Safety effects of unsignalized superstreets in North Carolina

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Arterials across the United States are experiencing far too many collisions. Agencies tasked with improving these arterials have few available effective solutions. Superstreets, called restricted crossing u-turns by the Federal Highway Administration (FHWA), are part of a menu of unconventional arterial intersection designs that may provide a promising solution. Up to this point, there is little valid information available on the safety effects of superstreets, as study results have been from basic analyses that only account for traffic volume changes. The purpose of this research was to determine the safety effects of the unsignalized superstreet countermeasure on existing arterials in North Carolina.

The safety study involved traffic flow adjustment, comparison-group, and Empirical Bayes analyses of 13 unsignalized superstreet intersections in North Carolina. The superstreets have been installed in the last few years across the state as opportunities presented themselves, but not necessarily at the most hazardous sites. The unsignalized superstreet countermeasure showed a significant reduction in total, angle and right turn, and left turn collisions in all analyses. Analyses also showed a significant reduction in fatal and injury collisions. The authors recommend that future analysts use a crash modification factor of 46 percent when considering the conversion of a typical unsignalized arterial intersection into a superstreet.

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1. Introduction

Divided four-lane arterials in rural and suburban areas across North Carolina and the United States experience far too many collisions, especially at unsignalized intersections. Drivers making turns to or from the minor street, or left turns from the major street, at such locations often face difficult decision making tasks and sometimes make errors that result in collisions.

Agencies tasked with fixing the intersections on these arterials have few available good solutions. Conversion of an intersection to an interchange can prevent many collisions, particularly on the major road, but the cost is high and the potential environmental disruption is great. Interchange projects typically cost $10 million or so in North Carolina, while unsignalized superstreet projects typically cost about $400,000 (approximate 2010 costs). Installing signals is expensive – typically $200,000 in North Carolina – adds delay to the major road, and can produce an increase in rear end collisions. Better warning signs and signals can help but usually only treat a small portion of the problem. Agencies in the US are reluctant to install roundabouts at intersections in rural or suburban areas between arterials and lower-volume minor streets because of the high speeds on the arterial, the imbalanced volumes, and the mixed safety record of multilane roundabouts in the US.

Superstreets are a part of a menu of unconventional intersection designs that may provide promising solutions for congested and/or unsafe arterials. They have the potential to move more vehicles efficiently and safely through the same amount of pavement as conventional intersections, at-grade, with minimal disruptions to the surrounding environment and businesses. To this point, there is little valid information available on the effects of superstreets however. Studies have been done analyzing the safety of this design, but the results are from analyses which do not account for many sources of variability in the data. There has never been an Empirical Bayes (EB) evaluation to account for regression-to-the-mean (RTM) on the safety effects of existing superstreets.

The purpose of this research was to fill the information gap and determine if superstreets at unsignalized intersections on four-lane divided arterials are providing safety benefits for North Carolina motorists. The research team determined the safety impacts of unsignalized superstreets through traffic flow...