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# **“Linking Burglary and Target Hardening at the Property Level: New Insights Into Victimization and Burglary Protection”**

**Alex Hirschfield, Andrew Newton and Michelle Rogerson**

## **Background**

Research has identified patterns in the distribution of domestic burglary both at the area level and at the level of individual properties. Routine activities theory (Cohen and Felson, 1979) explains the role of the physical and social environment in the generation of spatial concentrations of burglary. For example, the inter-related variables of demographic composition, housing tenure, residential turnover and levels of guardianship have been linked to spatial variations in the volume and location of crime (Bottoms and Wiles, 1998). These operate in conjunction with physical aspects of the environment such as street layout patterns and transport routes (Groff and LaVigne, 2001; Brantingham and Brantingham, 1993).

At the household level, the most significant finding has been the identification of repeat victimization and the discovery that prior victimization is the single best predictor of future victimization (Pease, 1998; Farrell, 2005). Repeat victimization is particularly prominent in high crime areas (Trickett et al, 1992). Offenders use available cues to discriminate between potential burglary targets. Research informed by rational choice theory (Cornish and Clarke, 1986) highlights offenders’ use of cues that signal: the likely value of goods within the property, the lack of occupancy, poor security and low levels of natural surveillance (Wright, Logie and Decker 1995, Nee and Taylor 2000, Coupe and Blacke 2006). Repeat victimization occurs partly because the factors which ‘flag’ a property as a

suitable target remain consistent over time, and partly because the increased knowledge an offender gains during victimization ‘boosts’ a property’s status as a suitable target for the future (Tseloni and Pease, 2003). Victimization may also boost the vulnerability of neighboring properties to future burglary giving rise to ‘near repeat’ burglaries (Townsend, Homel and Chaseling, 2003).

It is clear that a substantial and growing evidence base exists regarding the burglary problem, its manifestation and spatial patterning. The evidence highlights the potential to reduce burglary through situational crime prevention and the manipulation of the risk, effort and rewards as perceived by the would be burglar (Clarke, 19997) and advocates the prioritization of properties that have either already been burgled or that are in close proximity to victimized properties (Anderson, Chenery and Pease, 1995, Chenery, Holt and Pease, 1997). There is however a dearth of consistent and timely information on the manifestation of crime prevention policy, on the patterning of crime prevention activities and, more specifically, how these relate to crime and crime theories (Hirschfield and Newton, 2008). This paper posits that patterns of crime prevention policy have been less thoroughly researched and questions whether our existing knowledge of crime patterns is sufficient to inform the delivery of crime prevention policy.

Lessons on the effectiveness of crime prevention measures have been derived from evaluation exercises that have sought to establish how far observed reductions in burglary can be attributed to prevention measures (Hamilton-Smith and Kent, 2005). These studies bring together information on burglary patterns and changes in these over time with ‘policy data’ on burglary reduction interventions (Hirschfield, 2004). The evaluation of the Reducing Burglary Initiative in England and Wales indicated a significant positive relationship between the

intensity of burglary reduction measures measured at the area level (i.e. the scale and timing of action on the ground) and the number of burglaries prevented (Bowers, Johnson and Hirschfield, 2004a). This is indicative of an approach whereby information on burglary and that on crime prevention activity are effectively two data sets covering the same time periods and areas but not linked at the level of the individual property. This reflects a common dilemma in this field of research, namely, the absence of data that directly links the ‘problem’, in this case details about burglary at a given property with the ‘treatment’, namely, the target hardening installed at the property in question.

This paper focuses on the analyses that can be conducted and new insights that can be gained when information on domestic burglary and target hardening activity is linked at the level of the individual property. It draws on a recent policy evaluation that examined the impact of target hardening on domestic burglary in the City of Liverpool, North West England, between July 2005 and December 2007. Target hardening is a term used to describe the process of increasing the security of a property to make it more difficult to burgle, thereby increasing the effort needed by the offender to gain entry to a property. The intended outcome is ultimately to deter the offender from burgling an individual property. Target hardening has been employed internationally, and has been widely cited as an effective strategy for burglary reduction (Hirschfield, 2004; Millie and Hough, 2004; Hamilton-Smith and Kent, 2005).

During the period analyzed, the community safety partnership in Liverpool, Liverpool Citysafe<sup>1</sup> installed target hardening at 1,739 properties, at a total cost of £911,715. Target hardening comprised the fitting of new door and window locks, installation of alarms, the fitting of movement detection lighting, and fitting of security chains to doors<sup>2</sup>. Funding for target hardening was derived from several different funding streams but predominantly

through Liverpool Citysafe's community safety budget, the Housing Market Renewal Initiative (HMRI) and the Neighbourhood Renewal Initiative<sup>3</sup>. Each funding stream carried its own set of objectives for which target hardening was intended to meet. For example, one of the objectives of the HMRI funding was to encourage residents to remain in the area while regeneration took place around them. Some of the target hardening installed in order to prevent crime was not aimed primarily at burglary reduction but at domestic violence and criminal damage. To ensure co-ordination all target hardening, regardless of funding source, was conducted by Liverpool Citysafe installers. Target hardening was installed at no cost to residents. An unknown number of residents declined the offer of target hardening (these details were not recorded). The majority of target hardening was rolled out across Liverpool one area at a time, the locations of which reflected the geographical boundaries of the variant funding streams (Newton, Rogerson and Hirschfield, 2008).

An innovative feature of the evaluation of target hardening in Liverpool was the creation of longitudinal data on burglary and publicly-funded target hardening for individual properties in Liverpool. This paved the way for a number of analyses that simply would not be possible using data just on domestic burglary or target hardening records that had not been linked to burglary at address-level. For example, the burglary status of each target hardened property (e.g. not burgled, burgled once, burgled twice or more) and the target hardening status of each burgled property (e.g. target hardened, not target hardened) could be identified and linked. This could be broken down further by the timing and characteristics of the burglary and the nature, timing and expenditure of each target hardening episode. The extent to which all of this varied by location (e.g. within or outside of crime hot spots) could also be explored.

This paper focuses on the opportunities that linked data provide for more in depth and insightful analyses of the crime/intervention relationship. Linking burglary and target hardening can result in having the best of both worlds. All of the flexibility and advantages that come with disaggregate crime data remain, including the ability to identify repeat victimization, the opportunity to reveal spatial and temporal patterns in crime, and the option to aggregate burglary data to higher spatial levels (e.g. census zones, regeneration areas, different communities). In addition, there is the added value of being able to identify repeat episodes of target hardening, temporal and spatial patterns in target hardening and to relate all of this to burglary at both the address and area level.

### **Research goals**

The availability of data on exposure to both burglary and target hardening at a single address over a selected time period enables a more in-depth analysis of the relationship between burglary protection and prior burglary risk, or between prior burglary, target hardening and subsequent victimization. This included an investigation into whether the properties at greatest risk of burglary have received protection and a comparison of the likelihood of a repeatedly victimized property receiving target hardening compared to a property that has experienced one prior, or no prior burglaries.

Data on the precise location of each property added a spatial dimension that enabled geographical variations in the burglary-target hardening relationship to be explored. These questions included identifying the extent to which target hardening had been concentrated in burglary hot spot areas and whether burgled and repeatedly burgled properties in high crime areas more likely to be protected than those in low crime neighborhoods.

The research used the matched longitudinal data to explore the effectiveness of target hardening and whether being target hardened immunises properties from further burglary. Once again the individual level data was given a spatial dimension by exploring the extent to which spatial variations in the alignment of prevention to risk were reflected in the extent of burglary reduction.

Finally, the research aimed to provide new insights into the deployment of target hardening and related crime prevention measures. A central aim of the research, and this paper is to question the extent to which combining burglary and target hardening data can improve the targeting of crime prevention resources and to highlight the gap between the evidence base relating to crime problems and our knowledge of how crime prevention policies are targeted and implemented in practice.

### **Data and Methods**

A range of datasets was obtained to undertake this research and to address the questions outlined above. Police force analysts provided data extracted from their crime information system on recorded domestic burglary (including burglary attempts). The data contained information on the date, time, location and modus operandi of each offence. Details were provided for 14,262 burglaries reported to Merseyside police during the three year period January 2005 to December 2007.

Data on target hardening were provided by the local Community Safety Partnership, Liverpool Citysafe. The dataset was essentially an administrative database used to record and monitor the 1,739 target hardening installations conducted in the period July 2005 to December 2007. The target hardening data included type of measures installed (for example

locks, bolts, and new doors), the amount spent, and the date of intervention. Additional information on administrative boundaries (e.g. census output areas, regeneration zones) and socio-demographic indicators was also made available.

The burglary records and the target hardening data were joined together using the residential address of each property. The process was facilitated by the use of a Geographic Information System (GIS) and the National Land Property Gazetteer which contains all the addresses in the UK. Once the records were linked, the extent to which properties were target hardened on more than one occasion could be identified and this compared with the number of burglaries over a given time period. The time interval between burglaries could be calculated and any differences in this between target hardened and non target hardened properties established. The extent to which these findings are consistent across different communities in Liverpool or vary by the intensity of crime hot spots could also be explored. The focus of this paper is on the use of these datasets to examine the research questions outlined earlier.

### **Limitations to data**

There were a number of limitations to this research that must be borne in mind when considering the results. The analysis is based on secondary analysis of existing administrative datasets. Police data exclude burglaries not reported to the police, estimated at around 35 percent of all burglaries in England and Wales (Walker, Kershaw and Nicholas, 2009). The target hardening data only included publicly-funded installations. The British Crime Survey estimates that between 96 and 98 percent of homes in England and Wales have some form of security device installed (e.g. deadlocks, window locks security lights or burglar alarms)

(Walker, Kershaw and Nicholas, 2009). It is clear that prior to the target hardening program the majority of homes in Liverpool would have had some level of security. However, it was not possible to estimate the number of properties with existing target hardening or the level, adequacy or appropriateness of that security. It is safe to assume that at least some of the ‘unprotected’ properties would have had some degree of security.

The research was constrained by the use of a two and a half year monitoring period. Both burglaries and target hardening activity occurring before or indeed after this time period were not included in the analysis. Thus, properties that were identified as having no prior burglaries may have been burgled before the monitoring period and indeed thereafter. The truncation of data should be borne in mind in the consideration of the property profile categories described below.

Finally, the analysis reported here is concerned with the relationships between target hardening and burglary. However, burglary reduction was only one of the objectives underpinning the target hardening of properties in Liverpool. Thus, the analysis did not take into account the relationships between target hardening and other factors such as reductions in other types of crime, improvements in residents’ quality of life, impacts on neighborhood satisfaction and housing demand.

### **Construction of property profiles**

Data on the presence or absence of burglary and/or (publicly funded) target hardening at each property and the timing of these ‘events’ was used to construct a series of Property Profile Categories (PPCs). These were mutually exclusive groups defined by the trajectory of events affecting each property during the two and a half year monitoring period and

effectively classified properties according to their vulnerability to burglary, receipt of target hardening, and subsequent outcomes. The following PPCs were identified:

1. Neither burgled nor target hardened
2. Burgled and never target hardened
3. Never burgled, target hardened, no subsequent burglary
4. Prior burglary, then target hardened, no subsequent burglary
5. Prior burglary, then target hardened, subsequently burgled
6. No prior burglary, target hardened, then subsequently burgled

The first category accounted for the vast majority of properties in Liverpool (94%). Properties in this group were not included in the analysis as they did not appear in either the burglary or target hardening datasets. The analyses concentrated on categories two through six. In all categories other than two and three, both burglary and target hardening episodes had occurred at the properties in question albeit in a different order. Category two identified properties that were vulnerable but never protected; category three defined properties that had been protected but never victimized either prior to target hardening or subsequently (i.e. up to the end of the monitoring period). Of particular interest from the view of policy evaluation was category four. This group provided some indication of the fate of properties with a burglary history that had been protected through target hardening. Groups five and six, on the other hand identified properties where target hardening measures had not resulted in immunity to future victimization.

Interestingly, because the linked records contained data on the type of target hardening implemented and expenditure levels, the modus operandi of the burglary and the dates of each burglary and target hardening ‘event’ it was possible to explore variations in these variables between each PPC. Thus, differences between PPCs in repeat victimization, the duration of intervals between burglaries, concentrations of both burglary and target hardening within crime hot spots and other zones could all be explored. Initial analyses involved calculating the number and proportion of properties in each category and identifying levels of repeat victimization.

A GIS was used to generate a map of burglary ‘hot spots’ upon which the distribution of properties in each PPC could be plotted<sup>4</sup>. Thus, it was possible to visualize the distribution of properties in relation to hot spots generally and by the intensity of crime (i.e. burglary) within them. The GIS was also used to count the number of properties found in hot spots with different intensities of burglary. Thus, the extent to which properties in each PPC fell into the most intense high crime areas could be established.

## **Results**

The findings from the analyses reported here focus mainly on properties occupying each of the mutually exclusive PPCs. The number and percentage of properties falling into each PPC is displayed in two pie charts, Figures 1 and 2, below. The first pie chart (Figure 1) expresses the number of properties in each PPC as a percentage of all monitored properties (i.e. either target hardened, burgled or both). The second pie chart (Figure 2) shows the number and percentage of target hardened properties occupying each PPC.

FIGURE 1 ABOUT HERE

The first PPC (not shown in Figures 1 or 2) contains properties that were neither burgled, nor target hardened, during the monitoring period. This category represents the overwhelming majority, 94 percent, of Liverpool's properties and highlights the fact that, although, domestic burglary is classified as a 'high volume crime', it still affects only a small proportion of the total housing stock. Inevitably, an unknown number of properties in this major category would have experienced burglaries that were not reported to the police. A further unknown number of properties will have been protected by privately-funded security measures, although, regrettably, data were not available on these.

The second largest category (PPC2, figure 1) includes those properties that were burgled during the monitoring period but did not receive target hardening. These 11,607 properties constituted 6 percent of all Liverpool properties and 87 percent of all monitored properties. Thus, the overwhelming majority of properties that had been victimized had not received publicly-funded target hardening.

#### FIGURE 2 ABOUT HERE

The question then arises as to which properties did receive target hardening measures. Target hardened properties were divided into four groups (PPCs 3 through 6, shown in figure 2). Most of them (1,466 or 84% of the total) fell into PPC3 (namely, properties that were target hardened although they had not been burgled prior to the intervention nor subsequently (i.e. up to the end of the monitoring period). PPCs 4 and 5 represent the ten percent of monitored properties (178) that were burgled prior to target hardening. The 159 properties in PPC4 were free of burglary subsequent to target hardening. This sequence accords most closely with the desired outcomes of the target hardening program. Although representing just

9% of all properties target hardened, these 159 properties actually accounted for 60% of target hardened and burgled properties indicating some degree of success for target hardening.

The two remaining PPCs identify properties that were burgled after they were target hardened. Neither sequence accord to the desired program outcomes. The larger of the two groups, with 94 properties (6% of all those target hardened), was PPC6, namely, properties without burglary prior to target hardening that were subsequently victimized. The fate of these properties is counter intuitive; a reversal of the anticipated outcomes of situational crime prevention. Clearly, in this case target hardening appears not to have been effective in preventing a burglary. Whilst this might have been the case, an alternative proposition, namely, that target hardening raised the risk of burglary is less tenable. The remaining unsatisfactory scenario is PPC5; properties that were burgled, target hardened and then burgled again. This was a much smaller group comprising just 19 properties.

### **Repeat Victimization**

Future burglary risk increases with the number of prior burglaries experienced; this emphasizes the need to direct burglary prevention towards prior victims and repeat victims (Ashton et al, 1998, Everson and Pease, 2001, Farrell, 2005). Targeting of repeatedly victimized properties was lower than would be expected. Of the 1,663 homes which experienced two or more burglaries over the analysis period only 82 (5%) were target hardened. Table 1 provides a breakdown of the level of repeat victimization in PPC2, those 11,607 properties that experienced burglary but had not been protected with target hardening during the monitoring period. Within this group there were 1,581 properties that had been repeatedly victimized with over 300 burgled three or more times. The research literature

suggests that these would be the most appropriate candidates for protection through target hardening and yet, as shown in Table 2 only a small fraction of target hardening resources were directed at such properties.

TABLE 1 ABOUT HERE

TABLE 2 ABOUT HERE

The prior burglary histories of the 1,738 target hardened properties are provided in Table 2. Of these just under 89.8 percent (1560) had no prior burglary. It is possible that some of the latter may have been burgled just prior to the monitoring period and/or may have been targeted due to their close proximity to other burglaries. Most of the target hardening covering burgled properties went to those burgled just once. Only two percent (37) of target hardened properties had experienced repeat victimization. Therefore, while 87 percent of burgled properties had not been target hardened, just under 90 percent of target hardened properties had not been burgled previously. It is somewhat surprising that such a small proportion of target hardening was directed towards properties with a prior history of burglary given that this group is the most vulnerable to subsequent burglary. Importantly, these statistics would not have emerged without linking burglary addresses to those of target hardened properties.

Clearly, information beyond the mere sequence of events is needed to interpret the different scenarios represented by the PPCs. Additional insights can be gained by examining, the location of the properties (low versus high crime areas), the proportion of attempted versus successful burglaries, changes in offender modus operandi and differences in outcome by type of target hardening. Other factors such as the responsible use of target hardening and

how well maintained the equipment is over time, although important, were beyond the remit of this research.

Some of these factors are examined briefly, below. However, the main point to be emphasized here is that linking burglary and target hardening data at individual address level generates valuable insights, not only, about the efficacy of resource allocation decisions, but also, about vulnerability, risk and outcomes for individual properties.

### **High Crime Areas**

The inclusion of a range of geographical codes for each property afforded the opportunity to explore relationships between victimization, target hardening and the spatial concentration both of burglary and target hardening activity. Of particular interest, in this context, is the relationship between victimization, target hardening and outcomes at the property-level represented by the PPCs and geographical variations in the concentration of crime.

Disaggregate burglary data were used to define burglary hot spots of varying intensity within Liverpool. While hot spots can change in location and intensity over time, the hot spots identified remained relatively stable over the period. A hot spot intensity score was assigned to each monitored property based on its proximity to the hot spot areas and properties were assigned into quintiles according to the level of burglary risk at their location. The concentration of properties in burglary hot spots by PPC for the entire monitoring period (July 2005 to December 2007) is shown in Table 3.

TABLE 3 ABOUT HERE

Burgled properties overall were categorized into five equal groups from lowest risk of burglary to highest risk of burglary based on burglary hot spots. For properties ‘burgled and target hardened’ during the monitoring period (irrespective of the order of events) almost two thirds of these were situated in the two highest area risk categories for burglary. Forty percent of those ‘burgled, target hardened and then burgled again’ (PPC 5) were in the most intense burglary hot spots, and 33 percent of those ‘not burgled, target hardened, and subsequently burgled’ (PPC 6) were also in this highest risk areas. However, a far larger proportion (86%) of the properties that had been target hardened despite not having been burgled (PPC 3) were also located in hot spots with the highest burglary risk (i.e. Quintiles 4 and 5). This possibly accounts for why they were target hardened even though they had not been victimized.

The message emanating from this analysis is that there was a clear area based dimension underpinning the allocation of target hardening. This was strongest for properties target hardened without any prior or subsequent burglary (PPC3) followed by those previously burgled, target hardened and then free from burglary (PPC4). In both cases properties were in the most intense burglary hot spots where, arguably, the risks of being targeted by offenders were greatest.

Viewed in isolation from this spatial context, the decision to concentrate so much of the target hardening on non-victimized properties might be regarded as questionable and unjust. However, with the knowledge that 86% of the properties were, in fact, located in Liverpool’s highest crime hot spots, the decision makes more sense. A closer analysis of the spatial distribution of target hardening, reported in an earlier paper, revealed a strong concentration of activity in Liverpool’s Neighbourhood Renewal Areas and other regeneration zones (Newton et al 2008). This reflected the fact that target hardening was seen

as a means of boosting neighborhood satisfaction and as a way of strengthening housing demand in deprived communities as well as a set of interventions for reducing burglary. The allocation of target hardening has focused attention on high crime areas rather than individual high risk properties. The following section considers the impact that this patterning of crime prevention activity has had on the effectiveness of the intervention.

### **The cost effectiveness of target hardening**

The effectiveness of target hardening was assessed by comparing the incidence of burglary in target hardened properties before and after installation with the incidence of burglary for comparable periods in non target hardened homes. Estimates of 'expected burglaries' for the period following target hardening were calculated by assuming that without the intervention burglary trends at these properties would change in the same way as in the non target hardened properties (for more details on this methodology see Bowers, Johnson and Hirschfield, 2004b and Johnson et al, 2004). The availability of individual property-level data offers the potential to refine this method considerably by enabling anticipated changes in crime to be applied specifically to those properties that have been target hardened rather than to all properties within an area, many of which would not have been protected.

Over the monitoring period the total burglaries observed in the target hardened properties were 163 were fewer than the number of burglaries expected based on the change in the non target hardened properties. This suggests a small net reduction in burglary. However, given the £917,761 investment in target hardening and the estimated value of the prevented burglaries of £527,128 (Duborg, Hamed and Thorns, 2005), the cost benefit ratio for the initiative over the period was 0.57 meaning that for every £1 invested in target

hardening only 57p was returned in benefits. At less than one this ratio indicates that the target hardening initiative had failed to break even. Importantly, analysis of burglary change and cost effectiveness was repeated for each of the 30 electoral wards within Liverpool revealing notable variations. The cost benefits of target hardening varied dramatically across the city from 61.2 to -14.9 (with a mean of 15). Initial investigations into the factors underlying this variation have pointed to the role of targeting. As Table 4 shows, the greatest cost benefit returns were found not in the wards with the highest rate of, or spend on target hardening, nor in the wards with the highest level of burglary, but in those wards in which the greatest proportion of target hardening activity was directed towards properties with a prior history of burglary. This strong positive correlation was highly significant. This analysis, albeit preliminary, suggests that while across Liverpool there was a close alignment between areas of crime prevention activity and high burglary this does not guarantee the targeting of those properties at greatest risk, and it is at the individual level that targeting appears to be most important to the effectiveness of the intervention.

TABLE 4 ABOUT HERE

### **Further insights into Burglary and Target Hardening**

Further light can be shed on both the nature of the burglary event and the performance of target hardening by scrutinizing offender modus operandi, the balance between successful and attempted burglaries and the impact of different interventions across the PPCs. It is possible that burglaries following a target hardening event could either be unsuccessful attempts (demonstrating that target hardening has been successful) or committed through insecure doors or windows (because target hardening may not have been operational at the

time of the burglary). However, these explanations were not borne out by the analysis. Although fifteen percent (25) of burglaries occurring subsequent to target hardening (PPCs 5 and 6) were attempted burglaries, this is equivalent to the overall proportion of attempted burglaries across Liverpool. Therefore, the proportion of attempted burglaries did not appear to be higher for target hardened properties that were subsequently victimized.

The proportion of distraction burglaries amongst PPCs 5 and 6 (less than 1%) was equivalent to that for the rest of Liverpool. This negates the possibility that burglaries following target hardening occurred as a result of a tactical shift to distraction burglary. Of the 162 burglaries occurring at properties that had previously been target hardened (PPC 5 and 6) 20 percent (32) were committed via insecure doors or windows, which is only marginally lower than the proportion of insecure burglaries across Liverpool (22%).

There were few discernable differences in the level or variety of target hardening measures received between target hardened properties that were subsequently burgled and those that were not. Properties in the four PPCs that were target hardened received an average of two to three different types of products. No significant association was found between the number of target hardening product types and the occurrence of a repeat burglary. The same was true with respect to the total number of burglaries following interventions. However, as shown in Table 5, below, those properties suffering a burglary following target hardening (PPCs 5 and 6) were less likely to have received PIR lighting than properties not suffering a subsequent burglary (PPCs 3 and 4). However, the numbers in these categories were small and the difference was not statistically significant.

TABLE 5 ABOUT HERE

## **Linking burglary and target hardening: Policy Challenges**

By linking the analysis of crime and crime prevention patterns this paper has identified that despite a close alignment between crime and crime prevention activity at an area level, only a minority of the properties at highest risk of burglary were provided with target hardening. Non victimized properties appear to have been target hardened due to their proximity to intense burglary hotspots, however the success of this strategy will necessarily be limited if the victimized and repeat victimized properties contributing to high burglary rates are not themselves protected. This argument is supported by the evidence that cost effectiveness was improved when the intervention was targeted at the property level. Further investigation is needed to understand the dynamics of targeting and the competing benefits of property vs. area based targeting.

Findings from the evaluation suggested possible reasons why practitioners favored area based targeting. Firstly, area based implementation is more straightforward to plan, timetable and co-ordinate proving logistically more straightforward and more economical to implement. Secondly, in order to target at risk properties they must first be identified and located, a more complex task than the identification of high crime areas. The profiles presented in this paper are the culmination of considerable data processing and cross-referencing involving the joining of target hardening and burglary data and their integration with sophisticated spatial analysis software. The availability of data and the ability of practitioners to make the best use of information to inform their targeting decisions may be a factor in the targeting strategies adopted. The effectiveness of property level targeting will hinge on the extent and nature of data sharing, data quality and the availability of skills and software. Finally, burglary reduction was only one of the policy objectives for which target

hardening was implemented. The various policy objectives were not necessarily in competition, to the contrary there is an apparent synergy to the policy aims of crime reduction, neighborhood regeneration and neighborhood satisfaction. However, attempting to combine these priorities may have diluted the impact on burglary reduction.

### **Conclusions**

Research on burglary and target hardening is not generally conducted at the level of the individual property and certainly not for large numbers of properties spanning a city the size of Liverpool. Thus, individual properties have not been the primary units of analysis for exploring relationships between burglary and target hardening. This paper has demonstrated not only, that analysis at the level of the individual property is possible, but also, that by doing so, new insights can be gained about burglary risk, the presence or absence of protective measures and burglary outcomes over selected time periods. Thus, it has been possible to generate new data about the burglary status of target hardened properties and about the target hardening status of burgled properties. This has been explored by the frequency of victimization and according to the extent to which properties were located in burglary hot spots differentiated by the intensity of crime found within them.

Some of the results were unexpected. For example, a large number of properties that were repeatedly burgled were not protected by target hardening. Conversely, many of those that were protected by target hardening had not been burgled, at least within the monitoring period adopted for the study. Interestingly, many of the non-victimized properties that were target hardened were located in the most intense crime hot spots where the risks of victimization were greatest. Thus, while target hardening predominantly took place in high

crime areas this did not guarantee the protection of the highest risk properties within these areas. Of concern is the finding that the strategies for allocating target hardening may have diluted the cost effectiveness of the program in reducing burglary. None of this would have been apparent without linked data on burglary and target hardening for individual households.

There is considerable scope to broaden the range of analyses reported in this paper. Geographically-referenced individual-level property data pave the way for even more ambitious analyses. For example, the interval between burglaries for individual properties can be considered in the same way as periods of desistance from crime of individual offenders. This raises the prospect of applying survival analysis used in recidivism studies to evaluate the impact of intensive supervision and other interventions on desistance from crime to compare intervals between burglaries for protected and non-protected properties. The results from experimental research, that has already been undertaken in this area (Bowers, Lab and Johnson, 2008), is encouraging and suggests that this might be a viable approach for evaluating the impact of target hardening in both preventing and delaying victimization.

This paper has focused on the geographical alignment of the risk of crime and crime prevention activities. However, risk may not be the only concern of policy makers, Millie (2008) and Ekblom and Sidebottom (2008) have highlighted the need to consider the risk, vulnerability and impact of crime separately. This raises questions regarding how to priorities target hardening based on the likely risk and potential consequences of burglary. Should properties with the highest risk of burglary be targeted or those residents deemed to be more vulnerable to the consequences of burglary, or some combination of or all of these factors. It is apparent that analysis of the crime patterns in isolation from the policy environment can result in the prescription of crime prevention solutions that are not practical, desirable or

effective in practice. Moving forward requires the integration of crime theory with an improved understanding of the practicalities of delivery and the wider policy goals of crime prevention.

### **Endnotes**

<sup>1</sup>In England and Wales, the Crime and Disorder Act 1998 and the Police Reform Act 2002 place a duty on specific agencies to form partnerships within the community, to tackle crime, disorder and misuse of drugs. This partnership in Liverpool is known as Citysafe.

<sup>2</sup>Target hardening is used to refer to all measures covered by the Liverpool Citysafe 'Target Hardening Strategy'. The authors acknowledge that some of these improvements e.g. lighting may not be viewed as strictly target hardening strategies as they do not improve the actual physical toughness of a property,.

<sup>3</sup>The Housing Market Renewal Initiative is a national program aiming to rebuild housing markets and communities in areas where demand for housing is weak and which have seen a significant decline in population, dereliction, poor services and poor social conditions as a result. The Neighbourhood Renewal Fund is a non prescriptive grant which has been made available to England's most deprived areas.

<sup>4</sup> The hot spot analysis technique employed was Kernel Density Estimation (KDE) interpolation, using CrimeStat 3 <http://www.icpsr.umich.edu/CRIMESTAT/> see Newton, Rogerson and Hirschfield (2008) for further discussion of the methodology used.

## Tables and Figures

Table 1

*Repeat Burglaries in Group 2: Burgled Never Target Hardened (2005 – 2007)*

	Number of burglaries	Number of properties	Percent	Cumulative percent
1		10026	86.4	86.4
2		1218	10.5	96.9
3		226	1.9	98.8
4		77	.7	99.5
5 plus <sup>#</sup>		60	.5	100.0
Total		11607	100.0	100

<sup>#</sup>15 of these properties contained 'multiple addresses'

Table 2

*The Burglary Status of Target Hardened Properties Prior to Target Hardening*

	Target hardened properties (N)	Target hardened properties (%)
No Prior Burglary	1560	89.8
One Prior Burglary	141	8.1
Two or More Prior Burglaries	37	2.1
Total	1738	100

Table 3

*Percentage of properties by profile and burglary hot spot risk (2005 – 2007)*

Property profile category	Hot spots					N
	Lowest risk<----->Highest risk					
	1	2	3	4	5	
All Properties Burgled	20.0	20.0	20.0	20.0	20.0	15088
2 Burgled and Never Target Hardened	21.5	21.0	20.2	19.4	18.0	11540
3 Never burgled, target hardened, no subsequent burglary	2.2	3.5	8.1	32.1	54.1	1466
4 Prior burglary, then target hardened, no subsequent burglary	6.3	7.5	14.5	32.1	39.6	159
5 Prior burglary, then target hardened, subsequently burgled	10.0	15.0	20.0	15.0	40.0	20
6 No prior burglary, target hardened, then subsequently burgled	7.4	16.0	20.2	23.4	33.0	94
All Properties Burgled and Target Hardened	7.0	11.0	16.8	27.8	37.4	273

Table 4

*Correlations between Target Hardening Activity and Returned Cost Benefit Ratios Measured at the Electoral Ward Level (2005 -2007 n=30)*

Target hardening	Mean	SD	Correlation <sup>a</sup> with Cost benefit ratio	
Total number of properties target hardened	57.9	102.3	-0.279	ns
Target hardening rate per 1000 properties	2.5	4.3	-0.183	ns
Cost of target hardening per 1000 properties (£)	3.8	8.2	-0.379	*
Burglary rate per 1000 properties	23.8	6.8	-0.224	ns
% Target hardened properties with prior burglary	21.3	18.8	+0.681	**

<sup>a</sup> Spearman rho

ns Correlation is not significant.

\*p<.05 level (2-tailed).

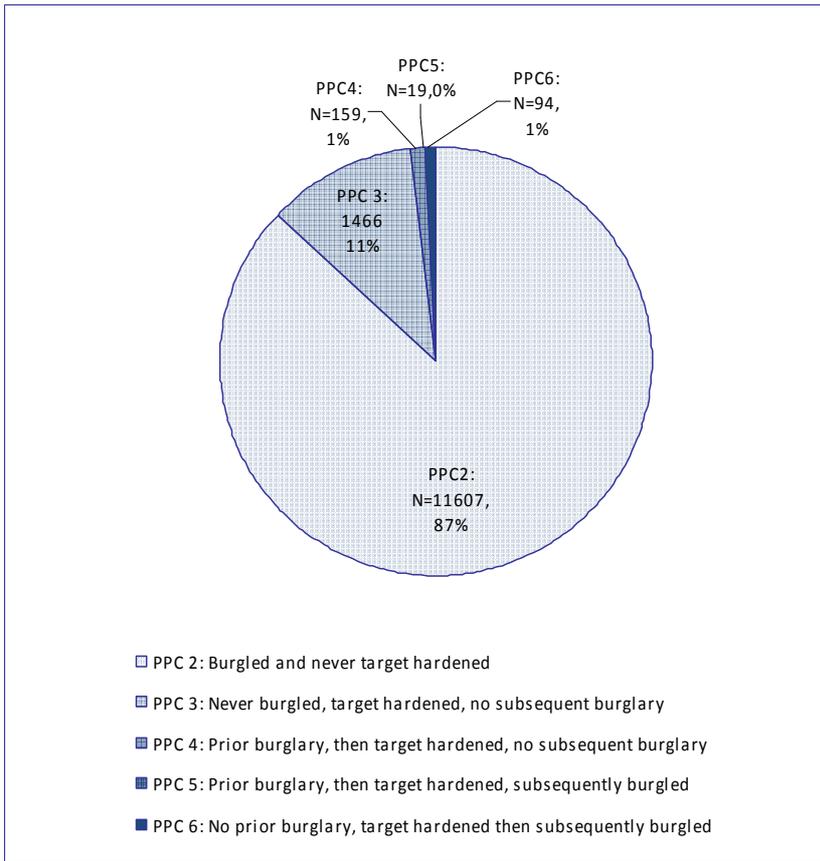
\*\*p<.01 level (2-tailed).

Table 5

*Profile status by proportion of properties receiving PIR lighting (2005 – 2007)*

Property Profile Category		Receiving PIR Lighting (N)	Receiving PIR Lighting (%)
Target hardened, no subsequent burglary	PPC3: Never burgled, target hardened, no subsequent burglary	1065	73
	PPC 4: Prior burglary, then target hardened, no subsequent burglary	84	53
Target hardened, subsequently burgled	PPC 5: Prior burglary, then target hardened, subsequently burgled	5	25
	PPC 6: No prior burglary, target hardened then subsequently burgled	22	23

Note: PIR = Passive Infra-Red sensor lighting that comes on when motion is detected.



*Figure 1.* Burglary profile of properties either target hardened or burgled (monitored properties) (2005 – 2007)

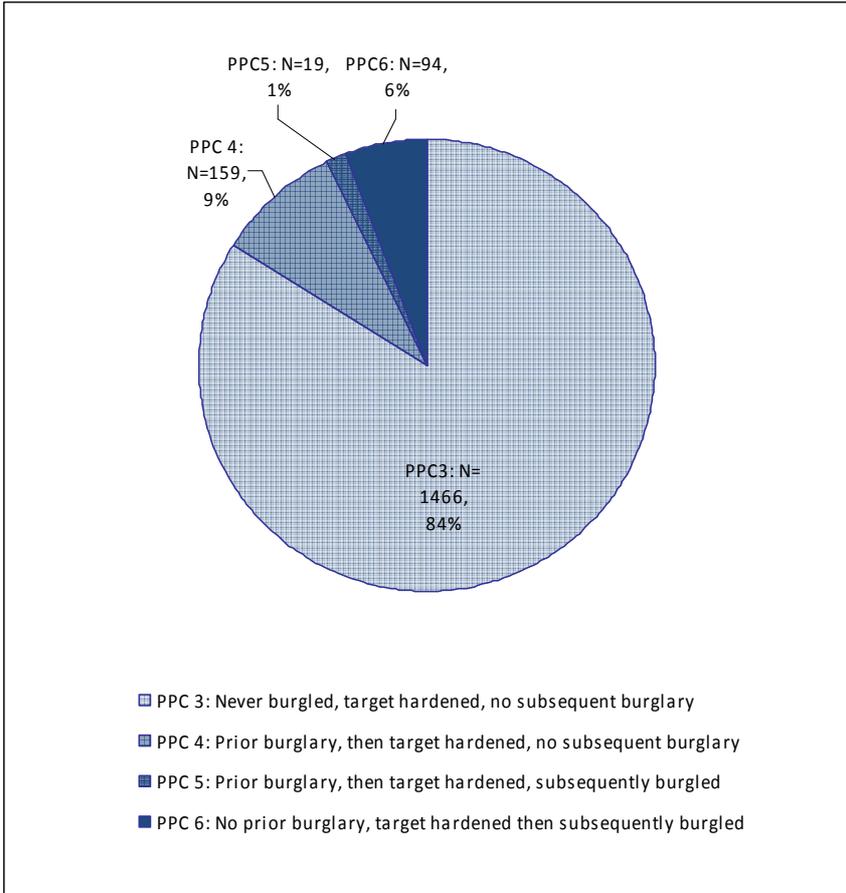


Figure 2. Burglary profile of target hardened properties only (2005 – 2007)

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