SAFE-D
SAFETY THROUGH DISRUPTION

Project Brief

Vehicle Operating Speed on Urban Arterial Roadways

Safe-D Project TTI-01-04:
Influences on Bicyclists and Motor Vehicles Operating Speed within a Corridor

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Introduction

With mounting evidence of its health benefits, bicycling as a transportation mode has become increasingly popular in recent years. The greater number of bicyclists on urban/suburban streets may affect vehicle drivers' speed selections. The hypothesis is that the roadway becomes safer for cyclists as their numbers increase and a greater number of cyclists are visible to motorists, making drivers more cautious about keeping sufficient lateral clearance and reducing speed. Identifying the amount of speed change as a function of the number of bicyclists could provide a better understanding of the potential for changes in bicyclist-vehicle crashes, including variations in crash severity levels. The primary goal of this research was to identify key contributing factors that influence vehicle operating speeds, including the presence of bicyclists on suburban arterials.

The collection of on-road speed data provides the opportunity to compare that data with crowdsourced data. There are a number of technologies, such as Bluetooth or GPS probe vehicles, that can be used to collect travel time and speed data, which private companies gather and sell for several applications. Due to the expense of collecting on-site travel performance measures, such as delay or spot speeds, and with the growing availability of crowdsourced data, the research team investigated whether there is a reasonable protocol for using crowdsourced data as a representation of operating speeds at a select location or along a corridor.

Research Objectives

This research explored (1) the relationship between suburban vehicle operating speeds and roadway characteristics, especially the presence of bicyclists and (2) whether crowdsourced speed data can be used to estimate the unconstrained speed for a location. As these relationships may be based on the geometric and traffic control device characteristics for the area, those variables were obtained and used in the evaluations.

Conclusions and Recommendations

Both vehicle volume per lane and bicycle volume were found to be influential in affecting average speeds on lower speed suburban arterial roadways. For 40.3 km/hr (25 mph) sites, an increase of 19 vehicles per 15-min period would decrease average speeds by 1.6 km/hr (1 mph), and an increase of more than 39 bicyclists per 15-min period would decrease average vehicle speeds by a similar amount. Because of the limited number of 15-min periods with bicycle counts greater than one, the research team also developed a model using all available 15-min periods with on-road speed data. Speed and volume data in 15-min increments for 2 weeks at nine sites were obtained using on-road tubes and via a crowdsourced speed data vendor. The difference between the tube data and the crowdsourced data was calculated as TMCS—a representation of tube (T) minus (M) crowdsourced (CS) data. The geometric variables that had the greatest influence on TMCS were the number of signals and the number of driveways within a corridor. When only including non-congested periods, weekends (Saturday or Sunday) were associated with the smallest TMCS.