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**
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 $\times$ risk $\times$ consequence

**Speed Safety Index vs. number of crashes**

$$\sum_{i=1}^{n} (V_i - V_{ij} \cdot AADT = SSI$$
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

Jiří Ambros, Jan Kubeček, Jan Elgner
CDV – Transport Research Centre
Mariusz Kieć, Radosław Bąk
Cracow University of Technology