



InDev

IN-DEPTH UNDERSTANDING OF ACCIDENT CAUSATION FOR VULNERABLE ROAD USERS

## The use of surrogate measures of safety in site-based observations of road traffic: a scoping review

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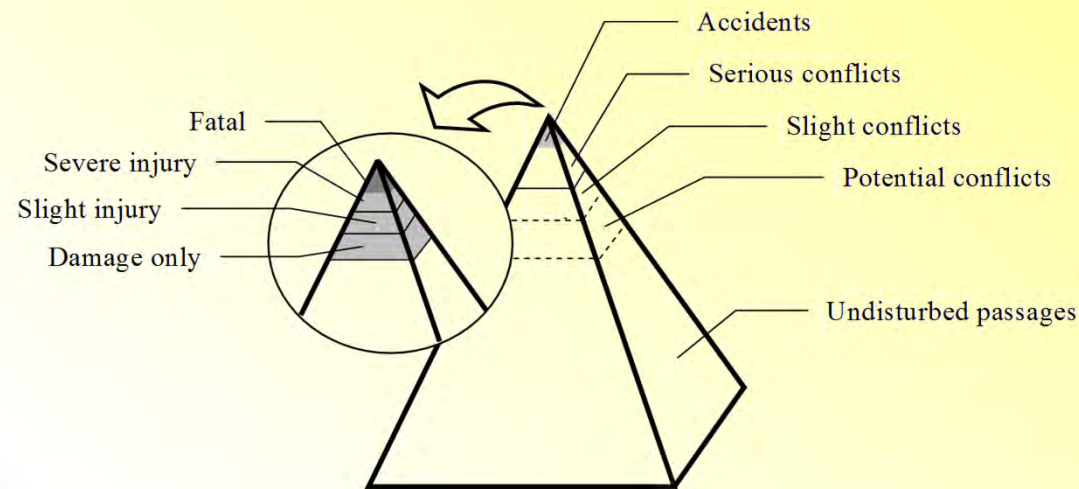
Presenter: Tim De Ceunynck

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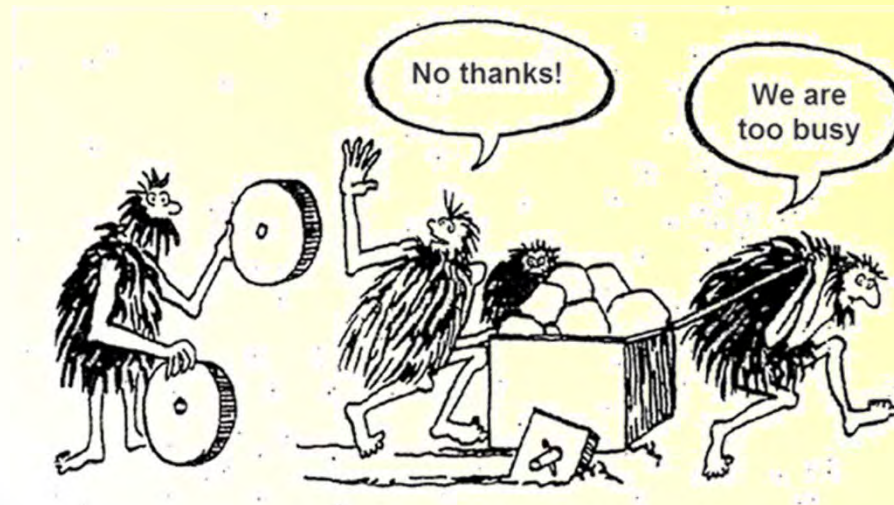
# Introduction

- Surrogate measures of safety:
  - Investigate road safety without relying on accident data
  - Alternative or complement to analyses of accident records



# Introduction

- Great improvements in sensor technologies
  - New opportunities for SSM, but also new challenges
- Literature in the domain is vast and diverse
  - Researchers risk to lose track of critical points of attention
  - „Reinventing the wheel“, double work, errors from the past repeated,...



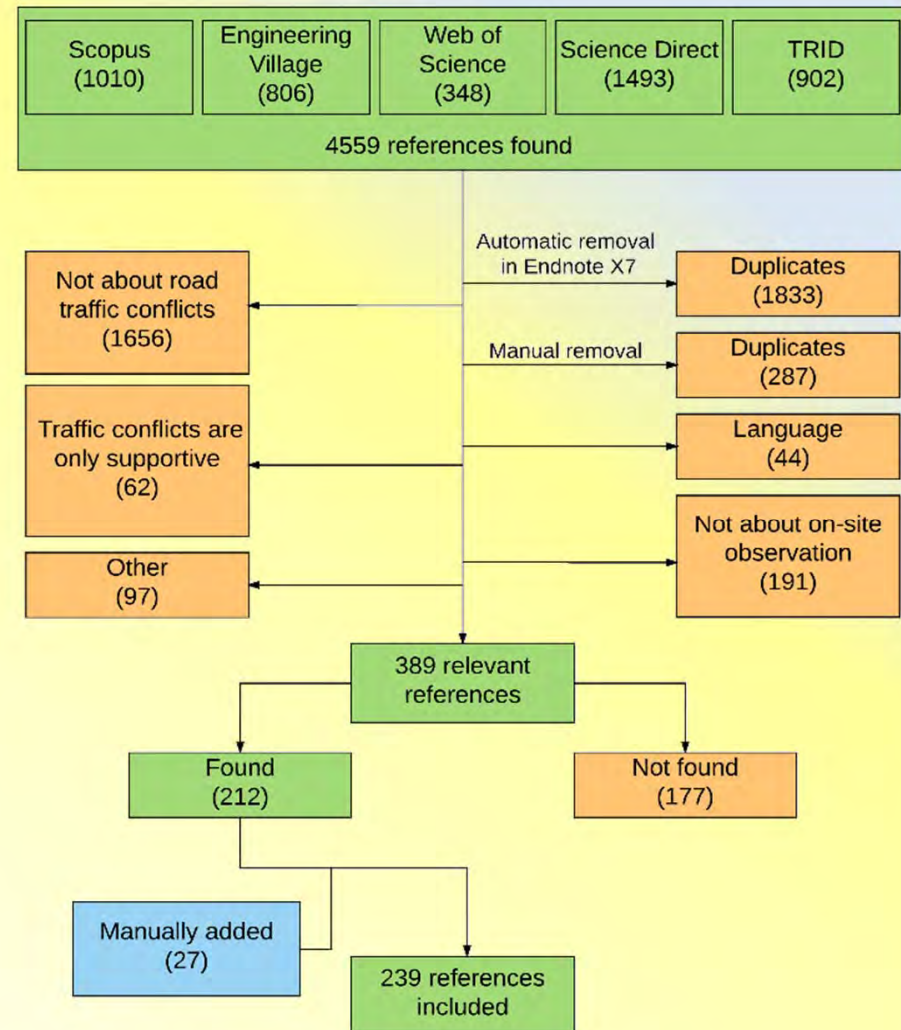
## Objectives

- Provide descriptive insight into the available literature
- Identify critical challenges and opportunities that should be central in future research
- Emphasis on Vulnerable Road Users (VRU)

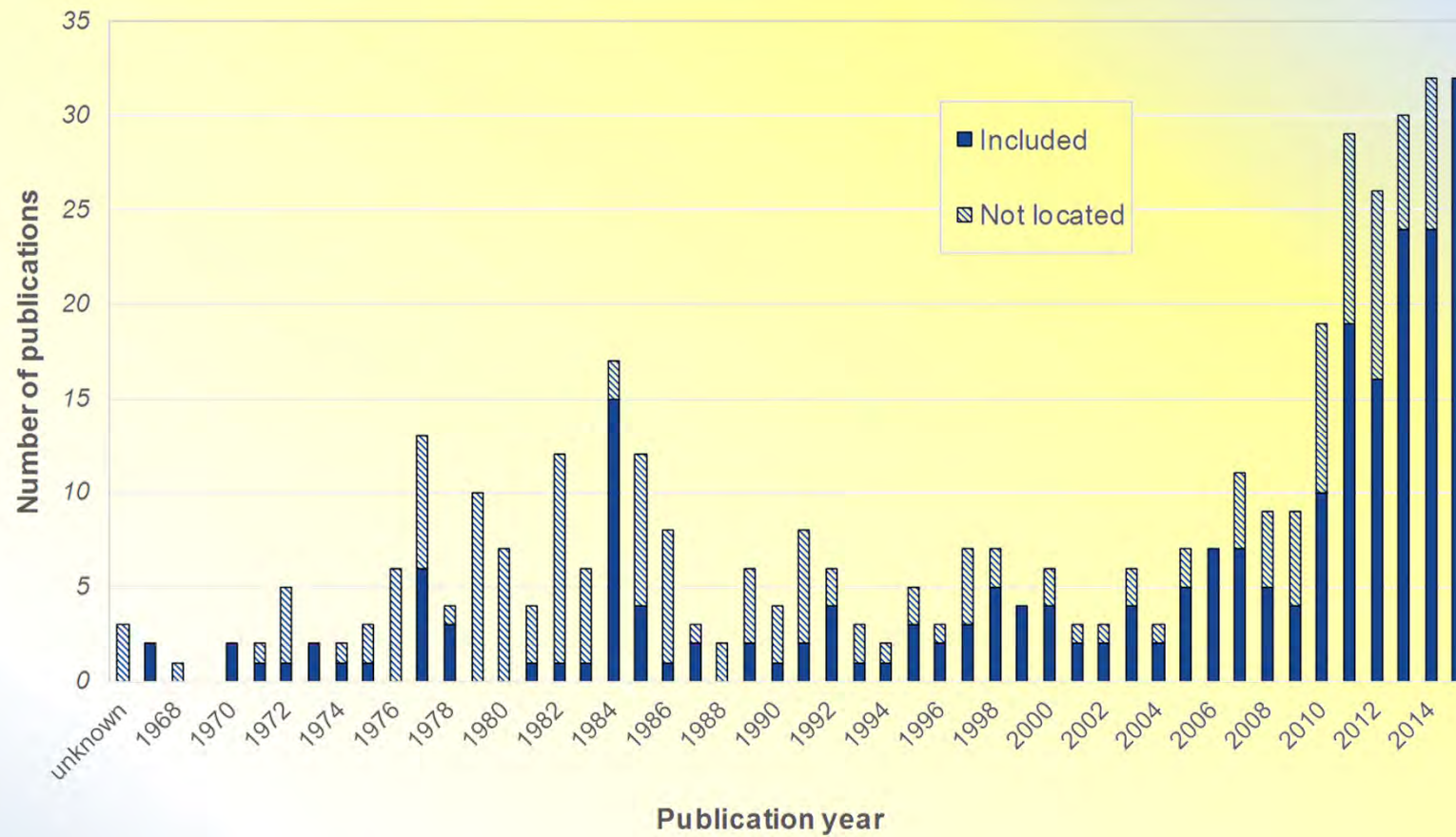


# Methodology

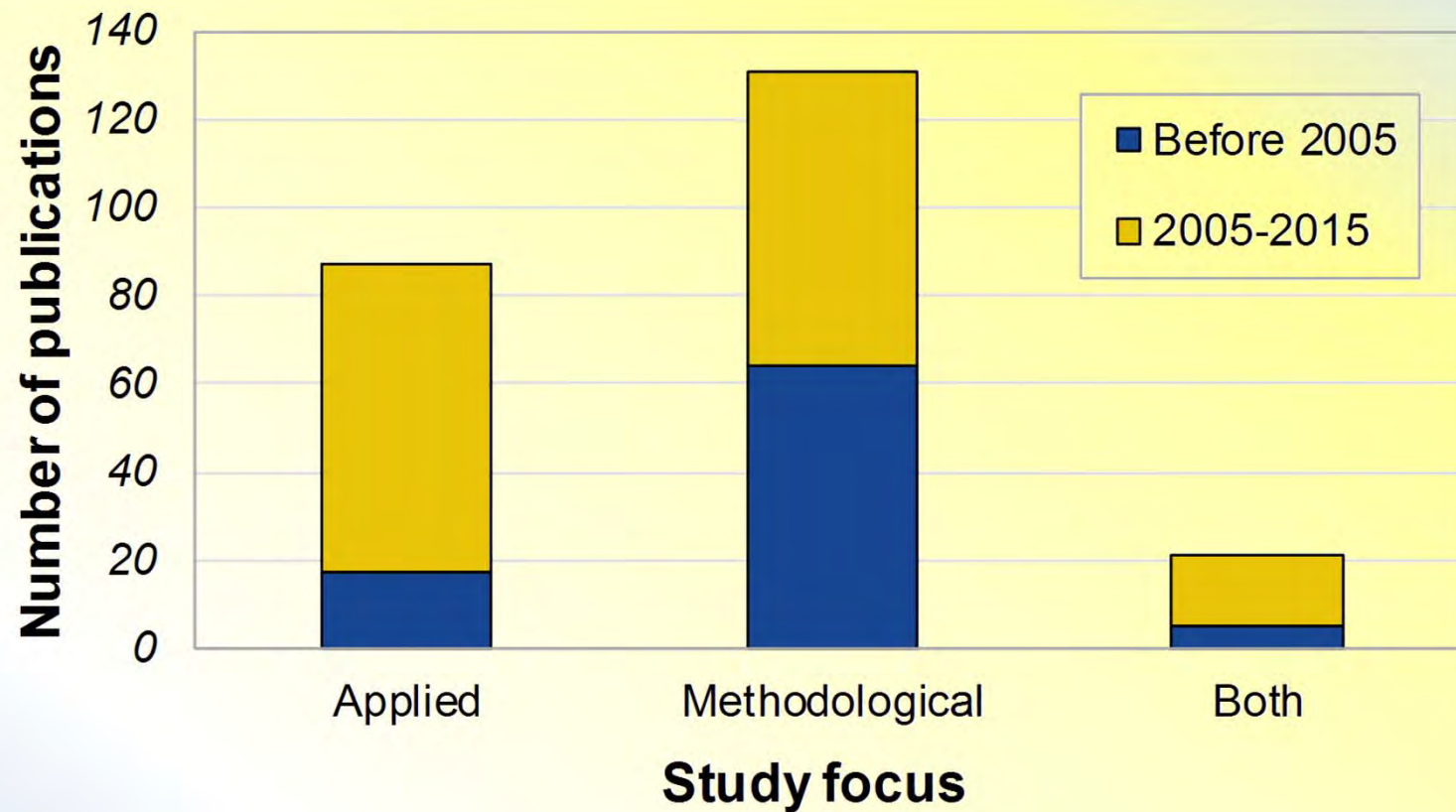
- Scoping review
  - Systematic protocol to identify relevant literature
  - Focus limited to studies that measure the severity of events from real traffic using static on-site cameras, sensors or observers
  - Information of each publication stored in predefined codebook



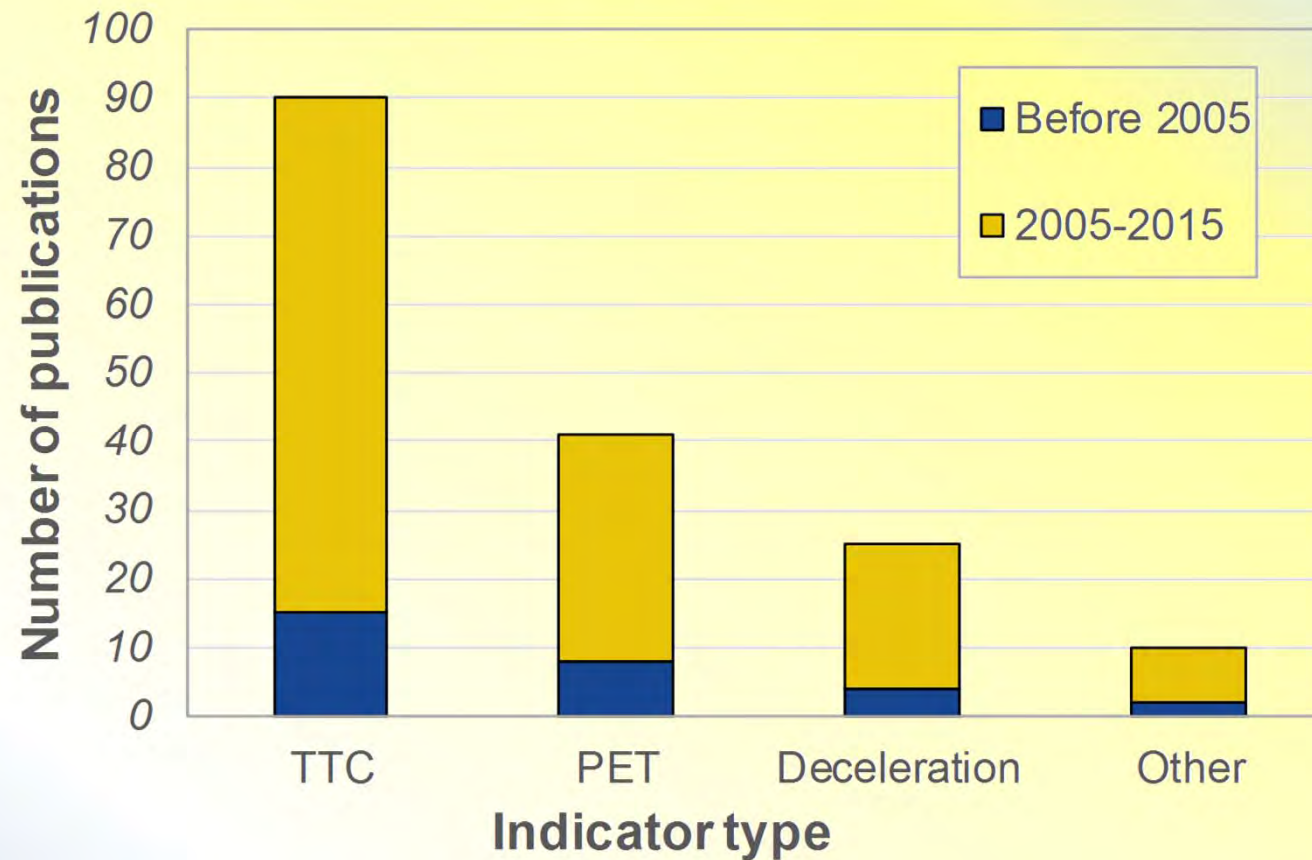
# Overview of the literature



## Focus of the studies



## Overview of indicator use



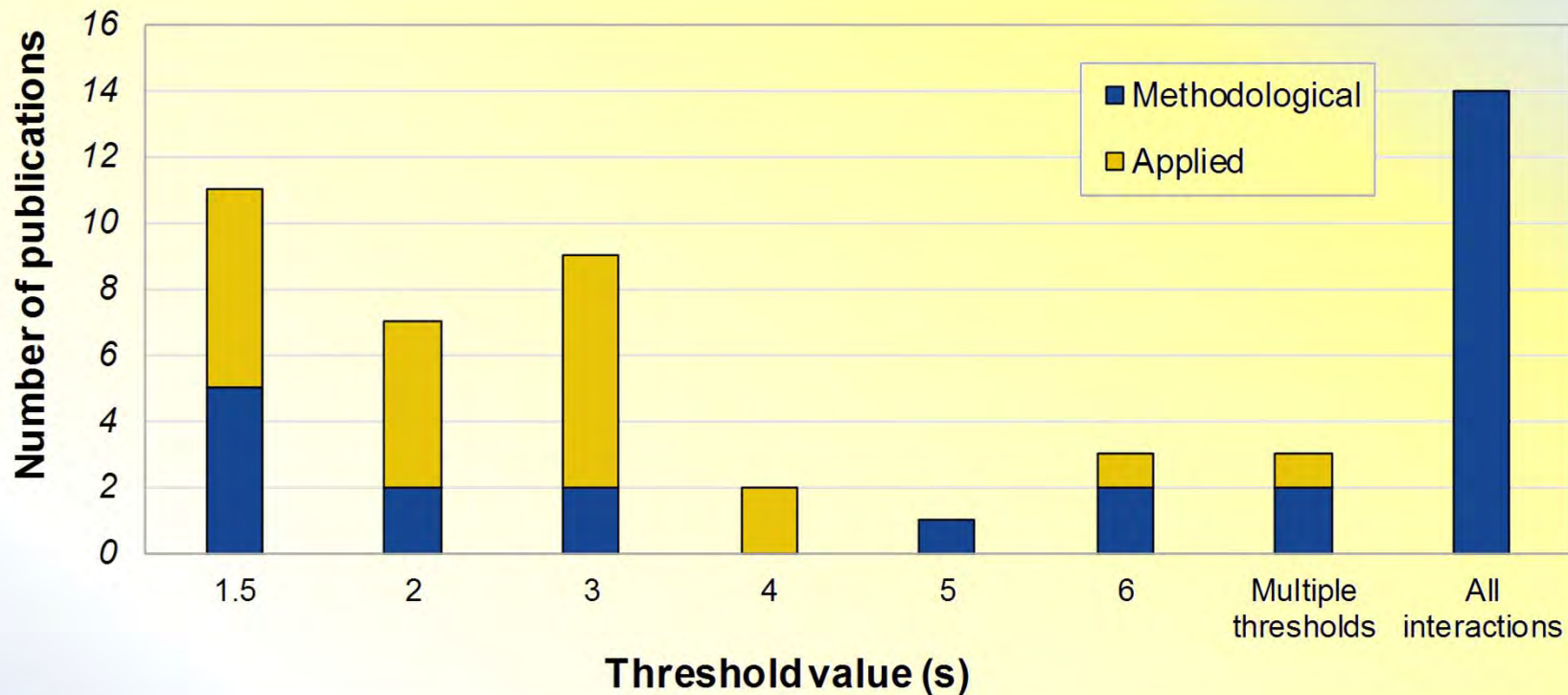


## TTC family

- Time-to-Collision (TTC) was originally defined as “time until a collision between two road users would occur if they continued on their present course at their present rates”
  - Not measured directly → calculated based on future motion prediction
  - Can be calculated as long as road users are on collision course
    - This concept is vital, but also subject to a lot of debate
  - Continuous indicator
- Most commonly used value: minimum TTC-value during an interaction ( $TTC_{min}$ )
- Other distinct value: Time-to-Accident: TTC at start of evasive action
  - Part of STCT
- And others: e.g. T2, TET, TIT, TTL

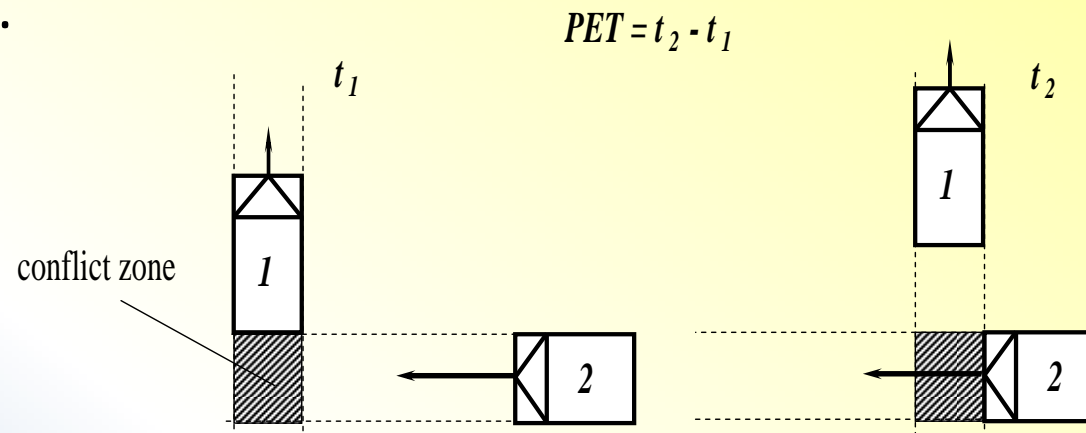
## TTC family

- Analysis of applied threshold values for  $TTC_{min}$  (N=55)



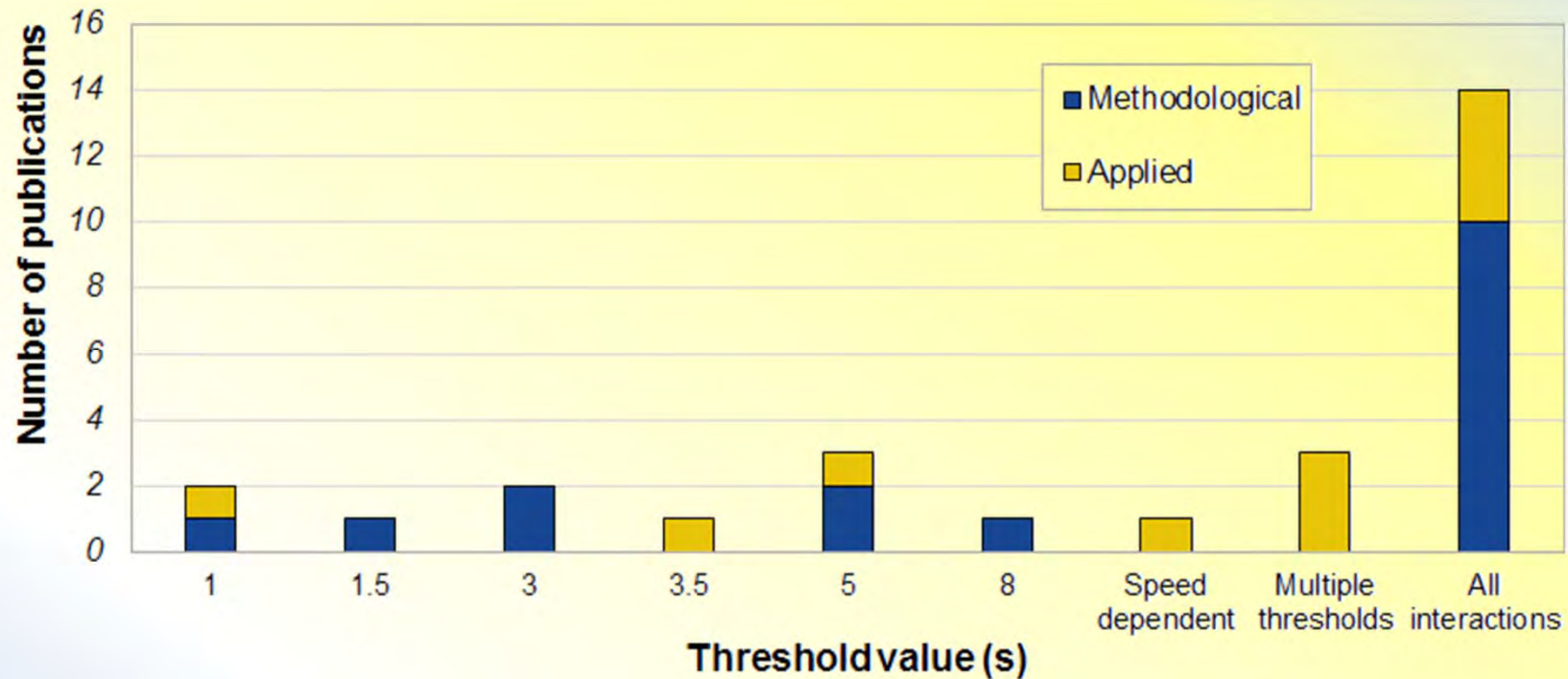
# PET family

- PET = time between the moment that the first road user leaves the path of the second and the moment that the second reaches the path of the first
- Argumentation: useful supplement to TTC because also non-collision course events can be risky
- Some related indicators include: Gap Time, Time Headway, TAdv,...



## PET family

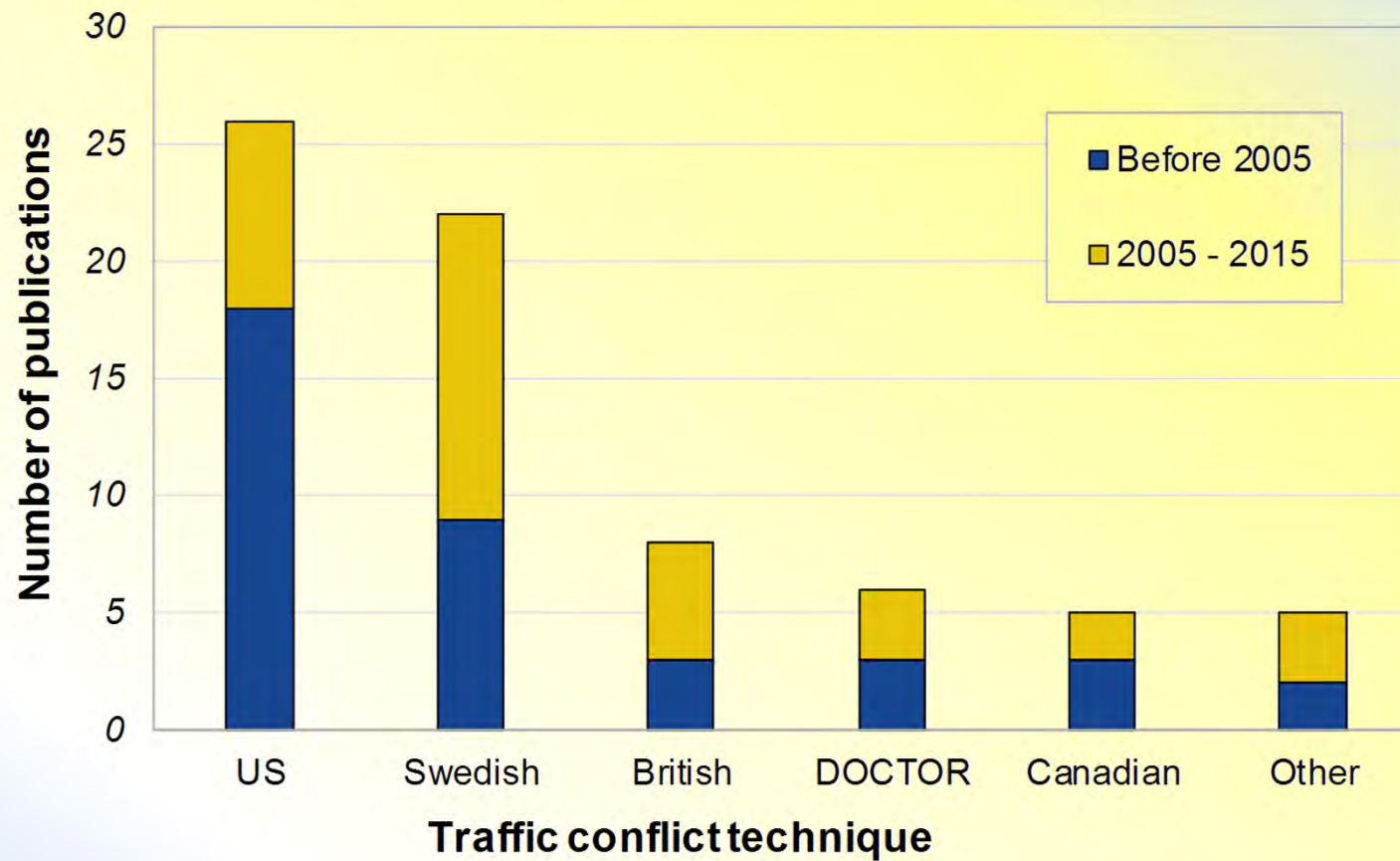
- Analysis of applied threshold values for PET (N=28)



## Integration of indicators to a single index

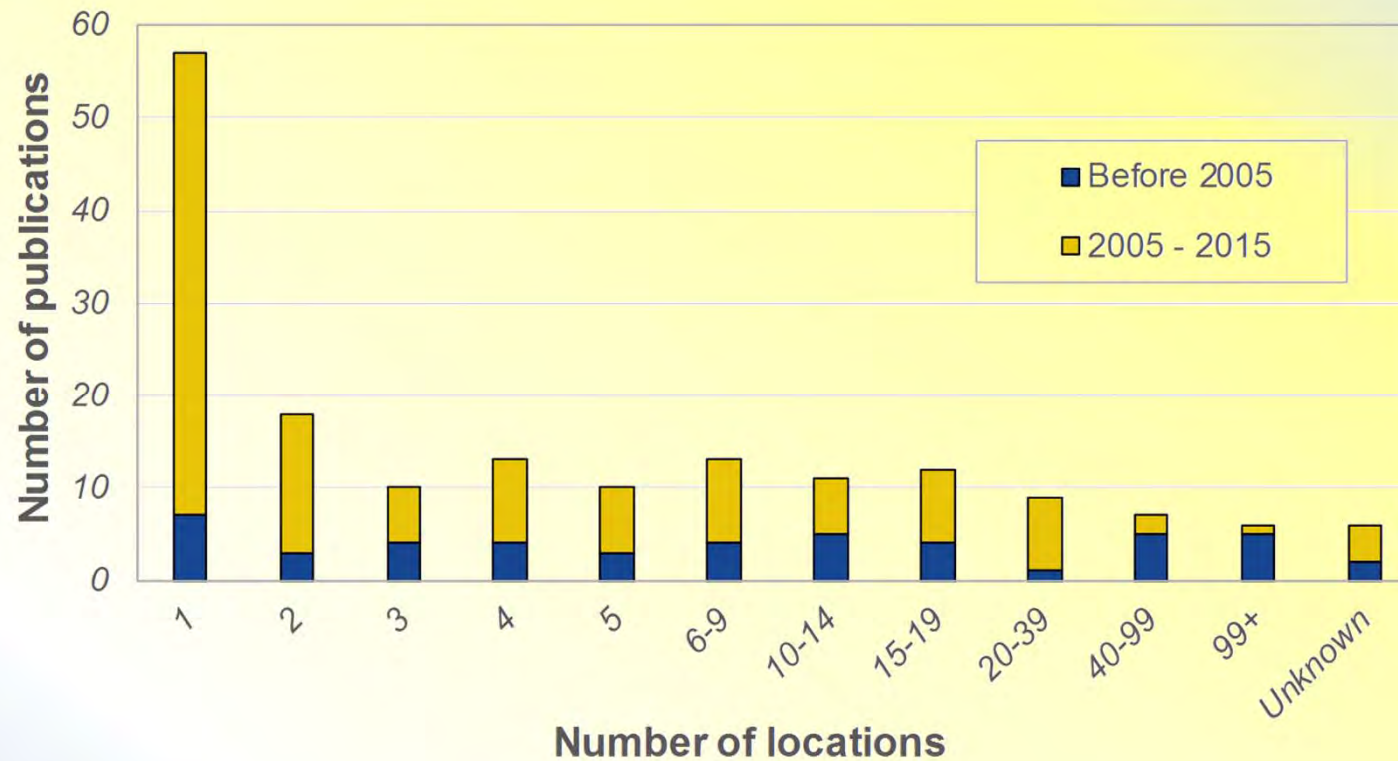
- Integrate different indicators describing a traffic event into on single value that describes “severity” of the event
  - Single indicators are usually not sufficiently universal to be applied to any situation at any time
  - Possibly they all represent partial images of the “true” severity of a traffic event
- Many TCT’s can also be considered part of this category

# Traffic Conflict Techniques



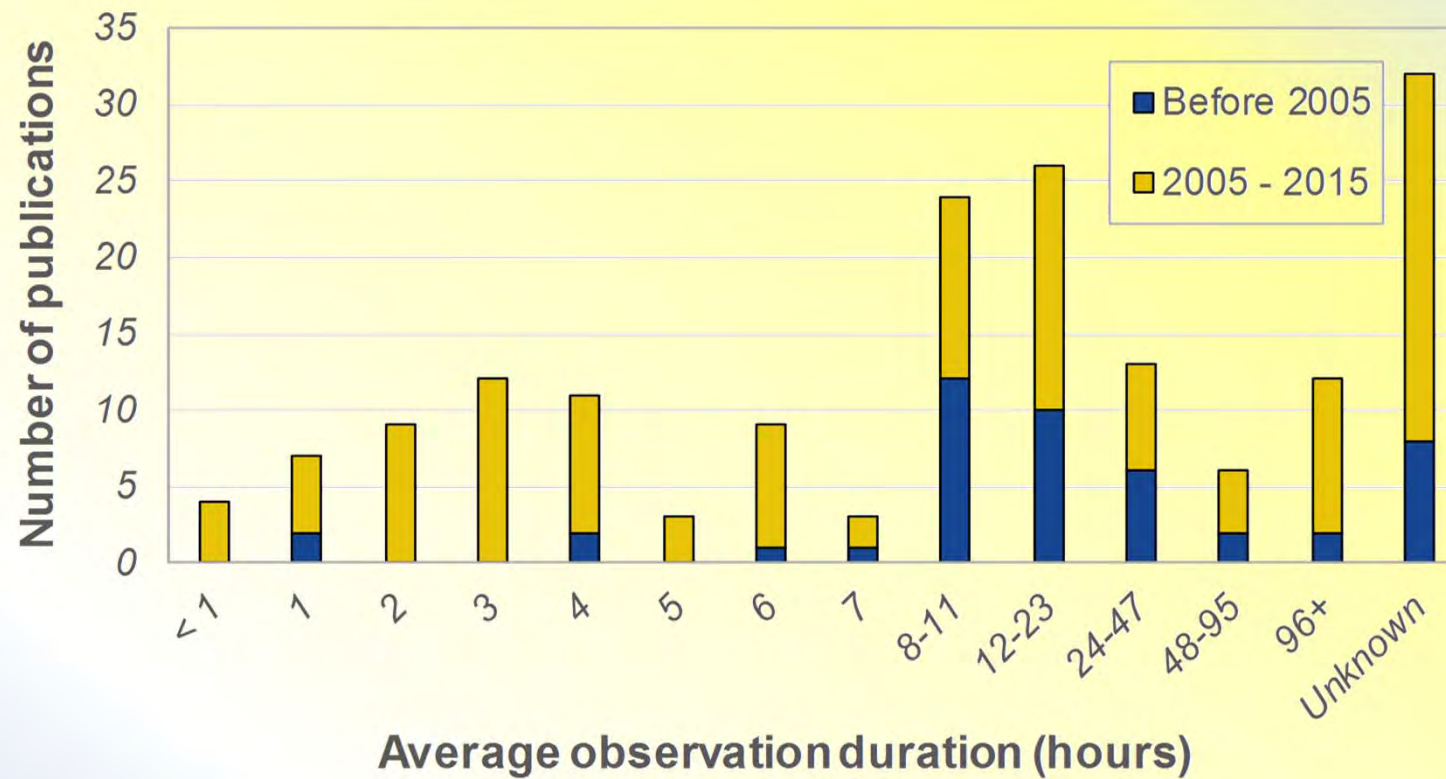
# Study design

- Number of observation sites



# Study design

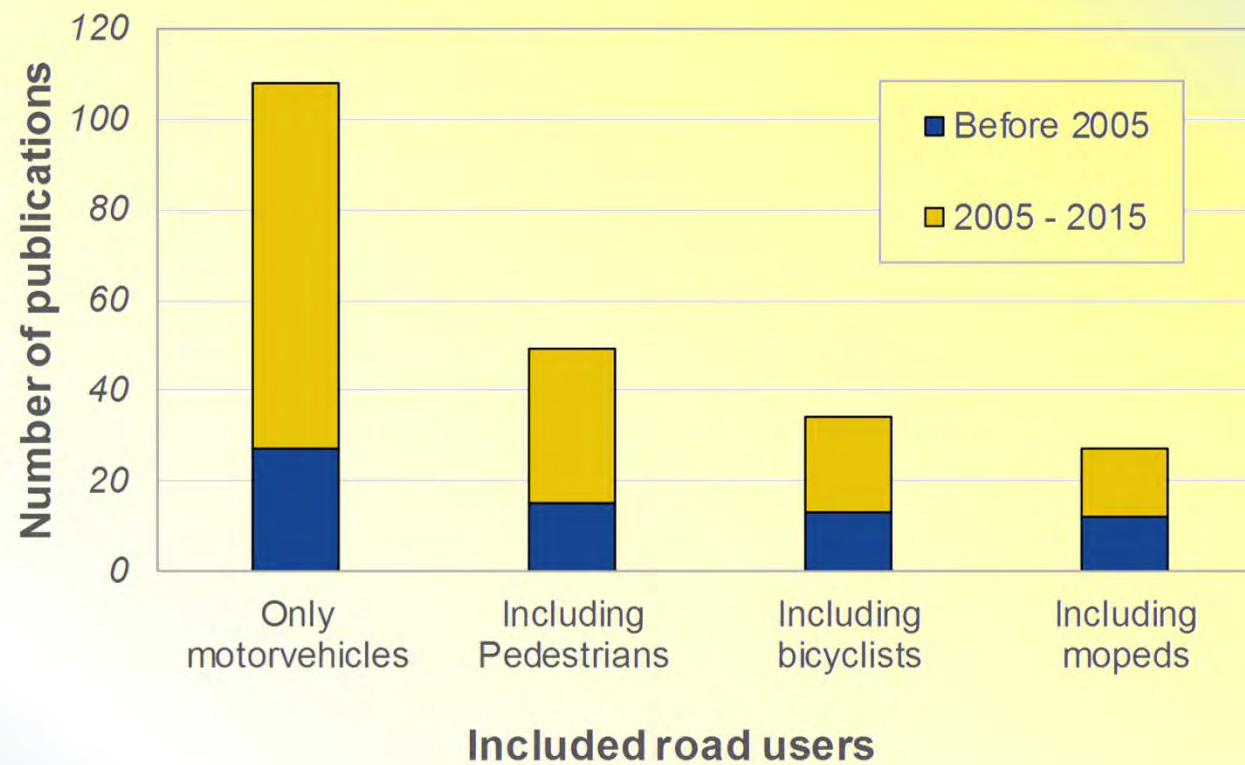
- Average duration of observations per site





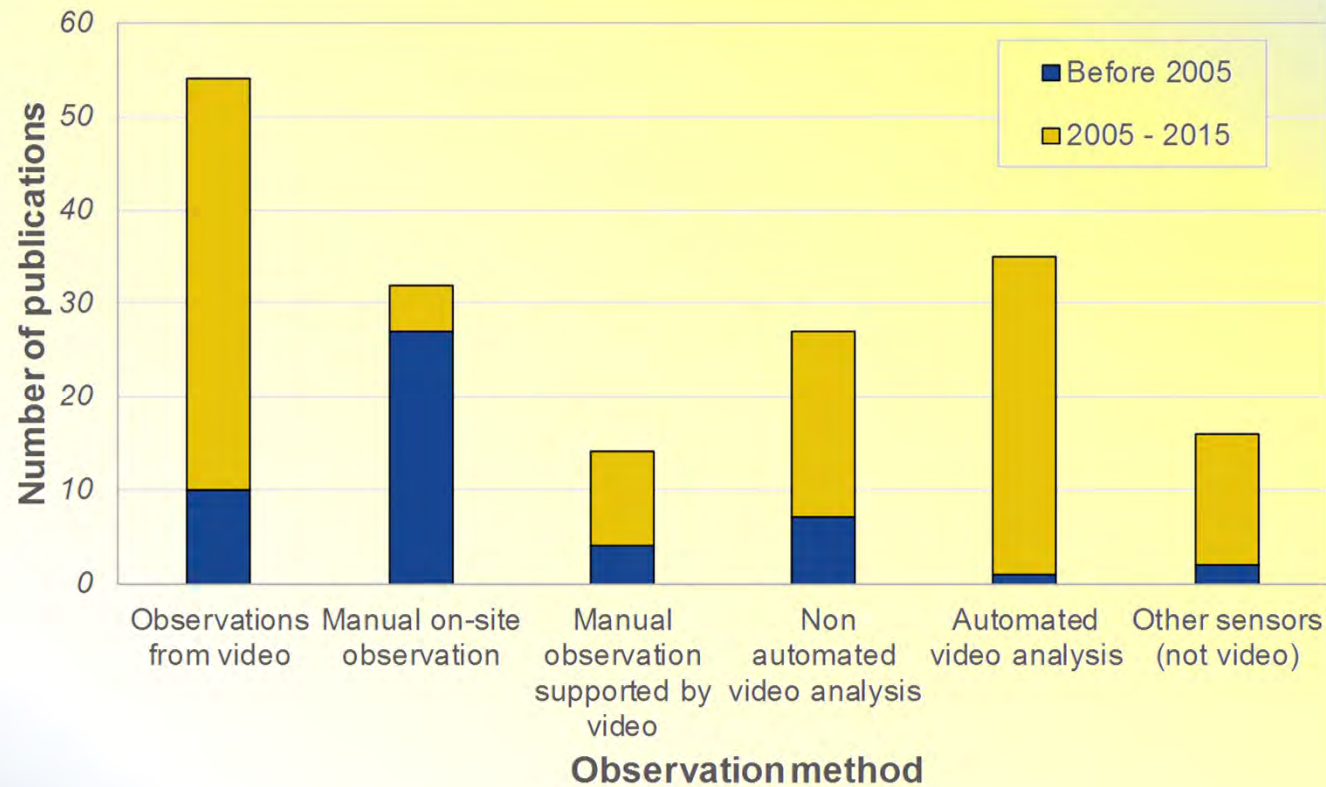
# Study design

- Types of road users that are observed



# Study design

- Data collection method



## Discussion and conclusions

- Applied TCTs and indicators show an overwhelming variety and creativity
- Relation with accidents needs to be explored further
- Validation studies are mostly based on human observations
  - Transferability to automated techniques uncertain
- Many indicators are hardly validated
  - Additional research around validity of surrogates is highly needed
- “Outcome severity” should be better reflected in applied surrogate measures of safety



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# Thank you very much for your attention!

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- Full report: InDeV Deliverable 2.1, Appendix 6
- Key publications: ICTCT library: [www.ictct.org/ictct-library/tct-library](http://www.ictct.org/ictct-library/tct-library)



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