

VULNERABLE ROAD USERS (VRU'S)

What Is a Vulnerable Road User?

A vulnerable road user, or VRU, is someone who is at greatest risk for serious injury or death when they are involved in a motor-vehicle-related collision. Florida law – §316.027(1)(b), F.S. – defines a VRU as any of the following:

- A pedestrian, including a person actually engaged in work upon a highway, or in work upon utility facilities along a highway, or engaged in the provision of emergency services within the right-of-way;
- A person operating a bicycle, motorcycle, scooter, or moped lawfully on the roadway;
- A person riding an animal; or
- A person lawfully operating on a public right-of-way, crosswalk, or shoulder of the roadway: 1) a farm tractor or similar vehicle designed primarily for farm use; 2) a skateboard, roller skates, or in-line skates; 3) a horse-drawn carriage; 4) an electric personal assistive mobility device; or 4) a wheelchair.

Children, the elderly, and the disabled are also categorized as VRU's because of their susceptibility to injury or death when involved in a crash.

Pedestrians

The environments in which pedestrian injuries and fatalities occur are broadly categorized as either urban or rural. A high percentage (approximately $\frac{3}{4}$) of pedestrian fatalities occur in urban areas because of the greater number of pedestrian trips that are taken in these areas.

VRU Fatalities 2012 – United States and Florida

VRU Type	U.S.	% of Total	Florida	% of Total
Pedestrians:	4,743	14%	473	19%
Cyclists:	726	2%	116	5%
Motorcyclists:	4,957	15%	425	17%
Total Fatalities:	33,561	--	2,430	--

Despite the fact that fewer pedestrian fatalities occur in rural areas, when they do occur, they tend to be deadlier, resulting in a pedestrian being 2.3 times more likely to die in a rural crash than in an urban one. Some of the reasons for this discrepancy are that rural areas have higher speeds combined with fewer separated facilities for pedestrians (such as sidewalks, trails, or paths), along with the slower response time from emergency responders in rural areas.

- Approximately two-thirds of pedestrian fatalities occur at night or under low-light conditions.
- Children (age 15 and under) and older adult pedestrians (over age 70) are generally over-represented in crash fatalities.
- Males of all ages account for 70 percent of pedestrian deaths, which can be partially accounted for by the fact that they tend to walk longer on trips and are therefore exposed to traffic for longer periods of time.

Disabled pedestrians who are particularly vulnerable in a crash include the following:

- Individuals with mobility disabilities who use a wheelchair, walker, or cane.
- Individuals who are blind or have impaired vision.
- Individuals with cognitive impairments from developmental disabilities such as stroke or brain injury.

Physical environments in which pedestrians are at a substantial risk of being involved in a traffic crash include high volume roadways, multi-lane crossing areas, intersections close to bus stops, and streets that are close to school zones (where children are likely to be present) or alcohol establishments. Pedestrians are also particularly vulnerable in construction zones, or when working on the roadside (such as emergency responders and tow truck operators) because of their proximity to traffic. Vehicle speed is a significant factor in pedestrian crashes – the probability of pedestrian death is 85 percent when the striking vehicle is traveling at 40 MPH.

Pedestrians can often reduce their chances of being involved in a crash by avoiding walking at night or in low lighting conditions, or increasing their conspicuity when they do so. They can also reduce their risk by obeying traffic laws – for example, crossing at a designated crosswalk instead of walking into the street from between parked cars. The threat of a crash with a pedestrian is increased if either the driver or the pedestrian is distracted by a cell phone or other form of distraction, or if either is using alcohol or drugs.

Safety Tips for Driving Near Pedestrians

Drivers are required to make every attempt to yield the right of way to pedestrians. Some safe driving techniques when driving near pedestrians include the following:

- Stop before the stop bar or crosswalk at intersections. Do not block the crosswalk with your vehicle.
- Be alert for pedestrians, especially children, who might step out unexpectedly from between parked cars.
- When you are preparing to turn, scan for pedestrians who might be about to cross a side street.
- Always turn your head to look behind your vehicle before backing. Use a rear view camera or walk behind your vehicle to check for children before you back out of a driveway.
- Reduce your speed when driving through areas in which pedestrians could be expected, such as shopping areas, school zones, churches, residential streets, etc. Always check carefully for especially vulnerable road users such as elderly and disabled pedestrians and children when you are driving in these areas.

Bicyclists

Approximately 700 operators of bicycles and other types of cycles die in the U.S. in traffic crashes each year. In 2012, this number amounted to approximately 2% of all traffic fatalities. The majority of the bicyclists killed or injured in 2012 were males (88% and 80%, respectively). Almost half of all bicyclist fatalities (48%) occurred between the hours of 4:00 PM and midnight.

More than one-fourth (28%) of the bicyclists killed in 2012 had blood alcohol concentrations (BACs) of .01 grams per deciliter (g/dL) or higher, and almost one-fourth (24%) had BACs of .08 g/dL or higher. Alcohol involvement – either for the driver of a motor vehicle or the bicyclist – was reported in more than 37 percent of the traffic crashes that resulted in bicyclist fatalities in 2012.

Crashes between motor vehicles and bicyclists can occur in any type of physical environment, but are particularly likely at controlled and uncontrolled intersections, on city streets, on rural roads, or within traffic lanes. The situations that most often lead to a bicyclist fatality include the following:

- Motorist overtaking bicyclist (33%)
- Head on (one of the parties traveling wrong way) (8%)
- Bicyclist left turn / merge (14%)
- Bicyclist failed to yield at a sign-controlled intersection (7%)
- Bicyclist failed to yield, midblock (10%)
- Bicyclist right turn / merge (6%)

How to Avoid a Crash with a Bicyclist

Most crashes involving motor vehicles and bicyclists can be avoided if drivers scan carefully for bicyclists and predict the worst about their behavior when they identify a bicyclist on or near the roadway.

- *Left turn crash with bicyclist* – These types of crashes usually occur when a motorist is preparing to pull out of a side street or driveway to make a left turn. The motorist spots a gap in traffic and pulls out, crashing into the bicyclist. Motorists can avoid a left turn crash with a bicyclist by scanning carefully for all forms of traffic, including bicyclists approaching from either direction, before pulling out.
- *Right hook crash with bicyclist* – This type of crash results when the motorist passes a bicyclist and then makes a right turn directly into his or her path. A right hook crash can be avoided if the motorist carefully estimates the speed at which the bicyclist is traveling and then adjusts the speed of his or her vehicle, yielding to the bicyclist if necessary.
- *Overtaking crash with bicyclist* – In this type of crash, the motorist strikes the bicyclist from the rear. These crashes often occur at night and tend to be more serious because of the speed differential between the motorist and the bicyclist. Bicyclists can help prevent an overtaking crash by increasing their conspicuity through the use of bicycle reflectors and light-colored clothing.
- *Dooring crash with bicyclist* – A dooring crash can result when a motorist or passenger in a parked vehicle opens a door into the path of an oncoming bicyclist. These types of crashes can be avoided by scanning carefully for bicyclists before opening vehicle doors.

Motorcyclists

Nearly 5,000 motorcyclists were killed and 93,000 were injured in the United States in traffic crashes in 2012. Motorcyclists accounted for 15% of all traffic fatalities.

Nearly half of the motorcycles involved in fatal crashes collided with another vehicle in transport, and three quarters of the motorcycles involved in crashes collided with the vehicle in front of them. Motorcycles are more likely to be involved in fatal collisions with fixed objects than are other vehicles.

In 2012, 34 percent of all motorcycle riders involved in fatal crashes were speeding, compared to 22 percent for passenger car drivers, 18 percent for light-truck drivers, and 8 percent for large-truck drivers.

While motorcyclists share the road with operators of other vehicle types, they are more vulnerable to hazards in the physical driving environment for a number of reasons: 1) motorcycles do not offer protection in the form of vehicle safety systems such as safety belts, airbags, or crush / crumple zones; 2) motorcycles are smaller than other vehicle types and therefore incur more damage in a crash; and 3) motorcycles are more susceptible to roadway hazards such as potholes, objects in the road, loose gravel, uneven surfaces, etc.

Roadside hazards accounted for 50% of riders killed in single vehicle motorcycle crashes. The objects most frequently struck include poles, posts, trees, curbs, embankments, culverts, and guardrails.

Nearly half of all fatal motorcycle crashes occur at intersections. In many cases, protected left turns for motorcycles are not possible because technology often does not detect the presence of the motorcycle waiting to make a left turn.

Sharing the Road with Motorcyclists

Motorists should practice the following safe driving tips when driving near motorcycles:

- Look longer for motorcycles, especially when turning left.
- Look for riders when pulling out on the road.
- Anticipate a motorcyclist's maneuvers.
- Give motorcycles their full lane.
- Use signals when appropriate.
- Treat riders with courtesy and respect.
- Allow plenty of space when following a motorcycle.
- Watch for motorcycles in your blind spot.
- Maintain safe following and stopping distances.
- Slow down in poor driving conditions.

Older Roadway Users

Many of the challenges presented by the physical environment to older drivers involve vision and the ability to detect hazards in a timely manner. Since eyesight deteriorates as a person ages, older drivers often have difficulty reading traffic signs, many of which are designed to be read from a relatively short distance. Driving at night is particularly dangerous for many older drivers because of an overall reduction in visibility, along with greater sensitivity to glare from headlights.

Older road users, including drivers, pedestrians, and those with disabilities, frequently find themselves in situations that require quick evaluation and responses to the driving environment. A mental mistake or a response that is too slow can easily lead to an older road user being involved in a crash. Older drivers as a group are killed most often in angle crashes at intersections.

The table to the right shows that U.S. fatality rates are highest for young drivers (ages 16-24) and old drivers (ages 75 and older). The table on the following page shows crash fatalities / rates by age group for Florida. Out of all 50 states in the U.S., driver involvement in fatal crashes in the 65+ age group was highest in Florida.

2012 U.S. Crash Fatalities / Rates

Age Group	Crash Fatalities (U.S.)	Fatality Rate per 100,000 Population
<5	405	2.03
5-9	345	1.68
10-15	613	2.47
16-20	3,224	14.82
21-24	3,436	19.05
25-34	5,902	13.95
35-44	4,534	11.19
45-54	5,184	11.71
55-64	4,297	11.14
65-74	2,692	11.22
>74	2,868	14.97
Unknown	61	--

Florida Laws Designed to Protect VRU's

2012 Florida Crash Fatalities / Rates

The following Florida laws have been enacted for the protection of VRU's:

- §316.027, F.S. – Also known as the “Aaron Cohen Life Protection Law,” this statute defines the terms “serious bodily injury” and “vulnerable road user.” §316.027(2)(a) requires that a driver remain at the scene of a crash and attempt to render aid to a VRU who *is not seriously injured*. A violation of this section is a third degree felony. §316.027(2)(b) requires that a driver remain at the scene of a crash and attempt to render aid to a VRU who *is seriously injured*. A violation of this section is a second degree felony. §316.027(2)(c) prohibits a driver from leaving the scene of a crash in which a VRU is killed. A violation of (2)(c) is a first degree felony with a mandatory minimum 4-year prison term. A violation of (2)(c) committed while the driver is under the influence will also result in a mandatory minimum 4-year prison term. A violation of (2)(a), (2)(b), or (2)(c) will result in a three-year driver license revocation.
- §316.079, F.S. – Lists requirements for drivers when driving near construction workers or flagpersons.
- §316.0825, F.S. – Requires that drivers use due caution when approaching a rider on an animal such as a horse.
- §316.123(3), F.S. – Basic law listing requirements for drivers to yield the right of way to pedestrians and other traffic at intersections.
- §316.126, F.S. – Also known as the “Move Over Law,” this statute protects roadside workers by requiring drivers to reduce speed by 20 MPH or vacate the lane closest to an emergency vehicle, sanitation vehicle, utility service vehicle, or wrecker that is working on the side of the road.
- §316.130, F.S. – Lists requirements for safe use of the roadway by pedestrians, lists requirements for drivers at crosswalks and intersections, lists requirements for drivers to yield to pedestrians.
- §316.1301, F.S. – Lists requirements for drivers to yield to blind or vision impaired pedestrians.
- §316.1303, F.S. – Lists requirements for drivers to yield to disabled pedestrians, allows disabled pedestrians to leave the sidewalk and use the roadway if no alternative route is available.
- §316.151, F.S. – Lists turning requirements for motorists and bicyclists.
- §316.172, F.S. – Lists stopping requirements for drivers approaching a school bus (protects children).
- §316.1895, F.S. – Sets speed limits and doubles fines for school zones (protects children).
- §316.1995, F.S. – Prohibits motorists from driving on a bicycle path or sidewalk.

Age Group	Drivers Killed (Florida)	Percent Killed
Under 15	3	.23%
15-19	75	5.63%
20-24	189	14.20%
25-29	174	13.07%
30-34	92	6.91%
35-39	73	5.48%
40-44	93	6.99%
45-49	98	7.36%
50-54	128	9.62%
55-59	105	7.89%
60-64	80	6.01%
65-69	42	3.16%
70-74	53	3.98%
75-79	40	3.01%
80-84	34	2.55%
85-89	30	2.25%
90+	22	1.65%
Unknown	0	0%

Trends Toward Reducing VRU Crashes

From a highway engineering perspective, several steps can be taken to reduce the number of VRU crashes that occur each year. Reducing speed in areas where motorists and bicyclists share the roadway can be accomplished by posting lower speeds, narrowing travel lanes, adding on-street parking or other objects close to the roadway, and traffic calming measures such as serpentine, speed bumps, and speed humps.

Measures that can assist with the safety of bicyclists include the placement of bike boxes before traffic signals, advanced stop bars that allow bikes to merge more safely into traffic, the use of leading bicycle green phase that allows the bicycle to proceed before other traffic, striping dashed bicycle lanes or colored paths through complex intersections, and restrictions on motorist right-turn-on-red. Dedicated bike lanes can help separate bicycle traffic from motorist traffic, and the use of convex mirrors where there are sight distance problems can help both motorists and bicyclists to see each other.

Roadway improvements that greatly benefit pedestrians, especially those with disabilities, include well-designed sidewalks, curb ramps at all crosswalks, and appropriate cross slopes and proper driveway designs. Intersection crossing islands can also be used to reduce pedestrian exposure to traffic.

Sources: US DOT, Florida DHSMV, Florida Statutes, NHTSA.