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# Modeling Impact of Acute Glucose on Speed Limit Adherence in Drivers with Diabetes

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## Abstract

Diabetes Mellitus is one of the leading causes of death around the world. Currently, 34.2 million adults in the United States are diagnosed with diabetes. They lead a life monitoring their blood glucose levels and remain vigilant in performing their daily activities. Countries around the world consider drivers with diabetes as a high-risk group. They face severe driving restrictions or frequent medical exams. Research shows that subjects with diabetes are prone to symptoms of cognitive and motor impairment; any of these during driving can be hazardous. However, many of these studies lack studying the direct correlation between diabetes and driving. Their main drawback was the inability to study the driving behavior in real-time. Even studies that looked at driving and diabetes particularly did not draw conclusions based on naturalistic data due to challenges in replicating real-world scenarios and controlling their blood glucose levels. Naturalistic driving studies help break this barrier and offer an efficient approach to studying the driver in their natural environment. Hence, this paper analyzes naturalistic driving data of drivers with diabetes to identify factors increasing their risk for traffic accidents. Data from in-vehicle sensors, cumulative glucose monitors, and statewide geographical information systems are collected for drivers with Type 1 Diabetes Mellitus (T1DM), drivers with Type 2 Diabetes Mellitus (T2DM), and other healthy drivers. A mixed-effects model analyzes the impact of the acute glucose episodes and traffic characteristics on speed limit adherence, calculated as the difference between the driver's speed and the speed limit. The results indicate a strong influence of acute glucose episodes on speed limit adherence in T1DM drivers. However, T2DM drivers remain unaffected by acute glucose episodes. Road conditions influence speed limit adherence in both cases, with a larger effect on T2DM drivers.