
BURNLEY CCTV EVALUATION

by

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***Abstract:** This study examines the effectiveness of a closed circuit television (CCTV) system installed in Burnley, Lancashire in northwest England. It considers both the outcomes and mechanisms through which they were brought about. Three areas are identified: "focal" beats, within which the CCTV cameras were installed; "displacement" beats, which were continuous to the focal beats; and "other" beats, comprising the remainder in the police division. With regard to both overall recorded crime and separate types of offences, the research finds significant decreases in the focal area, no spatial displacement, and some diffusion of benefit to the displacement area. There was some dilution of impact over time. There was no evidence that the proportional effect of CCTV changes by time of day, according to periods when surveillance with cameras would be more or less difficult. Crime fell more steeply as the first cameras were installed, with diminishing increases in effect as more were put in place. These patterns suggest that the impact of cameras is not simply a result of surveillance effects per se. Other preventive mechanisms were also triggered.*

THE NATIONAL CONTEXT

CCTV is one of the fastest growing sectors of the security industry, estimated by the end of the century to account for close to 30% of all

security system sales (Cully, 1996). The popularity of the method is very great, although the wisdom of many of the purchasing decisions may be called into question (Hearnden, 1996). The U.K. Home Office has actively promoted the use of CCTV for the surveillance of public areas, and expenditure on the tool has recently run at the astonishing level of *three-quarters* of *total* Home Office expenditure on crime prevention (Koch, 1997). Competitions for CCTV funding have survived the change of government, albeit with an apparently increased emphasis on mobile systems.

There is, at first sight, impressive evidence that CCTV may reduce crime. This has been brought together by Home (1996), and his summary table is modified and presented below as Table 1. Whilst the figures are at first sight impressive, three points must be made. First, the comparisons tend to be of a simple before-after design, and there is emerging evidence — in Glasgow, Scotland at least — that such comparison obscures more complex trends. Second, the evaluations vary in their competence. Third, they are not helpful in suggesting *how* CCTV achieves its effects.

Short and Ditton (1995, 1996) are particularly critical of the standard of CCTV evaluation. The points they make include the following:

- The evaluations have often not been carried out by independent researchers.
- The before and after periods are not long enough, or else are not seasonally matched.
- Crimes are aggregated, masking contrary trends in different crime types
- Appropriate comparison areas are seldom used as a baseline.
- The nature of the attendant publicity is never mentioned.
- Percentage falls, rather than absolute numbers, are often reported.
- Displacement is rarely mentioned.

The second issue concerns why CCTV has the effect it does. Pawson and Tilley (1997) offer a number of possibilities, which the present writer has extended into the following list:

- "*Caught in the act*" — perpetrators will be detected, and possibly removed or deterred.
- "*You've been framed*" — CCTV deters potential offenders who perceive an elevated risk of apprehension.
- "*Nosyporker*" — CCTV may lead more people to feel able to frequent the surveilled places. This will increase the extent of natu-

ral surveillance by newcomers, which may deter potential offenders.

- "*Effective deployment*" — CCTV directs security personnel to ambiguous situations, which may head off their translation into crime.
- "*Publicity*" — CCTV could symbolise efforts to take crime seriously, and the perception of those efforts may both energise law-abiding citizens and/or deter others.
- "*Time for crime*" — CCTV may be perceived as reducing the time available to commit crime, preventing those crimes that require extended time and effort.
- "*Memory jogging*" — the presence of CCTV may induce people to take elementary security precautions, such as locking their car, by jogging their memory.
- "*Anticipated shaming*" — the presence of CCTV may induce people to take elementary security precautions, for fear that they will be shamed by being shown on CCTV.
- "*Appeal to the cautious*" — cautious people migrate to the areas with CCTV to shop, leave their cars, and so on. Their caution and security-mindedness reduce the risk.
- "*Reporting changes*" — people report (and/or police record) fewer of the crimes that occur, either because they wish to show the effects of CCTV or out of a belief that "the Council is doing its best" and nothing should be done to discourage it.

Is it academic self-indulgence to be concerned with the mechanism whereby something worked? Shouldn't one just be pleased that it apparently did? In fact, it is crucial to know the mechanism. Only knowing it will enable the reproduction of success in new schemes, the maintenance of success in existing schemes, and the cost-efficiency of CCTV operation generally.

In short, CCTV has a central place in current crime control technology; such evaluation as has been done suggests substantial effects. However, there is good reason for remaining cautious about the nature and extent of these effects, and, most important, for exploring more thoroughly why CCTV worked.

Table 1: The Success of CCTV?

Location	Crime	Reduction (%)	Evaluation Time Period (months)
Newcastle-upon-Tyne	Burglary	56	unstated
	Vandalism	34	unstated
Glasgow	'Crime'	20	6
North Shields	Burglary	67	12
	Theft & damage	33	12
Stockton on Tees	Theft	43	3
	Burglary (non-dwelling)	43	3
	Assault	35	3
Kings Lynn (Industrial) (Car parks)	All	100	36
		95	12
City of London	All	29	unstated
Birmingham	All	14	12
Airdrie	All	21	24
	'Dishonesty'	48	24
Hull (Car Park)	Damage	45	7
	Theft of vehicle	89	7
	Theft from vehicle	76	7
Lewisham	Auto-crime	75	6
Bradford	Theft from vehicle	68	12
	Theft of vehicle	43	12

THE BURNLEY CONTEXT

All CCTV cameras installed to date in Burnley were placed in the three town centre beats, T1, T2 and T3. The present report will deal with matters *other than* the movement of crime *within* the beats covered by Burnley's CCTV. This point is of importance, since it looks at the very detailed relationship between camera coverage and crime, with its implications for camera siting and offender awareness, and the reason for its delay should be clarified. Such a study is under way.

While gross estimates of effect can be reached with a division of crime locations simply into beats, the more subtle effects require geocoding of the data very precisely. The Lancashire Police Service is currently moving towards routine geocoding of its crime data. That, of course, means that geocoding of the data other than in the very recent past did not happen. Even after retrospective geocoding was undertaken, upwards of one-third of even recent crime reports did not have a precise location attached. This can be improved by reference to text data but the process will be a hard manual grind. But it is worth going through this process. Otherwise, the data are vulnerable to the charge that non-geocoded events are somehow different from geocoded events, which makes any conclusions about the distribution of crime within the beats covered by CCTV unreliable.

This report concerns itself exclusively with recorded crime changes, comparing CCTV-covered and other areas. Also reported are time-trend data, examining changes of particular crime types alongside the number of cameras installed up to that point. The speed with which changes in different crime types occurred is also examined, as are the implications of those. An extended discussion section makes recommendations based on the data or upon problems and issues that are beginning to emerge in other areas of the country with which the writers are familiar.

We categorised areas of the Burnley police command into: beats with cameras (focal), beats having a common boundary with beats containing cameras (displacement), and other beats in the police division (other). The first group comprises beats in which crime should decline, insofar as CCTV has an effect. The second comprises areas into which crime would arguably be displaced from the beats covered by cameras. The last group operates as the baseline. Spatial displacement should not occur to these areas given that there are closer and equally promising areas to which CCTV may displace crime.

What follows are percentage changes in crime in the first two categories relative to the third, comparing each year with 1994 fig-

ures. Thus in Table 2 below are included all crimes. Also in the table is the number of crimes occurring in 1994 in the areas concerned, to get an idea of the relative scale of the areas' crime experience. To illustrate, total crime in 1996 was 28% lower in the focal areas than it had been in 1994. In the same year, total crime was 3% lower in displacement areas, and 9% higher in other areas. Figures for 1997 are grossed from crime occurring in the first eight months of the year, and are thus imprecise.

**Table 2: Total Crime Changes Relative to 1994
(Pre-CCTV)**

Area	95	96	97
Focal	-6	-28	-24
Displacement	+7	-1	+3
Other	+7	+9	+3

Note: N in 1994: 1,805 in focal areas, 6,242 in contiguous areas and 1,069 elsewhere. The numbers are greater than would be calculated from summing Ns from Tables 3-8, since some categories of crime do not feature in those tables.

Table 2 demonstrates that the areas in which cameras were installed showed a reduction of one-quarter in the crimes they suffered in 1996 and 1997 relative to 1994. The effect has held up quite well over time, suggesting that it was not solely the result of transient factors like additional publicity. Of great interest is the fact that the adjoining areas showed trends similar to those of the non-adjoining areas. This means that there is no evidence of displacement of crime to adjoining areas. In fact, in all three years, the change that occurred in displacement areas was intermediate in extent between those taking place in focal and other areas. If displacement had occurred, the displacement areas should have shown increases greater than those of other areas, since they would be experiencing their own crime increase *plus* crime displaced from the focal areas. If anything, the pattern shows diffusion of benefits rather than displacement. The concept of diffusion of benefits is crucial and will be briefly discussed.

When a crime prevention programme is put in place, the argument usually advanced by those sceptical of its worth is that crime is *displaced* to Other areas. Research has suggested that displacement is seldom if ever total, so that there is virtually always a net benefit in crime reduction. Even more interestingly, research sometimes shows

the opposite of displacement, namely, diffusion of benefits (see Hesseling, 1994). Diffusion of benefits occurs when the areas surrounding an area with a crime prevention programme also show a decline in crime. Intuitively, this makes sense, insofar as an offender does not think in terms of police beats or other administrative units, and will not be sure where a scheme's boundaries lie. Most volume crimes take place close to an offender's home base, and there is a limit beyond which most offenders do not typically travel to crime. The pattern of the Burnley data suggests a diffusion of benefits. Owing to CCTV, some crimes will become known to the police that would otherwise not have been recorded, so the observed reductions are almost certainly understatements of real reductions.

Having shown the change in crime generally, what does analysis of individual crime types show? Obviously, some crimes are so rare that analysis would not be meaningful. However, what is the picture for common crimes? Table 3 looks at all assaultive crimes combined (including robbery, attempted robbery and theft from the person). It will be seen that the reduction in the focal and displacement areas is greater for crimes of violence than for total crime, *in both focal and displacement areas*. The increase in other areas represents relatively few crimes. As in Table 2, the pattern is more consistent with diffusion of benefits than with displacement.

Table 3: Crimes of Violence: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	-12	-35	-27
Displacement	-20	-20	-9
Other	-14	0	+46

Note: N in 1994: 117 in focal areas, 267 in contiguous areas, and 32 in other areas.

Turning to drug crime, the pattern is rather different, as Table 4 shows. All drug crimes are combined in Table 4, from cultivation (there are few opium poppy fields in Burnley town centre) and supply through possession and allowing premises to be used for drugs. Most of the crimes are simple possession. Drug crimes fell in the focal area. Although both displacement and other areas show increases, once again the displacement area shows less of a rise than other areas. The sharp increase in recorded drug crimes outside the CCTV

area suggests a general trend that the focal area, by one means or another, was able to buck. Drug markets are particularly visual, and it may be that CCTV has been involved in the disruption of town centre drug markets. However, since the bulk of drug offences involve simple possession, this could not possibly be more than a contributory factor. More likely is a CCTV effect that is more complex than simple surveillance. This point will be returned to a little later.

Table 4: Drug Crimes: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	+41	-44	-71
Displacement	+125	+134	+94
Other	+146	+146	+161

Note: N in 1994: 46 in focal areas, 78 in contiguous areas and 13 elsewhere

Another crime that will take place in large measure in public areas is theft of and from motor vehicles. Table 5 reveals the trends involved. Offences combined here are theft of and from motor vehicles, aggravated taking of motor vehicles, and interfering with a vehicle.

Table 5: Motor Vehicle Crimes: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	-24	-48	-21
Displacement	0	-8	-6
Other	+10	-8	-9

Note: N in 1994: 375 in focal areas, 1842 in contiguous areas and 309 elsewhere

The familiar pattern recurs. Vehicle crime declines greatly in the target area, and the surrounding areas show trends that are intermediate between the focal areas and outlying areas, consistent with diffusion of benefits rather than displacement.

The next step is to look at burglaries, both domestic and other. The two are combined in Table 6. Roughly the same pattern is evi-

dent, with changes in displacement areas intermediate between CCTV and other areas.

Table 6: Burglary: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	-22	-41	-32
Displacement	+15	+9	+5
Other	+11	+34	-7

Note: N in 1994: 143 in focal areas, 2,208 in contiguous areas and 366 elsewhere

As for criminal damage, shown in Table 7, there is a more modest decline in CCTV areas, and the displacement/diffusion-of-benefits story is unclear. Criminal damage is a poorly reported crime, so changes are especially difficult to interpret here.

Table 7: Criminal Damage: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	-1	-23	-12
Displacement	+18	+20	+21
Other	+5	+42	+10

Note: N in 1994: 163 in focal areas, 643 in contiguous areas and 79 elsewhere

The next step is to look at a crime type on which CCTV should not have a direct, surveillance-based effect. Demonstrating a reduction for crimes not susceptible to visual scrutiny of public places would not suggest that the decline was spurious, just that its mechanism is a little more complex, within or beyond the mechanisms listed earlier. Table.8 combines fraud and handling of stolen goods, to generate numbers sufficiently large for analysis. These are crimes to which CCTV surveillance should not be directly relevant.

Although these crimes were aggregated so as to yield enough cases to make trend analysis feasible, there were still too few in outlying areas for comfort, hence the proportionately huge increase in these offences in 1997. The cell to which attention should be drawn is the 1997 cell for focal areas. The decline in 1997 is greater than in

1996. The only other table for which this was true concerned drug crime. A more detailed analysis of trends is presented later in this report.

Table 8: Fraud and Handling Stolen Goods: Changes Relative to 1994 (Pre-CCTV)

Area	95	96	97
Focal	-2	-32	-53
Displacement	+21	-7	-12
Other	+57	-7	+586

Note: N in 1994: 117 in focal areas, 173 in contiguous areas and 14 elsewhere

Why do crimes not occurring in public and therefore not liable to CCTV surveillance show a decline? In particular, why do they show a decline that increases with time, rather than one that decreases, as with other crimes? Three explanations come to mind. All of these are testable by conducting more research, but are beyond the scope of the work presented here.

- (1) Criminals are versatile, and (with some exceptions) the most active offenders are the most versatile (see, for example, Turling, 1993). By disrupting some types of offending, others are prevented directly (by the imprisonment or other control of perpetrators), or indirectly (by the generalisation of perpetrators' sense of the risks involved in offending). By either means, one would expect an *increasing* effect with time, whereas for direct effects, one would expect a diminishing effect with time. In short, CCTV has its effect by disrupting the general patterns of offending of *versatile* (and hence usually prolific) offenders. If this is true, it is important, because it would suggest that CCTV has its greatest effect on the people on whom one would most want it to impact, namely, versatile and prolific offenders. This could be tested by looking at detected crimes in the Burnley CCTV area. If this speculation is correct, then CCTV would coincide with a reduction in the proportion of cleared crimes attributable to the most prolific offenders. Thus, for example, if before CCTV the top 10% of offenders accounted for 50% of cleared crime, and afterwards the top 10% accounted for 25% of the cleared crime, that would support the notion advanced.

- (2) CCTV either changes the way the police and local authority work, by knowing and logging the whereabouts of prolific offenders, or releases police time to deal with offences that take place in private and that require proactive policing. Offences like handling stolen goods, and drug possession, for example, are cleared as they become known. Of these two sub-options, the first is testable by interview with staff in the CCTV control room, and scrutiny of the logs insofar as they deal with recognised individuals. The second (which is believed implausible) would be testable by examination of the manner of clearance of a sample of cleared fraud cases in 1994 and 1997.
- (3) By the memory jogging and reporting processes suggested by Pawson and Tilley, people become more crime conscious in private as well as public, so are more likely to become aware of these kinds of crime, and to report them. This is testable by examination of the number of crimes of these types cleared primarily through the public's supply of information to the police.

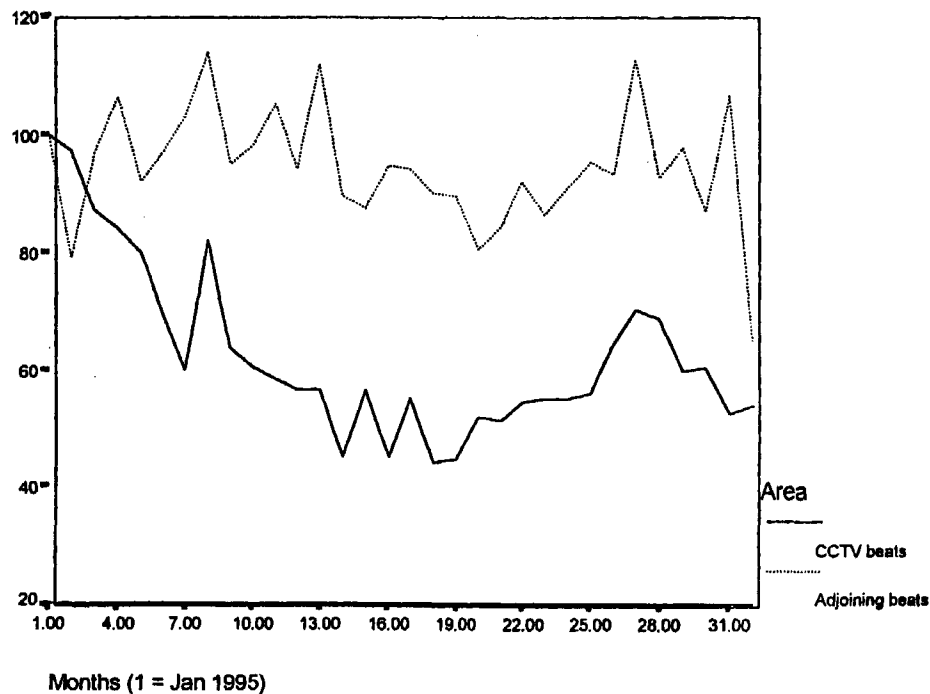
Time

The analysis of year-to-year trends, as presented in Tables 2 through 8, gives some partial insights into what happened in Burnley. However, this should be supplemented by examination of what happened over time, without breaking the time continuum into such crude slices. This is true for the important reason that the cameras were switched on at different times, so that the "active ingredient" — CCTV surveillance — grew in irregular steps. When time is broken down day by day, week by week or month by month in this way, the number of events occurring in each period quickly becomes too small to analyse. If the data are broken down into individual crime types, the numbers become too small to analyse very quickly indeed. This means either that the analysis must rely on aggregate crime, and/or that some method of smoothing the data statistically has to occur. For linking crime with camera deployment, the whole point of doing the analysis is to identify trends over short periods of time, so the second approach is unsatisfactory. Later, the trends of sub-aggregates of total crime are smoothed for a different purpose, namely the demonstration of which crime types decline quickly and which decline slowly.

For all its difficulties, time has to be incorporated in the analysis. Figure 1 presents monthly aggregate reported crimes for the CCTV

area and the total for adjoining beats. The figure for January 1995 was set at 100 for both data sets, to enable easy comparison. Figure 1 confirms what we knew from the preceding analyses, namely, that crime in the CCTV areas declined relative to surrounding areas. Since we already have indications that there is some diffusion of benefits to surrounding areas, Figure 1 somewhat understates the extent of the reduction. While not designed as such, the figure is useful in depicting the CCTV-associated gross reduction, an area covered in the tables appearing earlier in the paper. What Figure 1 is important for is providing an indication of how CCTV worked.

Figure 1: Monthly Crime by CCTV Presence



The decline seemed to begin in March 1995. The first CCTV camera went up in April 1995. This is not so bizarre as it may appear. In many cases, crime prevention measures work before they "should." Publicity, consciousness, and enthusiasm may all communicate themselves to people. What this trend suggests is that the CCTV mechanism may have more to do with a social climate change than changes in the processing of offenders, or changes in the perception that offenders have of situations in which they are taking a risk. The very simplest explanation may be that although the cameras were

switched on in April, they may have had effects before that. It would be nice to know the schedule of installation work.

A better indication of the process may be gained from Figure 2, and from statistics associated with it. Figure 2 expresses the data of Figure 1 in a different way, and alongside some different data. One line in Figure 2 represents the proportionate reduction in crime in CCTV areas relative to surrounding areas. For example, in May 1995 (month 5) crime in the CCTV areas, at 80%, was 20% lower than crime in the surrounding areas, against a baseline of January 1995. The second line in Figure 2 represents the number of CCTV cameras installed by that month. To be precise, it represents the proportion of the eventually installed cameras that had *not* been installed by that month. For example, from July through September 1995, three-quarters of the CCTV units had yet to be installed. The reason for presenting the data in this apparently bizarre way is that the amount of crime should *decline* as the number of cameras *increases*. It is easier to see trends when the data series go in the same direction, and since the two ways of expressing the relationship are identical, the number of cameras installed was converted to the number of cameras yet to be installed. Sceptical readers should simply trace one of the lines and turn the tracing paper upside down.

The basic question here concerns whether the periods in which cameras increased in number were also those in which the number of crimes fell. It looks as though during the first installations, crime declined apace. In fact, the relationship was quite a close one up to September 1995. The large number of extra cameras installed during autumn 1995 was not associated with further large decreases in crime. The decline in crime continued until it bottomed out in mid-1996. Of course, we cannot tell whether the continuing decline in late 1995 and early 1996 was linked with the installation of extra cameras, or the working through of the effects of the first cameras. For example, it is unclear which of these might have incapacitated offenders detected through the deployment of the first cameras after the time it took for bail, court appearance and sentence.

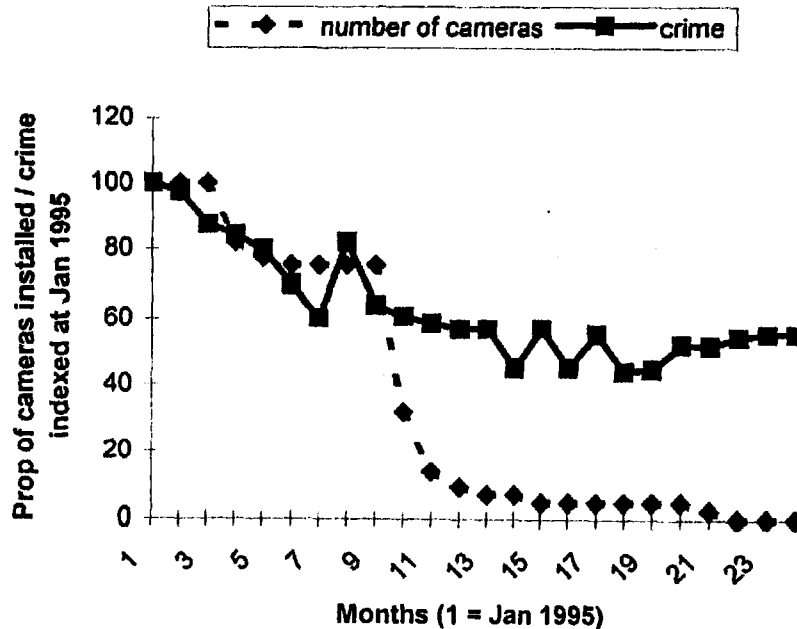
The installation of the last few cameras was linked to a very slight increase in crime. Looking at the figures reinforces the view that the effect of CCTV is not the simple effect of increased surveillability. This is so because:

- (1) The decline in crime began too early, i.e., it had started (perhaps through publicity) in the months before any camera was deployed.

- (2) There was no one-to-one relationship between the number of cameras deployed and either the absolute or the proportionate reduction in crime.

Oddly, this is good news. It may be that even quite a modest scheme, if appropriately presented and executed, may have a swift and disproportionately large effect upon rates of crime. However, it would be good to establish whether the later crime reduction was the immediate effect of extra cameras, or the delayed detection/incapacitation effect of the first cameras. A speculative attempt will be made to take this analysis further.

Figure 2: Crime and CCTV Cameras



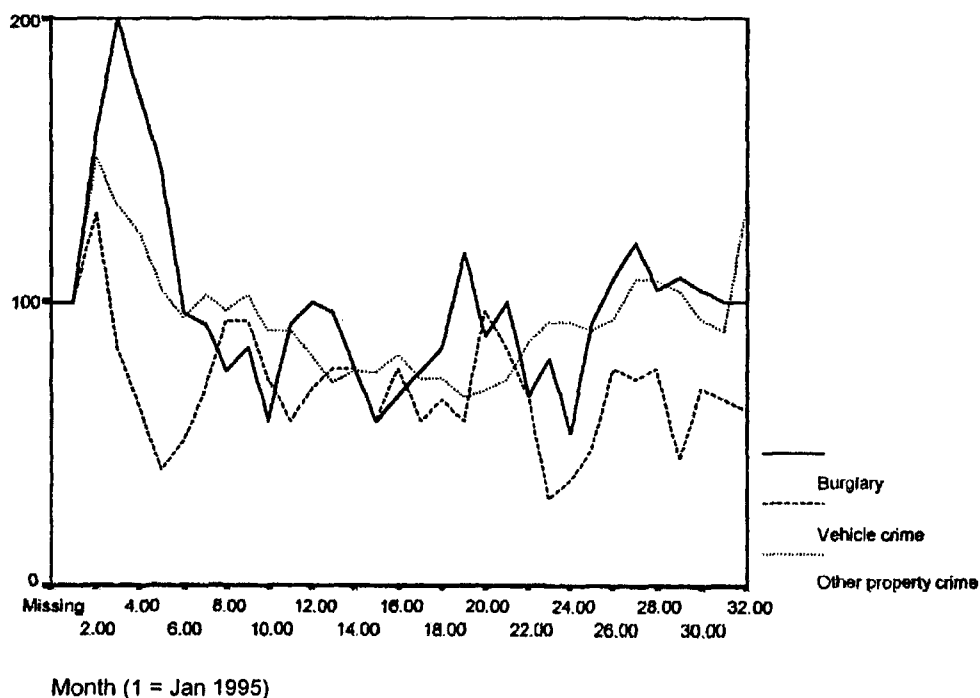
Crimes were aggregated into subtotals, for example, burglary, assaultive crime, sex crime and so on. Figure 3 shows those crimes that declined swiftly when (or even before) CCTV was installed. These were burglary, vehicle crime, and other property crime. The fact that these are the swiftly declining crimes gives confidence that CCTV is implicated in the declines, since they are among the crimes that may best be overseen.

Figure 4 shows those crimes whose decline was somewhat later. These are drug crime, fraud (including forgery and false accounting) and criminal damage. Violent and sex offences are intermediate be-

tween the crimes shown in Figure 3 and those shown in Figure 4. Sex crimes are quite rare, and a trend based on such small numbers is virtually meaningless.

What is different about the late-declining crimes? Fraud is a crime that typically occurs in private. Most drug crimes involve simple possession and are therefore not particularly conspicuous, so any effect of CCTV is likely to be indirect. Indeed, drug possession is entirely invisible unless one has a sackful of the stuff. Only when it is used is it visible, and even then the action is ambiguous in its interpretation.

Figure 3: Crimes that Fell Quickly with CCTV

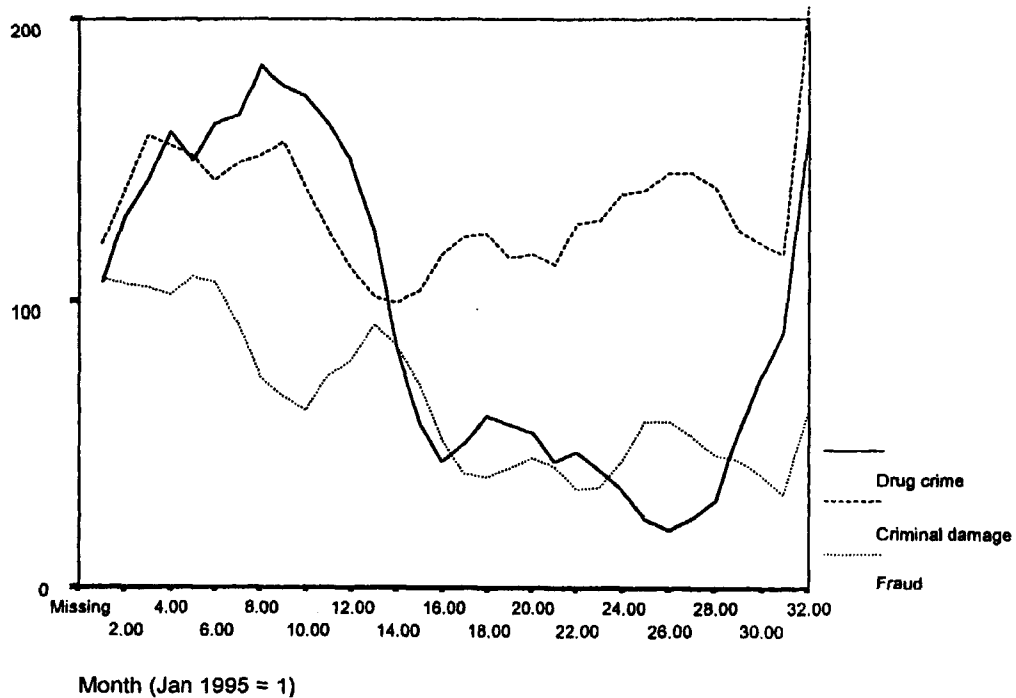


The decline in criminal damage may have been slow for a different reason; namely, that the cameras brought to attention damage that would otherwise have remained unreported, so that the real decline occurred earlier.

In short, all analysable crime types did decline. Two of the three types that declined later are crimes that typically occur in private. It is suggested, consistent with earlier data, that the CCTV effect is far from simple, and examination of the details of the offence should be undertaken to clarify this point.

An additional observation is that fraud and drug crime are crimes that are typically recorded at the point of detection. Unlike burglary and violence, for example, where victims suffer crimes and may or may not bring these to the attention of the police, fraud and drug crimes are typically only recorded when a police officer or other citizen identifies the offence as such. Those who possess drugs do not have a decision to make whether to report the crime to the police (or not a decision they would recognise as such). Thus the pattern observed is one that would be consistent with a more proactive policing style, perhaps made possible by the reduction in other types of town centre crime.

Figure 4: Crimes that Fell Slowly in CCTV Areas



Time trends may also be looked at to gain further information about displacement. Correlations reflect the degree of association between data sets, and may vary between +1 (which shows a perfect positive correlation, as, for example, between height and hand span) and -1 (which shows a perfect negative correlation, as, for example between individuals' enthusiasm for Burnley and Blackburn Rovers

soccer teams). Month-by-month correlations between rates of crime in CCTV and adjacent areas can be used to show the association between these variables.

The correlations between rates of individual crimes in CCTV and adjoining areas were generally very low. They are presented as Table 9. None of these correlations is statistically significant. More important, only one is negative. If displacement were an important issue, these correlations *should* be negative, since the decline in CCTV areas should be associated with a simultaneous or quickly following increase in adjoining areas. For those interested in statistics, manipulating the data by lagging (i.e., linking a decline in one area with the change in the next month or the month after that) does not change the conclusion, so the data do not suggest that this month's crime prevented in the town centre moves to an adjacent area *next* month.

Table 9: Correlation between CCTV and Adjoining Areas: Monthly Data by Crime Type

Crime Type	Correlation
burglary	.002
drugs	.086
fraud	.444
other property	.354
sex	-.326
vandalism	.115
vehicle	.172
violence	.167

Time of Day

If CCTV works by direct surveillance, at what time of day should it work best? One possibility is that it should work best at those times when there is the least general bustle, because the signal/noise ratio is most favourable, i.e., these are times at which there is less movement other than that associated with the crime itself to distract the CCTV operator. This assumes one kind of mechanism by which the effect is achieved. Other mechanisms would imply different patterns. What do the data suggest?

It is surprisingly difficult and time-consuming to establish this, for two reasons. First, the meaning of morning and evening hours de-

depends upon the season, and we do not have a whole year of pre-CCTV-timed data to make the appropriate seasonal adjustments. Second, crimes are not precisely timed, or precisely timeable, even by their victims. Particularly for crimes like car theft and burglary, much time may elapse before a crime is known to have occurred. In an extreme case, burglaries occurring when one is on holiday may have taken place at any time since one went away. These problems invite the question of how one allocates crimes to times without including meaningless time allocations but while retaining all the usable data for analysis.

This was done by selecting those crimes for which the first and last possible times were either on the same day or on successive days. Thus, a crime that could have occurred on February 2nd or 3rd was retained for further consideration. This included 91% of all crimes. However, allocating a time to a crime that may have taken place at any point between a minute after midnight on one day and a minute to midnight the next day is not especially helpful. For that reason, a time window was selected that did not reduce the data to meaninglessness. Then, those windows were selected that had a first and last possible time within six hours of each other. This comprised 68% of the remaining crimes (i.e., $.91 * .68$ of all crimes). The notional time was then set halfway between the first and last possible time, so that a crime that took place between 1 a.m. and 5 a.m. was timed at 3 a.m. The times were then classified into three-hour segments, as midnight but before 3 a.m. and so on. We thus ended up with each crime in one of eight time segments, as shown in Figures 5 and 6. Perhaps the first thing to say is the obvious point of how unequally crime is distributed across 24 hours, with very little crime occurring in the small hours. The writers' initial thought would be that CCTV would have its greatest proportional effect when particularly little was happening, because there would be few distractors at such times.

To allow for comparison of seasonally equivalent periods, the first three months of 1995, 1996 and 1997 were selected. These three-month periods are referred to below and in the figures as epochs.

The number of crimes in each of the three epochs — early 1995, early 1996 and early 1997 — is presented in Figure 5 for CCTV areas, and in Figure 6 for adjoining areas. The time distribution of crime in the adjoining areas remains fairly consistent. For CCTV areas, there is a reduction in crime in *each* of the time segments, and it is roughly

Figure 5: Changes in Crime by Time of Day: CCTV Areas

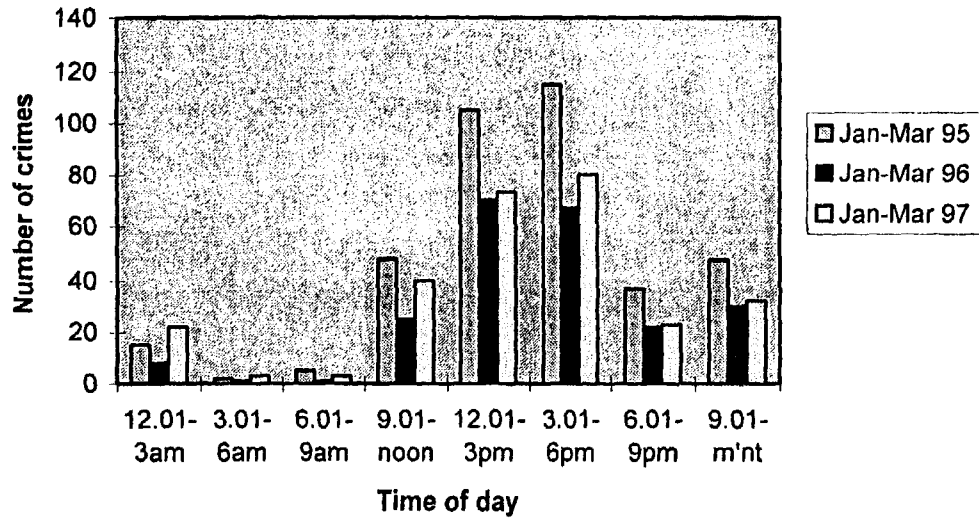
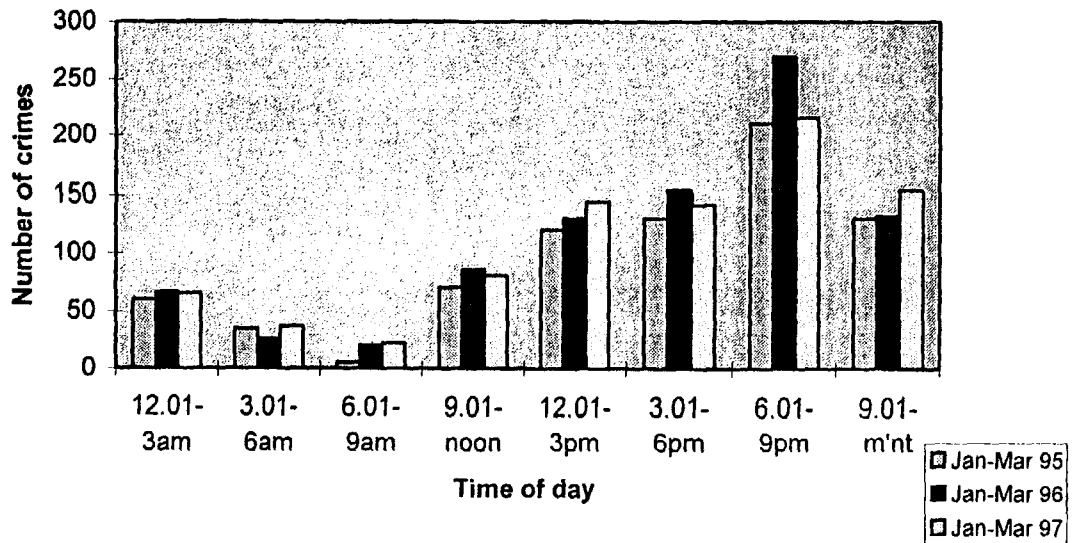


Figure 6: Changes in Crime by Time of Day: Adjacent Areas



in proportion to the number of crimes at that time in the pre-CCTV period. In other words, the suspicion does not hold that the effect is greatest at times when there is little to distract the observer. Similarly, the notion that the reduction is related to daylight does not hold. This pattern seems to have less to do with the technicalities of CCTV and more to do with a general, more complex and subtle change in how people — including offenders — see CCTV operations.

CONCLUSIONS FROM THE DATA

- (1) The area covered by CCTV showed crime reductions of 25% in 1996 and 16% in 1997 relative to statistically expected levels. The real reductions are almost certainly greater than those shown because of additional crimes that came to police notice through CCTV.
- (2) Effects occurred across crime types rather than being specific to some crimes. There were declines even in the kinds of crime that are not usually carried out in public view. Such declines tended to come later than more visible crimes, suggesting an indirect effect beyond simple surveillance. This effect was also suggested by the changing relationship between the number of cameras deployed and the rates of crime. This is an important point in that it may suggest an optimum number of cameras per area to maximise effect at minimum total cost.
- (3) There was no evidence of spatial displacement. This conclusion was reached by correlational analysis and by comparison of CCTV areas with adjoining and other areas in Burnley. There was some evidence of diffusion of benefits whereby areas adjoining CCTV coverage also received some advantage. If any further research were undertaken locally it should perhaps be an examination of the subsequent criminal careers of those who are known to have committed crime in the CCTV areas before coverage began.
- (4) There was no suggestion that CCTV locates crime more precisely in time, nor that the proportional effect of CCTV is greater at some times of the day or night than others. This is intriguing, and again suggests effects that go beyond the simple efficacy of surveillance.
- (5) More sophisticated estimates of effects within target areas will provide information with greater practical implications.

- (6) There are minor signs that crime is now beginning to increase in CCTV areas. It is suggested that some publicity be given to the final version of this report, complete with anecdotes of detections achieved via CCTV use. If we are right about how the effect is working, this may well induce a restoration of the full reduction.

SPECULATIONS AND RECOMMENDATIONS

There was a reduction in crime associated with the advent of CCTV, and it seems not to have been displaced. Indeed, the benefits of CCTV may have diffused to adjoining areas. Burnley has thus been successful in its CCTV work. What remains to be done is to clarify the means whereby the success was achieved and the ways available of maximising effects, both locally and nationally.

The reduction achieved seems to be more than a simple surveillance effect, and further research could clarify the mechanism further. However, what already exists is enough to speculate that even an unambitious scheme may have beneficial effects, and that extra camera coverage may not produce proportional extra reductions in crime.

Although what follows does not stem from the data analysis reported above, we would like to make some observations about emergent problems in CCTV usage elsewhere, and their relevance to the Burnley situation. CCTV has clearly been a success. To consolidate that success and to build upon it may be aided by an understanding of the dynamics of operating a system.

Control Room Operator Training

Two as yet unpublished studies of CCTV have concentrated on the performance of control room operators (see Norris and Armstrong, this volume). Both of these have yielded results that are controversial, and they will certainly stimulate debate. The criticism is that the choice of what is observed may be frivolous (with attractive women targeted), or may be stereotyped as to likely perpetrators (with young, minority-group males being observed more often than their frequency on the scene observed would justify). Obvious alternative responses to such charges could be found in training, and the requirement of awareness of the codes of practice that already exist. General principles that are not contentious can be enunciated to guide camera direction. These include targeting places in which more movement is

found, places with recent crime experience, and places with incongruities like no light and single-person movement at night. In our view, this should go along with an investigation of logs to determine within-shift effects, e.g., fewer incidents observed per crime reported in surveilled areas as shifts proceed. It seems astonishing to us that the rich literature on radar operators' vigilance and efficiency, optimal rest breaks and the like have not been brought to bear on CCTV control room practice. These two issues — the ethics and the efficiency of control practice — go together. Practice is optimised by maximising the number of incidents reported by CCTV control room staff per incident in the surveilled area known to the police. Obvious attention to the efficiency of the process allied to a clear ethical stance stressed in training and enforced in practice is the clear answer to the emergent criticism.

Scheme Ownership

The next point concerns ownership of schemes. In essence, this is the problem of the free-rider — the individual who stands aside from contribution to an innovation that directly benefits him or her. The process is familiar in all crime contexts: the retailer or publican who does not contribute to ring-round schemes; the householder who does not join Neighbourhood Watch; the credit card company that does not join the Association of Payment Clearing Services.

The free-rider effect can operate at two levels in the CCTV context. First, shops in a mall that do not contribute to CCTV costs will benefit from CCTV equally with shops that do, through extra shoppers and fewer crime losses. Second, ostensibly collaborating organisations involved may become rivals rather than partners. The third author was first astonished by this latter process in the competition for drug investigations and arrests between police and Her Majesty's Customs, experienced in France, Belgium and the U.K. in remarkably similar forms. Similarly, there are all the ingredients for competition and rivalry between the police and the local authority in the Burnley context. Indeed, despite all the rhetoric about partnership and multi-agency cooperation that has been central to the current and previous administration's policies over the last decade, the reality has almost universally been tension and conflict between supposed partners (see, for example, Crawford 1997). First-time occurrences in Burnley would certainly include the acknowledgement of emerging tensions and the need to confront them to head off the breakdown of relationships that is common even in successful initiatives.

In our view, the same approach is important in addressing problems of both types. It has three elements.

- (1) The attempt to improve the system is the only process in which all stakeholders have a common interest. It is suggested that there is periodic collaborative effort to advance the understanding of how CCTV works, shared with all involved. This sounds woolly, but it is necessary to stress the shared agenda positively, or the divisive factors will take over. For example, a summary of detections achieved through CCTV and how they happened would be informative. A study of retailer-CCTV-police interactions during incidents would be another. A study of store and street maintenance costs could easily be mounted by the stores. A study of indices of usage of the area by the Council by time of day may even help induce stores to increase opening hours.
- (2) Shopkeepers, both those who do contribute and those who do not, should be explicitly and collectively consulted about the conflicts and tensions experienced by CCTV control staff that are inevitable in such an arrangement. This consultation would address issues like: whether cameras should point at contributing shops more than noncontributing shops, or just track developing incidents; who has responsibility for notifying the police for intrastore events; and whether control room notification should occur in the same way for both kinds of store.
- (3) The police and the local authority should renegotiate their division of responsibilities now that practical experience of the scheme has been accrued. Elsewhere, there have been signs that unforeseen turf wars jeopardise partnership for no better reason than an agreement made in ignorance was not reconsidered. Topics for such negotiation should include police powers to direct camera operation in emergencies, and, more generally, ownership and maintenance of tapes/disks, procedures for review and use as evidence of tapes; and even simple matters like rights of access to the control room and the police station.

A final point in which Burnley may wish to take a leadership role is the availability *and use* of CCTV evidence in sentencing decisions. CCTV data are currently used in inducing guilty pleas and the like. Other work carried out by the third author and his colleagues Sgt. Chris Henshaw and Sylvia Chenery shows that magistrates are keen

to see available video evidence, and that the effect of such evidence is to increase the severity of sentences imposed. This evidence would both increase the efficacy of the process whereby offenders acknowledge their guilt and would make sentencing more commensurate with the act committed. Knowledge that such use of CCTV evidence was being promulgated in Burnley courts would almost certainly reinforce the publicity-driven effects of CCTV schemes.



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