Effectiveness of Red Light Cameras in Chicago: An Exploratory Analysis

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Effectiveness of Red Light Cameras in Chicago

Chicago leads the nation in red light cameras. The city claims the red light cameras (RLCs) are lowering accidents. The Chicago Tribune drew doubt on that claim based on accident data. This report seeks to provide a further analysis on the effectiveness of red light camera using data obtained from the city of Chicago and the Illinois Department of Transportation (IDOT).

This report explains the relationship between red light cameras and traffic accidents in Chicago. The analysis considers accidents at several different levels from overall accidents in Chicago, accidents at traffic signals in Chicago, and accidents at traffic signals with RLCs.

There are divergent views on the effects of RLCs. The city's position is that red light cameras are improving driving habits, resulting in fewer accidents. The city claims accidents are down 24% at RLC intersections[1] and accidents are dropping at 60% of all RLC intersections.[2] The city believes there is a direct effect at intersections with RLCs as drivers know these intersections are monitored and will be more careful. Additionally, there should be a spillover or halo effect that affects all intersections as drivers will drive more carefully.

The literature on RLC suggests RLCs are associated with increased crashes.[3]

The report begins by considering broader changes in accident patterns and narrows down to accidents rates at the RLC intersections. For background, the first red light camera was installed in 2003. In 2004 twenty more cameras were installed. In 2005, no cameras were installed, but between 2006-2008 cameras were steadily installed. At this point, there are about 187 intersections with RLCs.

Analysis

Overall Accidents

Here is a graph of accidents in Chicago between 2001 and 2008:

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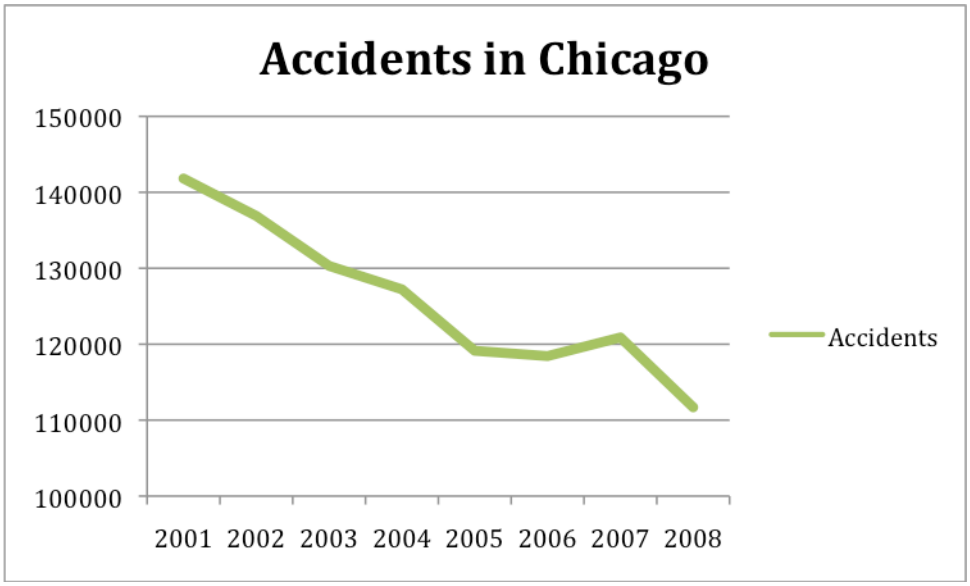
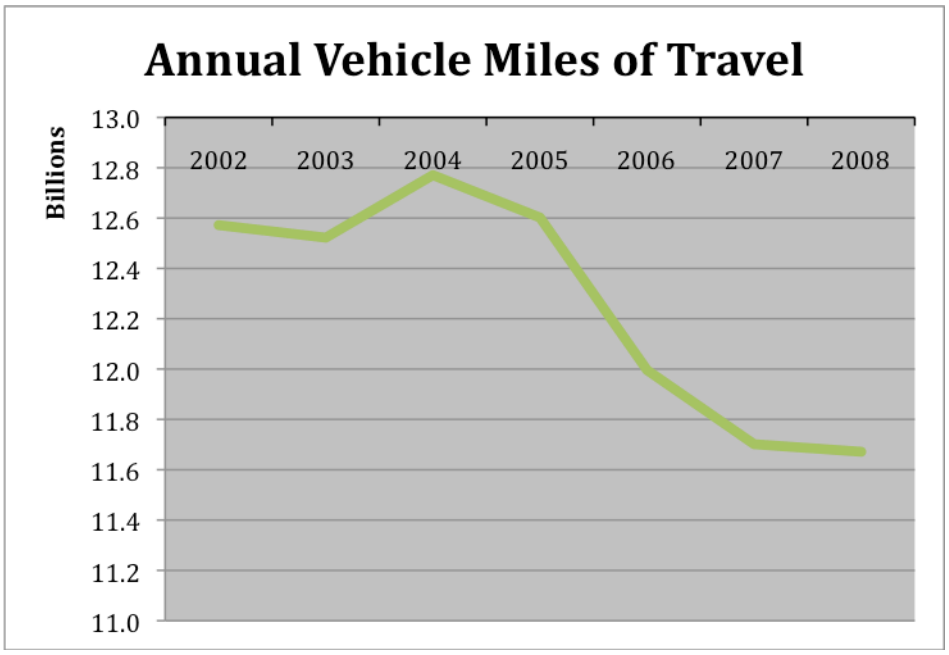
1 http://www.cityofchicago.org/city/en/depts/oem/supp_info/red_light_camerabrochure.html

2 http://articles.chicagotribune.com/2009-11-22/news/0911210177_1_red-light-cameras-years-of-accident-data-dangerous-intersections/2

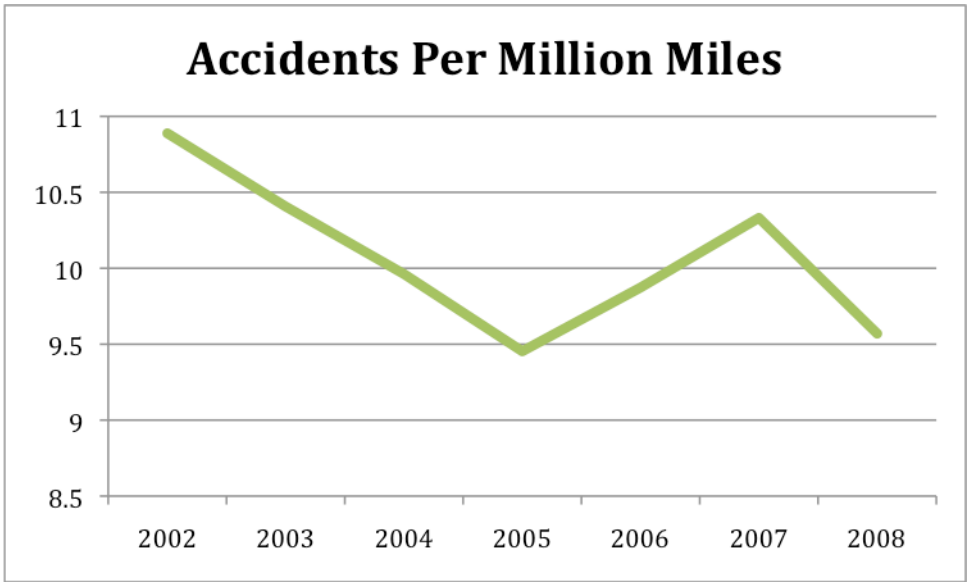
3 Langland-Orban, B, E. E. Pracht and J. T. Large, "Red Light Cameras: Would Crashes, Injuries and Automobile Insurance Rates Increase If They Are Used in Florida?, Florida Public Health Review, 2008; 5:1-7.



Clearly there has been a decline in accidents (over 21% between 2001 and 2008). There are a lot of factors affecting accidents from gas prices to the weather. One factor that can be taken into account is how much people drive. The IDOT provides an Annual Vehicle Miles of Travel statistic that allows us to account for how much people drive.



The graph shows vehicle miles dropping from 12.6 billion miles in 2002 to 11.6 billion miles in 2008 for Chicago. If people drive fewer miles, it seems reasonable there will be fewer accidents. We can analyze this by looking at the accident rate for each mile traveled.

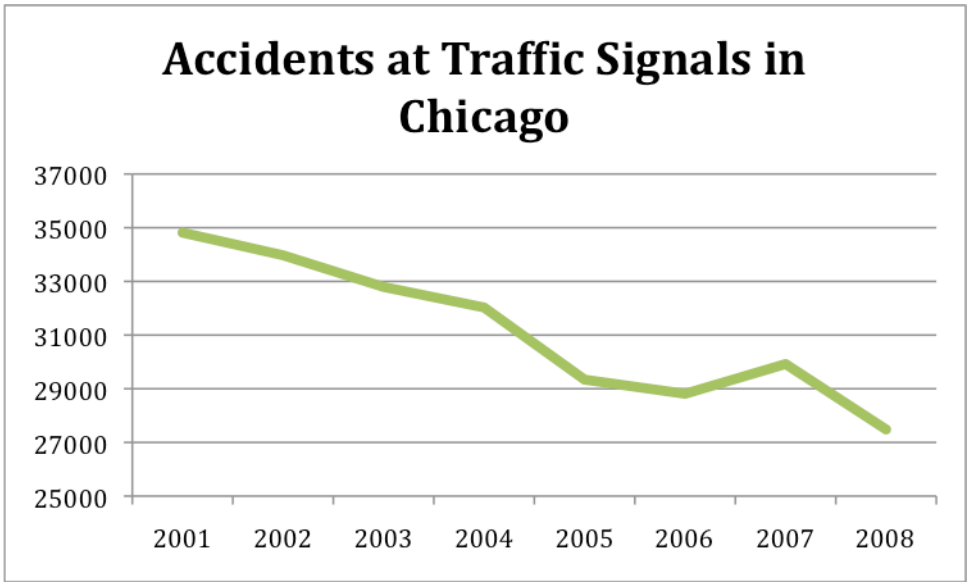


This graph shows when we account for the fewer miles driven, there is no longer a steady drop in accidents. Instead, it's hard to find a significant trend between 2001 and 2008. It's also important to note that you can find either a trend of accidents going up, down, or holding steady depending on the what years you include. So once we account for people driving less, there is not a steady trend of accidents dropping.

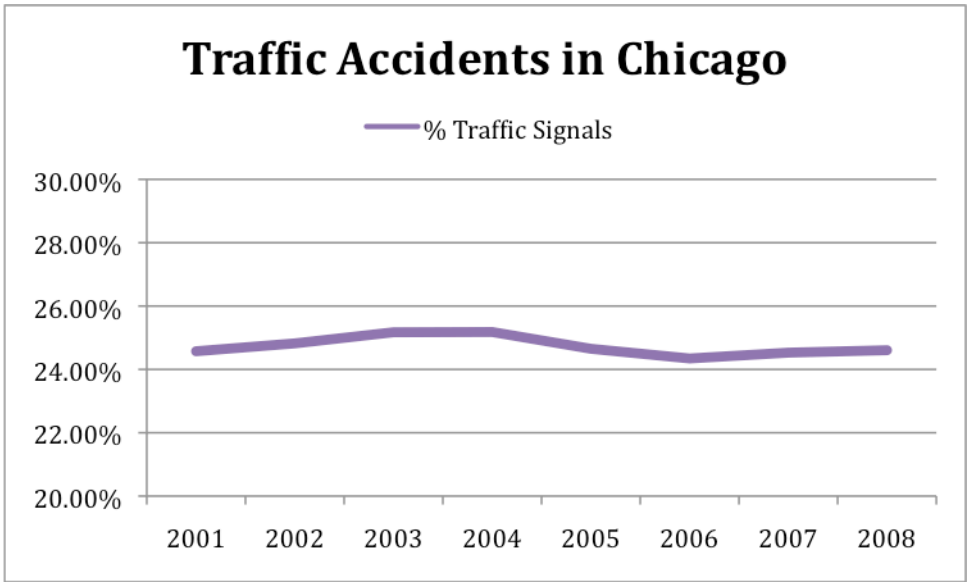
Any analysis of accidents needs to account for this trend. This trend suggests fewer accidents at construction zones, school zones, highways, and traffic signals (EVERYWHERE). If you are suggesting anything has contributed to safety, e.g., RLC, you need a control group to identify the contribution of the safety device or program. Otherwise it will appear that red light cameras have led to a drop of 21% in accidents (when the drop is due to other factors).

Accidents at Traffic Signals

This part of the analysis focuses on accidents at traffic signals. The IDOT data contains a separate variable for traffic signals. This allows us to isolate accidents that occur at traffic signals.

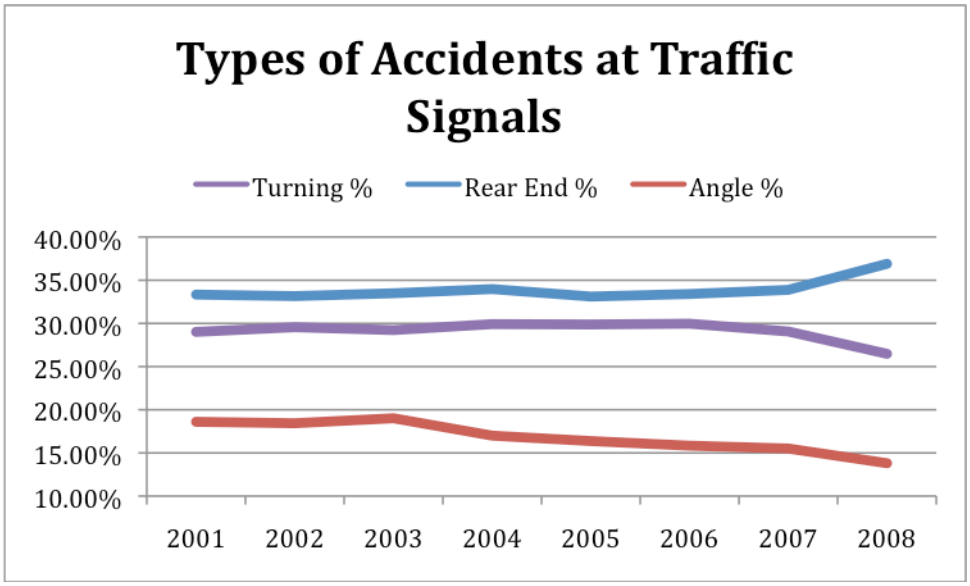


A quick look at this graph shows that it is very similar to the overall drop in accidents. To factor out the general trend of accidents dropping, we next determined the percentage of accidents that occur at traffic signals in Chicago between 2001 and 2008.



This graph shows that the percentage of accidents at traffic signals hasn't changed appreciably between 2001 and 2008. If people were driving more carefully at traffic signals, it would be expected that accidents at traffic signals would become relatively rarer. For example, dropping from a share of 25% of all accidents to 20% of all accidents. The results here suggest that traffic signal accidents are holding relatively constant. This also suggests the RLCs are not having a halo effect because accidents are not dropping throughout the city at traffic signals.

The next graph shows the types of accidents occurring at traffic signals in Chicago between 2001 and 2008.



The biggest finding here is the drop in Angle crashes (crashes where cars are heading in different directions). Between 2003 and 2008, there is a 5% drop in Angle crashes at traffic signals. This is a large! This drop supports the argument that red light cameras are leading drivers to be more careful at traffic intersections.

For both turning and rear end type crashes, their was little change with the exception of the 2008 numbers. Hopefully, 2009 numbers will identify if there is a trend in an increased share of rear end accidents and a decreased share of turning accidents at traffic signals.

Accidents at RLC Intersections

There are two sources of data on accidents at the RLC intersections. The first is from the Illinois Department of Transportation (IDOT). The second is from Chicago's Department of Transportation (CDOT). Accidents at intersections are measured differently by both agencies. CDOT defines the intersection as extending along the arterial street for a distance of 25 to 50 feet while IDOT will use measurements of 150 to 300 feet. Despite the differences in measurements, we believe any tanglible affect of RLCs should be found at either distance.

IDOT DATA

The IDOT data comes from the accident data the Chicago Tribune published on their website.[4] The data was for about 50 intersections, both Chicago and suburbs, that had installed red light cameras between roughly 2006 and 2007. The data contains the time and date of all accidents. We were able to use the data for 39 RLC intersections in Chicago. The startup dates for the cameras varied from January 1, 2006 to Nov 26, 2007

The simplest analysis we did was to look at accidents 1 year prior to the startup date and compare it to accidents 1 year after the start up date for the red light cameras. We found a total of 1118 accidents at the 39 intersections 1 year prior to the startup of the RLC. We compared this to 1 year after the startup date and we found a total of 1192 accidents. So in the year the RLCs were running, accidents as a whole went up!

We also used a longer time period, which varied according to the data we have for the individual intersection. The longer time period varied from 347 days to 1080 days with a mean of 500 days. This data also found an increase 4.5% in the number of accidents.

We examined the data to see if there was any "bumps" or changes in red light accidents over time. For example, was there an immediate decrease in accidents and then accidents went back up after 3 months? We found that the rate of accidents was constant at intervals of 1, 3, 6, 9, and 12 months.

Unfortunately, we don't have access to the entire data set (without manually entering in the Tribune data), so we can't perform a more sophisticated analysis, such as whether there were changes in the types of accidents (angle & rear end) at RLC intersections.

The results show that accidents went UP 5% at the intersections with RLCs. This is a shocking result, because you would expect accidents to decline with the introduction of RLCs. Moreover, the statistical effect of regression to the mean would suggest accidents would also decline at these intersections. The results also stand counter to the general trend of accidents falling at in Chicago about 7% between 2005 to 2008, as well as the 7% drop of accidents at traffic signals.

Chicago Data

A second source of data is from the city of Chicago. The OEMC and the Traffic Management Authority conducted a small study of RLC intersections. We only received this study through a FOIA requests and the aid of the ACLU in pushing the city to release this information. The study looks at 20 control of 20 RLC intersections and compares them.

We evaluated the study. We were forced to elimimate 10 of the intersections, both control and RLC, because they did not have a full 12 months of prior data. This left us with 10 control intersections and 10 RLC intersections. The control group experienced a 3.76% decrease in

[4] http://www.chicagotribune.com/news/local/chi-091122-redlight-map,0,1513125.htmlpage

accidents, while the RLC group experienced a 5.31% decrease in accidents. In sum, there was only a 1.5% different attributable to the RLCs using the city's data. This suggests a very small benefit for the RLCs and is a much smaller figure than the city claims.

Conclusions

Accidents in Chicago fell between 2001 and 2008. In contrast, accidents at intersections with RLCs in our study actually increased. This result throws doubt on the city's claims of significant accident reductions because of RLCs.

The data also shows that the share of accidents at traffic signals has stayed roughly constant. This suggests red light cameras are not reducing accidents throughout the city. If anything, the red light cameras are changing the dynamics of accidents, leading to a lower share of angle type crashes at traffic signals. There is also the possibility that the RLCs are leading to a larger share of rear end accidents at traffic intersections.

This data raises more questions than it answers. The goal was not to do a comprehensive study of RLCs, but only to ask whether the benefits of RLCs are obvious. A more comprehensive study would include control groups. In sum, our findings show that RLCs have, at best, a marginal positive impact on accidents. It's clear that the benefits claimed by the city are hyperbole and that there is no evidence that the RLC have had a significant safety benefit.

Acknowledgements

The data in this study was collected with the help of several parties. First, from the city through a FOIA process that required the help of the with the help of the ACLU of Illinois. Second, from the Chicago Tribune's publication of IDOT data acquired through the FOIA. Finally, IDOT also provided some data upon request to the author.

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