

SafetyCube - the European Road Safety Decision Support System

www.roadsafety-dss.eu



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National Road Safety Policy development – trends and challenges
Tbilisi, 14 November 2018



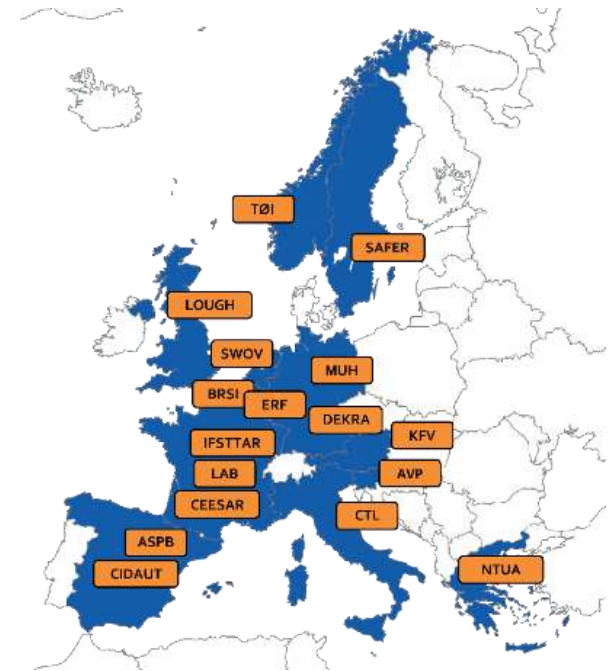
The SafetyCube Project



Funded by the European Commission under the Horizon 2020 research framework programme.



- Coordinator: Pete Thomas, Loughborough University
- Start: May 2015
- Finish: April 2018
- 17 partners from 12 EU countries
- The SafetyCube DSS objective is to provide the European and Global road safety community a **user friendly, web-based, interactive Decision Support Tool** to properly substantiate their road safety decisions for the actions, measures, programmes, policies and strategies to be implemented at local, regional, national, European and international level.



SafetyCube Methodology



1. Creating **taxonomies** of risk factors and measures
 2. Exhaustive **literature review** and rigorous study selection criteria
 3. Use of a template for **coding studies**, to be introduced in the DSS back-end database
 4. Carrying out **meta-analyses** to estimate the effects of risk factors / measures.
 5. Drafting **Synopses** summarising results of risk factors / measures.
 6. Carrying out **cost-benefit analyses** for the most effective measures
- **Systems approach:** links between infrastructure, user and vehicle risks
 - Rigorous assessment of the **quality of the data / study methods**



SafetyCube Taxonomies



Three-level taxonomies

Separately for risks and measures

- **4 Categories**
road user, infrastructure, vehicle, post impact care
- **38 risks, 50 measures (88 in total)**
e.g. distraction, roadside, crashworthiness
- **120 specific risks, 193 specific measures (313 in total)**
e.g. mobile phone use, no clear-zone, low pedestrian rating (NCAP)



Category	Infrastructure	Vehicle	Post Impact Care
Urban and suburban	Traffic flow	Front impact	Amputation/trauma care
Adaptation and voluntary learning w/ preparation	Traffic composition	Side impact	Education/first aid kit
Driver training and learning	Normal tools to address road network infrastructure	Rear impact	Pre hospital medical care
Efficient to drive assessment and rehabilitation	Speed management & enforcement	Roll-over	Triage and allocation to trauma facilities
Advanced riding and perception	Road type	Seatbelts	Pre and training course
	Road surface treatments	Child	
	Visibility / Lighting treatments	ETW	
	Work zones	Cyclist	
	Horizontal & vertical alignment treatments	Motor	
	Signage / road layout treatment	Infant/child	
	Clear / zone treatments	Adult control	

Selection and Coding of Studies



Study search in key databases

(Scopus, TRID, Elsevier, Taylor & Francis, Springer etc.)

Study selection and prioritization criteria

- Studies with quantitative results
- Meta-analyses, or other high quality studies (peer-reviewed)
- Recent studies
- European studies

Study selection and prioritization criteria

- Study design and methodology
- Results and their confidence intervals
- Study limitations



The Search Structure



- **Search**

(5 entry points: Keyword, Risk factor, Measures, Road Users, Accident Categories)

- **Results pages**

(Introduction, Colour codes, Synopses, Coded studies)

- Individual **Studies** pages

(Disaggregate level, detailed effects listed, some studies not in synopses)

- **Links** between Risk Factors Information about which risks can be remedied by which types of measures



SafetyCube DSS Results Pages



Search results

- Synopses, and their short summaries & colour codes
- Table listing the available studies

Refine search

- Specific Risk factor / Measure
- Other **search filters**:
 - Road user groups: All, car occupants, drivers, passengers, PTW riders, pedestrians, cyclists, HGVs.
 - Road types: All, motorways, rural roads, urban roads
 - Country: EU, EU countries, US and Canada, Australia, Asia.

Links to related measures

- Select a specific risk factor / measure
- Get the list of related measures
- Linking based on a dedicated model categorizing risks
- A total of 762 links between risk factors and measures



SafetyCube Synopses



215 Syntheses on risk factors / measures

Summary (2 pages)

- Effect of risk factor / measure and ranking (colour code)
- Risk / safety effect mechanisms
- Risk / safety effects size, transferability of effects

Scientific overview (4-5 pages)

- Comparative analysis of available studies
- Analysis results:
 - Meta-analysis/Vote-count analysis/Qualitative analysis

Supporting document (3-10 pages)

- Literature search strategy and study selection criteria
- Detailed analyses

<p>Presence of workzones - Workzone duration</p> <p>Please refer to the document for further information. For more information, please refer to the project website: www.roadops.eu</p>  <p><small>Figure 1: The studies included in this synopsis were selected from those identified by a systematic literature search of peer-reviewed scientific journals. The main criterion for the selection of studies for inclusion and the basis for the ranking of the studies was the presence of the risk factor or the measure in the studies. The studies included in this synopsis were selected from those identified by a systematic literature search of peer-reviewed scientific journals. The main criterion for the selection of studies for inclusion and the basis for the ranking of the studies was the presence of the risk factor or the measure in the studies. The studies included in this synopsis were selected from those identified by a systematic literature search of peer-reviewed scientific journals. The main criterion for the selection of studies for inclusion and the basis for the ranking of the studies was the presence of the risk factor or the measure in the studies.</small></p>	
<p>Presence of workzones - Workzone duration</p> <p>1 Summary</p> <p><small>1.1. INTRODUCTION</small></p> <p><small>1.2. OBJECTIVES</small></p> <p><small>1.3. CONCLUSIONS</small></p>	<p>Presence of workzones - Workzone duration</p> <p><small>1.4.1. Which safety outcomes are affected by work zone duration?</small></p> <p><small>1.4.2. How is the effect of work zone duration studied?</small></p> <p><small>1.4.3. SUMMARY OF RESULTS</small></p>

SafetyCube DSS Individual Study Pages



Title, author, source, abstract

- Link to URL for full-text download (depending on Institute permissions)

Study design info:

- Country
- Research Method, Design, Sample
- Exposure/Control group
- Risk/Outcome Group
- Modifying Conditions
- Potential limitations

Study results:

- Table listing the detailed effects reported in the study

SafetyCube DSS European Road Safety Decision Support System

Home Knowledge Database News/Events Support

Modeling work zone crash frequency by quantifying measurement errors in work zone length

Varg, L. Ulfarsson, Ulfarsson, B. B. (2016)

Abstract

Work zones are an essential part of road construction and maintenance, but they also pose a significant safety problem. Identifying and implementing necessary changes on roadways, such as increasing the length of work zones and increasing the number of lanes, can be a costly and time-consuming process. This study aims to quantify the impact of measurement errors on the estimation of work zone crash frequency. The study uses a Bayesian hierarchical model to estimate the true work zone length and the true crash frequency. The results show that measurement errors can lead to biased estimates of work zone length and crash frequency. The study also shows that increasing the length of work zones can lead to a decrease in crash frequency. The study concludes that measurement errors are a significant problem in work zone safety analysis and that increasing the length of work zones can be a cost-effective way to reduce crash frequency.

Basic Study Information

Title: **Modeling work zone crash frequency by quantifying measurement errors in work zone length**

Author: **Varg, L. Ulfarsson, Ulfarsson, B. B. (2016)**

Year: **2016**

Country: **UNITED STATES**

Keywords: **FULL-SCALE MEASUREMENT ERROR; BAYESIAN HIERARCHICAL MODEL; CRASH FREQUENCY; WORK ZONE**

Effects

Effect ID	Outcome	Exposure	Group Type	Group	Effect Estimator	Effect Direction	Sample Size	Lower Limit	Upper Limit	Calculator Comments
1	WORK ZONE CRASH FREQUENCY	WORK ZONE LENGTH	EXP.	HAZARD	OR	POSITIVE	1000	0.45	0.95	CONFIDENCE INTERVAL DOES NOT INCLUDE 1.0
2	WORK ZONE CRASH FREQUENCY	WORK ZONE LENGTH	EXP.	CONTROL	OR	NEGATIVE	1000	0.45	0.95	CONFIDENCE INTERVAL DOES NOT INCLUDE 1.0

SafetyCube DSS Calculator



- Combines information about the **effectiveness of a measure** (i.e. the percentage of crashes or casualties prevented) with the **costs** of this measure.
- Integrates updated information of **crash costs in the European countries**
- Allows to express all costs and benefits of a measure in monetary values and conduct **cost benefit analysis**.

Main Functions

- Perform cost-benefit analysis with **own input data**.
- Select one of the **SafetyCube examples** of cost benefit analyses
 - Measures with high effectiveness
 - For which reliable cost information could be found

The screenshot displays the SafetyCube DSS Calculator interface. The header includes the logo and the text 'European Road Safety Decision Support System'. Navigation tabs for Search, Knowledge, Calculator, Methodology, and Support are visible. The main content area features a 'Calculator' section with a scale of justice icon and a brief description of the tool's purpose. Below this is an 'Input' section with a dropdown menu set to 'Infrastructure safety management - Speed management & enforcement'. The 'Measure' section includes fields for Country (UK), Measure (30-zone speed limit), Distance (1000000), and Number of lanes (1). The 'Costs' section has checkboxes for 'Costs (excluding side-effects)' and 'Total Costs (including side-effects)'. On the right, a 'Cost-Benefit Analysis' table is shown for the selected measure.

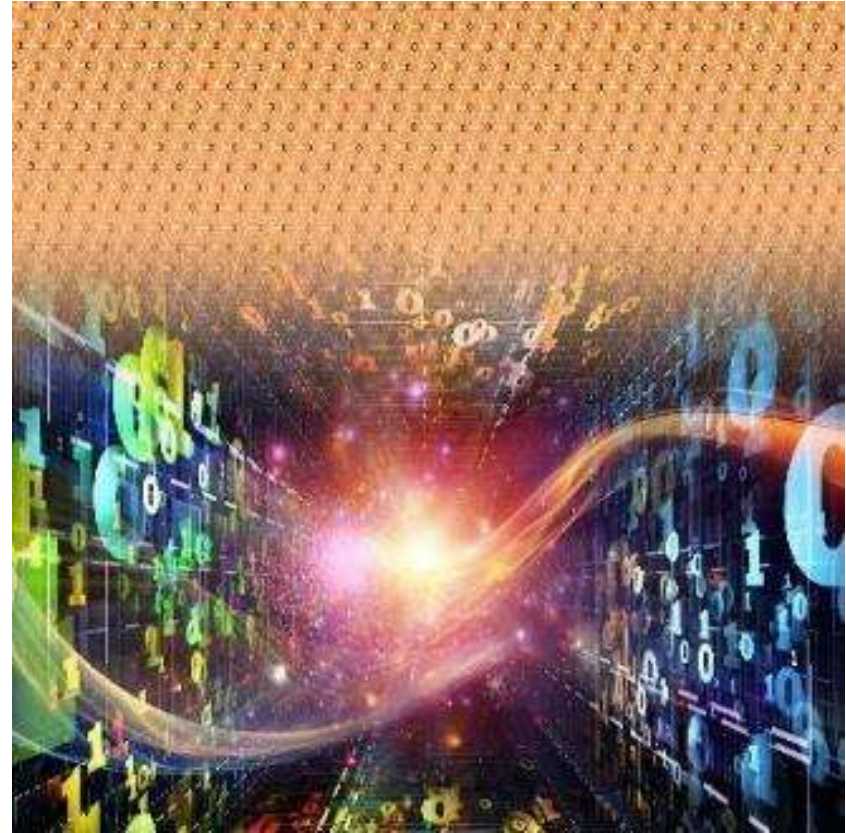
Cost-Benefit Analysis	
Infrastructure safety management - Speed management & enforcement - 30-zone implementation	
Costs (present values)	
Electric investment costs	52241.00€
Implementation costs	1.766.000.00€
Total costs (excluding side-effects)	1.818.241.00€
Side-effects	1.800€
Total costs (including side-effects)	1.820.041.00€
Benefits	
Projected savings	1.919.000.00€
Socio-economic return excluding side-effects	
Net present value	800.758.958.95€
Cost-benefit ratio	1.9
Socio-economic return including side-effects	
Net present value	802.558.958.95€
Cost-benefit ratio	1.9

SafetyCube DSS Knowledge Wealth



SafetyCube DSS contains:

- more than 1,250 **studies**,
- with more than 7,500 **estimates** of risks/measure effects on:
 - behaviour,
 - infrastructure,
 - vehicle, and
 - post impact care
- **215 Synopses**
- **37 cost-benefit analyses examples** (adjustable)



Delivering a long waited powerful tool



- SafetyCube DSS is the first integrated road safety support system **developed in Europe**
- SafetyCube DSS **offers for the first time** scientific evidence on:
 - risks and not only measures
 - risks and measures not only on infrastructure
 - a very large number of estimates of risks and measures effects
 - links between risks factors and measures
- SafetyCube DSS aims to be a **reference system** for road safety in Europe, constantly improved and enhanced



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