Illegal U-turn violations are considered part of the Wrong-Way Driving (WWD) maneuvers that could result in head-on crashes and severe injuries, which are often severe because of the high speed of the approaching traffic and limited time to avoid such crash. Therefore, reviewing this type of violation and understanding the contributing factors that may lead drivers to commit such illegal maneuver would help officials foresee and consequently minimize the potential risks that could lead to WWD crashes. The purpose of this thesis is to investigate the illegal U-turn maneuvers on limited access facilities and find the significant contributing factors that encourage or discourage drivers to commit this type of violation. The study area included the Central Florida area (CF), and the South Florida (SF) area. About 6 crossover crashes and 620 citations were found at the median facilities in the study areas from year 2011 to 2016.

The modeling methodology for this thesis had three goals: predicting the number of illegal U-turn violations across the traversable grass median sections per year using a Poisson regression model, selecting the most effective variables in predicting the illegal U-turn violations using the least absolute shrinkage and selection operator (LASSO) variable selection method, and estimating the probability of an illegal U-turn violation occurrence at a paved median opening for official use only per year, using a logistic regression model.

To determine the variables that influence the illegal U-turn violations, 9 geometric design and 2 traffic conditions exploratory variables were analyzed in the models mentioned earlier. Several variables were found significant from the Poisson model such as the distance to the nearest interchange, the length of the median segment, the number of access points in the segment, the median design, and the speed limit. Afterwards, the LASSO method concluded that the most effective variables found were the median design and the distance of to the nearest interchange.

The logistic regression model in the CF area indicated that the speed limit and the AADT as the significant contributing factors. However, in the SF area the significant variables were the distance to the nearest access point and the spacing between the median openings. The variation in results indicates a considerable difference between the two study areas that should be accounted for during the planning phases for allocating the median countermeasures.

The significant variables found in the mentioned modeling approach provide a first attempt to understand the illegal U-turn violations on limited access highways, and interpret the variables which influence drivers' behavior in performing such illegal maneuver. Along with required design guidelines, the models found could be used as effective planning tools to select the appreciate locations for installing new median openings and reevaluating the existing median openings to identify locations with the lowest potential risk.

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