A Practitioners Perspective of the Implementation Effectiveness of the Optimal Forager Theory Methodology Within the United Kingdom

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Abstract

The use of crime mapping has been used by the police to inform deployment of resources for many decades. Such approaches are commonly used to underpin crime control strategies designed to prevent or reduce acquisitive crimes such as domestic burglary. In recent decades there has been a shift away from simple hot spot identification to more complex geospatial mapping methodologies, such as near repeat analysis which was developed through research regarding burglary victimisation. One of these newly emerging methodologies is built upon the ecological, optimal forager theory (OFT). Research using this theory to examine domestic burglary offending intimated potential for positive results in predicting areas at risk of future crime. This led to a number of police services using crime analysis methodologies built upon OFT to underpin their deployment of resources in an effort to prevent or reduce domestic burglary through increased capable guardianship. However, to date, there has been no detailed examination of how the police services implemented such approaches. As such, this study seeks to fill this gap by examining OFT strategies implemented within 5 police services. By interviewing participants directly involved in the programs the study gathers views and perspectives of its relative success. As a result, we identify that participants felt the strategies produced limited impact on recorded burglary crime. We discuss how despite some positive by-products of the strategies, failure to comprehensively apply the theoretical foundations of OFT, and a variety of implementation failures have undermined the various programs, ultimately impacting their effectiveness.

Keywords: Optimal Forager Theory, Near-Repeat Theory, Burglary, Crime, Policing

Introduction

The use of crime mapping within policing has a long history. Rennison (2019) has suggested that as far back as the 19th century criminal intelligence analysis was conducted within the Metropolitan Police where it was used to review intelligence and to map hot spots within the policing jurisdiction. Over the following decades this approach was further developed by police leaders such as August Vollmer who during his career in the early 1900's used what has been described as '*pin mapping*' to visualise the geographical distribution of crime locations which he used to inform patrol deployment decision making (Rennison, 2019). Over the subsequent year's academics such as Herman Goldstein developed the philosophy of problem-oriented policing which advocated the identification and analysis of crime and disorder related problems, with a strong emphasis on the response by policing agencies to prevent and reduce crime (Hinkle et al, 2020). In the early 1990's, intelligence led policing also emerged as a complimentary model that has since been adopted in a wide array of western policing agencies (Ratcliffe, 2003). To support these philosophies systems such as a CompStat were developed by the New York Police Department with the aim of improving the efficiency of collating information and intelligence, and using this data to inform deployment decisions and tactical policing interventions (Rennison, 2019). Throughout these policing developments criminological research and specifically that which supports theories of crime pattern theory, rational choice and routine activity theory have evolved in parallel and began to converge. Theories such as routine activity developed concepts of capable guardianship which later evolved into policing models such as the problem analysis triangle (Clarke and Eck, 2009). As a result, police services worldwide now use a variety of methodologies for analysing, mapping and visualising crime. To further develop this area academics and practitioners alike have continued to use the scientific method to develop and test new spatial theories of crime in an effort to transition from a solely reactive model of crime analysis, to one that has the ability to predict what may occur in the immediate future. This shift coined the term '*predictive policing',* and this change in perspective has resulted in the emergence of more contemporary theories that are not only aimed at predicting potential future offenders and victims, but ones that are born from outside traditional spheres of criminological and policing study including the use of epidemiological theory that has been used to develop the near repeat theory of victimisation.

The most recently emerging of such crossover theories originates from ecology. Optimal foraging theory postulates that predatory animals search for prey in patches, and that they make a cost benefit analysis of risk vs. energy expenditure vs. reward when identifying geographical areas within which they forage. As a result of research in this area ecological observations have enabled ecologists to make robust predictions regarding the movements of foraging animals. Crime science research, predominately on domestic burglary offending, has shown that applying these same principles to offenders who commit criminal offences has similar advantageous outcomes in terms of the identification of areas at heightened risk of targeting by offenders. However, to date, the research conducted in this area has focused solely on quantitative methodologies with success measured against crime records. Despite this fact, a 2015 report published by the United Kingdom College of Policing identified that as many as 9 police services had begun using this methodology, or a form of it, to underpin their crime analysis mapping for offences of domestic burglary. This mapping was then used to inform the tactical level decision making regarding the deployment of police resources who are used to increase the capable guardianship presence in areas at risk of future criminal foraging behaviour. As a result, a few studies have examined the success of such implementations (Addis, 2012; Fielding and Jones, 2012 and Johnson et al, 2017) suggesting it does have an identifiable positive impact on recorded crime levels for domestic burglary. However, there is still no research that has examined how any of these police services implemented such programs and as such, this study will be the first to successfully examine this in detail in an effort to fill this gap in the research. To achieve this, key practitioners (n=15) from across police services in the United Kingdom involved in the implementation, co-ordination and operational delivery of optimal forager based predictive tasking and co-ordination were interviewed. Issues such as leadership, buy in and offending behaviour are discussed with the participants. Personal perspectives are also obtained that further enable assessment of the methods effectiveness, efficiency and accuracy. The results of the interviews are discussed within the context of optimal forager theory, wider criminological study of crime pattern theory and the implementation research evidence from studies of other forms of evidence based policing interventions.

Literature Review

The focus of this study is the practitioner's perspective of a place based crime prevention and reduction strategy. As such it is important to provide an outline of the underpinning theories that

relate to spatial theories of crime which include the three criminological concepts of routine activity theory (RAT) (Cohen and Felson, 1979), rational choice theory (RCT) (Cornish and Clarke, 1987) and crime pattern theory (Brantingham and Brantingham, 1991). Born from these theories modern methodologies for predicting crime, place, and victims have emerged such as near repeat theory (NRT) and optimal forager theory (OFT) and as such, a brief overview of these are also provided.

Crime pattern theory posits that crime is not randomly distributed. Much research has shown that its conduct concentrates in both place and time. To combat this, the police seek to identify geographical areas that suffer from high volumes of criminal behaviour, often referred to as 'hotspots'. Once identified, policing activity can be focused in the right place, at the right time by intervening with tactics that have the intention of preventing or reducing the number of crimes that occur, such as high visibility police patrols. The success born from identifying crime hotspots emerges because they maximise the ability of the police to impact on 'pinch points' of offending behaviour. Research examining how crime and space interact has identified that offences most commonly occur along pathways and at nodes where people routinely interact as they go about their 'routine activities' (Cohen and Felson, 1979 and Brantingham and Brantingham, 1991). Central to the success of this approach to crime control is the concept of the 'capable guardian', whose presence is said to deter a motivated offender who encounters a suitable target during these routine activities, from committing an offence (Reynald, 2011). Such guardians have been defined as *"the physical or symbolic presence of an individual (or group of individuals) that acts (either intentionally or unintentionally) to deter a potential criminal event"* (Hollis-Peel et al, 2011, pp 5). Historically there have been several distinct subtypes of guardians within the literature referred to as handlers (those that can control or monitor offenders), managers (those that control responses in geographic areas), and guardians (those capable of protecting potential targets and victims) (Eck, 1994; Felson and Boba, 2010; Sampson, Et al, 2009 and Tilyer and Eck, 2010). The focus of this study is on the guardianship provided through a place based management strategy and as such the interventions provided by place managers are key. It has been suggested that place managers are predominately the police, but can include security guards, citizen patrols, neighbourhood watch and the use of CCTV (Hollis-Peel et al 2011). Early research by Cohen and Felson showed that increased presence of a capable guardian through the above approaches does reduce levels of crime.

Despite their many positive contributions to crime control the aforementioned theories share a fundamental flaw in that they only highlight where crime has occurred, not where it is likely to occur in the future. As information technology has advanced and data analysis methods have increased in their effectiveness, how place managers such as the police deploy guardians has also evolved. In the past decade police services and criminologists have made tentative steps to move away from mapping what has occurred, on to predicting what will occur, coining the term '*Predictive Policing*' (Beck and McCue, 2009). There are several aspects to the concept of predictive policing which include methods for predicting crimes, offenders and victims (Perry et al., 2013). The theories used for predicting victims and offenders are intrinsically linked but is an entirely different science altogether and involves criminological theories of both geographical and offender profiling (Perry et al., 2013) which is not the focus of this study. The objective of this section is to provide an overview of the literature as it relates to the prediction of future crime locations. One of the most prominent newly emerged theories of crime prediction is that of near repeat theory. This theory emerged as a result of the examination of the commission of burglary through an epidemiological lens and identified that those who live nearest to a recent victim of crime are at the highest risk of future victimisation (Johnson and Bowers, 2004; Pitcher and Johnson, 2011 and Ratcliffe and Rengert, 2008). As a result, NRT is considered to be effective at identifying geographical areas for heightened police prevention activity. Since its emergence it has been demonstrated by numerous studies to be effective at predicting the location accuracy of future crimes (Bernasco, 2008; Chainey and Silva, 2016; Johnson and Bowers, 2004 and Johnson et al., 2009; Farrell and Pease, 2017; and Wang, 2018). Specifically, the theory has been shown to be consistently accurate when analysed in the context of volume acquisitive crimes such as burglary and vehicle thefts (Pitcher and Johnson, 2011). The concept '*flagging*' (Farrell and Pease, 2017; Ferguson, 2011; Wang and Lui, 2008 and Sagovsky and Johnson, 2007), which is outlined within NRT, indicates that an offender will target victims based on their perceived low level of risk. This theory is born from rational choice theory (RCT) (Cornish and Clarke, 1987) which effectively argues that criminals make calculated decisions whether to commit a crime or not based on a complex assessment of factors including the risk of apprehension, ease of commission, and financial reward. This position has been debated within the area of bounded rationality with some arguing that criminals are unlikely to conduct such complex decision making (Johnson and Payne,

1985 and Opp, 1999), with others citing research on burglary offenders that suggests they do make these very calculated decisions before committing a criminal offence (Nee and Meenaghan, 2006).

Optimal forager theory (OFT) is another recently emerged predictive approach that could also be considered to fall within the area of bounded rationality, but has a more primal origin. Similar to NRT, this theoretical concept has predominately been tested on domestic burglary crimes (Bernasco et al., 2015; Chainey et al., 2018; Chainey and Silva, 2016; Gerstner, 2018; Glasner et al., 2018; Hering and Bair, 2014; Johnson, 2014; Johnson and Bowers, 2004; Johnson et al., 2009; Nobles et al., 2016; Rey et al., 2012; Rosser et al., 2017; and Sidebottom, 2011) and it argues that offenders will act much the same way as an animal predator (Johnson and Bowers, 2004). It is suggested that as an animal does when hunting for prey, an offender will balance the costs and benefits of committing an offence and target their victims, based on vulnerability, to accordingly maximise their return (Johnson, 2014). For example, an animal will weigh the level of energy expenditure and risk i.e. being preyed upon themselves vs. the likelihood of sourcing food. A criminal will consider the same issues when searching for a victim by calculating the risk of detection or apprehension vs. the potential for criminal reward (Johnson et al, 2009). When making these calculations Johnson (2014) theorised that both the animal and criminal will display similar foraging behaviour as they search for their prey or victim. Furthermore, that areas which are closer together are more likely to be similar in their abundance of prey or victims and as such a clustering effect emerges which is in essence the same underpinning NRT and what provides the potential to predict future geographic areas at heightened risk of crime (Fortin and Dale, 2005). Despite its numerous similarities to NRT, the OFT has some nuanced distinctions. It has been outlined that the most notable of these is that the optimal foraging offender shifts between what the ecology literature refers to as patches (Charnov 1976). Unlike near repeat localities, patches are distinct micro-geographical areas, and when analysing the distribution of crimes, specifically domestic burglary, police analysts look for non-overlapping geospatial hotspots of burglaries to identify the presence of a 'foraging offender' (Halford, 2022).

As this section has illustrated, to date there has been a wide array of studies that have examined the effectiveness of traditional hotspot policing interventions and as such this has been able to reach somewhat of a consensus on its success. NRT has similarly been studied in relative detail. In contrast, although OFT research has been conducted, it has been exclusively quantitative in

nature, testing the predictive accuracy of methodologies against historical crime records to prove effectiveness of approaches such as regression analysis, density estimation, correlational analysis, and cluster analysis (Vandeviver et al, 2021). With the exception of just a few quantitative studies examining the impact of OFT pilot programs on recorded crime levels (Addis, 2012 and Fielding and Jones, 2012) there has also been no examination of the evidence based implementation of these programs. In fact, recent research has suggested that there remains an absence of any studies systematically examining responses by law enforcement, especially policing strategies conducted using a foraging perspective (Vandeviver et al, 2021). In addition, there still remains an absence of research that further considers the theoretical underpinnings of OFT and their application in the areas of policing and criminology (Vandeviver et al, 2021).

Aims of the Study

This studies overall objective is to fill the identified research gap within optimal forager theory that relates to the absence of qualitative research on its use and implementation, or its perceived effectiveness within a policing context. The aim of the study will be to achieve this through a process of semi-structured interviews of practitioners involved in the use of optimal forager theory to analyse burglary crime, and who conduct the subsequent tasking and co-ordination of police resources to increase their capable guardianship effect. Due to the absence of literature in the aforementioned areas, this study is positioned to provide an understanding of the *'if, what, why, when and how'* such policing programs that have used the OFT methodology have been implemented, and to what perceived success. Van Gelder and Van Daele (2014) have argued that the inability of researchers to directly observe criminal foraging behaviour is one of the reasons for the absence of the aforementioned research. Vandeviver et al (2021) support this position and highlight that the inability to observe foraging offenders inhibits research and this is why studies have resorted to inferencing offender behaviour from crime statistics and spatial, and temporal mapping. Although this study falls short of being able to directly observe the behaviour of foraging offenders it goes far closer to achieving this than any previous research by gathering the perspectives of the people at the *'coal face'* of capable guardianship and as such will provide essential and unique insights that will inform criminological and policing advancements in this continually developing area.

Method and Data

Data for this research was drawn from qualitative interviews of police practitioners involved in the implementation of the optimal forager predictive policing methodology. The reason for using semi structured interviews was to gather the richness required to increase understanding and if possible, assess the effectiveness of the implementation of the optimal forager predictive policing approach and its overall success in an operational Policing environment. It has been suggested that the semi-structured interview method is best suited for studying people's perceptions and opinions on complex subjects (Barriball & While 1994) and as such, it was a strong fit for this study. A survey of staff was considered but it was felt that to gather the depth of information required this methodology was insufficient and too restrained to adequately capture the knowledge and experiences of the participants. Interviews are the best way to do this because they offer the most effective method of obtaining an individual's subjective experience and any meaning they attach to that experience. Interviews properly constructed around open questions allow the interviewee opportunity to express their views and opinions. What Kallio et al (2016) describe as a semi-structured interview guide, was created to support the interviews. This included two layers of questions, primary themes, and secondly follow-up questions. Primary themes covered the subject in a systematic manner and were generated through a combination of the authors professional and academic experience, and born from key areas identified in the literature. As a result, the themes of training, crime analysis processes, frequency of product generation, governance, tasking and co-ordination, and the implementations crime prevention and reduction success were all pre-identified. Questions for these themes were all open ended except when a categorical answer was required, for example, what day was a meeting held on had 1 of 7 possible responses. Follow up questions were spontaneous and decided upon by the interviewer during the process to enable clarification, assist flow of the interview and put participants at ease. Predominately these questions were also open ended and followed a 5WH theme (who, what, when, where, why and how).

Participants interviewed were from Lancashire Constabulary, West Yorkshire Police, Greater Manchester Police, North Yorkshire Police and Durham Constabulary. Full details of the participants and their respective roles are illustrated in Table 1. To identify these participants a scoping exercise conducted by the College of Policing (CoP, 2015) which identified the various models in use within the UK was first examined. This review identified that at the time, within the

UK, only four pilot programs had been conducted that had used the optimal forager methodology. Through further liaison with the College of Policing, open source research and onward referral within the policing community, five further police services were identified that had not been recorded in the original review and this provided a total of nine potential police services for approach. Each police service was then written to directly via email with a request to interview practitioners involved in the pilot programs but only the aforementioned 5 permitted the research. Once authorized suitable participants were put forward by managers within each service who held a position that was involved directly within the implementation of the optimal forager policing pilot program. The roles in which the interviewees fulfilled within their organisation ranged from intelligence analysts and various ranks of Police officers ranging from constables to middle managers and chief officers. This provided a wide array of perspectives and expertise and the criteria ensured that the interviews were sufficiently experienced to provide relevant and insightful information. The majority of the interview's were conducted face to face (n=11). However, on occasions due to the geographical restraints faced internet based media such as MS Teams, Skype, Face Time or telephone (n=4) was used. Interviews were audio recorded and then transcribed after. This allowed the interview to be conducted in a conversational manner that allowed the participant to feel at ease and provide the best information possible.

In total 15 interviews were conducted for this part of the study. Of the police services approached, the Lancashire Constabulary optimal forager pilot provided the greatest level of freedom of access to interview staff who had been involved in the program. As such, the majority of interview participants (n=7) are from this organisation. Greater Manchester and West Yorkshire police both provided 3 interviewees. As a result of the approach to the College of Policing a request for further interview participants with knowledge of the use of optimal forager implementations was placed on '*POLKA*', the Police knowledge forum, and as a result two further interviewees were identified from North Yorkshire Police and Durham Constabulary respectively.

Interview Participants			
Police Force	Role	Rank	Reference ID
Lancashire Constabulary	Crime Co-ordinator	Detective Sergeant	LC1
	Community Safety Partnership Analyst	Analyst	LC2
	Operational Immediate Response	Constable	LC3
	Divisional Operations	Superintendent	LC4
	Pro-active Burglary Team	Sergeant	LC5

	Policing Operations	Chief Inspector	LC7
	High Impact Acquisitive Crime	Detective Inspector	LC8
West Yorkshire Police	Senior Intelligence Analyst	Analyst	WY1
	Head of Performance and Analysis	Analyst	WY2
	Operational Policing	Police Sergeant	WY4
Greater Manchester Police	Intelligence Bureau	Analyst	GMP1
	Intelligence Bureau	Analyst	GMP2
	Hub Manager	Police Inspector	GMP3
North Yorkshire Police	Research and Analysis Branch	Performance Analyst	NY2
Durham Constabulary	Intelligence Bureau	Senior Intelligence Analyst	DC1

Table 1. Breakdown of the studies interview participants

Interviews were analysed by following a 5 stage process. Firstly, all interviews were recorded on a smartphone voice recording application and subsequent familiarization of the content was achieved through a verbatim process of transcription. Second, due to its ease of access Microsoft Excel was used to record and conduct analysis of the data with each of the pre-defined primary themes being listed vertically on the 1st column of a Microsoft Excel data sheet. A further 15 columns were generated horizontally for each interview participant. Next, each transcript was reviewed systematically and content was highlighted by number to assign it to a theme. This process was repeated several times which resulted in the emergence of new themes not previously defined such as issues relating to culture, which broadly fell into 2 areas described as '*them and us*' and '*buy-in*', along with themes for partnership stakeholders and organised travelling criminals. After this stage, highlighted content was copied into the appropriate column that referred to the theme and interview participant. This stage created a horizontal row that brought together the cumulative discussions for each themed area. Finally, content from each of the horizontal rows was then transferred into a draft report for editing. Prior to referencing within the study all interviews were anonymized. The necessity for anonymity of the interviewees was because many of them held important roles within law enforcement and had previously worked within the arenas of organized crime, covert policing and counter terrorism, or had aspirations to do so in the future. As such a coded system adopted by Rozee (2012) was followed. Interviews were referenced using the initials of their organization and a number. This number was sequential when more than one interview was conducted in an organization. For example, an interview from The Metropolitan Police would be referenced as MP/1 and subsequent interviewees from the Metropolitan Police would be referred to as MP/2 and so on.

Results

Training

Participants were asked to explain the frequency, standard and quality of training supplied to those involved in the optimal forager predictive process and it was evidently clear that approaches to this area were incredibly inconsistent throughout the United Kingdom. Almost all analysts interviewed (n-5, 33%) identified that they had a prerequisite to possess qualifications, with several outlining those obtained from the National Intel Analyst Training (NIAT) course (LC2 and GMP2). In addition, some analysts also benefited from additional training through problem solving analysis courses, strategic analysis courses and inferential statistics training (LC2). However, none had received specific training on OFT. In contrast to the high level of skill and training possessed by analysts it was identified that practitioners (n-8, 53%) received poor training, if any, including those who had responsibility for acting on the product received (LC5);

> *"No training impeded because it was clear that there were many interpretations of optimal forager and predictive policing which influenced expectations"* (DC1)

The delivery method of training also varied and ranged from a single email explaining the introduction of the optimal forager operations (LC3) to detailed face to face lessons on the subject (DC1). However, the majority of staff received only a short briefing from a senior officer (LC4). Furthermore, the quality of the training that was delivered varied significantly. The best examples of the quality of training included the theory of the optimal forager approach;

> *"training was achieved by extensive team briefings to every member of staff who might undertake this activity to explain the science, what was required of officers and the results 'buy in' may bring"* (DC1)

However, despite the depth or quality of training it was clear that not all officers found it useful suggesting that they learnt very little new information from it (LC4).

> *"Had we implemented it again I would have had a roll out w*
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> *ere the science was explained to officers and the data shown to them to get them on board"*. (GMP2)

> *"More time should have been given over to training and convincing stakeholders and practitioners"* (WY2)

Process of Prediction

To maximise the accuracy of the optimal forager products each police service conducted prior, in depth testing, to ascertain the predictive accuracy of the OFT methodology (LC6, GMP2 and WY3), but difference was established regarding the time frames used for the data analysis;

> *"Prior to embarking on any form of implementation a 12-month historical crime data comparison was carried out which illustrated that if these predictive optimal forager techniques had been used 12-months prior, the Trafford division could have successfully predicted 61% of our burglary dwelling offences"* (GMP2)

On occasions data drawn from as far back as three years was used to complete this testing process (GMP3). For the OFT predictions that were used to generate the briefing products for frontline officers, most police services (n-3, 60%) opted to use historical data from between 14-21 days (NY1, LC1, WY3 and GMP2) on which to base their optimal forager predictions.

> *"When looking at where the next offence was going to take place we used a rolling three-week period. This data was and still is used to create the risk maps. These are pictorial patrol plans"* (GMP2)

> *"Two weeks, again this is based on the original research and the work carried out by Trafford Police"* (LC1)

However, it one service established during the pilot period that this frequency was too low and as a result the data analysis was reduced significantly to every 24 hours, or as required (LC1). Changing the prediction so regularly may have provided a more up to date product but does risk impacting on the overall predictive accuracy which is generated from a longer temporal data set. This was a danger identified by the analyst responsible for producing the product who stated;

> *"this fluid approach was essential but effectively bastardised the integrity of the initial data"* (LC1)

Once the requisite data had been extracted an analytical process was undertaken to produce the predicted optimal foraging product. The process for conducting this followed the same strategy in

each service examined. First, the analysts would identify areas with high volumes of domestic burglary offending. Then, they would attempt to identify linked (committed by the same offenders) and unlinked offences (NY1, LC1, WY3 and GMP2). This enabled the identification of serial offenders. Once established, the analysts could then visually identify foraging patches which they did using their own professional judgement. However, it appears that most did this by seeking to identify linked, domestic burglary offences that were in close proximity, but did not overlap (NY1, LC1, WY3 and GMP2). Finally, by assessing the geospatial location and trajectory of the historic patches, analysts then predicted future burglary foraging patches they believed were at heightened risk (NY1, LC1, WY3 and GMP2). For a fully trained analyst this process became a relatively simple task (LC2). An overall assessment of the identified areas was finally made by taking into consideration unlinked offence locations and wider threat's above and beyond the committed domestic burglary offences (LC2).

> *"traditional intelligence and also information from offender management units in relation to the recent behaviour and circumstances of known criminals within the predicted areas was taken into account when identifying the highest risk foraging predictions"*

(LC1 and LC2).

Once the analyst had collated all relevant information the predicted foraging areas were then categorised into high and lower risk areas, identified in red and blue 400 metre zones respectively (WY2, GMP2 and LC6). Red areas where considered of higher risk and they included offences which had occurred within the preceding 7 days, whereas the lower risk, blue areas included older offences (LC6).

> *"The briefing product has been designed so that the highest risk areas are highlighted (i.e. those that occurred most recently), if an offence occurred in the first week of the period, the risk is still present but based on the research is lower than the risk relating to more recent offences"* (LC1).

Within the product produced the exact offence locations were also included. This served to underpin the activity of neighbourhood level resources who could use this information to conduct cocooning activity such as leaflet drops or face to face contact with homeowners residing closest to the victims (LC6).

Frequency

The level of frequency differed with some police services (n-1, 20%) producing optimal forager patrol pans on a weekly basis (NY1) and others (n-1, 20%) opting for a more fluid approach (LC1). However, the most common frequency (n-3, 60%) was identified as being 3 times per week (GMP3, GMP2, DC1 and WY3).

> *"Initially the analysis was conducted twice a week – once on a Monday to direct tasking's for the week, and secondly on Friday to direct tasking's for the weekend"* (LC1)

> *"Initially one a week, but it moved to three times per week, which it still is at present"* (GMP2)

It was clear that a process of trial and error was required before finally settling on a frequency that police services felt met their needs. As a result, there are conflicting frequencies in place with different rationales for each. For example, some co-ordinators opted to produce an optimal forager predictive product twice weekly with the first being published on the Monday for the week ahead and a second product on the Friday to drive tasking and co-ordinating over the weekend (LC2). However, as time passed it was felt that altering the product twice a week, which often resulted in new high risk areas being predicted, reduced the effectiveness of the tasking and co-ordination as the tactics had insufficient time to make impact (LC1). As a result, the frequency was reduced to a single product that was produced on the Monday before being discussed at a governance meeting on the Tuesday (LC1).

> *A Forager meeting is held every Tuesday after the daily Risk & Threat meeting, and the product is used to identify actions and task resources accordingly. The meeting is chaired by the risk and threat Detective Inspector, and attended by the geographic Inspectors, partnership representation (Community Safety Partnership teams), and any other relevant parties (e.g. Neighbourhood Watch, Intel). Both police and partnership actions are identified and reviewed at each meeting* (LC1)

In certain areas the levels of criminality were greater than in others and as such there was insufficient data to make predictions at a frequency higher than one each week (LC2). Other co-ordinators felt that producing the predicted forager high risk areas only once a week was too infrequent and reduced the capability to respond effectively to emerging threats (GMP3). As a

result, the frequency was increased from once per week to three times a week on a Monday, Wednesday and Friday (GMP2). In doing so it was also identified that there was a reduction in internal demand for further information and analysis from staff within the geographic areas analysed (GMP2).

Governance

Participants advised that each police service (n-5) used the optimal forager predictive product as a core agenda item which was discussed within what are called 'risk and threat' (RaT meeting) or 'national intelligence meetings' (NIM meeting) which are held on a daily basis (LC1 and LC2). Such meetings form part of the place management and tactical tasking of police resources as outlined by the national intelligence model (Home Office, 2003). Underpinning the daily tasking meetings where weekly meetings that discussed the predictive products in greater detail, it was within these meetings that the specific tasking's were ratified (LC1 and LC2). Governance within this setting was almost always provided by a senior officer such as a chief Inspector, Inspector or Detective Inspector whose core position was to provide oversight for the optimal forager tasking and co-ordination within the relevant area (LC2 and LC4). Often in attendance within the governance meetings where other key stake holders. These included officers from neighbourhood policing teams, pro-active burglary teams and also external partners (LC1, LC2 and LC4 and LC6)

> "*The partnership element of the response has been key, especially in a time of diminishing resources across the public sector. The Forager response encourages shared responsibility to target risk areas*" (LC2)

At the weekly meetings the specifics of actions that related to predictions for both locations and offenders were discussed (LC2). A major part of these meetings was to identify how each department or agency in attendance could have a positive influence over the identified issues (LC1 and LC6).

> "*police uniform high visibility has been a key response, with Neighbourhood Policing Teams playing a key role. Partners have also been tasked to provide visibility using street cleaners, fire and rescue conducting Home Fire Safety Checks within risk areas, Trading Standards conducting activity*" (LC1).

Importantly, it was identified that despite being provided with a detailed product and being exposed to such high levels of joint governance, individual people of influence or rank were able to overrule both the product and key stakeholders to make key decisions and direct action (LC1)

Involvement of Partners

Some of the participants interviewed (n-5, 33%) indicated that their police service called upon partner agencies such as local councils, fire and rescue, and ambulance services were also involved in the governance team of the optimal forager policing approaches;

> "*This would allow for the most effective tasking of wider Police resources, maximise opportunities for partnership working, and build on the community-focussed element of Forager*" (LC6)

Reasons that the involvement of partners was such a key element has been cited as the level of reducing police resources available to conduct traditional pro-active or problem solving work, but also the ability to provide a more fluid response to identified threats (LC1).

> "*Some identified risk areas may require a robust Policing response to focus on active offenders, whereas other risk areas may only require more focus on issues such as security and target hardening. This is where shared responsibility between Police and partners is most important – in theory the Police could provide a robust response in one area, while relevant partner agencies provide visibility and crime prevention advice in another area*" (LC6)

It was suggested that by involving partners to such a close degree it ensured that all agencies could provide a truly joined up approach to identified issues and also avoid duplication of effort (LC1, LC2 and LC4). To begin with the pilot exercises quoted great success in rejuvenating previously disparate relations with partners;

> "*The forager product has refocused partnership tasking by bolstering channels of communication between partner agencies*" (LC6)

Strong examples of joint working included the flagging up of multiple occupancy homes as a high risk burglary issue resulting in visits from council landlord teams which helped reduce the number

of offences (LC6). Partners were also identified as being particularly helpful in terms of preventing repeat offences by assisting with the super cocooning of attacked properties (GMP2).

> *"We developed a complimentary strategic approach with local housing providers in relation to residual risk hot spots"* (GMP2)

> *"The local authority were extremely receptive and used the risk maps to task their own Community Safety Patrol Teams and implemented their own system of performance management based on these deployments. Trafford Housing Trust, the largest social housing provider in Trafford has been similarly receptive"* (GMP2)

Agencies such as fire and ambulance and even the Police driving school also used the forager predictions to co-ordinate Home Fire Safety Checks within the predicted forager areas and to influence their routes to and from non-emergency deployments so they navigated through the high risk areas (GMP2).

> *"Force Driving School who were asked to conduct driving lesson within risk areas"* (GMP2)

Other positive contributions included the deployment of high visibility guardians in the form of street wardens, parking attendants and street cleaners into predicted areas during the threat time periods (LC6). Local charities were also used to target harden properties in predicted high risk areas by improving locks, supplying window stickers and further free crime prevention advice to residents (LC6). Communities were also empowered with information regarding the predicted forager areas and conducted 'community stands' and 'days of action' in the high risk areas to also prevent offending (GMP2).

It was established that the greatest success in relation to joint working with partners was achieved through a greater understanding of what motivated the agency and what their performance indicators were (GMP2). Areas where these objectives could be aligned with the forager predictions resulted in greater levels of partnership working (GMP2). It was however, highlighted that as time progressed, despite the positive rhetoric there was a significant reduction in tangible work conducted by the partners involved who began to cite issues in resourcing or budgets as their main blockers (LC1).

Tasking and Co-ordinating

One of the primary functions of producing the optimal forager predictive policing product is to maximise the impact of location based crime prevention and reduction tactics. The main tactics used to achieve this that was cited by participants (n-14, 93%) was through providing capable guardianship through effective patrolling by high visibility resources, whether that be from a law enforcement agency or a partner, as the previous section has highlighted. This concept is expertly outlined by an interviewee in the study;

> "*The tactical use of the predictive risk maps as a guide to patrolling resources is not a panacea. It is an effective means to direct resources to operate at a particular location at a particular time. It coordinates and maximises what can be obtained from high profile uniformed resources in delivering capable guardianship"* (GMP2)

By providing staff with greater clarity in terms of their patrolling it removes the professional judgement which was so often used without a sound evidence base (GMP2). Furthermore, rather than creating additional burden on staff the aim of producing a predictive product for tasking and co-ordination is to allow staff to "*do what they normally do*" (LC2) but in a more effective manner.

To create the tasking actions, predominately location based patrol strategies are raised within the governance meetings outlined which are then provided to the relevant teams and departments through briefings and '*tasking documents'* (LC6). The generated actions, and who they are allocated to where not identified purely on the predicted geographical jurisdiction of the high risk forager areas, but also took into consideration the '*professional judgment and local knowledge'* (LC6) of the decision makers. The professional judgement based decision making process took into consideration factors such as the temporal risk, whether the predicted area was an emerging or long term, established problem, and also what resources were available to tackle the identified high risk area, for instance, whether they were police or partnership staff and also whether they were uniformed or plain clothes police officers (LC3).

The predicted forager high risk areas are also outlined on software based '*problem profile'* sections of electronic briefings delivered to staff which are specific to the time of day their shift relates to (LC6 and GMP3). The format of these briefings was in the form of a map displaying the patrol plan which were key to gaining buy in (GMP2).

> *"The maps would be placed on the electronic briefing site and supervisors on both Response Policing Teams and Neighbourhood Policing Teams would task patrols to patrol certain areas at certain time as dictated via the risk maps" (GMP2)*

Several participants (n-3, 20%) from 2 police services also disclosed that they shared the tasking documents provided to supervisors with the partner agencies involved in the weekly governance meetings (LC6 and GMP3). The purpose of the tasking documents was identified as being threefold, to record activity for the purpose of effectiveness evaluation, to avoid duplication of action by the tasked parties (LC1 and GMP3) and also to provide information for senior officers to direct reward and recognition to staff who had conducted the tasking's as a tactic to maintain motivation, '*buy in*' and co-operation from the staff tasked (GMP3).

The staff tasked by the optimal forager predictive product varied within police services, with some interviewed focusing on uniformed front line police resources (DC1) or staff from within criminal investigation departments (NY1). Others chose to use a wider pool of resources (LC2) and drew from non-front line staff including police driver training school, neighbourhood policing teams and an array of plain clothed officers as well as creating specific roles in the form of a dedicated unit to target only the predicted forager high risk areas (GMP2).

> *"Each RPT shift would nominate a dedicated vehicle which by default would be given the freedom to patrol the hotspot areas as indicated by the most recent maps and not allocated to an incident. At the end of the tour of duty this patrol would complete an end of shift template which would be submitted to the Divisional Intelligence Hub" (GMP2)*

> *"One of the key 'selling points' of forager is that it should not create any additional work in the response – we should just 'do what we normally do', but do it in specific defined areas" (LC2)*

> *"Uniform and CID, although the product was available to all officers" (NY1)*

The responses to the tasking's to staff and partners varied. Some officers (n-2, 13%) felt that they provided them with much more focus in terms of their patrolling so that they could maximise their time (LC3);

> *"...it provided increased efficiency in terms of 'maximum bang for your buck' from preventative patrol…"* (WY2)

On the other-hand a number of participants interviewed (n-5, 33%), particularly from specialist teams whose core role was the investigation of burglary offences felt that they provided very little benefit and at best were just a confirmation of their existing knowledge (LC5).

> *"We were already scanning crime patterns and the forager document did not affect how we did our work, also the previously mentioned issue about it being 'behind' or out of date"* (LC5)

Although a well-established process was in place around the tasking and co-ordinating of staff it is questionable whether that process was adhered to. Evidence was identified from within 2 police services that some supervisors rarely even discussed, or briefed their staff on the predicted forager high risk areas (LC3). Further information indicated that the predicted high risk areas were given little more than lip service with supervisors only instructing their staff to patrol the forager areas *"if and when they had free time available"* (LC3) as opposed to factoring it into their shift planning. There was also little consistency across shifts or departments in their approaches to tasking evidenced by occasions when only a single member of staff would be tasked to patrol the areas at the same time as responding to emergencies or other activities (LC3). This meant that the attention given was ad hoc at best. Other members of staff, particularly those from specialist pro-active departments simply rejected the predictive tasking's on the basis that they were designed to *"direct immediate response patrols to current or future crime hotspots"* and had little relevance to their role (LC4 and LC5). Ironically, this is despite such members of staff owning thematic responsibility for the investigation of domestic burglary.

> *"It might help in briefing staff who are not regularly scanning crime patterns but for me I found no real benefit"* (LC5)
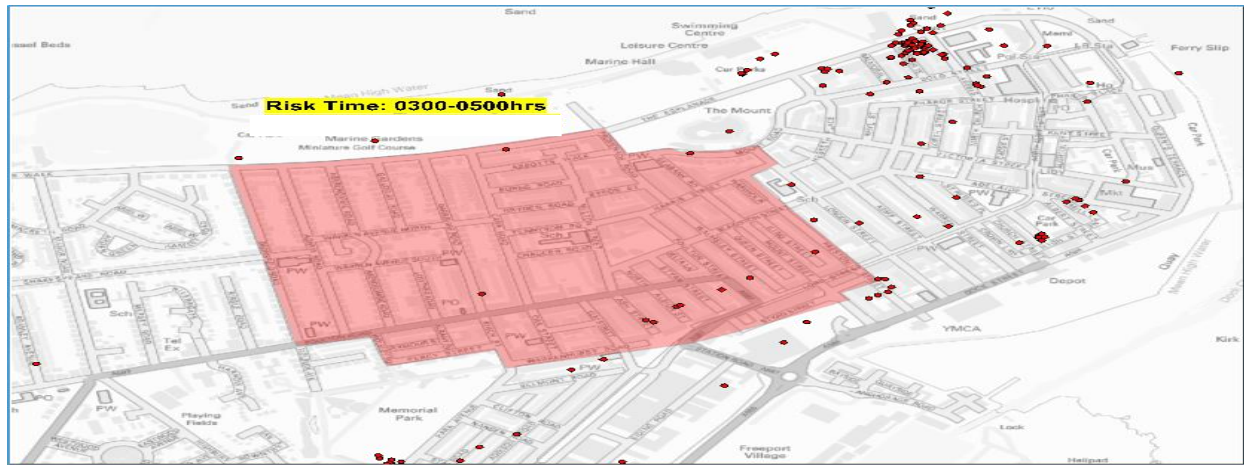
Figure 1. Predicted Forager Risk Area overlaid with ARLS GPS data 0300-0500hrs

The issues articulated by the interview participants can be seen in figure 1 and 2. The aforementioned maps were provided by an interview participant and show a predicted high risk forager area overlaid with GPS data which is drawn from police officers radios, and shows their movements whilst on patrol. As can be seen from this example, during the two-hour period identified as a high risk optimal forager burglary area, very few officers are present within the identified risk zone, instead choosing to radiate towards other zones. It was suggested that examination of the crime and incident records identified no major incidents in the locality of the clustered resources (LC6).
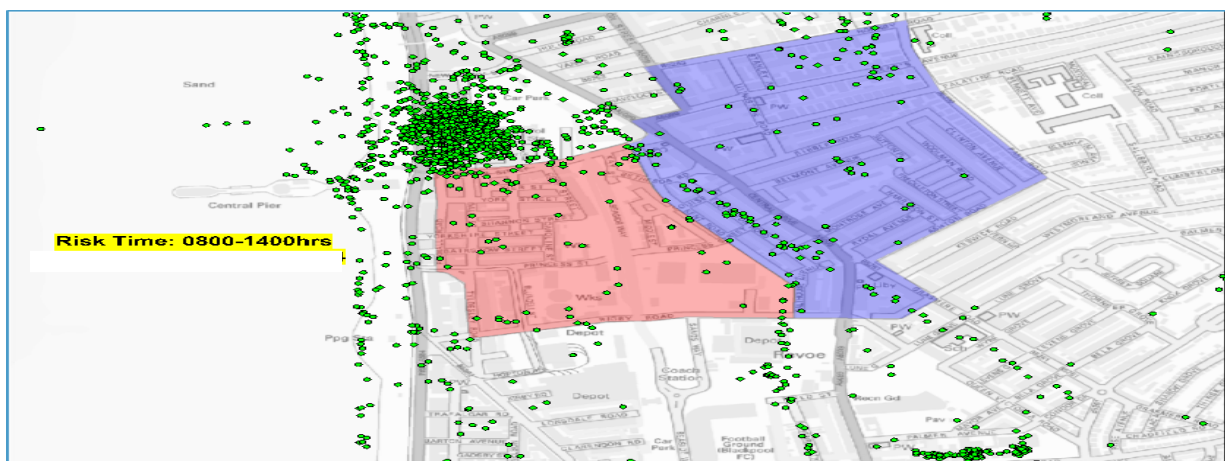

Figure 2: Predicted Forager Risk Area overlaid with ARLS GPS data 0800-1400hrs 01/10/2014

Such issues did not escape the attention of senior officers and those involved in driving the optimal forager approaches;

"the current set up does not allow us to fully monitor exactly how the risk areas are being targeted, and my suspicion is that resources are still being tasked 'generally' rather than in accordance with the specific streets, time periods provided by the Forager product" (LC2)

Culture - 'Them and Us'

It was suggested that within 2 police services a major cultural hurdle was also caused due to practitioners from different departments having very opposing opinions of roles and responsibilities (DC1 and LC2). This was also a problem highlighted within the partner agencies as well;

"It became increasingly Police led as even partners within the same council bickered over involvement and responsibilities" (LC1)

Interviews from those involved in producing the predicted forager high risk products identified that the feedback they had received from front line response officers was that they did not give much consideration to the predictive products because it was not their responsibility;

"Burglary is for the target teams to deal with" (LC3).

However, worryingly, it was also suggested that the '*target team'* staff did not pay much attention to the predictive product either (LC5). This was a fact that was confirmed through interviews with officers from the pro-active target teams;

"My duties were not directed as a result of optimal forager but as a team we did bear it in mind. I think the information was used to direct immediate response patrols to current or future crime hotspots.... It might help in the briefing of staff who are not regularly scanning crime patterns but for me I found no real benefit" (LC5)

As a result, it was evident that a cultural issue emerged whereby certain departments were reluctant to accept responsibility for acting on the products, pointing the finger at one another, resulting in neither of them using them effectively.

Senior Manager 'Buy-In'

Other cultural issues relating to leadership were also cited by a number of interview participants (n-7, 46%) from within all 5 of the police services. For example, it was argued that the negative impact of a failure to secure buy in from senior managers was one of the biggest factors in terms of the success or failure of the predictive Policing approach (GMP2 and GMP3). It is suggested that this is because ultimately, making a success of any new initiative within the police service requires an element of rule of law;

> *"making people do what they probably don't want to do"* (GMP2).

Culturally, one of the key tactics within the police service for ensuring this is achieved is through a '*command and control'* approach of effectively ordering staff to comply. However, if senior managers did not buy into the concept they were less inclined to enforce it (GMP2 and GMP3).

> "*Implementing a new or different way of working within the Police is never easy and if people can avoid it they will. I benefitted enormously from strong personal support and a regime of total compliance*" (GMP3)

The support provided by senior managers was often varied and wavering, ranging from complete buy in (LC1 and GMP2) to a stance of suspicion (WY2). It could be argued that a potential factor for this was because the approach did not provide the '*silver bullet'* that senior officers wanted;

> "*They want an off the shelf product that they can plug into their computers, press one button and their problems are solved"* (GMP2)

There were successful methods of gaining senior management buy in and support identified by interviewees. For example, if it was felt to be, or could be portrayed as the "*the next thing"* (DC1), or if it could help them achieve a positive impact on performance indicators (LC3 and WY2) then senior managers displayed a higher degree of enthusiasm towards the predictive Policing approach. It was further argued that as the culture within the police service had begun to shift away from performance targets, then the motivation to support such evidence based approaches began to significantly reduce as senior officers failed to grasp the wider potential benefits of the methodologies (NY1 and DC1).

> ### Local 'Buy-In'

It was also outlined by the interview participants that they felt it was essential to understand the blockers and enablers to achieving buy in from such key demographics, but this was identified as a continuous challenge (LC6).

> "*For forager to be successful, it is clear that the staff and officers who are physically implementing the approach are fully on board with the theory and what is trying to be achieved*" (LC6)

One of the main reasons cited as a blocker to gaining successful practitioner buy in was the feeling that staff were having their own experience overlooked and that the optimal forager predictive products reduced the use of their professional judgement (WY2). Others however felt that staff preferred simply to choose the easiest option, arguing that in essence it was easier to maintain the status quo then to change what they did (GMP2). These issues were further compounded *by "too little impetus being placed on winning the 'hearts and minds' of the staff"* (WY2). It was argued that this could be achieved by paying as much attention to the training of the practitioners, and providing them with the evidence base, as is given to the analytical processes (GMP2 and DC).

> "*When people read the research and were shown the data and patterns, they were more receptive*" (GMP2)

> "*By pursuing a process of engagement with front line practitioners a higher level of buy in could be achieved and there was a greater chance of success as every person knew how their role featured in the bigger picture and overall effectiveness of the predictive approach*" (DC1)

For the middle managers responsible for maintaining accountability and enforcement it was a difficult position. A great deal of motivation, and belief in the optimal forager approach was required;

> "*It was also my role to cajole and chivvy people to comply. I did not win any popularity contests, but was more than content in the knowledge that what I was doing was right and justified*" (GMP3)

Furthermore, the personality of the middle managers conducting this work was also key (LC6). It was identified that if the wrong person was in that role then there was a risk that the drive and motivation of staff to conduct the tasking's in the predicted high risk forager areas would subside;

> "*Local drive is very much dependant on the personalities involved. For example, the crime and tasking co-ordinator has a very keen interest in the idea of optimal forager, and has therefore worked hard to drive the approach; he has actively sought to co-ordinate a robust response, involving multiple departments and partner agencies. However, if another person were to take*

Organised Travelling Criminality

In addition to the cultural issues experienced, a number of participants (n-4, 26%) suggested that they had experienced a certain level of ineffectiveness of the use of the optimal forager patrol plans when they are used in certain criminal contexts. It was identified throughout the study that participants felt they were not effective to underpin police responses to organised crime groups committing domestic burglary (LC1, GMP2, GMP3 and LC6). The organised and co-ordinated nature of travelling criminals was suggested as being the main factor behind this (GMP3)

> "*It would not be as successful in deterring the criminal activity of an organised crime group who would present a more determined mind set to commit an intended crime*" (GMP3)

It was also suggested that such organised criminality could be identified relatively easily by their common modus operandi, which often involved the theft of high powered vehicles whilst concealing their identity with facial coverings (GMP2). Such crimes however, were more difficult to tackle using the optimal forager methodology as they could cover large distances and swiftly move between patches (LC1 and LC6). It is suggested that its ineffectiveness was also affected by the fact that the majority of organised travelling criminals came from outside of the jurisdictional boundaries of the researched police services (LC6). As a result, it was argued that the effectiveness of the predictive forager methodology was not consistent across the board (LC6). For example, it was identified that in rural areas that suffered from lower levels of organised travelling criminality the method was more effective when implemented to tackle locally based offenders (LC6). Conversely, participants felt it was less effective in areas that shared borders with several other

police services, or had large internal borders with another division resulting in high levels of cross border organised criminality (LC6). It is argued that the result was that the optimal forager methodology had little identifiable impact in preventing or reducing such organised crime (LC1). In respect of this issue, it was suggested that managers needed to 'manage their own expectations' when using such approaches to tackle organised burglary;

> *"There needs to be an acceptance of what such a methodology can and cannot do"* (GMP3)

It was further argued that although it may be an ineffective method to control organised criminality, by enhancing the police services capability to use frontline resources to tackle the local level foraging criminals, specialist investigative resources could increase their capacity to conduct reactive investigations into organised crime groups (GMP2 and GMP3), which was an unexpected positive by product of the approach.

Crime Reduction and Prevention Effectiveness

Fundamentally, the intention of using the optimal forager approach to direct capable guardianship and underpin their place management, was to prevent or reduce the volume of domestic burglaries occurring. However, the vast majority of participants interviewed (n-14, 93%) across each police service, expressed low levels of confidence in its impact;

> *"The effectiveness in combating Burglary, or Theft from Motor Vehicle is negligible. It is recommended that this type of predictive mapping is not used to combat these crime types, and further efforts are put into the development of more nominal focused methodologies"* (WY3)

> *"We did not highlight any positive results in relation to crime reduction which could be directly attributable to the predictive mapping"* (NY1)

> *"Overall crime reduction was minimal"* (LC1)

> "*No reductions in crime were related to forager, they were related to the arrest and remand of suspects, that has been the main thing that influenced falls in crime in my opinion"* (LC5)

Conversely, some felt they had experienced a positive impact, but due to this being against a backdrop of austerity and reducing police resources, it was difficult to identify this;

> "*I believe that optimal forager has impacted on crime figures, in that without it, our burglary dwelling figures would have been much higher*" (LC1)

It was also outlined that despite efforts to identify other factors that may have contributed to any recorded decreases in crime, that none could be identified beyond doubt, suggesting it may have had a positive effect after all (GMP3);

> "*Alternative explanations for the decrease in the specific crime types of burglary dwelling during the period of maximum application have been sought, however it has not been possible to identify additional contributing factors with any degree of certainty*" (GMP3)

Discussion

The main focus of this study was the examination of how police crime prevention and reduction strategies using the optimal forager theory have been implemented in the UK. This enabled the perceived success of these interventions to also be considered. However, it must first be acknowledged that this is done without the supporting police data to thoroughly assess their impact on recorded crime. As a result, a number of positive implementation outcomes were identified by the participants. This included the involvement of partner agencies, along with a wealth of other internal police departments also contributing to providing capable guardianship. In addition, it was established that after some short testing, a very efficient briefing process was enabled which included a combination of both electronic police briefings, and paper tasked information products. Regardless of these positive elements a number of potentially undermining factors were also identified with the majority of interview participants suggesting that as a result, they did not perceive the implementation of the program to be a success, either from an implementation perspective, or as a crime control strategy. When considering the reasons why in the context of literature that relates to implementing crime control strategies we begin to recognise why.

For any implementation of scientific principles to be effective, care should be taken as there are a multitude of factors that can impact on its success. Kirby (2013) has suggested that there are several factors that impact on the effectiveness of evidence-based implementations within policing. These are theory failure, implementation failure and measurement failure. Theory failure broadly relates to a situation when the theoretical framework of the scientific concept used, is

incorrect, or inaccurately implemented, as a result, the desired and anticipated outcome is not manifested (Kirby, 2013). It has been outlined that implementation failure relates to more tangible or identifiable aspects of an approach such as the leadership driving it, its co-ordination, and supervision. The training of those involved, the skills they are provided with and importantly, cultural influences within the affected organisation are also key (Hope and Murphy,). Previous literature has identified that examples of implementation failure have been identified within both intelligence-led policing, and problem orientated policing interventions, where ineffective leadership has reduced the anticipated positive outcomes (John & Maguire, 2004 and Ratcliffe, 2002 and 2016). As such, we should not be surprised to identify similar issues relating to both theory and implementation failure identified in this study.

The optimal forager programs examined in this study have used a relatively simplistic methodological approach, firstly identifying linked domestic burglary crimes, then self-identifying existing foraging patches, before making a prediction based on professional judgement regarding the location of future foraging patches. Despite its simplicity the method appears to have achieved reportedly high levels of predictive accuracy. This is unsurprising given that recent studies have identified that the use of OFT to study repeat burglary offending can be accurate, and has been proven to be successful in explaining spatiotemporal distributions of crime (Vandeviver et al, 2021). However, fundamentally, it has been argued that OFT is more akin to rational choice theory than crime pattern theory (Vandeviver et al, 2021) and as such, although such a process of heuristic prediction may have potential accuracy, we believe a number of key theoretical implications have been overlooked. This is important as a potential flaw in application of theory may lead to inaccurate prediction of the future foraging patches which are subsequently used to direct and control resource deployment, potentially leading to the police patrolling in the incorrect areas. Although previous research has suggested that similarities exist between animal foraging and the decision making of a criminal in respect of selection of prey type and patch location (Fagan & Freeman, 1999), we suggest there is far more that needs to be considered to predict movement choice, than has been used in the policing programs examined, a fact also supported by a recent examination of OFT criminological studies (Vandeviver et al, 2021). As such, in line with other recent research (Vandeviver et al, 2021) we argue that any reported predictive accuracy is more likely to have come about as a result of application of the near-repeat phenomenon, as opposed to a true implementation of OFT.

Although the implementations examined do not report any major adverse effects of using their approach to OFT, it does present a potentially undermining factor. Recent research (Vandeviver et al, 2021) has suggested that the optimal forager theory includes a number of associated fundamental issues that must also be considered, and these appear to have been overlooked in the identified implementations. Specifically, in this study we identified that the current use of the optimal forager method appears to adopt the assumption that the criminal is the predator and the victims are the prey. However, ecology literature identifies that this is not an entirely accurate interpretation of the relationship. Research using game theory has argued the relationship is actually a three tier one involving the predator, prey and the prey's resource (Hugie, 1994 and Sih, 1998). This means that within a crime context the relationship can be more likened to police (predator), criminal (prey) and victim (resource).

Another theory implementation failure is that current adoption of OFT within the policing implementations examined, has failed to take into consideration the nonlethal interaction between the predator and the prey. Lima (2002, p70) argues this is an important issue in respect of this relationship and the ecology literature within this area argues that increased predation (which in this scenario would be in the form of a raised police presence providing capable guardianship in the identified forager area) forces the prey (criminal) to alter their behaviour in a number of ways (Lima, 2002). One of the most obvious impacts upon prey (criminal) behaviour is the movement to alternate patches to seek out resources (victims), and to avoid the increased predation (police attention) (Lima, 2002). Lima (2002) argues that the movement of the predator (police) and prey (criminal) can occur simultaneously. This is because as predators (police) seek out areas where the prey (criminal) is at their most active, but the prey purposefully responds by avoiding the areas with increased numbers of predators. In the policing context this would manifest itself in the criminals simply avoiding the identified patrol areas and seeking victims elsewhere, fundamentally undermining the prediction. This issue has been identified within criminology literature where it is referred to as crime displacement. Crime displacement can reportedly result in an offender changing the victims they choose (target displacement), time they offend (temporal displacement), the location of offending (spatial displacement), changing the way they commit crime (tactical displacement), and committing different forms of crime (crime type displacement) (Hesseling, 1994). The research evidence regarding the existence and extent of such displacement is not conclusive and depends heavily on a number of factors, not least the ongoing motivation of an

offender (Johnson et al, 2014). In the context of its use in policing, a distinction of OFT within ecology is that a foraging prey animal (criminal) and a predator (police) must both seek out a resource or prey, or they will cease to exist. This is not the case here as both the forager (criminal) and predator (police) can choose not to act. This is a vital and important distinction and one that was evident in this study, which identified clear examples of police (predator) not conducting their requisite functions. As such, it is clear that for the use of OFT to be accurately implemented and to achieve its '*optimal*' name tag, much more research is required to understand these relationships and the impact of police interventions designed to affect the geospatial behaviour of the prey (criminals) involved.

As alluded to earlier in this discussion, implementation failure broadly relates to the training, knowledge and understanding of staff, and the leadership, communication and overall culture of the response to the new ways of working (Kirby, 2013). We suggest that this study has also identified that in addition to the aforementioned theoretical issues, there may also have been some potential flaws in the OFT implementation. For example, it was clear from the participants that there was a significant variation in the form, depth and method that staff were trained prior to the implementation of the OFT crime reduction programs. As a result, understanding and acceptance was not universal. Previous use of evidence-based methodologies of crime control in policing have identified training as a key area underpinning implementation success, especially in circumstances when a theoretical concept was being used (Ratcliffe, 2004), which was the case in the OFT programs. John and Maguire (2004) have also highlighted that previous implementations with poor investment in training that rely on theoretical concepts often resulted in knowledge gaps throughout all ranks regarding the concepts, process and importance, which all impacted on success. The presence of such issues in this study further corroborated previous literature that has directly linked the lack of an effective learning and development strategy to evidence-based implementation failures within policing (Clough, Adams and Halford, 2017). With that in mind, it is possible that the issues highlighted in this study are not necessarily related to the implementations specifically examined, and may be more evidence of a wider, continued decline in training standards within policing as a service.

A further issue that was identified in the study that is worthy of discussion was the frequency of product generation and the subsequent use of this within governance, tasking and co-ordination

processes. This is a vital area of implementation as the underpinning philosophy of capable guardianship relies heavily on the spatial and temporal effectiveness of the guardians utilised. As with the issues of training, there was little consistency in this area and although a production of the optimal forager products appears to have hit a '*sweet spot*' at roughly 3 publications a week, its subsequent use to drive decision making and intervention activity was wildly inconsistent. It has been suggested that the processes of intelligence-led policing has reduced in effectiveness over the past decade (Ratcliffe and Rengert, 2008 and Cope, 2004). It is argued that this is due to a lack of useable crime intelligence, and availability of trained analysts to interpret it (Ratcliffe, 2008 and Cope, 2004). Furthermore, previous research (Halford, 2019) has demonstrated that in some police forces the level of useable intelligence has decreased by as much as 75% between 2010 and 2015. As a result, it would be natural to presume that the desire for products such as those generated within the optimal forager programs would be high. However, this study suggests that although their value amongst both the police and partnership stakeholders was strong early on, this reduced over time and as a result has led to police analysts being unable to effectively influence leadership decision makers, an essential element of ILP. We suggest that this is largely due to the number of cultural problems encountered during implementation. For example, poor leadership was identified as negatively affecting implementation success in a number of cases, with a clear absence of support for some programs. John and Maguire have outlined that a complete *'buy in'* is required from senior managers to achieve the potential of any attempts at implementing a new theoretical framework within policing (John and Maguire, 1995). As a result, it was clear that a lack of accountability and inter-departmental '*finger pointing*' emerged, or was allowed to persist, further undermining program success. The most obvious and tangible way this emerged was in poor tasking and co-ordination which undermined the ability of place managers to increase capable guardianship in the affected areas, without significant dictatorial interventions. One reason for these cultural blockers could be the inconsistent training outlined, or an absence of time invested in communicating with the affected staff to improve their knowledge, awareness and overall buy-in. Much research has examined the importance of such communication (Langbein and Jorstad, 2004; Schotter, 1998; Miller and Whitford, 2002; Schneider, Teske and Marshall, 1991; Ostrom and Ahn, 2001) and identified that it can successfully gain the trust and buy in of staff for new ways of working, particularly in the realm of evidence based policing implementations. Mastrofski et al (1998) have previously cited such cultural issues as being a significant risk to implementation

success and literature suggests that '*early adopters*' of evidenced based approaches, do experience significant cultural resistance (Sherman, 2015), which appears to have been the case identified in this study.

Finally, the study has identified that the participants also felt that organised burglary offenders and those that cross police jurisdictional boundaries posed a distinct problem. It was argued by some participants that the OFT approach was not well suited to tackling this issue. However, because of the many aforementioned issues, it is difficult to draw any definitive conclusions regarding its effectiveness as a crime prevention and reduction strategy within this context as we feel it could quite easily have been due to further communication issues that arose as a result of jurisdictional boundaries, or the training, tasking or cultural issues outlined.

Limitations and Future Research

The main limitation of the study relates to the absence of police recorded crime data. Although establishing the overall impact on crime prevention and reduction was not the sole purpose of the study, the ability to consider the views and perspectives of participants alongside quantitative data would have enabled a more robust assessment of the factors that are correlated to positive impact. In addition, the number of interview participants presents a further limitation in respect of the views and perspectives obtained. As the police services dictated which staff access could be afforded to, although a good number of participants were secured, we are unable to state what representation this accounts for, but it is likely, given the respective size of the police services, that additional participants with valuable insights have been missed. Although a broad spectrum of roles and responsibilities have been covered, it should be acknowledged that they may not be fully representable. Further research that supports this study with quantitative data, or greater number of participants would therefore provide additional contribution to this area. In addition, the potential theory failures highlighted also need to be explored further, particularly those which relate to the offender responses to enhanced capable guardianship as a result of OFT, as this presents a potentially new area of exploration that could contribute greatly to research, both in the area of OFT, but also CPT and that which relates to the area of crime displacement.

Conclusion

This study used participant interviews to gather the views and perspectives of practitioners involved in the implementation of a new methodology used to direct police patrols and partnership capable guardianship. Interviewees cited extremely limited success in the OFT methodology in preventing and reducing domestic burglary offences as part of the crime control strategy. The study identified that the methodological process used to predict future spatial areas at risk of being targeted by an offender may be over simplistic and has not considered significant theoretical aspects of OFT. It was also suggested that any accuracy achieved by the method uses was likely to be as a result of the inadvertent use of the near repeat phenomenon. In addition, the study identified that there were significant implementation failures experienced by those attempting to embed a new evidence based approach to crime control. These included inconsistent training, poor leadership and supervision and at its core, significant cultural issues that were likely to have significantly undermined the program's success across the UK. Future implementation of evidence based practices, particularly those involving theoretical underpinnings, would do well to carefully consider these issues prior to implementing any new ways of working or crime control strategies. Limitations are outlined as the absence of supporting crime data and volume of participants. Future research is advocated in respect of the impact on offender behavioural responses and spatial decision making as a response to increased capable guardianship targeted at areas of predicted high risk.

References

Addis, N. (2012). Exploring the impact and effectiveness of the 'Project Optimal' Burglary

   Reduction Initiative in Leeds: A Spatio-Temporal Approach. *Department of Geography,*

   University of Leeds.

   https://doi.org/https://www.geos.ed.ac.uk/~gisteac/proceedingsonline/GISRUK2013/gisr

   uk2013_submission_35.pdf

Barriball, K., & While, A. (1994). Collecting data using a semi-structured interview: A

    discussion paper. *Journal of Advanced Nursing*, *19*(2), 328–335.

    https://doi.org/10.1111/j.1365-2648.1994.tb01088.x

Beck, C. (2014). Predictive Policing: What Can We Learn from Wal-Mart and Amazon about

    Fighting Crime in a Recession? *Police Chief Magazine*, 1–7.

Bernasco, W. (2008). Them Again? Same-Offender Involvement in Repeat and Near Repeat

    Burglaries. *European Journal of Criminology*, *5*(4), 411–431.

    https://doi.org/10.1177/1477370808095124

Bernasco, W., Johnson, S. D., & Ruiter, S. (2015). Learning where to offend: Effects of past on

    future burglary locations. *Applied Geography*, *60*, 120–129.

    https://doi.org/10.1016/j.apgeog.2015.03.014

Brantingham, P. J., & Brantingham, P. L. (1991). *Environmental criminology*. Waveland Press.

Chainey, S. P., & da Silva, B. F. (2016). Examining the extent of repeat and near repeat

    victimisation of domestic burglaries in Belo Horizonte, Brazil. *Crime Science*, *5*(1).

    https://doi.org/10.1186/s40163-016-0049-6

Chainey, S. P., Curtis-Ham, S. J., Evans, R. M., & Burns, G. J. (2018). Examining the extent to

    which repeat and near repeat patterns can prevent crime. *Policing: An International

    Journal*, *41*(5), 608–622. https://doi.org/10.1108/pijpsm-12-2016-0172

Charnov, E. L. (1976). Optimal foraging, the marginal value theorem. *Theoretical Population

    Biology*, *9*(2), 129–136. https://doi.org/10.1016/0040-5809(76)90040-x

Clarke, R. V., & Eck, J. E. (2009). *Become a problem solving crime analyst in 55 small steps*.

    Jill Dando Inst. of Crime Science, Univ. College London.

Clarke, R. V., & Hesseling, R. (1994). Displacement: A Review of the Empirical Literature. In *Crime prevention studies*. essay, Criminal Justice Press.

Clough, G., Adams, A., & Halford, E. (2017). Evidence Cafés and Practitioner Cafés Supported by Online Resources: A Route to Innovative Training in Practice Based Approaches. *European Police Science and Research Bulletin - Special Conference Edition Nr.3*. https://doi.org/https://bulletin.cepol.europa.eu/index.php/bulletin/article/view/287

Cohen, L. E., & Felson, M. (1979). Social Change and crime rate trends: A routine activity approach. *American Sociological Review*, *44*(4), 588. https://doi.org/10.2307/2094589

College of Policing (CoP). (2015). A Review of Predictive Policing Methods Within the United Kingdom. *National Policing Improvement Agency. Gov.UK*.

Cope, N. (2004). 'intelligence led policing or policing led intelligence?': Integrating volume crime analysis into policing. *British Journal of Criminology*, *44*(2), 188–203. https://doi.org/10.1093/bjc/44.2.188

Cornish, D. B., & Clarke, R. V. (1987). Understanding crime displacement: An application of rational choice theory. *Criminology*, *25*(4), 933–948. https://doi.org/10.1111/j.1745-9125.1987.tb00826.x

Eck, J. E. (1994). *Drug markets and drug places: A case-control study of the spatial structure of illicit drug dealing. Doctoral dissertation* (thesis). University of Maryland, College.

Fagan, J., & Freeman, R. B. (1999). Crime and work. *Crime and Justice*, *25*, 225–290. https://doi.org/10.1086/449290

Felson, M., & Boba, R. (2010). *Crime and Everyday Life*. Sage Publishing. Inc.

Ferguson, A. G. (2011). Predictive policing and the future of reasonable suspicion. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.1965226

Fielding, M., & Jones, V. (2012). 'disrupting the optimal forager': Predictive risk mapping and domestic burglary reduction in Trafford, Greater Manchester. *International Journal of Police Science & Management*, *14*(1), 30–41. https://doi.org/10.1350/ijps.2012.14.1.260

Fortin, M.-J., & Dale, M. R. (2005). Spatial analysis. https://doi.org/10.1017/cbo9780511542039

Gerstner, D. (2018). Predictive policing in the context of residential burglary: An empirical illustration on the basis of a pilot project in Baden-Württemberg, Germany. *European Journal for Security Research*, *3*(2), 115–138. https://doi.org/10.1007/s41125-018-0033

Glasner, P., Johnson, S. D., & Leitner, M. (2018). A comparative analysis to forecast apartment burglaries in Vienna, Austria, based on repeat and near repeat victimization. *Crime Science*, *7*(1). https://doi.org/10.1186/s40163-018-0083-7

Halford, E. (2022). Linking foraging domestic burglary: An analysis of crimes committed within police-identified optimal forager patches. *Journal of Police and Criminal Psychology*. https://doi.org/10.1007/s11896-022-09497-8

Halford, E. S. (2019). *Exploring the behaviour of foraging burglary offenders and predictive police interventions to prevent and reduce their offending* (thesis). University of Central Lancashire.

Hering, A. S., & Bair, S. (2013). Characterizing spatial and chronological target selection of serial offenders. *Journal of the Royal Statistical Society: Series C (Applied Statistics)*, *63*(1), 123–140. https://doi.org/10.1111/rssc.12029

Hinkle, J. C., Weisburd, D., Telep, C. W., & Petersen, K. (2020). Problem-oriented policing for reducing crime and disorder: An updated systematic review and meta-analysis. *Campbell Systematic Reviews*, *16*(2). https://doi.org/10.1002/cl2.1089

Hollis-Peel, M. E., Reynald, D. M., van Bavel, M., Elffers, H., & Welsh, B. C. (2011).

Guardianship for crime prevention: A critical review of the literature. *Crime, Law and Social Change*, *56*(1), 53–70. https://doi.org/10.1007/s10611-011-9309-2

Hope, T., & Murphy, D. J. (1983). Problems of implementing crime prevention: The experience of a demonstration project. *The Howard Journal of Criminal Justice*, *22*(1-3), 38–50. https://doi.org/10.1111/j.1468-2311.1983.tb00469.x

Hugie, D. (1994). Fish and game: A game theoretic approach to habitat selection by predators and prey. *Journal of Fish Biology*, *45*, 151–169. https://doi.org/10.1006/jfbi.1994.1220

John, T., & Maguire, M. (2004). *National Intelligence Model: Key Lessons from early research*. National Intelligence Model: Key Lessons from Early Research | Office of Justice Programs. Retrieved March 10, 2022, from https://www.ojp.gov/ncjrs/virtual-library/abstracts/national-intelligence-model-key-lessons-early-research

Johnson, E. J., & Payne, J. W. (1985). Effort and accuracy in choice. *Management Science*, *31*(4), 395–414. https://doi.org/10.1287/mnsc.31.4.395

Johnson, S. D. (2014). How do offenders choose where to offend? perspectives from animal foraging. *Legal and Criminological Psychology*, *19*(2), 193–210. https://doi.org/10.1111/lcrp.12061

Johnson, S. D., & Bowers, K. J. (2004). The stability of space-time clusters of burglary. *British Journal of Criminology*, *44*(1), 55–65. https://doi.org/10.1093/bjc/44.1.55

Johnson, S. D., Davies, T., Murray, A., Ditta, P., Belur, J., & Bowers, K. (2017). Evaluation of Operation Swordfish: A near-repeat target-hardening strategy. *Journal of Experimental Criminology*, *13*(4), 505–525. https://doi.org/10.1007/s11292-017-9301-7

Johnson, S. D., Guerette, R. T., & Bowers, K. (2014). Crime displacement: What we know, what

    we don't know, and what it means for crime reduction. *Journal of Experimental*

    Criminology, *10*(4), 549–571. https://doi.org/10.1007/s11292-014-9209-4

Johnson, S. D., Summers, L., & Pease, K. (2009). Offender as Forager? A direct test of the boost

    account of victimization. *Journal of Quantitative Criminology*, *25*(2), 181–200.

    https://doi.org/10.1007/s10940-008-9060-8

Kallio, H., Pietilä, A.-M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological

    review: Developing a framework for a qualitative semi-structured interview guide.

    Journal of Advanced Nursing, *72*(12), 2954–2965. https://doi.org/10.1111/jan.13031

Kirby, S. (2013). *Effective policing? Implementation in theory and Practice*. Palgrave

    Macmillan.

Langbein, L., & Jorstad, C. (2004). Productivity in the workplace: Cops, culture,

    communication, cooperation, and Collusion. *Political Research Quarterly*, *57*(1), 65.

    https://doi.org/10.2307/3219835

Lima, S. L. (2002). Putting predators back into behavioral predator–prey interactions. *Trends in*

    Ecology & Evolution, *17*(2), 70–75. https://doi.org/10.1016/s0169-5347(01)02393-x

Maguire, M., & John, T. (1995). 'Intelligence, Surveillance and Informants: Integrated

    Approaches. *Police Research Group: Crime Detection and Prevention Series*, *Paper 64*,

    1–58.

Mastrofski, S. D. (1998). *Systematic observation of public police: Applying field research*

    methods to policy issues. U.S. Department of Justice, Office of Justice Programs,

    National Institute of Justice.

Miller, G. J., & Whitford, A. B. (2002). Trust and incentives in Principal-Agent Negotiations. *Journal of Theoretical Politics*, *14*(2), 231–267. https://doi.org/10.1177/095169280201400204

Nee, C., & Meenaghan, A. (2006). Expert decision making in burglars. *The British Journal of Criminology*, *46*(5), 935–949. https://doi.org/10.1093/bjc/azl013

Nobles, M. R., Ward, J. T., & Tillyer, R. (2016). The impact of neighborhood context on spatiotemporal patterns of burglary. *Journal of Research in Crime and Delinquency*, *53*(5), 711–740. https://doi.org/10.1177/0022427816647991

Opp, K.-D. (1999). Contending conceptions of the theory of rational action. *Journal of Theoretical Politics*, *11*(2), 171–202. https://doi.org/10.1177/0951692899011002002

Ostrom, E., & Ahn, T. K. (2001). The meaning of social capital and its link to collective action. *Handbook of Social Capital*. https://doi.org/10.4337/9781848447486.00008

Perry, W., McInnis, B., Price, C., Smith, S., & Hollywood, J. (2013). Predictive policing: The role of crime forecasting in law enforcement operations. https://doi.org/10.7249/rr233

Pitcher, A. B., & Johnson, S. D. (2011). Exploring theories of victimization using a mathematical model of burglary. *Journal of Research in Crime and Delinquency*, *48*(1), 83–109. https://doi.org/10.1177/0022427810384139

Ratcliffe, J. (2002). Intelligence-led policing and the problems of turning rhetoric into practice. *Policing and Society*, *12*(1), 53–66. https://doi.org/10.1080/10439460290006673

Ratcliffe, J. (2016). *Intelligence-led policing*. Routledge, Taylor & Francis Group.

Ratcliffe, J. H. (2003). Intelligence-led policing. *Trends and Issues in Crime and Criminal Justice*, *248*, 1–6. https://doi.org/10.1037/e620002012-001

Ratcliffe, J. H. (2004). The hotspot matrix: A framework for the spatio-temporal targeting of crime reduction. *Police Practice and Research*, *5*(1), 5–23. https://doi.org/10.1080/1561426042000191305

Ratcliffe, J. H., & Rengert, G. F. (2008). Near-repeat patterns in Philadelphia shootings. *Security Journal*, *21*(1-2), 58–76. https://doi.org/10.1057/palgrave.sj.8350068

Rennison, C. M. (2019). *Interactive: Introduction to Criminal Justice (International Student Edition) (3rd Edition).* SAGE Publications Inc.

Rey, S. J., Mack, E. A., & Koschinsky, J. (2012). Exploratory space–time analysis of Burglary Patterns. *Journal of Quantitative Criminology*, *28*(3), 509–531. https://doi.org/10.1007/s10940-011-9151-9

Reynald, D. M. (2011). Factors associated with the guardianship of places: Assessing the relative importance of the spatio-physical and sociodemographic contexts in generating opportunities for capable guardianship. *Journal of Research in Crime and Delinquency*, *48*(1), 110–142. https://doi.org/10.1177/0022427810384138

Rosser, G., Davies, T., Bowers, K. J., Johnson, S. D., & Cheng, T. (2016). Predictive crime mapping: Arbitrary grids or street networks? *Journal of Quantitative Criminology*, *33*(3), 569–594. https://doi.org/10.1007/s10940-016-9321-x

Sagovsky, A., & Johnson, S. D. (2007). When does repeat burglary victimisation occur? *Australian & New Zealand Journal of Criminology*, *40*(1), 1–26. https://doi.org/10.1375/acri.40.1.1

Sampson, R., Eck, J. E., & Dunham, J. (2009). Super Controllers and crime prevention: A routine activity explanation of crime prevention success and failure. *Security Journal*, *23*(1), 37–51. https://doi.org/10.1057/sj.2009.17

Schneider, M., Teske, P., Marschall, M., Mintrom, M., & Roch, C. (1997). Institutional

   arrangements and the creation of social capital: The effects of public school choice.

   American Political Science Review, *91*(1), 82–93. https://doi.org/10.2307/2952260

Sherman, L. W. (2015). A tipping point for "totally evidenced policing." *International Criminal

   Justice Review*, *25*(1), 11–29. https://doi.org/10.1177/1057567715574372

Sidebottom, A. (2011). Repeat burglary victimization in Malawi and the influence of housing

   type and area-level affluence. *Security Journal*, *25*(3), 265–281.

   https://doi.org/10.1057/sj.2011.22

Sih, A. (1998). Game theory and predator-prey response races. *Oxford University Press, New

   York, Pp. 221–238*, *36*(02), 221–238. https://doi.org/10.5860/choice.36-0963

Tilley, N., Sidebottom, A., Farrell, G., & Pease, K. (2017). Preventing repeat and near repeat

   concentrations. In *Handbook of Crime Prevention and Community Safety*. essay, Taylor

   and Francis.

Tillyer, M. S., & Eck, J. E. (2010). Getting a handle on crime: A further extension of routine

   activities theory. *Security Journal*, *24*(2), 179–193. https://doi.org/10.1057/sj.2010.2

van Gelder, J.-L., & Van Daele, S. (2014). Innovative data collection methods in criminological

   research: Editorial introduction. *Crime Science*, *3*(1). https://doi.org/10.1186/s40163-014-

   0006-1

Vandeviver, C., Neirynck, E., & Bernasco, W. (2021). The foraging perspective in criminology:

   A Review of Research literature. https://doi.org/10.21428/cb6ab371.a832e977

Vandeviver, C., Neirynck, E., & Bernasco, W. (2021). The foraging perspective in criminology:

   A Review of Research literature. https://doi.org/10.21428/cb6ab371.a832e977

Wang, Z., & Liu, X. (2017). Analysis of burglary hot spots and near-repeat victimization in a

large Chinese city. *ISPRS International Journal of Geo-Information*, *6*(5), 148.

https://doi.org/10.3390/ijgi6050148

Waring, E. J., Weisburd, D., & Wang, E. (2002). Co-Offending as a Network Form of Social

Organization. In *Crime & Social Organization*. essay, Transaction Publishers.