VRU-Proxi-08-02-R1

Summary of Previous GSR/ACEA and Current STATS19 Collision Landscape Analyses (Revision 1)

February 2019

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TRL Background

TRL Background

Vision

World leader in creating the future of transport and mobility, using evidence-based solutions and innovative thinking

320

engineers, scientists, psychologists, IT experts and statisticians

Providing world-leading research, technology and software solutions for surface transport modes and the related markets of automotive, motorsport, insurance and energy

Mission

Challenge and influence our chosen markets, driving sustained reductions (ultimately to zero) in:

- Fatalities and serious injuries
- Harmful emissions
- Barriers to inclusive mobility
- Unforeseen delays
- Cost inefficiencies

1000 clients in

145 countries

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TRL Background…delivering impactful innovation

TRL

1950's/70's
The UK Motorway network

1969
The self-driving Citroën DS19

1997
NCAP launched

2014
TRL cycle infrastructure development
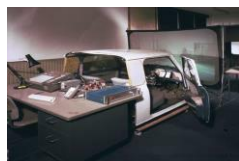
2015
Gateway driverless shuttles

2018
London Smart Mobility Living Lab

1960s
Early simulator

1972
The magic round-about, Swindon

1980's
Deflectometer

2012
London Summer Olympics

2016
Electric double decker bus

2017
HGV Truck Platooning

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Previous Research:
ACEA/GSR Background

ACEA/GSR Background

How do GSR and ACEA fit together?

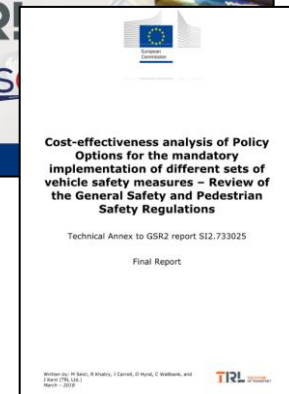|	
AEB	SFS
AEB-PCD	RFT
LKA	ALC
ESS	EDR
ISA	TPM
DDR	VIS
SBR	RUR
F94	LAT
FFW	BFS-CNG
FSO	BFS-AFE
S95	HED
PSI	REV

Published research (GSR2 systematic review)

Extensive stakeholder consultation (GSR2 report)

ACEA Accidentology
Results feed into GSR2 impact assessment

European Policy impact assessment (GSR2 technical annex)

In depth cost-effectiveness analysis of the identified measures and features regarding the way forward for EU vehicle safety

Final Report

Accident Analysis
Prepared by TRL, CEESAR, ACEA

September 2018

Cost-effectiveness analysis of Policy Options for the mandatory implementation of different sets of vehicle safety measures – Review of the General Safety and Pedestrian Safety Regulations

Technical Annex to GSR2 report SI2.733025

Final Report

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ACEA/GSR Background

Where do I find the GSR/ACEA reports?

- General Safety Regulation 2 report:
    - https://publications.europa.eu/en/publication-detail/-/publication/77990533-9144-11e7-b92d-01aa75ed71a1/language-en

- ACEA Accident Analysis report:
    - https://www.acea.be/uploads/publications/Accident_Analysis_TRL_CEESAR_2018.pdf

- TRL report for ACEA Accident Analysis:
    - https://trl.co.uk/reports/effectiveness-estimates-proposed-amendments-eus-general-and-pedestrian-safety-regulations-0

- Impact Assessment – Technical Annex to General Safety Regulation 2 report:
    - https://publications.europa.eu/en/publication-detail/-/publication/ed4aff17-49c5-11e8-be1d-01aa75ed71a1/language-en

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Previous Research:
Summary of GSR Approach

Summary of GSR Approach

Objective:

To **calculate** concrete **cost-effectiveness indicators and numbers of road casualties that could be prevented at an EU-28 level** for sets of safety measures proposed by the European Commission and considered for **mandatory implementation in new vehicles.**

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Summary of GSR Approach

The specific scope of the study was defined as:

- **Geographic scope**: EU-28

- **Vehicle categories covered**: Cars (M1), Buses (M2&M3), Vans (N1), Trucks (N2&N3)

- **Evaluation period**: 2021–2037

- **Baseline scenario**: No further policy intervention in the transport sector, but voluntary improvements and effects of already implemented policies continue: Continued dispersion of mandatory vehicle safety measures into the legacy fleet and **continued voluntary uptake of the safety measures under consideration**.

- **Action scenario:** 17 safety technologies made mandatory according to Commission proposal.

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Measure	Description	Applicable vehicle categories			
AEB-VEH	Autonomous emergency braking for vehicles (moving and stationary targets)	M1		N1	
AEB-PCD	Autonomous emergency braking for pedestrians and cyclists	M1		N1	
ALC	Alcohol interlock installation document	M1	M2&M3	N1	N2&N3
DDR-DAD	Drowsiness and attention detection	M1	M2&M3	N1	N2&N3
DDR-ADR	Advanced distraction recognition	M1	M2&M3	N1	N2&N3
EDR	Event data recorder	M1		N1	
ESS	Emergency stop signal	M1	M2&M3	N1	N2&N3
FFW-137	Full-width frontal occupant protection (current R137 configuration with Hybrid III ATDs)	M1		N1	
FFW-THO	Full-width frontal occupant protection (introduction of THOR-M ATDs and lower appropriate injury criteria thresholds to encourage adaptive restraints)	M1		N1	
HED-MGI	Adult head-to-windscreen impact (mandatory HIC limit in headform-to-glass impact tests; no mandatory A-pillar impact)	M1		N1	
ISA-VOL	Intelligent speed assistance (voluntary type system; can be overridden by driver and switched off for the rest of journey)	M1	M2&M3	N1	N2&N3
LKA-ELK	Lane keeping assist (emergency lane keeping system that intervenes only in case of an imminent threat such as leaving the road, or leaving the lane with oncoming traffic)	M1		N1	
PSI	Pole side impact occupant protection	M1		N1	
REV	Reversing camera system	M1	M2&M3	N1	N2&N3
TPM	Tyre pressure monitoring system		M2&M3	N1	N2&N3
VIS-DET	Front and side vulnerable road user detection and warning (no auto braking)		M2&M3		N2&N3
VIS-DIV	Minimum direct vision requirement (best-in-class approach)		M2&M3		N2&N3

Summary of GSR Approach

GSR Definitions of Relevant Safety Measure Functionality

VIS-DIV	VIS-DET	REV
Functionality: Improving the drivers situational awareness of VRU's in close proximity to the vehicle		
Best in class direct vision requirements for what the driver can see through windscreen, side windows and any additional windows	Sensor-based detection systems for alerting the driver to VRUs that are manoeuvring around the vehicle.	Camera Monitoring Systems (CMS) for increasing the driver's field of vision while reversing.
	No automated braking	
Front and sides of the vehicle		Rear

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Summary of GSR Approach

Approach of the study

- **Benefits considered**: Monetary values of casualties prevented/mitigated (fatal, serious, slight) by safety measures

- **Costs considered**: Cost to vehicle manufacturers (OEMs) of fitment of safety measures to new vehicles

- **Treatment of uncertainty**: Interval, scenario and sensitivity analysis

- **Results**: Benefit-to-cost ratios (BCRs) and numbers of casualties prevented. All results are **in comparison to the baseline scenario.**

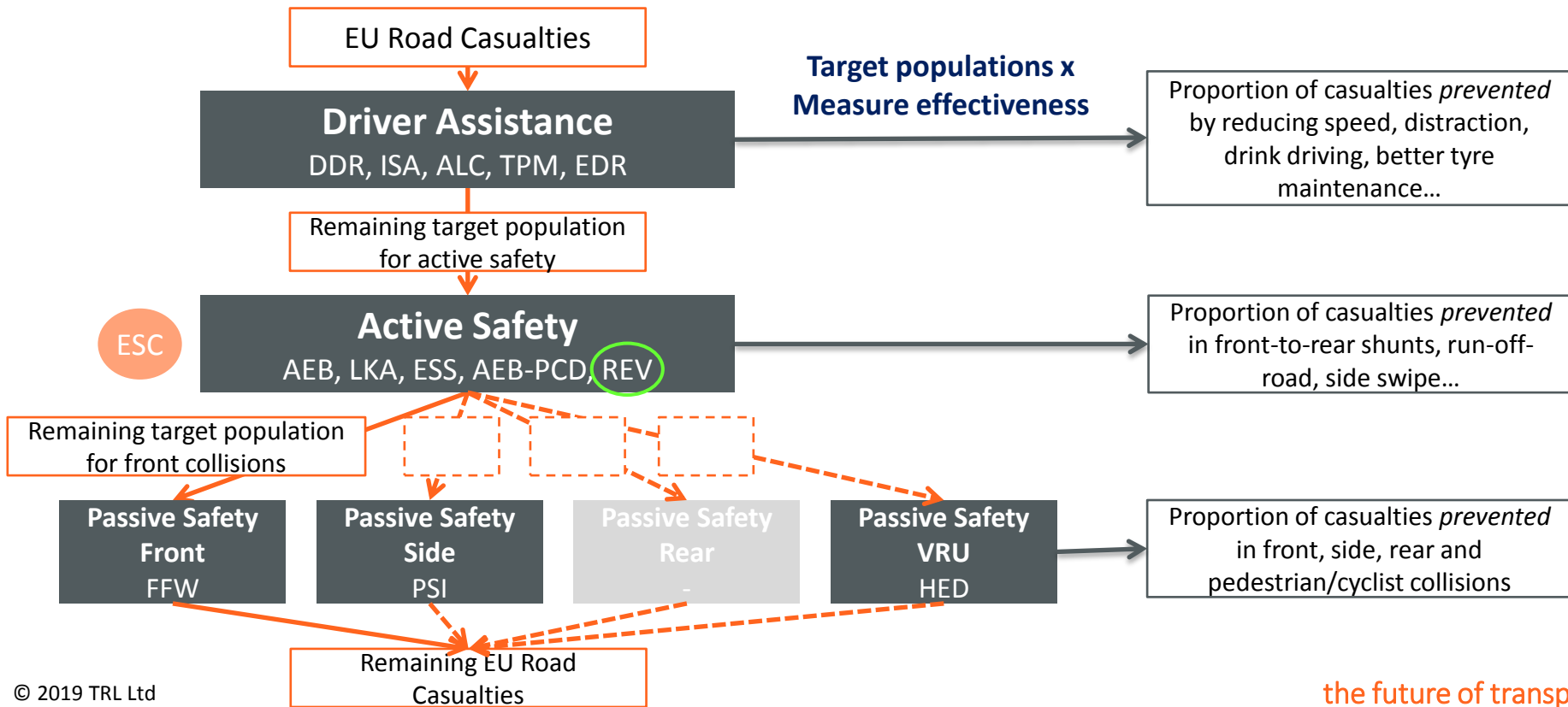the future of transport.

Summary of GSR Approach

Note that the model takes into account:

- The **interactions of all measures when implemented together** (to avoid double-counting of casualties prevented by different measures)

- The **voluntary uptake of the proposed measures** expected to happen without policy intervention (baseline scenario)

- The **effects of already existing mandatory measures**, which are still dispersing into the fleet (AEBS and LDWS for trucks and buses, ESC for all categories)

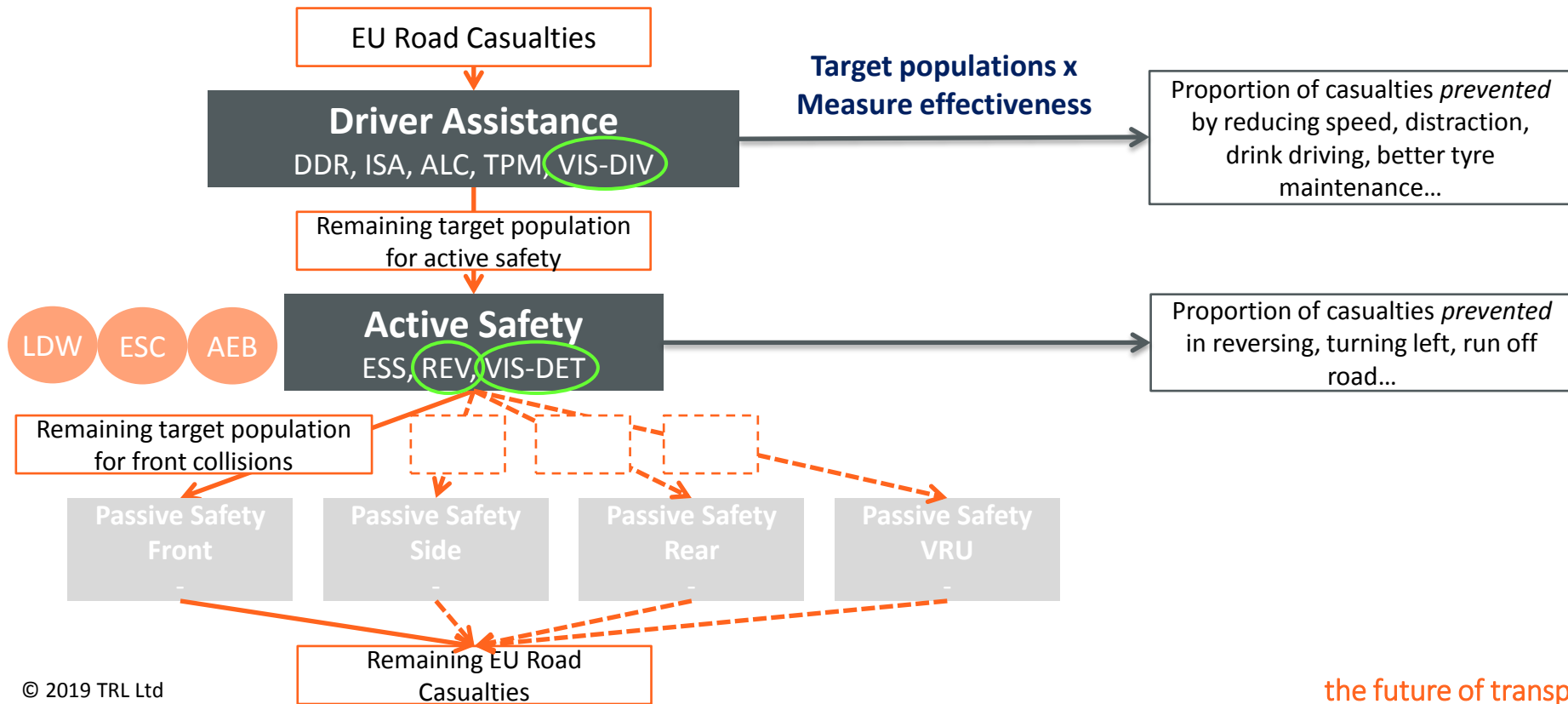- **Discounting and inflation** of monetary values

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Vehicle fleet calculation

Fleet dispersion model of safety measures for baseline and action

Benefit simulation

Accident analysis Stats19 and CARE

Proportion of new vehicles and fleet equipped

Cost calculation

Cost estimates for safety measures per vehicle

Cost of fitment EU-28 per annum

Target populations for safety measures

Measure effectiveness

Remove casualties prevented from target population for subsequent safety measures

Casualties prevented by measure

Economic calculation

Inflation and discounting

Net present value of benefits and costs

Monetary casualty unit values

Subtract baseline scenario benefits and costs

Calculate benefit-to-cost ratios compared to baseline

Monetary benefit EU-28 per annum

BCR

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Summary of GSR Approach

Summary of GSR Approach

TRL

Clustering of Safety Measures – Buses/Coaches (M2/M3) and Trucks (N2/N3)

EU Road Casualties

Driver Assistance
DDR, ISA, ALC, TPM, VIS-DIV

Target populations x Measure effectiveness

Proportion of casualties *prevented* by reducing speed, distraction, drink driving, better tyre maintenance…

Remaining target population for active safety

LDW   ESC   AEB

Active Safety
ESS, REV, VIS-DET

Proportion of casualties *prevented* in reversing, turning left, run off road…

Remaining target population for front collisions

Passive Safety Front
-

Passive Safety Side
-

Passive Safety Rear
-

Passive Safety VRU
-

Remaining EU Road Casualties

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Previous Research:
ACEA Analysis

ACEA Analysis

TRL

ACEA Definitions of Relevant Safety Measure Functionality

VIS				REV
Direct Vision		**Forward and Side VRU detection and cameras specifications**		**Reversing Detection or cameras specifications**
VIS: Best-in-Class Vision	**VIS: High Direct Vision**	**VIS: Warning**	**VIS: Automated Emergency Braking**	

VIS: Best-in-Class Vision
- Remove highest chassis and adopt new cabs
- Improved direct vision through wind shield, passenger door and side windows

VIS: High Direct Vision
- Low forward position cab
- Much improved direct vision through wind shield and passenger door and side windows

Direct Vision (combined)
- Benefits dependent on driver who needs to look at right time and take correct actions
- Beneficial when driving ahead and turning in low speeds, in dense traffic environment

VIS: Warning
- Detection and warning of VRU's ahead and at side of vehicle

VIS: Automated Emergency Braking
- Detection, warning and auto braking to avoid/mitigate collisions of VRU's ahead and at side of vehicle

Forward and Side (combined)
- Benefits less dependent on driver actions
- Additional benefit in higher speed traffic scenarios
- Includes crossing pedestrians
- All speeds including pulling away from stationery and very low speeds

REV
- Sensing systems to increase driver's view or warn of persons or obstacles when reversing
- Preference between camera and/or detection with visual/acoustic warning to be determined
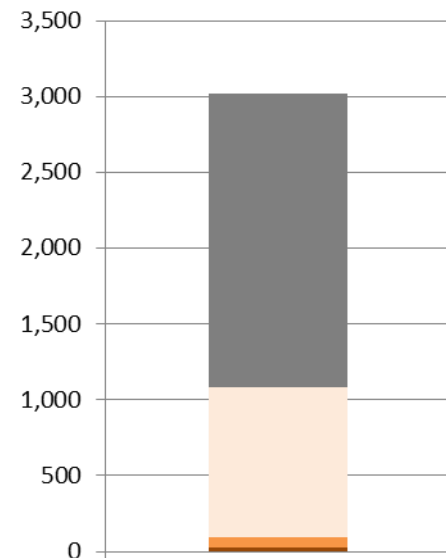
ACEA Analysis

All Casualties
- Includes casualties for other measures

Target Population
- For a given measure
- Phase 1 / RQ1 Pool of relevant casualties
- Includes casualties for other measures

Refined Target Population
- Phase 2 / RQ2
- Refined to account for effect of other measures

Effectiveness Estimate
- Phase 2 / RQ2
- More detailed assessment of effect of the measure

France
- BAAC
- VOIESUR

Germany
- GIDAS

Pooled Research

UK
- STATS19
- RAIDS

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ACEA Analysis

TRL

Safety Measure	Casualty type	TP source	Vehicle type	ACEA GB Target Population Estimations (5 year total)			
				TP casualties who benefit from measure			
				Fatal	Seriously injured	Slightly injured	Total
VIS – improved front end design for direct and indirect driver vision	Pedestrians & pedal cyclists	S19	N2	36	232	825	**1,093**
			N3	275	564	1,015	**1,854**
ISA – Intelligent Speed Assistance	All vehicle users & VRUs	S19	M1	1,470	7,691	44,078	**53,239**
			M2	0	27	109	**136**
			M3	9	18	86	**113**
			N1	18	190	1,551	**1,759**
			N2	0	14	90	**104**
			N3	54	68	321	**443**
FSO – Frontal impact Small Overlap crash test *	M1 occupants	S19+RAIDS	M1	72	855	13,175	**14,102**
SFS – Side impact Far Side occupant crash test *†	M1 occupants	S19+RAIDS	M1	133 - 181	896 – 1,713	10,723 -28,671	**11,752 – 30,565**
F94 – Frontal Impact Crash Test (removal of exemptions from Regulation 94)	M1 & N1 occupants	S19	M1	49	661	7,214	**7,924**
			N1	56	576	5,483	**6,115**
S95 – Side Impact Crash Test (removal of exemptions from Regulation 95)	M1 & N1 occupants	S19	M1	13	156	2,382	**2,551**
			N1	15	148	2,460	**2,623**
HED – Adult Head to Windscreen Area †‡	Pedestrians	S19+RAIDS	M1	107 – 269	1218 – 3046	-	**(1325 – 3315)**
	Cyclists	S19+RAIDS	M1	18	534	-	**(552)**
REV – Reversing Detection *Note: Stats19 only includes collisions on the public highway and excludes those occurring in car parks, service yards and private workplace sites.*	Pedestrians & pedal cyclists	S19	N2, N3, O3+O4	7	41	136	**177**

ACEA Analysis

ACEA Casualty Savings (5 year total) and Effectiveness: Best-in-Class Vision

VIS		Killed	Seriously Injured	Slightly Injured	Total Casualties
N2	TP (RQ1)	36	232	825	1,093
	CS (RQ2)	1	7	25	33
N3	TP (RQ1)	275	564	1,016	1,855
	CS (RQ2)	8	17	30	55
$N_{unknown}$	TP (RQ1)	1	14	56	71
	CS (RQ2)	0	0	2	2
Total	TP (RQ1)	312	810	1,897	3,019
	CS (RQ2)	9	24	57	90
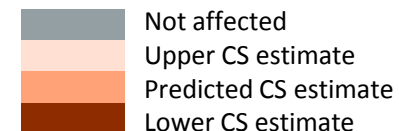
- Overall effectiveness value for requiring "best-in-class vision":
  - 3% (1%-36%)
  - Based on STATS19/RAIDS data only

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ACEA Analysis

ACEA Casualty Savings (5 year total) and Effectiveness: High Direct Vision

VIS		Killed	Seriously Injured	Slightly Injured	Total Casualties
N2	TP (RQ1)	36	232	825	1,093
	CS (RQ2)	10	63	223	296
N3	TP (RQ1)	275	564	1,016	1,855
	CS (RQ2)	74	153	274	501
$N_{unknown}$	TP (RQ1)	1	14	56	71
	CS (RQ2)	0	4	15	19
Total	TP (RQ1)	312	810	1,897	3,019
	CS (RQ2)	84	220	512	816
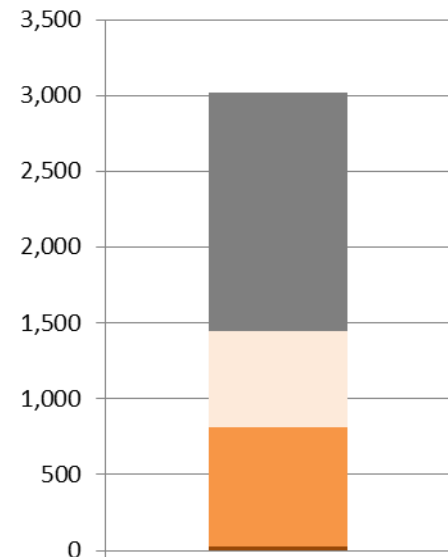
■ Overall effectiveness value for requiring "high direct vision":
   ■ 27% (1%-48%)
   ■ Based on STATS19/RAIDS data only

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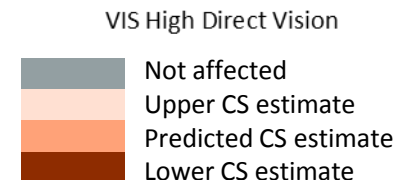
ACEA Analysis

ACEA Casualty Savings (5 year total) and Effectiveness: VRU Detection

VIS		Killed	Seriously Injured	Slightly Injured	Total Casualties
N2	TP (RQ1)	36	232	825	1,093
	CS (RQ2)	14	93	330	437
N3	TP (RQ1)	275	564	1,016	1,855
	CS (RQ2)	110	226	407	743
N$_{unknown}$	TP (RQ1)	1	14	56	71
	CS (RQ2)	0	5	23	28
Total	TP (RQ1)	312	810	1,897	3,019
	CS (RQ2)	124	324	760	1,208

VIS VRU Detection

- Not affected
- Upper CS estimate
- Predicted CS estimate
- Lower CS estimate
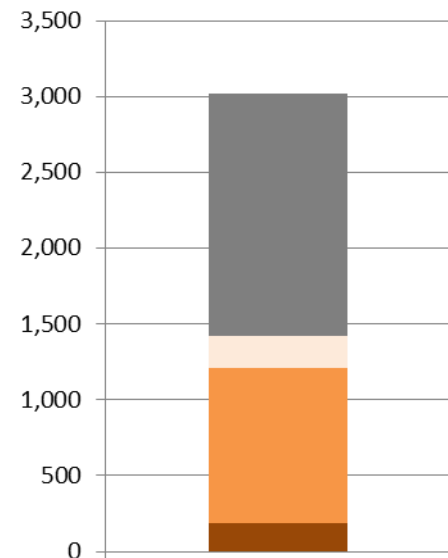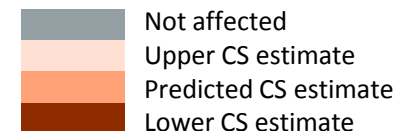
- Overall effectiveness value for requiring "VRU detection":
  - 40% (6%-47%)
  - Based on STATS19/RAIDS data only

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ACEA Analysis

ACEA Casualty Savings (5 year total) and Effectiveness: VRU AEB

VIS		Killed	Seriously Injured	Slightly Injured	Total Casualties
N2	TP (RQ1)	36	232	825	1,093
	CS (RQ2)	15	102	363	480
N3	TP (RQ1)	275	564	1,016	1,855
	CS (RQ2)	121	248	448	817
N_{unknown}	TP (RQ1)	1	14	56	71
	CS (RQ2)	0	7	25	32
Total	TP (RQ1)	312	810	1,897	3,019
	CS (RQ2)	136	357	836	1,329
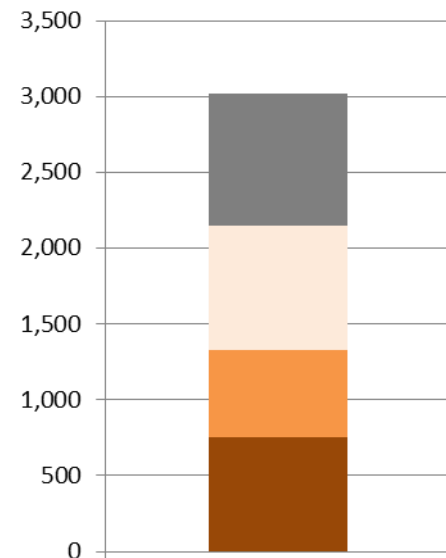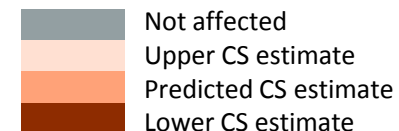
- Overall effectiveness value for requiring "VRU AEB":
  - 44% (25%-71%)
  - Based on STATS19/RAIDS data only

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ACEA Analysis

ACEA Casualty Savings (5 year total) and Effectiveness: Reversing Detection/Camera Systems

- Overall effectiveness value for requiring reversing detection & camera systems:
  - ACEA – no evaluation of the potential benefits possible as sample size was too small
- GSR adopted the below:
  - *M1/N1:*
    - 41% (95% confidence interval: 12% to 61%), based on Keall et al. (2017).
  - *M2/M3/N2/N3:*
    - Assumed 33% effective – based on ACEA consultation

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Previous Research:
Summary of GSR Outcomes

Summary of GSR Outcomes

Cost-effectiveness
Benefit-to-cost ratios (BCR) of the Commission Proposal
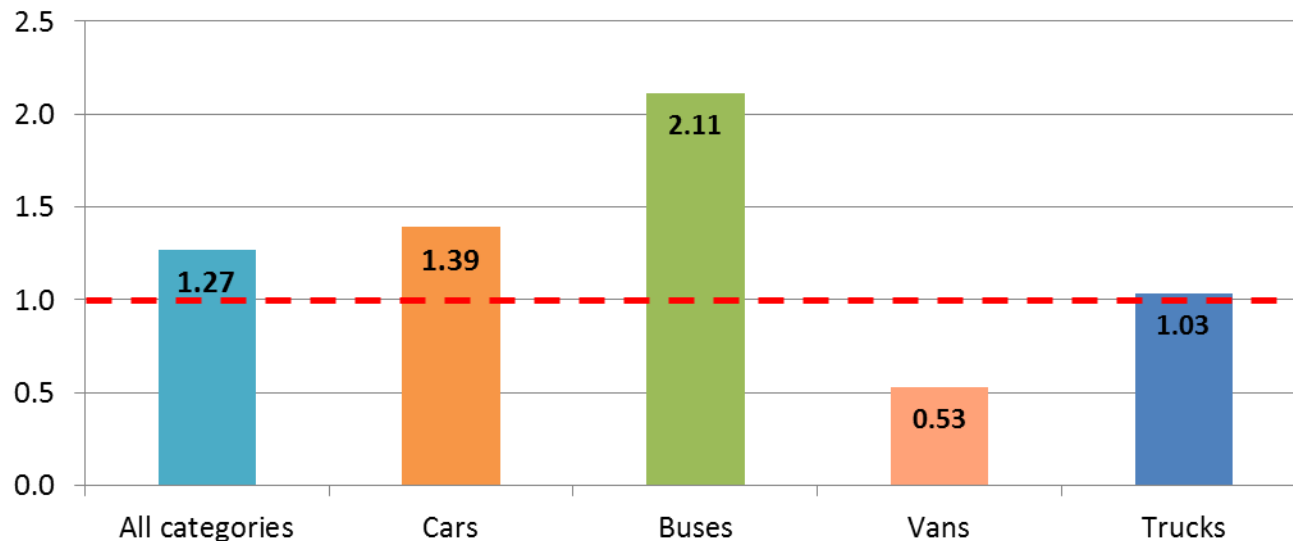
Years: 2021–2037

EU-28

Compared to baseline scenario

Values greater than 1 indicate that the benefits are greater than the costs

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Summary of GSR Outcomes

Number of casualties prevented by the Commission Proposal split by vehicle categories over the 2021–2037 evaluation period across EU-28 compared to baseline scenario

	Cars	Buses	Vans	Trucks
Fatalities	21,337	227	1,283	1,947
Serious casualties	126,390	2,410	6,917	5,023
Slight casualties	470,747	8,174	23,486	13,274

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Summary of GSR Outcomes

TRL

	VIS-DIV	VIS-DET	REV
Proposed Requirement	Best-in-Class DV	Front and Side Detection System	Reversing Cameras
Vehicle type	M2, M3, N2, N3		M1, M2, M3, N1, N2, N3
Target Population Description	M2/M3: Pedestrian/cyclist in front/side impact. Blind spot as a contributory factor. N2/N3: Pedestrian/cyclist in front/side impact. Adjusted to average population in France/Germany/UK		Pedestrian/cyclist collision with reversing vehicle. Adjusted for off-road collisions and populations
Other measures	No preceding safety measure interactions		
Potential Benefit %	M2/M3: 24% N2/N3: 3%	M2/M3: 40% N2/N3: 40%	M1/N1: 41% M2/M3/N2/N3: 33%

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In-Progress STATS19 Research:
STATS19 Analysis Approach

STATS19 Analysis Approach

- All vehicles categorised into Dir. 2007/46/EC categories using STATS19 data

- STATS19 variables used to define <u>total population</u> of casualties

- Further criteria to define <u>target populations</u> for each safety measure

- Target populations <u>split by vehicle category</u> to determine regulation scope

- Target populations presented as the number of casualties per annum and monetised cost to society per annum

- Target populations due to be scaled to European/global level

- Monetised cost to society figures used:

  - Fatal - €1.87million

  - Serious - €243,100

  - Slight - €18,700

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STATS19 Analysis Approach

- STATS19 is a national database of reported injury collisions on public roads in Great Britain

- Data for 2011-2015 has been used for this analysis

- Data is recorded at four levels

  - **Collision details** e.g. location, road type, weather/lighting conditions

  - **Vehicle details** e.g. vehicle type, vehicle manoeuvre, vehicle location

  - **Casualty details** e.g. casualty class, casualty location/movement (if pedestrian)

  - **Contributory factors** – factors which the police felt contributed to the collision e.g. 'failed to look properly'

- **Enhanced vehicle data** is also recorded for c.76% of vehicles, including max. gross vehicle weight, body type and wheelplan

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STATS19 Analysis Approach

Categorisation of Vehicles using STATS19

Category	European definition	S19 definition used if enhanced vehicle data available[1]	S19 definition used if enhanced vehicle data not available
M1	Passenger car not more than 8 passenger seats	Vehicle type = car or taxi Passenger seats: 8 or less TRL vehicle segment not equal to van[2]	Vehicle type = car or taxi
M2	Passenger vehicle with more than 8 passenger seats and maximum mass not exceeding 5t	Vehicle type = minibus or bus/coach Max gross vehicle weight ≤ 5t.	Vehicle type = minibus
M3	Passenger vehicle with more than 8 passenger seats and maximum mass exceeding 5t	Vehicle type = minibus or bus/coach Max gross vehicle weight > 5t.	Vehicle type = bus/coach
N1	Goods vehicles not exceeding 3.5t	Vehicle type = any goods vehicle category Max gross vehicle weight ≤ 3.5t M1 vehicles with TRL vehicle segment equal to van	Vehicle type = goods vehicles ≤ 3.5t
N2	Goods vehicles between 3.5t and 12t	Vehicle type = any goods vehicle category Max gross vehicle weight > 3.5t and ≤ 12t.	Vehicle type = goods vehicles > 3.5t and <7.5t
N3	Goods vehicles having a maximum mass exceeding 12t	Vehicle type = any goods vehicle category Max gross vehicle weight >12t.	Vehicle type = goods vehicles ≥ 7.5t
Nunknown		NA	Vehicle type = goods vehicle unknown weight

[1]For M1 the required enhanced vehicle data was seat capacity and for all other categories the required enhanced vehicle data was max gross vehicle weight

[2]TRL segment criteria only applies to those vehicles with make and model vehicle data available

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In-Progress STATS19 Research:
Total Population

Total Population

- VRU casualties 2011-2015: 320,638 (64,127.6 per annum)

- VRU casualties involved in 'single vehicle'[1] collisions with an M/N vehicle per annum: 53,180.4 (83% of all)

- VRU casualties involved in 'single vehicle' collisions with an M/N vehicle attended by a police officer: 40,846.4 (77% of all 'single vehicle')

- **'Police officer attended' criteria only needed for analysis of contributory factor data therefore not included in definition of total population**

- VRU casualties involved in 'single vehicle' collisions on roads with speed limit ≤20mph: 1,766.8 (3% of all 'single vehicle')

- VRU casualties involved in 'single vehicle' collisions on roads with speed limit ≤30mph: 45,914.4 (86% of all 'single vehicle')

[1] 'Single vehicle' collision defined as collision involving either one vehicle and a pedestrian, or a pedal cyclist/PTW and one other vehicle

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Total Population

- Collision landscapes for ≤20 mph/≤30 mph speed limit filters compared for different vehicle categories during relevant collision scenarios:
  - M1/M2/M3/N1/N2/N3
  - Left Turn, Moving Off, Slowing/Stopping
- Comparison of % differences in proportions of all collisions on roads with speed limit for different casualties, severities and vehicle categories
  - Differences between all collisions and ≤20 mph speed limit
    - Left turn: 15.9%; Moving Off: 5.3%; Slowing/Stopping: 13.9% - NB: large variance
  - Differences between all collisions and ≤30 mph speed limit
    - Left turn: 5.3%; Moving Off: 1.0%; Slowing/Stopping: 2.5%
- **Considerable difference in collision landscape demography**

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Total Population

- RAIDS case-by-case analysis of 26 cases of N2/N3 vs. VRU collisions shows:
  - Of the 14 collisions with low/very low vehicle impact speeds (i.e. 0-29 kph), **64% occurred on a road with a speed limit of ≥40 mph**
- Low speed manoeuvres still occur on roads with speed limits of ≥40 mph
  - E.g. vehicle turning left/moving off after having been stopped at traffic lights on a road with a posted 40 mph speed limit
- **It is proposed that no speed limit filter is applied to the total population**

Final total population definition:
Annual number of VRU casualties[1] from 'single vehicle' collisions with M/N category vehicles between 2011 and 2015

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[1] Casualties currently calculated for GB only

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Total Population

Total annual number of VRU casualties (GB)

Vehicle Category	Pedestrian			Cyclist			PTW			Societal Cost (€M)
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight	
M1	236.4	3,862.6	14,601.0	46.4	2,292.8	13,105.8	136.6	2,816.6	9,383.2	3,659.0
M2	1.8	19.2	63.0	0.2	8.0	34.6	1.0	8.0	26.0	16.5
M3	28.2	216.8	822.0	4.0	55.0	282.2	5.0	28.6	102.2	165.2
N1	30.4	304.4	1,134.8	6.2	232.8	1,123.4	19.2	258.4	858.6	356.0
N2	6.0	32.6	112.0	2.4	23.6	94.2	3.0	22.0	66.0	45.4
N3	41.6	71.6	121.8	17.0	62.0	143.8	12.0	57.8	110.8	185.6
N$_{unknown}$	0.2	1.6	8.4	0.0	2.4	7.4	0.0	1.8	3.0	2.1
Total	344.6	4,508.8	16,863.0	76.2	2,676.6	14,791.4	176.8	3,193.2	10,549.8	4,429.8

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Total Population

- Total annual societal cost to GB of €4.43bn
- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs
- Ranking of societal costs:
  - M1>N1>N3>M3>N2>M2
- Specific target populations (TP) derived from top-level total population
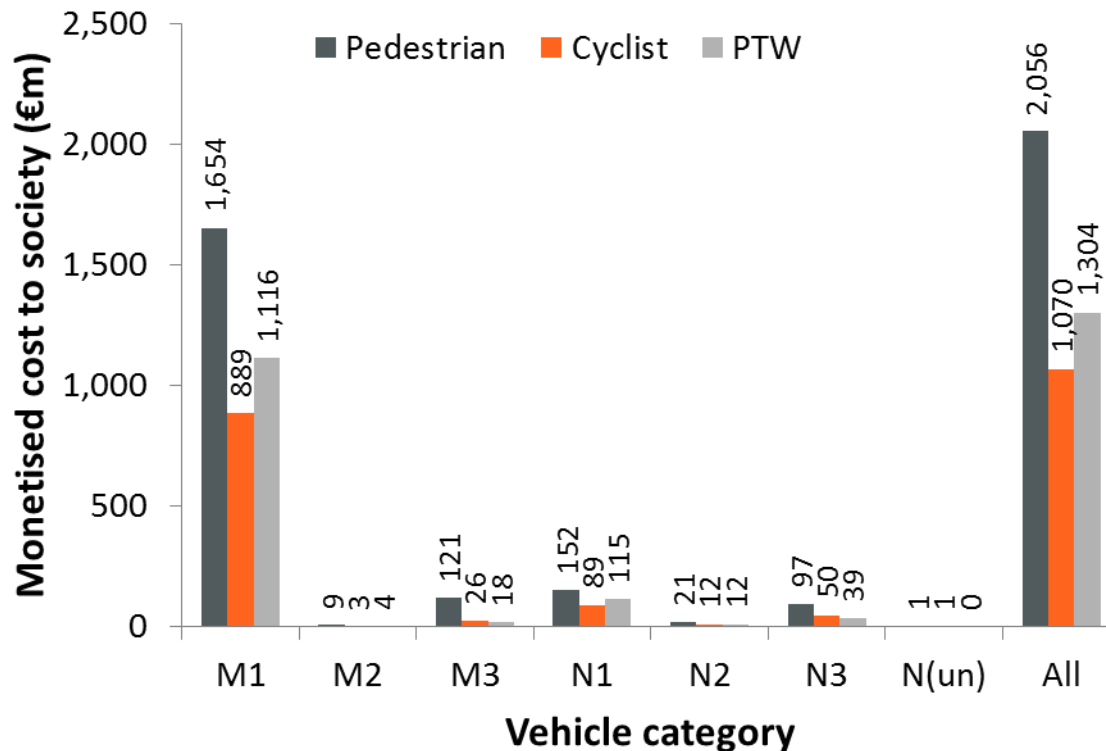
In-Progress STATS19 Research:
Specific Target Populations

Specific Target Populations

- Target population:
  - "The total number of fatalities and/or injured casualties that a particular safety measure is specifically designed to try to prevent each year"
- Two target populations are described for each safety measure:
  - **Top level (TP1)** – broader target population defined using vehicle manoeuvre and vehicle impact point only
  - **Detailed (TP2)** – more specific target population defined using both vehicle and VRU manoeuvres and both vehicle and VRU impact points
- Key results to consider for each target population include:
  - Cost to society per vehicle category/weight classification
  - Proportion of total cost to society per vehicle category/weight classification
  - Proportion of KSI per vehicle category/weight classification

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Blind-Spot Information System (BSIS)

Specific Target Populations: BSIS

BSIS Target Population Definitions

- **Top level target population (TP1):**
    - Vehicle manoeuvre = left turn
    - Vehicle impact = front or nearside

- **Detailed target population (TP2):**

| Pedestrian | | Cyclist/PTW | | | |
Vehicle manoeuvre	VRU manoeuvre	Vehicle manoeuvre	Vehicle impact	VRU manoeuvre	VRU impact
Left turn	Crossing from driver's n/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Left turn	Nearside Front	Going ahead LH bend/RH bend/other Moving off Overtaking on n/s Slowing or stopping Left turn Waiting to go ahead Waiting to turn left/right	Offside
		OR			
		Going ahead LH bend/RH bend/other Overtaking moving vehicle on its o/s Changing lane to left	Nearside	Going ahead LH bend/RH bend/other Moving off Overtaking on n/s Slowing or stopping Left turn Waiting to go ahead Waiting to turn left/right	Offside

Specific Target Populations: BSIS

Annual Target Populations for BSIS VRU casualties (GB)

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP1	2.4	114.2	591.2	0.8	188.2	1,513.6	0.8	49.6	317.4	138.3	3.8%
	TP2	1.6	68.6	345.8	1.8	153.6	1,034.0	0.8	50.6	324.0	106.0	2.9%
M2	TP1	0.0	0.4	3.4	0.0	0.2	4.6	0.0	0.2	0.6	0.4	2.2%
	TP2	0.0	0.2	1.6	0.0	0.4	2.6	0.0	0.0	1.8	0.3	1.6%
M3	TP1	2.8	12.6	34.0	1.0	2.0	14.8	0.0	0.8	3.0	11.8	7.2%
	TP2	1.8	9.6	21.6	0.6	10.2	62.0	0.0	1.0	5.0	11.2	6.8%
N1	TP1	1.2	10.0	50.6	0.2	23.6	171.4	0.0	6.0	41.4	17.2	4.8%
	TP2	0.8	6.4	31.4	0.4	24.0	157.2	0.0	4.4	41.8	15.0	4.2%
N2	TP1	1.0	2.6	7.6	0.2	3.2	12.6	0.0	0.0	3.2	4.1	9.0%
	TP2	0.8	2.0	4.6	0.4	5.6	22.8	0.0	0.4	3.8	4.8	10.5%
N3	TP1	2.0	5.8	10.8	5.8	14.4	21.0	0.4	2.0	7.4	21.5	11.6%
	TP2	1.8	4.2	6.8	5.0	14.2	38.6	1.2	2.4	9.8	21.0	11.3%
$N_{unknown}$	TP1	0.0	0.2	0.2	0.0	0.2	1.2	0.0	0.0	0.0	0.1	5.8%
	TP2	0.0	0.0	0.2	0.0	0.4	1.0	0.0	0.4	0.0	0.2	10.2%
Total	TP1	9.4	145.8	697.8	8.0	231.8	1,739.2	1.2	58.6	373.0	193.4	4.4%
	TP2	6.8	91.0	412.0	8.2	208.4	1,318.2	2.0	59.2	386.2	158.5	3.6%

Specific Target Populations: BSIS

- BSIS Target Population 1

- Total annual societal cost to GB of €193M

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- Cyclists most affected casualty (apart from M3)

- Ranking of societal costs:
  - M1>N3>N1>M3>N2>M2

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Specific Target Populations: BSIS

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- BSIS Target Population 2
- Total annual societal cost to GB of €159M
- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs
- Cyclists most affected casualty (apart from M3)
- Ranking of societal costs:
  - M1>N3>N1>M3>N2>M2

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Specific Target Populations: BSIS

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
N2 ≤7.5T	TP1	0.4	1.8	5.4	0.2	1.4	8.6	0.0	0.0	2.2	2.2	7.3%
	TP2	0.2	1.2	3.2	0.0	2.8	11.0	0.0	0.2	2.4	1.7	5.6%
N2 >7.5T	TP1	0.0	0.2	0.6	0.0	0.6	0.4	0.0	0.0	0.4	0.2	4.4%
	TP2	0.0	0.2	0.6	0.4	0.2	0.8	0.0	0.0	0.0	0.9	19.6%
N2$_{un\_GVW}$	TP1	0.6	0.6	1.6	0.0	1.2	3.6	0.0	0.0	0.6	1.7	16.2%
	TP2	0.6	0.6	0.8	0.0	2.6	11.0	0.0	0.2	1.4	2.2	21.0%
N3 ≤18T	TP1	0.8	0.8	3.2	1	5.2	4.8	0.0	0.6	1.8	5.2	16.0%
	TP2	0.8	0.8	2.2	1.4	2.8	4.0	0.0	0.6	1.6	5.3	16.3%
N3 >18T	TP1	1.2	3.4	5.6	4.6	7.8	10.6	0.2	0.6	4.2	14.5	11.5%
	TP2	1.0	2.4	3.2	3.0	7.8	20.8	0.8	0.4	5.2	12.1	9.6%
N3$_{un\_GVW}$	TP1	0.0	0.8	2	0.2	1	4.2	0.2	0.8	1	0.3	1.1%
	TP2	0.0	0.6	1.4	0.6	3.2	12.2	0.4	1.4	3.0	3.4	12.5%

Annual Target Populations for BSIS VRU casualties (GB): N2/N3 Weights

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Specific Target Populations: BSIS

Total annual societal costs of BSIS VRU Casualties (GB): N2/N3 Weights
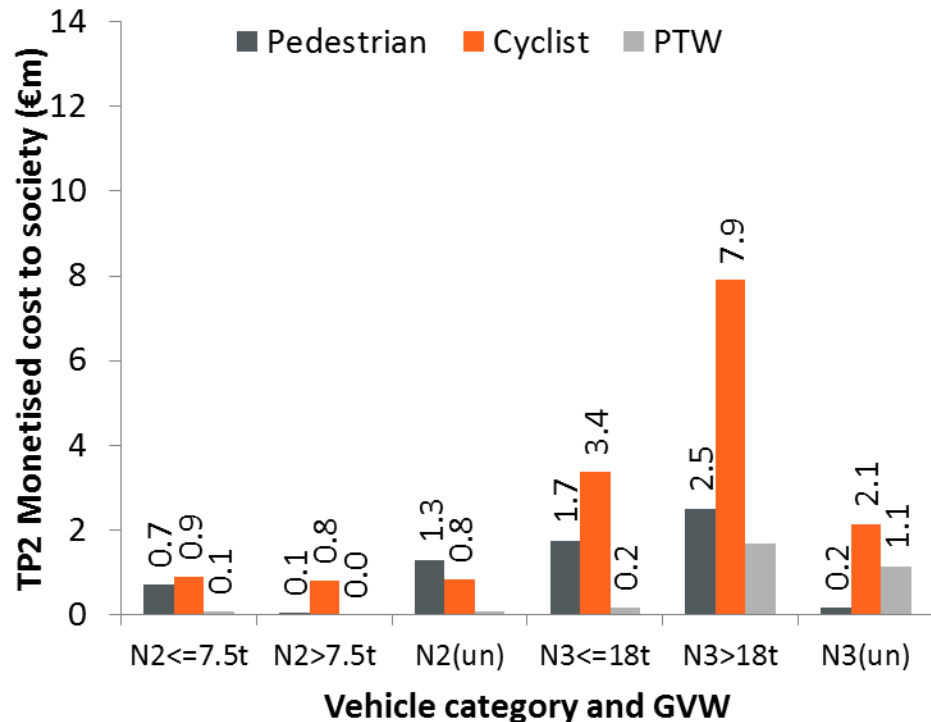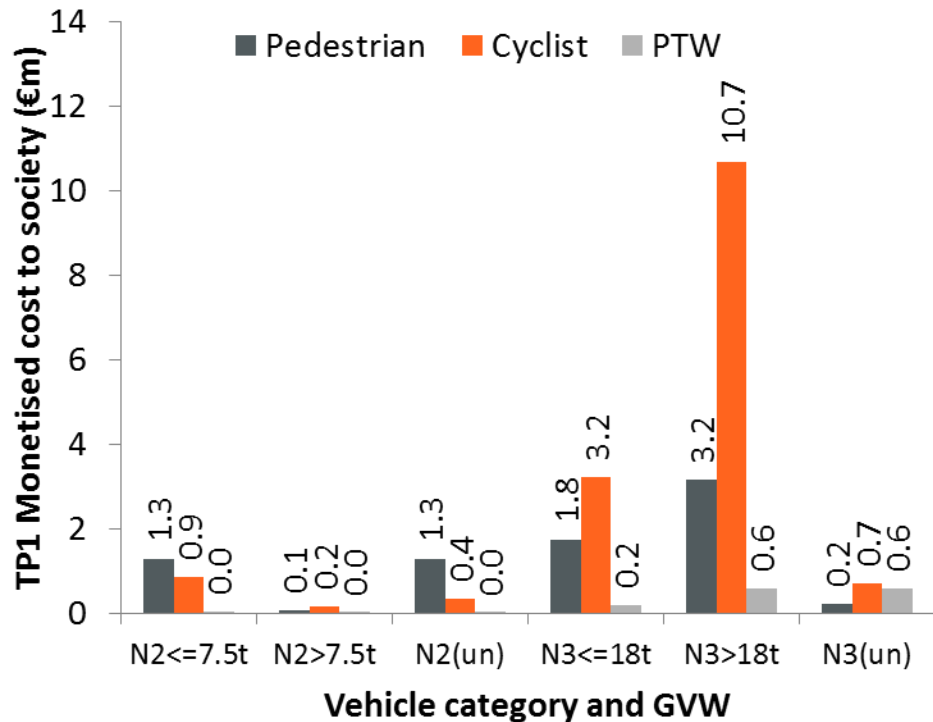
Specific Target Populations: BSIS

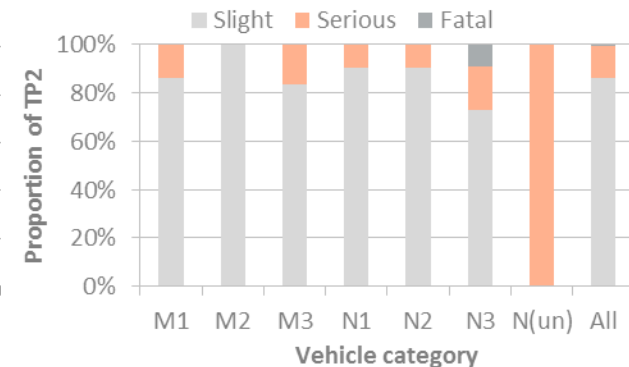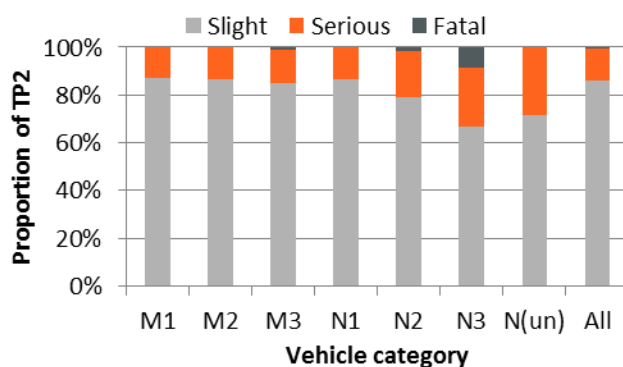**Injury severity as a proportion of BSIS VRU casualties for each vehicle category (GB)**
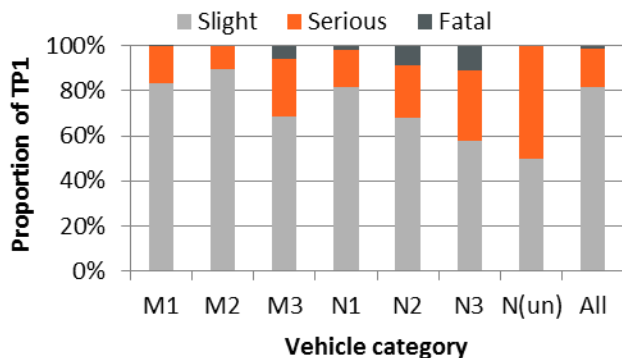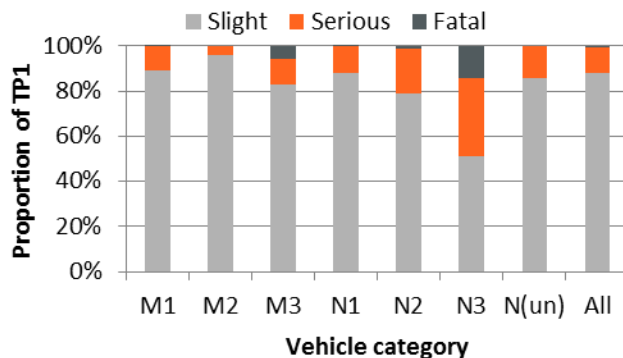
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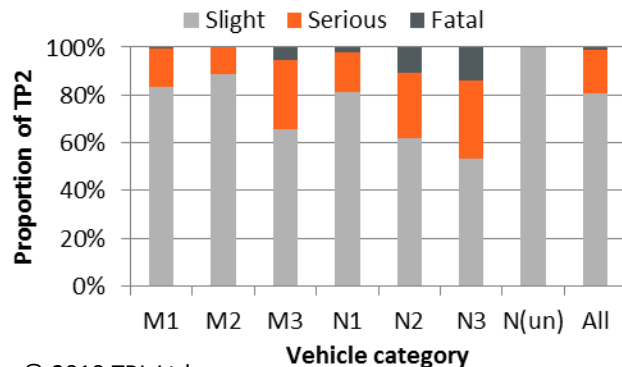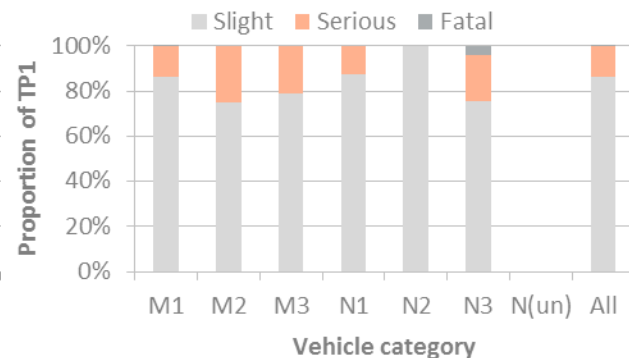# Specific Target Populations: BSIS

- Current scope proposal
  - Just to remind
- Required:
  - N2 (>8T)
  - N3
- Optional:
  - N2 (≤8T)
  - M2
  - M3

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vehicles, especially when turning into a narrow street, require a counter-turn that starts approximately 15 m before entering that street, so the test procedure included in this Regulation requires the information signal to be activated 15 m before the expected collision point.

1. **Scope**

1.1. This Regulation applies to the blind spot information system of vehicles of categories [M₂,] N₂ [(> 8 t of technically permissible maximum mass)] and [M₃ and] N₃. ~~Other v~~Vehicles of categories N₂ (≤ 8 t of technically permissible maximum mass), M₂ and M₃ may be approved at the request of the manufacturer.

1.2. The requirements of this Regulation are so worded as to apply to vehicles which are developed for right-hand traffic. In vehicles that are developed for left-hand traffic, these requirements shall be applied by inverting the criteria, when appropriate.

2. **Definitions**

For the purposes of this Regulation:

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Specific Target Populations: BSIS

BSIS Collision Landscape Conclusions Relating to Vehicle Categories

- VRU collisions relevant to BSIS dominated by collisions with M1 vehicles:
  - Should M1/N1 vehicles be considered in scope?

- Ranking of vehicle category priority:
  - Societal costs: M1>N3>N1>M3>N2>M2
  - Proportion of total societal costs for category: N3>N2>M3>N1>M1>M2
  - If N2/N3 in scope, should M3 be considered in scope?

- Considering N2/N3 scope exclusions based on GVW:
  - N2≤7.5T has larger TP than N2>7.5T ⇨ should N2≤7.5T be considered in scope?
  - N3≤18T and N3>18T both have larger TP than all N2 category vehicles

- Considering injury severities:
  - N3, N2, M3 all have greater proportion of KSI cost than M1

- Conclusions not affected by selection of target population definition (TP1/TP2)

Specific Target Populations: BSIS

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BSIS Regulatory Scope: Selection of Applicable Vehicle Categories

Vehicle Category	Societal Cost	% of Total Cost	Injury Severity	In Scope of GSR Policy	Proposed BSIS Scope?
M1	↑ (green)	→ (orange)	= (grey)		?
M2	↓ (red)	→ (orange)	↓ (red)	✔	?
M3	↑ (green)	↑ (green)	↑ (green)	✔	✔
N1	↑ (green)	→ (orange)	↑ (green)		?
N2≤8T	→ (orange)	↑ (green)	↑ (green)	✔	✔
N2>8T	↓ (red)	↑ (green)	↑ (green)	✔	✔
N3≤18T	→ (orange)	↑ (green)	↑ (green)	✔	✔
N3>18T	↑ (green)	↑ (green)	↑ (green)	✔	✔

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Reversing Camera & Detection System (REV)

Specific Target Populations: REV

- **Top level target population (TP1):**
  - Vehicle manoeuvre = reversing
  - Vehicle impact = rear

- **Detailed target population (TP2):**

Pedestrian		Cyclist/PTW			
Vehicle manoeuvre	VRU manoeuvre	Vehicle manoeuvre	Vehicle impact	VRU manoeuvre	VRU impact
Reversing	Crossing from driver's n/s Crossing from driver's o/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Reversing	Rear	Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	-
		OR			
		Reversing	Rear	Going ahead LH bend/RH bend/other	Offside Nearside

??

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Specific Target Populations: REV

Annual Target Populations for REV VRU casualties (GB)

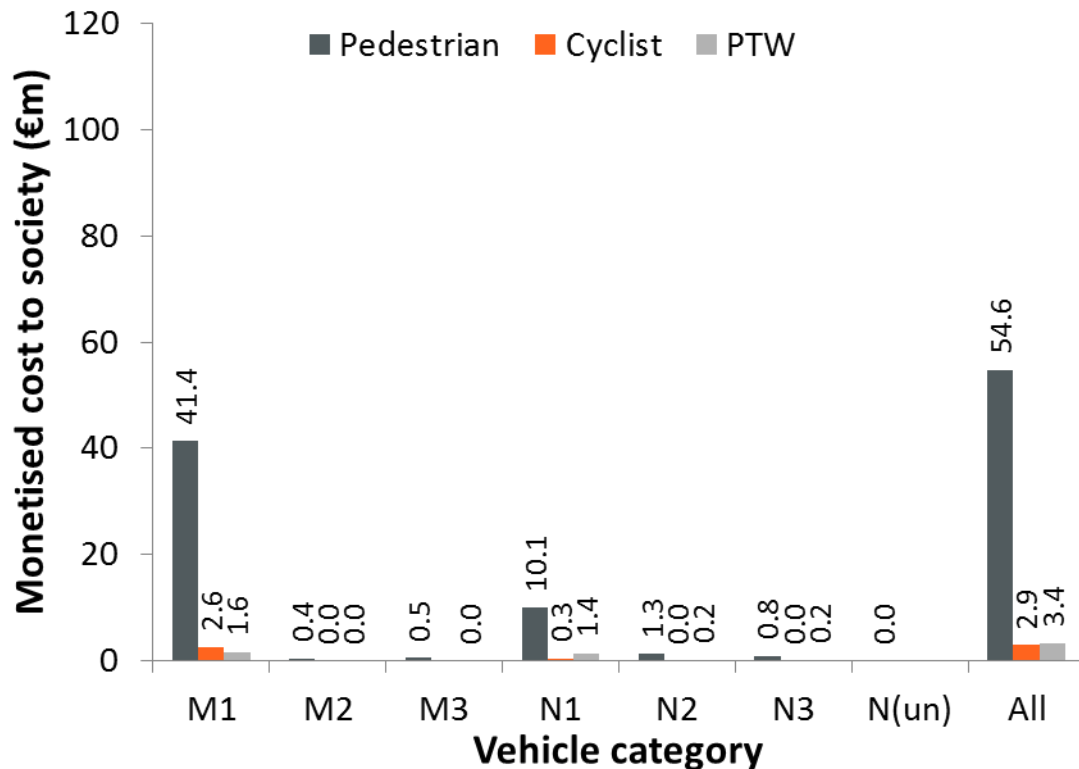| Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP1	6.6	185.0	1,119.2	0.0	12.6	133.0	0.0	8.4	83.2	87.4	2.4%
	TP2	2.6	103.0	617.2	0.0	5.8	62.8	0.0	2.8	48.6	45.6	1.2%
M2	TP1	0.0	2.6	7.6	0.0	0.0	0.2	0.0	0.0	1.2	0.8	4.9%
	TP2	0.0	1.4	5.4	0.0	0.0	0.2	0.0	0.0	0.8	0.5	2.8%
M3	TP1	0.2	0.8	4.6	0.0	0.0	0.0	0.0	0.0	2.0	0.7	0.4%
	TP2	0.2	0.4	2.4	0.0	0.0	0.0	0.0	0.0	1.0	0.5	0.3%
N1	TP1	3.2	42.6	189.2	0.0	1.4	23.4	0.0	4.4	49.6	22.7	6.4%
	TP2	1.0	26.0	103.4	0.0	0.4	12.6	0.0	2.8	36.4	11.8	3.3%
N2	TP1	0.6	3.2	10.0	0.0	0.0	0.6	0.0	0.6	4.2	2.3	5.1%
	TP2	0.4	1.8	4.8	0.0	0.0	0.4	0.0	0.6	4.0	1.5	3.3%
N3	TP1	0.6	2.0	9.0	0.0	0.0	0.8	0.0	0.6	4.8	2.0	1.1%
	TP2	0.2	1.6	4.2	0.0	0.0	0.2	0.0	0.4	3.0	1.0	0.5%
N$_{unknown}$	TP1	0.0	0.0	1.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	1.1%
	TP2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2%
Total	TP1	11.2	236.2	1,340.6	0.0	14.0	158.2	0.0	14.0	145.0	115.9	2.6%
	TP2	4.4	134.2	737.6	0.0	6.2	76.2	0.0	6.6	93.8	60.9	1.4%

Specific Target Populations: REV

- REV Target Population 1
- Total annual societal cost to GB of €116M
- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs
- Pedestrians most affected casualty
- Ranking of societal costs:
  - M1>N1>N2>N3>M2>M3

Chart: Monetised cost to society (€m) by Vehicle category

Legend: Pedestrian, Cyclist, PTW

- M1: Pedestrian 78.2, Cyclist 5.6, PTW 3.6
- M2: Pedestrian 0.8, Cyclist 0.0, PTW 0.0
- M3: Pedestrian 0.7, Cyclist 0.0
- N1: Pedestrian 19.9, Cyclist 0.8, PTW 2.0
- N2: Pedestrian 2.1, Cyclist 0.0, PTW 0.2
- N3: Pedestrian 1.8, Cyclist 0.0, PTW 0.2
- N(un): Pedestrian 0.0, 0.0
- All: Pedestrian 103.4, Cyclist 6.4, PTW 6.1

Specific Target Populations: REV

- REV Target Population 2

- Total annual societal cost to GB of €61M

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- Pedestrians most affected casualty

- Ranking of societal costs:
  - M1>N1>N2>N3>M3>M2

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Specific Target Populations: REV

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
N2 ≤7.5T	TP1	0.6	2.0	5.4	0.0	0.0	0.2	0.0	0.4	2.6	1.9	6.3%
	TP2	0.4	1.2	2.8	0.0	0.0	0.0	0.0	0.4	2.6	1.2	4.0%
N2 >7.5T	TP1	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0%
	TP2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0%
N2$_{un\_GVW}$	TP1	0.0	1.2	4.0	0.0	0.0	0.4	0.0	0.2	1.0	0.4	3.8%
	TP2	0.0	0.6	1.8	0.0	0.0	0.4	0.0	0.2	1.0	0.3	2.9%
N3 ≤18T	TP1	0.2	0.4	2.4	0.0	0.0	0.2	0.0	0.2	1.2	0.6	1.9%
	TP2	0.2	0.4	0.8	0.0	0.0	0.2	0.0	0.2	1.0	0.6	1.9%
N3 >18T	TP1	0.4	0.6	3.6	0.0	0.0	0.4	0.0	0.4	2.6	1.1	0.9%
	TP2	0.0	0.4	1.8	0.0	0.0	0.0	0.0	0.2	1.4	0.2	0.2%
N3$_{un\_GVW}$	TP1	0.0	1.0	2.4	0.0	0.0	0.0	0.0	0.0	0.8	0.3	1.1%
	TP2	0.0	0.8	1.4	0.0	0.0	0.0	0.0	0.0	0.4	0.2	0.7%

Annual Target Populations for REV VRU casualties (GB): N2/N3 Weights

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Specific Target Populations: REV

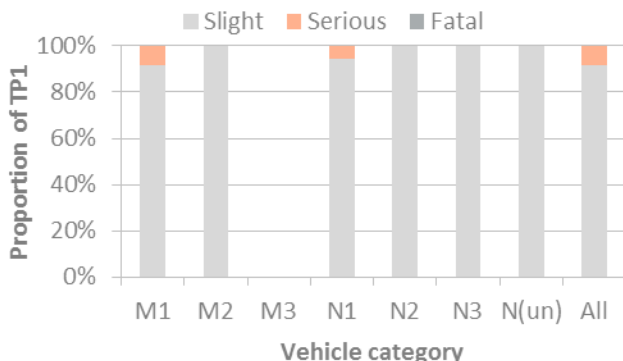Total annual societal costs of REV VRU Casualties (GB): N2/N3 Weights
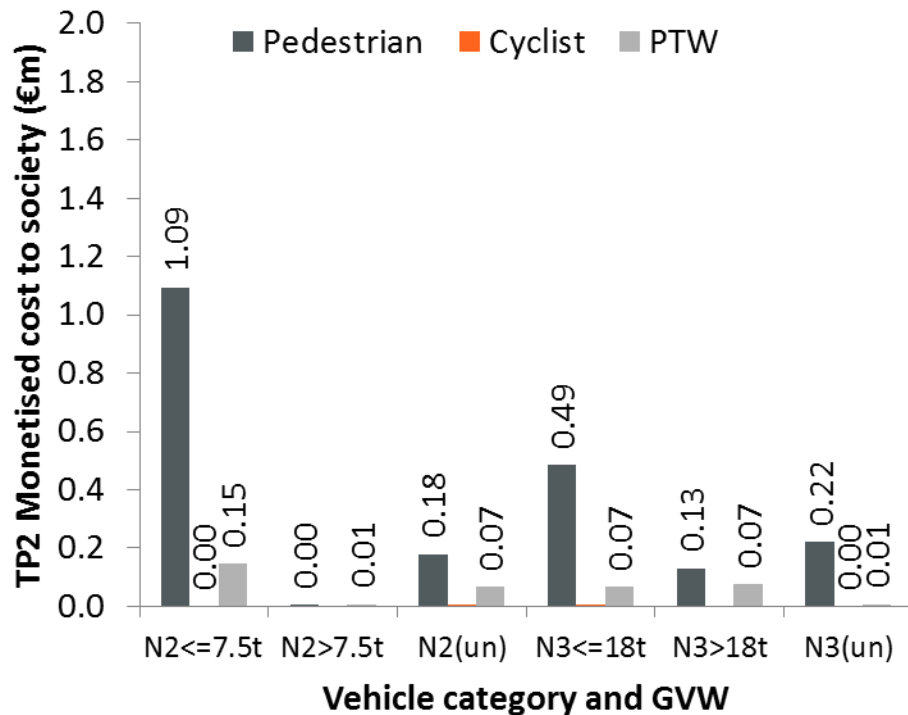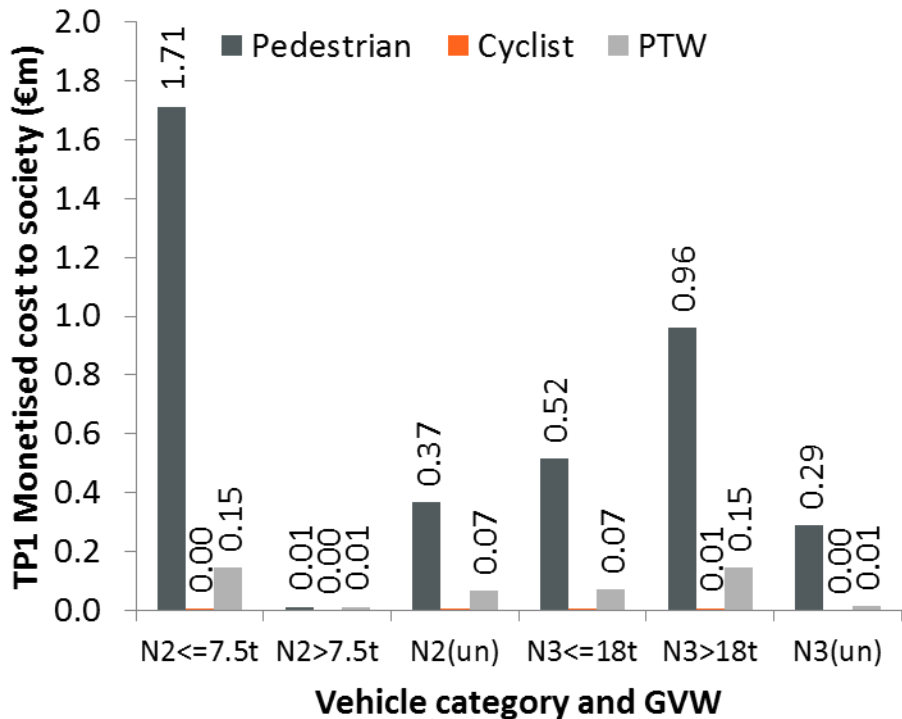
Specific Target Populations: REV

Injury severity as a proportion of REV VRU casualties for each vehicle category (GB)
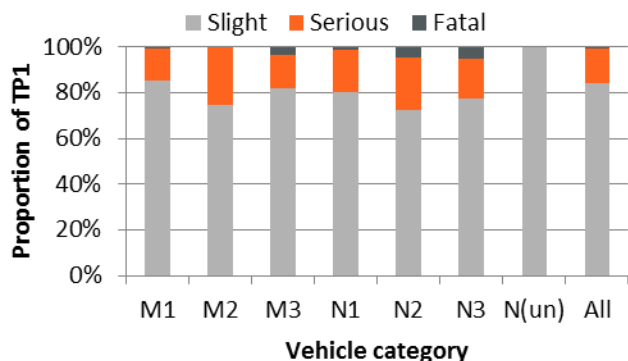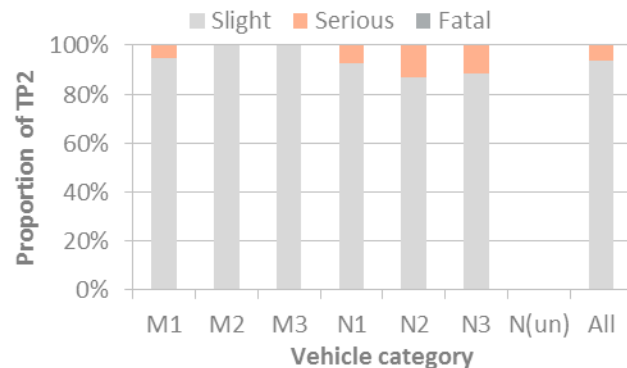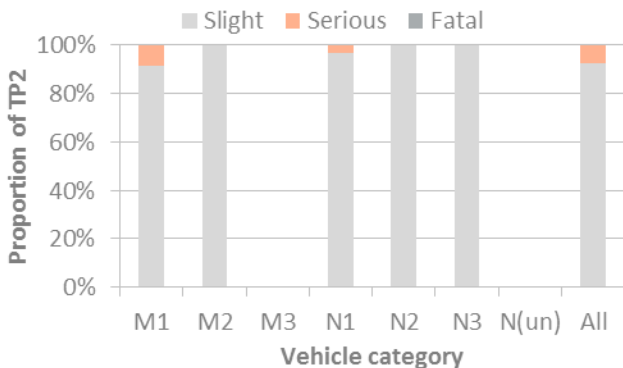
Specific Target Populations: REV
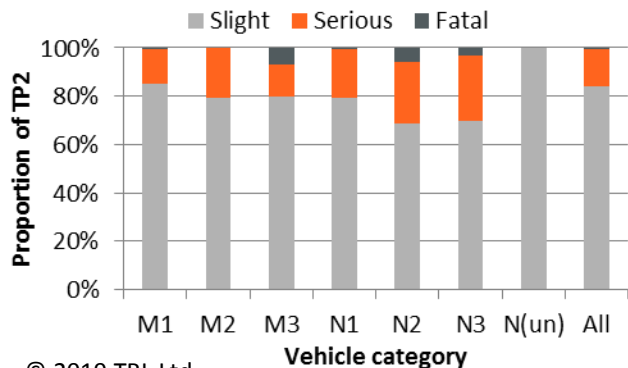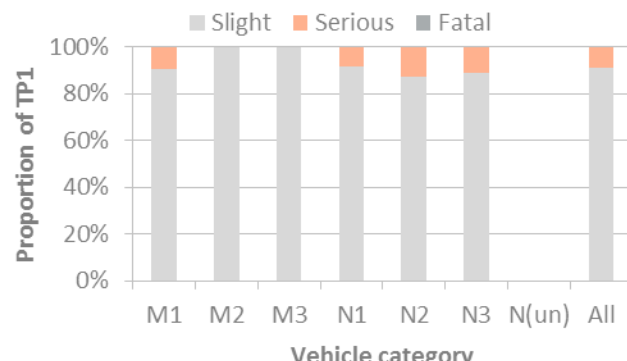
- Current scope proposal
  - Just to remind
- Required:
  - All categories and weight classes

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Add a new eighth column to the table in paragraph 15.2.1.1.3., to read:

"

Vehicle category	Close-proximity rear-view Class VIII
M₁	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
M₂	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
M₃	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N₁	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N₂ ≤ 7.5 t	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N₂ > 7.5 t	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N₃	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).

"

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Specific Target Populations: REV

REV Collision Landscape Conclusions Relating to Vehicle Categories

- VRU collisions relevant to REV dominated by M1/N1 vehicles:
  - <5% societal cost of casualties for all other vehicle categories combined
  - <6.5% of total societal costs for any vehicle category
  - Primarily involved in collisions with pedestrians (>89%)
  - Should other vehicle categories be considered in scope? Off-road collisions?

- Considering N2/N3 scope exclusions based on GVW:
  - N2≤7.5T has larger TP than N2>7.5T, with N2>7.5T ≈ 0
  - N3≤18T and N3>18T have similar TP, but smaller than N2≤7.5T

- Considering injury severities:
  - All categories have greater proportion of KSI cost than M1, while only N2/N3 have greater proportion of KSI than N1

- Conclusions not affected by selection of target population definition (TP1/TP2)

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Specific Target Populations: REV

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REV Regulatory Scope: Selection of Applicable Vehicle Categories

Vehicle Category	Societal Cost	% of Total Cost	Injury Severity	In Scope of GSR Policy	Proposed REV Scope?
M1	⬆ (green)	➡ (orange)	⬌ (grey)	✔	✔
M2	⬇ (red)	⬆ (green)	⬆ (green)	✔	✔
M3	⬇ (red)	⬇ (red)	⬆ (green)	✔	✔
N1	⬆ (green)	⬆ (green)	⬆ (green)	✔	✔
N2≤8T	➡ (orange)	⬆ (green)	⬆ (green)	✔	✔
N2>8T	⬇ (red)	⬇ (red)	⬆ (green)	✔	✔
N3≤18T	⬇ (red)	➡ (orange)	⬆ (green)	✔	✔
N3>18T	⬇ (red)	⬇ (red)	⬆ (green)	✔	✔

Legend

Societal Cost
Green: >€10M
Orange: >€1M
Red: <€1M

% Total Cost:
Green: >5%
Orange: >2%
Red: <2%

Injury Severity:
M1: Baseline
Green: >M1 %KSI
Orange: ~M1 %KSI
Red: <M1 %KSI

BSIS Scope:
Green: 1+ green
Orange: 1+ orange
Red: 0 orange

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Moving-Off Information System (MOIS)

Specific Target Populations: MOIS

- **Top level target population (TP1):**
  - Vehicle manoeuvre = moving off or slowing/stopping
  - Vehicle impact = front
- **Detailed target population (TP2):**

Pedestrian		Cyclist/PTW				
Vehicle manoeuvre	**VRU manoeuvre**	**Vehicle manoeuvre**	**Vehicle impact**	**VRU manoeuvre**		**VRU impact**
Moving off Slowing or stopping	Crossing from driver's n/s Crossing from driver's o/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Moving off Slowing or stopping	Front	Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right		-
		OR				
		Moving off Slowing or stopping	Front	Going ahead LH bend/RH bend/other		Offside Nearside

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Specific Target Populations: MOIS

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP1	3.0	166.8	966.0	0.4	126.8	888.2	1.2	92.0	465.8	145.7	4.0%
	TP2	1.8	113.2	657.0	0.4	64.0	446.4	0.4	40.4	198.8	82.1	2.2%
M2	TP1	0.0	0.6	3.4	0.0	0.4	2.2	0.0	0.0	2.0	0.4	2.3%
	TP2	0.0	0.2	1.6	0.0	0.2	1.0	0.0	0.0	1.0	0.2	1.0%
M3	TP1	2.0	15.2	99.6	0.4	1.8	16.0	0.2	0.6	5.8	11.4	6.9%
	TP2	1.4	11.4	65.6	0.2	0.4	6.2	0.0	0.2	1.8	7.3	4.4%
N1	TP1	0.6	9.4	56.4	0.0	10.2	58.2	0.2	8.2	32.4	11.0	3.1%
	TP2	0.2	5.2	39.6	0.0	5.6	31.8	0.0	3.4	13.8	5.4	1.5%
N2	TP1	0.6	1.2	4.2	0.0	0.2	2.6	0.0	0.4	2.6	1.7	3.8%
	TP2	0.4	0.8	3.4	0.0	0.2	2.0	0.0	0.2	1.6	1.2	2.6%
N3	TP1	8.8	5.4	8.8	0.4	1.2	6.2	0.2	1.4	7.6	19.9	10.7%
	TP2	7.0	4.4	6.2	0.2	0.8	4.0	0.2	0.4	3.2	15.4	8.3%
N$_{unknown}$	TP1	0.0	0.2	0.0	0.0	0.0	0.8	0.0	0.0	0.0	0.1	3.0%
	TP2	0.0	0.2	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.1	2.8%
Total	TP1	15.0	198.8	1,138.4	1.2	140.6	974.2	1.8	102.6	516.2	190.3	4.3%
	TP2	10.8	135.4	773.4	0.8	71.2	492.0	0.6	44.6	220.2	111.7	2.5%

Annual Target Populations for MOIS VRU casualties (GB)
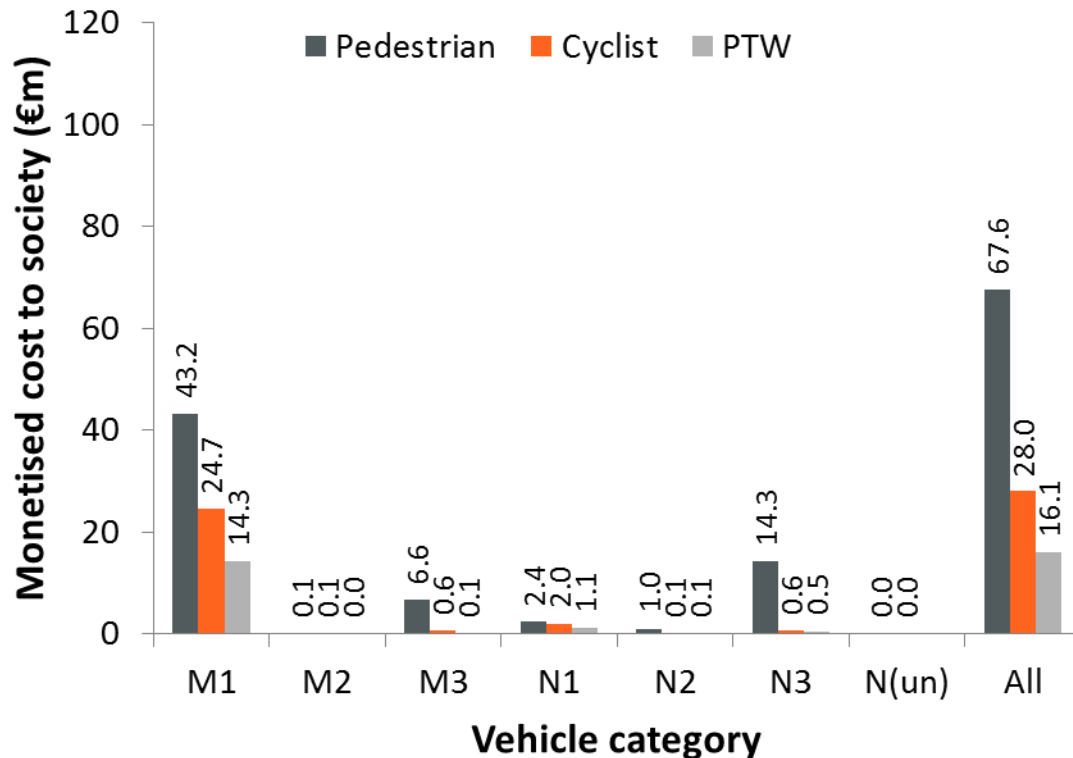
Specific Target Populations: MOIS

- MOIS Target Population 1

- Total annual societal cost to GB of €190M

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- Pedestrians most affected casualty

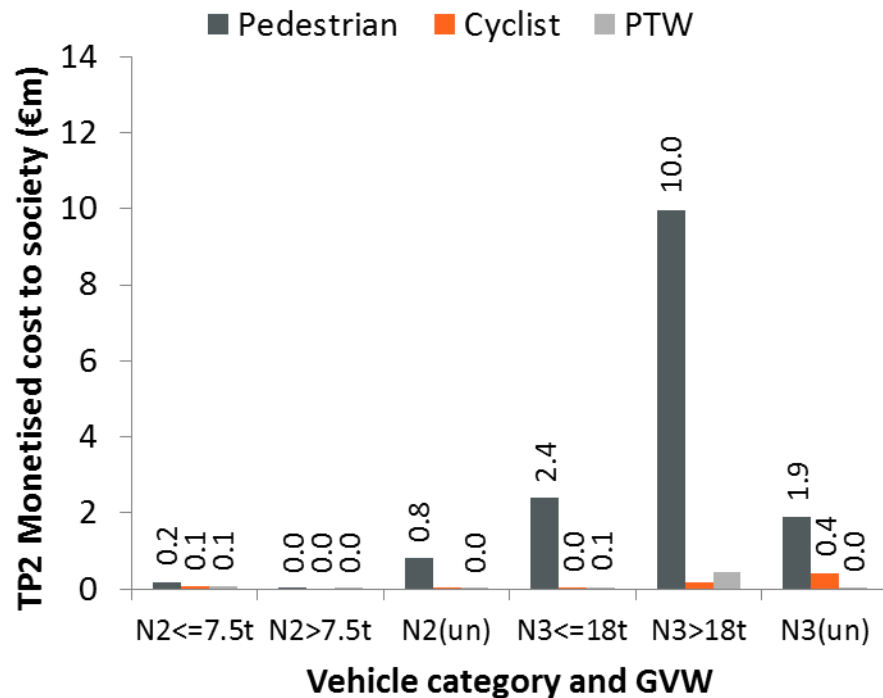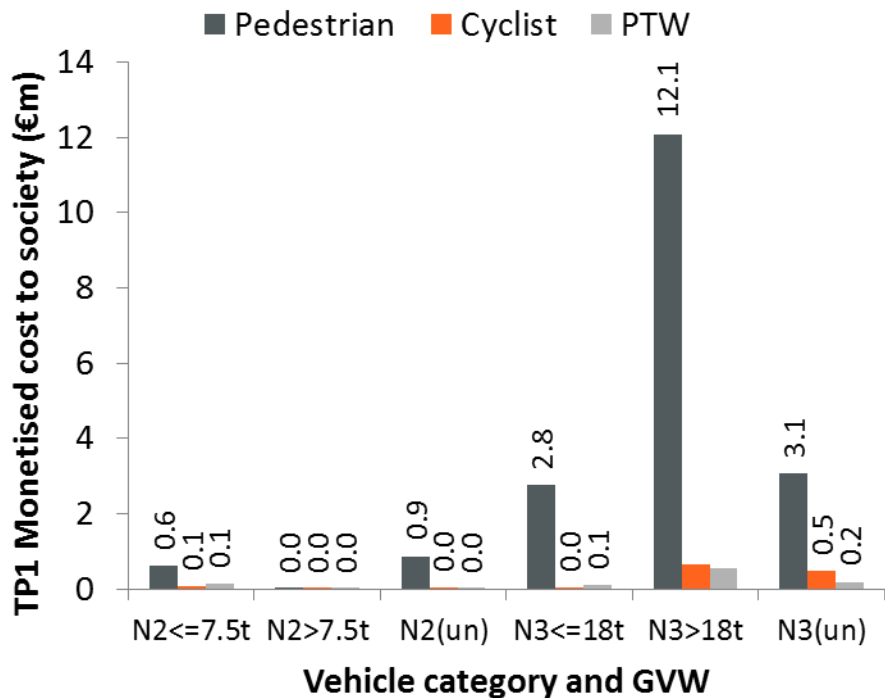- Ranking of societal costs:
  - M1>N3>M3>N1>N2>M2
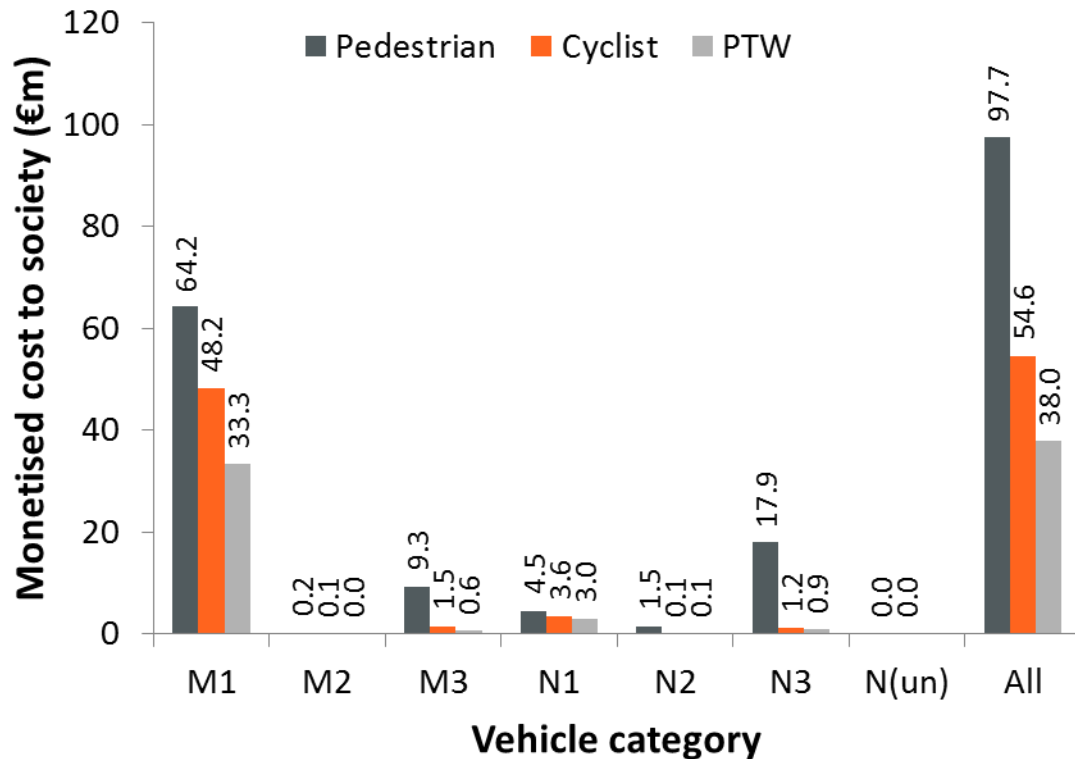
Total annual societal costs of MOIS VRU casualties (GB): TP1

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Specific Target Populations: MOIS

- MOIS Target Population 2

- Total annual societal cost to GB of €112M

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- Pedestrians most affected casualty

- Ranking of societal costs:
  - M1>N3>M3>N1>N2>M2

Chart: Monetised cost to society (€m) by Vehicle category

Legend: Pedestrian, Cyclist, PTW

Vehicle category	Pedestrian	Cyclist	PTW
M1	43.2	24.7	14.3
M2	0.1	0.1	0.0
M3	6.6	0.6	0.1
N1	2.4	2.0	1.1
N2	1.0	0.1	0.1
N3	14.3	0.6	0.5
N(un)	0.0	0.0	
All	67.6	28.0	16.1

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Specific Target Populations: MOIS

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
N2 ≤7.5T	TP1	0.2	0.8	2.6	0.0	0.2	1.4	0.0	0.4	2.0	0.8	2.6%
	TP2	0.0	0.6	2.0	0.0	0.2	1.0	0.0	0.2	1.0	0.3	1.0%
N2 >7.5T	TP1	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0%
	TP2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0%
N2$_{un\_GVW}$	TP1	0.4	0.4	1.2	0.0	0.0	1.0	0.0	0.0	0.4	0.9	8.6%
	TP2	0.4	0.2	1.2	0.0	0.0	1.0	0.0	0.0	0.4	0.8	7.6%
N3 ≤18T	TP1	1.4	0.6	0.6	0.0	0.0	1.4	0.0	0.4	0.8	2.9	8.9%
	TP2	1.2	0.6	0.6	0.0	0.0	1.2	0.0	0.2	0.4	2.5	7.7%
N3 >18T	TP1	5.8	4.6	6.0	0.2	0.8	4.0	0.2	0.4	4.6	13.3	10.6%
	TP2	4.8	3.8	4.0	0.0	0.6	2.6	0.2	0.2	2.0	10.6	8.4%
N3$_{un\_GVW}$	TP1	1.6	0.2	1.8	0.2	0.4	0.8	0.0	0.6	2.2	3.7	13.6%
	TP2	1.0	0.0	1.4	0.2	0.2	0.2	0.0	0.0	0.8	2.3	8.4%

Annual Target Populations for MOIS VRU casualties (GB): N2/N3 Weights

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Specific Target Populations: MOIS
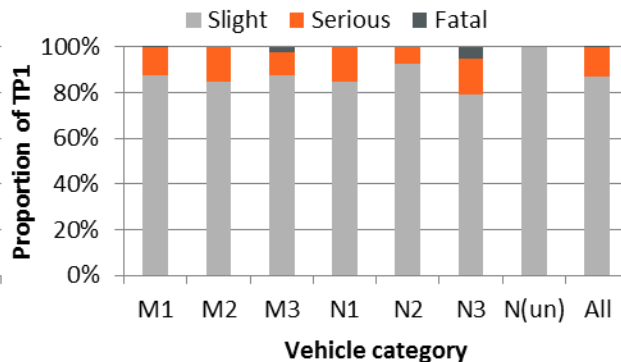
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Specific Target Populations: MOIS

Injury severity as a proportion of MOIS VRU casualties for each vehicle category (GB)

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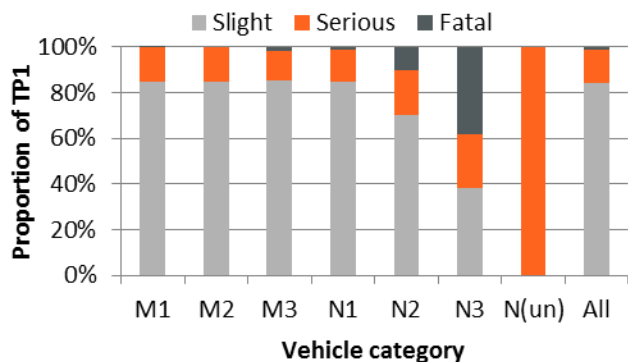
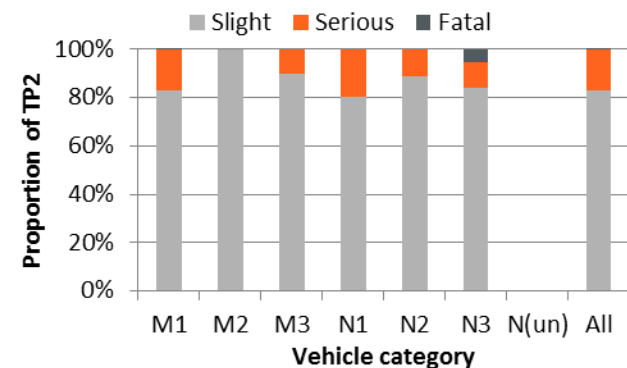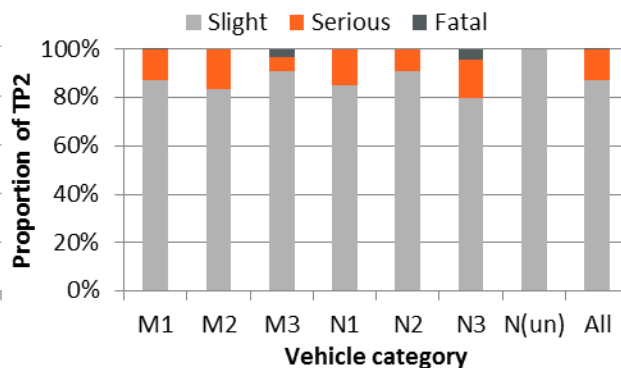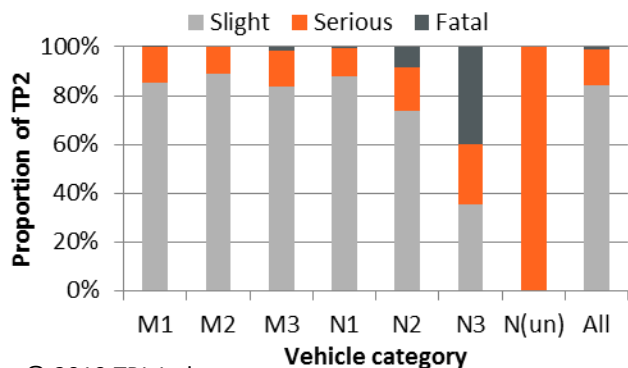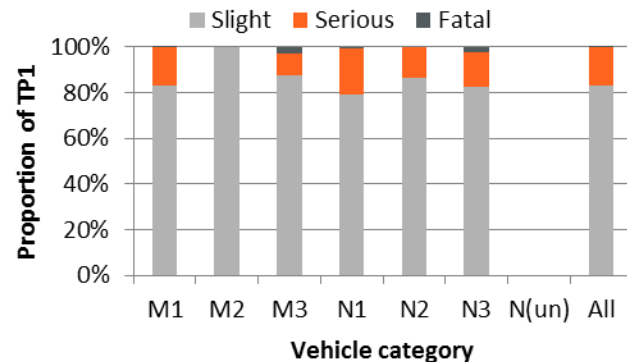# Specific Target Populations: MOIS

MOIS Collision Landscape Conclusions Relating to Vehicle Categories

- VRU collisions relevant to MOIS dominated by collisions with M1 vehicles:
  - Should M1/N1 vehicles be considered in scope?

- Ranking of vehicle category priority:
  - Societal costs: M1>N3>M3>N1>N2>M2
  - Proportion of total societal costs for category: N3>M3>M1>N2>N1>M2
  - If N2/N3 considered in scope, should M1, N1, M3 be considered in scope?

- Considering N2/N3 scope exclusions based on GVW:
  - N3>18T has largest TP, N3≤18T second largest TP
  - N2 has small TP, with N2≤7.5T larger than N2>7.5T

- Considering injury severities:
  - N3, N2, M3 all have greater proportion of KSI cost than M1

- Conclusions not affected by selection of target population definition (TP1/TP2)

Specific Target Populations: MOIS

TRL

MOIS Regulatory Scope: Selection of Applicable Vehicle Categories

Vehicle Category	Societal Cost	% of Total Cost	Injury Severity	In Scope of GSR Policy	Proposed MOIS Scope?
M1	↑ green	→ orange	= grey		?
M2	↓ red	→ orange	→ orange	✓	?
M3	↑ green	↑ green	→ orange	✓	✓
N1	↑ green	→ orange	→ orange		?
N2≤8T	→ orange	→ orange	↑ green	✓	✓
N2>8T	↓ red	→ orange	↑ green	✓	✓
N3≤18T	→ orange	↑ green	↑ green	✓	✓
N3>18T	↑ green	↑ green	↑ green	✓	✓

Legend

Societal Cost
Green: >€10M
Orange: >€1M
Red: <€1M

% Total Cost:
Green: >5%
Orange: >2%
Red: <2%

Injury Severity:
M1: Baseline
Green: >M1 %KSI
Orange: ~M1 %KSI
Red: <M1 %KSI

BSIS Scope:
Green: 1+ green
Orange: 1+ orange
Red: 0 orange

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Direct Vision (DIR)

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Specific Target Populations: DIR

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- **Top level target population (TP1):**
  - Vehicle manoeuvre = moving off or slowing/stopping or turning left or turning right
  - Vehicle impact = front or nearside or offside
- **Detailed target population (TP2):**

Pedestrian		Cyclist/PTW				
Vehicle manoeuvre	VRU manoeuvre	Vehicle manoeuvre	Vehicle impact	VRU manoeuvre	VRU impact	Cab-only impacts correction factor
Moving off Slowing or stopping Left turn Right turn	Crossing from driver's n/s Crossing from driver's o/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Moving off Slowing or stopping	Front	Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	-	-
		OR				
		Left turn	Nearside	Left turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Offside	0.7
		OR				
		Right turn	Offside	Right turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Nearside	0.7

Specific Target Populations: DIR

DIR Target Population Definitions – Impact Against the Driver Cab

- RAIDS case-by-case analysis of 26 cases of N2/N3 vs. VRU collisions shows:
  - Of the 7 collisions where the VRU impacted the nearside/offside of the vehicle **71% occurred against the driver cab**

- TfL case-by-case analysis of 28 fatal cases of M3 vs. VRU collisions shows:
  - Of the 10 collisions where the VRU impacted the nearside/offside of the vehicle **70% occurred against the driver cab**

- **It is proposed that the following correction factor is applied to the DIR target population for nearside/offside impacts:**

Cab-Only Impact Correction Factor:
70%

Specific Target Populations: DIR

TRL

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP1	17.6	691.0	3,442.2	4.0	906.0	5,990.8	51.6	1,359.6	4,363.0	1,113.6	30.4%
	TP2	12.4	523.2	2,529.4	0.0	21.0	174.4	0.0	25.4	258.2	217.0	5.9%
M2	TP1	0.2	3.0	15.4	0.0	2.6	16.2	0.4	3.6	12.2	4.2	25.3%
	TP2	0.2	1.8	8.8	0.0	0.4	0.8	0.0	0.0	1.6	1.1	6.8%
M3	TP1	7.8	62.4	291.0	1.6	10.7	70.9	1.6	9.2	34.0	48.0	29.0%
	TP2	5.4	40.0	161.2	0.0	0.5	10.5	0.0	0.6	4.6	23.4	14.2%
N1	TP1	4.6	55.8	255.6	0.4	86.6	520.4	7.4	111.6	356.2	106.1	29.8%
	TP2	2.8	40.0	184.8	0.0	2.0	19.4	0.0	1.8	22.0	20.1	5.6%
N2	TP1	2.0	7.2	22.2	0.2	6.3	30.1	1.2	6.6	21.5	12.6	27.8%
	TP2	1.4	5.0	14.8	0.0	0.5	2.1	0.0	0.2	2.7	4.4	9.6%
N3	TP1	13.6	19.2	37.4	7.8	21.8	45.4	3.6	17.9	37.8	63.4	34.1%
	TP2	11.0	13.6	23.2	0.8	1.0	5.8	0.2	0.9	6.6	26.9	14.5%
N$_{unknown}$	TP1	0.2	0.4	0.6	0.0	0.4	3.2	0.0	0.0	0.8	0.7	30.6%
	TP2	0.0	0.2	0.4	0.0	0.0	0.2	0.0	0.0	0.0	0.1	2.8%
Total	TP1	46.0	839.0	4,064.4	14.0	1,034.4	6,676.9	65.8	1,508.4	4,825.4	1,348.5	30.4%
	TP2	33.2	623.8	2,922.6	0.8	25.4	213.1	0.2	28.8	295.6	293.0	6.6%

Annual Target Populations for DIR VRU casualties (GB)

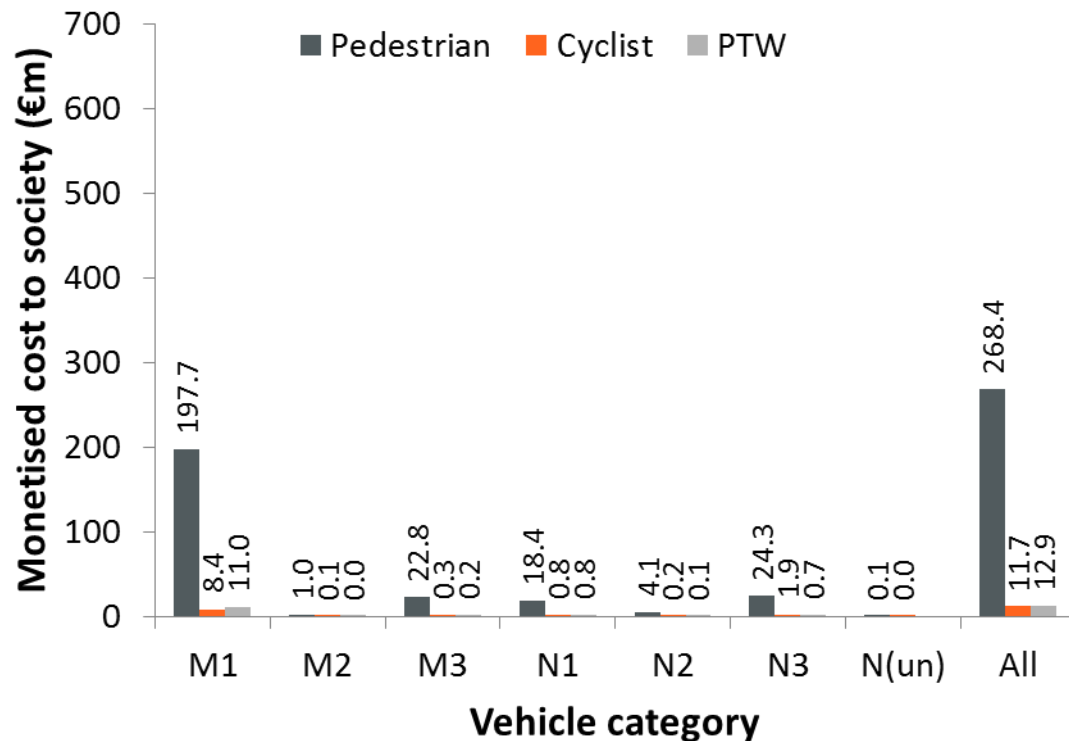# Specific Target Populations: DIR

- DIR Target Population 1

- Total annual societal cost to GB of €1.35bn

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- PTWs most affected casualty (apart from M3/N3 - peds)

- Ranking of societal costs:
  - M1>N1>N3>M3>N2>M2

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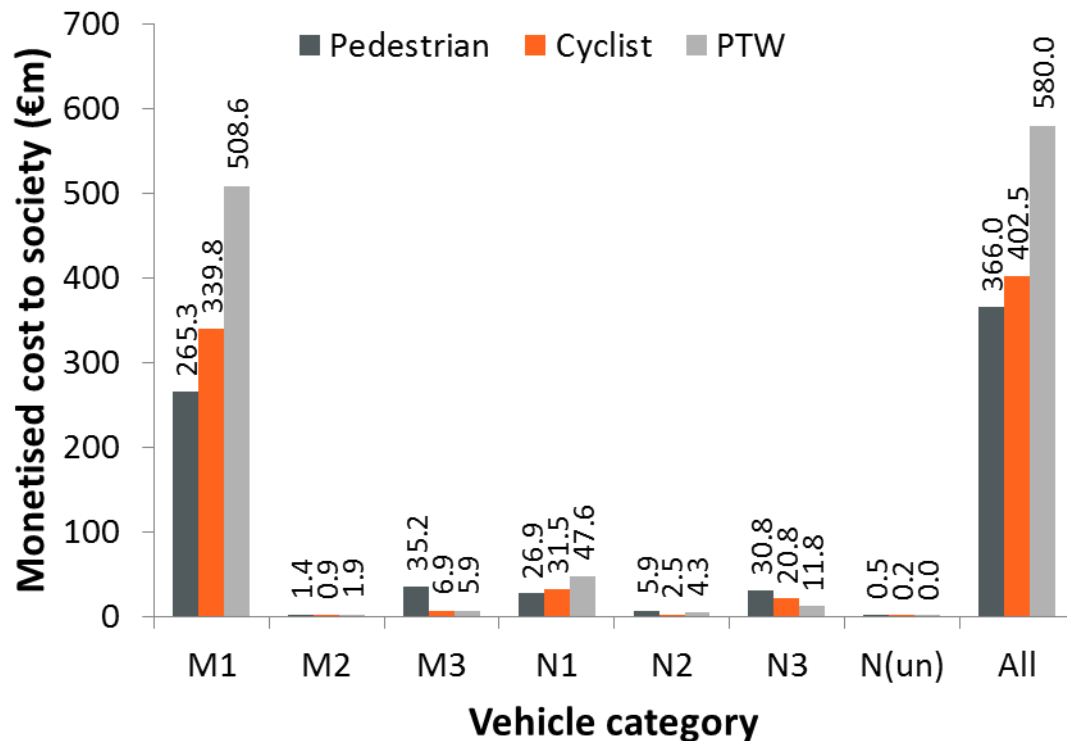
Specific Target Populations: DIR

Total annual societal costs of DIR VRU casualties (GB): TP2

- DIR Target Population 2

- Total annual societal cost to GB of €293M

- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs

- Pedestrians most affected casualty

- Ranking of societal costs:
  - M1>N3>M3>N1>N2>M2

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Specific Target Populations: DIR

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
N2 ≤7.5T	TP1	1.0	4.0	14.0	0.2	3.8	19.8	0.8	4.6	16.9	7.7	25.4%
	TP2	0.4	3.0	9.8	0.0	0.0	0.8	0.0	0.2	1.9	1.8	5.9%
N2 >7.5T	TP1	0.0	0.6	2.2	0.0	0.6	1.8	0.2	0.4	0.8	0.9	19.6%
	TP2	0.0	0.4	1.6	0.0	0.0	0.2	0.0	0.0	0.2	0.1	2.2%
N2$_{un\_GVW}$	TP1	1.0	2.6	6.0	0.0	1.9	8.5	0.2	1.6	3.8	4.1	39.1%
	TP2	1.0	1.6	3.4	0.0	0.5	1.1	0.0	0.0	0.6	2.5	23.8%
N3 ≤18T	TP1	2.6	2.6	7.0	1.6	6.7	9.7	0.2	2.4	6.2	11.5	35.5%
	TP2	2.4	2.0	5.2	0.0	0.5	1.3	0.0	0.2	0.2	5.3	16.3%
N3 >18T	TP1	9.2	13.6	21.4	5.6	12.6	24.8	2.6	9.8	22.0	42.6	33.8%
	TP2	7.4	10.0	13.6	0.6	0.0	3.2	0.2	0.2	4.0	18.2	14.5%
N3$_{unknown\_GVW}$	TP1	1.6	2.2	8.4	0.6	2.0	9.0	0.8	4.5	7.8	8.2	30.1%
	TP2	1.0	1.2	4.0	0.2	0.4	1.2	0.0	0.5	2.4	2.9	10.6%

Annual Target Populations for DIR VRU casualties (GB): N2/N3 Weights

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Specific Target Populations: DIR

Total annual societal costs of DIR VRU Casualties (GB): N2/N3 Weights
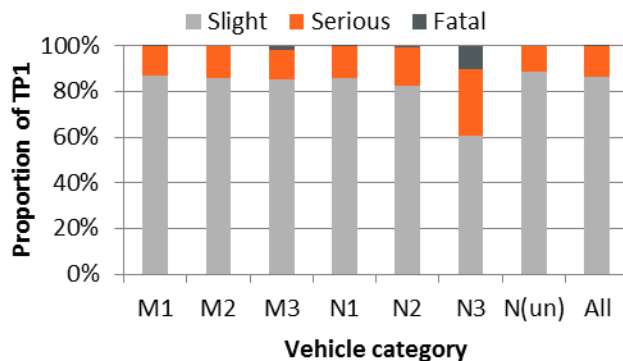
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Specific Target Populations: DIR

TRL
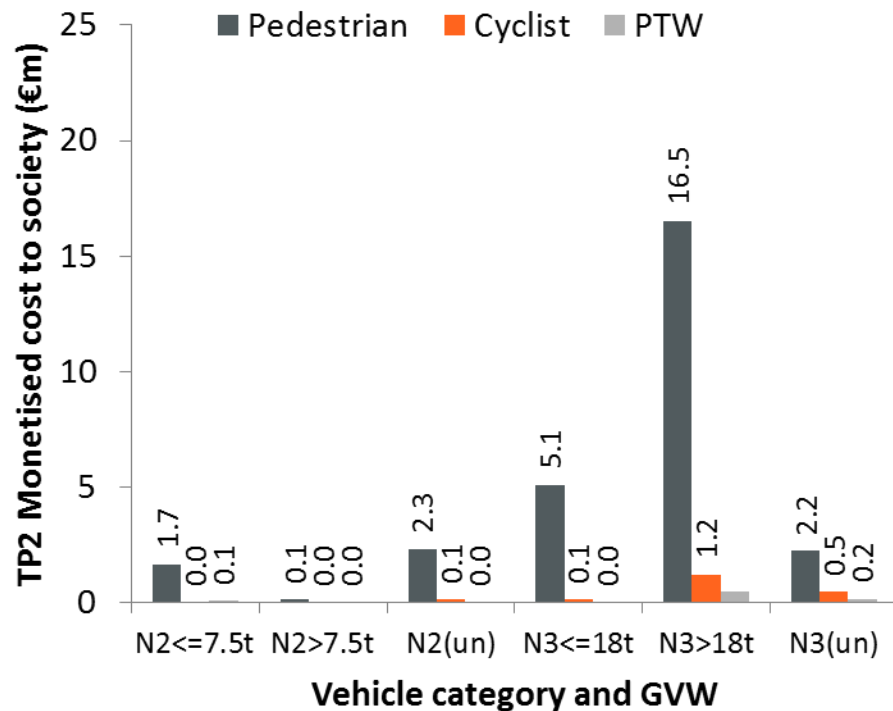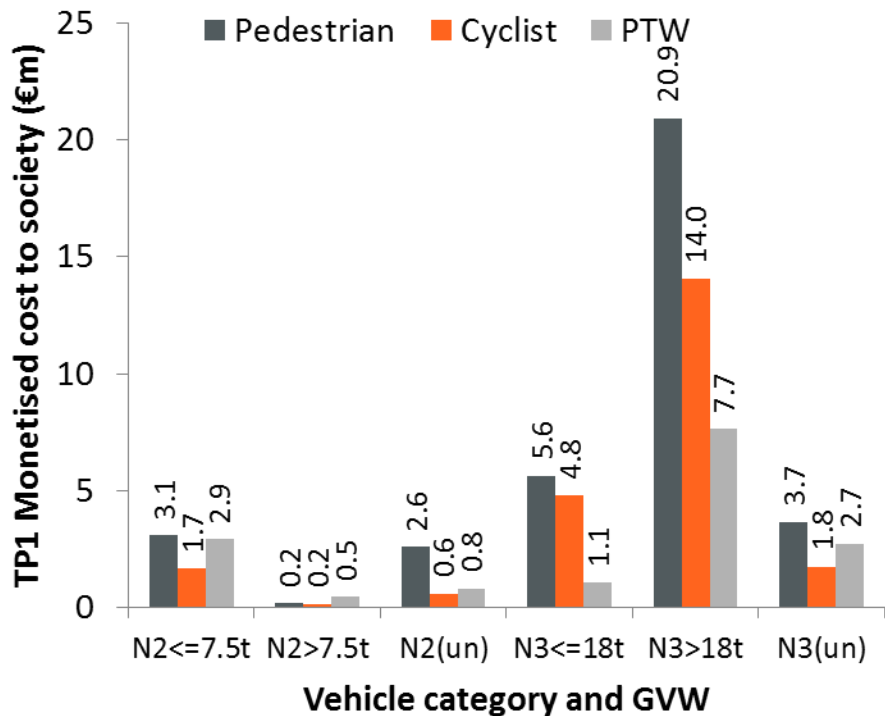
Injury severity as a proportion of DIR VRU casualties for each vehicle category (GB)

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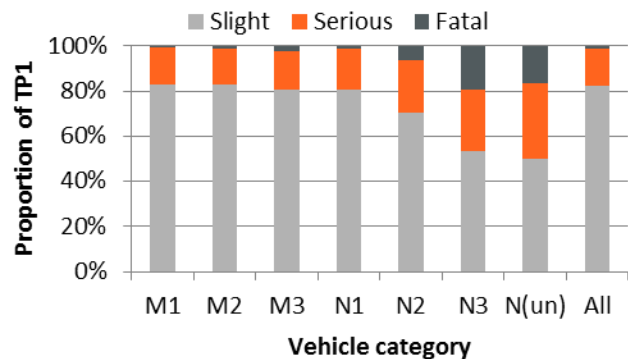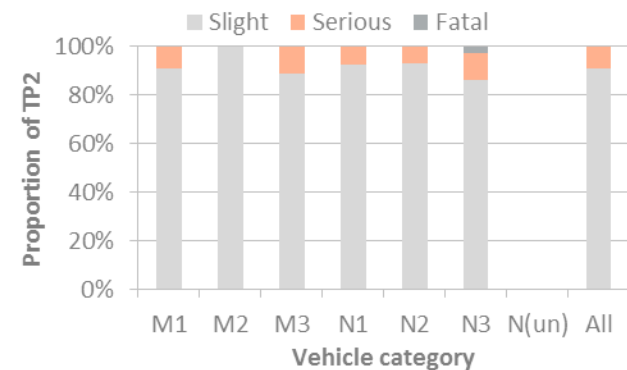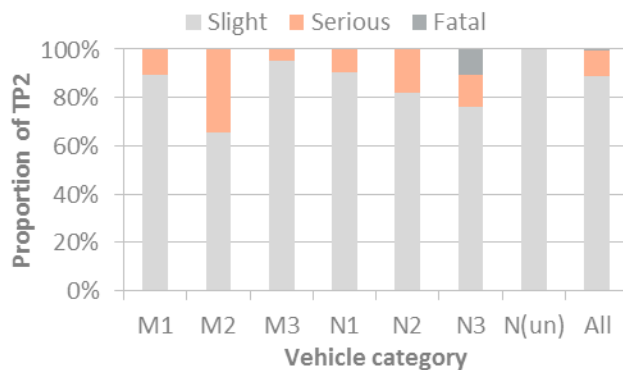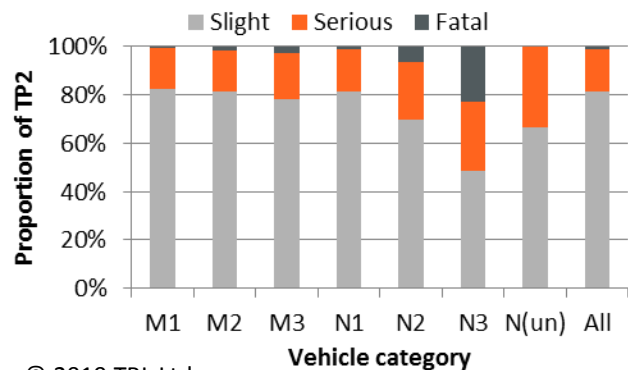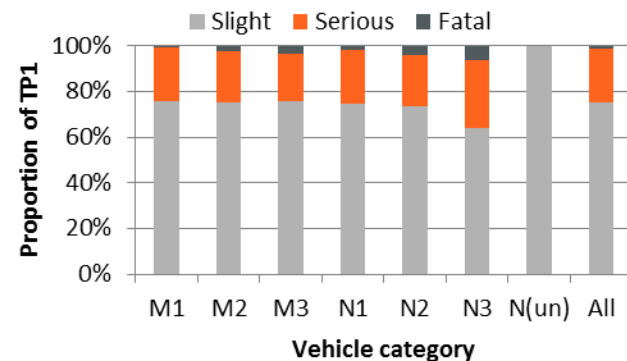
Specific Target Populations: DIR

DIR Collision Landscape Conclusions Relating to Vehicle Categories

- VRU collisions relevant to DIR dominated by collisions with M1 vehicles:
  - Should M1/N1 vehicles be considered in scope?

- Ranking of vehicle category priority:
  - Societal costs: M1>N3>M3>N1>N2>M2
  - Proportion of total societal costs for category: N3>M3>N2>M2>M1>N1
  - If N2/N3 in scope, should M3 be considered in scope?

- Considering N2/N3 scope exclusions based on GVW:
  - N2≤7.5T has larger TP than N2>7.5T ⇨ should N2≤7.5T be considered in scope?
  - N3≤18T and N3>18T both have larger TP than all N2 category vehicles

- Considering injury severities:
  - All vehicle categories have greater proportion of KSI cost than M1
  - Particularly evident for N3, N2, M3 vehicles

- Conclusions partially affected by selection of TP definition (TP1/TP2)
  - Most affected casualty type varies based on TP definition

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Specific Target Populations: DIR

DIR Regulatory Scope: Selection of Applicable Vehicle Categories

Vehicle Category	Societal Cost	% of Total Cost	Injury Severity	In Scope of GSR Policy	Proposed DIR Scope?
M1	⬆ (green)	⬆ (green)	⬛ (grey)		❓
M2	➡ (orange)	⬆ (green)	➡ (orange)	✔	✔
M3	⬆ (green)	⬆ (green)	⬆ (green)	✔	✔
N1	⬆ (green)	⬆ (green)	➡ (orange)		❓
N2≤8T	➡ (orange)	⬆ (green)	⬆ (green)	✔	✔
N2>8T	➡ (orange)	➡ (orange)	⬆ (green)	✔	✔
N3≤18T	➡ (orange)	⬆ (green)	⬆ (green)	✔	✔
N3>18T	⬆ (green)	⬆ (green)	⬆ (green)	✔	✔

Legend

Societal Cost
Green: >€10M
Orange: >€1M
Red: <€1M

% Total Cost:
Green: >5%
Orange: >2%
Red: <2%

Injury Severity:
M1: Baseline
Green: >M1 %KSI
Orange: ~M1 %KSI
Red: <M1 %KSI

BSIS Scope:
Green: 1+ green
Orange: 1+ orange
Red: 0 orange

the future of transport.

In-Progress STATS19 Research:
Next Steps

Next Steps

- Scaling of results
  - Investigate potential for scaling to EU and/or global level

- Investigation of effect of other important STATS19 factors:
  - Causation factors
  - Urban/rural
  - Towing and articulation
  - Body types
  - Wheel plan x engine capacity (VECTO categories)
  - Year first registered
  - Casualty age
  - Light conditions
  - Weather conditions

the future of transport.

Questions?

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