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Synthesis on the Contributing Factors and Effective Countermeasures for Low Volume Fatality Rates in the Southeast

INTRODUCTION

Of the more than four million miles of public roads in the United States, almost three million miles are rural roads [1]. In 2016, 50 percent of all fatal crashes occurred along rural roads, but only 30 percent of the total vehicle miles traveled were in rural areas [2]. Low-volume roads (LVRs) carry an annual average daily traffic (AADT) volume of fewer than 2,000 vehicles per day (VPD) and make up a large portion of the US roadway system [1]. These roads account for approximately 20 percent of the rural National Highway System and over 50 percent of the Federal-Aid System [1]. Despite these roads carrying low traffic volumes, historical crash data indicate their crash rates are higher than other highways, accounting for half of all fatalities [2]. Typically, LVRs are classified as local roads, and most are located in rural areas. In 2016, most of the states in the Southeastern Transportation Consortium (STC) experienced higher fatality rates than the rest of the nation. For example, 834 fatality crashes occurred in Kentucky; 607 took place on rural roads (approximately 73 percent). In Mississippi, 98 percent of its 690 fatal crashes occurred on rural roads [2].

OBJECTIVE

A synthesis was undertaken to address these issues aiming to summarize factors which contribute to LVR crashes, identify countermeasures that have been implemented to address LVR safety in the Southeast; and determine how effectively countermeasures address LVR safety.

SCOPE

This synthesis only addressed practices used by the 12 STC member states. However, its findings are applicable to all states, since they were based on review of national practices. Activities completed as part of this study included a literature review and web-based survey. Information gathered as part of these activities established the foundation for the analysis and conclusions presented in the final report.

METHODOLOGY

The research team prepared this synthesis using a two-phased approach. The first phase consisted of a literature review and designing a web-based survey to solicit information from STC member states on their current use of countermeasures for addressing LVR safety and the effectiveness of these practices. To compile the literature review, the researchers searched for materials on the Transportation Research Information Database (TRID) as well as other databases. The survey was administered during the second phase. The researchers used survey data to synthesize the performance of each countermeasure and the circumstances in which each treatment can help improve LVR safety.

CONCLUSIONS

The literature review indicated that roadside features, cross-sectional elements, and geometric design elements significantly influence road safety. With respect to roadside features, culverts,

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bridges, driveways, trees, ditches, slopes, utility poles, and public broadcast service routing stations can all pose a threat to drivers [3]. Cross-sectional elements that impact road safety include lane width, shoulder type and width, and pavement edge drop off. Salient geometric design elements include horizontal and vertical curves, driveway density, sight distance, and vertical grade.

Identifying high-risk road segments and implementing cost-effective safety treatments on LVRs is an enormous challenge for state transportation agencies (STAs). Researchers have proposed countermeasures to bolster LVR safety. These include widening shoulders and lanes, adding centerline and/or edge line rumble strips, widening centerline and edge line markings, installing additional horizontal alignment signage, remedying shoulder and side slope deficiencies, relocating objects situated near roads, correcting geometric deficiencies, and installing more visible pavement markings and signage. A number of manuals are available that instruct users on countermeasure selection.

The research team surveyed STA personnel across the Southeast to collect information on practices and countermeasures used to improve LVR safety. The goal of the survey was to identify the most frequently used treatments, have agency staff rate their effectiveness, and develop a list of countermeasures STAs can use to improve LVR safety. Twelve respondents from the following nine STAs participated: Georgia, Kentucky (3 respondents), Louisiana, Mississippi, South Carolina, Tennessee, Virginia, North Carolina, and Arkansas (2 respondents). While the research team did not obtain responses from all states, those that participated constituted a representative sample of Southeast agencies.

The survey of agencies indicated that 15 countermeasures are currently used by a majority of responding agencies. Pavement markings (e.g., adding new markings, repainting faded markings, and improving the retro-reflectivity of existing markings); pavement surface treatments (e.g., edge line and centerline rumble strips and high friction surface treatments); widening shoulders; and installing horizontal warning signs are regarded as the most effective countermeasures. One explanation for these rankings is that respondents factored in benefit-cost analyses when scoring treatments. More costly treatments, such as improving horizontal alignments, removing fixed objects, and increasing clear zones were also noted as effective but received higher scores. Adopting more expensive countermeasures can bring significant safety improvements, as noted in some of the examples, although in some cases their costs may be prohibitive due to the level of investment required.

A summary sheet for 15 countermeasures was prepared in a stand-alone guide. In addition to the 12 countermeasures identified with low scores and high usage, the addition of left-turn lane at intersections, addition of pavement markers, and installation of rumble strips at intersection or curve approaches were also included in the summaries because of their potential for safety gains and they had a reasonable number of states using them. Each sheet describes a treatment, how it can be implemented, its effectiveness, crash types addressed, and installation costs. While most of the countermeasures identified by the research team are inexpensive and can be used as either a spot treatment or more systemically, a few require major capital investments. The effectiveness of very expensive countermeasures has not been studied in-depth because they have not been implemented widely.

REFERENCES

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