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INFLUENCE OF WEATHER CONDITIONS ON FATAL ROAD ACCIDENTS ON HIGHWAYS AND URBAN AND RURAL ROADS IN ROMANIA

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ABSTRACT–This paper investigates the relationship between different weather conditions and the monthly road traffic accidents (N_{acc}) that caused injuries and fatalities between 2011 and 2014 on the Romanian highways and urban and rural roads. The monthly average temperatures (M_{AT}) and precipitation amounts (M_{APA}) and other weather factors influencing the road environment and drivers are also taken into account on a monthly basis: sleet, snow, ice storm, rain showers, showers rain, mixed precipitation, snow storm, wind intensification, fog, rime, glazed frost, hoar frost and drizzle. Multiple linear regressions have been applied and tests on both their global significance and individual meanings of the explanatory variables' coefficients have been conducted. M_{AT} and rain showers are partly correlated with N_{acc} and the fatalities produced in urban and rural areas. This paper shows that in case of increasing M_{AT} with 1 ºC, this will lead to an increase of 2.42 % of the N_{acc}. As this is the first research having been done on this topic in Romania, a surprising conclusion was that M_{APA} do not explain N_{acc} at all, fact that is not in line with the other studies' findings showing a relevant influence of the precipitation on the traffic accidents.

KEY WORDS : Road fatalities, Weather factors, Multiple linear regressions, Road accidents models, Road safety

NOMENCLATURE

N_{acc} : number of monthly road traffic accidents that caused fatalities and injuries, (-)
N_{gacc} : number of monthly road traffic accidents that caused fatalities and serious injuries, (-)
N_{sacc} : number of monthly road traffic accidents that caused only slight injuries, (-)
H_f : number of fatalities recorded on highways, (-)
R_f : number of fatalities recorded on rural roads, (-)
U_f : number of fatalities recorded on urban roads, (-)
M_{AT} : monthly average temperatures, (ºC)
M_{APA} : monthly average precipitation amounts, (mm)
SL : monthly presence of sleet, (-)
SN : monthly presence of snow, (-)

1. INTRODUCTION

The influence of the weather factors on road safety is a research subject that has attracted a considerable interest in the field literature (Karlaftis and Yannis, 2010), but, in the same time, generated conflicting results and findings. Air temperatures, as well as the precipitations, have an important impact on the road safety, since they affect both traffic volumes and the driver behavior.

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In a paper that investigated the relationship between precipitation and the traffic accidents occurring in US, a surprisingly negative and significant relationship between monthly precipitation and monthly fatal crashes was found (Eisenberg, 2004).

We have to point out that the findings of many studies are different since the country where they have been conducted faces different weather conditions. On a study regarding the fatal road traffic accidents, (Brodsky and Hakkert, 1988) it is found that, during rainy conditions, the crash rate increased over 100 % for the crashes that took place in US, meanwhile, in Denmark, the increase was not significant. In two other countries, Norway and Sweden, there are no changes in the crash rate (Fridstrøm *et al*., 1995).

While many studies are analyzing the influence of precipitations on crashes aggregated on a monthly basis (Scott, 1986; Fridstrøm *et al*., 1995; Shankar *et al*., 1995; Eisenberg, 2004; Bergel-Hayat and Depire, 2004; Hermans *et al*., 2006a), only a very few of them are dealing with air temperatures recorded at the moment of crashes (Malyshkina *et al*., 2008).

Another interesting debate topic found in the literature is how to analyze the crash data: either on a daily or on a monthly basis? Both methodologies have advantages and disadvantages. While changes in crash counts on a highly aggregated level can be explained by structural changes,