Home Office

Measuring the Impact of Forensic Science on the CJS

Marie Barrett MSc

Forensic Policy Team, Home Office

Data and Identity Directorate

World-leading use of Data
Public Trust | Safe and Secure Society

Why the project was initiated

Home Office

There has been a long held aspiration in the forensic community to better understand the value that forensic science delivers to the CJS.

More recently, the Home Office, NPCC and APCC have articulated the need for a system of ongoing measurement of forensic impact.

- **2016 Home Office Forensic Science Strategy**

"There is a need for in-depth analyses to enhance our understanding of the specific contribution of forensic science to the CJS in England and Wales"

- **2019 Joint Review of Forensics Provision**

"While assessing the impact of forensic evidence is challenging, some measures to indicate its value to criminal justice outcomes would be strongly preferable to reliance on anecdotal feedback."

What are the challenges to measuring impact

Home Office

The breadth of the question: Forensic Science is a term used for a very broad portfolio of techniques and scientific disciplines - from DNA to digital. The Criminal Justice System is a complex set of organisations, interactions, processes and practices – from crime scene to court.

The lack of data: Disconnected IT systems across different organisations, using different nomenclature and no common metrics or references mean that "normalised" datasets are unlikely to exist. Systems from charging onwards don't reference Forensic Science except for limited numbers of free text fields.

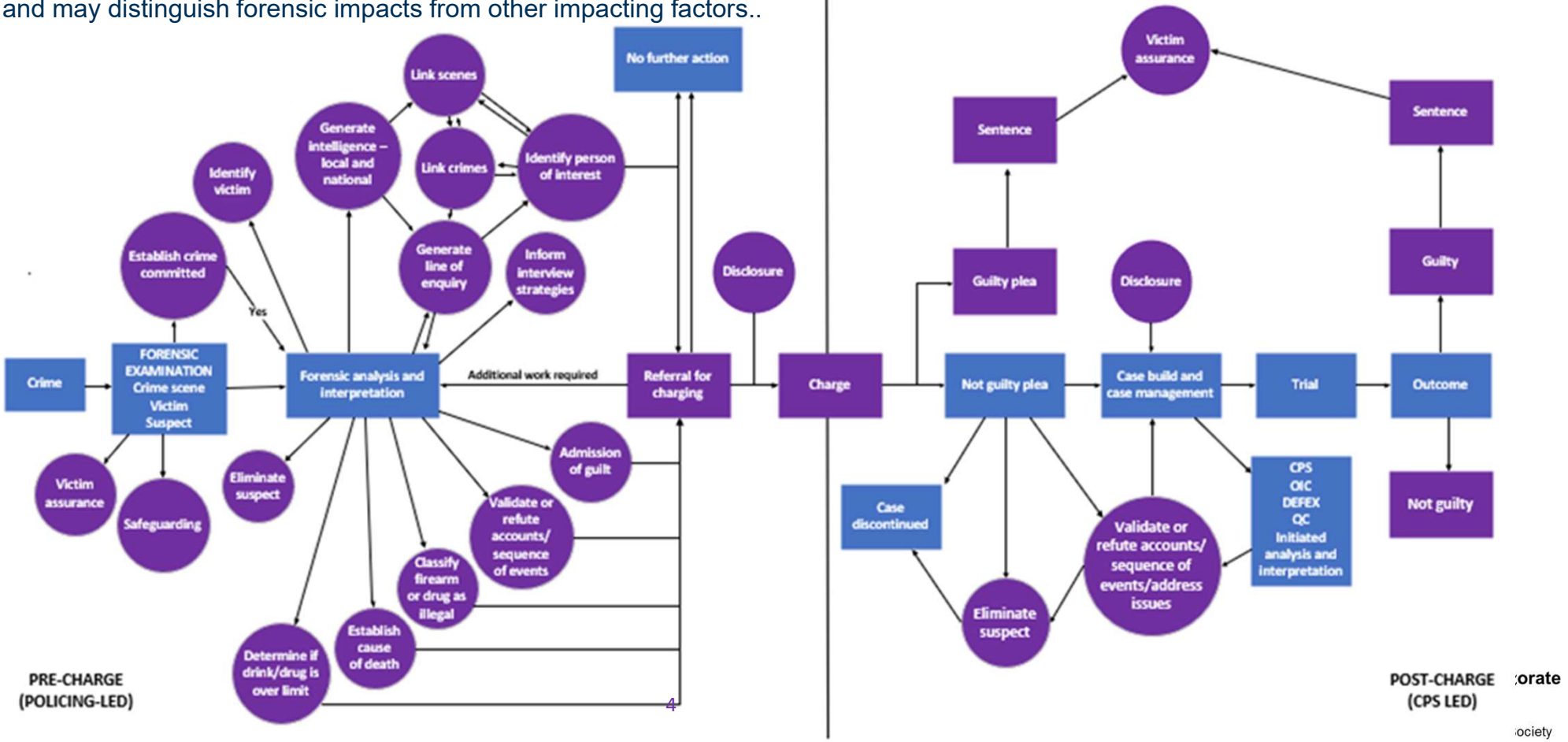
Understanding the impact of attrition and what is "not done": A relatively small percentage of investigations result in a court case – there is some anecdotal evidence that this includes only 10% of cases where forensic science is used. It's also important to consider that local policies and financial limitations may mean that forensics is not always used where it might be so it's potential value or impact is "lost" or hidden.

All the other factors that have impact: Outcomes and decisions in the CJS result from a multitude of factors and demographics, not just Forensic Science so it is important to try and ensure that any analytical method is focused on forensic science alone and not falsely attributing impact and value.

The approach the project developed – Impact Points

Home Office

A literature review indicated only limited work done previously to develop systematic value metrics and then limited only to links to “CJS outcomes” or “Idents”. We suggest that a more granular approach would be beneficial. In the diagram, purple indicates where forensic science has the potential to impact on the CJS. We suggest measuring those impacts. This focus would allow a broader understanding of the breadth of impact and may distinguish forensic impacts from other impacting factors..



The Impact Points in more detail

Define each Impact Point and pose a question of Forensics. For example:

Home Office

Establish crime committed

Definition: Confirming or refuting that the reported crime has occurred. **"Can we determine if a crime has been committed?".**

Further information: Most forensic disciplines can contribute to answering the question. Disciplines used are somewhat dependant on the crime type but include Crime Scene Analysis, Pathology, Fire Investigation, Toxicology, Drug Analysis, Biology and Chemistry trace evidence, Firearms classification, CCTV, mobile phone and computer analysis.

Identify victim

Definition: The process of Identifying who a victim is. **"Can we determine who is the victim of this crime?"**

Further information: The need to Identify a victim can be associated with Homicide cases and Child Sexual Abuse (CSA) or human trafficking cases. Forensic disciplines that impact on the former are predominantly biometric fields such as DNA profiling (including the use of NDNAD, MPDD and VPDD) and Fingerprints. For the latter, disciplines are predominantly digital forensics especially Imaging.

The Impact Metrics – we suggested 3 types of metric

Home Office

Effectiveness – how often Forensic Science contributes at a relevant Impact Point

Timeliness– how quickly does Forensic Science contribute at the Impact Point

Cost Benefit – how much does it cost for Forensic Science to contribute at the Impact Point

Proof of Concept studies were initiated with **police forces and academia.** The studies aimed to measure these metrics, each for a different **forensic discipline,** different **crime type,** at different **Impact Points.** They focused principally on the **investigative** phase.

These studies aimed to **find the data** we needed to measure the metrics at these impact points and if so, where? We wanted to see if the derived **metrics were useful**?

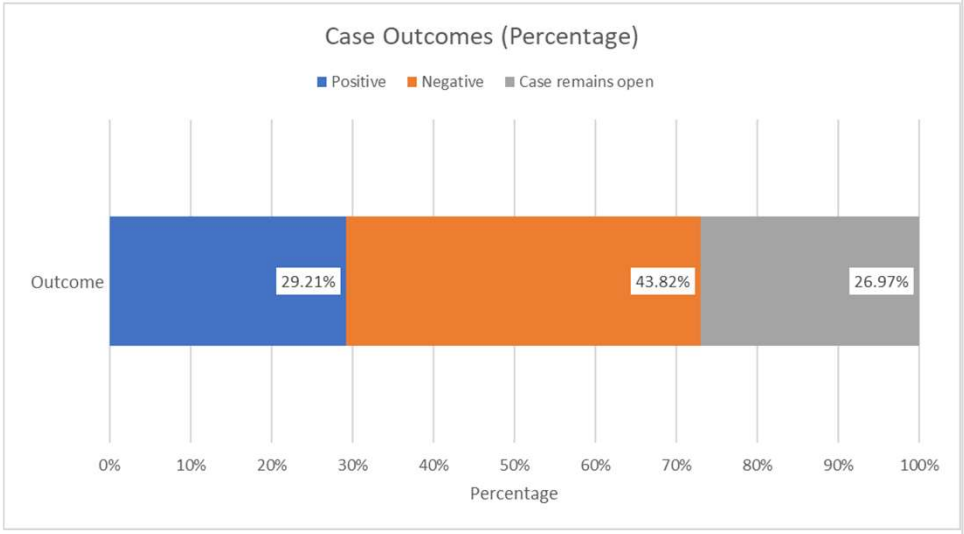
We now have 6 completed data sets to analyse – our initial findings are ready to share.

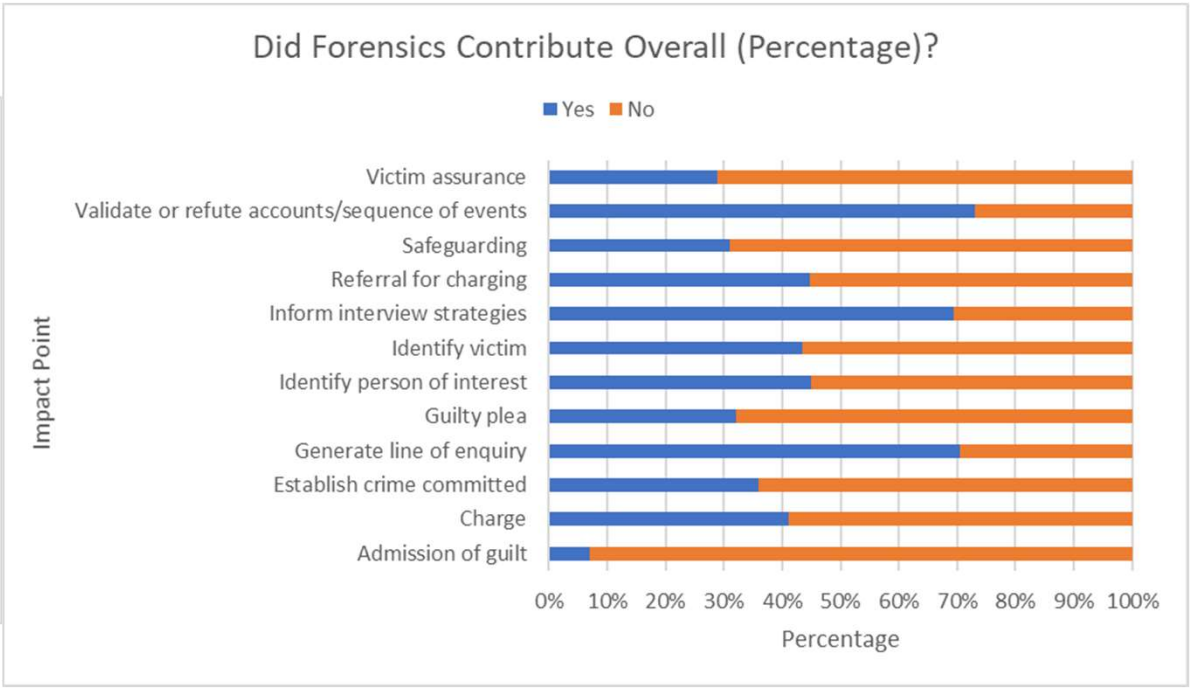
Impact and Value beyond Case Outcomes – Forensic Effectiveness

This approach allows us to demonstrate the effectiveness of forensic science at multiple stages of an investigation and shows the wider impacts beyond case outcomes, even before the case is complete.

Home Office

A study to measure the impact of digital forensics on the investigation of rape and serious sexual offences (RASSO). The Impact Point approach allows us to measure when forensic science positively contributed to different elements of the investigation and charging decisions and how often.





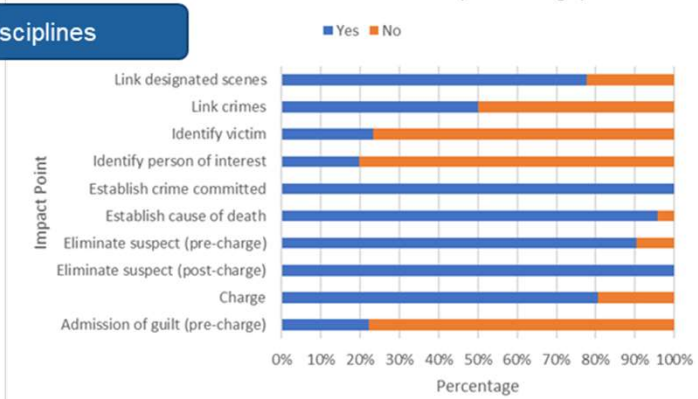
Metrics by forensic discipline – Forensic Effectiveness & "Impact Profiles"

Capturing details of forensic disciplines can allow measurement of how each performs at different Impact Points and also offers the chance to measure how they work in combination

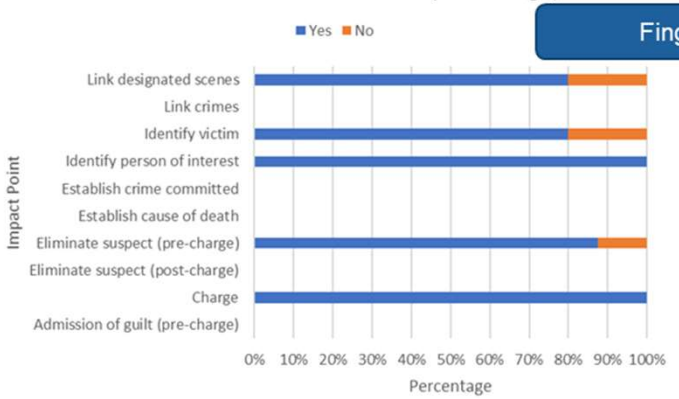
Home Office

A study to measure the impact of forensic science on the investigation of homicide offences. This study allows us to analyse data captured across all forensic disciplines and the impact that each discipline makes

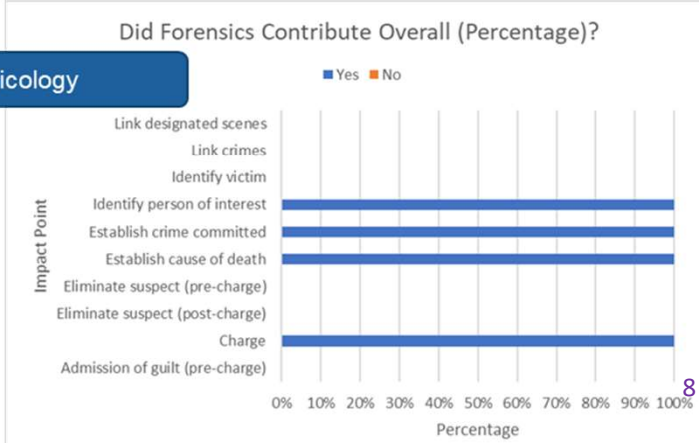
All Disciplines



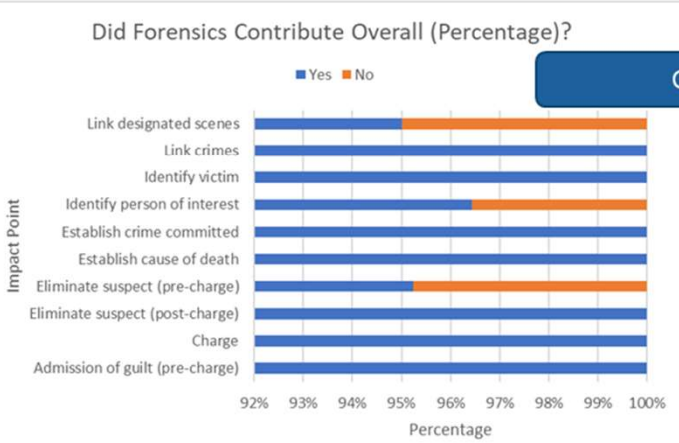
Fingerprints



Toxicology



CCTV

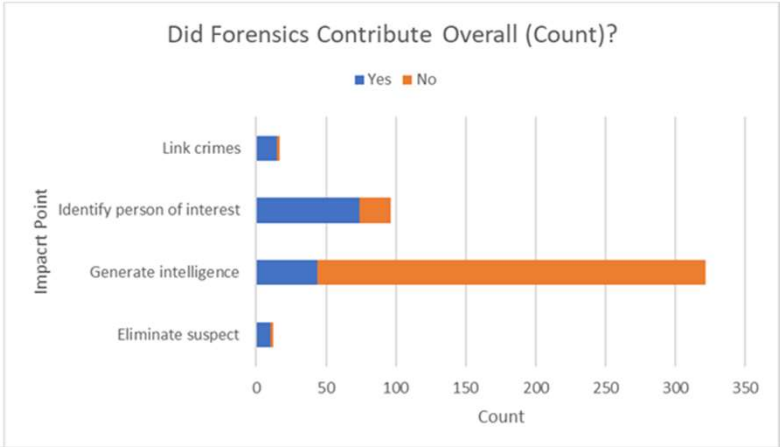


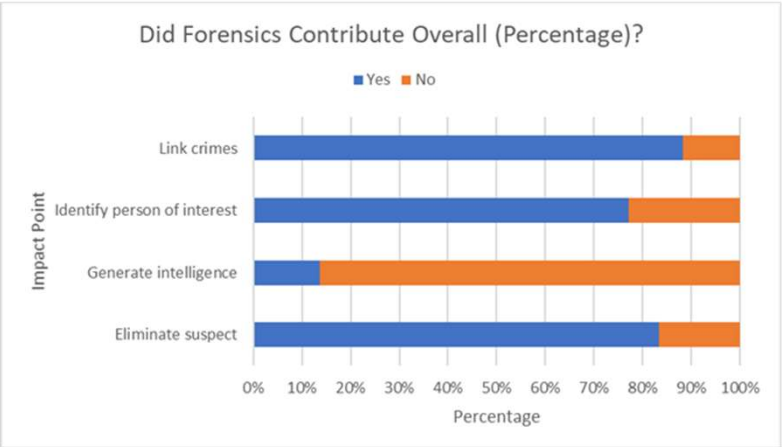
Impact of Forensics/Non Forensics – Exclusive Forensic Effectiveness

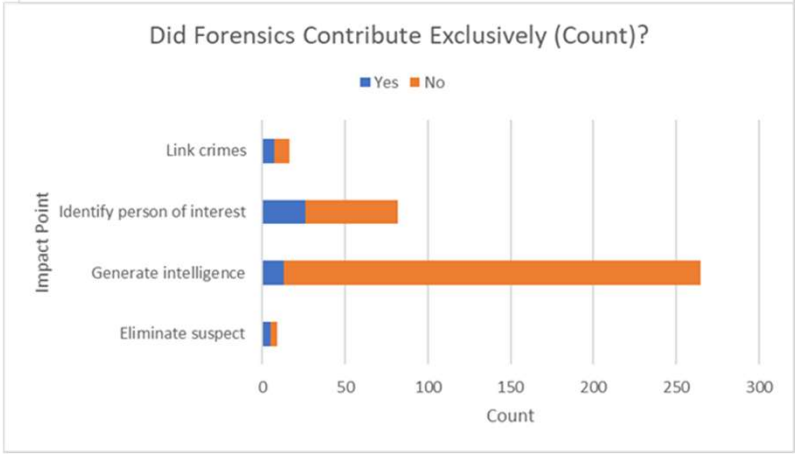
If we capture instances of non forensic interventions as well we can identify not only the impact of forensic science but also identify where it was the only way the impact was delivered.

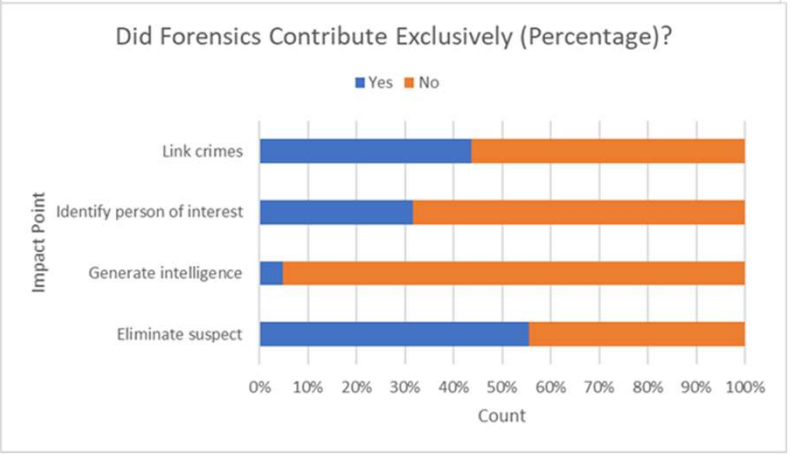
Home Office

A study to measure the impact of crime scene DNA profiling and the use of the NDNAD on the investigation of burglary offences. This study captured interventions - both forensic and non forensic - on all burglaries within the period.









Data and Identity Directorate

World-leading use of Data
Public Trust | Safe and Secure Society

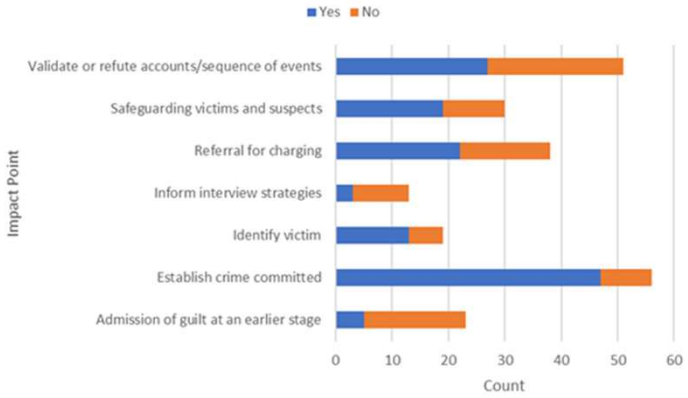
Impact of Operational Approaches – Comparing Forensic Effectiveness

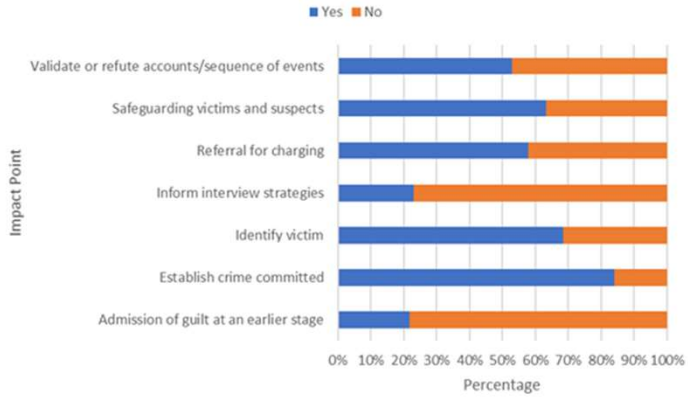
We can use effectiveness metrics to measure the impacts different operational approaches have on effectiveness, demonstrating “what works”, looking for indicators of best practice or benefits of change

Home Office

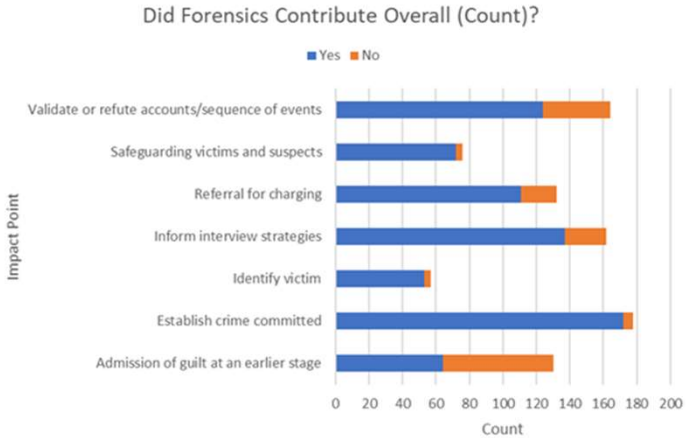
A study to measure the impact of digital forensics on the investigation of online CSE. This study captured the impacts of forensic science using 2 different operational approaches: with expert at scene triage of exhibits vs solely DFU based analysis.

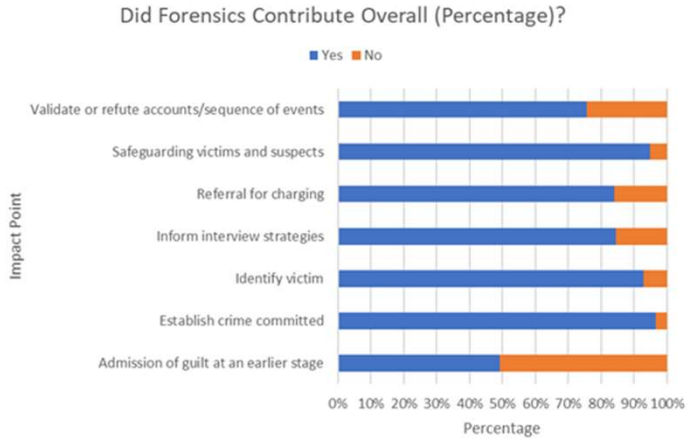
No Triage





Triage





Data and Identity Directorate

World-leading use of Data
Public Trust | Safe and Secure Society

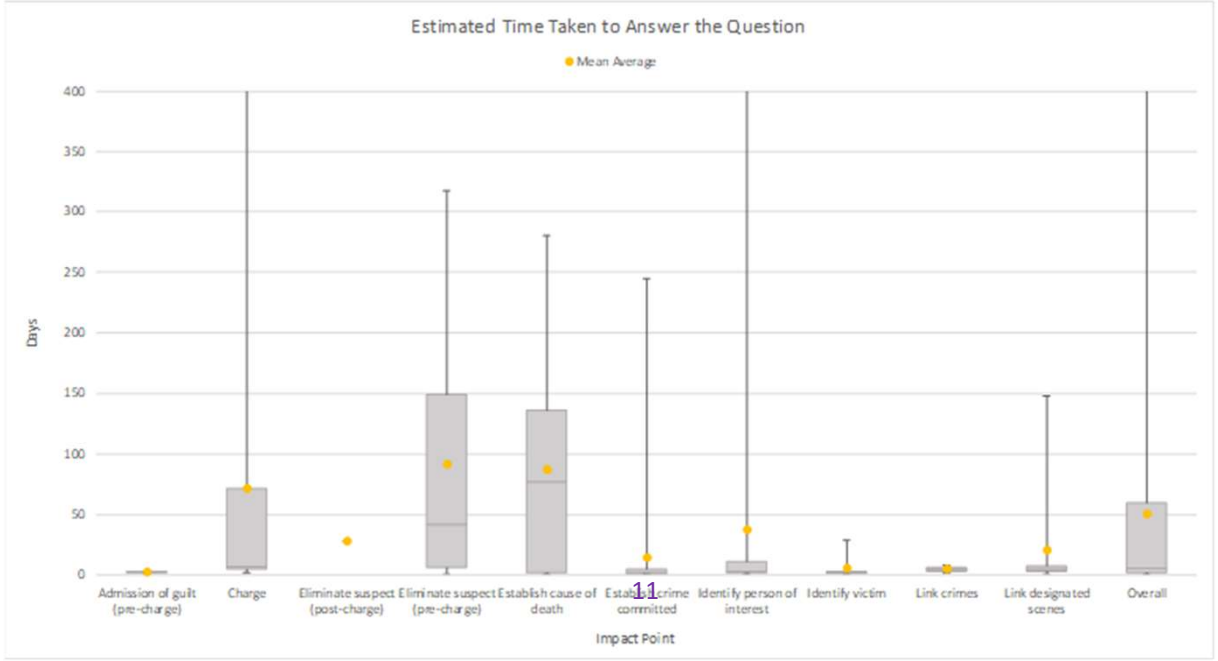
Impact and Value Metrics – Forensic Timeliness

Measuring the time taken to respond to the impact point question posed gives us an insight into the impact beyond SLA targets. It can capture the impact of interim reporting and verbal updates.

Home Office

A study to measure the impact of forensic science on the investigation of homicide offences. This study shows the impact of outliers on timeliness performance and the value in using median measurements to overcome that.

Row Labels	Count (Forensics)	Minimum (Forensics)	Median (Forensics)	Maximum (Forensics)	Mean Average (Forensics)	Standard Deviation (Forensics)
Admission of guilt (pre-charge)	2	2	2.50	3	2.50	0.71
Charge	50	2	7.00	793	71.74	145.24
Eliminate suspect (post-charge)	1	28	28.00	28	28.00	0.00
Eliminate suspect (pre-charge)	24	1	41.50	318	91.13	109.80
Establish cause of death	41	1	77.00	280	87.17	78.43
Establish crime committed	45	1	2.00	245	14.60	42.97
Identify person of interest	38	1	3.50	722	37.66	119.33
Identify victim	11	1	2.00	29	5.82	8.80
Link crimes	2	2	5.00	8	5.00	4.24
Link designated scenes	27	1	5.00	148	20.78	41.07
Overall	**241**	**1**	**6.00**	**793**	**50.22**	**100.96**



Data and Identity Directorate

World-leading use of Data
Public Trust | Safe and Secure Society

Impact of Different Operational Approaches – Forensic Timeliness

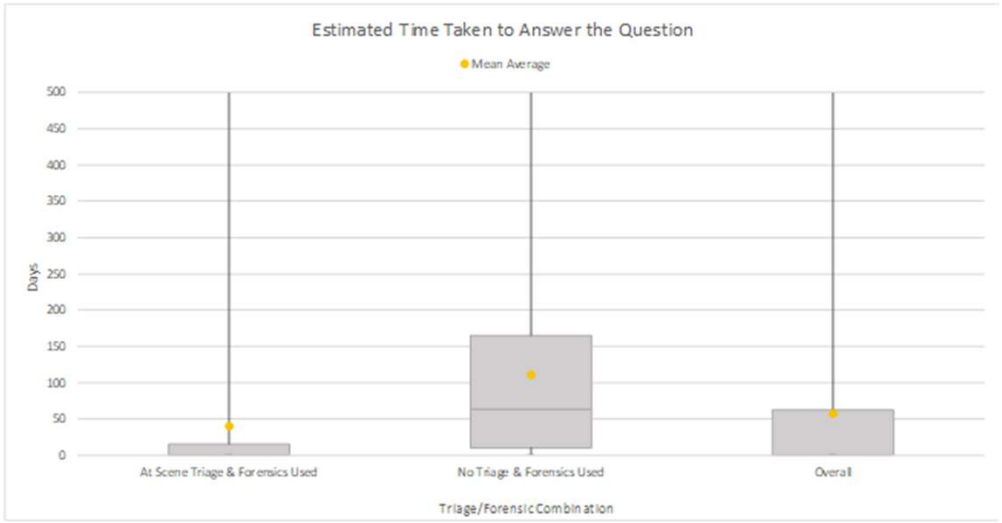
We can use impact point timeliness metrics to measure the impacts different operational approaches have on timeliness, again, demonstrating "what works", looking for indicators of best practice or benefits of change

Home Office

A study to measure the impact of digital forensics on the investigation of online child sexual exploitation (CSE). This study captured the impacts of forensic science using 2 different operational approaches – with expert at scene triage of exhibits vs solely DFU based analysis.

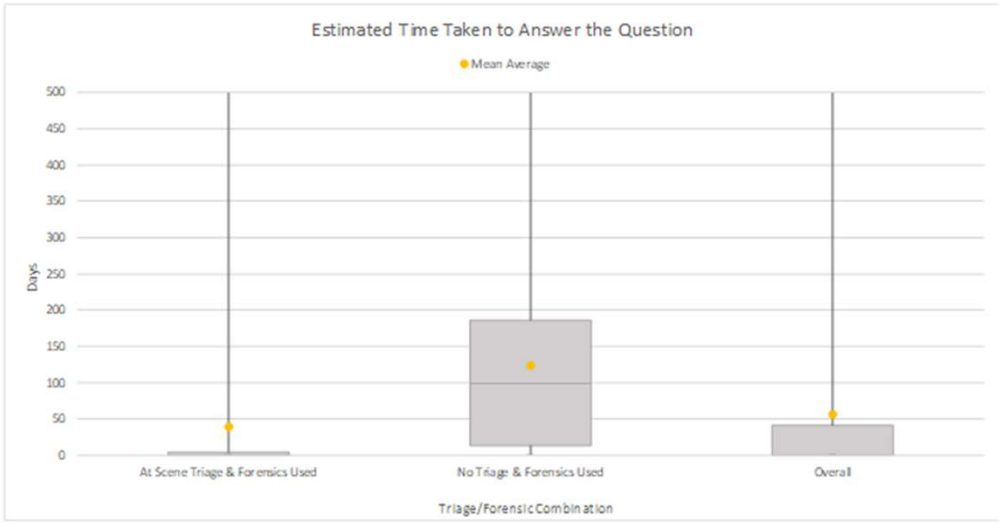
Establish a crime was committed

Impact Point	Count	Minimum	Median	Maximum	Mean Average	Standard Deviation
At Scene Triage & Forensics Used	177	0	0	955	40.42	107.24
No Triage & Forensics Used	55	0	64	650	111.27	133.97
Overall	**232**	**0**	**0**	**955**	**57.22**	**117.77**



Admission of Guilt

Impact Point	Count	Minimum	Median	Maximum	Mean Average	Standard Deviation
At Scene Triage & Forensics Used	73	0	0	701	39.89	113.99
No Triage & Forensics Used	18	0	98.5	536	124.00	140.08
Overall	**91**	**0**	**0**	**701**	**56.53**	**123.44**



In summary

Home Office

- **We have developed a model of forensic impact measurement with associated metrics.**
- **We have proved the concept of measuring Forensic Effectiveness and Timeliness, including the refinements of Impact Profiles and Exclusive Effectiveness.**
- **We want to develop it further with the policing and academic communities. Project Phase 1 report is now in circulation. Separately, we will publish the findings of several of the studies in detail.**
- **We think this approach offers opportunities to:**
  - inform local and national policy including investment decisions
  - identify good practice and what impacts on forensic science
  - articulate the benefits of pilots and change programmes

Phase 1 – Project Recommendations

Home Office

1. **The Home Office will create a suite of documents and guidance** to enable others to replicate this model of study and impact measurement.
2. **The FCN Expert Network on Performance and Risk should refine the model** to improve definitions and to categorise the impact points. **Policing and academic partners should prioritise utilising this approach** for pilot studies and change programmes.
3. **The FCN should lead work on automating** the approach with support from the Home Office. We have successfully bid for STAR funding to carry out several viability studies.
4. **The Home Office will engage with cross CJS data improvement projects** to highlight forensic science as a priority area for that improvement.
5. **The Home Office will look at alternative approaches to generating cost benefit metrics**.
6. **The Home Office should prove the concept of the impact point model beyond the impact on investigations** and work with CPS and HMCTS to measure the impact of forensic science on charging and the court system.
7. **The Home Office should consider expanding the scope** of the project to include the impact of forensic science on crime prevention and deterrence.

Home Office

Any questions?

Or email marie.barrett1@homeoffice.gov.uk