

Secondary Crash Research – A Multi-State Analysis

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Overview of Presentation

- Research objective
- Secondary crash definition
- Research approach
- Secondary crash data assembled
- Analysis of secondary crashes
- Secondary crash typologies and case studies

Research Objective

- Conduct research into the number of secondary crashes by roadway type and other factors across multiple states.
- Select one or more states for a deeper review into the potential causation of the secondary crashes.

Secondary Crash Definition



Beginning from the time of detection of a primary incident, a crash that occurs within that incident scene or within the resulting queue, including the opposite direction of travel.

– *FHWA*

Research Approach

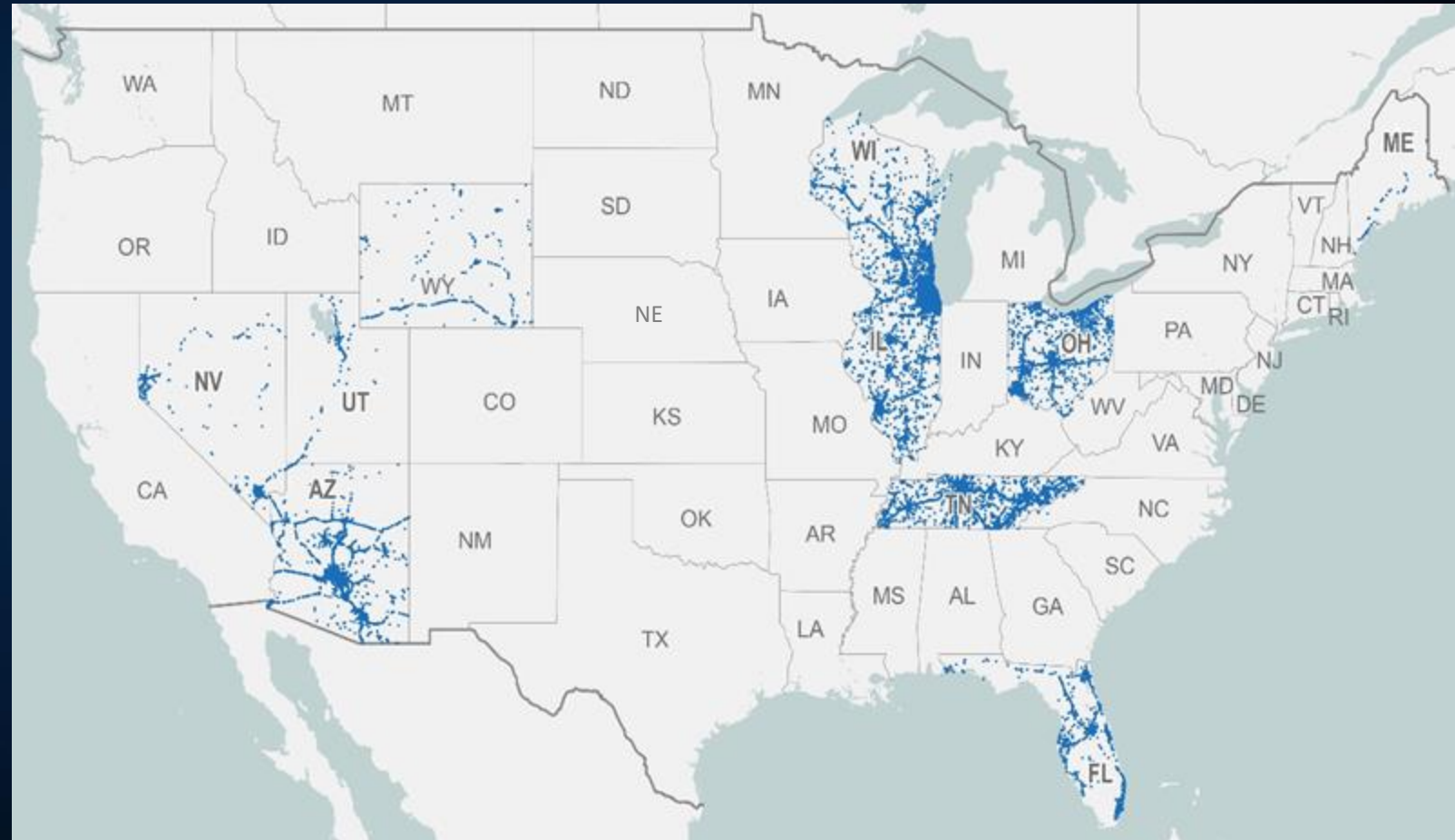
- Identify and assemble crash data from states with a secondary crash data element on their traffic crash report.
- Uniformize data across states and enrich with weather and roadway data.
- Conduct spatial-temporal analysis to match flagged secondary crashes to primary crash candidates.
- Analyze unified, enriched, and matched secondary crash data.
- Develop case studies on most “common” secondary crash types.

S3	Secondary Crash?	<input type="checkbox"/>
01	No	
02	Yes	

MMUCC Secondary Crash Data Element

Secondary Crash Data Assembled

- 10 contributing states.
- 51,856 crashes marked as secondary on crash reports.
- 15,488 matched with a primary crash.



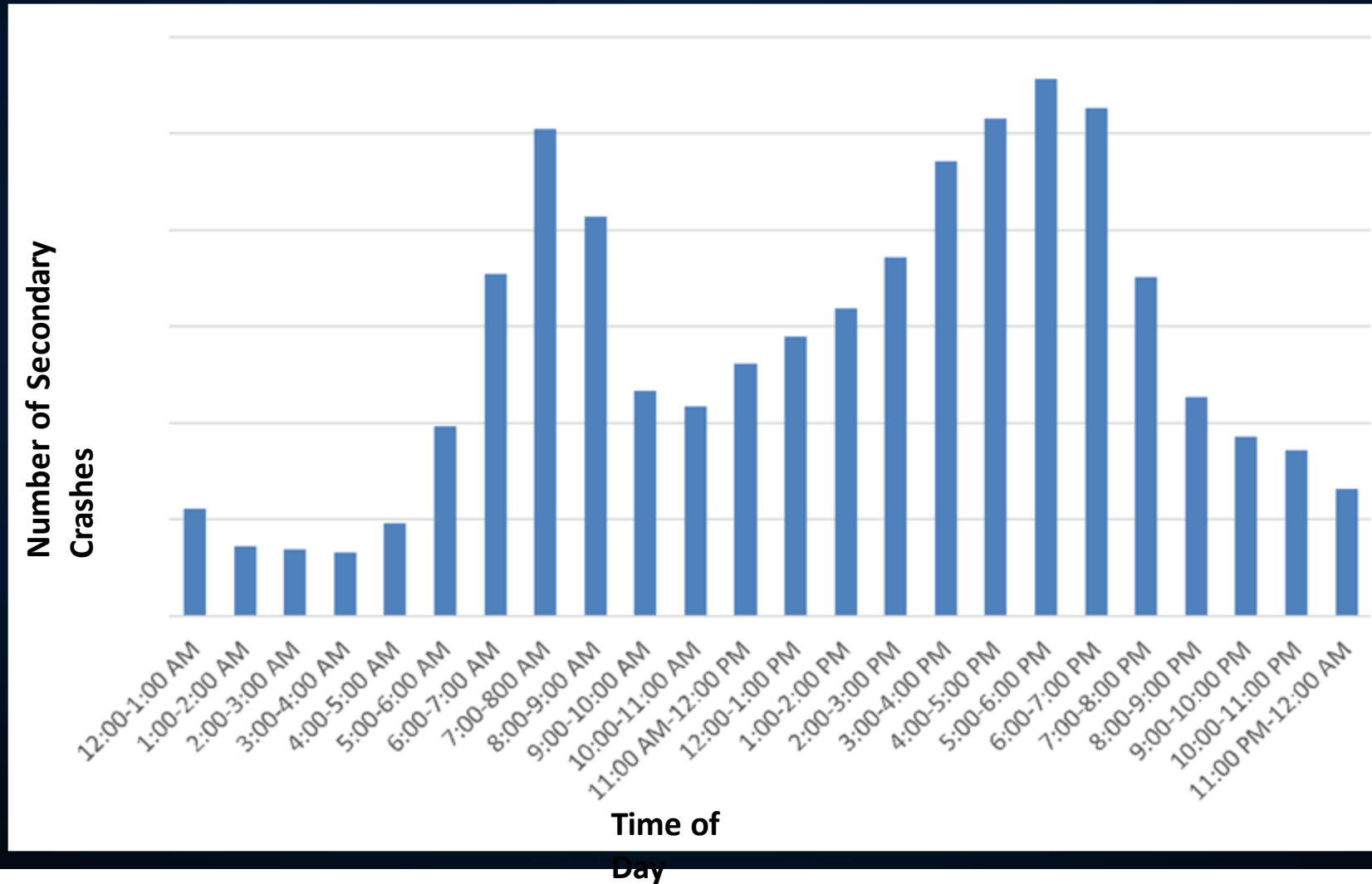
Number & Percentage of Secondary Crashes

State	# Crashes Marked as Secondary in State Crash Data	% Secondary Crashes Based on State Data	# Crashes Matched with Primary Crash	% Secondary Crashes (Matched/ Total Crashes)
Arizona	16,093	1.95%	6,688	0.81%
Florida	1,264	0.19%	848	0.13%
Illinois	18,110	3.23%	1,781	0.32%
Maine	63	0.10%	35	0.05%
Nevada	3,030	1.86%	520	0.32%
Ohio	2,158	0.28%	676	0.09%
Tennessee	7,425	0.45%	2,907	0.18%
Utah	182	0.10%	126	0.07%
Wisconsin	3,062	0.57%	1,660	0.31%
Wyoming	469	0.86%	207	0.38%
Total	51,856	0.95%	15,488	0.28%

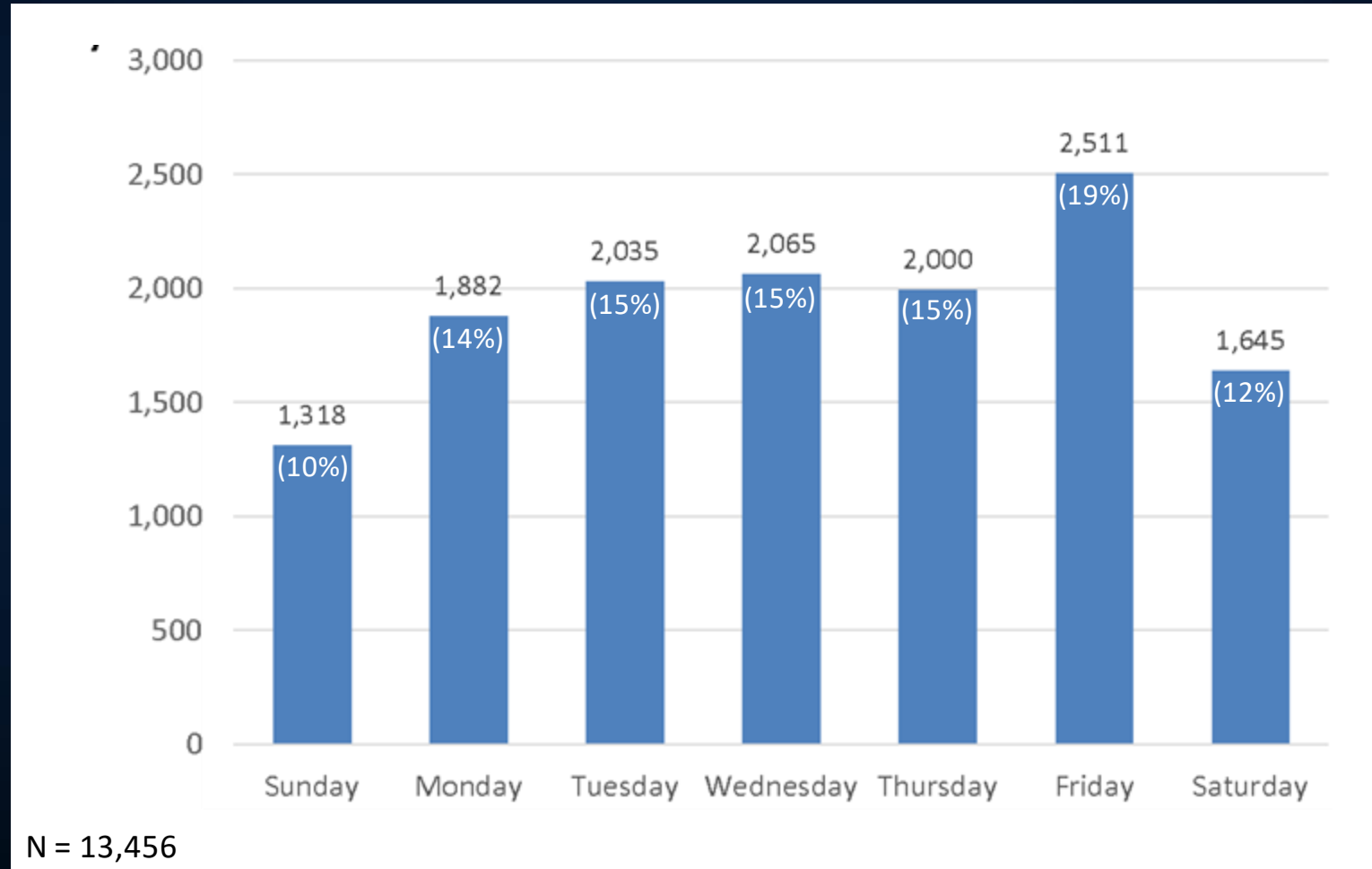
Analysis of Secondary Crash Data



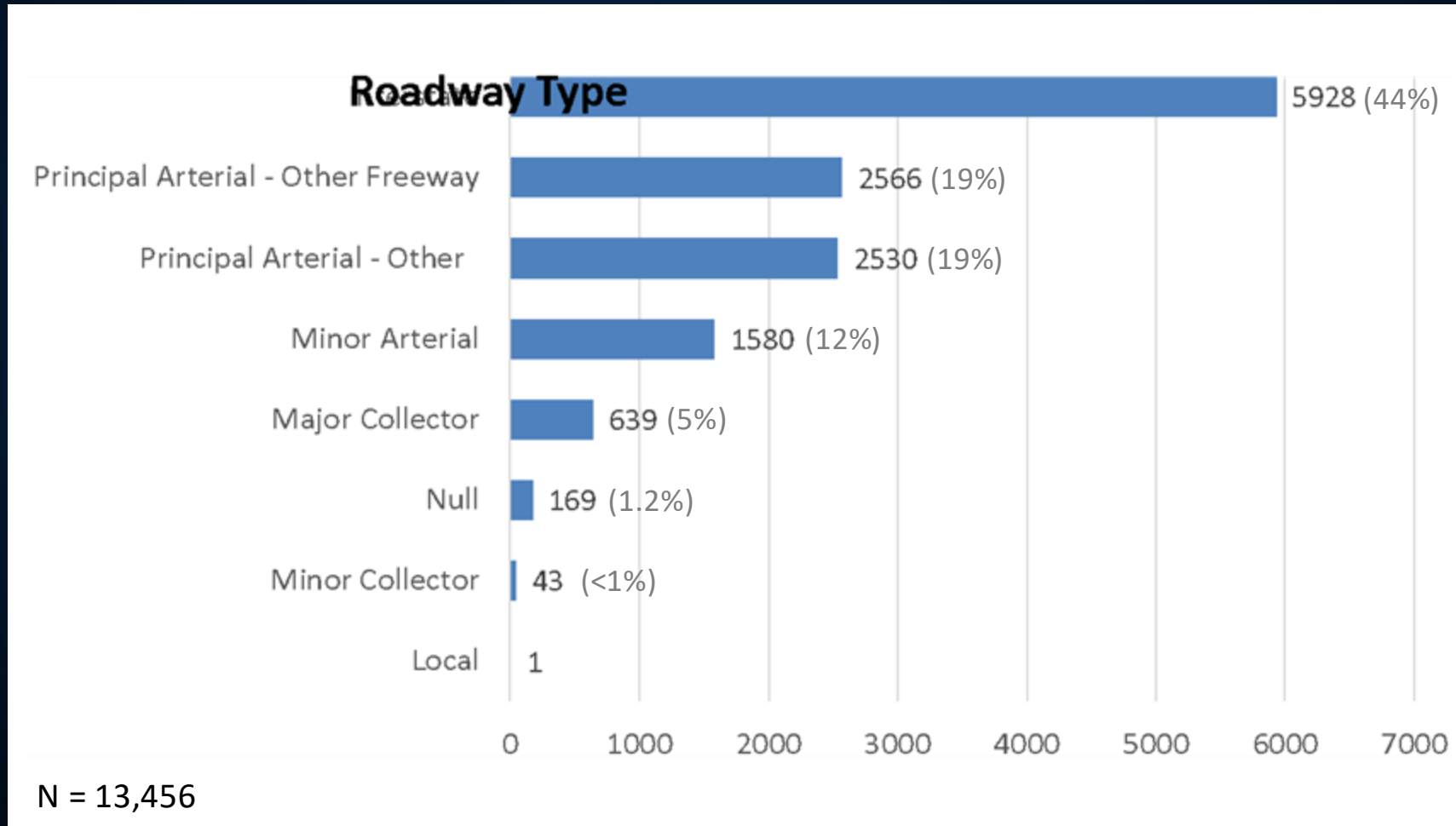
Secondary Crashes by Time of Day



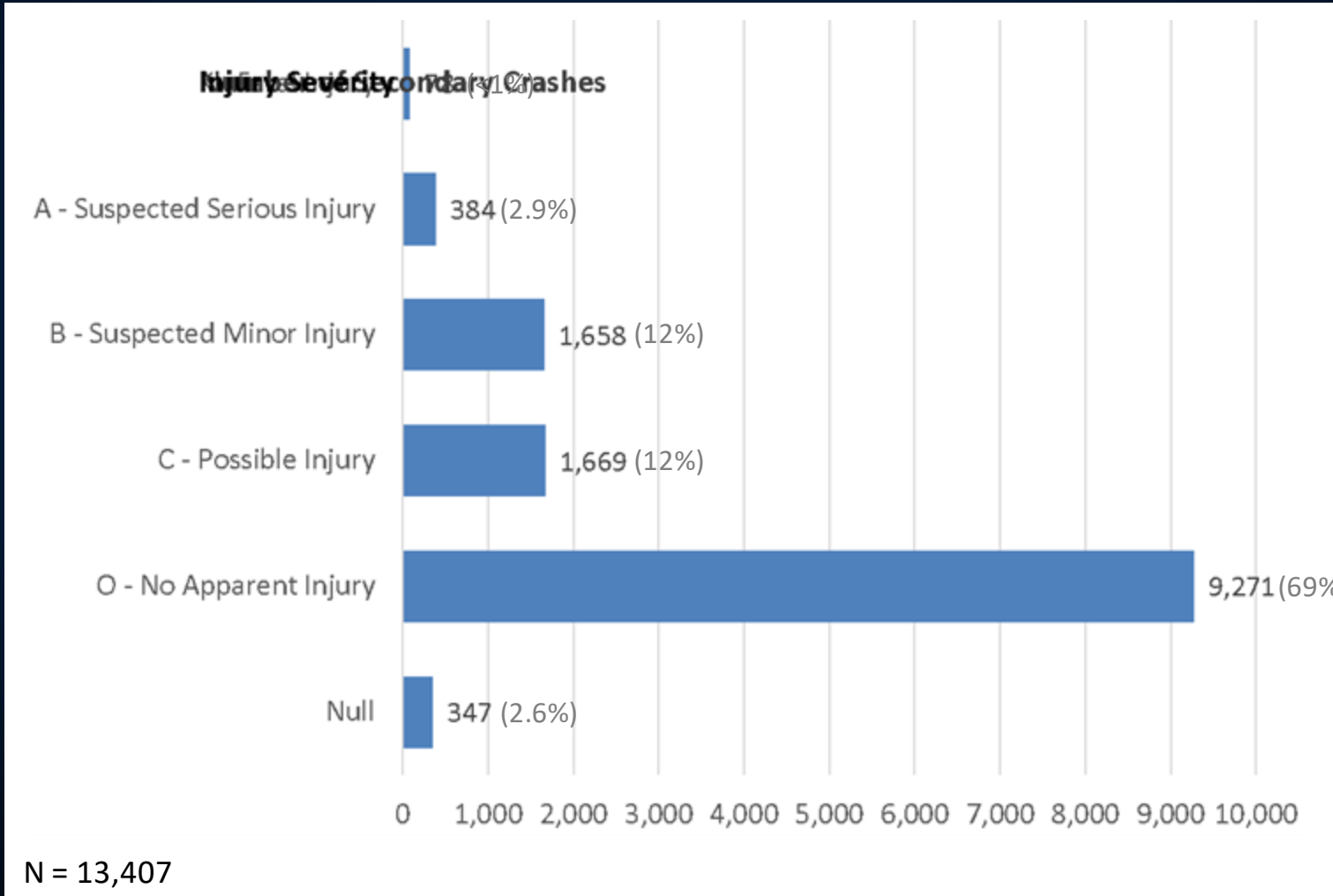
Secondary Crashes by Day of Week



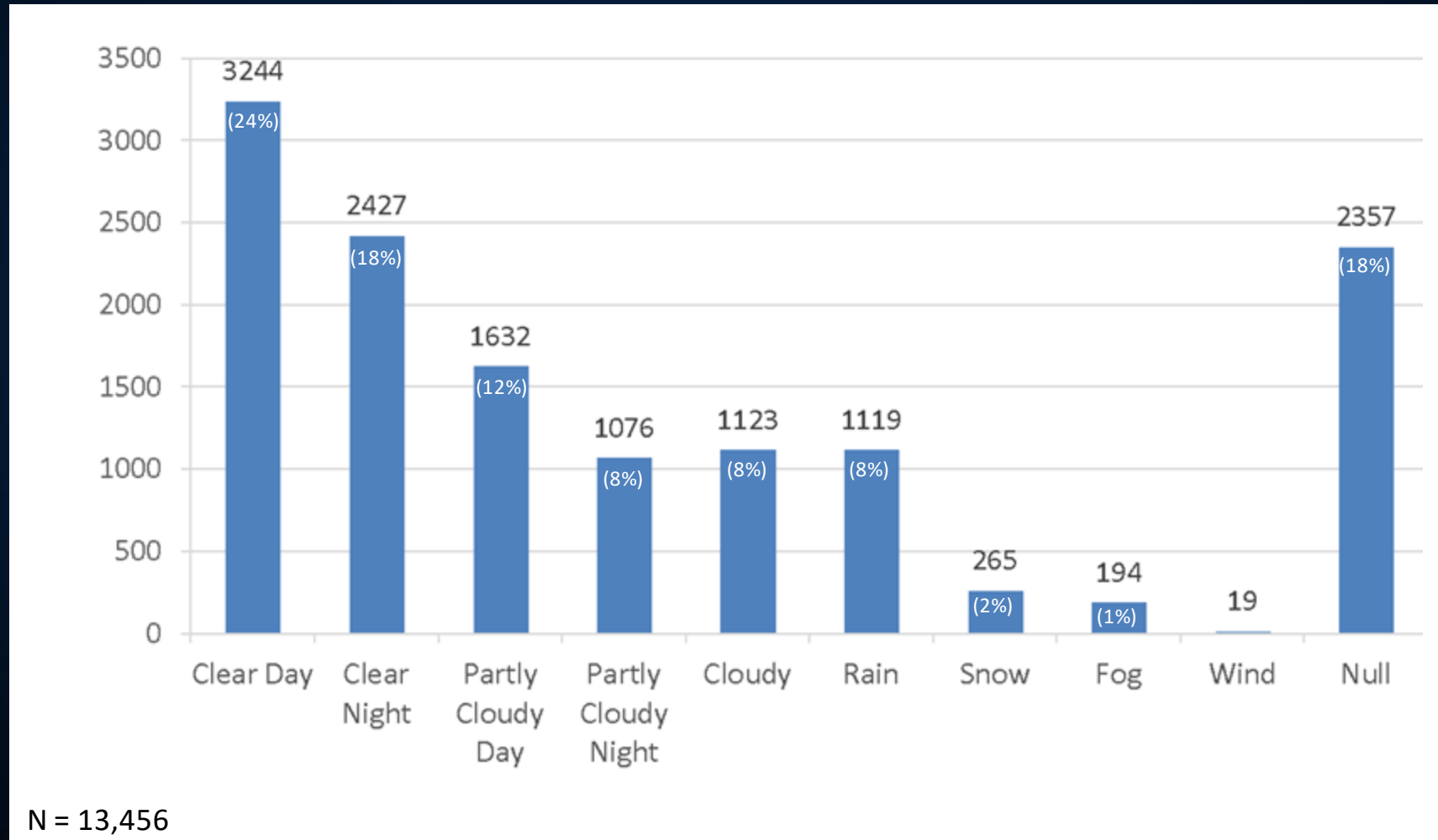
Secondary Crashes by Roadway Type



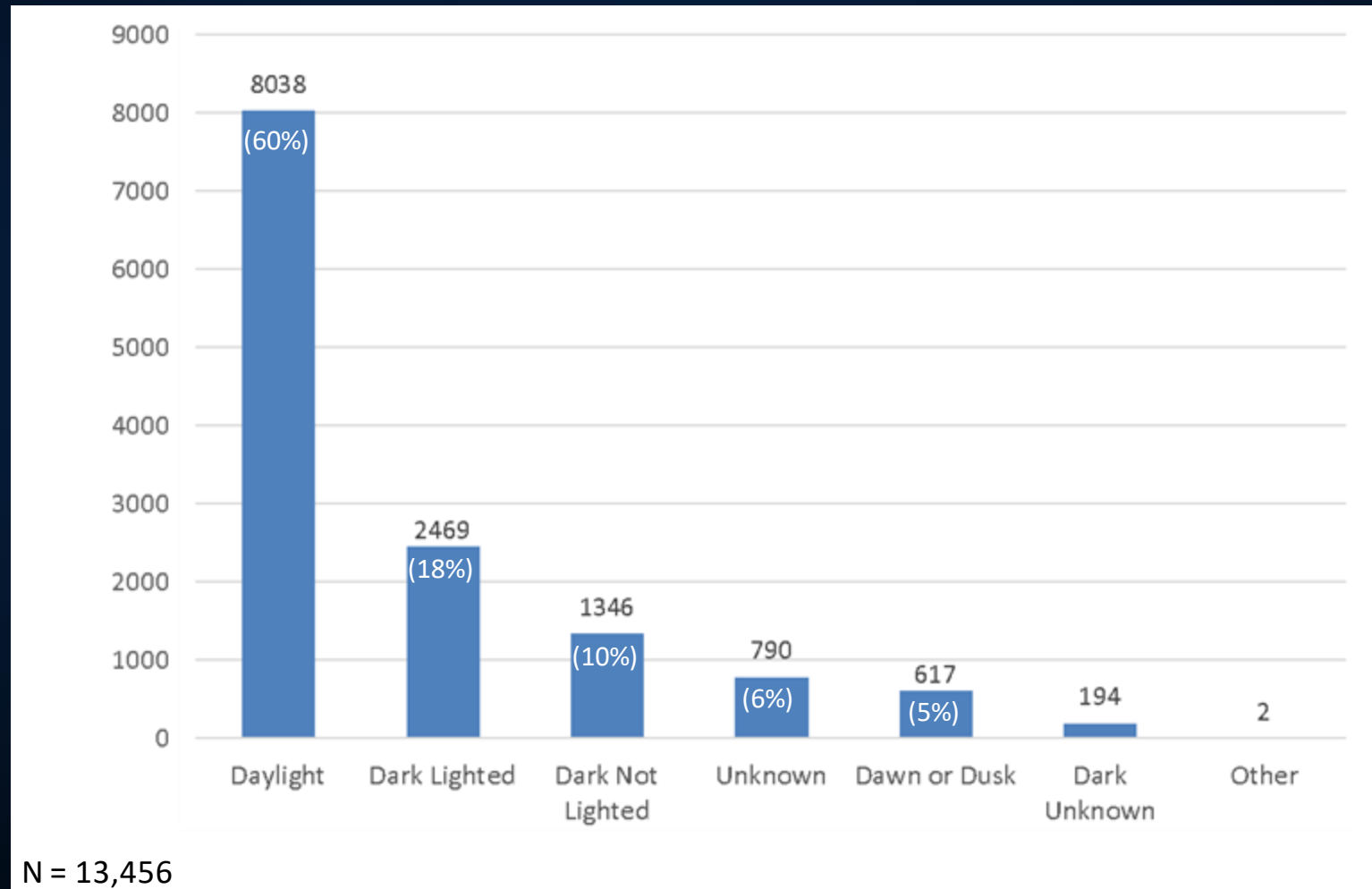
Secondary Crashes by Injury Severity



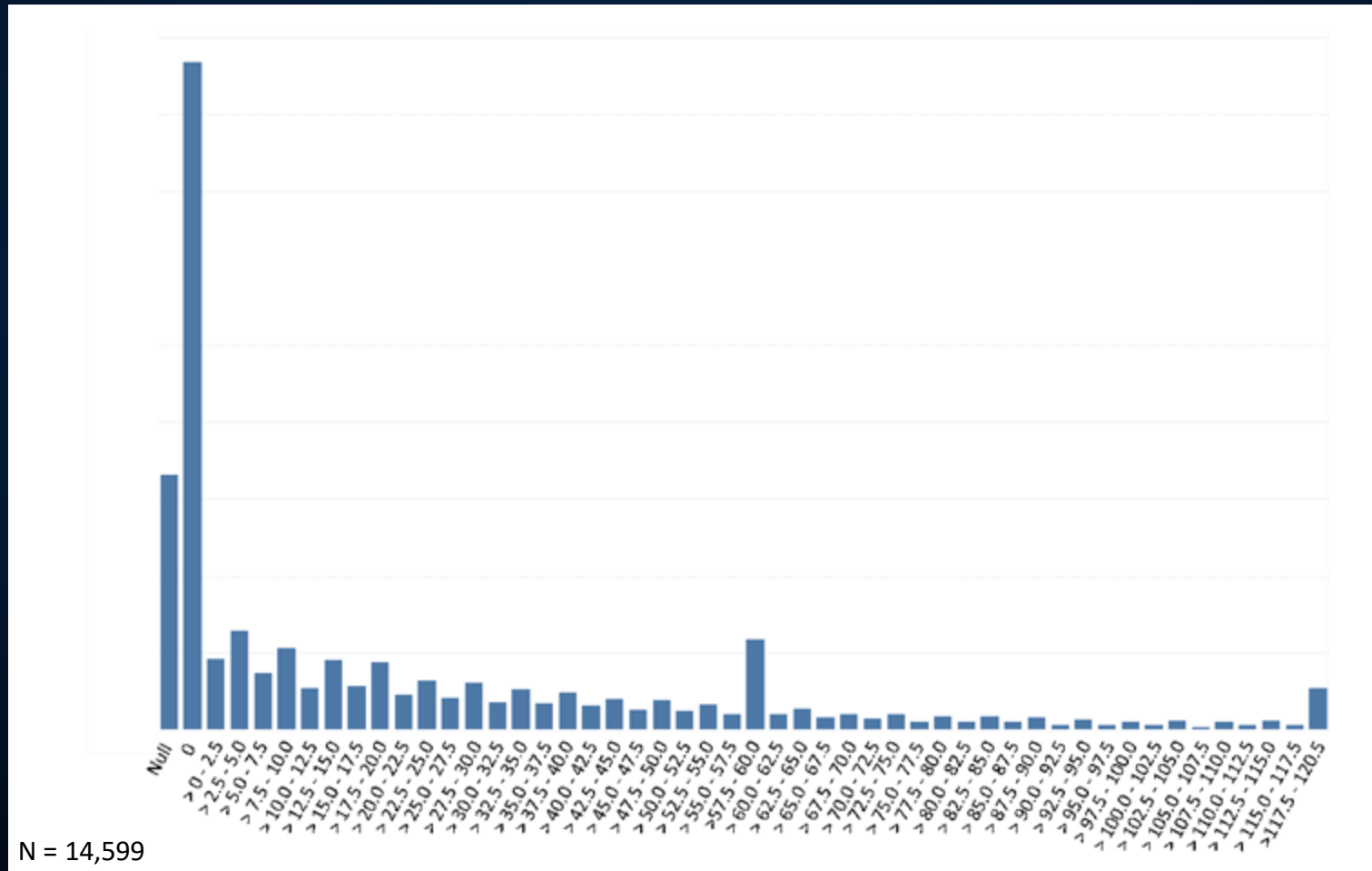
Secondary Crashes by Weather Conditions



Secondary Crashes by Lighting Conditions

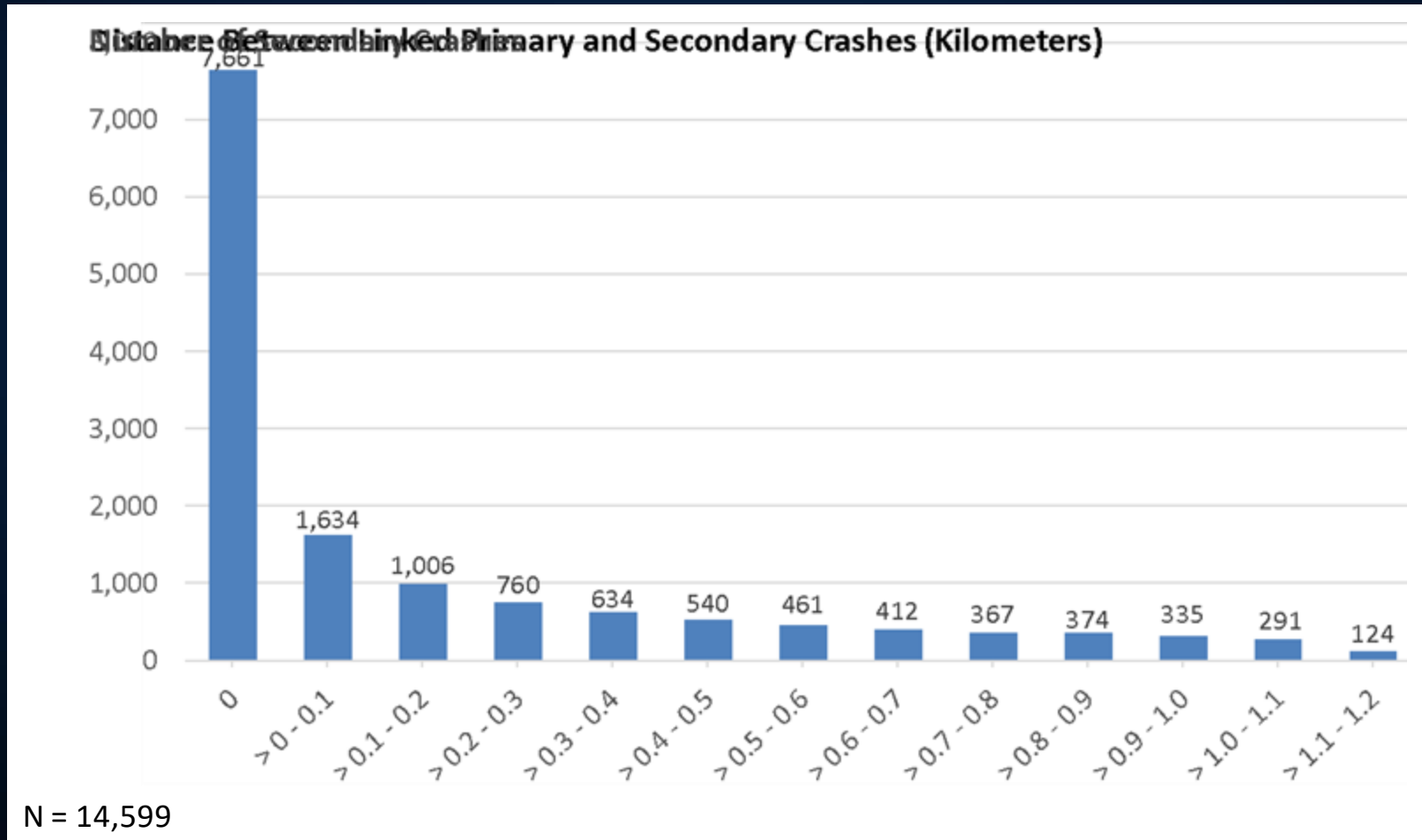


Secondary Crashes by Time Between Primary and Secondary Crashes



N = 14,599

Secondary Crashes by Distance Between Primary and Secondary Crashes



Case Studies – Secondary Typologies

Type 1: Rear-End in Slowing Traffic Adjacent to/Upstream of a Prior Crash.

Type 2: Crash with Vehicle Involved in Prior Crash.

Type 3: Single Vehicle Versus Fixed Object.

Type 4: Collision with Debris from Prior Crash.

Type 5: Lane Change Sideswipe near Prior Incident.

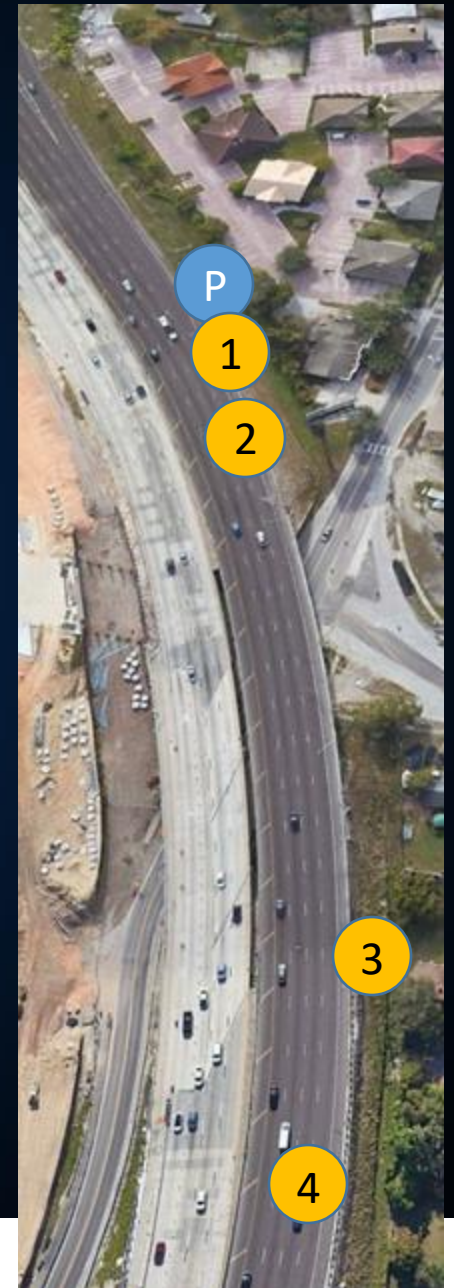
Type 6: Collision with Responder at Prior Incident (Responder Struck By Crash-Vehicle or Pedestrian).

Case Study – Types 1, 2, 3, 5, 6

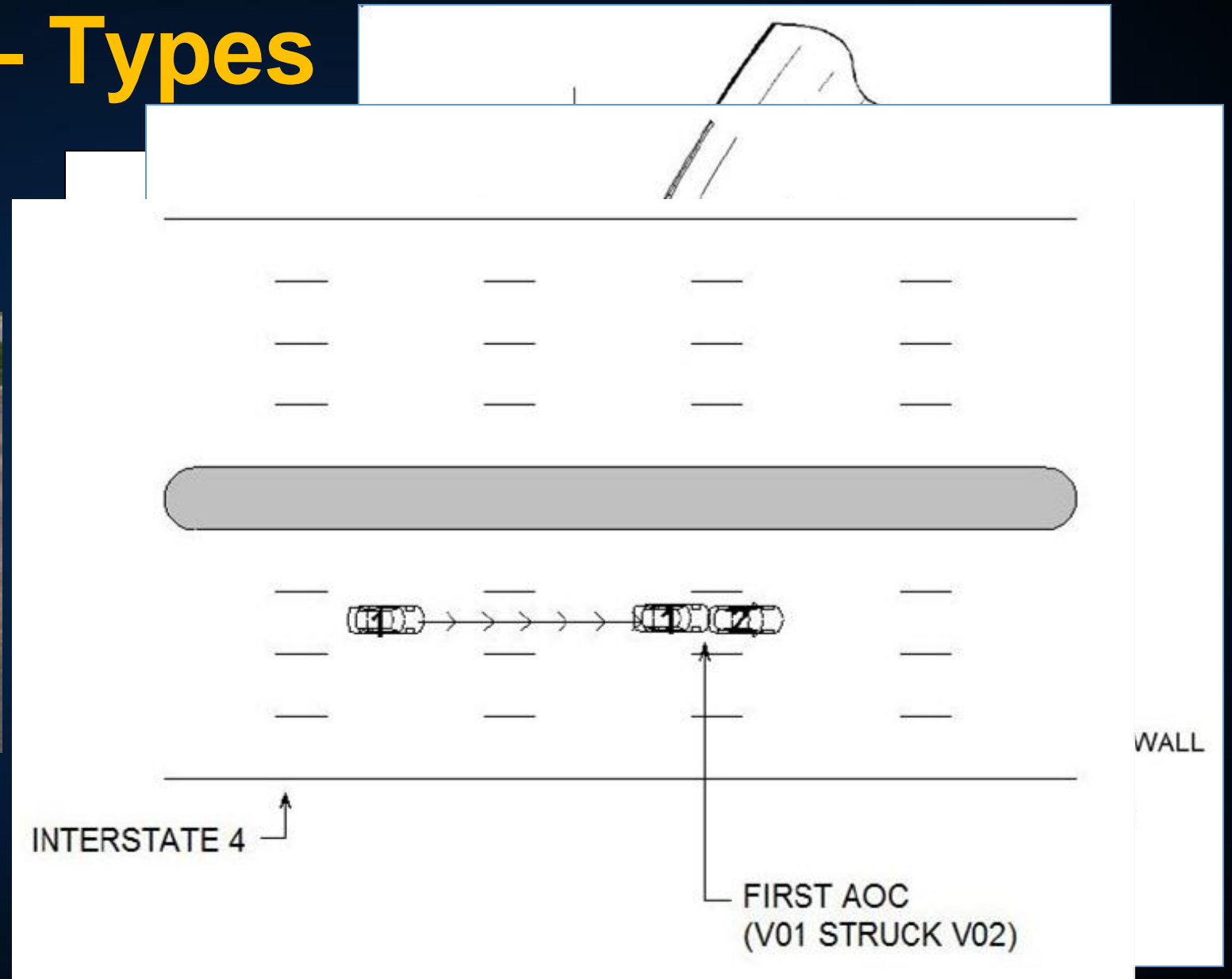
November 23, 2017

Downtown Orlando, Interstate 4

- P** Primary crash: single vehicle versus wall – disabling damage, no injuries
7:43 AM
- 1** Secondary crash: versus wall (type 3) & primary vehicle (type 2) – disabling damage, no injuries
7:45 AM
Responders arrive and setup traffic control.
- 2** Secondary crash: sideswipe (type 5) & responder vehicle (type 6) – injury requiring EMS transport
7:50 AM
- 3** Secondary crash: single vehicle versus wall (type 3) – disabling damage, no injuries
8:20 AM
- 4** Secondary crash: rear end in queue (type 1) – 2 non-incapacitating injuries
8:26 AM



Case Study – Types 1, 2, 3, 5, 6



I-4 E of Fairbanks



Case Study – Types 1, 4, 6

December 3, 2018

Martin County, FL, Interstate 95

P Primary crash: rear-end, light pole – no injury.

4:50 AM

1 Secondary crash: versus light pole in road (type 4) – no injury.

4:50 AM

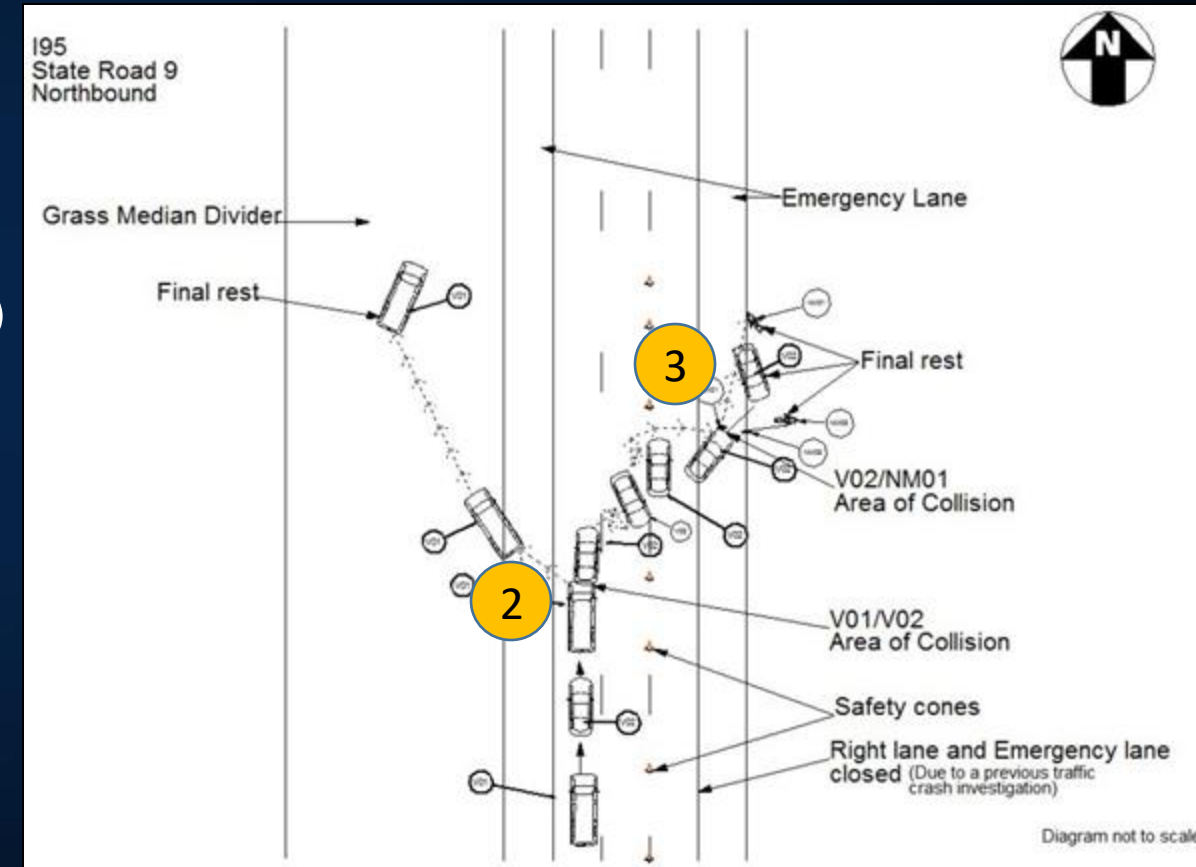
Responders arrive and setup traffic control.

2 Secondary crash: rear end (type 1) – no injury

7:22 AM

3 Secondary crash: responder struck (type 6) – injury requiring EMS transport.

7:22 AM



Case Study – Types 1, 4, 6



Case Study – Types 1, 4, 6



Key Research Findings

- Interstates, principal arterials, urban areas, clear weather.
- Few injuries.
- Two-thirds are front-to-rear; 10% same direction sideswipe; 10% single vehicle.
- Close time and proximity to primary crash:
 - Half occurred at same location, 84% within 0.5 km.
 - 30% occurred at same time, half within 20 minutes.

Recommendations

- Standardize definition (preferably with FHWA definition).
- Create better linkages between primary and secondary crashes.
- Focus analysis regionally or within-state.
- Standardize crash data across states.
- Work to improve quality and completeness of data.
- Consider alternative methods and new technologies for alerting drivers upstream of incidents (navigation apps/in-vehicle alerts, messaging).

Thank you!

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