Why are arson detection rates so low? A study of the factors that promote and inhibit the detection of arson.

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Abstract

The national detection rate for arson is very low when compared to that for most other offence types. This paper explores why this is the case. It begins by examining the way arson is identified and recorded, and highlights the large mismatch between the numbers of deliberate fires *recorded by fire and rescue services and the number of* arson cases *recorded by the police. It then turns to the issue of detection rates for those incidents identified as arson. Here particular attention is given to a study that tracked 240 investigations across six police BCU areas. Analysis is conducted by using a framework based upon considering how the nature of cases, police activities, regimes and resources impact upon detections. Finally, a number of concluding comments are made.*

Introduction

Crime statistics in England and Wales have consistently shown that detection rates for arson are significantly lower than the average national detection rate and for a number of individual crime types (see Walker *et al*, 2006). In 2005/06 the average detection rate nationally was 24%, though for arson the

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detection rate was 8% (Walker *et al*, 2006)[1]. Whilst some previous research has considered factors that promote detections for crime types such as murder (Innes, 2002), and volume crimes such as burglary and vehicle crime (Eck, 1979:1983; Burrows & Tarling, 1987; Coupe & Griffiths 1996; Hewitt 2002; Jacobson *et al*, 2003; Burrows *et al*, 2005; Tilley & Burrows, 2005), no research has been conducted in the UK that considers how the police investigate arson and what factors can help secure detection (or ultimately, the conviction of an offender).

Though the research presented focuses specifically on arson, it builds upon a wider body of work that considers what factors promote and inhibit detections across a variety of crime types (for a review see Jansson, 2005). In reviewing the literature in relation to a number of these studies, Jansson (2005) suggested that the factors key to securing detections from volume crime investigations included:

1. The *solvability* factors that present themselves to the police
2. The *information* the public can give the police
3. The *actions* the police take in those cases that are detectable with some effort
4. Making *prompt responses* to reports of crimes
5. The *activities* that are conducted during the initial contacts between the public and the police, as these are normally the first opportunity to obtain leads and can often lead directly to arrests being made

6. Management *practices* and local policies/practices in relation to crime investigation

Commenting on Jansson's work and drawing conclusions in relation to their analysis of over 3,000 volume crime investigations, Burrows *et al* (2005) suggested that explanation for variations in detection rates are likely to be found to lie in at least four generic areas. These include:

1. The *nature* of the *cases* presented for investigation in different areas (the contexts of the case)
2. The *activities* the police carry out when investigating such crimes (what is actually done to investigate the crime)
3. The *regimes* that different police areas set up to handle such investigations (local policing policies)
4. The scale and composition of the *resources* available to the police to respond (e.g. officers available to response and investigate, SOCOs to conduct crime scene investigation etc.)

Though the distinction made by Burrows *et al* (2005) was not drawn in relation to arson investigations, it is asserted here that these four generic areas will be also be applicable to such investigations. These four areas are therefore used as a conceptual framework to present the findings of the case tracking exercise presented later in the paper.

The recording and detection of arson

With all types of crime, there is a process of attrition from the point of the actual offence to the recording of the offence as a crime and subsequently, its detection (see Kelly *et al*, 2005). The process of attrition in arson cases, however, is slightly different to most other crime types as the first emergency service contacted in relation to the event will generally be the local Fire and Rescue Service (FRS). Typically it will only be after the fire has been dealt that an initial judgement will be made as to whether the fire was 'suspicious' or not. If the fire is thought to be suspicious, fire investigators will be asked to examine the scene of the fire to establish the cause. Only if the fire is then thought to be 'deliberate' (this requires no actual proof) will the police conduct a criminal investigation. As two emergency services are often involved in dealing with fires, data in relation to arson are available from both the FRS and the police. FRS data on 'fires' are categorised into 'primary'[2] and 'secondary'[3] fires (these can be recorded as 'accidental' or 'deliberate'). These are collated by fire service personnel by completing a 'fire data report' form FDR1[4] (for primary fires) or FDR3 (for secondary fires) after they have attended the scene of the fire. Statistics are recorded by the police in relation to those incidents that are eventually considered to be crimes and are thus 'crimed' as arson.

Table 1 compares the numbers of deliberate primary and secondary fires recorded by FR services with incidents that are crimed as arson by the police for 2002/03 to 2005/06 (the latest year which published data are available). This begins to give an indication of the rate of attrition from the recording of a 'deliberate' fire by the FRS to the eventual recording of the incident as a crime

by the police. The table shows that there are large differences in the overall number of fires that are suspected as being deliberate by the FRS and the number that are 'crimed' as arson by the police: in 2004/5, for example, only about 1 in 7 deliberate fires were finally recorded as arson.[5]

Explaining variations in the detection rate for arson

The commentary above has highlighted some of the issues faced in identifying and recording arson offences. We now turn to the main factors that promote and inhibit the detection of arson. In recent research for the Department for Communities and Local Government (DCLG), attention was directed at arson investigations in six police Basic Command unit (BCU) areas. The aim was to try and obtain a mixture of areas: they were selected by taking two areas with a high rate of arson per 10,000 population, two with a average rate and two with a low rate. In each of the pairs, one BCU achieved a higher than average detection rate and the other a lower than average detection rate. Within these areas, a total of 240 arson investigations were tracked (40 in each area: 20 detected and 20 non-detected)[6] from initial police notification to final disposal.[7] In addition to this case tracking exercise, interviews were also conducted with crime managers, police officers, CID and SOCOs in each BCU area.

The findings are presented by using a framework developed from the four key factors that Burrows *et al* (2005) cite as being key to explaining variations in detection rates. Therefore consideration is given to the:

1. Nature of the cases presented for investigation,

2. Activities conducted during investigations,

3. Regimes in different police areas and

4. Resources available to the police to investigate incidents.

1. The nature of the cases presented for investigation

It is difficult to fully understand the full context of a case when simply viewing police case files: cases that at face value appear to be very similar could be very different. The research looked at a wide range of characteristics of arson offences but it found that the most striking feature rested on the distinction typically drawn[8] between:

1. Arson not endangering life: these offences constituted 72% (n=172) of the full sample.

2. Arson endangering life: which accounted for the remaining 28% (n=68).

Whether a case was viewed as arson endangering life (AEL) or arson not endangering life (ANEL) appeared to have a significant impact on the likelihood of a suspect being convicted, suggesting that fires presenting the greatest risks will be those where most efforts will made to clear up the crime . The attrition rate - from whether a suspect was identified through to conviction - for both types is presented in Figure 1. These data are *weighted* to give a more accurate representation of the proportion of cases that fall into each

subset[9] and it should be noted that the weighted figure corresponds almost exactly with the national detection rate for arson.

The figure shows that, throughout the investigation process, there was a greater likelihood of a suspect being identified for AEL cases and this led to a greater chance of securing a conviction. Overall a suspect was identified in 22.3% (n=312) of all cases, charged in 8.4% (n=182) and convicted in 3% (n=42), though for AEL cases the rates were 39% (n=66), 34% (n=58) and 13% (n=22) respectively.

The rate of attrition here shows similarities to the rates of attrition that have been observed in similar studies[10]. For example, in a study of over 3,000 volume crime investigations (of burglary dwelling, burglary other, theft of motor vehicle and theft from motor vehicle) Burrows *et al* (2005) found that a suspect was identified in 18% of cases, charged in 7%, charged in 6% and convicted in 4%. By comparison with this profile of volume crime offences, the arson tracking data shows that there is a slightly higher attrition rate from offence recording to conviction for arson offences.

In line with the pattern presented in Figure 1, Table 2 shows that the detection rate is significantly higher for offences that fall into the category of 'arson endangering life'. Overall, 8.6% of the sample were detected (when weighted), though nearly 31% of all AEL offences were detected compared to only 5.5% of ANEL offences.

As indicated above, previous research has suggested that variations in detection rates can partly be explained by timeliness, namely a quick response to incidents (see Burrows *et al*, 2005). The case tracking data show that for incidents that are classified as 'arson endangering life' the police tend to be notified more quickly about the incident, compared to arson incidents where life is not thought to be endangered. This is illustrated in Table 3: in over 50% of AEL incidents the police are notified within 10 minutes of ignition. In comparison, the figure falls to 21% for ANEL offences.

In turn, quicker notifications to the police appear to generate an 'immediate' or 'urgent' grading of the call by police control rooms, which then generates a more rapid police response to the incident. In 47% (n=44) of cases where the police were notified about the incident within ten minutes of ignition, the call was graded as an immediate/urgent response (compared to 15% (n=9) that were classified as 'routine'). In total, 68% (n=41) of notifications received after one hour of ignition of the incident will be graded as 'routine'.

As a consequence of more rapid notifications, the police tend to arrive at the scene of crime much quicker for AEL cases (Table 4). In 24% of AEL offences (weighted), the police arrived at the scene within 10 minutes of the ignition of the fire (and, within an hour, for 64%). In contrast only 7% of ANEL cases were attended within 10 minutes (and 39% within one hour).

There are also differences in the lines of information available to the police at the point of notification in AEL and ANEL cases: see Figure 2. Data on the

lines of information available to the police were recorded in 192 cases. This shows that AEL incidents tend to have a higher proportion of leads at the point of notification. No initial lines of enquiry[11] were available in 29% of AEL cases compared to 61% of ANEL cases. It should also be noted here that, where a call was graded as urgent/immediate response, there were typically better lines of enquiry: in only 37% (n=37) of cases for immediate response there were no lines, compared to 73% (n=45) for cases graded as routine response.

2. Activities conducted during investigations

Though the characteristics of the cases that present themselves to the police appear to have a strong impact upon the likelihood of the case being detected, there is also evidence that there are both variations in the types of activities that are conducted during arson investigations, and that these activities vary in the contribution they make to the investigation.

Figure 3 presents a flowchart of the different stages that were observed in arson investigations and how far through that process the sample of arson cases under review were investigated. Data are weighted here to present a more realistic overview of the 'true' proportions in each subset. The diagram shows that the majority of cases (88%) are subject to some sort of response. As might be expected, there is a response in 99% of AEL cases and in only 86% of ANEL cases. A total of 2% (n=31) of cases were detected at this stage with a further 5% (n=71) having a suspect arrested or awaiting arrest. A total of 12% (n=170) cases are almost immediately filed as undetected. Few cases (only 18%) are screened for secondary investigation and only 10% (n=133) of all cases were subject to secondary investigation.

It is evident that in cases that are detected there tend to be more useful lines of enquiry available at the point of notification. In terms of the activities that are conducted during the initial investigation there are some differences that are worth noting. Figure 4 presents the 'implementation' and 'productivity' ratio for activities conducted in the initial investigation in detected and undetected cases. The 'implementation ratio' is percentage of cases where the activity was conducted. The 'productivity ratio' is the percentage of cases where the activity had a positive impact on the cases outcome (i.e. led to an arrest, a lead about a suspect etc). This highlights that:

- Area searches were conducted in 18% of detected cases and 20% of undetected cases. However, the search made a contribution to the investigation in 82% of detected cases, and only 17% of undetected cases.

- A Scenes of Crime Officer (SOCO) attended 42% of detected cases and 26% of undetected cases. The crime scene examination yielded materials that made a contribution to the investigation in 22% of detected cases, but made no contribution to any undetected cases.

- A victim statement was taken in 56% of detected cases and 54% of undetected cases. However, the statement made a contribution in 82% of detected cases and only 11% of undetected cases.

- A witness statement was taken in 47% of detected and 11% of undetected cases. The statement made a contribution in 89% of detected and 31% of undetected cases.

It is interesting to note that these ratios show similarities to ratios observed for burglary by Burrows *et al* (2005) for all activities except SOCO attendance (which was much higher in that study). It is also apparent that in AEL cases there was a higher implementation ratio of activities compared to ANEL cases. In total, area searches were conducted in 25% of AEL cases (compared to 17% for ANEL), a SOCO attended 60% of cases (compared to 24% for ANEL), house-to-house enquires with conducted in 36% (compared to 16%), victim statements taken in 69% (compared to 62%) and witness statements taken in 50% (compared to 24%). What is of particular interest, however, is that most of these activities made a substantially greater contribution to AEL investigations, except for area searches and taking victim statements.

These activities were critical in generating the evidence required to detect the case. In 90% (n=108) of the detected cases it was possible to ascertain what evidence links were available that led directly to the case being detected. It should be noted here that in many cases there were a constellation of factors that generated detections. In the sample 50% (n=60) of all detected cases had just one 'evidential link' that was significant in the detection, though in a further 40% (n=48) there was more than one (with 22% (n=27) having two such links, 13% (n=16) having three, and 4% (n=5) having four).

As Figure 5 indicates, overall the suspect was caught at or close to the scene in 42% (n=50) of all detected cases, and this was a major factor in the resulting detection. In 31% (n=37) and 30% (n=37) of cases, respectively, there was a witness or victim identification.

3. Regimes that different police areas set up to handle such investigations

Semi-structured interviews were conducted with a range of police staff (including crime managers, investigating officers and SOCOs) across the six areas about the processes and policies they have in place to deal with arson. In broad terms, it was observed that the process and policies for arson investigations bear close similarity to other types of volume crime (such as burglary and autocrime). However - as the commentary above suggests - the primary 'driver' of police initial actions to investigate arson seems to be the distinction between alleged arson incidents thought to endanger life, and those thought not to involve such a risk. There was broad agreement across the six BCUs reviewed that AEL fires would be most likely to graded as requiring an urgent response and would be attended immediately. There was also a common view that the broad label of 'arson' used - which can encompass events as diverse as murder though to the most minor, or 'victimless' incidents – has very limited common currency. Indeed it could be argued that such a generalist label is not 'fit for purpose'.

The initial actions that the police take when arriving at the scene are dependent upon the severity of the incident and the risks apparent. The first concern of the police (and the FRS) is for public safety (clearing the scene and extinguishing the fire). It is then common practice for the police to turn their attentions to seeking out witnesses and to start taking as many witness/ victim statements as possible (which is borne out by the high implementation ratio in the data). It was suggested by some SOCOs during interview that more should be done to try and preserve physical evidence in arson incidents. Often the entire crime scene will be trampled down and saturated with water. A number of SOCOs also suggested that there are often misconceptions about the need to (or the usefulness) or calling a SOCO out to the crime scene. None of the areas had a formal policy for SOCO attendance at arson crime scenes, though one area suggested that SOCOs should attend all AEL scenes. SOCOs often thought that physical evidence could be yielded from more arson crime scenes, but this is typically viewed by senior officers as being too costly to pursue.

In relation to the screening of cases for investigation, it was apparent that 'screening' meant different things to different areas. All areas suggested that arson cases tend to show their solvability factors very quickly, and for most cases there is no need for formal screening. In most cases, unless a suspect has been identified or there is another strong lead, the case will be filed. It was common for a case to be reviewed before it was filed. This review was normally conducted by the local crime management unit and was based upon a judgement about the likelihood of detectability rather than any formal scoring

criteria. Officers stated that it was rare for a suspect to be detained at the scene of an arson incident (though the evidence in Figure 6 suggests otherwise). However, they did place a strong emphasis upon the role of witness and victim statements as often incidents stem from domestic or personal disputes. [12]

4. Resources available to the police to respond

As the in-depth study was only conducted within a sample of six BCU areas, it is difficult to make any statistically meaningful conclusions about the relationship between resources and arson detection rates from this strand of work. However, national data show that the variation in detection rates are strongly related to the number of deliberate fires in police force areas and the number of police officers in each area. Figure 6 considers the relationship between the average number of deliberate primary fires per 10,000 population (as recorded by the FRS), and the rate of arson detections per 10,000 population in each English police area. A negative association is observed between the number of deliberate primary fires per population and the detection rate per10,000 population (r= -.748: sig at 0.01 level). *In short, as the number of deliberate fires increase in an area, the detection rate falls.*[13] Similarly, in the six BCU areas where case data were collected the number of arson incidents recorded was negatively associated (though weak) with the detection rate (phi=-.272 *ns*).

Figure 7 presents the relationship between the number of police staff per 100 arson incidents and the percentage of arson incidents detected across each English police force area. This shows that the forces where there are the most police staff per arson tend to display a higher rate of detections. The relationship has a correlation coefficient of r=.443 and is statistically significant (0.01 level).

Again a similar relationship is observed between the percentage of arson incidents that are detected and officer strength in the six sample BCU areas (r=.228; *ns*). Overall, there were 241 officers per 100,000 population in the three higher detection rate BCUs and 178 per 100,000 population in the three lower detection rate BCUs.

Summary and concluding comments

This paper begins to highlight why detection rates for arson are generally low and can vary quite substantially. This issue has been explored by considering how incidents of arson initially come to the attention of the police, how they are recorded and how they are investigated. It is apparent that arson is a 'unique' crime for two reasons. First, the FRS is often the first emergency service in attendance at a fire, whereas the police would normally be the first emergency service to respond to most other types of crime. Second, while the police record incidents of arson, the FRS also keep records on deliberate fires and thus observations can be made about the large attrition rate that appears

to exist between FRS data on deliberate fires to arson detections. It is apparent, however, that when considering how incidents of arson are investigated and what eventually leads to detections, there are many similarities to other crimes.

Arson detection rates vary considerably across police areas (rates ranging in 2005 from a high of 15% to a low of 4%). To try and begin to explain why these patterns exist, data were presented from a study of arson investigations commissioned by the DCLG. These data were presented within a conceptual framework that suggested that variations in detections could be explained by the nature of cases that present themselves to the police, activities conducted within investigations, police regimes and resources. The key findings were:

1. *Nature of the cases:* It is clear that the characteristics of cases presented to the police have a large impact upon the likelihood that a case will be detected. In the sample of 240 investigations, cases that were recorded as AEL were reported to the police more speedily than cases that were recorded as ANEL. These cases therefore had a quicker response, generated a greater number of lines of enquiry and had a higher detection rate.

2. *Activities:* Area searches and house-to-house enquires were conducted and witness statements taken for a similar proportion of cases that were eventually detected and undetected. However, in cases that were eventually detected, scenes were more likely to be

attended by SOCOs and witness statements taken. Area searches, house-to-house enquires, victim statements and witness statements tend to be perused as a routine part of an initial response, and these activities were often very productive in helping to produce the information that led to the detection. As expected, for AEL cases there was a higher implementation ratio for all of these activities.

3. *Regimes:* None of the BCU areas where the study was conducted had any special policies in place for the investigation of arson. In many areas a response was made in AEL cases and the subsequent chain of events triggered during the initial investigation led to a detection. All of the areas claimed to review cases throughout the investigation and had screening policies for further investigation. However, it was apparent that if a detection hadn't been secured during the initial investigation it was unlikely that much further could be done (it should be noted for example, that in detected cases 70% (n=70) of suspects were arrested within 24 hours of the offence commission). There was also little evidence of formal attendance policies for SOCOs to visit arson crime scenes. Some SOCOs suggested that not all arson crime scenes were fully exploited for physical evidence. There was, however, some evidence that BCUs with higher detection rates had stronger management regimes in terms of case review and data analysis of arson incidents.

4. ***Resources:*** Nationally, there is a negative correlation between the number of deliberate fires recorded and the detection rate within a police area. Thus, where there are more fires, the detection rate tends to be lower. There is also a strong positive correlation between the number of police officers per 100 arson incidents and the percentage of incidents that are detected across each police area. These patterns were replicated in the six BCU areas under review.

It is apparent there are wide variations in detection rates for arson across police areas that might be partly attributed to the resources that each police force has at their disposal and how these resources are utilised. However, the generally low detection rate for arson is also explained by the nature of the cases that present themselves to the police and the subsequent activities that are completed throughout the initial investigation. There is a strong emphasis on responding to arson cases that endanger life in a timely fashion. A quick response then generates initial leads and a greater chance of detection than for other types of arson. This is not to say that arson detections tend to be fortuitous, though most of the detected cases could be described as what Eck (1983) categorised as 'self-solvers'. Thus, rather than being detected through investigative effort, most incidents that are detected have 'solvability' factors that can be converted into detections if they are responded to in a timely fashion. The nature of the cases presented to the police trigger a chain of events that increase the chance of detection. Both reporting and response times for ANEL cases are slower and thus the chances of achieving a detection through the initial response are minimised. After these opportunities

are lost there often appears to be little potential in pursuing an investigation as the effort required to obtain a detection begins to outweigh the rewards.

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Tables and figures

Table 1: FRS 'deliberate' fires and police recorded arson, 2002/03 to 2005/06

	Deliberate Primary fires	Deliberate secondary fires	Total deliberate fires	Police 'recorded' arson	Difference
2002/03	108,000	209,100	317,100	53,200	263,900
2003/04	99,500	256,000	355,500	57,200	298,300
2004/05	77,700	256,000	333,700	48,038	285,662
2005/06	-	-	-	45,742	

Table source: ODPM fire statistics and Home Office recorded crime statistics

Table 2: Types of arson offences and likelihood of detection

	Arson endangering life	Arson not endangering life	Total
Detected	30.8 (n=52)	5.5 (n=68)	8.6 (n=120)
Not detected	69.2 (n=117)	94.5 (n=1162)	91.4 (n=1279)
All	**100 (n=169)**	**100 (n=1230)**	**100 (n=1399)**

Base: Weighted data 1399 cases (chi-square significant at 0.001 level)

Table 3: Time from ignition of fire to notification of the police

	Arson endangering life	Arson not endangering life	Total
0-4 Minutes	27.9 (n=43)	12.5 (n=141)	14.3 (n=184)
5-10 minutes	24.6 (n=38)	8.1 (n=92)	10.1 (n=130)
11-60 minutes	27.9 (n=43)	22.4 (n=253)	23.1 (n=296)
Over 1 hour	19.4 (n=30)	56.8 (n=640)	52.3 (n=670)
All	**100 (n=154)**	**100 (n=1126)**	**100 (n=1280)**

Base: 1280 weighted cases where time from ignition to notification known (chi-square significant at 0.001 level)

Table 4: Time from ignition of fire to police arrival at scene

	Arson endangering life	Arson not endangering life	Total
0-10 minutes	23.7 (n=23)	6.7 (n=52)	8.6 (n=75)
11 to 60 minutes	40.2 (n=39)	32.5 (n=250)	33.3 (n=289)
Over 1 hour	36.0 (n=35)	60.7 (n=467)	57.9 (n=502)
All	**100 (n=97)**	**100 (n=769)**	**100 (n=866)**

Base: 866 cases where time from notification to police arrival known (chi-square significant at 0.001 level) Data are collapsed into 0-10 minute cell due to low numbers of cases available for the 0-4 minute cell.

Figure 1: Attrition in all cases, Arson Endangering Life cases and Arson Not Endangering Life Case (expressed as proportion of cases within each subset).

Base: All weighted cases= 1,399 (169 AEL and 1,230 ANEL). Data are based on records that might not always be complete.

Figure 2: Initial lines of enquiry available at point of notification in arson endangering life and arson not endangering life cases

Base: 192 cases; 42 arson endangering life and 150 arson not endangering life

Figure 3: Stages of the investigation in the cohort of cases

Call to police ⟶ initial response ⟶ outcome of initial response ⟶ screening for secondary investigation ⟶ outcome of screening

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                                              ┌─────────────────────┐
                                              │ 2% -already         │
                                              │ detected (n=31)     │
                                              ├─────────────────────┤
                                              │ 12% -already        │
                                              │ filed undetected    │
                                              │ (n=170)             │
┌──────────────┐   ┌──────────────┐           ├─────────────────────┤
│ 100% -call   │   │ 88% -response│           │ 5% -suspect         │
│ made to police│  │ made and     │           │ arrested (n=71)     │
│ (n=1,399)    │   │ initial      │           └─────────────────────┘
│              │   │ investigation│
│              │   │ completed    │
│              │   │ (n=1,220     │
└──────────────┘   └──────────────┘
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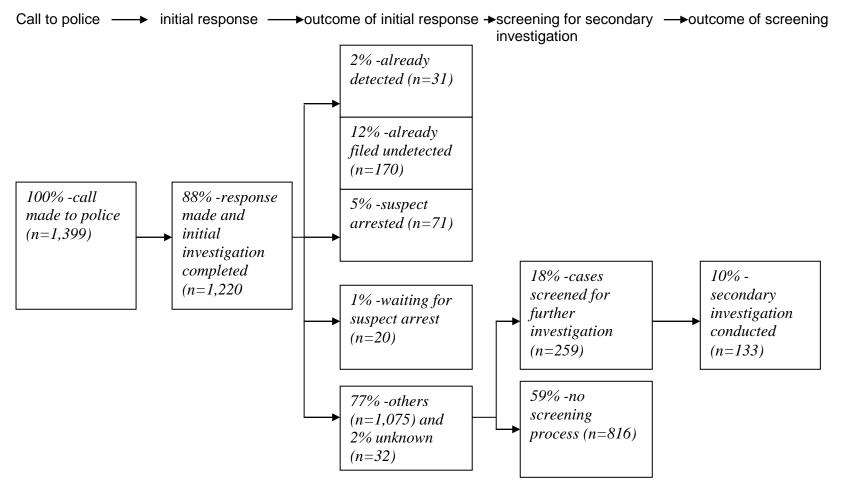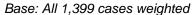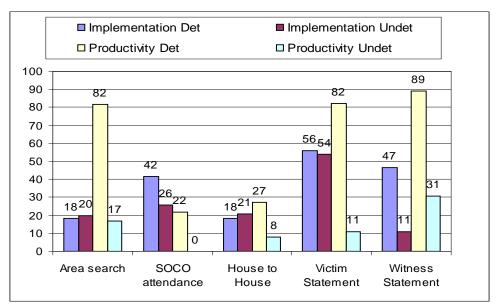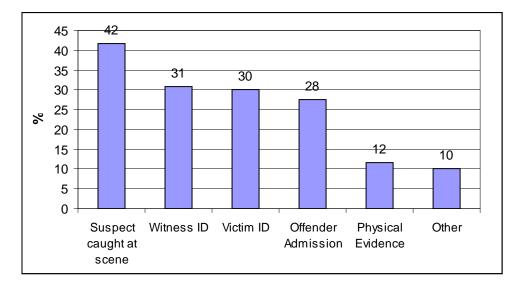
100% -call made to police (n=1,399)

88% -response made and initial investigation completed (n=1,220

2% -already detected (n=31)

12% -already filed undetected (n=170)

5% -suspect arrested (n=71)

1% -waiting for suspect arrest (n=20)

77% -others (n=1,075) and 2% unknown (n=32)

18% -cases screened for further investigation (n=259)

59% -no screening process (n=816)

10% - secondary investigation conducted (n=133)

Base: All 1,399 cases weighted

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Figure 4: Key activities carried out in the initial investigation and their 'productivity'

Legend: Implementation Det, Implementation Undet, Productivity Det, Productivity Undet

Activity	Implementation Det	Implementation Undet	Productivity Det	Productivity Undet
Area search	18	20	82	17
SOCO attendance	42	26	22	0
House to House	18	21	27	8
Victim Statement	56	54	82	11
Witness Statement	47	11	89	31

Base: All 240 sample cases

Figure 5: Key evidence types available in detected cases

Evidence type	%
Suspect caught at scene	42
Witness ID	31
Victim ID	30
Offender Admission	28
Physical Evidence	12
Other	10

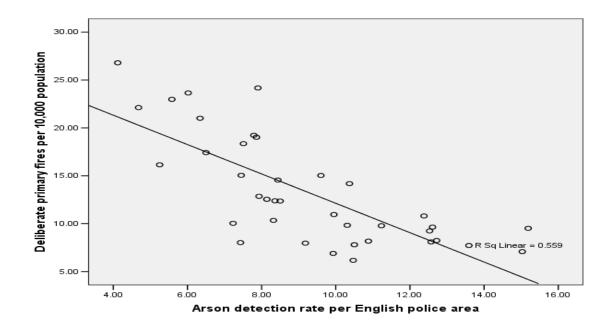*Base: All 120 detected cases*

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Figure 6: Deliberate primary fires per 10,000 population and detection rates for police force area.

Base: 38 English force areas: R square indicates that around 55% of the variation in arson detection rates is explained by the number of deliberate in the police force area.
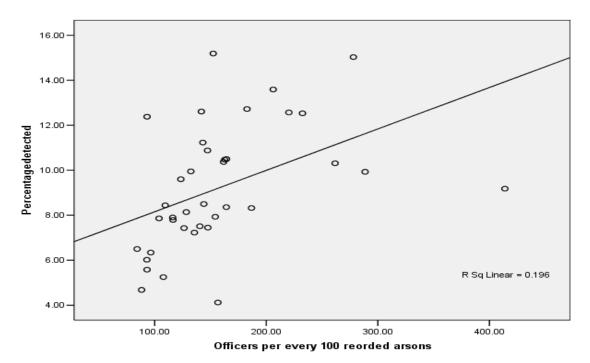
Figure 7: Number of police officers per 100 recorded arson incidents and percentage of arson detected.

Base: All 38 English forces: R square indicates that around 19% of the variation in arson detection rates is explained by the number of staff per 1000 arson incidents in each police force area.

[1] Arson tends to have lower detection rates than many other main offence groups. For example, in 2005/06 the detection rate for drug related offences was 93%, violence against the person was 42%, theft and handling stolen goods 16% and burglary 13% (Walker *et al*, 2006). For criminal damage (of which arson offences are included) the detection rate was 12% (these are sanction detection rates).

[2] Primary fires are reportable fires or any fires involving casualties, rescues, or fires attended by five or more appliances.

[3] Secondary fires are reportable fires that were not in primary fire locations, not chimney fires, did not involve casualties and were attended by four or fewer appliances.
[4] FDR- Fire data report

[5] Some previous research has highlighted why this high rate of attrition of attrition exists, though limitations on space prevent us going into detail. The research conducted primarily points to FRS recording and police recording practices for the rates of attrition. For a more detailed overview see, Burrows *et al*, 2000; Simmons *et al*, 2002; Sugg, 2003; Merrall & Chenery, 2005; ODPM, 2005 and FRS Circular, 1/2006.

[6] Cases were selected by taking a sample of cases that were completed over a period of 12 months working backwards from the start of the data collection period. Therefore if 20 undetected cases were required in a BCU area and 200 had been recorded over the course of the year, every tenth case would be sampled.

[7] Data were collected from police investigation files and directly inputted into an Access database. Data collected included details of the initial investigation such as if a response was made to the initial report, what actions were taken throughout the initial investigation (such as house-to-house enquires, taking victim statements, witness statements and so on), if a secondary investigation was conducted, what forensic evidence was collected, if any suspects were arrested and charged for the offence and final disposal codes.

[8] In one BCU a number of cases were simply recorded as 'arson'. However, after reading the notes on the case files these incidents could be classified into either 'arson endangering life' or 'arson not endangering life'.

[9] The weightings are primarily used where comparisons are required within a sample that represents the 'true' proportion of detected and not detected cases: for example, where detected cases are being compared to undetected cases.

[1010] In relation to the stages of the investigation that were observed in the data an initial response was made (i.e. police attendance) in 88% of all cases (n=212). After the initial response, 24% of the total sample had been detected (n=57), in 12% (n=32) a suspect was arrested, 8% of cases were waiting for a suspect to be arrested and a further 55% were still ongoing. A total of 23% of all cases were subject to formal screening for secondary investigation, and in 16% of cases there was a secondary investigation.

[11] The determination of what leads are available at this stage can sometimes be difficult. As previous work on investigations has pointed out (e.g Burrows *et al*, 2005), there can be something of a 'chicken and egg' issue here if the focus extends to all lines of enquiry: for example, the numbers of lines of enquiry evident in all arson cases where the police call for an urgent or immediate response may reflect why the police decided to respond rapidly (i.e. to take advantage of available leads), but it may also reflect the fact that calls that receive speedier police responses tend to reveal more potent leads.

[12] One area mentioned that patterns of arson incidents were often mapped using GIS software. However, there was little evidence of this impacting upon detections.

[13] A similar pattern is also observed for the relationship between the number of deliberate secondary fires and percentage of incidents detected, and for the number of incidents of arson recorded and detections. Both show statistically significant relationships with secondary deliberate fires and the percentage of detections being negatively correlated at $r=-.698$ and recorded arson and the percentage of detections being negatively correlated at $r=-.655$.