

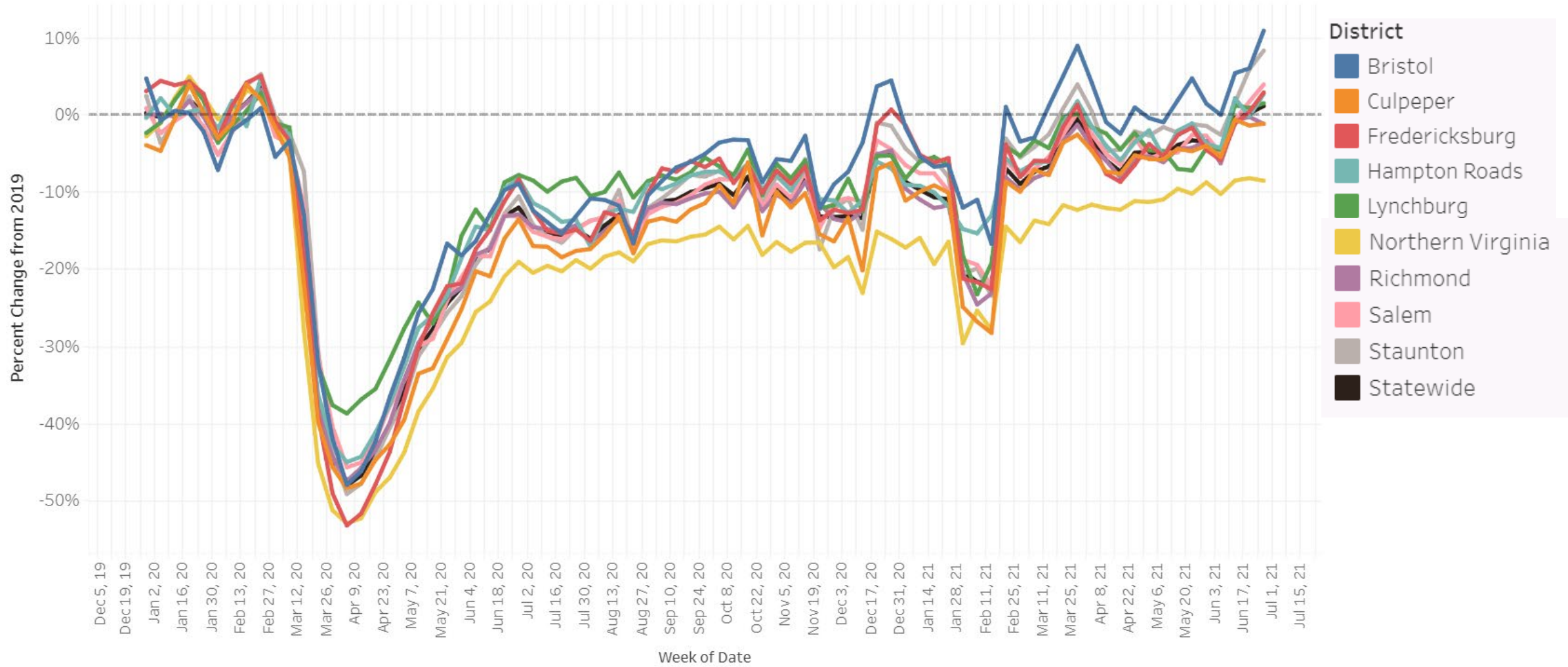
EVOLUTION OF THE FOUR E'S

Highway Safety Engineering Beyond 2020

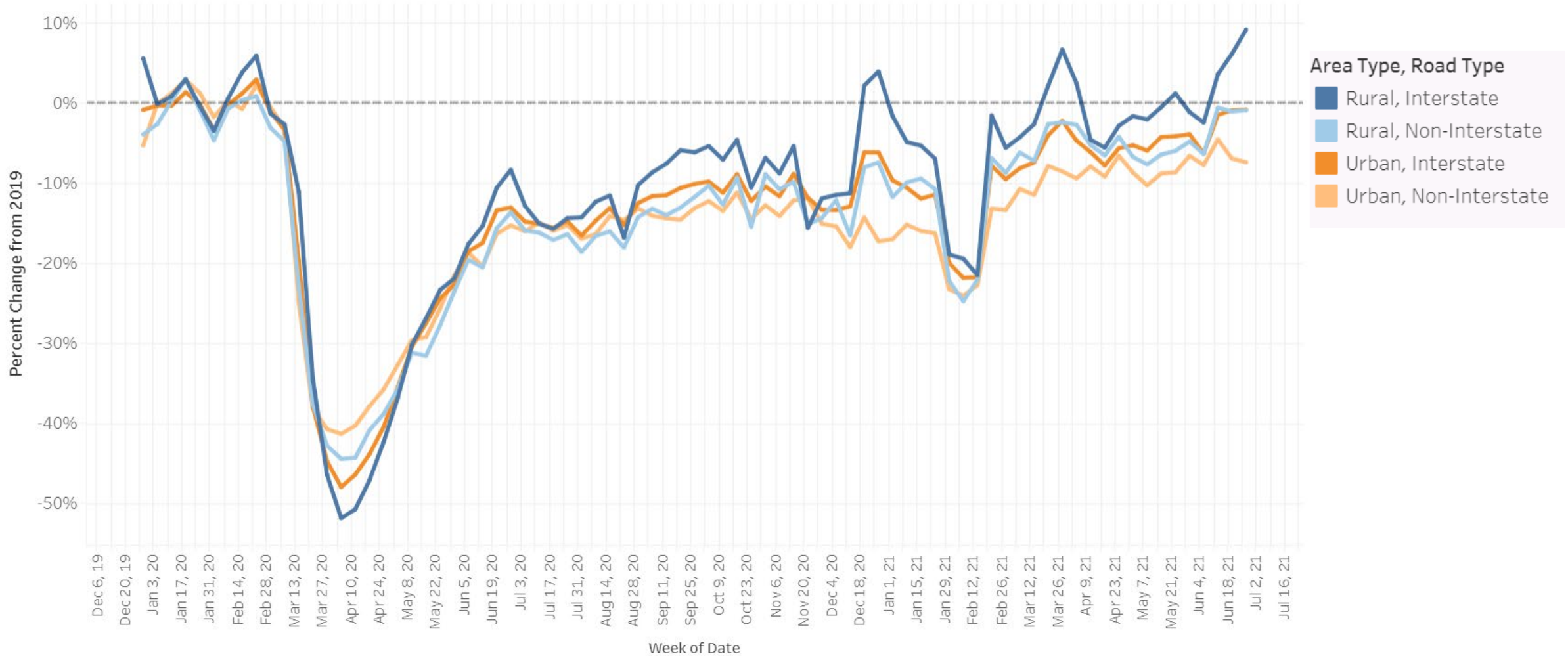
 Mark A. Cole, PE, Virginia Department of Transportation

July 21, 2021

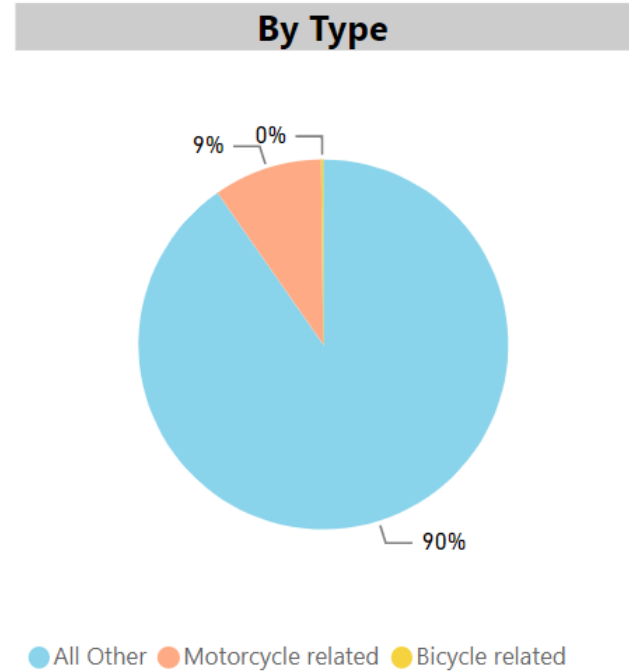
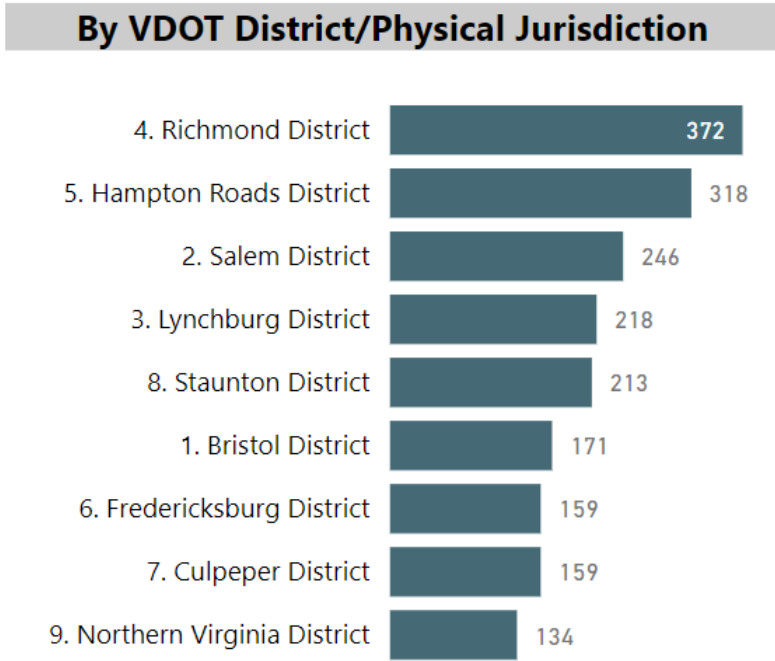
Virginia Traffic Volume Change By District



Virginia Traffic Volume Change By Urban/Rural

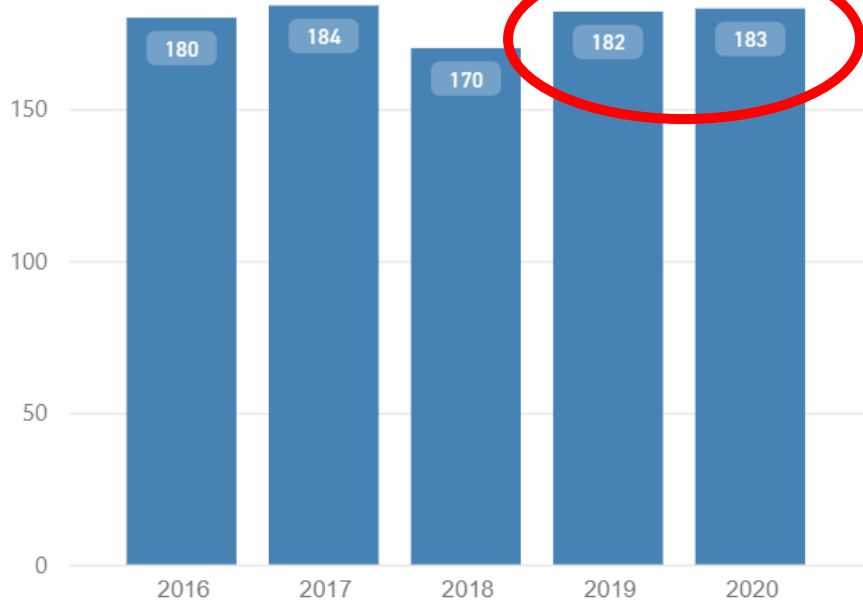


Virginia Road Departure Fatal Crashes

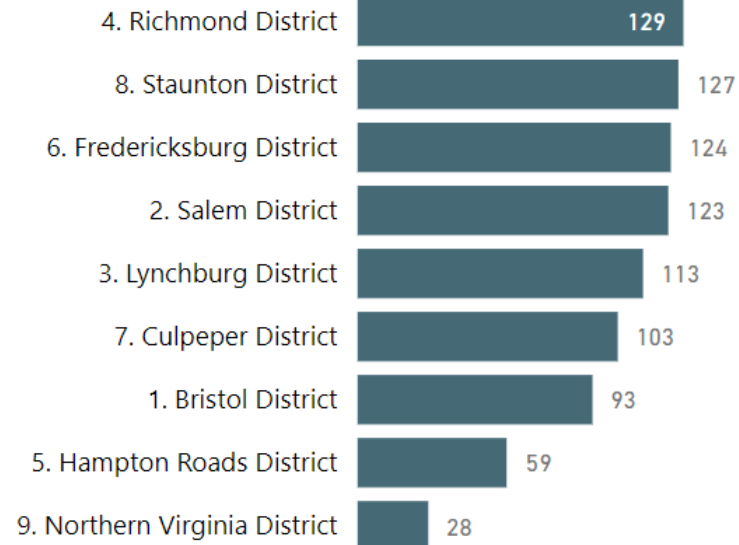


Virginia Speed Related Fatal Crashes – Rural Roads

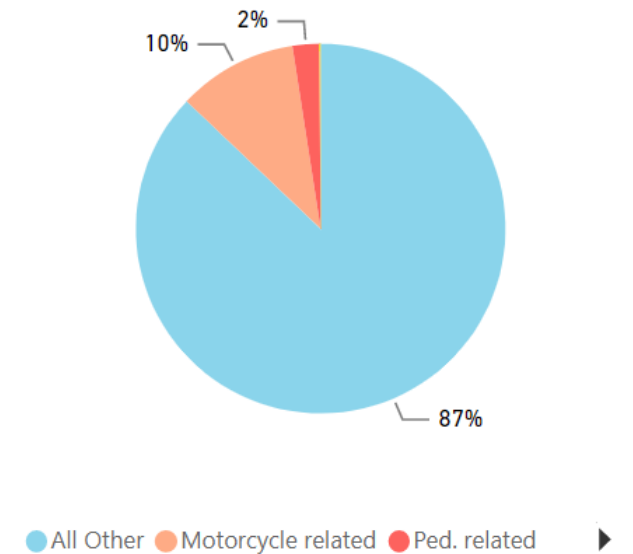
By Year/Month..



By VDOT District/Physical Jurisdiction



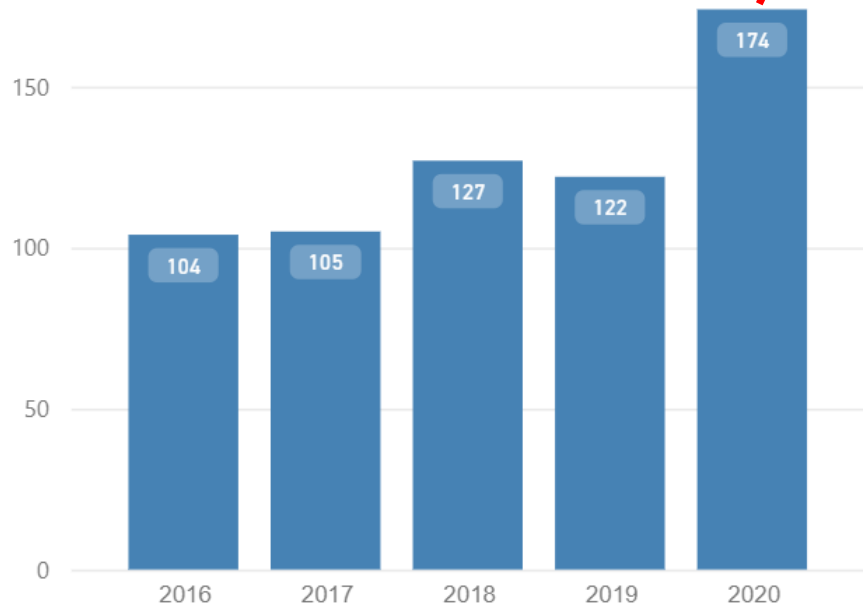
By Type



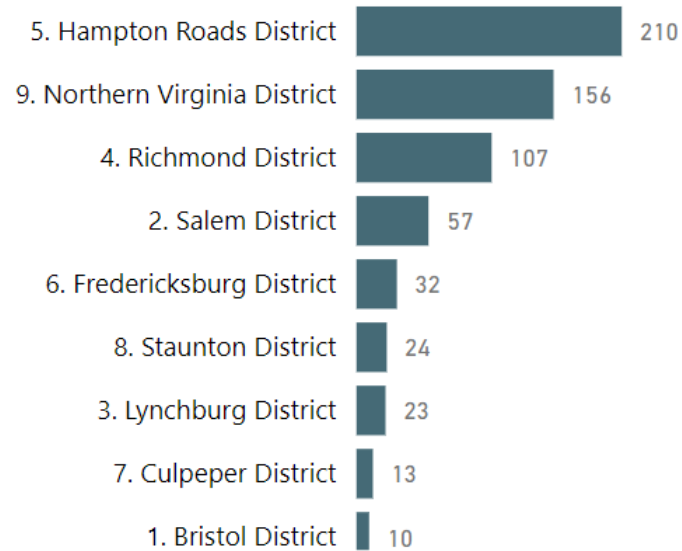
Virginia Speed Related Fatal Crashes – Urban Roads

Up 43%

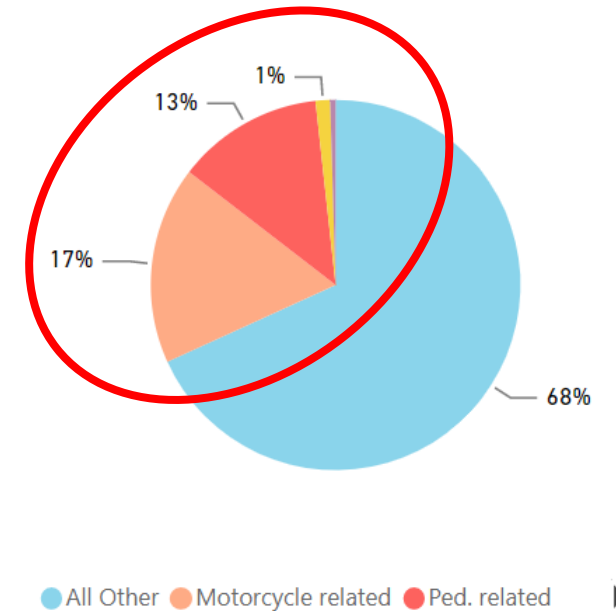
By Year/Month..



By VDOT District/Physical Jurisdiction



By Type



2020 Traffic Safety Trends – Engineering Takeaways

1. **Keep Doubling Down on Addressing Road Departure on Rural Roads**
2. **Protect Most Vulnerable Road Users in Urban Areas where speeding deaths are increasing**

Crash Factors and Risk (2016 - 2020)

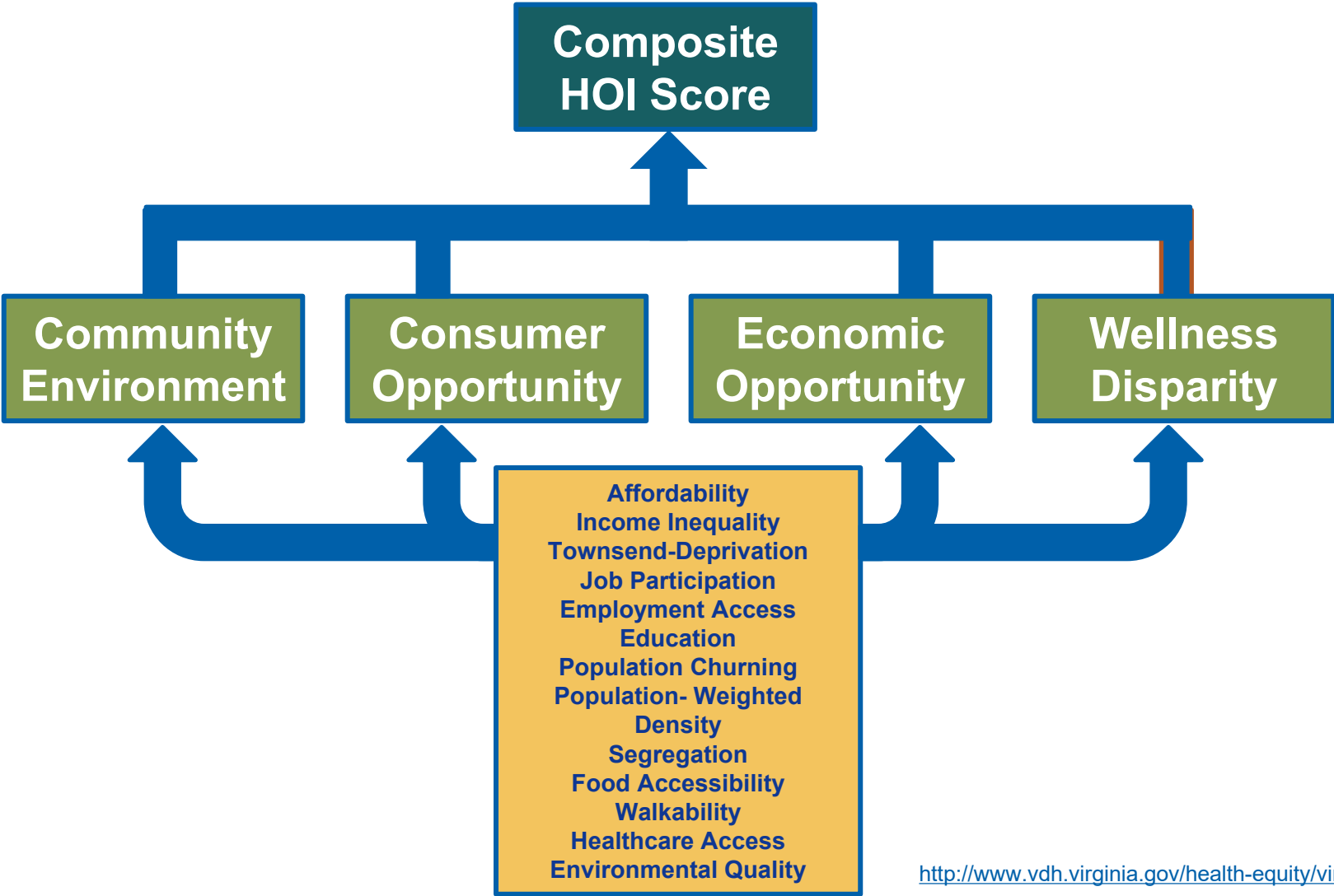
Crash Factor	Total Crashes	Number of Crashes		
		Fatal	Serious Injury	Other Injury
Pedestrian	7,750	591	2,075	5,084
Unbelted	24,143	1,655	6,042	9,816
Motorcyclist	9,617	438	3,242	4,331
Drinking	35,588	1,253	4,620	10,456
Bicyclist	3,148	58	646	2,317
Road Departure	140,047	1,990	11,941	35,771
Speeding	121,322	1,598	9,123	32,994
Large Truck Involved	48,988	502	2,406	11,534
Mature Driver (65+)	102,314	854	5,108	32,335
Distracted	119,318	699	6,358	36,245
Intersection	254,578	1,052	11,064	81,669
Young Driver (15-20)	115,417	416	4,768	32,329
All Travelers	621,520	3,849	30,382	175,028

Chance of ...		
Death	Death or Serious Injury	Injury
7.6%	34%	100%
6.9%	32%	73%
4.6%	38%	83%
3.5%	17%	46%
1.8%	22%	96%
1.4%	10%	35%
1.3%	9%	36%
1.0%	6%	29%
0.8%	6%	37%
0.6%	6%	36%
0.4%	5%	37%
0.4%	4%	33%
0.6%	6%	34%

Virginia Pedestrian Crash Severity By Speed Limit (2014-2018)



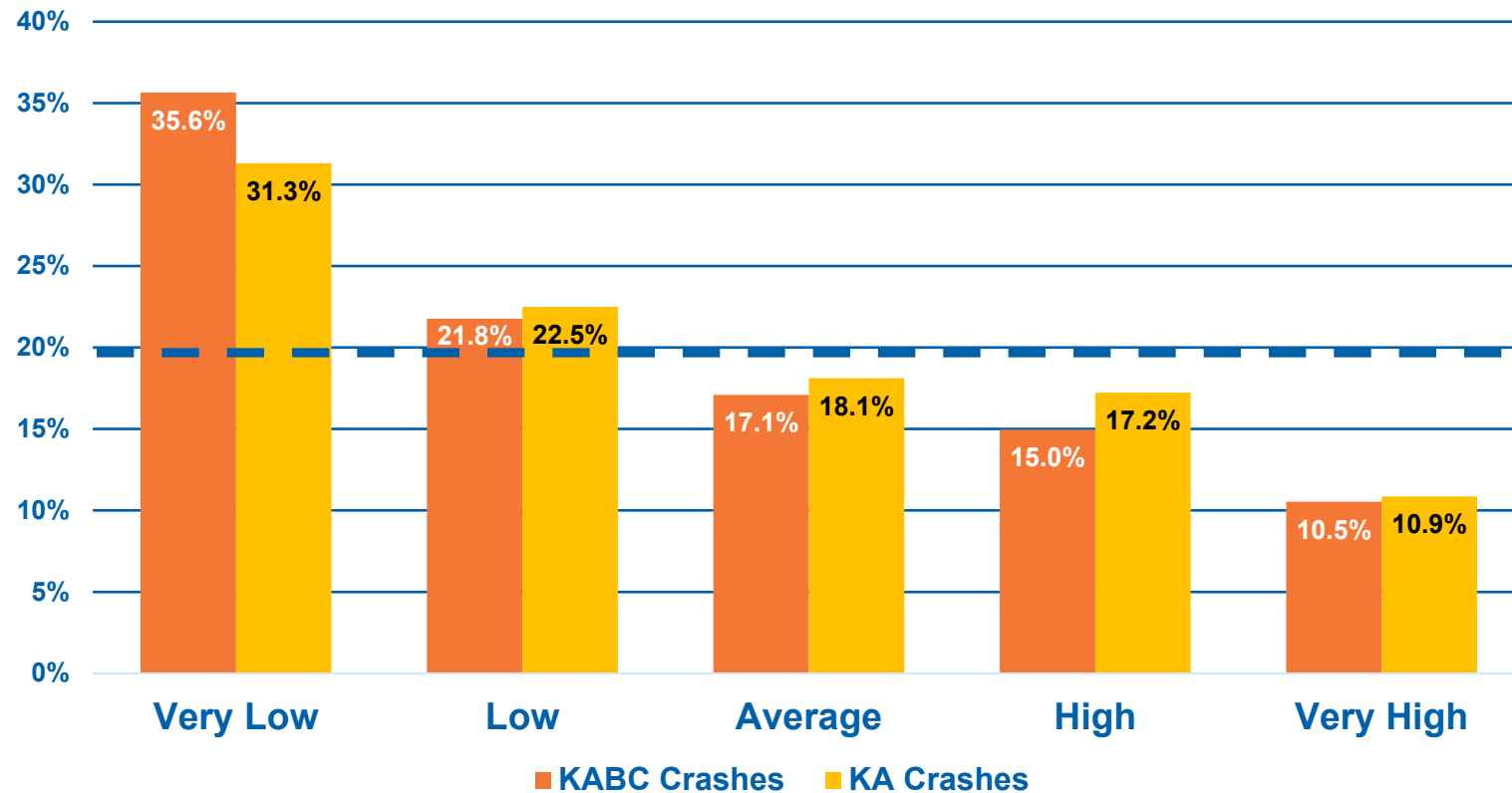
Virginia Health Opportunity Index



Equity & Safety – Virginia HOI and Pedestrian Crashes

Almost 60% of deaths and injuries occur in locations with VERY LOW or LOW Virginia Health Opportunity Index (HOI) Scores

Distribution of Pedestrian Crashes by HOI Category
(2014-2018)



VDOT Systemic Plan - 8 Proven Safety Countermeasures

High-visibility Backplates



Up to 15% crash reduction

Flashing Yellow Arrow

	Steady Red Arrow Drivers turning left must stop and wait (except where permitted by law).
	Steady Yellow Arrow Stop, if you can do so safely.
	Flashing Yellow Arrow Proceed with left turn after yielding to oncoming traffic and pedestrians.
	Steady Green Arrow Proceed with left turn.

Up to 20% crash reduction

Curve Signs




Up to 40% crash reduction

Pedestrian Crossings



Up to 56% crash reduction

Unsignalized Intersections



Up to 10% crash reduction

Shoulder Wedge



Up to 20% crash reduction

Centerline Rumble Strips



Up to 60% crash reduction

Edgeline Rumble Strips



Up to 50% crash reduction

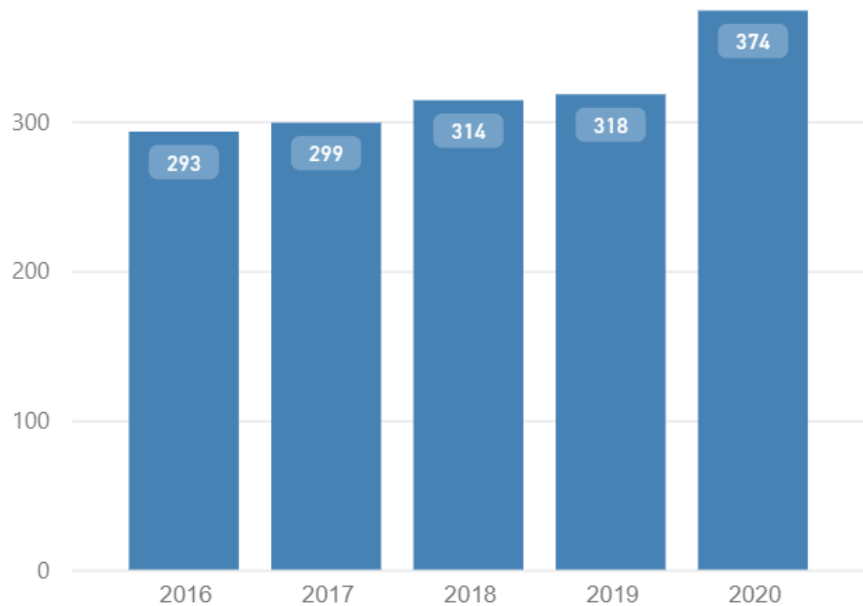
Thank you!

Mark A. Cole, P.E.
VDOT Assistant State Traffic Engineer
Mark.Cole@VDOT.Virginia.gov
(804) 786-4196

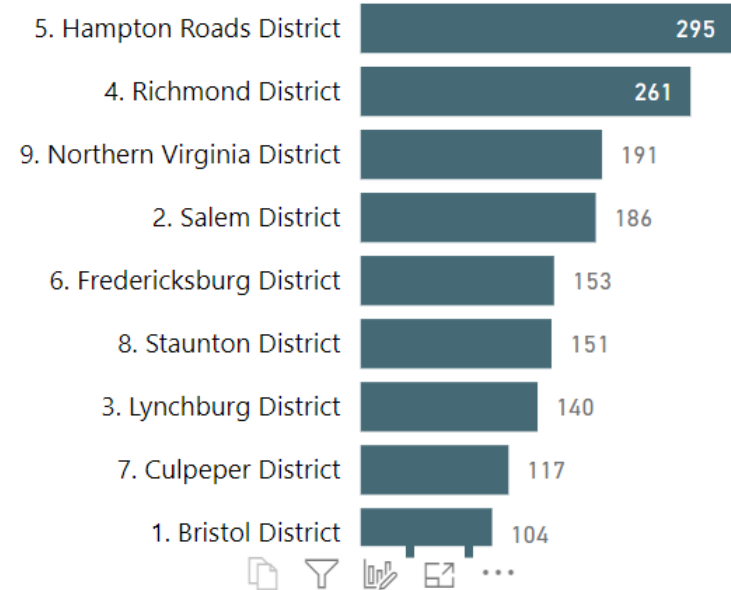


Virginia Speed Related Fatal Crashes

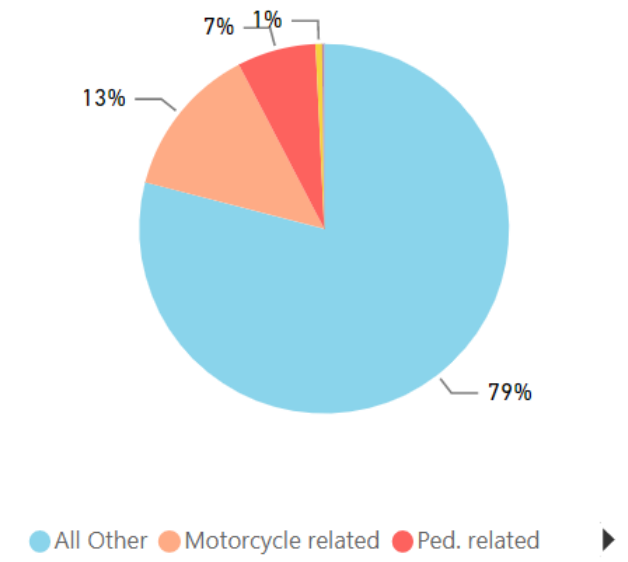
By Year/Month..



By VDOT District/Physical Jurisdiction

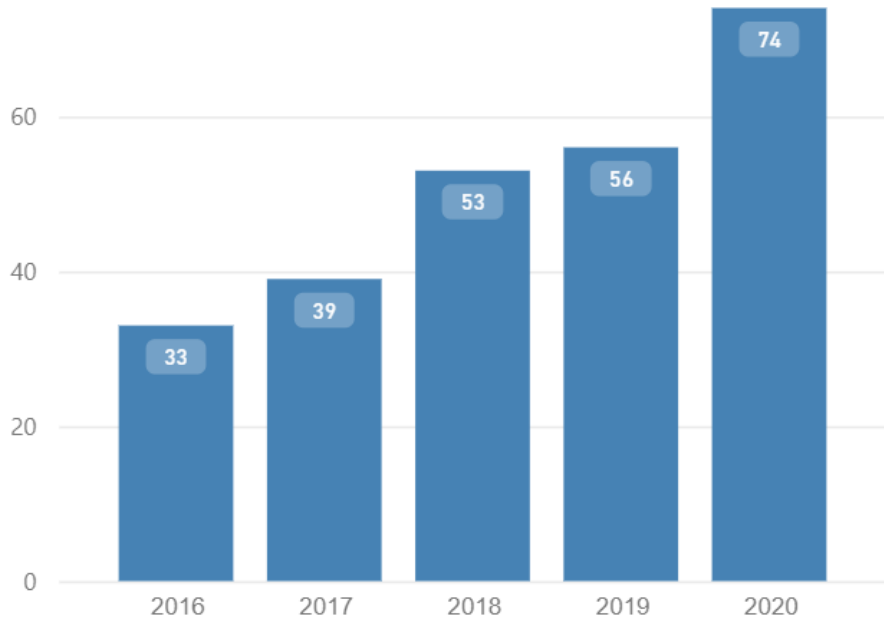


By Type

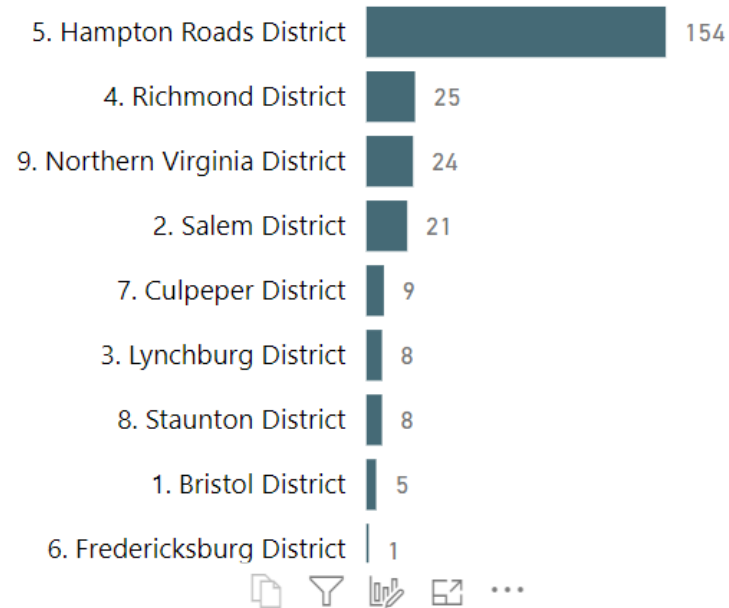


Speed Related Traffic Deaths on Locally-Owned Roads

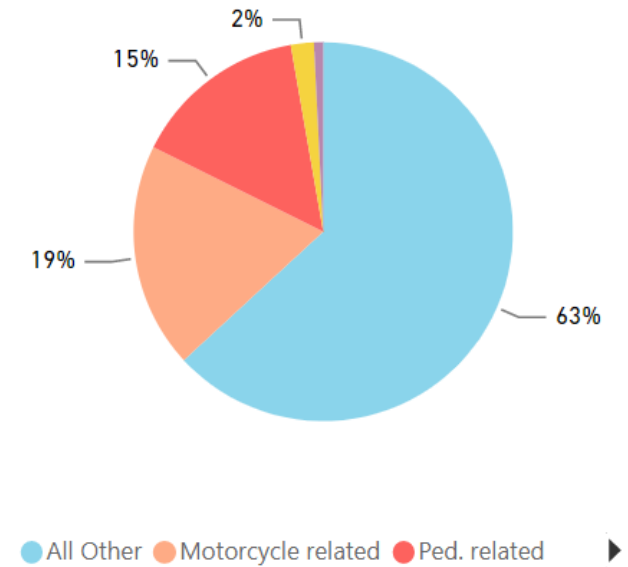
By Year/Month..



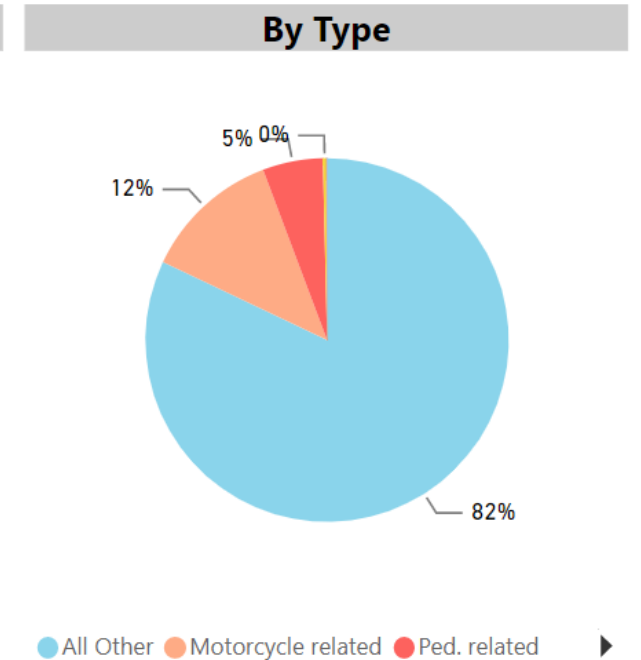
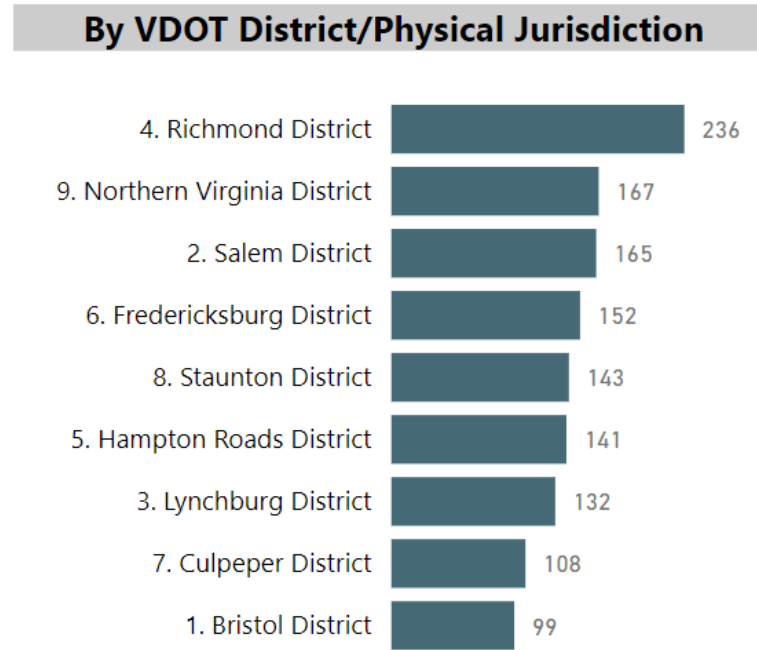
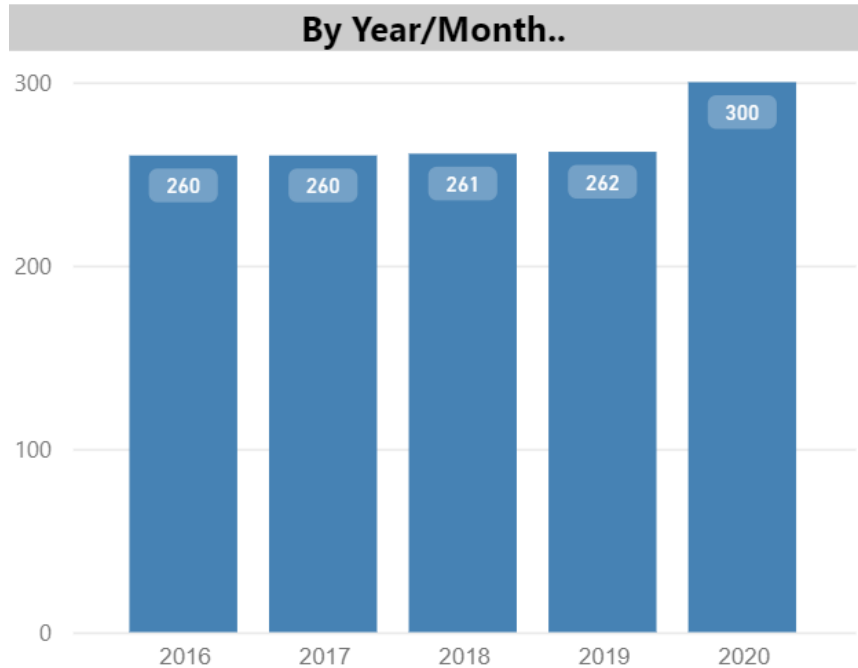
By VDOT District/Physical Jurisdiction



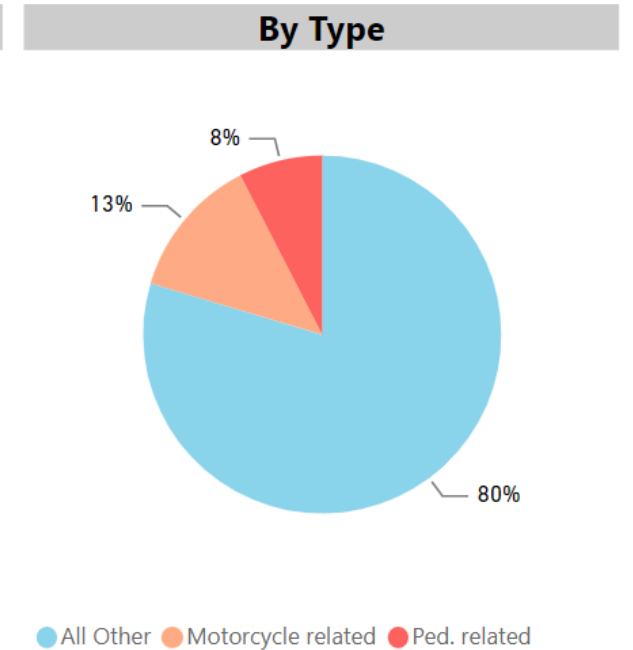
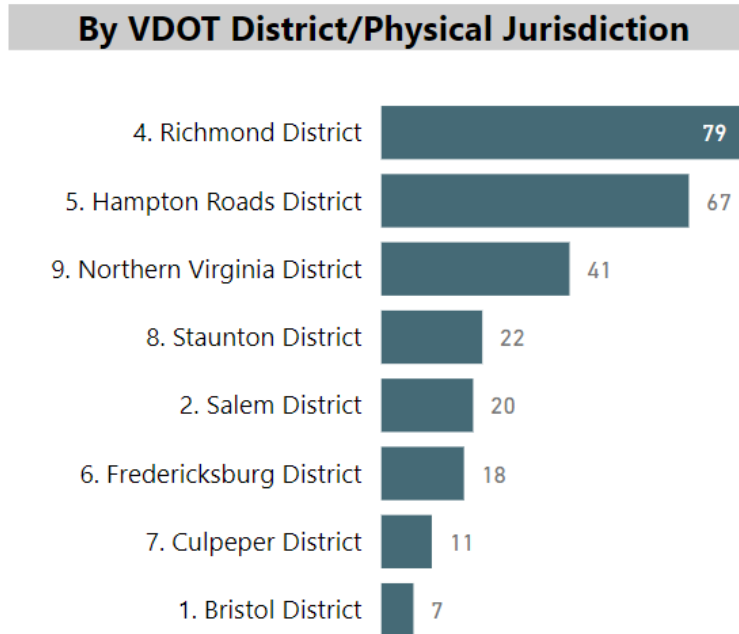
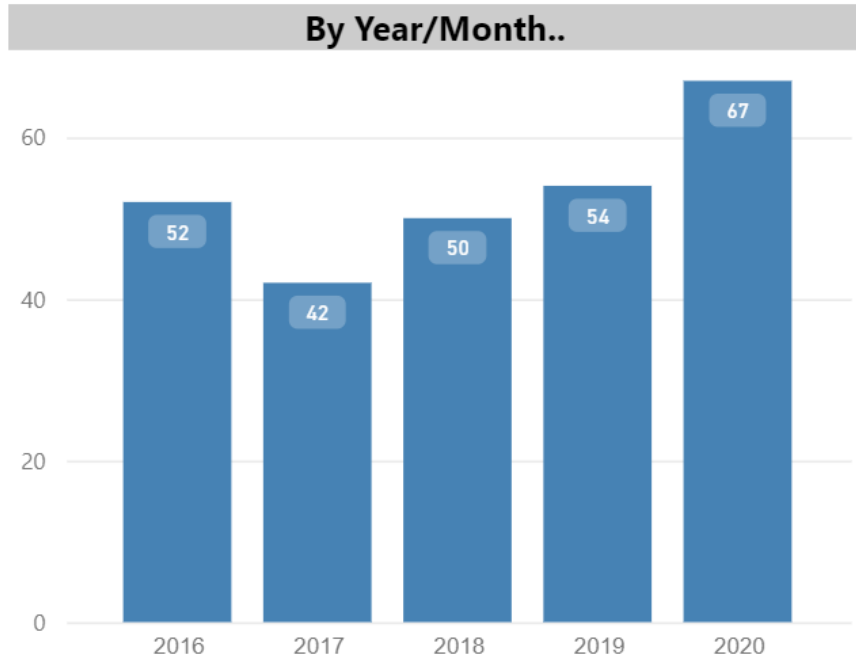
By Type



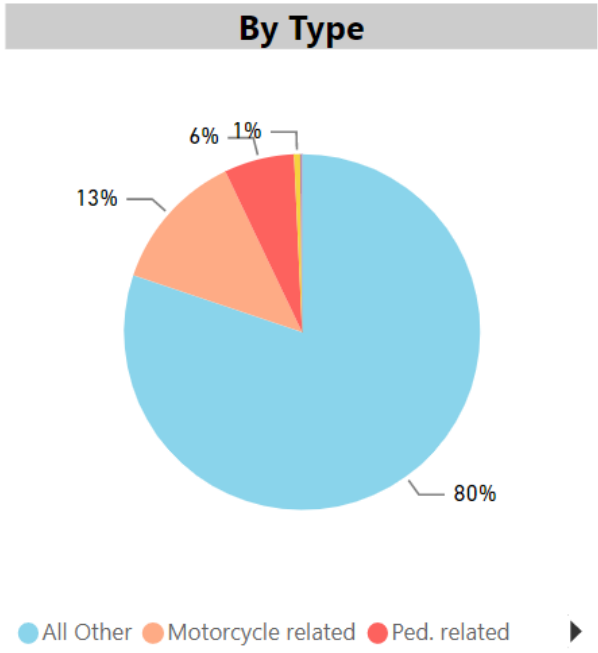
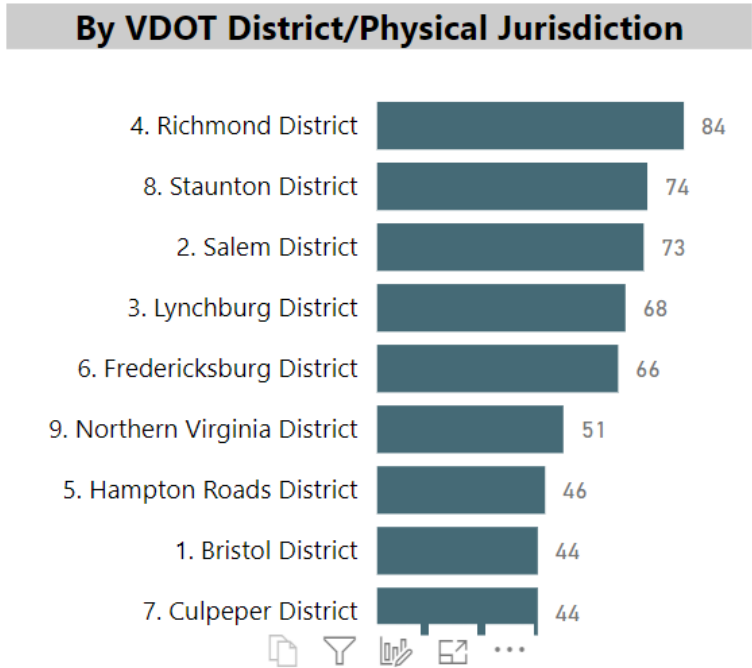
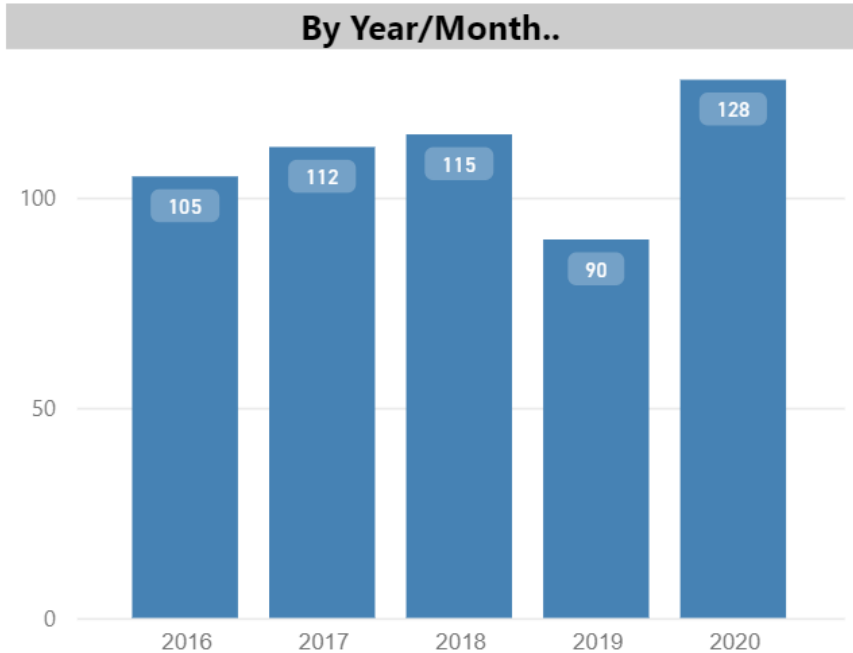
Speed Related Traffic Deaths on VDOT-Owned Roads



Speed Related Traffic Deaths on VDOT Interstates

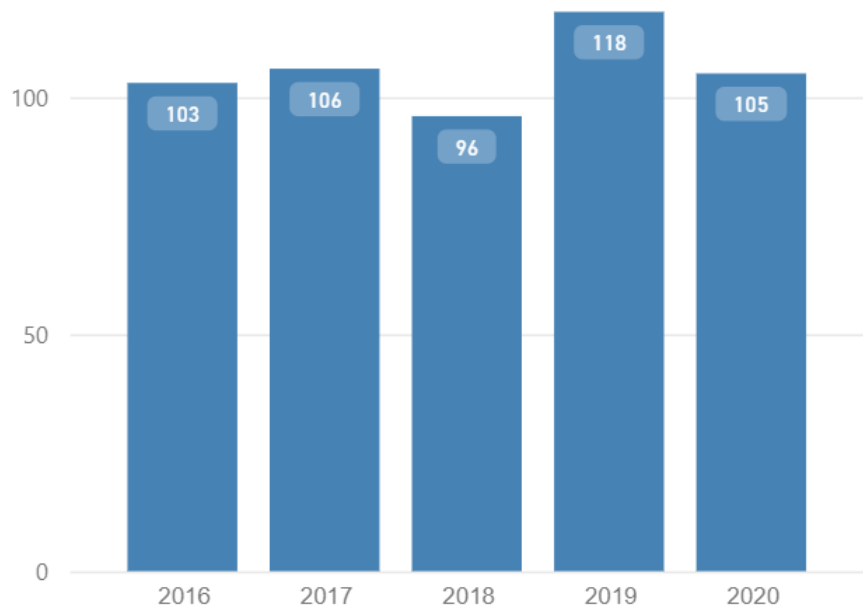


Speed Related Traffic Deaths on VDOT Primaries

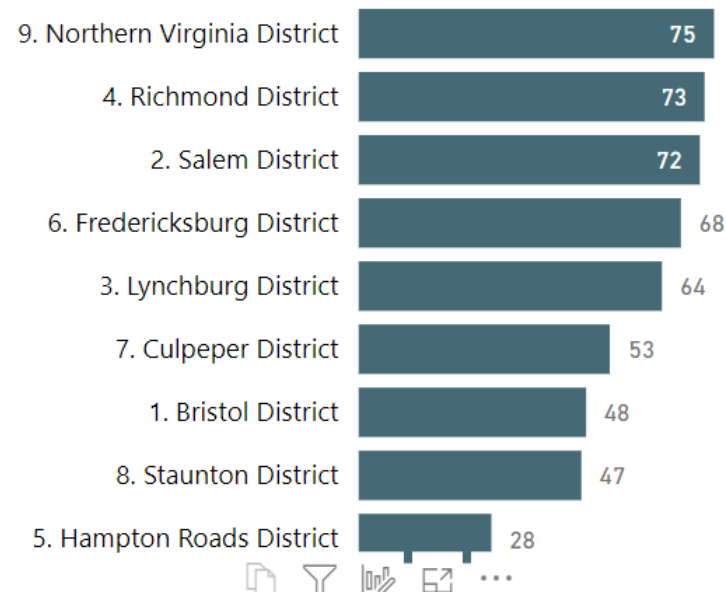


Speed Related Traffic Deaths on VDOT Secondaries

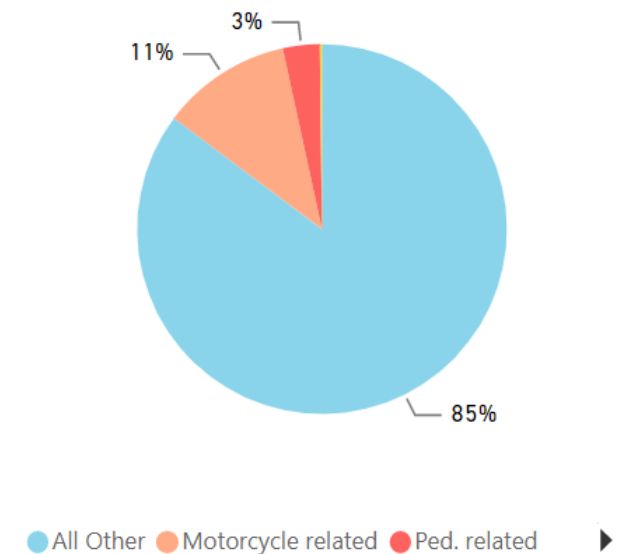
By Year/Month..



By VDOT District/Physical Jurisdiction



By Type



Fatal & Serious Injury Heat Map – 2016-2020

CRASH FACTORS

Fatal and Serious Injury Crashes (2016-2020)	Total Crashes	Interstate	Primary	Secondary	Other	Intersection	Road Departure	Speeding	Alcohol	Drugs	Large Vehicles	Bicycle	Pedestrian	Unrestrained	Young Driver	Aging Driver	Motorcycle	Distracted Driver	Drowsy Driver
Total Crashes	34,231	4,714	10,592	8,989	9,936	12,116	13,931	10,721	5,873	889	2,908	704	2,666	7,697	5,184	5,962	3,680	7,057	1,639
Intersection	12,116	66	3,679	2,676	5,695		383	2,555	1,742	258	732	420	1,235	2,120	1,953	2,688	1,273	2,379	308
Road Departure	13,931	2,404	4,156	4,965	2,406	383		5,889	3,215	504	945	29	0	4,640	2,007	1,575	1,239	3,149	1,178
Speeding	10,721	2,262	3,023	3,384	2,052	2,555	5,889		2,600	410	926	52	279	3,503	1,896	1,248	1,237	2,125	491
Alcohol	5,873	597	1,599	1,973	1,704	1,742	3,215	2,600		394	219	55	733	2,168	519	407	429	1,205	242
Drugs	889	100	289	280	220	258	504	410	394		50	7	60	368	102	61	49	240	69
Large Vehicles	2,908	1,010	1,079	390	429	732	945	926	219	50		21	142	642	227	620	91	600	161
Bicycle	704	3	114	129	458	420	29	52	55	7	21		3	15	152	136	5	127	1
Pedestrian	2,666	150	592	503	1,421	1,235	0	279	733	60	142	3		96	212	337	16	379	25
Unrestrained	7,697	956	2,509	2,641	1,591	2,120	4,640	3,503	2,168	368	642	15	96		1,220	930	35	1,753	443
Young Driver	5,184	536	1,569	1,673	1,406	1,953	2,007	1,896	519	102	227	152	212	1,220		467	289	1,154	239
Aging Driver	5,962	628	2,364	1,267	1,703	2,688	1,575	1,248	407	61	620	136	337	930	467		521	1,097	193
Motorcycle	3,680	504	1,058	1,004	1,114	1,273	1,239	1,237	429	49	91	5	16	35	289	521		397	15
Distracted Driver	7,057	957	2,233	1,600	2,267	2,379	3,149	2,125	1,205	240	600	127	379	1,753	1,154	1,097	397		1,202
Drowsy Driver	1,639	393	633	349	264	308	1,178	491	242	69	161	1	25	443	239	193	15	1,202	