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Zijn er meer verkeersongevallen als het regent? Verkennende analyse van de invloed van de weersomstandigheden op het aantal verkeersongevallen in België

Y a-t-il plus d'accidents de la route quand il pleut ? Analyse exploratoire de l'influence des conditions météorologiques sur le nombre d'accidents de la route en Belgique.

Objective and methodology

The Belgian Road Safety Institute monitors changes in the number of road accidents and casualties through various publications. However, its role is not limited to describing the trends it observes: it also has the responsibility of explaining these trends. This study is part of this explanatory perspective. With the aim of exploring, it is an exploratory first step in studying the impact of the weather on accidents. More specifically, its purpose is to determine how weather conditions do or do not influence the daily occurrence of injury- and fatal accidents in Belgium.

To this end, we compared the average number of accidents recorded on days for which a particular weather condition applied to those recorded on days with ‘normal’ weather. The impact of six meteorological parameters is investigated: rain, snow, fog, strong wind, temperature and two composite indicators characterizing days with “good” and “bad weather”. It is also investigated how the impact of a single meteorological parameter varies depending on the type of user (pedestrian, cyclist, motorcyclist, car, van or truck) and the time of the week (weekday or weekend).

The analyses are based on road accidents involving injuries (or fatalities) recorded in Belgium between 2003 and 2012. The accident data are obtained from the database of casualties compiled by the police and made available by Statistics Belgium (Directorate-General for Statistics and Economic Information of the FPS Economy). The weather condition for each day were either based on the meteorological variables within the accident forms or on data from the Belgian Royal Meteorological Institute.

Main results

For each weather condition and each type of road user, the average number of injury accidents recorded per day was compared to the average number of accidents on a normal day. Figure 1 gives an overview to these comparisons. Conditions that are associated with a higher number of accidents as compared to normal days are indicated in red with arrows pointed upwards, while conditions associated with fewer accidents are indicated in green with downwards arrows. The strength of the effects are indicated by the number of arrows. Only statistically significant effects are reported.

The most striking results are the following:

- ▶ The weather condition that most strongly influences the daily number of accidents is a combination of dry, relatively warm and relatively sunny weather for the season. In these circumstances, the average recorded accidents per day involving injury is 18.5% higher as compared to “normal” days.
- ▶ Snow forms the second most influential meteorological factor and is beneficial in terms of road safety: compared to “normal” days, there was a decrease of 12.2% in the number of accidents involving injury on days that were both snowy and rainy (in Belgium, on snow days, it mostly rains as well).
- ▶ Bad weather (according to a composite index), cold temperature and hot temperature all have statistically significant effects. However, the difference to normal days is relatively small. Bad weather is associated with a decrease of 9.8% in the daily number of accidents involving injury. A relatively cold day for the season is associated with a 7.1% decrease in the number of accidents. And a relatively hot day records an 9.0% increase in the number of accidents.
- ▶ For foggy days and rainy days no difference to the overall number of accidents on normal days was found.

The analyses furthermore demonstrate that a change in the total number of accidents is often the result of strong increase in the number of accidents involving two-wheeled vehicles (bicycle or motorcycle). These are accidents involving those users who are most sensitive to weather conditions. It is very likely in this case that increases or decreases noted in the number of two-wheelers accidents primarily reflect changes in the number of two-wheelers on the road rather than changes in the risk to have an accident.

For injury accidents involving trucks, the daily number varies very rarely according to weather. For accidents involving cars or vans the effects are significant but small and differ with respect to whether they increase or decrease the number of accidents.

Figure 1: Overview of the impact of different meteorological conditions on daily number of injury accidents, per road user type.

Comparison with normal days					
Meteorological factor studied		Rain	Snow and rain	Fog and rain	Strong wind and rain
Period of analysis		Year	December to March	September to February	November to February
Days selected for analysis		Rainy days (only rain, strict definition) (702 days)	Days of snow and rain only (151 days)	Days of fog and rain only (107 days)	Days of strong wind and rain only (151 days)
Control days		Normal days (555 days)	Normal days (95 days)	Normal days (123 days)	Normal days (95 days)
Injury accidents	Total	→	↘↘	→	↗↗
	Pedestrian	→	→	→	↗↗
	Cyclist	↘↘↘	↘↘↘	↘↘	→
	Motorcyclist	↘↘↘	↘↘↘	↘↘↘	↘↘
	Car	↗	↘	→	↗↗
	Car only	↗↗	↗↗	↗↗	↗↗
	Car against car	↗↗	↗	↗	↗↗
	Van	↗	→	→	↗↗
	Truck	↗	→	→	→

Meteorological factor studied		Relatively cold	Relatively hot	Relatively bad weather	Relatively good weather
Period of analysis		Year	Year	Year	Year
Days selected for analysis		Relatively cold days for the season (763 days)	Relatively warm days for the season (750 days)	Relatively gloomy days for the season (355 days)	Relatively fine days for the season (203 days)
Control days		Days at normal temperature (2140 days)	Days at normal temperature (2140 days)	Normal days (265 days)	Normal days (265 days)
Injury accidents	Total	↘	↗	↘	↗↗↗
	Pedestrian	↘	↗	↘	↗
	Cyclist	↘	↗	↘↘↘	↗↗↗
	Motorcyclist	↘	↗	↘↘↘	↗↗↗
	Car	↘	↗	↘	↗↗↗
	Car only	→	→	↗↗	→
	Car against car	→	→	↗	↗
	Van	→	↗	→	↗
	Truck	→	↗	→	→

Source: Statistics Belgium & the Royal Meteorological Institute

Analysis and interpretation: BRSI

Additional analyses were also conducted to assess the impact of weather conditions on the severity of accidents, and the variability of this impact depending on the time of week (week versus weekend). It turns out that the severity of accidents shows little variation depending on the weather conditions. Similarly, the effect for most meteorological parameters on the number of accidents is the same on weekdays and weekends. Only for a few cases there was a significant interaction, in particular for rainy days and days with bad weather. For motorcyclists, however, the moment of the week does seem to play a significant role in the sense that the effects of rain, fine weather, and bad weather [on the number of accidents involving a motorcycle] are stronger during the weekend.

A major limitation of this study is the confound between effects on the mobility of users and impacts on the accident risk (the probability of having an accident for a certain distance covered). It is very likely that the impact of weather on the number of accidents is largely due to an increase or a reduction in mobility.

To disentangle these two types of effects, mobility data for all types of road users at a low temporal resolution are needed.

This pilot study nevertheless identifies the meteorological parameters that have a positive impact, or on the contrary a negative impact, on the accident rate in Belgium. It shows, moreover, how this influence does (or does not) vary depending on the type of user and time of the week. It thus provides a first framework for interpreting changes in the number of accidents and forms the basis for further studies investigating in more detail the impact of the weather in terms of road safety in Belgium.



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