International Co-operation on Theories and
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Quantifying Hydén's traffic safety pyramid

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Based on a rich crash data-base for Berlin, Germany, covering the years 2001 to 2022, the weekly pattern of all crashes $N_0(t)$ (where t is the hour of the week, and $t = 0$ corresponds to the first hour on Monday morning 0:00 – 0:59), crashes with minor injuries $N_1(t)$, crashes with severely $N_2(t)$ and crashes with fatally injured persons $N_3(t)$ are compared to each other. Each of the four curves in Figure 1 displays a strong weekly pattern (in case of $N_3(t)$ there was not enough data available to make a clear pattern), which can be attributed mostly to the weekly course of the traffic flow, or slightly more general, the traffic state in each hour of the week. If Hydén's pyramid is considered literally, then these three ratios $r_i(t) = N_i(t)/N_{i-1}(t)$ between the four curves should be a constant when displayed in relationship to the hour of the week. Not surprisingly, they are not.

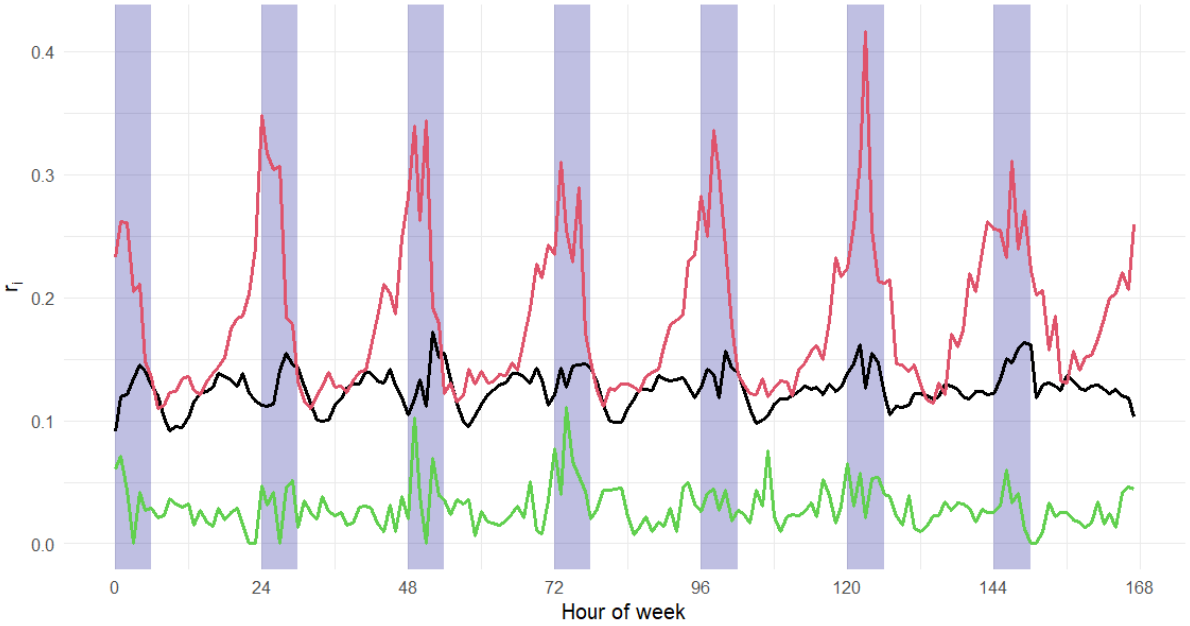

Figure 1. Crash relations $r_i(t)$

The strongest variation could be seen in the ratio between the number of crashes with light and seriously injured, in red: they peak strongly during the night hours, where there are much more crashes with seriously injured persons. The other two ratios display a much weaker weekly pattern, in black are the one between all crashes and the ones with lightly injured persons, and in green the ones between fatally and seriously injured persons.

These results point to an interesting dependency between traffic flow crash severity, which might be interesting to explore further. It may depend partially on the traffic flow, but in addition, biological rhythms of human drivers may shape these relationships.