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E-Survey of Road users' Attitudes

Cyclists

ESRA3 Thematic report Nr. 11

Publication date of this report: 10/12/2024
Main responsible organization for this report: Technical University of Denmark
D/2024/0779/76 - Report number: 2024-R-32-EN

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Please refer to this document as follows: *Møller, M. & Jensen, T. C. (2024). Cyclists. ESRA3 Thematic report Nr. 11.* ESRA project (E-Survey of Road users' Attitudes). (2024-R-32-EN). Technical University of Denmark. https://www.esranet.eu/storage/minisites/esra2023thematicreportno11cyclists.pdf

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Acknowledgement

The authors of this report would like to thank the following persons and organizations for their much-appreciated contribution to this report:

- PRP (Carlos Pires) for providing the descriptive figures;
- NTUA (Dimitrios Nikolaou) for providing contextual information on the topic;
- SWOV for reviewing this report (Ingrid van Schagen) and for coordinating the review procedure (Agnieszka Stelling);
- Vias institute (Uta Meesmann, Naomi Wardenier, Sophie Vanhove) for coordinating the ESRA initiative, the fieldwork and the development of the ESRA3 survey and database;
- all ESRA3 steering group members for helping to develop the ESRA3 survey and the common ESRA3 output;
- all ESRA3 partners for supporting and financing the national ESRA3 surveys in 39 countries.

ESRA is funded through the contributions of the partner organisations, either from their own resources or from sponsoring. Part of the funding for Vias institute is provided by the Belgian Federal Public Service Mobility & Transport.

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List of abbreviations

Country codes (in accordance with ISO 3166-1 alpha-2 (International Organization for Standardization (ISO), 2024))

AM	Armenia	KG	Kyrgyzstan
AU	Australia	LV	Latvia
AT	Austria	LU	Luxembourg
BE	Belgium	MX	Mexico
BA	Bosnia and Herzegovina	NL	Netherlands
BR	Brazil	PA	Panama
CA	Canada	PE	Peru
CL	Chile	PL	Poland
CO	Colombia	PT	Portugal
CZ	Czech Republic	RS	Republic of Serbia
DK	Denmark	SI	Slovenia
FI	Finland	ES	Spain
FR	France	SE	Sweden
DE	Germany	CH	Switzerland
EL	Greece	TH	Thailand
IE	Ireland	TR	Türkiye
IL	Israel	UK	United Kingdom
IT	Italy	US	United States
JP	Japan	UZ	Uzbekistan
KZ	Kazakhstan		

Other abbreviations

America8	Eight countries across America
AsiaOceania6	Six countries across Asia and Oceania
c-bike	Conventional (nonelectric bicycle)
e-bike	Electric bicycle
ESRA	E-Survey of Road users' Attitudes
Europe22	22 countries across Europe
EU	European Union
ICW	Individual country weight used in ESRA3
HIC	High income countries based on World Bank classification 2023 (The World Bank Group, 2023)
UMIC	Upper-middle income countries based on World Bank classification 2023 (The World Bank Group, 2023)
LMIC	Lower-middle income countries based on World Bank classification 2023 (The World Bank Group, 2023)

Executive summary

Objective and methodology

ESRA (E-Survey of Road users' Attitudes) is a joint initiative of road safety institutes, research centres, public services, and private sponsors from all over the world. The aim is to collect and analyse comparable data on road safety performance and road safety culture. The ESRA data are used as a basis for a large set of road safety indicators. These provide scientific evidence for policy making at national and international levels.

Vias institute in Brussels (Belgium) initiated and coordinates ESRA, in cooperation with ten steering group partners (BASt (Germany), DTU (Denmark), IATSS (Japan), ITS (Poland), KFV (Austria), NTUA (Greece), PRP (Portugal), SWOV (the Netherlands), TIRF (Canada), University Gustave Eiffel (France)). At the heart of ESRA is a jointly developed questionnaire survey, which is translated into national language versions. The themes covered include self-declared behaviour, attitudes and opinions on unsafe traffic behaviour, enforcement experiences and support for policy measures. The survey addresses different road safety topics (e.g., driving under the influence of alcohol, drugs and medicines, speeding, distraction) and targets car occupants, moped riders and motorcyclists, cyclists, pedestrians, and riders of e-scooters. In ESRA3 the questions related to vulnerable road uses (moped riders and motorcyclists, cyclists, pedestrians, and riders of e-scooters) have been expanded and questions on e-scooters and infrastructure have been added.

The present report is based on the third edition of this global survey, which was conducted simultaneously in 39 countries in 2023. In total this survey collected data from more than 37000 road users in 39 countries across five continents. An overview of the ESRA initiative and the project results is available on: www.esranet.eu.

This thematic ESRA report on cyclists describes the frequency with which people use a bicycle (both conventional bicycles (c-bikes) and electrical bicycles (e-bikes)), use of different infrastructures, self-declared engagement in potentially safety-critical behaviours, and attitudes towards different behaviours and policy measures aimed at cyclists. It includes comparisons between the participating countries, the three main regions (Europe22, America8, and Asia and Oceania) as well as between age groups and gender at the regional level.

Key results

The key findings from ESRA3 on cyclists are:

Frequency of cycling

- Close to 25% in all three ESRA3-regions self-declare using a c-bike at least once a week. The ESRA3 countries with the highest prevalence of using a c-bike at least 4 days a week are The Netherlands, Denmark and Thailand.
- E-bikes are still used less frequently than c-bikes. The Netherlands is the leading country regarding e-bike use. Other countries with comparably high e-bike use include USA, Belgium, Germany, Switzerland and Thailand.
- Women and older people cycle less than men and younger people. This is true for both e-bike and c-bike.
- Frequently cycling on rural roads and on urban roads with cycle lanes is associated with increased likelihood of using an e-bike compared to a c-bike.

Use and evaluation of different infrastructures

- Cyclists cycle more on roads with cycle lanes and evaluate them safer compared to roads without cycle lanes.

Self-declared behaviour

- Of the potentially safety critical behaviours included in the survey, cycling without a helmet and listening to music via headphones are the most common and cycling under the influence of alcohol or drugs the least common self-declared behaviour.
- Women and older cyclists are less likely to self-declare engagement in the included potentially safety critical behaviours than men and younger cyclists.

Attitude towards safety-related behaviours and policy measures

- Among all ESRA3 participants women and older persons are more likely to support mandatory helmet use and a zero-alcohol tolerance for cyclists compared to men and younger persons.

Key recommendations

- Develop initiatives to support increased cycling especially among women and young people, and in countries with comparably low cycle use.
- Build cycle lanes not only in cities but also in rural areas to increase not only actual safety, but also perceived safety among cyclists, and hence, increased bicycle use.
- Develop initiatives to increase cycle helmet use and awareness of the increased risk of crash involvement associated with impaired and distracted cycling especially among male cyclists.

The ESRA initiative has demonstrated the feasibility and the added value of joint data collection on road safety performance by partner organizations all over the world. The intention is to repeat this survey every three to four years, retaining a core set of questions in every edition. In this way, ESRA produces consistent and comparable road safety performance indicators that can serve as an input for national road safety policies and for international monitoring systems on road safety performance.

1 Introduction

Compared to motorized traffic cycling has environmental benefits (Xia et al., 2013) as well as individual health benefits which generally outweigh possible negative effects of increased exposure to air pollution (Woodward & Samet, 2016). However, cyclists are vulnerable road users. In case of a collision, the severity of the crash is largely determined by the kinetic forces resulting from differences in mass and speed of the involved types of road vehicles (OECD/ITF, 2013). Different from drivers and passengers in passenger cars cyclists do not benefit from protection provided by the vehicle thereby making them more vulnerable to physical injury. Consequently, the risk of being seriously injured or killed in a road traffic crash is comparably high for cyclists. In Denmark for instance, the risk of being seriously injured or killed in a crash is 13 times higher per km cycled for cyclists compared to drivers (Christiansen & Warnecke, 2018).

According to WHO cyclists account for 3% of all road user deaths worldwide. The corresponding shares are 5% in Europe, 3% in America (North and South), 4% in Africa, 2% in the Eastern Mediterranean and Southeast Asia and 6% in the Western Pacific region (WHO, 2018). In Europe, cyclists are the only road user type without a decline in fatalities since 2010 (European Commission, 2023). The high cycling nations the Netherlands, Denmark, Belgium and Germany have the highest share of road fatalities involving a cyclist. According to ITF (2023) cyclist fatalities on average decreased in 2022 by 3.3% compared to the average for 2017-2019 and by 8.3% compared to 2012 across 32 IRTAD countries. However, great differences between individual countries exist. Thus, in Lithuania, Hungary, and Norway cyclist fatalities decreased by 50% or more whereas they increased by 50% or more in Colombia, Argentina and Israel in 2022 compared to 2012. In France and The Netherlands cyclist fatalities increased by more than 40% (ITF, 2023). In EU the proportion of cyclists within the total number of road fatalities has grown from 7% in 2011 to 10% in 2020 (European Commission, 2023).

According to Adminaité et al. (2015) the risk of being killed as a cyclist is considerably higher for people older than 65 than for younger age groups (average of 10 deaths annually per million elderly population vs. 1.1 deaths annually per million child population under 15 or 2.6 deaths annually per million population aged 15-24). The loss of agility and skills and the increase in physical frailty can explain these differences (Eriksson et al., 2022). Males are more often involved in a bicycle crash than females. Possible reasons include a higher probability to engage in risk taking behaviour such as riding at night, under the influence of alcohol, at higher speed, as well as increased exposure as cyclists as males in general cycle more than females.

It must be noted that bicycle crashes, and single bicycle crashes in particular, are severely under-reported (Santacreu, 2018, OECD/ITF, 2013, Janstrup et al., 2016; Møller et al., 2021), which leads to a substantial underestimation of the crash risk for cyclists. If, for example, a cyclist hits a fixed object or falls, the event is rarely reported to the police and therefore also not included in the official crash statistics. Underreporting is less prevalent in the event of fatal bicycle crashes (OECD/ITF, 2013). Safety concerns have been shown to be a barrier for using the bicycle (e.g. Swiers et al., 2017). Increasing safety for cyclists is therefore important.

Engagement in risky behaviours such as cycling under the influence of alcohol and/or drugs or phone-use as well as characteristics of the cyclist play a role for the occurrence and outcome of a cycle crash.

Cycling under the influence of alcohol is influenced by factors such as age, gender, frequency of alcohol consumption, and time of day. Thus, being young, male, a frequent cyclist, and cycling in the evening or night-time increase the likelihood of engagement in the behaviour (see Christoforou et al., 2018 for an overview). Being under influence of alcohol is found to increase risk among cyclists. In an older study by Li et al. (1996) it was found that the risk of a fatal crash is almost three times higher for cyclists under the influence of alcohol (adj. OR=2.8) compared to cyclists not under the influence of alcohol. In a more recent study, it was found that alcohol also increases the crash risk among non-fatally injured cyclists (Asbridge et al., 2014). The higher risk may partly be due to a significant lower helmet wearing rate among cyclists under the influence of alcohol. In a Finish study based on cycle crashes registered at a hospital it was found that one third of the crash involved cyclists were impaired by alcohol (Airaksinen, 2018). In most cases, the cyclists were heavily intoxicated and did not wear a helmet which

led to having more head injuries compared to crash involved cyclists who were not under the influence of alcohol.

Studies show that secondary task engagement such as phone use while cycling impacts cyclists' performance (De Waard et al., 2014; Jiang et al., 2021) and is associated with an increase in unsafe behaviours among cyclists such as riding in the wrong direction, not slowing down to look for crossing traffic, or cycling so slow when entering an intersection that approaching traffic is forced to brake (Terzano, 2013; De Angelis et al., 2020). Secondary task engagement while cycling has also been found to be associated with increased risk of crash and near-crash involvement (e.g. Goldenbeld et al., 2012) as well as increased engagement in violations and associated near-crashes (e.g., Useche et al., 2018). Most studies focus on handheld secondary task engagement such as phoning or texting which is forbidden in most countries (e.g., de Waard et al., 2010; 2014; Jiang et al., 2021). However, handsfree secondary task engagement such as handsfree phone use is legal in many countries and among the most frequent types of secondary task engagement among cyclists (Brandt et al., 2021; Ethan et al., 2016; Huemer et al., 2019). However, knowledge about detrimental effects is still limited. De Waard et al. (2011) found hands-free phone use (via in-earbuds) reduced response to auditory cues, while Møller et al. (2024) found no behavioural effect of hands-free secondary tasks requiring cognitive but not visual-motor resources, possibly because the included traffic situations were too simple to require substantial cognitive resources.

People's attitudes towards cycling influence the likelihood of cycling, but the frequency of bicycle use also influences the attitudes towards cycling. Thus, in a study by Prati et al (2019) it was concluded that women perceived more risks while cycling and more discomfort while cycling at locations without cycle lanes compared to men, but also that women exhibited different attitudes towards cycling because they were less likely to cycle and cycled for different purposes. Further studies show that the attitude towards a behaviour is associated with the likelihood of engaging in that behaviour. Thus, a German study found that a positive attitude towards cycling under the influence of alcohol increases the likelihood of engaging in the behaviour (Huemer, 2018). In addition, cycling under the influence of alcohol has been found to be associated with higher acceptance and perceived as less dangerous compared to driving under the influence of alcohol (Hagemeister & Kronmeier, 2017).

Helmet use does not influence the crash risk but influences the risk of serious head injuries following involvement in a cycle crash. In a meta-analysis (Olivier & Creighton, 2016) it was found that helmet use reduced the odds of head injury, serious head injury, facial injury and fatal head injury among cyclists. Helmet use is associated with socio-demographic characteristics (see Ledesma et al., 2019 for an overview) although some inconsistencies exist. However, in general, results indicate that helmet use is lower among young males compared to older adults, but higher among children (e.g. Ebell and Desai, 2012, Friedman et al., 2016). Studies also show that helmet use is lower among people using shared bikes (e.g. Zanotto & Winters, 2017). Attitudes and actual helmet use among peers and family are highly important for one's own helmet use (Ross et al., 2011). Potential barriers include discomfort and lack of functionality and perceived barriers have been shown to be more important for helmet use than perceived advantages (e.g. Zavareh et al., 2018).

The visibility of cyclists is also a crucial issue. Many crashes occur because car drivers detect cyclists too late. Some studies indicate that, for visibility, cyclists' clothing may be more important than the bicycle light (Wood et al., 2012, Kwan & Mapstone, 2006). A Danish study indicate that high-visibility bicycle clothing can reduce the occurrence of bicycle crashes (Lahrmann et al., 2019). However, it has been found that cyclists only have limited awareness of effective strategies to increase their night-time conspicuity, and that they prioritize comfort over functionality (Fylan et al., 2020).

The data of ESRA (E-Survey of Road users' Attitudes) make it possible to study and compare different countries regarding amount of cycling, use and evaluation of different infrastructure, self-declared cycling behaviour and attitudes towards different behaviours and policy measures aimed at cyclists. The results presented in this report are based on the third edition of ESRA (ESRA3), in which data was collected in 39 countries around the world medio 2023. The countries participating in ESRA3 were grouped in three ESRA-regions labelled Europe22, America8, and Asia and Oceania (for more information see Chapter 2).

In some parts of this report a distinction is made between conventional bicycles (c-bikes) and electrical bicycles (e-bikes) where the pedalling is supported by a battery-powered electric motor. In many countries, electric bicycles with pedal assistance that does not exceed 0.25 kW, respectively limited to a speed of 25 km/h are considered bicycles. Beyond these limits, they are often classified as mopeds. However, in ESRA3 such criteria were not specified. Consequently, in this report no distinction between different kinds of e-bikes is made.

The ESRA3 findings are used to answer the following research questions:

- How does c-bike and e-bike use differ across ESRA3 countries and regions?
- How does use and evaluation of different infrastructure differ between the ESRA3 countries and regions?
- How does self-declared behaviour, attitude towards safety-critical behaviours, and related policy measures differ between ESRA3 countries and regions?
- What is the relationship between self-declared safety critical behaviours and support to policy measures and various background variables?

2 Methodology

ESRA (E-Survey of Road users' Attitudes) is a joint initiative of road safety institutes, research centres, public services, and private sponsors from all over the world. The aim is to collect and analyse comparable data on road safety performance, in particular road safety culture and behaviour of road users. The ESRA data are used as a basis for a large set of road safety indicators. These provide scientific evidence for policy making at national and international levels.

ESRA data are collected through online panel surveys, using a representative sample of the national adult populations in each participating country (aiming at n=1000 per country). A few exceptions exist. In four countries (Armenia, Kyrgyzstan, Luxembourg, and Uzbekistan) the targeted sample size was reduced to 500 respondents, as sample sizes of 1000 respondents were not feasible due to limitations of the national panel or too high costs.

At the heart of this survey is a jointly developed questionnaire, which was translated into 49 national language versions in ESRA3 (Appendix 1). The themes covered include self-declared behaviour, attitudes and opinions on unsafe traffic behaviour, enforcement experiences and support for policy measures. The survey addresses different road safety topics (e.g., driving under the influence of alcohol, drugs and medicines, speeding, distraction) and targets car occupants, moped riders and motorcyclists, cyclists, pedestrians, and riders of e-scooters. In ESRA3 the questions related to vulnerable road users (moped riders and motorcyclists, cyclists, pedestrians, and riders of e-scooters) have been expanded and questions on e-scooters and infrastructure have been added. The present report is based on the third edition of this global survey, which was conducted simultaneously in 39 countries in 2023. In total this survey collected data from more than 37000 road users in 39 countries, across five continents.

The participating countries in ESRA3 were:

- Europe: Austria, Belgium, Bosnia and Herzegovina, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Luxembourg, Netherlands, Poland, Portugal, Republic of Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom;
- America: Brazil, Canada, Chile, Colombia, Mexico, Panama, Peru, USA;
- Asia and Oceania: Armenia, Australia, Israel, Japan, Kazakhstan, Kyrgyzstan, Thailand, Türkiye, Uzbekistan.

Vias institute in Brussels (Belgium) initiated and coordinates ESRA, in cooperation with ten steering group partners (BASt (Germany), DTU (Denmark), IATSS (Japan), ITS (Poland), KFV (Austria), NTUA (Greece), PRP (Portugal), SWOV (the Netherlands), TIRF (Canada), and University Gustave Eiffel (France)). The common results of the ESRA3 survey are published in a Main Report, a Methodology Report and 13 Thematic Reports (Table 1). Furthermore, 39 country fact sheets, including different language versions, have been produced in which national key results are compared to a regional mean (benchmark). Scientific articles, national reports and many conference presentations are currently in progress. All common ESRA3 reports have been peer-reviewed within the consortium, following a pre-defined quality control procedure. An overview of the results and news on the ESRA initiative is available on: www.esranet.eu. On this website one can also subscribe to the ESRA newsletter.

Table 1: ESRA3 Thematic Reports.

Driving under influence of alcohol, drugs and medication	Support for policy measures and enforcement	Pedestrians	Young and aging road users
Speeding	Subjective safety and risk perception	Cyclists	Male and female road users
Distraction (mobile phone use) and fatigue	Infrastructure	Riders of e-scooters	
Seat belt & child restraint systems		Moped riders and motorcyclists	

The present report summarizes the ESRA3 results with respect to cycling. A more detailed overview of the data collection method and the sample per country can be found in the ESRA3 methodology report (Meesmann & Wardenier, 2023). Most figures in the report follow the ESRA3 standard.

Note that a weighting of the data was applied in the analyses. This weighting took into account small corrections with respect to national representativeness of the sample based on gender and six age groups: 18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65-74y (United Nations Statistics Division, 2023). The results are presented by country and region. The following regional means are used in the report: Europe22 (including 22 countries), America8 (including eight countries) and AsiaOceania6[1] (including six countries). For the regional means, the weighting also took into account the relative size of the population of each country within the total set of countries from this region (Appendix 2). The weighted sample size per region, country and main road user type are presented in Appendix 3.

SPSS 29.0 and R 4.3.1 was used for all analyses. Because of the large sample size, only differences with a p-value less than 0.001 are considered statistically significant in section 3.1 with overall results. In section 3.2 with advanced analyses more variables enter at the same time, so here also some results with higher p-values (up to 0.05) are considered worth commenting.

[1] *Armenia, Kyrgyzstan, and Uzbekistan were not included due to different methodology in data collection – face-to-face CAPI*

3 Results

3.1 Overall results

In this section we present the results of the ESRA3 survey regarding the use of a c-bike and an e-bike, attitudes and self-declared engagement in different behaviours. More specifically the results cover the following topics:

- Frequency of cycling in the past 12 months (Section 3.1.1)
- Use and evaluation of different infrastructures (Section 3.1.2)
- Self-declared behaviour (Section 3.1.3)
- Attitudes towards safety-critical behaviours and policy measures (Section 3.1.4)

For all topics, results regarding the use of c-bikes and e-bikes are as main rule presented in a fixed order. First the general level, second significant differences between countries and regions, third significant differences between genders and last differences across age groups. Because of the large number of observations most of the differences between regions, gender and age groups are statistically significant ($p<0.001$), even if they are small. Therefore, also the effect sizes (negligible, small, medium or large)[2] are evaluated using Cramer's V.

In Armenia, Kyrgyzstan, and Uzbekistan no online panels were available. Therefore, the sample size in these countries was reduced and the results from these countries are not included in regional means due to the different methodology.

3.1.1 Frequency of cycling

In the ESRA3-survey all participants in each participating country were asked to answer how often in the past 12 months they had used different transport modes including (see Q12 in Appendix 1). In this section we first present the frequency of using the c-bike and then the frequency of using an e-bike.

Table 1 provides an overview of the frequency of c-bike use. The table includes the information individually for each of the 40 participating countries as well as collectively for the three regions: Europe22, America8, and AsiaOceania6.

[2] *For regions the thresholds between the four are: 0.07, 0.21 and 0.35*
For gender the thresholds between the four are: 0.10, 0.30 and 0.50
For age groups the thresholds between the four are: 0.05, 0.13 and 0.22

Table 2: Frequency of using a c-bike by country and region.

Country	at least 4 days a week	1 to 3 days a week	a few days a month	a few days a year	Never
Armenia	0.9%	1.9%	5.9%	13.9%	77.3%
Australia	4.1%	15.3%	17.0%	11.3%	52.3%
Austria	7.9%	11.9%	21.0%	20.2%	39.0%
Belgium	9.3%	11.6%	15.2%	17.9%	46.0%
Bosnia and Herzegovina	10.8%	8.9%	20.1%	27.1%	33.1%
Brazil	12.4%	16.9%	22.5%	20.1%	28.2%
Canada	3.5%	9.5%	16.5%	16.5%	54.0%
Chile	7.3%	14.8%	18.4%	17.4%	42.2%
Colombia	11.4%	18.1%	24.1%	18.7%	27.7%
Czech Republic	7.2%	11.0%	20.8%	21.2%	39.8%
Denmark	19.6%	17.5%	14.6%	14.3%	34.0%
Finland	13.4%	20.6%	19.1%	21.2%	25.7%
France	7.0%	10.8%	18.9%	13.6%	49.6%
Germany	11.0%	19.7%	16.7%	14.4%	38.2%
Greece	5.0%	11.2%	15.9%	28.9%	38.9%
Ireland	4.1%	7.3%	14.6%	17.5%	56.5%
Israel	2.4%	3.1%	4.5%	15.9%	74.1%
Italy	12.1%	18.0%	19.8%	13.8%	36.4%
Japan	12.5%	11.5%	7.7%	8.5%	59.8%
Kazakhstan	6.8%	6.5%	14.2%	25.1%	47.5%
Kyrgyzstan	3.1%	3.8%	7.5%	13.4%	72.3%
Latvia	7.6%	11.2%	21.5%	28.6%	31.1%
Luxembourg	4.5%	5.6%	11.5%	19.1%	59.3%
Mexico	8.3%	15.0%	21.7%	16.1%	38.9%
Netherlands	23.7%	24.8%	15.6%	9.2%	26.7%
Panama	6.1%	10.7%	16.9%	25.5%	40.9%
Peru	8.9%	17.7%	22.5%	16.5%	34.4%
Poland	16.8%	19.9%	25.6%	15.5%	22.2%
Portugal	2.6%	7.8%	12.5%	22.8%	54.2%
Serbia	15.4%	12.9%	20.5%	20.0%	31.1%
Slovenia	10.0%	14.3%	22.6%	27.7%	25.3%
Spain	5.6%	14.2%	18.0%	15.5%	46.6%
Sweden	12.1%	15.8%	16.8%	19.9%	35.4%
Switzerland	9.4%	15.9%	19.0%	16.5%	39.3%
Thailand	18.0%	19.3%	14.9%	9.3%	38.4%
Türkiye	6.7%	11.6%	19.1%	13.7%	48.8%
United Kingdom	4.7%	13.1%	13.9%	11.2%	57.0%
United States	6.9%	16.1%	19.3%	12.1%	45.7%
Uzbekistan	4.3%	5.1%	7.7%	8.6%	74.3%
Region	at least 4 days a week	1 to 3 days a week	a few days a month	a few days a year	Never
Europe22	9.7%	15.6%	18.0%	15.2%	41.5%
America8	8.5%	15.9%	20.6%	15.6%	39.4%
AsiaOceania6	11.1%	13.0%	12.9%	11.2%	51.8%

Reference population: All road users. AsiaOceania6 does not include Armenia, Kyrgyzstan and Uzbekistan.

As can be seen in Table 2, close to 25% of the respondents declare using a c-bike at least once a week in all three regions, whereas 40% to 50% state never to use a c-bike. At the national level, the differences are bigger. The countries where more than 70% of the participants declare to have never used a c-bike in the past 12 months are Armenia, Kyrgyzstan, Uzbekistan[3] and Israel, whereas the countries Brazil, Colombia, Finland, The Netherlands, Poland and Slovenia, on the other hand, have percentages below 30% of participants indicating to have never used a c-bike in the past 12 months. However, the countries with the most frequent use of a c-bike (at least 4 days a week) include the Netherlands followed by Denmark and Thailand. The data do not allow conclusions about reasons for high or low frequency in the use of a c-bike.

In all countries, men are more frequent c-bike users than women are. On average, women use a c-bike around 25% less than men on. These differences are statistically significant ($p<0.001$) at the regional level, but according to Cramer's V they are small. Figure 1 shows the gender and age group distribution regarding the frequency of c-bike use at the regional level.

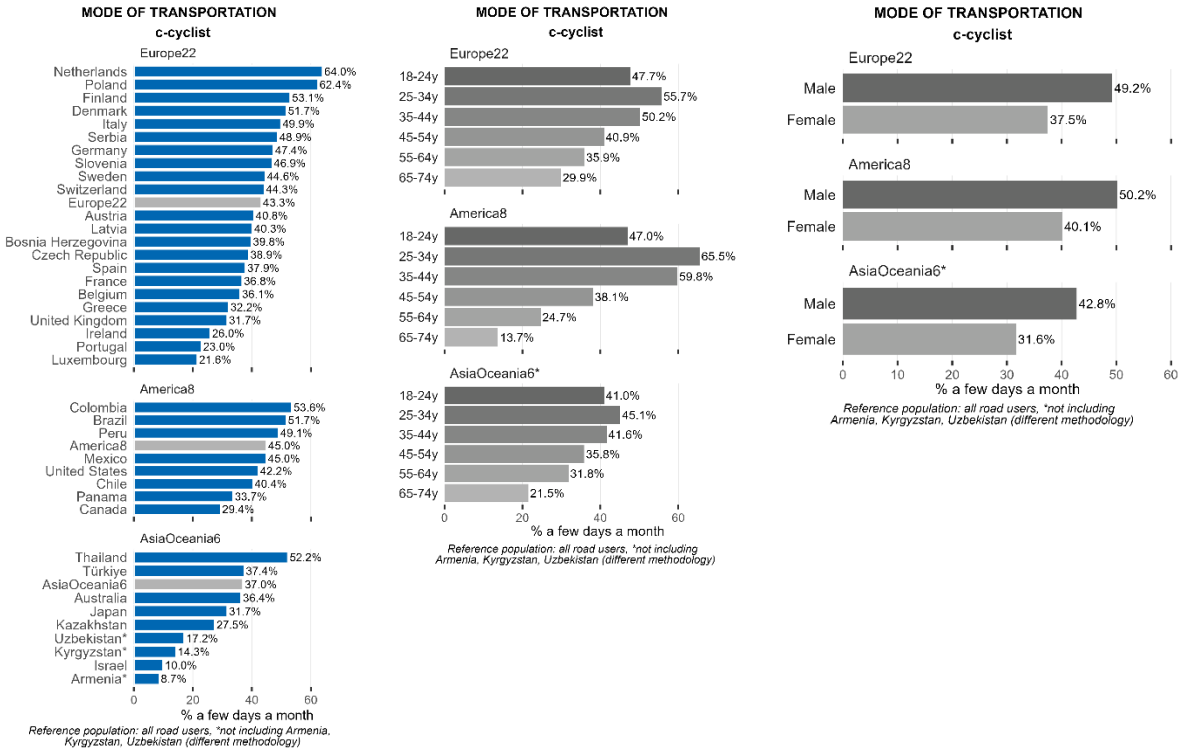


Figure 1: Frequency of using a c-bike by region, country, age group and gender (% few days a month).

Except for a few countries, c-bike use generally decreases with age (see Figure 1). More precisely, c-bike use decreases from age 25-34 onwards in all three regions. The differences are statistically significant ($p<0.001$) and according to Cramer's V they are medium and large.

However, the youngest participants (18-24 years old) seem to cycle somewhat less than the next age group (25-34 years old). The most remarkable exception is Italy where cycling increases with age. Based on the available data, we cannot determine whether it is an age effect or a cohort effect. Compared to c-bike use, the prevalence of e-bike use is still much lower than the use of c-bikes. Table 3 provides an overview of the frequency of e-bike use. The table includes the information individually for each of the 40 participating countries as well as collectively for the three regions Europe22, America8, and AsiaOceania6.

[3] *Note that for Armenia, Kyrgyzstan and Uzbekistan the data collection differs from other countries.*

Table 3: Frequency of using an e-bike by country and region.

Country	at least 4 days a week	1 to 3 days a week	a few days a month	a few days a year	Never
Armenia	0.2%	0.2%	0.6%	0.2%	98.7%
Australia	4.0%	10.2%	13.7%	7.7%	64.5%
Austria	2.0%	6.0%	7.8%	7.2%	77.0%
Belgium	7.1%	8.8%	9.3%	8.6%	66.1%
Bosnia and Herzegovina	1.7%	1.1%	2.8%	7.8%	86.6%
Brazil	1.9%	5.3%	7.5%	11.4%	73.9%
Canada	1.8%	4.6%	5.5%	5.7%	82.5%
Chile	2.1%	3.0%	6.0%	8.9%	79.9%
Colombia	3.0%	4.5%	10.8%	13.0%	68.7%
Czech Republic	1.4%	2.4%	5.2%	6.8%	84.4%
Denmark	5.9%	7.8%	6.6%	6.0%	73.8%
Finland	1.7%	3.6%	3.8%	8.7%	82.2%
France	3.7%	8.3%	11.4%	6.8%	69.9%
Germany	3.7%	11.1%	8.6%	6.9%	69.6%
Greece	1.0%	1.7%	2.7%	8.9%	85.7%
Ireland	2.0%	3.8%	5.2%	7.4%	81.6%
Israel	1.5%	1.4%	1.8%	7.0%	88.3%
Italy	3.6%	10.4%	9.9%	7.2%	68.9%
Japan	2.9%	3.7%	3.2%	2.5%	87.7%
Kazakhstan	1.7%	1.1%	3.4%	8.3%	85.6%
Kyrgyzstan	0.4%	0.6%	0.4%	2.0%	96.5%
Latvia	0.8%	0.6%	1.9%	6.6%	90.2%
Luxembourg	2.4%	4.5%	9.3%	9.5%	74.4%
Mexico	2.7%	4.3%	6.8%	8.0%	78.2%
Netherlands	16.4%	17.7%	11.4%	7.9%	46.7%
Panama	1.9%	3.2%	8.7%	12.0%	74.1%
Peru	2.8%	7.5%	12.2%	12.7%	64.8%
Poland	0.8%	2.0%	5.4%	9.3%	82.5%
Portugal	0.8%	2.5%	3.9%	9.7%	83.1%
Serbia	1.2%	0.8%	2.7%	5.1%	90.2%
Slovenia	2.1%	3.0%	4.9%	8.0%	82.1%
Spain	1.9%	5.3%	6.8%	7.1%	78.9%
Sweden	2.3%	7.0%	6.8%	9.4%	74.6%
Switzerland	5.8%	10.6%	10.7%	10.4%	62.6%
Thailand	5.8%	8.7%	10.2%	5.5%	69.9%
Türkiye	4.4%	10.5%	12.5%	13.3%	59.3%
United Kingdom	3.9%	10.6%	7.0%	3.8%	74.7%
United States	6.4%	16.8%	17.1%	9.0%	50.8%
Uzbekistan	1.9%	1.4%	2.9%	2.7%	90.9%
Region	at least 4 days a week	1 to 3 days a week	a few days a month	a few days a year	Never
Europe22	4.0%	10.0%	11.7%	9.6%	64.6%
America8	3.8%	6.6%	7.6%	6.4%	75.5%
AsiaOceania6	3.6%	8.1%	8.0%	7.0%	73.3%

Reference population: All road users. AsiaOceania6 does not include Armenia, Kyrgyzstan and Uzbekistan.

As can be seen in Table 3, in 21 out of the 40 participating countries more than 75% of the participants indicate to never have used an e-bike in the past 12 months. Only in one country, The Netherlands, less than 50% of the participants indicate to never have used an e-bike in the past 12 months. Generally, The Netherlands is the leading country regarding e-bike use with 16% having used an e-bike at least four days a week and with more than 50% having used it at least a few days in the past 12 months. Other countries with a relative strong propagation of e-bike use include Belgium, Germany, Switzerland, Thailand and the USA. In these countries, 6% to 7% are using an e-bike at least four days a week. The countries with the lowest propagation of e-bikes are Armenia, Kyrgyzstan and Uzbekistan with more than 90% never having e-biked, but again this can be due to differences in the collection of data. Apart from these three countries, Israel, Japan, Latvia and Serbia stand out with 88% to 90% stating to never having used an e-bike. With respect to gender, we see the same pattern as for c-bikes, but on a lower level (see Figure 2). On average, women are e-cycling around 25% less than men in Europe22 and America8, whereas the percentage is approximately the same among women and men in AsiaOceania6. In all three ESRA3 regions, 17-24% of the women report using an e-bike at least a few days a week, whereas the percentage for men varies between 19% and 28%.

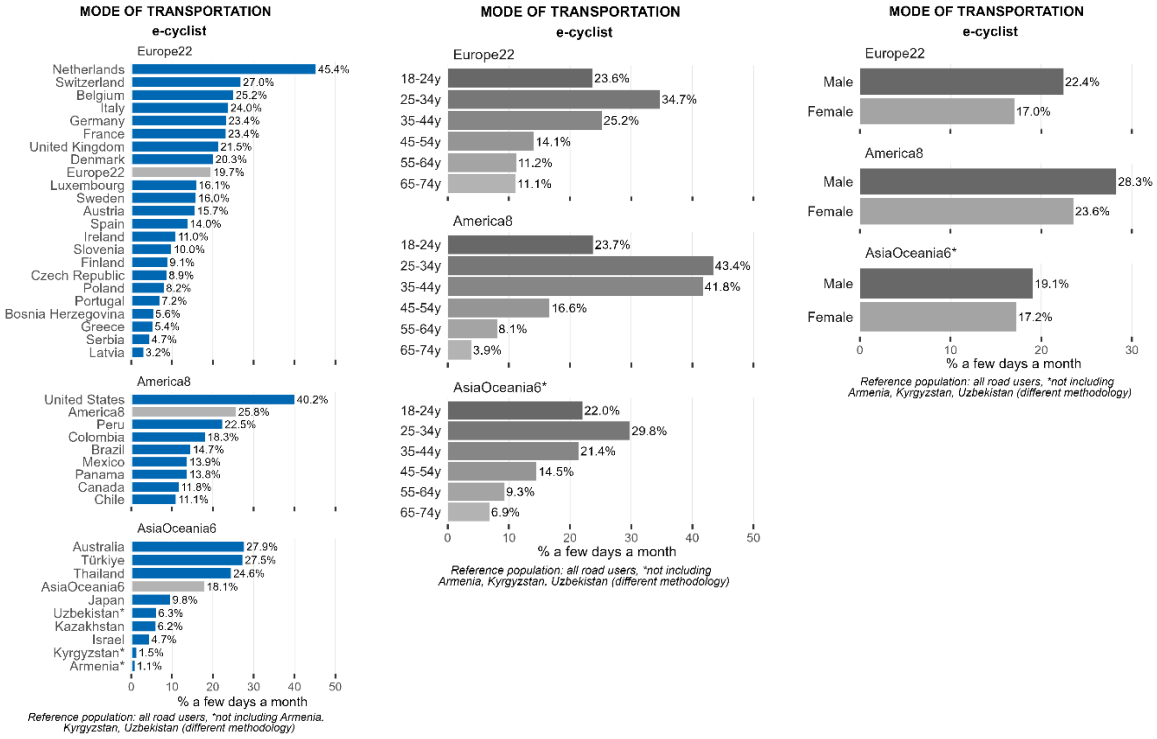


Figure 2: Frequency of using an e-bike by region, country, age group and gender (% few days a month).

3.1.2 Use and evaluation of different infrastructures

In ESRA3, participants who indicated to have used a bicycle (both c-bike and e-bike) at least a few days a month were asked to answer some questions about the infrastructure they had regularly used when cycling (see also Q25_3_a, and Q25_3b in Appendix 1). In the ESRA3 questionnaire, four types of infrastructure are included: Rural roads and urban roads, and with and without cycle lanes respectively. When looking at the results, it is relevant to keep in mind, that use of infrastructure is a result of both supply and demand. In some countries, like The Netherlands, there is a comprehensive network of bicycle lanes; in other countries, the cycling infrastructure may be sparse.

As can be seen in Table 4 more people declare having regularly used roads with cycle lanes than roads without. That goes for rural as well as urban roads. This may both reflect the supply of lanes, and that cyclists may prefer infrastructure with cycle lanes and choose such roads when possible. In addition, more people declare having regularly used urban than rural roads irrespectively of the presence of cycle lanes. This may reflect the degree of urbanisation, but maybe also that the travelling distance in towns typically are shorter and more attractive for cycling.

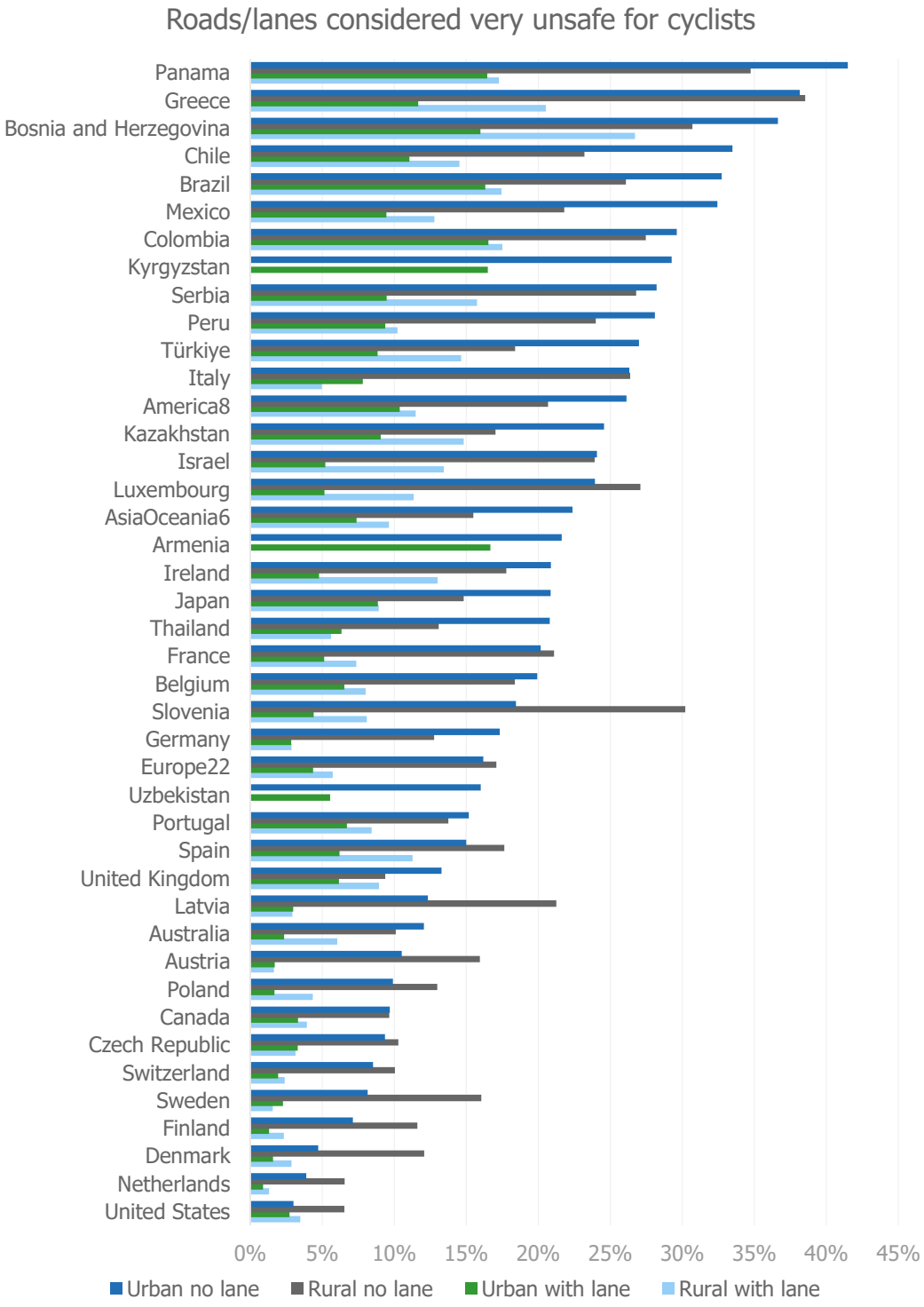
Table 4: Frequency of regularly using different types of infrastructure as cyclist (c-bike and e-bike).

Region	Rural roads with cycle lanes	Rural roads without cycle lanes	Urban roads with cycle lanes	Urban roads without cycle lanes
Europe22	44.5%	33.5%	71.6%	47.2%
America8	36.5%	25.4%	70.3%	36.5%
AsiaOceania6	43.5%	36.4%	56.2%	40.1%

Reference population: Cyclists at least a few days a month. AsiaOceania6 does not include Armenia, Kyrgyzstan and Uzbekistan.

There are significant differences between regions ($p<0.001$) for all four infrastructure types, but according to Cramer's V, the differences are small. With respect to gender, there are no differences in neither of the three regions, and with respect to age, there are significant differences ($p<0.001$) in some regions for some types of infrastructure, but they are small according to Cramer's V. The differences probably just reflect differences in cycling frequency and maybe trip lengths.

Regarding how safe the participants evaluate the infrastructure that they regularly used as a cyclist, a larger percentage of participants find roads without a cycle lane to be less safe than roads with a cycle lane (see Figure 3). Latin America and the Southeast of Europe have the poorest ratings of the infrastructure in terms of safety when respondents are asked to rate the roads as "very unsafe" or not. This is particularly the case for roads without cycle lanes and, among them, urban roads are often rated less safe than rural. Up to 40% perceive these roads as very unsafe, though there are large differences between countries. There seems to be opposite effects for roads with cycle lanes. Here, rural roads are in general rated as very unsafe more often than urban roads. In the Netherlands and the USA very few rate the roads as very unsafe, often below 5%. Here, and in other "safe" countries (typically in Northern Europe) rural roads without cycle lanes are more often rated as very unsafe than urban roads without lanes – i.e. the opposite as in the less safe countries.



Reference population: Cyclists at least a few days a month. AsiaOceania6 does not include Armenia, Kyrgyzstan and Uzbekistan.

Figure 3: Percentage of respondents in each county indicating that the infrastructure they regularly use as a cyclist is very unsafe.

When the respondents are asked to rate the roads, they regularly use as "very safe" or not, a somewhat similar picture appears. Roads with cycle lanes are considered much safer than roads without. The poorest ratings of the infrastructure are found in America8 and Asia Oceania6. Here 7% to 26% of the infrastructure is rated "very unsafe". In Europe22 it is 4% to 16%. Surprisingly, some of the countries with few "very unsafe" ratings also have relatively few "very safe" ratings. This is for instance the case for the Netherlands. Here more people give ratings in the middle of the scale than in the extremes.

3.1.3 Self-declared behaviour

ESRA3 respondents who indicated to have used a bicycle (c-bike or e-bike) at least a few days a month were asked about their behaviours as cyclists. The questions regarded how often they had engaged in different safety related behaviours such as secondary task engagement, riding while impaired and helmet use (see Q_14_4 in Appendix 1). The answering scale ranged from 1 (never) to 5 (almost always). For every question, it was determined how many respondents declared having engaged in the behaviour at least once in the past 30 days (answering scale 2 – 5). The weighted means of these questions by region are displayed in Figure 4.

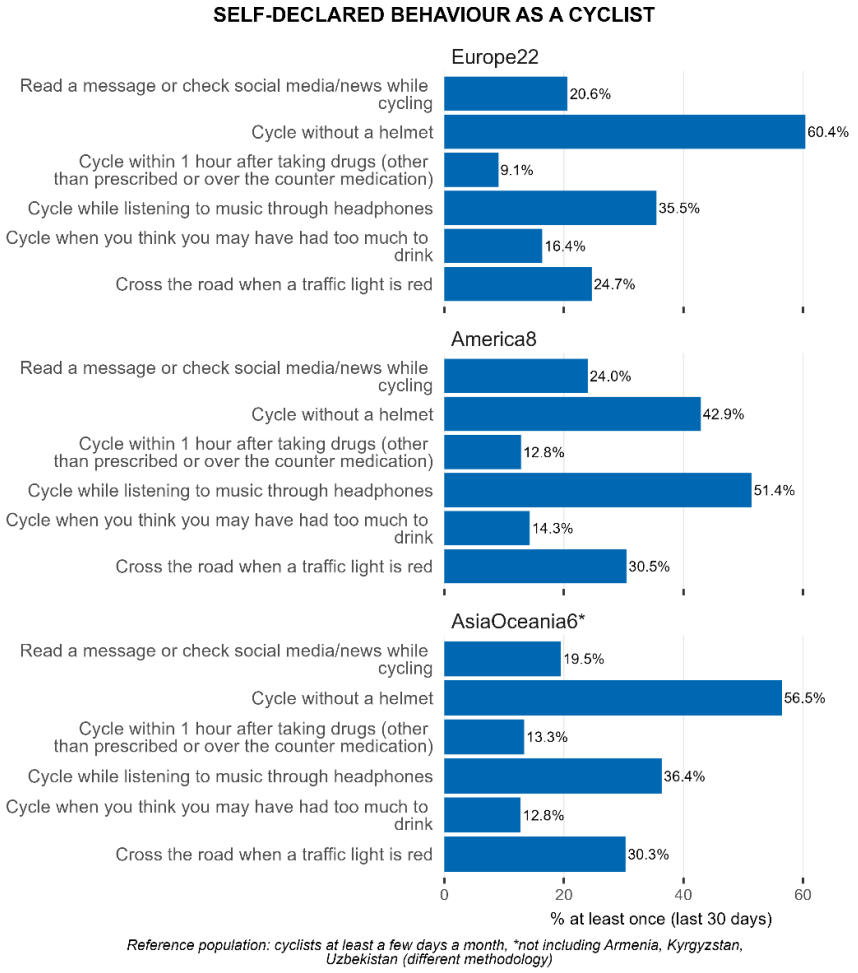


Figure 4: Self-declared behaviours as a cyclist (both c-bike and e-bike), by region (% indicating engagement in each behaviour at least once in the past 30 days).

The results for the six types of self-declared behaviour by ESRA3 region in Figure 4 are described below in the same order as in the figure. For some self-declared behaviours, the description includes results for individual countries as well.

Around 20% declare to have read a message or checked social media/news while cycling at least once during the last 30 days. The percentage is highest in Northern Europe and Latin America, but Israel and Thailand are also among the top 5 countries. Especially in America8, men are more likely to do so than women ($p<0.001$), but the shares are 28.8% and 18.2% respectively and according to Cramer's V this difference is small. Further, there is a very clear and significant age effect in all three regions ($p\leq0.001$). The youngest age group (18-24) does it 3 to 6 times more often than the oldest age group (65-74). According to Cramer's V, the differences are small in America8, medium in AsiaOceania6 and large in Europe22.

Helmet usage differs across the regions. In Europe22 60.4% of the cyclists indicate to have cycled without a helmet at least once in the last 30 days. This is higher than both America8 (42.9%) and

AsiaOceania6 (56.5%). The difference between the regions is significant (p<0.001), but according to Cramer's V it is small.

Cycling within one hour after having taken drugs is less common than the other behaviours included in the questionnaire (Figure 4). On average 10% to 13% of the cyclists' report having engaged in that behaviour. However, in Thailand cycling after having taken drugs is very widespread with 31% reporting having done that. Apart from that, the behaviour is most common in North America and some countries in Northern Europe. In the low end, we find countries like Latvia, Serbia and Greece. Men are engaging in the behaviour more frequently than women in America8 where the difference is statistically significant (p<0.001), but small according to Cramer's V. In Europe22 cycling within one hour after having taken drugs primarily occurs among young cyclists (p<0.001, medium size). In AsiaOceania6 the differences across gender and age are not statistically significant.

Large regional differences are also seen for listening to music through headphones while cycling. The difference is significant (p<0.001) and according to Cramer's V of medium size. The highest percentage indicating to have done so in the past 30 days is found in America8 with 51.4%. This percentage is lower in AsiaOceania6 and Europe22 (36.4% and 35.5%). If we look at individual countries, listening to music is most common in the Latin America countries where 60% to 75% are doing that frequently. In Northern Europe it is around 45%. The reported shares are a little higher for men than for women, but the difference is not statistically significant. The youngest (18-24 years of age) do it much more than the older age groups (25+ years of age) in all three regions. In all three regions the difference is statistically significant (p<0.001) and in Europe22 and AsiaOceani6 it is large according to Cramer's V; in America8 it is of medium size.

Cycling with maybe too much alcohol is most prevalent in Northern Europe. In countries like The Netherlands, Denmark, Sweden, Belgium, Czech Republic and Finland, more than 25% of people who cycle regularly (a few days a month or more) state that they have been cycling while they thought that they may have had too much to drink. Outside Europe, the share is only over 25% in Thailand (and Uzbekistan, but here the numbers are too small for conclusions). The most sober cyclists are found in Luxembourg, some Balkan countries (Bosnia Herzegovina, Greece and Serbia) and Japan with less than 9% having cycled while they think they may have had too much to drink. Beware that the respondents themselves define when they have had too much to drink and the perception of "too much" may differ among countries. Also, the legislation differs across countries. Among cyclists, more men than women report having cycled when having too much to drink in Europe22 and America8. These differences are statistically significant (p<0.001), but small according to Cramer's V. In AsiaOcenania6 the gender difference is small and not statistically significant. With respect to age, there are clear and statistically significant differences in Europe22 (p<0.001 and medium according to Cramer's V) where cycling while thinking that one may have had too much to drink decreases dramatically with age. The share among the age group 65-74 is approximately the same in all three regions (7% to 8%). This is to be compared with 28% for the youngest group (18-24) in Europe22. These differences will be explored in more detail in the section with advanced analyses.

Crossing when the traffic light is red at least once in a month is quite common in many countries. Across regions 25% to 31% state do have done that. Europe22 has the lowest share, and the difference is statistically significant (p<0.001), but the difference is negligible according to Cramer's V. In Northern Europe and Latin America, the share is 35% to 40%, whereas it is as low as 15% in Australia, Poland and Serbia. In Europe22 and America8 men do so more often than women, and the youngest group (18-24) more than the older age groups. These differences are statistically significant (p<0.001), but the gender difference is negligible in Europe22 and small in America8. The age differences are medium in Europe22 and small in America8 – all according to Cramer's V.

In Section, 3.1.2 the factors behind the self-declared behavior are analyzed further using discrete choice modelling.

3.1.4 Attitudes towards safety related behaviours and policy measures

In the ESRA3 survey, all respondents were asked to indicate their attitude towards safety related behaviours for a number of road users. The questions include all participants' view on car drivers, moped riders/motorcyclists, cyclists and pedestrians. In this section, we present all participants attitudes

towards safety related behaviours among cyclists. The questions relate to cycling while having had too much to drink, cycling without a helmet, reading messages or checking social media/news while cycling, and crossing the road when the traffic light is red (see Q16_3 in Appendix 1).

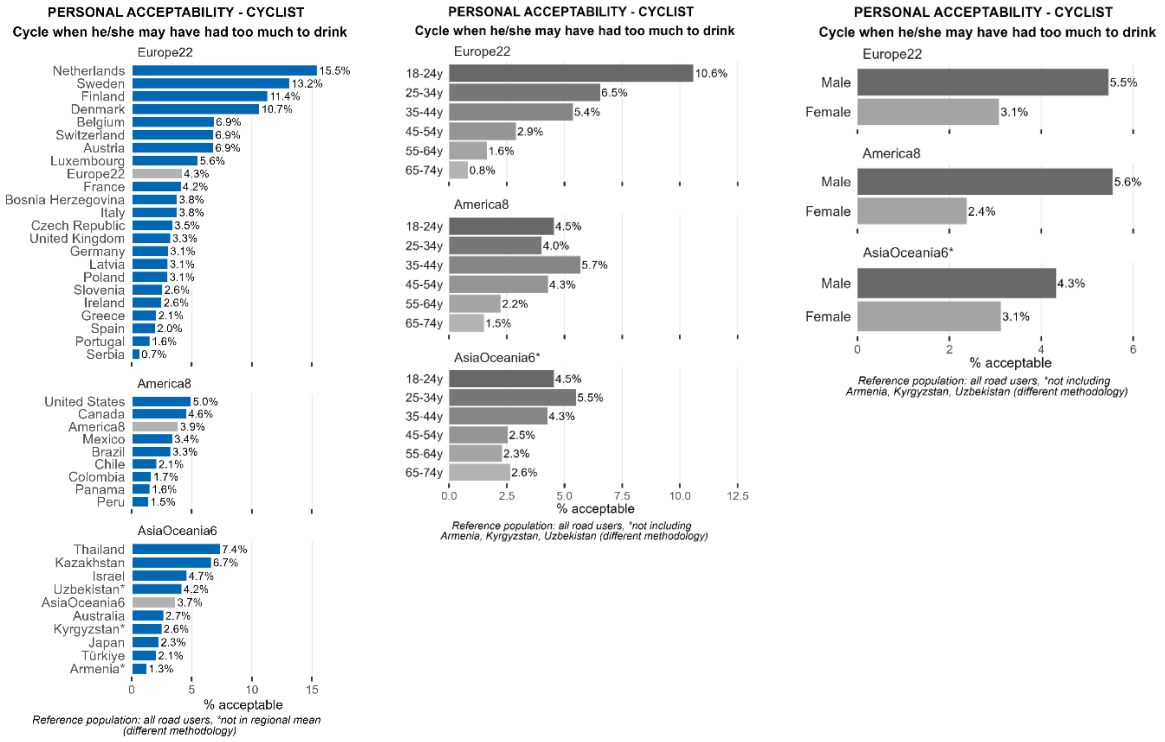


Figure 5: Attitudes towards cycling when having had too much to drink by region, county, age group and gender.

With regards to cycling while having had too much to drink (see Figure 5), the average acceptance is low in all three regions. Thus, on average approximately 4% find it acceptable compared to between 13-16% self-declaring to engage in the behaviour. The Netherlands together with the Nordic countries are on top with more than 10% acceptance. In the Netherlands, 32% report having cycled after having too much to drink, but 16% find it acceptable. There is a significant difference between the attitudes towards cycling while having had too much to drink between men and women (see Figure 5).

On average, in Europe22 and America8 half as many women as men find it acceptable ($p<0.001$), but the difference is negligible according to Cramer's V. In AsiaOceania6 the difference is not significant. The acceptance decreases considerably with age in Europe22 ($p<0.001$, medium size difference according to Cramer's V), but in America8 and AsiaOceania6 the differences are not significant at this level. See Figure 5. These patterns are also found when it comes to self-declared behaviour, but less pronounced.

Regarding attitude towards cycling without a helmet (see Figure 6), The Netherlands again stands out as the country with most people (64%) accepting cycling without a helmet. This mirrors the result that the Netherlands is the country with most cyclists self-declaring to ride without a helmet (88%). The countries with mandatory helmet wearing (fully or partly) stand out as the countries with least acceptance. Thus, in Australia, only 4% accept riding without it. Region wise, America8 lies with 11% acceptance significantly ($p<0.001$) below the other regions where the average acceptance is around 20%, but the difference is small according to Cramer's V. Women tend to be less acceptant compared to men (see Figure 6), but only in Europe22 and America8 ($p<0.001$) and the differences are small according to Cramer's V.

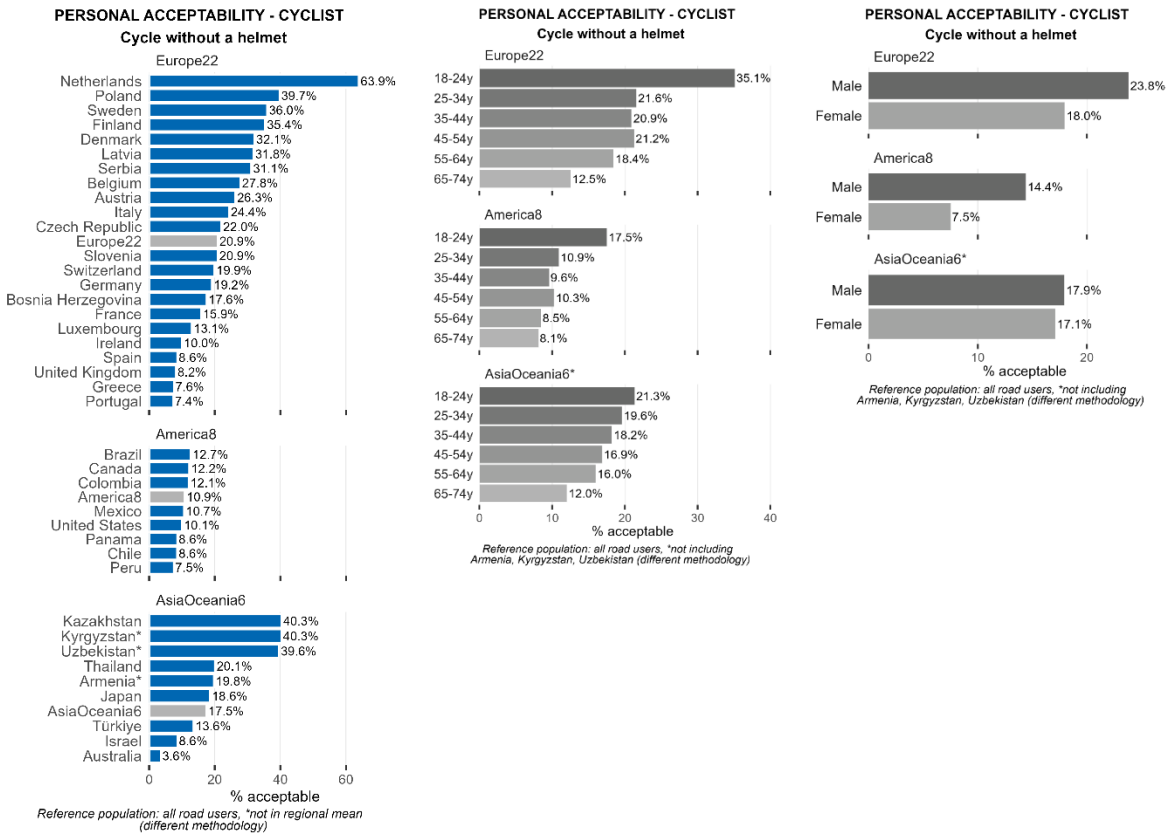


Figure 6: Attitudes towards cycling without a helmet by region, country, age group and gender.

Acceptance of riding without a helmet decreases with age ($p<0.001$) for Europe22 and America8, but not as strongly as for riding under the influence of alcohol and the differences are small according to Cramer's V (see Figure 6) The age effect is insignificant in AsiaOceania6. Again, these patterns are somewhat reflecting the patterns in self-declared behaviour.

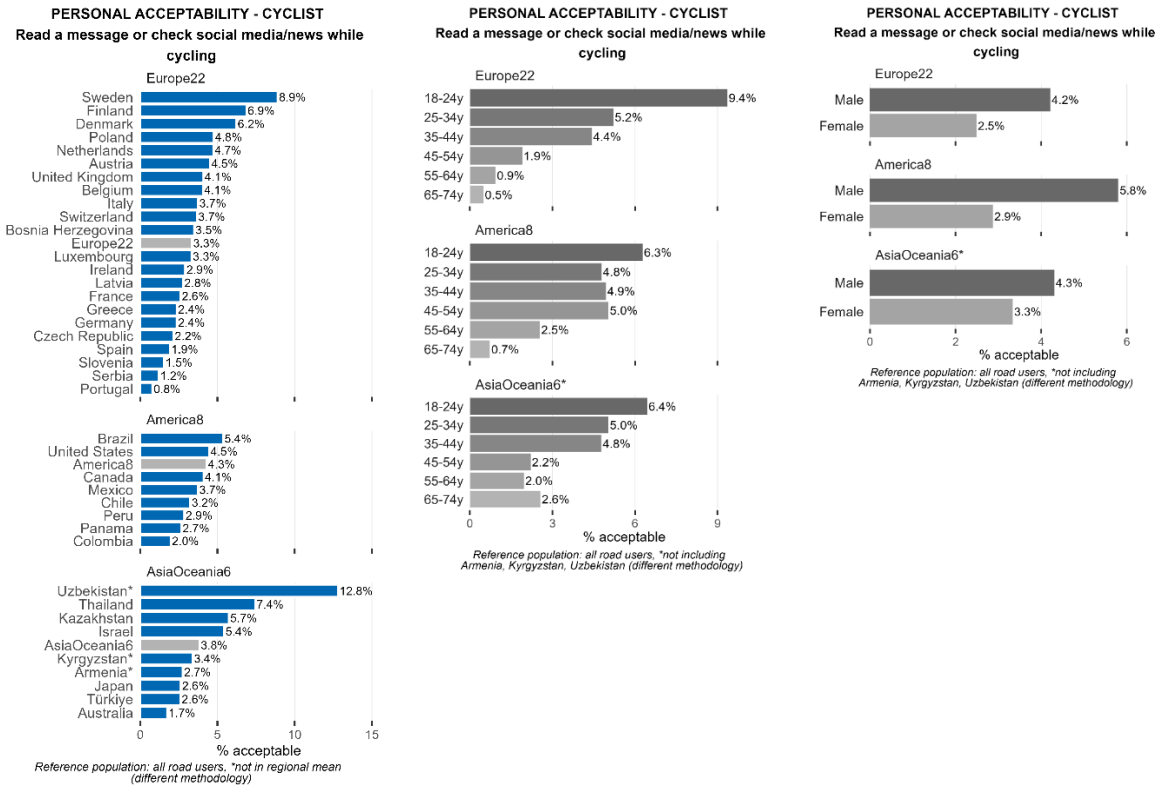


Figure 7: Attitudes towards reading messages or checking social media/news while cycling by region, country, age group and gender.

When it comes to reading messages or checking social media/news while cycling (see Figure 7), only 3-4% on average, find it acceptable to engage in these behaviours. It is most accepted in the Nordic Countries, in Thailand, and in some central Asian countries with 6-9% acceptance. In Portugal, Slovenia, Serbia, Spain and Australia the acceptance is below 2%.

On average, acceptance of reading messages is higher among men than among women in Europe22 and America8 ($p<0.001$), but the differences are negligible according to Cramer's V (see Figure 7). Again, the acceptance is decreasing with age, most prominently in Europe22. These differences are significant ($p\leq0.001$) in all three regions, but according to Cramer's V, they are small in America8 and AsiaOceania6 and medium in Europe22.

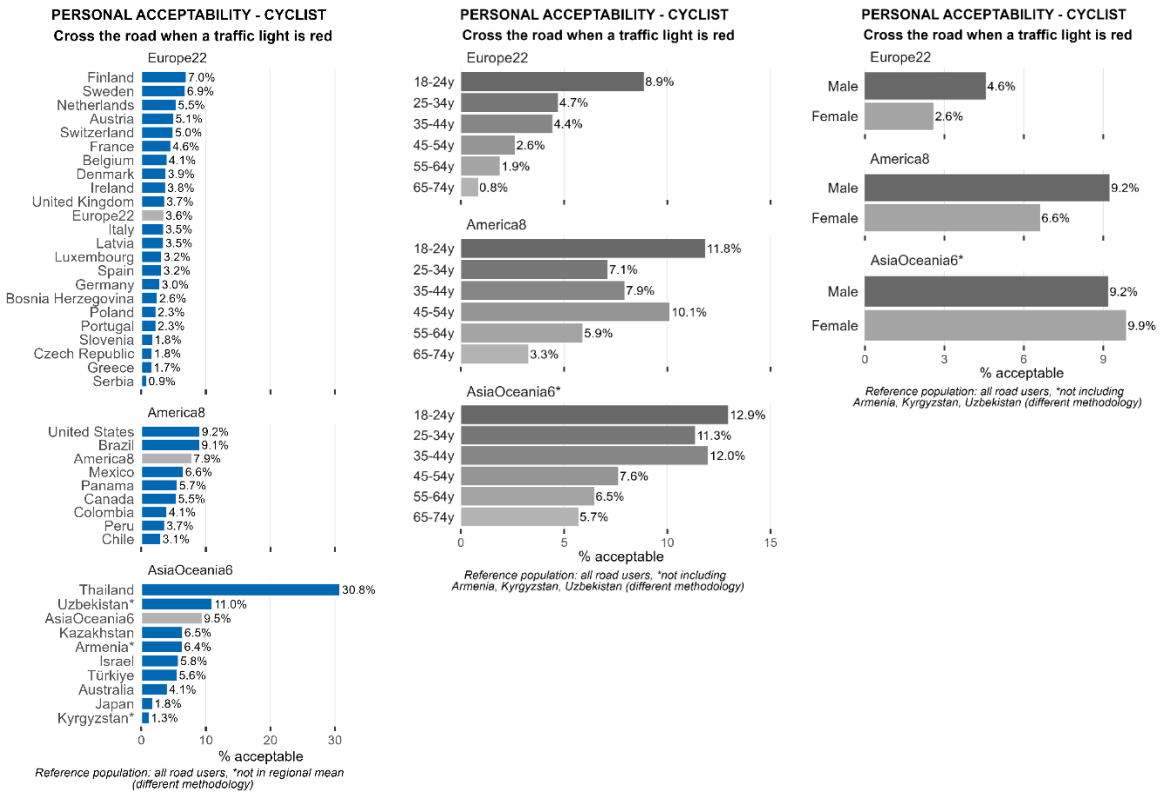
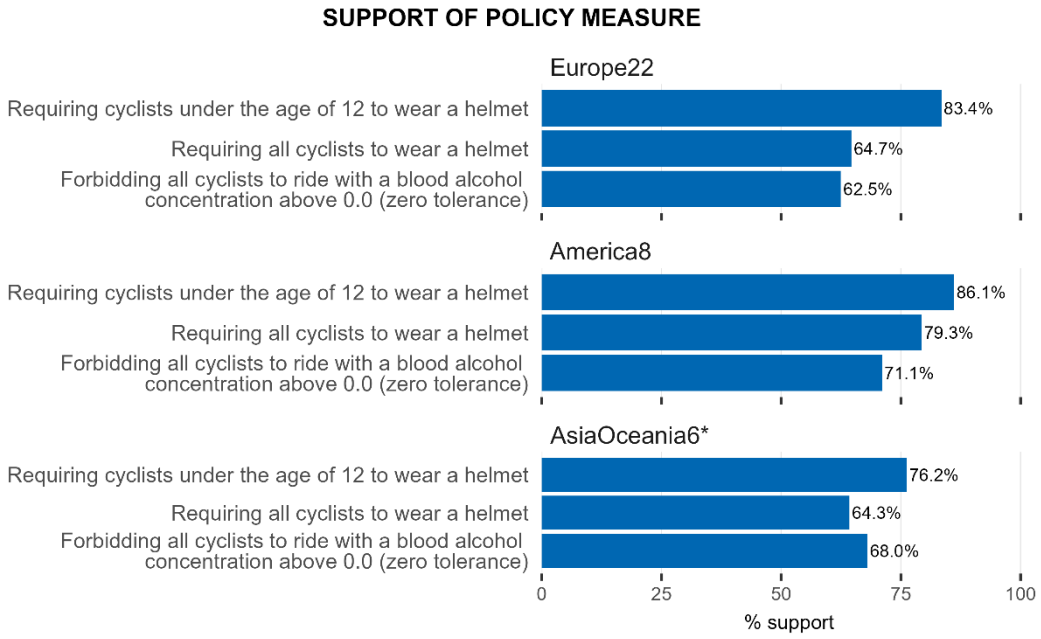


Figure 8 Attitudes towards crossing the road while the traffic light is red by region, country, age group and gender.

Regarding crossing the road while the traffic light is red (see Figure 8), acceptance is low (below 10%) in most countries. The remarkable exception is Thailand where 31% finds crossing the road when the light is red, acceptable. In the Balkan countries and Japan acceptance is below 2%. On average, the acceptance is lowest in Europe22 (3.6%) and highest in AsiaOceania6 (9.5%). These differences are significant ($p<0.001$), but small according to Cramer's V. In Europe22 the acceptance is lower among women than among men ($p<0.001$, but small according to Cramer's V), but in America8 and AsiaOceania6 there is no difference between the genders (Figure 8). Acceptance is decreasing with age, most clearly in Europe22 ($p<0.001$ in all three regions), but they are small according to Creamer's V.

The ESRA3 survey includes several questions about the support to various legal obligations. These questions are posed to all participants, not just cyclists. In the questionnaire, all participants are asked to indicate if they support or oppose several different legal obligations in traffic such as different speed limits, blood alcohol limits, and helmet use (see Q20 in Appendix 1). Three questions concern legal obligations for cyclists: 1) Requiring cyclists under the age of 12 to wear a helmet, 2) Requiring all cyclists to wear a helmet, 3) Forbidding all cyclists to ride with a blood alcohol concentration above 0.00 ‰ (zero tolerance). The answering scale ranged from 1 (oppose) to 5 (support), but here 1-3 is gathered as non-support and 4-5 as support. Below, the results are shown in Figure 9 and then briefly discussed. Recall that all participants, not just the ones who cycle, have answered these questions.



*Reference population: all road users, *not including Armenia, Kyrgyzstan, Uzbekistan (different methodology)*

Figure 9: Attitudes towards policy measures on helmet wearing for cyclists.

In most countries, there is a strong support for mandatory helmet wearing for children under the age of 12. Across countries, the support lies between 69% and 95% except for The Netherlands where the support is only 50%. Although the differences between regions are small according to Cramer's V, they are significant ($p<0.001$). In all three regions, the support among women is 6 to 8 percentage points larger than the support among men ($p<0.001$), but according to Cramer's V this difference is small. The support is increasing with age ($p<0.001$) in all three regions, most clearly in Europe22, but again the differences are small.

The support for mandatory helmet wearing for all cyclists is also quite strong, but weaker than for children. Across countries, the support varies between 46% and 90% if we disregard the support in The Netherlands where it is 21%. The difference between regions is significant ($p<0.001$), but this is only because America8 lies above the two other regions. Again, the support is significantly ($p<0.001$) stronger among women than among men in Europe22 and America8, but insignificant in AsiaOceania6. The size of the difference is small according to Cramer's V. The support is increasing with age. In all three regions there is a significant difference between age groups ($p<0.001$) with the largest difference between the youngest age group (18-24) and the next.

In general, there is also a wide support for forbidding all cyclists to ride with a blood alcohol concentration above 0.0‰ (zero tolerance). The share of support varies a lot across countries, but for the regions, around two thirds of the respondents support such a ban. The support is lower in Europe22 than in America8 and AsiaOceania6 ($p<0.001$), but the difference is small according to Cramer's V. The most opposing countries are found in Northern Europe (Finland, Denmark, Netherlands and Sweden) where the support ranges from 29% to 43%. In all three regions, the support from women is 9 to 11 percentage points larger than from men ($p<0.001$). The support increases with age ($p<0.001$ in all regions), but most pronounced in Europe22 and most pronounced when going from the youngest age group (18-24) to the next.

In Section 3.2.2, the policy support is analysed in more detail using discrete choice modelling to identify the factors behind the differences in support.

3.2 Advanced analyses

3.2.1 Predictors of self-declared behaviours

In this section, we analyse the relationship between self-declared behaviour and various background variables. We analyse the following self-declared behaviours based on question 14_4_1 – 14_4_6: How often did you as a cyclist: 1) cycle when you think you may have had too much to drink, 2) cycle without a helmet, 3) cycle while listening to music through headphones, 4) read a message or check social media/news while cycling, 5) cycle within 1 hour after taking drugs (other than prescribed or over the counter medication), and 6) cross the road when a traffic light is red. The explanatory variables are gender, age, level of education, frequency of cycling, infrastructure used and country dummies. The attitude towards the relevant risk behaviour was included as an explanatory variable in preliminary analyses but was left out because these variables took over most of the explanatory power, since self-declared behaviour and attitudes are closely correlated. The dependent variables are transformed from five categories to dichotomous variables by placing "Almost always" and its neighbouring category "Often" in the yes group and the three remaining categories in the no group. The sample is here limited to the cyclists among the respondents, i.e. the ones having declared that they cycle a few days a month or more (N=15,997).

The analysis was carried out as MNL logit estimations using ESRA weights with the SAS procedure "Surveylogistic".

The presentation of the results is split in two parts so that the results for the three first questions (Cycling while thinking one might have had too much to drink, cycling without a helmet, and cycling while listening to music through headphones), are shown first. Then we present the results for the three last questions (read a message or check social media/news while cycling, cycle within 1 hour after taking drugs (other than prescribed or over the counter medication), and cross the road when a traffic light is red. Because of the size, the tables are spilt in two parts in both cases, the last containing results for the individual country dummies. The reference country is chosen as the European country closest to the dataset average (weighted). After the tables, we present the results one by one.

Last in this section, we present a similar regression for the likelihood for a cyclist of choosing an e-bike over a c-bike.

Table 5: MNL logit estimations for behaviour: alcohol, helmet and music.

	Riding while thinking one might have had too much to drink (always or often)			Riding without helmet (always or often)			Riding with music in ears (always or often)		
	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper
Gender (male)									
Female	0.578**	0.410	0.813	0.887*	0.800	0.984	0.858*	0.762	0.967
Age Group (18-24 years)									
35-54 years	0.709	0.491	1.023	0.915	0.812	1.032	0.642***	0.563	0.732
≥ 55 years	0.226***	0.126	0.406	0.824**	0.714	0.951	0.402***	0.335	0.482
Level of education (Secondary or lower)									
Bachelors' degree or similar	1.294	0.871	1.922	0.765***	0.677	0.865	0.969	0.841	1.116
Masters' degree or similar	1.575	0.989	2.509	0.686***	0.591	0.796	0.856	0.721	1.017
Frequency of cycling (a few days a month)									
1 to 3 days a week	1.839***	1.296	2.610	0.855**	0.763	0.957	1.076	0.948	1.223
At least 4 days a week	2.104***	1.459	3.034	1.276***	1.125	1.447	1.102	0.953	1.274
Infrastructure regularly used (seldom used)									
Rural roads, no lanes	1.984***	1.383	2.846	0.969	0.861	1.091	1.068	0.933	1.222
Rural roads with lanes	0.857	0.609	1.205	0.759***	0.679	0.849	1.017	0.896	1.155
Urban roads, no lanes	0.639*	0.442	0.925	1.844***	1.657	2.051	0.833*	0.735	0.944
Urban roads with lanes	0.813	0.574	1.150	0.907	0.806	1.020	0.957	0.838	1.093
N/Somers'D/Concordance	15,997	0.525	75.0%	15,997	0.395	69.6%	15,997	0.326	66.0%

*Note: Country dummies included, see Table 6 below. ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001*
Reference population: Cyclists at least a few days a month not including Armenia, Kyrgyzstan and Uzbekistan.

Table 6 MNL logit estimations for behaviour: alcohol, helmet and music.

Continued	Riding with too much alcohol (always or often)			Riding with no helmet (always or often)			Riding with music in ear (always or often)		
Country	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper
Armenia[x]	-			-			-		
Australia	0.677	0.251	0.528	0.140***	0.091	0.216	0.706	0.491	1.016
Austria	0.707	0.276	0.433	0.952	0.748	1.211	0.920	0.697	1.215
Belgium	2.038	0.947	0.152	1.370*	1.078	1.741	1	Reference country	
Bosnia	0.345	0.068	0.364	1.176	0.871	1.587	1.223	0.854	1.751
Brazil	0.638	0.237	0.237	0.680**	0.517	0.895	2.192***	1.661	2.893
Canada	1.482	0.624	0.528	0.549***	0.414	0.730	1.158	0.854	1.571
Chile	0.690	0.246	0.433	0.771	0.575	1.033	2.186***	1.632	2.928
Colombia	0.280*	0.084	0.152	0.679**	0.513	0.898	2.310***	1.748	3.053
Czech	0.775	0.266	0.364	1.155	0.871	1.532	1.346	0.983	1.844
Denmark	1.750	0.762	0.237	0.991	0.760	1.292	1.553**	1.167	2.066
Finland	1.350	0.559	0.528	1.347*	1.039	1.745	1.389*	1.042	1.851
France	0.572	0.184	0.433	0.632**	0.475	0.841	0.910	0.650	1.272
Germany	0.615	0.208	0.152	1	Reference country		0.604**	0.416	0.877
Greece	0.354	0.073	0.364	0.604**	0.441	0.829	1.279	0.899	1.820
Ireland	1.139	0.423	0.237	0.556***	0.395	0.784	1.516*	1.061	2.167
Israel	1.431	0.412	0.528	0.330***	0.201	0.543	1.400	0.868	2.260
Italy	1.326	0.551	0.433	0.874	0.673	1.135	1.364*	1.018	1.828
Japan	0.317	0.083	0.152	1.584**	1.177	2.132	0.483***	0.315	0.741
Kazakhstan	1.250	0.444	0.364	1.707**	1.222	2.385	1.778**	1.261	2.508
Kyrgyzstan[x]	-			-			-		
Latvia	0.522	0.155	1.752	2.725***	2.018	3.680	1.591**	1.163	2.176
Luxembourg	-			0.460***	0.299	0.709	0.884	0.529	1.477
Mexico	0.885	0.349	2.241	0.640**	0.476	0.862	1.999***	1.493	2.677
Netherlands	2.351*	1.083	5.107	4.378***	3.379	5.672	1.167	0.889	1.531
Panama	-			0.788	0.559	1.111	2.169***	1.580	2.978
Peru	0.384	0.125	1.174	0.868	0.650	1.159	2.544***	1.915	3.380
Poland	0.486	0.167	1.413	1.591***	1.230	2.058	1.194	0.895	1.593
Portugal	0.864	0.277	2.694	0.554***	0.397	0.774	1.444*	1.006	2.073
Serbia	0.112*	0.014	0.900	2.462***	1.863	3.253	0.951	0.685	1.321
Slovenia	-			0.930	0.706	1.225	0.630*	0.437	0.906
Spain	1.198	0.474	3.027	0.522***	0.382	0.713	1.259	0.908	1.744
Sweden	1	Reference country		1.224	0.930	1.610	1.452*	1.073	1.965
Switzerland	1.245	0.528	2.934	0.595***	0.453	0.781	1.114	0.827	1.501
Thailand	1.037	0.433	2.484	0.789	0.596	1.046	1.454*	1.086	1.947
Türkiye	0.468	0.152	1.436	0.554***	0.404	0.760	1.389*	1.021	1.890
United Kingdom	0.928	0.364	2.370	0.324***	0.226	0.465	1.081	0.765	1.526
United States	0.626	0.237	1.654	0.292***	0.208	0.409	1.149	0.839	1.574
Uzbekistan[x]	-			-			-		

*Note: ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001. [x]: Excluded from the estimations.*
Reference country is the country closest to the dataset averages (weighted).

Regarding the likelihood of cycling while thinking one might have had too much to drink (Table 5 and Table 6), women (p<0.01) and people above 54 years (p<0.001) are less prone to declare to do so, but education does not seem to make any significant difference. The more the participants cycle, the more likely they are to declare engagement in the behaviour (p<0.001). Cyclists regularly using rural

roads without bicycle lanes, are more likely to ride when they have had too much to drink ($p<0.001$). Although there are large differences between countries (Table 6), only few of them are significant, probably because the number of cyclists declaring to engage in this behaviour is relatively low (2.0% among all cyclists in the sample) and the numbers for each country therefore are small. In a few countries, no participants at all declare to have cycled while thinking they might have had too much to drink. Nevertheless, the Netherlands stand out with an odds ratio of 1.89 of cycling while thinking one might have had too much to drink, which is statistically significant ($p<0.05$). It means that the likelihood is almost double compared to the reference country (Sweden) controlling for frequency of cycling among other things. Conversely, in countries like Serbia and Colombia the likelihood of cycling while thinking one might have had too much to drink is very low ($p<0.05$).

Regarding cycling without a helmet (Table 5 and Table 6), women are more likely to wear a helmet than men ($p<0.05$), but the difference is small (the odds ratio is 0.89). High age ($p<0.01$) and high education ($p<0.001$) make helmet use more common. People cycling at least four days a week are less likely to wear a helmet ($p<0.001$) and people riding 1-3 days a week are more likely ($p<0.01$) than people riding only occasionally. Participants who frequently cycle on rural roads with cycle lanes seem more likely to wear a helmet ($p<0.001$) and participants who frequently cycle on urban roads without lanes are more likely to cycle without a helmet ($p<0.001$). This could indicate that longer trips increase the likelihood of wearing a helmet, but we cannot say for sure based on these data. There may also be a difference between the behaviour of people living and/or cycling in cities and in rural areas. The differences in helmet use between countries are large and significant. The Netherlands are on top as a non-helmet country; the likelihood of riding without a helmet is more than 4 times higher ($p<0.001$) than in the reference country (in this case Germany). Australia and the USA are on top as helmet using countries; the likelihood of riding without a helmet is many times lower than in the reference country ($p<0.001$). In Australia, this may well be an effect of helmet wearing being mandatory which is also the case in some parts of the USA.

Results show that self-declaring to listen to music through headphones while cycling (Table 5 and Table 6) is very much linked to the age of the cyclist. The youngest cyclists are far more likely to self-declare engagement in this behaviour than older cyclists ($p<0.001$). The chance that cyclists over 55 listen to music through headphones while cycling is 40% less compared to young cyclists (18-24). The results also indicate that male cyclists are more likely to self-declare listening to music while cycling than female cyclists ($p<0.05$), but the difference is not large. Education, frequency of cycling and infrastructure type does not play a role. Country wise, the results show that cyclists in Latin America listen to music while cycling much more often than cyclists in other countries. In Brazil, Chile, Colombia, Mexico, Panama and Peru the Odds ratio is equal to 2 or higher compared to the reference country, Belgium. All these differences are significant at 0.001 level. The other extremes are found in Japan ($p<0.001$) and Germany ($p<0.01$) where the odds ratios are around 0.5-0.6.

Table 7 MNL logit estimations for behaviour: Reading, drugs and red light crossing.

	Reading while riding (always or often)			Riding with drugs (always or often)			Crossing red light (always or often)		
	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper
Gender (male)									
Female	0.722***	0.623	0.838	0.733**	0.594	0.905	0.724***	0.636	0.823
Age Group (18-24 years)									
35-54 years	0.549***	0.469	0.642	1.089	0.872	1.361	0.852*	0.739	0.983
≥ 55 years	0.301***	0.237	0.382	0.697*	0.505	0.962	0.591***	0.492	0.710
Level of education (Secondary or lower)									
Bachelors' degree or similar	1.009	0.848	1.200	1.192	0.927	1.533	1.125	0.969	1.306
Masters' degree or similar	0.946	0.775	1.154	1.287	0.955	1.735	1.042	0.861	1.260
Frequency of cycling (a few days a month)									
1 to 3 days a week	1.251**	1.068	1.466	1.601***	1.294	1.981	1.167*	1.017	1.341
At least 4 days a week	1.215*	1.013	1.457	1.394**	1.087	1.787	1.355***	1.163	1.577
Infrastructure regularly used (seldom used)									
Rural roads, no lanes	1.340***	1.145	1.569	1.273*	1.016	1.595	1.138	0.986	1.313
Rural roads with lanes	0.965	0.828	1.123	1.200	0.972	1.483	0.874	0.762	1.002
Urban roads, no lanes	0.881	0.756	1.027	0.510***	0.395	0.659	1.158*	1.013	1.323
Urban roads with lanes	0.836*	0.715	0.978	0.806	0.638	1.017	0.883	0.767	1.016
N/Somers' D/Concordance	15,997	0.329	66.0%	15,997	0.438	71.2%	15,997	0.256	62.4%

*Note: Country dummies included, see Table 8 below. ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001*
Reference population: Cyclists at least a few days a month not including Armenia, Kyrgyzstan and Uzbekistan.

Table 8 MNL logit estimations for behaviour: Reading, drugs and red light crossing.

Country	Reading while riding (always or often)			Riding with drugs (always or often)			Crossing red light (always or often)		
	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper
Armenia[x]	-			-			-		
Australia	0.587*	0.375	0.917	1.097	0.616	1.954	0.543*	0.337	0.874
Austria	0.737	0.513	1.058	0.902	0.523	1.555	1.136	0.803	1.607
Belgium	1.002	0.713	1.408	1.258	0.770	2.056	1.136	0.802	1.608
Bosnia	1.351	0.919	1.987	0.604	0.267	1.366	1.103	0.720	1.688
Brazil	1.093	0.754	1.584	0.775	0.423	1.420	1.549*	1.072	2.236
Canada	0.858	0.580	1.267	2.133**	1.284	3.544	1.150	0.783	1.689
Chile	1.173	0.796	1.728	0.740	0.383	1.431	1.445	0.979	2.131
Colombia	1.234	0.854	1.784	1.154	0.652	2.044	1.863***	1.299	2.674
Czech	0.706	0.456	1.095	0.718	0.355	1.454	1	Reference country	
Denmark	1.376	0.963	1.965	1.233	0.707	2.150	1.591*	1.106	2.289
Finland	1.229	0.856	1.765	0.455*	0.219	0.944	1.515*	1.054	2.176
France	0.759	0.501	1.149	1.329	0.746	2.369	0.898	0.594	1.358
Germany	0.773	0.510	1.170	0.527	0.254	1.094	1.002	0.667	1.506
Greece	0.833	0.528	1.313	0.681	0.311	1.491	0.880	0.563	1.377
Ireland	0.626	0.380	1.033	1.680	0.918	3.075	1.130	0.726	1.759
Israel	1.617	0.936	2.794	1.292	0.547	3.052	0.801	0.432	1.487
Italy	1	Reference country		0.772	0.425	1.401	0.993	0.676	1.458
Japan	0.556*	0.344	0.899	0.356*	0.151	0.839	1.533*	1.037	2.265
Kazakhstan	1.087	0.702	1.684	1.736	0.913	3.299	0.594*	0.356	0.991
Kyrgyzstan[x]	-			-			-		
Latvia	0.813	0.528	1.251	0.460	0.196	1.077	1.096	0.733	1.640
Luxembourg	0.590	0.305	1.143	0.279	0.066	1.183	1.582	0.957	2.614
Mexico	1.267	0.864	1.858	2.010**	1.190	3.395	2.053***	1.413	2.981
Netherlands	1.047	0.739	1.484	1.880*	1.163	3.039	1.790***	1.271	2.519
Panama	1.414	0.961	2.080	0.756	0.385	1.482	1.188	0.742	1.901
Peru	1.526*	1.061	2.194	1.484	0.869	2.533	1.797**	1.234	2.616
Poland	1.126	0.787	1.612	0.373	0.177	0.787	0.615*	0.411	0.921
Portugal	0.754	0.462	1.231	1.198	0.619	2.318	1.388	0.903	2.135
Serbia	1.125	0.767	1.651	0.736	0.368	1.471	0.682	0.451	1.033
Slovenia	0.793	0.524	1.201	0.969	0.518	1.812	1.054	0.712	1.559
Spain	0.833	0.546	1.269	1.271	0.715	2.258	1.493*	1.008	2.210
Sweden	1.111	0.754	1.638	0.633	0.314	1.273	1.366	0.931	2.005
Switzerland	0.913	0.627	1.330	1	Reference country		1.050	0.718	1.537
Thailand	1.140	0.779	1.668	3.644***	2.272	5.844	1.674**	1.152	2.431
Türkiye	0.624*	0.405	0.963	0.534	0.259	1.100	1.052	0.703	1.573
United Kingdom	0.587*	0.372	0.925	1.452	0.829	2.543	0.539*	0.332	0.876
United States	0.619*	0.405	0.946	1.621	0.964	2.725	0.816	0.536	1.244
Uzbekistan[x]	-			-			-		

*Note: ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001. [x]: Excluded from the estimations.*
Reference country is the country closest to the dataset averages (weighted).

In Table 7 and Table 8 the results from the estimation for the three last self-declared behaviours (reading a message or check social media/news while cycling, cycling within 1 hour after taking drugs (other than prescribed or over the counter medication), and crossing the road when a traffic light is

red), are shown. Like the results presented above the table is split in two parts, the last containing results for the individual country dummies. Again, the reference country is chosen as the European country closest to the dataset average behaviour (weighted).

Table 7 and Table 8 shows that gender and age mean a lot for the likelihood of reading messages or checking social media/news while cycling ($p<0.001$). Women self-declare less engagement in the behaviour than men do (odds ratio 0.72) and the older the cyclist is, the less likely the cyclist is to self-declare engagement in the behaviour. The level of education, on the contrary, does not influence the likelihood. The more often the cyclist cycle, the higher is the probability of reading messages or checking social media/news while cycling ($p<0.05$). The results for infrastructure type are mixed. It seems that people riding regularly on rural roads without lanes are more likely to engage in this behaviour ($p<0.001$) than those who seldom use this infrastructure. The differences between countries are small. Only for a few countries, significant deviations ($p<0.05$) are found: In Peru self-declared reading messages or checking social media/news while cycling is more frequent with an odds ratio of 1.5 compared to the reference country (Italy). Australia, Japan, Türkiye, UK and the USA are low with odds ratios around 0.6.

Self-declared cycling within 1 hour after taking drugs (other than prescribed or over the counter medication) is quite rare (Table 7 and Table 8). The pattern for gender and age resembles the one for alcohol, but less pronounced. The odds ratio for women is 0.73 ($p<0.01$), but age is only significant for the oldest group (55 years and above, $p<0.05$). This age group is less likely to self-declare cycling within 1 hour after taking drugs than the young are. Again, the level of education has no significant impact, but frequent cycling increases the likelihood of self-declared engagement in the behaviour ($p<0.01$). Apparently, cyclists who regularly use urban roads with no lanes are less likely to go cycling within 1 hour after taking drugs than cyclist using other types of infrastructure frequently (odds ratio 0.51, $p<0.001$). Country wise, only few significant differences are found. Canada, Mexico and Thailand are high in self-declared engagement in the behaviour with odds ratios above 2 ($p<0.01$), whereas Finland and Japan are low ($p<0.05$). The reference country is here Switzerland.

Regarding crossing a street when the light is red (Table 7 and Table 8), women and the older cyclists are less likely to self-declare engagement in this behaviour ($p<0.001$). The level of education has no significant effect. The more often participants cycle, the more likely the cyclist is to self-declare engagement in the behaviour. Whether it is rural or urban, with or without lanes does not seem to matter much. With respect to country, there are some differences. Self-declared crossing when the light is red is more common in Brazil, Colombia, Denmark, Finland, Japan, Mexico, Netherlands, Peru and Thailand where the odds ratios lie between 1.5 and 2.0 ($p<0.05$). In Australia, Kazakhstan, Poland and UK cyclists are less likely to cross while the light is red than the average with odds ratios around 0.6 ($p<0.05$).

To sum up on the six questions on self-declared engagement in risky behaviours, it is very clear that female and older cyclists self-declare more cautious behaviours and more often self-declare following the rules when cycling than other cyclists are. In general, education plays no role, but we see that higher education leads to more self-declared helmet wearing. Cyclists riding often declare to be involved in risky behaviour more frequent than occasional cyclists are, but that could just be because these respondents have more opportunities to act risky. The results regarding frequent use of different infrastructure are mixed. There is maybe a weak tendency that cyclists who frequently cycle on roads with no cycle lanes self-declare more engagement in risky behaviours than other cyclists do. Country wise, the pattern is also scattered, but in several cases participants from The Netherlands, Scandinavian countries, Latin American countries and Thailand stand out as self-declaring more engagement in risky behaviours compared to other countries.

Table 9 MNL logit estimations for behaviour: e-biking among cyclists.

	e-biking frequently (one or more days a week)		
	Odds Ratio	CI 95% lower	CI 95% upper
Gender (male)			
Female	0.986	0.875	1.111
Age Group (18-24 years)			
35-54 years	0.707***	0.619	0.808
≥ 55 years	0.539***	0.456	0.639
Level of education (Secondary or lower)			
Bachelors' degree or similar	1.129	0.976	1.306
Masters' degree or similar	1.600***	1.356	1.888
Infrastructure regularly used (seldom used)			
Rural roads, no lanes	1.379***	1.209	1.573
Rural roads with lanes	1.459***	1.287	1.654
Urban roads, no lanes	0.662***	0.583	0.751
Urban roads with lanes	1.370***	1.190	1.576
N/Somers'D/Concordance	15,997	0.427	71.1%

*Note: Country dummies included, see Table 10 below. ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001.*
Reference population: Cyclists at least a few days a month not including Armenia, Kyrgyzstan and Uzbekistan.

Table 10 MNL logit estimations for behaviour: e-biking among cyclists.

	e-biking frequently (one or more days a week)		
	Odds Ratio	CI 95% lower	CI 95% upper
Country			
Armenia[x]	-		
Australia	1.434*	1.057	1.945
Austria	0.630**	0.473	0.839
Belgium	1.479**	1.138	1.924
Bosnia	0.285***	0.173	0.470
Brazil	0.467***	0.333	0.655
Canada	0.780	0.567	1.074
Chile	0.400***	0.274	0.583
Colombia	0.433***	0.309	0.607
Czech	0.298***	0.197	0.451
Denmark	1	Reference country	
Finland	0.331***	0.229	0.477
France	1.305	0.961	1.772
Germany	1.135	0.834	1.545
Greece	0.362***	0.227	0.576
Ireland	0.734	0.499	1.080
Israel	1.067	0.656	1.736
Italy	1.244	0.930	1.663
Japan	0.734	0.515	1.046
Kazakhstan	0.402***	0.249	0.648
Kyrgyzstan[x]	-		
Latvia	0.110***	0.060	0.204
Luxembourg	0.870	0.543	1.395
Mexico	0.559**	0.395	0.791
Netherlands	2.382***	1.829	3.103
Panama	0.474***	0.323	0.696
Peru	0.684*	0.492	0.950
Poland	0.141***	0.090	0.221
Portugal	0.502**	0.329	0.765
Serbia	0.173***	0.105	0.285
Slovenia	0.384***	0.263	0.562
Spain	0.662*	0.467	0.939
Sweden	0.785	0.566	1.088
Switzerland	1.327	0.995	1.769
Thailand	1.103	0.811	1.499
Türkiye	1.500**	1.104	2.039
United Kingdom	1.797***	1.315	2.456
United States	2.118***	1.583	2.833
Uzbekistan[x]	-		

*Note: ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001. [X]: Excluded from the estimations.*
Reference country is the country closest to the dataset averages (weighted).

The last analysis in this section concerns the factors that predict the use of an e-bike among the cyclists in the sample (Table 9 and Table 10). The dependent variable is a dummy for all cyclists who declare to ride an e-bike at least once a week. The explanatory variables are the same as for the other behavioural estimations except that the frequency of cycling is left out – it is too correlated with the

dependent variable. The results are found in Table 9 and Table 10. From the tables it is clear, that e-biking is associated with low age as the odds ratio for cyclists over 55 is 0.54 ($p<0.001$), but gender has no significant effect. Cyclist with a master's degree or the like are more likely to use an e-bike (odds ratio 1.6) than others ($p<0.001$). Cyclists riding frequently in rural areas or on city roads with lanes are more likely to use an e-bike (odds ratio around 1.4, $p<0.001$), whereas cyclists using urban roads without lanes are less likely to use an e-bike (odds ratio 0.66, $p<0.001$). There are clear national differences in the use of e-bikes. Part of the pattern resembles the one in Table 3 showing e-bike use in the whole sample (not just among cyclists). In The Netherlands and the USA e-biking among cyclists is very frequent compared to the reference country (Denmark) with odds ratios above 2.0 ($p<0.001$). In the low end of e-bike use among cyclists we find countries like Poland and Serbia with odds ratios below 0.2 ($p<0.001$).

3.2.2 Predictors of support to policy measures for cyclists

In this section, we present results for all respondents' support to different legal obligations for cyclists. In the ESRA3 questionnaire participants are asked to indicate if they support or oppose several different legal obligations in traffic such as different speed limits, blood alcohol limits, and helmet use (see Q20 in Appendix 1). Three questions relate to legal obligations for cyclists: 1) Requiring all cyclists to wear a helmet, 2) Requiring cyclists under the age of 12 to wear a helmet, 3) Forbidding all cyclists to ride with a blood alcohol concentration above 0.00‰ (zero tolerance). The answering scale ranged from 1 (oppose) to 5 (support). In this section, we analyse support to the three legal obligations using gender, age, level of education and country dummies as explanatory variables.

The dependent variables (support) are transformed from five categories to dichotomous variables in this way: Answering scale 5 - 4 = "support" and answering scale 1 - 3 = "non-support". The estimations are carried out using the full sample in the survey (n=35,725), not just cyclists as in the previous section. Exceptions are Armenia, Kyrgyzstan and Uzbekistan - again they are left out due to incomparable data collection methods.

The analyses were carried out as MNL logit estimations using ESRA weights with the SAS procedure "Surveylogistic". In Table 11 and Table 12 the results from the estimation for 1) mandatory helmet use for all cyclists, 2) mandatory helmet use for all cyclists under the age of 12 and 3) zero tolerance for alcohol are shown. The table is split in two parts, the last containing results for the individual country dummies. The reference country chosen is the European country closest to the dataset average (weighted).

Table 11 MNL logit estimations of policy support: Mandatory helmet and zero alcohol tolerance.

	Support for mandatory helmet for all cyclists			Support for mandatory helmet for all cyclists under 12			Support for zero alcohol tolerance for all cyclists		
	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 5% upper	Odds Ratio	CI 95% lower	CI 5% upper
Gender (male)									
Female	1.548***	1.437	1.666	1.633***	1.493	1.785	1.513***	1.411	1.622
Age Group (18-24 years)									
35-54 years	1.361***	1.245	1.488	1.336***	1.207	1.480	1.346***	1.238	1.463
≥ 55 years	1.836***	1.665	1.025	2.155***	1.910	2.431	1.688***	1.540	1.851
Level of education (Secondary or lower)									
Bachelors' degree or similar	1.220***	1.118	1.332	1.021	0.919	1.134	1.011	0.931	1.097
Masters' degree or similar	1.150*	1.032	1.282	0.916	0.805	1.043	1.012	0.914	1.211
N/Somers'D/ Concordance	35,725	0.450	72.3%	35,725	0.369	67.6%	35,725	0.354	67.4%

*Note: Country dummies included, see Table 12 below. ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001.*
Reference population: all road users not including Armenia, Kyrgyzstan and Uzbekistan.

Table 12 MNL logit estimations of policy support: Mandatory helmet and zero alcohol tolerance.

	Support for mandatory helmet for all cyclists			Support for mandatory helmet for all cyclists u. 12			Support for zero alcohol tolerance for all cyclists		
Country	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper	Odds Ratio	CI 95% lower	CI 95% upper
Armenia[x]	-			-			-		
Australia	4.485***	3.466	5.804	1.946***	1.453	2.605	1.777***	1.460	2.164
Austria	0.712***	0.594	0.854	1.119	0.888	1.411	0.560***	0.477	0.656
Belgium	0.656***	0.547	0.787	0.949	0.755	1.193	0.691***	0.590	0.811
Bosnia	1	Reference country		1.273	0.954	1.699	1.223***	1.470	2.222
Brazil	2.121***	1.699	2.648	1.247	0.955	1.629	1.874***	1.537	2.286
Canada	1.420***	1.172	1.720	1.470*	1.149	1.882	1.033	0.874	1.221
Chile	4.728***	3.628	6.163	3.961***	2.776	5.651	2.947***	2.377	3.654
Colombia	4.708***	3.598	6.159	3.237***	2.285	4.585	2.709***	2.184	3.359
Czech	0.706***	0.578	0.864	1.498**	1.140	1.970	0.745**	0.621	0.893
Denmark	0.509***	0.414	0.625	0.656***	0.511	0.841	0.317***	0.262	0.384
Finland	0.545***	0.447	0.665	1.055	0.815	1.366	0.245***	0.203	0.296
France	1.479***	1.196	1.828	1.291	0.988	1.686	1.347**	1.114	1.628
Germany	0.690***	0.560	0.852	1	Reference country		0.883	0.729	1.070
Greece	1.812***	1.459	2.251	1.341*	1.023	1.757	1.068	0.888	1.285
Ireland	2.141***	1.712	2.677	1.920***	1.433	2.574	1.358**	1.121	1.645
Israel	4.267***	3.326	5.474	1.957***	1.471	2.605	1.528***	1.265	1.846
Italy	1.192	0.971	1.464	0.968	0.752	1.246	1	Reference country	
Japan	0.456***	0.372	0.559	0.431***	0.339	0.547	1.579***	1.301	1.916
Kazakhstan	0.591***	0.480	0.728	0.708**	0.550	0.912	0.992	0.818	1.203
Kyrgyzstan[x]	-			-			-		
Latvia	0.442***	0.360	0.541	1.155	0.885	1.507	0.714***	0.594	0.856
Luxembourg	1.280	0.992	1.651	1.580**	1.121	2.229	0.838	0.669	1.050
Mexico	3.955***	3.071	5.095	2.808***	2.038	3.869	1.845***	1.509	2.256
Netherlands	0.140***	0.112	0.175	0.192***	0.152	0.243	0.347***	0.288	0.419
Panama	5.191***	3.927	6.864	3.238***	2.149	4.879	2.039***	1.632	2.548
Peru	4.267***	3.296	5.523	2.597***	1.878	3.592	2.528***	2.040	3.133
Poland	0.486***	0.397	0.595	0.785	0.611	1.008	1.067	0.885	1.285
Portugal	2.647***	2.115	3.314	1.959***	1.474	2.605	1.227*	1.022	1.473
Serbia	0.639***	0.523	0.780	0.936	0.726	1.206	2.195***	1.800	2.676
Slovenia	0.666***	0.543	0.816	2.035***	1.510	2.741	0.907	0.755	1.090
Spain	3.114***	2.448	3.960	1.901***	1.418	2.549	1.934***	1.585	2.361
Sweden	0.525***	0.429	0.644	1.921***	1.432	2.576	0.473***	0.394	0.569
Switzerland	0.980	0.800	1.202	0.929	0.721	1.197	0.691***	0.577	0.828
Thailand	1.659***	1.327	2.075	0.561***	0.436	0.720	1.048	0.860	1.278
Türkiye	1.698***	1.364	2.116	1.276	0.962	1.692	1.358**	1.109	1.661
United Kingdom	1.770***	1.424	2.198	1.103	0.849	1.433	1.530***	1.263	1.854
United States	1.610***	1.297	1.998	0.961	0.741	1.245	1.314**	1.084	1.593
Uzbekistan[x]	-			-			-		

*Note: ESRA weights used. * p<0.05, ** p<0.01, ***p< 0.001. [x]: Excluded from the estimations.*
Reference country is the country closest to the dataset averages (weighted).

Table 11 shows, that the pattern regarding gender and age is very much the same for the three policies. Women are more in favour of these safety measures than men are (odds ratio around 1.5), and the older you get the more support (odds ratio for people over 55 between 1.7 and 2.2 compared to young people). These differences are highly statistically significant (p<0.001). With respect to education level, the pattern is more blurred, but the results indicate that higher education makes people more supportive

regarding mandatory helmet for all cyclist, whereas the support for children under 12 and banning alcohol is about the same for all education levels.

There are large differences between the countries as is shown in Table 12. There is much stronger support for mandatory helmet use for all cyclists in Latin America and in countries like Australia, Israel, Portugal and Spain ($p<0.001$ for all these countries). The support here is up to five times stronger than in the reference country (Bosnia and Herzegovina). This is probably because cycling in these countries is considered dangerous (see Figure 3), but in Australia it is more likely connected to the fact that helmet use is already mandatory. In other countries, mainly in Northern and Eastern Europe, the support is quite low, often half as strong as in the reference country. The Netherlands stands out with an extremely low support with and odds ratio of 0.14 ($p<0.001$). This is also the country with the lowest share of helmet use.

When it comes to mandatory helmet use for children under the age of 12, there are also large differences across the countries. In most countries there is strong support, but again many Latin American countries like Chile, Colombia, Mexico, Panama and Peru appear as the most supportive (odds ratio above 2.6 compared to the reference country Germany, $p<0.001$), and the Netherlands as the least supportive (odds ratio 0.2, $p<0.001$).

There are countries like The Czech Republic, Slovenia and Sweden that seem to care relatively more for the children's safety in the sense that they score low with respect to support for mandatory helmet use for all cyclists, but high for children under the age of 12. Thailand is exceptional with respect to this – here the relation is the opposite.

The support for forbidding all cyclists to drive under the influence of alcohol also varies a lot across countries. As for helmet use, there is a strong support for a ban in the Latin American countries (odds ratio 1.85 or higher compared to the reference country Italy, $p<0.001$) whereas the Scandinavian and The Netherlands countries are more sceptical with odds ratios below 0.5 ($p<0.001$).

To sum up on the policy support analyses, we find very much the same pattern as for the behaviour: Women and older people are more in favour of safety measures for cyclists, whereas educational level only plays a part in the case of helmet wearing. The Latin American countries stand out as having risky behaviour, but also have a strong support for policy measures improving traffic safety. In The Netherlands we see both risky behaviour and low support for safety measures.

3.3 Limitations of the data

In relation to the results presented in this report a few limitations should be mentioned. First, one should be aware that self-report data are vulnerable to several biases (Choi & Pak, 2005). One possible bias which is relevant in this context is the desirability bias. The desirability bias regards the possible tendency of respondents to provide a favourable image of themselves through their answers such as over-reporting behaviours good behaviours and under-reporting bad or undesirable behaviours. Although self-reports have been found to be a valuable and reliable tool in traffic research (Lajunen & Summala, 2003), a possible challenge in the context of ESRA3 results could be, that there might be differences between countries regarding the extent to which people are inclined to answer according to what they think is desirable. Further, in almost all countries ESRA3 data was derived from an online survey amongst a representative sample of the national adult population. One advantage of the online approach is that such data is less prone to social desirability (Holbrook & Krosnick, 2010; Meesmann & Wardenier, 2023). However, in Armenia, Kyrgyzstan, and Uzbekistan no online panels were available. Therefore, respondents were recruited on the street of different capital areas spread over the country (fact to face recruitment) and invited to participate in a Computer Assisted Personal Interview (CAPI). The results of these three countries were not included in regional means because of this different methodology. A second possible bias is the sampling bias as the data collection relied on voluntary participation (Cheung et al., 2017). However, the effect is expected to be limited due to the representativeness of the sample. Nevertheless, it is possible that some behaviours and motivations are underrepresented. Additionally, the results could be influenced by participants misunderstanding some of questions (e.g. questions with difficult words, long questions); or recall error leading to unintentional faulty answers due to memory errors. For further considerations regarding possible limitations regarding the ESRA3 data please see the ESRA3 methodology report (Meesmann & Wardenier, 2023).

4 Summary and discussion

In the introduction we stated 5 research questions. In the following we summarize the main results related to these questions.

How do regions and countries differ in the use of c-bikes and e-bikes?

- Cycling is common in most of the ESRA3 participating countries. Between 42% and 50% of the respondents in the three ESRA3 regions declare having used a c-bike or an e-bike at least a few times a month. The numbers are 48.4% in Europe22, 42.1% in AsiaOcenania6 and 49.6% in America8. The country with the most frequent use is The Netherlands where 82% declares to use a bike at least a few times a month and Denmark is number two with 60%. The Netherlands and Denmark are high-income countries, and thus low income is not the main factor behind cycling. Things like available infrastructure and hilliness are also important factors.
- On average, close to 25% of the respondents in all three regions declare to use a c-bike at least once a week, whereas 40% to 50% state never to use a c-bike. At the national level, the differences are larger. The countries where more than 70% of the participants declare to have never used a c-bike are Armenia, Kyrgyzstan, Uzbekistan and Israel, but it should be kept in mind that in the first three of these countries the data collection method was different which may have influenced participation and make comparison across countries less valid. In Brazil, Finland, The Netherlands and Poland, on the other hand, we find percentages below 30% of participants indicating to have never used a c-bike.
- E-bikes are still less used than c-bikes. They are most widespread in The Netherlands and the USA. In the regions, between 10% and 14% of the participants declare to have used an e-bike at least once a week. The numbers are 14.0% in Europe22, 10.4% in America8 and 11.7% in AsiaOceania6, and this is around half compared to c-bikes. Generally, The Netherlands is the leading country regarding e-bike use with 16% having used an e-bike at least four days a week and with more than 50% having used it at least a few days in the past 12 months. Other countries with a relative high level of e-bike use include Belgium, Germany, Switzerland, Thailand and the USA. In these countries, 6% to 7% are using an e-bike at least four days a week

How do regions and countries differ in the use and evaluation of different infrastructure?

- More cyclists declare having regularly used roads with cycle lanes than roads without, and more cyclists report having regularly used urban than rural roads. This may both reflect the availability of cycle lanes, and cyclists' preference for infrastructure with cycle lanes, choosing such roads when possible. The share of people living in cities of course also plays an important role.
- A large percentage of cyclists consider roads without a cycle lane to be less safe than roads with a cycle lane, but there is no clear pattern when it comes to evaluating the safety of rural versus urban roads. The poorest ratings of the infrastructure are found in America8 and Asia Oceania6. Here, 7% to 26% of the cyclists rate the infrastructure as "very unsafe". In Europe22 it is 4% to 16%. Latin America and the Southeast of Europe have the poorest ratings of the infrastructure in terms of safety, and here urban roads are often rated as less safe than rural. In The Netherlands and the USA, very few rate the roads as very unsafe. Here and in Northern Europe, rural roads without cycle lanes are rated less safe than urban roads without cycle lanes.

How do regions and countries differ in self-declared behaviour and attitude towards safety-critical behaviours and related policy measures?

- There is no clear regional pattern with respect to self-declared unsafe behaviour. Cyclists in America8 seem to act more safely with respect to helmet use but are more involved in listening to music while cycling. Cyclists in Europe22 take less often drugs before cycling and more often respect red traffic lights, but more often ride with too much alcohol in the blood.

What is the association between sociodemographic characteristics, self-declared behaviour and attitude towards safety-critical behaviours?

- Women are in general more safety-minded than men are. This is the case with respect to both behaviour, attitudes and policy support. The pattern is very clear for cycling with alcohol, reading messages while riding, riding with drugs and crossing red light, but less pronounced when it comes to own helmet use and listening to music. In general, there are clear and significant gender differences in Europe22 and America8, but this is less pronounced and often insignificant in AsiaOceania6.
- Attitudes and actual behaviour seem to be closely linked. The same groups that have low acceptance of unsafe behaviour are also the groups which declare to act more safely as they more seldom ride with alcohol in the blood or without a helmet.
- Older cyclists seem to be more safety-minded when it comes to their self-declared behaviour, their acceptance of unsafe behaviour and their support for safety measures.
- In general, the education level does not have much effect on behaviour or policy support with helmet use as an exception. Higher education leads to more helmet use and more support for mandatory helmet use for all cyclists.
- Women and older persons cycle less than others do, maybe partly because they are more cautious, but in many countries' car ownership increases with age and income. Since men in general have higher income than women and car ownership is known to squeeze out cycling, this may also be a reason. Another reason could be that women in general have less mobility than men.
- The Latin American countries stand out as having risky cycling behaviour, but also the poorest ratings of the infrastructure safety and a strong support for policy measures improving cycling safety.

Which explanatory variables are associated with the use of an e-bike, self-declared behaviour and attitude towards safety-critical behaviours and policy measures?

- E-biking is associated with low age, but there is no gender effect. Further, frequent cycling on roads (rural or urban) with cycle lanes is also associated with increased likelihood of using an e-bike.
- Country wise, some of the differences in behaviour and attitude can be explained by age, education level and infrastructure, but there is still a geographical pattern left. In Northern Europe and Thailand, the attitudes towards risky behaviour are more liberal, and here we find the countries where cyclists most often ride under the influence of alcohol/drugs or without a helmet. This is the case for The Netherlands in particular. In Australia, where helmet use is already mandatory, we see a very strong support for this measure.
- The three ESRA regions are very inhomogeneous. For instance, within America8 there are clear differences between the behaviour in the Latin American countries and in the North American countries, and AsiaOceania6 include both high-income countries like Japan and Australia and several low-income countries spread over that part of the world. This is probably one of the reasons that the averages of the three regions for many variables are often close even though there is much variation across the countries within the regions.

Discussion

As stated above, cycling is common in most ESRA3 participating countries, but particularly in high income countries like Denmark and the Netherlands. This could indicate that low income and a related lack of car accessibility is not the main reason for cycling at the general level. Results also indicate that roads with cycle lanes are perceived as safer as roads without cycle lanes. In addition, a larger share of the cyclists participating in ESRA3 declare to use infrastructure with cycle lanes more frequently than infrastructure without cycle lanes. This is in line with previous results on the impact and perception of cycling infrastructure (e.g. Hull & O'Hollean, 2014).

Like previous studies and other modes of transport our results show that women are more concerned with safety than men (e.g. Prati et al., 2019; Greystone et al., 2022) which may contribute to women cycling less than men, particularly in areas with poorer infrastructure (Pucher et al., 2011).

The initial aim of ESRA was to develop a system for gathering reliable and comparable information about people's attitudes towards road safety in several European countries. This objective has been achieved and the initial expectations have even been exceeded. ESRA has become a global initiative which already conducted surveys in more than 60 countries across six continents. The outputs of the ESRA project have become building blocks of national and international road safety monitoring systems.

The ESRA project has also demonstrated the feasibility and the added value of joint data collection on road safety attitudes and performance by partner organizations in a large number of countries. The intention is to repeat this survey every three to four years, retaining a core set of questions in every wave allowing the development of time series of road safety performance indicators.

Lists of tables and figures

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Appendix 1: ESRA3 Questionnaire

Introduction

In this questionnaire, we ask you some questions about your experience with, and your attitudes towards traffic and road safety. When responding to a question, please answer in relation to the traffic and road safety situation in [COUNTRY]. There are no right or wrong answers; what matters is your own experience and perception.

Socio-demographic information

Q1) **In which country do you live? _____**

Q2) **Are you ...** male – female - other

Q3) **How old are you (in years)?** [Drop down menu]

Q4_1) **Are you currently a student?** yes - no

Q4_2) **What is the highest qualification or educational certificate which you want to achieve?** primary education - secondary education - bachelor's degree or similar - master's degree or higher

Q4_3) **What is the highest qualification or educational certificate that you have obtained?** none - primary education - secondary education - bachelor's degree or similar - master's degree or higher

Q5) **Which of the descriptions comes closest to how you feel about your household's income nowadays?** living comfortably on present income - coping on present income - finding it difficult on present income - finding it very difficult on present income

Q6a) **Is the car you regularly drive equipped with seatbelts in the front seat?** yes – no
Only asked to LMIC countries.

Q6b) **Is the car you regularly drive equipped with seatbelts in the back seat?** yes - no
Only asked to LMIC countries.

Q7) **Are you using a carsharing organization (e.g., poppy or cambio[4])?** yes – no
Only asked to HIC/UMIC countries.

Q8) **Do you have to drive or ride a vehicle during your main professional activity?** yes, I transport mainly other person(s) (e.g., taxi, bus, rickshaw, …) - yes, I transport mainly goods (e.g., truck, courier, food delivery,…) - yes, I transport mainly myself (e.g., visiting patients, salesperson,…) - no, I drive or ride a vehicle only for commuting or private reasons

Q9) **Which phrase best describes the area where you live?** a farm or home in the countryside - a country village - a town or a small city - the suburbs or outskirts of a big city - a big city

Q10) **In which region do you live?** [List of regions per country]

Q11a) **How far do you live from the nearest stop of public transport?** less than 500 metres - between 500 metres and 1 kilometre - more than 1 kilometre

Q11b) **What is the frequency of your nearest public transport?** at least 3 times per hour - 1 or 2 times per hour - less than 1 time per hour

Mobility & exposure

[4] *The examples in brackets were adapted to national context.*

Q12) **During the past 12 months, how often did you use each of the following transport modes in [country]? How often did you ...?** at least 4 days a week - 1 to 3 days a week - a few days a month - a few days a year - never

Items_(random order): take the train - take the bus or minibus - take the tram/streetcar - take the subway, underground, metro - take a plane - take a ship/boat or ferry - be a passenger on non-motorized individual public transport mode (e.g., bike taxi, animal carriages,…) - be a passenger on motorized individual public transport mode (e.g., car-taxi, moto-taxi, tuk-tuk, auto rickshaw, songthaew,…) - walk or run minimum 200m down the street - cycle (non-electric) - cycle on an electric bicycle / e-bike / pedelec - drive a moped (≤ 50 cc or ≤ 4 kW) - drive a motorcycle (> 50 cc or > 4kW) - ride an e-scooter (electric-kick style scooter) - drive a car (non-electric or non-hybrid) - drive a hybrid or electric car - be a passenger in a car - be a passenger on a moped or motorcycle - use another transport mode

Q13) **Over the last 30 days, have you transported a child (<18 years of age) in a car?** yes - no

Items (random order): under 150cm - above 150cm[5]

Self-declared safe and unsafe behaviour in traffic

Q14_1a) **Over the last 30 days, how often did you as a CAR DRIVER ...?** You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable for most items: at least once (2-5) - never (1); only exception: items on protective systems: always wear/transport (1) – not always wear/transport (2-5)

Items (random order):

- drive when you may have been over the legal limit for drinking and driving
- drive after drinking alcohol
- drive within 1 hour after taking drugs (other than prescribed or over the counter medication)
- drive within 2 hours after taking medication that may affect your driving ability
- drive faster than the speed limit inside built-up areas
- drive faster than the speed limit outside built-up areas (except motorways/freeways)
- drive too fast for the road/traffic conditions at the time (e.g., poor visibility, dense traffic, presence of vulnerable road users)
- drive faster than the speed limit on motorways/freeways
- drive without wearing your seatbelt
- transport children under 150cm[6] without using child restraint systems (e.g., child safety seat, cushion)
- transport children above 150cm[7] without wearing their seat belt
- talk on a hand-held mobile phone while driving
- talk on a hands-free mobile phone while driving
- read a message or check social media/news while driving
- drive when you were so sleepy that you had trouble keeping your eyes open

Q14_1b_1) **You said that you have driven a car when you may have been over the legal limit for drinking and driving. Was this ...?** **You can indicate multiple answers:** in the week during daytime - in the week during night-time - in the weekend during daytime - in the weekend during night-time - on motorways - on urban roads - on rural roads

Only asked to HIC/UMIC countries.

Q14_1b_2) **You said that you have driven a car within 1 hour after taking drugs (other than prescribed or over the counter medication). Was this ...?** **You can indicate multiple answers:** cannabis - cocaine - amphetamines (e.g., speed, extasy) - illicit opiates (e.g., morphine, codeine; not prescribed as medication) - other

Q14_1b_3) **You said that you have driven a car within 2 hours after taking medication that may affect your driving ability. Was this ...?** **You can indicate multiple answers[8]:** antihistamines and/or cough medicines (such as Claritin, Allegra, Benadryl) - antidepressants (such as Prozac, Zoloft, Wellbutrin) - prescription pain medicines (such as Tylenol with codeine, OxyContin, Percocet, Vicodin/ hydrocodone) - muscle relaxants (such as Soma, Flexeril) - sleep aids, Barbiturates, or Benzodiazapines

[5] *This question was adapted to national legal regulation.*
[6] *This question was adapted to national legal regulation.*
[7] *This question was adapted to national legal regulation.*
[8] *The examples in brackets were adapted to national context.*

(such as Ambien, Lunesta, phenobarbital, Xanax, Valium, Ativan) - amphetamines (such as Adderall, Dexedrine, phentermine) - other

Q14_2) **Over the last 30 days, how often did you as a CAR PASSENGER …? You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.**

Binary variable for most items: always wear/transport (1) – not always wear/transport (2-5)
Items (random order):

- travel without wearing your seatbelt in the back seat
- travel without wearing your seatbelt in the front seat

Q14_3) **Over the last 30 days, how often did you as a MOPED RIDER or MOTORCYCLIST …?** You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable for most items: at least once (2-5) - never (1); only exception: items on protective systems: always wear/transport (1) – not always wear/transport (2-5)
Items (random order):

- ride when you may have been over the legal limit for drinking and driving
- ride faster than the speed limit outside built-up areas (except motorways/freeways)
- not wear a helmet on a moped or motorcycle
- read a message or check social media/news while riding
- ride within 1 hour after taking drugs (other than prescribed or over the counter medication)
- ride too fast for the road/traffic conditions at the time (e.g., poor visibility, dense traffic, presence of vulnerable road users) - Only asked to LMIC countries.
- ride a motorcycle with more than 1 passenger

Q14_4) **Over the last 30 days, how often did you as a CYCLIST …?** You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable for most items: at least once (2-5) - never (1); only exception: items on protective systems: always wear/transport (1) – not always wear/transport (2-5)
Items (random order):

- cycle when you think you may have had too much to drink
- cycle without a helmet
- cycle while listening to music through headphones
- read a message or check social media/news while cycling
- cycle within 1 hour after taking drugs (other than prescribed or over the counter medication)
- cross the road when a traffic light is red

Q14_5) **Over the last 30 days, how often did you as a PEDESTRIAN …?** You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable for most items: at least once (2-5) - never (1); only exception: items on protective systems: always wear/transport (1) – not always wear/transport (2-5)
Items (random order):

- listen to music through headphones while walking down the street
- walk down the street when you think you may have had too much to drink
- read a message or check social media/news while walking down the street
- text a message while walking down the street
- cross the road when a pedestrian light is red
- cross the road at places other than at a nearby (distance less than 30m[9]) pedestrian crossing

Q14_6) **Over the last 30 days, how often did you as RIDER OF AN E-SCOOTER (electric-kick style scooter) …?** You can indicate your answer on a scale from 1 to 5, where 1 is "never" and 5 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable for most items: at least once (2-5) - never (1); only exception: items on protective systems: always wear/transport (1) – not always wear/transport (2-5)
Only asked to HIC/UMIC countries.

[9] *This question was adapted to national legal regulation.*

Items (random order):

- ride with more than 1 person on board
- ride when you think you may have had too much to drink
- cross the road when a traffic light is red
- ride on pedestrian pavement/sidewalk
- ride without a helmet

Acceptability of safe and unsafe traffic behaviour

Q15) **Where you live, how acceptable would most other people say it is for a CAR DRIVER to ….?** You can indicate your answer on a scale from 1 to 5, where 1 is "unacceptable" and 5 is "acceptable". The numbers in between can be used to refine your response.

Binary variable: acceptable (4-5) – unacceptable/neutral (1-3)
Items (random order):

- drive when he/she may be over the legal limit for drinking and driving
- drive faster than the speed limit outside built-up areas (except motorways/freeways)
- drive without wearing the seatbelt
- talk on a hand-held mobile phone while driving
- read a message or check social media/news while driving

Q16_1) **How acceptable do you, personally, feel it is for a CAR DRIVER to …?** You can indicate your answer on a scale from 1 to 5, where 1 is "unacceptable" and 5 is "acceptable". The numbers in between can be used to refine your response.

Binary variable: acceptable (4-5) – unacceptable/neutral (1-3)
Items (random order; instructed response item (trick item) as last item):

- drive when he/she may be over the legal limit for drinking and driving
- drive within 1 hour after taking drugs (other than prescribed or over the counter medication)
- drive within 2 hours after taking a medication that may affect the driving ability
- drive faster than the speed limit inside built-up areas
- drive faster than the speed limit outside built-up areas (except motorways/freeways)
- drive too fast for the road/traffic conditions at the time (e.g., poor visibility, dense traffic, presence of vulnerable road users)
- drive faster than the speed limit on motorways/freeways
- drive without wearing the seatbelt
- transport children in the car without securing them (child's car seat, seatbelt, etc.)
- talk on a hand-held mobile phone while driving
- talk on a hands-free mobile phone while driving
- read a message or check social media/news while driving
- drive when he/she is so sleepy that he/she has trouble keeping their eyes open
- Please, select the answer option number 5 "acceptable". (Instructed response item (trick item))

Q16_2) **How acceptable do you, personally, feel it is for a MOPED RIDER or MOTORCYCLIST to …?** You can indicate your answer on a scale from 1 to 5, where 1 is "unacceptable" and 5 is "acceptable". The numbers in between can be used to refine your response.

Binary variable: acceptable (4-5) – unacceptable/neutral (1-3)
Items (random order):

- ride when he/she may have been over the legal limit for drinking and driving
- ride faster than the speed limit outside built-up areas (except motorways/freeways)
- not wear a helmet on a moped or motorcycle
- read a message or check social media/news while riding
- ride a motorcycle with more than 1 passenger - Only asked to LMIC countries.

Q16_3) **How acceptable do you, personally, feel it is for a CYCLIST to …?** You can indicate your answer on a scale from 1 to 5, where 1 is "unacceptable" and 5 is "acceptable". The numbers in between can be used to refine your response.

Binary variable: acceptable (4-5) – unacceptable/neutral (1-3)
Items (random order):

- cycle when he/she may have had too much to drink
- cycle without a helmet
- read a message or check social media/news while cycling
- cross the road when a traffic light is red

Q16_4) **How acceptable do you, personally, feel it is for a PEDESTRIAN to …?** You can indicate your answer on a scale from 1 to 5, where 1 is "unacceptable" and 5 is "acceptable". The numbers in between can be used to refine your response.

Binary variable: acceptable (4-5) – unacceptable/neutral (1-3)
Items (random order):

- walk down the street when he/she may have had too much to drink
- read a message or check social media/news while walking down the street
- cross the road when a pedestrian light is red

Attitudes towards safe and unsafe behaviour in traffic

Q17) **To what extent do you agree with each of the following statements?** You can indicate your answer on a scale from 1 to 5, where 1 is "disagree" and 5 is "agree". The numbers in between can be used to refine your response.

Binary variable: agree (4-5) – disagree/neutral (1-3)
Items (random order):
Behaviour believes & attitudes

- For short trips, one can risk driving under the influence of alcohol.
- I have to drive fast; otherwise, I have the impression of losing time.
- Respecting speed limits is boring or dull.
- Motorized vehicles should always give way to pedestrians or cyclists.
- I use a mobile phone while driving, because I always want to be available.
- To save time, I often use a mobile phone while driving.

Perceived behaviour control = self-efficacy

- I trust myself to drive after drinking a small amount of alcohol (e.g., one glass of wine or one pint of beer).
- I have the ability to drive when I am a little drunk after a party.
- I am able to drive after drinking a large amount of alcohol (e.g., a bottle of wine).
- I trust myself when I drive significantly faster than the speed limit.
- I have the ability to drive significantly faster than the speed limit.
- I am able to drive fast through a sharp curve.
- I trust myself when I check messages on the mobile phone while driving.
- I have the ability to write a message on the mobile phone while driving.
- I am able to talk on a hand-held mobile phone while driving.

Habits

- I often drive after drinking alcohol.
- I often drive faster than the speed limit.
- I often use my mobile phone while driving.

Intention

- I intend not to drive after drinking alcohol in the next 30 days.
- I intend to respect speed limits in the next 30 days.
- I intend not to use my mobile phone while driving in the next 30 days.

Subjective safety & risk perception

Q18) **How safe or unsafe do you feel when using the following transport modes in [country]?** You can indicate your answer on a scale from 0 to 10, where 0 is "very unsafe" and 10 is "very safe". The numbers in between can be used to refine your response.

Items (random) = Items indicated by the respondent in Q12 are displayed.

Q19) **How often do you think each of the following factors is the cause of a road crash involving a car**? You can indicate your answer on a scale from 1 to 6, where 1 is "never" and 6 is "(almost) always". The numbers in between can be used to refine your response.

Binary variable: often/frequently (4-6) - not that often/not frequently (1-3)
Items (random order):

- driving after drinking alcohol
- driving within 1 hour after taking drugs (other than prescribed or over the counter medication)
- driving faster than the speed limit
- using a hand-held mobile phone while driving
- using a hands-free mobile phone while driving
- inattentiveness or daydreaming while driving
- driving while tired

Support for policy measures

Q20) **Do you oppose or support a legal obligation …?** You can indicate your answer on a scale from 1 to 5, where 1 is "oppose" and 5 is "support". The numbers in between can be used to refine your response.

Binary variable: support (4-5) – oppose/neutral (1-3)
Items for all countries (random order):

- forbidding all drivers of motorized vehicles to drive with a blood alcohol concentration above 0.0 ‰ (zero tolerance)
- forbidding all drivers of motorized vehicles to use a hand-held mobile phone while driving
- limiting the speed limit to 30 km/h in all built-up areas (except on main thoroughfares)
- requiring all cyclists to wear a helmet
- limiting the speed limit to a maximum of 80 km/h on all rural roads without a median strip
- forbidding all novice drivers of motorized vehicles (license obtained less than 2 years ago) to drive with a blood alcohol concentration above 0.0 ‰ (zero tolerance)

Items only for HIC/UMIC countries (random order):

- installing an alcohol 'interlock' for drivers who have been caught drunk driving on more than one occasion (technology that won't let the car start if the driver's alcohol level is over a certain limit)
- requiring cyclists under the age of 12 to wear a helmet
- forbidding all cyclists to ride with a blood alcohol concentration above 0,0‰ (zero tolerance)

Items only for LMIC countries (random order):

- forbidding all professional drivers of motorized vehicles (e.g., taxis, vans, trucks, buses, …) to drive with a blood alcohol concentration above 0.0 ‰ (zero tolerance)
- requiring all moped and motorcycle riders and passengers to wear a helmet
- requiring all car drivers and passengers (front- and back seat) to wear a seatbelt
- making liability insurance mandatory for owners of cars

Q21) **Please think of the policy measure: "…" and indicate if you agree or disagree with the following statements about it. This policy measure would …?** disagree - agree

Random selection of one of the first 4 items in Q20 per respondent. All first 4 items in Q20 are be asked equally often in each country.
Items (random order):

- reduce the number of road crashes and injuries
- increase the safety feeling on the streets
- have negative side effects
- restrict people's individual freedom
- reduce the privacy of people
- limit people's mobility
- lead to discrimination
- be fair
- be expensive for people
- be easy to implement
- be difficult to enforce by the police
- be a burden for people
- be an unjustifiable intervention by the state
- be supported by many of my friends

Enforcement

Q22) **On a typical journey, how likely is it that you (as a car driver) will be checked by the police (including cameras or radars) for …?** You can indicate your answer on a scale from 1 to 7, where 1 is "very unlikely" and 7 is "very likely". The numbers in between can be used to refine your response.

Binary variable: likely (5-7) – unlikely/neutral (1-4)
Items (random order):

- alcohol, in other words, being subjected to a Breathalyser test
- the use of illegal drugs
- respecting the speed limits
- wearing your seatbelt
- the use of hand-held mobile phone to talk or text while driving

Q23_1) **In the past 12 months, how many times have you been checked by the police for using alcohol while driving a car (i.e., being subjected to a Breathalyser test)?** never - 1 time - at least 2 times - Binary variable: at least once - never

Q23_2) **In the past 12 months, how many times have you been checked by the police for using drugs (other than prescribed or over the counter medication) while driving a car?** never - 1 time - at least 2 times - Binary variable: at least once - never

Involvement in road crashes

The following questions focus on road crashes. With road crashes, we mean any collision involving at least one road vehicle (e.g., car, motorcycle, or bicycle) in motion on a public or private road to which the public has right of access. Furthermore, these crashes result in material damage, injury, or death. Collisions include those between road vehicles, road vehicles and pedestrians, road vehicles and animals or fixed obstacles, road and rail vehicles, and one road vehicle alone.

Q24a) **In the past 12 months, have you personally been involved in a road crash where at least one person was injured (light, severe or fatal crashes)?** yes - no

Q24b) **Please indicate the transport mode(s) YOU were using at the time of these crashes.** **You can indicate multiple answers:** as a car driver - as a car passenger - as a moped or motorcycle rider - as a moped or motorcycle passenger - as a cyclist - as a pedestrian - as a rider of an e-scooter (electric-kick style scooter) - other

Infrastructure

Q25_1_a) **As a CAR DRIVER, what type of roads do you regularly use in [country]?** You can indicate multiple answers: inter-city motorways - thoroughfares and high-speed roads within cities - rural roads and roads connecting towns and villages - other streets and roads in urban areas

Q25_1_b) **As a CAR DRIVER, how would you rate the roads that you regularly use in terms of safety?** You can indicate your answer on a scale from 1 to 7, where 1 is "very unsafe" and 7 is "very safe". The numbers in between can be used to refine your response.

Binary variable: safe (5-7) – unsafe/neutral (1-4)
Items (random order):

- inter-city motorways
- thoroughfares and high-speed roads within cities
- rural roads and roads connecting towns and villages
- other streets and roads in urban areas

Q25_2_a) **As a MOPED RIDER or MOTORCYCLIST, what type of roads do you regularly use in [country]?** You can indicate multiple answers: thoroughfares and high-speed roads within cities - rural roads and roads connecting towns and villages - other streets and roads in urban areas

Q25_2_b) **As a MOPED RIDER or MOTORCYCLIST, how would you rate the roads that you regularly use in terms of safety?** You can indicate your answer on a scale from 1 to 7, where 1 is "very unsafe" and 7 is "very safe". The numbers in between can be used to refine your response.

Binary variable: safe (5-7) – unsafe/neutral (1-4)
Items (random order):

- thoroughfares and high-speed roads within cities
- rural roads and roads connecting towns and villages
- other streets and roads in urban areas

Q25_3_a) **As a CYCLIST, what type of roads/cycle lanes do you regularly use in [country]?** You can indicate multiple answers: rural roads and roads connecting towns and villages with cycle lanes - rural roads and roads connecting towns and villages without cycle lanes - streets and roads in urban areas with cycle lanes - streets and roads in urban areas without cycle lanes

Q25_3_b) **As a CYCLIST, how would you rate the roads/cycle lanes that you regularly use in terms of safety?** You can indicate your answer on a scale from 1 to 7, where 1 is "very unsafe" and 7 is "very safe". The numbers in between can be used to refine your response.

Binary variable: safe (5-7) – unsafe/neutral (1-4)
Items (random order):

- rural roads and roads connecting towns and villages with cycle lanes
- rural roads and roads connecting towns and villages without cycle lanes

- streets and roads in urban areas with cycle lanes
- streets and roads in urban areas without cycle lanes

Q25_4_a) **As a PEDESTRIAN, what type of roads/sidewalks do you regularly use in [country]?** You can indicate multiple answers: rural roads and roads connecting towns and villages with sidewalks - rural roads and roads connecting towns and villages without sidewalks - streets and roads in urban areas with sidewalks - streets and roads in urban areas without sidewalks

Q25_4_b) **As a PEDESTRIAN, how would you rate the roads/sidewalks that you regularly use in terms of safety?** You can indicate your answer on a scale from 1 to 7, where 1 is "very unsafe" and 7 is "very safe". The numbers in between can be used to refine your response.

Binary variable: safe (5-7) – unsafe/neutral (1-4)
Items (random order):

- rural roads and roads connecting towns and villages with sidewalks
- rural roads and roads connecting towns and villages without sidewalks
- streets and roads in urban areas with sidewalks
- streets and roads in urban areas without sidewalks

Social desirability scale

Introduction: The survey is almost finished. Some of the following questions[10] have nothing to do with road safety, but they are important background information. There are no good or bad answers.

Q26) **To what extent do you agree with each of the following statements?** You can indicate your answer on a scale from 1 to 5, where 1 is "disagree" and 5 is "agree". The numbers in between can be used to refine your response.

Items (random order; instructed response item (trick item) as last item):

- In an argument, I always remain objective and stick to the facts.
- Even if I am feeling stressed, I am always friendly and polite to others.
- When talking to someone, I always listen carefully to what the other person says.
- It has happened that I have taken advantage of someone in the past.
- I have occasionally thrown litter away in the countryside or on to the road.
- Sometimes I only help people if I expect to get something in return.
- Please, select the answer option number 5 "agree". (Instructed response item (trick item))

Closing comment: Thank you for your contribution!

[10] *Q26 is asked together with some last questions on sociodemographic information, which have already been listed in the beginning of the questionnaire.*

Appendix 2: ESRA3 weights

The following weights were used to calculate representative means on national and regional level. They are based on UN population statistics (United Nations Statistics Division, 2023). The weighting took into account small corrections with respect to national representativeness of the sample based on gender and six age groups (18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65-74y). For the regions, the weighting also took into account the population size of each country in the total set of countries from this region.

Individual country weight	Individual country weight is a weighting factor based on the gender*6 age groups (18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65-74y) distribution in a country as retrieved from the UN population statistics.
Europe22 weight	European weighting factor based on all 22 European countries participating in ESRA3, considering individual country weight and population size of the country as retrieved from the UN population statistics.
America8 weight	American weighting factor based on all 8 North and Latin American countries participating in ESRA3, considering individual country weight and population size of the country as retrieved from the UN population statistics.
AsiaOceania6 weight	Asian and Oceanian weighting factor based on the 6 Asian and Oceanian countries participating in ESRA3 with data collected through online panel (Australia, Israel, Japan, Kazakhstan, Thailand, Türkiye - Armenia, Kyrgyzstan, and Uzbekistan were not included due to different methodology in data collection – face-to-face CAPI), considering individual country weight and population size of the country as retrieved from the UN population statistics.

Appendix 3: Sample size

Table 13: Weighted sample size by region and country.

Country	All road users	car drivers, at least a few days a year	car drivers, at least a few days a month	motorcyclists/ moped riders, at least a few days a month	cyclists, at least a few days a month	pedestrians, at least a few days a month
Armenia	467	140	122	8	41	441
Australia	953	828	809	280	392	757
Austria	1804	1506	1420	194	876	1682
Belgium	1795	1391	1346	222	852	1583
Bosnia and Herzegovina	914	644	597	96	369	716
Brazil	947	721	657	299	508	788
Canada	1904	1464	1385	221	611	1429
Chile	923	635	576	105	401	793
Colombia	909	557	472	284	510	805
Czech Republic	965	641	597	75	406	845
Denmark	874	689	647	115	520	729
Finland	993	769	683	97	554	889
France	965	801	769	190	409	768
Germany	832	649	618	133	457	678
Greece	978	814	754	200	325	843
Ireland	901	736	706	62	259	744
Israel	965	836	796	33	120	764
Italy	1007	921	906	266	549	885
Japan	986	603	570	84	365	740
Kazakhstan	845	336	250	49	245	707
Kyrgyzstan	468	176	166	7	69	429
Latvia	911	674	621	43	378	777
Luxembourg	471	433	424	44	141	411
Mexico	932	692	647	196	437	789
Netherlands	905	740	700	145	744	856
Panama	855	606	542	84	318	705
Peru	843	475	401	216	434	765
Poland	927	772	723	94	584	864
Portugal	1032	902	844	91	260	917
Serbia	982	724	676	72	488	893
Slovenia	945	824	805	146	464	849
Spain	935	748	710	159	381	865
Sweden	922	690	633	88	446	727
Switzerland	979	803	776	200	522	910
Thailand	870	620	586	632	482	592
Türkiye	897	738	692	264	405	830
United Kingdom	921	668	644	179	327	823
United States	938	823	782	407	468	644
Uzbekistan	433	103	82	30	86	287
Europe22	22000	17710	16900	3732	10650	19119
America8	8000	6331	5894	2650	3967	6187
AsiaOceania6*	6000	4180	3931	1708	2524	4705

** Not including Armenia, Kyrgyzstan, Uzbekistan (different methodology).*

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