HOW SAFE ARE NEW CARS SOLD IN THE EU? AN ANALYSIS OF THE MARKET PENETRATION OF EURO NCAP-RATED CARS

PIN Flash Report 30

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Road Safety PIN

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ABOUT THE EUROPEAN TRANSPORT SAFETY COUNCIL (ETSC)

ETSC is a Brussels-based independent non-profit organisation dedicated to reducing the numbers of deaths and injuries in transport in Europe. Founded in 1993, ETSC provides an impartial source of expert advice on transport safety matters to the European Commission, the European Parliament, and Member States. It maintains its independence through funding from a variety of sources including membership subscriptions, the European Commission, and public and private sector support.

ABOUT THE ROAD SAFETY PERFORMANCE INDEX PROJECT

ETSC's Road Safety Performance Index (PIN) programme was set up in 2006 as a response to the first road safety target set by the European Union to halve road deaths between 2001 and 2010. In 2010, the European Union renewed its commitment to reduce road deaths by 50% by 2020, compared to 2010 levels.

By comparing Member State performance, the PIN serves to identify and promote best practice and inspire the kind of political leadership needed to deliver a road transport system that is as safe as possible.

The PIN covers all relevant areas of road safety including road user behaviour, infrastructure and vehicles, as well as road safety policymaking. Each year ETSC publishes PIN 'Flash' reports on specific areas of road safety. A list of topics covered by the PIN programme can be found on http://etsc.eu/projects/pin/.

How safe are new cars sold in the EU, an analysis of the market penetration of Euro NCAP-rated cars is the 30th PIN Flash report edition. The report covers 32 countries: the 28 Member States of the European Union together with Israel, Norway, the Republic of Serbia and Switzerland.

CONTENTS

INTRODUCTION

In 2014 in Europe 25,964 people died in road traffic and 203,500 were seriously injured. However, the long term safety trend has been positive, especially so for car occupants who have benefitted more than other road users from road safety measures adopted over the past decade. There were 12,345 car occupant deaths in Europe in 2012 compared with 27,700 in 2001, a cut of 55%. Other road user deaths fell by 41% over the same period.[1]

Euro NCAP's evolving 5-star safety rating has come to represent the safety gold standard in Europe

Although the reduction in deaths may be a result of many factors, including better enforcement, changing behaviour and safer infrastructure, there is little doubt that improved vehicle safety standards since the late 1990s have played an important role.

Improvements in the safety of new vehicles in Europe have been driven by mandatory EU and UNECE safety requirements for new vehicles and by Euro NCAP (the European New Car Assessment Programme), a voluntary consumer testing organisation that carries out its own tests of many vehicles that sell in large numbers and awards safety ratings to them.

Euro NCAP's evolving 5-star safety rating has come to represent the safety gold standard in Europe. The crash tests carried out by Euro NCAP are stricter than those required by regulation – and have also become stricter over time. A car that only meets the minimum legal EU safety requirements would receive a zero-star Euro NCAP rating. Since 2009, cars must perform well across four 'boxes' – adult occupant protection, child occupant protection, pedestrian protection and safety assistance systems - in order to receive the top 5-star rating.

A car that only meets the minimum legal EU safety requirements would receive a zero-star Euro NCAP rating

One important indicator of the level of vehicle safety in Europe overall is what proportion of the number of tested vehicles actually sold meet Euro NCAP's highest safety ratings. The last assessment of the progress of the Euro NCAP programme carried out by ETSC in 2009 found that there were very significant differences between the average Euro NCAP rating of new cars sold in Eastern and Central European countries, compared to their Western European counterparts.[2]

Part I of this report gives an overview of how Euro NCAP's car assessment protocol works. Part II contains ETSC's updated analysis on what proportion of tested cars sold have a Euro NCAP rating, what ratings those vehicles received, and how they performed in each of the four boxes mentioned above. Part II also looks at what can be done at national level. Part III continues the data analysis with a look at how individual car brands are performing.

Part IV briefly discusses some of the questions raised by the dominance of the Euro NCAP programme in EU vehicle safety: it looks at the pros and cons of laboratory tests versus real world crash analysis and examines the issue of optimisation to meet laboratory tests.

In part V, the analysis looks ahead to the European Commission's forthcoming review of the General Safety Regulation and Pedestrian Protection Regulation, the key legislation for vehicle safety in Europe, and makes a series of recommendations.

Finally, part VI features an interview with Michiel van Ratingen, the secretary general of Euro NCAP, where he responds to the findings of this report and gives details to the changes the organisation had made to its testing protocol as of January 2016.

[1] ETSC (2014), Ranking EU progress on car occupant safety, 27th PIN Flash report
[2] ETSC (2009), Boosting the market for safer cars across the EU, 3rd PIN annual report

EXECUTIVE SUMMARY

Until the recent economic downturn in 2008, more than 15 million cars were sold each year in Europe. While in the last decade car sales have been increasing globally[3], by 2013 the number of new cars sold in the EU has dropped by 24% compared to pre-crisis levels to 11.9 million.[4] These new cars made up 4.8% of the 248 million cars registered in the EU in 2013, indicating cars on average have a lifetime of more than 20 years. Renewal of the fleet is a slow process, therefore it is important that currently available car safety improvements are taken up and all new cars have high safety standards.

Euro NCAP has changed the market for vehicle safety. However, Euro NCAP does not have resources to test all models of cars. Strong EU legislation is therefore needed in order to reach the lower priced segments of the market and address aspects of protection that are less attractive to car buyers.

Some consumers may think that all new cars sold on the EU market are safe because they have to meet EU type approval requirements.

Some consumers may think that all new cars sold on the EU market are safe because they have to meet EU type approval requirements. Euro NCAP reveals that the safety levels differ between models and that this difference could make the crucial difference between life and death in the event of a collision. Over the period covered by this report, Euro NCAP tested 151 models, 109 were granted the coveted 5 stars, 27 reached 4 stars, and 12 reached 3 stars only (Fig.1). Consumers should be advised to only buy 5-star cars.

Finland, Norway and Ireland are the countries with the highest proportion of cars awarded the coveted 5 stars by the Euro NCAP among new cars sold in 2013 and tested over the period 2010-2013 (Fig.2a). Car models rated 5 stars by Euro NCAP made up 60% or more of the new cars sold in these three countries in 2013. On the other end are Romania, Israel, Italy and Greece, where the share of 5-star cars among new cars sold does not exceed 48%.

Car models rated 4 or 3 stars by Euro NCAP represented only 7.5% of all new cars sold in 2013 that were tested by Euro NCAP over the period 2010-2013 but their proportion is a lot higher in Denmark (15%), Italy (14%), Romania (13%) and The Netherlands (12%). Green vehicle tax shifts in some countries, including Denmark and The Netherlands, had failed to promote safer as well as cleaner cars, leading to higher sales of cars with lower safety ratings.

The country comparison published in 2009 by ETSC[5] had revealed a geographical divide in Europe: safety levels of new cars sold were notably lower in Central and Eastern European countries. Five years later, the gap has been reduced – in Lithuania, Slovenia, Latvia, the Czech Republic, Poland, Slovakia and Estonia the proportion of 5-star cars among new cars sold in 2013 is higher compared to some Western European countries (Fig.2a). However, in all Central and Eastern European countries but Slovenia, Slovakia, the Czech Republic and Estonia, new cars accounted for less than 2% of all the cars registered, compared to 4.8% on average in the EU (Fig.9).

Achievements in vehicle safety, combined with other road safety measures, have been demonstrated to make a large contribution to improving car occupant safety. Deaths of unprotected road users have been decreasing at a slower rate than those of vehicle occupants. A large majority of pedestrian and cyclist deaths in the EU occur in collisions with cars.[6] Unfortunately, improvements in pedestrian protection by car manufacturers have been slower compared to achievements in adult and child occupant protection and the take up of new safety technologies (Fig.14).

[3] Statista, Number of cars sold worldwide from 1990 to 2015 (in million units)
[4] ACEA, The automobile industry pocket guide
[5] ETSC (2009), 3rd Annual Road Safety Performance Index report
[6] ETSC (2015), Making walking and cycling on Europe's roads safer, 29th PIN Flash report

Euro NCAP introduced in 2009 a new additional assessment area, called safety assist, to test collision avoidance and injury mitigation technologies (Fig.15). The majority of car manufacturers successfully responded to the challenge of meeting the requirements. It shows that in-vehicle technologies tested by Euro NCAP, among others, are mature enough and car manufacturers are ready to provide higher safety standards than what is required by the EU regulation.

The European Commission is due to revise the General Safety Regulation and the Pedestrian Protection Regulation which set minimum requirements for all new motor vehicles to be sold in the EU market. EU legislation on passive safety has not changed much over the last decade and as a result type approval crash tests need to be updated. In addition, since the last revision of these laws, new in-vehicle safety systems have developed rapidly and should be included in the regulation.

Even though vehicle standards are set at an international level, governments and companies can and should influence the consumer's choice of vehicle by running awareness campaigns or setting incentives, for example in the form of tax breaks, to purchase safer and environmentally friendly cars. Taxation should reflect climate change challenges and road safety – not promote one issue at the expense of the other. At the moment this is, unfortunately, not the case, and schemes to promote the purchase of environmentally friendly cars have had unforeseen adverse impact on safety.

ETSC Key recommendations to Member States

- Encourage the faster uptake of safer vehicles via the promotion of clear consumer information and the procurement of safer vehicles.
- Include information on in-vehicle safety technologies fitted on a model, when available, into collision reports to assess the effectiveness of safety technologies.
- Include strict safety criteria to tax deduction schemes for more environmentally-friendly cars.

ETSC Key recommendations to EU institutions

Within the context of the revision of Regulation 2009/661 concerning Type-Approval Requirements for the General Safety of Motor Vehicles:

- Extend the mandatory fitment of advanced seat belt reminders as standard equipment to all seats.
- Adopt legislation for fitting all new vehicles with an overridable assisting Intelligent Speed Assistance system.
- Adopt legislation for the mandatory fitting of all new cars and light trucks and vans under 3.5 tonnes with Autonomous Emergency Braking (AEB) systems.
- Upgrade type approval collision tests to be more closely aligned with the requirements of Euro NCAP crash tests.
- As a first step towards wider use of alcohol interlocks, legislate their use by professional drivers.
- Revise legislation on car CO_2 labelling and marketing to require inclusion of Euro NCAP test results when they are available ("Stars on cars!").
- Mandate Event Data Recorders in all new vehicles and require the data to be made available for accident investigation.

- Implement the recommendations of the EU funded research project DaCoTA on in-depth accident investigations and build an EU common in-depth accident investigation database. These could be funded by a negligible (i.e. 1 euro) fee on the price of a new car.
- Require manufacturers to provide information on in-vehicle safety technologies fitted on a model in its Vehicle Identification Number (VIN).

Within the context of the revision of Regulation 2009/78 on the Protection of Pedestrians and other Vulnerable Road Users:

- Update existing tests and extend scope of regulation to include cyclist protection.

ETSC Key recommendations to car manufacturers

- Include information on in-vehicle safety technologies in Vehicle Identification Numbers (VIN).
- Donate 1 Euro (or more) when a new car is sold to fund IGLAD (or a new pan European database) or invite their clients to do so.
- Offer safety features as standard rather than as options at extra cost.
- Help avoid customer confusion by introducing generic names for safety technologies in place of a variety of different marketing terms currently used to describe what are essentially the same features.

PART I
THE EUROPEAN NEW CAR ASSESSMENT PROGRAMME

Since its creation in 1997 Euro NCAP has provided consumers and businesses with an independent assessment of safety performance of some of the most popular cars sold in Europe and has challenged manufacturers to improve passive and active safety.

The level of safety is assessed in a series of technology tests and crash tests with dummies, designed and carried out by Euro NCAP. These tests represent, in a simplified way, important real life collision scenarios that could result in injured or killed car occupants and other road users. While a safety rating can never fully capture the complexity of the real world, Euro NCAP aims to promote best practice in car safety among car manufacturers.[7]

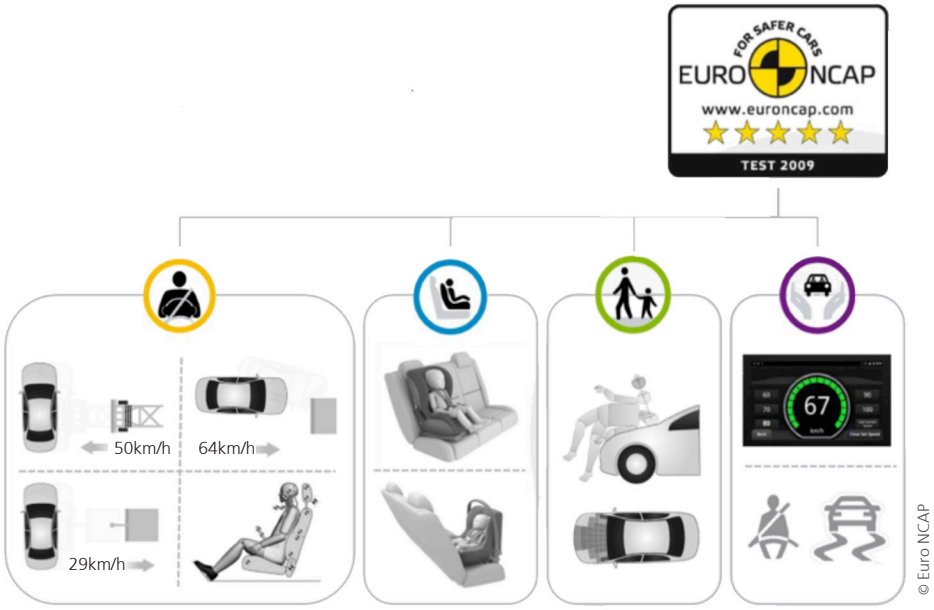
Not all models sold in Europe are tested by Euro NCAP and not all models of the same type are sold with the same standards of safety equipment

Euro NCAP goes far beyond the legal requirements set in the EU's General Safety Regulation when testing new cars. A car that just meets the minimum EU legal requirements would not be eligible for any stars. Yet, not all models sold in Europe are tested by Euro NCAP, because of limited resources, and not all models of the same type are sold with the same standards of safety equipment.[8] It took automotive innovations such as anti-lock braking, airbags and even seat-belts several decades from being introduced in cars in the premium segment until they trickled down to all models. Regulation is needed to ensure that safety benefits are spread faster among the entire fleet of new vehicles and that safety improvements are not limited to better informed or wealthier consumers.[9]

1.1 Four safety boxes assessed, one overall rating

Until 2009, Euro NCAP used to award three individual star ratings for each of the three areas of assessment: adult occupant protection, child occupant protection and pedestrian protection. The individual star rating for different categories was abandoned in 2009 in favour of a single overall star rating. At the same time, a new additional assessment area, called safety assist, was introduced to test collision avoidance and injury mitigation technologies.[10] The four areas of assessment, also referred to as "boxes", are shown in Picture 1.

[7] Euro NCAP, How to read the stars
[8] ETSC Position Paper, Revision of the General Safety Regulation, 2015 March
[9] Ibid
[10] Euro NCAP Assessment protocol – overall rating, Version 5.0, May 2009

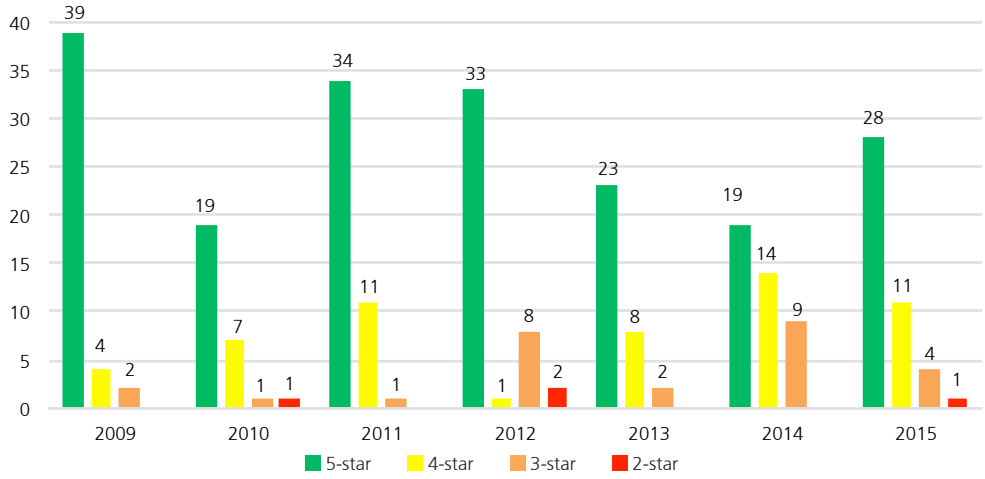


Picture 1. Four areas of Euro NCAP post-2009 protocol assessment: car occupant protection, child occupant protection, pedestrian protection and safety assist.

To challenge car manufacturers to continue to improve, the crash tests and rating protocols have become stricter over time and new tests are introduced to the system as new innovations become available.[11]

The number of cars awarded 5 stars dropped in 2010 and in 2014 in part following changes in protocols becoming effective. For this reason this report considers only Euro NCAP results of cars tested between 2010 and 2013. This ensures like-for-like comparison as, for example, a car model that was awarded 5 stars in 2009 would not have qualified for 5 stars in 2014, due to the changes to the protocols.

Figure 1. Number of Euro NCAP tested car models that scored 5, 4, 3 and 2 stars over the period 2009-2015. No cars tested scored 0 or 1 star.



1.2 How to read the stars?

To qualify for a certain number of stars, a vehicle must achieve a minimum threshold for overall score and a minimum threshold for each safety box. Vehicles that show a poor performance in one of the boxes will have their star rating lowered to indicate that they do not provide the best all-round protection.[12]

1.3 Which cars are tested?

There are two possibilities: the manufacturer submits a request for a model to be tested and provides a few of them to be crash tested or Euro NCAP buys them. When selecting a model, Euro NCAP looks at which variant is selling most, but also if the variant is representative in terms of fitment of safety equipment (what Euro NCAP calls "base safety specification"). The base safety specification model is defined as that which is fitted as standard in the majority of car sales, or predicted sales, across the model range.[13]

[11] Euro NCAP Assessment protocol – safety assist, Version 5.6, July 2012
[12] Euro NCAP assessment protocol – overall rating, Version 5.1, June 2011
[13] Euro NCAP car specification, sponsorship, testing and retesting protocol, Version 2.1, June 2007

INDICATOR

This report uses as its main indicator the proportion of cars rated 5, 4, 3 or 2 stars by Euro NCAP among new cars sold in 2013 by country (Fig.2a) and among Euro NCAP tested cars (Fig.2b). Around 11.9 million new cars were sold in 2013 in the EU which represents 4.8% of the total car fleet of 248 million. This study looks at how many of these 11.9 million cars sold were 5-, 4-, 3- or 2-star cars. In addition, the average percentage scores for adult occupant protection, child occupant protection, pedestrian protection and safety assist are included in the analysis.

More than 500 car models have been tested by Euro NCAP since its introduction in 1997. But due to major changes to the protocols in 2009 and to a lesser extent in 2014, only the 148 models tested over 2010-2013 have been considered in this report. A car rated 5 stars in 2009 does not offer the same level of safety as a car rated 5 stars in 2014, and Euro NCAP does not currently offer a way of calculating a revised rating for a model tested under the old protocol. Those 148 models represented 60% of all cars sold in 2013. The remaining 40% were either not tested or tested prior to 2010 or after 2013 by Euro NCAP as the data did not distinguish between sales of models not tested and of models tested prior to 2010 or after 2013.

For the purposes of this report, the scores are assumed to remain comparable over the 2010–2013 test period. However, there were some changes to the protocol over this period, including the scores required under the individual boxes in order to reach overall 5 stars.

Most of the car models are available in other variants that may have different safety levels than the one tested by Euro NCAP. For example, the Ford Focus is sold in Europe in hatchback, sedan and estate variants. Euro NCAP tested the 5-door hatchback variant in 2012. For the purpose of this report, the results are assumed to apply to the other variants of the same model as well.

The number of new cars sold in 2013 by models and by countries were provided by the MAPFRE Foundation[14]. Data for Bulgaria, Cyprus, Estonia, Latvia and Lithuania were provided by the ETSC PIN panellists. The number of cars sold by models in 2013 was not available in Croatia, Luxembourg and Malta. Euro NCAP crash test results and star ratings for particular models tested between 2010 and 2013 were provided by Euro NCAP and are available on www.euroncap.com.

The analysis builds on a similar country comparison published in 2009 in ETSC's 3rd Annual Road Safety PIN report. The publication can be downloaded from www.etsc.eu/pin.

[14] MAPFRE Foundation is a non-profit institution created by MAPFRE, the Spanish global insurance company. https://www.mapfre.es/seguros/particulares/

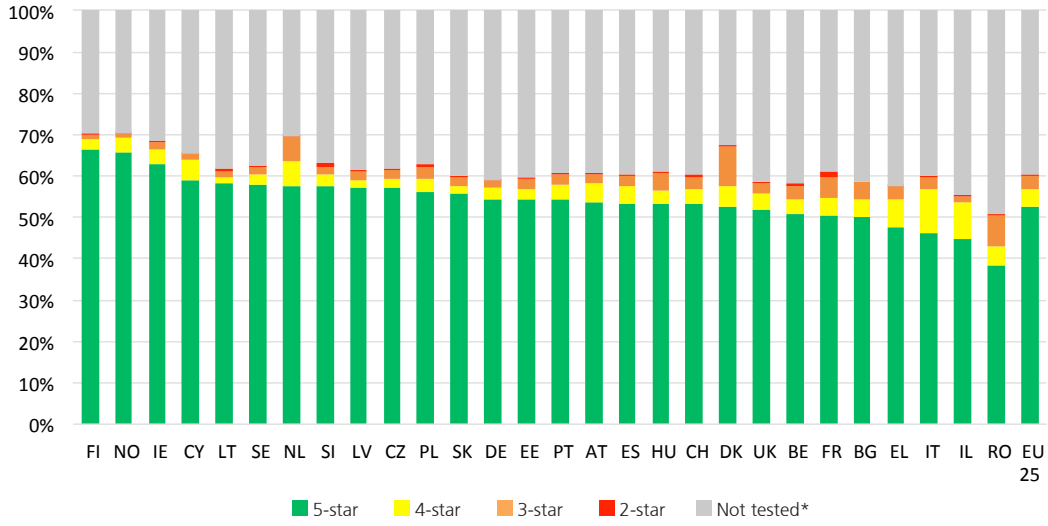
PART II
EURO NCAP COUNTRY-BY-COUNTRY STATUS REPORT

2.1 Half of all new cars sold in the EU were awarded 5 stars by Euro NCAP

Finland, Norway and Ireland were the countries with the highest proportion of cars awarded 5 stars by Euro NCAP among new cars sold in 2013 (Fig.2a). Cars rated 5 stars made up 60% or more of the new cars sold in these three countries in 2013. In contrast, the share of 5-star cars among new cars sold in Romania was 38%, in Israel 45%, in Italy 46% and in Greece 48%.

On average, 52.5% of all new cars sold in the EU in 2013 were awarded 5 stars by Euro NCAP, 4.5% were awarded 4 stars, 3% were awarded 3 stars and 0.5% 2 stars. Only 527,620 cars rated 4 stars and 349,100 cars rated 3 stars were sold in 2013 in the EU, representing 7.5% of all new cars sold, but their proportion is a lot higher than the EU average in Denmark (15%), Italy (14%), Romania (13%), and The Netherlands (12%).

Figure 2a. Proportion of Euro NCAP tested cars among new cars sold in 2013. Proportion of new cars awarded 5, 4, 3 and 2 stars over the period 2010-2013 and proportion of not tested cars. *Not tested car category includes not tested cars or cars tested prior to 2010 or after 2013 by Euro NCAP. None of the cars tested over the period 2010-2013 were awarded 1 or 0 star only. The data are not available for HR, LU and MT.



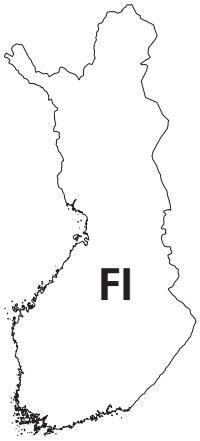
The country comparison published in 2009 by ETSC[15] revealed a geographical divide in the EU - safety levels of new cars sold were notably lower in Central and Eastern European countries. Five years later, the gap has been reduced – the proportion of 5-star cars among new cars sold in Lithuania, Slovenia, Latvia, the Czech Republic, Poland, Slovakia and Estonia in 2013 is higher compared to some Western European countries.

"Contrary to popular belief, many reasonably priced car models score very well in the Euro NCAP safety ratings and, in some cases, even better than more expensive ones. Safety is no longer a privilege of the wealthiest - 5-star cars are affordable."
Anders Lie, Swedish Transport Administration, Euro NCAP Board member

The percentage of cars either not tested or tested prior 2010 or after 2013 varies greatly between Member States from 30% in Finland to as much as 50% in Romania. Reasons for variation are not known but derive mainly from differences in national market characteristics.

[15] ETSC (2009), Boosting the market for safer cars across the EU, 3rd PIN annual report

A car that only meets today's minimum EU legal requirements for safety would not be eligible for any Euro NCAP star. Models not tested could, therefore, potentially clearly underperform compared to other models, but the consumers would have no information about their safety level. Euro NCAP's 5-star safety rating has come to represent the safety gold standard in Europe and, therefore, consumers should be advised not to buy a model that is not tested by Euro NCAP. Upgrading EU type approval regulation would ensure that all new cars on the EU market have high safety standards.



Finland: promoting in-depth collision investigation and comparing car safety performance in real world collisions to Euro NCAP test results

67% of new cars sold in Finland in 2013 were awarded 5 stars which is the highest proportion in the EU. Substantial governmental resources are dedicated to educating the citizens on the importance of driving a safe car.

In Finland every fatal road collision is investigated in-depth and on-the spot by an independent, multidisciplinary accident investigation team. The team delivers proposals and recommendations including further possible improvements in new car safety features, especially the ones that contribute in mitigating the consequences of accidents, such as Autonomous Emergency Braking, Intelligent Speed Assistance, Lane Departure Warning system and different seat belt systems. The data collected by in-depth accident investigation teams are widely used in legislation, road safety studies, also those comparing real life collision to Euro NCAP test results and for informing the public.

"Safety features have been recognised as one of the main criteria when buying a new car. The high level of awareness can to some extent be explained by Finland's high-quality and comprehensive accident statistics. The Finnish Motor Insurers' Centre (VALT) publishes each year six reports containing in-depth data. In cooperation with the Transport Safety Agency, VALT has conducted research on accident and injury risks by different car models. The results were compared to Euro NCAP stars and positive correlation was found. The study and the results were promoted in a leaflet which includes additional information on active safety systems."
Ilkka Nummelin, Finnish Motor Insurers' Centre (VALT)

Ireland: public awareness campaign on Euro NCAP ratings as part of the Government's Road Safety Strategy

63% of all new cars sold in Ireland received 5 stars; it is the second largest proportion in the EU. Action six of the Government's Road Safety Strategy 2013 to 2020 consists of a campaign promoting Euro NCAP ratings. The purpose of the campaign is to assist the public when purchasing a car, by informing them on which safety features are available on each model.[16]

"The Irish Road Safety Authority has implemented a national and local information campaign targeting the public through national press, digital and online marketing. The campaign is activated twice a year in the run up to the two dual registration periods at the start and middle of each year."
Sharon Heffernan, Road Safety Authority (RSA), Ireland

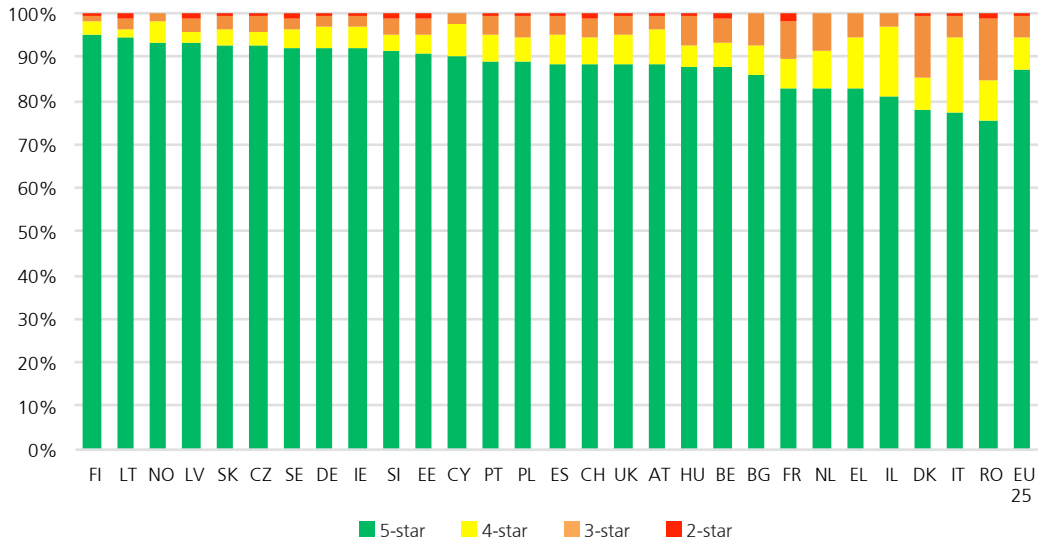
[16] http://www.rsa.ie/en/RSA/Your-Vehicle/About-your-Vehicle/Example-of-non-Dup/Vehicle-Safety-Ratings-/

2.2 Largest proportion of 4- and 3-star cars in Romania, Italy and Denmark

Figure 2b differs from Figure 2a as Fig.2b only looks at the proportion of 2, 3, 4 and 5-star cars out of tested cars only (while Fig.2a looked at their proportion out of all new cars sold). Figure 2b shows that among cars sold that had been tested by Euro NCAP, more than 93% were rated 5-stars in Finland, Lithuania, Norway, Latvia and Slovakia.

In contrast, as many as 25% of cars sold in Romania (that had been tested by Euro NCAP) were 4, 3 and 2-star only. Italy follows (23%), together with Denmark (22%), Israel (19%), Greece, The Netherlands and France (17%). 3-and 4-star superminis were sold in large quantities in all these countries. The most popular car sold in Romania in 2013, a small off-roader Dacia Duster, ranked 3 stars only.

Figure 2b. Proportion of 5,4,3,2-star Euro NCAP tested cars among all cars tested over the period 2010-2013 and sold in 2013. None of the cars tested over the period 2010-2013 were awarded 1 or 0 star only. The data are not available for HR, LU and MT.



Denmark: unintended consequence of tax deductions for fuel efficiency – a lower level of vehicle safety

Denmark has one of the highest levels of car registration tax in Europe. However, safety equipment, such as airbags, ABS and ESC are subjected to tax deduction, a practice in place for more than 20 years. Yet, the recent tax deduction schemes promoting the purchase of low energy consumption cars accelerated consumer demand for supermini cars. Some popular superminis (Toyota Aygo, Peugeot 107, Kia Picanto, Citroen C1, Nissan Micra, Fiat Panda) were only rated 4 or 3 stars. As a result, in 2013, 15% of new cars sold in Denmark were rated 3 or 4 stars only, compared to 8% on average in the EU. Superminis represented 93% of all 3 and 4-star cars sold in the country.

"In recent years, the number of supermini cars grew on Danish roads in part due to recent tax deduction schemes for fuel efficient cars. Anti-lock braking system, double and curtain airbags, seat belt reminders and ESC also benefit from tax deduction, as well as 5-star Euro NCAP cars. The results of this study are disturbing and invite Danish stakeholders to rethink the tax deduction schemes. We will ask the government to add a provision to the schemes promoting the purchase of environmentally friendly cars to avoid an unforeseen adverse impact on safety. Tax deductions should be granted to only cars which are both environmentally friendly and safe."

Jesper Sølund, Danish Road Safety Council

Italy: the most popular car model sold in 2013 scored 4 stars only

4 to 2-star Euro NCAP tested cars represented 14% of all new cars sold in Italy in 2013, superminis represented 85% of these models. The most popular car model sold in Italy in 2013 was an Italian manufacturer's supermini, the Fiat Panda, which scored 4 Euro NCAP stars. Therefore, it affected market penetration of 4-star cars substantially – Fiat Pandas accounted for 74% of all 4-star car model sales in the country.

Each year Euro NCAP selects a list of cars that have performed best in their class. The Renault Zoe (an electric car) was recognised as the safest supermini model in 2013, demonstrating that small environmentally-friendly cars can reach high safety standards and score better than some large cars.

The Renault Clio, Ford Fiesta and Peugeot 208 were also awarded 5 stars in 2012. The Skoda Fabia was recognised as the safest supermini in 2014 and the Honda Jazz received this award in 2015.

For more information on improved supermini safety, read the interview with Michiel van Ratingen, the Secretary General of Euro NCAP, in part VI.

Israel: car lease companies lack strict safety criteria for their car fleet

19% of cars sold in Israel in 2013 that had been tested by Euro NCAP were 4 and 3 stars, 89% of them were superminis.

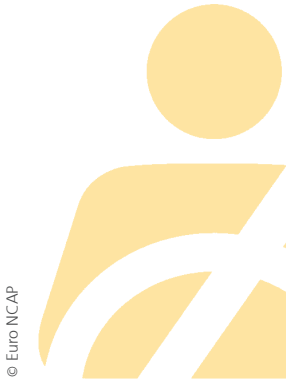
"Around 50% of all new cars are bought by car lease companies each year in Israel. Unfortunately, car lease companies lack strict safety criteria when renewing their fleet and do not communicate to their clients the importance of choosing a safer car. After about three years, lease companies sell cars for private use and this slows down the market penetration of 5-star Euro NCAP cars. We are urging the Israeli government to follow the example of some EU countries that are stimulating the purchase of safer cars through tax incentives and awareness-raising campaigns and we are calling lease companies to adopt strict safety criteria."

Shalom Hakkert, Ran Noar Foundation for Road Safety Research, Israel

2.3 Adult occupant protection

The adult occupant protection score is determined from frontal impact, side impact and whiplash tests, which are carried out to evaluate the protection of adult driver and passengers offered by the vehicle.[17] All Euro NCAP crash tests are based on the assumption that the driver and passengers are wearing seat belts, as required by law across the EU.

Good adult occupant protection was critical to a 5-star rating in the 2013 Euro NCAP protocol, owing to its 50% weighting in the overall score (Table a1, Annex 1). In addition, a car had to score at least 80% of the maximum of 36 points for adult occupant protection to qualify for an overall 5 stars (Table 1). Performance in adult occupant protection across the car board tested over the period 2010-2013 on average was better than the required minimum for 5 stars.



Euro NCAP tests are done with dummies wearing seat belt on all seats

	★★★★★	★★★★	★★★	★★
2010-2011	80%	65%	35%	30%
2012-2013	80%	70%	40%	30%
2014-2015	80%	70%	50%	30%
2016-2017	80%	70%	60%	50%

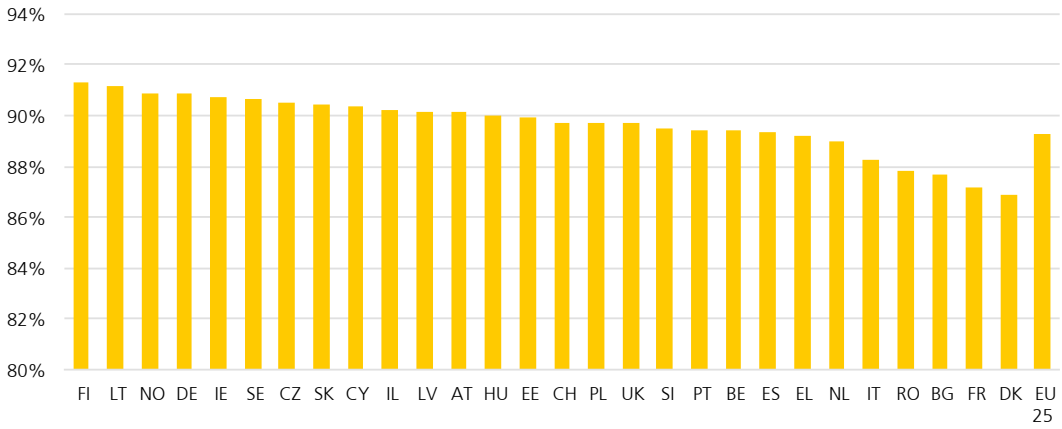
Table 1. Scores (in %) and corresponding stars for adult occupant protection. 2014-2017 for indication.

[17] Euro NCAP, Adult occupant protection

City Autonomous Emergency Braking (AEB) System was introduced in Euro NCAP adult occupant protection tests in 2014. The test addresses a common cause of whiplash injury in a low-speed, rear-end collisions which can cause neck injuries for the occupants of both participating cars.[18]

New cars sold in Finland, Lithuania, Norway, Germany, Ireland and Sweden performed better on average, reaching 91% of the points for occupant protection (Fig.3). Across the EU, new cars sold in 2013 reached on average 89% of the scores for occupant protection. In contrast, new cars sold in Denmark and in France reached on average 87% of the points for adult occupant protection, and 88% in Bulgaria, Romania and Italy. These countries have a larger proportion of 4-star and 3-star cars than the EU average, which can partly explain their position in Fig.3.

Figure 3. Average score (in %) for adult occupant protection among new cars sold in 2013. Fig. 3 does not take into account non-tested cars or cars tested prior 2010 or after 2013. Data are not available for HR, LU and MT.



2.4 Child occupant protection

Four in every million children aged 0-14 were killed in cars across the EU every year over the period 2010-2012. This rate ranges across most of the PIN countries from less than 1 to more than 8 children killed per million child population.[19]

The aspects of child occupant protection in cars assessed by Euro NCAP relate to the protection offered by the child restraint systems in the frontal and side impact tests; the availability of provisions for safe transport of children in the car and the vehicle's ability to accommodate child restraints of various sizes and designs.[20] The protection for 1½ and 3 year-old infants sitting in the rear seat in a child restraint recommended by the manufacturer is assessed.

To be rated 5 stars, a car had to score at least 60% out of the maximum of 49 points for child occupant protection in 2013 compared to 75% in the previous and following years (Table 2). In 2013 the minimum required score limit was reduced due to major changes in child occupant protection protocol to allow car manufacturers to make changes in their designs.

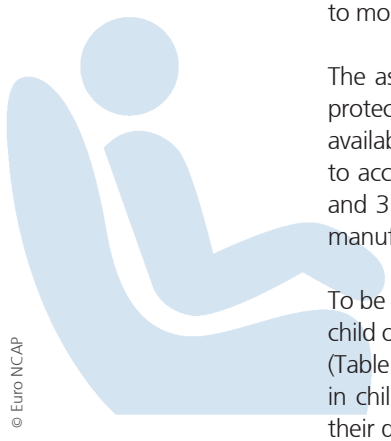
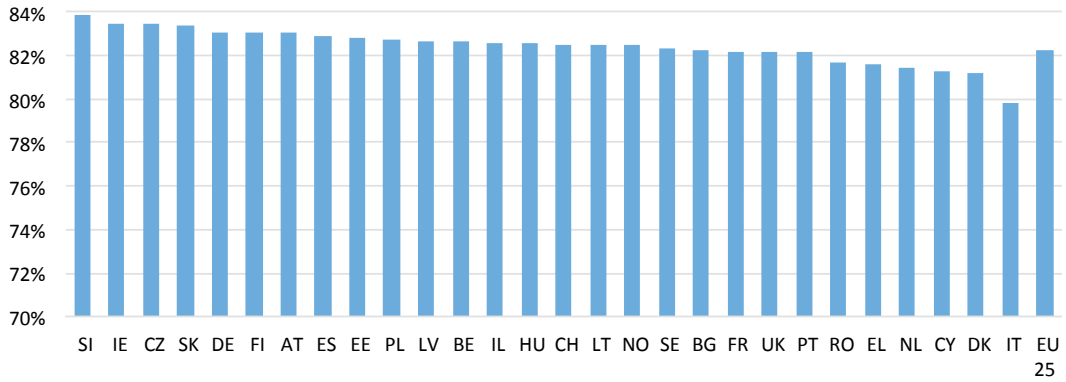


Table 2. Scores (in %) and corresponding stars for child occupant protection 2014-2017 for information.

	★★★★★	★★★★	★★★	★★
2010-2012	75%	60%	30%	25%
2013	60%	60%	30%	25%
2014-2017	75%	60%	30%	25%

[18] Euro NCAP, AEB City
[19] ETSC (2014), Ranking EU progress on car occupant safety, 27th PIN Flash report
[20] Euro NCAP, Child occupant protection

Figure 4. Average score (in %) for child occupant protection for new cars sold in 2013. Fig.4 does not take into account non-tested cars or cars tested prior 2010 or after 2013. Data are not available for HR, LU and MT.



New cars sold in the EU in 2013 performed on average well in the child occupant protection tests, reaching on average 82% of the 60% points threshold for 5 stars (Fig.4). New cars sold in Slovenia performed better than the EU average, reaching on average 84% of the points for child occupant protection. Cars sold in Italy and Denmark performed on average lower, but still above the 60% threshold for 5 stars.

2.5 More efforts needed to boost pedestrian protection

Deaths of unprotected road users have been decreasing at a slower rate than those of vehicle occupants in the EU. In the last ten years, deaths among pedestrians decreased by 41%, those among cyclists by 37% compared to a 53% decrease for vehicle occupants. Moreover, 68% of pedestrian deaths and 52% of cyclist deaths are a consequence of an impact with a car.[21]

© Euro NCAP

There is a correlation to car manufacturer improvements in pedestrian protection, which have been slower than those for occupant protection. To address this, Euro NCAP has increased the emphasis on all-round safety performance and is now demanding a higher level of achievement for pedestrian protection. However, pedestrian protection still accounted for only 20% of the overall rating in 2013 (Table a1, Annex 1).

The pedestrian protection score is determined from tests to the most important vehicle front-end structures such as the bonnet and windshield, the bonnet leading edge and the bumper. In these tests, the potential risk of injuries to pedestrian head, pelvis, upper and lower leg are assessed.[22]

There is big room for improvement in increasing pedestrian protection of new cars

To be rated 5 stars, a model had to reach 40% of the maximum of 36 points for pedestrian protection in 2010-2011. The bar was raised to 60% in 2012-2013 (Table 3). As a comparison, the threshold for 5 stars is 80% for adult occupant protection. There is, therefore, big room for improvement in raising pedestrian protection of new cars. According to research, this would be cost effective as this is mainly a matter of engineering in the design phase.[23]

Table 3. Scores (in %) and corresponding stars for pedestrian protection. 2014-2017 for information.

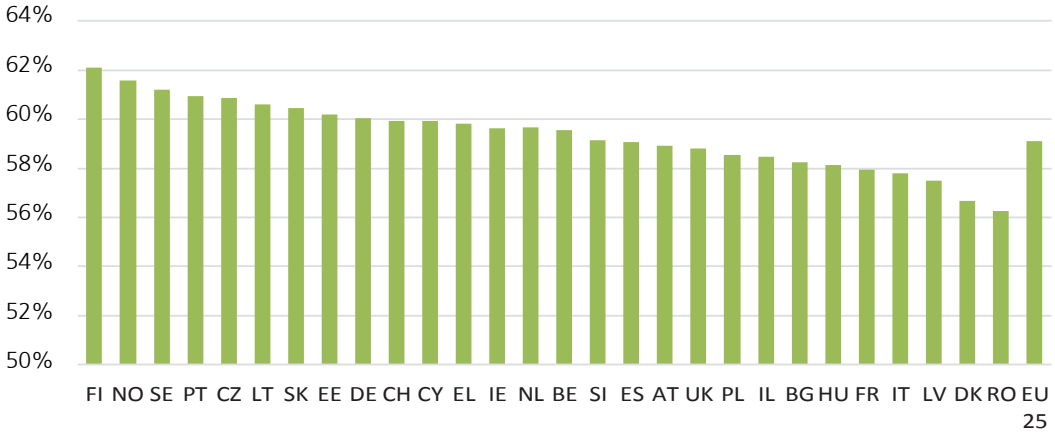
	★★★★★	★★★★	★★★	★★
2010-2011	40%	25%	15%	10%
2012-2013	60%	50%	25%	15%
2014-2015	60%	50%	40%	20%
2016-2017	60%	50%	40%	30%

[21] ETSC (2015), Making walking and cycling on Europe's roads safer, 29th PIN Flash report
[22] Euro NCAP, Pedestrian protection
[23] Johan Strandroth et al, The correlation between pedestrian injury severity in real-life crashes and Euro NCAP pedestrian test results, 2011

New cars sold in Finland and Norway in 2013 achieved, on average, 62% of the points for pedestrian protection, which is the best across the EU (Fig.5). Sweden, Portugal and the Czech Republic follow with a 61% score. However, new cars sold in Romania and Denmark received only 56% and 57% scores respectively.

A study by BASt shows that each additional point in the Euro NCAP pedestrian protection score reduces probability of road death by 2.5% and serious injury by 1%.[24] The 6% points lower average performance of new cars sold in Romania and Denmark (corresponding to a difference of 2.16 points) would translate into an increased risk of a pedestrian being killed by 5.4% in case of a collision and of being seriously injured by 2.6% compared to Finland and Norway.

Figure 5. Average score (in %) of pedestrian protection for new cars sold in 2013. Fig.5 does not take into account non-tested cars or cars tested prior 2010 or after 2013. Data are not available for HR, LU and MT.



"Most car manufacturers are still investing in pedestrian safety just to reach the minimum threshold to get 5 stars. It is disappointing that in the last decade the car industry has not found any solution on how to provide adequate pedestrian protection design in the most frequent pedestrian to car collision scenarios. In-depth accident analysis in Germany shows that the number of pedestrians seriously injured following an impact with a bonnet leading edge is not going down as we had expected after the updates in testing procedures had been introduced.

A revision of the EU legislation is badly needed mandating protection tests in the impact with windscreen, including A-pillar, and stronger regulation for the bonnet leading edge should apply. The potential of passive pedestrian protection safety measures can be maximised when coupled with collision avoidance systems, such as AEB, that can mitigate or prevent the accident. AEB systems should be used to increase the proportion of pedestrians protected, not as a reason to remove protection."
Prof. Dietmar Otte, Medical University of Hannover, Germany

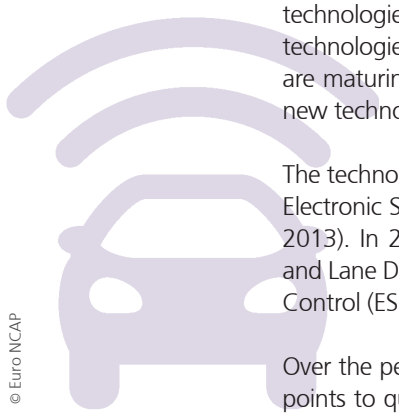
From 2016 onwards, the pedestrian protection score also includes points for Autonomous Emergency Braking (AEB) systems able to detect pedestrians and from 2018 for AEB systems that can detect cyclists.[25]

Denmark: looking at the possibility to introduce a tax incentive to promote AEB systems able to detect pedestrians

"Compared to other EU countries, Denmark and The Netherlands have a very high proportion of cyclists and, as a result, a lot of cyclist deaths and serious injuries. AEB systems able to detect cyclists and pedestrians are therefore of special interests for Denmark. We hope that those systems will be considered for tax reductions in the future."
Jesper Sølund, Danish Road Safety Council

[24] BASt, Claus Pastor, The correlation between pedestrian injury severity in real-life crashed and Euro NCAP pedestrian tests results, 2013
[25] Euro NCAP, Euro NCAP puts autonomous pedestrian detection on the test, 2015

2.6 Safety assist



The Safety Assist score is determined by testing the performance of in-vehicle safety technologies which help to avoid or mitigate collisions and injuries.[26] In addition, technologies should be standard on the great majority of the cars sold. As technologies are maturing, Euro NCAP is increasing the requirements for safety assist and is adding new technologies to the assessment.[27]

The technologies tested between 2010 and 2013 were Seat Belt Reminders (3 points[28]), Electronic Stability Control (ESC) (3 points) and Speed Assistance (1 point raised to 3 in 2013). In 2014, points for Interurban Autonomous Emergency Braking (AEB) System and Lane Departure Warning systems were introduced and points for Electronic Stability Control (ESC) withdrawn as ESC became mandatory in all new vehicles in the EU.[29]

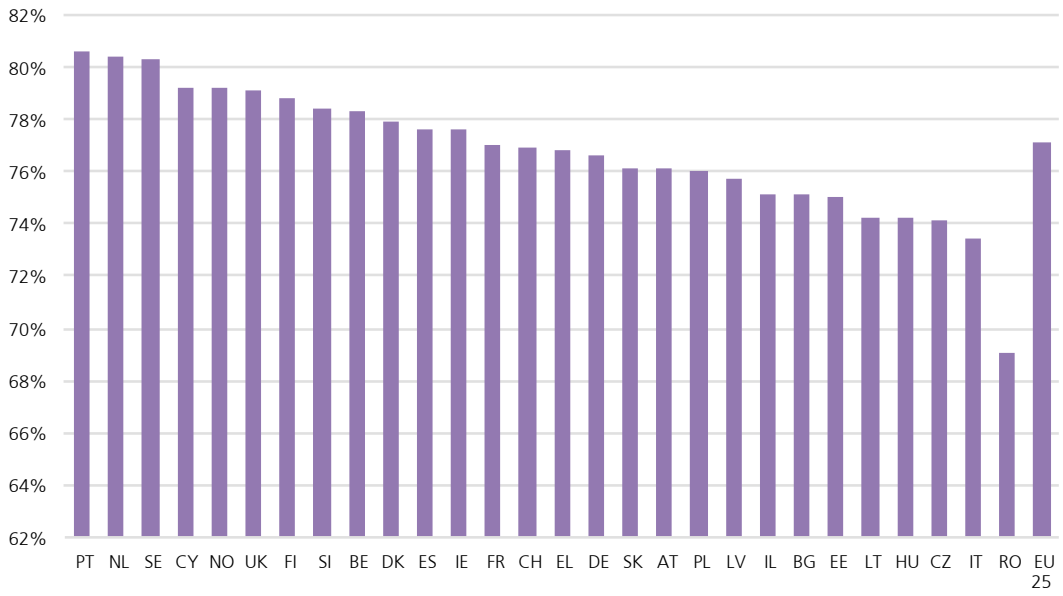
Over the period 2010-2011, the cars had to score at least 60% out of the maximum 7 points to qualify for 5 stars. In 2013, two additional points were allocated to promote Intelligent Speed Assistance systems and the requirement was raised to 65% out of the maximum 9 points (Table 4).

Table 4. Scores (in %) and corresponding stars for Safety Assist.
2015-2017 for indication.

	★★★★★	★★★★	★★★	★★
2009-2012	60%	40%	25%	15%
2013-2014	65%	55%	30%	20%
2015	70%	60%	40%	20%
2016-2017	50%	40%	25%	15%

New cars sold in 2013 in Portugal, The Netherlands and Sweden had reached on average 81% of the points for in-vehicle safety technologies (Fig.6). In contrast, cars sold in Romania had reached only 69% of the points for "safety assist', in Italy 73% and in the Czech Republic, Hungary and Lithuania 74%.

Figure 6. Average score (in %) for Safety Assist for new cars sold in 2013.
Fig.6 does not take into account non-tested cars or cars tested prior 2010 or after 2013. Data are not available for HR, LU and MT.



[26] Euro NCAP, Safety assist
[27] Euro NCAP, Assessment protocol – safety assist, Version 6.0, July 2013
[28] 2 points for all front seats with audible and visual signal and an extra point for the rear seats provided the front seats have 2 points.
[29] Euro NCAP, Electronic stability control

2.7 Background – big differences in national markets

No specific studies have been carried out to identify the causes of the differences in safety levels of average new cars sold across Europe, but they are likely to follow from a combination of factors

2.7.1 The most common consumer choice - small family cars and superminis

No specific studies have been carried out to identify the causes of the differences in safety levels of average new cars sold across Europe, but they are likely to follow from a combination of factors. These include differences in national market characteristics such as purchasing power, tax levels, availability of models, or cultural and mobility patterns.

Fig.7 shows big differences in consumer preferences for particular car categories between countries. Supermini cars sold best across the EU among Euro NCAP tested cars, representing 32% of all Euro NCAP tested cars sold, followed by small family cars (30%) and large family cars (13%).

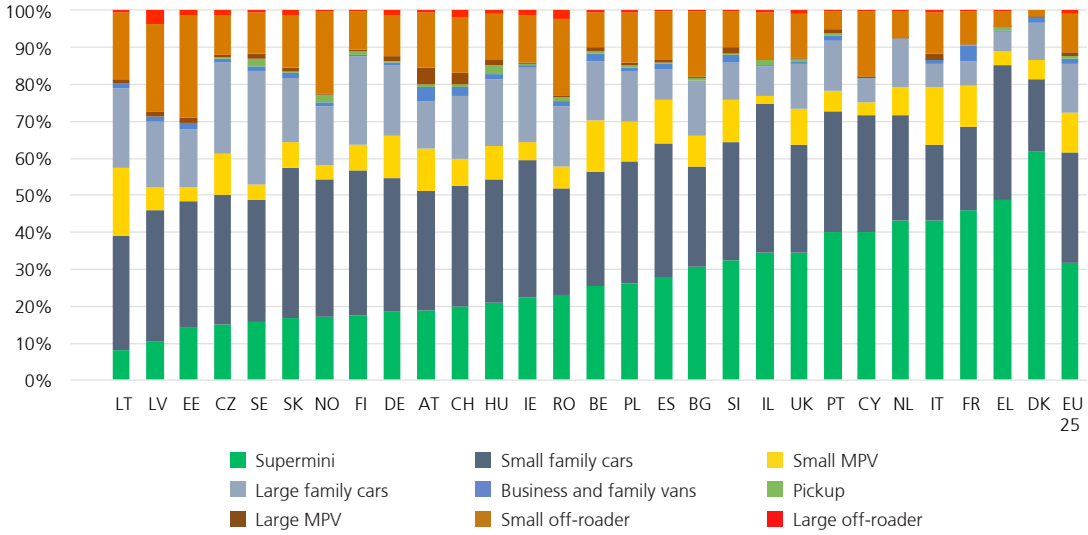


Figure 7. Proportion (in %) of cars according to car classification categories identified by the manufacturers among the new cars sold in 2013 tested by Euro NCAP, in the order of increasing proportion of Superminis. Fig.7 does not take into account non-tested cars or cars tested prior 2010 or after 2013. Data are not available for HR, LU and MT.

Superminis were sold in the highest proportion in Denmark, where they represent 62% of all cars sold in 2013 that had been tested by Euro NCAP, followed by Greece (49%), France (46%), Italy and The Netherlands (43%). The high proportion of superminis among new cars sold partly explains the lower scores in adult occupant and pedestrian protection in these countries - on average superminis scored lower in these areas of assessment compared to the other popular car categories (Fig.8). As many as 33% of supermini car models have been awarded 4 and 3 stars in Denmark and this explains the country's poorer performance in Fig.3, Fig.4 and Fig.5.

The countries in which the highest proportions of consumers buy small family cars are Slovakia and Israel, where they represented 41% and 40% accordingly of the new cars sold in 2013 tested by Euro NCAP. Small family cars are also popular in Finland with 39%, Ireland, Norway and Greece (37%). On average, this car category achieved higher scores for car occupant and pedestrian protection compared to the other popular categories of cars (Fig.8).

Large family cars are most common in Sweden with 31%, the Czech Republic with 25% and Finland with 24% of all new cars sold in 2013 tested by Euro NCAP. This category of cars on average provide better all-round protection compared to the other popular car categories (Fig.8).

Car classification categories

Euro NCAP uses ten car categories:

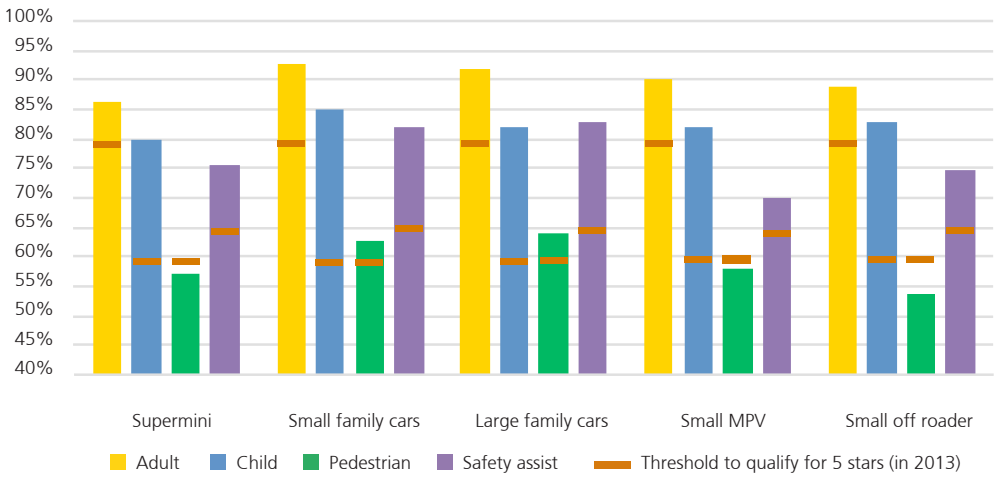
- Superminis (subcompacts, city cars), e.g. Ford Fiesta, Fiat Panda, Dacia Sandero
- Small family cars (compact cars), e.g. Volkswagen Golf, Peugeot 308, Toyota Auris
- Large family cars (mid-size cars, compact executive cars), e.g. BMW series 5, Lancia Thema
- Executive cars (full-size cars), e.g. Audi A6
- Small multi-purpose Vehicles (MPVs) (compact minivans), e.g. Kia Venga, Opel Meriva
- Small off-roaders (mini-, compact Sport Utility Vehicle (SUV)), e.g. Subaru Forester, Honda CRV
- Business and family vans (minivans with three rows for passenger seats), e.g Citroën Jumpy
- Roadsters sports (roadster), e.g. Audi TT
- Large off-roaders (mid-, full- size SUV), e.g. Range Rover
- Large multi-purpose Vehicles (MPVs) (minivans), e.g. Seat Alhambra
- Pick-ups (pick-up trucks), e.g. Ford Ranger

Business and family vans, roadsters sports, large off roaders, large MPVs and pick-ups are excluded from the Fig.8 as each of those categories represents less than 2% of the new cars sold in 2013 tested over the period 2010-2013 by Euro NCAP. Due to similar structure of the car, large family cars and executive cars are included in the large family car category.

2.7.2 Different car categories offer different all-round protection

Fig.8 shows average all round protection offered by different car categories as identified by the manufacturers[30]. Small and large family cars provide better all-round protection than other popular car categories in the EU. Small and large family cars on average score 93% and 92% of the points for adult occupant protection respectively, 85% and 82% for child occupant protection, 63% and 64% for pedestrian protection and 82% and 83% for safety assist. In contrast, superminis perform less well, a category representing 32% of all new cars sold in the EU in 2013 that were tested by Euro NCAP. On average superminis reached 86% of the points for adult occupant protection, 80% for child occupant protection and as low as 57% for pedestrian protection.

Figure 8. Average EU-25 scores (in %) for adult occupant protection, child occupant protection, pedestrian protection and safety assist for some car categories tested by Euro NCAP in 2010-2013 and sold in 2013. Data are not available for HR, LU and MT



[30] Car classification is used by manufacturers for different purposes and it provides general understanding about vehicle's size, power and design. However, car classification is rather subjective as there is no agreement on precise definitions among the manufacturers and in some cases one car model might cover several categories.

Pedestrian safety is still overlooked by car makers.

All car categories shown in Fig.8 are, on average, exceeding by a good margin the 80% threshold in adult occupant protection required for a 5-star rating. Manufacturers have for decades prioritised improvements in occupant protection. They are also responding to the new challenge of installing safety technologies - all car categories shown in Fig.8 are exceeding the threshold of 65% of the points for safety assist to qualify for the 5-star rating in 2013. It shows that in-vehicle technologies tested by Euro NCAP are mature enough and car manufacturers are ready to provide higher safety technology standards than the required minimum. However, pedestrian safety is still overlooked by car makers. Large family cars, which is the best performing car category for pedestrian protection, on average score only 64%. Small-off roaders, superminis and small multi-purpose vehicles on average do not reach the required 60% scores to qualify for 5-star rating. This is an alarming result that shows pedestrians do not benefit from car safety improvements at the same levels as car occupants.

2.7.3 New cars represent only 4.8% of the total car fleet in the EU

Around 11.9 million new cars were registered in 2013 in EU countries. New cars sold in 2013 represented 4.8% of the total car fleet of 248 million in the EU (Fig.9), 5-star Euro NCAP cars accounting for only 2.5% of the total car fleet.

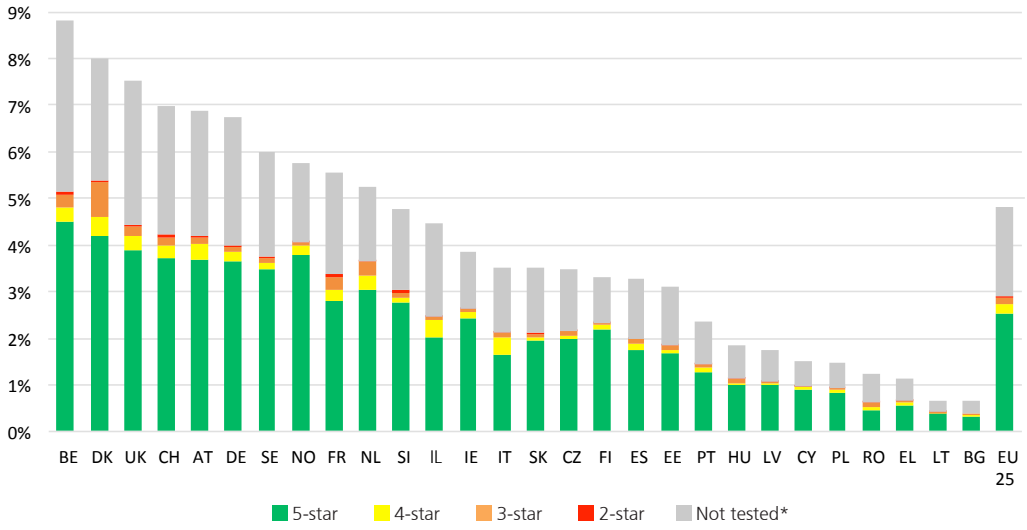


Figure 9. Proportion (in %) of 5-star, 4-star, 3-star, 2-star and non-tested new cars among all registered cars in 2013. HR, LU and MT are excluded from the figure due to the lack of data on Euro NCAP tested cars. Data source of new cars registered in 2013: EU Transport in Figures, Statistical Pocketbook 2015[31]. *Non tested car category includes not tested cars or cars tested prior 2010 or after 2013 by Euro NCAP.

The proportion of new cars among all registered cars in 2013 was the highest in Belgium (9%), Denmark (8%) and the UK (7.5%). In contrast, the proportion of new cars in Eastern and Southern European countries is far lower with less than 0.7% in Bulgaria and Lithuania, 1% in Greece and Romania, 1.5% in Poland and Cyprus.

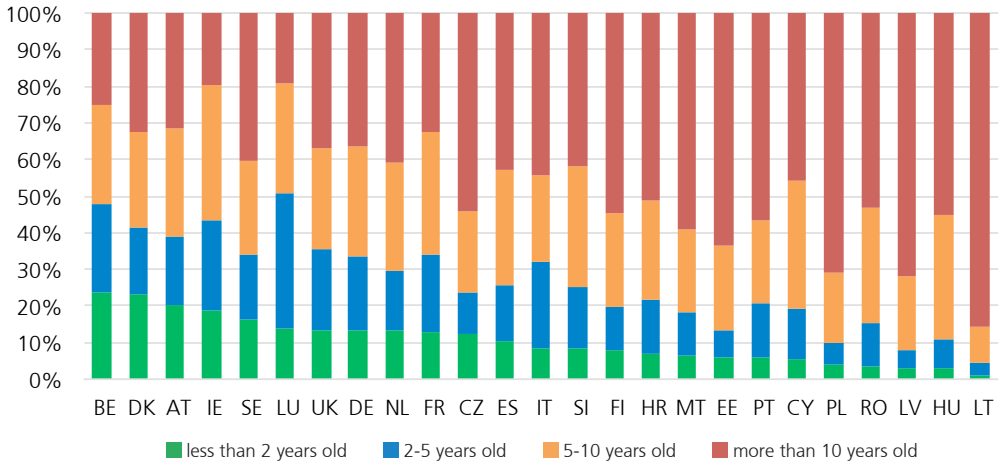
In recent years the decline in new cars sales was most visible in the Southern EU member states. In Spain, the number of new car registrations fell by more than 50% between 2007 and 2013.[32]

In the case of Eastern and Central Europe, higher imports of second–hand cars from Western countries affect car markets substantially. Generally, second hand cars are less safe than new cars because they are older and may pose additional hazards as they might have already been involved in a collision. The car might have been improperly repaired or simply not restored to the original safety specification due to technical constraints and extra costs. For example, airbags might have been deployed but not been replaced before the car was sold again.

[31] European Commission, EU transport in figures, statistical pocketbook 2015
[32] The International Council on Clean Transportation, European vehicle market statistics, pocketbook 2015

According to the European car manufacturer association (ACEA), cars on the EU's roads are on average 9.7 years old.[33] Countries with the oldest car fleet are Lithuania, where 86% of the cars are 10 years or older, Latvia (72%), Poland (71%) and Estonia (64%) (Fig.10). More than half of the cars are also older than 10 years in Malta, Portugal, Hungary, Finland, the Czech Republic, Romania and Croatia. Higher market penetration of new cars awarded 5 Euro NCAP stars could make a substantial difference in improving road safety in those countries.

Figure 10. The proportion (in %) of cars by age in 2012.
BG, EL, IL, NO and SK are excluded as the data were not available.



The reader should bear in mind that vehicle safety is an integral part of overall road safety. Combined measures, including road safety management, infrastructure and road user behaviour, should complement developments in vehicle safety performance in order to reach effective road safety results. Belgium has one of the highest proportion of new cars sold in the EU and, yet, the highest road mortality compared to other Western European countries. In contrast, Finland has one of the oldest car fleets in the EU but it is among the safest countries for road users.

2.7.4 What can national governments do? Create a market for safety

Even though vehicle standards are set at an international level, national governments can influence the consumer's choice of vehicles. They can provide incentives, for example in the form of tax breaks, to purchase safer and environmentally friendly cars. Taxation should reflect climate change challenges and road safety – not promote one issue at the expense of the other. At the moment this is unfortunately not the case, and schemes to promote the purchase of environmentally friendly cars have had unforeseen adverse impact on safety. Governments can also play a role in promoting safety as a criterion for consumers to consider by running consumer awareness campaigns.

In Europe, a large proportion of new cars are purchased by institutional customers. All institutional customers, such as government bodies, local authorities and companies can play an important role by including specific requirements on minimum safety levels in their vehicle purchase and leasing policies. In doing so, public authorities and companies can contribute to the market penetration of safer cars by supporting the demand for such cars and for safety technologies, which, hopefully, in turn will help lower the price of these same safety technologies.

[33] ACEA, The automobile industry pocket guide 2015-2016

Recommendations to Member States

- Include strict criteria for safety (5-star Euro NCAP cars) to tax deduction schemes for more environmentally-friendly vehicles, to avoid adverse consequences on safety of new cars.
- Encourage the faster uptake of safer vehicles via procurement policies requiring public bodies and their contractors to buy, lease or rent only 5-star Euro NCAP cars.
- Raise consumer awareness by launching information campaigns on the benefits of in-vehicle safety technologies and 5-star Euro NCAP cars.
- Encourage motor insurers to take into account car safety features in the setting of insurance premiums.

The Finnish Transport Safety Agency (TraFi) ensures its employees drive safer cars

The Finnish Transport Safety agency can only buy or rent 5-star Euro NCAP cars. TraFi policy also states that in case of contradiction between safety and environmental considerations, passenger safety must be prioritised.[34]

Swedish Transport Administration leading the way to improved car safety

The Swedish Transport Administration, a government body, is leading the way in terms of improving vehicle safety by setting high vehicle safety standards for its fleet - it demands 5 Euro NCAP star cars. The Swedish Government is also demanding from all governmental bodies to only use cars with high occupant and pedestrian protection scores.

UK to consider encouraging purchase of 5-star Euro NCAP cars

The UK Department for Transport is considering encouraging faster uptake of safer vehicles via the promotion of consumer information and the procurement of safer vehicles by Government departments[35].

"PACTS warmly welcomes the announcement by the UK Government that it will encourage faster uptake of safer vehicles, one of our longstanding recommendations. The National Health Service, one of the public bodies which has the largest procurement budget and a clear interest in preventing death and injury, could set the example already and buy or lease only 5 star cars."
David Davies, Parliamentary Advisory Council for Transport Safety (PACTS), UK

[34] ETSC, PRAISE report: Reducing road risk at work through procurement, 2015
[35] Gov.uk, Moving road transport forward, 2015

PART III
EURO NCAP BRAND-BY-BRAND STATUS REPORT

Out of 100 cars sold in 2013 and tested by Euro NCAP between 2010 and 2013, 12 were Volkswagens, there were almost 11 Fords, 8 BMWs and 7 Peugeots, the rest (62 out of 100) are from a broad range of car brands (Fig.11).

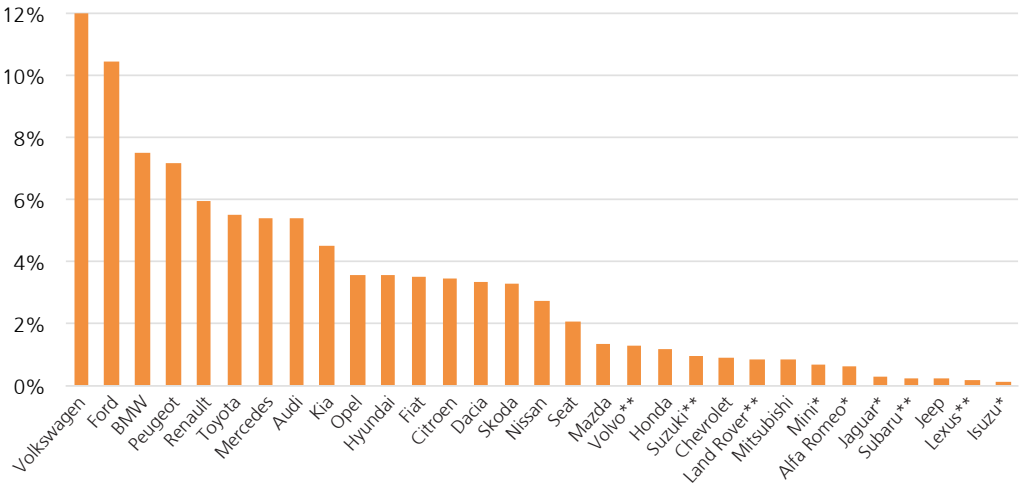


Figure 11. Market penetration of Euro NCAP tested cars over the period 2010-2013 sold in 2013 by manufacturer.
*One model tested over the period 2010-2013. **Two models tested over the period 2010-2013. Other manufacturers had more than three models tested.

Figures 12 to 15 show how car makers perform on average in each of the four areas assessed by Euro NCAP.[36] Twenty eight manufacturers and 135 models tested by Euro NCAP between 2010 and 2013 are considered. Manufacturers who had only one model tested over the period 2010-2013 by Euro NCAP are excluded from Figs.12 to 15.

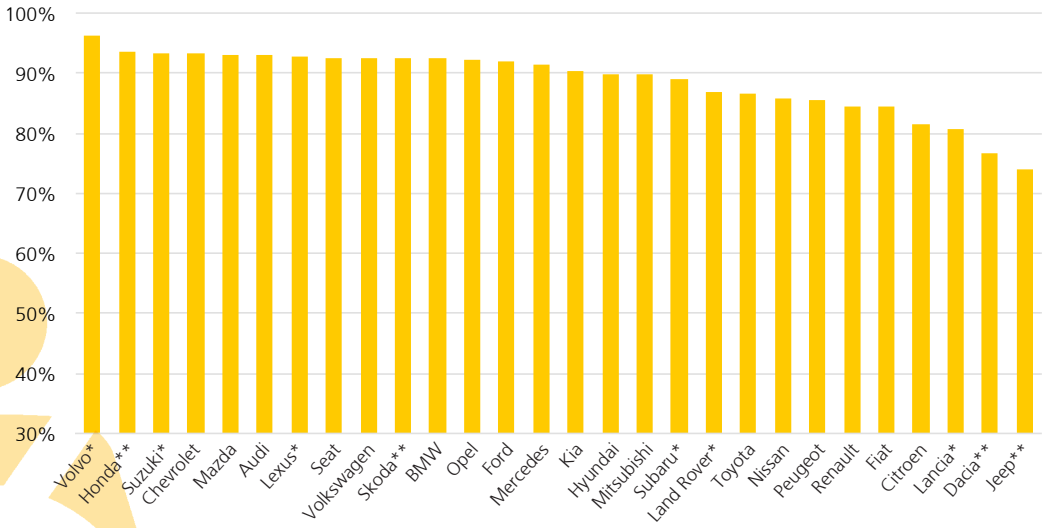
Twenty eight manufacturers and 135 models tested by Euro NCAP between 2010 and 2013 are considered

[36] Method of calculation: e.g. Four Audi models were tested by Euro NCAP over 2010-2013 (the Audi A1, A3, A6 and Q3). The total number of all four models sold in 2013 in the EU25 was calculated. In addition, total scores based on sales in 2013 for each of the four areas of assessment were calculated by multiplying the total number of each model sales by the scores it achieved for each of the four boxes. At the final step, the total scores for each individual box were divided by the total number of all four Audi models sold in 2013 in the EU25.

3.1 Manufacturer performance in adult occupant protection

All car makers, except Jeep and Dacia, exceeded, on average, the threshold of 80% of the points for adult occupant protection to qualify for 5 stars (Fig.12).

Figure 12. Average score (in %) for adult occupant protection by manufacturer among new cars sold in the EU25 in 2013 and tested over the period 2010-2013 by Euro NCAP. *Two models tested over 2010-2013. **Three models tested in 2010-2013.

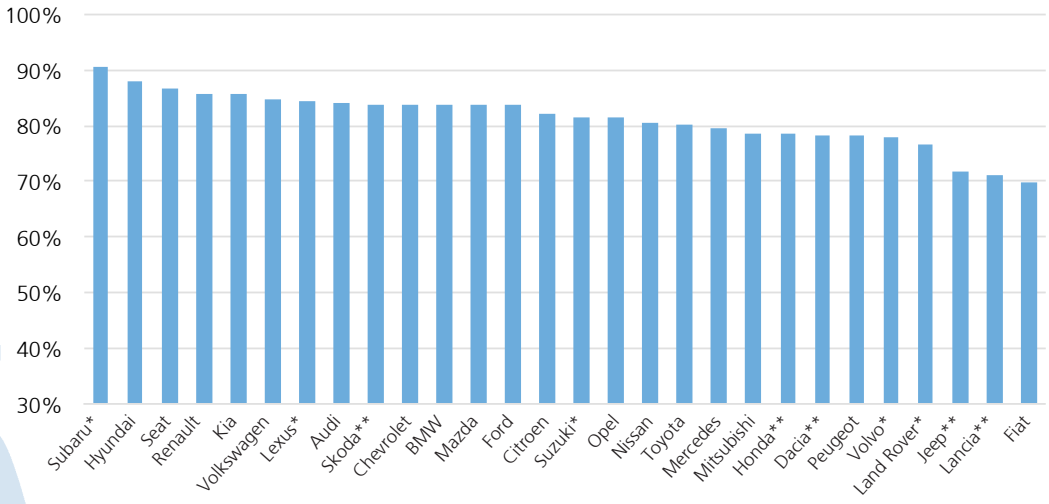


Volvo tops the ranking reaching on average 96% of the points for adult occupant protection. Jeep and Dacia tested cars not only clearly underperform in adult occupant protection but also in pedestrian protection and safety assist (Fig.14 and 15).

3.2 Manufacturer performance in child occupant protection

All car manufacturers included in Fig.13 exceeded, on average, with an appreciable margin the threshold of 60% of the points required for child occupant protection to qualify for 5 stars in 2013.

Figure 13. Average score (in %) for child occupant protection by manufacturer among new cars sold in the EU25 in 2013 and tested over the period 2010-2013 by Euro NCAP. *Two models tested over the period 2010-2013. **Three models tested over the period 2010-2013.



Subaru cars received on average 91% of the points for child occupant protection, followed by Hyundai (88%) and Seat (87%). Fiat, Lancia and Jeep disappoint with average scores of only 70%, 71% and 72% of the points for child occupant protection respectively.

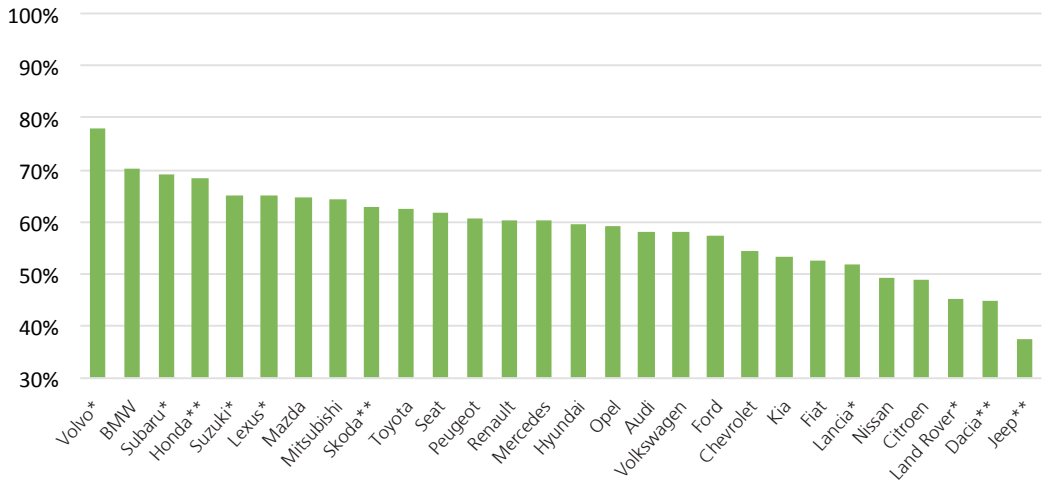
© Euro NCAP

3.3 Big differences between manufacturers in the protection of pedestrians

In contrast with adult and child occupant protection, performance in pedestrian protection varies greatly between car brands. Half failed the 60% threshold needed for a car to qualify for 5 stars in 2013 (Fig.14).[37] None of the car makers reached 80% of the points for pedestrian protection compared to adult and child occupant protections where the majority of manufacturers exceeded 80%.

As well as leading overall, Volvo was the best performer on pedestrian protection, scoring, on average, 78% of the points. This was followed by BMW (70%), Subaru (69%) and Honda (68%). The worst performer in pedestrian protection were Jeep Compass and Cherokee models which scored, on average, only 38%. Much more effort on pedestrian protection is also needed from Dacia, Land Rover (45%), Citroen and Nissan (49%).

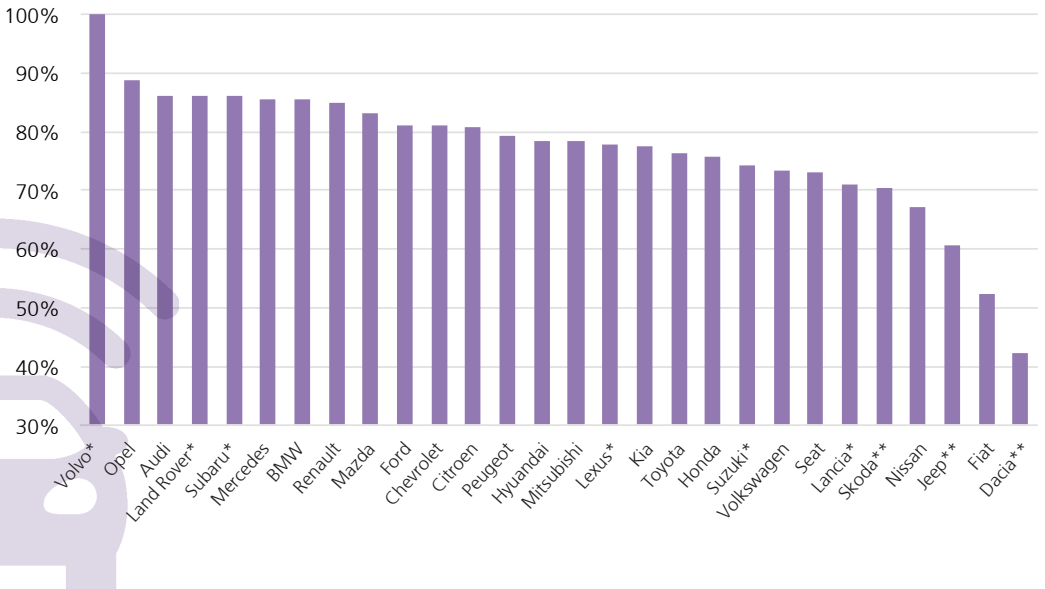
Figure 14. Average score (in %) for pedestrian protection by manufacturer among new cars sold in the EU25 in 2013 and tested over the period 2010-2013 by Euro NCAP.
*Two models tested over the period 2010-2013. **Three models tested over the period 2010-2013.

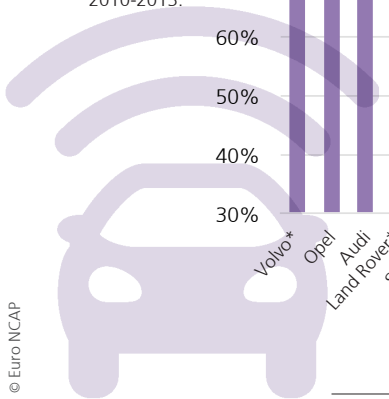


3.4 Manufacturer performance in safety assist

Volvo is also a leader in safety assist (Fig.15). The V60 and V40 models, both tested in 2012, are equipped with seat belt reminders on all seats, Electronic Stability Control and a driver-set speed limitation device as standard. The two models were awarded all 7 points for safety assist and received an advanced award for the City Autonomous Emergency Braking system which helps to avoid low speed collisions.

Figure 15. Average score (in %) for safety assist by manufacturer among new cars sold in the EU25 in 2013 and tested in 2010-2013 by Euro NCAP.
*Two models tested over the period 2010-2013. **Three models tested over the period 2010-2013.





© Euro NCAP

[37] The threshold for pedestrian protection to qualify for 5-star was increased in 2012 from 40% to 60%. As a result, car models that achieved 40% of the points for pedestrian protection would have qualified for 5-star in 2010 and 2011 but not in 2012 and 2013.

PART IV
LIMITATIONS OF THE EURO NCAP PROGRAMME

4.1 Laboratory tests versus real world collision outcomes

There are two methods for assessing a car's crashworthiness: analysis of real world collisions and crash tests.[38] Both EU type approval and Euro NCAP rely exclusively on laboratory testing to well-known test protocols.

Laboratory crash testing can only provide a limited evaluation of the overall safety level of a specific car model in an artificial environment. The real world performance gives a more comprehensive picture of the safety level from a variety of real-world representative collision types and their outcomes.[39] Neither approach guarantees a perfect rating system but both can complement each other and have the potential to produce consistent consumer information about the relative safety of cars.[40] While real-life collision data can only be retrospective, laboratory testing is the only way to predict how a new car model might perform in most common collision scenarios.

Only a few studies have researched the relationship between Euro NCAP ratings and real world collision outcomes. Research carried out in 2001[41], 2002[42], 2006[43] and 2010[44] found a significant correlation between Euro NCAP scores for adult protection and real world collision outcomes on average. Similarly, two studies found a significant correlation between Euro NCAP scores for pedestrian protection and real world injury outcomes in Germany[45] and Sweden[46]. However, research has also shown that on the individual model level, a higher Euro NCAP score does not necessarily lead to a higher level of safety in a collision.[47]

The Swedish insurer Folksam annually updates their assessment of the safety of cars sold in Sweden, according to both their involvement in injury collisions in Sweden if any and/or their performance in Euro NCAP tests. Consumers can access the ratings online.[48] In the 2015 English summary, Folksam concludes that the safest cars are the ones that show good performance in both collisions and Euro NCAP crash tests. But Folksam recommends consumers to purchase cars based firstly on Folksam's rating of real world performance and secondly on Euro NCAP star ratings, if the two differ.[49]

[38] Folksam, Car safety rating 2015
[39] Anders Kullgren et al. Comparison between Euro NCAP Test Results and Real-World Crash Data, 2010
[40] Klaus Langwieder et al. SARAC – safety rating based on real-world crashes for supplementation of new car assessment programs
[41] Anders Lie et al. Comparison of Euro NCAP test results with Folksam car model safety ratings, 2001
[42] Anders Lie et al. How do Euro NCAP results correlate with real-life injury risks? A paired comparison study of car-to-car crashes, 2002
[43] CEA, Insurers of Europe, Quality criteria for the safety assessment of cars based on real world crashes, 2006
[44] Anders Kullgren et al. Comparison between Euro NCAP Test Results and Real-World Crash Data, 2010
[45] Ibid
[46] Johan Strandroth et al, The correlation between pedestrian injury severity in real-life crashes and Euro NCAP pedestrian test results, 2011
[47] CEA, Insurers of Europe, Quality criteria for the safety assessment of cars based on real world crashes, 2006
[48] Folksam, Hur säker är bilen?
[49] Folksam, Car safety rating 2015 (in English)

Pan-European studies should be performed regularly to assess the validity of laboratory tests, using in-depth collision investigation reports from different EU countries. ETSC would also encourage the need to document the real-world effectiveness of the different new vehicle safety measures. At the moment however, police and in-depth collision reports do not provide information about the availability of safety technologies in the vehicles involved in a collision as this information is not readily accessible. Standardised codes should be added to the unique Vehicle Identification Number (VIN)[50] for each safety technology present and collision reports should include this information.

Car manufacturers are building a new database, IGLAD, containing standardised collision data enabling comparisons between datasets from different countries.[51] The database is being developed and contains data on around 1,550 collisions from 10 countries. As more collisions are added covering more countries, this database could contribute to increase the knowledge on performance of safety systems as it includes data on the presence of safety systems, information that is often missing in collision reports. Currently, police are not able to easily find out whether a vehicle was equipped with Automated Emergency Braking, for instance. This database is also not open to public scrutiny, and access is limited so far to members of the IGLAD consortium.

Recommendations to car manufacturers

- Include information on in-vehicle safety technologies fitted on a model in its Vehicle Identification Number (VIN).
- Donate 1 Euro (or more) when a new car is sold to fund IGLAD (or a new pan European database) or invite their clients to do so.

Recommendations to EU institutions

- Implement the recommendations of the EU funded research project DaCoTA on in-depth accident investigations and build an EU common in-depth accident investigation database. These could be funded by a negligible (i.e. 1 euro) fee on the price of a new car.
- Require manufacturers to provide information on in-vehicle safety technologies fitted on a model in its Vehicle Identification Number (VIN).
- Recommend Member States to include data on safety systems (based on the information provided by VINs) into collision reports to assess the effectiveness of safety technologies.
- Mandate Event Data Recorders in all new vehicles and require the data to be made available for accident investigation.

Recommendation to Member States

- Include information on in-vehicle safety technologies fitted on a model, when available, into collision reports to assess the effectiveness of safety technologies.

[50] https://en.wikipedia.org/wiki/Vehicle_identification_number.
Modern-day VIN systems are based on two related standards, originally issued by the International Organisation for Standardisation (ISO) in 1979 and 1980; ISO 3779 and ISO 3780, respectively. Compatible but somewhat different implementations of these ISO standards have been adopted by the EU and the USA.

[51] IGLAD, Initiative for the global harmonisation of accident data

4.2 The risks of optimising for crash tests

Regulatory and consumer crash tests for new vehicles have been in place for several years. Over time, more and more vehicles are awarded the highest ratings. But optimising car design to pass regulatory or consumer tests can lead to undesirable real world outcomes.

When the US Insurance Institute for Highway Safety (IIHS) began testing cars using a new 'small overlap' crash test in 2012, many cars performed poorly, despite the test reflecting a relatively common type of frontal crash (for example, the vehicle hitting a tree head-on). As the IIHS said at the time: "Most automakers design their vehicles to ace our moderate overlap frontal test and NHTSA's [the US regulator] full-width frontal test, but the problem of small overlap crashes hasn't been addressed. We hope our new rating program will change that."[52]

The response of some carmakers to the new test also highlights the risks of optimisation. Since the tests were introduced, the IIHS has reportedly become suspicious that some manufacturers were only improving the structural safety of their vehicles on the left, driver side, - the side of the vehicle used in the test - and not on the right, passenger side. An investigation is under way, which will include some small overlap crash tests being carried out on the passenger side.[53]

Recommendation to EU institutions

- Mandate an evaluation study on crash worthiness optimisation.

[52] Insurance Institute for Highway Safety, New crash test aims to drive improvements in protecting people in frontal crashes, 2012

[53] Edmunds, IIHS to take hard look at passenger-side crash protection, 2015

PART V
MAKING VEHICLES SAFER

5.1 Two major revisions of EU legislation on car safety due in 2016

Euro NCAP has changed the market for vehicle safety. However, Euro NCAP cannot test all models of car and permits variations in safety equipment for the same model between EU Member States. Strong EU legislation is therefore needed in order to reach the lower priced segments of the market and address aspects of protection that are less attractive to car buyers.

The EU has exclusive competence on vehicle safety measures and vehicle type approval. These legally-binding tools represent the most direct and effective measures the EU has at its disposal to reduce road casualties.

As the EU has exclusive competence on vehicle safety measures and vehicle type approval under Article 114 of the EU treaty, these legally-binding tools represent the most direct and effective measures the EU has at its disposal to further reduce the numbers of deaths and injuries on the road. Those numbers would have been significantly higher had it not been for the measures already taken by the EU to mandate improvements in vehicle passive and active safety, most recently in 2009 in the last revision of the General Safety Regulation.

Key vehicle safety technologies already mandatory in the EU

- ISOFIX anchoring system - mandatory in all new types of vehicles in the rear seats since 2012 and all new vehicles since 2014[54]
- Visual and audible seat belt reminders on driver's seat – mandatory in all new types of vehicles since 2012 and all new vehicles since 2014[55]
- Advanced Emergency Braking systems – mandatory in all new types of HGVs and buses since 2013 and for all new HGVs and buses since 2015[56]
- Lane Departure warning system – mandatory in all new types of HGVs and buses since 2013 and for all new HGVs and buses since 2014[57]
- Electronic Stability Control – mandatory in all new types of vehicles since 2011 and for all new vehicles since 2014[58]
- eCall – mandatory in all new cars and vans by 2018[59]

Yet EU legislation on passive safety has not changed much over the last decade and, as a result, type approval crash tests need to be updated. In addition, since the last revision of these laws, new technologies have developed rapidly and should be included. The European Commission is due to revise the General Safety Regulation and the Pedestrian Protection Regulation which set minimum requirements for all new motor vehicles to be sold in the EU market.

Revision of the General Safety Regulation and the Pedestrian Protection Regulation offers a unique opportunity to maximise safety benefits for all by mandating new in-vehicle life-saving technologies and improved vehicle protection tests for both car occupants and vulnerable road users. The life-saving potential of the proposal to revise both regulations will depend on which vehicle safety measures are prioritised for fitment, to which vehicle types and by when.[60]

[54] European Commission, Press release, Cars safer from 1 November 2012
[55] Ibid
[56] European Commission, Mobility and transport, Intelligent transport systems
[57] Ibid
[58] Ibid
[59] European Commission, Digital agenda for Europe, eCall: Time saved=lives saved
[60] ETSC Position Paper, Revision of the General Safety Regulation, 2015 March

Recommendations to EU institutions

- Regularly monitor developments in passive and active safety technologies for market penetration and/or eventual legislation.
- Revise legislation on car CO_2 labelling and marketing to require inclusion of Euro NCAP test results when they are available ("Stars on cars!").
- Require manufacturers to publish their tests to show compliance with Human Machine Interface (HMI) Guidance Statement of Principle on in-vehicle information and infotainment systems.

Recommendations to Manufacturers

- Offer safety features as standard rather than as options at extra cost.
- Help avoid customer confusion by introducing generic names for safety technologies in place of a variety of different marketing terms currently used to describe what are essentially the same features. Electronic Stability Control is a previous example of generic term that replaced various marketing names. Automated Emergency Braking is currently known as 'City Emergency Braking', 'City Safety', 'City Brake Control', 'Safety Sense', 'Collision Mitigation Braking System' and others, for example.

5.1.1 Safer car fronts

In most of the collisions involving pedestrians or cyclists and a car, the impact occurs between these vulnerable users and the front of the vehicle, making the frontal area of the car of particular importance. The EU Directive 2009/78 on Pedestrian Protection[61] prescribes minimum passive safety standards for more forgiving car fronts, including shock absorbing areas where the pedestrian's head would hit the car bonnet in the event of a collision. An update of motor vehicles testing procedures could incorporate improvements in the crush depth available in the event of a collision with an unprotected road user and therefore reduce the number and severity of injuries.

German and Swedish research based on real-life collisions confirms the validity of pedestrian protection tests done by Euro NCAP.[62] A study from the German Federal Highway Research Institute (BASt) found that a vehicle scoring 22 points reduces pedestrian death risk by 35% and serious injury by 16% compared to a vehicle scoring 5 points.[63]

Improvements in pedestrian protection, mainly a matter of engineering in the design phase, are cost-effective

The Swedish study evaluated a correlation between Euro NCAP pedestrian protection test result scores and car-to-pedestrian and car-to-cyclist injury collisions. It found that large reductions both of injury severity and the risk of permanent medical impairment can be achieved for cars with better Euro NCAP pedestrian scoring. The study also showed that pedestrian friendly car fronts can yield benefits for cyclists too, although the injury reduction is slightly lower.[64] It concluded that since improvements in pedestrian protection require only minor additional technology and are mainly a matter of engineering in the design phase, the cost could be considered low compared to other vehicle safety systems relative to their benefits.[65]

[61] Regulation (EC) No 78/2009 of the European Parliament and of the Council of 14 January 2009 on the type-approval of motor vehicles with regard to the protection of pedestrians and other vulnerable road users, amending Directive 2007/46/EC and repealing Directives 2003/102/EC and 2005/66/EC
[62] BASt, Claus Pastor, The correlation between pedestrian injury severity in real-life crashed and Euro NCAP pedestrian tests results, 2013
[63] Ibid
[64] Johan Strandroth et al, The correlation between pedestrian injury severity in real-life crashes and Euro NCAP pedestrian test results, 2011
[65] Ibid

AEB should be used to increase the proportion of pedestrians protected, not as a reason to remove protection.

Additional measures that in some cases can prevent the impact or reduce the vehicle's speed before impact, such as AEB, should be used to increase the proportion of pedestrians protected, not as a reason to remove protection.[66]

Recommendations to EU institutions

- Mandate the bonnet leading edge test according to the latest Euro NCAP pedestrian testing protocol.
- Mandate the head form test.
- Update the head form to windscreen test, adjusting the impact speed to at least 40km/h, a level appropriate to real life collision circumstances.
- Mandate an evaluation study to investigate the type of injuries resulting from vehicle to pedestrian and cyclist collisions and update the existing bonnet leading edge and windscreen tests.
- Require type-approval authorities to communicate the results of the monitoring of the tests at least every 3 years.
- Mandate an evaluation study on the effect of the pedestrian protection regulation.
- Extend the scope of the pedestrian protection regulation[67] to include cyclist protection.

Recommendation to Euro NCAP

- Raise the 60% threshold for pedestrian protection in order for a model to be awarded 5-stars.

5.1.2 Crash tests

Current tests should be extended to also cover rear-seat occupant safety, rear-end crashes and small overlap frontal crashes.

Recommendations to EU institutions

- Upgrade type approval collision tests to be more closely aligned with the requirements of Euro NCAP crash tests when suitable.
- Update the existing side impact regulation R95 by revising the current mobile deformable test condition and adopt the new R135 (GTR 14) standard for side pole testing.
- Introduce tests for rear-end crashes and for small overlap frontal crashes.

Recommendation to car manufacturers and EU institutions

- Update existing crash test dummies to allow a proper assessment of the risk of sustaining potentially fatal abdominal injuries for rear-seat passengers.

[66] ETSC Position Paper, Revision of Regulation 78/2009 on the protection of pedestrians and other vulnerable road users, 2016 February
[67] Ibid

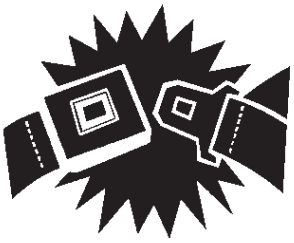
5.2 Implementing the most effective technologies

An evaluation study by TRL carried out on behalf of the European Commission identified a range of new vehicle safety technologies as suitable for mandatory fitting as part of the revision of the General Safety Regulation. The study named technologies including seat belt reminder systems in passenger seats, Intelligent Speed Assistance (ISA) and Autonomous Emergency Braking (AEB) as feasible in terms of the technology required, which is already available on the market and offers a positive benefit-cost ratio.[68]

A study carried out by TRL on behalf of the European Parliament concluded that safety systems reducing speeds, such as ISA, or reducing impact speeds, such as Autonomous Emergency Braking systems able to detect pedestrians and cyclists, would further reduce casualties among vulnerable road users.[69]

5.2.1 Seat belt reminders

The seat belt remains the single most effective safety feature in vehicles. Moreover, other important safety features such as airbags work as designed only if occupants are restrained by their seat belts.[70]



On average, seat belt use in cars in the EU is estimated to be 88% for front seats and as low as 74% for rear seats in the countries that are monitoring wearing. Although progress has been made in both front-seat wearing and rear-seat wearing across the EU, Eastern and Southern European countries still underperform.[71]

ETSC estimates that 8,650 occupants of light vehicles in the EU survived serious collisions in 2012 alone because they wore a seat belt. Another 900 deaths could have been prevented if 99% of occupants had been wearing a seat belt, a rate that could be reached with intelligent seat belt reminders on all car seats.[72] This technology can detect car occupants and their seat belt use in all seating positions, and then create a series of alarms to alert the car occupant if he or she is not belted. Despite the legal obligation to wear a seat belt on all seats, current provisions of the 2009 General Safety Regulation mandate seat belt reminders as standard on driver seat only.

Despite the legal obligation to wear a seat belt on all seats, current legislation mandates seat belt reminders on driver seat only.

Euro NCAP awards points for seat belt reminders if certain criteria are met. Occupancy detection is required in the front passenger's seat but is only recommended in rear seats.[73] As a consequence, most car manufacturers are fitting SBR that would only be triggered if a passenger on a rear seat unbuckles during the ride. As of 2017, points will be attributed only if advanced SBR systems are fitted on all seating positions, i.e. systems which will detect if a seat is occupied and will be triggered if the person is not buckled.

The effectiveness of SBR in motivating seat belt use was analysed in several on-road observational studies. The most extensive one, conducted by Lie et al., showed that seat belt reminders fulfilling the Euro NCAP seat belt reminder protocol are increasing seat belt use significantly.[74] Around 80% of drivers not wearing the belt without a seat belt reminder do so in cars equipped with a SBR.

Recommendations to EU institutions

- Extend the mandatory fitment of advanced seat belt reminders as standard equipment to all seats.

[68] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015
[69] TRL, Research for TRAN committee – the impact of higher or lower weight and volume of cars on road safety, particularly for vulnerable users, 2015
[70] ETSC (2014), Ranking EU progress on car occupant safety, 27th PIN Flash report
[71] Ibid
[72] Ibid
[73] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015
[74] Anders Lie et al. Intelligent seat belt reminders – do they change driver seat belt use in Europe? 2009

- Support the development of restraint systems that adapt to the needs of the user, their individual bio-mechanics and the severity of the specific collision.
- Introduce seat belt pre-tensioners and load limiters.

Recommendation to car manufacturers

- Fit advanced restraint systems combining seat belt load limiters, airbags and pre-tensioners to all seats not only front seats and offer better protection to elderly and young occupants of all sizes.

5.2.2 Intelligent Speed Assistance

Speeding is a primary factor in about one third of fatal accidents and an aggravating factor in all collisions.[75] Intelligent Speed Assistance (ISA) systems help drivers to comply with legal speed limits. The introduction of ISA as standard in the EU regulation could help to achieve a high level of compliance with speed limits and, thereby, reduce road deaths substantially.

Many studies have found that the presence of ISA has positive effects on collision and injury reduction.[76] Estimates by Carsten show that assisting ISA could cut deaths by 21%. A cost-benefit analysis produced ratios of 7.9 to 15.4 depending on the type of ISA system considered.[77]

Euro NCAP encourages manufacturers to promote speed limitation devices and fit them as standard equipment. The 2015 protocol gives maximum 1.5 points for Manual Speed Assist systems, where the drivers have to set the speed limit themselves, and maximum 3 points for ISA systems, where the car knows the current legal speed limit to be used in the warning or speed limitation function.[78]

Recommendations to EU institutions

- Adopt legislation for fitting all new commercial vehicles with assisting Intelligent Speed Assistance systems in line with the recommendations of the evaluation study conducted on behalf of the European Commission. The system should be overridable up to 100km/h for buses and 90km/h for lorries, in line with existing EU legislation on speed limiters.
- Adopt legislation for fitting all new cars with an overridable assisting Intelligent Speed Assistance system.

5.2.3 Autonomous Emergency Braking

Collisions between motorised vehicles and/or pedestrians or cyclists occur due to failure to brake, late braking or braking with insufficient force. A driver may brake too late for several reasons: being distracted or inattentive; visibility being poor or there not being sufficient time to react in a situation when, for example, a pedestrian crosses the street unexpectedly.

In order to avoid or mitigate this kind of imminent collision, AEB systems, which variously use lasers, radar or video cameras, activate the brakes and automatically apply them when an imminent collision is detected. The most advanced systems can detect moving pedestrians and cyclists in the path or periphery of the vehicle. These systems can either warn the driver or apply AEB or do both. With sensors used to detect pedestrians, AEB

[75] OECD, Speed Management, 2006
[76] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015
[77] Oliver Carsten, How much benefit does Intelligent Speed Adaptation deliver: an analysis of its potential contribution to safety and the Environment, 2012
[78] Euro NCAP, Assessment protocol – safety assist, Version 7.0

can reduce impact speeds by as much as 15km/h so reducing the severity of injury.[79] AEB also maximises the benefit of softer and 'forgiving' car fronts. So the combined effect of improved pedestrian crashworthiness and crash avoidance promises further gains in safety for pedestrians.

AEB could reduce rear-end collisions by 20%[80] to 57%[81] depending on implementation scenario. Hummel et al (2011) found that 2.2% of road deaths and 9.4% of serious injuries could be prevented with AEB.[82]

Regular AEB systems are compulsory for all new lorries and buses in the EU, but their fitment in new cars and lorries under 3.5 tonnes is still voluntary.

Starting from 2014 Euro NCAP gives maximum 3 points to vehicle manufacturers that equip their models with robust forward collision warning and/or automatic braking technology. In 2016 Euro NCAP introduces a new test checking the performance of AEB systems that detect and prevent collisions with pedestrians and as from 2018 also AEB that can detect collisions with cyclists.

Recommendation to EU institutions

- Adopt legislation for the mandatory fitting of all new cars and light trucks and vans under 3.5 tonnes with Autonomous Emergency Braking (AEB) systems which operate at all speeds, as well as those that can detect pedestrians and cyclists.

5.2.4 Alcohol Interlocks

The European Commission estimates that across the EU around 25% of all road deaths are alcohol related. The risk of a road death increases exponentially with the blood alcohol content (BAC) level of the driver. The risk for drivers with low BAC levels (0.1 to 0.5 g/L) is 1 to 3 times the risk of sober drivers. For drivers with a BAC level of 0.5 to 0.8 g/L it is already up to 20 times higher, increasing up to 30 times for drivers with BAC levels of 0.8 to 1.2 g/L.[83]

Alcohol interlocks are an effective countermeasure in the fight against drink driving

Alcohol interlocks are an effective countermeasure in the fight against drink driving. These devices are connected to the vehicle ignition system and require the driver to take a breath test in order to drive the vehicle. If the driver is found with alcohol above a certain limit the engine will not start. In many EU countries the technology has found its way as part of rehabilitation programmes and on a voluntary basis into vehicles which are used for the transport of goods or passengers.

A study conducted by TRAFI in Finland revealed that drink-driving re-offending rates among drivers using alcohol interlocks is 6% compared to 30% for other drivers.[84]

Another study commissioned by the European Commission concluded that alcohol interlocks can offer effective and cost-beneficial improvement to road safety in Europe, particularly for offenders and in commercial vehicles.[85] A study carried out on behalf of the European Parliament includes recommendations calling for the adoption of a legislation within 5 years which introduces mandatory use of alcohol interlocks as part of rehabilitation programmes and as a preventive measure in commercial vehicles.[86]

[79] Global NCAP, Democratising Car Safety: Road Map for Safer Cars 2020, 2013
[80] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015, Hummel et. Al. (2011), page 94
[81] Matteo Rizzi et al. Injury crash reduction of low-speed Autonomous Emergency Braking (AEB) on passenger cars, 2014
[82] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015, Hummel et. Al. (2011), page 96
[83] ECORYS, Study on the prevention of drink-driving by the use of alcohol interlock devices, 2014
[84] Anne Vehmas et al. Effectiveness and impact of alcohol interlock-controlled driving rights, 2013
[85] ECORYS & COWI, Study on the prevention of drink driving by the use of Alcohol Interlock devices, 2014
[86] TRT, Technical development and deployment of alcohol interlocks in road safety policy, 2014

Recommendations to EU institutions

- Mandate the CENELEC standards for alcohol interlocks in Europe which ensure that vehicle interfaces make it possible to fit an alcohol interlock.
- Legislate for a consistently high level of reliability of alcohol interlock devices.
- As a first step towards wider use of alcohol interlocks, legislate their use by professional drivers.

Recommendation to Member States

- Introduce alcohol interlocks in drink driving rehabilitation programs.

Recommendation to Euro NCAP

- Attribute points to cars that allow alcohol interlocks to be retrofitted.

5.2.5 Lane Departure Warning

Studies made in the US show that the Lane Departure Warning Systems could reduce the number of impacts by 37%. This technology is already mandatory for HGVs.

Most Lane Departure Warning systems rely on the presence of road markings, although some systems are capable of detecting road edges and on work roads with no or poor markings.[87] Road markings are already required on European roads but the types of markings differ between countries. For smooth functioning of all Lane Departure Warning Systems, Member States should ensure that lane markings are well maintained.[88]

Recommendation to EU institutions

- Extend the introduction of Lane Departure Warning systems to passenger cars and light trucks and vans.

Recommendation to Member States

- Prioritise road markings in maintenance budgets to achieve optimal performance of Lane Departure Warning.

[87] TRL, Visvikis et al. Study on Lane Departure Warning and Lane Change Assistant Systems: Final Report TRL, 2008 http://www.trl.co.uk/umbraco/custom/report_files/PPR374.pdf

[88] TRL, Benefit and feasibility of a range of new technologies and unregulated measures in the field of vehicle occupant safety and protection of vulnerable road users, 2015

PART VI
INTERVIEW WITH MICHIEL VAN RATINGEN

Michiel van Ratingen is a Mechanical Engineer with extensive experience in the field of vehicle safety. He worked at the Netherlands Organisation for Applied Scientific Research (TNO), as head of Automotive Safety, and later at First Technology Safety Systems. Since 2007 he has been Secretary General of Euro NCAP.

Michiel van Ratingen is the Secretary General of Euro NCAP. In this interview, he responds to the results of this report and explains the new steps the organisation is taking in 2016.

ETSC: There are significant differences in the market penetration of the most highly-rated Euro NCAP cars across Europe. For example, there is a rather high proportion of 3 and 4-star cars in Denmark and the Netherlands (Fig.2b), countries that otherwise have a good road safety record. What do you think the response of governments should be?

Denmark and the Netherlands, among others, have introduced tax incentives to promote lower emission vehicles, but the criteria don't take account of safety. As a consequence, consumers bought cars that failed to reach 5 stars. It is possible, and some manufacturers are proving it, to produce cars that are both environmentally friendly and also provide the best safety standards. Governments should be smarter when rolling out market initiatives. This would send a clear message to some manufacturers, particularly those that produce so-called budget cars, that they should move away from offering cheaper cars by taking away safety equipment.

ETSC: We found that superminis, on average, score fewer points in all safety boxes than other popular car categories. Have you seen improvements in supermini performance in the recent years? How can superminis provide similar safety levels to other popular car categories?

There are significant improvements in superminis performance, but still a large number of superminis score 3 and 4 stars. This category is price competitive and price sensitive. But Euro NCAP protocols allow all car categories to achieve 5 stars, it is rather a choice of the manufacturer to go or not to go for the best safety performance. It cannot be claimed that superminis are fundamentally less safe than large cars, even though vehicle mass has a big effect in case of a collision. If you have a small car with robust avoidance technology and a large family car without, you could make a case for the small car because it is better equipped to avoid collisions.

ETSC: There are only a few studies investigating the relationship between vehicle performance in laboratory tests and outcomes in the real world. What could be done to address this?

It is true that more resources need to be dedicated to fund EU-wide accidentology studies. Nowadays it is even more needed than ever as we need to assess how in-vehicle safety technologies, such as Automated Emergency Braking, will function in real world and assess their effectiveness in saving lives and serious injuries.

Laboratory tests are designed to tackle the most common collision types and they evaluate functional performance of safety systems at certain speed ranges or certain conditions. If the tests are designed well, a car that performs well in the tests will perform well in real world situations. But better data would allow the tests to be improved and made more accurate in real life. However, in-depth studies are expensive and must be carried out over a longer period to be useful. Governments are increasingly reluctant to make funding available for this purpose. But why not ask consumers to donate 1 Euro when they buy a car to fund pan-European in-depth accident investigation?

ETSC: It was recently revealed in the USA that Volkswagen cars were programmed to activate emission controls during laboratory emissions testing in order to meet the requirements while in real life the cars were emitting up to 40 times above the legal limits. Is there a risk of 'defeat devices' being used for safety?

A known downside of standardised tests is that engineers create systems that work at their best during testing for the lowest possible cost. We know optimisation is happening. However, optimisation is not the same thing as cheating. Optimisation is understanding what the test requires and trying to do your best to meet the requirements while cheating means that you intentionally develop a system that works only in the test but does not work effectively in real world. However, if cheating in vehicle safety was done on large scale, real world performance of those cars would reveal it rather quickly. But this, again, assumes that we have an efficient way of tracing vehicle safety performance in the real world.

ETSC: In this report, ETSC recommends that Euro NCAP increases the thresholds for pedestrian protection scores and to attribute points to cars that have standard alcohol interlock interfaces. Would Euro NCAP consider those?

Euro NCAP increased the threshold for pedestrian safety over the period 2009-2012 significantly and the industry has responded by improving the performance of their vehicles. A step further was made in 2016 by adding to the pedestrian protection test points for the availability of robust Autonomous Emergency Braking systems able to detect pedestrians. We will ask manufacturers to provide collision avoidance technologies for vulnerable road users, pedestrians and cyclists, as standard. Once we have taken that step, we will once again review the thresholds for pedestrian protection.

We agree that the alcohol interlock is a life-saving technology as a lot of collisions are due to drink driving. A CENELEC standard has been developed and this standard could become mandatory in the EU very soon if included in the upcoming revision of the General Safety Regulation. We have no concrete plans to include points for the provision of an interface to install an alcohol interlock for the time being, but we might consider it in the future, together with other driver monitoring systems, such as systems detecting fatigue and distraction.

ETSC: What technologies will become essential to reach 5 stars in the near future?

The whole family of Autonomous Emergency Braking (AEB) systems will fast become a discriminator to reach 5 stars. Some segments of AEB, whether car-to-car or car to vulnerable road user, are not yet fitted in a wide range of smaller vehicles and these vehicles will have more and more difficulties in reaching 5 stars without AEB. However, as the price of sensors comes down, also these cars will be able to reach 5 stars.

ETSC: Can you explain the aim of the new dual star rating? How will it contribute to car safety and better consumer information?

Our policy so far was to only attribute points to systems fitted as standard in all European countries to avoid consumers in countries with lower purchasing power to not have access to technologies as it used to be in the past. Over the years, however, we have made some exceptions to encourage innovation and the uptake of new, more expensive technologies, that carmakers would otherwise have not offered as standard at all. For example, a model tested in 2010 would be credited points for side curtain airbags fitted as standard in some model variants or countries, providing that the models fitted with side curtain as standard would represent 90% of the predicted sales of all the variants of that car. We gradually increased the threshold for a model to be granted those points – the technology had to be fitted as standard on 90% of the predicted sales of all variants, then 95% and finally 100%. This fitment strategy was successful as manufacturers started offering advanced safety systems as standard on more variants and more countries than before. The downside of this fitment strategy is that consumers in some markets think they buy a 5-star car but, in fact, they are not able to get the

variant tested by Euro NCAP as the vehicle manufacturer may not offer the equipment. We know that the same car is sold at a lower price in some Eastern European markets than in Western or Northern European countries, to match different purchasing power and, therefore, the same car will not have the same level of safety.

Euro NCAP wanted to break through this situation, in particular in light of the emerging collision avoidance technology. A radical revamp of the scores means cars may soon be sold with two separate star ratings as from January 2016. From 2016, points will be attributed only to technology fitted as standard. As a result, certain models, in particular in price sensitive segments, might not be able to reach 5 stars. To compensate, manufacturers whose model did not achieve 5 stars because it was not fitted with technologies as standard, are allowed to test an upgraded variant, providing that the optional safety pack is available in all markets, on all variants and sold in high numbers across Europe. Motorists will then have to decide whether to buy the standard car with the lower score or the safer version instead. They will be able to make an informed decision and compare the price of a 5-star version versus, let's say, a 3 star one.

ETSC: What will the progressive automation of new cars mean for Euro NCAP and vehicle safety in general?

We are, of course, closely following developments in this area. It is crucial we remain able in the future to assess the safety performance of semi-automated and fully-automated cars. Some advanced driver systems, such as highway traffic jam assistance or highway cruise control, are paving the way to what is called 'level 3' of automation i.e. the vehicle can drive itself under certain circumstances, but at certain point, the driver's intervention is triggered. What will the impact on safety be when the driving task is going back and forth to drivers who might be reading their emails? Level 3 automation works in a million possible scenarios where systems have to make their own decisions. This requires a much more intelligent approach towards assessing the robustness of technologies. It can possibly be done by simulating some common collision scenarios or it might need driving on the roads. Very soon optional packages will offer level 3 automation on premium cars. Without doubt, there is a value of an independent assessment for consumers on what are the safety systems of such cars and what safety benefits they will bring.

ANNEXES

Country	ISO Code
Belgium	BE
Bulgaria	BG
Czech Republic	CZ
Denmark	DK
Germany	DE
Estonia	EE
Ireland	IE
Greece	EL
Spain	ES
France	FR
Croatia	HR
Italy	IT
Cyprus	CY
Latvia	LV
Lithuania	LT
Luxembourg	LU
Hungary	HU
Malta	MT
The Netherlands	NL
Austria	AT
Poland	PL
Portugal	PT
Romania	RO
Slovenia	SI
Slovakia	SK
Finland	FI
Sweden	SE
The United Kingdom	UK
Great Britain	GB
Serbia	RS
Israel	IL
Norway	NO
Switzerland	CH

ANNEX I

Euro NCAP star calculation method

1. Assessing the relative score for each box

Each test included in all four safety boxes has a certain maximum number of points (i.e. the maximum number of points for the whiplash test, which is part of the adult occupant protection test, is 11). Points can have decimal values. Once the points are applied for each safety box, they are converted into relative scores (in %). The relative score (in %) is equal to the score that car achieved divided by the maximum score.

2. A certain level of performance in each box is needed to qualify for 5 stars

To qualify for 1, 2, 3, 4 and 5 stars, the relative scores (in %) should exceed a specific threshold for each safety box. The thresholds are listed in Table 1, Table 2, Table 3, and Table 4 in the main text.

3. Weight factors

The weight factors (Table a1) reflect the importance of each box when calculating overall star rating (i.e adult occupant protection scores represented 50% of the final overall relative score over the period 2009-2013).[89]

Table a1. Weight factors of each box in the overall rating[91]

Year	2009	2010	2011	2012	2013	2014	2015
Box 1: Adult Occupant Protection	50%	50%	50%	50%	50%	40%	40%
Box 2: Child Occupant Protection	20%	20%	20%	20%	20%	20%	20%
Box 3: Pedestrian Protection	20%	20%	20%	20%	20%	20%	20%
Box 4: Safety Assist	10%	10%	10%	10%	10%	20%	20%
Total	100%	100%	100%	100%	100%	100%	100%

4. The overall star rating

The single overall car star rating is calculated by multiplying the relative scores (in %) achieved in each box by a respective weight factor (Table a1). The contributions of all four boxes are added. The result shows how many stars should be applied for the car (Table a2).

To explain how Euro NCAP weights the different boxes, let's imagine a car tested in 2013 that would have achieved the following points:

1.a 28.8 points in adult occupant protection. It equals 80% of the maximum 36 points and qualifies for maximum 5 stars (Table 1 in the main text).

1.b The score (in %) is then weighted as shown in Table 1: (80%*50%)/100%=40%

2.a 29.4 points for child occupant protection. It equals 60% of the maximum 49 points and qualifies for maximum 5 stars (Table 2 in the main text).

2.b The score (in %) in child occupant protection is then weighted: (60%*20%)/100%=12%

[89] Euro NCAP assessment protocol – overall rating, Version 5.1, June 2011, Version 6, July 2012

3.a 5.4 points for pedestrian protection. It equals 15% of the maximum 36 points and qualifies for maximum 2 stars (Table 3 in the main text).

3.b The score in pedestrian protection is then weighted (15%*20%)/100%=3%

4.a 5.4 points for safety assist. It equals 60% of the maximum 9 points and qualifies for maximum 5 stars (Table 4 in the main text).

4.b The score in safety assist is then weighted (50%*10%)/100%=5%

5. The final result is made of the sum of the weighted scores for each box: 40%+12%+3%+5%=60%. According to the Table 2, this car could qualify for 3 stars in 2013. However, this car's overall star rating will be restricted to 2 stars only because it showed a poor performance in pedestrian protection box, which did not allow the car to qualify for more than two stars.[90]

Table a2. Total points applied to star values, based on weighting[92]

	★★★★★	★★★★	★★★	★★
2009	70%	55%	45%	35%
2010	75%	60%	50%	35%
2011	75%	60%	50%	35%
2012	80%	70%	60%	55%
2013	80%	70%	60%	55%
2014	75%	65%	50%	40%
2015	75%	65%	50%	40%

[90] Ibid

ANNEX II

Table 1: List of car models tested by Euro NCAP over the period 2010-2013 that were included in the analysis

Manufacturer	Model	Testing year	Euro NCAP stars	Adult occupant protection score	Child occupant protection score	Pedestrian protection score	Safety assist score	Car category
Alfa Romeo	Giuletta	2010	5	97	85	63	86	Small Family Car
Audi	A1	2010	5	90	79	49	86	Supermini
Audi	A3	2012	5	95	87	74	86	Small Family Car
Audi	A6	2011	5	91	83	41	86	Executive
Audi	Q3	2011	5	94	85	52	86	Small Off-Road
BMW	i3	2013	4	86	81	57	55	Small Family Car
BMW	Serie 1	2012	5	91	83	63	86	Small Family Car
BMW	Serie 3	2012	5	95	84	78	86	Large Family Car
BMW	serie 5	2010	5	95	83	78	100	Executive
BMW	X1	2012	5	87	86	64	71	Small Off-Road
BMW	X3	2011	5	88	83	53	71	Small Off-Road
Chevrolet	Aveo	2011	5	95	87	54	93	Supermini
Chevrolet	Captiva	2011	5	88	82	48	71	Small Off-Road
Chevrolet	Malibu	2011	5	94	83	57	71	Large Family Car
Chevrolet	Orlando	2011	5	95	79	49	71	Small MPV
Chevrolet	Trax	2013	5	94	85	64	81	Small Family Car
Chevrolet	Volt	2011	5	85	78	41	86	Small Family Car
Citroën	C1	2012	3	68	73	53	71	Supermini
Citroën	C4	2010	5	90	85	43	97	Small Family Car
Citroën	C4 Picasso	2013	5	86	88	68	81	Small MPV
Citroën	C-Zero	2011	4	73	78	48	86	Supermini
Citroën	DS4	2011	5	90	80	43	86	Small Family Car
Citroën	DS5	2011	5	89	83	40	97	Large Family Car
Citroën	Jumpy	2011	3	59	86	26	26	Business and Family Van
Citroën	Nemo	2010	3	50	74	55	29	Small MPV
Dacia	Duster	2011	3	74	78	28	29	Small Off-Road
Dacia	Sandero	2013	4	80	79	57	55	Supermini
Dacia	Lodgy	2012	3	72	77	44	29	Small MPV
Fiat	500L	2012	5	94	78	65	71	Small MPV
Fiat	Freemont	2011	5	83	82	50	71	Large MPV
Fiat	Panda	2011	4	82	63	49	43	Supermini
Fiat	Scudo	2012	3	59	86	26	26	Business and Family Van
Ford	B-Max	2012	5	92	84	67	71	Small MPV
Ford	C-Max	2010	5	92	83	50	71	Small MPV
Ford	Ecosport	2013	4	93	77	58	55	Small Family Car
Ford	Fiesta	2012	5	91	86	65	71	Supermini
Ford	Focus	2012	5	92	80	43	97	Small Family Car
Ford	Grand C-Max	2010	5	96	81	50	71	Small MPV
Ford	Kuga	2012	5	94	86	70	100	Small Off-Road
Ford	Ranger	2012	5	96	86	81	71	Pick-up
Ford	Transit Custom	2012	5	84	90	48	71	Business and Family Van
Ford	Tourneo Connect	2013	5	94	85	62	70	Small MPV
Geely	Emgrand EC7	2011	4	75	80	42	86	Large Family Car
Honda	Civic	2012	5	94	83	69	86	Small Family Car
Honda	CRV	2013	5	93	74	68	66	Small Off-Road

Honda	CRZ	2010	5	93	80	71	86	Supermini
Hyundai	H1	2012	3	55	75	34	43	Business and Family Van
Hyundai	i30	2012	5	90	90	67	86	Small Family Car
Hyundai	i40	2011	5	90	86	43	86	Large Family Car
Hyundai	ix20	2011	5	89	85	64	71	Small MPV
Hyundai	ix35	2010	5	90	88	54	71	Small Off-Road
Hyundai	Santafe	2012	5	96	89	71	86	Large Off-Road
Hyundai	Veloster	2011	5	96	89	49	71	Small Family Car
Infiniti	Q50	2013	5	86	85	67	81	Executive
Isuzu	DMAX	2012	4	83	67	51	71	Pick-up
Jeep	Cherokee	2013	5	92	79	67	74	Small Off-Road
Jeep	Compass	2012	2	61	76	23	43	Small Off-Road
Jeep	Grand Cherokee	2011	4	81	69	45	71	Large Off-Road
Kia	Carens	2013	5	94	85	62	70	Small MPV
Kia	Ceed	2012	5	89	88	61	86	Small Family Car
Kia	Rio	2012	5	92	84	46	86	Supermini
Kia	Sportage	2010	5	93	86	49	86	Small Off-Road
Kia	Venga	2010	5	89	85	64	71	Small MPV
Kia	Picanto	2011	4	86	83	47	43	Supermini
Lancia	Thema	2011	5	83	77	59	71	Executive
Lancia	Voyager	2011	4	79	67	47	71	Large MPV
Landwind	CV9	2010	2	34	45	31	29	Small MPV
Lexus	CT200h	2011	5	94	84	55	86	Small Family Car
Lexus	IS300h	2013	5	91	85	80	66	Large Family Car
Maserati	Ghibli	2013	5	95	79	74	81	Executive
Mazda	6	2013	5	92	77	66	81	Large Family Car
Mazda	3	2013	5	93	86	65	81	Small Family Car
Mazda	CX5	2012	5	94	87	64	86	Small Off-Road
Mazda	CX7	2010	4	76	79	43	71	Small Off-Road
Mercedes	C-Class Coupe	2011	5	90	79	57	86	Small Family Car
Mercedes	Citan	2013	4	79	81	56	70	Small MPV
Mercedes	A-Class	2012	5	93	81	67	86	Small Family Car
Mercedes	B-Class	2011	5	94	83	53	86	Small MPV
Mercedes	CLA-Class	2013	5	91	75	74	81	Small Family Car
Mercedes	E-Class	2010	5	86	77	59	86	Executive
Mercedes	M-Class	2012	5	96	75	60	86	Large Off-Road
Mercedes	GLK	2010	5	89	76	47	86	Small Off-Road
MG	MG6	2011	4	73	71	42	71	Small Family Car
Mini	Countryman	2010	5	84	83	63	71	Small MPV
Mitsubishi	ASX	2011	5	86	78	60	71	Small Family Car
Mitsubishi	i-Miev	2011	4	73	78	48	86	Supermini
Mitsubishi	Mirage	2013	4	90	72	73	55	Supermini
Mitsubishi	Outlander	2012	5	94	83	64	100	Small Off-Road
Mitsubishi	Outlander PHEV	2013	5	88	84	64	81	Small Off-Road
Mitsubishi	Space Star	2013	4	90	72	73	55	Supermini
Nissan	Cube	2010	4	83	64	56	84	Small MPV
Nissan	Juke	2011	5	87	81	41	71	Supermini
Nissan	Leaf	2012	5	89	78	60	71	Small Family Car
Nissan	Micra	2010	4	84	79	58	57	Supermini
Nissan	Evalia	2013	3	68	81	67	55	Small MPV
Nissan	Note	2013	4	86	82	58	70	Supermini
Opel	Adam	2013	4	87	72	65	81	Supermini

Opel	Ampera	2011	5	85	78	41	86	Small Family Car
Opel	Astra GTC	2011	5	91	79	50	71	Small Family Car
Opel	Meriva	2010	5	89	77	55	86	Small MPV
Opel	Mokka	2012	5	96	90	67	100	Small Family Car
Opel	Zafira	2011	5	94	83	53	86	Small MPV
Peugeot	107	2012	3	68	73	53	71	Supermini
Peugeot	208	2012	5	88	78	61	83	Supermini
Peugeot	308	2013	5	92	79	64	81	Small Family Car
Peugeot	508	2011	5	90	82	64	100	Large Family Car
Peugeot	2008	2013	5	88	77	72	70	Supermini
Peugeot	Expert	2012	3	59	86	26	26	Business and Family Van
Peugeot	Ion	2011	4	73	78	48	86	Supermini
Quoros	3 sedan	2013	5	95	87	77	81	Small Family Car
Land Rover	Evoque	2011	5	86	75	41	86	Small Off-Road
Land Rover	Range Rover	2012	5	91	84	64	86	Large Off-Road
Renault	Captur	2013	5	88	79	61	81	Supermini
Renault	Clio	2012	5	88	89	66	99	Supermini
Renault	Fluence ZF	2011	4	72	83	37	84	Small Family Car
Renault	Trafic	2012	2	58	79	28	14	Business and Family Van
Renault	Zoe	2013	5	89	80	66	85	Supermini
Seat	Exeo	2010	4	77	81	50	57	Large Family Car
Seat	Mii	2011	5	89	80	46	86	Supermini
Seat	Alhambra	2010	5	96	80	46	71	Large MPV
Seat	Leon	2012	5	94	92	70	71	Small Family Car
Seat	Toledo	2012	5	94	80	69	71	Small Family Car
Skoda	Citigo	2011	5	89	80	46	86	Supermini
Skoda	Octavia	2013	5	93	86	66	66	Large Family Car
Skoda	Rapid	2012	5	94	80	69	71	Small Family Car
Subaru	Forester	2012	5	91	91	73	86	Small Off-Road
Subaru	XV	2012	5	86	90	64	86	Small Family Car
Suzuki	Swift	2010	5	94	82	62	71	Supermini
Suzuki	SX4	2013	5	92	80	72	81	Small Family Car
Toyota	Auris	2013	5	92	84	68	66	Small Family Car
Toyota	Aygo	2012	3	68	73	53	71	Supermini
Toyota	Corolla	2013	5	94	82	67	66	Small Family Car
Toyota	RAV4	2013	5	89	82	66	66	Small Off-Road
Toyota	Verso	2010	5	89	75	69	86	Small MPV
Toyota	Yaris	2011	5	89	81	60	86	Supermini
Volvo	V40	2012	5	98	75	88	100	Small Family Car
Volvo	V60	2012	5	94	82	64	100	Large Family Car
VW	Amarok	2010	4	86	64	47	57	Pick-up
VW	Beetle	2011	5	92	90	53	86	Small Family Car
VW	Golf	2012	5	94	89	64	71	Small Family Car
VW	Jetta	2011	5	94	86	56	71	Small Family Car
VW	Passat	2010	5	91	77	54	71	Large Family Car
VW	Sharan	2010	5	96	80	46	71	Large MPV
VW	T5	2013	4	79	74	32	57	Business and Family Van
VW	Up	2011	5	89	80	46	86	Supermini

Note: most of the car models are available in other variants that may have different safety levels than the one tested by Euro NCAP. For example, the Ford Focus is sold in Europe in hatchback, sedan and estate variants. Euro NCAP tested the 5-door hatchback variant in 2012. For the purpose of this report, the results are assumed to apply to the other variants of the same model as well.

Table 2 (Fig.2a). Proportion of Euro NCAP tested cars among new cars sold in 2013.

Proportion of new cars awarded 5, 4, 3 and 2 stars over the period 2010-2013 and proportion of not tested cars

	Proportion of 5-star cars	Proportion of 4-star cars	Proportion of 3-star cars	Proportion of 2-star cars	Proportion of non-tested* cars
FI	66.6%	2.3%	1.1%	0.2%	29.8%
NO	65.8%	3.4%	1.2%	0.1%	29.5%
IE	62.9%	3.6%	1.5%	0.4%	31.5%
CY	59.0%	4.9%	1.5%	0.0%	34.5%
LT	58.3%	1.3%	1.7%	0.6%	38.2%
SE	57.8%	2.7%	1.6%	0.6%	37.3%
NL	57.6%	5.9%	6.1%	0.0%	30.3%
SI	57.6%	2.6%	2.0%	1.0%	36.8%
LV	57.3%	1.7%	2.0%	0.6%	38.4%
CZ	57.3%	1.9%	2.2%	0.4%	38.2%
PL	56.0%	3.5%	2.9%	0.5%	37.1%
SK	55.7%	1.9%	2.1%	0.3%	40.0%
DE	54.3%	3.0%	1.5%	0.2%	41.0%
EE	54.3%	2.4%	2.5%	0.6%	40.3%
PT	54.2%	3.5%	2.7%	0.4%	39.1%
AT	53.6%	4.8%	1.9%	0.5%	39.2%
ES	53.4%	4.1%	2.4%	0.4%	39.6%
HU	53.4%	2.9%	4.3%	0.4%	39.0%
CH	53.2%	3.7%	2.7%	0.7%	39.7%
DK	52.6%	5.0%	9.3%	0.5%	32.5%
UK	51.8%	3.9%	2.7%	0.3%	41.4%
BE	51.0%	3.3%	3.3%	0.6%	41.8%
FR	50.5%	4.3%	5.0%	1.3%	39.0%
BG	50.3%	4.2%	4.2%	0.0%	41.3%
EL	47.5%	6.9%	3.2%	0.0%	42.4%
IT	46.2%	10.5%	2.9%	0.3%	40.0%
IL	44.7%	9.0%	1.4%	0.1%	44.8%
RO	38.3%	4.7%	7.3%	0.6%	49.1%
EU 25	**52.5%**	**4.5%**	**2.9%**	**0.5%**	**39.6%**

The number of new cars sold in 2013 by models and by countries were provided by the MAPFRE Foundation, except for BG, CY, EE, LV and LT, for which the data was provided by PIN Panellists. Data source for new cars registered in 2013: European Commission statistical pocketbook 2015.

*Non tested car category includes not tested cars or cars tested prior 2010 or after 2013 by Euro NCAP. None of the cars tested over the period 2010-2013 were awarded 1 or 0 star only. The number of new cars sold in 2013 by models are not available for HR, LU and MT.

Table 3 (Fig.2b). Proportion of 5, 4, 3, 2-star cars among cars tested by Euro NCAP over the period 2010-2013 and sold in 2013

	Proportion of 5-star cars	Proportion of 4-star cars	Proportion of 3-star cars	Proportion of 2-star cars
FI	94.8%	3.2%	1.6%	0.3%
LT	94.3%	2.0%	2.8%	0.9%
NO	93.4%	4.8%	1.7%	0.1%
LV	93.1%	2.7%	3.2%	1.0%
SK	92.8%	3.2%	3.5%	0.4%
CZ	92.7%	3.2%	3.5%	0.7%
SE	92.2%	4.2%	2.5%	1.0%
DE	91.9%	5.1%	2.6%	0.4%
IE	91.9%	5.3%	2.3%	0.6%
SI	91.1%	4.2%	3.2%	1.5%
EE	90.8%	4.1%	4.2%	0.9%
CY	90.2%	7.5%	2.3%	0.0%
PT	89.1%	5.8%	4.4%	0.7%
PL	89.0%	5.6%	4.6%	0.9%
ES	88.5%	6.8%	4.0%	0.7%
CH	88.3%	6.2%	4.4%	1.2%
UK	88.3%	6.6%	4.6%	0.5%
AT	88.2%	7.8%	3.1%	0.9%
HU	87.6%	4.7%	7.1%	0.6%
BE	87.6%	5.6%	5.7%	1.0%
BG	85.6%	7.2%	7.2%	0.0%
FR	82.8%	7.0%	8.1%	2.1%
NL	82.7%	8.5%	8.8%	0.1%
EL	82.5%	12.0%	5.5%	0.0%
IL	81.0%	16.2%	2.6%	0.2%
DK	78.0%	7.5%	13.8%	0.7%
IT	77.0%	17.5%	4.9%	0.6%
RO	75.3%	9.2%	14.4%	1.2%
EU 25	**86.9%**	**7.4%**	**4.9%**	**0.8%**

The number of new cars sold in 2013 by models and by countries were provided by the MAPFRE Foundation, except for BG, CY, EE, LV and LT, for which the data was provided by PIN Panellists.

Data source for new cars registered in 2013: European Commission statistical pocketbook 2015.
*Non tested car category includes not tested cars or cars tested prior 2010 or after 2013 by Euro NCAP. None of the cars tested over the period 2010-2013 were awarded 1 or 0 star only. The number of new cars sold in 2013 by models are not available for HR, LU and MT.

Table 4 (Fig.3-6). Average score (in %) for new cars sold in 2013 for each assessment area

Fig.3

	Adult occupant protection
FI	91%
LT	91%
NO	91%
DE	91%
IE	91%
SE	91%
CZ	90%
SK	90%
CY	90%
IL	90%
LV	90%
AT	90%
HU	90%
EE	90%
CH	90%
PL	90%
UK	90%
SI	90%
PT	89%
BE	89%
ES	89%
EL	89%
NL	89%
IT	88%
RO	88%
BG	88%
FR	87%
DK	87%
EU 25	**89%**

Fig.4

	Child occupant protection
SI	84%
CZ	84%
IE	83%
SK	83%
DE	83%
AT	83%
FI	83%
ES	83%
EE	83%
PL	83%
IL	83%
BE	83%
LV	83%
HU	83%
NO	83%
CH	83%
LT	82%
SE	82%
BG	82%
UK	82%
FR	82%
PT	82%
RO	82%
EL	82%
NL	81%
CY	81%
DK	81%
IT	80%
EU 25	**82%**

Fig.5

	Pedestrian protection
FI	62%
NO	62%
SE	61%
CZ	61%
PT	61%
LT	61%
SK	60%
EE	60%
DE	60%
CY	60%
CH	60%
EL	60%
IE	60%
NL	60%
BE	60%
SI	59%
ES	59%
AT	59%
UK	59%
PL	59%
IL	58%
BG	58%
HU	58%
FR	58%
IT	58%
LV	58%
DK	57%
RO	56%
EU 25	**59%**

Fig.6

	Safety assist
PT	81%
NL	80%
SE	80%
CY	79%
NO	79%
UK	79%
FI	79%
DE	79%
SI	78%
BE	78%
DK	78%
ES	78%
IE	78%
CH	77%
FR	77%
EL	77%
SK	76%
AT	76%
PL	76%
LV	76%
IL	75%
BG	75%
EE	75%
LT	74%
HU	74%
CZ	74%
IT	73%
RO	69%
EU 25	**78%**

Fig.3 to 6 do not take into account non-tested cars or cars tested prior 2010 or after 2013.
The data are not available for HR, LU and MT.

Table 5 (Fig.7). Proportion (in %) of cars according to car classification categories identified by the manufacturers among new cars sold in 2013 tested by Euro NCAP

	Supermini	Small Family Cars	Small MPV	Large Family Cars	Business and Family Vans	Pickup	Large MPV	Small Off Roader	Large Off Roader
LT	8%	31%	18%	21%	1%	0%	1%	18%	1%
LV	10%	35%	6%	18%	1%	0%	2%	23%	4%
EE	14%	34%	4%	16%	2%	0%	1%	28%	1%
CZ	15%	35%	11%	25%	1%	0%	1%	11%	1%
SE	16%	33%	4%	31%	2%	2%	2%	11%	1%
SK	17%	41%	7%	18%	1%	0%	1%	14%	1%
NO	17%	37%	4%	16%	1%	2%	0%	22%	0%
FI	17%	39%	7%	24%	1%	1%	0%	10%	0%
DE	19%	36%	11%	19%	1%	0%	1%	11%	1%
AT	19%	32%	12%	13%	4%	1%	4%	15%	1%
CH	20%	33%	7%	17%	2%	1%	3%	15%	2%
HU	21%	33%	9%	18%	1%	3%	1%	13%	1%
IE	22%	37%	5%	20%	1%	1%	0%	13%	1%
RO	23%	29%	6%	17%	1%	1%	0%	21%	2%
BE	25%	31%	14%	16%	2%	1%	1%	9%	1%
PL	26%	33%	11%	14%	1%	1%	1%	13%	1%
ES	28%	36%	12%	8%	1%	0%	1%	13%	0%
BG	31%	27%	8%	15%	0%	1%	0%	17%	0%
SI	32%	32%	11%	10%	2%	0%	1%	10%	0%
IL	34%	40%	2%	8%	0%	1%	0%	13%	1%
UK	34%	29%	10%	12%	1%	1%	0%	12%	1%
PT	40%	33%	6%	13%	1%	1%	1%	5%	0%
CY	40%	32%	4%	6%	0%	0%	0%	18%	0%
NL	43%	29%	7%	13%	0%	0%	0%	7%	0%
IT	43%	20%	16%	6%	1%	0%	2%	11%	1%
FR	46%	23%	11%	7%	4%	0%	0%	9%	0%
EL	49%	37%	4%	5%	0%	1%	0%	4%	0%
DK	62%	19%	5%	10%	1%	0%	0%	2%	0%
EU 25	**32%**	**30%**	**11%**	**13%**	**1%**	**1%**	**1%**	**11%**	**1%**

Fig.7 does not take into account non-tested cars or cars tested prior 2010 or after 2013.
The data are not available for HR, LU and MT.

Table 6 (Fig.9). Proportion (in %) of 5-star, 4-star, 3-star, 2-star and non-tested new cars among all registered cars in 2013

	Total number of cars registered in 2013	Number of new cars registered in 2013	Proportion of new cars registered in 2013 among all cars registered	New cars registered in 2013 among all cars registered, among which proportion of				
				5-star cars	4-star cars	3-star cars	2-star cars	non-tested cars
AT	4,641,308	319,035	6.9%	3.7%	0.3%	0.1%	0.0%	2.7%
BE	5,504,809	486,065	8.8%	4.5%	0.3%	0.3%	0.1%	3.7%
BG	2,910,200	19,352	0.7%	0.3%	0.0%	0.0%	0.0%	0.3%
CH	4,320,885	301,942	7.0%	3.7%	0.3%	0.2%	0.0%	2.8%
CY	474,561	7,102	1.5%	0.9%	0.1%	0.0%	0.0%	0.5%
CZ	4,729,185	164,746	3.5%	2.0%	0.1%	0.1%	0.0%	1.3%
DE	43,851,230	2,952,431	6.7%	3.7%	0.2%	0.1%	0.0%	2.8%
DK	2,278,121	182,201	8.0%	4.2%	0.4%	0.7%	0.0%	2.6%
EE	628,500	19,503	3.1%	1.7%	0.1%	0.1%	0.0%	1.2%
EL	5,124,208	58,694	1.1%	0.5%	0.1%	0.0%	0.0%	0.5%
ES	22,024,538	722,689	3.3%	1.8%	0.1%	0.1%	0.0%	1.3%
FI	3,127,399	103,455	3.3%	2.2%	0.1%	0.0%	0.0%	1.0%
FR	32,243,826	1,790,456	5.6%	2.8%	0.2%	0.3%	0.1%	2.2%
HR	1,448,299	27,802	1.9%	n/a				
HU	3,040,732	56,140	1.8%	1.0%	0.1%	0.1%	0.0%	0.7%
IE	1,933,129	74,367	3.8%	2.4%	0.1%	0.1%	0.0%	1.2%
IL	213,113	9,536	4.5%	2.0%	0.4%	0.1%	0.0%	2.0%
IT	36,962,934	1,304,648	3.5%	1.6%	0.4%	0.1%	0.0%	1.4%
LT	1,808,982	12,073	0.7%	0.4%	0.0%	0.0%	0.0%	0.3%
LU	363,247	46,624	12.8%	n/a				
LV	634,603	11,038	1.7%	1.0%	0.0%	0.0%	0.0%	0.7%
MT	256,096	5,749	2.2%	n/a				
NL	7,932,290	416,730	5.3%	3.0%	0.3%	0.3%	0.0%	1.6%
NO	2,500,265	144,202	5.8%	3.8%	0.2%	0.1%	0.0%	1.7%
PL	19,389,446	288,913	1.5%	0.8%	0.1%	0.0%	0.0%	0.6%
PT	4,480,000	105,921	2.4%	1.3%	0.1%	0.1%	0.0%	0.9%
RO	4,695,660	57,710	1.2%	0.5%	0.1%	0.1%	0.0%	0.6%
RS	1,770,162	82,549	4.7%	n/a				
SE	4,495,473	269,558	6.0%	3.5%	0.2%	0.1%	0.0%	2.2%
SI	1,063,795	50,878	4.8%	2.8%	0.1%	0.1%	0.0%	1.8%
SK	1,879,759	66,000	3.5%	2.0%	0.1%	0.1%	0.0%	1.4%
UK	30,074,857	2,264,737	7.5%	3.9%	0.3%	0.2%	0.0%	3.1%
EU 28	**247,997,187**	**11,884,617**	**4.8%**	**2.5%**	**0.2%**	**0.1%**	**0.0%**	**2.3%**

Data source for cars registered in 2013: European Commission statistical pocketbook 2015.
Data source for Euro NCAP tested cars: MAPFRE foundation.

Table 7 (Fig.10).The proportion (in %) of cars by age in 2012

	< 2 years old	2-5 years old	5-10 years old	> 10 years old
BE	23.8%	24.2%	27.0%	25.0%
DK	23.1%	18.1%	26.2%	32.6%
AT	20.1%	19.0%	29.4%	31.5%
IE	18.7%	24.7%	37.0%	19.6%
SE	16.2%	18.1%	25.3%	40.5%
LU	13.7%	36.9%	30.2%	19.2%
UK	13.5%	22.1%	27.4%	37.0%
DE	13.3%	20.4%	29.8%	36.5%
NL	13.1%	16.7%	29.4%	40.8%
FR	12.7%	21.2%	33.6%	32.5%
CZ	12.1%	11.5%	22.2%	54.2%
ES	10.5%	15.4%	31.3%	42.8%
IT	8.6%	23.7%	23.3%	44.4%
SI	8.3%	17.1%	32.8%	41.8%
FI	7.8%	11.9%	25.6%	54.7%
HR	7.1%	14.5%	27.2%	51.1%
MT	6.3%	12.0%	22.5%	59.2%
EE	5.8%	7.8%	22.9%	63.6%
PT	5.7%	14.8%	22.8%	56.7%
CY	5.3%	13.9%	35.0%	45.9%
PL	4.0%	5.8%	19.2%	71.0%
RO	3.3%	12.1%	31.2%	53.4%
LV	3.0%	5.0%	20.4%	71.7%
HU	2.9%	7.9%	34.0%	55.2%
LT	1.0%	3.6%	9.7%	85.7%

Data source: Eurostat. Latest year available: 2012.

Data not available in BG, EL, IL, NO and SK.

Table 8 (Fig.11). Market penetration of Euro NCAP tested cars over the period 2010-2013 sold in 2013 by manufacturer

List of car manufacturers	Total number of cars sold in 2013 in EU25	Proportion of cars sold among Euro NCAP tested cars in 2013	Number of models tested over the period 2010-2013
VOLKSWAGEN	861,689	12.1%	8
FORD	744,224	10.5%	10
BMW	535,432	7.5%	6
PEUGEOT	511,136	7.2%	7
RENAULT	425,308	6.0%	5
TOYOTA	412,181	5.8%	6
MERCEDES	385,897	5.4%	8
AUDI	384,698	5.4%	4
KIA	323,722	4.5%	6
OPEL	254,275	3.6%	5
HYUNDAI	253,418	3.6%	7
FIAT	250,711	3.5%	4
CITROEN	245,601	3.4%	8
DACIA	237,884	3.3%	3
SKODA	236,800	3.3%	3
NISSAN	194,737	2.7%	6
SEAT	149,625	2.1%	5
MAZDA	98,011	1.4%	4
VOLVO	93,952	1.3%	2
HONDA	86,470	1.2%	3
SUZUKI	69,090	1.0%	2
CHEVROLET	66,555	0.9%	6
LAND ROVER	60,265	0.8%	2
MITSUBISHI	59,431	0.8%	6
MINI	49,808	0.7%	1
ALFA ROMEO	44,224	0.6%	1
JAGUAR	19,633	0.3%	1
SUBARU	18,501	0.3%	2
JEEP	16,456	0.2%	3
LEXUS	14,881	0.2%	2
ISUZU	9,666	0.1%	1
LANCIA	5,231	0.1%	2
MG	291	0.0%	1
INFINITI	249	0.0%	1
LANDWIND	181	0.0%	1

Total	**7,120,233**

*One model tested over the period 2010-2013.
**Two models tested over the period 2010-2013.
Other manufacturers had more than three models tested.

Lancia, MG, Infiniti and Landwind are not included in Fig.11 as their cars represented less than 0.1% of cars sold in the EU.

Table 9 (Fig.12 to 15). Average score (in %) by manufacturer among new cars sold in the EU25 in 2013

Fig.12

	Adult occupant protection
VOLVO*	96.3%
HONDA**	93.5%
SUZUKI*	93.4%
CHEVROLET	93.3%
MAZDA	93.0%
AUDI	92.9%
LEXUS*	92.8%
SEAT	92.6%
VOLKSWAGEN	92.5%
SKODA**	92.4%
BMW	92.4%
OPEL	92.1%
FORD	92.0%
MERCEDES	91.5%
KIA	90.4%
HYUNDAI	89.9%
MITSUBISHI	89.7%
SUBARU*	89.0%
LAND ROVER*	86.9%
TOYOTA	86.7%
NISSAN	85.7%
PEUGEOT	85.6%
RENAULT	84.4%
FIAT	84.4%
CITROEN	81.4%
LANCIA*	80.6%
DACIA**	76.8%
JEEP**	73.9%

Fig.13

	Child occupant protection
SUBARU*	90.5%
HYUNDAI	88.1%
SEAT	86.8%
RENAULT	85.6%
KIA	85.6%
VOLKSWAGEN	84.8%
LEXUS*	84.4%
AUDI	84.0%
SKODA**	83.9%
CHEVROLET	83.8%
BMW	83.7%
MAZDA	83.6%
FORD	83.6%
CITROEN	82.2%
OPEL	81.5%
SUZUKI*	81.4%
NISSAN	80.6%
TOYOTA	80.2%
MERCEDES	79.4%
MITSUBISHI	78.6%
HONDA**	78.5%
DACIA**	78.4%
PEUGEOT	78.3%
VOLVO*	77.9%
LAND ROVER*	76.6%
JEEP**	71.8%
LANCIA**	71.0%
FIAT	69.8%

Fig.14

	Pedestrian protection
VOLVO*	78.0%
BMW	70.1%
SUBARU*	69.2%
HONDA**	68.4%
SUZUKI*	65.1%
LEXUS*	65.1%
MAZDA	64.6%
MITSUBISHI	64.2%
SKODA**	62.8%
TOYOTA	62.4%
SEAT	61.8%
PEUGEOT	60.8%
RENAULT	60.5%
MERCEDES	60.3%
HYUNDAI	59.4%
OPEL	59.1%
AUDI	58.1%
VOLKSWAGEN	58.1%
FORD	57.5%
CHEVROLET	54.4%
KIA	53.3%
FIAT	52.6%
LANCIA*	51.7%
NISSAN	49.2%
CITROEN	48.9%
LAND ROVER*	45.1%
DACIA**	44.9%
JEEP**	37.5%

Fig.15

	Safety assist
VOLVO*	100.0%
OPEL	88.8%
AUDI	86.0%
LAND ROVER*	86.0%
SUBARU*	86.0%
MERCEDES	85.6%
BMW	85.4%
RENAULT	85.0%
MAZDA	83.1%
FORD	80.9%
CHEVROLET	80.9%
CITROEN	80.7%
PEUGEOT	79.4%
HYUNDAI	78.5%
MITSUBISHI	78.4%
LEXUS*	77.9%
KIA	77.4%
TOYOTA	76.2%
HONDA	75.8%
SUZUKI*	74.1%
VOLKSWAGEN	73.5%
SEAT	73.2%
LANCIA*	71.0%
SKODA**	70.5%
NISSAN	67.1%
JEEP**	60.8%
FIAT	52.3%
DACIA**	42.2%

28 manufacturers and 135 models tested by Euro NCAP between 2010 and 2013 are considered. Average scores are weighted by sales.
*One model tested over the period 2010-2013.
**Two models tested over the period 2010-2013.
Other manufacturers had more than three models tested.

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