The focus of this dissertation was to examine wrong-way driving (WWD) events on Florida Toll Roads and Interstates. Most of the previous research focused only on WWD crashes. While WWD citations and 911 calls data is abundant, this data has been largely overlooked in other studies. This dissertation provides a novel and holistic approach for evaluating WWD risk that uses risk factors such as WWD citations and 911 calls in addition to WWD crashes. WWD crashes are rare because they are less than 3% of all crashes, which makes them difficult to predict and analyze. WWD is very dangerous especially on high-speed limited access facilities. There is an average of 300 to 400 fatalities every year in the United States due to WWD. There were 386 fatalities in Florida due to WWD crashes from 2007-2011; this ranked Florida third in terms of total WWD fatalities.

The majority of WWD crashes occur during late night hours, and these crashes can be attributed to intoxicated drivers, confused/elderly drivers, and suicidal drivers. However, these are not all of the reasons causing WWD and it is important to look beyond just crash events.

This research focused on two major toll road networks in Florida, which were the Central Florida Expressway (CFX) and the Florida Turnpike Enterprise (FTE). Overall, WWD crashes on the FTE system accounted for around 0.45% of all crashes, but accounted for 1.5% of fatal crashes. WWD on FTE shows that 15.2% of these crashes are usually fatal compared to 2% of all WWD rural freeway crashes. 15% of the WWD citations in the FTE dataset resulted in a crash. While analyzing the citation events, it has been found that they commonly do not result in crashes. WWD Traffic Management Center SunGuide data was explored in depth for the FTE system. 55% of the SunGuide events were never found, 11% were pulled over by Law Enforcement Officers (LEO), and 8% of the events resulted in crashes. 19% of the events were false calls. In 3% of the events drivers corrected their WW action without an incident or crash.

The relationships between non-crash events and crash events were explored using several models developed in this dissertation. Weighted crash risk values that take into account all three types of WWD events (crashes, citations, and 911 calls) were created using the developed models from this research and were applied to rank locations that are in need for enhanced WWD countermeasures. SR 821 is one of the hottest routes for WWD in Florida. It ranked high in terms of WWD crash risk using a statewide developed model in this dissertation. Furthermore, a microscopic model was developed to help agencies focus on the highest WWD risk segments within a corridor.

Florida toll road agencies are testing enhanced/flashing "Wrong Way" signs at exit ramps. These flashing devices add emphasis to the existing “Wrong Way” signs at the exit ramps. The CFX application of the Rectangular Rapid Flashing Beacon (RRFB) for “Wrong Way” signs is an entirely new concept that was first tested in Central Florida. The implementation of enhanced Intelligent Transportation System (ITS) countermeasures shows that Florida toll road agencies are diligently working to reduce the risk of WWD crashes and non-crash events with the end goal of saving lives and money.

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