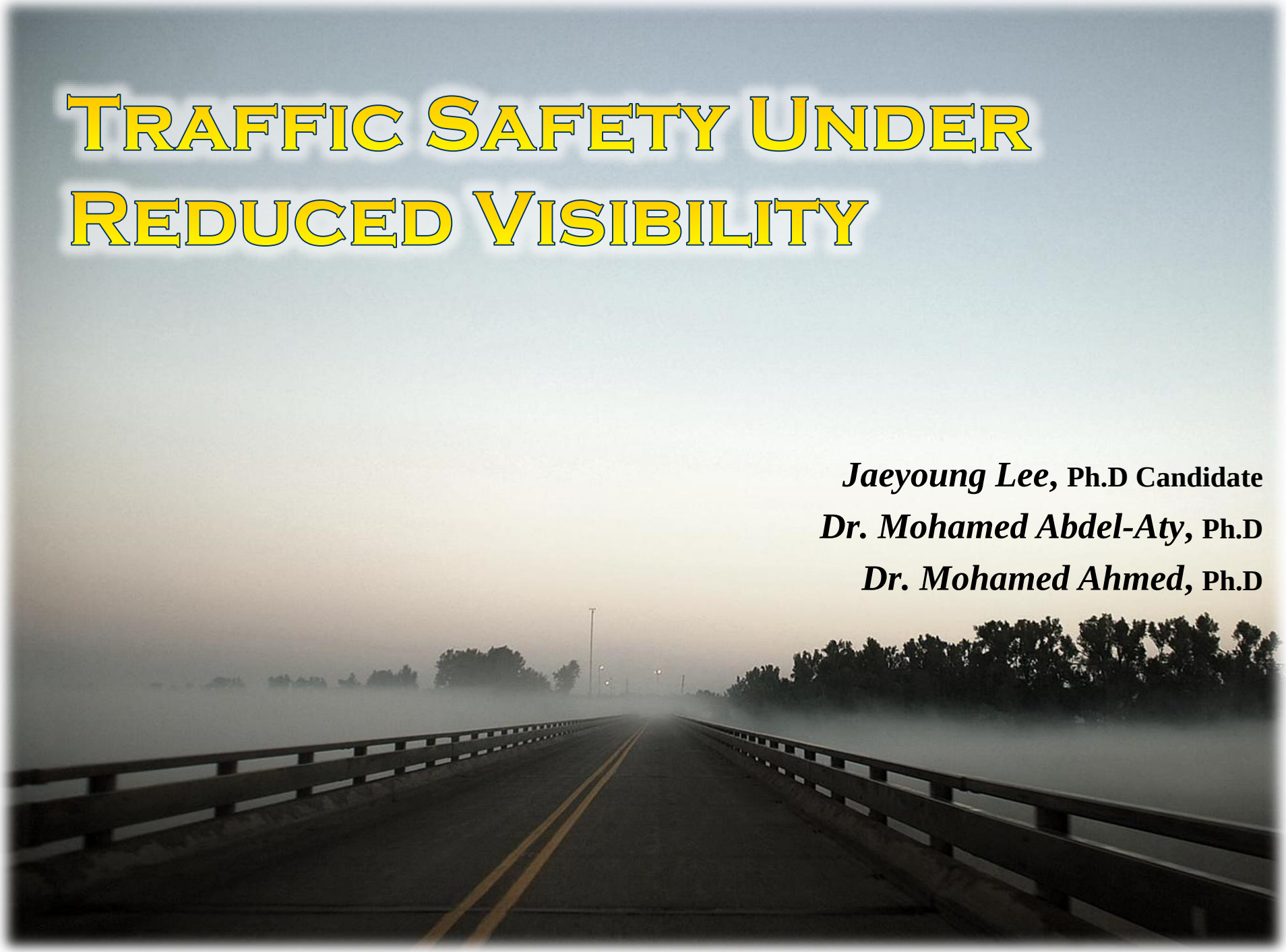
Traffic Safety Under Reduced Visibility



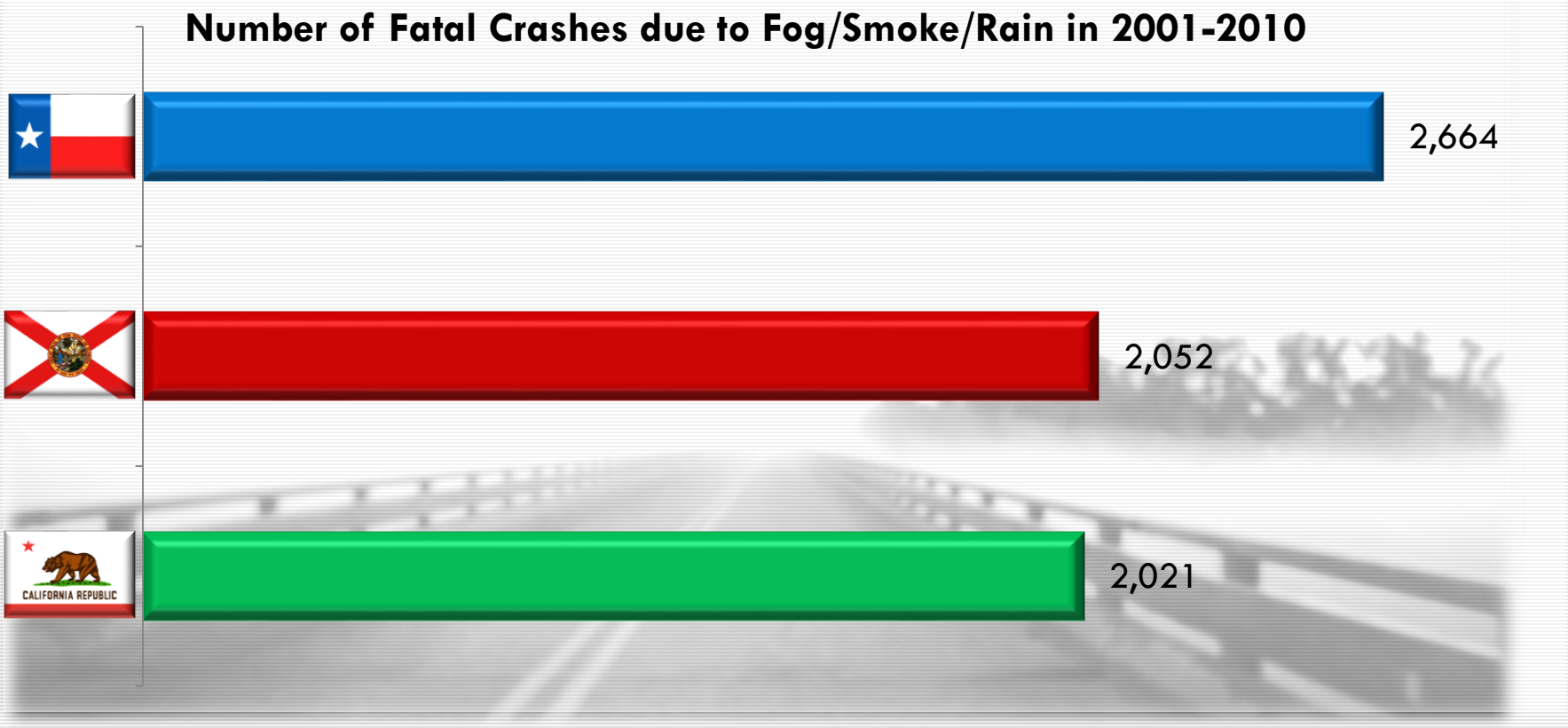
Jaeyoung Lee, **Ph.D Candidate**

***Dr. Mohamed Abdel-Aty*, Ph.D**

***Dr. Mohamed Ahmed*, Ph.D**

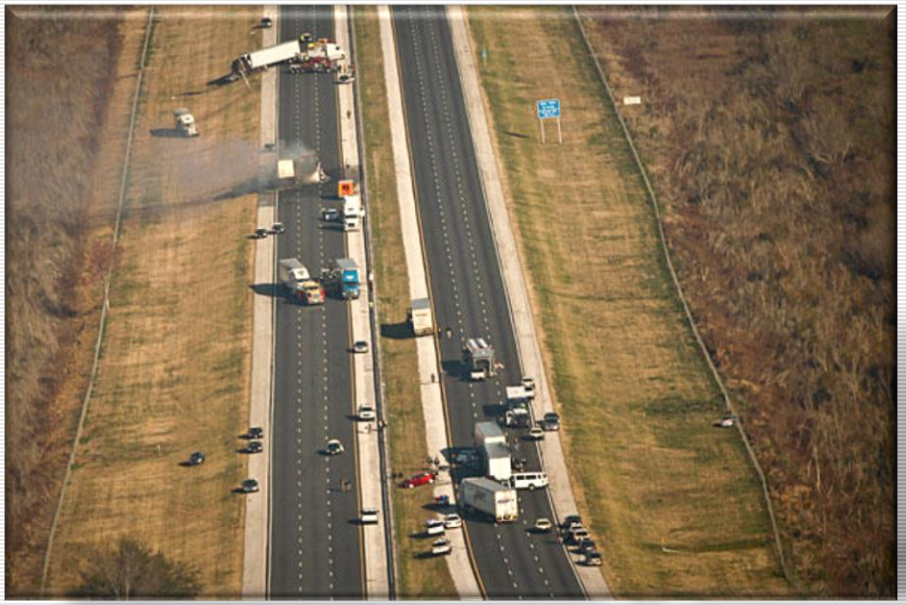
CRASHES DUE TO REDUCED VISIBILITY

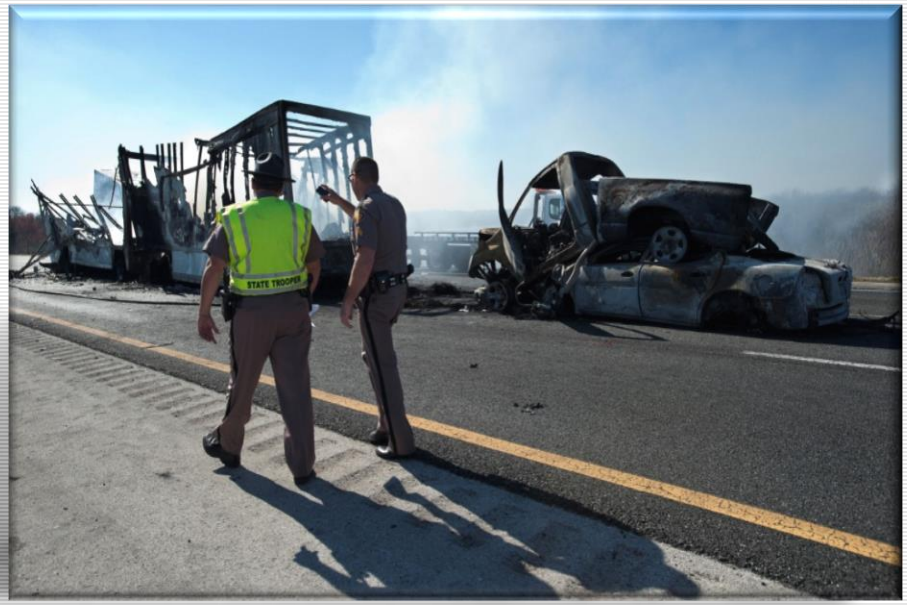
- Florida is among the top state in the US regarding traffic safety problems resulting from adverse visibility conditions due to fog/smoke and heavy rain.



PILE-UP CRASH ON I-75 IN 2012

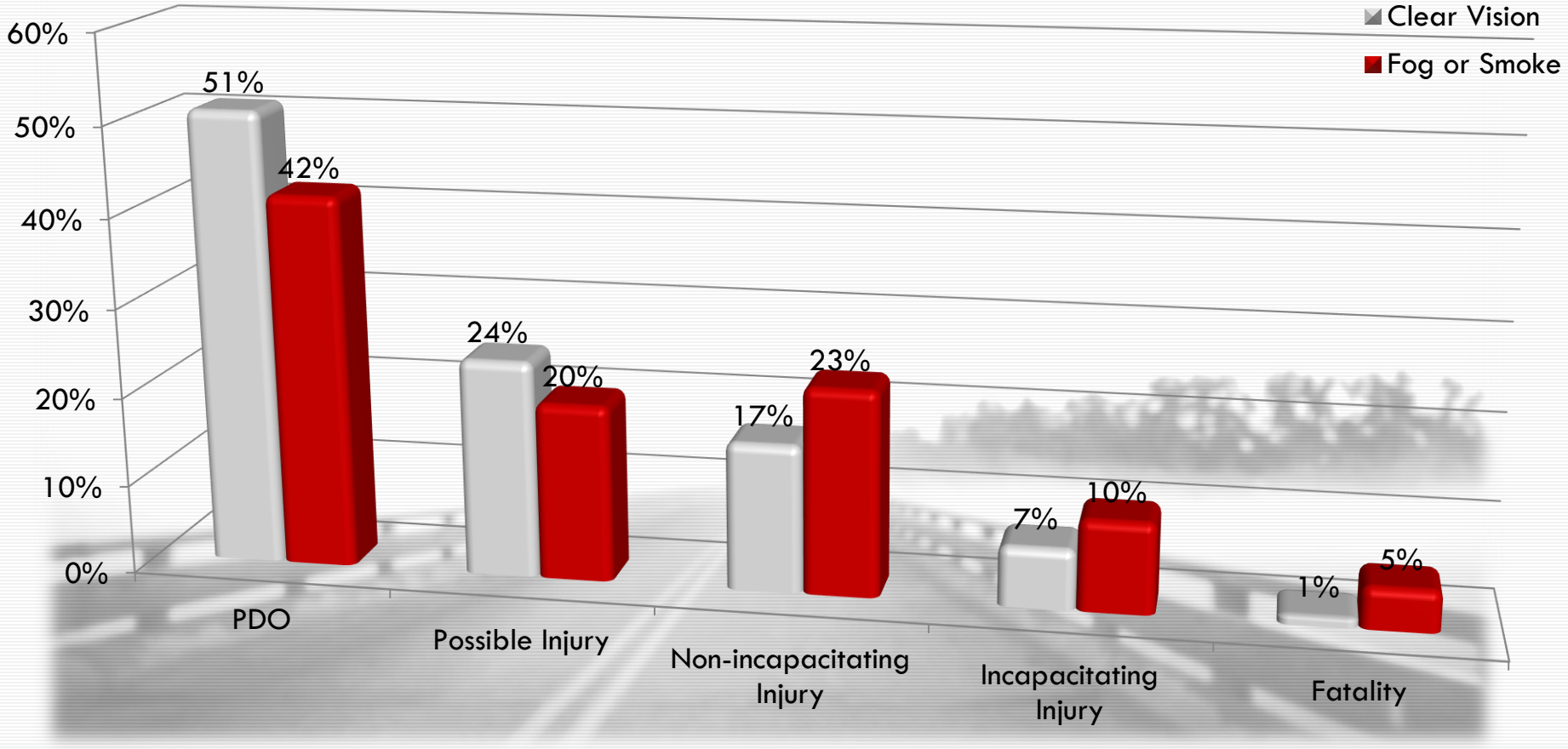
- Recently, 10 people were killed and another 18 were injured from fog/smoke related pile-up crash on I-75 near Gainesville (Jan 29, 2012).





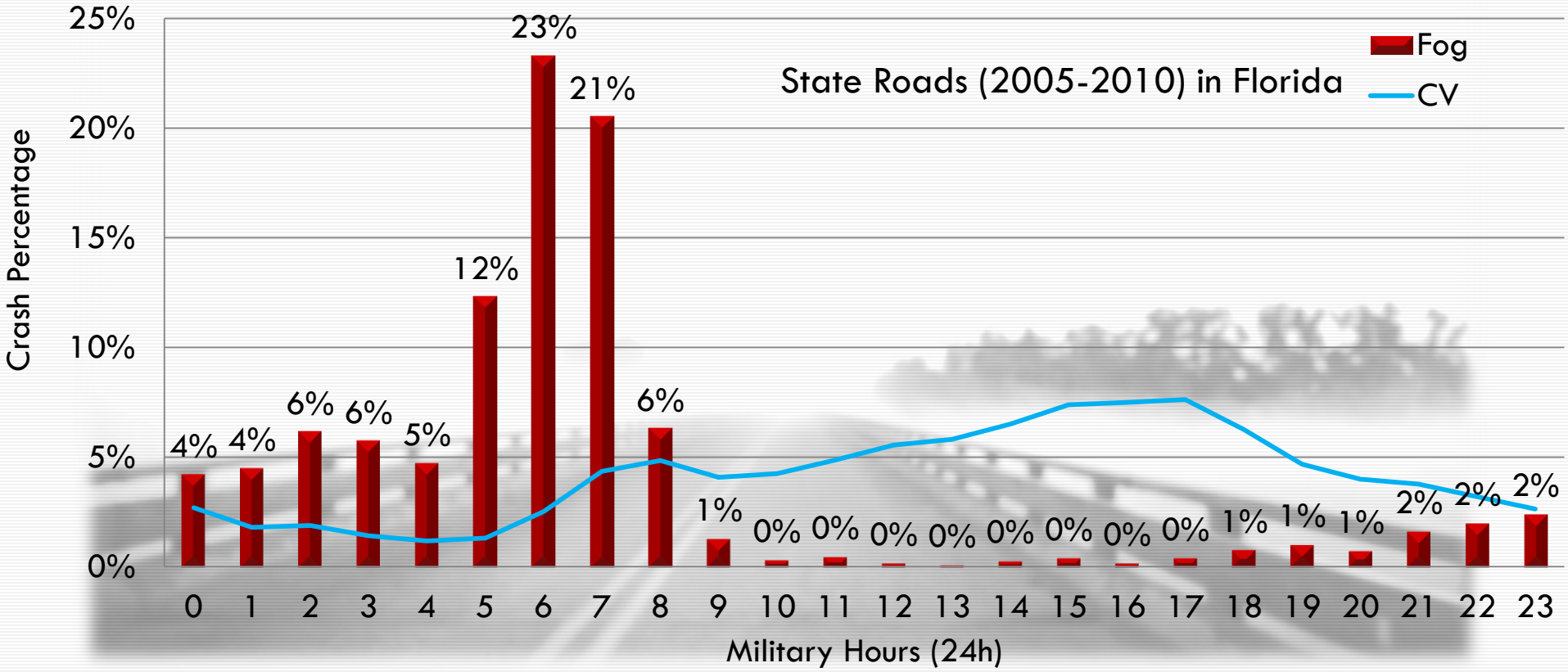
SEVERITY OF VISIBILITY RELATED CRASHES

- Generally, Crashes due to reduced visibility from fog/smoke are more severe compared to non-fog related crashes.



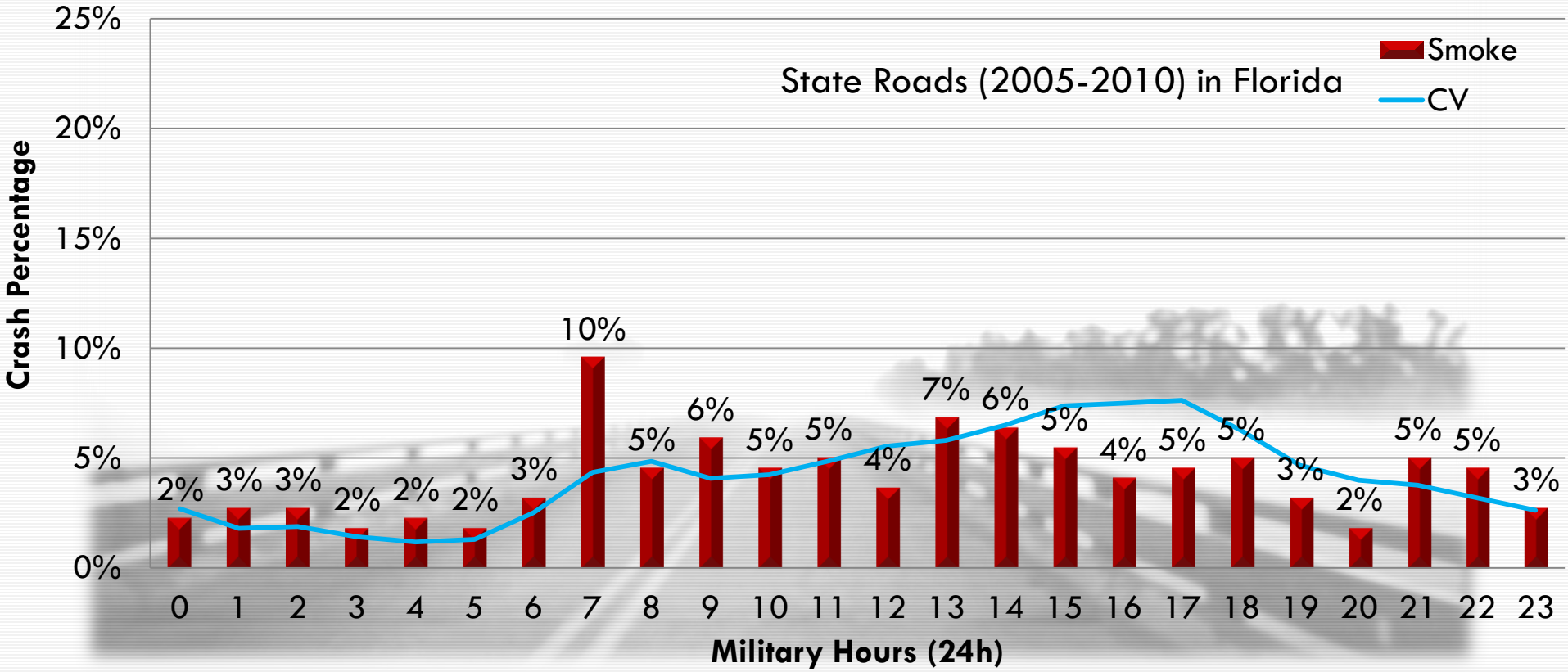
TEMPORAL DISTRIBUTIONS (1/4)

- Hourly distribution of fog crashes shows that early hours of dawn & subsequent hours where fog is prominent (5-8 AM).



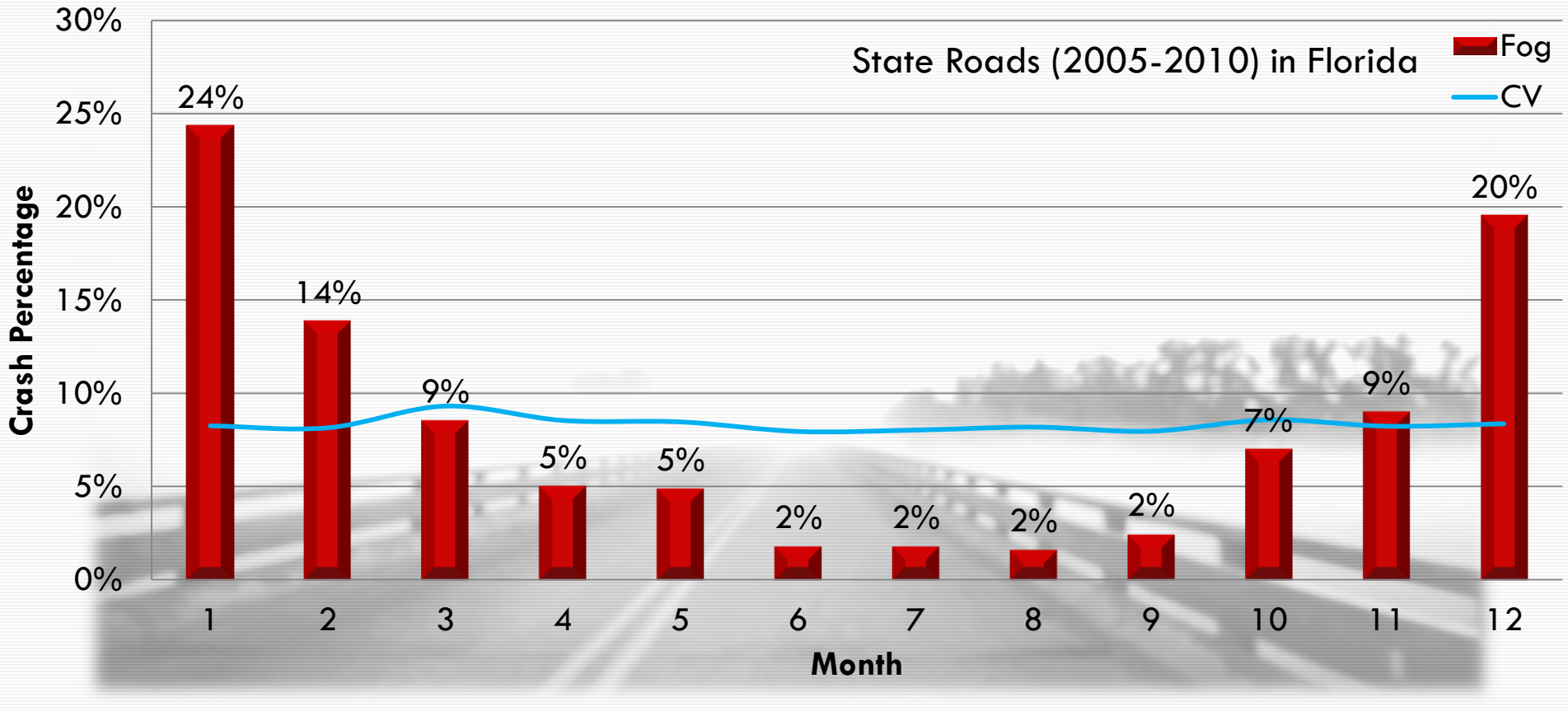
TEMPORAL DISTRIBUTIONS (2/4)

- Hourly distribution of smoke crashes does not show any obtrusive patterns, which implies smoke crashes do not occur at specific time period.



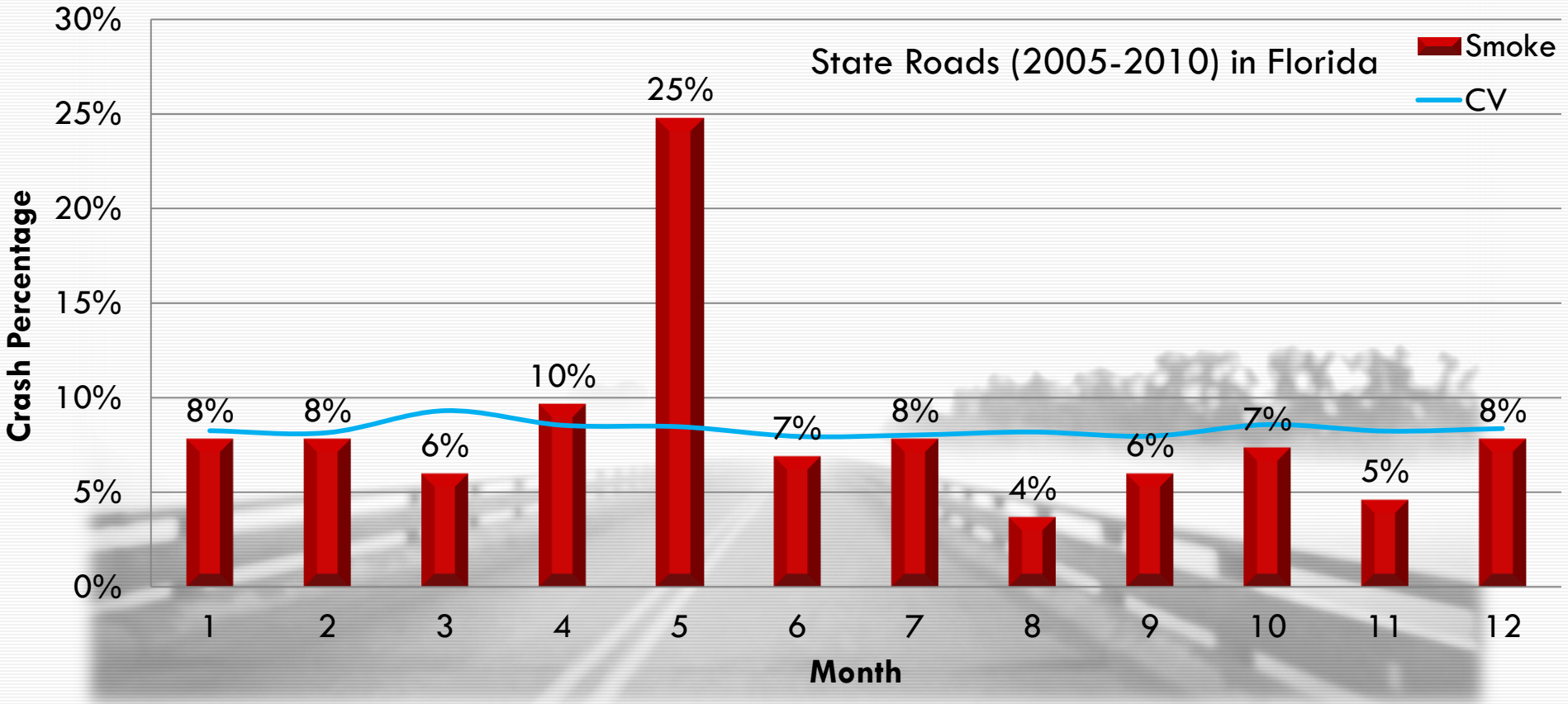
TEMPORAL DISTRIBUTIONS (3/4)

- Monthly distribution of fog crashes indicated nearly 60% of fog crashes occurs during the winter period, from Dec to Feb.



TEMPORAL DISTRIBUTIONS (4/4)

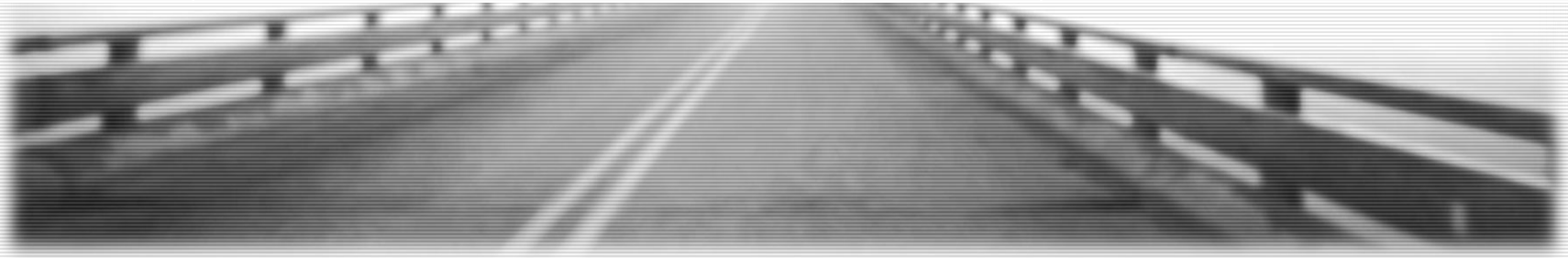
- Monthly distribution of smoke crashes showed it most frequently occurs in May which is the dry period.

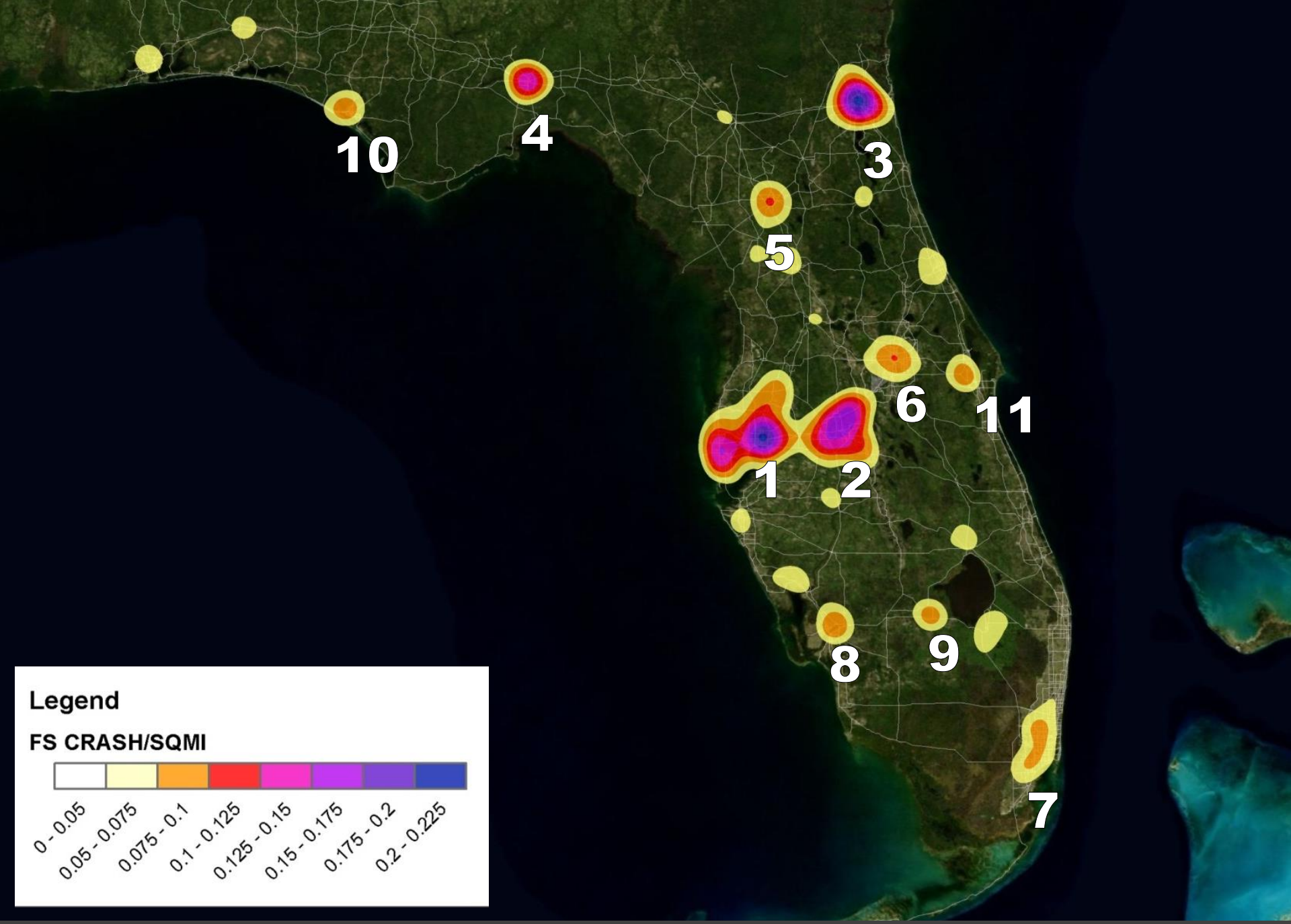


SPATIAL DISTRIBUTIONS (1/3)

- Kernel density estimation was used to identify fog/smoke crash hotspots.

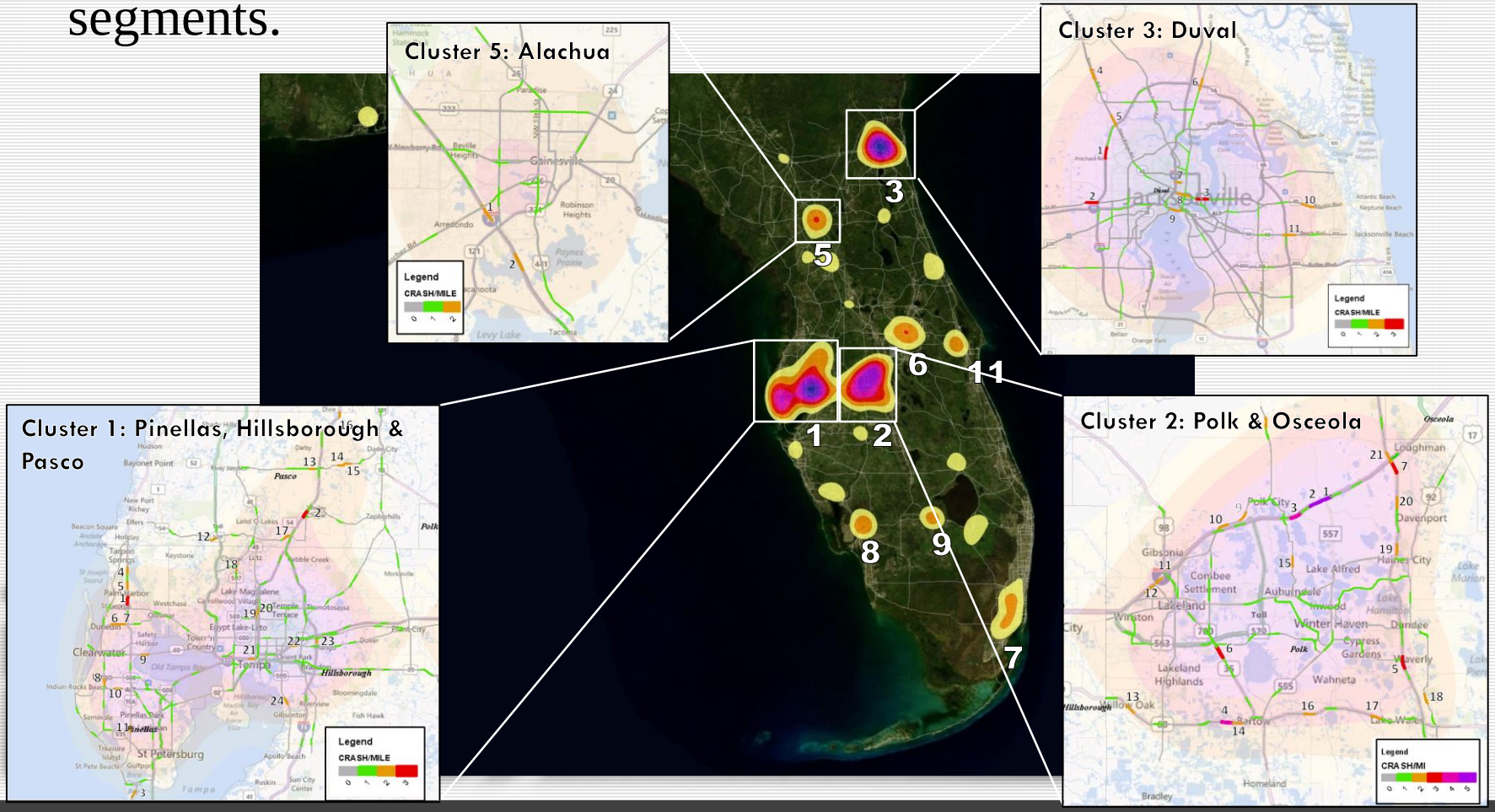
Cluster	County	Cluster	County
1	Pinellas, Hillsborough & Pasco	7	Miami-Dade & Broward
2	Polk & Osceola	8	Lee & Charlotte
3	Duval	9	Glades & Hendry
4	Leon	10	Bay
5	Alachua	11	Brevard & Orange
6	Orange		




10
4
3
5
6
11
1
2
8
9
7
Legend
FS CRASH/SQMI
0 - 0.05
0.05 - 0.075
0.075 - 0.1
0.1 - 0.125
0.125 - 0.15
0.15 - 0.175
0.175 - 0.2
0.2 - 0.225

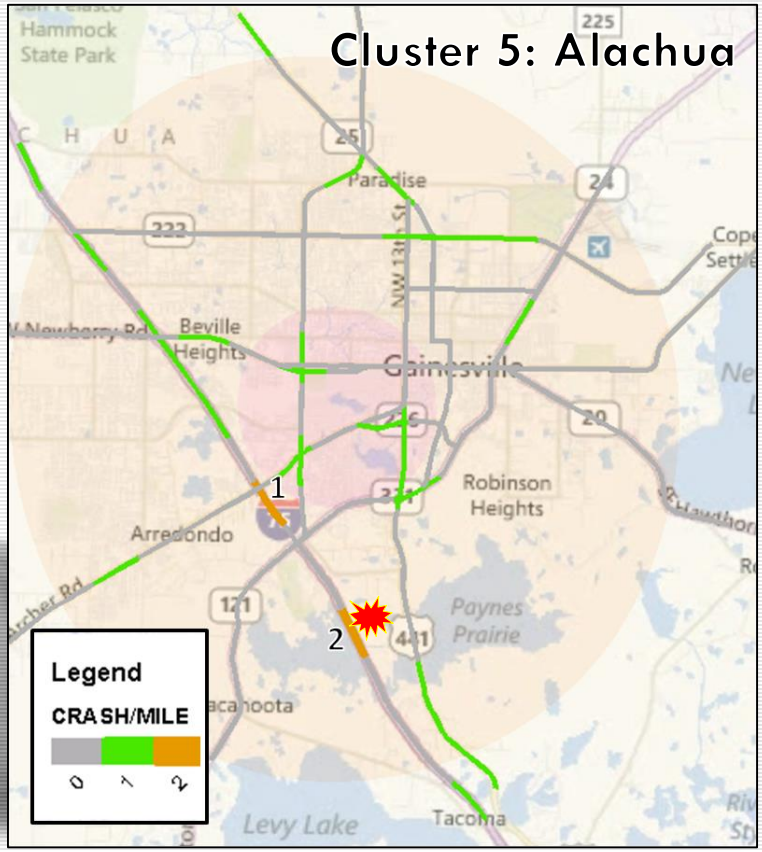
SPATIAL DISTRIBUTIONS (2/3)

- 11 hotspots were magnified and divided highways into one mile segments and thus FS crashes were counted based on the segments.



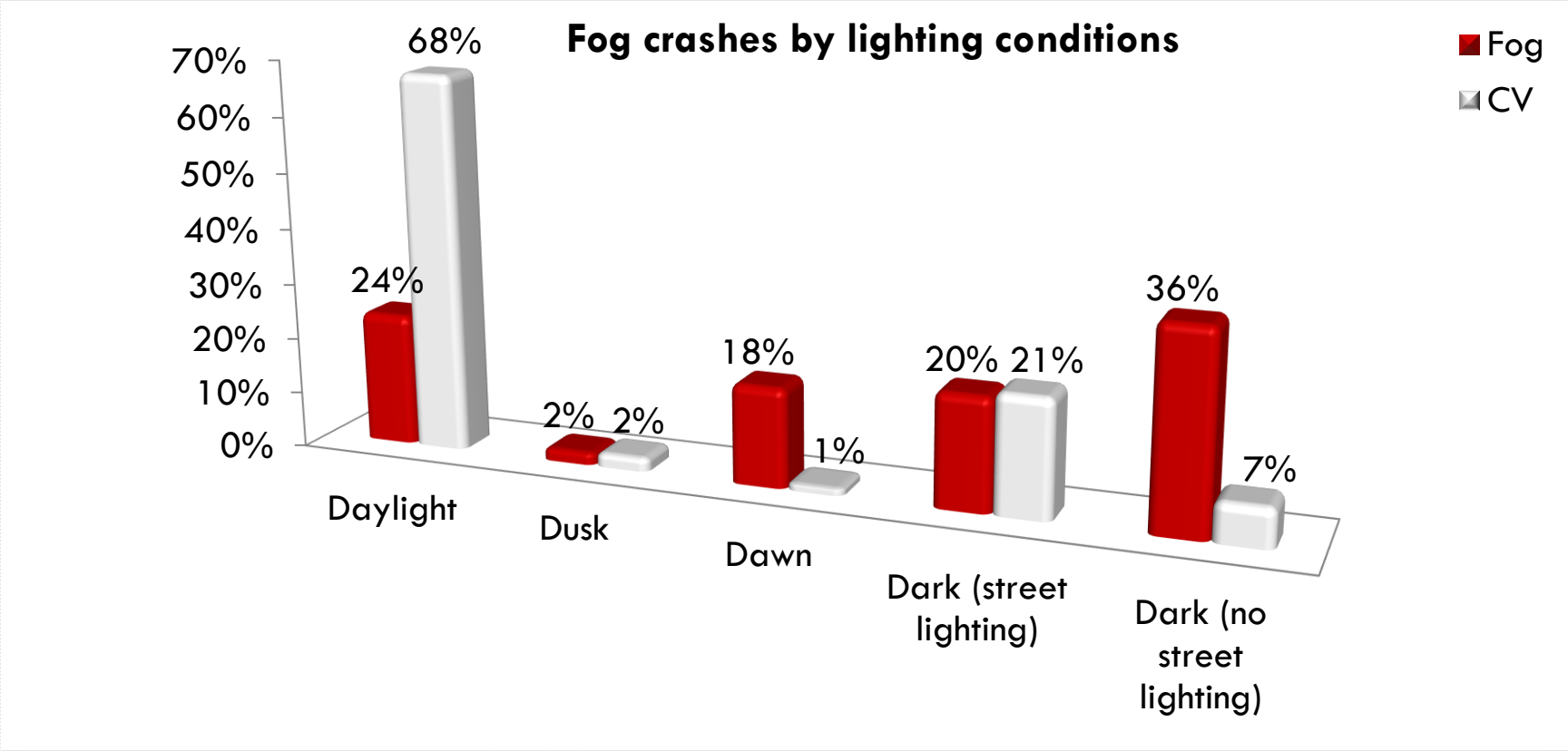
SPATIAL DISTRIBUTIONS (3/3)

- Segment 2 on I-75 were identified as a fog/smoke crash hotspot using previous crash data (2005-2010), the pile-up crash occurred due to fog & smoke involving large trucks at the very same location.
- Thus, this crash could be avoided if appropriate treatments were conducted, proactively.



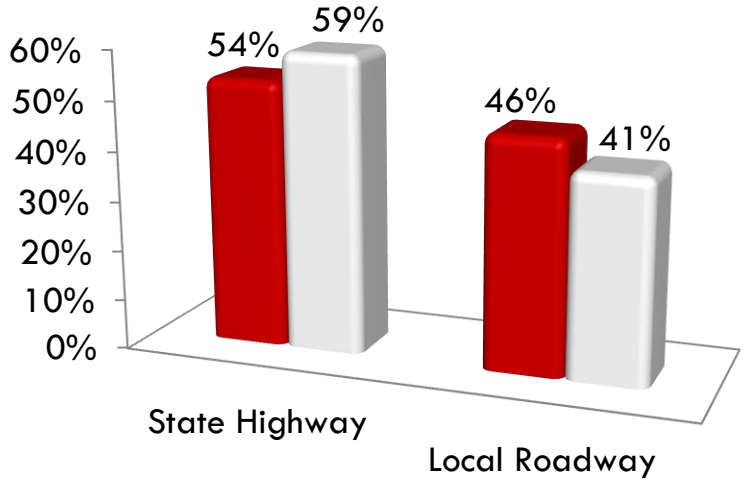
CONTRIBUTING FACTORS (1/3)

- Fog crashes are more frequent at the roadway with poor lighting condition, divided median, and at segments (not intersections) in the rural area.

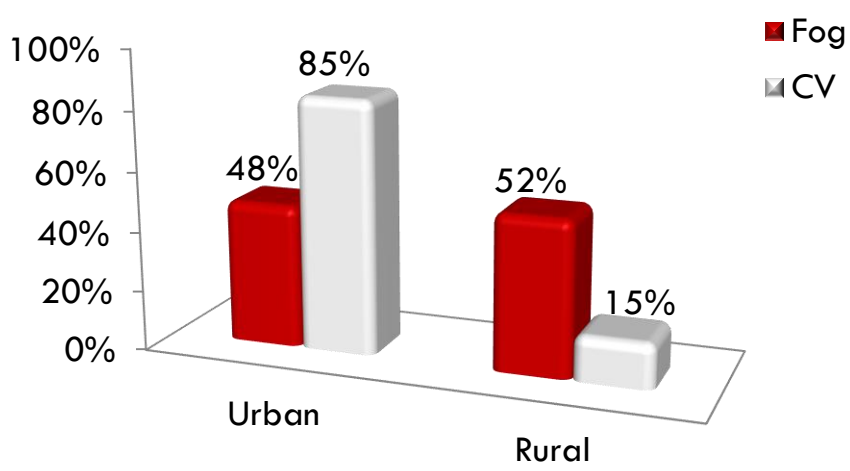


CONTRIBUTING FACTORS (2/3)

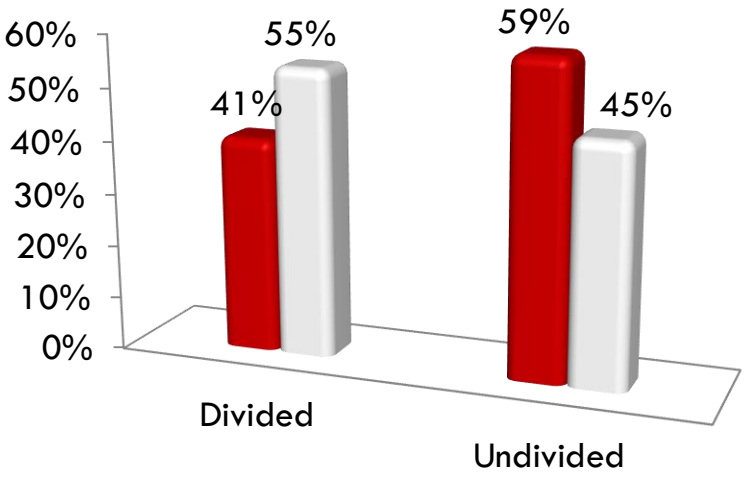
Fog crashes by roadway types



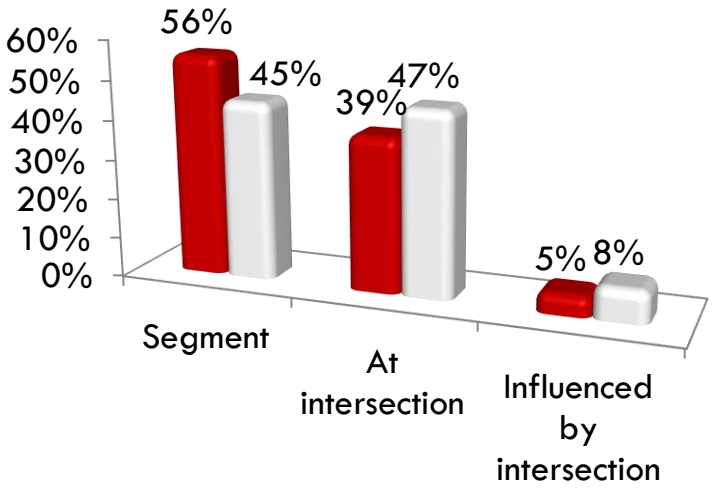
Fog crashes by community types



Fog crashes by median types

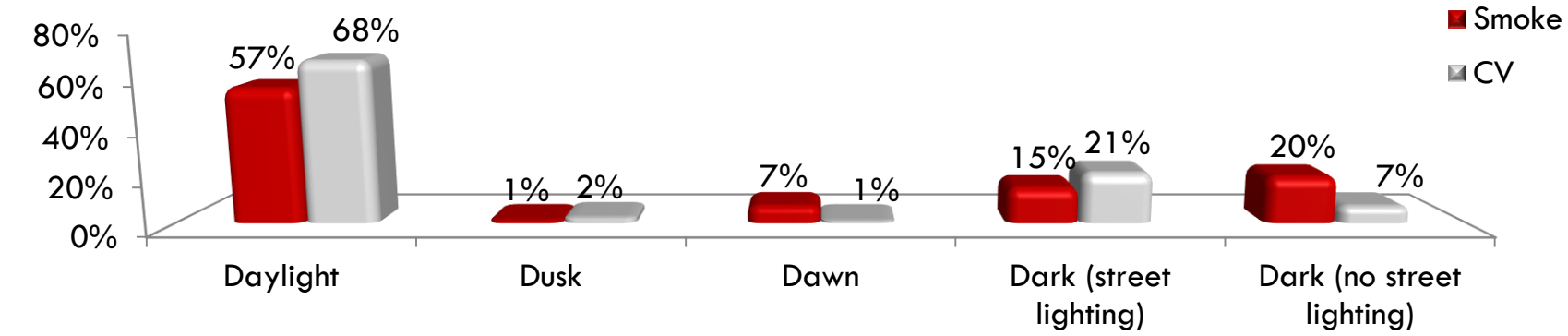


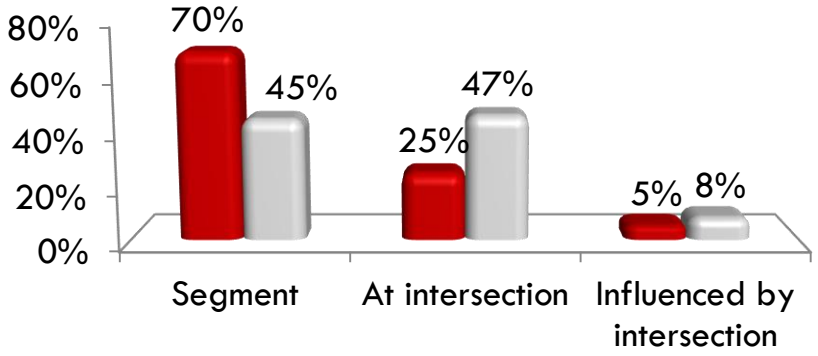
Fog crashes by locations

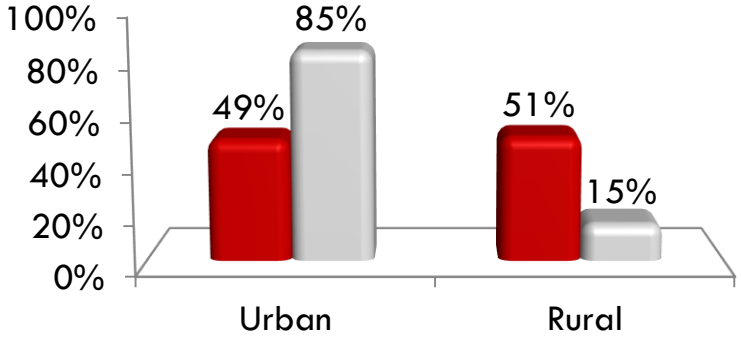


CONTRIBUTING FACTORS (3/3)

- Smoke crashes are more frequent at the roadway with poor lighting condition, and at segments (not at intersections) in the rural area.



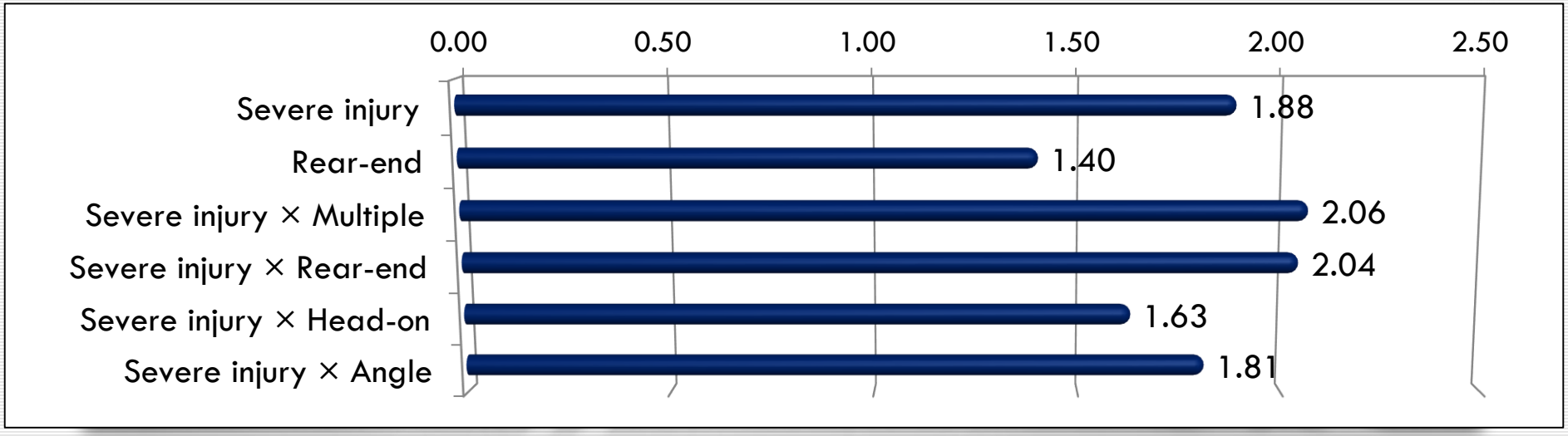




FREQUENT CRASH TYPES IN FOG CRASHES

- Fog crashes lead to more severe injuries and are associated with rear-end crashes compared to crashes in clear vision (CV) conditions.
- Moreover, multivehicle, rear-end, head-on or angle crashes occurring in foggy conditions have significantly higher probability to result in severe crashes.

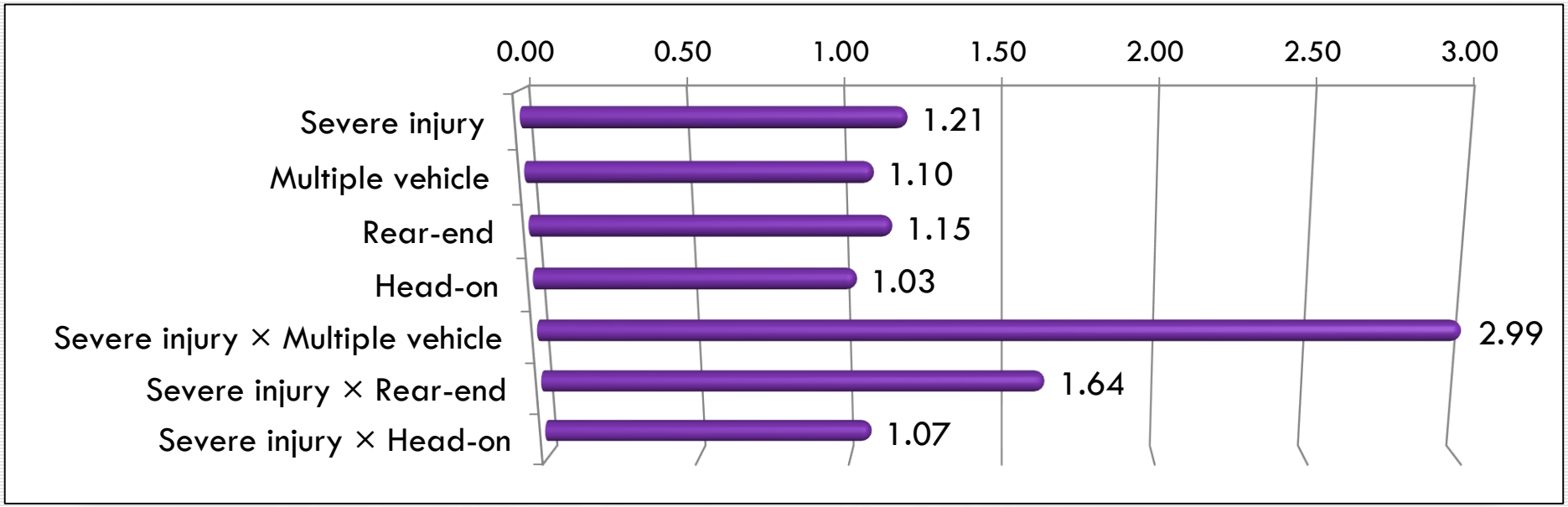
Odds ratio of crash types and their interactions in fog to CV crash



FREQUENT CRASH TYPES IN SMOKE CRASHES

- Smoke crashes lead to more severe injury crashes and are associated with multiple, rear-end and head-on crashes.
- In addition, multivehicle, rear-end or head-on or angle crashes occurring in smoky conditions have higher probability to result in severe crashes.

Odds ratio of crash types and their interactions in smoke to CV crash



SUMMARY (1/3)

- Florida is among the top state in the US regarding traffic safety problems resulting from adverse visibility conditions due to fog/smoke and heavy rain.
- Crashes due to reduced visibility from fog/smoke are more severe compared to non-fog related crashes.
- Fog crashes occur mostly in the morning in Dec to Feb, whereas smoke related crashes occur most frequently in May.

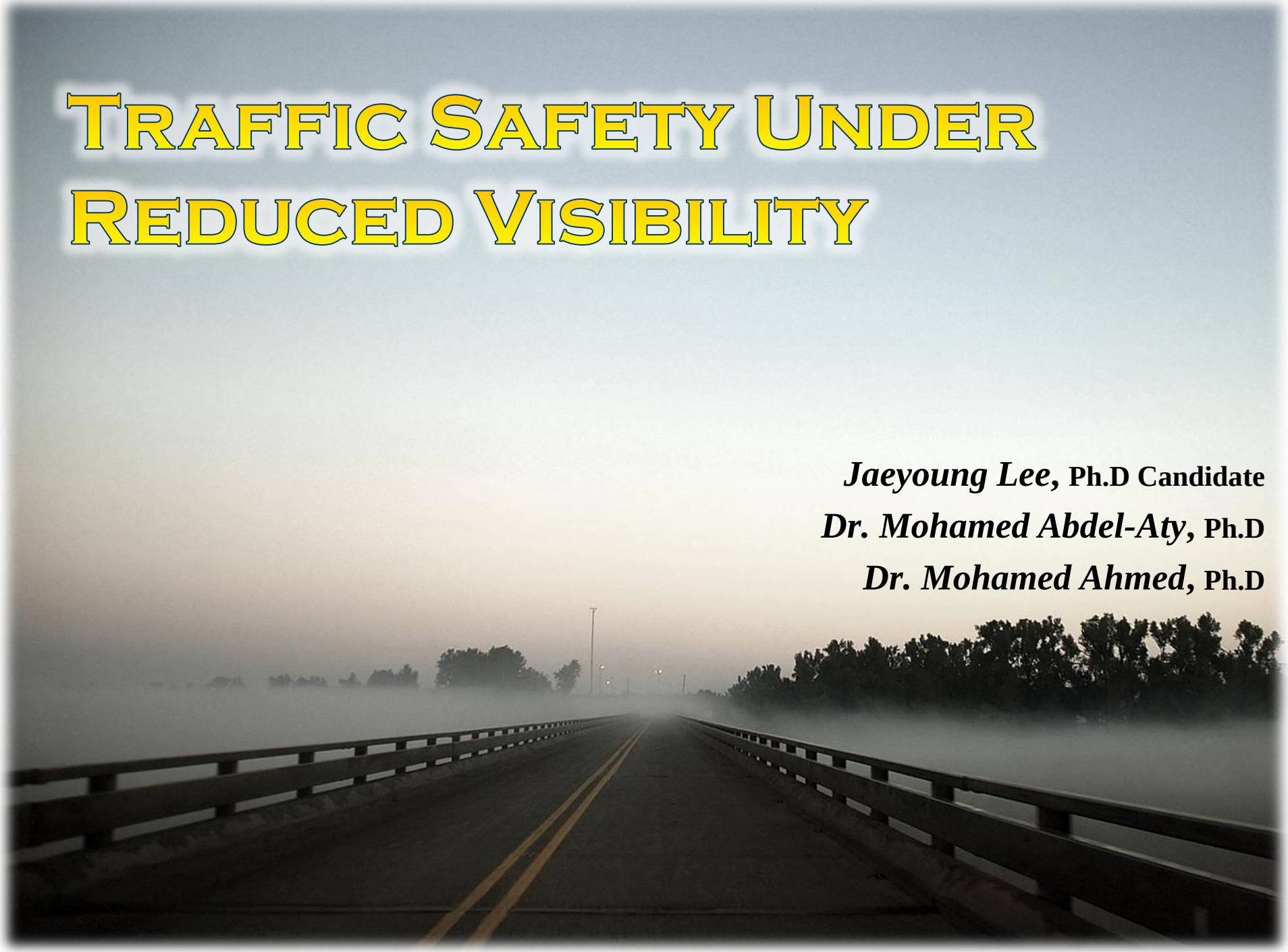
SUMMARY (2/3)

- Roadway with poor lighting condition, undivided segments (not at intersection) in the rural area has the increased probability of fog/smoke crash occurrence.
- Through the macroscopic analysis, we can understand the big picture of fog/smoke crashes, and more specific segments with frequent fog/smoke crashes can be identified through micro-level analysis.

SUMMARY (3/3)

- Both fog and smoke crashes lead to more severe injuries compared to crashes in CV conditions.
- Furthermore, multivehicle, rear-end, head-on or angle crashes occurring in foggy conditions have significantly higher probability to result in severe crashes.

Traffic Safety Under Reduced Visibility



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