Red light cameras

Remote enforcement of traffic lights to prevent crashes caused by drivers running red lights.

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Effect scale	Quality of evidence				
	Effect Impact on crime	Mechanism How it works	Moderator Where it works	Implementation How to do it	Economic cost What it costs
Overall reduction	■■■■ Very strong	■■■□ Strong	■□□□ Low	■■□□ Moderate	No information

Focus of the intervention

Red light cameras (RLCs) are an enforcement mechanism that permit the remote enforcement of traffic signals to prevent crashes occurring after running a red light.

RLCs are fully automated photo detection systems that include three key elements:

- cameras
- sensors or triggers
- a computer

The cameras may take still or video images, or both. Modern systems generally use digital cameras but some older systems may use 35-mm wet film cameras.

In the UK, the cameras are usually placed on one arm of an intersection where a problem with individuals running red lights has been identified. In the USA, the cameras generally are located on all four corners of an intersection, so that vehicles coming from any direction may be photographed

from multiple angles.

The cameras are activated when a vehicle moves over the triggers at a predetermined speed.

After the RLCs have captured images of the violation, the evidence is reviewed and penalty tickets sent to the address where the violating vehicle is registered.

The focus of this review is on the prevention of red light running, road traffic crashes, and injuries and fatalities resulting from road traffic crashes.

This narrative is based on one updated meta-analytic review covering 38 studies (28 of which were new since the last review) and including a total of 41 separate analyses. Of the primary studies in the review, 26 were based on evidence from the USA, eight from Australia, two from Canada and two from Singapore.

Effect – how effective is it?

Overall, the evidence suggests that the intervention has reduced red light violations.

The meta-analysis found that red light camera (RLC) programmes led to reductions in:

- red light violations (-61%)
- right angle crashes (-24%)
- right angle injury crashes (-29%)
- total injury crashes (-20%)

Conversely, RLCs were also associated with an increase in rear-end crashes (+19%).

How strong is the evidence?

The review was sufficiently systematic that most forms of bias that could influence the study conclusions can be ruled out.

The evidence is taken from a systematic review covering 38 studies. The studies demonstrated a high-quality design in terms of having a transparent and well-designed search strategy, featuring a valid statistical analysis, sufficiently assessing the risk of bias in the analysis and giving due consideration to the way outcomes were measured and combined. The review did not explore the issue of publication bias.

Mechanism – how does it work?

The review suggests that the primary mechanism by which RLCs reduce red light running is deterrence, although no mechanisms were specifically tested in the studies.

This involves the threat of being caught and punished discouraging people from offending and may operate in the following ways.

- Specific deterrence – RLCs may reduce overall offending by increasing the actual or perceived risk of being caught and punished among drivers who regularly jump red lights. Because RLCs are fully automated, drivers who run red lights are more likely to be detected and punished.
- General deterrence – RLCs may also reduce overall offending by increasing the actual or perceived risk of apprehension and punishment among drivers in general, not just those who have jumped red lights in the past. This may include both the actual risk of being detected and the perceived risk, which reflects the driver's belief about the likelihood that they will be detected in a violation. Perceived risk is presumed to be most likely to influence driving behaviour ,with RLCs designed to create a feeling of surveillance that suggests a greater risk of apprehension and punishment for running red lights.

RLCs are designed to increase the actual risk of apprehension as well as the perceived risk of apprehension, to create a general deterrent effect.

The impact of RLCs may not be limited to only those junctions with cameras, they may also create a diffusion of benefit, so that they have a more general effect on driver behaviour on the roads.

Moderators – in which contexts does it work best?

The review notes that the effect of the intervention might differ by time and day of week, signal timing, or average daily traffic. There was not enough information in the primary studies to analyse these potential moderators.

The review did examine whether the effect of RLCs differed by country (USA and Australia) but found few differences in the effect of RLCs on most outcomes.

Implementation – what can be said about implementing this initiative?

The review identifies a number of implementation issues.

First, public knowledge of the implementation of an RLC programme is considered essential for success. Many of the programmes that were tested included publicity campaigns and warning signs to increase driver awareness of the RLCs in order to enhance their deterrent effect.

This review explored the effect of warning signs on total crashes and total injury crashes in primary studies, but found no significant difference in the effect of RLCs on either outcome.

Other implementation issues were identified in the report.

- Quality of the technology – ensuring that cameras obtained clear images of drivers at RLC intersections
- Legal challenges – particularly in the USA, the legality of RLCs have been challenged in the courts. Legal issues have centred on the legality of parties other than law-enforcement officers issuing traffic penalties and concerns about due process.
- Public concerns about privacy – including misuse of photographs taken by RLCs and control of personal information by third parties.
- Public concerns about safety versus revenue – there are public concerns that RLCs are introduced to collect revenue rather increase public safety.

Economic considerations – how much might it cost?

Many of the studies did not include any economic information. Those that did varied widely in the amount of detail provided. None of the studies conducted a full cost-benefit analysis that included both economic viability and societal benefits (including crash costs).

While studies examining economic viability in the USA and Australia found mixed results, an early cost-benefit analysis in the UK identified significant benefits for RLCs, with most areas able to obtain a net benefit within one year.

General considerations

- The review notes that the primary studies differed widely in terms of quality. Out of the 28 included studies, only four were assessed as high quality and eight of moderate quality.
- The included studies were also geographically limited to USA, Australia, Canada and Singapore.
- Results of the meta-analyses may be affected by the high levels of variation found among the results of the included studies. This means that the effect sizes within a given outcome lacked consistency.

Summary

Overall, the evidence suggests that RLC programmes led to reductions in red light violations, right angle crashes, right angle injury crashes and total injury crashes. However, importantly, RLCs were also associated with an increase in rear-end crashes.

Primarily, RLCs are thought to reduce red light running through deterrence.

A number of potential moderators were identified, such as time and day of week, signal timing, or average daily traffic. These were not tested in the studies.

While public knowledge of RLCs is considered important for the success of the intervention, this review found no evidence that warning signs were associated with a change in the effect of RLCs on total crashes and total injury crashes.

Further studies are need to examine economic considerations around RLCs.

Reviews

Review one

Reference

- Cohn E and others. (2020). **Red light camera interventions for reducing traffic violations and traffic crashes: a systematic review**

Additional resources

Perkins C and others. (2017). Red light enforcement cameras to reduce traffic violations and road traffic injuries

Summary prepared by

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