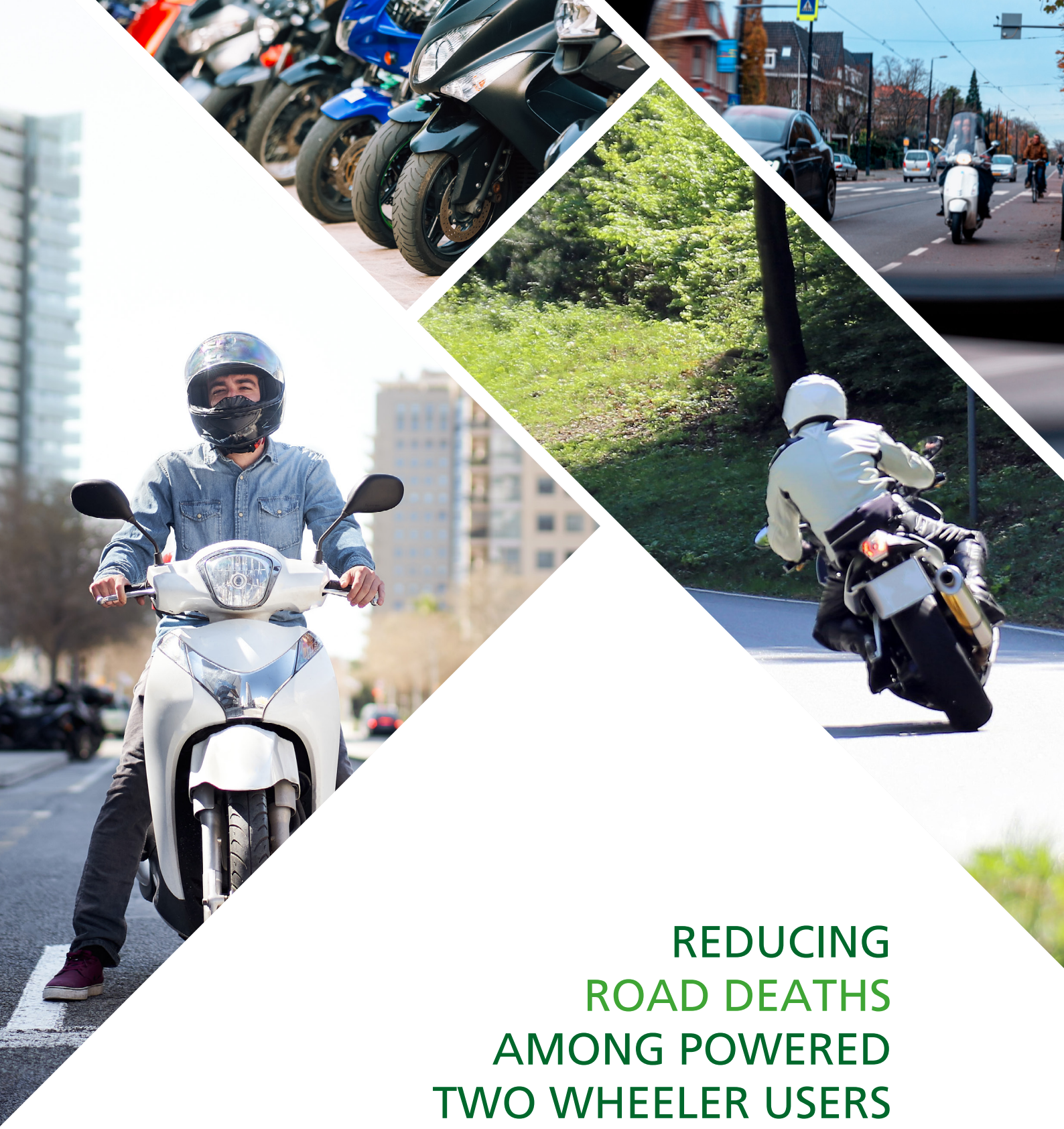

REDUCING ROAD DEATHS AMONG POWERED TWO WHEELER USERS

PIN Flash Report 44

March 2023

European Transport Safety Council

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REDUCING ROAD DEATHS AMONG POWERED TWO WHEELER USERS

PIN Flash Report 44

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March 2023

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The PIN programme relies on panellists in the participating countries to provide data and to carry out quality assurance of the figures provided. This forms the basis for the PIN Flash reports and other PIN publications. In addition, all PIN panellists are involved in the review process of the reports to ensure the accuracy and reliability of the findings.

ETSC is grateful for the financial support for the PIN programme provided by the German Road Safety Council (DVR), Toyota Motor Europe, the Swedish Transport Administration, the Norwegian Public Roads Administration, the Fundación MAPFRE and CITA, the International Motor Vehicle Inspection Committee.

About the PIN Programme

The ETSC Road Safety Performance Index (PIN) is a policy tool to help national governments and the European Union improve road safety. By comparing performance between countries, it serves to identify and promote best practice in Europe and bring about the kind of political leadership that is needed to create a road transport system that maximises safety.

Launched in June 2006, the index covers all relevant areas of road safety including road user behaviour, infrastructure and vehicles, as well as road safety policymaking more generally. The programme covers 32 countries: the 27 Member States of the European Union, together with Israel, Norway, the Republic of Serbia, Switzerland and the United Kingdom.

National research organisations and independent researchers participate in the programme and ensure that any assessment carried out within the programme is based on scientific evidence.

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 European countries. It maintains its independence through funding from a variety of sources including membership subscriptions, the European Commission, the European Parliament, and public and private sector support.

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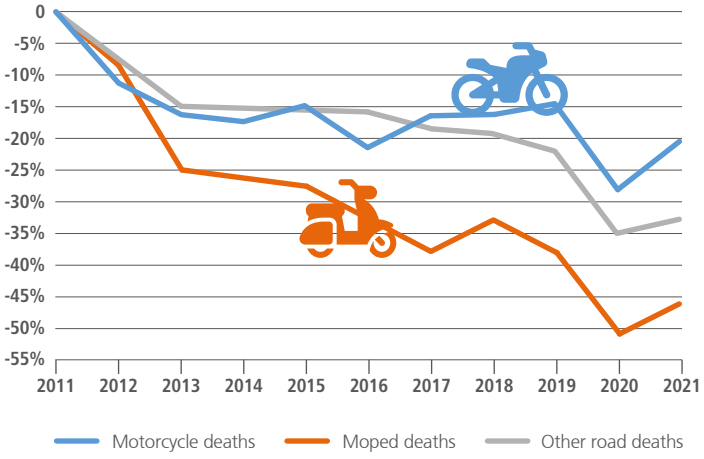

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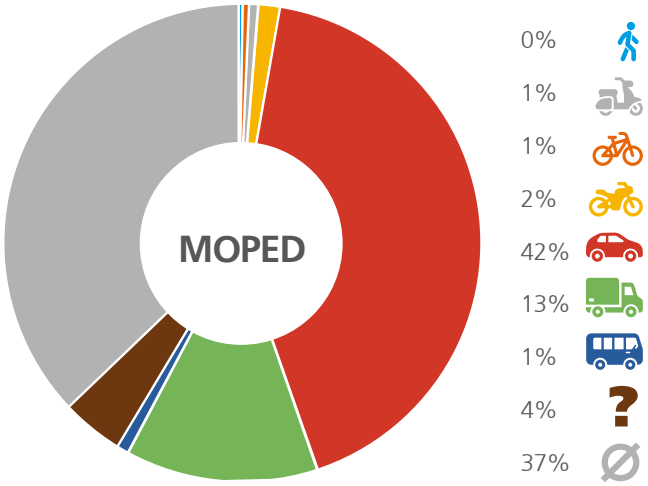

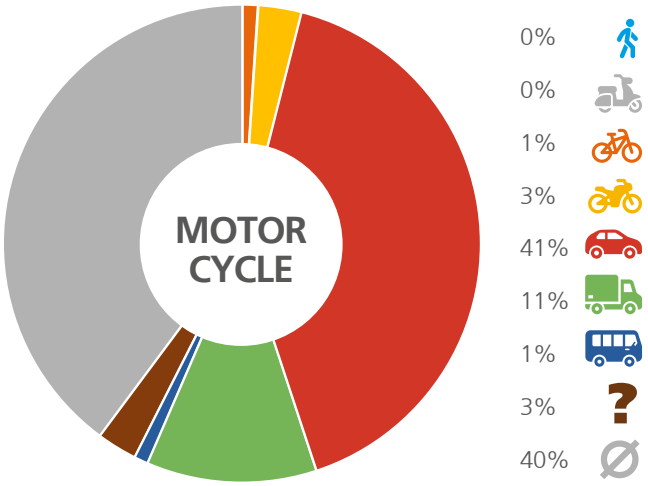

HELMET WEARING RATES IN THE COUNTRY WITH THE HIGHEST RATE IS

1.5 TIMES HIGHER

THAN THE COUNTRY WITH THE LOWEST RATE

ETSC RECOMMENDS

- Do not allow the lowering of the minimum age for solo driving for any vehicle category
- Make a comprehensive practical test mandatory to obtain an AM driving licence
- Mandate compulsory Anti-lock braking systems (ABS) for all motorcycles
- Extend periodic technical testing to cover all motorcycles, including mopeds
- Develop infrastructure guidelines which address the issues of PTW safety

EXECUTIVE SUMMARY

In this report, the term Powered Two Wheeler (PTW) encompasses mopeds and all motorcycles. The report examines the most recent data on the current safety levels of PTW users across the EU and other countries that provide data to ETSC as part of its Road Safety Performance Index (PIN) programme.

In the last decade, the number of PTW user deaths in the EU decreased by 25%, from 5,216 road deaths in 2011 to 3,891 in 2021. The majority of these were motorcyclists. The number of all other road deaths decreased by 33% over the same period.

In the last ten years the number of motorcyclist deaths decreased on average by 2% annually in the EU26[1], from 4,233 in 2011 to 3,364 in 2021.

Moped rider deaths are decreasing faster than motorcycle rider road deaths. In the last ten years, the number of moped deaths decreased on average by 6% each year in the EU24[2], from 983 in 2011 to 526 in 2021.

6,759 moped users and 17,228 motorcycle users were reported seriously injured in 2020 in the EU27. However, these numbers are likely to be lower than the true numbers due to a high level of underreporting of serious injuries.[3]

The 3rd European Driving Licence Directive, which came into force in 2013, effectively introduced Graduated Driver Licensing for riders by creating a series of stages to acquire a full licence for the largest and most powerful PTWs. Minimum ages apply to each stage, but those over 24 have direct access to the more powerful machines. A revision of the Directive is underway with further changes.

The data show a large reduction in PTW road deaths among 14-23 year olds between 2011 and 2021. It could be presumed that some of this reduction is related to the above-mentioned changes to driver licensing. The biggest reduction was among 14-year-olds, with the recommended minimum age for riding a moped now set at 16. Training for this category is now mandatory across the EU.

The average age of motorcyclists has increased steadily over the years and there are more mid-life riders being killed today than in 2011. These recent changes suggest that a significant proportion of motorcyclists either use newly learned skills or rely on skills that were developed some years before and which may have subsequently degraded through lack of use. The way in which motorcyclists build up their experience has also changed. Mid-life recruits to motorcycling tend to move up to powerful machines much more quickly.

While riding a motorcycle will carry more risk for the foreseeable future than driving a car, studies show that the implementation of dedicated safety measures can substantially improve PTW safety.

Motorcycle safety is a male problem. Among motorcycle user deaths, 92% are male riders, 2% are male passengers, 3% are female riders and 3% are female passengers. Among moped user deaths in the EU, 86% are male riders, 4% are male passengers, 8% are female riders and 2% are female passengers.

Among the countries that monitor levels of speed compliance on urban roads with a 50 km/h speed limit countrywide, between 41% and 61% of PTW speed observations in free-flowing traffic are compliant with the legal speed. Among countries monitoring speed on rural non-motorway roads, between 27% and 81% of PTW speed observations in free-flowing traffic are within the speed limit. Among the countries monitoring speed on motorways, the proportion of PTW speeds observed in free-flowing traffic compliant with the speed limit ranges from 42% to 85%.

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1 EU26: EU27 minus MT due to lack of data.
2 EU24: EU27 minus SK for inconsistency in the data trend and IE and MT for lack of data.
3 Source: EU CARE database. Please note that for some years, countries that are not included in the figure are France, the Netherlands, Ireland, Italy and Estonia due to problems of comparability, missing data or a break in the time series.

The two most important collision scenarios for PTWs are collisions where the main opponent is a passenger car and collisions involving no other vehicle.

While PTW users are vulnerable users themselves, other vulnerable road users are also killed in collisions with PTWs. In 2020, in the EU27, 97 pedestrians were killed in a collision with a motorcycle and six pedestrians were killed in a collision with a moped. In the same year in the EU27, 33 cyclists were killed in a collision with a motorcycle and 10 cyclists were killed in a collision with a moped.

Young rider age is among the most important risk factors for motorcyclists. The risks associated with young drivers and riders stem from inexperience, immaturity and lifestyle linked to their age and gender.

Anti-lock braking systems (ABS) were made mandatory for all new motorcycles over 125cc in the EU from 2016. An EU study commissioned to examine mandatory fitment for small motorcycles has been carried out and recommends that, 'given the relatively low cost and potentially significant associated benefits, ABS should be made mandatory for all new motorcycles'.

It is of the utmost importance for PTW users safety that driver assistance systems and automated driving systems and Cooperative Intelligent Transport Systems are capable and tested to correctly identify and react to PTWs and take PTW safety into consideration.

Technical failures of PTWs can have much more severe consequences than those for cars, and the condition of the vehicle can influence the consequences and the severity of an average occurrence. The European Commission is in the process of preparing a review of Directive 2014/45/EC on periodic roadworthiness tests with a proposal expected later in 2023. Last year the European Parliament called for periodic technical inspections to be required for all motorcycles, with extra checks for high-mileage vehicles such as those used for food deliveries. Tampering, allowing excessive speed, is a common factor in moped collisions, but could be mitigated by a more robust technical inspection regime.

PTW riders are not required to have a licence plate in front and, therefore, remain unidentified by safety cameras that photograph from the front. Motorcycle riders can also avoid sanctions in countries applying driver liability as the rider's face is covered by the helmet.

In relation to the distance travelled, a motorcyclist is, depending on the country, between nine to 30 times more likely to be killed in a road collision than a car driver.

Wearing a helmet on a motorcycle is mandatory in all EU countries and, on the whole, compliance rates are high. And yet, in some countries, the proportion of killed PTW users who are not wearing a helmet remains high.

Research has found that gig economy workers, many of whom use PTWs to make food deliveries, face a 'perfect storm' of risk factors on the road including inadequate training, a payment model that pressurises drivers to speed and to work while sick, absence of oversight of vehicle safety or condition and a lack of protective equipment.

MAIN RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Make theoretical and practical training mandatory for all PTW categories (A1, A2, A and AM) and establish minimum standards for the training.
- Follow the EU Driving Licence Directive's recommended minimum age per category.
- Develop infrastructure guidelines that address the issues around PTW safety.
- Extend periodic technical testing to cover all motorcycles, including mopeds, without exemptions: as a minimum, first inspection after four years, subsequent inspection after two years then every year after that.[4]
- Install speed cameras, including average speed cameras, that are able to detect speeding riders and enforce PTW rider compliance with speed limits.
- Enforce the compulsory wearing and proper fastening of helmets for PTW riders.

MAIN RECOMMENDATIONS TO THE EU

- Make a comprehensive practical test mandatory to obtain an AM driving licence.
- Make theoretical and practical training mandatory for all PTW categories (A1, A2, A and AM) and establish minimum standards for the training.
- Introduce hazard perception training and testing also for motorcyclists; introduce formal training to cover riding style including risk awareness, perception, risk of distractions.
- Do not lower the minimum age for obtaining a driving licence for any road user.
- In light of the EU Road Infrastructure Safety Directive (RISM) 2019/1936, prepare the technical guidance on 'road design quality requirements' for Vulnerable Road Users including PTWs. With the new guidelines, installation of road equipment including protective systems and improved maintenance could reduce the severity of PTW collisions in many EU Member States. The guidelines should be based on independent research.
- Develop a standard for PTW-friendly guardrails.
- Extend periodic technical testing to cover all motorcycles, including mopeds, without exemptions: as a minimum, first inspection after four years, subsequent inspection after two years then every year after that.[5]
- Mandate compulsory Anti-lock Braking Systems (ABS) for all motorcycles.
- Carry out research into the feasibility of mandating ABS for mopeds.
- Evaluate the opportunity of introducing eCall for PTWs.
- Support the setting up of a European helmet and protective clothing consumer information scheme, providing independent consumer information on the safety performance of the most popular helmets and protective clothing sold in the EU including information on durability and required maintenance.

In the context of the Revision of the Cross Border Enforcement Directive[6]:

- Encourage EU Member States to install speed cameras able to detect speeding riders and enforce PTW rider compliance with speed limits.

[4] ETSC (2020), Position on Roadworthiness Package https://bit.ly/3h4HPed
[5] ETSC (2020), Position on Roadworthiness Package https://bit.ly/3h4HPed
[6] EU Directive 2015/413 Facilitating cross-border exchange of information on road-safety-related traffic offences https://bit.ly/3ppicEX

INTRODUCTION

Powered Two Wheelers (PTW)

The general term Powered Two Wheeler is used to encompass all relevant vehicles, the main types being mopeds and full-sized motorcycles. **In this report, the term PTW encompasses mopeds and all motorcycles, while the term motorcycle includes the three CARE categories 'U-2.03', 'U-2.04' and 'UA-2.51' but it excludes mopeds**. Differences in machines and their use between mopeds and motorcycles are important and are discussed here as far as the data allow.

In recent years there has been much discussion about whether a PTW user falls into the category of vulnerable road user since they can pose risks to other road users such as pedestrians and cyclists. This is why we are also using the term 'unprotected'. Although PTW users are to some extent protected by helmets and clothes, they are not protected by a vehicle body and the other protection systems that vehicle occupants enjoy, which exposes them to the risks of motorised traffic.

The European Commission's CARE database divides PTWs into the categories listed below.

CARE definitions:

U-2.02 Moped: Two or three wheeled vehicle equipped with internal combustion engine, with size less than 50 cc and maximum speed that does not exceed 45 km/h (28mph).

U-2.03 Motorcycle up to 125 cc: two or three wheeled motor vehicle, with engine size up to 125 cc, or maximum speed exceeding 45 km/h (28mph).

U-2.04 Motorcycle over 125 cc: two or three wheeled motor vehicle, with engine size more than 125 cc.

UA-2.51 Two wheel motor vehicle: motor vehicle moving on two wheels. Includes mopeds and motorcycles but not bicycles.

However, given the high number of unknowns, it was not possible to analyse all the categories separately in this report and the decision was taken to consider all motorcycles (and two-wheel motor vehicles) together and only separate-out mopeds.

This report does not cover care definitions: 'U-2.21 E-pedelec' and 'U-2.22 Motorised micro-mobility device'.

This report examines the most recent available data on the current safety levels of powered two wheeler (PTW) users across the EU and other countries that provide data to ETSC as part of its Road Safety Performance Index (PIN) programme.

In recent years there has been much discussion about whether a PTW user falls into the category of vulnerable road user since they can pose substantial risks to other road users such as pedestrians and cyclists. But they remain unprotected by a vehicle body and the other protection systems that vehicle occupants enjoy, which exposes them to greater risks in motorised traffic.

While PTW user road deaths have been decreasing, they have not been decreasing at the same rate as other road deaths and there are differences between the reduction in moped road deaths and motorcycle road deaths. This also holds true for PTW user serious injuries.

Age is another important factor in PTW safety.

Improving the safety of PTW users can be achieved through a variety of measures starting with training and licensing through to infrastructure and new technologies. Some measures, such as speed enforcement or safe road design, benefit all road users.

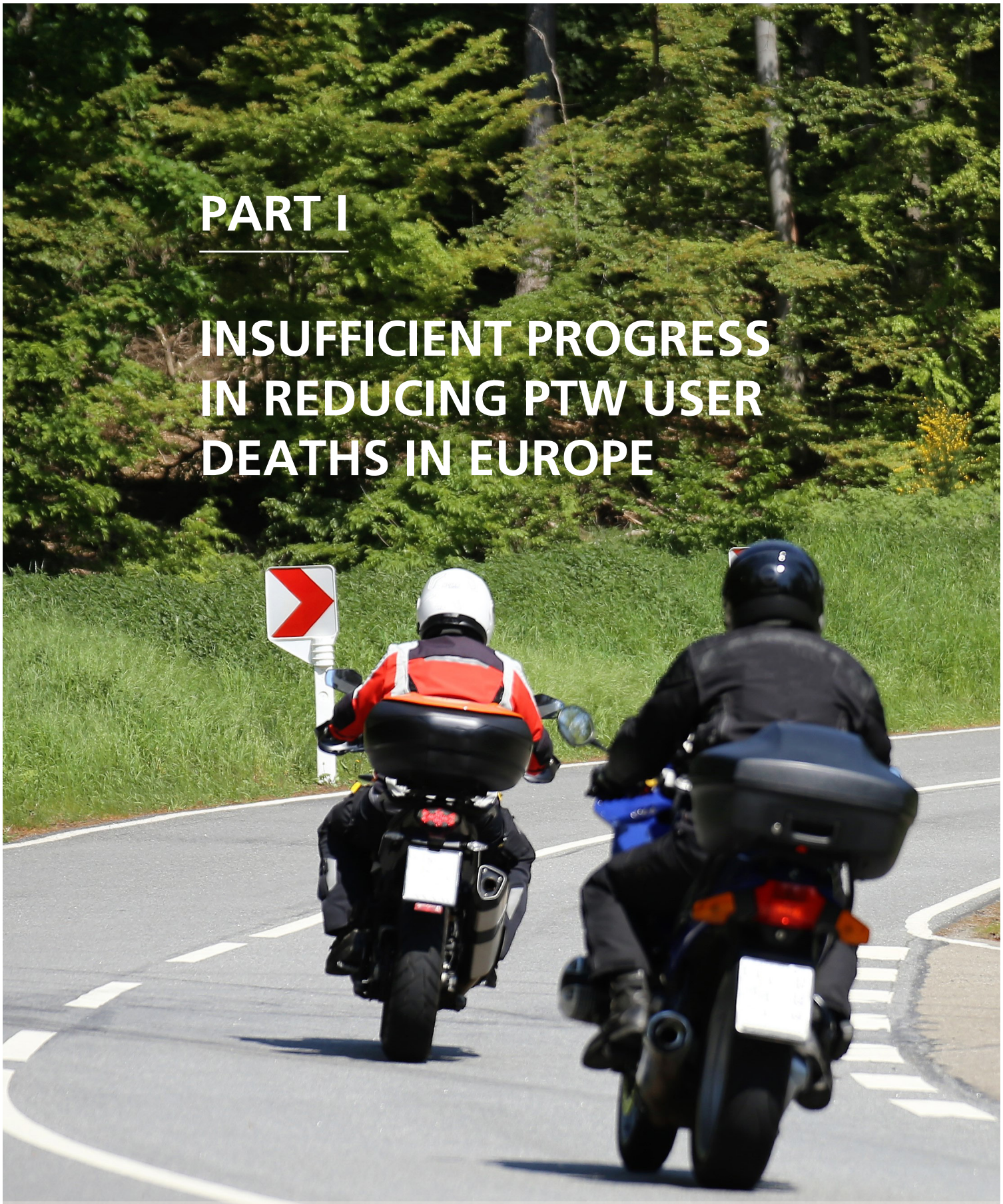
Part I of this report examines the latest data on PTW user road deaths from across the EU and other countries that form part of ETSC's Road Safety Performance Index (PIN) programme. As well as showing the differences that still exist between countries, it gives examples of policies that have led to faster progress and areas for improvement.

Part II looks at the main measures for reducing the risks to PTW users including training, licensing, infrastructure, technical inspections, the use of protective equipment and new technologies. Riding a PTW for work is also examined, particularly in light of the rise of the gig-economy.

Recommendations for national and EU policy-makers are made throughout, and a shorter list of priority measures is given at the end of the executive summary.

PART I

INSUFFICIENT PROGRESS IN REDUCING PTW USER DEATHS IN EUROPE



COVID-19 PANDEMIC

In this report we cover the period 2011-2021. In 2020 the COVID-19 pandemic hit the world. The initial response to the pandemic was to severely restrict people's travel and this resulted in unprecedented reductions in traffic volumes in most PIN countries during 2020. In many countries traffic volumes did not reach pre-pandemic levels in 2021 either, so data in both 2020 and 2021 should be considered with this in mind. Due to the many possible short and long-term effects of the pandemic, in our analyses of the trends and data we have not tried to correct for the influence of COVID-19.

01

1.1 ALMOST 4,000 RIDERS KILLED IN THE EU IN 2021 – 25% FEWER THAN IN 2011

In the last decade, the number of PTW user deaths in the EU decreased by 25%, from 5,216 road deaths in 2011 to 3,891 in 2021. The majority of these were motorcycle users. The number of all other road deaths decreased by 33% over the same period.

This result is far from the EU target inspired by Vision Zero of a 50% reduction in road deaths by 2030 and the EU aspiration of 0 road deaths by 2050.

Moreover, PTW deaths accounted for 21% of all road deaths on average in the EU in 2021, compared to 19% in 2011.

The next section looks at the differences in the figures between motorcycle users and moped users.

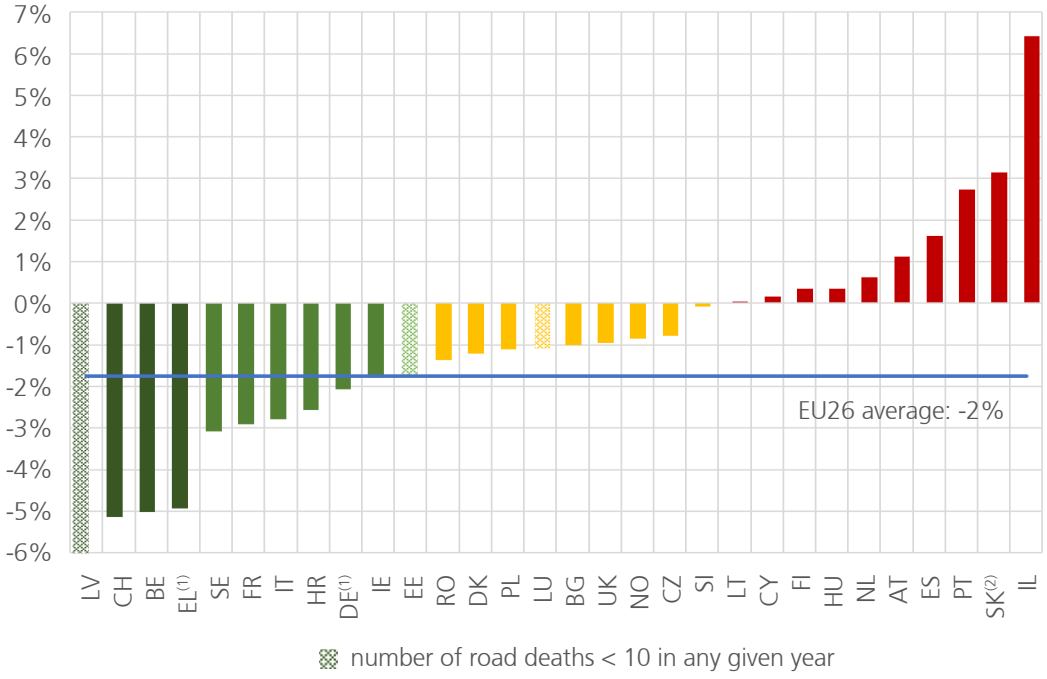
1.1.2 Motorcycle user road deaths

In the last ten years the number of motorcycle user deaths decreased on average by 2% annually in the EU26[7], from 4,233 in 2011 to 3,364 in 2021. Latvia achieved the highest average annual reduction of 6% over the period 2011-2021 (Fig. 1). Switzerland and Belgium achieved a 5% average annual decrease over the period 2011-2021 and Greece achieved a 5% average annual decrease over the period 2011-2020. Motorcycle deaths decreased on average each year by 3% in Sweden, France, Italy and Croatia and by 2% in Germany.

In 10 countries the number of motorcycle user deaths increased on average annually over the past 10 years. The number of motorcycle user deaths increased by 6% in Israel over the period 2011-2021, by 3% in Slovakia over the period 2012-2021, by 3% in Portugal over the period 2011-2021, 2% in Spain and 1% in Austria and the Netherlands over the period 2011-2021.

The number of motorcycle users killed on the roads in Estonia, Latvia and Luxembourg does not exceed 10 in any given year over the period 2011–2021, therefore, the estimated average annual reduction in motorcycle road deaths is affected by relatively high statistical uncertainty.

Figure 1. Average annual change in motorcycle user deaths over the period 2011-2021
(1)2011-2020, (2)2012-2021
EU26: EU27 countries excluding MT for lack of data. A different calculation method has been used for Estonia (see methodological note).[8]



[7] EU26: EU27 minus MT due to lack of data.
[8] The average annual decrease is based on the entire time series of all the nine annual numbers of road deaths between 2011 and 2021, and estimates the average exponential trend. For more information, see the methodological note: https://bit.ly/3VDlX7S

GREECE
PTW, A MAJOR ROAD SAFETY ISSUE

Motorcycles and mopeds are popular with a large part of the population (as well as tourists) in Greece, due to the good weather conditions almost all year round. In 2020 motorcycles represented 17% of all registered vehicles in Greece, followed by mopeds which represented 14% of all registered vehicles (the estimated share of registered motorcycles and mopeds on the total of registered vehicles at EU level in 2020 is 6% and 3.6% respectively). These high proportions lead to one of the most significant road safety problems in Greece, as PTW user deaths account for 36% of total road deaths; significantly higher than the respective EU average (23%). In 2020, Greece had the highest motorcycle user mortality in the EU (20 deaths per million population), while the EU average was about eight deaths per million population. Moreover, both PTW riders and passengers in Greece have low helmet use rates (only 80%) (see also fig. 14), especially inside urban areas. This fact has been highlighted in the new national road safety strategic plan for Greece, which foresees specific targets for PTWs including a reduction in the number of PTW riders killed by 66% by 2030 (40% by 2025) and an increase in helmet wearing rate to 95% by 2030 (90% by 2025), together with specific measures to meet these targets. PTW riders' safety is included in several road safety actions and measures of all five road safety pillars in the strategic plan (management, user, infrastructure, vehicle, post-crash care). In order to address this issue, PTW safety was one of the exchange topics in the EU Road Safety Exchange, involving Greece and Spain.

SWITZERLAND
A DECREASE IN THE NUMBER OF MOTORCYCLE USER DEATHS OVER THE LAST DECADE

In Switzerland, there has been a clear decrease in the number of motorcycle users killed over the last decade, similar to that recorded for all road users. Yet, between 2011 and 2021, the number of motorcycle users killed has not decreased consistently. There have also been some increases from one year to the next, the largest between 2019 and 2020, when motorcycle user deaths increased by 73%.

While variations in road deaths from one year to the next are accentuated by the relatively small number of motorcyclists killed each year in Switzerland, between 2019 and 2020 there was also a significant increase, from 175 to 230, in motorcycle users with a learner's permit involved in serious collisions. This increase can likely be attributed to a change in the law. Direct access to heavy motorcycles without power restrictions (category A) was possible up until the end of 2020 but the law changed in January 2021 and now a category A licence can, in principle, only be obtained if the driver has held an A2 licence for at least two years. Many more people applied for a category A licence in 2020 than in previous years, to avoid the consequences of the law change. This probably resulted in an increasing number of motorcycle users with learner's permits on the roads in 2020 and may explain why more of them have been involved in collisions.

SLOVAKIA
INCREASE IN THE MOTORCYCLE FLEET SIZE

The increase in the number of motorcycle user deaths between 2011 and 2021 in Slovakia is undoubtedly influenced by the increase in the popularity of the use of motorcycles in road traffic, which is reflected in the increase in the number of registered motorcycles in Slovakia during the same period, from 63,859 motorcycles registered in 2011 to 131,316 in 2021.

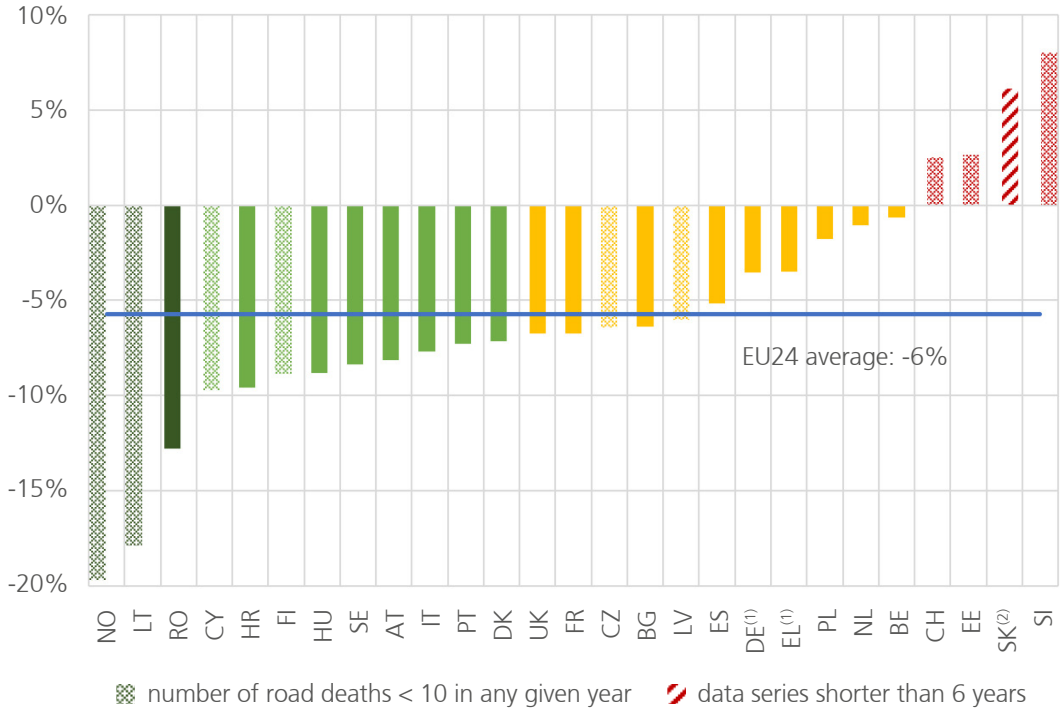
1.1.3 Moped user road deaths

Moped user road deaths are decreasing faster than motorcycle user road deaths. In the last ten years the number of moped deaths decreased on average by 6% each year in the EU24[9], from 983 in 2011 to 526 in 2021. Norway and Lithuania achieved the highest average annual reduction of 20% and 18% respectively over the period 2011-2021 (Fig. 2). In Norway and Lithuania, moped rider deaths decreased from four in 2011 to one in 2021. Moped deaths decreased on average annually by 13% in Romania, 10% in Cyprus and Croatia, and 9% in Finland and Hungary.

In four countries the number of moped user deaths increased on average annually over the past ten years, by 8% annually in Slovenia, 6% in Slovakia over the period 2016-2021, 3% in Estonia and Switzerland.

The number of moped users killed on the roads in Cyprus, Czechia, Estonia, Finland, Latvia, Lithuania, Slovenia, Slovakia, Switzerland and Norway does not exceed 10 in any given year over the period 2011–2021, therefore, the estimated average annual reduction in moped road deaths is affected by relatively high statistical uncertainty.

Figure 2. Average annual change in moped user deaths over the period 2011-2021
(1)2011-2020
(2)2016-2021
EU24: EU27 countries excluding SK for inconsistency in the data trend and IE and MT for lack of data. A different calculation method has been used for Cyprus, Czechia, Estonia, Lithuania and Norway (see methodological note). Luxembourg is excluded from the figure due to fluctuation in particularly small numbers of moped deaths.



[9] EU24: EU27 minus SK for inconsistency in the data trend and IE and MT for lack of data.

FRANCE
MODAL SHIFT AMONG YOUNG PEOPLE

Over the last decade, moped user deaths have decreased by on average 7% per year. This can be explained by a shift away from this kind of vehicle by young people, who were the most affected by collisions involving mopeds. The share of mopeds in the total number of PTWs decreased from 25% to 19% in France between 2010 and 2019. Moreover, between 2008 and 2019, the modal share of PTW for the age group 15-18 years old went from 8.5% to 2.0%. At the same time, the modal share of public transport went from 29.5% to 34.5% and the modal share of cars from 29.7% to 33.8% for this age group.[10]

ITALY
DECLINING USE OF MOPEDS OVER THE LAST DECADE

In Italy, the number of moped user deaths decreased on average by 8% annually over the last decade. This decrease can be partly attributed to an overall reduction in the use of mopeds since the early 2000s. In the decade 2001-2010 more than 100,000 mopeds were sold each year, whereas, between 2018 and 2021, only 15,000 were sold each year. The fleet at the beginning of the 2000s numbered 4.5 million mopeds whereas now it is 2.5 million.

1.2 ALMOST 24,000 PTW USERS SERIOUSLY INJURED IN THE EU IN 2020

6,759 moped users and 17,228 motor-cycle users were reported seriously injured in 2020 in the EU27. However, these numbers are likely to be lower than the true numbers due to a high level of underreporting of serious injuries.[11]

RECOMMENDATION TO NATIONAL GOVERNMENTS

- Collect serious injury data according to the MAIS3+ definition and continue collecting data based on national definitions.

RECOMMENDATION TO THE EU

- Support Member States with an exchange of best practice in MAIS3+ recording procedures and in training of data handling professionals.

[10] Personal Mobility Survey (2019), https://bit.ly/3YPS7zr
[11] Source: EU CARE database. Please note that for some years, countries that are not included in the figure are France, the Netherlands, Ireland, Italy and Estonia due to problems of comparability, missing data or a break in the time series.

1.3 A GREAT DISPARITY OF RISK

INDICATOR

The ideal way to relate the number of casualties to travel is by calculating risk: casualties per distance travelled. Fleet size is less adequate to use as an indicator.

Countries with a higher number of trips by PTW are more likely to register higher PTW deaths per population and may register higher deaths per vehicle registered, but not necessarily higher deaths per distance travelled. This report, therefore, uses as an **indicator** the **number of PTW user deaths per distance travelled**.

PTW distance-ridden data may also be influenced by the PTW-type most commonly used in a given country. A study carried out in Austria, for example, found that when PTW collision data were combined with travel data and examined according to engine power, displacement and category, significant differences were found by engine power and by displacement.[12]

Since the PTW-distance ridden is available only for a few countries, this report also includes as an indicator the **number of PTW user deaths per million vehicles registered**.

The data collected to calculate the indicators are supplied by the PIN Panellists in each country: 12 out of the 32 countries covered by the PIN programme have provided estimates of distance travelled by PTW, and 18 out of 32 provided estimates of the fleet size.

Data concerning PTW road deaths and serious injuries were retrieved by the European Commission from its CARE database upon ETSC's request and confirmed or complemented by the PIN Panellists. The full dataset is available in the Annexes. Population figures were retrieved from the Eurostat database and confirmed or complemented by the PIN Panellists.

This report builds on previous rankings on PTW road deaths in ETSC's 5th PIN annual report (2011). The publication can be downloaded from etsc.eu/projects/pin.

Looking at PTW rider deaths per distance travelled, PTW riders in Switzerland and moped riders in the Netherlands benefit from a lower level of risk than riders in other PIN countries (Fig. 3). In these countries, where the overall level of road safety tends to be above average,[13] average rider deaths are 22 and 36 per billion km respectively. On the other hand, PTW rider deaths per billion km in Ireland and Croatia are 148 and 191 respectively.

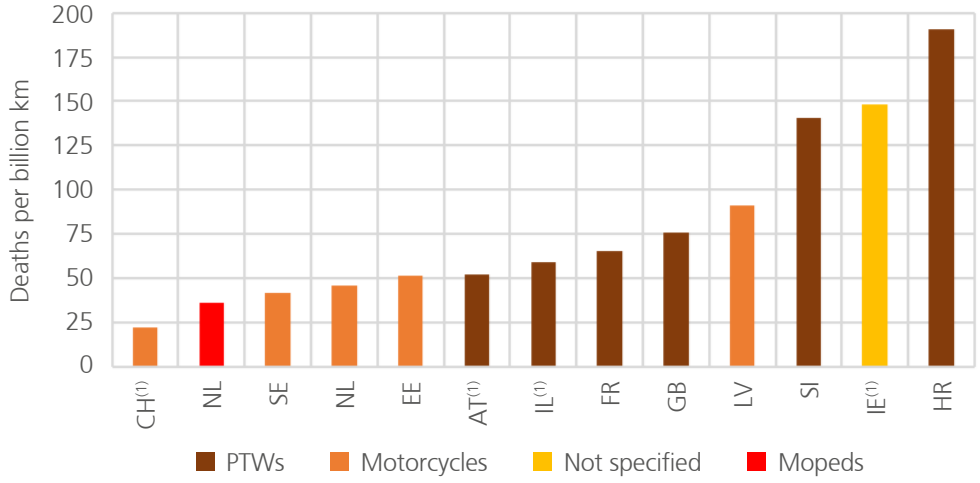


Figure 3. Powered two wheeler rider deaths per billion km over the period 2019-2021 (or latest three years available)
(1)2018-2020. Numbers between all countries are not comparable. AT, FR, HR, SI, GB and IL: all PTW deaths per billion km travelled by PTWs. EE, LV, SE and CH: motorcycle deaths by billion km travelled by motorcycles. NL: differentiate mopeds and motorcycles. IE: not specified.

[12] Winkelbauer M. (2013) Mileage of PTWs in Austria https://bit.ly/3jXkBHK
[13] ETSC (2022) 16th Annual Road Safety Performance Index (PIN) Report https://bit.ly/3IBUWic

SWEDEN

Road risk in Sweden is amongst the lowest in all PIN countries and PTW users also benefit from the country's general road safety measures. For example, a recent evaluation of speed cameras in Sweden showed that PTW users decrease their speeds when they see a camera, even though they cannot be fined as Sweden has driver liability (motorcycle users wear helmets which obscure their face from cameras).[14] Similarly, studies in Sweden have shown that, when speed limits are changed, PTW users also change their speed in line with the change in the limit.[15] The decrease is somewhat smaller than the decrease for cars, but it is still significant. Transforming rural roads into 2+1 roads (which are commonplace in Sweden) also has a positive road safety impact on motorcyclists as head-on collisions are prevented and motorcyclists are not hit by oncoming vehicles that have lost control.[17]

In the absence of distance travelled data, another way to measure the relative safety of motorcycle users is to divide the number of PTW deaths by the number of vehicles registered. According to the number of vehicles registered, moped users in Italy and the Netherlands benefit from a lower level of deaths per vehicle than users in the rest of the EU (Fig. 4). In these countries, an average of 26 and 28 user deaths per million vehicles registered were recorded respectively. On the other hand, in Israel and Ireland these numbers are 413 and 385 respectively.

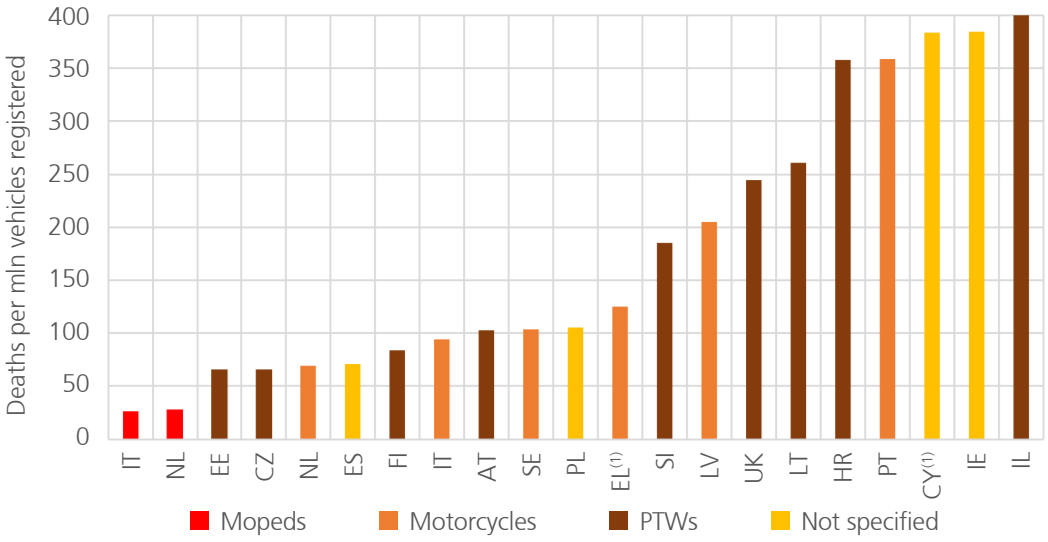


Figure 4. Powered two wheeler rider deaths per million PTWs registered over the period 2019-2021 (or latest three years available)
(1)2018-2020
Numbers between all countries are not comparable. AT, CZ, EE, FI, HR, LT, SI and UK: all PTW deaths per million PTW vehicles registered. EL, LV, PT and SE: motorcycle deaths per million motorcycles registered. IT and NL: differentiate mopeds and motorcycles. CY, ES, IE, IL and PL: not specified.

ITALY

The difference in the level of risk between mopeds (26) and motorcycles (94) in Italy could be due to the fact that mopeds circulate in urban areas and at reduced speed. In these conditions the use of a helmet can offer even better protection against fatal injuries.[16]

[14] Vadeby A., Howard C. (2022), Speed cameras in Sweden. Effects on speed and traffic safety. (in Swedish), https://bit.ly/3JV0ogN
[15] Vadeby A., Yahya M. (2012), Speed of motorcyclists – levels and changes on roads with new speed limits (in Swedish), https://bit.ly/3XgUIAY
[16] Andrea Costanzo (2004), A helmet to save a life (in Italian), https://bit.ly/41CkjaG
[17] Carlsson A. (2009), Evaluation of 2+1 roads with cable barrier. Final report, https://bit.ly/3x6JWCG

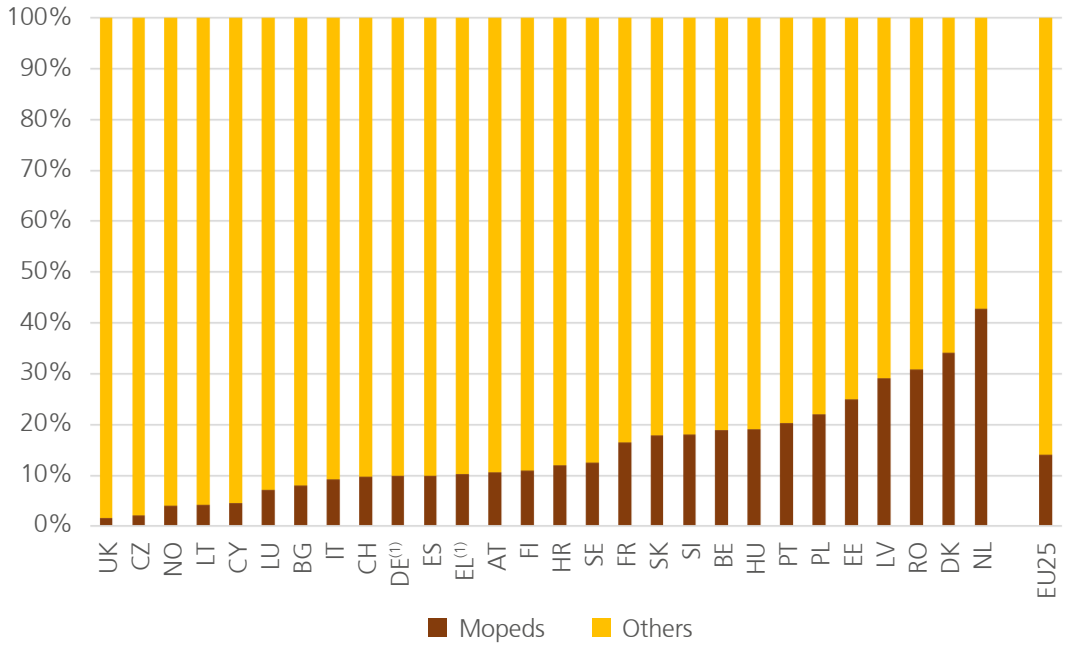
1.4 SOME SOURCES OF DISPARITIES IN RISK

Many factors other than road safety policy measures can impact the road safety of PTW users. These other reasons include climate, topography, seasonal variation, the age-distribution of the users, and the mix of commuting, work and leisure journeys for which the vehicles are used.

In the case of PTW riders there is another particular and substantial source of difference between countries and that is the proportion of mopeds, which differ in characteristics and pattern of use from larger and more powerful PTWs. A comparison of the proportion of moped rider deaths in the total number of PTW rider deaths can help countries to identify and prioritise safety measures for PTWs.

Fig. 5 shows that the proportion of PTW riders killed who were moped riders differed among the 28 studied countries over the last three years. The proportion is lowest in the UK and Czechia and highest in the Netherlands, Denmark, Romania and Latvia. In other countries, moped riders are among 4% and 25% of all PTW deaths.

Figure 5. Moped (rider and passenger) deaths as a proportion of total PTW (rider and passenger) deaths over the period 2019-2021 (average)
(1)2018-2020
EU25: EU27 minus IE and MT for lack of data.



1.5 FEWER RIDERS KILLED AMONG 15-23 YEAR OLDS IN 2021 COMPARED TO 2011

The 3rd European Driving Licence Directive, which came into force in 2013, effectively introduced Graduated Driver Licensing for riders by creating a series of stages to acquire a full licence for the largest and most powerful PTWs. Learners begin on smaller, less powerful vehicles, before graduating to the more powerful categories. Minimum ages apply to each stage, but those over 24 have direct access to the more powerful machines.

In Fig.6 it can be observed that there has been a large reduction in PTW road deaths among 14-23 year olds between 2011 and 2021. It could be presumed that some of this reduction is related to the above mentioned changes to the European Driving Licence Directive.

Table 1 shows that 14-year-old male riders in particular could be presumed to have benefitted the most from the changes in the Driving Licence Directive where the recommended minimum age for riding a moped is now set at 16 and a test has been made mandatory. 14-year-old male riders saw a 67% reduction in PTW user road deaths between 2011 and 2021.

Previously, they could ride a moped with no training or test in some countries.

Figure 6. Male and female PTW deaths by age (10 to 90) in 2021 and 2011 for comparison.
Source: EU CARE database

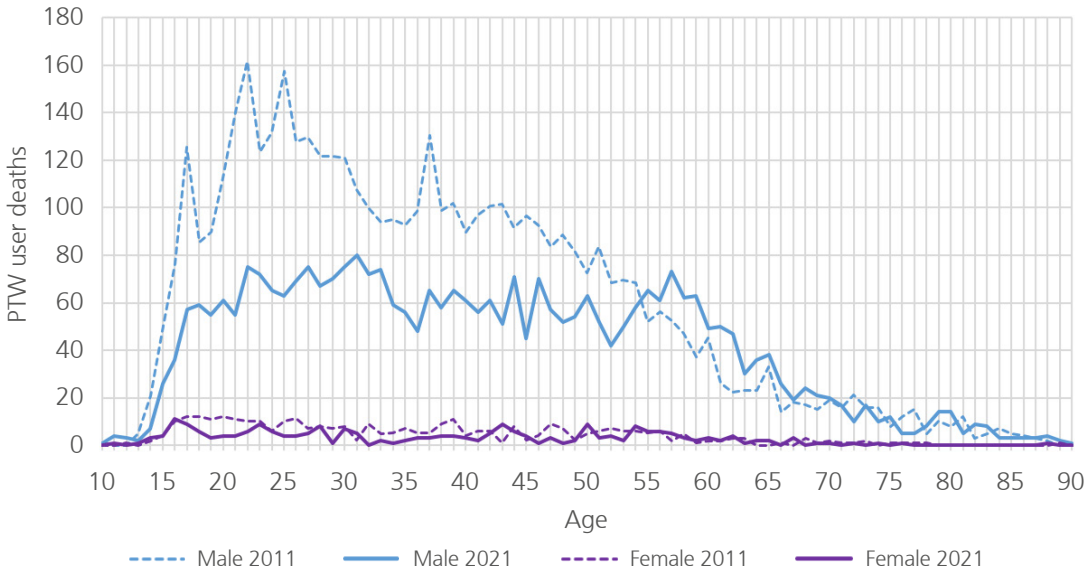


Table 1. Variation % in the number of male PTW rider deaths (14-23 years old) between 2011 and 2021
Source: EU CARE database

	Male		
Age	**2011**	**2021**	**% variation**
14	21	7	-67%
15	48	26	-46%
16	76	36	-53%
17	126	57	-55%
18	86	59	-31%
19	90	55	-39%
20	112	61	-46%
21	140	55	-61%
22	161	75	-54%
23	123	72	-42%

On the other hand, there are more mid-life riders being killed today than in 2011 (Fig. 6). The age of motorcycle users has increased steadily over the years.[18] These recent changes suggest that a significant proportion of motorcyclists either use newly learned skills or rely on skills that were developed some years before and which may have subsequently degraded through lack of use.[19] The way in which motorcyclists build up their experience has also changed. Mid-life recruits to motorcycling tend to move up to powerful machines much more quickly – helped in particular by higher incomes – than their younger counterparts. However, since many young people are unable to afford a new motorcycle, they rely on older, second-hand motorcycles which can lack more modern safety technologies.[20]

While riding a motorcycle will carry more risk for the foreseeable future than driving a car, studies show that the implementation of dedicated safety measures can substantially improve PTW safety. [21]

1.6 GENDER DIFFERENCES

Motorcycle safety is a male problem. Among motorcycle deaths, 92% are male riders, 2% are male passengers, 3% are female riders and 3% are female passengers (Fig. 7). The proportion of male rider deaths varies from 86% in Denmark to 100% in Ireland and Luxembourg. In the case of passengers, there is no significant difference between male and female but numbers are particularly small. It should be noted that the PTW rider population is composed mostly of male users.[22]

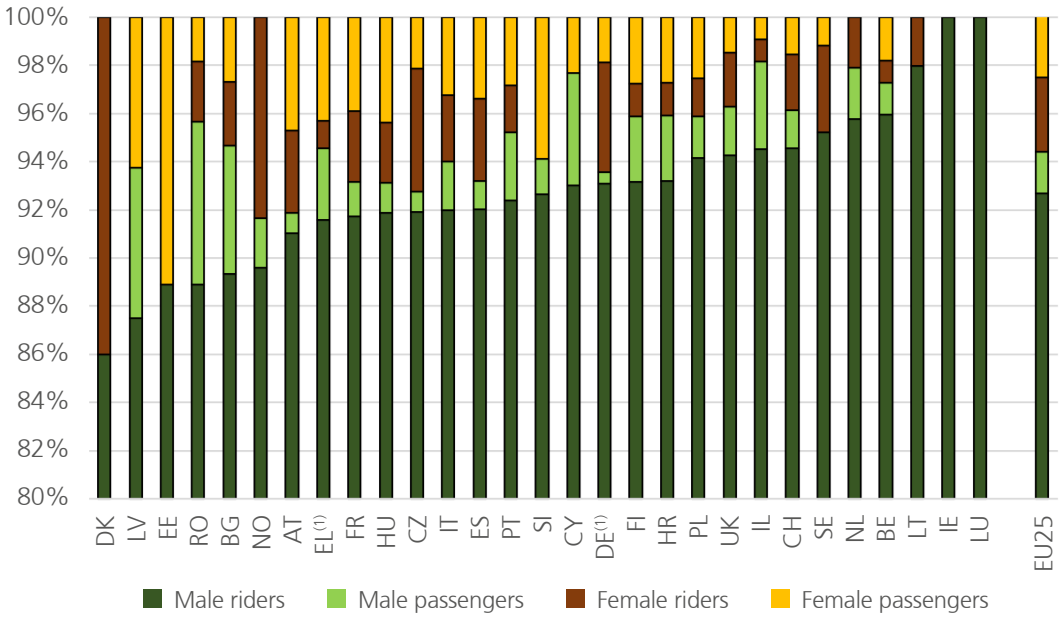
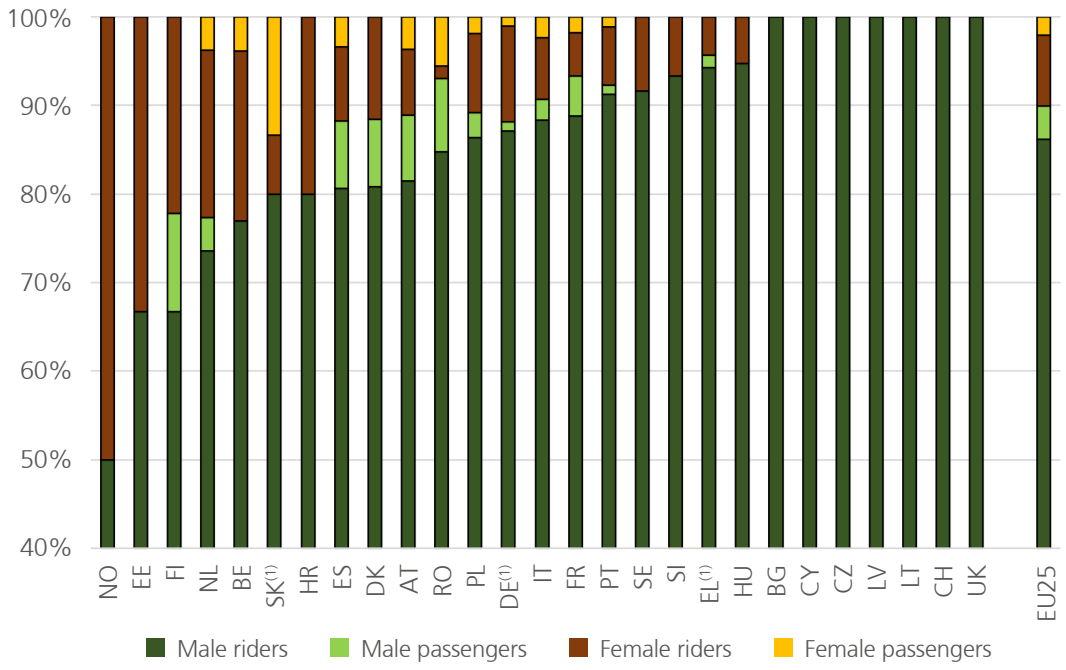


Figure 7. Proportion (%) of male and female rider and passenger deaths for motorcycles for the period 2019-2021 or last three years available (average) ranked by proportion of male riders, from lowest to highest
(1)2018-2020
EU25: EU27 minus MT and SK due to lack of data.

[18] D. Fitzpatrick, D. O'Neill (2016) The older motorcyclist https://bit.ly/3XxVQQA
[19] Ibid
[20] Department for Transport (2010), The Characteristics of Speed Related Collisions, Road Safety Research Report 117, p48. https://goo.gl/01pkZ3
[21] TØI (2016) Report 1517, Summary Motorcycle Safety https://bit.ly/3HlbOcG
[22] OECD (2015) Improving Safety for Motorcycle, Scooter and Moped Riders https://bit.ly/3wT7E5d

Among moped user deaths in the EU, 86% are male riders, 4% are male passengers, 8% are female riders and 2% are female passengers (Fig. 8). The proportion of male rider deaths varies from 50% in Norway to 100% in many other countries. The proportion of female moped riders is slightly higher with respect to the proportion of motorcycle female riders but it is still considerably lower than male moped riders. Numbers for moped deaths are small in many countries, therefore proportions could be affected by statistical fluctuations.

Figure 8. Proportion (%) of male and female moped rider and passenger deaths for the period 2019-2021 or last three years available (average) ranked by proportion of male riders, from lowest to highest
(1)2018-2020
EU25: EU27 excluding IE and MT due to lack of data



1.7 SPEED AND PTWS

INDICATOR

In order to support Member States in responding to 'Vision Zero', the European Commission launched the **Baseline project**, aiming to produce values for Road Safety Key Performance Indicators (KPIs).[23] Each participating country will provide between one and eight national KPI values. The methodological guidelines for all KPIs are designed to ensure international comparability.

One of the eight KPIs is '**Speed – percentage of vehicles travelling within the speed limit**'. The minimum requirement is to estimate the proportion of vehicles travelling within the speed limit (over the national territory on sections of roads that allow free flowing traffic).

This report therefore uses as an **indicator** the **percentage of vehicles travelling within the speed limit**.

1.7.1 Great disparity in speed limit compliance on 50km/h urban roads

More and more local authorities recognise the risks to vulnerable road users associated with 50 km/h or higher motor vehicle speeds. A growing number of cities and towns across Europe are introducing or extending 30 km/h zones, especially around schools and in residential and shopping areas with many pedestrians and cyclists. However, it is still a challenge to enforce and achieve speed compliance in urban areas on both 50 km/h and 30km/h roads.

Among the countries that monitor levels of speed compliance on urban roads with a 50 km/h speed limit countrywide, between 41% and 61% of PTW speed observations in free-flowing traffic are compliant with the legal speed (Fig. 9). As little as 41% of observed PTW speeds were within the speed limit of 50km/h in Great Britain, 46% in Cyprus, 47% in Greece in 2022, 52% in Poland, 55% in Estonia and 61% in Austria.

Austria and Switzerland were also able to provide data on PTW speed observations on roads with 30 km/h limits.

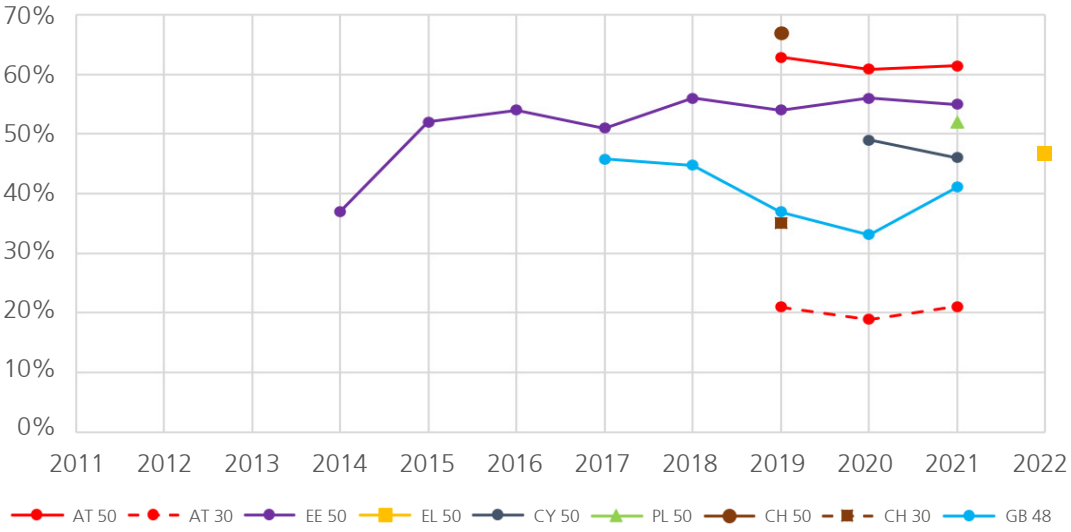


Figure 9. The proportion (%) of observed PTWs within the speed limit in free-flowing traffic on urban roads over the period 2011-2022 based on countries' individual data collection methodologies
Note that the proportion of observed PTWs within the speed limit on 50km/h roads also includes mopeds which have a speed limit of 45km/h.

As little as 21% of observed PTW speeds were within the speed limit of 30km/h in Austria in 2021 and 35% in Switzerland in 2019.

[23] https://baseline.vias.be/en/

1.7.2 Speed on rural non-motorway roads

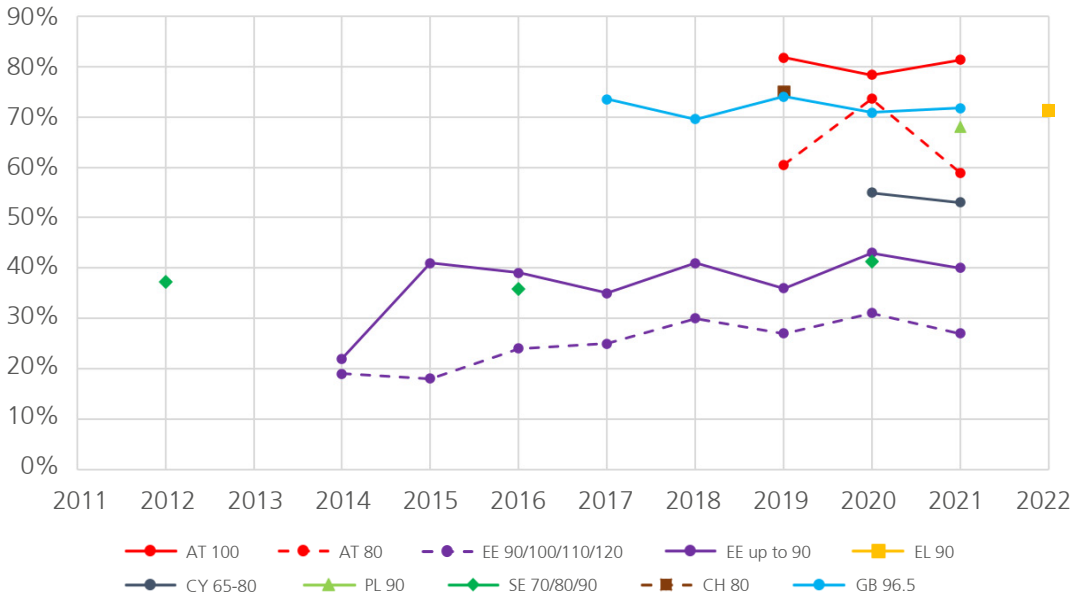
In 2018, 53% of PTW user deaths in the EU occurred on rural non-motorway roads, which are often designed as single carriageways with no median barrier to separate opposing traffic flows.[24] Due to the relatively low level of infrastructure safety, high speeds and composition of road users, rural roads are considered to be the most dangerous roads in terms of design.

Speed limits should be safe and credible and supported by the design of the road taking into account its function and use.

Rural roads with similar design characteristics might have different legal speed limits in different countries. In countries with lower legal speed limits, the proportion of observed PTWs within the speed limit could be lower than in those countries where rural roads have higher speed limits.[27] On rural roads with higher speed limits, the posted speed limit might be too high considering the road design.

Among countries monitoring speed on rural non-motorway roads, between 27% and 81% of PTW speed observations in free-flowing traffic are within the speed limit (Fig. 10).

Figure 10. The proportion (%) of observed PTWs within the speed limit in free-flowing traffic on rural roads over the period 2011-2022 based on countries' individual data collection methodologies
The sample for 80km/h roads in Austria is very small and can therefore be affected by high fluctuations.



1.7.3 Speed on motorway roads

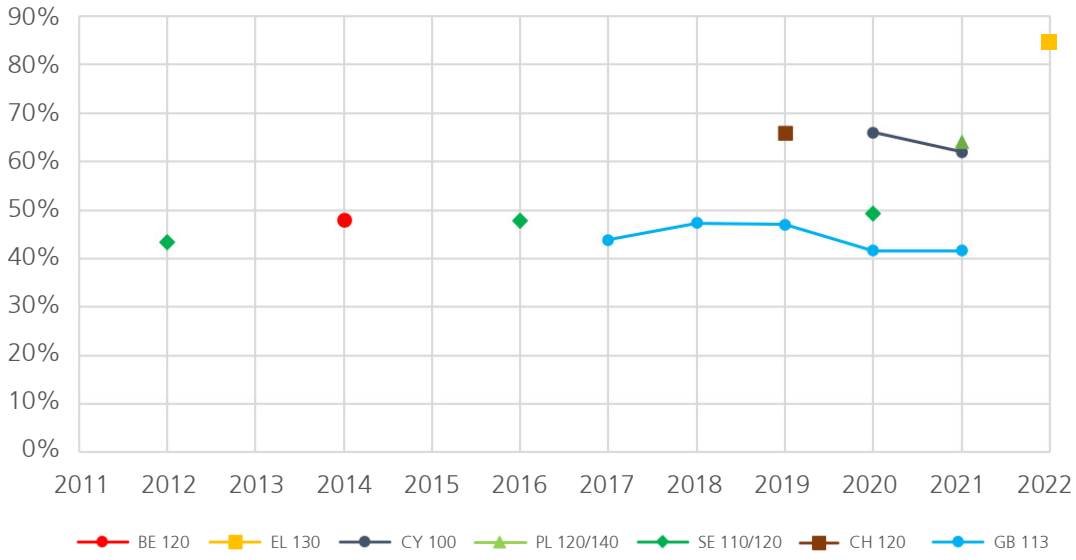
Motorways are high volume, high speed roads, but they are safer than other types of roads by design and regulation. On average, 9% of car occupant road deaths and 7% of motorcycle rider deaths in the EU occur on motorways.[25]

Among the countries monitoring speed on motorways, the proportion of PTW speeds observed in free-flowing traffic compliant with the speed limit ranges from 42% to 85% (Fig. 11).[26]

In the last year for which data are available, 85% of observed PTW speeds are within the 130km/h speed limit in Greece, 66% within the 120km/h limit in Switzerland, 64% within the 120 and 140 km/h speed limits in Poland, 62% within the 100 km/h limit in Cyprus, 49% within the speed limit in Sweden, 48% in Belgium, and 42% in Great Britain.

[24] European Road Safety Observatory (2020), Motorcyclists and moped riders, https://bit.ly/3BcVSp0
[25] EC (2021), Annual statistical report on road safety in the EU, https://bit.ly/3Yf9OrU
[26] Please note that in some countries not all PTWs are allowed to ride on motorways.
[27] ETSC (2019), PIN Flash 36, Reducing speeding in Europe, https://bit.ly/3jgBM6W

Figure 11. The proportion (%) of observed PTWs within the speed limit in free-flowing traffic on motorways over the period 2011-2022, based on countries' individual data collection methodologies

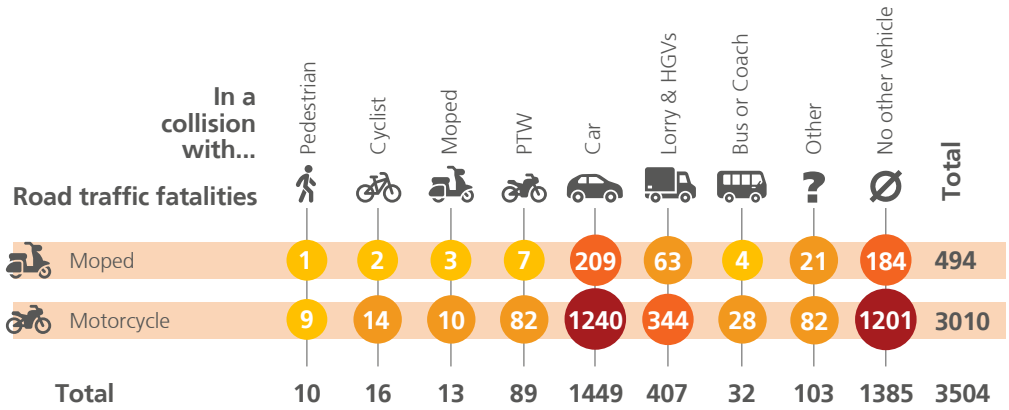


1.8 PTW USER DEATHS TAKING INTO ACCOUNT THE MAIN OTHER PARTICIPANT IN THE COLLISION

The two most important collision scenarios for PTWs are crollisions where the main opponent is a passenger car and collisions involving no other vehicle. In 2020 in the EU27, 1,449 PTW riders were killed in a collision involving a car, accounting for 41% of all PTW road deaths (Fig. 12). These findings are based on the EU CARE database. More specifically, 1,240 motorcycle users were killed in a collision involving a car, accounting for 41% of all motorcycle user deaths and 209 moped users, accounting for 42% of all moped user deaths.

1,385 PTW riders died in a collision with no other vehicle involved, accounting for 40% of all PTW road deaths. Of these, 1,201 were motorcycle user deaths, accounting for 40% of all motorcycle user deaths and 184 were moped user deaths, accounting for 37% of all moped user deaths. Single vehicle crashes have the tendency to be more underreported than two vehicle crashes.

Figure 12. EU27 PTW user road deaths in 2020 taking into account the main other participant in the collision. Methodological note: the data cover deaths in single-vehicle collisions and collisions involving one or more road users. For the majority of fatal collisions, only one other vehicle is involved in the collision. For multi-vehicle collisions, the 'main vehicle' is the heaviest of the vehicles involved as this tends to be responsible for the most serious consequences. As a result, the figures in each column likely underestimate the number of cases a particular vehicle was involved in a collision. Source: EU CARE database 2021 data are not yet available.



At the same time, while PTW users are vulnerable users themselves, other vulnerable road users are also killed in collisions with PTWs. In 2020 in the EU27, 97 pedestrians were killed in a collision with a motorcycle and six pedestrians were killed in a collision with a moped. In the same year in the EU27, 33 cyclists were killed in a collision with a motorcycle and 10 cyclists were killed in a collision with a moped (Fig. 13).

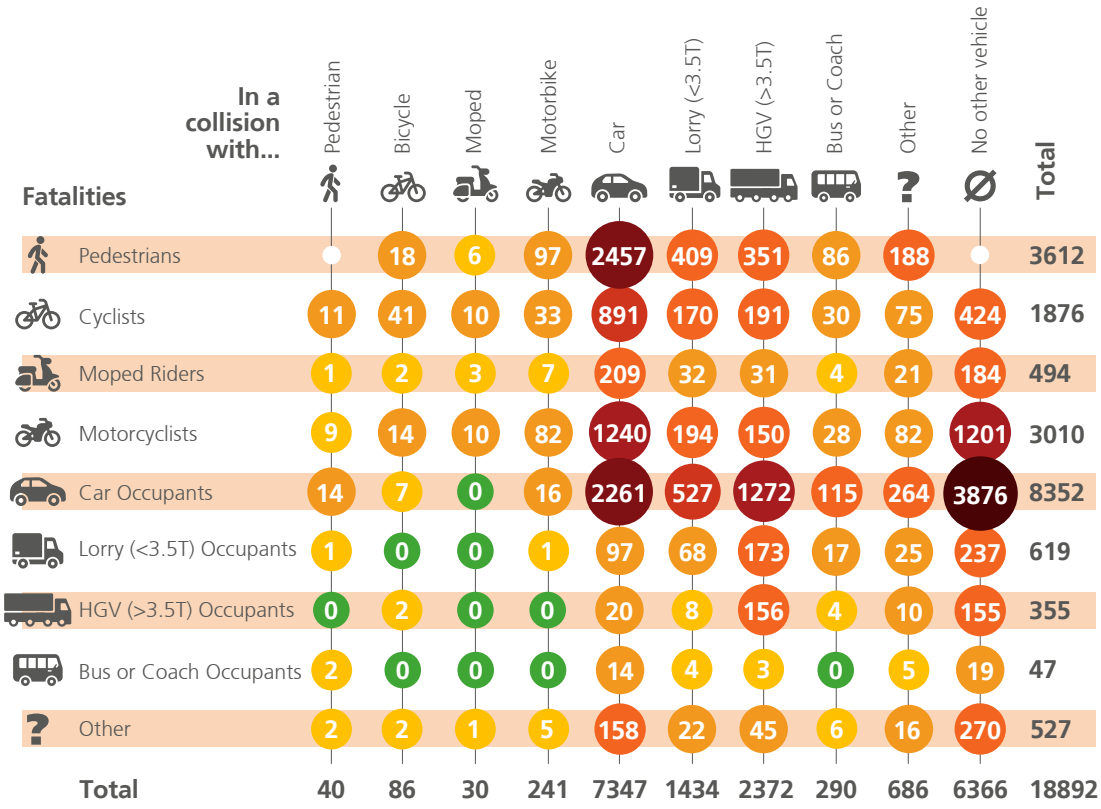


Figure 13. EU27 road deaths in 2020 for each transport mode taking into account the main other participant in the collision
Source: EU CARE Database

PART II

COUNTERMEASURES

02

Knowing the causes of powered two wheeler collisions and the circumstances in which they occur are crucial elements in the development of effective countermeasures.

The Safer Wheels study, commissioned by the European Commission in 2018 collected in-depth crash investigation data from 500 collisions involving PTWs or bicycles in the EU. The study found that inappropriate speed (travelling at a speed too high for the prevailing traffic and environmental conditions) was a contributory factor in 22% of PTW rider collisions. Errors of observation, including for example 'looked but failed to see' collisions, were also prevalent and considered a contributing factor in over one-third of PTW collisions (38%). 25% of killed and seriously injured PTW riders were involved in a single vehicle collision. 64% of PTW riders killed or seriously injured in a single vehicle collision lost control of their motorbike on a curve or bend.[28]

Other factors such as age, experience and training can also influence PTW safety as can the quality and choice of infrastructure, the use of protective equipment and vehicle safety.

2.1 IMPROVING RIDER AND DRIVER SKILLS - TRAINING

A PTW rider's skills, training, experience and attitudes are fundamental to safe riding. Governments should ensure that riders receive appropriate training when they start to use a motorcycle (or re-start after a period of non-use) and that they receive further training as they progress from smaller to larger motorcycles. Motorcyclists should be made aware of the difficulties other road users have in detecting PTWs and evaluating their speed.

Motorcycle riders, because of their inherent vulnerability, need to attain a level of skill that will enable them to ride defensively and to avoid putting themselves at unnecessary risk. Higher order skills, such as personal attitudes, risk awareness, self-awareness, dealing with risks such as distraction, peer pressure and impaired driving, are difficult to test. Nonetheless, several studies have highlighted the importance of training for these skills.[29] The training for graduated access to a higher category may not need to cover all elements of the practical test as the candidate already has experience. It could, for instance, instead focus on the high-level skills mentioned above.

In 2011, the European Commission published an Initial Rider Training manual.[30] The manual proposes that initial rider training should include theoretical, machine control and traffic interface elements with the aim of addressing one of the main problems affecting the quality of initial rider training, namely the focus on machine control skills to the detriment of hazard awareness and rider attitude and behaviour.

The effects of such training were evaluated in a study carried out in the Netherlands where the Royal Dutch Motorcyclists Association (KNMV) runs a 'Risk' advanced training course, teaching motorcyclists to recognise, analyse, and anticipate potential traffic hazards. The evaluation indicated that the 'Risk' training course has a positive effect on the riding behaviour and hazard perception of motorcyclists both in the short and long term.[31]

Schemes such as free courses offered at the point of sale or regular refresher courses should be encouraged as well. Car drivers also need to be educated to actively search for motorcyclists in their visual field, particularly at junctions. Studies demonstrate that multimodal motorcycle warning and training could improve detection of motorcycles by other vehicle drivers.[32]

[28] European Commission (2018), Directorate-General for Mobility and Transport, Davidse, R., Margaritis, D., Brown, L., et al., SAFERWHEELS: study on powered two wheeler and bicycle accidents in the EU: final report https://bit.ly/3enGkXa
[29] OECD (2006), Young Drivers – The Road to Safety, OECD, pp.75–76. https://goo.gl/dHJJRj
[30] http://www.initialridertraining.eu/
[31] SWOV (2014), Evaluation advanced training course for motorcyclists https://bit.ly/3VkH3ZA
[32] bmvit (2019), Improved Perception of Motorcycles https://bit.ly/3Znvymw

European Training Quality Label

The European Training Quality Label[33] is a label that helps riders to clearly and easily identify high-quality post-licence training programmes.

Recognising the importance of voluntary post-licence training in enabling riders to increase their safety awareness, as well as enhance their hazard perception skills, the label seeks to promote high quality post-licence training schemes across the European Union.

The European Quality Training label received a Road Safety Charter Award from the European Commission in 2019.

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Introduce hazard perception training and testing for motorcyclists; introduce formal training to cover riding style including risk awareness, perception, risk of distractions.
- Make theoretical and practical training mandatory for all PTW categories (A1, A2, A and AM) and establish minimum standards for the training.
- Consider introducing mandatory periodic re-training for all PTW categories, linked to licence renewal.
- Include training on interaction with vulnerable road users, including motorcyclists, and in risks of distraction as part of the syllabus of training of all drivers.
- Support the national implementation of both voluntary and mandatory elements of driver training and periodic re-training.

RECOMMENDATIONS TO THE EU

Recommendations in the context of the revision of the Driving Licence Directive

- Make a comprehensive practical test mandatory to obtain an AM driving licence.
- Make theoretical and practical training mandatory for all PTW categories (A1, A2, A and AM) and establish minimum standards for the training.
- Introduce hazard perception training and testing also for motorcyclists; introduce formal training to cover riding style including risk awareness, perception, and risk of distractions.
- Consider introducing mandatory periodic re-training for all PTW categories, linked to licence renewal.
- Train new and existing riders in how to use new vehicle safety features.
- Ensure that motorcycle tests remain valid for new technologies.
- Include training on interaction with vulnerable road users, including motorcyclists, and in risks of distraction as part of the syllabus of training for all drivers.
- Develop and include minimum standards for PTW instructors, including previous experience, education, testing and periodic retraining. Consider the introduction of quality assurance.

[33] https://motorcycle-training-label.eu/

2.2 EU LEGISLATION FOR OBTAINING A MOTORCYCLE LICENCE

2.2.1 EU legislation for obtaining a driving licence for moped riding

The EU Driving Licence Directive offers an element of graduated access to the more powerful PTWs with experience required on a less powerful vehicle before permitting early access to larger ones.

Since 2013 it has no longer been possible to ride a moped in the EU without a driving licence, thanks to amendments to EU Directive 2006/126/EEC on driving licences.

The amendments to the Directive introduced a new AM category.[34] A theoretical test was made mandatory for AM riders following the implementation of the Directive, while practical training remained optional.[35] Most Member States have stricter licencing requirements for mopeds: 20 EU countries require mandatory practical training and 21 require a practical test.[36]

The EU Driving Licence Directive recommends that the minimum age for obtaining an AM category driving licence should be 16, but in Estonia, France, Hungary, Italy, Latvia and Poland, an AM category licence can be obtained at 14 years old. A further 12 PIN countries allow a licence at 15 years old (AT, CH, CZ, DE, DK, ES, FI, HR, LT, SE, SI, SK). On the other hand, in Cyprus, an AM licence can only be obtained at 17 years old and, in Malta, at 18 years old. Indeed, the AM category is the licence category with the largest variation in minimum age requirements (Table 2).

2.2.2 EU legislation for obtaining a driving licence for motorcycle riding

The EU Driving Licence Directive recommends a minimum age of 20 for obtaining a category A[37] licence if a rider already has two years of experience driving with an A2 licence (graduated access). Where an applicant does not already have two years' experience of driving with an A2 licence, the recommended minimum age is 24 (direct access).

Six EU Member States have set the minimum age for graduated access to a category A licence at 22 (BE, CY, DK, EL, MT and NL), higher than the EU Directive recommends. One Member State, Hungary, sets the age for graduated access at 21 which is also higher than the EU Directive recommends. Non-EU countries, the UK and Israel, have also set the age for graduated access at 21.

The minimum age for access to the A2[38] licence is recommended in the directive as 18. Six EU Member States have set a higher age, 20, for access to the A2 licence (BE, CY, DK, EL, MT and NL). Non-EU member state, the UK, also has a higher age of 19. In Israel, access to the A2 licence is granted from 16.

[34] AM category includes: Moped – two-wheel vehicles or three-wheel vehicles with a maximum design speed over 25km/h and not more than 45km/h; Light quadricycle with an unladen mass of not more than 350kg, not including the mass of the batteries in case of electric vehicles, whose maximum design speed is over 25km/h and not more than 45km/h.
[35] EU Directive 2006/126/EC on Driving Licences https://bit.ly/3a4GgGE
[36] ETSC (2022), PIN Flash 43, Reducing Child Deaths on European Roads https://bit.ly/3SVKzaN
[37] Category A – heavy motorcycles without power restrictions
[38] Category A2 – motorcycles with a power rating under 35 kW

	Minimum driver age for different PTW categories				
	AM (EU recommended minimum age 16)	A1 (EU recommended minimum age 16)	A2 (EU recommended minimum age 18)	A (EU recommended minimum age 20 with two years of experience)	
				2 years experience under A2	No experience under A2
AT	15[1]	16	18	20	24
BE	16	18	20	22	24
BG	16	16	18	20	24
CY	17	18	20/24[2]	22	24
CZ	15	16	18	20	24
DE	15[3]	16	18	20	24
DK	15/18[4]	18	20	22	24
EE	14	16	18	20	24
ES	15	16	18	20	20
FI	15	16	18	20	24
FR[5]	14	16	18	20	not allowed
EL	16	18	20	22	24
HR	15	16	18	20	24
HU	14	16	18	21	24
IE	16	16	18	20	24
IT	14[6]/16	16	18	20/21[7]	24
LU	16	16	18	20	20
LV	14	16	18	20	24
LT	15	16	18	20	24
MT	18	18	20	22	24
NL	16	18	20	22	24
PL	14	16[8]	18	20	24
PT	16	16	18	20	24
RO	16	16	18	20	24
SE	15	16	18	20	24
SI	15	16	18	20	24
SK	15	16	18	20	24
UK	16	17	19	21	24
CH	15	16	18	20	[9]
IL[10]	n/a	18	16	21	21
NO	16/18[11]	16	18	20	24
RS	16	16	18	20	24

Table 2. Minimum driver age for different PTW categories. Category AM - Two- and three-wheel vehicles with a maximum design speed of not more than 45 km/h, as well as light quadricycles. Category A1 - light motorcycles with a cylinder capacity not more than 125cc and a power rating less than 11 kW. Category A2 motorcycles with a power rating under 35 kW. Category A - heavy motorcycles without power restrictions

Source: National statistics provided by PIN Panellists in each country [1]AT - AM below 16 only with written parental consent. [2]CY - Min. 20 yrs, if in possession of A1 for 2 years. If not then min. 24 yrs. [3]DE - From the age of 15 until 16, young moped drivers are allowed to drive only on German territory. [4]DK - age limits: small moped 30km/h: 15 years, big moped 45km/h: 18 years. [5]FR - in accordance with the principle of progressive access to powered two wheelers (generalised to the wider population), there is no direct access to driving licence A. [6]IT - Provided that no other people are transported besides the driver [7]IT - for driving tricycles for which a Category A driving licence is required. [8]PL - Written parental consent is required before the age of 18. [9]CH - Only those who need to drive such motorbikes as part of their profession (e.g. motorbike mechanics, police officers or traffic experts) can obtain the corresponding category directly. [10]IL - there is no AM category in Israel, A2: motorcycle no more than 125cc and a power rating less than 11 kW, A1: motorcycles with a power rating under 35 kW. [11]NO - 18 years for heavy PTW (over 150kg)

2.2.3 Minimum age for obtaining a PTW licence

Young rider age is among the most important risk factors for motorcyclists.[39] The risks associated with young drivers and riders stem from inexperience, immaturity and lifestyle linked to their age and gender.[40] Young people undergo significant biological and social changes between the ages of 15 and 25. Cognitive development during puberty can lead to greater emotional instability and more assertive behaviour. Consequently, as road users, young people tend to display risky behaviours and have a diminished appreciation of the hazards that they face.[41]

Research carried out in Norway found that increasing the age limit for obtaining a light motorcycle driving licence from 16 to 18 years could be expected to result in a considerable reduction in collision involvement among 16- and 17-year-old riders of powered two wheelers and three- or four-wheeled mopeds. For collisions resulting in death or severe injury, the reduction is estimated at about 34%.[42] Research carried out in Austria found that 15-year-olds are not always mature enough to ride (mopeds) safely in traffic.[43]

Raising, or not lowering, the minimum age for solo driving and riding will save lives, by virtue of the fact that it prevents young and inexperienced drivers and riders from solo driving or riding until they are older. It reduces PTW use, but it also reduces the risk to these riders who, when starting to ride at a higher age, have a lower risk than they would have at a lower age.[44] Conditions for driving motorised two-wheeled vehicles should be similarly stringent to prevent migration to less safe forms of transport.[45]

UK

UNDERSTANDING YOUNG RIDERS

In 2020, the National Young Riders Forum[46] in the UK, commissioned a study into understanding young riders. Analysis of the collision data found the majority of the 30,862 young people (16-24 years) injured whilst riding a motorcycle in Great Britain between 2014 and 2018 were young males on motorcycles with engines up to 125cc. The highest numbers of young injured motorcycle riders were aged between 16[47] and 21 years old.[48]

SWITZERLAND

SERIOUS INJURIES AMONG MOTORCYCLE USERS MORE THAN DOUBLED FOR 0-17 YEAR OLD AGE GROUP BETWEEN 2020 AND 2021

The number of serious injuries among motorcycle users in the age group 0-17 in Switzerland more than doubled between 2020 and 2021. The majority of those seriously injured were 16- and 17-year-olds. This increase is likely to be related to the fact that since 2021, 16- and 17-year-olds were granted access to the more powerful, 125cc motorcycles. Prior to 2021 access to these vehicles was only possible from the age of 18.[49]

[39] Høye, A. (2016), Summary, Motorcycle safety TØI Report 1517/2016 https://bit.ly/3WGrqN3
[40] European Commission (2018), Novice Drivers https://bit.ly/3qT3Xt8
[41] Twisk, D., Stelling, A., (2014), Young people's risky behaviour requires integral approach, SWOV, p4. https://bit.ly/3dwwm5q
[42] Sagberg, F. Amundsen, A.H, (2015) TØI Report 1419, Increased licensing age for light motorcycles? Potential traffic safety effects https://bit.ly/3k5TIlm
[43] Bmvit (2019) MOVER – Young moped riders and their readiness to ride (in German) Jugendliche MopedlenkerInnen und Verkehrsreife https://bit.ly/3HUljzA
[44] SWOV (2014) Brain development and crash risk of young novice drivers; A literature study https://bit.ly/3yZrZ8W
[45] OECD (2015), Improving Safety for Motorcycle, Scooter and Moped Riders, https://goo.gl/kAwsjq
[46] The National Young Rider Forum (NYRF) is a group of road safety professionals which includes representatives from MCIA, MAG, local authority road safety teams, police forces, fire & rescue and road safety partnerships from across the UK.
[47] Definition of motorcycle includes mopeds which can be ridden at 16 years of age.
[48] Agilysis (2020), Understanding Young Riders: Research for the National Young Rider Forum https://bit.ly/3EjfYjk
[49] SINUS (2022) Safety level and collision occurrence in road traffic in 2021 (in German) https://bit.ly/3YFOKef

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Follow the EU Driving Licence Directive's recommended minimum age per category.
- Undertake further research into young road user risk and its causes, including the use of PTWs by young people.

RECOMMENDATIONS TO THE EU

- Do not allow the lowering of the minimum age for obtaining a driving licence for any road users.

2.3 PROVIDE A SAFER ENVIRONMENT FOR PTW RIDERS - INFRASTRUCTURE

Shortcomings in infrastructure are a contributory factor in PTW collisions. The EU Road Infrastructure Safety Directive requires governments to carry out regular road safety audits, identify high-risk sites and prioritise safety when building new roads. The revised EU Road Infrastructure Safety Directive 2019/1936[50] has extended its scope beyond the trans-European transport network roads (TEN-T) to include all motorways and primary roads. A new network-wide risk assessment has been introduced. The recent changes also strengthen the requirements to protect vulnerable road users including users of PTWs.

Under the Directive, the Commission must develop new guidance on quality requirements regarding vulnerable road users, including users of PTWs. Such guidance is due to be developed in close cooperation with Member State experts. With the new guidelines, the installation of road equipment including protective systems and improved maintenance could mitigate the severity of PTW collisions in many EU Member States.[51] The guidelines should be based on independent research. At the time of writing the work is delayed.

Several handbooks and manuals have identified good practices addressing the specific needs of PTW users in road design and maintenance such as using anti-skid surfaces and making roadsides more forgiving.[52] For instance, the safety of PTW users could be increased if protective systems such as guardrails are only placed where necessary and are certified as 'motorcycle friendly' (ie with underrun protection). Motorbike-specific road markings in curves can also improve PTW safety.[53] In Germany, updated guidelines for motorcycle-friendly infrastructure now differentiate between measures to be taken inside urban areas and measures to be taken on all types of roads outside urban areas.[54]

The intention of the European Road Assessment Programme (EuroRAP) to include PTW characteristics in risk-assessment and performance-tracking is welcome as it will provide a sound basis for upgrading road networks to be forgiving for all users, including riders.[55] Specific training on the needs of PTWs should also be developed for road auditors and inspectors.

[50] EU Directive 2019/1936 amending Directive 2008/96/EC on road infrastructure safety management https://bit.ly/3VSh23o
[51] VTI (2009), Evaluation of 2+1 roads with cable barrier https://bit.ly/40aC5B3
[52] eSUM Safer urban infrastructure guidelines and ACEM (2006) Guidelines for PTW-safer road design in Europe https://bit.ly/3VGWz1S
[53] KFV (2021), Special road markings for motorcycle traffic (in German - Sondermarkierungen Motorradverkehr) https://bit.ly/3k5TvP6
[54] https://www.bikerunion.de/c2/?q=node/1174
[55] EuroRAP (2020), Barriers to change: designing safe roads for motorcyclists https://bit.ly/3HuJd3Y

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Include PTW safety in Road Safety Programmes and Strategies.
- Develop infrastructure guidelines which address the issues of PTW safety.
- Set up a national communication platform involving all relevant stakeholders in order to discuss problems and potential solutions on a broad basis.

RECOMMENDATIONS TO THE EU

- In light of the EU Road Infrastructure Safety Directive (RISM) 2019/1936, prepare the technical guidance on 'road design quality requirements' for Vulnerable Road Users including PTW users. With the new guidelines, installation of road equipment including protective systems and improved maintenance could reduce the severity of PTW collisions in many EU Member States. The guidelines should be based on independent research.
- Ensure Member States make provisions for PTWs in Road Safety Audits,[56] Road Safety Inspections[57] and Network Wide Assessment[58] in line with the revised RISM Directive (2019).
- Introduce common EU curricula for auditors and inspectors, including specific training on the needs of PTWs.[59]
- Develop a standard for PTW-friendly guardrails.

2.4 IMPROVING THE SAFETY OF THE MACHINES

2.4.1 Technologies

2.4.1.1 Anti-lock braking systems (ABS)

Anti-lock braking systems (ABS) were made mandatory for all new motorcycles over 125cc in the EU from 2016. The same piece of legislation[60] also states that motorcycles up to 125cc[61] must be fitted with an advanced braking system consisting of either an ABS or a combined braking system (CBS) or both, at the discretion of the manufacturer.

Anti-lock brakes on motorcycles have been investigated empirically and on average were found to reduce collision involvement by about 30%. Greater effects were found on more serious collisions and on collisions on wet roads than on other collisions.[62]

By the end of 2019, the European Commission was required to produce a report to examine the potential of making the fitment of ABS mandatory for motorcycles up to 125cc. Although the Commission report has not yet been published, a study commissioned to examine this mandatory fitment has been carried out. This study recommended that, 'given the relatively low cost and potentially significant associated benefits, ABS should be made mandatory for all new motorcycles'.[63]

[56] A road safety audit means: an independent detailed systematic and technical safety check relating to the design characteristics of a road infrastructure project and covering all stages from planning to early operation. RISM Directive 2019 https://bit.ly/3VSh23o
[57] A targeted investigation to identify hazardous conditions, defects and problems that increase the risk of accidents and injuries, based on a site visit of an existing road or section of road. RISM Directive 2019 https://bit.ly/3VSh23o
[58] Network-wide road safety assessments shall evaluate accident and impact severity risk, based on: (a) primarily, a visual examination, either on site or by electronic means, of the design characteristics of the road (in-built safety); and (b) an analysis of sections of the road network which have been in operation for more than three years and upon which a large number of serious accidents in proportion to the traffic flow have occurred. RISM Directive 2019 https://bit.ly/3VSh23o
[59] ETSC (2019) Briefing: EU Strategic Action Plan on Road Safety https://bit.ly/3R37amn
[60] EU Regulation No 168/2013 on the approval and market surveillance of two- or three-wheel vehicles and quadricycles https://bit.ly/3wqe0sC
[61] So-called L3e-A1 subcategory
[62] TØI (2016) Report 1517, Summary Motorcycle Safety https://bit.ly/3HlbOcG
[63] European Commission (2020) Guy, I., Hammond, J., Kent, J., et al., Examination of the mandatory fitting of an anti-lock brake system and a supplemental combined brake system at the choice of the manufacturer to L3e-A1 subcategory motorcycles, https://bit.ly/3XDDFKd

2.4.1.2 ADAS and ARAS

Advanced Driver Assistance Systems (ADAS) are increasingly available on new cars and commercial vehicles, indeed some are mandated through the EU's General Safety Regulation (GSR). These technologies have the potential to improve the safety of PTW users, through, for instance, better detection of vulnerable road users. However, as these technologies are relatively new and developing, the extent to which they are able to correctly identify motorcycle riders remains unclear. It is of the utmost importance for PTW rider safety that driver assistance systems and automated driving systems and Cooperative Intelligent Transport Systems are capable and tested to correctly identify and react to PTWs and take PTW safety into consideration.

Although increasingly found on cars and commercial vehicles, ADAS (or ARAS – Advanced Rider Assistance Systems) are less common on motorcycles and are not mandated through EU legislation as they are for cars and commercial vehicles. Research has shown however that some systems could be beneficial.[64]

Other stability aids and assistance systems for PTWs, such as traction control systems, combined brake systems, Blind Spot Information Systems (BLIS), corner anti-locking braking systems (ABS) are available but they tend to be offered as standard only on the higher classes of motorcycles.

Euro NCAP already targets motorcycle incidents by, for instance, including car-to-PTW collision scenarios in collision avoidance testing. In its recent Vision 2030 report, Euro NCAP outlined plans to expand these tests in the future, for instance by increasing test speed, but also by introducing vehicle-to-PTW scenarios to the Commercial Van and Assisted Driving assessment.[65]

2.4.1.3 e-Call for PTWs

eCall, the automated emergency call system that alerts emergency services in the event of a collision, has been mandatory on all new car models since 2018. The possibility to extend this technology to PTWs is still being evaluated. The EU-funded I_HeERO[66] project concluded that an eCall for two- and three-wheeled vehicles would need to differ significantly from the one used in passenger cars due to different collision dynamics with injury patterns and severity. The project also defined the minimum requirements for a motorcycle-specific eCall system, embedded in the vehicle. More recently, a second EU-funded project, known as sAFE[67], allowed manufacturers to conduct real tests with Public Safety Answering Points (PSAPs) for motorcycle eCall devices with the aim of refining the PTW eCall concept developed by I_HeERO.

2.4.2 Technical inspection

Both national and European laws require motorists to keep their vehicles in a roadworthy condition. Roadworthiness testing exists so that relevant aspects of a vehicle's original design and manufacture are retained in service.

There are two types of testing: on-the-spot road-side inspections and periodic technical inspections (also known as periodic road-worthiness tests).

The EU roadworthiness package was last revised in 2014 (with implementation from May 2018) and consists of Directive 2014/45/EC on periodic roadworthiness tests, Directive 2014/47/EC on technical roadside inspections of commercial vehicles and Directive 2014/46/EC on the requirements for issuing registration certificates.

Technical failures of PTWs can have much more severe consequences than those for cars, and the condition of the vehicle can influence the consequences and the severity of an average occurrence.[68] Even if there was a lower distance travelled, an undetected technical failure in a PTW can lead to fatal consequences for an unprotected PTW user.

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64 TØI (2016) Report 1517, Summary Motorcycle Safety https://bit.ly/3HlbOcG
65 Euro NCAP (2022) Vision 2030: A safer future for mobility https://bit.ly/3DaB1DK
66 https://bit.ly/3ZfSNih
67 https://www.iskratel.com/en/company/news/2019/05/1158-Participation-in-the-sAFE-project
68 ETSC (2020), Position on Roadworthiness Package https://bit.ly/3h4HPed

In Austria between 2011 and 2021, four PTW deaths were recorded with technical failure as the main cause of deaths according to the police assessment. In Finland, where an in-depth collision investigation takes place after every fatal crash, out of a total of 83 PTWs that had caused a fatal motor vehicle collision between 2016 and 2020, six had technical defects which influenced the collision. In addition, four PTWs had technical defects which didn't influence the collision. Where PTWs were involved in a collision, but were not the cause of it, three vehicles out of 26 had technical defects which had influenced the collision. Meanwhile, research carried out in Spain found that poor maintenance of the vehicle had influenced the collision in 7% of collisions involving PTWs, with the most frequent cause being the poor condition of the tyres.[69]

Focussing on mopeds, in-depth studies conducted by the Norwegian Public Roads Administration of 27 fatal moped collisions in Norway between 2007 and 2016 found that in about every fourth fatal moped collision the moped involved had a technical defect.[70]

From the data received from PIN panellists, 19 out of 27 EU Member States require motorcycle owners to have their vehicles checked for roadworthiness. 11 Member States also require moped owners to have their vehicles checked for roadworthiness. (Table 3).

2.4.2.1 Motorcycles of more than 125cc

Motorcycles of more than 125cc are subject to periodic technical inspections as from January 2022. Member States are free to determine the elements, methods and frequency of roadworthiness tests for motorcycles (contrary to other motor vehicles). Member States may be exempted from this obligation if they show, on the basis of relevant road safety statistics for the previous five years, that the same road safety results are achieved with other effective alternative road safety measures.[71] Since implementation, four EU Member States have applied this exemption (Finland, France, Ireland and the Netherlands).

The European Commission is in the process of reviewing Directive 2014/45/EC on periodic roadworthiness tests with a proposal expected in 2023. Last year the European Parliament called for periodic technical inspections to be required for all motorcycles, with extra checks for high-mileage vehicles such as those used for food deliveries.[72]

2.4.2.2 Tampering

Tampering, allowing excessive speed, is a common factor in moped collisions.[73]

According to a survey in Austria, up to half of mopeds (47%) are tuned in a way that enables them to travel at higher speeds.[74] In Denmark, between 2006 and 2012, 17% of all moped collisions resulting in death or serious injury involved vehicles that had been tampered with – some 800 vehicles.[75]

In Finland a total of 91 PTWs caused a fatal motor vehicle collision between 2017-2021 (41 collisions with another vehicle and 50 single-vehicle collisions). Of those, in 16 cases the investigation team mentioned tampering as an influencing risk factor (10 collisions with another vehicle and six single-vehicle collisions). 29 PTWs were involved in collisions caused by another vehicle. In four cases out of those 29, the investigation team mentioned tampering as an influencing risk factor.[76]

In-depth studies conducted by the Norwegian Public Roads Administration of 27 fatal moped collisions in Norway between 2007 and 2016 found that 59% of the mopeds involved in fatal moped collisions had been tuned. Indeed, half of those tuned mopeds had a speed above 45 km/h, above the legal maximum speed for mopeds.[77]

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[69] Fundación MAPFRE y Asociación Española de la Carretera (2021) Roadmap for improving road safety for motorcycle and moped users (in Spanish) https://bit.ly/3Hw7YwO
[70] TØI (2017) Moped crashes in Norway 2007-2016, https://bit.ly/3jFqZnk
[71] Directive 2014/45/EU on periodic roadworthiness tests for motor vehicles and their trailers and repealing Directive 2009/40/EC https://bit.ly/3E5q2M4
[72] https://etsc.eu/motorcycles-must-face-technical-inspections-in-france-from-october/
[73] VIAS Institute (2017), Motorised two-wheelers (in Dutch - Gemotoriseerde tweewielers) https://bit.ly/3Te6MRf
[74] Hoschopf, H., Tomasch, E., Spitzer, P., Kleewein, F., Pregartner, H., Brandlmayr, G., Zunzer, S., Oberwallner, R.: TUNE-IT? (2020) Moped tuning – the temptation to modify: motivation – possibilities – effects/consequences (in German) https://bit.ly/3UDhnqh
[75] Source: https://bit.ly/3X9trQW
[76] Data provided by PIN panellist.
[77] TØI (2017) Moped crashes in Norway 2007-2016, https://bit.ly/3jFqZnk

In the Netherlands, an in-depth study into factors influencing collisions involving slow mopeds[78] (snorfietsen) found that in between 8-14% of slow moped collisions, poor quality tyres or brakes was a factor in the collision. In addition, in between 6-17% of collisions, the slow moped engine power had been tampered with.[79]

These collisions might have been prevented if compulsory technical inspections had been in place.

The extension of technical inspections to other motorcycle types was recommended in an EC study published in 2019.[80]

Table 3. Periodic technical inspections (PTIs) of PTWs
Source: National statistics provided by PIN Panellists in each country. (1)CY - for rental PTWs frequency is 24/24. (2)EE – first inspection 48 months after first registration, then if the vehicle has been used for less than 10 years every 24 months, otherwise every 12 months. (3)SI – for mopeds with speed limit below 25 km/h first technical inspection five years after first registration. Frequency - The first number corresponds to the first PTI after the date on which the vehicle was first registered, the second number(s) for the periodicity of all PTIs after that first one. Example: AT: first inspection three years after the date on which the vehicle was first registered, subsequent inspection after two years then every year after that.

	Motorcycles	Frequency (months)	Mopeds	Frequency (months)
AT	Yes	36/24/12	Yes	36/24/12
BE	n/a		n/a	
BG	Yes	24	Yes	24
CY(1)	Yes (from 01/06/23)	48/24	Yes (from 01/06/23)	48/24
CZ	Yes	72/48	Yes	72/48
DE	Yes	24	No	
DK	Yes	Must be inspected when older than 5 years and sold	No	
EE(2)	Yes	48/24/12	No	
ES	Yes	48/24	Yes	36/24
FI	No		No	
FR	No		No	
EL	Yes	24	No	
HR	Yes	24/12	Yes	24/12
HU	Yes	48/24	No	
IE	No		No	
IT	Yes	48/24	Yes	48/24
LU	n/a		n/a	
LV	Yes	24	No	
LT	Yes	24	Yes	24
MT	n/a		n/a	
NL	n/a		n/a	
PL	Yes	36/12	Yes	36/12
PT	n/a		n/a	
RO				
SE	Yes	48/24	Yes	48/24
SI(3)	Yes	48/24	Yes	60/48/24
SK	Yes	L3eA1: 48, L3eA2: 48/24, L3eA3: 48/24	No	
UK	n/a		n/a	
GB	n/a		n/a	
CH	Yes	60 (max 72)/36/24	No	
IL	n/a		n/a	
NO	n/a		n/a	
RS	n/a		n/a	

[78] Slow moped limited to 25km/h.
[79] SWOV (2017), Slow moped collisions occurring on cycle paths: collision characteristics and scenarios: results of an indepth study into slow moped collisions and suggestions for measures to take (in Dutch) https://bit.ly/3Y4QlKD
[80] European Commission (2019), Study on the inclusion of light trailers and two- or three-wheel vehicles in the scope of the periodic roadworthiness testing https://bit.ly/3TgeD0C

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Extend periodic technical testing to cover all motorcycles, including mopeds, without exemptions: as a minimum, first inspection after four years, subsequent inspection after two years then every year after that.[81]
- Encourage the purchase of vehicle safety features through campaigns and tax reductions.

RECOMMENDATIONS TO THE EU

- Mandate compulsory ABS for all motorcycles.
- Carry out research into the feasibility of mandating ABS for mopeds.
- Extend periodic technical testing to cover all motorcycles, including mopeds, without exemptions: as a minimum, first inspection after four years, subsequent inspection after two years and then every year after that.[82]
- Introduce a new concept for improved conspicuity for PTWs, this could include a new vertical lighting scheme[83] which is automatically on regardless of the time of day.
- Consider the practical application of mandating the fitment of AEB and speed assistance systems on motorcycles.
- Evaluate the opportunity of introducing eCall to PTWs.
- Ensure that all ADAS installed in other vehicles can detect PTWs.
- Prioritise support for improving PTW safety in the EC's research programme.
- Commission studies on the safety potential of cooperative technologies and other ARAS.

2.5 ENFORCEMENT

Excessive speed, drink-driving, and failure to wear protective equipment are still the leading causes of death and serious injury on European roads. Despite legislation designed to prevent all three, many drivers and riders involved in fatal collisions clearly failed to comply with one or more road traffic laws at the time of their collision.

Roads should be designed in such a way that PTW users and other road users interacting with them are encouraged by the road environment to adopt safe behaviour as their intuitive behaviour; speed limits should be set at levels so that driving within the speed limit is comfortable and an easy choice to make. According to the Safe System approach, traffic law enforcement is an essential component of the road environment in preventing death and injury and should accompany the aforementioned measures.

Traffic law enforcement is based on giving drivers and riders the feeling that they are likely to be detected and sanctioned when breaking the rules. Efficient enforcement strategies are, therefore, not about increasing the level of fines, but about increasing the chance of being detected as perceived by the drivers.[84]

PTW riders are not required to have a licence plate in front and, therefore, remain unidentified by safety cameras that photograph from the front. Motorcycle riders can also avoid sanctions in countries applying driver liability as the rider's face is covered by the helmet. (see table 4)

[81] ETSC (2020), Position on Roadworthiness Package https://bit.ly/3h4HPed
[82] ETSC (2020), Position on Roadworthiness Package https://bit.ly/3h4HPed
[83] Institut für Zweiradsicherheit (ifz) e.V. (2018) Innovative motorcycle headlight design for improving motorcycle visibility https://bit.ly/3y8kD3v
[84] ETSC (2011), Traffic Law enforcement, Tackling the Three Main Killers on Europe's Roads https://bit.ly/33W5eY6

Table 4. Driver/rider or owner liability as a legal basis for traffic law enforcement. (Hybrid where liability is not simply owner or driver/rider but can be one or the other in different situations)
Source: National statistics provided by PIN Panellists in each country

	Does your country have driver or owner liability?
Driver/Rider	AT, DE, EE, EL, IL, NO, PL, RO, RS, SE
Owner	BE, CH, CY, CZ, HR, HU, IT, LV, NL
Hybrid	BG, DK, ES, FI, FR, IE, LT, LU, PT, SI, SK

2.6 SPEED

High speed is among the most important risk factors for motorcyclists.[85] The Safe System approach, which has been endorsed in the EU strategic action plan on road safety,[86] requires the road traffic management system to limit speeds to survivable levels, taking into account that humans make mistakes and their bodies have a limited tolerance for kinetic forces in case of a road collision.

Motorcycle riders are the road user group with the highest risk, i.e. the highest number of injuries and road deaths per distance travelled.

In relation to the distance travelled, a motorcyclist is, depending on the country, between nine to 30 times more likely to be killed in a road collision than a car driver.

The relative risk of a motorcycle rider being seriously injured is even higher.[87]

A study into 'slow mopeds' in the Netherlands found that excessive speed or inappropriate speed for the circumstances was a factor in between 19-28% of all collisions.[88] In Ireland, a Motorcyclist Rider Behaviour Study[89] carried out in 2019 found that 40% of those surveyed acknowledged exceeding the speed limit on country/rural roads and 23% on residential roads at least occasionally. In addition, analysis of coronial data for 2015-2019 deaths found that, of the 68 motorcycle driver deaths with a record of their action(s) prior to the collision available, 40% (n = 27) were exceeding a safe speed.[90]

CROATIA
A 10% DECREASE IN MOPED USER DEATHS

In order to decrease the number of deaths and injuries among moped and motorcycle users, the police intensify their prevention activities at the start of every motorcycle riding season. Working in cooperation with representatives of motorcycle associations and clubs, the police conduct joint preventative and educational activities related to the protection of PTW users. These activities also involve driving instructors, supervisors of the technical inspections of vehicles, moped and motorcycle mechanic workshop owners and other experts.

[85] Høye, A. (2016), Summary, Motorcycle safety TØI Report 1517/2016 https://bit.ly/3WGrqN3
[86] European Commission (17.05.2018), Annex to the communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and Committee of the Regions, Europe on the Move, Sustainable Mobility for Europe: Safe, connected and clean, https://goo.gl/Qanhzd
[87] OECD-ITF (2015), Improving safety for motorcycle, scooter and moped riders, https://goo.gl/7Hsrcd
[88] SWOV (2017), Slow moped collisions occurring on cycle paths: collision characteristics and scenarios: results of an indepth study into slow moped collisions and suggestions for measures to take (in Dutch - Snorfietsongevallen op het fietspad: karakteristieken en scenario's van ongevallen op wegvakken en kruispunten: resultaten van een dieptestudie naar snorfietsongevallen en aanknopingspunten voor maatregelen. https://bit.ly/3Y4QlKD
[89] RSA (2019), Motorcyclist Rider Behaviour Study https://bit.ly/3wfs1sR
[90] Exceeding a safe speed refers to driving above the speed limit, or driving at a speed that is too high for the road/conditions.

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Install speed cameras, including average speed cameras, which are able to detect speeding riders and enforce motorcyclists' compliance with speed limits.
- Improve enforcement of speed limits upon riders of PTWs by improving number plate visibility and the accuracy of speed detection.
- Set enforcement plans with yearly targets for numbers of checks and compliance with traffic laws, in particular addressing the priority areas, also for riders, of speeding, drink- and drug-driving, red-light running and/or helmet use. Share those enforcement plans with the European Commission to facilitate the exchange of best practice on enforcement across the EU.
- Introduce owner or keeper[91] liability as opposed to driver liability to facilitate enforcement of speed limits.

RECOMMENDATIONS TO THE EU

In the context of the Revision of the Cross Border Enforcement Directive

- Encourage EU Member States to install speed cameras able to detect speeding riders and enforce motorcyclists' compliance with speed limits
- Evaluate the impact of distraction of riders from new technologies, communication tools (including mobile phones) and infotainment systems, and develop countermeasures.

2.7 PROTECTIVE EQUIPMENT

2.7.1 Helmets

A review of 61 international observational studies shows that wearing a motorcycle helmet reduces the risk of a fatal motorcycle collision by approximately 42%, and the risk of severe head injury by about 69%.[92]

Wearing a helmet on a motorcycle is mandatory in all EU countries and, on the whole, compliance rates are high. And yet, in some countries, the proportion of killed PTW users who are not wearing a helmet remains higher than is accounted for by the protective effects of helmet wearing. (see table 5 below)

From the data that we were able to gather from PIN countries, helmet wearing rates remain relatively low in some countries such as Greece and Belgium (see Fig.14). Austria, Czechia, Denmark, Finland, Germany, Ireland, Portugal and Switzerland all report helmet wearing rates of between 99-100%.

[91] In the UK a distinction is made between a vehicle owner and keeper. The registered keeper is the driver who is responsible for taxing, insuring and maintaining the vehicle. The vehicle owner is the one who has bought the vehicle or received it as a gift. It is the keeper that is liable to pay any penalties.

[92] Liu BC, Ivers R, Norton R, Boufous S, Blows S, Lo SK. (2008), Helmets for preventing injury in motorcycle riders. Cochrane Database of Systematic Reviews 2008, Issue 1. Art. No.: CD004333. DOI: 10.1002/14651858.CD004333.pub3. Accessed 06 May 2021.

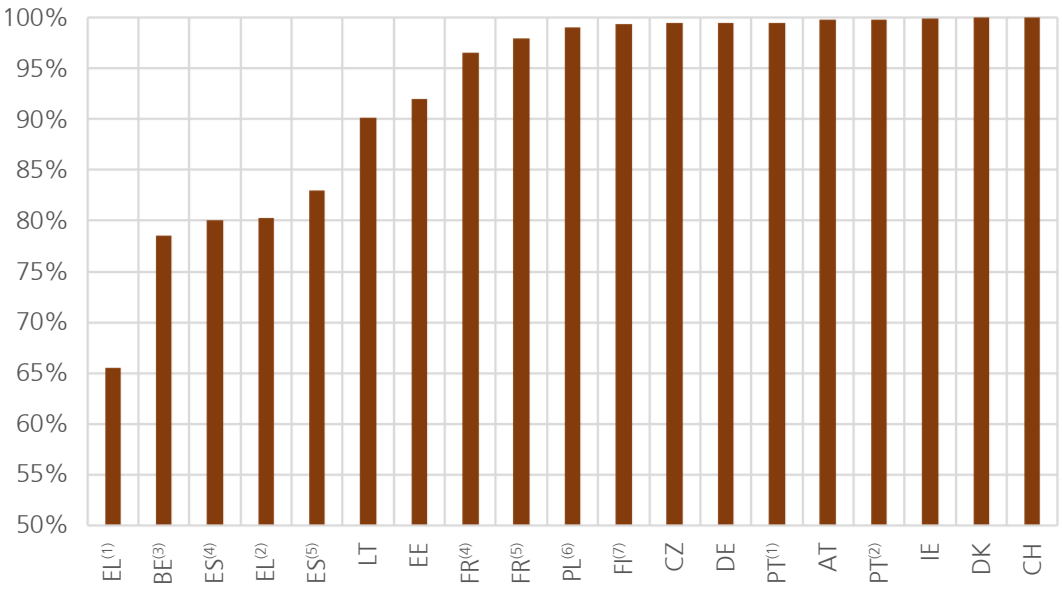

Figure 14. Helmet wearing rates (riders and passengers) in 2021 or the latest year available
(1)2022 – passenger; (2)2022 – driver; (3)2013, (4)outside urban areas; (5) inside urban areas, (6)2015, (7)2020

The EU's Road Safety Policy Framework 2021-2030 introduced, for the first time, a list of Key Performance Indicators (KPIs) which will be used to measure overall road safety performance in the coming decade. This list of KPIs includes 'the percentage of riders of powered two wheelers and bicycles wearing helmets'. Although work has already begun within the 'Baseline' project to produce values for each of the KPIs, there is still some way to go in terms of collecting the data and setting targets.[93]

The numbers of PTW users killed not wearing a helmet varies across PIN countries. In Greece, in 2019, 114 PTW users killed were not wearing a helmet, representing 46% of all PTW users killed in that year. In Cyprus in 2021, 6 PTW users killed were not wearing a helmet, representing 43% of all PTW users killed. In Austria in 2021, 1 PTW user killed was not wearing a helmet representing 1% of all PTW riders killed that year.

Table 5. Proportion of PTW users killed not wearing a helmet. Data are for the last year available
(1)FI – Three PTW users killed not wearing a helmet were excluded from the table as they rode a PTW with a closed cabin where helmet use is not comparable. Source: Finnish Crash Data Institute (OTI). (2)ES – rural roads. (3)ES – urban roads. (4)LT – Six PTW user deaths excluded as information on whether or not they were wearing a helmet was not available.

	PTWs killed not wearing a helmet	Total PTWs killed	% of PTWs killed not wearing a helmet
AT	1	88	1%
CY	6	14	43%
CZ	6	89	7%
ES	13	297	4%
FI(1)	1	27	4%
FR	20	668	3%
EL	114	247	46%
HR	8	64	13%
LT(2)	1	11	9%
PT	5	142	4%
SI	4	33	12%
CH	3	50	6%

[93] Baseline project, https://baseline.vias.be/

2.7.2 PROTECTIVE CLOTHING

Protective clothing can have two main aims: visibility (fluorescent, bright or reflective clothing) and protecting body parts against injury. EU standards exist for protective clothing including the standards EN 13634 for motorcycle protective gloves, EN 1938 for motorcycle goggles, EN 13634 for protective footwear for motorcyclists and EN 17092 part 1 to 6 for all protective equipment.

Studies have shown significant reductions in the risk and severity of injury if motorcycle protective clothing is worn. Riders were significantly less likely (20% to 60%) to be hospitalised if they were wearing jackets, trousers or gloves and less likely to incur injury if the garments included fitted body armour. Even non-motorcycle boots showed a halving of risk compared with shoes. Worryingly the study also showed that between 25% to 30% of gloves, jackets and trousers designed for motorcyclists failed due to material damage in the collision.[94]

Airbags jackets aim to reduce injury and could be effective in collisions where the rider is thrown from the vehicle.[95] However, more research is needed to investigate the extent to which these jackets are a viable PTW safety measure.

SWITZERLAND
HIGH HELMET-WEARING RATES

Helmet-wearing rates in Switzerland are very high at almost 100%. In a survey carried out in 2022, two of the 2,007 motorcyclists surveyed were not wearing a helmet. Wearing rates for other items of protective equipment are also relatively high with over 80% of motorcyclists wearing protective gloves and jackets and over 60% wearing protective trousers.[96]

AUSTRIA
DIFFERENCES IN HELMET AND PROTECTIVE CLOTHING WEARING RATES

Helmet wearing rates in Austria are very high at 99.8%. Protective clothing wearing rates vary depending on vehicle category and whether the PTW is being ridden in an urban or rural area. For motorcycle riders for instance, while around 93% of riders wear leather or textile upper-body protective clothing in rural areas, only 57% do so in urban areas. On average, only 11% of moped and scooter riders wear protective jackets.[97]

SPAIN
THE IMPORTANCE OF PROPER HELMET USE

In Spain, according to data from the DGT, 98% of motorcycle riders killed on rural roads and 93% of motorcycle riders killed on urban roads were wearing a helmet in 2021. For moped riders, 80% of moped riders killed on roads outside urban roads and 83% of moped riders killed on urban roads, were wearing a helmet in 2021. Fatality data for 2022 (24 hours after the crash count) show that, out of the 251 motorcyclists killed in rural roads in Spain, 5 were not wearing a helmet.[98]

Subsequent studies of the data found that in 5.5% of cases of motorcycle riders killed wearing a helmet, the helmet fell off during the collision. For moped riders the proportion was 29% whose helmets fell off during the collision.

As regards other protective clothing, approximately 59% of motorcyclists killed in Spain between 2016 and 2019 used an element of protective clothing other than a helmet. Wearing rates vary between rural and urban roads with 53% of motorcyclists killed on rural roads wearing additional protective clothing and 18% in urban areas.[99]

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[94] de Rome et al. (2011), Motorcycle protective clothing: protection from injury or just the weather? https://bit.ly/3Y4aK2H also OECD/ITF (2015), Improving Safety for Motorcycle, Scooter and Moped Riders,https://bit.ly/3uxNw7t
[95] OECD (2015) Improving Safety for Motorcycle, Scooter and Moped Riders https://bit.ly/3wT7E5d
[96] BFU (2022), Surveys 2022: Personal protective equipment (PPE) in motorcycling, https://bit.ly/3Dg7WXm
[97] KFV (2022), Motorcycle & moped protective clothing in urban and rural areas in Austria (in German, Motorrad- & Moped 2022 Schutzbekleidung im Ortsgebiet und Freiland in Österreich (provided by KFV, not publicly available)
[98] DGT (2023), 1,145 people died in traffic accidents during 2022 (in Spanish), http://bit.ly/3y2m7MG
[99] Hoja de ruta para la mejora de la seguridad vial de usuarios de motocicletas y ciclomotores / autores Fundación MAPFRE y Asociación

SPAIN
CIVIL GUARD EQUIPPED WITH PROTECTIVE EQUIPMENT

The Spanish DGT[100] is actively promoting the use of airbags vests/jackets in Spain and in January 2023 it announced that all 3,595 Civil Guard motorcyclists would be equipped with this protective gear.[101]

RECOMMENDATIONS TO NATIONAL GOVERNMENTS

- Enforce the compulsory wearing and proper fastening of helmets for PTW riders.
- Encourage PTW users to use protective equipment that meets EU standards.

RECOMMENDATIONS TO THE EU

- Support the setting up of a European helmet and protective clothing consumer information scheme, providing independent consumer information on the safety performance of the most popular helmets and protective clothing sold in the EU including information on durability and required maintenance.
- Investigate the extent to which airbag jackets are a viable PTW safety measure.

Española de la Carretera https://bit.ly/3Hw7YwO

[100] https://www.dgt.es/inicio/

[101] La Vanguardia (2023), The DGT plans to invest 2.5 million in the first 3,595 airbag vests for the Civil Guard (in Spanish) http://bit.ly/3ZvnejI

2.8 RIDING A PTW FOR WORK

It is estimated that around 40% of all road deaths are work-related.[102] Duty of care, occupational safety and health (OSH) and road safety compliance are legal necessities in all EU Member States, and employers must take them into consideration.

The most important piece of legislation in the EU addressing OSH is Directive 89/391/EEC on occupational safety and health. The Directive requires every employer in the EU to undertake a work-related risk assessment according to the principles of prevention. Even though work-related road safety (WRRS) is not specifically mentioned in the Directive, it is a part of all the work-related risks that employees face and create for others. Therefore, it ought to be covered in employee risk assessments, but in practice this might not always be the case.

While the EU definition of a work-related road (WRR) death is present in the OSH field, there is no common EU definition of a WRR death in the road safety area. In some countries, the definition of a WRR collision includes commuting and all road user groups, while in others commuting is excluded.[103]

2.8.1 Platform workers and the gig economy

Digital labour platforms (known collectively as the 'gig economy') have seen rapid growth in the last decade, particularly in the transport sector. In Great Britain, a study published in 2018, estimated that around 4.4% of the population (around 2.8 million people) had worked in the gig economy within the last 12 months.[104] But those who work through these platforms often face challenges, including health and safety challenges. To date, however, data on work-related collisions involving platform workers are scarce and generally not publicly available.

Research has found that gig economy workers face a 'perfect storm' of risk factors on the road including inadequate training, self-employment status, a payment model that pressurises drivers to speed and to work while sick, absence of oversight of vehicle safety or condition and a lack of protective equipment.[105]

Further research in 2022 focussing particularly on hot food delivery by motorcycle, found that these workers were significantly more likely to agree that their phone was a distraction and that they violated traffic laws related to speeding, red light running and, unsurprisingly, that they had more points on their licence compared to employed riders. These riders were also more likely to be incentivised to ride in dangerous conditions and carry unstable loads. Hot food delivery riders were also more likely to report being involved in collisions where their vehicle was damaged and where someone was injured.[106]

In its communication on digital labour platforms,[107] the European Commission acknowledged that many of those working through digital labour platforms operate under precarious working conditions. The OSHA (European Agency for Safety and Health at Work) also found substantial differences between traditional and platform companies as regards the awareness and prevention of OSH and road safety risks, as well as the compliance, monitoring and enforcement of key rules and regulations in the field of OSH.[108]

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[102] ETSC (2017), Tapping the potential for reducing work-related road deaths and injuries https://bit.ly/3RVkWrz
[103] Ibid
[104] Department for Business, Energy and Industrial Strategy (BEIS), (2018), The characteristics of those in the gig economy. https://bit.ly/2Li4sWv
[105] Christie N., Ward H. (2018), The emerging issues for management of occupational road risk in a changing economy: A survey of gig economy drivers, riders and their managers https://bit.ly/3GSgNRu
[106] Christie N., Ward H. (2022), Delivering hot food on motorcycles: A mixed method study of the impact of business model on rider behaviour and safety https://bit.ly/3UBsK1M
[107] European Commission (2021), COM 761 Better working conditions for a stronger social Europe: harnessing the full benefits of digitalisation for the future of work https://bit.ly/3ToYupQ
[108] OSHA (2022), Occupational safety and health risks of parcel delivery work organised through digital labour platforms https://bit.ly/3VIKAAR

The Fundación MAPFRE recently undertook a study[109] into PTW sharing and road safety. Using Spanish data from the Directorate General of Traffic (DGT) for the year 2019, the study found that one in every 12 shared PTWs was involved in a collision, the vast majority resulting in injuries. Although the majority of injuries were relatively minor as collisions generally occurred at low speeds (more than 80% did not require hospitalisation, only medical attention at the scene), the collision rate for shared PTWs remains high. The collision rate for shared PTWs (number of collisions/size of fleet) was around 8% in 2019. This is 26 times higher than the average for all vehicles and ten times higher than for all motorcycles.

The Fundación MAPFRE also urges shared PTW companies to improve the roadworthiness of their vehicles, as a large percentage of the sample of vehicles inspected as part of this study showed mechanical defects.

The study highlights a number of good practices from PTW sharing companies operating in Spain, such as, for example:

- Motorbike sharing companies that offer riding courses to their customers, in some cases even on a compulsory basis.
- Companies that offer various driving modes, with limited speeds for urban areas, for example.

Recommendations made by Fundación MAPFRE in the report include:

- Encouraging (or mandating) drivers to do a safety pre-check to ensure that the main safety aspects of the vehicle are reviewed before they set off.
- A requirement to send a photo of the vehicle correctly parked to finish a rental session.
- A pricing scheme that his based not only on time, as this may encourage riders to try to reach their destination as fast as possible.

[109] Fundación MAPFRE (2022) Motorbike sharing: a summary of good practices and recommendations for reducing accident rates (in Spanish, La Contribución del Motosharing a La Seguridad Vial) https://bit.ly/3vW8mOJ

ANNEXES

ISO Codes

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

Table 1 (Fig. 1) Total number of motorcycle user deaths

	Motorcycle user deaths										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT	67	68	87	75	83	85	83	102	79	74	75
BE	132	99	106	84	105	79	77	87	84	78	62
BG	35	48	49	47	50	47	43	42	55	33	38
CY	14	14	15	10	13	11	14	14	16	14	12
CZ	82	90	68	93	93	63	69	97	85	60	87
DE	708	586	568	587	639	536	583	619	542	499	553*
DK	23	10	15	18	19	26	11	21	27	11	12
EE	4	2	4	5	4	1	0	6	3	3	3
ES	347	304	302	287	329	343	359	359	417	313	357
FI	28	20	24	17	20	17	13	24	25	20	28
FR	786	692	658	649	614	613	669	627	615	479	572
EL	305	282	271	278	237	240	216	190	228	188	202*
HR	76	62	49	44	58	38	42	55	45	44	58
HU	52	39	58	58	50	48	43	49	64	42	55
IE	18	19	26	24	22	22	19	15	16	17	22
IT	923	847	728	704	773	657	735	687	698	586	695
LU	3	5	8	8	6	3	7	9	3	7	3
LV	4	7	10	10	5	12	1	3	1	6	10
LT	12	15	15	13	13	12	10	13	19	17	10
MT	n/a	n/a	n/a	n/a	n/a	9	2	6	4	n/a	n/a
NL	50	53	29	51	43	44	53	42	45	44	53
PL	292	261	253	237	208	244	231	238	295	244	215
PT	107	104	78	91	73	59	106	112	127	116	113
RO	69	62	52	45	55	46	52	55	51	64	47
SE	46	31	40	31	42	36	38	44	29	28	27
SI	30	19	18	17	25	23	25	16	22	18	28
SK	20*	26	14	21	29	23	26	23	21	30	27
UK	363	320	337	364	367	320	366	366	332	290	320
CH	68	74	55	53	67	43	51	42	30	52	47
IL	44	39	47	38	56	41	62	44	64	68	85
NO	14	17	20	19	20	22	20	14	16	17	15
RS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EU 26	**4,233**	**3,765**	**3,545**	**3,504**	**3,608**	**3,328**	**3,525**	**3,549**	**3,612**	**3,035**	**3,364**

Source: CARE database and national statistics provided by PIN Panellists in each country.
EU26: EU27 countries excluding MT for lack of data.
*Estimated

Fig.1 Average annual change in motorcycle deaths over the period 2011-2021

LV	-6%	
CH	-5%	
BE	-5%	
EL	-5%	2011-2020
SE	-3%	
FR	-3%	
IT	-3%	
HR	-3%	
DE	-2%	2011-2020
IE	-2%	
EE	-2%	
RO	-1%	
DK	-1%	
LU	-1%	
BG	-1%	
UK	-1%	
NO	-1%	
CZ	-1%	
PL	-1%	
SI	0%	
LT	0%	
CY	0%	
FI	0%	
HU	0%	
NL	1%	
AT	1%	
ES	2%	
PT	3%	
SK	3%	2012-2021
IL	6%	
EU26	**-2%**	

Fig.2 Average annual change in moped deaths over the period 2011-2021

NO	-20%	
LT	-18%	
RO	-13%	
CY	-10%	
HR	-10%	
FI	-9%	
HU	-9%	
SE	-8%	
AT	-8%	
IT	-8%	
PT	-7%	
DK	-7%	
UK	-7%	
FR	-7%	
CZ	-6%	
BG	-6%	
LV	-6%	
ES	-5%	
DE	-4%	2011-2020
EL	-3%	2011-2020
PL	-2%	
NL	-1%	
BE	-1%	
CH	3%	
EE	3%	
SK	6%	2016-2021
SI	8%	
EU 24	**-6%**	

Fig.5 Moped (rider and passenger) deaths as a proportion on total PTW (rider and passenger) deaths over the period 2019-2021 (average)

	Mopeds	Others	
UK	2%	98%	
CZ	2%	98%	
NO	4%	96%	
LT	4%	96%	
CY	5%	95%	
LU	7%	93%	
BG	8%	92%	
IT	9%	91%	
CH	10%	90%	
DE	10%	90%	2018-2020
ES	10%	90%	
EL	10%	90%	2018-2020
AT	11%	89%	
FI	11%	89%	
HR	12%	88%	
SE	13%	88%	
FR	17%	83%	
SK	18%	82%	
SI	18%	82%	
BE	19%	81%	
HU	19%	81%	
PT	20%	80%	
PL	22%	78%	
EE	25%	75%	
LV	29%	71%	
RO	31%	69%	
DK	34%	66%	
NL	43%	57%	
EU 25	**14%**	**86%**	

Table 2 (Fig. 1 and 5) Total number of moped user deaths

	Moped user deaths										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
AT	18	18	15	14	7	7	13	8	10	4	13
BE	23	17	14	19	20	15	25	19	20	15	17
BG	10	4	6	8	11	8	11	7	2	5	4
CY	3	3	0	4	2	2	2	2	0	0	2
CZ	2	3	4	3	4	0	2	2	1	2	2
DE	70	93	73	87	62	68	59	78	63	53	65
DK	14	14	11	13	19	8	9	10	13	8	5
EE	0	1	1	2	0	1	2	0	1	1	1
ES	74	58*	55	53	56	54	49	62	49	32	38
FI	10	7	5	3	2	5	5	3	3	2	4
FR	220	179	159	165	155	121	117	133	134	100	96
EL	34	35	25	20	32	25	32	27	19	24	23*
HR	10	16	14	11	14	10	8	4	9	5	6
HU	31	25	24	17	27	16	17	13	10	16	12
IE	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
IT	165	127	125	112	105	116	92	108	88	59	67
LU	0	0	0	0	0	0	0	0	1	0	0
LV	5	3	3	6	6	6	6	4	1	2	4
LT	4	6	4	1	3	0	4	1	0	1	1
MT	0	0	0	0	0	0	0	0	0	0	0
NL	37	40	41	32	37	34	37	33	37	28	41
PL	87	82	62	71	66	77	55	76	87	71	54
PT	66	57	51	43	42	44	43	42	36	26	29
RO	87	99	39	30	34	33	17	18	18	21	33
SE	11	8	3	8	5	8	1	7	5	4	3
SI	2	4	3	2	1	2	4	2	3	6	6
SK	n/a	n/a	n/a	n/a	n/a	8	2	3	2	10	5
UK	10	12	4	6	8	8	3	8	7	4	4
CH	4	3	8	1	3	6	2	5	5	6	3
IL	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NO	4	4	3	2	1	1	1	2	0	1	1
RS	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EU 24	**983**	**899**	**737**	**724**	**710**	**660**	**610**	**659**	**610**	**485**	**526**

Source: CARE database and national statistics provided by PIN Panellists in each country.
EU24: EU27 countries excluding SK due to inconsistency in the data trend and IE and MT for lack of data.
*Estimated

Table 3 (Fig. 3) Billion km ridden by PTW users over the period 2019-2021 (or last three years available)

	Billion km ridden			
	2018	2019	2020	2021
AT	1.726	1.759	1.812	n/a
BE	n/a	n/a	n/a	n/a
BG	n/a	n/a	n/a	n/a
CY	n/a	n/a	n/a	n/a
CZ	n/a	n/a	n/a	n/a
DE	n/a	n/a	n/a	n/a
DK	n/a	n/a	n/a	n/a
EE	0.056	0.058	0.056	0.061
ES	n/a	n/a	n/a	n/a
FI	n/a	n/a	n/a	n/a
FR	11.340	11.340	9.583	9.822
EL	n/a	n/a	n/a	n/a
HR	0.304	0.306	0.287	0.282
HU	n/a	n/a	n/a	n/a
IE	0.109	0.114	0.101	n/a
IT	n/a	n/a	n/a	n/a
LU	n/a	n/a	n/a	n/a
LV	0.061	0.057	0.066	0.064
LT	n/a	n/a	n/a	n/a
MT	n/a	n/a	n/a	n/a
NL	1.055	1.266	0.789	0.875
NL	1.462	1.283	0.945	0.894
PL	n/a	n/a	n/a	n/a
PT	n/a	n/a	n/a	n/a
RO	n/a	n/a	n/a	n/a
SE	0.645	0.662	0.692	0.653
SI	0.169	0.175	0.202	0.214
SK	n/a	n/a	n/a	n/a
UK	n/a	n/a	n/a	n/a
GB	4.400	4.300	3.500	4.100
CH	1.868	1.881	1.949	n/a
IL	0.999	1.019	0.997	n/a
NO	n/a	n/a	n/a	n/a
RS	n/a	n/a	n/a	n/a

Source: National statistics provided by PIN Panellists in each country

Fig.3 Powered two wheeler rider deaths per billion km over the period 2019-2021 (or latest three years available)

CH	22	Motorcycles	2018-2020
NL	36	Mopeds	
SE	42	Motorcycles	
NL	45	Motorcycles	
EE	51	Motorcycles	
AT	52	PTWs	2018-2020
IL	59	PTWs	2018-2020
FR	65	PTWs	
GB	76	PTWs	
LV	91	Motorcycles	
SI	140	PTWs	
IE	148	Not specified	2018-2020
HR	191	PTWs	

Table 4 (Fig. 4) PTW vehicle registered for the years 2019-2021 (or last three years available)

	Fleet size			
	2018	2019	2020	2021
AT	796,478	811,358	824,733	847,962
BE	n/a	n/a	n/a	n/a
BG	n/a	n/a	n/a	n/a
CY	39,764	39,703	40,351	n/a
CZ	1,132,085	1,163,140	1,196,354	1,217,894
DE	n/a	n/a	n/a	n/a
DK	n/a	n/a	n/a	n/a
EE	n/a	n/a	n/a	n/a
ES	5,393,167	5,515,718	5,627,674	5,734,276
FI	345,192	332,883	324,217	320,535
FR	n/a	n/a	n/a	n/a
EL	1,583,491	1,609,923	1,637,608	n/a
HR	148,258	149,514	146,854	147,627
HU	n/a	n/a	n/a	n/a
IE	39,851	41,471	43,491	n/a
IT	6,780,733	6,896,048	7,003,618	7,152,760
IT	2,574,005	2,625,485	2,627,273	2,976,532
LU	n/a	n/a	n/a	n/a
LV	22,540	25,000	27,078	30,878
LT	45,304	53,283	60,946	69,725
MT	n/a	n/a	n/a	n/a
NL	n/a	665,880	679,848	700,102
NL	n/a	1,230,038	1,249,420	1,292,975
PL	2,852,800	2,962,035	3,069,151	3,169,014
PT	270,000	300,000	330,000	363,000
RO	n/a	n/a	n/a	n/a
SE	300,356	302,183	310,086	312,987
SI	130,935	135,780	140,316	145,147
SK	n/a	n/a	n/a	n/a
UK	1,265	1,273	1,298	1,342
GB	1,243	1,250	1,274	1,315
CH	n/a	n/a	n/a	788,800
IL	139,548	143,010	148,771	n/a
NO	n/a	n/a	n/a	n/a
RS	n/a	n/a	n/a	n/a

Source: National statistics provided by PIN Panellists in each country

Fig.4 Powered two wheeler user deaths per million PTWs registered over the period 2019-2021 (or last three years available)

IT	26	Mopeds	
NL	28	Mopeds	
EE	66	PTWs	
CZ	66	PTWs	
NL	69	Motorcycles	
ES	71	Not specified	
FI	84	PTWs	
IT	94	Motorcycles	
AT	103	PTWs	
SE	104	Motorcycles	
PL	105	Not specified	
EL	125	Motorcycles	2018-2020
SI	185	PTWs	
LV	205	Motorcycles	
UK	245	PTWs	
LT	261	PTWs	
HR	358	PTWs	
PT	359	Motorcycles	
CY	384	Not specified	2018-2020
IE	385	Not specified	
IL	413	PTWs	

Table 5 (Fig. 7) Total number of motorcycle rider and passenger deaths by gender for the period 2019-2021 (or last three years)

	Male riders	Male passengers	Female riders	Female passengers
DK	86%	0%	14%	0%
LV	88%	6%	0%	6%
EE	89%	0%	0%	11%
RO	89%	7%	2%	2%
BG	89%	5%	3%	3%
NO	90%	2%	8%	0%
AT	91%	1%	3%	5%
EL[(1)]	92%	3%	1%	4%
FR	92%	1%	3%	4%
HU	92%	1%	3%	4%
CZ	92%	1%	5%	2%
IT	92%	2%	3%	3%
ES	92%	1%	3%	3%
PT	92%	3%	2%	3%
SI	93%	1%	0%	6%
CY	93%	5%	0%	2%
DE[(1)]	93%	0%	5%	2%
FI	93%	3%	1%	3%
HR	93%	3%	1%	3%
PL	94%	2%	2%	3%
UK	94%	2%	2%	1%
IL	95%	4%	1%	1%
CH	95%	2%	2%	2%
SE	95%	0%	4%	1%
NL	96%	2%	2%	0%
BE	96%	1%	1%	2%
LT	98%	0%	2%	0%
IE	100%	0%	0%	0%
LU	100%	0%	0%	0%
EU 25	**93%**	**2%**	**3%**	**3%**

EU25: EU27 minus MT and SK due to lack of data.
CARE database and national statistics provided by PIN Panellists in each country.
[(1)]2018-2020
Ranked by proportion of male rider deaths, from lowest to highest.

Table 6 (Fig. 8) Total number of moped rider and passenger deaths by gender for the period 2019-2021 (or last three years)

	Male riders	Male passengers	Female riders	Female passengers
NO	50%	0%	50%	0%
EE	67%	0%	33%	0%
FI	67%	11%	22%	0%
NL	74%	4%	19%	4%
BE	77%	0%	19%	4%
SK[(1)]	80%	0%	7%	13%
HR	80%	0%	20%	0%
ES	81%	8%	8%	3%
DK	81%	8%	12%	0%
AT	81%	7%	7%	4%
RO	85%	8%	1%	6%
PL	86%	3%	9%	2%
DE[(1)]	87%	1%	11%	1%
IT	88%	2%	7%	2%
FR	89%	5%	5%	2%
PT	91%	1%	7%	1%
SE	92%	0%	8%	0%
SI	93%	0%	7%	0%
EL[(1)]	94%	1%	4%	0%
HU	95%	0%	5%	0%
BG	100%	0%	0%	0%
CY	100%	0%	0%	0%
CZ	100%	0%	0%	0%
LV	100%	0%	0%	0%
LT	100%	0%	0%	0%
CH	100%	0%	0%	0%
UK	100%	0%	0%	0%
EU 25	**86%**	**4%**	**8%**	**2%**

EU25: EU27 excluding IE and MT for lack of data.
CARE database and national statistics provided by PIN Panellists in each country.
[(1)]2018-2020
Ranked by proportion of male rider deaths, from lowest to highest.

Table 7 (Fig. 9) Proportion of observed PTWs within the speed limit in free-flowing traffic on urban roads over the period 2011-2022 based on countries' individual data collection methodologies

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
AT 50									63%	61%	61%	
AT 30									21%	19%	21%	
EE 50				37%	52%	54%	51%	56%	54%	56%	55%	
EL 50												47%
CY 50										49%	46%	
PL 50											52%	
CH 50									67%			
CH 30									35%			
GB 48							46%	45%	37%	33%	41%	

Source: National statistics provided by PIN Panellists in each country

Table 8 (Fig. 10) Proportion of observed PTWs within the speed limit in free-flowing traffic on rural roads over the period 2011-2022 based on countries' individual data collection methodologies

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
AT 100									82%	78%	81%	
AT 80									60%	74%	59%	
EE up to 90				19%	18%	24%	25%	30%	27%	31%	27%	
EE 90/100/110/120				22%	41%	39%	35%	41%	36%	43%	40%	
EL 90												71%
CY 65-80										55%	53%	
PL 90											68%	
SE 70/80/90		37%				36%				41%		
CH 80									75%			
GB 96.5							74%	70%	74%	71%	72%	

The sample for 80km/h roads in Austria is very small and can therefore be affected by high fluctuations.
Source: National statistics provided by PIN Panellists in each country

Table 9 (Fig. 11) proportion of observed PTWs within the speed limit in free-flowing traffic on motorways over the period 2011-2022 based on countries' individual data collection methodologies

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
BE 120				48%								
EL 130												85%
CY 100										66%	62%	
PL 120/140											64%	
SE 110/120		43%				48%				49%		
CH 120									66%			
GB 113							44%	47%	47%	42%	42%	

Source: National statistics provided by PIN Panellists in each country

Table 10 (Fig. 14) Helmet wearing rates (riders and passengers in 2021 or the latest year available

EL	65.5%	2022 - passenger
BE	78.5%	2013
EL	80.3%	2022 - driver
LT	90.1%	
EE	92.0%	
FR	96.5%	outside urban areas
FR	97.9%	inside urban areas
PL	99.0%	2015
FI	99.4%	2020
CZ	99.5%	
DE	99.5%	
PT	99.5%	2022 - passenger
AT	99.8%	
PT	99.8%	2022 - driver
IE	99.9%	
DK	100.0%	motorcycle
CH	100.0%	

Source: National statistics provided by PIN Panellists in each country

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