



## Accident Analysis & Prevention

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# Connected vehicle real-time traveler information messages for freeway speed harmonization under adverse weather conditions: Trajectory level analysis using driving simulator

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### Highlights

- Effectiveness of CV Traveler Information Messages on drivers' speed behavior was assessed.
- High-Fidelity driving simulator experiments were developed to simulate various real-world traffic scenarios.
- The average speed and speed variance under CV scenarios were generally lower than under baseline scenarios.
- Time-to-Collision (TTC) under the baseline scenario is approximately 40% lower than the CV scenario.
- Deceleration to Avoid a Crash (DRAC) under the baseline scenario is approximately 19.3% higher than the CV scenario.

## Abstract

This paper employed a high-fidelity driving simulator to investigate the impacts of the Wyoming Department of Transportation (WYDOT) Connected Vehicle (CV) Pilot's Traveler Information Messages (TIMs) on drivers' speed selection and the safety benefits of their speed harmonization. Three driving simulator experiment scenarios were developed to simulate the typical traffic and weather conditions on the rural Interstate 80 (I-80) in Wyoming. A total of 25 professional drivers from the WYDOT and trucking industry were recruited to participate in the driving simulator experiment. Participants' instantaneous speeds at various locations were collected to reveal the effects of CV TIMs on their speed selection. The results showed that average speed profiles under CV scenarios were generally lower than under baseline scenarios, particularly for winter conditions (snowy and severe weather). The variance of speed under CV scenarios was found to be significantly lower than the baseline scenarios, indicating that CV TIMs have the potential to harmonize the variations in speed. In addition, for the work zone driving simulator experiment, this research revealed that the mean time-to-collision (TTC) under baseline scenario is approximately 40 % lower than CV scenario, and the mean deceleration to avoid a crash (DRAC) under baseline scenario is approximately 19.3 % higher than CV scenario. These findings suggest that CV TIMs can reduce the risk of crashes. Research findings would provide the WYDOT with early insights into the effectiveness of CV TIMs, which could assist with developing more efficient transportation management strategies under adverse weather conditions.

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## Keywords

Wyoming connected vehicle pilot; Adverse weather; Traveler information messages; Speed harmonization; Driving simulator experiment

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