

The effects of speed cameras: how drivers respond (No.11)

Contents

Executive Summary	2
Chapter One: Introduction	7
Chapter Two: Methods and Samples Used.....	12
Chapter Three: The Four Types of Driver	18
Chapter Four: The Effects of Installing Signs without Cameras	23
Chapter Five: The Effects of Publicity Campaigns against Speeding.....	28
Chapter Six: The Effects of Prosecution.....	35
Chapter Seven: The Effects of Speed Cameras when first installed and over time	42
Chapter Eight: Drivers' Perceptions, Beliefs and Attitudes to Cameras.....	47
Chapter Nine: Comparisons of the Deployment Strategies Used.....	57
Chapter Ten: Summary and Conclusions	61
Tables 1 - 5.....	75
Appendix A: Statistical Tests Used in the Data Analysis	80
References	81
Acknowledgements.....	85
Abstract.....	86

Executive Summary

1. Introduction

This study set out to examine the effects and effectiveness of various strategies related to the deployment of speed cameras, and to explore how different types of driver responded to cameras and perceived their operation. Recommendations for best deployment were to be considered. It was carried out between 1993 and 1996 after the Road Traffic Act 1991 authorised the use of automatic speed devices for the detection of offences. A series of 12 surveys arranged in five sets and having some cross-sectional and some longitudinal elements was undertaken together with some depth interviews, and self-report measures predominated. Five police forces helped to set up the research. In total 6879 drivers took part. The particular interventions focused upon comprised camera signing alone; two kinds of publicity campaign linked with speed camera deployment; prosecution following detection by speed camera; and the effects of cameras when first installed and over time.

2. Profiles of the Four Driver Types

Earlier research by one of the authors had indicated that drivers' initial reactions to the installation of cameras (Corbett 1995) had largely been one of four types. Drivers reported either that they had normally complied with speed limits on the survey road and so cameras would make no difference to them (these we termed 'conformers'); or that they had reduced their speed on the survey road to avoid detection (the 'deterred'); or that they slowed down on approach to cameras and accelerated away downstream ('manipulators'); or that they carried on as before driving well above the speed limit ('defiers'). As the ideal aim of speed cameras is to enlarge the proportion of deterred drivers, to maintain the number of those who have 'always complied' and to reduce the ranks of the defiers and manipulators, this study aimed to find out more about the two latter types of driver. To give an overall picture based on larger numbers, four samples, totalling 3440 cases, were added together.

The general picture conjured up of manipulators was that they were the most calculating and sophisticated in their reactions to cameras. They approved of them less than other types but were familiar with them, they thought they knew where they were, how they operated and how to drive past them without getting caught. In our surveys they tended to be the youngest and had the second highest offending and speeding scores and the highest accident rate.

Defiers were like manipulators in being most likely to drive company or high performance cars and they were most likely to deny a general link between speed and accident risk. Not unexpectedly they had the highest speeding and offending scores, and reported the highest speeds on the survey road after cameras or signs were installed. Such speed preferences could arise from defiers being the type most likely to discount the risk of detection (if driving above 45 mph on the survey road), least likely to think the police would take action against them if they were photographed, and most likely to expect leniency if police action followed.

Conformers on the other hand presented a picture of generally law-abiding, cautious drivers who approved of cameras. They were the oldest and most experienced with the lowest speeding and offending scores and were least likely to have had an accident in the previous three years. The deterred tended to fall between conformers on the one hand and manipulators and defiers on the other, but on many variables they were much like conformers implying that it was the cameras that had made them so.

Despite its apparent crudeness, our four-class typology was found to distinguish ably between the types of drivers we had earlier identified on background characteristics, general driving style and perceptions of cameras. Moreover, results between surveys were consistent and stable, and the bulk of conformers and deterred on the survey road behaved similarly on other roads. More lability was indicated in the case of manipulators and defiers, suggesting that on less familiar roads a minority behaved as deterred, which raises questions about these defiers' true nature as people who apparently are uncaring about the threat of detection. Yet the impression from all our data was that 'everyone has a price' and provided the threat of cameras remains a potent one, the proportion who ignore them will reduce sooner rather than later.

3. Effectiveness of Each Deployment Strategy

a) Camera signing alone

Three surveys were conducted in Eastleigh, Hampshire, the first before signs were erected, the second two months after and the third six months after. Overall it appeared there was a substantial reduction in speed and most of it lasted six months. At that point, of those respondents with scope to slow down over half were going more slowly, and 90% of those who before the signs had been keeping to the limits were still doing so. Although there were other enforcement signs and red light camera housings in a nearby city (Southampton), it seems that speed camera warning signs represented a real objective threat (correlating with the high subjective threat noted). So while the results must be considered in context, they were overall encouraging.

b) Two local publicity campaigns relating to the deployment of speed cameras

A longitudinal 'before' and 'after' design was used for both pairs of surveys in Northumbria and West Midlands, the second one taking place one to two months after each campaign had been mounted. The campaign in Northumbria aimed to enhance the perceived efficacy of existing fixed-site cameras by announcing that they would be supplemented by mobile ones, so undermining drivers' reliance on knowing where cameras were sited. That in West Midlands intended to suggest that the prosecution threshold (trigger) speed of existing speed cameras had been lowered, increasing the risk of detection. Together, the results suggested that local publicity campaigns may help reinforce perceptions of the potency of cameras and perhaps of the dangers of speed, even if at less than a conscious level for many, although among those at greater risk of losing their licence awareness may have been more conscious.

c) Payment of a fixed penalty after detection by speed camera

One survey was carried out of a sample of drivers detected on a road in the Thames Valley police force area, all of whom had paid a fine. At face value, many of the results indicated that the impact of prosecution was in the desired direction. So, for instance, while 26% said that before prosecution they normally kept below 31 mph on the survey road, this proportion rose to 87% afterwards. However, the inadvertent speeding of the majority, some of which was apparently due to believing the speed limit was higher, meant that for an unknown proportion (but less than 54%) the deterrent effects of prosecution may have been more apparent than real. Some information was also gathered from four other samples on the impact on their driving style of having penalty points. Together the results suggested that penalty points may have a restraining influence on a substantial proportion of drivers' speeds.

d) Effects of speed cameras when first installed and over time

A series of four surveys was specifically set up for the purpose of assessing initial reactions to cameras and drivers' behavioural and perceptual responses over time. These were carried out in Surrey in hitherto 'virgin' territory, and data from two other surveys also supplemented the findings. The first Surrey survey was conducted before cameras were installed; the rest took place at two, six and eight months after commencing operation. The impact of the camera was greatest when first installed, with speed choice markedly reducing and the perceived risk of detection substantially increasing. These effects were largely maintained at least until the eight months point, although other perceptions and beliefs remained more or less static between the first and last Surrey surveys. It would be unrealistic to attribute all the encouraging results in the Surrey surveys to the operation of just one camera and it is likely that other peripheral factors were influential.

Eight surveys addressed the issue of whether camera-induced speed behaviour generalises to other roads which have no indications of cameras. This is of importance because the use of speed cameras is restricted, being considered only when other potential solutions to speed-accident problems have been rejected. Altogether the results from the self-report data lent strong support to the notion that the deterrent effects of cameras spread to unsigned roads.

4. Comparison of the Deployment Strategies Used

In sum, a main finding from our research was that, according to self-report measures, camera deployment can reduce drivers' speeds markedly. Our results suggest that *any* of the measures investigated can be useful in helping to lower drivers' speeds, and most of the effects of installing cameras or signs lasted for several months. Moreover, some speed reduction was reported among all types of driver, not just the deterred, in regard to all deployment strategies. Overall, and for all types of driver except defiers, prosecution appeared to have the strongest deterrent effect, but results are site specific. The installation of cameras also had a pronounced effect, with a majority in our samples describing themselves as deterred after the erection of warning signs and cameras. Camera warning signs alone were moderately productive, and the effects were still largely present some months later. Local publicity campaigns seemingly influenced fewer than half of the speeders, especially manipulators, to slow down but as part of the effort to raise driver awareness of the risks of speeding they probably have merit. Defiers were the most intractable group, the majority remaining uninfluenced by any of the measures.

5. Perceptions, Beliefs and Attitudes to Cameras

Estimates of threshold speed above which cameras are activated varied little between survey sites (which all had 30 mph limits) or across time, the modal estimate being 35 mph and the next most frequent being 40 mph. In ten surveys the big majority thought the risk of detection for doing more than 45 mph on the survey road over the next three months was high. In the five surveys which questioned drivers a second time up to a third of respondents believed the risk of being caught for exceeding a speed limit on other main roads in the county had increased since they were first surveyed. The big majority of respondents believed that some police action would follow if they were detected by camera, and this perception varied little over time though it did vary somewhat by area. Around three quarters expected that the most likely penalty for doing 45 mph on the survey road would be a fixed one (a speeding ticket). Altogether it appeared that respondents collectively had a realistic idea of the likely consequences of detection for speeding.

Most drivers in each survey were favourable to cameras, although those who had been caught approved less. Where measured, the proportions holding positive attitudes increased over time. Among those not previously caught by speed camera the bulk of manipulators and defiers also expressed views in favour of cameras, which is interesting since their behaviour in response to cameras would suggest otherwise.

While overall the results on perceptions, beliefs and attitudes towards cameras were promising, there may nonetheless be an element of 'preaching to the converted'. The drivers most in favour of cameras, and most fearful and respectful of them, were those who are probably least likely to fall foul of them, i.e. conformers. At the other extreme, those who present the main problem to road safety planners - defiers and manipulators - seem the least respectful and fearful of cameras and least attitudinally influenced by them.

6. Recommendations

The conclusions of our research lead us to recommend that:

a) local publicity campaigns concerning the operation and existence of speed cameras continue to be mounted even if direct local benefits are not readily apparent. It appears that local campaigns can help keep the risks of speeding and the existence of cameras on the public agenda, and in cumulation with each and in combination with national efforts they may produce speed reductions.

b) a way be found to remind all drivers of current speed limit conventions and signing rules and to check more frequently their speedometers to help prevent inadvertent speeding. Some of those caught speeding unintentionally exceeded the limit through lack of attention and some through believing they *were* complying at the time of detection but were mistaken about the speed limit.

(c) a sustained and uniform policy of reducing camera threshold speeds is proceeded with as originally envisaged. In addition, it is suggested that future local publicity campaigns might usefully focus on advising drivers directly of reduced prosecution threshold ('trigger') speeds in the area. Prosecution seemed especially salutary among intentional speeders, and most of those caught held positive attitudes to

cameras (although only a minority of manipulators who had been caught were supportive). Based on our findings, reducing threshold speeds as originally planned is likely to lead to more speed reductions and only some slight loss of approval. Moreover, such a policy should help change perceptions among some that driving up to 10 mph above the speed limit is complying with the law.

(d) current resourcing arrangements be reviewed. In order to bolster the subjective risk of detection and increase the deterrent capability of speed cameras the objective risk must be maintained and preferably enhanced.

(e) insurance policies against disqualification for speeding be proscribed. Some drivers, especially defiers, may be tempted to ignore cameras safe in the knowledge that satisfactory alternative arrangements will be made for them in the event of their disqualification for speeding.

(f) a policy of reducing the visibility of roadside camera installations be introduced, and linking with (b) above, a policy of combined speed limit and camera warning signs in the target area is recommended. Undermining drivers' confidence in knowing the location of fixed-site cameras may reduce manipulating and encourage more uniform lower speeds, as indicated by manipulators' and defiers' reports of driving on other (perhaps less familiar) signed roads. Signs are considerably cheaper than camera installations, and provided there is some genuine objective risk of detection our study suggests that subjective risk will follow.

(g) mobile cameras should have a continuing place in enforcing speed limits even if resource constraints mean that police do not actually use as many of them as their publicity campaigns might suggest. While mobile cameras may raise uncertainty as to the risk of detection provided drivers are aware of their existence, unless they are used in unattended mode their operation rather defeats a key purpose of cameras to free-up police time and they are costly in terms of limited police resources.

(h) wide use be made of powers to impose graduated fines based on declared net weekly income on speeding drivers who come before the courts (in accordance with revised guidelines for Magistrates' Courts (Magistrates' Association 1997)). While most drivers expected a fixed penalty if caught, our earlier and present research suggests that at current levels these are unlikely to deter the fastest ones unless they already have six or more penalty points. However, more points combined with heavier fines may have more effect.

(i) camera installation be restricted to sites which have previously experienced a speed-related accident problem or where the potential for accidents is higher than average, such as at roadworks. This is to prevent speculation that cameras are a good money-earner for police or the state and to raise the likelihood that cameras will cut accidents at a particular site.

(j) future media campaigns should point out that most drivers think they are better and safer than others which is illogical, and that the message of the danger of speed is directed at all drivers and does not exclude those who believe they are better. Some paradoxical findings highlighted the challenge ahead, such as manipulators and defiers holding mainly positive attitudes to cameras but attempting to subvert their purpose nonetheless.

7. Wider Implications

Implicit throughout the report and underpinning much of our earlier research is that the ethos of speed not only permeates discourse on driving, but has infiltrated all aspects of modern life. So tackling the problem of speed on our roads runs counter to the general trend in society where speed is desired, valued and attractive. In this broader picture, attempts to modify drivers' speed by means of enforcement is unlikely ever to be enough (unless top speeds are restricted by technology), and a fundamental attitude change to speed on the roads is required.

Individual inclinations to speed at a particular time and place are motivated by a range of factors, but the most important in our view is that drivers do not see occasions when they exceed limits as dangerous otherwise they would not do it. When they speed they feel they are in control and that little harm will befall them, and these perceptions are strengthened by the fact that negative reinforcement occurs only rarely. But

this perception of control is to some extent illusory since, for instance, most drivers think they are more skilful than the average (e.g. Svenson 1981), most believe accidents are more likely to happen to them as passengers than as drivers (Horswill and McKenna 1997), and most think the roads would be safer if everyone drove like themselves (Corbett and Simon 1992).

In addition, individual instances of speeding are carried out against a social backcloth in which several factors interlink. Most drivers speed, so it is a consensual activity and a social norm legitimated by other speeders, and in combination with the feeling of being in control leads to few drivers perceiving speeding as serious, harmful, criminal or immoral (Corbett and Simon 1992). Since there are difficulties in achieving widespread enforcement, the message picked up by drivers from this could be that some speeding is condoned, especially given the latitude in camera thresholds. And when drivers are detected, unless disqualification is imposed outright or under the 'totting' rules, fixed penalties are not perceived as particularly onerous (Corbett, Simon and O'Connell 1998). This is all set against a backdrop where motor vehicle manufacture is encouraged and is indeed a measure of the country's economic health, and where the demand for production of high performance vehicles is not discouraged by the state.

So although we conclude that the proliferation of speed cameras is an important means by which to raise drivers' awareness of the dangers of speed and of inadvertent speeding, ultimately more than this and other forms of speed limit enforcement will be required in order to modify drivers' views on speed. Attention will need to be given to factors associated with overconfidence in being in control and with the broader social climate in which our car culture is embedded.

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Chapter One: Introduction

1. Background to the Study

Following recommendations made by the Road Traffic Law Review (1988) for greater use to be made of camera technology, new legislation was introduced under the Road Traffic Act 1991. Section 23 of that Act (which inserts a new S.20 into the Road Traffic Offenders Act 1988) provides that in the prosecution of drivers for exceeding speed limits photographs from an approved automated speed camera may be used as evidence without the corroboration of a police officer. The majority of the 43 police forces in England and Wales have availed themselves of the new speed camera technology, and coverage is growing fast although it varies between forces. Most cameras in use are of the 'fixed-site' variety, unmanned and mounted on grey poles at the roadside, while others - sometimes termed 'mobile cameras' - are mounted on tripods and are capable of being moved from site to site. In addition, some forces use a number of video cameras deployed from police vehicles.

In October 1993, Brunel University was commissioned by the then Department of Transport to examine the effects and effectiveness of speed cameras and to make recommendations for best practice and deployment. The current study links with and is a continuation of our earlier work on the deterrence of fast drivers (Corbett, Simon and O'Connell 1998), and as in that research self-report measures figure prominently. The project was carried out by a series of 12 surveys and depth interviews of some survey respondents, and aimed to explore drivers' speed-choice behaviour and perceptions in relation to the cameras. This report describes the methods and some of the main findings from the surveys and interviews, and it is hoped that the results complement findings from other research which has used aggregate measures of observed behaviour to analyse the effects of speed cameras (e.g. London Accident Analysis Unit 1997; Hooke et al 1996).

2. The Problems of Speed

Reducing accidents and speed are high on the agenda of many European nations (e.g. European Road Safety News 1997), and the British government is committed to reducing the number of road accidents by one third by the year 2000 compared with the average of 1981-1985 figures (Department of Transport 1987). Progress is being made towards that aim with, for example, the death toll down 35.7% from an annual average of 5,598 between 1981 and 1985 (Department of Transport 1991) to 3,598 in 1996 (Department of Transport 1997); yet this fall may be due more to safer vehicle design and better on-scene emergency medical care than to improvements in drivers' behaviour. Indeed, in order to meet the government's objective in full various obstacles must be overcome.

While not all drivers accept that higher speeds are correlated with a higher risk of accident involvement (e.g. Corbett, Simon and O'Connell 1998), statistical aggregate studies have demonstrated that there is a causal link between speed and accidents which prompts the need for lower speeds (e.g. Finch et al 1993; Baum, Wells and Lund 1991; O'Neill 1990). Moreover, research suggests that up to a third of all fatal road traffic accidents are speed-related (Finch et al, *ibid*), which means that in 1996 around 1,200 people died because of inappropriate speed. Despite this, drivers regard speeding as one of the least serious traffic offences (e.g. Corbett and Simon 1991; Brown and Copeman 1975), speed limit offences processed by police continue to rise (although this could be a result of the proliferation of cameras: Home Office 1996, Table 2), and most drivers in Great Britain admit to exceeding limits (Lex 1997).

These facts illustrate our view that speed constitutes one of the main social dilemmas of the twentieth century. On the one hand speed on the road is valued and attractive and we want more of it; on the other hand it can kill or injure and it adds to environmental pollution, and we want less of it. Because of the tensions between these opposing positions, solutions to the problem of lowering speeds to acceptable levels may not be simple, and may require more effort and cultural change than have been needed to bring about the general decline in prosecutions for drink-driving since 1988 (Home Office 1996, Table 2). Yet small reductions can have a dramatic effect: Transport Research Laboratory estimates from international studies

show that a 1 mph fall in average speeds can provide a 5% saving in accidents across a range of road types (Finch et al, *ibid*).

3. Efforts to Control Speed

Traditionally, efforts to induce change in drivers' behaviour have been spearheaded by three approaches involving engineering, education and enforcement, and the best solution may ultimately be found in their combination.

Engineering initiatives hold out much promise for controlling maximum speeds from within the vehicle. For instance, offences could be registered on in-vehicle 'smart cards' which could be read at regular intervals by police (Rothengatter 1991); or, less drastically, in-vehicle feedback and warning systems could advise drivers when they were exceeding a posted speed limit (see Rothengatter 1995; Harper 1991). Outside the vehicle, changes to the road environment are engineered by traffic calming measures such as road humps, chicanes and traffic islands although there are limitations to their use. The crunch may come when technology is ready to impose greater curtailment of free choice of speed than the driving public is prepared to accept.

However, such conflict might be averted if educational attempts proved successful in changing society's attitudes to the desirability of speed. Only a few years ago, one quarter of advertisements for new cars depicted unsafe behaviour and promoted speed or performance as the main selling points (Automobile Association 1992); high performance cars that can cruise well over top speed limits continue to be in demand, and interest in Formula One motor racing is worldwide, claiming an average of 32 million viewers in 130 nations for each of the season's races (The Times 6.11.97). These examples illustrate the excitement generated by, and deep-rooted attraction of, speed among people in general and they point to the challenge facing education at a societal level.

On an individual basis too, some reshaping of drivers' beliefs and perceptions is required. Research by the authors has shown that many drivers can recognise the danger of high speed but think that when they themselves drive fast they are in control so no harm will befall them (Corbett, Simon and O'Connell 1998). This illustrates the operation of the illusion of control, well documented by other researchers, which shows *inter alia* that drivers tend to hold the following beliefs: they are better than average (e.g. Svenson 1981; Corbett and Simon 1992), they are less likely to have an accident as a driver than as a passenger (Horswill and McKenna 1997), they are less likely to be involved in accidents than other drivers (Finn and Bragg 1986), the roads would be safer if others drove like them even if they are high offenders (Corbett and Simon 1992); and that faster drivers think they are less likely to have an accident than slower drivers (Corbett and Simon 1992). In other words, education is needed not only globally to turn around the value placed on speed and substitute a greater value placed, for example, on safety or smoothness while driving; but also it is needed to encourage individual drivers to acknowledge that they are vulnerable to higher speeds and that the majority cannot be 'better than average'.

Given that attitude change in this context may be a slow process, education of drivers holds out more hope in the longer than the shorter term. Until then enforcement of road traffic law remains the backstop measure to procure compliance. It aims to do this by deterring drivers in general from breaches of the law by the threat of future punishment, and when general deterrence fails and some are caught enforcement then serves as a punishment and a future deterrent to those individual drivers against further breaches. Moreover, road traffic law and its enforcement serve an educative function by informing the driving public about the safety implications of breaching rules and that following them will reduce the risk of accident, congestion and loss of amenity (Road Traffic Review Report 1988: 23; and see Corbett 1993).

Unfortunately, the extent and pervasiveness of speed limit breaches present practical problems for effective enforcement. Police resources are continually under pressure, and given the reactive nature of much police work (e.g. Audit Commission 1996), proactively enforcing speed limits has not always received the highest priority (see Corbett, Simon and O'Connell 1998, ch.6; Southgate and Mirrlees-Black 1991); it is just one of many competing demands on resources. As one of the supposed benefits of automated cameras is to free up police patrol time for other tasks, it is possible that in future more reliance will be placed on automated cameras in the pursuit of greater speed and accident reductions. Whether this happens could depend on the

scope of cameras, their future funding arrangements and how well they 'work', matters which are not necessarily independent.

4. The Scope, Funding and Effectiveness of Speed Cameras

Contrary to the view of some drivers (see Chapter 8, this report), cameras are not intended as an easy way to make money. In fact the official purpose of deploying speed cameras, outlined in guidance issued by the Department of Transport (Circular 1/92), the Home Office (HON 38/1992) and the Welsh Office (Circular 22/92), is to maximise road safety benefits in a given area bearing in mind local road accident figures and whether alternative means of reducing them are more appropriate; i.e. speed cameras should be used after other potential solutions have been rejected, and only where there is an existing speed-related accident problem.¹ The requirement to deploy speed cameras strategically means their scope is limited, unless any speed reductions obtained generalise substantially to surrounding roads where cameras are not used. The extent of generalisation is considered in later chapters especially Chapter 9.

The funding of camera technology is in practice shared between several agencies (the local authorities, police forces, the Highways Agency, the Crown Prosecution Service and the courts), although the apportionment varies considerably between areas. Research commissioned by the Traffic Committee of the Association of Chief Police Officers (ACPO) in conjunction with the Home Office conducted by Hooke et al (1996) found that in the ten force areas studied local authorities met about two-thirds of the start-up purchasing costs of cameras, with the police contributing almost a quarter of those costs. As for operation and prosecution costs, the police met almost two-thirds with the bulk of the remainder borne by the courts. The average fixed cost per site for a speed camera was ,12,500, with recurrent (operational) costs around ,8,500 per site per annum. Revenue from prosecutions including fixed penalty payments is currently returned to the Treasury rather than to the funding agencies, although a recent Treasury decision (Times 10.12.98) should allow police to use part of the money raised from speed camera fines to help run and maintain the cameras.

Dissatisfaction with the funding arrangements led ACPO to report in a press release in January 1997 (ACPO 1997) that in some areas fixed-camera sites were necessarily serviced less frequently than the optimum and that prosecution thresholds (trigger speeds) had been 'adjusted', with the result that fewer offenders were being processed. The inference is that in some force areas resources were insufficient to cope with the volume of drivers exceeding speed limits at camera sites.

Not unexpectedly such information from the police tends to be widely reported in the media (e.g. Sunday Express 5.3.95; Independent 23.1.97). For example, one newspaper, in response to the above press release noted that camera films were not changed as often as they might be so that 'tens of thousands of speeding motorists are escaping prosecution' (The Times, 23.1.97). The special relevance of this is that media reports of how cameras operate may impinge substantially on drivers' perceptions of their effectiveness in terms of the perceived threat of apprehension, and may alter their behavioural responses to cameras. Ultimately, if drivers perceive a lesser or an empty threat, speeds could rise and any safety benefits so far accrued might diminish. These perceptions will be examined in Chapter 8.

Yet despite any current inadequacies in the operation of cameras and the onward processing of errant drivers, research results based on aggregate data on the effectiveness of cameras are generally positive (e.g. LAAU 1997). The study by Hooke et al (1996) also provided a positive view of speed cameras in the ten police force areas studied. This analysis concluded that the benefits generated by cameras far outweighed the costs of purchasing, installing and running them. Among the benefits it was calculated that accidents fell by an average of 28% at the 174 speed camera sites covered, which translated into a reduction of 1.25 accidents per site per year, and that speeds fell by an average of 2.3 mph per site.

Speed cameras are in use in other countries including Canada, the United States, Australia, New Zealand and many countries in the European Union, although their effects have not all been rigorously evaluated. Yet there are some exceptions (e.g. Makinen 1994). Perhaps the best known study of speed camera effectiveness is that reported in Victoria, Australia (Bourne and Cooke 1993). In a co-ordinated programme of publicity, signing, high levels of speed limit enforcement, random breath testing and the introduction of 60 mobile cameras rotated between 2,500 sites across the State, speeds of more than 30 kph above the posted limit

reduced by two-thirds since the programme's inception in 1989. In addition, the proportion of speeding vehicles fell by three-quarters and accidents by 45%. Notably in this programme, infringement notices (fines) increased over 30-fold, from around 20,000 notices annually before 1989 to over 600,000 in 1991-2, suggesting that the much greater risk and higher incidence of detection may have contributed to the large speed reductions which were recorded. More recent figures from the programme show that in 1997 the proportion of vehicles speeding above the enforcement threshold of all vehicles checked was at an all time low of 2.2%, corresponding with the lowest fatality rate recorded in the state since 1951 (Victoria Police 1998). These figures suggest that such a programme which focuses on mobile speed cameras can return increasing levels of effectiveness over a number of years.

5. Broad Objectives of the Brunel Research

Accumulating evidence therefore indicates that speed cameras can and do work, and with increasing investment in speed camera technology it is important to understand more about how they affect drivers' behaviour and perceptions of them, and how they might best be deployed. Our study was designed to go some way towards meeting these goals. More precisely the objectives were as follows:

- (i) to determine the beliefs of drivers concerning how speed camera enforcement operates in relation to the actual deployment strategy adopted, and how these beliefs change with time and in response to changes in the deployment strategy;
- (ii) to determine the attitudes of different groups of drivers to speed cameras, the perceived effect of the equipment on their behaviour and on that of other drivers, and how these attitudes and perceptions change with time and exposure to the technology;
- (iii) to explore, in depth, drivers' decision-making processes which determine their speed behaviour;
- (iv) in light of the above, to make recommendations for the most efficient and effective deployment of speed camera technology, and associated sanctions, in order to reduce the speeds selected by drivers.

The background to objective (ii) is linked with earlier research which indicated that drivers initially reacted to the introduction of speed cameras in West London in one of four main ways (Corbett 1995). Drivers reported that either they had always tended to comply with speed limits so cameras made no difference (**conformers**); or they had reduced their speeds somewhat on the camera-targeted road to avoid being caught (**deterred**); or (as noted above) they slowed down approaching a camera site and accelerated away afterwards (**manipulators**); or they continued to drive fast irrespective of the presence of camera signs (**defiers**). Understanding more about the perceptions and beliefs of manipulators and defiers in particular was thought important from the perspective of promoting road safety, and at the same time objective (iii) - exploring how drivers in general decide on their choice of speed - aimed to provide useful information.

Objectives (i) and (iv) relate to the core of the research and are closely linked with the research design. An internal DOT survey undertaken at the start of our study asked police forces in England and Wales what they most wanted to know in connection with best deployment of speed cameras. As a result of their responses and further discussions, a largely quasi-experimental design was thought the most appropriate to yield the required answers, and various deployment strategies were selected. Eventually five police forces were involved in helping with the study.

6. Plan of This Report

In Chapter 2 we describe the research design and methods: how the various samples of drivers were gathered and the kinds of questions that were asked. In view of our dependence on self-report data, a section on the reliability and usefulness of such data is included. Background characteristics of the samples of drivers are described. Chapter 3 addresses the four-class driver typology referred to above: conformers, deterred, manipulators and defiers. It summarises data from the study to build up pictures of the four types, which are then relevant to the topics discussed in later chapters.

Then follow four chapters which examine the different strategies or manipulations that were used. Chapter 4 considers the sufficiency and effects of camera signing alone on drivers' perceptions and behaviour on a

camera-free road, and seeks explanations for the generally positive findings. Chapter 5 looks at the effects of two kinds of publicity campaign: one which announced the introduction of mobile cameras to supplement fixed-site ones, and another which aimed to suggest to drivers that the prosecution threshold or 'trigger' speed had been lowered, thus increasing the risk of detection. Respondents' awareness of local and national publicity are examined in conjunction with any changes in their behaviour and perceptions. Chapter 6 explores the effects on drivers' perceptions and behaviour of the experience of prosecution and payment of a fixed penalty after being photographed by a camera, and discusses the reasons respondents gave for having been caught. It also briefly considers the effect of penalty points on drivers' reactions to cameras. Chapter 7 examines the impact of speed cameras when first installed and then looks at the passage of time, assessing the extent to which any effects endured or wore off.

Chapter 8 focuses specifically on drivers' perceptions, beliefs and attitudes to cameras and makes some general assessments. Chapter 9 presents comparative analyses of the effects of the various camera strategies, and how far effects differ between types of driver. It also looks at the extent to which camera-induced speed reductions generalise to other roads without cameras. Finally, Chapter 10 sums up the findings of the study, makes recommendations regarding the future deployment of cameras, and discusses some wider implications. For this report some descriptions of methods and results have been condensed. More detailed treatment is given in the final technical report submitted to the DETR (Corbett and Simon 1998).

1. In fact research suggests that fixed-site cameras are not always deployed at sites with a known speed-related accident problem (Winnett 1995).

Chapter Two: Methods and Samples Used

Altogether 6879 drivers took part in this research by providing information through one or two postal questionnaires organised in 12 surveys. In addition, depth interviews were conducted with a sub-sample of 105. This chapter outlines the main procedures, considers the reliability of self-report data, and describes the respondents' background characteristics.

1. Postal Surveys

a) Aims and methods

The 12 surveys comprised five sets. Each set was carried out in a different locality and focused on a particular camera deployment strategy, though they all explored other topics too and had much in common. Between them the five sets were a group of quasi-experiments having both cross-sectional and longitudinal elements, enabling some comparisons between independent samples of drivers and other comparisons between data on the same drivers at different times. The five sets were as follows.

Surrey

Four surveys, designed to study drivers' reactions to the installation of speed cameras in hitherto 'virgin territory' and to see whether their reactions changed with the passing of time. The first survey (S1) was carried out before cameras were installed; the second (S2) was carried out on a fresh sample of drivers two months after installation; the third (S3R) questioned half of the S2 sample a second time six months after installation; and the fourth (S4R) questioned the other half of the S2 sample a second time eight months after installation.

Thames Valley

One survey (TV), designed to study drivers' reactions to the experience of being caught speeding by a camera and then being prosecuted and paying a fixed penalty (i.e. given a 'speeding ticket').

Northumbria

Two surveys, designed to study drivers' reactions to a local publicity campaign. The campaign was intended to enhance the efficacy of existing (fixed-site) cameras by advertising that they would be supplemented by mobile ones, thus undermining drivers' reliance on knowing where cameras were located. The first survey (N1) was carried out before the campaign; the second (N2R) questioned the same drivers again between one and two months after the campaign.

West Midlands

Two surveys, designed (as with Northumbria) to study drivers' reactions to a local publicity campaign. This campaign was intended to suggest to drivers that the trigger speed of existing cameras had been lowered, thus increasing the chance of being caught. The first survey (WM1) was carried out before the campaign; the second (WM2R) questioned the same drivers again between one and two months after the campaign.

Hampshire

Three surveys, designed to study drivers' reactions to the erection of camera warning signs without actual cameras and to see whether their reactions changed with the passing of time. The first survey (H1) was carried out before signs were erected; the second (H2) was carried out on a fresh sample of drivers two months after erection; the third (H3R) questioned the H2 drivers again six months after erection.

Since the 12 surveys will often be referred to in this report by the abbreviations shown these are listed below for ease of reference, together with the stage at which each survey was conducted, and whether a fresh or repeat sample was used. It will be seen that the suffix 'R' denotes that a repeat sample was used.

S1	Surrey 1	fresh	before cameras
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S2	Surrey 2	fresh	2 months after cameras
S3R	Surrey 3	repeat	6 months after cameras (half of S2)
S4R	Surrey 4	repeat	8 months after cameras (other half of S2)
TV	Thames Valley	fresh	after paying a fixed penalty
N1	Northumbria 1	fresh	after cameras and before publicity campaign
N2R	Northumbria 2	repeat	after publicity campaign
WM1	West Midlands 1	fresh	after cameras and before publicity campaign
WM2R	West Midlands 2	repeat	after publicity campaign
H1	Hampshire 1	fresh	before camera signs
H2	Hampshire 2	fresh	2 months after signs
H3R	Hampshire 3	repeat	6 months after signs (repeat of H2)

b) Sampling procedures

In each set of surveys drivers were sampled at one site, and in all five sets the site was a stretch of a single carriageway urban road having a 30 mph speed limit and a history of speed-related accidents. The sampling was carried out by the TRL, the police, or both between October 1994 (for S1) and September 1995 (for H2). Vehicles driven along the stretch of road were recorded at one or two points by existing cameras or by TRL video equipment (temporarily set up for the purpose), and samples of cars whose speeds met certain criteria (see below) were selected. The DVLA identified their registered keepers to the Brunel research team, who then arranged for each to be sent a questionnaire and explanatory letter (and asking for these to be passed onto the person driving at the time of sampling, if he or she was different from the addressee). The letter assured drivers that their data would be treated in confidence and that if they were exceeding the limit when photographed for the research no prosecution would result. The one exception to this procedure was the Thames Valley survey, where the police did all the sampling (following the researchers' criteria) and sending out of questionnaires (designed by Brunel) to drivers who had already been caught speeding by camera and had paid a fixed penalty.

Thus drivers were selected according to their observed speed on one occasion. No attempt was made to get a representative sample; rather, the aim in each set of surveys was to obtain enough drivers to study in each of the four categories of driver type: **conformers**, **deterred**, **defiers** and **manipulators** (see Chapter 1, section 5).

The criteria for choosing observed speeds from which to sample drivers differed between the seven surveys which gathered fresh samples (S1, S2, TV, N1, WM1, H1 and H2), depending on features of the site (including the trigger speed of a camera if present), the time available for the research, and growing experience of the sampling procedures and their problems. To target people likely to report themselves as conformers or deterred, the observed speed was set at a maximum (differing between surveys) in a range not much above 30 mph; for targeting defiers a minimum speed was set in a higher range; and for targeting manipulators a maximum was set at one point on the road and a minimum, higher, speed at a second point. A 3-second minimum headway was required where it was imperative to ensure that choice of speed was unconstrained. In practice this meant that to target conformers and the deterred where cameras were already in place (S2, WM1, N1) such a headway was used at the first and second sampling points. To target manipulators a headway was required at the first point only, a higher speed at the second point precluding the need for a headway. Where cameras were not yet installed (H1, H2 and S1) drivers were targeted at one sampling point travelling above or below specified speeds. A 3-second minimum headway was required to target drivers in the slower groups which were expected to contain mainly conformers; no headway was required in the faster groups expected to contain (future) deterred, manipulators and defiers.

As the number of defiers was expected (from earlier work) to be small, the S2, N1 and WM1 samples included a booster element of drivers sampled by the police from those who triggered the camera, while the TV sample consisted only of such people. For the duration of each set of surveys the prosecution threshold (trigger speed) at the survey site remained unaltered, although these speeds varied by up to 10 mph between sites.

c) Complications

The five sites, while having the common feature of being a single carriageway stretch of road with a 30 mph speed limit, all differed from one another in other respects. Though four of the sets of surveys were seen as quasi-experiments, ultimately it was not possible to control conditions so that the only variable operating was the experimental one (installation of a camera or signing, advent of local publicity, or the passage of time). Differences occurred between the surveys in the physical features of the sites, the times available for sampling drivers, the weather, traffic patterns in the surrounding area, and the involvement of agencies other than the police and the TRL. One result of these differences was that we could not use the same criteria of observed speed at each site for sampling drivers, and in fact the criteria were always less satisfactory than we would have liked. These various problems made the research more complicated than had been foreseen at the outset, and they are mentioned in later chapters where appropriate.

d) The questionnaires

These were sent out between November 1994 (for S1) and May 1996 (for S4R reminders). The number initially sent out (i.e. excluding reminders) ranged from 836 (for S4R) to 2611 (for S2), and totalled 15,983. Cases where the researchers were notified that the actual driver could not be contacted were discounted in calculating response rates, as were those where the respondent said in follow-up surveys that she/he no longer used the survey road. Allowing for such discounts, the response rates ranged from 60% (for TV) to 79% (for S3R). The maximum number of cases available for analysis in any one survey ranged from 405 (for S4R) to 1696 (for S2).

In the seven surveys using fresh samples the questionnaires covered a large number of areas of interest. These concerned the driver's background and general driving habits; driving behaviour on the survey road and on other roads; perceptions, beliefs and attitudes concerning cameras; and a few other matters. In all but TV many of the questionnaires were designed to establish a baseline of self-reported behaviour and attitudes against which to compare the responses of later samples in the same set. S2 and H2 shared this purpose as well as providing data to compare with S1 and H1. The TV survey was a 'one-off' and included some questions not used in others.

In the five surveys which questioned the same drivers a second time the focus was on changes in behaviour on the survey road and elsewhere, and in perceptions, beliefs and attitudes concerning cameras. Many of the questions repeated the wording used before with the addition (where appropriate) of 'since you completed the last questionnaire'. Others asked the driver outright whether his/her behaviour and perceptions had changed.

For analyses one other item was added to the questionnaire data for each respondent: his or her observed speed when sampled. Except for the TV survey, cases of drivers who had been caught by camera were omitted from most analyses (other than simple frequencies) to remove the potentially confounding effect of prosecution on drivers' responses. Throughout this report, unless otherwise indicated, most statistical findings are significant at the level of at least $P < .05$ (and many were significant at much higher levels). Statistical tests (all 2-tailed) were as shown in Appendix A.

2. Depth Interviews

In order to explore in depth the perceptions, beliefs and attitudes of drivers about speed cameras, interviews were carried out with a small sub-sample of those who had already taken part in the postal surveys. The key purposes were to find out more about the cognitions of the four types of driver - manipulators, defiers, deterred and conformers - in relation to their choice of speed near cameras, and about drivers' perceptions of the particular deployment strategy operating in the area where they were observed. Such information was

thought difficult to elicit in a postal questionnaire. A further objective was to obtain perceptions about camera deployment according to driver type, although in view of the small numbers in some categories this produced mainly qualitative information.

The original target sample was 100 respondents drawn equally from four of the police force areas in which surveys were carried out, in order to examine how the different deployment strategies were perceived. At the same time efforts were made to sample the four driver types within each area, over-representing manipulators and defiers as far as possible. Yet despite our attempts to oversample manipulators and defiers very few were available for interview. Of the total 105 interviewees, 25% were manipulators, 9% defiers, 41% deterred and 26% conformers according to their survey responses. Sixty percent were males, and 63% were aged 36 or over, which were similar proportions to those for the total of all survey respondents.

3. The Use of Self-Report Data

All the survey data except one variable - observed speed at the time of sampling - depended on drivers' reports of their own behaviour (and perceptions, beliefs and attitudes). The use of self-report data is well established in criminological research. (See, for example, Hirschi et al 1980, and the discussion by Graham and Bowling 1995: 6, 8-9.) Its appropriateness for research on drivers has been discussed previously (Corbett and Simon 1992: 11-12), where it was concluded that for measuring traffic offending self-report was far superior to what could have been obtained from official records routinely collected, although in self-report drivers probably understated their more serious transgressions. For these and other reasons all our data on the drivers in our samples is self-report except for their speed observed on just one occasion.

a) Reliability of self-report speeds

The data offered two approaches to this question. The first was to compare drivers' observed speed at the time of sampling with what they reported as their usual speed in free-flowing traffic on the survey road. This compared the subjective measure with an objective one, though it must be remembered that the latter was obtained on only one occasion which may or may not have been typical. The second approach was to look for internal consistency in self-report.

Comparison of observed with self-report speed

This was appropriate for samples S1, S2, N1, WM1, H1 and H2, and it was carried out in two ways.

(1) Calculating a correlation coefficient (Kendall's tau b) between the actual observed speed and the driver's self-report of usual free-flow speed on the survey road as indicated by his/her endorsement of one of six categories on the questionnaire.² In each of the six samples the correlation was found to be statistically significant, but it was very low, ranging from 0.10 in S1 to 0.17 in H1. These significant yet low correlations support the results obtained by West et al (1993), Parker (1997), De Waard and Rooijers (1994) and Aberg et al (1997).

(2) Grouping both observed speed and self-report speed into three categories: ≤ 31 mph, 32-37 mph, and ≥ 38 mph, and comparing them. If a driver's self-report speed was in a lower category than his/her observed speed (which of course was possible only for people observed at 32-37 mph or ≥ 38 mph), this was taken as an indication that the driver was inclined to understate his/her speed in self-report. In each of the six samples it was found that (i) drivers observed at 32-37 mph had, overall, a fairly strong tendency to understate (the proportions doing so ranging from 44% to 87%; and (ii) drivers observed at ≥ 38 mph had, overall, a very strong tendency to understate (the proportions doing so ranging from 80% to 98%).

In any one survey the number of 'understaters' as a proportion of the whole sample depended, of course, on the proportion of the sample who were observed driving at ≥ 32 mph, i.e. who had scope for understatement as we have defined it. In the three surveys where real cameras were operating and drivers were asked for their self-report speeds 'when passing the cameras' only a minority of people were observed at ≥ 32 mph, so the total proportions of understaters in these surveys were also relatively low. In the two surveys where no cameras or signs were present a big majority of people were observed at ≥ 32 mph so there was plenty of scope for understatement, and this was also largely the case in H2 where despite camera signs 74% were observed at ≥ 32 mph. All these three surveys yielded a majority of understaters.

These comparisons suggest why the correlation between observed and self-report speeds, though statistically significant, was weak. It appears that many drivers may have a tendency in self-report to understate their habitual speeds, since although observed behaviour was measured on one occasion only, a consistent bias towards lower rather than higher reported speeds was found in comparison with the direct measure. It also seems that the fastest drivers may be most inclined to understate.

Internal comparison of self-report data

The five surveys which questioned people a second time (S3R, S4R, N2R, WM2R and H3R) offered the opportunity to look at the consistency of drivers' own reports of their speeds. People were asked whether, since completing the first questionnaire, they had changed their choice of speed on the survey road, i.e. whether they now drove there more slowly, no differently, or faster than before. Elsewhere in the same questionnaire they were asked to state their usual choice of speed (nowadays) on that road (in the same six categories as used earlier), and their responses to the latter were compared with what they had said in the first questionnaire (using the three grouped categories of speed).

In each sample the great majority of respondents were broadly consistent. Most of those who said they had slowed down put themselves either in a lower category than before, or in the same one (within which they could have reduced their speed). Nearly all of the few who said they went faster put themselves either in a higher category than before or in the same one (within which they could have speeded up). And the majority of those who said they drove no differently put themselves in the same category as before. But in each sample there was a tiny minority ranging from 3% to 5%, who put themselves in a lower speed category while saying that they were driving no differently or were going faster; and a larger minority, ranging from 8% to 16%, who put themselves in a higher speed category while saying that they were driving no differently or had slowed down. Thus a minority of each sample showed inconsistency in their answers about self-report speed, and on balance the inconsistency was in the direction of understating speed (in one or the other answer in the second questionnaire).

These two exercises - comparing observed with self-report speed, and examining consistency of self-reports of speed, suggest that some drivers have a tendency to report their habitual speeds as lower than they actually are. The implications of this bias are discussed in the report where appropriate.

4. Background Characteristics of the Survey Samples of Drivers

These will now be discussed and selected characteristics are shown in Table 1.

The seven fresh samples (S1, S2, TV, N1, WM1, H1 and H2) were all collected under different conditions and therefore could not be expected to mirror one another in terms of the kinds of driver included. Compared with the national population of licence holders six contained fewer females, 40% or less (the national proportion being 42%). The seven samples also had slightly fewer young drivers (those aged 17-25) than in the national population, and the average sample member had rather more driving experience. Average weekly mileage varied quite widely between the seven samples (from 154 miles in WM1 to 269 in N1), as did the proportion of drivers using company cars (from 14% in H2 to 27% in N1). As for the extent to which drivers used the survey road, in WM1 two-thirds said they drove on it at least twice a week and in most of the other fresh samples about 40%-50% did. The exception was TV, where only 19% used the survey road regularly and 20% had used it only once or twice (and by contrast, the TV sample were more familiar than the others with camera-targeted roads elsewhere). The TV sample was unique in that all its drivers had been caught by camera, and it seems that far fewer of them than of other samples were local drivers. Apart from the TV sample only 2%-3% said they had ever been caught speeding by a camera, though between 9% (in WM1) and 17% (in N1) had penalty points on their current licence.

Altogether the seven fresh samples contained a wide variety of drivers. One matter of particular interest was to see to what extent each sample told the same story in revealing characteristics associated with the four types of driver, and this is examined in Chapter 3.

For the five repeat samples (S3R, S4R, N2R, WM2R, and H3R) the main interest in Table 2 was to see how far each one was representative of the 'parent' from which it was selected, in terms of the parent's

characteristics. In general, those responding to the second questionnaire tended to be older, driving lower mileages and fewer company cars and they included more women. They gave the impression of being marginally more mature or responsible than in the parent survey, though S4R showed less of this difference than S3R.

2. These were: 'a lot below 30 mph', 'a bit below 30 mph', 'as close as possible to 30 mph', 'between 32-37 mph', 'between 38-45 mph', and 'above 45 mph'. In analyses using just three speed categories, ≤ 31 mph included the first three mentioned and ≥ 38 mph included the last two. Throughout this report we use the terms 'speed category' and 'speed band' interchangeably to mean one of these (six or three) ranges of speed in mph.

Chapter Three: The Four Types of Driver

1. Introduction

A survey of drivers' initial responses to the introduction of cameras on a London arterial road in May 1993 (Corbett 1995) indicated that most reactions could be grouped in one of four ways: either drivers said they had always complied with speed limits so cameras would make no difference (these people we termed 'conformers'); or they said that they had reduced their speeds in general on the camera-targeted survey road as a result of the cameras (the 'deterred'); or they said that they drove above the limit until slowing down on the approach to a camera and then accelerated away downstream ('manipulators'); or they said they paid little attention to cameras and continued to drive well above the speed limit all along the road ('defiers'). The Lex Report (1997) found that one third of a representative sample of drivers claimed to behave like those we term manipulators and another third claimed not to slow down at camera sites or to bother about them, similar to people we term defiers. Since these two groups present the greater risk of speed-related accidents, an obvious aim of cameras is to encourage more of them to join the 'deterred' category. A main purpose of our surveys, therefore, was to explore further the characteristics, perceptions and behaviour of the four types, the rationale being that a greater understanding of individuals who react inappropriately to cameras might signal ways forward to develop relevant countermeasures.

The study initially defined the four types from their self-report driving styles (and alternatively, from their observed speeds when sampled) on the survey road. Other data from the questionnaires were then analysed to compare the types on a wide range of variables: background demographics, driving history and habits, and specific reactions to cameras. Interview data supplemented this material. In this chapter we summarise the findings to build up pictures of the four types which can then be borne in mind as later chapters expound particular topics.

2. Self-Report Types on the Survey Road

a) Definitions

The four types were derived from respondents' answers to a question about their driving style on the survey road, which in most cases was worded as follows. Drivers were asked: 'Altogether, how are the cameras affecting your speed on [the survey road]?' and asked to choose one of the following six options as coming nearest to describing their style.

I keep close to or under the speed limit on the 30 mph stretch of this road:

- (i) because I always did before cameras arrived and still do
- (ii) because I have slowed down to avoid being caught by cameras, although I know where there is a camera box
- (iii) because I do not know where there is a camera box

I drive well above the speed limit on the 30 mph stretch of this road:

- (iv) ALL ALONG IT, although I know where there is a camera box
- (v) ALL ALONG IT, and I do NOT know where the cameras are
- (vi) ONLY where I know there are NO cameras. Where there is a camera box, I slow down close to the limit.

For analysis option (i) defined conformers, (ii) and (iii) deterred, (iv) and (v) defiers, and (vi) manipulators.

There were variations on this wording according to the timing and purpose of the survey. In S1 and H1 the question was hypothetical, asking drivers how they thought their speed would be affected if cameras were to be introduced on the survey road; in TV the question referred to drivers' behaviour *since* they had been

caught speeding; in H2 and H3R the wording allowed for the fact that only signs had been installed *and* for the possibility that drivers might think there were boxes containing working cameras.

As well as this question about the survey road, three of the later surveys asked a similar question about driving style 'on other roads with cameras with which you are familiar', the purpose here being to enquire whether the responses defining the four types were specific to the survey road or were general. In the rest of this chapter self-report type refers to the survey road unless otherwise stated.

b) Distributions

As already mentioned the seven fresh surveys did not attempt to obtain a representative sample of drivers, but rather to gather enough of each type to study. Even so, manipulators and (especially) defiers were thin on the ground. In three surveys defiers were so scarce that comparisons could be made only between the other three types. Across the samples the minimum and maximum proportions of each type were as follows: conformers 29%-54%; deterred 36%-61%; manipulators 3%-14%; and defiers 1%-7%.

3. Comparisons of Self-Report Types

In each of the seven fresh surveys the self-report types were compared on other variables and by and large all seven sets of comparisons presented much the same broad picture of differences between the four types (though some analyses were limited by the small numbers of manipulators and defiers). For this chapter, in order to give an overall picture based on larger numbers, we have added four samples together: S2, N1, WM1 and H2. This gave a total of 3,440 cases for analysis (omitting those where the respondent had been caught by camera and those where the question on driver type was not answered).

In comparisons of background characteristics and general driving style, variables showing statistically significant differences between the four types included the following. As would be expected, self-report conformers appeared as the most steady, mature and law-abiding group. They were the oldest and most experienced drivers, with the lowest offending and speeding scores, and the lowest speeds on the survey road both before and after the cameras (or signs) were introduced. They were the least likely to drive company cars or high performance ones; fewest of them had penalty points on their current licence, or had had an accident in the last three years; and they were more likely than other drivers to agree that there was a link between speed and accident risk, both for drivers in general and for them personally.

In all these respects manipulators and defiers were at the other end of the scale, sometimes together and sometimes distinct. Manipulators were perhaps the most interesting group: they were the youngest, the least experienced (with defiers), they had the second highest offending and speeding scores, and reported the highest speeds on the survey road before cameras (or signs) were installed. They had the highest accident rate (though not by much), and they were the least likely to admit a link between speed and the risk of accidents, both general and personal. Together with defiers they were the most likely to drive company cars and high performance ones, and (along with the deterred) to have penalty points on their licence.

Defiers were distinctive in several ways one might expect. They were the second to youngest group, they had the highest offending and speeding scores, and the highest speeds on the survey road after cameras (or signs) appeared. They were the most likely to deny a general link between speed and accident risk. In other ways they resembled manipulators as already noted.

In almost all these characteristics the deterred fell in between conformers at one end and manipulators or defiers at the other. The only exception was the proportion having penalty points on their licence: in this they were like manipulators and defiers, but the fact that they had described themselves as deterred by the cameras suggests that they were more aware of the endorsement and the possible consequence of a further breach. Support for this interpretation comes from the interviews, where the fear of collecting penalty points appeared a main reason for drivers to become deterred, especially among those who had already been caught speeding by camera.

Many of these differences between types appeared in analyses of some or all of the seven fresh samples separately, and there were no appreciable contradictions. Interestingly, gender did not distinguish the types significantly except in TV, where manipulators were more likely than conformers and deterred to be male;

though it was noted in S2 and WM1 that male drivers were more likely to have high offending and speeding scores, which are also characteristic of manipulators and defiers.

Further analyses compared the four driver types on numerous variables describing their reactions to cameras. The findings are mentioned later at appropriate points, especially in Chapter 8. We may note, however, that the overall picture they suggested was quite consistent with the one presented above, and may be summed up as follows. Manipulators appeared as the driver type most calculating and sophisticated in their reaction to cameras. They approved of them less than other drivers but they were used to them, they thought they knew where they were, how they operated and how to drive past them without being caught. Defiers were like manipulators in preferring high speeds generally and discounting the likelihood of being caught, but unlike manipulators they continued to speed as if uncaring of the threat of detection. Conformers on the other hand presented a picture of generally law-abiding, cautious drivers who approved of cameras. The deterred were now fairly like conformers in behaviour, and implied that it was the cameras that had made them so.

4. Self-Report Types on Other Roads

In each fresh survey the four driver types were defined by their self-report behaviour on a particular road. The fact that over all the surveys they tended to show such consistent differences suggests that the four-class typology is not site specific but is of general application in describing drivers' responses to speed cameras. Further evidence for this came from the three surveys in which respondents reported their driving style on other familiar roads with cameras (S2, WM2R and H2).

In regard to conformers and deterred there was a great deal of consistency. In each survey between 82% and 86% of conformers on the survey road were conformers elsewhere, nearly all the rest being deterred. Between 76% and 91% of those deterred on the survey road were deterred elsewhere, nearly all the rest being conformers. Manipulators and defiers showed less consistency, though still some. So it seems that the great majority of drivers who were conformers or deterred on the survey road behaved the same way on other roads with cameras (or signs). Some manipulators and defiers did likewise, but others tended to behave as deterred, perhaps because they did not know the 'other' roads quite so well (despite using them a little more often than did conformers or deterred). Overall, however, the evidence suggests that the four-class driver typology (self-report) is quite stable.

5. Observed Types, And Comparisons With Self-Report

The observed speeds at which drivers were sampled were chosen with the aim of obtaining enough cases of each driver type, but as already mentioned (Chapter 2, section 1c) they differed between surveys because of the various constraints and complications. In S2 defiers were specified as those passing the camera at a minimum speed of 41 mph, but in N1 the minimum for defiers was 34 mph. In addition to the considerable variations in the definitions of observed type, it must be remembered that drivers were assigned to a type according to their speed behaviour on only one occasion, which may not have been typical for them.

So it would not have been surprising if comparisons between observed types had yielded little in the way of consistent differences across surveys, but in fact there were encouraging patterns. But taken all in all, the profiles of conformers and deterred on the one hand, and manipulators and defiers on the other, revealed for observed types were remarkably similar to those for self-report types despite the sampling difficulties and variations in criteria. This similarity gives further grounds for confidence in the driver typology.

However, when self-report and observed types were compared at an individual level of analysis the picture became more complex. While most of the seven surveys showed a statistically significant association between the two classifications, there remained some apparent inconsistencies between self-report and observed types. For instance, in S2 of self-report manipulators, 17% were observed as conformers or deterred. Several factors could help to explain these including: the possible atypicality of one or two split-second measurements of observed behaviour; the inadequacy of the observed speed criteria; the crudeness of the self-report distinctions (section 2a) which forced respondents to choose between descriptions they may have felt inadequate for them (and see section 7 below); the tendency to understate speeds; and some drivers'

interpretation of 'keeping close to the speed limit' which may be more liberal than we had had in mind when designing the surveys. This topic will now be examined.

6. Interpretations of 'Compliance with Speed Limits'

There were several indications that some drivers especially manipulators felt they were more or less complying with the limit as long as their own speed was within the range they observed other drivers using, even if most others exceeded the limit on a particular stretch of road. Interviews with self-report conformers provided most insight into how compliance with limits was conceived, and how liberal interpretations were made. While some people, through moral commitment to the law, held strict views that posted limits should be adhered to and tried always to drive accordingly (except when they inadvertently exceeded a limit), others had different interpretations. The most common centred on the idea that speed limits were to be used as guidelines for constructing their own set of rules as to what were appropriate speeds (cf. Corbett and Simon 1992: 35-36). As long as they conformed to these private rules this was perceived as compliance and, importantly, as law-abiding behaviour. Thus their own rules seemed to substitute for the authority of the law.

Such drivers did not see it as wrong to drive between 35 and 40 mph in a 30 mph limit and, as might be expected, many of the conformers said they kept to such speeds because they did not like to break the law. One who said he drove between 35 and 40 mph on familiar and unfamiliar (30 mph) roads, whether or not camera signs were up, said he conformed because he realised the danger posed by speed (and he had not changed his speed since the cameras arrived), and because he did not like breaking the law. 'The law is the law but a certain slight latitude is reasonable.' Some conformers who were asked seemed reluctant to accept that driving at 40 mph in a 30 mph area was in fact breaking the law. 'Some don't want to admit they break limits even to themselves.' 'It's so easy to do 40 but difficult to see ourselves as criminals doing 33% above the limit.' So an elastic conception of compliance was best seen among conformers who had a tendency to hold on to a self-image as law-abiding drivers: an image achieved through the private construction of a set of guidelines that substituted for real speed limits. As long as they felt in control and safe, and conformed to their own speed standards, they saw their resulting behaviour as indeed 'complying with speed limits'.

7. Changes In Self-Report Types between Surveys

The five repeat surveys each enabled us to compare the way drivers described their response to cameras (or signs) on the survey road with the way they had done so a few months earlier. Of course it had been hypothesised that certain changes would occur because of the experimental variable, as follows. In the Northumbria and West Midlands surveys, if publicity had had the desired effect, one would expect that (between N1 and N2R and between WM1 and WM2R) some drivers would change from manipulators or defiers to deterred, while conformers remained as such. In Surrey and Hampshire, if the effect of cameras or signs was wearing off, one would expect (between S2 and S4R, S3R and S4R, and H2 and H3R) that some drivers would change from deterred to manipulators or defiers, while conformers remained as before.

Findings in relation to the hypotheses are reported in other chapters. But as well as those, each of the five comparisons revealed other apparent changes of type, most of them occurring between conformers and deterred, and vice versa (as they were the most numerous types). Between 21% and 27% of people who said in the first survey that they were conformers said in the second one that they were deterred. A possible explanation is that these drivers did in fact feel persuaded (by publicity or something else) to drive more slowly even though they had felt they were complying with the speed limit before. But less easily explained is the finding that between 17% and 34% of people who said in the first survey that they were deterred said in the second one that they were conformers. A few other people also changed their descriptions in unexpected ways. Altogether, between 8% and 15% of the total number in each sample described themselves in the second survey as conformers whereas in the first survey they had said something else.

These discrepancies suggest that some respondents had difficulty with the questions on driver type. In particular, the surveys allowed only one response in regard to self-report type, and in fact more than one category may apply. This was most noticeable in interviews, when attempts were made to ascertain the interviewee's driving style in regard to speeds generally, how this was modified (if at all) in response to

cameras, and whether any changes had occurred since the experimental manipulation (if the interviewee recognised that there had been one) or over time. Some examples, using our definitions, will illustrate:

- A self-styled 'conformer' who was caught by camera (defier), reduced his speed to around 35 mph in 30 mph areas (deterred), but still slows down at cameras and accelerates away from them (manipulator).
- A driver who slowed down generally on the survey road when cameras arrived (deterred), but still speeds up between cameras (manipulator), and drives well over the speed limits elsewhere to make up lost time.
- A 'manipulator' who got caught and then slowed down generally on the survey road (deterred), but slows down further at cameras and accelerates away from them (manipulator). He says he is 'deterred now' and thinks cameras are a good thing.
- A 'defier' who 'pushes his luck', takes risks in most places, and (like many of the 'conformers') does up to 40 mph on 30 mph roads, has slowed generally on the survey road because he has heard of the cameras there from the publicity campaign (deterred). He now thinks the 'warning period' is over and that the risk of being prosecuted is too high.

These examples indicate that our four categories of driver type, used for both self-report and observation, do not encompass all aspects of driving style in response to cameras, and might benefit from redefinition or expansion to take in dimensions of, say, time (how people drove before cameras), place (how they drive elsewhere) and general speed preference (fast or slow). However, this chapter has shown that the categories as they stand were quite distinguishable in terms of drivers' various background characteristics, perceptions and aspects of driving behaviour, and that they remained so over time and between surveys. Moreover, there was a good correlation between reported driving style on the survey road and on other camera-targeted roads.

Chapter Four: The Effects of Installing Signs without Cameras

1. Introduction

Roadside signing aimed at reducing vehicle speeds tends to be of two types. The first type attempts to promote lower speeds through encouraging drivers to comply with the perceived social norm. Results tend to be mixed (e.g. see Casey and Lund 1993), but various international studies have confirmed the usefulness of feedback signing experiments where, for example, the proportions of drivers complying with limits are posted on roadside signs (e.g. Muskaug and Christensen 1995; Ragnarsson and Bjorgvinsson 1991). The theory underpinning this strategy is based on what drivers know and believe about the speed behaviour of others (Muskaug and Christensen, *ibid*), and for this reason it is generally agreed that such feedback methods are most effective on roads where the majority of drivers already comply with limits (Rothengatter 1995).

The second type of roadside signing encourages lower speeds through the threat of enforcement of the speed limit, and this is the type in which we were interested. The obvious benefit of erecting camera warning signs without actual camera installation is in the markedly lower cost of operation - if signs are effective. At the stage when deployment strategies for this project were selected the effectiveness of signs alone was one of the key questions raised by police, since usually signing is contingent on the installation of cameras and is not a substitute for it. So a main objective of the set of three surveys conducted in Hampshire was to see whether speeds dropped after signs were put up alerting drivers to the supposed presence of speed cameras, and whether they had crept up again when measured some months later.

The design involved cross-sectional and longitudinal elements. The survey site was the Southampton Road at Eastleigh, where two 'speed enforcement camera' signs and three double-sided repeater signs were erected in August 1995. As in the rest of Hampshire, no actual speed cameras were installed. The first sample of drivers were invited to complete the H1 questionnaire in June 1995 and 901 did so. The second sample received the H2 questionnaire in October 1995 and yielded 1159 respondents. All the H2 respondents were sent the H3R questionnaire in February 1996, and 650 completed and returned it.

2. Behaviour on the Survey Road

a) Types of driver

Hampshire drivers were asked about their driving style on the survey road by the same six-option question as was used in other surveys (see Chapter 3, section 2a), except that for H1 the wording was slightly adapted because the question was hypothetical, and for H2 and H3R it allowed for the fact that only signs had been put up *and* for the possibility that drivers might believe there were actual cameras working.

The answers enabled respondents to be classified into the four (self-report) driver types; in H2, for example, 52% answered as conformers, 36% as deterred, 4% as manipulators and 7% as defiers. When they were compared on other variables - their background characteristics, other aspects of driving style, and their reactions to cameras in terms of speeds, perceptions and attitudes - the pattern of differences between the types was the same as that revealed in other surveys where real cameras (not just signs) were operating. Also, differences between observed types (in H2) were broadly consistent with those found in other surveys, and with the differences between self-report types. Thus it seemed that Hampshire respondents reacted to signs in much the same ways as others did to real cameras, and the similarity allowed us to incorporate Hampshire survey data when building the pictures of the four types which have been presented in Chapter 3.

In the rest of this chapter the driver typology will be mentioned only when especially relevant to particular points.

b) Changes in self-report speeds

Analyses on Hampshire respondents' self-report speeds on the survey road showed that these did decrease significantly after the signs were installed, with very little recovery by a few months later. Before the erection of signs only two-fifths of drivers were generally keeping to the speed limit, while one in seven were driving at 38 mph or more. Two months after the signs were put up two-thirds were keeping to the limit and only one in 16 were doing ≥ 38 mph. Four months later the proportion keeping to the limit had fallen slightly, to three-fifths, but still those exceeding 37 mph were only 6%.

An alternative analysis was carried out on the H3R sample alone, examining for each driver any change in speed band from 'before signs' (reported retrospectively) to 'two months after' to 'six months after' (reported contemporaneously). These formed a number of patterns. The most frequent pattern was driving at ≤ 31 mph before signs, two months after and six months after: 35% of the total sample reported this pattern. The next most frequent was driving at ≥ 32 mph before signs, slowing down into a lower speed band two months after signs, and staying in this lower band (or moving into a lower one still) by six months after: 23% reported this pattern. Altogether the pattern analysis, taking the figures at face value, showed that by six months after the erection of signs 53% of drivers who before signs had scope for slowing down were now going more slowly, 90% of those who before signs had kept to the limit were still doing so, 28% of those with scope for slowing down had made no change, and in the whole sample only 5% had speeded up. So the erection of signs was apparently followed by a significant overall reduction in speed, and most of the effect lasted at least six months.

Further analyses showed that it was mainly some of the understaters (see Chapter 2, section 3) who tended to speed up again after an initial reduction, thus producing the slight overall (non-significant) increase in speed between two and six months. The analyses controlling for understating suggested that the overall reduction in speed after signs may have been less than the combined figures showed, but altogether the balance of the evidence implied that there was a real reduction at two months and that much of it was being maintained four months later.

c) Self-report changes in speed, and reasons

Another way of enquiring whether speeds were creeping up again was to ask the H3R drivers directly whether they had changed their usual speeds in the four months since they had answered the H2 questionnaire. Forty percent said they were now driving more slowly, 58% said they were driving no differently, and only 2% said they were driving faster. Some people's answers were inconsistent with the changes in their self-report speed, and this is discussed in Chapter 2, section 3. But the main point is that very few reported increasing their speeds.

Some of the reasons they gave (by endorsing any they wished from an offered list) for changing, or not changing, were interesting³. Among drivers who said they had slowed down, three-quarters said 'There may be a bigger risk of being caught', three-fifths said 'There may be more cameras than I thought', and half said 'I've seen more camera signs near this road', although in fact no more had been erected on the survey road. This suggests that for a substantial number of the H3R drivers the effects of the signs, far from diminishing over time, had actually increased. By contrast, 37% of the drivers who said they had not changed their speed endorsed as one of their reasons 'I don't think there has been any change in the number of camera signs'. It is noteworthy here how perceptions of change or no change in signing accorded with speed behaviour.

Among the 13 drivers who indicated that they were now driving faster several endorsed reasons suggesting that the effect of camera signs was wearing off: 'There may be a lower risk of being caught than I thought', 'I haven't seen any cameras', 'I don't take as much notice of the camera signs as I used to', and 'I haven't been caught for speeding yet'. But again, the main point is that these drivers were only a tiny number.

d) Changes in self-report driver type

A third approach using the H3R sample was to compare their self-report driver type with what it had been in H2, i.e. to see whether respondents' description of their driving style changed between the two and six months points. If the effect of the signs was wearing off, one might expect the following: (a) conformers to remain conformers; (b) some deterred to remain deterred, as cautious drivers, but others to become defiers,

or perhaps manipulators if they still thought there might be active cameras somewhere; (c) some manipulators to remain so, but others to become defiers; (d) defiers to remain defiers.

This analysis revealed very little evidence of the changes to be expected if effects were wearing off, though nearly two-fifths of respondents answered the 6-option question on driver type inconsistently between the two surveys and this is discussed in Chapter 3, section 7. But if we combine conformers with deterred, as people who did observe the speed limit after the signs were erected, 87% said in both surveys that they did so, while among the other 13% very few showed evidence of the signs wearing off. So again, from considering self-report driver types it seemed that the overall reduction in speed was maintained.

In sum, whether we examined speeds grouped into three bands, or changes in speed, or changes in driver type, the self-report data strongly indicated that speeds fell markedly after signs were erected and that these reductions largely endured to the six month point among understaters and non-understaters alike.

3. Perceptions, Beliefs and Attitudes towards Cameras

Drivers' perceptions and beliefs about speed cameras were an important component throughout this research, and these were measured mainly by similar sets of questions in each survey enabling comparisons to be made and changes assessed. The questions focused on perceptions of risk and the likely consequences of being caught, and all are considered in some depth in Chapter 8. A particular interest in the Hampshire surveys was to examine whether drivers' perceptions, and any changes over time, were similar to those found elsewhere, given that in Hampshire only signs had been erected.

It was found that the installation of camera signs resulted in a bigger majority of respondents thinking they would be caught (if they drove regularly on the survey road at more than 45 mph), and the majority holding favourable attitudes towards cameras also increased. Otherwise there was very little change. As with self-report speeds, there was practically no indication that the effect of signs wore off with time. Moreover, the Hampshire respondents' perceptions, attitudes and beliefs regarding cameras were broadly similar to those of respondents in other surveys where actual cameras were operating (see Chapter 8). One would expect the views of many to be formed partly by their experience of cameras elsewhere, not just by signs in Hampshire, but there was no evidence in the Hampshire results that erecting signs without cameras diminished drivers' responsiveness to cameras generally in either perceptual or behavioural terms.

4. Behaviour and Perception of Risk on Other Roads

A key question in our research was whether any behavioural or perceptual changes that occurred in relation to the survey roads generalised to other roads without cameras or signing. This is of interest since cameras are only appropriate for use in some places, and any positive 'halo' effects beyond the targeted roads are desirable. In Hampshire, we wished to know whether the effects of warning signs alone would spread to other roads without cameras or signs.

H2 drivers were asked whether, since the erection of signs on the survey road, they had changed their speeds on other roads where there were no camera signs, and H3R drivers were asked a similar question about change during the two to six months period. In both surveys around 20% said they had reduced their speed on unsigned roads (and fewer than 4% had speeded up), but those who had slowed down on the survey road were much more likely than others to slow elsewhere too. Thus it seemed that for a substantial proportion of drivers their behavioural response to signs had generalised to unsigned roads, and very little of the effect had worn off by six months later.

The H3R survey asked drivers an additional question: whether since completing the H2 questionnaire they thought the risk of being caught for speeding had changed on other main roads in Hampshire. Only 2% thought the risk was less, and nearly one-third thought it was greater which is especially interesting since nothing had changed during this period. So here again there was practically no evidence that the effect of signs was wearing off; rather, for about a third of H3R drivers it seemed to have increased.

These findings suggest that perception of an increased risk of detection was more likely than behaviour change: around 1 in 3 respondents believed there was a greater likelihood of being caught on other Hampshire roads while only around 1 in 5 reported slowing down on other roads.

5. Awareness of the Distinction between Signs and Cameras

Some results suggested that at least a small minority of motorists were alert to the distinction between camera signs and camera boxes. In H2 and H3R the six-option question defining the four driver types used slightly different wording from that shown in section 2 of Chapter 3, especially in relation to defiers. Option (iv) referred to camera signs, not boxes, and option (v) allowed defiers to say 'I drive well above the speed limit [on the survey road] because I have not seen a camera box'. Five per cent of H2 respondents ticked option (v) implying that if they had seen boxes rather than merely signs they might have behaved differently (perhaps as manipulators or even deterred).

We should not infer too much from these small numbers. But the notion that a few drivers were alert to the distinction receives support from some of the reasons given by the very few who said they had speeded up between H2 and H3R (see section 2c), especially those who said 'I haven't seen any cameras'. In fact one respondent wrote on his H2 questionnaire, 'it's not the signs that slow you down it's the cameras themselves because some roads have signs and no cameras'.

6. Comments on the Effects of Signing

The results of the three Hampshire surveys (derived from self-report data) are encouraging: overall there was apparently a substantial reduction in speed and most of it lasted at least six months. Some of it spread to non-signed roads, though the presence of signs on other Hampshire roads (see below) may have contributed to the effect. Despite some drivers' tendency to understate their speeds, the weight of the evidence implied that a real and lasting reduction in speed did occur after camera signs were erected in Hampshire. The police and local authorities can thus feel encouraged that signs alone, which of course are far cheaper than actual cameras, can induce a substantial proportion of drivers to moderate their speeds.

Yet it does seem surprising that signing alone appears to have induced this effect, especially given Winnett's research (1995) that in 1993 in Devon and Cornwall signing by itself made no appreciable difference to drivers' observed speeds. It could be, therefore, that on the Hampshire survey road (Southampton Road in Eastleigh) other extrinsic factors besides the signing there may have contributed to the noted moderation in speeds, and we now suggest several.

(1) Although in drafting the questionnaires we had tried to use words neither confirming nor denying the existence of cameras on Southampton Road, some respondents may have been encouraged to believe cameras were operating there. Indeed, the receipt of our letters advising drivers of the research may have had this effect on some, as was suggested in other areas by interview evidence.

(2) During the two years between Winnett's research in Devon and Cornwall and ours in Hampshire, much media attention focused on speeding and more police forces installed cameras. This climate may have heightened Hampshire drivers' awareness of the topic and enhanced the threat posed by the new signs in Eastleigh.

(3) Other evidence (see Chapter 6) suggested that some drivers' speed inadvertently rose through lack of concentration. The Hampshire signs may simply have prompted some unintentional speeders to check their speedometers and slow down, without necessarily believing cameras were present.

(4) While some of the above points may partly explain the drop in speed of the H2 and H3R respondents, there is another to consider. Although we had originally sought an area without cameras and signing in which to conduct this quasi-experiment, in the event this was not completely achieved. While at the time of the surveys there were no operational speed cameras in Hampshire, around 18 'traffic enforcement cameras' signs and 30 repeater signs showing a camera icon in nearby Southampton had already been erected, together with 12 aerial traffic flow monitoring cameras and various red light camera housings. The nearest operational red light camera to our site on Southampton Road was about one mile away. Since members of

the driving public might be unable to distinguish between red light, aerial traffic monitoring and speed cameras, it is likely that those respondents familiar with the area would have taken the two 'speed enforcement cameras' signs and three repeater signs erected on Southampton Road seriously. Thus in view of the proximity of 'real' cameras, some respondents may well have believed speed cameras were around in Eastleigh even if they were unseen.

This relates to Shinar and McKnight's (1985) conclusions that both objective and subjective risk are required for successful deterrence since if the objective risk is viewed as absent then there can be no subjective risk. Because in the H2 and H3R surveys the latter was high, this suggests that at least some objective risk of the camera signs was perceived. Respondents may have believed mobile cameras were operating or that fixed-site ones were functioning but were not visible, or they may have believed in the imminent arrival of speed cameras. In other words, our results indicated that camera warning signs acted as an impressive moderator of speed in Eastleigh, but the particular circumstances of the site should be borne in mind. If there had been no evidence of camera activity in the vicinity, the perceived threat of detection represented by speed camera signs might have been less potent, and this might have resulted in fewer reports of reduced speed.

3. Driving a different vehicle could be an explanation for a general change in speed but such a reason was not offered to those who had slowed down. However, the statement 'I'm driving a better vehicle' was in the list offered to those driving faster (in each of the repeat surveys), but only one of the 13 available respondents in H3R (and few in the other surveys) endorsed this as a reason. Confidence in the accuracy of one's speedometer might also exert a subtle influence on speed choice, and both this and the effect of driving a different vehicle might be included in future work on speed choice.

Chapter Five: The Effects of Publicity Campaigns against Speeding

1. Introduction

In order to change habitual behaviour, such as a tendency to drive too fast for the circumstances, drivers must be made aware of information likely to influence their habits. It is hoped that through such information either attitude change will occur to modify the targeted behaviour, or the threat of enforcement will be sufficient to alter the behaviour without a corresponding shift in attitude (see Rothengatter 1990; Shinar and McKnight 1985). Publicity campaigns are obviously a useful tool in the quest to moderate inappropriate speeds, by changing either attitudes, behaviour or both.

Campaign messages designed to alter attitudes may focus on the dangers of speed, such as the types of injuries pedestrians are likely to suffer when hit at different speeds (e.g. the DOT 1991-1993 'Don't look now' campaign), or they may use more emotive tactics aimed at pricking the driver's conscience (e.g. the DOT campaign in September 1995 'Kill your speed not a child' which broadcast excuses made by drivers for speeding that might end in child fatalities). Campaigns aimed primarily at altering behaviour tend to advise the public of initiatives or changes in police enforcement. A study which assessed both types of message was carried out by Rooijers (1987, reported in Rothengatter 1995) who compared the potency of a poster campaign and a leaflet campaign which conveyed either a behavioural or an attitudinal message. This experiment showed that behavioural messages produced larger speed reductions than attitudinal ones whether posters or leaflets were used. However, other studies have confirmed that behavioural message campaigns are more effective when combined with active police enforcement than when used alone (e.g. Riedel et al 1988).

Few studies have examined the effects of publicity in regard to enforcement by speed camera. Bourne and Cook (1993) in Victoria, Australia reported that marked reductions in speed, sustained over a period of several years, were achieved by a combination of publicity campaigns advising drivers of speed camera enforcement, the introduction of many mobile speed cameras and red light cameras, more frequent posting of speed limits and random breath testing. Yet in such action research it was not possible to separate out the effects of publicity from other components of the campaign. In the UK too, speed cameras are usually installed with concomitant publicity removing the opportunity to measure the effect of each independently, although Winnett (1995) noted that there was a substantial fall in the 85th percentile speed when advance publicity was mounted three months before the introduction of speed cameras in West London in October 1992.

Our research was concerned mainly to investigate whether any speed reduction resulting from the introduction of cameras could be enhanced by the launch of publicity campaigns having a behavioural message linked with the threat of more effective enforcement by speed camera. This had been one of the matters raised by police forces at the start of our study when asked what they would like to know in regard to best deployment of cameras. As outlined in Chapter 2, two campaigns were mounted as part of the research. One in Northumbria was designed to suggest that mobile speed cameras had been deployed in addition to the fixed-site ones, thus making their combined effect more powerful; the other in West Midlands was intended to suggest that the threshold speed which would activate local cameras had been lowered, thus increasing the likelihood of being caught. The salience of the West Midland campaign is linked to one of the overall goals of speed cameras which is to achieve a gradual reduction of drivers' speeds through the progressive lowering of the threshold.

Because national campaigns and other local ones ran independently during the time of the research, drivers in all but two surveys (S1 and TV) were asked what media messages they recalled. One question concerning local publicity had obvious relevance to our analysis of the two local campaigns, but both it and one on national publicity were of general interest. The questions were as follows:

The fresh surveys asked drivers:

There is often national or local publicity to announce the start of campaigns designed to reduce drivers' speeds.

(a) Have you heard recently of any new national initiative(s) with this aim?

Yes - No - Maybe/not sure

If you answered yes or maybe/not sure, please say what you can remember about any national publicity (even if you have only a vague idea).

(b) Have you heard recently of any new local initiative(s) with this aim in your area?

Yes - No - Maybe/not sure

If you answered yes or maybe/not sure, please say what you can remember about any local publicity (even if you have only a vague idea).

The repeat surveys asked the same question, except that 'recently' was altered to 'since completing the last questionnaire'. It may be noted that the wording of the question could cover both a publicity campaign per se, warning drivers of the dangers of speeding, and publicity announcing an initiative of physical action designed to reduce speeding.

2. National Campaigns

From 9 May 1995, for two weeks, the DOT mounted a hard-hitting national television campaign about the danger speeding motorists posed to the life of a young girl. It showed the child going about her normal activities while her voice, against a background of evocative music, repeated the message to drivers 'You're going to kill me...unless you kill your speed.' From 2 September 1995, for three weeks, the DOT ran a national radio advertising campaign using the same theme and six different children's voices. This was supported by four days of national press advertising as well as regional press features. In May 1996, for four weeks, the DOT launched an emotive television publicity campaign showing home video footage of children who had been killed in road traffic accidents as a result of inappropriate speed.

a) Awareness of national publicity

Considering the timing of the three national campaigns in relation to the months in which the survey questionnaires were sent out, one could predict that the proportions of respondents saying they were aware of national publicity against speeding would be higher in some surveys than in others. In fact, across the ten surveys the proportions of 'yes' answers ranged from 12% to 36%; and as predicted it was highest (at least 31%) in the four surveys where the timing of the questionnaires coincided with, or closely followed, one of the DoT's national campaigns.

b) What did drivers actually remember?

A content analysis of responses in those four surveys showed that in three of them the DoT campaigns described above were clearly remembered by many. In particular, in N1, H1 and H2 of those who said what they remembered, between 49%-55% referred to 'you are going to kill me', 'kill your speed not a child' or something very similar. So around half the drivers in these three surveys who remembered any message had been impressed by the national one that a speeding motorist could kill a young girl.

However, for S2 the picture was different. Here, the message best remembered was about variable speed limits on the M25: 44% mentioned this, while only 32% mentioned 'kill your speed not a child' or something similar. This result implies that many Surrey drivers (who would have been regular users of the M25) took more notice of publicity about action which could directly affect their everyday driving than of publicity intended to remind them that by speeding they might possibly kill other people. These figures lend some support to Rooijers' finding (1987) that publicity comprising a behavioural message was more effective in reducing speed than an attitudinal one.

c) Which drivers became aware of national publicity?

Interestingly, there was very little evidence in the ten surveys that awareness of national publicity against speeding, whatever people remembered of it, was related to the background characteristics of drivers noted

in Chapter 2. Gender, age, and most others made no difference. Variables describing drivers' reaction to cameras, attitudes to cameras, and beliefs about speed and accidents also made little difference in most surveys. In none of the ten was driver type related to awareness of national publicity. In S4R, WM1, H1 (and H3R to a non-significant extent: $P = .07$), people aware of publicity were more inclined than others to have favourable attitudes to cameras, but the analyses did not show whether the publicity influenced their attitudes or whether people with already favourable attitudes were more likely to notice the publicity. So altogether, the surveys turned up little evidence of any connection between drivers' general beliefs and behaviour and their awareness of national publicity campaigns against speeding.

3. Local Campaigns: General

The surveys in Northumbria and the West Midlands were specifically designed to test the effects of a local campaign, and we report on them below. There were probably other local campaigns that we did not know about (except for the regional media support of the national campaign in September 1995). The proportion of 'yes' answers to the question about local publicity ranged across the ten surveys from 6% to 22%, and respondents mentioned all kinds of things, frequently road humps and other traffic calming measures. As with national campaigns, there was very little evidence that awareness of local campaigns was higher among drivers with particular characteristics. In regard to driving behaviour, attitudes to cameras, and beliefs linking speed and accidents, very few relationships with awareness of local publicity were found. There was no consistent association with driver type.

Much more important was the whole body of results in Northumbria and the West Midlands to which we now turn, and it is convenient to consider both pairs of surveys together.

4. The Local Campaigns In Northumbria and West Midlands

a) Contents of the campaigns

Northumbria

The Northumbria campaign took place early in July 1995. Television stations broadcasting in Northumbria (Tyne Tees and Border TV), together with most of the local newspapers, announced that, from then till at least the end of the summer, the police would, in addition to using their fixed cameras, be making frequent random speed checks throughout the county, especially on the A69 (of which the survey road was a part), with cameras which could be operated from roadside tripods or the back of a car and moved about at will. Four hundred posters with the same message were distributed to service stations and other public buildings, and announcements were regularly included by AA Roadwatch in their bulletins to motorists.

A potentially complicating factor was the national campaigns in May and September. The N1 sample were questioned in May and June, and the N2R sample in August and September. Although the N2R people were asked about new local initiatives since they had completed the N1 questionnaire, some of them might still have been thinking of the national campaign in May, and those replying in September or later might have been most conscious of the September national campaign. Apart from these matters, however, the Northumbria local campaign was strong and well focused.

West Midlands

By contrast, the message of the West Midlands campaign was relatively obscure and weak. The intention (i.e. the planned experimental manipulation) had been to suggest to drivers, without actually saying so, that the trigger speed of cameras in Solihull (including the Monkspath Hall Road of which the survey road was part) had been reduced, thus giving less latitude for exceeding the speed limit. There was no plan actually to lower the trigger speed (which remained constant for the duration of the WM2R survey), nor was there at the time of conducting the survey a wish to confirm to drivers that trigger speeds existed. A few years later it has become quite common for the media to report the raising or lowering of threshold speeds by police (see Chapter 1). But in early 1995 the idea of actually lowering the trigger speed for the purpose of the study was rejected mainly for ethical and practical reasons. Operationalising the concept of threshold speed reduction through the construction of a publicity campaign became the preferred option.

The publicity consisted of a single interview with a senior police officer, broadcast by 12 local radio stations on 26 September 1995. As it turned out, the intended central message (the trigger speed manipulation) was rather unclear. Moreover, in discussing the wish that drivers would take note of the publicity (which said that those who ignored the speed limits and signs would very likely be caught and prosecuted), unplanned reference was made to the possibility of using 'portable cameras' locally between fixed-site ones. Coincidentally, on the following day the same police officer was interviewed on local television and radio in conjunction with the national DOT campaign, apparently giving the message that 'speed kills' and that local speed cameras had cut speeds and accidents, but not making reference to lower trigger speeds locally.

The upshot of this was that the intended message may have been submerged by the threatened introduction of portable cameras and/or by the local television and radio interviews next day (and the subsequent newspaper report) related to the national campaign.

b) Awareness of local publicity

To the question asking if they had heard of a new local initiative, 83% of the N2R sample answered 'no', 12% 'yes', and 5% 'maybe/not sure'. In WM2R the answers were very similar: 81% 'no', 14% 'yes', and 5% 'maybe/not sure'. Considering the strength of the Northumbria campaign it is surprising that the proportion of 'yes' answers among N2R drivers was so low (indeed slightly lower than in WM2R).

When asked about the content of the message, the majority of N2R respondents who said what they remembered referred in some way to the Northumbria Police campaign. In particular, twenty-nine percent mentioned mobile speed cameras, especially on the A69, 17% mentioned police speed checks, and 12% mentioned cameras without specifying mobile ones, though a few of these references were to localities outside Northumbria.

In WM2R, of respondents who said what they remembered, 10% referred to cameras or speed checks in Solihull by name. Sixteen percent mentioned portable cameras (e.g. 'radar guns used by police'), and 17% mentioned cameras in other ways. Twenty percent had noticed media messages but did not say what they were, though it was interesting that the majority of these people referred to posters on buses. Thus it seemed that many of the WM2R respondents who replied positively to the question about a local campaign were aware that the police were doing something with cameras, and the use of portable cameras had been clearly remembered by one in six.

Of the 50 West Midlands and Northumbria respondents interviewed (see Chapter 2, section 2), only three (6%) could clearly recall any recent national publicity about speed reduction although nine (18%) were vaguely aware of some. These proportions are lower than found in the WM2R and N2R surveys and may reflect the further lapse of time between the launch of the previous national campaign and the attempt at recall. Despite over half the interviewees in both areas saying they were frequently exposed to local media, few could remember specific details of the local initiatives. So drivers' memory for the existence of local or national publicity about speed reduction in general seemed greater than their ability to recall clear details of specific local campaigns linked with cameras.

c) Which drivers became aware of the local campaign?

During analysis of the Northumbria and West Midlands data we looked to see whether respondents' answers in N2R or WM2R, about awareness of local publicity since the previous questionnaire, were related to anything they had said about themselves or their driving in N1 or WM1, before the local campaign began. Those variables described their personal characteristics, driving history and habits, and reactions to speed cameras.

It was found in both Northumbria and West Midlands that respondents who became aware of a local campaign were barely distinguishable from those who did not. In Northumbria such respondents were more likely than others to be already familiar with other camera-signed roads, to know of other drivers caught by camera, to believe that if they triggered the camera the police would take action against them, and to have endorsement points already on their licence. A possible interpretation of these findings is that the factors just mentioned, taken together, indicate a heightened consciousness of the topic of speed cameras which could tend to sensitise drivers to the local campaign. In West Midlands, however, the only one of the factors just

mentioned which was related to awareness of a local campaign was having endorsement points already on one's licence. This could possibly be explained in the same way, but the other evidence for such an interpretation was absent.

Both Northumbria and West Midlands data revealed one other factor related to awareness of a local campaign: awareness of previous campaigns. Moreover, in both areas respondents aware of earlier local publicity were more likely to say they were aware of new local publicity, independently of whether they had points on their licence (though not all the links reached statistical significance because of small frequencies). These results suggest that publicity campaigns can reinforce one another in raising drivers' awareness. But the matter is not necessarily straightforward. When we consider (a) that the timing of the national campaigns overlapped the message from the local ones; (b) that the content analyses of responses in four surveys suggested that some people were not distinguishing between national and local publicity (see section 2b); (c) that some respondents were apparently remembering local publicity from other areas; (d) the lack of clarity of the West Midlands local message; (e) the variety of speed-related messages which respondents recalled: considering all these things, one could easily say that some drivers were confused when answering our questions about publicity campaigns and could not recall accurately what they had heard when. But in a sense this does not matter: the important point is that they remembered some message about the undesirability of excessive speed. And, regardless of their other characteristics, the few people who remembered earlier messages were more likely to remember later ones, which suggests that persistent efforts to raise drivers' consciousness about speed may eventually bear fruit.

But now, before going further, we must look at whether the Northumbria and West Midlands drivers behaved any differently after the local campaign from the way they had behaved before, or whether their perceptions and beliefs about cameras changed. And for the time being we will put to one side the question of whether or not they were actually aware of local publicity.

d) Changes in driving behaviour following the local campaign

As in other repeat surveys drivers were asked to report on their speed behaviour in three ways. In one question they were asked if they were driving any differently on the survey road and given five response options from 'a lot slower' through to 'a lot faster'; in the second they were asked to indicate their general speed in free-flow traffic on the survey road (by endorsing one of six speed categories - see Chapter 2, section 3a); and in the third they were similarly asked their normal speed when passing places where they thought there was a camera box.

Analysis of changes in speed categories, as between the fresh and repeat surveys, showed in Northumbria a small net reduction in speed both generally and at the camera, while in West Midlands one occurred only at the camera. However, after the local campaign 36% of respondents in N2R and 39% in WM2R said that they now usually drove more slowly on the survey road, while all but a handful of the rest said their usual speed there had not changed. (It should be noted that the wording of the questionnaires did not invite drivers to make any link between publicity campaigns and their driving or other topics. The second questionnaire simply asked them to report on matters 'since you completed the last questionnaire'. In both questionnaires publicity was mentioned only near the end, and then not in connection with anything else.) A comparison between these answers and the difference in respondents' self-report speed categories between the first and second questionnaires suggested that people may not have slowed down as much as they said they had, because of the tendency to understate speeds (see Chapter 2, section 3). But clearly more than a third in both Northumbria and West Midlands believed (or told researchers) that they were now driving more slowly.⁴

In both areas drivers who before the campaign had been going faster than others were more likely to say they had slowed; of course they had more scope to do so, but some of the slower drivers reduced their speed as well. People who in the first survey had appeared as deterred or manipulators (and in Northumbria, as defiers) were more likely than conformers to say they had slowed down. In both areas a large proportion who said they had slowed on the survey road also said they were now driving more slowly on other roads without cameras. (The proportion varied with the type of road, and was 38%-44% in Northumbria and 51%-71% in West Midlands.) So apparently there was a strong tendency to generalise the change in speed behaviour.

It should be noted, however, that in both areas scope for reducing speed following the local campaign was rather limited, because many drivers had (according to them) already slowed down on the survey road in response to the installation of the cameras. In Northumbria, 53% of the N2R sample had driven on the survey road generally at not more than 31 mph before the cameras arrived, and after they arrived (but before the publicity campaign) that proportion rose to 79%, so that only one in five were still exceeding the limit. In West Midlands the picture was fairly similar: before the cameras arrived 18% of the WM2R sample had kept to speeds of 31 mph or less on the survey road generally, but after the cameras (and before the local campaign) 65% said they did so. So in both areas it seemed that the installation of the cameras had induced a big reduction in speed before the local publicity campaign took place.

e) Changes in perceptions and beliefs following the local campaign

Following the local campaign drivers in both areas were inclined to perceive a general increase in the risk of being caught for speeding. In Northumbria 34% thought the risk of being caught on other stretches of the A69 was now greater (and only 3% thought it was less), and they gave very similar responses about the risk on other main roads in the county. People who had slowed on the survey road were most likely to perceive a general increase in risk. In West Midlands all these effects occurred but not so strongly as in Northumbria. In Northumbria also, N2R respondents as a whole thought they were more likely to be caught if they regularly exceeded 45 mph on the survey road, but in West Midlands there was no overall change. However in WM2R respondents tended to believe that if they were caught the penalty would be more severe; a similar tendency in Northumbria was not significant.

So we see that in both Northumbria and West Midlands a substantial proportion of drivers said after the local campaign that they had slowed down on the survey road and elsewhere, and they believed the general risk of being caught for speeding had increased. But now we recall that in both areas fewer than one in five people were actually aware of local publicity. So the question arises: were the drivers who were aware of local publicity more likely than others to change? That is to say, what evidence was there that the publicity helped to cause the changes?

f) Did local publicity help to cause the changes?

In both N2R and WM2R respondents aware of local publicity were more likely than others to believe the risk of being caught for speeding had increased. In N2R the proportion perceiving a greater risk on other parts of the A69 was 54% for people aware of publicity, but only 31% for those not aware, while for the risk on other main roads in the county the corresponding proportions were 56% v. 32%. These figures are evidence of a direct effect of the Northumbria Police campaign. In WM2R a similar difference occurred: 31% of respondents aware of publicity, compared with 13% of those not aware, thought the risk on other parts of the MHR had grown, and for other main roads the figures were 42% v. 23%. So in West Midlands, like Northumbria, local publicity seemed to have had some direct effect on drivers' perceptions of risk on main roads generally. But changes in speed on the survey road, other main roads, or local side roads, were not related to awareness of publicity: drivers who said they slowed down were no more likely than others to be aware of publicity.

The only other factors related to awareness of publicity occurred among the reasons given for slowing down by drivers who said they had done so. In N2R, when drivers who had reduced their speed were offered a list of eight possible reasons (any of which they could endorse as applying to them), people aware of publicity were more likely than others to endorse 'There may be more cameras than I thought' and 'I've heard about new ways to catch speeding drivers'. These two reasons had been included in the list to test awareness of the Northumbria Police campaign, and the greater proportion of endorsements among drivers who said they were aware of publicity was evidence that the campaign message had been noticed.

In West Midlands the result was rather different. Among the eight reasons offered to WM2R drivers who slowed down, the reason 'I've heard about changes in the way cameras are being used' had been included to test awareness of the intended message of the publicity (see section 4a). But this reason did not attract significantly more endorsements from drivers who said they were aware of local publicity than from others. And in both areas, whatever respondents who reduced their speed said about their reasons for doing so, the

fact remained that similar proportions of people slowed down who were aware of local publicity as among those not aware.

Finally, in West Midlands the intended focus of the local campaign had been drivers' perception of the camera trigger speed. But in WM2R respondents who said they were aware of local publicity did not differ from others in respect of their estimate of the trigger speed, nor in whether that estimate was lower, the same, or higher than the one they had given in WM1. So here there was no evidence that beliefs about the trigger speed were affected by the publicity campaign.⁵

5. Comments on the Effects of Local Publicity

In summary, it appeared that the introduction of speed cameras in both areas had a substantial effect on reducing speeds among those with latitude to do so before the local publicity campaigns were launched. Yet despite the limited scope for a further drop in speed, up to two-fifths of respondents in both repeat surveys said they had slowed down since the earlier survey (although this figure was higher than that indicated by their responses to the speed category measure). But slowing down was not linked with awareness of local publicity. Awareness of earlier publicity and having penalty points on one's licence were the only characteristics which were found in both areas to distinguish between drivers aware of current local publicity and those not aware; this suggests that both general and self-interest may be salient in the recall of publicity messages. There was some slight evidence that the stronger and longer initiative in Northumbria had more effect (in lowering speeds on the survey road where actually there was less scope for drivers to slow down); this result perhaps corresponds with the finding that in that area more people were aware of the specific message of the campaign.

Together, the results suggest that these local publicity campaigns may have helped reinforce perceptions of the potency of cameras and of the dangers of speed, even if at a less than conscious level for many respondents - although perceptions may have been more conscious among those at greater risk of losing their licence. Yet whether the campaigns contributed directly to speed reduction is more difficult to answer. It is certain that the perceived risk posed by the introduction of speed cameras on the survey roads had the greater impact on speed choice (see Chapter 9 for comparisons). But it is likely that the publicity campaigns helped, at least indirectly, to maintain or slightly augment the reported reductions: some evidence for this will be given by comparisons in Chapter 9 which suggest that, especially in Northumbria, drivers who initially slowed down in response to the introduction of cameras were persuaded by the publicity campaign to continue at their lower speed or even to decrease it further. Yet in Surrey, as we shall see in Chapter 7, speed reductions were (according to respondents) maintained and increased over several months without any local publicity. This could indicate that the general media climate, in which many issues concerned with driving and traffic law enforcement currently receive much exposure nationally and locally, is sensitising the driving public to the dangers of speed, and hopefully encouraging attitude change as well. In this climate local publicity campaigns are part of the overall effort, and are therefore likely to play an important role.

4. Changes in behaviour among the interviewees who said they were aware of the local campaigns are not reported here because of the small number (five). However, there were no strong patterns.

5. None of the three interviewees who said they were aware of a local campaign in West Midlands believed the trigger speed had changed.

Chapter Six: The Effects of Prosecution

1. Introduction

a) The prosecution process

Under section 23 of the Road Traffic Act 1991, devices other than radar may now be used in the prosecution of traffic offences provided they satisfy certain conditions and have the approval of the Secretary of State. This provides for the use of unattended automated cameras, and since 1992 when the Act was implemented, speeding and traffic light offences detected by camera have grown substantially; for example, in 1995 automatic cameras provided evidence for a total of 206,930, or 30% of, speeding offences officially dealt with by police (Table D, Motoring Offence Statistics, Home Office 1996). Two photographs are taken to verify each offence where the vehicle is travelling above the prosecution threshold ('trigger speed'), and any doubtful cases are not taken further. In all remaining cases, a notice of intended prosecution must be sent to the registered keeper of the vehicle within 14 days of the offence occurring in order to identify the driver at the time of detection. In the event that the registered keeper did not commit that offence, which is particularly relevant where the keeper is a hire or leasing company, it is the keeper's responsibility to contact the driver who did. Non-disclosure may result in the registered keeper being prosecuted in lieu (section 21, Road Traffic Act 1991).

Depending on the offence committed, the detected driver may then be sent a warning letter, or may be summoned to appear in a magistrates' court, or more usually may be sent a conditional offer of a fixed penalty, currently set at £40. If the offer is accepted, payment together with the licence is sent to the fixed penalty clerk and the licence is endorsed in the usual way. A conditional offer is so-called since even if it is accepted by the alleged offender, it may subsequently transpire that that person is liable for disqualification, for example under the 'totting' rules of section 35 of the 1988 Road Traffic Offenders Act, in which event the case must go to court and the prosecution process is set in motion.

b) Research on prosecution of driving offences

Although the criminological literature is replete with studies exploring the effects of different kinds of sentences on different types of offender (e.g. Brody 1976; McGuire 1995), surprisingly little attention has been given in Britain to the effects of different penalties imposed on traffic offenders. There are some notable exceptions which have all focused on disqualification (e.g. Willett 1973; Kriefman 1975; Mirrlees-Black 1993), but to our knowledge no study has systematically explored the impact of penalty points or fines on subsequent driver behaviour. However, De Waard and Rooijers (1994) found in an experimental study that drivers who were fined for speeding reported lower average speeds than a group of speeding drivers who were not fined, although neither group changed their positive attitudes to speeding following apprehension. This supports the view that behaviour may be modified as a result of being caught and prosecuted, but underlying attitudes towards the behaviour may remain unchanged (see Chapter 5, section 1 and Rothengatter 1988).

The current study provided a limited opportunity to examine the effects on drivers of paying a fine for speeding, and to adduce some information on the effects of having penalty points on one's licence. The evidence for the latter comes from the six fresh surveys (all but TV): self-reported speeds could be compared by whether or not drivers had points, and drivers with points could be asked about the effect of them on their choice of speed. However, the bulk of the evidence on the effects of paying a fine comes from the Thames Valley survey, and this will be examined first.

2. The Thames Valley Sample and Its Characteristics

This sample was a special one comprising 594 drivers dealt with by the police, and these motorists had all driven at speeds above the prosecution threshold (the trigger speed) on the survey road and been photographed by the camera there. All were sent a notice of intention to prosecute with a conditional offer of a fixed penalty, i.e. they received a speeding ticket. (The fastest drivers were summoned to appear in court,

and not included in our sample.) The sample were all sent a survey questionnaire after they had paid the fine.

People in the TV sample were broadly like those in our other samples in most of their background characteristics, except for one noticeable difference: far fewer of them were familiar with the survey road. (Twenty-nine percent said they had used it only once or twice, and only 19% were regular drivers there compared with at least 37% in other samples.) But they were more likely than drivers in other surveys (except H3R) to have plenty of experience of cameras elsewhere. Also the TV sample had a higher average speeding score than other samples, which is hardly surprising.

3. Why Did Drivers Think They Had Been Caught?

a) Unintentional and intentional speeding

The questionnaire offered drivers a list of six statements and asked them to indicate which one came closest to describing the main reason for their being caught speeding on this occasion. By far the most frequent answer, given by 54%, was 'I didn't realise I was exceeding the speed limit'. Next in frequency, given by 22%, was 'I didn't realise there were cameras on that road'. Ten percent said 'I forgot there was a camera box at that site'. Seven percent said 'I didn't know there was a camera box at that site' and another 7% said 'I didn't believe I was going fast enough to be caught'. (Nobody endorsed the other statement offered, which was 'I wasn't too bothered about being caught'.)

In looking at these answers it is relevant to consider some features of the survey road. This was the B4493 at Station Road in Didcot, Oxon, where the speed limit was 30 mph and a single camera was operating. One mile further back along the B4493 the limit was 60 mph, so that drivers approached the survey site from a faster stretch of road. There was a 30 mph roundel sign at the interface between the 60 mph and 30 mph limits. No speed camera warning signs had been erected on the B4493. (This was in line with the policy of Thames Valley Police, which was to distribute camera warning signs along main A roads, but not necessarily where there were cameras, in order to promote general deterrence and discourage manipulators.)

Over a quarter of the sample said they were unaware of cameras either at the site or on that road. This would be congruent with the police policy of warning drivers of cameras but not of any specific location for them. However, respondents' main reason for being caught - failing to realise they were exceeding the speed limit - could, with the luxury of hindsight, be interpreted in two ways. The intended meaning was to express the driver's inadvertence at exceeding the known speed limit of 30 mph, and indeed four of the 31 TV respondents who were later interviewed confirmed this explanation. Yet another five interviewees had genuinely believed before they were prosecuted that the speed limit was higher than 30 mph on the survey road (most said 40 mph) and this reason would also apply to them. One implication is that we cannot say for those who endorsed the 'inadvertence' reason in the larger survey sample what proportion supported each interpretation.

Despite this, however, inadvertent speeding - for whichever reason - may be related indirectly to the law which states that roundel signs signalling a reduction to 30 mph can be erected only at the boundary between two limits and not within any 30 mph area itself. (DOT Circular 1093: Traffic Signs, Regulations and General Directions 1994.) Thus should drivers miss noticing such a boundary sign, or have an inaccurate visual conception of 200 yards (the distance between lamp posts in built-up 30 mph areas), they may genuinely believe they are complying with the law, until otherwise informed. As illustration, one interviewee said he had not seen any signs, and felt that he was complying when caught because it was not a built-up area and he therefore saw no need to slow down to 30 mph. He and several other TV interviewees were angry at what they perceived as inadequate 30 mph signing.

Drivers who used the survey road not more than once a week were more likely than others to say they had been unaware there were cameras on it, while the more frequent users were more likely than others to say they had forgotten there was a camera. (Other reasons, including inadvertent speeding, were not related to the frequency of using that road, thus even those familiar with the road and camera site could be caught through inattention.) Altogether 39% of the sample chose to say they had been caught because they had been unaware of or had forgotten about cameras, not because they were unaware of the speed limit or of their own

speed. This suggests that for a substantial proportion their choice of speed well above the speed limit was deliberate, and this is relevant to the findings on driver type discussed below.

b) Driver type and reasons for being caught

TV respondents were asked how the cameras were affecting their speed on the survey road (by the same 6-option question as in other surveys - see Chapter 3, section 2) *since* they had been caught speeding. Thus the self-report driver typology refers only to their response to cameras after prosecution, and we do not know what they would have said if asked before then. (If classified from their observed behaviour on the occasion they were caught, all of course would have been defiers and this is expanded below.) Rare users of the survey road were not asked that question (and a few others about behaviour there), so the sample size was reduced for some findings.

Twenty-eight percent answered as conformers, endorsing the statement 'I keep close to or under the speed limit on Station Road because I usually did before the cameras arrived and still do'. Since all these people had been caught travelling at 41 mph or more (the threshold speed at that time) this seems rather puzzling, and once again two interpretations are possible. The first is that drivers' interpretation of 'keeping close to the limit' was rather liberal, especially given that this interpretation was maintained after prosecution showed that the police took a different view. Yet the majority of TV interviewees, including several 'conformers', indicated that driving between 35 mph and 40 mph even at the camera was seen as acceptable and 'more or less' as complying with the 30 mph limit. This means that before detection these people saw themselves as conformers (and some still did afterwards), while in our terms the faster members of this group would more likely have been classed as defiers and were on the occasion they were caught. This discussion also reflects earlier findings considered more fully in Chapter 3, section 6.

The second interpretation relates to the question put to respondents about driver type. All had been asked to endorse one of six statements that came *closest* to describing their response to cameras, and all statements focused on how drivers actually responded to cameras rather on how they intended to respond. Given this instruction, any genuine conformers who believed prior to detection that the speed limit was higher than 30 mph would quite likely have endorsed the statement suggesting that normally they complied with the limit - in the absence of a statement that normally they *intended* to comply with it. Fitting in with either interpretation, however, 72% of conformers, when asked their reason for being caught, said they had failed to realise they were exceeding the limit, and endorsement of this reason would be consistent with the self-image they wished to convey (in answering the driver-type question) as drivers who normally intended to observe it.

The bulk of the survey sample (61%) answered as deterred, saying that since being caught they kept near the limit on Station Road on account of the cameras. This suggests that the experience of prosecution had influenced their driving in the desired way (which was confirmed by the 14 deterred interviewees in the TV sample who said they had slowed to avoid similar consequences in future). On their reason for being caught the largest group, 47%, said (like the majority of conformers) that they had not realised they were over the limit. This could suggest that this group accepted the experience of being caught as a salutary reminder and perhaps they had always intended to comply; or like some of the conformers (and as confirmed by two deterred TV interviewees) they also may have believed before prosecution that the limit was higher.

Rather unexpectedly, only nine percent (34 people) answered as manipulators, and among them the commonest reason for being caught (given by 44%) was that they had forgotten about the camera box in Station Road. This is an entirely consistent response, and suggests that in the period before they were caught these drivers may have been successful manipulators. It may be that if the TV sample had been categorised from their behaviour on Station Road during the previous few months, with the camera in place but before they were caught, there might have been fewer deterred and more manipulators than the proportions which emerged from their survey answers. Certainly, the speed patterns of four of the deterred interviewees suggested that to a mild extent they had manipulated the cameras before detection: all said that on 30 mph roads they normally chose a speed of 45-50 mph, slowing to around 40 mph at a camera.

As the survey results stand, the finding that deterred drivers far outnumbered manipulators supports the policy of not necessarily posting warning signs in close proximity to cameras: it seems that among drivers

previously caught for speeding by camera such a strategy may encourage a general speed reduction on the targeted road and not just when passing a known camera site.

Not surprisingly, only six drivers (1.6%) answered as defiers, saying that they drove well above the limit on Station Road, but it is interesting that they said so even after being prosecuted. (These six cases were not included in most analyses by driver type because they were so few.) Two of these defiers, who agreed to be interviewed, gave slightly different explanations. One said he wouldn't be bothered until he had gathered nine penalty points (three short of disqualification) and slowed down a bit at cameras if he remembered but wasn't concerned otherwise. The other said there were so few cameras in boxes that he wasn't going to change yet and 'wouldn't be dictated to by anyone'. He said he would change to manipulating if the risk increased.

Twenty-five percent of the conformers, 45% of the deterred, and 74% of the manipulators gave reasons for being caught which referred to cameras, not to their own speed: they had not realised there were cameras on the B4493 or at the Station Road site, or they had forgotten about the camera there. Thus it seemed that for many drivers in the sample, even some who wanted to be seen as normally observing speed limits, it was the wish not to be caught by camera rather than a wish to keep to the speed limit that regulated their speed; which suggests that many including conformers had actually been speeding until the experience of prosecution induced them to slow down. This is borne out by the comparisons in the next section of respondents' speeds before and after prosecution.

4. Changes in Speed Behaviour after Prosecution

a) Usual speed on the survey road

Drivers were asked to indicate (by choosing one of six speed categories -see Chapter 2, section 3a) what their usual speed in free-flowing traffic in Station Road had been before they were caught, and what it was now. Taking their answers at face value, the data showed the dramatic effect of being caught. Before prosecution only 26% drove at 31 mph or below, whereas after prosecution this proportion rose to 87%.

Because so many people (54%) said they had not realised they were exceeding the speed limit, it was thought important to make comparisons between these 'inadvertent speeders' and the rest of the sample in regard to their self-report speeds. Among the inadvertent speeders only 34% said that before prosecution their usual speed in Station Road was 31 mph or less. Forty-three percent said it was 32-37 mph and 24% that it was 38 mph or more; on the face of it, these figures would support the idea that some drivers genuinely had not known before they were caught that the speed limit in Station Road was 30 mph. After prosecution, only 8% of the inadvertent speeders said their usual speed was more than 31 mph, and further analyses showed that, of those who before prosecution had exceeded the limit, 88% now observed it (as did all the others who said they had observed it before). These results suggest that to people who had inadvertently exceeded the 30 mph limit on Station Road through lack of attention or belief in a higher limit the experience of prosecution conveyed a message which the great majority took to heart.

An analysis comparing the self-report speeds by driver type (excluding the tiny number of defiers) revealed that each type slowed down considerably after apprehension, and at that stage over 90% of both conformers and deterred were driving at 31 mph or below. But manipulators still drove fastest both before and after. Further analyses showed that, of those respondents who before prosecution had exceeded the limit, the proportions now observing it were 87% among conformers, 90% among deterred, 48% among manipulators, and one out of four defiers. Thus manipulators and defiers were, as one would expect, least influenced by the experience of prosecution though (according to their self-report speeds) some of them were.

b) Reasons for changing, or not changing, choice of speed after prosecution

One aim of the questionnaire was to enquire of drivers whether they had changed their choice of speed since being caught speeding, and the reasons for their decision to change it or not to. The questionnaire posed two alternatives.

Among nearly 400 respondents who said they had changed, the imposition of penalty points weighed with nearly all of them, the fine with nearly two thirds, and the embarrassment of being caught with just over

half. The inadvertent speeders were much like the others except that rather more of them admitted to embarrassment. As for driver types, conformers and deterred gave similar responses but manipulators were less inclined to attribute importance to any of these three reasons, and they especially downplayed the idea of embarrassment (though the small number of manipulators should be borne in mind). Of 113 who said they had not changed, nearly three-quarters ticked the statement 'I normally keep close to or under all speed limits', while one in eight said 'I think the risk of being caught again is extremely low' and the rest gave other answers.

c) Generalisation of speed behaviour to roads without cameras

A key issue is whether any reduction in speed caused by the experience of being caught by camera generalises to the driver's behaviour elsewhere. Over half of drivers professing themselves to have been deterred on Station Road said they now drove more slowly on camera-free roads. This is an encouraging result, though it was also noted that four people deterred on Station Road reportedly drove faster on other main roads and five went faster on side roads. Altogether the results suggest that a slight majority of drivers deterred on the road where they were caught followed up with some speed reduction on other roads without cameras; at the other extreme, a very small proportion of drivers deterred on the camera-targeted road responded by going faster on roads without cameras. Less encouraging was the finding that only about one in five manipulators reported any slowing down on other roads after apprehension; and indeed, like several of the deterred, a few manipulators reported driving faster elsewhere, which suggests some displacement activity.

5. Perceptions and Beliefs about Cameras

a) Perceptions of risk

A particular interest in the TV survey was to see how the experience of being caught might influence drivers' beliefs and perceptions about speed cameras. The design did not allow 'before and after' measures to be taken, but on several points people's answers could be compared with those from respondents in other surveys who had not been caught by cameras.

All 12 surveys asked drivers to estimate their likelihood of being caught in the next three months if they regularly drove on the survey road at more than 45 mph. Except in S1 and H1 (where no cameras or signs were present) the proportion of people saying 'quite likely' or 'very likely' ranged from 87% to 95%, and in six surveys (apart from TV) the figure was over 90%. The TV sample was well within this range at 92%, so it appears that the experience of prosecution did not raise their perceptions of the chance of being caught above those of other drivers who had not been caught, the great majority of whom in any case thought apprehension likely if they regularly exceeded 45 mph.

TV respondents on average gave lower estimates of the trigger speed than people in other surveys: the proportion estimating it at 40 mph or higher was only 28% in TV compared with 33%-42% elsewhere. This suggests that the experience of prosecution may have made the TV drivers extra cautious. That idea is reinforced by the finding that the TV respondents, by and large, when driving past the Station Road camera after prosecution left a gap between the speed they chose there and the speed they thought would set off the camera, and in many cases the gap was quite wide.

When drivers were asked what source of information (from an offered list) had led to their estimate, 25% said 'word of mouth' and 59% said 'guesswork', which were higher and lower proportions respectively than those found in the nine other surveys which posed the question. These figures prompt one to speculate that perhaps, after prosecution, some TV drivers took the trouble to ask acquaintances if they knew what the trigger speed was; but of those who said 'word of mouth' only 8% estimated correctly.

For drivers preferring to travel faster than the posted limit, perception of the likelihood that a fixed-site housing will contain an operational camera may be influential in their decision whether to 'risk it' by not slowing down. (This will be discussed further in Chapter 8.). Fifty-eight percent of TV respondents believed that at least half the boxes contained operational cameras, a result broadly in line with those of the five other

surveys which asked this question. This finding is interesting from a deterrence perspective, since the actual proportion of working cameras was considerably lower at the time of the TV survey.

b) Attitudes to cameras

In Thames Valley, as in all the nine other surveys which asked drivers their views on speed cameras, a majority of respondents expressed an overall positive attitude. But in TV this favourable majority at 53% was significantly smaller than in any of the others where it ranged from 60% to 68%. Correspondingly, more people in Thames Valley had an unfavourable overall attitude (27%) than in the other surveys (13%-18%).

As Chapter 8 describes more fully, drivers' views were elicited in the surveys by means of eight statements, (A-H). With six of the eight the views of the TV sample were significantly less favourable than the views of any other sample. The most striking difference was with statement D: 'cameras are an easy way of making money out of motorists'. Only 20% of the TV sample disagreed with this (i.e. were favourable to cameras), 19% said 'neither agree nor disagree' (i.e. were neutral), and 60% agreed with it (i.e. were unfavourable to cameras). On this attitude the TV sample was nearly twice as unfavourable as its nearest neighbour from the other samples, and for the remainder of the other samples the contrast with TV was greater still.

This finding is important since the introduction of cameras to a new area may be regarded with suspicion among drivers (Streff and Molnar, 1995), and from a police viewpoint it is vital not to alienate drivers, in order to continue policing with the public's support. Indeed, it was partly for fear of undermining support for cameras (Hansard, 24.11.1995, 900-908) that the last Conservative administration rejected the notion of hypothecation of fines (channelling them back to the local authority area/local police rather than the Treasury). Given the cynicism of the bulk of the TV sample about cameras as money-making machines, at first sight such a policy might reasonably be supported. However, if hypothecation helped to raise the objective and subjective risk of detection through facilitating improved camera operation (see Chapter 8, section 2d and Chapter 10, section 7) any reservations against it might be weakened, and indeed it seems the police have recently succeeded in persuading the Treasury to allow them to utilise some of the proceeds from speed camera fines for this purpose (Times 10.12.98).

In sum, it was shown that on three quarters of the eight attitude statements TV respondents were clearly less favourable to cameras than other survey respondents who had not been caught. The fact that they placed the statements in much the same rank order as in other surveys, but were less positive on nearly all of them and especially on statement D, suggests that the experience of being caught by camera and given a speeding ticket does not give drivers an intrinsically different view of cameras but it makes their attitudes generally less supportive, and the fine is felt as a particular grievance. This suggestion of reduced support is lent weight by the fact that drivers previously caught speeding by camera in our large four-survey sample (which combined S2+H2+WM1+N1; see Chapter 3, section 3) were overall less favourable to cameras than their counterparts who had not been caught. These findings together support those of Streff and Molnar (1995) who showed that observed speeders in Michigan and those who reported having more than one traffic citation during the previous two years were less favourable to automatic speed enforcement devices than the general population.

6. Comments on the Thames Valley Findings

The TV survey was unique among the 12 in that the sample comprised only drivers who had been prosecuted after being caught speeding by camera. They were questioned after the event, so that the findings depend entirely upon self-reports of their driving (some in retrospect) and on comparisons of their perceptions and attitudes with those of other drivers not caught by camera.

Taken at face value, many of the findings indicate that the experience of prosecution had a large effect in the desired direction, i.e. deterrence, and altogether the TV findings are encouraging. But they should be viewed with some caution (though we are far from suggesting they should be completely discounted) because of two reasons. The first is some drivers' inclination to report their behaviour in the best light. We discuss elsewhere the tendency of many to under-estimate their own speeds (see Chapter 2, section 3) and to interpret 'keeping close to the speed limit' rather liberally (see Chapter 3, section 6).

The second reason is that some drivers may have reduced their speed *only* because they had believed before detection that the limit was higher. In that case it may have been primarily their wish to comply (in line with their usual speed choice behaviour) rather than the effect of prosecution that induced this group to lower their speeds. In other words, the experience of being prosecuted after being caught by speed camera seems to have encouraged the big majority to slow down nearer to the 30 mph limit on the survey road, but for different reasons. Many modified their speed to avoid further prosecution (the 'true' deterred), while some intended always to stay 'close to the limit' and had exceeded it either through inattention or through believing it was higher. However, in such cases the fact of prosecution may have been a salutary reminder of their wish to comply. Together, these results suggest that the bulk of TV respondents now saw themselves, and wanted to be seen, as law-abiding drivers, but the experience of prosecution may not have reduced their speeds as much as they said it did.

As for their attitudes to cameras, it seems that these did not radically alter in that the pattern of responses to the eight statements was like that in other surveys and a majority of TV drivers still gave favourable answers to four of them; nevertheless overall the TV drivers were less favourable than others, and they seemed especially disgruntled about having been fined.

7. Having Points on one's Licence

In the fresh surveys drivers were asked whether they currently had any endorsement points on their licence. Apart from the TV sample, all of whom of course did, the proportion saying 'yes' ranged from 9% in WM1 to 17% in N1. A set of analyses was carried out using this information, and for these analyses (unlike most others) respondents who said they had been caught by camera were included. The purpose was to see whether data on endorsement points could add anything to the findings from the TV sample on the effects of prosecution.

a) Changes in self-report speed after installation of cameras (or signs)

In four samples people were asked what had been their usual speed on the survey road before the erection of camera signs there, and what it was now. As discussed elsewhere (Chapter 9, section 2a), all those samples showed on average a marked reduction in speed after signs were erected. But none showed a significant relationship between having or not having points and the amount of the reduction. This may be due to the fact that the questionnaires did not ask drivers who had points when or why the penalty had been imposed. However, when people with points were asked about the effect of having them, some relationships were found as described below.

b) Self-report effect of having points

In four samples drivers with points were asked what was the effect, if any, on their speed on the survey road. Omitting those who drove only rarely on the survey road, between 36% and 52% said 'I drive slower in general than I would if I had not got any points', while the remainder (48%-64%) said 'I drive no differently in general, despite having points'. So it seemed that, among that minority of drivers who had points, a substantial proportion believed that the endorsement was a restraining influence on their speed.

For three samples the two groups of points-holders (those who said they drove more slowly and those who said they drove no differently) were compared in regard to their change in self-report speed after the erection of camera signs. In all, people who said that having points slowed them down were inclined to reduce their self-report speed more than other points-holders did; this at least suggests consistency in self-report, and perhaps having points did make some drivers more responsive to the intended purpose of camera signs. The latter notion receives some support from the finding (see Chapter 5, section 4c) that in Northumbria and West Midlands people with points were more likely than other respondents to say they were aware of the local publicity campaign.

Altogether, evidence from several of the survey samples indicated that (as would be expected from common sense) drivers with points on their licence were inclined to reduce their (self-report) speeds as a consequence. The strongest evidence came of course from the TV sample which has been the main topic of this chapter.

Chapter Seven: The Effects of Speed Cameras when first installed and over time

1. Introduction

Various statistical aggregate studies of observed behaviour have established that reductions in speed do occur when cameras are first installed, and some suggest speed decreases can be maintained and are sometimes enhanced over time.

For instance, Makinen (1994) monitored the speeds of drivers travelling along a 50 km stretch of a two-lane highway in Finland where 12 camera poles had been erected (and a camera rotated between them). Measuring speeds at and between camera sites, he found that mean speeds decreased by 1.3 kph over a two year period on 80 km/h stretches and by 2 kph on 100 km/h stretches. More impressive was the cut in the percentage of speeding cars compared to a baseline year: 7% fewer were recorded at the end of the first year on both 80 km/h and 100 km/h stretches. In the well publicised speed and accident reduction programme in Victoria, Australia, the proportion of vehicles travelling above the enforcement threshold commenced at over 23% in 1989 and reduced gradually to an all time low of 2.2% in June 1997 as a result of the introduction of many mobile cameras across the state, much repeated publicity and awareness campaigns and high enforcement levels (Victoria Police 1998). This indicates that a sustained and intensive campaign can achieve very positive results.

In this country, monitoring of the West London camera project showed that average speeds fell by an impressive 5 mph during the first year of operation (Swali 1993). Hooke et al (1996) used data provided by local authorities on mean speeds or 85th percentile speeds for 53 of the camera sites involved in their accident reduction survey. Measuring speeds over one or two days during the 12 month period either side of camera installation, they found that at 52 of the 53 sites an overall reduction of 4.2 mph per site was achieved. While they did not say whether speed change following installation was constant or waxed or waned over time, this is impressive evidence that drivers do slow down when passing camera sites.

The purpose of our study was not to emulate but to complement research like the above through the use of self-report with drivers sampled for our various surveys. In this way we hoped to shed some light on the cognitions of drivers in relation to the operation of speed cameras, in order ultimately to achieve greater compliance with them and to reduce speeds in general.

Thus the main objective of the four surveys in Surrey, which was hitherto 'virgin territory' in respect of speed cameras, was to examine 'before and after' information on drivers' speeds to assess the effects of a camera when first installed, and to monitor any effects over a follow-up period to see how these might change when all other local factors remained unaltered. In the event it was not possible to hold constant all extraneous factors, and there were several complications. The site was the A25 (Epsom Road) at Mellow, and the original design had been to survey drivers for S1 in October 1994, approximately two months before the planned installation of a single camera there, and those for S2 two months after it. But the installation was delayed for six months, and in January 1995 Surrey County Council initiated a local press article advising readers of 17 Surrey sites where cameras were to be introduced; then camera signs were put up at these sites and subsequently covered. The camera box at Mellow was erected in April but did not become operational till July, and several days after that a second Surrey camera began operating on the A25 at Bletchingly some miles distant. Survey questionnaires for S2 were eventually sent out in September 1995, those for S3R in January 1996 and those for S4R in March 1996. The erection and covering of the warning sign before the Mellow camera began operating may have confused some drivers, and the delays reduced the 'passage of time' design planned for the study to eight months. Also, the reminder phase for S4R coincided with a speed camera becoming 'live' at Whyteleafe on the other side of the county and with two traffic signal (red light) cameras starting operation at Guildford about a mile from the survey site. This may have led some S4R respondents to believe there were more cameras about. Despite these difficulties, however, the Surrey study produced some interesting and valuable results. In particular, an advantage of our research over studies based on aggregate data was that patterns of speed behaviour over time could be examined on an individual basis.

This chapter draws chiefly on Surrey data, but the N1 and WM1 samples also supplied a little 'before and after' information on drivers' speeds, so they are included in the first part of the text below.

2. Speeds on the Survey Road

a) Before and after installation of cameras (signs)

The S2, N1 and WM1 surveys asked drivers what their usual speeds on the survey road had been before the erection of camera signs there, and what they were now both generally and 'when passing places where you think there is a camera box'.

Subject to reservations about self-report and retrospective report, results suggested strongly that in each sample the coming of the cameras was followed by a marked reduction in speeds on the survey road generally, and an even bigger reduction when passing the camera. Whereas before the cameras only 27% of respondents in S2, 51% in N1, and 18% in WM1 had usually driven below 32 mph, after installation nearly two-thirds in S2 and WM1, and over three-quarters in N1 said they kept to the speed limit generally, and in each sample at least four-fifths said they did so at the camera, while only tiny minorities said they exceeded 37 mph. So on three different roads the installation of cameras appears to have produced a large decrease in speeding.

b) The passage of time

Table 2 shows that the substantial speed reduction which occurred at the Surrey site after the camera was installed was still being maintained at six months and eight months afterwards. Before the camera was installed fewer than two-fifths of S1 drivers were keeping to the speed limit and one in six were driving at 38 mph or more; among S2 drivers those keeping to the limit were just over one quarter while another quarter were doing ≥ 38 mph. Two months after installation, nearly two-thirds were keeping to the limit and only one in 20 were doing ≥ 38 mph. By six months after installation the proportion keeping to the limit had, if anything, increased. By eight months after there was a slight rise in speed, but it was not statistically significant, so that at eight months the proportions in the three speed bands were very little different from what they had been at two months. A similar analysis of all the Surrey samples, looking at speeds actually at the camera, told a very similar story.

c) Individuals' progress through time

While Table 2 shows how the drivers in each sample were distributed between the three speed bands it does not take account of individuals' progress through time. In order to do so for the S3R sample, an analysis was carried out which examined for each driver any change in speed band (for speed on the survey road generally) from 'before camera' to 'two months after' to 'six months after'. These formed a number of patterns. The most frequent pattern was driving at ≥ 32 mph before the camera, slowing down into a lower band two months after, and staying in this lower band (or moving into a lower one still) by six months after: 50% of the S3R sample reported this pattern. The next most frequent pattern was driving at ≤ 31 mph before the camera, two months after and six months after: 21% reported this pattern. Altogether the pattern analysis, taking the figures at face value, showed that six months after the camera began operation 77% of S3R drivers with scope to slow down were now going more slowly, 91% of those who before the camera had complied with the limit were still doing so, 10% of those with room to reduce their speeds had made no change, and in the whole S3R sample only 1% had speeded up.⁶ Thus the results of the pattern analysis supported the message from Table 2 that the S3R sample, as a whole, made a substantial reduction in speed by two months and this was maintained at six months.

A similar pattern analysis was carried out on the S4R sample, and the results were in the same directions as for S3R though mostly not quite so large. Thus the S4R sample as a whole made a substantial reduction in speed over the total period, though perhaps not quite as much as S3R.

Further work repeated Table 2 and the pattern analyses for understaters and non-understaters separately. By and large these two groups behaved quite similarly (though there were tendencies - usually not significant -

for understaters to reduce their speeds somewhat less than non-understaters or to reduce them later rather than sooner).

A comparison of patterns between S3R and S4R, for drivers whose speed before the camera was ≥ 32 mph, suggested some slight evidence for a waning of the effect of the camera between six and eight months (and 1% of S3R and 3% of S4R speeded up over the whole period). But an alternative explanation could be that S3R and S4R were slightly different samples (see section 6 below).

All the investigations indicated by Table 2 and the pattern analyses were repeated in relation to the Surrey samples' speeds when actually passing the camera. The results were very largely consistent with those described for speeds on the survey road generally, and (as would be expected) the reductions were greater: i.e. the decreases in speed at the two, six and eight months points were more pronounced when measured at the camera itself.

This body of results concerning the Surrey respondents' speed changes should be taken with some caution because they are based on fairly crude data: change in speed refers to change between one speed band and another which necessarily ignores any change within a band, and understaters (by definition) may not have reduced their speeds as much as the figures would imply. Yet these reservations aside, it appears that a substantial majority of those drivers with scope to slow down following the Merrow camera becoming live did so, very few of those who were already observing the limit speeded up, and most of this effect was still evident six and eight months later.

3. Self-Report Changes in Speed, And Reasons

Another approach to studying the Surrey drivers' responses to the camera over time was to ask those in S3R and S4R directly whether they had changed their choice of speed on the survey road since answering the S2 questionnaire. The results for both samples were quite similar. At least half said they had slowed down, and nearly all the rest said their speed had not changed; no more than 2% said they were driving faster. Not all these answers were consistent with changes in respondents' self-report speed (see Chapter 2, section 3), but the chief point is that very few people said their speed had increased.

Drivers were asked to give their reasons (for changing or not changing) by endorsing any they wished from an offered list, and some of their responses were pertinent to our interest in whether the effects of the camera were wearing off. Among people who said they had slowed down the commonest reason (given by 76% in S3R and 80% in S4R) was 'There may be a bigger risk of being caught than I thought'; 39% in S3R and 43% in S4R said 'There may be more cameras than I thought'; and 39% of each sample said 'I've seen more camera signs near this road'. By contrast, among those who said their speed was no different from before, 43% in S3R and 34% in S4R said 'I don't think the risk of being caught has changed', while 36% in S3R and 28% in S4R said 'I don't think there has been any change in the number of cameras'. Thus in each sample the proportion of respondents who slowed down because they thought the risk of being caught had increased was much bigger than those who refrained from doing so because they saw no change in risk; and the proportions who slowed thinking there might be more cameras, or that they had seen more signs, outweighed those who kept the same speed because they had no such thoughts.

More salient here is the fact that no more cameras, or signs, were installed near the survey road between the S2 and S3R surveys, although things were slightly different for S4R. A minority of S4R drivers could have been affected by the installation of a speed camera at Whyteleafe and of two red light cameras at Guildford, and this may possibly explain why slightly more S4R than S3R respondents perceived a bigger risk. But leaving that point aside, the responses of the S3R and S4R drivers suggested that for substantial minorities the effects of the Merrow camera, far from wearing off, had increased.

Reasons offered to drivers for going faster had included three designed to test whether the effects of the Merrow camera were wearing off with time. These were: 'There may be a lower risk of being caught than I thought', 'I don't take as much notice of the cameras as I used to', and 'There are fewer cameras than I thought'. But none of these was endorsed by more than six respondents altogether, suggesting they were not particularly salient explanations for faster driving.

4. Changes in Self-Report Driver Type

A third approach to studying the effects of time in the Surrey data was to compare the self-report driver type of S3R and S4R respondents with what it had been in S2, i.e. to see whether people's descriptions of their driving style changed. If the effect of the camera was waning, the expectation would be that (a) conformers would stay as conformers; (b) some deterred would remain as deterred, but the less cautious would become manipulators or even defiers; (c) some manipulators would become defiers, the rest staying the same; and (d) defiers would remain defiers.

The comparisons revealed a good deal of change and some inconsistency between people's earlier and later self-descriptions, not all in the directions just mentioned, and some of which may be explained in the ways discussed in Chapter 3 section 7. But if we combine conformers with deterred, as people who (according to them) did observe the speed limit after the camera was installed, 87% of S3R and 85% of S4R said in both the earlier and later surveys that they did so. Among the rest not all showed evidence of the camera effect wearing off; indeed, though a few S2 deterred became manipulators or defiers in S3R or S4R, a few other S2 people made the opposite change. So again, there was little indication of any net decrease in the effectiveness of the camera.

5. Speed Choice and Perceptions of Risk on Other Roads

S2 drivers were asked whether, since the installation of the camera on the survey road, they had changed their speeds on other roads where there were no indications of cameras, and in S3R and S4R similar questions were asked about change on such roads since the time of the S2 survey. The results were quite similar: about a quarter said they had slowed down on camera-free roads (and no more than 2% had speeded up). Those who said they had slowed down on the survey road were more likely than others to slow elsewhere too. Thus a considerable proportion of drivers who slowed down in response to the camera on the survey road believed they had generalised this behaviour to other roads where there were no cameras; and again it seemed that very little of the effect had worn off by six or eight months later.

The S3R and S4R surveys asked drivers an additional question: whether since answering the S2 questionnaire they thought the risk of being caught for speeding had changed on other main roads in Surrey. No more than 5% thought it was less, and 22%-39% thought it was greater. So here again there was very little indication that the effect of the camera was wearing off; rather, for over one fifth of S3R and S4R drivers the perceived risk of detection by camera elsewhere seemed to have increased, corresponding with broadly similar proportions of drivers who had lowered their speeds elsewhere.

6. Perceptions, Beliefs and Attitudes towards Cameras

Altogether the advent of the camera at Merrow resulted in a bigger majority of Surrey respondents (91% of S2 compared with 66% of S1) thinking they would be caught (if they regularly drove there at more than 45 mph), while perceptions of risk remained stable thereafter. Yet otherwise there was very little change in their perceptions and beliefs, or their attitudes to cameras in general, over the span of the four surveys. One point may be noted here. Although nearly all the small shifts in perceptions that occurred between one sample and another were statistically insignificant, the direction of all those between S3R at six months and S4R at eight months could be read as suggesting that S4R were slightly less deterred by the camera, and this would be consistent with suggestions from the pattern analysis (see section 2c above) that between six and eight months the effect of the camera was beginning to wane. But a different explanation could be that S3R and S4R were slightly different samples, S4R being marginally less responsible drivers (see Chapter 2 section 4). This notion was supported by the directions of the minor (and non-significant) differences between S3R and S4R noted at two months: the S4R group then had more people exceeding the speed limit, fewer thought they were likely to be caught, and their attitudes to cameras were marginally less favourable.

7. Summary and Comments

The series of four surveys in Surrey was designed to assess drivers' responses over time to the introduction of a speed camera in a police force area unfamiliar with speed cameras. Overall the results were very

encouraging: even allowing for people's tendency to understate their speeds, and for some differences between the Surrey samples, the findings indicated that the arrival of the Merrow camera induced many more drivers than before to keep near the speed limit on the survey road, and most of this substantial reduction in speed lasted at least eight months. Some of it spread to other roads. After the camera installation drivers perceived the risks of being caught as higher, an effect which was maintained over time, although other perceptions and beliefs about the operation of the camera remained stable over the span of the surveys. Similarly, drivers' overall positive attitudes to cameras were no less favourable after eight months than before the camera was installed.

There was some slight evidence suggesting a waning of effect between six and eight months, but it could have been interpreted differently because the S3R and S4R samples were not exactly equivalent. But we may also speculate that any tendency for the deterrence of the Merrow camera to wear off with time may have been counteracted by other things. Although the intention in the Surrey surveys had been to study the effect of a single camera over time, other extraneous factors being controlled, this was not entirely achieved. The addition of the cameras at Whyteleafe and Guildford during the S4R reminder phase may have inclined some S4R drivers to think there were more cameras about; publicity campaigns against speeding nationally or elsewhere may have unconsciously influenced some to maintain their speed reduction (see Chapter 5, section 5); and many Surrey drivers may have had increasing experience of speed cameras in other areas. (Fifty-four percent of the S2 sample said they often drove on other camera-signed roads.) These factors may have masked any loss over time of the effect of the survey camera. Moreover, the same factors, as well as the existence of the second speed camera some miles distant on the A25 at Bletchingly which started operation just after the camera at Merrow, mean that we cannot attribute the positive results in the Surrey surveys (including the generalisation of reduced speeds) to the operation of the Merrow camera alone.

6. Interviewees drawn from the S3R sample, and some interviewees in N2R and WM2R who had not heard of the local publicity campaigns, confirmed in free response the patterns of speed behaviour over time found in the S3R data. For example, the bulk of this group confirmed that most speed reduction had occurred in initial response to the cameras either generally on the survey road or just at the camera site, and a minority stated instead that they did not curb their speeds until sometime later - usually when they believed the camera was 'live' or that prosecution was likely to follow.

Chapter Eight: Drivers' Perceptions, Beliefs and Attitudes to Cameras

1. Introduction

Statistical aggregate studies can provide accurate data on how drivers actually respond to cameras and on any net accident savings that are made (e.g. Hooke et al 1996; LAAU 1997), but to obtain perceptions and beliefs as to how cameras operate drivers must be asked. The series of surveys provided a good basis for the latter, and this chapter summarises the perceptual data obtained from all of them. Our particular interest was to see whether and how drivers changed their perceptions, beliefs or attitudes as a result of the various interventions and over time, and to arrive at an overall assessment of speed cameras from the information in our samples. Hopefully, this might point to ways of enhancing the deployment of cameras.

The chapter starts with a section looking at six factors that are likely to feed into drivers' decisions as to whether and how to modify their speed choice in response to cameras: their estimate of the trigger (threshold) speed, knowledge of the cameras' location, estimate of the proportion of working cameras, perceived risk of being caught, perceived likelihood of police action if photographed, and of the likely penalty that would ensue in that case. It continues with a section on drivers' attitudes to cameras. All these topics have been mentioned in previous chapters, but we now examine them more closely. The final section is a brief summary.

2. Perceptions and Beliefs

a) Estimates of the threshold (trigger) speed

When cameras are introduced into a locality, the usual strategy to procure widespread compliance is to lower gradually the trigger or threshold speed (above which action will be taken against drivers). How long this process takes will vary according to the capacity of the local administrative machinery for detecting and prosecuting drivers, and perhaps according to the volume of speed offences on the particular stretch of road. However, when cameras were first introduced nationally few reports disclosed that there was any latitude to breach limits (Sunday Express, 5.3.95 was one of the few). It is therefore not surprising that between 5% and 11% of respondents in each survey (all of which were carried out before mid 1995) believed that drivers were allowed no scope to exceed limits when passing a camera box.

Yet common sense says the numbers are growing of drivers who have intentionally or unintentionally 'defied' cameras, through exceeding limits by a considerable margin, without incurring legal consequences; and the number of media reports advising drivers of the variation in trigger speeds between sites and over time is also mounting (e.g. Independent, 23.1.97; Mirror, 17.7.97). Thus two years on from our surveys more information on this matter is in the public domain. Yet knowing that there may be some latitude is not the same as knowing the maximum speed at which one can avoid being photographed, and doubtless many individual drivers' estimates will change over time. Such estimates are, of course, more pertinent to those who do not intend to comply with the posted limit, but in our surveys it was of interest to examine all drivers' perceptions in this regard.

Drivers in all 12 surveys were asked how fast they thought they would have to drive on the survey road for a camera to photograph their vehicle. In S1 and H1 it was a hypothetical question ('if speed cameras were to be installed along (the survey road) ... how fast do you think...'), and for drivers in TV, all of whom had been caught, the wording emphasised that they were being asked the minimum speed they thought would trigger the camera.

In all surveys the most popular estimates were 35 mph, given by 31%-37%, and 40 mph, given by 21%-29%. As already noted, in each sample a small proportion of people apparently believed there would be no latitude at all saying the trigger speed was 31 mph or less, while at the other end of the scale 3%-10% gave estimates of 45 mph or higher. There was little difference in the patterns of estimates as between three groups: (i) S1 and H1 for whom the question was hypothetical, (ii) H2 and H3R where only camera signs existed, and (iii) all the other surveys (except TV) where real cameras were operating. Nor did differences in the actual trigger speed (which varied by up to 10 mph between the four survey sites (Surrey, Thames

Valley, Northumbria and West Midlands) appear to affect the estimates. But TV drivers on average gave lower estimates than respondents in the other surveys, which suggests that the experience of being caught had made them more wary.

Apart from TV, the various experimental situations which the sets of surveys were designed to test did not seem greatly to affect drivers' estimates of trigger speed. In both Northumbria and West Midlands the second survey sample showed practically the same distribution of estimates as the first, suggesting that the publicity campaign did not affect the overall pattern. In Hampshire the H2 sample gave higher estimates of trigger speed after camera signs were in place than H1 had done beforehand, but although the difference was statistically significant it was not very large; and six months after the signs went up the total distribution of H3R's estimates was very similar to what it had been at two months. In Surrey there was no significant difference between S2's estimates after cameras were installed and S1's beforehand. Both the S3R and S4R samples gave slightly higher estimates at (respectively) six and 8 months after the cameras were in place than they had done at two months, suggesting that they increased their estimates with increasing experience of the cameras (and it should be noted that in Surrey the actual trigger speed was considerably higher than elsewhere), but the shift was not large.

So altogether, apart from TV, respondents' estimates of the trigger speed did not vary greatly with the site or time of the surveys. They did, however, vary considerably according to driver type. Conformers gave the lowest estimates, followed by deterred drivers, while manipulators and defiers gave the highest ones. These differences are consistent with the other characteristics of the driver types, conformers appearing as the most cautious.

When drivers were asked for the basis of their estimate most were likely to say it was guesswork. (S1 and H1 were not asked.) The majorities giving this answer were greater in Surrey (72%-75%) and H2 (75%) than in Northumbria and West Midlands (64%-67%). It may be that in areas where cameras (or signs) had only recently been introduced people were more inclined to guess than they were elsewhere. The second most frequent answer was 'word of mouth' (13%-14% in Surrey, 10% in H2, 17%-19% in Northumbria and West Midlands). None of the other possible answers (personal experience, privileged contacts, the media) attracted more than 7% of responses. TV respondents were less likely to guess (59% did) and more likely to say 'word of mouth' (25%), and this is discussed in Chapter 6, section 5a. As mentioned in Chapter 3, section 3, manipulators were less likely than other self-report types of driver to say they were guessing. This finding, combined with their tendency to give high estimates of trigger speed, helps to build up the picture of manipulators as calculating drivers.

Given that around three quarters of the estimates were based on guesswork (implying that no external source informed the estimate) the lack of variation, except by driver type, is perhaps unsurprising. It is interesting that no more than 7% of estimates were informed by media reports, and one wonders whether this proportion has increased since then in a media climate more sensitive to speed cameras.

b) Knowledge of the cameras' location

Five surveys (S2, S3R, S4R, N1 and WM1) asked drivers: 'On a typical journey on [the road of which the survey road was a 30 mph stretch], how well do you know where the cameras are?' Excluding people who said they did not make typical journeys on that road, a majority of each sample answered 'very well' or 'quite well'. The proportion was lowest in S2 (53%) where cameras had only recently been installed on the A25, and in three of the others it was 59%-62%. But in WM1 it was 86%. Here the survey road, Monkspath Hall Road in Solihull, was a local road used much by local people but also used by rush hour traffic as a through route between nearby arterial roads. Cameras had been operating for nine months before the WM1 survey and it is not surprising that nearly all respondents said they knew well where the cameras were. It may also be noted that the WM1 sample contained a higher proportion of self-report manipulators (10%) than any other survey (except S1 where no cameras or signs were operating and the question on driver type was hypothetical); this may partly account for the higher figure since in all the five surveys manipulators knew the location of the cameras better than other self-report types of driver.

In sum, the majority of regular users believed they knew where the fixed-site cameras were located along the survey road. This knowledge could encourage manipulating behaviour. Despite the increased incidence of

'bunching' at camera sites being rejected as a contributory cause of accidents in the West London study (LAAU 1997), the perceived danger posed by bunching (most likely caused by manipulating behaviour) was one of the most common negative features of speed cameras volunteered by interviewees in our research, and perhaps it should continue to be considered as a possible cause of accidents elsewhere. Yet if cameras are sited where previous speed-related accidents have occurred a decrease in speed, however temporary, may help to maintain any reduction in accidents following the cameras' installation.

c) Proportion of working cameras

For drivers not wishing or intending to comply with posted speed limits, assessment of the likelihood that any given camera housing will contain an operational camera will be one of the salient factors in their decision on choice of speed. In view of the high cost of camera hardware (see Chapter 1, section 4) and the lower cost of dummy 'flash' units or indeed of empty camera housings, drivers' perceptions of the likely ratio of cameras to boxes is salient from the viewpoint of police resource budgeting and road safety planning. But such perceptions are unlikely to remain static and may be influenced by several variables including media messages about the operation of cameras. For instance, drivers' perceptions may have changed as a result of recent national press coverage of police resource difficulties which have advised that not all housings contained working cameras all the time (Times, 17.7.97 and 10.12.98; Mirror, 17.7.97; Independent 23.1.97 and 17.7.97).

Six surveys (S2, S3R, S4R, TV, N1 and WM1) asked drivers to say what proportion of camera boxes in the county they thought had cameras working inside them at any one time. In five of those samples a majority of respondents (52%-60%) estimated the proportion of operational cameras to be at least half and in the sixth (WM1) 47% said that. In fact in TV, Northumbria and West Midlands the actual camera-to-box ratio was low (between 1 in 8 and 1 in 13), while in Surrey during the time of the surveys there were no more than three speed camera boxes in the whole county (see Chapter 7). The finding that respondents tended to have similar perceptions of a high camera-to-box ratio is encouraging from the point of view of deterrence, since as mentioned above the estimated ratio is likely to be a factor in drivers' beliefs about the risk of detection.

However, comprehensive research remains to be done to determine the optimum camera-to-box ratio for deterrence. While Winnett's (1995) research showed that speed reductions occurred at sites which were not actively enforcing - and these results may still hold - the Lex Report (1997) found that a third of drivers interviewed apparently did not slow down at all when they saw a speed camera. This suggests that some drivers perceive a camera site as an empty threat or a risk that is worth taking, and it may serve as a warning that the actual risk of being detected should have some correlation with the subjective risk if unwanted behaviour is to be reduced (e.g. Shinar and McKnight 1985).

In WM1 there was a clear relationship between estimates of the ratio and self-report driver type: conformers gave the highest estimates, deterred drivers came next, and manipulators gave the lowest ones. S2, TV and N1 showed tendencies in the same direction, while in S2 and N1 defiers also gave low estimates. Thus there was some evidence that manipulators (and sometimes defiers) have the most realistic idea of the proportion of operational cameras, which illustrates that these drivers are groups whose general propensity to speed will be hard to influence.

d) Risks of being caught

It has been estimated that the subjective risk of detection is the key variable in the success of efforts to deter traffic offending (e.g. Rothengatter 1995). This makes sense, since even if they fear the perceived likely penalty drivers who believe there is very little risk of receiving it are likely to continue their offending practices unaffected. Such a finding occurred in Corbett et al's (1991) study of pub patrons, where most of those who thought they would shortly drive away while over the blood alcohol limit thought a disqualification order would be the likely penalty if they were caught, and indeed feared one; however, they believed the chance of discovery was remote. As noted in Shinar and McKnight's (1985) literature review, successful strategies for achieving compliance require objective enforcement at a level sufficient to create a true threat of detection. In other words, there can be little or no subjective risk without objective risk. In our study, in view of the varying levels of objective risk on the survey roads, the perceived risk of detection was of interest and was assessed in two ways.

On the survey road

Drivers in each survey were asked how likely they thought they were to be caught during the next three months if they regularly drove on the survey road at a speed above 45 mph. In S1 and H1 where there were no cameras or signs, the proportion of respondents saying 'very likely' or 'quite likely' was 65%-70%. In H2 and H3R with signs but no cameras, it was 87%-88%. In all the others, where cameras were operating, it was 89%-95%. Thus the majority of drivers felt it was risky to exceed 45 mph on the survey road, and they were most likely to think so at the sites where there were actual cameras. It is interesting to note (from comparing S1 and H1 estimates with the others) that without any visible signs or cameras on the survey road the perceived risk of detection was around 25% lower. Thus the presence of camera activity (in addition to or instead of traditional police enforcement practices) appeared to raise the risk of detection. However, it is perhaps surprising that the perceived risk was so high in the H2 and H3R surveys and remained high for up to six months after the signs were first erected, in view of the lack of camera boxes on the survey road and the comments above about the need for an objective risk of detection. While a tiny number of Hampshire respondents indicated by their reasons for going faster that they doubted the existence of cameras there (see Chapter 4, section 5), it would seem that signs of camera activity were a sufficient objective threat to the majority, who may have believed that either (a) cameras were installed but not visible; or (b) mobile cameras were operating; or (c) cameras would arrive imminently, given the existence of red light cameras not far from the survey site. Whatever the case, signs seemed to provide little less threat than active cameras.

In three of the four experimental situations people's perceptions of risk changed in the desired direction. In Surrey the proportion thinking they were likely to be caught rose from 66% before the installation of cameras to 91% two months afterwards, and there was very little overall change by four and six months later. The Hampshire result was similar: before signs were erected 70% of respondents thought they were likely to be caught, whereas 87% did so two months afterwards, and four months later there was practically no net change. In Northumbria there was a significant net increase in perception of risk following the publicity campaign, with the proportion saying 'very likely' rising from 54% in N1 to 60% in N2R. In West Midlands, however, there was practically no overall change.

The general tenor of these results suggests that when cameras or signs moved from the hypothetical to reality, perception of the risk of detection changed substantially. Yet once the experimental manipulation had occurred in Surrey and Hampshire the perceived risk of being caught remained stable, and where in West Midlands the rather unfocused local publicity campaign was mounted (well after camera installation) there was no net change in risk of detection. However there was a small but significant increased perception of risk in Northumbria where a more focused campaign had been run. Thus interventions such as local publicity may help somewhat in raising the perceived risk of detection once cameras are installed, but in our research the biggest effects occurred shortly after the cameras' arrival. The other main finding was that the presence of signs alone appeared to represent little less threat than signs plus cameras.

As for differences between driver types, conformers and deterred perceived the highest risk and defiers the lowest, with manipulators in between. In the large four-survey sample (Chapter 3, section 3) 39% of self-report defiers thought they were unlikely to be caught if exceeding 45 mph, compared with 6%-7% of conformers and deterred, and 20% of manipulators. These differences are entirely consistent with the definitions of each type, and they indicate a strong correlation between speed behaviour on the survey road and perception of risk there: drivers who felt they always kept close to the limit, and those who had slowed down because of the cameras, perceived higher risks of being caught (if they were to speed) than those who manipulated their speed to avoid detection, while those who continued to speed regardless perceived the lowest risk of all.

On other roads: generalised risk and behaviour

In the five repeat surveys drivers were asked whether, since completing the last questionnaire, they thought there was any change in the risk of being caught for exceeding a speed limit on (a) other stretches of the road of which the survey road was a part, and (b) other main roads in the county generally. (A five-point response scale was offered.)

With respect to other stretches of the survey road, a majority of each sample (64%-73%) thought the risk was no different from before. In all but WM2R a tiny minority (3%-5%) thought it was less. A larger proportion, ranging from 15% in WM2R to 34% in N2R, said the risk was higher. As for other main roads in the county, the responses of the five samples were quite similar. The majority thinking the risk was no different was 59%-70%, the minority saying it was less was 2%-3%, and the proportion perceiving an increased risk was 29%-39%. In all five samples people who perceived an increased risk of being caught on other roads were most likely to be among those classified as conformers or deterred on the survey road, while nearly all the manipulators and defiers thought the risk on other roads had not changed. The experimental deployment strategies where used, the general media climate, experience of travel elsewhere and general expectations may have combined to create the impression of an enhanced risk locally.

Changes in perception of risk were linked with changes in speed behaviour. As reported in Chapter 9, section 4, in each of the five repeat surveys a substantial minority of respondents (at least 20%) said they now drove more slowly than before on other kinds of road where there were no cameras or signs - other stretches of the survey road, other main roads in their areas, and local side roads. Such drivers tended to be people who had reduced their speed on the actual survey road. Analyses showed that respondents who perceived an increased risk of being caught for speeding, whether on the survey road or other main roads in the county, were approximately twice as likely as those who thought the risk had not changed, to say they were now driving more slowly on any of the three kinds of camera-free road. For example in N2R, among people who thought the risk of being caught on the survey road was the same as before, 16% said they had reduced their speed on other main roads without cameras and 15% said they had done so on camera-free side roads, but among those who perceived a higher risk on the survey road the corresponding proportions were 33% and 30%. This pattern was found consistently in every sample. (Also, in WM2R, people perceiving a lower risk of being caught were more likely than others to drive faster on camera-free roads. WM2R was the only sample with large enough frequencies to show this tendency.) Thus, subject to the usual caveat about self-report data, the results show a clear connection between perception and behaviour.

In sum, up to 1 in 3 drivers in our repeat surveys believed the risk on other main roads in the county had grown since the previous survey, at least 1 in 5 said they had reduced their speeds on unsigned roads, and drivers in the first group were more likely to be in the second. This could be a result of the effect of the experimental manipulations where these occurred, or of an increase in objective risk on roads in neighbouring counties where conditions were not controlled over our survey period. Or it could be a combination of these and a heightened awareness generated by greater media attention to driving issues including speeding and cameras. Although it is not possible to separate out the contribution made by cameras it is very likely, considering all our findings, that cameras played an important role in facilitating the generalised perceived threat of detection. Moreover, the link found between an increased subjective risk and reduced speeds on the survey and other roads suggests that perceptions of risk do affect speed choice behaviour in the expected direction. Finally, the groups of drivers who were least likely to report any broadening of perceived threat - manipulators and defiers - are those representing the greatest concern to road safety planners.

e) Likelihood of police action if photographed

For many drivers the thought of being 'flashed' by a camera is likely to be a strong deterrent against speeding. For others, including those who have had the experience, being photographed may be seen as but one stage towards prosecution. In fact, there is not a perfect correlation between the two stages, and it is possible that more knowledgeable drivers may give as much weight to the perceived likelihood of police action as to the perceived risk of being 'flashed' twice (indicating that a photo has been taken) in their overall risk assessment. Once again, the media may have a role in shaping perceptions, and there have been various recent reports indicating that prosecution is not inevitable following detection. For instance, The Times (25.1.97) reported findings from the Lex Report (1997) that two-thirds of motorists who believed they had been caught on camera heard no more subsequently. While to our knowledge the national media had made few revelations about shortcomings in the prosecution process before our survey period ended (but see Sunday Express 5.3.95), drivers' perceptions would still be coloured by their own and others' experiences and any reports in local media. So changes in perception over time, even short periods, would be unsurprising.

In all surveys except TV, drivers were asked how likely they thought it was that the police would take action against them if a camera photographed them driving on the survey road at what they had estimated was the trigger speed. In each survey respondents saying 'likely' or 'very likely' were in a majority, which ranged from 68% in S2 where cameras had only recently been installed (and the figure for S1 was 69%), to 80% in WM2R. Thus most drivers thought that if they were caught by camera the police would do something about it.

Each of the experimental situations made very little overall change to the distribution of respondents' perceptions of this matter. In Surrey, for example, though there was a very slight net movement over the period of the four surveys towards perceiving police action as more likely, it was far from significant. The findings in Northumbria, West Midlands and Hampshire were quite comparable: very little net change. Conformers and deterred were most likely to believe police action probable and defiers were least so, with manipulators in between. In the large four-survey sample 42% of self-report defiers thought the police would be unlikely to act.

So the findings in general indicated that the majority of respondents thought prosecution was far more likely than not if they were detected, but also there was some variation between areas (possibly related to the different proportions of driver types in each survey who answered this question). Although there was some lability in the perceptions of individual drivers over time the general net effect was one of relative stability. Yet in January 1997 reports were circulating (e.g. Independent 23.1.97; Times 23.1.97), which indicated that in some police forces resource difficulties meant that camera films were not being removed as often as they might be, or were being left to decay beyond the 14 days allowed by law for contacting the registered keeper. If more reports of this kind occur (e.g. Sunday Times, 3.5.98; Times 10.12.98) cameras could lose a considerable amount of their potential for deterrence.

f) Likely penalty if caught by camera

Knowledge and fear of the likely penalty are important factors in the deterrence equation, since if a driver has an inaccurately lenient perception of the likely penalty, or no fear of it, a high perceived chance of receiving it may be insufficient to prevent the undesired behaviour. This is illustrated by a conclusion in Corbett and Simon's study (1992: 78), which indicated that although high speeders thought they might get caught more often than low speeders did, they had little fear of the perceived likely penalty.

In the present research, drivers in all surveys were asked to say what they thought the penalty would be if their vehicle was photographed doing 45 mph on the survey road. For the TV sample the wording was altered to 'before you were caught on this occasion, please indicate what you thought the penalty would be if...(even if you now know it to be inaccurate)'. Respondents were invited to choose one of four options.

In each sample except TV, about three quarters thought they would get a speeding ticket: the proportion saying so ranged from 71% to 78%. Only 1% (or fewer) thought no action would be taken. Between 7% and 12% hoped they would get off with just a written warning from the police, and at the most severe end 11%-21% thought they would have to go to court. Overall there seemed to be little relationship between the survey site and the proportions expecting one penalty or another. The exception was TV, where only 66% said that before their recent experience they would have expected a speeding ticket and 16% would have expected just a warning. As the TV sample was on a different footing from the others it will not be mentioned further here except to note that, taken at face value, the TV sample's spread of responses suggested they had expected greater leniency to be shown than did other samples. This may perhaps help to explain why some had forgotten there were cameras on the survey road at the time of detection.

There was a close similarity between the perceptions of our samples and the actual likelihood of receiving different penalties for speeding offences in 1995 (when eight of the surveys were conducted). Home Office figures for speeding offences detected whether or not by camera and dealt with officially or by written warning showed that 4% were dealt with by written warning, 77% by fixed penalties and 19% by court proceedings (Tables 2, 3, 5, and 8, Motoring Offence Statistics 1995, Home Office 1996). So the overall distributions in our samples of the perceived likely penalty closely corresponded with those actually awarded in 1995.

In regard to the experimental situations, the biggest relationship with expected penalties was in West Midlands, where between the first and second surveys there was a significant, though not large, shift towards expecting greater severity. Elsewhere net changes over time were very or fairly slight. As for differences between driver types, defiers were more likely than conformers, deterred or manipulators to hope for lenient treatment. In the four-survey sample 31% of defiers thought they would get off with just a warning and only 9% expected to go to court.

3. Attitudes to Cameras

This research did not use a specially-designed attitude scale, nor have we viewed attitudes within a particular theoretical framework such as the theory of reasoned action (Fishbein and Ajzen 1975). Instead, we wished to assess the strength of drivers' positive and negative views towards speed cameras to see whether they varied according to the experimental situation (including the passage of time) and according to driver type. At the same time we were mindful of an imperfect correlation between attitudes and behaviour, especially when the behaviour is proscribed. As Rothengatter (1988, 1995), for example, has pointed out, police enforcement activity may reduce drivers' speeds to acceptable levels but it may be less successful in altering attitudes to speeding in the desired direction.

a) Method of measurement

In each survey except N2R and WM2R drivers were asked to indicate their views on speed cameras by responding to each of eight statements, using a 5-point scale: 'strongly agree', 'agree', 'neither agree nor disagree', 'disagree', and 'strongly disagree'. The eight statements were as shown in Table 3.

It will be noted that four statements (A, C, E and G) express a positive view of cameras while the other four express a negative view. For analysis the responses were converted to a common polarity, and then 'strongly agree/agree' (with positive view) was counted as favourable, 'neither agree nor disagree' as neutral, and 'disagree/strongly disagree' as unfavourable. For an overall measure of attitude the converted responses were averaged over the eight statements.

b) Comparisons using the overall measure of attitude

In each survey the majority of respondents had a favourable overall attitude to cameras. In the nine samples excluding TV the proportions in favour ranged from 60% in H1 to 68% in WM1; around 20% in each sample were neutral; and the proportions unfavourable ranged from 13% in S3R to 18% in H1. While the difference between the least favourable (H1) and the most favourable (WM1) is statistically significant ($P < .02$), it can be seen that altogether the nine samples were fairly similar in their distribution of the overall attitude measure. However, drivers in TV were clearly less favourable than those elsewhere: for TV the proportions were 53% favourable (i.e. still a majority though not by much), 20% neutral and 27% unfavourable. The less favourable attitudes of the TV sample compared with others were examined in more detail in Chapter 6, section 5b.

Overall attitude in relation to the passage of time could be looked at in Surrey and Hampshire. In Surrey the proportion of respondents in favour was 64% both before cameras were installed and two months after, and by eight months after it was 66% (the difference being not statistically significant). In Hampshire the proportion in favour increased from 60% before the erection of signs to 64% two months afterwards, and then 66% four months later. So altogether after the erection of cameras and signs it appeared that drivers became, if anything, slightly more favourable towards cameras than they had been before, which is encouraging from the point of view of the driving public's acceptance of cameras.

Driver types (self-report) differed significantly. In the large four-survey sample (Chapter 3, section 3) 69% of conformers had a favourable overall attitude, followed by 65% of deterred, 58% of defiers and 54% of manipulators. In the other fresh samples conformers and deterred were the most favourable and manipulators the least (and in TV only 35% of manipulators were favourable).

As less support for cameras was noted among those who had been caught (the TV sample), a comparative check was made whereby overall attitude scores were constructed for those drivers who had previously been caught speeding by camera among the large four-survey sample (see Chapter 3, section 3)⁷. Although only

95 drivers were available for this analysis, it showed that as in TV fewer drivers who had been caught were favourable to cameras. Thus only 53% of conformers, 57% of deterred and 39% of manipulators expressed an overall supportive attitude to cameras⁸. Detection and prosecution may therefore dampen enthusiasm for cameras.

c) Comparing driver types on each attitude statement

Table 3 compares, for the large combined sample from four surveys (which had the common feature that cameras or at least signs were present on the survey road), the distribution of favourable responses to each attitude statement as between the four (self-report) types of driver. On all statements except D conformers and deterred were the most favourable (on D conformers and defiers were); on four statements (A, B, E and G) there was little difference between conformers and deterred while on three (C, F and H) conformers were clearly in front and deterred came next. At the other end, manipulators were the least favourable on all statements except A and E, where defiers took last place. It is interesting that defiers were the least likely of all four types to agree to statement A, that cameras help to prevent accidents. It may also be noted that statement A is the only one of the eight attracting more favourable responses from the deterred than the conformers, though the difference is not significant. Altogether, Table 3 shows that for the large four-survey sample differences between the four driver types were very consistent across all eight statements.

This analysis was repeated using S1 and H1 combined, omitting the few defiers. It showed that in most respects the results for conformers, deterred and manipulators were very similar to those in Table 3, so drivers surveyed on roads where there were no cameras or signs had very similar attitudes to others surveyed on roads where cameras or signs were in place.

An analysis of the TV sample, omitting its six defiers, revealed two main points. First, on each statement manipulators were less favourable than the other two types, so in this respect TV was like the other two sets of samples. Second, on five statements in the TV survey the deterred gave more favourable responses than the conformers, which is in contrast with the position found in analysis of the large four-sample set and the smaller (S1+H1) set. This finding reinforces the suggestion in Chapter 6, section 3b that many of the deterred accepted the experience of being caught and prosecuted as a reminder of the desirability of observing the speed limit. Moreover, it was found that in all three sets of samples statement A about cameras reducing the risk of accidents attracted more favourable responses from deterred drivers than from other types, which perhaps indicates that the deterred are drivers most likely to be influenced by an appeal to road safety, backed up by the presence of the cameras.

d) Attitudes to cameras in general: qualitative data

We saw above that the majority of all four types of driver held an overall positive attitude to cameras with defiers and manipulators the least in favour. This finding is interesting since defiers and manipulators essentially are subverting the main purpose of cameras, which is to encourage compliance at and between camera sites to reduce the risk of accidents. One of our aims in interview was to draw out these two types of driver on this issue, and all interviewees were first asked what they saw as the key purposes of cameras. If accident reduction was not mentioned drivers were specifically asked, and around three quarters of each of the four types volunteered or agreed with this aim. Three quarters of the deterred and almost half of the other three types agreed that accident reduction had been achieved.

However it proved difficult to expand discussion with manipulators and defiers on the contrast between their own response to cameras and their acknowledgement of speed (and accident) reduction as a key purpose of them. Some drivers just accepted the paradox and their conflicting views and behaviour, some denied any deliberate attempt to subvert the acknowledged purpose of cameras, more could not explain the disjunction, and some attempted to. Some expressed the view that it was natural and logical to slow down to avoid being prosecuted (although it apparently was not seen as illogical to frustrate the acknowledged purpose of cameras). It seemed that many manipulators could not accept that they were frustrating efforts to reduce accidents because they felt they drove safely and in control above the speed limit, and indeed more manipulators (70%) than the other types (36%-48%) said the speed limit was too low on the survey road (perhaps to justify their own behaviour). As one manipulator said, 'everyone thinks they're not part of the problem'. All this reflects the self-serving tendency noted by research that drivers perceive others as less

skilful and safe than themselves (e.g. McKenna, Stanier and Lewis 1991; Zaidel 1992); hence they may perceive any safety message or intervention like speed cameras as meant for other drivers (cf. Kanellaidis et al 1995).

Interviewees were asked whether they felt there was a link between higher speeds and more accidents, and whether the advent of cameras had in any way influenced this belief (whatever their behavioural response to them). One quarter said their belief in the link had been strengthened (the remainder said it had not or 'maybe'), but few could explain why except to say that either the arrival of cameras, or their own experience of being caught, had made them think about speed and its dangers. So it appeared that for some drivers the existence of cameras or the consequences of failing to respond to them acted as a reminder of the association between speed and accidents.

The impact of cameras was also evident when interviewees were asked what was the most important thing, if anything, to have influenced their style of driving over the previous three years. Over a quarter (28%) said they had not changed their style; 10% (all from TV) said being caught by camera, and 17% (nearly all of whom had not been caught) said the introduction of cameras. The deterred were more likely to mention these two reasons than the other types. (The rest mentioned a variety of other things.)

Altogether our data on attitudes showed that most drivers held positive views of cameras despite some cynicism especially among those who had been caught by camera. It seemed that these attitudes (where measured) remained stable over time, and if anything became more favourable. Yet although the majority of surveyed manipulators and defiers had positive views of cameras, and more of the manipulators interviewed had positive than negative overall views⁹ their behaviour in response to cameras does not fit easily with holding such attitudes, and indeed most of the manipulators interviewed had difficulty reconciling the gap between their opinions and their behaviour. These results partly reflect those of Aberg et al (1997) who found that while a majority of drivers in Sweden and Denmark expressed attitudes in favour of compliance with speed limits, more than half were observed to exceed the speed limit (and self-reported speed was significantly correlated with that observed). From other results Aberg et al (1997) concluded that an overestimation of others' speeds might be one factor that could explain the mismatch between attitudes and speed behaviour, and suggested that a method of informing drivers about actual proportions of complying drivers might reduce the pressure towards higher speeds. These and our own results point up the challenge ahead, and they also support the findings of DeWaard and Rooijers (1996) and Rothengatter (1988) who concluded that though police enforcement activity may modify behaviour, attitudes do not always follow suit.

4. Summary and Comments

This chapter has taken the pulse of our driver samples in regard to their perceptions, beliefs and attitudes to speed cameras. To begin with, variables that feed into a general assessment of perceived risk were examined. It was found that estimates of the threshold speed above which cameras are activated varied little between survey sites or over time, the modal estimate being 35 mph. At the time of our surveys a small minority of drivers in each believed no tolerance of exceeding limits was allowed, and guesswork formed the basis of trigger speed estimates for most people. The majority of regular users knew well where fixed-site cameras were located along the survey road, the proportion being higher where cameras had been installed longer. Such knowledge might raise the likelihood of manipulating behaviour and 'bunching' which in turn could lead to accidents, although research to date does not support the notion that manipulating causes accidents (LAAU 1997). In five of six samples, the majority of respondents believed at least half the camera boxes contained a working camera. At the time of the surveys, the real proportion varied but was generally lower than this. For drivers not wishing to comply with limits, such an assessment may be crucial in decisions whether to 'risk it'.

The large majority in ten surveys thought the risk of being caught for doing more than 45 mph on the survey road over the next three months was high. The other two surveys (with a lower majority) were where cameras had not yet been introduced, which suggests that the addition of cameras may raise the perceived risk of detection. Interestingly, perception of risk was little lower where signs alone, warning of speed

camera activity, were operating; thus our findings strongly indicate that signs constituted an objective risk similar to visible camera boxes, although the site for the signing surveys must be borne in mind.

Around a third of respondents in five surveys perceived a higher risk of detection on other main roads than they had before, which may have resulted from the combined effects of the experimental manipulations where these happened, experience of camera activity elsewhere, media interest and drivers' heightened awareness of cameras generally. The big majority believed that further action would follow from being photographed. As to the most likely penalty for doing 45 mph on the survey road, around three quarters expected a fixed penalty (speeding ticket). The similarity of the distribution of responses in each survey with the actual distribution of penalties awarded nationally in 1995 was noted, respondents collectively having a realistic idea of the likely consequences of being caught speeding.

The majority of drivers in each survey held positive attitudes towards cameras although those who had been caught (in TV and in the four-survey sample) were less favourable, especially manipulators¹⁰. Where measured, the proportions in favour increased slightly over time. The bulk of manipulators and defiers who had not been caught also expressed positive views to cameras which is interesting since their behaviour would suggest otherwise.

7. The use of such cases was a departure from usual practice in this report since, as noted in Chapter 2 section 1d, all drivers previously caught speeding by camera were omitted from the large bulk of analyses to avoid the potentially confounding effect of prosecution.

8. The number of defiers in the four-sample survey who had been caught were too few for analysis.

9. The small number of defiers answering this question is excluded here.

10. Defiers who had been caught (in TV and the four-survey sample) were too few for their answers to be measured.

Chapter Nine: Comparisons of the Deployment Strategies Used

1. Introduction

Although each of the surveys was designed to be self-standing, many of the questions posed could be compared within each subset of surveys. Moreover, subject to various caveats that are listed in section 2 (a) below, drivers' responses to some questions could be contrasted over the several quasi-experimental situations that were surveyed, thus enabling a limited comparison of the different deployment strategies. Altogether the 12 surveys investigated, in one way or another, effects of the following: installation of cameras; erection of signs alone; passage of time; publicity campaigns (mainly local ones); and prosecution.

Detailed results for each have been presented in the preceding chapters. In this one we show comparative analyses using drivers' speeds on the survey road before and after the various deployment strategies for all respondents and for each driver type. Then comes a section addressing the topic of generalisation to other roads, followed by a brief summary.

2. Comparisons between Strategies

a) Ten situations

We begin by taking all respondents together (regardless of driver type) in each of ten samples (omitting S1 and H1). Table 4 sets out their self-report speeds on the survey road in general after the experimental situation allowing for what they had been before it, using the three speed categories ≤ 31 mph, 32-37 mph and ≥ 38 mph. For each category of 'speed before' the table shows the proportion of cases falling into each category of 'speed after' and this is done for each situation, thus enabling comparison across situations for any one category of 'speed before'. For the installation of cameras the figures to focus on are those of S2, N1 and WM1; for erection of signs, H2; for the passage of time, S3R, S4R and H3R; for local publicity, N2R and WM2R; and of course for prosecution, TV.

Among the fastest drivers who reported travelling at ≥ 38 mph 'before cameras' in the S2, N1 and WM1 surveys, 34%-41% apparently lowered their speeds down to ≤ 31 mph and 43%-46% reduced theirs to 32-37 mph, leaving less than 20% travelling in the same speed band as before. Thus the impact of installing cameras was quite substantial on the fastest. By contrast, only 25% of the fastest drivers in the H2 survey dropped their speeds to ≤ 31 mph in response to the erection of camera warning signs, and 44% reduced theirs to 32-37 mph. For both cameras and signs most of the effect was still present several months later. The local publicity campaigns appeared to have some positive effect on respondents' speeds, 39% of the fastest N2R drivers but only 23% of the fastest WM2R drivers reducing their speeds to ≤ 31 mph. In the TV survey 73% of the fastest drivers curbed their speeds to ≤ 31 mph following prosecution, and only 7% made no reduction, which implies that prosecution apparently had the greatest impact of all. Comparison between four 'strategy groups' in respect of the proportion of drivers who lowered their speeds to at least 32-37 mph showed significant differences, with prosecution having the greatest effect, then cameras, then signs, and publicity least.

For drivers professing lower speeds (though still above the limit) before the intervention, it again appeared that prosecution had most effect in lowering speeds. Installing cameras had a pronounced impact and erecting signs was fairly productive; again, the effects were still largely present several months later. Local publicity, especially in Northumbria, appeared to influence some people. (As before, there were significant differences between prosecution, cameras, signs and publicity in that order.)

For drivers who said that before the intervention they were already driving at or below the 30 mph limit, the figures suggest that all types of intervention strongly reinforced their intention to keep on doing so, and again cameras and signs were still largely effective several months later. The rows for N2R and WM2R imply that the reinforcing effect of local publicity was less than that of other manipulations (especially in West Midlands) and this difference was significant. As for prosecution, 99% of the TV sample who said they had been keeping to the limit apparently continued thus, but it will be remembered that all of them had been caught travelling considerably above it, many saying they had not realised they were doing so.

The comparisons in Table 4 are crude in several ways, as follows.

- (1) They depend entirely on drivers' self-report speeds, and understating is ignored here.
- (2) 'Speed before' is reported retrospectively (except in N2R and WM2R).
- (3) Changes of speed within a speed category are ignored.
- (4) Differences between the samples, in driver characteristics and in features of the survey sites, which could affect speeds, are ignored.
- (5) Other variables which could affect speeds (such as national publicity campaigns at various times) are ignored.
- (6) Only one variable - change in self-report speed category - is examined.

But subject to the above, we may sum up the message of Table 4 as follows. Prosecution of speeders appears to have the strongest effect in reducing their speeds; installing cameras, or even signs alone, is fairly effective, and most of the effect lasts for at least several months; local publicity campaigns may have some effect (even if few drivers consciously remember them - see Chapter 5, section 5). This brief assessment is compatible with the detailed results reported and discussed in earlier chapters.

b) Publicity compared with the passage of time alone

Some of the figures underlying Table 4, for the repeat samples, enabled a rough comparison between the apparent effects of publicity and those of the passage of time alone, to see whether, once cameras or signs were in place, a local publicity campaign was any more effective than no further intervention. Here we took as a baseline drivers' speeds when first reported after the installation of cameras or signs and compared them with the speeds they reported later, while bearing in mind what change (planned as part of the research design) had occurred in the meantime. The findings suggested that (1) most drivers who had responded to cameras or signs by observing the speed limit (or who had always observed it) were likely to continue to do so over the next few months, but a publicity campaign might slightly reinforce their decisions; and (2) about a third or more of drivers who were still above the limit after the installation of cameras or signs might subsequently reduce their speeds, but only a strong publicity campaign (as in Northumbria) would significantly increase the proportion who slow down further.

3. Comparisons for Each Driver Type

a) Four deployment strategies

Now in Table 5 we attempt to compare the deterrent effects of each kind of deployment strategy - installation of cameras, erection of signs, publicity campaigns and prosecution - for each of the four self-report driver types, using some of the data underlying Table 4. Analysing by driver type modifies caveat (4) somewhat since driver type takes some driver characteristics into account, but the other caveats remain. To maximise the numbers available for each type where possible, samples are added for cameras and for publicity as before. Deterrent effect is measured by counting those drivers whose 'speed before' was 32 mph or more (i.e. who had scope to slow down) and noting the proportion who moved into a lower category for 'speed after'. The four experimental manipulations are compared in the last column of the table.

Table 5 suggests that the superior deterrent effect of prosecution occurred with each of the first three driver types separately, with almost all conformers and deterred, and 73% of manipulators, slowing down (among those who could do so). Defiers were the exception, which would be consistent with the picture of this type as drivers who pay little regard to cameras. For defiers the greatest speed reduction apparently followed a publicity campaign. (But here we must note that the sample of defiers is small, so the differences are probably not reliable.) After prosecution the next most deterrent situation, for all driver types, was the installation of cameras: among the deterred 83% moved into a lower speed category, while 67% of manipulators and 53% of conformers did so. Signs appeared to be the least deterrent situation for conformers, with only 32% slowing down, whereas 76% of the deterred responded to signs. Publicity apparently influenced fewer than half of the possible respondents of any driver type.

b) Passage of time, and comparison with publicity

Somewhat similar analyses for each driver type were carried out to look at the effects of time on the influence of cameras (S3R and S4R) and on that of signs (H3R).

The results showed that for conformers, the deterrent effect of both cameras and signs appeared if anything to have increased between two months and six to eight months. For the deterred the effect of cameras hardly changed, but the effect of signs waned somewhat, suggesting perhaps that over time some of those H3R drivers became more aware that there were no actual cameras operating. For manipulators there was apparently little or no change over time with either cameras or signs. For defiers deterrence seemed to have increased, but the numbers here were too small to be taken seriously.

An analysis similar to that described in 2(b) above was carried out to compare the apparent effects of publicity with time alone, for each driver type separately, and combining S3R+S4R+H3R for 'time', and N2R+WM2R for 'publicity'. It was found that after the installation of cameras or signs the deterred, rather than other driver types, seem to have been influenced by local publicity: among those who said they were now keeping to the limit the campaign helped them to continue doing so, and among those still above it the strong Northumbria campaign (though not the West Midlands one) induced them to slow down further.

4. Generalisation of Speed Change

As was noted in Chapter 1, knowing whether any positive effects of a single camera, or a series of cameras, extends to neighbouring roads is salient since speed cameras must be used only after other potential solutions have been rejected, and only where there is an existing speed-related accident problem (Department of Transport Circular 1/92; Home Office circular HON 38/1992). Winnett (1994), commenting on results from the West London camera programme, noted that while accidents were not displaced to local non-trunk roads in the camera network area, there was also little indication of any speed reduction on such roads, and the results implied only a localised effect. By contrast, more recently Winnett et al (1997) found some generalisation of effect, in the short term at least, following the monitoring of vehicle speeds soon after a single camera had been installed on a road in Norfolk. According to Winnett, this generalised effect was caused possibly by local knowledge of the camera installation or by anticipation of further enforcement along the route.

Thus there was particular interest in our study to see what drivers said about the generalised effects of cameras, and altogether eight of our driver samples were questioned on this topic. The results for each deployment strategy have been reported separately in previous chapters: see Chapter 4 section 4, Chapter 5 section 4(d), Chapter 6 section 4(c) and Chapter 7 section 5. We may now gather and summarise these responses, and note that they all point in the same direction. A main finding was that of all drivers asked (whether or not they had slowed down on the survey road) between around a fifth and a half said they had slowed down on other non-signed roads. A related finding provided a very consistent picture: drivers who reduced their speed on the survey road, or who said that cameras or signs there had deterred them from speeding there, were much more likely than other drivers to reduce their speed on other roads where there were no indications of cameras; while nearly all the others, who had made no change on the survey road, made no change on camera-free roads either.

Of course the majority of respondents had gained experience of cameras elsewhere as well as the survey road, so that for the present purposes we may take the survey road as, in a sense, representing all camera-signed roads. Subject to the reservations about self-report data, the findings produced a convincing demonstration that for many drivers camera-induced behaviour generalises to roads without cameras.

5. Summary and Comments

The comparisons made in this chapter invite conclusions about the relative effectiveness of different ways of using cameras or camera-related action. They are subject to the caveats in section 2(a), which may be summed up by saying: self-report speeds should be considered with caution because drivers have a tendency to present themselves in the best light; the tables ignore a host of other variables which could influence

speeds; and self-report speed on the survey road was only one among many ways in which we assessed the outcome of camera-related measures. But subject to these warnings we sum up as follows.

For all types of driver except defiers, prosecution appears to have the strongest effect in lowering excessive speeds and in reminding drivers who believe they normally keep within the limit to go on doing so. The installation of cameras is also effective, particularly among drivers (a majority in our samples) who after the erection of signs or cameras describe themselves (in effect) as deterred. Signs alone are also fairly effective, again especially for the deterred. For drivers who see themselves as conformers the effect of cameras or signs lasts at least six months; for the deterred the effect of signs alone may wane somewhat. Manipulators are influenced to a worthwhile extent by cameras, and rather less by signs. Publicity campaigns apparently influenced fewer than 50% of the speeders, especially among manipulators. But once cameras or signs have been installed a strong campaign may reinforce their effects, especially on the deterred; also (as discussed in Chapter 5, section 5) publicity campaigns are probably still worth having for their general effect on drivers' perceptions of the risks of speeding. As for defiers, none of the four measures appears to have been especially effective in persuading them to slow down, but such is the nature of defiers.

At present, it is not practicable (nor perhaps desirable) to prosecute all those drivers who exceed speed limits. But taken all in all, our results suggest that *any* of the measures investigated in the 12 surveys can be worthwhile in helping to lower drivers' speeds. Installing cameras, or even just signs, produces a considerable effect, most of which endures for at least some months; prosecution is a sharp reminder to offenders; and a publicity campaign, whether or not motorists are aware of it, can induce some to slow down and others to maintain a reduction, while at the same time it contributes to the general climate in which other anti-speed measures can bring about changes in driving behaviour. Moreover, the findings indicated that not only did drivers reduce their speeds on the survey roads, but also many of them said they had slowed on camera-free roads elsewhere. Thus there were strong indications that when speed cameras were deployed in the several ways described their effects on drivers' choice of speed generalised to other roads without cameras.

Chapter Ten: Summary and Conclusions

1. Introduction

This study set out to examine the effects and effectiveness of various strategies related to the deployment of speed cameras, and to explore how different types of driver responded to cameras and perceived their operation. Recommendations for best deployment were to be considered. It was carried out between 1993 and 1996 after the Road Traffic Act 1991 authorised the use of automatic speed devices for the detection of offences. A series of 12 surveys arranged in five sets and having some cross-sectional and some longitudinal elements was undertaken together with some depth interviews, and self-report measures predominated. In total 6879 drivers took part. The particular interventions focused upon comprised camera signing alone; two kinds of publicity campaign linked with speed camera deployment; prosecution following detection by speed camera; and the effects of cameras when first installed and over time.

Section 2 of this chapter summarises the profiles of the four driver types in which we were interested and assesses the usefulness of the typology in terms of its applicability and stability. Section 3 summarises the main effects and effectiveness of each deployment strategy considered, and section 4 summarises findings on whether camera-induced speed behaviour generalised to unsigned roads. Section 5 draws together findings on drivers' perceptions, beliefs and attitudes towards cameras. Section 6 contrasts the behavioural effects of the different interventions and then compares the interventions and the passage of time by type of driver. In section 7 we make some general conclusions on the whole research, outlining recommendations for the best deployment of cameras. Then in section 8 we round off by exploring some wider implications of our findings.

2. Profiles of the Four Driver Types

a) Background characteristics, perceptions and driving style

Earlier research by one of the authors had indicated that drivers' initial reactions to the installation of cameras (Corbett 1995) had largely been one of four types. Drivers reported either that they had normally complied with speed limits on the survey road and so cameras would make no difference to them (these we termed 'conformers'); or that they had reduced their speed on the survey road to avoid detection (the 'deterred'); or that they slowed down on approach to cameras and accelerated away downstream ('manipulators'); or that they carried on as before driving well above the speed limit ('defiers'). As the ideal aim of speed cameras is to enlarge the proportion of deterred drivers, to maintain the number of those who have 'always complied', to reduce the ranks of the defiers who profess to pay little regard to the existence of cameras, and to encourage those who wish to avoid detection to reduce their speed along the whole length of camera signed roads not just at camera sites, this study aimed to find out more about defiers and manipulators, who present the main road safety problem. Therefore the seven fresh surveys did not attempt to obtain a representative sample of drivers, but rather to gather enough of each type to study. Even so, manipulators and (especially) defiers were thin on the ground. By and large all seven samples presented much the same broad picture of differences between the four types, though some analyses were restricted by small numbers of manipulators and defiers.

The general picture conjured up of manipulators was that they are the most calculating and sophisticated in their reactions to cameras. They approve of them less than other types but are familiar with them, they think they know where they are, how they operate and how to drive past them without getting caught. In our surveys they tended to be the youngest and had the second highest offending and speeding scores, the highest accident rate and were least likely to admit a link between speed and accident risk, both general and personal. They reported the highest speeds on the survey road before cameras (or signs) were installed, and gave the highest estimates of the camera threshold speed.

Defiers were like manipulators in being most likely to drive company or high performance cars and they were most likely to deny a general link between speed and accident risk. Not unexpectedly they had the highest speeding and offending scores, and reported the highest speeds on the survey road after cameras or

signs were installed. Such speed preferences could arise from defiers being the type most likely to discount the risk of detection (if driving above 45 mph on the survey road), least likely to think the police would take action against them if they were photographed, and most likely to expect leniency if police action followed. Such beliefs could, of course, account for their seemingly uncaring attitude to the threat of detection, in contrast to the views of manipulators.

Conformers on the other hand presented a picture of generally law-abiding, cautious drivers who approved of cameras. They were the oldest and most experienced with the lowest speeding and offending scores and were least likely to have had an accident in the previous three years. Conformers reported the lowest speeds on the survey road both before and after the cameras or signs, and gave the lowest estimates of camera trigger speeds. With the deterred, they were most likely to believe they would be detected if driving regularly on the survey road at more than 45 mph, and that action would follow if they were photographed. So conformers appear to be the most fearful of cameras, perhaps with the least justification.

The deterred tended to fall between conformers on the one hand and manipulators and defiers on the other - in reported speeds on the survey road, estimates of threshold speed and attitudes to cameras. But on many other variables they were much like conformers implying that it was the cameras that had made them so.

b) Usefulness of the four-class typology

In three surveys respondents reported their driving style on other familiar roads with cameras. In regard to conformers and deterred there was a great deal of consistency indicating that many of such drivers behaved the same way on other roads with cameras or signs. However, manipulators and defiers were less consistent, some behaving as deterred on other roads perhaps because of less familiarity there. Yet the evidence overall suggested the four-class driver typology was quite stable. Another piece of evidence giving further grounds for confidence in it was the fact that altogether, across the fresh surveys, the profiles of conformers and deterred on the one hand, and manipulators and defiers on the other, which were revealed for observed types were remarkably similar to those for self-report types, despite various constraints and complications in the selection criteria for sampling and observing drivers.

However, there were some apparent inconsistencies between self-report and observed types, which may have been explained by several factors. One of these was the apparent tendency of many respondents to under-estimate their own speeds in self-report, and another was that some drivers' interpretation of 'keeping close to the speed limit' seemed more liberal than that we had in mind when designing the surveys. The most common interpretation of complying, often found among conformers, centred on the view that speed limits were to be used as guidelines for constructing their own set of rules as to appropriate speeds. Drivers felt that provided they conformed to these rules they were complying, and thus their own rules seemed to substitute for legal ones. So such drivers did not see it as wrong to exceed the 30 mph limit by 5-10 mph, and many of them kept to such speeds (rather than going faster) because they did not like breaking the law. One upshot of this disjunction between legal and personal conceptions of compliance was that some drivers observed at, say 40 mph, would have been classified as defiers according to our criteria but as conformers according to their own.¹¹

Some inconsistencies in respondents' self-descriptions suggested that they had had difficulty with the questions on driver type. The surveys had allowed only one kind of response and interviews showed that more than one category might apply. Thus it appeared that some conformers and deterred manipulated the cameras but kept reasonably close to posted limits at all times, and some manipulators or defiers had reduced their speeds somewhat but still manipulated or paid little attention to cameras. It looks probable, therefore, that our four category typology needs expanding or redefining, perhaps to take in dimensions of time (how they drove before cameras), place (how they drive elsewhere) and general speed preference (fast or slow). Yet overall, despite some blurring of distinctions between the four categories, reported profiles of the different types were quite distinguishable, stable and consistent across the surveys, and the typology overall provided a useful framework in which to classify drivers' behaviour and perceptions.

3. Effects and Effectiveness of Each Strategy

a) Camera signing alone

Since speed camera warning signs cost far less to purchase and install than camera devices themselves, interest was expressed to see how effective they might be in a location where no speed cameras were operating. Three surveys were conducted in Eastleigh, Hampshire, the first before signs were erected, the second two months after and the third six months after. Fresh samples were contacted for the first two surveys, and for the third survey the second sample was followed up and questioned again. Different self-report measures revealed slightly different results, but overall it appeared there was a substantial reduction in speed and most of it lasted six months. Self-reported change in speed patterns showed that six months after signs were installed, of those respondents with scope to slow down over half were going more slowly, and 90% of those who before the signs had been keeping to the limits were still doing so. Another measure showed that only 2% of drivers reported going faster on the survey road between the two and six month points. Some of the speed reduction spread to other non-signed roads, though the presence of other enforcement signs and red light camera housings in a nearby city (Southampton) may have contributed to the effect.

Before the signs went up 70% of the first (H1) sample thought they were likely to be caught if travelling at over 45 mph on the 30 mph survey road, whereas two months afterwards 87% of the second (H2) sample thought so, and four months later there was almost no change from that position. Over the period of the three surveys the proportions of drivers holding favourable attitudes to cameras increased slightly from 60% to 66%, and the perceptions and attitudes of the Hampshire respondents in general closely mirrored those found in other surveys where actual cameras were operating.

While a small proportion of the H2 respondents were alert to the distinction between camera signs and boxes, the effects of the signing were little less than those of real cameras. The proximity of red light cameras and traffic enforcement camera signs nearby may have helped account for this through raising the perceived likelihood that speed cameras were around in Eastleigh even if unseen, but in any event it seems that speed camera warning signs represented a real objective threat (correlating with the high subjective threat noted). Yet if there had been no local camera activity at all the experimental warning signs might have been less potent. So while the results must be considered in context, overall they are encouraging, and especially the finding that they endured for up to six months after the erection of the signs alone.

b) Two local publicity campaigns relating to the deployment of speed cameras

Pairs of surveys in Northumbria and West Midlands were designed to study drivers' reactions to local publicity campaigns. The campaign in Northumbria aimed to enhance the perceived efficacy of existing fixed-site cameras by announcing that they would be supplemented by mobile ones, so undermining drivers' reliance on knowing where cameras were sited. That in West Midlands intended to suggest that the prosecution threshold (trigger) speed of existing speed cameras had been lowered, increasing the risk of detection. A longitudinal 'before' and 'after' design was used for both pairs of surveys, the second one taking place one to two months after each campaign had been mounted. Unintentionally, the strength of the campaigns differed: in Northumbria it was strong, focused, involved several media and lasted longer; in West Midlands it was weak, unfocused and short. Similar proportions of drivers in each area (less than 1 in 5) professed to be aware of new local initiatives, yet while most of these in Northumbria seemed at least vaguely aware of the campaign's intended message, few in West Midlands did. Those who became aware of the latest local publicity were more likely to be people who had noticed earlier campaigns, and the few in both areas who had points on their licence were also more aware of local publicity than others, suggesting that both general or self-interest may be salient in the recall of publicity messages.

Since many in both areas reported that they had slowed down in response to the installation of cameras, only one fifth in Northumbria and one third in West Midlands still had scope to moderate their speed in response to the publicity. Analysis of change in their reported speed categories showed no net reduction to lower speeds in West Midlands on the survey road though there was a small one at the camera itself, and there was a small net reduction in Northumbria both generally and at the camera. The greater reduction in

Northumbria, where there was less scope for one, could suggest the stronger campaign there had some small direct effect.

Again, different measures resulted in slightly different findings, and in contrast to the results above more than a third of drivers in both surveys said they were now driving more slowly since completing the first questionnaire. Many of them said they were now also driving more slowly on other roads: up to 44% who had slowed on the survey road in Northumbria, and up to 71% in West Midlands, reported reduced speeds on other roads without cameras, which is evidence for a generalised effect.

A fair minority in both areas thought the risk of detection on the survey road and others was greater after the local publicity, an effect more strongly noted among those who had slowed down. Interestingly, in both areas those aware of local publicity were more likely to believe the risk of detection for speeding had increased especially on other main roads, which is evidence of a direct link between the campaigns and perception of risk. Yet drivers who said they had slowed down on the survey road (or unsigned roads elsewhere) were no more likely than others to be aware of local publicity, indicating that speed behaviour was *not* related to awareness of local publicity.

Together, the results suggested that local publicity campaigns may help reinforce perceptions of the potency of cameras and perhaps of the dangers of speed, even if at less than a conscious level for many, although among those at greater risk of losing their licence awareness may have been more conscious. Yet how far the campaigns contributed directly to speed reduction is more difficult to answer. The Surrey surveys (see (d) below) found that speed reductions were maintained after camera installation without any interventions such as local publicity. However there was a little evidence from comparisons between strategies (see section 5 below) to suggest that, especially in Northumbria, drivers who initially slowed down in response to the installation of cameras were influenced by publicity to maintain or slightly augment the reported reductions. It could be that as the driving public becomes more sensitised to issues of speed through growing media attention, local publicity campaigns help to maintain public awareness and accordingly play an important part in the overall effort to moderate speeds.

c) Payment of a fixed penalty after detection by speed camera

The few studies that have examined the effects of prosecution on traffic offenders have focused almost entirely on the impact of disqualification orders, and our study aimed partly to fill the gap by exploring the specific deterrent effect of payment of a fixed penalty on drivers caught speeding by camera. One survey was carried out of a sample of drivers detected on a road in the Thames Valley police force area, all of whom had paid a fine. Limited evidence could also be adduced from several other surveys on the effects of having penalty points on one's licence.

At face value, many of the TV results indicated that the impact of prosecution was in the desired direction. So, for instance, while 26% said that before prosecution they normally kept below 31 mph on the survey road, this proportion rose to 87% afterwards. Sixty-one percent said they were now deterred from speeding on the survey road.¹² More than half said they had not realised they were speeding at the time of detection, but both these 'inadvertent speeders' and the rest now drove more slowly. Interestingly, of those with scope to do so, not only did 90% of the deterred reduce their speeds, but also 87% of the conformers (who said they usually kept near the limit on the survey road) reported lower speeds as did 48% of the manipulators. (Not surprisingly, after prosecution the number of reported defiers was tiny). About half the sample, especially the deterred, said they now drove more slowly on other unsigned roads, indicating a considerable generalisation of effect. Yet only about one in five manipulators reported similar behaviour, and indeed, like several of the deterred, a few reported driving faster elsewhere, suggesting some displacement activity.

It might be erroneous, however, to attribute the lower speeds of most TV respondents to the deterrent effect of prosecution in view of the large proportion who had inadvertently exceeded the limit. (Some of these apparently had done so through inattention and some through believing the speed limit was higher on the survey road.) It is likely that some moderated their speed primarily through the wish to comply (in line with their normal speed preference) rather than through having been deterred from intentionally driving above the limit. However, in such cases the fact of prosecution might have been a salutary reminder of their wish to comply.

Despite prosecution following detection by camera the majority of the TV respondents, like those in other surveys, held overall favourable attitudes to cameras. But they were less favourable than other samples and they seemed especially disgruntled about being fined. In particular, only a minority of TV manipulators (and manipulators previously caught speeding in the four-survey sample) expressed an overall positive attitude to cameras, which suggests that detection by camera and subsequent prosecution can dampen support for camera enforcement among this type of driver.

Some information was also gathered from four of the fresh samples on the impact on their driving style of having penalty points. (But since drivers who had points were not asked when or for what offence these points had been imposed, any relationships found with speed or the effects of speed cameras could only be suggestive.) Among the small minority with points who were asked how these affected their speed on the survey road, between 36% and 52% said 'I drive slower in general than I would if I had not got any points'. People who said that having points slowed them down were inclined to reduce their self-report speed more than other points-holders did, which at least indicates some consistency in self-report, and altogether the results suggested that penalty points may have a restraining influence on a substantial proportion of drivers' speeds.

The salience of having penalty points was also noted among reasons TV drivers gave for having changed speed: points weighed with nearly all of them, the fine with nearly two-thirds and the embarrassment of being caught with just over half. The inadvertent speeders were more likely than the others to admit to embarrassment, and manipulators were less likely to attribute importance to any of these reasons for having reduced their speeds.

d) Effects of speed cameras when first installed and over time

At the time this research was commissioned the extent to which drivers might slow down in response to cameras was not known. Statistical aggregate studies of observed behaviour have since provided considerable information on this (e.g. Hooke et al 1996), and our research afforded the opportunity to complement these findings with data on individual drivers' reports of their initial reactions to cameras and their behavioural and perceptual responses over time. A series of four surveys was specifically set up for this purpose in Surrey in hitherto 'virgin' territory, although data from the first Northumbria and West Midland surveys also supplemented the Surrey findings.

The first Surrey survey (S1) was conducted before cameras were installed; the second (S2) was carried out on a fresh sample of drivers two months after installation; the third (S3R) followed up half of the S2 respondents six months after installation, and the fourth (S4R) followed up the other half of S2 eight months after.

Subject to reservations about self-report and retrospective report, results suggested that the advent of cameras was followed by a marked reduction in speeds on the survey roads generally and more substantial reductions when passing the camera sites. In S2 and WM1 nearly two-thirds, and in N1 over three-quarters, of respondents said they kept to the speed limit generally on the survey road, and in each sample at least four-fifths said they did so at the camera, while only tiny minorities said they exceeded 37 mph.

As reported by Surrey drivers, most of the reductions in speed lasted at least eight months and some of it spread to other local side and main roads without cameras. Pattern analysis of individual drivers' reported speed bands in the S3R sample showed that six months after the camera began operation 77% of drivers who before it had exceeded 31 mph were now going more slowly, 91% of those who had complied with the limit were still doing so, and among the whole sample only 1% had speeded up. Results for the S4R sample were similar.

The commonest reasons among drivers who said they had slowed down were 'There may be a bigger risk of being caught than I thought', 'There may be more cameras than I thought' and 'I've seen more camera signs near this road'. Since no more cameras or signs were installed in Surrey between the S2 and S3R surveys (although things were marginally different for S4R), it could be that heightened awareness of speed cameras (perhaps partly as a result of our S2 survey) sensitised some drivers to noting already existing signs or the other operational Surrey speed camera.

All but one of the perceptions, beliefs and attitudes explored remained remarkably stable over the span of the four Surrey surveys. The biggest shift related to the risk of detection (if regularly driving at more than 45 mph on the survey road). Before the camera arrived 66% of S2 thought they were likely to be caught, but two months after it 91% of S2 thought so, with very little change later.

Thus the impact of the camera was greatest when first installed, with speed choice markedly reducing and the perceived risk of detection substantially increasing. These effects were largely maintained at least until the eight months point, although other perceptions and beliefs remained more or less static between the S2 and S4R surveys. Similarly, Surrey drivers' overall positive attitudes to cameras were no less favourable after eight months than before the camera was installed. On the other hand it would be unrealistic to attribute all the encouraging results in the Surrey surveys, including the generalised speed reductions, to the operation of just one camera. Many Surrey drivers may have had increasing experience of cameras in other areas, publicity campaigns against speeding nationally or elsewhere may have unconsciously influenced some to maintain their speed reductions, and another Surrey speed camera became operational on the same route shortly after that at Merrow. Moreover, installation of a red light camera in a nearby town and of a speed camera some miles distant in the S4R reminder phase may have inclined some S4R drivers to think there were more cameras about.

4. Generalisation of Speed Change

Eight surveys addressed the issue of whether camera-induced speed behaviour generalises to other roads which have no indications of cameras. This is of importance because the use of speed cameras is restricted, being considered only when other potential solutions to speed-accident problems have been rejected. Among the fresh surveys, S2 asked drivers whether, since the arrival of cameras on the survey road, they had changed their speed on camera-free roads (main roads and side roads); H2 asked a similar question referring to the arrival of signs; and TV asked a similar question referring to the experience of prosecution. It was found that in S2 and H2 about one in five respondents, and in TV about one in two, said they had reduced their speeds on non-signed roads (and very few had increased them); moreover, the deterred were much more likely than other types of driver to do so.

In the five repeat samples drivers were asked whether since answering the first questionnaire they had changed their speed on the survey road and on camera-free roads. The findings were very consistent: respondents who had slowed down on the survey road were much more likely than others to curb their speed on other roads without indications of cameras, while nearly all the rest, who had made no change on the survey road, made no change on camera-free roads either.

Altogether these results lend strong support to the notion that the deterrent effects of cameras spread to unsigned roads. They contrast with the results of the West London camera study (e.g. Winnett 1994) but are consistent with those of Winnett et al (1997) in Norfolk.

5. Perceptions, Beliefs and Attitudes to Cameras

A particular purpose of our research was to explore drivers' cognitions with regard to the operation of cameras, afforded by the use of self-report. Several of the measures that were examined feed into drivers' perceptions of risk of detection, which is a key variable influencing speed choice behaviour (e.g. Shinar and McKnight 1985). It was found that estimates of threshold speed above which cameras are activated varied little between survey sites or across time, the modal estimate being 35 mph and the next most frequent being 40 mph. While the situation may have changed now, at the time of our surveys a small proportion in each believed that no latitude was allowed to breach the limit, and guesswork informed these 'trigger speed' estimates for a majority in each. The bulk of regular users knew well where camera sites were located along the survey road, the proportion being higher where cameras had existed longer. In five of six surveys, the majority believed at least half the camera housings contained an operational camera; at the time of our surveys the real proportions varied but were generally much lower than this.

In ten surveys the big majority thought the risk of detection for doing more than 45 mph on the survey road over the next three months was high. The other two (with a lower majority) were S1 and H1 where cameras had not yet been introduced, so it seems that the addition of the real thing may raise the perceived risk of

detection. While the site for our signing surveys (in Hampshire) must be borne in mind (it being close to areas where red light cameras were signed and operating), perception of risk appeared to be little lower than where speed cameras were installed, indicating that signs alone, in the experimental context, represented a sufficient objective threat to drivers similar to visible camera boxes.

In the five repeat surveys up to a third of respondents believed the risk of being caught for exceeding a speed limit on other main roads in the county had increased since they were first surveyed. This could have been due to the experimental manipulations where these had occurred (e.g. in Northumbria and West Midlands), or to an increase in objective risk on roads in neighbouring counties where conditions were not controlled during the survey periods. Or it could have been both these factors together with an increased awareness resulting from greater media attention to driving matters including cameras and speeding. It is not possible to distinguish the contribution made by cameras, but it seems very likely, in view of all our findings, that cameras helped to facilitate a generalised perceived threat of detection.

There were several indications that perception of risk was linked with speed behaviour. First, on the survey road the types of driver who perceived the highest risk of being caught (if they were to exceed 45 mph) were the conformers and deterred; manipulators perceived a lower risk, and defiers perceived the lowest risk of all. Secondly, in each of the repeat surveys people who perceived an increased risk of being caught on other main roads were most likely to be among those who described themselves as conformers or deterred on the survey road, while nearly all the manipulators and defiers thought the risk on other roads had not changed. Thirdly, in each repeat survey drivers who perceived an increased risk, whether on the survey road or other main roads in the county, were about twice as likely as those who thought the risk unchanged to have lowered their speeds on any of the three kinds of roads without cameras. The corollary was found in one survey (WM2): people perceiving a lower risk of being caught were more likely than others to drive faster on camera-free roads. These findings together are evidence of a relationship between perceptions of risk and actual speed behaviour.

The big majority of respondents believed that some police action would follow if they were detected by camera, and this perception varied little over time though it did vary somewhat by area. Around three quarters expected that the most likely penalty for doing 45 mph on the survey road would be a fixed one (a speeding ticket). In each survey (except TV) the distribution of responses to the latter question was quite similar to the actual distribution of penalties awarded nationally in 1995, so it appeared that respondents collectively had a realistic idea of the likely consequences of detection for speeding.

Most drivers in each of ten surveys were favourable to cameras, although those who had been caught (in TV) approved less. The proportions holding positive attitudes increased over time. The bulk of manipulators and defiers who had not been caught also expressed attitudes in favour of cameras, which is interesting since their behaviour in response to cameras would suggest otherwise.

While overall the results on perceptions, beliefs and attitudes towards cameras were promising, there may nonetheless be an element of 'preaching to the converted'. The drivers most in favour of cameras, and most fearful and respectful of them, were those who are probably least likely to fall foul of them, i.e. conformers. At the other extreme, those who present the main problem to road safety planners - defiers and manipulators - seem the least respectful and fearful of cameras and least attitudinally influenced by them.

6. Comparison of the Deployment Strategies Used

a) The interventions and the passage of time

While each of the surveys had been designed to be self-standing, responses to some questions could be contrasted over the surveys, enabling a limited comparison of the deployment strategies used. Drivers' reported speeds on the survey road measured before and after the intervention (installation of cameras, erection of signs, publicity, and prosecution) provided the basis for the main comparative analysis in this section. However, the findings are subject to several caveats including the problems associated with self-reported data, retrospective reporting of speeds, and differences within samples and across survey sites (see Chapter 9, section 2(a) for more details).

But taking the results at face value, it was found that all the interventions seemingly had a substantial effect, in lowering the speeds of drivers who had been exceeding the limit, and in reinforcing the intentions of the apparently law-abiding to remain so. For example, among the fastest drivers who reported travelling at 38 mph 'before cameras' in the S2, N1 and WM1 surveys, 34%-41% apparently lowered their speeds to 31 mph and 43%-46% reduced theirs to 32-37 mph, leaving fewer than 20% travelling in the same speed band as before. So the impact of installing cameras was quite substantial on the fastest. The effect of erecting only camera warning signs was a little less, 71% of the fastest N2R drivers reducing their speeds, but for both cameras and signs most of the effect was still present several months later. Fast drivers in Northumbria made more reduction than those in West Midlands. In the TV sample, 73% of the fastest drivers curbed their speeds to 31 mph following prosecution, and only 7% made no reduction, which implies that prosecution apparently had the greatest impact of all.

Altogether the results suggested that prosecution of speeders appears to have the strongest effect in reducing their speeds; installing cameras, or even signs alone, is fairly effective and most of the effect lasts for at least several months; local publicity campaigns may have some effect even if few drivers consciously remember them.

A second analysis using the repeat samples enabled a rough comparison between the apparent effects of publicity and those of the passage of time alone, to see whether, once cameras or signs were in place, a local publicity campaign was any more effective than no further intervention. The findings suggested that (1) most drivers who had responded to cameras or signs by observing the speed limit (or who had always observed it) were likely to continue to do so over the next few months, but a publicity campaign might slightly reinforce their decisions; and (2) about a third or more of drivers who were still above the limit after the installation of cameras or signs might subsequently reduce their speeds, but only a strong publicity campaign (as in Northumbria) would significantly increase the proportion who slow down further.

b) Comparisons by type of driver

Results of a comparative analysis of reported speeds on the survey road, looking at those drivers with scope to slow down (i.e. those whose speed 'before' was 32 mph or more) showed that the superior deterrent effect of prosecution occurred with almost all conformers and deterred and nearly three quarters of manipulators. Defiers were the exception, which would be consistent with the picture of this type as drivers who pay little regard to the threat of cameras. (For defiers the greatest speed reduction apparently followed a publicity campaign although numbers were small so the differences are probably not reliable.)

After prosecution the next most deterrent intervention, for all driver types, was the installation of cameras. Cameras seemed especially effective for those claiming to be deterred, of whom 83% moved into a lower speed band, while 67% of manipulators and 53% of conformers did so. Signs appeared to be the least deterrent strategy for conformers, with only 32% slowing down after their erection, whereas 76% of the deterred moved to a lower speed category. Publicity seemed to influence fewer than half of the possible respondents of any driver type.

Somewhat similar analyses for each driver type were conducted to look at the effects of time on the influence of cameras and on that of signs. While some caution is needed in considering these results, the following observations can be made. For conformers, the deterrent effect of both cameras and signs appeared if anything to have increased between two and six to eight months. For the deterred the effect of cameras hardly changed, but the effect of signs waned somewhat, suggesting perhaps that over time some H3R drivers became more aware that no cameras were actually operating. For manipulators there was apparently little or no change over time with either cameras or signs. For defiers deterrence seemed to have increased, but numbers were too small to be taken seriously.

An analysis comparing the apparent effects of publicity with those of time alone, once cameras or signs had been installed, suggested that the deterred rather than other driver types seemed to have been influenced by a local campaign. Among the deterred who said that after installation they were keeping to the limit it looked as if the campaign helped them to continue doing so, while among those still above the limit there was evidence that the strong Northumbria campaign induced some to slow down further.

In sum, our results suggest that *any* of the measures investigated can be useful in helping to lower drivers' speeds, and most of the effects of installing cameras or signs lasted for several months. Moreover, some speed reduction was reported among all types of driver, not just the deterred, in regard to all deployment strategies. For all types of driver except defiers prosecution appeared to have the strongest deterrent effect; but results are site specific and it is recalled that some TV drivers said they wished to comply with the speed limit but had erroneously believed it to be higher, so some drivers' subsequent reduction in speed may have been due more to the wish to comply than to the deterrent effect of prosecution. The installation of cameras was also effective, with a majority in our samples describing themselves as deterred after the erection of warning signs and cameras. Camera warning signs alone were moderately effective although they induced fewer drivers of all types to curb their speed than did installing cameras. Local publicity campaigns seemingly influenced fewer than half of the speeders, especially manipulators, to slow down but as part of the effort to raise driver awareness of the risks of speeding they probably have merit, contributing to the general climate in which other speed reduction measures can help to moderate drivers' behaviour. Defiers were the most intractable group, the majority remaining uninfluenced by any of the measures.

7. Conclusions and Recommendations

A main finding from our research programme was that, according to self-report measures, camera deployment can reduce drivers' speeds markedly and with lasting effect. As reported by drivers in several surveys the impact of camera installation was substantial, but camera signing alone also produced good speed reduction, although the existence of red light cameras not far away from the signing site may have enhanced drivers' perceptions of the subjective risk of detection there. Prosecution of speeding drivers caught by camera appeared to have the strongest deterrent effect of all the strategies examined. However, the inadvertent speeding of the majority of those caught, some of which was apparently due to believing the speed limit was higher, meant that for an unknown proportion (but less than 54%) the deterrent effects of prosecution may have been more apparent than real.

The two publicity campaigns differed in strength and focus, yet it was difficult to attribute any subsequent speed reductions (which were moderate) directly to their impact, especially since few drivers could recall any specific details of them. However, it was shown in a variety of ways that the local campaigns were likely to have had an indirect effect on respondents' choice of speed, and there was some evidence that they helped to maintain speed reduction among drivers who had initially slowed down in response to cameras. More generally, we conclude that local publicity contributes to wider efforts to raise awareness of the dangers of speed and so plays an important role.

While this research shows that drivers do respond to the threat of detection by camera, it is less certain to what extent they slow down just because they wish to avoid detection (and are behaviourally deterred), or because they have had a change of attitude and realised the dangers of speed (attitudinally deterred). This issue was not examined systematically in the research yet various findings bear on the matter. On the one hand, among the deterred in interview only a minority seemed to have changed their attitudes to speed, and the speed reductions of most of them were mainly motivated by the wish to avoid (further) detection and penalty points. On the other hand, there are the findings that the effects of cameras spread to unsigned roads. Was the generalised threat or anticipation of detection so strong that at least a fifth of drivers on other camera-free main roads in the local area reported reducing their speed because of cameras on the survey road, or was some of that effect attributable to a change of attitude about speeding?

This is impossible to answer from our data. But along with other rather contradictory findings, such as the overall positive attitude to cameras of the majority of defiers and manipulators despite their subversive behaviour, we conclude that attitudes and driving behaviour do not always match, and that modifying attitudes to speed may be more difficult than modifying inappropriate speeds themselves (cf. Rothengatter 1988; DeWaard and Rooijers 1994; Aberg et al 1997).

Despite its apparent crudeness, our four-class typology was found to distinguish ably between the types of drivers we had earlier identified on background characteristics, general driving style and perceptions of cameras. Moreover, results between surveys were consistent and stable, and the bulk of conformers and deterred on the survey road behaved similarly on other roads. More lability was indicated in the case of

manipulators and defiers, suggesting that on less familiar roads a minority behaved as deterred, which raises questions about these defiers' true nature as people who apparently are uncaring about the threat of detection. Indeed, while a very few indicated that nothing would stop them from deciding for themselves how fast to travel, the impression from all our data was that 'everyone has a price' and that provided the threat of cameras remains a potent one, the proportion who ignore them will reduce sooner rather than later.

As fixed-camera sites become better known, it is likely that many of those who are not deterred by cameras (by reducing their speeds all along the survey road) and who prefer to drive faster than the speed limit, will join those who already slow down before a camera site and who accelerate away from it. At one level this may not matter provided any 'bunching' that results is not translated into more accidents than are prevented by cameras - and indeed research confirms that accidents are reduced as a consequence of cameras (e.g. Hooke et al 1996). Yet at another level, it does. The views and behaviour of manipulators, confirmed by interviews with some of them, suggest it is as if the purpose of cameras is not directed at them but at less able and safe drivers who would do well to lower their speeds. If, as seems quite likely given our qualitative findings, manipulating the cameras (to some degree) becomes the social norm, it will become more important to make such drivers realise that they are not excluded from the safety message sent by cameras through their perceptions of being better or safer drivers.

Yet whether drivers continue to be deterred, to defy, to manipulate, or to change between these types depends largely on the perceived potency of cameras. At the time of our surveys between 1994 and 1996, cameras on the survey roads were perceived to be reasonably effective (although less so by manipulators and defiers): most drivers thought that at least half the camera boxes contained a working camera, that there was a high chance of detection (for driving over 45 mph regularly on the survey road over the next three months), and that some police action would follow detection. Yet since then media reports have increased, advising the public that cameras in some areas function at less than full or even at quite reduced capacity. Whatever funding arrangements are agreed in future, if cameras are to retain their deterrent effectiveness then a high subjective risk of detection will need to be maintained, which is less likely if media reports about reduced objective risk continue to circulate.

A similar argument applies to the generalised effects of cameras. Taken at face value, our study indicated that the risk of detection on the survey road spread positively to influence the risk of detection on unsigned roads in the local area together with choice of speed there. A lowering of perceived efficacy of cameras where they are installed could lead to a lower perceived threat of detection elsewhere and an increase in speeds.

Finally, our study has reported valuable findings on the relationship between observed and self-reported behaviour and on the value of self-report itself. Although the results indicated that on balance some drivers have a tendency to report their habitual speeds as lower rather than higher than they actually are, and that the fastest drivers may be most inclined to understate, a weak but statistically significant relationship between observed and self-report speeds was nevertheless found. This finding supports similar results noted in other studies (e.g. Aberg et al 1997; West et al 1993; Parker 1997), and our research joins with these in affirming and commending the use of self-report techniques. However, we do so with a reservation that centres on the tendency, just noted, of many drivers to understate (which is highlighted by the weakness of the correlation between observed and self-reported speeds). It could be that such a tendency in self-report applies to research other than our own and to behaviours other than driving - but such an enquiry was beyond the ambit of our study. Or it could be that in the context of our particular research, the inclination to understate is a reflection of the wider picture of speed culture which we discuss further in section 8. If we consider that in interview many drivers, even conformers, held an elastic notion of 'keeping close to the limit'; that the majority of drivers in the TV survey said they had been speeding inadvertently when caught (though certainly some of these may have thought the limit was higher than it was); and that most people think their driving is above average (e.g. Svenson 1981), it could be that these findings are pointing to the same thing: drivers think that self-reports about speeding do not need to be exact because breaching speed limits is not considered that important (because it is not dangerous when they do it, and anyway they are more skilled than others).

Arising from the above discussion and from points made earlier in the report, we list below our main recommendations for best deployment of cameras based on the findings.

(a) Given that one of the local publicity campaigns mounted as part of this research was weak and unfocused and yet still may have produced some speed reductions indirectly, it appears local campaigns can help keep the risks of speeding and the existence of cameras in the public arena, especially in cumulation with each other and in combination with national efforts.

Indeed, the sustained speed reductions reported by Surrey respondents in an area where no local publicity had been mounted may be partly explained by the general social-cultural climate in which drivers are becoming more sensitised to issues around speed arising from local and national publicity and by media attention. Thus indications were that camera installation can be effective for lasting periods without further local intervention providing that the matter of speed is kept on the public agenda by other means. **It is recommended that local publicity campaigns concerning the operation and existence of speed cameras continue to be mounted even if direct local benefits are not readily apparent.**

(b) The erection of camera warning signs produced good speed reductions in the Hampshire surveys. While some drivers may have been motivated to curb their speeds by the threat of detection even if the camera housings were unseen, others may have been speeding inadvertently and wishing to comply. In other words, seeing camera signing may have reminded some to check their speedometers (as affirmed by interviewees).

Yet because some people in the TV survey had not only been wishing to comply with the limit but thought they *were* complying at the time of detection, **it is recommended that a way be found to remind all drivers of current speed limit conventions and signing rules and to check more frequently their speedometers** to help prevent unintentional speeding. While often suggested, blanket coverage of 30 mph areas with speed limit repeater signs is not the easy solution it might at first appear. Unless a uniform policy of signing on every 30 mph road were applied, inconsistent signing practice might lead to grounds for successful evasion of prosecution. In support of the quest to reduce unintentional speeding, it is noted that a recent survey (Goldenfeld 1997) found that more than half the European drivers taking part said they would find it useful to have an in-vehicle device to help them respect the speed limit.

(c) Although the primary purpose of cameras is to encourage lower speeds without prosecution, not all drivers are duly influenced. In this study, prosecution induced the greatest speed reductions, and seemed especially salutary among intentional speeders, most of whom reduced their speeds on the survey road. And despite paying a fixed penalty most of those caught had overall positive attitudes to cameras, even if they were less favourable and a bit more cynical than those reported in our other surveys. A challenge to the police and the state is to enforce traffic laws consensually without losing the support of the driving public, and despite some concern about the impact of prosecution on speeding drivers detected by camera, overall in this study approval of cameras was lower but still positive among those caught (although the attitudes of non-respondents, whether or not they had been previously caught, could have been different). Moreover, while manipulators who had been detected were relatively few in our research, among such drivers (in TV and the four-survey sample) only a minority expressed an overall favourable attitude to cameras.

As a policy, therefore, reducing camera threshold (trigger) speeds as originally planned and more recently reaffirmed (e.g. Times 16.9.1997) is likely to lead to increased prosecutions but more speed reductions even if some disaffection among those caught prevails (especially among manipulators). Yet reducing threshold speeds will also help to change the perceptions among drivers (and conformers in particular) that they are not breaking the law and are complying when driving up to 10 mph above the limit. At present it is difficult to blame drivers for having liberal interpretations of compliance when some considerable latitude is allowed in the threshold speed. It is as if police and public are operating with the shared belief that one is not breaking the law unless one exceeds it by a substantial margin. Moreover, despite considerable proportions of drivers saying they had always kept to speed limits, many such conformers still reported lowering their speed in response to the deployment strategy used, as if it had nevertheless induced them to modify their conception of compliance. For all of these reasons, **it is recommended that a sustained and uniform policy of reducing camera threshold speeds is proceeded with** as originally envisaged.

In addition, **we suggest that future local publicity campaigns might usefully focus on advising drivers directly of reduced prosecution threshold ('trigger') speeds in the area** to reduce any impression that compliance only begins well above the speed limit, and to retain the level of acceptance of and support for cameras already apparent among the driving public.

(d) In order to maintain and build up the ranks of deterred drivers, the subjective risk of detection must be bolstered, and this bears upon the objective risk. **It is recommended that current resourcing arrangements be reviewed in order to increase the deterrent capability of speed cameras.** In view of our impression from interviews that a small minority (mostly deterred drivers) had come to view speed as more dangerous than previously thought in response to the operation of cameras, continuing public confidence in cameras may eventually help to engender a sea change in attitude towards the desirability of speed. This is another reason to aim for sustaining or enhancing levels of camera operation.

(e) It is our view that many of those who presently 'defy' cameras by deliberately driving fast past them will change to join the 'deterred' or 'manipulators' as such drivers realise that prosecution does result from detection by camera. Some, however, may not change, especially those who can afford to take out insurance policies against disqualification as a result of speeding. Although none surfaced in the present research several did in our earlier study of fast drivers (Corbett, Simon and O'Connell 1998), and in order to curb the speeds of such drivers **it is recommended that such insurance policies against disqualification for speeding be proscribed.**

(f) The primary purpose of cameras is to achieve speed reduction of vehicles on stretches of road with a known speed-related accident problem. One frequent result is manipulating behaviour, encouraged by camera warning signs along the road in question. Manipulation of cameras can lead to a 'concertina' effect, but research so far has found no adverse consequences of this for accident figures (LAAU 1997). The secondary purpose of cameras is to achieve speed reductions generally among drivers, which may prove more difficult although our results on generalised effects are hopeful. Undermining drivers' confidence in knowing the whereabouts of fixed-site cameras not only might reduce the incidence of 'braking and accelerating', but also might bring about lower speeds generally, as indicated by some manipulators and defiers who said they behaved as 'deterred' on other (perhaps less familiar) camera-signed roads. **A policy of reducing the visibility of roadside camera installations is recommended, and linking with (b) above, a policy of combined speed limit and camera warning signs in the target area is recommended.** Some police forces and local authorities have already instituted a policy of widespread coverage by repeater signs in the target area. Signs are considerably cheaper than camera installations, and provided nearby there is some degree of objective risk, our study like others suggests that subjective risk will follow (although this will vary according to the perceived level of objective risk, a matter which has yet to be determined by further research - see Winnett 1995).

(g) A well orchestrated and well focused local publicity campaign advising that police were using mobile cameras to supplement fixed-site ones in a particular area was mounted as part of this research and lasted several months. Although few respondents could recall clear details of its central message, it is likely that this police initiative in Northumbria did contribute to the overall effect, especially as its impact on drivers' behaviour was greater than that of the West Midlands' campaign. Yet while 'mobile' cameras may raise uncertainty as to the risk of detection provided the driving public are made aware of their existence, unless they are used in unattended mode their operation rather defeats a key purpose of cameras which is to free-up police time, and they are costly in terms of already limited police resources. However, **we see no reason why mobile cameras should not have a continuing place in enforcing speed limits even if police do not actually use as many of them as their publicity campaigns might suggest.**

(h) A consistent finding in our surveys was that about three-quarters of respondents thought a fixed penalty (speeding ticket) would be most likely for driving at 45 mph on the 30 mph survey road, and in fact a similar proportion of fixed penalties was awarded in 1995 for speeding breaches (Motoring Offence Statistics, Home Office 1996). However, our earlier study (Corbett, Simon and O'Connell 1998) showed that a fine of ,32 and three penalty points (imposed on a clean licence) would do little to reduce the frequency of exceeding 40 mph in a 30 mph area among fast drivers, unless the likelihood of receiving such a penalty was once in the next one to three months. On the other hand, higher fines combined with penalty points and a high risk of detection would have had more effect, and in the present study having six or more points already on their licence seemed to induce some interviewees to behave as 'deterred'.

Increasing the standard number of penalty points from three to four in conjunction with a conditional offer of a fixed penalty would bring closer the prospect of disqualification unless speed choice was modified, although raising the standard fixed penalty from ,40 (currently) to the proposed ,60 (but see for example

Times, 21.1.99) may do little to deter the fastest drivers. However, in accordance with the principle of 'equality of hardship' rather than 'equality of monetary penalty' underpinning recent revised guidelines for Magistrates' Courts (Magistrates' Association 1997), **it is recommended that wide use be made of powers to impose graduated fines based on declared net weekly income on speeding drivers who come before the courts** (who have usually committed the worst offences), in order that better-off high speeders who are caught might be encouraged to review their speed preferences. If publicity was given to graduated fines, some other speeders might also be deterred by the threat of higher sanctions.

(i) In order to help promote public confidence in cameras and to avoid speculation that cameras are indeed installed as 'a good money-earner', we join with others (e.g. Winnett 1995) **in recommending that camera installation be restricted to sites which have previously experienced a speed-related accident problem or where the potential for accidents is higher than average, such as at roadworks.**

(j) The paradoxical nature of some of our results points up the challenge ahead. For instance, findings indicating that manipulators and defiers had overall positive attitudes to cameras, despite their contrary behaviour, suggest that such drivers believe they are different from other drivers to whom the message of cameras is really directed. **It is recommended that future media campaigns should point out that most drivers think they are better and safer than others which is illogical, and that the message of the danger of speed is directed at all drivers, and does not exclude those who believe they are better.**

8. Wider Implications

Implicit in the discussion throughout this report, and underpinning much of our earlier research, is that the ethos of speed not only permeates discourses on driving, but has infiltrated all aspects of modern life. So tackling the problem of speed on our roads runs counter to the general trend in society where speed is desired, valued and attractive. In this broader picture, attempts to modify drivers' speed by means of enforcement is unlikely ever to be enough (unless maximum speeds are restricted by technology), and a fundamental attitude change to speed on the roads is required. This need is illustrated, for example, by a recent SWOV survey (Goldenbeld 1997) which showed that slightly more than half the European respondents thought that the freedom of car manufacturers to use the appeal of speed in car advertisements should not be restricted; and by the registration of new specialist sports cars in Britain which increased at more than double the rate for new registrations generally between 1992 and 1995, illustrating the attractiveness of such vehicles (from Table 26, Society for Motor Manufacturers and Traders 1996).

Individual inclinations to speed at a particular time and place are motivated by a range of factors such as fun, being in a good mood and being in a hurry, but the most important in our view is that drivers do not see occasions when they exceed limits as dangerous otherwise they would not do it. When they speed they feel they are in control and that little harm will befall them, and these perceptions are strengthened by the fact that negative reinforcement occurs only rarely. But this perception of control is to some extent illusory since, for instance, most drivers think they are more skilful than the average (e.g. Svenson 1981), most believe accidents are more likely to happen to them as passengers than as drivers (Horswill and McKenna 1997), and most think the roads would be safer if everyone drove like themselves (Corbett and Simon 1992: 41).

In addition, individual instances of speeding are carried out against a social backcloth in which several factors interlink. Most drivers speed (DETR 1997; LEX 1997), so it is a consensual activity and a social norm legitimated by other speeders, and in combination with the feeling of being in control leads to few drivers perceiving speeding as serious, harmful, criminal or immoral (Corbett and Simon 1992: 37-41, 75-6). Difficulties of achieving widespread enforcement have already been noted, but the message picked up by drivers from this could be that some speeding is condoned, especially given the latitude in camera thresholds. And when drivers are detected, unless disqualification is imposed outright or under the 'totting' rules, fixed penalties are not perceived as particularly onerous (Corbett, Simon and O'Connell 1998: 20, 46), and it remains to be seen what use is made by courts of new guidelines to match income with monetary penalties. This is all set against a backdrop where motor vehicle manufacture is encouraged and is indeed a measure of the country's economic health, and where the demand for production of high performance vehicles is not discouraged by the state. However, slightly at odds with this is the state's active promotion of the message that speeding is serious: this contradiction suggests that the purchase of new fast cars is approved but that new owners must drive slowly in them.

So although we conclude that the proliferation of speed cameras is an important means by which to raise drivers' awareness of the dangers of speed and of inadvertent speeding, ultimately more than this and other forms of speed limit enforcement will be required in order to modify drivers' views on speed. Attention will need to be given to factors associated with overconfidence in being in control and with the broader social climate in which our car culture is embedded.

11. Drivers' beliefs about the accuracy of their speedometer were not explored in this research but these might have subtly influenced some drivers' perceptions of real speeds chosen (and reported to researchers), possibly accounting for some inconsistency between reported and observed speeds.

12. It must be remembered that all the TV sample were surveyed after having been caught. So the question about their normal speed before prosecution was answered retrospectively, and the question eliciting driver type referred to their response to cameras since the prosecution experience.

Tables 1 - 5

Table 1: Selected background characteristics of the 12 samples

Sample	S1	S2	S3R	S4R	TV	N1	N2R	WM1	WM2 R	H1	H2	H3R
Whether fresh or repeat	fresh	fresh	repeat of half S2	repeat of other half S2	fresh	fresh	repeat N1	fresh	repeat WM1	fresh	fresh	repeat H2
Max N	678	1696	504	405	594	1072	690	779	536	901	1159	586
Gender % female	40	40	46	45	39	22	22	46	45	37	38	42
Age %												
17-25	11	11	5	12	9	9	8	12	9	13	12	11
26-55	69	62	61	62	75	70	66	67	65	72	68	68
56+	20	27	35	26	16	22	26	21	25	16	19	20
Driving expce years (median)	22	24	28	24	20	23	25	20	21	18	20	20
Offending score¹ mean	48.8	46.8	45.8	45.8	42.4	39.5	37.6	42.7	42.0	47.8	48.5	42.2
Speeding score¹ mean	43.5	44.9	42.8	42.7	47.9	36.8	35.5	44.8	44.7	42.2	41.6	38.5
Use of survey road %												
rare	16	17	5	5	29	16	13	6	5	5	7	4
infrequent (<= once a week)	35	44	48	46	52	47	49	28	28	41	45	43
regular (>=2 days a week)	49	39	47	49	19	37	38	67	67	54	48	53
Any penalty points on licence? % yes	12	12	9	11	(100)	17	15	9	8	14	14	13
Accident in last 3 years? % yes	24	22	20	24	22	19	20	21	21	21	22	22

Notes: 1. Offending and speeding scores were calculated for each respondent as in our previous research: see Corbett and Simon 1992: 8.

Table 2: Surrey surveys: self-report speeds on the survey road generally

Time to which speed refers	Sample	SR speed (mph)	n (100%)
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		<=31 %	32-37 %	>=38 %	
Before camera	S1	37	46	17	521
	S2 (retrospective answers)	27	48	25	1154
2 months after camera	S2	65	30	5	1247
	S3R (their S2 answers)	65	32	3	439
	S4R (their S2 answers)	63	31	6	348
6 months after camera	S3R	70	28	2	371
8 months after camera	S4R	66	30	5	287

Notes

1. S2 speed 'before camera' reported **retrospectively**. All other speeds reported **contemporaneously**.
2. 'Before camera' means before July 1995 (see Chapter 7 section 1).
3. 2 months after camera: differences between S2, S3R and S4R not significant.
4. 2 months after (S2, S3R or S4R) compared with before (S1 or S2): difference highly significant ($P < .0001$). There is a substantial drop in speed after camera installation.
5. 6 months after (S3R) compared with 2 months after (S3R): there is a further slight drop in speed, but it is not significant.
6. 8 months after (S4R). S4R at 8 months have slightly higher speeds than S3R at 6 months, but the difference is not significant. S4R speeds at 8 months are not significantly different from speeds of S2, S3R or S4R at 2 months. S4R speeds remain much lower than those of either S1 or S2 before cameras ($P < .0001$). So the substantial drop in speed has been maintained.

Table 3: Comparisons of the four driver types (self-report) on each of the attitude statements A-H, using samples S2, N1, WM1 and H2 added together
Percent showing attitude favourable to cameras

Statement	Conformers	Deterred	Manipulators	Defiers	Main contrasts ¹
	n=1478-1486 %	n=1567-1576 %	n=213-214 %	n=144-146 %	most fav'ble - least fav'ble
A Fewer accidents are likely to happen on roads where cameras are installed	67	70	53	45	(C+Dt) : M : Df
B Cameras mean that the government is gaining too much power over drivers	56	53	43	58	(C+Dt) : Df : M
C Cameras mean that dangerous drivers are now	81	78	63	67	C : Dt : Df : M

more likely to get caught					
D Cameras are an easy way of making money out of motorists	49	42	36	51	(C+Df) : Dt : M
E Cameras are meant to encourage drivers to keep to the limits, not punish them	85	84	74	68	(C+Dt) : M : Df
F Cameras are a new way to harass drivers	66	62	50	60	C : Dt : Df : M
G Cameras are an accurate way of detecting drivers' speeds	78	76	69	63	(C+Dt) : Df : M
H On roads with cameras the enjoyment is taken out of driving	67	55	42	55	C : (Dt+Df) : M

Note 1. All main contrasts shown are statistically significant at $P < .001$. The significance tests took into account not only the proportions shown but also those of neutral and unfavourable responses.

Table 4: Comparison of ten situations, using self-report speeds on the survey road before and after

Sample, and situation under study	Speed before ¹ (mph)	Speed after ²			n (100%)
		≤ 31 %	32-37 %	≥ 38 %	
S2					
before/2 mos after installation of cameras	≤ 31 32-37 ≥ 38	96 62 34	4 38 46	- <1 19	305 549 289
S3R					
before/6 mos after installation of cameras	≤ 31 32-37 ≥ 38	92 73 30	8 26 56	- <1 4	83 182 70
S4R					
before/8 mos after installation of cameras	≤ 31 32-37	89 64	9 35	3 1	70 122

	>=38	37	49	13	67
TV					
before/after prosecution (fixed penalty)	<=31	99	1	-	101
	32-37	91	9	-	176
	>=38	73	20	7	122
N1					
before/after installation cameras	<=31	99	1	-	400
	32-37	65	34	1	286
	>=38	37	43	20	89
N2R					
before/after publicity campaign	<=31	90	9	<1	390
	32-37	51	44	6	87
	>=38	39	28	33	18
WM1					
before/after installation of cameras	<=31	99	1	-	115
	32-37	75	25	-	250
	>=38	41	46	13	264
WM2R					
before/after publicity campaign	<=31	84	13	2	305
	32-37	28	66	6	138
	>=38	23	38	38	26
H2					
before/2 mos after erection of signs	<=31	96	4	-	370
	32-37	49	51	<1	395
	>=38	25	44	31	140
H3R					
before/6 mos after erection of signs	<=31	90	10	<1	155
	32-37	50	47	3	176
	>=38	24	50	26	66

Notes

1. 'Speed before' was reported **retrospectively** in all samples except N2R and WM2R. In these two samples it refers to speed after the installation of cameras but before the publicity campaign, as reported contemporaneously by those N1 and WM1 respondents who later responded to the N2R and WM2R surveys.
2. 'Speed after' was reported **contemporaneously** in all samples.
3. Both speeds refer to speed in free-flowing traffic along the survey road generally, not just when passing any camera there.

4. In all samples except TV, these analyses omit cases where the respondent had been caught speeding by camera.

Table 5: Comparison of deterrent effects of four experimental situations, for each driver type

Driver type (SR)	Situation				Significant differences	
	cameras (S2+N1+WM1)	signs (H2)	publicity (N2R+WM2R)	prosecution (TV)	most deterrent	least deterrent
Conformers n % who slowed	32 53	133 32	48 46	53 92	pros : (cams + pub) : signs	
Deterred n % who slowed	992 83	258 76	120 43	188 96	pros : cams : signs : pub	
Manipulators n % who slowed	166 67	33 42	44 23	33 73	(pros + cams) : (signs + pub)	
Defiers n % who slowed	65 22	54 9	23 48	4 25	pub : (cams + pros) : signs	

Notes

1. n is the number of drivers whose self-report 'speed before' on the survey road was 32 mph or more.
2. '% who slowed' is the sum (as % of n) of (i) those for whom 'speed before' was 32-37 mph and 'speed after' was ≤ 31 mph, and (ii) those for whom 'speed before' was ≥ 38 mph and 'speed after' was ≤ 31 mph or 32-37 mph.
3. Most differences shown in the last column are significant at $P < .001$ (and all are significant at $P < .05$).

Appendix A: Statistical Tests Used in the Data Analysis

Statistical tests were all 2-tailed and most statistical findings shown were significant at the level at least of $P < .05$ (and many were significant at much higher levels). The tests used were as follows:

Correlation between observed and self-report speeds: Kendall's tau b.

Changes over time (or during the experimental situation) in self-report speeds (e.g. Table 2): between-drivers, Mann-Whitney U test; within-drivers, Wilcoxon matched-pairs signed-ranks test. Pattern analyses (e.g. Ch.4, S.2b, H3R sample): Wilcoxon matched-pairs signed-ranks test.

Changes over time (or during experimental situation) in perceptions of likelihood of being caught (e.g. Ch.8, S.2d), estimates of trigger speed (e.g. Ch.8, S.2a), likelihood of police action (e.g. Ch.8, S.2e), likely penalty (e.g. Ch.8, S.2f): between -drivers, Mann-Whitney U test; within-drivers, Wilcoxon matched-pairs signed-ranks test. Changes over time in overall attitude (e.g. Ch.8, S.3b): chi-square for comparing samples, or parts of samples, that were independent. Tests involving ranking or pairing individuals were not feasible because of the construction of the measure of overall attitude.

Chi-square tests were used for all other statistical links and comparisons tested, of which major examples are the following:

- Comparisons of self-report driver types (Ch.3, S.3) and of observed types (Ch.3, S.5)
- Relationships between drivers awareness of publicity and other variables (Ch.5, S.2c, 4c, 4f)
- Responses of TV drivers compared with others (Ch.6, S.5a, 5b)
- Differences in responses between driver types (Ch.8, S.2a, 2c, 2d, 2e, 2f)
- Differences in attitudes between driver types (Ch.8, S.3c, Table 3)
- Comparison between strategy groups in respect of proportion of drivers lowering speed (Ch.9 S.2a, 2b, 3a and Table 5)
- Association between reduction of speed on survey road and reduction on other roads (Ch.9, S.4).

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Acknowledgements

The research which forms the basis for this report was funded by the Department of Environment, Transport and the Regions, and the authors are grateful for the support, help and co-operation given in particular by Elaine Forsyth and Superintendent David Rowe of the Road Safety Division. In addition, the support of Dr Graham Grayson of the Transport Research Laboratory throughout the study was extremely welcome, and the help of Dr Alan Quimby and his team in sampling drivers for the surveys is also gratefully acknowledged.

Five police forces - Hampshire, Northumbria, Thames Valley, Surrey and West Midlands - gave generously of their time in helping to set up the various camera deployment strategies, and we are very grateful to their senior officers for participating in the research. We would like to thank the many operational and civilian officers who were involved in administering these strategies and in assisting with the sampling of drivers. We are especially appreciative of the help given by Brian Pritchard and his team at Thames Valley Police who also helped with mailing out questionnaires.

Over six thousand drivers completed at least one questionnaire, and without their time and energy the research could not have been undertaken. Those who agreed to be interviewed are specially thanked.

On the home front, we were ably assisted in the earlier stages by Jeff Crick, who helped design the questionnaires, who liaised with police and Transport Research Laboratory personnel in gathering samples of drivers, who co-ordinated the mailshots of thousands of letters and questionnaires and who oversaw the subsequent data processing arrangements. In sum, Jeff was responsible for the day to day running of the survey programme and we are grateful to him. Dr Brian Block carried out the interviews around the country. Amanda Kemmish deserves thanks for moral support and practical assistance in the early data analysis stages, and we would like to express our thanks to Dorothy Corbett, Amanda Crew and Jenny Deiches for their time in helping with our administrative burden.

Abstract

This study set out to examine the effects and effectiveness of various strategies related to the deployment of speed cameras, and to explore how different types of driver responded to cameras and perceived their operation. Recommendations for best deployment were to be considered. It was carried out between 1993 and 1996 after the Road Traffic Act 1991 authorised the use of automatic speed devices for the detection of offences. A series of 12 surveys arranged in five sets and having some cross-sectional and some longitudinal elements was undertaken together with some depth interviews, and self-report measures predominated. Five police forces helped to set up the research. In total 6879 drivers took part. The particular interventions focused upon comprised camera signing alone; two kinds of publicity campaign linked with speed camera deployment; prosecution following detection by speed camera; and the effects of cameras when first installed and over time.

A main finding from our research was that, according to self-report measures, camera deployment can reduce drivers speeds markedly and that cameras on the survey roads were perceived to be reasonably effective. Our results suggested that *any* of the measures investigated can be useful in helping to lower drivers' speeds, and most of the effects of installing cameras or signs lasted for several months. Moreover, some speed reduction was reported among all four types of driver investigated, not just those describing themselves as deterred, in regard to all deployment strategies. Overall, prosecution appeared to have the strongest deterrent effect, but results were site specific. The installation of cameras also had a pronounced effect, and camera warning signs alone were moderately productive. Local publicity campaigns seemingly influenced fewer than half of the speeders to slow down, but as part of the effort to raise driver awareness of the risks of speeding they probably have merit. Those who said cameras had made little difference to their speed choice were the most intractable group, the majority remaining uninfluenced by any of the measures. Despite the behaviour of some of them, most drivers expressed favourable attitudes towards cameras.

Implicit in the report is that the ethos of speed not only permeates discourses on driving, but has infiltrated all aspects of modern life. So tackling the problem of speed on our roads runs counter to the general trend in society where speed is desired, valued and attractive. In this broader picture, enforcement of speed limits is unlikely ever to be enough, and a fundamental attitude change to speed on the roads is required. Thus although we conclude that the proliferation of speed cameras is an important means by which to raise drivers' awareness of the dangers of speed and of inadvertent speeding, ultimately more than this will be required. Attention will need to be given to factors associated with overconfidence in being in control and with the broader social climate in which our car culture is embedded.