Terrorism Watch Lists, Suspect Ranking and Decision-Making Biases

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The large number of names on terrorism watch lists raises the problem of monitoring. Given the existing resource constraints and other logistical considerations, efficient and accurate ranking of individuals in terms of threat posed is of paramount importance. This process, however, may be impacted by reference points, diminishing sensitivity, loss aversion and other aspects of the human decision-making process that introduce biases. This paper explores the relevance of decision-making processes and biases to the specific task of ranking and monitoring individuals whose names have been placed on a terrorism watch list.

A watch list is a list of individuals and groups who are known or reasonably suspected of being involved in terrorism and who are, as a result, potentially subject to surveillance and other restrictions.[1] It must be noted at the outset that not everyone whose name is on a terrorism watch list must be watched all of the time for a watch list to 'work'. A terrorism watch list is also a *mechanism*.[2] An individual's name added to a terrorism watch list should trigger an alert to authorities if, for example, that individual purchases a firearm or tries to board a flight. This trigger mechanism, when functioning effectively, will go a long way towards circumventing terrorist actions without significant surveillance resources being allocated. Despite this, there will always be some cases where, for one reason or another, the watch list mechanism fails and questions are inevitably raised about why an individual whose name was on a terrorism watch list was not being *watched*. This has been highlighted in a number of recent cases. In Australia, the perpetrator who shot several police officers during a terrorist incident in Melbourne in June 2017 was on a terrorism watch list. The elder of the two Boston Marathon bombers was on a terrorism watch list. So were the murderers of British soldier Lee Rigby in London.[3] So were two of the three London bridge attackers[4] and the Berlin Christmas market attacker had been under surveillance on suspicion of planning to acquire automatic weapons for use in a terrorist attack.[5,6] Examples like this have emerged with increasing frequency.

A watch list is not the only type of list that governments and their agencies have developed to circumvent terrorist activity. In the United Kingdom, for example, HM Treasury in conjunction with the Office of Financial Sanctions Implementation (OFSI) prepares a publicly available list of 'Designated Persons, Terrorism and Terrorist Financing', the purpose of which is to enforce financial sanctions, usually asset freezes, against individuals and entities associated with terrorism. For example, the 2017 Designated Persons, Terrorism and Terrorist Financing list includes an entry for the Abu Nidal Organisation (ANO),

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which is associated with a number of targeted groups (Arab Revolutionary Brigades, Black September, Fatah Revolutionary Council and Revolutionary Organisation of Socialist Muslims).[7] In the United Kingdom, financial institutions must comply with the Terrorist Asset Freezing Act 2010 (TAFA) by ensuring that any accounts held by the listed individuals or entities are frozen, that no financial services are provided and a report is made to the OFSI if listed individuals or entities attempt to engage in financing activity. If a list such as this works effectively, the financing of terrorist activity should be impeded and financing patterns added to the stock of collected intelligence. Different lists with different mechanisms each contribute a part to the counter-terrorism infrastructure.

In this paper we are primarily concerned with the development and management of terrorism watch lists and, especially, with the decision-making process of prioritisation or ranking of listed individuals and groups for different degrees of surveillance or restriction. In 2017 a list of Islamic State recruits was recovered during an operation in Syria and Iraq. Interpol circulated the list of names among its members, seeking additional information such as border crossings, social media activity and criminal history that might be held by European governments and agencies. The information would then be used to decide whether an individual would be elevated to a higher level of surveillance.[8] This is an example of the type of process that we concentrate on.

At all critical points during the development and management of a terrorism watch list, decisions must be made. These include: (1) the decision to add an individual's name to a terrorism watch list; (2) the decision to subject a particular individual to closer surveillance; (3) the decision to discontinue surveillance; and (4) the decision to remove an individual from the watch list. We are most interested in the second of these decisions but our conclusions apply equally well to the others. With limited resources, the surveillance of individuals must be prioritised and resources allocated to the monitoring of high risk individuals. Arriving at a conclusion regarding which individuals represent a more significant security concern than others involves decision-making processes that are not always free from biases or errors. We identify some relevant decision-making biases that impact upon any ranking procedure and explore their implications for the efficient prioritising or ranking of individuals for surveillance. To accomplish this we draw mainly on Tversky and Kahneman's[9] behavioural-descriptive model of the decision-making process under conditions of risk and uncertainty, cumulative prospect theory (CPT).

Terrorism Watch Lists: Construction, Challenges and Legal Considerations

In the first instance, a terrorism watch list is built from intelligence. Detecting a potential threat and deciding whether the individual's name will be added to the watch list is itself a complex task.[10] In the United States, the terrorism watch list consists of two components. The first is called the Terrorist Identities Datamart Environment (TIDE). The second, which is really 'the' list, is called the Consolidated Terrorist Screening Database (CTSD). Intelligence submitted by the Federal Bureau of Investigation (FBI), Central Intelligence Agency (CIA), National Security Agency (NSA), Department of Defence (DOD) and other agencies is assessed by the National Counterterrorism Centre (NCTC). The NCTC then decides whether or not to nominate an individual for inclusion on the CTSD. The nomination flows to the FBI-administered Terrorist Screening Centre (TSC) and, if accepted, the individual's name is added to the list accessed and monitored by various specialist agencies in conjunction with state and local law enforcement. For example,

the Transport Security Administration (TSA) utilises the CTSD as the basis for its 'no fly' list.[11] The other agencies and task forces, of course, continue any monitoring activities and investigations. New intelligence is continually gathered and assessed. Specific investigative or law enforcement actions will be initiated when triggered by some event, such as an individual whose name is on a 'no fly' list attempting to board a flight.

The management of terrorism watch lists utilises advanced technology, particularly with regards to surveillance of communications and internet activity. Even so, the amount of data collected makes it difficult for any algorithm or computer program to identify a pattern of behaviour and trigger surveillance or other investigative action. The case of the Orlando nightclub shooting in June 2016 starkly illustrates some of the most pressing challenges. Following credible information provided in 2013, the FBI opened a preliminary investigation into the eventual shooter, Omar Mateen. He was subjected to surveillance and even interviewed twice during a 10-month long investigation. His name was added to a terrorism watch list. The investigation was closed when no evidence emerged to support the conclusion that Mateen was a credible and imminent threat to security.[12] His online activity, which when considered holistically might have provided enough evidence to maintain Mateen's terrorism watch list status, was not red flagged by any surveillance algorithm operating at the time. His name was removed from the terrorism watch list in 2014. When he legally purchased the firearms he used in the nightclub attack, during which he killed 49 people, the FBI received no notification.[13]

In Europe, where cooperation and communication between the agencies of different governments is critical, the watch list mechanism may fail because of communication breakdowns. When these occur, an individual who has been placed on a terrorism watch list in one European country may fail to be added to the watch list of another country. The case of Youssef Zaghba, one of the London Bridge attackers, illustrates the challenges involved in efficiently and effectively managing terrorism watch lists across multiple jurisdictions. Zaghba was detained in Italy in early 2016 after he raised suspicions while boarding a flight to Istanbul and was later found to possess Islamic State material. He was released soon after but was being monitored. His name was added to the Schengen Information System (SIS), a shared database that is designed to alert member nations to security threats. Even though his name appeared in this database, Zaghba travelled in and out of Britain on at least two occasions without being seriously challenged. Despite being known to Italian authorities, Zaghba's name was not placed on the UK terrorism watch list.[14] Communication between agencies operating in different jurisdictions represents a major challenge. So too does the sheer length of the terrorism watch lists.

In the United Kingdom, there are more than 20,000 people on the terrorism watch list. Of these, more than 10 percent, or around 2000 to 3000 individuals, are the subject of very serious concern on the part of intelligence agencies.[15] It is impossible to watch all of these people all of the time using physical mobile surveillance. To undertake mobile surveillance of one individual for 24 hours requires fielding three teams of five agents and even this assumes that a team is not noticed by a suspect and forced to rotate.[16] At a ratio of 15-to-1, the 24 hour surveillance of just the 3000 individuals who are of 'most concern' would require 45,000 security agency personnel in the field simultaneously and continuously. Even if such manpower could be gathered and such large numbers of suitably qualified individuals recruited and trained and funded, there would still remain the exceedingly high equipment and resources costs that such

a vast operation would require. The resources that are available for mobile surveillance must be prioritised which means prioritising or ranking individuals on the basis of an assessment of the risk they represent. Such a ranking is susceptible to errors that emerge from within the decision-making process.

In the United States, by 2013 there were more than one million individual names listed in both the TIDE and CTSD, about 25,000 of these are the names of US citizens. As mentioned before, this is the basis for action taken by specialist agencies including the TSA.[17] The TSA's no fly list contains about 50,000 names. Less than 1,000 of these are the names of US citizens.[18] Other actions can also be triggered. For example, non-profit organisations in the US must check employees' names against the terrorism watch list for the organisation to be eligible to receive contributions.[19] The US Treasury Department's Office of Foreign Assets Control (OFAC) freezes and blocks assets based on details contained in the terrorism watch list.[20] The expansion of the size and scope of terrorism watch lists has been dramatic when one considers that there were just 16 names on the TSA's no fly list on September 11, 2001. This has been the outcome of the vast security initiatives put in place after the 9/11 terrorist attacks.[21]

The management of a terrorism watch list and, indeed, the very existence of a watch list, raises various points of law. Problems and subsequent legal challenges began to emerge soon after the rapid expansion of the terrorism watch list and no fly list during the early 2000s. These are discussed in detail by Florence[22] and include the US constitutional right to travel. Miss-identifications have also proved to be a long running point of contention.[23,24] Expansions in the scope of the terrorism watch list are also subject to challenge. For example, following the Orlando night club shooting there were numerous calls for individuals on the terrorism watch list to be banned from purchasing firearms.[25] That is, a purchase would be blocked at the point of sale. The Democratic Senator from California, Dianne Feinstein, had proposed such legislation. The proposal was rejected by the Senate in late 2015 and again in mid-2016 following intense debate about the effectiveness of such a measure and the potential violation of rights involved in restricting firearms purchases, especially when a person's name could have been mistakenly added to a terrorism watch list.[26,27]

The type of information that is gathered about individuals whose names are either on a terrorism watch list or who, on the basis of the gathered information, will have their name placed on a terrorism watch list has attracted a great deal of commentary. Surveillance methods that we mentioned before, where an individual is physically followed during the course of a day, for example, are supplemented by various forms of 'electronic surveillance'. Following the Snowden revelations, the nature of electronic surveillance became the subject of intense international debate. In the United Kingdom, the Regulation of Investigative Powers Act (RIPA) 2000, amended by the Investigatory Powers Act 2016, governs the use of covert techniques by public authorities. Covert techniques include the surveillance methods mentioned before (observing a person's activity in private and public areas) as well as intercepted communications (telephone calls, emails), communications data (subscriber details, telephone accounts), electronic data protected by encryption or passwords and the use of human intelligence (informants, undercover officers). Judicial approval is required prior to the use of covert techniques.[28]

Compliance with RIPA and the legal framework within which the intelligence services operate was addressed at length by the UK Foreign Secretary, William Hague, in the days following the leak of classified material outlining the collection of intelligence by US agencies.[29] In his statement to the House of Commons,

much emphasis was placed on the role and methods of the Government Communications Head-Quarters (GCHQ), the British counterpart of the NSA. The GCHQ is responsible for the collection of communications and electronic intelligence. In undertaking this activity, approval in the form of a warrant signed by the Foreign Secretary or Home Secretary is required and these approvals are subject to review by the Intelligence Services Commissioner. The legal frameworks apply to both the collection of data within the United Kingdom and whenever the GCHQ operates internationally or in cooperation with other agencies such as the NSA. The legal frameworks governing the collection of communications and electronic surveillance continue to be amended both as governments seek to balance democratic oversight and the achievement of counter-terrorism objectives and as different jurisdictions make their own amendments which, in turn, affect the behaviour of agencies operating from another jurisdiction.

Such are the issues involving due process and individual rights, both of which run up against the margins of the scope and scale of terrorism watch lists, the reach and implications of any potential triggers, the possibility for mistaken inclusion and the difficulty in removing one's name from a list once it is there. In prioritising an individual for surveillance, multiple legal processes are brought into play. As a result, any ranking or prioritising of individuals becomes even more important because errors will result in lost resources, opportunity costs (measured in terms of the hours forgone in applying surveillance to more appropriate targets) and legal challenges.

Prioritising or Ranking Criminal Suspects

The ranking of suspects is common practice in all areas of law enforcement.[30] For the most part, this ranking is undertaken by investigators and other personnel based on the available information and applying their individual and collective experience and intuition. Formal processes are sometimes applied to certain suspect ranking tasks and the development of these formal processes and research into their effectiveness is where the relevant literature on this matter can be found. Whenever a crime or series of crimes occurs and is not immediately solved, investigators will rank suspects according to the degree to which the investigative team believes it likely that a particular individual was responsible. This ranking then becomes the starting point for the investigation.

Interestingly, most of the academic work has centred on behavioural-spatial models where prioritisation of suspects is based on both behavioural aspects of the unsolved crime and its location. Broadly, the primary task is to predict where the perpetrator of offenses resides relative to the location of the crime or crime series.[31] Offenders with a criminal history who reside near to this determined location will be questioned first. This is different, of course, from the task of ranking individuals whose names are on a terrorism watch list because these individuals might never have committed a crime. The ranking task is one that involves an assessment of the possibility of these individuals committing an act of terrorism. The nature of terrorism also requires unique approaches or adjustments to existing approaches. Developments in investigative psychology[32] and recent advances in the economic analysis of terrorism[33] are beginning to highlight the ways in which theoretical and empirical approaches may assist investigators in drawing inferences about unknown terrorist offenders.

There are at least several suspect ranking techniques that are applied in criminal investigations. These range from basic heuristics to more complex algorithms that are used to prioritise suspects based

on the distance between suspects' residential addresses and the location range that the heuristic or algorithm indicates as being most likely to contain the offender's location.[34] Some of these techniques are purely spatial but many have embedded within their underlying frameworks a reasonably sophisticated psychology of place.[35] At the most basic level, there is the circle hypothesis. From a series of crimes, the distance between the two crimes that are furthest apart becomes the diameter for the circle that geographically encompasses all of the crimes in the series. Canter and Larkin[36] hypothesised that the offender's residence would be found inside the circle. Individuals with a criminal history who live within the area of a 'circle' are prioritised for investigation and questioning. This turns out to be a relatively successful approach.

A more complex version of the circle hypothesis, drawing on the established fact that serial offenders tend to live close by to the location of their *first* offense, uses the location of the first offense in a series to shrink the size of the geographic area to be considered.[37] More sophisticated techniques that build on the same principles include prioritisation of suspects based on the most *recent* (rather than first) offense in the series[38] and Kind's[39] approach which ignores the order in which the offenses occurred and instead computes the point that can be connected with the least total distance to all of the offense locations. This point is the 'centre of gravity' for the offenses (and is most likely to be close to where the offender resides). There are also purely algorithmic-based or mathematical-functional approaches that work by minimising distance functions.[40] Research into the comparative effectiveness of these distance or place-based prioritisation techniques is ongoing.[41] The concepts and foundations of these techniques are explored further by Canter and Youngs.[42]

Innovating upon these techniques involves embedding additional aspects of psychology and criminology into the prioritisation process. Snook et al.[43] use a combination of criminal history *and* location as the basis for their prioritisation technique. This approach is based on two empirical regularities: (1) offenders have a criminal history; and (2) offenders commit crimes close to their home. Rather than simply determining a search area and ranking known prior offenders on the basis of their residential addresses in relation to the search area, additional criminology-psychology research is incorporated into the analysis. In particular, both criminal careers and journey-to-crime research. The crime is mapped and a search area identified. The suspect whose criminal history aligns with the unsolved crime *and* who lives closest to the crime's location is ranked first and so on. The combination of criminal careers and journey-to-crime research does appear to improve the results of the process.[44] However, there are still wide margins for error and the list of suspects can remain large even after the technique is applied. On most occasions the list may be so large as to make it infeasible for a local police department to follow up on all of the suspects. As such, law enforcement agents will still need to make decisions that narrow the list further. This might rely on experience and intuition or it might involve incorporating additional information into the search. For example, eyewitness accounts might be used to rule out certain suspects on the basis of age, height or ethnicity.[45] In all cases, the human decision-making process, which might be improved considerably by the use of formal techniques, must still be brought to bear on the problem of ranking and prioritising suspects.

As we shall see, human decision-making processes that involve probabilities exhibit systematic biases.[46] For example, there is a tendency for decision-makers to overweight unlikely outcomes and underweight more likely outcomes.[47] Although formal probability-based models for suspect ranking are

less common in the literature, there are approaches that apply probability measures over various factors relevant to the task of suspect prioritisation. For example, Bache et al.[48] use language modelling and Bayesian probability to prioritise suspects by matching crime descriptions across solved and unsolved crimes. Investigators typically enter a 20-word standard crime report into a police database. Each report for a solved crime becomes a document that could be relevant or irrelevant to an unsolved crime. Probabilistic techniques are used to facilitate efficient document retrieval in many different fields.[49] Bache et al.[50] apply these techniques to suspect prioritisation by transforming the probability of document relevance into a probability of suspect likelihood. Suspects are identified because reports of their previous crimes align to some degree with the reports of the unsolved crimes. This can be applied to crimes of varying levels of seriousness. A suspect may have served a considerable prison sentence for a serious offense and the possibility of re-offending must not be overlooked. The likelihood that a suspect is indeed the perpetrator is calculated and the suspects are prioritised according to this computed probability. Of course, such probabilities must be interpreted and a decision made as to how much weight to accord them. No technique draws on a comprehensive dataset and investigators must decide how to treat the results. It is here, once more, that judgement involving probabilities enters into the investigative process.

Decision-Making under Risk and Uncertainty and the Investigative Process

An ordering or ranking of alternatives is a fundamental concept in the analysis of human decision-making. The economic theory of consumer preference, for example, is based on the concept of a scale of preferences across alternative consumer goods.[51] The concept is also fundamental in decision theory where alternatives are not consumer goods but risky prospects (gambles) with a range of possible outcomes each occurring with some probability. There are a number of different ways that alternative risky prospects may be ordered:[52] (1) expected value or basic mathematical expectation;[53] (2) expected utility;[54] (3) subjective expected utility;[55,56] (4) stochastic dominance;[57] (5) prospect theory;[58] (6) CPT;[59] and (7) SP/A theory[60], among others. Each has strengths and weaknesses and each is designed for a particular purpose (prediction, description, prescription).[61] The careful study of decision-making has yielded a tremendous volume of results. Some of the most important of these have been incorporated into the formal models of choice. The most prominent of the descriptive models is CPT. We use CPT as the basis for an examination of the challenges involved in prioritising watch-listed individuals for surveillance.

One of the principal findings of decision theory and the motivation for development of models such as CPT is the way in which people deal with risk, uncertainty and probability. Even when chances are assessed correctly, decision-makers tend to accord more significance to unlikely outcomes and less significance to more likely outcomes.[62,63,64,65] This tendency[66], along with several others, leads to divergences from the optimal rankings that are prescribed by orthodox models such as expected utility theory. Based on available information and intelligence, law enforcement agencies prioritise those individuals whose names appear on terrorism watch lists based on an assessment that incorporates some measure of the likelihood, p_i, that a particular individual will perpetrate an act of terrorism. This measure may be implicit. It may also be subjective. Each individual, x_i, is expected to perpetrate an act of terrorism with probability p_i, which may be zero. The challenge is to rank these individuals in order according to the

threat they represent. This prioritisation is analogous to any type of ordering of prospects under conditions of risk and uncertainty.

In developing prospect theory and its refined version (CPT), Kahneman and Tversky identified several aspects of the decision-making process that had emerged time and again in experimental studies. They included these in their descriptive model of the process that people use to order alternatives in contexts characterised by risk and uncertainty. The structure of prospect theory can be summarised by listing the main findings that are incorporated within it or which flow from it.[67] Decision-makers:

1) Subjectively overweight unlikely outcomes and subjectively underweight more likely outcomes;
2) Use reference points in assessing alternatives;
3) Are loss averse;
4) Take risks to avoid losses and shun risk in order to protect gains.[68]

All but the first of these are directly reflected in the S-shaped ordering (value) function that has come to be viewed as the quintessential feature of prospect theory. In Figure 1, the way in which decision-makers order alternatives is depicted by a function that is S-shaped and inflects around a reference point. The reference point may be the status quo, it may be 'zero' or it may be determined in some other way. For example, Phillips and Pohl[69] argue that the terrorist or terrorist group forms a reference point based on the outcomes that other terrorist attacks have generated (number of fatalities). Investigators may also form reference points. For example, the characteristics of a most recent perpetrator.

In the domain of gains, to the right of the reference point, the decision-maker's value function is concave to reflect a formal mathematical property of risk aversion. That is, a risk averse individual would prefer to receive outcome a for sure than to participate in a gamble x with an expected value of a (and a chance of some amount greater or less than a). After experiencing gains, the decision-maker tries to protect them. The opposite is the case for the domain of losses. Here the decision-maker's value function is convex to reflect risk seeking. Rather than accept a sure loss of b, the decision-maker now prefers to participate in a gamble and is willing to bear the risk of losing more in taking the chance of losing some amount less or, better still, not losing at all. This risk seeking behaviour to avoid losses derives from the decision-maker's loss aversion.

[Insert Figure 1 Here]

If we think about the task of prioritising suspects whose names appear on terrorism watch lists in these conceptual terms, it is possible to glimpse the (unintended) ways in which such an ordering may be shaped. This is not just a matter of pointing out the source of potential errors but the influence of systematic aspects of the decision-making process. A decision-maker is less sensitive to those outcomes whose probabilities are further away from either 0 or 1. This is called 'diminishing sensitivity'. An outcome that has a likelihood of occurring 90 percent of the time may be accorded a decision weight that is somewhat less than 0.90. This does not mean that the decision-maker errs in underestimating the probability. Knowing full well what it means for something to have a 90 percent chance of occurrence, the decision-maker accords it less weight. At the other end of the probability distribution, when an outcome has a 10

percent chance of occurrence it is accorded more weight. Again, not because of an error but because of the way that uncertain outcomes are treated during the decision-making process.[70]

Diminishing sensitivity explains why certain suspects attract more attention and why their likelihood of offending is underweighted or overweighted. When ranking a list of suspects, the differences in the likelihoods that each suspect will offend (or has committed an offense) is critically important. When the probability of offending is near 0 or 1, the differences between two suspects' likelihoods of offending appears more substantial. A suspect who is a 10 percent chance of offending appears much more likely to offend than a suspect whose chance of offending is 5 percent and, hence, more than proportional weight is assigned. Conversely, a suspect who is a 92 percent chance of offending appears much less certain to offend than a suspect whose chance of offending is 97 percent and, hence, less than proportional weight is assigned. By contrast, two suspects whose chances of offending are 50 percent and 55 percent do not seem to be so dramatically different from each other and do not attract the same degree of attention and, hence, are accorded weights that are proportionally closer to their actual probabilities of offending. Whether the outcomes of a decision-making process are the result of error or some systematic quirkiness, the prioritisation may be shaped in unintended and potentially undesirable ways.

Let us start with the influence of reference point dependence. An investigator or investigative team may form a reference point that shapes the prioritisation of watch listed individuals. A source of such a reference point is the most easily recalled (potentially the most recent) characteristics of a successful or unsuccessful case.[71] In prioritising watch listed individuals $x_1, x_2, \ldots, x_n$, the reference point x_R is a set of remembered characteristics. The degree to which a watch listed individual, say x_1, matches x_R shapes the prioritisation process by pushing x_1 higher up the order of priority or lower down. Unless the characteristics of each case are assessed absolutely, without reference to the set of remembered characteristics, there is a tendency for watch listed individuals to be accorded more or less priority depending on the ease with which they can be mapped against x_R. This is one way in which previous experience can shape the prioritisation process. This may or may not lead to errors in prioritisation. The degree of error will, of course, be determined by the degree to which x_R is reflective of the threat posed by x_1. A strong (weak) correspondence between x_1 and x_R tends to increase (decrease) the priority attached to the further investigation or surveillance of x_1.

The reference point of remembered characteristics, then, focuses the attention of the investigative team. Decision-makers display diminishing sensitivity at points further and further from the reference point. A watch listed individual, say x_2, may not be close to x_R and may be accorded less attention than he or she should be accorded. This is a potentially serious shortcoming of a reference dependent decision-making process in a terrorism context. Individuals that are close to the set of remembered characteristics will be accorded more attention and those that are further away will be accorded less because of the attention that x_R focuses and the diminishing sensitivity that decision-makers exhibit for cases that lie further and further away from x_R. The investigative team will also form some subjective assessment of the likelihood that a watch listed individual will engage in a serious action within a given period. This will be shaped by the probability domain that underlies the set of remembered characteristics that form the foundation for the reference point.

Assume that the investigative team determines (subjectively) a set of probabilities that they attach to each watch listed individual to reflect the likelihood that the individual will perpetrate an act of terrorism. The determination of probabilities can be prone to error but the main point that we want to highlight here is the effect of over-weighting or under-weighting of the probabilities once (and however accurately) they are determined. This applies even if the assessment of likelihood is implicit, as it will be unless some formal process or technique is used. The extreme probabilities of 0 and 1 operate as dual reference points that focus the attention in the same way as our set of remembered characteristics (x_R). The distance between the subjective or implicit likelihood attached to the watch listed individual's chance of perpetrating an act of terrorism and each of the two probability domain reference points will shape the weight that the investigative team assigns to the likelihood that the individual will offend. Whether the weight that is applied emerges from error or systematic aspects of the decision-making processes, there is a very real possibility that subjectively assigned probability weights lead to suboptimal threat assessments and suspect prioritisation.

Consider three individuals who have been identified as being 'very unlikely', 'very likely' and 'moderately likely' in terms of the risk that they will perpetrate a terrorist action. Each falls into a particular probability range in the probability domain in Figure 2. The first watch listed individual falls into the south-western region, the second into the north-eastern region and the third into the central region. The subjective weights that are attached to these determined likelihoods are inverse S-shaped through the probability domain, indicating diminishing sensitivity away from 0 and 1 likelihoods and systematic overweighting (underweighting) of lower (higher) probabilities. Any watch listed individual whose likelihood of perpetrating an action is less than 50 percent will be accorded a proportionally higher and higher decision weight while any watch listed individual whose likelihood of perpetrating an action is greater than 50 percent will be accorded a proportionally lower and lower decision weight.

[Insert Figure 2 Here]

The influence of non-linear probability weighting, diminishing sensitivity (or attention) and the 0-1 reference points that characterise the probability domain is summarised by Figure 2.[72] The first watch listed individual, who has been identified as being 'very unlikely' to perpetrate an action, is accorded more than proportionate weight. The second is accorded less than proportionate weight and so is the third, though not to the same degree. The likelihood that the first watch listed individual perpetrates a terrorist action is over-weighted and the likelihood that the second or third individuals perpetrate a terrorist action is under-weighted. A source of potential error regarding the priority accorded to the third watch listed individual also lies in the relatively scant attention that he or she attracts. For watch listed individuals whose likelihood of perpetrating an action lies further and further away from 0 or 1, the less attention they are accorded.

The prioritisation process is not static. It is ongoing and any ordering that is determined is subject to continuous revision. Over time, the investigative team will experience successes (gains) and failures (losses), some of which may be more obvious than others. When the investigative team successfully

prioritises a watch listed individual, the team experiences a gain. When the investigative team fails to prioritise a watch listed individual, the team experiences a loss. These gains and losses shape decision-making dynamically, introducing risk aversion and risk seeking into the process. The influence of these might be checked. Before that can be accomplished, however, a level of awareness must be established. Professional development exercises that introduce opportunities for feedback and reflection upon previous decisions are essential to establishing this awareness. Such exercises would be specifically designed to identify the ways in which risk preferences have shaped the decisions that were made. This is important because the influence of risk seeking and risk aversion on the outcomes of the decision-making process can be far-reaching.

Investigative teams must take risks in deciding to prioritise or deprioritise a watch listed individual. The task is not mechanical and the investigative team may adjust the amount of risk taking that characterises their approach to the prioritisation task. More risk taking may be associated with greater reliance on the least mechanical aspects of the evaluation process and *vice versa*. For example, the role that intuition is allowed to play. The intuition of professionals can be an essential if somewhat controversial element in the decision-making process.[73] Decision-makers display a tendency to consolidate successes and protect their gains. When the investigative team experiences successes, the team's risk aversion will tend to increase. The team has received positive recognition for its good work and seeks to protect the reputation that it has established. The task will be approached with more caution and, perhaps, more formally with more checking and double-checking of the conclusions that the team has reached. When the investigative team experiences losses, the team's loss aversion will prompt a tendency towards more risk taking to recoup those losses and re-establish the team's record or, potentially, save the team from reassignment. Under these circumstances the prioritisation task may be approached less formally with more weight given to intuition. In both cases, the judgements formed by the investigative team can be disrupted.

Before concluding, it is necessary to address another related and extremely robust behavioural characteristic: overconfidence. With regards to the scenario that we have just been discussing, we might be tempted to conclude that success breeds overconfidence and, therefore, more risk seeking behaviour. It is true, overconfidence does indeed foster risk seeking but not necessarily in a manner that contradicts the predictions of CPT. Rather, overconfidence complements the insights into decision-making that derive from CPT. Overconfidence of three varieties has been detected in virtually every context that has been studied: (1) people having overconfidence in their estimates; (2) people overestimating their abilities; and (3) people over-placing themselves relative to others.[74] In a context characterised by risk and uncertainty, the primary impact of overconfidence on the outcomes of the decision-making process stems from its effect on probability estimates.

As we have seen in our discussion of CPT, non-linear probability weightings emerge from the interaction of diminishing sensitivity and the 0 and 1 reference points in the probability domain. The decision weights imply no fundamental misunderstanding of the probability distribution on the part of the decision-maker. However, an overconfident decision-maker will systematically assign incorrect probabilities and, in consequence, the proportion of times the decision-maker is correct about an outcome will be lower than it would be if probabilities were correctly 'calibrated'.[75,76] The incorrect probabilities are

then weighted in the manner described by CPT leading to additional distortions.[77] The combination of the behavioural characteristics embedded within CPT and the effects of overconfidence lead to errors in threat likelihood assessments that generate losses for the investigative team that foster the inherent risk seeking of the overconfident decision-maker. At such a point, the decisions being made are likely to be far from optimal.

Concluding Remarks

Suspect prioritisation is an essential component of the investigative process and no purely formal system can replace the decision-making process as it applies to this task. Given the size of the terrorism watch lists that have been built and are being managed across many jurisdictions, efficient prioritisation of watch listed individuals for investigation or surveillance is critical. In prioritising watch listed individuals, or even in deciding to place an individual on a terrorism watch list in the first place, law enforcement and intelligence agencies make decisions in a complex environment characterised by risk and uncertainty. The decision-making processes that are brought to bear on the task are potentially subject to the same biases that have been identified over many decades of experimental and empirical research by decision theorists.

Much research has been accorded to the ways in which decision-makers rank or order alternatives under conditions of risk and uncertainty. There are many different complementary perspectives from which to view the problem. In this paper, we have used the most prominent theoretical framework, CPT, to explore the decision-making processes that are applied to the task of prioritising watch listed individuals. CPT encompasses some of the most robust behavioural idiosyncrasies that have been repeatedly found to shape the ways in which alternatives are ranked. These include loss aversion, reference point dependence, risk seeking to avoid or recoup losses, risk aversion to consolidate or protect gains and reference point dependence. The subjective determination of probabilities and the subjective weighting of them is also central to the decision-making process described by prospect theory. By depicting the task of prioritising watch listed individuals as a task involving the ranking of alternatives under conditions of risk and uncertainty, we enable prospect theory as a perspective from which the problem can be viewed and by which the factors that may shape the outcome of the task can be brought into the foreground.

If our analysis is broken into its component parts, then perhaps our most important single point is our definition of the reference point that operates in this context. As a set of remembered (available) characteristics, the reference point is itself the product of a heuristic. Attention is focused on those characteristics of the watch listed individual that most closely align with the reference point. Because of diminishing sensitivity, watch listed individuals who are further and further away from the reference point receive less and less attention. The degree to which this is a problem depends on the degree to which the set of remembered characteristics, the reference point, correlates with the threat that individuals represent. A more formal system of categorising individuals on the basis of multiple criteria may mitigate the influence of reference point dependence. Peer reviews by different investigative teams may also mitigate the influence of any single team's set of remembered characteristics.

In prioritising watch listed individuals, law enforcement operates under conditions of risk and uncertainty and must bear risk at each step in the process. There is the risk that resources will be wasted on a low threat individual who is accorded more priority. There is the risk that a terrorist action will be

perpetrated because a high threat individual was accorded lower priority. The investigative team's preferences for risk will shape its decisions. Furthermore, as we have pointed out, risk preference will shape those decisions dynamically. Risk aversion will tend to emerge after a series of correct decisions (successes or gains). Risk seeking will tend to emerge after a loss. When combined with overconfidence and the inaccurate initial probability estimates that overconfidence helps to produce, the divergence from a well calibrated ranking of watch listed individuals may be substantial. Because the prioritisation process is never fully mechanical or driven entirely by a formal system, intuition and experience must enter into the decision-making process. Indeed, it is direct and indirect experience that determines the set of remembered characteristics that is the reference point. Ever present and essential, yet controlled to some degree by the procedural nature of the law enforcement agency itself, professional intuition may play a greater or lesser role in shaping the outcomes of the prioritisation process. Risk seeking loosens the structure around professional intuition.

Reference points (remembered characteristics), subjective probability weighting, loss aversion, risk seeking to avoid or recoup losses and risk aversion to consolidate or protect gains are several of the most robust behaviours observed by decision theorists experimentally and empirically over more than fifty years. For the effect of these types of behaviours on any particular task involving decision-making under conditions of risk and uncertainty to be recognised, the task itself must be viewed from the perspective of a behavioural model of decision-making. In this paper, we have re-worked some of the essential features of the task of prioritising watch listed individuals so that it can be viewed from such a perspective. The result is a more nuanced understanding of just how complex this task is and, we hope, an enhanced awareness of the subtle ways in which the outcomes of the decision-making processes applied to this task can be shaped by systematic features that characterise the ways in which humans approach the task of ordering alternatives in a risky and uncertain environment. Practically, these insights may be used as the foundation for training and development exercises that concentrate specifically on identifying the role that particular behavioural characteristics have played in the decision-making process and as the rationale for procedural changes that recognise the impact that these characteristics have, such as peer reviews designed to mitigate an investigative team's set of remembered characteristics. Following periods in which deficiencies in the prioritisation process have become apparent, the structure of decision theory as we have applied it here may form the foundation for a review process aimed at improving the assessments of the terrorism threat that certain individuals and groups represent.

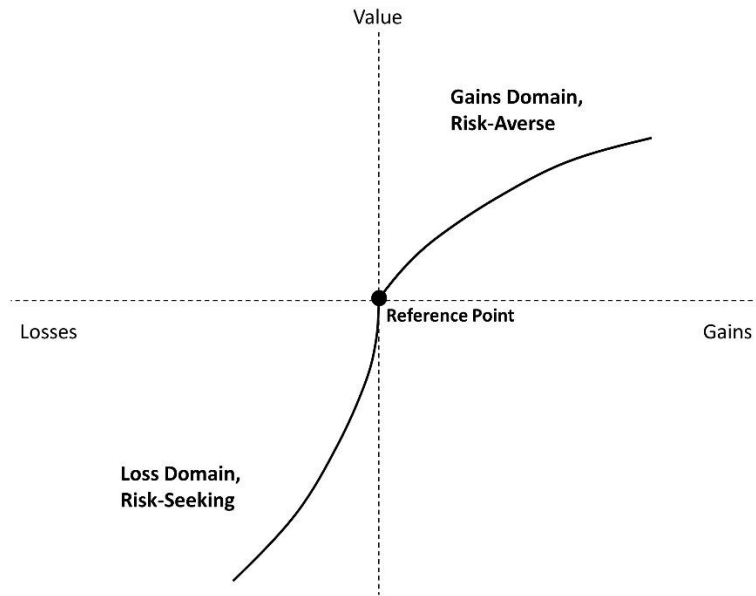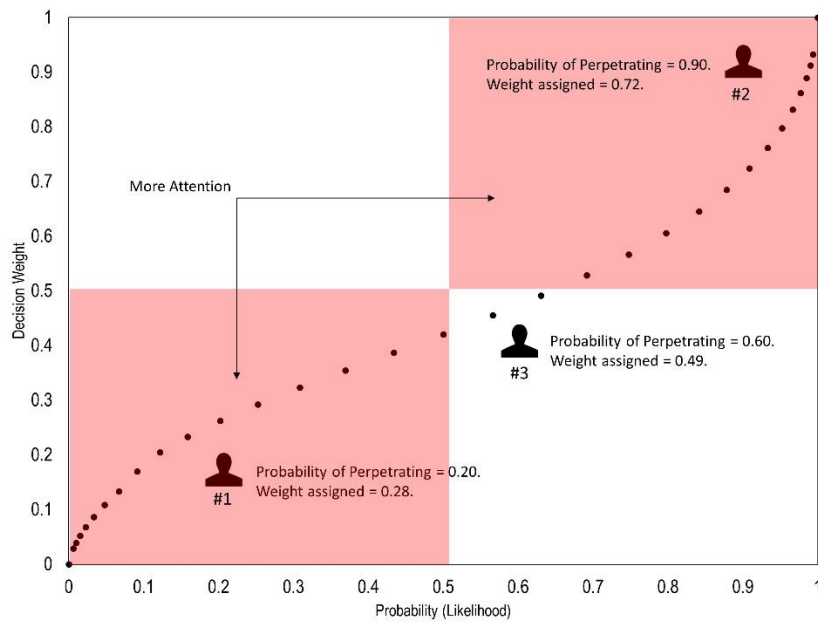**Figure 1: The S-Shaped Value Function of Prospect Theory**

Figure 2: Subjective Probability Weights, Diminishing Sensitivity and Suspect Prioritisation

Notes

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[20] Ibid, p.2148.

[21] Ibid, p.2153.

[22] Ibid.

[23] William Krouse and Bart Elias, op. cit., p.19.

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[77] That is, overconfidence introduces errors in probability assessments which are then further distorted by non-linear probability weighting.