days from analysis to ID	
Units	d	d
National mean	4	21
Lowest, highest	0, 13	4, 42
Metro, Regional	4, 4	18, 34
National median	0	15
Lowest, highest	0, 12	4, 32
Metro, Regional	0, 0	15, 16
Cases	362	132
Significance		
by jurisdiction	***	***
by location	NS	NS

Key Points:

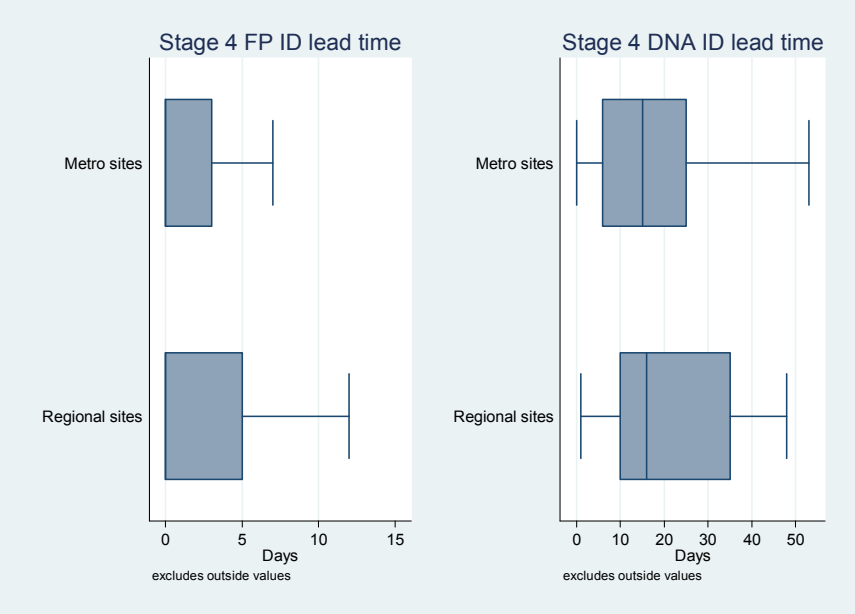
- Overall identification rate for both fingerprints and DNA is 23%.
- There are statistical differences across jurisdictions but there is more variation for DNA identification rates (5% to 53%).
- There are higher identification rates in fingerprints at regional sites, but no difference for DNA.
- The jurisdictional ranking is different between fingerprints and DNA.
- The DNA data available is from a smaller sample than for fingerprints.
- Jurisdiction G has only one case with a DNA identification.

Figure 16: Identification Lead time: By Jurisdiction with National (Median)



Note: scale different between two plots

Figure 17: Identification Lead time: By Location (Fingerprints and DNA)



Note: scale different between two plots

Key Points:

- There are statistically significant differences across jurisdictions in the lead time for both fingerprints and DNA, but metropolitan and regional sites are similar.
- There are longer lead times for DNA than fingerprints (median 15 days vs. same day for fingerprints).

Results: Stage 5 (Investigation)

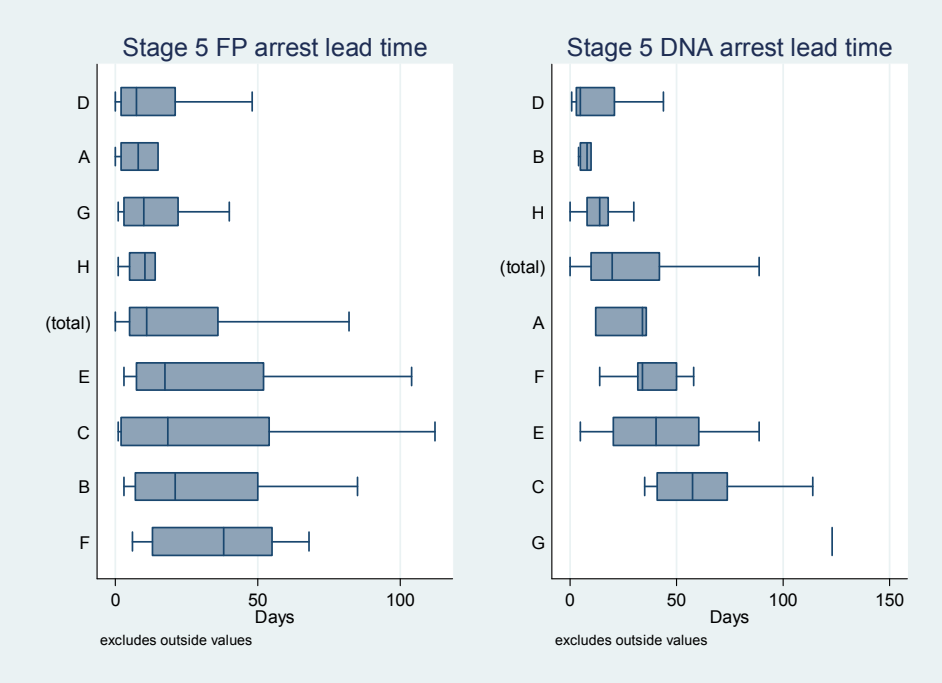
Table 6

	Stage 5 Investigation	
Success rate	FP	DNA
Description	Arrest / ID	
Cases	135/362	67/134
National mean	37%	50%
95% CI	32%-42%	42%-58%
Lowest, highest	22%, 63%	21%,71%
Metro, Regional	39%, 32%	53%, 37%
Significance		
by jurisdiction	*	*
by location	NS	NS
Lead Time		
Description	Days from ID to arrest	
Units	d	d
National mean	23	29
Lowest, highest	11, 40	10, 123
Metro, Regional	22, 28	26, 43
National median	11	20
Lowest, highest	8, 38	5, 123
Metro, Regional	11, 14	20, 45
Cases	135	67
Significance		
by jurisdiction	***	***
by location	NS	NS

Key Points:

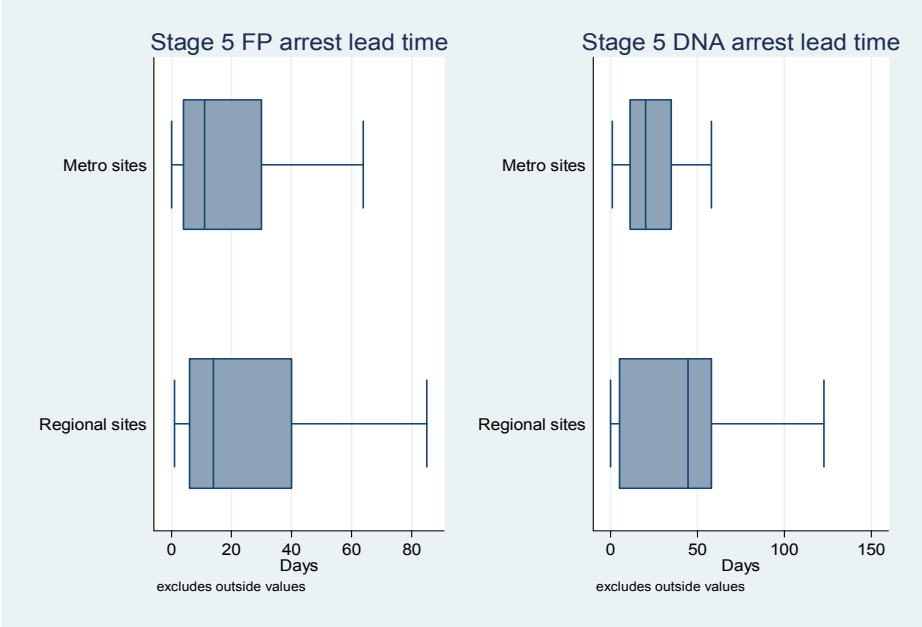
- The overall arrest rate after fingerprint identification is 37% and 50% after DNA identification.
- Significant variation is observed by jurisdiction but there is more variation for DNA identification than fingerprints.
- There is no difference by location.
- Note that the DNA data available is a smaller sample than for fingerprints.
- Jurisdiction G was excluded from the DNA comparisons due to it being represented by only one case.

Figure 18: Arrest Lead time: By Jurisdiction with National (Median)



Note: scale different between two plots

Figure 19: Arrest Lead time: By Location (Fingerprints and DNA)



Note: scale different between two plots

Key Points:

- No significant differences are observed between Metropolitan or Regional sites.
- Longer lead times are seen for DNA than fingerprints.
- Significant differences are observed between jurisdictions.

Overall Forensic Performance

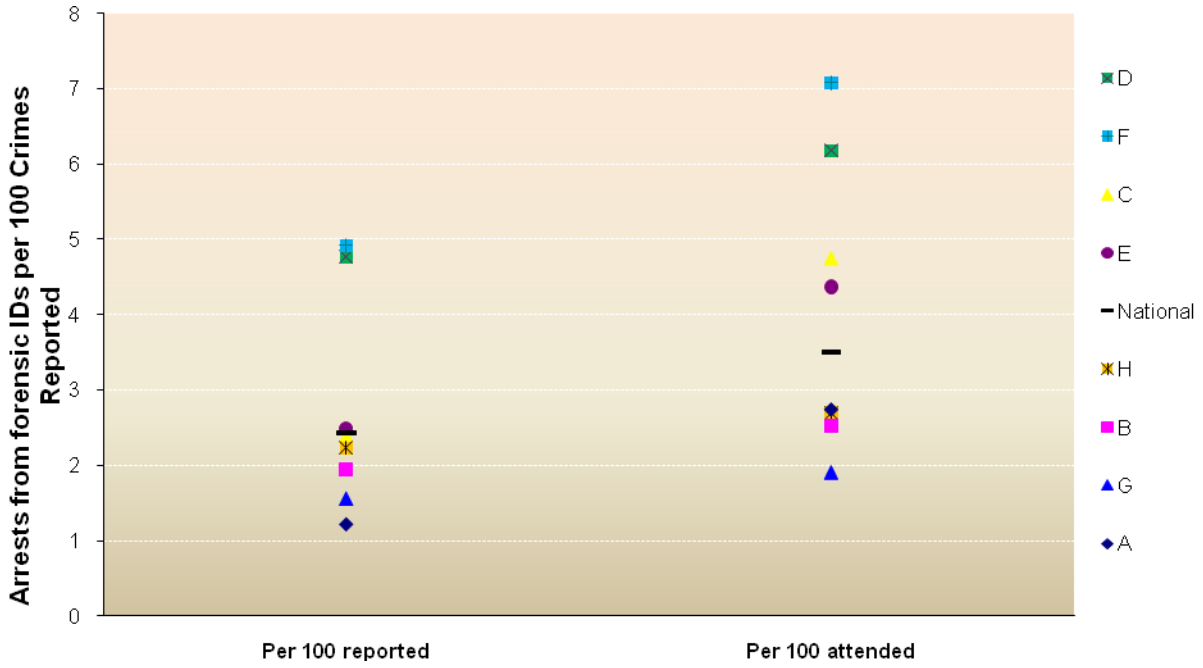
Table 7

	Stage 1 - Stage 5 Investigation			Stage 1 - Stage 5 Investigation		
Success rate	FP	DNA	FP and/or DNA	FP	DNA	FP and/or DNA
Description	Arrest/Reported			Arrest/Attended		
Cases	135/8179	67/8179	199/8179	135/5691	67/5691	199/5691
National mean	1.7%	0.8%	2.4%	2.4%	1.2%	3.5%
95% CI	1.4-2.0%	0.6-1.0%	2.1-3.0%	2.0-2.8%	0.9-1.5%	3.0-4.0%
Lowest, highest	0.9,3.8%	0.1,1.6%	1.2,4.9%	1.3, 4.9%	0.1, 2.4%	1.9, 7.1%
Metro, Regional	1.6,1.9%	0.9,0.6%	2.4,2.5%	2.3, 2.6%	1.2, 0.9%	3.5, 3.4%
Significance						
by jurisdiction	***	**	***	***	**	***
by location	NS	NS	NS	NS	NS	NS
Lead Time						
Description	Days from report to arrest			As per left column		
Units	d	d	d			
National mean	33	60	41			
Lowest, highest	13, 72	25,158	22, 83			
Metro, Regional	31, 40	55, 85	39, 51			
National median	19	49	29			
Lowest, highest	9, 52	26, 158	14, 87			
Metro, Regional	16, 29	42, 92	28, 39			
Cases	135	67	199			
Significance						
by jurisdiction	***	***	***			
by location	NS	NS	NS			

Key Points:

- When the arrests are related back to the number of crimes reported the overall success rates are 1.7% for fingerprints (or 1.7 per 100 crimes reported) and 0.8% for DNA.
- There are statistically significant differences across jurisdictions but not by location.

Figure 20: Results Overall: By Jurisdiction



Key Points:

- There are significant differences by jurisdiction but more variation exists per attendance due to the wide range in attendance rates.
- Note that Jurisdiction C is obscured, but has the same value as the national rate per crimes reported. Jurisdiction H is partly obscured, but has the same value as jurisdiction A as per crimes attended.

Figure 21: Arrests from DNA vs. Fingerprints per 100 Crimes Reported: By Jurisdiction

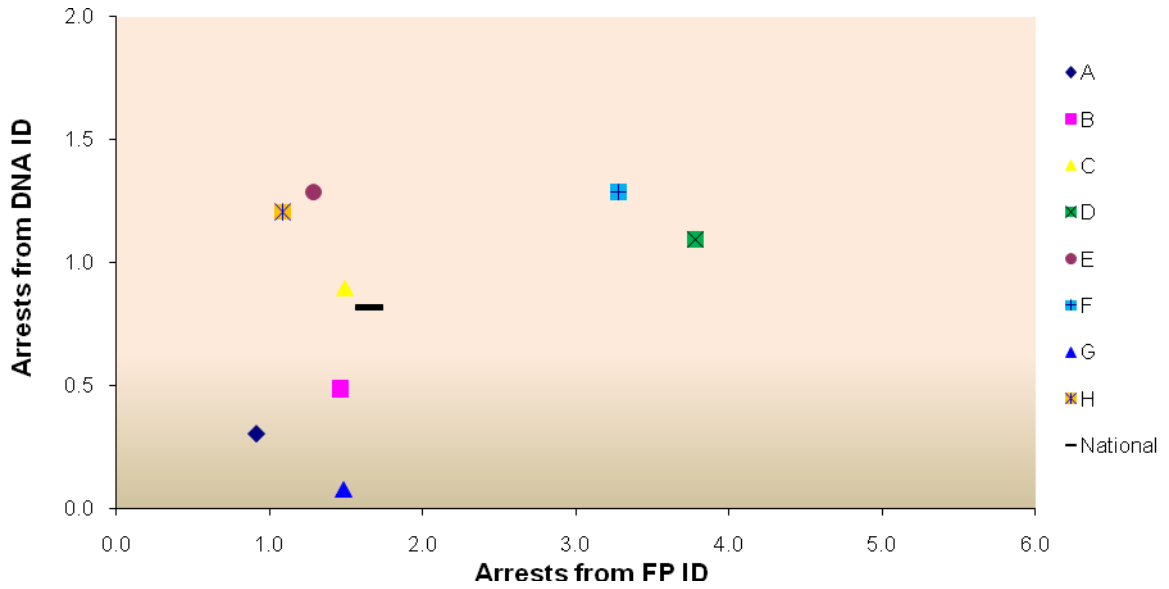
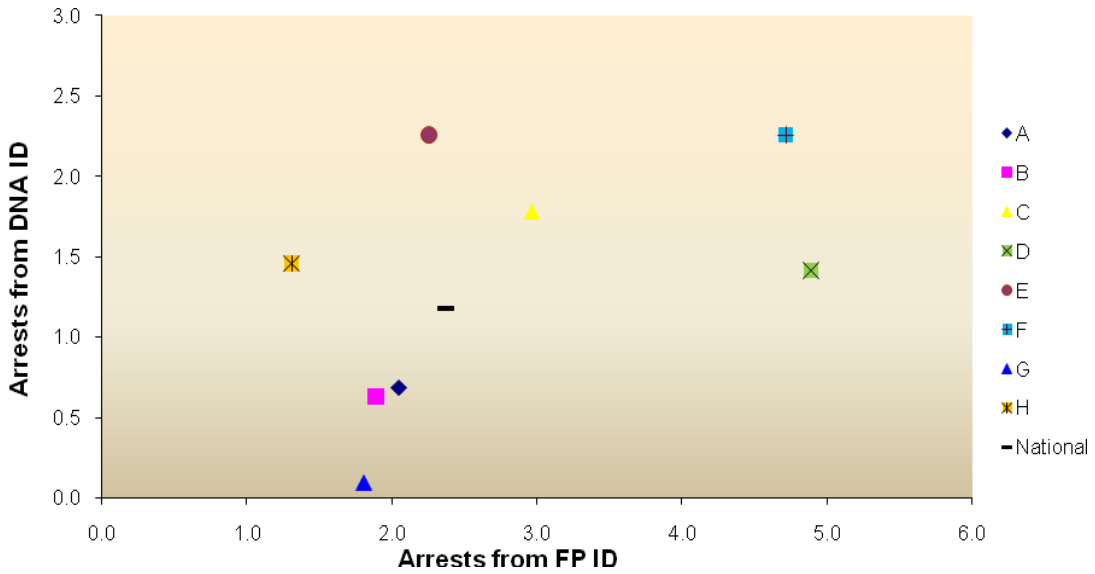


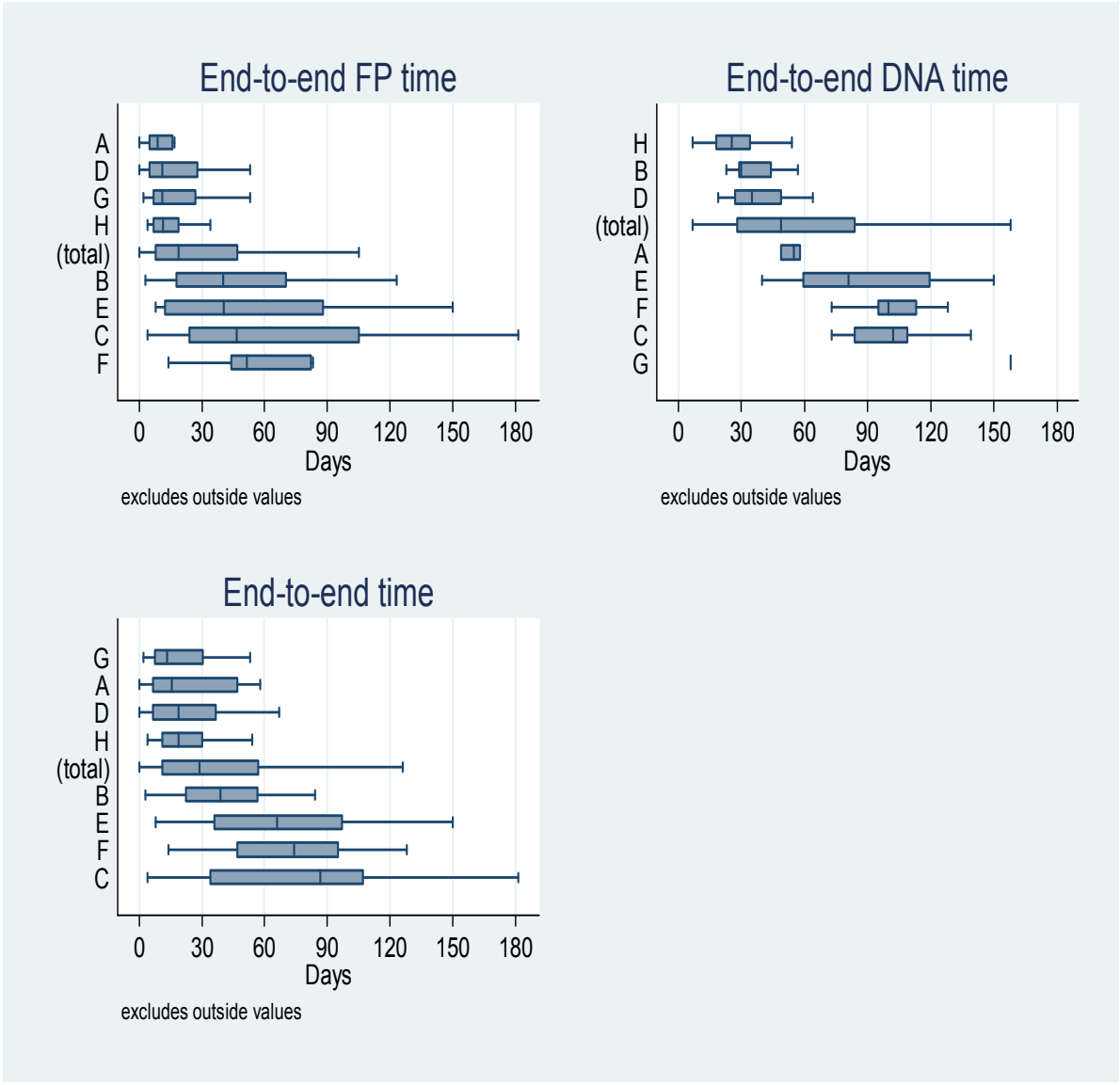
Figure 22: Arrests from DNA vs. Fingerprints per 100 Crimes Attended: By Jurisdiction



Key Points:

- These graphs compare the relative jurisdictional performance for DNA vs. fingerprints.
- There is less variation in the DNA results across jurisdictions and overall lower arrest rates.
- Some jurisdictions achieve twice the fingerprint arrest rate than the national median.
- There is not a strong correlation between performance regarding DNA and fingerprint evidence, but the jurisdictions with the highest overall arrest rates from fingerprints also have DNA arrest rates above the aggregate national figure.

Figure 23: Overall End-to-End Lead times: By Jurisdiction



Key Points:

- Overall median lead times across all sites were 19 days for fingerprints and 49 days for DNA evidence. The fastest times achieved were a median of 9 days for fingerprints (Jurisdiction A) and 26 days for DNA (Jurisdiction H).
- When fingerprint and DNA information was considered together, the fastest times were achieved in Jurisdiction G (but this jurisdiction collected very little DNA evidence).
- The median lead time for the cases with arrest from the report to arrest, regardless of evidence type and not by stage is 29 days.

Figure 24: Lead times (Median in each Stage): By Jurisdiction (Fingerprint)

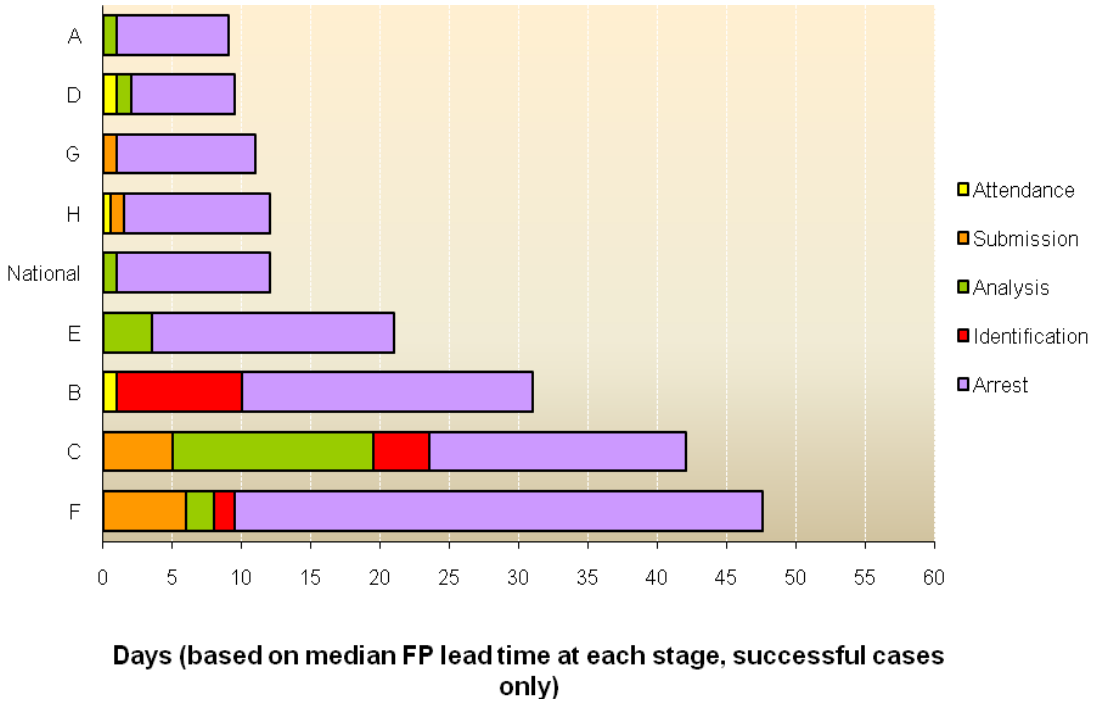
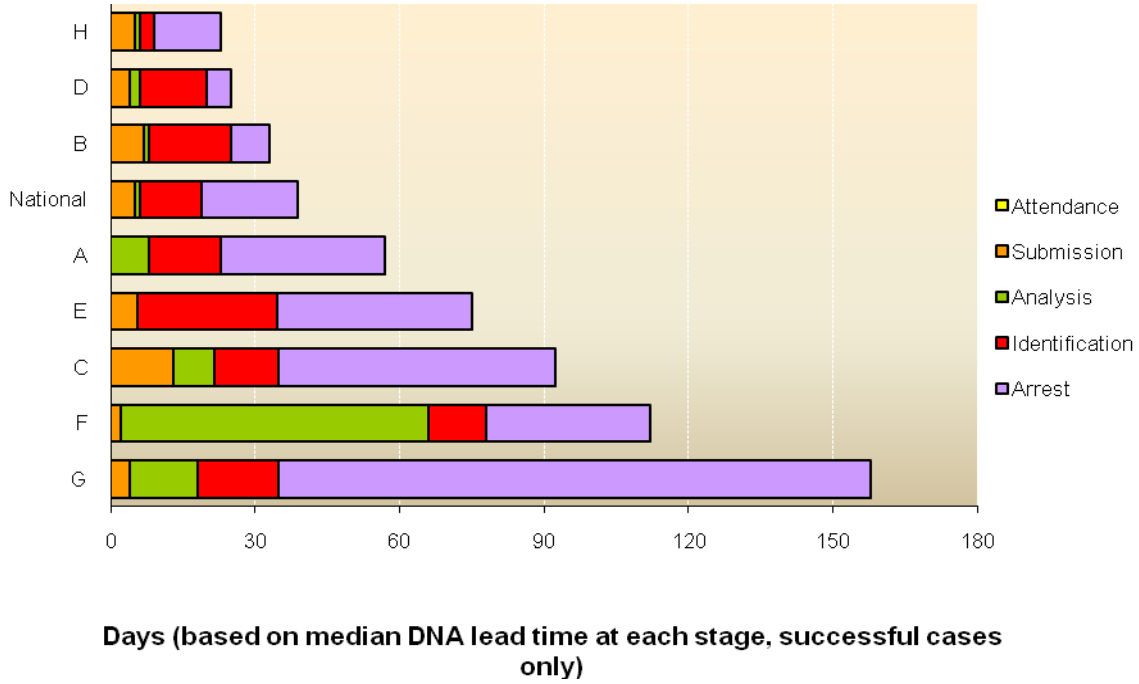
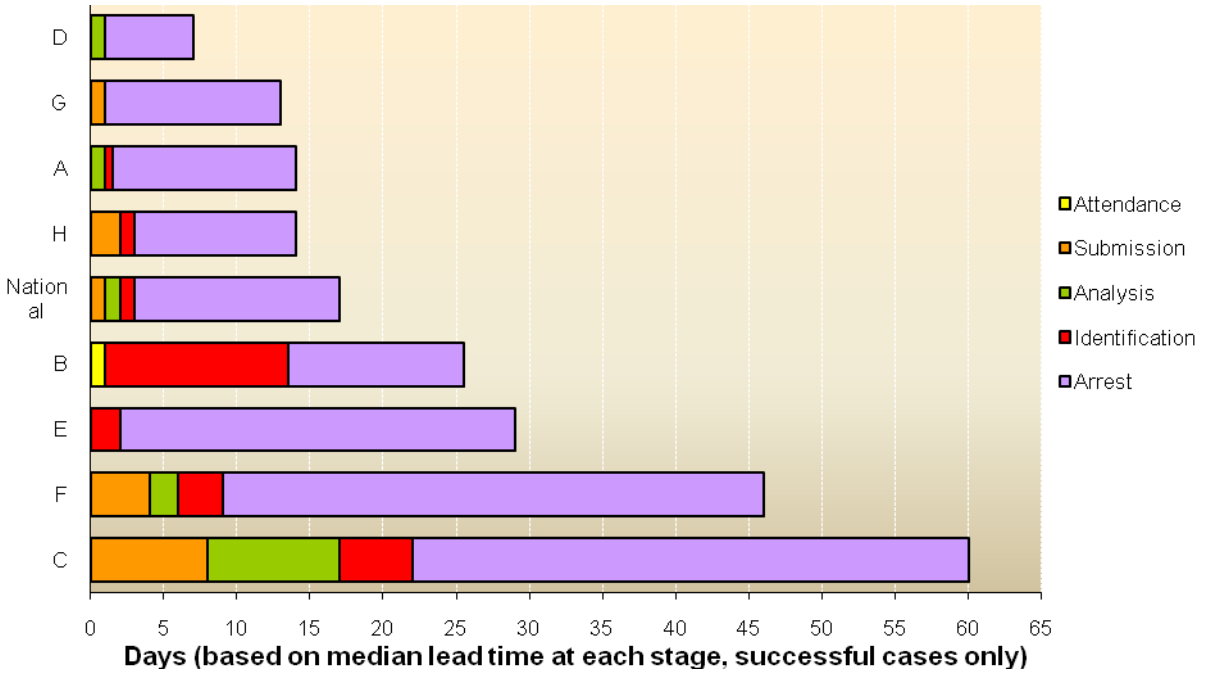


Figure 25: Lead times (Median): By Jurisdiction (DNA)



Note: the lead time scale for figure 25 is three times longer than the lead time scale for figure 24

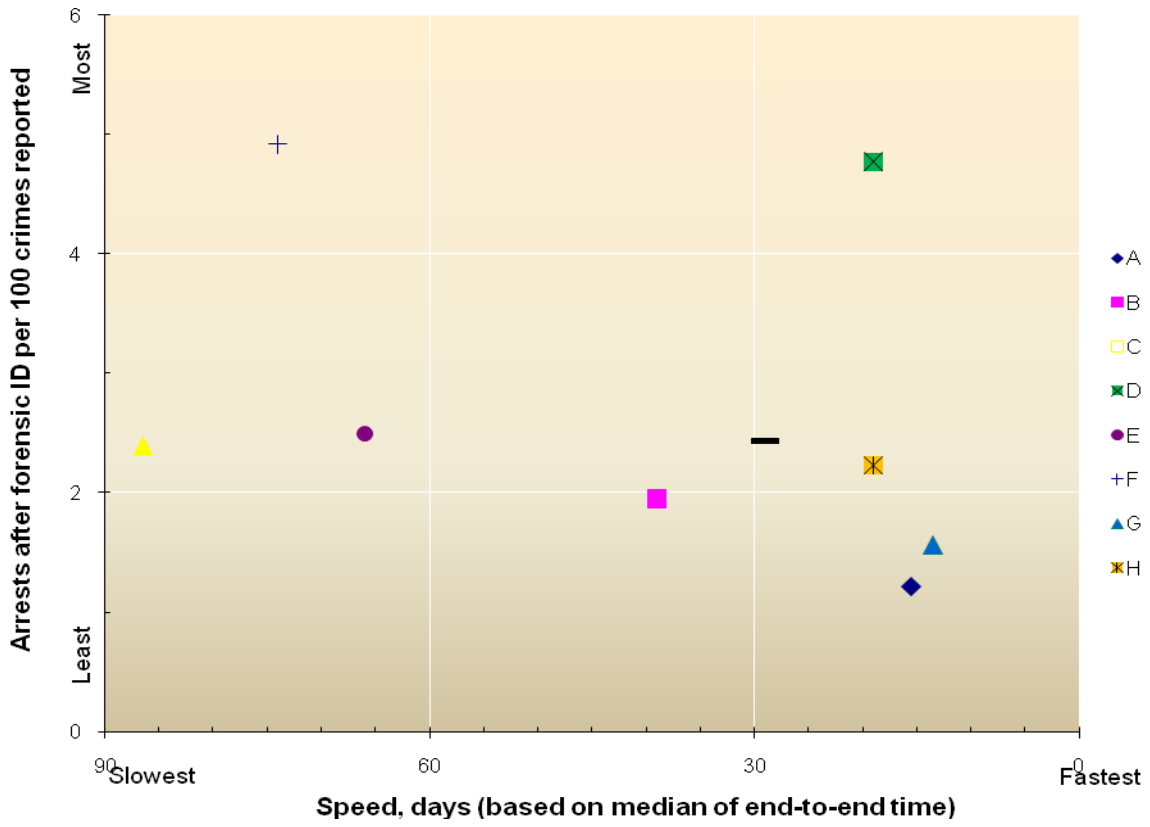
Figure 26: Lead times (Median): By Jurisdiction (Forensic Evidence)



Key Points:

- These graphs illustrate the relative length of each stage in contributing to the overall end-to-end lead time. This may assist in identifying where it may be possible to improve efficiency in the various jurisdictions.
- The last stage dominates the overall time in almost all jurisdictions.
- Longer identification lead times for DNA contribute to the longer overall lead times for DNA compared with fingerprints.

Figure 27: Success vs. Time (Median) per 100 Crimes Reported: By Jurisdiction



Key Points:

- This graph provides an overall performance summary plotting end-to-end effectiveness (arrest rates) against end-to-end efficiency (lead time). The scale is adjusted so that the top right area of the graph indicates best performance in both dimensions.
- The overall arrest rate is 2.4 per 100 crimes reported with a median lead time of 29 days (on evaluation of only the data for the 199 cases that successfully completed all stages).
- There is statistically significant variation in the arrest rates and lead times across jurisdictions.
- However, there is no consistent correlation between these two measures. The jurisdictions with the fastest lead times are not necessarily the ones with the highest arrests.).
- From an overall forensic performance perspective, the top performer is jurisdiction D.
- Jurisdiction F achieved similar arrest rates but with longer lead times.

Multivariate Model Results

		Outcome for each logistic regression model			Explanatory variables									
					Site		1			2		3	4	4
Model	Cases	Stage	Outcome success	Forensic evidence	Loc-ation	Juris-diction	Attend-ance rate	Attend-ance lead time	Time at scene	Sub-mission rate	Sub-mission lead time	Analysis lead time	ID lead time	ID-IO lead time
1	4830			FP	NS	***	NS	NS	***					
2	4830			DNA	***	***	NS	NS	***					
3	4830	2	Sub-mission	FP/ DNA	NS	***	NS	NS	***					
4	1536			NAFIS	NS	***	NS	NS	***	NS	NS	NS		
5	539	3	Suitability	NCIDD	NS	***	NS	NS	*	NS	NS	NS		
6	1356			FP	NS	***	NS	NS	***	NS	NS	NS		
7	540			DNA	NS	**	NS	NS	**	NS	NS	NS		
8	1629	4	ID after sub-mission	FP/ DNA	NS	***	NS	NS	***	NS	NS	***		
9	307			FP	NS	*	*	NS	NS	**	NS	NS	NS	NS
10	121			DNA	NS	*	NS	NS	NS	NS	NS	NS	*	NS
11	395	5	Arrest after ID vsID'd	FP/ DNA	NS	*	NS	NS	NS	**	NS	NS	NS	NS
12	8179			FP	NS	***	*			NS				
13	8179			DNA	NS	*	NS			NS				
14	8179	5	Arrest after ID vs. Reported	FP/ DNA	NS	***	NS			NS				
15	4984			FP	NS	***	*	NS	***	*				
16	4984			DNA	NS	NS	NS	NS	***	NS				
17	4984	5	Arrest after ID vs. Attended	FP/ DNA	NS	***	NS	NS	***	*				

Notes:

- Each model has different amounts of data (cases) depending on the stage of the process
- Statistical significance of explanatory variables denoted by*
- (***=p<.001; **=p<.01; *=p<.05; NS=p≥.05 considered not statistically significant)
- Grey shaded regions indicate where the explanatory variable is not relevant to the model

Key Points:

- Higher submission rates are associated with longer time at the scene (models 1-3).
- Higher DNA submission rates are observed in metropolitan sites (model 2).
- Higher suitability rates are associated with longer time at the scene (models 4-5).
- Higher ID rates are associated with longer time at the scene (models 6-8) and shorter analysis lead time (model 8).
- Higher arrest rates after fingerprint identification are associated with higher attendance rates (models 9, 12, 15) and lower submission rates (models 9, 11, 15, 17).
- Higher arrest rates after DNA identification are associated with shorter DNA identification lead times (model 10).
- Jurisdictional differences remain statistically significant across all stages even when these other associations are adjusted for.

Discussion

The effectiveness of forensic science is a function of both the quality of the scientific analysis and the timeliness with which that analysis is provided, while efficiency is associated with attempts to minimise costs without negatively impacting quality (4). Effectiveness requires an evaluation of the trade-off between cases reviewed and cases delayed (backlog). Greater investment in the review of cases increases the quality but simultaneously reduces effectiveness due to an increase in time to process those cases as well as delays in processing other cases (backlog) (4).

Case backlogs can grow to the point where, the analysis achieves very little benefit or result, court proceedings are delayed and public criticism in the media can result. Where there is a delay in analysis and therefore a delay in the identification of a suspect, particularly prolific offenders, the organisation carries a risk of delaying justice. The cost of analysis cannot be evaluated on a case by case basis to the exclusion of others, as each individual case may not be cost effective but the process is one that must exist.

INTERFACES BETWEEN SCIENCE, MEDICINE AND LAW ENFORCEMENT PROJECT (NIFS KEY PROJECT)

NIFS in association with the University of Tasmania has undertaken the Interfaces between Science, Medicine, Law and Law Enforcement Project. The project is designed to explore how medical practitioners, pathologists, forensic scientists, police officers, lawyers and sexual assault centre personnel work together during homicide and/or sexual assault cases. It is clear that forensic science plays a significant role in the criminal justice system whether that is to assist prosecutors to help establish the guilt of an accused person or allowing investigators to quickly establish whether persons of interest are more than likely to be innocent (6).

Courtesy of Professor Roberta Julian, University of Tasmania

While quality evidence collected will have a higher probative value and give better results, a balance needs to be met in regard to ensuring that when trying to expedite the process we are not sacrificing quality. Poor quality evidence will only waste the time of the experts and divert them from analysing evidence with a high probative value.

The elimination or investigation of a suspect in a timeframe of close proximity to the perpetration of the offence can focus an investigation and provide a greater likelihood of a successful justice outcome.

Attrition points exist in the forensic process and identifying means by which such points can be reduced will ensure a better flow for the forensic process. Overall police organisations have been able to reduce the attrition points for fingerprints with the conversion to digital imaging and the subsequent transmission of fingerprint evidence electronically. There is still room for improvement with technology such as remote data entry.

Significant work has been undertaken within the DNA laboratories to streamline processes, improve on policies surrounding the submission of samples and reduce backlogs for volume crime. There is still room for improvement in regard to reducing the lead time for submission of samples and lead time for distribution of identification details to investigators.

As stated, forensic science facilities have actively been developing strategies to improve service delivery for some time, but these strategies have not extended to the investigation stage.

The investigation stage has the longest lead time, in fact a lead time longer than all 4 previous stages put together. There are a variety of reasons why the lead time at this stage is long and these can include the inability of the investigators to locate the suspects due to their transient nature, high workloads associated with a range of investigations and the lower priority applied to volume crime investigations.

QUEENSLAND – FINGERPRINT PROCESS IMPROVEMENT STRATEGY

The aim of the Fingerprint Process Improvement Strategy was to design and implement an improved, quality-assured process for fingerprint identification which would be highly efficient, providing front line police with a rapid means of offender identification. This new end-to-end process, building upon in-house technological initiatives, has produced a dramatic reduction in reporting times.

The Fingerprint Process Improvement Strategy has been successful in designing and implementing an end to end workflow which enables latent fingerprints located at the scenes of crime to be examined, searched and reported upon with unprecedented speed and without compromise to the quality and reliability of results. The Strategy has built upon technological solutions developed in-house by QPS Forensic Services. These include the Forensic Register (case management system) and the Remote Data Entry Project. The latter allows digital images of latent fingerprints to be wirelessly transmitted to the Fingerprint Bureau directly from the crime scene.

A dramatic and novel redesign of workflows within the fingerprint laboratory, including the creation of paperless case files and the introduction of on-screen examinations, has resulted in the time taken to examine and report on latent fingerprints being reduced from an average of 10 to 14 days to 24 hours. Indeed, a large proportion of latent fingerprints are actually being identified within the same shift in which they are received. This means that many offenders are being identified and can be stopped before they reoffend.

The fingerprint initiative won a QPS Award for Excellence in Corporate and Support Services, the Remote Data Entry Project earned the Queensland Police Service the 2009 Premiers Award for Excellence in Public Service Delivery.

Courtesy of Queensland Police Service, Forensic Services Branch

While forensic science continues to develop strategies to improve service delivery, police organisations correspondingly need to apply strategies to develop means to improve the investigation stage.

QUEENSLAND - DNA IMPROVEMENT STRATEGY, SUB-SAMPLING AT VOLUME CRIME

The DNA Improvement Strategy was a joint initiative between the Queensland Police Service, Forensic Services Branch and Queensland Health Forensic and Scientific Services aimed at reducing DNA analysis turnaround times.

Prior to the initiative prioritised samples took 13 to 16 weeks to be analysed. This delay gave opportunity for offenders to commit further crimes which in turn create more victims.

The end to end process of DNA sampling and analysis was examined to determine where efficiencies could be gained. This revealed that the initial screening and sampling of physical exhibits caused the greatest delay. Other delays included transport of exhibits to the laboratory and reporting of results.

Efficiencies could be gained if:

- the screening and sub-sampling of whole items was performed by QPS crime scene officers in the field;
- sub-samples were reduced to a form that could be directly introduced to automated laboratory platforms;
- sub-samples were forwarded to the laboratory by secure registered post; and
- the reporting of results was streamlined through interface of the Laboratory Information Management Systems used by the two organisations.

Sampling resources were developed that would enable field collected sub-samples to be placed into automated analytical platforms. Over 300 officers were provided training on how to target and sample items for DNA whilst preventing loss or contamination. In July 2008 the QPS began to take sub-samples in the field.

As a result of this initiative, under normal laboratory conditions all samples are now able to be analysed within two to three weeks of receipt. Police are now able to use DNA results to direct investigations.

QPS Forensic Services through the Forensic Register and good intelligence alliance practices is able to then link the DNA analysis to any fingerprint analysis and also to any other linked crime or suspect and provide the Investigating Officer with a Linked Chart for intelligence purposes.

The DNA Improvement Strategy won the 2010 QPS Gold Award for Excellence in Policing Operations and the IPAA Prime Ministers Awards for Excellence in Public Sector Management and Collaboration.

Courtesy of Queensland Police Service, Forensic Services Branch

NEW SOUTH WALES – DNA SUB-SAMPLING STRATEGY

As a result of an increasing backlog of DNA samples and identification that there was duplication between the sampling performed by field investigators and subsequent re-examination by laboratory biologists in the preparation of DNA samples, New South Wales Police in conjunction with Division of Analytical Laboratories (DAL) implemented the following strategies:-

- Automated analysis via robotics to streamline the DNA analysis process (installation of a state-of-the-art robotic solution and associated new chemistry);
- Field-based sub-sampling for all items requiring DNA analysis. This involves the production of robot-ready samples in the field which are submitted directly to DAL, effectively removing the duplicate examination by laboratory staff.

At the peak of the backlog in late 2010, DAL had 3,500 unstarted cases for both major and volume crime. The turn-around times for volume crime at this stage was 2 – 3 years.

Prior to the implementation of sub sampling, a number of other solutions were first implemented. The first was sending out letters to the Local Area Commands (LACs) and where there was no response (after a third letter), the exhibits were forwarded back to the LACs, where if necessary they could be re-submitted. This reduced the backlog to 1500 and was followed by the deployment of the robotic solution in the Laboratory.

The second strategy was implemented in mid-2011 where biologists from the Police Forensic Laboratory at Pemulwuy were seconded to DAL to assist with processing the cases. This resulted in the unstarted cases at DAL being reduced to zero.

The sub-sampling roll out timeline in NSW involved training of personnel and implementation for all volume crime in late 2011 and training and implementation for complex major crime is underway.

At a non-complex (volume crime) examination, generally undertaken by a SOCO, the items will be examined for fingerprints, recorded and sub-sampled at the scene and generally not retained as evidence.

The decision of what and where to sample rests with the examiner and should be based on a critical analysis regarding the probative value of the item/sample. The examiner gives consideration to which samples will contribute to and advance the investigation and which samples have the greatest chance of yielding evidence i.e. a useable DNA profile.

Sub-samples to be analysed are forwarded to DAL via a security satchel on the day of collection or on the first business day after collection. All sub-samples submitted to DAL as analysis ready will be DNA tested without question. Samples are not submitted 'for completeness' and therefore, where a suspect has made admissions in regard to handling or being in contact with the scene, the samples will not be submitted in the first instance as this only increases the backlog, causing delays in turnaround times.

Currently the turn-around-times from submission of the robot ready samples to when a result is available is 8 days.

Courtesy of New South Wales Police, Forensic Services Group

Impact of Immature DNA and Fingerprint Databases on Success Rate of Forensic Identification Process

The development and expansion of the NAFIS and NCIDD databases in Australia has greatly enhanced law enforcement's ability to solve cases using DNA profiles and fingerprints. Through the partnership between CrimTrac and Australia's police agencies, these databases store tens of thousands of potential offender and suspect reference DNA profiles and fingerprints, against which DNA profiles and fingerprints collected from crime scenes can be compared.

Given the recidivistic nature of many crimes, the likelihood exists that the individual who committed the crime being investigated was previously convicted of a similar crime and already has his or her DNA profile or fingerprints in the respective database. Moreover, NAFIS and NCIDD also permit the cross-comparison of DNA profiles and fingerprints developed from evidence found at crime scenes. Even if a perpetrator is not identified through the database, crimes may be linked to each other, thereby aiding an investigation, which may eventually lead to the identification of a suspect.

AUSTRALIAN CAPITAL TERRITORY – FORENSIC INTELLIGENCE CASE STUDY

As part of the Australian Federal Police (AFP) Forensic and Data Centres' new Forensic Intelligence initiative, ACT Crime Scenes reviewed their procedures and now attend all reported burglaries for the purpose of ensuring all evidence and intelligence is harvested from such scenes. This case study highlights the use of forensic intelligence in the form of shoeprints initiating the identification and arrest of one unknown offender and the clearance of 15 burglaries in the ACT.

Through utilisation of the Shoeprint Image Capture and Retrieval (SICAR) database as a forensic intelligence tool, similar shoeprints were observed at four burglaries within a two month time period. On interrogation of the evidence associated with these cases and liaison with relevant forensic disciplines, a number of further scene to scene linkages were introduced resulting in ten linked burglary cases. Whilst these scene linkages included two known persons, they also included the fingerprints of an unknown person of interest (POI) at seven of the ten cases. The AFP intelligence analyst embedded within the Forensic Intelligence team nominated a suspect for the unknown POI based on their knowledge of the associates of the two known persons.

The Forensic Intelligence team subsequently developed an intelligence package that was utilised by AFP investigators to support their successful application for a Magistrate's Order to obtain the nominated suspect's fingerprints and DNA. Collection of the suspect's fingerprints (no DNA was collected) resulted in the identification of the unknown POI as the nominated suspect for the seven cases, as well as the POI's fingerprints being identified at an additional eight unsolved burglaries. A pair of shoes matching the sole pattern of the original shoeprints were also recovered a couple of days later during a search warrant executed on the residence of the POI's brother.

Courtesy of the Australian Federal Police, Forensic and Data Centres

The more reference and crime scene data contained in the NAFIS and NCIDD, the more powerful a tool they become for law enforcement, especially in their application to unsolved case investigation. In jurisdictions where the databases are relatively immature, the identification rate for crime scene DNA profiles and fingerprints is reduced. The reasons for under populated databases may include education and training for frontline police officers, where there is a lack in understanding of potential impacts on clearing unsolved cases through collection of reference samples, or there could be a policy or legislation issue constraining their ability to collect such evidence as a part of the routine processing of suspects and offenders.

For jurisdictions with low rates of identification, the population of the DNA and fingerprint databases should be an area for consideration.

Future Applications of the Project

The project team has given consideration to future applications of the End-to-End Project as follows.

End-to-End Forensic Identification Process Project – Implement Recommendations

The End-to-End Project has benchmarked the forensic process in Australia for the first time on a national basis. Much like the SWIM Report, this project was a pilot program. However, the data strongly indicates that there is an opportunity to learn from the best performers in each of the five phases studied. Once this learning has been identified and implemented, the project should be repeated to benchmark any improvements that have been realised.

End-to-End Forensic Identification Process Project – Judicial System

The current End-to-End Project considered the final stage for the forensic process as the arrest or charge of a suspect. Much can happen with a prosecutorial case and as such, value would be gained by tracking the success and lead time measures through the further stages of prosecution, trial, conviction and sentencing. Anecdotal evidence from the jurisdictions indicates that at the time of prosecution, cases may be dropped due to lack of value being placed on the forensic evidence.

There are 199 cases where an arrest occurred within this data collection period, with 35 ongoing cases that should now have a stage 5 result. This project could provide a largely historical review of these cases tracked through the judicial system, resulting in a comprehensive review of the data from reported crime to the final possible outcome for the case.

Crime Scene Investigator Skills and Attributes Project

The SWIM Report provided a range of information relating to performance of individual crime scene investigators (CSI). The report indicated that the performance of CSI as it relates to identification was not linked to the average time spent at the scene and that the quality of evidence was not guaranteed simply by spending longer at a scene (2). However, indicators

suggest that success at the identification stage relates closely to the skills of the CSI to gather high quality evidence.

The Identifying the Skills and Attributes of Good Crime Scene Personnel Project conducted by the University of Tasmania has identified key CSI attributes and a small number have been noted earlier in the report (refer to page 11).

While the End-to-End Project has not conducted an evaluation on the individual performance of the CSI participating in this project, the project officer does have the relevant data (5,691 cases).

Analysis of the individual CSI and the effectiveness of their practices at collecting evidence for comparison against the key attributes identified by Dr Sally Kelty would be a means to test both theories and demonstrate the interaction between the two key NIFS projects.

Validation Process Project

The End-to-End Project evaluated the effectiveness of forensic evidence at the conclusion of the forensic process but, as can be seen in the flowchart (Page X), an arrest can be made at any stage through other investigative techniques.

Consideration should be given to undertaking a validation-verification sub-project that incorporates a validation of the value of forensics within the investigative process. The project has generated a sub-sample of data from three metropolitan and one country sites. In total, data is available for 2,418 cases from the total of 8,179 provided for the project.

This sub-sample assembly was only considered after the data collection period had commenced and the project team agreed that any further validation should be undertaken as a stand-alone project due to the limits of methodology applied.

However, limited analysis has indicated that to charge an offender, there is a statistically significant higher success rate if CSI attend and statistically significant higher success rate if forensic evidence is collected.

Further analysis of each case is likely to lead to a far more comprehensive evaluation of the data. Further information involves collating the following:

- circumstances surrounding the arrest of the suspect.
- whether the forensic evidence led to the identification of the suspect arrested.
- whether the forensic identification was a significant component of the arrest brief.
- whether any subsequent arrests were made as a result of the initial arrest based on forensic evidence.

Recommendations

This report has provided an indicative evaluation of the current lead time and success rates in relation to the performance of burglary investigations in Australia. The data provided and the analysis conducted is by no means the complete picture, but is an indication of the possibilities that exist to improve service delivery with respect to forensic evidence.

The project team makes the following recommendations:

- Members of the project team attend each jurisdiction to:
  - present the findings across the five stages of the forensic process to all relevant personnel; and
  - discuss processes and procedures within each jurisdiction that may provide further explanation of trends in observed data and identify opportunities for national learning;
- Following the implementation of national learning, repeat the study to measure the effects of implemented changes;
- Continue to track the cases with stage 5 results through the judicial process;
- Analyse the results for the individual CSI and the effectiveness of their practices at collecting evidence for comparison against the key attributes identified by the Crime Scene Investigator Skills and Attributes Project; and
- Complete the validation-verification sub-project that incorporates a validation of the value of forensics within the investigative process.

Appendix 1: Glossary

Early on in the project, the project officer defined common terminology. A broad range of definitions and cross referencing was required due to the different practices employed at local level.

Burglary	Refers to a breaking or attempted breaking offence on a dwelling or business premises, also referred to at various jurisdictions as serious criminal trespass (SCT), unlawful entry or break and enter.
Case File	A case file is generated by the Crime Scene Investigator (CSI) at the crime scene. This may be created as an electronic document at the scene or converted to an electronic document on return to the office.
Crime Reported	The time and date the crime was reported to Police. This time varied between jurisdictions as sometimes it was the first contact by the victim to the Police and sometimes it was when the written report was taken. The project agreed to use the time recorded for corporate reporting at jurisdictional level.
Crime Scene	The study only relates to the initial scene attendance at a burglary offence and does not include secondary scenes, travel time for attendance at scenes where the victim is not home and therefore no access to the scene is available.
CSI	Crime Scene Investigator also referred to as a Scenes of Crime Officer (SOCO) or Crime Scene Examiner (CSE). It does not include the attendance of general duties personnel or investigators examining the scene and collecting evidence.
DNA	Refers to the collection of DNA samples in the form of trace/contact, blood or saliva either as a swab or as items submitted to the Laboratory for analysis.
Fingerprints	Refers to the collection of fingerprints from the scene in the form of lifts, photographs or items for chemical treatment.
Study Data Collection Period	The period identified for the collection of data, 1 May 2011 to 30 September 2011.
Unique Case Identification	Case number applied to each case by the project team on the master spread-sheet.
State	Refers to the State from which that participating site is located.
Metro/Country	Refers to whether the jurisdiction considers that participating site to be a metropolitan or country policing area.
Site No	Number given to a participating site during the pilot study data collection period.
Project Case ID	The unique case number applied by the project officer
Stage 1: Attendance	Includes the period from when the crime is reported to the police and the end of the scene examination.
Scene Exam Start	The time and date that the CSI commences examination of the crime scene.
Scene Exam End	The time and date that the CSI completes the examination of the crime scene.

Stage 1 Comments	A notation was made in this column where there was a negative duration due to the crime report being taken after the commencement of the scene examination or other factors that impacted on the ability to collect the data.
Stage 2: Evidence Submission	Includes whether fingerprints or DNA were collected at the crime scene and the date and time the fingerprints and DNA are received at the Fingerprint Bureau or Laboratory.
FP Located	When fingerprints are located and collected at the crime scene a 'Y' was recorded and when fingerprints were not located an 'N' was recorded.
DNA Located	When DNA is located and collected at the crime scene a 'Y' was recorded and when DNA was not located an 'N' was recorded.
FP@FPB	Time and date the fingerprint case file/evidence was received at the Fingerprint Bureau.
DNA@Lab	Time and date the DNA case file/evidence was received at the DNA Laboratory.
Stage 2 Comments	A notation was made in this column where there was a deviation from the project requirements, i.e. inability to collect the time or the evidence was not submitted or rejected for analysis.
Stage 3: Analysis of Evidence	Includes the date and time that analyses of the evidence was commenced and whether the evidence was suitable for upload on the databases.
FP Analysis Start	The time and date the fingerprint case file was removed from the waiting list and the analysis commenced.
DNA Analysis Start	The time and date the DNA case file was removed from the waiting list and the analysis commenced.
FP Suitable NAFIS	When the fingerprint was suitable for upload to NAFIS a 'Y' was recorded and when it was not suitable an 'N' was recorded.
DNA Suitable NCIDD	When the DNA was suitable for upload to NCIDD a 'Y' was recorded and when it was not suitable an 'N' was recorded.
NAFIS	National Automated Fingerprint Identification System is a finger and palm print database and matching system that assist Australian policing agencies and the Department of Immigration and Citizenship (DIAC) to manage fingerprint records, confirm identities of persons of interest and resolve crime.
NCIDD	National Criminal Investigation DNA Database is a tool for police and forensic scientists to match DNA profiles nationally. It is a powerful investigative tool and intelligence resource crossing all jurisdictional boundaries.
Stage 3 Comments	A notation was made in this column where there was a deviation from the project requirements, i.e. an inability to collect the time or where the evidence was not analysed.
Stage 4: Identification	Includes the time and date that an identification was made from the fingerprints or DNA and the time and date that the identification was promulgated to the investigating officer.
FP ID	Date and time when a fingerprint identification was achieved.
DNA ID	Date and time when a DNA identification was achieved.

FP ID to IO	Date and time when a fingerprint identification advice was sent to the investigating officer.
DNA ID to IO	Date and time when a DNA identification advice was sent to the investigating officer.
Stage 4 Comments	A notation was made in this column where no identification was made.
Stage 5: Investigation	Includes the time and date the investigating officer took action as a result of the forensic led identification and the type of action taken.
FP ID Action	Date and time action was taken by the Investigating Officer in response to the Fingerprint Identification.
FP ID Action (Type)	Action taken by the Investigating Officer in response to the Fingerprint Identification (charged, not charged, eliminated, no action).
DNA ID Action	Date and time action was taken by the Investigating Officer in response to the DNA Identification.
DNA ID Action (Type)	Action taken by the Investigating Officer in response to the DNA Identification (charged, not charged, eliminated, no action).
Stage 5 Comments	A notation was made in this column where a suspect was charged prior to the identification or where the identification led to a victim or otherwise elimination.
Validation	Validation studies were applied to a quarter of the cases to evaluate the effectiveness of forensic evidence and to validate the project. For these cases a notation was made in regard to whether a suspect was charged or not charged.
Validation comments	Where a suspect was made one of the following comments was made: Not Charged Charged – no forensic attendance Charged – nil forensic evidence Charged – negative forensic evidence Charged – forensic evidence

Appendix 2: Participating Jurisdictions

Tasmania

Burnie/Devonport

Population: 20,000
Key Industries: Heavy machinery manufacturing; forestry; farming
Burnie is located on the north-west coast of Tasmania and is Tasmania's largest general cargo port and Australia's fifth largest container port, located 35 kilometres north-west of Hobart. It is the nearest Tasmanian port to the Australian mainland. Burnie is connected to Devonport via the four lane Bass Highway and connected to the west coast of Tasmania by the Murchison Highway.
Policing Description: Burnie Police Station is the District Headquarters for the Western District of Tasmania Police. The Burnie Division contains six police stations and has a CIB contingent, the Forensic Services headquarters, Traffic Services and Marine policing, as well as support services for the District. The Burnie Division has one 24 hour station (Burnie) and the others are staffed day shift/afternoon shift/on call. There are 125 sworn police personnel in this Division.

Launceston

Population: 68,000
Key Industries: Launceston is Tasmania's second largest city and has redefined itself as a cultural hub with vibrant cafes, museums and open parkland. Launceston sits at the junction of the North and South Esk rivers. From here, the broad Tamar River Valley opens to Bass Strait 58 kilometres away. Launceston is 198 kilometres north of Hobart.
Policing Description: Launceston Police Station is the District Headquarters for the Northern District of Tasmania Police. The Launceston Division consists of seven police stations and has a CIB contingent, Drug Investigation, Forensic, Traffic and Prosecution Services, Marine policing, as well as support services for the District. The Launceston Division has one 24 hour station (Launceston) and the others are staffed day shift/afternoon shift/on call. There are 189 sworn police personnel in this Division.

Victoria

Ballarat

Population: 90,000
Key Industries: Manufacturing, agriculture, technology and retail
Ballarat is one of the largest inland cities in Australia. Located in the Central Highlands Region of Victoria, Ballarat is approximately 110 kilometres north-west of Melbourne. Access to other key regional centres is via four main State highways; the Western, the Midland, the Glenelg and the Sunraysia Highways. The urban settlement patterns offer a diversity of living

environments, including small villages and country towns, as well as the main cityscape of central Ballarat.
Policing Description: Ballarat is the Western Region Division 3 Headquarters and has two 24 hour Police Stations, the largest and busiest at Ballarat. There are eight 16 hour stations and nine one man stations scattered throughout the various small towns. In all there are 225 sworn positions to Police the Division. Out of that number there are two CIU stations, a Sex Offence Office, two Traffic units, one plain clothes unit and one Crime Scene Officer Unit.

Wyndham

Population: 158,000
Key Industries: Strong industrial area at Laverton North and technology districts and intensive vegetable growing
Spanning 542 square kilometres on a coastal plain in the outer south-western suburbs of Melbourne and between Melbourne and the regional city of Geelong the city is large and diverse, with principal areas of population being Werribee and Hoppers Crossing containing new housing estates and is one of the fastest growing residential areas in Victoria. The City of Wyndham's population has experienced a 5.9% or about 6,000 people increase per annum which equates to about five new families moving into the municipality each day.
Policing Description: There are two police stations being Werribee and Wyndham North. Werribee is the central police headquarters providing 24/7 services and Wyndham North has approximately 30 members.

South Australia

Murray Mallee

Population: 66,700
Key Industries: Agriculture and farming
The Murray Mallee Local Service Area (LSA) spans 54,000 square kilometres, the area stretches from the pastoral districts above Renmark in the north, the Victorian Border in the East, the Coorong in the South and the foot hills of the Flinders Rangers in the West. This is a strong wine and fruit growing region including the Murray River with a diverse multi-cultural component of 50 different nationalities. The Sturt Highway, Mallee Highway and Princes Highway are the main arterial roads.
Policing Description: Murray Mallee LSA has 17 police stations including nine multi member stations and eight single person police stations jointly staffed by 156 sworn personnel and 12 non-sworn personnel. The headquarters is Berri Township 2.5 hours from Adelaide CBD. Berri/Renmark and Murray Bridge Police provide 24/7 services to their communities and each Station has dedicated CIB, Crime Prevention, Criminal Justice, Intelligence and Training Officer Sections.

Holden Hill

Population: 187,000
Key Industries: Residential
Holden Hill Local Service Area (LSA) spans 495 square kilometres the area commences at the northern edge of the Adelaide CBD and continues to the north eastern foothills approximately 30 kms from the CBD. The area is a diverse community of mainly middle class origins.
Policing Description: Holden Hill LSA has two central police stations, being Holden Hill and Golden Grove with smaller stations being Pooraka, Modbury, Gumeracha and Tea Tree Gully. Holden Hill Police Station provides dedicated CIB, Crime Prevention, Criminal Justice, Intelligence and Training Officer Sections and provides 24/7 services.

Australian Capital Territory

Canberra

Population: 347,000
Key Industries: Home of Federal Government of Australia
Canberra is the nation's capital, and is a planned city being a city in a park surrounded by bushlands. Tourism highlights what it means to be Australian through its identity, culture, history, Indigenous heritage, politics, flora and fauna.
Policing Description: ACT Policing is a business unit of the AFP and was created for the purpose of providing policing services to the ACT. There are five police stations across the North and South District of the ACT. Police attached to these stations work together to respond to general and urgent requests for police assistance across the ACT. There are three police stations located in North District - Belconnen, City and Gungahlin. There are two police stations located in South District - Tuggeranong and Woden. South District also operates a two member Rural Patrol team from the Tuggeranong Police Station that services the ACT's rural population with the support of other ACT Policing teams as required. In addition to patrol response, all stations provide a 24-hour-a-day general enquiry and face-to-face reporting service.

New South Wales

Flemington, Campsie and Marrickville

Population: 80,000 for Auburn City Council
Key Industries: Residential and industrial
Flemington Local Area Command (LAC) is diverse culturally and in socio-economic terms and has the largest overseas population with the highest percentage of new arrivals from refugee backgrounds, per capita, than any other local government area in the state. Auburn is the centre of this area and is 17 kilometres from Sydney CBD and 6 kilometres from Parramatta. Heavily residential but includes Olympic Park at Homebush. Auburn City is bounded by the Parramatta River in the north, the City of Canada Bay and the Strathfield Council area in the east, Bankstown City in the south and Parramatta City in the west. The M44 is the main freeway in the area.
Policing Description: Flemington Local Area Command (LAC) is located within the South West Metropolitan Region of the New South Wales Police Force. Police stations within this

LAC include Auburn and Strathfield. Auburn is the only station open 24 hours. Also includes Campsie and Marrickville.

Griffith

Population: 23, 801 (Griffith Shire)
Key Industries: Agriculture and Murrumbidgee Irrigation
570 kilometres south-west of Sydney the Griffith Shire area is 1,605 square kilometres. Griffith was established as part of the NSW State Government Murrumbidgee Irrigation Area project to supply irrigation from the Murrumbidgee River in western NSW to be used for farming. Farming includes rice, citrus and other fruit and vegetables and is one of the most productive agricultural regions in Australia. This can be partly attributed to the high Italian population which has also aided in the growing and successful wine region. It can be accessed by road from Sydney and Canberra via the Hume Highway and the Burley Griffin Way and from Melbourne via the Newell Highway.
Policing Description: Griffith Local Area Command (LAC) is located within the Southern Region of the New South Wales Police Force. Police stations within this LAC include Barellan, Barmedman, Carrathool, Coleambally, Darlington Point, Goolgowi, Griffith, Grong Grong, Hillston, Leeton, Narrandera, Rankins Springs, Tallimba, Ungarie, Weethalle, West Wyalong, Whitton and Yenda. Griffith is the only station open 24 hours.

Western Australia

South Metropolitan District

Population: 230,000
Key Industries: Residential and port
The area is approx. 19 kilometres southwest of Perth CBD and covers a geographical area of 256 square kilometres. This South Metropolitan District is bordered by the Swan River to the north, the west with the Australian coastline and the south with the Murdoch district a rapidly developing residential, University and hospital area. Fremantle is the inner harbour of the Fremantle Port and is located at the mouth of the Swan River. Freemantle Port is a deep water facility for handling container trade, live exports, cruising ships and visiting naval vessels. Freemantle Port is also the closest of Australia's five major capital city ports to Singapore and is often the first and last port of call for shipping operating between Australia and overseas destinations. This area is a broad mixed-class of professionals.
Policing Description: This area is overseen by South Metro District Forensic Investigation office, based at Fremantle police station; 45 Henderson Street, Fremantle, tel: 9430 1222. The district contains five Police Stations with the Fremantle station the only open 24 hours. This district includes police stations at Cockburn, Murdoch, Palmyra and Rottnest.

Great Southern District

Population: 33,000
Key Industries: Agriculture and farming

Albany is 409 kilometres South East of Perth on the South Coast of Western Australia. Great Southern geographical area amount to 100,289 square kilometres of which 4,310 square kilometres is Albany police area. Albany is located on Princess Royal Harbour and King George Sound. A profound and continuing connection with the Anzac legend as Albany was the place of assembly and departure for some 30,000 troops serving in the Great War and Gallipoli in 1914. Bounded by the Southern Ocean, the picturesque Stirling Range and the Great Southern hinterland, Albany embraces clean, green principles, from wind-generated energy to sustainable and organic agriculture, to ensure its continuing viability as a liveable, progressive centre.

Policing Description: To ensure the accurate collection of data I am narrowing the area to that specific to Albany District Forensic Investigation office (see below), Albany Police Station, 210 Stirling Terrace, Albany WA 6330 Tel: (08) 9892 9300. This district contains 23 Police Stations. For ease of reference and data recording the defined service area being used for this project is specific to postcode 6330.

Northern Territory

Darwin

Population: 70,055
Key Industries: Mining, offshore gas production, pastoralism, tourism, tropical horticulture
Darwin is Australia's most northerly city, on the coast of the Timor Sea, at the 'Top End' and covers an area 112 square kilometres. As the capital of the Northern Territory, Darwin is the centre of government and the major administrative and commercial centre. The Port of Darwin is the main outlet for Australia's live cattle export trade into South East Asia. Darwin has an onshore $1.75 billion LNG gas plant, at the end of a 500km pipeline from the Timor Sea gas fields. Darwin has more than 60 nationalities and some 76 ethnic groups living in the city and about 28 percent of the Territory's population is Aboriginal.
Policing Description: There are three police stations within the city bounds. The Peter McAulay Centre at Berrimah contains the administrative and specialist areas including Forensic Services. Headquarters, Darwin Police Station is in the Central Business District and contains the watch house. The most common issues for police in the suburbs are juvenile crime and unlawful entries and in the city are associated with nightclubs, hotels and busy tourist trade.

Katherine

Population: Town 8,500 and region a further 18,000
Key Industries: Cattle, horticulture, mining and tourism
Katherine is located 310 kilometres south of Darwin on the Katherine River and covers an area of 22,500 square kilometres. Katherine is a regional centre for communities from the Western Australia border to the Gulf of Carpentaria on the Queensland border. The Jawoyn people are the traditional owners of the Katherine Gorge and joint management of Nitimiluk National Park provides work and training opportunities for Aboriginal people. Tindal RAAF Base, Australia's northern air defence command centre, is 15 kilometres south of the town.
Policing Description: Pine Creek, Lajamanu, Kalkaringi, Timber Creek, Mataranka, Maranboy and Ngukurr. The station includes a range of services including one Forensic Officer. Police will attend a diverse range of incidents in this district.

Queensland

Metropolitan District

Population: 250,000
Key Industries:
300,000 square kilometres
Policing Description:
5 Divisions

Regional District

Population: 80,000
Key Industries:
35,000 square kilometres
Policing Description:
12 Divisions

Appendix 3: Spread-Sheet Template

STAGE 1: SCENE ATTENDANCE					STAGE 2: EVIDENCE SUBMISSION				STAGE 3: ANALYSIS				STAGE 4: IDENTIFICATION				STAGE 5: INVESTIGATION			
Case ID	Reported (Date Time)	Offence Code (B&E)	Scene Exam Start (Date Time)	Scene Exam End (Date Time)	FP Located (Y/N)	DNA Located (Y/N)	FP @ FPB (Date Time)	DNA @ Lab (Date Time)	FP Analysis Start (Date Time)	DNA Analysis Start (Date Time)	FP Suitable NAFIS (Y/N)	DNA Suitable NCIDD (Y/N)	FP ID (Date Time)	DNA ID (Date Time)	FP ID to IO (Date Time)	DNA ID to IO (Date Time)	FP ID Action (Date Time)	DNA ID Action (Date Time)	FP ID Action (Type)	DNA ID Action (Type)

Letters

Dear ,

Re: **End-to-End Volume Crime Identification Process Project**

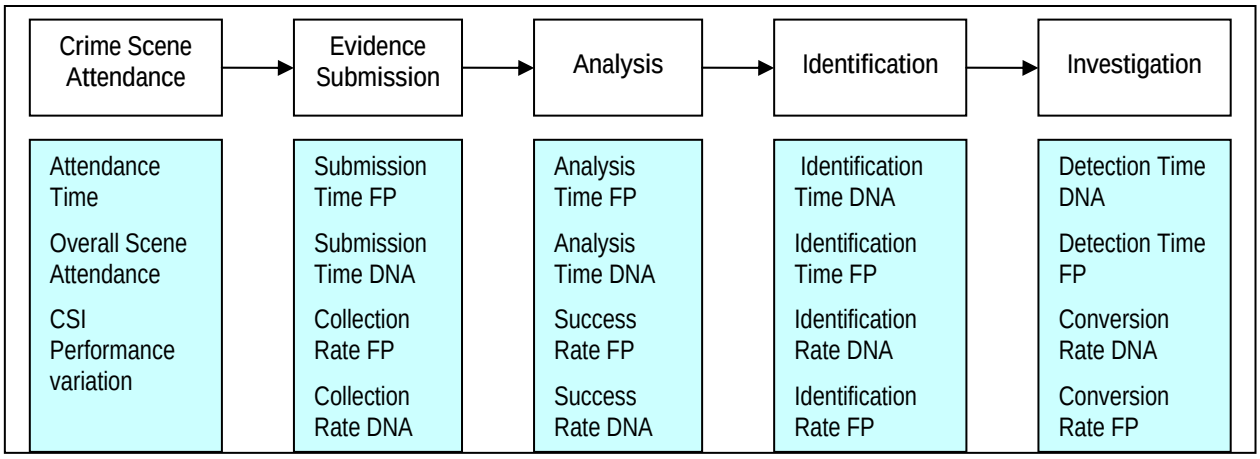
As you are aware, in response to the ANZPAA Strategic Priorities, NIFS has commenced a project to review end-to-end forensic processes and develop a national framework for efficient crime scene analysis.

The approach is fundamentally a systematic five-step process of analysis designed to measure the effectiveness of forensic processes. The project is based on the UK Scientific Work Improvement Model (SWIM Report). The project aims to evaluate forensic systems in Australia and make recommendations for improvements in much the same manner as occurred in the UK and is now occurring in New Zealand. The development of a framework for consistent reporting will lead to a situation where all jurisdictions will be in a position to learn from better performers both at an organisational and individual level.

The aim of the process ultimately is crime reduction by utilising rapid forensic processes to convert scientific evidence into arrests at an increased rate. A framework has been developed with a defined scope designed to be implemented as a pilot project for 6 months. In the first instance it is proposed that the pilot study will apply only to volume crime (burglary dwelling) and evidence types of fingerprints and DNA. The project team is seeking to implement the pilot study in only two service areas within each jurisdiction, one country and one metropolitan district.

NIFS and the project team will work together with the jurisdictions to provide advice and guidance on the relevant metrics and implementation of the pilot study. The project team proposes to provide a one day workshop with all relevant participants in each jurisdiction to ensure participants are fully conversant with the requirements of the pilot study. As can be seen the data collation for the entire end-to-end process involves coordination and communication between both law enforcement and forensic science facilities.

The schematic of the Framework for the pilot study is similar to that developed for the SWIM Report:



The measures are as follows:

Attendance

- ⇒ *Attendance time:* time lapse between victims' call and scene attendance by CSI
- ⇒ *Overall scene attendance:* the percentage of burglary dwelling crime scenes attended by CSI
- ⇒ *CSI performance variation:* average time spent at a burglary dwelling crime scene by CSI

Evidence Submission

- ⇒ *Submission time fingerprints:* time lapse between the time the item is collected at the scene and time it is received for analysis at the Fingerprint Bureau
- ⇒ *Submission time DNA:* time lapse between the time the item is collected at the scene and the time it is received for analysis at the Laboratory.
- ⇒ *Fingerprint collection rate:* the percentage of scenes attended from which fingerprints are collected and submitted for analysis.
- ⇒ *DNA collection rate:* the percentage of scenes attended from which items for DNA analysis are collected and submitted for analysis.

Analysis

- ⇒ *Analysis time fingerprints:* time lapse between the time the item is received for analysis and the time it was analysed.
- ⇒ *Analysis time DNA:* time lapse between the time the item is received for analysis and the time it was analysed.
- ⇒ *Fingerprint success rate:* the percentage of items received for analyses that were uploaded for comparison.
- ⇒ *DNA success rate:* the percentage of items received for analyses that were uploaded for comparison.

Identification

- ⇒ *Identification time fingerprints:* time lapse between the time an item was analysed and a notification of identification (result) is provided to the investigating officer.

⇒ *Identification time DNA:* time lapse between the time an item was analysed and a notification of identification (result) is provided to the investigating officer.
⇒ *Identification rate fingerprints:* the percentage of fingerprints uploaded for comparison that resulted in a database link (person to crime).
⇒ *Identification rate DNA:* the percentage of DNA items that were uploaded for comparison that resulted in a database link (person to crime).

Investigation

⇒ *Detection time fingerprints:* time lapse between the time that a notification of identification is provided to the investigating officer and the time taken to act on the information (i.e. charges laid).
⇒ *Detection time DNA:* time lapse between the time that a notification of identification is provided to the investigating officer and the time taken to act on the information (i.e. charges laid).
⇒ *Conversion rate fingerprints:* the percentage of fingerprint identifications that result in a crime clearance.
⇒ *Conversion rate DNA:* the percentage of DNA identifications that result in a crime clearance.

All data collated will be kept confidential and for the purposes of any report will be de-personalised. An evaluation of the data and recommendations will be available for all jurisdictions on completion of the pilot study.

As identified at the 2010 SMANZFL Meeting in Adelaide, to proceed with the project requires the commitment of the relevant organisations in this forensic process. Initial contact has been made with the police organisations to evaluate the ability to obtain data for the above measures. Some jurisdictions will require further advice and guidance in implementing data collection and this advice can be provided.

I am seeking a commitment from your organisation to participate in the pilot study and the nomination of a contact officer from within your organisation with whom I can liaise and coordinate the progress of the organisation in preparation for the pilot study.

The project team aims to provide the workshops in February 2011 with commencement of the pilot study shortly thereafter hence I seek the name of the contact officer by 1 January 2011.

If I can be of any further assistance please do not hesitate to contact me.

Thank you in anticipation.

Yours sincerely,

Cheryl Brown APM
ANZPAA NIFS Project Officer
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Acknowledgements

ANZPAA would like to acknowledge the following personnel for their contribution to the project.

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Simon Davies	Senior Scenes of Crime Officer Forensic Services Group NSW Police
Vivien Bielby	Senior Forensic Biologist Division of Analytical Laboratories

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