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ABSTRACT

The purpose of this study is to provide an exploratory analysis of the proportion of pedestrians, bicyclists, and drivers exhibiting four specific behaviors at 12 intersections near transit stations in the San Francisco Bay Area. The target behaviors include: 1) pedestrians crossing the roadway while using a mobile device, such as a cell phone, 2) pedestrians crossing a signalized intersection against a red light, 3) bicyclists running a red light at a signalized intersection, and 4) automobiles turning right on red without stopping. These four behaviors are important because they may lead to pedestrian crashes. Overall, 8% of pedestrians used mobile devices while crossing, but the proportion ranged from less than 3% to more than 18% at specific study sites. At some locations fewer than 3% of non-motorized road users violated red lights, whereas approximately 70% did at other sites. The percentage of motorists turning right on red without stopping ranged from zero to more than 70%. Female pedestrians were more likely than males to talk on mobile devices while crossing the street, but males were more likely to violate traffic signals while walking or bicycling. However, these observations do not control for differences in gender and other characteristics among sites. As pedestrian and bicycle mode shares increase, it will be essential for all users to understand their rights and responsibilities in the roadway environment. Documenting behaviors helps provide a foundation for engineering, education, enforcement and encouragement countermeasures that will improve safety for pedestrians and other roadway users.

INTRODUCTION

Pedestrian travel is an affordable means of mobility for people of nearly all ages and abilities. In addition, substantial efforts have been made by planners, safety advocates and public health advocates in the last several years to increase walking as a way to promote physical activity, use public space and infrastructure efficiently, and improve air quality. However, over the last decade in the United States, roadway collisions have resulted in an average of approximately 4,700 pedestrian fatalities and 69,000 pedestrian injuries per year *(1)*. Therefore, it is essential to improve the safety of interactions between pedestrians, bicyclists, and motor vehicle drivers in the roadway environment in order to increase the overall benefits of walking.

The number of annual pedestrian deaths occurring on San Francisco Bay Area roadways decreased from 105 in 2005 to 93 in 2009 *(2)*. This decrease in fatal pedestrian crashes occurred while pedestrian volumes increased slightly (the estimated number of annual pedestrian trips in California increased from 5.4 billion in 2001 to 6.3 billion in 2009) (*3*). This may be due to improved engineering, education, and enforcement initiatives, but it may also reflect an overall decrease in vehicle miles traveled (VMT), which has been positively correlated to crashes. However, pedestrian fatalities are still overrepresented in comparison to other travel modes. According to the 2000 Bay Area Travel Survey (*4*), 10% of all trips were made by walking, but from 2005 to 2009, pedestrians accounted for 19% of total Bay Area fatal collisions (*2*). Therefore, safety improvements are needed.

Purpose

Pedestrian crash risk has been related to several categories of factors, including roadway characteristics; surrounding land uses; time of day, week, and year; and pedestrian and driver behaviors (*5*). This paper focuses on individual behaviors. It is intended to provide an exploratory analysis of the proportion of pedestrians, bicyclists, and drivers exhibiting four specific behaviors at a sample of intersections near transit stations in the San Francisco Bay Area. These target behaviors include: 1) pedestrians crossing the roadway while using a mobile device, such as a cell phone, 2) pedestrians crossing a signalized intersection against a red light, 3) bicyclists running a red light at a signalized intersection, and 4) motorists turning right on red without stopping.

This study reports data on each of the target behaviors at specific study sites in the San Francisco Bay Area. Given the research on risk associated with distracted walking, along with the risk associated with vehicular turning violations, this paper contributes to an understanding of the frequency of pedestrian, bicycle and driver behaviors that could lead to crashes. It is intended to show:

- Pedestrian, bicyclist, and motorist behaviors can be quantified at specific study sites.
- The percentage of people exhibiting each behavior is different at each site.
- Individual pedestrian and bicyclist characteristics may be associated with specific behaviors.

This paper is not intended to:

- Estimate the frequency of particular behaviors throughout the urban region or country.
- Evaluate the risk of pedestrian crashes at a particular site.
- Develop a detailed database of site characteristics or identify specific built or natural environment factors that are associated with particular behaviors.
- Understand why certain types of people may exhibit particular behaviors.
- Identify specific countermeasures to reduce the occurrence of particular behaviors.

These important issues are left for future research.

LITERATURE REVIEW

It is common for researchers to observe behaviors as a surrogate for the risk of crashes when evaluating specific pedestrian safety treatments (*6,7,8,9*). While behaviors are not necessarily associated with actual crash occurrence, behavior observations can be useful for pedestrian safety analysis because they:

- Provide more data at specific sites than reported crashes.
- Can account for the rate of occurrence (e.g., the percentage of pedestrians or drivers who exhibited a behavior) more easily than reported crashes. Actual crash analyses require good estimates of pedestrian volumes before and after treatments are installed.
- Enable data collection at a wider range of sample of sites, not just sites with high numbers of reported crashes (*9*).

Several previous studies have explored how the four target behaviors are associated with pedestrian crash risk.

Pedestrians crossing the roadway while using a mobile device

A growing body of research focuses on risks associated with roadway user distraction. While much of this literature explores driver distraction, as many as 15% of pedestrian fatalities may result from inattentiveness of the pedestrian (*10*). Compared to a control group, pedestrians on mobile phones tend to cross the street more slowly and are less likely to look for traffic or wait for traffic to stop before entering the street (*10,11*). Pedestrian distraction studies have also found that pedestrians talking on mobile phones recalled fewer objects in their path than those not conversing (*11*).

Understanding the extent of distracted driving or walking is challenging. Some states' traffic crash reporting procedures have not been able to capture the proliferation in cell phone use since crash report forms do not all include questions directly related to mobile phone use (*12*). To try to understand the extent of cell phone use while driving, the National Highway Traffic Safety Administration (NHTSA) has conducted a national survey using methodology from the National Occupant Protection Use Survey (NOPUS). Results from this survey reveal that 5% of drivers observed held cell phones to their ears. Using data from self-reported surveys of drivers' cell phone use, NHSTA estimates that 9% were using either hand-held or hands-free cell phones while driving (*13*). Similar national survey data are not available for pedestrians.

Pedestrians crossing a signalized intersection against a red light

A meta-analysis of seven jaywalking studies between 1940 and 1982 showed that an average of nearly 25% of pedestrians crossed against a red light. Individual jaywalking behavior was influenced by other pedestrians nearby and by sidewalk crowding (*14*). A study of 15 towns in Sweden found that pedestrians crossed against red lights more often in larger cities, at intersections with less cross traffic and turning traffic. Shorter crossing distances and median islands were also positively associated with disobeying red signals. Males were more likely to jaywalk than females (*15*). Research has also shown that the longer the traffic signal, the more pedestrians violate the signal (*16*).

Bicyclists running red lights at a signalized intersection

Red light violations by bicyclists may lead to crashes. Bicyclist traffic signal violations were listed as a contributing factor in approximately five percent of bicycle-motor vehicle crashes in the early 1990s (*17*). It is likely that bicyclists running red lights are dangerous for crossing pedestrians, but there is little existing research on how bicyclist traffic signal violations are associated with pedestrian risk.

Automobile drivers running a red light while turning right at a signalized intersection. Previous studies noted that about 6% of crashes occurred between right-turning vehicles and pedestrians crossing the street at an intersection (*18*) and found a higher risk of pedestrian crashes at intersections with right turn-only lanes (*19*). Specifically, permitted Right-Turn-on-Red (RTOR) has been documented as a danger for pedestrians and bicyclists (*20*). Drivers turning right may pay less attention to pedestrians in the crosswalk or to oncoming bicyclists than to vehicles approaching from the left. This problem is compounded for pedestrians when drivers encroach into the crosswalk to improve their vision of oncoming cars (*20,21*). In an analysis of crash data from four states, RTOR crashes represented a small proportion of the total number of traffic crashes; however, it also showed that RTOR crashes involve a pedestrian or bicyclist 22% of the time, and that injuries occur a vast majority of the time (93%). RTOR pedestrian crashes occur evenly among females and males, and most of these crashes occur between 6 am and 6 pm (*22*).

METHODS

The San Francisco Bay Area's Metropolitan Transportation Commission (MTC) has launched a Safe Routes to Transit (SR2T) Program to support regional transportation projects to reduce congestion along the seven state-owned toll bridge corridors by facilitating walking and cycling to regional transit stations. To date, approximately $12 million over three funding cycles have been awarded to 30 capital and planning projects. The goals of the program are to increase the number of bicyclists and pedestrians accessing regional transit in the Bay Area, enhance safety for bicyclists and pedestrians, improve air quality, and reduce traffic congestion.

Study Sites

Behavior-observation sites were chosen to coincide with locations of pedestrian and bicycle improvements being made between Spring 2011 and Fall 2012. The research team will also be gathering crash records at these sites from the Statewide Integrated Traffic Record System (SWITRS). The crash data will be limited, however, given the infrequency of crashes and the small number of sites. The study sites are near 10 Bay Area Rapid Transit (BART) stations and two transit centers (San Rafael Transit Center and the Palo Alto Caltrain Station/Transit Center) (Figure 1).

FIGURE 1. Map of Bay Study Sites

MTC SR2T Program Evaluation

Behavior Observations

Field data collection included observing pedestrian, bicyclist, and driver behaviors at intersections near the 12 Bay Area transit stations. Data collection at each site was done from 4-6pm on a fair-weather weekday in spring 2011. Intersections for observation were chosen near the transit stations/centers to maximize numbers of observations of potential transit users.

To help ensure accurate observations, the research team pilot-tested a behavior observation form. Student data collectors were then trained at a test intersection to observe specific behaviors and record them on the form. During training, student data collectors were critiqued and given suggestions about how to improve their observation and recording technique. Finally, when actual observations were made at each study site, a member of the research team served as an on-site supervisor.

Three different data collectors, one for each mode, were used at each intersection to observe the pedestrians, bicyclists, and drivers. They observed each subject as they approached and passed through the intersection. In order to randomize the subject selection process, data collectors observed the next user who approached from the adjacent intersection after the last observation was completed. If two users were traveling together, only one person was observed.

Behavior observation sheets were used to document a variety of pedestrian, bicyclist, and driver behaviors at each site. For all observations, pedestrian and bicyclist age, gender, and positioning on the roadway were recorded. Driver characteristics were not recorded because noting age and gender for people inside cars would have added too much complexity to the data collection task. Therefore, driver observers focused only on behaviors. Data collectors marked all behaviors that were exhibited by the road user as they approached and crossed the intersection. Pedestrian behaviors included:

- Crossed on green or yellow light.
- Was in street when light turns red.
- Stopped and waited at red light.
- Jaywalked against red light.
- Looked both ways before entering crosswalk.
- Entered crosswalk without looking.
- Ran or hurried to avoid approaching vehicles.
- Used cell phone or other communication device.

Bicyclist behaviors included:

- Entered on green or yellow light.
- Stopped at red light.
- Ran red light.
- Turned right on red.
- Stopped/slowed at stop sign.
- Ran stop sign.

Driver behaviors included:

- Passed crossing because had right-of-way.
- Yielded to let pedestrian cross.
- Did not yield to pedestrian.
- Sped past pedestrian crossing.
- Honked at pedestrian.
- Slowed abruptly or skidded to yield to pedestrian.
- Ran red light.
- Ran stop sign.

- Encroached over crosswalk line.

While many behaviors were observed, this study focuses on four specific behaviors associated with pedestrian crash risk. These behaviors are defined below.

Pedestrian Used Mobile Device while Crossing
Subject pedestrians who crossed the study intersection while using a mobile device were noted on the data collection sheets. Behaviors noted included talking, texting or other activities involving the device. This behavior was observed at all 12 locations.

Pedestrian Crossed Against a Red Light
Pedestrians were determined to be crossing against a red light if they began crossing the street before the light for parallel traffic turned green. The "WALK" signal began at the same time as the green phase at all signalized study sites. This behavior was also recorded if pedestrians entered the crosswalk when the traffic signal for parallel traffic was yellow or red. Crossing against a red light was not recorded if the pedestrian entered the crossing on a flashing "DON'T WALK" signal, but the parallel traffic still had a green signal. Pedestrians who arrived at the crossing during the "WALK" phase were not considered in the evaluation of this behavior. Not all observation sites were signalized; only nine of the 12 locations included data on this behavior.

Bicyclist Disobeyed Red Light
Bicyclists were considered to be disobeying a red light if they entered an intersection during a red light or before the light turned green. They were also recorded as disobeying a red light if they did not complete crossing the intersection before the light turned red. Bicyclists who arrived at the intersection on green were not considered were not considered in the evaluation of this behavior. Eight of the 12 locations include data on this behavior.

Motorist Did Not Stop Before Turning Right on Red
Drivers were recorded as not stopping before turning right on red if they did not stop or slow nearly to a stop before turning. Since few motorists came to a complete stop, it was not useful to define a stop as "wheels no longer turning." Therefore, the data collection manager provided examples of when a stop was "complete enough" to data collectors during training. This was roughly when vehicles slowed to less than two miles per hour (0.9 meters per second). Since three different data collectors used their judgment to determine whether a driver stopped or not, this observation was not completely objective and it is likely to be less reliable than the other behaviors. Observations only included drivers who turned right on a red light. Drivers who arrived at the intersection when the light was green or yellow were not considered in the evaluation of this behavior because they did not have an opportunity to choose to either stop or not stop before turning on red. Only seven of the 12 intersections had right-turns controlled by a signal. Right turns were allowed on red at all seven intersections. There were designated right-turn lanes at all but three of these seven intersections (Rockridge, Palo Alto, and Lafayette).

Data Summary
A total of 1,144 pedestrians, 557 bicyclists and 2,267 drivers were observed (Table 1). Rockridge had more observations of pedestrians and bicyclists than any other site. The greatest number of automobiles were observed at the Richmond and Pittsburg sites. Lafayette had the fewest overall observations.

TABLE 1. Total Behavioral Observations of Pedestrians, Bicyclists and Drivers

	Pedestrians	Bicyclists	Drivers	Total
Bay Fair BART	139	7	295	441
Rockridge BART	156	168	103	427
Richmond BART	57	26	310	393
San Leandro BART	112	43	216	371
Palo Alto TC	137	68	160	365
Pittsburg BART	39	6	314	359
Balboa Park BART	104	33	202	339
Fremont BART	109	33	184	326
Civic Center BART	100	78	142	320
San Rafael TC	68	23	169	260
Glen Park BART	83	48	107	238
Lafayette BART	40	24	65	129
TOTAL	**1144**	**557**	**2258**	**3968**

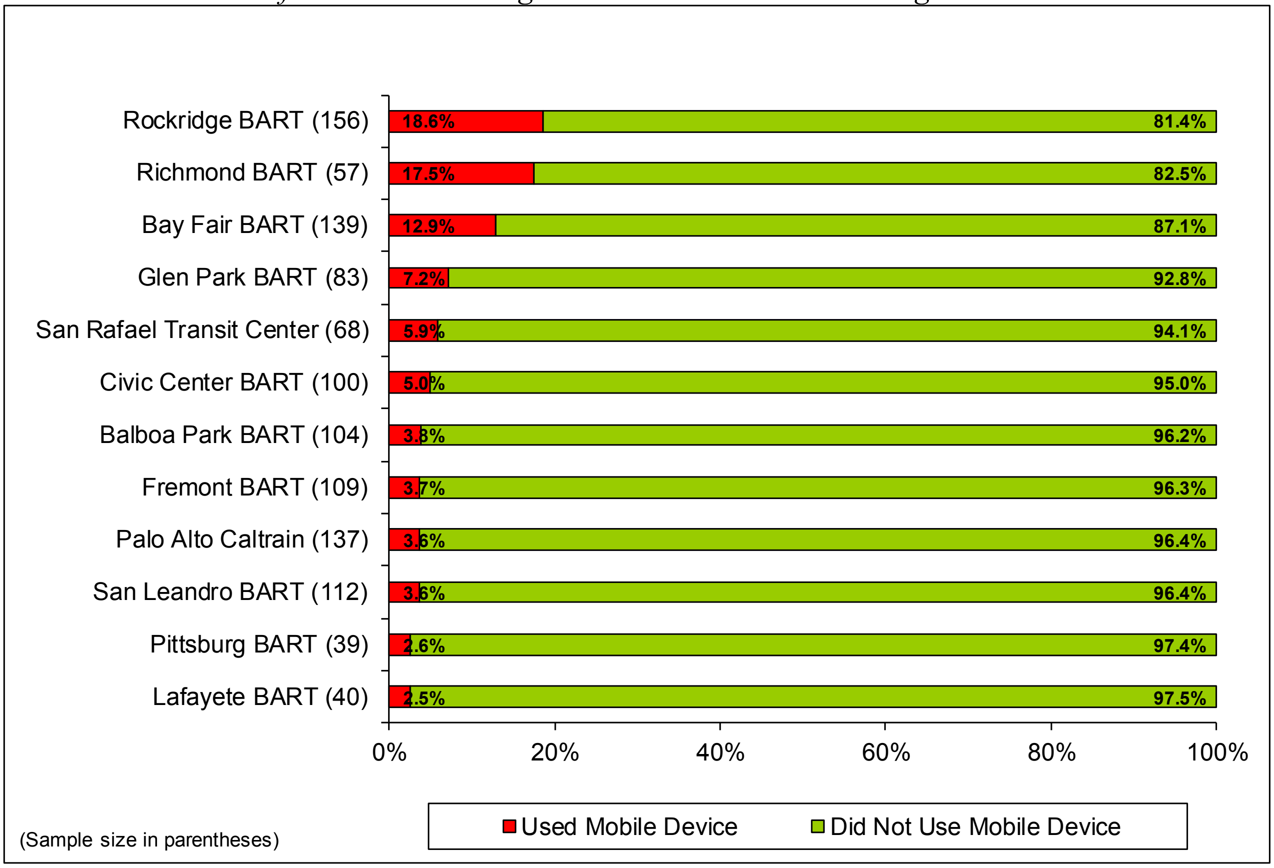
RESULTS

This study documented many incidences of the four targeted behaviors at the 12 study sites. The first part of this section reports the frequency of these target behaviors and also provides a cursory analysis of site characteristics to begin to hypothesize why specific behaviors were more common in certain locations. The second part shows individual characteristics associated with the target behaviors.

Frequency of the 4 target behaviors

Pedestrians crossing the roadway while using a mobile device
Overall, 8% of the 1,144 pedestrians used mobile devices while crossing, but the proportion ranged from less than 3% to more than 18% at specific study sites. The locations associated with the highest level of pedestrian mobile device use were both relatively urban: Rockridge, where 19% of pedestrians were using a mobile phone and Richmond, where 18% were doing so. Fewer than 3% of observed pedestrians crossed while using a mobile device in Lafayette and Pittsburg (Figure 2).

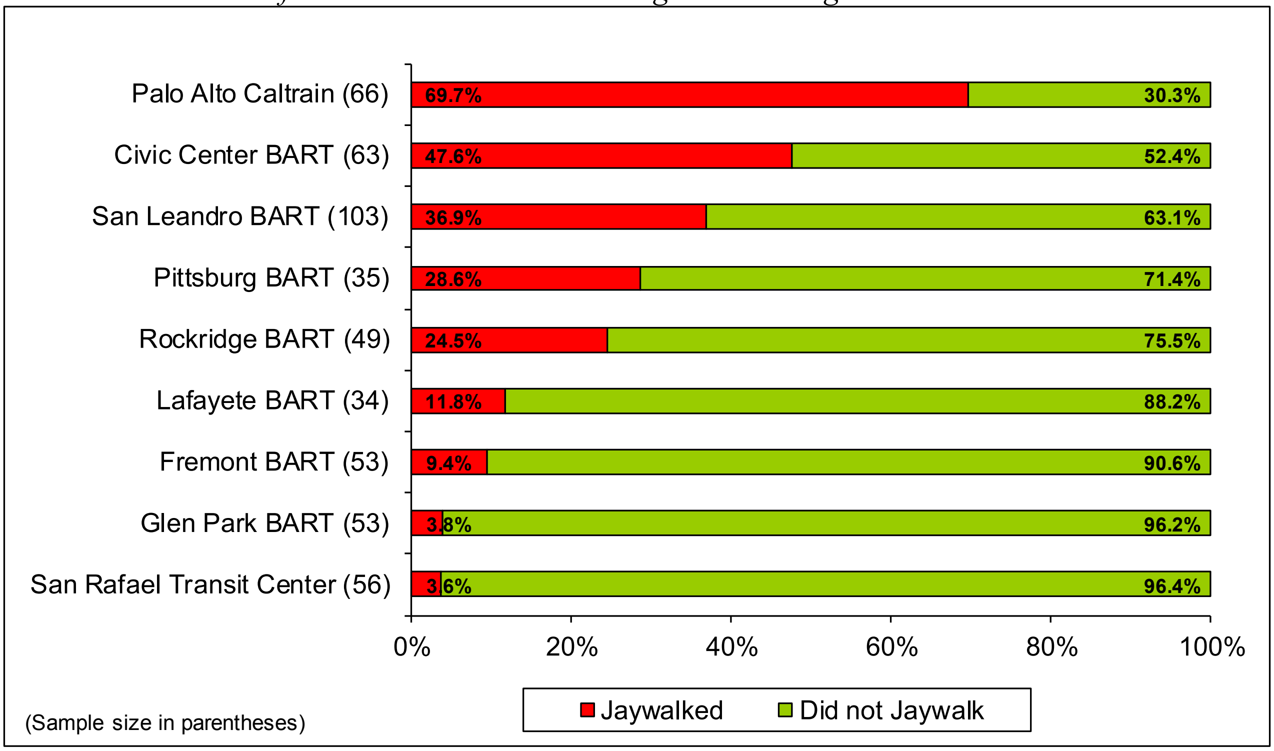
FIGURE 2. Percent of Pedestrians Using Mobile Device while Crossing the Street



Pedestrians crossing a signalized intersection against a red light

Of the 512 pedestrians who arrived at a signalized intersection when the light was red, 29% crossed against the red light. The highest level of pedestrians violating red lights occurred at the Palo Alto Caltrain site (70%). The lowest level of pedestrians violating red lights occurred at the San Rafael and Glen Park sites (4%) (Figure 3). Several site characteristics could be related to differences in pedestrian jaywalking frequencies. Opportunistic pedestrians were likely to find gaps in traffic to cross at the Palo Alto site. The crossing distance was also shorter than most other locations. In contrast, San Rafael and Glen Park may have had fewer pedestrians violating the traffic signal because cross-street traffic flows were relatively steady and crossing distances were long. The Civic Center and San Leandro locations had pedestrian crossing islands, and some pedestrians crossed to these refuge areas while waiting for the “WALK” signal. This may help explain the higher pedestrian signal violations at these sites.

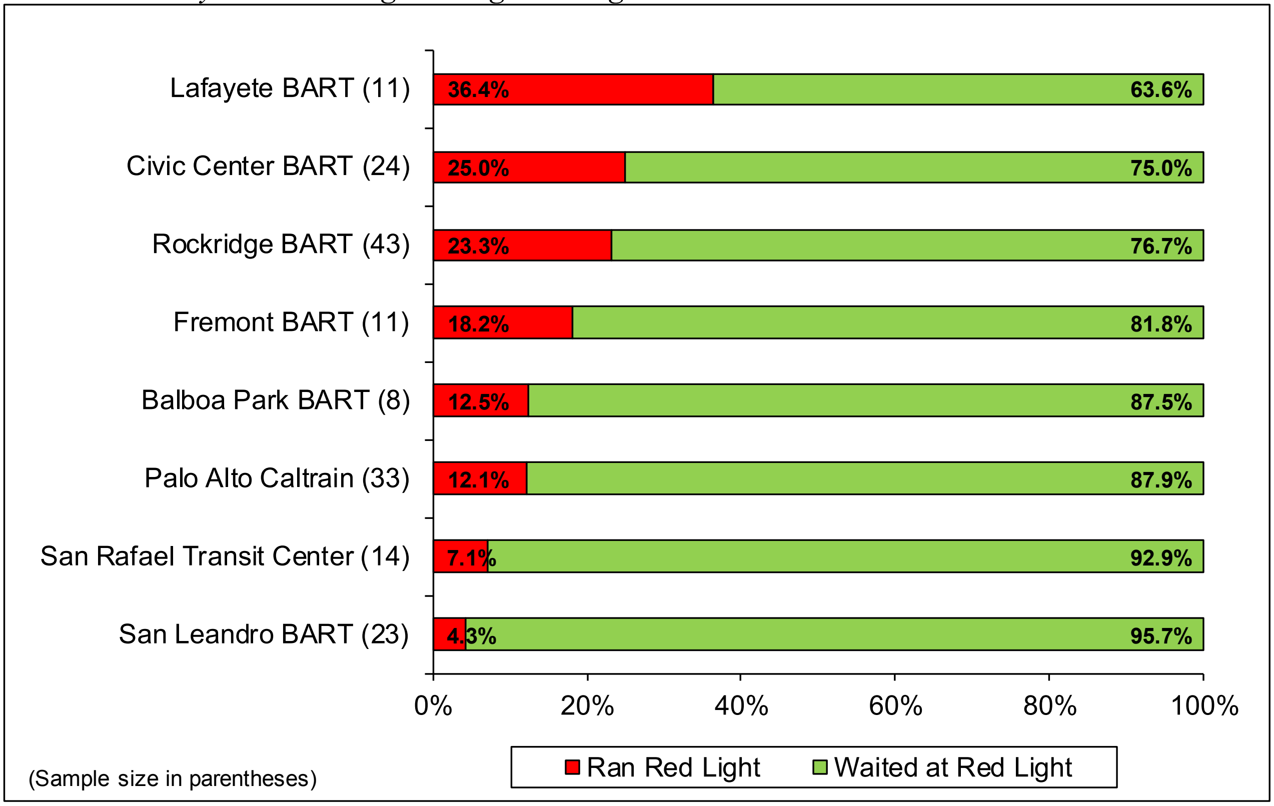
FIGURE 3. Percent of Pedestrians Who Crossed against Red Light



Bicyclists running a red light at a signalized intersection

Approximately 17% of the 167 bicyclists who arrived at a signalized intersection when it was red violated the signal. The location with the highest percentage of bicyclists who disobeyed the red light was Lafayette (36%). The lowest percentages of bicyclists who disobeyed a red light were at the San Leandro (4%) and San Rafael (7%) locations (Figure 4). In general, the Lafayette intersection had lower traffic volumes, so there were more gaps in opposing traffic where bicyclists took the opportunity to run the red light. Fremont and Rockridge had gaps in cross-street traffic that may have also created opportunities for red-light running. Nearly all bicyclists who violated the red signal near the Civic Center BART in San Francisco started a few seconds before the light turned green or did not complete crossing before the light turned red. As for pedestrians, the steady flows of cross-traffic may have inhibited bicyclists from running red lights in San Rafael. It is possible that red-light violations were less common for bicyclists than for pedestrians in San Leandro because few bicyclists crossed to the median refuge island like pedestrians when the light was red.

FIGURE 4. Bicyclists Running Red Lights at Signalized Intersections

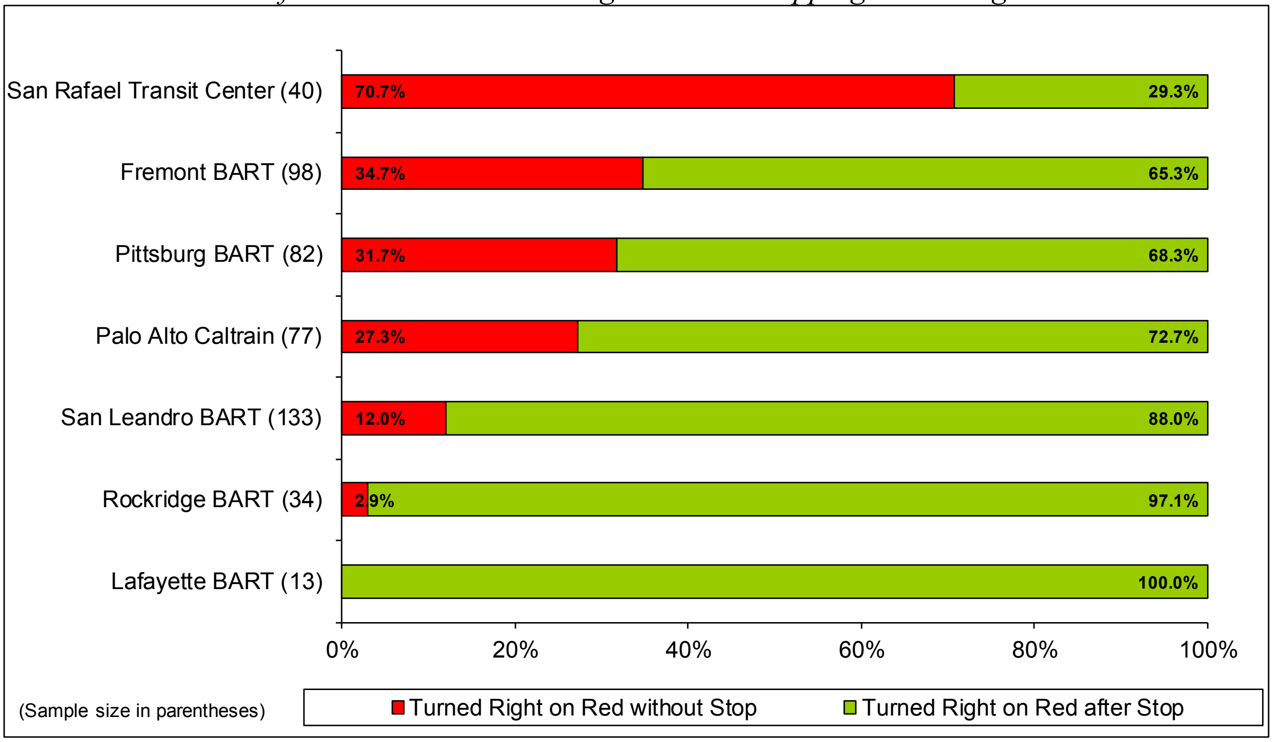


Motorists running a red light while turning right at a signalized intersection

Approximately 27% of the 478 drivers who arrived at a red light and were turning right failed to stop before turning. More than 70% of drivers at the San Rafael location turned on red illegally (Figure 5). Fremont (35%) and Pittsburg (32%) also had a high frequency of red light running. All three of these intersections had exclusive right turn lanes. Fremont and Pittsburg had larger corner turning radii than most other sites.

Few drivers were observed to turn right on red without stopping in Rockridge (3%) and Lafayette (0%). Neither intersection had an exclusive right turn lane. In addition, the Lafayette intersection crosswalks were set back further from the center of the intersection than crosswalks at most other sites, and the Rockridge intersection had high pedestrian, bicyclist, and automobile traffic volumes on the cross street. Turning drivers may have been more cautious at these intersections.

FIGURE 5. Percent of Drivers Who Turned Right without Stopping at Red Light



Future research on site factors associated with target behaviors

While this section hypothesized the relationship between several of the target behaviors and specific site factors, it is not intended to imply a statistical association between these characteristics. Future studies should observe behaviors at many more sites and compare these to detailed site measurements. Potential site factors that could be explored include surrounding land use attributes; roadway design features; and pedestrian, bicyclist, and vehicle traffic characteristics.

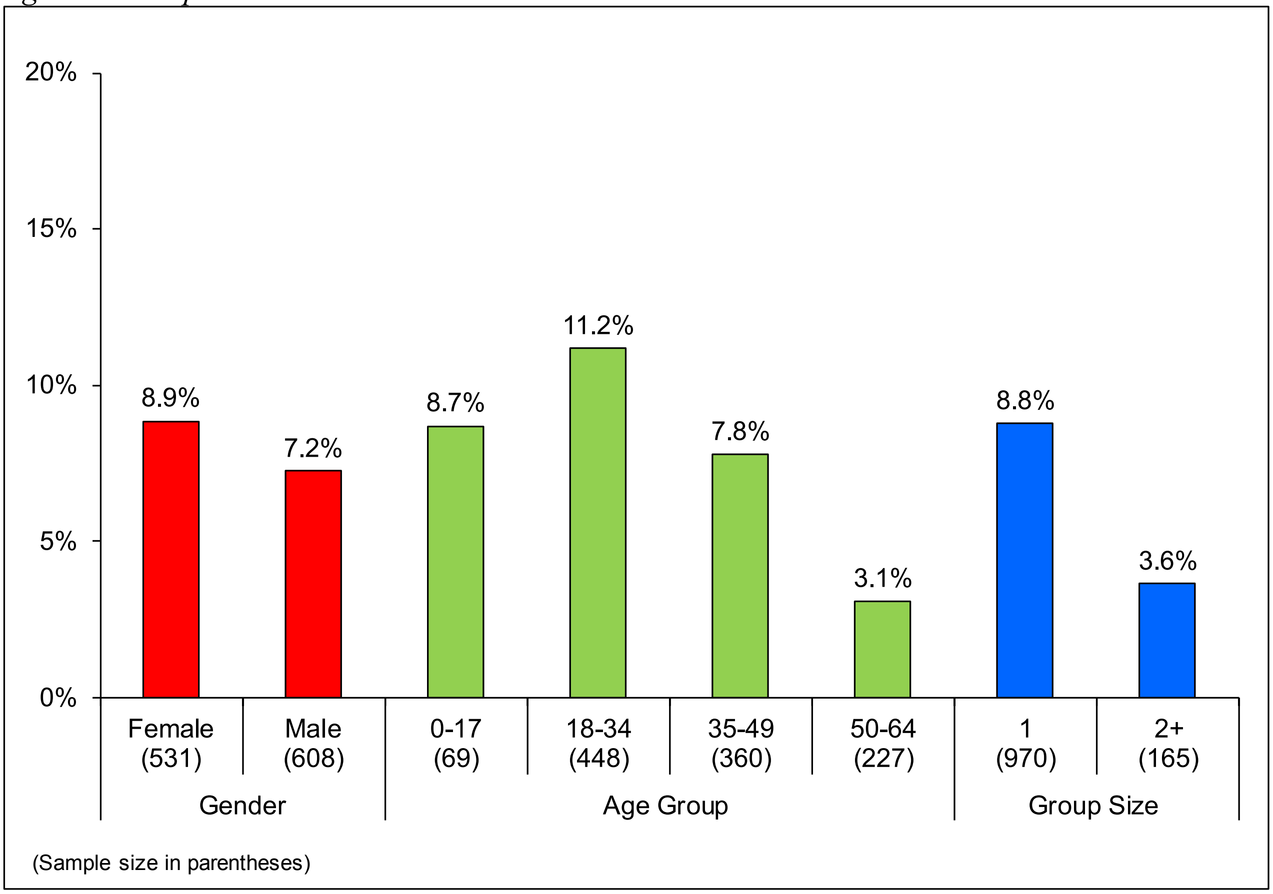
Individual Characteristics

Pedestrian and bicyclist gender and age ranges were also estimated at all sites. Age range was categorized into the following: 0-17 (children in strollers were counted as pedestrians); 18-34; 35-49; 50-64; and 65 and over. Whether or not people walked or bicycled alone or in groups was also recorded.

Mobile Device Use

Examining all sites together, females (8.9%) were more likely to use mobile devices while crossing the street than males (7.2%). Younger pedestrians were also more likely to be using a mobile device. More than 11% of people aged 18-34 used a mobile device while crossing the street, while 8% of people between 35-49 and only 3% of people between 50-64 used these devices. There were not enough observations of people aged 65 or older who used mobile devices while crossing the street to document this activity. People walking alone were more than twice as likely to use a mobile device as people walking in groups (Figure 6). It is possible that people traveling with others are more likely to engage with each other than use a device.

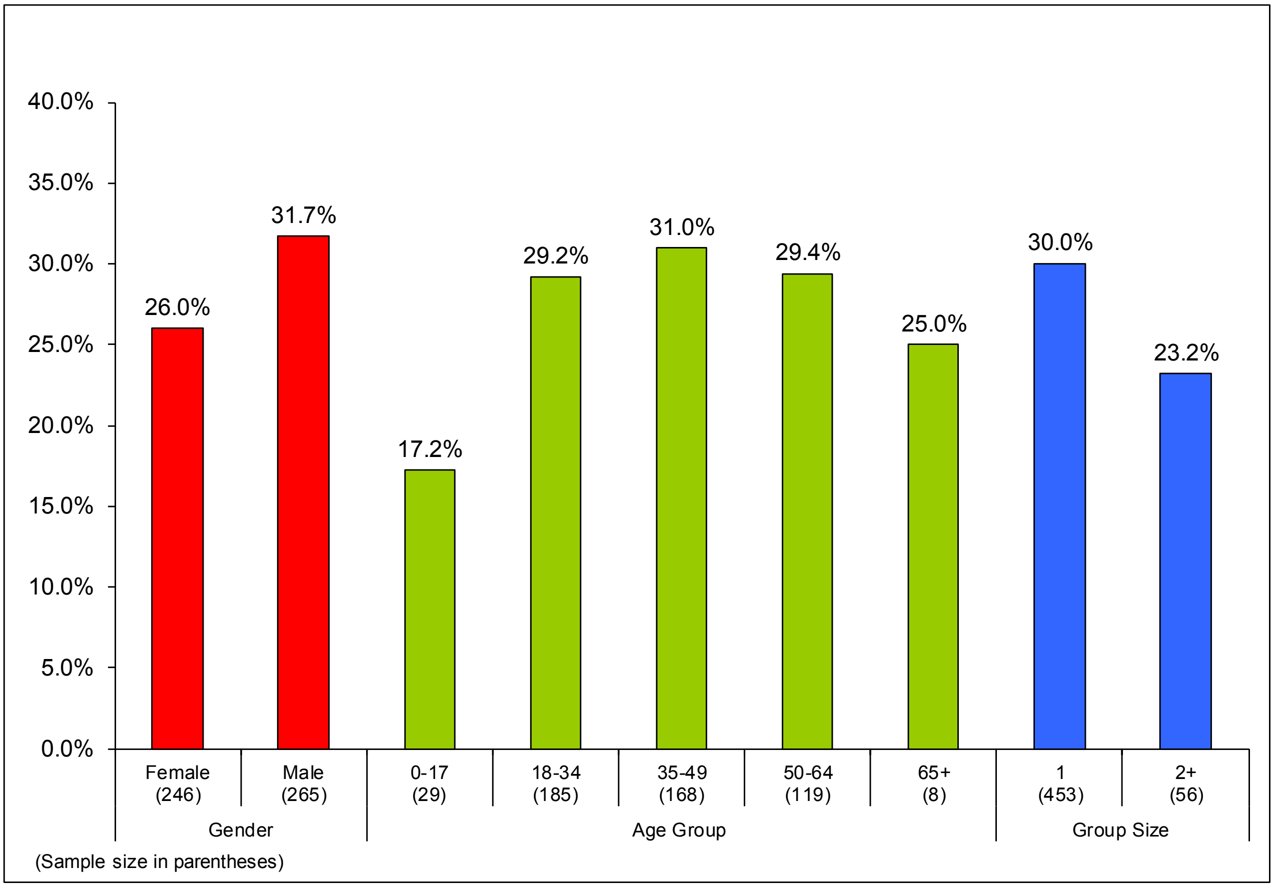
FIGURE 6. Percent of Pedestrians Using a Mobile Device while Crossing the Street by Gender, Age and Group Size



Pedestrians crossing a signalized intersection against a red light

In contrast to mobile device use, men (32%) were more likely to cross against a red light than women (26%) (Figure 7). The age group that exhibited the most crossing against the red at all sites were pedestrians aged 35-49 (31%). Individual pedestrians were more likely to cross against the red; 30% of people walking alone crossed while the light was red, as opposed to 23% walking in groups of two or more.

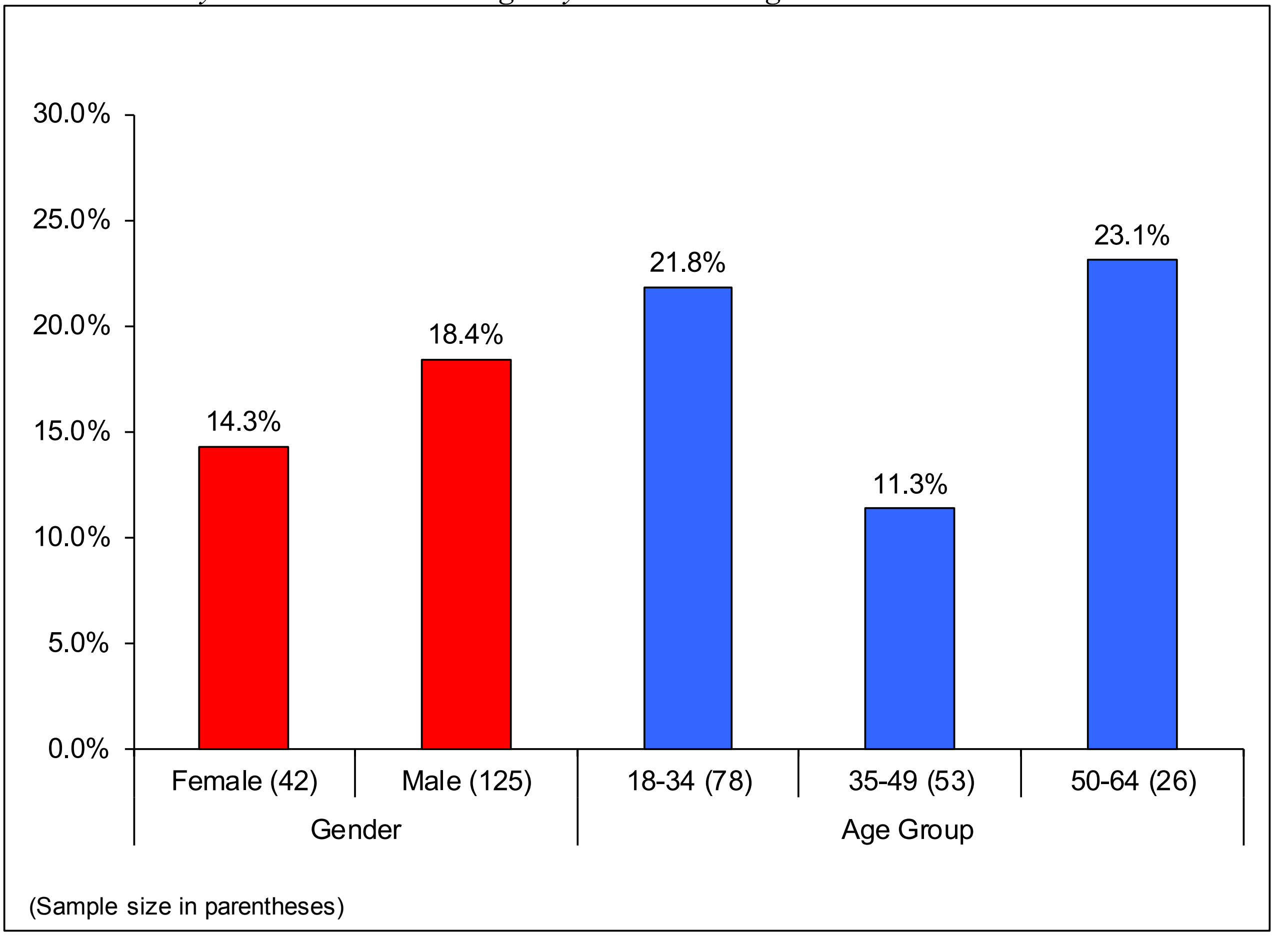
FIGURE 7. Percent of Pedestrians who Crossed against the Red Light by Gender, Age and Group Size



Bicyclists running a red light at a signalized intersection

Consistent with gender behavior described above, male bicyclists (18%) were more likely to run red lights than female bicyclists (14%). Subjects aged 18-34 and 50-64 had similar rates of red-light running (22% and 23%, respectively), although there was a relatively small sample of bicyclists aged 50-64 (Figure 8).

FIGURE 8. Bicyclists Who Ran Red Light by Gender and Age



DISCUSSION

The purpose of this study is to explore behaviors that contribute to pedestrian crash risk. Data from observations of four types of behaviors that could compromise safety of pedestrians in intersections are presented. Two of these behavior types relate to pedestrian behavior (pedestrians crossing while using mobile devices and pedestrians crossing against red lights), one centers around bicycle behavior (bicycle crossing against red lights), and the final behavior type focuses on motorist behavior (drivers turning right on red lights without stopping first).

There is a range of observed pedestrian and bicycle violation of red lights. At some locations as few as 2.4% of non-motorized road users violated red lights, whereas 70% did at other sites. The rate of vehicles violating red lights also varied by observation site, with 0%-71% of drivers turned right illegally on a red light. Similar to previous studies, the behavioral observations found that males were more likely to cross against red lights (*16*). The findings from this study also contribute information about pedestrian and bicyclist behaviors by age and group size. However, the study did not control for the differences in pedestrian and bicyclist gender or other characteristics between sites. It is possible that the sites where it was easier to jaywalk or run red lights may have had higher proportions of certain types of pedestrians and bicyclists. Additional multivariate analysis is needed before broader conclusions can be drawn about individual characteristics associated with particular behaviors.

Considerations and Future Research

This study quantified behaviors associated with pedestrian safety in 12 locations around the San Francisco Bay Area. Results from the observations will become part of a baseline study to evaluate capital projects designed to increase both mobility and safety. There were limited resources for this study, so it was not possible to evaluate certain behaviors, such as motorist speeding and failing to yield to pedestrians in crosswalks. These would require objective speed assessment methods and a clear definition of driver yielding that could be determined reliably by data collectors. In addition, more rigorous data collection methods, such as a sensitive radar gun, could be used to assess whether drivers slowed enough to be considered a stop before turning right on red rather than relying on subjective observations. Multiple data collectors could also be used to record the same behaviors, making it possible to compare the reliability of each observer. More data collectors would also make it possible to observe characteristics of drivers, which could produce results similar to the characteristics of pedestrians and bicyclists. These data could indicate the value of education and enforcement programs for particular groups.

Future research could also:

- Observe pedestrian, bicyclist, and motorist behaviors at a larger, more representative sample of sites so that it is possible to estimate the frequency of particular behaviors across a broader geographic area.
- Compare specific behaviors to reported crash data. With a larger sample of behavior observations, it may be possible to identify specific behaviors that are the best indicators of pedestrian crash risk.
- Develop a detailed database that includes built and natural environment characteristics as well as behaviors observed at many sites. This could be used to identify specific roadway design and other features associated with particular behaviors.
- Conduct surveys and interviews to understand what motivates certain types of pedestrians, bicyclists, and motorists to exhibit particular behaviors in different roadway environments.
- Observe sites before and after specific engineering, education, and enforcement treatments are made to determine if the treatments are effective at changing particular behaviors.

IMPLICATIONS

In reviewing opportunities to increase safety, it is critical to look at engineering, education and enforcement opportunities for intervention. In pursuing interventions it is important to acknowledge the role that behavior plays in safety and to plan for interventions that affect behavior (*23,24*). Lengthened crossing times allow pedestrians more time to cross, although longer waiting cycles may create more pedestrian and bicycle crossings against red (*16*). Engineering options, such as narrowed crossing distances, restricted right-turn-on-red (RTOR), narrowed curb radii may alter driver-pedestrian interactions by slowing vehicles. Narrowed crossing distances also reduce the exposure of pedestrians in crosswalks.

Enforcement plays a critical role in encouraging safe roadway user behaviors. Many law enforcement agencies have strengthened pedestrian, bicyclist, and driver safety enforcement. Often tragic fatalities in communities spur action. In Glendale, California, after a number of pedestrian deaths, the City's police department became active in pedestrian enforcement, conducting stings, educating road users, and attending community-wide pedestrian safety training and planning events (*25*). Enforcement of compliance with red lights, as well as distracted driving laws can go far in protecting all road users.

Education efforts often intersect with enforcement, as police play an important role in increasing awareness of traffic safety laws. In addition to enforcement, police have conducted leafleting at intersections with high volumes of pedestrians. To reduce the extent of distracted driving and increase awareness of the problem, California has begun high visibility enforcement of cell phone laws, modeled after other successful high visibility enforcement efforts around DUI and seat belt use. It is essential for drivers to understand the rights and responsibilities of all road users, and to realize that pedestrians and bicyclists are equal "owners" of roads. Work is currently ongoing in California to integrate bicycle and pedestrian safety material into the DMV's educational materials for driver licensing.

As pedestrian and bicycle mode shares increase, it will be essential for all users to understand their rights and responsibilities in the roadway environment. Documenting behaviors helps provide a foundation for engineering, education, enforcement and encouragement treatments and/or efforts that will improve safety for pedestrians and other roadway users.

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