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The States' Voice on Highway Safety

This report was made possible by a grant from

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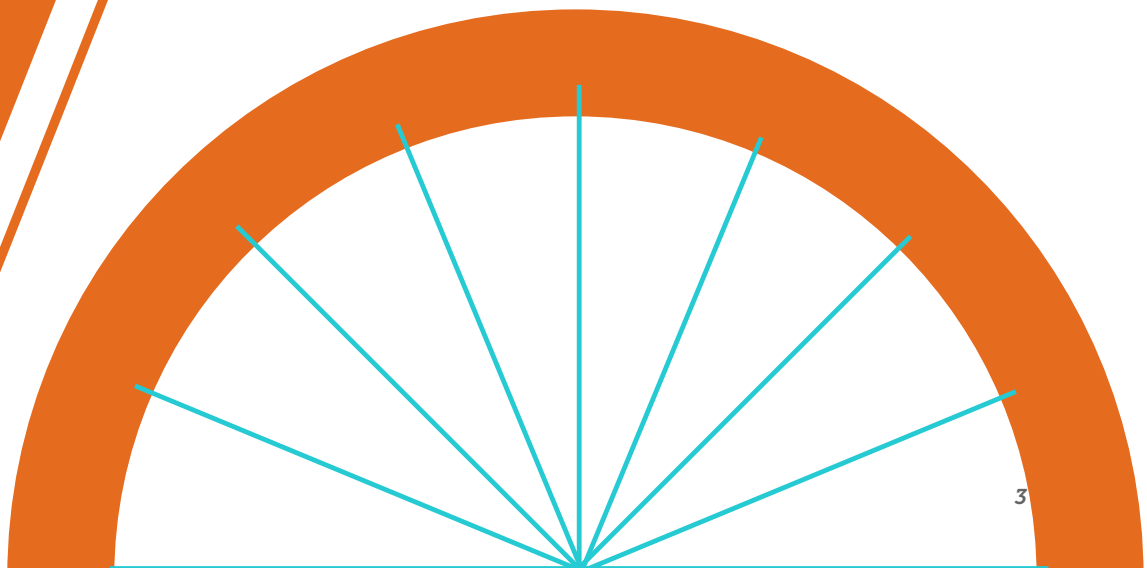
A Right to the Road

Understanding & Addressing Bicyclist Safety

Contents



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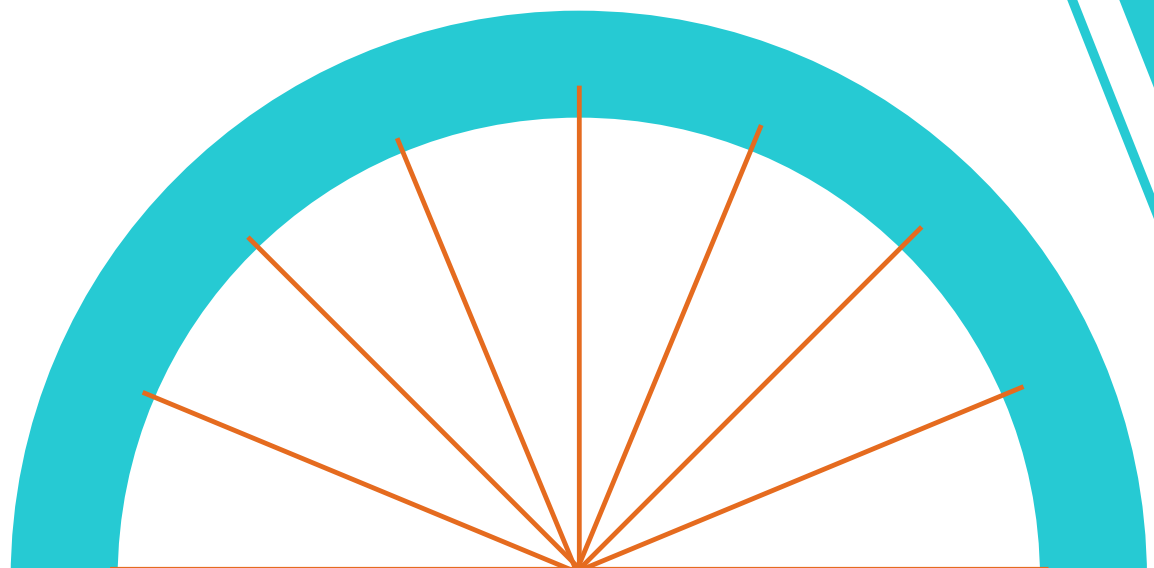
The views and recommendations in this publication do not necessarily reflect those of State Farm, GHSA or the individuals and organizations represented on the Expert Panel.

*Served in an advisory capacity.



Executive Summary

GHSA analyzed bicyclist fatal crash data resulting from a collision with a motor vehicle from 1975 to 2015 using the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Report System (FARS) to identify changes in trend lines associated with who is being killed, when and where those crashes are more likely to occur and why.
Bicyclist fatalities had been declining steadily, hitting an all-time low of 621 in 2010. Since then, however, the trend line has been moving in the wrong direction; in 2015, 818 bicyclists were killed on U.S. roadways, a 12.2% increase over the previous year and the largest uptick in two decades. Bicyclists have consistently accounted for at least 2 percent of all roadway fatalities.

Adults rather than children are now more likely to die in a bicyclist-motor vehicle crash. Today, adults account for 88 percent of bicyclist fatalities, with the average age being 45. Male bicyclists are almost six times more likely to be killed than female cyclists, a finding that has remained unchanged since 1975.

As to where and when these fatal bicyclist-motor vehicles crashes are occurring, 70 percent take place in urban settings and 72 percent at locations not at an intersection. While these crashes are fairly evenly distributed between daylight and darkness (47 percent each), the fact that 80 percent of cycling trips take place during daylight hours points to the increased risk for riding at night.

Bicycle-motor vehicle crashes are often the result of the motorist failing to notice the bicyclist. Riders, on the other hand, are more likely to see the vehicle and expect the driver to give way. When they do not, bicyclists often cannot stop in time to avoid a crash. Attentiveness is critical for safely sharing the road. In 2015, bicyclists accounted for 2.2% (79) of the 3,477 roadway users killed in a distraction-related crash. This number is likely underreported, since a third of drivers say they are distracted for at least a minute in about one in ten trips. A smaller number of bicyclists also admit to being distracted, with approximately 9 percent reporting the use of a cell phone or other mobile device on nearly all of their cycling trips.

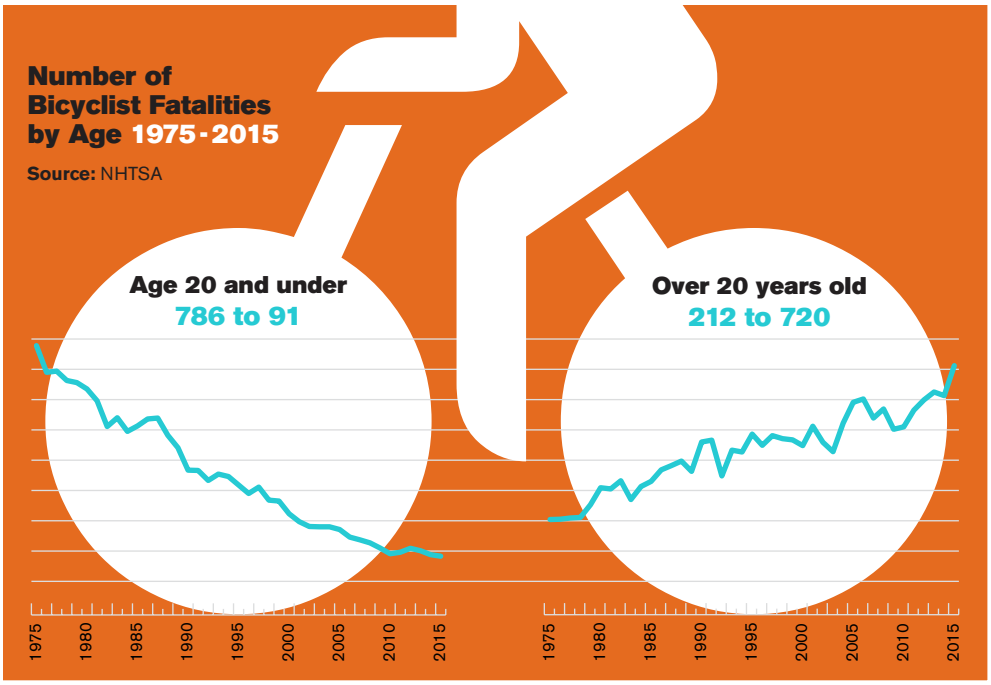
Bicyclist fatalities had been declining steadily, hitting an all-time low of 621 in 2010. Since then, however, the trend line has been moving in the wrong direction; in 2015, 818 bicyclists were killed on U.S. roadways, a 12.2% increase over the previous year and the largest uptick in two decades. Bicyclists have consistently accounted for at least 2 percent of all roadway fatalities.

Alcohol is also a factor for both bicyclists and drivers involved in bicycle-motor vehicle fatal crashes. In 2015, 22 percent of the fatally injured cyclists and 12 percent of the motorists in these crashes had blood alcohol content (BAC) level of .08 or higher. Additionally, 27 percent of all bicyclists killed in these crashes had a BAC of .01 or higher. While these numbers have declined for both groups, they have not fallen as dramatically for bicyclists as they have for drivers. On the other hand, alcohol-impaired driving fatalities involving either a car or truck driver or motorcycle operator accounted for 29 percent of all roadway fatalities in 2015.

The FARS data also revealed that 54 percent of the bicyclists killed in 2015 were not wearing a helmet, a proven countermeasure for preventing serious and fatal head injuries for cyclists of all ages in the event of a crash or fall.

Taking a three "E" approach – engineering, education and enforcement – is needed to make gains in bicyclist safety. While infrastructure improvements (engineering) are key, behavioral-related initiatives (education and enforcement) must work in tandem with the built-environment to ensure the safety not only of bicyclists, but all roadway users. GHSA is calling on states and their partners to consider 30 recommendations that address planning, resource allocation, education and training, public outreach, policy and technology.

By the Numbers



Since 2011, an average of

55

additional bicyclists have died annually on U.S. roads.

Source: NHTSA

2015*

Bicyclist fatalities up

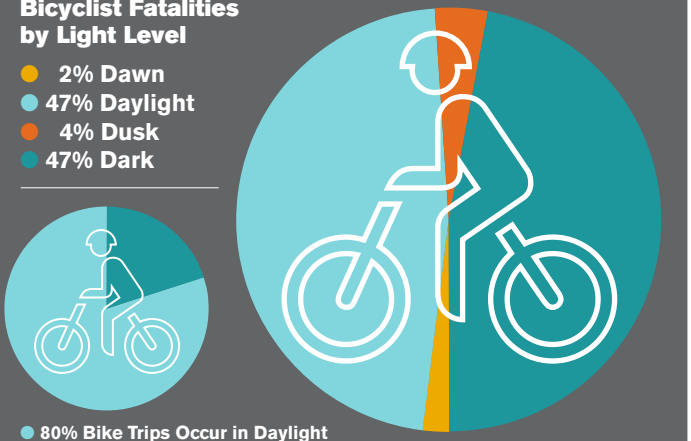
12.2%

Total U.S. traffic fatalities up

7.2%

*most recent year with final data

Source: NHTSA



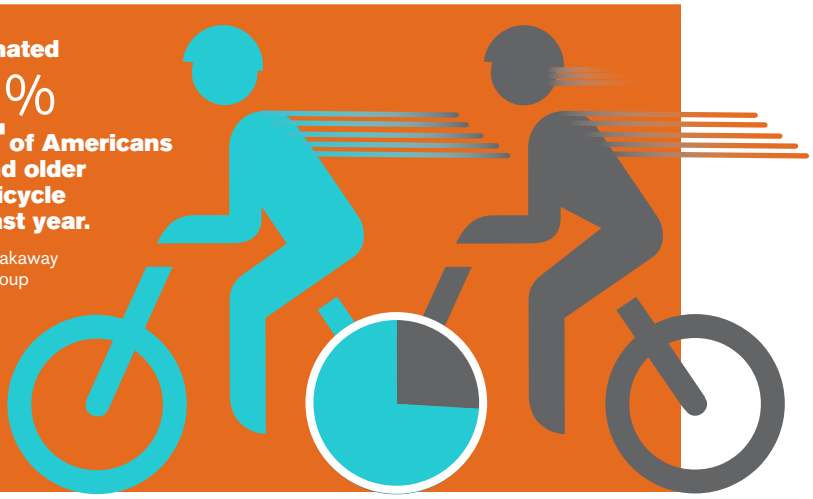
Source: NHTSA

An estimated

34%

of Americans age 3 and older rode a bicycle in the past year.

Source: Breakaway Research Group



74% men | **26%** women

Introduction

Happy 200th birthday, bicycle! Invented by German Baron Karl von Drais in 1817, the first human-powered, two-wheel bicycle – a velocipede – featured a steering mechanism, but no pedals. Cyclists generated power by running and pushing with their feet. Nearly fifty years would pass before the bicycle was pedal-operated. Also noteworthy is that the bicycle was born out of the need to provide an alternative to the primary form of transportation of the day – the horse. That fact is probably lost on the generations who have grown up with the automobile and learned to ride a bicycle purely for recreational purposes. However, people who bike, just like people who drive and walk, do so for a variety of reasons, including transport.

And therein lies the rub, this mix of modes shares a roadway system that presents challenges for all users, particularly bicyclists and pedestrians. This struggle, however, is not a 21st Century phenomena. The first bicycle crash reportedly occurred in 1842 when a Scottish cyclist knocked down a young girl. Fortunately, the child was unhurt; the bicyclist, on the other hand, was fined five shillings (The British Broadcasting Company, 2014). In the U.S., New York City has the dubious distinction of being the site of the first bicycle-motor vehicle crash. It occurred on May 30, 1896, when the operator of a "horseless wagon" appeared to "lose control... confusing [a] bicyclist" (Robbins, 2014). The cyclist suffered a fractured leg, while the "motorman" was "locked up in the police station" (Robbins, 2014).

Fast forward to 1975 – the first year that U.S. crash data was captured via the Fatality Analysis Reporting

System (FARS). While motor vehicle occupants accounted for the largest share of the 44,525 people killed on the nation's roadways (69 percent), 1,003 bicyclists died as well, representing 2 percent of all lives lost. Advances in roadway design and vehicle technology, coupled with stronger laws, high visibility enforcement and education have helped to reduce the number of roadway deaths since then. But even when U.S. motor vehicle fatalities dropped to an all-time low of 32,479 in 2011, bicyclists continued to account for 2 percent (680) of all roadway deaths in that year (Insurance Institute for Highway Safety [IIHS], 2017).

As the U.S. grapples with a 7.2% uptick in roadway fatalities (35,092) in 2015 (the latest year for which a full data set is available), the news is particularly troubling for bicyclists. Not only did bicyclists as a percentage of crash deaths remain stubbornly unchanged at 2.3 percent, but they represented the largest increase in fatalities (12.2%) when compared to all roadway user groups. During this 12-month period, 818 bicyclists died on U.S. roadways, the largest number since 1995 (National Highway Traffic Safety Administration [NHTSA], 2017a).

Why hasn't the percentage of bicyclists killed on U.S. roadways decreased? The simplest explanation may be the lack of protection afforded to bicyclists and the difference in mass when they collide with a motor vehicle. This results in asymmetric risk – bicyclists are likely to sustain a serious injury; the vehicle occupants are not (Ragland as cited in Williams, 2014). Also, noteworthy is the impact weather can have on bicycling. A mild winter, for example, can change bicycling patterns, resulting in increased exposure risk from motor vehicle crashes. Another factor is the economy – more traffic fatalities tend to occur with low unemployment and low gas prices (NHTSA, 2016).

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Changes in exposure may also be due to the increase in popularity of bicycling because of its health and environmental benefits. It is estimated that 34 percent of Americans (103.7 million) three years of age and older rode a bicycle in the past year (Breakaway Research Group, 2015). While most rode for recreational purposes, bicycle commuting is also increasing, although the U.S. continues to lag behind other countries in the percentage of people who commute by bike (McKenzie as cited in Williams, 2014). Even so, according to the latest U.S. bicycling and walking benchmarking report, the percentage of adults biking to work has increased from 0.4% in 2005 to in 0.6% in 2013. The increase is more significant in large cities, which saw commuting by bicycle increase from 0.7% to 1.2% during this same time period (Alliance for Biking & Walking [ABW], 2016).

Bike share programs are also helping to spur the growth in U.S. cycling, as the number of systems has increased from four in 2010 to 55 in 2016, with users logging 88 million trips over the past six years. In 2016 alone, bike share riders took over 28 million trips; that is equivalent to Amtrak's annual ridership and tops visits in a single year to Walt Disney World (National Association of City Transportation Officials [NACTO], 2016a). Despite this unprecedented growth, it is important to note that there have been only two deaths associated with bike share programs.

Ridership to and from school by youth under 16 years of age is also making a rebound, albeit more slowly. According to the National Center for Safe Routes to School (NCSRTS), the percentage of students who biked to and from school fell below 2 percent from 2009 through 2011. Since then, however, it

has increased to 2.2% and stabilized (NCSRTS, 2016).

Millennials, born between 1979 and 1995, may also be contributing to increased bicycle ridership. They are more likely than the previous two generations to choose a less car-centric lifestyle, to prefer living in a city and to identify city neighborhoods as their "ideal neighborhood" type, trends associated with lower levels of car dependence (Pew Research Center, Transit Center, & Dutze et al., as cited in ABW, 2016). Finally, it is estimated that 20 to 30 percent of today's older teens (Generation Z) have not yet obtained a driver's license (Shults et al., 2015; The Children's Hospital of Philadelphia [CHOP], 2016), which may also be fueling biking trips.

Is the U.S. on the cusp of a bicycle renaissance? It's unclear. But one thing is certain: bicyclists, like motorists and pedestrians, have a right to be on the road. In fact, in many states a bicycle is deemed a vehicle and riders are required to observe motor vehicle laws. Even so, conflict between roadway users is a daily occurrence putting everyone at risk. While some may argue that bicyclists represent just a small proportion of the people injured or killed in traffic crashes, everyone's safety is paramount.

Highly populous, warm weather states like Florida, California and Texas accounted for 40 percent of all U.S. bicyclist fatalities in 2015, with seven additional states reporting between 23 and 50 cyclist deaths (NHTSA, 2017a). All states – even those without a fatality – must consider bicyclists when examining their crash data and employ proven countermeasures. After all, every state has a traffic safety problem, and solving that problem requires addressing the safety of all roadway users regardless of mode.

Investing in bicyclist safety saves lives. Data for the four communities that

have received $25 million in federal Non-Motorized Transportation Pilot Program grants since 2005 show an increase in active transportation along with a decrease in bicyclist and pedestrian fatalities and injuries resulting in societal savings. In Minneapolis, for example, bicycle commuting is preventing 12 to 61 deaths per year, saving $100 to $500 million annually (Qian et al., 2016).

Bicyclist safety also impacts a community's economy and livability. In Portland, Oregon, for example, where significant emphasis has been placed on making streets safer for bicyclists and pedestrians, non-motorized users made more frequent trips and spent more on average per month than consumers who drove (Clifton et al., as cited in Alliance, 2016). In Washington, DC, 20 percent of businesses located near the Capital Bikeshare stations saw sales increase, and 70 percent said it is having a positive impact on the surrounding area (Buehler & Hamre, as cited in ABW, 2016). And in neighborhoods in Orlando, Florida and Dubuque, Iowa, where roadway improvements factored in bicyclists and pedestrians as well as motorists, property values increased 80 and 111 percent, respectively (Smart Growth America, as cited in ABW, 2016).

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About This Publication

This publication is one in a series funded by State Farm®. It provides an overview of current bicyclist safety data, with a particular focus on injuries and fatalities resulting from motor vehicle crashes, and researches and discusses how states are using – and can use – this and other information to improve bicyclist safety. Using the National Highway Traffic Safety Administration's (NHTSA) Fatality Analysis Reporting System (FARS), which provides a consistent and complete national perspective on bicyclists involved in the most serious crashes, the Governors Highway Safety Association (GHSA) examined crash data from 1975 to 2015 to identify: changes in trend lines, who is involved, when and where crashes occurred, crash characteristics, and alcohol and helmet use.

Taking a three "E" approach – engineering, education and enforcement – is essential for making gains in bicyclist safety. While a safer environment is paramount to protecting bicyclists, education and law enforcement initiatives can work in tandem with a complete transportation system to keep all road users safe. For this reason, several examples of bicyclist-related infrastructure and policy (e.g., bike boxes, Complete Streets) are included to illustrate the important role State Highway Safety Offices (SHSOs)[1] can play in educating their partners and the public about how these proven countermeasures work to prevent crashes and save lives.

In addition to the FARS analysis, GHSA surveyed the states to learn about bicyclist safety funding, planning and programming, consulted with an expert panel of federal and state highway safety officials, bicycle advocates and researchers, and conducted telephone interviews with advocates; educators; law enforcement; and federal, state and city officials to gain a better understanding of their activities. Some, but not all, of the initiatives included in this report have been or are being evaluated through crash data analyses, pre- and post-surveys or peer review, which are essential for determining impact and informing future efforts. This report, however, is not intended to be inclusive of all bicyclist safety policies or programs, nor does inclusion of a particular policy or program imply endorsement.

While SHSOs are the primary audience for this report, the information that follows is instructive to others working to address bicyclist safety, including advocates, educators, elected officials, and planning and transportation professionals. A list of action steps is provided on the next page to foster discussion among SHSOs and these individuals following review of this document.

1 GHSA member states are tasked with addressing the behavioral safety issues that plague the nation's roadways and contribute to an estimated 94% of traffic crashes.

Action Steps to Bolster Bicyclist Safety

The following action steps are listed in the order in which they are addressed in this report and identified with the icon shown on the left on the page where they are discussed in more detail. They are provided in this format to help states assess their current bicyclist safety programs, policies and practices and take action to bolster bicyclist safety.

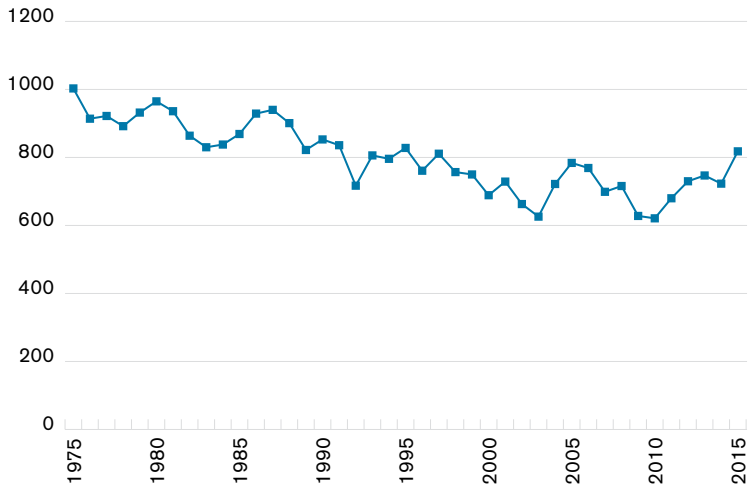
- ***Refine crash reports so they capture critical data elements for bicycle-motor vehicle crashes and provide tools and training to help law enforcement capture this data.*** (page 13)
- ***Carefully review crash data to fully understand the extent of your state's bicycle-motor vehicle crash problem, including who is crashing and why, and develop and implement appropriate and proven countermeasures using the 3 E's delivered through the most cost-effective channels.*** (page 13)
- ***Partner with businesses and bicyclist, community and civic groups to promote the importance of rider conspicuity and drivers to looking for and giving adequate space to bicyclists.*** (pages 16, 17).
- ***Educate the public and the hospitality industry about the dangers of impaired cycling and promote alternatives for getting home safely.*** (page 18)
- ***Poll bicyclists to gauge their education and training needs.*** (page 23)
- ***Leverage NHTSA's bicycle safety training and assessment tools.*** (page 27)
- ***Apply for Section 405(h) and 403 grants, if eligible.*** (page 29,30)
- ***Coordinate efforts to maximize resources and minimize duplication of efforts to grow Safe Routes to School activities.*** (page 31)
- ***Establish a dedicated funding source for bicyclist safety initiatives.*** (page 32)
- ***Partner with bicycling and community-based organizations to deliver safety programs.*** (page 33)
- ***Promote law enforcement's use of proven technology to enforce safe passing laws.*** (page 39)

- *Follow design standards that offer a model for designing safe, attractive and sustainable streets that accommodate and encourage bicycling.* (page 41)
- *Educate all bicyclists about the proven benefits of helmets with a particular focus on proper fit and the role parents play in modeling their use.* (page 42)
- *Clarify state laws to address bicycling while impaired.* (page 43)
- *Allow communities to reduce speed limits or establish slow zones in areas with a history of bicyclist-motor vehicle crashes and in neighborhoods with schools, parks, and day care and senior centers.* (page 45)
- *Allow the use of automated enforcement to deter speeding and red light running.* (page 45)
- *Expand distraction initiatives to include bicyclists who may be riding inattentive as well as the danger distracted drivers pose to non-motorist road users.* (page 45)
- *Develop and enforce an electric powered bicycle policy.* (page 46)
- *Couple new or improved infrastructure with educational and enforcement strategies that convey why and how the roadway improvement works.* (page 48)
- *Educate bicyclists and motorists about intersection safety.* (page 49)
- *Educate policy makers about Complete Streets policies.* (page 50)
- *Develop and deliver bicyclist safety training to law enforcement officials on traffic safety laws applicable to bicycle safety, to include why bicycle-motor vehicle crashes occur and the importance of serving the most vulnerable roadway users.* (page 51)
- *Partner with bicycling and community groups prior to conducting enforcement.* (page 53)
- *Conduct high visibility enforcement coupled with public outreach on high bicycle-motor vehicle crash corridors.* (page 55)
- *Offer ticket diversion programs for bicyclists and motorists.* (page 57)
- *Review driver licensing exams for bicyclist safety information and call for inclusion of the Dutch Reach in driver manuals.* (page 58)
- *Provide bicyclist safety training, resources and information to driver education professionals.* (page 58)
- *Incorporate on-bike and on-road training components into bicycle education programs for all riders, and develop more widespread and compelling promotion.* (page 60, 62)
- *Humanize traffic crashes and transportation mode nomenclature.* (page 63)
- *Use bicycling ambassadors to foster street-level engagement and education with all roadway users.* (page 66)

What the Data Reveal

A close look at the bicyclist fatality data[1] for 1975 to 2015 reveals an interesting, yet troubling, turn of events. First, the trend line for bicyclist deaths had been moving downward, albeit slowly, since 1975, when 1,003 bicyclists died on U.S. roadways. Bicyclist deaths fell below 700 for the first time in 2000, but then jumped nearly 6 percent the following year and continued to seesaw back and forth until hitting an all-time low of 621 in 2010. But the numbers then started moving back in the wrong direction. Since 2011, an average of 55 additional bicyclists have died annually on U.S. roadways. In 2015, 818 bicyclists were killed, up 12.2 percent from the previous year, and the largest uptick in two decades. If this pattern continues, bicyclist deaths could surpass the all-time high recorded in 1975 in just two years.

Figure 1: U.S. Bicyclist Fatalities, 1975-2015



People 20 years of age and younger accounted for more than three-quarters (78 percent) of the bicyclist deaths in 1975. Fifteen years later, more than 50 percent of bicyclists killed in crashes were 20 years of age or older, marking the first time that children and teens did not account for the greatest number of cyclist deaths. The number of children and teens

1 The FARS data includes only motor vehicle-related bicyclist fatalities occurring on public roadways. Therefore, any fatalities that occurred on private roadways, bike paths or other off-road locations are not included in this database.

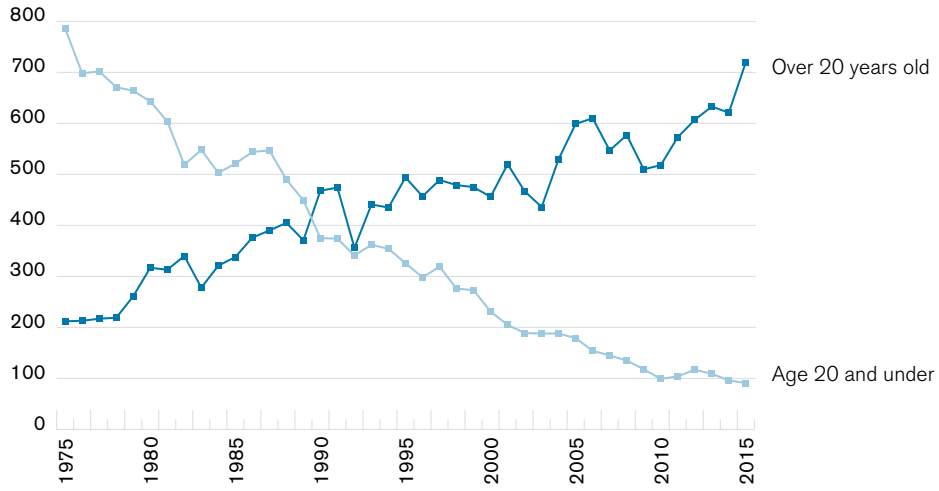
Data Limitations Hamper What We Know

Good data is critical, but it is not always readily available. The fatal bicycle-motor vehicle data used for this analysis comes from police-generated crash reports that states share with NHTSA. There is no Federal mandate for uniform definitions and attributes. However, states are working on a voluntary basis to collect similar crash information through guidelines known as the Model Minimum Uniform Crash Criteria (MMUCC). While MMUCC is helping to improve the quality, timeliness and accuracy of crash data, what we know about crashes involving bicyclists is far from complete.

For this reason, more work is needed to refine crash reports so that they capture as much information as possible, including where and when the crash occurred, who was involved, and exactly what happened, with a particular focus on contributing circumstances for all involved. This will not only require states to carefully examine and revise their crash reports and systems to ensure they are capturing all critical data elements, but also to provide law enforcement the tools and training they need to efficiently and effectively provide the data. Only then will those working to improve safety for bicyclists and all roadway users have the data they need to fully understand the problem and implement effective countermeasures using a 3 E approach.

killed in motor vehicle-bicycle crashes has continued to fall steadily, dropping to 91 in 2015, with slightly less than half of those deaths involving children 14 and younger (44) (NHTSA, 2017b). This marks the third time in the past six years that deaths involving bicyclists 20 and younger have fallen below 100. Adult bicyclist deaths, on the other hand, have continued to climb, peaking at 720 in 2015, a record high. Today, adults account for 88 percent of bicyclists killed in motor vehicle crashes.

Figure 2: U.S. Bicyclist Fatalities by Age, 1975-2015



Why the dramatic reduction in bicyclist fatalities for those younger than 20? A decline in bicycling by children and teens is the likely explanation, particularly when taking into account biking trips to and from school. For example, in 1969 nearly half of children (48 percent) walked or biked to school. That compares to just 2.2% of school-age youth today (although that number is up since 2011) (NCSRTS, 2016). Although riders younger than 16 are responsible for 39 percent of all U.S. biking trips (ABW, 2016), the number of children riding bicycles has clearly fallen off, perhaps impacted as well by parental concerns about safety.

Educational initiatives aimed at young riders also cannot be discounted when it comes to the remarkable decline in bicyclist fatalities for this age group. Many states reported making highway safety program grant funds available for the provision of school and community-based programs that expressly teach children and teens safe riding practices and the rules of the road. Some SHSOs also fund bicycle helmet programs for young riders that focus on proper fit and how approved headgear reduces the potential for injury in the event of a fall or crash.

The injury data for bicyclists is also telling. Looking just at 2015, 45,000 bicyclists were injured on U.S. roadways – 12,000 youth and 33,000 adults. The good news is this is down from 50,000 injuries in 2014. However, it is likely that the actual number is significantly higher, since research examining hospital records found that only a small percentage of bicycle crashes resulting in injury are reported to police (NHTSA, 2017a; Pedestrian and Bicycle Information Center [PBIC], 2017a). Why? A reportable crash is often defined as occurring on a public roadway where an injury and/or fatality occurred or at least one of the vehicles had to be towed from the scene. Bicycles do not get towed or usually do not cause enough damage to a vehicle to necessitate a tow, and many cyclists do not report a crash if they are not seriously injured.

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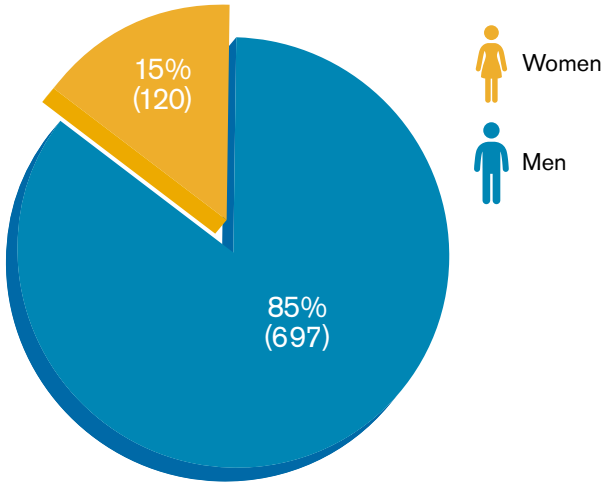
A Closer Look at Age & Gender

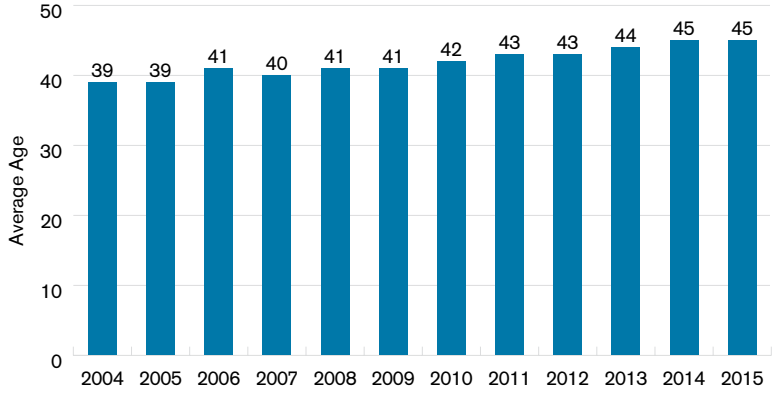
Male bicyclists are almost four times more likely to be injured and six times more likely to be killed than females, a finding that has remained relatively unchanged since 1975. In 2015, 697 males (85 percent) and 119 females (15 percent) died in bicyclist crashes, while 36,000 males (80 percent) and 9,000 females (20 percent) were injured. Segmenting this same data by age, more male bicyclists 55 to 59 years of age (92) followed closely by males 50 to 54 years of age (87) and 45 to 49 years of age (71) died in traffic crashes. When it comes to injuries, male bicyclists ages 15 to 19 and 25 to 29 each accounted for 8.8% (4,000) of all reported injuries in 2015, compared to 2.2% (1,000) and 4.4% (2,000) of injuries, respectively, for their female counterparts (NHTSA, 2017c).

Figure 3: Number U.S. Bicyclist Fatalities by Gender, 2015



The average age of bicyclists killed in traffic crashes has steadily increased over the past four decades. Teens between the ages of 16 and 20 had accounted for the greatest number of bicyclist fatalities through 1989. However, the FARS data analysis conducted for this report found that the average age has risen steadily to 45 in 2015.

Figure 4: Average Age of U.S. Bicyclists Killed in Traffic Crashes



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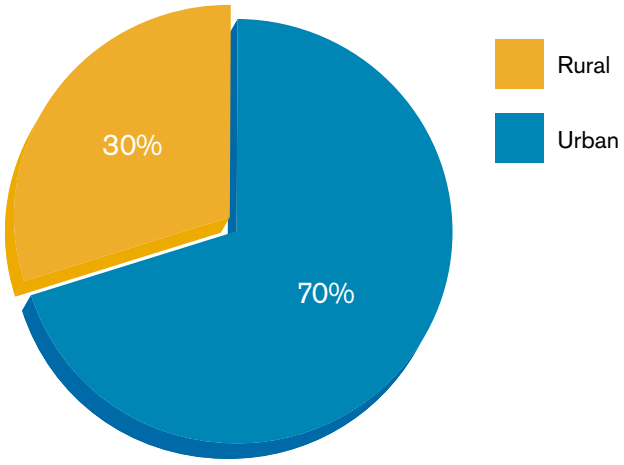
While states should carefully review their own crash data to identify demographic information, it is unlikely their findings will differ significantly from the national data discussed above. However, digging into state and local data to fully understanding who is crashing (both bicyclists and drivers), with an eye toward identifying not only gender and age, but also race/ethnicity, is critical for developing appropriate countermeasures and identifying the most cost-effective delivery channels. For example, an analysis by the League of American Bicyclists (LAB) found that the fatality rate for Black and Hispanic bicyclists is 30 percent and 23 percent higher, respectively, than for White bicyclists (LAB as cited in National Association of City Transportation Officials [NACTO], 2016b). Careful analysis of the data may reveal that a legacy program is either no longer appropriate for addressing a state and/or community's bicycle safety problem or in need of significant retooling.

At the same time, it is important to note that children under 14 and aging adults remain highly vulnerable when it comes to bicycling. The latter, if involved in a crash, are more likely to suffer serious or fatal injuries due to frailty issues, while the former are limited by physical, cognitive and social development. Younger children in particular lack the ability to adequately judge the speed, proximity and direction of moving vehicles. And if involved in a crash, they are more susceptible to head injury than adults (World Health Organization [WHO], 2017a).

Where & When Are Bicycle/Motor Vehicle Crashes Occurring?

The FARS data analysis also revealed important information about where motor vehicles and bicycles are crashing, as well as when and why. Like pedestrian fatalities, bicyclists are more likely to be killed in urban settings than in rural settings, with the former accounting for 70 percent of all cyclist deaths in 2015. (Rural and urban boundaries are determined by State Departments of Transportation using U.S. Census Bureau definitions.) Of course, the fact that the bulk of bicyclist fatalities occur in urban areas correlates with a greater volume of both bicyclists and motorists in those settings.

Figure 5: Percent of U.S. Bicyclist Fatalities by Land Use, 2015

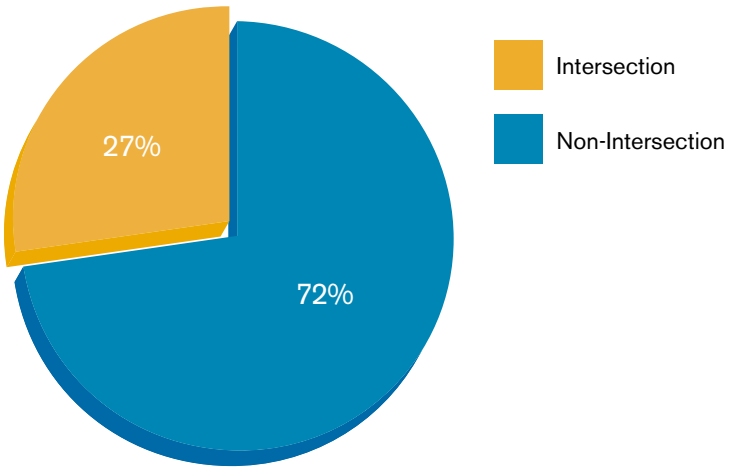


When it comes to location in the roadway, nearly three-quarters of all bicyclist fatalities (72 percent) occurred at locations not at an intersection (this includes shoulder/roadside and bicycle lane). While this finding is significant, it should not marginalize safety issues associated with intersections. A common cause of bicyclist-motor vehicle collisions at intersections involves motorists or bicyclists failing to yield

Like pedestrian fatalities, bicyclists are more likely to be killed in urban settings than in rural settings, with the former accounting for 70 percent of all cyclist deaths in 2015.

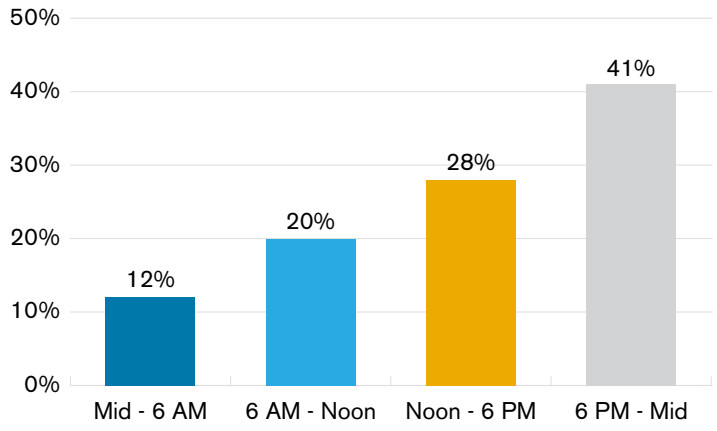
the right of way and motorists turning left or right into the path of a bicyclist going in the same or opposite direction (Hamann & Schwarz, 2016).

Figure 6: Percent of U.S. Bicyclist Fatalities by Crash Location, 2015



As for time of day, 41 percent of bicyclist fatalities occurred between 6 p.m. and midnight, while 28 percent occurred between Noon and 6 p.m., 20 percent from 6 a.m. to Noon, and the remaining 12 percent between midnight and 6 a.m. While fatal crashes appear to be evenly distributed between daylight and darkness – 47 percent – the fact that most cycling trips take place during daylight hours (80 percent) rather than nighttime hours (20 percent) points to the increased risk for riding during the latter time period. Ensuring that riders are highly visible is critical, as is engaging with businesses who have employees who commute by bicycle, as well as motor vehicle, at dusk, dawn or in the dark. Riders need to make themselves as conspicuous as possible, while motorists need to be on the lookout for bicyclists.

Figure 7: U.S. Bicyclist Fatalities by Time of Day, 2015



A closer look at bicyclist fatalities by three-hour intervals starting at midnight shows that regardless of season, the 6 to 8:59 p.m. time period is the most dangerous, with 27 percent of fatalities occurring during the winter, 18 percent in the spring, 20 percent in the summer, and 29 percent in the fall. In addition,

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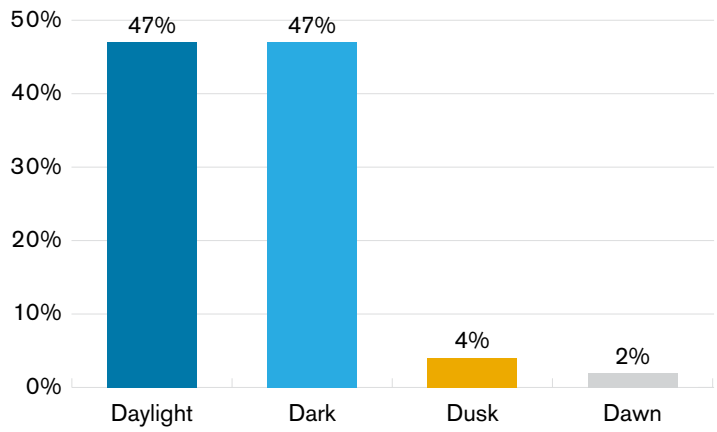
the time periods of 3 to 5:59 p.m. and 9 to 11:59 p.m. had the second and third highest rates of bicyclist fatalities, with 22 percent occurring in the winter for both and in the fall for the afternoon interval (NHTSA, 2017a). These findings are significant. While there may be more bicyclists riding during the summer months, fueling the perception that this is the most dangerous season for cyclists, the data tell a different story.

Figure 8: U.S. Bicyclist Fatalities by Light Level, 2015



Alcohol's Impact on Bicyclist Safety

Of the 818 bicyclists killed in 2015, alcohol involvement of .08% Blood Alcohol Content (BAC) or higher either for the motorist (12 percent) or the fatally injured cyclist (22 percent) was a factor in 37 percent of these crashes. While a BAC of .08 is the legal limit, a BAC below that amount can impact psychomotor skills, which are essential for the safe operation of non-motorized and motorized vehicles. For this reason it is important to note that more than a quarter (27 percent) of the bicyclists killed in 2015 had a BAC of .01 or higher.

The good news is that these percentages have fallen over the past decade, when 38 percent of fatally-injured bicyclists had a BAC of .01 or higher and 28 percent had a BAC of .08 or higher (NHTSA, 2017a). However, researchers and advocates note that these rates have not fallen as dramatically for impaired bicyclists as they have for impaired drivers (IIHS, 2017b). It is also important to note that alcohol-impaired driving fatalities involving either a car or truck driver or motorcycle operator accounted for 29 percent of all fatalities in 2015 (NHTSA, 2016). This reaffirms the continuing need for countermeasures that address impaired driving by motor vehicle operators.

State and local safety officials also should carefully review their data to understand who is most likely to cycle impaired and identify and deliver appropriate countermeasures for these roadway users as well. In 2015, fatally-injured 25- to 34-year-old bicyclists (36 percent) and 45- to 54-year-old bicyclists (35 percent) had the highest rates of BAC levels of .01 and higher and .08 and higher (NHTSA, 2017a). Campaigns focusing on reducing impaired driving may be prompting the public to think that biking is a safer option after drinking, when in fact it also poses a risk. Educating the public, as well as the hospitality industry, about the problem of impaired bicycling, coupled with promoting safer options for getting home, is critical (IIHS, 2017b).

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Crash Causation Factors

Alcohol is just one causation factor for bicyclists and motorists involved in fatal motor vehicle-bicycle crashes. Another is failure to yield the right of way, which was found in 25 percent of bicyclist fatalities in 2015 and a common underlying characteristic in non-fatal collisions as well. Other contributing factors in fatal bicyclist crashes in 2015 were: lack of visibility, commonly resulting from the bicyclist not being conspicuous to other roadway users due to dark clothing and/or poor or no lighting (11.7%); failure to obey traffic control devices or an officer (9.9%); improper crossing of a roadway or intersection (6 percent); wrong-way riding (5.1%); making an improper turn (4.5%); and operating without required equipment (3.8%) (NHTSA, 2017c).

When considering why bicycle-motor vehicle crashes occur, it is important to understand the common crash types, which include (Hamann & Schwarz, 2016):

- A motorist overtakes a bicyclist traveling in the same direction.
- A motorist turns right or left into the path of a bicyclist going in the same or opposite direction.
- A motorist drives straight and a bicyclist comes from the right or left.
- A motorist drives into the roadway from a driveway, side street, alley, or parking lot.
- A bicyclist rides in the wrong direction.
- A motorist opens the car door directly in front of a bicyclist (often referred to as *dooring).*
- A bicyclist is not visible due to an obstruction (e.g., another vehicle, signage, foliage) or in darkness due to conspicuity issues (e.g., low or no roadway lighting, wearing dark clothing, no reflector or bicycle light).
- A bicyclist and/or motorist misjudge the passing distance between their respective vehicles.
- A bicyclist and/or motorist fail to obey the rules of the road and/or a traffic control device.

A unifying theme in nearly all of these crash types is that the motorist often fails to notice or observe the bicyclist. Research on bicycle-motor vehicle crashes conducted by Rasanen and Summala (as cited in Hamann & Schwarz, 2016) found that only 11 percent of drivers detected the bicyclist before a collision occurred, while 68 percent of bicyclists saw the motorist prior to the crash. Interestingly, the researchers also found that "92 percent of the bicyclists who noticed the motorist had expected the driver [to] give way and could not stop in time to avoid a crash" (Rasanen & Summala as cited in Hamann & Scharwz, 2016).

Educating both bicyclists and motorists about the importance of scanning the road – looking at least 10 to 15 seconds ahead of their bike or car/truck – enables them to spot hazards, and each other, earlier. Motorists should check their mirrors frequently to take in what is happening not only in front of them, but also on the side of the road and behind them. Bicycle mirrors – handlebar, helmet, eyeglass, and on-lens are the common types – can also help a bicyclist better monitor what is going on behind and beside them.

Minimizing distractions is also critical. Distracted drivers were involved in the deaths of 551 non-motorized roadway users, 79 of whom were bicyclists, and 804 passengers in the U.S. in 2015. (It is not known how many of these non-motor vehicle occupants were distracted as well). Drivers, however, accounted for the greatest number of people killed in distraction-affected crashes – 2,122 or 61 percent (NHTSA, 2017d).

A national survey of bicyclist and pedestrian attitudes and behaviors conducted in 2012 found that bicyclists pointed to distraction on the part of drivers and riders as the third most frequent reason why they believe it is dangerous to bicycle in their neighborhood (traffic/congestion and fast moving traffic were one and two, respectively). Two-thirds of survey respondents also indicated that they never used electronic devices (e.g., cell phone, mp3 player) during their bicyclist trips in the past year. Of the 23 percent who did, approximately 9 percent reported using a device on nearly all their cycling trips (Schroeder & Wilbur, 2013). Regardless of mode, remaining attentive to the roadway and other users is essential. People engaged in sending or reading a text take their eyes off the road for approximately five seconds (NHTSA, 2017e), which could prove deadly.

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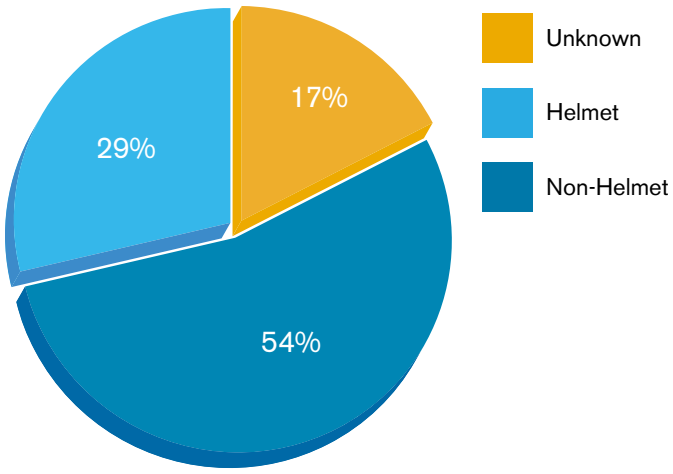
Bicycle Helmets

While no state mandates bicycle helmets for adult riders, 54 percent of the cyclists killed in 2015 were not wearing a helmet, while 17 percent were helmeted and the status of 29 percent was unknown. (This is the best information available, but not 100 percent accurate.) The positive impact of wearing a properly fitted and positioned helmet cannot be overstated. Nearly one-third of non-fatal injuries among bicyclists are to the head, which "pose the greatest risk of death and disability to bicyclists" (Haileyesus et al.; Thompson & Rivara; and Thompson, Rivara & Thompson as cited in Jewet et al., 2016).

Figure 10: Percent of U.S. Bicyclist Fatalities by Helmet Use, 2015



Research examining all bicyclists, not just children, estimated that the use of helmets reduced the risk of a non-fatal head injury by 42 percent (Elvik as cited in Goodwin et al., 2015). Another study found that helmet use reduced moderate injury for bicyclists by 50 percent, serious injury by 62 percent and severe head injury by 75 percent. The current edition of *Countermeasures That Work* gives bicycle helmet laws for children and adults five stars (the highest rating) and four stars respectively, the highest rated bicyclist safety countermeasures (Goodwin et al., 2015).

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Who is Bicycling & Why

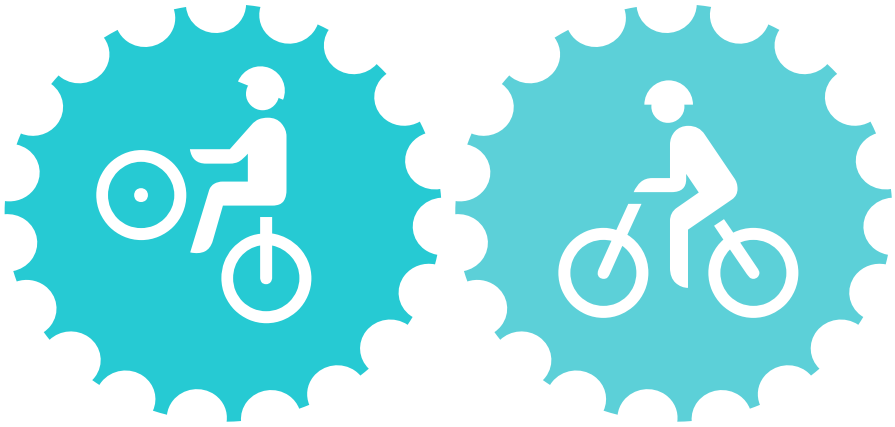
It is estimated that 34 percent of Americans (103.7 million) age 3 and older rode a bicycle in the past year (Breakaway Research Group, 2015). Who are these bicyclists? They represent both genders – although men are more likely than women to bicycle (76 percent versus 24 percent) – and all age groups. Youth under 16 years of age account for 39 percent of all biking trips in the U.S., while adults 65 and older make just 6 percent. Millennials (21 to 38 years of age), as noted earlier in this report, are more likely to be less car-centric and interested in living in the city than older adults, thereby increasing their likelihood of using an active mode of transportation such as bicycling (NHTSA as cited in ABW, 2016).

When considering race and income, nearly a quarter (23 percent) of people of color (including those of Hispanic origin) and 13 percent of low-income households (making an annual income less than $20,000) bicycle regularly. Interestingly, bicycling by Black Americans increased 90 percent between 2001 and 2009, "faster than any other racial or ethnic group" (Michael as cited in NACTO, 2106a). Why people bicycle varies by age and socioeconomic status. Taking into account all trips, more than half (62 percent) are recreational or social in nature (including vacation), 18 percent are for family or personal business, 13 percent are job-related, and 6 percent are for travel to school or church, with 1 percent of trips taken for other reasons. A closer look reveals that all income levels ride predominantly for social and recreational purposes, ranging from 47 percent for the lowest income level to 68 percent for the highest. However, those making less than $20,000 are more likely to ride for other purposes.

Perhaps what is most interesting is that households making between $70,000 and $99,999 were more likely than any other income group to bicycle to work at 19.6%. Low income households had the second highest bike to work share at 17.2%, while the third highest group is households earning $100,000 or more at 12.6% (NHTSA as cited in Alliance, 2016). For those people who do bike to work, they are more likely to say they enjoyed their trip than people who commute by car (67 percent versus 58 percent) (Morris & Guerra as cited in Alliance, 2016).

Four Types of Bicyclists

In addition to age and income, bicyclists are also segmented by rider type: the *Strong and Fearless*, the *Enthused and Confident*, the *Interested But Concerned*, and *No Way, No How* (Geller, 2017). These types were identified more than a decade ago by Roger Geller, Portland, Oregon's Bicycle Coordinator, to better understand the comfort level of people when it comes to bicycling and what it will take to get them on two wheels. Since then, Geller's typology has been verified by planning researchers Jennifer Dill and Nathan McNeil (2013; 2016) via analysis of survey data collected from adults in Portland and nationwide and recognized by bicycling advocates as representative of other urban areas.



Strong and Fearless

Enthused and Confident

Interested But Concerned

No Way, No How

Better Exposure Data Needed

One of the challenges of effectively addressing bicyclist safety is a lack of exposure data. Understanding exactly where bicyclists are traveling and how far is critical for the allocation of resources that address the built environment as well as enforcement and education countermeasures. There are data sets that include travel by bicyclists and can be useful as a proxy for exposure.

For example, the U.S. Census Bureau's American Community Survey provides state by state commuting data for each mode that can be segmented by gender, age, language, occupation, industry, poverty status, and more. Five-year (2011-2015) and single-year estimates are available.

The National Household Travel Survey, meanwhile, which is conducted every five years (the latest data will be released in 2018), collects data by mode on daily trips taken in a 24-hour period including trip purpose, mode, how long it took, time of day, day of week, and more. Approximately 129,000 households across the U.S. participated in this latest survey.

Research is also underway in Washington State to determine how to estimate the miles people bicycle and walk on a state-wide level (BMT/PMT). Strategies being explored include permanent and short duration counters placed in diverse areas and by region that count bikes and pedestrians separately, improving travel surveys to include a larger sample, and integrating other data sources such as GPS apps with count data. One outcome of the research is a guidebook for communities that will be released in late 2017. Click here to access a webinar exploring the researchers' findings and the obstacles they have encountered.

What can SHSOs and their partners learn from a closer examination of these rider types? First, the number one reason why people do not ride a bicycle is because they are afraid to be on the road with motor vehicles. This concern for one's personal safety is at the heart of the four rider types. Take the *Strong and Fearless*, who make up less than one percent of bicyclists. This type is comfortable riding regardless of roadway conditions – even on busy city streets. The *Enthused and Confident*, approximately 7 percent of riders, are also comfortable sharing the road with motor vehicles, but prefer biking on streets clearly marked for cyclists or with separate facilities (e.g., bike lanes and boulevards) (Geller, 2006).

On the other hand, people identified as *Interested But Concerned* would like to ride more, but they are afraid of speeding and aggressive drivers and are unlikely to venture out onto commercial and/or employment destinations on their bikes. They represent the largest rider type (60 percent) and prefer quieter streets and separate bicycle-only facilities. The fourth group, *No Way, No How*, accounts for a third (33 percent) of riders. They are simply uncomfortable with the idea of bicycling due to "topography, inability or simply a complete and utter lack of interest" (Geller, 2006).

Bicycling advocates interviewed for this report agreed that removing the fear associated with bicycling – and thus increasing ridership – will require promoting pro-cycling policies and practices; making infrastructure improvements; enforcing motor vehicle and bicycle safety laws; and educating and training both motorists and bicyclists about laws, safely sharing the road and safety practices. Growing ridership, they added, will positively impact safety. This concept known as *safety in numbers* is supported by research conducted in the U.S. and Europe that found that higher levels of biking (and walking) result in fewer motor vehicle collisions. When bicyclists and pedestrians are commonplace in the street environment, motorists expect them to be there and take the necessary precautions (Federal Highway Administration [FHWA], 2009; Jacobsen, 2003). The 2016 Alliance for Biking and Walking Benchmarking Report examined bicycling rates and crash data for 52 cities and found that those with the highest rates of bicycling generally had the lowest cyclist fatality rates (ABW, 2016).

There is also consensus among bicycling advocates that the *Interested But Concerned* adults represent the largest market for increasing cycling. While providing a physical separation from motor vehicles is important for addressing their personal safety concerns, that is a countermeasure beyond the purview of SHSOs. However, SHSOs provide grant funding to law enforcement agencies for speed enforcement, which benefits all roadway users. Education and training can also prove helpful, but it is important to survey or poll this rider type to gauge their interest before developing a program.

For example, researchers who surveyed *Interested But Concerned* riders in Portland found that a significant number said they are knowledgeable about safe bicycling practices in traffic. While they still expressed a desire to learn more, this finding led researchers to question whether—and how much—education would be helpful. Digging deeper, they discovered that the adults in this rider group who said they did not cycle expressed concerns about bicycling in the rain or after dark. In this case, teaching them wet weather riding techniques and how to be more conspicuous at night could prove effective in helping them overcome this fear so they would ride more and feel safer doing so (Dill & McNeil, 2013).

Bike Share & Its Impact on Ridership

The growth in bicycle sharing, or what are commonly known as bike share systems in the U.S., is also helping to spur ridership among people of all ridership types and demographics. Defined as a publicly-available system with at least ten stations and 100 bikes (NACTO, 2016b), a bike share program allows people to check out a bicycle at one station and return it to

An examination of bicycling rates and crash data for 52 cities and found that those with the highest rates of bicycling generally had the lowest cyclist fatality rates.

that station or another at the end of their ride. Most bike share systems offer an initial free period for the first 30-60 minutes of each trip, after which usage fees are assessed in 30 minute increments. A membership is typically required (e.g., daily, annual).

According to NACTO, as of the end of 2016, there were 55 systems in the U.S. with over 42,000 bikes, and more on the way. The largest systems, which accounted for 85 percent of the 88 million trips taken between 2010 and 2016, are in New York, the District of Columbia (DC), Miami, Chicago, and Boston. The average trip is just 12 minutes for members, which suggests that they are likely using the system to complete transit trips (e.g., last mile) and/or in lieu of transit (trip is too short) or walking (trip is too far), and 25 minutes for casual riders.

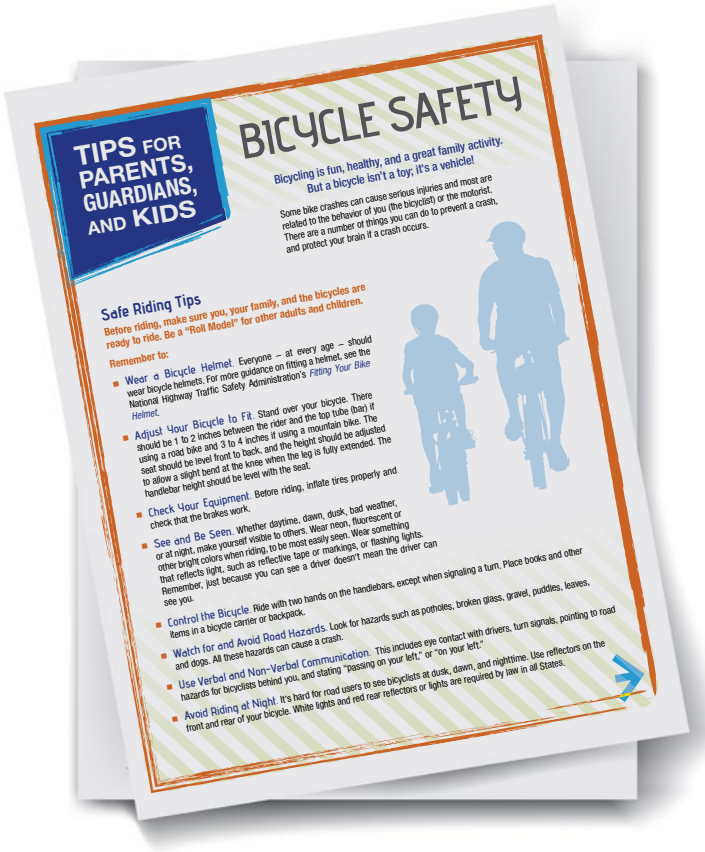
While bike share is billed as a low-cost transportation option, a quarter of the systems offer an income-based subsidy (typically determined by income threshold or residence in affordable housing) as low as $5 per year to ensure accessibility to all. In Philadelphia, where a subsidy program was launched in 2016, membership jumped from 27 percent to 44 percent among people earning less than $35,000 a year (NACTO, 2017). Making alternative modes of transportation such as bicycling readily available is critical for this socioeconomic group, since 18 percent do not own a car – double the rate of all American households (Center for Transit-Oriented Development as cited in Alliance, 2016).

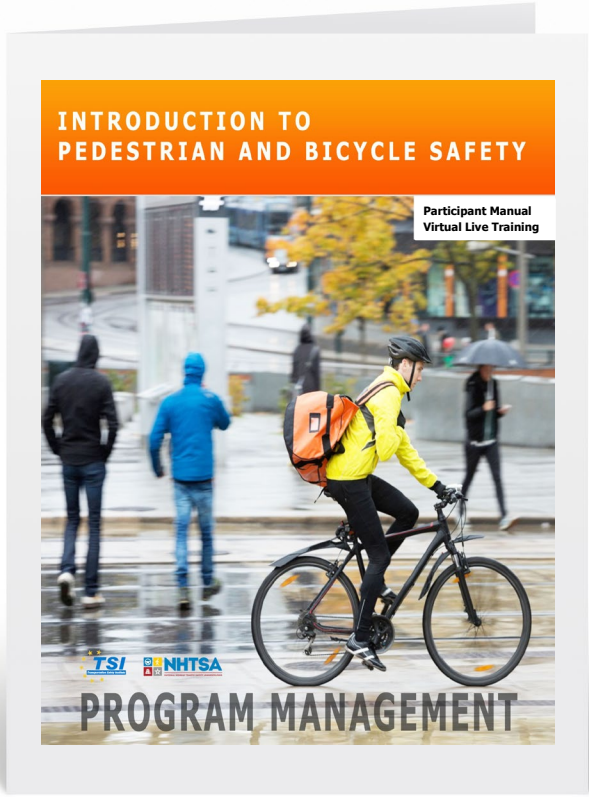
The secret to bolstering this ridership even more, contend bicycle advocates, is to match bike share systems with a strong, connected bike lane network. Why is this important? "People ride more when they have safe places to ride," so coupling bike share with a network of protected bike lanes has the potential to attract those *Interested But Concerned* riders (NACTO, 2016b). A NACTO analysis of seven major cities found that building bike lanes increases the number of bicyclists on the street, resulting in a significant drop in the risk of injury or death for riders. Adding bike share to the mix, they continued, can accelerate the number of cyclists, resulting in more investment in bicycle infrastructure that

sparks even more ridership, "including people on their own bikes" (NACTO, 2016b), which makes cycling safer.

Considering bike share's enviable safety record – two fatalities in the U.S. since the first system launched in 2010, with more than 204 million miles logged – it is difficult to find fault with this argument (K. Fillin-Yeh, personal conversation, June 15, 2017). It is also clear that building a network of safer places to ride is working to spur bicycling. Cities such as Austin, Chicago, Portland, San Francisco, and Washington, DC found that adding protected bike lanes increased ridership on those roadways by anywhere from 21 percent to 171 percent (National Institute for Transportation and Communities as cited in NACTO, 2016b). In New York City, a plan to expand the network of bike lanes over a seven-year period starting in 2007 doubled the number of daily cyclists during the same time period. The addition of bike share in 2013 added another 56,000 more cyclists daily (New York City Department of Transportation as cited in NACTO, 2016b).

Even more compelling is that bike share station placement is helping to make roadways safer for not only bicyclists, but also pedestrians (NACTO, 2016b). In Austin, Texas, for example, a bike share station is located inside a painted bulb-out design, which shortens the crossing distances for pedestrians and defines the sidewalk. Concerned about frequent illegal U-turns and speeding on a wide-two-way street, Battery Park City (New York) residents worked with planners to place a double-sided bike share station in the painted media. This created a mid-crossing refuge for pedestrians, better defined the travel lanes, prevented illegal U-turns, and calmed traffic (NACTO, 2016b).





The Federal Focus & Approach

The U.S. Department of Transportation (USDOT) launched the **Safer People, Safer Streets** *initiative in 2015.* The plan outlines steps the USDOT is taking to address non-motorized safety issues and help communities create safer and better connected bicycling and walking networks. New resources and research as well as existing tools were rolled out for use by transportation officials, road safety assessments were conducted in all 50 states, and a *Mayors' Challenge* was launched to encourage elected officials to take the lead in advancing bicycle and pedestrian safety. The initiative is based on the *2010 USDOT Policy Statement on Bicycle and Pedestrian Accommodation*, which promotes seven challenges:

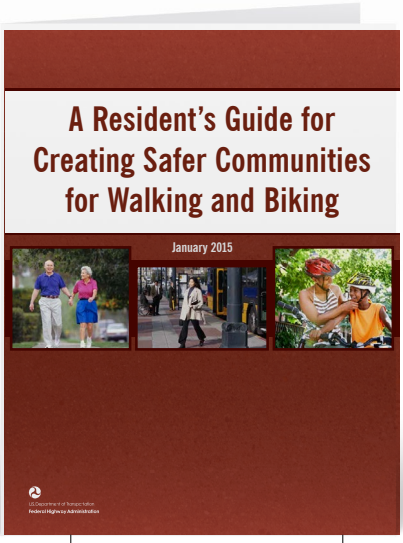
1. *Take a Complete Streets approach to infrastructure improvements.*
2. *Identify and address barriers to make streets safe and convenient for all road users, including people of all ages and abilities and those using assistive mobility devices.*
3. *Gather and track bike and walk data.*
4. *Use designs that are appropriate to the context of the street and its uses.*
5. *Capture opportunities to build on-road bike networks during routine surfacing.*
6. *Improve safe biking and walking laws and regulations.*
7. *Educate and enforce proper road use behavior by all.*

Action steps and resources are provided to help implement the challenges. To improve biking and walking laws, cities are encouraged to examine current statutes addressing speeding, failure to yield, safe passing, helmet use, and distracted driving. To educate and enforce proper behavior, the *Mayor's Challenge* promotes the use of highly visible, well-publicized and targeted enforcement coupled with educational campaigns that address all roadway users. Refraining from drinking and driving or bicycling, yielding to pedestrians, and obeying posted speed limits are also stressed.

Downloadable resources such as a Bikeability Checklist, parent/child bicycle safety tip sheet, smart cycling brochure, rules of the road and bicycle helmet videos, and an updated version of the Federal Highway Safety Administration's (FHWA) The Resident's Guide for Creating Safe and Walkable Communities are also available. The FHWA publication provides examples of how communities are working to improve bicyclist and pedestrian safety along with fact sheets, worksheets and materials that may be adapted for local use. The FHWA also built an interactive Bicycle Safety Guide and Countermeasure Selection System, which provides a list of engineering, education or enforcement treatments to improve bicyclist safety and/or mobility based on user input about a specific location.

In total, 244 cities representing 46 states and DC participated in the *Mayor's Challenge,* which culminated with a summit in September 2016. The initiative sparked a myriad of programs that are positively impacting ridership and safety. In the suburban Tucson (AZ) community of Oro Valley, which has an extensive network of multi-use paths and bicycle-friendly streets, the Police Department developed an education and enforcement plan to address high-bicycle crash corridors. Bicycle safety information was disseminated via a month-long, city-wide public information campaign conducted in April 2016 that included public service announcements, a video and social media, while police conducted high visibility enforcement where bicycle routes crossed major roadways. During the deployments, officers educated motorists and bicyclists about traffic safety and issued citations. In conjunction with the enforcement, the Oro Valley Court also developed an educational diversion program for bicyclists who received a traffic citation. The city continued to publicize bicyclist safety and conduct enforcement details leading up to November's El Tour de Tucson, one of the largest bicycling events in the U.S. (USDOT, 2016a).

Washington, DC created the Vision Zero DC Task Force in 2015 in response to the *Mayor's Challenge*. An action plan outlining 67 strategies focusing on data collection, education, enforcement, and laws guides the Task Force's work. To improve data collection, the city installed bicyclist and pedestrian counters and publishes crash, enforcement and traffic counts on the Vision Zero website (crash data is updated daily). The public can report location-based safety concerns via an online safety map, while police are using data analysis to identify crash hot spots and deploy either automated enforcement or officers to improve safety. The Task Force developed a *Road Rules* public education campaign featuring videos, bus wraps and social media publicizing key bicycle and pedestrian rules, including DC's 3-feet passing law and restrictions on biking on sidewalks. Legislation has also been introduced or advanced to improve the safety of non-motorized users (USDOT, 2016b).



The FHWA publication provides examples of how communities are working to improve bicyclist and pedestrian safety along with fact sheets, worksheets and materials that may be adapted for local use.

Training & Assessments

FHWA and NHTSA also make training and assessment tools available to help states develop and/or manage a comprehensive bicyclist safety program. These include:

- Free pedestrian and bicycle safety technical assistance, training and courses are available to focus cities and states along with free bi-monthly webinars (the latter are also available at no cost to non-focus states). Fee-based training is available to non-focus states and cities through the Pedestrian and Bicycle Information Center and the National Highway Institute.
- Pedestrian and Bicycle Safety Program Management virtual online training is designed to help highway safety staff gain the skills and knowledge needed to manage a successful and sustainable program. This training addresses what it means to take a comprehensive and integrated approach to bicyclist and pedestrian safety, problem identification and data analysis, proven countermeasures and implementation resources, and best practices for building a safety coalition.
- Pedestrian and Bicycle Safety Workshop is advanced training for highway safety professionals that includes applying data analysis in problem identification, developing an effective problem statement and performance measures with appropriate countermeasures, creating a communications/public outreach plan, establishing a strategy for building a coalition, and program evaluation.
- Law enforcement training is provided by the International Association of Directors of Law Enforcement Standards and Training's online training system, NLEARN. NHTSA's Enforcing Laws for Bicyclists video is also available online and Regional Offices may be contacted for technical assistance in delivering a pedestrian and bicycle safety train-the-trainer course for law enforcement.
- A Pedestrian and Bicycle Safety Assessment is arranged and funded by the SHSO. An assessment examines a state's bicycle and pedestrian safety program (program management, policies, law enforcement, outreach and education, data management) using NHTSA's uniform guidelines, noting both strengths and weaknesses and provides recommendations that take into account a states' unique characteristics. To date, three states – Florida, Nevada and Wisconsin – have conducted assessments. The agency is currently in the process of revising the advisory document as well as the delivery mechanism to include both an online and onsite component, with a pilot anticipated in late 2018.
- Community-Based Bicyclist and Pedestrian Safety Assessment is a new tool being readied for pilot testing. It provides uniform guidance to help communities assess their local bicyclist and/or pedestrian safety problems and develop and implement strategies and tactics that take a comprehensive approach to addressing them. SHSOs are encouraged to work directly with a community to conduct the assessment, or provide technical assistance and/or funding.

Community Pedestrian & Bicycle Safety Training (CPBST) in California

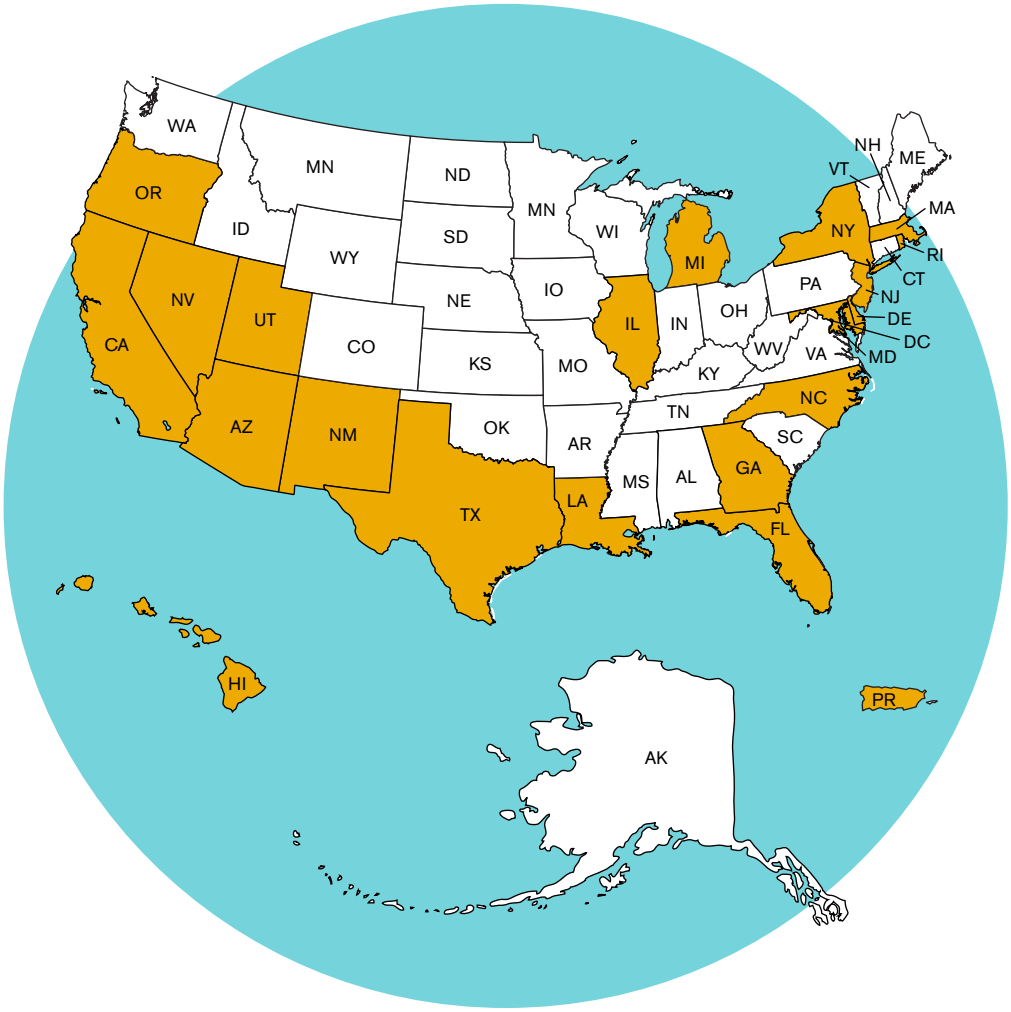
California's four-hour, community-based workshop designed to help local advocates and community members develop pedestrian safety actions plans that leverage best practices, promote walkability and ensure community engagement, has been revamped to include bicycles. Developed by the University of California Berkeley's Safe Transportation Research and Education Center, the CPBST is targeted to underserved communities with high pedestrian and bicyclist fatality and injury rates. The workshops are led by on-the-ground experts from California Walks, a nonprofit pedestrian safety agency with local affiliates across the state. Each CPBST is tailored to meet the community's needs, ensuring cultural and linguistic appropriateness and access. Participants receive a primer on the traffic safety E's and then examine data, demographic information and campaigns specific to their community. They also conduct a walking/biking audit to identify safety concerns and barriers as well as positive features promoting safety and bikeability/walkability. With the facilitator's guidance, the participants then identify what they want to focus on, how to secure resources and next steps. To learn more, contact Jill Cooper.

Investing in Bicyclist Safety

Dedicated funding for bicyclist and pedestrian safety has long been a point of contention for advocacy organizations. Historically, about 2 percent of federal transportation dollars have been spent annually on bicycling and pedestrian projects, despite non-motorized users accounting for 11.4% of road trips and 18 percent of road deaths (Copeland, 2015; NHTSA, 2016). Most of these funds are used by state departments of transportation (DOTs) for infrastructure projects ranging from reconfiguring intersections and adding bike lanes to installing sidewalks, pedestrian signals, traffic calming devices, and other countermeasures.

States detail how federal and state transportation dollars (infrastructure and behavioral) will be spent to address their most critical traffic safety problems, including bicyclist safety, in their statewide Strategic Highway Safety Plans (SHSP), infrastructure focused-Highway Safety Improvement Programs (HSIP) and behavioral safety focused-Highway Safety Plans (HSP). Of the 24 states that responded to the GHSA survey conducted for this report, 21 and 22 respectively, include bicyclist safety as an emphasis area in their SHSP and HSP. Ten states indicated that they have a separate bicyclist/pedestrian safety action plan, while four have a bicyclist safety plan. Nearly all states responding to the survey (21 out of 24), said they are the lead agency when it comes to addressing behavioral safety issues associated with bicyclist safety.

States that are 405(h) Non-Motorized Grant Fund eligible, FY2017



Non-Motorized Grant Funds, 405(h)

The latest federal transportation funding bill, the FAST (Fixing America's Surface Transportation) Act, ushered in a new era for bicyclists and pedestrians in 2015. In addition to continuing to make funds available for infrastructure-related improvements, the FAST Act requires states to "fully integrate non-motorized accommodation into all surface transportation projects" (US DOT, 2016c). At the same time, the legislation eliminated the provision that had allowed states to use 10 percent of their HSIP funds for non-infrastructure related safety projects (commonly known as *flexing*). This may prove problematic for some states where HSIP funds have been used to support bicyclist safety education and enforcement programs.

However, behavioral safety programs did get a boost in the FAST Act, as five percent of Section 405 National Priority Safety Program funds are now earmarked for non-motorized safety incentive grants – 405(h). Prior to this, SHSOs had only one federal funding source to address bicyclist safety: Section 402 State and Community Highway Safety grants. It should be noted that federal funding guidelines expressly state that Section 402 funds are granted to states "to improve driver behavior and reduce deaths and injuries from motor-vehicle related crashes." No specific reference is made to other roadway users. However, the guidelines establishing the Section 402 program allow states to expend these funds to improve pedestrian and bicyclist safety

and for other purposes including impaired driving, speeding, occupant protection, traffic records, and more. This puts tremendous pressure on states to ensure that the funds are dispersed not only across all modes, but also to address those modes that crash data indicate are involved in the greatest number of serious injury and fatal crashes.

To be eligible for a 405(h) grant, a state must provide a 20 percent matching share (the only incentive grant with a specific federal fund limit). Additionally, a state's annual combined bicyclist and pedestrian fatalities must exceed 15 percent of the total annual crash fatalities in the state using the most recently available final FARS data. States may use these funds only to train law enforcement on bicyclist and pedestrian safety laws; conduct enforcement mobilizations and campaigns designed to enforce these laws; or implement education and awareness programs designed to educate all roadway users about these laws. Twenty-seven states and DC applied for Section 405(h) funds in Federal Fiscal Year (FFY) 2017; 22 of those states (includes DC and PR) met the eligibility requirements and were awarded funding (NHTSA, 2017f).

Of the 24 SHSOs that responded to the GHSA survey, half qualified for 405(h) funds with most indicating that they had not yet determined how the monies would be programmed. The survey also asked if an SHSO directly funds or sponsors bicyclist safety programs, educational materials, messaging, and/or rider and/or law enforcement training and, if so, how much funding is allocated in the current (FY2017) Highway Safety Plan (HSP). Each SHSO is required to submit an annual HSP to NHTSA that not only details the extent of the safety problem for all modes including bicycles, but also include performance measure targets for each roadway user group. A performance measure for bicyclist safety was added to the HSP requirement for FY 2016. SHSOs reported dedicating an average of 2.65% of their FY 2017 Section 402 grant funds to bicyclist safety, with the amount by state ranging from less than 1 percent to 15 percent.

Focus State & Cities Grant, Non-Motorized Pilot Program

Since 2007, NHTSA has awarded Section 403 (Public Law 112-140) Research and Demonstration grants to *Focus Cities* (defined by FHWA as cities exceeding an annual national average number of 20 or rate of 2.33 per 100,000 population pedestrian fatalities) to demonstration implementation of effective enforcement and education techniques identified in the city's pedestrian safety action plan (PSAP). (These grants are administrated at the federal, and not the state, level.)

To be eligible for consideration, a city had to be among the top 50 cities in pedestrian fatalities. In 2015, bicyclist fatality data was added to the *Focus Cities* determination and the selection criteria changed to include the 20 cities with the largest number of pedestrian/bicyclist fatalities and any city that had a fatality rate per population higher than the average of the top 50 cities.

Currently there are 16 *Focus States* and 26 *Focus Cities* (every state that has at least one *Focus City* is a *Focus State*). The expanded 403 grant program – Statewide Pedestrian and Bicyclist Focus Education and Enforcement Effort – seeks to demonstrate state management, implementation of a city's pedestrian and bicycle safety action plan and direct support of community-based education and enforcement strategies that support engineering improvements to biking and walking facilities that together improve biking and walking safety, resulting in a reduction in non-motorized user injuries and fatalities. Three grants totaling $1.5 million were awarded in this latest round of funding to Arizona, Florida and Tennessee (approximately $500,000 per state).

Tennessee is using the funding to develop and implement a four-year plan that includes education and training for both roadway users and law enforcement (the latter focuses on enforcing the state's bicycle and pedestrian laws), high visibility enforcement of bicycle and pedestrian

laws to raise awareness and change behavior, and targeted media at high-crash locations using outdoor advertising (e.g., billboards, bus benches/backs) and social media. Administered by the Tennessee Highway Safety Office (THSO), the initiative will kick off in Nashville and Chattanooga in the first year of the grant (2017) and subsequently be rolled out in Memphis, Knoxville, and Kingsport/Johnson City over the next three years (THSO, 2017). For more information contact, Sharmila Patel.

Established in 2005 under SAFETEA-LU (the federal transportation act that directed all federal transportation programs from FY 2005 through 2009), FHWA's Non-Motorized Transportation Pilot Program (NTPP) awarded grants of $25 million each to four communities – Columbia, MO; Marin County, CA; Minneapolis, MN; and Sheyboygan County, WI – for bicycle and pedestrian projects. These communities invested approximately $88.5 million in NTPP funds. The bulk, $79 million, was spent on infrastructure, with $7.5 million used for outreach, education and marketing programs that promote safe behavior by all roadway users. The pilot sites also leveraged an additional $59 million in other federal, state, local, and private funds (FHWA, 2014).

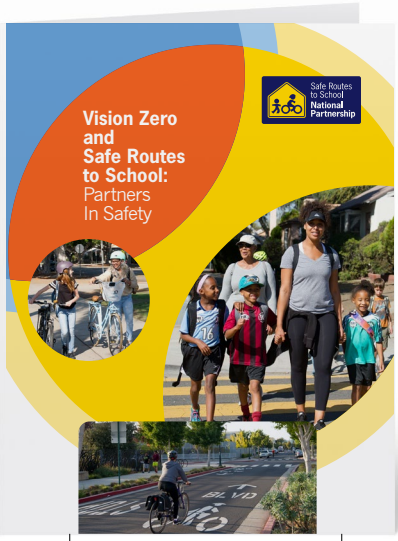
An analysis of data from the pilot sites found that this injection of funds increased biking and walking across all four counties and decreased fatalities and injuries. Looking only at the bicycle data (2007-2013), bicycle trips increased 48.3% across all four communities, with one individual project site increasing ridership by 115 percent. Bicycle fatalities decreased collectively by 28.6%, while bicyclist injury rates in each community fell between 8.6% and 38.2% (2002-2012). In addition, the economic cost of mortality from bicycling was reduced by $46.3 million in 2013 (Lyons et al. as cited in ABW, 2016).

Safe Routes to School

State DOTs are tasked with implementing Safe Routes to School (SRTS) activities, which aim to increase the number of children in kindergarten through eighth grade who bike and walk to school. Originally designed to provide grants only for infrastructure improvements, the focus was expanded to include non-infrastructure activities under SAFETEA-LU. Funding was provided for SRTS on a competitive basis in the transportation bill that followed (MAP-21) and retooled under the FAST Act. States seeking SRTS funding must now compete through the Surface Transportation Block Grant (STBG) program (FHWA, 2016).

The bulk of SRTS funds have been used for infrastructure enhancements such as sidewalks, bike lanes and intersection improvements. However, many communities have applied and received grants for education, encouragement and enforcement purposes. Since its onset, states were given flexibility to develop their own grant application guidelines and encouraged to award grants to programs that leverage the SRTS five E's – engineering, education, enforcement, encouragement, and evaluation. SRTS activities are credited with increasing biking and walking to school by 43 percent and reducing injuries while helping children get the recommended 60 minutes of daily exercise (Safe Routes to School National Partnership [SRTS NP], 2015a).

In 2016, the *Vision Zero for Youth* initiative was launched using SRTS as a framework to engage and build support from local elected officials and communities nationwide for safe biking and walking. Speed reduction in and around schools and other places where children and youth travel is a program focus. National Bike and Walk to School Days, held annually in May and October, respectively, help call attention to the issue and the importance of safe



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active transportation for school-age children (National Center for Safe Routes to School [NC SRTS], 2017a). Bike to School Day 2017, which involved over 2,500 schools in 49 states, was supported by the FIA Foundation and took place during UN Global Road Safety Week, an international road safety campaign that calls on all countries to address speed management and make roadway improvements that will reduce traffic deaths and injuries worldwide (NC SRTS, 2017b).

A variety of biking and walking resources are available to SRTS partners. For example, the National Center for SRTS website houses a comprehensive inventory of bicycle and pedestrian curricula with summaries and contact information. The Safe Routes to School National Partnership offers trainings, workshops, research, and more to help schools successfully implement a SRTS program. Many states also produce their own materials for use by local partners. For example, Georgia's SRTS Center offers a free, downloadable Bicycle Rodeo Toolkit with step-by-step instructions for conducting this popular community-based bicycle education program.

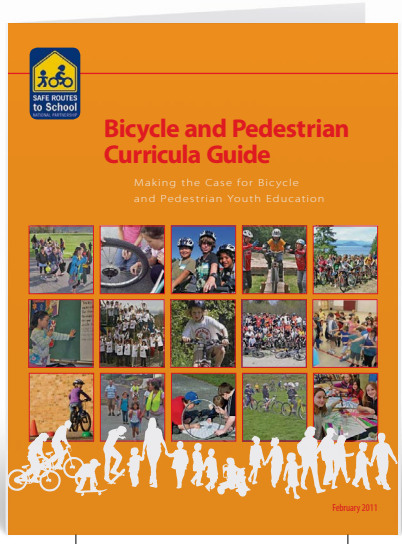
In many states, SHSOs are active SRTS partners and in some cases even administer the program. State highway safety officials serve on grant application review panels, offer assistance identifying potential behavioral safety-related projects and provide other resources such as crash data, supplemental grant funds, educational materials, speakers, and/or other guidance. Additionally, NHTSA provides staff support to the program both at headquarters and through its regional offices. Coordinating efforts between the state DOT and SHSO is encouraged to maximize all available resources and minimize duplication of effort.

State & Local Funding Sources

In addition to federal funding, some states and local governments have established a dedicated source of revenue to fund biking and walking projects. In some cases, these monies come from the general fund and/or gas taxes, while other localities charge developers impact fees to cover service costs related to new construction.

Approximately 25 states have created specialty license plates with the funds set aside for bicycle safety or education programs or shared with bicycle advocacy organizations (The League of American Bicyclists [LAB], 2017). In Texas, for example, drivers can purchase a *Share the Road Y'all!* license plate for $30, with $22 of that going directly to the SRTS program run by BikeTexas.

Half of the $200 fine collected from motorists speeding in school crosswalks and playground zones in Washington State is used to make engineering improvements in school zones, and to conduct aggressive enforcement of school speed limits and public education campaigns directed toward motorists (SRTS NP, 2015). And in some communities, grants are available from state departments of transportation or health or through public-private partnerships to fund bicyclist safety initiatives.



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National, State & Local Bicyclist Organizations

There are many organizations focused on promoting safe bicycling in the U.S. today. However, that was not always the case. Established in 1880 to advocate for paved roads, the League of American Bicyclists (LAB) is perhaps the oldest bicycle advocacy organization. While it continues to call for better biking environments, LAB also operates the nation's only certification for bike education, and established and administers National Bike Month and National Bike to Work Week and Day (all observed annually in May), the National Bike Challenge (which kicks off in May and runs through the summer) and the Bicycle Friendly America (BFA) program. All promote the benefits of bicycling and the importance of safe riding practices, but BFA provides tools and resources that take a five E approach to bicycling also used by the SRTS program. It is designed for use by states, communities, businesses, and universities and is a complement to NHTSA's bicycle and pedestrian assessment program.

The National Center for Bicycling and Walking (NCBW), formerly the Bicycle Federation of America, got its start in 1977 as a clearinghouse for technical assistance and advocacy support for bicycling. Today, it is housed at the Project for Public Spaces (PPS), which works in the U.S. and internationally to help communities create and sustain public spaces that include streets that provide for the safety and mobility of all users. NCBW developed the award-winning Walkable Community Workshop program; has consulted on more than 50 statewide, regional and local bicycle and pedestrian plans; and hosts the biannual Walk/Bike/Places conference (formerly ProWalk/ProBike). Recognizing the value of the SRTS program, NCBW developed the City SRTS initiative to address the needs of underserved, urban neighborhoods (NCBW, 2009).

The cycling movement got a shot in the arm in the 1990s, with the founding of four national organizations. Launched in 1994, the Association of Pedestrian and

(below) Association of Pedestrian and Bicycle Professionals (APBP) Strategic Planning Report. (right) Imagery from the PeopleForBikes website, which includes both an industry coalition of bicycling suppliers and retailers and a charitable foundation.

Bicycle Professionals (APBP) started with a handful of state bicycle and pedestrian coordinators seeking to share information and today has grown to include 1,300 public, private and nonprofit sector members working in the U.S. and Canada. APBP offers technical training and resources including Complete Streets workshops and a Bicycle Parking Guidelines publication.

The Alliance for Biking and Walking (ABW) followed in 1996. Formed to link advocacy leaders who share a common goal of making communities great places to bike and walk, ABW started with just 12 organizational members and now boasts more than 200. Nearly all (97 percent) work on bicycling, with a third (32 percent) addressing both biking and walking. Half are city-focused, 38 percent work at the regional level, and 29 percent address state or provincial efforts (ABW, 2017). While infrastructure improvements are a focus of slightly more than three-quarters of ABW members, nearly half (47 percent) also engage in safety education and training programs, and over a third (38 percent) in Vision Zero initiatives (ABW, 2016).

Founded in 1999, the Pedestrian and Bicycle Information Center's (PBIC) mission is to improve a community's quality of life through an increase in safe bicycling and walking. To do that, PBIC, which is funded by FHWA and NHTSA and housed at the University of North Carolina Highway Safety Research Center, maintains a national clearinghouse of information addressing health and safety, education, enforcement, and engineering along with a searchable collection of more than 3,000 images. It also provides resources for planning and design and bike to work events as well as research guides, assessment tools, case studies, toolkits, training/webinars, crash data, fact sheets, and a quarterly newsletter.

Also established in 1999, PeopleForBikes (PFB) includes both an industry coalition of bicycling suppliers and retailers and a charitable

Partnering to Bolster Bicyclist Safety

*The West Virginia Governor's Highway Safety Program (GHSP) recognized that it needed to be more proactive when it came to bicycle safety. Meanwhile, West Virginia Connecting Communities (WVCC), a small nonprofit that advocates for bicyclists, needed funds to expand distribution of its **Rules for the Road** bicyclist/motorist tip card. Thanks to a chance meeting at a bicycle safety summit, the two organizations are now working together to not only print and disseminate the card via GHSP's eight traffic safety regions and local law enforcement, but also collaborating on the production of a training video for high school driver education classes.*

*Using grant funds provided by GHSP, WVCC conducted focus groups with driver education students and their teachers at both an urban and rural high school to develop the video content. "We know it's needed," said WVCC's Executive Director, "because we are aware of some students being advised by their teachers that bicyclists are not allowed on our roads." A letter was sent to all public and private high school driver education teachers to advise them about the new video (available on YouTube) and how to secure copies of the **Rules for the Road** tip card. GHSP regional coordinators are also helping with distribution.*

foundation, with the latter responsible for all programming and engagement with individual members, affiliate organizations and corporate sponsors. To achieve its goals (dubbed *5X*, for growing bike rides, protected bike lanes, single track mileage, bike parks, and bicyclists by five times the current number by 2025), the organization focuses on building grassroots support for better bicycling, developing new high-profile leaders, improving infrastructure, and sharing cycling's positive impact on people (PeopleForBikes, 2017). In the Get Local section on the PFB's website, a visitor can click on a state to learn about current grants, protected bike lanes, events, local groups, and more. There are also statistics including the percent of commuters who bike to work and the number of bicyclist fatalities per 10,000 commuters.

The newest addition to the bicycling community is the American Bicycling Education Association (ABEA). Incorporated in 2014, ABEA is run by and for educators and is dedicated to delivering bicycling education to traffic engineers, transportation planners, law enforcement, educators, and the public. It offers the Cycling Savvy (discussed on page 62) traffic cycling training program and facilitates information sharing among advocates, traffic safety and transportation professionals, and the public through its i am traffic website and social media platform.

SHSOs are encouraged to learn more about and identify opportunities to collaborate with these bicycling organizations and others working at the state and local level including bicycle coalitions, Transportation Management Associations (TMAs) (nonprofit organizations that work with business, commuters, local and county government, and state agencies to provide transportation services such ridesharing and shuttles as well as bicycle safety education and training) and Safe Kids Coalitions. Bicycle advocates interviewed for this report stressed that they want to work with SHSOs and their partners to address bicyclist safety. While the built environment is a central focus of their work, so too is education and training along with equitable enforcement of traffic safety laws. In New Jersey, for example, the Division of Highway Traffic Safety (the state's SHSO) provides a grant to the state's eight TMAs to provide bicycle safety education to children and adults and conduct bicycle helmet fittings. SHSOs are also partnering with local Safe Kids Coalitions (there are more than 400 across the U.S.) to educate children about safe riding practices through bicycle rodeos and other community and school-based events.

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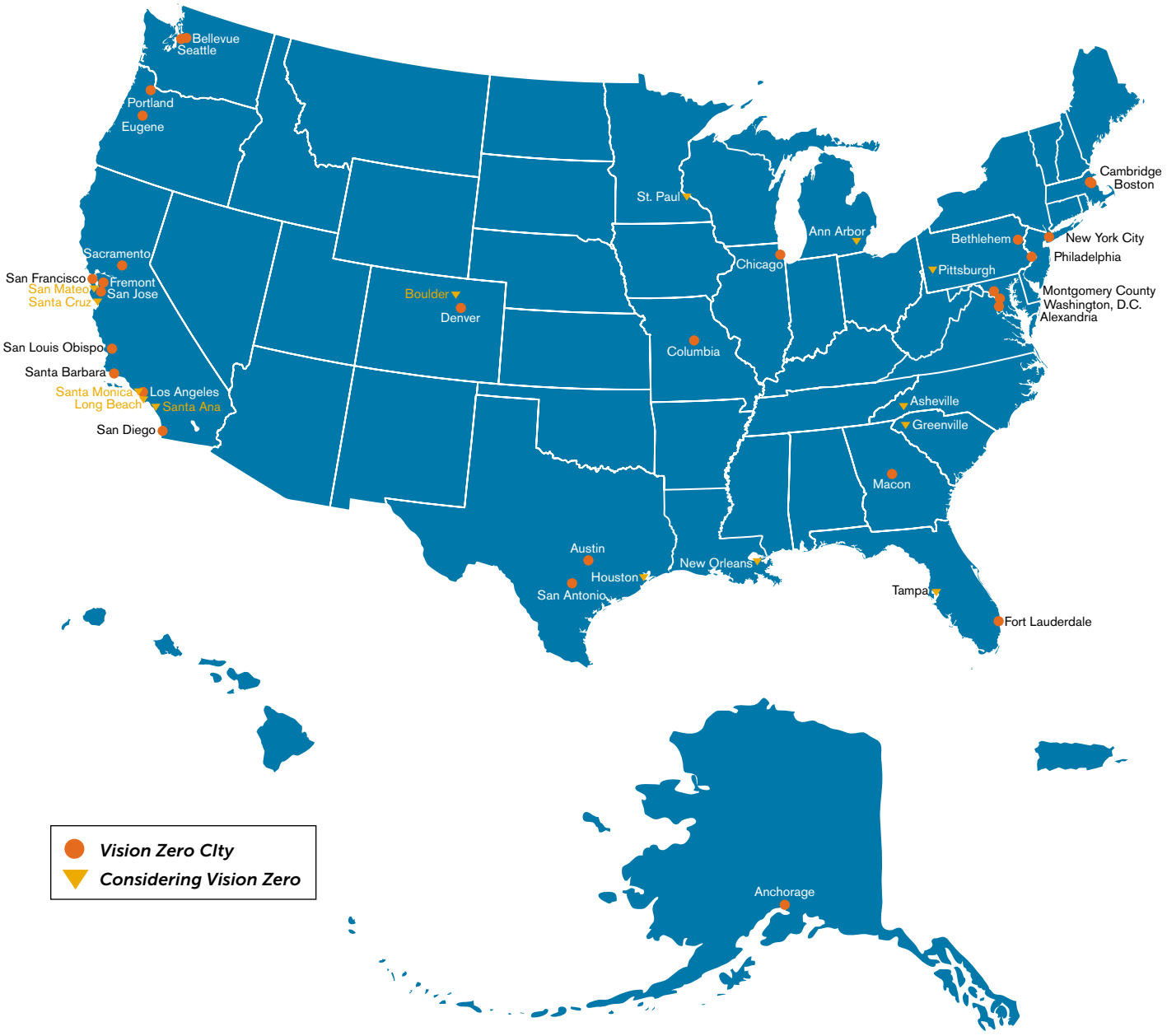
Vision Zero Network

Another important ally in addressing bicyclist safety is the Vision Zero Network (VZN). While many states have adopted zero as their long-term traffic fatality goal, the Network fosters collaboration at the community level by helping local leaders, government officials and citizen advocates unite under a common goal: making streets safe for all users. VZN recognizes that safe mobility is impacted by a variety of factors – roadway design, speed, enforcement, behavior, technology, and policies – and sets goals for preventing fatalities and serious injuries. To achieve these goals, communities are implementing proven strategies such as lowering speed limits, redesigning streets, executing meaningful behavior change campaigns, and using data-driven traffic enforcement (VZN, 2017a).

VZN launched a *Focus Cities* program in 2016 to promote collaboration between the leaders of ten cities – Austin, Boston, Chicago, Fort Lauderdale, Los Angeles, New York, Portland, San Francisco, Seattle, and Washington, DC – that were early adopters of a zero goal. They share data, ideas, strategies, and information to advance traffic safety policy, roadway design and programs. Through its *Emerging Cities* program, VZN is also facilitating peer exchanges and information sharing among small and large communities that are at "various stages of commitment to Vision Zero" (VZN, 2017b). As of March 2017, there are 27 Vision Zero cities in 15 states and DC, and another 14 cities are considering joining the movement.



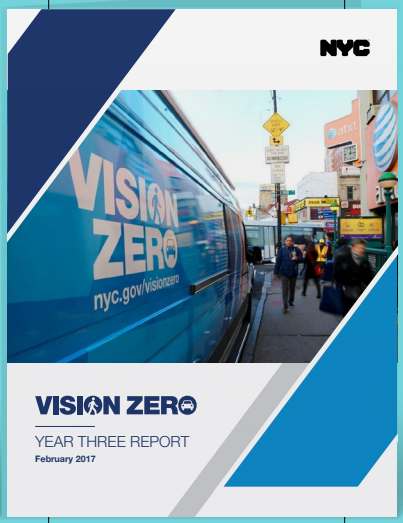
Vision Zero at Work: Traffic Fatalities Fall in New York City

New York City – home to more than 8 million people – launched its Vision Zero initiative in 2014. An ambitious goal, but the results to date are impressive: a 23 percent drop in traffic fatalities (230 people were killed in traffic crashes in 2016), the safest three-year period in the city's history (NYC DOT, 2017). Led by the City's Departments of Transportation (DOT) and Health and Mental Hygiene (DOHMH), the Police Department (NYPD), Taxi and Limousine Commission (TLC), and Administrative Services (which includes the Mayor's Office), the initiative takes a multi-pronged approach to addressing the safety of all roadway users.

DOT and the NYPD, for example, are concentrating street redesign, enforcement, education, and engagement resources on the highest-crash corridors and intersections in each of the City's five boroughs. The approach is paying off as fatalities at these locations are down 29 percent, which is ahead of the overall citywide decline in traffic deaths. Crash data analysis and DOHMH surveys also guide the development of public outreach messages which are delivered via on-street engagement and television and drive-time ads to reach the target audience at key times. Education programs are delivered in schools (1,000 to date) and to TLC licensed drivers (37,069 reached in 2016) and Metropolitan Transit Authority bus operators (6,000 trained in 2016). Nearly 22,000 bicycle helmets were fitted and distributed to riders across the city in 2016. It is not surprising that 75 percent of City residents are aware of the Vision Zero campaign (NYC DOT, 2017).

A total of 242 safety engineering projects have been completed under the Vision Zero banner including the installation of 64 miles of dedicated bike lanes, left turn calming treatments at 107 intersections, and 776 Leading Pedestrian Intervals (LPIs). (An LPI gives pedestrians a three to seven second head start when entering an intersection with a corresponding green signal in the same direction of travel.) The NYPD also launched Operation Safe Passage in 2016 to combat motorist violations that are particularly dangerous for bicyclists such as parking in bike lanes and improper turns. (Eighteen bicyclists lost their lives on city streets in 2016.) Police issued 530,000 parking violations and 54,000 moving summonses (NYC DOT, 2017).

Year four plans are well underway and include measures that are either bicycle-specific or will benefit cyclists, such as making upgrades to at least 20 key cycling intersections within the bike network, continuing to conduct safe cycling programs, upgrading lighting at 1,000 intersections, adding 120 speed guns to local precincts to increase speed enforcement, installing more truck side-guards on city vehicles (discussed in more detail on page 49), improving ignition interlock device monitoring, and incorporating Vision Zero safety training into high school curricula (NYC DOT, 2017).



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Policies Protecting Bicyclists

According to the National Conference of State Legislatures (NCSL, 2017), 285 bills addressing bicyclist and/pedestrian safety were introduced in 2016; 38 were enacted by 19 state legislatures. While most focus on pedestrians, the new bicyclist safety measures address safe passing, operation and equipment; enhanced penalties for crashes involving bicyclists and pedestrians; safety and equipment standards for electric bicycles; and supporting bicycle and pedestrian infrastructure (Teigen et al., 2017). States also considered more than 100 speed-related bills, including lowering the posted speed limit in school zones or on roads adjacent to schools or parks, as well as giving cities and towns the authority to make changes to existing speed limits (NCSL, 2017).

An overview of the most prevalent laws addressing bicyclist safety and their current status are provided to assist SHSOs and their partners as they work with bicycling advocates, elected officials, the media, and the general public to adopt effective and enforceable policies.

Safe Passing Laws

Safe passing laws call upon vehicle operators to pass each other at a safe distance. Every state has a variation of a safe passing law, with 36 states and DC explicitly addressing bicyclists. However, the actual distance – typically 3-feet – is defined by 28 states and DC, with Pennsylvania (4-feet) and South Dakota

(3-feet on roads with a speed limit at or below 35 mph; 6-feet on roads with speed limits over 35 mph) mandating even greater minimum distances.

Ohio and North Carolina are the latest states to establish a minimum passing requirement for motorists that overtake a bicyclist. Ohio's law establishes 3-feet or greater as the safe passing distance and also requires a motorist to stay to the left until safely clearing the bicyclist. North Carolina, meanwhile, created a 2-feet standard and allows a motorist to pass a bicyclist in a no-passing zone with 4-feet of clearance. Failure to do so can result in a minimum fine of $200 that increases to at least $500 if the bicyclist is injured or sustains property damage (Teigen et al., 2017).

The Michigan Legislature, meanwhile, is considering a bill that would require drivers to give cyclists 5-feet of cushion when passing. The measure was introduced in response to a fatal truck-bicyclist crash which killed five cyclists and seriously injured four others. Proponents of the bill say unlike 3-feet, a 5-feet standard is easier for a motorist to visualize (Constans, 2017).

As for a model safe passing law, the League of American Bicyclists (LAB) lauds New Hampshire's measure which not only defines a safe passing distance – "at least 3-feet when a vehicle is traveling at 30 mph or less" – but also calls for "one additional foot of clearance…for every 10 miles per hour above 30 mph" (LAB, 2017). The latter language makes it clear that "3-feet is not an absolute" and that speed and road conditions must be considered (LAB, 2017). Additionally, the law calls on motorists to "exercise due care," which the LAB points out "creates a relationship of responsibility" and "may make it easier for a bicyclist to hold a driver liable" if struck (LAB, 2017).

Vulnerable Road User Laws

When there is a collision between a bicyclist and a motor vehicle, a vulnerable road user law creates a middle ground between a traffic citation with no or minimal penalties and a vehicular manslaughter or negligent homicide offense. It usually includes a substantial fine, license suspension, community service, or participation in training, plus the charge appears on a driver license record. In the event a bicyclist is seriously injured or killed in a crash, the prosecutor in a state with a vulnerable user law may be more inclined to charge the motorist with reckless driving. Typically, these laws include language addressing a buffer or safe passing distance or to move over as far as safely possible. They may also address vehicle speed, calling on the motorist to slow down when approaching a bicyclist or other non-motorized roadway user.

Eleven states have vulnerable user laws – Nevada, Tennessee, Washington, Oregon, Illinois, Maryland, Maine, Delaware, New York, Hawaii, and Connecticut – and another 23 have provisions in statute addressing actions against vulnerable users, such as harassment or throwing of objects (Teigen et al., 2015). Oregon

A Tool to Help Officers Enforce Safe Passing Laws

Enforcing a safe passing law is challenging. Unless there is definitive proof the motorist failed to give a cyclist adequate space, a court is likely to dismiss the ticket, prompting reluctance on the part of the officer to cite the violator. For Chattanooga Police Officer Rob Simmons, the issue became personal when his friend died in a bicycling crash after being sideswiped by a motorist who failed to comply with Tennessee's 3-feet passing law. An avid cyclist and bike patrol officer, Simmons worked with Texas-based technology start-up Codaxus, LLC, to bring 3CFT™ to Chattanooga. CPD partnered with Friends of Outdoor Chattanooga to secure the $1,400 needed to purchase the unit. (The device is also used by the Austin, Houston, Fort Collins [CO] and Las Vegas Police Departments and the Utah Department of Public Safety.)

The C3FT™ uses ultrasonic detection to measure the distance between the bike mount and other vehicles. A numeric display, buzzer and LED indicators alert the officer when a passing vehicle reaches the preset distance threshold. A separate go-pro camera is also mounted on the bike to record the bicycle/motor vehicle interaction and the passing distance on the C3FT™ digital display. The camera can also be synced to a tablet via Bluetooth enabling the officer to show the footage to a motorist to educate him/her about the 3-feet law.

"It has worked flawlessly," said Simmons, who vetted the technology with several judges before putting it on the street. "We did a series of time stamped tests and found it was accurate every time." The CPD employs the device in two ways. In the first, a bicycle officer in full uniform rides in the city's heavily signalized downtown corridor, recording motor vehicle passing distances via the C3FT™. If a passing motorist falls to adhere to the 3-feet law, the officer rides up to the stopped motorist at the traffic light to address the infraction. In the second, a plain clothes bicycle officer (a decoy) wearing a retro-reflective vest to increase his visibility to passing motorists, rides on a stretch of roadway that data indicate is problematic for bicyclists. The decoy is supported by two officers in a marked patrol car. If a motorist passes the decoy too closely, he radios the vehicle description to the officers in the patrol car who make the stop.

Educating the motorist about the 3-feet law, rather than issuing a ticket is the focus. Simmons noted that it is common for motorists who are shown the footage to say they did not realize they were so close. Tickets are only written if the officer does not believe the violator's behavior will be modified.

enacted the first vulnerable user law in 2007. It establishes penalties for serious physical injury or the death of a vulnerable road user under the Careless Driving Law. Careless driving is a Class A or B traffic violation (depending on whether it involves a crash) that requires the driver to attend a hearing if a vulnerable road user is seriously injured or killed. If found guilty, the motorist is subject to fines that are six times greater than the maximum fine for a Class A traffic violation and a one-year license suspension. Oregon also treats vehicular assault against bicyclists and pedestrians as a separate Class A misdemeanor. This vehicular assault law complements or provides police an alternative to issuing a citation for violation of the state's safe passing law, since it allows for consideration of the driver's behavior (McLeod, 2013).

Concerned about an uptick in pedestrian fatalities, New York City enacted a right of way law in 2014 to warn drivers to be on the lookout for vulnerable, non-motorized users and respect their right of way by imposing sanctions when drivers do not. Prior to the law, a police officer had to witness a collision before taking action against a motorist. The revised provision gives police the ability to review the facts and circumstances to determine if a motorist had been careless in failing to yield the right of way to a pedestrian or bicyclist. In 2016, the New York Police Department (NYPD) issued more than 1,900 civil summonses under the statute and arrested 39 motorists that struck and either killed or injured a bicyclist or pedestrian (NYC DOT, 2017).

Where to Ride, Dooring, Mandatory Use & Sidewalk Riding Laws

Where a bicyclist may ride has been debated by roadway users and elected officials for decades. **Where to ride** laws generally tell bicyclists where they should position themselves on the road, which in most states is typically as far to the right as practicable. The challenge comes with defining practicable, which likely means different things to a cyclist, a motorist and a law enforcement official. The LAB notes that "what is practicable is often context sensitive based upon road and traffic conditions" and therefore "recommends that cyclists ride in the right third of the lane with traffic" (2017).

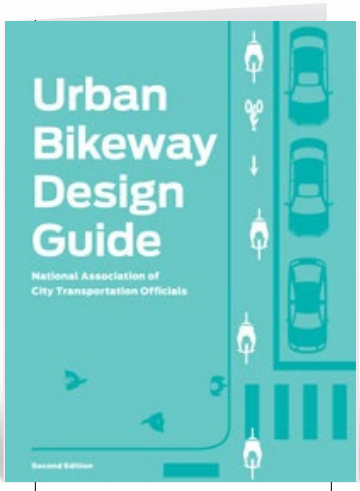
Safety should be the primary focus when it comes to where a bicyclist rides in the roadway. To that end, Colorado's law states that a bicyclist should ride "far enough to the right as judged safe by the bicyclist to facilitate the movement of…overtaking vehicles" (LAB, 2017). The language strikes a balance between a cyclist's safety and the efficient movement of traffic.

Where to ride laws generally tell bicyclists where they should position themselves on the road, which in most states is typically as far to the right as practicable.

It reaffirms the importance of bicyclists riding with traffic – those who do not triple their chances of being involved in a collision – while calling upon cyclists to ride as far right as possible so that motor vehicles can pass when there is sufficient room to do so.

Currently, 42 states and DC have a where to ride law. Most, however, make exceptions when it comes to riding far right and allow bicyclists to take the lane under certain circumstances including: riding at or above the rate of speed of normal traffic flow, passing, turning left, avoiding hazards, riding in a lane that is not wide enough to accommodate a bicycle and a vehicle side by side, riding on a one-way street, and when proceeding straight when the right lane is a right turn only lane (to avoid a right-hook collision, discussed previously) (LAB, 2017). As for avoiding hazards, bicyclists are vulnerable not only to what is in or on the roadway (e.g., debris, sewer grates, uneven/rough pavement), but also what is parked alongside it.

For example, **dooring** – when a bicyclist is hit by an open vehicle door – is a common form of bike-motor vehicle collision, particularly in urban areas. Chicago reported 300 cases of dooring in 2015, a 50 percent increase over the previous year (Vivanco, 2017). Forty states have a dooring law, with nearly all applying to motorists who leave their door open longer than necessary as well as opening the door without caution. A dooring law not only provides protection to bicyclists, but also other roadway users. The intent is to ensure that a person – the driver as well as other vehicle occupants – opens a door when it is safe and will not impede traffic, and that it remains open no longer than necessary. However, only three states' laws – Massachusetts, Rhode Island and Oregon – specifically define bicyclists and pedestrians as part of traffic. Rhode Island's law is particularly noteworthy because it applies to both sides of a vehicle when a door(s) is left open (LAB, 2017).



The *Urban Bikeway Design Guide* offers a model for designing safe, attractive and sustainable streets that accommodate and encourage bicycling.

While research confirms that the "most protective way" to safely integrate motorized and non-motorized vehicles on our roadway system is through "total physical separation" (Teschke as cited in Williams, 2013), bicyclists and the organizations that represent them believe they have a right to be on the road. For that reason, cycling advocates are not supportive of **mandatory use laws**, which require bicyclists to use bike paths, marked bike lanes or other cyclist-specific infrastructure rather than adjacent roadway lanes.

Seventeen states have a mandatory use law, with many giving bicyclists the option to ride in the roadway if the facility fails to meet a certain standard set by the state. Advocates argue that these laws "undermine…a bicyclist['s] ability to protect him or herself when [these] facilities are not well planned, designed and/or maintained" which can impact safety as well as their ability to ride "without fear of prosecution" (LAB, 2017). Additionally, bike path or lane design does not take into consideration the various types of bicyclists (children versus adults, beginner versus advanced) and their needs (LAB, 2017).

In lieu of a mandatory use law, the League of American Bicyclists, calls on communities to "build bike lanes and build them well" citing strong demand by bicyclists for safe infrastructure (LAB, 2017). (As noted earlier in this report, 60 percent of bicyclists – those *Interested But Concerned* riders – would ride more if their community provided separate bicycle-only facilities.) The key is to follow design standards such as those outlined in NACTO's Urban Bikeway Design Guide which offers a model for designing safe, attractive and sustainable streets that accommodate and encourage bicycling. The Guide has been endorsed by FHWA, eight states (CA, CO, DE, GA, MA, OR, VA, WA), one county, and more than a dozen cities (NACTO, 2017b).

One additional place where bicyclists may or may not be restricted from riding

is **sidewalks**. A hodgepodge of laws exists addressing this issue as well as riding in and around pedestrians. In eight states, bicyclists are expressly prohibited from riding on a sidewalk because a bicycle is deemed a vehicle and the latter is barred from sidewalks. In ten states, it is unclear whether a bicycle is a vehicle; however, bicyclists have the same rights and duties as a driver, implying a sidewalk prohibition. And in 13 states, a bicyclist riding on a sidewalk has all the rights and duties of a pedestrian, including (in all but one state) the restriction on not creating a hazard by suddenly entering the path of an oncoming vehicle. In states where bicyclists may ride on a sidewalk, 21 have statutes requiring bicyclists to yield to pedestrians, 18 mandate bicyclists give an audible signal before passing a person on foot, and four limit the riding speed (LAB, 2017b).

Interestingly, Ohio has a law that allows for the prohibition of bicycles from sidewalks by sign or ordinance, but signs and ordinances may not be used to require bicyclists to ride on sidewalks. Advocates point out that this measure guarantees bicyclists access to the road, while recognizing that bicycles are vehicles and have duties and responsibilities associated with both sidewalk and roadway riding (LAB, 2017b).

Bicycle Helmet Laws

Currently, 21 states and DC require bicyclists younger than 18 years of age to wear a helmet, with the age threshold varying by state (typically 16). Sixteen of these states, along with DC and Virginia (the latter does not have a helmet law, but allows enactment of local helmet ordinances), have language in their laws that indicates compliance with a helmet law may not be considered in a tort case (LAB, 2017b). This provision is considered critical by bicycling groups, that argue that the "circumstances of a crash" rather than compliance with a mandatory helmet law should be the central focus (LAB, 2017b).

The value of wearing a bicycle helmet cannot be overstated, since in a majority of bicyclist deaths the most serious injuries are head-related (Sacks et al., as cited in IIHS, 2016). Helmets are estimated to reduce the risk of head injury by 50 percent, and head, face or neck injury by slightly more than 33 percent (Sacks et. al, as cited in IIHS, 2016). However, a 2012 national survey of adults found that slightly more than half reported never wearing a helmet (Schroeder & Wilbur, 2013).

While all riders should consider the merits of proper head gear, the use of an approved

bicycle helmet is especially important for children 14 year of age and younger. Children under 10, in particular, are at a greater risk for falling from a bicycle due to their higher center of gravity, lack of physical development and poor balance compared to adults (MacKay et al., 2017). Slower reaction times and less coordination also impact a child's ability to break a fall (American Academy of Pediatrics, Zeuwts et al., as cited in MacKay et al., 2017). Approximately 50 children visit an emergency room every hour with an injury related to wheeled sports, with concussions, internal head injuries and head fractures accounting for 13 percent of those visits for cyclists 19 years of age and younger (MacKay et al., 2017).

For this reason, parents should be educated about the importance of their children always wearing bicycle helmets as well as the vital role they play in reinforcing and modeling their use. A 2017 Safe Kids Worldwide survey of U.S. parents found that among those who always wear a bicycle helmet, 86 percent of their children do as well. That compares to 38 percent for children whose parents report never wearing a helmet (McKay et al., 2017).

SHSOs are encouraged to educate bicyclists of all ages about the effectiveness of helmets, including proper fit. Law enforcement officials can also help by not only enforcing local ordinances or state laws, but also by being positive role models. In addition, police departments should mandate helmet use by bicycle patrol officers. Not doing so could result in the denial of a workmen's compensation claim if the officer sustains a head injury while on duty (PBIC, 2017b).

Bicycling Under the Influence Laws

Alcohol is also a factor in bicyclist crashes, with 22 percent of fatally injured cyclists having a .08 or higher BAC in 2015. While alcohol can negatively impact the ability to safely operate a bicycle, intoxicated

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cyclists are more likely to engage in risky behaviors such as riding without a helmet, riding at night and riding without reflective gear or lights. Also troubling are the escalated health care costs for impaired bicyclists, which are double that of sober injured riders (Crocker et al. as cited in LAB, 2017b).

In response to this problem, four states have enacted Bicycling Under the Influence (BUI) laws (California, Delaware, Kentucky, and Washington), while five have statutes expressly exempting bicyclists from all or part of state DUI laws (California, Montana, South Dakota, Utah, and Vermont). The issue is murkier in the 41 states without either of these laws, requiring a careful review of the definition of a bicycle. If it is deemed a motor vehicle, the law may apply to an impaired rider. However, a state's DUI statute may include language that either excludes vehicles that are human powered or contain other language specific to motor vehicles (LAB, 2017b). While there is case law in 18 states addressing BUI, lack of a clear standard creates challenges for law enforcement.

One state that has worked to address the confusion associated with whether an impaired bicyclist should be charged for DUI or BUI is Washington. Despite a bicycle being defined as a vehicle under that state's law, a Court of Appeals found that Washington's DUI law applied only to motor vehicles. That prompted passage of a BUI law that addresses safety issues for cyclists, while minimizing the penalties for riding impaired. Under the statute a police officer may offer to transport a bicyclist who appears to be under the influence of alcohol or any drug that is walking or riding on a public roadway to a safe place or release him or her to a competent person. If the rider refuses assistance, the bicyclist cannot hold the police officer or his department as well as another governmental entity responsible in the event the former is negatively impacted. Finally, if the police officer believes the rider is a threat to himself or the safety of others, he may impound the bicycle. The rider must be given written notice about

(above) Scenes from the video *Bicycles, Rolling Stops, and the Idaho Stop.*

where and when to reclaim the bicycle without assessment of a fee, and may only do so once sober. If the bicycle is not claimed in 30 days, it will be sold or disposed of following agency procedures (LAB, 2017b).

Cycling advocates point out that this does not constitute a "free pass" or make police a "taxi service," but instead offers a solution for removing an impaired bicyclist – who is more apt to harm him/herself than others – from the road without "invoking harsh penalties meant for intoxicated drivers" (LAB, 2017b).

Idaho Stop & Dead Red Laws

Enacted first and only in Idaho – hence the name – the **Idaho stop** allows a bicyclist to slow down rather than come to a complete stop at a stop sign. (As this report went to press, Delaware was considering Idaho stop legislation.) The rider must, however, yield the right of way to a pedestrian or vehicle, and stop completely if proceeding could negatively impact safety. As for **Dead Red laws**, these typically are in place to address the fact that traffic signals often cannot detect bicycles. Currently, six states have a dead red law (ID, IN, SC, UT, VA, and WI), while seven (AZ, IL, KS, MN, MO, TN, and WI) allow a bicyclist to proceed through a signalized intersection where the light is not working. Washington requires that signals "be adjusted to routinely and reliably detect bicycles" (LAB, 2017b)

While advocates point out that these laws make cycling easier and safer, they can prompt a negative reaction from motorists. Additionally, they run counter to the idea of all vehicles – including bicycles – following the same rules of the road. For this reason, the League of American Bicyclists, which does not have a formal position on the Idaho stop, recommends that cyclists adhere to the rules of the road including stopping at signs, signals and markings, while also noting that "responsible cyclists should follow the rules of their state and local jurisdictions" (LAB, 2017b).

In addition to these laws, some cities allow bicyclists to proceed on **Leading Pedestrian Intervals** (LPI). An LPI typically gives pedestrians a head-start to walk before motorists get the green, establishing the former's right of way while improving their visibility. DC's Bicycle Safety Amendment Act of 2013, allows a bicyclist to follow the pedestrian control signal in the direction of travel and to proceed on an LPI. A similar measure has been proposed in New York City, but has yet to be approved by the City Council. Supporters of the LPI provision contend that "when cyclists get a head start, it reduces the need for them to guess a motorist's intent" (Gordon, 2015).

The idea is supported by research. In Pennsylvania, LPIs reduce vehicle-pedestrian crashes by as much as 60 percent. The study also pointed out the cost-effectiveness of the device; the annualized cost of an LPI is $115 per intersection per year, while the estimated annual cost of a pedestrian-vehicle crash is $164,029 (Evans, 2016). The New York City Department of Transportation (NYC DOT) analyzed data before and after installation of LPIs at 104 intersections and found that severe and fatal injuries involving pedestrians and bicyclists declined 62 percent (NYC DOT, 2017).

Local Laws, Speed Limits

In addition to state laws governing bicyclists, it is commonplace for local communities to have separate laws or regulations governing cycling, which are allowed under state law. Currently, 29 states have measures in place giving local jurisdictions the ability, following enactment of local ordinances, to regulate bicycles or bicyclists, and explicitly allow for the collection of fees. Since a cyclist's ride may cover more than one community, differing laws can create confusion. What is important to note, however, is that in most states local law must be consistent with state law.

Speed limits also come into play when examining local laws. One of the core strategies of Vision Zero is lowering speed limits, which is critical since more than a quarter of U.S. traffic fatalities in 2015 were speed-related. Examining this same data for urban areas, which accounted for the largest percentage of bicyclist fatalities, 27 percent of the deaths were the result of speeding-related crashes. More than half of drivers involved in these crashes were on roadways with speed limits at or below 50 miles per hour (NHTSA, 2017g). Even at 35 mph, a driver needs 100 more feet to react and stop compared to a driver traveling at 25 mph (NYC DOT, 2017).

In response, states are adopting legislation allowing communities to reduce their speed limits. In Oregon, for example, communities were granted the authority to lower speed limits from 25 to 20 mph beginning in 2011, with neighboring Washington State following suit in 2013. Portland and Seattle, cities with the nation's top (6.2%) and fifth (3.7%) highest bicycle commuter rates (ABW, 2016), respectively, took advantage of these provisions and lowered the speed limit on neighborhood greenways – residential streets that prioritize travel by bike and foot (Eigen et. al, 2015). The New Hampshire Legislature (NHL) enacted SB230 in 2015 that gives municipalities the ability to petition the Department of Transportation to reduce the speed limit to no less than 20 miles per hour on segments of the state highway system that are seasonally congested by bicyclists and pedestrians (NHL, 2015).

The New York City Council, following amendment of a more than 50-year-old statute that prohibited a speed limit of less than 30 mph in the City, adopted a measure to lower the speed limit from 30 to 25 mph as part of its Vision Zero initiative. This 5-mph difference doubles the odds of a non-motorized user surviving a crash with a motor vehicle (NYC DOT, 2017). The City also leveraged state legislation that allows the use of speed cameras on streets that abut or are within 1,325 feet of a school building or property and only during prescribed hours. The technology is helping to deter speeding as violations issued by a speed camera fall more than 50 percent in the first year of deployment. However, a DOT analysis found that 85 percent of fatal and serious injuries to bicyclists, pedestrians and motorists occur outside of school zones or at times where speed cameras are prohibited. This has prompted the Vision Zero partners to call on the state legislature to amend the law to allow for camera deployment at times and locations where crashes are occurring (NYC DOT, 2017).

Distracted Driving

According to FARS, distraction was a factor in 3,477 roadway fatalities in 2015, an 8.8% increase over the previous year. Of those deaths,

Combating Speeding Goes Global

Speeding was the focus of the 2017 UN Global Road Safety Week, conducted annually in May by the World Health Organization (WHO). This year WHO and its partners called on communities to "reduce speeds where kids live, walk or cycle to school" as a way to address speed management (FIA Foundation, 2017). Speed contributes to around one-third of all fatal road traffic crashes in high-income countries, and up to half in low- and middle-income countries (WHO, 2017b).

To build momentum for what is a long-term effort, businesses and organizations not only in the U.S. but around the world were urged to ask employees to take a slowdown pledge and share and discuss the message with family members. Community members, parents and schools hosted Bike to School Days and a statement was developed for endorsement by mayors.

WHO also partnered with the United Kingdom-based, nonprofit 20's Plenty for Us (20 denoting what the default speed limit in mph should be on residential and urban streets) to develop a Slow Down Days toolkit. Designed for use by government, advocacy and community members, the toolkit provides guidance for planning and implementing a Slow Down Day to promote slower speed limits. The document does not include recommendations on how to change national or local speed legislation or discuss specific interventions, but rather provides guidance on organizing and conducting community-based events to promote slower speed limits (WHO, 2017c).

79 were bicyclists. There is general agreement, however, that distraction is likely underreported. A recent analysis of hundreds of thousands of U.S. drivers' cell phones revealed that "about one in four drivers involved in a crash… were using [their phones] within one minute before the [crash] occurred" (Rocheleau, 2017). Additionally, the study found that even for drivers not involved in a crash, one-third were significantly distracted (with 29 percent of them driving over 56 mph) and this lack of focus on driving lasted more than a minute in about one in ten trips (Rocheleau, 2017).

Recognizing the danger posed by distracted drivers, 47 states and DC ban text messaging for all drivers, and it is a primary enforcement law (an officer may cite a driver for texting without any other traffic offense taking place) in all but four states. Another 14 states and DC prohibit all drivers (primary offense) from using a hand-held cell phone while driving. No state has a total cell phone (no texting, hand-held or hands-free use) for all drivers, but 38 states and DC do ban all novice drivers and 20 states and DC prohibit it by school bus drivers (GHSA, 2017a).

Should there be a ban on cell phone use by non-motorized roadway users? Several states have deliberated bills addressing distracted walking, but none have been approved. As discussed earlier in this report, two-third of respondents to a national survey of bicyclists and pedestrians conducted in 2012 indicated that they never used electronic devices (e.g., cell phone, mp3 player) during their bicyclist trips in the past year. Of the 21% who did, almost half reported using a device on nearly all their cycling trips (Schroeder & Wilbur, 2013). Research confirms that engaging in a cell phone conversation or texting, results in manual, visual and cognitive distraction, thereby putting distracted roadway users and others around them at significant risk. Ensuring that all roadway users are singularly focused on the task of driving, bicycling or walking is critical for everyone's safety.

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Electric Bicycles

No discussion of bicyclist safety policies would be complete without an examination of electric bicycles, or e-bikes. Equipped with a low-speed electric motor that is typically engaged when the rider pedals (some are equipped with a throttle), low-speed e-bikes are considered safe and sturdy like a traditional bike and travel at similar speeds. The challenge is how to classify them. In 2002, Congress enacted HB727, which amended the Consumer Product Safety Commission's definition of e-bikes. The law defines the device as:

> *a two or three-wheeled vehicle with fully operational pedals and an electronic motor of less than 750 watts whose maximum speed on a paved level surface, when powered solely by such a motor while ridden by an operator who weighs 170 pounds is less than 20 mph (NCSL, 2016).*

Federal law permits e-bikes to be motor powered alone (throttle assisted) or by a combination of the motor and human power (pedal assisted). It also makes the distinction that an e-bike is not a moped, scooter or other motorized vehicle. E-bikes that meet the federal definition are regulated by the Consumer Product Safety Commission and must meet bicycle safety standards. The task of regulating their operation on streets and bicycle facilities falls on the states (NCSL, 2016).

With the growth in e-bike sales (approximately 200,000 a year), state legislatures have been active on this issue. Most have either focused on revising the classification of e-bikes, which may include addressing license, registration and/or equipment requirements, or further refining more current e-bike laws. Twenty-seven states and DC define an e-bike, with the majority (23) grouping them with mopeds, scooters and other motor-powered vehicles.

In 2016, four states – North Carolina, Tennessee, Utah, and Vermont – enacted e-bike legislation. Tennessee's law defines an e-bike using the federal standard, Utah included electric-assisted under its definition of a bicycle, and both states joined with California in developing a three-tier classification system for e-bikes. North Carolina created an electric-assisted bicycle classification and more fully defined an e-bike based on the federal language. Vermont also defined a motor-assisted bicycle noting that they are bicycles and therefore must adhere to the same rights and duties as cyclists. The state's law also prohibits their use on sidewalks and on a highway by anyone less than 16 years of age, and exempts e-bikes from motor vehicle registration, inspection and licensing requirements (NCSL, 2016).

E-bikes are gaining in popularity – they are far cheaper to own and operate than a car (the average annual cost for the latter is $8,556 [AAA, 2016]), less physically demanding than a bicycle and may be a viable transportation option for people with disabilities and physical limitations. They can also replace a car for short trips, making them especially appealing. Fifty percent of all trips in the U.S. are three miles or less, an easy distance for most adults on a regular bike, made even easier on an e-bike (NCSL, 2016).

Bike sharing systems recognize the benefits of e-bikes as well, with the University of Tennessee-Knoxville launching the first e-bike share in 2011. Birmingham, AL came on board in 2015, followed by Baltimore in 2016 and a small system at Utah's state house. And e-bike share systems are in the works in Seattle and Richmond, VA.

Recognizing their potential, it is critical for state legislatures, SHSOs and bicyclist organizations to collaborate on developing policy that ensures the safe operation of e-bikes. Safety was the top concern of American's surveyed about e-bikes in 2015, with a particular focus on speed. A study of the University of Tennessee's program found that e-bicyclists and traditional bicyclists showed little difference in travel speeds or average top speeds. Research was also conducted to determine the likelihood of an e-bike versus a traditional bike being involved in a roadway conflict. The study found that while there was a higher risk for e-bikes at an intersection due to higher speeds upon approach, overall the risk was essentially the same (NCSL, 2016).

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Taking a 3 E Approach to Bicyclist Safety

How Education Can Bolster Engineering Improvements

Engineering, education and enforcement must all be leveraged to address bicyclist safety. The evidence, however, is clear that providing infrastructure that separates riders from motorist is the most effective countermeasure. Cycle tracks, on-street bicycle lanes that are physically separated from motor vehicles by barriers such as curbs or bollards, are 89 percent safer than streets with parked cars and no cycling facilities (Teschke et. al, 2012). When physical separation is not possible, reducing the distance or time that bicyclists are exposed to risk is essential (Ragland as cited in Williams, 2015). This can be done through:

- Marked bike lanes, which may include specially-colored lanes that provide a distinct visual indication that the space is designated for bicyclists or contra-flow lanes that allow bicyclists to travel against the flow of traffic on a one-way street.
- Bicycle boulevards, also called greenways, give priority to bicyclists while discouraging motor vehicle traffic. They often use turned stop signs that allow cyclists to continue without stopping, while requiring cross traffic to stop.
- Bike boxes, a pavement marking that features a stop line closer to the intersection for bicyclists, and a stop line for motorists positioned further back and behind the cyclists. This gives bicyclists a head-start when the light turns green as well as improves their visibility to motorists who can see in which direction cyclists are proceeding.
- Bicycle traffic lights, which provide an advance green signal that is specially marked for cyclists.

These engineering treatments can be supplemented by enacting and enforcing slower speed limits as well as through signage and lighting that enhance visibility. New York City's Slow Zones, neighborhoods with a history of crashes as well as proximity to schools, daycare and senior centers, are demarcated by high-visibility, blue gateway signs, 20-mph speed limit signs, speed bumps, and 8-feet tall 20 MPH markings stenciled on the roadway to make it clear to motorists they are in a reduced speed area. Slow Zones cover more than 65 miles of city streets and are used in conjunction with speed cameras, traffic calming measures, stepped up enforcement, and education. Collectively, the designation is credited with helping to reduce vehicle speeds and traffic fatalities to record lows (City of New York, 2013).

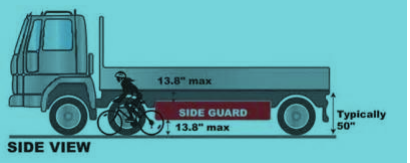
While SHSOs are tasked with addressing the behavioral issues associated with traffic safety, not infrastructure, it would be easy to make the case that the physical attributes of a roadway are best left to the engineers. However, SHSOs and their partners can help bolster the positive impact of bicycling infrastructure by educating law enforcement, other government officials and the public about how and why it works. Law enforcement officials, in particular, need to understand how infrastructure complements their efforts to improve traffic safety and how to advocate for better roadway design. For example, the installation of a bike box is just the first step in improving safety at an intersection. Ensuring that bicyclists and motorists know what to do upon approaching a bike box will bolster its effectiveness and ultimately reduce the risk of bicycle-motor vehicle collisions.

A study of bikes boxes in Portland found an increase in the number of right-turning motorists yielding for bicyclists at treated intersections, and a decrease at an untreated location. The former is important because bicycle-motor vehicle crashes often involve either a left-hand turn, where a vehicle turns directly into the path of a cyclist going the opposite direction, or a right hook, where the vehicle passes the cyclist going in the same direction and then immediately makes a right turn into the cyclist's path. Surveys indicated that both motorists and cyclists perceived the intersections to be safer following installation of a bike box – 42 percent and 77 percent, respectively. But perhaps what is most important is that 86 percent of the motorists indicated they understood the purpose and use of the treatment (National Committee on Uniform Traffic Control Devices, 2014).

Improving Intersection Safety

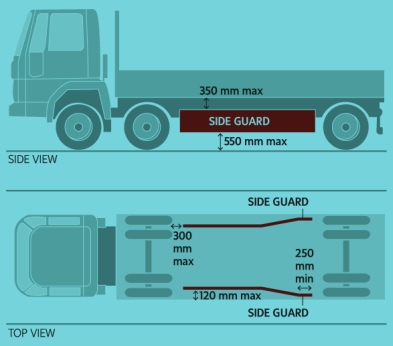
Bike boxes help improve safety at intersections, but so too does overall intersection design. Communities with a higher density of intersections have fewer severe crashes for all modes (Marshall and Garrick as cited in ABW, 2016), but intersections that do not meet at right angles are particularly problematic for bicyclists. Researchers examining bicycle and car crashes in New York City found that 60 percent occurred at intersections. When examining these crashes by intersection type – right angle versus non-right angle – the latter were 37 percent more likely to result in serious injury for cyclists. Visibility appears to be a key issue – when intersections are not right angles, the distance drivers can see decreases significantly (Fox News, 2016).

Encouraging communities to adopt design standards that consider all roadway users is important for addressing dangerous intersections and other roadway segments. SHSOs can help by encouraging state, county



Low Cost Devices Reduce Bicycle/Truck Collisions

Nearly half of bicyclists killed by a large truck first strike the side of the vehicle. Two low cost, but highly effective measures for protecting bicyclists are truck side guards and convex and cross-over mirrors. Side guards are panels installed between the truck's wheels to prevent bicyclists from being pulled or swept under the vehicle during a side-impact crash. Convex mirrors help drivers see down the entire length of a vehicle from 3-feet and up, while cross-over mirrors help drivers see bicyclists in their front blind spot, from 3-feet above the front bumper to where a direct line of sight is possible. The cost to install side guards ranges from $600 to $2,500, while mirrors run about $100.



A United Kingdom study evaluating the effectiveness of side guards, found that bicyclist fatalities fell 61 percent in side-impact crashes (Vision Zero Network [VZN], 2016). There are no U.S. regulations requiring the use of side guards and convex or cross-over mirrors. However, the cities of Boston, New York, San Francisco, and Seattle are taking steps to equip their fleets with these proven devices (USDOT, 2016d; VZN, 2016; NYC DOT, 2017).

and local departments of transportation to utilize design guides that take an inclusive approach to transportation. NACTO's Urban Street Design Guide and Urban Bikeway Design Guide, for example, offer guidance for reimaging and reorienting streets as safe places for people who bike, walk and drive.

Reconfiguring every intersection, however, is not only expensive, but unlikely to happen or happen quickly. Recognizing the time and expense associated with making roadway improvements, SHSOs are also encouraged to work with law enforcement, schools, and bicycle and community groups to educate cyclists and drivers of all ages about intersection safety with a focus on awareness. Obeying signs and signals is critical, but so too is being alert when it comes to other traffic. Bicyclists should never assume that motorists see them or know what they are going to do next and be especially attentive when riding near trucks or buses. Wearing reflective clothing and equipping bicycles with reflectors, lights and other approved devices will enhance bicyclists' conspicuity to others, which is essential since many bicycle-motor vehicle crashes occur after dark.

Non-motorized users also need to be particularly cautious at signalized intersections that allow motorists to turn right on red. Studies conducted after states first adopted this provision found that bicyclist/pedestrian-motor vehicle collisions increased by 43 to 123 percent (Zadar; Preusser et al. as cited in IIHS, 2016b), and in 93 percent of right turn on red crashes pedestrians and bicyclists sustained injuries (NHTSA as cited in IIHS, 2016b). Educating motorists to come to a complete stop and specifically look for bicyclists and pedestrians before proceeding could help reduce collisions.

Complete Streets

Roadway design should take into account how people need and want to travel. Since 2004, more than 1,000 state, county and municipal agencies have adopted Complete Streets policies. The concept is simple – Complete Streets are designed for everyone, which means that people and places are integrated into the planning, design, construction, operation, and maintenance of the roadway system. The focus is on ensuring streets are safe and accessible for all roadway users regardless of mode, age and ability. There is not, however, a single Complete Streets design, rather the elements are determined by a community's political, social and economic context. Complete Streets may include sidewalks, bike lanes or wide paved shoulders, bus lanes, comfortable and accessible public transportation stops, plenty of places for safe crossing along with median islands and curb extensions, narrower travel lanes, roundabouts, and many other features. What is consistent regardless of whether a Complete Streets policy is adopted in a large city or a rural community, is a balance between safety and convenience for all (Smart Growth, 2017).

Educating motorists to come to a complete stop and specifically look for bicyclists and pedestrians before proceeding could help reduce collisions.

SHSOs, working collaboratively with departments of transportation, planners, engineers, advocates and community members, can play a pivotal role in helping to educate policy makers at all levels of government about the impact adoption and implementation of Complete Streets policies can have on safety. This is vitally needed since most elected officials do not have expertise in traffic safety or transportation and are juggling a myriad of competing interests. Equally important is educating the public about how to take full advantage of roadway improvements once a project is completed.

Before beginning work on a Complete Streets project to improve Fletcher Avenue in the City of Tampa Bay, the Florida Department of Transportation (FDOT) conducted research to fully understand the wants, needs, values, motivators, and barriers of those who use the roadway. The corridor is heavily transit-oriented; 67 percent of the users do not have access to a vehicle and live within one half mile of the roadway. Observational and behavioral surveys and in-depth interviews conducted before work began, found that while more

than 75 percent used crosswalks, nearly half did so improperly as well as felt unsafe crossing. Twenty-five percent felt slow changing signals were barriers to crossing along with the location of crosswalks (Lester et. al, 2016).

Observations and surveys were conducted immediately after completion of the project, which included the installation of mid-block crossings with Rectangular Rapid Flash Beacons, raised refuge islands and traffic separators, marked bicycle lanes and wrong way bicycle signs, and LED street lighting and enhanced landscaping, along with a reduction in the speed limit from 45 to 35 mph. While crosswalk use fell nearly 4 percent, other findings were positive. Adherence to the crosswalk signal and use of the signal button increased 9 percent and 7 percent, respectively. Helmet use by bicyclists increased slightly more than 2 percent, riding on the sidewalk dropped by nearly 7 percent and cycling on the street with traffic jumped by nearly 10 percent (Lester et al., 2016). But most importantly, pre- and post-fatality data indicate a drop from 48 pedestrian deaths in the year prior to the completion of the project to 25 the year after (Smith, 2017).

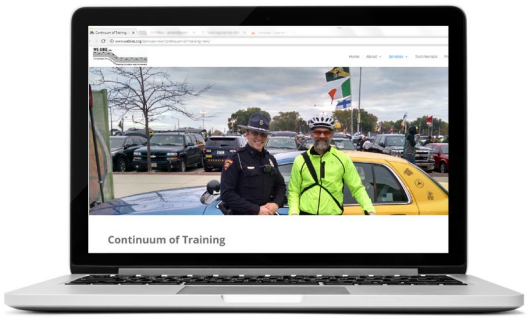
The takeaway for SHSOs is that roadway improvements alone do not necessarily change behavior. Rather, coupling that investment with educational strategies and messages targeted to roadway users can help to influence behavior change. One of the interesting findings gleaned from the pre-project interviews is that Fletcher Avenue users are interested in learning about crosswalk safety from on-street ambassadors. Comments heard during the in-depth conversations included: conduct "public outreach by walking the streets," "give out safety items, vests and lights," and keep doing "what you are doing – talking…[with] the same people every day" (Lester et al., 2016).

Effective Enforcement Starts with Training

Effective enforcement of bicycle safety laws starts with officer training. Most police officers, however, receive little if any training on traffic safety laws as recruits and once on the job are likely given no or limited direction by leadership to focus on non-motorized users. "Cops don't enforce laws they don't know and won't enforce laws they can't defend," pointed out Peter Flucke, President of Wisconsin-based WE BIKE, etc. which has delivered bicyclist and pedestrian safety training to law enforcement officials in more than 30 states (some through SHSO-provided funding). That fact, coupled with a lack of support from the top and an understanding of how officers should prioritize their time to focus on those most at risk, reinforces the need for training.

This presents an opportunity for SHSOs to partner with state and local law enforcement agencies to fill this gap. As discussed earlier in this report, Section 402 and 405(h) funds may be expended to support bicyclist safety training for police officers that addresses state laws and their enforcement. But what should this training look like?

Training should start not with an overview of bicycle safety laws, but an in-depth discussion about the leading causes of local bicycle-motor vehicle crashes. How else would an "officer know which laws to enforce to keep bicyclists safe?," asked Flucke, who is a former law enforcement officer. Coupled with that, he pointed out, is that police must understand that the definition of traffic includes bicyclists and pedestrians and that protecting and serving the "most vulnerable" roadway users is part of their job.



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"If we get it right for these folks, who are at higher risk for serious injury or death, it benefits all," he explained. When police adopt that mindset, he added, and "can clearly articulate it when making a traffic stop," it defuses any issues associated with race, ethnicity or mode. This is particularly critical in today's environment where traffic stops have escalated into violence, even death, leading to charges of police harassment and undue force.

Therefore, training is not only important, but essential. The challenge comes with finding the time and resources to make it happen. Many law enforcement agencies are asking officers to work more or longer hours due to manpower and/or budgetary issues. These resource issues can be addressed through a continuum of training approach that uses a variety of cost-effective media to reach the most officers in ways that best meet their learning styles. It is designed to give officers basic knowledge about bicyclist (and pedestrian) safety (step 1) and tools to educate others (step 2), recognizing that not all will become fully versed in the subject. Those who do, typically several officers, will complete the remaining steps (3-6) and become an agency's experts and advocates for bicyclist safety. The six-step continuum includes (WE BIKE, etc. 2017):

1. *Distributing a brochure (print copy or electronic version) addressing bicycle (and pedestrian) safety through enforcement of relevant state laws to all officers, with a requirement to thoroughly review the content. This requires minimal effort and cost on the agency's part and conveys to officers their leadership's support of bicyclist safety. Click here for an example developed for officers in New York.*
2. *Providing the means – ordering instructions, funding, suggestions for their use – for officers to obtain and distribute local, state and/or national bicycle safety materials (e.g., brochures, posters, flyers, stickers, pocket guides, coloring books) to community members during a traffic stop, an interaction with a bicyclist or motorist, or in conjunction with a school visit or community-based event. Click here for an example of a pocket guide developed for Oregon bicyclists.*
3. *Showing a short bicycle safety video targeted to law enforcement during roll call to prompt discussion and best practice sharing among officers. Click here for an example developed for officers in Florida.*
4. *Making available self-paced, interactive bicycle safety enforcement training that can be used to broaden officers' knowledge while fulfilling continuing education or in-service credit requirements. NHTSA is updating its 2-hour, video training for delivery via a Web-based platform. Click here to access NHTSA's training via the Georgia Bikes website.*
5. *Offering more intense training (typically 2 days) that includes both classroom and on-the-road components that help officers gain an in-depth understanding of the five W's (who, what, when, where, and why) and the how of bicycling and*

Tips for Citing Bicyclists and Motorists

The following tips are provided courtesy of the Chattanooga Police Department (2015), which has been operating a safe bicycling initiative since 2014:

- *Complete the stop like any other traffic offense.*
- *Quote the specific law that the bicyclist or motorist has violated. Many offenders do not fully understand or know the law; they will have the opportunity to contest the citation in court.*
- *Consider issuing a warning, with educational information, rather than a citation for a first offense. The fact that the bicyclist or motorist was stopped may prompt behavior change.*
- *If the violator is a minor, the warning or citation should be directed to the parent or guardian.*
- *Use discretion! Bicyclists are not required to carry identification, but they are required to comply with an officer's request for ID when detained for a traffic violation. If the violator cannot be identified, a citation cannot be written which could result in arrest if it is a state offense.*

walking; the connection between engineering, education and enforcement; how crashes happen; laws; crash investigation and reporting; collaboration with community partners; and other pertinent topics. Click here to access information about Watch for Me NC's bicycle and pedestrian safety program, which included 2-day training for law enforcement (developed by WE BIKE, etc.). An officer's bicycle safety enforcement pocket guide can support this training in the field. Also, instructor training for officers who have completed the entire continuum of training can make this program self-sustaining for departments, counties, regions, and/or states.

6. *Conducting a bicyclist safety enforcement exercise such as a bike light giveaway in partnership with a local organization or a safe passing operation to provide officers the opportunity to put the knowledge gained through classroom training into practice.*

For those officers who participate in step 5, one of the most important and enlightening activities is conducted on bicycles. Students ride through a neighborhood focusing on basic skills and eventually progress to collector and arterial roadways. This is what Flucke refers to as the "crux" of the ride, where the officer is thinking why would a cyclist ride here. The goal of the exercise is to help police officers understand why cyclists make certain choices, and that sharing the road with motor vehicles can be done safely.

Flucke also stresses the importance of including an enforcement operation in the training. "You wouldn't want to work with an officer who learned to shoot a gun by watching a video. The same holds true for enforcing bicycle safety laws." To that end, officers learn about where to position themselves to spot violations, how to issue a citation and what to address in court if the violation warrants the officer's appearance (see the side bar tips for citing bicyclists and motorists).

Discussion also focuses on why people change their behavior and tactics for engaging with a violator. Officers are encouraged to humanize the encounter with the driver, bicyclist or pedestrian by pointing out the risk (doing this is unsafe), the lack of courtesy (would this occur if the violator were engaged in some other activity such as standing in line for a movie) and that what he or she did is against the law (the financial pain or embarrassment associated with a ticket). "One of those three points is likely to resonate with the offender," Flucke added.

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Putting Training into Practice

Once officers are trained, they have the knowledge and skills to enforce bicycling safety laws. What that enforcement looks like will likely vary from department to department. For some, it may involve officers enforcing bicyclist safety laws as part of their daily routine, and/or educating children and/or adults through daily interaction on the street or via community or school-based events. For others, officers may be deployed to conduct special patrols and/or operations or to conduct high visibility enforcement activities that also include public outreach and education and/or earned and paid media. Regardless of the scope and size of these activities, the goal should be to decrease crashes, increase motorist and bicyclist understanding of laws and safe driving/riding practices along with cooperation between these groups, and to build trust between bicyclists and law enforcement.

This last point merits additional discussion. Representatives of bicycling groups interviewed for this report want police officers to enforce traffic laws, including

laws violated by cyclists. However, they also point out the need for equity – enforcement and education should be equal for both bicyclists and motorists, and race should never be a factor. An investigation in Tampa (FL), for example, found that police issued 80 percent of bicycle citations to African Americans, who represent only a quarter of the city's population (Zayas & Stanley as cited in ABW, 2016). And in New York City a study revealed that neighborhoods receiving the most citations for riding bicycles on sidewalks were predominantly Hispanic or African American, while those given the least were primarily White (Levine & Siegel as cited in ABW, 2016).

Working with the cycling community and neighborhood organizations to make them aware of ongoing or special enforcement activities, including where they will take place and why, will go a long way in garnering their support and eventual trust. Sharing crash and causation factor data and other information used to determine hot spots or high-crash corridors will facilitate better understanding of the bicyclist safety problem and the need for enforcement and education. But so too will asking for their input to identify problem intersections or roadways and to help educate members or residents about safe riding practices.

The Chattanooga (TN) Police Department (CPD) made outreach to local cycling organizations a cornerstone of its citywide safe biking initiative. Launched in 2014, the program involved three phases: educating motorists about bicyclists' rights (phase 1), educating bicyclists about their responsibilities (phase 2), and enforcing traffic safety laws regardless of mode (phase 3). All officers participated in training that addressed bicycle laws and crash causation factors. (It is interesting to note that officers must complete monthly online training, which includes bicycle safety.) The latter was determined through a detailed analysis of bicycle crash data and report narratives, which revealed that bicyclists were at-fault in approximately 65 percent of the crashes (R. Simmons, personal communication, June 12, 2017).

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To garner the cycling community's support, officers joined in group rides and bicycling safety events. They also conducted roundtables at a neutral, relaxed site, in plain clothes and used nomenclature such as *people who bike or drive* to make the participants feel more comfortable and encourage dialogue. A clear and dependable channel of communication was established between bicyclists and law enforcement that included providing the lead officer's email address and telephone number to all riders who wanted to help with the initiative. In addition, cyclists were invited to submit queries via the department's Facebook page with a guarantee that they would be answered within 24 hours. Any problems or incidents that occurred due to the initiative were personally handled by the lead officer with follow-up directly to the complainant. CPD even designed a cycling jersey that featured a 3-feet graphic on the back to remind motorists of the state's safe passing law and law enforcement's support of cyclists.

As a result, cyclists asked how they could help. Their support and engagement (educating members, publicly supporting the initiative) was key since the CPD not only stopped motorists who failed to give cyclists a safe passing distance, but also bicyclists who were not riding in the proper lane, failed to signal or did not comply with a traffic control device. Education rather than issuing citations was the focus of the enforcement operations, but violators were ticketed if they were argumentative with the officer. The effort proved successful. A comparison of 12 months of crash data before and after the initiative found that bicycle-motor vehicle crashes fell 26 percent, while crashes resulting in injuries or property damage dropped 23 percent and 40 percent, respectively (CPB, 2016). To learn more about Chattanooga's safe biking initiative, contact Rob Simmons.

Bicycle/Pedestrian Focused High Visibility Enforcement

Between 2011 and 2015, Florida recorded an average of 6,522 bicyclist crashes annually resulting in approximately 6,116 injuries and 132 fatalities. That represents 2.1% of all crashes, 2.89% of all injuries and 5.21% of all fatalities during this five-year period. While Florida's population has grown, topping more than 20 million residents in 2015, it also hosts more than 113 million visitors annually (McPherson, personal communication, June 22, 2017). In 2015, Florida had the nation's highest proportion of bicyclist fatalities – 7.4% of all traffic-related deaths – compared to all other states (NHTSA, 2017a).

Bicyclist safety is addressed in Florida's statewide Pedestrian and Bicycle Strategic Safety Plan (PBSSP), which was developed by a multi-disciplinary coalition hosted by the Florida Department of Transportation (FDOT) and unveiled in 2013. The data-driven PBSSP takes a comprehensive 4 E approach (including emergency services) to reduce traffic crashes resulting in serious and fatal injuries to bicyclists and pedestrians. The Law Enforcement and Emergency Services Emphasis Area of the PBSSP includes a high visibility enforcement (HVE) program, funded through the SHSO and coordinated by the University of South Florida. It is targeted equally at bicyclists, pedestrians and motorists who violate traffic laws and designed specifically to protect the state's most vulnerable roadway users. A total of $2.05 million was allotted for the FY 2016-17 program (Center for Urban Transportation Research [CUTR], 2016).

To qualify for these funds, law enforcement agencies must be located in one of the state's 20 priority counties that have the greatest number of traffic crashes resulting in bicyclist and pedestrian fatalities. Since FDOT provides educational materials and support at no cost to all participating agencies (ensuring consistency of messaging), grant funds are designated for overtime enforcement operations only. To qualify, an enforcement agency must (FDOT/CUTR, n.d.):

- Certify that all officers participating in the HVE activities complete four training courses – NHTSA's self-paced Pedestrian and Bicycle Safety Training for Law Enforcement programs (accessed through the National Law Enforcement Academy Resource Network) and Alert Today Florida's Cycling Safety and Pedestrian Safety for Law Enforcement roll call videos
- Conduct repeated overtime enforcement operations following a progression of education, warning and citation in problematic locations identified through crash data. The emphasis is on education, with officers issuing warnings and citations as a last resort.
- Distribute Florida's Alert Today, Alive Tomorrow campaign educational materials as part of all enforcement contacts with roadway users.
- Provide a bicycle light to those cyclists who cannot purchase one and are stopped for failing to comply with Florida's bicycle light law. (A bike must be equipped with a front, white light and a rear, red light and reflector for nighttime riding per state law.) Crash data indicate that lower socioeconomic areas have a high rate of non-motorized/motor vehicle crashes and nearly three-quarter of all traffic crashes resulting in a bicyclist or pedestrian fatality occur at night.
- Distribute at least two press releases (but more are recommended), the first at the start of HVE activities and the second when officers move from issuing warnings to citations.

The data-driven Pedestrian and Bicycle Strategic Safety Plan takes a comprehensive 4 E approach (including emergency services) to reduce traffic crashes resulting in serious and fatal injuries to bicyclists and pedestrians.

Participating agencies are required to submit detailed records for all enforcement activities that include: the location, time and date of all operations; officers assigned; safety issues addressed and enforcement approaches used; number of contacts, warnings and citations issued to the three modes via the appropriate statute; and educational materials distributed.

The HVE initiative does not limit officers only to distributing educational materials and bike lights. Alert Today Florida also works with community partners to reward safe behavior through a positive reinforcement pilot conducted in areas overly represented in crashes involving bicyclists and pedestrians.

One of the agencies participating in the positive reinforcement pilot is the Hillsborough County Sheriff's Office, which serves the Tampa Bay area. Officers distribute Chick-fil-A gift cards, donated by the restaurant chain, to motorists observed stopping for pedestrians in the crosswalk and sharing the road with bicyclists, pedestrians using the crosswalk with the walk signal, and bicyclists using bike lights at night and following traffic laws (the behavioral objectives of the HVE initiative). The goal is to change the culture by incentivizing safe behavior in lieu of punishing bad behavior (FDOT, 2015).

The positive reinforcement pilot appears to be working. During a 2-month period, officers in the participating communities conducted 32 details, resulting in nearly 2,000 contacts and the distribution of 543 gift cards (an average of 17 per detail). But more importantly, officers observed a greater driver yielding rate, a 2 percent increase in bicyclists riding with motor vehicle traffic, and a 1 percent increase in pedestrians crossing within the crosswalk. Overall, the positive reinforcement pilot sparked a combined decline in bicyclist and pedestrian crashes and fatalities of 5.4% and 11.7%, respectively (McPherson, personal communication, June 22, 2017).

Addressing Speeding, Red Light Running, and Distracted & Impaired Driving

Bicyclists and all roadway users also benefit from enforcement of other traffic safety laws, particularly those addressing speeding, red light running, and impaired and distracted driving. As discussed earlier in this report, lower speed limits impact a non-motorized user's survival rate in the event of a collision with a motor vehicle. They also play a role in bicyclists' perceptions about the safety of a roadway. A bicyclist on a street with a high traffic volume moving at a low speed may be more comfortable riding there, than on a roadway with fewer vehicles that are traveling at much faster speeds (Poole, 2012).

Red light running, like speeding, can be deadly. In 2014, 709 people were killed – more than half were bicyclists, pedestrians and people in other vehicles – and approximately 126,000 injured by red light runners in the U.S. An IIHS study of urban crashes found that drivers who ran red lights, stop signs and other traffic control devices were the most prevalent type of crash (22 percent) (IIHS, 2016b). Despite most drivers (92.8%) indicating that red light running is unacceptable, more than one-third admitted to doing it in the past month (AAA Foundation for Traffic Safety [AAA FTS], 2017).

Including speed and red light running enforcement in a patrol officer's regular duties is critical for preventing crashes and saving lives. Under New York City's Vision Zero initiative, the city's police department (NYPD) manually issued 137,256 speeding summons in 2016, a 78 percent increase over the five year average prior to the program. Failure to stop at a traffic signal accounted for another 59,187 citations. Particularly noteworthy is the role automated enforcement plays in this effort. The city's speed cameras, which are allowed only in school zones, issued over 1.3 million notices in 2016. Red light cameras are also

States Encouraged to Leverage Automated Enforcement

GHSA supports the use of automated enforcement to combat speeding, red light running and other unsafe behaviors that put bicyclists as well as all roadway users at risk. Automated enforcement should be used in combination with engineering analyses and public information campaigns, as part of the coordinated implementation of a state's SHSP. It should be used at high crash locations as a supplement to rather than a replacement for law enforcement personnel. Revenue generated from this technology should be used solely to fund highway safety initiatives and not for other purposes (GHSA, 2017b).

in use at 150 intersections (the maximum number allowed by state statue) which represent approximately one percent of the City's 12,700 signalized intersections. The number of Notices of Liability (NOLs) each camera issues daily fell from 32 in 1994 (the first year of the program) to just eight in 2015 – a 75 percent decline. Right angle crashes and the resulting injuries at these intersections fell at similar rates – 62 and 76 percent, respectively – when comparing pre- and post-camera crash data (NYC DOT, 2017).

The FARS data analysis conducted for this report clearly shows that alcohol impairment directly impacts bicyclist safety. States are encouraged to analyze their crash and citation data to identify locations where enforcement of impaired driving laws also has the potential to reach intoxicated bicyclists. In addition, the 22 states that qualified for the 2017 Section 405(h) non-motorized grant would benefit from examining their fatal and serious injury crash data to determine the rate of bicyclist impairment along with the applicability of their state DUI laws to cyclists. Two of the four states with BUI laws – California and Delaware – qualified for 405(h) funds, but it is unknown if any of these dollars will be used for enforcement or education initiatives associated with this statute.

As for distraction, more than two in three drivers reported talking on a cell phone in the past month and one in three did it regularly, despite strong disapproval of the practice. Texting while driving is also viewed as unacceptable by most drivers, but 31 percent admitted to sending a text message or email and 40 percent said they read a text or email while driving in the past month (AAA FTS, 2017). NHTSA-funded state and regional demonstration research projects confirm that high visibility enforcement results in a reduction in texting and/or cell phone use. Sustaining this effort is critical for making long terms gains in changing the safety culture.

The NYPD includes regular enforcement of the state's texting and hand-held cell phone bans as part of the city's Vision Zero initiative. The number of texting citations increased from a three-year, pre-Vision Zero (2011-2013) average of 10,693 to 46,629 in 2016. Cell phone citations, on the other hand, fell from a three year, pre-Vision Zero average of 143,552 to 75,898 in 2016 (NYC DOT, 2017). This decrease is the result of motorists using hands-free devices in lieu of hand-held, resulting in fewer violators. Additionally, the NYPD continually reviews crash and citation data and refocuses its enforcement efforts based on what will have the greatest impact on traffic safety (Alsop, personal conversation, June 1, 2017).

While there are currently no prohibitions against distracted bicycling, cyclists do admit to using their phones will riding (as previously discussed on page 19). As noted earlier, states are encouraged to review and refine their crash reports to ensure

Ticket Diversion Programs for Motorists & Bicyclists

When police in Madison, Wisconsin – home to the state's university and a large bicycling population – conduct bike safety enforcement using Section 402 grant funds provided by the SHSO, motorists who fail to yield to pedestrians at crosswalks and bicyclists caught violating the law receive a ticket and information about a pedestrian or bicyclist safety class. When appearing in court, the offender is assigned to the class by the Municipal Judge. Upon completion of the no-fee class, a bicyclist's ticket is dismissed, while a motorist's fine and penalty points are reduced.

Facilitated by Arthur Ross, the City's Bicycle/ Pedestrian Coordinator, the bicycle course delves into predictability, visibility, conspicuity, hazard recognition and avoidance, and defensiveness versus aggressiveness. A common point of discussion is wrong way riding. Motorists learn about the city's multi-modal goals which include ensuring the safety of all roadway users, and how the issue is raised regularly with elected officials. Laws are reviewed, with a focus on right of way and the responsibility for looking out for others.

California had allowed only motorists to participate in ticket diversion programs, but that changed in 2015 with enactment of A.B. 902. Removal of the prohibition is a big deal, since a bicyclist charged with a moving violation pays the same fine as a motorist, which can be hundreds of dollars. Until passage of the law, there were only a handful of diversion programs in the state.

At the University of California Davis (UC Davis), which has its own police department, bicyclists cited for a traffic violation may complete an online Bicycle Education and Enforcement Program (BEEP) within 14 days of receiving the citation, pass a test and have their fine waived. The program costs $70 for offenders, but is free for bicyclists who want to take it for educational purposes. The fee supports the program as well as funds an on-campus program to provide bike lights to students who need them. More than 1,600 people have completed BEEP for ticket diversion purposes, with another 2,300 enrolling to enhance their knowledge and skills (Curry, 2017a).

Giving bicyclists the opportunity to take a class and avoid paying a fine is a significant benefit and included in NHTSA's Countermeasures that Work, 8th Edition (see Chapter 9, pages 9-29/30). Advocates point out, however, that they also provide an opportunity to educate and inform bicyclists about safe riding practices and to strengthen relationships between police, the public and bicycle advocacy organizations (Curry, 2017b). The former is key since most bicyclists have never received formal safety training (Schroeder & Wilber, 2013).

they are capturing as much information as possible regarding bicyclist-motor vehicle crashes to fully understand and appropriately address these collisions. The MMUCC 5th edition, released in the summer of 2017, includes guidelines on collecting more data on distraction for motorists and non-motorists.

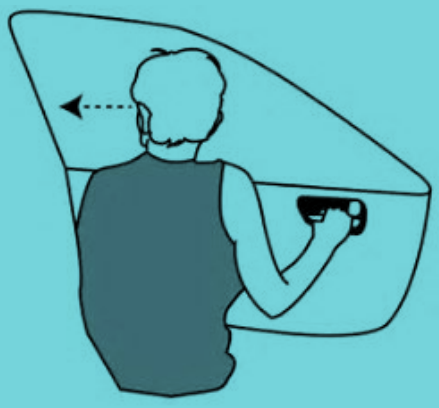
Educating Motorists & Bicyclists

A comprehensive approach to bicyclist safety should include education and training for both motorists and cyclists. The good news is that NHTSA, the American Driver and Traffic Safety Education Association (ADTSEA) and state motor vehicle agencies recognize the importance of educating drivers about sharing the road with bicyclists. NHTSA's Uniform Guidelines for State Highway Safety Plans, Guideline 14 (Pedestrian and Bicyclist Safety) expressly call on states to include driver training, rules of the road, sharing the road, and the dangers posed to non-motorized users by aggressive and speeding drivers in communications, public outreach, and driver education and licensing programs. ADTSEA's 3.0 Novice Driver Curriculum includes a unit on *Sharing the Road With Other Users*, with components specifically addressing bicycles.

It is not uncommon, particularly following a fatal crash, for legislation to be introduced in a state house calling for the inclusion of bicyclist and/or pedestrian safety information in driver education courses and novice driver training materials. An online search of state novice driver licensing manuals found that bicyclist and pedestrian safety laws are covered in many these publications along with tips for safely sharing the road, while some also include information about bicyclist specific signage and their right to the road. However, the extent to which this information is addressed in driver education curricula as well as driver licensing exams and behind-the-wheel tests is not known. SHSOs are encouraged to explore this issue and make recommendations to the appropriate administrative bodies.

Driver education professionals working with teen drivers through high school, community-based or commercial programs are seeking information, resources and training that will help them help their students build skill and become safe drivers. SHSOs are encouraged to partner with bicycle coalitions to offer workshops and email updates for these educators that discuss sharing the road with non-motorized users, the rights of bicyclists and applicable laws, how bicycle infrastructure works to improve safety (e.g., bike boxes, bicycle signals, bike lanes, sharrows), and the leading causes of bicycle-motor vehicle crashes based on local and state crash data and how to prevent them.

One-hour training for driver education professionals is offered through Wisconsin's *Share and Be Aware* bicycle and pedestrian safety program. Educators who complete the training report incorporating 60 rather than 30 minutes of bicyclist and pedestrian safety information into their classroom driver education programs. In 2015, 288 instructors received training and subsequently shared what they learned with nearly 16,000 novice drivers (Fischer et al., 2016).



Teaching Drivers the Dutch Reach to Prevent Dooring

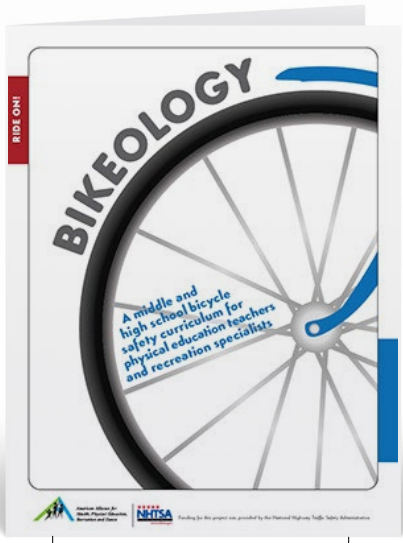
Getting hit by an opening car door – dooring – is a fear of most bicyclists, especially on roadways with on-street parking. It is a common problem, but there is a simple solution, the Dutch Reach. The practice – which drivers in the Netherlands are trained and tested on prior to licensure, hence the name – calls for reaching over and using the right arm rather than the left to open a car door. (This applies to passengers, too. A passenger on the right side would use his left arm, and vice versa.) Doing so requires the driver to turn or swivel so that his/her head and shoulders are looking back. That simple action makes it easy to see oncoming bicyclists and other vehicles through the side mirror before opening the door. Teaching novice and seasoned drivers to do this here in the U.S. could save lives. So far, Massachusetts has added the technique to its driver's manual. Click here to watch a short video demonstrating the technique.

The U.S. could learn a lesson from the Netherlands, a nation known for its bicycling culture. There, children start their cycling education at five years of age and continue through age 12, when they must pass a test demonstrating that they can ride safely and comfortably in traffic.

When to Start Educating & Training Bicyclists

There is general agreement that more can and needs to be done to educate motorists about bicyclist safety. This education needs to start not when a teen is learning to drive, but at a much earlier age – when first learning to bike. Traffic safety education is not required curricula for U.S. students, which means that it must compete for attention in a busy school day. As more communities adopt and implement Complete Streets policies, which call for infrastructure for all modes, and more schools join the Safe Routes to School movement, safe bicycling education is essential. Cyclists and pedestrians who are "educated to interact in a safe and predictable manner with… [motor vehicles]… are likely to be better accepted as part of the normal traffic stream" and that acceptance will lead to non-motorized users enjoying "greater safety and equity" on public roadways (Pion & Cline, 2016).

What will it take to make traffic safety education (or, at a minimum, bicyclist safety) a priority in schools? The U.S. could learn a lesson from the Netherlands, a nation known for its bicycling culture. There, children start their cycling education at five years of age and continue through age 12, when they must pass a test demonstrating that they can ride safely and comfortably in traffic. By the time these trained cyclists reach the legal age to obtain a driver's license, they have used bicycles as their primary transportation mode for years (Powers as cited in Pion & Cline, 2016). The training appears to be paying off, according to Dutch officials "the nation's per capita traffic fatality rate is the lowest in the world" (Miller as cited in Pion & Cline, 2016). It merits noting, however, that bicycling in the U.S. and the Netherlands differs in where cyclists may ride – Dutch cyclists are prohibited from using the road if an alternative facility exists, but they do have priority where bike lanes and roadways intersect (Pion & Cline, 2016).



U.S. Bicycle Safety Programs for Children

There are programs in the U.S. designed to teach children safe cycling, but none meet the rigorous standards set by the Dutch. For instance, FHWA developed the age-specific *Bicycle Safer Journey* for delivery by teachers, parents or other adults in a classroom or one-on-one. It consists of three videos – one for three different age groups (5 to 9, 10 to 14, and 15 to 18) – along with a quiz or discussion guide and a resource library that is designed to introduce bicycle safety skills or supplement another curriculum. The program does not include a riding component.

NHTSA partnered with SHAPE America (Society of Health and Physical Educators) to develop Bikeology, a ready-to-use bicycle safety curriculum for physical education teachers and recreation specialists working with students in grades 6-12. The two-part curriculum (which includes advanced skills on-bike) aligns with the K-12 national physical education standards and includes lessons and assessment for the skills and knowledge students need to enjoy a lifetime of safe bicycling. It also includes a guide designed to help parents support safe bicycling along with guidance on selecting an appropriate bicycle and helmet for their children (SHAPE, 2017).

NHSTA partnered with SHAPE to develop Bikeology, a ready-to-use bicycle safety curriculum for physical education teachers and recreation specialists working with students in grades 6-12.

Riding is critical for teaching children key traffic safety principles. According to John Forester (2014), who is considered the father of vehicular cycling, there are five tenets of safely and effective bicycling in traffic:

1. *Always ride on the right with traffic, not against it.*
2. *At the approach to a larger road, or one carrying more or faster traffic that has a stop or yield sign, obey the sign.*
3. *When moving from left or right on a roadway, yield to the traffic in the new line of travel.*
4. *At an intersection, position yourself in the direction you want to go.*
5. *Between intersections, position yourself according to your speed, with slower vehicles on the right, faster on the left.*

Forester contends that a "cyclist who rides in this way will not cause any car-bike collisions" (2014). Teaching these principles requires not only explanation, but demonstration which can only be done effectively on a bicycle and on a roadway. For children, telling and showing followed by repeated practice is critical. For this reason, SHSOs that fund or are considering funding bicycle safety programs should carefully review the curriculum to ensure that it includes an on-bike/ on-road component and what will be addressed. There are far too many bicycle safety education programs for children and youth to discuss and/or list in this report. One that was identified through the GHSA survey of SHSOs, and is having a positive impact at the community-level, is detailed on the next page.

Bike Sense

Bike Louisville's Bike Sense program is taught on bicycles. Designed as a series of five 30-40 minute lessons, it is delivered through physical education classes to students in grades 3-5. Students learn how to ride bikes for transportation and fitness, especially to and from school; safe riding skills and proper equipment use, with an eye toward addressing typical childhood crashes (falls due to lack of control, balance and/or riding too fast); new skills such as racing; how to maintain a bicycle and make minor repairs; and basic safety and first aid techniques. While students are asked to bring their own equipment to school (a bike and helmet), a fleet of bikes and color-coded helmets (to delineate size) are available (hairnets/shower caps are also provided).

"We teach the first class and then turn it over to the teacher," explained Rolf Eisinger, Louisville's bicycle and pedestrian coordinator and the program's architect. Before delivering Bike Sense, teachers (and others including police, bike club members, and community volunteers) participate in a one-day, 6-hour certification training, where they review the curriculum, equipment needs and the setting for each lesson, and techniques for teaching bicyclists with a focus on first-time riders. All Bike Sense lessons are designed to be conducted on school grounds, preferably outdoors, but a gym or large multi-purpose room can be used if necessary.

Teachers are encouraged to think creatively about how to use the existing environment to engage and educate students, and asked to administer a pre- and post-test to gauge improvement in students' knowledge of key concepts. The findings are positive, students are learning to bike safely – many as first time riders – and learning about cycling's appeal to get around and be healthy. School administrators praise the program and have asked for a high school curriculum that is rider-focused.

The program began in 2010 with a single school and has grown to include slightly more than a third (35) of Louisville's elementary schools. Currently, 40 teachers are trained to facilitate the program that has educated approximately 4,000 students. The program is also offered through summer camps and community centers, promoted by Bike Louisville in partnership with the Police Department's Community Policing Division. As police officers interact with children in neighborhoods across the city, they distribute flyers announcing the location of the nearest Bike Sense program. Many of these interactions are posted on the Bike Louisville and Cops for Kids Facebook pages to increase program awareness.

Funding for the program has come from a variety of sources including a state grant, share the road license plate fees, and city revenue. Future funding is uncertain, although a full-time city employee (formerly a volunteer) was hired last year to oversee the program and is supported by two interns during the Summer Bike Sense program.

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Bicycle Safety Education for Adult Riders

The safe bicycling skills learned as a child can help that rider as he or she transitions to driving. But an adult who has not ridden for many years or is new to cycling needs training, too. As one long-time bicycle educator put it, "many adults' bike-riding skills are frozen in time," so they ride like children rather than grown-ups (Pion & Cline, 2016). A national survey of bicyclists found that just 8 percent indicated that they had received safety training in the past five years (Schroeder & Wilbur, 2013). That finding coupled with Geller's bicyclist typology that identifies 60 percent of bicyclists as *Interested But Concerned* clearly points to the need for more widespread and compelling promotion of the benefits of bicycle education and training.

The League of American Bicyclists (LAB) developed the nation's first comprehensive bicycling education program, Smart Cycling (formerly Bike Ed). LAB's adult course (for riders 14 years of age and up), *Traffic Skills 101*, is taught by certified instructors and includes guidance in the basic principles of vehicular bicycling. Nine hours in length, students receive four hours of classroom instruction and discussion that covers: choosing your bike, conducting a pre-ride safety check, basic maintenance, clothing and equipment including helmets, and handling basics (e.g., gears, starts/stops, steering, scanning, signaling). The remaining five hours are conducted on-bike and focus on the rider's role in traffic (including laws and safely changing lanes), crash prevention, hazard avoidance techniques, riding enjoyment and etiquette, and how to safely share the road with motorists, including common cyclist errors. All riding takes place on residential streets, minor arterials, and multi-lane low and moderate speed roadways (speed limits at or below 35 mph) (LAB, 2017b).

LAB's *Traffic Skills 201* is for more advanced students who understand vehicular cycling principles. The 12-hour course addresses fitness and physiology, training for longer rides, advanced bike mechanics, paceline skills (riders travel in a line, one behind the other), advanced traffic negotiation, and night and inclement weather riding (New Jersey Bike & Walk Coalition, 2017).

The other widely known adult education program is Cycling Savvy, which was developed in 2010 by LAB-certified instructors affiliated with the Florida Bicycle Association. (It is now under the auspices of the American Bicycling Education Association discussed previously on page 35.) Unlike *Traffic Skills 101*, the three-part, 9.5-hour course focuses on bicycling handling and traffic safety, minus bike mechanics. The first three hours are conducted in the classroom, where students learn about the *Truth and Consequences of Traffic Cycling* through a review of graphics and animation that address bicycle-specific laws, traffic dynamics and problem-solving strategies. Next, they participate in a three hour parking lot session dubbed *Train Your Bike* that consists of a series of progressive drills (e.g., start/stop, slow-speed balance, shoulder check, emergency braking) designed to increase students' control and comfort in a variety of situations. This segment and the one conducted in the classroom can be taken as stand-alone courses (CyclingSavvy, 2017).

In the final 3.5 hour block, an experiential *Tour of the City* that may only be taken after completing the first two parts, students travel as a group, stopping to survey and discuss challenging locations such as intersections, interchanges and merges. This discussion takes the form of a *Chalk Talk;* the certified instructor uses colored chalk to illustrate on a sidewalk or driveway how to safely and easily navigate the roadway feature. Each student then rides solo through the roadway segment and meets up with the group at a nearby spot (CyclingSavvy, 2017).

Teaching Children About Reflectivity and Safety

A permanent exhibit at The Works Museum in Bloomington, MN, is helping to teach children and their parents how to be safe and seen while bicycling and walking after dark. The centerpiece of the exhibit, developed by the Roadway Safety Institute, is a dark room where children can sit behind the wheel of a car while others try on reflective clothing to see how visible they are to drivers after dark. Visitors can also use a microscope to get a close up look at reflective materials and watch a 3M video explaining how reflective gear enhances safety (Roadway Safety Institute, 2017).

Reinforcing the Importance of Conspicuity

With nearly half of all bicyclist fatalities occurring after dark, educating riders about the importance of being highly visible to others on the road is critical. Programs for both children and adult bicyclists should address conspicuity not only when riding at night, but in low visibility conditions such as dawn, dusk and inclement weather.

All states require bicycles operated after dark to be equipped with a front light that illuminates the roadway along with red reflectors. Best practice calls for the installation of reflectors on both the front and back of a bicycle. If a carrier is added, the rider should make sure the rear reflector is visible. Adding a flashing red light on the rear of the bicycle, or to a backpack or helmet, will make a rider more visible to others on the road. Wearing retro-reflective vests, jackets and wristbands or adding the material to clothing, helmets, pack backs, or the bicycle helps cyclists stand out as well.

New technology is also helping to improve cyclist conspicuity. London's bike-share fleet is equipped with Laserlights that project a green bicycle symbol on the roadway 20 feet ahead. This gives notice to other roadway users that a bicycle is approaching and is helpful when a cyclist is entering a roadway from a blind spot such as an alley or the side of a vehicle. Research indicated that a cyclist riding a Laserlight equipped bicycle at night was more visible than a cyclist in daylight, while London bus drivers said the "light made it easier to notice and react to cyclists at night" (Metcalfe, 2017).

The technology has made its way across the pond; 250 bikes in New York's Citi Bike program are now equipped with Laserlights costing $150 each. Cyclists who prefer not to use the green bicycle projection feature can turn it off. The light then becomes a white, 300-lumen LED (CityLab, 2017).

Meanwhile, new bicycle helmet technology is not only helping to protect cyclists' heads in the event of crash or fall, but also making them more conspicuous to motorists. The Lumos helmet is equipped with turn signals and brake lights. The turn signals are located in the front and back of the helmet and flash when the cyclist activates a wireless remote attached to the handlebars. The brake lights come on automatically when the cyclist slows down, so the cyclist does not have to think about it. The helmet sells for $169 and comes with a remote, a mount and a charging cable. An app that works on both iOS and Android platforms alerts the cyclist when the helmet and remote's batteries needed to be recharged (Streit, 2017).

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Educating Motorists About Their Choices, Humanizing the Message

All motorists share the responsibility of safely operating their vehicles so that they and others with whom they are sharing the road arrive safely. Public awareness and educational campaigns (using earned and/or paid media) that address speeding, impairment (drunk, drugged, distracted and drowsy driving) and other unsafe behaviors by motorists, benefit all roadway users including bicyclists.

New York City's award-winning *Your Choices Matter* campaign, part of the Vision Zero initiative, uses outdoor advertising (billboards, bus posters, gas station toppers) and television public service announcements to convey to motorists how a specific action such as speeding or turning can lead to severe consequences.

The ad's tagline reminds drivers that the choices they make behind the wheel can save lives. The City's Department of Health and Mental Hygiene also joined in the effort by co-branding its *Just One More Drink Can Hurt* campaign with Vision Zero. Using the image of a car driver about to strike a bicyclist, the campaign reminds New Yorkers about the risks of excessive drinking, which can result in traffic deaths and injuries (NYC DOT, 2017).

Humanizing the tragic events of traffic crashes is a Vision Zero strategy. The New York City victim advocacy group, Families for Safe Streets, works to call attention to the unnecessary loss of life. In 2016, the City's Vision Zero initiative partnered with the Liao Family, one of the group's members, to launch an online pledge to educate New Yorkers about the fatal consequences of driving dangerously (NYC DOT, 2017). Those who take the pledge are invited to upload a photo of themselves to help humanize the message.

This tactic was also used by the Pittsburgh, PA bike advocacy group BikePGH, when it launched the Drive With Care campaign in 2013 after a series of fatal bicyclist crashes. The goal was to humanize people on bikes by depicting actual community members in a series of ads directed to the public. It had such an impact that the following year, PeopleForBikes took it national, creating a series of seven ads under the moniker Travel With Care. The two organizations agreed to make the campaign available to other communities and produced a guidance document that includes local models and logos.

While it is unknown how many cities are using the campaign (PeopleForBikes does not track usage), one community that has embraced it is Cleveland, OH. Led by Bike Cleveland, the We're All Drivers campaign highlights that "people on bikes come from all walks of life and… deserve the same courtesy and respect on the road as they do anywhere else" (2017). The theme is designed to convey to motorists that "bicycles are legal road vehicles, and people on bikes are drivers," too, "subject to the same rules and rights as people in cars." Thus, they are "not blocking traffic, they are traffic" (PeopleForBikes, 2017). A series of print and broadcast ads featuring local people who are avid bicyclists – a minister (the Sunday Driver), a middle school student (the Student Driver), a Cleveland Indian baseball player (the Line Driver), a young child riding in a bike seat (the Backseat Driver) – help to drive home the point. A web page for each includes a synopsis of nine local ordinances and state laws that expressly address bicyclists' safety and right to the road.

Bike Cleveland has been using a REACH (Racial and Ethnic Approaches to Community Health) grant provided by the Centers for Disease Control to disseminate the campaign via social media; bicycle billboards; and radio, television and way finding ads. While the organization has not conducted research on the campaign's effectiveness, it has generated 3 million paid impressions. Additionally, social media posts are positive, with commenters noting that the use of local people resonates with them (J. VanSickle, personal communication, June 13, 2017). For more information, contact Jacob VanSickle.

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Going Human in Southern California

This focus on people – the human element of transportation – is also at the heart of the Southern California Association of Government's (SCAG) Go Human campaign. The goal of the public outreach initiative, which uses advertising, education, advocacy, information sharing, and events to foster engagement, is to encourage more people to "use human-powered transportation and raise awareness of all roadway users" (SCAG, 2017). The six-county region, home to more than 18 million people, ranks as one of the most dangerous for people who bike and walk. In 2014 (the latest year for which regional data is available), 470 people were killed and more than 13,600 were injured while biking or walking (California Statewide Integrated Traffic Records System as cited in Harris, 2017).

In collaboration with county transportation commissions and public health departments from each of the six counties, *Go Human* launched in 2015 through a $2.3 million grant from the California Active Transportation Program (CATP). The initial launch included a region-wide advertising campaign that featured ads on billboards, bus shelters and social media, as well as radio jingles. To expand partnership opportunities, a digital toolkit was developed featuring electronic files of the print and radio ads and social media posts in English and Spanish. Partners are encouraged to co-brand materials for their jurisdictions.

The California Office of Traffic Safety (OTS) provided grant funds in FY 2017 to help expand the program's reach. Successful partnerships have been forged with cities, county health departments, law enforcement agencies including the California Highway Patrol, nonprofits, and the Department of Motor Vehicles (information is included in the *California Driver Handbook*). Los Angeles police officers offered their support to the *GO Human* campaign by distributing more than 4,000 *Go Human* safety cards in English and Spanish at several DUI checkpoints in early 2017.

Go Human has also developed a toolbox of resources for community groups, safety and health professionals, employers, government agencies, and elected officials to advance active transportation in their cities. The toolbox includes strategies, case studies, funding opportunities, bikeability and walkability checklists, statistics by county, and facts sheets to help communities promote safety and encourage biking and walking.

A third component of the *Go Human* program includes partnering with cities to host open streets events and safety demonstrations. These events showcase potential re-designed streets that promote safety such as bike lanes and enhanced crosswalks. For cities, these events are valuable engagement tools, giving residents the opportunity to try potential street improvements while collecting input. They also help educate roadway users about how infrastructure enhancements can improve safety. During the first year of the campaign, SCAG and its partners hosted six

go human
GoHumanSoCal.org

Tips for Bicyclists & Drivers on the Go

Most SHSOs offer tips to help bicyclists and drivers safely share the road that are disseminated via cards, flyers, posters and/or websites. SCAG's Go Human campaign offers the following tips to...

Bike safely

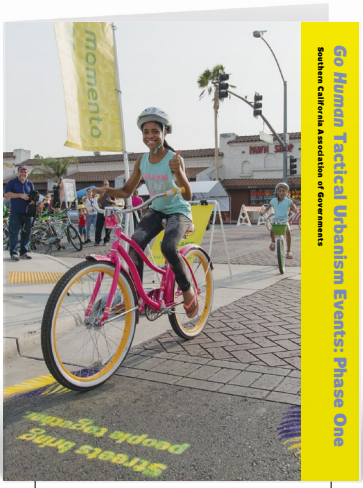
- *Always ride in the same direction as traffic flow.*
- *Stop at red lights and stop signs. Traffic signs and signals apply to bicyclists, too.*
- *Be predictable by signaling your intentions and only change lanes when it is safe to do so.*
- *When riding at night, use a front and rear light to make yourself visible.*
- *Wear a helmet to reduce the risk of injury. (Riders under 18 in California are required by state law to wear helmets.)*
- *Slow down and take care around people walking on sidewalks and in crosswalks.*
- *Be alert. Put your cell phone away, keep your eyes on the road, and watch for people driving and walking.*

Drive safely

- *Slow down. Drive at or below the posted speed limit. Be alert for people walking, bicycling, in wheelchairs or on skateboards.*
- *Look twice for people biking or walking before making a turn. Always come to a complete stop before turning right on red.*
- *Allow at least 3-feet when passing people on bikes.*
- *When there is not enough room for a bike and a car to safely ride side-by-side, bicyclists are allowed to use the entire lane. Change lanes and pass only when it is safe to do so.*
- *Be alert. Put your cell phone away, keep your eyes on the road, and watch for people biking and walking.*

demonstrations projects. Participants were asked to provide feedback on their transportation habits as well as the completed or proposed safety improvements. They overwhelmingly said that the "safety improvements made the streets feel safer and more inviting to use" (96 percent), supported plans to make "temporary safety improvements permanent" (98 percent) and "were inspired to bike and/or walk more because of the events" (96 percent) (SCAG, 2015).

All campaign materials, along with guidance for developing the demonstration events, may be downloaded from the *Go Human* website.



Bicycle Ambassadors

Getting bicyclist safety information into the hands of both riders and motorists is only effective if they read it. But that is often not the case, despite SHSOs and their partners printing and distributing literally hundreds of thousands of brochures and flyers annually. A more effective approach is to take the message directly to where bicyclists and motorists are cycling and driving, using billboards and other outdoor media and radio advertisements. Even more impactful, however, is hands-on street-level engagement with roadway users, conducted by Bicycle Ambassadors.

Bicycle ambassadors are bicycling enthusiasts who engage with the public to promote cycling for transportation, fitness and fun. They engage with roadway users of all ages to educate them about bike safety and rules of the road. Ambassadors also conduct training for new riders that addresses safe riding practices, bicycle maintenance and helmet use. In some communities, they work in partnership with law enforcement to disseminate information to motorists and bicyclists that are stopped for failure to comply with local and/or state laws.

The City of Chicago's bicycling ambassadors have been taking to the city's streets for more than 16 years to educate and encourage residents to bicycle, walk and take transit – and to do it safely. Run by the Chicago Department of Transportation (CDOT) and funded through a Section 402 safety grant administered by the SHSO (located in the Illinois Department of Transportation [IDOT]), the program operates year-round, but most activity occurs during the summer months. In 2016, there were four full-time and two seasonal ambassadors, who were supported by a program manager and three, full-time office staff who also attend community events. They participated in approximately 800 events, educated more than 100,000 people including 41,355 children and 11,676 seniors, visited 145 parks and 106 schools, and fitted nearly 1,600 helmets (CDOT, 2016). This summer (2017), the bicycle ambassadors are teaming up with Divvy, the operator of Chicago's bike sharing system, and Blue Cross Blue Shield of Illinois (BCBSIL) to provide free bike riding lessons for adults. The two hour classes are offered in the evening and all participants receive a free helmet courtesy of BCBSIL to wear and take home with them (WNG9, 2017).

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The ambassadors also work with the Chicago Police Department to stage traffic safety education and enforcement events at high crash locations to address unsafe and illegal behaviors – parking or driving in bike lanes, failing to obey traffic signals, riding on sidewalks, and distracted driving – that endanger all road users. They conducted 66 of these events in 18 wards across 14 police districts last year, with police issuing 850 warnings to cyclists and 700 to motorists. An evaluation of a series of these events directed at ensuring that bicyclists and motorists stop for a pedestrian in a crosswalk (required by City ordinance) at a high-crash intersection, found that stopping rates improved from 3.4% prior to enforcement to 37.78% after (CDOT, n.d.).

The information the ambassadors deliver is user-specific, interactive and often in the roadway user's native language. Through one-on-one conversation and

demonstration, the ambassadors talk with bicyclists, pedestrians and motorists about how to avoid collisions, including specific situations that are likely to result in a crash; use bike lanes safely; and communicate with each other. For motorists, they share information on the purpose and use of bike lanes and provide education on how to safely maneuver alongside bicyclists. The ambassadors also focus on helping motorists recognize three high-risk actions that negatively impact bicyclists – cutting off bicyclists when turning, dooring, and parking or driving in bike lanes (PBIC, n.d.). For more information, contact Lauren Crabtree.

In 2011, the Wisconsin Bureau of Traffic Safety (BOTS) in partnership with Wisconsin Bike Fed (WBF) launched the Share & Be Aware (S&BA) campaign that is delivered by a team of regional, ethnically diverse ambassadors who provide bicycle and pedestrian safety education to roadway users across the state. Trained by a LAB cycling instructor, the ambassadors deliver education and training to cyclists and walkers of all ages, engage with the media, and help citizens conduct grassroots pop-up events. While this is a statewide initiative, emphasis is given to conducting outreach in high bicycle and pedestrian crash areas and communities with low rates of bicycling (Fischer et al., 2016).

In 2016, the ambassadors (WBF, 2017):

- Facilitated 162 classes reaching 3,550 people with information about commuting by bicycle, riding in traffic, group riding, savvy cycling, and pedestrian safety.
- Educated more than 92,000 people through table top or rolling bicycle displays at 318 events, and 62 public meetings.
- Conducted six law enforcement trainings to ensure police officers understand and enforce the state's bicyclist and pedestrian safety laws.
- Discussed bicyclist and pedestrian safety with nearly 13,000 novice drivers through high school driver education classes.
- Generated 2 million media impressions.

The ambassador's work is supported by a website and social media. On the S&BA Facebook page, the public can post short videos calling on motorists to *Stop for Your Neighbor*, an ambassador-supported grassroots initiative designed to call attention to the safety of non-motorized users on local streets. Billboards and television and radio public service announcements are also used to deliver key messages including: share the road, give 3-feet when passing bicycles, follow the rules of the road when cycling, and give pedestrians the right of way at unsignalized crosswalks (Fischer et al., 2016).

Approximately 80 percent of S&BA campaign costs had been funded by the state's HSIP. BOTS is working to identify a new funding source for FY 2018 as a result of the FAST Act prohibition on using HSIP funds for non-infrastructure initiatives (Fischer et al., 2016). For more information, contact Larry Corsi.

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Focused Educational Initiatives

All roadway users benefit from education that will help them make better choices whether they bike, walk or drive, coupled with a roadway environment that reinforces those choices. Some cities and towns are developing initiatives designed specifically to reach key constituency groups that may be overrepresented in bicycle-motor vehicle collisions. Mining bicycle crash data to identify just who is involved in these crashes could focus education and outreach efforts.

New Immigrants

The HART Transportation Management Association, which promotes sustainable transportation in Hunterdon County (New Jersey), recognized that it had to address a rash of bicyclist-motor vehicle crashes in the small town of Flemington. Crash data indicated that these crashes were happening late at night and involved Latino immigrants, many of whom were working in local restaurants and bicycling to and from work in darkness. To address this problem, HART developed what its Executive Director, Tara Shepherd, calls a "street level ministry" to educate this demographic about safe riding practices, with a particular focus on conspicuity.

Hazte Visible Dejese Ser Visto (*Let Yourself Be Seen*) was delivered by a HART employee who was recognized by the Latino community as a credible messenger. She provided safe riding tips, bicycle helmets and reflectorized materials via short, one-on-one conversations always delivered in Spanish and often at a restaurant's back door. Rather than simply telling the bicyclists, many of whom were men, about what they needed to do to ride in compliance with the law, she pointed out the financial and physical burden they could be to their families if they were involved in a crash. She was very detailed in retelling the stories of crash incidents, highlighting who was involved (often someone that the men knew or had heard about) and the impact of the crash on their ability to work. "This is a very visceral message for this community," stressed Shepherd. "Many of them are here working to send money home to their families" (Shepherd, personal communication, June 13, 2017).

Shepherd also pointed out that this is both a largely transient and non-literate population. Therefore, programs addressing this audience must be ongoing and the information transmitted orally. "Turnover is high, and printed materials don't work," she explained. To address the latter, the HART employee carried a three-ring binder with photos that showed what to do and not do to bike safely.

Although HART was not able to sustain the program (the bi-lingual employee left the agency), Shepherd said that faith-based and nonprofit agencies that provide services to this population are helping to distribute reflectorized vests and basic bike safety information. In addition, early adopters who were reached by the former HART employee are helping to share what they learned with others in the community. The peer-to-peer influence of the early adopters is valuable as the use of reflective items and helmets becomes normalized within the community.

Vacationers & International Students

Every year, approximately 850 bicyclists and 3,000 pedestrians are struck by cars on North Carolina's streets. To address the problem, the Department of Transportation launched Watch for Me NC (WFM), a statewide initiative designed to empower communities to address bicyclist and pedestrian crashes through public outreach and education coupled with high visibility enforcement of traffic safety laws. Piloted in Wake, Durham and Orange Counties in 2012, as part of a NHTSA-funded focus state demonstration project, the program is now deployed in more than two dozen counties, cities and towns across the state (North Carolina Department of Transportation [NCDOT], 2017).

One of those is Corolla, a small coastal community located in the Outer Banks, with a permanent population of 500. During the peak tourist season, however, that number swells to more than 60,000, with many riding bicycles for recreation or as their main mode of transportation. Bicycle-motor vehicle collisions have occurred and sometime involve out-of-towners, but addressing the problem through educational measures is challenging due to the transient nature of the population (NCDOT, 2016).

Through the WFM campaign, the town collaborates with partners who frequently interact with visitors, such as vacation property rental companies, local law enforcement and approximately 100

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businesses. Each of these organizations offered to display placards with bicyclist and pedestrian safety information, with the aim of demonstrating to visitors the culture of safety in the community and the best ways to safely travel while in town. These placards are also disseminated to homeowner's associations, with the request that they be displayed on refrigerators to reach vacation home renters. Bicyclist safety is also addressed during an orientation conducted with more than 2,000 international students and summer employees who come to work each year in the town's local businesses. And, *WFM* safety information is distributed at the town's weekly 5K races (NCDOT, 2016).

As a result, thousands of visitors and residents are seeing the information. The education and public engagement efforts are complemented by enhancements to the built environment. In 2016, the town constructed a 2.5-mile shared use path that parallels the two-lane Route 12 (the main roadway through Corolla and the entire Outer Banks) and connects residents and visitors to two retail centers. WFM and Corolla's complementary *CFR Cares* (Corolla Fire and Rescue) initiative helped to foster the discussion that led to the path's development (NCDOT, 2016).

Located at the northernmost part of the Outer Banks, Dare County also hosts a large population of international employees during the busy travel season. That prompted the County's WFM partners to build relationships with large local employers, such as the Food Lion grocery store, to reach these temporary residents. While emphasis is placed on reaching visitors during tourist season, local residents, who account for more than half of all crashes, are engaged as well. WFM partners reach out to local residents through a variety of educational activities such as bike safety camps offered by parks and recreation, story-time bike safety presentations for pre-school aged children, and at community events including National Night Out and Kmart Safety Day (NCDOT, 2015). For information on the statewide campaign, contact Laura Sandt.

For-Hire & Fleet Drivers

For-hire and fleet drivers make up a significant portion of the motorists operating on city streets in New York. Recognizing the impact these drivers have on roadway safety, the Taxi and Limousine Commission (TLC), Department of Citywide Administrative Services (DCAS) (government vehicles) and the Metropolitan Transit Authority (MTA) (city buses) provide training to enhance drivers' skills through the Vision Zero initiative. To date, more than 70,000 operators have received training (NYC DOT, 2017).

Improving and broadening driver training is a core tenet of the TLC's Vision Zero efforts. In 2015, the agency expanded the 24-hour pre-licensure course requirement to drivers of for-hire vehicles, which includes liveries, black cars and luxury limousines. All for-hire drivers now receive instruction on the rules of the road along with the Vision Zero curriculum, which addresses new roadway design such as protected bike lanes, high risk driving behaviors and the critical role professional drivers play in promoting a safe driving culture (NYC DOT, 2017).

In San Francisco, an uptick in bicyclist and pedestrian fatalities resulting from collisions with large vehicles prompted the City and County and the San Francisco Municipal Transportation Authority (SFMTA) to establish a Safe Streets Working Group. Representatives from FedEx, UPS, the San Francisco Bicycle Coalition, Walk SF, the California Trucking Association and other groups met over three months and subsequently developed a series of short, medium and long-term solutions to increase safety on the City's streets. One of those recommendations called for driver education. As a result, a policy was enacted requiring all city-employed truck and bus drivers (the transit agency is overseen by the City's DOT) and commercial shuttle drivers to complete a safety course addressing the safe operation of trucks in urban settings. (VZN, 2016).

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Conclusion

Bicyclists have a right to the road. Therefore, it is incumbent upon all transportation and traffic safety officials, law enforcement agencies, and bicycling organizations and advocates to work collaboratively to identify and implement proven countermeasures that ensure the safety of all roadway users – including bicyclists. While engineering solutions are key, states and communities simply cannot build their way out of the bicyclist safety problem; roadway improvements must be accompanied by education and enforcement to be most effective.

For that reason, bicyclist safety should be addressed in states' comprehensive Strategic Highway Safety Plans and the supporting infrastructure (HSIP) and behavioral safety (HSP) plans. The fact that states must now include bicyclist safety in their highway safety performance measures, which SHSOs began doing voluntarily in advance of the federal requirement, ensures that these roadway users are factored into the planning process. Development of these plans provides the opportunity for a broad coalition of stakeholders to work together to identify strategies and proven countermeasures and subsequently implement them not only for the benefit of bicyclists, but all roadway users.

Ensuring that states have adequate resources to implement these plans, however, remains problematic, particularly when it comes to addressing those behavioral safety issues that put both non-motorized and motorized roadway users at risk. For this reason, the FAST Act prohibition on using HSIP funds for non-infrastructure purposes is

disappointing, particularly for those states that relied on these funds for bicyclist safety programs. On the other hand, inclusion of the Section 405(h) non-motorized grant program in the transportation reauthorization bill is good news – especially for those states that qualified and are receiving these funds. It merits noting, however, that this is the only behavioral safety grant program requiring a state match, a caveat that could disqualify some. And as states make gains in reducing bicyclist and pedestrian fatalities, they essentially disqualify themselves from leveraging this funding source in the future.

Therefore, to maximize resources, it is imperative that all SHSOs (even those with no or a small number of bicyclist fatalities and severe injuries) carefully analyze crash and citation data to fully understand the extent of the state and local bicyclist safety problem. It is not enough to know where and when the crashes are occurring, but why and who (age, gender, race/ethnicity, socio-economic status) is involved. Carefully mining these data are critical for ensuring that education and enforcement are targeted at the right demographic groups using the most effective channels and tactics. In some states, this analysis is likely to reveal the need to retool or replace legacy programs with new activities that have clearly defined behavioral objectives that, if adopted by roadway users, will prevent crashes and save lives.

Before launching or funding any new bicyclist safety enforcement initiative, law enforcement training must be provided that gets to the heart of why bicyclist-motor vehicle crashes occur and why protecting and serving the most vulnerable roadway users is a police officer's job. Once equipped with this information, officers will be far more effective in educating bicyclists and motorists about the importance of complying with traffic safety laws. Sharing the rationale for any new enforcement effort with local bicyclist and community groups before launch is also critical; this dialogue could turn antagonists into allies prompting not only an endorsement, but an offer to help.

It is time to change the nomenclature when it comes to transportation. Defining the modes in terms of people who bike, walk or drive, rather than bicyclist, pedestrian and motorist, humanizes the conversation and reaffirms that we are all in this together.

Education and training, particularly on-bike and on the road, are also essential for creating a community of roadways users – regardless of mode – who know how to interact with each other in a safe and predictable manner. Teaching children and teen safe cycling practices that they carry with them into adulthood will help to not only foster greater acceptance among roadway users, but also greater safety and equity on our roads. This presents a tremendous opportunity for SHSOs to bring bicycling advocates, departments of education, driver education organizations, state licensing agencies, community groups, and other interested parties to the table to build and implement a bicyclist safety education and training program that is an integral part of K-12 school-based learning.

Finally, it is time to change the nomenclature when it comes to transportation. Defining the modes in terms of people who bike, walk or drive, rather than bicyclist, pedestrian and motorist, humanizes the conversation and reaffirms that we are all in this together. When people recognize this, *Sharing the Road* will no longer be a catchy slogan or a grandiose idea, but the cultural norm.

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