

Dane County

Bicycle and Pedestrian Crash Study



November 2017



Study Goals

- Identify common types, characteristics, and locations of bicycle/pedestrian–motor vehicle crashes to inform safety education, enforcement and facility design.
- Set a benchmark for future performance measurement.
- Compare current City of Madison bicycle crash statistics to those presented in the 1992 city crash study.

Work Plan

- Review previous research and identify information to be added to crash geodatabase (complete)
- Add new information to crash geodatabase and correct errors, based on review of crash reports (complete)
- Analyze data to identify common crash factors and trends (ongoing)
- Write final report (ongoing)

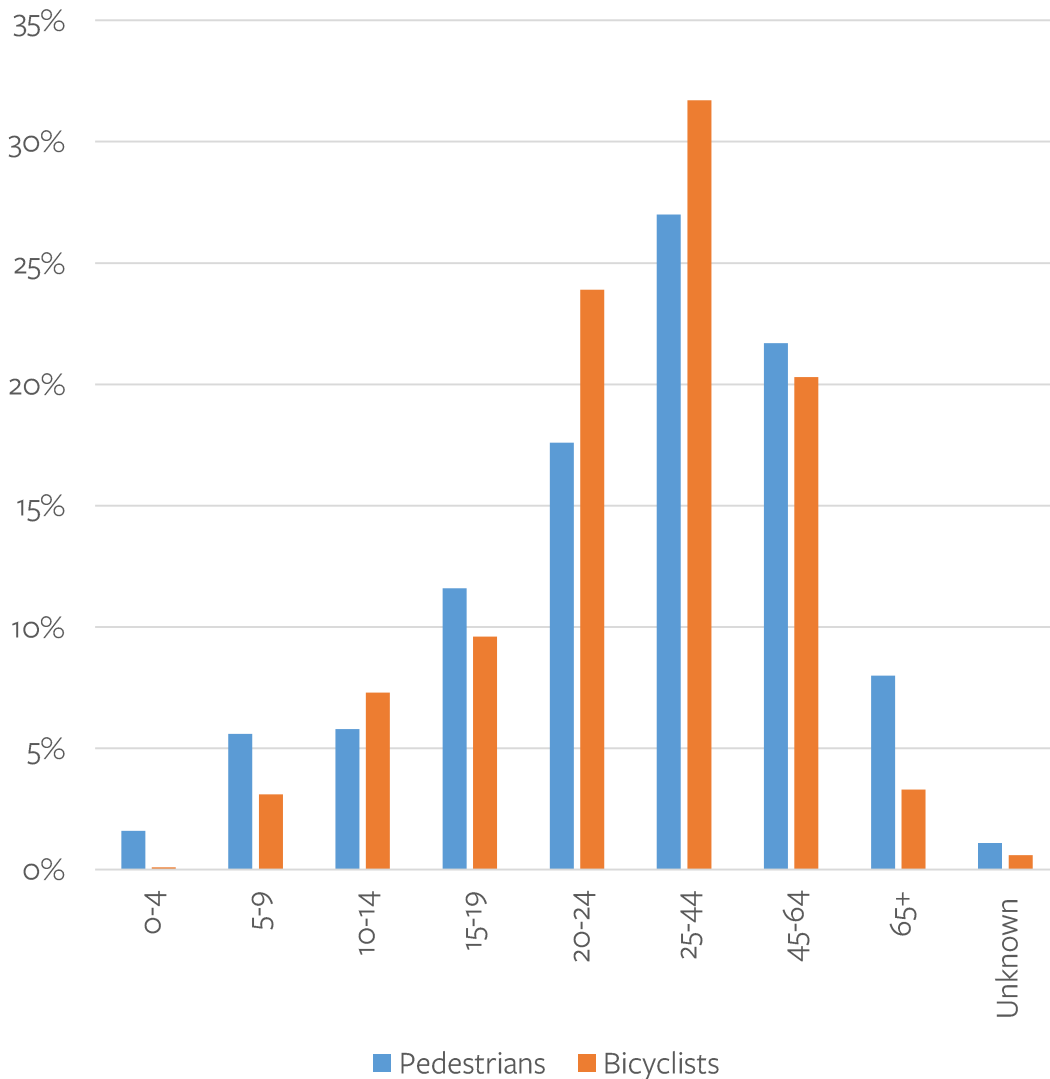
WisTransPortal Crash Data (TOPS Lab/WisDOT)

- Includes information from MV4000 crash reports:
 - Date/time
 - Location (city, county, roadway, etc.)
 - Severity (# of persons, vehicles, fatalities, injuries)
 - General (location type, light/weather, urban/rural, etc.)
 - Flags (alcohol/drugs, auto, bike, ped, CMV, etc.)
 - Driver actions/characteristics, citations, etc.
 - Factors (driver/roadway possible contributing factors)
 - Enforcement (law enforcement info - jurisdiction, etc.)

Additional Information added by MATPB

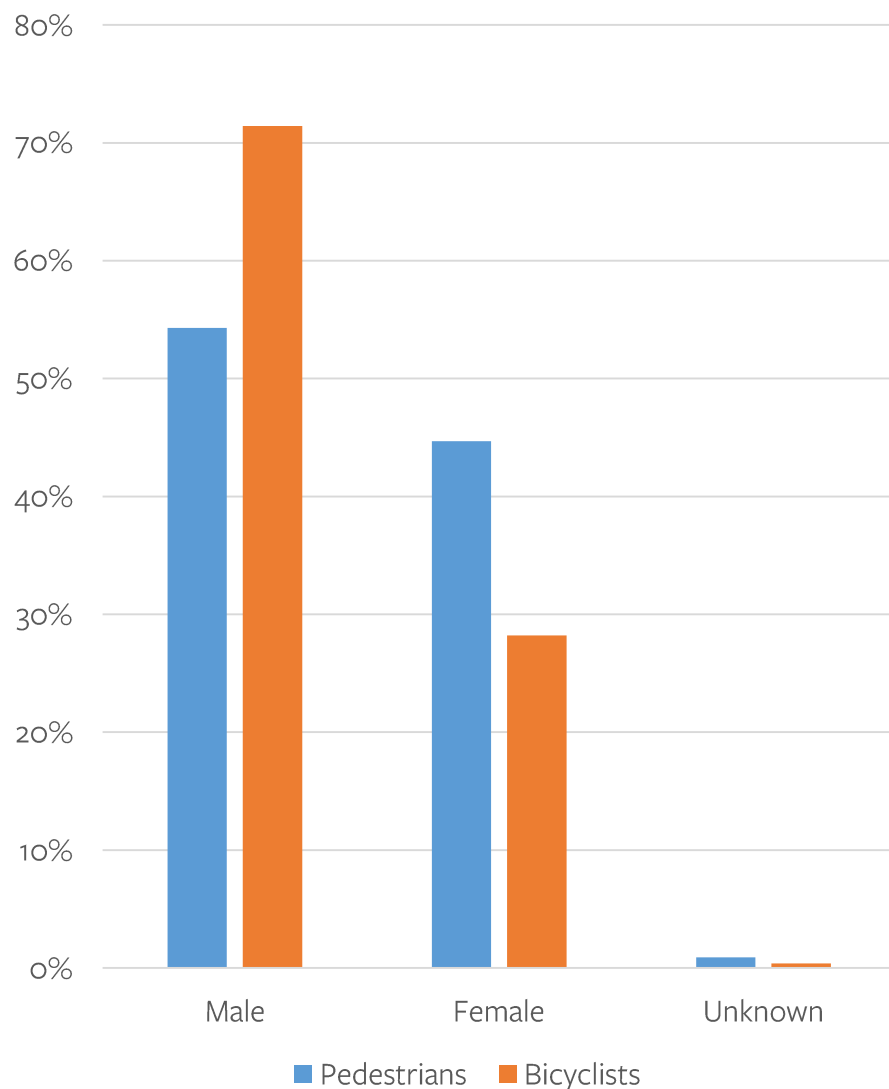
- NHTSA Bicycle and Pedestrian Crash Type
- Location Movement Classification Method (LMCM) Crash Type
- Facility Type
- Travel Direction
- Number of Lanes, Speed Limit
- Bicycle Crash Subtype
- Location of Pedestrian
- Other
 - Aggression Flag
 - Bike Trailer Flag
 - Bike/Pedestrian Light
 - Phone Use
 - Transit Flag

Demographics: Age



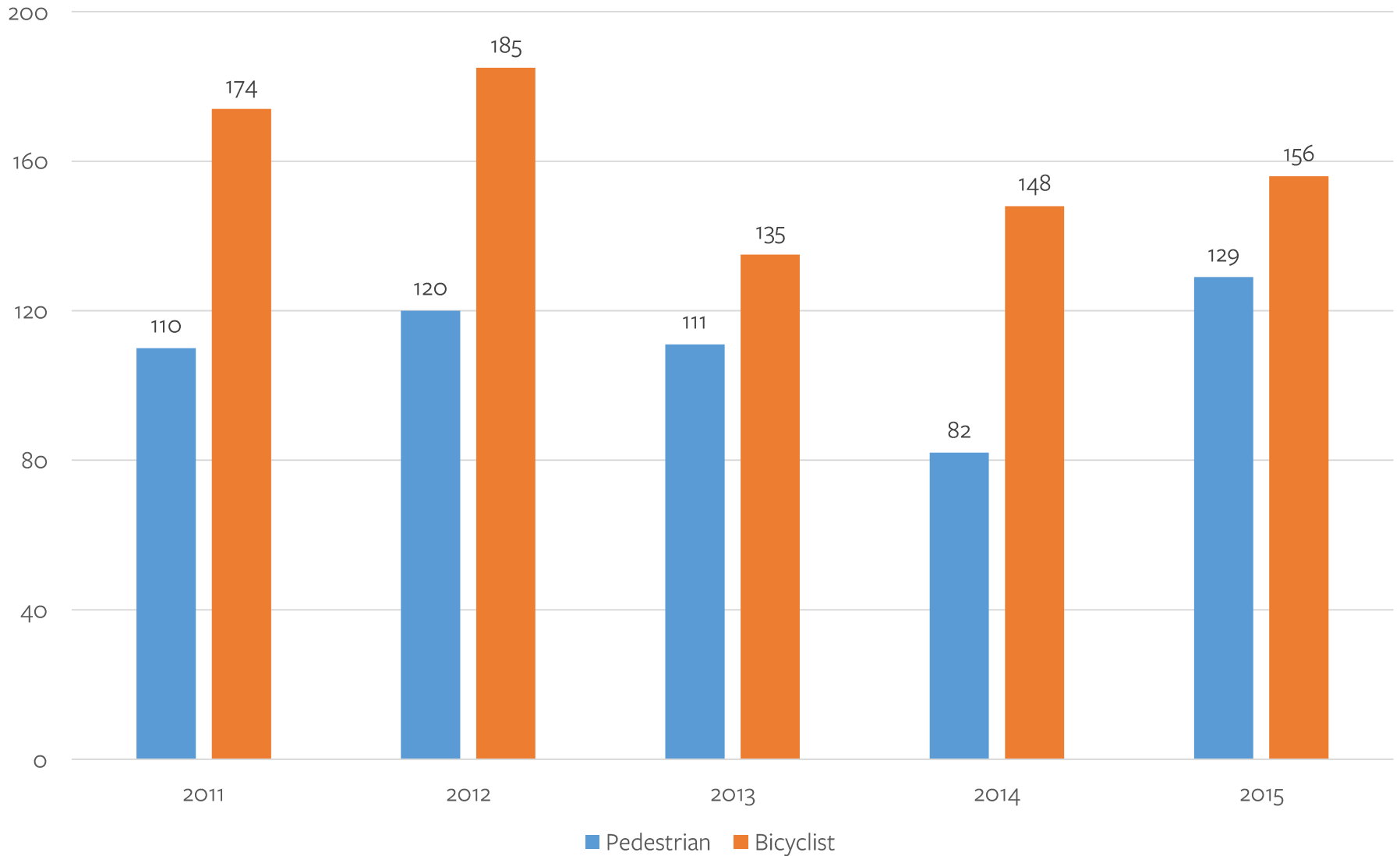
	Pedestrians		Bicyclists	
Age Group	#	%	#	%
0-4	9	2%	1	0%
5-9	31	6%	25	3%
10-14	32	6%	58	7%
15-19	64	12%	77	10%
20-24	97	18%	191	24%
25-44	149	27%	253	32%
45-64	120	22%	162	20%
65+	44	8%	26	3%
Unknown	6	1%	5	1%
Total	552	100%	798	100%

Demographics: Gender

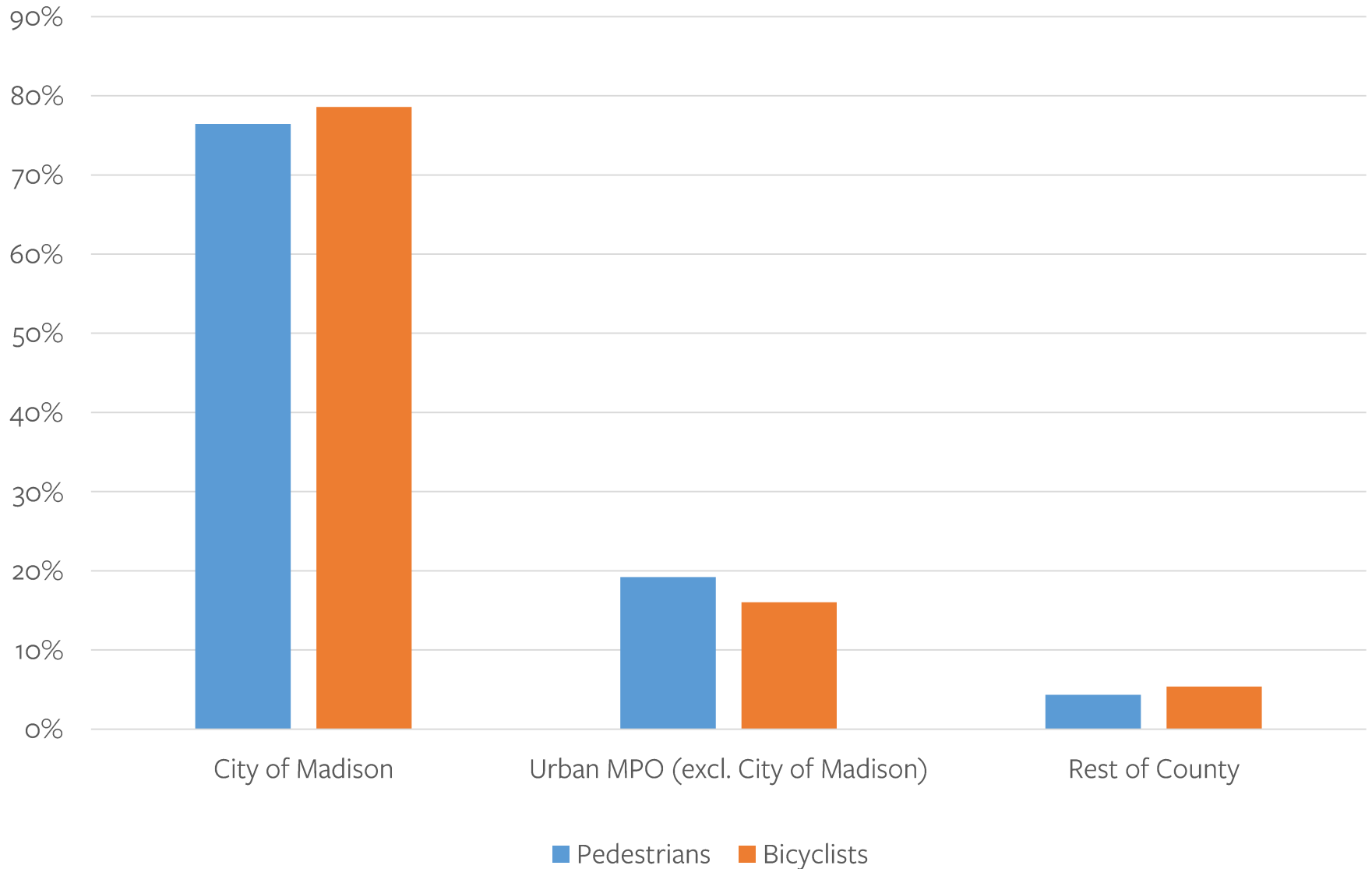


Pedestrians			Bicyclists	
Sex	#	%	#	%
Male	300	54%	570	71%
Female	247	45%	225	28%
Unknown	5	1%	3	0%
Total	552	100%	798	100%

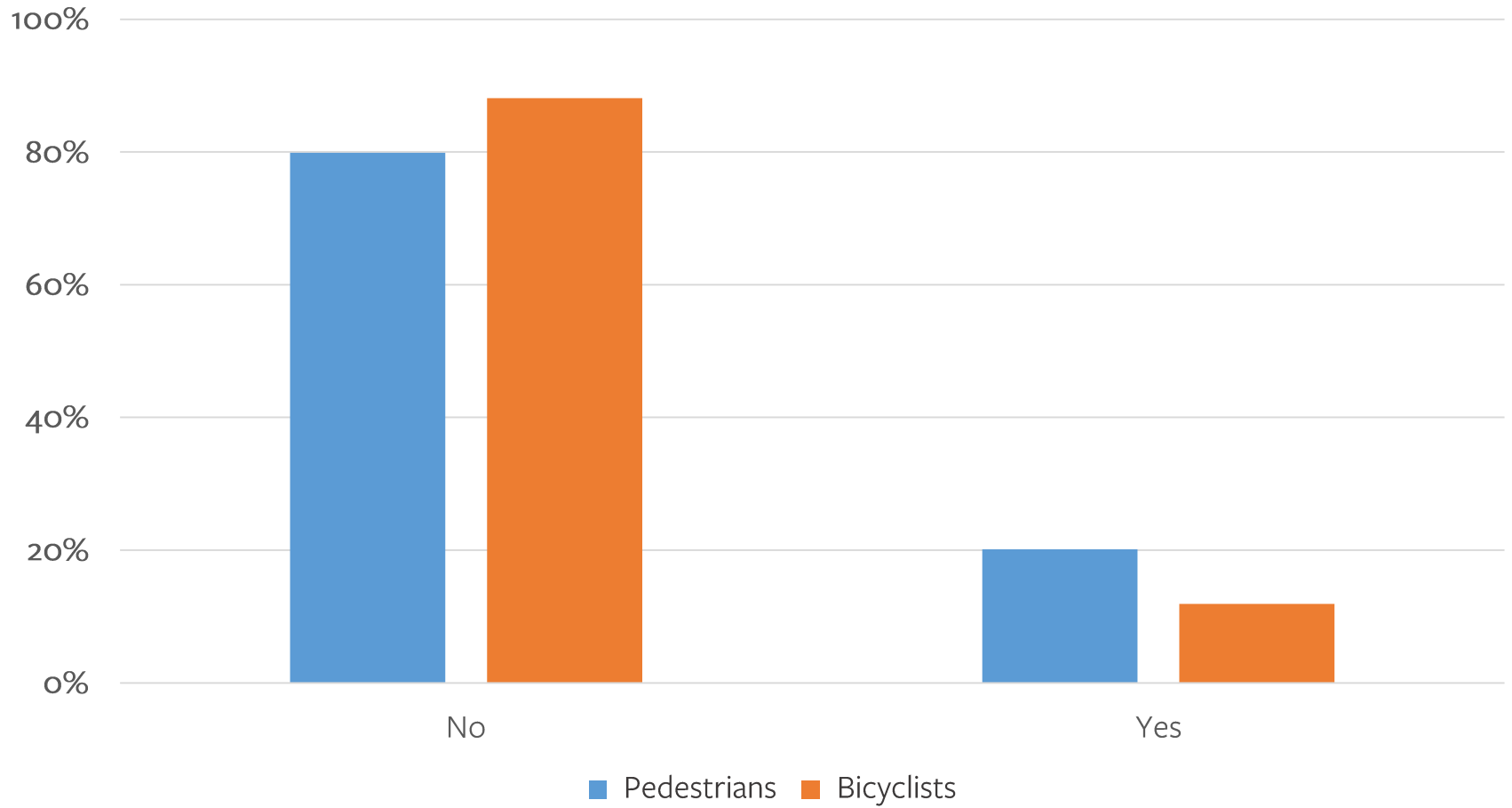
Crashes by Year



Crashes by Location



Hit & Run



Bicycle Crashes

39 NHTSA¹ Bicycle Crash Types

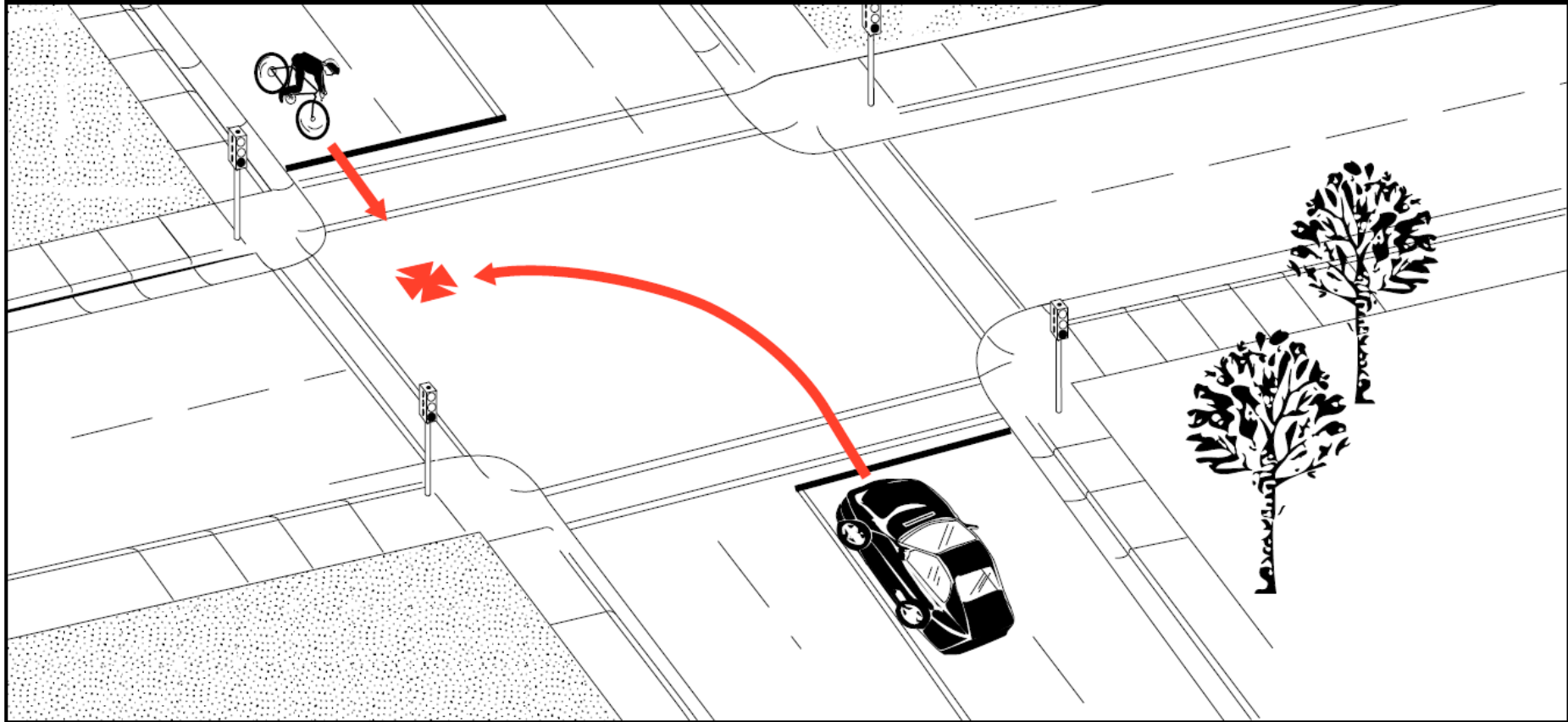
- Bicycle Failed To Clear
 - Multiple Threat
 - Trapped
- Bicycle Left Turn
 - Facing Traffic
 - In Front Of Traffic
- Bicycle Lost Control
- Bicycle Ride Out
 - At Commercial Driveway
 - At Intersection, Other
 - At Midblock
 - At Residential Driveway
 - At Stop Sign
 - From Sidewalk
- Bicycle Right Turn
- Bicycle Strikes Parked Vehicle
 - Dooring²
 - Other²
- Bicycle Wrong Way
- Bicycle Overtaking
- Motorist Backing
 - Controlled Intersection
 - Non-Roadway
 - Play Vehicle
 - Uncontrolled Intersection
 - Unknown
 - Weird
- Motorist Drive Out
 - At Midblock
 - At Intersection, Other
 - At Stop Sign
 - From On-Street Parking
- Motorist Drive Through
- Motorist Left Turn
 - Facing Bicyclist
 - In Front Of Bicyclist
- Motorist Lost Control
- Motorist Overtaking
 - Bicyclist Path Obstructed
 - Counteractive Evasive Actions
 - Failed To Detect
 - Misjudged Passing Space
 - Other
- Motorist Right Turn
 - On Red
 - Other
- Motorist Wrong Way
- Other

¹Crash-Type Manual for Bicyclists,
<https://www.fhwa.dot.gov/publications/research/safety/pedbike/96104/index.cfm>

²The original NHTSA crash type, *Bicycle Strikes Parked Vehicle*, was divided into Dooring and Other for the present study.

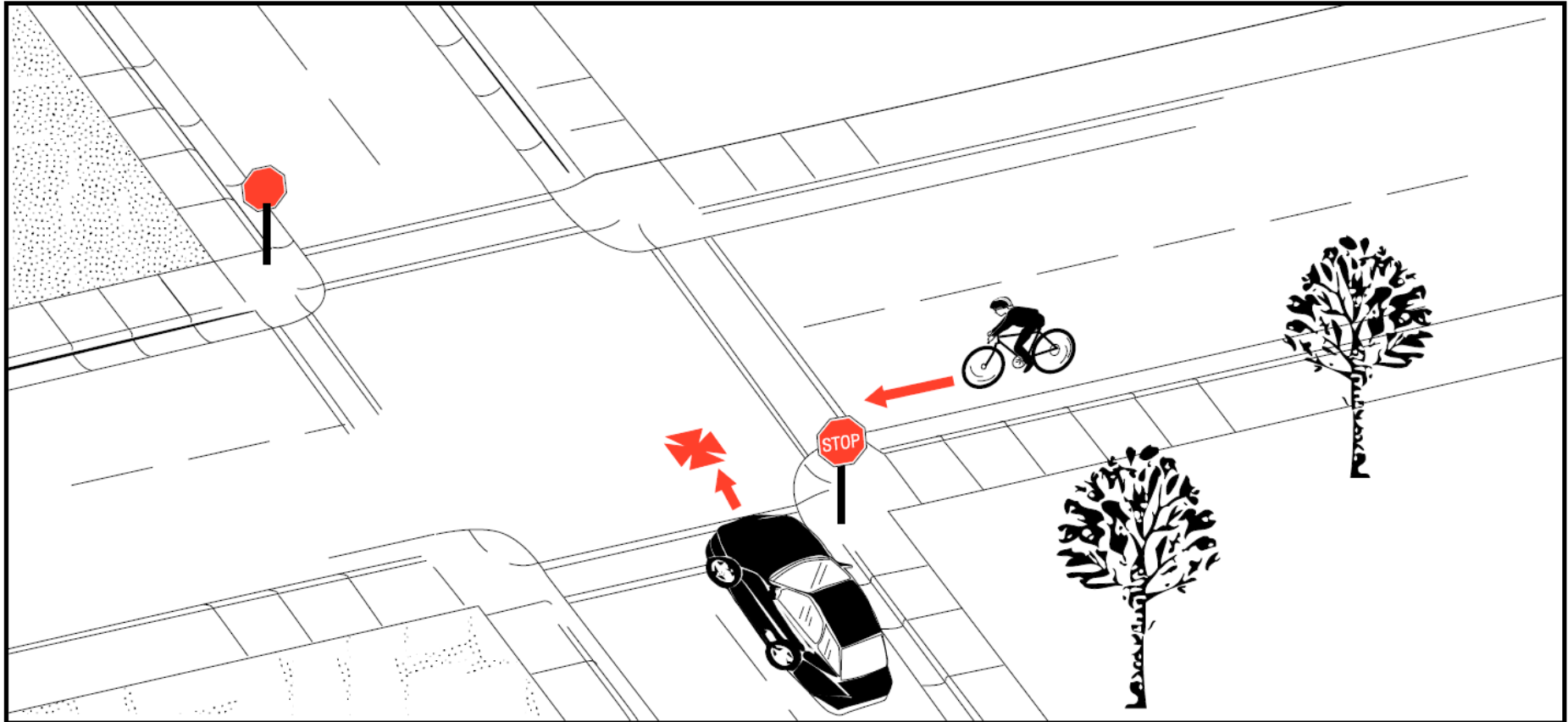
**Most Common
NHTSA Bicyclist Crash Types
in Dane County**

Motorist Left Turn – Facing Bicyclist



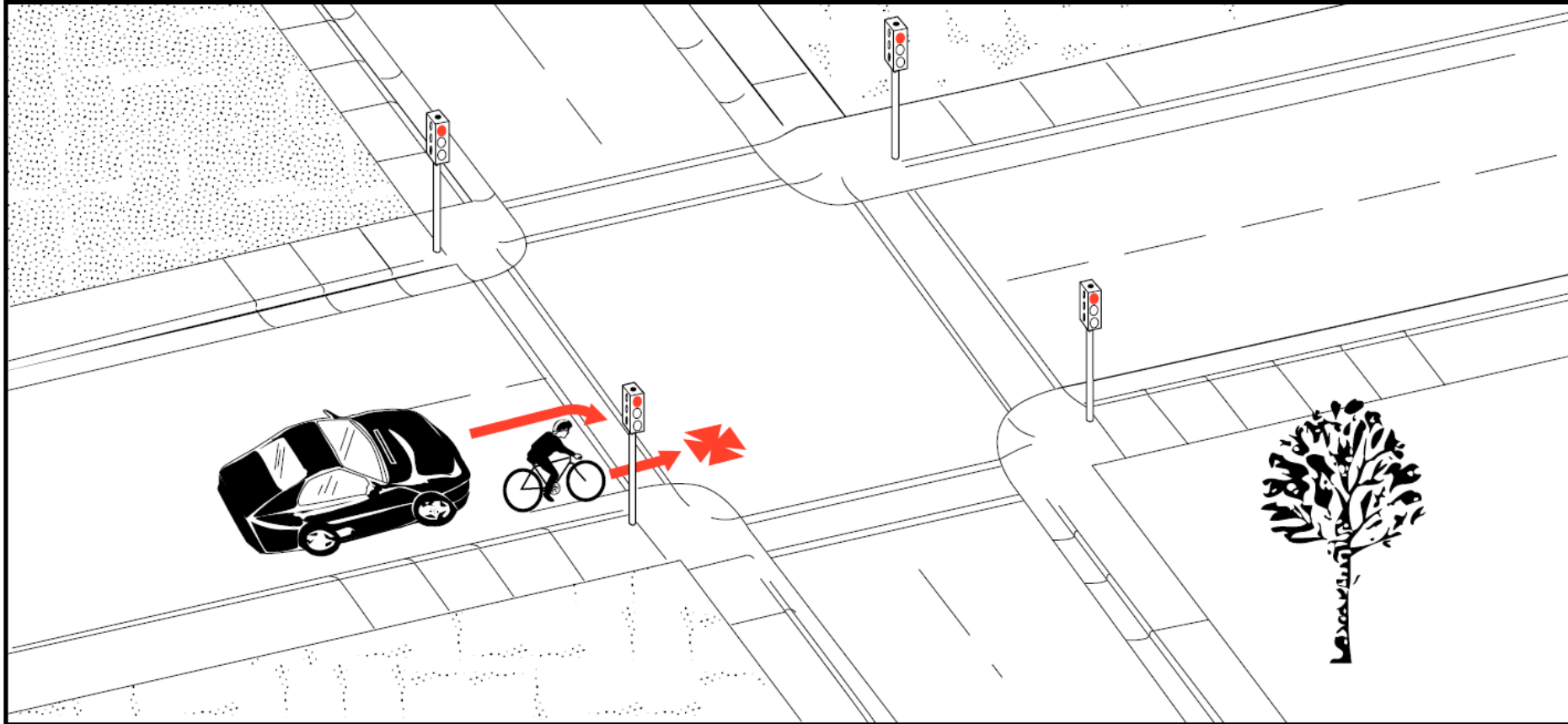
17.4% Motorist turned left while facing approaching bicyclist.

Motorist Drive Out – At Stop Sign



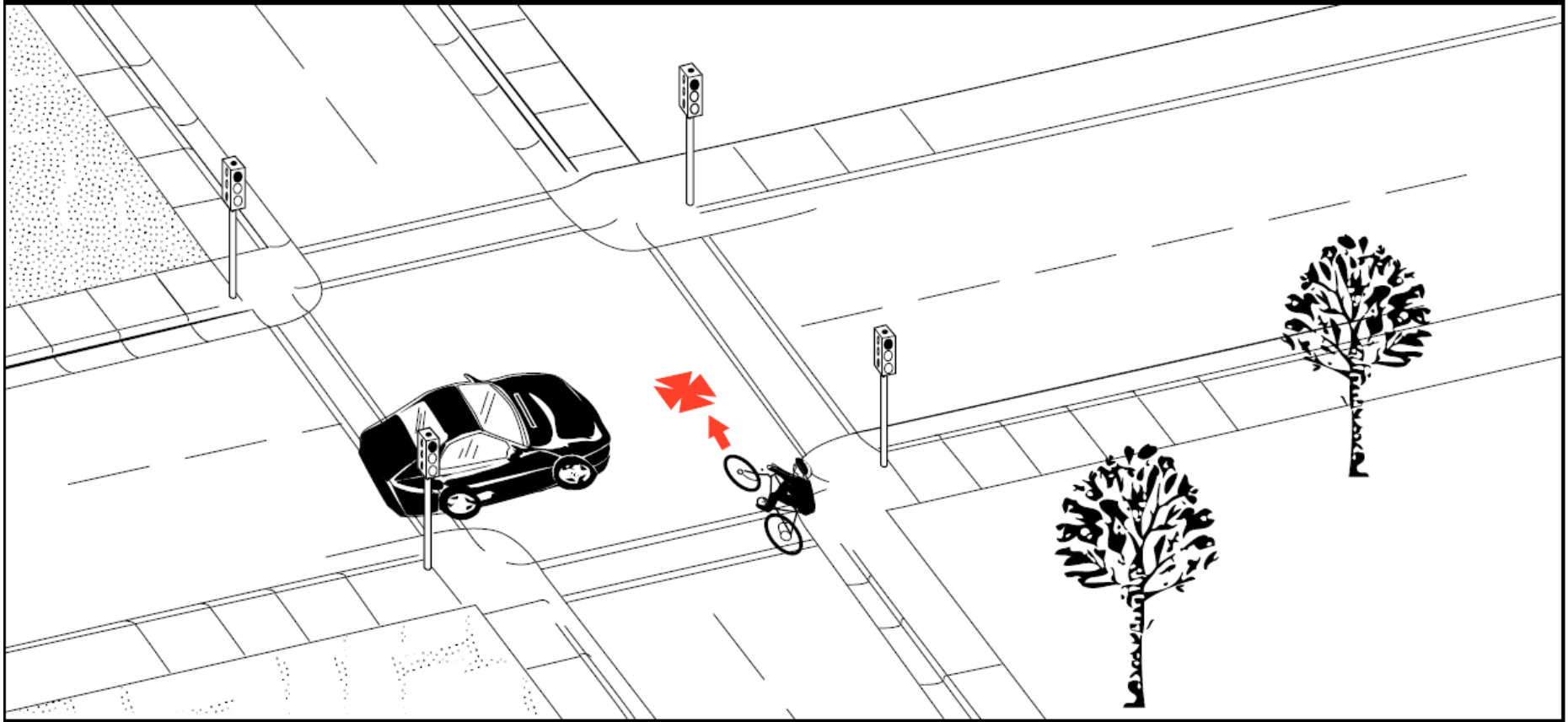
13.0% Motorist stopped at a stop sign but then failed to yield.

Motorist Right Turn - Other



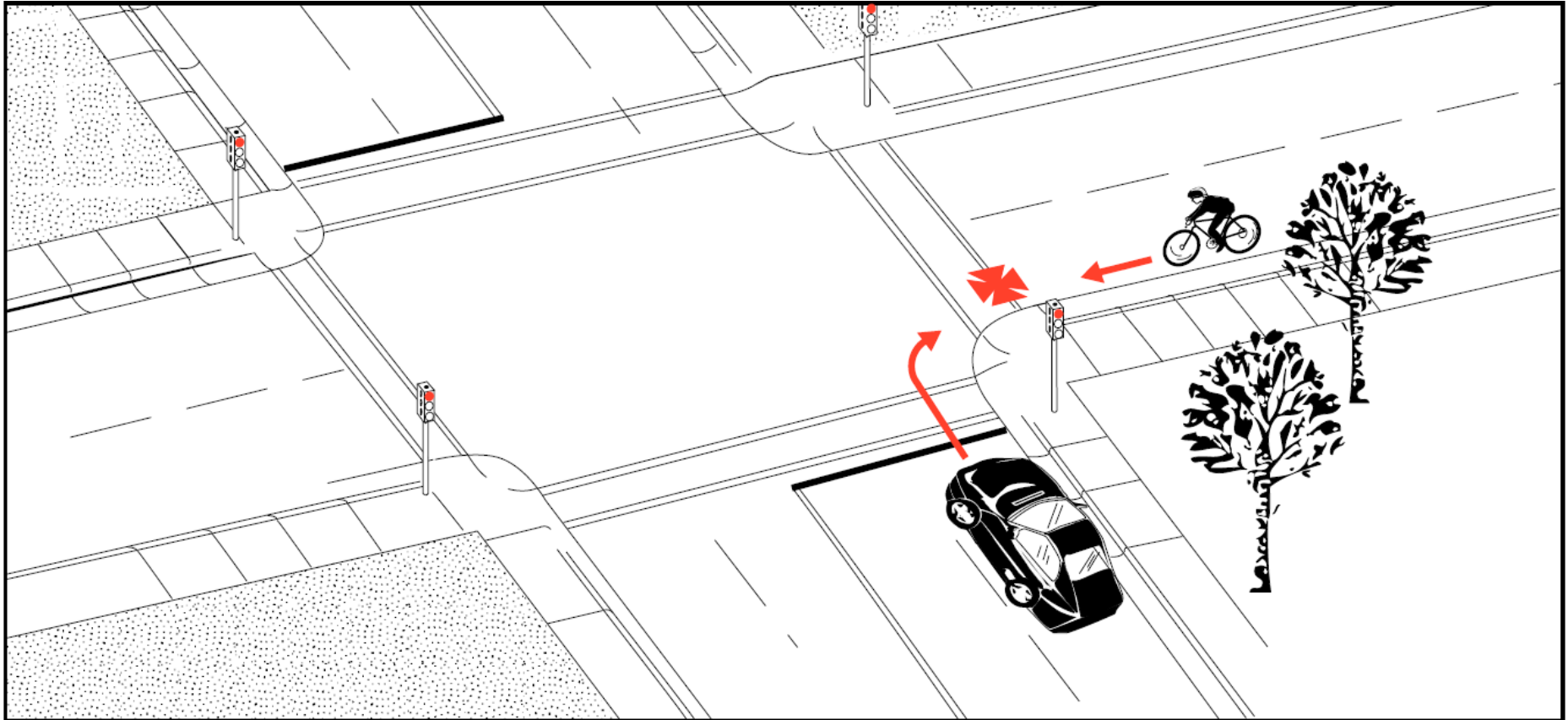
10.4% Motorist was turning right and bicyclist was riding in same or opposing direction

Bicycle Ride Out – At intersection



7.6% Bicyclist failed to yield at intersection

Motorist Right Turn – On Red



7.3% Motorist turned right while facing a red light.

Top NHTSA Bicyclist Crash Types

City of Madison

Crash Type	% of Total	Description
Motorist Left Turn – Facing Bicyclist	19.8%	Motorist turned left while facing approaching bicyclist
Motorist Right Turn – Other	11.6%	Motorist was turning right and bicyclist was riding in same or opposing direction
Motorist Drive Out – At Stop Sign	11.3%	Motorist stopped at a stop sign but then failed to yield
Bicycle Ride Out – At Intersection, Other	8.3%	Bicyclist failed to yield at a signalized or uncontrolled intersection
Motorist Right Turn – On Red	7.8%	Motorist turned right while facing a red light
Motorist Left Turn – In Front Of Bicyclist	5.3%	Both parties were traveling in the same direction and the motorist turned in front of the bicyclist
Other Types	35.9%	

Top NHTSA Bicyclist Crash Types

Urban Metro Area (excl. City of Madison)

Crash Type	% of Total	Description
Motorist Drive Out – At Stop Sign	23.4%	Motorist stopped at a stop sign but then failed to yield
Bicycle Ride Out – At Stop Sign	9.4%	Bicyclist stopped at a stop sign but then failed to yield
Motorist Left Turn – Facing Bicyclist	9.4%	Motorist turned left while facing approaching bicyclist
Motorist Right Turn – On Red	7.0%	Motorist turned right while facing a red light
Motorist Right Turn – Other	7.0%	Motorist was turning right and bicyclist was riding in same or opposing direction
Bicycle Ride Out – At Intersection, Other	7.0%	Bicyclist failed to yield at a signalized or uncontrolled intersection
Other	36.7%	

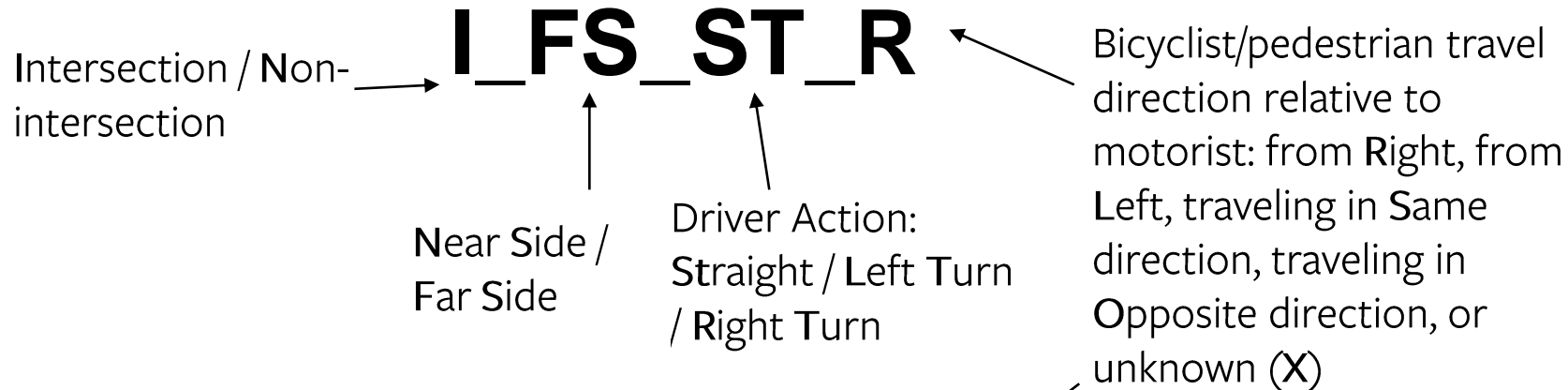
Top NHTSA Bicyclist Crash Types

Rest of Dane County

Crash Type	% of Total	Description
Motorist Overtaking – Other	18.6%	Motorist was overtaking a bicyclist and the circumstances could not be specified
Motorist Overtaking – Failed To Detect	16.3%	Motorist was overtaking and failed to detect the bicyclist
Bicycle Lost Control	11.6%	Bicyclist lost control and swerved into the path of the motorist
Motorist Drive Out – At Stop Sign	7.0%	Motorist stopped at a stop sign but then failed to yield
Motorist Left Turn – Facing Bicyclist	7.0%	Motorist turned left while facing approaching bicyclist
Motorist Overtaking – Counteractive Evasive Actions	7.0%	Motorist was overtaking and the bicyclist swerved and crashed
Motorist Overtaking – Misjudged Passing Space	7.0%	Motorist was overtaking and misjudged the width or length required to pass the bicyclist
Other Types	25.6%	

Location Movement Classification Method (LMCM) Crash Types

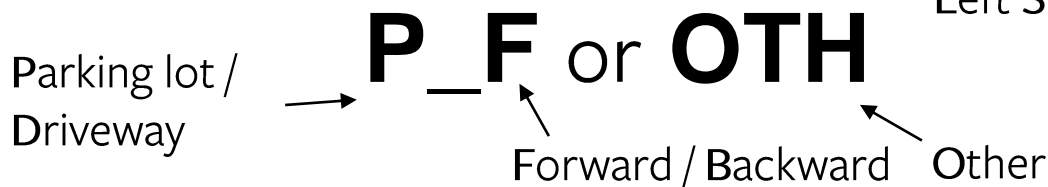
- 57 crash types identified by letter code
- Intersection crashes:



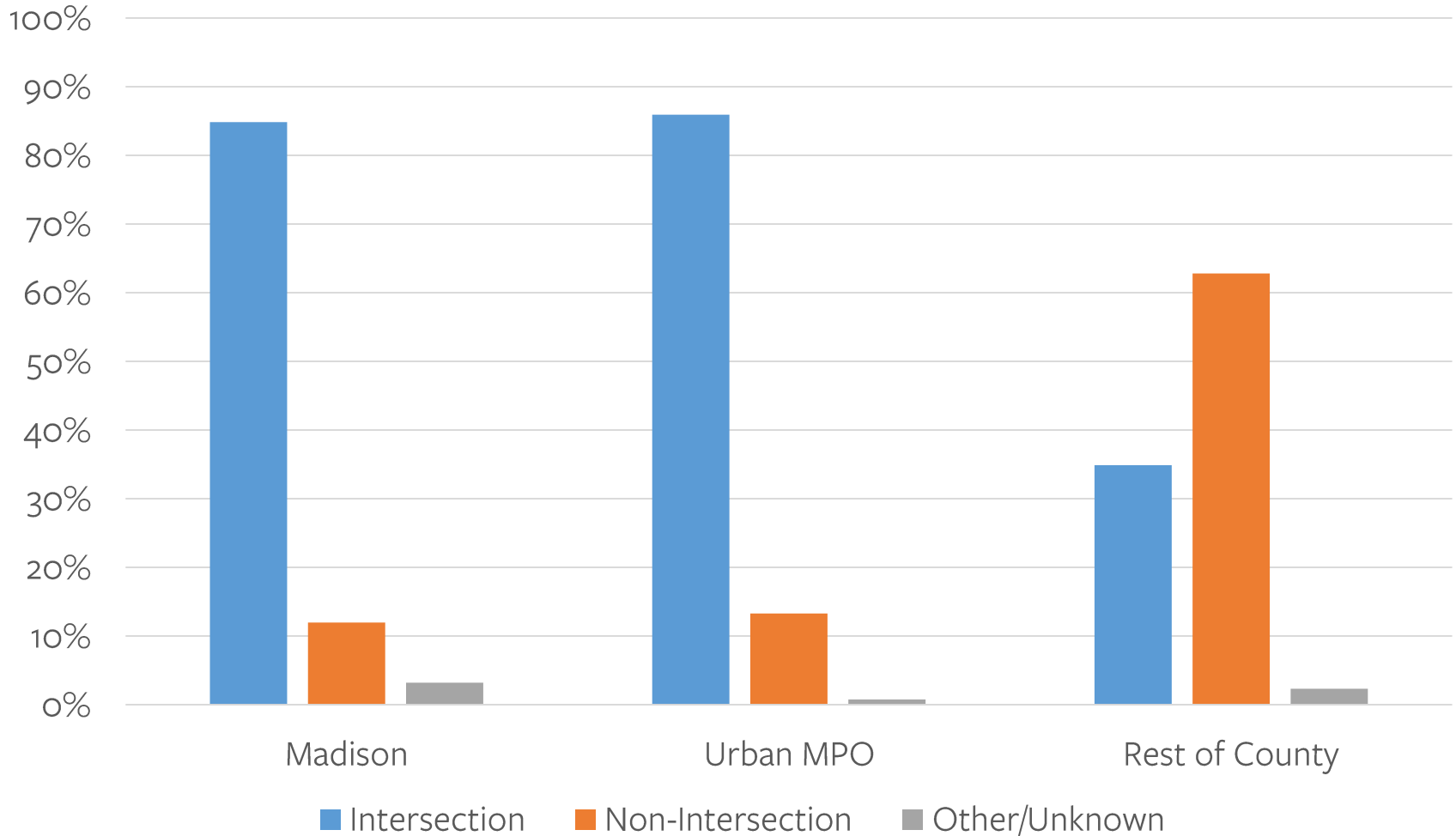
- Non-intersection:

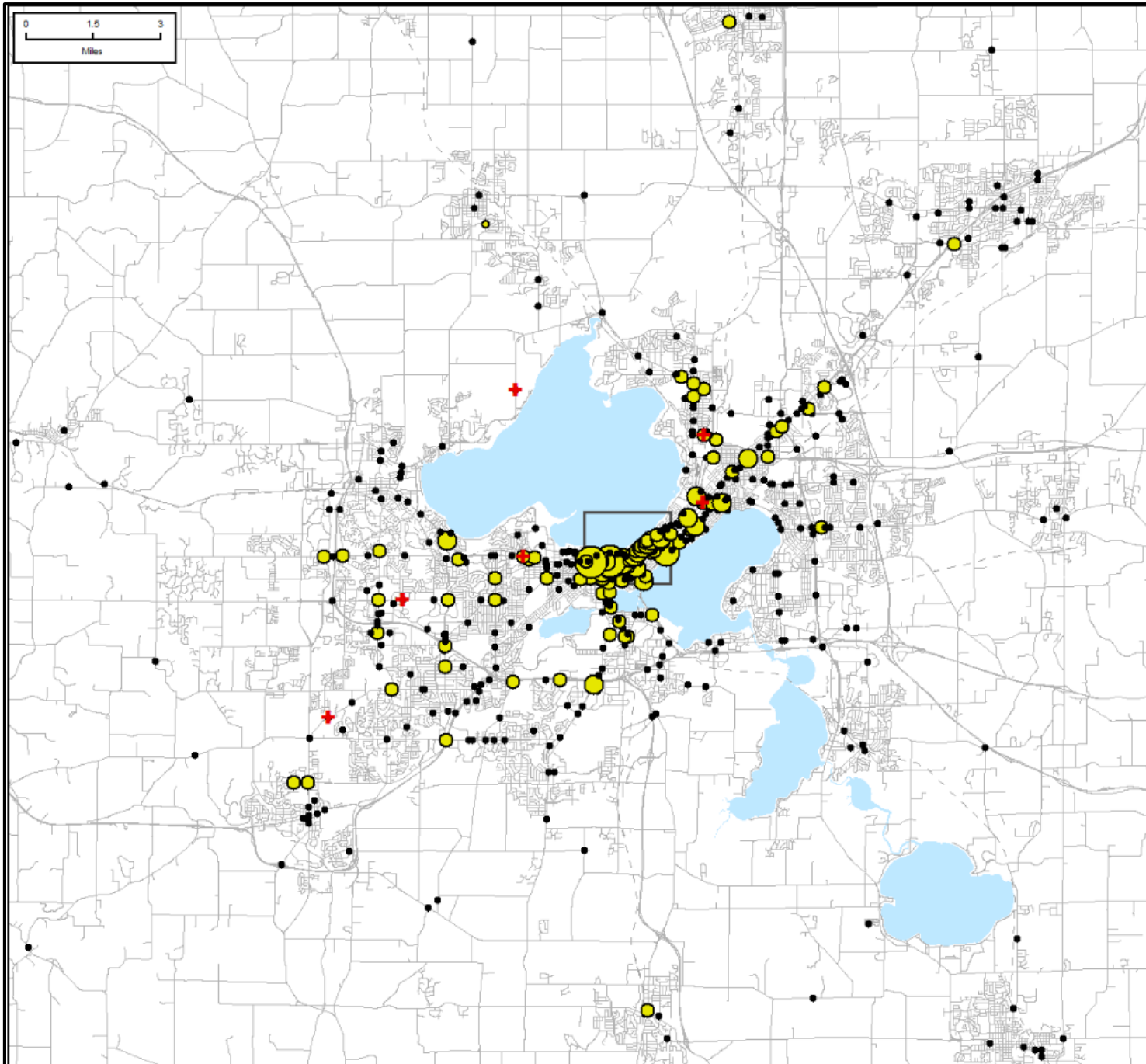


- Other:



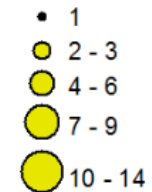
Bicycle Crash Locations by Community Type



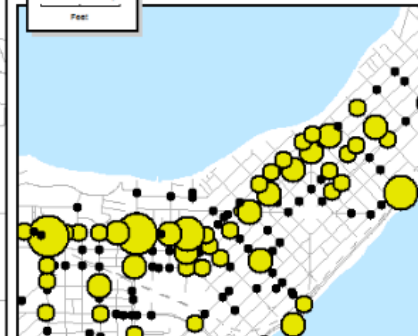
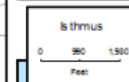
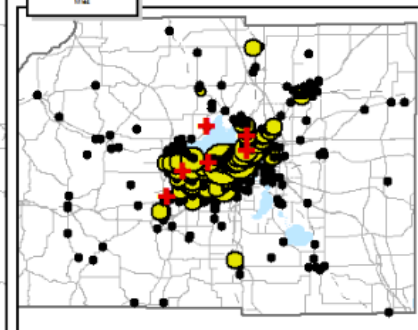
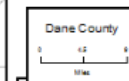


Bicycle-Motor Vehicle Crashes by Location 2011 - 2015

Crashes



+ Bicyclist Fatalities



Sheet Name: 00-17 (PARTIAL DC USD)
 Draw Date: 00-11-2010 (W/TOP & L&L TOP)



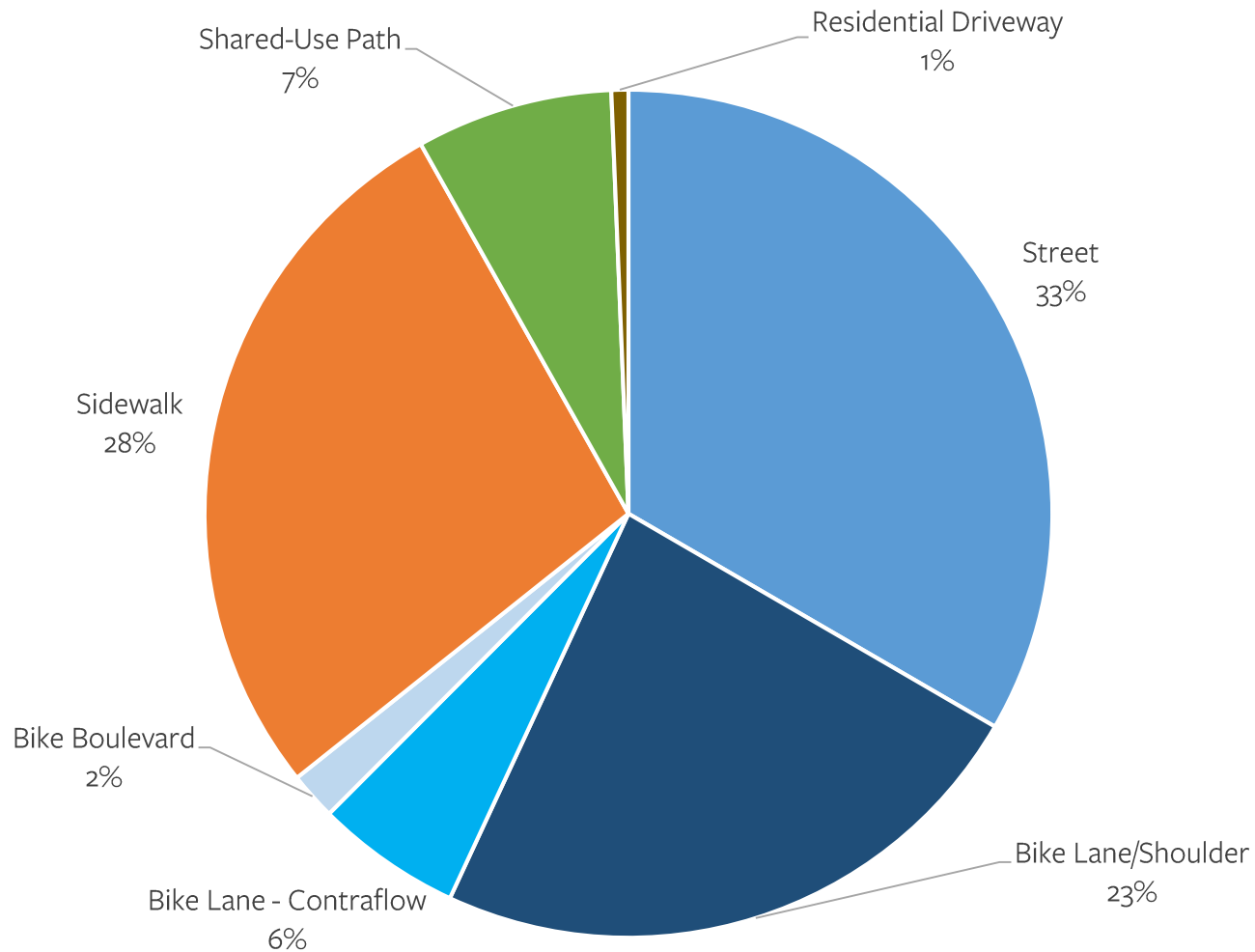
Coordinate System:
NAD 1983 HARN NADCR2 Data County Feet
Projected on: Lambert Conformal Conic

Top Bike Crash Locations 2011 – 2015

Top Bicycle Crash Locations

Location	Crashes	Fatalities
University Ave at N. Park St	14	0
University Ave at N. Randall St	12	0
John Nolen Dr at S. Blair St	9	0
University Ave at N. Frances St	9	0
John Nolen Dr at North Shore Dr	6	0
University Ave at N. Brooks St	6	0
E. Johnson St at N. Pinckney St	6	0
E. Johnson St at N. Hamilton St	6	0

Facility Type Used by Bicyclist

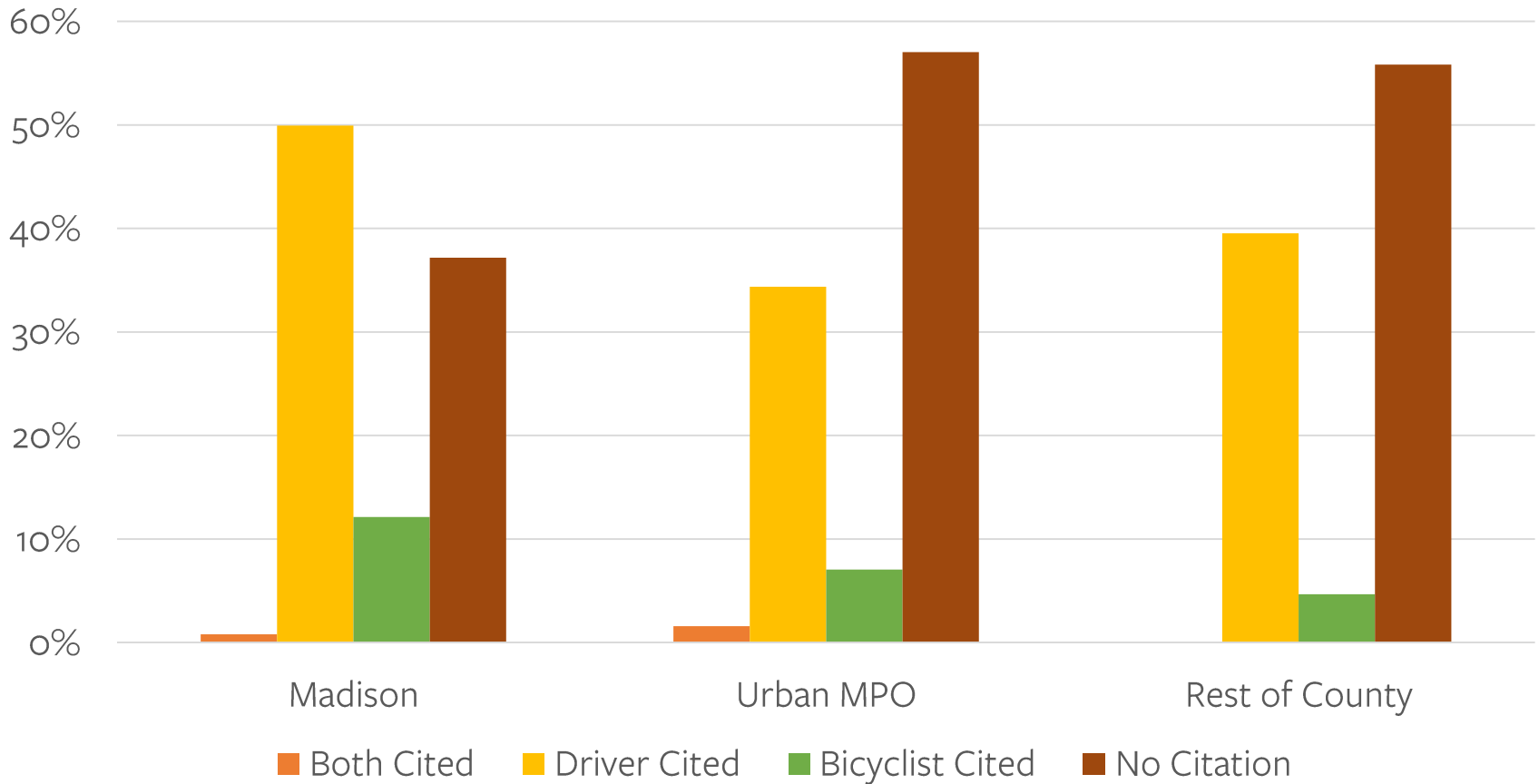


■ Street ■ Bike Lane/Shoulder ■ Bike Lane - Contraflow ■ Bike Boulevard ■ Sidewalk ■ Shared-Use Path ■ Residential Driveway

Injury Severity by Posted Speed Limit – Bicyclists

	Fatal		Incapacitating		Non-Severe		Unknown		Total	
Posted Speed Limit	#	%	#	%	#	%	#	%	#	%
≤25	1	0.2%	37	6.9%	494	92.5%	2	0.4%	534	100%
30	0	0%	3	3%	97	97%	0	0%	100	100%
35	3	2.8%	8	7.5%	94	87.9%	2	1.9%	107	100%
≥40	2	3.5%	10	17.5%	44	77.2%	1	1.8%	57	100%
Grand Total	6	0.8%	58	7.3%	729	91.4%	5	0.6%	798	100%

Citations Issued in Bicycle Crashes



Comparison:
Bicycle Crashes in the City of Madison
1987-1990 vs. 2011-2015

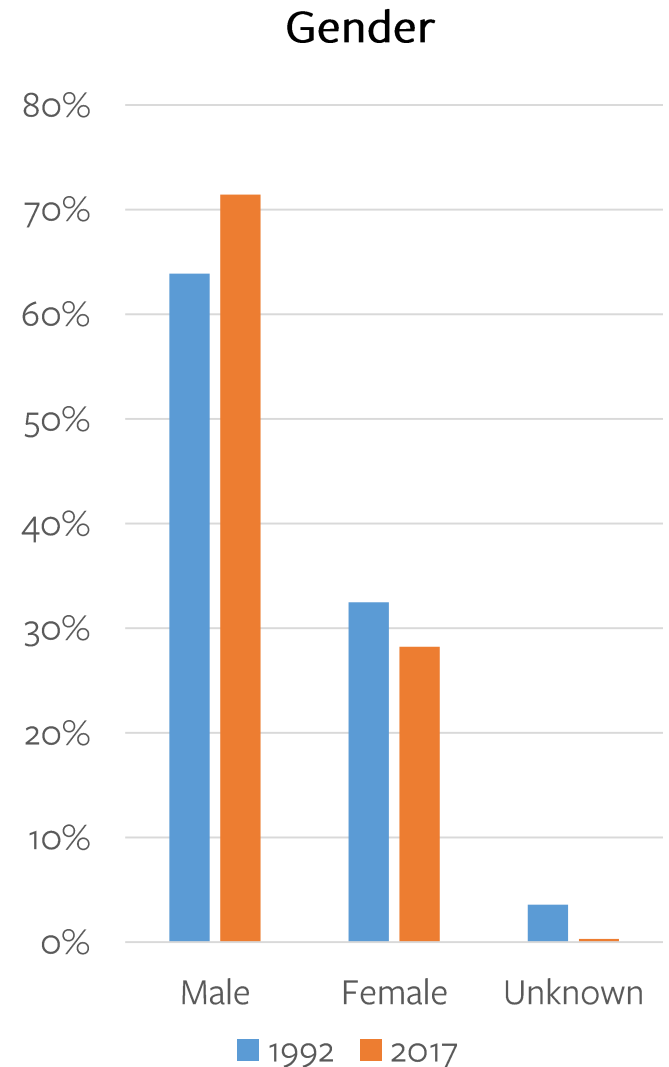
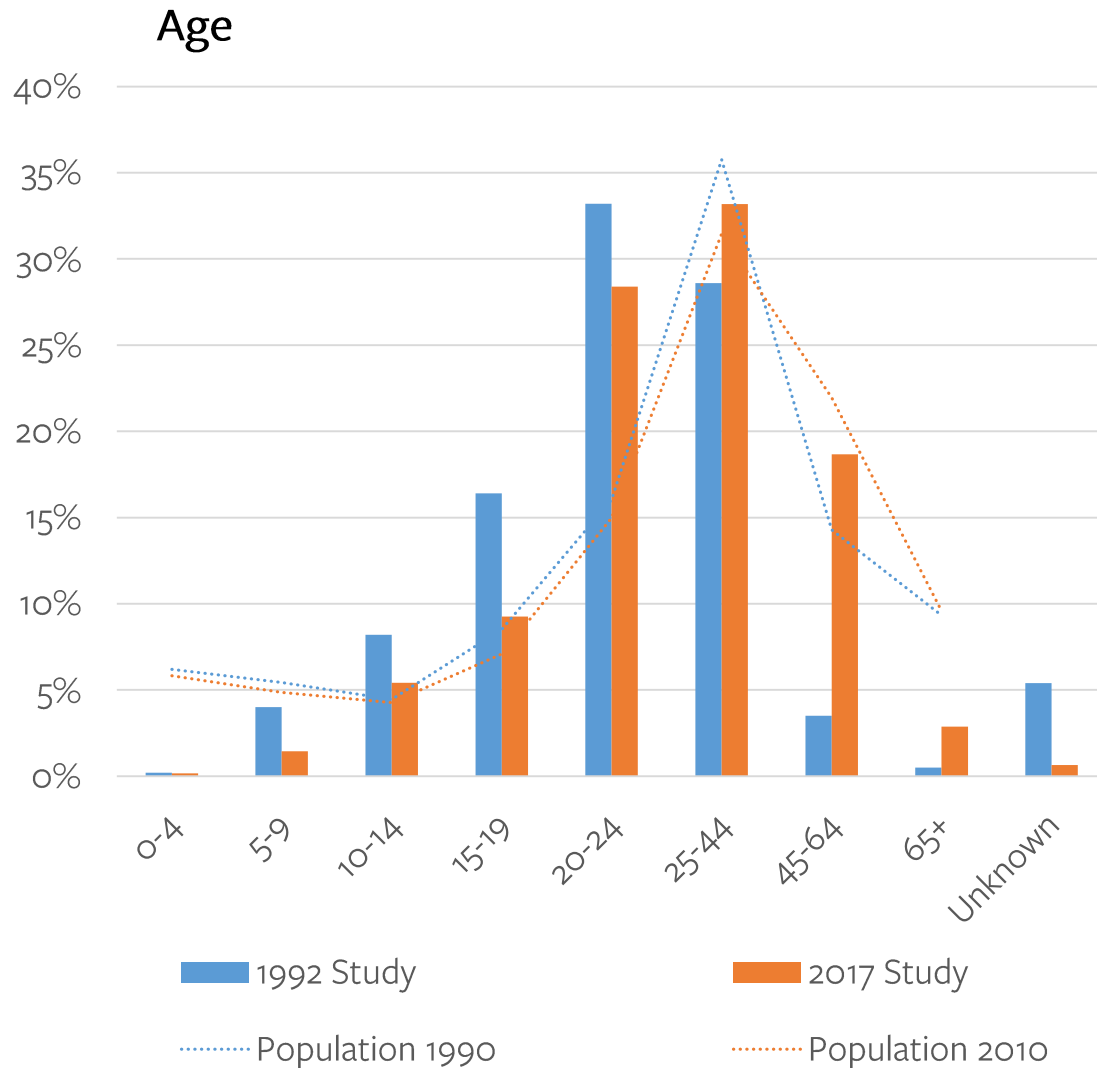
Bicycle Crashes:

2011-2015 vs 1987-1990

	2017 Study	1992 Study
Time Period	2011-2015	1987-1990
Number of Years	5	4
Study Area	Dane County	City of Madison
Total Crashes*	798	774
City of Madison	627	774
Population	243,122 (2011-2015 est.)	190,766 (1990)
Annual Crashes	125	194
Bicycle Commuting Pct.	5.2%	3.3%
Crash Rate per 100,000 pop.	51.4	101.7

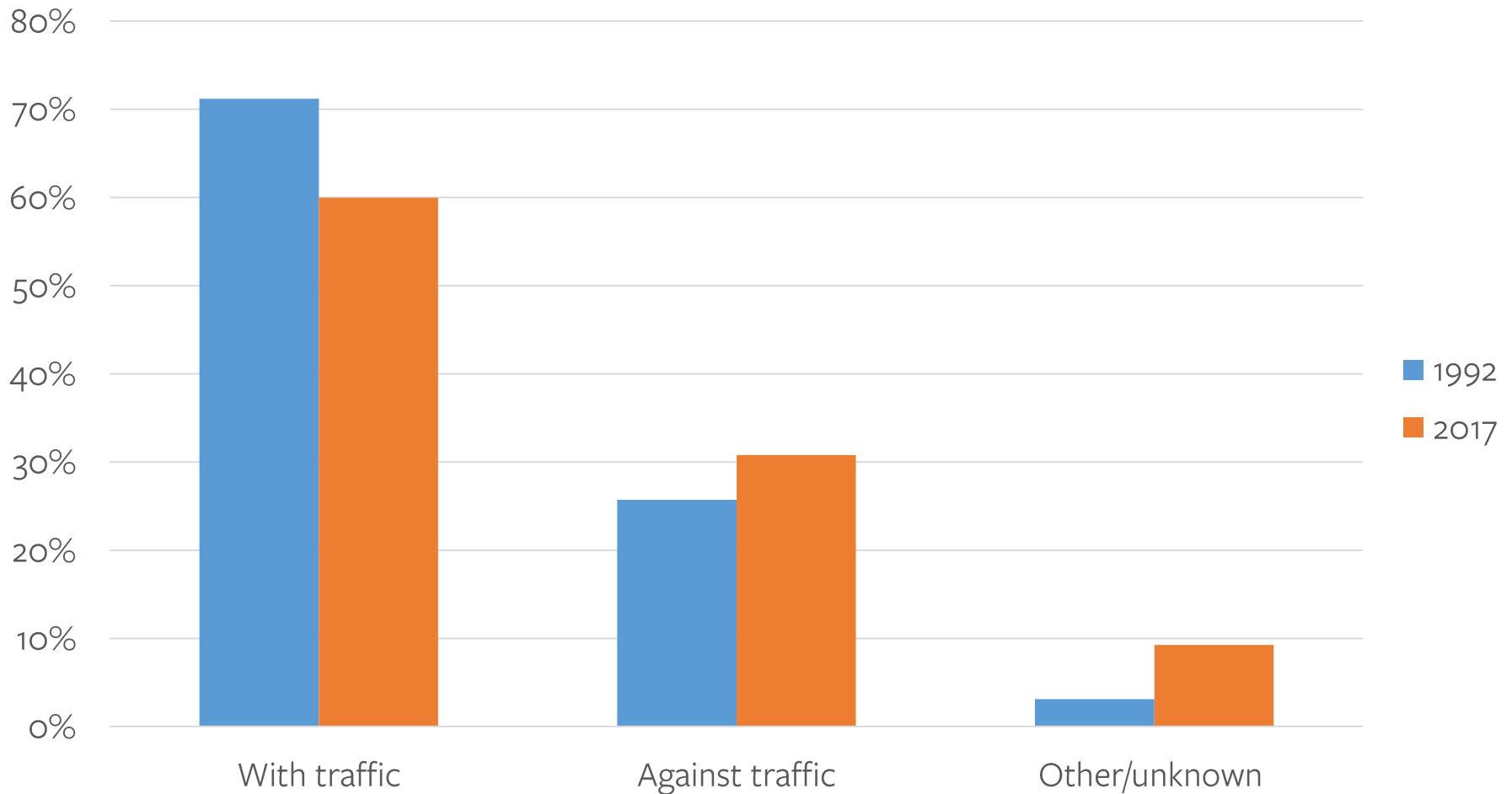
*Includes only motor vehicle – bicycle crashes

City of Madison Bicycle Crashes: 2011-2015 vs 1987-1990

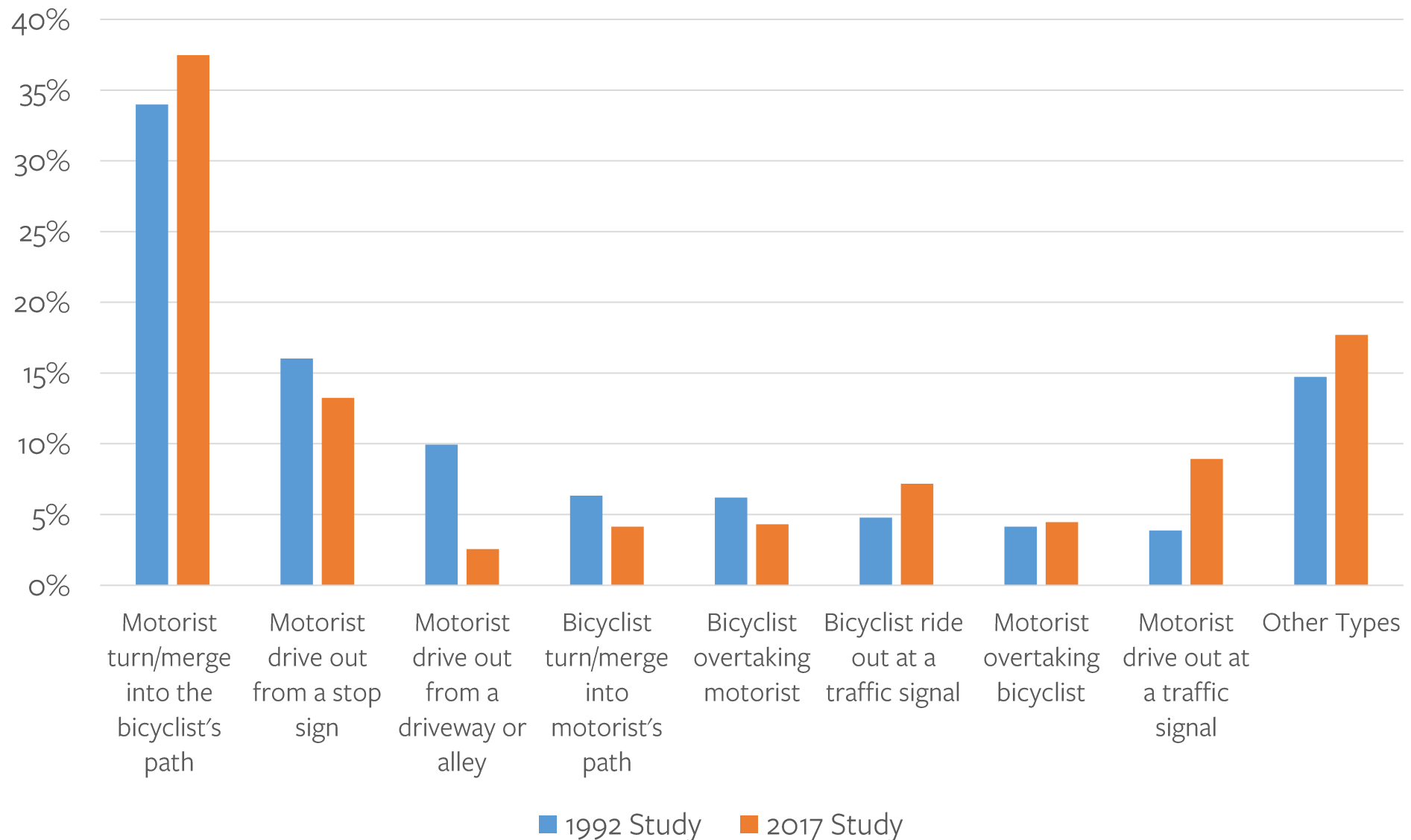


2011-2015 vs 1987-1990

Bicyclist Direction of Travel Relative to Nearest Traffic Lane



2011-2015 vs 1987-1990 Crashes by Type



Summary – Bicycle Crashes

- Crash Types, Citations Issued
 - *Motorist Left Turn Facing Bicyclist, Motorist Drive Out at Stop Sign, and Motorist Right Turn* most common urban crash types
 - *Bicycle Ride Out at Stop Sign* also common in suburban areas
 - *Motorist Overtaking* most common rural crash type
 - Driver cited in 50% of City of Madison crashes, 35-40% of other crashes while bicyclist cited in about 10% of crashes
- Fatal Crashes
 - 6 total fatal crashes (<1% of reported bicyclist crashes)
 - None at downtown Madison crash hotspots
- Comparison to 1992 Study (City of Madison)
 - Annual crashes declined from 194 (1987-1990) to 125 (2011-2015)
 - Older cyclists (45 – 65 age group) involved in a much larger share of crashes – 3.5% (1987-1990) to 18.6% (2011-2015)
 - Common crash types generally the same; even higher % - motorist turn/merge into bicyclist's path

Pedestrian Crashes

38 NHTSA¹ Pedestrian Crash Types

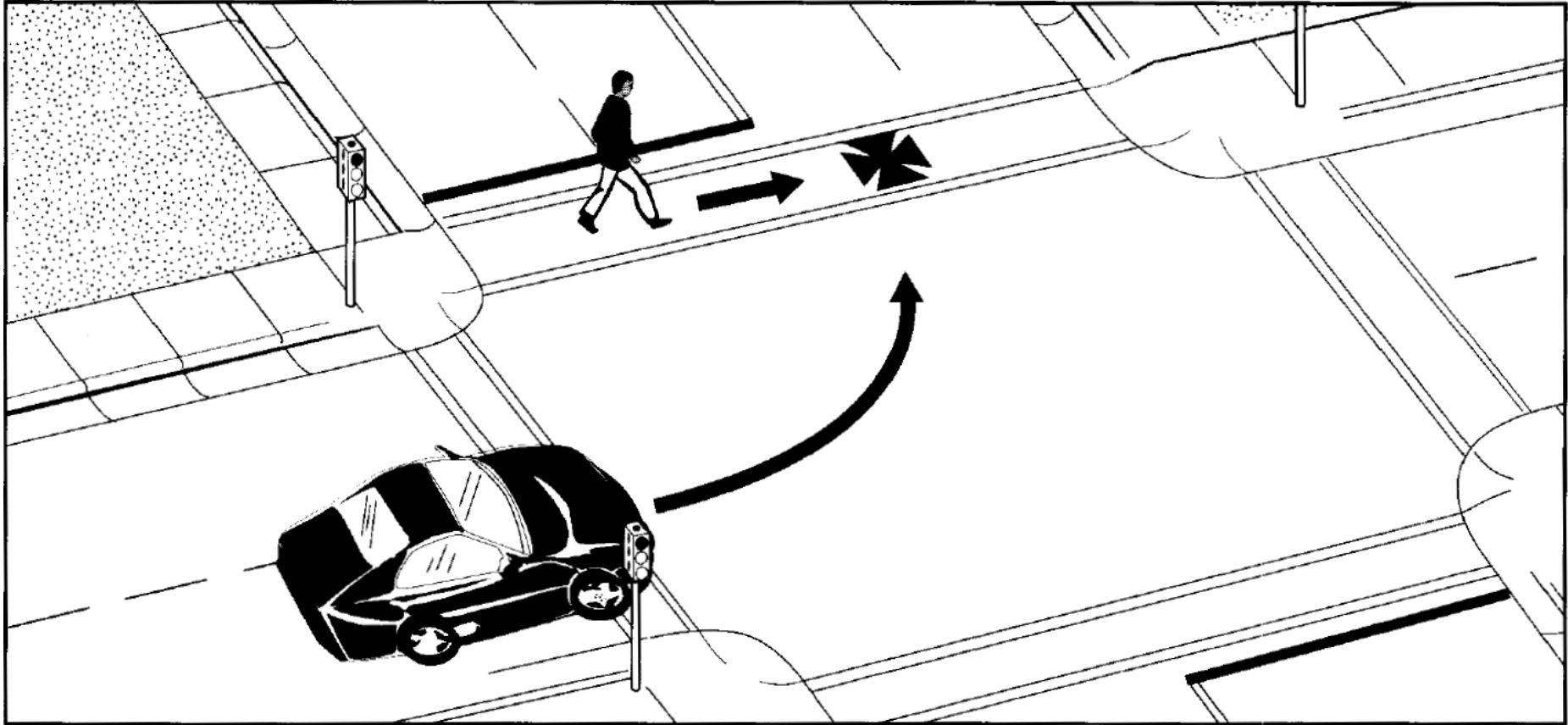
- Special Circumstances
 - Commercial Bus Related
 - School Bus Related
 - Ice Cream Vendor
 - Mailbox Related
 - Exiting or Entering Parked Vehicle
- Vehicle Specific
 - Driverless Vehicle
 - Backing Vehicle
 - Hot Pursuit
- Disabled/Emergency Vehicle Related
- Working/Playing in Roadway
 - Working on Roadway
 - Play Vehicle Related
 - Playing in Roadway
- Walking along Road
- Expressway Crossing
- Not in Road
 - Waiting to Cross
 - Not in Roadway
- Intersection Related
 - Multiple Threat at intersection
 - Vehicle Turn/Merge
 - Intersection Dash
 - Trapped
- Intersection Related (continued)
 - Walked into Vehicle at Intersection
 - Driver Violation at Intersection
 - Intersection – Other
- Midblock Related
 - Multiple Threat at Midblock
 - Midblock Dart Out
 - Midblock Dash
 - Walked into Vehicle at Midblock
 - Driver Violation at Midblock²
 - Midblock – Other
- Other
 - Lying in Road
 - Suicide
 - Assault With Vehicle
 - Pedestrian On Vehicle
 - Motorist Lost Control²
 - Vehicle-Vehicle Crash
 - Vehicle-Object Crash
 - Weird
 - Inadequate Information

¹Pedestrian Crash Types: A 1990s Informational Guide,
<https://ntl.bts.gov/lib/20000/20000/20099/PB98109671.pdf>

²The original FHWA crash type: *Domestic/Dispute Related* was not used in the present study. *Motorist Lost Control* and *Driver Violation at Midblock* were added.

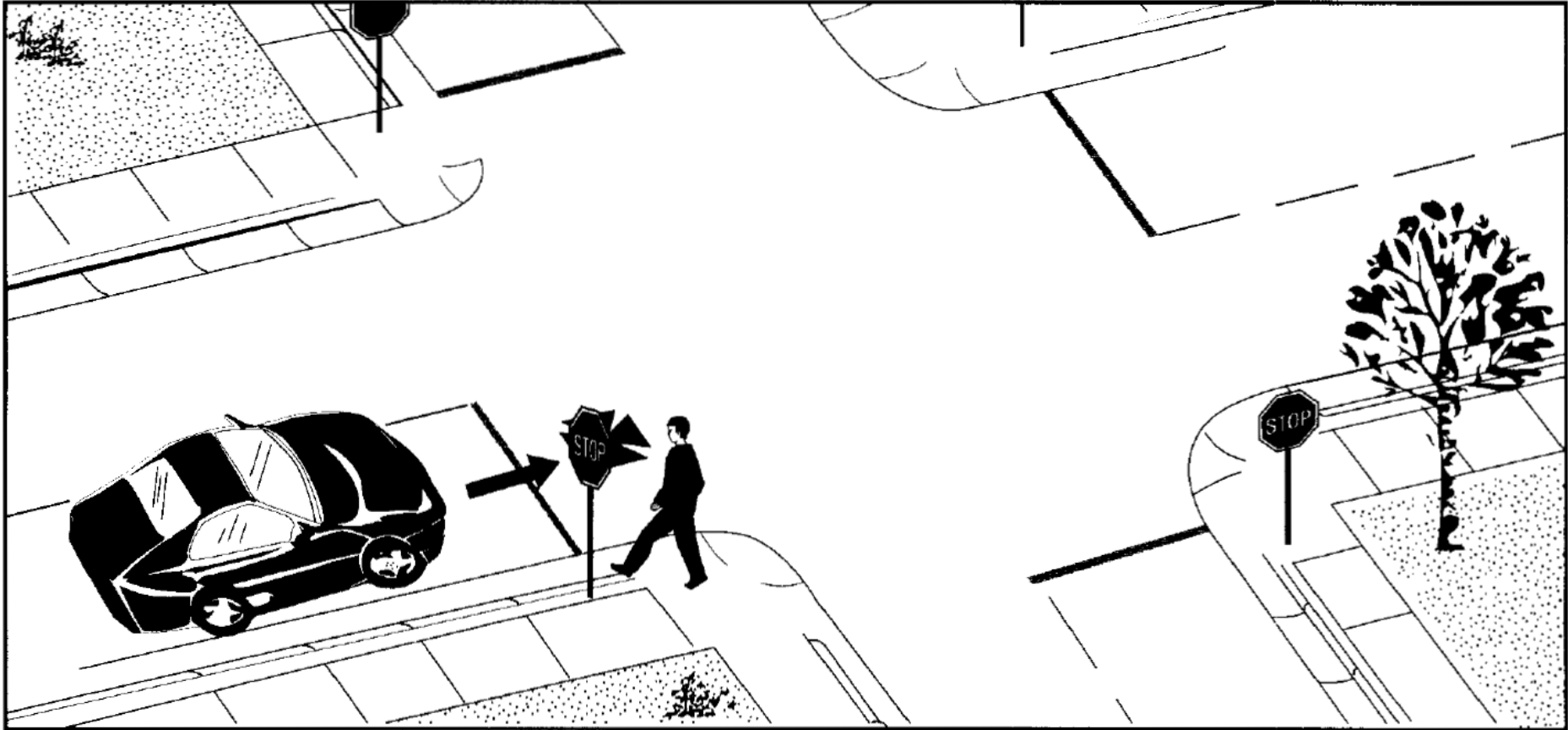
**Most Common
NHTSA Pedestrian Crash Types
in Dane County**

Vehicle Turn/Merge at Intersection



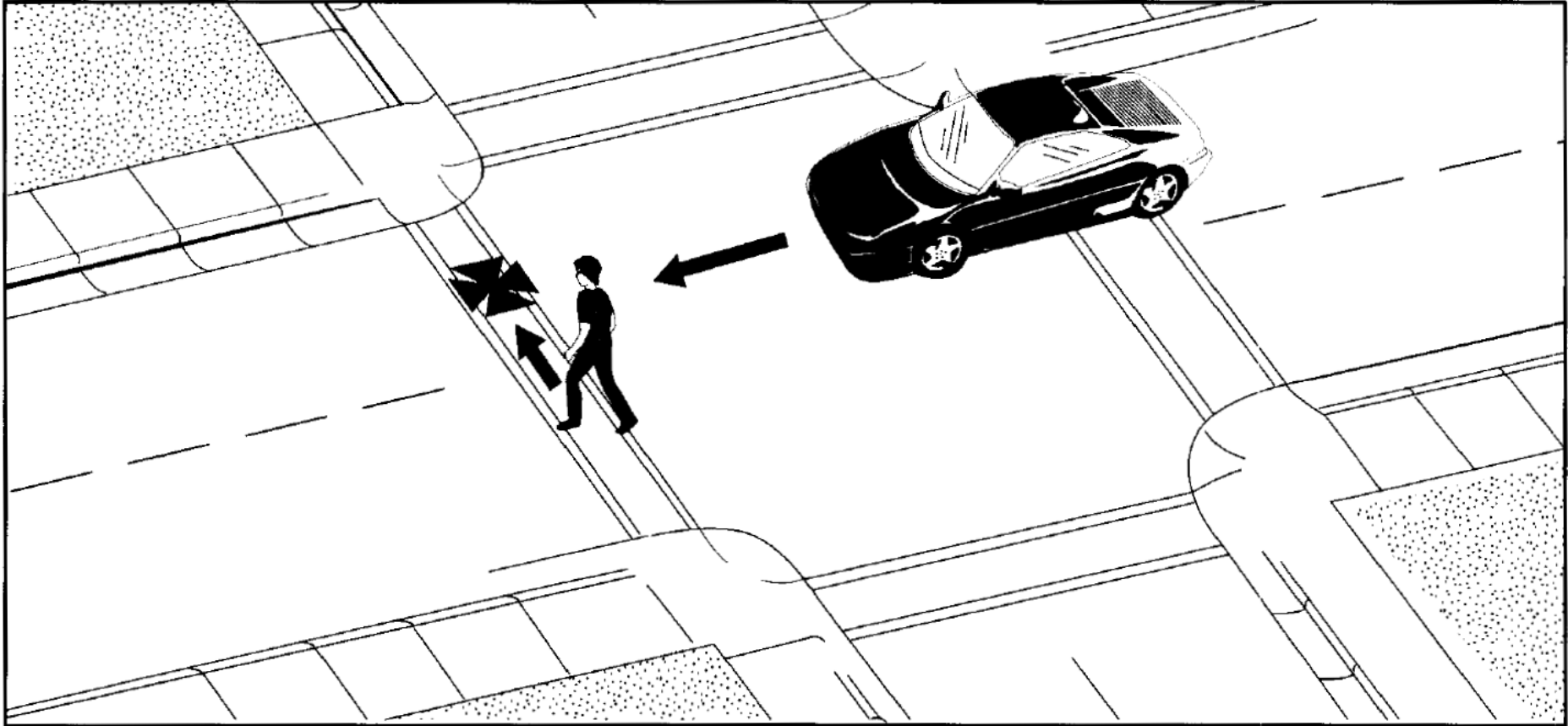
33.9% The pedestrian and vehicle collided while the vehicle was preparing to turn, in the process of turning or had just completed a turn (or merge).

Driver Violation At Intersection



10.3% Motorist was going straight and committed a violation.

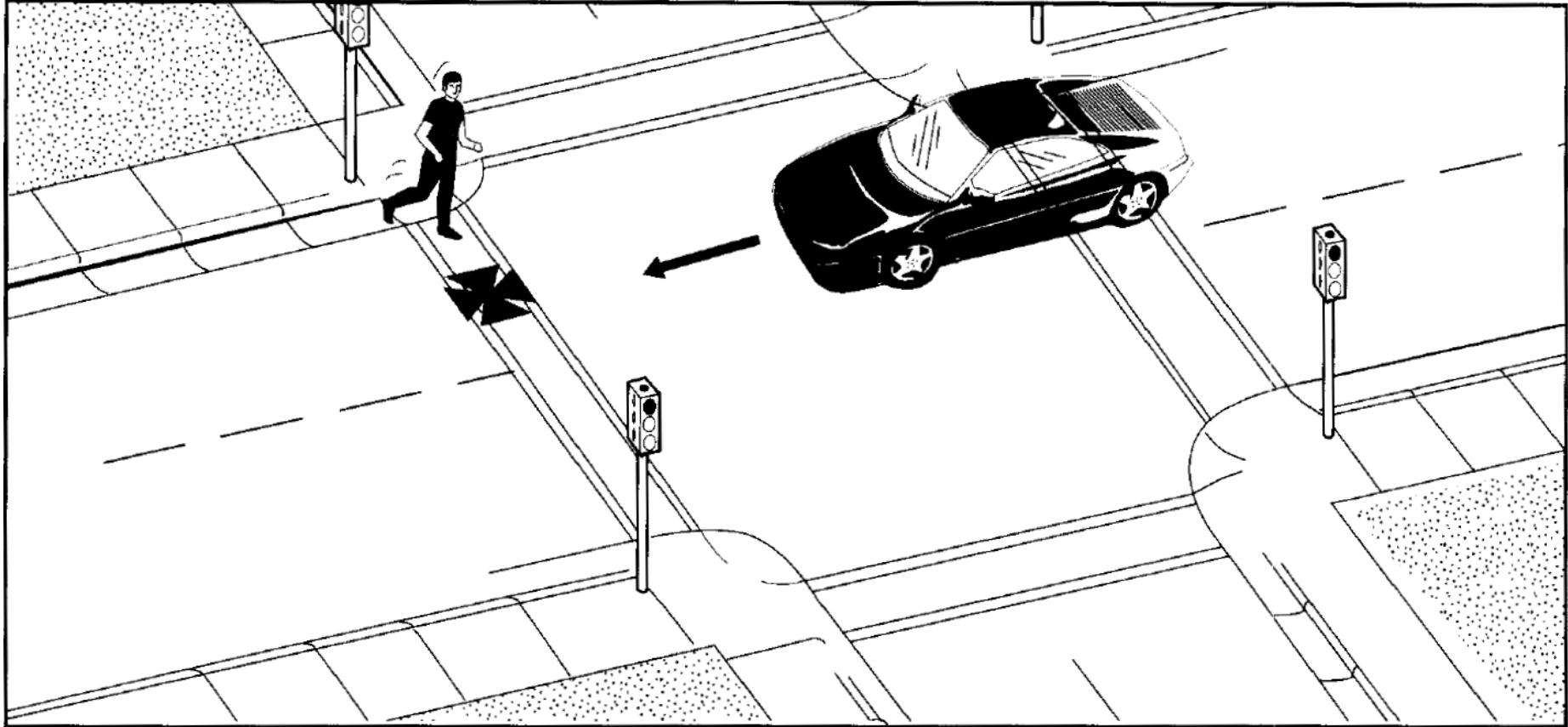
Intersection Related - Other



9.4%

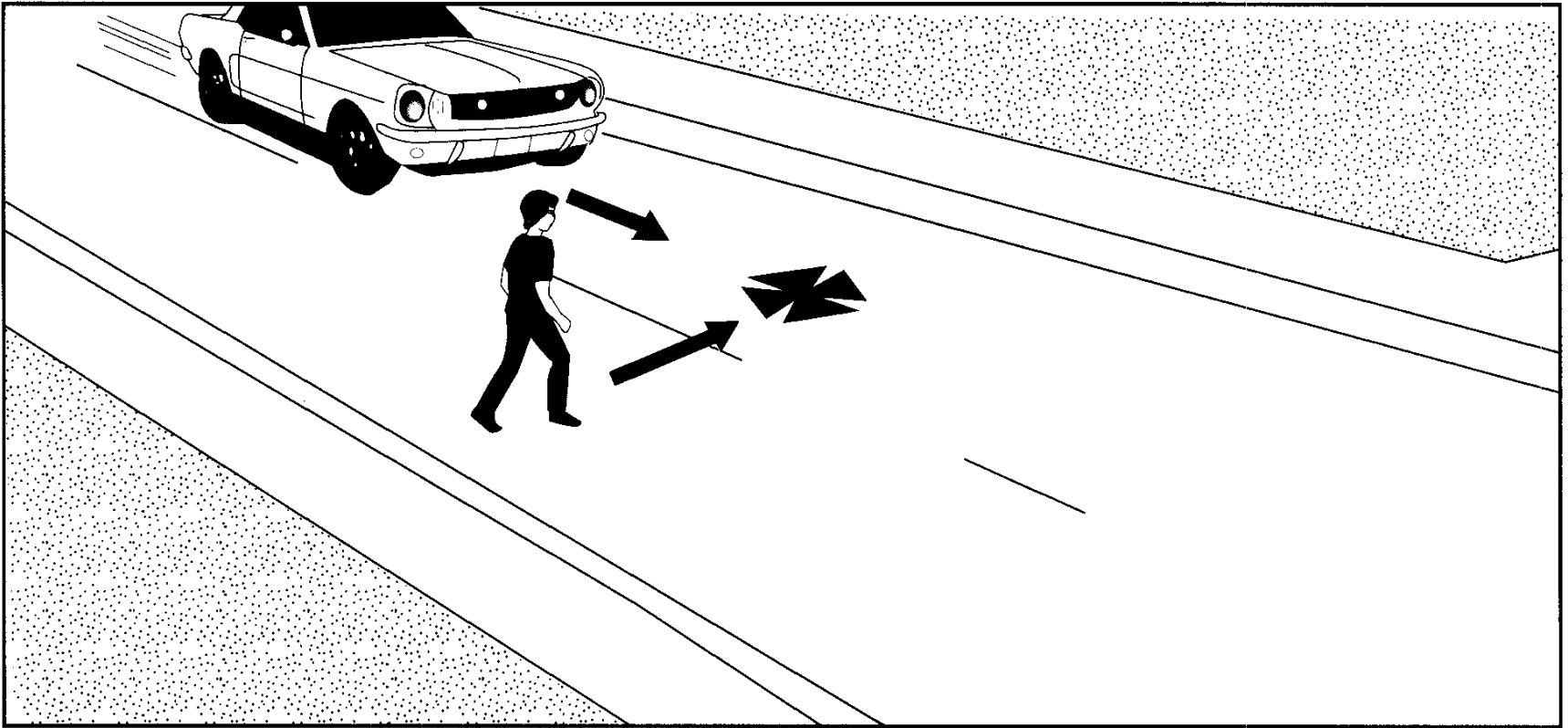
All of these crashes involved a pedestrian walking out at intersection.
*30 out of these 52 crashes involve pedestrians crossing against a traffic signal.

Intersection Dash



5.1% Pedestrian was running and/or the motorist's view was blocked.

Midblock Related – Other



4.2%

All of these crashes involved a pedestrian walking into the street at midblock.

Top NHTSA Pedestrian Crash Types

City of Madison

Crash Type	% of Total	Description
Vehicle Turn Or Merge At Intersection	38%	The vehicle was preparing to turn, in the process of turning, or had just completed a turn (or merge)
Driver Violation At Intersection	11%	The vehicle was proceeding straight ahead and the report indicated that the driver committed a violation such as careless driving, failure to yield, DWI, etc.
Intersection Related - Other	10%	The crash occurred at an intersection but does not conform to any other specified crash type (Note: All of these crashes involved a pedestrian walking into the street at an intersection.)
Intersection Dash	5%	The pedestrian was running through an intersection and/or the motorist's view of the pedestrian was blocked until an instant prior to impact
Midblock Related - Other	4%	The crash occurred at midblock but does not conform to any other specified crash type (Note: All of these crashes involved a pedestrian walking into the street at midblock.)
Other/Unknown Crash Types	33%	

Top NHTSA Pedestrian Crash Types

Urban Metro Area (excl. City of Madison)

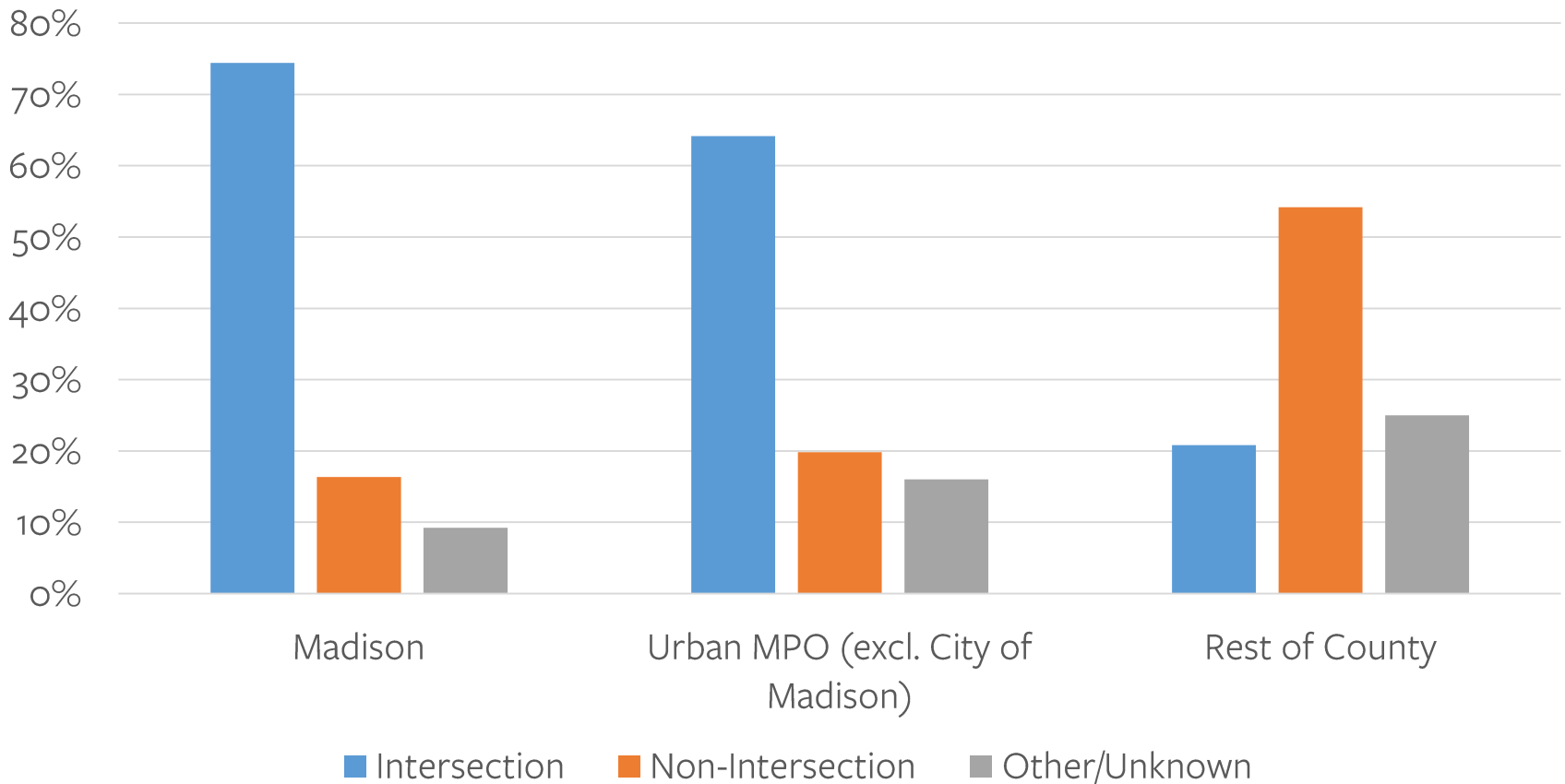
Crash Type	% of Total	Description
Vehicle Turn Or Merge At Intersection	25%	The vehicle was preparing to turn, in the process of turning, or had just completed a turn (or merge)
Intersection Related - Other	9%	The crash occurred at an intersection but does not conform to any other specified crash type (Note: All of these crashes involved a pedestrian walking into the street at an intersection.)
Driver Violation At Intersection	9%	The vehicle was proceeding straight ahead and the report indicated that the driver committed a violation such as careless driving, failure to yield, DWI, etc.
Multiple Threat At Intersection	8%	The pedestrian entered the traffic lane in front of stopped traffic and was struck by another vehicle traveling in the same direction as the stopped traffic
Intersection Dash	6%	The pedestrian was running through an intersection and/or the motorist's view of the pedestrian was blocked until an instant prior to impact
Play Vehicle Related	6%	The pedestrian was struck while riding a play vehicle such as a skateboard, wagon, tricycle, etc.
Other/Unknown Crash Types	38%	

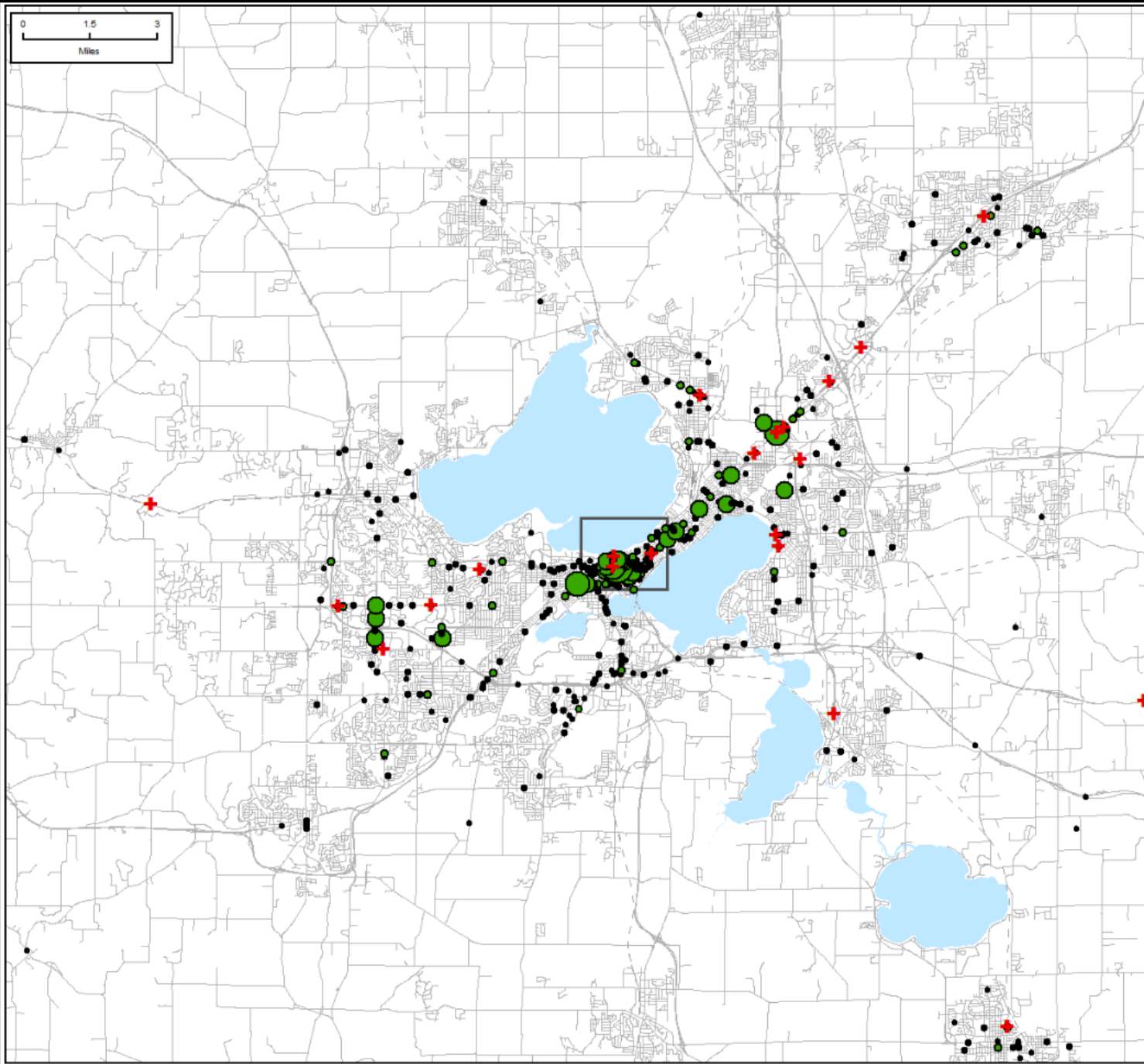
Top NHTSA Pedestrian Crash Types

Rest of County

Crash Type	% of Total	Description
Working On Roadway	13%	The pedestrian was struck while working on/over/under the roadway
Vehicle Turn Or Merge At Intersection	8%	The vehicle was preparing to turn, in the process of turning, or had just completed a turn (or merge)
Intersection Related - Driver Violation At Intersection	8%	The vehicle was proceeding straight ahead and the report indicated that the driver committed a violation such as careless driving, failure to yield, DWI, etc.
Walking Along Road	8%	The pedestrian was struck while walking or running along a road without sidewalks
Midblock Related - Other	8%	The crash occurred at midblock but does not conform to any other specified crash type (Note: All of these crashes involved a pedestrian walking into the street at midblock.)
Backing Vehicle	8%	The pedestrian was struck by a vehicle that was backing
Not In Roadway	8%	The pedestrian was struck in a parking lot, sidewalk, yard, or other non-roadway location
Disabled/Emergency Vehicle Related	8%	The pedestrian was struck walking to/from or while near a disabled or emergency vehicle
Other/Unknown Types	31%	The pedestrian was struck while riding a play vehicle such as a skateboard, wagon, tricycle, etc.

Pedestrian Crash Locations by Community Type

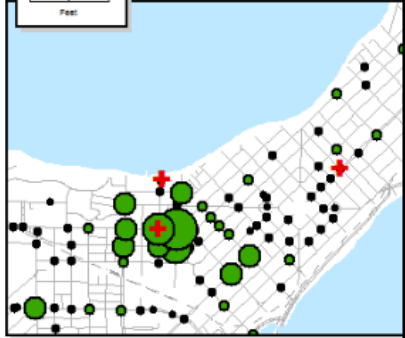
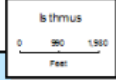
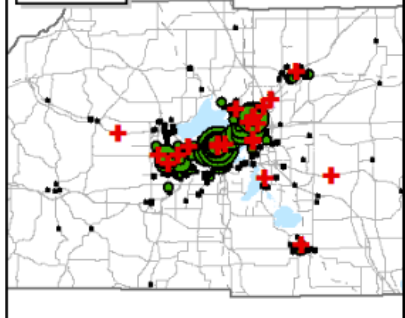
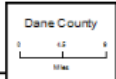




Pedestrian-Motor Vehicle Crashes by Location 2011 - 2015

Crashes

- 1
- 2
- 3 - 4
- 5 - 6
- 7 - 11
- + Pedestrian Fatalities



Source: DHS
Data Year: 2011-2015
Data Source: Dane County Traffic Data



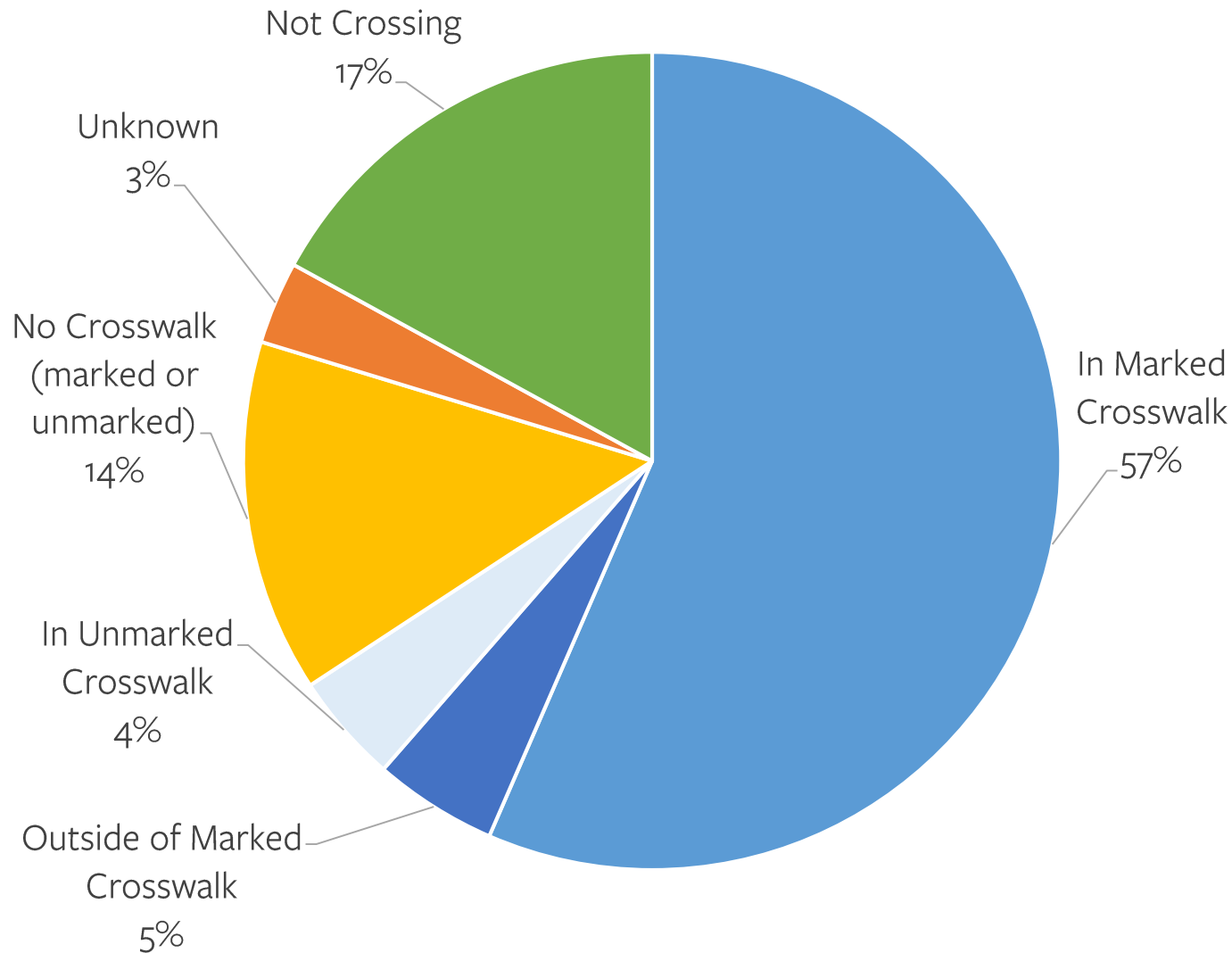
Coordinate System:
NAD 83 UTM 16Q UTM Zone 16Q
Projection: Lambert Conformal Conic

Top Pedestrian Crash Locations 2011 – 2015

Top Pedestrian Crash Locations

Location	Crashes	Fatalities
University Ave at N. Frances St	11	0
Monroe St at Regent St	6	0
University Ave at N. Lake St	5	1
E. Washington Ave at Stoughton Rd	4	2
University Ave at N. Park St	4	0
W. Johnson St at N. Frances St	4	0
W. Johnson St at N. Lake St	4	0
W. Washington Ave at Broom St	4	0

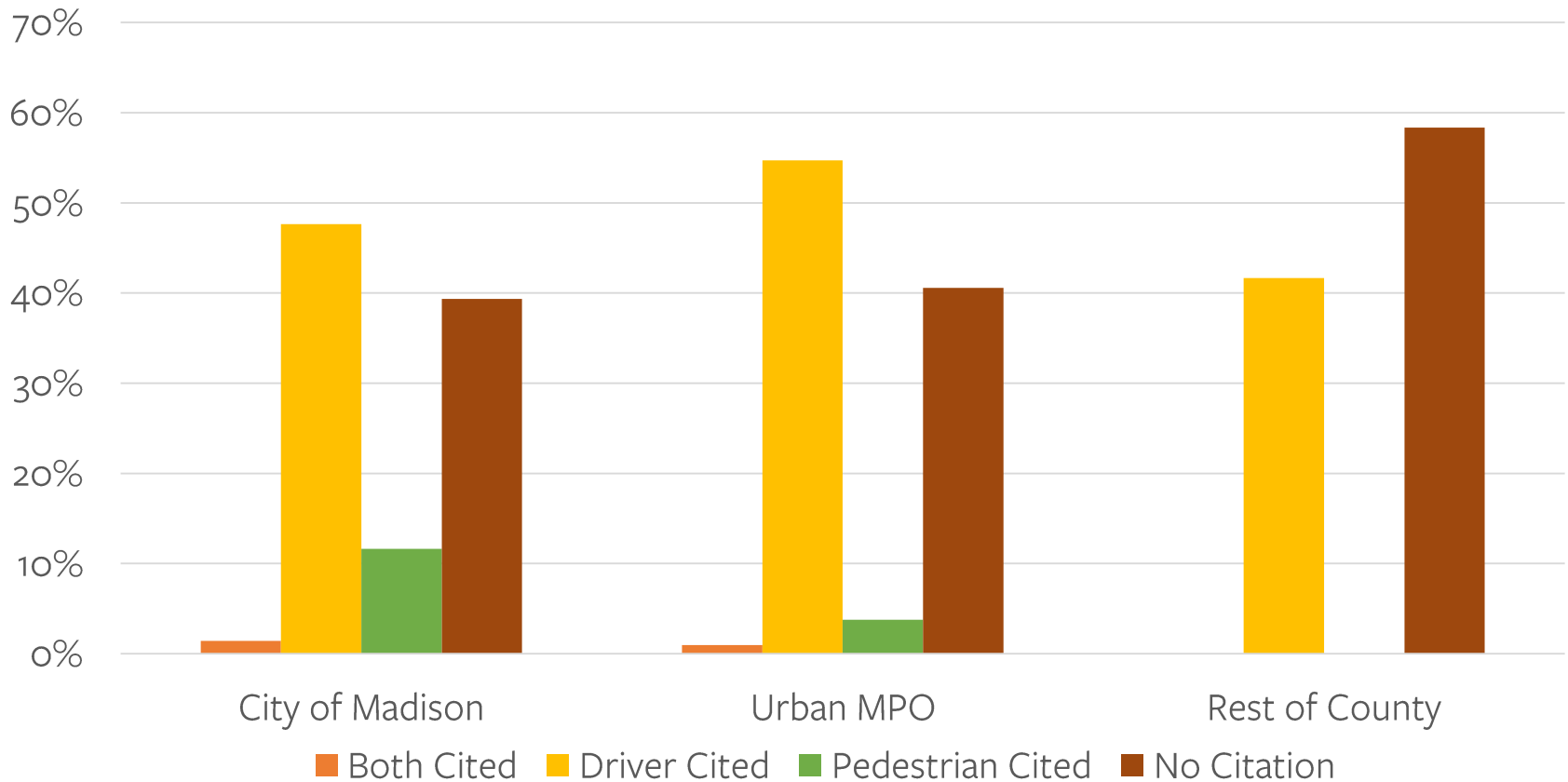
Pedestrian Location at Time of Crash



Injury Severity by Posted Speed Limit – Pedestrians

	Fatal		Incapacitating		Non-Severe		Unknown		Total	
Posted Speed Limit	#	%	#	%	#	%	#	%	#	%
≤25	4	1.1%	47	13.1%	304	84.7%	4	1.1%	359	100%
30	4	4.7%	12	13.95%	69	80.2%	1	1.2%	86	100%
35	6	8.45%	13	18.3%	52	73.2%	0	0%	71	100%
≥40	8	22.2%	7	19.4%	21	58.3%	0	0%	36	100%
Grand Total	22	3.99%	79	14.31%	446	80.8%	5	0.91%	552	100%

Citations Issued in Pedestrian Crashes



Summary – Pedestrian Crashes

- Crash Types, Citations Issued
 - By far most common is *Vehicle Turn/Merge at Intersection*, accounting for 1/3 of crashes
 - Other common types are *Drive Violation at Intersection* and *Intersection Related – Other* (all pedestrian walk-outs)
 - Driver cited in around 50% of crashes
- Fatal Crashes
 - 22 total fatal crashes (4% of reported crashes)
 - Widely distributed throughout the metro area
- Crashes in Crosswalks
 - 312 (57%) occurred in a marked crosswalk.
 - 51 (9%) occurred outside a marked crosswalk or in an unmarked crosswalk.
- Speed
 - 14 (64%) fatalities occurred on streets with speed limits of at least 35 mph. These streets accounted for only 104 (19%) total crashes.

Thank You

Questions?

Contact Info:

Bill Holloway, Transportation Planner, MATPB

wholloway@cityofmadison.com