Hot Spots, Cold Spots and the Areas in between: Exploring Changes in Crime Across Time at a Neighbourhood Level

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THE UNIVERSITY *of* EDINBURGH

AQMeN
Applied Quantitative Methods Network

Drawing on two pieces of work

Findings from PhD:
Vandalism: A crime of place a case study of recorded vandalism across 6 years in a Scottish City (funded by SCCJR)
Ellie Bates, University of Edinburgh (2014)
Supervisors: Susan McVie and William Mackaness

AQMeN Crime Strand:
Work on winners and losers in the crime drop at the neighbourhood level – preliminary findings
(funded by ESRC)
Ellie Bates, Jon Bannister, Manchester Metropolitan University, Ade Kearns, University of Glasgow (2015 and ongoing)

Broader context

International Crime Drop

- **Multiple and competing explanations**

- Formal Social Control:
punishment, policing and a reduction of criminal opportunities

- Social Trends:
prosperity / austerity, demography and social dynamics

Crime problems manifest and persist at differing spatial scales (the hot spot and multiple neighbourhoods)

- Effective, efficient and legitimate police interventions rest on **(1) sensitivity to scale** – place based policing / places of meaning, and **(2) recognition of the factors and agencies capable of changing places** / spaces of influence
- Examining **micro-spatial variance in crime trends can inform**:

- The **scale (of deployment)** and type of **crime prevention** measures
- The **scale (of deployment)** and type of **reassurance** measures

Three Themes

The importance of hotspots, coldspots and areas in between.

What scales should we examine crime patterns at.

How might we examine trends in crime across time.

What is the scale of neighbourhood crime?





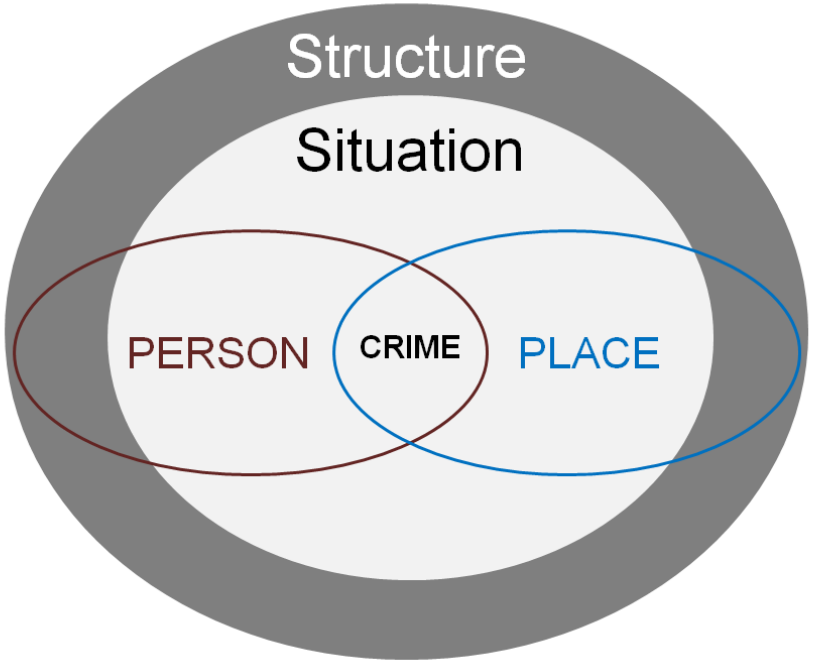
Background: PhD research:

Vandalism: a crime of place?

Are there areas (places) that experience high and low concentrations of vandalism year in and year out?

Do concentrations of vandalism change over space and time, and are there any particular patterns that appear to exist?

Some theories of crime and place relevant to vandalism



- **Routine Activities**

- **Use and Abuse of Space**

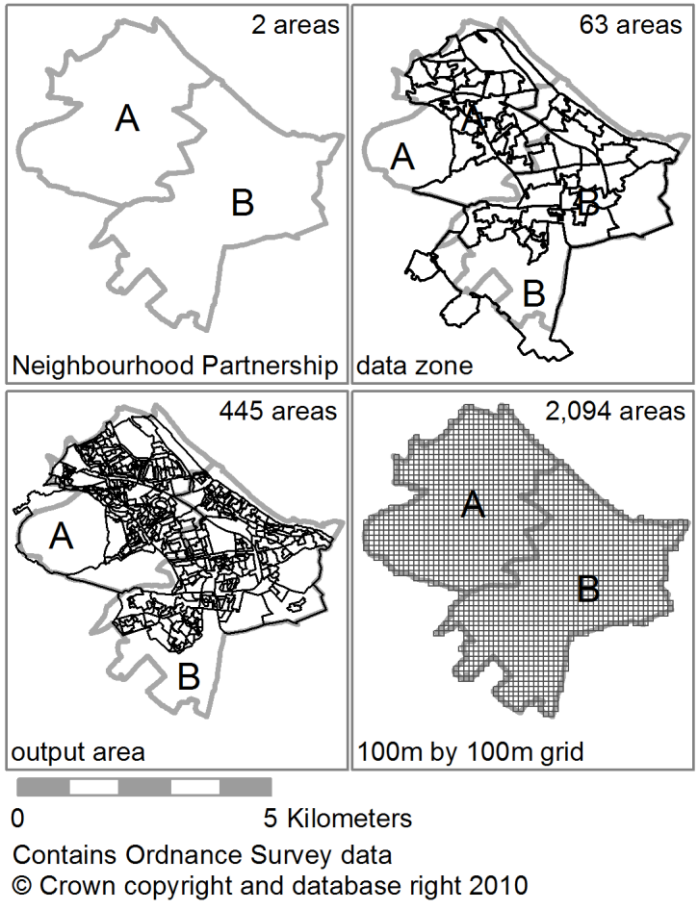
Crime pattern theory; liminal space; contested public and private space

- **Advanced Marginality / Persistent Inequality**

- **Community Based Interactions**

Social Disorganisation; Collective Efficacy

Vandalism Case Study



- 6 years of police recorded crime data (Vandalism and Fire-raising) 1st April 2004 to 31st March 2010 (Individual crimes - 6 figure Easting and Northings)

- Aggregated and analysed for each of the 6 years (1st April – 31st March – the following yeat)

Looking for crime patterns across time - methods

- Visualising crime data using descriptive mapping and Local Indicators of Spatial Association (LISA) – Gi* and Local Moran's I

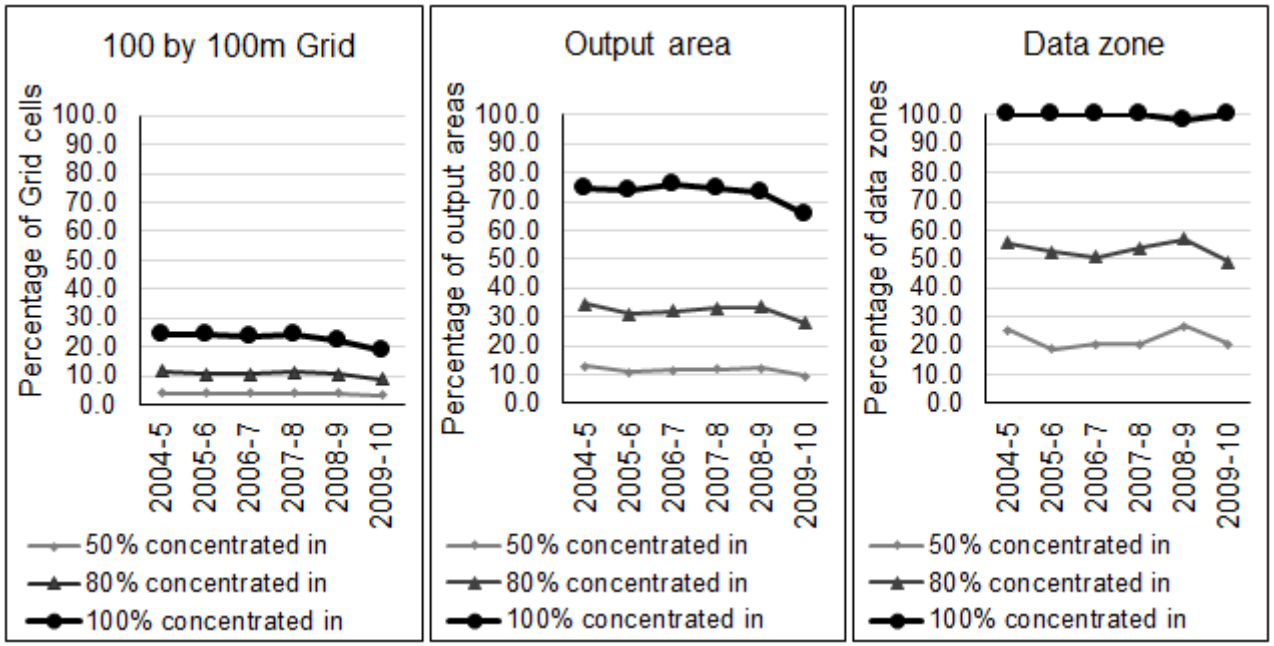
- Focus Groups - 'Talking to the map'

- Group Trajectory Analysis (Latent classes) (Negative Binomial Count models and Categorical models)

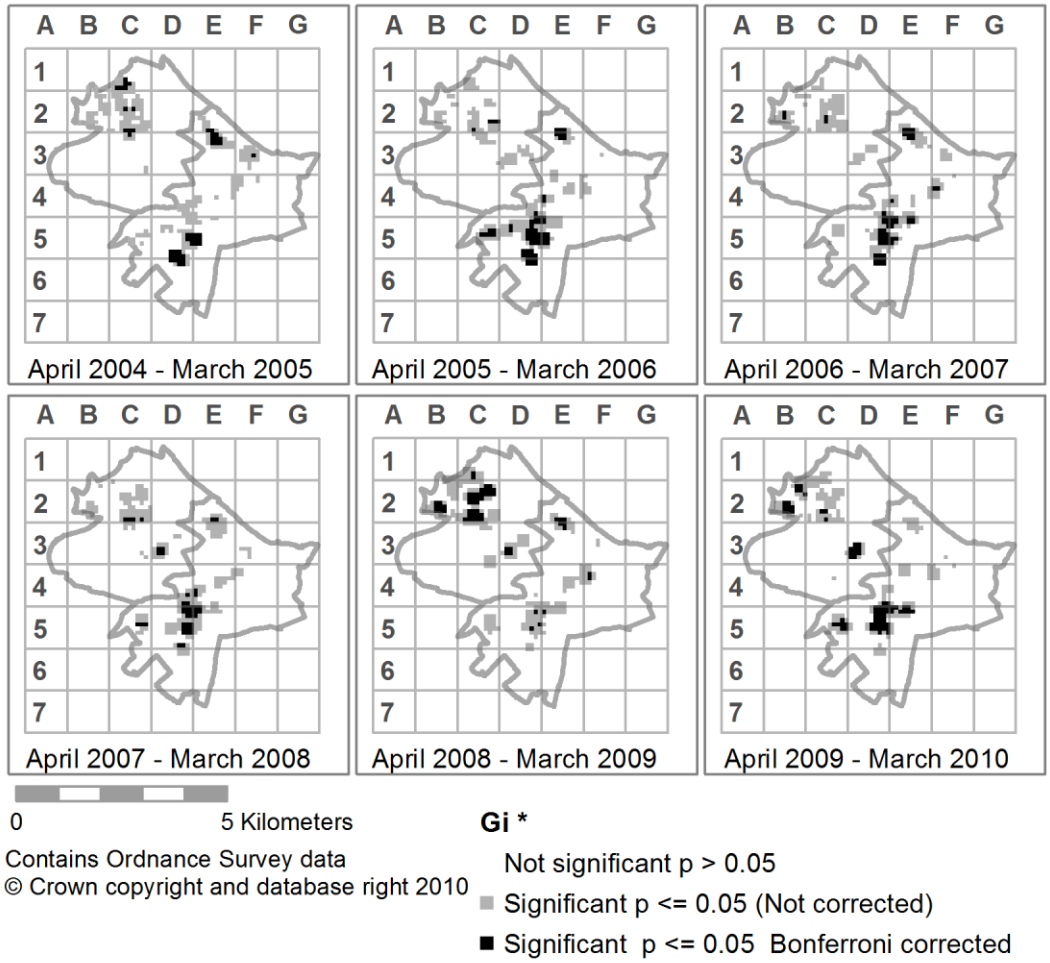
Stability of crime concentrations across time

David Weisburd speculates a "law of crime concentrations": despite change of crime levels across time the proportion of areas accounting for 50% of crime stays stable (Weisburd et al, 2012)

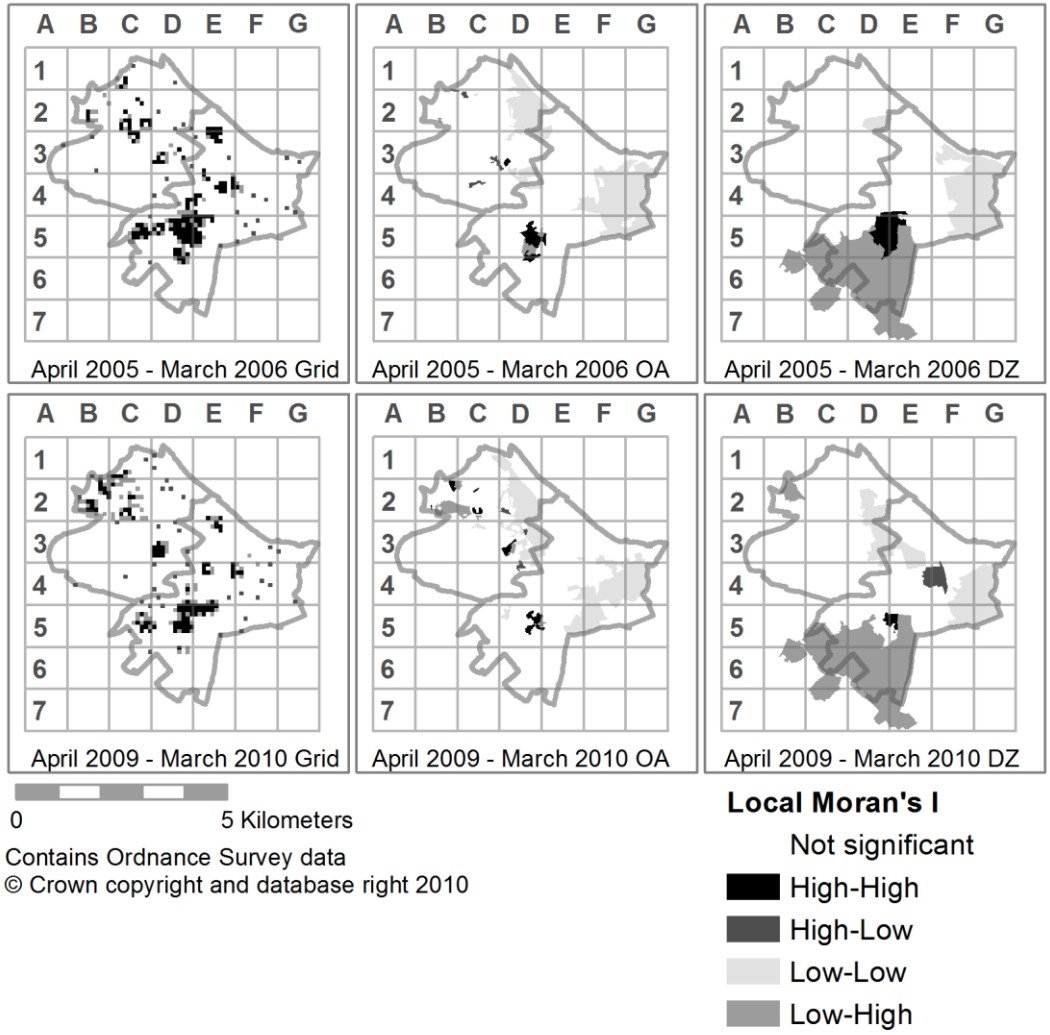
The percentage of recorded crimes of vandalism in the study area accounted for by proportion of local areas is stable but the ratio is scale dependent.



Locations of significantly high vandalism vary slightly across time



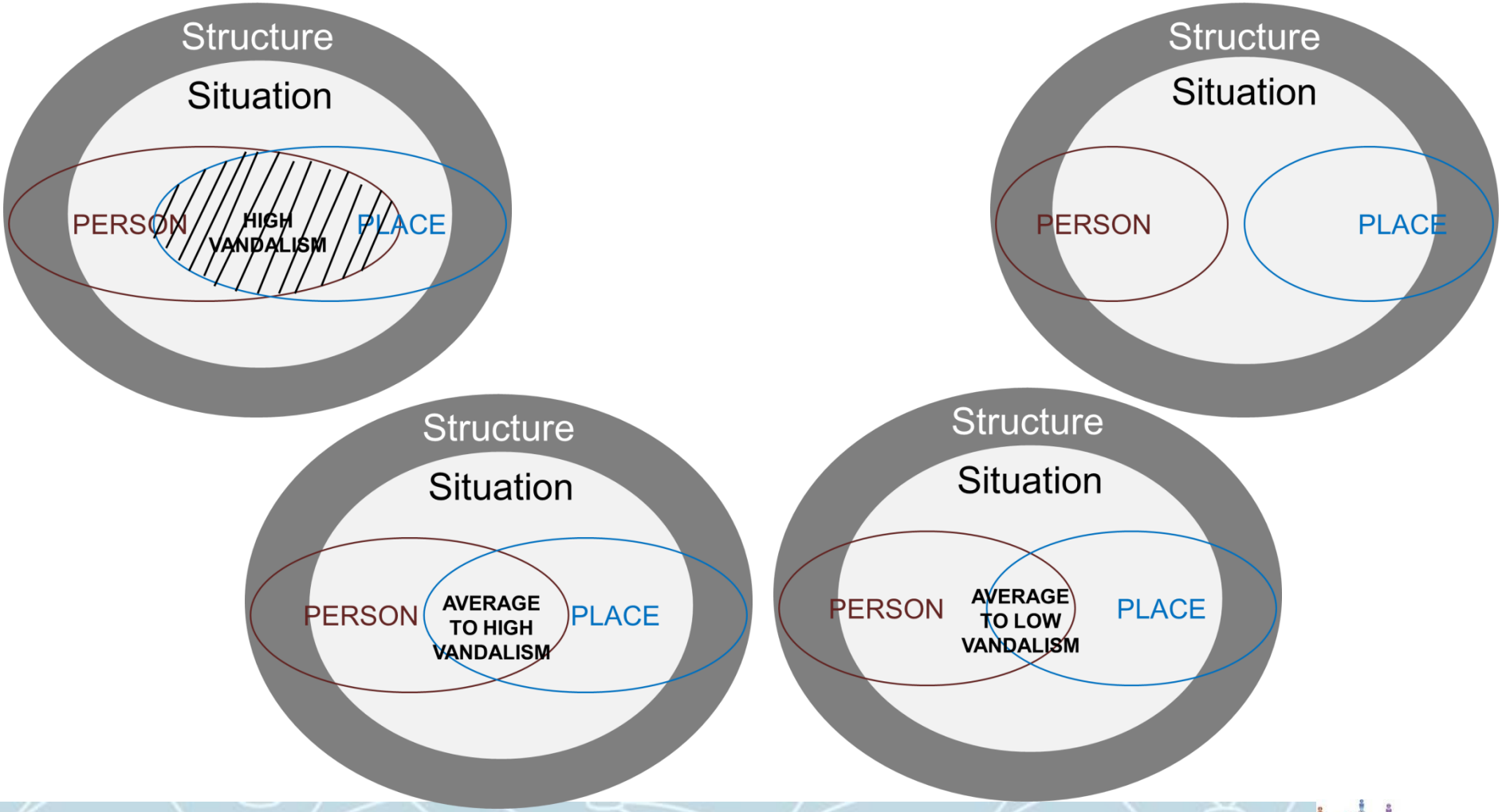
Hotspots and coldspots vary both across time and with scale



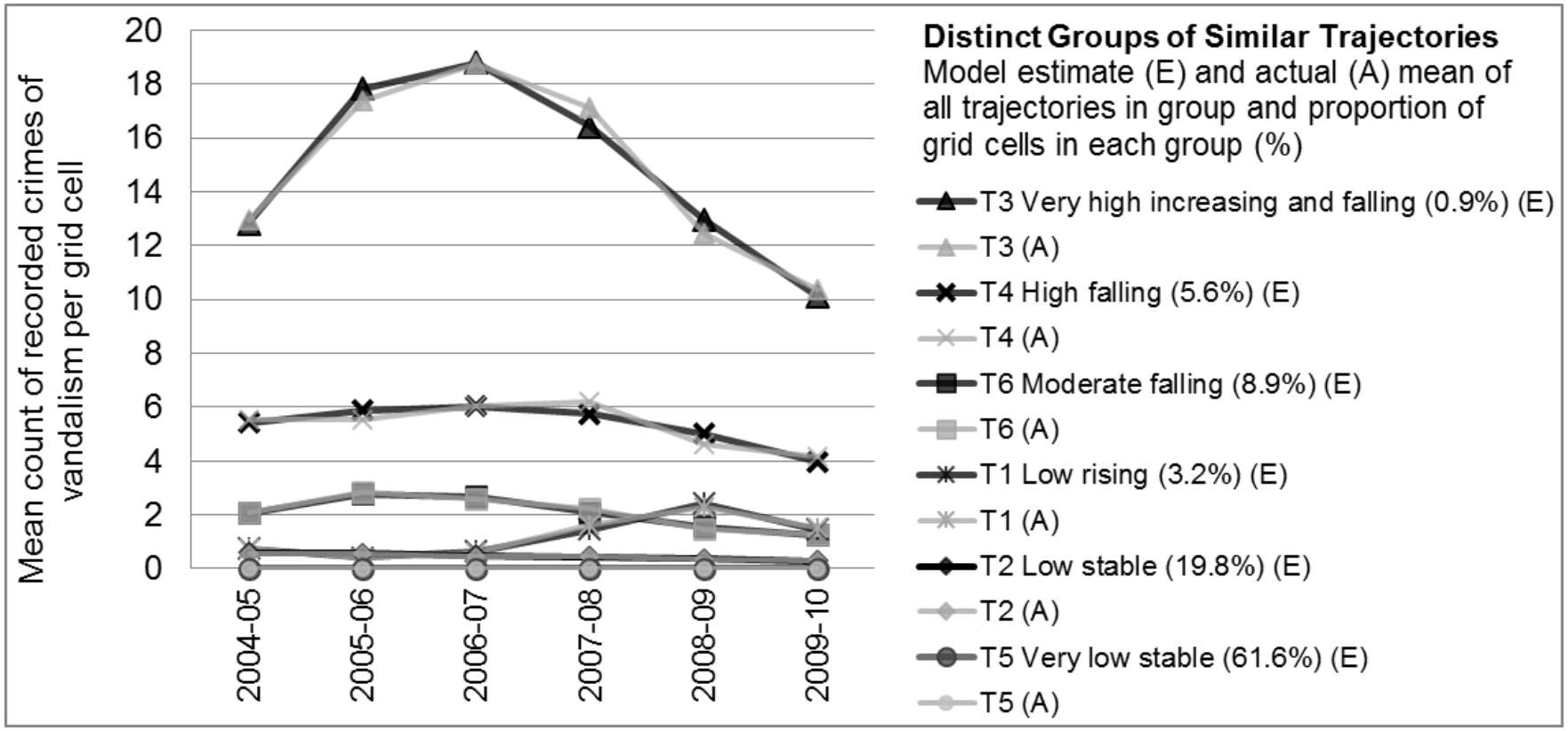
HIGH CRIME
("Hot Spots")

DRIFT

LOW CRIME
("Cold Spots")

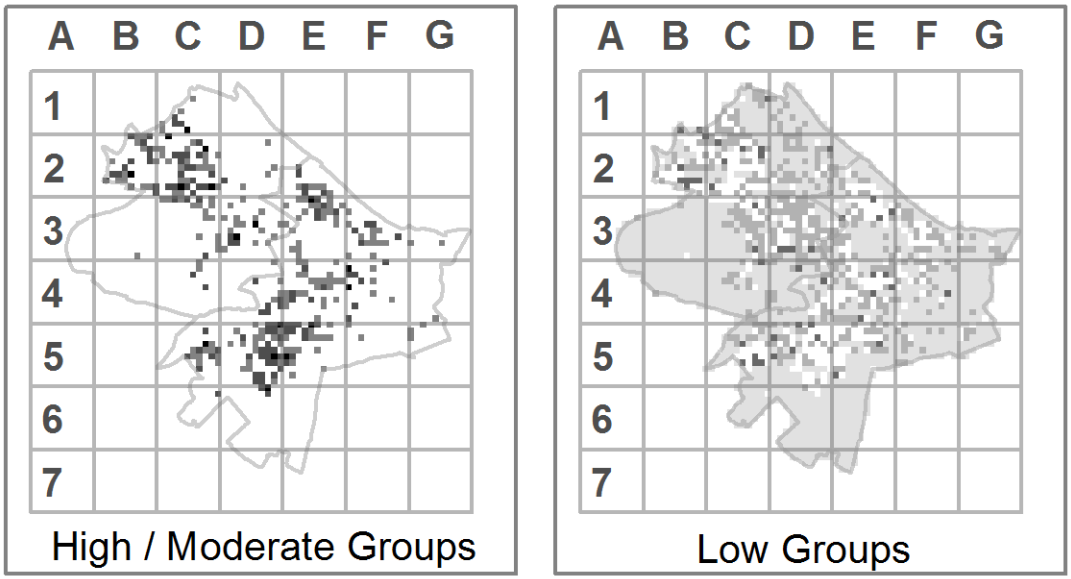


Individual areas have distinct high, moderate and low trajectories of vandalism



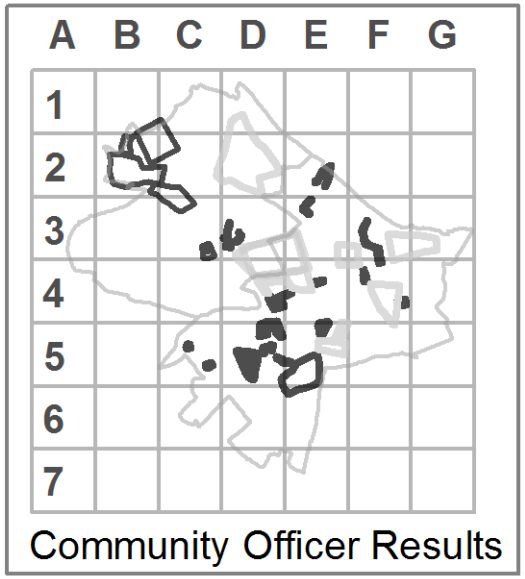
All Grid Cells	2004-5	2005-6	2006-7	2007-8	2008-9	2009-10
Mean	0.8	0.9	0.8	0.8	0.6	0.5
Standard Deviation	2.3	2.6	2.6	2.7	1.9	1.7

Individual areas have distinct high, moderate and low trajectories of vandalism



Focus Groups - “ Talking to the map”

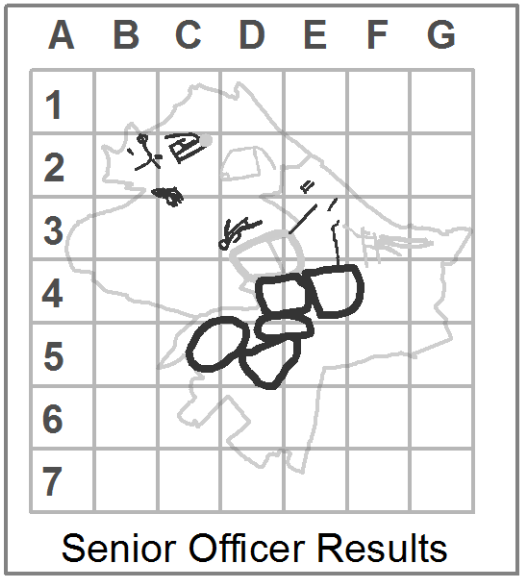
Focus Groups – High and Low Areas



Community Officer Results

Focus Group Shading

- High shaded
- High not shaded
- Low

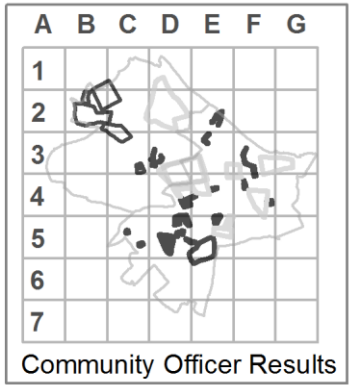


Senior Officer Results

Focus Group Shading

- High (shaded)
- High - not shaded
- Low
- Low (shaded)

Focus Groups and LISA Combined – Hotspots, coldspots and areas in between



Community Officer Results

Focus Group Shading
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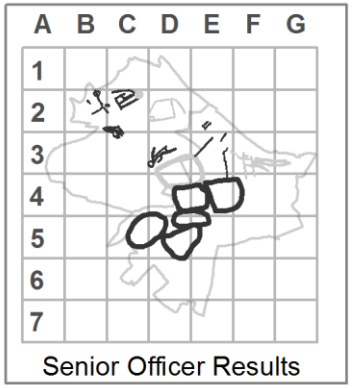
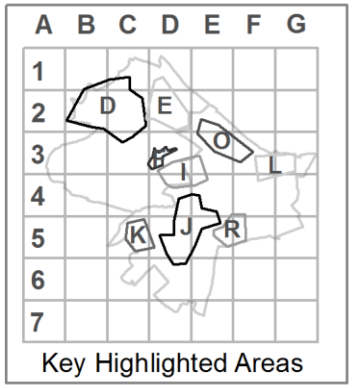


Senior Officer Results

Focus Group Shading
- High (shaded)
- High - not shaded
- Low
- Low (shaded)

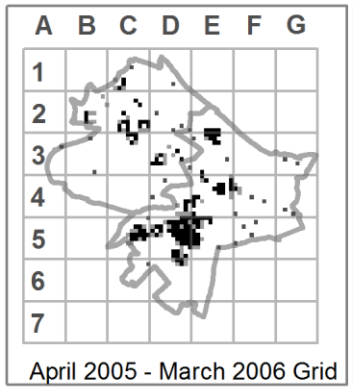


Key Highlighted Areas

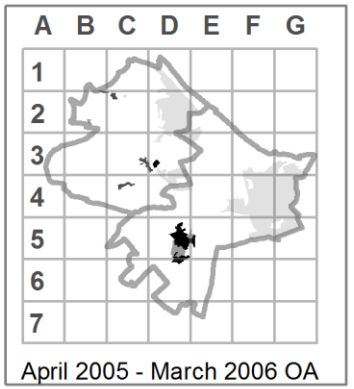
Neighbourhood Partnership A
- Delta - Drifting / High
- Echo - Consistently Low
- Foxtrot - ~> Persistently High
- Indigo - Low Drifting

Neighbourhood Partnerhsip B
- Juliet - Persistently High
- Kilo - Drifting High
- Lima - Consistently Low
- Oscar - High / Drifting
- Romeo - Low Drifting

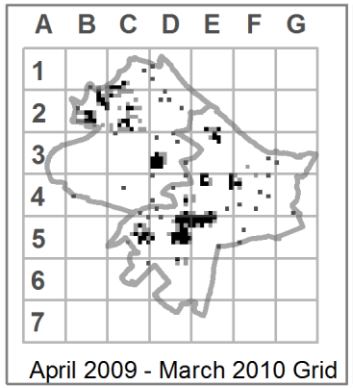
0 5 km



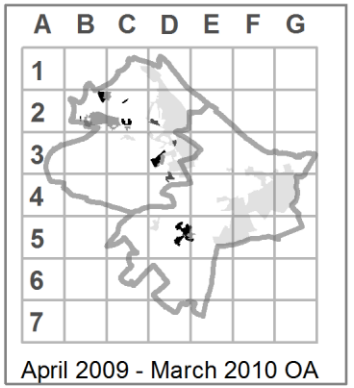
April 2005 - March 2006 Grid



April 2005 - March 2006 OA



April 2009 - March 2010 Grid

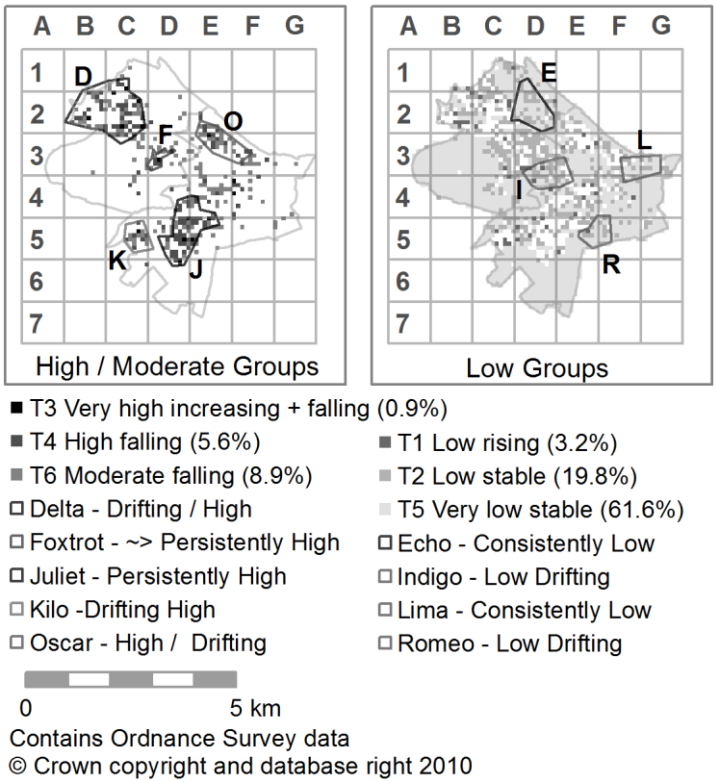


April 2009 - March 2010 OA

0 5 Kilometers

Local Moran's I
- Not significant
- High-High
- High-Low
- Low-Low
- Low-High

Focus Groups and Trajectory Groups combined – Hotspots, coldspots and areas in between



Winners and losers in the crime drop
Methodology

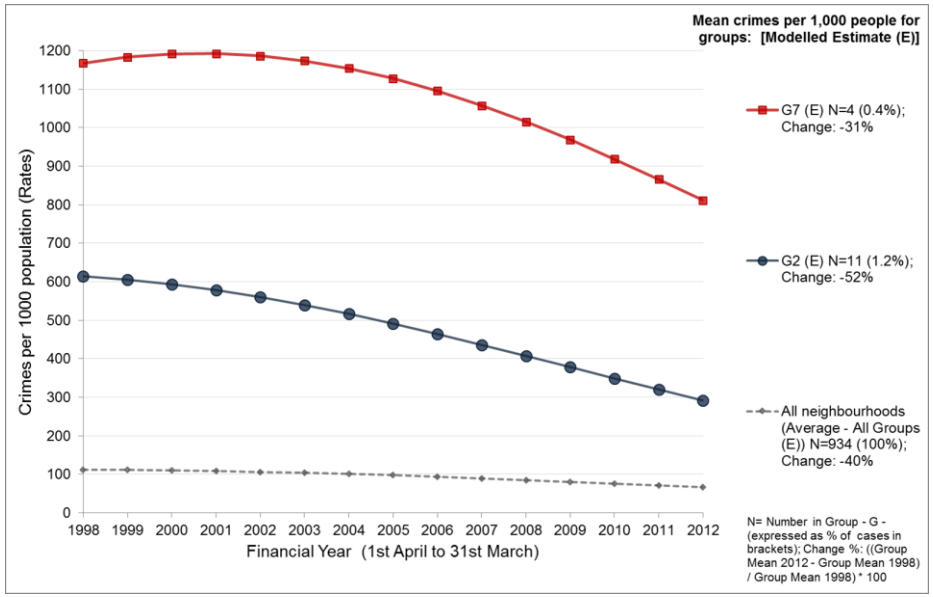
Study Area: Greater Glasgow (comprises the City of Glasgow, East Dunbartonshire and East Renfrewshire).

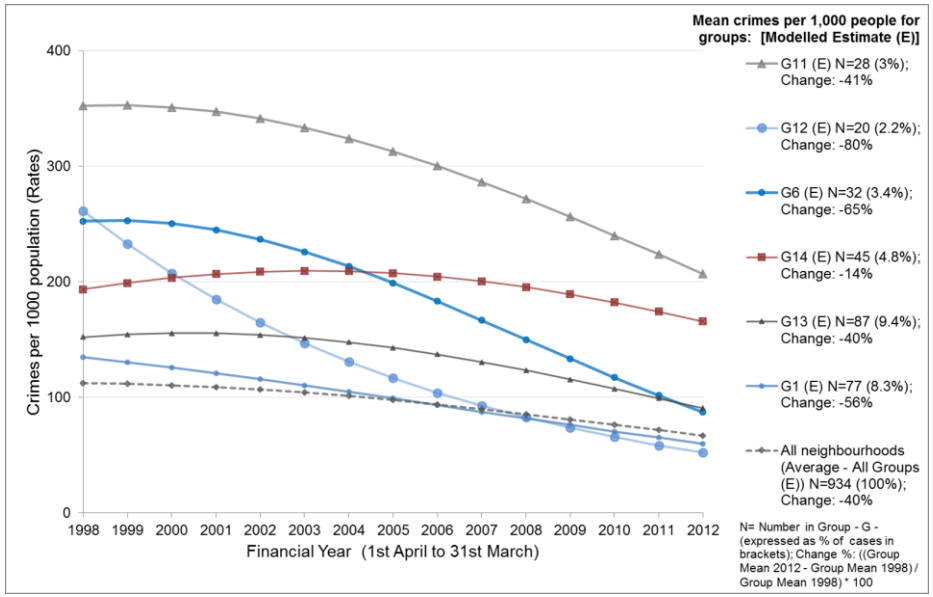
Data: Police Scotland Recorded Crimes and Offenders Data Bases (1998-2012), crimes excluding sexual crimes (Groups:1,3,4,5).

Techniques: Group Trajectory Analysis – a type of latent class analysis which provides a method for finding distinct statistically significant groups following different trajectories and models the mean trajectory of each group across time.

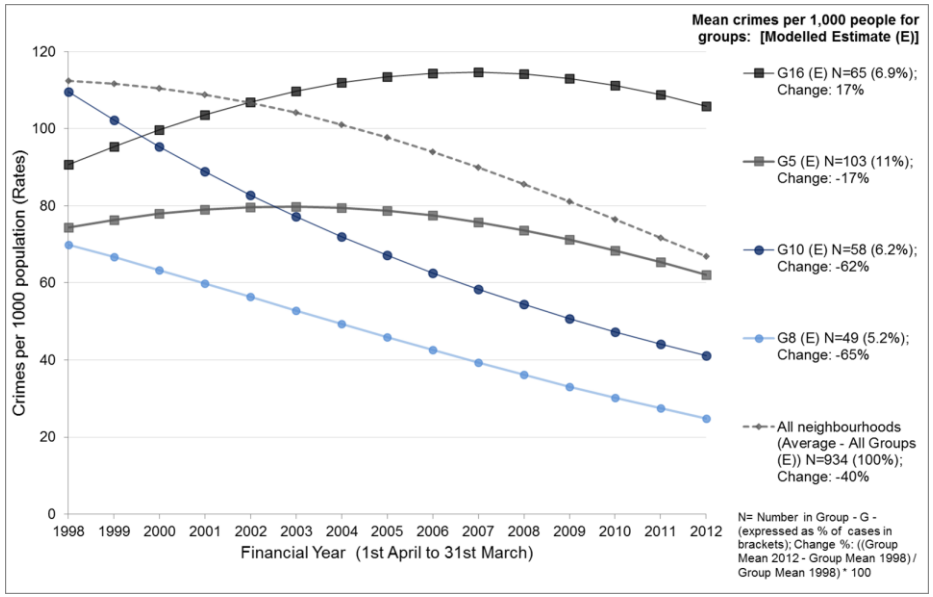
Data Unit: Scottish data zones – populations of around 500 – 1000 (mean 800) people – natural communities with similar social characteristics.

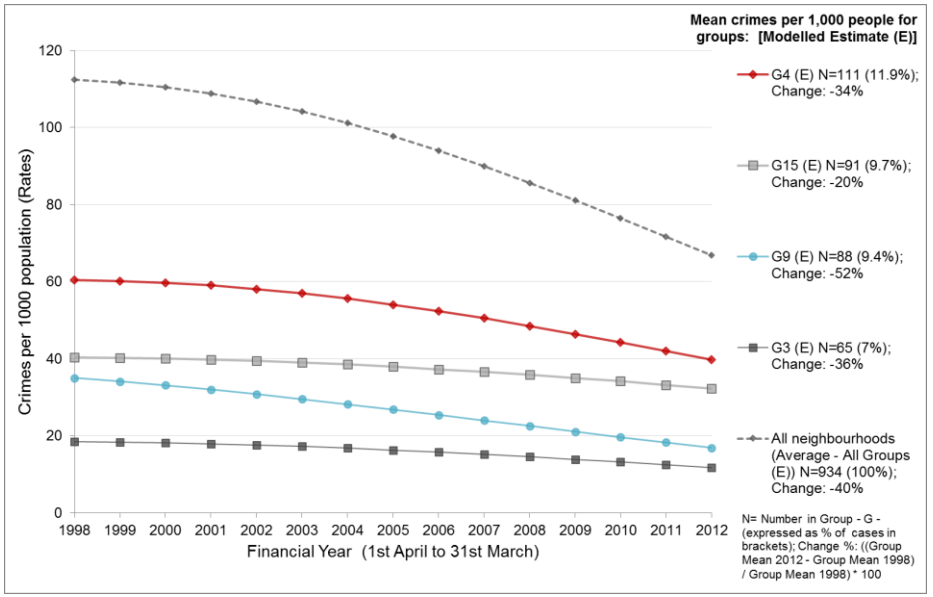
Winners or Losers?
High and Medium crime neighbourhood groupings



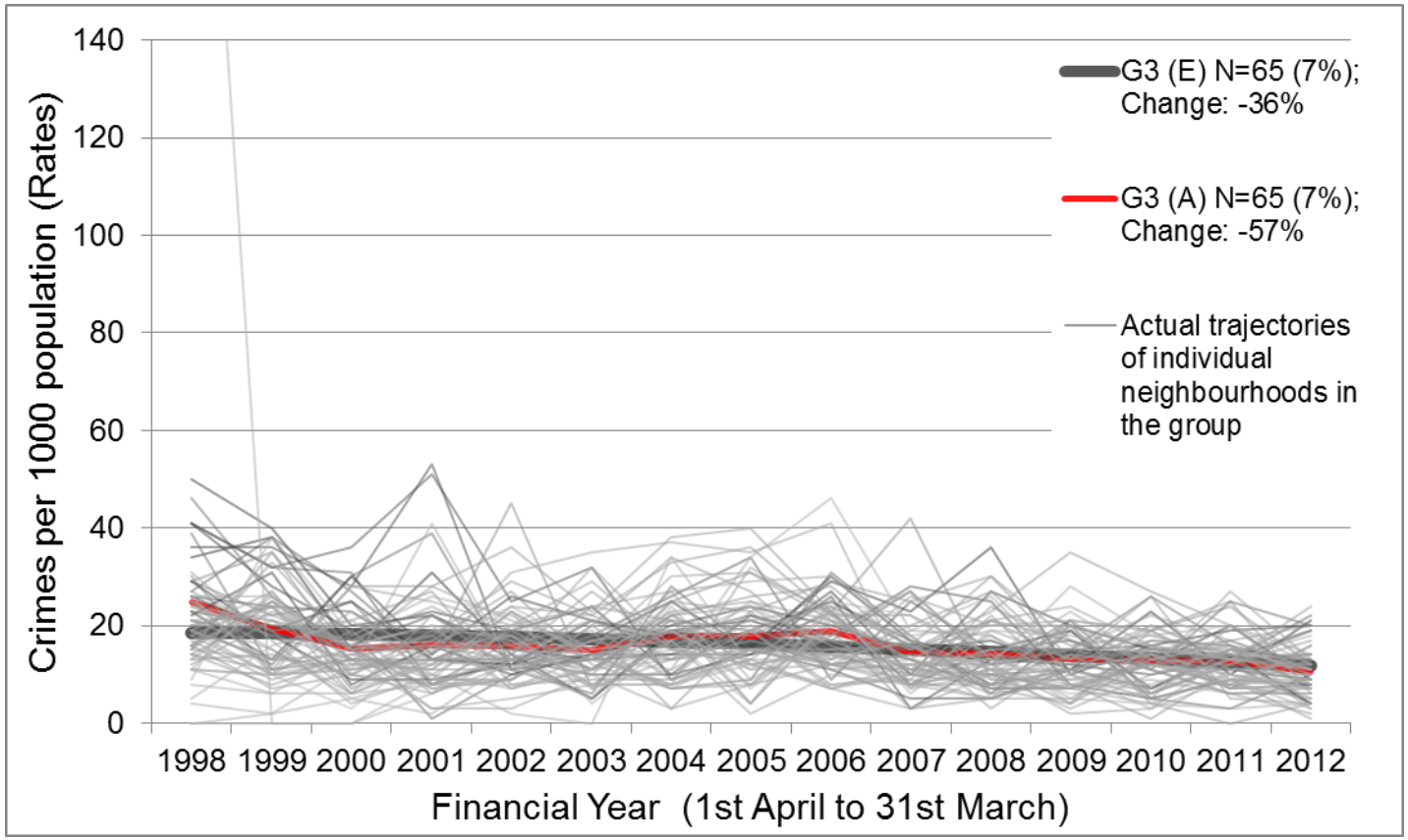


Winners or Losers?
Medium and Low crime neighbourhood groupings

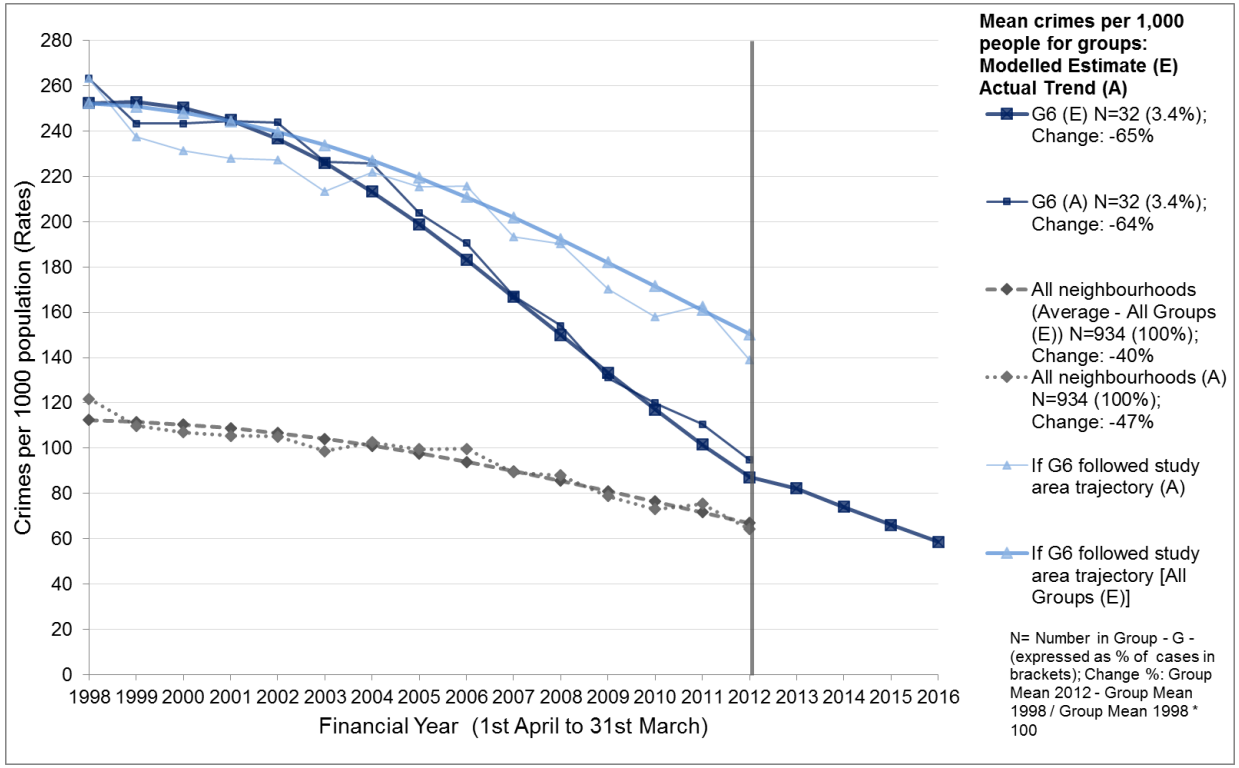




Feeling the crime drop?



Predicting Future Demand?



Conclusions

Visualising, exploring and analysing not only hotspots but also cold spots and the areas in between is important.

LISA, Group Trajectory analysis complemented with community officers perspectives can improve our understanding of local crime problems.

Broader area crime drops mask evidence of significant variation at the neighborhood level. There are multiple ways of conceiving of the winners and losers of the crime drop.

This patterning of crime levels provides strong support of the potential of placed based policing – it may be useful in predicting demand and shaping effective, efficient and legitimate policing interventions.

Acknowledgements

Applied Quantitative Methods Network (AQMeN)

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ESRC

University of Edinburgh

Thank you!

Questions?

Methodological challenges for researching vandalism and place – and more broadly crime and place

- Near things tend to be like other near things... (spatial dependency and spatial autocorrelation)
- Small numbers
- Assessing ‘significance’ (Multiple Testing)
- Scale and the Modifiable Areal Unit Problem
  - Single scale or multi-level?
  - Situational factors only or more broader structural factors

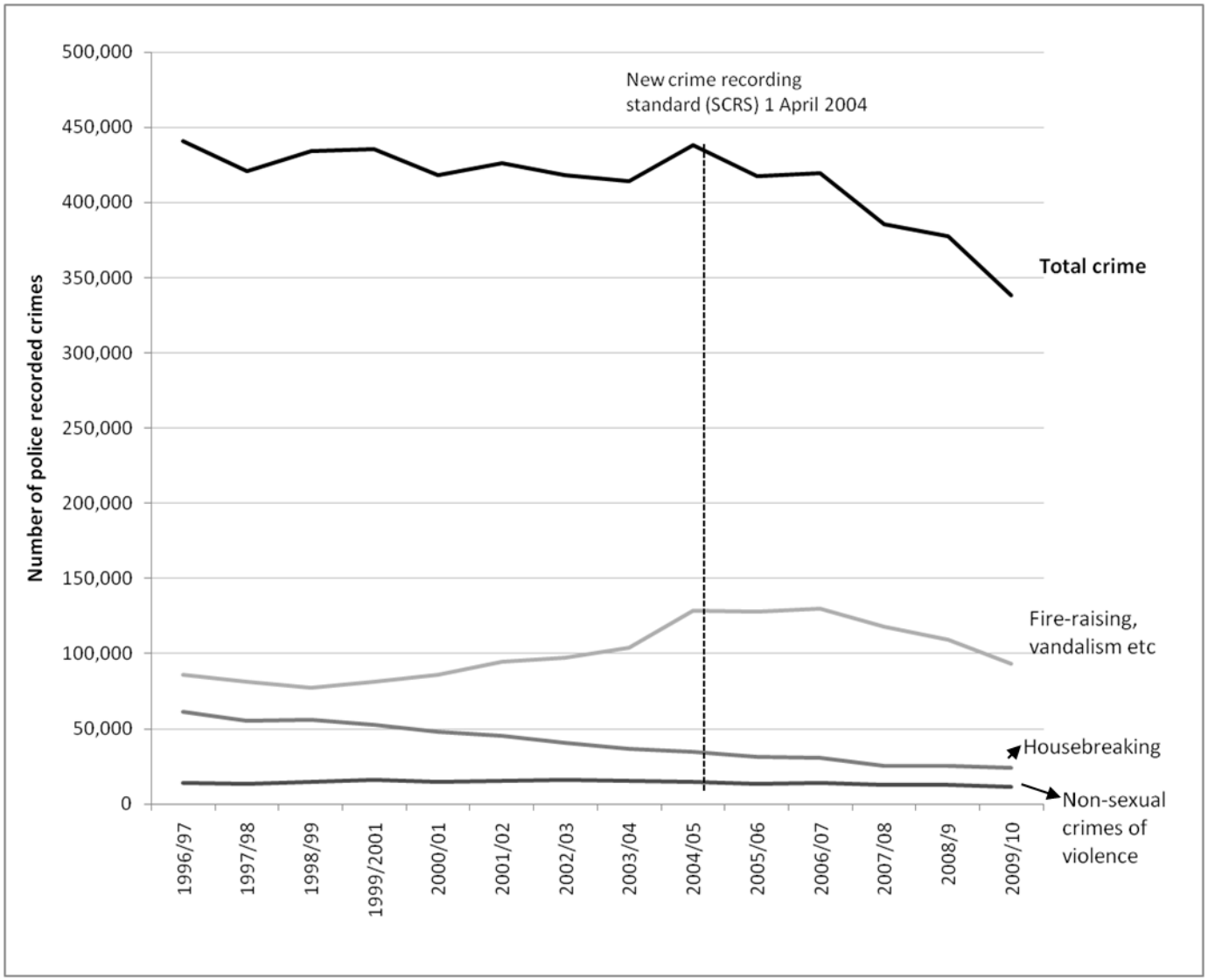
What is Vandalism? A definition

"action involving deliberate destruction of or damage to public or private property." – Oxford English Dictionary

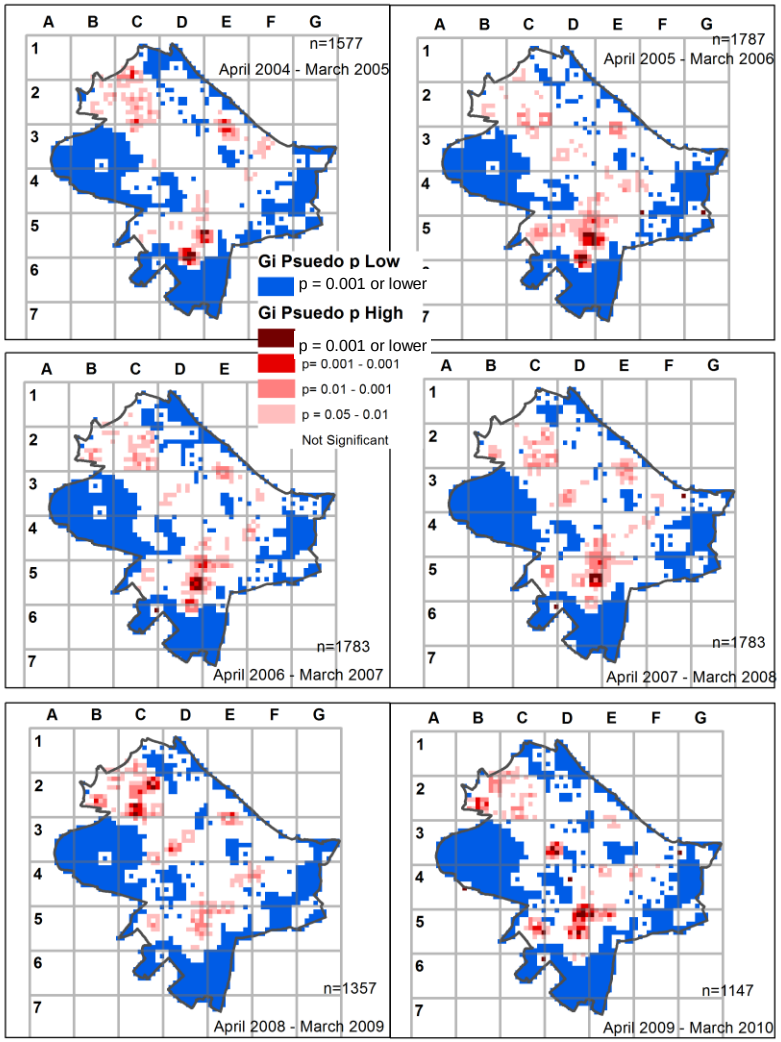
"any person who, without reasonable excuse, wilfully or recklessly destroys or damages any property belonging to another shall be guilty of the offence of vandalism"
Criminal Law Consolidation Scotland Act 1995 section 52(1)

"malicious mischief" – Scottish common law offence

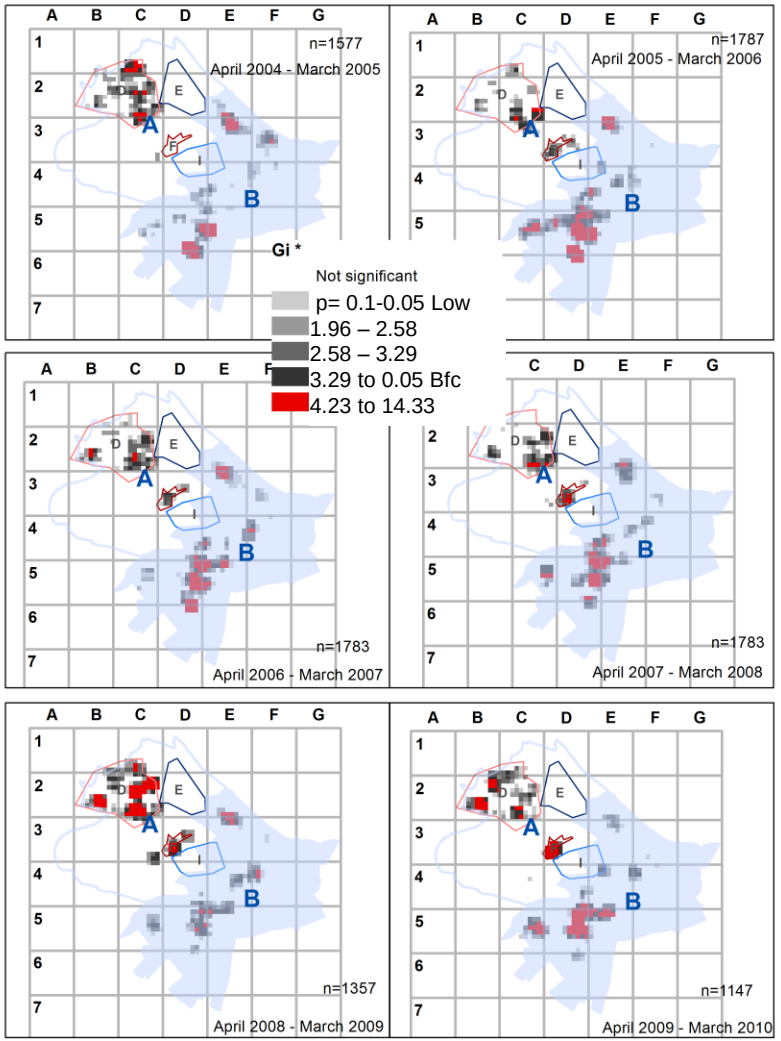
Why Vandalism?



LISA Weaknesses: Multiple testing – competing methodologies – software dependent results?



All Vandalisms - Vandalism, Malicious Mischief and Fire-raising



All Vandalisms - Vandalism, Malicious Mischief and Fire-raising

What is Vandalism? – a complicated phenomenon rooted in place...

"So in summary I'd say you've got the transient, people passing through area with the alcohol, under the influence of alcohol where generally you wouldn't get damage, but they're doing it because they're either drunk or they see them as being more privileged than they are so they'll go and do a little bit of nuisance on the way through. The places where it's really run down already, and not looking very nice anyway I think young people tend to think, {A says in background "What does it matter"} well, if we cause damage here what does it matter, you know, the place is run down, it looks a mess, we're not really gonna make it worse let's have a bit fun smashing a window or something which then appears to go away as the area gets developed. You've got the stuff that is either boredom, anti-social behaviour or maybe to do with a little bit of hatred for other people where things are being thrown at windows causing damage, and then you've got your tagging, your graffiti"(Community Officer Focus Group 3)