



The effects of precipitation on traffic accidents in Sofia, Bulgaria

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Introduction: In Bulgaria road safety is a problem of high importance in terms of its medical, social and economic consequences. Over the last 20 years an average of 1106 people died, and 8301 were injured, in car accidents annually. Bulgaria is among the countries with the highest number of traffic deaths per one million people. Therefore it is important to study the factors leading to road accidents. Among them, meteorological factors play an important role. In the present article we research the effect of precipitation on road safety as one of the most important meteorological elements affecting traffic and the number of accidents.

Data and method: We used daily information for the number of minor and serious road accidents in the city of Sofia for the period October 2001 - January 2009. The number of traffic accidents on days with precipitation was compared with the number of accidents on days without precipitation. Statistical processing of the output information included the method of comparative analysis (t-test).

Results: There are statistically significant differences between the numbers of traffic accidents in different weather conditions. The number of minor traffic accidents is statistically higher during days with precipitation over 0.1 mm per day ($x=125,1$) than on days without precipitation ($x=110,95$). Considering the fact that traffic is lighter during rainy and snowy periods, the results are even more significant. The aggregate state of precipitation also influences the number of accidents. In days with liquid precipitation (rain, drizzle, dew, etc.) the number of minor road accidents increases slightly ($x=116,3$). Accident numbers are highest during periods of frozen precipitation (snow, hail, etc.) ($x=124,4$). The number of serious traffic accidents is highest during periods of liquid precipitation compared with periods without precipitation, or with solid precipitation; with a result very close to the statistically significant level. Atmospheric precipitation (rain, drizzle, snow, hail, etc.) is also connected to higher numbers of minor accidents compared to surface condensation (dew, frost and black ice).

Conclusion: The obtained results could be useful in terms of taking preventive measures, affecting drivers' and pedestrians' behavior in bad weather, and for the improvement of vehicles and the characteristics of roadways.

Keywords: precipitation, traffic accidents, road safety