

**Attitudes Toward Red Light
Camera Enforcement in Cities
with Camera Programs**

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Abstract

Objective: To obtain information on attitudes and experiences related to red light camera enforcement in cities with camera programs and in Houston, Texas, where cameras were removed after voters rejected the program in November 2010.

Methods: Telephone surveys were conducted with 3,111 drivers in 14 large cities (population greater than 200,000) with long-standing red light camera programs and 300 drivers in Houston, using random samples of landline and cellphone numbers. For analyses combining responses from the 14 cities, cases were weighted to reflect each city's share of the total population for the 14 cities.

Results: Among drivers in the 14 cities with red light camera programs, two-thirds favor the use of cameras for red light enforcement, and 42 percent strongly favor it. The chief reasons for opposing cameras were the perceptions that cameras make mistakes and that the motivation for installing them is revenue, not safety. Forty-one percent of drivers favor using cameras to enforce right-turn-on-red violations. Nearly 9 in 10 drivers were aware of the camera enforcement programs in their cities, and 59 percent of these drivers believe the cameras have made intersections safer. Almost half know someone who received a red light camera citation and 17 percent had received at least one ticket themselves. When compared with drivers in the 14 cities with camera programs, the percentage of drivers in Houston who strongly favored enforcement was about the same (45 percent), but strong opposition was higher in Houston than in the other cities (28 percent versus 18 percent).

Conclusions: Most drivers in cities with long-standing red light camera programs support cameras and recognize their safety benefits, but communities could do a better job of educating the public about the dangers of right-turn-on-red violations and the need for enforcement. Given that camera opponents frequently said cameras make mistakes, it appears communities also could do a better job of explaining the safeguards that ensure citations are issued only to drivers who clearly run red lights.

Keywords: Red light running; red light cameras; public opinion; survey

Introduction

Running a red light is a common traffic violation in the United States. In a study of traffic at 19 intersections in 4 states, there was an average of 3.2 red light running events per hour per intersection (Hill and Lindly, 2003). Ninety-three percent of respondents to a 2010 national survey said it is unacceptable to go through a red light if it is possible to stop safely, but 34 percent reported having done so in the past 30 days (AAA Foundation for Traffic Safety, 2010). Almost a quarter of respondents reported doing so more than once in the past 30 days, and 4 percent said they often or regularly do so.

Red light violations are not only common; they also are dangerous. A study of urban crashes reported that running red lights and other traffic controls was the most common type of crash (22 percent), and injuries occurred in 39 percent of these crashes (Retting et al., 1995). In 2009, 676 people were killed and an estimated 130,000 were injured in crashes in which police were able to establish that drivers ran red lights. Sixty-four percent of these deaths were people other than the red light runners, including passengers in the red light running vehicles, occupants of the other vehicles, pedestrians, and bicyclists (National Highway Traffic Safety Administration, 2009).

Motorists are more likely to comply with traffic laws when they perceive a high likelihood of being cited for a violation. However, many enforcement agencies have insufficient personnel to mount effective enforcement programs using traditional police patrols. Red light cameras can supplement traditional methods of enforcement at intersections, where pursuit of violators can endanger motorists and pedestrians as well as officers. Studies have reported reductions in red light violations of 40-96 percent after the introduction of red light cameras (Retting et al., 1999a, 1999b; Retting et al., 2008), and reductions occurred not only at camera-equipped sites but also at signalized intersections without cameras. A study of red light camera enforcement in Oxnard, California, found a citywide 29 percent reduction in injury crashes at intersections with traffic signals (Retting and Kyrychenko, 2002). Right-angle collisions, the crash type most closely associated with red light running, declined by 32 percent, and right-angle crashes involving injuries fell by 68 percent.

Some studies have reported that the use of red light cameras can increase rear-end crashes. An evaluation of red light camera programs in 7 communities reported a 25 percent reduction in right-angle crashes, whereas rear-end crashes increased by 15 percent (Council et al., 2005). The types of crashes prevented by red light cameras tend to be more severe and more costly than rear-end crashes. Thus, the study estimated a positive social benefit of more than \$18.5 million in the 7 communities, based on medical costs; the costs of emergency services, property damage,

and lost productivity; and monetized quality-adjusted life years. Not all studies have reported increases in rear-end crashes. A review of before-after studies of red light camera effectiveness that adjusted for regression to the mean, spillover effects, or both, reported an estimated 13-29 percent reduction in all types of injury crashes, a 24 percent reduction in right-angle injury crashes, and a nonsignificant 18 percent reduction in rear-end injury crashes (Aeron-Thomas and Hess, 2005).

The number of U.S. communities with red light camera programs has increased dramatically during the past two decades, from zero communities in 1992 to 25 communities in 2000 and 533 communities in 2010. Public opinion surveys have found strong acceptance of cameras. A survey conducted in 2000 in 10 U.S. cities, 5 with red light camera programs and 5 without, found more than 75 percent of drivers supported the cameras (Retting and Williams, 2000). A 2002 national survey also found favor among 75 percent of drivers (Royal, 2004), yet red light camera enforcement remains controversial in some communities, and eight communities have voted out red light cameras in ballot initiatives during the past three years.

In 2011 the first study examining the effects of red light camera enforcement on fatal crashes was published (Hu et al., 2011). From the 99 U.S. cities with more than 200,000 residents in 2008, 14 cities were identified that used red light camera enforcement during the entire 2004-08 period but not at any time during 1992-96, and 48 cities were identified without camera programs during either period. After controlling for population density and land area, the per capita rate of fatal red light running crashes during 2004-08 for cities with camera programs was an estimated 24 percent lower than what would have been expected without cameras. The rate of all fatal crashes at signalized intersections for cities with camera programs was an estimated 17 percent lower. All but two of the 14 cities with camera programs experienced reductions in the rate of fatal red light running crashes, and all but three experienced reductions in the rate of all fatal crashes at signalized intersections.

The current study extends this research by examining the public attitudes toward cameras in the 14 study cities, which have retained their red light camera programs even as other cities have chosen not to install cameras in the face of vocal opposition or have voted them out. Telephone surveys were conducted of drivers in each of the 14 cities. A telephone survey also was conducted of residents in Houston, where voters voted to remove red light cameras on November 2, 2010, and ticketing was discontinued on November 15. Houston is the largest city to date to vote out red light cameras.

Methods

Random-digit-dialing methods were used to obtain a representative sample of drivers in each city. Among the 14 cities with red light camera programs in the Hu et al. (2011) study, about 300 interviews were conducted in Bakersfield, Calif., and Raleigh, N.C., where there were increases in the rates of fatal red light running crashes and all fatal crashes at intersections, and in Baltimore, Md., which experienced a decline in the rate of red light running fatal crashes but an increase in the rate of all fatal crashes at intersections. About 200 interviews were conducted in each of the 11 cities with declines in both fatal crash rates (Chandler and Phoenix, Ariz.; Chicago, Ill.; Garland, Texas; Long Beach, Sacramento, San Diego, and Santa Ana, Calif.; Portland, Ore.; Toledo, Ohio; and Washington, D.C.). All 14 cities still use red light cameras. Interviews were conducted with 300 people in Houston.

For each city, a random sample of landline numbers and a random sample of cellphone numbers were obtained from an industry supplier of telephone samples, with the samples drawn from the area codes and exchanges for each city. In all, nearly 28,000 landline numbers and more than 5,600 cellphone numbers were obtained. Telephone interviews were completed between February 19 and March 29, 2011, with 3,111 drivers 18 and older in the 14 cities with cameras and with 300 drivers in Houston. Interviews were conducted by OpinionAmerica Inc. (Cedar Knolls, N.J.), a professional survey organization. People were interviewed only if they were at least 18 years old, drove a vehicle at least once a week, and had lived in the city for at least 1 year.

Young males typically are the most difficult group to reach in telephone surveys. After reaching a household via a landline number, the interviewer asked to speak to the youngest male member of the household. If that person was not home, but expected home later, the interviewer set up a callback appointment to reach this person. If that callback proved unsuccessful or the person was not expected home later, then the survey was completed with any person in the household who was willing to participate. When reaching a person via a cellphone number, the interviewer asked that person to participate in the survey. In all cases, when calling either a cellphone or landline number, due to call forwarding and phone number transfers, respondents were asked if they were driving or were otherwise in a situation that would make it unsafe to talk. If so, the interviewer made provisions to call that number again at a later date/time. Multiple dialing attempts were made to each record in the sample pool in an effort to complete a survey. After five dialing attempts a number was retired unless a specific callback appointment had been arranged.

Of the 8,285 households contacted in the 14 cities combined, 4,253 (51 percent) declined to participate or began but did not finish the survey, 921 (11 percent) agreed to participate but did not meet the screening criteria, and 3,111 (38 percent) completed the survey. The percentage of households contacted that completed the survey varied among the 14 cities, ranging from 31 percent in Chandler to 48 percent in Raleigh. Eight percent of the completed interviews were conducted via cellphone. Of the 887 households contacted in Houston, 501 (56 percent) declined to participate or began but did not finish the survey, 86 (10 percent) agreed to participate but did not meet the screening criteria, and 300 (34 percent) completed the survey. Twelve percent of completed interviews in Houston were conducted via cellphone.

Respondents in the 14 cities with red light camera programs were randomly assigned to a long or short version of the questionnaire. All respondents were asked about their attitudes toward the dangers of red light running, whether they ran a red light in the past 30 days, their attitudes toward red light cameras, whether there were red light cameras in their cities, and a set of demographic questions (age, educational attainment, and household income). For the respondents answering the long questionnaire, those who were aware of the red light camera programs in their cities were asked some questions about their perceptions and experiences related to the program, for example whether they had received a red light camera citation. A pilot test of 50 interviews was conducted; these interviews were included in the final sample, as only minor revisions to the questionnaire or protocol were made.

Results were analyzed for the 14 cities with camera programs combined. For these analyses, the responses for each city were weighted based on the city's 2010 population relative to the 2010 population for the 14 cities combined (U.S. Census Bureau, 2011). Each response was multiplied by "wt" using the following calculation:

$$wt = (\text{Citypop} * \text{Totalsamp}) / (\text{Citysamp} * \text{Totalpop}),$$

where Citypop is the population of each city, Citysamp is the number sampled in each city, Totalpop is the total population of all 14 cities (10,119,753), and Totalsamp is the total number sampled (3,111). All analyses for the 14 cities combined were based on the weighted data set. Comparisons also were made among the 14 cities and the results were tabulated for Houston. For both sets of analyses, the data were not weighted as each city's responses were designed to be a random sample of drivers in that city.

The chi-square statistic ($p < 0.05$) was used to test the statistical significance of differences in responses. Given the sample size and sampling method, the estimated sampling tolerance for survey percentages for the sample

of the 14 cities combined (N=3,111) was about ± 2 percentage points (with $p < 0.05$) for responses based on the total sample. The estimated sampling tolerance for survey percentages for Houston (N=300) was about ± 6 percentage points (with $p < 0.05$) for responses based on the total sample.

Results

Interviews were completed with 3,111 drivers in the 14 cities with red light camera programs (approximately 300 drivers in 3 cities and approximately 200 drivers in 11 cities). The characteristics of the weighted combined sample for the 14 cities are listed in Table I. The sample was almost evenly divided between males and females. About 5 percent of survey respondents were 30 or younger, about 30 percent were ages 51-60, and about a third were older than 60. Almost 60 percent had a college degree or had attended graduate school. About one-fifth said their household income was less than \$50,000, and 31 percent reported household incomes of at least \$75,000; almost one-third of the survey respondents declined to provide their household income. The characteristics of the Houston sample, also listed in Table 1, were similar to those of the weighted 14-city sample.

Results for 14 cities with camera programs

The majority of drivers in the 14 cities with red light camera programs believe drivers running red lights is a problem in their cities (Table II). Eighty-two percent believe drivers' running red lights is a serious threat to their personal safety, and almost all (93 percent) believe running red lights is unacceptable. Still, 7 percent of drivers said they had run a red light at least once in the past month. Most of these drivers (86 percent) also said it is unacceptable to run a red light.

Table III summarizes opinions about using cameras to identify red light violations. About two-thirds of drivers in the 14 cities combined favor cameras; 42 percent strongly favor them. The top reasons for supporting camera enforcement were that it increases safety (61 percent), that it effectively deters red light running (24 percent), and that it enforces the law all the time, even when police cannot be there (22 percent). More than one-quarter of drivers oppose red light cameras, and 18 percent strongly oppose them. Asked why they oppose cameras, drivers most often said that cameras can make mistakes (26 percent), are used to generate revenue for governments rather than for safety (26 percent), lead to more crashes because drivers speed up to beat the red light or stop suddenly and are rear-ended (19 percent), or are an invasion of privacy (17 percent).

Opponents of red light cameras were asked whether cameras are an invasion of privacy. Forty-eight percent believe that they are. Opponents of cameras also were asked whether they oppose the use of surveillance cameras by law enforcement agencies in general or oppose only red light cameras. Forty-nine percent oppose only red light cameras, and 41 percent oppose all surveillance cameras.

There is less support for using cameras to identify right-turn-on-red violations than other types of red light running (Table IV). Forty-one percent of drivers support using cameras to issue citations for right-turn-on-red violations. Nineteen percent favor red light camera enforcement but not for right-turn-on-red violations, most often because these violations are not perceived to be a problem (33 percent).

Sixty percent of drivers in the 14 cities said it is acceptable for revenues from camera citations to exceed the costs of camera enforcement. A smaller percentage, 46 percent, said it is acceptable for revenues to be less than the costs.

Eighty-nine percent of drivers interviewed in the 14 cities were aware that red light cameras are used in their cities (Table V). A majority of these drivers said cameras were used at 1 or 2 intersections (9 percent) or at some intersections but fewer than half (63 percent), and three-quarters of these drivers said they know which intersections have cameras. Among the drivers aware of camera enforcement, 59 percent said the cameras have made intersections safer (Table V). Twenty percent said the cameras have made intersections less safe, primarily because drivers may stop abruptly and be rear-ended (47 percent) or crash after speeding up to avoid the red light (38 percent). Nineteen percent also noted that the flashing cameras can distract drivers.

Among the drivers who are aware of camera enforcement, 56 percent said they are more careful to stop for red lights because of the cameras, and almost all of these drivers said they are more likely to stop at all intersections with signal lights, not only at intersections with cameras (Table V).

Forty-nine percent of drivers in the 14 cities knew someone who had received at least one traffic citation from a red light camera. Seventeen percent of drivers had received a citation themselves. Fifty-one percent of these drivers believed the citation was deserved, and 20 percent appealed the citation. Of the drivers appealing their citations, 39 percent said the citation was dismissed; it should be noted that the number of respondents answering this question (N=54) was small.

Age and gender differences: Responses for the combined 14-city survey were examined by driver age and gender. Among drivers aware of the red light cameras in their cities, the proportion who believe the cameras had made intersections safer generally increased with age, ranging from about half of drivers 40 and younger to 74 percent of drivers older than 70 ($\chi^2=24.9$, $p=0.006$). Support for cameras also generally increased with age, but at least 60 percent of the drivers in each age group supported them ($\chi^2=19.1$, $p=0.039$). The youngest drivers (30 and younger) were most likely to say they are more careful to stop for red lights because of red light cameras (74 vs. range of 52-59 percent; $\chi^2=49.5$, $p<0.001$). The proportion of drivers who knew someone who had received a red light camera citation decreased with age, ranging from 70 percent of drivers 30 and younger to 34 percent of drivers older than 70 ($\chi^2=65.3$, $p<0.001$). The proportion of drivers who had received a camera citation themselves declined from 27 percent of drivers younger than 40 to 12 percent of drivers 70 and older ($\chi^2=40.3$, $p<0.001$).

Female drivers were more likely to perceive running red lights as a problem (61 vs. 55 percent; $\chi^2=16.7$, $p<0.001$) and to believe it is a serious threat to their safety (87 vs. 79 percent; $\chi^2=38.4$, $p<0.001$). They also were more likely to believe red light cameras keep intersections safer (63 vs. 56 percent of drivers aware of the camera enforcement; $\chi^2=33.0$, $p<0.001$) and to favor red light cameras (71 vs. 61 percent; $\chi^2=56.0$, $p<0.001$). There were not significant gender differences with regard to reports of running a red light in the past month, the effects of cameras on drivers' own red light running behavior, or receiving a camera citation.

City differences: There were similarities but also some differences among the 14 cities with camera programs. Given the relatively large sample sizes and the large number of cities compared, small differences were sometimes statistically significant. The pattern of city differences rarely was consistent across survey items. The most important differences are highlighted below.

In seven cities, more than 90 percent of drivers were aware of the red light camera enforcement in their cities. In the other seven cities, the percentage who were aware ranged from 72 percent in Phoenix to 83 percent in Chandler ($\chi^2=237.5$, $p<0.001$). In all but one city, the majority of drivers who were aware of the camera enforcement said it has made intersections safer (ranging from 52 percent in Chicago to 77 percent in Sacramento); in contrast, only 42 percent of drivers in Long Beach believed intersections were safer because of the cameras ($\chi^2=69.6$, $p<0.001$) (Figure 1). Drivers residing in Long Beach also were the least likely to favor red light cameras (Figure 2). Support for cameras ranged from 48 percent in Long Beach to 78 percent in Washington, D.C.

($\chi^2=104.6$, $p<0.001$). Views about the effects of red light cameras on safety generally were similar to attitudes toward red light camera enforcement.

One of the most striking differences among cities was the proportion of drivers who knew someone who had received a red light camera citation (Figure 3). The proportion ranged from 27 percent in Chandler, Portland, and Phoenix to 72 percent in Chicago ($\chi^2=53.0$, $p<0.001$). The percentage of drivers who had received a camera citation themselves also varied among the cities (Figure 4), ranging from 3 percent in Long Beach to 36 percent in Baltimore ($\chi^2=70.2$, $p<0.001$). In general, cities with higher proportions of drivers who knew someone who had been ticketed also were cities with high proportions of drivers who were ticketed, but there were exceptions.

Analyses also explored whether there were discernible differences in the patterns of responses in the three cities studied by Hu et al. (2011) that experienced increases in at least one of the measures of fatal crash rates. These analyses looked at the responses for each of the three cities – Raleigh, Baltimore, and Bakersfield – relative to the other 11 cities with camera programs combined. Relative to the 11-city survey respondents, drivers in Raleigh were more likely to have run a red light in the past 30 days (8 vs. 6 percent; $\chi^2=13.3$, $p=0.001$) and less likely to say that red light running is a problem in their cities (47 vs. 58 percent; $\chi^2=13.2$, $p=0.001$), to be aware of the camera enforcement (81 vs. 88 percent; $\chi^2=13.6$, $p=0.001$), to say that cameras have made intersections safer (55 vs. 59 percent; $\chi^2=9.7$, $p=0.008$), to say that cameras make them more careful to stop for red lights (44 vs. 56 percent; $\chi^2=10.2$, $p=0.006$), and to favor red light camera enforcement (62 vs. 66 percent; $\chi^2=15.9$, $p<0.001$). Drivers in Raleigh also were much less likely to know someone who received a red light camera citation (33 vs. 49 percent; $\chi^2=14.2$, $p<0.001$) and less likely to have received a citation themselves, but not significantly so (12 vs. 16 percent, $\chi^2=2.6$, $p=0.278$).

Drivers in Baltimore also were significantly more likely than drivers in the 11-city sample to report running a red light in the past 30 days (Baltimore: 12 vs. 6 percent; $\chi^2=17.6$, $p<0.001$). Awareness of camera enforcement was higher in Bakersfield (98 percent; $\chi^2=27.5$, $p<0.001$) and Baltimore (95 percent; $\chi^2=13.6$, $p=0.001$) than in the 11-city sample (88 percent). The proportion of drivers who knew someone who had received a red light camera citation was higher in Baltimore than in the 11-city sample (60 vs. 49 percent; $\chi^2=8.2$, $p=0.02$) and also higher in Bakersfield, although not significantly so (58 vs. 49 percent; $\chi^2=4.9$, $p=0.09$). As noted above, 36 percent of drivers in Baltimore said they had received a red light camera citation; this was the highest percentage among the 14 cities with camera programs and significantly higher than the proportion in the 11-city sample (16 percent; $\chi^2=29.5$,

p<0.001). The level of support for cameras and the perceived safety effects of the cameras were similar among drivers in Baltimore, Bakersfield, and the 11-city sample of drivers.

Results for Houston

Attitudes of drivers residing in Houston were similar in most respects to the attitudes of the combined sample of drivers residing in the 14 communities with red light camera programs, but there were some important differences. Compared with the combined 14-city sample, a larger proportion of Houston drivers believe that red light running is a problem in their city (67 vs. 58 percent; $\chi^2=10.4$, p=0.006), and the percentage of these drivers who said it is a big problem was larger in Houston than in the 14-city sample (53 vs. 43 percent; $\chi^2=6.9$, p=0.03). Drivers in Houston also were more likely to say they had run a red light in the past 30 days (10 vs. 7 percent; $\chi^2=16.0$, p<0.001).

Attitudes toward red light camera enforcement also differed significantly between drivers in Houston and drivers in the combined sample of cities with camera programs (Table VI). The proportion of drivers who strongly favored cameras was similar (45 in Houston vs. 42 percent in 14 cities combined), but the proportion who strongly opposed cameras was larger in Houston (28 percent in Houston vs. 18 percent in 14 cities combined). These differences were statistically significant ($\chi^2=36.6$, p<0.001). The reasons for opposing cameras also differed. A higher proportion of the drivers in Houston than in the other cities said the cameras can make mistakes (38 vs. 26 percent; $\chi^2=6.0$, p=0.01), and a smaller proportion of drivers in Houston said the focus was revenue rather than safety (15 vs. 26 percent; $\chi^2=6.1$, p=0.01) or that cameras cause more crashes (6 vs. 19 percent; $\chi^2=10.7$, p=0.001). Among drivers opposed to red light cameras, the percentage who believe red light cameras are an invasion of privacy was significantly higher in Houston than in the other cities (60 vs. 48 percent, $\chi^2=18.1$, p=0.0001). There were not significant differences in the attitudes toward using cameras to enforce right-turn-on-red violations in Houston and in the 14 cities with camera programs.

Discussion

Although the use of red light cameras has been controversial in some communities, the current study found strong support for cameras in 14 large cities with longstanding camera programs. When responses for the cities were aggregated, two-thirds of drivers said they support cameras, and 42 percent strongly support them. Among the

89 percent of drivers who were aware of the camera programs in their cities, a majority said the cameras have made intersections safer.

Despite the majority support for cameras, a sizeable minority of drivers – about one-quarter – oppose them. Asked why, drivers most often said that cameras can make mistakes, are used to generate revenue rather than for safety, lead to more crashes, and are an invasion of privacy. These responses reflect some misperceptions about how camera programs work and suggest that governments could do a better job educating the public about the workings of their programs. For example, the photographic evidence is reviewed by police officers before citations are issued, and there are other safeguards to minimize errors. Among drivers who noted that cameras can make mistakes, some said citations are issued for drivers who are already in the intersection when the light turns red. However, red light violations are defined as entering the intersection after the signal has turned red, and many programs provide motorists with a grace period of up to half a second after the light switches to red. There also were misperceptions about the safety effects of camera programs. When implementing programs, communities should emphasize the problem of intersection crashes and the demonstrated success of cameras in reducing red light violations and crashes, including fatal crashes (Hu et al., 2011; Retting et al, 1999a, 1999b; Retting and Kyrychenko, 2002). Some drivers in the current survey were concerned that rear-end crashes increase with camera enforcement. Not all evaluations of cameras have found increases in rear-end crashes (e.g., Aeron-Thomas and Hess, 2005), and even where rear-end crashes have increased, there were net safety benefits due to reductions in more serious right-angle crashes (Council et al., 2005).

There was less support in the 14 cities for using cameras to identify right-turn-on-red violations. Forty-one percent of drivers support using cameras for these violations. About a fifth of drivers support cameras, but oppose using them for right-turn-on-red violations. These drivers most often attributed their opposition to the belief that these right-turning violations are not a problem in their cities. Other responses (e.g., should be able to turn right on red if safe, too complicated to enforce) suggested some confusion about these violations, which include turning on red where it is not permitted and making the turn without stopping. Cities differ as to whether they issue tickets for rolling right-on-red turns when they are caught on camera, and this may explain some of the confusion among the survey respondents. When states began to allow right turns on red in the 1970s, studies found increases in right-turning crashes at intersections where these turns are allowed. A review of the research found estimated increases of 23 percent for all right-turn crashes, 60 percent for pedestrian crashes, and 100 percent for bicyclist crashes (Zador,

1984). The current findings suggest that communities need to do a better job explaining the right-turn-on-red laws and the importance of enforcing them.

In Houston, 53 percent of voters cast ballots against the cameras in November 2010. In the current study, however, 57 percent of the drivers interviewed said they favor camera enforcement, and 45 strongly favor cameras. The level of strong support was similar to that found in the 14-city sample. But opposition was stronger in Houston. Twenty-eight percent of the survey respondents in Houston said they strongly oppose cameras, compared to 18 percent in the other 14 cities. Houston drivers also were more likely than drivers in the other cities to say the cameras can make mistakes. The future of Houston's camera program is unknown; on June 17, 2011, a federal judge invalidated the referendum that ended the camera program (*City of Houston v. American Traffic Solutions*, 4:10-cv-04545, June 17, 2011, US Dist. Ct. (Texas So. Dist.)).

Most survey respondents in all 15 cities believe running red lights is dangerous. Almost all say it is unacceptable behavior. Still, 7 percent of drivers in the 14 cities with camera programs and 10 percent of drivers in Houston say they ran a red light on at least one occasion in the past 30 days. Most of these drivers also said running a red light is unacceptable, suggesting that some drivers do not set out to run a red light intentionally. One-third of respondents in a 2010 national survey reported running a red light at least once in the past 30 days (AAA Foundation for Traffic Safety, 2010). The much lower prevalence of reported red light running in the current survey likely reflects different samples and the fact that red light violations are lowered with cameras. The current survey interviewed drivers in cities with current camera programs and drivers in Houston, where cameras were removed shortly before interviews were conducted, rather than a representative sample of the U.S. population.

There were some differences among the 14 cities with camera programs. Information about the current and historical scope of the cities' programs (e.g., number of cameras, percent of intersections with cameras, number of citations issued) was not available for all the cities so that differences in survey responses could not be related to differences in the programs. Support for cameras was lowest in Long Beach and Santa Ana. This may reflect ongoing controversy about red light cameras in some California cities, including nearby Los Angeles (Nguyen, 2010; Richards, 2010; Rosenberg, 2010; Rubin, 2011). Penalties for red light camera violations are higher in California than in other states (\$100 fine plus court costs totaling more than \$300 and 1 license penalty point) (IIHS, 2011). There were large differences among cities in the proportion of drivers who knew someone who had received a camera citation and the proportion of drivers who had received a citation themselves. The cities with the largest

percentage of drivers who had received a citation – Baltimore, Chicago, Toledo, and Washington, D.C. – also were the cities with the most cameras at the time the survey was conducted, based on information obtained by city agency websites and media reports. There was no apparent relationship between a city’s level of support for cameras and the proportion of drivers who had received a camera citation.

Responses were scrutinized in the three cities that experienced an increase in at least one of the fatal crash rate measures in the study by Hu et al. (2011), when the other 11 cities experienced declines in both measures. The responses from drivers in Baltimore and Bakersfield were generally similar to responses from drivers in the 11-city sample, or reflected higher levels of awareness of the cameras and greater support for them. There was a discernible difference in the pattern of responses for Raleigh that may help explain why the camera program may be less effective, although unknown other factors also may have influenced the program’s effects. Compared to the 11-city sample, drivers in Raleigh were more likely to have run a red light in the last 30 days, and they were less likely to think red light running is a problem in their city, to be aware of the camera program, to believe the cameras have made intersections safer, to be more careful to stop for red lights because of the cameras, to know someone who had received a camera citation, and to favor red light cameras. In particular, a lower awareness of the camera enforcement could limit community-wide effects of cameras on violations and crashes.

Delaney et al. (2005) studied the use of speed cameras internationally and concluded that wherever speed cameras have been used, they have been controversial. Some of the controversies related to attitudes about speed enforcement in general, but most were specific controversies related to the use of cameras. These same controversies were mentioned by respondents in the current survey. For example, some respondents thought that the aim of camera programs is raising revenue rather than increasing safety, and some questioned the reliability of the cameras. Delaney et al. concluded that the success of camera programs depends most importantly on political will and a strong and sustained government commitment, based on the research evidence of the safety effects of cameras. It seems that these lessons also pertain to red light camera programs. The current study suggests that most drivers in cities with longstanding camera programs realize their safety benefits, even though some opposition and misperceptions remain. Communities seeking to implement camera programs may wish to address the controversies from the outset by demonstrating the dangers of red light running and articulating the rationale for red light cameras and how they are being used. Messages about the likelihood of detection and the associated penalties are important, and it is essential that the equipment and operating procedures are reliable.

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Table 1 Characteristics of drivers interviewed in 14 large U.S. cities with red light cameras and in Houston, Texas

| | 14 cities combined Percent of sample Weighted N=3,111 | Houston Percent of sample N=300 |
|-------------------------------------|---|---------------------------------------|
| Age (years) | | |
| 19-30 | 4.7 | 6.0 |
| 31-40 | 10.9 | 11.0 |
| 41-50 | 19.4 | 18.3 |
| 51-60 | 29.6 | 28.3 |
| 61-70 | 27.2 | 26.7 |
| 71 and older | 7.2 | 7.3 |
| Don't know/refused | 1.1 | 2.3 |
| Gender | | |
| Male | 50.7 | 53.0 |
| Female | 49.3 | 47.0 |
| Education | | |
| Less than high school graduate | 2.3 | 3.3 |
| High school graduate | 14.7 | 12.3 |
| Some college | 22.6 | 21.7 |
| College graduate or graduate school | 58.6 | 60.0 |
| Other/don't know/refused | 1.8 | 2.7 |
| Household Income | | |
| < \$25,000 | 7.2 | 9.7 |
| \$25,000-49,999 | 14.4 | 12.0 |
| \$50,000-74,000 | 15.9 | 12.7 |
| \$75,000-149,999 | 21.1 | 22.0 |
| \$150,000+ | 9.8 | 12.3 |
| Don't know/refused | 31.6 | 31.3 |

Table 2 Opinions about red light running in 14 large U.S.cities with red light camera enforcement

| | Percent Weighted N=3,111 |
|--|-----------------------------|
| Believe drivers running red lights is a problem in city | |
| Problem | |
| Big problem | 25.0 |
| Somewhat of a problem | 31.8 |
| Unsure how big a problem | 1.0 |
| Not a problem | 38.0 |
| Don't know/refused | 4.1 |
| Believe drivers running red lights is a serious threat to personal safety | |
| Threat | |
| Very serious threat | 59.0 |
| Somewhat serious threat | 23.4 |
| Unsure how serious a threat | 0.7 |
| Not a threat | 15.6 |
| Don't know/refused | 1.2 |
| Acceptable for drivers to go through red lights even when it's possible to stop safely | |
| Unacceptable | |
| Completely unacceptable | 78.3 |
| Somewhat unacceptable | 14.5 |
| Unsure how unacceptable | 0.5 |
| Acceptable | |
| Completely acceptable | 1.6 |
| Somewhat acceptable | 2.9 |
| Unsure how acceptable | 0.1 |
| Don't know/refused | 2.1 |
| In past 30 days have driven through a light that had turned red | |
| Yes | 6.6 |
| No | 92.9 |
| Don't know/refused | 0.5 |

Table 3 Opinions about using red light cameras to enforce red light violations in 14 large U.S. cities with red light camera enforcement

| | Percent |
|--|-------------------|
| Favor or oppose red light cameras to enforce against red light running | Weighted N=3111 |
| Favor | |
| Strongly favor | 42.2 |
| Somewhat favor | 23.6 |
| Not sure how strongly favor | 0.5 |
| Oppose | |
| Strongly oppose | 17.6 |
| Somewhat oppose | 9.9 |
| Not sure how strongly oppose | 0.1 |
| Don't know/refused | 6.1 |
| If favor red light cameras, reasons why | Weighted N=2,064* |
| Increased safety/fewer crashes/less red light running | 61.1 |
| Deterrent/teaches red light runners a lesson | 24.0 |
| Enforces law/can't always have police | 21.8 |
| More accurate than police/objective evidence | 5.8 |
| Protecting pedestrians and bicyclists including children | 5.8 |
| Other | 3.4 |
| Don't know/refused | 1.3 |
| If oppose red light cameras, reasons why | Weighted N=858* |
| Cameras can make mistakes | 26.4 |
| Focus is money, not safety/revenue generator | 26.1 |
| Less safe/drivers speed up/stop abruptly | 18.7 |
| Invasion of privacy | 16.8 |
| Flash is distracting/makes nervous | 7.3 |
| Cameras won't deter people/won't make a difference | 6.0 |
| Should have longer yellow or all-red | 5.1 |
| Red light running is not a problem | 4.0 |
| Camera programs cost too much money | 4.4 |
| Police should enforce red light violations/right to face accuser | 2.9 |
| Other | 4.4 |
| Don't know/refused | 2.6 |

*Multiple responses allowed; percentages sum to more than 100 percent

Table 4 Opinions about using red light cameras to enforce right-on-red violations in 14 large U.S. cities with red light camera enforcement

| | Percent |
|--|-----------------|
| Favor or oppose using cameras to enforce right-turn-on-red violations | Weighted N=3111 |
| Favor cameras for right-turn-on-red enforcement | 41.3 |
| Favor cameras but not for right-turn-on-red enforcement | 19.0 |
| Favor cameras but unsure about right-turn-on-red enforcement | 6.0 |
| Oppose all red light camera enforcement | 27.6 |
| Don't know about camera enforcement/refused | 6.1 |
| If favor cameras but not for enforcing right-turn-on-red violations, reasons why | Weighted N=591* |
| Right-on-red violations not a problem | 32.9 |
| Right-on-red is legal unless otherwise posted | 19.0 |
| Cameras can make mistakes | 15.9 |
| Should be able to make right-on-red turn if safe | 16.5 |
| Focus is money, not safety/revenue generator | 6.1 |
| Too complicated to enforce with cameras/too many gray areas | 1.8 |
| Cameras are too expensive/waste of money | 1.2 |
| Other | 5.9 |
| Don't know/refused | 9.0 |

*Multiple responses allowed; percentages sum to more than 100 percent

Table 5 Awareness of red light camera enforcement and its perceived effects in 14 large U.S. cities with red light camera enforcement

| | Percent |
|--|-------------------------------|
| Aware that red light cameras are used in city to enforce against red light running | Weighted N=3,111 |
| Yes | 88.6 |
| No | 5.1 |
| Don't know/refused | 6.3 |
| If aware of cameras, opinion about whether cameras have made intersections safer | Weighted N=1,384 [†] |
| Safer | 59.3 |
| Less safe | 20.2 |
| Don't know/other | 20.5 |
| If believe intersections less safe, reasons why | Weighted N=279 ^{†*} |
| Drivers stopping abruptly may get rear-ended | 47.3 |
| Drivers speed up to avoid red light | 37.8 |
| Flashing camera is distracting, makes drivers nervous | 18.8 |
| Other | 14.9 |
| Don't know/refused | 2.0 |
| If aware of cameras, whether more careful to stop for red lights because of cameras | Weighted N=1384 [†] |
| More careful | 56.0 |
| Cameras make no difference because never run red lights | 39.1 |
| Cameras make no difference for other reasons | 4.1 |
| Don't know/refused | 0.9 |
| If more careful, whether more likely to stop at all intersections with stop lights or only at intersections with red light cameras | Weighted N=775 [†] |
| All intersections with stop lights | 95.5 |
| Only intersections with cameras | 3.9 |
| Don't know/refused | 0.6 |

[†]Responses based on respondents who answered the long questionnaire

*Multiple responses allowed; percentages sum to more than 100 percent

Table 6 Opinions about using red light cameras to enforce red light violations in Houston, Texas

| | Percent |
|---|---------|
| Favor or oppose red light cameras to enforce against red light running | N=300 |
| Favor | |
| Strongly favor | 45.3 |
| Somewhat favor | 11.3 |
| Oppose | |
| Strongly oppose | 28.0 |
| Somewhat oppose | 9.3 |
| Don't know/refused | 6.0 |
| | |
| If oppose red light cameras, reasons why | N=112* |
| Cameras can make mistakes | 37.5 |
| Invasion of privacy | 22.3 |
| Focus is money, not safety/revenue generator | 15.4 |
| Less safe/drivers speed up/stop abruptly | 6.2 |
| Red light running is not a problem | 6.2 |
| Cameras won't deter people/won't make a difference | 5.4 |
| Should have longer yellow or all-red | 5.4 |
| Flash is distracting/makes nervous | 4.5 |
| Police should do it/face accuser | 3.6 |
| Camera programs cost too much money | 1.6 |
| Other | 1.8 |
| Don't know/refused | 5.4 |
| | |
| If oppose red light cameras, whether believe it is an invasion of privacy | N=112 |
| Yes | 59.8 |
| No | 31.2 |
| Don't know/refused | 8.9 |

*Multiple responses allowed; percentages sum to more than 100 percent

Figure 1 Percentage of drivers in 14 large U.S. cities with red light cameras who believe cameras have made city intersections safer among drivers aware of enforcement, by city

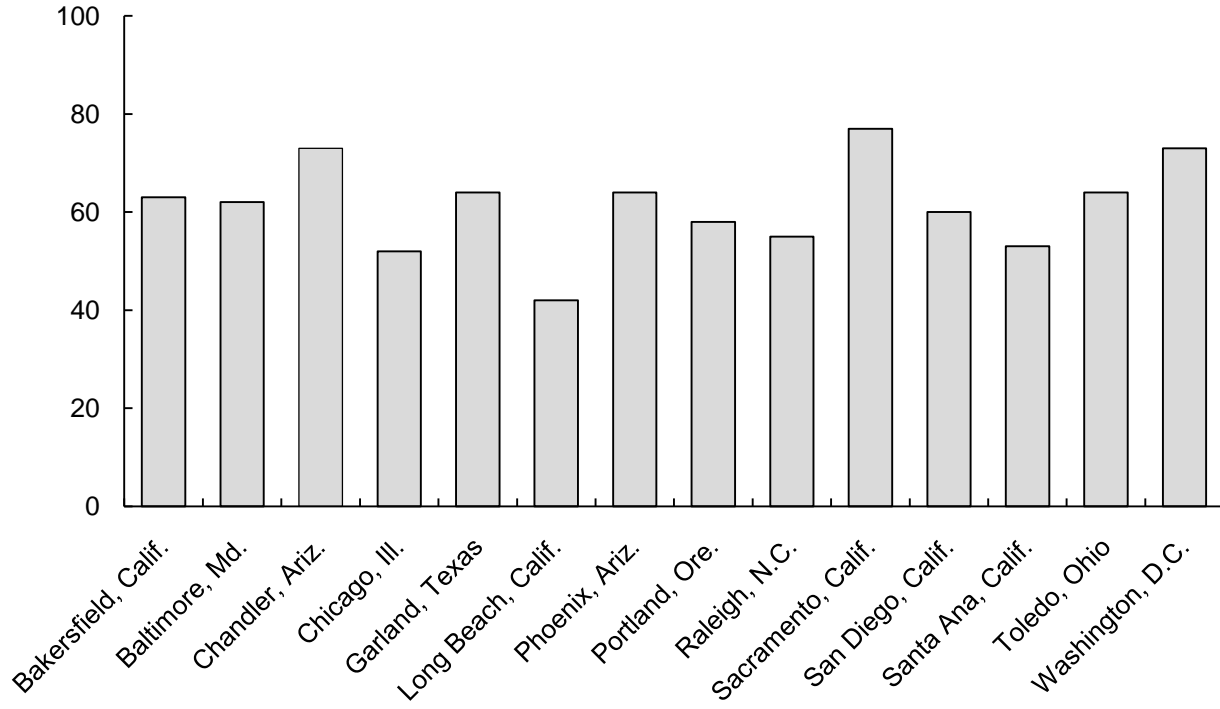


Figure 2 Percentage of drivers in 14 large U.S. cities with red light cameras who favor using red light cameras, by city

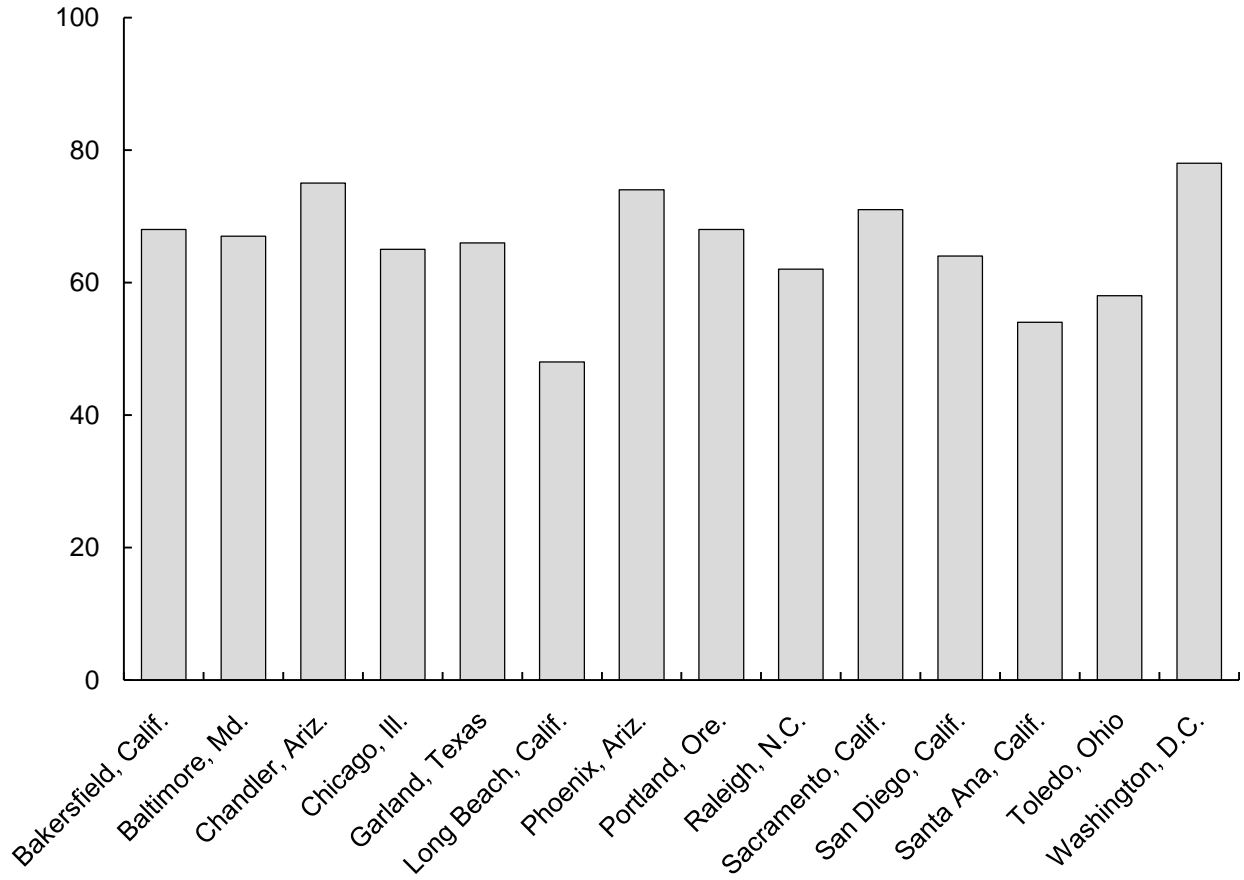


Figure 3 Percentage of drivers in 14 large U.S. cities with red light cameras who knew someone who had received a red light camera citation, by city

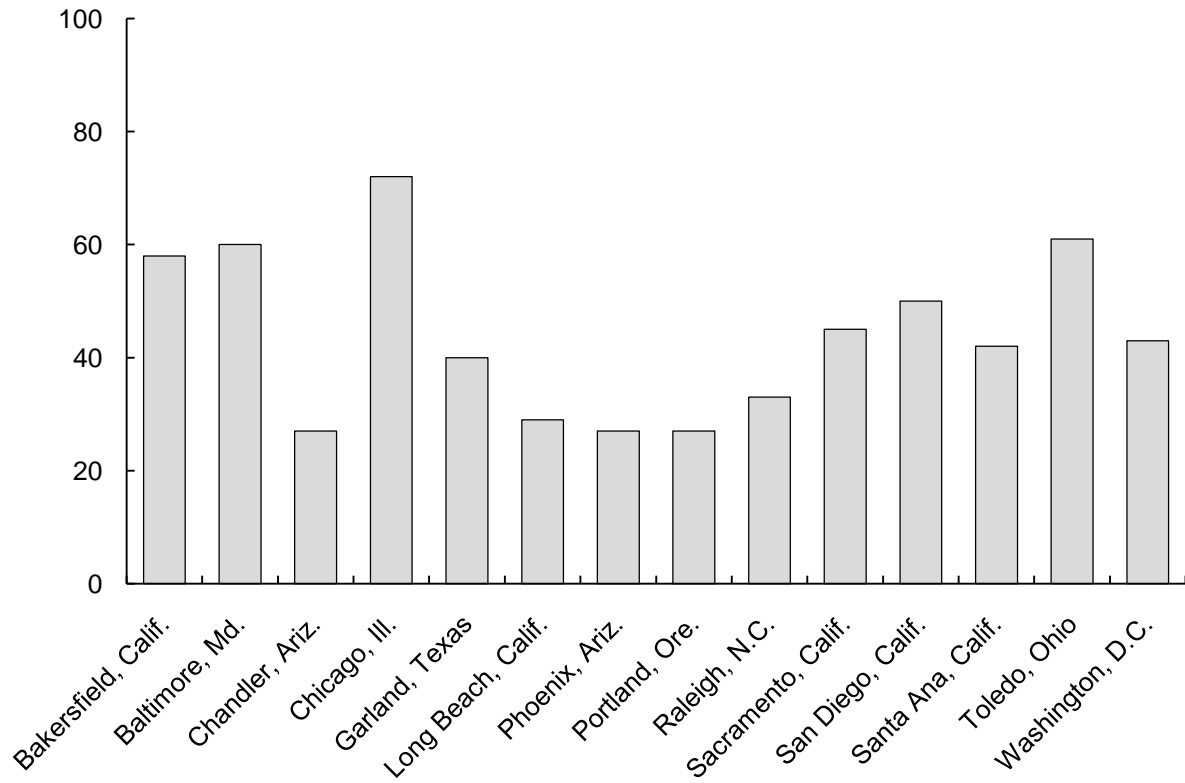


Figure 4 Percentage of drivers in 14 large U.S. cities with red light cameras who received a red light camera citation, by city

