Office of Research and Implementation

FFY2027 Request for Proposals

Reference SPR Item # 2506

Research Problem Statement Title:

Oklahoma Specific SPFs for Data-Driven Highway Safety Improvements

Problem Statement:

The Highway Safety Manual (HSM) provides Safety Performance Functions (SPFs) that are primarily derived from crash data collected in a limited number of states over a decade ago. These SPFs are used to estimate crash frequencies for various facility types and to guide safety decision-making. While HSM suggests that states may calibrate these SPFs to account for local conditions, multiple studies have shown that calibration has significant limitations and may not fully account for the differences and unique characteristics of a jurisdiction. An alternative approach recommended by HSM is the development of state-specific SPFs. In Oklahoma, preliminary analyses indicate that these models may produce inconsistent crash estimates. This research is proposed to identify the critical geometric, operational, and contextual factors that influence crash frequency, and to develop state-specific SPFs for key facility types, established by ODOT, in Oklahoma. These models will enable ODOT to fully leverage HSM methods and procedures for proactive safety planning and safety improvement.

Proposed Research:

Oklahoma has a need to develop state-specific safety performance functions to improve highway safety analysis. Currently, the department relies on models that underpredict crashes or when not available use outdated national models that do not accurately reflect local driving behaviors, weather, or infrastructure, leading to inconsistent crash predictions. By creating specialized models tailored to Oklahoma's unique conditions, officials aim to identify high-risk locations with much greater precision. This shift from generic calibration to data-driven local modeling is expected to optimize the allocation of safety funding and resources. Ultimately, these updated tools will help the state implement more effective crash countermeasures to save lives and reduce severe injuries on public roadways.

Suggested Tasks (to include but not limited to):

The proposed research will include, but is not limited to:

- Existing SPFs data acquisition
- Test existing SPFs for overfitting or underfitting
- Hypothesis development
- Ideal factor identification for new SPFs to avoid overfitting or underfitting
- SPF development with new factors
- Test new SPFs, spatial model behavior analysis of factors spread across Oklahoma

Implementation:

- Justification reports will be aligned with predictive outputs from Oklahoma-specific SPFs to ensure compliance with federal and state reporting standards. Using Oklahoma-specific SPFs will influence multiple existing procedures and specifications, including: (1) HSM-Based Safety Analyses: all predictive safety analyses using HSM methodologies could be done with Oklahoma SPFs rather than calibrated or outdated SPFs. (2) Safety project prioritization: Decision-making

processes for selecting locations for safety interventions will be updated to reflect more accurate crash predictions. (3) Funding and reporting requirements: crash reduction and project.

Benefits:

The proposed development of Oklahoma-specific SPFs will allow ODOT to fully implement HSM procedures with models reflecting local traffic and crash conditions and addresses the limitations of calibration methods and ensures predictive safety analyses are more accurate, actionable, and defensible.

Deliverables:

All projects require the submission of the following reports:

- Monthly Progress Reports
- Multi-Year Projects require a Year-end Annual Report
- Copies of the project Draft Final Report in Microsoft Word and ADA accessible Adobe Acrobat .pdf electronic formats
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The Year-end Annual Report, Draft Final Report, Final Report and Color Article should be submitted to satisfy all federal and state requirements pertaining to the accessibility of documents including but not limited to:

- Oklahoma State Statute 62 § 41.5e and the Americans with Disabilities Act (ADA) of 1990, 42 USC 12.01 et seq.

The PI must also participate in the following project meetings:

- New project initiation meeting
- Semi-annual project meeting
- Close-out project meeting
- Continuing project meeting

Estimated completion time twenty-four (24) months.