



# ESRA

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## E-Survey of Road users' Attitudes



### ESRA2 methodology

ESRA2 report Nr. 1 (updated version)



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# ESRA2 methodology

## ESRA2 report Nr. 1 (updated version)

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## List of Abbreviations

### Country codes (ISO-alpha2)

AT	Austria	IT	Italy
AU	Australia	JP	Japan
BE	Belgium	KE	Kenya
BJ	Benin	KR	Republic of Korea
BG	Bulgaria	LU	Luxembourg
CA	Canada	LB	Lebanon
CI	Ivory Coast	MA	Morocco
CH	Switzerland	MY	Malaysia
CM	Cameroon	NG	Nigeria
CO	Colombia	NL	Netherlands
CZ	Czech Republic	NO	Norway
DE	Germany	PL	Poland
DK	Denmark	PT	Portugal
EG	Egypt	RS	Serbia
EL	Greece	SE	Sweden
ES	Spain	SI	Slovenia
FI	Finland	TH	Thailand
FR	France	TN	Tunisia
GH	Ghana	UG	Uganda
HU	Hungary	UK	United Kingdom
IS	Iceland	US	United States
IE	Ireland	VN	Vietnam
IL	Israel	ZA	South Africa
IN	India	ZM	Zambia

### Other abbreviations

ESRA	E-Survey of Road users' Attitudes
LOI	Length of the interview
Q	Question
y	Years of age

## Executive summary

This report provides an overview on the ESRA methodology, in particular the fieldwork, data processing and reporting procedures. The report also presents information on the survey sample and on the quality assurance arrangements for the common ESRA outputs.

### The ESRA initiative

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.

Vias institute in Brussels (Belgium) initiated and coordinates ESRA, in cooperation with eleven core group partners (BASt (Germany), BFU (Switzerland), CTL (Italy), IATSS (Japan), IFSTTAR (France), ITS (Poland), KfV (Austria), NTUA (Greece), PRP (Portugal), SWOV (the Netherlands), TIRF (Canada)). The current ESRA edition was released in two waves: a first wave in 2018 involving 32 countries and a second wave in 2019, ending in 2020, including 16 additional countries. In total 39 partners from 48 countries participated in the current edition of this ESRA survey.

### Data collection and scope of the questionnaire

ESRA data are collected through online panel surveys, using a representative sample of the national adult populations in each participating country (at least N = 1,000 per country). A few exceptions exist. In some countries sample sizes of at least 1,000 respondents is not feasible, therefore smaller sample sizes were used.

At the heart of this survey is a jointly developed questionnaire, which is translated into 61 national language versions in ESRA2. The survey addresses several types of road users (e.g. car drivers, powered-two-wheelers, cyclists, pedestrians). 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, powered-two-wheelers, cyclists and pedestrians.

Hard quota are used for gender and age<sup>1</sup> distribution during the sampling procedure (United Nations Statistics Division, 2019). The geographical spread of the sample across the country was at least monitored (soft quota). Five market research agencies (INFAS, Ipsos (formerly GfK), Punto de Fuga, Dynata (formerly RN SSI) and TNS Ilres) organised the fieldwork under the supervision of Vias institute. For the first wave, the fieldwork was conducted simultaneously in all 32 participating countries in December 2018<sup>2</sup>. The second wave, involving the 16 additional countries, was launched in November 2019<sup>3</sup>.

### Data processing

Vias institute predefined hard quota for gender and age distribution per country as well as a series of minimum criteria for data cleaning, which the market research agencies had to respect. The provided data files of the market research companies had to respect a specified database template. All the national data files were merged into one file, including the answers of all respondents in 48 countries. Vias institute checked the quality of the data and carried out a second data cleaning, which included controlling for duplicate entries, removing inconsistencies with panel information, checking for the length of the interview (identifying and eliminating 'speeders' and 'turtles'), and removing straightliners (respondents who give the same answers for many questions). From the original, pre-cleaned sample

<sup>1</sup> 6 age groups: 18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65y+.

<sup>2</sup> Only in Switzerland the fieldwork extended to January 2019.

<sup>3</sup> Due to the covid-19 pandemic situation, the fieldwork for the second wave had to be extended until July 2020 for some countries.

provided by the market research agencies (N=45,664), 550 respondents were removed from the dataset. The final sample consists of N=45,114 respondents.

In view of facilitating dissemination of ESRA2 results, some original answer categories (mainly 5-point and 7-point scales) were dichotomized (2 answer categories; binary variables). The dichotomization process was conducted centrally by Vias institute and used in presenting all descriptive analyses of the ESRA2 reports. The dichotomizations and reference categories for each question are indicated in the ESRA2 questionnaire in Appendix 1 (see information on binary variable).

A weighting of the data was applied in the descriptive 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, 65y+ (United Nations Statistics Division, 2019). 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.

The statistical packages used within the data processing were SPSS 25.0 (IBM Corp., 2017) and R (R Core Team, 2020).

### **Sample characteristics**

In total the ESRA2 survey collected data from more than 45,000 road users across 48 countries. The samples (after applying a weighting factor) are representative for the national adult population based on interlaced quota of gender and six age groups (United Nations Statistics Division, 2019). The survey addresses several types of road users (e.g. car drivers, powered-two-wheelers, cyclists, pedestrians). Distribution of the national samples according to transport mode, gender, age groups, internet use and education level are presented in this report.

### **Reporting and quality control**

The common results of the ESRA2 survey are published in a Main Report, a dedicated report on the African continent, a Methodology Report and 15 Thematic Reports (Table 5; page 26). Furthermore, 48 country fact sheets have been produced so far 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 ESRA2 reports have been peer-reviewed within the consortium, following a pre-defined quality control procedure.

### **Further information on ESRA and its results**

An overview of the results and news on the ESRA initiative is available on: [www.esranet.eu](http://www.esranet.eu)



# 1 The ESRA initiative

## 1.1 Monitoring road safety attitudes and performance

Trends in road safety performance and the success of policy measures can be monitored using road safety performance indicators, based on accident statistics, roadside observations, or (questionnaire) surveys.

There is a broad consensus amongst road safety experts that roadside observations are the golden standard to produce road safety performance indicators since they are based on observed behaviour in traffic. But observation-based studies have also limitations. The number and nature of variables that are observable are limited. Moreover, roadside observations require a sophisticated study design and protocol. They are very time intensive and cost consuming. At present, moreover, due to methodological differences, results of such studies are often not comparable across countries.

An alternative is to use questionnaire surveys. Such surveys, when properly designed and with an adequate sampling approach, can yield very useful information on road safety performance and road safety culture as well. Moreover, when online panels are used, such surveys appear to be a relatively inexpensive way for obtaining indicators on safety practice and road users' behaviour. A further advantage of such surveys is that they allow to collect data on many additional factors as well and hence can provide insights into socio-cognitive determinants of behaviour: attitudes, perceived social norm, risk perception, or existing habits. Socio-cognitive factors can help to understand the underlying motivations of certain behaviour (e.g. Ajzen, 1991; Rosenstock, 1974; Rogers, 1975; Vanlaar & Yannis, 2006). In the current literature those factors are often closely linked with assessing road safety culture (e.g. Ward et al., 2019).

Hence, it is tempting to use road safety indicators based on surveys for benchmarking purposes. However, the results of national surveys are seldom comparable across countries because of differences in aims, scope, methodology, questions used, or sample population being surveyed.

Therefore, in 1991 the European Commission initiated the European project SARTRE (Social Attitudes to Road Traffic Risk in Europe (Cestac & Delhomme, 2012)). A common questionnaire and study design were developed, and face-to-face interviews were conducted among a representative sample of the national adult population. Four editions of the SARTRE survey were completed (1991, 1996, 2002, 2010). In the first three editions of the SARTRE project, surveys were directed only to car drivers. In the fourth edition, the target group was extended to powered two-wheelers, pedestrians, cyclists, and users of public transport (Cestac & Delhomme, 2012). SARTRE4 involved 19 European countries. It was the last of the SARTRE series that was funded by the European Commission.

In 2015, Vias institute (formerly the Belgian Road Safety Institute) launched the ESRA (E-Survey of Road users' Attitudes) initiative to build on the SARTRE experience and extend scope and coverage, initially with partners from a number of EU countries. In a few years, the project evolved into a global initiative.

## 1.2 Aim and objectives

ESRA 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.

The main objectives of the ESRA initiative can be summarized as follows:

- to provide scientific support for road safety policy at national and international levels;
- to make internationally comparable data available on the current road safety situation in countries all over the world;

- to develop a series of reliable, cost-effective and comparable road safety performance indicators;
- to develop time series on road safety performance.

The intention is to repeat this survey every three years and extend it to an increasing number of countries.

### 1.3 Consortium and evolution

The ESRA initiative was initiated by the Vias institute (Belgium) in 2015 (Torfs et al., 2016) and has already been conducted in 60 countries across six continents. The number of countries is still growing. Figure 1 gives an overview of the geographical coverage of the different ESRA surveys (2015-2020).

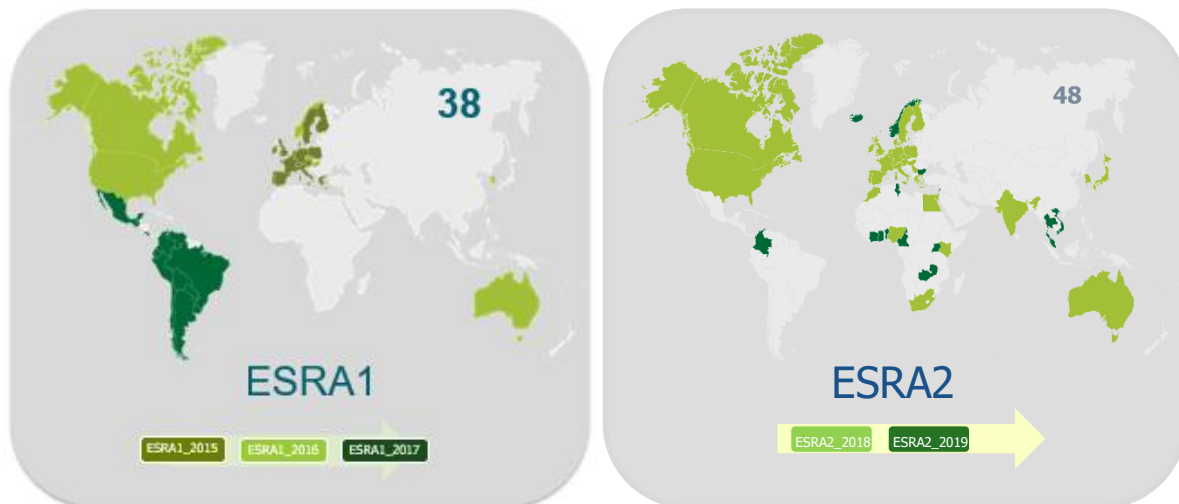


Figure 1: Evolution: Geographic coverage of the different ESRA surveys (2015-2020)

The first edition of the ESRA survey (ESRA1) was carried out in three waves in 2015, 2016 and 2017. Data were collected from almost 40,000 road users in 38 countries across five continents (Meesmann et al., 2018). The current report focusses on the second edition of the ESRA survey, which, in its first wave in 2018, already involved 32 countries (ESRA2\_2018) and 16 additional countries in its second wave (ESRA2\_2019) for a total of 48 countries and more than 45,000 road users.

Vias institute in Brussels (Belgium) coordinated the ESRA2 survey in close collaboration with eleven additional core group partners: BAST (Germany), BFU (Switzerland), CTL (Italy), IATSS (Japan), IFSTTAR (France), ITS (Poland), KfV (Austria), NTUA (Greece), PRP (Portugal), SWOV (the Netherlands), TIRF (Canada).

In each country that participates in ESRA, there is a national partner to support the initiative. They are responsible for the funding of the survey, the translation of the survey questionnaire into the national language(s) and interpretation of the findings. For the twelve African countries, funding was provided by the Group Renault and The World Bank Group. A list of all partners (organisations and contact persons) supporting the ESRA2 survey can be found on page 3 of this report.

### 1.4 Costs and resources

From the beginning onwards, the intention was to keep costs as low as possible. The main principles to achieve this are: (1) using online panel services; and (2) sharing the analysis work amongst the ESRA partner organisations.

In most countries, the cost for collecting the data was in the range between €5,000 and €15,000 (for 1,000 respondents). The financial resources for the national survey costs and the staff time needed for the analyses were secured by the ESRA2 partners' own sources.

The ESRA2 questionnaire was developed by Vias institute in collaboration with the ESRA2 core group partners. National partners were responsible for the translations of the master version into their national language version(s). Furthermore, they were responsible for the validations of the national results and provided contextual information necessary for the interpretation of the results. The analyses of the common data were a joint effort of ESRA2 core group members and Vias institute, who spend over 80 person months on analysing and producing the common ESRA2 outputs.

## 2 Data collection and scope of questionnaire

### 2.1 Scope

The ESRA2 survey addresses several types of road users, i.e.:

- car drivers
- powered-two-wheelers
- cyclists
- pedestrians.

The main themes covered in the questionnaire are:

- transport modes
- road crash involvement
- self-declared behaviour in traffic
- acceptability of safe and unsafe traffic behaviour
- attitudes towards safe and unsafe traffic behaviour
- subjective safety and risk perception
- support for policy measures
- enforcement of traffic laws
- vehicle automation
- socio-demographic information.

In addition, there are two bonus questions which were chosen freely by each national partner.

The survey addresses different road safety topics:

- driving under the influence of alcohol, drugs and medicines
- speeding
- protective systems (e.g. seat belt use, helmet use)
- distraction and fatigue.

Furthermore, for the interpretation of the results additional contextual information on country level were gathered via external data sources (e.g. WHO, IRTAD, CARE) and a dedicated ESRA2 expert survey (e.g. questions on current national legal regulations).

Figure 2 gives an overview of the scope of the ESRA2 survey.

### ESRA main topics & themes (over 300 variables collected)

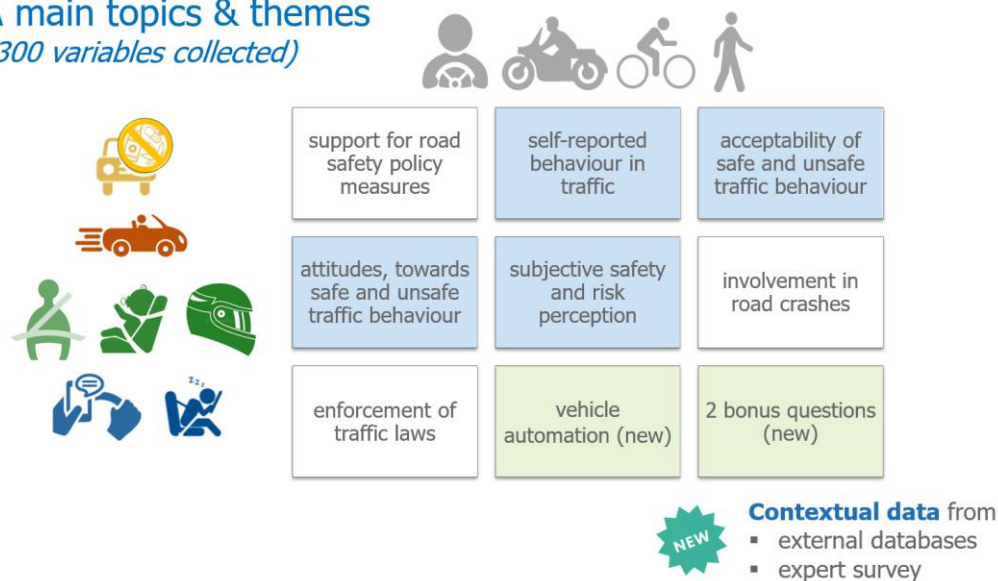


Figure 2: Scope of ESRA2 questionnaire

The median length of the interview was 22 minutes. The questionnaire was first developed in English by the ESRA core group, based on the experience with ESRA1 and subsequently translated into 61

national language versions. The survey was programmed in seven different character sets: Greek, Hebrew, Hindi, Japanese, Korean, Arabic and Latin.

## 2.2 Online panel survey

ESRA data is derived from an extensive online survey amongst a representative sample of the national adult populations in each participating country. More specifically, ESRA2 is based on a web-based survey using internet panels.

This approach has some advantages compared to other survey modes, especially given the international context of the study. These advantages are:

- Self-administered web surveys are less prone to social desirability in responses compared to interviewer-administered surveys (De Leeuw et al., 2008; Baker, Blumberg et al. 2010; Goldenbeld & de Craen, 2013).
- The common study design provides better comparability across countries (i.e. identical criteria in sampling procedure, identical programming of questionnaire; one project management across all countries as the ESRA survey is actually 'one' survey which is only linked to different national translations).
- Reduction of time (fieldwork in most countries ca. 2-3 weeks; efficient data processing), workload (e.g. less time for fieldwork and data processing) and costs (national survey costs typically between €5,000 – €15,000).

## 2.3 Sample and fieldwork

The survey targets all types of road users. The aim is to cover a representative sample of the national adult population of at least 1,000 respondents in each country. Hard quotas were used for gender and age<sup>4</sup> distribution during the sampling procedure (United Nations Statistics Division, 2019). The geographical spread of the sample across the country was monitored (soft quota). Five market research agencies (INFAS, Ipsos (formerly GfK), Punto de Fuga, Dynata (formerly RN SSI) and TNS Ilres) organised the fieldwork under the supervision of Vias institute. The fieldwork was conducted simultaneously in all 32 participating countries in December 2018<sup>5</sup>. The second wave, involving the 16 additional countries, was launched in November 2019<sup>6</sup>.

It should be recognized, however, that internet penetration and computer skills vary between countries (see also section 4.2). Consequently, coverage and sampling may have been suboptimal in some areas. Also, the minimum sample size (at least N = 1,000) could not be met in some countries as the size of the available online panels in some countries was too small. In two countries part of the data was collected through another method<sup>7,8</sup>.

The participating countries in the first wave of ESRA2 (ESRA2\_2018) were:

- Europe: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, the Netherlands, Poland, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom;
- America: Canada, USA;
- Asia and Oceania: Australia, India, Israel, Japan, Republic of Korea;
- Africa: Egypt, Kenya, Morocco, Nigeria, South Africa.

For the second wave, the participating countries in ESRA2 (ESRA2\_2019) were:

- Europe: Bulgaria, Iceland, Luxembourg, Norway;
- America: Colombia;
- Asia and Oceania: Lebanon, Malaysia, Thailand, Vietnam;

<sup>4</sup> 6 age groups: 18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65y+.

<sup>5</sup> Only in Switzerland the fieldwork extended to January 2019.

<sup>6</sup> Due to the Covid-19 pandemic situation, the fieldwork for the second wave had to be extended until July 2020 for some countries.

<sup>7</sup> For Benin, a different approach was also used where potential participants were first approached on the street and invited to participate in the online questionnaire.

<sup>8</sup> For Iceland, 200 respondents of the total sample of 413 were telephone interviews as it was not possible to reach the target sample size with the online panel only.

- Africa: Benin, Cameroon, Ghana, Ivory Coast, Tunisia, Uganda, Zambia.

In total the ESRA2 survey collected data from more than 45,000 road users across 48 countries. Figure 3 shows the geographical coverage of the survey. Details on the sample can be found in chapter 4 and a summary of the fieldwork per country in Appendix 2.

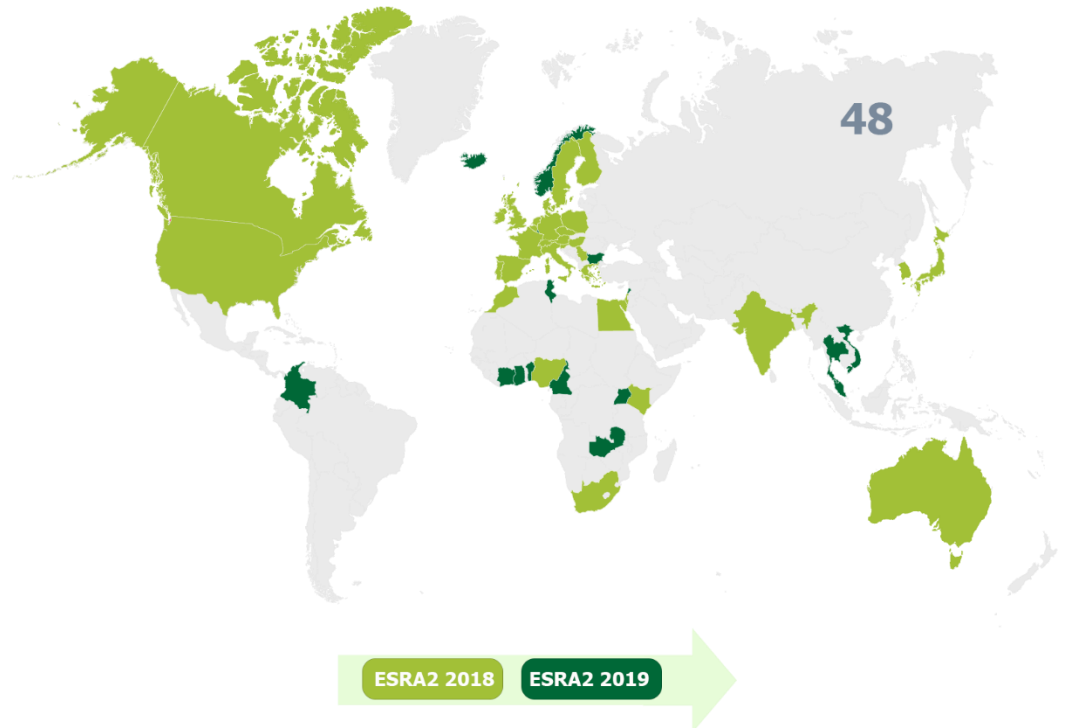


Figure 3: Geographical coverage of the ESRA2 survey.

## 3 Data processing

### 3.1 Data preparation

The market research companies that had been selected for collecting the data had to respect minimum criteria for data cleaning which had been defined by Vias institute and provide the data in a custom made database template. The cleaned data files provided by the market research companies were merged together into one database which include all the answers of all respondents in 48 countries. The statistical packages used in the further processing of the data were SPSS 25.0 (IBM Corp., 2017) and R (R Core Team, 2020).

After receiving the cleaned data file from the market research agencies, Vias institute conducted the following steps of quality control before data cleaning:

1. check received data from panel providers against predefined ESRA2 codebook;
2. check programming consistency (i.e., compare predefined filters in the questionnaire with the expected number of missing variables for which filters had to be used);
3. check whether the requested quota per country had been respected (national representativity of the sample based on gender and age (United Nations Statistics Division, 2019); a deviation of 5% of quota value was tolerated).

In step 1-2 only minor mistakes were identified and corrected in in the final database, without any further implications on the quality of the data. Concerning step 3, it should be mentioned that in the subcontract with the market research agency we defined, that a small deviation from the original quota of less than 5% was tolerated (to be corrected with small weighting factors). The data show, that for 30 out of 48 ESRA2 countries the requested quota for national representativity were entirely respected even without having to use small weighting factors. In thirteen countries, deviations larger than 5% of the predefined quota were present (United Nations Statistics Division, 2019). Those countries were: Greece, India, Republic of Korea, Morocco, Nigeria, Serbia, Slovenia, Spain, Benin, Iceland, Ivory Coast, Lebanon, and Tunisia. The main problems were an underrepresentation in the sample of woman 65y+ (and to a lesser extent men 65y+) and an overrepresentation in the sample of men 35-44y (and to a lesser extent women 35-44y). For these groups we decided to accept larger weighting factors to correct for national representativity.

### 3.2 Data cleaning

As mentioned before, Vias institute predefined criteria for data cleaning for the market research agencies before delivering the database. Figure 4 provides an overview of the ESRA2 data cleaning process.

The following text describes the double check of Vias institute if these predefined criteria had been respected. Furthermore, some amendments were done related to step 3.

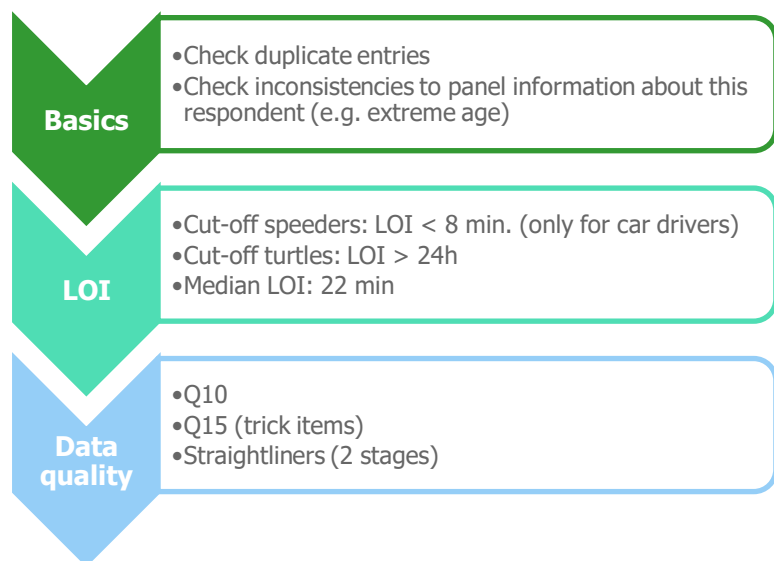


Figure 4: Overview of ESRA2 data cleaning



### Step 1 – Duplicate entries and inconsistencies

Duplicate entries (mostly based on age, gender, country but also on IP address) had to be removed. For some outliers, the consistency of the socio-demographic info (gender, age, etc.) with the information which the provider has of this respondent was checked.

### Step 2 – Length of the interview (LOI)

The ESRA2 questionnaire aimed at a median LOI of 20 minutes. The original criteria to clean out for 'speeders' (those, who fill out the questionnaire too fast) and 'turtles' (those who fill out the questionnaire too slow) was defined as two standard deviations of the median LOI. Because several market research agencies stated that some of their respondents do not fill in such questionnaires anymore in one go (e.g. take a break or have difficulties with internet connection). In such cases the timer of the interview keeps on running. Therefore, Vias institute decided to omit the criterion of 'turtles' during the fieldwork.

Within the ESRA2 core group a pragmatic consensus was found and the cut-offs for 'speeders' and 'turtles' were redefined as follows: 'speeders' were defined as car drivers (based on filter of Q10 (use of transport mode)) who filled in the questionnaire in less than 8 minutes. Respondents that were not defined as car drivers were excluded from this criterion as they had to fill in less questions. 'Turtles' were defined as those respondents who needed more than 24 hours to fill in the questionnaire (independent of road user type). Though we loosened our initial criterion, we opted to exclude interruptions of more than one day which might increase the effect on answering patterns.

### Step 3 – Data quality checks

On two questions data quality checks were integrated in the ESRA2 survey:

- (1) Respondents who answered on Q10 items (use of transport mode) always 'never' or on the first block of Q10 (use of transport mode: pedestrians, cyclists and powered-two-wheelers) always 'at least 4 days/week' had to be removed as those replies do not make sense.
- (2) In Q15 (attitudes and opinions) we included two 'trick items' (e.g. indicate number 1 on the answer scale). Respondents who answered twice incorrectly had to be removed from the sample (indication that respondent is not reading the items properly).

These data quality checks were performed by the agencies, and there was no need to remove any additional respondents based on these criteria.

### Step 4 – Straightlining (2-step approach)

So-called straightlining is a response strategy where respondents fill in the same response on a scale on all items of a question. This type of answer patterns was double checked by Vias institute after the check by the agencies (who also check for other systematic response patterns). This additional check was done in 2 steps:

Round 1: 'Straightliners'

Here, a 'straightliner' is defined as a person who answered on all items (100%) of a particular question the same answer; exception Q15 (attitudes and opinions +/-90%). This included the following matrix questions:

- Q12\_1b (self-declared behaviour as a car driver; except for answering 'never' which is plausible);
- Q13\_1 (perceived acceptability of unsafe traffic behaviour of car drivers);
- Q14\_1 (personal acceptability of unsafe traffic behaviour of car drivers);
- Q15 (attitudes and opinions; here straightlining defined as same response on 24 out of 27 items, so not including 2 trick items);
- Q17 (risk perception);
- Q18 (support for measures).



If a respondent is indicated as straightlining on at least four of these six questions, the respondent was removed from the sample.

Round 2: 'Almost straightliners'

Here, an 'almost straightliner' is defined as a person who answered on +/- 75% of items of a particular question the same answer. This included the following matrix questions:

- Q12\_1b (self-declared behaviour as a car driver; except for answering 'never' which is plausible; same response on 11 items out of 14);
- Q13\_1 (perceived acceptability of unsafe traffic behaviour of car drivers; same response on 5 out of 7 items);
- Q14\_1 (personal acceptability of unsafe traffic behaviour of car drivers; same response on 9 out of 12 items);
- Q15 (attitudes and opinions; same response on 20 out of 27 items, so not including 2 trick items);
- Q18 (support for measures; same response on 11 out of 15 items).

If a respondent is indicated as 'almost straightlining' on all five questions, the respondent is removed from the sample.

During these data cleaning procedures 550 respondents were removed from the original sample provided by the research agencies (N=45,664). The final sample consists out of N=45,114 respondents.

### 3.3 Dichotomisation of the data

In view of facilitating dissemination of ESRA2 results, some original answer categories (mainly 5-point and 7-point scales) were dichotomized (2 answer categories; binary variables). The dichotomization process was conducted centrally by Vias institute and used in presenting all descriptive analyses of the ESRA2 reports. The dichotomizations and reference categories for each question are indicated in the ESRA2 questionnaire in Appendix 1 (see information on binary variable).

### 3.4 Regional groups

Four groups were defined in order to compare the results at regional level:

- Europe24: Austria, Belgium, Bulgaria, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Poland, Portugal, Serbia, Slovenia, Spain, Sweden, Switzerland, United Kingdom;
- America3: Canada, Colombia, USA;
- AsiaOceania9: Australia, India, Israel, Japan, Korea, Lebanon, Malaysia, Thailand, Vietnam;
- Africa12: Benin, Cameroon, Egypt, Ghana, Ivory Coast, Kenya, Morocco, Nigeria, South Africa, Tunisia, Uganda, Zambia.

### 3.5 Weighting of the data

The following weights were used to calculate representative means on national and regional level (Table 1). They are based on UN population statistics (United Nations Statistics Division, 2019). 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, 65y+). For the regions, the weighting also took into account the population size of each country in the total set of countries from this region.

Table 1: Overview of weights applied in ESRA2 analyses

Weight	Description
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, 65y+) distribution in a country as retrieved from the UN population statistics.
Europe24 weight	European weighting factor based on all 24 European countries participating in ESRA2, considering individual country weight and population size of the country as retrieved from the UN population statistics.
America3 weight	American weighting factor based on all 3 North and Latin American countries participating in ESRA2, considering individual country weight and population size of the country as retrieved from the UN population statistics.
AsiaOceania9 weight	Asian and Oceanian weighting factor based on all 9 Asian and Oceanian countries participating in ESRA2, considering individual country weight and population size of the country as retrieved from the UN population statistics.
Africa12 weight	African weighting factor based on all 12 African countries participating in ESRA2, considering individual country weight and population size of the country as retrieved from the UN population statistics.

## 4 Sample characteristics

In total the ESRA2 survey collected data from more than 45,000 road users across 48 countries. The geographical coverage of the survey can be seen in Figure 3 (page 14).

In the following sections we will highlight sample size, gender and age distribution in the sample, as well as educational level, internet use and the most frequently used transport modes. Additional sociodemographic information of the respondents is also available in the data (e.g. professional occupation or level of urbanisation). These additional characteristics allow for more in-depth comparisons and provides possibilities for advanced data analyses.

### 4.1 Sample size, gender and age distribution

Table 2 shows the sample size, gender and age distribution for the different countries and regions. In most countries the ESRA2 survey aimed at a sample size of 1,000 respondents per country. In Austria, Belgium and Germany, the national partner decided to increase the samples size to 2,000 respondents, as this enables more detailed analysis. In some countries, sample sizes of at least 1,000 respondents was not feasible, therefore smaller sample sizes were used. The gender distribution in the total sample is 49.6% men and 50.1% women (0.3% other).

Figure 5 shows the age description by region (weighted means), which is in line with the demographic characteristics of the regional samples (e.g. younger population in the African region compared to the European or American region; United Nations Statistics Division, 2019).

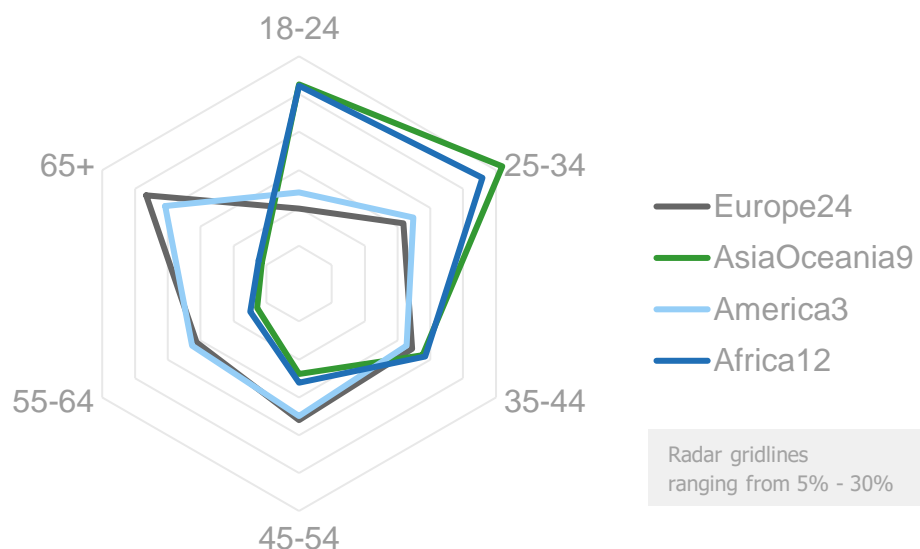


Figure 5: Age distribution by region (weighted means)

The youngest respondents were 18 years old (as defined in the study design) and the oldest respondent 98 years old. The average age was 44 years with a standard deviation of 16.4 years, the median age was 42 years.

It should be noted that the share of the oldest age group 65y+ varies strongly by country. This is to some extent the result of their real share in the population (United Nations Statistics Division, 2019), but in some cases, it is also due to underrepresentation of this age group within the sample (Cameroon, Ghana, Greece, Iceland, Ivory Coast, Kenya, Lebanon, Malaysia, Morocco, Nigeria, Republic of Korea, Serbia, Slovenia, Spain, Thailand, Tunisia, Uganda, Vietnam and Zambia).

Table 2: Sample size, gender and age distribution by country (unweighted) and region (weighed means)

Country	Sample size	Gender			Age group					
		male	female	other	18-24y	25-34y	35-44y	45-54y	55-64y	65y+
Australia	968	48%	52%	0%	11%	19%	18%	17%	15%	20%
Austria	1999	48%	52%	0%	10%	17%	16%	19%	16%	23%
Belgium	1985	49%	51%	0%	10%	16%	17%	18%	16%	23%
Benin	272	75%	25%	0%	41%	43%	13%	3%	0%	0%
Bulgaria	1005	48%	52%	0%	8%	16%	18%	17%	15%	26%
Cameroon	204	45%	55%	0%	27%	29%	22%	21%	0%	2%
Canada	980	49%	51%	0%	11%	16%	16%	18%	18%	21%
Colombia	1013	49%	51%	0%	15%	26%	23%	16%	12%	8%
Czech Republic	989	49%	51%	0%	8%	16%	21%	16%	15%	23%
Denmark	984	49%	51%	0%	11%	15%	15%	18%	16%	24%
Egypt	996	54%	46%	0%	20%	32%	32%	11%	2%	2%
Finland	994	49%	51%	0%	10%	16%	15%	16%	17%	26%
France	994	48%	52%	0%	10%	16%	16%	17%	16%	24%
Germany	1989	49%	51%	0%	9%	15%	14%	20%	16%	25%
Ghana	378	48%	52%	0%	30%	29%	21%	17%	2%	1%
Greece	1015	50%	48%	2%	9%	20%	31%	25%	13%	3%
Hungary	1014	45%	50%	5%	10%	16%	19%	16%	17%	22%
Iceland	413	50%	50%	0%	15%	30%	35%	15%	4%	2%
India	1035	54%	45%	1%	22%	25%	22%	16%	9%	6%
Ireland	1031	46%	54%	0%	11%	19%	24%	20%	14%	11%
Israel	984	49%	51%	0%	16%	21%	19%	15%	13%	16%
Italy	980	48%	52%	0%	8%	13%	17%	19%	16%	27%
Ivory Coast	379	56%	44%	0%	28%	32%	23%	15%	2%	1%
Japan	980	48%	52%	0%	8%	13%	17%	15%	15%	31%
Kenya	1000	50%	50%	0%	27%	36%	22%	12%	3%	1%
Lebanon	1016	55%	45%	0%	33%	27%	21%	13%	5%	0%
Luxembourg	555	49%	51%	0%	11%	21%	18%	17%	15%	18%
Malaysia	529	50%	50%	0%	16%	29%	25%	16%	10%	5%
Morocco	1047	55%	45%	0%	27%	35%	24%	9%	2%	2%
Netherlands	983	49%	51%	0%	11%	15%	15%	19%	16%	23%
Nigeria	1000	55%	45%	0%	28%	37%	21%	10%	3%	2%
Norway	1040	49%	51%	0%	11%	16%	20%	18%	15%	21%
Poland	993	48%	52%	0%	10%	19%	18%	15%	18%	19%
Portugal	998	49%	51%	0%	10%	15%	18%	18%	19%	21%
Republic of Korea	1043	50%	48%	1%	13%	19%	22%	21%	18%	8%
Serbia	1041	49%	50%	1%	13%	20%	22%	20%	19%	6%
Slovenia	1035	51%	49%	0%	10%	18%	18%	20%	21%	13%
South Africa	1013	46%	54%	0%	17%	30%	22%	15%	11%	5%
Spain	980	54%	46%	0%	9%	15%	22%	12%	17%	24%
Sweden	987	50%	50%	0%	11%	17%	16%	17%	15%	25%
Switzerland	1020	51%	49%	0%	10%	17%	17%	20%	16%	19%
Thailand	1026	50%	50%	0%	17%	27%	29%	17%	9%	2%
Tunisia	383	51%	49%	0%	20%	23%	18%	32%	5%	2%
Uganda	378	44%	56%	0%	34%	30%	16%	18%	1%	1%
United Kingdom	963	49%	51%	0%	11%	17%	16%	18%	15%	23%
United States	1016	47%	52%	1%	12%	18%	16%	18%	17%	20%
Vietnam	1009	50%	50%	0%	24%	28%	23%	17%	7%	1%
Zambia	478	46%	54%	0%	31%	33%	16%	17%	2%	0%
Europe24	25987	48%	52%	0%	10%	16%	17%	18%	16%	23%
AsiaOceania9	8590	50%	49%	1%	26%	31%	19%	12%	6%	6%
America3	3009	48%	51%	0%	12%	17%	16%	17%	16%	20%
Africa12	7528	49%	51%	0%	26%	28%	19%	13%	7%	6%
TOTAL	45114	50%	50%	0.3%	14%	21%	20%	17%	13%	15%

Note. (1) Reference population: all road users. (2) Unweighted sample except for regional weighed means.

## 4.2 Educational level and internet penetration

In ESRA2 we asked the respondents to indicate the highest qualification or educational certificate that they had obtained. Figure 6 shows the educational level of the respondents by region (weighted means). Table 3 provides an overview of the educational level of the respondents by country and region and the internet use by country. In most countries the largest group was the one with secondary education diplomas followed by the group with a bachelor's degree. The educational level of respondents in most Asian and African countries was higher. Here, most of the respondents had a bachelor's degree. As this might differ from the actual distribution of educational levels in the national populations, this variable should be considered in further analyse and the interpretation of the results.

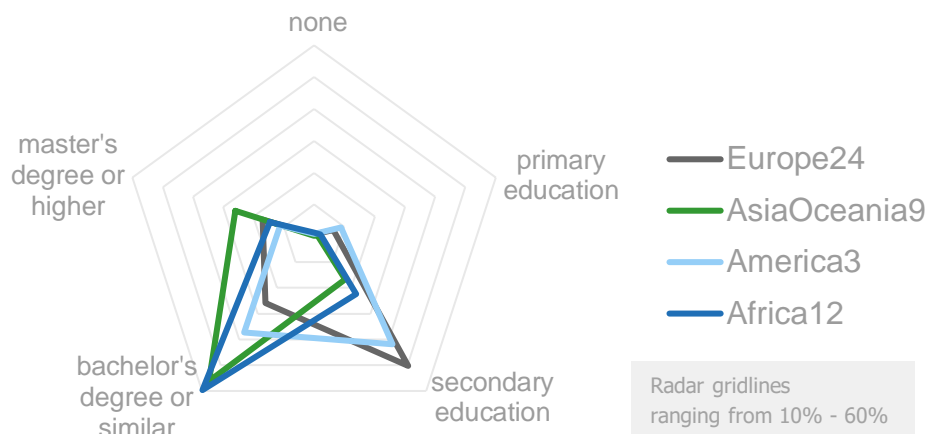


Figure 6: Educational level by region (weighted means)

Within the framework of the ESRA2 project contextual data was collected including the internet penetration in the participating countries (The World Bank Group, 2021). The internet penetration is used in the ESRA2 survey as an indicator for the representativity of an online panel sample for the national population. As Table 3 shows, the number of internet-users<sup>9,10</sup> is in most participating countries very high (on average 71%). It is above 60% in all countries, except for South Africa (56%), Egypt (47%), Nigeria (42%), Ghana (39%), Ivory Coast (36%), India (34%), Uganda (24%), Cameroon (23%), Benin (20%), Kenya (18%) and Zambia (14%), which indicates a limitation of the representativity of the online panel sample, as actually only a minority of the population uses the internet. This contextual information should be considered in further analyses and interpretation of the results.

<sup>9</sup> Includes people younger than 18y.

<sup>10</sup> For the first wave countries, the internet penetration in the year 2018 is reported, for the second wave countries the internet penetration in the year 2019 is reported.

Table 3. Internet penetration and highest qualification of the respondents by country and region (weighted means)

Country	Internet-users (per 100 people)	none	primary education	secondary education	bachelor's degree or similar	master's degree or higher
Australia	87	0%	1%	51%	38%	9%
Austria	88	0%	7%	68%	10%	15%
Belgium	89	1%	4%	46%	32%	16%
Benin	20	1%	2%	24%	59%	14%
Bulgaria	68	0%	1%	35%	24%	40%
Cameroon	23	3%	1%	21%	52%	23%
Canada	91	0%	3%	42%	43%	11%
Colombia	65	0%	1%	18%	67%	14%
Czech Republic	81	0%	5%	70%	8%	18%
Denmark	98	1%	16%	44%	29%	11%
Egypt	47	1%	1%	16%	68%	13%
Finland	89	0%	13%	54%	19%	14%
France	82	1%	6%	44%	32%	17%
Germany	90	0%	15%	57%	12%	15%
Ghana	39	1%	3%	21%	69%	6%
Greece	73	0%	1%	32%	49%	18%
Hungary	76	0%	3%	58%	24%	14%
Iceland	99	1%	17%	42%	29%	11%
India	34	0%	1%	9%	55%	36%
Ireland	85	0%	1%	46%	40%	12%
Israel	82	1%	1%	38%	46%	14%
Italy	74	0%	6%	58%	13%	23%
Ivory Coast	36	3%	7%	21%	46%	23%
Japan	85	0%	3%	42%	51%	4%
Kenya	18	0%	0%	14%	78%	7%
Lebanon	78	1%	3%	19%	50%	26%
Luxembourg	97	0%	1%	50%	25%	24%
Malaysia	84	1%	0%	37%	54%	8%
Morocco	65	2%	4%	20%	51%	23%
Netherlands	95	1%	3%	55%	32%	10%
Nigeria	42	0%	0%	14%	72%	14%
Norway	98	0%	8%	47%	33%	12%
Poland	78	0%	2%	49%	14%	35%
Portugal	75	0%	2%	45%	42%	11%
Republic of Korea	96	0%	1%	23%	66%	9%
Serbia	73	0%	1%	41%	34%	25%
Slovenia	80	0%	3%	52%	39%	5%
South Africa	56	0%	1%	51%	44%	4%
Spain	86	0%	4%	36%	46%	14%
Sweden	92	0%	10%	48%	33%	9%
Switzerland	90	0%	20%	43%	25%	12%
Thailand	67	1%	4%	31%	57%	7%
Tunisia	67	1%	3%	16%	51%	29%
Uganda	24	0%	0%	17%	76%	7%
United Kingdom	95	1%	1%	53%	36%	9%
United States	87	1%	10%	45%	33%	10%
Vietnam	69	1%	0%	23%	68%	7%
Zambia	14	0%	1%	33%	62%	4%
Europe24	68-99	1%	6%	50%	26%	17%
AsiaOceania9	34-96	0%	1%	17%	56%	26%
America3	65-91	1%	9%	42%	37%	11%
Africa12	14-67	1%	2%	22%	60%	15%

Note. (1) Reference population: all road users. (2) Weighted sample. (3) Source internet use per country: The World Bank Group (2021). (4) For the first wave countries, the internet penetration in the year 2018 is reported, for the second wave countries the internet penetration in the year 2019 is reported.

### 4.3 Use of transport modes

In ESRA2 we asked the respondents how often they used the following transport modes in the last 12 months. Table 4 presents an overview of percentage of respondents who answered that they use a certain mode of transport at least a few days a month (in our study defined as 'frequent use of transport modes'). Figure 7 presents these results per region (weighted means).

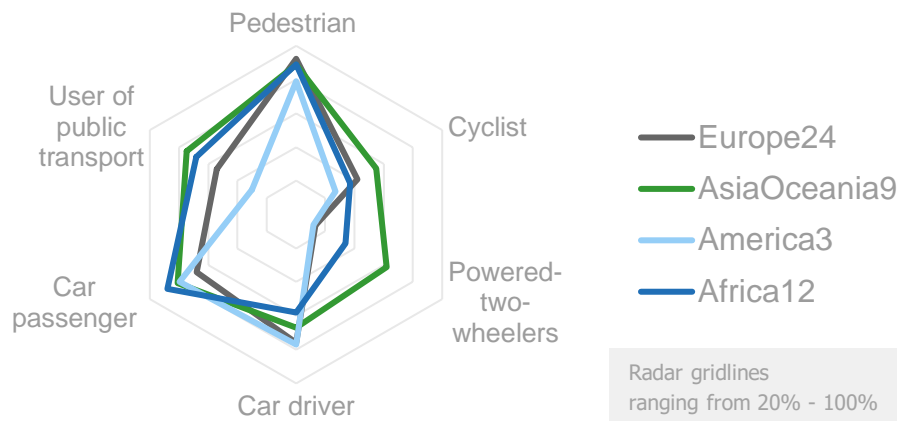


Figure 7: Frequent use of transport modes by region (weighted means)

The most striking differences between the regions are the frequent use of powered-two-wheelers, which is in the Asian Oceanian region clearly higher than in all other regions, and the frequent use of public transport and cycling, which is in America clearly lower than in all other regions. In most countries walking, car driving and being a passenger in the car are the most frequent transport modes. Riding a powered-two-wheeler is in all countries, except for Vietnam (93%), India (71%), Thailand (71%), Benin (63%), Cameroon (62%), Nigeria (48%), Malaysia (47%) and Ivory Coast (27%) the least frequently used transport mode.

Table 4: Frequent use of transport modes by country and region (weighted means)

Country	Pedestrian	Cyclist	Powered-two-wheelers A few days per month	Car driver	Car passenger	User of public transport
Australia	89%	21%	8%	80%	72%	46%
Austria	98%	49%	12%	49%	37%	33%
Belgium	90%	40%	11%	77%	63%	42%
Benin	95%	28%	63%	32%	77%	43%
Bulgaria	91%	41%	15%	68%	82%	67%
Cameroon	96%	25%	62%	43%	99%	64%
Canada	83%	28%	9%	77%	71%	38%
Colombia	93%	59%	36%	56%	89%	83%
Czech Republic	93%	35%	11%	61%	66%	64%
Denmark	95%	57%	8%	74%	79%	50%
Egypt	84%	41%	34%	60%	83%	77%
Finland	96%	49%	7%	71%	71%	48%
France	90%	27%	9%	78%	68%	45%
Germany	94%	50%	10%	76%	60%	49%
Ghana	93%	41%	40%	45%	95%	84%
Greece	94%	33%	22%	80%	83%	67%
Hungary	97%	58%	16%	71%	79%	70%
Iceland	81%	42%	27%	81%	62%	37%
India	91%	57%	71%	68%	87%	82%
Ireland	90%	30%	9%	77%	77%	51%
Israel	90%	14%	5%	84%	77%	53%
Italy	93%	48%	23%	88%	69%	56%
Ivory Coast	96%	19%	27%	31%	94%	58%
Japan	76%	42%	11%	64%	61%	54%
Kenya	95%	46%	38%	61%	94%	87%
Lebanon	85%	25%	18%	72%	64%	28%
Luxembourg	98%	34%	8%	91%	71%	48%
Malaysia	89%	45%	47%	86%	78%	52%
Morocco	85%	40%	33%	61%	84%	69%
Netherlands	91%	74%	14%	72%	58%	40%
Nigeria	91%	45%	48%	69%	94%	88%
Norway	95%	44%	9%	78%	69%	58%
Poland	93%	61%	12%	74%	72%	65%
Portugal	90%	24%	13%	87%	71%	47%
Republic of Korea	89%	39%	11%	71%	81%	90%
Serbia	96%	51%	14%	70%	90%	68%
Slovenia	96%	55%	15%	83%	72%	34%
South Africa	86%	27%	16%	83%	86%	35%
Spain	94%	38%	19%	80%	69%	67%
Sweden	95%	47%	12%	69%	74%	58%
Switzerland	97%	41%	13%	77%	66%	65%
Thailand	85%	65%	71%	65%	61%	57%
Tunisia	92%	37%	30%	61%	84%	60%
Uganda	94%	39%	39%	46%	96%	67%
United Kingdom	89%	24%	7%	67%	73%	55%
United States	77%	23%	10%	80%	81%	24%
Vietnam	95%	70%	93%	49%	72%	50%
Zambia	95%	36%	23%	53%	92%	83%
Europe24	92%	42%	13%	76%	68%	54%
AsiaOceania9	89%	55%	62%	67%	81%	75%
America3	79%	27%	12%	77%	80%	30%
Africa12	89%	37%	34%	58%	88%	68%

Note. (1) Reference population: all road users. (2) Weighted sample.

#### 4.4 Particularities in the countries of the African continent

Comprehensive safety data is important for effective road safety management. Safety data is essential for an evidence-based approach, particularly in producing results-focused strategies, action programmes and projects; identifying key crash types and locations; diagnosing the causes of serious and fatal injury in road traffic crashes; selecting treatments; and monitoring and evaluating progress.



Managing road safety data is a major challenge in most African countries. The United Nations Economic Commission for Africa (UNECA) found through a review of the implementation of the Africa Road Safety Action Plan (UNECA, 2015) that most of the countries that responded to the review were performing below average as far as data management is concerned. The review found that 40% or more of the countries reviewed have not taken any significant action on the following activities:

- establish baseline data on road safety;
- establish/strengthen/harmonise injury data system for health facilities;
- engage local research centres on road safety data management;
- build capacity for road safety data management;
- mandatory reporting, use of standardised data, and sustainable funding for road safety data management. Only few countries integrate and link information collected by various agencies, such as databases managed by police, the road safety lead agency, health systems insurance companies driver and vehicle licensing and registration etc.

The participation of selected African countries in the ESRA survey therefore represented a special opportunity to give a first overview of comparable road safety data across different countries.

Due to the lower level of internet penetration, methodological adjustments had to be made for some of these countries, in particular concerning the original sample size (at least  $N = 1,000$ ). This sample size was maintained for Egypt, Kenya, Morocco, Nigeria and South Africa, and adapted for Zambia (at least  $N = 500$ ), Ghana, Ivory Coast, Tunisia, Uganda (at least  $N = 400$ ), Benin (at least  $N = 300$ ) and Cameroon ( $N = 200$ ). Considering demographic characteristics and the very low internet penetration rate among the over 45s, it was also decided to adapt the age quotas for the African countries that participated in the second wave (ESRA\_2019). The quota in 6 age-group categories (18-24y, 25-34y, 35-44y, 45-54y, 55-64y, 65y+) were replaced by 4 age-group categories (18-24y, 25-34y, 35-44y, 45+) for these countries.

A special method has also been developed for Benin. Benin is one of the integrated countries with the lowest internet penetration rate (20%). For this reason, the expected sample size (at least  $N = 300$ ) could not be achieved by the usual online method. A face-to-face recruitment method was therefore developed to reach the rest of the sample. In the meantime, the occurrence of the Covid-19 crisis also led to the adaptation of some questions in the survey (see Appendix 1) and to a postponement of data collection to spring 2020.

## 5 Reporting and quality control

### 5.1 ESRA2 outputs

The key results of the ESRA2 survey will be published through a series of reports including a Main Report (to be published in 2021), the dedicated report on the African continent (Road Safety culture in Africa - Results from the ESRA2 survey in 12 African countries, 2021), this Methodology Report (Meesmann, Torfs, Wardenier & Van den Berghe, 2021), 15 Thematic Reports on different topics (driving under influence of alcohol and drugs, speeding, fatigue, distraction (mobile phone use), seat belt and child restraint systems, enforcement and traffic violations, subjective safety and risk perception, vehicle automation, pedestrians, cyclists, moped drivers and motorcyclists, young road users, senior road users, gender issues and support for policy measures; see Table 5) and 48 country fact sheets, in which national key results are compared to a regional mean (benchmark).

Table 5: ESRA2 Thematic Reports

Driving under influence of alcohol and drugs	Seat belt and child restraint systems	Pedestrians	Senior road users
Speeding	Enforcement and traffic violations	Cyclists	Gender issues
Fatigue	Subjective safety and risk perception	Moped drivers and motorcyclists	Support for policy measures
Distraction (mobile phone use)	Vehicle automation	Young road users	

The first wave outputs (32 countries) have been presented at the '2nd ESRA Symposium' in Brussels, Belgium (18/06/2019) and have also been published in a special issue in IATSS Research (<https://www.sciencedirect.com/journal/iatss-research/vol/44/issue/3>) (Pires et al., 2020; Meesmann & Nakamura, 2020). Results and news on the ESRA initiative is available on: [www.esranet.eu](http://www.esranet.eu).

### 5.2 Quality control

For all common ESRA2 outputs produced by the core group partners, the consortium defined and implemented a peer-review procedure. All Thematic Reports were peer reviewed by an independent core group member who was not involved in the writing but an expert in the field. This review procedure was coordinated by SWOV (the Netherlands).

### 5.3 Closing remarks

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 60 countries across six continents. The outputs of the ESRA project have become building blocks of national and international road safety monitoring systems.

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## Appendix 1: ESRA2 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. Thank you for your contribution!

### Socio-demographic information

**Q1) In which country do you live?** \_\_\_\_\_

**Q2) Are you ...** male – female – other (only in country who officially recognizes another gender)

**Q3a) In which year were you born?** Dropdown menu

**Q3b) In which month were you born?** Dropdown menu

**Q4\_1) 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

**Q4\_2) What is the highest qualification or educational certificate that your mother has obtained?** none - primary education - secondary education - bachelor's degree or similar - master's degree or higher - I don't know

**Q5a) Which of the following terms best describes your current professional occupation?** white collar or office worker (excluding executive)/employee (public or private sector) →Q5b - blue collar or manual worker/worker →Q5b - executive →Q5b - self-employed/independent professional →Q5b - currently no professional occupation →Q5c

**Q5b) Do you have to drive or ride a vehicle for work?** (Please indicate the job category that is most appropriate for you) yes, I work as a taxi, bus, truck driver, ... - yes, I work as a courier, mailman, visiting patients, food delivery, salesperson, ... - no

**Q5c) You stated that you currently have no professional occupation. Which of the following terms best describes your current situation? I am ...** a student - unemployed, looking for a job – retired - not fit to work - a stay-at-home spouse or parent - other

**Q6) What is the postal code of the municipality in which you live?** \_\_\_\_\_

**Q7) In which region do you live?** Drop down menu

**Q8a) How far do you live from the nearest bus stop, light rail stop, or metro/underground station?** less than 500 metres → Q8b - between 500 metres and 1 kilometre → Q8b - more than 1 kilometre → skip Q8b

**Q8b) What is the frequency of your nearest bus stop, light rail stop, or metro/underground station?** at least 3 times per hour - 1 or 2 times per hour - less than 1 time per hour

### Mobility & exposure

**Q9) Do you have a car driving licence or permit (including learner's permit)?** yes - no

**Q10) 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): walk minimum 100m (pedestrian; including jogging, inline skate, skateboard, ...) - cycle (non-electric) - cycle on an electric bicycle/e-bike/pedelec - drive a moped ( $\leq 50$  cc or  $\leq 4$  kW; non-electric - drive a motorcycle ( $> 50$  cc and  $> 4$  kW non-electric) - drive an electric moped ( $\leq 4$  kW) - drive an electric motorcycle ( $> 4$  kW) - drive a powered personal transport device such as an electric step, hoverboard, solowheel,... - drive a car (non-electric or non-hybrid) - drive a taxi - drive a bus as a driver - drive a truck/lorry - drive a hybrid or electric car - take a taxi or use a ride-hail service (e.g. Uber, Lyft) - take the train - take the bus - take the tram/streetcar - take the subway - take the aeroplane - take a ship/boat or ferry - be a passenger in a car - use another transport mode

**Q11) Over the last 30 days<sup>11</sup>, have you transported a child (<18 years of age) in a car? yes - no**

Items: below 150cm - above 150cm

**Self-declared safe and unsafe behaviour in traffic****Q12\_1a) Over the last 12 months, 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 all items: at least once (2-5) - never (1)

Items (random):

- drive after drinking alcohol
- drive faster than the speed limit outside built-up areas (but not on motorways/freeways)
- read a text message or email while driving

**Q12\_1b) Over the last 30 days, how often did you as a CAR DRIVER ...?<sup>12</sup>**

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 all items: at least once (2-5) - never (1)

Items (random):

- drive when you may have been over the legal limit for drinking and driving
- drive after drinking alcohol
- drive 1 hour after using drugs (other than medication)
- drive after taking medication that carries a warning that it may influence your driving ability
- drive faster than the speed limit inside built-up areas
- drive faster than the speed limit outside built-up areas (but not on motorways/freeways)
- drive faster than the speed limit on motorways/freeways
- drive without wearing your seatbelt
- transport children under 150cm without using child restraint systems (e.g. child safety seat, cushion)
- transport children over 150cm without wearing their seatbelts
- talk on a hand-held mobile phone while driving
- talk on a hands-free mobile phone while driving
- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving
- drive when you were so sleepy that you had trouble keeping your eyes open

**Q12\_2) Over the last 30 days, how often did you as a CAR PASSENGER ...?<sup>13</sup>** 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 all items: at least once (2-5) - never (1)

Item:

- travel without wearing your seatbelt in the back seat

**Q12\_3) Over the last 30 days, how often did you as a MOPED DRIVER OR MOTORCYCLIST ...?<sup>14</sup>** 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 all items: at least once (2-5) - never (1)

Items (random):

- ride when you may have been over the legal limit for drinking and driving
- ride faster than the speed limit outside built-up areas (but not on motorways/freeways)
- ride a moped or motorcycle without a helmet
- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while riding a moped or motorcycle

**Q12\_4) Over the last 30 days, how often did you as a CYCLIST ...?<sup>15</sup>** 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.

<sup>11</sup> For data collection in Benin, due to the covid-19 situation, some wordings of questions needed to be addressed. During this period, this sentence was phrased as follow: "During a typical month, do you transport a child (<18 years of age) in your car at least one day of the month?"

<sup>12</sup> For data collection in Benin, during covid-19 lockdown: "During a typical month, how often do you as a CAR DRIVER...?"

<sup>13</sup> For data collection in Benin, during covid-19 lockdown: "During a typical month, how often do you as a CAR PASSENGER ...?"

<sup>14</sup> For data collection in Benin, during covid-19 lockdown: "During a typical month, how often do you as a MOPED DRIVER OR MOTORCYCLIST ...?"

<sup>15</sup> For data collection in Benin, during covid-19 lockdown: "During a typical month, how often do you as a CYCLIST ...?"

Binary variable for all items: at least once (2-5) - never (1)

Items (random):

- 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 text message/email or check social media (e.g. Facebook, twitter, etc.) while cycling
- cycle on the road next to the cycle lane

**Q12\_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 all items: at least once (2-5) - never (1)

Items (random):

- listen to music through headphones as a pedestrian while walking in the streets
- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while walking in the streets
- cross the road when a pedestrian light is red
- cross the road at places other than at a nearby (distance less than 30m) pedestrian crossing

### Acceptability of safe and unsafe traffic behaviour

**Q13\_1) 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):

- drive when he/she may be over the legal limit for drinking and driving
- drive 1 hour after using drugs (other than medication)
- drive faster than the speed limit outside built-up areas (but not on motorways/freeways)
- not wear a seatbelt while driving
- transport children in the car without securing them (child's car seat, seatbelt, etc.)
- talk on a hand-held mobile phone while driving
- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving

**Q14\_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)

- drive when he/she may be over the legal limit for drinking and driving
- drive 1 hour after using drugs (other than medication)
- drive after taking a medication that may influence the ability to drive
- drive faster than the speed limit inside built-up areas
- drive faster than the speed limit outside built-up areas (but not on motorways/freeways)
- drive faster than the speed limit on motorways/freeways
- not wear a seatbelt while driving
- 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 hand-free mobile phone while driving
- read a text message/email or check social media (e.g. Facebook, twitter, etc.) while driving
- drive when they're so sleepy that they have trouble keeping their eyes open

### Attitudes towards safe and unsafe behaviour in traffic

**Q15) 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):

Normative believes & subjective norms (including injunctive norms from Q13)

- Most of my friends would drive after having drunk alcohol.
- Most of my friends would drive 20 km/h over the speed limit in a residential area.

Behaviour believe & 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.
- For short trips, it is not really necessary to use the appropriate child restraint.
- 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 (here: self-efficacy)

- I trust myself to drive after having a glass of alcohol.
- 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. half a liter of wine).
- I trust myself when I drive significantly faster than the speed limit.
- I am able to drive fast through a sharp curve.
- I trust myself when I check my 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.
- Even when I am a little drunk after a party, I drive.
- It sometimes happens that I drive after consuming a large amount of alcohol (e.g. a liter of beer or half a liter of wine).
- I often drive faster than the speed limit.
- I like to drive in a sporty fast manner through a sharp curve.
- It happens sometimes that I write a message on the mobile phone while driving.
- I often talk on a hand-held mobile phone while driving.
- I often check my messages on the mobile phone while driving.

#### Intentions

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

#### Quality control items

- Indicate number 1 on the answering scale.
- Indicate number 4 on the answering scale.

### Subjective safety & risk perception

**Q16) 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 Q10 are displayed.

**Q17) 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)

- driving after drinking alcohol
- driving after taking drugs (other than 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 day-dreaming while driving
- driving while tired

### Support for policy measures

**Q18) Do you oppose or support a legal obligation to ...?** 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 (random)

- install 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 the legal limit)
- have zero tolerance for alcohol (0,0 ‰) for novice drivers (licence obtained less than 2 years)
- have zero tolerance for alcohol (0,0 ‰) for all drivers
- install Intelligent Speed Assistance (ISA) in new cars (which automatically limits the maximum speed of the vehicle and can be turned off manually)



- install Dynamic Speed Warning signs (traffic control devices that are programmed to provide a message to drivers exceeding a certain speed threshold)
- have a seatbelt reminder system for the front and back seats in new cars
- require all cyclists to wear a helmet
- require cyclists under the age of 12 to wear a helmet
- require all moped drivers and motorcyclists to wear a helmet
- require pedestrians to wear reflective material when walking in the streets in the dark
- require cyclists to wear reflective material when cycling in the dark
- require moped drivers and motorcyclists to wear reflective material when driving in the dark
- have zero tolerance for using any type of mobile phone while driving (hand-held or hands-free) for all drivers
- not using headphones (or earbuds) while walking in the streets
- not using headphones (or earbuds) while riding a bicycle

**Q19\_1) What do you think about the current traffic rules and penalties in your country for driving or riding under the influence of alcohol?** agree – disagree

Items:

- The traffic rules should be stricter.
- The traffic rules are not being checked sufficiently.
- The penalties are too severe.

**Q19\_2) What do you think about the current traffic rules and penalties in your country for driving or riding faster than the speed limit?** agree – disagree

Items: Q19\_1

**Q19\_3) What do you think about the current traffic rules and penalties in your country for using a mobile phone while driving or riding?** agree – disagree

Items: Q19\_1

### Enforcement

**Q20\_1) On a typical journey, how likely is it that you (as a CAR DRIVER) will be checked by the police 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)

- ... alcohol, in other words, being subjected to a Breathalyser test
- ... the use of illegal drugs
- ... respecting the speed limits (including checks by a police car with a camera, fixed cameras, mobile cameras, and section control systems)
- ... wearing your seatbelt
- ... the use of hand-held mobile phone to talk or text while driving

**Q21\_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 - I prefer not to respond to this question

Binary variable: at least once - never (removing "I prefer not to respond to this Q")

**Q22\_1) In the past 12 months, how many times have you been checked by the police for the use of drugs (other than medication) while DRIVING A CAR?** never – 1 time – at least 2 times - I prefer not to respond to this question

Binary variable: at least once - never (removing "I prefer not to respond to this Q")

### Involvement in road crashes

Introduction: 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.

**Q23\_1a) In the past 12 months, how many times have you personally been involved in road crashes in which you or somebody else had to be taken to the hospital?** \_\_\_ times (number; max. 10) if 0 →

Q23\_2a; if >0 → Q23\_1b → Q23\_2a

Binary variable: at least once - never

**Q23\_1b) Please indicate the transport modes you were using at the time of these crashes.**

Items indicated by the respondent in Q10 are displayed; Threshold = 'at least a few days a year'.

Number to be indicated after each transport mode; note the sum should be equal to the number indicated in Q23\_1a

**Q23\_2a) In the past 12 months, how many times have you personally been involved in road crashes with only minor injuries (no need for hospitalisation) for you or other people? \_\_\_ times (number; max. 10) if 0 → Q23\_3a; if >0 → Q23\_2b → Q23\_3a**

Binary variable: at least once - never

**Q23\_2b) = Q23\_1b**

**Q23\_3a) In the past 12 months, how many times have you personally been involved in road crashes with only material damage?**

\_\_\_ times (number; max. number 10) if 0 → skip Q23\_3b; if >0 → Q23\_3b → next Q

Binary variable: at least once - never

**Q23\_3b) = Q23\_1b**

**Vehicle automation**

I2) Introduction: The following questions focus on your opinion about automated passenger cars. We talk about two different levels of vehicle automation:

Semi-automated passenger cars: Drivers can choose to have the vehicle control all critical driving functions, including monitoring the road, steering, and accelerating or braking in certain traffic and environmental conditions. These vehicles will monitor roadways and prompt drivers when they need to resume control of the vehicle.

Fully-automated passenger cars: The vehicle controls all critical driving functions and monitoring all traffic situations. Drivers do not take control of the vehicle at any time.

**Q24) How interested would you be in using the following types of automated passenger car?** You can indicate your answer on a scale from 1 to 7, where 1 is "not at all interested" and 7 is "very interested". The numbers in between can be used to refine your response.

Binary variable: interested (5-7) - not interested/neutral (1-4)

Items:

- semi-automated passenger car
- fully-automated passenger car

**Q25\_1) How likely do you think it is that the following benefits will occur if everyone would use a semi-automated passenger car?** 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):

- fewer crashes
- reduced severity of crash
- less traffic congestion
- shorter travel time
- lower vehicle emissions
- better fuel economy
- time for functional activities, not related to driving (e.g. working)
- time for recreative activities, not related to driving (e.g. reading, sleeping, eating)

**Q25\_2) How likely do you think it is that the following benefits will occur if everyone would use a fully-automated passenger car?** 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.

Items (random) = Q25\_1

**Bonus question to be filled in by national partner**

**Q26) .....** You can indicate your answer on a scale from 1 to 5, where 1 is "..." and 5 is "...". The numbers in between can be used to refine your response.

Items (random; 4 items)

**Q27) .....**? You can indicate your answer on a scale from 1 to 5, where 1 is "..." and 5 is "...". The numbers in between can be used to refine your response.  
Items (random; 4 items)

### Social desirability scale

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

**Q28) To what extent are the following statements true?** You can indicate your answer on a scale from 1 to 5, where 1 is "very untrue" and 5 is "very true". The numbers in between can be used to refine your response.  
Items (random):

- I always respect the highway code, even if the risk of getting caught is very low.
- I would still respect speed limits at all times, even if there were no police checks.
- I have never driven through a traffic light that had just turned red.
- I do not care what other drivers think about me.
- I always remain calm and rational in traffic. (if needed pop-up: rational = non-emotional)
- I am always confident of how to react in traffic situations.

## Appendix 2: Summary of ESRA2 fieldwork per country

ESRA2\_2018

Country	Panel provider	National subcontractor	National language versions	Sample size	Median LOI (minutes)	Start date field (yyyy-mm-dd)	End date field (yyyy-mm-dd)
<b>Australia</b>	Dynata (RN SSI)	Dynata (RN SSI)	English_AU	968	18.44	2018-12-14	2018-12-29
<b>Austria</b>	Punto de Fuga	CINT	German_AT	1999	18.57	2018-12-04	2018-12-18
<b>Belgium</b>	Dynata (RN SSI)	Dynata (RN SSI)	Dutch_BE; French_BE	1985	18.90	2018-12-14	2018-12-31
<b>Canada</b>	Dynata (RN SSI)	Dynata (RN SSI)	English_CA; French_CA	980	19.50	2018-12-19	2018-12-31
<b>Czech Republic</b>	Dynata (RN SSI)	Dynata (RN SSI)	Czech_CR	989	20.81	2018-12-14	2018-12-30
<b>Denmark</b>	Dynata (RN SSI)	Dynata (RN SSI)	Danish_DK	984	20.31	2018-12-14	2018-12-31
<b>Egypt</b>	Punto de Fuga	CINT	Arabic_EG; English_EG	996	21.92	2018-12-04	2018-12-24
<b>Finland</b>	Dynata (RN SSI)	Dynata (RN SSI)	Finnish_FI	994	20.04	2018-12-14	2018-12-27
<b>France</b>	Dynata (RN SSI)	Dynata (RN SSI)	French_FR	994	19.02	2018-12-14	2018-12-30
<b>Germany</b>	Dynata (RN SSI)	Dynata (RN SSI)	German_DE	1989	18.67	2018-12-14	2018-12-29
<b>Greece</b>	Ipsos (GfK)	Toluna	Greek_EL	1015	23.52	2018-12-05	2018-12-19
<b>Hungary</b>	Punto de Fuga	CINT	Hungarian_HU	1014	21.89	2018-12-04	2018-12-12
<b>India</b>	Punto de Fuga	CINT	Hindi_IN; English_IN	1035	24.12	2018-12-04	2018-12-12
<b>Ireland</b>	Ipsos (GfK)	Toluna	English_IE	1031	21.00	2018-12-05	2018-12-24
<b>Israel</b>	Dynata (RN SSI)	Panel4All	Hebrew_IL; English_IL	984	20.02	2018-12-17	2018-12-29
<b>Italy</b>	Dynata (RN SSI)	Dynata (RN SSI)	Italian_IT	980	20.04	2018-12-14	2018-12-24
<b>Japan</b>	Dynata (RN SSI)	Dynata (RN SSI)	Japanese_JP	980	17.37	2018-12-14	2018-12-25
<b>Kenya</b>	Punto de Fuga	CINT	Swahili_KE; English_KE	1000	30.55	2018-12-04	2018-12-13
<b>Morocco</b>	Punto de Fuga	CINT	Arabic_MA; French_MA	1047	27.05	2018-12-05	2018-12-23
<b>Netherlands</b>	Dynata (RN SSI)	Dynata (RN SSI)	Dutch_NL	983	19.19	2018-12-17	2018-12-27
<b>Nigeria</b>	Punto de Fuga	CINT	English_NG	1000	34.08	2018-12-04	2018-12-21
<b>Poland</b>	Dynata (RN SSI)	Dynata (RN SSI)	Polish_PL	993	22.04	2018-12-17	2018-12-31
<b>Portugal</b>	Punto de Fuga	CINT	Portuguese_PT	998	21.34	2018-12-04	2018-12-17
<b>Republic of Korea</b>	Ipsos (GfK)	Toluna	Korean_KR	1043	18.62	2018-12-05	2018-12-18
<b>Serbia</b>	Ipsos (GfK)	CINT	Serbian_RS	1041	24.00	2018-12-05	2018-12-18
<b>Slovenia</b>	Ipsos (GfK)	CINT	Slovenian_SI	1035	23.58	2018-12-05	2018-12-15
<b>South Africa</b>	Ipsos (GfK)	Toluna	Afrikaans_ZA; English_ZA	1013	28.28	2018-12-05	2018-12-19
<b>Spain</b>	Dynata (RN SSI)	Dynata (RN SSI)	Spanish_ES	980	20.61	2018-12-14	2018-12-28
<b>Sweden</b>	Dynata (RN SSI)	Dynata (RN SSI)	Swedish_SE	987	19.53	2018-12-17	2018-12-30
<b>Switzerland</b>	INFAS	Lightspeed	German_CH; French_CH; Italian_CH	1020	19.79	2019-01-04	2019-01-22
<b>United Kingdom</b>	Dynata (RN SSI)	Dynata (RN SSI)	English_UK	963	16.91	2018-12-14	2018-12-26
<b>USA</b>	Punto de Fuga	CINT	English_US	1016	16.93	2018-12-04	2018-12-11
<b>32</b>	<b>4</b>	<b>5</b>	<b>42</b>	<b>35036</b>	<b>20.82</b>	<b>2018-12-04</b>	<b>2019-01-22</b>

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Country	Panel provider	National subcontractor	National language versions	Sample size	Median LOI (minutes)	Start date field (yyyy-mm-dd)	End date field (yyyy-mm-dd)
<b>Benin</b>	Ipsos (GfK)	Ipsos (GfK)	French_BJ	272	41.16	2020-06-02	2020-07-06
<b>Bulgaria</b>	Punto de Fuga	CINT	Bulgarian_BG	1005	24.28	2019-12-10	2020-01-08
<b>Cameroon</b>	Punto de Fuga	CINT	French_CM; English_CM	204	39.16	2019-11-19	2020-01-08
<b>Colombia</b>	Punto de Fuga	CINT	Spanish_CO	1013	28.73	2020-04-17	2020-04-20
<b>Ghana</b>	Punto de Fuga	CINT	English_GH	378	37.03	2019-11-19	2020-01-15
<b>Iceland</b>	Ipsos (GfK)	Ipsos (GfK)	Icelandic_IS; English_IS	413	20.22	2020-06-01	2020-07-10
<b>Ivory Coast</b>	Punto de Fuga	CINT	French_CI	379	43.65	2019-11-19	2020-02-20
<b>Lebanon</b>	Ipsos (GfK)	Ipsos (GfK)	Arabic_LB; English_LB	1016	23.27	2020-06-01	2020-07-02
<b>Luxembourg</b>	TNS	TNS	French_LU	555	24.82	2020-06-25	2020-07-01
<b>Malaysia</b>	Dynata (RN SSI)	Dynata (RN SSI)	Malay_MY	529	22.30	2020-04-22	2020-04-29
<b>Norway</b>	Dynata (RN SSI)	Dynata (RN SSI)	Norwegian_NO	1040	20.05	2020-04-22	2020-04-28
<b>Thailand</b>	Dynata (RN SSI)	Dynata (RN SSI)	Thai_TH	1026	22.13	2020-04-22	2020-04-29
<b>Tunisia</b>	Punto de Fuga	CINT	Arabic_TN	383	26.70	2019-11-19	2019-12-23
<b>Uganda</b>	Punto de Fuga	CINT	English_UG	378	35.24	2019-11-19	2020-01-08
<b>Vietnam</b>	Ipsos (GfK)	Ipsos (GfK)	Vietnamese_VN	1009	21.82	2020-06-01	2020-06-09
<b>Zambia</b>	Punto de Fuga	CINT	English_ZM	478	39.00	2019-11-19	2020-01-08
<b>16</b>	<b>4</b>	<b>4</b>	<b>19</b>	<b>10078</b>	<b>25.65</b>	<b>2019-11-19</b>	<b>2020-07-10</b>



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