



COMMONWEALTH of VIRGINIA
Office of the
SECRETARY of TRANSPORTATION

Safety – Defining the Problem

Stephen Read, P.E. Highway Safety Engineer, VDOT

Brandy Brubaker, Director, Virginia Highway Safety Office, DMV



VIRGINIA DEPARTMENT
of Aviation



MVDB



VIRGINIA **SPACEPORT**
AUTHORITY



Goals of Presentation

1. In this administration, we want to push towards a step-change in safety improvements.
2. This presentation sets the stage by defining the problem so that CTB and the public have the right background to engage in future discussions and can get questions answered.
3. 2025 was an improvement and we should be glad. In the coming months we will share more about why 2025 improved. However, we are still not where we need to be.
4. In future months, we will discuss what we plan to do about it, leading up to Strategic Highway Safety Plan update.
5. **Nota Bene** – This board doesn't vote to approve the SHSP. Instead, the board has responsibility to approve spending resulting to the plan. Thus, it's important for the board to understand the underpinning.

Presentation Agenda

1. Topline annual trends and comparisons to other states/nation
2. Current Strategic Highway Safety Plan – what we've seen 2022-2025
 1. Engineering related factors
 2. Behavioral related factors
 3. Combination of Multiple Factors
3. Next steps for CTB and Safety

What Leaps Out : Top Problem Areas

- **Intersections**, especially in urban areas
- **Roadway Departures**, especially while speeding, especially in rural areas, especially on VDOT roads
- **Speeding**, especially with roadway departures and at intersections
- **Impairment**, especially in rural areas
- **Aging road users**, especially at intersections and near pedestrians
- **Unbelted drivers**, especially when speeding*
- **Young drivers**
- **Motorcyclists**
- **Heavy Vehicles**
- **Pedestrians**, especially on arterials at intersections at night*
- **Bicyclists**, especially at urban intersections*

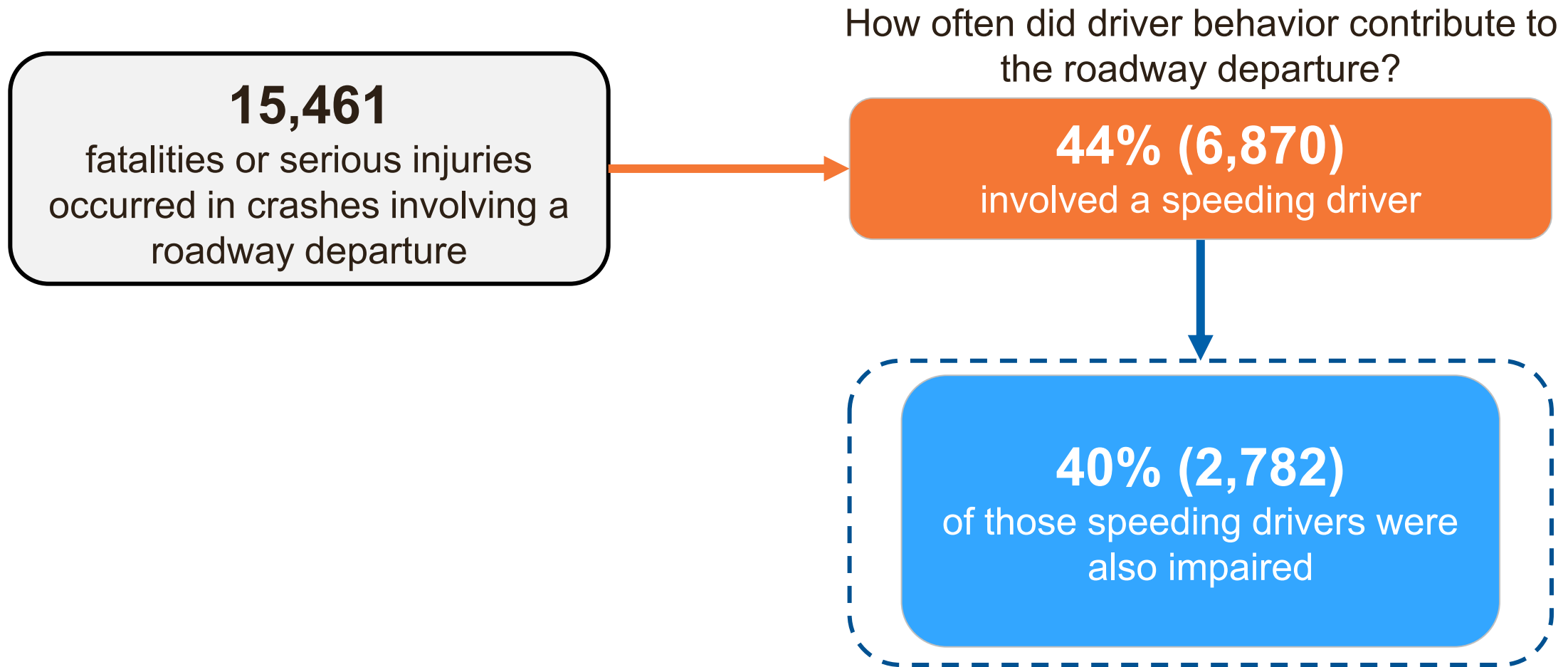
* Disproportionately important contributor to fatalities, as opposed to fatalities + serious injuries.



This list has been largely the same for 12+ years. COVID era spikes in certain contributors (e.g., unbelted drivers) and effects (e.g., spike in fatalities) seem to have settled back into the longer-term trend.

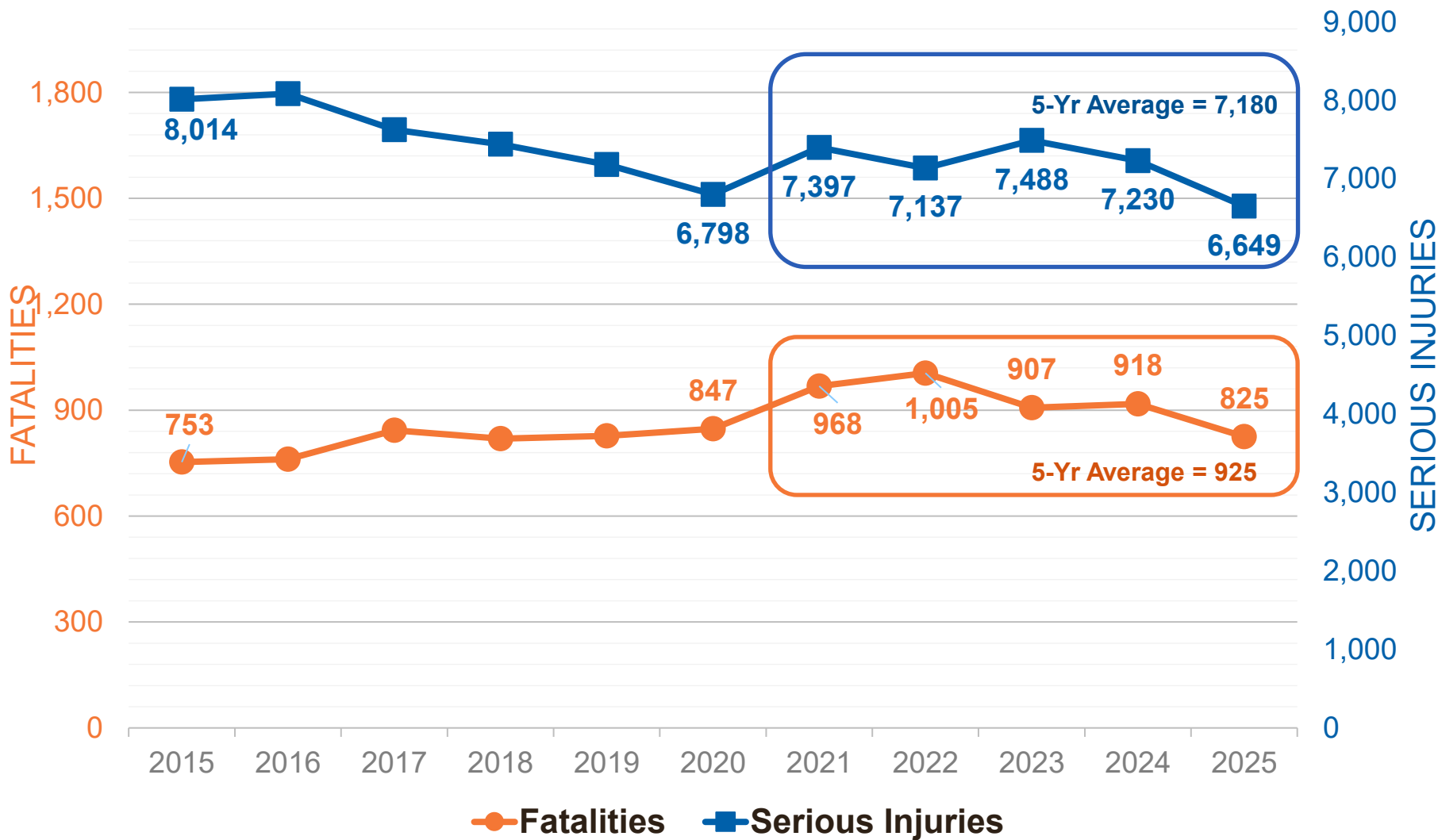
This presentation reviews these features and how they interact.

What Leaps Out : Interaction Between Factors



2020-2024 Crash Data

What Leaps Out : 2025 Improved, But Not Where we Want to Be.

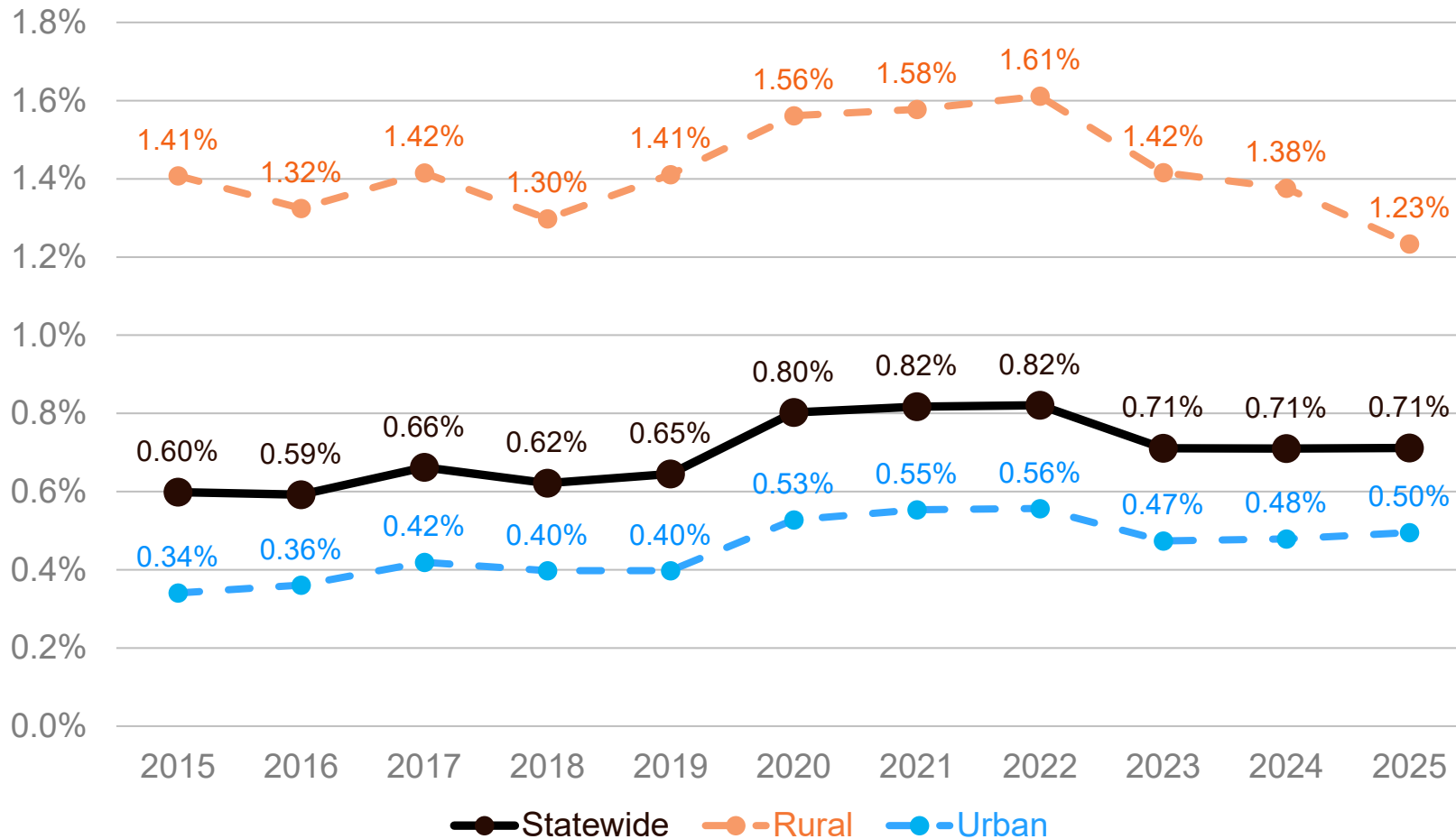


Note: 2025 data is preliminary

- 2014 had the lowest Fatalities at 700. In 2025 we remain higher, despite year over year improvements.
- In 2025 there was a severe crash every 70 minutes.
- The 2025 societal cost of F and SI was \$20.4B.

Why are Fatalities Up While Ser. Inj. are at an All Time Low?

% of crashes resulting in a fatality

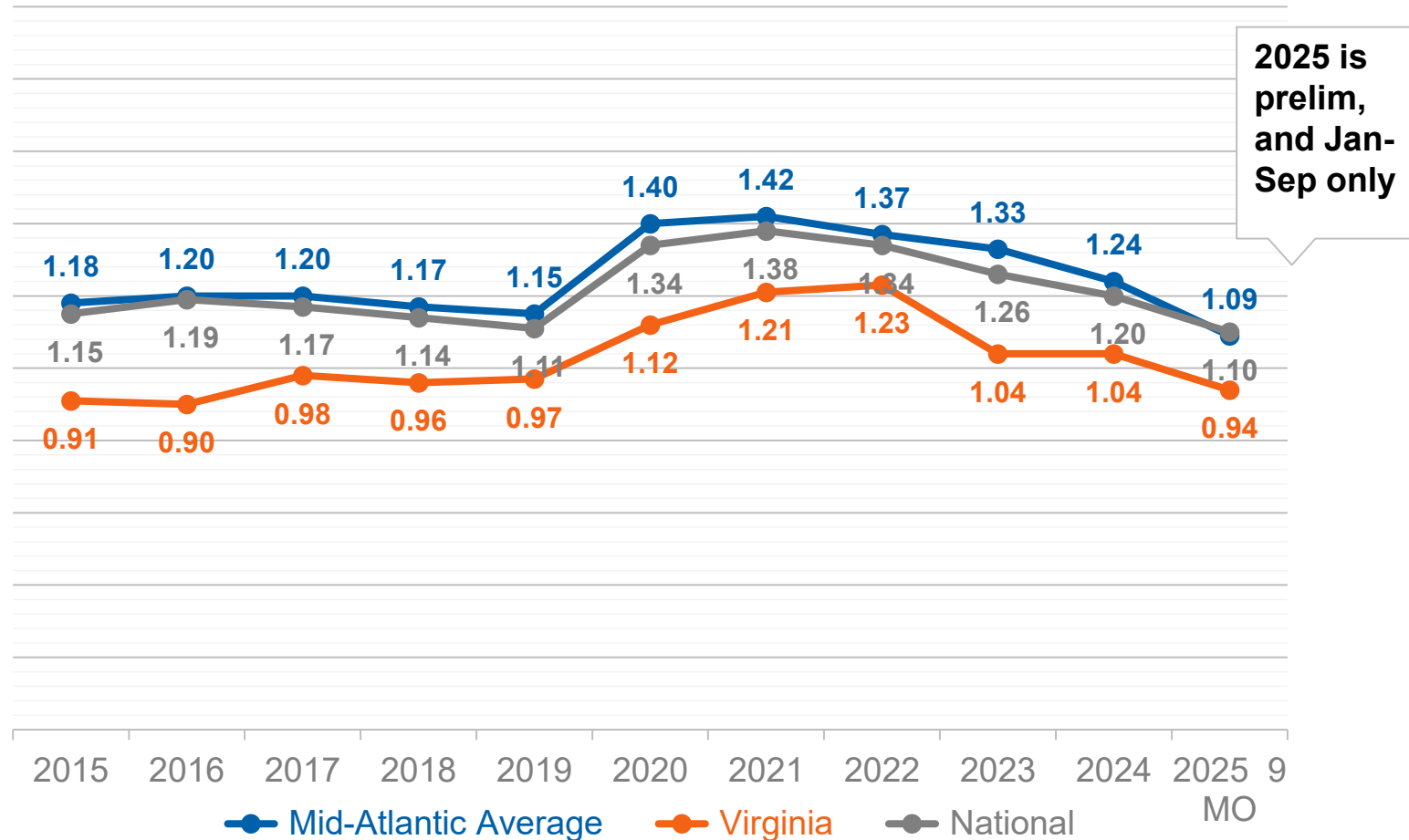


Note: 2025 data is preliminary

- The ratio of deaths increased during the pandemic by 25% (conjecture – higher speeds from less traffic, and a reduction in seatbelt use were key causes)
- The risk is higher in rural areas but that has now declined below pre-pandemic levels
- Urban risk increased 37% and has not returned to the lower levels

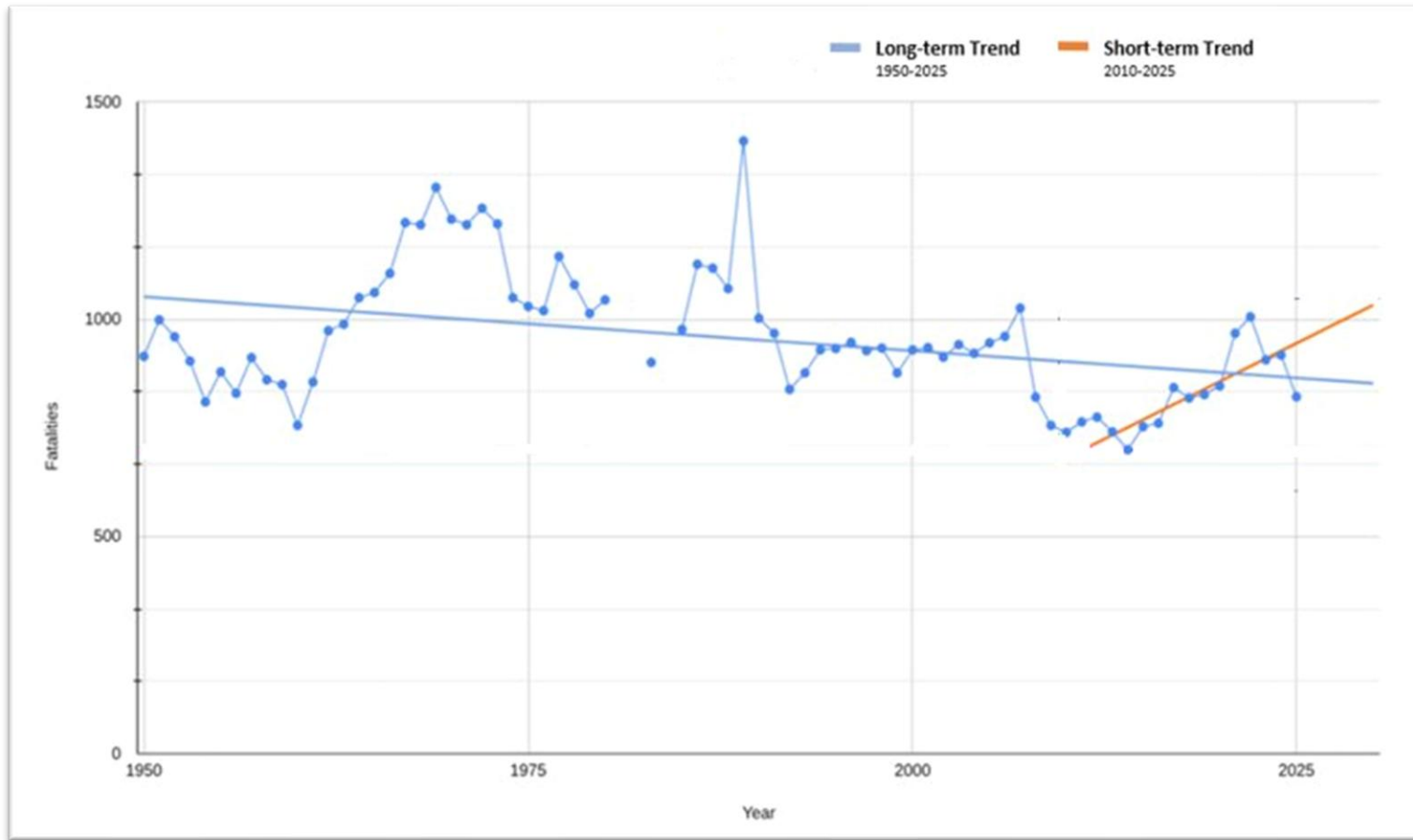
Virginia in Context – National and Regional Comparison

Fatalities per 100M VMT (2025 is Preliminary for First Nine Months Only)



- In general, Virginia has followed the national trend. **This means factors bigger than our state influencing our rates are.**
- The pandemic brought an increase in speeding and DUI, and unlicensed drivers
- Further, more people were active and pedestrian and cyclist deaths increased
- Urban arterials saw the largest increase in fatalities.

Longer Term Trends: Fatalities are Constant, Despite Deeply Different Underlying Pressures

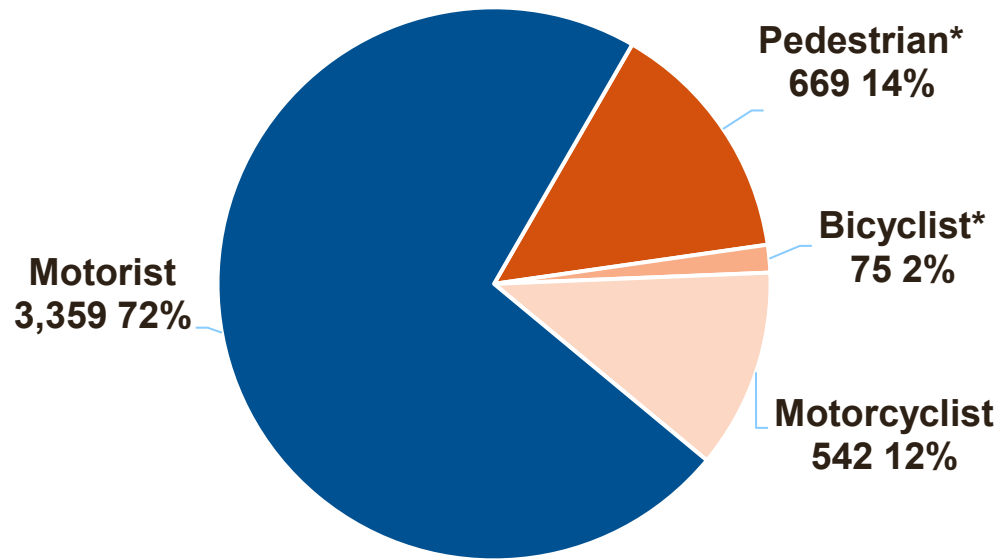


- Virginia has consistently oscillated between 700 and 1,000 fatalities per year since 1950.
- While the population and VMT have risen over the long term, which would be expected to create a rise in fatalities, other factors have pushed the rate down leading to a ~consistent absolute number.
- A short-term (2010-2025) trend shows increasing fatalities. The pandemic and recovery from it confuse the picture in recent years, but the rise began in 2010.

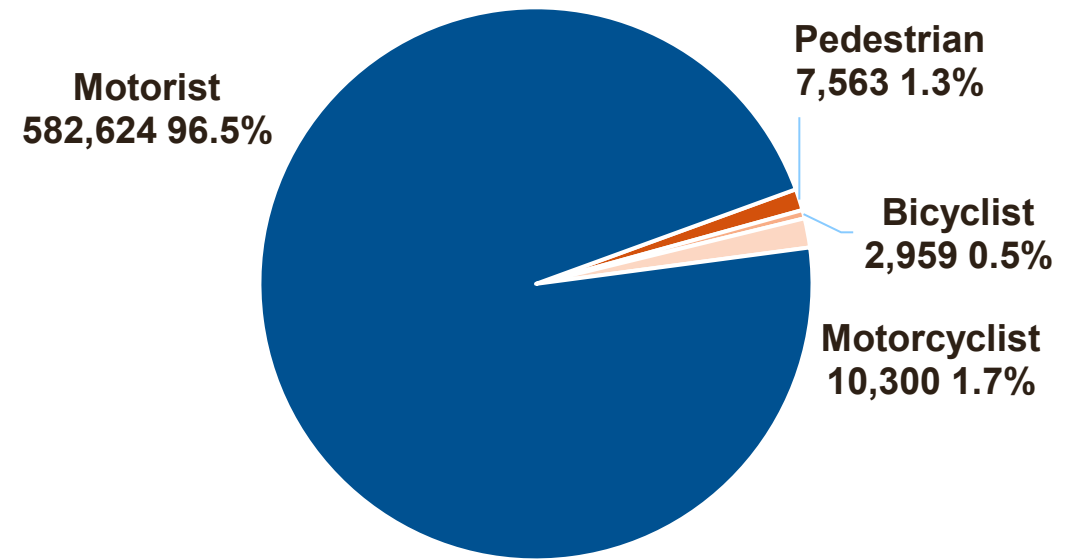
Road User Risks of Death

Road Users Who Died

Crashes by Road Users Involved



2020-24 Fatal Crashes



2020-24 Total Crashes

* Pedestrian and bicyclists are “Vulnerable Road Users” (VRUs) per FHWA terminology.

Reminder: Transit – Far Safer Than Driving

Public transit is ~ 10x safer than traveling by automobile when measured by fatalities per mile (AASHTO)

Transit systems have very low fatality rates, typically well under 0.2 fatalities per 100 million miles of service. (NTD)

Virginia operators maintain low crash and injury rates (NTD)

Transit reduces:

- ✓ Vehicle Miles Traveled (VMT)
- ✓ DUI, Drowsy, and Distracted driving
- ✓ Traffic congestion and crash exposure

Safety Metric (NTD)	Virginia Rate	Relative Performance	U.S. average
Major Safety Events per 100k VRM ^{**} (approx.)	~0.5 - 0.7	Better than national average	~0.8–1.0
Fatalities per 100M VRM (approx.)	~0.4 – 0.6	Better than national average	~0.9
Injury Rates per 100K VRM (approx.)	~0.3	Better than national average	~0.6

- National Transit Database (NTD) is the primary federal source for transit safety statistics
 - Major Safety Event: fatality, injury requiring immediate medical attention, property damage ≥ \$25,000, collisions involving transit vehicles that require towing, evacuations
- ^{**} per Vehicle Revenue Mile (VRM)

TRENDS AND UPDATES FROM THE 2022-2026 SHSP



Strategic Highway Safety Plans – Last Updated 2022-2026

Strategic Highway Safety Plan (SHSP)

- Comprehensive multi-stakeholder plan to reduce highway deaths and serious injuries
- Establishes and implements Safe System actions to improve the safety of the highway system through engineering, education, enforcement, and emergency response solutions

Vulnerable Road User Safety Assessment (VRUSA)

- Required supplement to SHSP that includes additional data analysis and strategies to reduce pedestrian and bicyclist severe crashes

Plans will be combined and updated in 2026



<https://bit.ly/VASHSP>

How Emphasis Areas Were Determined in SHSP








Emphasis areas were established to address:

- Crash type outcomes with a disproportionate number of fatalities or serious injuries
- Behavioral issues that contribute to the frequency or severity of crashes
- User types that contribute to the frequency of crashes or that are more vulnerable to serious injuries



Emphasis areas largely align with federal safety initiatives and funding programs

Shared Responsibility for SHSP Emphasis Areas

SAFE ROAD USERS

-  Pedestrians
-  Bicyclists
-  Motorcyclists
-  Impaired Driving
-  Occupant Protection
-  Aging Road Users
-  Young Drivers

SAFE ROADS

-  Intersections
-  Roadway Departures

SAFE VEHICLES

-  CAV
-  Heavy Vehicles

SAFE SPEEDS

-  Speeding




POST-CRASH CARE

-  Emergency Response and Medical Services

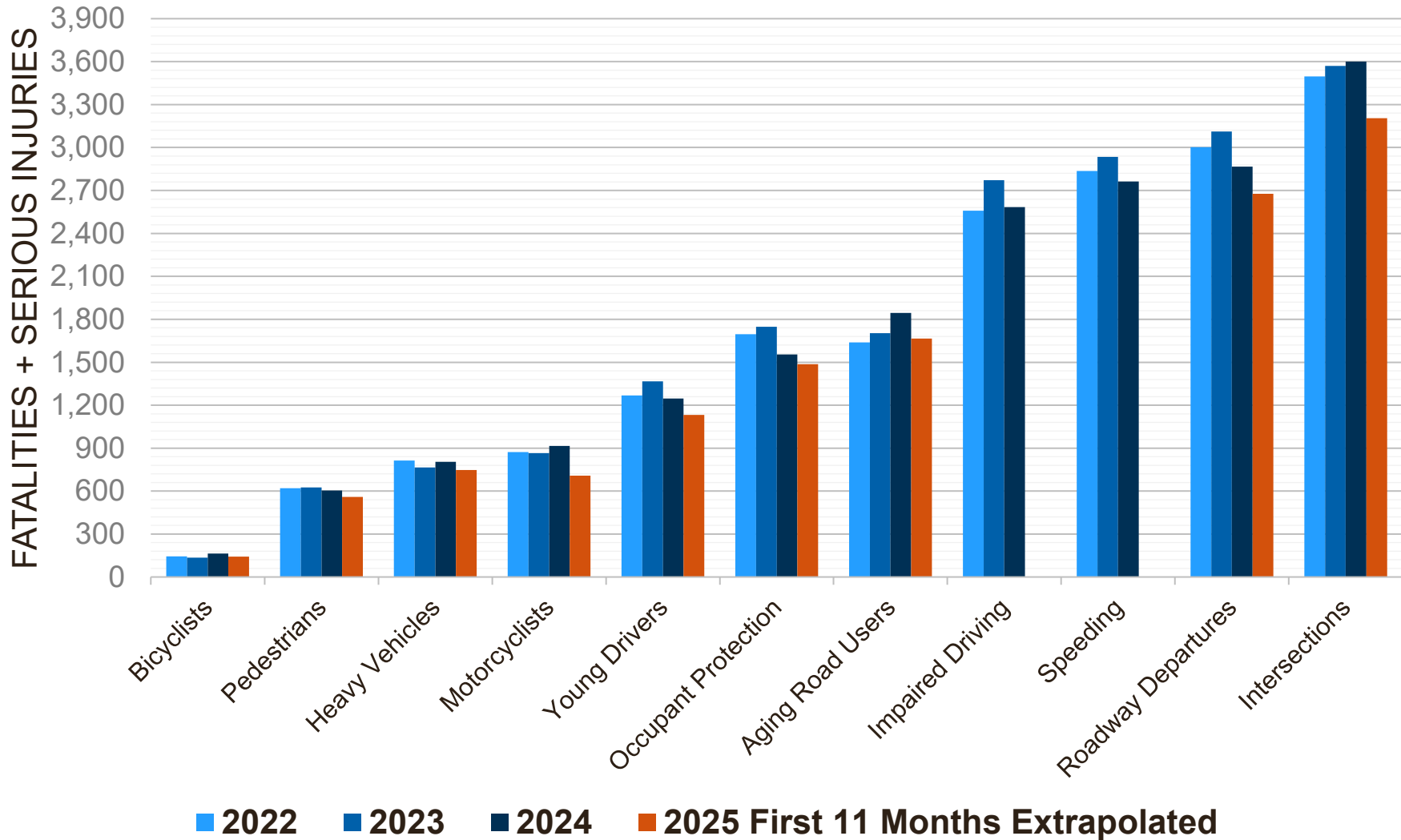
SUPPORTING

-  Data & Analytics

Primary Responsibility

-  Engineering (VDOT)
-  Education (DMV, DOE, VDH & Others)
-  Enforcement & EMS* (VSP, VDH & Others)

Annual Fatalities + Serious Injuries per SHSP Emphasis



- Through 2024, we had not seen any big movement on these top categories.
- 2025 had an overall reduction in SI + F.
- **PRELIMINARY** results indicate that this improvement shows up in every category.
- The biggest improvements were:
 - Motorcyclists (-12%)
 - Intersections (-11%)
 - Bicyclists (-12.8%)
- This trend is not the same for fatalities alone – Pedestrian fatalities increased.
- 2025 Speeding, Impaired Driver statistics are not available until later.

ENGINEERING PRIMARILY RESPONSIBLE

Engineering Infrastructure Focused Emphasis Areas

- **Roadway Departures**
- **Intersection related**
- **Pedestrians***
- **Bicyclists***

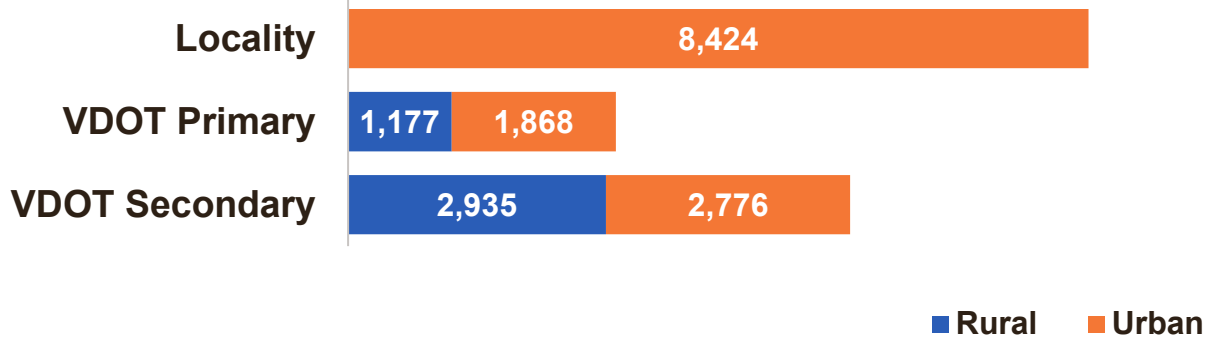
(all the above with Speed considerations)

* These will be covered in depth in April. Slides about them are in the appendix and can be brought in during Q&A

Intersection Fatalities & Serious Injuries

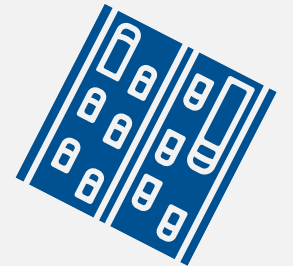
Annual Averages: **310** Fatalities; **3,126** Serious Injuries

System and Area Type

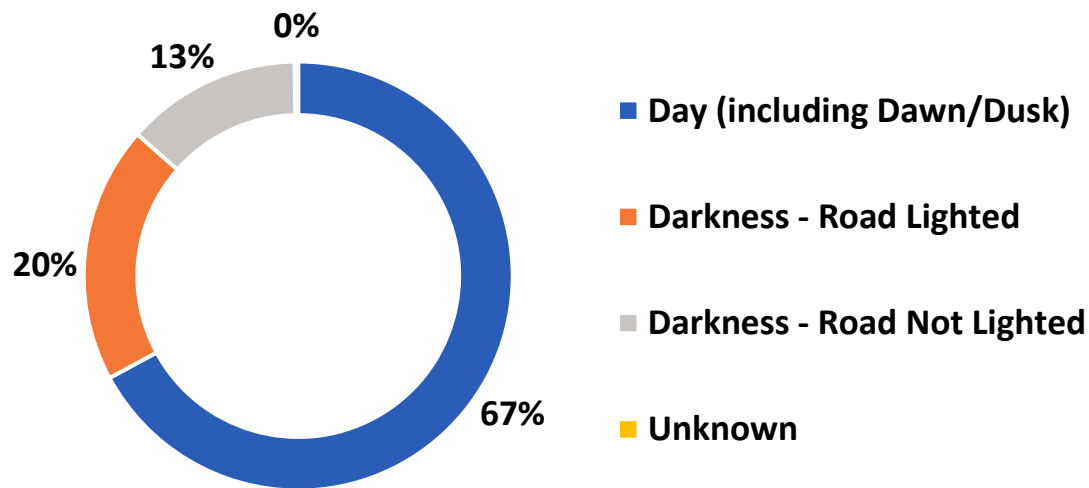


24% occurred in Rural areas

76% occurred in Urban areas



Time of Day



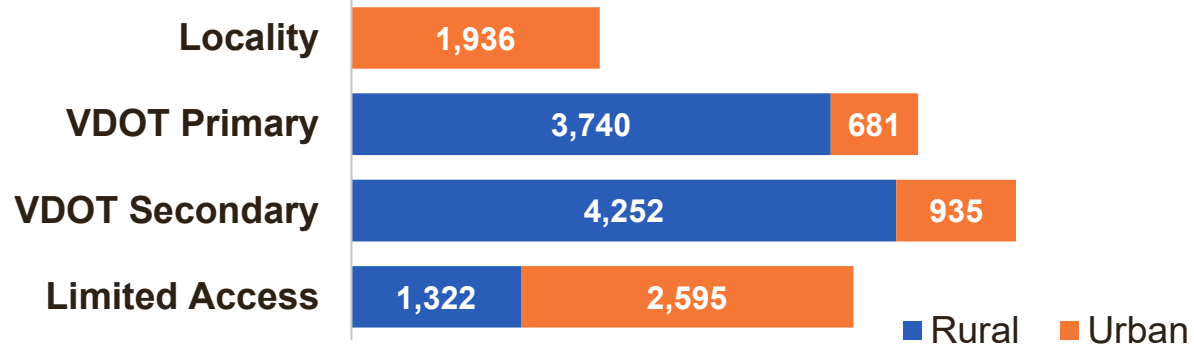
Speed Limit/Lanes	2 or less	4 Lanes	6+ Lanes
<=25 mph	1,742	657	168
<=35 mph	1,489	2,835	526
<=45 mph	1,546	2,988	1,265
<=55 mph	1,630	1,403	93
>55 mph	46	463	6

All summaries based on 2020-2024 Crash Data

Roadway Departure Fatalities & Serious Injuries

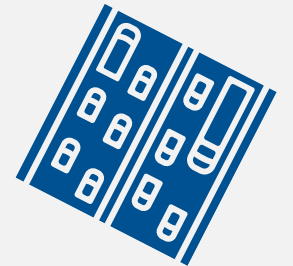
Annual Averages: **454** Fatalities; **2,638** Serious Injuries

System and Area Type

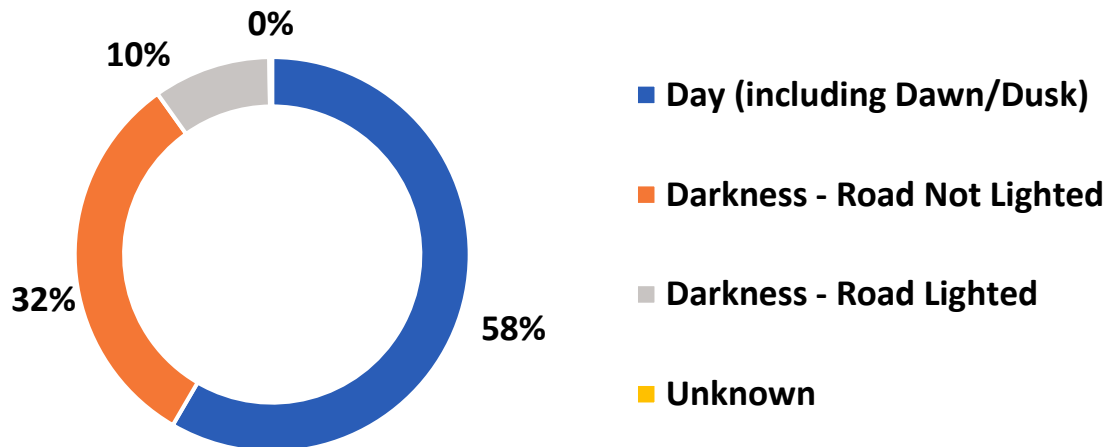


68% occurred in **Rural** areas

32% occurred in **Urban** areas



Time of Day



Speed Limit/Lanes	2 or less	4 Lanes	6+ Lanes
<=25 mph	891	47	11
<=35 mph	1,285	359	47
<=45 mph	2,664	498	126
<=55 mph	4,194	1,294	594
>55 mph	167	2,124	985

All summaries based on 2020-2024 Crash Data

What Leaps Out : Interaction Between Factors

15,461
fatalities or serious injuries
occurred in crashes involving a
roadway departure

How often did driver behavior contribute to
the roadway departure?

44% (6,870)
involved a speeding driver

40% (2,782)
of those speeding drivers were
also impaired

2020-2024 Crash Data

EDUCATION PRIMARILY RESPONSIBLE

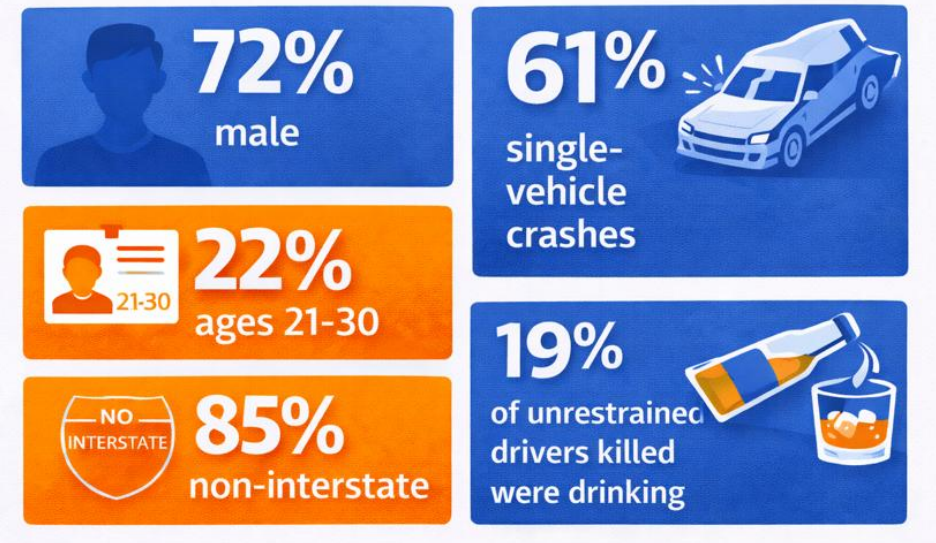
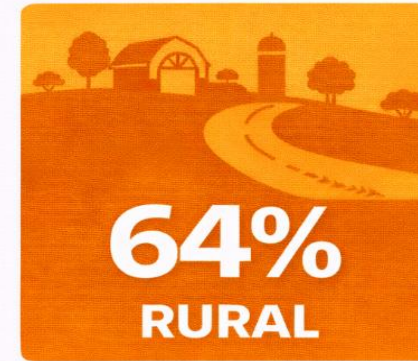
Behavioral Focused Emphasis Areas

- **Bicyclists and Pedestrians***
- **Motorcyclists**
- **Impaired driving (drunk, distracted, drowsy, drugged)**
- **Occupant protection**
- **Speeding**
- **Heavy vehicles**
- **Aging and young drivers**

* These will be covered in depth in April. Slides about them are in the appendix and can be brought in during Q&A

Occupant Protection: Unrestrained Fatalities

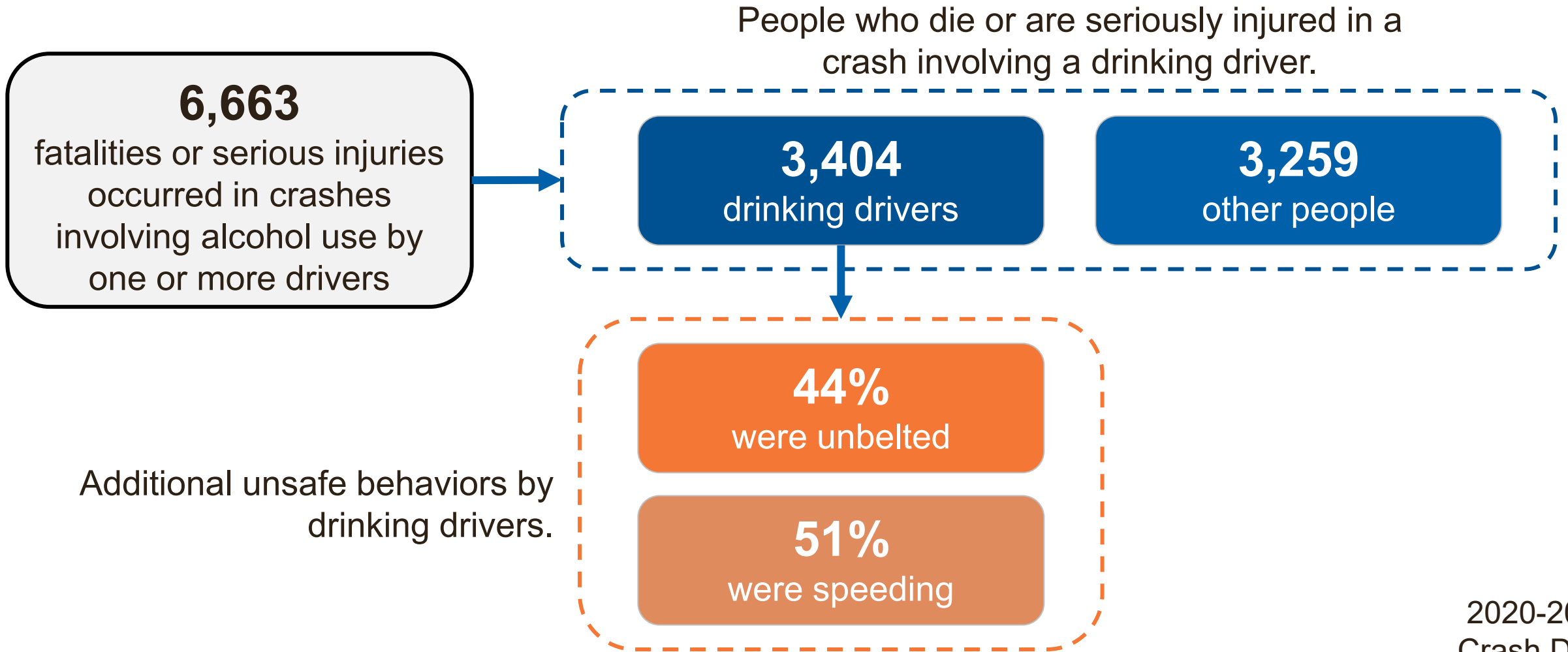
Annual Averages: **342** Fatalities; **1,352** Serious Injuries



All summaries based on 2020-2024 Crash Data

The Overlap of 2+ Emphasis Areas is Important

Example- Drunk Driving + Unbelted



2020-2024
Crash Data


CONCLUSION

Thank you for your attention!

Numerically, these Top Problem Areas Leap Out

- **Intersections**, especially in urban areas
- **Roadway Departures**, especially while speeding, especially in rural areas, especially on VDOT roads
- **Speeding**, especially with roadway departures and at intersections
- **Impairment**, especially in rural areas
- **Aging road users**, especially at intersections and near pedestrians
- **Unbelted drivers**, especially when speeding*
- **Young drivers**
- **Motorcyclists***
- **Heavy Vehicles**
- **Pedestrians**, especially on arterials at intersections at night*
- **Bicyclists**, especially at urban intersections*

* Disproportionately important contributor to fatalities, as opposed to fatalities + serious injuries.



Each of these problems has a different toolkit of techniques available to ameliorate the outcomes. Each tool has different levels of effectiveness and cost.

In the next few CTB meetings, we will dig into the balance of effectiveness and cost as we plan to improve safety in the future.

APPENDICES

Appendix A: List of all appendices

Fatalities & Serious Injuries Overlap Heat Matrix (2020-24)

	Impaired Driving	Speeding	Occupant Protection	Roadway Departure	Intersections	Young Drivers	Bicyclists	Pedestrians	Aging Road Users	Motorcyclists	Heavy Vehicles
Total	13,496	14,054	8,468	15,461	17,180	6,309	716	2,875	8,189	4,257	3,766
Impaired Driving	-	5,509	3,836	6,047	5,220	1,876	172	1,141	1,842	768	1,040
Speeding	5,509	-	4,208	6,870	4,313	2,768	67	366	1,976	1,477	1,241
Occupant Protection	3,836	4,208	-	4,916	2,609	1,343	1	29	1,011	11	763
Roadway Departure	6,047	6,870	4,916	-	0	2,352	32	163	2,026	1,369	1,174
Intersections	5,220	4,313	2,609	0	-	2,859	482	1,675	4,349	1,749	1,169
Young Drivers	1,876	2,768	1,343	2,352	2,859	-	130	225	703	448	337
Bicyclists	177	70	1	34	489	136	-	7	162	4	19
Pedestrians	1,213	418	29	198	1,742	234	3	-	713	18	166
Aging Road Users	1,846	1,980	1,011	2,027	4,354	704	159	690	-	693	902
Motorcyclists	797	1,510	11	1,385	1,795	462	5	23	705	-	117
Heavy Vehicles	1,040	1,241	763	1,174	1,169	337	19	146	899	111	-

HOW TO INTERPRET CRASH OUTCOME HEAT MATRIX

Each cell is the number of total fatalities and serious injuries associated with the factor in that **COLUMN** where the **CRASH** involved the contributing factor in each **ROW**.

The sum of cell values in each column will not equal the column total because crashes may have more than two factors.

LEGEND

EA Overlap by Column

Minimum

Maximum

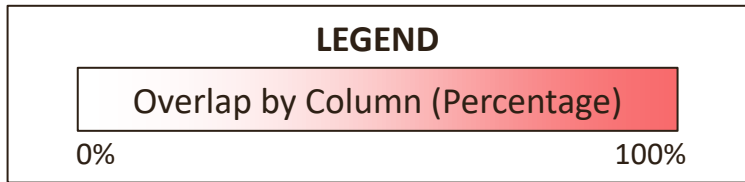
Heat Matrix for Infrastructure Emphasis Areas

2020-2024 Crash Data

Impairment includes 4Ds:
 - Drunk
 - Drugged
 - Drowsy
 - Distracted

	Intersections	Roadway Departure	Pedestrians	Bicyclists
Total Fatalities + Serious Injuries	17,180	15,461	2,875	716
Impairment	5,220 (30%)	6,047 (39%)	1,141 (40%)	172 (24%)
Speeding	4,313 (25%)	6,870 (44%)	366 (13%)	67 (9%)
Roadway Departure	0 (0%)	-	163 (6%)	31 (4%)
Intersections	-	0 (0%)	1,675 (58%)	482 (67%)
Young Drivers	2,859 (17%)	2,352 (15%)	225 (8%)	130 (18%)
Aging Road Users	4,354 (25%)	2,027 (13%)	690 (24%)	159 (22%)
Motorcyclists	1,795 (10%)	1,385 (9%)	23 (1%)	5 (1%)
Heavy Vehicles	1,169 (7%)	1,174 (8%)	146 (5%)	19 (3%)

“24% of bicyclist serious injury/fatalities involved impaired driving.”



HOW TO INTERPRET CRASH OUTCOME HEAT MATRIX

Each cell represents the number of total fatalities and serious injuries associated with the crash outcome in that **COLUMN** where the **CRASH** involved the contributing factor in each **ROW**.
 The sum of cell values in each column will not equal the column total because crashes may have more than two factors.

Heat Matrix for Behavior Emphasis Areas

2020-2024 Crash Data

	Alcohol	Distracted	Drowsy	Drugs	Speeding	Unbelted
Total Fatalities + Serious Injuries	6,663	6,077	1,665	1,251	14,054	8,468
Alcohol	-	1050 (17%)	195 (12%)	590 (47%)	3,200 (23%)	2,279 (27%)
Distracted	1,050 (16%)	-	169 (10%)	236 (19%)	2,089 (15%)	1,397 (16%)
Drowsy	195 (3%)	169 (3%)	-	75 (6%)	602 (4%)	462 (5%)
Drugs	590 (9%)	236 (4%)	75 (5%)	-	644 (5%)	455 (5%)
Speeding	3,200 (48%)	2,089 (34%)	602 (36%)	644 (51%)	-	4,208 (50%)

Number of *all people* who die or are injured in crash

Number of *unbelted people* who die or are injured in crash

LEGEND

Overlap by Column (Percentage)

0%

100%

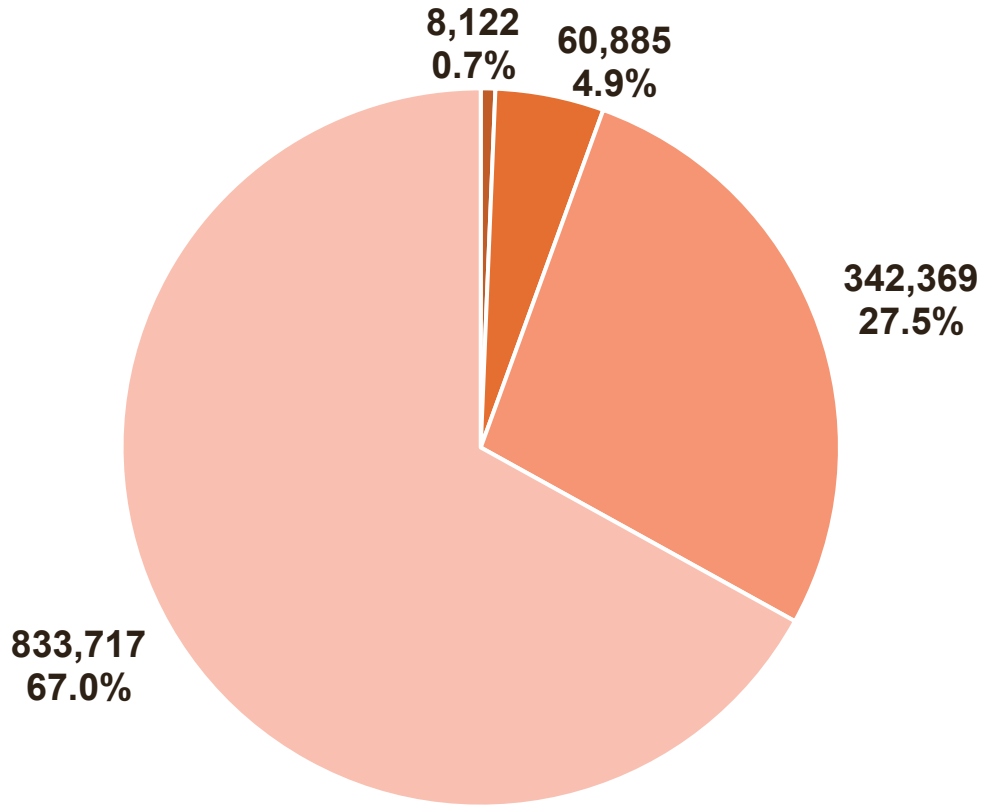
HOW TO INTERPRET BEHAVIOR HEAT MATRIX

Each cell represents the number of total fatalities and serious injuries associated with the behavior in that **COLUMN** where the **CRASH** also involved the behavior in each **ROW**.

The sum of cell values in each column will not equal the column total because crashes may have only one behavior or more than two behaviors present.

Statewide Crashes by Severity

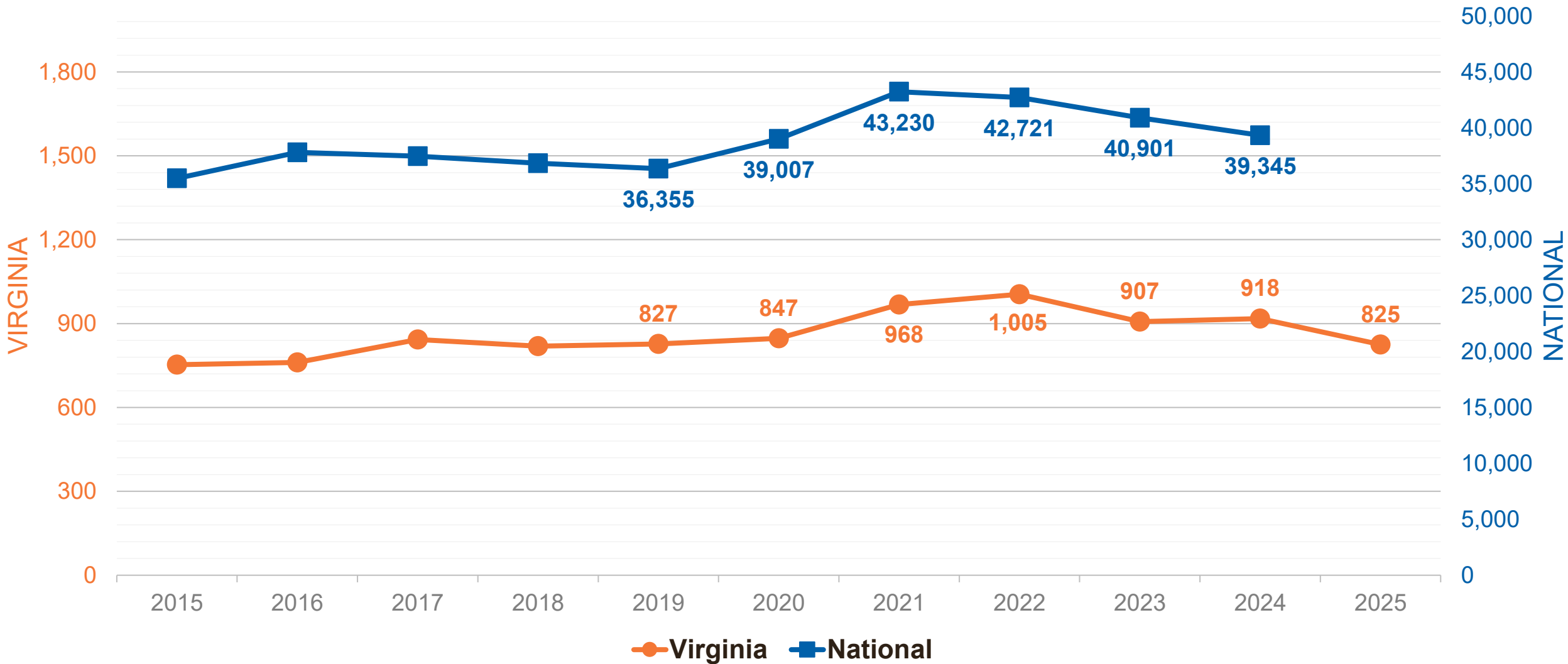
2015-2024 Crash Totals by Severity



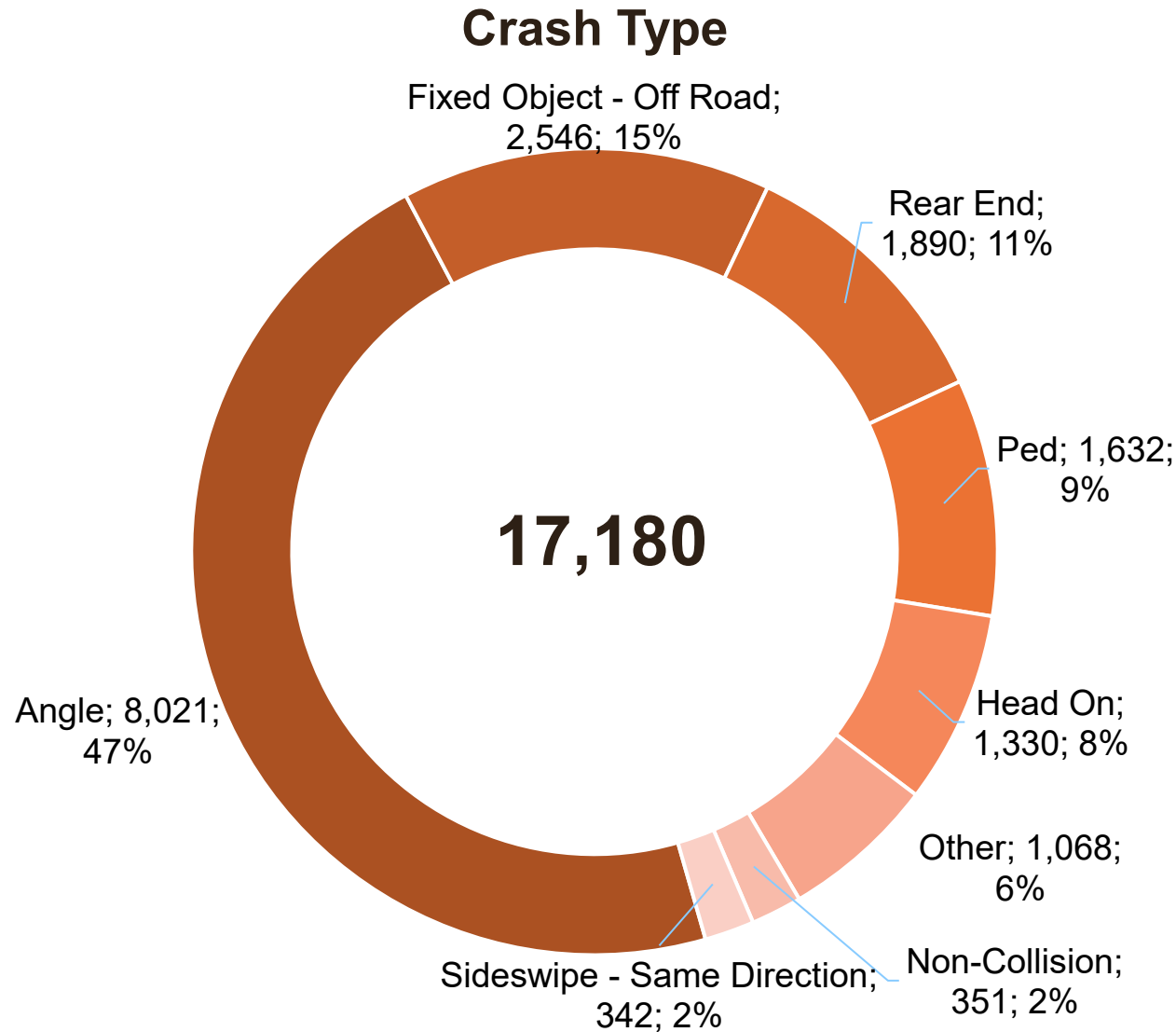
- Fatal Crashes
- Serious Injury Crashes
- Other Injury Crashes
- Property Damage Only Crashes

Crash Severity	Minimum Annual Percentage	Maximum Annual Percentage
Fatal	0.6%	0.8%
Serious Injury	4.5%	5.2%
Other Injury	25.9%	29.2%
Property Damage Only	65.1%	68.6%

Crash Fatality Trend: Virginia vs. National



Intersection Fatalities & Serious Injuries



2020-2024 Crash Data

Roadway / Lane Departure Fatalities & Serious Injuries

Crash Type

2020-2024 Crash Data

Fixed Object Type Struck

15,461

9,927

Head On; 2,220; 14%

Other; 805; 5%

Angle; 793; 5%

Non-Collision; 772; 5%

Rear End; 430; 3%

Sideswipe - Opposite Direction; 266; 2%

Fixed Object in Road; 247; 2%

Overturn; 617; 6%

Parked Vehicle <1%

Fence, Post, or Mailbox; 397; 4%

Signal, Sign, or Utility Pole; 607; 6%

Other; 1,585; 16%

Traffic Barrier; 1,711; 17%

Tree; 3,126; 32%

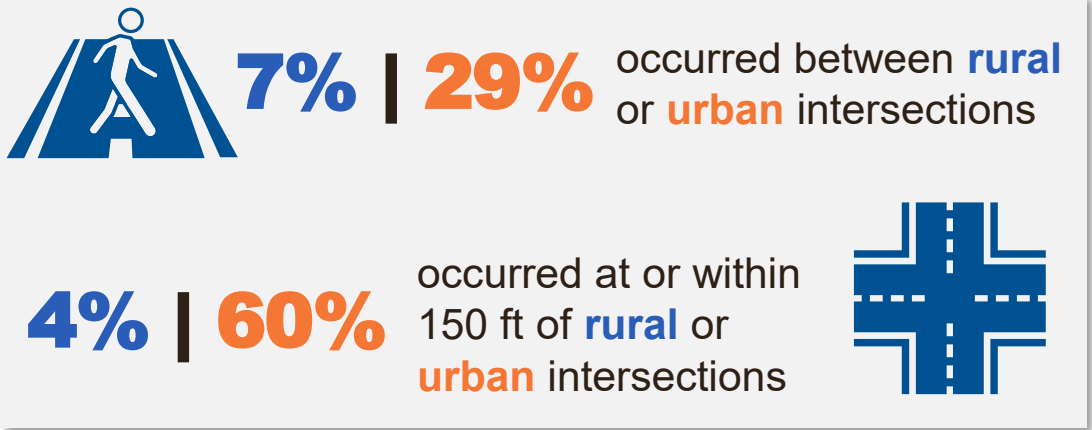
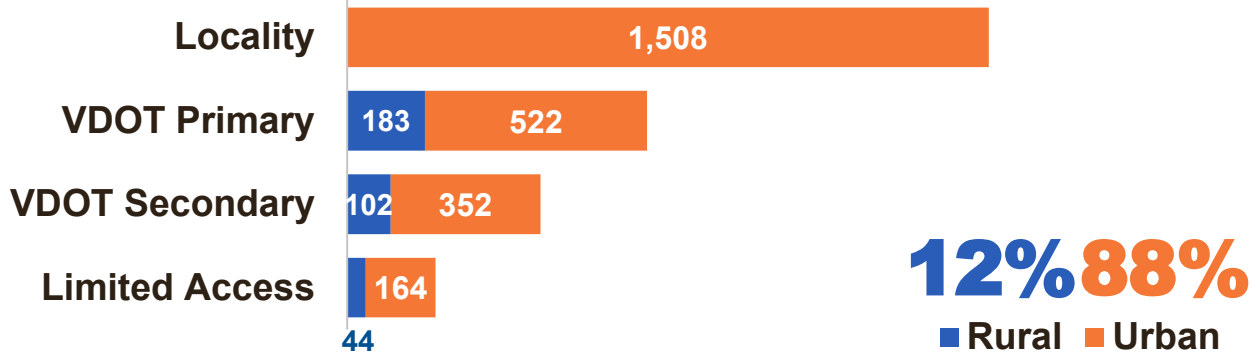
Ditch, Bank, or Ledge; 1,861; 19%

Fixed Object - Off Road; 9,927; 64%

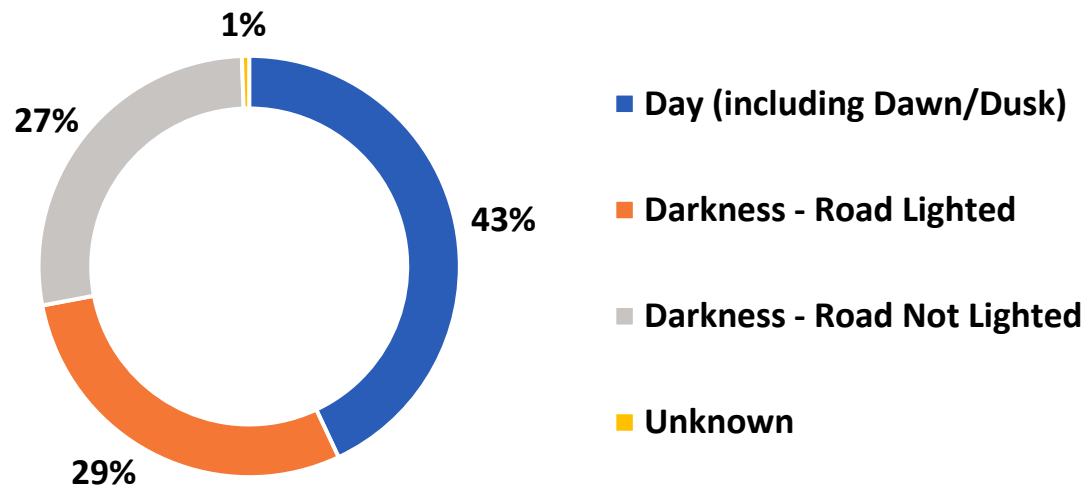
Pedestrian Fatalities & Serious Injuries

Annual Averages: **133.8** Fatalities; **441.2** Serious Injuries

System and Area Type



Time of Day



Excludes crashes on limited access facilities or in work zones

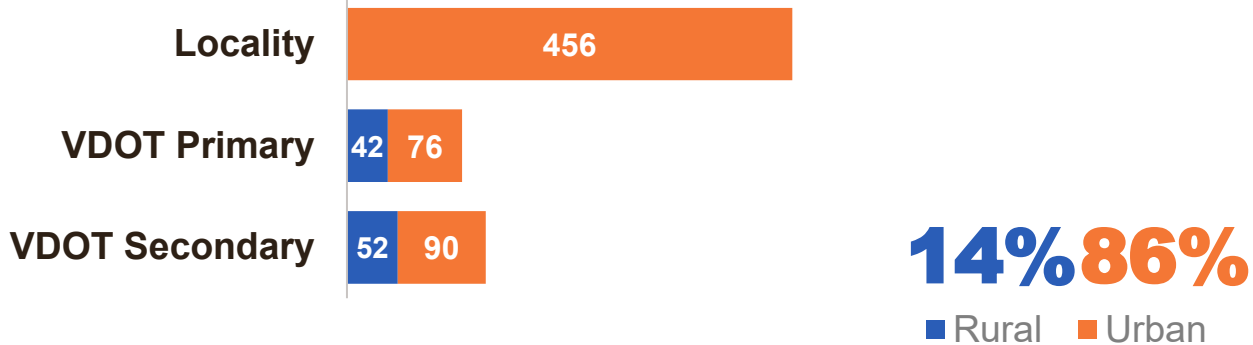
Speed Limit/Lanes	2 or less	4 Lanes	6+ Lanes
<=25 mph	569	181	49
<=35 mph	217	465	125
<=45 mph	162	347	266
<=55 mph	106	98	60
>55 mph	9	77	58

All summaries based on 2020-2024 Crash Data

Bicyclist Fatalities & Serious Injuries

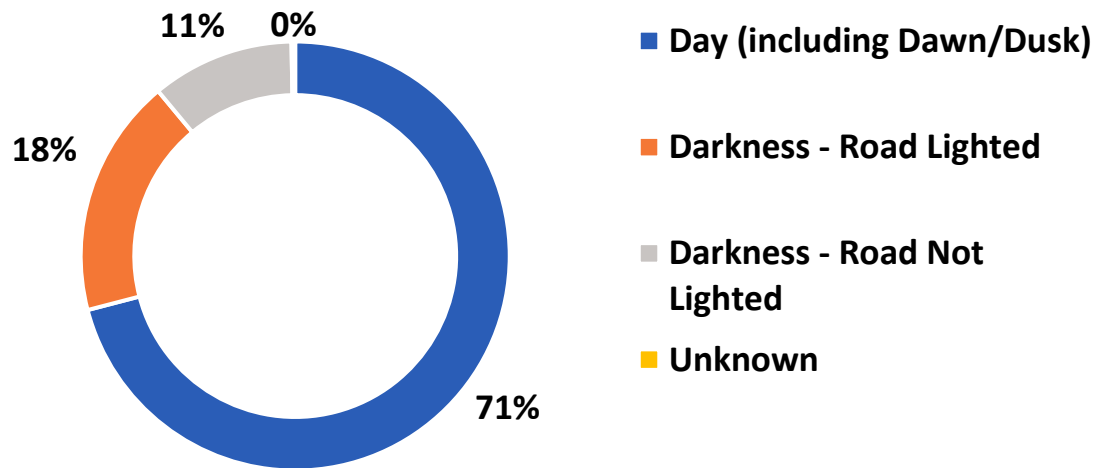
Annual Averages: **15.0** Fatalities; **128.2** Serious Injuries

System and Area Type



Excludes crashes on limited access facilities or in work zones

Time of Day

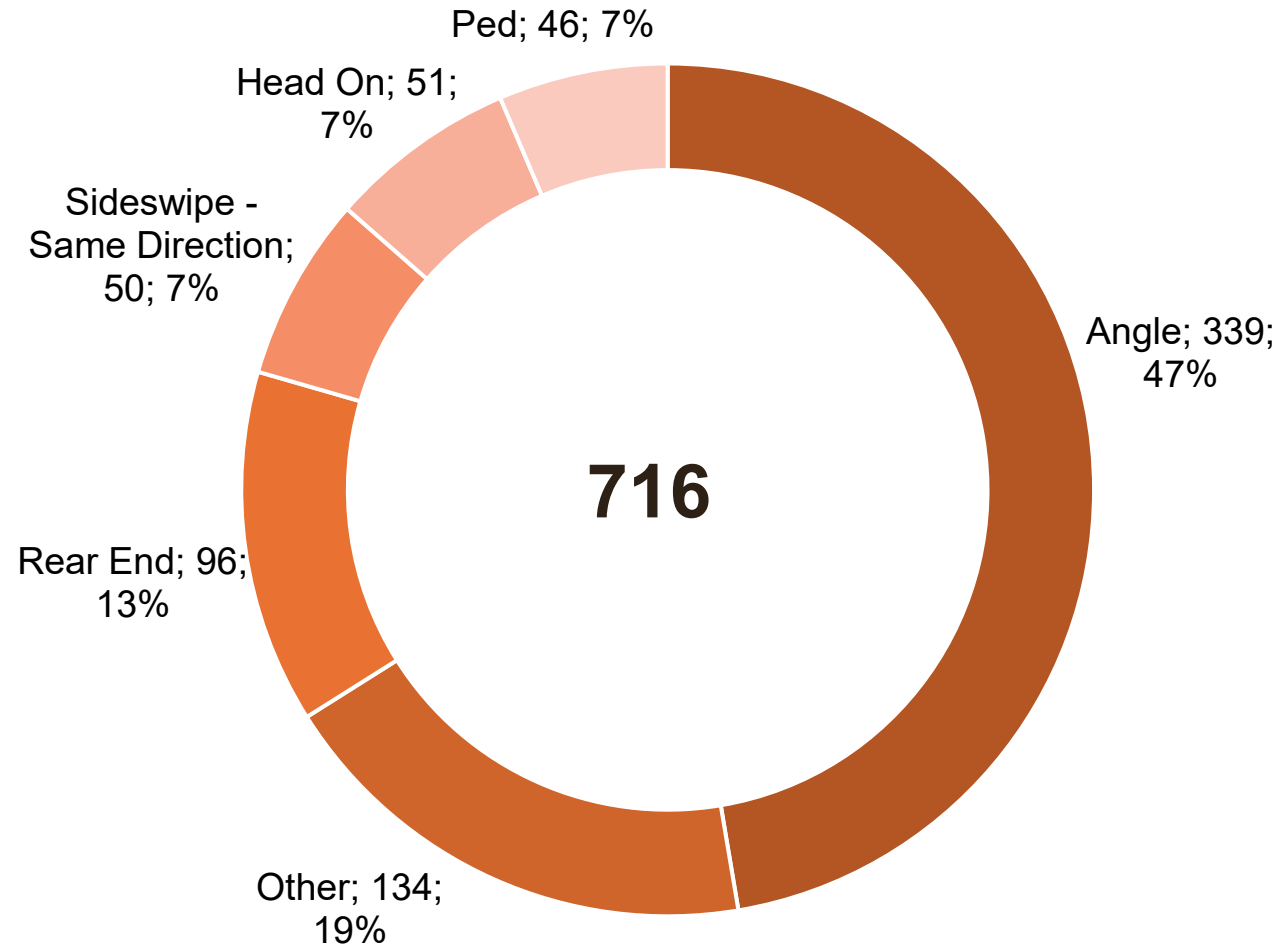


Speed Limit/Lanes	2 or less	4 Lanes	6+ Lanes
<=25 mph	189	54	13
<=35 mph	76	97	14
<=45 mph	44	88	43
<=55 mph	51	23	1
>55 mph		2	1

All summaries based on 2020-2024 Crash Data

Bicyclist Fatalities & Serious Injuries

Crash Type



2020-2024 Crash Data

What Factors Contribute To Crash Frequency Vs Severity?

	Factor*	Contributor to Crash Frequency	Contributor to Crash Severity
Engineering	Roadway design elements	✓	
	Collision type		✓ (road users, impact angle)
	Speed	✓	✓
Behavioral	Aging road users	✓ (decreased reaction times)	✓ (vulnerability to injuries)
	Young drivers	✓	
	Impaired driving	✓	
	Seat belt use		✓
Outside Purview	Weather conditions	✓	
	Vehicle age	✓ (advanced safety features)	✓ (crashworthiness)
	Vehicle size and weight		✓



It's important consider Serious Injuries + Fatalities (not Fatalities alone) when analyzing safety trends and developing solution, especially for roadway design.

*Non-exhaustive list of contributing factors