Repeat Burglary Victimisation: Spatial and Temporal Patterns

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To date there has been little Australian research on repeat victimisation. This is a study of repeat burglary in an area of Brisbane using police calls for service data. We demonstrate: (a) the prevalence of residential repeat victim addresses ('hot dots') is of a similar magnitude to that found in studies in the United Kingdom; (b) the time distributions of revictimisation are identical with those found in studies in the UK and elsewhere; (c) 'hot spots' (small areas with high crime density) can be identified by statistical analyses of spatial concentrations of incidents; (d) unstable hot spots tend to be temporary aggregations of hot dots, whereas stable hot spots seem to reflect more the social and physical characteristics of certain localities; and (e) the overall incidence of burglary could be reduced by at least 25 per cent if all repeat victimisation could be eliminated. There are a number of areas where concepts and techniques for repeat victim research could potentially be strengthened: (a) clarifying the connections between hot dots and hot spots, particularly through exploration of the concept of a 'near repeat address'; (b) applying survival analysis to the data on the time periods between victimisations; and (c) using moving average techniques to examine changes in the spatial distributions of burglary over time.

Burglary has been a growing problem, both in Queensland and in Australia as a whole, for the past 20 years, although police statistics and crime victim surveys indicate that the Queensland rate is close to the national average (Criminal Justice Commission, 1996). However, there are indications that the rate may have peaked, with recent marked declines in the burglary rate in Queensland (Queensland Police Service, 1998). If Australia follows the US trends, this recent decline may presage a long term and substantial decline in the incidence of burglary (Decker, 1998; Langan & Farrington, 1998). Nevertheless, as Decker points out, even in the

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context of unprecedented declines, burglary remains a serious problem that poses challenges for prevention.

In the past decade the concept of repeat victimisation has gripped the criminological imagination, so much so that Skogan observed that "Probably the most important criminological insight of the decade has been the discovery in a very systematic fashion of repeat multiple victimisation" (cited in National Institute of Justice, 1996, p. 3). According to the British Crime Survey, repeat victims probably account for between 60 to 80 per cent of all crime incidents, yet are a small minority of all victims, at most around 20 per cent of the victim population (Ellingworth et al., 1995; Farrell & Pease, 1993; Farrell, 1995). There is clearly considerable potential for reducing overall crime rates if repeat victimisation can be reduced or eliminated. However, perhaps surprisingly, there has been very little research in Australia on repeat victimisation.

In this paper we use the tools of spatial and temporal analysis of calls for service data in the Beenleigh police division to explore the phenomenon of repeat victimisation, with a view to developing explanatory models and devising more effective preventive strategies. In addition, we explore briefly some of the improvements in methodologies that would enhance the study of repeat victimisation.

Beenleigh is a semi-rural district about half way down the Brisbane-Gold Coast 'corridor', stretching from the South East Freeway to the coast. The population is predominantly low income with unemployment at 13 percent, compared to a state average of 9.6 per cent (ABS, 1996). Public housing for the police division comprises 19.5 per cent of housing (compared to a state average of 13 per cent) (ABS, 1996). The Beenleigh police division has the sixth highest burglary rate in Queensland (Criminal Justice Commission, 1996).

This study partly replicates the Cambridge (UK) study by Bennett and Durie (1996), where preliminary analysis identified burglary hot spots and repeat victimised addresses. Innovative aspects of the study attempted to describe hot spots and how they vary over time. Our work is based on 18 months of data from calls for service for break and enter offences in Beenleigh, and identifies both hot spots and repeat victimisation. It arises from the Beenleigh Calls for Service Project (Criminal Justice Commision, 1998), the main aim of which was to determine to what extent problem oriented policing (POP) initiatives could reduce telephone calls for service.

Research on Repeat Victimisation

Repeat victimisation, where a place or person experiences more than one criminal offence within a given period of time, has been a recognised phenomenon since the early study by Johnson et al. (1973) and the seminal publications by Sparks et al. (1977) and Hindelang et al. (1978), but it has only been in the 1990s that extensive research has been conducted. Since the early seventies, repeat victimisation has developed from a concept of purely academic interest to the point where some police services now organise their responses to specific crimes on the basis of repeat victims data (Pease, 1998).

It must be acknowledged, however, that research involving repeat victimisation is reliant on overcoming two methodological factors that limit the detection of repeats: the accurate recording of addresses on police information systems (Farrell & Pease, 1993) and the sensitivity of the time window. The time window can undercount repeats by being not long enough or by not detecting repeat incidents that lie either side of the time window, also known as the 'edge effect'.

Despite these problems, there is intensified interest in the academic literature with the realisation that some areas experiencing high crime rates over long periods of time have consistently high rates of repeat victimisation (Hope, 1995; Trickett et al., 1992; 1995). The argument is that *concentration* (the mean number of victimisations per victim) rather than the *prevalence* (the percentage of the potential victims who are actually victimised in a given time period) is the main reason why the *incidence* of victimisation (total crime incidents per capita) is so high in some areas. If confirmed in subsequent research, this finding has important implications both for criminological theory and for prevention strategies.

Perhaps the main reason for the growing interest in repeat victimisation, for both academics and practitioners, is the success of the Kirkholt Burglary Prevention Project, UK (Forrester et al., 1988; 1990). This was the first project in which an attempt was made to prevent burglary events by focusing on previously burgled properties. The logic was simple and relied on two key findings from the English research of the 1980s: the best predictor of future victimisation, of a place or person, is that of prior victimisation; and a numerically small group of people suffers a large proportion of all crime through repeatedly being victimised (Pease, 1998).

Farrell and Pease (1993) show from British Crime survey data that throughout the 1980s, about 14 per cent of the population were victimised on two or more occasions in the past year, and that this group accounted for 71 per cent of all incidents. The three per cent who experienced five or more crimes suffered nearly a quarter of all the crime reported. To the extent that individual crimes, such as burglary, are not reported with 100 per cent frequency either to the police or to survey researchers, *multiple* victimisations will necessarily be even more underreported, suggesting that even the skewness found by Farrell and Pease understates the case for *rationing* crime prevention resources by concentrating on those who have already been victimised (Chenery et al., 1997; Mukherjee et al., 1997; Pease & Laycock, 1996). They also cite data (Polvi et al., 1990; 1991) that the risk of victimisation is greatest in the period immediately after the victimisation, which has obvious implications for prevention but also cries out for theoretical explanation.

Farrell and Pease (1993) argue that the most likely explanations of repeat burglary victimisation are that some offenders return to take things they overlooked the first time, and that they tell others of the opportunities. Thus a bonus flowing from this approach to crime prevention, from the police point of view, is that prevention and detection are brought together. Maximum prevention is achieved if action is taken within 24 hours, with strategies including temporary locks and alarms, surveillance by neighbours and even in extreme cases 'lying in wait' for offenders.

In the light of these research findings the rationale for the underlying strategy of Kirkholt is apparent: the prevention of repeat victimisation (that is, the future victimisation of one-time victims) resulted in significant impacts on absolute levels of domestic burglary. Within five months, a 60 per cent drop in burglary was observed and after three years, the Kirkholt Housing Estate recorded a 75 per cent decrease in the level of burglaries with no apparent displacement, geographically or offense-wise (Farrell, 1995; Forrester et al., 1988; 1990). Measures such as security upgrading, cocoon neighbourhood watch and removal of coin operated gas meters were combined to prevent revictimisation, which did in fact fall dramatically.

Not surprisingly, this result received a great deal of attention. Replications of the Kirkholt project in the UK have been numerous (Farrell, 1995; Pease, 1998; Tilley, 1993). In addition, there have been applications of similar techniques to other offence types such as school burglary, racial attacks, domestic violence, and car theft (Farrell & Pease, 1993; Farrell, 1995; Pease, 1998). Although no other project has actually achieved the same impact on crime levels as Kirkholt, it has recently been proposed as an example of international best practice (Waller & Welsh, 1998). However, it must be remembered that transferring crime prevention projects is a risky practice. Both Tilley (1993) and Crawford and Jones (1996) explore the replication of projects and identify a number of dimensions, including social, cultural, spatial and temporal, that need to be taken into consideration before interventions can be successfully 'cut and pasted'.

Virtually all of the ground breaking research in repeat victimisation has been carried out in the UK. The evidence in favour of repeat victimisation is so compelling that the reduction of repeat victimisation is now a key performance indicator for police in that country. Police services are responsible, in their jurisdiction, for identifying and reducing repeat victimisation and evaluating the method (Pease, 1998). There have been isolated studies regarding repeat victimisation by US researchers (mainly Fienberg, 1980; Lauritsen & Quinet, 1995; Nelson, 1980; Robinson, 1998; Roundtree et al., 1994; Sparks, 1981; Spelman, 1995), but most of these have been modelling exercises of limited use to practitioners. Presently the Police Executive Research Forum (PERF) is conducting a large three city experiment in Dallas, San Diego and Baltimore to replicate the UK research.

Time Course of Revictimisation

The time course of revictimisation was first explored by Polvi et al. (1990, 1991). They showed that the risk of revictimisation was greatest immediately after the offence. The chance of experiencing a second offence within a year of the first was four times the expected rate, but a second offence within a month was roughly twelve times more likely than expected. The length of the elevated risk period has significant implications for crime prevention practices (Spelman, 1995). Indeed, one of the critical elements in the success of the Kirkholt Project was the timing of the interventions. Security upgrading and the temporary loan of alarms were carried out as soon as possible after the report by the victim, sometimes within 24 hours (Forrester et al., 1988; 1990).

The time course has been shown to fit an exponential curve (Bowers & Hirschfield, 1998; Ratcliffe & McCullagh, 1998; Spelman, 1995). Polvi et al. (1990) estimate for all repeat burglaries occurring within the same month "28 per cent of repeat burglaries occur on the same day or adjacent days" (p. 11). By the end of the first week, half of the month's repeat burglaries had occurred. This means that in one day 28 per cent occur but the following six days account for a comparatively meager 22 per cent.

Nonetheless, the modelling of the time course of revictimisation is not without its problems. Time courses show between-times of all repeats, not just the between-time of the first and second incident. This means that chronically victimised addresses are represented more than once (the between-times for first-second, second-third, third fourth, etc… victimisations). By virtue of being chronic victims, they will most likely have smaller between-times than other, less victimised addresses. So they have more frequent, shorter between-times which tends to inflate the number of shorter between-times. The only way to circumvent this problem is to do a time course analysis for the between-times of each pair of victimisations. Unfortunately, this is of limited appeal because *N* for each pair of victimisations will decrease with victimisations and the confidence intervals for each time course will increase to a point that is unuseable (Broadhurst & Maller, 1991a). Survival analysis techniques are the most obvious way out of this dilemma, as they take into account diminishing risk periods and incomplete data (Morgan, forthcoming).

Hot Spots and Crime Mapping

Farrell and Pease (1993) identify as a challenge for future research elaboration of the relationship between repeat offending, repeat victimisation (hot dots) and crime hot spots. The development of repeat victimisation research in the UK has run parallel to the development of research into spatial distributions of victimisation in the US. Computer mapping of crime is not widespread but most medium to large police departments automate the geocoding of criminal incidents (Rich, 1995; Mamalian, 1999). Although crime hot spots have received some attention in the academic literature, their use has been more widespread in police forces.

Spatial studies of criminal activities have consistently demonstrated that certain locations experience crime far more than others. For example, Sherman et al. (1989) showed that 3 per cent of possible locations accounted for 50 per cent of the annual crime count in Minneanapolis. Many explanations for spatial concentration have been proposed but there is little theoretical consensus (Baldwin, 1979; Eck, 1998). Technological improvements, such as computer processing speed, memory, graphical capability and desktop publishing quality have improved our capacity to quantify factors but a lack of well constructed theory ultimately limits research. Technology has placed the field beyond the present reach of theory (Baldwin, 1979).

Hot spots of crime are small areas that have statistically significant high levels of crime relative to surrounding areas. STAC (Spatial and Temporal Analysis of Crime) is a computer program developed by the Illinois Criminal Justice Authority that determines the area with the highest density of incidents and uses an algorithm to calculate a hot spot boundary. STAC is one of the more widely used empirical methods of identifying hot spots. It has been used in a number of studies (eg Block & Block, 1995; Canter, 1998; Eck, 1998; Hirschfield et al., 1995; Johnson et al., 1997; Rengert, 1997).

The usefulness of hot spot analysis becomes clearer when the areas are mapped and relationships between the environment and criminal activity are explored. For example, Block (1998) studied hot spots of gang-related drug activity in order to predict gang-related violence, while Hirschfield et al. (1995) explored the relationship between social disadvantage and hot spots of crime. Block and Block (1995) examined hot spots of violence offences in relation to the location of licensed premises and Harries (1995) has analysed locations of homicide and social stress (poverty, unemployment, residential stability). All of these studies have demonstrated that hot spots are related in predictable ways to features of the social and physical environments.

One of the major criticisms of spatial studies of crime, particularly those involving hot spots, is a failure to account for temporal trends in offending (Bennett, 1996; Rengert, 1997). There is evidence, for a number of offence types, of increased offending during particular times of the day or year. For example, the frequency of assaults compared across calendar months generally follows a cycle of increased offending in the summer months (Queensland Police Service, 1998, p. 19), while Rengert (1997) showed that peak times for auto theft varied widely depending on city location. By ignoring time, hot spots become a one-off, static measure of offending, with reduced analytic specificity. Indeed, generalisations about hot spots on the basis of analyses that ignore the time dimension may be as misleading as those that ignore the effect of aggregation on relationships (the ecological fallacy).

Bennett (1996) is one of the few researchers to consider seasonal variation. He developed a method that provides a degree of stability and some protection from seasonal effects by taking eighteen months of data and partitioning the entire data set into three six-monthly blocks. The inherent stability of the patterns could be related to how well they emerged across all three time periods. The locations of the stable hot spots were used to identify the area targeted for preventive interventions (Bennett, 1996).

Australian Studies

Computer crime mapping has had some limited applications in Australia, largely restricted to in-house analyses by law enforcement agencies (Cameron, 1998). The few published studies include Criminal Justice Commission (1997), Devery (1992) and Jochelson (1997). There is a little more published research on repeat victimisation (e.g., Criminal Justice Commission, 1997; Morgan, forthcoming; Mukherjee and Carcach, 1997), with several projects in progress in Queensland (Criminal Justice Commission, 1999) and South Australia (Fisher et al., 1999). Mukherjee and Carcach analysed two Australian victimisation surveys, the National Crime and Safety Survey (1993) and the Queensland Crime Victim Survey (1995), and demonstrate that the extent of repeat victimisation is of a similar magnitude to that revealed in the British Crime Survey (for example, 2.4 per cent of property victims experience over half the incidents).

The Present Study

The research presented in this paper emerged from a joint Queensland Criminal Justice Commission (CJC) and Queensland Police Service (QPS) initiative, the *Beenleigh Calls For Service Project* (Criminal Justice Commission, 1998). Its main aim was to determine to what extent Problem Oriented Policing (POP) initiatives could reduce telephone calls for service.

There are several reasons in a study of repeat victimisation to focus on burglary:

1. Burglary is a relatively well reported offence, due to insurance companies' policy of not proceeding on a claim until the incident is reported to the police.

2. Burglary has accurate location information. The owner, the tenant or a neighbour is invariably the individual reporting the offence and it can be assumed that these individuals would be able to provide address information.
3. Burglary is a crime against property. Properties are easier to 'manage' than people for prevention purposes.
4. Burglary generates sufficient numbers of incidents. The Beenleigh Police Division has the sixth highest residential burglary rate of all police divisions in the state (Criminal Justice Commission, 1996). In Queensland burglary is second only to theft in frequency (Queensland Police Service, 1998, p. 4). Burglary calls make up nearly 14 per cent of all calls for service in the Beenleigh Police Division (Criminal Justice Commission, 1997).

Data

The source of crime data for this research was a police information system called IMS (Incident Managment System). IMS is a computerised job card database, used primarily for command and dispatch duties. Requests for service come in from three sources; the community, other police divisions and emergency services. Communication room operators enter details onto a job card that appears on a computer screen. IMS is used throughout the state at the region level, except for Brisbane metropolitan regions, which have their own more developed command and dispatch system, ESCORT (Emergency Service Communications and Operation Resource Tracking).

Every offence category is represented on IMS by a three digit code. The code is used twice on each job card; once, when the IMS operator first receives the telephone call (an *r-code* or reported code) and the second time when a police officer verifies the nature of the incident (a *v-code* or verified code).

The time frame of this research spans eighteen months, from June, 1995 to November, 1996, inclusive. All jobs in the Beenleigh Police Division with a break and enter *v-code* within the time frame were included in the study. This amounted to 1750 verified break and enter incidents.

A great deal of time was spent cleaning the IMS data. Almost without exception, the IMS address location fields were unuseable for our purposes (consistent with the universal experience of other repeat victim researchers). Two phases of data cleaning were conducted:

1. Completion of addresses. Many of the IMS records were incomplete, with street names being spelt incorrectly, missing street numbers, complete addresses missing, property or business names instead of an address. Much work was done to correct or complete erroneous or missing addresses.
2. Uniform format of addresses. Various spellings and abbreviations of road type descriptors (street, road, court, crescent, lane, etc.) severely hindered accurate location. In some instances, an incorrect descriptor was used. A uniform format was developed that could be used by mapping software and for identifying repeat addresses.

Even when these phases were complete, it was not possible for many incidents occurring on non-residential properties to distinguish individual offices, shops and warehouses (only the whole complex could be identified).

The large amount of time spent on this phase to produce mappable data explains why hot spot mapping and analysis of repeat victimisation are not routinely performed by Queensland police, at least any that use IMS. Most police information systems are not designed for it; the main objective of IMS is to get patrol cars to incident locations as quickly as possible, so location information does not have to be in a standard format. Police are also reluctant to devote the required resources of a full-time research officer for over two months to make eighteen months of data for one offence suitable for this type of research.

The problems encountered with cleaning the data have resulted in a number of modifications to IMS. The incident address field has been separated into a series of linked fields (previously it was one long string field), and an address validation system that corrects spelling mistakes and formatting errors has been introduced. These modifications resulted in a fourfold increase in accuracy in later analyses (Criminal Justice Commission, 1998).

Determining Repeats

Once the dataset had been cleaned as much as possible, a set of distinct victimised addresses was compiled and a victimisation count for each address was calculated. This was performed using the AGGREGATE function in SPSS (on the appropriate address field) and the SQL format of MapInfo.

Repeat victimisation, for our purposes, is when a property has been recorded in IMS as burgled on more than one occasion during a given time period. Individual addresses in properties such as retirement villages and shopping centres are not generally identified in the IMS data. This means that the whole complex must become the unit of analysis, and that its rate of repeats will generally be higher than for individual addresses within it. Whether this lack of specificity matters depends on details of the immediate physical environment, the characteristics of the businesses or other targets, and the nature of the prevention strategies being planned.

Following general practice in the literature, the victimised addresses were split into two groups: residential and non-residential properties. More than 90 per cent of residential properties were single dwellings, but also included were caravan parks, retirement villages and home units. Within the non-residential group, schools, shopping centres, sporting clubs, service stations, bottle shops and other retail outlets featured prominently.

Repeat Victimisation Results

Addresses were separated into residential and non-residential property types. The following tables show the extent of recorded repeat victimisation for both property types.

Key points to note from Table 1 are that:

1. over 90 per cent of residential properties in Beenleigh police division did *not* record a break and enter during the study period;
2. of those residential addresses in Beenleigh police division which were burgled, most (83.7 per cent) were burgled only once during the study period;

TABLE 1

Repeat Break and Enter Victimisation of Residential Properties, Beenleigh, June 1995 to November 1996 (inclusive)

Times victimised	Estimated number of residential properties	per cent of residential properties	per cent of victimised addresses	Number of crimes	per cent of crimes
0	10,864	91.6	0.0	0	0.0
1	830	7.0	83.7	830	68.1
2	127	1.1	12.8	254	20.8
3	23	0.2	2.3	69	5.7
4	5	0.1	0.5	20	1.6
5 or more	7	0.1	0.7	46	3.8
Total	11,856	100.0	100.0	1,219	100.0

Sources: Data on total number of residential properties from ABS 1991 Census, Table B45, calls for service data from Beenleigh IMS

Notes: Percentages have been rounded to nearest decimal point. Due to rounding, percentages may not add to 100

3. just 0.4 per cent (35) of all residential properties in Beenleigh police division (3.5 per cent of burgled properties) accounted for 11.1 per cent of all reported residential break and enters during the study period;
4. a mere seven addresses, or 0.7 per cent of all victim address in Beenleigh police division accounted for 46 incidents (3.8 per cent of all incidents) during the study period.

The chance of a residential address being victimised one time only was 830/11,856 = 0.07. Having been a victim once, the chances of revictimisation were (127+23+5+7)/(830+127+23+5+7) = 0.1633, more than double the initial chance of becoming a victim. This probability is lower than in most other studies (Forrester et al., 1988; Polvi et al., 1990), which typically estimate the rates of revictimisation as at least four times the rate of initial victimsation.

The data in Table 1 show that the elimination of all recorded repeat victimisation in residential properties (i.e., a 100 per cent effective prevention program that stopped all revictimisation with no displacement) would prevent, in eighteen months, 227 break and enters, or 18.6 per cent of the total. This provides a theoretical 'ceiling' on the benefits that could be obtained by focusing on repeat residential incidents using police data (of course, in practise, the benefits of any prevention project implemented will fall short of this ceiling). However, we demonstrate below how the real ceiling could be higher.

Table 2 presents data on victimisation patterns for non-residential properties. It shows that:

1. a greater proportion of non-residential properties (23.3 per cent) in the Beenleigh police division were victimised during the study period;
2. 44.5 per cent of victimised non-residential properties in the Beenleigh police division were victimised more than once during the study period;

TABLE 2

Repeat Break and Enter Victimisation for Non-Residential Properties, Beenleigh, June 1995 to November 1996 (inclusive)

Times victimised	Estimated number of non-residential properties	per cent of non-residential properties	per cent of victimised addresses	Number of crimes	per cent of crimes
0	754	76.7	0.0	0	0.0
1	127	12.9	55.5	127	23.9
2	41	4.2	17.7	82	15.4
3	26	2.6	11.4	78	14.7
4	13	1.3	5.7	52	9.8
5	12	1.2	5.2	60	11.3
6	1	0.1	0.4	6	1.1
7	0	0.0	0.0	0	0.0
8	2	0.2	0.9	16	3.0
9 or more	7	0.7	3.1	110	20.7
Total	983	100.0	100.0	531	100.0

Sources: Calls for service data from Beenleigh IMS
Notes: Percentages have been rounded to nearest decimal point. Due to rounding, percentages may not add to 100

3. seven locations (3.1 per cent of victimised premises) in the Beenleigh police division accounted for 20 per cent (110) of all burglaries committed on non-residential properties during the study period.

The chances of a non-residential property being victimised once only are 127/983 = 0.129. Having been victimised once, the chances of being burgled in the same eighteen month period were (41+26+…+7)/(127+41+26+…+7) = 0.445. This is almost three and a half times the rate for a single victimisation only. If all repeat victimisations in non-residential addresses identifiable through police data were eliminated through 100 per cent effective prevention with no displacement, 302 incidents, or 56.9 per cent of the total, would be eliminated. It seems, therefore, that the prevention potential is much greater with non-residential than residential break and enter.

In order to demonstrate clearly the differences between the two property types, Table 3 lists burglary distribution attributes and the corresponding values derived from Tables 1 and 2 for residential and non-residential properties.

In analysing Table 3, it must be remembered that in absolute terms residential properties suffer more burglaries than non-residential, 1,219 versus 531 incidents. However, victimised properties are nearly three times more prevalent in non-residential properties than in residential. The intensity of victimisation, concentration, is also higher for non-residential properties. Non-residential properties that have been victimised experience, on average, nearly one burglary more than victimised residential properties (although the possibility that separate shops or offices within the complex are being targeted on each occasion needs to be kept in mind). A higher prevalence and concentration for non-residential properties serve to yield more than a five times higher incidence, or burglary rate, than residential properties.

TABLE 3

Property Type and Burglary Distribution Attributes, Beenleigh, June 1995 to November 1996 (inclusive)

Distribution Attributes	Residential properties	Non-residential properties
Prevalence (percentage properties victimised)	8.4	23.3
Concentration (average victimisations / victim)	1.229	2.319
Incidence (# incidents / 100 properties)	10.282	54.018

TABLE 4

Top 15 addresses, Beenleigh Police Division, June 1995 to November 1996 (inclusive)

Position	Nature of address	Frequency
1	School	25
2	Shopping centre	22
3	Motel	18
4	Shopping centre	16
5	Residential units	11
6	Shopping centre	11
7	School	10
8	School	10
9	School	10
10	School	10
11	Commercial	9
12	Residential	9
13	Residential	9
14	Residential	8
15	Retirement village	8

There may be several reasons why victimisation rates are higher for non-residential addresses in semi-rural areas like Beenleigh. Levels of insurance are likely to be higher amongst non-residential property owners than residential owners and therefore the former are more likely to report a burglary. The spatial distribution of non-residential properties, particularly commercial, retail and industrial properties, is fundamentally different to residential properties. They are commonly clustered together on main roads and they are far more dense than residential properties. It is also probably fair to say that non-residential properties are more lucrative targets (there is more to steal). Whether these factors apply more generally to other areas is difficult to determine, but UK research seems to indicate greater repeat burglary victimisation among businesses (Taylor, 1999).

Table 4, which shows the fifteen addresses with the highest number of burglaries, indicates that many of the most frequently victimised addresses are public facilities such as schools, shopping centres and commercial properties.

Explaining the Low Rate of Repeat Victimisation for Residential Addresses

As noted above, the repeat rate (the proportion of repeat incidents that make up the overall crime count) seems low for residential properties compared to Kirkholt and other studies. In fact, there is a general sense of confusion over what the 'average' repeat rate is. This comes about because repeat rates can be calculated from three different sources: victimisation surveys, project impacts, and police data.

Victimisation surveys typically report between 60 to 80 per cent of property crime experienced by repeat victims (Ellingworth et al., 1995; Farrell & Pease, 1993; Farrell, 1995; Pease, 1998), in line with data from Australian surveys (Mukherjee & Carach, 1998). Kirkholt-like projects have reported between 20 to 30 per cent reductions in residential burglary (Chenery et al., 1995; Janice Webb Research, 1996).

Repeat rates generated from police statistics reflect reporting patterns of victims. This affects both the police officer's perception of the problem and the measures taken to prevent future incidents. The number of repeat incidents occurring, according to the criminal information system used, is an often overlooked, yet vitally important quantity. Repeat rates from police statistics in a number studies have ranged from 8 to 32 per cent in the UK (Bennett & Durie, forthcoming; Johnson et al., 1997; Ratcliffe & McCullagh, 1998) and 29 per cent in the US (Robinson, 1998). The repeat rate for Beenleigh is 18.7 per cent, comfortably within the above range. However, the fact that Beenleigh has the sixth highest residential burglary rate of Queensland police divisions coupled with Trickett et al.'s (1995) observation that high crime areas, in the UK, have high repeat victimisation may lead critics to question the usefulness of focusing on repeat victimisation in an Australian setting.

There is one other important factor when using police data that should be considered. There is no doubt that police data severely underestimate the 'real' extent of crime (Farrell & Pease, 1993; Sherman et al., 1989). An estimate of levels of police underreporting in Australia is given in Mukherjee et al. (1997). These authors show that based on survey data for residential break and enter in Queensland, 83 per cent of victims of a single break and enter incident report the incident to the police, compared with roughly 55 per cent of repeat victims. Adjusting for underreporting, if repeat victimisation were prevented absolutely, total residential burglary would fall by 24.3 per cent, an increase of 6 per cent due solely to the correction for underreporting. This increase is still quite conservative as the reporting rate for repeat victims will vary depending on the extent of victimisation (Chenery et al., 1997; Pease & Laycock, 1996). The estimate of reporting for repeat victims (55 per cent) will overstate the degree that chronically victims report.

If 'edge effects', the failure to detect repeats that span the start or finish of the time window, are also considered, the estimated maximum reduction would be even greater. However, although 25 per cent (plus) is a higher figure than 18 per cent, and more in line with the high repeat rates of other studies, one could still expect a higher proportion of repeats in such a high burglary area.

Morgan (forthcoming) suggests that another mechanism may be present that is suppressing the extent of repeat victimisation. He observed that, in a Perth suburb, several one-time victims tend to cluster around a repeat victim. He found the repeat victim addresses occurred first and the one-time victims were burgled later in the month. This suggests that some form of 'contagion' process was at work. Morgan named the surrounding one-time victims *near repeats*.

An hypothesis worth exploring is the relationship between the homogeneity of dwelling type in an area and its impact on repeat victimisation. If an offender specialises in breaking into a particular dwelling type and operates in an area predominantly consisting of the favoured dwelling type, it is plausible that the offender would not concentrate on a particular address, but would 'visit' other addresses that shared similar features. This is similar to Pease's (1998) concept of 'virtual repeats,' where criminal acts may be linked by virtue of victim (or target) similarity. Pease uses racial attacks (all *x*'s look the same) and same model car theft as examples of virtual repeats. Near repeats differ from virtual repeats with respect to the spatial component; they are geographically close whereas virtual repeats are not necessarily so. It is this which makes the near repeat concept so attractive. Near repeats could be the theoretical construct needed to explain more fully the relationship between repeat victimisation and hot spots.

The Beenleigh area has several new housing estates. Typically, land development companies buy large amounts of land, about the size of a suburb, and offer inexpensive house-and-land packages. Prospective buyers generally have a choice of five or six designs to choose from. Several suburbs in the Beenleigh Police Division have developed this way and there are many pockets of nearly identical dwellings. In fact, there are some cul de sacs that are comprised of exactly the same model house. For these reasons, Beenleigh is considered an ideal site to test the near repeat hypothesis in the future.

Time Course of Break and Enter Victimisation

Analyses of the time course of victimisation are primarily concerned with the amount of time that passes between repeat events. However, the use of a time window, inevitable in any research study, means necessarily that the time course distribution is biased to short periods. For example, in the 18 month dataset in this study there are 17 adjacent month pairs, but only six twelve month combinations of time blocks. The larger the time between victimisations, the less likely that it will be detected.

One way this bias can be overcome is by adjusting the time course frequencies using a correction factor, a number that adjusts a score to make a measurement unbiased. The correction factor used here (the total number of time units divided by the number of time units until the end of the time window) is the simple weighting measure outlined in Anderson et al. (1995). At the start of the time window the correction factor is close to one, but as time passes the denominator decreases (as the number of time units until the end becomes smaller) which causes the correction factor to increase. The raw scores for the time course are multiplied by the correction factor to give the adjusted score. The increasing value for the correction factor is meant to compensate for the artifically low later month frequencies.

Figures 1 and 2 show the time course, both uncorrected and corrected, for repeat burglary victimisation in Beenleigh for residential and non-residential properties. Although the graphs relate to different property types they display similar characteristics and agree with every time course distribution ever published (Farrell & Pease, 1993; Farrell, 1995).

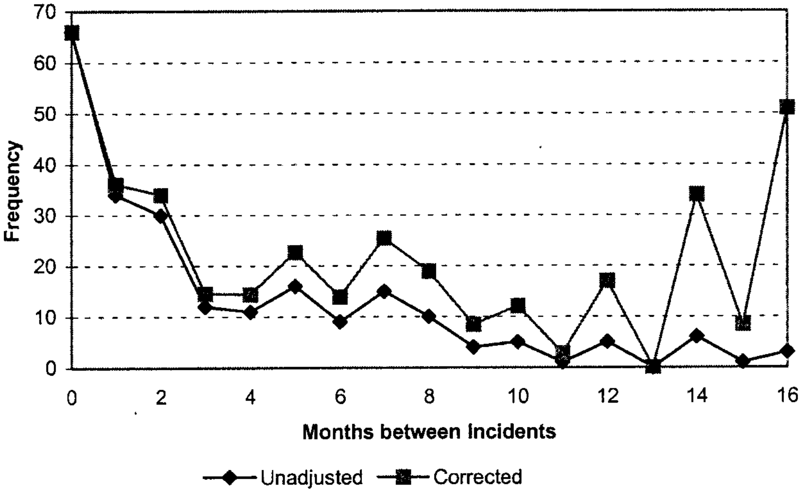

FIGURE 1

Time Course for Residential Properties Beenleigh, June 1995 to November 1996 (inclusive).

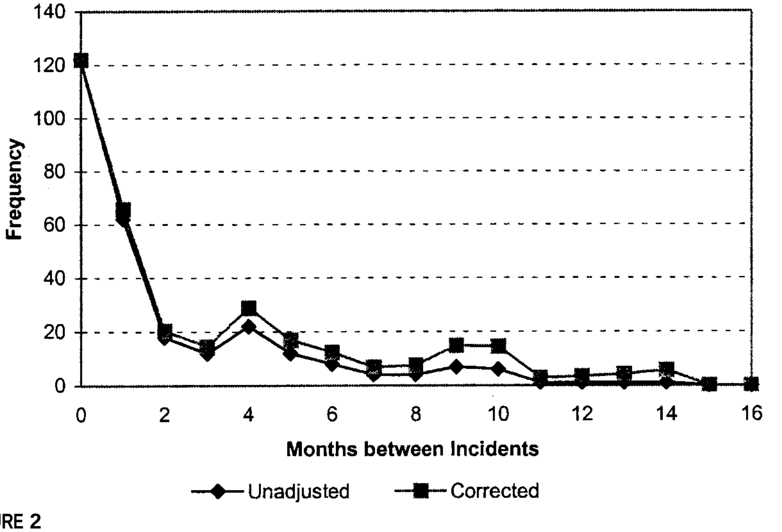

FIGURE 2

Time Course for Non-Residential Properties Beenleigh, June 1995 to November 1996 (inclusive).

Key features are:

1. Most of the repeat victimisation occurs within one to two months of the first victimisation. After that time, a large drop-off occurs and a relatively stable level is maintained for the duration of the time period. For example, across all property types, 188 addresses experienced two break and enters within the space of a month, but only 102 were revictimised in the next month. There were 54 addresses with two months between incidents.

2. For residential properties, the difference between the unadjusted and corrected frequencies becomes larger as the time between incidents increases. This is a reflection of both the mechanics of the correction factor and the erratic behaviour of the tail of the time distribution.
3. A four month 'hump', an increase in frequencies at about four months, is present for non-residential properties, and a five month hump for residential addresses. Four month humps have been observed in Canada (Polvi et al., 1990; 1991) and in the UK (Chenery et al., 1997). A US study (Robinson, 1998) reported a slight five month hump. It has been speculated that the humps reflect offenders returning for the insurance-replaced goods stolen in the earlier incident (Pease, K 1998, pers comm). Nevertheless, the humps are not statistically significantly different from the time course. The number of repeats for each hump falls within the confidence intervals at those points under an exponential regression model (Bowers et al., 1998; Johnson et al., 1997; Spelman, 1995).

More work needs to be done to understand why some properties experience long times between 'visits' and others only short ones. Perhaps with the aid of CRISP (Crime Reporting Information System for Police), an information system used by QPS to record detailed crime scene reports and case histories, a better predictive model can be developed. For example, if properties that experience short times between victimisations tend to have little taken on the initial incident and much more on the second, then that implies the first offence is used to 'scope' the dwelling and if sufficient rewards are present, then a second offence will follow quickly. On the other hand, if households that experience long between-times have a large amount stolen both times, then it would indicate offenders waiting for the replacement of stolen goods. By combining CRISP and IMS, a comprehensive and potentially powerful tool would be available for analysing the time course distribution.

Hot Spots

To observe spatial distributions of victimisation, a Geographical Information System (GIS) was used, in conjunction with an up to date digitised street map. The GIS used was MapInfo, a relatively user-friendly computer package (MapInfo, 1998).

The process of matching records from the database with specific points on a map is called geo-coding. It is not important for the purposes of this paper to outline the mechanics of geo-coding except to observe that the degree of success is directly related to the accuracy of the street map and obviously the degree of precision of the address field of the data to be mapped. Ultimately, 107 addresses, just over six per cent of the total, were not geo-coded. This occurred for two reasons: although only a few years old, the street map used in this project did not contain every address in the Police Division; and incidents outside the boundary of the Police Division sometimes appeared in the dataset, and were therefore not mapped.

Once mapped, it was observed that the incidents were concentrated in the north-west corner of the police division. A target area was selected within the Division, which was thought would capture the majority of the incidents. The area is rectangular in shape and covers over 66 square kilometres. Of the 1,643 records examined, 1,427 incidents, or 87 per cent, were contained in the target area.

Just as the concept of repeat victimisation was used to illustrate numerical distributions of victimisation, hot spots were used to illustrate spatial distributions of victimisation. The standard definition for a hot spot is an area, place or address that has a high volume of crime (Block, 1995; Canter, 1998; Hirschfield et al., 1995; Sherman et al., 1989).

Bennett (1996) defined two types of hot spots, stable and unstable. Stable hot spots were those that occurred in all three time periods whereas unstable hot spots were those that occurred in at least one, but not all, time periods. Three six-month time periods were also used in the present study. The first period spans June, 1995 to November, 1995; the second includes December, 1995 to May, 1996; the third and last time period is June, 1996 to November, 1996.

The software package STAC was used to identify and locate hot spots within each of the three time periods. STAC calculates hot spots of spatially distributed data and represents the boundaries as standard deviational ellipses. For large sample, normally-distributed data, the standard deviational ellipse will include roughly 95 per cent of the incidents in the cluster. STAC relies on two parameters set by the user, the *search radius* and *the minimum number of incidents per cluster*. Combinations of parameters were tested to determine the values that would provide useful (not overly sensitive) results. The most consistent results were obtained for a search radius of 150 metres and 10 incidents per cluster (five or six hot spots were generated each time period in this manner).

The algorithm used for calculating standard deviational hot spots is a two step process. First, a grid of points is placed over the area of interest. Circles of consistent radius (equal to the *search radius*) are placed over each grid point, which are a half search radius apart. The number of incidents within each circle is tallied and the top 25 circles are kept. The program then checks for overlapping circles in the top 25 list, ie ones that 'share' incidents, and if present are grouped together, ie the union of these circles becomes a cluster. The second part of the process then starts. For each circle or cluster that has more incidents than the minimum number, the second parameter, a standard deviational ellipse is calculated. The centre of the ellipse is the arithmetic mean of the *x* and *y* co-ordinates of the incidents that comprise the cluster. STAC outputs values for 'the number of events in each cluster', 'the number of events in each ellipse', 'the area of each ellipse', 'the number of events per one million square metres' and 'the centre of the ellipse'. A more detailed description of the algorithm and equations STAC uses can be found in the STAC Users Manual (Illinois Criminal Justice Authority, 1996).

A number of hot spots were identified[1], but only three consistently appeared in all three time periods, and thus can be considered stable (see Figure 3)[2].

Hot Spot 1. The first hot spot is in an outlying suburb. This is a designed suburb, adjacent to an arterial road which is the only access route. The suburb has one main road that starts at one point on the arterial road and winds through the suburb, to finish by linking back to the arterial road. The suburb is nearly entirely residential, but includes primary and secondary schools, a train station and a small block of retail shops. The hot spot is focused on the small block of retail shops, although it does spill over to the surrounding residential properties. The shops are located on the intersection of the suburb's main road and the street linking the

FIGURE 3

First Six Months (June to November, 1995).

main road to the train station. The number of people passing through this hot spot would be substantial.

Hot Spot 2. This hot spot is centred on a major intersection of a main road and an arterial road. On one corner is a service station and adjacent to it is a complex of retail outlets. Nearby, to the north, are several large residential apartment blocks and there are numerous retail outlets scattered throughout the surrounding area. Perhaps the most interesting feature of this hot spot is the disparate land type composition. The intersection is the unofficial border of the commercial sector and the industrial sector of Beenleigh. To the east of the roundabout is the commercial sector of Beenleigh, while to the west of the intersection is the start of the industrial sector. As mentioned above, a residential area lies to the north. This hot spot experiences a large volume of traffic.

Hot Spot 3. This hot spot is centred in the Central Business District (CBD) of Beenleigh. A significant number of people visit this area by various means, a five-way main road intersection lies in the area, nearby is a train station, a major bus terminal, a secondary school, a public swimming pool, a community centre, a sports centre, several shopping centres and numerous other retail outlets. The land usage is predominantly non-residential. The properties are characterised by high levels of target hardening, particularly barbed wire, bars and grilles on doors and windows and obvious security devices, including alarms.

In general terms, all the hot spots, stable and unstable, have a high number of targets in a small area. This probably reflects the presence of paths which give immediate access to the rear of properties. In addition, many areas (paths, streets, lanes) are poorly lit and some heavily trafficked areas have street lighting on one side of the street only. Other places are characterised by large amounts of public space surrounding them. Unfortunately, this space is generally poorly maintained, being marred by litter, rusting cars, shoulder high grass and graffiti. This makes surveillance of properties difficult for place managers, security personnel, owners and tenants.

Bennett's (1996) method of accounting for seasonal variation goes a long way toward reducing the likelihood of missing seasonal cycles, but there is still a degree of the 'snapshot' problem, ie variations within the six monthly period are possible. A new mapping methodology was developed to alleviate this problem and represent spatial change smoothly, avoiding the sharp, stop-start feature of spatial patterns that may occur using methods that simply partition the time window.

Moving Average Mapping

A moving average is most often used to smooth fluctuations and to make trends clearer for a time series (Borowski & Borwein, 1989). This is achieved by taking a number of the series' previous values and averaging the scores. Similarly, the moving average mapping methodology takes a number of six monthly blocks and compares the movement of hot spots across the series. The first time period in the series uses the first six months of the dataset. The second six month time period in the series comprises months two through seven, making a five month overlap between the first time period and the second. The third time period in the series uses months three to eight, and so on until the last time period, the thirteenth, which uses months thirteen through to eighteen[3].

By having a five month overlap between adjacent time periods, the moving average method provides a more fluid indicator of the spatial behaviour of victimisation across time than the 'snapshot' approach. For example, at the beginning of the time frame in the Beenleigh analysis, the suburb known as Fairview, an invented name, had very high levels of burglary. Cresttown, also an invented name, had much lower levels of buglary initially. Fairview has a river bordering to the north and farmland to the south and east. To the west is Cresttown, which has a very large number of attractive targets. Figures 4 and 5 show the frequency of reported break and enter offences for each suburb, as well as the proportional split between single incidents and repeats.

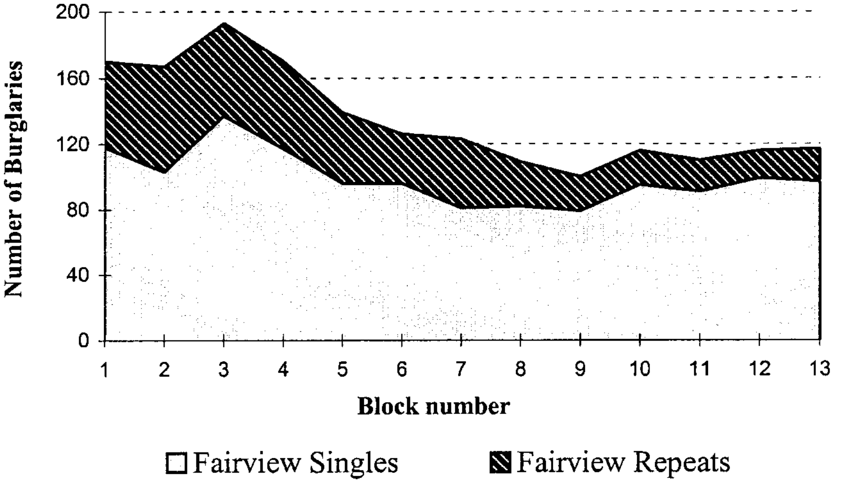

FIGURE 4

The proportion of revictimisation in Fairview.

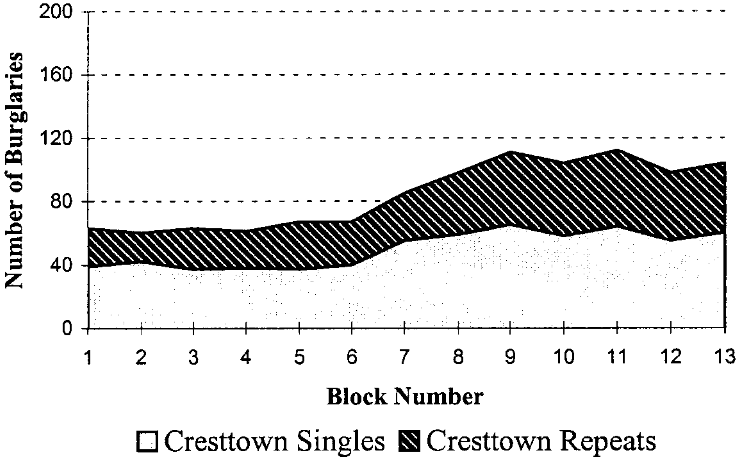

FIGURE 5

The proportion of revictimisation in Cresttown.

There are two interesting features of the two graphs:

1. Fairview's contribution of repeats to the total tapers off noticeably over time, and there is a general reduction of incidents at approximately the same time as an increase in both repeats and overall incidents at Cresttown.
2. The overall decrease in Fairview is approximately 50–60 incidents (from a high of 170–180, to a low of 120) and the overall increase in Cresttown is 50–60 (from a low of 60 to a high of 110–120).

The fact that the change for the two neighbouring suburbs occurred at the same time and was of similar magnitude suggests displacement of offending from Fairview to Cresttown. It would be difficult to capture this type of phenomenon using most other mapping approaches.

Repeat Victimisation and Hot Spots

By definition, hot spots are the densest areas of criminal activity. Apart from Bennett and Durie (1996), no other researchers have looked at the composition of victimisation within hot spots, although several researchers have acknowledged that this is an important area to investigate (Farrell & Pease, 1993; Hope, 1995). It is possible that a hot spot may arise either as a result of many one or two off victimisations (high prevalence, low concentration) or as the result of relatively few chronically victimised addresses (low prevalence, high concentration — a coalescence of hot dots). Using the stable/unstable typology introduced by Bennett (1996), Table 5 shows the relationship between stability and repeat victimisation.

It is apparent that unstable hot spot areas have the highest number of high frequency repeat victim addresses (3 or more victimisations). Stable hot spots have a higher proportion of repeat victim addresses than non-hot spot areas, and the relationship is statistically significant[4]. The results for stable hot spots presented here are somewhat 'stronger' than Bennett and Durie's (1996) findings for Cambridge. For example, Bennett and Durie found that 19 per cent of all addresses burgled in their hot spot in the eighteen months were burgled more than once, but the comparable figure for stable hot spots in Beenleigh was 32 per cent.

TABLE 5

Hot Spots and Repeat Victimisation, Beenleigh, June 1995 to November 1996 (inclusive)

Number of	Stable hot spots		Unstable hot spots		Rest	
Victimisations	N	per cent	N	per cent	N	per cent
1	80	67.8	33	70.2	1,040	88.2
2	28	23.7	6	12.8	98	8.3
3	3	2.5	3	6.4	34	2.9
4+	7	5.9	5	10.6	7	0.6
Total	118	100.0	47	100.0	1,179	100.0
Area	0.4 km^2		0.1 km^2		62 km^2	

Notes: 1. Chi-square (6) = 85.9, p = 0.000; Cramer's V = 0.18

Percentages have been rounded to the nearest decimal point. Due to rounding, percentages may not add to 100

The finding that some hot spots flare up because of repeat victimisation is important, and suggests that police strategies should be developed to nip ‘serial break and enter’ in the bud. However, it is also clear that some spots are hot because of the type of area they are, and that the whole locality, not just repeat addresses, should be the focus of attention.

Discussion

This paper has presented numerical and spatial distributions of victimisation of burglary. In the broad sense, the results agree with the findings of similar research conducted outside Australia, although there may be variations in patterns compared to the well established literature of the UK. We showed that by preventing repeat incidents, the overall burglary count could be reduced by at least 25 per cent. A number of hot spots, three of which were stable, were identified. The victimisation composition of hot spots appears to vary according to the nature of the hot spot. Unstable hot spots had a higher level of repeats than stable hot spots. The temporal distributions displayed here match very closely patterns reported elsewhere.

The problems we encountered with our data were similar to researcher’s accounts from overseas (Farrell & Pease, 1993; Sherman et al., 1989). Until address validation becomes a routine feature of crime information systems, no police service will have the ability to identify hot dots or analyse them rigorously. Both hot dot and hot spot analyses are heavily reliant on the accuracy and consistency of addresses. Due to their greater experience in crime mapping, address validation has become heavily developed in the US, with several police agencies across that country reporting a 95 per cent or better hit rate in the geocoding process (Foy, 1999; Olligschlaeger, 1998).

An information system’s capacity to facilitate the recognition of repeats directly affects the ability of police to deal with the problem. Actual repeat rates may be substantial, but if the rate according to the police service (i.e., generated by their information system) is significantly lower, then other, less effective techniques may become more attractive than a focus on prevention of repeats. Clearly, this sort of Type II error (a false negative) is a situation that victims, the community, police, policy makers and researchers all wish to avoid.

We recommend three extentions of existing analytical methods. The first extention involves the concept of near repeats. Although repeat burglary victimisation is a problem in Australia, there appear to be variations in patterns compared to the well established literature of the UK. The concept of near repeats has the potential to be very useful for crime analysis (offender targeting patterns, police intelligence), crime prevention (security advice tailored to specific dwelling types), town planning (distribution of similar housing types, urban development guidelines) and criminological research (added complexities of international perspectives on repeat victimisation).

Farrell and Pease (1993) identify as a challenge for future research elaboration of the relationship between repeat offending, repeat victimisation and crime hot spots. Bennett (1996) and Bennett and Durie (forthcoming) come closest to this in their Cambridge study, although Eck (forthcoming) addresses the problem in a theoretical sense. It is our contention that near repeats are important in explaining the relationship between hot spots and hot dots, although data on offender behaviour patterns and on the extent and nature of social disadvantage in the area will also be crucial (Hirschfield et al., 1995).

With the aid of CRISP, the relationship between property type homogeneity and burglary can be explored further. Aspects of the incident such as modus operandi, point of entry and amount stolen that are not recorded in IMS may prove to be critical factors to explain burglary patterns for particular dwelling types.

Our second recommendation is to use survival analysis. The major limitation of time course analysis is the inability to control for diminishing risk periods (events close to the end of the time window are not given the same chance to repeat as those at the start). Survival analysis, a quantitative method largely restricted to medical and operations research, focuses on the time until an event occurs, in this case, a repeat offence. Morgan (forthcoming) showed that substantial differences exist in burglary rates for small areas within a Perth suburb and he was one of the first to use survival analysis on repeat victimisation data (Spelman [1995] was the first).

Covariate mixture models have been used for nearly twenty years (Schimdt & Witte, 1988) to model recidivism of prison inmates and the metholodology has been well developed by Broadhurst and Maller in a series of excellent research pieces (Broadhurst & Maller, 1991a; 1991b; 1992; Broadhurst et al., 1988; see also Maller & Zhou, 1996). Modelling the time between victimisations is analogous to modelling the time between offences and seems a logical progression for those interested in time course analysis, especially since Maller and Zhou have developed tests to identify minimum follow-up periods for statistical reliability and have also addressed other conditions for effective use of survival analysis.

The advantages of applying survival analysis in this context are twofold. By fitting data to a distribution, estimates outside the time frame can be calculated; and the underlying assumptions of the particular distribution can be used to say something about the data, provided there is a good fit. Survival analysis has not been included in this analysis because an eighteen month dataset will not have sufficient observations for maximum likelihood estimation. We are currently working on a larger dataset (four and a half years) which should generate sufficient observations for this type of analysis.

We introduced moving average mapping as a method to avoid the snapshot effect that occurs whenever crime incidents are aggregated across some time period. Our third recommendation is to make greater use of this approach, because it allows the identification of seasonal and other time-related effects. A more advanced version of this concept has been developed in conjunction with animation techniques. Animated crime maps show areas ‘fading in and out’ depending on their temporal incidence intensity (Goldsmith & Williamson, 1998). Although maps of this type look good and impact greatly on the viewer, care must be taken not to be overly reliant on aesthetic appeal to the detriment of quality analysis. Equally this can be said for the trend toward the inclusion of interpolated surfaces in crime mapping. A number of software packages are available that build three dimensional surfaces interpolated from point data (e.g., MapInfo Professional 5.0, Surfer, Vertical Mapper). This is very useful in some areas (e.g., public release information and patrol briefings) where the exact location of a crime site may not be required, but is unlikely to replace fully point level analysis.

We now consider potential prevention applications, and also some future research directions.

First, the probable high level of under-reporting of repeat residential victimisation to police suggests that police should keep in touch with all households in an area known to have been broken into in the past year or so, in order both to provide support and suggest prevention strategies, but also to ascertain whether they have been victimised again but have not reported the incident(s). This would serve the dual purposes of providing a valuable public service and improving the quality of police data, hence increasing the effectiveness of police responses designed to prevent repeat burglary.

Second, and consistent with the overseas research (Farrell & Pease, 1993; Polvi et al., 1990, 1991), preventive measures need to be put in place very quickly after the 'first' burglary. This may involve such methods as 'cocoon neighbourhood watch', temporary installation of silent alarms, or intensive efforts to apprehend the offenders (Forrester et al., 1988; Criminal Justice Commission, 1997; Pease, 1998). The role of police is vital here. Our results suggest that the greatest gains are likely to be made, at least in areas like Beenleigh, by focusing on non-residential properties, especially schools and other public facilities.

Third, crime prevention through environmental design (CPTED) needs to be taken seriously as a strategy. There are large, open, public areas in many parts of the Beenleigh Police Division. Unlit tracks providing access to the rear of properties also appear to be a problem in the area. The installation of adequate lighting and the better maintenance of public areas may help repair some 'broken windows' in the more chronic areas (Kelling & Coles, 1996). At the same time, however, the amenity of the area needs to be kept in mind. Open space with trees can be a real bonus in terms of lifestyle, illustrating the familiar point that crime prevention cannot be divorced from other aspects of social policy and planning. CPTED thinking should be incorporated in an overall plan for the development of the area that gives due weight to the cost and suffering caused by repeat victimisation for burglary.

Finally, the reasons why some areas are hot, regardless of the incidence of repeat victimisation within those areas, need to be better understood. Bennett's (1996) research suggests that maybe half of all the incidents in these areas are caused by a small group of offenders who live nearby. These areas, and the offenders, could probably be characterised as 'high risk' or multiply disadvantaged (Vinson & Homel, 1975; Developmental Crime Consortium, 1999). Prevention is not just about 'designing out crime' or detecting and incapacitating repeat offenders; it is also about understanding and dealing with some of the social problems that are the primary generators of crime in hot spots and disadvantaged areas. Environmental prevention techniques and data-driven policing responses, combined with an investment in community-based prevention programs that promote prosocial developmental pathways for young people, should do much to reduce crime and related problems in areas like Beenleigh.

Endnotes

1 Both residential and non-residential incidents are included in the hot spot maps. Of the three stable hot spots, two are entirely non-residential. Future research will investigate mapping the property types separately.

2 Although this is a black and white map, readers are encouraged to view the colour maps at the following Internet site: *http://www.gu.edu.au/school/ccj/mtmaps.html*

3 All thirteen moving average maps are viewable from the above Internet site (space restrictions do not allow a full presentation here).

4 Comparing only hot spots areas, stable and unstable hot spots are not statistically significantly different. Given the low frequency of multiple victimisation, further analysis of this topic should be conducted on a larger dataset.

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