THE FUTURE OF TRANSPORT

VRU-Proxi-09-03

Update to Summary of Collision Landscape Analyses

March 2019

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TRL Background

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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

1950's/70's
The UK Motorway network

1960s
Early simulator

1969
The self-driving Citroën DS19

1972
The magic round-about, Swindon

1997
NCAP launched

FOR SAFER CARS
EURO NCAP

1980's
Deflectometer

2012
London Summer Olympics

2014
TRL cycle infrastructure development

2015
Gateway driverless shuttles

2016
Electric double decker bus

2017
HGV Truck Platooning

2018
London Smart Mobility Living Lab

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Update to Previous Collision Landscape Analysis Approach

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Update to Previous Analysis Approach

- All vehicles categorised into Dir. 2007/46/EC categories using STATS19 data
- STATS19 variables used to define total population of casualties
  - Updated to scale total and target populations to EU28 level
- Further criteria to define target populations for each safety measure
  - Updated to include contributory factors as further filter
- Target populations split by vehicle category to determine regulation scope
- Target populations presented as the number of casualties per annum and monetised cost to society per annum
- Monetised cost to society figures used:
  - Fatal - €1.87million, Serious - €243,100, Slight - €18,700

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Update to Previous 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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Update to Previous 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
$N_{unknown}$		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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Update to Total Population for EU28

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Update to Total Population for EU28

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

- Total population at EU28 level derived using data from CARE database
  - Fatal/serious/slight VRU injury data for 2011-2015 used for this analysis
  - Broken down based on vehicle category
    - Split N2/N3, M2/M3 and weight categories using STATS19 proportions
  - CARE data replicated in approach adopted by GSR project (Table 17)

[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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Update to Total Population for EU28

Total annual number of VRU casualties (EU28)

Vehicle Category	Pedestrian			Cyclist			PTW			Societal Cost (€M)
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight	
M1	3,600	27,549	83,758	1,005	16,833	86,001	1,939	30,768	106,274	**35,668.1**
M2	11	79	212	2	37	128	9	71	215	**96.9**
M3	173	893	2,763	47	251	1,045	43	252	845	**918.3**
N1	463	1,832	6,102	164	1,321	5,572	271	2,435	8,230	**3,409.9**
N2	55	250	687	27	217	862	38	243	706	**438.3**
N3	381	550	747	191	569	1,316	150	638	1,185	**1,839.2**
$N_{unknown}$	2	12	52	0	22	68	0	20	32	**19.4**
Total	4,685	31,165	94,321	1,436	19,250	94,992	2,450	34,427	117,487	**42,390.0**

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Total Population

Total annual number of VRU casualties (EU28): N2/N3 Weights

Vehicle Category	Pedestrian			Cyclist			PTW			Societal Cost (€M)
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight	
N2 ≤7.5T	40	164	399	16	129	491	28	168	488	**294.1**
N2 >7.5T	2	18	39	9	17	53	8	13	34	**48.4**
$N2_{un_GVW}$	13	68	249	2	72	319	3	62	184	**95.8**
N3 ≤18T	64	106	163	31	140	273	20	119	214	**317.1**
N3 >18T	269	352	375	142	316	668	110	353	631	**1,254.2**
$N3_{un_GVW}$	48	92	209	18	114	375	20	166	340	**267.8**

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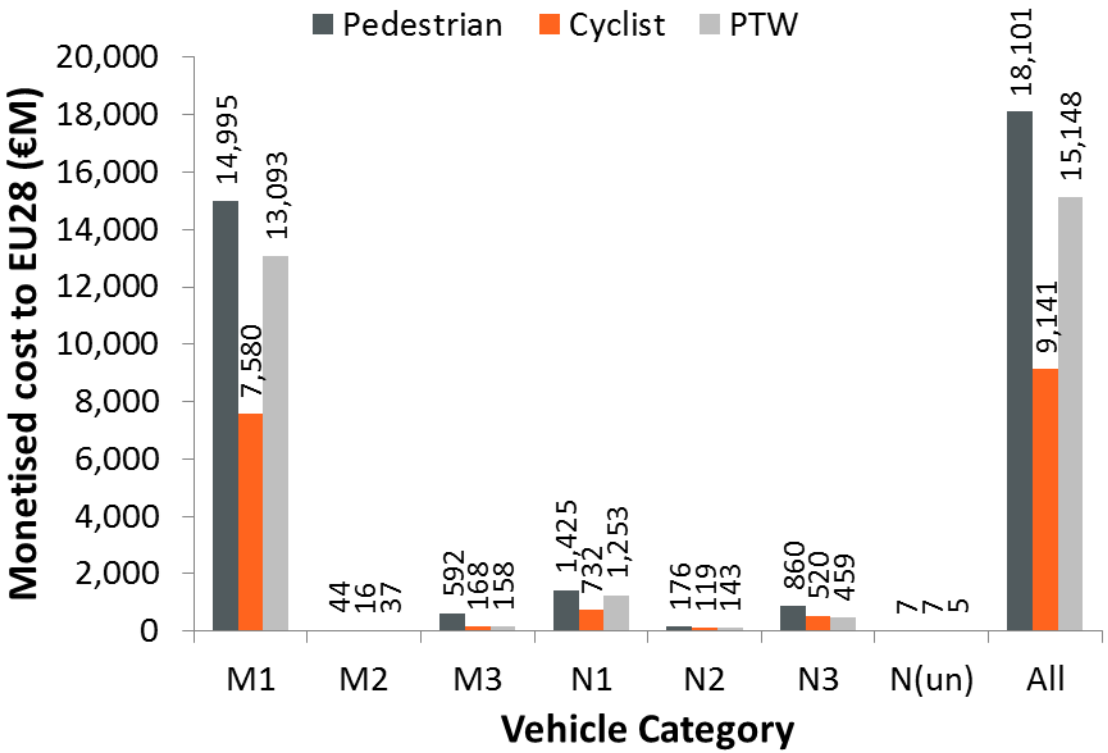
Update to Total Population for EU28

Total annual societal costs of VRU casualties (EU28)

- Total annual societal cost to EU28 of €42.4bn
- Collisions between M1 vehicles and VRUs have highest occurrence and societal costs
- Ranking of societal costs:
  - M1>N1>N3>M3>N2>M2
  - N2≤7.5T greater than N2>7.5T
  - N3>18T greater than N2≤18T
- Target populations (TP) derived from total population



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Update to Total Population for EU28

- Scaling correction factors adopted from GSR/ACEA data (Table 40)
  - Reversing (on/off road ratio – *Kuhn (2017)*)

		Correction factor fatal	Correction factor serious	Correction factor slight
Pedestrian and cyclist casualties caused by a reversing motor vehicle.	… (account for collisions that happen away from public roads and are therefore not included in official road casualty statistics (Seidl, et al., 2017)) x (adjust to average population in France, Germany and UK (ACEA TF-ACC, 2017c)).	M1/N1: 2.00 M2&M3/N2&N3: 2.00x1.25	M1/N1: 2.00 M2&M3/N2&N3: 2.00x1.08	M1/N1: 2.00 M2&M3/N2&N3: 2.00x1.00

  - Direct Vision *and* VRU Detection Systems

		Correction factor fatal	Correction factor serious	Correction factor slight
For N2&N3: Pedestrian and cyclist casualties in impacts with vehicle front or side. For M2&M3: Pedestrian and cyclist casualties in impacts with vehicle front or side where a vehicle blind spot contributed to the collision. Note: The narrower target population definition for buses and coaches is necessary to make meaningful effectiveness estimates, because the current direct vision of these vehicles is considerably better than that of trucks.	… adjust to average population in France, Germany and UK (ACEA TF-ACC, 2017d).	0.80	1.21	1.33

  - Data from France, Germany and UK assumed representative of EU28

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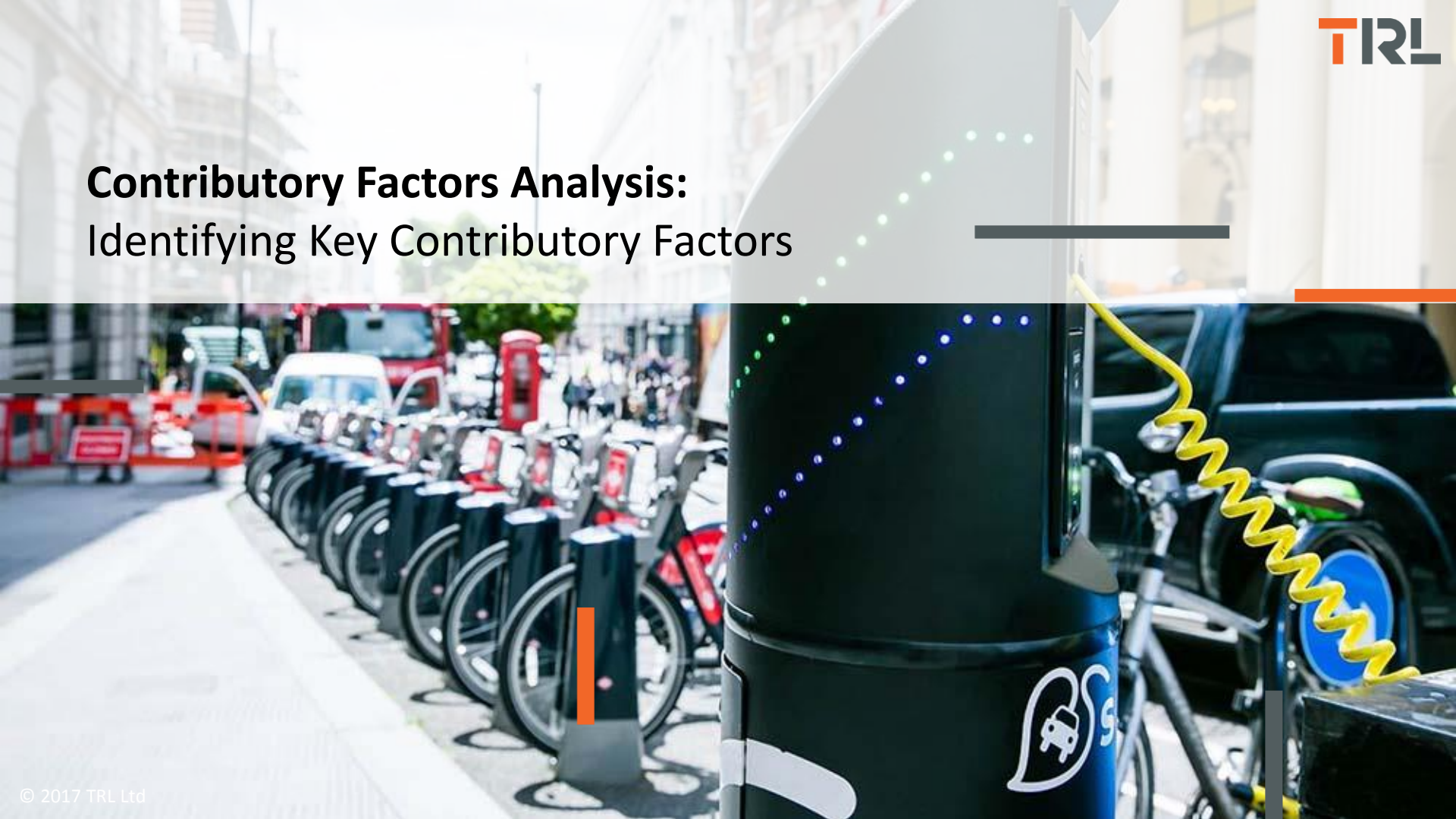
Contributory Factors Analysis:
Identifying Key Contributory Factors



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Identifying Key Contributory Factors

Target Population Definitions

- 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 previously calculated 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
- Clear that the TP2 definition was more specific to the IWG needs
  - Agreement that further refinement of TP2 is necessary via contributory factors
  - Proposed to develop a new TP3 based on relevant contributory factors

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Identifying Key Contributory Factors

Contributory Factor Definitions

- Contributory factors:
  - "The key actions [or conditions]… that led directly to the actual impact"
- Background on collection:
  - Only completed when a police officer attends the scene
  - Based on attending officer collection of 'evidence' at scene
    - Witness statements, vehicle inspections, site inspections – not extensive investigation
    - Subjective and dependent on experience of officer in reconstructing collision
  - Collection of up to 6 contributory factors (CFs) from list
  - Key relevant CFs for IWG scope:
    - "Driver Failed to Look Properly (405)" – *relevant to information systems only*
      - A driver/rider either failed to look where they were going or looked, but misinterpreted what they saw (looked but did not see). Code may be used where driver/rider was not paying attention to road ahead.
    - "Vehicle Blind Spot (710)" – *relevant to vision systems/approaches only*
      - A driver is unable to see a pedestrian or another vehicle because of a blind spot caused by the design of the vehicle (eg. windscreen or door pillars), vehicle loading or inadequate coverage of the mirrors.

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Blind-Spot Information System (BSIS)

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Identifying Key Contributory Factors: BSIS

BSIS Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Nearside turn	Nearside Front	Crossing from driver's n/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Nearside 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 RH bend/LH 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

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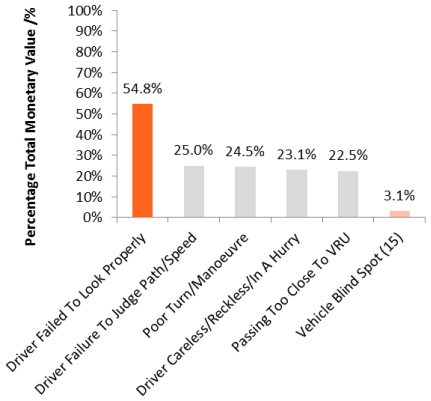
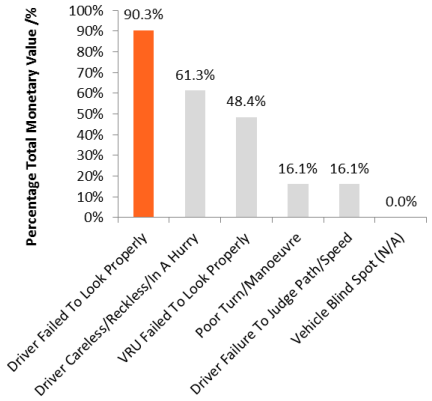
Identifying Key Contributory Factors: BSIS

Leading Contributory Factors for BSIS TP2 casualties (EU28)

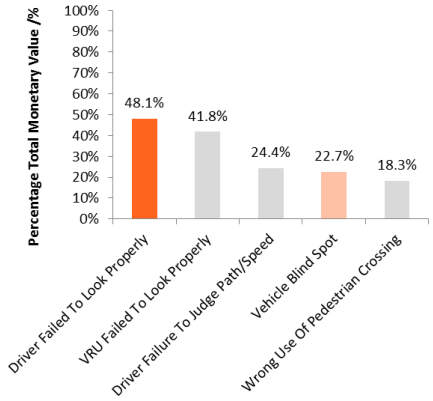
M1



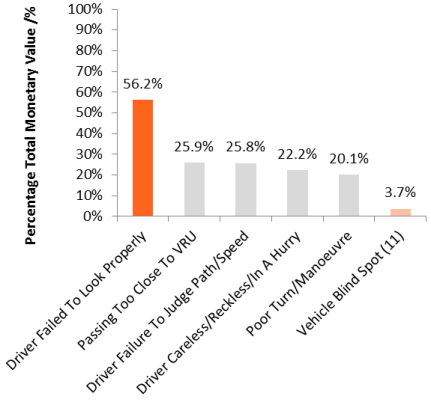
M2



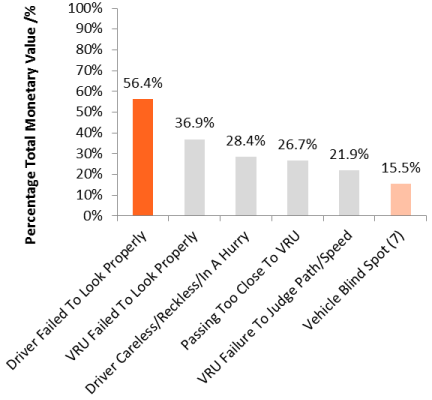
M3



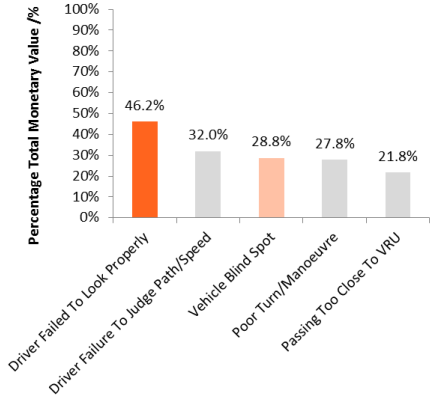
N1



N2



N3



Identifying Key Contributory Factors: BSIS

BSIS Collision Landscape Conclusions Relating to Contributory Factors

- "Driver Failed To Look Properly (405)"
  - Leading CF across all vehicle categories
  - c.50% of total societal costs associated with total BSIS collision landscape
- "Vehicle Blind Spot (710)"
  - Very little effect on M1/N1/M2 vehicle categories
  - 15-30% of total societal costs associated with M3/N2/N3 BSIS collision landscape
    - Means that, without improvements in direct/indirect vision, BSIS may be less effective in these cases
- Proposed regulatory approach
  - Information system only
  - CF(s) to be included in TP3:
    - "Driver Failed To Look Properly (405)" for all vehicle categories

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Reversing Camera & Detection System (REV)

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Identifying Key Contributory Factors: REV

REV Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Reversing	Rear	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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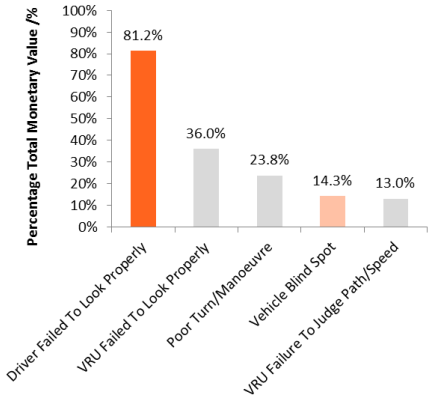
Identifying Key Contributory Factors: REV

Leading Contributory Factors for REV TP2 casualties (EU28)

M1



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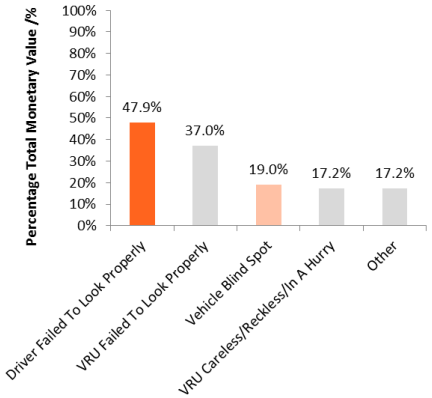
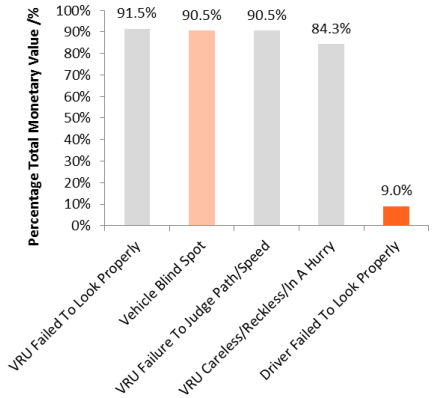
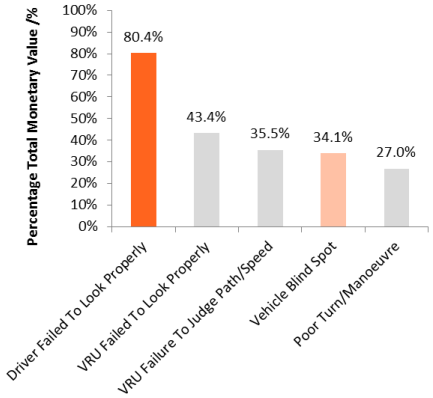


M3



N1



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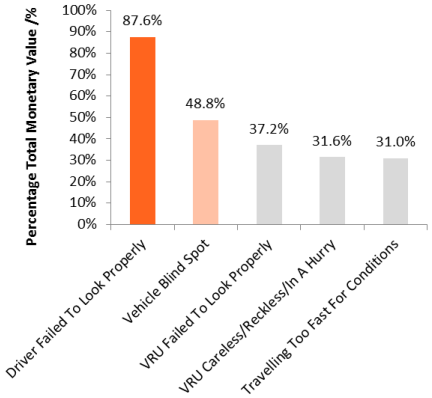

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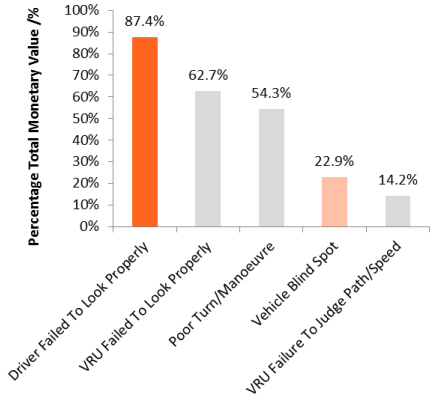

Identifying Key Contributory Factors: REV

REV Collision Landscape Conclusions Relating to Contributory Factors

- "Driver Failed To Look Properly (405)"
  - Leading CF across all vehicle categories
    - Except M3 category vehicles where 2nd most prevalent driver-related CF (5th overall)
  - c.80-90% of total societal costs associated with total REV collision landscape
    - Except M2 (48% - small numbers?) and M3 (9% - large unregulated rearward blind spots) vehicles
- "Vehicle Blind Spot (710)"
  - c.15-25% of total societal costs associated with M1/M2/N3 REV collision landscape
  - c.35-50% of total societal costs associated with N1/N2 REV collision landscape
  - c.90% of total societal costs associated with M3 REV collision landscape
- Proposed regulatory approach
  - Both vision and information systems
  - CF(s) to be included in TP3:
    - "Driver Failed To Look Properly (405)" for all vehicle categories *AND*
    - "Vehicle Blind Spot (710)" for all vehicle categories

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Moving-Off Information System (MOIS)

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Identifying Key Contributory Factors: MOIS

MOIS Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Moving off Slowing or stopping	Front	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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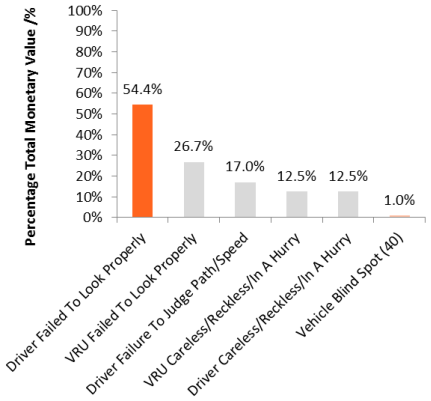
Identifying Key Contributory Factors: MOIS

Leading Contributory Factors for MOIS TP2 casualties (EU28)

M1



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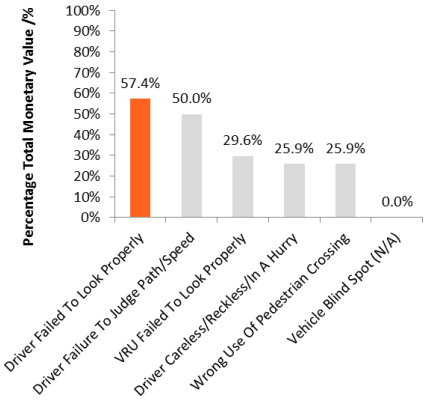
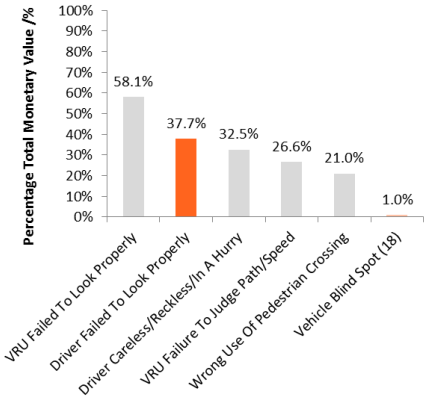


M3



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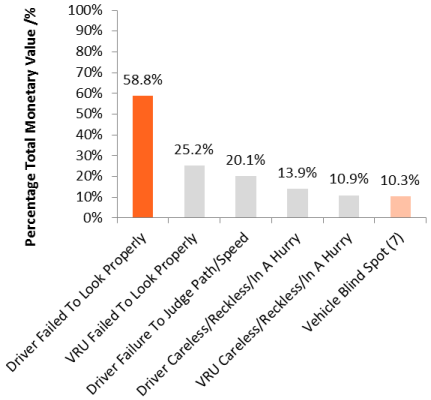

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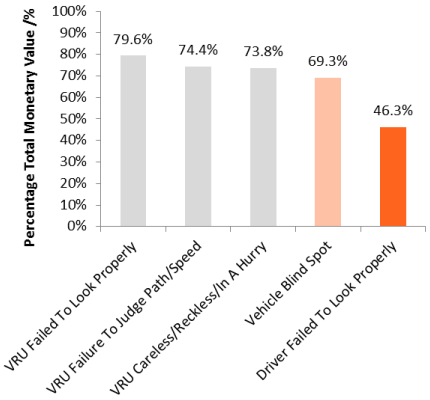
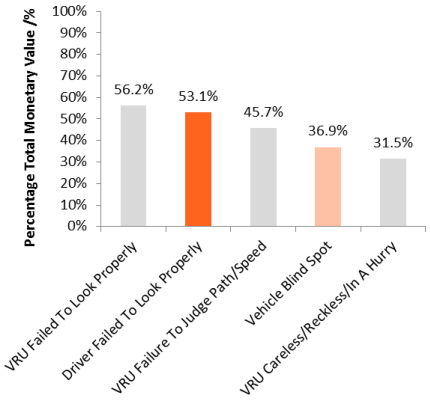


N3



Identifying Key Contributory Factors: MOIS

MOIS Collision Landscape Conclusions Relating to Contributory Factors

- "Driver Failed To Look Properly (405)"
  - Leading CF for M1/M2/N1 vehicle categories
    - Also key CF for M3/N2/N3 vehicle categories
  - 35-60% of total societal costs associated with total MOIS collision landscape
- "Vehicle Blind Spot (710)"
  - Very little effect on M1/M2/M3/N1(?) vehicle categories
  - 35-70% of total societal costs associated with N2/N3 MOIS collision landscape
    - Means that, without improvements in direct/indirect vision, MOIS may be less effective in these cases
- Proposed regulatory approach
  - Information system only
  - CF(s) to be included in TP3:
    - "Driver Failed To Look Properly (405)" for all vehicle categories

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Direct Vision (DIR)

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Identifying Key Contributory Factors: DIR

DIR Target Population Definitions

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

Pedestrian			Cyclist/PTW				
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	
Moving off Slowing or stopping Nearside turn Offside turn	Front Nearside Offside	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				
			Nearside turn	Nearside	Left turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Offside	0.7
			OR				
			Offside turn	Offside	Right turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Nearside	0.7

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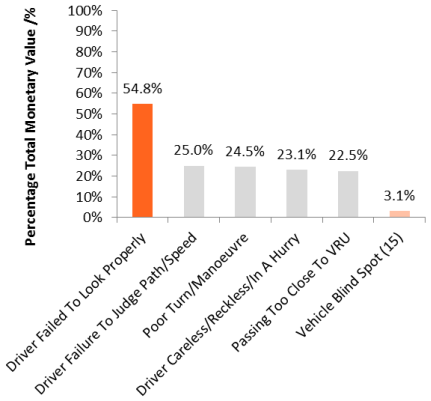
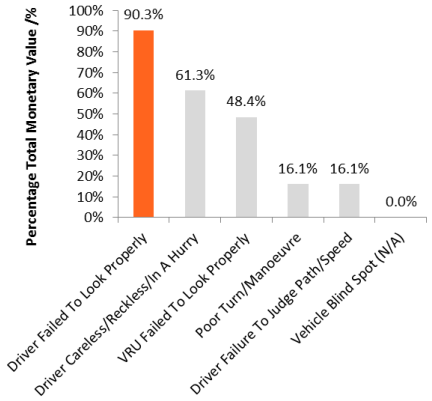
Identifying Key Contributory Factors: DIR

Leading Contributory Factors for DIR TP2 casualties (EU28)

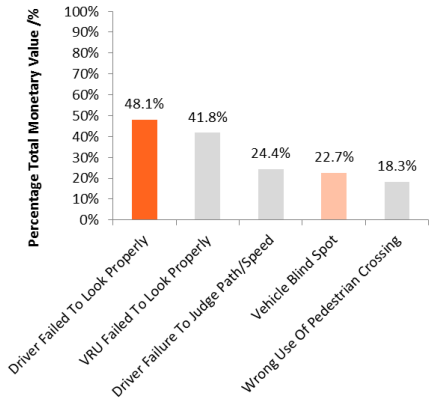
M1



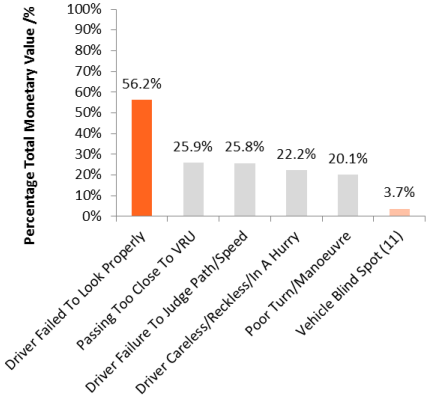
M2



M3



N1



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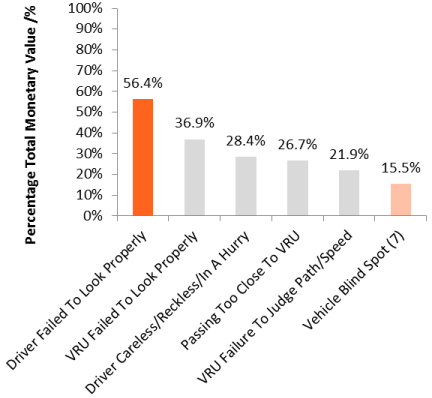
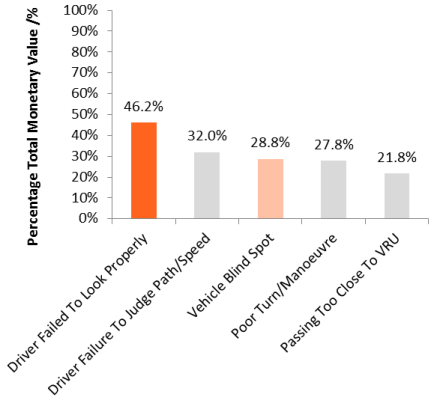


N3



Identifying Key Contributory Factors: DIR

DIR Collision Landscape Conclusions Relating to Contributory Factors

- "Vehicle Blind Spot (710)"
  - Very little effect on M1/M2/N1 vehicle categories
  - 15-30% of total societal costs associated with M3/N2/N3 DIR collision landscape
- "Driver Failed To Look Properly (405)"
  - Leading CF across all vehicle categories
  - c.50% of total societal costs associated with total DIR collision landscape
    - Means that, even with improvements in direct vision, improvements may be ineffective in c.50% of cases without addition of VRU information systems
- Proposed regulatory approach
  - Vision-based approach only
  - CF(s) to be included in TP3:
    - "Vehicle Blind Spot (710)" for all vehicle categories

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Contributory Factors Analysis:
Update to Specific EU28 Target Populations

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Blind-Spot Information System (BSIS)

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Update to Specific EU28 Target Populations: BSIS

BSIS Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Nearside turn	Nearside Front	Crossing from driver's n/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Nearside 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

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Update to Specific EU28 Target Populations: BSIS

BSIS Target Population Definitions

- **Detailed target population (TP3):**

Pedestrian			Cyclist/PTW				Contributory Factors
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	
Nearside turn	Nearside Front	Crossing from driver's n/s In carriageway, not crossing Walking along back to traffic Walking along facing traffic	Nearside 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	Driver Failed To Look Properly (405)
			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	

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Update to Specific EU28 Target Populations: BSIS

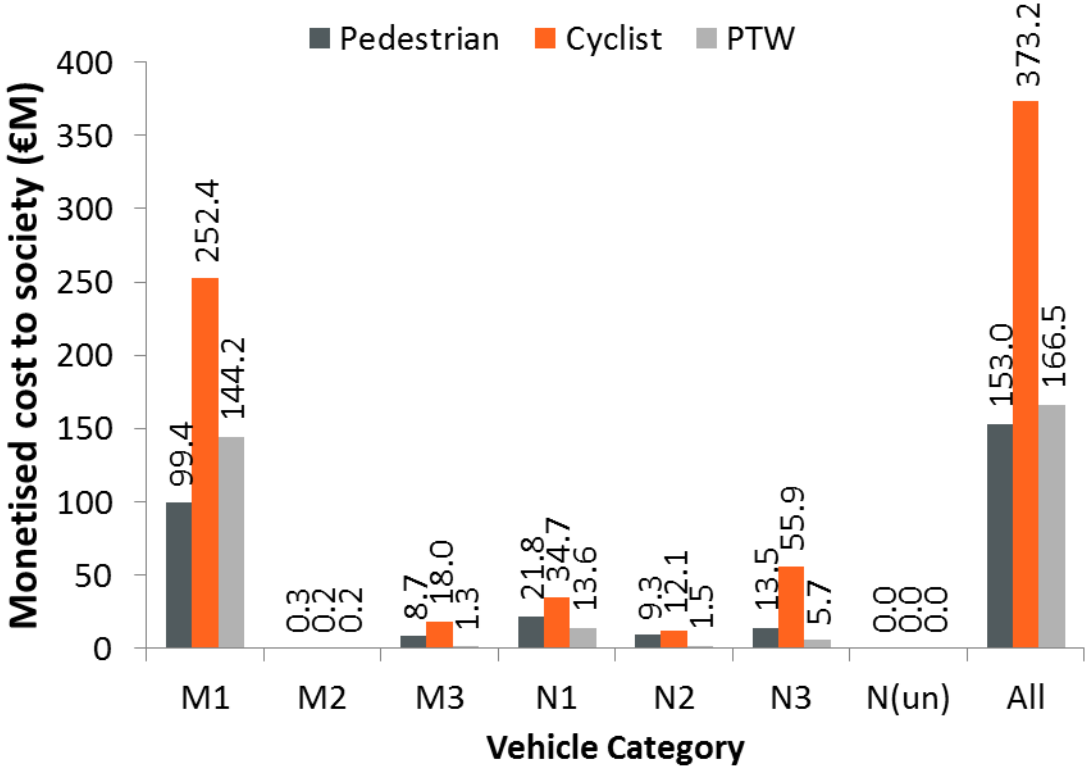
Annual Target Populations for BSIS VRU Casualties (EU28)

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP2	19.5	585.1	2551.3	31.2	1364.5	9024.3	9.1	668.8	4880.6	1056.0	3.0%
	TP3	9.7	256.1	1008.8	17.3	555.1	4547.6	0.0	340.6	3283.0	495.9	1.4%
M2	TP2	0.0	1.0	7.2	0.0	2.2	12.8	0.0	0.0	19.8	1.5	1.6%
	TP3	0.0	1.0	5.4	0.0	0.0	8.5	0.0	0.0	12.4	0.7	0.8%
M3	TP2	8.8	47.8	95.7	5.6	56.4	305.3	0.0	10.7	55.0	63.5	6.9%
	TP3	2.9	11.4	22.8	5.6	21.2	127.6	0.0	2.7	33.6	28.0	3.0%
N1	TP2	9.7	45.2	217.4	8.5	164.8	1037.0	0.0	50.2	532.9	130.7	3.8%
	TP3	7.3	26.0	94.3	4.2	68.3	543.3	0.0	26.6	381.1	70.0	2.1%
N2	TP2	5.9	18.6	37.5	3.6	62.2	277.5	0.0	5.3	54.1	45.5	10.4%
	TP3	4.4	3.1	15.8	1.8	24.9	143.4	0.0	2.7	43.9	22.8	5.2%
N3	TP2	13.2	39.0	52.2	44.9	157.8	469.9	12.0	32.1	139.4	199.2	10.8%
	TP3	5.9	9.3	16.7	19.5	64.1	200.9	0.0	17.8	74.8	75.1	4.1%
$N_{unknown}$	TP2	0.0	0.0	1.6	0.0	4.4	12.2	0.0	5.3	0.0	2.6	13.6%
	TP3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Total	TP2	57.1	736.7	2962.9	93.8	1812.3	11139.0	21.1	772.4	5681.7	1499.1	3.5%
	TP3	30.3	307.0	1163.8	48.5	733.6	5571.3	0.0	390.3	3828.8	692.7	1.6%

Update to Specific EU28 Target Populations: BSIS

- BSIS Target Population 3
- Total annual societal cost to EU28 of €693M
- Collisions between M1 vehicles and VRUs have highest societal costs
- Cyclists most affected casualty
- Ranking of societal costs:
  - M1>N3>N1>M3>N2>M2

Total Annual Societal Costs of BSIS VRU Casualties (EU28)



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Update to Specific EU28 Target Populations: BSIS

Annual Target Populations for BSIS VRU Casualties (EU28): N2/N3 Weights

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	TP2	1.5	11.1	26.1	0.0	31.1	133.9	0.0	2.7	34.1	17.3	5.9%
	TP3	1.5	3.7	8.0	0.0	11.3	65.1	0.0	2.7	26.6	8.9	3.0%
N2 >7.5T	TP2	0.0	1.9	4.9	3.6	2.2	9.7	0.0	0.0	0.0	8.0	16.5%
	TP3	0.0	0.0	3.3	1.8	2.2	4.9	0.0	0.0	0.0	4.1	8.4%
$N2_{un_GVW}$	TP2	4.4	5.6	6.5	0.0	28.9	133.9	0.0	2.7	19.9	20.2	21.1%
	TP3	2.9	0.0	4.4	0.0	10.8	77.5	0.0	0.0	17.1	10.0	10.4%
N3 ≤18T	TP2	5.9	7.4	18.0	12.6	31.1	48.7	0.0	8.0	22.8	47.5	15.0%
	TP3	1.5	3.7	2.0	6.3	16.8	27.8	0.0	5.3	16.3	21.6	6.8%
N3 >18T	TP2	7.3	22.3	26.1	27.0	86.7	253.2	8.0	5.3	74.0	113.5	9.1%
	TP3	4.4	3.7	12.1	11.6	36.5	99.4	0.0	0.0	38.6	42.4	3.4%
$N3_{un_GVW}$	TP2	0.0	5.6	8.2	5.4	35.6	148.5	4.0	18.7	42.7	35.9	13.4%
	TP3	0.0	1.9	2.7	1.8	9.7	69.6	0.0	11.2	19.4	10.6	4.0%

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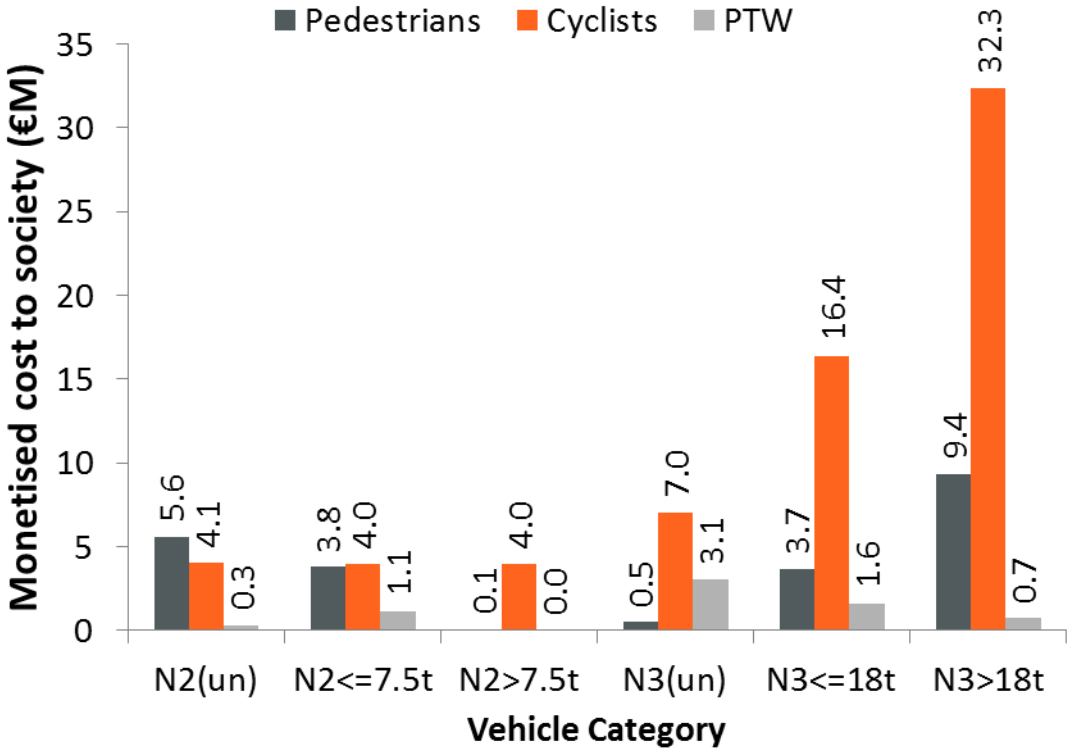
Update to Specific EU28 Target Populations: BSIS

Total Annual Societal Costs of BSIS VRU Casualties (EU28): N2/N3 Weights



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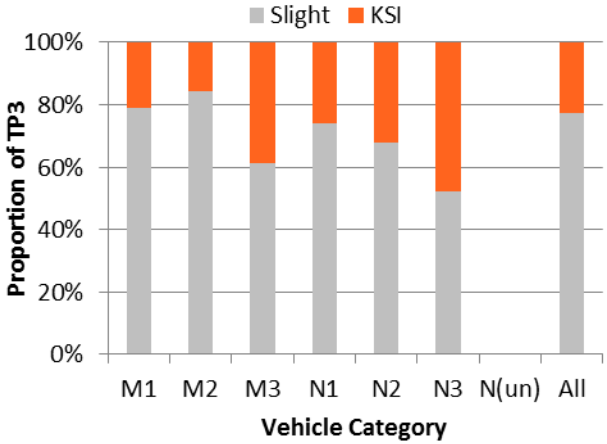
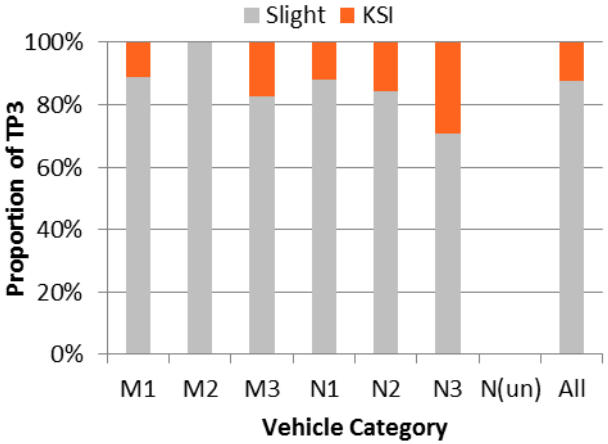
Update to Specific EU28 Target Populations: BSIS

KSI as a Proportion of BSIS VRU Casualties (EU28)

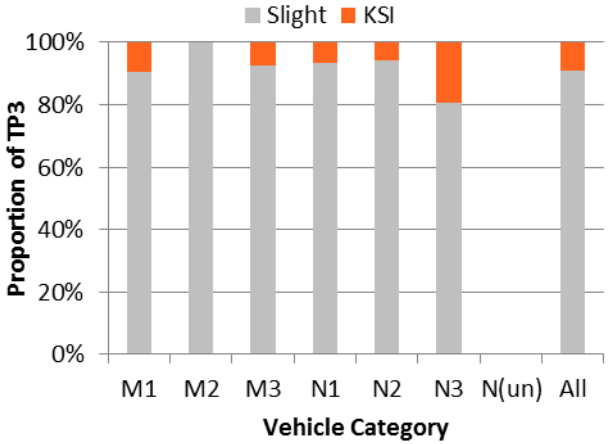
Pedestrians



Cyclists



PTWs



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Update to Specific EU28 Target Populations: BSIS

BSIS Proposed Regulation Scope

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

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 ~~[M_2,]~~ N_2 ~~[~~(> 8 t of technically permissible maximum mass)~~]~~ and ~~[M_3 and]~~ N_3. ~~Other v~~Vehicles of categories N_2 (≤ 8 t of technically permissible maximum mass), M_2 and M_3 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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Update to Specific EU28 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? Are there different mechanisms involved?
- Ranking of vehicle category priority:
  - Societal costs: M1>N3>N1>M3>N2>M2
  - Proportion of total societal costs for category: N2>N3>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≤8T be considered in scope?
  - N3≤18T and N3>18T both have larger TP than all N2 category vehicles
- Considering injury severities:
  - M3/N1/N2/N3 all have greater proportion of KSI's than M1
- Considering affected casualties:
  - Cyclists most important VRU – but pedestrians and PTWs also important

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Reversing Camera & Detection System (REV)

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Update to Specific EU28 Target Populations: REV

REV Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Reversing	Rear	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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Update to Specific EU28 Target Populations: REV

REV Target Population Definitions

- **Detailed target population (TP3):**

Pedestrian			Cyclist/PTW				Contributory Factors
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	
Reversing	Rear	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	-	Driver Failed To Look Properly (405) *OR* Vehicle Blind Spot (710)
			OR				
			Reversing	Rear	Going ahead LH bend/RH bend/other	Offside Nearside	

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Update to Specific EU28 Target Populations: REV

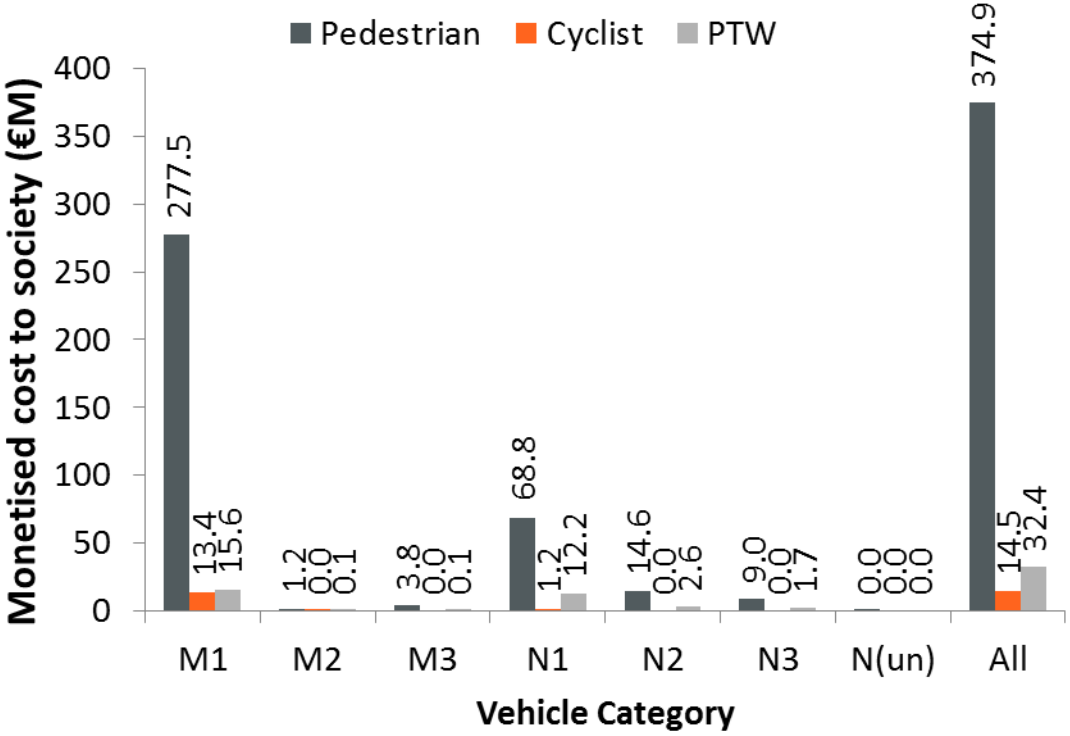
Annual Target Populations for REV VRU Casualties (EU28)

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP2	39.6	734.6	3540.5	0.0	42.6	412.1	0.0	30.6	550.4	354.6	1.0%
	TP3	39.6	608.0	2977.6	0.0	29.8	326.8	0.0	28.2	465.2	306.4	0.9%
M2	TP2	0.0	6.7	18.2	0.0	0.0	0.7	0.0	0.0	6.6	2.1	2.2%
	TP3	0.0	4.0	11.1	0.0	0.0	0.7	0.0	0.0	6.6	1.3	1.4%
M3	TP2	1.8	1.9	8.1	0.0	0.0	0.0	0.0	0.0	8.3	4.2	0.5%
	TP3	1.8	1.0	7.1	0.0	0.0	0.0	0.0	0.0	5.5	3.9	0.4%
N1	TP2	15.2	156.5	556.0	0.0	2.3	62.5	0.0	26.4	348.9	91.6	2.7%
	TP3	15.2	129.5	473.9	0.0	1.1	47.5	0.0	26.4	311.6	82.2	2.4%
N2	TP2	5.5	16.0	29.5	0.0	0.0	3.7	0.0	7.7	42.8	17.5	4.0%
	TP3	5.5	16.0	22.5	0.0	0.0	0.0	0.0	7.7	39.7	17.2	3.9%
N3	TP2	2.7	14.2	25.8	0.0	0.0	1.8	0.0	5.1	32.1	11.0	0.6%
	TP3	2.7	14.2	18.9	0.0	0.0	0.0	0.0	5.1	26.3	10.7	0.6%
$N_{unknown}$	TP2	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.1%
	TP3	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.1%
Total	TP2	64.9	930.0	4179.2	0.0	44.9	480.8	0.0	69.8	989.1	481.0	1.1%
	TP3	64.9	772.7	3512.2	0.0	30.9	375.1	0.0	67.4	854.9	421.8	1.0%

Update to Specific EU28 Target Populations: REV

- REV Target Population 3
- Total annual societal cost to EU28 of €422M (for on-road only)
- Collisions between M1 vehicles and VRUs have highest societal costs
- Pedestrians most affected casualty
- Ranking of societal costs:
  - M1>N1>N2>N3>M3>M2

Total Annual Societal Costs of REV VRU Casualties (EU28)



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Update to Specific EU28 Target Populations: REV

Annual Target Populations for REV VRU Casualties (EU28): N2/N3 Weights

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	TP2	5.5	10.7	17.2	0.0	0.0	0.0	0.0	5.1	27.8	15.0	5.1%
	TP3	5.5	10.7	12.9	0.0	0.0	0.0	0.0	5.1	25.0	14.8	5.0%
N2 >7.5T	TP2	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	4.3	0.1	0.2%
	TP3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3	0.1	0.2%
$N2_{un_GVW}$	TP2	0.0	5.3	11.0	0.0	0.0	3.7	0.0	2.6	10.7	2.4	2.5%
	TP3	0.0	5.3	8.8	0.0	0.0	0.0	0.0	2.6	10.7	2.3	2.4%
N3 ≤18T	TP2	2.7	3.6	4.9	0.0	0.0	1.8	0.0	2.6	10.7	7.0	2.2%
	TP3	2.7	3.6	4.9	0.0	0.0	0.0	0.0	2.6	5.3	6.8	2.2%
N3 >18T	TP2	0.0	3.6	11.0	0.0	0.0	0.0	0.0	2.6	15.0	2.0	0.2%
	TP3	0.0	3.6	7.4	0.0	0.0	0.0	0.0	2.6	15.0	1.9	0.2%
$N3_{un_GVW}$	TP2	0.0	7.1	8.6	0.0	0.0	0.0	0.0	0.0	4.3	2.0	0.7%
	TP3	0.0	7.1	6.9	0.0	0.0	0.0	0.0	0.0	4.3	1.9	0.7%

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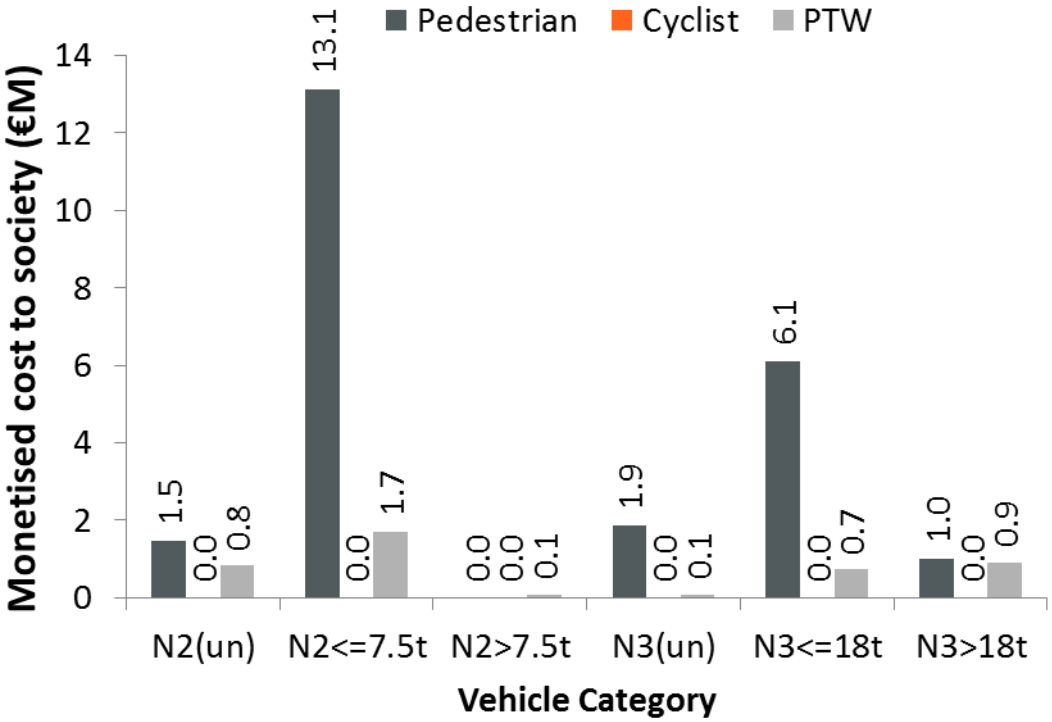
Update to Specific EU28 Target Populations: REV

Total Annual Societal Costs of REV VRU Casualties (EU28): N2/N3 Weights



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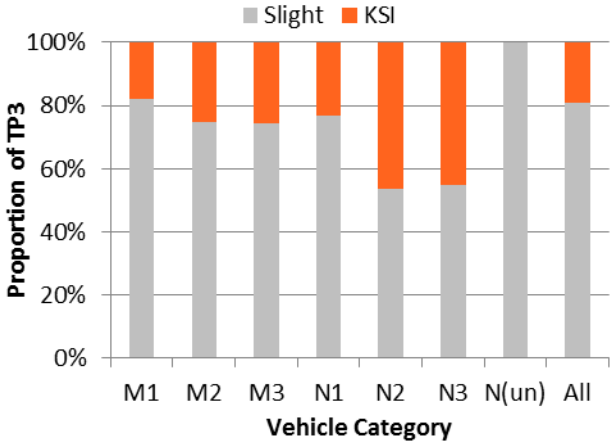
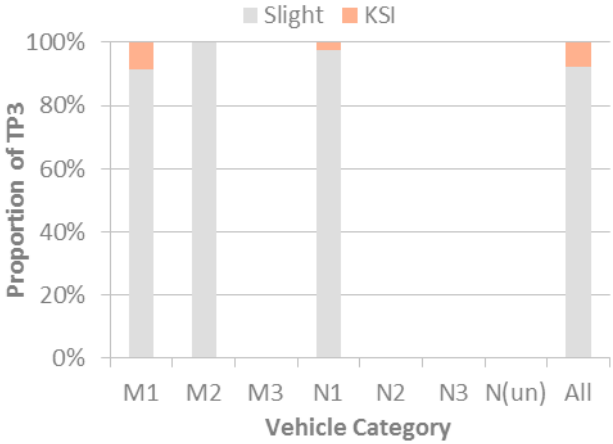
Update to Specific EU28 Target Populations: REV

KSI as a Proportion of REV VRU Casualties (EU28)

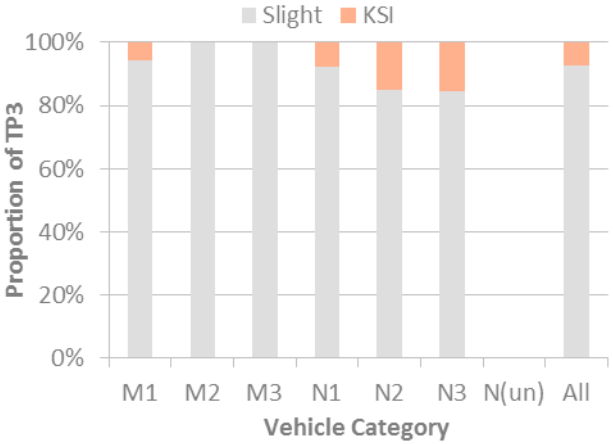
Pedestrians



Cyclists



PTWs



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Update to Specific EU28 Target Populations: REV

REV Proposed Regulation Scope

- Current scope proposal
  - Just to remind
- Required:
  - All categories and weight classes

ECE/TRANS/WP.29/GRSG/2019/10

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*
M_1	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
M_2	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
M_3	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N_1	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N_2 ≤ 7.5 t	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N_2 > 7.5 t	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).
N_3	**Compulsory** May be viewed using a combination of direct view and indirect vision devices (of Classes I through VI).

"

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Update to Specific EU28 Target Populations: REV

REV Collision Landscape Conclusions Relating to Vehicle Categories

- On road VRU collisions relevant to REV dominated by M1/N1 vehicles:
  - 7% societal cost of casualties for all other vehicle categories combined
- Ranking of vehicle category priority:
  - Societal costs: M1>N1>N2>N3>M3>M2
  - Proportion of total societal costs for category: N2>N1>M2>M1>N3>M3
  - If M1/N1 in scope, should M2/N2 be considered in scope?
- Considering N2/N3 scope exclusions based on GVW:
  - N2≤7.5T has larger TP than N2>7.5T, with N2>7.5T ≈ 0 (large proportion with unknown GVW)
  - N3≤18T has larger TP than N3>18T, but smaller than N2≤18T
- Considering injury severities:
  - All other categories have greater proportion of KSIs than M1/N1
- Considering affected casualties:
  - Pedestrians most important VRU

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Moving-Off Information System (MOIS)

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Update to Specific EU28 Target Populations: MOIS

MOIS Target Population Definitions

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

Pedestrian			Cyclist/PTW			
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact
Moving off Slowing or stopping	Front	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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Update to Specific EU28 Target Populations: MOIS

MOIS Target Population Definitions

- **Detailed target population (TP3):**

Pedestrian			Cyclist/PTW				Contributory Factors
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	
Moving off Slowing or stopping	Front	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	-	Driver Failed To Look Properly (405)
			OR				
			Moving off Slowing or stopping	Front	Going ahead LH bend/RH bend/other	Offside Nearside	

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Update to Specific EU28 Target Populations: MOIS

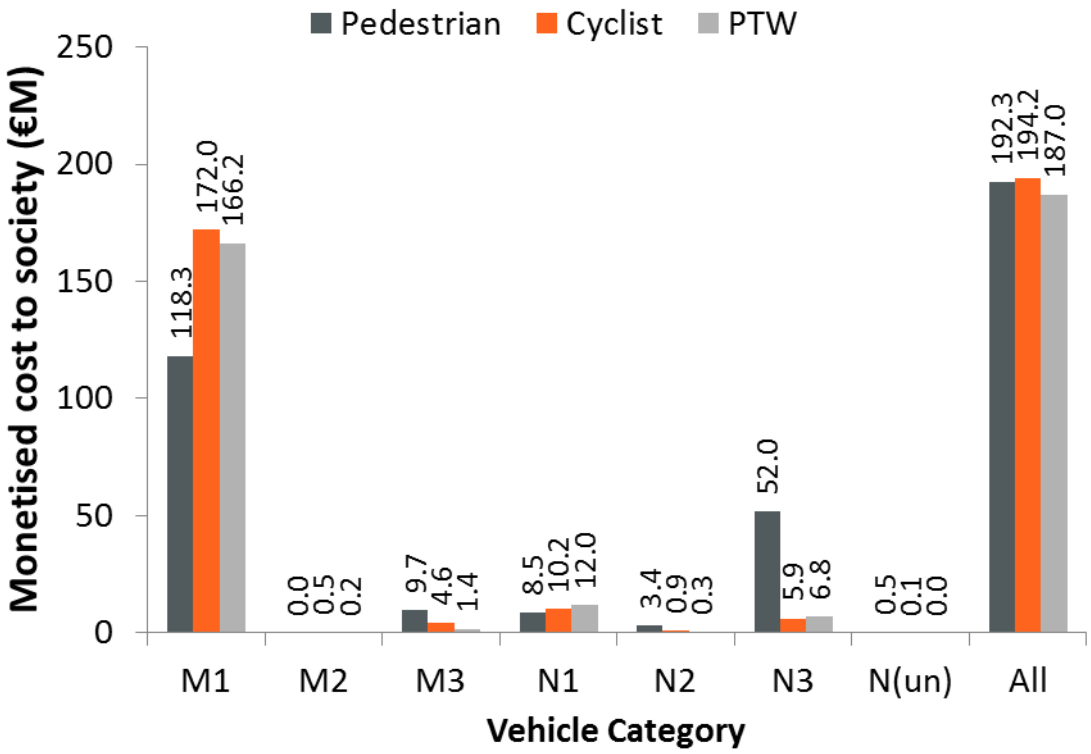
Annual Target Populations for MOIS VRU Casualties (EU28)

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP2	21.9	976.9	5012.6	6.9	593.4	4122.9	4.5	626.5	4597.4	853.3	2.4%
	TP3	5.5	335.4	1417.6	6.9	448.1	2677.1	2.3	441.3	2924.9	456.5	1.3%
M2	TP2	0.0	1.0	7.2	0.0	2.2	5.9	0.0	0.0	17.6	1.4	1.4%
	TP3	0.0	0.0	0.0	0.0	2.2	0.0	0.0	0.0	10.1	0.7	0.7%
M3	TP2	6.9	56.8	293.3	1.9	2.2	47.3	0.0	4.3	44.0	38.9	4.2%
	TP3	3.9	6.3	42.2	1.9	2.2	28.7	0.0	4.3	17.6	15.6	1.7%
N1	TP2	2.4	37.9	283.2	0.0	41.2	236.2	0.0	47.9	303.4	50.8	1.5%
	TP3	2.4	9.5	89.0	0.0	28.8	168.1	0.0	32.8	217.2	30.7	0.9%
N2	TP2	2.9	7.4	27.7	0.0	2.2	29.2	0.0	5.3	31.3	10.8	2.5%
	TP3	1.5	1.9	11.1	0.0	2.2	20.9	0.0	0.0	17.4	4.7	1.1%
N3	TP2	51.3	40.9	50.6	1.8	11.1	51.1	2.0	8.0	82.5	121.1	6.6%
	TP3	26.4	9.7	12.6	1.8	8.3	29.8	2.0	8.0	60.3	64.7	3.5%
$N_{unknown}$	TP2	0.0	1.9	0.0	0.0	0.0	7.3	0.0	0.0	0.0	0.6	3.0%
	TP3	0.0	1.9	0.0	0.0	0.0	7.3	0.0	0.0	0.0	0.6	3.0%
Total	TP2	85.5	1122.7	5674.6	10.6	652.4	4499.9	6.5	692.0	5076.2	1076.9	2.5%
	TP3	39.7	364.6	1572.6	10.6	491.9	2931.8	4.3	486.4	3247.4	573.5	1.4%

Update to Specific EU28 Target Populations: MOIS

Total Annual Societal Costs of MOIS VRU Casualties (EU28)

- MOIS Target Population 3
- Total annual societal cost to EU28 of €573M
- Collisions between M1 vehicles and VRUs have highest societal costs
- Equal importance for all VRU casualty types
  - Pedestrians affected for N3/M3
  - Cyclists/PTW affected for M1/N1
- Ranking of societal costs:
  - M1>N3>N1>M3>N2>M2



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Update to Specific EU28 Target Populations: MOIS

Annual Target Populations for MOIS VRU Ccasualties (EU28): N2/N3 Weights

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	TP2	0.0	5.6	16.3	0.0	2.2	14.6	0.0	5.3	22.8	4.2	1.4%
	TP3	0.0	0.0	6.5	0.0	2.2	7.3	0.0	0.0	9.8	1.0	0.3%
N2 >7.5T	TP2	0.0	0.0	1.6	0.0	0.0	2.4	0.0	0.0	2.8	0.1	0.3%
	TP3	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	2.8	0.1	0.2%
$N2_{un_GVW}$	TP2	2.9	1.9	9.8	0.0	0.0	12.2	0.0	0.0	5.7	6.5	6.7%
	TP3	1.5	1.9	2.4	0.0	0.0	12.2	0.0	0.0	5.7	3.6	3.7%
N3 ≤18T	TP2	8.8	5.6	4.9	0.0	0.0	14.6	0.0	2.7	5.7	18.9	6.0%
	TP3	5.9	3.7	0.0	0.0	0.0	9.7	0.0	2.7	5.7	12.8	4.0%
N3 >18T	TP2	35.2	35.3	32.6	0.0	6.7	31.6	2.0	2.7	48.4	82.5	6.6%
	TP3	17.6	5.9	7.7	0.0	3.3	17.6	2.0	2.7	35.5	40.7	3.2%
$N3_{un_GVW}$	TP2	7.3	0.0	11.4	1.8	4.4	4.9	0.0	2.7	28.4	19.6	7.3%
	TP3	2.9	0.0	4.6	1.8	4.4	0.0	0.0	2.7	19.0	11.0	4.1%

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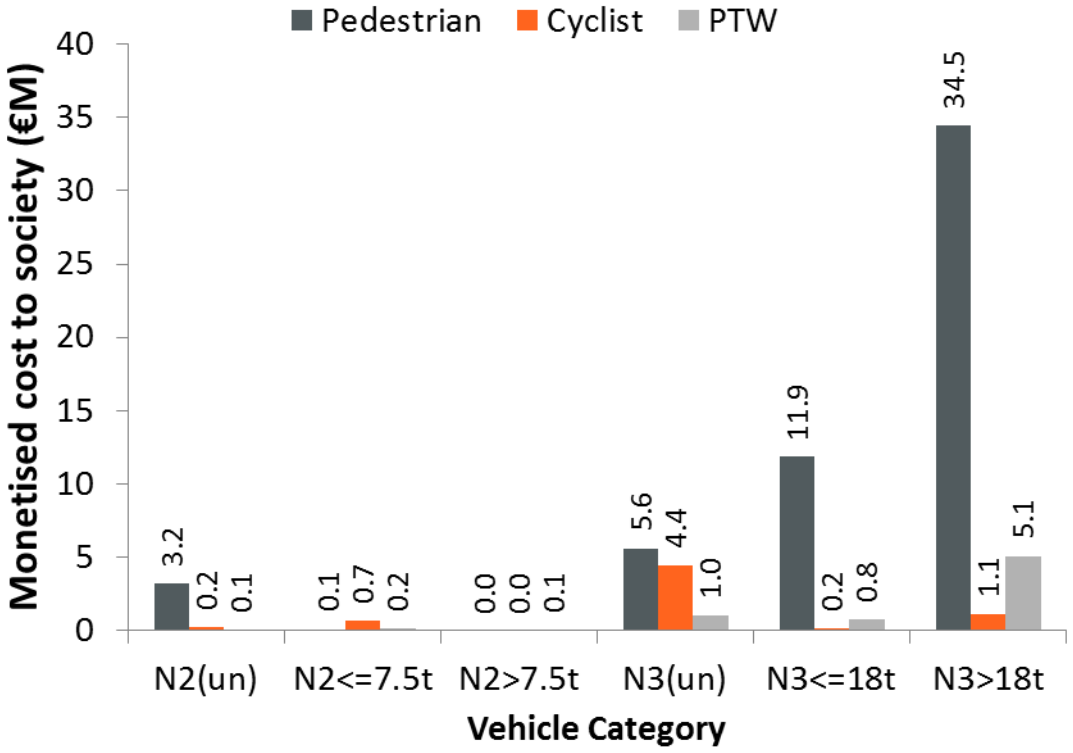
Update to Specific EU28 Target Populations: MOIS

Total Annual Societal Costs of MOIS VRU Casualties (EU28): N2/N3 Weights



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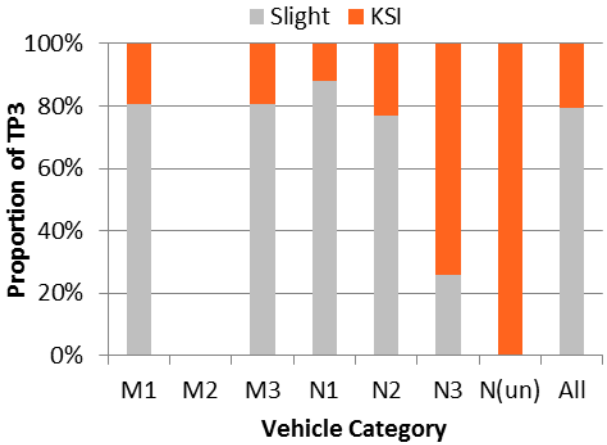
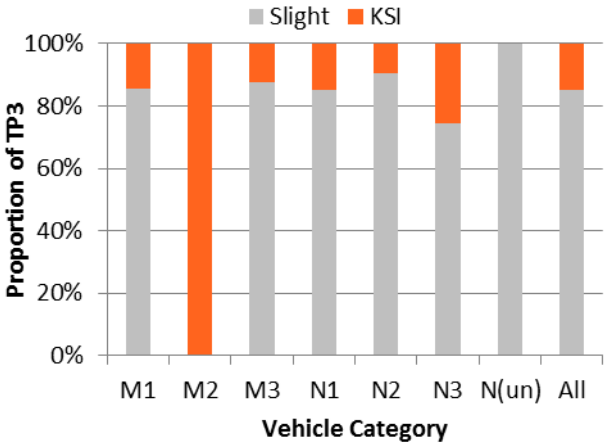
Update to Specific EU28 Target Populations: MOIS

KSI as a Proportion of MOIS VRU Casualties (EU28)

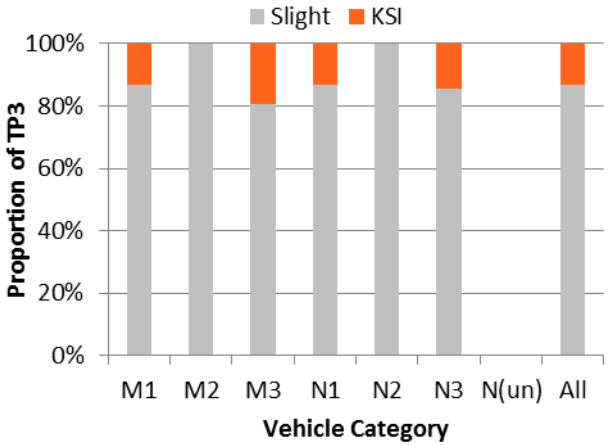
Pedestrians



Cyclists



PTWs



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Update to Specific EU28 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>N1>M3>N2>M2
  - Proportion of total societal costs for category: N2>N3>M3>N1>M1>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:
  - M3/N1/N2/N3 all have greater proportion of KSIs than M1
- Considering affected casualties:
  - All VRU types involved in MOIS relevant collisions – peds more relevant to heavier vehicles

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Direct Vision (DIR)

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Update to Specific EU28 Target Populations: DIR

DIR Target Population Definitions

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

Pedestrian			Cyclist/PTW				
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	Cab-Only Impacts Correction Factor
Moving off Slowing or stopping Nearside turn Offside turn	Front Nearside Offside	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				
			Nearside turn	Nearside	Left turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Offside	0.7 (M2/M3/N2/N3)
			OR				
			Offside turn	Offside	Right turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Nearside	0.7 (M2/M3/N2/N3)

Update to Specific EU28 Target Populations: DIR

DIR Target Population Definitions

- **Detailed target population (TP3):**

Pedestrian			Cyclist/PTW					Contributory Factors
Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	Vehicle Manoeuvre	Vehicle Impact	VRU Manoeuvre	VRU Impact	Cab-Only Impacts Correction Factor	
Moving off Slowing or stopping Nearside turn Offside turn	Front Nearside Offside	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	-	-	Vehicle Blind Spot (710)
			OR					
			Nearside turn	Nearside	Left turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Offside	0.7 (M2/M3/N2/N3)	
			OR					
			Offside turn	Offside	Right turn Moving off Slowing or stopping Waiting to go ahead Waiting to turn left/right	Nearside	0.7 (M2/M3/N2/N3)	

Update to Specific EU28 Target Populations: DIR

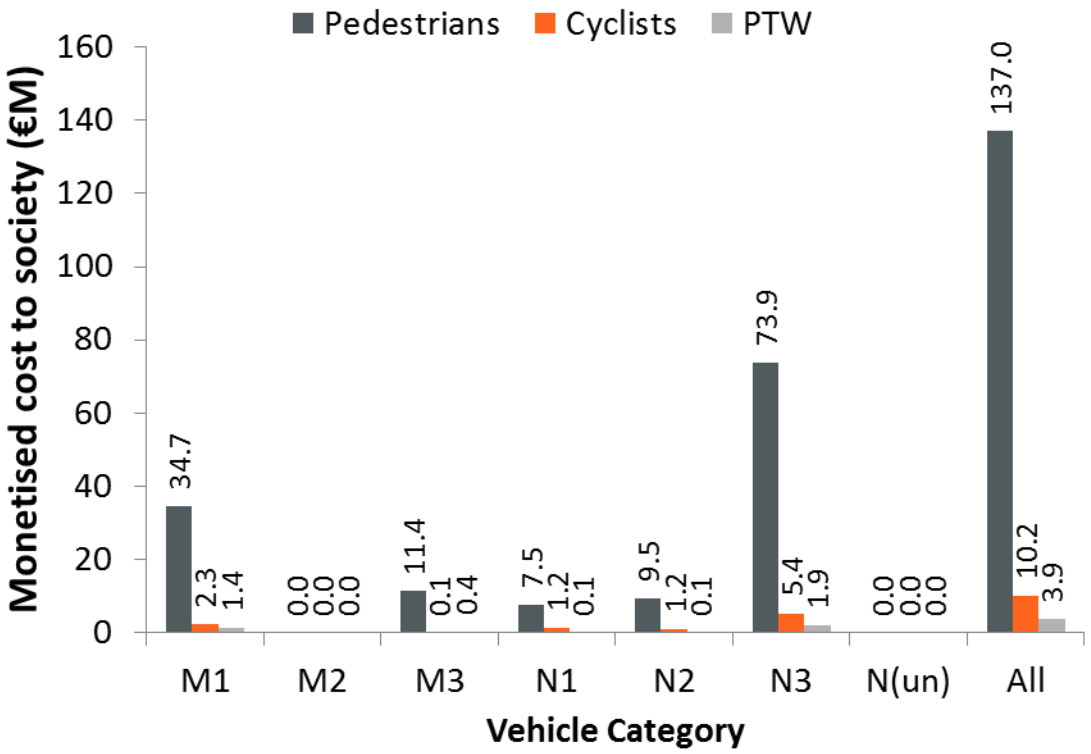
Annual Target Populations for DIR VRU casualties (EU28)

Vehicle Category	Target Population	Pedestrian			Cyclist			PTW			Societal Cost (€M)	% of Total Cost (%)
		Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight		
M1	TP2	151.1	4515.2	19298.0	0.0	186.6	1522.1	0.0	335.7	3889.4	1969.2	5.5%
	TP3	5.3	78.8	300.2	0.0	7.9	20.5	0.0	3.3	30.8	38.4	0.1%
M2	TP2	1.0	9.0	39.3	0.0	2.2	3.6	0.0	0.0	16.9	5.7	5.9%
	TP3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
M3	TP2	26.5	199.3	720.7	0.0	2.7	49.9	0.0	5.8	49.5	115.4	12.6%
	TP3	4.9	7.5	21.2	0.0	0.0	6.7	0.0	1.5	1.9	11.9	1.3%
N1	TP2	34.1	291.3	1321.6	0.0	13.7	128.0	0.0	20.5	280.5	175.3	5.1%
	TP3	2.6	8.3	29.8	0.0	3.9	14.9	0.0	0.0	6.6	8.8	0.3%
N2	TP2	10.3	46.4	120.8	0.0	4.7	24.8	0.0	2.7	37.3	35.7	8.1%
	TP3	4.4	4.6	5.8	0.0	4.7	2.7	0.0	0.0	4.7	10.7	2.4%
N3	TP2	80.6	126.3	189.3	6.8	10.0	66.5	2.0	11.0	92.7	209.6	11.4%
	TP3	35.8	25.7	36.2	2.5	0.0	35.3	0.0	4.5	42.3	81.2	4.4%
$N_{unknown}$	TP2	0.0	1.9	3.3	0.0	0.0	1.7	0.0	0.0	0.0	0.5	2.8%
	TP3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
Total	TP2	303.6	5189.4	21693.0	6.8	219.8	1796.6	2.0	375.7	4366.3	2511.4	5.9%
	TP3	53.1	124.9	393.1	2.5	16.5	80.1	0.0	9.4	86.3	151.1	0.4%

Update to Specific EU28 Target Populations: DIR

- DIR Target Population 3
- Total annual societal cost to EU28 of €151M
- Collisions between N3 vehicles and VRUs have highest societal costs
- Pedestrians most affected casualty
- Ranking of societal costs:
  - N3>M1>M3>N2>N1>M2

Total Annual Societal Costs of DIR VRU Casualties (EU28)



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Update to Specific EU28 Target Populations: DIR

Annual Target Populations for DIR VRU Casualties (EU28): N2/N3 Weights

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	TP2	2.9	27.9	80.0	0.0	0.0	9.3	0.0	2.7	26.7	15.1	5.1%
	TP3	0.0	2.3	5.5	0.0	0.0	0.0	0.0	0.0	4.5	0.7	0.3%
N2 >7.5T	TP2	0.0	3.7	13.1	0.0	0.0	2.4	0.0	0.0	2.8	1.2	2.6%
	TP3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
$N2_{un_GVW}$	TP2	7.3	14.9	27.7	0.0	4.7	13.1	0.0	0.0	7.7	19.4	20.2%
	TP3	4.4	2.5	0.0	0.0	4.7	3.4	0.0	0.0	0.0	10.0	10.5%
N3 ≤18T	TP2	17.6	18.6	42.4	0.0	4.7	14.9	0.0	1.9	2.8	40.1	12.7%
	TP3	11.7	2.1	6.4	0.0	0.0	4.3	0.0	1.9	0.0	23.1	7.3%
N3 >18T	TP2	54.2	92.9	111.0	5.0	0.0	36.5	2.0	2.7	56.3	141.6	11.3%
	TP3	21.1	21.3	25.1	2.5	0.0	20.5	0.0	0.0	29.7	50.7	4.0%
$N3_{un_GVW}$	TP2	7.3	11.1	32.6	1.8	3.8	13.4	0.0	6.4	33.6	23.7	8.9%
	TP3	2.9	2.2	4.4	0.0	0.0	8.0	0.0	2.7	12.7	7.1	2.7%

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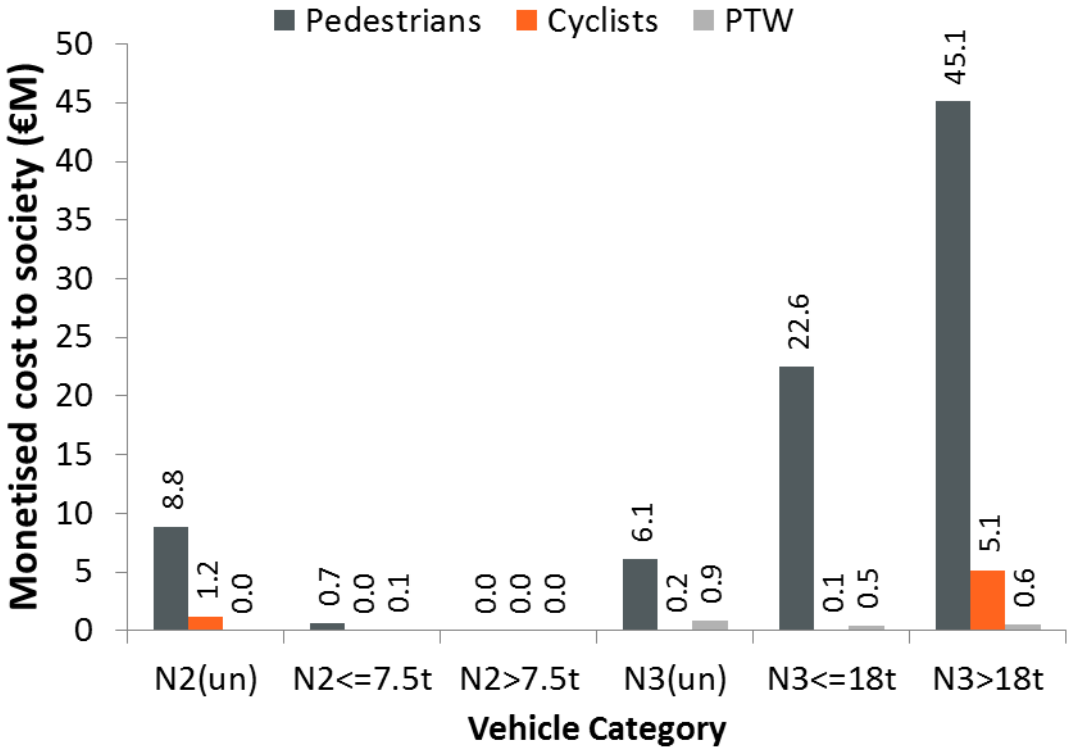
Update to Specific EU28 Target Populations: DIR

Total Annual Societal Costs of DIR VRU Casualties (EU28): N2/N3 Weights



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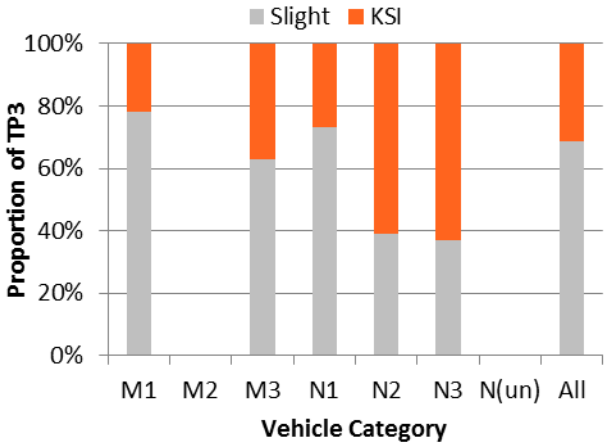
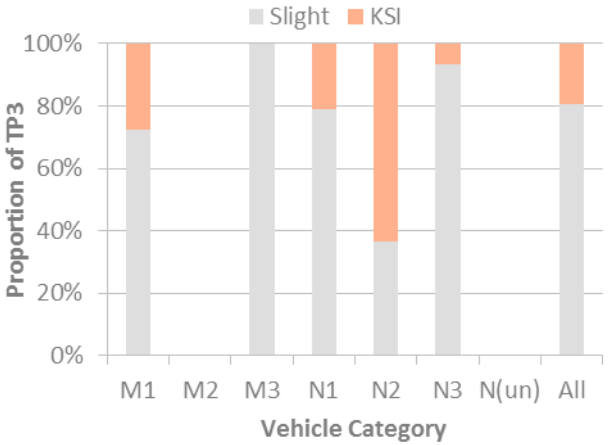
Update to Specific EU28 Target Populations: DIR

KSI as a Proportion of DIR VRU Casualties (EU28)

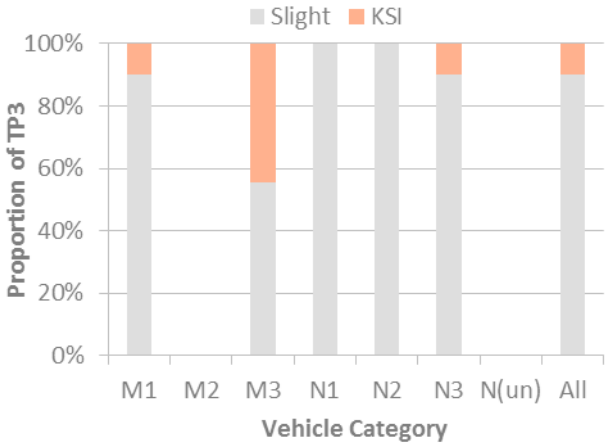
Pedestrians



Cyclists



PTWs



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Update to Specific EU28 Target Populations: DIR

DIR Collision Landscape Conclusions Relating to Vehicle Categories

- c.50% of VRU collisions relevant to DIR caused by collisions with N3 vehicles:
  - M1 vehicles also contribute to a large (c.25%) proportion of DIR relevant collision
  - Should M1/N1 vehicles be considered in scope?
- Ranking of vehicle category priority:
  - Societal costs: N3>M1>M3>N2>N1>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:
  - N3>18T has largest TP, N3≤18T second largest TP
  - N2 has smaller TP, with N2 vehicles with unknown GVW affecting results
- Considering injury severities:
  - All vehicle categories (aside from M2) have greater proportion of KSIs than M1
- Considering affected casualties:
  - Pedestrians most important VRU

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Exploratory Analysis

Urban/Rural

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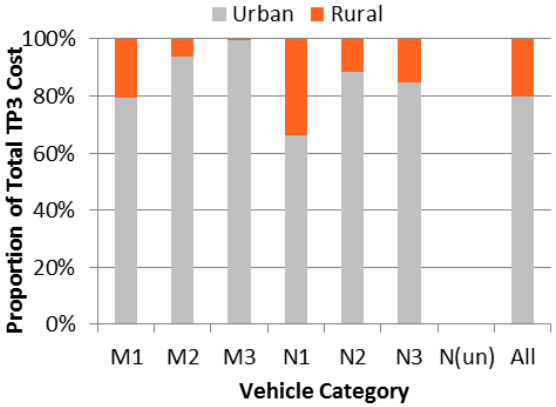
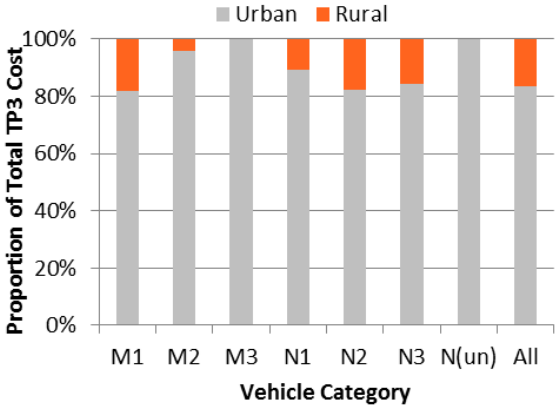
Exploratory Analysis: Urban/Rural

Urban/Rural as a Proportion of Total Annual Societal Costs of VRU Casualties (EU28)

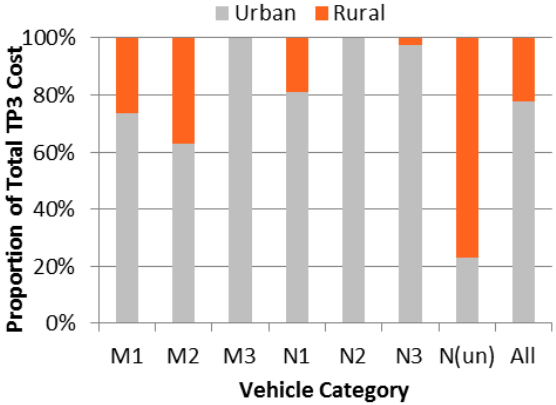
BSIS



REV



MOIS



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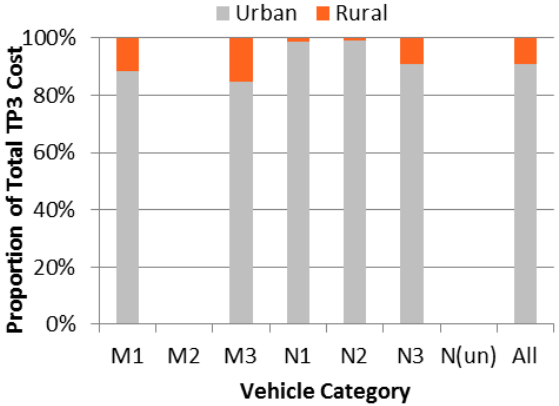

Exploratory Analysis: Urban/Rural

Urban/Rural Exploratory Analysis Conclusions

- From additional fields of STATS19 dataset
  - Based on grid references and ONS definitions of urban/rural areas
  - A built up area with a minimum population of 10,000 and area of 20 hectares is defined as an urban area
- c.80% of VRU collisions relevant to 4 safety measures occur in urban settings
  - M3/N2/N3 collisions typically occur even more frequently in urban areas
- Low speed manoeuvres performed in urban areas perhaps unsurprising
- But evidence perhaps that a significant proportion of the types of collisions associated with these 4 safety measures still occur in “rural” settings

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Exploratory Analysis

Vehicle Articulation Status

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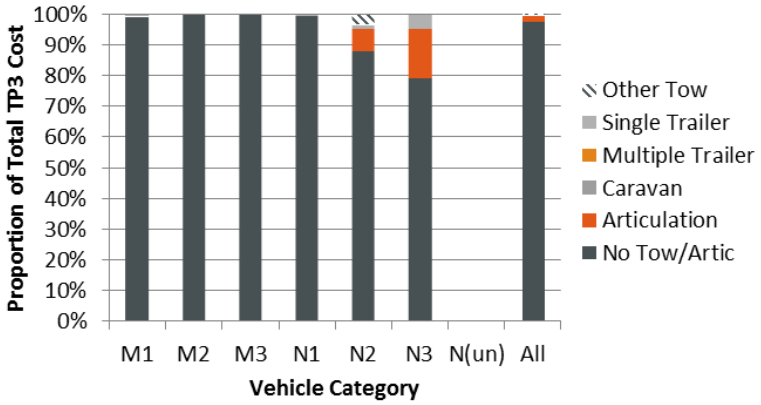
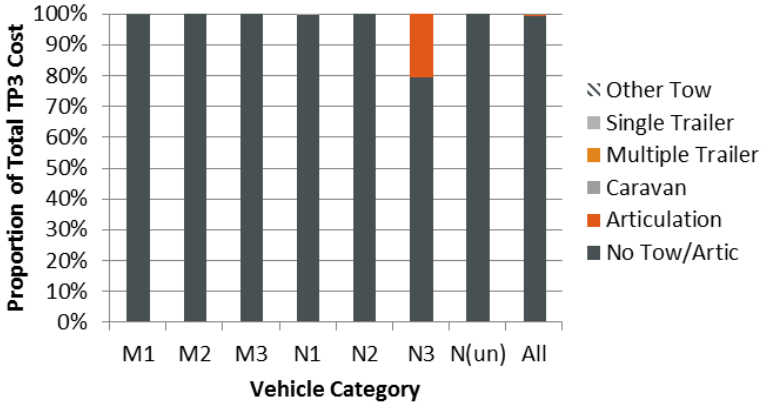
Exploratory Analysis: Vehicle Articulation Status

Vehicle Articulation as a Proportion of Total Annual Societal Costs of VRU Casualties (EU28)

BSIS



REV



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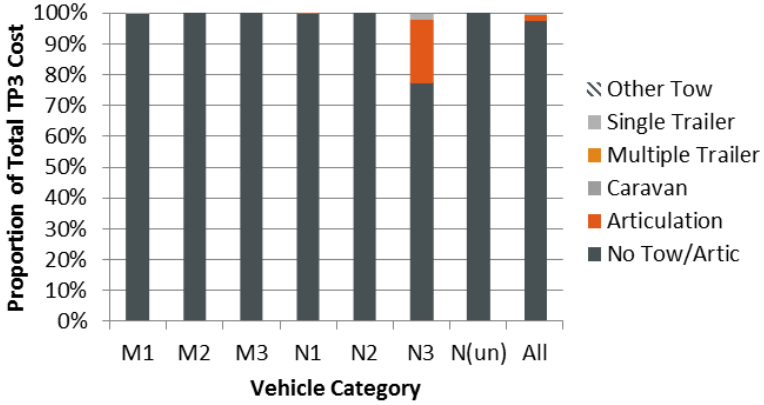

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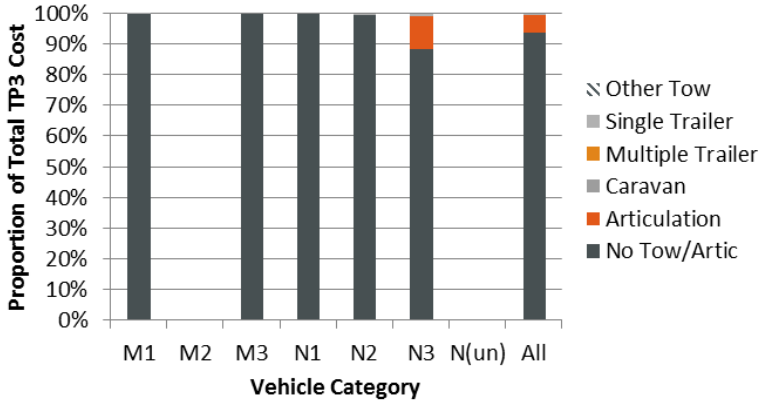

Exploratory Analysis: Vehicle Articulation Status

Vehicle Articulation Status Exploratory Analysis Conclusions

- From standard fields of STATS19 dataset
  - Articulation ⇨ Tractor + semi-trailer
  - No tow/articulation ⇨ Tractor only *or* rigid vehicle
  - Single trailer ⇨ Drawbar
  - Other tow ⇨ Towing vehicle
- Nearly all VRU collisions relevant to 4 safety measures involve the above vehicle articulation status
  - Dominated by collisions with rigid/tractor only vehicles (even N3 @c.80%)
  - Articulated vehicles next most important category – especially for N3 vehicles
- Articulated N3 vehicles therefore involved in a significant proportion of VRU collisions relevant to the 4 key safety measures

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Exploratory Analysis

Casualty Age

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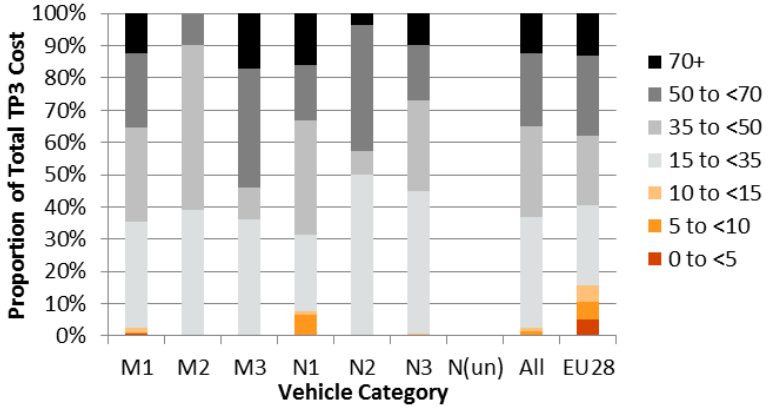
Exploratory Analysis: Casualty Age

Casualty Age as a Proportion of Total Annual Societal Costs of VRU Casualties (EU28)

BSIS



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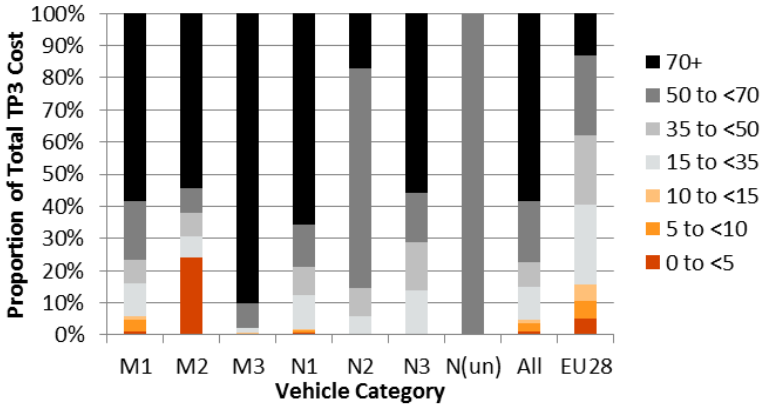

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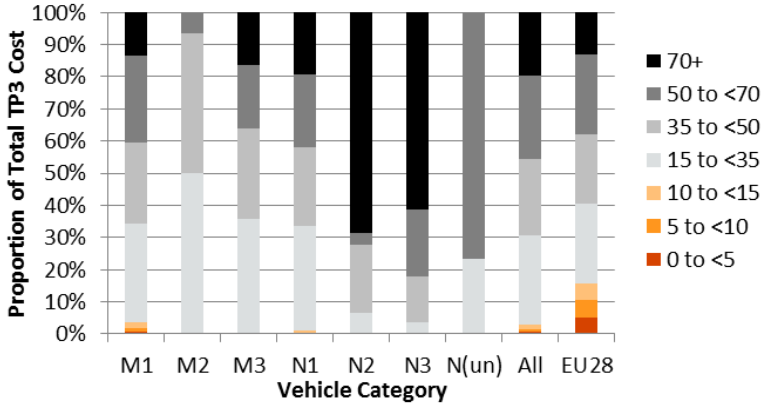

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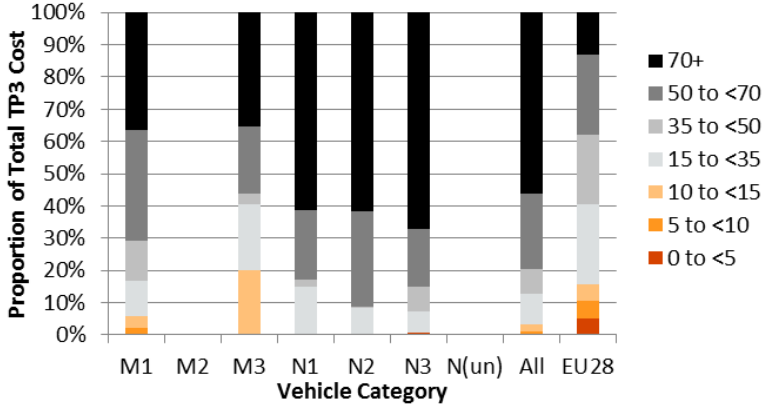

Exploratory Analysis: Casualty Age

Casualty Age Exploratory Analysis Conclusions

- From enhanced fields of STATS19 dataset
  - Grouped to map against EU28 population statistics for 2011-15
- Children largely unaffected by on-road collisions
  - Small relative proportion of collisions, exceeding population rates in only a few instances
- Elderly adult casualties disproportionately affected
  - Particularly for REV/MOIS/DIR
  - Primarily linked to greater relative severity of injuries (leading age range for fatal casualties for all three safety measures)
- Elderly adults need to be considered in any future regulation design
  - e.g. walking speeds, heights, etc.
- Must find more evidence for casualty ages involved in off-road collisions

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Questions?

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