Institution: University College London

Unit of Assessment: 22 – Social Work and Social Policy

Title of case study: Improving police practice and reducing the incidence of crime through mapping and analysis

1. Summary of the impact (indicative maximum 100 words)

Research on spatial patterns of crime at UCL has influenced police practice and has informed policy and its implementation in countries including Australia, Canada, UK, and USA. Our research has challenged conventional wisdom amongst police and policymakers about spatial patterns of crime. Working directly with police forces and through our continuing professional development training, we have spearheaded the use of crime mapping and forecasting methods in practice. Implementation has led to documented reductions in crimes such as burglary of between 20–66%.

2. Underpinning research (indicative maximum 500 words)

Research at UCL Security & Crime Science (SCS) concerns the identification and explanation of regularities in spatial and space-time patterns of crime and how their identification can be used to reduce crime. Research on spatial patterns of crime began when Spencer **Chainey** joined the department (part of the UCL Jill Dando Institute of Crime Science) in 2003. Research on space-time patterns commenced in 2004 when Professors Kate **Bowers** and Shane **Johnson** arrived.

Between 2004 and 2009, **Johnson** and **Bowers** led a British Academy-funded international collaboration between researchers at UCL, the Netherlands Centre for the study of Crime and Law Enforcement (Amsterdam, Netherlands), and Temple University (Philadelphia, USA) to study space-time patterns of crime in different countries. The research showed that across cities in five different countries (see [a] in section 3) the risk of burglary spreads in space and time much like a disease, with a regularity that makes it amenable to prediction. Further research, conducted as part of this collaboration showed that this extended to improvised explosive device (IED) attacks in Iraq. Departmental research has shown this to be the case for a range of other crime types including theft from motor vehicles, cash in transit robbery, riots, and even maritime piracy. With respect to burglary, we demonstrated that novel predictive models based on our findings outperform alternative methods [b]. And, with a view to assessing the utility of predictive approaches more generally, we conducted the first reviews of the predictive accuracy of traditional methods of crime mapping [c], and showed that – in contrast to conventional wisdom – geographically focused police initiatives do not displace crime [d].

Underlying the research on the space-time dynamics of crime, and the forecasting method developed, is the hypothesis – developed at UCL – that offenders adopt 'foraging' strategies at least some of the time, seeking to maximise the benefit of their activity whilst minimising search time and associated risks [b, e]. As such, burglars (for example) are predicted to return to previously victimised homes/locations (repeat victimisation) when the benefits outweigh the risks, and nearby places that share similar characteristics (near repeat victimisation). With further British Academy funding (2007–2008) **Johnson** directed a study that used computer simulation, quantitative and qualitative methods to test this hypothesis. The analysis of crimes detected by the police [e] facilitated the study of patterns of observed offender spatial choices; computer simulation (e.g. [f]) – a generative modelling approach which allows theoretical models to be formalised and tested in silico – was used to test and assess competing theories; and, qualitative research interviews with offenders provided a "bottom-up" approach to further develop understanding of offender spatial decision-making. The findings, generated using very different research methods that are rarely used together, support the offender as forager hypothesis and provided insights relevant to the crime reduction enterprise.

3. References to the research (indicative maximum of six references)

Researchers at SCS (at the time of research and publication) are listed in **bold**. All publications have been through rigorous peer review.

[a] **Johnson**, S. D., Bernasco, W., **Bowers**, K. J., Elffers, H., Ratcliffe, J., Rengert, G., & **Townsley**, M. (2007). Space–Time Patterns of Risk: A Cross National Assessment of Residential Burglary Victimization. *J. of Quant. Criminol*, *23*, 201–219. DOI: 10.1007/s10940-007-9025-3.

Cited 94 times (Google Scholar); **3rd most cited article** in journal published since 2007. Consistently a top 5 Criminology and Penology journal (ISI Web of Knowledge).

[b] **Johnson**, S. D., **Bowers**, K. J., **Birks**, D. and **Pease**, K. (2009). Predictive Mapping of Crime by ProMap, Weisburd, D., W. Bernasco and G. Bruinsma (Eds.) Putting Crime in its Place: Units of Analysis in Spatial Crime Research, New York: Springer. (Available upon request)

[c] **Chainey**, S., **Tompson**, L., & Uhlig, S. (2008). The Utility of Hotspot Mapping for Predicting Spatial Patterns of Crime. *Security Journal*, 21, 4–28. DOI: 10.1057/palgrave.sj.8350066.
Cited 65 times (Google Scholar), and the **3rd most cited** article in *Security Journal* since 2007.

[d] **Bowers**, K.J., **Johnson**, S.D., Guerette, R.T., **Summers**, L., & Poynton, S. (2011). Spatial Displacement and Diffusion of Benefit Among Geographically Focused Policing Initiatives: A Meta-Analytical Review, *J. Exp. Criminol.*, 7(4), 347–374. DOI: 10.1007/s11292-011-9134-8.

[e] **Johnson**, S. D., **Summers**, L., & **Pease**, K. (2009). Offender as forager? A direct test of the boost account of victimization. *J. Quant. Criminol. 25*(2), 181–200. DOI: 10.1007/s10940-008-9060-8.
Cited 41 times (Google Scholar) and the **5th most cited** article in journal since publication in 2009.

[f] **Johnson**, S. D. (2008). Repeat Burglary Victimization: A Tale of Two Theories. *J. Exp. Criminol.*, 4, 215–240. DOI: 10.1007/s11292-008-9055-3.
Cited 39 times (Google Scholar); **5th most cited** article published in journal since 2008.

Key peer-reviewed grants

'Predicting Patterns of Criminal Activity' British Academy International Collaborative Activities Network Grant. PI: Professor Shane Johnson. Amount £13,150. Duration Feb 2004–Dec 2008. Outputs from this grant: [a], [b].

'Offender Targeting Decisions for Acquisitive Crime' British Academy Large Grant. PI: Professor Shane Johnson. Amount: £62,613. Duration May 2007–Oct 2008. Outputs from this grant: [e], [f].

'Campbell collaboration systematic review on spatial displacement among geographically focused policing initiatives' National Policing Improvement Agency grant. PI: Professor Kate Bowers. Amount $46,363. Duration: Nov 2009–April 2010. Output from this grant [d].

4. Details of the impact (indicative maximum 750 words)

For a long time, police responses to crime reduction have focused on catching offenders. This is partly due to the perception that the timing and location of crime events is not predictable and, even if it were, the police and others have commonly questioned the idea that place-based strategies actually reduce crime, assuming that crimes prevented at one location will simply be 'displaced' to others. More generally, the practical value of academic research in policing has often been questioned by practitioners. However, our research on crime prediction has shown that prediction is possible and practicable, our systematic review of research concerned with crime displacement has dispelled the myth that place-based crime prevention merely displaces crime, and our applied research has demonstrated the value of academic research in practice.

Through presentations at over 50 practitioner events (including the Government of Alberta's 2007 international conference on crime reduction, which informed [11]), our continuing professional development courses (over 300 practitioners at 30 courses, 2008–2013), and participation on advisory boards and direct knowledge transfer activities, our research has **challenged accepted wisdom and substantially influenced policy and practitioner discourse**.

Research has had substantial media coverage, which both reinforces and demonstrates its influence on discourse. This has included, for example, articles in the *New Scientist* (3 May 2008, readership 736k per issue), on the BBC News website (9 September 2011, >160m page views per month), and TV coverage on the BBC breakfast news (18 September 2012, viewership ~1.1m) [1].

In the UK, research contributions to policy discussion and impact on police action were recognised at every level. Examples include:

- In May 2012, **Chainey** was called as expert witness by the Parliamentary Select Committee on Public Accounts to provide evidence on the use and impact of online crime mapping for their

Implementation of the Transparency Agenda. His testimony led to the recommendation that they publish better quality and more useable data [2].

- An independent report from Her Majesty's Inspectorate of Constabularies (HMIC) acknowledged SCS research as the basis for pioneering work employing predictive mapping; a Police Federation article noted our research has informed police practice; while **Johnson**'s participation on advisory panels led to an invited contribution in 2012 to HMIC briefing materials for newly elected Police Crime Commissioners on what works to reduce crime [3].
- The UK College of Policing (formerly the National Police Improvement Agency, NPIA), for whom **Johnson** contributed to the 2012 NPIA Masterclass on predictive policing, argue that our work has directly changed the way the police perform hotspot analyses in practice, stimulated debate on how this analysis can be effectively used, challenged conventional wisdom held by those in law enforcement concerning (say) crime displacement, and informed the future of predictive crime analysis [4].
- Locally, in addition to the changes of practice described below, Greater Manchester Police note that departmental research has changed police attitudes to the value of academic research [5].

The global reach of this influence is demonstrated by:

- Discussion of our research in the 2012 Digest of the International Association of Crime Analysts (members in 47 countries) focusing on key academic work on hot-spots policing, and in an Australian Institute of Criminology (a government agency) brief on using geographical analysis to prevent crime [6].
- In the United States, the National Institute for Justice recognised the importance of our work by funding Professor Jerry Ratcliffe (Temple University, $95k) to develop "the near repeat calculator" [7] which implements some of the algorithms developed as part of our research.

Research at SCS has **influenced police practice in the UK and police forces internationally, as well as community groups concerned with neighbourhood security**. This has **led to reduced crime in target areas**, and initiatives have subsequently been extended or imitated elsewhere.

In the UK, based on our research and with support from departmental staff [5], Greater Manchester Police (GMP) implemented a predictive mapping approach to help reduce burglary in Trafford (population 226,578) [5] in 2010. Predictive maps are used to direct police patrols and, where feasible, staff from other agencies not usually engaged in crime reduction (e.g. police driving instructors, and the fire service) to provide guardianship where (and when) it is predicted to be most needed. This innovative and successful intervention was recognised by the HMIC as having scope for wider adoption [8]. Evaluation results [5] show a 38% reduction in burglary (471 fewer victims of burglary) in the area of implementation over a two-year interval. Inspired by departmental research [e] on other crimes, GMP extended the approach to other high volume offences, reporting a 29% reduction in *theft from motor vehicle* [5]. These projects were recognised internationally: the team were finalists in the US Goldstein Problem Oriented Policing awards 2012, and nominated by the Home Office for the 2012 European Crime Prevention awards.

Similar interventions have been implemented elsewhere with comparable results. For example, in 2012 in North West Leeds (population 321,000), which had previously experienced the highest burglary rate in the country, West Yorkshire police reported a 48% decrease in burglary accompanied by increased public confidence in the police [9]. Other UK police forces implemented similar approaches in 2008–2013, including Kent, West Mercia, and the Metropolitan police.

In North Lincolnshire, with Home Office funding and assistance from **Johnson**, the Safer Neighbourhoods Team developed the Vigilance Modeller, a software application based on **Bowers** and **Johnson's** early predictive mapping work. This is used to prioritise areas for crime prevention in North Lincolnshire (population 167,400) and it was distributed to over 400 community safety partnerships in the UK in 2010. Initially developed for use by community safety teams (not the police), in 2011 this software was used by Humberside Police to catch a prolific burglary team [10].

The reach of these impacts has been expanded overseas both directly and through research by others. Community safety organisations implemented successful interventions based on our work.

In Edmonton (Canada) a Neighbourhood Empowerment Team (NET) developed the Notification of Community Crime (NOCC) intervention to increase community empowerment to reduce crime. As part of the programme, youth volunteers visit burglary victims and their neighbours to deliver crime prevention advice and kits. Following recommendations from departmental research, teams deliver advice and kits as swiftly as possible. First implemented in 2009, this intervention is ongoing in three NET neighbourhoods and had "a substantial impact on rates of residential burglary" – e.g. reducing burglary by 66% in a six-month interval in the Bonnie Doon NET area (pop. 5000) [11].

Following invited presentations by **Bowers** (an update of [b]) and **Johnson (**a version of [f]) in Jan 2007, researchers at UCLA published an article on predictive mapping in 2011 that built on our work on crime prediction (citing 4 of our papers including [b,f,c] seven times in the article). This led to a US spin out company (predpol.com) that has developed commercially available predictive mapping software, grounded in the principles set out in our research [a,b,e,f]. Their algorithm refined our approach by incorporating an estimate of the time-stable risk of crime at locations (discussed in [b,f]) and better calibrating the way in which the risk of crime is predicted to spread (see [f]). Use of this product by the police is reported to have resulted in crime reductions of 14% and 27% respectively in areas of Los Angeles and Santa Cruz [12].

5. Sources to corroborate the impact (indicative maximum of 10 references)

[1] Media coverage includes: 'Could Predictive Policing Help Prevent Burglary?' *BBC News* 18 Sep 2012 (http://bbc.in/1ids6ya) (2011 page views http://bbc.in/HatvtW [PDF]); 'Sin Cities: What makes some city districts so dangerous?' *New Scientist* 3 May 2008 (readership http://bit.ly/HeCJ8H); 'How to get more with less in the police' BBC News 9 Sep 2011 (http://bbc.in/HeCPgL).

[2] Public Account Committee on transparency (2012) http://bit.ly/1635PRe; see e.g. Chainey's response to Q26, reflected in recommendation 2 in the committee's findings: http://bit.ly/HhbkSQ.

[3] HMIC recognition of research: An advanced police for an advanced world by Sir Denis O'Connor, Police Federation 2011 (http://bit.ly/17fk2h1 [PDF]); What works in policing to reduce crime, 2012 HMIC online briefing for Police and Crime Commissioners (http://bit.ly/17IilDa).

[4] Letter from the UK College of Policing on how our work directly changed the way police perform hotspot analyses, stimulated debate on the effective use of this type of analysis, and challenged conventional wisdom amongst law enforcement practitioners.

[5] Letter from GMP confirms that their predictive mapping approach was based on our research and supported by our staff, and that this has led to substantial reductions in crime; Published evaluation (first 12 months of implementation): Fielding, M., and Jones, V. (2012). Disrupting the Optimal Forager: Predictive Risk Mapping and Domestic Burglary Reduction in Trafford, Greater Manchester. *Police Science & Management*, 14(1) 30–41 DOI: 10.1350/ijps.2012.14.1.260.

[6] Australian Institute of Criminology brief on using geography to reduce crime (June 2008): http://bit.ly/1bep61L.

[7] Near repeat calculator funded by the US National Institute of Justice: http://bit.ly/1cdqjvm.

[8] HMIC recognition of GMP approach: Taking the time for crime: A study of how police officers prevent crime in the field, 2012 HMIC report (http://bit.ly/18aV9MW [PDF]); see p. 11–12.

[9] Statement from North West Leeds police discusses how our research informed the policing operation "operation optimal" and that this led to substantial reductions in burglary.

[10] Statement from North Lincolnshire confirms how our research informed the development of the vigilance modeller, how this has been used, and the wide circulation of the modeller in England and Wales; A newsletter documenting the North Lincolnshire work is also provided (see p. 2).

[11] Neighbourhood Empowerment Team (NET) intervention, titled the Notification of Community Crime (NOCC), implemented in Canada at Edmonton's official blog: http://bit.ly/1eINz22.

[12] Reason.com article discusses PredPol and the near repeat theory on which it is based, including link to [a], http://bit.ly/1jc5e2k. Also see link to Predictive Policing: The Future of Reasonable Suspicion in the same article.