UC San Diego Health

Harnessing Technology for Safer Roads: Research from UC San Diego TREDS

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VISION: The TREDS Center aspires to be a leader in transit safety by aligning cutting-edge research with innovative education programs to reach zero fatalities and injuries across transportation systems.

PRIORITY AREAS:

- Education and training to improve roadway safety;
- Research to inform public policy;
- Serve health care providers, law enforcement, industry professionals, and general public;
- Aging road users, distracted driving, pedestrian safety, and driving under the influence;
- Passenger vehicles, commercial vehicles, bikes, and trains

CMV EDUCATIONAL PROGRAMS

Just Drive
DELIVER DISTRACTION-FREE

Just Drive
DELIVER DRUG-FREE

FREE!

AGENDA

- Introduction of TREDS
- Use of Artificial Intelligence Supported Cameras to Improve CMV Safety
  - Summary of Study Design
  - Research Findings
  - Plan for Year 2
- Use of Real-Time Driver Alerts to Improve CMV Safety (9:30 - 10:00 AM)
  - Summary of Study Design & Alert Deployment
  - Research Findings

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Artificial Intelligence Technology for Deidentified Data Collection on High Risk Commercial Motor Vehicle Driving Behaviors

Primary Investigators:
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Project Manager: JJ Rogers, MS Edu

October 2024

Heads-Up AI for CMV Safety

- Two-year study funded by FMCSA
- Leverages Acusensus AI technology
  - Assess prevalence of dangerous behavior in CMV drivers
  - Understand the impact of real-time, targeted messaging to address those risky driving behaviors
- Partnership with Caltrans, SD County Public Works
- Anonymous CMV driver behavioral data collected on freeways and in rural areas

Acusensus' MULTI-FUNCTION SOLUTION

Two Cameras	Run on object recognition algorithm to select target
Radar	To detect Speed
Solar Power	Plus Backup Generator
Onboard CPU	For real-time processing and brief image storage

acusensus

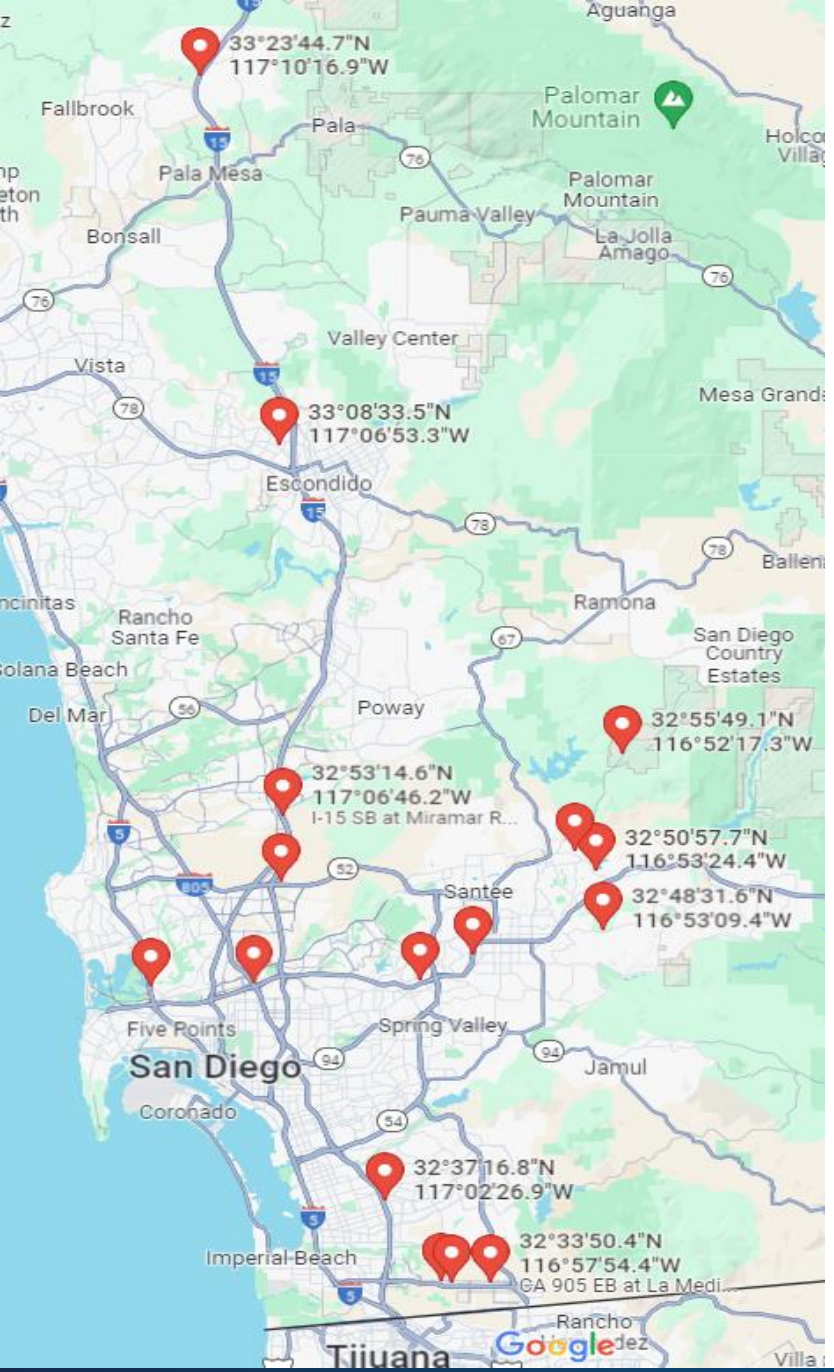
Research Objectives

Year 1

- Measure the **prevalence** of CMV driver **speeding**, **seat belt noncompliance**, and **handheld phone** use.
- Determine whether factors such as time of day and location are associated with risky driving behaviors.

Year 2

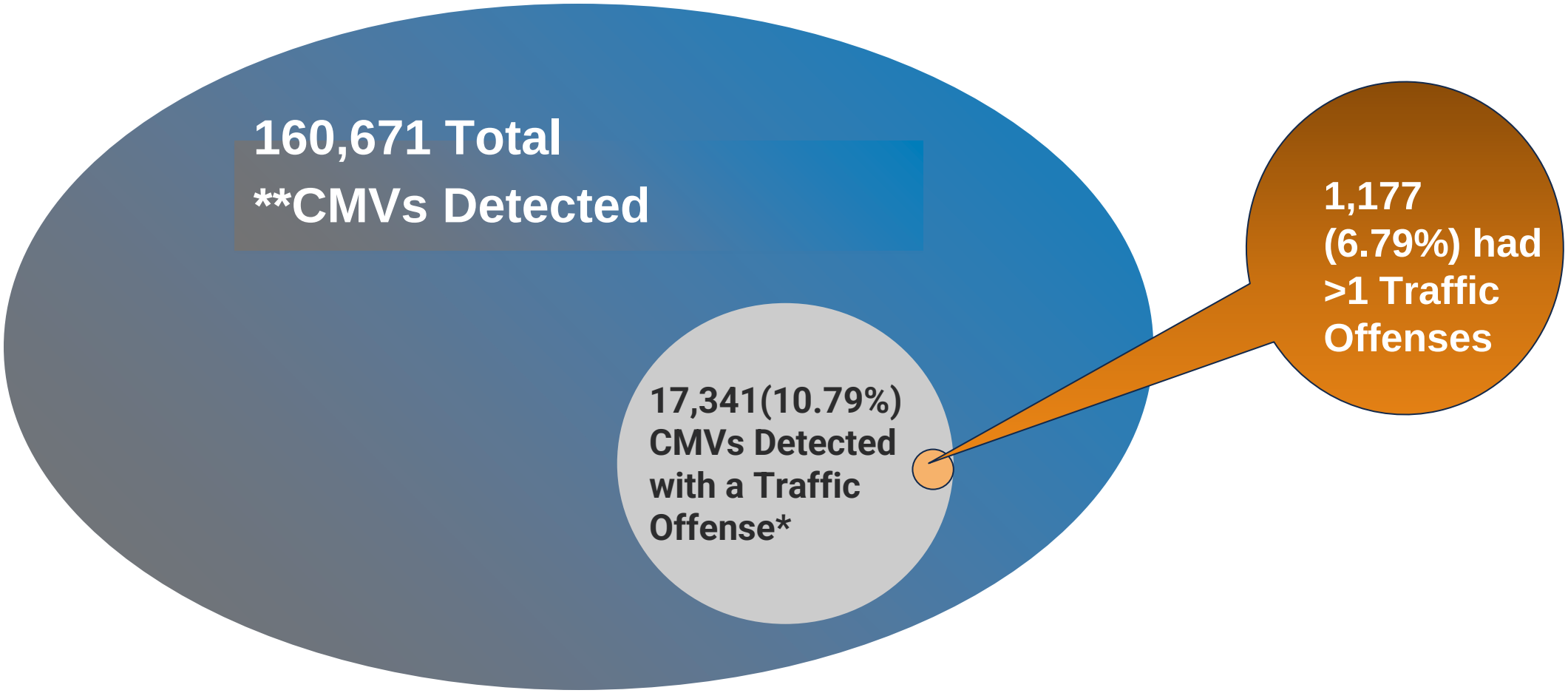
- Implement a **variable message system (VMS)** to deliver targeted safety messages based on real time Heads-Up data.
- Assess changes in driving behavior after receiving a message.
- Determine **measurable change in risky driving behavior** among CMV drivers who receive VMS messages.



Year 1- Methods

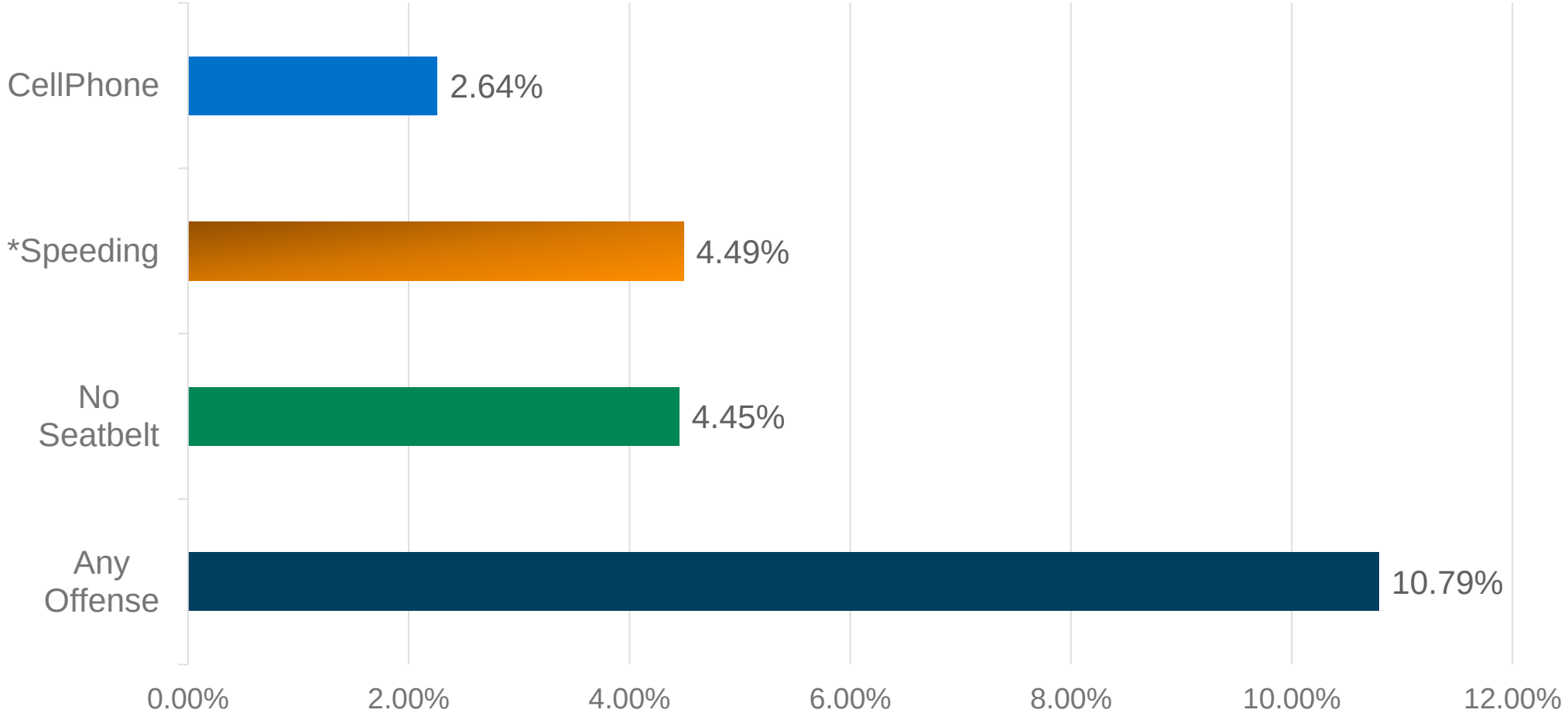
- Obtained baseline data from 16 locations for 168 hours each
- 10 locations on state and interstate highways; 6 locations in unincorporated areas
- Identified the prevalence of speeding, non-seat belt use, and handheld device use across multiple roadway types (i.e., Residential, Rural, near Border)

Results: CMVs** with ≥1 Traffic Offenses (total n=160,671)



* Speeding defined as exceeding the posted speed limit (max. 65mph)
**Analyses were restricted to vehicles >5.4m long to minimize misclassification of passenger vehicles as CMVs

Percent of CMVs** with an Observed Traffic Offense by Offense Type (n=160,671)



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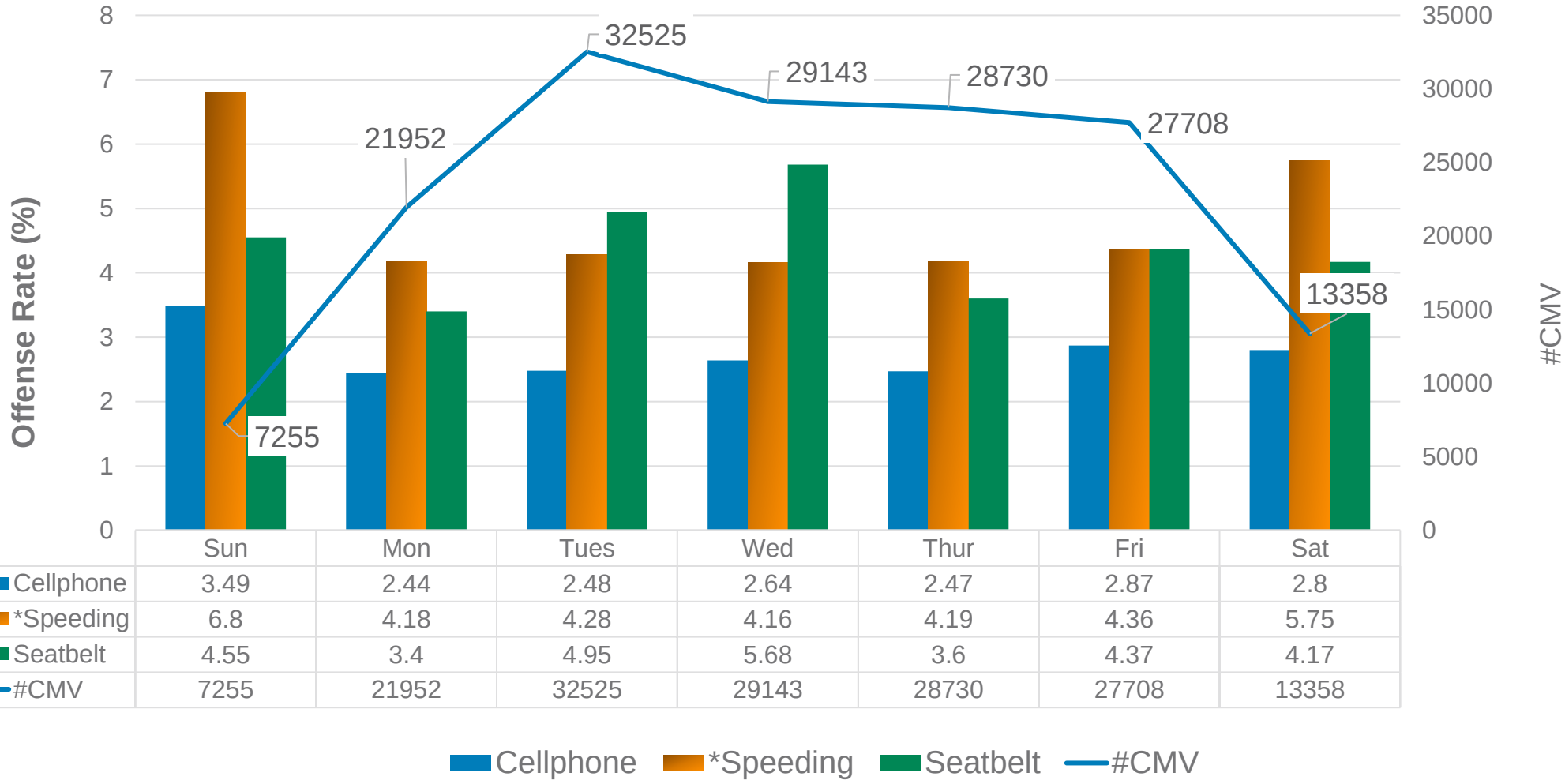
Percent of CMVs** with an Observed Traffic Offense by Offense Type and Day of the Week (n=160,671)



	Sun	Mon	Tues	Wed	Thur	Fri	Sat
Cellphone	3.49	2.44	2.48	2.64	2.47	2.87	2.8
*Speeding	6.8	4.18	4.28	4.16	4.19	4.36	5.75
Seatbelt	4.55	3.4	4.95	5.68	3.6	4.37	4.17
#CMV	7255	21952	32525	29143	28730	27708	13358

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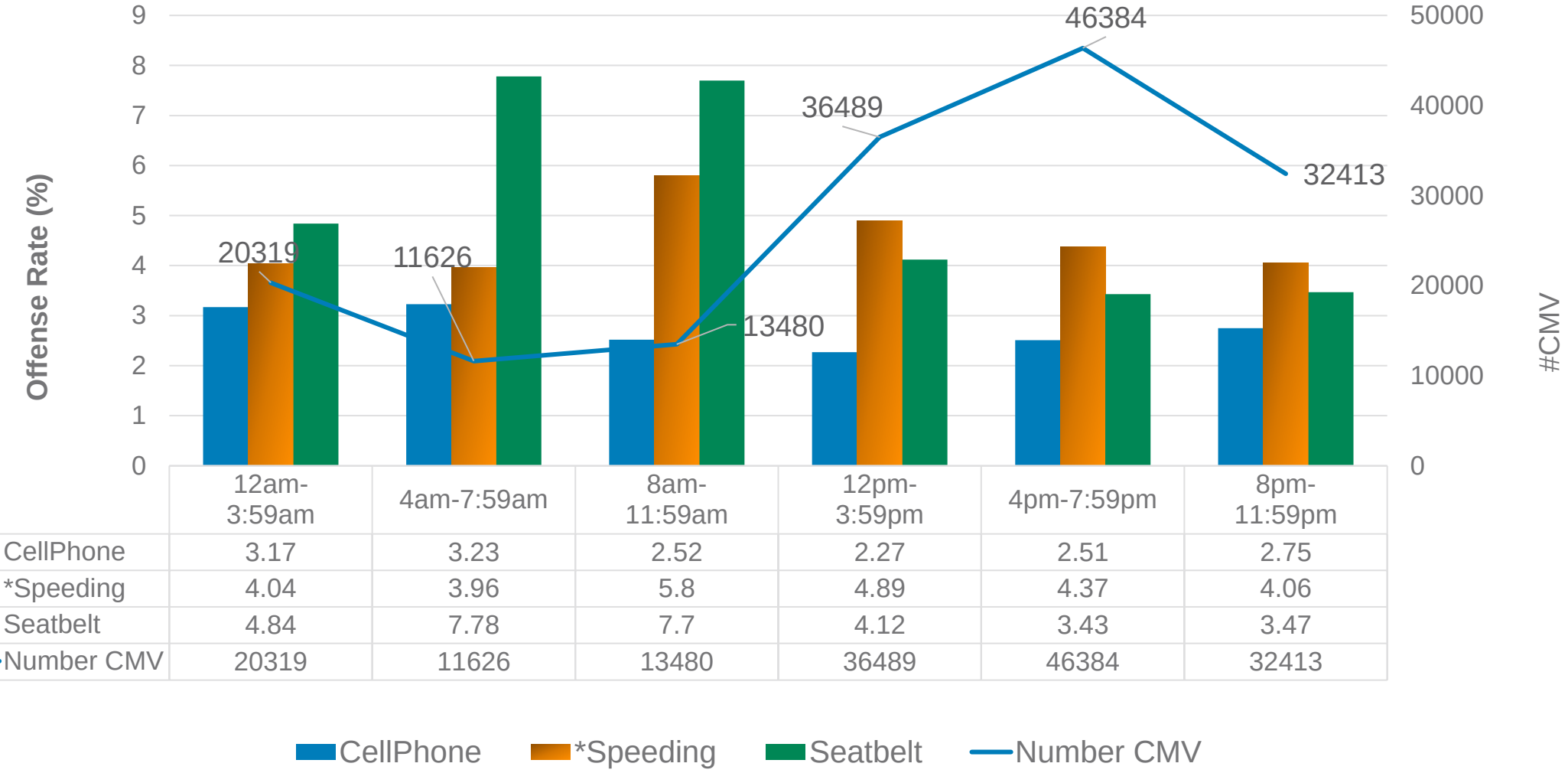
Percent of CMVs** with an Observed Traffic Offense by Offense Type and Time of Day (n=160,671)



	12am-3:59am	4am-7:59am	8am-11:59am	12pm-3:59pm	4pm-7:59pm	8pm-11:59pm
CellPhone	3.17	3.23	2.52	2.27	2.51	2.75
*Speeding	4.04	3.96	5.8	4.89	4.37	4.06
Seatbelt	4.84	7.78	7.7	4.12	3.43	3.47
Number CMV	20319	11626	13480	36489	46384	32413

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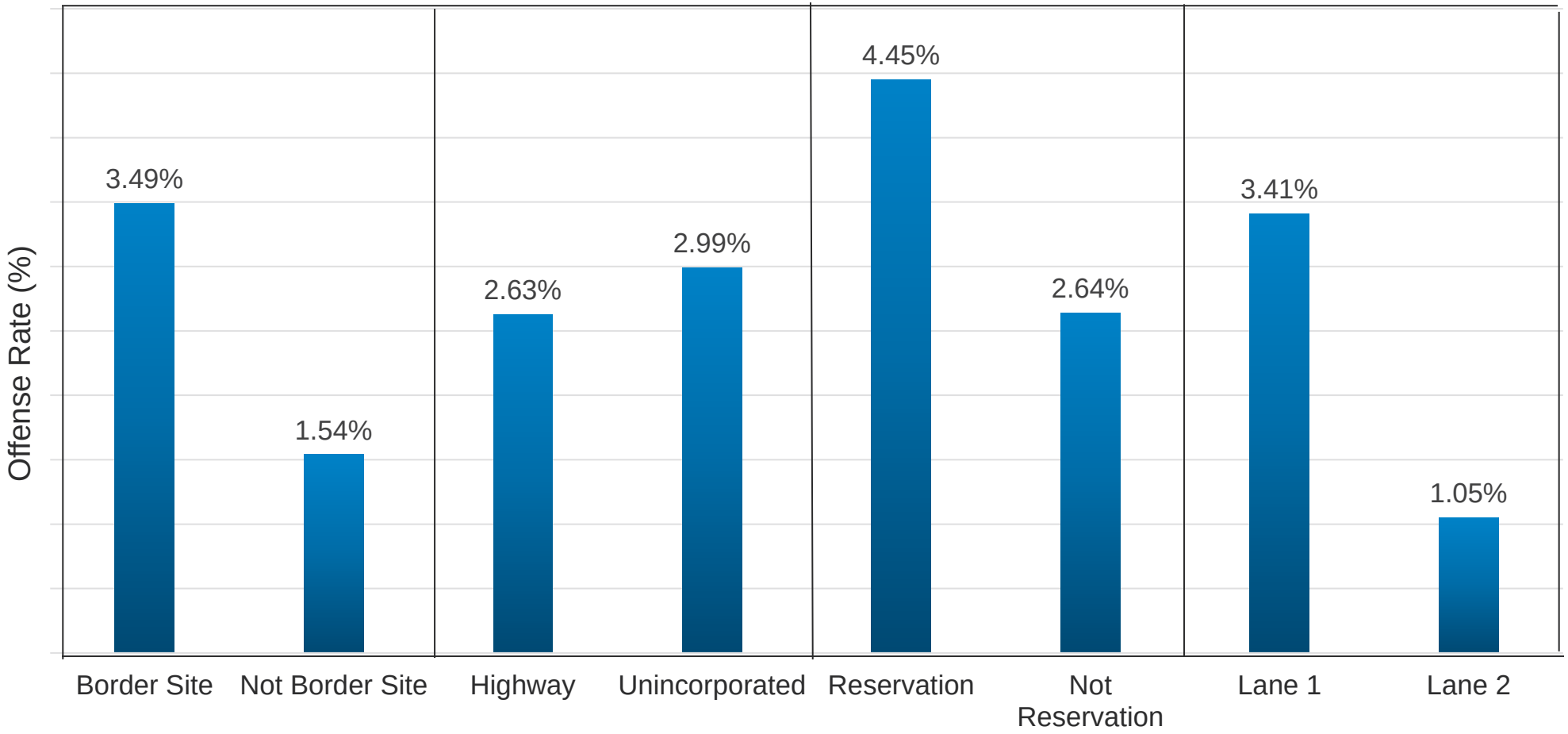
Percent of CMVs** with an Observed Cell Phone Offense by Location Type (n=160,671)



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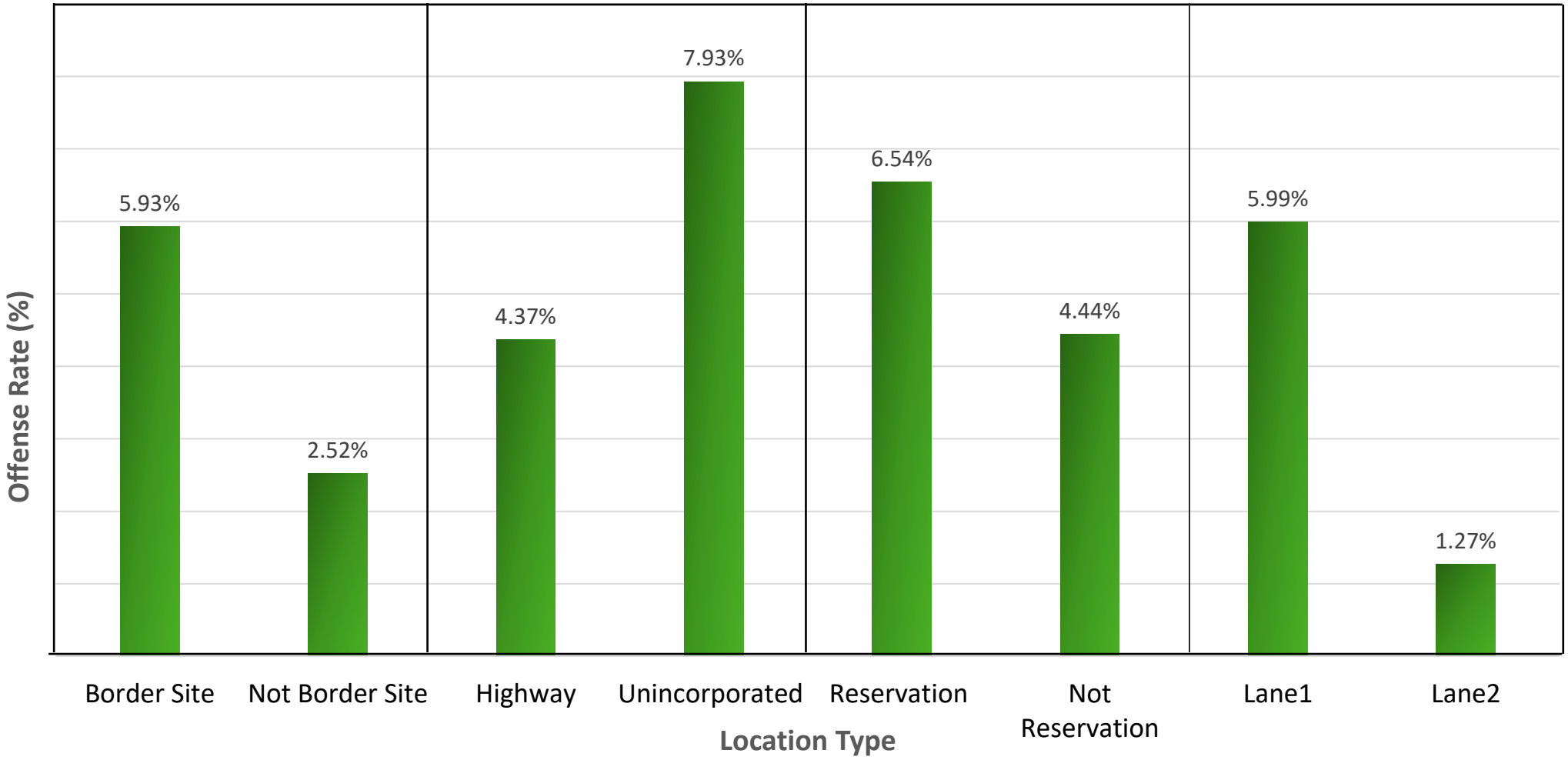
Percent of CMVs** with an Observed Seatbelt Noncompliance by Location Type (n=160,671)



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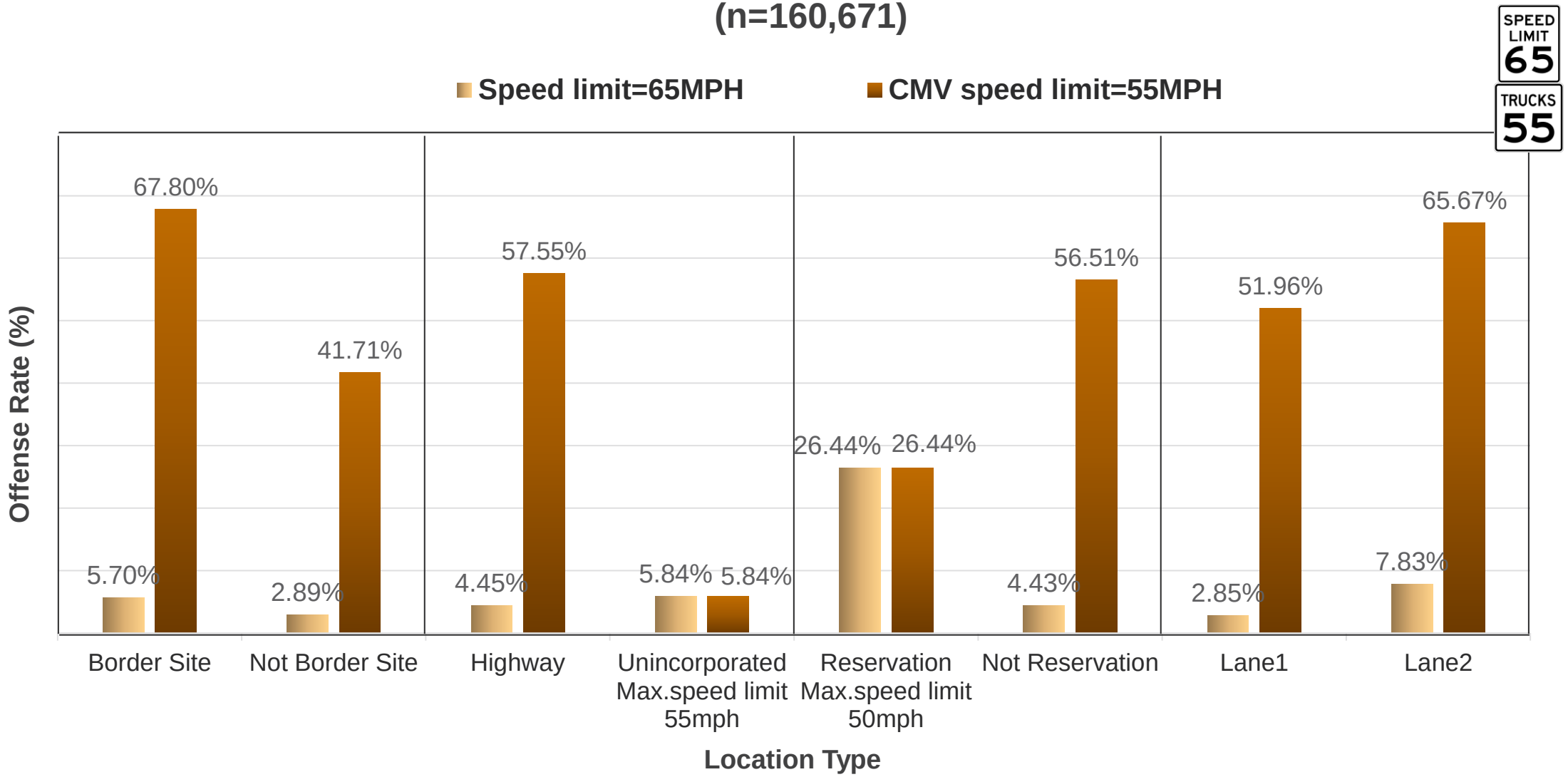
Percent of CMVs** Observed Exceeding the Posted Speed Limit by Location Type (n=160,671)



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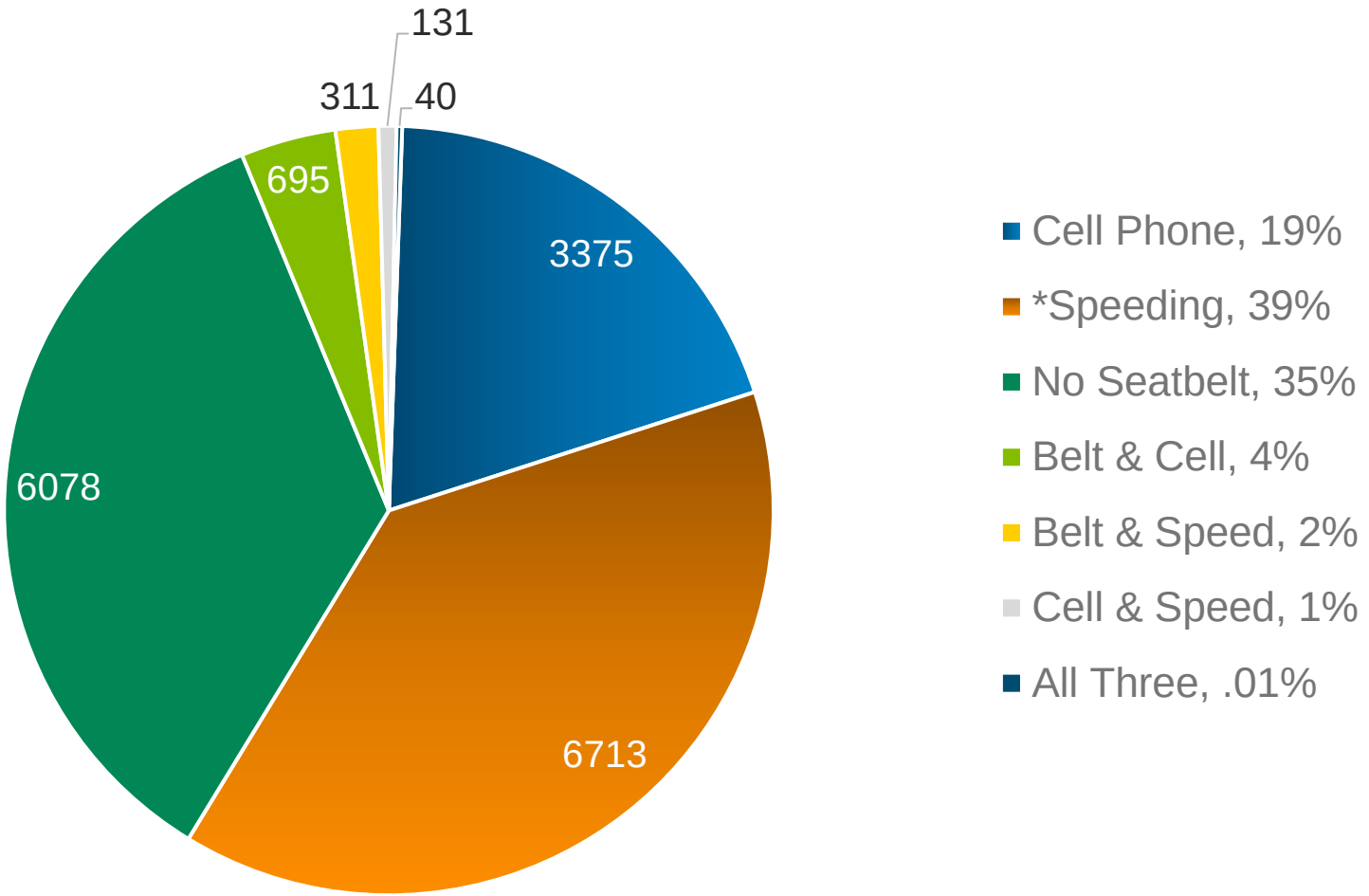
Percent of CMVs** Observed with Traffic Offenses by Type and Number of Offenses (n= 17,341 Offenders or 10.79 % of total CMVs)



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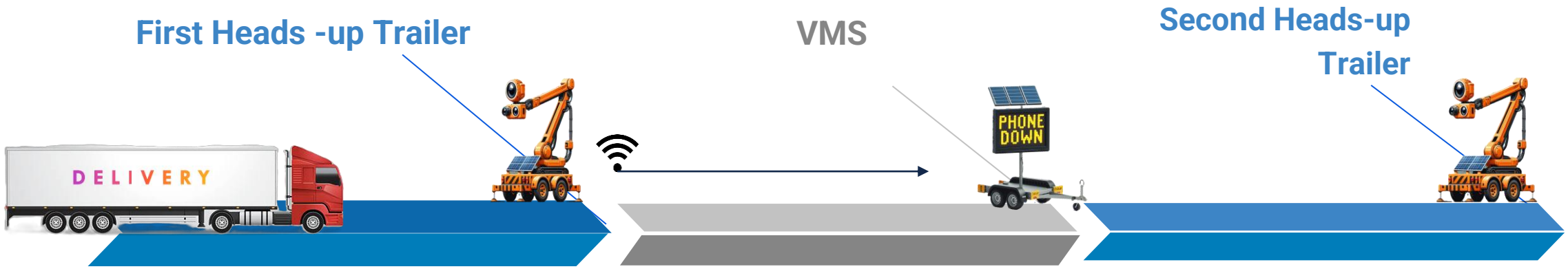
Other findings

- Only 2,374 CMVs were observed in unincorporated areas compared to 158,297 on Freeways. This is due to the low amount of CMV traffic in unincorporated areas.
- 56.42% of all CMVs were traveling over the posted speed limit for trucks (typically 55mph)
- 83% of all triple offenders (speeding, using cell phone and seatbelt noncompliance) were driving on the CA 905, within 5-6 miles from the US/Mexico border.
- On the rural road leading to the casino/reservation, 33.51% of CMVs committed some sort of offense compared to a 10.74% total offender rate on other roadways observed.

Next Steps- Year 2 Experiment Set-up



CMV drivers pass the first Acusensus Heads-Up trailer.

If risky behavior is detected, ~1000 ft down road a VMS message addresses it.

Second Heads-Up trailer placed ~1200ft after VMS to look for change in behavior.

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Use of Real-Time Driver Alerts to Improve CMV Safety

Principal Investigators:
Linda Hill, MD, MPH
Ryan Moran, MD, MPH
Research Program Manager: Julia McMillan, MA, MS

TREDS

Study Overview

Partnership

- UC San Diego TREDS is partnering with Drivewyze to offer real-time alerts notifying CMV drivers of upcoming active work zones in California
- Caltrans Commercial Wholesale Web Portal Version 2 (CCWWP-2) provides locations of active work zones
- Participants are existing subscribers of Drivewyze free safety alert services

Alerts

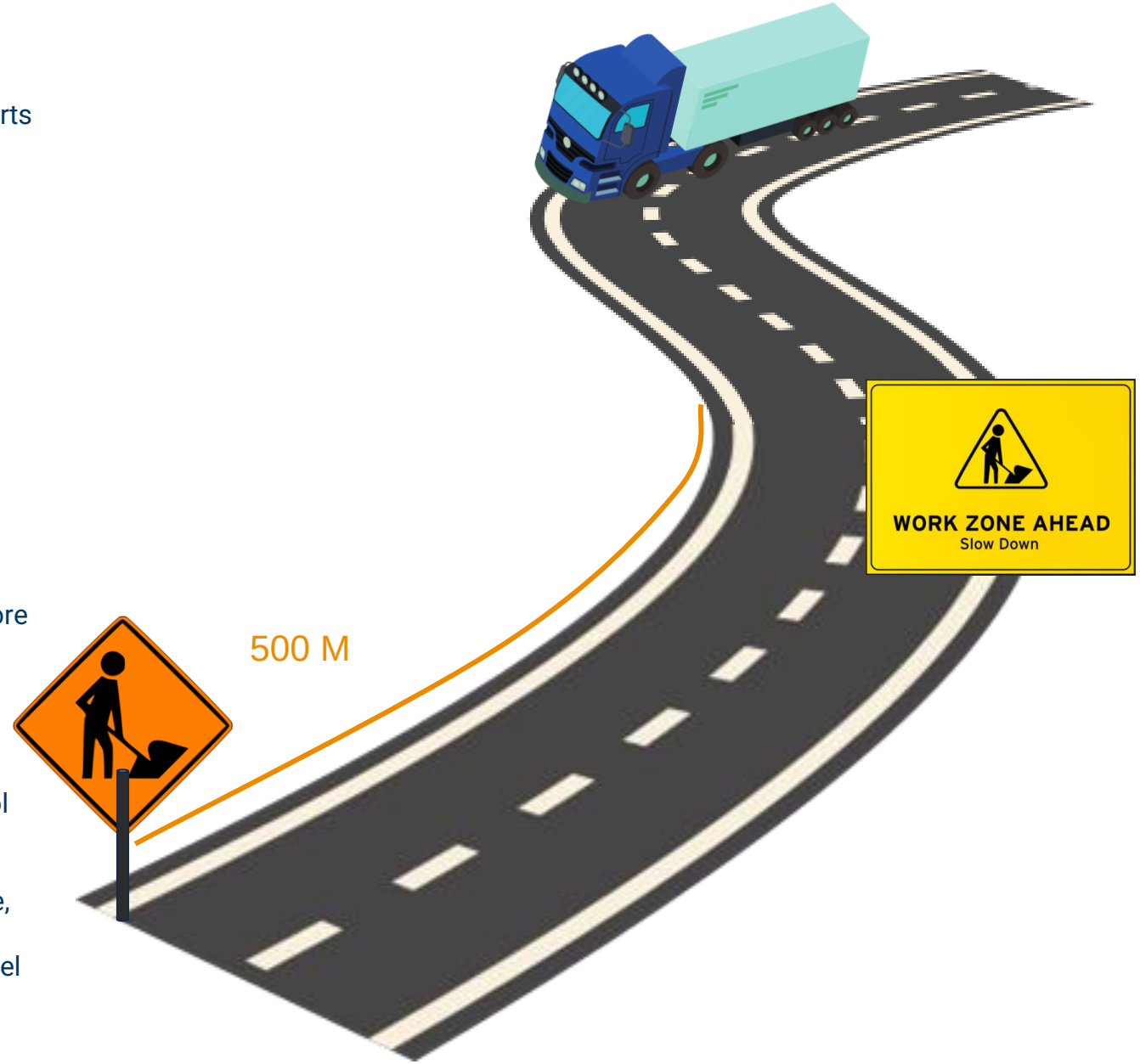
- MUTCD-compliant alerts are sent to in-cab Electronic Logging Devices (ELDs) 500 m before active work zones
- Currently active in Caltrans District 11 (Southern border) and District 2 (Northeast border)
- Random 25% control group does not receive these safety alerts, but receives all other safety alerts

Data Collection

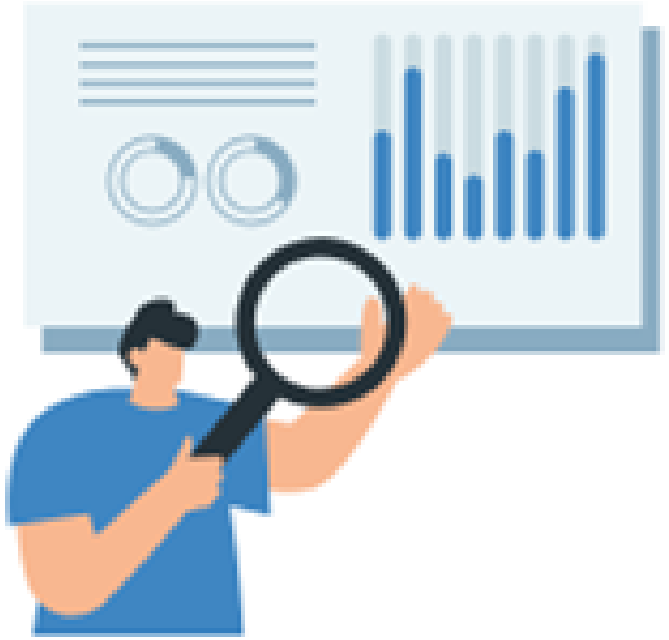
- Time and location data are collected once per second 30 seconds before through 5 minutes after alerting for both experimental and control vehicles
- Vehicle and driver data are completely anonymous to researchers

Analysis

- Researchers calculate differences in speed and acceleration for control vs. experimental vehicles
- Exploratory analysis currently underway, with capacity to expand to factors such as District, time of day, day of the week, type of work zone, and individual work-zone specific factors
- Driver survey currently in deployment, with plan to compare sample-level driver behaviors with reported response to these alerts

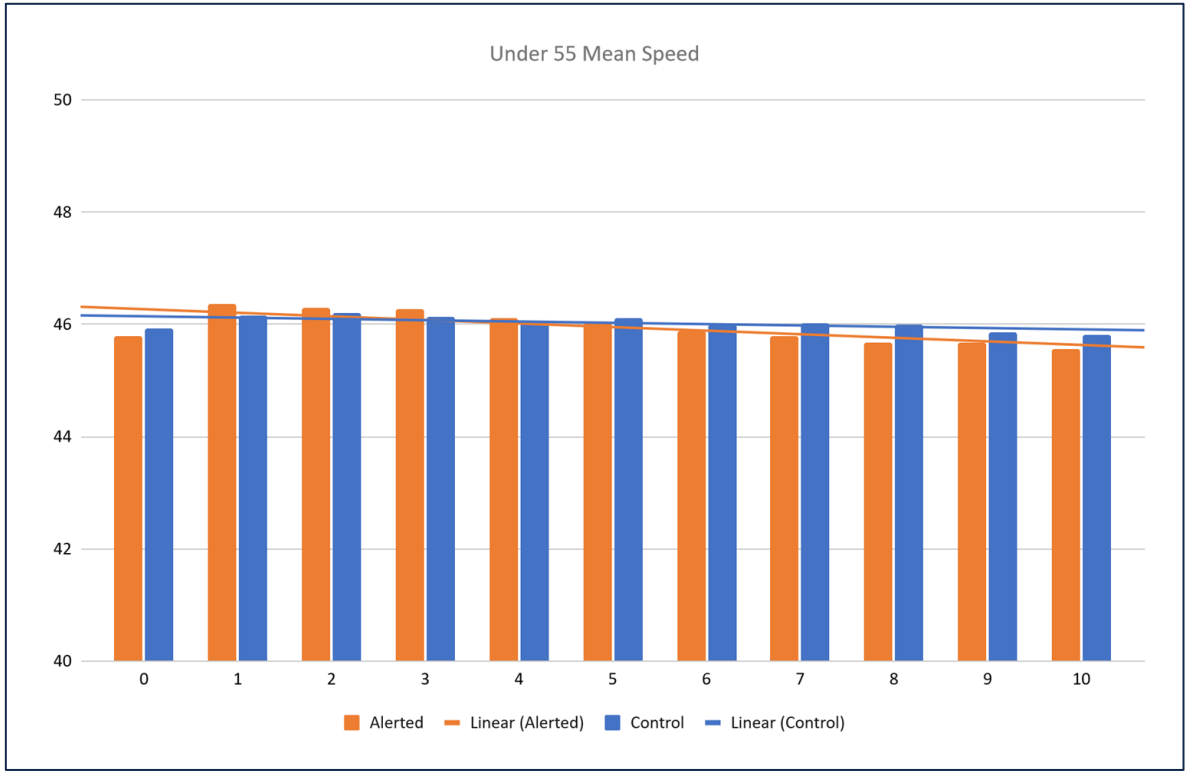


What do we hope to achieve?



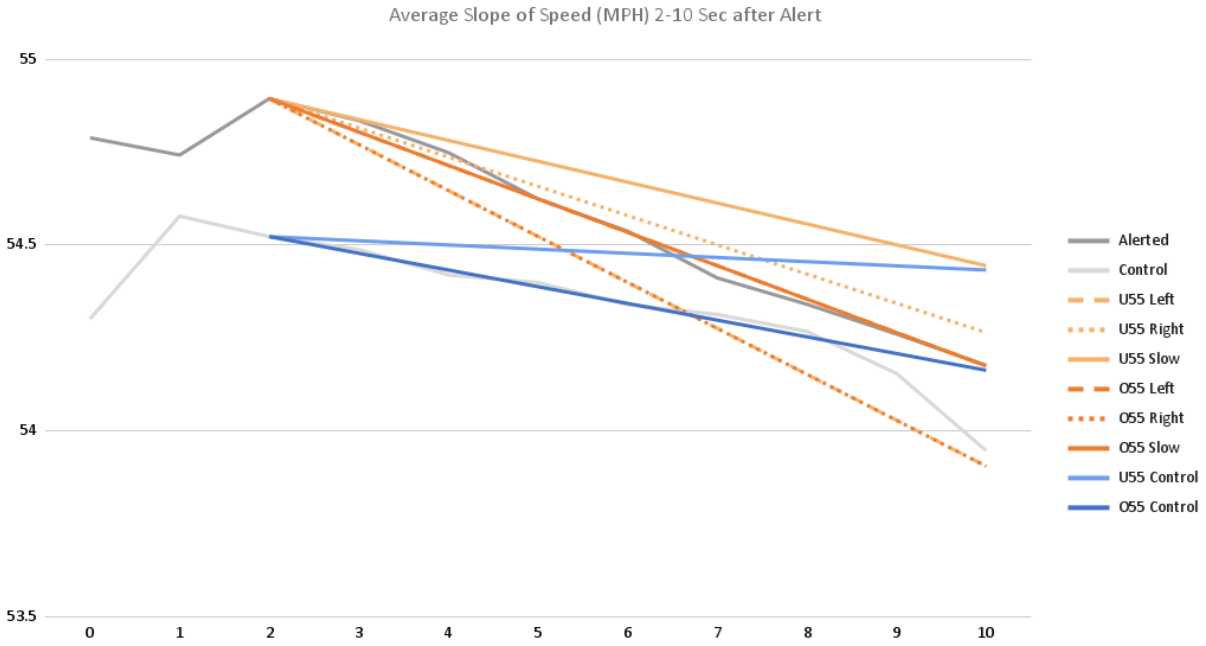
- Measurable changes in driver behavior (such as overall speed reduction and reduction in hard braking) in response to in-cab notifications during study period
- Reduction in CMV-involved crashes in California work zones
- Understanding the perception of in-cab alerting among key stakeholders such as participating fleets, driver supervisors, drivers, and road workers
- Increasing awareness and adoption of free safety alerts among fleets and drivers

Initial Finding #1: Alerted vehicles traveling over 55 MPH slow more than control vehicles



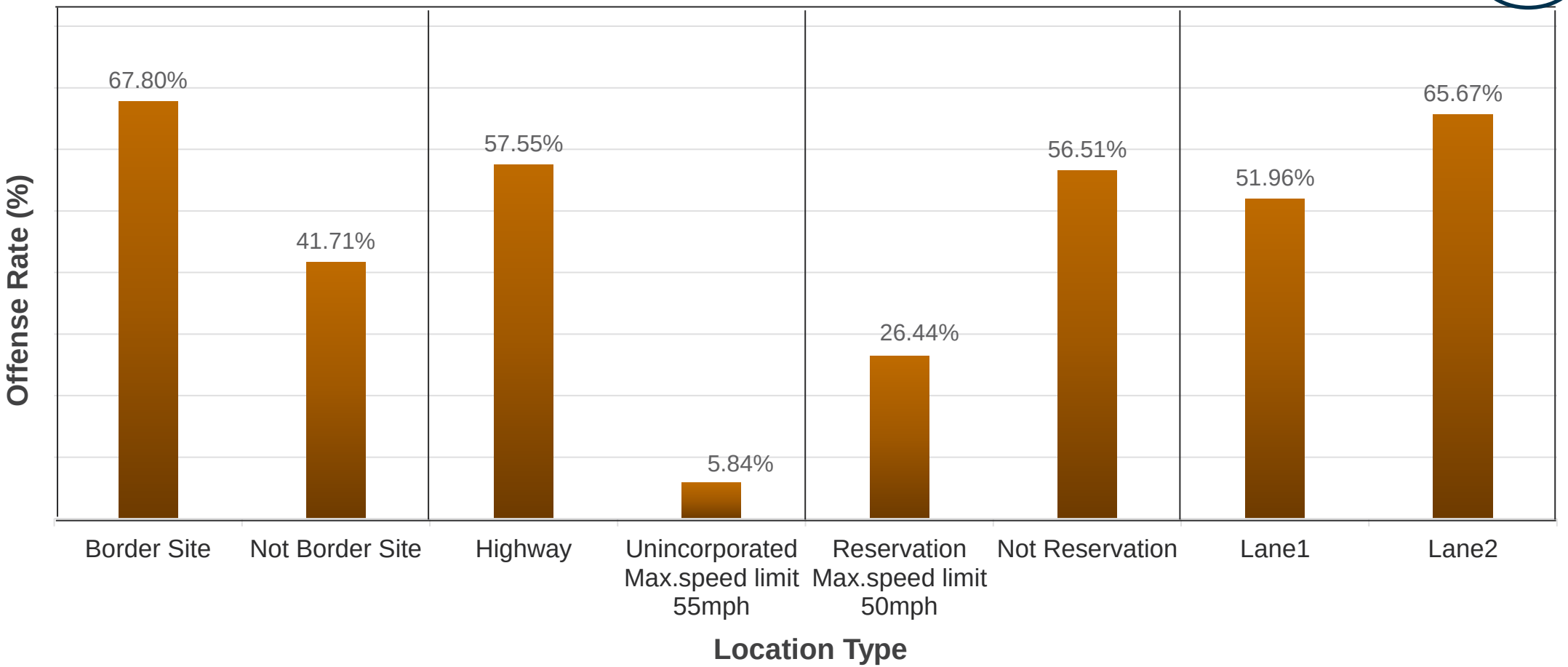
Initial Finding #2: Lane-Specific Alerting appears more impactful than generic alerting

	Pre-Alert Speed Under 55 MPH		Pre-Alert Speed Over 55 MPH	
	Alerted	**Control**	**Alerted**	**Control**
(none)		-.01		-.04
Left Lane Closed	-.11		-.08	
Right Lane Closed	-.07		-.11	
Slow Down	-.05		-.08	



QUESTIONS AND DISCUSSION

Percent of CMVs** Observed Exceeding the Truck Posted Speed Limit by Location Type (n=160,671)



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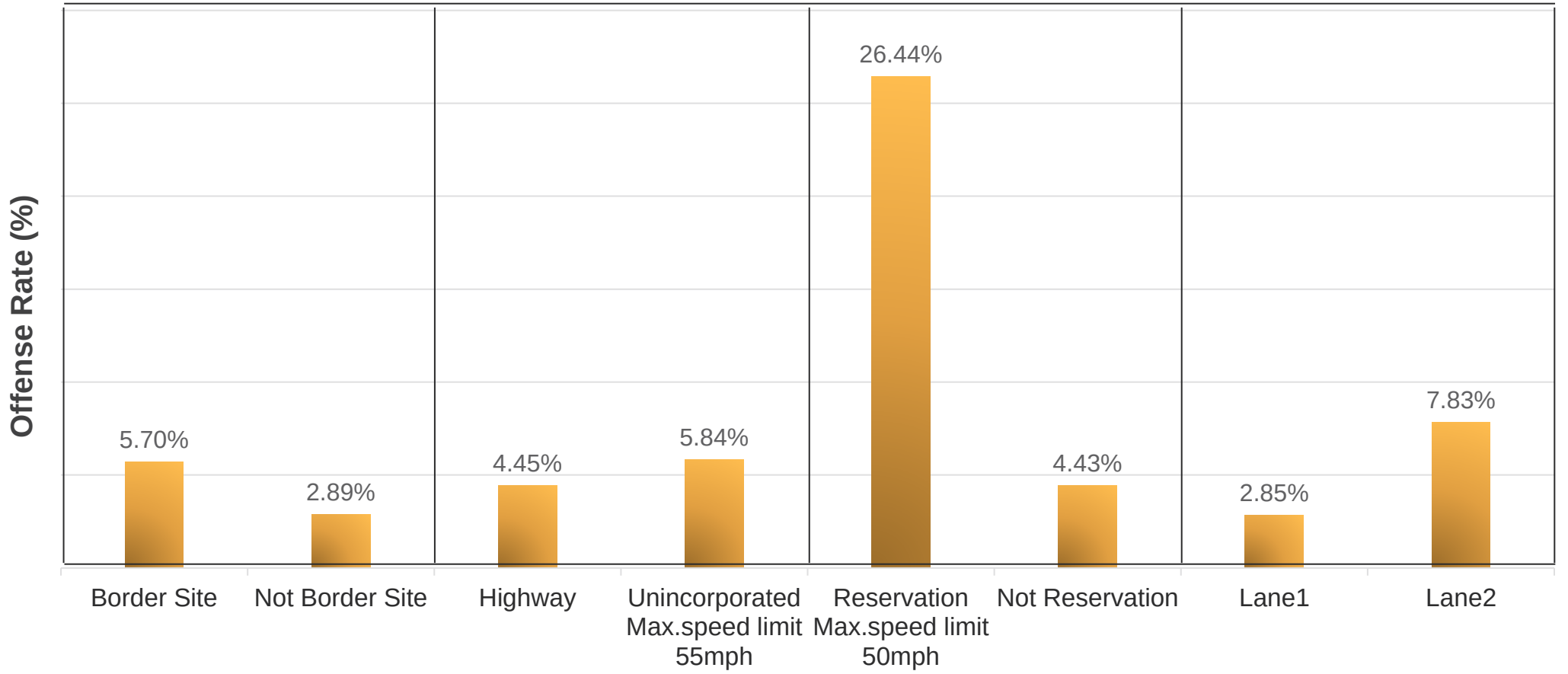

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