Analyzing Safety of Access Management Implementation on Utah Roadways

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ABSTRACT: Research performed by researchers at Brigham Young University for the Utah Department of Transportation will be summarized and referenced in this paper. Specific research that will be included will be that of raised median safety impacts from both a traditional analysis methodology and using Bayesian methods, as well as an analysis of access management techniques (e.g., corner clearance, access spacing, median openings, etc.) at major-arterial intersections. The purpose of the paper will be to present references to papers that provide an overview on the safety impacts of access management such that the reader can review the details and specific analysis results of these and other safety studies. The results of the analyses indicate that access management techniques play a significant role in improving and maintaining safety along urban arterials and at major-arterial intersections.

INTRODUCTION

Access management is defined by the Transportation Research Board (TRB) as "the coordinated planning, regulation, and design of access between roadways and land development. It encompasses a range of methods that promote the efficient and safe movement of people and goods by reducing conflicts on the roadway system and at its interface with other modes of travel" (TRB 2014). Access management has been shown to have a positive impact on roadway safety. Numerous studies have been conducted on the safety relationship of access management techniques as a function of access spacing, corner clearance, and medians. Several of these studies have been conducted in the United States, including several studies completed in the state of Utah (Olsen et al. 2011; Schultz 2011; Schultz et al. 2010a; Schultz et al. 2008a; Schultz and Braley 2007; Schultz et al. 2008b; Schultz et al. 2009; Schultz et al. 2010b; Schultz and Lewis 2006; Schultz et al. 2007; Schultz et al. 2010c; Schultz et al. 2011). These studies have been conducted in urban and suburban settings in Utah. As such, the results are somewhat specific to Utah and U.S. settings; however, the

principles, when applied to the individual circumstances, are appropriate in settings throughout the world.

Research performed by researchers at Brigham Young University (BYU) for the Utah Department of Transportation (UDOT) is highlighted in this paper. Specific research includes raised median safety impacts from both a traditional analysis methodology and using Bayesian methods, as well as an analysis of access management techniques (e.g., corner clearance, access spacing, median openings, etc.) at major-arterial intersections. The purpose of the paper will be to present the abstract and corresponding references to papers that provide an overview on the safety impacts of access management such that the reader can review the details and specific analysis results of these and other safety studies. Because the highlighted research has been published previously, this paper will not attempt to report on the results of the research, but will rather provide references to the reader to obtain these documents. Overall, the results of the different papers and analyses indicate that access management techniques play a significant role in improving and maintaining safety along urban arterials and at major-arterial intersections. The following sections will present the reference and abstract for the research highlighted.

ACCESS MANAGEMENT RESEARCH

Analyzing Safety using Bayesian Methods

The first series of research was conducted to analyze the safety benefits of raised median implementation using Bayesian statistical methods. The abstract for the research project states: “Recent research suggests that traditional safety evaluation methods may be inadequate in accurately determining the effectiveness of roadway safety measures. In recent years, advanced statistical methods are being utilized in traffic safety studies to more accurately determine the effectiveness of roadway safety measures. These methods, particularly Bayesian statistical techniques, have the capabilities to account for the shortcomings of traditional methods. Hierarchical Bayesian modeling is a powerful tool that more fully identifies a given problem than a simpler model could. This report explains the process wherein a hierarchical Bayesian model is developed as a tool to analyze the effectiveness of two types of road safety measures: raised medians and cable barrier. Several sites where these safety measures have been implemented in the last 10 years were evaluated using available crash data. The results of this study show that the installation of a raised median is an effective technique to reduce the overall crash frequency and crash severity on Utah roadways…The tool developed through the research can now be utilized for additional analyses, including hot-spot analysis, before-after change, and general safety modeling” (Schultz et al. 2010c).

Several additional papers were prepared based on the results of this research that are available in the literature (Olsen et al. 2011, Schultz et al. 2011).

Crashes at Major Arterial Crossroads

The second series of research was conducted to analyze crashes in the vicinity of major arterial crossroads. The abstract for the research project states: “Major

crossroads are designed to facilitate the conflicting movements of numerous vehicles in a manner that is both safe and efficient. Accesses located within the functional areas of major crossroads add complication to intersection activity. In this research, the impact of accesses on crashes within major crossroad functional areas was analyzed. The statistical analyses show that the existence of accesses within the functional areas was correlated with increased crashes and crash severity costs. In particular, an increase in commercial access density was associated with increases in crash totals, crash rates, and rear-end crashes in intersection functional areas. The analyses also showed that study site intersections meeting [UDOT] corner clearance standards exhibited fewer right-angle crashes and lower crash severity costs. Finally, intersections that prohibited all unsignalized access had lower crash totals, crash rates, right-angle crash totals, and rear-end crash totals than intersections that allowed some unsignalized access" (Schultz et al. 2008a).

One additional paper based on the results of this research is available in the literature (Schultz et al. 2010a).

Prioritizing Access Management Implementation

The third series of research was conducted to prioritize access management implementation and to identify when access management treatments should be implemented. The abstract for the research project states: "Appropriate access management techniques can improve the safety and efficiency of arterial roads. To determine which roads can most benefit by the implementation of access management techniques, a prioritization process was developed to recommend various access management treatments. To serve as the basis for the performance index, a database was created including identifying features, characteristics, and crash history for 175 arterial road segments on Utah state routes. Stepwise linear regression was applied to the data collected to determine which characteristics of the roads were correlated with crash rate, crash severity, and specific collision types. Recommendations for access management treatments were given in the form of a decision tree to classify existing or future road segments into subcategories based on volume, signal spacing, land use, and other criteria, with recommendations provided for each subcategory" (Schultz and Braley 2007).

Additional papers based on the results of this research are also available in the literature (Schultz et al. 2008b, Schultz et al. 2009, Schultz et al. 2010b).

Safety Benefits of Access Management

The fourth, and earliest, series of research was conducted to determine the safety benefits of access management implementation. The abstract for the research project states: "Access management techniques such as raised median installation and driveway consolidation improve safety conditions for motorists. Several locations where these access management techniques have been installed in the state of Utah were selected for analysis of the safety benefits. Although crash rates were not necessarily reduced as a result of the access management techniques, other safety improvements were observed. The raised medians generally reduced the more serious types of collisions, which resulted in a decrease in the severity of crashes. The fatality

rates generally decreased as crashes became less severe. Because fatalities and the overall severity of crashes decreased, the overall cost of crashes was reduced. The cost of installing the raised medians was easily recouped by this reduction in the cost of crashes" (Schultz and Lewis 2006).

As with other studies, one additional paper based on the results of this research is available in the literature (Schultz et al. 2007).

CONCLUSIONS

The purpose of this paper was to highlight research performed at BYU for UDOT on access management related topics. Specific research included raised median safety impacts from both a traditional analysis methodology and using Bayesian methods, as well as an analysis of access management techniques (e.g., corner clearance, access spacing, median openings, etc.) at major-arterial intersections. The paper has summarized the abstract for several research studies and provided references to papers that provide an overview on the safety impacts of access management such that the reader can review the details and specific analysis results of these and other safety studies. The overall results of the different papers and analyses indicate that access management techniques play a significant role in improving and maintaining safety along urban arterials and at major-arterial intersections when installed correctly.

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