How can spatial analytical techniques be used to highlight the geography of burglary in Leeds?

[Excerpt only as this assignment likely to be set again for future MSc students]

INTRODUCTION

Although socio-demographic classification of areas is also important to the analysis of burglaries, this report focuses on analysis of their spatial clustering. After a literature review highlighting the expected nature of spatial clustering of burglaries, several relevant spatial analysis techniques are discussed in turn, followed by a short discussion including the limitations of these techniques.

PREVIOUS FINDINGS ON CLUSTERING OF BURGLARIES

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OVERVIEW: CHLOROPLETH MAPPING

Figure 1 gives an indication of distribution (and therefore clustering) of burglaries in Leeds. In order to map where burglary is above average it is important to normalise the counts by the 'population' at risk, typically number of households ([REF]). However, this still isn't entirely accurate as repeat burglaries can occur at a household.

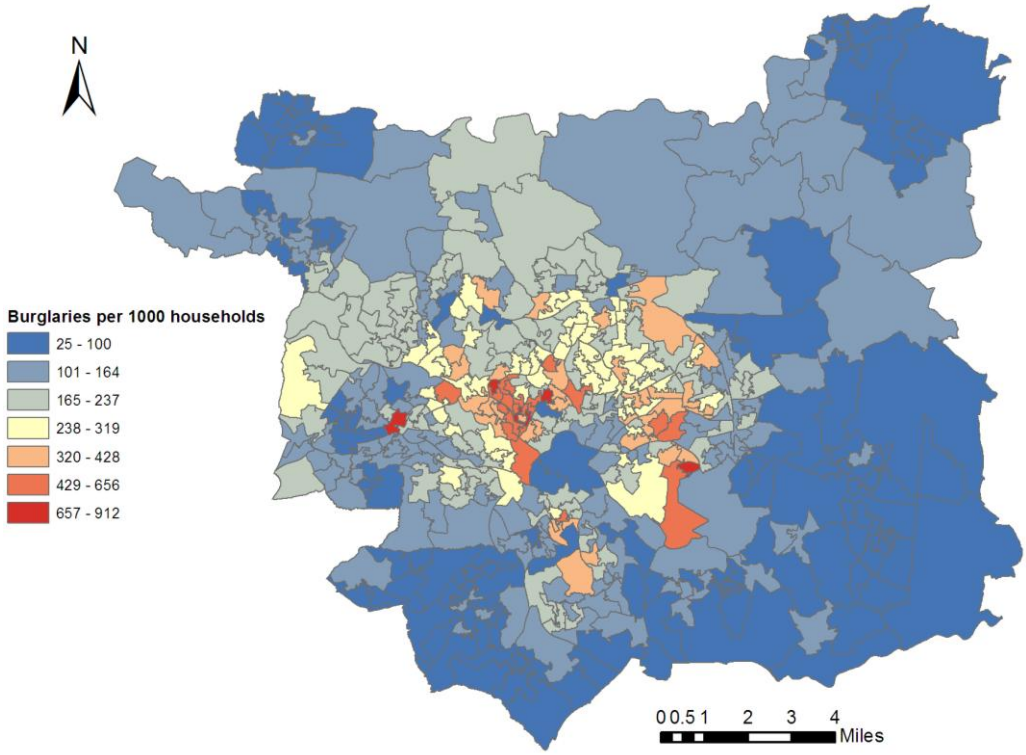

Figure 1: Burglaries by each census 'LSOA' in the Leeds Metropolitan District for the period 2000 - 2003

KERNEL DENSITY ESTIMATION (KDE): CLARIFY PROBLEM AREAS + EVOLUTION

Due to its simplicity of operation, KDE output is relatively simple to visually interpret and can have its bandwidth (circle radius) tuned to detect large clusters or to explore smaller scale clustering within those larger clusters .... For the analyses in this report, for Leeds-wide cluster detection, a radius of 500m was settled upon ... of the right order for a typical housing neighbourhood. The actual calculations performed were of 'double density' KDE type (dividing by a 'population' figure representing a 'local' household count); this should give a burglary risk factor normalised for the density of housing in an area.

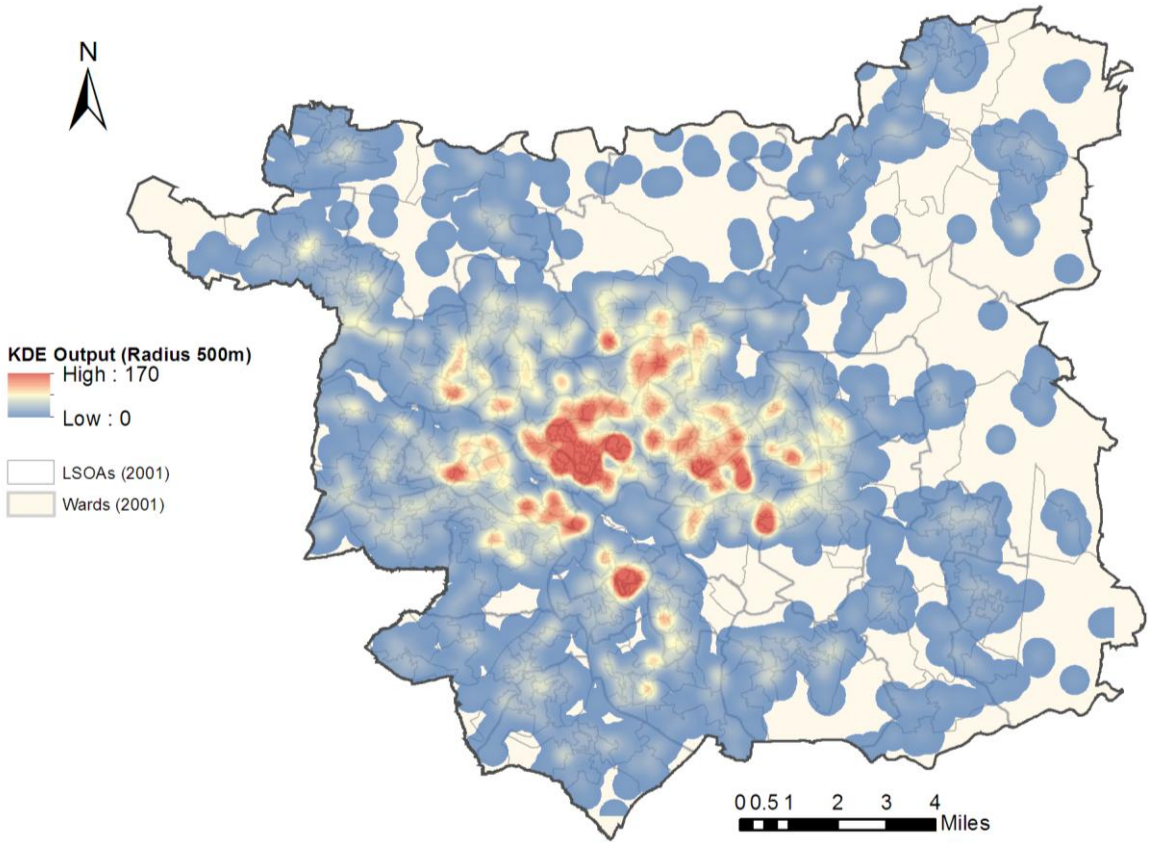

Figure 2: Kernel Density Estimation (KDE) cluster detection output for the period 2000 - 2003

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KDE: SMALL SCALE FOCUS ON PROBLEM AREAS

Re-running KDE with much smaller bandwidths (50m in figure 3) can help identify problem clusters of particular streets (or even street sections).

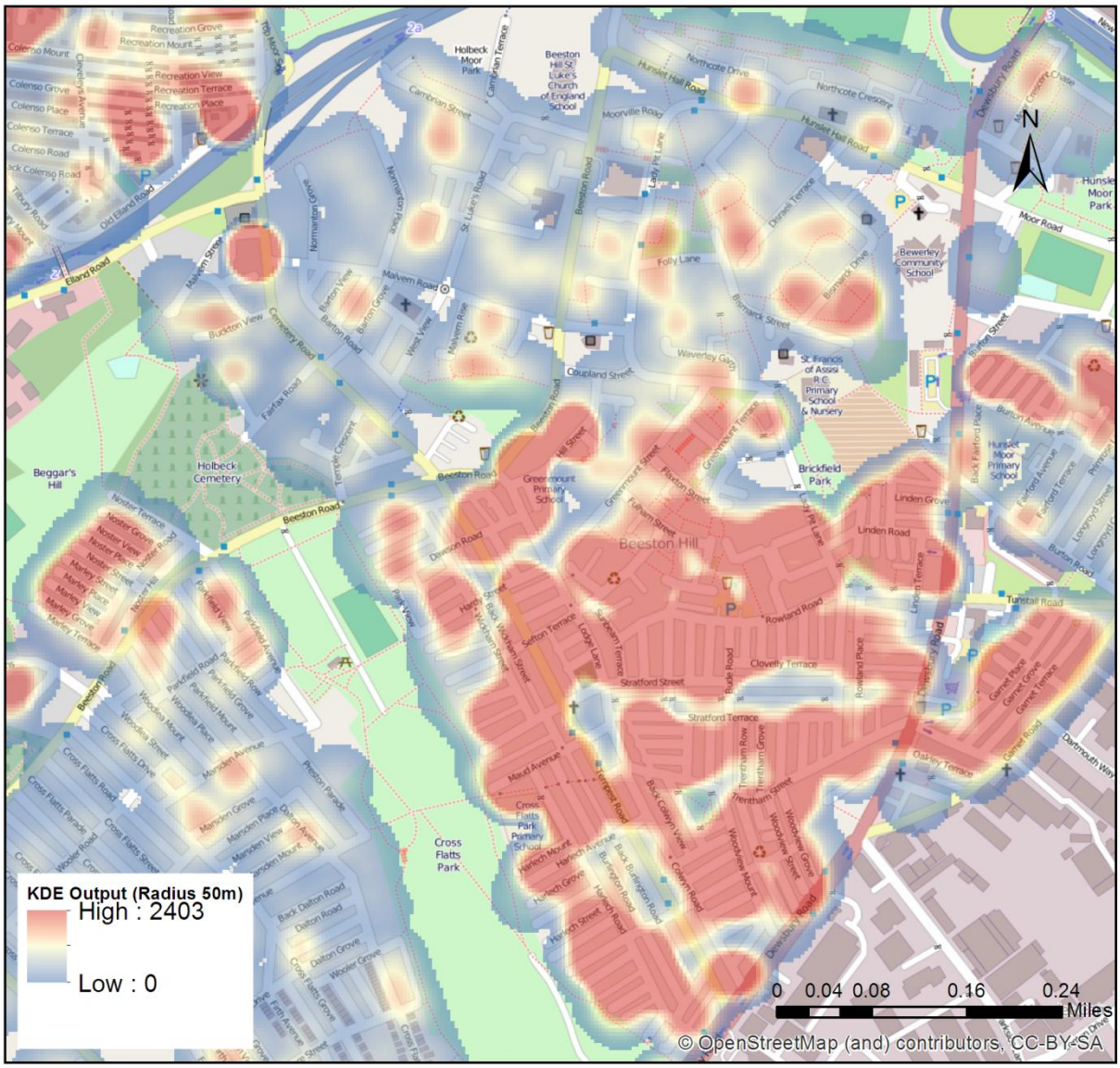

Figure 3: KDE Street level clustering within larger scale cluster (Beeston Hill)

REPEAT VICTIMISATION

Repeated burglaries of the same household can indicate systematic security or behaviour problems. In a study of burglary in Cambridge, [REF] found that 35% were repeat burglaries (corresponding with 19% of addresses). Figure 4 shows an alternative way to view the Beeston Hill area highlighting the incidence of repeat victimisation that cannot be seen with KDE or point mapping.

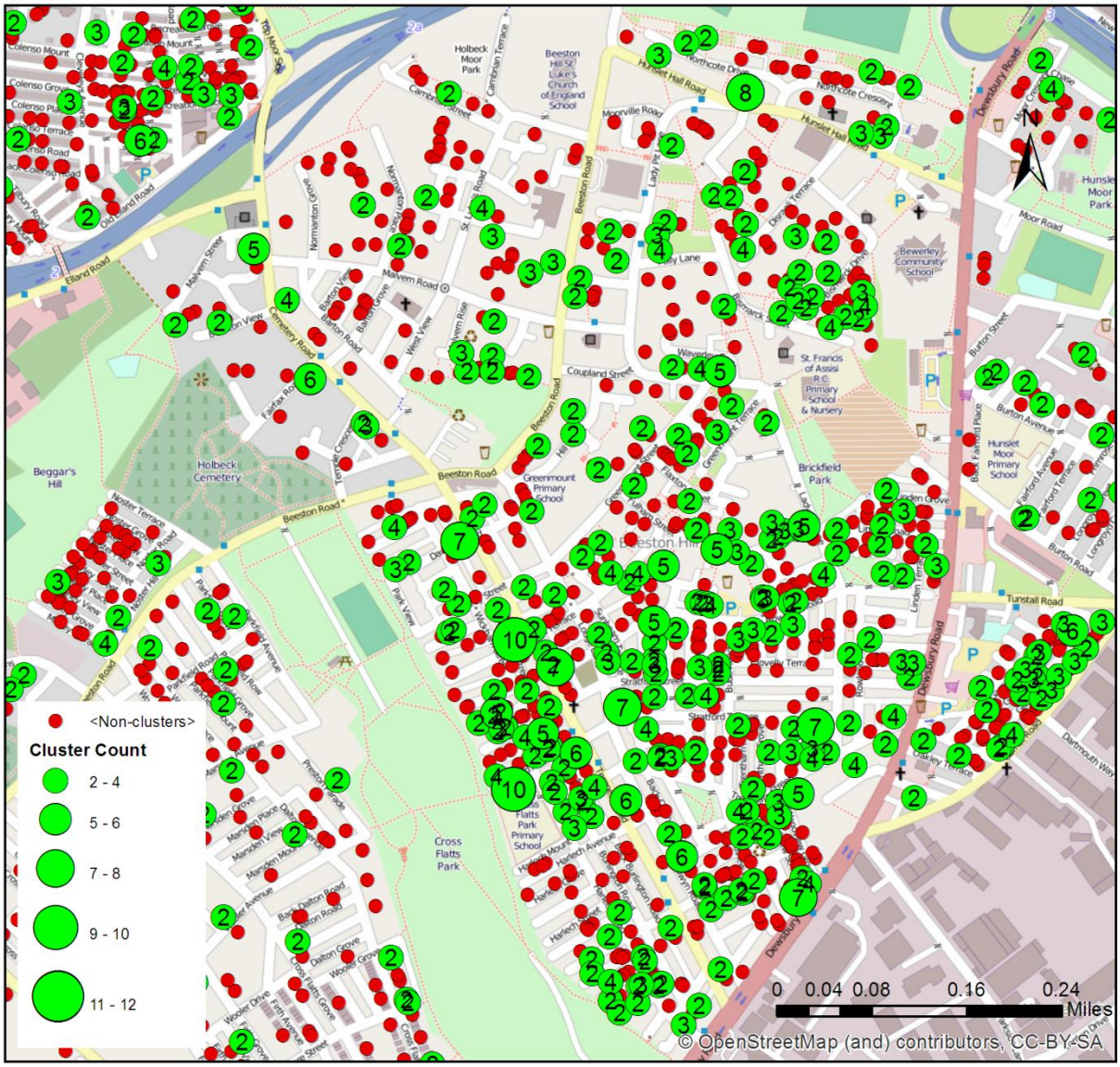

Figure 4: Repeat victimisation mapping within Beeston Hill cluster

CONCLUSION

This report has outlined several techniques to better analyse and visualize spatial clustering of burglaries, which should be used in conjunction with other techniques including socio-demographic classification-based attribute-clustering analysis. One of the limitations of these methods is the difficulty in considering temporal clustering and change, for which additional tools could be investigated (including ArcGIS CrimeAnalyst). The use of more dynamic tools such as Agent-Based Modelling of journeys to crime ([REF]) could help predict or suggest ways of deterring future burglaries.