

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Linking Road Casualty and Clinical Data to Assess the Effectiveness of Mobile Safety Enforcement Cameras
AUTHORS	Thorpe, Neil ; Fawcett, Lee

VERSION 1 - REVIEW

REVIEWER	Prof Mark Stevenson Monash University Accident Research Centre
REVIEW RETURNED	07-Aug-2012

THE STUDY	<p>This is an interesting paper however the execution of the research has a number of limitations the authors will need to address before it can be considered for publication. Listed below is an array of concerns.</p> <p>i) the authors provide limited detail on the linkage process - one assumes a probabilistic approach was undertaken although there is reference to individual manual matching?</p> <p>ii) the low rate of matching is a significant concern - the authors acknowledge this and indicate this rate reflects other jurisdictions. Although this is true, there are some jurisdictions - internationally, that are achieving linkage rates of 60% and in the absence of higher linkages - the authors need to consider the threat to the validity of their findings</p> <p>iii) the authors provide no detail on the breakdown of the quality of the health data depending on whether the injured were admitted or only attended AandE. As well, was the classification of the costs blinded to whether the event was pre or post camera installation - again this is a further potential bias that needs to be discussed.</p> <p>iv) the authors provide little detail on the control group selection despite the fact that the selection of the controls is paramount to understanding the effects of regression to the mean. The reason cameras are installed is for the obvious reason that the sites reflect high crash risk, therefore, it is difficult to select a control group similar to a camera site unless it is selected based on high crash frequency. The authors make no reference to this and the significant flaw in their study if in fact, the control sample is inappropriate.</p>
REPORTING & ETHICS	No reference to ethics approval despite accessing hospital data.

REVIEWER	Paul Pilkington Senior Lecturer in Public Health University of the West of England United Kingdom
	I have no competing interests.
REVIEW RETURNED	22-Aug-2012

THE STUDY	<p>I would recommend that the authors give a clear definition of what a casualty was in this study. I presume, someone who was admitted to hospital, but this does need clarifying. This includes whether fatalities were excluded from analysis - either those killed at the crash site or those who died in hospital.</p> <p>I would also suggest the authors provide some additional background information in the beginning of the article on the approaches towards calculation of costs for road traffic casualties. They do mention at the end of the paper about additional costs to society but don't reference earlier on and I do think this needs discussing further. As at present the paper's focus on treatment costs saved as an indicator of safety/speed camera effectiveness presents a somewhat limited picture. I do appreciate that treatment costs are a worthy focus, but it just needs setting within a wider public health context.</p>
RESULTS & CONCLUSIONS	<p>I feel that the discussion could be strengthened by following the suggested structure that is outlined in the BMJ Open Instructions for Authors. In particular, there needs to be more discussion in relation to the existing evidence and also the policy implications.</p> <p>Also, there is no mention in the paper about cost-effectiveness. Even if the present study did not seek to quantify the costs of camera operation, the issue does warrant discussion, especially given the changed nature of how cameras are funded. Reference to issues of cost effectiveness would I feel strengthen the paper.</p> <p>Another issue I feel needs consideration is that safety cameras have been shown to reduce the number killed on the roads - however, this may then increase hospital treatment costs, if a potential fatality then becomes a seriously injured casualty. But it would still be a preferred outcome for both the individual, their family, and wider society. It underscores the need to set the article within a wider societal context, rather than focussing too much on saved treatment costs.</p>
GENERAL COMMENTS	<p>This is a potentially valuable addition to the literature, taking an innovative approach to examining the impact of speed/safety cameras. However, I do feel that it needs setting within a wider road safety / public health context.</p>

VERSION 1 – AUTHOR RESPONSE

Reviewer 1

1. Please include the study design in the title. This helps anyone searching the literature see that your article reports original research and is not, for instance, a commentary.

We have amended the title to indicate that the paper reports the results of a before-and-after study. Therefore, the title now reads:

“Linking Road Casualty and Clinical Data to Assess the Effectiveness of Mobile Safety Enforcement Cameras: a Before and After Study.”

2. The authors provide limited detail on the linkage process - one assumes a probabilistic approach was undertaken although there is reference to individual manual matching?

The following text has been inserted into the second paragraph of the Methods section to provide details of the two-stage linkage process. This clarifies the success rates from the automatic linking stage and a supplementary manual stage to boost the sample size:

“A two-stage data-linking process was designed. The first (automatic) stage involved seeking identical matches between police and hospital databases on three key casualty variables: age, gender and date of collision (on police records)/date of admission (on hospital records). This exercise achieved a 44% matching success rate for the ‘before’ period data and 48% for the ‘after’ period data from over 18,000 Accident and Emergency and over 3000 in-patient records [9]. To boost the disappointing sample size resulting from this automatic stage, a second and significantly more labour intensive (manual) stage was implemented. Having obtained relevant data protection approvals, this involved obtaining the names of unmatched casualties from the police and interrogating databases at each of the eleven hospitals in the study area and the immediate surroundings. This increased the matching success rate in the ‘before’ and ‘after’ periods to 66% and 68% respectively.”

3. The low rate of matching is a significant concern - the authors acknowledge this and indicate this rate reflects other jurisdictions. Although this is true, there are some jurisdictions - internationally, that are achieving linkage rates of 60% and in the absence of higher linkages - the authors need to consider the threat to the validity of their findings;

The following text has been inserted at the end of the second paragraph of the Discussion and Conclusions section to address the potential for bias caused by the unmatched cases:

“As already mentioned, the issue of unmatched casualties introduces the potentially serious problem of bias, in this case in the estimates of the cost savings. Clearly it is not known how the unmatched casualties in the ‘before’ period are distributed between the Accident and Emergency and In-patient HRG combinations. If this distribution of unmatched casualties is weighted more towards the higher cost combinations (compared to the distribution for matched casualties) then the cost savings will be under-estimated as the casualties that did not occur in the ‘after’ period will be under-represented in the higher cost combinations and vice versa.”

4. The authors provide no detail on the breakdown of the quality of the health data depending on whether the injured were admitted or only attended A and E. As well, was the classification of the costs blinded to whether the event was pre or post camera installation - again this is a further potential bias that needs to be discussed.

If we understand this point correctly, we have no information regarding how the unmatched cases are distributed between those casualties that only attended A and E and those that were then also admitted to hospital as in-patients. We hope this is reflected in the new text under point 3 above where we state that we have no knowledge whether the unmatched cases are distributed in the same way between low and high cost combinations. Unfortunately we are not entirely clear what is meant by the ‘classification of the costs’, but hope that the new references to potential bias from unmatched cases cover this aspect. Casualties that were deemed to be saved as a direct result of the safety cameras were allocated between HRG combinations based on probabilities determined from the distribution of casualties in the ‘before’ period between HRG combinations. Our allocation to HRGs uses only the pre-camera data, as we are trying to assess the cost of treatment had no camera been installed, and so pre/post camera differences are considered not to affect our results.

5. The authors provide little detail on the control group selection despite the fact that the selection of

the controls is paramount to understanding the effects of regression to the mean. The reason cameras are installed is for the obvious reason that the sites reflect high crash risk, therefore, it is difficult to select a control group similar to a camera site unless it is selected based on high crash frequency. The authors make no reference to this and the significant flaw in their study is in fact, the control sample is inappropriate.

This is an extremely important point. We have included in the paper a comment regarding a permutation test we conducted during the project to test the similarity between the explanatory variables for the camera and control sites. The following text has been included in the middle of the fourth paragraph in the Methods section:

“To improve the reliability of the regression model outputs, it is crucial that both sets of sites (camera and control) are as comparable as possible in terms of the explanatory variables to control for the effects of all other factors except for the effect of a safety camera. To test the degree of comparability in the explanatory variables between the control and camera sites, a Monte Carlo permutation test was conducted on the site characteristics data which confirmed that our sites are comparable at the 5% significance level.”

6. No reference to ethics approval despite accessing hospital data.

The following text has been inserted in the second paragraph of the Methods section making reference to ethical approval:

“Data were also extracted from Accident and Emergency Departments’ records at the seven hospitals in the case-study area (and those in the immediate surroundings of Carlisle, Durham and the Scottish Borders). For this, approval was granted by the local Research Ethics committee in 2005, and Research and Development Trust and Caldicott approval obtained from each NHS hospital involved.”

Reviewer 2

7. I would recommend that the authors give a clear definition of what a casualty was in this study. I presume, someone who was admitted to hospital, but this does need clarifying. This includes whether fatalities were excluded from analysis - either those killed at the crash site or those who died in hospital.

We have included the following sentence in paragraph two of the Methods section:

“Thus, casualties who were not admitted to hospital (i.e. via Accident and Emergency or as an in-patient), for example those who died at the collision scene, are not included in the analysis.”

8. I would also suggest the authors provide some additional background information in the beginning of the article on the approaches towards calculation of costs for road traffic casualties. They do mention at the end of the paper about additional costs to society but don't reference earlier on and I do think this needs discussing further. As at present the paper's focus on treatment costs saved as an indicator of safety/speed camera effectiveness presents a somewhat limited picture. I do appreciate that treatment costs are a worthy focus, but it just needs setting within a wider public health context.

We have inserted the following text after the first paragraph in the Introduction:

“In reality, medical and ambulance costs represent only a tiny fraction of the estimated overall value of preventing a road casualty in the UK – for example less than 1% of the £1.8m for a fatal casualty and approximately 7% (of £200,000) and 5% (of £20,000) for serious and slight casualties respectively. In

comparison, the human cost element (representing pain, grief and suffering for the casualty and close friends and relatives) accounts for as much as 70% of the value of preventing a serious casualty, and 55% and 50% of the value for fatal and slight casualties. It is important to consider these different cost elements, for example when a potential fatal casualty becomes a seriously injured casualty due to a safety camera. Although medical and ambulance costs are much higher for serious casualties (approximately £13,000 compared to £1,000 for a fatal), the human costs are considerably different - £1m for a fatal compared to £140,000 for a serious casualty. Thus, relatively small increases in medical and ambulance costs must be considered in the light of very much larger reductions in human costs when reducing casualty severity.”

9. I feel that the discussion could be strengthened by following the suggested structure that is outlined in the BMJ Open Instructions for Authors. In particular, there needs to be more discussion in relation to the existing evidence and also the policy implications.

The following text has been inserted at the start of the Discussions and Conclusions section. Minor modifications to the text have been made elsewhere in this section to reflect the journal's recommendations for the structure of the discussion section:

“This study's principal findings are that, based on the matched casualty and clinical data, the estimated 'cost of treatment saved' by secondary healthcare providers in the study area is between £12,500-£15,000 per annum during the study period as a result of the deployment of mobile safety cameras. If these findings are typical, then annual savings at a national level across all the safety camera partnerships that cover the vast majority of the UK could be considerable. The study identified inconsistencies between available casualty and clinical databases that limited the number of successful matches that could be made, and also that conventional statistical methods have the potential for under-estimating the effects of regression-to-mean thus over-valuing the benefits of road safety interventions.

The main strength of the study which, sets it apart from previous research lies, in the development of a procedure for estimating more accurately the actual benefits of mobile safety camera deployment in terms of the 'cost of treatment saved', with the method accounting more realistically for the confounding factors of regression-to-mean and general casualty trends. Casualties are matched with the cost of their clinical treatment and the procedure has the potential to be used in the evaluation of a wide range of other road safety measures. Therefore, the results clearly have implications for the cost effectiveness of mobile safety cameras, especially if the benefits in terms of casualty reduction are not as great as currently thought due to the under-estimation of regression-to-mean. Until 2007, camera operations were funded by the fine revenues they generated through a hypothecation scheme. Since then however, funding has been through a road safety grant where safety cameras have to compete against other road safety initiatives for financial support. This competition has therefore focussed attention very sharply on safety cameras' value-for-money relative to other road casualty reduction measures, and the outcome of this competition for funds will determine whether or not local road authorities in the UK continue with the policy of traffic speed enforcement through speed cameras and at what level.”

10. Also, there is no mention in the paper about cost-effectiveness. Even if the present study did not seek to quantify the costs of camera operation, the issue does warrant discussion, especially given the changed nature of how cameras are funded. Reference to issues of cost effectiveness would I feel strengthen the paper.

Please see text inserted in relation to point 9 above which makes reference to cost effectiveness of cameras and funding arrangements.

11. Another issue I feel needs consideration is that safety cameras have been shown to reduce the

number killed on the roads - however, this may then increase hospital treatment costs, if a potential fatality then becomes a seriously injured casualty. But it would still be a preferred outcome for both the individual, their family, and wider society. It underscores the need to set the article within a wider societal context, rather than focussing too much on saved treatment costs.

Please see the text in response to point 8 above which we feel now addresses this point.

12. This is a potentially valuable addition to the literature, taking an innovative approach to examining the impact of speed/safety cameras. However, I do feel that it needs setting within a wider road safety / public health context.

VERSION 2 – REVIEW

REVIEWER	Prof Mark Stevenson Director Monash University Accident Research Centre Melbourne, Australia
REVIEW RETURNED	10-Oct-2012

- The reviewer completed the checklist but made no further comments.