

**UNDERSTANDING CAR PARKS,
CRIME AND CCTV:
EVALUATION LESSONS FROM SAFER CITIES**

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Crime Prevention Unit Papers

The Home Office Police Research Group (PRG) was formed in 1992 to carry out and manage research relevant to the work of the police service and Home Office Policy Divisions. One of the major Police Department divisions which acts as customer for the PRG is the Home Office Crime Prevention Unit which was formed in 1983 to promote preventive action against crime. It has a particular responsibility to disseminate information on crime prevention topics.

The object of the present series of occasional papers is to present research material in a way which should help and inform practitioners, whose work can help reduce crime.

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Foreword

The Safer Cities Programme is a Home Office crime prevention initiative which currently operates through 20 projects in England. The projects provide financial and other support for a wide variety of local crime prevention schemes. This report is the first 'thematic' study of such schemes. The effectiveness of closed circuit television (CCTV) in car parks was chosen for study reflecting the importance of controlling car-related offending and the increasing interest in CCTV as a crime management tool.

The results are encouraging and suggest that CCTV can, in certain circumstances, make a useful contribution to crime control. But perhaps one of the most valuable lessons from the report is the illustration of the need to consider the precise reasons why CCTV might help to prevent crime in a particular case. As the report shows, even with a relatively simple measure such as CCTV there are a variety of ways in which it could contribute to crime control. Which of these ways is most relevant will often depend on local circumstances and the nature of the local car crime problem. This thought provoking report valuably brings out the need to consider these interactions carefully if value for money in crime prevention is to be achieved and if we are to learn from experience.

I M BURNS
Deputy Under Secretary of State
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January 1993

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1. Introduction

The most recent figures available (July 1991 – June 1992) at the time of writing show vehicle crime accounting for 28% of all recorded offences in England and Wales (Home Office 1992), an increase of 7% over the previous year. There were 571,700 thefts of motor vehicles. The 1992 British Crime Survey finds that 99% of such thefts are reported and 93% recorded, the highest rates for any offence category examined (Mayhew and Aye Maung 1992). The number of recorded thefts from vehicles stood at 931,300, and the British Crime Survey estimates that 53% of such thefts are reported, and 32% eventually recorded by the police. Hope (1987), using data from the 1984 British Crime Survey, shows that the highest vulnerability to all car crime is found on the street close to drivers' homes. However, a substantial amount of crime occurs in car parks. Webb, Brown and Bennett (1992) indicate that British Crime Survey data show that 22% of thefts of cars and 20% of thefts from cars take place in private or municipal car parks, though there are substantial local variations. They give figures of 40% for thefts of vehicles in Nottingham and 39% for thefts from vehicles in Derbyshire which were reported to the police during one week in 1991.

Car crime in general including that in car parks in particular is clearly a serious issue. One aspect of the problem can be addressed by designing cars to make them less vulnerable (Mayhew, Clarke, and Hough 1980; Southall and Ekblom 1985), for example by installing improved steering locks, better door locks, identity marks, and car alarms, and by encouraging the public to activate security devices where fitted, and to remove clearly attractive items from sight where possible. Mayhew and Aye Maung (1992) show that the highest rate of increase in offences from 1981 to 1991, both for police recorded crime and for British Crime Survey data, is that of attempted thefts of and from vehicles, with figures of 336% and 395% respectively. 'This', they state 'suggests not only that car thieves are more active, but that cars have become better protected whether by manufacturers or owners.' Another aspect of car crime is addressed in attempts to divert or discourage the potential car criminal, though research is needed to establish the effectiveness of measures aimed at this. A third aspect of the problem relates to the environment in which the offence takes place. Poyner & Webb (1991) examine the effect of the design and layout of residential areas on car crime. There has been some research into the management and organisation of car parks and how this may impact on patterns of crime (Laycock & Austin 1992; Webb, Brown and Bennett 1992). Findings suggest that variations in the setting in which the car is parked are associated with different crime rates.

Little systematic evidence, however, has been collected on the impact of changes in the physical environment on car crime, and in particular on the effectiveness of CCTV in reducing it. Poyner (1992) reports a study of The University of Surrey in Guildford, where he found a significant decrease in thefts from cars in the year in which CCTV was installed as compared to the previous year — from 92 in 1985 to 31 in 1986, but a much smaller decrease in thefts of cars — from 15 to 12. This paper

focuses on the rather more extensive experience of Safer Cities schemes where CCTV has been installed in public car parks.

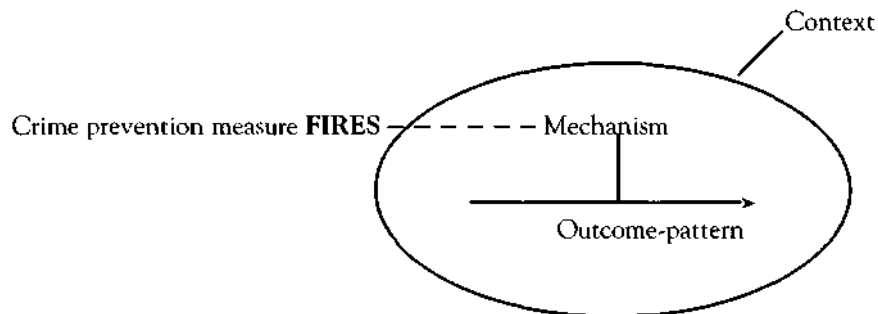
It may seem obvious to some that CCTV has the potential to reduce car crime, and therefore that to discuss the whys and wherefores of it is superfluous. Yet CCTV does not create a physical barrier directly stopping car crime. Policy makers and crime prevention practitioners need to be clear concerning exactly what it is about CCTV which might lessen car crime and in what circumstances the potential can most effectively and economically be released. We begin, therefore, with a brief theoretical discussion of what will be referred to as the mechanisms through which and contexts in which CCTV may lead to a reduction in car crime in car parks.

2. Theory and Method in Evaluating the Effects of CCTV

Following Pawson & Tilley (1992), in which a general account of the evaluation methodology exemplified here is given, we begin with a brief explanation of key terms — ‘mechanism’, ‘context’ and ‘outcome-pattern’. These are employed throughout this paper, where usage will further clarify their meaning.

In a given context, a particular crime prevention measure fires one or more causal mechanisms, which produce a particular outcome-pattern. Mechanism questions ask what it is about a crime prevention measure which may lead it to have an outcome-pattern in a particular context. Context questions ask about the conditions needed for a crime prevention measure to fire its (potential) causal mechanism/s to produce an outcome-pattern. Outcome-pattern questions ask what the practical effects are of causal mechanisms being fired in given contexts. This is represented in diagrammatic form in Figure 1.

Figure 1: Mechanism, context and outcome pattern.



The mechanisms whereby CCTV may impact on car crime

What is it, then, about CCTV which makes car crime less likely? There are several possibilities. Consider the following:

- a) CCTV reduces car crime by making it more likely that present offenders will be caught, stopped, removed, punished and deterred.
- b) CCTV reduces car crime by deterring potential offenders who will not wish to risk apprehension and conviction by the evidence captured on videotape or observed by an operator on a screen on which their behaviour is shown.
- c) The presence of CCTV leads to increases in usage of car parks, because drivers feel less at risk of victimisation. Increased usage enhances natural surveillance which deters potential offenders, who feel they are at increased risk of apprehension in the course of criminal behaviour.

- d) CCTV allows for the effective deployment of security staff/police officers towards areas where suspicious behaviour is occurring. They then act as a visible presence deterring potential offenders. They may also apprehend actual offenders red handed and disable their criminal behaviour.
- e) The publicity given to CCTV and to its usage in catching offenders is received by potential offenders who avoid the increased risk they believe to be associated with committing car crimes in car parks. The perceived risks of offending exceed the perceived benefits, and offending either ceases or is displaced by place or offence.
- f) CCTV, and signs indicating that it is in operation symbolise efforts to take crime seriously and to reduce it. The potential offender perceives crime to be more difficult or risky and is deterred.
- g) Those car crimes which can be completed in a very short space of time will be less reduced than those which take more time, as the offender calculates the time taken for police or security officers to come or the probability that panning cameras will focus in on him/her.
- h) CCTV and notices indicating that it is in operation remind drivers that their cars are vulnerable, and they take greater care to lock them, to operate any security devices, and to remove easily stolen items from view.
- i) Cautious drivers, who are sensitive to the possibility that their cars may be vulnerable and are habitual users of various security devices, use and fill those car parks with CCTV and thereby drive out those who are more careless, whose vulnerable cars are stolen from elsewhere.

The imaginative reader may be able to think of other ways (or 'mechanisms') in which CCTV may impact on patterns of car crime. It is also clearly possible that more than one mechanism may operate simultaneously — crime prevention may be 'overdetermined' by CCTV. Finally and most importantly the mechanisms fired by CCTV and their efficacy will be context-bound. Just as the potential diversity of mechanisms fired by CCTV needs to be illustrated, so does the variety of contexts for car crime prevention in car parks.

Context, CCTV and Car Crime

To state the perfectly obvious, neither car parks nor car crimes are all alike. Our interest lies in such contextual variations which have significance for the crime reduction mechanisms which may be fired by CCTV. Here are a few examples:

- a) A given rate of car crime may result from widely differing prevalence of offending. For example if there are 1000 incidents per annum, this may be by anything from a single very busy offender to as many as 1000 offenders, or still more if they operate in groups. A mechanism leading to disablement of the offender (as in [a] above) holds potential promise according to the offender-offence ratio.

- b) A long stay car park may have an enormous influx of vehicles between eight and eight-thirty in the morning when it becomes full up. It may then empty between five and six in the evening. If the dominant CCTV fired mechanism turns out to be increased confidence and usage (as in [c] above) then this will have little impact because the pattern of usage is already high with little movement, dictated by working hours not fear of crime. If, however, the car park is little used, but with a very high per user car crime rate then the increased usage mechanism may lead to an overall increase in numbers of crimes but a decreased rate per use.
- c) Cars parked in the CCTV blind spots in car parks will be more vulnerable if the mechanism is increased chances of apprehension through evidence on videotape (as in [b] above), but not if it is through changed attributes/security behaviour of customers (as in [h] or [i] above).
- d) The local patterns of motivation of offenders, together with the availability of alternative targets of car crime, furnish aspects of the wider context for displacement to car crimes elsewhere, whatever crime reduction mechanisms may be fired by CCTV in the specific context of a given car park (for a recent discussion opening up issues of motivation and vehicle choice, see Clarke and Harris 1992).
- e) In an isolated car park with no security staff and the police at some distance away, the deployment of security staff/police as a mobile and flexible resource to deter car crime (as in [d] above) is not possible.

Context and mechanism

It is clear that CCTV may fire a number of mechanisms. It should also be pointed out that the way CCTV is implemented will affect its mechanism firing potential. For example, if resources are not available for watching monitors at the time events are occurring, some mechanisms cannot be fired (for example the dispatch of security/police). If the quality of the pictures is too poor to allow the identification of offenders, then conviction through video evidence is not possible and crime prevention outcome- patterns springing from that cannot be fired. Moreover, the mechanisms fired with certain forms of implementation can be expected to yield only short term crime reducing outcome patterns. If, thus, the mechanism is deterrence via a rise in perceived risk which is not rooted in real risk increase, then, in the absence of periodic reinforcements, many offenders may come to appreciate that they can safely resume their criminal behaviour, and the crime rate will then increase (cf Austin 1988).

Which potential crime reducing mechanisms are fired turns on context and implementation. A well designed scheme with greatest promise for success will be one in which effective mechanism firing will be tailored to the context in which it is occurring.

Evaluation

Some readers may now be asking if baldly stated questions about whether CCTV does or does not reduce car crime are meaningful. They are absolutely right to do so. What we need to ask instead is this, 'Under what initial circumstances (context) and how can CCTV be used (mechanism) to reduce specified car crimes and for how long (outcome-pattern)?' Addressing the issue in this way will enable us to begin to flesh out what can be achieved using CCTV, and promises helpful results for those wishing to address car crime problems in particular car parks. The overall potential of CCTV can only be progressively uncovered over time by a series of studies to deal with the various aspects of this question. The study reported here will merely scratch at the issues. It will permit more informed judgments about the present potential of CCTV to fire mechanisms and reduce some forms of car crime in given contexts. It will also cast doubt on the plausibility of a number of mechanisms presumed to play a part.

Having recast the evaluation question, how does one go about answering it? The clues are already there. At the level of the scheme, what is needed is first, a clear specification of the mechanism or mechanisms it is intended to try to fire; second, an analysis of how the CCTV will be operated in order to fire its mechanism/s; third, a specification of what pattern of outcomes is expected (across time, space, offence type etc); and fourth the instituting of measurements tailored to capture those expected outcome-patterns, and in some cases the mechanisms deemed to have been fired. It will be important also to monitor the implementation of the CCTV to check that it is being operated in accordance with the potential mechanism-firing as conceived in the scheme. In devising the scheme, its operation will obviously be tailored to the context (which also needs to be monitored) in an effort to achieve the intended result.

Monitoring and evaluation, as here specified, are closely tied to mechanism-firing, context and expected outcome-patterns. It may well be that there is uncertainty over which mechanism/s are fired with what precise effects. Provided that this is thought through in advance, this does not matter. Indeed it is to be welcomed, for it creates the opportunity to arbitrate between or measure the relative contributions of different mechanisms. It is important, finally, to remember to consider unintended as well as intended features of outcome-patterns which might be expected from contextually specified mechanism-firing.

It is hoped that this section highlights the importance of theory for developing and evaluating crime prevention schemes. Without some theory a scheme can have no shape, and its evaluation no direction. The scheme constitutes an hypothesis about social change, held, however implicitly, in the minds of those designing and implementing the scheme. By doing W (implementing a given measure) in situation X (a particular social and physical context) we affect underlying process Y (fire a causal mechanism) which will produce intended effect Z (lead to an outcome-pattern in which crime is reduced). Unless we can make fairly precise statements about W, X, Y

and Z our evaluation efforts will be ill directed and our outcome measures poorly focused. We shall learn little, if anything, that is of value. Evaluation needs to be theory driven.

Thematic studies

A thematic investigation takes a number of schemes and attempts to sift through the mechanism/context patterns which are emerging. Thematic studies are parasitic on scheme data of a minimum standard. With a sufficient number of schemes, however, even if there are weaknesses in the data and provided these are not identical across the schemes, some provisional conclusions can be drawn from repeated patterns where these are identified. In the best circumstances research would work the other way round: a framework of actions, mechanisms, contexts and expected outcome-patterns would be theoretically specified and then empirically tested. We are a long way from that even with something as simple as CCTV in car parks.

3. Results

For six Safer Cities schemes (or suites of schemes) in which CCTV has played a major part in efforts to reduce car crime sufficient data were available for incorporation into this thematic evaluation. The schemes are in Hartlepool, Hull, Bradford, Lewisham, Coventry and Wolverhampton.

Hartlepool

The centre of Hartlepool is circled with car parks, used by both shoppers and workers. Almost all of these are surveilled by CCTV. The only exceptions are some floors in a multi-storey car park. Most of the cameras are tilt, pan and zoom and have an infra red facility. Thus, they are highly versatile. They can be used day and night for broad surveillance of wide areas, and can also be used to home in in detail on some specific car, person or event. Each camera may be surveilled by another. Hence both tampering and malfunctions can be observed and appropriate remedial action arranged.

The control room is staffed day and night throughout the year. There is thus no time when the cameras are not in operation with a person able to arrange the dispatch of police or security personnel as they judge appropriate. There is a staff of seven security officers in all (not all of whom, of course, are on duty at any one time) who can be mobilised and whose daily round is shaped by what they learn of needs from the member of staff in the control room. There is a line from the control room to the police station, from which officers can be summoned when required.

The images from all the cameras are stored in encrypted form on a single tape, which is retained for a period before re-use in the event that it might contain evidence which can subsequently be used in prosecutions. Re-running the tapes requires, of course, a dedicated machine to decode the images. The images carry a running date and time, allowing precise pinpointing of the events displayed. The presence of the cameras is prominently advertised in the car parks in which they operate. A few well publicised convictions have followed from the observation of offences on video. The chief security officer had appeared in court to give an account of what he had seen on the screen. Also defence lawyers had come to view what had been recorded on some occasions, following which they had advised clients that their case was weak, and not worth defending.

The above description makes clear that the CCTV system in Hartlepool has been implemented in a way which fires several potential crime reducing casual mechanisms. The efficacy of security personnel as visible capable guardians is increased as CCTV informs their deployment. Signs, well publicised convictions and the cameras

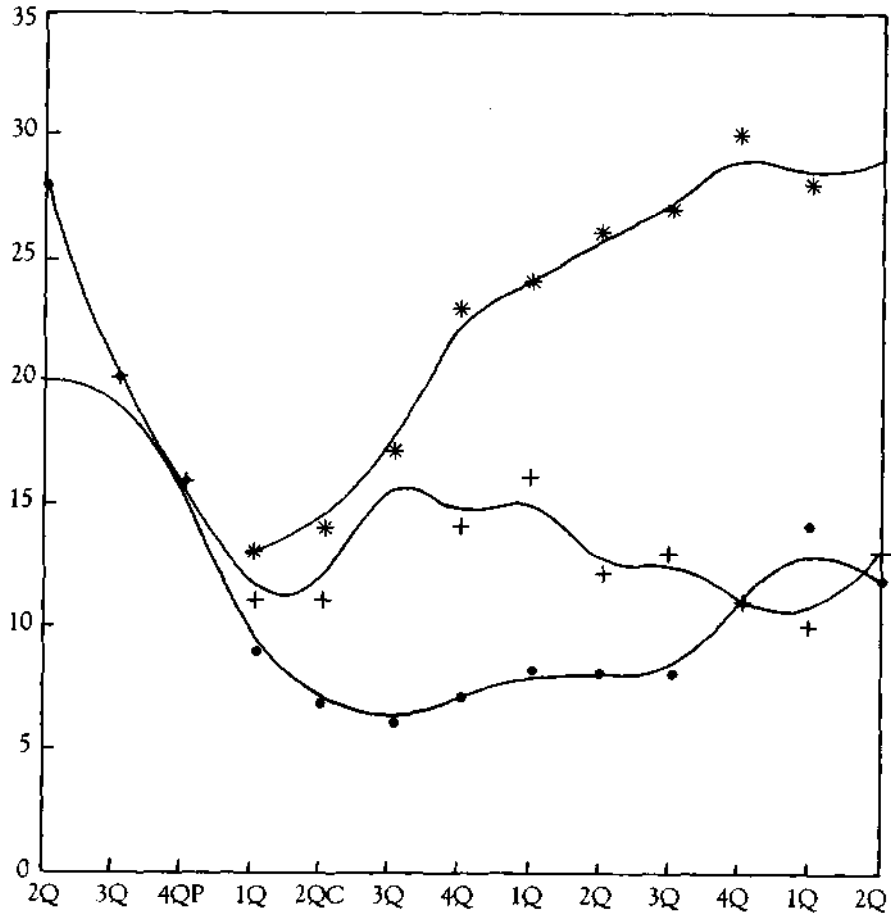
themselves remind the potential offender of the risks of apprehension, especially in regard to offences which cannot be quickly completed. The signs also remind car drivers to leave their vehicles secure. Moreover the pattern of usage of the car park has changed, furnishing a greater throughput of shopper/parkers in some parts who are potential observers/guardians. Ample space means that it is unlikely that more cautious drivers are excluding those who are less so.

The data available on the scheme relate to the overall patterns of various car crimes. Unfortunately, as with other work described below, they have not enabled disaggregation of effects by homing in on different patterns which would be expected according to the operation of the mechanisms fired. Moreover, the introduction of a payment scheme in October 1989, shortly before installation of CCTV in April 1990, further muddies the picture. Except for one small car park, with 150 spaces (of the 1,700 in all), all non-CCTV car parks were also non charge car parks. The payment scheme potentially fired at least two crime reducing mechanism: first the occasional presence of ticket wardens acting as visible guardians; and second the reduced usage of the car parks by employees, creating more short term parking and more surveillance by users. The conjectured outworkings of this potential crime reducing measure could in principle be compared with those of the CCTV, looking to detailed intra-scheme output variations which would follow from alternative mechanism operations. This, though, is possible only in a limited way with the data collected.

The overall pattern of crime rate changes emerges clearly when looking at the moving average. Figure 2 shows a three quarter moving average for theft of cars from both CCTV-covered and non-CCTV covered car parks in Hartlepool from 1989 to 1992, together with available equivalent scaled (1/20) figures for Hartlepool as a whole (from January 1990). The curves are subject to smoothing both from the use of moving averages and from the best fit line drawn. They disregard, thus, the quarterly fluctuation found in the raw figures for the car parks (for these, see Table A1 in the appendix). Prior to CCTV installation (and after introduction of the payment scheme), there is a decline in thefts of cars in both those car parks which came to be covered by CCTV and those not so covered. The downward trend continues in car parks where CCTV was installed but is reversed in the others. The upward swing in non-CCTV car parks in the early stages closely corresponds to that for theft of cars in Hartlepool as a whole, though a clear divergence is seen from the third quarter of 1990, for which no plausible explanation came to light.

The marked relative advantage of CCTV covered car parks in relation to theft of cars clearly declines over time and there are signs that the underlying local trends begin to be resumed. This pattern has been found in relation to property marking (Laycock 1992), and more generally fits with the 'life cycle' of crime prevention initiatives identified by Berry and Carter (1992). It may, of course, be that there was some temporary displacement from the CCTV to non-CCTV car parks.

Figure 2: Three quarter moving averages for theft of cars in Hartlepool, showing the total (scaled to 1/20), CCTV covered and non-CCTV covered car parks, 1989-1992.

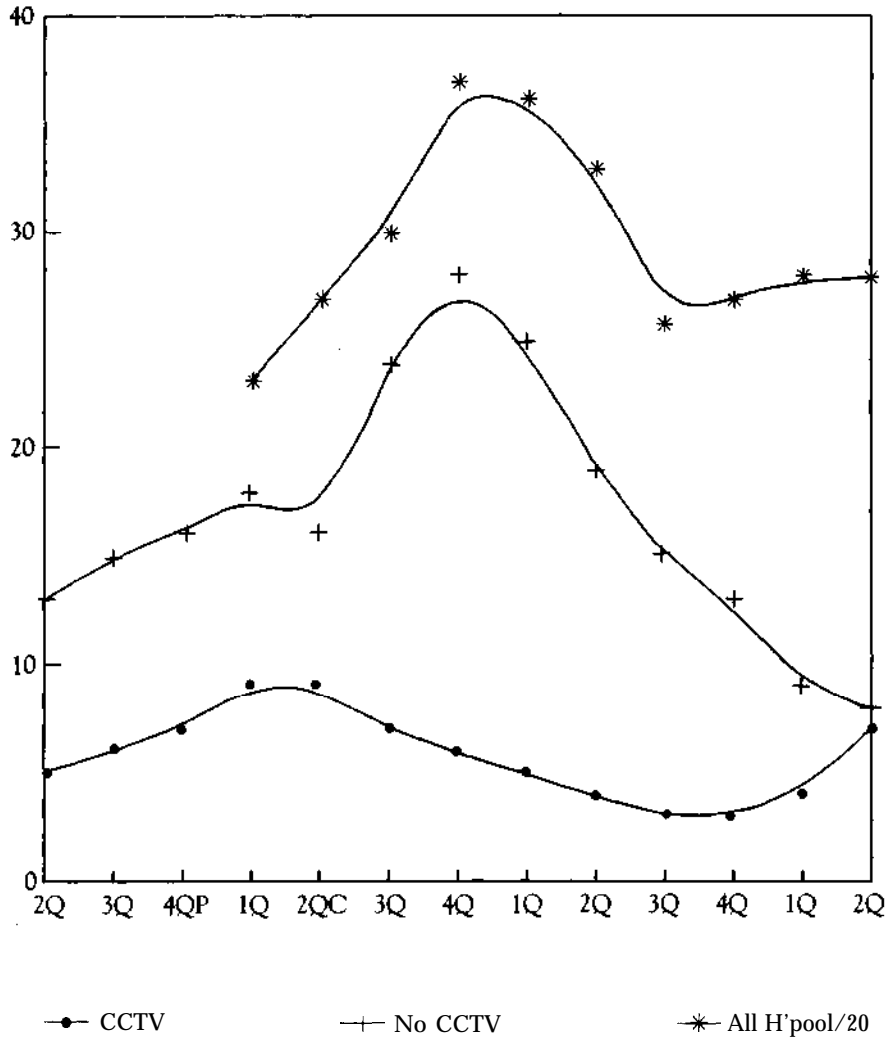


—●— CCTV car pks —+— No CCTV car pks —*— All H'pool/20

Note: The payment scheme was introduced in October 1989 (at the start of the quarter marked 4QP), and the CCTV system was installed in April 1990 (at the start of the quarter marked 2QC). Given that moving averages are shown the preceding quarter begins to reflect any change following from these initiatives.

Figure 3 shows the pattern for theft from cars, the curves being derived in the same way as those for theft of cars shown in Figure 2, whilst the raw, fluctuating quarterly figures for theft from cars are shown in Table A2 in the appendix.

Figure 3: Three quarter moving averages for theft from cars in Hartlepool, showing the total (scaled to 1/20), CCTV covered and non-CCTV covered car parks, 1989-1992.



Note: The payment scheme was introduced in October 1989 (at the start of the quarter marked 4QP), and the CCTV system was installed in April 1990 (at the start of the quarter marked 2QC). Given that moving averages are shown the preceding quarter begins to reflect any change following from these initiatives.

In the car parks covered by CCTV we see a rather more gradual decline in theft from cars than in the case of theft of cars. This is followed by an increase, which begins to mirror the pattern shown for all Hartlepool car crime. In the short term following installation of CCTV the pattern of theft from cars in non-CCTV car parks matches remarkably closely the scaled (1/20) pattern for overall theft from cars in Hartlepool, with which that in CCTV-covered car parks is in marked contrast. No plausible explanation emerged for the divergence discernible from late 1991 in the pattern for non-CCTV covered car parks in comparison with that for CCTV covered car parks and the overall trend in Hartlepool.

The clear relative advantage for CCTV covered car parks in relation to patterns of theft from cars lasts for three quarters following installation. There is again some evidence for the life cycle of crime prevention measures which we noted in relation to theft of cars in Hartlepool.

A reduction in both theft of and theft from cars can thus be seen to have occurred in the short term following installation of CCTV in some car parks in Hartlepool. This contrasts with the pattern in car parks in which CCTV was not installed and in Hartlepool overall, where car crime increased. The downward trend in CCTV covered car parks, however, was followed by an increase, with signs that this is beginning to mirror the underlying local trend.

In addition to its use for enhancing the security of car parks, the CCTV in Hartlepool has also been put to other crime control purposes, which had neither been planned nor anticipated when the scheme was first mooted. The cameras can be and are directed to sites where and when trouble is expected, for example to the exits of night clubs around closing time, to those places where young people congregate both in the daytime and at night and might be expected to cause trouble, and to the streets to control crowds when there are popular football matches. They have also been used in conjunction with the police to mount special operations in relation to various crimes. The cameras appear to be popular with the police, public, and commercial organisations alike. There was no evidence of resistance from anyone to their deployment or use (cf Honess & Charman 1992).

Hull

In Hull CCTV has been introduced to the Albion Street car park. As in Hartlepool, the monitors are continuously observed. The cameras are also tilt, pan and zoom, with the versatility which comes from this. Albion is a flat car park, all of which can be surveilled with the cameras. Again as in Hartlepool, the dated and timed images are recorded in encrypted form, with storage for a period in the event of a need to review the tape for evidential purposes. If necessary, there is a facility in Hull (which is not present in Hartlepool) for producing a hard still copy of a frozen image from the screen. The cameras are routinely controlled and monitors observed by employees of Hull Borough Council, though there is a facility for transmission to the police either with or without their direct control of the cameras. The police can thus be apprised of situations in which they might usefully intervene, and can also make their own

judgement on the basis of what they can see from the CCTV. The controller of the CCTV can also call on mobile security officers to attend the car park if necessary.

In the Hull car park, both prior to and since the installation of CCTV prepayment was required and attendants' presence to deal with this has not changed. CCTV was operational from November 1991, with the police link in place from December 1991. The figures for recorded car crime changes are given in Table 1. This shows significant reductions in damage to cars (by 45%), in theft of cars (by 88.9%) and in theft from cars (by 76.3%) in Albion street car park, comparing equivalent seven month periods before and after installation of CCTV. These improvements took place in a context in which over the same periods in Hull city centre as a whole theft of cars fell by only 6%, from 430 to 406, whilst theft from cars rose by 3%, from 961 to 988.

Table 1: Changes in rate of car crime in Albion Street Car Park, Hull, before and after installation of CCTV

	1/11/90-30/6/91	1/11/91-30/6/92	Change
Damage to vehicle	11	6	-45%
Theft of vehicle	27	3	-88.9%
Theft from vehicle	38	9	-76.3%

Comparing February to June 1991 with the corresponding period for 1992, usage of the car park between 8.00 am and 6.00 pm increased from 98,663 to 107,064. The rate of usage of other municipal car parks decreased, though some cars may have been syphoned off to a private multi-storey car park which reduced its fees at the same time, substantially undercutting the council. There is, in this, some evidence that installation of CCTV has if anything increased the rate at which Albion Street would otherwise have been used, though the change is not so great that it could plausibly be a mechanism through which the car crime rate reductions would have been effected. What the increased daytime usage may suggest is that the introduction of CCTV has reduced fear of crime in this car park. It is not clear what if any displacement to car crime elsewhere there has been. The Hull data do not allow us to clarify the mechanism through which car crime has been reduced, beyond saying that usage changes and natural human surveillance does not seem to have played a part. Thus, we do not know what it is about the CCTV set-up which has led to the reduction in car crime.

Usage of CCTV for surveillance purposes has proved a more politically sensitive issue in Hull than in Hartlepool. A published Code of Practice for the Monitoring of Close Circuit Television regulates the use of the facility. This prohibits, on pain of disciplinary action or dismissal, disclosure of matters which are confidential. It also sets conditions for the transfer to the police of transmitted pictures and camera control, and procedures for the use of material in court. Those council officials controlling CCTV at present, which covers a bus station as well as the car park, are aware of its potentially greater use and are discussing the possibility of its extension to the Railway Station Car Park. They also see its use for other crime control purposes and have already worked with the police in relation to drugs offences. Their view is that extension would be inevitable in changed political circumstances.

Lewisham

The Lewisham scheme operates in a station car park, and is run by the the local traders' association. As with Hartlepool and Hull, the car park is pay and display, with no permanent attendant, though tickets are apparently checked very regularly so there is some official presence. This was so during the year prior to the installation of CCTV and has remained so since. The system differs from the Hartlepool and Hull schemes in several respects. There are three fixed lens, unadjustable cameras as well as one dummy camera. These cover not quite all the car park. When in automatic mode no-one watches the monitor on which events in the car park are displayed, but they are recorded to tape on which time and date are superimposed. Thus it is possible to review tapes if necessary. However, playback does not produce sufficient clarity of definition to make the identification of individuals or reading of number plates possible. Indeed, even viewed 'live' one would be hard pressed to recognise a particular individual, and it is not straightforward to discern number plates. Even eighteen months after its installation, no arrests have followed from use of the equipment. The monitor and video equipment is located in the basement of a local business, whose proprietor is Chairman of the traders' association and who casually watches the screen as he works. Volunteers also drop in periodically to watch the monitor, and this has led to the police being called out although at the time of writing it was estimated that this had not happened for four to five months. Where there have been incidents the tape has been handed to the police, though their use of the material is unknown - it was thought unlikely that it was used, and it had certainly led to no identifiable action. The businessman in whose basement the equipment sits conscientiously maintains continuous recording, even during bank holidays, when he makes a special visit to the shop to change tapes. He is convinced of its usefulness.

Notices indicating operation of the equipment are displayed fairly prominently in the car park. The equipment was installed and began use in April 1991. From April 1st to July 1990, there were twenty-four recorded auto-crimes, whereas in the corresponding period following installation of the equipment in 1991, there were only six. Data were not available for Lewisham as a whole, within whose police area the car park is located, but background patterns are unlikely to explain such a dramatic fall.

Assuming the reduction is real, it is clear that the mechanism effecting this reduction has not been removal of offenders, since none has been caught through the CCTV. They have also played a negligible role in mobilizing police or security staff. The outcome figures for this scheme are small, but if the apparent reduction in car crime is real then the mechanism would seem to be their perceived potential, as assessed by would-be car criminals, or their impact on the security behaviour of users rather than through other mechanisms described above. This may be reinforced by efforts of the local beat officer to disseminate local knowledge of its presence and its ability to identify people in his work in a junior school which is next to the car park. Following its commissioning during crime prevention week in 1991, there was substantial publicity about the scheme in the local newspaper. This was not altogether positive, expressing some anxiety about the introduction of 'big brother'. That said it will have served to communicate the presence of CCTV to local potential offenders and may have had a deterrent effect. The negative publicity has since died away.

The arrangements for this scheme are very economical. Beyond the initial installation costs of £13,053 in 1991, very little expense has been incurred. Lewisham borough council pays the cost of electricity for the cameras and the silversmith pays the cost of the electricity for the monitor and video recorder. The platform used to put up and later take down the Christmas Lights is also used to reach the cameras and to clean them.

Bradford

John Street Car Park lies in the centre of Bradford. It is multi-story, has had CCTV installed on each floor, and there are signs prominently placed round the car park indicating its operation. Lighting has been improved and the walls painted. It was hoped, when the cameras were first installed in July 1991, that one of them on the top floor would also cover the adjacent Simes Street and Rawson Street surface car parks.

In the event, because the designated camera lacked the power to do so, an additional camera specifically for this purpose was attached to the side of the John Street car park in March 1992. The monochrome CCTV images are stored as in Hartlepool and Hull. In a control room for a variety of CCTV installations in Bradford, where hard copy can also be made, screens are watched daily from 6.30am to the following 3.30am by members of a dedicated team. No convictions have arisen specifically from this work. The John Street multi-storey and other surface car parks are all pay and display, and were so before the security upgrade.

The following data, in Tables 2 and 3, compare the thefts of and thefts from cars during the twelve months prior to the installation of CCTV in John Street in July 1991 with the corresponding figures for the succeeding twelve months. The changes in the John Street Car Park figures are then compared with those for the surrounding streets, where parking also occurs, as well as with rates for the Simes and Rawson Street car parks, and finally with Bradford City Centre Sub-Division as a whole.

The possible impact of the additional camera covering the Simes and Rawson Street car parks from March to June 1992 are disregarded, and thus the differences between the multi-storey and surface car parks may be slightly understated, if the camera was having an additional effect. There are insufficient data to make a judgement about this.

Figure 4: Map of John Street, including car parks and surrounding streets.

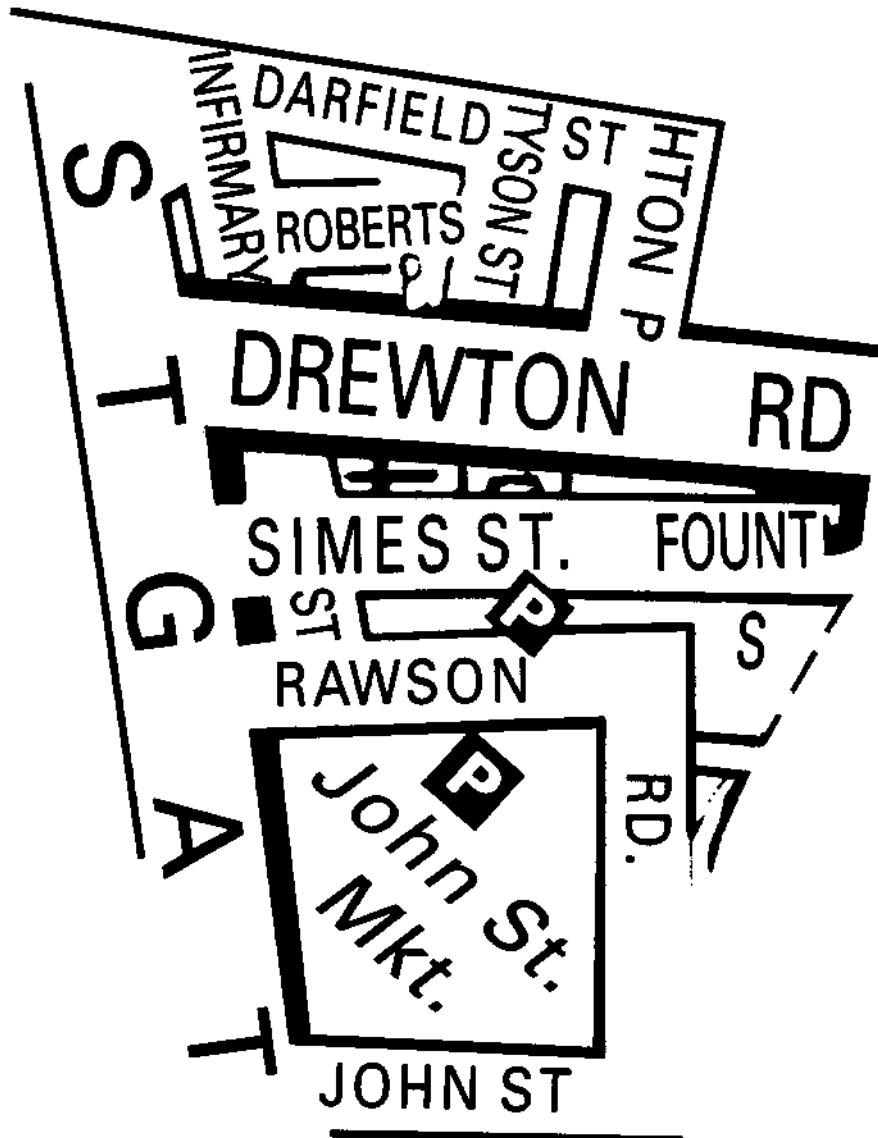


Table 2: Theft from cars in the John Street Car Parks, adjacent car parks and local streets, and Bradford City Centre Sub-Division before and after installation of CCTV.

Thefts from cars in and around John Street Car Park			
Area	7/90-6/91	7/91-6/92	% change
John Street Car Park	32	10	-68
Surface car parks	22	23	+5
Street car parking	33	35	+6
City Centre Sub-Div	1481	1627	+10

Table 3: Theft of cars in the John Street Car Parks, adjacent car parks and local streets, and Bradford City Centre Sub-Division before and after installation of CCTV.

Thefts of cars in and around John Street Car Park			
Area	7/90-6/91	7/91-6/92	% change
John Street Car Park	23	13	-43
Surface car parks	17	18	+6
Street car parking	22	29	+32
City Centre Sub-Div	976	1055	+8

It can be seen that the John Street Car Park has enjoyed a substantial reduction in both theft from (by 68%) and theft of cars (by 43%) in the twelve month following installation of CCTV and other associated security upgrading. This is in marked contrast with the surface car parks and local streets where there has been some increase in these car crimes, and with the city centre sub-division where car crime has also risen.

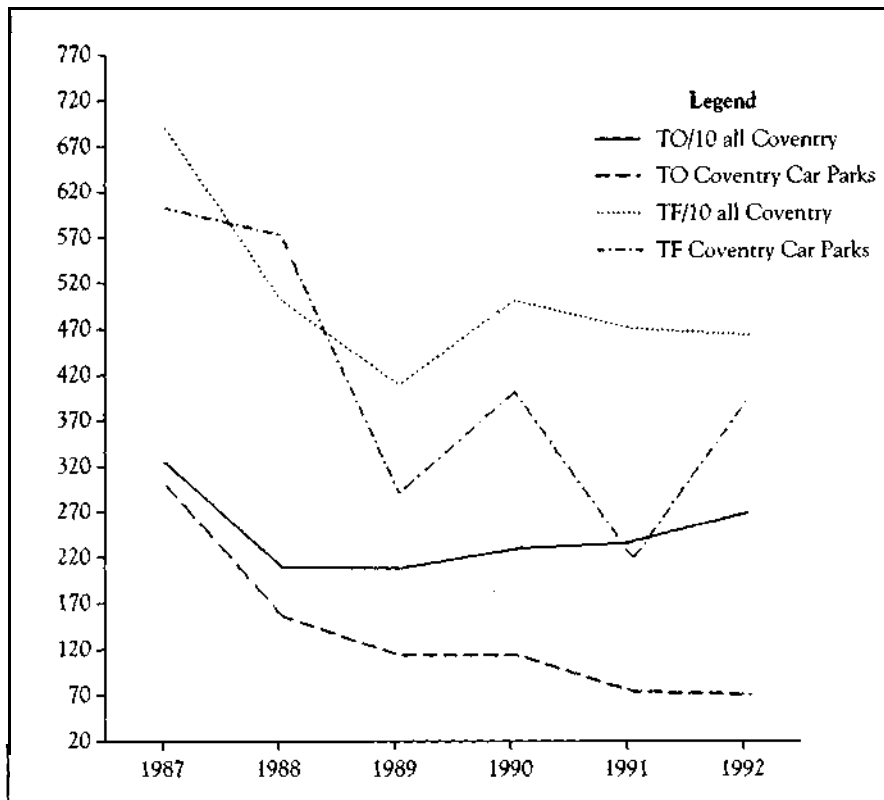
As elsewhere, it is clear that the mechanism effecting crime reduction here cannot be actual apprehension of offenders because no-one was arrested, nor is it deployment of security personnel, since these were not conveniently at hand. The range of work undertaken, including CCTV, painting and lighting improvements, may have increased the perceived risk to potential offenders at least for the period of crime reduction identified here.

In Bradford, CCTV has been adapted for surveillance of streets with no significant local opposition.

Coventry

The car park superintendent in Coventry has taken a particular interest in car crime. He is a member of the local Crime Prevention Panel, and has worked closely with the police in attempting to control car crime in his car parks, recently with funding from Safer Cities. Over the years, a wide variety of measures has been adopted in various car parks. These include reduction in the height of walls and cutback of foliage to improve surveillance, erection of high fencing to restrict access by foot, painting and lighting upgrades to improve visibility and reduce fear, as well as installation of CCTV together with signs alerting those in the car parks that it is in operation. CCTV monitors are continuously watched in the daytime and evening, but not through the night. Video recordings are made and kept as in other areas in the event of requests from the police to view them, and there are facilities for making hard copy of particular images.

Figure 5: January to August rates of theft of and theft from cars in Coventry overall (scaled to 1/10), and in council run public car parks, 1987-1992.



Meticulous crime records are kept and efforts are made to improve security in the light of emerging car crime patterns. The apparent overall effect on rates of theft of cars in Coventry is striking. Theft from cars has proved much more difficult to control, as Figure 5 indicates (see also Table A3 in the Appendix).

The higher of the bottom two lines in Figure 5 shows the changing rate of theft of cars in Coventry in January to August of each year from 1987 to 1992, scaled to one tenth. The very bottom line shows the number of thefts of cars in Coventry in council run public car parks over the same periods. It is clear that after initial similar falls, the lines diverge, theft of cars increasing in Coventry overall, but decreasing in the car parks. Table A3 reinforces the point. It shows that the percentage of all thefts of cars in Coventry, which are from public council car parks, declines annually, beginning at 9.2% in 1987, and ending at 2.7% in 1992.

The top two lines in Figure 5 relate to theft from cars. The higher of the two at the beginning and end of the graph relates to theft from cars in Coventry as a whole for January to August each year from 1987 to 1992, scaled to one tenth. The lower of the top two lines relates to theft from cars in the council run public car parks. The pattern is much less clear than it is for theft of cars, reflecting greater fluctuation in theft from cars, which is accentuated in the case of offences committed in the car parks. Table A3 does not indicate the same steady decline in the proportion of thefts from cars occurring in these car parks as it does for theft of cars.

Five car parks, which jointly are responsible for about two thirds of the public car park related crime in Coventry, are examined in greater detail: Barracks, Bond Street, Fairfax, Greyfriars, and Whitefriars. The year by year changes in their car crime rates, and the security related improvements which have been made in them, can be seen in Table 4. This is quite complex, containing a wide range of data. Whilst for 1987 the base numbers of incidents are shown, in subsequent years percentage changes are given. These compare January to August figures with those for the same period in the immediately preceding year. For example, the 47% increase in theft of cars, noted in relation to Barracks Car Park (the column headed BAR) in January to August 1989, compares the number of incidents in that year with the number in the same period in 1988. In the appendix, Table A4 gives the raw figures from which the calculations have been made; it shows that the number of thefts of cars from Barracks Car park rose from 15 in 1988 to 22 over the equivalent months in 1989. Table 4 also indicates that the car park was painted in 1989 ('P'), and had two cameras installed as part of a CCTV surveillance system in 1988 (2C). Some readers may find clearer the graphical representation of the changes identified in these tables in Figure A1 in the appendix.

Table 4: Changes in car crime rates and crime prevention measures, Coventry car parks.

Year (figs January-August)		BAR	BON	COX	FAI	GRE	WHI	Total
1987	Theft of	56	40	43	32	4	16	191
	Theft from	200	33	44	67	18	28	390
	Crime prev measures			IC; P				
1988	% change TO	-73%	-20%	-30%	-47%	-25%	-25%	-52%
	% change TF	-5%	+33%	+27%	-34%	+16%	+14%	-1%
	Crime prev measures	2C			L			
1989	% change TO	+47%	-31%	-50%	+24%	+133%	+8%	-6%
	% change TF	-65%	-59%	-63%	+9%	-61%	0%	-50%
	Crime prev measures	P	2C	L		L	L	
1990	% change TO	-18%	+20%	-20%	-52%	-28%	+23%	-15%
	% change TF	+33%	+44%	+95%	+7%	+125%	+41%	+40%
	Crime prev measures				L; P		IC; F	
1991	% change TO	-38%	-38%	+42%	-20%	-40%	-63%	-30%
	% change TF	-31%	-50%	-46%	+4%	-33%	-78%	-37%
	Crime prev measures							
1992	% change TO	-9%	+72%	-35%	-50%	-33%	+20%	-2%
	% change TF	+14%	+138%	+90%	+155%	-9%	+20%	+77%
	Crime prev measures	IC				IC		

Note: TO=theft of; TF=theft from; L=lighting upgrade; P=painting; F=fencing; C=number of CCTV cameras; BAR=Barracks (surface, short stay, pay on exit, 1029 spaces); BON=Bond St. (surface, short stay, pay and display, 415 spaces); COX=COX St. (surface, long stay, pay and display, 354 spaces); FAI=Fairfax St. (multi-storey, short stay, pay on exit, 318 spaces); GRE=Greyfriars (surface, short stay, pay and display, 138 spaces); WHI=Whitefriars (surface, long stay, pay and display, 140 spaces); figures have been marked where either base number involved in calculating change is less than 10.

It is not easy to discern precise patterns in these data, in part because information on the months in which improvements were made was not available. However, a number of points emerge:

- a) Theft of and theft from cars appear to vary independently. At 15 points the direction of change differs between theft of and theft from, whilst in the remaining 14 the direction of change is the same (in one instance there was no change in theft from and an increase in theft of cars).
- b) Theft from cars has a more erratic pattern than theft of cars.
- c) Overall, a much greater impact has been had on theft of than on theft from cars.
- d) There is no clear, sustained pattern of reduction following individual security improvements for particular car parks.
- e) The overall impact on the openness of car parks to crime because of attention to the issue may be more important than individual measures taken.
- f) Whitefriars car park saw a dramatic reduction in theft of and theft from cars in 1991, largely sustained in 1992, following a broad approach as indicated together with systematic efforts to enhance surveillance through regular trimming of bushes.

Wolverhampton

In late February 1991 CCTV (with pan, tilt and zoom facilities) was installed to the car park at the rear of Bilston Leisure Centre, where signs stating that it is in operation are displayed. During the day the single camera overlooks the car park, of which there is no natural surveillance. The images are beamed through to a monitor which sits behind the centre's reception desk. Outside opening hours the camera is directed to the roof of the building which had been used as a way to break in. The CCTV images are also recorded 24 hours a day in the event of the police needing them. No convictions have been secured on the basis of observations made possible through CCTV.

Table 5 compares the month by month figures for theft of and theft from cars for the years before and after installation of CCTV. A very slight reduction in theft of cars can be seen (from 11 to 9), and a much greater one in theft from cars (from 28 to 15). In considering these figures it is worth noting, a) that in the subdivision as a whole theft from vehicles decreased by 3% in the period in question, while theft of them increased by 3%; b) usage of the leisure centre decreased by 28%; and c) the brief spate of thefts from cars in December 1990 has a high and possible distorting impact on the apparent pattern.

For part of the year we also have data on the times when offences were committed. Of the 22 car crimes committed immediately before installation of CCTV 17 were recorded before 8.00pm and 5 after that time. Of 13 car crimes after CCTV

Table 5: Car Crime at Bilston Leisure Centre before and after installation of CCTV.

	Pre CCTV Theft of	Post CCTV Theft of	Pre CCTV Theft from	Post CCTV Theft from	Pre CCTV Total	Post CCTV Total
Feb		1		5		6
Mar			1		1	
Apr	2				2	
May			2		2	
June	1	1		2	1	3
July		1	2	1	2	2
Aug	2		2		4	
Sept		2	3		3	2
Oct	1		3		4	
Nov	1	2	2	2	3	4
Dec	4		10	3	14	3
Jan			3	2	3	2
Feb		2				2
Tot	11	9	28	15	39	24

installation 5 were recorded before 8.00pm and 8 later in the evening. This may plausibly suggest that CCTV could be playing a part in inhibiting car crime during that time of the day when the camera is beamed at the car park, but not when it is directed at the roof. This would suggest that those involved in committing car crimes are persuaded of the potential of CCTV to apprehend them, and are sufficiently attentive to its operation to take advantage of periods when it could not, in principle, have that use.

4. Conclusion

The data from Bradford, Lewisham, Coventry, Hartlepool, Hull and Wolverhampton presented above provide quite strong evidence, consistent with Poyner (1992), that schemes deploying CCTV have generally led to reductions in various categories of car crime. It is more difficult on the basis of the available data to make a judgement about what it is about CCTV and its various modes of operation which have had that effect in the contexts described. It is also not possible to estimate what displacement of offences by place, type or time has occurred. The following look the most promising conjectures:

1. Although matters might change, and rapid improvements are certainly being made in systems, it is not presently essential that CCTV be technically highly sophisticated to have an impact on crime in car parks (though this might of course be necessary for other crimes in different settings), nor is continuous surveillance of monitors necessary. In few cases in the systems examined here, would it be easy quickly to obtain a sufficiently sharp image to make an offender recognizable. Moreover, with the exception of Hartlepool, it would be unlikely that sight of an offender would lead to prompt deployment of security personnel to try and catch them in the act or drive them away.
2. Since only a negligible number of arrests have followed from the installation of CCTV the removal of offenders does not constitute the mechanism through which CCTV currently reduces car crime. It is difficult to conceive of a situation in which technical wizardry will be married to a sufficiently large population of camera manipulators and police or security guards to obtain recognizable images of significant numbers of offenders, to identify them, to find them and finally to prosecute them. Nevertheless, CCTV, with other situational measures, can alter the perceived patterns of opportunity for crime in car parks as sites for car crime, and lead to a reduction or redistribution of offences.
3. The effect of CCTV appears to be enhanced when it is installed alongside other complementary measures, raising its credibility as a source of increased risk to potential offenders. Additional measures may include other physical alterations such as lighting, fencing and painting (as in Bradford, Coventry, and Hull); the deployment of visible security personnel (as in Hartlepool); publicity of the potential for offender identification (as in Lewisham); and the broadcasting of successes, where they can be claimed (as in Hartlepool). The effects are most equivocal, where enhancement was least (as in Wolverhampton). In Poyner's Guildford study (1992) of short term impact, other measures were adopted immediately preceding implementation of CCTV (lighting improvement and foliage cut-back), there were (unusually) arrests attributable to CCTV, and a loudspeaker facility enabled security guards to shout warnings. All this may have combined to indicate to the potential offender that risks were increasing as car crime was being attended to. The assignment of effects to CCTV in reducing theft from cars in the car park covered and the idea that these have spilt over to

the car park not covered by CCTV are premature. They assume particular causal mechanisms which may not be those which operated.

4. As with many other crime prevention efforts, if and when the real potential of CCTV to lead to apprehension loses credibility amongst car criminals, the effect will begin to fade, though by highly publicised (over)-statement of successes periodic effectiveness may be reestablished. There is some evidence, where there are data over a long period as in Hartlepool, that CCTV installation to reduce crime follows the life cycle of initiatives identified by Berry and Carter (1992). If rates begin to increase system credibility might be reasserted through special efforts by the police to apprehend offenders and to ensure through appropriate publicity that any part CCTV might have played is communicated to prospective offenders.
5. The evaluation of crime prevention initiatives ideally needs to go beyond the comparison of one year before and one year after patterns. This raises questions over individual cases, such as some of those reported here, as it does of Poyner's study. There are questions of impact maintenance which need both theoretical explication and empirical study. In this case in particular the relative long term effectiveness of 'all systems' (large-scale once for all security upgrades), and 'drip feed' (episodic injections of new crime prevention activity) approaches need to be addressed. Provision for awards for secured car parks (HOCPC 1992) are suggestive of an all systems approach. There is certainly evidence here for the effectiveness of packages of measures. However, it may be a mistake to assume that a single major blitz will have a sustained effect if the crime inhibiting mechanism amounts to persuading potential offenders of increased risk. The life cycle model, for which there is also some evidence, suggests that highly publicised periodic injections of crime prevention effort may be more effective. The appropriate choice between all systems, particular intervention mixes and patterns of drip feed depends on the (context specific) mechanisms through which effects are mediated.
6. Theft of and theft from cars seem to have contrasting patterns. Motivations are unlikely to be the same. Moreover, problems for those committing the offence will be different. Escape on foot is clearly possible for theft from, but not for theft of cars. Moreover, theft of may take rather longer than theft from cars. The crime prevention problems differ accordingly. CCTV'S prospects, as currently implemented, look better for theft of than theft from cars. Notwithstanding this general pattern, there are, of course, examples wherein the short term theft from seems to have decreased more than theft of cars. Fixed CCTV cameras, beamed at pedestrian egresses, might usefully be tried to see whether this could increase perceived risk amongst those committing crime on foot, and have an impact on theft from cars.
7. Extension of the use of CCTV from car crime reduction efforts to other crime prevention or detection purposes appears common when technically feasible. Apart from some initial civil liberties worries expressed by local politicians and

newspapers, this has been accomplished with minimal objections, and none from the general public, confirming the findings of Honess and Charman (1992).

The discussion towards the beginning of this paper constitutes a research agenda. It can be seen that, though a little progress has been made, there is scope for more work. What can be said at this stage with some confidence is that CCTV can play a part, in conjunction with other measures, in reducing car crime, especially theft of cars. It is, however, no panacea. Coventry furnishes an instructive example of what can be achieved with sustained broadly based efforts to address the issue over a number of years.

Finally, turning from CCTV and car parks in particular to crime prevention evaluation efforts more generally, it should be clear that post hoc evaluations of this kind will have built-in limitations related to the data which have been collected, given that opportunities for retrospective reconstruction of evidence will normally be very limited. Informative scheme level evaluations, it is suggested, are most effectively conducted in terms of the mechanism, context and outcome-pattern framework outlined earlier in this paper. This will enable evaluation data collection to be sharply focused on particular outcome-patterns, and monitoring to be focused on salient features of context and scheme delivery. If schemes are evaluated in this way thematic studies of suites of schemes can be made more instructive.

Just how uninformative weakly conceived scheme evaluations can be, when aggregated, is shown in the Dutch experience, where 200 projects were looked at following a five year crime prevention programme (Polder 1992). This study concluded a) that crime prevention efforts need to be large enough to have an impact; b) that some problems may be too serious to achieve results with prevention; and c) that strategies chosen make a difference, in particular increasing the effort needed and perceived probability of sanction can deter potential offenders. There is no quarrel with this, only that more specific findings might be hoped for. If series of schemes and their associated evaluations are performed in the way suggested here and are then also orientated to one another, cumulative understanding of what can work in what circumstances can be hoped for. The longer term pay off will be more economical and more effective crime prevention.

No-one needs to be unduly defensive because we cannot prove that effects follow from our interventions. Proof is not possible in the hardest of the hard sciences. They are all, as Popper (1972) has convincingly argued, irredeemably fallible. A fortiori, no-one can sensibly expect proofs outside the laboratory in the pragmatic world of developing responses to crime, where there are many specific and thorny evaluation problems (Ekblom 1990). All that can be hoped for is movement towards better theories informing better practice, and that can only happen if evaluations are performed well.

Appendix

Table A1: Quarterly figures for theft of motor vehicles from Hartlepool car parks
January 1989-September 1992

Year	Quarter	Thefts of Motor Vehicles		
		CCTV (from April 1990)	No CCTV	Total
1989	Jan-Mar	34	14	48
	Apr-Jun	25	17	42
	Jul-Sep	25	28	53
	Payment scheme begins			
	Oct-Dec	9	14	23
1990	Jan-Mar	13	7	20
	CCTV installed			
	Apr-Jun	4	12	16
	Jul-Sep	3	14	17
	Oct-Dec	11	25	36
1991	Jan-Mar	7	3	10
	Apr-Jun	6	20	26
	Jul-Sep	10	12	22
	Oct-Dec	9	8	17
1992	Jan-Mar	13	13	26
	Apr-Jun	20	8	28
	Jul-Sep	4	19	23

Table A2: Quarterly figures for theft from motor vehicles in Hartlepool car park January 1989-September 1992

Year	Quarter	Thefts from Motor Vehicles		
		CCTV (from April 1990)	No CCTV	Total
1989	Jan-Mar	5	19	24
	Apr-Jun	6	12	18
	Jul-Sep	4	8	12
	Payment scheme begins			
	Oct-Dec	7	24	31
1990	Jan-Mar	10	17	27
	CCTV installed			
	Apr-Jun	10	12	22
	Jul-Sep	6	20	26
	Oct-Dec	6	39	45
1991	Jan-Mar	5	24	29
	Apr-Jun	4	12	16
	Jul-Sep	3	21	24
	Oct-Dec	2	12	14
1992	Jan-Mar	4	6	10
	Apr-Jun	6	10	16
	Jul-Sep	12	9	21

Table A3: Changes in car crime in Coventry, overall and in city centre council car parks

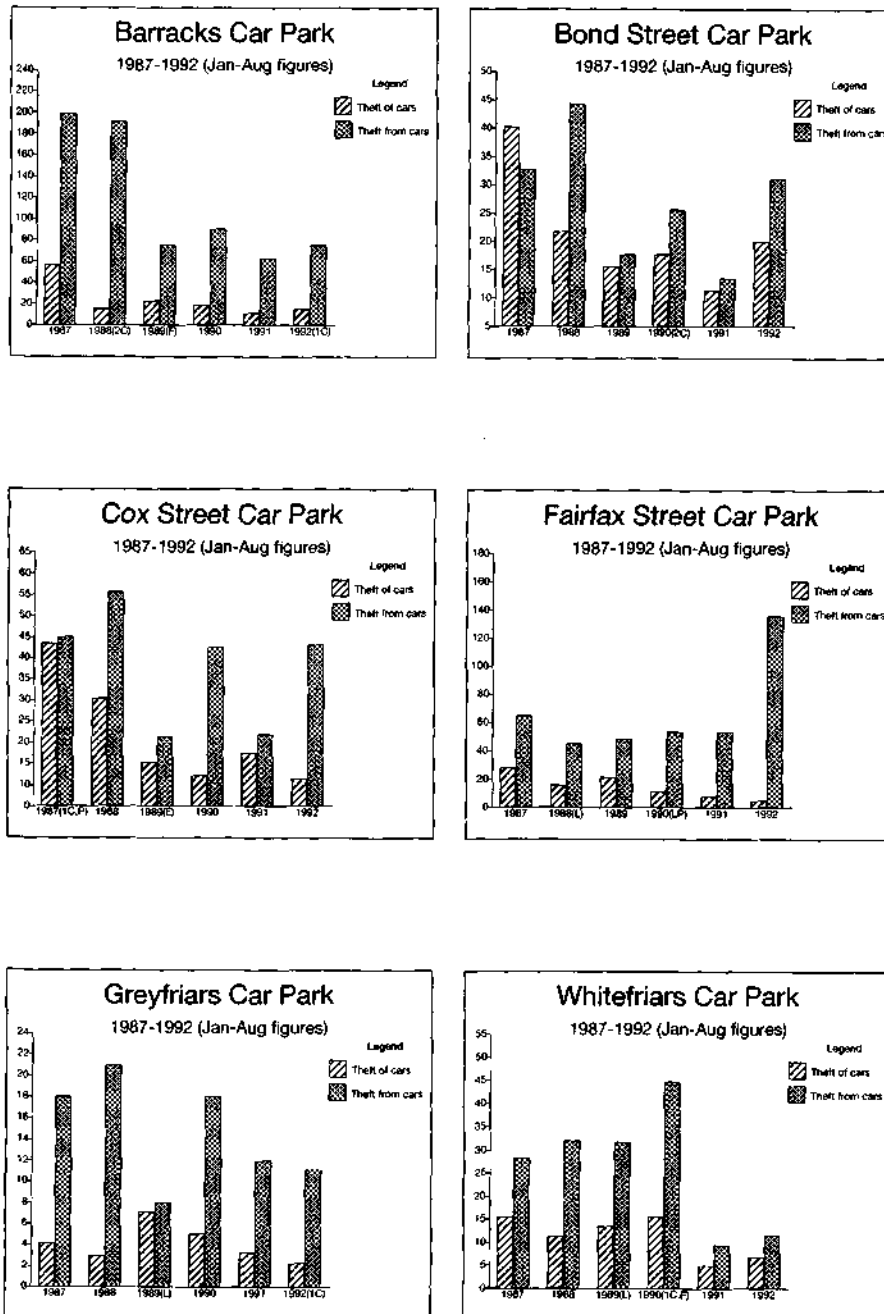
Jan to Aug	Car crime in all Coventry			Car crime in council city centre car parks			Percentage of Coventry car crime in council city centre car parks		
	Theft of	Theft from	Total	Theft of	Theft from	Total	Theft of	Theft from	Total
1987	3269	6941	10210	300	604	904	9.2%	8.7%	8.9%
1988	2130	5032	7162	157	575	732	7.4%	11.4%	10.2%
1989	2102	4114	6216	113	290	403	5.4%	7.1%	6.5%
1990	2323	5032	7355	113	402	515	4.9%	8.0%	7.0%
1991	2361	4723	7084	74	218	292	3.1%	4.6%	4.1%
1992	2696	4687	7383	72	398	470	2.7%	8.5%	6.4%

Table A4: Car crime rates in selected Coventry car parks 1987-1992, January to August of each year.

Year (January-August)		BAR	BON	COX	FAI	GRE	WHI	Total
1987	Theft of	56	40	43	32	4	16	191
	Theft from	200	33	44	67	18	28	390
1988	Theft of	15	22	30	17	3	12	99
	Theft from	190	44	56	44	21	32	387
1989	Theft of	22	15	15	21	7	13	93
	Theft from	65	18	21	48	8	32	192
1990	Theft of	18	18	12	10	5	16	79
	Theft from	87	26	41	51	18	45	268
1991	Theft of	11	11	17	8	3	5	55
	Theft from	60	13	22	53	12	10	170
1992	Theft of	12	19	11	4	2	6	54
	Theft from	70	31	42	135	11	12	301

Note: BAR=Barracks; BON=Bond St.; COX=COX St; FAI=Fairfax St.; GRE=Greyfriars; WHI=Whitefriars.

Figure A1: Graphical representation of data presented in Tables 4 and A4, concerning car crime in individual car parks in Coventry.



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