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Automated Traffic Enforcement Research

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The Insurance Institute for Highway Safety is a nonprofit research and communications organization that identifies ways to reduce deaths, injuries, and property damage on our nation's highways. We are supported by auto insurers. Thank you for the opportunity to submit for the record research findings about the use of automated enforcement to reduce speeding and red light running violations and roadway crashes.

A high likelihood of apprehension is what convinces motorists to comply with traffic laws, but many enforcement agencies have insufficient personnel to mount effective enforcement programs using traditional police patrols. Automated traffic enforcement can supplement traditional methods, especially at times of day and on roads where traditional enforcement can be difficult if not hazardous.

The most important question about the use of automated enforcement is whether it reduces crashes — and it does. A wealth of research in U.S. communities and elsewhere indicates it reduces crashes and associated deaths, injuries, and property damage by reducing illegal and dangerous driver behavior. As of February 2015, more than nearly 140 U.S. communities operate speed camera programs, and nearly 470 communities operate red light camera programs.

Speeding

Speeding is a major factor in motor vehicle crashes, especially those resulting in serious injuries.[1] In the United States, speeding — as defined on police crash reports as driving too fast for conditions, exceeding posted speed limits, or racing — was a contributor in 29 percent of crash deaths in 2013, resulting in more than 9,600 fatalities.[2] Although speeding often is associated with interstates and other high-speed roads, 87 percent of speeding-related fatalities in 2013 occurred on roads other than interstate highways and freeways,[2] In 2013, 25 percent occurred on streets with speed limits of 35 mph or less.[3]

Speeding poses multiple risks to everyone on the road: Speeding is one of the most prevalent factors contributing to motor vehicle crashes.[4] It contributes to both crash frequency and severity.[5] Speed increases frequency because at higher speeds motorists have less time to react and stopping distances are longer. The probability of severe injury in crashes increases sharply with the impact speeds of the vehicles, reflecting the laws of physics.

The risk of death to pedestrians — the most vulnerable people on the road — climbs rapidly as speed increases. Researchers estimate that the risk of death for a pedestrian struck by a vehicle is about 5 percent for a vehicle traveling at 20 mph, about 40 percent for a vehicle traveling at 30 mph, and about 80 percent for a vehicle traveling at 40 mph.[6] Urban areas are prime candidates for speed enforcement because 73 percent of pedestrian deaths in 2013 occurred in urban areas.[7]

New ways needed to reduce speeding on high-risk roads: The perception of the risk of getting a speeding ticket strongly influences motorists' speed choices. Traditional police patrols are the most common method of apprehending motorists who travel at excessive speeds. However, many enforcement agencies do not have sufficient personnel to mount effective speed enforcement programs. Staffing levels have not kept pace with the growth in motor vehicle travel. Between 1995 and 2013, the estimated number of vehicle miles traveled in the United States increased by 23 percent,[8] but the number of law enforcement officers grew by only 1.2 percent.[9] Other police

priorities such as apprehension of violent criminals and antiterrorism efforts can limit resources available for traffic enforcement. In addition, during periods of heavy congestion, it can be dangerous for police to make traditional traffic stops on some roads.

Cameras reduce speeding violations and crashes: The challenge is to find better methods of controlling speeds, and speed cameras can help. The cameras photograph motor vehicles going above a specified speed threshold, typically significantly faster than the posted speed limit. To increase the deterrent value, prominently posted signs are used to alert motorists that cameras are being used.

Automated speed enforcement can substantially reduce speeding on a wide range of roads. Institute studies of the use of speed cameras on residential roads in Montgomery County, Maryland, on a major highway in Scottsdale, Arizona, and on city streets in the District of Columbia found that the proportion of drivers exceeding speed limits by more than 10 mph declined by 70, 88, and 82 percent, respectively, after cameras were introduced.[10,11,12] In the Montgomery County and Scottsdale studies, travel speeds also declined significantly on nearby roadways, indicating a spillover effect of the camera enforcement. For example, the proportion of drivers in Montgomery County traveling more than 10 mph above the speed limit declined by about 70 percent at locations with both warning signs and speed camera enforcement, 39 percent at locations with warning signs but no speed cameras, and 16 percent on residential streets with neither warning signs nor speed cameras.[10]

A 2010 systematic review published by the Cochrane Collaboration (an international organization that conducts systematic reviews of the scientific literature on public health issues) examined 35 studies from various countries.[13] The authors concluded that speed cameras — including fixed, mobile, overt, and covert devices — cut average speeds by 1-15 percent and reduced the percentage of vehicles traveling above the speed limits or designated speed thresholds by 14-65 percent compared with sites without cameras.

Studies have found that the implementation of automated speed enforcement results in fewer crashes. The Cochrane Collaboration review analyzed data from 28 studies of the effects of camera enforcement on crashes, finding reductions ranging from 8 to 49 percent for all crashes, 8 to 50 percent for injury crashes, and 11 to 44 percent for crashes involving fatalities and serious injuries.[13]

Red light running

The running of red lights is also a common — and a serious — violation. An Institute study conducted at five busy intersections in Fairfax, Virginia, indicated that, on average, a motorist ran a red light every 20 minutes,[14] and at peak travel times the violations became more frequent. In another Institute study conducted in Arlington, Virginia, red light runners were compared with drivers who had an opportunity to run a red light but did not.[15] As a group, the violators were younger, less likely to use safety belts, and had poorer driving records. Red light runners were more than 3 times as likely to have multiple speeding convictions on their driver records.

Traffic signal violations may seem trivial to the violators, but the safety consequences are considerable when things go wrong. An Institute study of urban crashes found that running red lights and other traffic controls was the most common cause of all crashes (22 percent).[16] Injuries occurred

in 39 percent of crashes in which motorists ran traffic controls. This was the highest proportion found for any crash type.

On a national basis in 2013, drivers who ran red lights were responsible for 697 deaths and an estimated 127,000 injuries.[17] About half of the deaths in red light running crashes were pedestrians, bicyclists, and occupants in other vehicles who are hit by the red light runners.

Cameras reduce signal violations: Like speed cameras, red light cameras are effective in modifying driver behavior. Violation rates in Oxnard, California, and in Fairfax, Virginia, decreased about 40 percent during the first year of camera enforcement.[14,18] Increases in driver compliance with signals were not limited to camera-equipped sites but spilled over to intersections without cameras.

A 2014 study found that significant reductions in violations at camera intersections in Arlington, Virginia, were found 1 year after ticketing began.[19] These reductions were greater for violations occurring later in the red phase, when violations are more likely to result in crashes. Violations occurring at least a half second after the light turned red were 39 percent less likely than would have been expected without cameras. Violations occurring at least 1 second after were 48 percent less likely, and the odds of a violation occurring at least 1.5 seconds into the red phase fell 86 percent. Violations were lower at two nearby noncamera intersections on camera corridors but not at two other noncamera sites not on camera corridors. A larger, more widely publicized program likely is needed to achieve broad community-wide effects.

It is sometimes claimed that proper timing of yellow signals can eliminate red light running. While adequate timing is important and can reduce signal violations, longer yellow timing alone does not eliminate the benefits of red light cameras. An Institute study conducted in Philadelphia illustrated the benefits of both countermeasures by first lengthening yellow signals and then introducing red light camera enforcement.[20] Extending yellow lights reduced violations by 36 percent, and camera enforcement further reduced the remaining violations by 96 percent beyond the levels that had been achieved by the longer yellow intervals.

Cameras reduce intersection crashes: The key question is whether red light camera enforcement improves safety. Findings from Institute research indicate it does. In 2010, researchers looked at 14 cities that had cameras during 2004-08 and found that the combined per capita rate of fatal red light running crashes fell 35 percent, compared with 1992-96.[21] The rate also fell in 48 cities without camera programs in either period, but only by 14 percent. Based on that comparison, the researchers concluded that the rate of fatal red light running crashes in cities with cameras in 2004-08 was 24 percent lower than it would have been without cameras. That adds up to 74 fewer fatal red light running crashes or, given the average number of fatalities per red light running crash, approximately 83 lives saved. The researchers estimated that had all cities with at least 200,000 population had red light camera programs during this period, as many as 815 deaths would have been prevented in signalized intersection crashes.

Significant citywide crash reductions followed the introduction of cameras in Oxnard, California.[22] Injury crashes at intersections with traffic signals were reduced 29 percent. Front-into-side collisions — the crash type most closely associated with red light running — were reduced 32 percent, and front-into-side crashes involving injuries were reduced 68 percent. Crashes declined throughout

Oxnard, even though cameras were installed at only 11 of the city's 125 intersections with traffic signals.

An Institute review of the international literature concluded that red light camera enforcement reduces violations by an estimated 40-50 percent. It reduces injury crashes 25-30 percent.[23] The Cochrane Collaboration reviewed 10 controlled before-after studies of red light camera effectiveness.[24] Based on the most rigorous studies, there was an estimated 13-29 percent reduction in all types of injury crashes and a 24 percent reduction in right-angle injury crashes.

Some studies have reported that, even as red light cameras reduce front-into-side collisions and overall injury crashes, they can increase rear-end crashes in the initial period following camera installation. A 2005 study sponsored by the Federal Highway Administration evaluated red light camera programs in seven communities, finding a 25 percent reduction in right-angle crashes while rear-end collisions increased 15 percent. [25] But because the types of crashes that are prevented by red light cameras tend to be more severe and more costly than the additional rear-end crashes that can occur, the study estimated a positive societal benefit of more than $18.5 million in the seven communities. Not all studies have reported increases in rear-end crashes. The 2005 Cochrane Collaboration did not find a statistically significant change in rear-end crashes.[24]

Some studies have purported to find overall crash increases following camera enforcement,[26,27] but careful review indicates the researchers failed to incorporate appropriate comparison sites. The result is that the expected number of crashes at intersections where cameras were installed could not be properly estimated,[28,29] so the effects of the enforcement on crashes could not be determined.

Another option: A good way to reduce crashes is to convert traditional intersections to roundabouts, which eliminate the need for traffic signals as well as cameras. Where roundabouts have been installed, crashes have declined about 40 percent. Crashes involving injuries have declined about 80 percent.[30] However, many intersections will continue to be controlled by traffic lights, so red light cameras will continue to be useful.

Public support for automated enforcement programs

Like other government policies and programs, camera enforcement requires acceptance and support among the public as well as government officials. Some opponents of automated enforcement raise the "big brother" issue to stir up disapproval, but acceptance of cameras always has been strong.

Telephone surveys conducted by the Institute in jurisdictions with speed camera programs show that the majority of drivers support them. A survey conducted 6 months after speed cameras were deployed on residential streets in Montgomery County, Maryland, found that 62 percent of drivers favored them.[10] In Scottsdale, Arizona, where speeds limits on an urban freeway were enforced with cameras, 77 percent of drivers supported the camera program.[11] A 2012 survey of residents of the District of Columbia, which has an extensive automated enforcement program, found strong support for speed cameras.[31] Seventy-one percent of residents who had driven a car in the past month and 90 percent of residents who had not driven supported speed cameras.

Institute surveys of residents in communities with red light camera programs also have found support for them. A 2011 Institute survey found that two-thirds of drivers in 14 large cities with longstanding camera programs supported their use.[32] In the 2012 survey of District of Columbia residents, 87 percent indicated that they support red light cameras.[31] An earlier Institute survey conducted in 10 U.S. cities, five with red light cameras and five without, found more than 75 percent of drivers supported the cameras.[33]

Summary and conclusions

Automated traffic enforcement is not a panacea, but it is a proven way to reduce traffic violations and prevent crashes, especially serious crashes that result in injury and death. Opponents often criticize the revenue-generating aspects of camera programs, but a plus is that such programs can be financially self-sufficient. Once cameras have been in place long enough that residents know they will be ticketed for flouting the law, violations and revenues decline.

Cameras are sometimes said to violate privacy, but driving is a regulated activity on public roads. By obtaining a license, a motorist agrees to abide by certain rules, such as to obey traffic signals. Neither the law nor common sense suggests that drivers should not be observed on the road or have their violations documented.

In tallying the costs and benefits of camera enforcement, communities should factor in the considerable social and economic benefits of successfully reducing crashes. Besides foregone medical costs, car repair bills, and lost income, citizens in communities with cameras experience direct savings in terms of reduced police time to investigate and report crashes, lessened need for emergency response service, and lower roadway cleanup costs.

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