



# GoSafe – safety camera statistical analysis report

Produced by the Local  
Government Data Unit ~ Wales

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July 2015



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## Executive summary

The analysis in this report uses data on collisions and speed surveys associated with speed cameras in Wales. Not all road safety cameras are speed cameras. For example red light cameras are not included in this analysis.

**There is evidence to suggest that speed cameras in Wales reduce both the speed of vehicles and the number of Fatal or Serious Collisions in their vicinity**

The findings below refer to the roads in the vicinity of speed cameras which are included in the analysis and do not refer to the whole of Wales.

### Collisions

The analysis suggests that Personal Injury Collisions had increased in the years before speed camera establishment. Following establishment there is evidence that it has **decreased**.

There was also evidence to suggest that the number of Fatal or Serious Collisions had increased in the years before speed camera establishment. Following establishment the analysis suggests that these **collisions reduced by around 17%**.

### Speed

The analysis of speed survey data suggests that the establishment of speed cameras **reduces the speed of traffic** in their vicinity. Before speed camera establishment nearly 70% of traffic in these areas was travelling over the speed limit. Following establishment this reduced to around 27%.

Around 14% of locations showed an increase in the speed of traffic following establishment of a speed camera site. In all but one case these were where Mobile speed cameras were used. The analysis was unable to take all the available speed survey data into account which may have had an impact on the findings.

### Fixed and Mobile speed cameras

The analysis of **Fixed** speed cameras showed a **reduction in the overall number of collisions** in their vicinity and there is evidence that their presence may reduce Fatal or Serious Collisions by around 46%. Following camera establishment around 12% of traffic was travelling over the speed limit at these locations. This is a reduction of 38 percentage points.

In the years before **Mobile** speed cameras were established there is

evidence that the number of collisions had increased. Since establishment the analysis suggests that there may be a reduction in the number of Personal Injury Collisions. There is also evidence of a **reduction in the percentage of traffic travelling over the speed limit** in the vicinity of Mobile speed cameras. However, around 50% of traffic is still traveling over the speed limit at these locations following establishment of a mobile speed camera site.

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## Background

- 1 The strategic aim of GoSafe is to make people safer on Welsh roads by reducing casualties and saving lives. This includes collating collision data associated with road safety cameras as well as speed survey information. In January 2015, GoSafe commissioned the Local Government Data Unit ~ Wales (the Data Unit) to analyse this data to determine if there has been a change in the number of collisions in the vicinity of speed cameras since establishment.

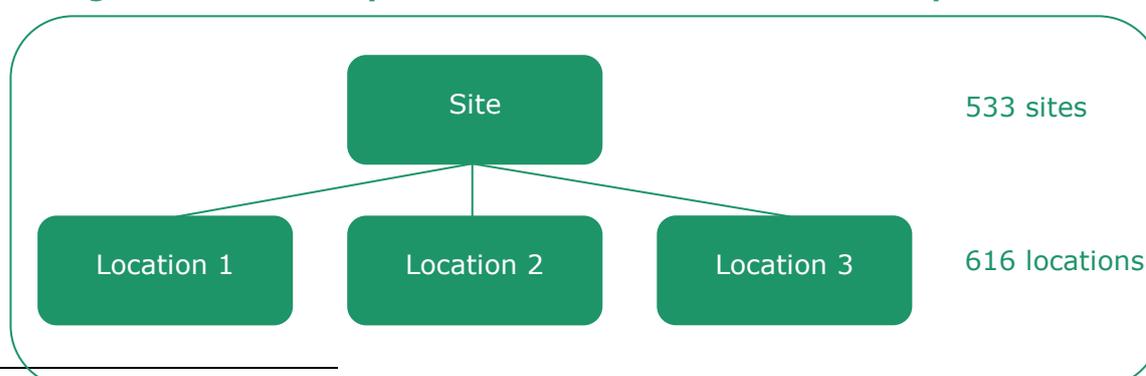
### Approach

- 2 Guidance on the use of speed camera data was proposed by Professor Richard Allsop (University College London) for the RAC Foundation in 2013<sup>1</sup>. This included a methodology for local authorities and other road safety partnerships to use in order to analyse their data. It uses a generalised linear model (GLM) to estimate the change in the number of collisions in the vicinity of speed cameras before and after establishment, across the partnership area as well as in the vicinity of individual speed cameras. Further detail on the purpose and specification of the GLM can be found in Appendix A.
- 3 The method considers the number of Personal Injury Collisions (PICs) and also the number of Fatal or Serious Collisions (FSCs). In 2011 the Department for Transport recommended that speed camera data for England should be publicly available. Allsop's report gives the findings of the analysis for several English partnership areas, where data was available, and this report gives the findings for the equivalent data for Wales.
- 4 The database provided by GoSafe contains collision and speed information from 1996 to 2013 for active Fixed and Mobile safety cameras in Wales. The locations of the safety cameras are available on the GoSafe website ([www.gosafe.org](http://www.gosafe.org)). Due to the number and locations of safety cameras in Wales, the analysis is for Wales as a whole as any analysis at a lower level, such as local authority, would not be robust.

### Road safety camera information and data

- 5 GoSafe provided a database containing information on road safety camera sites and locations in Wales that could be considered for analysis. The database contained 533 road safety camera sites where at least one camera is located. Some sites will contain more than one camera and therefore the database contained 616 locations. This structure is shown in Figure 1.

**Figure 1: Road safety camera site and location relationship**



<sup>1</sup> "Guidance on the use of speed camera transparency data", Allsop, R (November 2013)

[http://www.racfoundation.org/assets/rac\\_foundation/content/downloadables/speed\\_camera\\_data\\_revised-allsop-nov2013.pdf](http://www.racfoundation.org/assets/rac_foundation/content/downloadables/speed_camera_data_revised-allsop-nov2013.pdf)

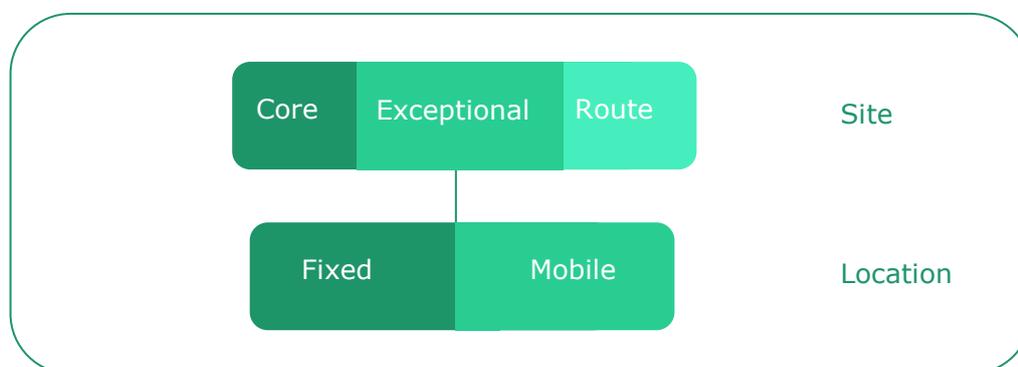
## Road safety camera sites

- 6 Road safety camera sites are classified as: **Core**, **Exceptional** or **Route**.
- 7 **Core** sites are established as a result of a Fatal or Serious Collision (FSC) occurrence in the vicinity of the site and an appropriate baseline survey period of observation.
- 8 **Exceptional** sites are established as a result of community concern and an appropriate baseline survey and do not require FSCs to have occurred in the vicinity.
- 9 **Route** sites are located on a longer stretch of road than other sites. There are two Route sites in Wales and these have not been included in the analysis.

## Road safety camera location

- 10 There are two types of road safety camera location: **Fixed** and **Mobile**. The analysis has been split, where possible, to consider these separately as well as together, as they are operated differently. This structure is shown in Figure 2.

**Figure 2: Road safety camera site and location classification**



- 11 Not all road safety cameras are speed cameras. For example, a red light camera is not a speed camera.
- 12 For each analysis considered in this report it will be made clear which of the road safety camera sites and locations were included.

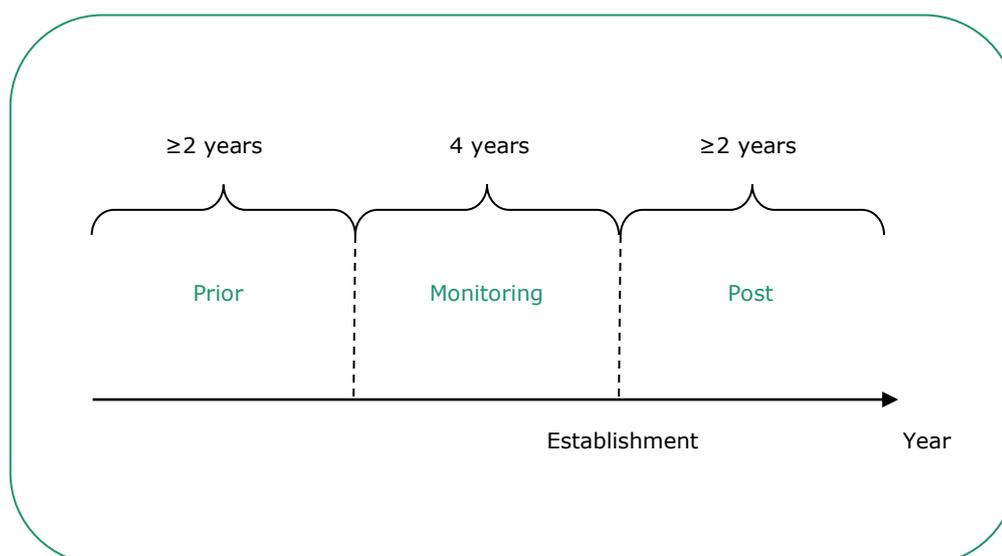
## Collision analysis

- 13 **Collision** data is associated with a stretch of road and therefore is attributed to a road safety camera site, not to a speed camera location. Where a site has more than one road safety camera location associated with it, it is not possible to know which of the road safety camera locations the collision data should be attributed to; for example if speed cameras are located on both sides of a dual carriageway. Therefore only road safety camera sites that have a single speed camera location associated with them have been used in this analysis.
- 14 As Exceptional road safety camera sites are not necessarily established as a result of collision information they have not been included in the collision analysis.

### Data requirements for the collision analysis

- 15 Allsop's model estimates the change in the number of collisions in the vicinity of a speed camera following its establishment. This is done by splitting the collision data into three distinct time periods. These are shown in Figure 3.

**Figure 3: Time periods considered by Allsop's model**



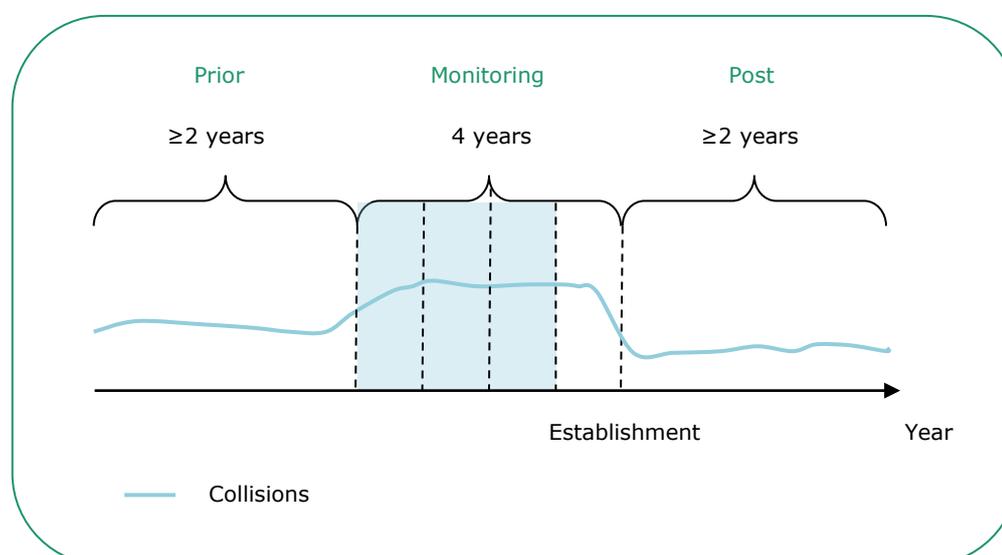
- 16 Before a road safety camera site or location is established a period of monitoring begins at the site or location. It is during this time that the number of collisions is likely to be at its highest. This is because the site has been identified as potentially having an increase in collisions that would mean establishment of a speed camera site should be considered. The model requires that there are a number of years of collision data available before the establishment of the speed camera. Ideally, all the collision data available before establishment would be included in the model, however some speed cameras were established soon after the availability of collision data (1993). If a speed camera site does not have at least six years of collision data associated with it before establishment then it has not been included in the analysis.
- 17 Similarly, there needs to be a sufficient number of years of collision data available post speed camera establishment to ensure that any change in collision rate is properly estimated. If a speed camera site did not have at least two years of collision data post establishment it has not been included in the analysis.

- 18 In summary, to be included in the analysis speed camera sites had to meet the following requirements:
- it must be a Core site;
  - there must be only one speed camera location associated at the site (single location site);
  - there must be at least six years of collision data available for the site before speed camera establishment; and
  - there must be at least two years of collision data available for the site post speed camera establishment.
- 19 From the 533 speed camera sites included in the database 298 were Core camera sites, of which, 251 were camera sites with only one speed camera location. Of these, 227 sites had sufficient collision data available to be included in the collision analysis. This comprised of 55 Fixed speed camera sites and 172 Mobile speed camera sites.
- 20 The model was run using data for the number of Personal Injury Collisions (PICs) and the number of Fatal or Serious Collisions (FSCs) for all suitable speed camera sites.

### Personal Injury Collisions (PICs)

- 21 The number of Personal Injury Collisions (PICs) at speed camera sites will vary from year to year. This is taken into account by the model and it also takes account that there is likely to be more collisions in the years just before speed camera establishment. The model will estimate the change in the number of PICs in relation to the prior period. This is shown in Figure 4.

**Figure 4: Time periods considered in the model**



- 22 The model estimates that there were 17.2% more PICs at sites where speed cameras were established in the first three of the four years of the monitoring period compared to the prior period.
- 23 It also estimates that there were 3.2% less PICs in the vicinity of camera sites following speed camera establishment compared to the prior period. However, there is uncertainty associated with these estimates because of the random variation in the number of collisions and the estimated percentages could range between 12.0% less and 6.5% more. This means that there could be between

12.0% less and 6.5% more collisions that involve personal injury than would be expected in the prior period.

- 24 Therefore, whilst there was an increase in the number of PICs at camera sites where speed cameras were established in the monitoring period there has been a decrease in the number of PICs in the vicinity of these sites since establishment.
- 25 As there is uncertainty associated with the estimates it is possible that this decrease may return the number of collisions to similar levels observed before the monitoring period. Similarly, it is possible that the estimated decrease in PICs in the vicinity of speed cameras after they were established may result in a substantial reduction in the number of collisions.

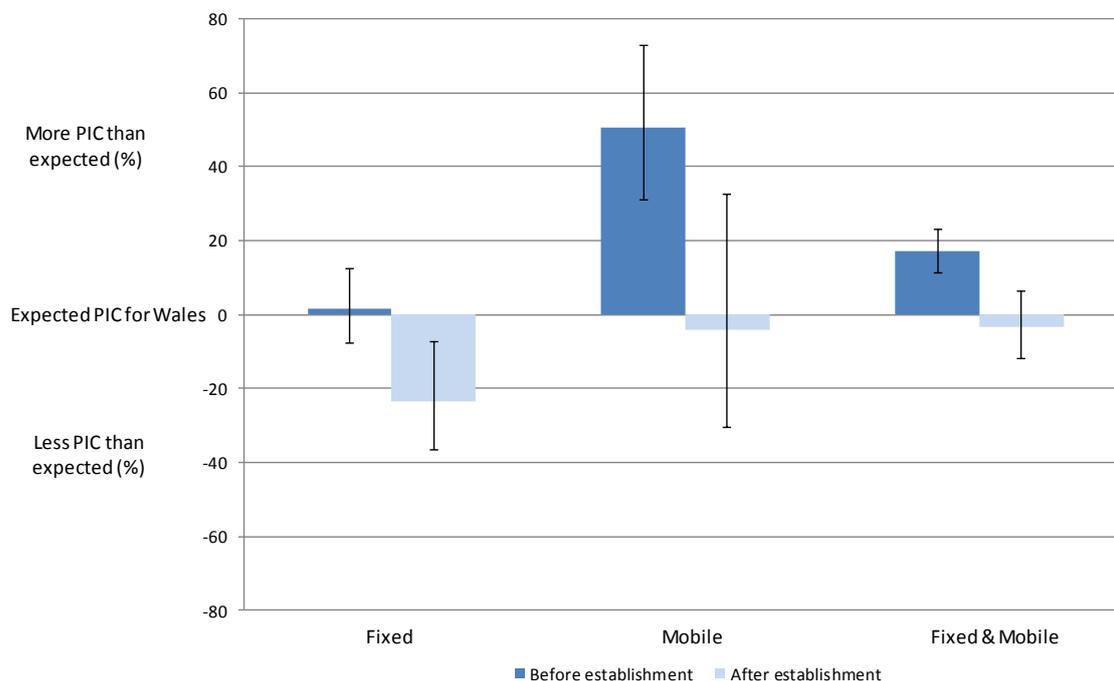
### Fixed camera sites

- 26 At Fixed camera sites the model estimates that there may have been an increase in the number of PICs in the vicinity of sites where speed cameras were established in the first three of the four years of the monitoring period. This increase is estimated at 1.7% compared to the prior period. The uncertainty associated with it mean it could range from an increase of 12.3% to a decrease of 7.9%.
- 27 The estimated percentage change in the number of PICs in the vicinity of sites after a speed camera was established is a decrease of 23.3% compared to the prior period. The uncertainty associated with it mean the estimate could range from a 36.5% decrease to a 7.5% decrease in the number of PICs.
- 28 This suggests that there was probably little change in the number of PICs in the vicinity of Fixed camera sites in the relevant years prior to establishment. However, there is a reduction in the number of PICs in the vicinity of Fixed camera sites after establishment relative to the number of PICs in the prior period.

### Mobile camera sites

- 29 For Mobile camera sites the model estimates that there was an increase in the number of PICs in the vicinity of sites where speed cameras were established in the first three of the four years of the monitoring period. This increase was estimated to be 50.5% compared to the prior period. The uncertainty associated with it mean it may have ranged between a 31.0% and a 72.8% increase.
- 30 The estimated percentage change in the number of PICs is a decrease of 4.1% compared to the prior period. However, the uncertainty associated with the estimates mean this could range from a 30.7% decrease to a 32.7% increase. This wide spread of estimated change reflects the range of observed changes at the camera sites used in the analysis.
- 31 This suggests that there was an increase in the number of PICs in the vicinity of Mobile camera sites in the monitoring period compared to the prior period. Since establishment the number of PICs may have decreased. However, the uncertainty associated with the estimates ranges greatly and it may only suggest a slight decrease compared to levels during the monitoring period or a decrease in PICs compared to those prior to establishment.
- 32 The estimated percentage change in PICs for Fixed camera sites, Mobile camera sites and both Fixed and Mobile camera sites is shown in Figure 5. The lines on the bars represent the uncertainty associated with the estimates. Where the bars and lines are above zero there is an increase in the number of PICs and where they are below zero there is an estimated decrease in the number of PICs. The expected number of PICs relates to the number that was recorded at other sites in the partnership area (Wales) in the prior period.

**Figure 5: Estimated percentage change in the number of Personal Injury Collisions (PICs) for Core single location sites by type**

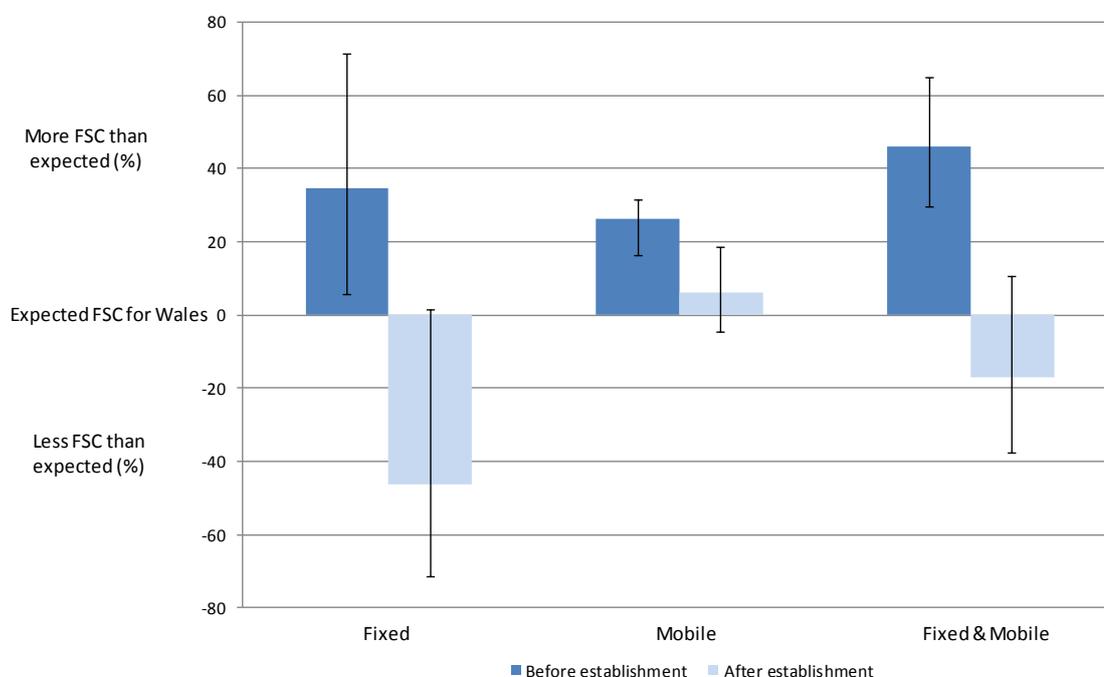


### Fatal or Serious Collisions (FSCs)

- 33 The number of Fatal or Serious Collisions (FSCs) will be a small proportion of the number of PICs. This means that the estimates produced by the model may have more uncertainty associated with them.
- 34 When all suitable camera sites are used in the model it estimates that there was an increase in the number of FSCs in the vicinity of speed camera sites in the first three of the four years of the monitoring period. This is estimated to be a 46.2% increase compared to the prior period. The uncertainty associated with the estimate mean it could range from a 29.6% increase to a 64.9% increase.
- 35 Since establishment there was an estimated 17.2% decrease in the number of FSCs in the vicinity of speed camera sites compared to the prior period. The uncertainty associated with the estimate mean this could range from a 37.9% decrease to a 10.6% increase.
- 36 Therefore there is evidence to suggest that there was an increase in the number of FSCs in the monitoring period compared to the prior period. There is also evidence to suggest that there was a decrease in the number of FSCs in the vicinity of speed camera sites post establishment
- 37 The model estimates that in the vicinity of Fixed camera sites the number of FSCs increased by 34.5% in the first three of the four years of the monitoring period compared to the prior period. The uncertainty associated with this estimate mean that it may range from a 5.6% increase to a 71.3% increase.
- 38 The model also estimates that there was a 46.2% decrease in the number of FSCs in the vicinity of Fixed camera sites following establishment compared to the prior period. The uncertainty associated with the estimate mean that this ranges from a 71.5% decrease to a 1.4% increase.
- 39 Therefore there is strong evidence of a reduction in the number of FSCs in the vicinity of Fixed speed cameras post establishment.

- 40 When considering Mobile camera sites the model estimates that there was a 23.6% increase in the number of FSCs in the vicinity of the sites in the first three of the four years of the monitoring period compared to the prior period. The uncertainty associated with the estimate mean that this could range from a 16.4% increase to a 31.4% increase.
- 41 The estimated percentage change in the number of FSCs for Mobile camera sites post establishment is a 6.2% increase compared to the prior period. The uncertainty associated with the estimate mean this could range from a 4.9% decrease to an 18.6% increase in the number of FSCs at Mobile camera sites post establishment.
- 42 Therefore there is evidence to suggest that the number of FSCs increased at Mobile camera sites in the monitoring period and that it may have increased post establishment compared to the prior period.
- 43 The estimated percentage change in FSCs for Fixed camera sites, Mobile camera sites and both Fixed and Mobile camera sites is shown in Figure 6.

**Figure 6: Estimated percentage change in the number of Fatal or Serious Collisions (FSC) for Core single location sites by type**



## Summary

Overall, there is evidence to suggest that there is a reduction in the number of PICs and FSCs in the vicinity of Core camera sites in Wales following establishment compared to the prior period. However, the uncertainty associated with these estimates allows for the possibility that this reduction merely returns the number of collisions to levels experienced elsewhere across Wales in the prior period.

The analysis suggests that there is evidence that the number of PICs in the vicinity of Fixed camera sites are reduced following the establishment of a speed camera compared to the prior period. It would also suggest that there is a substantial reduction in FSCs following establishment compared to the period prior to establishment.

The evidence for Mobile speed camera sites is less clear. Mobile speed camera sites may help to reduce the number of PICs as these were shown to increase in the relevant years during the monitoring period.

It is important to note that this analysis has been conducted on the information that was available and some sites were not included in the analysis due to a lack of data, change of circumstance or other reason. The analysis also required a known date of establishment to determine the year in which the speed camera was operational. This was not available and a date of approval for the speed camera site was used as a proxy. In most cases this is unlikely to have influenced the year of establishment, but in some cases may have.

The data used in the analysis represents 37% of all camera sites in Wales and 76.2% of Core location speed camera sites.

The camera sites that were excluded were Exception sites, Route sites, those where multiple speed camera locations were present at a site or there was insufficient collision data before or after establishment of the speed camera at the site.

## Speed survey analysis

44 Speed surveys are conducted at various times and are associated with speed camera locations. One or more speed surveys will be conducted at a location before a speed camera is established (the baseline survey) and one or more speed surveys will be conducted after speed camera establishment.

### Mobile site evaluation

45 All sites are prioritised on a RAG strategy (Red, Amber, Green); with Red sites being visited at least five times within a monthly period, Amber sites three times, and Green sites twice. Each visit can last from 1 hour to 1.5 hours. The frequency and timing of the site visit is likely to have a significant impact on public perception of risk of detection, and therefore driver's speed choice.

### Speed survey data

46 Speed survey data is obtained to assist evaluation and vehicle speed monitoring data (using seven day traffic data) will be variable between years. Such variations can occur as a consequence of local traffic conditions, or indeed weather and road conditions.

47 There are several statistics that are produced from a speed survey. These are:

- 85<sup>th</sup> percentile speed;
- percentage of traffic over the speed limit; and
- percentage of traffic 15 mph over the speed limit.

### Data requirements for the speed survey analysis

48 To be included in the speed survey analysis each speed camera location needed to meet the following criteria:

- it must be a Core speed camera site;
- it must be a Fixed or Mobile speed camera location (not a Red light camera);
- there must be at least one speed survey before establishment; and
- there must be at least one speed survey after establishment.

49 Where data for more than one speed survey exists, either before or after establishment, it is necessary to take account of the multiple readings; for example by averaging them.

50 Of the 616 road safety camera locations in Wales there were 541 locations in the database that included speed survey information. Of these 298 were Core camera sites and within these 22 were Red light camera locations and were not suitable for the speed survey analysis. Of the remaining 276 suitable speed camera locations only 59 Fixed and Mobile camera locations had at least one survey before and after establishment of the speed camera. Where there was an insufficient number of speed surveys the majority of these were missing a speed survey prior to establishment. Of these more than 90% were established during or before 2004. Of the speed cameras with sufficient speed tests 30 were Fixed camera locations and 29 were Mobile camera locations. The speed limit of the camera site was also given for each speed camera location and 50 of the 59 camera locations were 30 mph speed limits.

### 85<sup>th</sup> percentile speed analysis

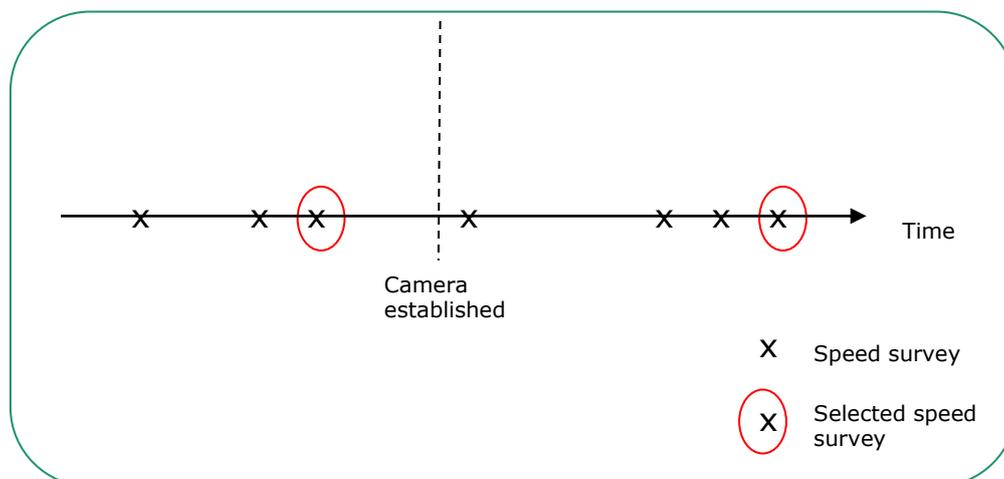
51 A speed survey records the speed of each vehicle passing through the speed camera location. The 85<sup>th</sup> percentile of these speeds is the value at which 85% of the data is below. This means that only 15% of the vehicles are travelling above this speed.

- 52 For each location the values for the speed surveys were reviewed to identify any possible anomalies. None were identified.
- 53 Of the 59 speed camera locations included in the analysis two speed camera locations had only two speed surveys associated with them (one before and one after establishment). The number of tests before and after establishment varied; however, two speed camera locations had more than 30 tests after establishment.
- 54 For each speed camera location the readings from the speed surveys before and after establishment were averaged to produce a single value. The change in speed following speed camera establishment was the difference between these values.
- 55 The analysis showed that there was a decrease in speed for 55 of the 59 speed camera locations with four speed camera locations (all Mobile camera locations) having an increase in speed.
- 56 For those speed camera locations with a decrease, the average decrease in the 85<sup>th</sup> percentile was 5.6 mph. For Fixed speed camera locations there was a greater average decrease in speed of 7.2 mph. Mobile speed camera locations had a decrease of 3.6 mph.
- 57 The four Mobile speed camera locations that had an increase in speed had an average increase of 1.6 mph. All of these speed camera locations were in 30 mph speed limit areas. These increases in speed ranged from 0.8 mph to 2.7 mph.
- 58 The analysis suggests that most Core, Fixed and Mobile speed camera locations have a decrease in speed at the 85<sup>th</sup> percentile of around 5 mph following speed camera establishment. This increase is likely to be larger in the case of Fixed speed camera locations. Some speed camera locations show a small increase in the speed at the 85<sup>th</sup> percentile, all were Mobile speed camera locations.
- 59 This analysis doesn't take into account any possible changes in speed associated with the seasons. For example, it might be argued that speeds are slower during bad weather and reduced light over the winter. In most cases there would not be sufficient speed surveys to conduct such analysis.
- 60 There also appears to be some inconsistency as to when the speed surveys are conducted. In some cases surveys are conducted in relatively quick succession. This may affect the analysis by giving undue weight to certain periods.

### **Percentage over the speed limit analysis**

- 61 The percentage of vehicles exceeding the speed limit is also recorded in a speed survey. Unfortunately, the database didn't contain the numerator and denominator information for these recordings. This means that the figures can't be averaged as they are percentages created from different volumes of traffic.
- 62 The method chosen to analyse this data was to take the speed survey closest to the establishment of the speed camera as the reading before establishment, and the most recent speed survey for the reading after establishment. This would show the change in speed that is currently being observed, but would not take into account that the speed is likely to vary following establishment. The choice of surveys is shown in Figure 7.

Figure 7: Speed survey selection



- 63 The analysis showed that there was a decrease in the percentage of traffic travelling over the speed limit in 47 of the 59 Core, Fixed and Mobile speed camera locations. The 12 speed camera locations that showed an increase in the percentage of traffic travelling over the speed limit comprised 11 Mobile speed camera locations and one Fixed speed camera location.
- 64 For those speed camera locations that had a decrease in the percentage of traffic travelling over the speed limit the average decrease was 30.4 percentage points. The average percentage of traffic travelling over the speed limit at Core, Fixed and Mobile speed camera locations was 56.9% before establishment of the speed camera and 26.5% after.
- 65 This decrease was greater at Fixed speed camera locations. Before establishment of a speed camera there was an average of 50.5% of traffic travelling above the speed limit. After the speed camera had been established this had reduced to 11.8%, a change of 38.7 percentage points.
- 66 For Mobile speed camera locations with a decrease in the percentage of traffic travelling over the speed limit there was an average decrease of 16.9 percentage points. This reduced the percentage of traffic travelling over the speed limit after speed camera establishment to 50.1%.
- 67 For the speed camera locations with an increase in the percentage of traffic travelling over the speed limit the increase was an average of 15.2 percentage points. For the one Fixed speed camera location where there was an increase this was an increase of 1.5 percentage points. 5.5% of traffic was travelling over the speed limit after speed camera establishment. The speed limit at this location was 30 mph. For the 11 Mobile speed camera locations the average percentage of traffic travelling over the speed limit was 48.1% before the establishment of the speed camera. This increased by 16.4 percentage points after establishment of the speed camera. Of these 11 speed camera locations nine were 30 mph speed limits, one a 60 mph speed limit and one a 70 mph speed limit.
- 68 The analysis suggests that there has been a reduction in the percentage of traffic travelling over the speed limit for Core, Fixed and Mobile speed camera locations. This is greater for Fixed speed camera locations as opposed to Mobile speed camera locations. Some speed camera locations show an increase in the percentage of traffic travelling over the speed limit.

## Percentage 15 mph over the speed limit analysis

- 69 In addition to those travelling over the speed limit the percentage travelling 15 mph over the speed limit was also recorded. The analysis was conducted in the same way as the percentage of traffic travelling over the speed limit by taking the most recent speed survey and the one closest to establishment.
- 70 Overall, 42 of the 59 speed camera locations showed a decrease in the percentage of traffic travelling 15 mph over the speed limit. There were 16 speed camera locations, five were Fixed and 11 were Mobile that had an increase in the percentage of traffic travelling 15 mph over the speed limit. One Fixed speed camera location showed no change.
- 71 Of those speed camera locations with a decrease in the percentage of traffic travelling 15 mph over the speed limit the average decrease was 3.3 percentage points meaning that 0.9% of the traffic was travelling 15 mph over the speed limit after establishment of the speed camera.
- 72 This was a greater decrease for Mobile speed camera sites with a decrease of 4.2 percentage points after establishment. This meant that 2.0% of the traffic was travelling more than 15 mph over the speed limit following speed camera establishment. For Fixed speed camera locations the decrease was 2.7 percentage points following establishment. This meant that 0.1% of the traffic was travelling more than 15 mph over the speed limit after establishment of the speed camera.
- 73 For the five Fixed speed camera locations that had an increase in the percentage of traffic travelling 15 mph over the speed limit the average increase was 0.2 percentage points after establishment. There was just over 0.1% of traffic travelling more than 15 mph over the speed limit before speed camera establishment and just under 0.4% after. One speed camera location was a 40 mph speed limit area and the other four were 30 mph speed limit areas.
- 74 The average increase in the percentage of traffic travelling more than 15 mph over the speed limit for the 11 Mobile speed camera locations was 1.8 percentage points. The percentage of traffic travelling more than 15 mph over the speed limit increased to 3.3% after establishment. Eight of the Mobile speed camera locations were in 30 mph speed limit areas with three in 40 mph, 60 mph and 70 mph speed limit areas.
- 75 The analysis suggests that there was a decrease in the percentage of traffic travelling more than 15 mph over the speed limit for Core, Fixed and Mobile speed camera locations. At these locations just 0.9% of traffic was travelling above this speed after speed camera establishment. There was a greater decrease for Mobile speed camera locations, however these had higher percentages of traffic travelling at these speeds before establishment compared to Fixed speed camera locations. Some speed camera locations showed an increase in the percentage of traffic travelling more than 15 mph over the speed limit.

## Summary

The analysis suggests that for most Core, Fixed and Mobile speed camera locations there is a reduction in speed following the establishment of a speed camera. There is a small amount of speed camera locations that show an increase in speed after speed camera establishment. The changes in speed are more evident at Fixed speed camera locations.

The data used in the analysis represents 21% of the Core, Fixed and Mobile camera locations in Wales. Camera locations that were not used in the analysis were Exceptional sites and Red light safety camera locations as well as those for which there was insufficient speed survey data. For the speed camera locations with insufficient speed survey data the most common reasons for exclusion were that the speed camera was established recently or that it was established some time ago and there was no baseline speed survey data before establishment.

## Appendix A - Methodology

### Generalised linear models

- 76 A Generalised Linear Model (GLM) is a flexible generalisation of Ordinary Least Squares (OLS) regression. OLS regression models are used to predict relationships that have normal distributions.
- 77 An OLS regression model uses a response variable and one or more predictor variables. This model works well when the response variable is on a continuous scale, such as the size of an organism or the weight of an object. When the response variable is a count of events, such as the number of collisions, then this is a special case called Poisson regression.
- 78 Where the relationship between the response variable and the predictor variables is not linear then a GLM is used to allow for this.
- 79 A GLM has a more complex form but follows a similar pattern. It uses a link function to define the non-linear relationship between the predictor variables and the response variable.

### Collision data analysis methodology

- 80 Collision data requires the use of a GLM as it is predicting the discrete number of collisions using data which is not normally distributed. The predictor variables include data on the establishment of a speed camera and the number of collisions before and after installation.
- 81 The GLM that is used is of Poisson form with a log link function. The model is fitted to the ratio of the number of collisions in the vicinity of a speed camera for a given year over the number of collisions in the partnership for the same year. The model can be used to estimate the change in the ratio as a result of the installation of the speed camera in the form of a multiple. These multiples can be expressed as a percentage to show the change in collisions.
- 82 This method was developed by Professor Richard Allsop<sup>2</sup> who was commissioned by the RAC Foundation to provide a methodology to analyse speed camera data.
- 83 We have followed this method and used the statistical software, R<sup>3</sup>, to conduct the analysis.

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<sup>2</sup> "Guidance on the use of speed camera transparency data", Allsop, R (November 2013)

[http://www.racfoundation.org/assets/rac\\_foundation/content/downloadables/speed\\_camera\\_data\\_revised-allsop-nov2013.pdf](http://www.racfoundation.org/assets/rac_foundation/content/downloadables/speed_camera_data_revised-allsop-nov2013.pdf)

<sup>3</sup> R Core Team (2014). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria <http://www.R-project.org/>.

## Appendix B - Glossary of terms

*Camera location* – a point on a stretch of road at which a road safety camera is placed.

*Camera site* – a stretch of road that may have road safety cameras located on it.

*Core site* – a camera site at which at least one Fatal or Serious Collision has taken place and has been approved for road safety camera establishment.

*Establishment* – the date at which a road safety camera is installed at a camera location.

*Exception site* – a camera site which has been approved for road safety camera establishment but may not have had a fatal or serious collision at the camera site.

*Fatal or Serious Collision (FSC)* – a reported collision that resulted in a fatality or serious injury.

*Fixed camera* – a permanent road safety camera.

*Generalised Linear Model (GLM)* – a type of statistical modelling that fits a model to data producing an estimate of change.

*Mobile camera* – a road safety camera that is not permanent.

*Model estimate* – a value produced by a statistical process which is indicative of a true value.

*Monitoring period* – a period of four years before the establishment of the road safety camera

*Personal Injury Collision (PIC)* – a reported collision that resulted in personal injury.

*Road safety camera* – cameras of varying types that monitor road safety including red light cameras.

*Route site* – a site that contains average speed camera locations.

*Speed camera* – a type of road safety camera that monitors the speed of vehicles.

*Speed survey* – a set of observations of traffic speed at a camera location.

*85th percentile speed* – the speed below which 85% of the traffic at a camera location is travelling during a speed survey.

The Data Unit is part of the local government family in Wales. We have long-standing, trusted and direct working relationships with local government. For many years we have been supporting the drive for improvement through a range of products and services specifically designed for local government. Many of these have also been used to support improvement in other public and private sector organisations.

Our range of specialist services is designed to help you find and use information effectively.

For more information visit [www.dataunitwales.gov.uk](http://www.dataunitwales.gov.uk) or call 029 2090 9500.



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