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INTRODUCTION

Czech core road network = motorways + national roads

- the highest portion of traffic, very dense road network
- interest in safety screening of Czech core road network
- state-of-the-art approach ... need of safety performance functions (SPFs) for all types of network elements (segments, intersections, interchanges) and using them to identify hotspots based on empirical Bayes (EB) method



STUDY OUTLINE

DATA COLLECTION

(crashes, AADT, geometry)

SPF DEVELOPMENT

crashes = f (AADT, geom.)

SAFETY SCREENING

by EB approach (SPF + crashes)

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Safety screening of Czech core road network

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DATA AND METHODS



Function forms were calibrated using the collected data (NB GLM in IBM SPSS). Risk factors were added stepwise, controlling for achieved statistical significance

REFERENCES

- 1. Ambros, J., J. Sedoník, and Z. Křivánková. How to simplify road network safety screening: Two case studies. In 2017 TRB Annual Meeting, Washington, DC. 2. Ambros, J., and J. Sedoník. A Feasibility Study for Developing a Transferable Accident Prediction Model for Czech Regions. Transportation Research Procedia,
- Vol. 14, 2016, pp. 2054–2063.

The results are available at http://sfdi.cdvgis.cz/

For other applications of Czech road safety modelling, see project websites: https://veobez.cdvinfo.cz/ (roundabouts) https://ideko.cdv.cz/ (safety screening of secondary road network) https://dopad.cdvinfo.cz/ (road safety impact assessment)

RESULTS

SPF 1: Interchange conflict points – 4-leg points associated with the highest risk Minimal risk associated with diverge and merge conflict points - Unsignalized points associated with lower risk, compared to signalized (endogeneity?)

- SPF 2: Interchange ramps

- **SPF 3:** Motorway segments

SPF 4: 3-leg intersections on national roads - Presence of turn lanes associated with lower risk, compared to condition without turn lanes

SPF 5: 4-leg intersections on national roads – Type of traffic control device suggests the highest risk at STOP signs (endogeneity?)

SPF 6: Roundabouts on national roads - 3-leg roundabouts associated with lower risk, compared to 4-leg roundabouts Increasing width of truck apron seems to decrease risk

SPF 7: Segments of national roads - Effect of minor intersection density associated with increasing risk

SPFs were used for safety screening, according to empirical Bayes (EB) methodology, which combines predicted and reported crash frequencies (P and R), using weighted average (with weights w):

Potential for safety improvement:

The ranked list of locations were visualized in an online map and handed over to the road agency, which will use them to prioritize and select for improvements.

DISCUSSION AND CONCLUSIONS

The study helped establishing the ranked list of hotspots to be selected for treatment.

Follow-up studies may focus on future SPF updating and improvements, as well as developing crash modification factors to be used in selecting the best countermeasures.



crash frequency associations: decreasing / increasing

– Curved ramps associated with higher risk than straight ramps – Similarly off-ramps, compared to on-ramps.

– Crossroads (minor roads above the mainline motorway) associated with the lowest risk.

AADT coefficient is close to 1, which indicates approximately 1:1 relationship to crashes

 $EB = w \bullet P + (1 - w) \bullet R$

PSI = EB - P(used for safety screening)

- State-of-the-art approach to safety screening applied to complete Czech core road network - Seven SPFs enabled identification of hotspots, as well as studying influence of risk factors (some effects were insignificant, e.g., channelization, parking space along motorway, bypass lanes, urban/rural location; and some categories had unexpected effects ... endogeneity ?) - Using total number of crashes may mask the effect of the factors related to specific severities – Potential omitted variables: speed behavior, vertical alignment, land use, etc.