Needs and Uses of Road Safety Data within the UN SafeFITS Model

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Objectives and structure

To discuss the needs and uses of road safety statistics in individual countries and globally, especially in the context of the UN SafeFITS Model

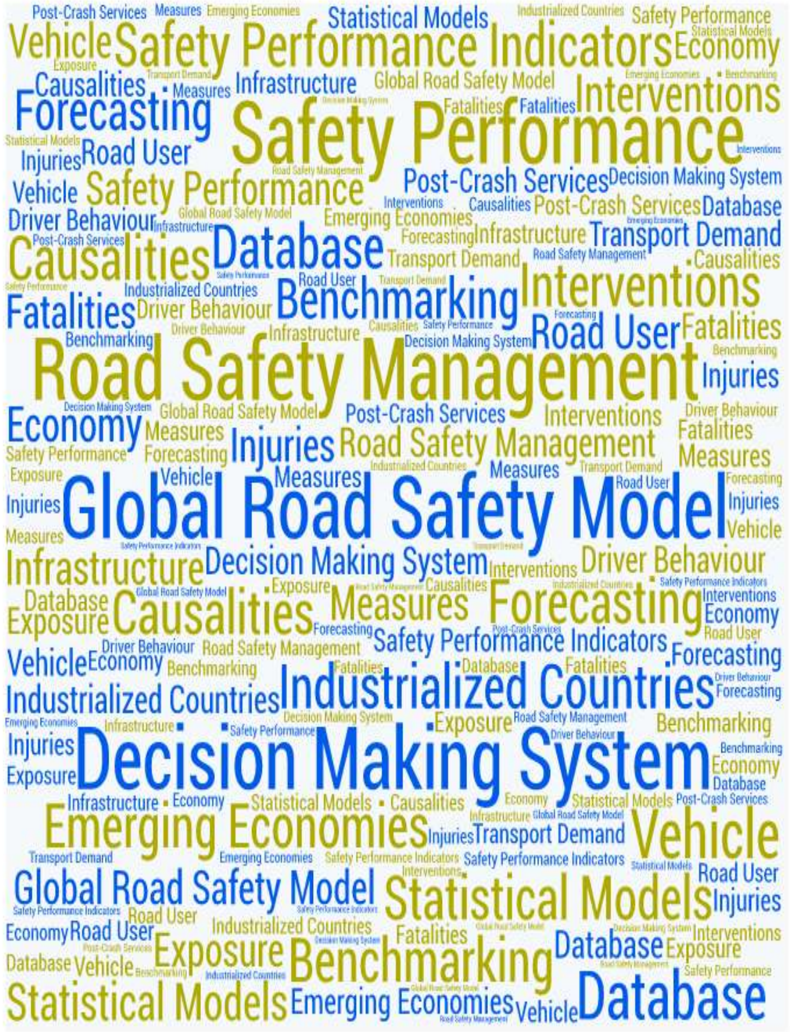
<u>Structure</u>

I. Needs and uses of road safety data

II. The experience of Greece with road safety data

III. The SafeFITS model

IV. Road safety data in Albania



I. Needs and uses of road safety data

Initial Considerations

- Road Safety is a typical field with high risk of **important investments not bringing results**.

- Absence of **monitoring** and accountability limits seriously road safety performance.

- Decision making in road safety management is highly dependent on appropriate and **quality data**.

- Very often we look where the data are and **not where the problems** and solutions are.

Effective strategies, the weakest link

- Institutional management functions
  - First pillar of the Decade of Action: Road safety management
- Interventions
  - Four other pillars of the Decade of Action
- Results
  - Less fatalities and injuries
  - Road safety targets: which is the acceptable road safety level?

Data needed for Road Safety Decision Support

Data to identify the problems

- Crash data
- Risk exposure and performance indicators

Data to identify the solutions

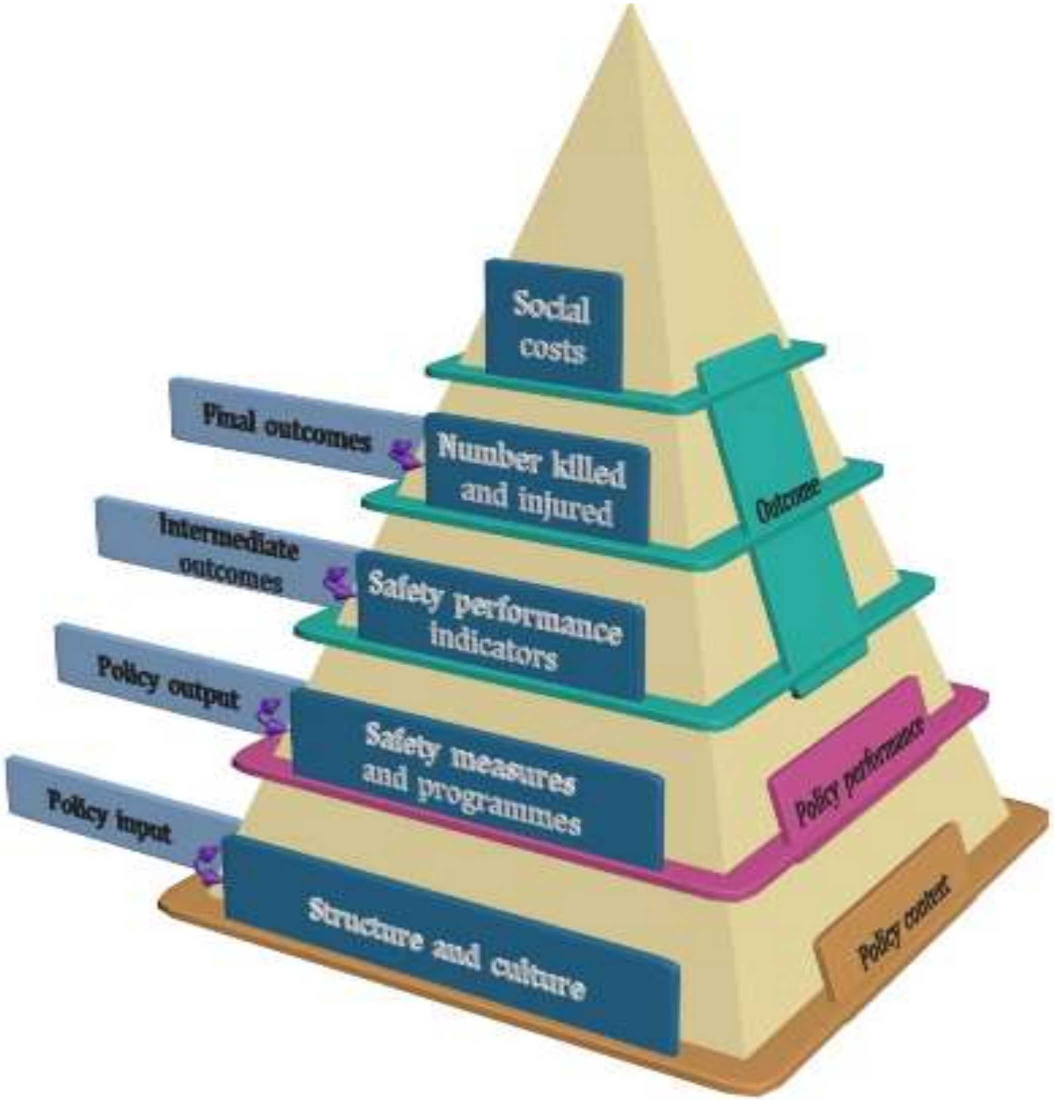
- data on measures implementation
- data on measures effectiveness

Macroscopic data

- for the whole population
- for a city, region, country, globally

Microscopic data

- driver, passenger pedestrian behaviour and performance
- junction, road segment, small area performance
- specific accident analysis data



Critical Data Properties

- Crash data are meaningful only if they are combined with **exposure data** (crash per km driven, per traffic characteristics, per time, etc.)

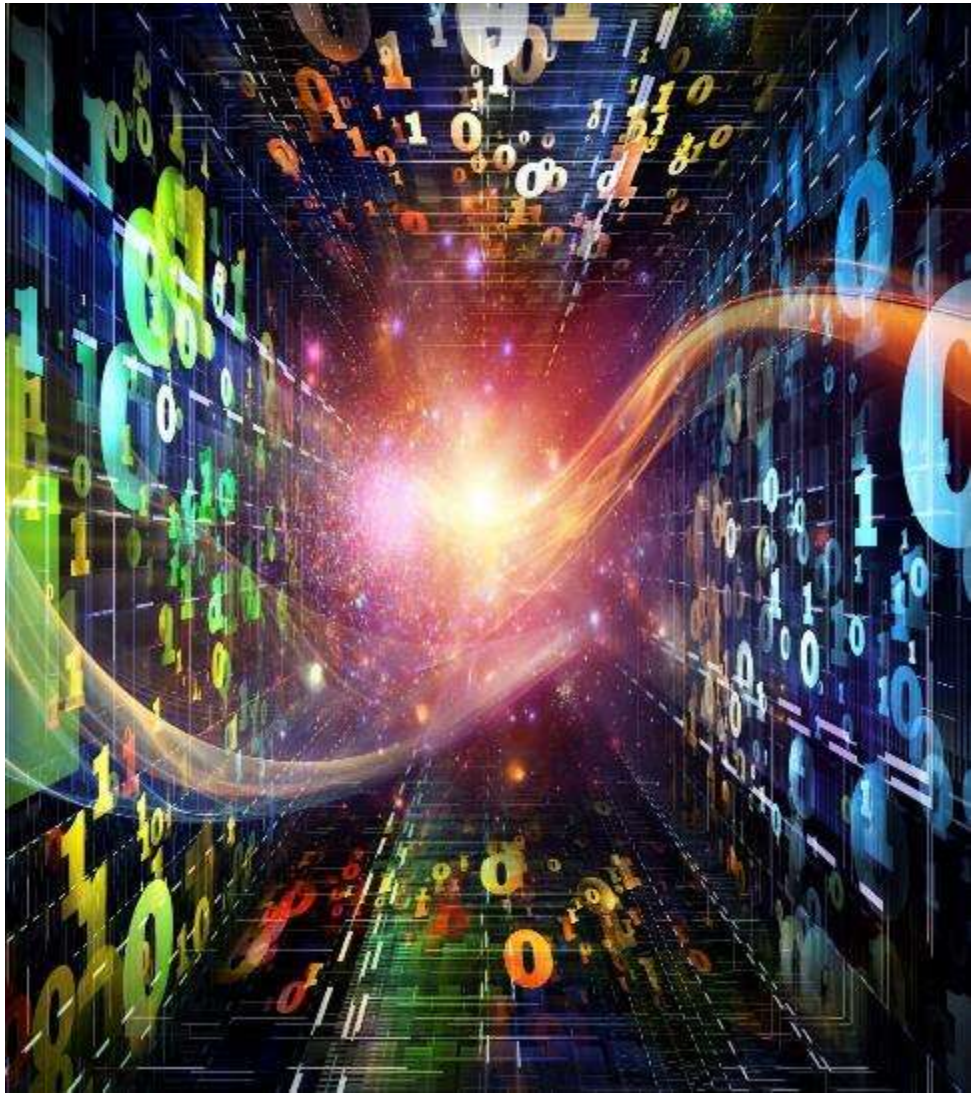
- Crash causalities are revealed when crashes are correlated with **safety performance indicators (SPI)** (behaviour, infrastructure, traffic, vehicles)

- The **evaluation of safety measures** effectiveness provides valuable information, necessary for matching problems with solutions

- Analysis of **high resolution data** reveals hidden and critical crash properties

Importance of Road Safety Data Collection

- **Identify high-risk sites**, prioritize needs and plan necessary improvements
- Investigate the **impact of various factors** (geometric characteristics, electric lighting, parking, driver training, enforcements, etc.) on accidents reduction
- In the **monitoring** of projects (e.g. signaling, lighting, signage, etc.) and actions (e.g. increased enforcement, parking ban) in order to improve road safety
- In "before and after" studies in order to determine the **effect of an intervention** at a road section or intersection
- **In-depth investigation** (experts' report) on a particular accident



Problems when Recording Road Accidents

- Definitions (accident, fatality etc.)
- Unclear determination of road accident location
- Insufficient or incorrect recording
- Insufficient accident coverage & under-reporting

Exposure and Crash Rates

Mortality rates & risk rates

- **Epidemiology approach**

  (fatalities per population, per licensed drivers)

- **Road traffic risk approach**
  (crashes per vehicle kilometres travelled, per road length, and per number of vehicles in the fleet)

- **Road user at risk**
  (casualties per person kilometres travelled, per number of trips, per time spent in traffic)

- Basic requirements
  - Travel/mobility surveys for collecting veh-km or persons-km data
  - Traffic counts systems established on the national and main interurban road network (veh-km)
  - Vehicle / driver classification as per international standards

Exposure Indicators

Specific Exposure Indicators

- Population
- Driver population
- Road length
- Vehicle fleet
- Vehicle kilometres, Person kilometres
- Number of trips
- Time spent in traffic

- **Disaggretated per road user, vehicle and road characteristics**
- **Time dimension?**

How to define SPIs?

- SPIs reflect the operational level of road safety
  - Mean speed on motorways, rural, urban roads
  - The share of drivers under the influence of alcohol on the road network
  - The seat-belt use rate

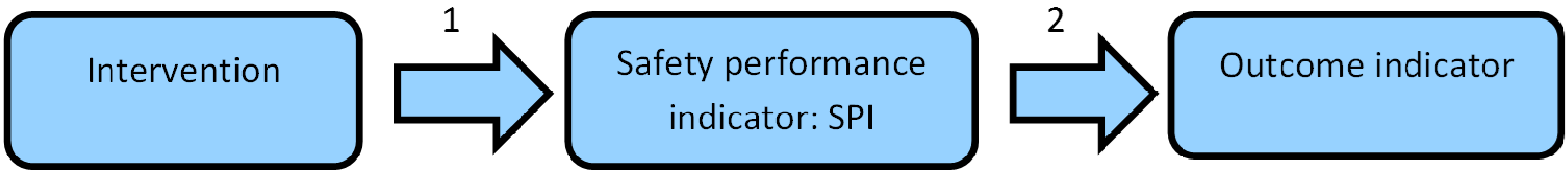
- SPIs should cover the **whole road transport system**: roads, behaviour, vehicles
- Measured by means of **surveys**; sampling is needed
- A strong **causal relationship** between risk and SPIs

Why Use SPIs?

- Provide **more complete picture** of the road safety level
- Able to **highlight the emergence of developing problems** at an early stage
- Provide a means for **monitoring, assessing and evaluating** the effectiveness of safety actions applied
- Utilize qualitative and quantitative information to help **determine a program's success** in achieving its objectives
    - Able to reflect unsafe operational conditions
    - More general than direct outputs of specific safety interventions

Interventions, intermediate and final outcome

The relationship between Intervention, Safety Performance and Final Outcome indicators



Road Safety Performance Indicators – examples (1/2)

Road User Behaviour

- Speed: mean speed and speed variance, speed limit violations
- Percentage of seat belts, child restraints and helmets' use
- Incidence/prevalence of drinking and driving
- Incidence/prevalence of mobile phone use/texting
- Failure to stop or yield at junctions or at pedestrian crossings
- Inadequate headways – close following
- Use of reflective devices for cyclists and pedestrians
- Use of pedestrian crossing facilities by pedestrians

Road Safety Performance Indicators - examples (2/2)

Roads and vehicles

- Percentage of road network not meeting safety design standards
- Pavement friction on wet road surfaces
- Percentage of new cars with the top star rating according to NCAP
- Percentage of technically defective vehicles

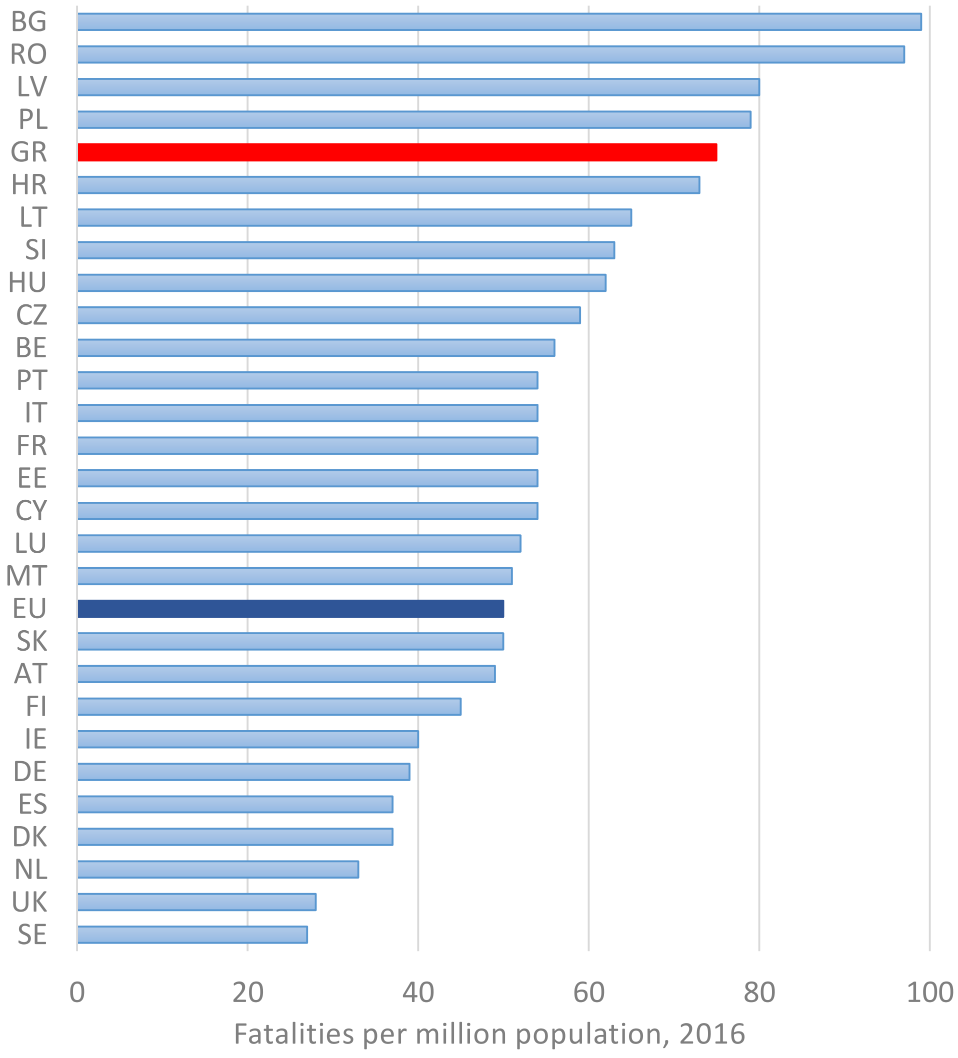
Post-crash care

- EMS response time
- Quality of trauma care
- Number of hospital beds per population

II. The Greek experience with road safety data

Road Safety in the EU

- In 2016, about **25.500** people were killed and **135.000** were seriously injured in road accidents in the EU
- In 2016, road accident fatalities were reduced by **2%** after two years of stagnation and by **19%** since 2010
- The mean number of road fatalities per million population was **50** in 2016 and was reduced by **43%** compared to 2007
- Only 10 countries have a better performance than the EU average



Source: European Commission

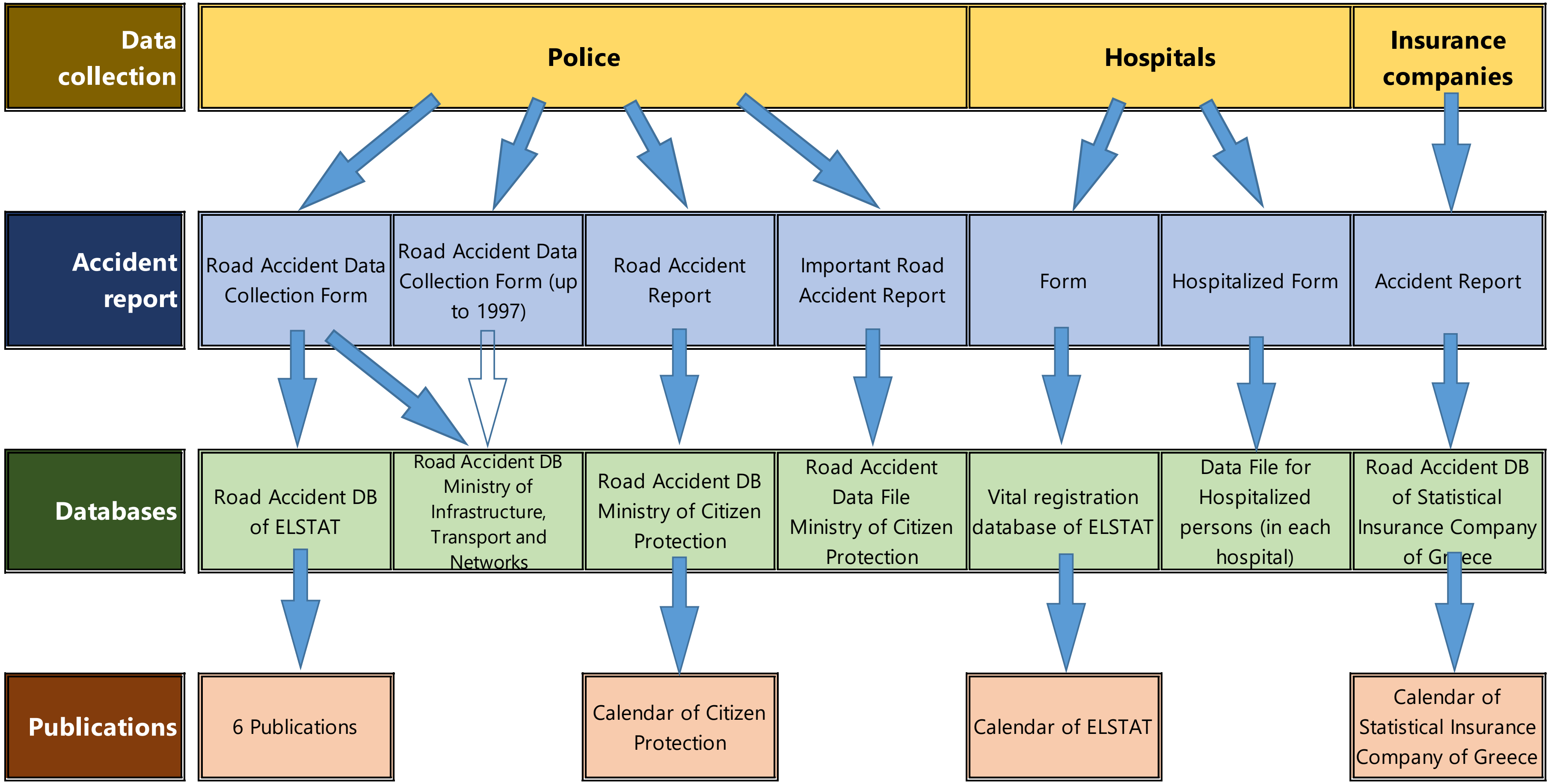
Road Safety in Greece

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Change 2006-2016
Fatalities	1.657	1.612	1.553	1.456	1.258	1.141	988	879	795	793	824	-50%
Injured persons	20.675	19.766	19.010	18.641	19.108	17.259	15.640	15.175	14.564	14.096	13.825	-33%
Accidents	16.019	15.499	15.083	14.789	15.032	13.849	12.398	12.109	11.690	11.440	11.318	-29%
Vehicles (x1000)	6.996	7.380	7.729	7.911	8.062	8.087	8.070	8.035	8.048	8.076	8.173	17%
Fatalities/million vehicles	237	218	201	184	156	141	122	109	99	98	101	-57%
Fatalities/million population	149	146	140	131	115	98	89	80	73	73	76	-49%

Source: ELSTAT

- During the past decade, Greece was among the EU countries with the **worst road safety performance**
- However, Greece recorded an **impressive reduction in road fatalities by 46%** during the period 2009-2015
- This impressive reduction in road fatalities during economic crisis **was stopped in 2015**

Data Collection and Processing in Greece



The Role of Police (1/2)

- The **Police** are the first to arrive at the accident site and the last to update the related data

- Responsible to:
  - **Forward** the data to the Hellenic Statistical Authority (ELSTAT)
  - **Maintain** the National Data File

- Draw up an accident report by filling-in an **accident data collection form**

The Role of Police (2/2)

- Task **on accident site:**
  - Carry out an investigation
  - Fill-in autopsy report, and part of the road accident data collection form (completed later on at the police headquarters)

- The road accident data collection forms are finalised with the necessary updates **within 30 days from the day of the accident**

- The source with **the most detailed data** collected at national level, in terms of variables and values collected

ELSTAT Database

- Detailed Disaggregate Data (1985-2012)
- Accident
- Vehicle
- Injured persons

- Road Accident Data Collection Form (DOTA)
- Updated since 1996

- **Fatality Definition: Common European definition (Killed within 30 days from the day of the accident)**

- Statistics
- Publication of aggregate statistics
- Provide with data international organizations (CARE, Eurostat, OECD etc.)


STOP ...στα τροχαία ατυχήματα

ΔΕΛΤΙΟ

ΟΔΙΚΟΥ ΤΡΟΧΑΙΟΥ ΑΤΥΧΗΜΑΤΟΣ

ΝΟΜΟΣ

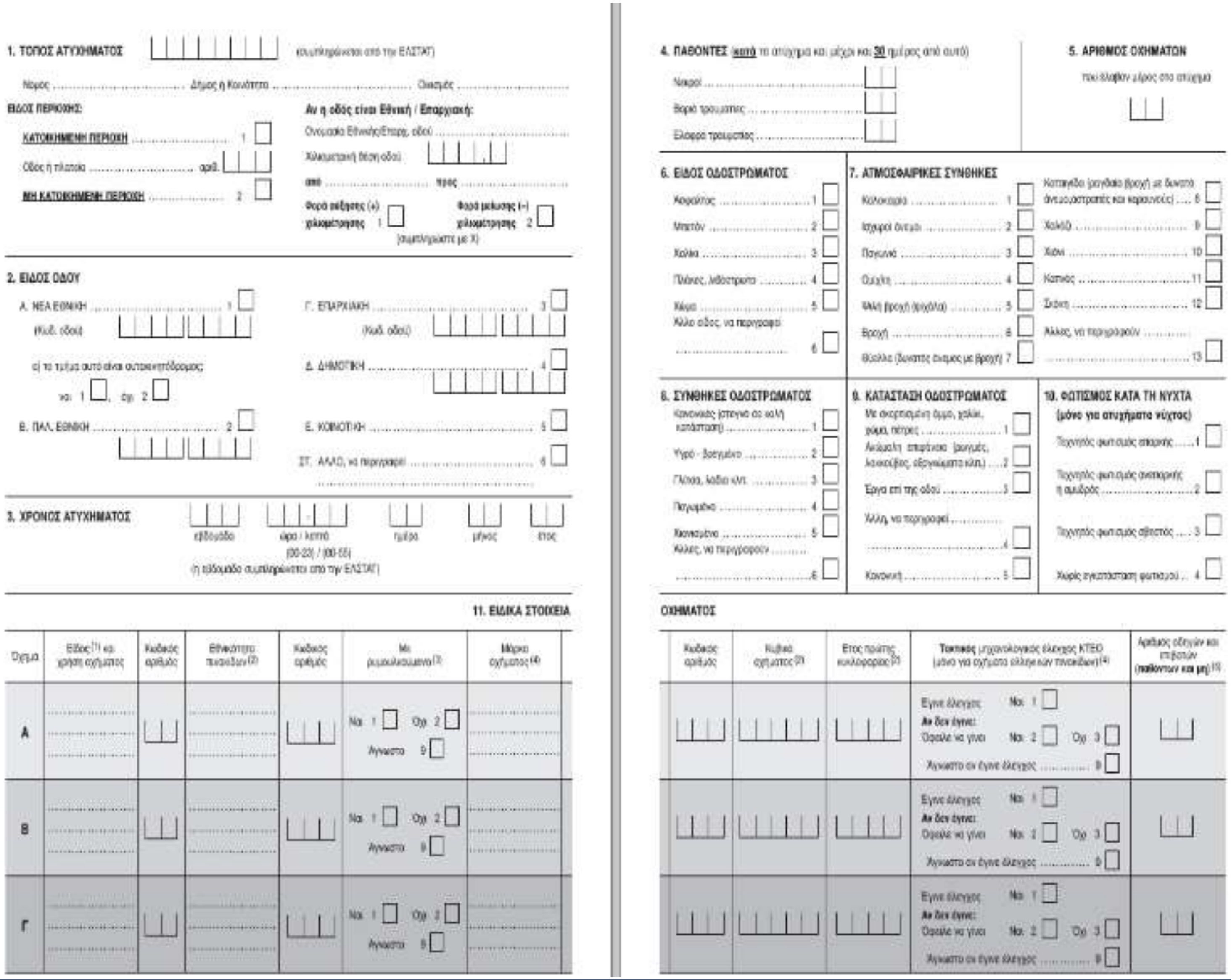
Α/Α ΔΕΛΤΙΩΝ ΔΕΣΜΙΔΑΣ

ΑΣΤΥΝΟΜΙΚΗ/ΛΙΜΕΝΙΚΗ ΑΡΧΗ:

ΠΕΙΡΑΙΑΣ, 2010

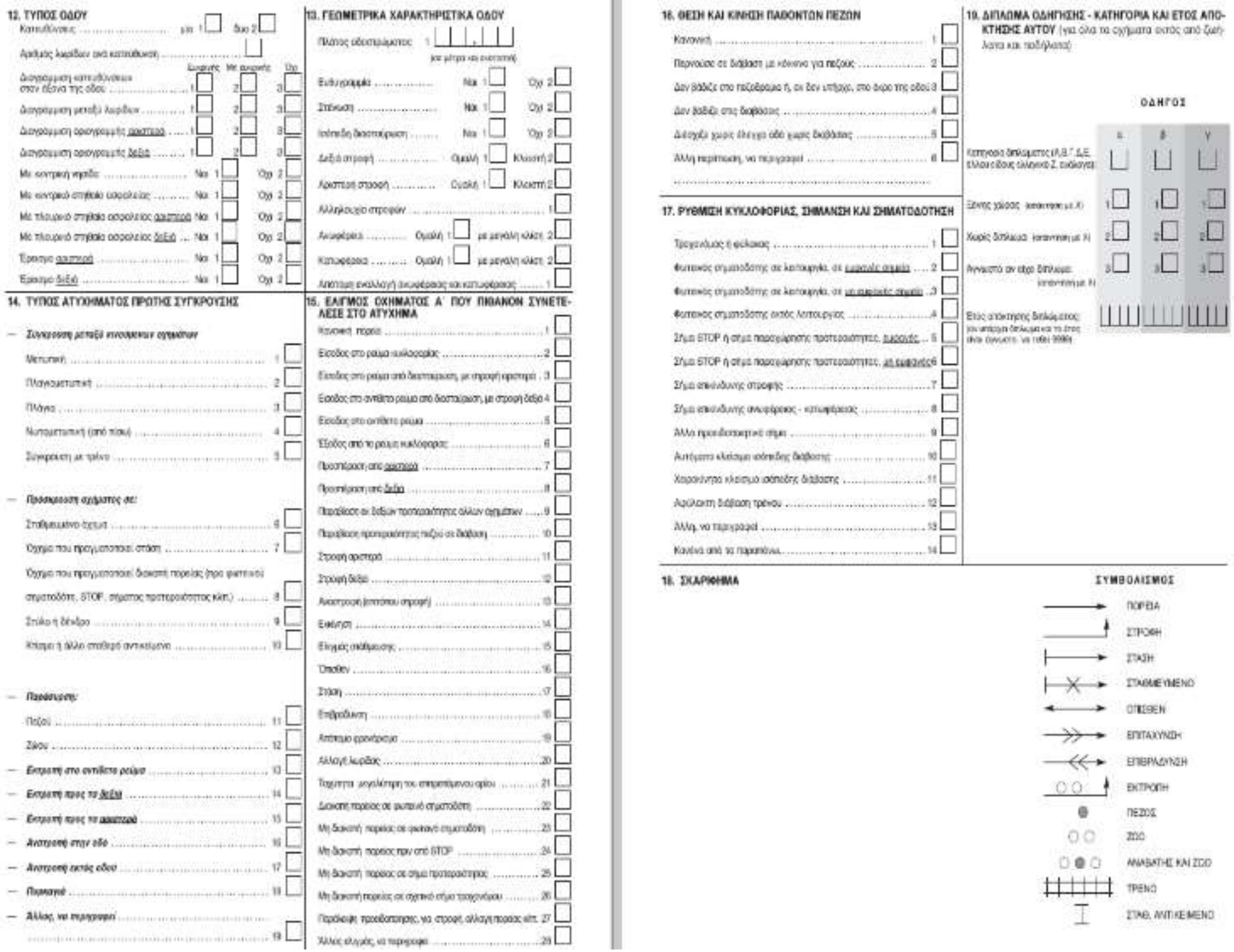
Road Accident Data Collection Form (1/3)

- Type of accident
- Type of area
  (inside/ outside built-up area)
- Type of road
- Time of accident
  (week/ time/ day/ month/ year)
- Injured persons
  (fatally, seriously, slightly)
- Number of vehicles involved
- Type of road surface
- Weather conditions
- Road surface conditions
- Night-lighting
- Specific characteristics of vehicles
  (type of vehicle, nationality, brand, cc, technical inspection, number of drivers and passengers)



Road Accident Data Collection Form (2/3)

- Road characteristics
- Geometric road characteristics
- Type of accident
- Vehicle manoeuver type
- Injured pedestrians’ position and movement
- Traffic regulation, signage and signaling
- Driver’s license – category and year
- Sketch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14. ΤΥΠΟΣ ΑΤΥΧΗΜΑΤΟΣ ΠΡΩΤΗΣ ΣΥΓΚΡΟΥΣΗΣ

15. ΕΛΙΓΜΟΣ ΟΧΗΜΑΤΟΣ Α' ΠΟΥ ΠΙΘΑΝΟΝ ΣΥΝΕΤΕΛΕΣΕ ΣΤΟ ΑΤΥΧΗΜΑ

16. ΘΕΣΗ ΚΑΙ ΚΙΝΗΣΗ ΠΑΘΟΝΤΩΝ ΠΕΖΩΝ

17. ΡΥΘΜΙΣΗ ΚΥΚΛΟΦΟΡΙΑΣ, ΣΗΜΑΝΣΗ ΚΑΙ ΣΗΜΑΤΟΔΟΤΗΣΗ

18. ΣΚΑΡΙΦΗΜΑ

19. ΔΙΠΛΩΜΑ ΟΔΗΓΗΣΗΣ - ΚΑΤΗΓΟΡΙΑ ΚΑΙ ΕΤΟΣ ΑΠΟΚΤΗΣΗΣ ΑΥΤΟΥ

ΟΔΗΓΟΣ

ΣΥΜΒΟΛΙΣΜΟΣ

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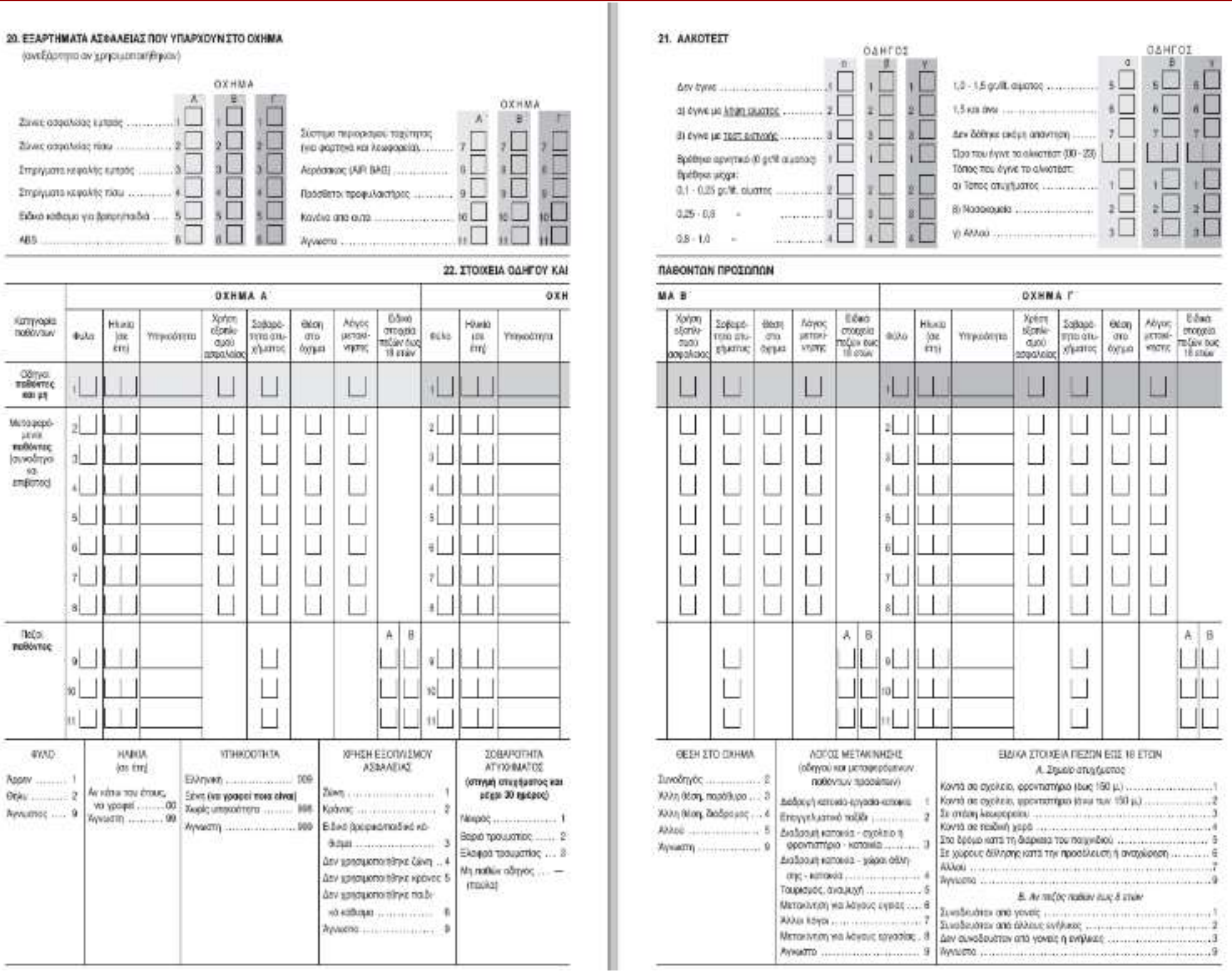
ΣΤΑΘ. ΑΝΤΙΚΕΙΜΕΝΟ

Road Accident Data Collection Form (3/3)

- Restraints systems in vehicle
- Alcotest results
- Driver's and injured persons' information


20. ΕΞΑΡΤΗΜΑΤΑ ΑΣΦΑΛΕΙΑΣ ΠΟΥ ΥΠΑΡΧΟΥΝ ΣΤΟ ΟΧΗΜΑ

21. ΑΛΚΟΤΕΣΤ

22. ΣΤΟΙΧΕΙΑ ΟΔΗΓΟΥ ΚΑΙ ΠΑΘΟΝΤΩΝ ΠΡΟΣΩΠΩΝ

ΟΧΗΜΑ Α

ΟΧΗΜΑ Β

ΟΧΗΜΑ Γ

Data Files for Hospitalized Persons

In Hospitals

- Recording causes of hospitalization
- Recording road accident injured persons

- These files show the lowest degree of incomplete recording
- No central archive is kept, not electronic form

ELSTAT Vital Registration Database (demographic data included)

- Recording time and cause of death
- Statistics
- Publication of aggregate statistics

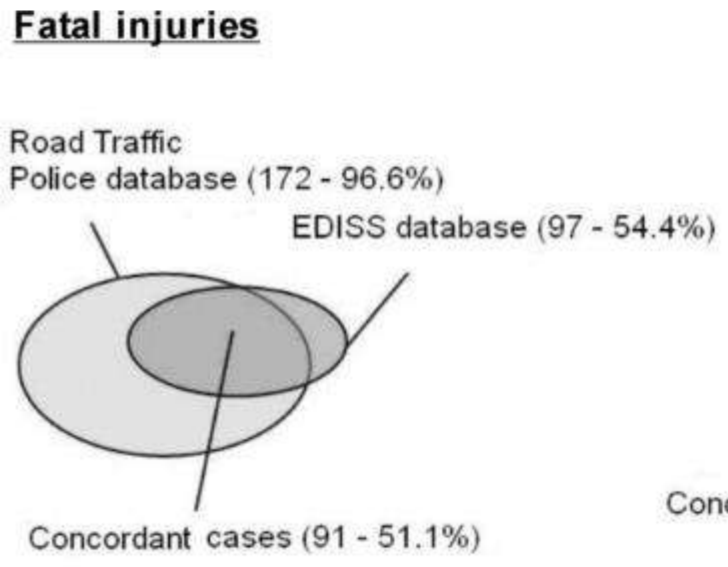
Comparison of Fatality Data from Different Sources

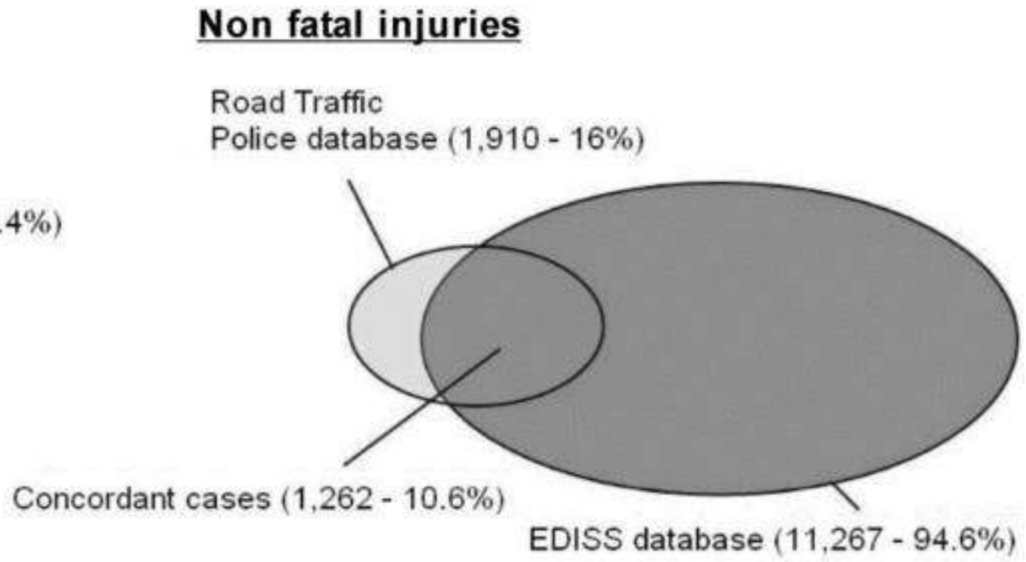
	Source			Correction Coefficient		
	ELSTAT*	Police*	Hospital*	Police-ELSTAT	Hospitals/ELSTAT	Average
1990	1.737	1.986	2.247	249	1,29	1,20
1991	1.790	2.013	2.246	223	1,25	
1992	1.829	1.995	2.252	166	1,23	
1993	1.830	2.008	1.986	178	1,09	
1994	1.909	2.076	2.221	167	1,16	
1995	2.043	2.149	2.435	106	1,19	
1996	2.157	2.175	2.540	18	1,18	1,15
1997	2.105	2.141	2.333	36	1,11	
1998	2.182	2.229	2.324	47	1,07	
1999	2.116	2.181	2.226	65	1,05	
2000	2.037	2.103	2.288	66	1,12	
2001	1.880	1.911	2.035	31	1,08	
2002	1.634	1.655	1.865	21	1,14	
2003	1.605	1.613	1.794	8	1,12	
2004	1.670	1.547	1.984	-123	1,19	
2005	1.658	1.470	1.971	-188	1,19	
2006	1.657	1.493	1.851	-164	1,12	
2007	1.612	1.449	1.793	-163	1,11	
2008	1.553	1.550	1.722	-3	1,11	
2009	1.456	1.463	1.647	7	1,13	
2010	1.258	1.281	1.430	23	1,14	
2011	1.141	1.092	1.339	-49	1,17	
2012	988	976	1.191	-12	1,21	
2013	879	865	1.096	-14	1,25	
2014	795	798	1.025	3	1,29	
2015	793	796	956	3	1,21	

* up to 1995 on accident site, since 1996 within 30 days

Comparison of Casualty Data from Police vs. Hospitals

- **Linking data files from Police and Hospitals (records "matching")**
  - On the basis of unique record identification
  - In a specific study area, with sufficient Hospital coverage and Police Divisions
  - Different linking methods (probabilistic, deterministic etc.)
  - Allows to identify the degree of injury under-reporting by Police and Hospitals
  - Results can be generalised at national level *under certain conditions*





Traffic Data in Greece

Data

- Motorway tolls
- Traffic Management Centre
- Other individual studies
- Previous studies
- Louis - Berger Study (1979-1989)
- Annual Average Daily Traffic (AADT) of the main country's road network
- New National Survey of Origin – Destination (1993)

Surveys

- In the context of the Metro Development Study (1996-2000), detailed origin - destination data were gathered for the area of Athens
- Vehicle mileage data for urban and intercity buses are available through the Athens Urban Transport Organization (OASA) and KTEL interurban buses respectively

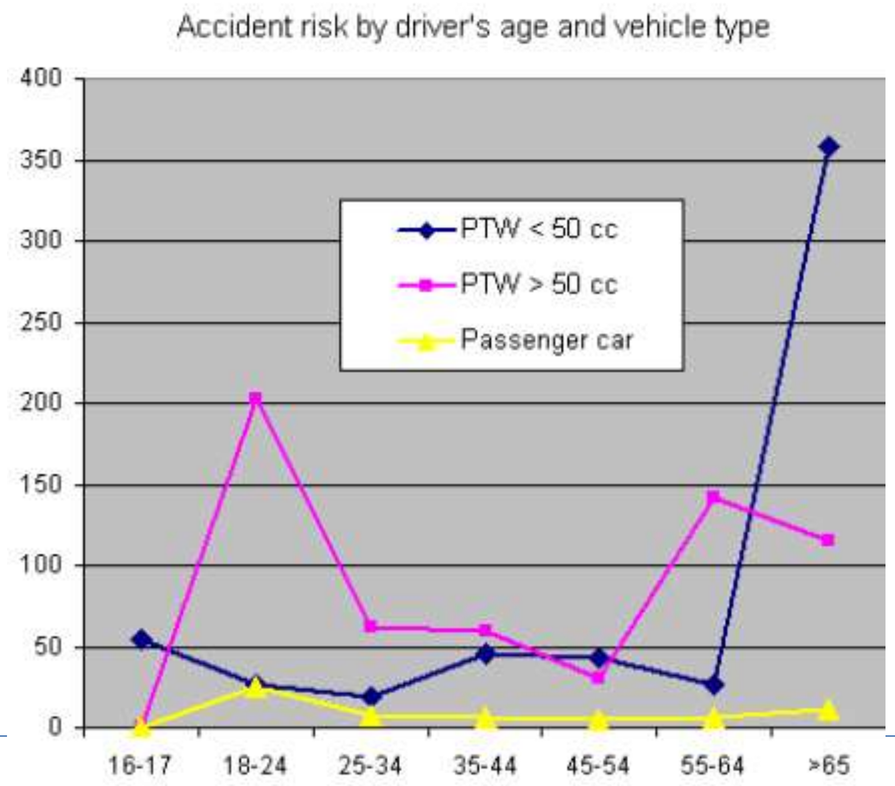
No systematic traffic data collection

NTUA Travel Survey for risk exposure in Greece

Data

- Travel surveys on 2004 & 2008
- Vehicle-kilometres travelled
  - Passenger cars
  - Mopeds
  - Motorcycles
  - Urban areas
  - Rural areas
  - Driver age groups
  - Vehicle age groups

Vehicle type	Driver's age 16-17	18-24	25-34	35-44	45-54	55-64	>65	Total
PTW < 50 cc	54,7	26,7	18,4	45,3	42,5	26,6	357,8	**40,1**
PTW > 50 cc	-	202,0	62,3	59,5	30,1	141,9	115,4	**77,8**
Passenger car	-	25,2	7,7	6,3	5,3	6,5	11,5	**8,0**
Total	-	**40,6**	**11,9**	**9,3**	**6,3**	**7,9**	**17,0**	**11,8**



Risk estimates

- Fatalities per million veh-Km

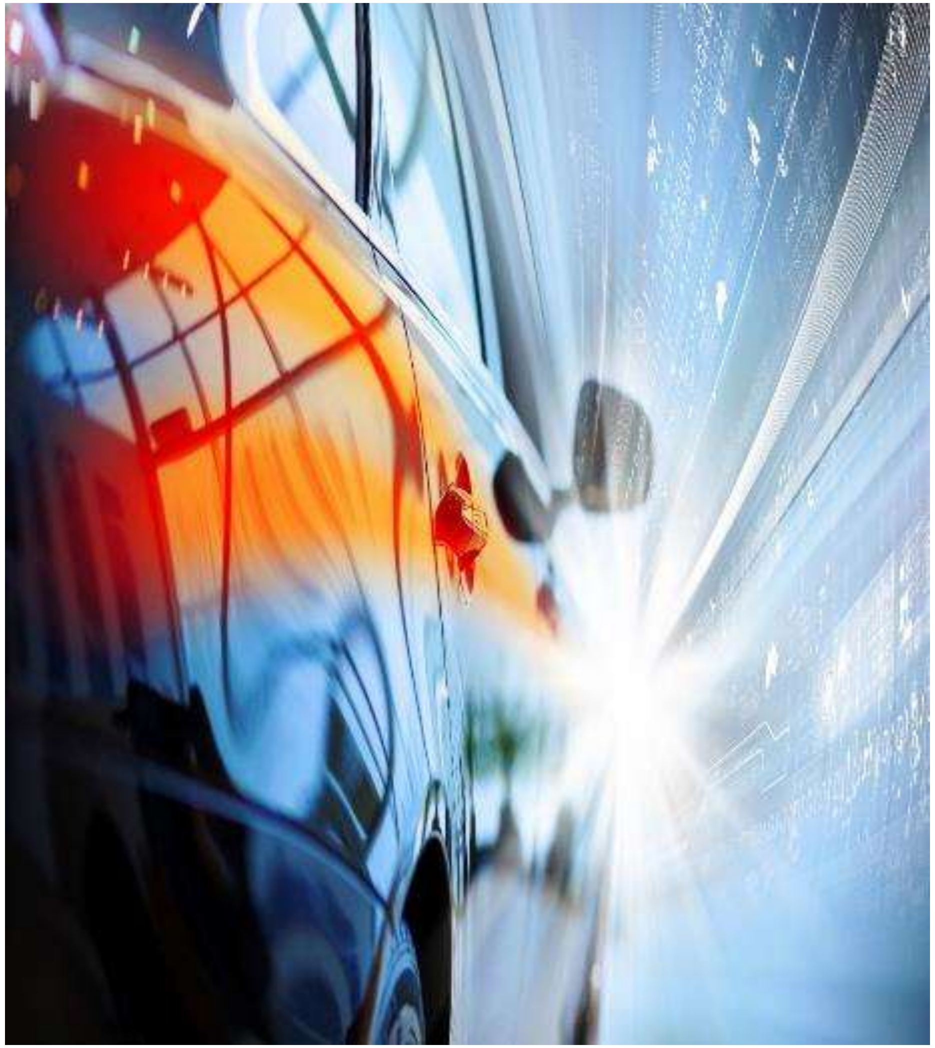
Database of Vehicles Fleet

- Disaggregate data
- Technical characteristics of vehicles
- Characteristics of registration licenses

- Data could be used in statistical road accident analyses providing useful indicators

Parameters limiting the potential of their exploitation

- Invalid recording of withdrawals
- No information for vehicles that are no longer in traffic
- No information on mopeds



Safety Performance Indicators in Greece

- Data on Road Safety Performance Indicators are **not collected systematically** in Greece.

- Latest data come from an observational survey conducted by **NTUA** in 2009.

- Data on **seat-belt use, helmet use and mobile phone use** while driving were collected.

Seat-belt use rates in Greece

gr71. Seat belt use rate, Greece 2009

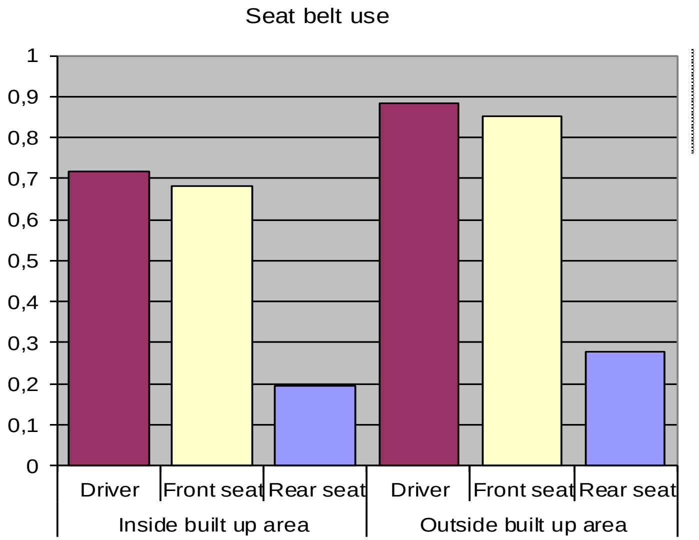
www.nrso.ntua.gr

Driver	Male 16-24	Male 25-54	Male >55	Female 16-24	Female 25-54	Female >55	Total
Yes	71%	75%	71%	73%	84%	84%	77%
No	29%	25%	29%	27%	16%	16%	23%
Total	100%	100%	100%	100%	100%	100%	100%

	Inside built up area			Outside built up area		
	Driver	Front seat	Rear seat	Driver	Front seat	Rear seat
Yes	72%	68%	19%	88%	85%	28%
No	28%	32%	81%	12%	15%	72%
Total	100%	100%	100%	100%	100%	100%

	Vehicle type		
Driver	Large	Small	Total
Yes	77%	76%	77%
No	23%	24%	23%
Total	100%	100%	100%

	Child restraint use		
	Inside built up area	Outside built up area	Total
Yes	57%	59%	57%
No	43%	41%	43%
Total	100%	100%	100%



- Around 1 out of 4 drivers do not use seat belts
- Females have higher seat belt use rates
- Only 19% of rear seat passengers use seat belt inside urban area and 28% outside urban area
- Child restrain use is 57% with no significant difference inside / outside urban area

Issued : *November 6th, 2009*
About the data : *nrso-data-gr.pdf*
Sources : *NTUA,2009*
Processing : *National Technical University of Athens - Road Safety Observatory*

Helmet use rates in Greece

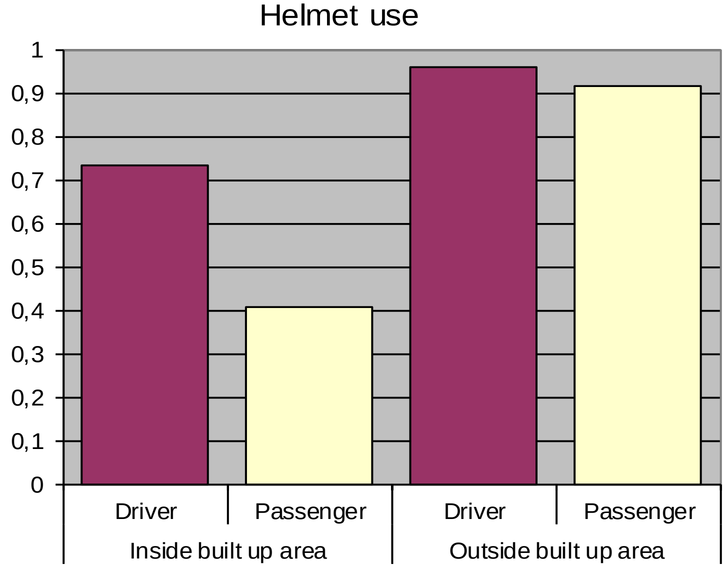
gr72. Helmet use rate, Greece 2009

www.nrso.ntua.gr

	Male			Female			Total
Driver	16-24	25-54	>55	16-24	25-54	>55	
Yes	61%	79%	67%	44%	82%	100%	75%
No	39%	21%	33%	56%	18%	0%	25%
Total	100%	100%	100%	100%	100%	100%	100%

	Inside built up area		Outside built up area	
	Driver	Passenger	Driver	Passenger
Yes	73%	41%	96%	91%
No	27%	59%	4%	9%
Total	100%	100%	100%	100%

	Power Two Wheel		
Driver	Large	Small	Total
Yes	80%	72%	75%
No	20%	28%	25%
Total	100%	100%	100%



- 75% of motorcycle riders use their helmet
- Young females (16-24) have fewer helmet use rates than young males, while the opposite is the case for the other age groups
- Only 41% of motorcycle passengers use their helmet inside built-up areas
- More than 90% of riders use their helmet outside built-up areas

Issued : *November 6th, 2009*
About the data : *nrso-data-gr.pdf*
Sources : *NTUA,2009*
Processing : *National Technical University of Athens - Road Safety Observatory*

Mobile phone use while driving in Greece

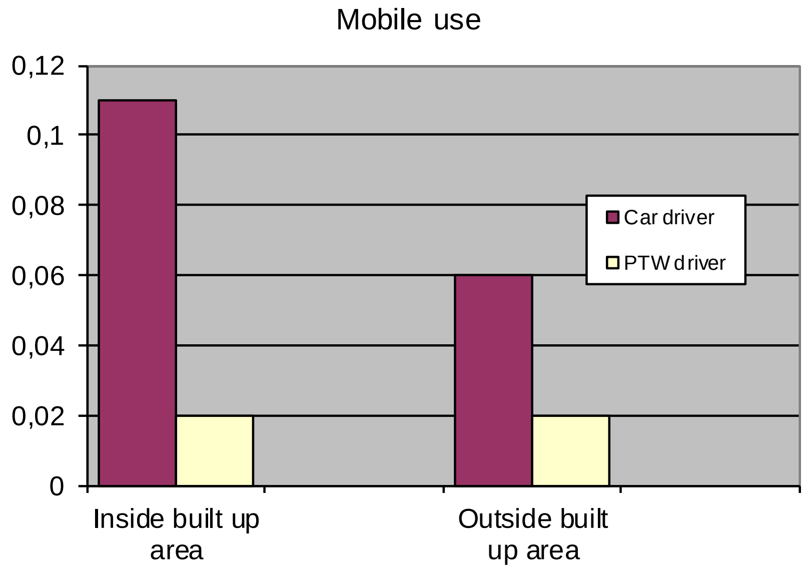
gr73. Mobile phone use rate, Greece 2009

www.nrso.ntua.gr

	Male			Female			Total
	16-24	25-54	>55	16-24	25-54	>55	
Car driver	15%	9%	4%	16%	12%	1%	9%
PTW driver	4%	2%	2%	12%	3%	0%	2%

	Inside built up area	Outside built up area
Car driver	11%	6%
PTW driver	2%	2%

	Large	Small	Total
Car driver	9%	10%	9%
PTW driver	2%	3%	2%



Issued : *November 6th, 2009*

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Sources : *NTUA,2009*

Processing : *National Technical University of Athens - Road Safety Observatory*

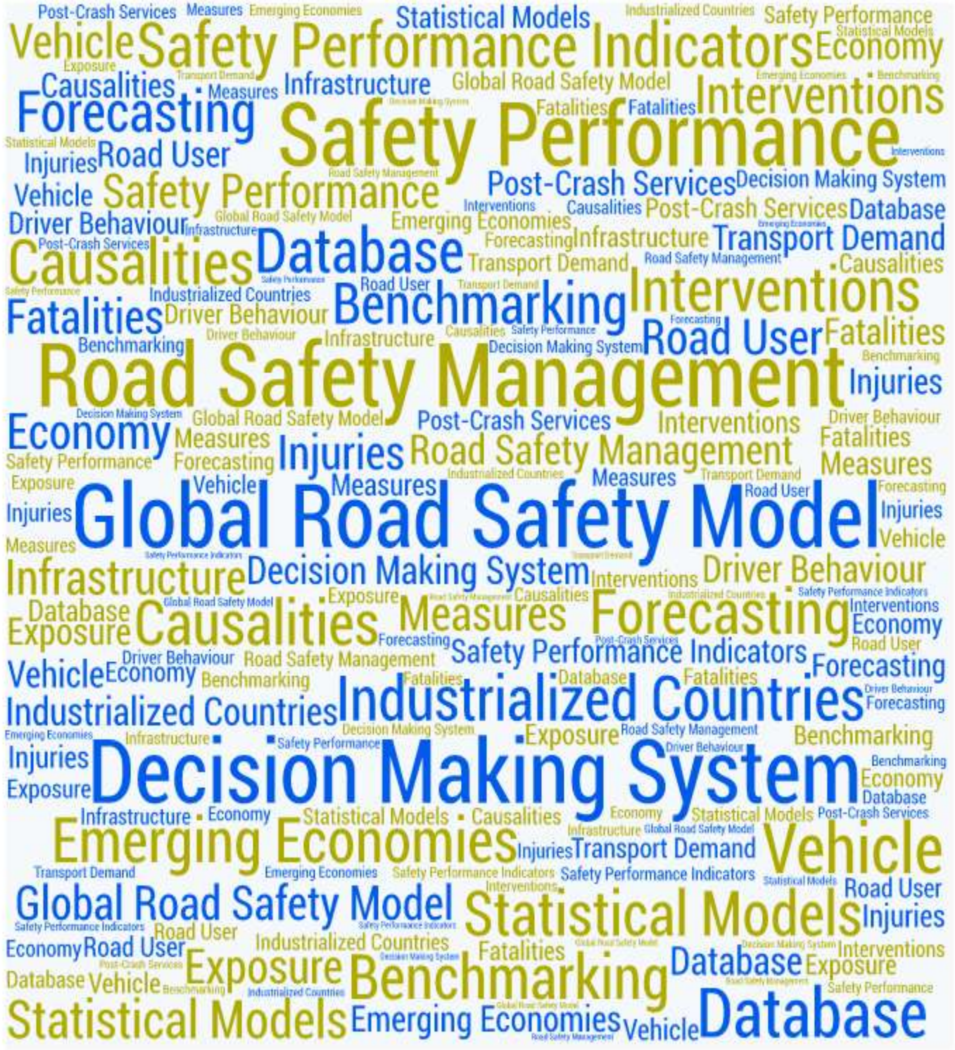
- Mobile phone use rate is increased for young car drivers (16 - 24)
- Mobile phone use rate is increased inside built-up area
- PTW riders present very low mobile phone use rates, except for young females (12%)

III. The SafeFITS Model

Objective

- To develop a macroscopic **road safety decision making tool** that will assist governments and decision makers, both in developed and developing countries, to decide on the most appropriate road safety policies and measures in order to achieve tangible results.

- Based on work carried out in the framework of the **"Safe Future Inland Transport Systems (SafeFITS)"** project of the United Nations Economic Commission for Europe (UNECE), financed by the International Road Union (IRU).



Conceptual Framework

Based on the five pillars of WHO Global Plan of Action (WHO, 2011) and an improved version of the SUNflower pyramid (2002):

<u>SafeFITS layers</u>

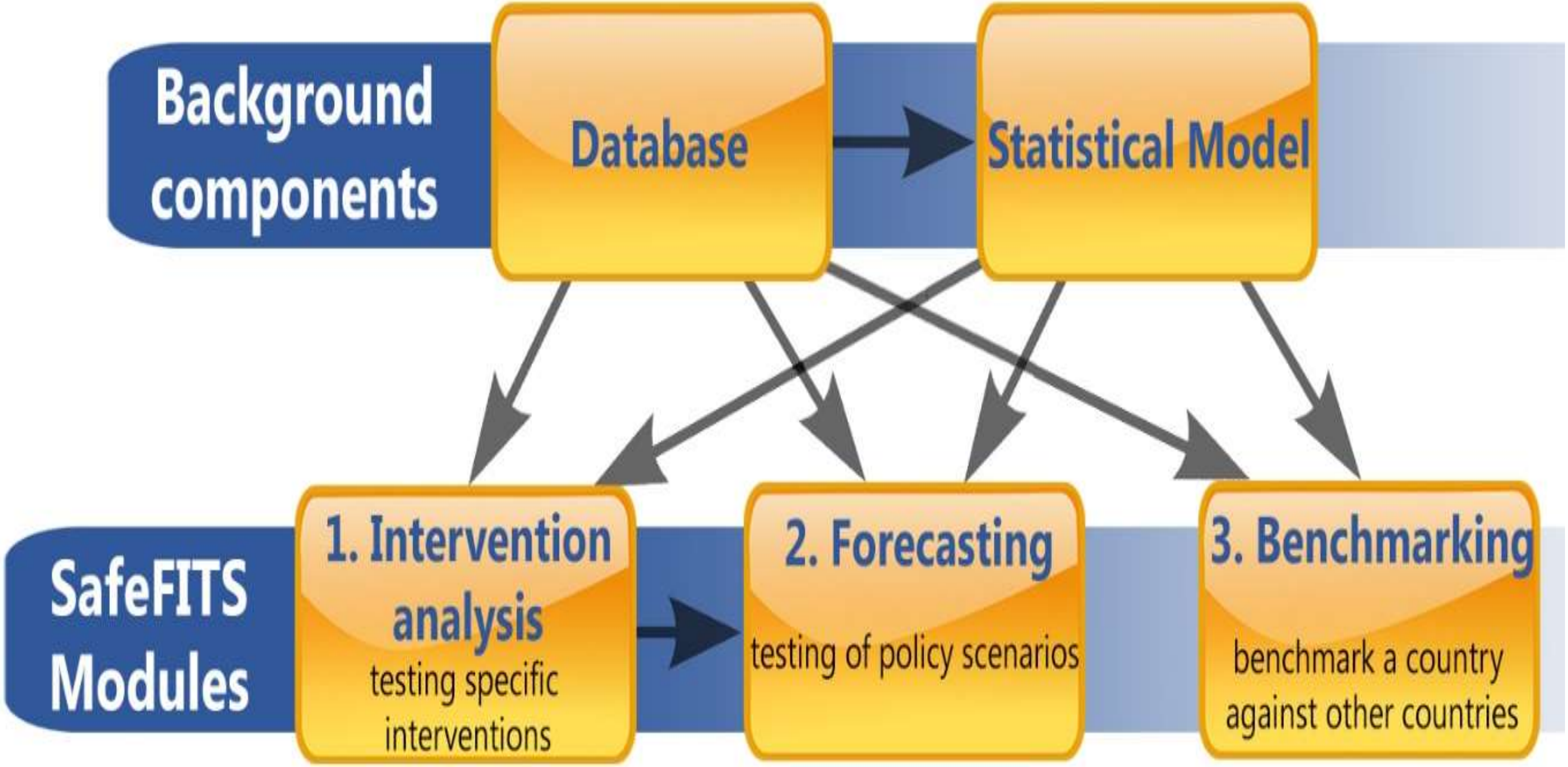
1. Economy and Management
2. Transport Demand and Exposure
3. Road Safety Measures
4. Road Safety Performance Indicators
5. Fatalities and Injuries

<u>SafeFITS pillars</u>

1. Road Safety Management
2. Road Infrastructure
3. Vehicle
4. User
5. Post-Crash Services

		PILLARS				
		1. Road Safety Management	2. Road Infrastructure	3. Vehicle	4. User	5. Post-Crash Services
LAYERS	1. Economy & Management	Economic Developments, Strategy & Targets, Regulatory framework (compliance with UN regulations)	Existence of motorways, of non-paved roads, of road tunnels, Existence of guidelines (for design, RSA etc.), Legislation on speeding	Number of registered vehicles, Vehicle age, Technical inspection legislation (maintenance, roadworthiness, overweight, ADR)	Requirements & regulations on drivers' licensing, Drivers' training, Medical exams of drivers, Legislation on alcohol / use of seatbelts / use of helmets	Trauma management sector level of development Number of hospitals / doctors / Intensive Care (IC) beds per population
	2. Transport demand & exposure	Transport Modal Split (road/rail, passenger/freight, private/public), Share of urban areas, Weather conditions	Exposure with regard to road type, Length of road per road type, Share of Motorway length out of the total road network, Number of railway level crossings	Exposure with regard to vehicle type, Share of PTW, HGV / carriage of dangerous goods vehicles in the vehicle fleet	Exposure with regard to age & gender	
	3. Road Safety Measures	Assessment of measures, Data collection & analysis, International comparisons, Vehicle taxation, Road pricing	Treatment of High Risk Sites, Road Safety Audits, Tunnel Road Safety Management, Improvement of signage, Installation of road restraint systems, Lighting, Speed limits in urban areasTraffic Calming	Renewal rate of vehicle fleet, Measures for second-hand vehicles, Vehicle related roadside controls, Automated driving	Enforcement, campaigns, Road safety education, Training	e-call, First aid training, Existence & organisation of trauma centers
	4. Road Safety Performance Indicators	Safety targets, stakeholders' involvement, detail of analysis for intervention selection, economic evaluation	Number of RSAs conducted, Percentage of High Risk Sites treated	Global NCAP score, Mean age of the vehicle fleet per vehicle type, Existence of safety equipment, e-safety	Speeding / Drink & drive infringements, Seatbelts use, Helmets use, Driver distraction, Driver fatigue	Emergency response time, Type of field treatment, Speed of treatment in hospital, Number of ambulances per population, Number of good samaritanians per population
	5. Fatalities & Injuries	Fatalities / injuries per million inhabitants, fatalities / injuries per million passenger cars, fatalities / injuries per 10 billion passenger-km	Fatalities / injuries in motorways, in 2-lane rural roads, in urban roads	Share of motorcycle fatalities out of the total fatalities	Share of pedestrian / bicyclist / motorcyclist fatalities out of the total fatalities, drink-driving related fatalities	Death rate, Hospitalization in IC Unit, Total length of hospitalization

Overview of the SafeFITS model

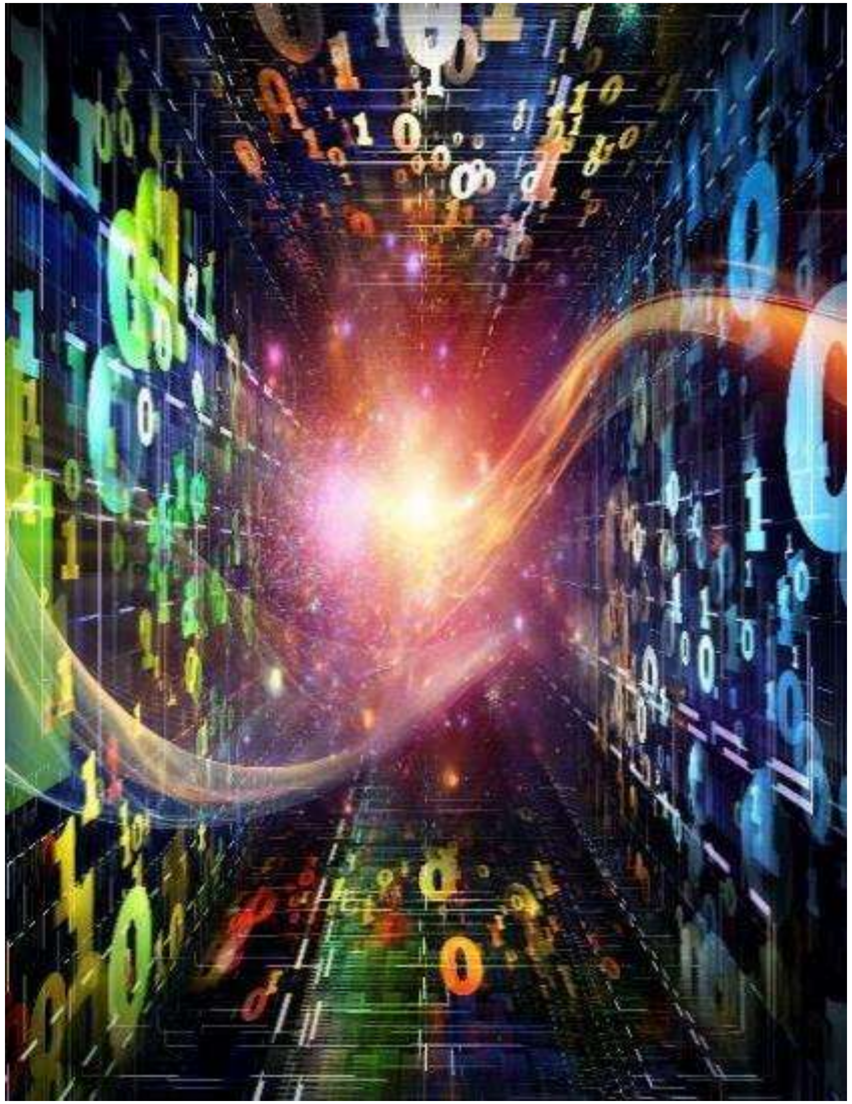


Architecture of the SafeFITS Database

- Data from the five layers and the five pillars
- **International databases** explored: WHO, UN, IRF, OECD, etc.
- Data for **130 countries** with population higher than 2,8 million inhabitants
- Data refer to **2013** or latest available year

SafeFITS Database Overview

- Wherever data for 2013 were not available, the **latest data available** were used.
- The missing values of each indicator of the countries were filled with **the mean value** of the indicator in their regions.
- The respective information of each variable is **properly represented** in the database for the statistical process.
- **Data for most variables were available for almost all countries.**
- **Low data availability** is observed for few variables regarding:
  - the restraint use rates
  - the percentage of fatalities attributed to alcohol
  - the distribution of fatalities by road user type
  - transport demand and exposure indicators



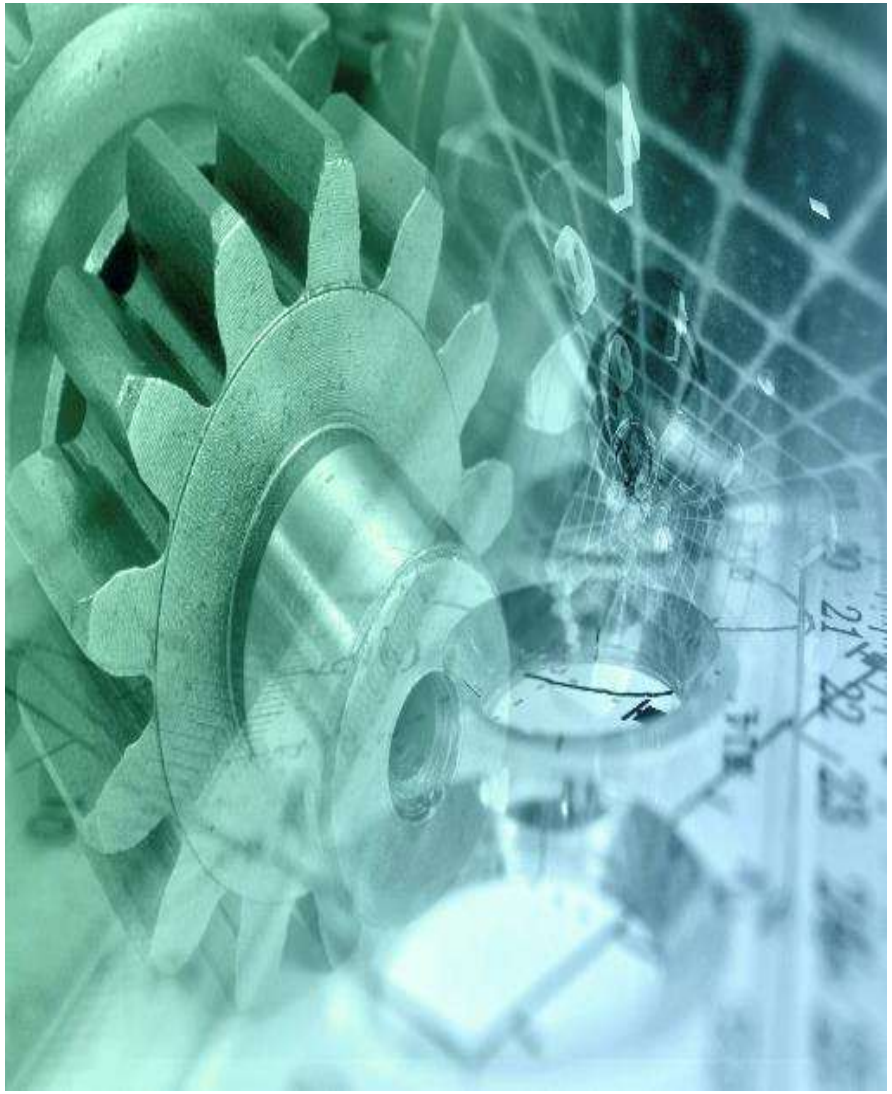
Data Analysis Methodology

- **Two-step approach** of statistical modeling:
  - Estimation of **composite variables** (factor analysis) in order to take into account as many indicators as possible of each layer
  - Correlating road safety outcomes with indicators through composite variables by developing a **regression model with explicit consideration of the time dimension**

- **Model specification**

Log(Fatalities per Population)$_{ti}$ = A_i + *Log(Fatalities per Population)*$_{(t-\tau)}$ + B_i * GDP_{ti} + K_i * *[Economy & Management]*$_{ti}$ + *Li* * *[Transport demand & Exposure]*$_{ti}$ + M_i * *[Road Safety Measures]*$_{ti}$ + N_i * *[RSPI]*$_{ti}$ + ε_i

Where [Composite Variable]



Calculation of composite variables – Economy and Management

[Comp_EM] = -0.250 (EM2_lt15yo) + 0.229 (EM3_gt65yo) + 0.228 (EM4_UrbanPop) + 0.224 (EM7_NationalStrategy) + 0.221 (EM8_NationalStrategyFunded) + 0.222 (EM9_FatalityTargets)

Indicator loadings and coefficients on the estimated factor (composite variable) on Economy and Management

	Component	
	Loadings	Score coefficients
EM1_Popdensity	,091	,029
EM2_lt15yo	-,778	-,250
EM3_gt65yo	,714	,229
EM4_UrbanPop	,709	,228
EM5_LeadAgency	,284	,091
EM6_LeadAgencyFunded	,226	,073
EM7_NationalStrategy	,697	,224
EM8_NationalStrategyFunded	,626	,201
EM9_FatalityTargets	,692	,222

Calculation of composite variables – Transport Demand and Exposure

[[Comp_TE] = 0.161 (TE1_RoadNetworkDensity) + 0.149 (TE2_Motorways) + 0.238 (TE3_PavedRoads) + 0.272 (TE4_VehiclesPerPop) + 0.267 (TE5_PassCars) - 0.221 (TE7_PTW) - 0.117 (TE10_PassengerFreight)

Indicator loadings and coefficients on the estimated factor (composite variable) on Transport Demand and Exposure

	Component	
	Loadings	Score coefficients
TE1_RoadNetworkDensity	,497	,161
TE2_Motorways	,460	,149
TE3_PavedRoads	,734	,238
TE4_VehiclesPerPop	,839	,272
TE5_PassCars	,825	,267
TE6_VansLorries	-,132	-,043
TE7_PTW	-,681	-,221
TE8_Vehkm_Total	,269	,087
TE9_RailRoad	,136	,044
TE10_PassengerFreight	-,360	-,117

Calculation of composite variables - Measures

[Comp_ME] = 0.069(ME2_ADR) + 0.045(ME4_SpeedLimits_urban) + 0.064(ME6_SpeedLimits_motorways) + 0.088(ME7_VehStand_seatbelts) + 0.091(ME8_VehStand_SeatbeltAnchorages) + 0.092(ME9_VehStand_FrontImpact) + 0.091(ME10_VehStand_SideImpact) + 0.090(ME11_VehStand_ESC) + 0.087(ME12_VehStand_PedProtection) + 0.090(ME13_VehStand_ChildSeats) + 0.068(ME15_BAClimits) + 0.068(ME16_BAClimits_young) + 0.065(ME17_BAClimits_commercial) + 0.057(ME19_SeatBeltLaw_all) + 0.063(ME20_ChildRestraintLaw) + 0.034(ME22_HelmetFastened) + 0.038(ME23_HelmetStand) + 0.038(ME24_MobileLaw) + 0.035(ME25_MobileLaw_handheld) + 0.038(ME27_PenaltyPointSyst) + 0.040(ME29_EmergTrain_nurses)

Indicator loadings and coefficients on the estimated factor (composite variable) on Measures

	Component	
	Loadings	Score coefficients
ME1_RSA	,245	,025
ME2_ADR	**,681**	**,069**
ME3_SpeedLaw	,229	,023
ME4_SpeedLimits_urban	**,443**	**,045**
ME5_SpeedLimits_rural	,200	,020
ME6_SpeedLimits_motorways	**,634**	**,064**
ME7_VehStand_seatbelts	**,877**	**,088**
ME8_VehStand_SeatbeltAnchorages	**,906**	**,091**
ME9_VehStand_FrontImpact	**,908**	**,092**
ME10_VehStand_SideImpact	**,904**	**,091**
ME11_VehStand_ESC	**,891**	**,090**
ME12_VehStand_PedProtection	**,862**	**,087**
ME13_VehStand_ChildSeats	**,896**	**,090**
ME14_DrinkDrivingLaw	,126	,013
ME15_BAClimits	**,670**	**,068**
ME16_BAClimits_young	**,670**	**,068**
ME17_BAClimits_commercial	**,645**	**,065**
ME18_SeatBeltLaw	,297	,030
ME19_SeatBeltLaw_all	**,570**	**,057**
ME20_ChildRestraintLaw	**,628**	**,063**
ME21_HelmetLaw	,236	,024
ME22_HelmetFastened	**,334**	**,034**
ME23_HelmetStand	**,379**	**,038**
ME24_MobileLaw	**,375**	**,038**
ME25_MobileLaw_handheld	**,350**	**,035**
ME26_MobileLaw_handsfree	-,295	-,030
ME27_PenaltyPointSyst	**,378**	**,038**
ME28_EmergTrain_doctors	,178	,018
ME29_EmergTrain_nurses	**,399**	**,040**

Calculation of composite variables - SPIs

[Comp_PI] = 0.144 (PI1_SeatBeltLaw_enf) + 0.155 (PI2_DrinkDrivingLaw_enf) + 0.152 (PI3_SpeedLaw_enf)+ 0.160 (PI4_HelmetLaw_enf) + 0.155 (PI5_SeatBelt_rates_front) + 0.146 (PI6_SeatBelt_rates_rear) + 0.150 (PI7_Helmet_rates_driver)+ 0.127 (PI8_SI_ambulance) + 0.116 (PI9_HospitalBeds)

Indicator loadings and coefficients on the estimated factor (composite variable) on **SPIs**

	Component	
	Loadings	Score coefficients
PI1_SeatBeltLaw_enf	,756	,144
PI2_DrinkDrivingLaw_enf	,812	,155
PI3_SpeedLaw_enf	,795	,152
PI4_HelmetLaw_enf	,837	,160
PI5_SeatBelt_rates_front	,811	,155
PI6_SeatBelt_rates_rear	,766	,146
PI7_Helmet_rates_driver	,784	,150
PI8_SI_ambulance	,667	,127
PI9_HospitalBeds	,607	,116

Final Statistical Model

The **optimal performing model** for the purposes of SafeFITS

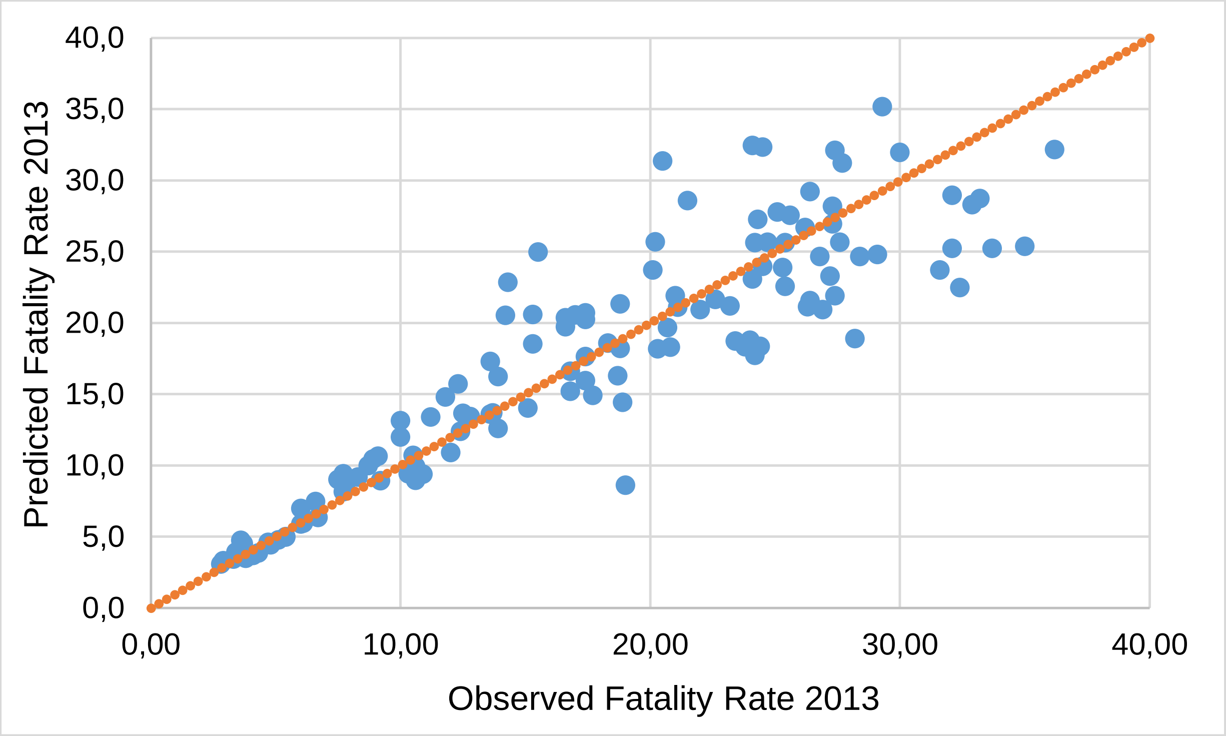
- **Dependent variable** is the logarithm of the fatality rate per population for 2013
- The main **explanatory variables** are the respective logarithm of fatality rate in 2010 and the respective logarithm of GNI per capita for 2013
- Four **composite** variables: the economy & management, the transport demand and exposure, the measures, and the SPIs

Parameter	B	Std. Error	95% Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	p-value
(Intercept)	1,694	,2737	1,157	2,230	38,291	1	<,001
Comp_ME	-,135	,0646	-,261	-,008	4,358	1	,037
Comp_TE	-,007	,0028	-,013	-,002	7,230	1	,007
Comp_PI	-,007	,0030	-,013	-,001	5,652	1	,017
Comp_EM	,007	,0051	-,003	,017	2,009	1	,156
LNFestim_2010	,769	,0462	,678	,859	276,322	1	<,001
LNGNI_2013	-,091	,0314	-,153	-,030	8,402	1	,004
(Scale)	,038						
Likelihood Ratio	1379,00						
df	6						
p-value	<,001						

Statistical Model Assessment

In order to **assess** the model, a comparison of the observed and the predicted values was carried out:

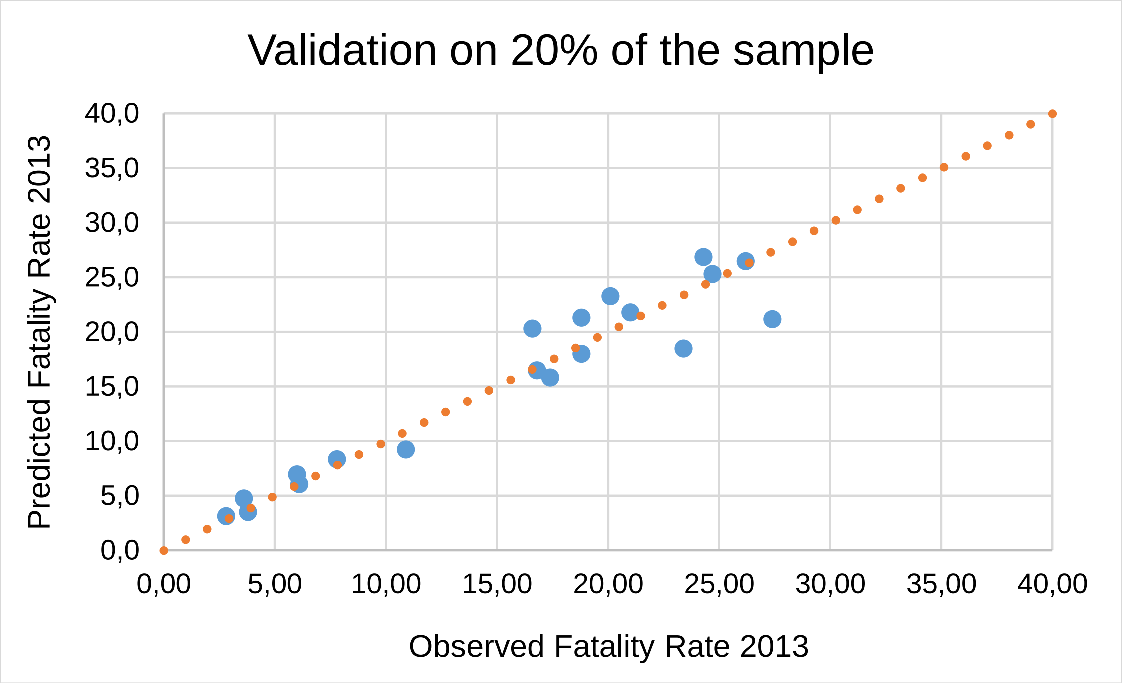
- The mean absolute prediction error is estimated at **2.7 fatalities per population**, whereas the mean percentage prediction error is estimated at **15%** of the observed value.
- The model is of **very satisfactory performance** as regards the good performing countries (low fatality rate) and of **quite satisfactory performance** as regards the medium performing countries.

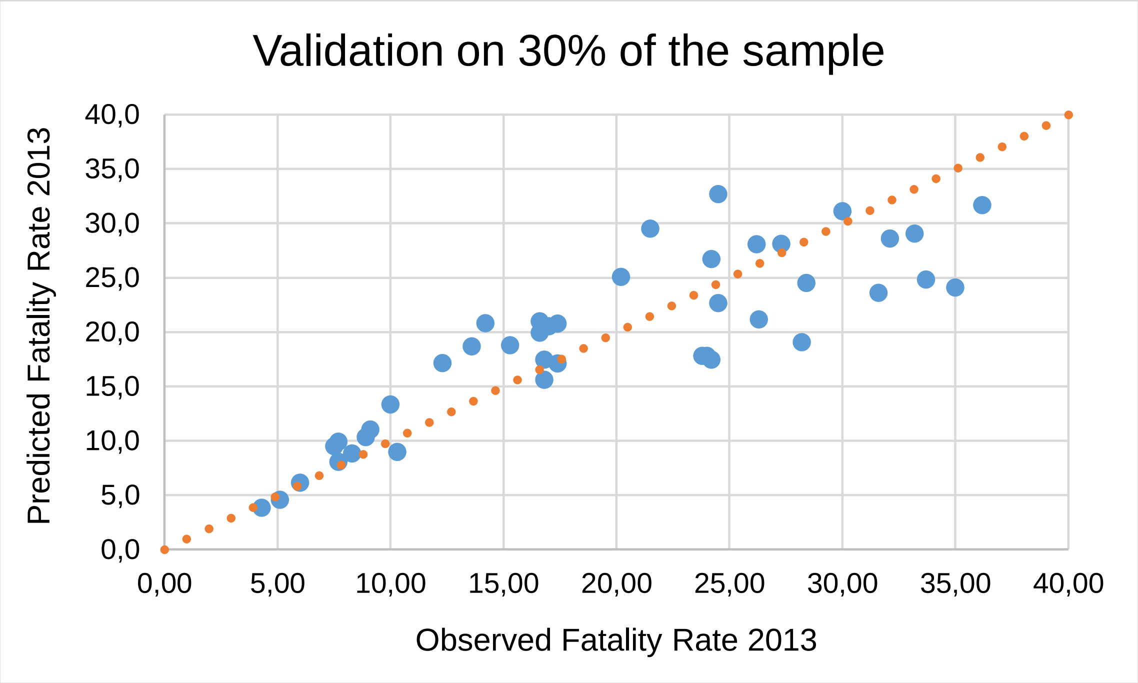


Statistical Model Validation

In order to **validate** the model, a cross-validation was carried out with two subsets:

- **80%** of the sample was used to develop (fit) the model, and then the model was implemented to predict the fatality rate for 2013 of the 20% of the sample not used
- **70%** of the sample was used to develop (fit) the model, and then the model was implemented to predict the fatality rate for 2013 of the 30% of the sample not used

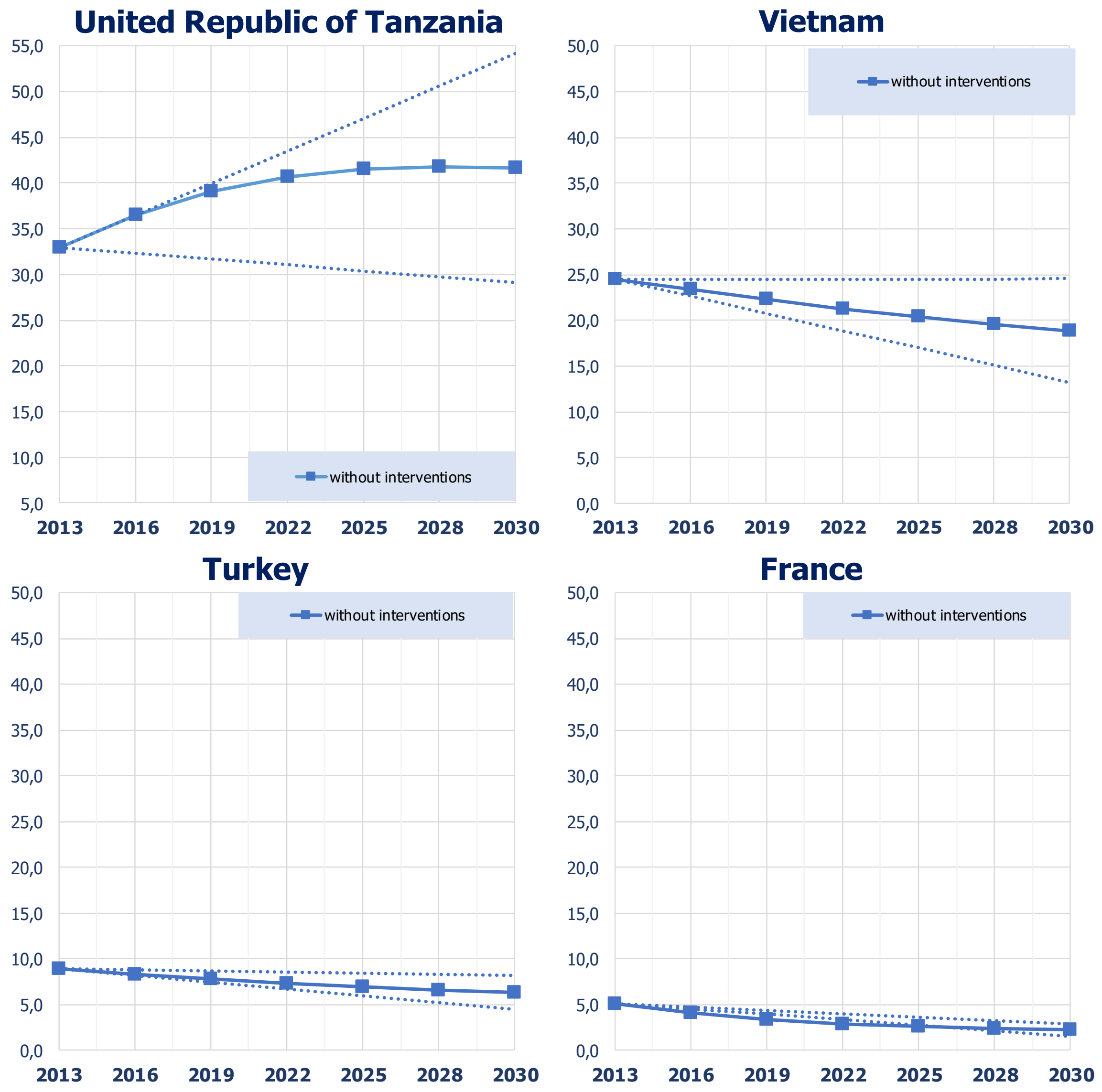




Model Application

Examples of statistical model application:

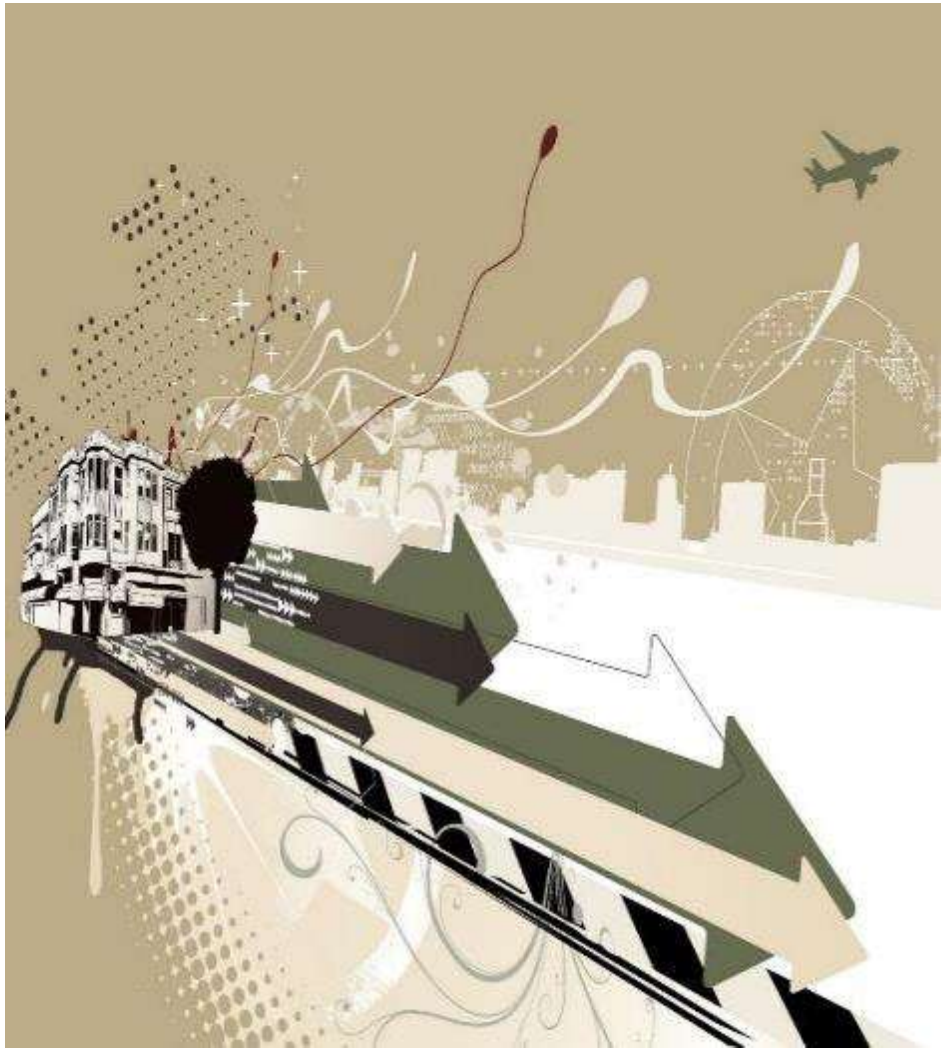
- one **low performance** country
- two **middle performance** countries
- one **high performance** country



SafeFITS Model Demonstration - Georgia

The overall model implementation includes 3 distinct steps:

- Step 1 – Countries Benchmark
- Step 2 – Forecast with no new interventions
- Step 3 – Forecast with interventions

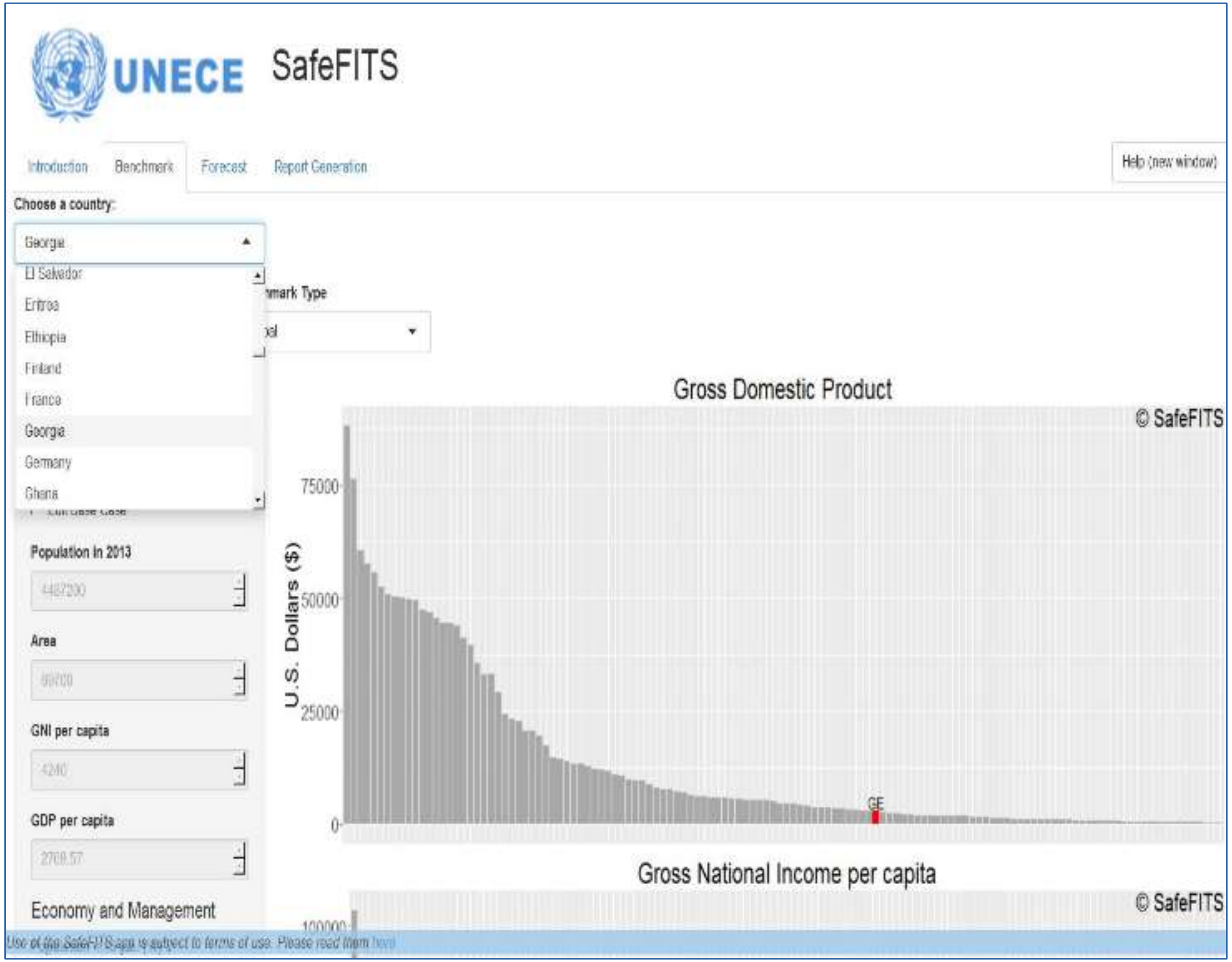


Step 1: Benchmark

<u>User input:</u>
The user has the option to select a country, the category of indicators to be displayed and benchmark type.

<u>Benchmarking results</u>:

- Reactive diagrams presenting a benchmark of the base year situation for a selected category
- Benchmarking takes place on a global and regional scale

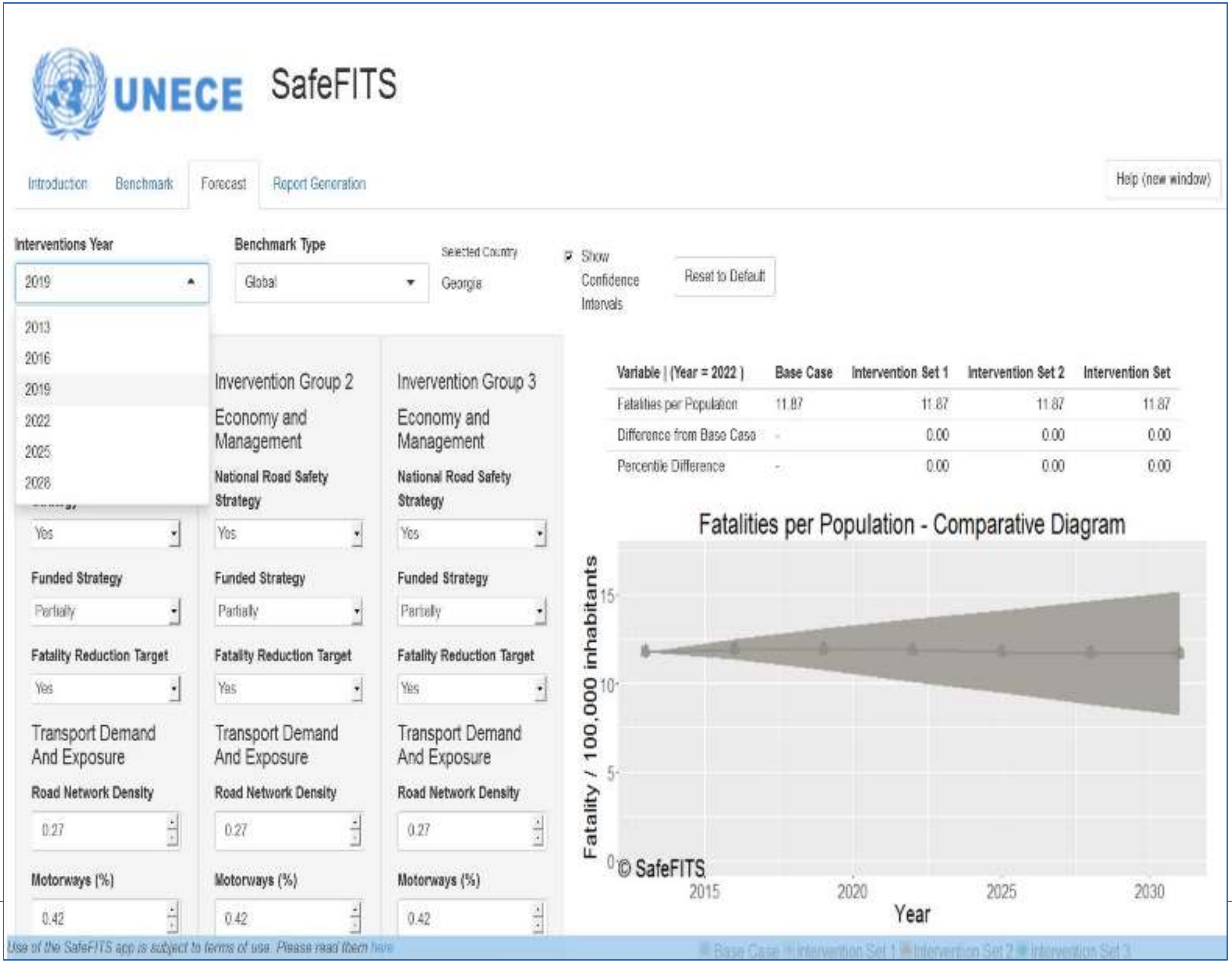


Step 2: Forecast with no new interventions

<u>User input:</u>
The user selects the country

<u>Analysis:</u>
The SafeFITS model is implemented for the year of reference on the basis of GNI and demographic indicators projection

<u>Forecasting results:</u>
The trend for the variable fatalities per population through the years (2013-2031), alongside with the confidence intervals

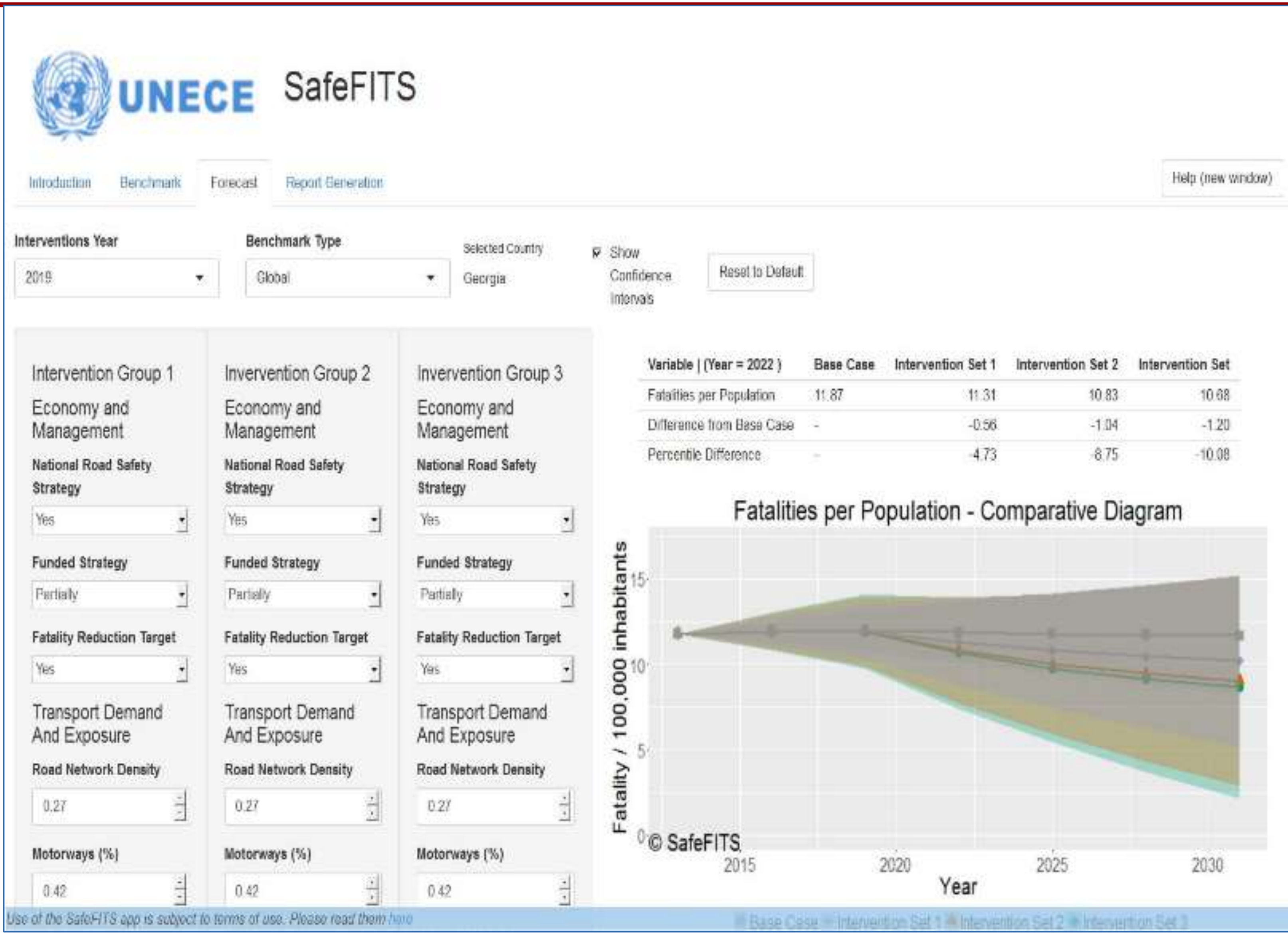


Step 3: Forecast with interventions

<u>User input:</u>
The user selects the intervention year and then up to 3 different sets of interventions

<u>Analysis:</u>
The SafeFITS model is implemented for the forecasting year on the basis of the intervention set selected

<u>Forecasting results:</u>
The trend for the variable fatalities per population through the years (2013-2031), on which the forecast for the intervention year is also identifiable.



Model limitations and future improvements

- The SafeFITS model was developed on the basis of **the most recent and good quality data available internationally**, and by means of rigorous statistical methods. However, data and analysis methods always have some limitations.

- Data are primarily **directed at vehicle occupants** and thus, effects on road safety outcomes of VRUs may not be captured.

- The effects of interventions may not reflect the unique contribution of each separate intervention. It is strongly recommended to **test combinations of "similar" interventions** (e.g. several vehicle standards, several types of enforcement or safety equipment use rates etc.)

- The model **does not assume or indicate that a direct causal relationship exists**.

- The **calibration with new data** will be the ultimate way to fully assess the performance of the model.

Benefits for the Policy Makers

- The first global road safety model to be used for policy support
  - Global assessments (i.e. monitoring the global progress towards the UN road safety targets)
  - Individual country assessments of various policy scenarios
- A framework which **enhances the understanding of road safety causalities**, as well as of the related difficulties.
- Full exploitation of the currently available global data, and use of rigorous analysis techniques, to **serve key purposes in road safety policy analysis**: benchmarking, forecasting.
- An important step for **monitoring, evidence-base and systems approach** to be integrated in decision-making.

IV. Road Safety Data in Georgia

Data for Georgia in SafeFITS Database

- In the SafeFITS model data for 2013 have been used.
- Missing data mainly for exposure and safety performance indicators
- For the missing values, the latest available data were used.
- Some of the latest available data in international databases may not refer to a recent year (e.g. latest data for vehicle kilometres of travel in Georgia are from 2002).
- Full time series of fatality data exist in international databases.
- The WHO accepts the reported number of fatalities for Georgia as the actual one.

Data for Georgia – Economy and Management

1	Population in thousands (2013)	World Bank Database	4,487,200	2013
2	Area (sq km) (2013 or latest available year)	World Bank Database	69,700	2013
3	Gross national income per capita in US $ (2013 or latest available year)	World Bank Database	4,240	2013
4	Population density	World Bank Database	64.4	2013
5	Percentage of population under 15 years old (2013 or latest available year)	World Bank Database	17.10	2013
6	Percentage of population over 65 years old (2013 or latest available year)	World Bank Database	19.00	2013
7	Percentage of urban population (2013 or latest available year)	World Bank Database	53.31	2013
8	Existence of lead agency	WHO, 2015	Yes	2013
9	The lead agency is funded	WHO, 2015	Yes	2013
10	Existence of national road safety strategy (2013)	WHO, 2015	Yes	2013
11	The strategy is funded (2013)	WHO, 2015	Partially	2013
12	Existence of fatality reduction target (2013)	WHO, 2015	Yes	2013

Data for Georgia –Transport Demand and Exposure

13	Length of road network (kms)	IRF, 2015	18,935	2013
14	Road network density (2013 or latest available year)	IRF, 2015	0.27	2013
15	Percentage of motorways of total road network (2013 or latest available year)	IRF, 2015	0.42	2013
16	Percentage of paved roads of total road network (2013 or latest available year)	IRF, 2015 & CIA database	100.00	2010
17	Total number of vehicles in use (excl. 2-wheelers)	IRF, 2015	874,613	2013
18	Total number of vehicles in use (incl. 2-wheelers)	IRF, 2015	n/a	
19	Total number of vehicles in use per population (2013 or latest available year)	IRF, 2015	0.195	2013
20	Number of passenger cars (2013 or latest available year)	IRF, 2015	738,746	2013
21	Number of buses/motorcoaches (2013 or latest available year)	IRF, 2015	51,949	2013
22	Number of vans and lorries (2013 or latest available year)	IRF, 2015	83,918	2013
23	Number of power two wheelers (2013 or latest available year)	IRF, 2015	n/a	
24	Ratio of passenger cars in use of total vehicle fleet (2013 or latest available year)	IRF, 2015	n/a	
25	Ratio of vans and lorries in use of total vehicle fleet (2013 or latest available year)	IRF, 2015	n/a	
26	Ratio of powered two wheelers in use of total vehicle fleet (2013 or latest available year)	IRF, 2015	n/a	
27	Vehicle kilometres - total in millions (2013 or latest available year)	IRF, 2015	322	2002
28	Passenger kilometres - total in millions (2013 or latest available year)	IRF, 2015	6,978.0	2013
29	Passenger kilometres - road in millions (2013 or latest available year)	IRF, 2015	6,393.0	2013
30	Passenger kilometres - rail in millions (2013 or latest available year)	IRF, 2015	585.0	2013
31	Tonne kilometres - total in millions (2013 or latest available year)		6,172.0	2013
32	Ratio of rail per road passenger transport (2013 or latest available year)	calculated from IRF, 2015	0.09	2013
33	Ratio of passenger per freight transport (2013 or latest available year)		0.011	

Data for Georgia – Road Safety Measures

34	Road safety audits on new roads	WHO, 2015	No	2013
35	Existence of ADR law	UNECE database	No	2013
36	Existence of speed law (2013)	WHO, 2015	Yes	2013
37	Maximum speed limits on urban roads (2013)	WHO, 2015	60 km/h	2013
38	Maximum speed limits on rural roads (2013)	WHO, 2015	90 km/h	2013
39	Maximum speed limits on motorways (2013)	WHO, 2015	110 km/h	2013
40	Vehicle standards-seat belts (2013)	WHO, 2015	No	2013
41	Vehicle standards-seat belt anchorages (2013)	WHO, 2015	No	2013
42	Vehicle standards-frontal impact (2013)	WHO, 2015	No	2013
43	Vehicle standards-side impact (2013)	WHO, 2015	No	2013
44	Vehicle standards-Electronic Stability Control (2013)	WHO, 2015	No	2013
45	Vehicle standards-Pedestrian Protection (2013)	WHO, 2015	No	2013
46	Vehicle standards-child seats (2013)	WHO, 2015	No	2013
47	Existence of drink-driving law (2013)	WHO, 2015	Yes	2013
48	BAC limits less than or equal to 0.05 g/dl (2013)	WHO, 2015	Yes	2013

49	BAC limits lower than or equal to 0.05g/dl for young/novice drivers (2013)	WHO, 2015	Yes	2013
50	BAC limits lower than or equal to 0.05g/dl for commercial drivers (2013)	WHO, 2015	Yes	2013
51	Existence of seat-belt law (2013)	WHO, 2015	Yes	2013
52	The seat-belt law applies to all occupants (2013)	WHO, 2015	No	2013
53	Existence of national child restraints law (2013)	WHO, 2015	No	2013
54	Existence of helmet law (2013)	WHO, 2015	Yes	2013
55	Law requires helmet to be fastened (2013)	WHO, 2015	No	2013
56	Law requires specific helmet standards (2013)	WHO, 2015	No	2013
57	Existence of national law on mobile phone use while driving (2013)	WHO, 2015	Yes	2013
58	The law applies to hand-held phones (2013)	WHO, 2015	Yes	2013
59	The law applies to hands-free phones (2013)	WHO, 2015	No	2013
60	Demerit/Penalty Point System in place (2010)	WHO, 2013	No	2010
61	Training in emergency medicine for doctors (2013)	WHO, 2015	Yes	2013
62	Training in emergency medicine for nurses (2013)	WHO, 2015	Yes	2013

Data for Georgia – Safety Performance Indicators

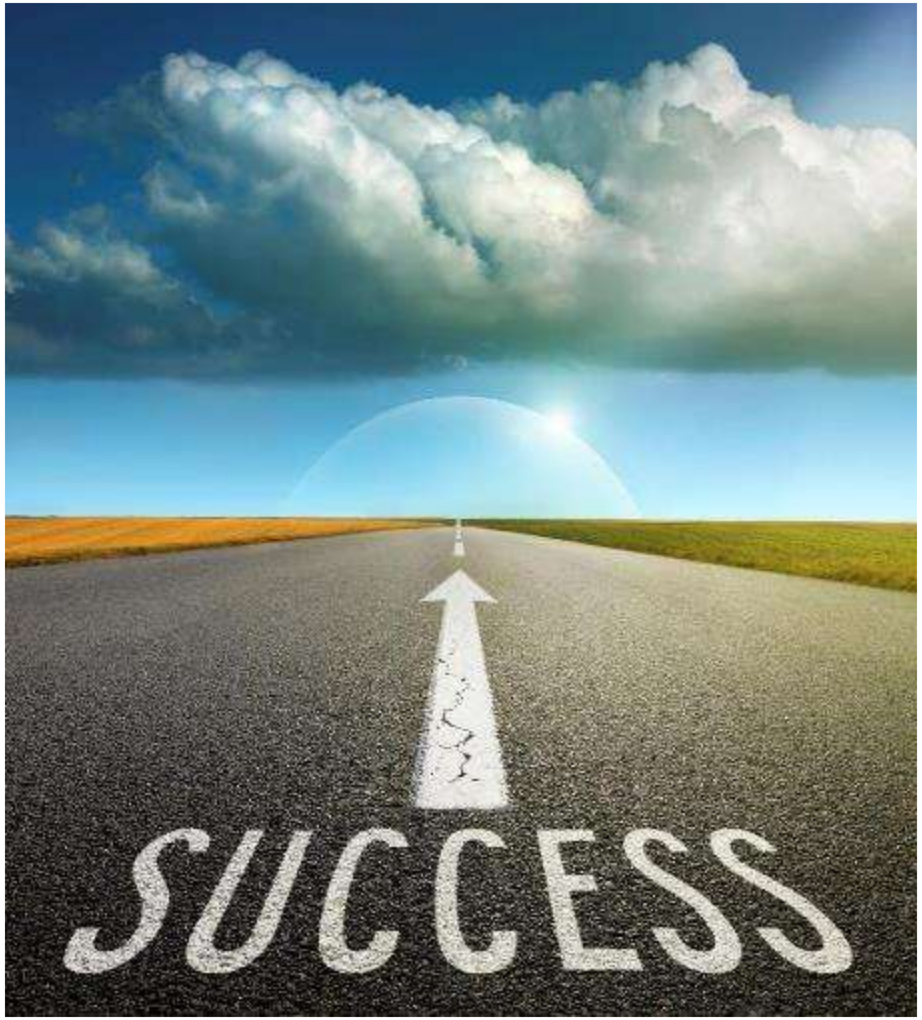
63	Effectiveness of seat-belt law enforcement (2013)	WHO, 2015	8	2013
64	Effectiveness of drink-driving law enforcement (2013)	WHO, 2015	8	2013
65	Effectiveness of speed law enforcement (2013)	WHO, 2015	7	2013
66	Effectiveness of helmet law enforcement (2013)	WHO, 2015	7	2013
67	Seat-belt wearing rate in fronts seats (2013 or latest available year)	WHO, 2015	80.00	2013
68	Seat-belt wearing rate in rear seats (2013 or latest available year)	WHO, 2015	n/a	
69	Helmet wearing rate for drivers (2013 or latest available year)	WHO, 2015	n/a	
70	Estimated % seriously injured patients transported by ambulance (2013)	WHO, 2015	50%-74%	2013
71	Number of hospital beds per 1,000 population (2012 or latest available year)	Wold Bank Database	2.60	2012

Data for Georgia – Fatalities and Injuries

72	Fatality rate per 100,000 population (2013)	IRF, 2015	11.45	2013
73	Fatality rate per 100,000 population (2010)	IRF, 2015	15.38	2010
78	Estimated Fatality rate per 100,000 population (2013)	WHO, 2015	11.80	2013
79	Estimated Fatality rate per 100,000 population (2010)	WHO, 2013	15.70	2013
85	Share of 4-wheelers fatalities (%) (2013)	WHO, 2015	44.7	2013
86	Share of 2-wheelers fatalities (%) (2013)	WHO, 2015	3.1	2013
87	Share of cyclist fatalities (%) (2013)	WHO, 2015	0.6	2013
88	Share of pedestrian fatalities (%) (2013)	WHO, 2015	24.3	2013
89	Alcohol related fatalities (%) (2013)	WHO, 2015	5.3	2013
90	Share of male fatalities (%) (2013)	WHO, 2015	54	2013
91	Share of female fatalities (%) (2013)	WHO, 2015	17	2013
92	Number of fatalities-IRF	IRF, 2015	514	2013
93	Reported number of fatalities-WHO	WHO, 2015	514	2013
94	Estimated number of fatalities-WHO	WHO, 2015	514	2013

Conclusions

- A variety of data is needed to support road safety decision making
- There are still many challenges on data availability and quality in most countries
- SafeFITS is the first global road safety model making full exploitation of the existing data - however the quality of the data poses limitations to the usability of the model
- The collection of more, more recent and more accurate data will allow to further improve SafeFITS
- Case studies in selected countries will allow to demonstrate the potential for model improvement and the importance of the quality of the data



Next steps

- SafeFITS pilot projects in Albania and Georgia

- Objectives:
  - Model validation for 2016
  - Testing of policy scenarios on the basis of the RSPRs
  - Model calibration and lessons learned

- Data collection
  - SafeFITS indicators update with more national data
  - Collection of additional road safety indicators
  - Time series of road fatalities
  - Interventions and measures in the country per year of implementation

Needs and Uses of Road Safety Data within the UN SafeFITS Model

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