

## *Safety effects of traffic calming on roads through villages: proactive evaluation using GPS data*



**Jiří Ambros, Jan Kubeček, Jan Elgner**  
CDV – Transport Research Centre



**Mariusz Kieć, Radosław Bąk**  
Cracow University of Technology



### **Contents**

#### **Introduction**

- Characteristic of roads through villages
- Safety problems

#### **The study**

- GPS data collection
- Speed variations (surrogate safety measures)

#### **Results**

- Speed profiles
- Surrogate safety measure based on GPS data

#### **Conclusions**

### **Background**

- Two-lane road sections through small towns or villages
- Variation of speed in built-up area
- High share of heavy vehicles
- Various land use in the road surrounding
- No access control in built-up areas
- Mixed local and through traffic
- Various physical speed management devices

Traffic disruptions and speed changes may be caused by: intersections, accesses, bus stops, pedestrian crossings...

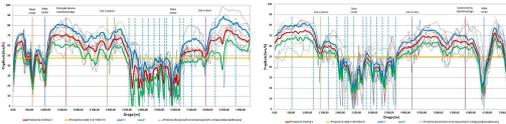


### **Safety problems**

- Speeding problem
  - The safety effects for villages are not always known and may be highly variable, given the differences in design, configuration, or surroundings conditions
  - Overlapping of through traffic with local traffic leading to interruptions, in result changes in speed variations and road safety levels
  - More collision points, and the need for speed reduction, stopping, accelerating, the frequency of the disruptions depends on the land use character
- Many variables have impact on road safety

### Aim of study

- To test a proactive safety evaluation approach, speed data from vehicles on selected roads through a sample of small towns or villages in the Czech Republic and Poland were collected
- The effects include impacts on speed and standard deviation of speeds as well as safety



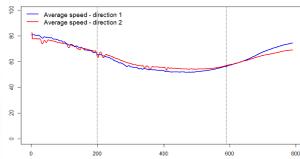
### Method

- Data collection techniques:
  - Test vehicle technique (10 Hz GPS) and video recording - PL
  - Floating Car Data - CZ
- Drives through the villages in both driving directions of each section were conducted and analyzed, in order to collect data on drivers' behaviour
- The collected GPS data was used to obtain representative speed profiles
- Estimation of speed changes, induced by variables, related to cross-section, road surroundings, access, etc.

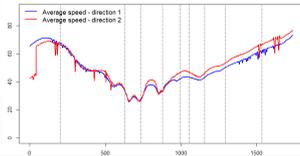


### Results – Czech examples

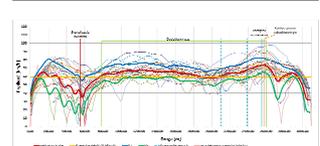
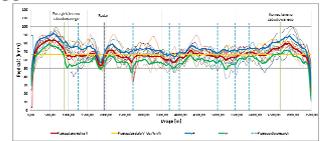
- without calming



- with calming

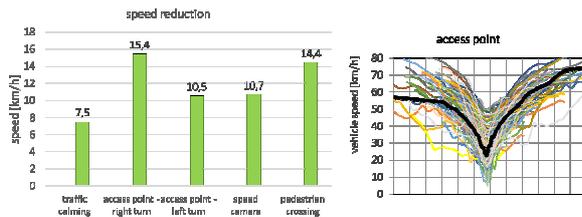


### Results – Polish examples



## Results

Variability of speed across roads through a small towns or villages



## How to assess road safety?

- Low occurrence of accidents
- Many variables: traffic exposure (local and through), variables reflecting geometric features, land use, access

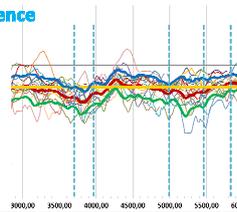
The Traffic Safety Problem = exposure x risk x consequence

## How to assess road safety?

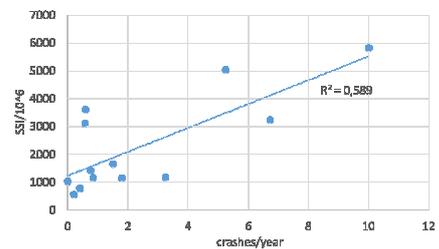
• Safety through villages =  $f$  (speed, changes in speed, AADT)

- $\sigma_i$  – standard deviation of speed at  $i$ -th section - **risk**
- $V_i$  – speed at  $i$ -th section - **consequence**
- AADT – traffic volume - **exposure**
- SSI – speed safety index

$$\sum_{i=1}^n \sigma_i \cdot V_i \cdot AADT = SSI$$



## Speed Safety Index vs. number of crashes



### ***Conclusions***

- The developed method enables using GPS data to obtain speed-based metrics. Speed Safety Index is a promising surrogate safety measure, applicable for proactive safety evaluations.
- Segmentation has to be analyzed because of impact on Speed Safety Index value
- GPS data present a valuable emerging big data source, but they have also limitations, e.g. sampling rate, uncertain estimation of free-flow speed, or generalizability to driving population
- Research needs to find a compatibility between test vehicle technique and Floating Car Data results

*Thank you for your attention*



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