'A wicked problem'? Risk assessment and decision-making when licensing possession and use of firearms in Greater London

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Abstract
This paper analyses the risk assessment and decision-making used by a police force to assess the suitability of a person to own a firearm. The decision to grant a firearms licence has many characteristics of a 'wicked problem'. Firearms Enquiries Officers (FEOs) in the police force concerned primarily use professional judgement to solve this problem, employing various forms of reasoning and heuristics, but potentially also prone to cognitive bias. We conclude with some observations on how training of FEOs and their supervisors in risk assessment and decision-making might be further developed.

Introduction

The ability of members of the public in the UK to obtain licensed firearms remains tightly controlled, with successive legislation incrementally giving rise to one of the most restrictive firearms control regimes in the world (Squires et al., 2008: 10). Gun

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ownership levels in the UK are also relatively low compared with most other European countries (European Commission, 2013: 7) and Greater London has one of the lowest per capita rates in England and Wales.[1] Further, the majority of the 32,000 or so licence-holders in Greater London are law-abiding citizens who have good reason to own a shotgun or firearm, and store and use their guns in a safe and responsible manner. Moreover, compared to other more 'action-oriented' spheres of policing, firearms licensing may appear to be a largely bureaucratic, transactional function with little to interest the policing or academic communities.

And yet the three most recent, non-terrorist-related mass killings in the UK that involved the use of firearms (in Hungerford in 1987, in Dunblane in 1996 and in the county of Cumbria in 2010) were all committed by individuals holding shotgun and/or firearm certificates.[2] Similarly, there have been several tragic domestic incidents involving licensed firearms, including the attempted murder of Rachel Williams in 2011, the murders committed by Michael Atherton in Durham in 2012, and the murders of Christine and Lucy Lee in Surrey in 2014. Evidence is also emerging of an upward trend in firearms offences in England and Wales from 2016 onwards (Allen and Audickas, 2017).[3]

In England and Wales the procedures that determine whether a member of the public can lawfully possess and use a firearm are governed by the Firearms Act 1968 (as amended). The Home Office Guide on Firearms Licensing Law 2016 provides detailed guidance to police forces on how best to interpret and implement statute (Home Office, 2016).

The Firearms Act 1968 provides several tests in relation to the grant or renewal of certificates (licences). A key test is that a police force chief officer must be satisfied that any grant or renewal of a licence is 'without danger to the public safety or to the peace'. However, as HMIC notes, 'there is no definition, either in the Firearms Act 1968 or in the Home Office guidance to describe or explain how "danger to the peace" should be applied' (HMIC, 2015: 8). Case law offers limited direction, but suggests that 'irresponsible and uncontrolled behaviour' would amount to 'danger to the peace' (HMIC, 2015: 63). In the absence of detailed guidance, police forces have taken a pragmatic approach on what constitutes 'irresponsible and uncontrolled behaviour' amounting to 'danger to the public safety or peace'. However, there can also be a tension between the emotive or normative effect of an incident involving a certificate-holder and the tests imposed by the Firearms Act 1968 which govern how the police can react. For example, during the analysis of 730 case files (see 'Methods' below) we found certificates revoked by FEOs and their managers on grounds such as 'unsuitable behaviour to have a SGC [shotgun certificate] or FAC [firearms certificate], case of possession of multiple indecent images'. In this case even if this licence-holder were to be convicted of an offence under the Protection of Children Act 1978 and subject to a Community Order there would still not be a prima facie case that public safety or order would be at risk if the certificate were not revoked.[4] However, neighbours of the convicted person might naturally question why the offender retained the 'right' to own a potentially lethal weapon and was licensed to do so by the local police force.

Forces are also expected to 'have regard' to Authorised Professional Practice (APP) on firearms licensing, issued by the UK's College of Policing (College of Policing, 2016). APP provides advice to police forces on the risk factors that could be considered when deciding on licensing firearms, and these include any history of domestic incidents or violence, and the medical and mental health of the applicant (College of Policing, 2016). However, the advice does not include a rationale for the choice of the risk factors listed, nor how these factors should be weighted or combined in an overall assessment. In 2015 HMIC also found that many police forces in England and Wales were 'working outside' APP (HMIC, 2015: 10). It is also of note that neither statute, guidance nor APP provide forces with a comprehensive description of how those with delegated authority should arrive at a decision, and this allows 'room for interpretation and the creation of inconsistency in the way firearms licensing is undertaken within and between police forces' (HMIC, 2015).

In 2015 Her Majesty's Inspectorate of Constabularies (HMIC, now HMICFRS) reviewed firearms licensing across England and found that the way that forces managed the risk in relation to legally-held firearms was 'unsatisfactory'. Indeed, HMIC concluded with the observation that 'we cannot make our position any clearer: it is now for others to accept the need for change. If they do, perhaps the life of the next victim of firearms misuse might be saved. What is highly likely is that, if change is not effected, there will be another tragedy' (HMIC, 2015: 75).

There is clearly a need for a deeper understanding of the assessment and management of risk in firearms licensing in the UK and how decisions are made in practice. The two key questions that emerge are just how police forces should tackle the risks associated with the 'wicked problem' of firearms licensing (particularly as some 'off the shelf' risk assessment tools appear to be fraught with both conceptual and technical difficulties) and how current practice and training should be developed to support sound and effective decision-making?

Literature review

Although there is little research specifically concerned with risk assessment and firearms licensing in the UK[5] there are cognate studies concerned with how risk and decisions are made in other fields of policing and law enforcement. Of pertinence is a study by Carson et al. which reviews how the police and other public-sector employees take 'risky' decisions which may lead to, or prevent, serious injury. The authors suggest that good leadership, rather than administration or management, is necessary to tackle such 'wicked problems' (Carson et al., 2013). Other studies focus upon risk assessment and decision-making in relation to specific policing activities, such as managing missing person enquires (Smith and Shalev Greene, 2015), child protection (Munro, 1999), exercising the use of force (Dror, 2007) or protecting victims of domestic abuse (Ariza et al., 2016b; Robinson et. al., 2016b; Sebire and Barling, 2016).

Whilst the subject of these studies differ, it is possible to discern a number of common findings. In particular there is a concern around the value of highly structured risk

assessment methodologies, such as the use of 'risk matrices', which can lead to inflexible thinking and the devaluing of professional judgement (Munro, 1999). Dror emphasises the value of developing specialist cognitive skills through experience but supported through effective instructional and reflective opportunities (Dror, 2007). Moreover, two studies independently question the value of risk assessment tools when not supported by effective training and leadership (Sebire and Barling, 2016; Smith and Shalev Greene, 2015). Similarly, a study by Robinson et al. into the use of risk assessment tools in relation to domestic abuse was 'consistent with prior research which suggests that practitioners often rely on a small subset of risk factors, despite the presence of other available information which may be relevant for evaluating risk' (Robinson et al., 2016b: 11).

Methods

The methodology employed included desk-bound research and information collection to understand how firearms licensing legislation and guidance was implemented by the Metropolitan Police Service (MPS)'s Firearms Enquiry Team (FET); the risk assessment and decision-making processes used by the FET; the sampling of firearms application 'case files'; the development and testing of three scenarios subsequently used alongside 'dummy' firearms application forms and a series of semi-structured interviews with FET staff.

The interviews with FET staff were conducted in two phases: the first phase included 13 Firearms Enquiry Officers (FEOs); the second phase of interviews involved four sergeants who consider recommendations made by the FEOs and in some instances make the final decision to grant or renew a firearms or shotgun licence. The semistructured interviews explored the FEO's general approach to decision-making and specific risk assessment in firearms licensing, followed by a series of questions based on three scenarios issued to FEO participants at the beginning of interviews. Semistructured interviewing was used as it can elicit valuable qualitative insights into police decision-making and receptivity in other policing contexts (for example, Lumsden, 2017).

The scenarios included alongside the dummy application form involved the renewal of a shotgun licence and the grant (that is, a first-time application) of a firearm licence and these were developed through iteration and revision. Scenarios were employed as they are capable of generating rigorous, actionable material for researching complex and uncertain contexts (Ramirez et al., 2015) and have been used successfully in other research into police decision-making (for example, Brown and Daus, 2015). The scenarios were based on the collation and analysis of information from a large sample of Greater London applicant/licence-holder 'case files' – folders for each individual that contained the application form(s), an 'enquiry form' and risk assessment proforma completed by an FEO, references provided by the applicant, intelligence and other police database reports, GP reports (where applicable) and a report made by the FEO for a supervisor (normally a FET police sergeant) which included recommendations on decisions.[6] A stratified[7] random sample of case files[8] spanning the years 1992–2016 was

made and a relational database (tested for reliability and validity) was created. A proportion of sampled case files included reasons for an application for a firearms licence to be refused in the first instance (in which case no certificate was issued) or 'revoked' at some point after grant (for example, because of a subsequent criminal conviction) or for the refusal of an application for renewal (after five years). The database was queried and the primary reasons for refusal or revocation identified. The three primary reasons for refusal to grant a certificate (in descending order of frequency) were 'violence', 'driving offences' and 'domestic violence'.[9] However, the three main reasons for revoking a certificate (also in descending order) were 'domestic violence', 'mental health problems' and 'violence'. Furthermore, Latent Cluster Analysis (LCA) (Collins and Lanza, 2010) highlighted a correlation between 'driving offences', 'alcohol abuse' and 'violence' as factors likely to lead to a refusal.[10] Similarly, for revocation, LCA highlighted correlation between 'mental health' and the 'security of a firearm'. Three scenarios were constructed using the database queries and the LCA results. The scenarios were presented to FEO interviewees alongside a standard firearms application form (a '201') together with background information on the 'applicant'.[11] The research interviewer had additional information which could be provided 'on demand' during discussion of the application form and scenario if requested by the FEO interviewee. Supplemental questioning focused on the FEO's cognitive processes and decision-making when dealing with each dummy application and associated scenario, the reasoning behind their responses, and how they arrived at the overall recommendation.

A brief initial analysis of the semi-structured interviews revealed the key points and risk assessment and decision strategies used, and these informed the second set of interviews with the sergeants. The sergeants were provided with the same set of scenarios (including background information) together with the summary report completed by the FEO. The purpose of the interviews with the sergeants was to gauge concordance between the FEO's recommendations and their line manager's decisions, and to gain insight into the forms of dialogue and argumentation that occurs.

The transcripts of the semi-structured interviews were analysed for general decisionmaking and risk assessment strategies employed, and in particular the presence of forms of reasoning, heuristics and possible cognitive biases. As part of this analysis, a qualitative content analysis (after Mayring, 2000) and coding framework was employed with master tables of common forms of reasoning, heuristics and types of cognitive bias derived from the literature (for example, in terms of heuristics, Shah and Oppenheimer, 2008: 214). Reliability and validity of the coding was improved through the use of triangulation between the results obtained by the researchers involved in analysing the transcripts.

Results

An applicant is assessed for the risk he or she poses in terms of future threats (which may or may not involve the use of a licensed firearm), judged against a legal framework which empowers the police to either refuse an application for a shotgun or firearms certificate

or to revoke an existing certificate. When doing so, Firearms Enquiry Officers (FEOs) and their supervisors are encouraged and expected to adopt a form of 'structured professional judgement', in common with other forms of the 'policing of risk' (for example, domestic violence; Robinson et al., 2016a: 2). Complementary actuarial (statistical) methods of risk assessment are not currently used by the Firearms Enquiry Team (FET) surveyed but at the time of writing (2018) were being explored.

Although the risk assessment methods used by FEOs shared much in common with police officers in more operational roles, many of the cognitive and decision-making processes employed by FEOs permitted consideration of risks other than those used during rapid 'on-the-spot' risk assessments. FEOs were better able to consider all the realistic potential risks associated with an individual, checking evidence that either supports or refutes a hypothesis concerning the applicant, and drawing conclusions based on the results of their investigations.

Our semi-structured interviews with FET staff revealed that external factors played a significant role in FEO decision-making (echoing the findings of Dror (2007), on police officers' decisions to use force). In particular, FEOs were conscious that where a firearms application is rejected or a certificate is revoked, the applicant had a statutory right of appeal at Crown Court. They were also acutely aware that there would be significant repercussions on the FEO responsible if a tragedy occurred that could be even partly attributable to their assessment of risk.

FEOs and the 'home visit' with the applicant

During the semi-structured interviews for this research all the FEOs stressed the importance of a visit to the home of an applicant (the 'home visit'). This was reinforced during the interviews with the sergeants, who explained that they would regularly opt for additional face-to-face meetings with the applicant should the FEO report require further investigation or a second opinion. There is no Home Office obligation on police forces to conduct a home visit in the case of a renewal application for a certificate (unless a 'riskbased assessment' suggests otherwise: Home Office, 2016: 87, 91). When asked about this, the interviewees expressed that they would find it very difficult to advise on a 'renewal' applicant without a home visit. They were also very clear that a home visit was needed (not just a face-to-face meeting at some other location), as the home setting was seen as a major component in determining 'fitness' to own a firearm.

Both the analysis of the case files and the semi-structured interviews provided examples of the condition of the applicant's home being used by many FEOs as a 'proxy' for the physical and mental state of the applicant, with a dilapidated building potentially indicating mental and/or physical illness. FEOs, however, made it clear that this was not a final judgement, but simply a prompt for later questioning. The home visit is also used by the FEO to collect evidence that supports or contradicts the information given on the application form. In doing so, the FEOs are using the material presented on the application form as a self-declared 'picture' of the applicant (albeit limited in nature),

and then use the home visit to detect any possible significant disparities from this impression.

FEOs described their assessment of the fabric of the applicant's home visit assessment as being a threefold process: namely to assess the type of building in the context of the area, the physical security of the location and the condition of the person's home (the latter as a possible insight into mental and physical health of the applicant).

As a part of a preparatory reconnoitre, the FEOs assess the applicant's home compared with other buildings in the neighbourhood and evaluate its condition, layout and level of occupancy. Many of the MPS FEOs had worked in the same geographical areas for several years and it is likely that they were comparing the building, its location and occupants with others in the locality and using this to inform the assessment of risk. The FEOs noted any observable alarm systems and any shared entrances or communal areas so they could be discussed subsequently with the applicant in the interview.

Once inside the applicant's home, FEOs described carrying out a similar assessment of the interior of the building, looking for indicators of physical security, the state of the rooms and how the building relates to similar dwellings in the surrounding area. This evaluation of the interior of the premises would be tested against the impression given by the exterior and, if the two matched, some level of corroboration is given to the initial assessment of the applicant. If the two do not correspond, then the mental picture is revised to accommodate the new information, or a flag is raised to indicate the need for further investigation.

The FEOs considered the home visit interview with the applicant to be the most 'individualised' aspect of risk assessment, with each FEO adopting his or her own approach. In all cases, however, it was clear that the outcome of the home visit interview was an important contribution to the FEO's assessment of the applicant and the recommendation to a supervisor. FEOs were aware that they might have to elicit information which the applicant may not wish to divulge (such as an undocumented criminal past, stresses in personal relationships, or medical problems). Direct questioning, however, tended only to be employed when the applicant was being evasive or did not appear to understand the question. The response of applicants to questions was carefully monitored and evasiveness, stalling or prevarication perceived by some FEOs as an indicator of possible deliberate deception. However, whilst FEOs appear to be using intuitive methods to identify potential lying or deception (based on verbal and other cues) they did not appear to root their techniques in any 'evidence-based' research or theory (for example, Vrij, 2008; Whelan et al., 2015) and particularly so in terms of 'factoring in' stress as a contributory explanation for some of the behaviour of applicants during the home visit.

Forms of reasoning employed by FEOs

For the purposes of this research, we defined 'reasoning' as the 'set of evaluative and inferential processes that people have at their disposal and can draw on in the process of making decisions' (Koehler and Harvey, 2004: xv). However, it is worth noting at the

outset that sound (valid and reliable) reasoning does not, by necessity, lead to 'correct' decision-making.[12] An FEO might also employ reasoning to assess a risk posed by an applicant and arrive at the 'right' decision but then decide on a different outcome for physiological or psychological reasons, or because of the adverse influence of 'group think' (Baron, 2005). The stresses involved in firearms licensing might paradoxically lead to either increasing the likelihood of making the wrong decision, or in the case of moderate stress, it could improve decision-making (Starckea and Branda, 2012).

The qualitative content analysis of the transcripts of the semi-structured interviews provided clear examples of the forms of reasoning the FEOs used to draw an inference (for example, deriving conclusions) from the information available to them.[13] Three particular cognitive forms of inferential reasoning were identified using the methods described earlier:[14] abduction, induction and deduction.

Abductive reasoning is 'reasoning to the best available explanation' or deriving the most likely explanation that fits the observed facts, observations or assumptions. Abductive reasoning parallels the 'clinical reasoning' (Durning, 2018; Haig, 2008; Ward and Haig, 2007) used in medical contexts. For example, an FEO might decide that certain information concerning an applicant is indicative of attempted deception and that other possible explanations are sufficiently unlikely in the circumstances to be discounted. The FEO employment of abductive reasoning may be of particular note for as Patokorpi (2007: 172) observes 'abduction comes to its own in the face of incomplete evidence and high uncertainty that are usually related to very rare or non-repeatable events and to the realm of the unique in general'. The abductive reasoning employed by FEOs was also often 'non-monotonic' and dynamic in nature– the plausibility of an inference increased or decreased as new information emerged in scenarios (see 'Methods' above), and the inference was modified.

Deductive reasoning essentially involves reasoning where a conclusion (the deduction) must necessarily follow if the assumptions (premises) are true. The strength of inference using deductive reasoning resides in its 'watertight' nature: the conclusion must by necessity follow from the suppositions. Although inferences derived through deduction were not often explicitly articulated in the FEO interview transcripts and case files we analysed, a number of FEO observations concerning risk were clearly based (at least in part) on deductive reasoning. For example, if the assumed age of the applicant (as derived from the date of birth given in the application form) contradicts other information then a conclusion is that one or other is incorrect. This is in itself cause for further investigation of the possibility of deliberate deception.

Inductive reasoning takes a variety of forms, including generalising from specific occurrences that have common features, to a more general rule (to go from 'some' to 'all'). Forms of inductive reasoning we identified in interview transcript analysis included 'analogical reasoning' (Gentner and Smith, 2013) and 'case-based reasoning' (Ribaux and Margot, 2003). With the latter, risk assessment was made with reference to previous similar (analogous) situations which were often drawn from the experience of the individual. It is also possible that although the analogous examples may be unique

and specific to actual previous cases the FEO could be drawing on more archetypal 'schema' (prototypes, scripts, familiar sequences of events with recognisable characters).

The analysis of case files and FEO responses to scenarios demonstrated that even apparently simple inferences made by FEOs were often implicit combinations of different forms of reasoning, combined as complex forms of probabilistic inference – that is, examples of 'complex cognition' (Knauff and Wolf, 2010). FEOs might use abduction to make an initial 'guess' (or hypothesis, a preliminary 'diagnosis') which is then tested using deduction (what would logically follow as a consequence?) and induction (what information/evidence supports or refutes this?). This leads to an inference being supported, rejected in favour of alternatives, or abandoned altogether.

Use of heuristics by FEOs

The 'heuristic' is a form of decision-making that uses simple 'rules of thumb' reasoning to solve complex problems (Mousavi and Gigerenzer, 2014: 5) in a 'fast and frugal' manner, reducing the 'cognitive load' on individuals. Remarkably, heuristics do not necessarily trade off accuracy for speed as more information and deliberation do not necessarily lead to better decisions (Todd and Gigerenzer, 1999). However, although heuristics are indispensable tools for decision-making in everyday life, their failure (for example, in non-routine situations) can equate to forms of cognitive bias (Gilovich et al., 2002).

The use of a 'representativeness' heuristic[15] by FEOs when assessing the risk presented by an applicant was identified through analysis of the semi-structured interviews, with home environments and applicant behaviour during the interview being seen as 'representative' of archetypes. However, it is was emphasised by FEOs that they do not simply accept the first explanatory hypothesis but rather search for more evidence, both contradictory or affirmative. This is especially the case when assessing the mental health of applicants, as FEOs reported using overt observations of behaviour and environment (such as messy houses or unusual speech patterns) as 'proxies' for mental stability. However, the application of these criteria could easily lead to false positives (e.g. caused by factors unrelated to mental health) and without further assessment, could lead to an inaccurate assessment of risk. Most FEOs were aware of this problem, and all expressed the view that such criteria would not be the sole justification for a refusal, and would be used only as a basis for further assessment.

This research also identified evidence of the 'availability heuristic'[16] being employed by FEOs as a means of assessing risk: the immediate 'summoning up' of a similar set of circumstances that had occurred recently and its outcome. However, not all FEOs were aware that the availability heuristic could constitute a form of cognitive bias and the need to avoid misjudging the level of risk simply through having encountered a similar event recently, especially if the event was emotionally charged or unusual. This is a particular danger given the repetitiveness of the application process and the quantity of applications.

Finally, the analysis of the interviews and case files indicated that some FEOs are also regularly using the 'anchoring and adjustment' heuristic[16] in the risk assessment process. This involves the FEO determining a working hypothesis and using the generated information to support, refute or to adjust the hypothesis. When utilising this heuristic, the FEO starts with the working hypothesis that the applicant is suitable to possess a firearms certificate. As information about the applicant is gathered, the FEO continually reassesses this hypothesis, turning a binary decision-making process into a more 'shades of grey' assessment of risk.

Decision-making support for the FEO and supervisors

Our desk-bound research, information gathering, analysis of case files and semistructured interviews confirmed that the application form(s), the police database checks, the medical report, the home visit and interview are the main ways the FEO gathers information. Both the FEO and their supervisor must then risk-assess the information collected and make a binary decision – to grant or deny a licence.

We found that there are three tools potentially available to FET staff to help them assess information and make an informed decision: a police service 'risk matrix', the College of Policing 'National Decision Model' (NDM) and an MPS 'Vulnerability Assessment Framework' (MPS, 2015).

A number of police forces use a 'risk matrix' to help guide the assessment of the risk factors, as recommended by the College of Policing Authorised Professional Practice (APP) in order to 'prioritise workloads' (College of Policing, 2016). Moreover, the Firearms and Explosive Licensing Working Group (FELWG)[17] have endorsed a specific firearms licensing risk matrix.[18] There are several obvious advantages in using risk matrices to inform decision-making, not least the simplicity and clarity of the risk assessment process and outcome. However, our analysis of case files (see 'Methods' above) identified inevitable technical problems when risk is quantified in a simple numerical manner using integers (whole numbers) and nominal variables are treated as if they are at the interval level of measurement.[19] It is also not clear, for example, why a linear scale is frequently adopted with risk matrices rather than, say, a logarithmic one. Questions could also be raised about the practice of multiplying likelihood scores by impact scores, which is presumably based upon an assumption of statistical independence (otherwise a conditional Bayesian probability would be more appropriate). Our research findings echo both other recent studies into the problematic use of riskassessment tools in other areas of policing, particularly in relation to domestic abuse (Robinson et al., 2016a; Sebire and Barling, 2016; Smith and Shalev Greene, 2015) and earlier more general research into the limitations of 'risk matrices' (Cox, 2008).

The second tool for decision-making for FEOs and their managers is the policing National Decision Model (NDM).[20] The NDM was launched in 2012 and adopted by the MPS FET in 2014. It consists of six elements, with the Code of Ethics (as the first element) being central to the remaining five elements (information; assessment; powers and policy; option; and action and review). The relevant College of Policing Authorised

Professional Practice outlines 10 risk principles that are aimed at encouraging and supporting professional judgement, and these are fundamental to the NDM (College of Policing, 2013b).

In terms of decision-making for firearms licensing, the 'Assessment' element of the NDM is significant. It involves 'assessing the situation, including any specific threat, the risk of harm' (College of Policing, 2013b). A user of the NDM is advised to ask his or herself the questions: 'How probable is the risk of harm?', 'How serious would it be?' and 'Is that level of risk acceptable?' (College of Policing, 2013b). FEOs often made reference to the NDM during our semi-structured interviews with them and in their responses to the dummy application forms and scenarios (see 'Methods' earlier). However, a number of FEOs did express doubts concerning the applicability of the NDM to the risk-assessment problems they confront on a daily basis and suggested that the model had greater applicability to operational policing (a reservation shared by O'Neill, 2018: 83).

FEOs also discussed the use of the MPS 'Vulnerability Assessment Framework' (VAF), particularly to assess the mental health of an applicant when conducting a home visit. The VAF is a 'tool to assist MPS police and staff in identifying vulnerability in members of contact they have contact with' (MPS, 2015). Although it was designed to help front-line officers identify vulnerable people, the framework has been adopted and adapted by FEOs for the mental health risk assessment elements of firearms licensing. The VAF has five main components ('ABCDE' – 'Appearance, Behaviour, Communication capacity, Danger and Environment circumstances'). Whilst not used in the same manner as with the original VAF, these five criteria are assessed by the FEO on the home visit and the conclusions are used to inform the risk-assessment of the applicant's suitability to be granted a certificate. This modified 'ABCDE' assessment seems to encourage an FEO focus on the key potential indicators of vulnerability, and can also help articulate any nascent concerns.

However, in general terms the mental health assessment training provided to FEOs was not seen as sufficient, with most FEOs stating that they did not feel that the training provided them with the necessary 'tools for the job'. The reliance on GP reports alone to identify applicants with mental health conditions was also identified as problematic. Indeed, a consistent theme emerging from the semi-structured interviews with FEOs was that gaining access to medical information, whether relating to mental or physical health, was one of the most difficult aspects of the role. Current practice is that applicants declare any relevant medical conditions at the time of application. FEOs also write to GPs on receipt of an application to ask whether the applicant has any relevant medical conditions (covered by a declaration of consent on the initial application form), and to place an 'enduring marker' on the patient's medical record to show for the duration of the licence that the person has ready access to guns. However, case files analysed during our research indicated some GP unwillingness to cooperate with the FET and provide information – citing 'conscientious objections' to anyone owning firearms, others stating that they were not qualified to provide opinion about their patient's mental health, whilst others claimed that it was not within their contract to provide such a service. Similar problems were

encountered by other police forces in 2016 (PULSE, 2016). The situation is further complicated when an applicant uses a private doctor. In addition, case file analysis suggested that even when an FEO obtains a medical report, there is often insufficient specialist advice available to interpret its relevance to the applicant's suitability to own firearms.

Limitations of the research

Inevitably there are a number of limitations with our research, particularly in terms of the methodologies employed. First, conclusions are based on desk-bound research and an analysis of case files and semi-structured interviews with staff from a single police force, albeit the largest in the UK.[21] Second, assumptions were made when sampling case files which might be not be valid. Given the relatively large time period that samples were drawn from, it was also not surprising to encounter incomplete or inchoate case files. Third, in terms of a working definition of 'risk' with firearms licensing we adopted a pragmatic approach of identifying the most commonly held interpretation within the FET, but this was not necessarily shared by all FEOs in the team (or indeed, by other police forces). Fourth, the identification of forms of reasoning, heuristics and possible cognitive biases amongst FEOs and their managers was problematic on a number of levels: these include the likelihood that FEO cognition will often be a collaborative group process[22] (Theiner et al., 2010); that interviewees are sometimes unable or unwilling to express thought processes,[23] particularly when 'thinking fast' (Kahneman, 2012) and especially in circumstances where risk is involved. Fifth, the methodology adopted for the analysis of transcripts (although tested in other policing contexts) relied in part on the skill of researchers in identifying canonical forms of reasoning, heuristics and cognitive bias. Finally, one of the authors is both a police officer and an experienced manager of FEOs,[24] with the attendant issues encountered when operating within the 'insider insiders' (Brown, 1996) dichotomy in police research.

Discussion and conclusions – a 'wicked problem'?

Our research found that estimating 'risk' (in the sense of the likelihood of an individual posing a threat in the future) involved in firearms licensing rapidly takes the form of a 'wicked problem'.[25] Decision-making is made particularly difficult in the context of firearms licensing due to the complexities and confusions of firearms law (NBIS cited in Law Commission, 2015: 1). The rules established by the Firearms Act 1968 which provide the legal framework for the process of licensing are ambiguous, while official guidance is similarly open to (non-binding) interpretation. Further, the risk assessment carried out by FEOs and their managers is almost always based on incomplete information. Referees are selected by the applicant and liaison between the police and medical practitioners is currently fraught with difficulty. Moreover, the issue of drawing inference from police intelligence checks is problematic, with few evidence-based methods available to aid risk-assessors to gauge the importance of the information

gathered. Riskmatrices or similar 'automating' tools can also cause decision-making difficulties, both theoretical and practical.

Although risk assessment is a relatively common undertaking in policing (for example, in terms of children reported missing; Hayden and Goodship, 2015) and ubiquitous across a range of security fields (Phythian, 2012), firearms licensing involves the particularly difficult task of determining what indicators might be pertinent, and what weight they should carry. We found during the analysis of case files many examples of decision makers attempting to assess factors such as an applicant's apparent interest in Nazi memorabilia, uncovered during a 'home visit'; reconciling alternative lifestyles with societal norms (such as an applicant living in a small one bedroom flat with ten large dogs, and their faeces evident throughout the premises); what importance to place on previous offending history (for instance, should a caution for an assault five years ago adversely affect an application?) and how best to assess the relevance of declared medical conditions.

It is clear also from our research that, at least in one large police force, the home visit and interview is at the heart of the FEO information-gathering process that informs risk assessment. FEOs used the home visit to assess risks which could only be discerned in person (such as environmental scanning of the neighbourhood, physical security, the demeanour of the applicant and any other person living there, and the nature of the interior of the home environment). This is a critical facet of the information-gathering phase and likely to be weakened by any move by police forces towards replacing the home visit with telephone-based risk-assessments, particularly in terms of initial application (an observation supported by HMIC, 2015: 81).

Our research also confirmed that FEOs employ a number of cognitive means to help arrive at an assessment of risk, including combinations of canonical forms of reasoning. FEOs also employ familiar mental shortcuts such the 'anchoring and adjustment heuristic'. There was also some evidence that the FEOs were aware of the dangers inherent with heuristics and, more generally, the possibility of cognitive bias.

Our research finding concerning the lack of formal training of FEOs and their supervisors was also a factor highlighted in the 2015 HMIC report into firearms licensing, and more recently in the highly critical IPCC report into firearms licensing in Surrey following the murder of Christine and Lucy Lee (IPCC, 2016). Whilst a number of police forces in England and Wales (most notably, Dorset Police; HMIC, 2015: 26) have offered courses to FEOs from 2007 on a national basis, none were nationally accredited and not all police forces utilised them (HMIC, 2015) and this position remains unchanged (FELWG, 2016). Hence, there is further research needed concerning what training staff involved in firearms licensing in 43 police forces in England and Wales have received, how learning is assessed and what measures are taken to ensure consistency from force to force.

The question of providing a nationally accredited training course of FEOs was considered in 2016 by the College of Policing, when they suggested that ACPO (now replaced by the NPCC) was 'seeking to develop accredited appropriate training' (College of Policing, 2016). Our research suggests that, in addition to legislation, guidance and

authorised practice, training should focus on the how of firearms licensing. For example, the formulating and testing hypotheses; the principles and theories of risk assessment, sensitivity and specificity of risk; pattern recognition and anomaly detection; heuristics in decision making and cognitive errors. Practical training with 'dummy' firearms application forms and scenarios that are designed to stimulate the use of the different forms of reasoning required for risk assessment might also assist trainee FEOs in recognising cognitive and other logical fallacies.

Finally, it is clear that further research is also needed to discover whether other police forces consider risk and make decisions in a similar way to the MPS FET when granting or revoking the right of a member of public to legally obtain a firearm. The results of such research would enable FEOs and others to contribute to the 'morphing of experience into evidence' (Pease and Roach, 2017) that is required to help solve the 'wicked problem' of firearms licensing.

Notes
1. Reflecting the fact that most legally held firearms in the UK are used for gamekeeping, fieldsports, pest control and target shooting and hence the highest per capita rates occur outside of cities in rural locations of the UK such as North Yorkshire (Home Office, 2017).
2. In the UK firearms and shotguns are both 'lethal barrelled weapons' (as defined by the Firearms Act 1968). However, there are some differences in licensing criteria between the two, defined as distinct elements as s. 1 (firearms) and s. 2 (shotguns) by the Act. Nevertheless, for ease of reference this paper will use the term 'firearm' to cover both s. 1 and s. 2 guns. Similarly, the term 'application' is used to denote a grant or renewal application, unless otherwise indicated.
3. It is not known what proportion of the increase is due to legally-owned firearms but this islikely to be small.
4. Although the possibility of the offender self-harming might be a risk and hence likely to leadto revocation of the licence.
5. Most studies appear to be US-focused; for example, Yuval (2011), Phillips (2013), Webster(2015) and Mueller (2017).
6. Case files for those refused on application, or whose licences had been revoked containedadditional information.

7. The strata reflected the volume of applications each year and the proportions selected werealso increased for more recent years of application. The sample size for 2014 was 61% (93 from a possible 153) and for 2015 it was 66% (98 from 149). Sample sizes from previous years are unknown but, given the random nature of the sampling, would be expected to be similar (apart from the period 1992–2004).

8. The files were predominantly in paper format, containing loose-leaf documentation for eachapplicant, but were digitalised and collated for the purposes of this research.

9. Note, however, that the definitions of 'domestic violence' and 'domestic abuse' had changedduring the period covered by our sample.

10. Cluster analysis is a practical tool used to reveal 'natural groupings' within datasets. Althoughcluster analysis has been employed for some time in marketing, biology (including genetics) and medical research, it has only recently been employed to better understand 'hidden' patterns in crime and policing data.

11. For example: 'Mr Allen is a 35-year-old stockbroker from Tottenham who has applied for afirearm certificate for both .22RF and .308 calibres in order to target-shoot and control vermin. He lives alone in a flat. His application seems fine: his background checks have come back with no issues, he has been through an induction course at a local shooting club and his GP states that Mr Allen is of sound body and mind. His referees are a local magistrate and a surgeon at "St Barts" hospital. He has regularly been attending a shooting club for three months.'

12. There are a number of possible reasons for this, including on grounds of logic alone (forexample a sound argument being employed, but invalid assumptions have been used through limitations in the information available).

13. The forms of reasoning, heuristics and cognitive biases that we identify in this section andelsewhere in the paper might occur 'naturally' within decision-making by FEOs or might also have partly arisen as a result of the research methodology used. See 'Limitations of research' later.

14. Additional forms of reasoning were also found but are not discussed in this paper.

15. First identified by Tversky and Kahneman (1974). For an example of its use in anotherprofessional 'diagnostic' context such as nursing, see Ferrario (2003).

16. Again, first formally identified by Tversky and Kahneman (1974).

17. At its head is the National Police Chiefs Council (NPCC) lead for firearms licensing. A national FELWG meeting is held once a quarter with police force representatives and other stakeholders such as the Home Office, NABIS, the NCA and others. This is replicated at regional level, where regional representatives brief their fellow firearms licensing managers.

18. At the time of writing the matrix is five by five, with one scale measuring 'likelihood' and theother measuring 'impact' – the potential danger to the public. In both cases the scale ranges from 'very low' (one) to 'very high' (five).

19. For instance, in the FELWG risk matrix 'treatment for mental illness' will be awarded aparticular risk 'score', whereas a previous history of 'multiple assaults' scores two thirds of the value.
20. This was devised and promoted by the College of Policing (2013a) for the police service as awhole and not exclusively for use by FEOs and their managers.
21. However, the legislative context, Home Office guidelines and College of Policing APP arecommon to all police forces in England and Wales.
22. Particularly when leading to deliberate (conscious) decision-making.
23. Hence our use of scenarios.
24. Although he did not participate in semi structured interviews, case file or transcript analysis.
25. A 'wicked problem' is a seemingly intractable problem with no simple solution, wheredecisions are made based on incomplete and confusing information and the outcome is not simply 'true' or 'false' but more often 'good' or 'bad'. The term was coined by Churchman (1967) although Rittel and Webber (1973) provided a detailed description of 10 characteristics that differentiate 'wicked problems' from more readily solvable ones.

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