



**INSURANCE INSTITUTE  
FOR HIGHWAY SAFETY**

## **Survey about Pedestrian Safety and Attitudes toward Automated Traffic Enforcement in Washington, D.C.**

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## **ABSTRACT**

**Objective:** Pedestrians represent more than one-third of all traffic deaths in Washington, D.C. The District plans to expand its long-standing automated traffic enforcement program in 2013 from speed and red light cameras to cameras to enforce pedestrian right-of-way laws at crosswalks and stop sign laws. This study collected information on the opinions, behaviors, and knowledge of D.C. residents related to camera enforcement and pedestrian safety issues.

**Methods:** A telephone survey of 801 adult D.C. residents was conducted in November 2012 with approximately equal numbers of respondents in each of D.C.'s eight wards. Quotas were used to ensure that the sample was representative of the demographic characteristics of adults in each ward. For analyses combining responses across the wards, data were weighted to correspond with the demographic characteristics of adults in the city.

**Results:** Most respondents believed that drivers speeding, running red lights, running stop signs, and not stopping for pedestrians are serious threats to their safety. A much larger proportion of respondents who had walked on D.C. streets in the past month felt safe crossing the street at intersections with traffic controls and marked crosswalks (76%-84%) than at locations without one of those features (37%-42%). Respondents strongly supported the speed and red light camera programs, with 76 percent of respondents favoring speed cameras and 87 percent favoring red light cameras. Support was more limited for the camera enforcement that was not yet in place at the time of the survey, with 50 percent of respondents favoring stop sign cameras and 47 percent of respondents favoring crosswalk cameras. Twenty-four percent of respondents had not driven a car in D.C. in the past month, and higher proportions of these non-drivers favored speed cameras (90%), stop sign cameras (67%), and crosswalk cameras (59%) than respondents who drove in D.C. in the past month. The primary reasons for opposing stop sign and crosswalk cameras were that the cameras are not necessary and that stop sign and crosswalk violations are not big problems. Respondents who supported camera enforcement of all types cited safety as their main reason. More than 9 in 10 respondents knew that D.C. law requires drivers to stop for pedestrians crossing the street in marked crosswalks at intersections without traffic signals and midblock, but only 54 percent knew drivers must stop for pedestrians crossing the street at intersections without marked crosswalks. Forty-three percent of respondents who had walked on D.C.

streets in the past month reported that they had crossed the street against a traffic light in the past month, and almost two-thirds reported that they had crossed the street midblock where there is no crosswalk in the past month.

**Conclusions:** More than eight in ten D.C. residents believed that it is dangerous when drivers violate the laws enforced by cameras. Most residents supported speed cameras and red light cameras, but support was lower for stop sign and crosswalk cameras. The safety benefits of stop sign and crosswalk cameras and the extent of safety problems at stop signs and crosswalks should be emphasized to increase support for these new forms of camera enforcement. Communities considering automated enforcement should consider the protection it affords pedestrians and the opinions of pedestrians, even though they are not subject to camera citations.

**Keywords:** Red light cameras; Speed cameras; Stop sign cameras; Crosswalk Cameras; Pedestrians; Public opinion; Survey

## **INTRODUCTION**

In Washington, D.C. during 2007-2011, 41 percent of fatalities in motor vehicle crashes occurred at intersections (Insurance Institute for Highway Safety 2013a). Among fatalities at intersections, 73 percent occurred at intersections with traffic lights and 14 percent occurred at intersections with stop signs. Speeding was a factor in 25 percent of fatalities during this 5-year period. Motor vehicle crashes involving pedestrians are common in D.C. During 2007-2011, 40 percent of D.C.'s traffic fatalities were pedestrians. Fifty-two percent of fatally injured pedestrians were killed at intersections.

Enforcement of traffic laws makes roads safer for pedestrians as well as for motor vehicle occupants. In particular, enforcing laws against speeding, red light, stop sign, and crosswalk violations are beneficial to pedestrians. Enforcing speed limits reduces the severity of pedestrian collisions that do occur; the risk of serious injury or death to a pedestrian in a motor vehicle collision increases dramatically as the speed of the vehicle increases (Tefft 2013). Research has found that installing multiway stop signs has lowered vehicle speeds and reduced urban pedestrian crashes, and installing traffic signals has reduced vehicle-pedestrian conflicts (Retting et al. 2003a). If drivers do not stop at stop signs and red lights, however, the protective functions of traffic controls on pedestrian safety are diminished. High-visibility enforcement of pedestrian right-of-way laws increases the likelihood that drivers will yield to pedestrians crossing the street in marked crosswalks. In a high-visibility enforcement program of pedestrian right-of-way laws in Miami Beach, the percentage of drivers that yielded to pedestrians in crosswalks increased after the program began and remained high during the following year (Van Houten & Malenfant 2004). In a similar program in Gainesville, Florida, driver yielding increased at enforcement sites and also generalized to other uncontrolled crosswalks in the city (Van Houten et al. 2013).

Highly visible enforcement increases compliance with traffic laws by raising the public's perception that they will be issued citations if they violate laws. Many law enforcement agencies, however, do not have sufficient personnel to conduct effective traditional, patrol-based enforcement programs. To supplement traditional enforcement, some jurisdictions have begun programs of camera enforcement, typically of speeding and red light violation laws. As of February 2013, nearly 550 communities in the U.S. use red light cameras and more than 125 use speed cameras (Insurance Institute for Highway Safety 2013b). A large body of international research has shown that red light

cameras and speed cameras significantly reduce violations (e.g., Aeron-Thomas & Hess 2005; McCartt & Hu 2013; Retting et al. 1999a, 1999b, 2008a, 2008b, 2008c; Wilson et al. 2010) and reduce crashes, including crashes involving injuries and fatalities (Aeron-Thomas & Hess 2005; Hu et al. 2011; Retting & Kyrychenko 2002; Wilson et al. 2010). The effects can extend beyond the specific locations in a community with cameras to other non-camera locations (e.g., Aeron-Thomas & Hess 2005; Retting et al. 1999a, 1999b, 2008a, 2008c; Retting & Kyrychenko 2002).

Washington, D.C. began using red light cameras in 1999 and speed cameras in 2001. An evaluation of D.C.'s speed camera program found an 82 percent reduction in the proportion of vehicles exceeding the speed limit by 10 mph or more at locations with cameras 6 months after the speed camera program began, relative to the proportion in nearby Baltimore, which did not have speed cameras (Retting & Farmer 2003). Public support for speed and red light camera enforcement has typically been high in D.C. and in other communities. In a survey of licensed drivers in 14 cities with long-standing red light camera programs, including D.C., McCartt and Eichelberger (2012) found two-thirds of drivers across all cities favored red light cameras. Support for cameras was highest in D.C., with 78 percent of D.C. drivers favoring them. Earlier surveys reported support for red light cameras to be more than 75 percent in cities with and without cameras and in a national survey of drivers (Retting et al. 1999a, 1999b; Retting & Williams 2000; Royal 2004). In 2002, 9 months after the speed camera program began in D.C., 51 percent of D.C. drivers favored the cameras (Retting 2003). In more recent surveys, between 62 and 77 percent of drivers in communities with speed camera enforcement supported cameras (Retting et al. 2008a, 2008c).

Despite the safety benefits of automated enforcement, camera enforcement has been a contentious issue in some communities. This has been the case in D.C., where media reports since the inception of D.C.'s automated enforcement program have described concerns with the accuracy of cameras, the locations of cameras, and the use of revenue generated by cameras (e.g., DeBose 2001; Halsey 2012; Wilber 2005). Most recently, controversy has focused on the level of speed camera fines. In response to public criticism of speed camera fines, on November 2, 2012, Mayor Vincent Gray issued an emergency rulemaking that changed the fines for traditional and camera speeding citations effective November 5, 2012. The rulemaking decreased the fine for speeding up to 10 mph over the limit from \$75

to \$50 and the fine for speeding 11-15 mph over the limit from \$125 to \$100, and increased the fine for speeding more than 25 mph over the limit from \$250 to \$300. The fines of \$150 for speeding 16-20 mph over the limit and \$200 for speeding 21-25 mph over the limit were unchanged. The D.C. City Council passed a bill in December 2012 that further reduced speeding fines effective April 1, 2013, to \$92 for speeding 11-15 mph over the limit, \$100 for speeding 16-20 mph over the limit, and \$150 for speeding 21-25 mph over the limit.

D.C. plans to expand the camera enforcement program in 2013 to include stop sign cameras and crosswalk cameras. Stop sign cameras will enforce violations where vehicles do not come to a complete stop before the stop bar at an intersection with a stop sign, meaning that the vehicle rolled through the stop sign without stopping prior to the stop bar or stopped on top of the crosswalk. The cameras will be located at three- and four-way stop sign-controlled intersections and can detect when a vehicle has not stopped prior to the stop bar. Crosswalk cameras will enforce violations where vehicles do not stop for pedestrians crossing the street in marked crosswalks in the same lane as the vehicle or in an adjacent lane. These cameras will be placed at marked crosswalks midblock or at intersections where the marked crosswalk is not controlled by traffic lights or stop signs but the minor intersecting street may be stop sign-controlled. Crosswalk cameras will use video to detect movement at crosswalks. For both camera types, if a violation is detected, the associated video and images will be reviewed before a citation is issued. The new cameras initially will be used near schools and recreation centers. The legislation passed by the D.C. City Council to lower speeding fines also lowered fines for several other violations that will be enforced by cameras, including not stopping for pedestrians in crosswalks (from \$250 to \$75), blocking an intersection (from \$100 to \$50), turning right on red without stopping (from \$100 to \$50), and turning right on red where prohibited (from \$100 to \$50). The \$50 fine for not stopping at a stop sign and \$150 fine for not stopping at a red light remained unchanged.

The primary objective of this study was to assess the perception of D.C. residents about the safety of pedestrians at various types of locations, their understanding of pedestrian right-of-way laws, and their attitudes toward the proposed stop sign and crosswalk cameras and existing speed and red light cameras, including opinions of the modified speed camera fines. A telephone survey of D.C. residents

was conducted. Previous surveys of attitudes toward camera enforcement generally included only licensed drivers, and this survey built upon earlier work by interviewing non-drivers as well.

## **METHODS**

A sample was sought that was representative of the age and gender of the adult population of each of D.C.'s eight wards and also was representative of the overall age, gender, and ethnic and racial characteristics of the adult population of D.C. The wards are political jurisdictions with the borders drawn so that each ward includes approximately one-eighth of D.C.'s population; in 2010, each ward contained between 10 and 15 percent of the adult population (D.C. Office of Planning 2012).

An industry supplier of telephone number samples provided random samples of listed landline numbers and cellphone numbers with D.C. exchanges and random samples of numbers of registered voters in D.C. with associated voting wards. The three samples were merged, and duplicate numbers were deleted. The merged list consisted of 62,734 telephone numbers, including 37,142 (59%) numbers of registered voters, 4,330 (7%) other landline numbers, and 21,262 (34%) other cellphone numbers. The phone numbers called were randomly selected from this merged list.

Interviews were conducted between November 9 and November 20, 2012, by G2 and Associates (D.C.), a professional survey firm. A pilot test of 20 respondents was conducted prior to the start of the survey. Some questions were changed as a result, and responses from the pilot surveys were excluded from the analyses.

Quotas were used to obtain approximately equal numbers of interviews of adult residents in each of D.C.'s wards, representative samples by gender and age of people ages 18 and older residing in each voting ward, and an overall sample that corresponded to the racial and ethnic makeup of the city. Age, gender, and race/ethnicity characteristics of the D.C. population were obtained from 2010 U.S. Census data, classified by ward (D.C. Office of Planning 2012).

Respondents were asked if they were driving or in another situation that would make it unsafe for them to talk. If so, the interviewer scheduled a time to call back. Up to 12 callbacks to a household were made. People were interviewed if they were 18 or older, resided in D.C., and their ward was available from the phone list of voters or provided by the respondent.

The cooperation rate (American Association for Public Opinion Research 2011) was 18 percent, resulting in 801 completed interviews from the 4,545 households contacted. Of the households that did not participate, 1,724 (38%) declined to participate or began but did not finish the survey, 1,047 (23%) did not meet the screening criteria, and 973 (21 percent) agreed to participate but exceeded the demographic quotas. A total of 222 (28%) completed interviews were conducted via cellphones.

The sample was weighted to match the gender and race/ethnicity distributions of the residents of D.C., and the age distribution of the residents ages 18 and older, based on 2010 U.S. Census data (U.S. Census Bureau 2013). The data were weighted using rim weighting, an iterative technique in which multiple characteristics are weighted simultaneously (Deming & Stephan 1940). Analyses are based on the weighted sample, with the exception of analyses of differences in demographic characteristics, driving patterns, and walking patterns across wards. Weighting was not needed for these analyses because the sampling method used quotas to ensure the sample was representative of the age and gender distribution of residents in each ward. The chi-square statistic ( $p < 0.05$ ) was used to identify statistically significant differences among respondents in knowledge and attitudes by age (18-30, 31-44, 45-54, 55-64, 65 and older), gender, and driver/non-driver status (driving/not driving in D.C. the past month). "Don't know" and "refuse" responses were excluded from analyses, with the exception of analyses of questions on attitudes toward camera enforcement and attitudes toward speed camera fine changes; the proportion of "don't know/refuse" responses was larger for these questions than for others that were analyzed.

## **RESULTS**

Interviews were completed with 801 D.C. residents, including approximately 100 residents of each ward. The demographic characteristics of the overall weighted sample and of the adult population of D.C. residents are provided in Table 1. Consistent with the sampling and weighting protocols, the survey sample closely approximated the D.C. adult population in terms of age, gender, and race/ethnicity distributions. Compared with the D.C. adult population, the survey sample was somewhat more highly educated and had a smaller proportion of households with incomes less than \$25,000, although 14 percent of the survey respondents did not provide their household income.

The demographic characteristics of the survey respondents varied widely across the eight wards. The percentage of respondents ages 18-30 within the wards ranged from 8 to 27 percent ( $\chi^2[28]=57.3$ ,

p<0.001). The proportion of black/African American respondents ranged from 6 to 93 percent ( $\chi^2[14]=326.1$ , p<0.001), the proportion who were college graduates ranged from 38 to 91 percent ( $\chi^2[21]=126.0$ , p<0.001), and the proportion with household incomes of less than \$25,000 ranged from 1 to 26 percent ( $\chi^2[28]=155.7$ , p<0.001).

Table 1 also summarizes the reported driving and walking patterns of respondents during the past month. The majority of respondents said they drove daily (38%), at least once a week (28%), or at least once a month (9%); about one-quarter said they did not drive in the past month. Almost all respondents said they walked on D.C. streets for 5 minutes or longer in the past month, either daily (70%), at least once a week (19%), or at least once a month (5%). A total of 71 percent of respondents reported that they had both driven and walked in the past month, 23 percent had walked but not driven, 4 percent had driven but not walked, and 1 percent reported they did not drive or walk. The proportion of respondents who walked for at least 5 minutes daily ranged from 51 to 90 percent across the wards (Figure 1;  $\chi^2[21]=103.3$ , p<0.001). Those who reported driving daily in the past month ranged from 26 to 48 percent, and the percentage who did not drive ranged from 17 to 31 percent ( $\chi^2[21]=45.1$ , p=0.002).

### **Perceived Safety of Crossing Streets**

Survey respondents who reported walking on D.C. streets for at least 5 minutes in the past month were asked a series of questions about the safety of walking in D.C. Table II summarizes how safe pedestrians reported feeling when crossing the street at different locations. More than three-quarters of pedestrians felt very (32%) or somewhat (52%) safe when crossing at intersections with traffic lights and marked crosswalks, and very (25%) or somewhat (52%) safe when crossing at intersections with stop signs and marked crosswalks. Pedestrians felt less safe when crossing at intersections with stop signs but without marked crosswalks, at intersections with marked crosswalks but without stop signs or traffic signals, and at marked crosswalks in the middle of the block; about 8 percent said they felt very safe at these locations and 30-34 percent said they felt somewhat safe.

Among the 25 percent of respondents with children ages 5-18 in their households, 69 percent said at least one of their children walks to schools or playgrounds in their neighborhood. More than two-thirds of parents also said that it is very safe (18%) or somewhat safe (51%) for children to walk to schools and playgrounds in their neighborhood. A slightly higher percentage of parents whose children

walk to schools or playgrounds (70%) said that it is safe for children to walk to these places than parents whose children do not walk to these places (66%); this difference was not significant ( $\chi^2=0.5$ ,  $p=0.49$ ).

### **Pedestrian Right-of-Way and Crossing Laws**

All respondents were asked a series of questions about D.C. laws pertaining to pedestrians. Most respondents believed that drivers in D.C. often (54%) or sometimes (33%) violate laws on stopping for pedestrians crossing the street, and that pedestrians often (67%) or sometimes (24%) violate laws on crossing the street.

Respondents were asked about their knowledge of select laws in Washington relating to pedestrians (Table III). D.C. law requires drivers to stop for pedestrians crossing the street in the crosswalk at any intersection, whether or not the crosswalk is marked, and in marked crosswalks in the middle of the block (D.C. Municipal Regulations 2013a). A large majority correctly believed that drivers must stop for pedestrians at intersections without traffic lights and with marked crosswalks, and at marked crosswalks in the middle of the block, but only slightly more than half knew that drivers also must stop for pedestrians crossing at intersections without traffic lights or marked crosswalks.

Most respondents did not know the D.C. laws governing the midblock locations without marked crosswalks at which pedestrians are permitted to cross the street. Pedestrians are permitted to cross if there is a traffic light at one end or at neither end of the block, but are not permitted to cross if there are traffic lights at both ends of the block (D.C. Municipal Regulations 2013b). Similar proportions of respondents (16-20%) said that pedestrians are permitted to cross in each of these situations (Table III).

### **Driver and Pedestrian Behavior**

All respondents were asked if several driver behaviors were serious threats to their personal safety as drivers or pedestrians. About 9 in 10 respondents reported that drivers running red lights, running stop signs, not stopping for pedestrians, and speeding in D.C. were serious threats to their personal safety (Table IV). In contrast, 44 percent of respondents said that drivers turning right on red were a serious threat.

Drivers were asked whether they had engaged in various behaviors in the past month. Of these behaviors (Table IV), drivers most often reported speeding, with 70 percent having driven more than 5

mph and 24 percent having driven more than 10 mph over the speed limit. A smaller percentage said that during the past month they had turned right on red (20%) or driven through a stop sign (17%) without coming to a complete stop, driven through a traffic light after it had turned red (5%), turned right on red where it was not permitted (8%), or not stopped for pedestrians at a marked crosswalk or intersection (8-12%).

Among respondents who said they had walked at least five minutes on D.C. streets in the past month, about two-thirds reported that they had crossed the street in the middle of a block without a marked crosswalk in the last month (Table IV). Forty-three percent had crossed at an intersection against the traffic light.

## **Camera Enforcement**

### *Knowledge of Camera Enforcement*

Most of the survey respondents (93%) were aware that cameras are used in D.C. to enforce traffic laws. Those who were aware of camera enforcement were asked if cameras are used to enforce certain violations and if they had seen specific types of cameras in use. Among respondents who were aware of camera enforcement in D.C., 98 percent correctly believed that cameras are used to enforce speeding violations and 91 percent correctly believed cameras are used to enforce red light violations. A much smaller percentage incorrectly believed that cameras are used to enforce stop sign violations (21%) and crosswalk violations (11%). If respondents were unsure of what crosswalk violations were, interviewers explained that they were violations where vehicles do not stop for pedestrians in marked crosswalks in the middle of the block or at intersections without traffic lights. Red light cameras in D.C. enforce violations where drivers turn right on red without coming to a complete stop or turn right on red at intersections where it is prohibited; however, only 32 percent believed that cameras are used to enforce right-on-red violations.

Most respondents who were aware of camera enforcement in D.C. had seen speed cameras (94%) or red light cameras (88%) in use in D.C. Far fewer erroneously reported seeing stop sign cameras (13%) or crosswalk cameras (8%) in use.

Fifty-eight percent of drivers reported that they had received a citation in the mail for a camera violation in D.C., and of these, 55 percent had received more than one citation. Among drivers who had

received citations, 85 percent had received a citation for speeding, 20 percent had received a citation for red light running, and 3 percent had received a citation for a right-on-red violation. Sixty-seven percent of respondents said that someone they knew had received a camera citation in D.C.; the citations were for speeding (80%), red light running (21%), and right-on-red violations (1%).

The majority of drivers who had received a citation (59%) agreed that they deserved their most recent citation. Drivers who said they did not deserve the citation explained most often that they were going only a little over the posted speed limit (23%), the speed limit was too low (13%), and there was no posted speed limit (12%). Only 11 percent of drivers who received a camera citation appealed the most recent citation, and of the citations appealed, 54 percent were dismissed.

#### *Attitudes toward Camera Enforcement*

Respondents were asked about their attitudes toward using cameras to enforce laws against speeding violations, red light violations, stop sign violations, and crosswalk violations (Table V). Support was highest for the two camera types that were already operating in D.C. at the time of the survey: speed cameras and red light cameras. About three-quarters of respondents favored using cameras to enforce laws against speeding violations, and 87 percent favored using cameras to enforce laws against red light violations. Half of respondents favored using cameras to enforce laws against stop sign violations, and 47 percent favored using cameras to enforce laws against crosswalk violations.

Respondents were asked why they favored or opposed each type of camera enforcement. Questions were open ended, with multiple answers allowed. The top reasons for supporting camera enforcement were identical for speed, red light, and stop sign cameras: increasing safety (55%, 59%, and 51% of respondents, respectively); enforcing the laws when police cannot be present (30%, 28%, and 27%, respectively); protecting pedestrians and bicyclists, including children (18%, 20%, and 27%, respectively); and serving as a deterrent or teaching violators a lesson (11%, 11%, and 10%, respectively). For crosswalk cameras, the primary reasons for support were that the cameras increase safety for/protect pedestrians and bicyclists specifically (61%), increase safety in general (25%), enforce laws when police cannot be present (25%), and are a deterrent/teach violators a lesson (11%).

Twenty-two percent of respondents opposed using cameras to enforce laws against speeding violations. When asked why they opposed speed cameras, respondents most often said that speed

cameras are used to raise revenue rather than for safety (35%) or make mistakes or do not work well (24%), that cameras are not necessary or that speeding is not a big problem (15%), and that police should enforce speed violations or people should have the right to face their accusers (14%). Twelve percent of respondents opposed using cameras to enforce laws against red light violations. The top reasons for opposition included that cameras make mistakes or do not work well (24%), are used to raise revenue rather than for safety (22%), or cannot tell if drivers are already in the intersection when the light turns red (13%); that cameras are not needed or red light running is not a big problem (12%); and that red light cameras make intersections less safe because drivers slow down or speed up abruptly (12%).

Using cameras to enforce laws against stop sign violations was opposed by 44 percent of respondents. Respondents most frequently opposed stop sign cameras because they are not necessary or running stop signs is not a big problem (34%), or that cameras are used to raise revenue rather than for safety (19%), make mistakes or do not work well (16%), and cannot tell if drivers have come to a complete stop (11%). Forty-six percent of respondents opposed using cameras to enforce laws against crosswalk violations. The principal reason for opposing crosswalk cameras was that the cameras are not necessary or that drivers not stopping for pedestrians in crosswalks is not a big problem (31%). Other reasons were that cameras are used to raise revenue rather than for safety (17%); cannot tell if drivers have come to a complete stop, a pedestrian is in the crosswalk, or a pedestrian had begun crossing after the driver was in the crosswalk (13%); and cameras make mistakes or do not work well (12%).

For each type of camera location, cameras were more often favored by the pedestrians who felt unsafe crossing than the pedestrians who felt safe. For example, a higher percentage of pedestrians who felt unsafe crossing the street at marked crosswalks midblock favored crosswalk cameras (52%) than pedestrians who felt safe crossing at this location (42%,  $\chi^2[2]=9.5$ ,  $p=0.009$ ). A larger proportion of respondents who believed that driver behaviors were threats to their safety favored cameras to enforce violations involving those behaviors than other respondents; these differences were significant for drivers speeding (79% vs. 50% favored speed cameras,  $\chi^2[2]=39.2$ ,  $p<.001$ ), drivers turning right on red (90% vs. 84% favored red light cameras,  $\chi^2[2]=6.9$ ,  $p=.032$ ), and drivers running stop signs were threats to their safety (52% vs. 35% favored stop sign cameras,  $\chi^2[2]=6.7$ ,  $p=.035$ ).

Among respondents who were aware of camera enforcement in D.C., respondents who had received camera citations themselves or knew someone who had were less likely to favor all types of camera enforcement than other respondents; these differences were significant for speed cameras (75% vs. 86%,  $\chi^2[2]=7.5$ ,  $p=0.024$ ), stop sign cameras (48% vs. 65%,  $\chi^2[2]=14.3$ ,  $p<0.001$ ), and crosswalk cameras (46% vs. 57%,  $\chi^2[2]=7.1$ ,  $p=0.029$ ).

#### *Attitudes toward Speed Camera Fine Changes*

Respondents who were aware of camera enforcement in D.C. were asked if they knew that fines for camera violations had recently changed for some speeding violations and were asked about their attitudes toward the new fine system. Fifty-six percent were aware of the change in fines. It was explained to those who were unaware of the change that camera enforcement fines had been lowered for speeding 15 mph or less over the speed limit and raised for speeding more than 25 mph over the limit, effective November 2012.

About three-quarters of respondents who were aware of the camera enforcement favored the lower fines for camera citations for speeding by 15 mph or less over the limit (Table V). The primary reasons for favoring the lower fines were that fines should not be a revenue generator (18%), are too high for all speeding violations (15%), or are too high for all traffic violations (14%); that speeding by 15 mph or less is not a big problem, not that dangerous, or can be accidental (14%); and that fines are too high for all traffic violations captured by cameras (11%). Nineteen percent of those aware of camera enforcement in D.C. opposed the lower fines for speeding 15 mph or less over the limit, with the main reasons being that higher fines increase safety (40%), higher fines deter speeders or teach them a lesson (20%), or fines are too low for speeding violations (16%).

Of respondents who were aware of the camera enforcement, more than three-quarters favored the increased fines for camera citations for speeding more than 25 mph over the limit. Most supporters (80%) said that they favored the higher fines because they increase safety. Seventeen percent of respondents opposed higher fines. The top reasons for opposing higher fines were that fines are too high for all speeding violations (37%), the old fine was high enough (14%), fines should be lower for speeding by more than 25 mph (12%), and speed cameras are not necessary or speeding is not that big of a problem (11%).

Respondents who had received camera citations or knew someone who had received a camera citation were more likely to support the lower fines for speeding 15 mph or less over the limit than other respondents (79% vs. 60%,  $\chi^2[2]=22.1$ ,  $p<0.001$ ). A larger proportion of respondents who believed drivers speeding are threats to their personal safety (80%) than other respondents (66%) favored the higher fines for driving more than 25 mph over the speed limit ( $\chi^2[2]=15.4$ ,  $p<0.001$ ).

### **Differences in Attitudes by Driving Frequency**

Attitudes toward pedestrian issues and camera enforcement were examined between respondents who had driven in D.C. in the past month and those who had not. A larger proportion of drivers than non-drivers believed that pedestrians often violate laws on crossing the street (71% vs. 53%;  $\chi^2[3]=26.7$ ,  $p<0.001$ ) and that drivers often violate laws on stopping for pedestrians (55% vs. 48%;  $\chi^2[3]=14.6$ ,  $p=0.002$ ). A much higher proportion of non-drivers (63%) than drivers (34%) believed that drivers turning right on red were serious threats to their personal safety as drivers or pedestrians ( $\chi^2[1]=46.8$ ,  $p<0.001$ ).

Non-drivers were more likely than drivers to favor speed cameras (90 vs. 71%,  $\chi^2[2]=29.8$ ,  $p<0.001$ ), stop sign cameras (67 vs. 45%,  $\chi^2[2]=29.1$ ,  $p<0.001$ ), and crosswalk cameras (59 vs. 44%,  $\chi^2[2]=14.2$ ,  $p<0.001$ ). Support for red light cameras was similar for non-drivers and drivers (88 vs. 86%,  $\chi^2[2]=0.3$ ,  $p=0.86$ ). Among respondents who knew about the camera enforcement in D.C., support for the lower fines for camera violations for speeding 15 miles or less over the limit was lower among non-drivers (56%) than drivers (81%) ( $\chi^2[2]=42.8$ ,  $p<0.001$ ).

### **Differences in Attitudes by Age and Gender**

The proportion of pedestrians who reported crossing midblock without a marked crosswalk in the past month generally decreased with increasing age ( $\chi^2[4]=36.0$ ,  $p<0.001$ ) and was reported by almost three-quarters of pedestrians ages 18-44 compared with 42 percent of pedestrians ages 65 and older. The proportion of pedestrians who reported crossing against the traffic light in the past month also generally decreased with age, ranging from 43-56 percent of pedestrians ages 18-54 to 22 percent of pedestrians ages 65 and older ( $\chi^2[4]=32.5$ ,  $p<0.001$ ).

Among respondents who had driven a car in D.C. in the past month, the reported prevalence of speeding by more than 5 mph in the past month decreased as age increased, from 80 percent of drivers ages 18-30 to 55 percent of drivers ages 65 and older ( $\chi^2[4]=19.9$ ,  $p=0.001$ ), as did reports of turning right on red without coming to a complete stop (from 28% of ages 18-30 to 9% of ages 55 and older,  $\chi^2[4]=24.2$ ,  $p<.001$ ) and turning right on red where prohibited (from 11% of ages 18-44 to 2% of ages 65 and older,  $\chi^2[4]=10.8$ ,  $p=0.029$ ). The reported prevalence of driving through a stop sign without coming to a complete stop varied by age but did not follow a consistent trend ( $\chi^2[4]=12.5$ ,  $p=0.014$ ).

Support for speed cameras generally was lower among respondents ages 18-44 (65%-76%) and higher among respondents ages 65 and older (88%;  $\chi^2[8]=31.8$ ,  $p<0.001$ ). The proportion of respondents who favored stop sign cameras increased with age, from 41-44 percent of respondents ages 18-44 to 71 percent of respondents ages 65 and older ( $\chi^2[8]=43.6$ ,  $p<0.001$ ). Support for red light cameras and crosswalk cameras varied significantly by age but did not follow consistent trends (red light cameras:  $\chi^2[8]=21.7$ ,  $p=0.006$ ; crosswalk cameras:  $\chi^2[8]=25.3$ ,  $p=0.001$ ). The percentage of respondents who favored the higher fines for speeding more than 25 mph over the limit decreased by age, from 80 percent of respondents ages 18-30 to 74 percent of respondents ages 65 and older ( $\chi^2[8]=16.6$ ,  $p=0.035$ ).

Females were more likely than males to believe that drivers speeding (91% vs. 85%,  $\chi^2[1]=6.1$ ,  $p=0.013$ ), running red lights (94% vs. 91%,  $\chi^2[1]=4.7$ ,  $p=0.030$ ), turning right on red (50% vs. 38%,  $\chi^2[1]=11.9$ ,  $p<0.001$ ), and not stopping for pedestrians (94% vs. 89%,  $\chi^2[1]=6.7$ ,  $p=0.010$ ) were serious threats to their personal safety. Female pedestrians were similarly less likely than male pedestrians to report feeling safe when crossing the street at intersections with traffic lights and marked crosswalks (81% vs. 87%,  $\chi^2[1]=5.0$ ,  $p=0.025$ ), intersections with stop signs and marked crosswalks (72% vs. 81%,  $\chi^2[1]=7.6$ ,  $p=0.006$ ), intersections with stop signs but without marked crosswalks (36% vs. 49%,  $\chi^2[1]=12.6$ ,  $p<0.001$ ), intersections with marked crosswalks but without stop signs or traffic lights (32% vs. 43%,  $\chi^2[1]=9.8$ ,  $p=0.002$ ), and marked crosswalks midblock (36% vs. 47%,  $\chi^2[1]=8.9$ ,  $p=0.003$ ). A larger proportion of male pedestrians than female pedestrians reported crossing midblock without a marked crosswalk (71% vs. 59%,  $\chi^2[1]=13.1$ ,  $p<0.001$ ) and crossing against a traffic light (53% vs. 34%,  $\chi^2[1]=27.4$ ,  $p<0.001$ ) in the past month. A larger percentage of male drivers than female drivers reported that they drove more than 10 mph over the speed limit (29% vs. 18%,  $\chi^2[1]=9.6$ ,  $p=0.002$ ), drove through

a stop sign without coming to a complete stop (21% vs. 12%,  $\chi^2[1]=9.8$ ,  $p=0.002$ ), and turned right on red without coming to a complete stop (26% vs. 14%,  $\chi^2[1]=14.6$ ,  $p<0.001$ ). Females were significantly more likely than males to support speed cameras (82% vs. 69%,  $\chi^2[2]=16.9$ ,  $p<0.001$ ) and crosswalk cameras (52% vs. 42%,  $\chi^2[2]=8.6$ ,  $p=0.014$ ).

## **DISCUSSION**

Previous public opinion surveys have shown strong support for red light cameras and speed cameras among drivers in D.C., but the level of support for the planned stop sign cameras and crosswalk cameras in D.C. was unknown. In the current survey, D.C. residents strongly supported red light cameras and speed cameras, with 87 and 76 percent of residents favoring them, respectively. The proportion of residents who favor these cameras exceeds the 77 percent of D.C. drivers who favored red light cameras in a 2011 survey (McCartt & Eichelberger 2012), and the 51 percent of D.C. drivers who favored speed cameras in a 2002 survey (Retting 2003). Support was more modest for the planned stop sign cameras and crosswalk cameras, with 51 and 48 percent of residents favoring them, respectively. There are several reasons to think that D.C. residents may be more positive towards stop sign and crosswalk cameras after they are in place. In some previous surveys conducted in communities before and after camera enforcement programs were implemented, support for the programs was higher after implementation than before (Retting et al. 1999a, 1999b, 2008a, 2008c), and it is possible that support for stop sign cameras and crosswalk cameras will increase once D.C. residents become familiar with how they operate or are educated on the problems being addressed with cameras. Stop sign and crosswalk cameras will initially be placed near schools and recreation centers, but respondents were asked about their opinions of these cameras without being told where they would be located. It is likely that more D.C. residents will support these cameras if they know they are used in areas where children walk. Finally, fines for crosswalk violations were reduced significantly after this survey was conducted, from \$250 to \$75, in anticipation of the use of cameras to enforce the violations.

Support for cameras is likely based largely on the perceived risk of receiving a citation, and the perceived need for enforcement of violations. A person's own driving practices and personal experiences with camera citations can greatly affect perceived risk. Unlike most previous surveys of camera enforcement support, this study did not limit its sample to licensed drivers or residents who drive

regularly. About a quarter of D.C. residents surveyed had not driven a car in D.C. in the past month, and support for speed, stop sign, and crosswalk cameras was 15-22 percentage points higher among non-drivers than drivers. Ninety percent of non-drivers favored speed cameras, two-thirds favored stop sign cameras, and nearly 60 percent favored crosswalk cameras. Respondents who had not received a camera citation or did not know someone who had received a camera citation were similarly more likely to favor speed, stop sign, and crosswalk cameras than other respondents.

Although more than 90 percent of the survey respondents said that drivers running stop signs and drivers not stopping for pedestrians are serious threats to their personal safety, those who opposed stop sign cameras and crosswalk cameras most often said that these cameras are not necessary or that stop sign and crosswalk violations are not big problems. This may suggest that D.C. residents do not believe that drivers often run stop signs or fail to stop for pedestrians, even though these behaviors are perceived as dangerous. However, crashes at stop signs and with pedestrians are frequent in urban areas. A study of police-reported crashes in four urban areas found that 22 percent of urban crashes involved drivers running a traffic control, and of those crashes, 40 percent ran a stop sign (Retting et al. 1995). An analysis of 1,788 crashes at stop-controlled intersections in four cities found that 70 percent of these crashes involved a stop sign violation (Retting et al. 2003b). In D.C., 9 people were killed at intersections with stop signs from 2007-2011 (Insurance Institute for Highway Safety 2013a). A total of 2,417 people were injured at stop sign-controlled intersections during 2007-2009, and police established that 725 of the collisions involved stop sign violations (Wang et al. 2010). Forty percent of traffic fatalities during 2007-2011 were pedestrians (Insurance Institute for Highway Safety 2013a); 35 percent occurred in crosswalks at intersections. During 2007-2009, 1,861 pedestrians were involved in crashes of all severities in D.C. (Wang et al. 2010).

More than a third of D.C. residents who opposed speed cameras said that the objective of camera programs is raising revenue rather than safety. More than three-quarters of respondents supported the recent reduction in camera fines for speeding 15 mph or less over the limit. When asked why, these respondents most often said that fines should not be used to generate revenue. However, three-quarters of respondents also favored D.C.'s increased speed camera fines for violations of more than 25 mph over the limit, with the majority favoring the higher fines because they believe the higher

finer increase safety. Safety was similarly the top reason underlying support for all types of cameras. Respondents who perceived some driver behaviors to be serious threats to their personal safety were more likely to support cameras to address those problems, and pedestrians who felt unsafe crossing at various locations also were most likely to favor camera enforcement at those locations. In a review of the use of speed cameras internationally, Delaney et al. (2005) recommends that jurisdictions introducing speed camera programs communicate the dangers of speeding and the safety benefits of speed cameras to the public to help garner support for them. The reasons that D.C. residents gave for supporting camera enforcement and fines, and the higher support for camera enforcement among residents who perceived that driver behaviors and crossing locations were unsafe, suggest that camera enforcement and fines may be more highly supported when people believe they are linked to safety.

An enforcement program will have limited success if people do not know the laws that are being enforced. Most survey respondents knew that drivers are required to stop for pedestrians crossing the street at intersections without traffic lights but with marked crosswalks and at marked crosswalks midblock, where cameras are planned. Only half knew that drivers also are required to stop for pedestrians crossing at intersections without traffic signals and without marked crosswalks. This confusion about pedestrian right-of-way laws for unmarked crosswalks is similar to that in a survey conducted in California (Mitman & Ragland 2007), which found that at least half of drivers and pedestrians did not know that drivers were required to yield to pedestrians in unmarked crosswalks.

Pedestrian safety also depends on pedestrians crossing safely and obeying crossing laws. It is illegal to cross the street in D.C. at an intersection when the traffic light is red or if the pedestrian signal otherwise indicates not to cross, and crossing against the light at signalized intersections is associated with a much higher crash risk than crossing with the light (King et al. 2009). Similarly, crossing the street is more dangerous at midblock locations without marked crosswalks than at intersections; most pedestrian crashes occur at intersections, but most pedestrian deaths occur midblock (Jermakian & Zubay 2011). Nearly two-thirds of D.C. pedestrians reported that they crossed midblock without a marked crosswalk in the past month, and 43 percent reported crossing against the light. Although the reported prevalence of these crossing behaviors by D.C. pedestrians is relatively high, it is comparable with what has been seen in surveys of pedestrians in other locations. A survey of French pedestrians found that 32

percent reported often or very often crossing the street when the pedestrian light is red, and 16 percent reported often or very often crossing the street when the light for opposing traffic is green (Granié et al. 2013). In a survey of pedestrians in Michigan, only 30 percent said that they never crossed at locations other than intersections or designated crosswalks (Sisiopiku & Akin 2003).

More D.C. residents thought that pedestrians often violate laws on crossing the street than thought that drivers often violate laws on stopping for pedestrians, which is consistent with their self-reported behavior. Twelve percent of drivers said that they had failed to stop for a pedestrian crossing the street in the past month, whereas, for example, 43 percent of pedestrians said they had crossed against the light in the past month. However, perceptions of how often pedestrians break crossing laws also may be influenced by their lack of understanding of where pedestrians are allowed to cross. Although it is legal to cross midblock without a marked crosswalk in D.C. if there are not traffic lights at both ends of the block, more than two-thirds of respondents thought that it was illegal to cross midblock without a marked crosswalk in any location.

D.C. pedestrians were most likely to report feeling safe crossing the street at intersections that had both traffic controls and marked crosswalks, which are similar to roadway features that pedestrians in other surveys have reported make them feel safe when crossing the street (Bernhoft & Carstensen 2008; Chu 2004; Fitzpatrick et al. 2004). It is important to note, though, that pedestrians' perceptions of the safety of a location do not always correspond with the risk of being involved in a crash at that location (Schneider et al. 2004). In particular, although pedestrians report feeling safer crossing at intersections with marked crosswalks than at intersections with unmarked crosswalks, crosswalk markings without additional enhancements are ineffective in reducing pedestrian crash rates (Zegeer et al. 2002).

In sum, more than eight in ten D.C. residents believed it is a serious threat to their personal safety when drivers violate the laws enforced by cameras. There was strong support for camera enforcement in D.C. of speeding and red light violations. Support was more moderate for the stop sign cameras and crosswalk cameras that were not yet installed at the time of the survey, but these were still favored by about half of all respondents and a higher percentage of non-drivers. Individuals who favored camera enforcement were most likely to say they supported them because cameras increase safety. Enforcement of traffic laws can increase safety for all road users, including pedestrians, as can ensuring

that drivers and pedestrians know what the laws entail. When considering public acceptance of camera enforcement, communities should consider the opinions of all types of road users protected by traffic enforcement and seek to educate residents about the safety problem and traffic laws being addressed.

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**Table I** Demographic characteristics and travel patterns of survey respondents based on a sample weighted to reflect the age, gender, and race/ethnicity characteristics of D.C. residents

	Percent of survey respondents, weighted (N=801)	Percent of D.C. residents ages 18 and older, 2010 (N=500,908) <sup>a</sup>
Age (years)		
18-30	26.9	33.9
31-44	28.0	24.5
45-54	16.0	15.1
55-64	14.0	12.8
65 and older	15.1	13.7
Gender		
Female	53.1	53.4
Male	46.9	46.6
Race/Ethnicity		
Non-Hispanic Black/African American	52.1	47.0
Non-Hispanic White	42.9	38.3
Asian/Pacific Islander	2.3	3.8
Hispanic	2.1	8.5
Other	0.7	2.4
Education		
Less than high school graduate	3.6	12.5
High school graduate	15.7	20.2
Some college	15.5	20.9
College graduate or graduate school	63.8	46.4
Don't know/refused	1.3	—
Household Income		
< \$25,000	11.8	24.0
\$25,000-49,999	14.2	18.2
\$50,000-74,000	14.3	15.7
\$75,000-149,999	26.2	24.6
\$150,000+	19.6	17.4
Don't know/refused	13.9	—
How often drove a car in D.C. in the past month		
Every day	38.2	
At least once a week	28.3	
At least once a month	9.0	
Never	24.3	
Don't know/refused	0.2	
How often walked on D.C. streets for 5 minutes or more in past month		
Every day	69.8	
At least once a week	19.2	
At least once a month	5.0	
Never	5.7	
Don't know/refused	0.3	

<sup>a</sup>Characteristics of population ages 18 and older were obtained from U.S. Census Bureau (2013). Household income is percent of households, 2010 (N=252,388).

**Table II** Percentage distributions of how safe people feel when crossing the street at various types of locations in D.C. among survey respondents who walked at least 5 minutes in the past month

	Very safe	Somewhat safe	Somewhat unsafe	Very unsafe	Don't know/refused	Total (N=752)
Intersections with traffic lights that have marked crosswalks	31.7	52.2	11.8	4.0	0.3	100
Intersections with stop signs that have marked crosswalks	24.6	51.7	16.6	6.5	0.6	100
Intersections with stop signs that do not have marked crosswalks	8.0	34.1	33.3	23.0	1.6	100
Intersections without traffic lights or stop signs that have marked crosswalks	7.5	29.7	30.8	30.4	1.7	100
Marked crosswalks in the middle of the block	8.5	32.7	30.9	24.2	3.7	100

**Table III** Percentage distributions of responses to questions about D.C. laws pertaining to pedestrians

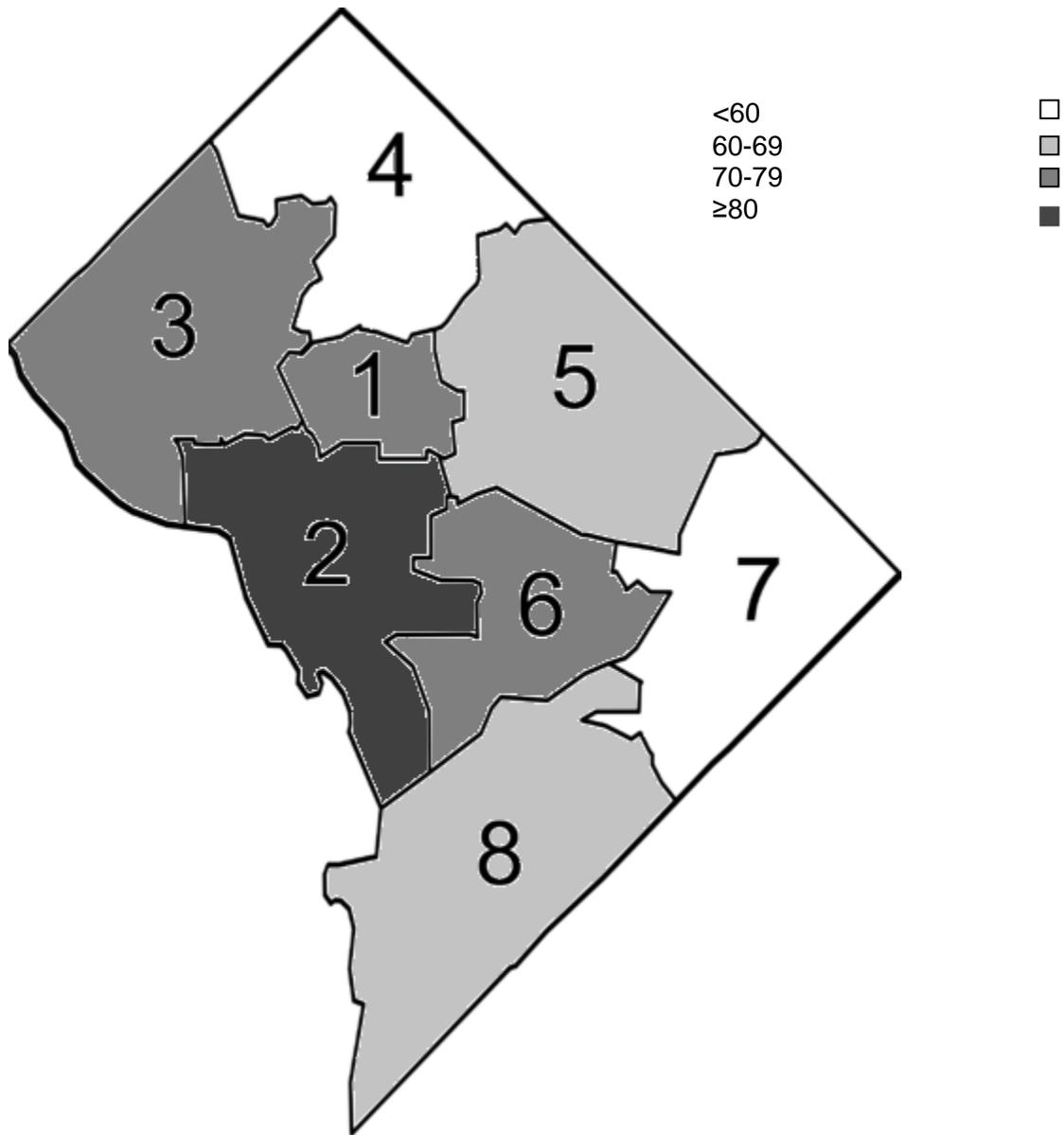
	Yes	No	Don't know/refused	Total (N=801)
D.C. law requires drivers to stop for pedestrians crossing the street at... (Correct answers in bold)				
Marked crosswalks in the middle of the block	<b>91.7</b>	4.8	3.5	100
Intersections without traffic lights that have marked crosswalks	<b>93.2</b>	4.3	2.5	100
Intersections without traffic lights that do not have marked crosswalks	<b>54.2</b>	34.4	11.4	100
D.C. law allows pedestrians to cross the street midblock where there is no crosswalk if...(Correct answers in bold)				
There are traffic lights at both ends of the block	15.5	<b>75.7</b>	8.7	100
There are no traffic lights at both ends of the block	<b>17.5</b>	68.1	14.4	100
There is no traffic light at one end of the block	<b>19.8</b>	67.5	12.6	100

**Table IV** Perceptions about unsafe driving and walking behaviors in D.C.

	Percent
Percentage of respondents who find the following situations in D.C. to be a serious threat to personal safety as driver or pedestrian	(N=801)
Drivers running red lights	92.7
Drivers running stop signs	91.9
Drivers not stopping for pedestrians	91.6
Drivers speeding	88.2
Drivers turning right on red	44.1
Percentage of drivers who did the following in past month	(N=605)
Drove more than 5 mph faster than the speed limit	69.7
Drove more than 10 mph faster than the speed limit	23.5
Turned right on red without coming to a complete stop	19.7
Drove through a stop sign without coming to a complete stop	16.6
Did not stop for pedestrians crossing the street at an intersection without a marked crosswalk	12.4
Did not stop for pedestrians crossing the street in a marked crosswalk in the middle of a block or at an intersection without traffic lights	11.9
Turned right on red at an intersection where it is not allowed	8.3
Did not stop for pedestrians crossing the street in a marked crosswalk at an intersection with traffic lights	8.2
Drove through a traffic light after it turned red	5.4
Percentage of pedestrians who did the following in past month	(N=752)
Crossed the street in the middle of the block where there is no crosswalk	64.5
Crossed the street at an intersection against the traffic light	43.3

**Table V** Attitudes toward various types of camera enforcement and changes to fines for speed camera violations

	Strongly Favor	Somewhat Favor	Somewhat Oppose	Strongly Oppose	Don't know/ refused	Total
Percentage of all respondents who favor or oppose the cameras to enforce laws against ...						(N=801)
Speeding violations	43.4	32.5	12.4	9.9	1.8	100
Red light violations	61.0	25.5	6.1	6.2	1.2	100
Stop sign violations	30.5	19.6	20.6	23.2	6.1	100
Crosswalk violations	27.7	19.8	26.2	20.2	6.1	100
Among respondents aware of camera enforcement in D.C., percentage who favor or oppose changes in speed camera fines						(N=743)
Lower fines for speed camera violations of ≤15 mph	49.4	25.8	9.1	9.0	6.8	100
Higher fines for speed camera violations of >25 mph	59.3	18.7	9.6	7.7	4.7	100



**Figure 1** Percentage of respondents within each ward who reported walking on D.C. streets for 5 minutes or more daily during the past month