

## ABSTRACT

Figueroa Medina, Alberto M. PhD, Purdue University, May, 2005. Subjective and objective risk implications in highway design. Major Professor: Andrew Tarko.

The investigation of the highway crash occurrence and its causation has certainly been a prominent research subject in recent decades due to its significant impact and cost to society. Highway crashes are random events that are caused by many and very different contributing factors. The principal crash factors can be categorized as roadway, vehicle and driver factors and their relationship with crashes is extremely complex.

Highway design principles are based primarily on sound engineering judgment and experience. Misinterpretation of the risk by drivers has been identified as a primary factor resulting in crashes on the highway. It is generally accepted that a link exists between the objective risk and the subjective risk that is determinant in the likelihood of a crash. Decades of intense research have resulted in models that link separately the roadway characteristics with the operating speed or the crash rate. However, the relationship between risk perception (subjective risk) and crash rate (objective risk) has not been fully researched. This study seeks the opportunity to measure and evaluate the drivers' risk perception of highway sections that will provide new insight to the relationship between the objective risk and subjective risk. The results from a video-based survey provide an understanding of the effects of the roadway and driver

demographic characteristics on the risk perception that can contribute to the design of safer highway conditions.

The goal of this research is to present the results from an exploratory analysis of the relationship between the roadway characteristics, human behavior and highway safety. An advanced econometric model that links human behavior (free-flow speeds), risk perception and roadway geometry features was developed in this research. Roadway characteristics, free-flow speeds and crash data from four-lane highway sections in Indiana were collected to develop the econometric model. The model results provide a valuable contribution to the highway safety and highway design fields. The incorporation of crash and human behavior factors will improve the safety evaluation of highway sections by identifying the roadway features that affect the risk perception of drivers, and will provide more insight of the relationship between risk perception and crashes.