Evaluating Red Light Running Programs in Iowa

tech transfer summary

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> Red light running is a serious concern among Iowa communities, who are turning to automated enforcement to address safety issues.

Objective

As communities across the United States attempt to address red light running (RLR), a number of them have implemented RLR camera-enforcement programs. Since 2004, three Iowa communities—Davenport, Council Bluffs, and Clive—have implemented RLR camera-enforcement programs. The objective of this research was to evaluate the effectiveness of RLR cameras in these three Iowa communities. A reduction in crashes was evaluated for Council Bluffs and Davenport, and a reduction in the number of RLR violations was evaluated for Clive.

Problem Statement

The Federal Highway Administration (FHWA) estimates that red light running causes more than 100,000 crashes and 1,000 fatalities annually, and results in an estimated economic loss of over $14 billion per year in the United States (FHWA 2006). Retting et al. (1995) indicated that occupant injuries occurred in 45% of RLR crashes as compared to other urban crashes and accounted for 16%–20% of total crashes at urban signalized intersections. Red light running can be particularly dangerous because many RLR crashes are right-angle collisions.

Research Description

The number of RLR crashes in Iowa was determined by selecting crashes that occurred at signalized intersections from 2001 to 2006. RLR crashes were defined as crashes where an officer indicated "ran traffic signal" as the major cause. An average of 8,162 total crashes and 147 fatal- and major-injury crashes occur at signalized intersections in Iowa every year (2001–2006), and an average of 1,682 RLR crashes occur per year. This includes an average of 51 fatal- and major-injury crashes per year at signalized intersections in Iowa due to red light running. Of signalized intersection crashes, RLR crashes account for 21% of total and 35% of fatal- and major-injury crashes.
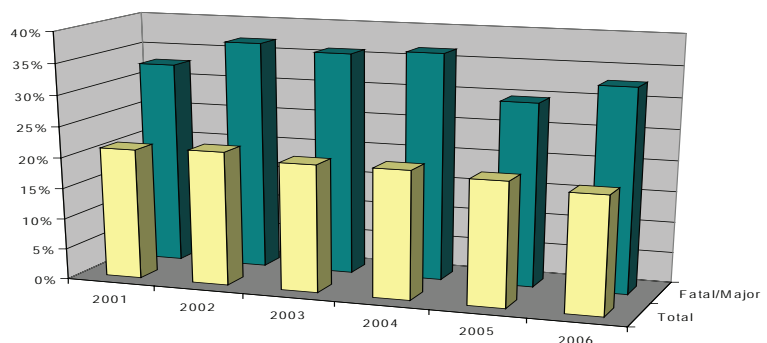
RLR crashes as a percentage of signalized intersection crashes

Effectiveness of RLR camera systems in Iowa

Red light running poses a significant safety issue for communities. Communities rarely have the resources to place additional law enforcement in the field to combat the problem and they are increasingly using automated RLR camera-enforcement systems at signalized intersections. The state of Iowa, as of November 2007, has no state-mandated laws regarding the use of automated enforcement and no recommended scheduled traffic fine for violations captured by photography. Each community that installed an automated-enforcement system in Iowa enacted local, municipal ordinances, which were allowed by the Code of Iowa but could not supersede established traffic laws. The effectiveness of the RLR camera systems was evaluated for each community.
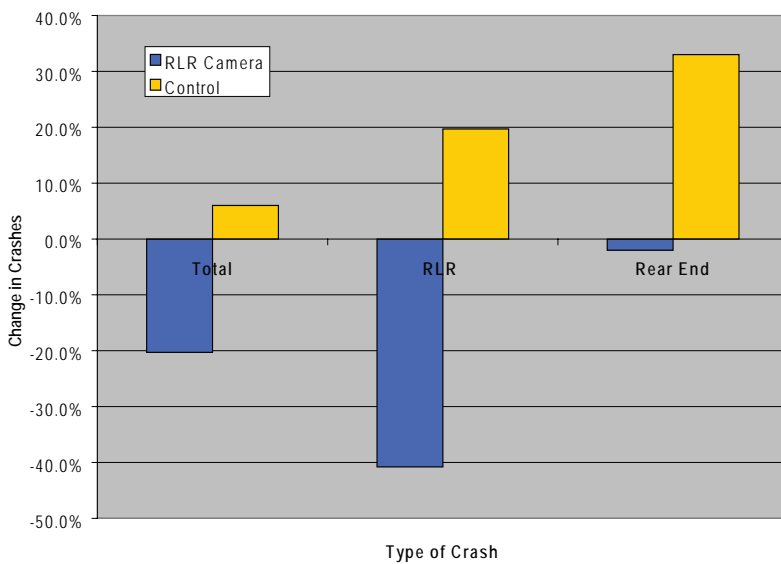
Davenport

The city of Davenport installed RLR cameras between August and October 2004 at the following intersection approaches.

- Brady Street, northbound approach, at Kimberly Road
- Brady Street, eastbound approach, at Kimberly Road
- Brady Street, westbound approach, at Kimberly Road
- Elmore Avenue, eastbound approach, at Kimberly Road
- Elmore Avenue, westbound approach, at Kimberly Road
- Welcome Way, southbound approach, at Kimberly Road
- North Harrison Street, southbound approach, at West 35th Street
- 4th Street and Division Street

In June 2006, one set of cameras was moved from 4th Street and Division Street to Lincoln Avenue and Locust Street, so neither intersection was included in the analysis. Five control locations were selected in Davenport for use in the statistical analysis. The before analysis period included 12 quarters of crash data and the after analysis period consisted of 8 quarters of crash data. A Bayesian statistical analysis was used to evaluate the reduction in crashes after installation of the RLR cameras.

The expected number of total crashes decreased by 20% from the before to after period for intersections with camera enforcement, while total crashes increased by almost 7% at control intersections. RLR-related crashes were also evaluated. RLR crashes were defined as any crash, except rear-end crashes, where either an officer or witness to the crash indicated that at least one driver had run a red light. The expected number of RLR crashes decreased by 40% after installation of cameras at intersections with camera-enforced approaches, while the expected number of RLR-related crashes increased by almost 20% at control intersections. The change in rear-end crashes that was related to red light running was also evaluated. The expected number of rear-end crashes changed very little from the before to after period for intersections with camera-enforced approaches, while the expected number of rear end crashes increased by around 33% for the control intersections.

Change in crashes for Davenport after installation of RLR cameras

Front view of an RLR camera system

Council Bluffs

The city of Council Bluffs installed RLR cameras at the following seven approaches at five intersections in August 2005.

- Willow Way, southbound approach, at 7th Street
- Kanesville Blvd., westbound approach, at 8th Street
- Kanesville Blvd., eastbound approach, at 8th Street
- Broadway, westbound approach, at 16th Street
- Broadway, eastbound approach, at 16th Street
- Broadway, westbound approach, at 21st Street
- Broadway, eastbound approach, at 35th Street

Only one year of crash data was available to evaluate the effectiveness of the Council Bluffs RLR program in reducing crashes. Consequently, only a simple before and after crash comparison was conducted. Four control intersections were used to reflect crash trends that were independent of the cameras. Changes in crashes from the before to after period were evaluated by comparing changes in crashes per quarter. The number of crashes per quarter was calculated for a before period consisting of 12 quarters and an after period consisting of 4 quarters.

Total crashes at intersections with camera enforcement decreased an average of 44% after the RLR cameras were installed. Total crashes also decreased at control intersections but only by 12 percent. A more dramatic result was found when only RLR-related crashes were evaluated. RLR crashes at camera-enforced intersections decreased an average of 90%, while no overall change was noted at the control intersections. Rear-end crashes, which were determined to be a result of red light running, were also compared. RLR-related rear-end crashes decreased by 40% at intersections with camera-enforced approaches but increased by 29% at control intersections.

Rear view of RLR camera system

Camera-enforced system at busy intersection
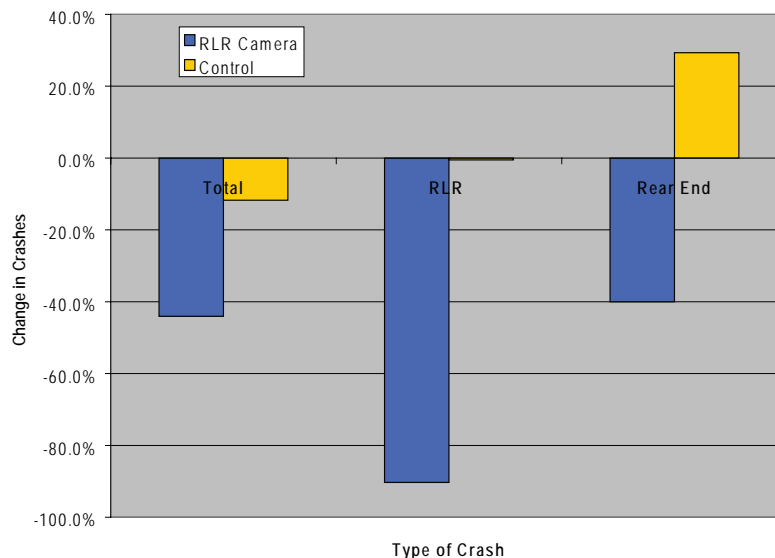
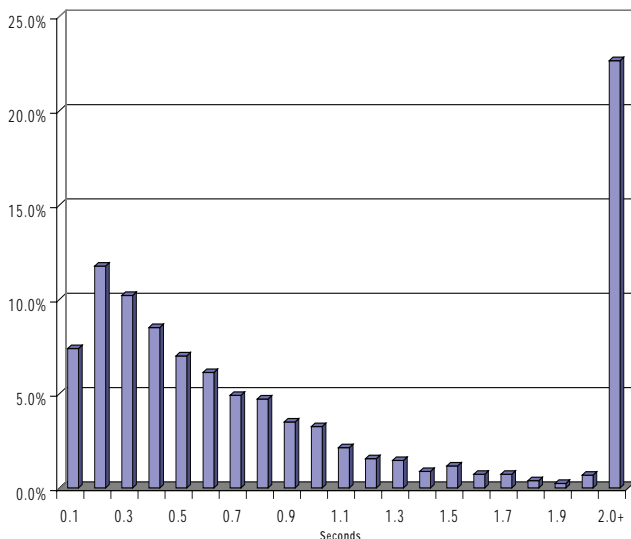*Change in crashes for Council Bluffs after installation of RLR cameras*

Clive

RLR cameras were installed at the following six approaches at four intersections in Clive in July 2005.

- 100th Street, northbound approach, at Hickman Road
- Hickman Road, eastbound approach, at 128th Street
- 128th Street, northbound approach, at Hickman Road
- Hickman Road, eastbound approach, at 142nd Street
- Hickman Road, eastbound approach, at 156th Street
- 156th Street, northbound approach at Hickman Road

The ideal way to evaluate the effectiveness of RLR cameras is to evaluate the reduction in crashes. However, because the cameras in Clive weren't installed until June 2006, there was not sufficient data to conduct a crash analysis. As a result, the only way to evaluate the effectiveness of Clive's automated RLR enforcement system was to evaluate the reduction in RLR violations that occurred. A cross-sectional analysis was conducted that compared violations at intersections with RLR cameras to violations at control intersections where no cameras were present.

Control intersections were selected so that they were similar to the RLR camera-enforced intersections. Violation data for the camera-enforced approaches were obtained from the city of Clive, and violations for control intersection approaches were videotaped in the field and manually reduced.

A cross-sectional analysis was conducted using a generalized linear model to evaluate the differences between violations at approaches with RLR cameras and at the control intersections. The model indicated that intersection approaches without cameras had 25 times more RLR violations than intersection approaches with RLR cameras.

The amount of time after the red indication had been given to indicate that vehicles were running the red light was also evaluated. It might be expected that a certain number of drivers entered the intersection just at the beginning of the red phase. However, 22% of left-turning vehicles, and more than 10% of vehicles that were traveling straight through the intersections, ran the red light two or more seconds into the red.

Key Findings

Results of the research indicate that RLR cameras were very successful in reducing crashes related to red light running in the two Iowa communities studied. In Davenport, a 40% reduction in RLR crashes was found. In Council Bluffs, a 90% reduction was found.

Total crashes also decreased at intersections with RLR camera enforcement. Reductions in total crashes of 20% and 44% were found in Davenport and Council Bluffs, respectively. Additionally, while there has been some concern at the national level that use of RLRcameras increase rear-end crashes, the present research did not find an increase in rear-end crashes.

The reduction in RLR violations was evaluated for a third Iowa community. However, a crash analysis could not be conducted since there was less than one year of crash data. The number of RLR violations for intersections with no RLR cameras was compared against RLR violations at camera-enforced intersections. Results of a statistical analysis indicate that on average, RLR violations were 25 times higher in locations without cameras than with cameras.

Distribution of time into red indicator for left-turning vehicles
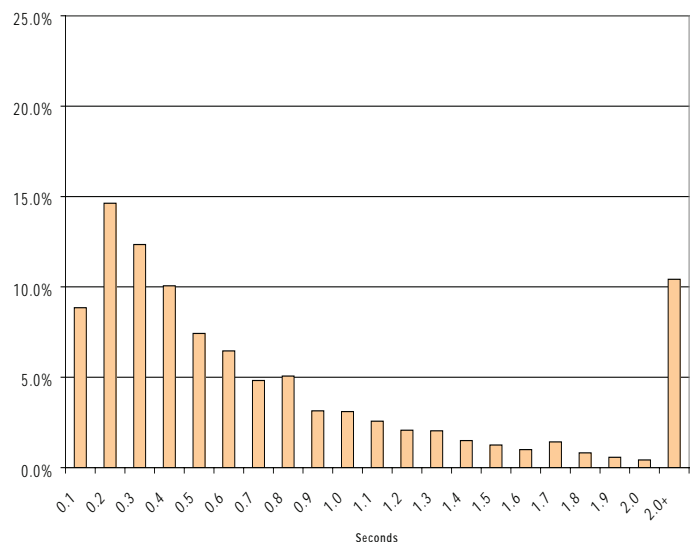
Distribution of time into red indicator for through vehicles