European Road Safety Policy: Towards Evidence-Based Decision Making, Especially for Vulnerable Road Users

A quiz on the EU projects SafetyCube & InDev
Klaus Machata, KFV (Chair)
Evidence-based road safety in the EU: from Policy to R&I

Ingrid Skogsmo, European Commission - DG RTD
Since when does Horizon 2020 include dedicated calls on automated road transport?

a) That has still to happen
b) Since 2016
c) Since 2010
Improve Road Safety –
A European policy objective

...halving road deaths by 2020

... move close to zero deaths and serious injuries by 2050
... It is only on the basis of detailed knowledge about the performance of different parts of the system that activity can be focused where it is most effective in reducing deaths and serious injuries...
Developing an in-depth understanding of road accident causation for all road users, covering all aspects of road safety (vehicle, driver and infrastructure) together with appropriate actions for their prevention and mitigation. This shall include methods for conducting a comprehensive assessment of socio-economic costs related to road accidents, taking into consideration secondary costs related to congestion, material damage, vehicle uptime etc. as a basis for robust cost-benefit analysis of safety countermeasures at a transport system level.

Research will fill knowledge gaps at both European and national levels, and take into account regional differences. ...

Expected impact: Research in this area will contribute to delivering essential knowledge for the design and implementation of an efficient strategy. Overall, research will contribute to the achievement of the European policy objective of halving road deaths by 2020, and, in the longer term, to the Transport White Paper's "Vision Zero" objective.
Road Safety in Horizon 2020

- Accidentology
- EU-Africa road safety
- Protection of all road users in crashes
- Vulnerable Road Users
- Distraction
- Influence of behaviour in Transport Safety
- Human Factors in Transport Safety
- Safety in an evolving road mobility environment
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019

Automated Road Transport

- Safety & end user acceptance
- Support for networking activities &
  - impact assessment for road automation
... It is only on the basis of detailed knowledge about the performance of different parts of the system that activity can be focused where it is most effective in reducing deaths and serious injuries...
... and the correct answer?
Since when does Horizon 2020 include dedicated calls on automated road transport?

a) That has still to happen
b) Since 2016
c) Since 2010
Contact

Ingrid.skogsmo@ec.europa.eu
The potential of road safety performance indicators in road safety management

Rune Elvik, Institute of Transport Economics, Norway
What is percentage of motor vehicles complying with speed limits today in Norway?

a) 48.6 %
b) 59.9 %
c) 61.4 %
d) 41.1 %
The potential of road safety performance indicators in road safety management

○ What is a road safety performance indicator?
  • Any risk factor that influences the number and/or severity of crashes and that can be influenced by road safety policy
  • Examples: mean speed, seat belt wearing, drinking and driving

○ How can a road safety performance indicator be used in road safety management?
  • Set at a target value for it and use that to determine what actions you must take to reach the target value
... and the correct answer?
By 2022, 70 % of motor vehicles should comply with speed limits (in Norway)

What is percentage of motor vehicles complying with speed limits today?

- A) 48.6 %
- B) 59.9 %
- C) 61.4 %
- D) 41.1 %
Contact

Rune Elvik, Institute of Transport Economics, Gaustadalleen 21, 0349 Oslo, Norway
re@toi.no
New ways in evidence-based decision-making: The SafetyCube project

Prof. Pete Thomas, Loughborough University, UK
What does DSS stand for?

a) Desperately Silent Statistics
b) Decision Support System
c) Dynamic Speed Substitution
d) Double Standards in Safety
Delivering a long awaited 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
Example questions addressed

- how important is my road safety problem?
- what is the nature of that problem?
- what solutions are usually proposed for my problem?
- how efficient are the solutions proposed?
- which is the most efficient solution?
- and if I have a combination of problems ...

... then use SafetyCube DSS to have the answers
SafetyCube DSS Users

- Public Authorities
  - local, regional, national, European and international
- Industry
  - Infrastructure, Vehicle, Insurance, Technology
- Research Institutes, Experts
- Non Governmental Organisations
- Mass Media
- Everyone

The SafetyCube DSS is intended to have a life well beyond the end of the SafetyCube research project.
SafetyCube Methodology

1. Consulting stakeholders to understand needs
2. Creating taxonomies of risk factors and measures
3. Exhaustive literature review and rigorous study selection criteria
4. Use of a template for coding studies, to be introduced in the DSS back-end database
5. Carrying out meta-analyses to estimate the effects of risk factors / measures.
6. Drafting Synopses summarising results of risk factors / measures.

- Systems approach: links between infrastructure, user and vehicle risks & measures
- Emphasis on risk factors and measures of priority issues (VRUs, ADAS, speed management, distraction, etc.)
- Rigorous assessment of the quality of the data / study methods
... and the correct answer?
What does DSS stand for?

a) Desperately Silent Statistics
b) Decision Support System
c) Dynamic Speed Substitution
d) Double Standards in Safety
Contact

Pete Thomas, p.d.thomas@lboro.ac.uk
Economic evaluation of road safety measures

Wouter Van den Berghe, VIAS, Belgium
Which of the following 4 measures in road safety has the highest benefit-to-cost ratio?

- Section control
- Alcohol interlock program
- Dynamic speed limits
- Autonomous Emergency Breaking
Some of the issues to be considered...

Effectiveness
Target group
Penetration rate

Monetary valuation
of avoided crashes and victims
Side effects

Assessing
benefit/cost ratio

Time horizon
Implementation costs
Annual costs

Transferability across countries
Validity over the years
The SafetyCube approach

- Development of an algorithm and system that
  - can be used for all kinds of measures
  - takes into account all factors
  - can use different types of effectiveness data
  - can be used across countries
  - uses standardized crash costs data for all EU countries

- Use the E³ *(Economic Efficiency Evaluation)* calculator on the DSS website
  - [https://www.roadsafety-dss.eu](https://www.roadsafety-dss.eu) → Tab “Calculator”
  - get guidance on the methodology
  - read existing worked-out examples (over 36 already available)
  - adapt existing examples or make a CBA from scratch!
User interface
Explanation

CBA: Road lighting

Atul Tripathy, Banita Akhialsingh (2019)

ABSTRACT

An Evaluation of the cost-benefit analysis (CBA) of road lighting and measures to improve road safety in urban and inter-urban areas in the city of Accra, Ghana. The study used the Cost-Benefit Analysis (CBA) technique to determine the cost-effectiveness of road lighting. The results showed that the cost of implementing road lighting was lower compared to the benefits derived. The findings are expected to inform policymakers on the need to implement road lighting in Accra.

INTRODUCTION

Road safety is a critical issue in urban and inter-urban areas, with road lighting playing a significant role in reducing accidents. In Ghana, road lighting is provided by the Ghana Armed Forces (GAF), which has been responsible for the provision of road lighting in the city of Accra. However, the cost-effectiveness of road lighting in Accra has not been evaluated.

METHODS

The study used the Cost-Benefit Analysis (CBA) technique to determine the cost-effectiveness of road lighting in Accra. The CBA technique involves comparing the costs and benefits of a project or intervention to determine its overall cost-effectiveness. In this study, the costs and benefits of implementing road lighting in Accra were evaluated.

RESULTS

The results showed that the cost of implementing road lighting in Accra was lower compared to the benefits derived. The benefits of implementing road lighting in Accra include reduced accidents, improved visibility, and enhanced road safety. The findings are expected to inform policymakers on the need to implement road lighting in Accra.

CONCLUSIONS

The study found that the cost-benefit analysis of road lighting in Accra was cost-effective. The findings are expected to inform policymakers on the need to implement road lighting in Accra. The findings can be used by policymakers and stakeholders in making informed decisions on the implementation of road lighting in Accra.

https://www.roadsafety-dss.eu/#/calculator
### Getting back to the basic facts

<table>
<thead>
<tr>
<th></th>
<th>Costs</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section control</td>
<td>€€€</td>
<td>++++</td>
</tr>
<tr>
<td>Alcohol interlock programme</td>
<td>€€</td>
<td>+++</td>
</tr>
<tr>
<td>Dynamic speed limits</td>
<td>€€€€</td>
<td>+++</td>
</tr>
<tr>
<td>Autonomous Emergency Breaking</td>
<td>€</td>
<td>+</td>
</tr>
</tbody>
</table>
... and the correct answer?
Which of the following 4 measures in road safety has the highest benefit-to-cost ratio?

- **Section control** 19.5
- **Alcohol interlock program** 10.9
- **Dynamic speed limits** 1.1
- **Autonomous Emergency Breaking** 1.2
Contact

Wouter Van den Berghe, VIAS, Belgium
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Measuring the Road User

The challenges of quantifying human related risk factors and measures

Susanne Kaiser, Austrian Road Safety Board (KFV), Austria
Which of the following road user related risk factors was prioritized by stakeholders as pressing issue to tackle?

A) Tailgating
B) Fatigue
C) ADHD
Common objective

Estimating safety effects of risk factors and measures related to

- Road users
- Road infrastructure
- Vehicles
Risks and measures in the DSS

- 450+ considered individual studies
- ~50 synopses on human related risk factors and measures

<table>
<thead>
<tr>
<th>Risk Factors</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Behavior</strong></td>
<td><strong>Behavior</strong></td>
</tr>
<tr>
<td>Speed choice</td>
<td>Law and enforcement</td>
</tr>
<tr>
<td>Driving under the influence of alcohol</td>
<td>Education and voluntary training or programmes</td>
</tr>
<tr>
<td>Driving under the influence of drugs</td>
<td>Driver training and licensing</td>
</tr>
<tr>
<td>Risk taking</td>
<td>Fitness to drive assessment and rehabilitation</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Awareness raising and campaigns</td>
</tr>
<tr>
<td>Distraction and inattention</td>
<td>Traffic rule violations</td>
</tr>
<tr>
<td>Functional impairment</td>
<td>Personal factors</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td><strong>Diseases and disorders</strong></td>
</tr>
</tbody>
</table>

16.04.2018
Challenges involved

- Observation vs. inference of risk factors
- Confounding and interacting risk factors
- Actual contribution to accidents occurrence of risks and measures
To be considered

Importance of

- alternative safety performance indicators (SPI)
- contextual information provided in synopses
- further research and development of valid and reliable SPI
... and the correct answer?
Which of the following road user related risk factors was prioritized by stakeholders as pressing issue to tackle?

A) Tailgating
B) Fatigue
C) ADHD
Contact

Susanne Kaiser, KFV
susanne.kaiser@kfva.at
The SafetyCube European Road Safety Decision Support System

Prof. George Yannis, NTUA, Greece
How many studies have been coded in the DSS?

a) approx. 150
b) approx. 500
c) approx. 850
d) approx. 1300
SafetyCube DSS will eventually include by April 2018:

- more than 1,250 studies,

- with more than 7,500 estimates of risks/measures effects on:
  - behaviour,
  - infrastructure,
  - vehicle, and
  - post impact care

- 211 Synopses

- 36 cost-benefit analyses
SafetyCube DSS Menu

- **Search**
  Risk Factors & Measures

- **Knowledge**
  211 Synopses, Serious Injuries, Accident Scenarios

- **Calculator**
  Economic Efficiency Evaluation

- **Methodology**
  System documentation

- **Support**
  Contact, help, feedback
SafetyCube DSS Search Pages

DSS Search through five entry points:

- **Keyword** search
  (all database keywords)

- **Risk factor** search
  (taxonomy)

- **Measures** search
  (taxonomy)

- **Road User Groups**
  (database keywords related to each group)

- **Accident Categories**
  (under development)
The Search Structure

- **Search**
  (5 entry points)

- **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 Synopses

211 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
… and the correct answer?
How many studies have been coded in the DSS?

a) approx. 150
b) approx. 500
c) approx. 850
d) approx. 1300
Contact

George Yannis, geyannis@central.ntua.gr
Surrogate safety measures - theory, application, examples

Aliaksei Laureshyn
Lund University (Sweden)
Why is it so difficult to make safety analysis based only on accidents?

a. Accidents are rare and random
b. Accidents are under-reported
c. Accidents are not properly documented
d. All above-mentioned is true
We don’t have enough evidence this is unsafe.
Let’s wait for some more planes to crash…
How???

Time-to-Collision (TTC)
Time-to-Accident (TA)
$TTC_{\text{min}}$

Post-Encroachment Time (PET)
Time Advantage (TA)
$T_2$

Evasive action-based
SSM publications

Number of publications
Publication year
Included
... and the correct answer?
Answer D is correct!!!

a. Accidents are rare and random
b. Accidents are under-reported
c. Accidents are not properly documented
d. All above-mentioned is true

Accidents are rare, random, under-reported and not properly documented!
Contact

Aliaksei Laureshyn
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TECHNICAL TOOLS FOR SAFETY DATA COLLECTION

Niels Agerholm
Aalborg University (Denmark)
How often, on average, can you see a serious traffic conflict at an intersection in a “normal” European city?

a) Every hour
b) Once per day
c) Once per week
d) 1-2 times per months
RUBA

- Watchdog = Very simple but efficient
- Operates by defining region-specific detectors and rules
T-Analyst

- Conflicts and encounters
  - Cyclist/vehicle
  - Pedestrian/vehicle
- Trajectories
  - Time-based values
Naturalistic data from VRUs

- Questionnaires
  - Tool to generate questionnaires
  - Self-reporting of accidents via questionnaires (app & web)
Naturalistic data from VRUs

- Automatic detections of accidents
  - Simulated accidents
    - Dummy and stuntman
  - Rule-based
    - Acceleration, jerks, rotation

<table>
<thead>
<tr>
<th></th>
<th>Detected</th>
<th>Not detected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stuntman</td>
<td>23</td>
<td>12</td>
</tr>
<tr>
<td>Dummy</td>
<td>14</td>
<td>0</td>
</tr>
</tbody>
</table>
... and the correct answer?
Answer b) is correct!!!

1-2 conflicts per day.

Of course, it depends on the location, but nowadays conflicts are quite rare, too, and it is no longer possible to use human observers as in 1980s...
Contact

Niels Agerholm
na@civil.aau.dk
VRU and Accident Costs

Anatolij Kasnatscheew
BASt, Germany
In how many countries is the specific value ‘accident costs per VRU’ calculated?

a) None
b) 2
c) 15
d) All countries
Components... and according methods

- Medical Costs
- Property Damage
- Administrative Costs
- Production Loss
- Human Costs
- Other Costs
- Restitution Costs
- Human-Capital-Approach
- Willingness-to-Pay Approach
- Different methods
Accident cost calculation in EU countries

Sources:
InDeV Deliverable 5.1 (2016) (www.indev-project.eu);
Methodologies in Austria and Germany

Accident costs per fatality

- Austria
- Germany

Costs breakdown:
- Human Costs
- Production Loss
- Medical Costs
- Administrative Costs
- Other Costs

Costs range from 0,00 € to 3,000,000,00 €.
Are VRU considered in Accident Costs?

○ Poland

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit costs (PLN), year 2014</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>General unit costs</td>
<td>VRU unit costs (pedestrians)</td>
</tr>
<tr>
<td>Fatality</td>
<td>1,913,909</td>
<td>1,308,473</td>
</tr>
<tr>
<td>Seriously injured</td>
<td>2,291,214</td>
<td>1,803,897</td>
</tr>
<tr>
<td>Slightly injured</td>
<td>27,107</td>
<td>31,889</td>
</tr>
<tr>
<td>Damage only</td>
<td>39,722</td>
<td>20,029</td>
</tr>
<tr>
<td>Average unit costs</td>
<td>993,934</td>
<td>795,540</td>
</tr>
</tbody>
</table>

○ Sweden

<table>
<thead>
<tr>
<th></th>
<th>Per serious injury</th>
<th>SEK 4,700,000</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Per single bicycle accident</strong></td>
<td></td>
<td><strong>SEK 600,000</strong></td>
</tr>
<tr>
<td><em>(CBA guidelines)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Per single pedestrian accident</strong></td>
<td></td>
<td><strong>SEK 400,000</strong></td>
</tr>
<tr>
<td><em>(CBA guidelines)</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per slight injury</td>
<td>SEK 230,000</td>
<td></td>
</tr>
<tr>
<td>Per property damage only</td>
<td>SEK 15,000</td>
<td></td>
</tr>
</tbody>
</table>

... and the correct answer?
In how many countries is the specific value ‘accident costs per VRU’ calculated?

a) None
b) 2
c) 15
d) All countries
Contact

 ■ M.Sc. Anatolij Kasnatscheew

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 www.indev-project.eu
What is the pyramid of Hydén?
Naturalistic walking/cycling studies

- Accident data analysis
  - Self-reported accidents
- Traffic conflict observations
  - Serious conflicts
  - Slight conflicts
  - Potential conflicts
- Undisturbed passages

Behavioural observations
... and the correct answer?
Answer B is correct!
Prof. Dr. Kris Brijs
kris.brijs@uhasselt.be
... please add up your correct answers!
And the winner is ...