

Crime Detection and
Prevention Series
Paper 73

Forensic Science and Crime Investigation

*Nick Tilley
Andy Ford*

*Editor: Barry Webb
Home Office
Police Research Group
50 Queen Anne's Gate
London SW1H 9AT*

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Police Research Group: Crime Detection and Prevention Series

The Home Office Police Research Group (PRG) was formed in 1992 to carry out and manage research relevant to the work of the police service. The terms of reference for the Group include the requirement to identify and disseminate good practice to the police.

The Crime Detection and Prevention Series follows on from the Crime Prevention Unit papers, a series which has been published by the Home Office since 1983. The recognition that effective crime strategies will often involve both crime prevention and crime investigation, however, has led to the scope of this series being broadened. This new series will present research material on both crime prevention and detection in a way which informs policy and practice throughout the service.

A parallel series of papers on resource management and organisational issues is also published by PRG, as is a periodical on policing research called 'Focus'.

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Foreword

Forensic science has long made an important contribution to criminal investigation. Its use by the police, however, needs to be properly managed and organised if it is to make an efficient as well as effective contribution to the detection and prevention of crime.

This report describes the findings of a team set up under a joint ACPO/FSS steering group to advise on good practice in this respect. It describes the current situation and practices in forces and identifies areas where improvements might be sought to maximise the cost-effective use of forensic science. A complementary report by the team 'Using forensic science effectively' goes on to provide good practice guidelines. That report is published by ACPO/FSS and is available from the Forensic Science Service.

S W BOYS SMITH
Director of Police Policy
Home Office
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This paper reports one part of a multi-disciplinary/multi agency project, whose members comprised:

David Barclay (FSS)

Andy Ford (Home Office)

Detective Inspector R Leary (West Midlands Police)

Acting Detective Chief Inspector S Walters (West Mercia Police)

Brian Rankin (FSS)

Nick Tilley (Nottingham Trent University).

Dave Barclay, Dick Leary, Brian Rankin and Steve Walters worked tirelessly on the collection and interpretation of interview data, and contributed substantially to our thinking. We are grateful to them. This paper, which discusses the current position, is complemented by their *Using Forensic Science Effectively*, which provides guidelines for good practice.

Helen McCulloch of the Police Research Group has worked on a related project looking at data on forensic science usage routinely collected by our sample forces. We have made some use of her data and thank her for her help with it, as well as for her comments on earlier drafts of this report. Richard Harris, a Surrey University Sandwich Student attached to the Police Research Group for 1994-5, entered large volumes of data into SPSS and did much statistical analysis for us. We are grateful to him.

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Nick Tilley

Andy Ford

The Authors

Nick Tilley is Professor of Sociology at the Nottingham Trent University. Andy Ford works within the Organised and International Crime Directorate of the Home Office.

Executive summary

The aims of the study reported in this paper are first to examine and evaluate police use of forensic science, and second to assess the extent to which police needs are being met by current forensic science provision. A complementary volume, to be published by the Forensic Science Service with the Association of Chief Police Officers, will make proposals for good practice in use and supply of forensic science which are intended to improve value for money.

The report examines the background to current arrangements for forensic science in England and Wales (excluding London), giving an overview of the major reports since the 1981 Rayner scrutiny as they relate to relevant organisational issues and the processes through which forensic evidence can contribute to police investigations. It then looks at current practices. The issue of performance measurement and value for money is also considered. Finally, a brief overview of factors which might impact on forensic science provision and use is given.

The main conclusions drawn are that:

- 1) Most of the broad structural arrangements suggested in 1987 by Touche Ross for external provision of forensic science, and the management of scientific support within police forces have been implemented.
- 2) Many detailed recommendations made by Touche Ross and the Police Requirements Support Unit - Scientific Support Team aimed at improving yields from forensic evidence have not been implemented or have only been implemented patchily. These relate, for example, to the use of a standard Scenes of Crime Officer scene examination form, quality assurance for scene work and for devolved scientific processes, and pre-trial case conferences for forensic scientists and counsel.
- 3) Later reports, notably the House of Lords Select Committee on Science and Technology (1993) and the Royal Commission on Criminal Justice (1993) as it relates to forensic science, are still being enacted.
- 4) There continue to be wide variations between forces in numbers of SOCOs relative to numbers of police officers and numbers of reported crimes. There are also wide variations in expenditure on external forensic science services.
- 5) There is widespread lack of awareness within the police service about forensic science itself and what various tests can do, which inhibits the optimal usage of forensic science. Whilst the use of forensic science in the investigation of major crimes appears to be relatively well informed and to take place efficiently, the forensic/investigative process in volume crime appears generally to be less well thought through. Training and communication weaknesses identified in Touche Ross remain, and are fundamental to the problems currently being experienced.

- 6) Little pro-active use is currently made of forensic science. It is almost entirely used in reactive investigations of single incidents. Exploration of its potential for wider use has scarcely begun and the cost-benefits of this will need to be carefully examined in demonstration projects, before general adoption could be advocated with confidence. This may provide an alternative way of using forensic science in police responses to volume crime.
- 7) The absence of sustained research into ways of solving crimes and their costs means that questions about cost-effectiveness, value for money etc. cannot be answered. In any case current patterns of usage of forensic science could not reveal its investigative cost-benefit potential.
- 8) What the future holds for forensic science use is not clear. In particular, the development of a national DNA database may have a strong influence on patterns of usage. In the longer term it might have an impact on more traditional forms of forensic analysis.
- 9) Apart from the work of the FSS (which covers the bulk of forensic science analysis) much that is done in force or by some external suppliers is not quality controlled or quality assured. The risks of this to justice and to credibility are obvious.
- 10) Current within-force routine methods of estimating the effectiveness of forensic related work have dubious reliability or validity. They are, at best, starting points for further investigation.

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1. Introduction

The aims of this study are:

- i) to examine and evaluate patterns of police use of forensic science,
- ii) to assess the extent to which police needs are being met by current forensic science provision, and
- iii) to make proposals for good practice in the use and supply of forensic science which will enhance value for money on the basis of what is found.

This 'diagnostic' document relates to the first two aims and looks at current practices in forensic science usage and provision, together with their strengths and weaknesses. A second, complementary volume is to offer guidance on good practice (see Annex A). Neither paper considers forensic science in the criminal justice system comprehensively. In particular, provision for and use of forensic science for the defence was beyond the scope of the study, as was much relating to the use made of forensic evidence by the Crown Prosecution Service and during legal proceedings.

The discussion relates to England and Wales, excluding London. Other jurisdictions entail different patterns of forensic science use (for a brief overview of arrangements abroad and elsewhere in the UK, see Home Office/Metropolitan Police 1994, Appendix 6: 9-12). The Metropolitan Police Forensic Science Laboratory (MPFSL), which serves London, has operated differently from the remainder of England and Wales, since it does not hard charge for its services to the police. The MPFSL is, however, now merging with the Forensic Science Service (FSS) and will presumably come to operate along similar lines. The discussion is also confined to laboratory based forensic science services of the kind provided by the Forensic Science Service and the MPFSL. It thus excludes, for example, forensic pathology, forensic psychiatry and forensic odontology. There is no consideration of the MPFSL as it has operated to date.

This report is based on work undertaken between July 1994 and June 1995. The study was carried through by a team based at the Headquarters of the FSS in Birmingham. It comprised two police officers seconded full time for a year from West Mercia and West Midlands Police Forces, two forensic scientists also seconded full time from the Birmingham and Wetherby Laboratories of the FSS, together with a Home Office official and an independent academic consultant each working part-time to the project. Research support has been provided by the Home Office Police Research Group. The team has also benefited from occasional inputs from a wide range of those working in forensic science and in the police. The project has been overseen by a joint Association of Chief Police Officers (ACPO)/FSS consultative group.

Section 2, which follows, begins with a brief history of forensic science use and

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organisation in England and Wales, especially over the past decade. It introduces the major reviews which have informed decisions shaping present practices. This section will put current issues in context. Section 3 of the report explains the methods employed and sources used in this study. Sections 4-7 describe findings about current practices, including their strengths and their weaknesses. They cover contributions to the investigative process, organisational and management issues, and value for money. Section 8 considers issues which may in the short to medium term impact on use and provision of forensic science services. Finally, Section 9 presents a concluding overview. In all this report constitutes the research foundations for the associated good practice guide.

2. Background

The following brief review of recent studies and recommendations relating to forensic science provision and usage will be used to put the findings reported here in context. Most attention is given to the Touche Ross report because of its wide scope and extensive influence.

The development of current forensic science arrangements in England and Wales

Whereas in 1981 the Rayner scrutiny had been preoccupied with indiscriminate use of forensic science, Touche Ross were concerned that 'selectivity had now gone too far' (Touche Ross, 1987, Vol 2). Touche Ross noted that forensic science was free to the police at the point of delivery, since it was paid for as part of common police services. Over the previous five years serious (violent) crimes had been rising rapidly, whilst the numbers of forensic scientists had remained stable. At the same time techniques had been developing and requirements for checks expanding. The Forensic Science Service had become unable to meet the demands made by the police for its service, leading to greater case selectivity. This had led to reduced confidence amongst operational police officers that they were receiving the forensic support they needed. The upshot, they felt, was that 'a large number of potential convictions' could be lost (Touche Ross, 1987, Vol 1).

The means to match supply and demand was deemed to lie in the introduction of market mechanisms. If the police were to have to pay directly it would be up to them to shape the volume of service they received (Touche Ross, 1987, Vol 1). To achieve the required supplier flexibility and responsiveness Touche Ross believed that direct Home Office control of the Forensic Science Service should cease. The creation of a 'Non-Departmental Public Body' (NDPB) was advocated (Touche Ross, 1987, Vol 2). The Home Affairs Committee (HAC) agreed, with the proviso that direct charging be successfully introduced in advance (HAC 1989). In the event agency status and direct charging were introduced simultaneously in 1991.

The Royal Commission on Criminal Justice (RCCJ) noted a number of possible advantages in the introduction of direct charging. These included increased 'transparency' over forensic science charges, competition from other suppliers ensuring reasonable public sector laboratory charges, and the ability of the FSS to respond more flexibly to the demands of its (mainly police) customers. The RCCJ indicated that it would not support the changes introduced if pursuit of higher profits¹ increased charges and thereby deterred the police from seeking forensic assistance when it was needed (RCCJ 1993).

¹ It must be stressed that the Forensic Science Service does not and may not make profits.

Organisation of scientific support

Touche Ross made several recommendations for the organisation of scientific support within the police, with clear implications for use of forensic science.

Management of scientific support

The management of scientific support was found generally to be poor, with insufficient understanding of what forensic science could contribute (Touche Ross, 1987, Vol 3). It was suggested that each force appoint a scientific support manager (SSM) to co-ordinate the relevant work. The appointee would be responsible for provision of scientific support services (including Scenes of Crime Officers (SOCOs) and fingerprint departments), for the forensic science budget, and for procedures for the preservation and collection of physical evidence at scenes of crime.

The role of SOCOs

Wide variations were found between forces in numbers of SOCOs relative to numbers of crimes (from 1 per 1,674 crimes to 1 per 5,226 crimes) in the number of SOCOs relative to force authorised establishment (from 0.9% to 2.7%), and in the numbers of cases each SOCO handled per year (from 331 to 1,426) (Touche Ross, 1987, Vol 3). This meant that the detail of examinations differed widely. High crime loads were associated with examination only for latent fingerprints in all but the most serious cases, whilst lower crime loads afforded the opportunity for more thorough examinations for material which might be sent to a laboratory.

Touche Ross recommended a common approach to the role of SOCOs covering recruitment standards, career structure and pay-scales. SOCOs should be based in divisions, but be responsible to the SSM. Civilianisation should continue. Appropriate staffing levels should be agreed.

In follow-up work the Police Requirements Support Unit-Scientific Support Team (PRSU-SST) suggested that staffing levels should allow an average annual maximum of 600 cases per SOCO to allow time for satisfactory examination of scenes. SOCO core functions should include searching for and recovering fingerprints and other physical evidence and crime-related photographic work. They might also carry out devolved processes, provide intelligence by maintaining various indices, act as quality controllers for items submitted to laboratories, provide scientific advice to CID and uniformed personnel, fit intruder alarms to premises subject to repeated forced entry, maintain equipment and supplies, and prepare statements and appear in court to give evidence (PRSU-SST, 1988, Recommendation 20).

Devolution of scientific processes

Touche Ross concluded there was no major scope for devolution of scientific work to police forces (Touche Ross, 1987, Vol 1). The PRSU-SST considered the following suitable: restoration of erased serial numbers; examination of documents for indented writing; simple examination of altered or forged documents; presumptive testing of powders suspected of containing controlled drugs using commercially available drug testing kits; presumptive testing for blood, with laboratory confirmation; lifting footwear marks; use and maintenance of a footwear mark collection; simple examinations of tyres; and simple tachographic examinations. Moreover, devolved scientific processes must be carried out to the same standard as that expected in the laboratories, with adequate quality assurance procedures. The advantages of some devolution were seen to lie in reducing the work of the forensic laboratories, extending the scientific support officer's role, obtaining quick results for the police, and sifting cases in-force so that only essential items are submitted to the laboratories for examination (PRSU-SST, 1988, Recommendation 17).

The RCCJ could also see no objection to straightforward in-force scientific work, again provided there were adequate, specified arrangements for quality and performance control (RCCJ 1993).

The forensic process

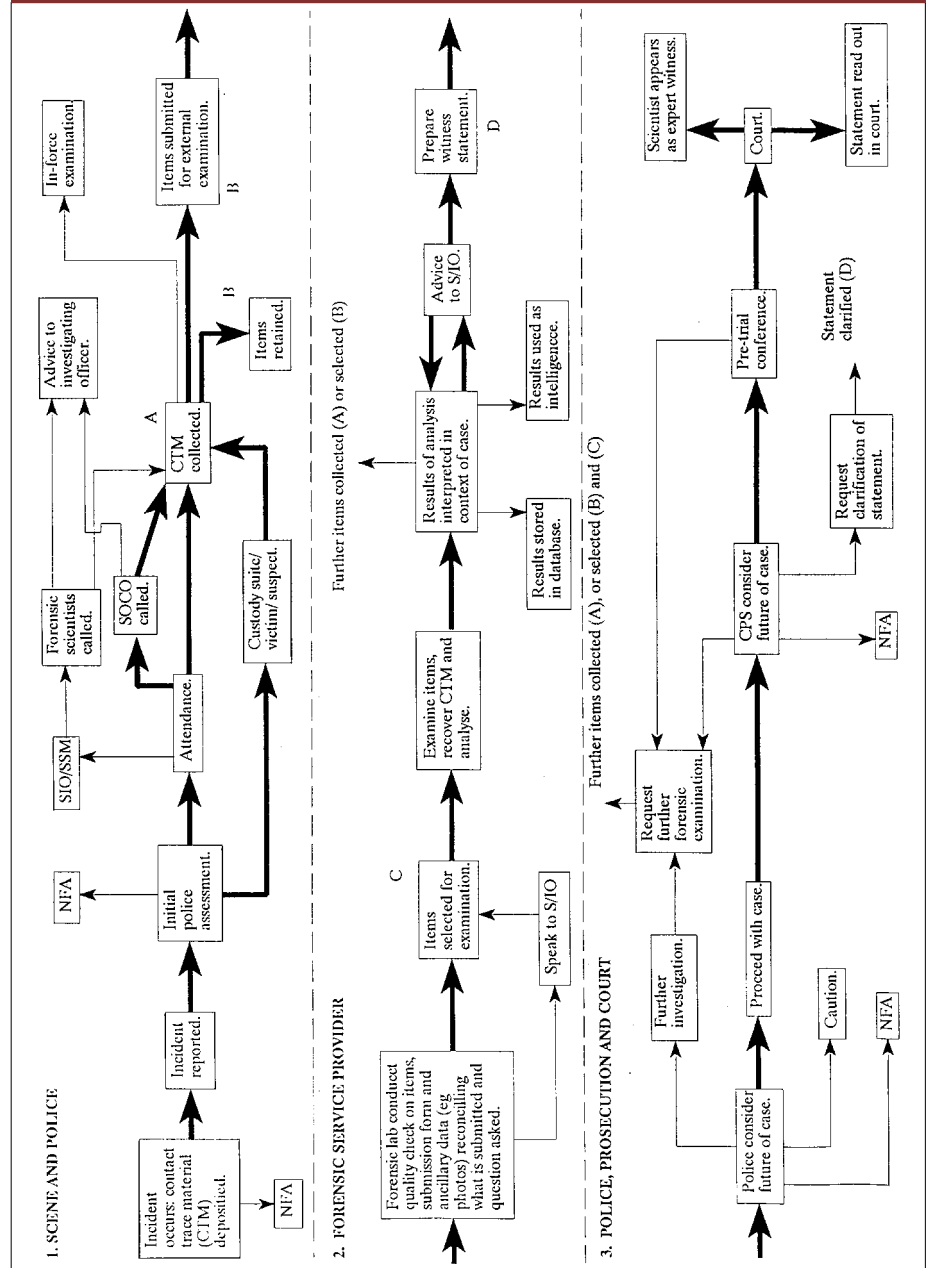
Figure 1 attempts to capture in some detail the stages through which contact trace materials may come to be used in the investigation of crime and eventually the prosecution of suspects. The guidelines complementing this report go in some detail into ways of maximising yields from what is done. Here we confine ourselves to the major stages in the process.

Scene attendance by SOCOs

Touche Ross point out that in provincial forces SOCOs' potential annual average caseload comprised some 1,900 cases. The actual average was 705 cases a year (70% to 90% being burglaries) with wide variations in numbers of scenes visited. A review of four divisions in one force showed variations by a factor of four in scenes visited per SOCO. SOCOs were also attending a diminishing proportion of possible scenes, because of their declining resource relative to changes in recorded crime rates.

The Audit Commission (1993) noted that between 1987 and 1991 numbers of SOCOs went up by 16%, whilst recorded crime increased by 40%. It estimated that about one in three relevant cases was being attended, with an average annual total of 800 per SOCO. This exceeds by a third that advocated by PRSU-SST in 1988, and is 100 more per annum than that found by Touche Ross in 1987. There were wide variations between forces - from 450 in one force to 1,350 in another. The

Figure 1: The forensic process



Audit Commission suggest that forces whose SOCOs were visiting a high proportion of scenes, but achieving a low yield of marks per visit, should reconsider their selection criteria, tailoring discretionary efforts to the most promising scenes.

More recently, Saulsbury et al (1994) looked at reasons why SOCOs are not called to crime scenes. Table 1 shows the replies to questions asked of 194 respondents, comprising PCs, DCs, first line supervisors of either, detective inspectors and senior investigating officers.

Source: Saulsbury et al, 1994

With regard to the commonest factor mentioned - apparent lack of evidence -

Table 1: Main factors deterring officers from calling out SOCOs

	No	%
Apparent lack of evidence	148	76
Weather	33	17
Availability	31	16
Formal policy	30	15
Accepted informal practice	18	9
Minor offence	14	7
Complainant's lack of cooperation/availability	8	4
Time constraints	6	3
Intervention by supervisor	4	2
Other evidence available	4	2
Suspect/person arrested	3	2
Distance of scene	3	2
Other	79	41

Saulsbury et al point out that these officers 'tend to misjudge the usefulness of certain types of evidence'. This suggests that not only may there be insufficient SOCOs, who cannot therefore give adequate attention to each scene visited, but also that they are not being called to some promising scenes.

The evidential materials collected by the SOCO

There appear to be wide and continuing performance variations by SOCOs when they visit scenes. Touche Ross found success rates in finding fingerprints varied from 120 to 500 scenes per year (Touche Ross, 1987, Vol 3). The Audit Commission in

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1988 found that fingerprints were found overall at about one in four scenes, and in 1991 they found variations of between 120 to almost 400 scenes where fingerprints were found per SOCO per annum (Audit Commission, 1993).

Touche Ross found little monitoring of the work and overall performance of SOCOs bar measurements of the number of fingerprints found and of positive identifications of offenders achieved from them. They recommended that occasional quality assurance (QA) trials be introduced, with tests for SOCOs once or twice a year. Later, the Royal Commission on Criminal Justice suggested that the FSS and the MPFSL assume responsibility for setting standards, auditing performance and establishing a code of practice for SOCOs (RCCJ, 1993).

PRSU-SST provided a standard scene examination form, which they suggested should be used by all SOCOs to stimulate common minimum standards (PRSU-SST, 1988, Recommendation 22).

Communication of SOCO findings

The Audit Commission noted in 1993 the inadequate day-to-day communications between detectives and SOCOs, for instance in one study force 31% of a sample of crime reports could not be matched up with a scene of crime report (Audit Commission, 1993).

The submission of cases for external forensic examination

Ramsay (1987) looked at the types of case types submitted by four police forces in 1984. This is shown in Table 2.

Source: Ramsay, 1987

Touche Ross commented that though the investigative and evidential support

Table 2: Breakdown of cases submitted by four police forces to the laboratories in 1984, by offence type		
Criminal statistics categories	No	%
Violence against the person	98	17
Sexual offences	84	14
Burglary	132	22
Robbery	16	3
Theft (and handling)	96	16
Damage (all forms including arson)	154	26
Fraud/forgery	3	1
Other	10	2
TOTAL	593	100

provided by the FSS in relation to major offences continued to be readily available,

this was no longer the case in relation to lesser offences (Touche Ross, 1987, Vol 3).

Later, in 1994, Saulsbury et al examined what was then leading to decisions not to submit items for forensic examination. Table 3 shows the results. It is notable that the single most important reason not to submit items related to cost.

Source: Saulsbury et al, 1994

Table 3: Reasons for not submitting evidence to the forensic laboratory		
	No	%
Financial considerations	83	40
Suspect arrested	68	33
Perceived usefulness of evidence type	65	32
Availability of other evidence	28	14
Procedural or other errors	24	12
Minor nature of the offence	22	11
On advice	15	7
Supervisory intervention	5	2
Formal policy	5	2
Exam done in force	3	1
Turnaround time of lab	3	1
Previous experience with lab	2	1
Time constraints	1	<1
Accepted informal practice	1	<1
Distance to lab	–	–
Other	114	56

The selection of materials for examination within the forensic science service

Following increases in selectivity within forces at the behest of forensic laboratory directors, Touche Ross found very few cases rejected by the laboratories. Only the most useful items were selected for examination, however, in a particular case.

The forensic analysis itself

The high quality of scientific casework within the laboratory is consistently noted. Touche Ross found that about 16% of Forensic Science Service laboratory time is spent on quality assurance activities. The Home Affairs Committee supported the

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QA programme within the Forensic Science Service, noting that it had helped maintain exceptionally high standards of work (HAC 1989).

The report submitted to the police by the forensic scientist

The report or statement is the usual end-product of the scientist's work. It has to be easy to understand, as precise as possible and scrupulously correct. Ramsay found that two thirds of the 87 police interviewees who mentioned the reports said they found them vague or obscure (Ramsay, 1987). He also found misinterpretations of reports. He noted that in a third of cases there were significant differences between the police and scientists over the value of the results of the scientific examination. Ramsay speculated that police difficulties in making sense of forensic scientists' reports may have been shared by prosecuting solicitors and even jurors. He stressed the need for scientific reports to be clearly written and linked explicitly to the case details.

Following Ramsay's study the Forensic Science Service attempted to improve their witness statements, to make them clearer and more accessible, consulting widely with the police and Crown Prosecution Service (Forensic Science Service, 1990). A 1993 British Market Research Bureau (BMRB) survey of 1278 officers found that 23% found statements easy to understand, 59% fairly easy to understand, 11% not very easy to understand and 1% not at all easy to understand, the remaining 6% not giving an opinion. 33% were satisfied with the information contained in the statements, with 55% quite satisfied, 33% not very satisfied and less than 1% not at all satisfied, 7% not giving an opinion. 4% felt there was too much detail, 78% that there was about the right amount, 12% that there was too little, with 7% not giving an opinion. These findings were replicated almost exactly in the 1995 BMRB survey.

The use made by the police of the forensic analysis

Ramsay (1987) tabulated the primary outcome of the FSS report for police investigation as follows.

Table 4: Primary outcome of FSS report for police investigation

	Cases with uncharged suspects	Cases with charged suspects	Cases without suspects	Total
OUTCOME	%	%	%	%
Contributed to prosecution evidence	39	76	n.a.	46
Suspect fully cleared	14	<1	n.a.	5
Helped define nature of case	n.a.	n.a.	82	18
No contribution	47	23	18	30
	100%	100%	100%	100%
n =	117	140	73	330

Source: Ramsay, 1987

Over a third of the cases without a suspect were those where arson was surmised, where the FSS helped to determine whether there was an offence to investigate. The others were varied.

Ramsay noted that the clear up rate for cases submitted for forensic examination (about two out of three) was about twice the average national rate. 79% of those where the police judged the forensic contribution as useful/substantial/crucial were cleared, whilst 59% of those assessed less favourably were cleared.

Forensic evidence in court

Touche Ross in 1987 and the House of Lords Select Committee on Science and Technology in 1993 both referred to difficulties forensic scientists experience in communicating the significance of their evidence to counsel and in court. The House of Lords Select Committee made various suggestions: 'pre-trial conferences' where counsel meet and discuss the nature and strength of the forensic evidence; 'pre-trial review' where scientific evidence is in dispute - supervised by the trial judge and involving both sides' experts and counsel - to seek to resolve or narrow the disagreement along lines which participants will be bound to during the trial; invitations to expert witnesses to add to their testimony if they needed to do so; use of visual aids etc. in the presentation of evidence; and training in forensic science for lawyers (House of Lords Select Committee on Science and Technology, 1993). These proposals were broadly endorsed by the RCCJ in 1993.

3. Method of National Project Team research

A cross-section of the 41 forces outside London was selected for detailed examination. Two were used as pilots. Twelve forces were chosen from the remaining 39 for the main study, to cover those with high and low crime rates, predominantly rural and urban forces, high and low rate users of the FSS, representatives of all Audit Commission families of forces, and coverage of at least one force attached to each of the FSS laboratories. Some information was collected on behalf of the project team from the Metropolitan Police, though it has not proven possible to do justice to the rather different circumstances there.

In each force the SSM and a sample of SOCOs and Police Officers were interviewed. This produced respectively 12, 40, and 81 respondents. The SSMs arranged the interviews and selected respondents in terms of their availability on the days arranged for the fieldwork. Police and SOCO respondents are thus not a strict random sample, but are believed to be generally representative. Both uniformed and CID officers were seen. Semi-structured interviews were conducted, enabling issues of concern to respondents to be examined in detail. Each interview lasted on average just under two hours. Assurances were given to respondents that their replies to questions would remain anonymous, which means that participating forces cannot be named.

A range of documentary evidence was collected from the forces taking part in the study, including scene examination forms, job descriptions, force policy and guidelines on scene attendance, scene examination, and submission of items for forensic examination and so on. Statistical information relating to each study force was assembled, including PRSU and Scenes of Crime Information and Management System (SOCIMS) data, which will be reported in McCulloch (1996) in a separate Police Research Group paper.

As well as examining police practices in relation to forensic science, the National Project Team also consulted forensic science suppliers. Semi-structured interviews were conducted with a sample of staff, including scene attending reporting officers, non-scene attending reporting officers, non-reporting officers and a customer services representative. Personnel were interviewed at each of the FSS laboratories (36 in all), as well as the MPFSL (6), the Strathclyde Police Laboratory (6), and various independent suppliers (8 from 5 separate suppliers).

4. Forensic science in the investigative process

Scene attendance by SOCOs and forensic scientists

Scene attendance by SOCOs

Data were available on scene attendance at eight of the twelve sample forces. Rates varied from 1:4.1 to 1:6 of recorded offences in 1994, averaging 1:5.2. The average number of scenes examined per SOCO was 616, close to the PRSU-SST recommendation of 600 and less than the average of 705 found in Touche Ross. Across forces averages varied from 334 to 705, and in seven of them varied only between 602 and 702, a much narrower range than found both by Touche Ross and later by the Audit Commission.

Scene attendance policies differ by force. In some forces, the first officer attending (FOA) has full discretion about cases to which a SOCO is called. In others there are policies or guidelines covering at least some visits, specifying for example that all burglaries should normally be visited. There are forces where cases may be filtered out by the SSM, a Senior SOCO, a SOCO or a clerk. In others all requests will be met, with work allocated through the Crime Information System (CIS) or via the control room. In one there appeared to be more direct control, with scene visiting only if ten formal conditions were satisfied. In another there was a formal policy specifying categories of scene to be visited. These included all scenes of serious crime, all burglary dwelling house, all burglary other (excluding minor cases of sheds and garages), all woundings (excluding minor assaults unless a police officer is involved), stolen vehicles if used in the commission of crime, if part of a series or if a suspect denies the offence, and any other crime scenes at the discretion of the divisional Detective Chief Inspector (DCI). It was estimated by the SSM that 50% of his time was spent policing this policy.

Widely differing accounts of force policies and practices were found in the same force, even when formal policies specified the offences where visits were expected. Many respondents admitted that they did not know whether or not there was a policy. For instance in one force where many respondents stated that all burglaries were visited as a matter of course, other respondents commented:

“I believe there is a force policy but I’m not sure what it is. I know they don’t attend car crime and burglaries under a certain value, I think £1,000, unless there is obvious evidence.”

“Because of my (short) length of service I tend to be cautious and call SOCO to almost every burglary I attend. I do exercise discretion, though, in assault cases, car crime and criminal damage.”

In practice there was evidence, whatever the policy, that FOA requests for SOCO attendance are very rarely refused. Amongst police officer respondents 78% said that

seriousness of the case and 66% said that presence of physical evidence played a large part in influencing their decisions to call for SOCO attendance (n=81). Burglary attendance appears to be the norm in almost all forces.

There are serious weaknesses in systems which depend heavily on the judgements of the first officer attending. Tests of their understanding of the potential discriminative powers of varying physical evidence types revealed widespread gaps in understanding, so much so that most would have done better by simply randomising their responses. This confirms findings from Saulsbury et al (1994). Respondents were asked the following question:

“Some contact trace materials have been recovered. Using the scale, conclusive = 1; strong = 2; some/limited significance = 3; no evidential value = 4; don't know = 5; - how significant do you think an individual forensic science test could be in associating the following?”

They were then presented with 15 hypothetical circumstances. The full question and marking methods are given at Annex B.

Figure 2: Forensic awareness within the police service

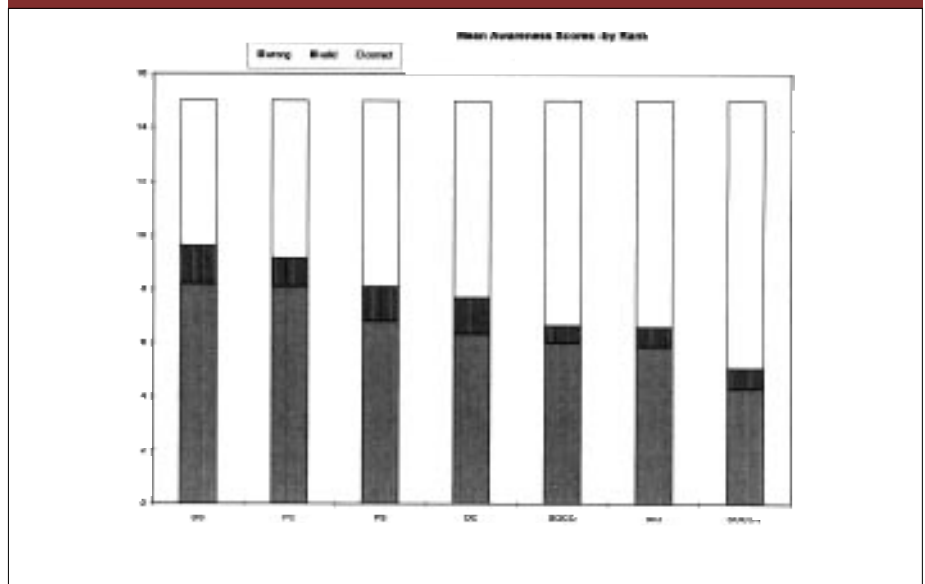


Figure 2 shows the scores achieved by differing categories of respondent. 'Don't knows' and near misses were treated as valid. Ignorance is clearly widespread, but greatest amongst Detective Sergeants (DSs) and Police Constables (PCs) and lowest amongst Senior Investigating Officers (SIOs) and Senior SOCOs. There is wide variation within each group. Those dealing with crime routinely are clearly not well placed currently to assess the potential value of various forms of forensic analysis.

Few officers interviewed realised how little they understood. Yet they are frequently playing a key part in the deployment of SOCO resources. Moreover, since SOCOs are a scarce resource relative to the number of scenes which they could potentially be asked to examine, some form of selection is clearly needed. Present systems are poorly placed to yield the most fruitful outcomes.

There is evidence of some promising innovation. In one force a Crime Scene Assessment Unit, with a specialist and trained group of police officers, attend every scene of burglary and decide whether a SOCO should attend. They look for physical evidence or potential physical evidence including latent fingerprints. This is an effort to provide for most incidents a one stop approach (Audit Commission, 1993).

Scene attendance by forensic scientists

In very serious and complex cases a forensic scientist may also attend and provide some preliminary interpretation of what is at the scene and what might benefit from forensic examination at the laboratory. The forensic scientist will normally work closely with the SIO in coming to a view about what may have happened at the scene and what may be learned from forensic tests. Procedures vary for calling out the forensic scientists, and few forces had formal policies. Most often it appeared that the IO/SIO would contact the SSM informally to obtain agreement that a forensic scientist be called. Concerns were expressed that the forensic scientist who attended should have a background in the appropriate forensic discipline.

Several forensic scientists felt that there were scenes they could fruitfully have visited, but were not called to. One stated,

"I don't think the police always use the correct parameters to make a decision on whether or not to call out a scientist to a scene. One of my cases at the moment would have benefited from my attendance - I am being asked to comment upon blood distribution from photographs and items which had been moved by ambulance men. It would have been better to see the items in situ. The interpretation I can give will now not be the best evidence."

In the years following agency status for the FSS the rate at which forensic scientists have attended suspected arson cases has diminished, compared to the MPFSL, and

this may have to do with charging though it may also be that local fire services are being called on instead, again perhaps to save money. Annual attendance by the FSS went down from 400 to 209 between 1989-90 and 1994-95. It went up from 211 in 1990 to 234 in 1994-95 by the MPFSL. National reported figures for arson went from 24,469 to 30,608 between 1990 and 1994.²

Scene examination and the evidential materials collected by SOCOs

For seven of the sample forces 1994 figures were made available giving the rate at which fingerprint marks were found by SOCOs at scenes examined. These varied from 1:2.3 to 1:4.5 of scenes examined, with an average of 1:3.2. The highest rate was in the force with the lowest rate of scenes visited per SOCO (334). In regard to identifications, for the five forces for which data were available rates varied from 1:5.4 to 1:8.6 of those scenes where marks were found, with an average of 1:6.8. It varied from 1:14 to 1:25 of all scenes examined, with an average of 1:18. In the force with the low average number of scenes attended identifications were made at a rate of only 1:19 scenes examined. Whilst more marks were found this did not translate into very high rates of identification per scene examined. Nationally, in 1993 force variations in the rate at which marks were found at scenes varied from 1:1.8 to 1:6.7 with an overall national rate of 1:3.2. Nationally rates at which identifications were made in relation to scenes visited varied from 1:9.6 to 1:44, with an overall rate of 1:19 (National Conference of Scientific Support). In no case were maximum or minimum national rates amongst sample forces. Of course identifications are not the same as clearances or convictions for which we have no data nationally or for the sample forces.

Data were not readily or commonly available on the rate at which items which may be susceptible for forensic examination were found.

Scene preservation

SOCOs consistently emphasise that scene preservation is crucial for them to determine what can usefully be gleaned from a scene and what can be collected. The quality of scene preservation is a function in part of the FOA's actions, including advice given to those at the scene about what to do and not to do before the SOCO attends. It is also a function of the behaviour of victims, witnesses and reporters of crime before the FOA is called or attends. The project did not examine scene preservation prior to the arrival of the FOA. We know in the case of rape, for example that the victim - here the scene of crime her/himself - often naturally inclined to wash the evidence away. This may also be the case in assaults. Victims of

² It is worth noting also that arson cases submitted to the FSS went down from 959 to 680 between 1991 and 1994-95.

property crimes may again, for a variety of reasons, also often clear up and clear potential contact trace material away. Given the recent growing body of research about patterns of repeat victimisation (Farrell & Pease, 1993), there may be scope for targeted public education about scene preservation.

Communication

All SOCO respondents stated that briefings prior to scene visits are either essential or useful. They indicated that verbal briefings are most effective. In volume crimes, the SOCO most commonly attends the scene 'blind'. There will often be no background information at all, and where there is information it is normally sketchy at best. Overnight, some items of information may be provided on a CIS. In volume crime the SOCO will only very infrequently attend at the same time as a police officer. In very many cases the first officer attending will learn nothing of what is found by the SOCO, though reports are sometimes available on the CIS. In volume cases communication about the case before and after scene examination is, thus, not normal. Yet it is highly valued. One respondent said:

"The request for the SOCO goes to force HQ by telephone...Often there is no briefing other than the register message."

A SOCO noted:

"There is a double standard because at major crime scenes I am expected to assist and advise the SIO on all aspects of evidence collected but in volume crime scenes this does not apply."

At least four of the sample forces are making use of mobile phones routinely to enable visiting SOCOs to access more information from the FOA and to pass on findings speedily to the IO.

Search and recovery of contact trace material

In examining scenes, widely varying reports were given of the proportion of time spent at the scene looking for fingerprints and for other evidence. In the case of fingerprints estimates ranged from 20% to 95% of the time, with an average of about 70% (n=40). In the case of other items which might be subject to forensic examination, estimates ranged from 5% to 80% with an average of about 30% of the time at the scene. These figures suggest that an average 70% of time at a scene is spent looking for fingerprints and 30% is spent looking for other forensic evidence.

SOCOs had mixed views about limited scene searches. They were generally thought to be undesirable. It was stated, however, that the large number of scenes which have to be attended often means that in practice scene examination has to concentrate on a small number of evidence types. In extreme cases only fingerprints

will be sought in volume crimes, as had been found in 1987 by Touche Ross. One SOCO respondent commented:

“(The type of search) depends entirely on the scene. It is difficult to have a general policy and a SOCO view. Most burglaries it's only fingerprints, but if we do have a suspect then the OIC will ask for other forensic. There is not enough time to collect forensic in every case.”

Worries were expressed about the possibility of missing evidence that might either implicate or eliminate suspects where restricted scene examination practices and policies operate. In practice, however, almost all scene examination is less than fully comprehensive, since exhaustively combing every scene for any contact trace materials (as happened for example in the case of Michael Sams's workshop, where readers may remember Stephanie Slater had been held captive) is clearly impractical. Prioritisation in scene examination seemed generally to be ad hoc. SOCOs value the professional autonomy to determine what should be examined and collected from the scene of an incident.

In serious cases the SOCO will very often attend at the same time as the IO or SIO and will discuss possible pieces of evidence and the uses to which they may be put (over two thirds said the IO or SIO would always attend with them in such cases). Even when not attending with the IO, the SOCO will be fully briefed for the scene examination.

Quality control

Despite recommendations from Touche Ross, the House of Lords Select Committee and the RCCJ, there is very little in-force quality control or quality assurance of scene visits. One SSM commented that scene work is based on “trust and logistics”, and that:

“...there is a difference between a SOCO attending a scene and collecting evidence and an expert witness giving an opinion based upon the examination. The latter requires clear QA procedures.”

Another SSM stated that since SOCO evidence is given as ‘fact’ no QA is needed.

One sample force, in contrast with the general pattern, did have well developed QA arrangements, with clear responsibilities for senior SOCOs to re-visit scenes - reviewing scene work, the appearance of the SOCO and any submissions/Home Office Laboratory Submission (HOLAB) form. This is linked to annual career assessments and annual pay awards. Senior SOCOs in turn have to undertake practical scene assessments as part of their regular performance review. Where shortcomings are found workshops are arranged to deal with them, with the ultimate sanction of dismissal.

There is mandatory peer review for FSS forensic scientists when they return to the lab following scene visits.

Communication of SOCO findings

Notwithstanding recommendations from Touche Ross, forces differed in the ways SOCOs record what they find at scenes visited. The standard scene examination form provided by PRSU-SST, is not used by all forces. This does not facilitate achieving the full potential for scene and offender profiling across boundaries. At one extreme there are forces with no scene examination forms at all. What is found is simply recorded in a pocket book. At the other extreme is a force where very comprehensive records are made on a pro-forma. In that force one SOCO remarked that he spent three hours of an eight hour shift simply filling in negative scene examination forms.

The records kept by SOCOs partly shape how and what they can communicate to IOs and FOAs. In practice as already indicated it appears that in volume crimes there is little effective feedback to First Officers Attending. Where SOCOs shared working space with local operational staff, there was much informal feedback on case work which was found invaluable by police and SOCOs. This was, as one respondent put it, “hugely important and effective”.

At major crime scenes matters are routinely very different, with immediate and direct feedback to police officers involved in the case.

The submission of materials for external forensic examination

Table 5 shows the distribution both of the cases submitted for external forensic examination and of the spend on them for the 10 sample forces where data were available. The column headed ‘% Ramsay subset of cases’ shows the current distribution of those case types which had been looked at earlier by Ramsay. Comparison of present figures in table 5 with Ramsay’s 1984 data, which can be found in table 2 above, shows that cases submitted have tended to become more serious. For example, the proportion of cases relating to violence has increased from 17% to 27%, whilst the proportion relating to criminal damage and arson has decreased from 26% to 8%. It should be noted that there are substantial variations in the usage made of forensic science in differing forces. Drugs cases, for example, vary from 31.9% to 54.8% (both of them rural, sparsely populated forces). Burglary varies from 28% to less than 10% of cases. It is difficult to make sense of these simply in terms of crime pattern variations.

There are various ways in which submissions are made and approved. Full central submissions authorisation involves all information and all items being scrutinised by

Table 5: Expenditure and cases submitted for forensic examination of contact materials collected for sample forces

Offence type	No. of cases	% all cases	% Ramsay subset of cases	% spend
Violence against the person	1182	10	27	24
Sexual offences	612	5.1	14	10.6
Burglarly	1375	11.5	31	22.1
Robbery	214	1.8	5	3.5
Theft	445	3.7	10	3
Criminal damage/Arson	370	3.2	8	5.1
Fraud/forgery	246	2.1	6	1.3
Drugs	5056	42.4	n/a	16.2
Theft of/from motors	170	1.4	n/a	3
Alcohol	152	1.3	n/a	1.1
Road traffic	1301	10.9	n/a	3.7
Misc	799	6.7	n/a	7.2
Total	11922	100	101	101

the scientific support unit (SSU) to gauge, in consultation with IOs, whether the case is worth submitting and if so what items to submit. Partially devolved submission involves paperwork scrutiny within the SSU to determine approval, with devolved selection and submission of items. Fully devolved submission involves case and item discretionary decisions made locally with no reference to or approval required centrally at the SSU. Devolved submissions might or might not be accompanied by a devolved budget to purchase forensic science services.

Where force areas are large and relatively sparsely populated, full central submissions are impracticable. Here either paperwork based approvals systems are in place or discretion is fully devolved to local commands. Where discretion is fully devolved, budgetary monitoring and control are problematic. Unless the forensic science budget is treated for practical purposes as unlimited there is a clear potential for periodic budgetary crises with knock-on effects on patterns of forensic science usage. There was one sample force where usage of forensic science is erratic because of these budgetary and decision-making arrangements - discretionary spending is simply stopped for periods of time. In another sample force fully devolved decision making was accompanied by effectively unlimited funds so that there had been no need for

periodic moratoriums on expenditure.

Where they exist, central authorisation policies are quite widely resented when police officers hope that forensic examinations may help inform their investigations, but fear that the materials will not be submitted. Seriousness of case often takes precedence over prospects of useful investigative results in determining what will be submitted. SOCOs generally have a better understanding than police officers of the potential benefits from forensic tests, though there are some forces where it is quite weak. Clearly, they are ill equipped there to help make case and item selections or to take part in the approval process.

One of the pilot forces included in the study follows a distinctive submission policy. It submits all relevant items recovered to the forensic laboratory, and allows the decision to be made there as to which can usefully be examined to inform the investigation of the case. There is then regular review of the decisions made by the laboratory, with scope to query what has been done and to claim a refund where charges have been made for inappropriate tests.

Information provided to forensic scientists

Forensic suppliers are provided with background information on the case and the question or questions it is hoped that examinations at the laboratory will answer, as well as a sample of items collected. Questions asked are not always formulated in ways which are answerable by scientific examinations. Forensic suppliers were critical of some of the information provided. One referred to receiving the 'bare minimum information'. Suppliers were not always convinced they had been sent the most useful items for examination. A full list of items retrieved is not routinely included to enable the supplier to determine whether it might be possible to provide additional or more useful information with further tests on items not initially submitted. As one forensic scientist put it:

"The difficulty here is that (the service supplier) is often kept in the dark that other evidence has not been submitted. We need to establish a system so that (the service supplier) knows exactly what evidence is available but must be aware of the conflict of interest in being able to demand more items to enhance charging. There is an important conflict between the lab knowing what evidence is available and being in a position to exploit that position. Trust is needed."

Another forensic scientist making much the same point stressed that,

"(Provision of full lists of items) used to happen prior to item charging (but) we still carry out the same scientific processes and do not wish to spend time looking at negative items purely to increase charges to the police."

There was indeed suspicion in several police forces that suppliers might not always do the minimum needed to answer case-relevant questions. Levels of trust in suppliers were variable. In a few cases, particularly amongst SSMs, they are quite low. Here scientists are conceived of and treated as technicians contracted to answer questions at the lowest price possible, rather than as partners in an integrated investigative process. There is a corresponding lack of trust and confidence on the part of the forensic supplier.

The forensic analysis

Overall performance data

What is sent and subjected to external forensic examination is recorded on SOCIMS, where forces use it. There are variations in the number of items submitted and examined by offence, as indicated in table 6 below. The relative seriousness and complexity of cases probably explains some of the variance. There are also differences by force. An average of 4.31 items is submitted across all cases in all eleven sample forces for which these data were available. Of these an average 87% were examined and charged for. The within force average number of items per case submitted varied from 3.07 to 6.21. The percentage examined varied, for the ten forces for which these data were available, from 60% to 100%, though nine fell between 83% and 100%. There may be differences in practices in laboratories which partly explain variations in return rates.

The SSU and officer in the case (OIC) assessment criteria vary, though both are on a four point scale, where 1 refers to conclusive evidence identifying or eliminating a suspect; 2 refers to strong evidence identifying or eliminating a suspect; 3 refers to some evidence identifying or eliminating a suspect and 4 refers to no evidential value. There are some inconsistencies in practices between forces, and some cautionary remarks about these assessments are made on pp. 39-40.

Table 6: Average numbers of items sent and examined by case category

Offence type	Number of items sent	Number examined	% examined
Murder/suspicious death	8.63	5.53	64
Fraud	8.38	7.35	88
Sexual offence	7.34	5.43	74
Assault	7.1	5.54	78
Robbery	6.31	4.21	67
Burglary other	6.04	5.14	85
Theft	5.64	4.85	86
Burglary dwelling	5.5	4.75	86
Arson/suspicious fire	5.02	4.02	80
Theft of/from motor vehicle	4.92	3.9	79
Criminal damage	4.27	3.71	87
Misc	3.29	2.51	76
All	4.31	3.76	87

The SSU assessment is concerned with the adequacy of the answer to the question posed. It is a measure of ‘effectiveness’, that is of how strongly the analytic results associate or disassociate. The OIC assessment is concerned with the usefulness of the laboratory results in dealing with the case. Table 7 shows the percentage of assessment scores of 1 or 2 on the four point scale. It shows that the OIC assessment is consistently higher than that of the SSU. This is partly explained by the tendency of the OIC to return assessments where they feel forensic science has been more useful, and not to return those where it has been less useful. This can be seen by comparing the last two columns. The first shows the difference in scores for all cases assessed by the OIC and all cases assessed by the SSU. The second shows the difference for the sub-set of cases assessed by both the SSU and the OIC. It is clear that, even though the OICs still consistently give a more positive assessment, the difference is substantially smaller in this sub-set.

Table 7: Percentage of assessments of 1 or 2 by OIC and SSU for cases submitted for forensic examination, for all cases assessed and that sub-set assessed by both OIC and SSU

Offence type	OIC all 1/2	SSU all 1/2	OIC common set 1/2	SSU common set 1/2	Diff all	Diff sub-set
Murder/suspicious death	84	47	73	65	+37	+7
Fraud	74	62	75	62	+12	+3
Sexual offence	63	43	64	53	+20	+11
Assault	63	44	64	54	+19	+10
Robbery	56	36	54	39	+18	+15
Burglary other	80	63	79	70	+17	+9
Theft	66	50	65	62	+16	+3
Burglary dwelling	76	55	75	62	+21	+13
Arson/suspicious fire	66	47	66	58	+19	+8
Theft of/from motor	81	60	81	71	+22	+10
Criminal damage	77	63	77	67	+14	+10
Drugs	97	95	97	96	+2	+1
Alcohol	90	70	89	82	+20	+7
Road traffic	81	82	80	80	-1	=
Misc	86	66	87	81	+20	+6
All	84	75	83	79	+9	+4

Forensic work in force and by independent forensic suppliers

In addition to work undertaken by external forensic suppliers, forensic examinations can take place within force. We do not have performance data relating to this work.

A varying range of scientific processes are undertaken in-force. Table 8 shows the involvement of forces in devolved processes as reported by the twelve SSMs interviewed. It shows that the PRSU-SST suggestions (outlined on page 5) are only being implemented currently very partially.

Table 8: Degree to which selected forensic processes are undertaken within the twelve sample forces

Devolved process	Amount performed in-force			
Description	None	Little	Lot	All
a) Restoration of serial nos	1	2	5	4
b) Examine documents, indented writing (ESDA)	3	5	4	0
c) Examine altered – forged docs	2	1	4	5
d) Presumptive test drugs/kits	1	4	5	2
e) Presumptive test blood	0	1	2	9
f) Lift footwear marks	8	2	2	0
g) Use/maintain footwear mark collection for intelligence	6	2	2	2
h) Examine tyres	5	3	3	1

It was clear in all forces that understanding of what devolved processes are undertaken is very patchy. Table 9 shows the pattern for one (typical) force.

In one force devolved processes are primarily to screen items before submission to forensic science laboratories where they are intended as a cost-saving measure. In others, the in-force procedures are alternatives to external suppliers. Perceived advantages of in-force arrangements related to their speed and their costs compared to external suppliers. Police officers, however, knew little about the nature and range of processes undertaken in-force. Table 9 is typical in showing the range of understandings about what was done.

Despite the strong recommendations from PRSU-SST, there is very little QC/QA³ for in-force scientific work. References were occasionally made to procedures for ESDA (ElectroStatic Document Analysis) and for fingerprint identifications, but to little else. Some concerns were expressed about this. In some forces plans to introduce QA procedures were mentioned. Where expert evidence was not going to be given as a result of the work, it was believed by others that QA was unnecessary. In one force the SSM was anxious about health and safety arrangements for in-force work, especially in relation to work on erased serial numbers on engines, where strong acids are used.

³ Quality Assurance refers to tests of systems in place, for example by declared or undeclared trials. Quality Control refers to procedures to make sure operations are functioning properly.

Table 9: Variations of respondents' assessments of devolved processes undertaken in one force

Devolved process	Amount performed in-force			
Description	None	Little	Lot	All
a) Restoration of serial nos		sibo	ib	m
b) Examine documents, indented writing (ESDA)	s	ibof	i	m
c) Examine altered – forged docs	mif	sbb	i	
d) Presumptive test drugs/kits	iif	b	sbi	m
e) Presumptive test blood	sif	mb	i	
f) Lift footwear marks		sb	ibo	mif
g) Use/maintain footwear mark collection for intelligence		siibf	b	mo
h) Examine tyres	o	sb	ib	m
m = scientific support manager s = senior investigating officer i = investigating officer b = beat officer o = other (custody sergeant) f = first officer attending				

Unfortunately it was not possible to gauge whether there are overall savings from in-force processes and if so how large they are in the forces included in the study. Full costs could be quite high in some cases, where time, equipment and space costs are all included. When asked forces were, however, unable to estimate the full costs of processes undertaken. This is presumably because they do not have to be paid in the same way as do external suppliers.

Where external services are used, SSMs play a crucial role in selecting which forensic supplier to use. Information on suppliers was deemed by some to be commercially confidential. It is possible only to estimate the spending patterns on non-FSS suppliers for ten of the twelve forces. Amongst these, 95% of the cases were sent to the FSS, involving 98% of the expenditure on external forensic suppliers. Of the non-FSS suppliers, 73% of the cases, involving 67% of what was sent went to one firm dealing with the examination of documents. Non-FSS suppliers were

generally working in niche markets. None provided the full range of services offered by the FSS.⁴

Though the FSS has quite elaborate QC/QA arrangements, other suppliers' arrangements are less clear. FSS laboratories have National Measurement Accreditation Services (NAMAS) accreditation for methods used in them, for example, though this does not go for all others.

Communication with IO in undertaking forensic work

In many cases the forensic scientist will need to contact the IO to clarify exactly what scientific work to undertake, the nature of the question(s) to be addressed and the sorts of answer which can be expected from the scientific work. One forensic scientist explained:

“Only after nine years of experience do I fully understand why police ask for specific examinations. Quite often from reading a set of circumstances provided on the HOLAB form you can anticipate what questions you are likely to be asked - sometimes however those questions are not asked.”

More information appears to be provided to the forensic science supplier for serious than volume crimes. For example, whilst witness statements were provided in 37% of 150 serious crimes, they were provided in only 5% of the same number of volume ones dealt with by the forensic scientist respondents.

Forensic scientists had direct contact with the OIC in 44% of the total of the 150 serious crime cases, but in 37% of the volume crimes cases. This included some scientists who make contact with the OIC a standard feature of their work.

From data collected in this study, shown in figure 2, as well as Saulsbury et al (1994) it is clear that in force there is insufficient understanding of what can reasonably be expected from various scientific procedures. The police user of results will thus not be in a position to determine in advance what usefulness can be hoped for from the work which is commissioned.

The report submitted to the police by the forensic scientist

The principal report of forensic science findings takes the form of a witness statement. In this the scientist outlines the background to the case as they understand it from information provided by the police, the question posed by the agency commissioning the analysis, an explanation of the test/s undertaken and their results, and an opinion as to their meaning in terms of the question posed about the

⁴ The reader is reminded once more that this report deals only with forensic science provision and usage outside London, and the comments here do not deal with the MPFSL.

case in the light of the circumstances presented to the scientist.

The results will quite frequently refer to the probability of matches of items examined in the light of statistical data-bases. The expert opinion is phrased rather differently and refers to levels of strength of the evidence examined in the light of the known context of the case. It includes a judgement, not on the guilt or innocence of a particular person - that is deemed a matter for the court - but on whether there is strong or weak evidence that they were somewhere or did something because of the co-presence of trace materials with known distributions and other circumstantial evidence. The discussion on page 9 showed that statements by forensic scientists, at least within the FSS, are now well regarded by the police.

The forensic scientist may also communicate results informally to the police either to amplify on the written statement or to provide them more quickly.

The use made by the police of forensic analysis

Police use of forensic findings clearly depends on the circumstances of a particular case. If a suspect is eliminated, then this clearly suggests the need for a new line of inquiry. If a suspect is implicated results may indicate that yet more corroborating evidence is needed. Alternatively it may furnish sufficient corroborative evidence to warrant a charge being made. The case may then be sent to the Crown Prosecution Service or, in some cases where the suspect admits the offence they may be cautioned. The forensic evidence may also be used in questioning suspects to obtain further evidence from them implicating others or clearing the case. The forensic evidence may finally indicate that the incident is one of a series which needs to be investigated collectively.

The very availability of materials which might be submitted for forensic examination may play a part in investigations, where a suspect decides to admit an offence they have been denying because they have been told of the availability of materials which will connect them with the incident. Many forces will not submit materials once an offence has been admitted. The possibility that items might be sent is enough to sustain the admission. If the admission is withdrawn only then will the examination be called for.

The use made of forensic evidence in court

The study did not include examination of CPS understanding and use of forensic evidence. There is anecdotal evidence from the SSM in one force, however (not in our sample), that as many as 10% of case submissions are made at the behest of the

CPS, presumably in the hope of strengthening their case. Other forces claim that this is exceptional, and forms a negligible proportion of the forensic work undertaken in their area. The issue warrants further research.

It is clear that forensic scientists themselves believe their attendance at case conferences with the CPS to be very useful. As one respondent put it:

“You get to learn about the likely challenges to your evidence and future questions for cross examination. Often counsel tries to solicit from the expert the likely responses to some of the defence questions in order to test the strength of the evidence which is then passed back to the defence counsel. That provides guidance for all involved and also points can be agreed or jointly accepted as a fact in issue.”

Case conferences, however, continue to be infrequent, notwithstanding comments from Touche Ross in 1987 and the RCCJ in 1993. Data from interviews with forensic scientists related to 81 attendances at Magistrates Court in the previous year. There were 48 presentations of evidence to the court and one case conference. There were 138 attendances at Crown Court over the same period. This led to 82 presentations of evidence to the court and twelve case conferences. Of 247 cases discussed with forensic scientists there had been only nine contacts about the casework with the CPS. This contrasts starkly with the much closer relationship which typically exists between defence counsel and their expert witnesses.

Summary

Figure 3 summarises what was found concerning the way forensic science was used in the investigation of incidents. It juxtaposes what actually occurs with what in theory is needed if contact trace materials and their analysis by forensic scientists are to play their most effective and efficient role in police investigations in particular and in the criminal justice system more generally. It is clear that there are many shortcomings.

There are obvious costs in the mismatch between theory and practice at each stage. The weaknesses are more significant in volume than in major crime.

Figure 3: The use of forensic science in crime investigation – a summary of findings

The theory	The practice
1 Scene well preserved by victim/reporter of incident and then FOA.	Not looked at, some evidence that evidence frequently disturbed/washed away.
2 FOA/IO assesses scene accurately for scope for SOCO/forensic scientist collection of cas relevant and useful contact trace material (CTM).	FOA ignorant about potential discriminative powers of forensic science. Determine SOCO/forensic scientist attendance with insufficient understanding of their potential contribution.
3 SOCO/forensic scientist examine scene adequately briefed by FOA/IO, look for CTM confirming/disconfirming and adding to initial line of investigation.	In volume crime little briefing about case. Generally routine scene examination without focus on details of case. In major crime more information on case, more verbal briefing, more directed examination.
4 SOCO/forensic scientist communicate useful findings to FOA/IO.	In volume crime little direct communication, at best available on computer. Much more in major crime.
5 Cases selected for submission where there are prospects of evidence informing direction of inquiry and cost is warranted.	Seriousness of case often more significant than prospects of usefulness. Little use for inceptive purposes. Corroboration rather than elimination orientation.
6 Items selected for submission which throw light on case, plus list of all other items collected which might be analysed.	Lists of other items rarely provided. Selection on cost basis.
7 Items packaged appropriately with continuity assured.	Some evidence of packaging problems.
8 Submissions provide full background information on case, enabling the forensic scientist to make a judgement about answerability and intelligibility of question asked.	Variable amounts and adequacy of information. Questions often poorly formulated.
9 Forensic scientist examines items which are likely to throw light on questions addressed and other issues germane to the inquiry.	Some supplier examination of almost all materials sent to them, and some failure to assess whether other forensic science examinations might be significant for inquiry.
10 IO and forensic scientist communicate verbally about question posed, proposed analysis and results.	Some verbal communication.
11 Full QC/QA procedures for forensic analysis.	Not all suppliers have QC/QA. In force scientific procedures rarely have QC/QA.
12 Forensic scientist writes clear, objective witness statement.	Generally OK. Some police expectation of less equivocal reports.
13 CPS grasps meaning and significance of forensic scientist witness statement in context of case and takes appropriate account in prosecution decisions.	Infrequent informal contact/consultation of CPS with forensic supplier pre-trial.
14 Court enables expert evidence to be presented clearly, with agreed points of difference between prosecution and defence highlighted.	Small number of pre-trial conferences involving counsel, prosecution and defence experts.

5. Pro-active uses of forensic science

The discussion has so far concentrated on the conventional use of forensic science, that is in the reactive investigation of individual incidents after the event. We move now to pro-active uses of forensic science. There is rather little to report here.

The Forensic Science Service is keen to promote more imaginative uses of forensic science. There are also police officers and SOCOs in many forces who can foresee benefits from additional uses of forensic science in achieving police objectives. As Figure 4 shows, the extent of actual use of forensic science beyond the conventional reactive one already discussed here is, however, very limited. There have been several footwear projects, where local indices of footwear marks have been used both to identify series of crimes and to apprehend suspects. Marker grease has been used to target offenders repeatedly returning to the same premises, and 'Probe-FX' for property marking. Occasional efforts have been made to target forensic efforts in high crime areas to help catch and convict prolific offenders. Some forces have tried to use forensic evidence as part of crime pattern analysis packages to identify series of offences as an aid to detection of sequences of incidents once a suspect has been identified. More recently, of course, the DNA database has been established.

Unfortunately even where there have been initiatives where more pro-active uses have been made of forensic science these have not been subject to rigorous evaluation, so that the pay-off is unclear and there are no adequate grounds for disseminating them further. It has not been possible in this short and wide-ranging study to fill the gaps in research in these areas. There is scope for the development of well designed, rigorous assessments by independent evaluators.

It is worth stressing the potential that repeat victimisation may offer for proactive use of forensic science. Patterns of repeat victimisation show that those victimised in many crime categories, such as domestic and commercial burglary, are at increased risk of further victimisation particularly in the short term. Moreover the enhanced risk grows as the number of victimisations goes up. This clearly offers scope for targeted proactive use of forensic science to assist in the apprehension of offenders, for example through the use of unique markers.

Figure 4: Pro-active use of forensic science in achieving police objectives

Potential uses	Actual uses
Identification/information on series of offences.	Use of footwear, tool mark, drug databases, etc.
Information on likely attributes of offender.	Little use.
Part of local crack-down campaigns.	Little use.
Protect high vulnerability crime targets.	Little use.
Trap particular offenders.	Little use, except for petty crime.

6. Organisation and management

Organisation and management are considered in three areas: first, within police forces; second, within forensic science service suppliers; and third, in the relationship between suppliers and users, in particular the police.

Organisation and management within police forces

All twelve sample forces had some form of Scientific Support Manager, even though this was not always the term used to describe the role. The background and attributes of SSMs differed widely. There were seven civilians, of whom two were ex-forensic scientists, one a scientist but not a forensic scientist, one with a background in management, and three who had already worked in scientific support. There were five police officers or ex-police officers of whom the most junior was a sergeant and the most senior a DCI. Not surprisingly, when asked if background was important several SSMs replied that it was, and that their particular background - in police investigation, scientific work or management - was especially appropriate! Notwithstanding this, several also did note the importance of an understanding of police investigation even where they had not had previous experience of this, and all acknowledged that managerial skills are needed, as had been stressed in the Touche Ross report.

The areas of work over which the SSMs had responsibility generally accorded well with Touche Ross recommendations. They oversee the work of SOCOs, the fingerprint unit and the photographic section, within a Scientific Support Unit. They are almost all accountable to the head of CID. Several respondents, though, mentioned that they would prefer to be directly accountable to an Assistant Chief Constable (ACC). This would give them a stronger voice in force decision-making and would take account of the broad role played by the SSU, which goes beyond the concerns of CID. Ten of the twelve SSMs were based at force headquarters and valued the access this gave them to heads of other departments and the decision makers in force. Those not based at headquarters felt this to be problematic.

In discharging their overall responsibilities SSMs were asked about particular tasks they were expected to perform. These again generally corresponded well with Touche Ross/PRSU-SST recommendations. Two points, though, are worth noting. First, responsibility for criminal intelligence was often devolved to others and/or not considered a central task. Second, a supposed formal responsibility of SSMs relates to major crime scene management, for which several were ill-prepared by background.

The SSM was asked about the number and background of the SOCOs for whom they were responsible. It was not possible to make sense of the wide variations in the numbers of SOCOs per force in relation to police officers or recorded crimes. The ratio of SOCOs to recorded crimes varied from 1:2,141 to 1:5,290, with an overall figure of 1:3,439. This variation is only slightly less than that found in Touche Ross

in 1987 (see page 4). The ratio of SOCOs to police officers varied from 1:45 to 1:105, with an overall figure of 1:75. The most well provided force on both measures most frequently complained of staff shortages!

Within the forces examined, of the 59 senior SOCOs there were slightly fewer civilians than police officers, with 28 civilians and 31 police officers. However, amongst the 383 main grade workers the ratio of civilians to police officers was about two to one, with 254 civilians and 129 police officers. Home Office Circular 105/1988 had included SOCOs amongst those for whom civilianisation was recommended. The cost differentials between police and civilian SOCOs is evidently shrinking. Whilst police respondents did not complain about either police or civilian SOCOs, and the career commitment to scene examination was mentioned in relation to civilians, many stressed benefits from police involvement in scenes of crime work. Police SOCOs were thought to have a better grasp of the investigative process and their role in it, to understand the law better, to deal with suspects more effectively, and often to be more sensitive to victims.

As already noted SOCOs were generally more knowledgeable about forensic tests and their potential discriminative powers than more junior police officers, especially FOAs, though there were some exceptions, and one force where they were particularly weak. This is significant as SOCOs are often called on in forces to give advice in cases of uncertainty about forensic work.

The geographical distribution of SOCOs within forces varies quite widely, and does not consistently fit with the Touche Ross preference for a divisional base. In one of the sample forces, all SOCOs were based at police headquarters. Here the location of HQ meant that travel times would never exceed much more than 30 minutes. In other, larger and more geographically dispersed forces different patterns exist. SOCOs have their own bases in some to reduce travel time. Each covers more than one division, and SOCOs are available if needed outside their patch. In others, in accordance with Touche Ross recommendations, SOCOs are divisionally based. Where they are divisionally based SOCOs normally have dual accountability - both within the division for operational matters and to the SSU centrally for professional purposes. The most effective arrangement appears to be that where SOCOs are based on division and share premises with operational officers, enabling informal communication about cases and feedback on scene visits.

SIOs at major crime scenes work closely with the crime scene manager and with SOCOs in deciding what to collect for what purposes. This seems to work well.

Police officers quite often collect items directly from suspects and from victims, and there are varying procedures to enable that to happen more or less effectively. In some cases there was confusion over packaging requirements and a lack of forensic

awareness about the potential usefulness of differing materials.

Some divergences, ambiguities and ambivalences

There were certainly some SOCOs who defined their task in fairly narrow terms. If called to a scene, they were to examine all fully to the same professional standards, and to take fingerprints and collect all contact trace materials found. They did not, thus, so much identify themselves as members of an investigative team as technically proficient and specialised scene examiners and CTM collectors. Other SOCOs saw themselves as partners in or servants to the investigative process, aligning their work to the investigative needs of the case. Others still were concerned to perform well in terms of performance measurements, that is maximising scenes where marks are found, regardless of professionalism or case-related prospective usefulness.

The varying definitions of SOCO tasks mirror variations in the way SSMs appeared to approach their role, though the following makes sharper distinctions than are actually found and several SSMs would not fit purely into any one of the types outlined. There were those who deemed themselves custodians of a limited budget and were concerned to maximise output from it in terms of Scientific Support Unit products. They wanted to maximise the scene visits by SOCOs or the scenes where trace materials were found. They would also try to minimise the cost of analyses by forensic scientists by assiduously looking for the cheapest supplier. These produce a narrowly market driven approach. There were other SSMs who looked to maximise the contribution of their units to achieving force objectives. Here scientific support and its deployment was subordinated to wider force concerns, for example with crime clear-up rates, or with solving serious or high profile crimes. Finally, there were SSMs who were anxious to provide a high level professional service to as many cases as this could be provided for, without regard much either to quantity or to relevance to force objectives.

Organisation and management of forensic providers

The major supplier of forensic science to the police outside London is the Forensic Science Service which, as indicated earlier from our sample force data, received 98% of police expenditure on external provision in 1994. The Metropolitan Police Forensic Science Laboratory is obviously the key provider for London at the time of writing, though this is merging with the FSS, with full effect from April 1996.

The FSS operates six laboratories: Aldermaston, Birmingham, Chepstow, Chorley, Huntingdon and Wetherby. Each of these services a number of forces. There is some specialisation also, for example Huntingdon undertakes firearms work nationally.

Because the FSS has retained its position as the major supplier of forensic science services to the police outside London, and because its change of status has opened

the market to other suppliers, it warrants particular attention.

The benefits of hard charging, competition and agency status for the FSS in helping to produce flexible, economical and responsive provision of forensic science services to the police were alluded to by the RCCJ and have already been mentioned. The FSS regularly conducts customer satisfaction surveys relating to its own work and these reveal significant improvements. For example, the BMRB survey of 1995 reveals that whilst in 1993 41% of respondents believed the FSS service overall to be excellent or very good, this had increased to 50% in 1995 (BMRB 1995). This survey also sought to identify continuing needs for further improvement. These were found in relation to work on volume crime, speed of delivery, value for money and communications. The FSS believes its customer facing approach, which has been engendered through agency status and the need to respond to market pressures, ensures it actively attends to the users' concerns.

There are numerous other suppliers normally specialising in particular niche markets.

Forms of relationship between suppliers and users

Notwithstanding the benefits which may have followed from hard charging and agency status for the FSS, uneasiness in the purchaser-provider relationship sometimes surfaces. This may simply reflect the recency with which these have been introduced.

Within police services, there is often some equivocation about what is expected from the FSS, or any other supplier. In some a professional relationship is wanted, in others a commercial relationship is stressed and in yet others a partnership is expected. It has not so far proven easy everywhere to combine the benefits from each of these. The FSS is on the one hand defined as a public sector, public service organisation with which the police have a special relationship. On the other hand the police understandably reserve the right to withhold information and to turn to alternative suppliers whenever they can save money by doing so, and thereby to treat the FSS just like any other commercial supplier in open market competition.

Running through the FSS are perceived to be corresponding equivocations. The FSS refers to the police as 'customers'. It also operates a marketing department. This can sometimes appear to the police to represent a promotional/commercial orientation at the expense of shared participation in the pursuit of common goals. Yet the FSS is also known to be owned by the Home Office, to be staffed by civil servants, and to have a history of public service with a commitment to work with the police in the efficient and effective attainment of their ends. This image of the FSS also sometimes seems to prevail.

The major organisational day-to-day contact between the FSS and the police is

conducted by the FSS account manager and the SSM. The SSM is at the sharp end of managing the budget for external forensic science services, making purchasing decisions, and achieving best value for money outcomes for the police service to which they belong. The SSM also deals with a range of other suppliers, as well as the FSS. The ambivalences over the FSS/police relationship are vividly illustrated in the varying ways in which they are resolved by differing SSMs, though their action is also of course shaped by the policies, budgets and orientations of their home forces.

Some SSMs, without effective budgetary limits, operate an unregulated public servant-public servant relationship with the FSS. There is little need for or interest in cost minimisation or cost-benefit maximisation. Agency status for the FSS has not affected the way forensic science is used. There is little or no discipline to expenditure. The benefits of a market are not being obtained. Some SSMs, with strict budgetary limits, operate a public servant-public servant relationship, but with little thought for expenditure. They risk periodic budgetary crises. Other SSMs operate a customer-commercial supplier relationship. Cost control is central. Output-maximisation and input-minimisation is aimed for. Police and criminal justice outcomes, however, may be overlooked. Finally, some SSMs have tried to exert a degree of commercial discipline in their relationship with the FSS, whilst continuing to acknowledge its public service ethos. Several SSMs acknowledge the public service character of the FSS, but ration use to remain within budget for example by central screening. Where the forensic budget was perceived to be limited it was clear in interviews that police officers knew that this was the case and exercised restraint accordingly.

However natural it might seem in view of the history of the FSS, its place in the public sector and its overwhelming significance as a supplier to the police, the special relationship between the police and the Forensic Science Service is often resented by other suppliers. On being asked if effectiveness scores could be released to the project, one major independent supplier, articulating the general concerns of many, wrote:

“I have to say we are alarmed at the possibility of details of our effectiveness being passed on to Government agencies that are our commercial rivals...We already operate at a considerable disadvantage by being excluded from the Scientific Support Managers’ meeting while our competitors have full access. Is the balance being further weighted against us?”

7. Effectiveness, value and value for money

Asking whether forensic science is cost-effective is not intelligible: forensic science is used in too many different ways; there is too little data on costs of alternative ways of solving crimes; forensic science normally operates not as an alternative but as a complement to other police work; there are many opportunities to improve the way forensic science related decisions are made with uncertain pay-offs and so on. There is a research agenda which could ask how and in what circumstances forensic science can be used most cost-effectively. The good practice guidelines are intended to provide informed pointers as to what would be needed to achieve this.

A few issues concerning assessments of forensic science related work are addressed below.

Cost-benefit measurement

The project has been unable to cost forensic science use - it would clearly be inappropriate to cost only that part of expenditure on external suppliers, since it is only one element, possibly a small one. Yet other costings are hard to obtain. No force was able fully to cost its own devolved processes. Moreover, the cost-benefits of forensic science usage are entirely contextually determined, and contexts vary. The same might be said of other means of undertaking police inquiries. There has been remarkably little research relating to the cost-benefits of using informants, or door to door enquiries or extended interviews with victims or from increasing the speed with which police respond to reports of incidents or any other investigative tool. The relative cost-benefits of expenditure on forensic science need to be set alongside those from other uses of scarce resources. As Her Majesty's Inspectorate of Constabulary said in the recent report on South Yorkshire:

“Until the various alternative methods of crime investigation - for example, interviewing, enquiries, criminal targeting, surveillance, crime pattern analysis, fingerprints - are costed, no force can assess whether it is achieving value for money from its use of forensic science, or whether the proportion of monies allocated to this aspect of crime investigation is appropriate. It is also essential to weigh carefully which forensic tasks should be done internally or by external agents other than the FSS; in the longer term, the police benefit from the complex and expensive research carried out by the FSS and their credibility in the judicial system, but that requires the police to make continuous best use of their services.” (HMIC 1994).

Since different forms of inquiry are often complements rather than substitutes comparative cost-benefit calculations become enormously complex.

Table 10 shows that amongst the nine sample forces for which data were provided there were wide variations in disposition to invest in forensic science related work.

Spend per recorded offence and per SOCO vary by a factor of four, that per police officer by a factor of two. No transparent force-need differences could explain these variations. Regrettably, the project is unable to determine whether all or any are spending either too much or too little. It is almost certain, however, that each could improve the value for money from its level of expenditure, whatever that might be.

Table 10: Variations in expenditure on external forensic science provision in sample forces

Force	£ per recorded offence	£ per SOCO	£ per police officer
A	11.70	36,292	371
B	8.10	24,444	234*
C	7.80	21,428	297
D	5.90	22,022	289
E	5.70*	19,569*	213
F	5.10	18,527	243
G	4.70	9,756	216
H	4.50	15,917	187
I	3.30	17,172	212
* = median scores			

Measurements of effectiveness

To make matters worse, existing methods of measuring effectiveness and usefulness of forensic science work are highly problematic. Table 7 (p. 24) gives some of the results. Measurements need to satisfy two conditions. They need to be reliable and they need to be valid. Reliability relates to consistency - to the reproducibility of results. Reliability questions ask, 'Would any competent person come up with much the same number when making the measurement?' Validity relates to the match of the measurement to the phenomenon being examined. Validity questions ask, 'Does this measurement really capture what it is supposed to represent?' Validity and reliability are by no means the same. Children asked to estimate the straightness of a pencil put in a glass of water will reliably report that it is bent, even when it is not. By asking a number of assessors to examine the same set of witness statements, the 'North-West Forensic Effectiveness Group' are helpfully looking at the reliability of SSU assessments. They are finding some systematic differences between forces, but also a degree of overlap.

They have not looked at the consistency of assessments from differing types of assessor, that is reliability across disciplines. Their reliability tests also tell us nothing about the validity of the measurements. Indeed it is difficult to know exactly what the assessments mean. Assessors are asked to judge the adequacy of the answer given in the witness statement to the question posed, using a one to four scale. Just what is being assessed - the adequacy of the question, and/or the adequacy of the materials sent, and/or the adequacy of the background information, and/or the quality of the scientific investigations themselves, and/or the nature of scientific understanding of the materials being looked at, and/or the composition of the statement - is unclear. Often there are several questions, several tests and a range of materials sent to the forensic supplier. The uncertainties multiply. The scores on all fronts may correspond on a number of cases which will produce rough reliability in assessments, but the meaning is intrinsically unclear. The measurement may have face validity, but is highly ambiguous.

Measurements of usefulness

Officer-in-the-case assessments of value of forensic science to individual cases are also made. These come closer to final outcome measures than SSU ones. There have been no efforts to assess their reliability. Whatever their validity they are problematic because of the low and highly variable response rate. There are reports of their completion within the SSU, which of course does undermine their validity. Officers also report that they often fill them in after the case quickly and not very thoughtfully, in the midst of other more pressing work. What it is that leads them to make their assessment is not clear. In individual cases, of course, there are thoughtful and informative judgements, the numerical score frequently supplemented with considered comments. These supplementary comments highlight the inadequacy of a simple number score, and make it doubtful whether aggregating and averaging scores adds up to anything very meaningful.

Assessing value

Notions of 'value' in value for money raise difficult problems. There is no clear index of value. Its assessment involves normative judgements which may vary from person to person, role to role, time to time, and case to case. How much value is to be attached to the non-conviction of an innocent suspect? How much value is to be attached to solving a particular high-profile case? How much value is to be attached to a particular clear-up rate for any volume crime? What value is to be attached to securing convictions of guilty persons in court for various offence categories? Where there are alternative means to achieving ends to which a given value is attached relative cost-effectiveness may be measured, but as already stated we do not have data on this; moreover often there will not be alternative means to a given end and in other circumstances means are often not discrete alternatives but operate jointly.

Force performance indicators

One danger with performance indicators is that they may be misleading. Even more seriously, they may actually distort behaviour in counterproductive ways (Tilley, 1995). For example, an existing performance measure for SOCOs, the rate at which fingerprints are found, might lead to the collection of marks with little or no attention to or prospect of helping police in individual inquiries.

Some ways forward

A practical way forward is to look to ways in which efficiency improvements can be made by attending to weaknesses in current practices. Earlier sections of this report make it clear that there is ample scope for this approach. The guidelines deriving from this project spell out in some detail what needs to be attended to in the investigative process if increased benefit is to be obtained from investment in forensic science related work within force and in conjunction with external suppliers. The various stages can be thought of as a 'value chain' in regard to which each link may be stronger or weaker. The guidelines spell out what shapes the strength of the linkages and points to ways of achieving improvements. The outcome will be a more efficient way of using forensic science in the investigative process to achieve whatever values prevail.

8. Factors impacting on future forensic science provision and use

The implementation and use of the DNA database

The study described here and the PRG programme of work which has fed into it have clearly not been able to assess the use and consequences of the National DNA Database since this only went live in April 1995, six weeks before the date this report was to be delivered.

There were initial fears amongst a number of SSMs and forensic scientists that the development of the DNA database might syphon funds from budgets allocated by forces for other forensic analysis. Early indications are that forces appear generally if not universally to have set aside a separate sum for DNA database work, though estimating needs is problematic since there are widely varying estimates of the proportion of scenes which will yield stains susceptible to DNA profiling. Any longer term effect of the DNA database will presumably depend in part on its outcome effectiveness, which has obviously yet to be evaluated.

The DNA database will certainly involve new training for officers who will take buccal samples from suspects for DNA analysis. It will also require the creation of appropriate sample storage arrangements. These were not in place in all police stations at the time of the study.

Changes in police organisation

Those commanding Basic Command Units (BCUs) are being given increasing discretion in the use of their resources. They are also developing local policing plans which, though not fully independent of force and national objectives, speak to the particular needs and interests of the local community. A part of this local control of resources may include decisions about investment in SOCOs and in forensic science examinations. The wide variations in patterns of usage of forensic science and in use of SOCOs at force level may be replicated at divisional level. Central control will become more difficult, and the relationship between the central SSU and what happens on divisions may change. Depending on how scene work is construed it is possible to imagine a scenario in which types of and variations in relationship between divisional purchasers and force central providers may replicate those currently between force purchasers and providers of forensic science services. There may even be competition between alternative SOCO suppliers. It is not inconceivable that forensic suppliers may then themselves compete for the scene examination business. They may compete for case and item sifting work, though this might be difficult if purchaser/provider divisions are to remain clear.

With regard to scene and forensic work currently undertaken for volume crime, there seems no reason why decisions should not be taken as locally as possible, in divisions; or why all existing central scientific services should remain where they are. To stop this local control falling into serious difficulties much more local expertise would be required than is presently available.

Changes in the criminal justice system

Clearly changes in the law could impact on the extent and nature of demands for forensic science services. If, for example, the law surrounding possession of drugs were to be changed, as has been mooted in some quarters, then this would reduce the number of drugs analyses.

If changes were to be made to the kinds of evidence required to prove cases in court this too could again plainly have an impact on the uses made of forensic science.

National objectives for the police

The police orientate their priorities in part to the Home Secretary's National Objectives for policing. If these were to change radically, which is not intended in the short term, then they could affect decisions about which incidents to focus on and differing incidents entail differing patterns of forensic science use.

Alterations in the forensic science market

Since the Forensic Science Service was given agency status, there has so far been rather little change in the nature and range of alternative suppliers. There are 'niche' suppliers, but no new general purpose fully staffed forensic laboratory is yet fully operational. This limited penetration into the police market for forensic science may in part be explained by the enormous costs of setting up a laboratory which are estimated at approximately £7 million, and in part by the lack of personnel with the necessary skills for forensic work outside the Forensic Science Service and the MPFSL.

There may be more scope for alternative suppliers of routine tests to emerge. These would be capable of providing bulk quality assured analytic tests relatively cheaply. If this were to happen across a significant proportion of the work currently undertaken by the FSS, accredited forensic scientists could then be used to interpret the results in the context of the case. If expertise related mainly to interpreting (and maybe commissioning) analyses generally done elsewhere, it is much less clear that large general purpose forensic laboratories are needed. A disaggregation of the FSS might then be conceivable with a plurality of small interpretative practices amongst whom police customers could pick and choose. This would radically alter the pattern of

provision. There is nothing to suggest it would be cheaper, more effective or more useful, but it is a conceivable scenario. Intuitively it is less likely to be effective, because of the complex communication channels.

Change in the nature or status of the Forensic Science Service

Since the FSS continues overwhelmingly to be the main provider of forensic services for the police and prosecution, any change in its position potentially has a high impact. At one extreme, were all or significant elements of it to join the private sector, then the continuing close and special relationship with the police might change. At the other extreme were the market no longer to be used as the mechanism for allocating the nature and volume of forensic science work done, then other suppliers would be less attractive and their share of the market might become still less than it is now. There are clearly a range of other possible futures for the Forensic Science Service which might have an effect on the supplier side of forensic science.

The FSS merger with the MPFSL

The effects of the FSS/MPFSL merger may be larger on the patterns of usage and provision in London than elsewhere in England and Wales, given that the MPFSL currently has a different pattern of work to the FSS.

Changes in crime rate

In relation to volume crime, the current pattern of usage of forensic science might change rather little. A greater or lesser proportion of the available population of cases would be examined. Changes in numbers of major crime incidents might, however, have an impact, though it again might only lead to a reassignment of priorities within the police service and amongst forensic suppliers.

Changes in analytic techniques available to forensic scientists

The potential for new techniques to impact on forensic science related work within forces and amongst suppliers has already been illustrated by reference to the DNA database. It is not possible to foresee future developments, though research is ongoing and will be important in shaping what can be used by the police in coming decades. Greater automation of processes may reduce the demand for forensic scientists and could remove the labour barrier to entry into this market.

The FSS/ACPO National Project

This project, to which ACPO, the FSS (the largest supplier of forensic science services) and the Home Office are party is intended to help inform future developments. A good practice guidance volume, which is informed by this diagnostic paper, is advocating quite substantial changes which if implemented may affect patterns of usage.

9. Conclusions

This report has reviewed current policies, practices and organisational arrangements within which forensic science services are used by the police and provided by suppliers. Whilst independent suppliers have been discussed at various points, greater specific attention has been paid to the FSS because of its unique and continuing dominant position.

If the tone of this report appears negative, this is in part because many matters of concern were identified. The good practice guidelines, which are also a product of the study, provide positive messages about ways forward by addressing the source of the weaknesses identified.

Baldly stated the main conclusions are as follows:

- a) Even though many of the broad structural arrangements suggested by Touche Ross have been implemented, rather less of the details aimed at improving yields from forensic evidence have been. Later reports, notably the House of Lords Select Committee and the RCCJ as it relates to forensic science, have yet to be acted on.
- b) There is widespread lack of awareness within the police service about forensic science itself and what various tests can do. This, combined with the wide discretion employed by those making decisions leading to its use and non-use, will inhibit optimal usage of forensic science.
- c) The absence of sustained research into ways of solving crimes and their costs means that questions about cost-effectiveness, value for money etc. cannot be answered. In any case current patterns of usage of forensic science could not reveal its investigative cost-benefit potential.
- d) The use of forensic science in the investigation of major crimes appears to be relatively well informed and to take place efficiently. The forensic/investigative process in volume crime appears generally to be less well thought through.
- e) Little pro-active use is currently made of forensic science. It is almost entirely used in reactive investigations of single incidents. Exploration of its potential for wider use has scarcely begun and the cost-benefits of this will need to be carefully examined in demonstration projects, before general adoption could be advocated with confidence. This may provide an alternative way of using forensic science in police responses to volume crime.
- f) In a number of respects it is not clear what the future holds for forensic science use. In particular, the development of a national DNA database may have a strong influence on patterns of usage. It is not clear yet what its pay-off will be. In the longer term it might have an impact on more traditional forms of forensic analysis.

- g) Apart from the work of the FSS and other public sector laboratories, rather little that is done in force or by external suppliers is quality controlled or quality assured. The risks of this to justice and to credibility are obvious.
- h) Current within-force routine methods of estimating the effectiveness of forensic related work have dubious reliability or validity. They are, at best, starting points for further investigation.
- i) Training and communication weaknesses identified in Touche Ross remain, and are fundamental to the problems currently being experienced.

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Annex A: A brief summary of 'Using Forensic Science Effectively'

The following is a very brief outline of major themes developed fully in the National Project Team's guidelines on good practice: Using Forensic Science Effectively. This document is being published by ACPO/FSS and will be available from the Forensic Science Service.

Maximising the benefits from forensic science in police work

The successful use of forensic science in police work depends on the following linked principles:

- a) Good communication between all those involved from initial investigation, through scene examination, item collection, and case submission, to scientific analysis and interpretation.
- b) Sound and effective management mechanisms based on maximising teamwork, ownership, focus and direction, and fitness for purpose.
- c) An appropriate and adequate level of understanding of forensic science, the law and the investigative process for the role held to be performed successfully.
- d) Partnership between police and forensic suppliers based on trust that both are working together in the pursuit of the shared aims of efficient investigation of crime leading to the identification and prosecution of the guilty and the rapid elimination of the innocent from investigation.

Detailed advice is given about ways of translating these principles into specific practices.

Forensic science in the investigative process

The benefits of forensic science are affected by the competence and behaviour of all those involved in investigating an offence, about which again detailed practical recommendations are made.

- a) The victim or reporter of the incident needs advice on scene preservation if best use is to be made of any potential forensic evidence which may be available.
- b) The first officer attending, if required to advise on SOCO attendance, needs sufficient understanding of forensic science matters to come to an informed judgement. If a scene is to be examined FOAs need to know what needs to be preserved and how to preserve it.
- c) The SOCO needs sufficient information about a case to examine the scene intelligently. Verbal communication is rare in volume crime cases but is much preferred. It occurs most readily where officers meet SOCOs as a routine part of

work practices, for instance where they share a building.

- d) The investigating officer needs to understand or to have ready access to someone who does understand the potential (or lack of potential) items have for useful forensic examination if educated decisions about submission are to be made. They need also to have sufficient understanding, or advice, to determine the potential usefulness of scene attendance by a forensic scientist.
- e) The scientific support unit need to be very well informed if they are to make appropriate decisions about item or case selection for transmission to the laboratory. If cases and items are selected inappropriately opportunities for forensic examinations which might contribute to the investigation may be lost. In most forces item selection does not occur. Where it does there are many examples of missed opportunities for fruitful forensic examinations. Item selection in force may in many cases prove very costly in the longer term.
- f) The forensic scientist needs to be given full information about the case, its circumstances, and the physical and other evidence collected properly to interpret the significance of test results for the case. Clear lines of communication between the IO and the forensic scientist are needed to clarify any potential misunderstandings.
- g) Forensic examination results need to be made available at a time when they can inform the direction of a police enquiry.
- i) The investigating officer needs to have clearly understandable statements from forensic scientists to be able properly to interpret findings and act in relation to the case accordingly.

Proactive use of forensic science

Potential but hitherto underdeveloped opportunities to align forensic science to responses to repeat victimisation, to crack-downs in high crime areas, to crime pattern analysis, and to crime intelligence are noted.

What needs to be done

In no known force are conditions yet in place where maximum benefits can be obtained from current levels of use of forensic science. No supplier is known fully to meet the needs of police services. There is, thus, room for improvement through close examination locally of the adequacy of current arrangements.

There are serious communication weaknesses through the whole investigative

processes, which forces and suppliers are advised to address in their own circumstances. There is scope for providers and suppliers to devise ways of working which enhance partnership ways of working based on mutual trust and professional respect, whilst disciplined by market mechanisms. There are wide scale training needs to provide those performing separate roles with adequate understanding of what they are doing.

Each force/division could usefully review its own provision for optimum incorporation of forensic science into the crime investigative process. Each force could usefully consider what contribution forensic science could make to proactive aspects of police work, though the pay-off from this is as yet uncertain.

Annex B: The forensic awareness question

Some contact trace materials have been recovered. Using the scale, conclusive = 1; strong = 2; some/limited significance = 3; no evidential value = 4; don't know = 5; - how significant do you think an individual forensic science test could be in associating the following? Assume normal situations, and by all means comment if you are not sure or wish to qualify your answer.

1. soil recovered from a shoe to a particular flower bed
2. a splash of blood to link to an individual (non-DNA)
3. a multi-layered and multi-coloured paint flake to a damaged vehicle
4. sawdust and debris from clothing to a safe ballast
5. a footwear mark to an item of footwear
6. glass fragments from clothing to a modern house window
7. a semen stain to a donor (by an appropriate test)
8. an instrument (tool)mark to a particular instrument
9. a single layered white paint flake to a sample of paint
10. determination of the presence of an accelerant on clothing
11. a tyre impression to a tyre
12. a single hair to a person (assume no DNA)
13. a DNA analysis to identify a person
14. fibres to a particular jumper
15. broken pieces of an object to make a mechanical fit

Marking scheme

Most of the questions have only one 'correct' answer, but for some there is a 'best' answer and a 'valid' one. In addition, if a qualifying remark is made this may uprate an answer. The scoring therefore included 'wrong', 'right' and 'valid' marks, with don't knows being scored as 'valid'. The 'correct' answers are given below. 2/1 means 2 or 1 right, with 2 most likely (conclusive is used in its everyday sense), 3(2) means 3 is correct, with 2 possible on qualification. Other answers may also be allowed when good reasons are given, since the purpose is to determine the actual knowledge of the subject.

1. soil recovered from a shoe to a particular flower bed		3
2. a splash of blood to link to an individual (non-DNA)		2/3
3. a multi-layered and multi-coloured paint flake to a damaged vehicle		2/1
4. sawdust and debris from clothing to a safe ballast		3
5. a footwear mark to an item of footwear		1
6. glass fragments from clothing to a modern house window		3
7. a semen stain to a donor (by an appropriate test)		1
8. an instrument (tool)mark to a particular instrument		1
9. a single layered white paint flake to a sample of paint		4
10.determination of the presence of an accelerant on clothing	1	
11.a tyre impression to a tyre		1(2)
12.a single hair to a person (assume no DNA)		3/4
13.a DNA analysis to identify a person		1
14.fibres to a particular jumper		3(2)
15.broken pieces of an object to make a mechanical fit		1

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