



#### **PRACT**

Predicting Road ACcidents a Transferable methodology across Europe:
Project Results for Practitioners I: Repository

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### **Presentation Structure**



- Review of existing APM/CMF Databases and Road Safety Toolkits
- 2. Development of PRACT Repository
- 3. Repository Operation and Features
- 4. Example Queries
- 5. Conclusions







# Web-based CMF databases and Road Safety Toolkits



- FHWA CMF Clearinghouse
   (<a href="http://www.cmfclearinghouse.org">http://www.cmfclearinghouse.org</a>),
- AustRoads Road Safety Engineering Toolkit (http://www.engtoolkit.com.au/),
- iRAP Road Safety Toolkit (<a href="http://toolkit.irap.org/">http://toolkit.irap.org/</a>)
- SPF Clearinghouse
   (http://spfclearinghouse.org/),







#### **FHWA CMF Clearinghouse**



- Includes only CMFs.
- Currently includes 5,378 CMFs (421 CMFs from HSM and 4,957CMFs not in the HSM).
- A rating process of CMFs has been applied, however not as demanding as the one of HSM.
- Detailed background information on presented CMFs is available.





# AustRoads Road Safety Engineering Toolkit



- 67 treatments, all concerning road infrastructure, are included, with an estimated "crash reduction effectiveness".
- Searchable database of treatments according to:
  - Treatment type/ name,
  - Crash type,
  - Safety issue,
  - Road user group
- Information on the estimation of crash reduction effectiveness is generally not available.





### **iRAP Road Safety Toolkit**





- Includes 58 treatments (infrastructure, vehicle & user related).
- No CMFs or APMs are included.
- Rough assessment of each treatment's effectiveness using a four scale system:
  - 0-10%,
  - 10-25%,
  - 25-40%,
  - 60% or more.

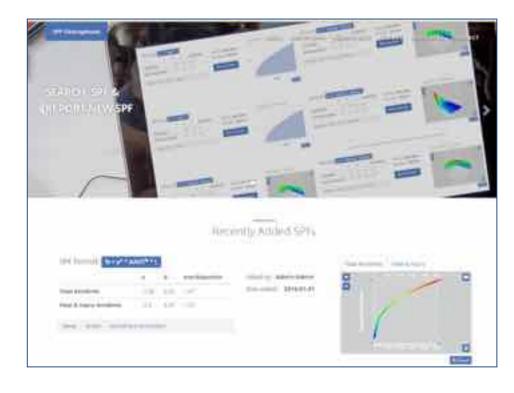




#### **SPF Clearinghouse**



- Includes only SPFs
- Data gathered primarily on a voluntarily basis from users
- Detailed background information on included SPFs (sample size, study citation, statistical methodology etc.) available only to subscribers.





## **Additional Value of** PRACT Repository (1/2)



- **Stand-alone Regression Equation** APMs are not available in any of the above web databases.
- SPFs are available only in SPF Clearinghouse (to subscribers only), without however providing adequate background www.pract-repository.eu information.
- **Existing Databases include mostly** data from USA and Australia. Results from European studies are very uncommon.







# Additional Value of PRACT Repository (2/2)



#### In PRACT Repository:

- All types of data required in accident prediction are available:
  - CMFs,
  - SPFs, and
  - Regression Equation APMs.
- www.pract-repository.eu
- The quality of included CMFs has been verified through an evaluation process.
- User is provided with additional information to verify the quality and the transferability of CMFs and APMs.
- Data from European studies are included.

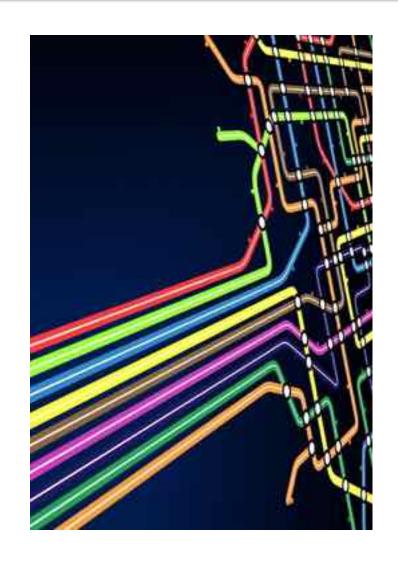




## **Development of Repository**



- The repository has two parts:
   the CMF part and the APM part.
- Both parts are based on the respective inventories developed within PRACT review process.
- All reviewed APMs were included in the repository.
- Only high quality CMFs were included in the repository, on the basis of specific criteria.







#### **Criteria for CMF inclusion**



- Quality criteria refer to:
  - statistical design,
  - testing for statistical significance, and
  - sample size.
- CMFs originating from the Highway
   Safety Manual were considered "a priori"
   of adequate quality and were included in
   the repository.
- All other CMFs were assessed prior to inclusion in the repository, on the basis of fulfilling all of the quality criteria.







### **CMF Criterion 1: Statistical Design**



- Naive B-A analysis (no comparison group): not accepted
- Simple cross sectional analysis: not accepted
- B-A with comparison group: accepted, provided that:
  - the comparison group (CG) is comparable to the treated group,
  - CG is properly selected to address most common biases, and
  - there are sufficient controls to deal with time trends in accidents.
- Empirical Bayes B-A analysis: accepted, provided that:
  - there are no evident problems in the choice of the reference group.
- Poisson / Negative Binomial / Quasi Poisson Regression modelling: accepted only for treatments with random treatment allocation (e.g. blanket treatments), not accepted for treatments applied to high risk sites.





# CMF Criterion 2: Testing for Statistical Significance



- Statistically significant at 10% level as a minimum.
- 95% interval does not include 1.
- If 95% interval includes 1 and all other criteria are met, the CMF was included in the repository with the code "not significant" instead of the CMF value, as an indication that the treatment has no significant impact to accidents.





# CMF Criterion 3: Sample Size (sites and years)



- B-A analysis studies: at least 10 treated sites and at least 3 years of data, both for the before and the after period.
- Multivariate cross-sectional models inclusion criteria depended on the number of explanatory variables (EV) and on whether observations for each year are treated as separate observations in the model e.g.:



- 1. If observations for each year are treated as separate observations:
  - For 5 or less EV, the criterion is: sites x years > number of EVs + 50
  - For 6 or more EV, the criterion is: sites x years > number of EVs x 10
- 2. If average / mean values of variables over all years are used in the model:
  - For 5 or less EV, the criterion is: sites x years > number of EVs + 50
  - For 6 or more EV, the criterion is: number of sites > number of EVs x 10





### **Results of Criteria Application**



- The quality criteria were applied to the CMFs (1,526 Factors and Functions) gathered during the review process.
- 889 CMFs were found to satisfy the quality criteria and were included in the repository.





## **Main Features of PRACT Repository**



- Link to website: www.pract-repository.eu
- Five basic sections:
  - HOME: basic information about the repository and about PRACT project,
  - SEARCH FOR APMs: search the database for APMs with specific characteristics,
- pract
  - SEARCH FOR CMFs: search the database for CMFs with specific characteristics,
  - GLOSSARY: definitions of the most commonly used terms
  - CONTACT: allows the user to send email to the partners responsible for the operation and maintenance of the website.





#### "HOME" section







HOME SEARCH FOR APMS SEARCH FOR CMFS GLOSSARY CONTACT

#### ABOUT PRACT - PREDICTING ROAD ACCIDENTS - A TRANSFERABLE METHODOLOGY ACROSS EUROPE

This Repository contains the most recent Accident Prediction Models and Crash Modification Factors, highlighting effectiveness of road safety measures worldwide, for use by road safety decision makers and practitioners worldwide.

This Repository has been developed within the framework of the project PRACT, (Predicting Road ACcidents a Transferable methodology acress Europea carried out by the University of Florence, the National Technical University of Athens, the Technical University of Berlin and the Imperial College London, commissioned by the Conference of European Directors of Roads.

The basic assumption on which the PRACT Repository is built is that Accident Prediction Models (APM) and Crash Modification Factors (CMF) can be transferred to conditions different from the ones for which they have been developed. If selected based on scientifically valid criteria and adapted to local conditions based on historical crash data.

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### "GLOSSARY" section







HOME	SEARCH FOR APMS	SEARCH FOR CMFS	GLOSSARY	CONTACT
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#### GLOSSARY

Accident Prediction Model (APM) or Safety Performance Function (SPF): an equation used to estimate or predict the expected average accident frequency at a location, as a function of traffic volume and road infrastructure characterizates (e.g. number of lates, type of median, traffic control). In PRACT repository, APMs are disoded in two types:

Regression Equation Models and SPFS, CMFs, Models (see also respective definitions in the gessiary).

Average Annual Daily Traffic (AADT): the counted for estimated) total traffic volume in one year divided by 365 days/ year.

Before - After Study: the evaluation of implemented safety measures in terms of crash reduction, by comparing frequency or severity of crashes before and after implementation, that often result in the development of CMFs. There are several different types of before - after studies - see also: Naive Before-After Study, Before-After Study and Full Bayes Before-After Study.

Before After with Comparison Group Study: a type of before after study, in which a group of untreated sites that are smaller in nature to the treated sites is used to control for changes in crash frequency not influenced by the treatment. For the approach to give unbiased estimates, treatment implementation must be random (e.g., a blanket treatment applied to all sites) rather than related to accident rates and reference sites must have similar characteristics to the treatment sites, including accident rates in the before period.

Crash Modification Factor (CMF) or Function, or Accident Modification Factor; the relative change in accident frequency due to a change in one specific condition (when all other conditions and site characteristics remain constant). CMF is the ratio of the expected accident frequency after a modification or measure is implemented to the estimated





### "CONTACT" section







HOME	SEARCH FOR APMS	SEARCH FOR CMFS	GLOSSARY	CONTACT	
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CONTACT					Università degli Studi di Sirenze (UNIN) Francesca La Form
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## "SEARCH FOR APMs" section (1/3)



- The search page allows the user to search the database for APMs by providing any of the characteristics displayed in the figure to the right.
- If one or more of the above search criteria are left blank (or the blank field is selected at the drop-down list), the criterion is ignored. Thus, a search with all fields blank will return all the 273 entries of the APM database.

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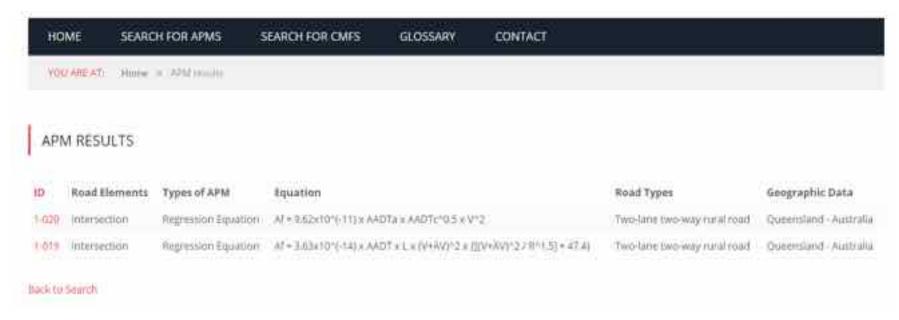




## "SEARCH FOR APMs" section (2/3)



- The search leads to a results page with a list of the APMs in the database that meet the search criteria and their most basic characteristics.
- Further clicking on any specific ID number from this list provides the user with all the available data related to this specific APM.







## "SEARCH FOR APMs" section (3/3)



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#### Comments





## "SEARCH FOR CMFs" section (1/3)



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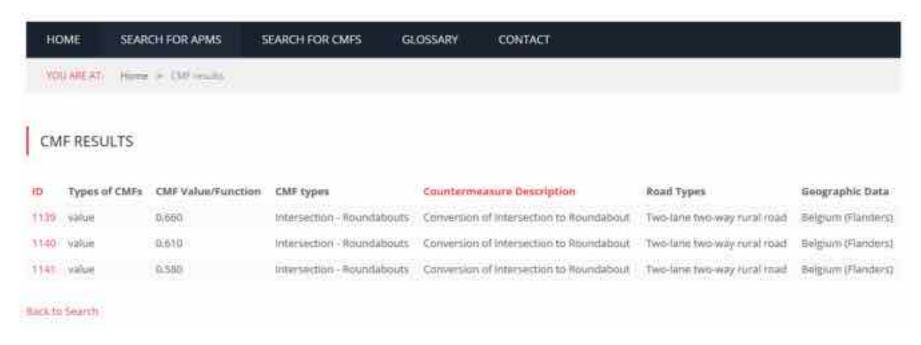
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## "SEARCH FOR CMFs" section (2/3)



- The search leads to a results page with a list of the CMFs in the database that meet the search criteria and their most basic characteristics.
- Further clicking on any specific ID number from this list provides the user with all the available data related to this specific CMF.







## "SEARCH FOR CMFs" section (3/3)



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#### **Conclusions**



## The PRACT Repository is a valuable road safety decision support system because:

- it organizes current knowledge on accident prediction (both APMs and CMFs) in a user-friendly and easily accessible by all road safety practitioners website,
- it is a complementary database to the PRACT Tool & Guideline,
- it provides all the available background information on the APM or CMF development, to assist in the assessment of the suitability of the provided data.





HOME

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FARCH FOR CMFS

SLOSSARV

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