Analyzing the effect of legislation in children’s safety when they travel as motor-vehicle passengers and bicycle riders can allow us to evaluate the effectiveness in transportation policies. The Child Restraint Laws (CRL) and Bicycle Helmet Laws (BHL) were studied by analyzing the nationwide Fatality Analysis Reporting System (FARS) to estimate the fatality reduction as well as drivers’ decisions to use Child Restraint Systems (CRS) and bicycle helmets respectively. Differences in legislation could have different effects on traffic fatalities. Therefore, this study presents multiple methodologies to study these effects. Traffic safety theory has several proven statistical models that can be applied depending on the data characteristics, targets and statistical analyses. Using the theory and predictive data analysis, guided the process to attempt different models leading at the end to the development of three specific models to best estimate the effectiveness of these laws. By using these models, it was found that legislation in Child Safety Policy has consequences in traffic fatalities. A negative binomial model was created to analyze the CRL influence at the state-level in fatal crashes involving children, and showed that legislating on CRS can reduce the number of fatalities by 29% for children aged 5 to 9. Additionally, at the drivers’-level a logistic regression model with random effects was used to determine the significant variables that influence the driver’s’ decision to restrain his/her child. Such variables include: driver’s restraint use, road classification, weather condition, number of occupants in the vehicle, traffic violations and driver’s and child’s age. It was also shown that drivers from communities with deprived socio-economic status are less likely to use CRS. In the same way, a binary logistic regression model was developed to evaluate the effect of BHL in bicycle helmet use. Findings from this model show that bicyclists from states with the BHL are 236 times more likely to wear a helmet compared to those from states without the BHL. Moreover, the bicyclist’s age, gender, education, and income level also influences bicycle helmet use. Both studies suggest that enacting CRL and BHL at the state-level for the studied age groups can be combined with education, safety promotion, enforcement, and program evaluations as proven countermeasures to increase children’s traffic safety. This study evidenced that there is a lack of research in this field, especially when policy making requires having enough evidence to support the laws in order to not become an arbitrary legislation procedure affecting children’s protection in the transportation system.

Major: Civil Engineering

Educational Career:
Bachelor’s of Civil Engineering, BS, 2004, University of Cauca

Committee in Charge:
Mohamed Abdel-Aty, Chair, Civil, Environmental, & Construction Engineering
Jaeyoung Lee, Civil, Environmental, & Construction Engineering
Naveen Eluru, Civil, Environmental, & Construction Engineering

Approved for distribution by Mohamed Abdel-Aty, Committee Chair, on March 8, 2017.

The public is welcome to attend.