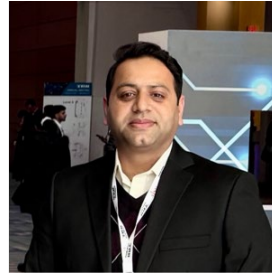


HSIS STUDENT RESEARCH PAPER COMPETITION
EXCELLENCE IN HIGHWAY SAFETY DATA AWARD
TIED FOR THIRD PLACE

**Frank Selase Dzawu with Mujahid Ali Bahadur
and Brandon Loughrin**
University of Nebraska-Lincoln

**“Direction Matters: Curve Alignment Moderates Severity Risk
on Sharp Horizontal Curves in Rural Washington”**

ITE—A Community of Transportation Professionals is pleased to recognize **Frank Selase Dzawu**, with **Mujahid Ali Bahadur** and **Brandon Loughrin**, as the third-place recipients of the [2026 HSIS](#)



[Excellence in Highway Safety Data Award Student Research Paper Competition](#) for their paper, **“Direction Matters: Curve Alignment Moderates Severity Risk on Sharp Horizontal Curves in Rural Washington.”**

The Federal Highway Administration’s Highway Safety Information System (HSIS) Student Research Paper Competition encourages university students to use HSIS data to introduce future highway safety professionals to quality safety data, appropriate research methods, and the practice of using data to support transportation safety decisions.

The award-winning paper examines run-off-road crash severity on horizontal curves on rural arterials in Washington State. Using Washington HSIS data from 2020 to 2023, the research matched 1,621 run-off-road crashes to curve geometry and roadway characteristics, then applied an ordinal logistic regression model to better understand how curve sharpness and direction influence serious and fatal injury risk.

The study addresses an important gap in rural highway safety research. While previous studies have examined how curve radius relates to crash risk, this paper focuses on whether the direction of the curve—left or right from the driver’s perspective—changes the relationship between curve sharpness and crash severity.

The findings show that curve radius alone did not significantly predict crash severity after controlling for roadway and environmental factors. However, the interaction between curve

sharpness and direction was significant: crashes on sharp right-turning curves with a radius of less than 500 ft were associated with 2.76 times higher odds of serious or fatal injury compared with the reference category.

Exposure-adjusted crash rates reinforced this finding. Sharp right-turning curves generated 3.6 times the serious/fatal crash rate per million vehicle miles traveled compared with sharp left-turning curves. The paper's safety prioritization analysis further showed that sharp right-turning curves stood apart from all other curve categories because they combined both elevated crash generation and higher injury potential.

The research offers practical guidance for transportation agencies seeking to improve rural curve safety. The authors recommend that safety audit programs and curve countermeasure investments consider curve direction alongside radius, particularly when prioritizing treatments such as enhanced delineation, advisory speed reductions, and guardrail installation on sharp right-turning rural arterial curves.

ITE congratulates Frank Selase Dzawu, Mujahid Ali Bahadur, and Brandon Loughrin on this outstanding achievement and celebrates their contribution to advancing highway safety research, HSIS data application, and more targeted, data-driven rural roadway safety investments.

You can read about their research in an upcoming issue of *ITE Journal*. Learn more about [ITE's Awards Program](#).