UC San Diego Health

Use of Real-Time Driver Alerts to Improve CMV Safety

Principal Investigator: Linda Hill, MD, MPH
Research Program Manager: Julia McMillan, MA, MS
**Data Analyst: Sarah Hacker**

TREDS

CMV Work Zone Crashes: On the Rise

Although large trucks make up only 5% of total vehicular traffic, 30% of fatal crashes in work zones involved a large truck in 2022.

From 2020 - 2022, the number of fatalities from crashes involving large trucks increased 20%.

The proportion of fatal work zone crashes that involve CMVs has been steadily increasing.

CMV-Involved Fatal Work Zone Crashes and Percent Involvement in All Fatal Work Zone Crashes, 2013-2022

- CMV Fatal Work Zone Crashes
- % CMV Involvement in Fatal Work Zone Crashes
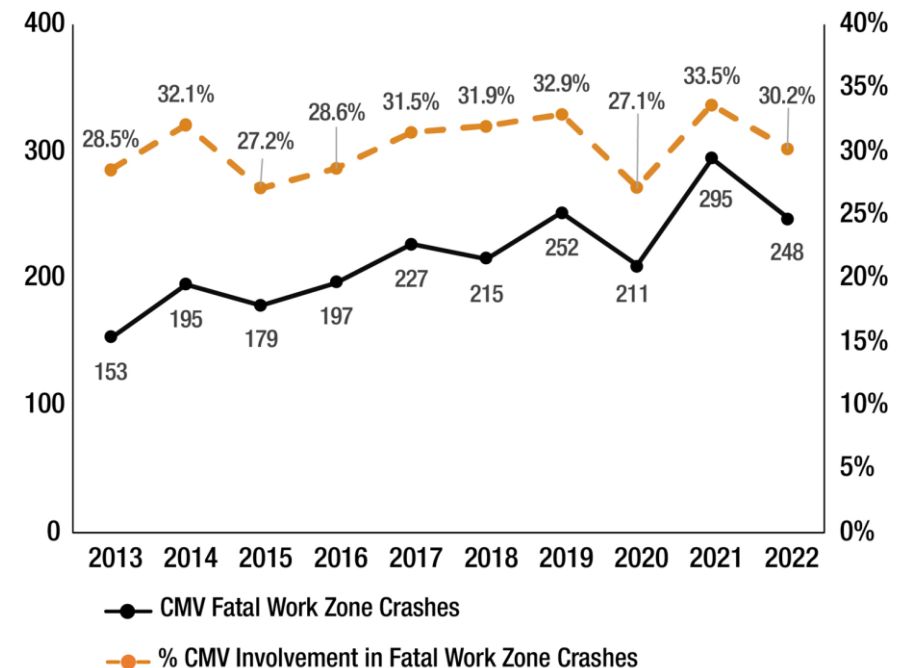
Causality is multifaceted - Could in-cab alerts before active work zones mitigate these crash risk factors?

- Speeding
- Impairment (including substances & fatigue)
- Distraction & inattention
- CMV characteristics: Size, weight, visibility
- Improperly secured cargo
- Inadequate training
- Inadequate work zone management
- Dangerous roadway conditions
- Passenger vehicle unsafe driving behaviors

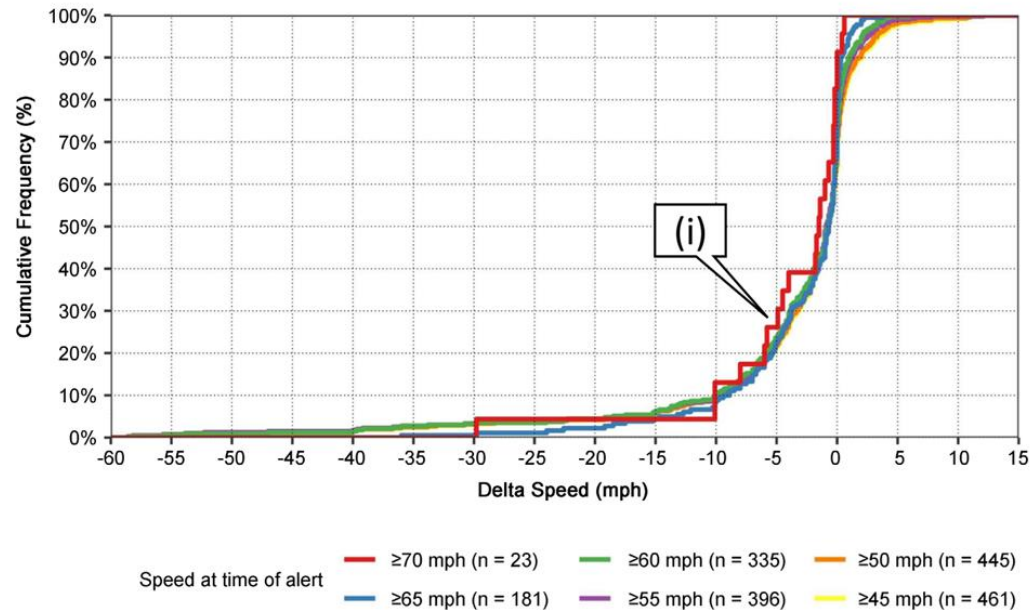# In-Cab Alerts: Successful for Sudden Slowdowns

Figure 7. Cumulative speed reductions 30 seconds after alert compared to speed at time of alert for Dangerous Slowdown alerts.

Recent studies by Purdue University and Cleveland State University have associated in-cab congestion alerts with significant reductions in CMV speed as slowdowns approach

Will work zone alerts have the same dramatic impact?

Study Design: Alert Deployment & Data Collection

Pre-alert data

DriveWyze collects vehicle behavior data such as speed, acceleration, and bearing at one-second intervals.

Work Zone Alert Trigger

At 500 meters outside the CALTRANS-designated work zone location, an alert about the upcoming work zone is delivered to the vehicle's ELD.

Post-alert data

Data is collected on vehicle behavior measures each second for a 5-minute time period once the alert is displayed.
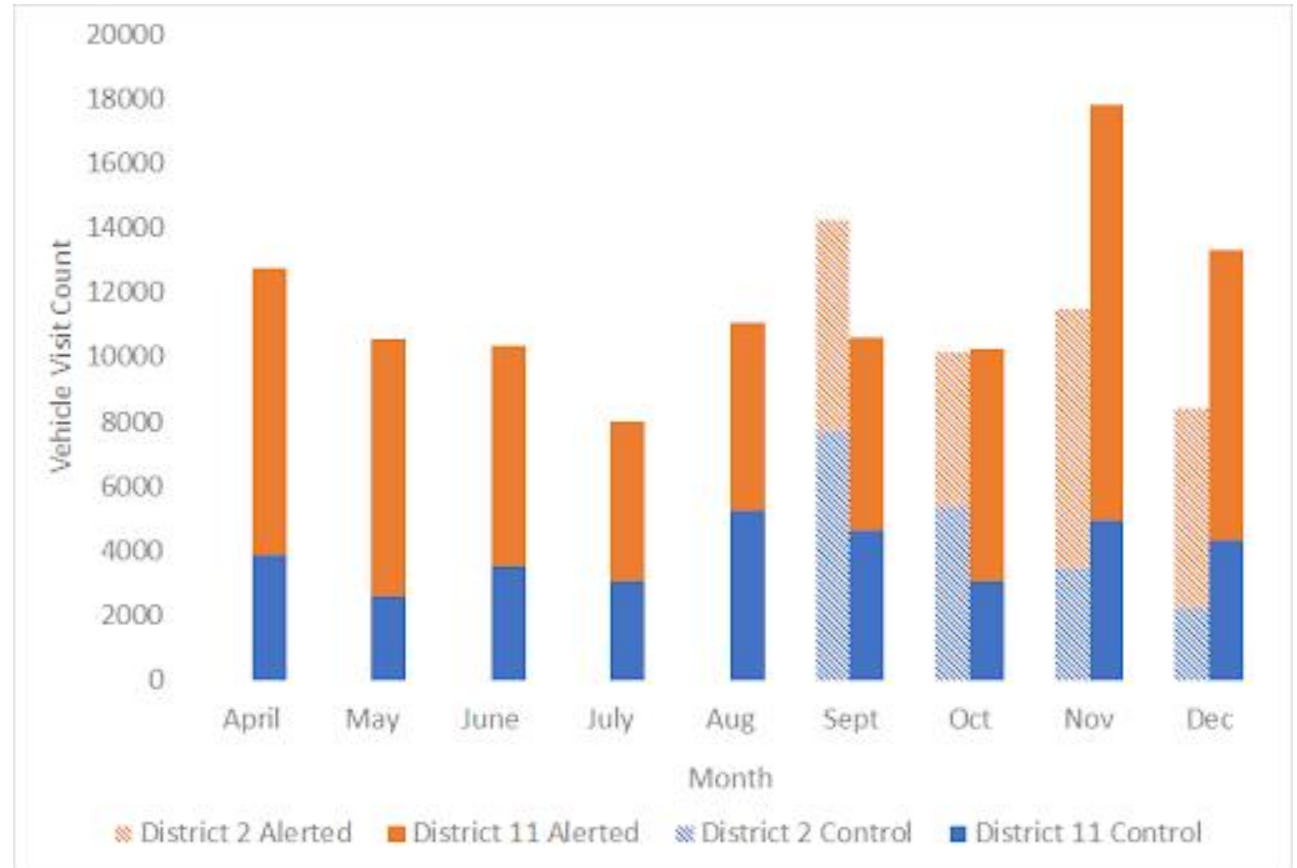
Control Group

DriveWyze will 'ping' the vehicle as if an alert were to be displayed, but nothing shows on the ELD; therefore, the same data can be collected pre-and post-alert for comparison.
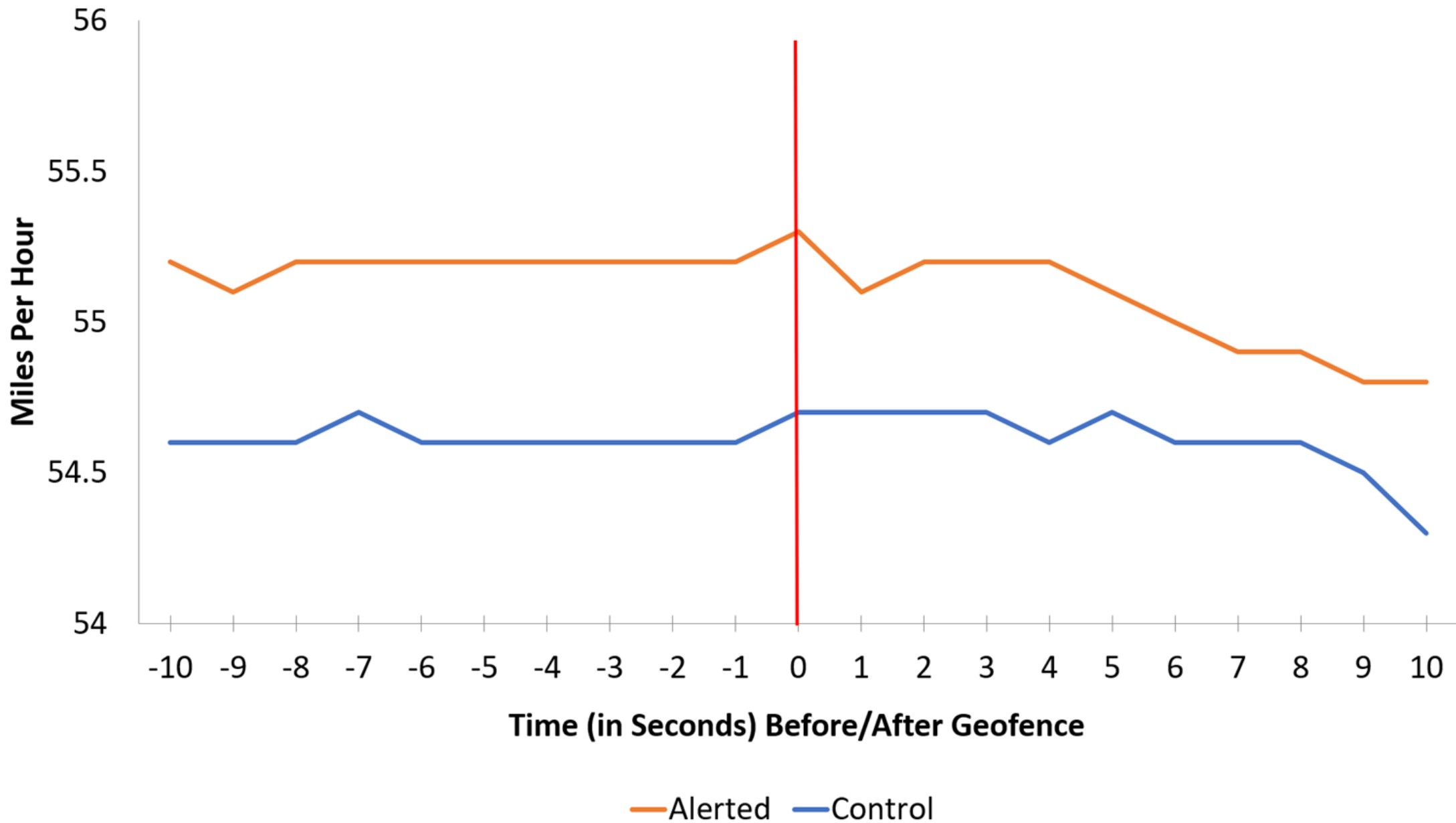
WORK ZONE AHEAD
Slow Down

ORK ZONE AHEAD
Slow Down

500 M
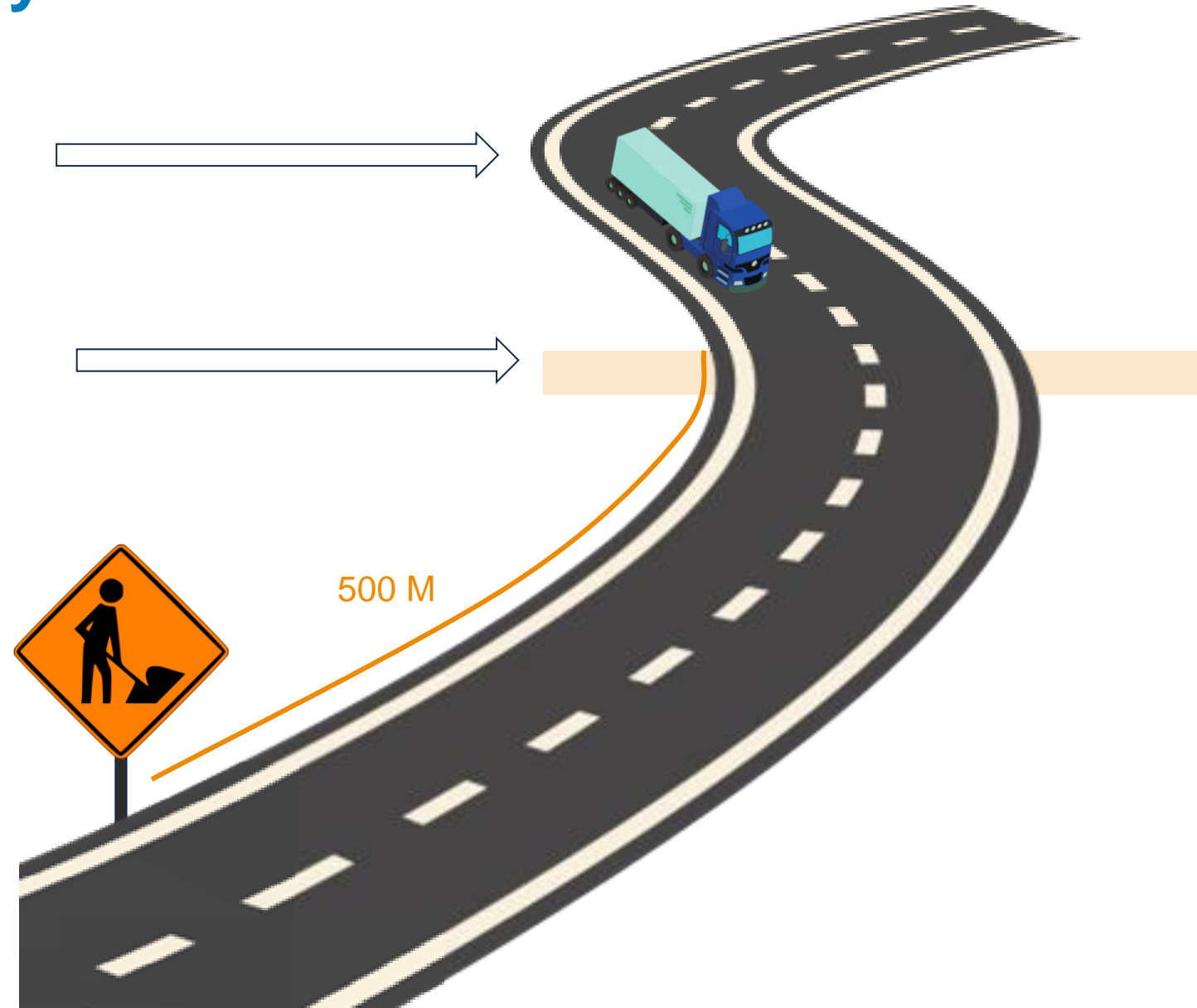
Alerts Overview

As of December 23, 2024:

❖ 228,713 vehicle visits have been recorded for 4,040 unique active work zone sites across Caltrans Districts 11 and 2, for 64 categories of work

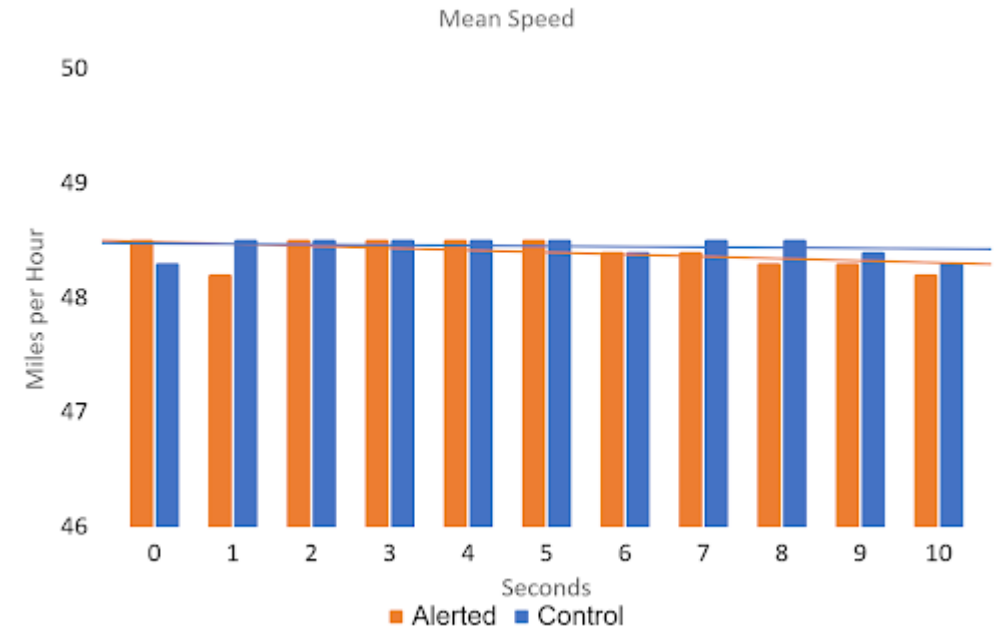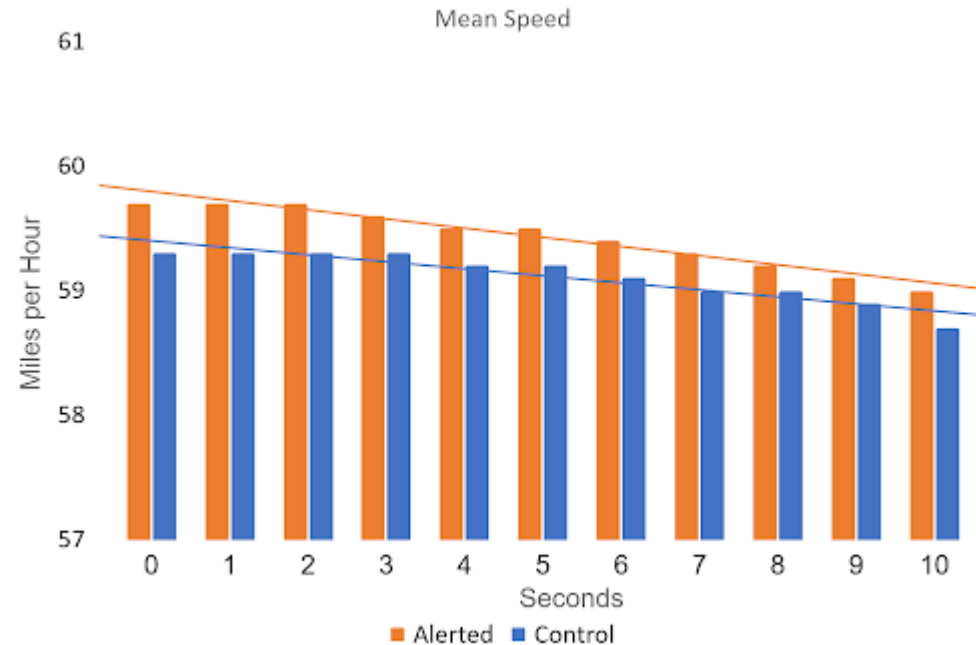❖ Total of 168,153 alerted vehicle visits and 60,560 control vehicle visits.

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Average Work Zone Speed

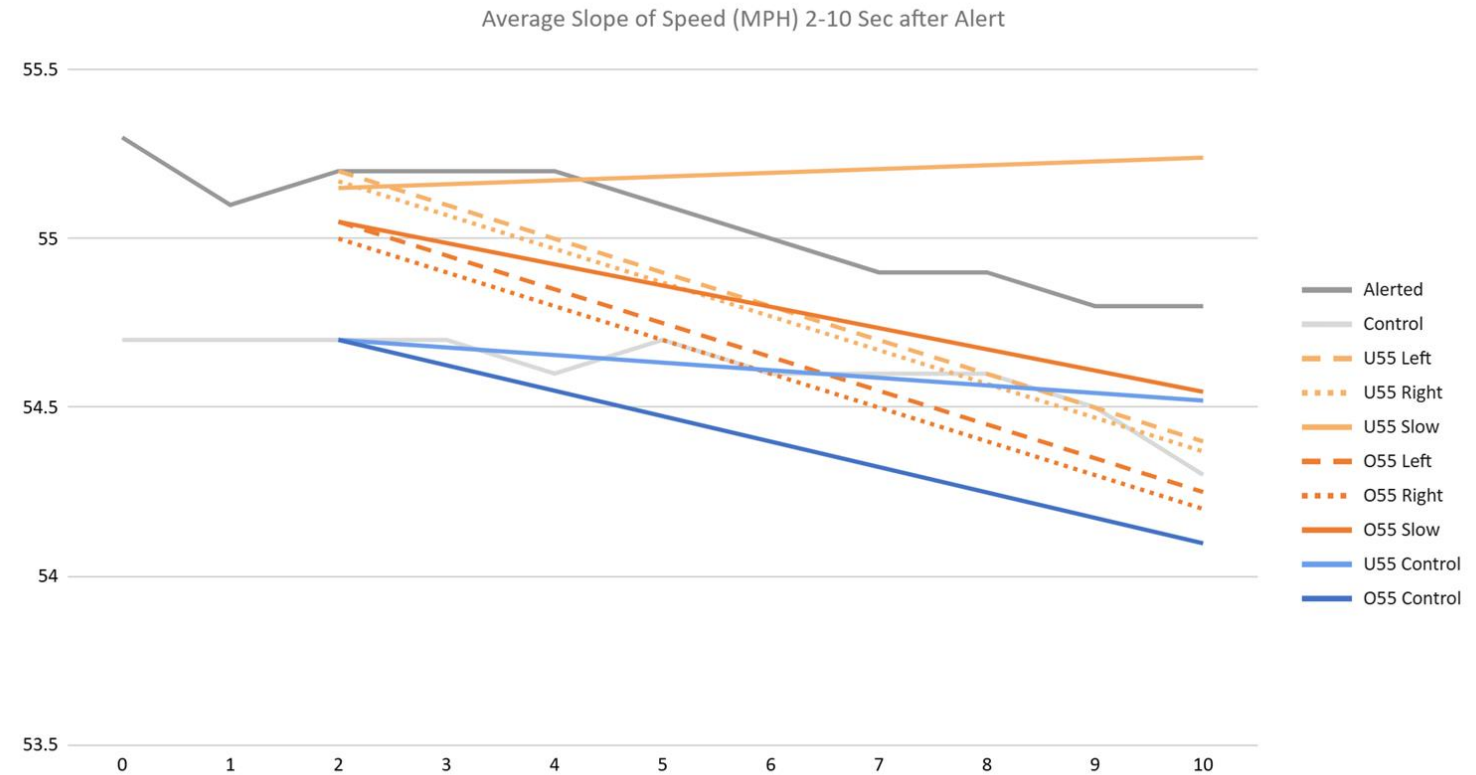# Alerted vehicles traveling over 55 MPH slow more than control vehicles

Alerted drivers traveling above 55 mph reduce speed by a magnitude of about 30% greater than control group, with a mean speed reduction of 0.5 MPH more within 10 seconds and an estimated extrapolated mean speed reduction of 3 MPH within one minute.

Data: April 1 - December 23, 2024

Lane-Specific Alerts May Be More Effective, Especially for Speeders

Average Slope of Speed (MPH) 2-10 Sec after Alert

Legend:
- Alerted
- Control
- U55 Left
- U55 Right
- U55 Slow
- O55 Left
- O55 Right
- O55 Slow
- U55 Control
- O55 Control

Data: April 1 - December 23, 2024

Slopes of deceleration for lane-specific alerts are up to 1.5 times steeper than a simpler 'slow down' message in speeds over 55 ($p < .001$).

Driver Survey - Initial Findings
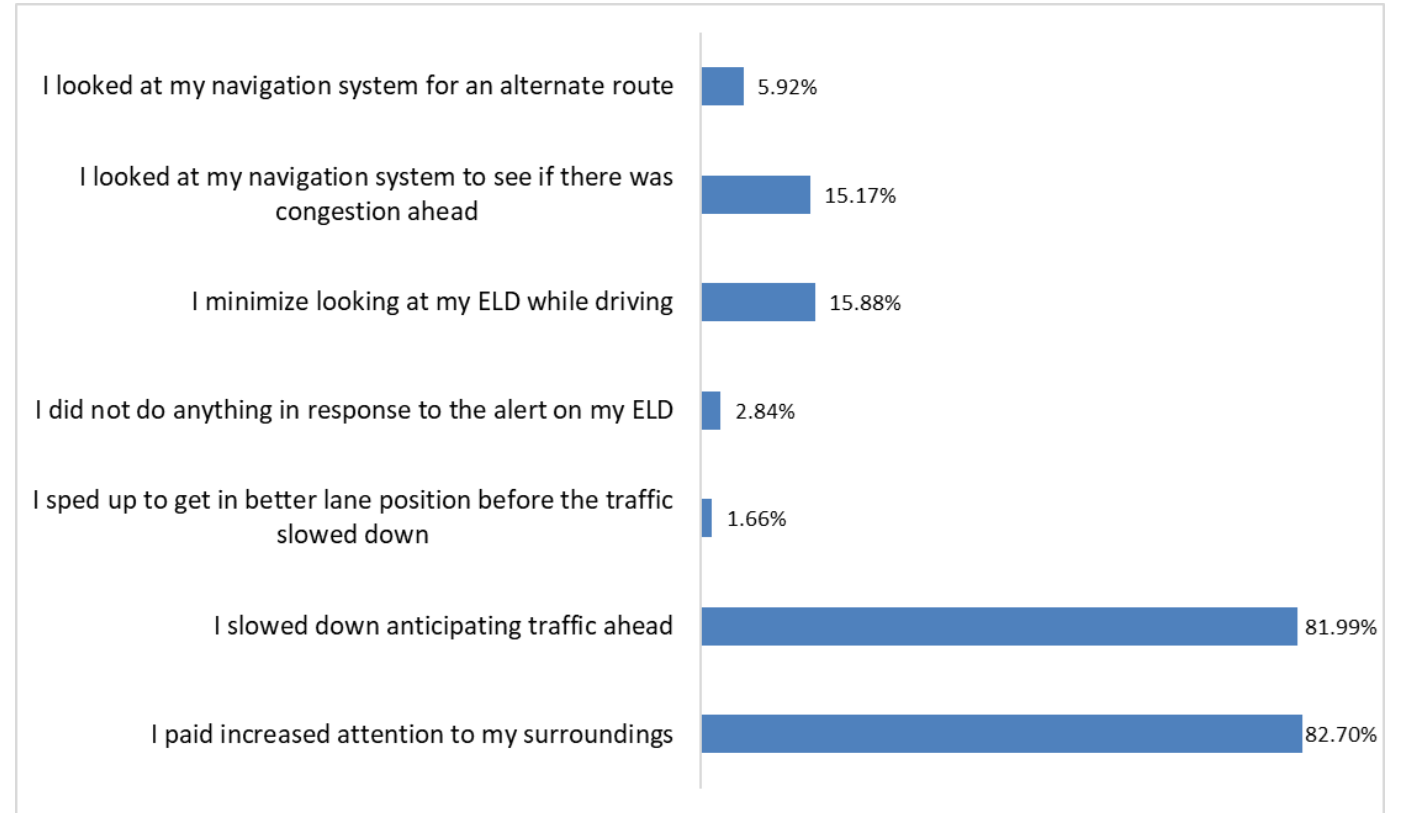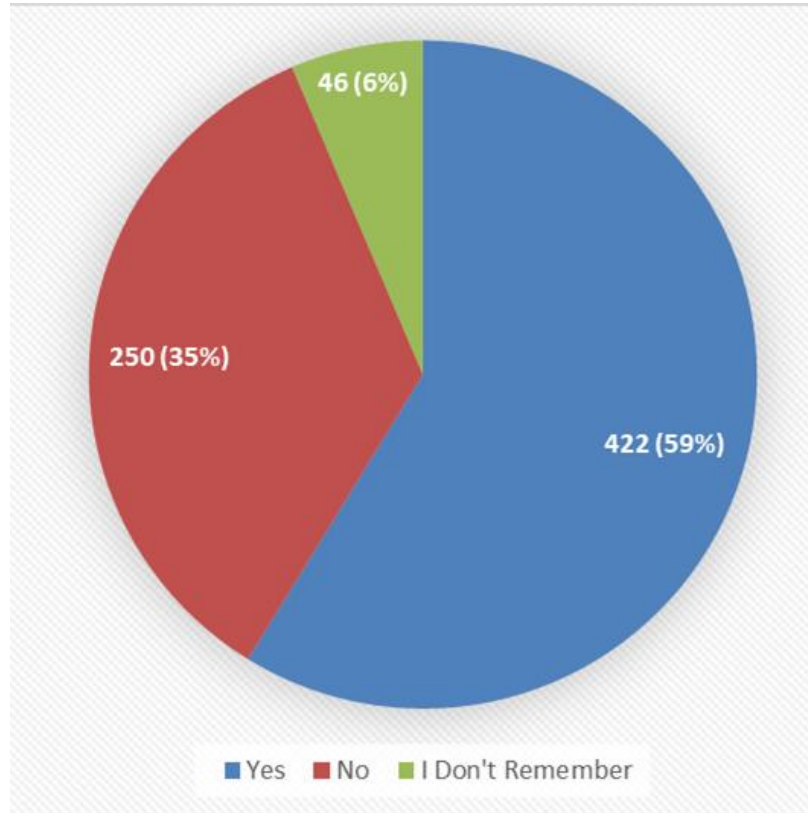
Moving Forward: Next Steps

- Continuing to improve data quality and integrity
- Expanding analyses on longer time frame
- Driver survey - Secondary analyses
- Individual vehicle trajectories
- Hard braking
- Aligning output and lane closure data
- Indepth work zone crash data & state-level analyses
- Meaningful analyses for a naturalistic setting