New Deal for Communities

The National Evaluation

Research Reports

Investigating the Crime Reduction Claims of NDC Partnerships

Research Report 3

Sheffield Hallam University

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Executive Summary

This report examines the claims made by a number of NDC schemes in relation to crime reduction. Each of the schemes made claims with regard to specific crime types, generally for burglary and vehicle crime. The main problem with the claims made is that they are based on a methodology that is flawed. Thus, we present a method for measuring changes in levels of crime which is not subject to the criticisms of the approach adopted by the NDC schemes discussed here. Our analyses show that whilst the percentage reductions calculated by the schemes are in line with those that we calculated independently using their approach, this was not always the case when more robust analyses were performed.

Considering the measurement of changes in levels of crime, changes in the scheme area should be considered in relation to the general changes in crime observed in the wider area, or in comparison areas that did not receive NDC funding. Otherwise, the calculations do not consider what is referred to as the 'counterfactual' – the outcome that would have occurred in the absence of the schemes. Furthermore, there should be a method of testing whether or not changes are significant in statistical terms and therefore would have been unlikely to have occurred through a chance fluctuation. Thus, to examine the changes observed using a more sophisticated method we calculated an 'odds ratio' for each type of crime for two of the schemes, those for which data were available.

The odds ratios for East Manchester, which compared the financial years of 2000/1 and 2001/2, showed that there were no significant reductions in vehicle crime or domestic burglary when changes in the NDC were related to changes in a series of comparison areas. The most significant reduction in the Manchester NDC area according to the odds ratio method was for robbery. This is in line with the percent reduction seen in robbery between 2000/1 and 2001/2 calculated using a simple before and after comparison for the NDC area.

In the case of Brighton, there were percentage reductions in burglary and vehicle crime as claimed. Furthermore, the odds ratio analysis showed some evidence of a reduction in burglary in the scheme area, albeit non-significant in statistical terms. In contrast, using the odds ratio approach, analyses suggested that there were no significant reductions in theft from or theft of a vehicle in the NDC area. If anything there appeared to be a slight increase in these types of crime.

The issue of geographical displacement is also discussed here, as is 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'. The rationale underlying the analyses conducted is briefly presented and interim findings discussed. The latter showed that for the East Manchester scheme there was some evidence of the geographical displacement of robbery. In contrast, for the Brighton NDC, there was some evidence, albeit statistically non-significant, that for burglary there was a diffusion of benefit, with the risk of victimisation being lower in both the action area and the surrounding area than would have been expected.

The above findings suggest that to get an accurate picture of what effects the schemes are having on levels of crime, any calculations need to be based on a more robust technique than that previously used by the NDCs discussed in this report. These issues are discussed in more detail in the main body of the report. There is also a full explanation of the method used, which should enable other evaluators to replicate the technique, along with a discussion of salient factors that should be considered when conducting this type of analysis. Finally, we discuss the need to consider scheme implementation intensity when attributing any reductions in crime observed in the target areas to the activity of the schemes, rather than (other) external factors. An example of some of the types of analysis that can be conducted where data are available are presented.

A final point that requires qualification is that whilst the techniques presented here represent a considerable advance on those previously used by the NDCs, they are not without their criticisms. Thus, the work presented here should be seen as part of an ongoing process. The main reason for adopting the methods used here was that detailed data (such as quarterly data for police force areas and smaller boundaries) were unavailable at the time of writing. The authors are currently endeavouring to acquire more precise data and anticipate that further analytical techniques will be identified or developed that will improve upon those described here.

Introduction

Determining the impact of the New Deal for Communities (NDC) initiatives on levels of crime is important both for the evaluation of the NDC programme, and, more generally, to advance our understanding of what works in crime prevention (for reviews see, Hirschfield, Johnson and Bowers; Sherman et al.; Visher and Weisburd). However, measuring the impacts of crime prevention (or other) schemes is not necessarily a simple process and is one that is often misunderstood.

A number of the NDCs have made claims regarding the impact of initiatives on levels of crime. In this report we examine the claims made by three NDCs, these being Bradford, East Brighton and East Manchester. We then discuss the method they adopted to generate these claims, and present our own analyses of the changes in the levels of crime for these areas using different techniques, where data has been made available.

Changes in the NDC areas relative to themselves

Each of the three NDC areas made claims regarding changes in levels of recorded crime within their respective areas. As summarised in Table 1, the three NDCs made claims about various types of crime and the analyses were based on data for different time periods. What the claims made do have in common is that they are based on the same methodology. Specifically, the level of crime for the NDC in the most recent period was contrasted with that for an earlier period of time. Any changes observed were thus expressed as percentage of the prior level of crime. To illustrate this approach consider the following hypothetical example. In year one the raw count of crime for an action area is 200 crimes, in year two this figure falls to 100 crimes. Using the approach adopted by the NDCs this change would represent a 50% reduction in crime.

Table 1: Claims made concerning crime reduction by the three NDCs

	Claim made	Time period
Bradford (Little Horton)	Violent crime reduced by 32%	April 2002 vs April 2001
Brighton (East Brighton)	Overall crime reduced by 15% Domestic burglary reduced by 28% Vehicle crime reduced by 33%	2001/02 vs 2000/01
Manchester (Beswick & Openshaw)	Total crime reduced by 25% Burglary reduced by 34% Vehicle crime reduced by 26% Theft from person reduced by 22%	2000/01 vs 1999/00

To examine these claims, disaggregate level data (individual level crime data) were requested from the relevant police forces. Data of this resolution was requested as it allows the most precise testing of the claims made. We also obtained the geographical boundaries for each of the NDC areas. Thus, using a Geographical Information System (GIS), this would allow us to intersect the crime data with the geographical boundaries to produce counts of crime for each area that were based on police recorded crime data, rather than analyses performed on behalf of the NDCs themselves. For the purposes of illustration, the NDC boundaries for two of the areas considered are shown in Figures 1 and 2 (East Manchester and East Brighton). To provide a geographical context, Figures 1 and 2 also shows the surrounding police force areas (PFAs) and police basic command units. For a variety of reasons, discussed in a subsequent section, we were unable to obtain adequate downloads of this data for all three areas of interest. Aggregate level data were available, however, for two of the areas; East Manchester and East Brighton. It is on these data that the subsequent analyses are based. At this point, therefore, this report contains no information that can help confirm or refute the claims made by the Bradford NDC.

Figure 1: Map of the Manchester NDC areas, police force area and police basic command units
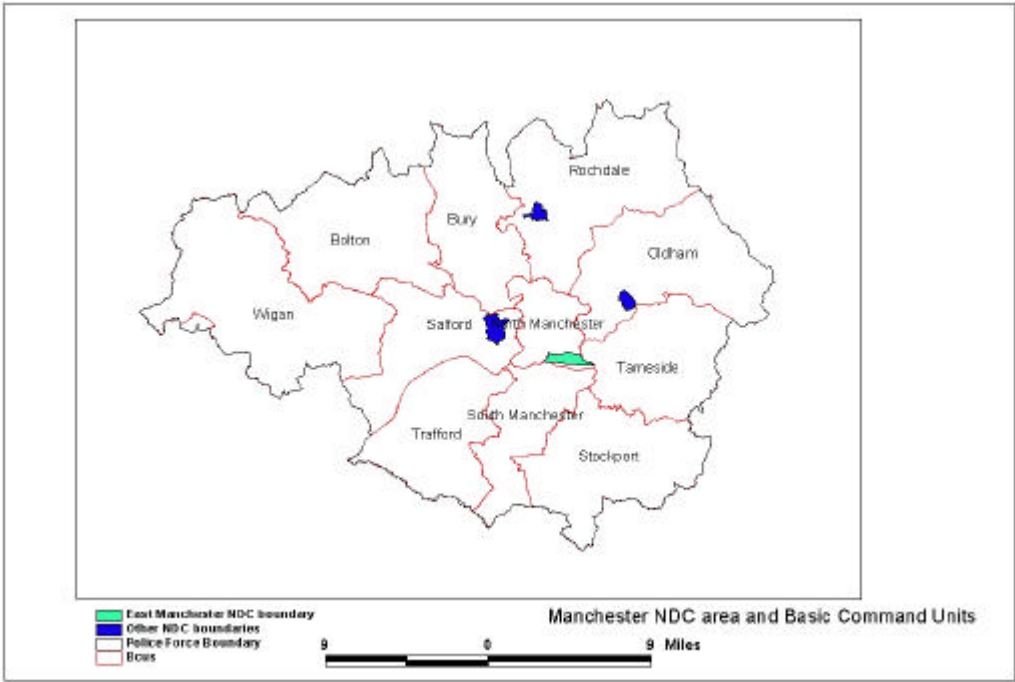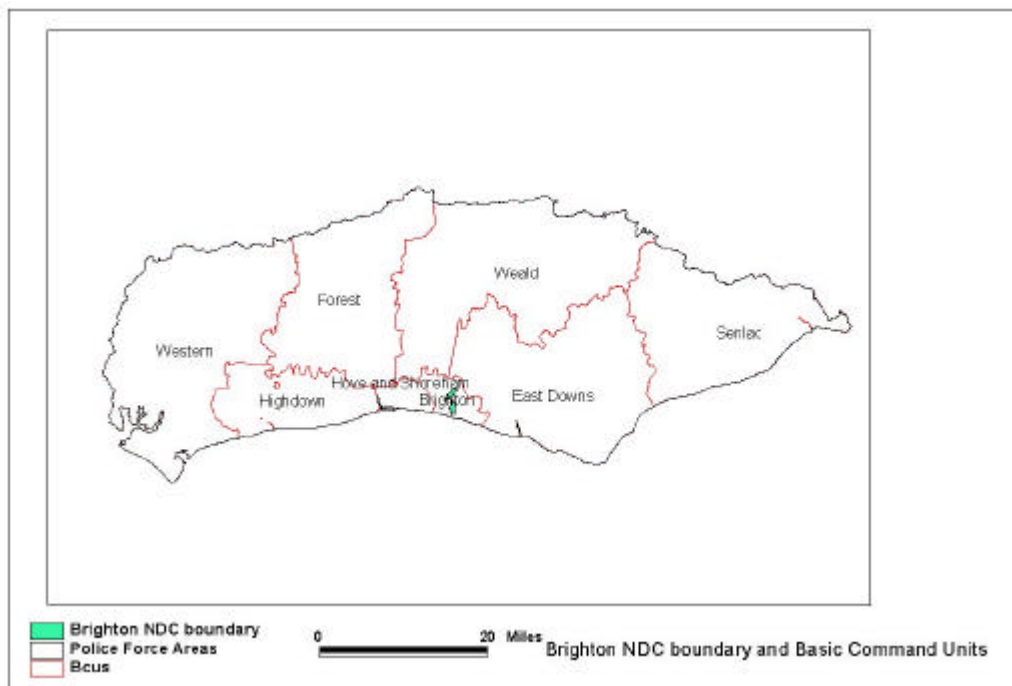
Figure 2: Map of the Brighton NDC area, police force area and police basic command units

Brighton NDC boundary and Basic Command Units

East Manchester

For East Manchester, we were provided with data for a variety of different crime types for a total of four financial years covering the period 1 April 1998 to 31 March 2002. Of the crime types for which data were supplied, only four of these conformed to the Home Office classification system of offences. These were robbery, domestic burglary, theft of and theft from vehicle.

Figure 3 shows the percentage change in the levels of crime for the last two financial years for which data were available. Although the East Manchester NDC made claims only about the penultimate year, the changes apparent for the last two years are shown for comparison purposes. The analysis shown is based on data supplied by contacts at the East Manchester NDC and hence there is no discrepancy between their claims and the results shown. However, consideration of the changes observed in the year 2001/02 are potentially (see below) less favourable than those for the previous year, showing increases in each type of crime except for robbery, which decreased in this time period.

Figure 3: Manchester NDC area percentage change between 2000/01 and 2001/02
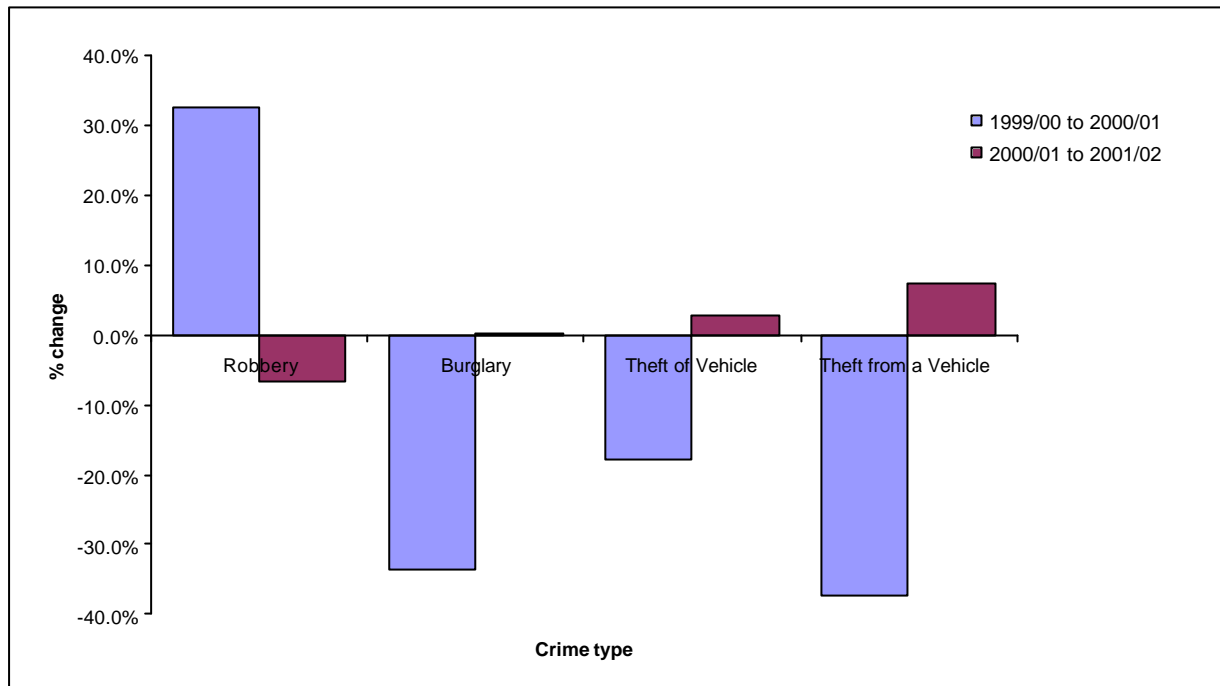
East Brighton

A similar analysis was conducted for the Brighton NDC. In this case the analysis of change was limited to the year 2001/02 as the claims made related to this period of time only. As was the case for East Manchester, of the crime types for which data were supplied, only some of these conformed to the Home Office classification system. For Brighton these were domestic burglary, theft of and theft from vehicle. For this reason, it was not possible to investigate East Brighton NDC's claim that there was a reduction for all crime types considered together. The results are shown as Figure 4. It would appear that whilst the reductions found here are similar to the claims made by the NDC, they are somewhat smaller. For instance, for burglary the NDC claimed a reduction of 28% whereas the reduction calculated here was around 17%.

Figure 4: Brighton NDC area percentage change between 2000/01 and 2001/02
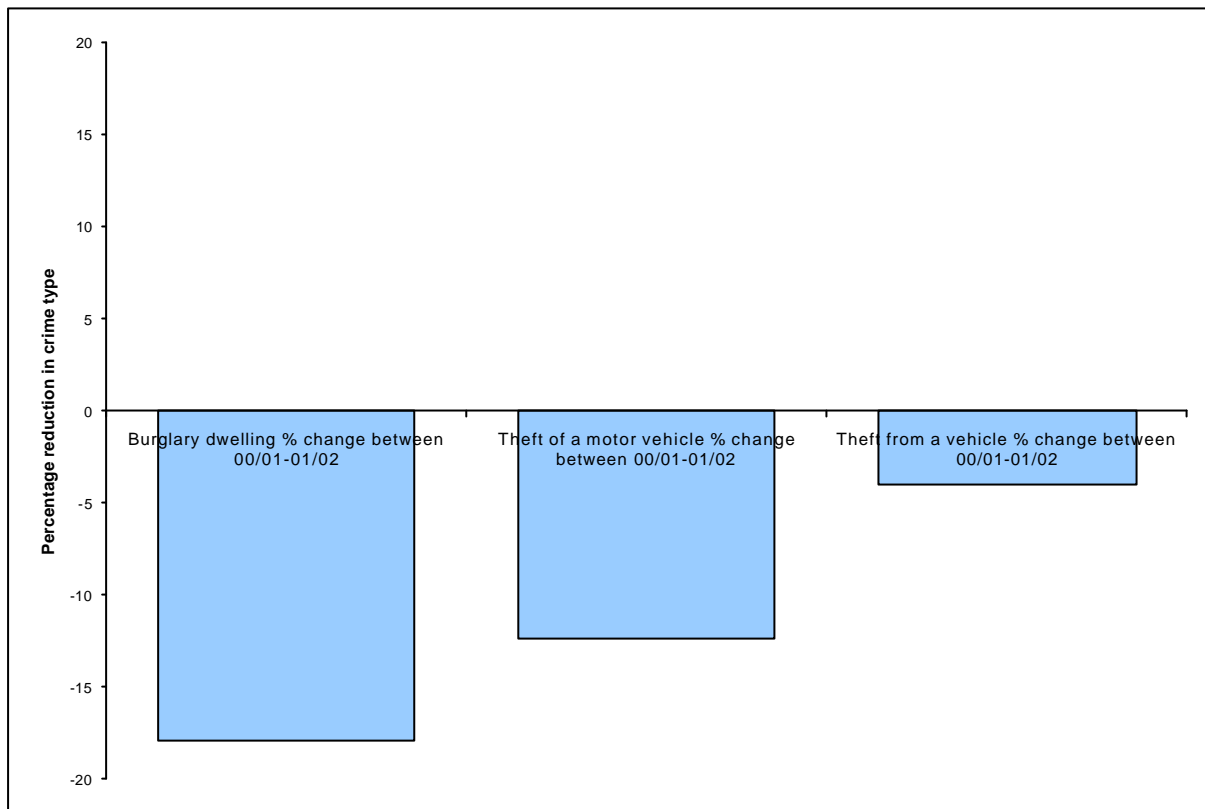
Limitations of the simple before and after comparison approach

One major problem with this type of analysis is that, by considering only changes in an NDC area over time, the influence of factors outside of the control of the NDC schemes is ignored. Such factors include general trends in crime and, changes in policing and local government policy that operate over a wider geographical area that might feasibly have an influence on crime both within the NDC areas and elsewhere. For instance, the launch of a new countywide anti-robbery campaign would undoubtedly have an equal likelihood of reducing crime in NDC and non-NDC areas alike. As a result, in the above analyses there is no consideration of the *counter-factual*, that is, what would have happened in the absence of the scheme.

Previous authors (Ekblom and Pease) have argued that changes in area crime rates are generally attributable to two factors (see also, Johnson et al.). The first being general trends in the wider area, and these may be influenced by a myriad of factors such as changes in the number of young males in the population, or fluctuations in the local or national economy (e.g. see Dhiri, Brand, Harries and Price). Second are factors which operate at the local level and which are subject to more rapid fluctuation and influenced by things such as the number of offenders residing and/or offending within an area, changes in police patrols or sting operations, and the implementation of crime prevention schemes. With the exception of evaluated crime prevention schemes, for which detailed data should be collected concerning the implementation of measures, the latter may be thought of as more random in nature. This is because their effects will be difficult to tease apart from the more general trend in the absence of detailed data on offending and policing activity.

In the current report, two important points warrant consideration. First, where reductions in crime are observed the question exists as to whether these can be attributed to NDC funded

activities, or, if it is likely that the changes observed are simply commensurate with changes observed in a suitable comparison area. Simply put, would the changes observed have occurred anyway? Second, it is critical to bear in mind that a decrease can be both absolute, as is the case when the number of crimes is less in one year than in the previous year, or relative, for instance where an increase in a target area is much slower than an increase in the wider area. Thus, when considering the changes in an action area, it is important to place these in the context of changes either in a suitable comparison area, or the wider area. For instance, if the crime rate in both an NDC area and the surrounding police force area fell by 30%, then the change observed in the NDC area would simply be commensurate with that witnessed elsewhere, thereby suggesting that the reduction would have occurred even in the absence of NDC activity. Alternatively, it is possible that there will be no change in the crime rate for an NDC area which is coincident with a rise in the crime rate in the surrounding area. In this case, the change in the NDC area would represent a relative reduction, as, if the crime rate in the NDC area had followed the trend apparent for the surrounding area, the crime rate in the NDC area would have risen rather than remaining stable.

In the following sections we present analyses which control for the counter-factual. In doing so we show how the level of crime changed in each of the NDC areas relative to the changes observed elsewhere (that is, in relevant control areas). For those not familiar with meta-analysis we also introduce a methodology for determining the statistical significance of any changes observed and apply this to the data acquired.

Analyses using comparison areas

As discussed above, to isolate the impact of NDC activity on levels of crime it is essential to control for the influence of 'other' factors likely to affect the area's crime rate. One approach to doing this is to compare the changes in the NDC areas with changes in suitable comparison or reference areas. The rational underlying this approach is that all things being equal, the crime rates for two similar areas should follow roughly the same pattern over time. Thus, the reasonable assumption made is that where the pattern of crime for two similar areas, one with and one without crime prevention activity, are similar before the inception of a scheme but differ afterwards, reductions in crime may be attributed to crime prevention strategies with some confidence.

Identifying comparison areas

The first challenge then, involves the identification of a suitable comparison area. One approach that may be adopted is to use the police force area (PFA) in which the scheme is located as the comparison, or reference area. Across England and Wales there are 43 PFAs, which usually have geographical boundaries co-terminus with the counties of England. Each PFA has a different chief constable and a separate policing budget. Whilst this might not represent a typical comparison area, it has the following advantages: a) it is easily identifiable and data readily available; b) policy changes in policing (and to some extent for most other public sector organisations) will be identical for both the scheme and comparison areas; and, c) the police force area is large enough for trends to be reliable. In some ways, using the PFA may be thought of as using a series of comparison areas which are used to simply determine the general trend observed in the surrounding area - the purpose of using comparison areas (for examples of where this approach has been adopted elsewhere in the UK, see Bowers and Johnson; Johnson and Bowers; and, in the US, McGarrell, Chermack, Weiss and Wilson).

An alternative approach is to compare the changes in the NDC areas with changes observed in the police Basic Command Units (BCUs) which surround them. A BCU is a sub-division of a Police Force Area (PFA) of England and Wales, and BCUs tend to cover between 20,000

and 113,000 households. BCUs are, therefore, somewhat smaller than PFAs. Using different comparison areas allows one to compare the changes within an NDC area with those for a series of different areas. Of course, for the current type of analysis, it is important to avoid comparing the change in one NDC with the change observed in a BCU that contains a different NDC scheme. Such a comparison would be confounded.

In the absence of multiple comparison areas, it may be important to account for social and economic differences in action and control areas. For example, levels of affluence or unemployment may differ significantly between these areas. In such cases, it is useful to acquire socio-demographic data to enable the analysis to control for any differences. In the current analysis, we have used a large number of control areas in each case (eight or more) to control for differences in area characteristics.

Using multiple comparison areas can also increase confidence in any effects (or null effects) observed. For instance, if the same pattern of results is observed for a variety of comparison areas, then it is possible to conclude with reasonable certainty that the effect observed was robust and not simply due to measurement (or other) error.

Measuring scheme effect sizes

For the reasons discussed above, in the current report we compare the changes observed in the NDCs with those in the relevant PFAs and BCUs. This takes into account the counterfactual and thereby allows us to estimate the *effect size*, a measure of success (or failure), for each scheme. In addition, to allow comparisons to be made between the areas it was necessary to use a standardized measure of effect size. To do this we used an approach advocated by Farrington and Welsh, which involves computing odds ratios for each scheme. This is particularly useful here as only limited data are available for each scheme. Fortunately, only a limited amount of data is required to apply the technique, namely data concerned with levels of crime before and after the inception of a scheme for both action and control areas.

The elegance of this approach is that odds ratios are readily interpretable. They indicate the proportional change in crime in an action area relative to that in a comparison area. An odds ratio of 1.0 indicates a scenario where changes in the crime rates in the two areas are simply commensurate. An odds ratio of greater than 1 reflects a desirable outcome, whereby relative to the change observed in the comparison area, there was a reduction in the action area. In contrast, an odds ratio of less than 1 indicates an undesirable effect, with the increase in the crime rate in the action area exceeding that in the comparison area. Importantly, odds ratios convey more information than simply whether or not there was a reduction or an increase in the action area relative to the comparison area. Interpretation of the magnitude of change is also easily understandable. For instance, an odds ratio of 1.50 represents a situation where there was a 50% increase in the control area relative to the action area (1.20 a 20% increase, and so on).

A further advantage of using odds ratios is that they allow the calculation of the statistical significance of the effect size observed. This is done by computing the standard error of the odds ratio (see Lipsey and Wilson) and then calculating a z-score. The statistical significance of the resulting z-score is established by consulting existing tables, generated for the z distribution (as a rough guide, a value of 1.96 or more is statistically significant at the 5% level).

Data

Considerable difficulties were encountered in acquiring the data necessary to conduct the analyses that follow. This is a problem typical to the majority of evaluations of crime prevention schemes. For instance, the three evaluation teams commissioned to evaluate the Home Office's Reducing Burglary Initiative encountered substantial problems in acquiring data from the various police forces approached. In some cases data was not forthcoming by the end of the 30-month evaluation period. There are a variety of reasons why this is the case. First, many police force data protection officers insist that extensive data protection agreements are agreed and enforced. Negotiating the terms of such agreements can take a long time (years in some cases).

Even when adequate agreements have been reached there is the problem of police resources. Downloading recorded crime data can be a time consuming process, particularly where disaggregate level data (that concerned with individual crimes) is required and where data for an entire police force area are needed. In some cases there is no existing provision for the extraction of such data and there may be a lack of skilled people who could write the software necessary to perform such a task. Given the time sometimes needed to extract the data, police officers are often reluctant to deploy the resources necessary to get the task completed.

Fortunately, it was possible to acquire some data for statistical analysis. In particular, recorded crime statistics for each of the BCUs in England and Wales were obtained from the Home Office for the financial years 2000/1 and 2001/2. Aggregate level data, in the form of counts of crime for the NDC and surrounding areas, were obtained from Brighton and East Manchester. Some disaggregate level data, that covered some of the NDC and immediately surrounding area, was also obtained for the Bradford NDC area. However, it was not possible to use the data in the current analysis, since the information was incomplete as it did not cover the entire time period of interest. We are in ongoing negotiations with the data providers to resolve this problem, and provide us with information covering the entire NDC area.

At the time of writing, crime data for the comparison areas were only available (via the Home Office's website) to the authors for yearly periods, and hence the techniques used here are limited to an examination of annual crime trends. We strongly advocate the use of quarterly data (where available) in evaluation research, and intend to use such data in subsequent reports. Such data is, of course, required for the relevant comparison areas as well as the NDC action areas themselves. We are currently making considerable effort to acquire this data.

It is also important to point out that there can be differences in data provided through different channels. For instance, data from a central police crime recording unit can be very different from that provided at the local level. This can happen for a number of reasons including the occurrence of duplicate records which might be cleaned at the local level, the existence of "dump sites" for crimes which cannot be easily geo-coded, and, indeed, discrepancies may simply be due to differences in who is undertaking analysis or aggregation. In the case of the East Manchester and East Brighton schemes, the aggregate data used below was provided by the NDC teams themselves.
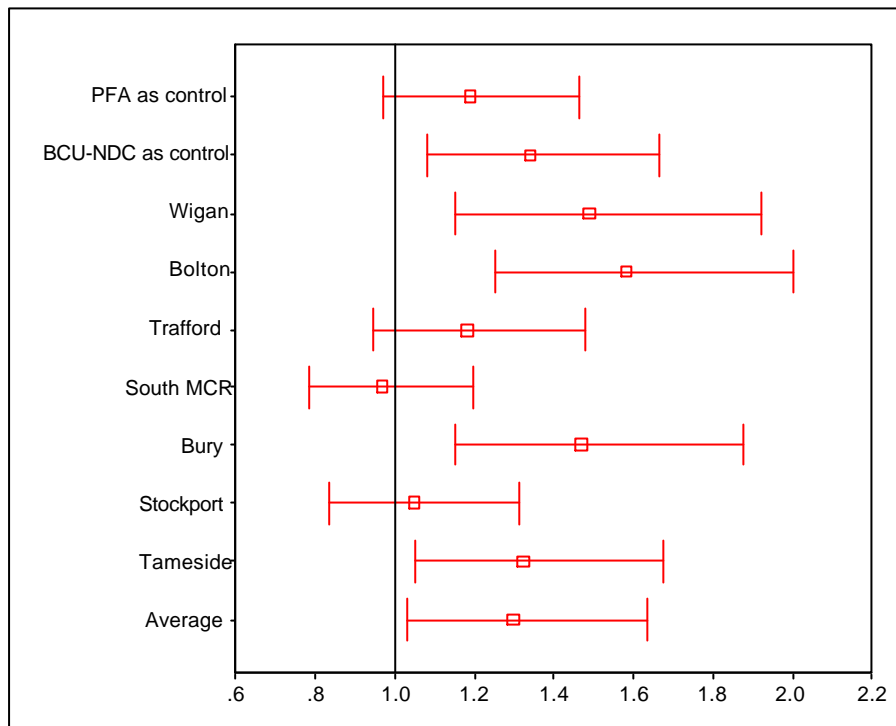
Results

Where the data permitted, we computed odds ratios and z-scores for each crime type for every scheme. As discussed above, a series of odds ratios were calculated using different comparison areas, these being the relevant PFA and each of the police BCUs within the PFAs that did not have NDCs located within them. To ease interpretation, the odds ratios are presented as a series of "forest" graphs. Each graph shows the odds ratio (and associated 95% confidence limits) calculated using the different comparison areas. A reference line shows the baseline odds ratio of 1. As noted above an odds ratio of 1 indicates that the change in the action area was simply in line with that observed in the comparison area. For odds ratios where the 95% confidence limits overlap the baseline odds ratio of 1, the change in the action area was (statistically) non-significant. Where they do not, the change was statistically significant. The analyses will be presented for each scheme in turn, starting with East Manchester and moving onto East Brighton.

East Manchester

Figure 5 shows the odds ratios for the crime of robbery for East Manchester, calculated by comparing the financial year of 2001/2 to 2000/1. The first odds ratio was derived using the police force area as the comparison area. In this case, the odds ratio of 1.19 indicated that relative to the PFA, robbery reduced in the NDC area by around 16% (the reduction in the action area is one minus the reciprocal of the odds ratio, here 1-1/1.19=0.16). Despite this change the reduction was, as is reflected by the fact that the confidence limits overlap the baseline odds ratio of 1, marginally non-significant. The associated z-score for this odds ratio was 1.66, the required value of z for a statistically significant result (two-tailed) being 1.96. The subsequent odds ratio was calculated using the BCU (minus the NDC) in which the NDC was located as the comparison area. In this case, the odds ratio and associated z-score of 2.67 were statistically significant. The following 7 odds ratios were calculated using each of the remaining BCUs that did not have NDCs located within them. With the exception of one case, where the BCU for South Manchester was used as the comparison area, the NDC area showed a reduction relative to the different comparison areas. Moreover, in 4 cases (Wigan, Bolton, Bury and Tameside) the reduction in the NDC area was statistically significant relative to the changes observed in the comparison area. The final odds ratio shown in Figure 5 is the average of the 7 odds ratios derived for the BCUs that did not have NDCs located within them. This was also statistically significant (z=2.22, p<.05).

Figure 5: Odds ratios (and 95% confidence limits) for Robbery in East Manchester

Taken together the results presented in Figure 5 suggest that the East Manchester NDC had a significant effect on robbery, with a typical estimate of the reduction being around 23% relative to the various comparison areas used.

The same set of analyses for the crime type of domestic burglary are shown as Figure 6. In this case, relative to the PFA the NDC showed a slight reduction in crime. However, the average odds ratio for the 7 BCUs suggested that relative to the comparison areas, burglary had slightly risen in the NDC area. Despite this, none of the odds ratios, including the average odds ratio, were statistically significant (z-scores ranged from -1.84 to 1.21), suggesting that the small effect observed was due to chance.

Figure 6: Odds ratios (and 95% confidence limits) for Burglary in East Manchester


Odds Ratios for Domestic Burglary: Manchester
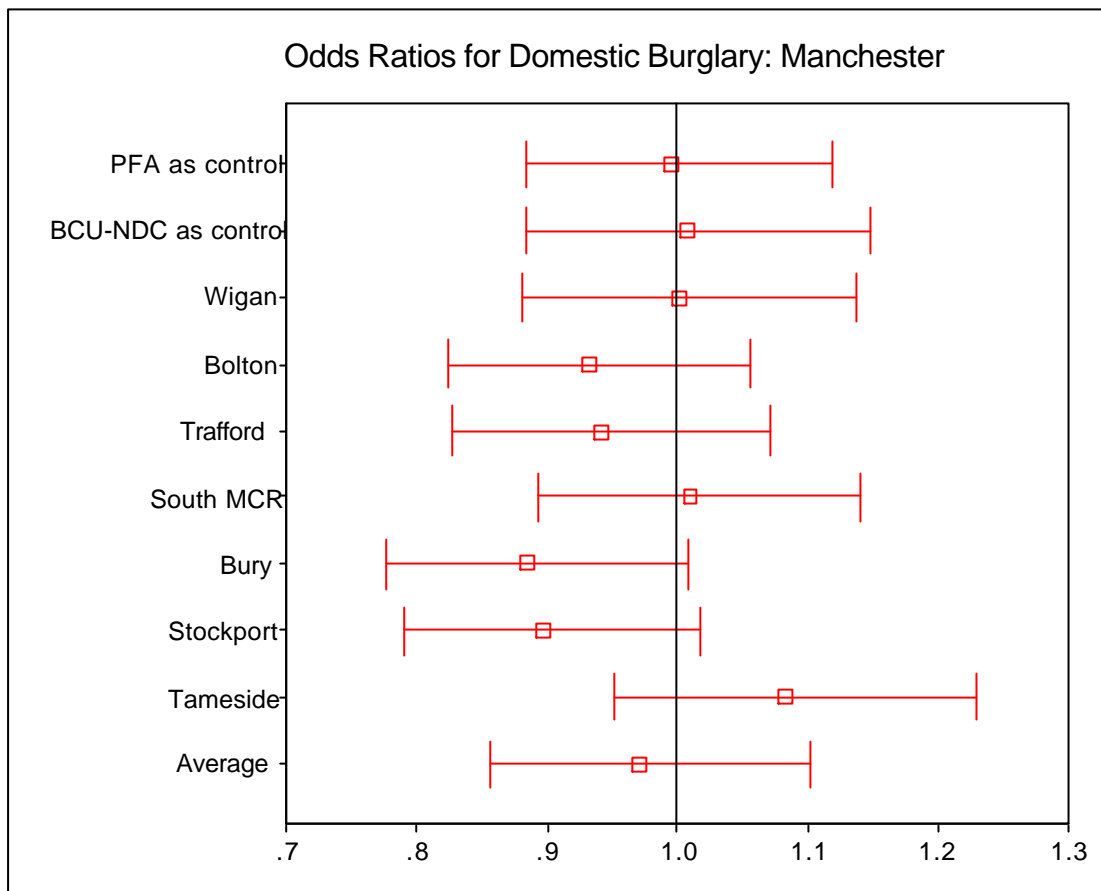
The analyses for the crime theft from vehicle are shown in Figure 7. The general pattern of results suggests that there was an increase in this type of crime for the period considered, this increase typically being around 5%. Relative to three of the BCU areas considered (Trafford, South Manchester and Stockport), the increase in the NDC was statistically significant for this type of crime. This was not, however, the case for the comparisons made with the remaining reference areas (such as the PFA and average BCU change). Thus, in this case there was an increase in the level of crime in the NDC area but this generally was not significantly different to the changes observed elsewhere.

Figure 7: Odds ratios (and 95% confidence limits) for the crime 'theft from vehicle' in East Manchester
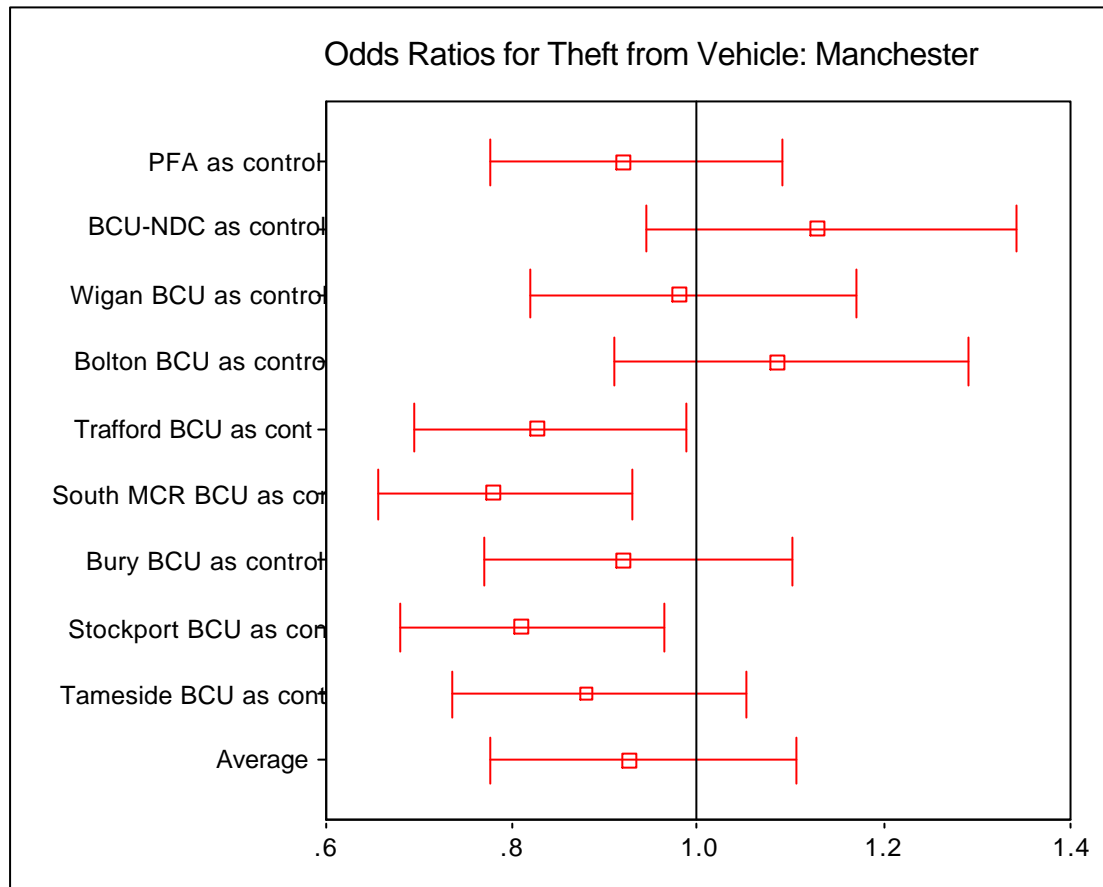
Analyses for the crime category of theft of vehicle showed a more consistent pattern of results. The results, shown in Figure 8, demonstrate that with one exception (Bolton), the change in the level of crime for this type of offence in the NDC area represented an increase relative to the changes observed in the comparison areas. Relative to 5 of the ten comparison areas, the increase in the NDC area was statistically significant (z scores -2.44 to -3.76, all p-values <.05). The increase was also marginally non-significant relative to the changes observed for two of the comparison areas (the comparison area average and Trafford). In one case only (Bolton), the level of crime in the NDC showed a reduction to the comparison area, although the reduction was very small and statistically non-significant.

Figure 8: Odds ratios (and 95% confidence limits) for Vehicle theft in East Manchester

Odds Ratio for Theft of Vehicle: Manchester
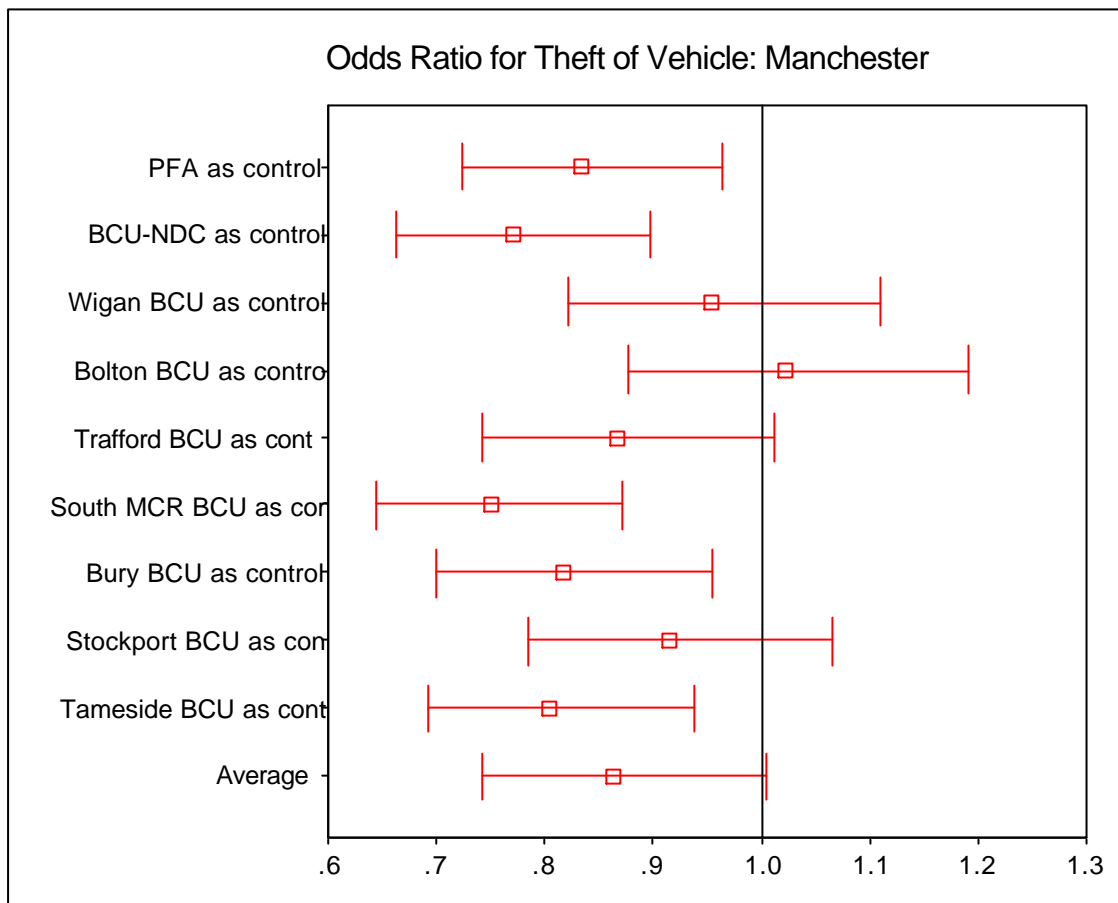
East Brighton

The same type of analyses were conducted for the NDC located in Brighton. Results for the crime type burglary are shown in Figure 9. The odds ratios calculated using the PFA as a comparison area suggests that although there was reduction in the NDC area this was not statistically significant. The same pattern was also fairly typical for the analyses conducted using the BCUs as the comparison areas, and for the average odds ratio. The only notable exception was for the odds ratio calculated using the Forest BCU as the comparison area. In this case the odds ratio was statistically significant (z=2.72, p<.05). Thus, it would appear that the Brighton NDC generally appeared to reduce burglary, although the effect was typically statistically non-significant.

Figure 9: Odds ratios (and 95% confidence limits) for Burglary in Brighton
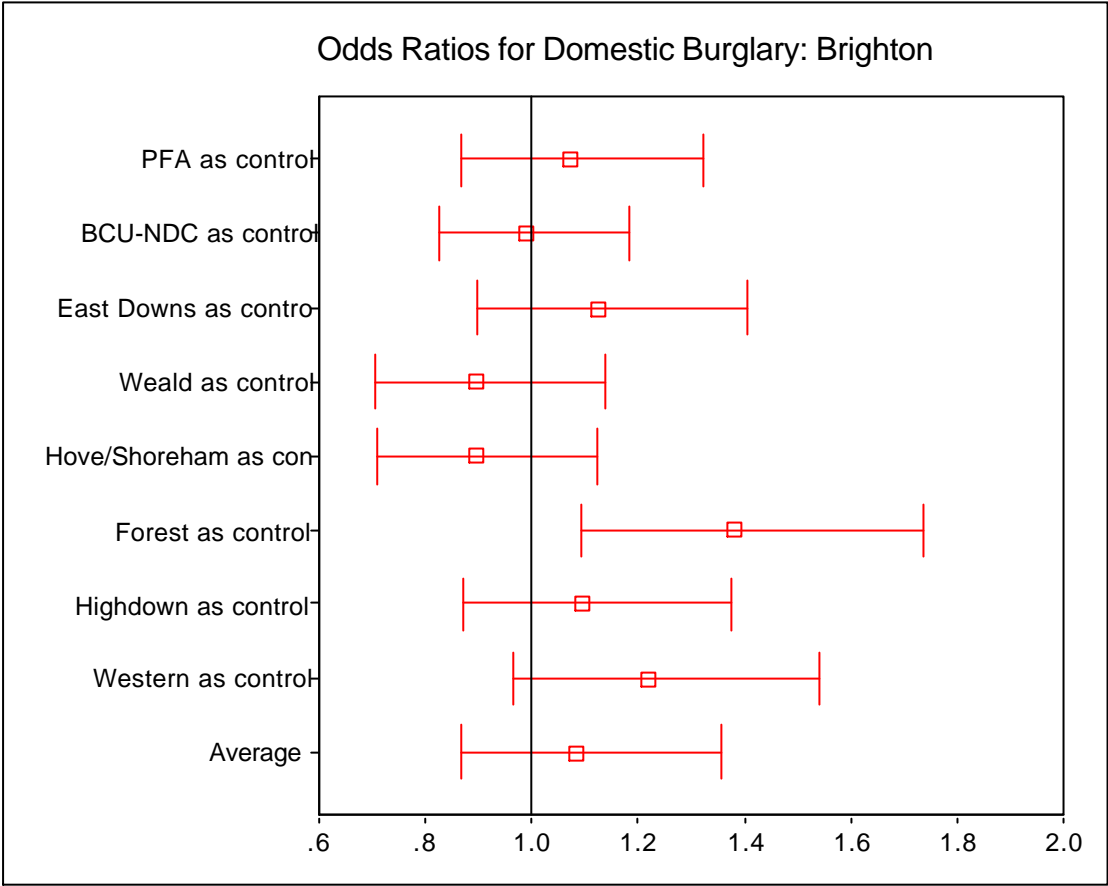

Figure 10 shows the results for the crime type 'theft of vehicle'. It is clear from Figure 10 that, in general, relative to the comparison areas the level of crime in the NDC increased. The increase in the level of crime in the NDC area was statistically significant for only one comparison, that with the BCU (-NDC) in which the NDC was located. In only one case (when Forest BCU was used as the comparison area) the level of crime in the NDC showed a reduction relative to the change in crime in the comparison area. Thus, whilst there was a general increase in this type of crime, the change typically was not statistically significant.

Figure 10: Odds ratios (and 95% confidence limits) for 'theft of vehicle' in Brighton

Odds Ratios for Theft of Vehicle: Brighton
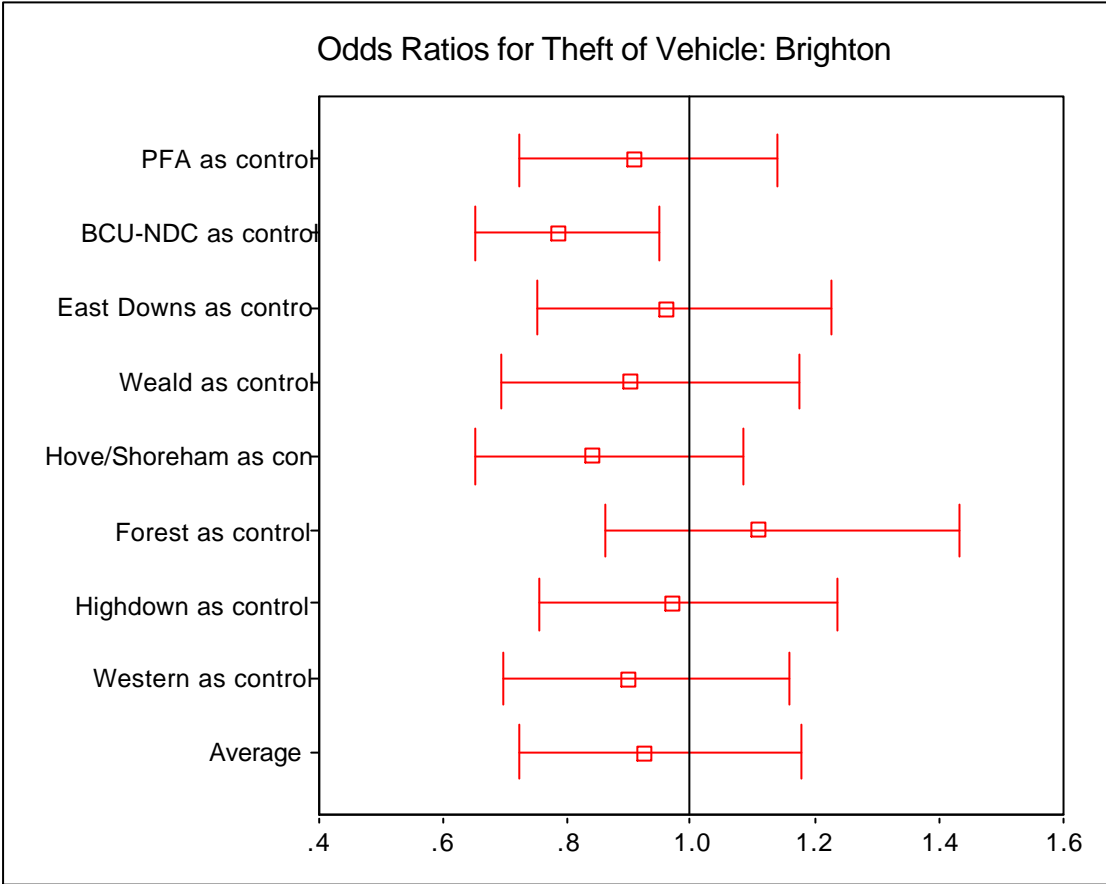
Finally, the results of analyses conducted for the crime type 'theft from vehicle' are shown as Figure 11. Consideration of the analyses conducted using the PFA and the average BCU change as the comparisons, it appears that the change in the NDC area was simply commensurate with the change observed elsewhere. This pattern was also the most likely outcome for the remaining comparison areas. For two comparisons, the level of crime in the NDC showed a statistically significant increase (Hove BCU) and a marginally non-significant decrease (Forest BCU) relative to the reference area. Nevertheless, in general the analyses suggested that the change in the NDC area was in line with the counter-factual (i.e. what would have happened anyway).

Figure 11: Odds ratios (and 95% confidence limits) for 'theft from vehicle' in Brighton

Odds Ratios for Theft from Vehicle: Brighton
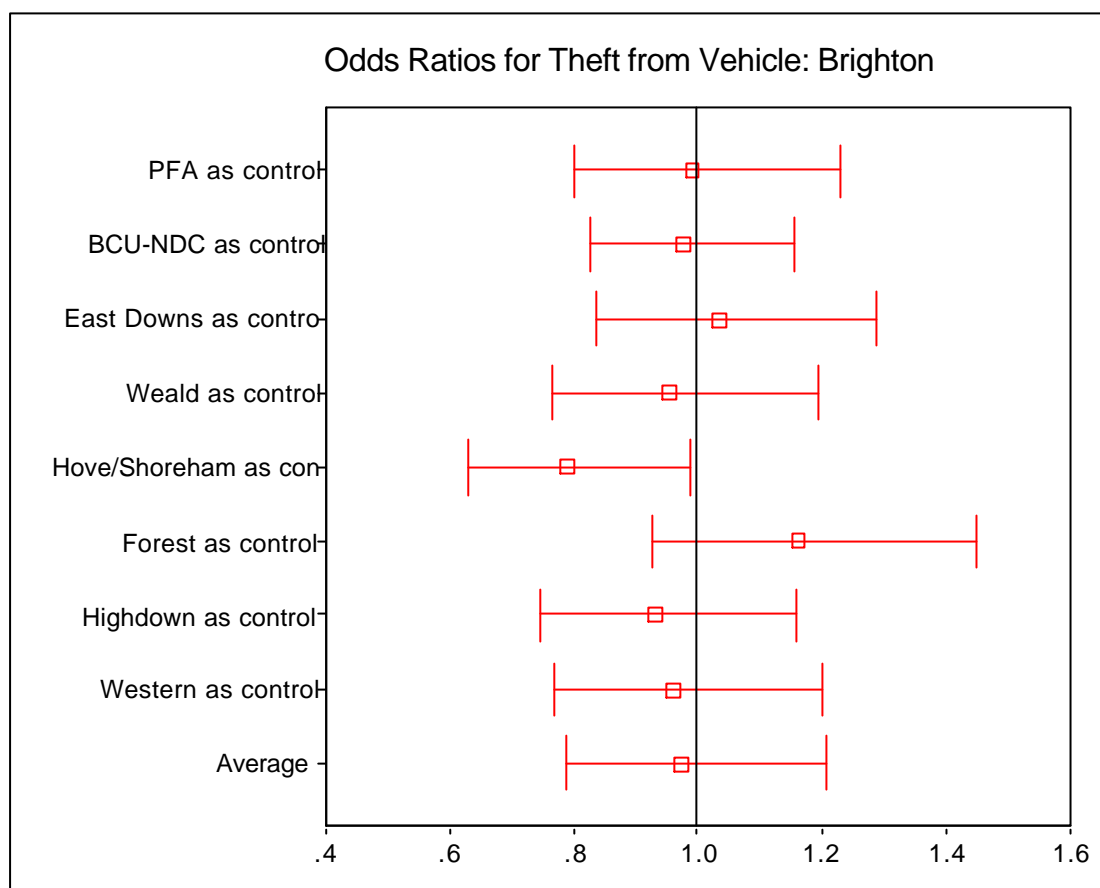
Displacement and diffusion of benefit

One of the most significant potential negative consequences of crime reduction schemes is that of crime displacement. Thus, one important consideration in relation to the crime prevention elements of the NDC is whether successful schemes cause geographical crime displacement. In other words, is there evidence that the crime prevention activity implemented caused offenders to commit crimes that they would have otherwise committed within the NDC area elsewhere? However, an alternative possibility exists. That is, schemes may also have a "diffusion of benefit" reducing the risk of victimization for potential targets that are within close proximity of the target area. Thus, it is plausible that as a result of NDC activity, offenders may not only avoid the NDC area but also neighbouring areas, perhaps because they do not know the boundaries of the NDC scheme, and therefore play it safe by avoiding the wider area.

For a number of reasons, research suggests that where geographic displacement (or diffusion of benefit) occurs, it is most likely to do so in nearby similar areas (Eck; Bowers and Johnson). Thus, to examine this issue, we examined changes in the wider Basic Command Unit[1] in which the NDCs were located. However, to examine this issue it is necessary to consider changes not only in the action area and a surrounding 'buffer' zone, but also in a third reference area. It is important to examine changes in this third area to determine whether or not the changes in both the action and buffer areas are simply commensurate

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[1] Smaller areas can be used where more detailed data are available. For an example of a more precise analysis see Johnson et al. (2001).

with those observed elsewhere. If they are, they cannot reasonably be attributed to scheme activity.

It is useful to envisage the three areas involved as nested areas such as those shown in Figure 12. Here, area A is the NDC area, area B is the remainder of the police basic command unit or BCU (the "displacement buffer zone") and area C is the remainder of the police force area (PFA).

Figure 12: Three Nested Areas
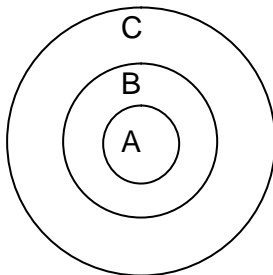
To reiterate, to examine the issue of geographical displacement (and, of course, diffusion of benefit) it is necessary to compare changes in the levels of crime in area B with those in the remainder of area C. In a recent paper (Bowers and Johnson), we have shown that the crime rates for areas similar in size to a typical NDC tend to follow a similar general trend over time to the remainder of the relevant police force area. Thus, analyses can be conducted to see whether, following the start of the scheme (after a period of intense implementation, or some other time of interest), the change in the level of crime in area B is above or below that which would reasonably be expected on the basis of the change observed in area C.

An important point to note is that it is only reasonable to look for evidence of displacement or diffusion of benefit where reductions in crime are realised in the action areas themselves, otherwise it is not plausible to attribute changes in the buffer zones to scheme activity (Bowers and Johnson). In order to test for displacement and/or diffusion of benefit here, we compare changes in the buffer zone (area B in Figure 12) with those in the PFA (area C in Figure 12) in a similar way to the method used earlier in this report to compare changes in the action and comparison areas. To do this, we compute odds ratios using the buffer zone as our area of interest and the remainder of the PFA as the comparison or reference area. These odds ratio can be interpreted as follows; if the odds ratio has a value of one or more, we can conclude that following the start of the NDC in question, relative to the change in the relevant wider PFA, there was a reduction in the buffer zone. That is, there has been a possible diffusion of benefit from the NDC scheme whereby, relative to the wider PFA, the levels of crime in both the buffer and action areas reduced over time. By contrast, if the odds ratio has a value of less than one, this indicates that, relative to the wider police force area, there was an increase in crime in the buffer zone following the start of the scheme. This could be an indication of geographical displacement. That is, where an increase in the level of crime in the buffer zone was coincident with a decrease within the NDC area itself. It is important to reiterate that for obvious reasons, there is no point in looking for evidence of displacement or diffusion of benefit for schemes or crime types where the scheme itself has not had a significant effect itself.

In the current report, we first present analyses for the East Manchester NDC. In this case, the findings presented in an earlier section of this report suggested that the NDC showed a significant reduction in robbery. Interestingly, the results of the displacement analysis showed some evidence of displacement to the remainder of the BCU (the buffer zone or area

B). The odds ratio for robbery in this buffer was 0.92 showing an 8% reduction in the remainder of the PFA relative to the displacement buffer area. The relative increase in the buffer displacement area was significant, with a Z score of -2.38 ($p < 0.05$). These results may therefore suggest that there was some evidence of geographical displacement of robbery to areas just outside the NDC boundary. However, it should be noted that displacement is only one possible explanation for the increase in robbery in the buffer area. Without more detailed evidence of what else could have been happening in the remainder (or just outside) of the BCU at the time, it would be unwise to directly attribute the increases shown here to geographic crime displacement.

A similar exercise was undertaken for the Brighton NDC area. In this case it appeared from the analysis presented earlier in this report that burglary had significantly decreased in the NDC area. In this case, the odds ratio for the remainder of the BCU (the buffer zone or area B) was 1.08, showing that relative to the change observed in the remainder of the PFA, there was a decrease in the level of burglary in the buffer zone. The decrease in the buffer zone was marginally non-significant but indicated a definite trend (the Z score was 1.86, $p < 0.062$, two tailed). Thus, this suggests that there may have been some evidence of a diffusion of benefit, although the effect observed was not sufficiently large to be statistically significant. Again, before attributing this effect to NDC activity, it would be wise to collect information on what else, if anything, was operational in the buffer zone during that period that may have plausibly contributed to the pattern observed.

Scheme activity and changes in crime levels

So far, the analyses presented have examined how crime levels changed in relation to control areas for the NDC areas of Brighton and East Manchester. However, what is yet to be discussed is the connection between any reduction in crime observed and the actual implementation of preventative measures on the ground. To increase confidence that any reduction observed was attributable to NDC activity, it is important to examine the relationship between levels of implementation activity and changes in the relevant crime rates. For example, we would not attribute a large drop in the crime rate in the NDC area to the scheme's activity if the reduction had occurred six months before the scheme commenced (but see Johnson and Bowers; Smith et al.).

Figure 13: The relation between implementation intensity and levels of crime

Brighton NDC Expenditure and crime levels
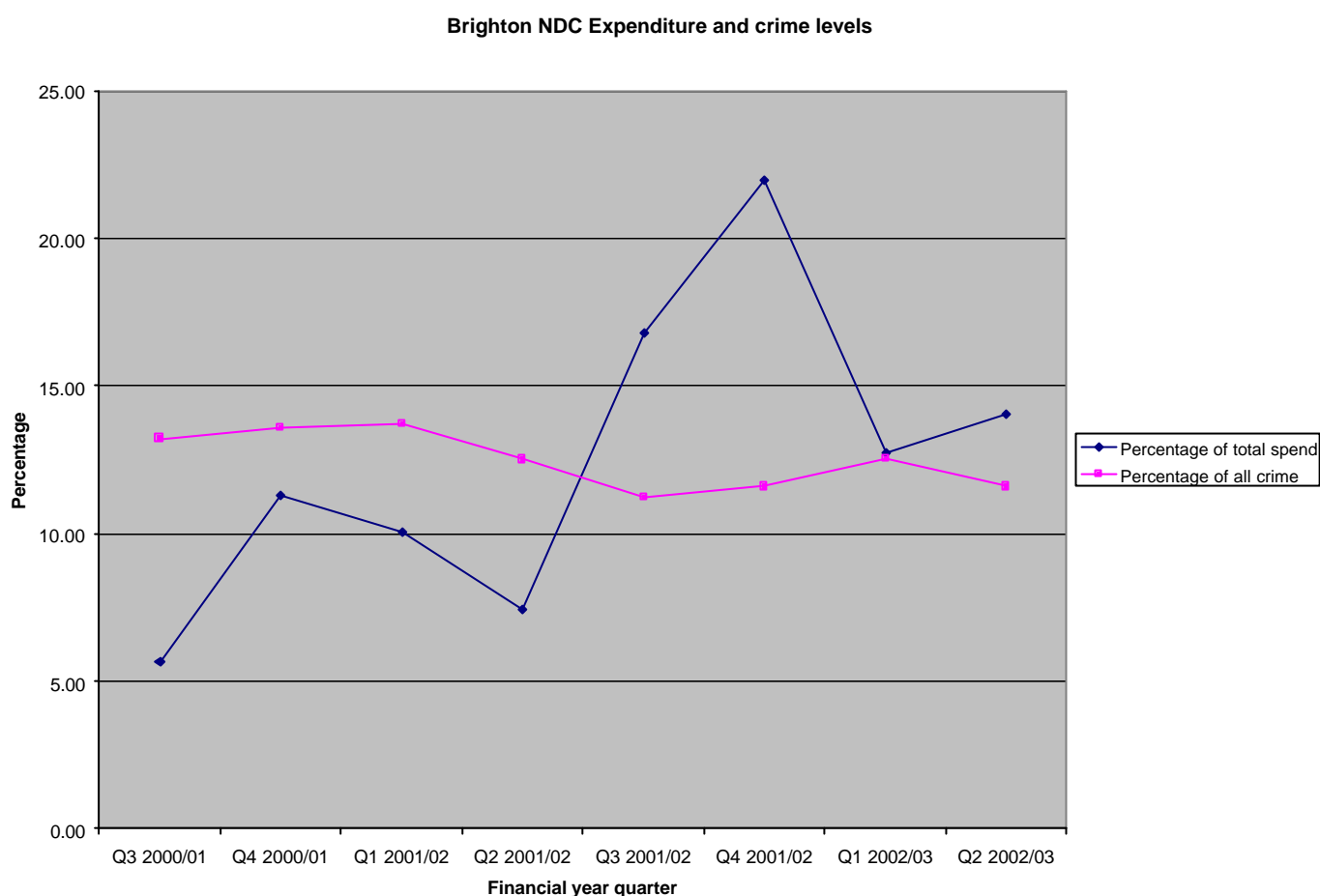
In order to examine the relationship between reduction in crime and scheme activity, it is necessary to analyse information relating to the timing and scope of activity; this is usually recorded in terms of the expenditure of the scheme at certain times. At the time of writing this report, information concerned with expenditure was only available for the Brighton NDC. In what follows, the spend per quarter by the NDC was used as an indicator of scheme activity, or intensity. Figure 13 shows this information expressed as a percentage of the total spend across the eight quarters (3-month periods) for which data was available. It shows that there was a peak in expenditure in the final quarter of the financial year 2001/2002. Far less was spent in the second quarter of this financial year. Figure 13 also shows the percentage of the total crime recorded over the two-year period in the NDC that fell into each quarter. It can be seen that the percentage falling into each quarter remains fairly steady. However, there was a slight dip in the recorded crime levels in the third and fourth quarters of the financial year 2001/2002. Interestingly, these dips were coincident with a peak in expenditure.

At present there is insufficient data to undertake statistical analysis of these trends. To conduct the kind of analyses required, in this case time-series analyses, crime data that covered a two-year period that pre-dated the inception of the scheme would be required. Such data would be required for each quarterly time period for the NDC scheme *and* the comparison areas such as the relevant Police Force area (in this case, Sussex) or for the appropriate police Basic Command Units. Furthermore, if intensity data on costs were available for several different NDC sites (ideally 20 or more), it would be possible to undertake a multi-level analysis of the data to establish whether there was a general

relationship between levels of scheme activity and reductions in rates of crime (for details of this method see Bowers, Johnson and Hirschfield).

It is also possible to summarise the costs associated with the schemes using generic various categories (e.g. staffing costs, equipment costs etc) to establish whether the relationship between intensity and crime reduction is stronger for certain types of spend. Figure 14 shows the cost data for Brighton separated into staffing, publicity, equipment and other costs. It can be seen that the timing of these spends vary quite dramatically. For example, all the costs associated with publicity occurred from the second quarter of the 2001/2002 financial year onwards, whereas there is a bimodal distribution for the spend on equipment, with peaks for quarter 4 of 2000/2001 and quarter 4 of 2001/2002. It is interesting that a drop in the crime rate appears to be co-incident with the introduction of publicity into the costings for the scheme. Recent research has shown that there is a particularly strong effect of publicity on scheme success and that in fact, publicity can be an effective crime reduction strategy in the absence of other interventions (Johnson and Bowers).

Further possible analysis would involve examining the association between scheme intensity and changes in particular types of crime. It would also be useful to look not only at the spend per quarter, but also the number of outputs per quarter, generated by the scheme. There is an important difference between these data sets - one traces inputs to the scheme in terms of the cost, and the other is traces outputs. It is possible that it is actual outputs in terms of victims assisted etc. that are more likely to have a direct effect on the crime rates, as these are indications of actual work on the ground. In contrast, inputs might be spent on staffing, meetings or equipment that are never realised as direct outputs on the ground, or that are implemented some time after they are purchased. In this case, such inputs are less likely to directly influence crime rates.

Figure 14: Relative timing of different types of expenditure in the Brighton NDC
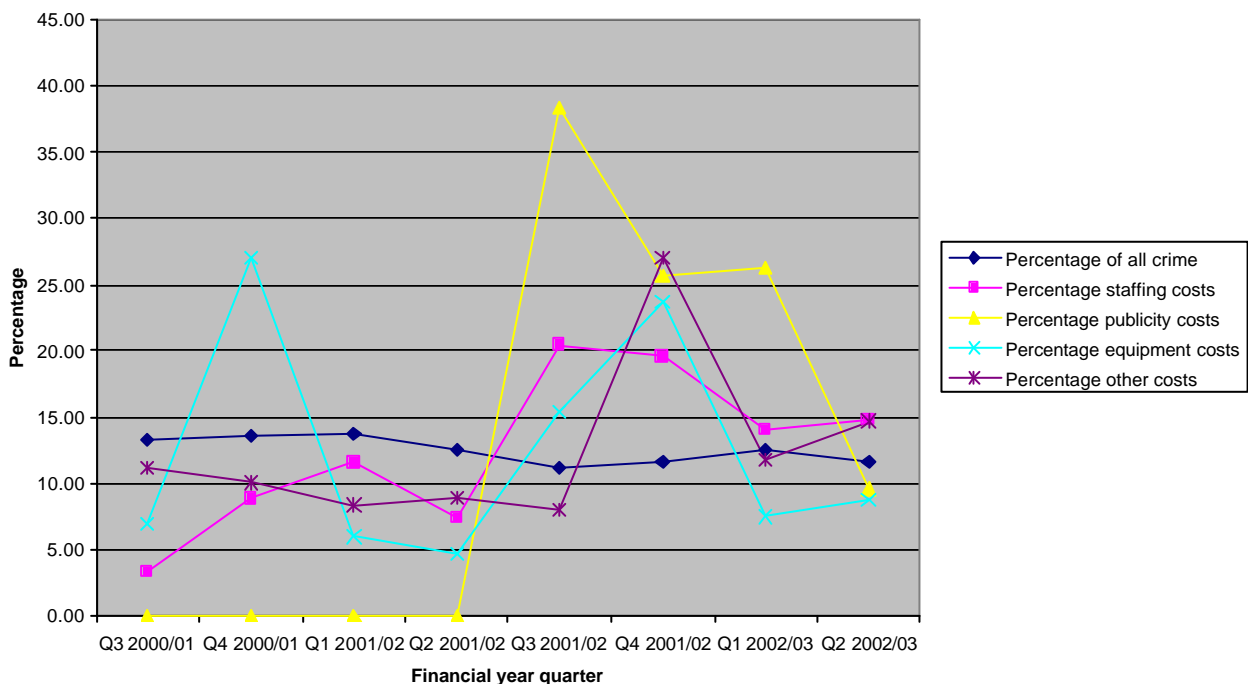
Summary and concluding comments

This report has shown that there is evidence of reductions in crime in the NDC areas of East Manchester and East Brighton. The percentage reductions that have been calculated by the schemes are in line with those that we calculated independently. However, the major problem with the claims made by the schemes is a flaw in the method used to calculate the reduction associated with the NDCs.

Reductions in the scheme area should be considered in relation to the general changes in crime observed in the wider area, or in comparison areas that did not receive NDC funding. Furthermore, there should be a method of testing whether or not the change is significant in statistical terms and therefore would have been unlikely to have occurred through a chance fluctuation. The odds ratio method used in this report meets both these criteria. For comparison purposes, selected results are shown in Table 2.

The odds ratios for East Manchester, which compared the financial years of 2000/1 and 2001/2, showed that there were no significant reductions in vehicle crime or domestic burglary when changes in the NDC were related to changes in a series of comparison areas. The most significant reduction in the Manchester NDC area according to the odds ratio method was for robbery. This is in line with the percent reduction seen in robbery between 2000/1 and 2001/2 calculated using a simple before and after comparison for the NDC area. Unfortunately, Home Office BCU level data were only available for Manchester for 2000/1 and 2001/2, which made it difficult to investigate the claims made by Manchester for the period comparing 1999/00 to 2000/01.

Table 2: Percentage changes in crime and odds ratios for East Brighton and East Manchester (values could not be calculated for cells with a '-')

NDC scheme and crime category	Years compared	Odds ratio for PFA as comparison area	Percentage change claimed by scheme	Percentage change calculated by ourselves
East Manchester				
Total crime	1999/0	-	-25%	-
Robbery	and	-	-	+24%
Burglary	2000/1	-	-34%	-33%
Vehicle crime (all)		-	-26%	-
Theft from vehicle		-	-	-33%
Theft of vehicle		-	-	-16%
Theft from person		-	-22%	-
East Manchester				
Total crime	2000/1	-	-	-
Robbery	and	1.19	-	-7%
Burglary	2001/2	0.99	-	+0.2%
Vehicle crime (all)		-	-	-
Theft from vehicle		0.92	-	+7%
Theft of vehicle		0.83	-	+3%
Theft from person		-	-	-
East Brighton				
Overall crime	2000/1	-	-15%	-
Domestic burglary	and	1.07	-28%	-18%
Vehicle crime (all)	2001/2	-	-33%	-
Theft from vehicle		0.99	-	-4%
Theft of vehicle		0.91	-	-12%

In the case of Brighton, there were percentage reductions in burglary and vehicle crime as claimed. Furthermore, the odds ratio analysis showed some evidence of a reduction in burglary in the scheme area, albeit marginally non-significant in statistical terms. In contrast, using the same (odds ratio) approach, analyses suggested that there were no significant reductions in theft from or theft of a vehicle in the NDC area. If anything there appeared to be a slight increase in these types of crime.

A number of issues should be carefully considered concerning the method used to calculate reductions in crime. As we have seen, it is crucial to compare any reductions over time observed in the NDCs with changes in comparison areas. In particular, it is important to consider relative reductions in crime in relation to comparison areas rather than merely comparing the crime in the NDC area to itself at an earlier time.

It is also important to consider the effect of using different comparison periods to calculate crime reduction. For instance, the change observed between the years 1997 and 2001 may be very different to the change apparent for 2000 to 2001. Whilst there may be a considerable reduction for the former, there may be an increase for the latter. Thus it is important to consider the not only the geographical context in which the NDC is located but also the period of time over which changes are considered. For instance, once a program is operational, we may not expect a decrease in crime every year. This may be particularly true if the program meets its targets early on in the implementation process (e.g. that compared to the baseline, a 30% reduction in crime will be realised). In this case a satisfactory outcome may be to ensure that the crime rate remains stable over time, consolidating the initial reduction, rather than expecting a reduction. Alternatively, it is possible that crime may be reduced to an extremely low level early in the implementation process, to such as extent that it would no longer be feasible to create further reductions (referred to as a floor effect in statistics). Again, in this case, a satisfactory outcome would simply be to maintain the areas crime rate. It is also important to ensure that the time periods considered are not engineered to put the NDC in the most favourable light. It is advisable to use logical reasoning to ascertain which time periods should be compared, or to undertake an analysis that considers a number of different before and after periods.

A final consideration is that of cross-referencing changes in crime levels with the activity of the NDC itself. The most robust form of analysis relates crime reduction to the level of intensity of the scheme's activity. This can be measured in terms of financial expenditure or the outputs realised on the ground. A far more convincing case can be presented regarding the attribution of change if crime reduction can be shown to be coincident with high levels of scheme activity. However, to do this, in addition to crime data, information concerning scheme inputs and outputs are required.

A final point that requires qualification is that whilst the techniques presented here represent a considerable advance on those previously used by the NDCs, they are not without their criticisms. Thus, the work presented here should be seen as part of an ongoing process. The main reason for adopting the methods used here was that detailed data (such as quarterly data for police force areas and smaller boundaries) were unavailable at the time of writing. The authors are currently endeavouring to acquire more precise data and anticipate that further analytical techniques will be identified or developed that will improve upon those described here.

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