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Research Reports

Taking an Analytical Approach to Crime Prevention in NDC Areas

Research Report 44

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CONTENTS

Executive Summary

- this report establishes a best practice model for identifying local crime problems and for evaluating crime reduction interventions in NDC partnerships using Knowsley NDC as a case study

- the model adopts a 'theories of change' framework and explores the likely impact of interventions on crime in a systematic way through the 'mechanisms' that link actions to outcomes. Methods for measuring crime displacement and diffusion of benefit (i.e. where crime reduces in areas not directly subject to interventions) are also discussed

- crime profiles for NDC areas need to show, for each crime category, the volume of crime, its location (hot spots), its prevalence, levels of concentration (e.g. NDC crime as a percentage of the Police Force Area total) and how it varies seasonally, monthly, weekly, by day of week and time of day. Analyses should also benchmark NDC crime relative to suitable comparison areas (e.g. the remainder of the police force area)

- data should also be collected on contextual factors (e.g. social make-up and land use) that potentially influence the appropriateness of crime-prevention interventions and their effectiveness

- a Demographic, Land Use and Crime Risk Profiler was designed and piloted in Knowsley NDC using data from the 2001 Census. This comprised 26 variables and produced aggregate statistics for the 2001 Census Output Areas contained within the NDC boundary

- Knowsley NDC had over representations of terraced properties, juveniles and young adults, single parent households, and unemployment; the rate for the latter exceeding five times the national average. From this profile one would expect interventions to include the targeting young people and terraced housing (e.g. target hardening initiatives)

- in understanding crime and how it may be reduced it is necessary to map out the links between the policy inputs (e.g. what is done on the ground) and the desired outcomes (reductions in crime). Following this procedure enables interventions to be selected on the likelihood that they will succeed in reducing crime rather than on the basis of other considerations (e.g. convenience, popularity). This form of analysis was absent from Knowsley NDC's Delivery Plan

- in Knowsley NDC, theory of change models were developed for street lighting, neighbourhood wardens, Community Liaison Officers, additional police support and security equipment for vulnerable residents and businesses and inter-agency collaboration in crime reduction

- to determine whether a particular mechanism (for example, improved street lighting) has led to a reduction in crime, it is necessary to collect data on where and when the mechanism was operational (i.e. 'intensity measures' such as the number of lights provided, dates of installation, locations, the number of properties protected by lighting) and to relate this information to crime change. This can be achieved by keeping a detailed 'event diary' for each intervention to identify the timing and intensity of the implementation process

- the replication of this analysis across all 39 NDCs requires that data concerning the timing and dosage of different crime-prevention measures (e.g. how many locks or CCTV cameras were installed, where and when) be made available for each programme. This would allow evaluators to conduct a robust dose-response analyses using statistical techniques

- measuring scheme outcomes also requires collecting data on all types of crime that feasibly may be affected by an intervention, directly or indirectly. Data on assault, robbery, burglary (dwelling), burglary (other), theft of car, theft from car, simple theft and theft from shop were assembled for the NDC area and for the rest of Merseyside covering a period of four years (1/4/99 - 31/3/03)

- the only significant change in crime in the operational phase of the NDC, compared with the previous year, was a statistically significant reduction in burglary other, essentially crimes against businesses. This reduction remained statistically significant after removing the local BCU and police force area trends

- further analyses were carried out to establish if this change was likely to be attributable to NDC Crime Theme activity. Thus, if a crime-prevention intervention is successful, reductions in crime should occur when the intervention is implemented and greater reductions in crime should be observed as crime prevention activity increases

- in Knowsley NDC, non-domestic burglary was falling before the NDC began and rose during most of the period the NDC had been operational, suggesting that changes in this type of crime were unlikely to be attributable to the NDC

- domestic burglary showed little change in the NDC operational period and criminal damage increased, but both decreased during the before period. Robbery against businesses decreased following implementation but the downward trend began well before implementation

- these results highlight the need to conduct more complex analyses than the 'before' and 'after' comparisons routinely used in evaluation research

- analyses were carried out of geographical displacement (crime shifting to another location) and diffusion of benefit (positive effects of NDC activity extending beyond the operational boundary of the scheme) for non-residential burglary; the only crime type to show a significant reduction in the NDC operational period

- overall, there was a likely diffusion of benefit of the NDC schemes to areas adjacent to the NDC for non-residential crime but no evidence of crime displacement. To search for possible crime switch (where offenders having been deterred from committing one type of crime, choose to commit another) involved looking for changes in other types of crime within the NDC area. None of the changes in the other types of crime were statistically significant, indicating that crime switch had not occurred

- data from other initiatives was not sufficiently specific, with respect to location, timing and inputs to enable the impact of other crime reduction initiatives affecting the NDC area to be identified. A systematic approach to the collection of information on other initiatives that could potentially impact on NDC crime rates needs to be implemented in Knowsley and other NDC areas

- the preventative effects of crime interventions can continue beyond the main phase of implementation. Therefore, outcome analysis needs to be conducted for a suitable period beyond the life of NDCs crime interventions to ensure that the full impact of the measures on crime is measured

- the techniques illustrated in this report will be useful to practitioners and crime analysts planning for, identifying and targeting appropriate interventions and for evaluating their impact and effectiveness

1.   Introduction

The purpose of this report is to provide some useful lessons relating to the implementation of crime prevention interventions. To do this, we will examine the Crime Theme activities of one NDC Partnership in detail. The research has two main elements. The first is to consider the processes involved in selecting appropriate crime reduction initiatives. For instance, why is a particular intervention relevant in a particular area or time, and what is the likely causal mechanisms through which it might work? Such an understanding can also inform monitoring and evaluation. For instance, by helping to identify what should change as a result of an intervention, and hence what data is needed to evaluate the scheme. This should also assist with the development and evolution of interventions; when changes are made, the consequences of these on the mechanism through which crime will be reduced, needs to be considered. And second, to discuss the types of methods currently available for evaluating scheme success and how these relate to the first aim of the research.

Broadly, the report will discuss:

- some analytical approaches for determining what types of crime should be tackled
- approaches for selecting crime preventions interventions
- the best method of measuring the outcome of the schemes
- a more precise measurement of displacement/diffusion of benefit
- developing a more theoretically based approach which links implementation and inputs to outcomes (which examine the theory of change of each activity)
- accounting for the influence of other initiatives in the area
- assessing sustainability of crime prevention measures

The following sections will deal with each of these issues and give details of the tasks necessary to undertake the analysis in each case. It will do so by illustrating each task using detailed information collected on the crime prevention activity of the Knowsley NDC.

2.   Understanding the Crime problem

Before designing a crime reduction programme it is important to understand the problems apparent in the area selected. To do this, it is necessary to conduct a series of analyses including, but not limited to, an assessment of the crime problems in the area. A variety of different types of analysis can be conducted, many of which have recently been discussed by Ron Clarke and John Eck in an excellent manual published by the Jill Dando Institute of Crime Science.
(see http://www.jdi.ucl.ac.uk/publications/manual/crime_manual_content.php). For this reason, we will illustrate only a few approaches here.

Perhaps the most sensible first step should be to see what the main problems are, in terms of the volume (or rates) of different types of offence. This will vary across different areas. So, one approach might be to see if the volume of each type of offence is unusual by comparing it to a meaningful reference area, such as the police force area in which the area is located. This type of analysis will allow you to see which crimes are particular problems and, how much of the crime across the entire county of that particular type is concentrated within the scheme area. For the purposes of illustration, Table 1 shows a simple analysis conducted for the Knowsley NDC area for the financial year 1999-2000. The first column shows crime type considered, of which there are five.

The second shows the number of crimes of that type that occurred in the NDC area during the year considered. The final column shows what percentage of the total crime of this type committed across the county of Merseyside took place in the NDC area.

Table 1: Crime counts for the Knowsley NDC for the year 1999-2000

	Volume	% of county
Burglary	120	0.9
Assault	128	1.1
Robbery-commercial	10	1.76
Theft from car	77	0.45
Theft of Car	114	1.07

The final two columns show slightly different things. First of all, during this period, there were more incidents of assault, theft of car and burglary than any of the other types of crime considered. In terms of the concentration of crime within the county, it is apparent from the third column that the crime that was most concentrated in the Knowsley NDC was robbery committed against businesses. However, it is also apparent that this was a very low volume crime. Thus, it is clear that to determine which crimes are the most problematic in an area; it is wise to consider both the volume for that particular type of crime, and how this compares to that for a reference area. In this case, it might be wise to concentrate on assault and theft of car, as these are relatively high volume crimes, and are more concentrated within the area than the other types of incident.

Having determined which types of crime are most problematic, the next basic step is to see if they are concentrated in specific areas of the NDC and at particular times of the day or year. In general, the majority of crime (e.g. 80%) tends to be suffered by a minority of people (e.g. 20%). Various techniques can be used to determine precisely where crimes are concentrated in space, but to do this it is, of course, necessary to have the relevant data - in this case, this is usually police recorded crime data which shows precisely when and where the crimes occurred. Once the data are obtained, a commonly used procedure is that of identifying hotspots of crime, which simply show the geographical areas where the greatest number of crimes occur (for more details about hot-spotting techniques, see the manual by Clarke and Eck, step 21).

It is also often the case that different types of crime occur at different times of the day. This is important to know. For instance, if there were a large number of thefts in an area, and these tended to occur at night, it may be sensible to install improved street lighting. However, if they occurred during the day, it may be a waste of money to install new lighting. Thus, it is important to understand the main problems in an area before attempting to solve them.

Figures 1 and 2 below illustrate fluctuations in the time of year and the time of the day that crime occurs within the Knowsley NDC area. The figures shown relate to non-residential burglary[1], but a similar exercise could be undertaken for any other crime type. Figure 1 shows that there are certain months of the year in which non-residential burglary is more common; namely May and November. In contrast February, September and December generally have lower levels of this type of crime. Figure 2 shows a similar graph for time of the day. Here we see that there is a peak in non-residential burglary at about five o'clock in the afternoon, there is also a large amount of activity between eight and ten o'clock at night. This intelligence would be useful in, for

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[1] This includes burglaries to commercial premises, public buildings and organisations and also includes shed break-ins

example, the deployment of security guards to areas with a large number of non-residential properties. The activity of these guards would be particularly effective if concentrated into the months and the times of day for which non-residential burglary is particularly prolific.

Figure 1: The seasonality of non-residential burglaries in Knowsley NDC area
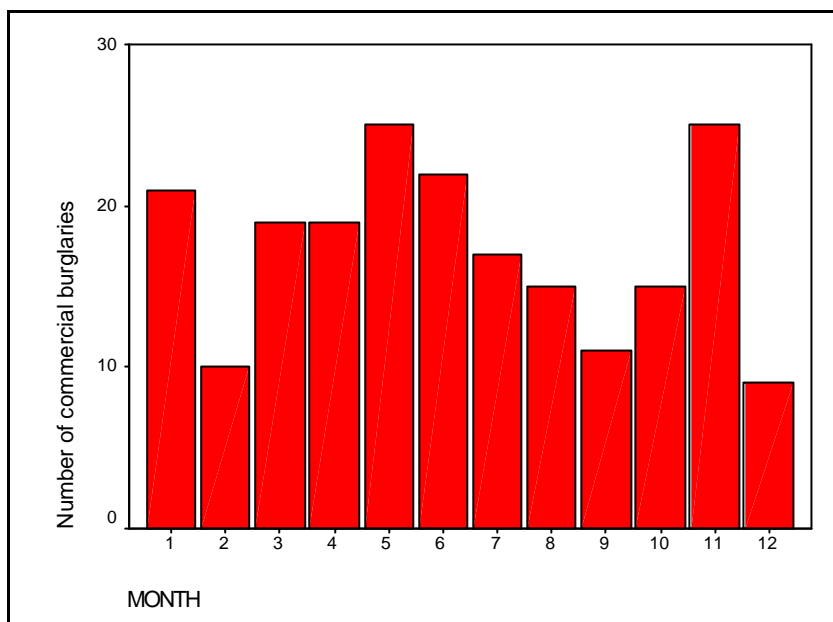
Figure 2: Temporal variation in the time of non-residential burglaries in Knowsley NDC
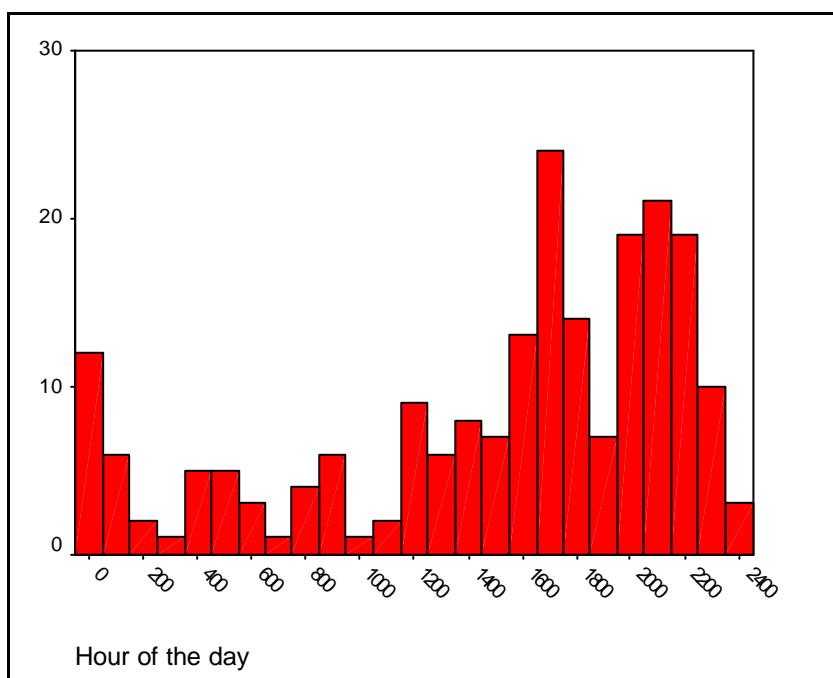
As suggested above, as well as looking at temporal variations in levels of crime it is also useful to look at spatial variations. Figure 3 below shows a simple hotspot map of non-residential burglary in the Knowsley NDC area. It can be seen that the number of burglaries experienced in each of the areas shown varies considerably. For instance, there is one area in the north that experienced 24 burglaries, but other areas where there were no burglaries at all. Once more such evidence can be used effectively at the

planning stage of an intervention to ensure that resources are being focussed into the areas that need them the most.

Figure 3: The spatial distribution of non-residential burglaries in Knowsley NDC
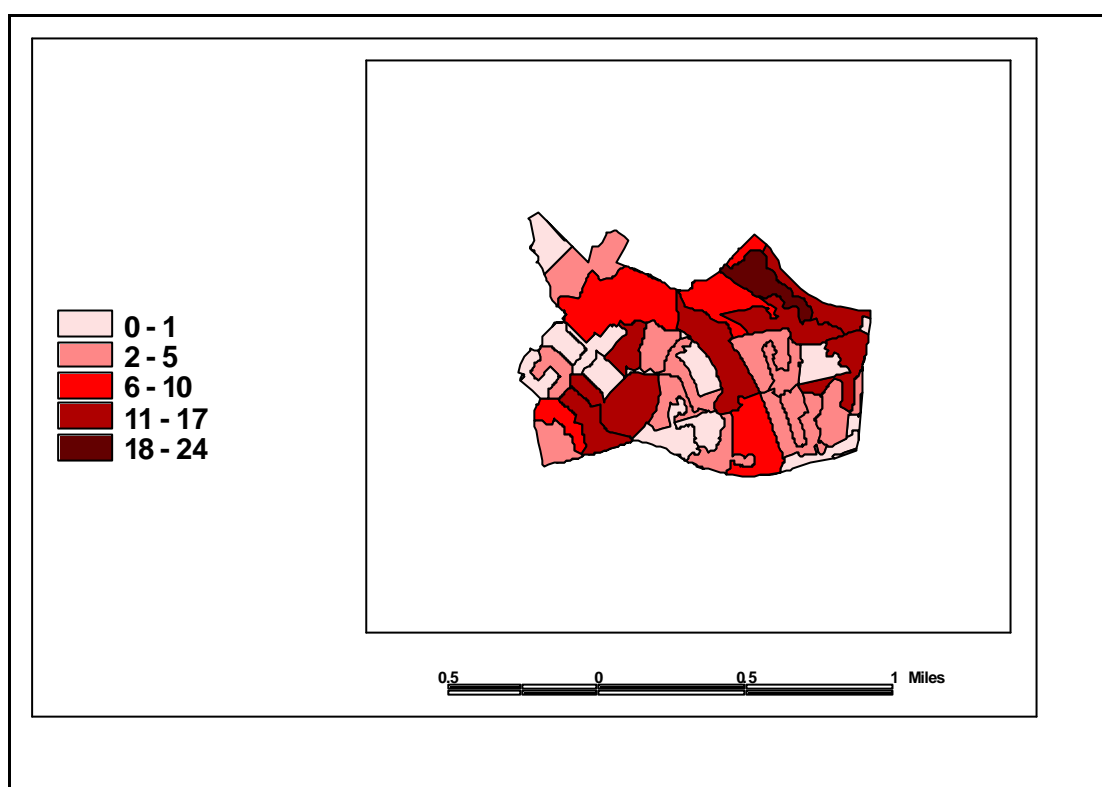
In this section we have considered only a few aspects of a crime problem; to truly understand what is happening in an area, and how problems might be reduced it is important to consider as much evidence as possible. For instance, is an area where a lot of robberies occur near a pub? or, do they occur at a time of day when a large number of vulnerable people are about? The factors that need to be considered will vary, depending on the area and type of problem. Common sense should be used to help identify what they might be.

3. Examining Theories of change

In order to further our understanding of the mechanism(s) by which interventions are effective, it is important to map the steps between the inputs, or what is done on the ground, and the desired outcome(s). One of the criticisms of the original delivery plan for the Knowsley NDC crime domain was that it was vague in terms of what actually was to be done as part of each of the interventions that would lead to a reduction in crime. It is important for practitioners and evaluators to document the work as precisely as possible prior to, and during the implementation of the intervention. Otherwise, it is entirely possible that money will be spent on initiatives that were not thought through, or for which there is no reason to expect that they will have any impact on crime.

This is an important stage in the pre-implementation process, and interventions should be selected on the likelihood that they will succeed, rather than popularity. If reasonable mechanisms through which an intervention might work cannot be identified, then alternatives should be pursued. However, it is acknowledged that the selection of

interventions is often politically sensitive and subject to the perceived needs of the community, so sometimes some compromise may be necessary.

To illustrate techniques that can be used to identify possible mechanisms (also known as 'theory of change' models), we will consider the interventions implemented in the Knowsley NDC in more detail. These were (broadly):

- installation of street lighting
- the introduction of Neighbourhood Wardens /Community Liaison Officers
- a dedicated Police Officer
- supply of security equipment to vulnerable residents and businesses
- inter-agency collaboration in crime reduction

Theory of change analyses can be conducted in a number of different ways. The important thing is to provide a clear explanation of the way in which the inputs (what has been implemented) will lead to the outcomes (reduction in crime). Appendix 2 shows a detailed theory of change analysis for street lighting. The box at the top is the input (new or improved street lighting). The blue boxes are known as the first order mechanisms, the white boxes the second order mechanisms or intermediate outcomes, and the grey boxes the desired outcomes. It is evident that there are complex relations and mappings between these different items. The mapping shows that there are numerous ways in which installing lighting could lead to reductions in crime. Where changes do occur, one of the challenges is to derive methods that can be used to assess which of the mechanism(s) were most likely to be responsible for the changes observed.

The following boxes summarise the various possible mechanism by which each of the interventions of the Knowsley NDC could achieve their desired outcomes. It is important to note that these have been produced or adapted by the scheme manager, Dr Michael Townsley, to assist him in the implementation of the schemes in practice. It is interesting that although Appendix 2 and the box referring to street lighting mechanisms below were produced in isolation (the evaluation team produced the figure; the box was adapted from Painter and Farrington 1999), there is a large amount of overlap between them.

Having identified the mechanisms through which an intervention may work, it is then important to identify possible interim outcome measures that may help isolate which of a series of chain of events is the most likely mechanism through which change might occur. This is an important step, as to be able to say that a particular intervention caused a particular effect, it is necessary to link what was done with any changes in the crime rate. Moreover, if there are a number of potential mechanisms that could cause a change, it is advantageous to be able to say which it was that caused the change. In order to do this it is necessary to be able to measure or document what has been done and at what point in time. It is also necessary to be clear about what information would allow a specific hypothesis to be tested. For instance, in the case of improved street lighting, in order to determine whether the mechanism SL2 might have caused a reduction in crime, it would be necessary to see if there was an increase in street usage. To do this, it would be necessary to measure street usage both before and after implementation. Other similar approaches may be used to examine the other possible mechanisms.

Box 1: Street lighting mechanisms (adapted from Painter and Farrington)

- **offender de-motivation via visibility** - offenders are deterred because they are easier to see
- **offender de-motivation via surveillance** - greater levels of light facilitate increased street usage providing more guardianship
- **offender de-motivation via combination of visibility and surveillance** - the interaction of improved visibility and surveillance produce a situation where guardians are greater in number and have greater vision
- **offender de-motivation via investment** - an obvious capital investment throughout the entire area is a sign to offenders that the social control, surveillance and general order have (perceptively) increased. Crime opportunities are seen to be riskier here than elsewhere
- **community confidence via investment** - fear is reduced because there is an obvious sign of investment in the area by authorities
- **SL6) safety** - well lit areas are perceived as less dangerous than poorly lit ones

Box 2: Neighbourhood Wardens Mechanisms (constructed by Dr Mike Townsley)

- **guardianship for suitable targets** - the increased protection of otherwise suitable targets dissuades offending
- **handling for motivated offenders** - as relationships develop between NWs and young people NWs may function as role models for some individuals
- **disruption of offenders** - NWs will refer serious acts of criminality or anti-social behaviour to police. A Pavolian effect may develop whereby the presence of NWs is associated with the police and individuals, on seeing the NWs may move on voluntarily or abandon opportunities
- **removal of subnormal cues** - by rapidly removing signs of neglect and decay, cues about the values of the area will be realigned to more prosocial values
- **provocative agent removal** - the degree of substance abuse (mainly alcohol) by minors is substantial. NWs will play a part in restricting young people's access to drugs which alter decision making either directly (confiscation) or indirectly (terminating the supply)

Box 3: Police - Patrols and Schools (constructed by Dr Mike Townsley)

- **official attention on prolific offenders** - bringing intense police action to those individuals who are disproportionately responsible for levels of crime. This may include policing of conditional bail, routine patrolling outside certain houses, being placed under surveillance
- **offender disruption via increased police visibility** - increased police contact with potential offenders results in changed routine activities (eg no longer able to loiter at particular corner). In addition, the bright yellow NDC police van will be deployed extensively throughout the area
- **offender incapacitation via increased police contacts** - evidence based police operations will bring the police into contact with individuals that they have powers over at a far greater extent than is currently achieved

Box 4: Police: Domestic Violence (constructed by Dr Mike Townsley)

- **offender de-motivation via rule enforcement** - the police will inform the offender that their actions constitute a criminal act and are not tolerated by the police. This reinforcement of appropriate conduct may be sufficient to check the violent behaviour or at least remove the excuse
- **victim protection via establishment of personal networks** - assisting victims re-establish contacts with family and friends increases the guardianship of the victim. Often these contacts are broken as a deliberate tactic of the perpetrator to exercise control of the victim
- **DV reduction via the combination of rule enforcement and establishment of personal networks** - it is likely that is the combination of rule setting and enhanced network interacts to reduce repeat incidents
- **victim protection via enhanced proximal guardians** - the incorporation of a type of cocoon neighbour watch will increase guardianship for the victim
- **offender de-motivation via rapid response alarms** - the use of personal attack alarms monitored by a third party which alert police in the event of a DV incident will increase risk of apprehension for offenders

Box 5: NDC and Knowsley Housing Trust Tenancy Enforcement Unit collaboration (constructed by Dr Mike Townsley)

- **removal of persistent transgressors** - the expulsion of the worst problem families will reduce a proportion of crime and nuisance alone
- **improved place management via general deterrence** - action taken against the worst offenders will signal to the entire community that no one is immune from official sanction for inappropriate behaviour
- **improved place management via specific deterrence** - communicating potential future action (eg eviction) contingent on a breach of tenancy to a cohort of households with an unambiguous reference to recent activity (eviction of a well known problem household) will motivate households to act in a manner consistent with the wider community
- **improved place management via intervention provision** - the problems of households causing nuisance will be remedied by providing relevant services that will build capacity. For example, if the parent/s is/are not able to control children under their care, access will be gained to a parenting skills course
- **improved place management via combination of specific deterrence and intervention provision** - it is the combination of an explicit threat with provision of a solution that halts the continuation of the undesirable behaviour
- **TEU6) changed neighbourhood values** - as action is taken toward the worst of the problem households, the community sees that certain behaviour will be challenged. This allows residents to foster a healthy degree of intolerance towards crime and nuisance. As values change, the degree of informal social control prevents other households from offensive behaviour

4. Collecting information on scheme intensity

To evaluate the effectiveness of a scheme, and to make it possible to determine whether or not any changes were actually attributable to the scheme, rather than other factors, it is necessary to collect information known as intensity data. This will include detailed information on what is being implemented as part of the Crime Theme activity.

One example of a way of doing this is evident in Knowsley, where Dr Townsley has been recording information relating to the implementation of initiatives in an event diary. Entries into this diary give details of, for example, what equipment has been purchased and what has been implemented. It also provides details of where and when the measures were implemented, and where relevant, who the recipients of the measures were. This type of record provides invaluable information about the timing and intensity of the implementation process. And can be used to see if reductions in crime occurred when the measures were implemented, and if this was particularly the case where they were implemented. This assists considerably in determining that the reduction in crime was due to the action taken. Other evidence provided by the scheme can be invaluable to assessing the impact of the scheme and relating any reductions seen to the activity of the scheme. Some examples include victimisation surveys and output tracking. Appendix 1 lists the information that is being collected by the Crime Theme manager of the Knowsley NDC.

# 5.   Examining the underlying context of the scheme

As well as gathering information on the mechanisms through which schemes might achieve their objectives, and on the timing of activity on the ground, it is also useful to know as much as possible about the context in which a scheme has been implemented. This is because exactly the same scheme implemented in two different places could have a very different effect because of the nature of the areas. For example, an initiative aimed at young people might have more of an effect on crime levels in an area in which there are a lot of young residents.

An idea of the nature of the area can be produced by generating a 'profile' of the area in terms of its socio-demographic characteristics. To do this, it is necessary to firstly define the NDC area on a map. This was done for the Knowsley scheme using a Geographical Information System (GIS). The advantage of using a GIS is that different types of administrative geographical boundaries can be used and compared. In order to generate the NDC profile, it was necessary to define the area in terms of UK Census 2001 Output Areas (OAs)[2]. This was due to the fact that the population census is the only reliable countrywide source of socio-demographic data.

Figure 4 below shows how the NDC area (shown in red) relates to census geography: in this case census wards. The NDC area itself is mainly made up of OAs from two wards; Longview and Princess. In all, the boundary incorporates 38 different OAs in whole or in part. If the NDC had comprised only complete OAs (i.e. if there were no OAs that were partially located within the area), the generation of the NDC profile would have been straightforward. In this case, the profile could have been derived by simply adding up the values for each OA for every social or economic variable considered (e.g. the population or the number of terraced houses). However, this was not the case and hence an alternative approach was required, as follows. Where an OA was only partially located within the NDC boundary it was necessary to decide how much of the population (and other characteristics) should be apportioned to the NDC area. To make the approach systematic, this was done by considering how much of the physical area of a particular OA overlapped with the NDC area. For example, the proportion of the OA BXFG0001 that fell into the NDC area was 0.23, whereas for BXFP0002 the entire OA was within the boundary and hence had a proportion of 1.0. Thus, in the case of the former, 23% of the population was apportioned to the NDC, whereas, in the case of the latter the entire population of the OA was used. It should be noted that any OA where the proportion was less than 0.05 was omitted from the action area definition.

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[2] Output areas are the smallest areas for which 2001 census data are made available

Figure 4: Ward boundaries and the Knowsley NDC area
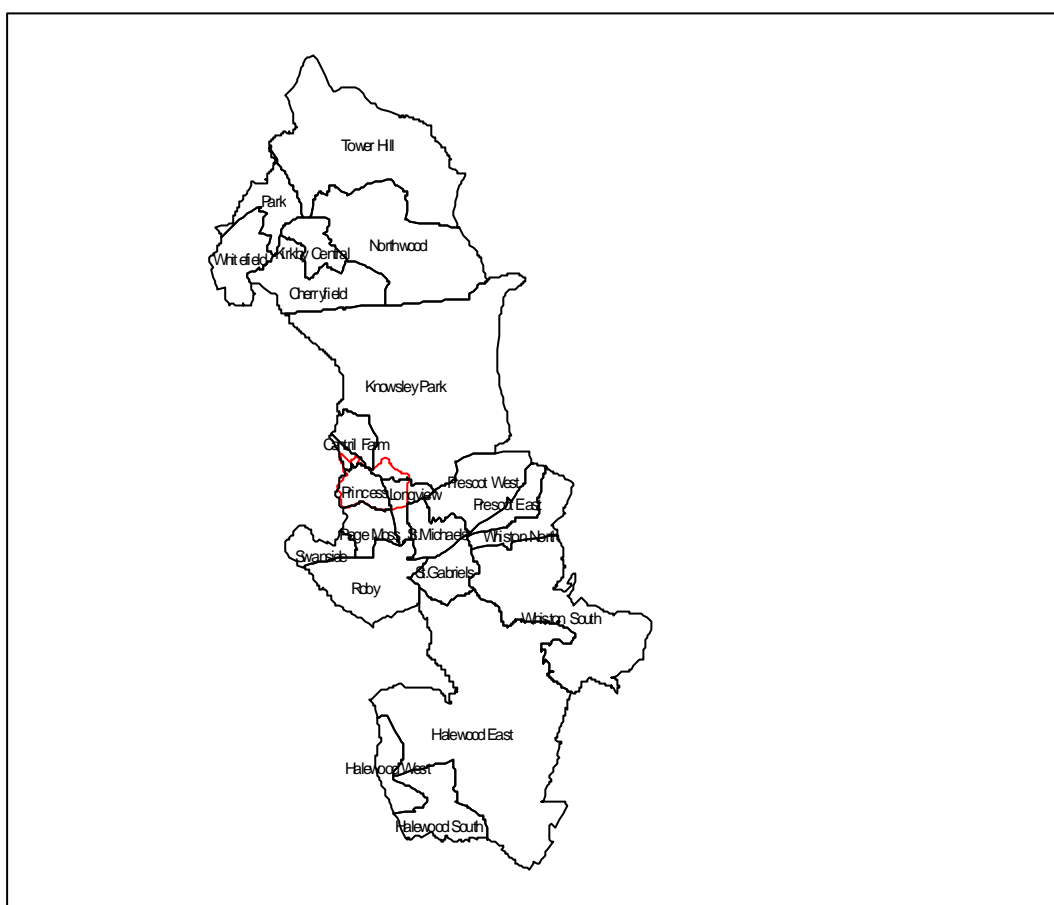
Using this technique, a social demographic and land use profile was produced using a tool developed for earlier research (Hirschfield and Bowers, 1997). The original procedure aggregated census data to a defined area using Enumeration District level data from the 1991 population census. This has now been updated to enable profiles to be produced using Output Area data from the 2001 census. The procedure has the advantage that it scales the results using information on the proportion of each OA that is within the area boundary, as suggested above. Table 2 below gives statistics on some key census indicators for the Knowsley NDC area.

In Table 2, three levels of measurement are included. These are provided for all variables where they are appropriate. For the purposes of illustration, these measurements will be described for one variable; the number of detached houses.

1. The first column shows the total count of detached houses in the Knowsley NDC (261).
2. The second column shows what proportion of the relevant denominator (in this case the total number of houses) the total figure represents within the NDC. Thus, in the Knowsley NDC only 6 percent of the properties in the area were detached houses.
3. The third column shows how typical the total figure is for England and Wales. The measure, known as a location quotient, has a minimum value of zero. If the value is equal to 100, this indicates that the percentage of detached houses in the area is the same as the average for England and Wales as whole. If the value is less than 100, this means that, compared to the whole of England and Wales there are fewer detached houses in the NDC area than typical. If the value is greater than 100, this indicates that there are more detached houses compared to the typical number

in other areas of England and Wales. In the Knowsley NDC, the location quotient is only 26, indicating that compared to the national picture, there are very few detached houses in the Knowsley NDC.

For some of the variables in Table 2, such as the residential population, only the total value is provided. This is simply because the value in question is purely the 'denominator'. As this is the total for the area, values for the last two measures cannot be derived. The value for the second column (%total) would always be 100%, and it is therefore also excluded.

Table 2: A Social, Demographic and Land Use Profile of Huyton NDC

Variable	Count	Percentage (Knowsley)	Location Quotient
Households	4019	N/a	-
Residents	9586	N/a	-
Aged 0-4 Years	747	8	133
Aged 5-9 Years	889	9	150
Aged 10-14 Years	926	10	143
Aged 15-17 Years	521	5	125
Aged 18-19 Years	271	3	150
20-29	1071	11	85
30-44	2128	22	275
45-59	1343	14	64
60-64	497	5	26
65-74	723	8	160
75+	469	5	63
Households Without A Car	2515	64	237
Households With Two Or More Cars	232	6	20
Dinkies	295	8	44
Persons Unemployed	663	24	480
Persons Aged 16-74 With No Qualifications	3697	58	200
Lone Parent Households	1126	29	290
Ethnicity-White	9447	99	109
Ethnicity-Mixed	134	1	11
Vacant Properties	95	2	67
Detached Properties	261	6	26
Semi-Detached Properties	770	19	60
Terraced Properties	2709	67	258
Flats	281	7	350

Table 2 shows that the NDC area is primarily made up of terraced housing, with some semi-detached housing and very few detached houses. The age profile of the action area is quite distinct to that of England and Wales as a whole, with a greater number of juveniles and young adults than average resident within it. There is also an under-representation of elderly people in the action area. The unemployment rate (24%) is almost five times what it is on average across the whole country (the location quotient for this variable is 480). There are also higher than average proportions of households headed by a lone parent. There is a large under-representation of households with two or more cars, and an over-representation of those without a car. There is also a smaller than average number of non-white residents and higher than average number of people with no qualifications.

This profile gives us some clues as to the problems that the NDC area faces and the types of initiative that are likely to make an impact. For example, schemes focussing on young people might be useful given the population's age profile and crime prevention measures that can be used in terraced housing would be potentially beneficial (for example, target hardening or alley-gating if the set-up of the alleys are suitable).

6.   Measuring scheme outcome

Outcome analysis is concerned with the degree to which a scheme has achieved its original objectives, such as causing a reduction in the level of crime in an area. In order to learn valuable lessons for future practice, it is important that outcome analysis is undertaken. There are a number of different methods which can be used to assess the outcome of a scheme that are traditionally used in evaluation research. Here, we use some of these methods with the data available at this stage for the Knowsley NDC. The current analysis therefore looks for broad patterns that are evident to date in the New Deal area, and demonstrates the methods that can be used and developed in outcome analysis.

To examine the effect of a scheme on levels of crime, a number of steps are required. The first of these is to acquire data on the crimes that should be affected by the measures. It is important to recognise that certain crimes may be affected directly by a scheme. For instance, a direct effect would be evident where offenders are deterred from committing that type of crime. Alternatively, a scheme may have a less direct impact on a particular type of crime. For instance, where offenders desist from committing one type of crime but instead commit another (crime-switch displacement). Thus, it is important to collect data on all types of crime that may feasibly be affected by a scheme (either directly or indirectly).

To do the job properly, it is necessary to collect a large amount of crime data for which the locations and times of the offences are known. For the purposes of this report we have acquired disaggregate crime data for the following crime types for the entire county of Merseyside for the period between 1 April 1999 and 31 March 2003: assault, robbery, burglary (dwelling), burglary (other)[3], theft from car, theft of car, theft from person, simple theft and theft from shop. The data includes the following fields of information: a crime code; the address of each offence, stored as free text; the date of the offence; and, the geographical coordinates of the offence, stored as X and Y coordinates (accurate to a resolution of 1 metre). These data, extracted in an ASCII format, were then imported into a database and cleaned. To do this it was necessary to remove duplicate records, those without X and Y coordinates, and those without dates. Due to the large amount of events for some crime types, the data were extracted as a series of files. After the data had been cleaned they were imported into a Geographical Information System (GIS).

6.1.   Data Manipulation

Before the analyses could be conducted it was necessary to process the data to make it suitable for this task. For each crime type, using a GIS, we were able to count how many incidents occurred within the NDC boundary and elsewhere. More specifically, the GIS processing allowed us to generate a new dataset that contained information on every crime event including the date and location of the offence, which police beat and police Basic Command Unit (BCU) it occurred in and whether or not it occurred within the NDC boundary or nearby.

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[3] This is also known as non-residential burglary

The datasets were then imported into a statistical computer package, SPSS, for further processing. For each dataset, this included adding an additional field to each crime event to indicate in which year and financial quarter it occurred, and aggregating the data to produce a file which contained the quarterly counts of crime for a series of areas, these being: the NDC scheme, a surrounding area or buffer zone (see page 19 below), the BCU (Basic Command Unit) in which the scheme was located and, the remainder of the Merseyside Police Force Area (PFA).

6.2. General Trends

To examine the general change in the NDC area, we compared the changes within the NDC area with those apparent across a suitable reference area. To do this, we computed crime ratios using both the PFA and the BCU as the reference area. A crime ratio is simply the total volume of crime in one area divided by that in the other. For example, to compute a crime ratio that compares the NDC area with the PFA, the following formula would be used:

Crime ratio = $\dfrac{\text{Volume of crime in the NDC area}}{\text{Volume of crime in the PFA}}$

As the Knowsley NDC scheme did not begin until October 2001, the after period (that during which the scheme was operational) was simply the period 1 October 2001 to 31 March 2003, the final six quarters for which data were available. However, for the period before implementation, it was possible to derive counts for a number of periods of time ranging from 1 to 10 quarters. For the analyses presented in this section, we limited the historic period to six quarters to ensure that the before and after time periods were comparable in terms of time.

To begin with, we computed crime ratios for the periods before and after the start of the scheme for a series of different types of crime. The pattern of results obtained for the two sets of analyses (those using the PFA as the reference area, and those using the BCU) are shown as Figures 5 and 6. To ease interpretation, the crime ratios shown were multiplied by factors of 1000 and 100 respectively. The results demonstrate that, relative to the PFA (and BCU); there were changes in the ratio of crime in the NDC areas for all crime types. This suggests that the changes in the raw counts of crime within the NDC area cannot be entirely explained either by changes apparent across the entire police force or at the more local (BCU) area level.

Figure 5: Before and after crime patterns (crime ratios derived relative to the PFA)
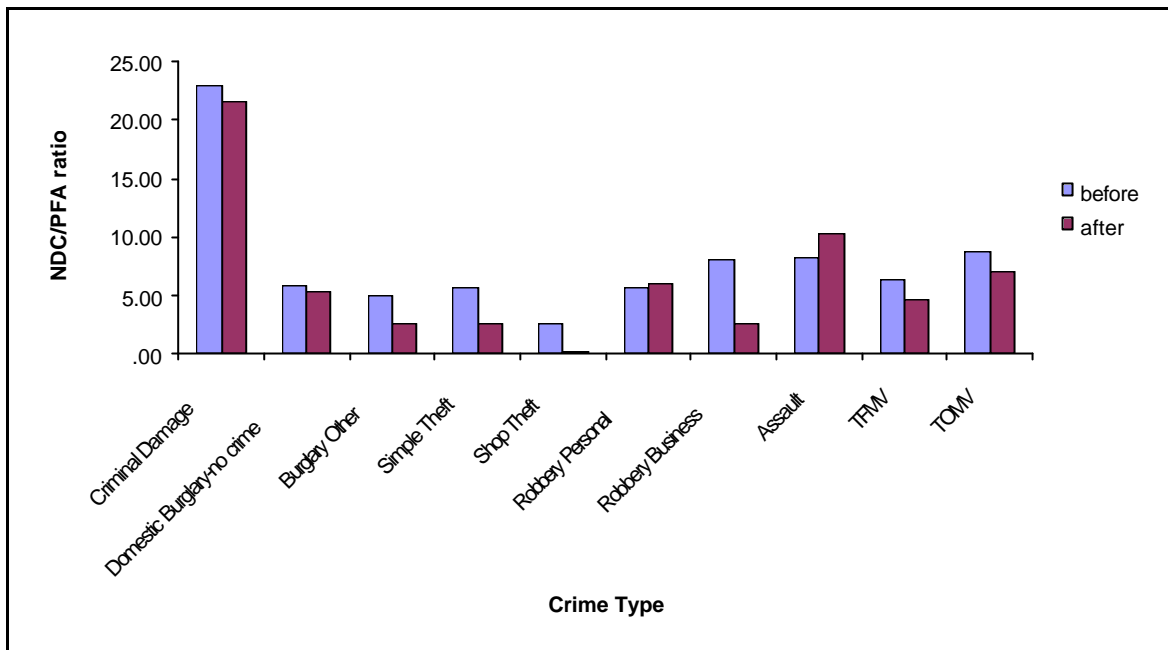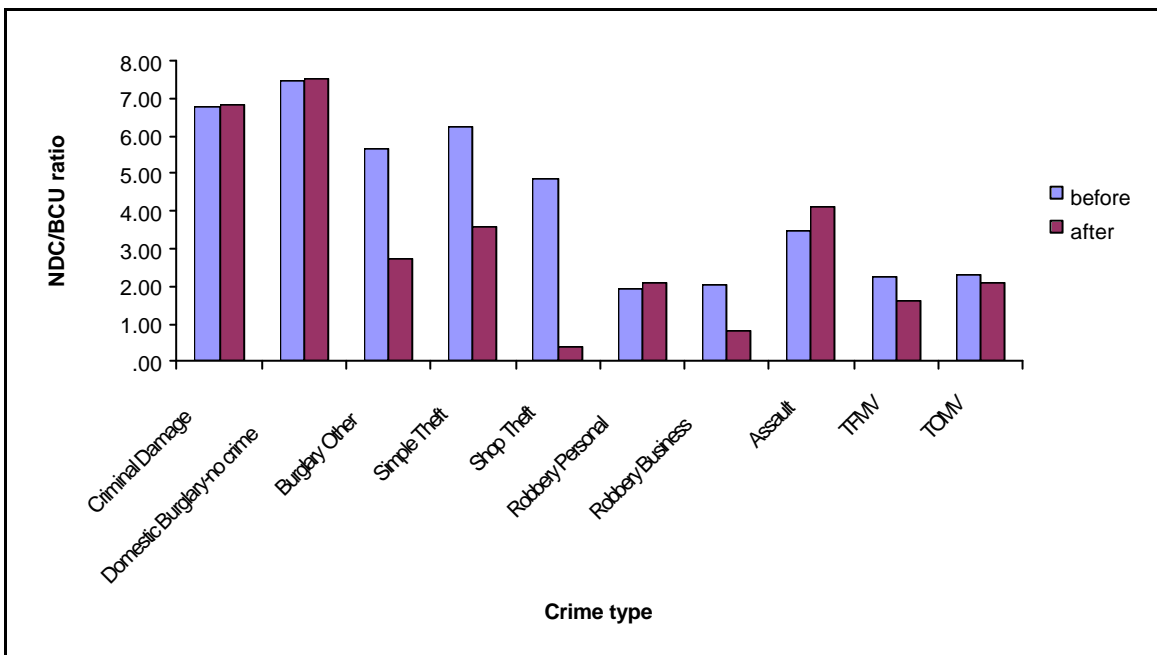

Figure 6: Before and after crime patterns (crime ratios derived relative to the BCU)

It is also apparent that the changes vary across the different types of crime, with increases being evident for some crimes and reductions for others. For example, it appears that there were decreases in commercially related crimes such as burglary other, shop theft and robbery from businesses. In contrast, there have been some small increases in a number of personal crimes such as robbery and assault since the start of the scheme. However, the results presented in the above Figures are purely descriptive and do not indicate whether the changes observed are simply due to chance fluctuations.

To extend the analysis, it was therefore necessary to use another technique that could test the statistical significance of the changes. Simply put, where a change is found to be statistically significant it is unlikely that it could have been the result of chance, and hence it is likely to be a reliable change.

To illustrate the type of statistical tests that can be used, we computed odds-ratios. An odds ratio is computed in much the same way as a crime ratio - by comparing the changes in one type of crime (or series of types of crimes) in two areas, one an action area, the other a comparison area. An odds ratio of exactly 1 indicates that the changes in the two areas were identical, which would suggest that a scheme had no effect on that type of crime. An odds ratio of more than 1 (e.g. 1.5) indicates a positive outcome, where the level of crime in the action area decreased over time relative to the change apparent in the comparison area. In contrast, an odds ratio of less than one (e.g. 0.7) indicates a detrimental pattern, where the level of crime essentially rose in the action area, compared to the comparison area. To test the statistical significance of the odds ratio, a confidence interval is also calculated, which is explained in more detail below. Odds ratios can be derived using a variety of reference areas. Here we use both the BCU and PFA.

Rather than listing the results of this analysis in a table, they are presented in Figures 7 and 8. The figures show reductions in several crimes (all those with an odds ratio greater than one; to the right of the reference line). However, only those whose confidence intervals (shown as horizontal lines) do not intersect with the reference line at a value of exactly one, are statistically significant. Only burglary 'other' (non-residential burglary) shows such a quality for both the analyses conducted using the BCU and the PFA as the reference area.

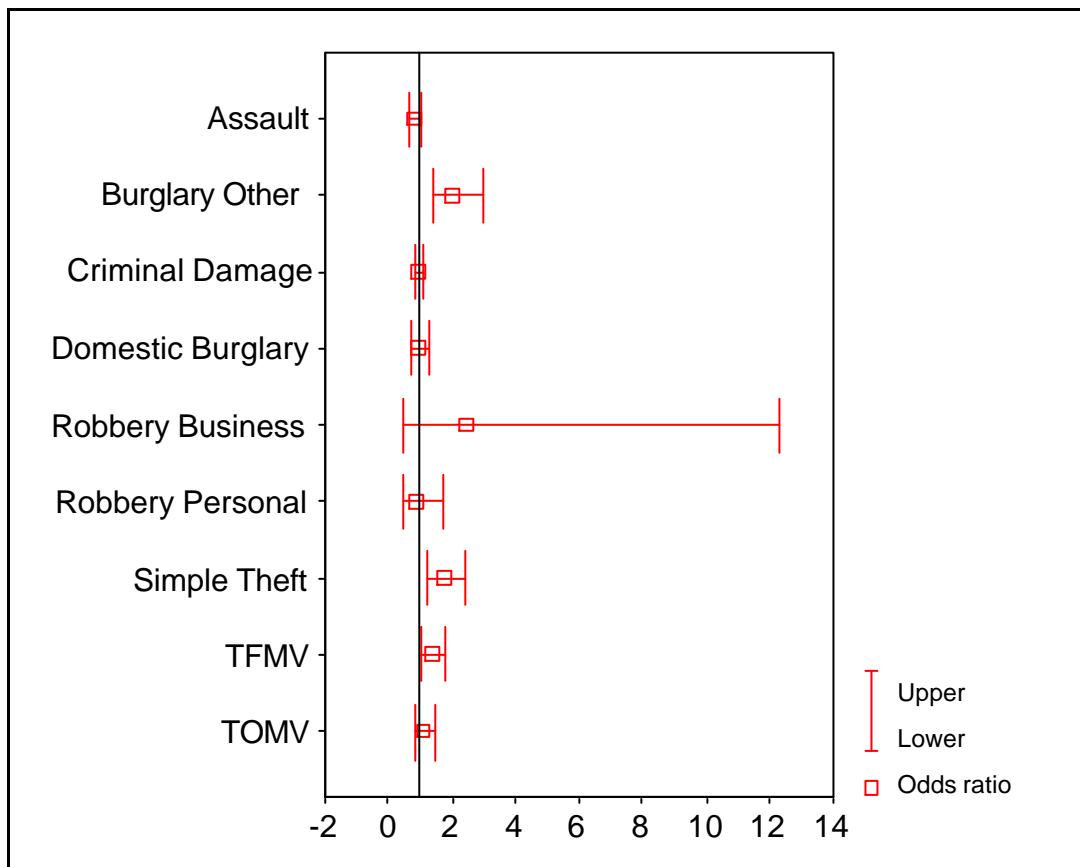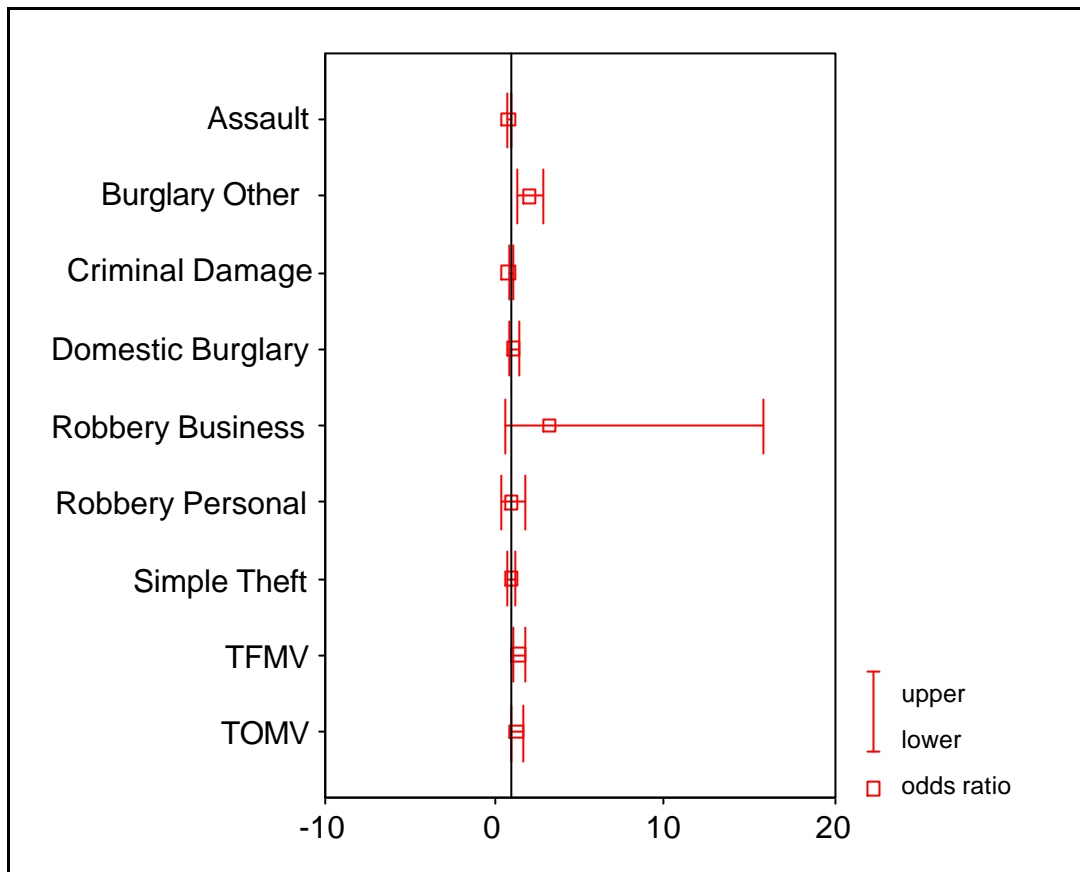**Figure 7: Odds-ratios using the BCU as the reference area**

Figure 8: Odds-ratios using the PFA as the reference area

So, what does this tell us so far? It is apparent from the analyses shown in Figures 7 and 8 that, since the start of the Knowsley NDC, there have been changes in a number of different types of crime. Some have been reductions whereas others have been increases. However, despite this, so far the only change that would appear to be statistically significant is that for the crime type burglary other (essentially crimes against businesses). It is possible that there may have been other changes in the levels of crime since the 31 March 2003, but these will not be considered here.

It is important to note that even though changes have been observed, this alone is not sufficient to link them to the NDC scheme. The reason for this is that other things may have changed in the NDC area, or the comparison area, over the same period of time. Consequently, to attribute the change to the NDC, it is necessary to do further analyses, which will now be discussed.

6.3. Simple time-series analysis

As discussed above, information on when and where things have been done have been recorded for the Knowsley NDC using an event diary. This should allow us to examine the relationship between changes in levels of crime and the timing and intensity of implementation. This type of approach, commonly referred to as a dose-response analysis, has been used for some time in medical research. The basic principle is that if a drug (or in our case, a crime prevention intervention) is successful then a change in symptoms (for us levels of crime) should occur when the drug is administered and, (up to a point) increases in the amount or potency of the drug should lead to a greater change in symptoms. In relation to crime prevention, this means that if an intervention is successful, reductions in crime should occur when interventions are implemented, and greater reductions in crime should be observed as the amount of crime prevention

activity increases. Thus, relating what is being done by the NDC to changes in levels of crime should allow us to determine if any reduction in crime observed is attributable to the NDC, or if it is more likely to be explained by other factors.

In the evaluation of the NDC, it is hoped that data concerning the timing and dosage of different crime prevention measures will be available for each of the 39 schemes (e.g. when and how many locks or CCTV cameras were installed). Where this is the case, it will allow the evaluators to conduct robust dose-response analyses using statistical techniques. This type of analysis will be fully illustrated further when the information on intensity becomes available and the individual interventions have been running a sufficient time to enable reliable analysis at this level.

However, here we can illustrate the basic principle using a more simple technique by examining the crime trends and the timing of implementation using a simple time-series graph. To do this, we first plotted the quarterly crime ratios for each crime on a graph. Next, we marked the start date of the scheme on the graph. The results of these analyses are shown as a series of graphs for property crime (Figure 9), crimes against the person (Figure 10), and crimes against businesses and vehicle crime (Figure 11).

Figure 9: Crime ratios for property crime for the Knowsley NDC (derived using the PFA as the denominator)
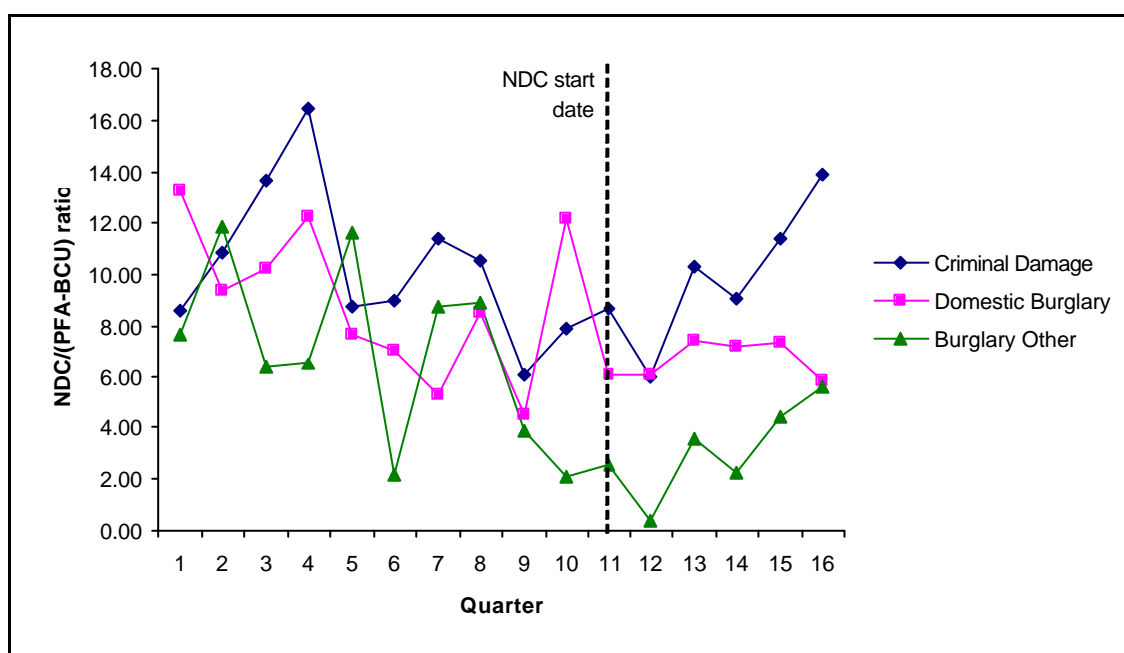
Figure 10: Crime ratios for personal crime for the Knowsley NDC (derived using the PFA as the denominator)
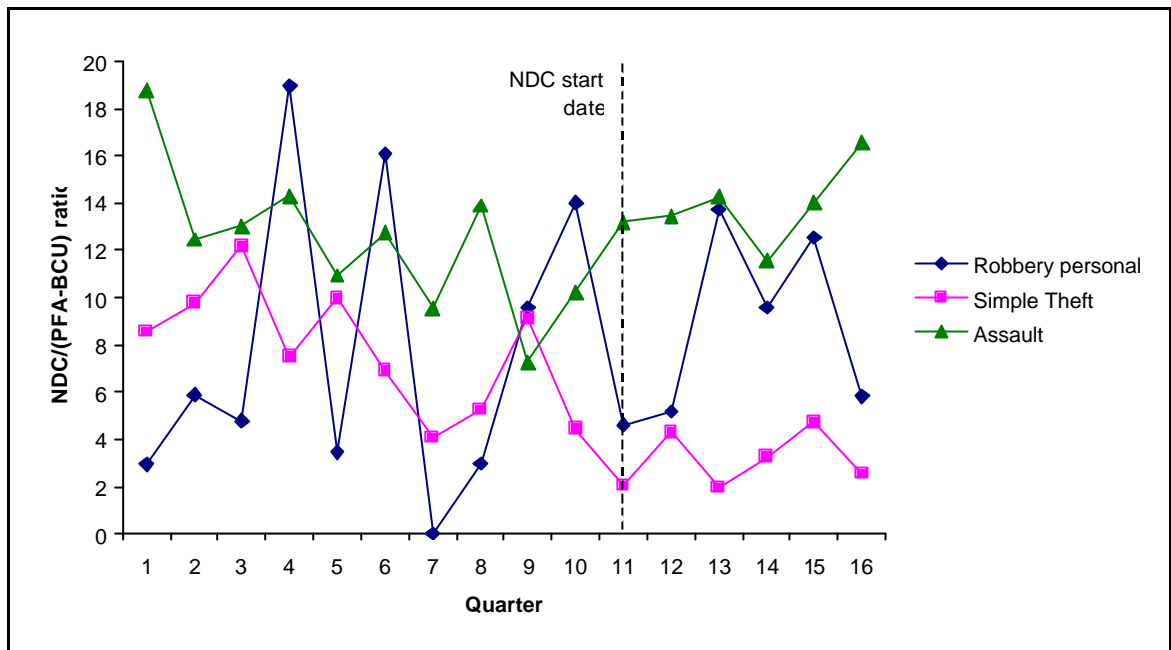
Figure 11: Crime ratios for crimes against businesses and vehicle crime for the Knowsley NDC (derived using the PFA as the denominator)
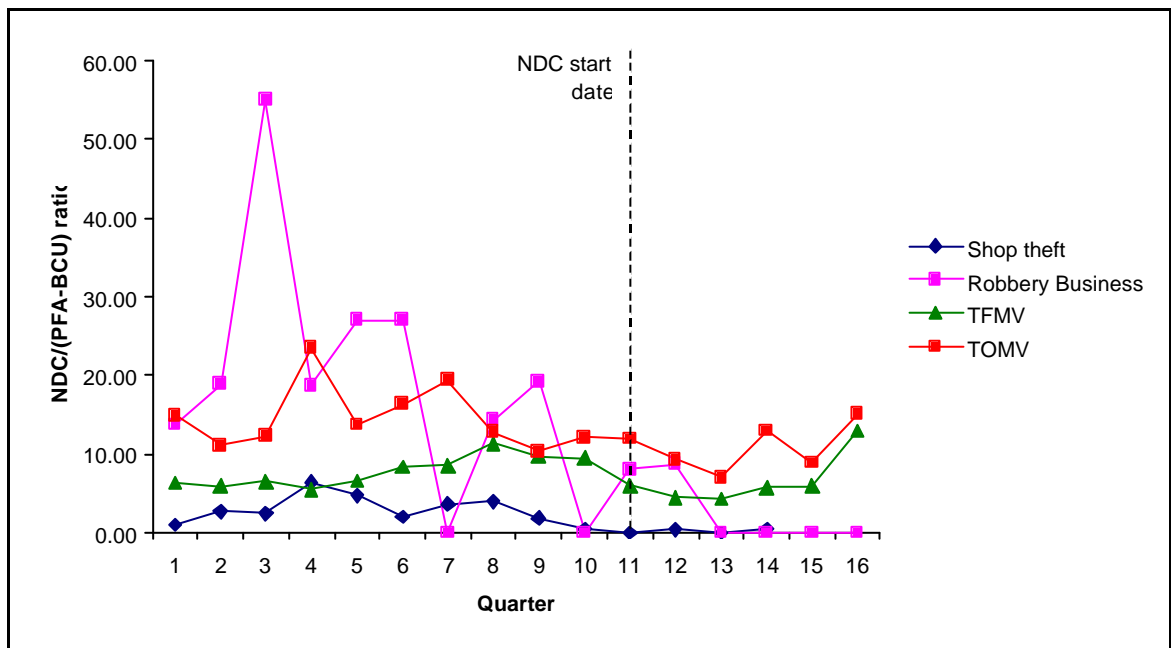
Figure 9 shows that although burglary other is, in general, lower following the start of the NDC, it appears that this type of crime was falling before the NDC began. Moreover, the results suggest that levels of this type of crime began to rise in quarter 13 and continued to do so through to quarter 16. This suggests that the change in this type of crime was unlikely to be entirely attributable to the NDC.

Domestic burglary appears to remain fairly steady following the start of the scheme inception, whereas criminal damage, again, appears to increase during this period. Interestingly, the level of these two types of crime also appear to decrease during the 'before' period; with levels between quarter 6 and quarter 12 being lower than those

between quarters 1 and 5. Similar results are evident in Figure 10, for personal crimes, although the time lines are more difficult to interpret due to the fact that these are lower volume crimes.

For vehicle crime (shown in Figure 11) there is perhaps more consistency in the crime trends over time. For robbery against businesses there is a decrease following the start of the scheme, although again there was evidence that this downwards trend began before the inception of the scheme.   One explanation for this fairly widely seen decrease in crime in the period before the start of the scheme might be that another initiative was launched within the Knowsley NDC area before the NDC began to operate which was effective at reducing crime.   A further possibility is that word of mouth warned offenders that something would be happening in the area soon, which leads to crime reduction (Bowers, K. J. and Johnson, S. 2003).

The time-series graphs shown, although very simple, illustrate the need to conduct more complex analyses than the before and after analyses routinely used in evaluation research. In the absence of time-series analyses it is easy to attribute changes in an area to NDC activity when this is simply not the case.

As noted above, more complex statistical analyses can be conducted to relate the changes in an area to NDC activity. Moreover, where the appropriate data have been collected, it is possible to test theory of change models such as those discussed above. The importance of doing this is that it can help us to understand what it was about a scheme that caused the changes observed so that lessons can be learned, and the scheme replicated elsewhere.

For instance, we could test the theory that improved street lighting leads to an increase in the use of an area which, in turn, leads to a reduction in crime. To do this, we would need to acquire data concerned with the timing of the installation of the lighting, area usage and levels of crime. In this case, to test the proposed mechanism of change (that improved lighting leads to an increase in area usage) we would want to see if there was an increase in area usage around the time that the lights were switched on. Further, that area usage increases with the number of lights that are switched on. Next, we would wish to see if reductions in crime also took place just after area usage increased. If we found no increase in area usage following implementation, but there was a reduction in crime, we could rule out the proposed theory. If, however, there was an increase in area usage that was swiftly followed by a reduction in crime we could conclude that changes in area usage are likely to contribute to crime reduction in street lighting initiatives.

In order to do this, it would be useful to have, amongst other things, the Value for Money (VFM) data generated for the NDC evaluation.   This may need to be supplemented by local information depending upon the nature of the data. The data will hopefully allow us to track the finance invested into the scheme over time (ideally on a quarterly basis). This could be used to derive a measure of intensity.

7.   Measuring displacement and diffusion of benefit

There are a number of different types of possible displacement and diffusion of benefit as a result of the scheme.   The issue of whether initiatives just cause crime to move elsewhere is often raised and it is therefore important to consider this. Two of the most widely debated forms of displacement are geographical displacement and crime switch displacement, which we now discuss in turn.

Geographical displacement occurs when crime that would have been committed within a particular area, simply takes place elsewhere. The problem is therefore simply 'shifted' to another location. Equally, it is important to explore the possibility that the positive effects of scheme activity may have extended beyond the operational boundary of the schemes - a so-called 'diffusion of benefit'. To examine this issue, in addition to considering changes in the level of crime in an NDC area, it is necessary to consider changes in the area which surrounds it, subsequently to be referred to as a 'buffer zone'. As with the examination of changes in levels of crime within the NDCs, it is critical to relate the changes in the buffer zones to those observed in the wider area, to consider what would have happened in the absence of NDC activity. If, following NDC activity, there is a decrease in crime in the NDC area which is coincident with an increase in the buffer zone, it is possible that geographical displacement occurred. However, if under the same circumstances, there was a decrease in the level of crime in the buffer zone, then it may be reasonable to assume that there was a diffusion of benefit.

A number of different approaches to studying geographical displacement have been proposed. We will illustrate using a systematic method we developed for earlier work here; an approach which generates a "Weighted Displacement Quotient" (WDQ) (for further details, the interested reader is referred to in the crime analysis manual by Clarke and Eck).

Figure 12 shows a cartographic map of the Knowsley NDC and surrounding area. The buffer boundary identified is made up of a series of concentric rings which have the same morphology as the NDC area itself. The map shows five different concentric rings, each of which are 100 metres in width. The first buffer, for example, begins at the scheme boundary and ends 100 metres from it in all directions. The fifth buffer begins at 400 metres from the boundary and ends 500 metres from it. Having a series of five concentric buffers will allow us to track crime movement over time. Past research, for example, has found a diffusion of benefit within the closest buffers to the scheme and displacement within those slightly further away.

**Figure 12: Knowsley NDC with geographical buffer zones**
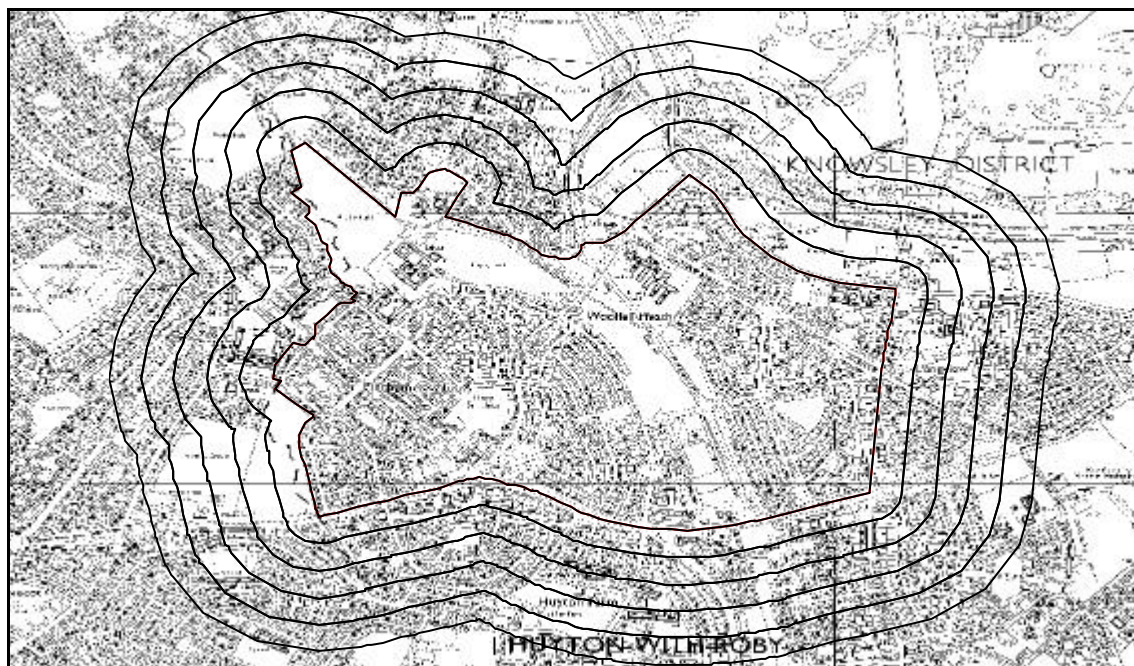
To examine the issue of displacement, levels of crime were established for the NDC area, each of the buffer zones and, for the remainder of the Basic Command Unit (the reference area).

Importantly, the starting point for displacement analysis is to examine whether, relative to the reference area, there is a reduction in crime in the NDC area following the implementation of the interventions. This is a critical step. If there is no reduction in the NDC area, or this change is simply in line with that in the reference area (so the change is not attributable to the scheme), there will be no reason to look for displacement or diffusion of benefit as, by definition, these could not plausibly occur. If however, there is a reduction in the NDC area (compared to the reference area) that can be attributed to the scheme, the search for displacement and diffusion of benefit will begin.

Figure 13 below shows the changes in the level of crime in the five different geographical buffer zones. Importantly, this figure only examines these changes for one crime type: non-residential burglary. This is because the outcome analysis above revealed that this was the only crime type for which a significant reduction in crime was observed in the action area. Geographical displacement or diffusion of benefit would not be expected if this reduction had not been observed. The figure shows that in the closest buffer zone to the action area boundary, there was no change in the amount of non-residential burglary experienced following the scheme. It is unlikely that any geographical displacement or diffusion was encountered here. However, there is a particularly substantial drop in the non-residential burglaries occurring in the second buffer ring. This could be indicating some possible diffusion of benefit of the scheme within this ring.

Figure 13: Change in the number of non-residential burglaries in the buffer zones
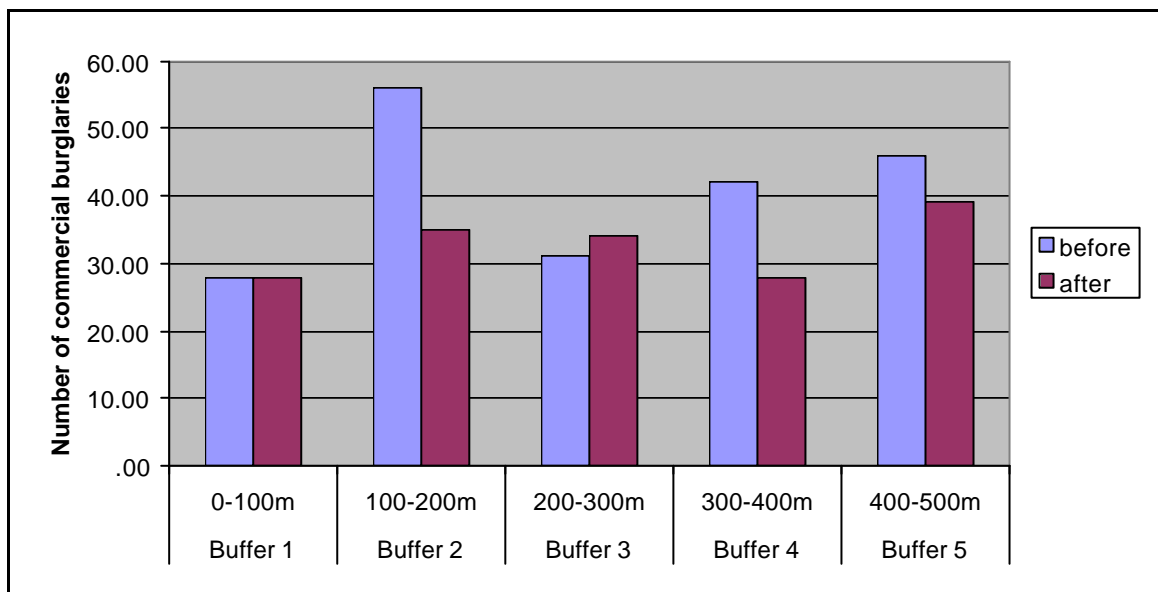
However, it is important to expand this basic approach to see if there are changes apparent within the buffer zones that are above and beyond those seen in a suitable reference area (such as the remainder of the Basic Command Unit or Police Force Area). Where changes are simply in line with changes in the reference area, it is likely that they simply reflect a general trend and are thus not attributable to displacement or diffusion caused by the scheme. Where changes in the buffer zones are greater than those in the reference area, an increase in crime may indicate that geographical displacement occurred, whereas a decrease in these areas would suggest that a diffusion of benefit was the more likely outcome.

The WDQ method therefore proposes looking at the change in both the action area and the buffer area over time relative to a suitable control area to shed light on the possibility of displacement. This can be done using two simple equations. The first is known as the success measure:

$$\text{Success measure} = A\,t_1/C\,t_1 - A\,t_0/Ct_0$$

Where   A = Crime rate in action area
           C = Crime rate in wider control area

Time t_1 relates to the period after implementation and t_0 relates to the period before. Therefore, if the scheme is successful at reducing crime relative to the control area, this measure will be negative.

The second equation is known as the buffer displacement measure:

$$B\,t_1/C\,t_1 - B\,t_0/C\,t_0$$
Where   B = Crime rate in buffer area
           C = Crime rate in wider control area

Once more, time t_1 relates to the period after implementation and t_0 relates to the period before. Therefore, if there is a reduction in crime in the buffer zone relative to the control area, this measure will be negative, indicating a diffusion of benefit. If the measure is positive the measure would be indicating possible displacement.

These two measures were calculated for the Knowsley NDC scheme, for non-residential burglary. The success measure was –0.038 indicating a reduction in the action area relative to the control. The buffer displacement measure was also -0.038 (this was across all the buffer rings). This indicates that there was also a decrease in non-residential burglary in the buffer zone relative to the control, following implementation of the scheme. This therefore indicates that overall a diffusion of benefit of the NDC scheme to other areas was the most likely outcome, rather than displacement. The WDQ goes on to compare the ratio between these two equations.

Of course, other forms of displacement (and diffusion of benefit) may occur including crime switch displacement. This occurs when, deterred from committing one type of crime, offenders choose to commit another. For instance, in an area where a burglary reduction scheme is implemented, those deterred from committing burglary may decide to commit another type of acquisitive crime, such as theft from car. The theory underlying this prediction is that offenders will wish to gain the same rewards as they would have done from committing a burglary, but that they also will want to commit similar types of crime that involve comparable skills and types of risk. Alternatively, a diffusion of benefit may occur. In this case, this would mean that offenders desist from committing crimes other than the one(s) targeted by the scheme.

To detect crime switch displacement, a similar approach may be adopted to that outlined above. Namely, the search for this type of displacement will be contingent upon there being a reduction of the crime targeted within the NDC area, when compared to the changes apparent within the reference area. However, for this analysis, rather than looking at changes within a geographical buffer zone that surrounds the scheme, we will focus on changes in other types of crime within the NDC area. If there is an increase in another type of crime within the NDC (which exceeds any changes in the reference area), this may suggest that there was evidence of crime switch. In contrast, if there is evidence of a reduction in another type of crime within the NDC area, this would suggest there was a diffusion of benefit, whereby offenders

refrain from committing offences other than that targeted. We know from Figures 7 and 8 above that there was a significant decrease in only one type of crime examined; burglary other. Although there were changes in the level of many other types of crime, none of these decreases or increases were statistically significant. We can therefore conclude that in this case there was no evidence of displacement from non-residential burglary to other crime types.

8.   Accounting for Other Initiatives

It is very rare for one crime prevention scheme to be implemented in isolation of other crime reduction efforts. For example, every local authority in England & Wales has a Crime and Disorder Strategy and a Crime and Disorder Reduction Partnership. However, many of the efforts at the district level will affect the NDC area and its comparison areas reasonably equally. What is of more concern is the existence of much localised crime prevention schemes which may geographically overlap in whole or in part with the NDC area. Therefore it is important to:

- collect information on other initiatives existing simultaneously with the NDC which might affect the level of crime reduction
- assess the degree to which these initiatives are likely to be responsible for some or in fact all of the crime reduction in the NDC area

One major initiative that is running in particular areas of Merseyside is the Safer Merseyside Partnership (SMP). This has been running since 1995 and across Merseyside as a whole has annually spent an average of £2.3 million on crime prevention initiatives. Figure 14 below shows the geographical areas in which the SMP operates in red. The figure also shows the Knowsley NDC area in purple. It can be seen from this figure that the Knowsley NDC scheme operates entirely within one of the SMP target areas. It is therefore likely that the SMP activity will have at least some influence over the crime rates within the NDC area.

Figure 14: The Overlap between the Knowsley NDC area and the SMP areas
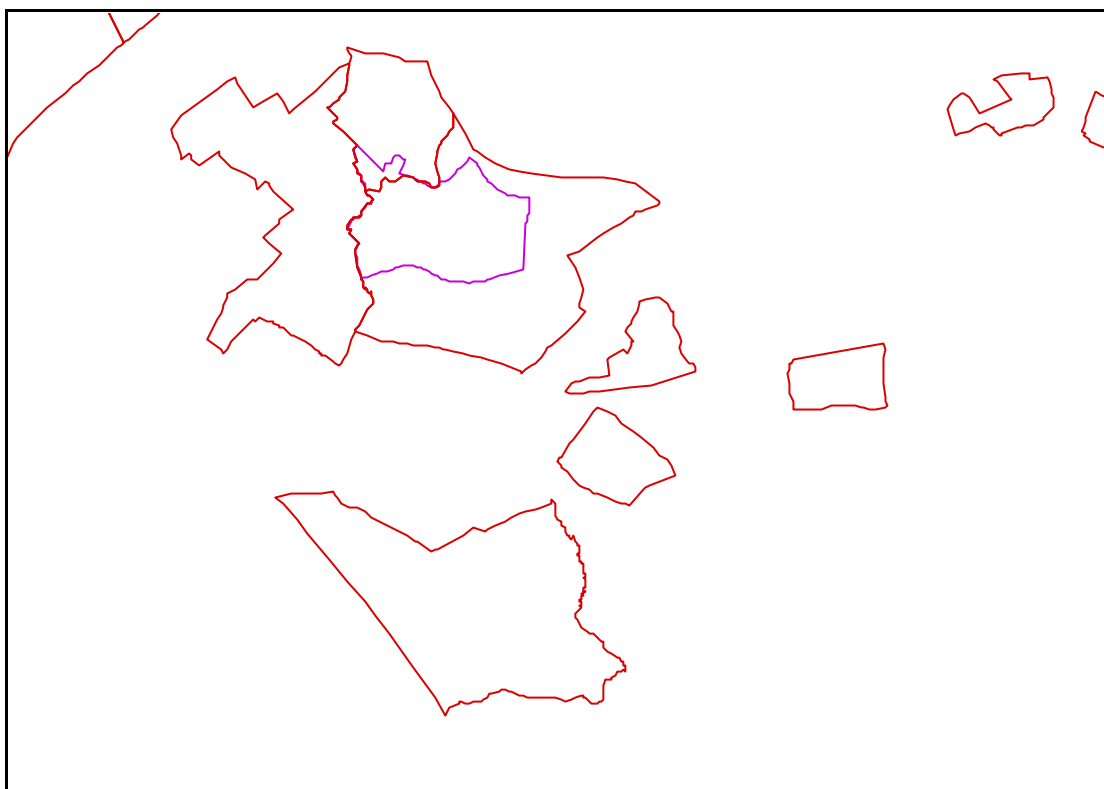
Knowsley Council's website gives details of many other schemes that run within the area (website: http://www.knowsley.gov.uk/community/safer/strategy/). These include, but are not restricted to youth offending teams, race awareness schemes, domestic violence programmes, neighbourhood policing, arrest referral for drug users, vehicle crime reduction schemes, truancy reduction and parenting skills, CCTV, target hardening and designing out crime. Many of these schemes will also have an impact on the level of crime in the NDC area. However, without extensive information on the recipients and beneficiaries of each of these schemes and where they live, it is difficult to estimate the degree to which the activity undertaken by other initiatives is concentrated into the NDC boundary. It is also important to check that information on such websites is up-to-date and is specific concerning the timescale over which initiatives are operating. It is recommended therefore, that information on other initiatives that could particularly impact on crime rates in the NDC area are collected in detail.

9. Other outcomes and sustainability

Two other issues that are of concern when assessing the impact of an NDC scheme are other outcomes and sustainability. An earlier section explained the concept of diffusion of benefit. Importantly, the crime theme of the Knowsley NDC has not worked in isolation, but has had an influence upon or a connection with many of the other areas of work undertaken by the NDC. For example, the collaboration between the crime prevention team and the Housing Trust is likely to result in an improved standard of housing through a reduction in the number of problem tenants. Similarly this collaboration could assist in providing better education through referring at risk families to parenting skill classes. Such overlap of the work undertaken by the different NDC domains should be considered where possible. It is likely to be too complex to quantify the precise contribution of the crime team to the outcomes of other domains, but theory

mapping should at least be able to help substantiate where the other domains may benefit.

Finally, some thought needs to be given to the issue of sustainability. This report has illustrated techniques that can be used with the data available at the time of writing (1 April 1999 to 31 March 2003). However, the crime team of the Knowsley NDC will continue to be active for some time. Therefore, it is important to update the outcome analysis as new data becomes available. Furthermore, research has shown that preventative effects can continue to be sustained for some time after the completion of the implementation phase of schemes (Sherman, 1990). It is recommended that outcome analysis is conducted for a suitable period after completion to ensure that the full effect of the measures taken is captured.

10. Conclusion

This report has laid out the steps necessary in gathering intelligence on the most effective types of crime prevention measures to use in specific NDC areas. Practitioners, as well as crime analysts and academics, can use some of these techniques to assist them in the implementation, as well as the evaluation, of crime prevention schemes. Pre-implementation analysis can assist considerably in the planning and targeting of any measures taken, to ensure that the right targets receive the right treatment at the right time. In contrast, post-implementation evaluation can produce valuable lessons in assessing which aspects of an initiative were or were not effective, and hence which are likely to be promising approaches in the future.

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Appendix 1: Information from NDC project manager

There will be a number of extra sources of data on the performance of the Knowsley NDC through items collected directly by the project manager. This will include:

1. An annual victimisation survey of residents in the area. This will cover both levels of victimisation and changes in residents perceptions of their own areas. There will be a sample of 400 residents questioned, the first survey will be conducted sometime in 2003/early 2004. There will also be information collected from a sample of residents in a suitable control area. This has a housing estate that is very similar to the action area. The area borders the NDC action area but is unlikely to be an area of potential displacement due to the barrier of a major arterial road.

2. A measure of the level of pedestrian traffic in the action and control areas will be monitored before/after the installation of street lights. This will establish whether the dynamics of the area in terms of the way it is used will change as a result of the interventions. It will also help to establish the mechanism through which any change in levels of crime occurs.

3. A delinquency/ young persons survey. This will investigate the effect that interventions have had on the attitudes and behaviour of young people in the area. This might be done in the form of focus groups as well/ instead of through surveys.

4. An event diary. The project manager is keeping an event diary which will identify where and when each of the interventions and measures are installed. It will also include details of expenditure on each of the different interventions. This will be useful in the production of intensity or dose-response information on the scheme.

5. Information on publicity and promotion. The project manager wishes to publicise and promote interventions where possible. He feels using the local community radio or posters is unlikely to make much of an impact on young people in the area and is currently exploring more innovative ways of disseminating information to this group. A record of the publicity used will be kept

6. Problem solving team outputs. The problem solving team is made up of a number of different agencies including the police, housing and the NDC team. Meetings are going to take place once a week and they will be working on a variety of issues such as profiling and dealing with problem families. The Police will generate the relevant outcomes and output figures for the different issues tackled.

Appendix 2: Theory of Change Analysis for Street Lighting

New Deal for Communities: The National Evaluation
Research Report 44: Taking an Analytical Approach to Crime Prevention in NDC Areas

27

New/improved street Lights installed in area

Residents notice street lamps

Strangers using area notice street lamps

Offenders notice street lamps

Residents believe council is helping them

Residents feel safer using street

Strangers feel safer using street

Strangers believe council is helping area

Offenders are deterred by increased level of visability

Offenders believe council/police is helping area

Resident's fear of crime decreases

Residents use the street more often

People tell friends and they use street more often

Strangers use street more often

Others fear of crime of using area decreases

Offenders notice increased use of the street/ New offenders notice street

Resident's satisfaction with their area increases

Street use increases and levels of natural guardianship increase

Street use increases and level of potential victims goes up

Increase of use of area by those other than residents

Offenders perceive increase in natural guardianship

Offenders perceive increase in potential victims

Residents take more interest in their area

Level of opportunity for unmonitored crime goes down

Offenders perceive increase in likelihood of apprehension

Community pulls together to reduce crime

Incident of crime decreases

Incidents of crime increases

Offenders are discouraged from offending in area

Offenders are encouraged to offend in area