Baseline

Baseline report on the KPI Post-crash care

January 2023

Baseline

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Version history

Version	Date	Changes
1.0	February 17, 2021	First draft version using data collected in 2021.
2.0	August 23, 2022	Second draft version using data collected in 2022.
3.0	September 16, 2022	Third draft version using data collected until September 15, 2022
4.0	September 28, 2022	Fourth draft version after processing reviews of KEG members
5.0	December 21, 2022	Fifth draft version after processing reviews of countries that are data provider
6.0	January 19, 2023	Sixth draft version after last round or reviews

Contents

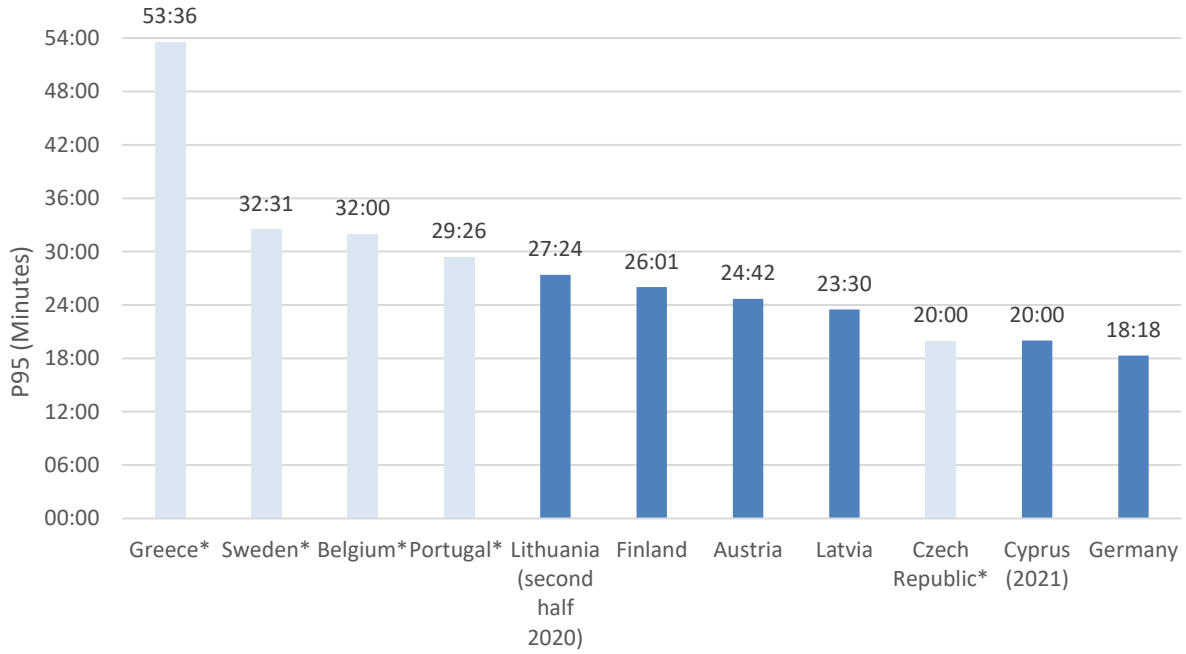
Executive summary

In the European Baseline project, countries provide data and estimates for 8 KPI's that are indicative of a country's level of road safety. This report is about the KPI post-crash care. The KPI is defined as "the time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services". The response time starts from the moment that the call is taken by the dispatching centre (not when the call is closed) and ends when the EMS unit arrives at the crash scene (not when the first medical services are delivered). This specific KPI is chosen because the time needed for the Emergency Medical Services to arrive at the crash scene plays an essential role to minimise the consequences of the crash. Eleven countries provided data and estimates related to the post-crash KPI.

The Baseline project formulates a set of minimum requirements that the KPI estimate for post-crash care must meet, including, for example, the requirement that the KPI estimate cover all types of road accidents and be representative of a country's entire territory. Five of the eleven countries that provided the KPI estimate deviate so much from the requirements that we cannot guarantee their representativeness and comparability with the other countries. These countries are light-coloured in the figure below. Their ranking in the figure should be treated with caution. Germany appears to have the shortest 95th percentile of response times.

Actual differences in KPI estimates may be related to the availability of ambulances and ambulance personnel, road and traffic conditions, and the accuracy of accident site descriptions (Elvik et al., 2009). In addition, it may also be related to the location and density of hospitals providing EMS services.

Figure 1. Post-crash care KPI estimates, P95 of EMS response times, 2019



* Representativeness of data and/or comparability with other countries not guaranteed

With regard to breakdowns of the KPI estimate, we see in terms of road type that response times are longest on rural roads and in terms of period of the week that response times are shortest at daytime during weekdays. The ranking of the countries is not very different when based on the 50th percentile compared to the 95th percentile.

We recommend keeping the current definition of the KPI, focusing more on a comparison of the evolution between countries than of the absolute values of the KPIs and on an extension of KPI estimate breakdowns.

Introduction

1.1 Context

The Communication of the European Commission "Europe on the Move – Sustainable Mobility for Europe: safe, connected and clean" of the 13th of May 2018 confirmed the EU's long-term goal of moving close to zero fatalities in road transport by 2050 and added that the same should be achieved for serious injuries. It also proposed new interim targets of reducing the number of road deaths by 50% between 2020 and 2030 as well as reducing the number of serious injuries by 50% in the same period. To measure progress, the most basic – and important – indicators are of course the result indicators on deaths and serious injuries.

In order to gain a better understanding of the different issues that influence overall safety performance, the Commission has elaborated, in cooperation with Member State experts, a first set of key performance indicators (KPIs). The list of the KPIs is given in *Table 1*. The minimum requirements for these KPIs are described in the *Commission Staff Working Document SWD (2019) 283*, further referred to as 'SWD'.

Table 1. List of European KPIs for road safety

KPI area	KPI definition
Speed	Percentage of vehicles travelling within the speed limit
Safety belt	Percentage of vehicle occupants using the safety belt or child restraint system correctly
Protective equipment	Percentage of riders of PTWs and bicycles wearing a protective helmet
Alcohol	Percentage of drivers driving within the legal limit for blood alcohol content (BAC)
Distraction	Percentage of drivers not using a handheld mobile device
Vehicle Safety	Percentage of passenger cars with a Euro NCAP safety rating equal or above a threshold
Infrastructure	Percentage of distance driven over roads with a rating above an agreed threshold
Post-crash care	Time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services

Funding has been made available by the European Commission to support Member States in the data collection and analysis for these KPIs. Eighteen Member States participate in a common project, called "Baseline". The aim of the BASELINE project, funded partially by the European Commission, is to assist participating Member States' authorities in the collection and harmonized reporting of these KPIs and to contribute to building the capacity of Member States which have not yet collected and calculated the relevant data for the KPIs. The outcomes of this project will be used to set future European targets and goals based on the KPIs.

1.2 Participation in Baseline

The following EU Member States participated in the Baseline project: Austria; Belgium; Bulgaria; Cyprus; Czech Republic; Finland; Germany; Greece; Ireland; Latvia; Lithuania; Luxembourg; Malta; The Netherlands; Poland; Portugal; Spain; Sweden. Some data regarding KPIs of EU Member States that were not participating in Baseline are also included in the deliverables. Not all countries participating in the Baseline project provide data for all KPIs.

1.3 Final deliverables of the Baseline project

The final public outcomes and deliverables of the Baseline project are:

- Eight specific reports, each on one KPI
- A dashboard with the KPIs
- A website on which all public information is accessible
- A final report including the key results of the project and recommendations for next steps.

This document is the report providing information on the ***KPI Post-crash care***. This KPI has been defined as:

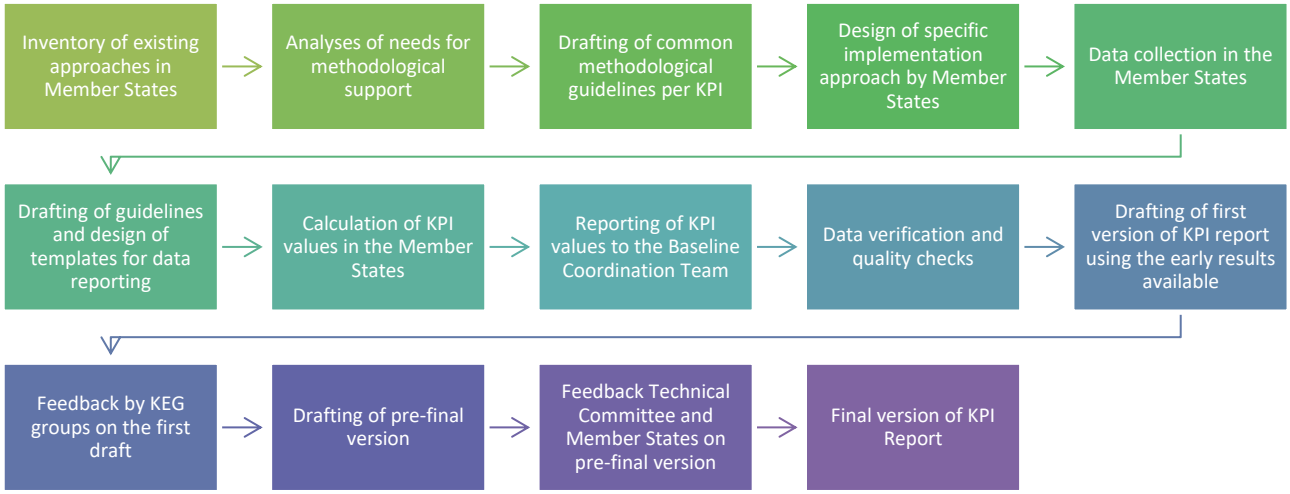
"Time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services (to the value of the 95th percentile)."

Methodology

1.4 Overall process

The process followed for arriving at this report is summarized in the following scheme:

Figure 2. Process leading to this report



For each KPI, a "KPI Expert Group" (KEG) was established, which was responsible for the design of the methodological guidelines and for the review of a draft version of this report. The KEG for the post-crash indicator consisted of the following persons:

- Wouter Van den Berghe, Vias institute (Belgium)
- Nina Nuyttens, Vias institute (Belgium)
- Maria Segui-Gomez, consultant (Spain)
- Wendy Weijermars, SWOV (the Netherlands)

The overall process was overseen by the Technical Committee, which focused in particular on issues that were important for several KPIs (e.g. structure and content of methodological guidelines, minimum samples, number of observations and locations, weighting of data, data reporting, etc.). The Technical Committee consisted of:

- Peter Silverans, Vias institute (Belgium) - Coordinator
- Wouter Van den Berghe, Vias institute (Belgium)
- Frits Bijleveld, SWOV (Netherlands)
- Sheila Ferrer López, DGT (Spain)
- Peter Larsson, Trafikverket (Sweden)
- Markus Schumacher, BASt (Germany)
- Veronika Valentova, CDV (Czech Republic)
- George Yannis, NTUA (Greece)

1.5 Support tools developed

For every KPI, methodological guidelines were developed, covering topics such as:

- definition of the KPI concerned, and possibly complementary or alternative KPIs
- methods to be used for data collection
- breakdowns requested of the KPI values (road category, vehicle type, day of week, …)
- minimum sample of observations/cases and observation locations
- methods for weighting and analysing the data
- nature and format of data to be reported

The methodological guidelines of the KPI Post-crash care can be accessed from the Baseline website via this link. Many elements of the Methodological Guidelines have been integrated in this report, either within the main body of the text, or as part of the Annex.

In order to streamline and harmonize the data flow, data reporting guidelines and data reporting templates were developed. The data reporting templates (in Excel) were used by the Member States for reporting their KPI values to the Baseline Coordination Team.

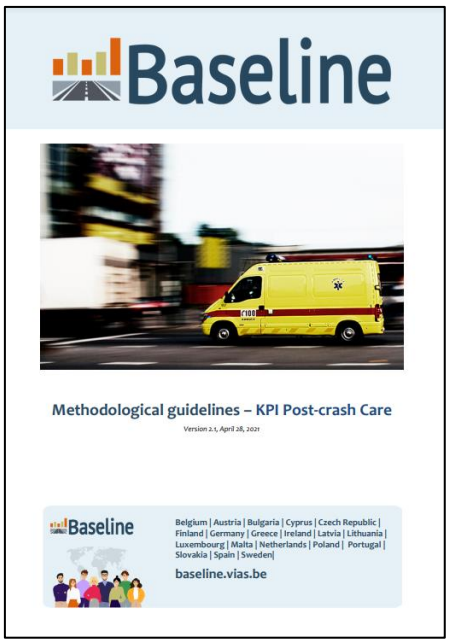


Figure 3.Data reporting template

Year	Road Type	Month	Time period	E-call warning	Number of accidents	95th percentile
2019	(all roads)	Jan-Total	(all periods)	(all options)	1754	00:32:11
2019	(all roads)	Feb-Total	(all periods)	(all options)	1468	00:34:39
2019	(all roads)	Mar-Total	(all periods)	(all options)	1463	00:34:43
2019	(all roads)	Apr-Total	(all periods)	(all options)	1423	00:31:23
2019	(all roads)	May-Total	(all periods)	(all options)	1616	00:30:49
2019	(all roads)	Jun-Total	(all periods)	(all options)	1826	00:32:44
2019	(all roads)	Jul-Total	(all periods)	(all options)	1790	00:33:47
2019	(all roads)	Aug-Total	(all periods)	(all options)	1730	00:30:51
2019	(all roads)	Sep-Total	(all periods)	(all options)	1663	00:30:08
2019	(all roads)	Oct-Total	(all periods)	(all options)	1771	00:31:28
2019	(all roads)	Nov-Total	(all periods)	(all options)	1883	00:32:29
2019	(all roads)	Dec-Total	(all periods)	(all options)	1761	00:33:52
2019	(all roads)	(all months)	weekday/daytime-Total	(all options)	11020	00:31:39
2019	(all roads)	(all months)	weekday/night-time-Total	(all options)	3016	00:32:47
2019	(all roads)	(all months)	weekend/daytime-Total	(all options)	3309	00:34:18
2019	(all roads)	(all months)	weekend/night-time-Total	(all options)	2803	00:32:31
2019	(all roads)	(all months)	(all periods)	(all options)	20148	00:32:31

1.6 Definition of response times

This KPI has been defined as: "Time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services (to the value of the 95th percentile)." The Emergency Medical Services (EMS) response times used to calculate the KPI estimate should only refer to road crashes and no other accidents for which an intervention of an EMS unit is needed. The time starts from the moment that the call is taken by the dispatching centre (not when the call is closed) and ends when the EMS unit arrives at the crash scene (not when the first medical services are delivered). This specific KPI is chosen because the time needed for the Emergency Medical Services to arrive at the crash scene plays an essential role to minimise the consequences of the crash (European Commission, 2019). A meta-analysis of response times in several countries, found that 10%-13% of traffic fatalities could (probably) be prevented by better and faster trauma treatment; similar percentages also apply to serious injuries (Vis et al., 2005).

1.7 Minimum and optional requirements for the KPI Post-crash care

The minimum requirements for the KPI Post-crash care are given in *Table 2*. The table also includes optional supplementary additions. Baseline partner countries had the option of either just meet the minimum requirements or to extend (part of) their methodology and include other elements.

Table 2. Minimum requirements and optional additions for the KPI Post-crash care

	Minimum requirement	Optional additions
KPI definition	• Time elapsed between the emergency call following a collision resulting in personal injury and the arrival at the scene of the collision of the emergency services (to the value of the 95th percentile). The unit of measurement is minutes and seconds.	Additional percentiles: • 25th percentile (1st quartile) • 50th percentile (median) • 75th percentile (3rd quartile) • 85th percentile.
Conditions	• Only response times referring to road crashes • KPI should refer to all road crashes (involving any type of vehicle) • Only first emergency medical units. Consecutive medical units should not be included. • All types of interventions included (with and without a medical doctor) • The timestamp for the emergency call should refer to the moment when the call starts (not when the call is closed) • The timestamp for the arrival is when the emergency unit arrives at the crash scene • KPI estimate should refer to the whole year of 2019 • KPI should be representative of the whole Member State territory	Additional years in addition to 2019

In addition, Member States are asked to provide, if possible, breakdowns of the KPI post-crash care across different characteristics. All breakdowns (see *Table 3*) are optional.

Table 3. Optional breakdowns for the KPI Post-crash care

	Optional breakdowns
Locations	• By degree of urbanization (Eurostat classification using three categories: cities, towns & suburbs, rural areas) • By area type (Eurostat classification using three categories: predominantly rural regions, intermediate regions and predominantly urban regions) • By NUTS 3 level (geographical classification of subnational units by Eurostat) • By municipality
Vehicle types	Breakdown by transport mode (categories to be chosen by Member State)
Road types	Breakdown by motorways, rural roads (defined as roads outside built-up areas, but no motorways), urban roads (defined as roads inside built-up areas)
Time periods	• By month • By day of the week • By hour

	• By exact date and hour
Crash severity	Breakdown by: • Number of casualties in the crash (incl. fatalities) • Number of fatalities in the crash
Type of emergency services	• Breakdown by Medical Emergency Services, Fire and Rescue Services, or both • Breakdown by EMS vehicle equipment (mobile intensive care unit, basic life support unit, regular ambulance) • Breakdown by presence of emergency physician at crash : yes/no
eCall	• eCall activated: yes/no

Results

In this chapter, we focus on the year 2019. In the Methodological Guidelines, Member States have been asked to provide the KPI estimate for 2019, as the years after 2019 are affected by the covid pandemic.

1.8 Metadata

Table 4 shows the list of countries that provided the KPI estimate post-crash care and their metadata. Almost all countries provided data for the year 2019, except Cyprus that only provided data for 2021, and Lithuania that provided data for 2020 (second half) and 2021 (first half), corresponding to 12 consecutive months in total. Some countries provided no breakdowns, while others managed to provide (almost) all breakdowns.

Table 4. Member states participating and metadata

	Data source	Avai-lable years	Number of observations 2019	Coverage - representativeness	Breakdowns included (at least 1st level of disaggregation)
Austria	Database(s) covering whole country. "9 regions databases"	2019	28101 crashes (unweighted data)	Full coverage of the country (all road crash interventions included).	Road type Month Time period
Belgium	Database covering whole country. "Federal Public Service Health, database about ambulance interventions (=ambureg)"	2019-2020	2581 crashes (unweighted data)	No full coverage, lack of variable to select road crashes directly[1]. Moreover, interventions of EMS units involving a doctor or interventions involving nurses are not included. An additional 15,5% of interventions are not included because of unknown "timestamp arrival at the scene of the road crash". Level of representativeness cannot be assessed.	Month Time period
Cyprus	Database covering whole country. Ambulance Services of Cyprus.	2021	672 (unweighted data)	All regions are covered. Stratified random sampling with regions as strata. 10,7% of the interventions are excluded because of unknown timestamps. Data provider is not aware of any bias in the data.	No breakdowns
Czech Republic	Regional database. "Medical rescue services of the region Hradec Králové"	2019-2020	1405 crashes (unweighted data)	No full coverage, regional database. Road type distribution of the selected regional data is typical for the country according to	No breakdowns

[1] Crashes are selected indirectly: when the category "securing environment and road safety" of the variable "additional to 112 requested resources: reasons to request police" is ticked and the category "public road" of the variable "type of place of intervention" is ticked, it is assumed that the intervention is related to a crash.

				data provider. Still, degree of representativeness is difficult to assess.	
Finland	Database covering mainland Finland. Åland Islands are excluded. "PRONTO-database: Resource and accident statistics database of the Finnish rescue services."	2019-2020	6174 crashes (unweighted data)	Almost full coverage of the country. All road crash interventions covered, except for interventions on Åland Islands	Road type Month Time period eCall
Germany	Regional databases. Stratified Cluster-Sampling of EMS Dispatch-Centers	2019-2020	66900 (weighted data)	Stratified cluster-sampling and extrapolation by population in each stratum. Data provider is not aware of any bias in the data.	No breakdowns
Greece	The national EMS database covers only 17 out of 74 regions or 54% of the population.	2019-2020	19345 (unweighted data)	Stratified cluster-sampling and extrapolation by population in each stratum. Still, there is no full coverage of the whole country as the weighting procedure does not take into account the Greek Islands and western Greece. 8% of the interventions are excluded because of unknown timestamps. Level of representativeness cannot be assessed.	Month
Latvia	Database covering whole country. "State Emergency Medical Service"	2019-2020	3403 interventions (unweighted data)	Almost full coverage. 5% of the interventions are excluded because of unknown start of the emergency call.	Road type
Lithuania	Database(s) covering whole country. "Emergency medical service dispatching centers and national Emergency Response Centre 112"	July 2020 – June 2021	1391 crashes in second half 2020 1835 crashes in first half 2021 (unweighted data)	No data available for the year 2019. Full coverage for twelve months starting from July 2020 till June 2021.	Road type
Portugal	Database covering mainland Portugal. Açores and Madeira Islands are not included.	2019	2127 crashes (unweighted)	Interventions on Açores and Madeira Islands are not included. 94% of interventions are not included because of unknown "timestamp arrival at the scene of the road crash". For the remaining crashes, the level of	Road type eCall

				representativeness was evaluated (in terms of road type and NUTSIII). Sufficient representativeness is not guaranteed	
Sweden	Database covering whole country. "Data received from SOS Alarm, a state-owned company that is responsible for the emergency number in Sweden."	2019-2020	20148 crashes (unweighted)	No full coverage. Crashes without motorized vehicle involved are excluded. Therefore, not fully comparable to other countries.	Month Time period

Based on the information in Table 4, the representativeness of the data and the KPI estimate is ambiguous for at least five countries. These are, on the one hand, Belgium and Sweden, due to a biased selection of road crash interventions and, on the other hand, the Czech Republic, Greece, and Portugal due to a fairly incomplete and thus possibly biased selection of road crash interventions.

Deviations of countries from the Baseline minimum requirements are shown in ***Table 5***. Examples of deviations are:

- The KPI estimate does not refer to the whole national territory
- The KPI estimate is not delivered in seconds but in minutes
- The KPI estimate does not cover all types of crashes involving any type of vehicle

Table 5. Deviations from Baseline minimum requirements (as stated in Table 2)

	Deviations from KPI Guidelines
Austria	/
Belgium	KPI estimate delivered in minutes, not in seconds. Not all interventions are included: - No variable that allows road crashes to be selected directly from the EMS interventions. They are selected based on the values of proxy variables, leading to underreporting and possible bias of the number of road crashes (see footnote 1). - Not all types of interventions are included. Interventions of EMS units involving a doctor or interventions involving nurses are not included. - An additional 15,5% of interventions are not included because of unknown "timestamp arrival at the scene of the road crash".
Cyprus	KPI estimate delivered in minutes, not in seconds. 10,7% of the interventions are excluded because of unknown timestamps. KPI estimate only available for 2021 and not for 2019 or 2020.
Czech Republic	KPI estimate delivered in minutes, not in seconds. Not all interventions are included: KPI estimate is based on one out of fourteen regions.
Finland	Åland Islands are excluded from KPI estimate.
Germany	/
Greece	Western Greece and Greek Islands are excluded from KPI estimate. 8% of the interventions are excluded because of unknown timestamps.
Latvia	5% of the interventions are excluded because of unknown start of the emergency call.

Lithuania	No KPI estimate available for a full year. Two KPI estimates available: one for July-December 2020, another one for January-June 2021.
Portugal	Açores and Madeira Islands are excluded from KPI estimate. Not all interventions are included: 94% of interventions are not included because of unknown "timestamp arrival at the scene of the road crash".
Sweden	Not all interventions are included: only crashes involving at least one motor vehicle are included.

Most countries use a national database of EMS interventions for KPI estimation. This was not possible for three countries, the Czech Republic, Germany, and Greece. Although these three countries also use database(s) to estimate the KPI at the national level, these databases do not cover (almost) the entire national territory. The Czech Republic only had access to a database of a specific region, Hradec Králové. Germany conducted a stratified cluster-sampling of EMS Dispatch Centers. The Greek database is called a national database but covers only 17 of 74 regions or 54% of the population. For this reason, we classify Greece under the category "database not covering the whole country". ence, to estimate the KPI, 8 of the 11 countries used a national administrative database that covers the whole country and selected all calls related to road crashes.

Figure 3. Data source

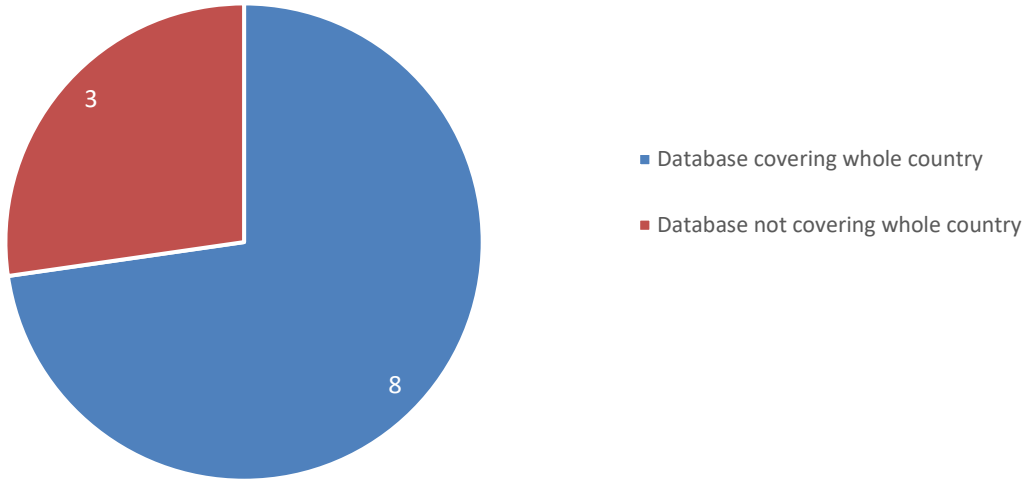
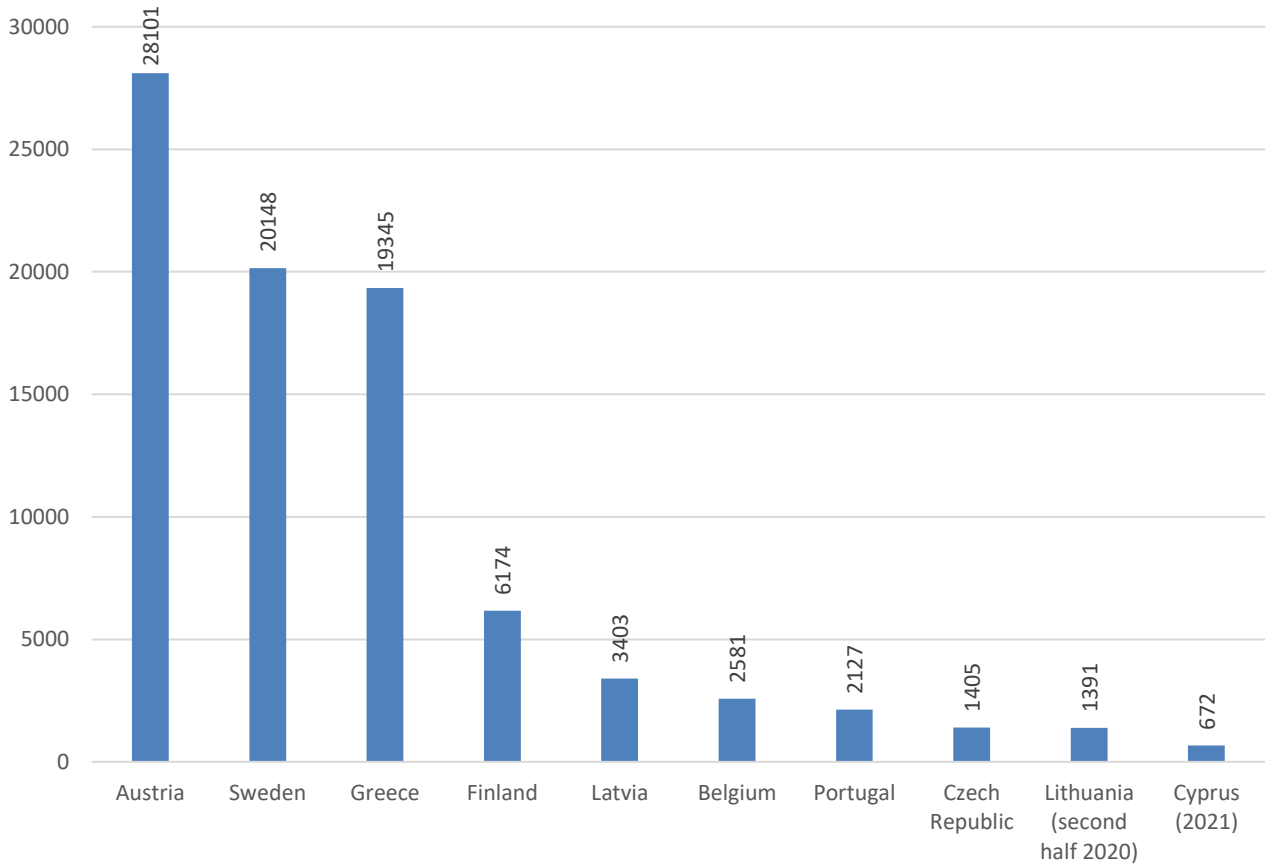


Figure 4 presents the number of unweighted observations on which the countries' KPI estimate is based (see column "Number of observations 2019" in *Table 4*). One observation corresponds to one crash or one EMS intervention. For some countries, their unweighted data do not cover all road crash interventions in the country. This is largely the case for Belgium, Cyprus, the Czech Republic, Greece, and Portugal, and to a smaller extent for Sweden, Finland, and Latvia. As for Lithuania, the number of observations covers half a year (second half of 2020). The country with the highest number of observations is Austria. The Czech Republic and Lithuania show the lowest numbers of observations. Germany is not included in the figure as only a weighted figure was provided.

Figure 4. Number of observations/interventions (unweighted data), 2019

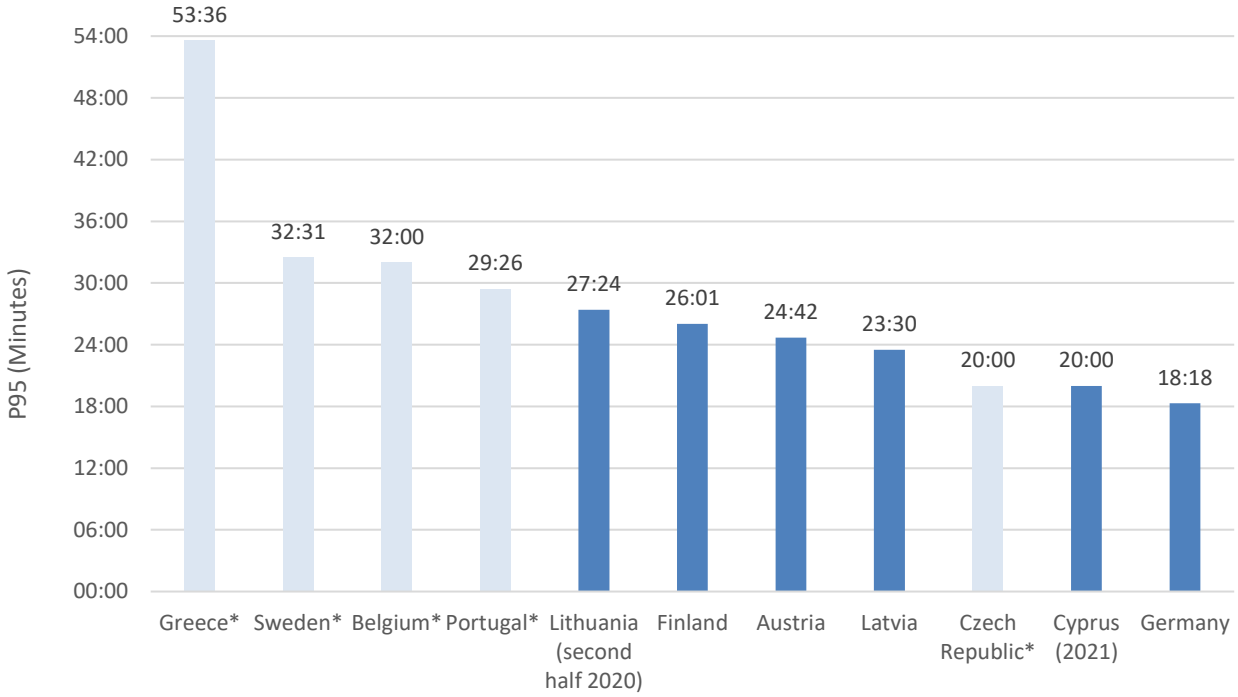


1.9 General country comparison

Figure 5 shows the post-crash care KPI estimates for the EU Member States. KPI estimates vary broadly between 18 and 54 minutes. Germany appears to have the shortest 95th percentile of response times. Greece appears to have the longest 95th percentile. According to the Greek data provider, this may be explained by a high number of remote areas that are difficult for ambulances to reach (although the KPI estimate does not include islands or western Greece). It also cannot be excluded that the high value of the KPI is related to data quality.

Because of the differences between countries in data collection, data coverage and because of respective deviations from Baseline guidelines (see Chapter 1.8), it cannot be ruled out that observed differences in KPI estimates are sometimes due to the respective methodologies used rather than to real differences in KPI estimates. "Real" differences in KPI estimates may be related to the availability of ambulances and ambulance personnel, road and traffic conditions, and the accuracy of accident site descriptions (Elvik et al., 2009). In addition, it may also be related to the location and density of hospitals providing EMS services. The unweighted average 95th percentile of EMS response times is 27 minutes and 57 seconds.

Figure 5. Post-crash care KPI estimates, P95 of EMS response times, 2019



* Representativeness of data and/or comparability with other countries not guaranteed

1.10 Breakdown by year

KPI estimates are available for seven countries for both 2019 and 2020. The year 2020 falls during the COVID pandemic. Therefore, this report mainly presents figures for 2019, and caution is needed when comparing the two years. Regarding the seven countries that have data for both years, we see that for four of them, the response time in 2020 is shorter than in 2019; for two of them, the response time is longer; for one, the response time remains the same.

Table 6. Post-crash care KPI estimates, P95 of EMS response times, 2019-2021

	2019	2020	2021
Austria	24:42	/	/
Belgium*	32:00	33:00	/
Cyprus	/	/	20:00
Czech Republic*	20:00	20:00	/
Finland	26:01	25:32	/
Germany	18:18	18:00	/
Greece	53:36	49:00	/
Latvia	23:30	22:37	/
Lithuania	/	27:24 (second half 2020)	28:56 (first half 2021)
Portugal*	29:26	/	
Sweden*	32:31	32:52	/

***** Representativeness of data and/or comparability with other countries not guaranteed

1.11 Breakdown by road type

For all countries that provided data by road type where the crash occurred, response times are longest on rural roads. Depending on the country, the second longest response times are found on urban roads or motorways. The variation of response times by road type is greater for Finland than for other countries in ***Figure 6***.

The fact that response times are longest on rural roads also implies that countries with a high proportion of rural roads will possibly have a higher overall post-crash care KPI estimate. Latvia differs geographically from the other participating Member States in that it has no motorways. This may affect the value of Latvia's overall KPI estimate.

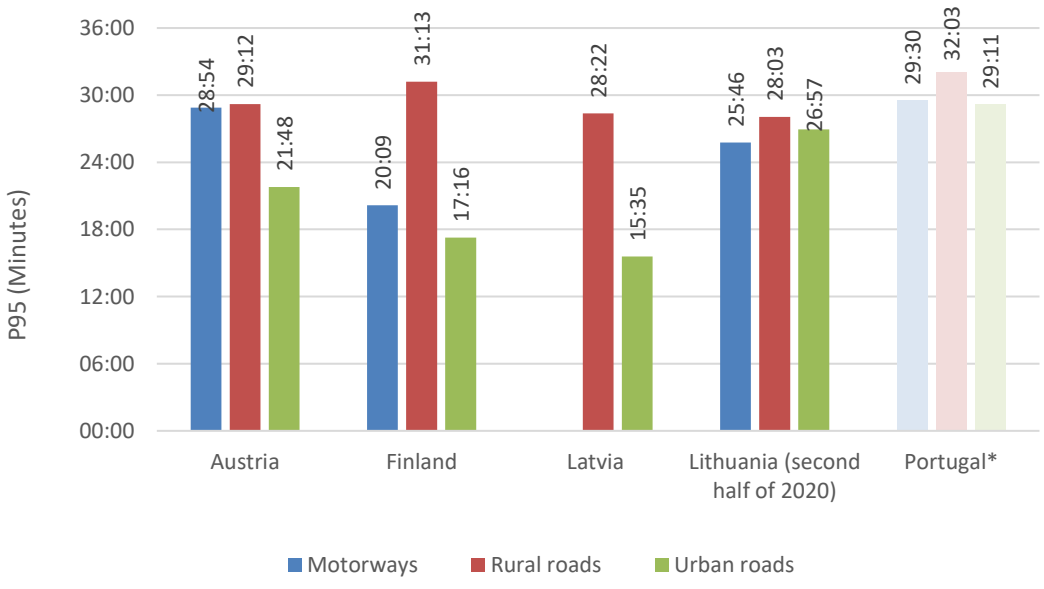
Chapter 1.18 presents the definitions used for the three categories of road type. The definitions of the five countries in ***Figure 6*** are somewhat similar. Depending on the country, "urban roads" are roads in "built-up areas", roads in "cities", or roads in "urban areas". "Rural roads" are roads outside "built-up areas", "cities", or "urban areas", excluding motorways. However, none of the three categories, including motorways, are comprehensively defined. In practice, therefore, the three road type categories might be quite different in terms of, among other things, type of environment and type of infrastructure. Dissimilar definitions make cross-country comparisons less reliable (see Chapter 1.16).

Table 7. Post-crash care KPI estimates, P95 of EMS response times, per road type, 2019

	Motorways	Rural roads	Urban roads
Austria	28:54	29:12	21:48
Finland	20:09	31:13	17:16
Latvia	No motorways in Latvia	28:22	15:35
Lithuania (second half of 2020)	25:46	28:03	26:57
Portugal*	29:30	32:03	29:11

* Representativeness of data and/or comparability with other countries not guaranteed

Figure 6. Post-crash care KPI estimates, P95 of EMS response times, per road type, 2019



* Representativeness of data and/or comparability with other countries not guaranteed

1.12 Breakdown by time period

For all countries that provided data by time period, response times are shortest at daytime during weekdays. During weekdays, response times at night are longer than during the day for all countries. This also applies to weekends (although Sweden is an exception to this rule). The variation of response times by time period is greater for Finland than for the other countries in Figure 6.

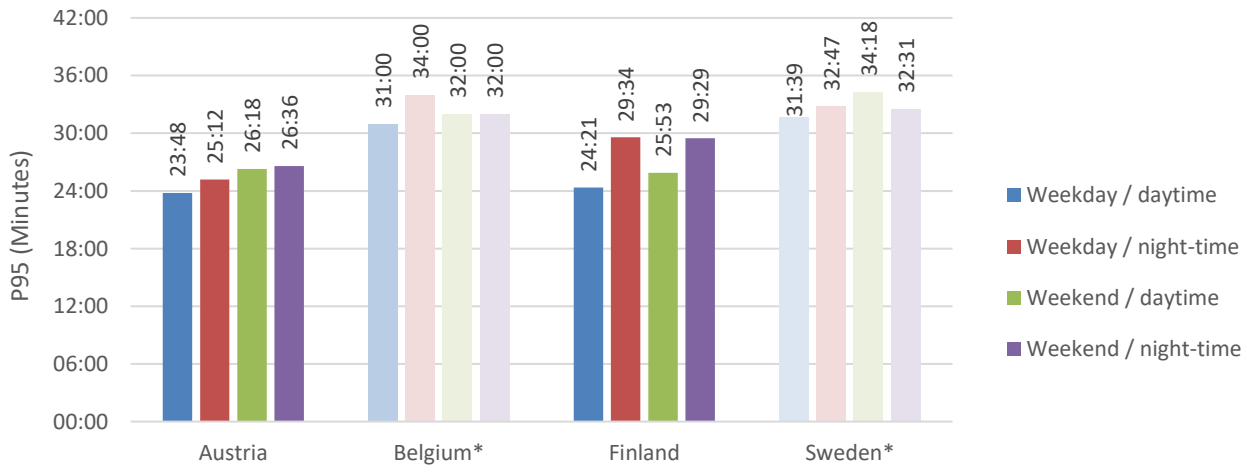
Chapter 1.19 presents the definitions used for the four categories of time period. The definitions of the four countries in ***Figure 7*** are quite different. This is best illustrated by the description of one time period, namely weekend nights. Only in one country (Sweden) are some hours on Friday and Monday considered weekend nights; in the other countries, all hours of weekend nights fall on Saturday or Sunday. Moreover, weekend nights start at a different time in each country, between 7 p.m. (Sweden) and 10 p.m. (Belgium). The different definitions make comparisons between countries less reliable (see Chapter 1.16). When the Baseline project is repeated, the definitions of the four time periods should be homogenized across countries.

Table 8. Post-crash care KPI estimates, P95 of EMS response times, per time period, 2019

	Weekday / daytime	Weekday / night-time	Weekend / daytime	Weekend / night-time
Austria	23:48	25:12	26:18	26:36
Belgium*	31:00	34:00	32:00	32:00
Finland	24:21	29:34	25:53	29:29
Sweden*	31:39	32:47	34:18	32:31

***** Representativeness of data and/or comparability with other countries not guaranteed

Figure 7. Post-crash care KPI estimates, P95 of EMS response times, per time period, 2019



* Representativeness of data and/or comparability with other countries not guaranteed

1.13 Breakdown by month

Figure 8 shows the results for all countries that provided data by month. It is difficult to observe a clear seasonal trend per country, let alone for the five countries together.

Figure 8. Post-crash care KPI estimates, P95 of EMS response times, per month, 2019

***** Representativeness of data and/or comparability with other countries not guaranteed

1.14 Breakdown by involvement of eCall

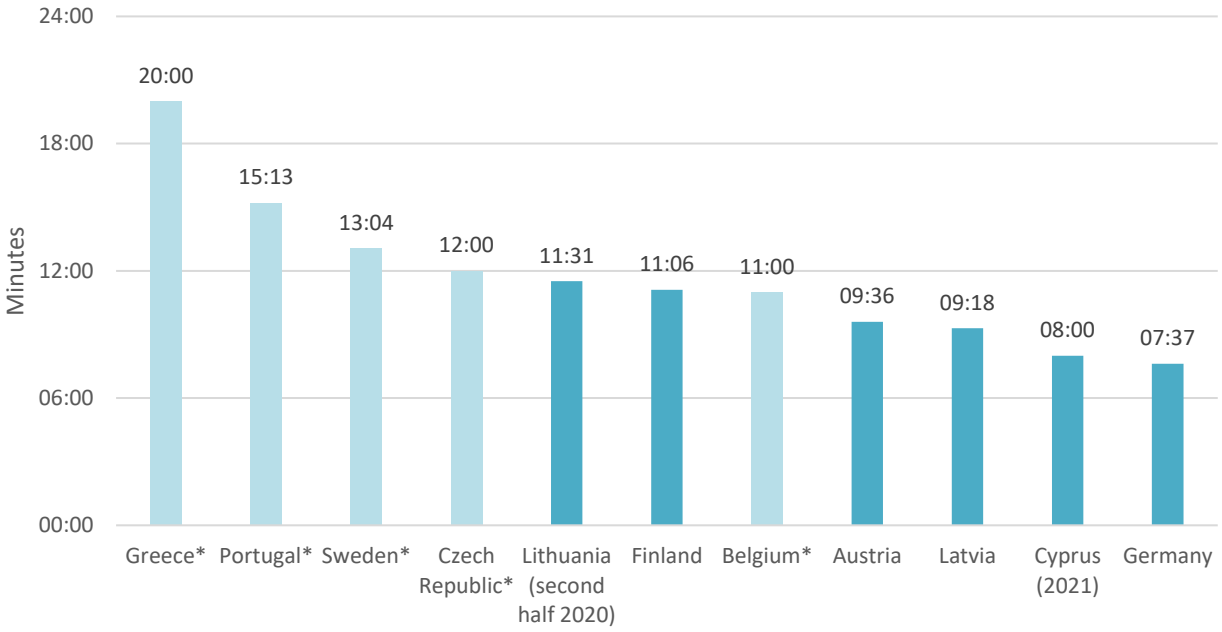
In most countries, no information was available on whether or not eCall was activated after a road crash. In countries where this information was available, eCall was rarely or never activated (Portugal: zero interventions in 2019; Finland: 5 out of 6174 interventions in 2019). Therefore, it cannot be investigated whether response times differ depending on whether eCall is activated or not.

1.15 Additional indicators

The previous sections all relate to the KPI estimates of the 95th percentile of response times and its breakdowns. Most participating countries also provided other percentiles of response times. Below the results are shown regarding the 50th percentile, also called the median. The unweighted average 50th percentile of EMS response times is 11 minutes and 40 seconds. The ranking of the countries in ***Figure 9***, showing the 50th percentile is similar to the ranking of countries in

Figure 5, showing the 95th percentile. Only the rankings of the Czech Republic and Belgium are quite different.

Figure 9. Post-crash care KPI estimates, P50 of EMS response times, per road type, 2019



* Representativeness of data and/or comparability with other countries not guaranteed

Conclusions on data quality and recommendations for the future

1.16 Quality and comparability of data

The results in this report should be treated with caution. Several reasons complicate comparisons of KPI estimates across countries.

A first reason are country-specific deviations from the Methodological Guidelines. A first type of deviation occurs in **geographical coverage**. The KPI estimate does not always cover the entire national territory in all countries. This is the case to a moderate extent for Finland, Portugal and Greece, where islands are not included (and in the case of Greece, the west of the country). This is to a greater extent the case for the Czech Republic where the KPI is based on only one region. Latvia, in turn, differs geographically from the other participating Member States in that it has no highways. Although this is not a deliberate deviation from the guidelines it may affect the value of Latvia's overall KPI estimate, as response times vary by road type.

A second type of deviation occurs in **terms of time**. Lithuania and Cyprus deviate from the other participating Member States because their KPI estimate is not referring to 2021. Regarding the **time unit of measurement**, three countries (Belgium, the Czech Republic, and Greece) report response times with an accuracy of minutes instead of seconds. This form of measurement bias affects the accuracy of the KPI estimate and the comparability with other countries.

Another deviation is related to the **type of crashes and interventions included in the KPI estimate**. The Methodological Guidelines define road crashes as crashes involving any vehicle that result in personal injury. Both responses involving EMS units with a medical doctor on board and responses involving EMS units without a medical doctor on board should be included. Some countries deviate from this definition. In Belgium, for example, interventions of EMS units involving a doctor or interventions involving nurses are not included. In Sweden, crashes without motorised vehicles are not included in the KPI estimate. Still in Sweden, there are never doctors on board of EMS units. Although the latter is not a deliberate deviation from the guidelines, together with the absence of crashes without motorised vehicles, it may have an impact on Sweden's overall KPI estimate.

A fourth type of deviation is related to the **definition of the response time** itself. The timestamp for the emergency call refers to the moment when the call starts; the timestamp for the arrival refers to the moment the EMS unit arrives at the crash scene. In Latvia, 5% of interventions could not be included due to missing information on the start of the call. In Cyprus and Greece respectively 11% and 8% of the interventions were not included because of unknown timestamps. In Portugal, as many as 94% of interventions could not be included because of missing knowledge about the "timestamp arrival at the scene of the road crash". Especially for the latter country, due to the high proportion of missing data, there is a possible bias in the data.

Many of the above deviations from the guidelines amount to a form of selection **bias**, where certain EMS interventions that should have been selected were not selected. For five countries, the selection bias is suspected to be so large that it could affect the representativeness of the data and thus the comparability with other countries: Belgium, Greece, Sweden, Portugal and the Czech Republic.

Apart from the country-specific deviations from the Methodological Guidelines, another reason why the estimates of the KPIs should be treated with caution is the fact that the **definitions of the breakdown categories** (e.g., the four categories of the variable time period) do not correspond exactly between countries (see the annexes in Chapter 0).

1.17 Recommendations

A **first recommendation** is that, despite the complications of cross-country comparisons, a KPI on post-crash care should be maintained. The speed of response time is a determining factor for the survival of road victims. We would also retain the exact wording of the KPI in terms of the 95th percentile. An interesting finding in this report is that the ranking of countries does not differ much when looking at the 95th percentile of response times or the 50th percentile of response times. This means that there is not a big difference in the ranking of countries according to the indicator used in terms of percentile. An alternative approach could be to reverse the wording of the KPI and ask countries which percentile corresponds to, say, a 15-minute response time. This target of 15 minutes is for example used in Belgium (90% of response times should be below 15 minutes). However, other countries may still use a target other than 15 minutes. We therefore recommend maintaining the current wording of the KPI. This will help maintain continuity and comparability between years.

A **second recommendation** is that when the KPI estimate is made for different years, not only the absolute values of the KPI estimates should be compared between countries, but even more importantly the development over the years between countries. The absolute values of the KPI estimates of different countries may not be fully comparable because of different methodologies, but if each country uses the same methodology over the years, comparisons of the respective trends may be more reliable than comparisons of absolute values.

A **third recommendation** relates to the requested breakdowns. Since the KPI estimates seem to vary rather randomly from month to month, it is not very useful to calculate these breakdowns in the future. Since variations do occur by road type and time period, it is useful to maintain these breakdowns. Currently, eCall rarely plays a role in an EMS intervention, but as this will change in the future, this breakdown should be maintained to measure the effect of eCall on the speed of interventions. Some breakdowns recommended in the Methodological Guidelines were not included in the data reporting files because most countries cannot provide these breakdowns. However, breakdowns by vehicle type, type of emergency service and accident severity should be considered in the future. Regarding accident severity, it could be interesting to examine whether interventions with longer response times have a more severe outcome. Regarding type of emergency service, it could be examined whether interventions with a doctor involved have shorter or, on the contrary, longer response times.

References

European Commission (2019). Commission staff working document EU road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero". SWD (2019) 283 final. Retrieved from: https://transport.ec.europa.eu/system/files/2021-10/SWD2190283.pdf

Elvik, R. Vaa T, Hoye A and A Erke A and M Sorensen Eds (2009) The Handbook of Road Safety Measures, 2nd revised edition Emerald Group Publishing Limited.

Van den Berghe, W. et al. (2021). Methodological guidelines – KPI Post-crash Care. Baseline project, Brussels: Vias institute. Retrieved from: https://baseline.vias.be/storage/minisites/methodological-guidelines-kpi-post-crash-care.pdf

Vis, M.A. ... et al, 2005. Building the European Road Safety Observatory. SafetyNet. Deliverable D3.1 State of the art report on road safety performance indicators. Retrieved from: http://www.dacota-project.eu/Links/erso/safetynet/fixed/WP3/Deliverable%20wp%203.1%20state%20of%20the%20art.pdf

Annex 1. Breakdown definitions

1.18 Road type

Austria

Urban roads	Built up areas
Rural roads	Outside built up areas except motorways
Motorways/highways	Motorways and expressways

Finland

Urban roads	All roads (excluding motorways) which are located within urban localities (taajama)
Rural roads	All roads (excluding motorways) which are located outside urban localities (taajama)
Motorways/highways	Motorways only

Latvia

Urban roads	Streets in cities
Rural roads	Roads outside cities
Motorways/highways	No motorways in Latvia

Lithuania

Urban roads	Roads within the validity of traffic signs indicating traffic rules for urban areas
Rural roads	Roads outside of the validity of traffic signs indicating traffic rules for urban areas or motorways
Motorways/highways	Roads within the validity of traffic signs indicating traffic rules for motorways

Portugal

Urban roads	Roads inside urban boundary signs, motorways not included.
Rural roads	Roads outside urban boundary signs, motorways not included.
Motorways/highways	Public road with dual carriageways and at least two lanes each way. All entrances and exits are signposted, and all interchanges are grade separated. Central barrier or median present throughout the road. No crossing is permitted, while stopping is permitted only in an emergency. Restricted access to motor vehicles, prohibited to pedestrians, animals, pedal cycles, mopeds, agricultural vehicles.

1.19 Time period

Austria

Weekday - daytime	Monday – Friday; 6.00 – 20.59
Weekday - night-time	Monday – Friday; 21.00 – 5.59
Weekend - daytime	Saturday – Sunday; 6.00 – 20.59
Weekend – night-time	Saturday – Sunday; 21.00 – 5.59
The weekend starts when Friday switches to Saturday (midnight), likewise, weekdays start when Sunday switches to Monday (midnight).	

Belgium

Weekday - daytime	Monday – Friday; 6.00 – 21.59
Weekday - night-time	Monday – Friday; 22.00 – 5.59
Weekend - daytime	Saturday – Sunday; 6.00 – 21.59
Weekend – night-time	Saturday – Sunday; 22.00 – 5.59
The weekend starts when Friday switches to Saturday (midnight), likewise, weekdays start when Sunday switches to Monday (midnight).	

Finland

We have defined weekend as Saturday & Sunday. Therefore, the night hours from those days (20–06) have been defined as night. Specifically, this means that during the night between Friday and Saturday the hours starting from 00:00 on Saturday are weekend nights and on Monday starting from 00:00 is again weekday night.

Sweden

Weekend nights are the nights from Friday night (at 19.00) to Saturday morning (at 7.00), Saturday night to Sunday morning, and Sunday night to Monday morning.

Annex 2. Requirements for representative post-crash care measurements

1.20 Data collection methods

It is requirement is to identify and select at least a representative sample of responses to emergency calls in relation to road traffic crashes and base the analyses on this sample. If feasible, an even better approach is to consult a national administrative database for emergency calls and to select all calls related to road traffic crashes. This would allow the KPI to be calculated on the total population of emergency calls, without the need for weighting or extrapolation.

It is recommended to use sampling only if no national database can be used for calculating the KPI.

The following section describes the nature of the data required, regardless of which data collection method is used.

1.21 Data required for the calculation of the KPI on post-crash care

1.21.1 Data sources

In order to calculate the KPI on post-crash care, it is necessary to identify the time of the emergency call and the time of arrival of the emergency service. An intervention typically consists of several steps performed by emergency teams (Nemeckova & Atchison, 2019):

(1) receipt of the call
(2) dispatching of the call
(3) travelling to the crash scene
(4) arrival and care at the crash scene
(5) patient transfer to a medical facility.

We need the time stamps corresponding with step (1) and step (4). Whether that data – disaggregated or aggregated – is easy to retrieve depends on how the EMS system is organized in a particular country and how EMS data is collected, stored and aggregated. The most convenient situation is where a country has a dataset in which both timestamps are registered. In that case it is not necessary to link / combine datasets to calculate response rates.

However, this is not the case in all countries. Information about the timestamps may be scattered across different datasets and over different data owners, such as: the Ministry of Public Health, individual hospitals, ambulance services, the police, individual dispatch centres, Ministry of Internal Affairs, a dedicated agency, regional public authorities or other stakeholders. Countries that are in this situation should ideally make a link between the respective datasets, but this will not always be possible due to the lack of common emergency IDs and overlapping information in the datasets.

1.21.2 Need for clear definition and scope

Even if data is complete at national level and available in aggregated form, it may not be adequate for meeting the definition and requirements of the KPI:

(1) We need only EMS response times for **road crashes**. In most countries, only a small minority of the EMS interventions concern road crashes, and the response times for these interventions may be different from all interventions combined (cf. description of response times in Germany in Hakkert & Gitelman, 2007). If possible, one should derive the KPI only from the EMS interventions that relate to road traffic crashes. If not possible, the KPI may be approximated or estimated by using the data for all EMS interventions. In this case the deviation from the KPI must be clearly stated in the metadata.

(2) EMS units are not the only units arriving at the crash. Also police and fire and rescue services may arrive at the crash scene, and may in some countries provide medical pre-hospital care. So when looking for response time data, make sure that you only use the data that refer to **emergency services that provide medical pre-hospital care**, be it Emergency Medical Services (EMS), Fire and Rescue Services (FRS) and/or police.

(3) Sometimes more than one emergency unit arrives at the crash scene. For the calculation of the KPI, only the arrival of the **first emergency medical unit** should be taken into account. Thus, if feasible, please remove data records for the 2nd, 3rd, 4th, etc. medical emergency units that arrive on a crash scene.

(4) Some EMS response units have a medical doctor (emergency physician) on board, some don't. Make sure that both types of interventions (**with and without a medical doctor**) are included in the data. If this is not possible, and only a subset of interventions is included, this should clearly be mentioned in the metadata.

(5) The timestamp for the emergency call should refer to the moment **when the call starts** (not when the call is closed).

(6) The timestamp for the arrival is when the emergency **unit arrives at the crash scene** (not when the first medical services are delivered).

It also recalled that the KPI value should refer to the **whole country.** If sampling is used or the administrative database does not cover the whole country, some kind of weighting/extrapolation is needed in order to arrive at the national value.

1.21.3 Data access

Even if the data is complete and of high quality, some problems may arise regarding data accessibility:

(1) Privacy and health regulations make access to data very difficult.

(2) The monitoring of EMS interventions is organized at local/regional level in different ways.

(3) Part of the data is not stored electronically.

(4) Lead times for obtaining the data are long (approval by authorities, no resources for pre-processing, involvement of a third party, etc.).

Because of these potential data access problems, it is important to approach data owners early in the data collection process, and to clearly outline the legal procedure to obtain the data. In case it is not possible to access a national database, one can proceed to sampling, which may involve fewer data access problems.

1.21.4 Possible data quality issues

Data is never perfect. It is important to have a good idea of the accuracy and the reliability of the data. Possible data quality problems are:

(1) There is a systematic or random underregistration of the EMS interventions, leading to a possible bias in the data.

(2) The database includes erroneous data, errors or many outliers, which requires a tedious cleaning process before the data can be used for calculation of the KPI. The metadata should clearly state the proportion of interventions for which the response times are unknown/ erroneous.

If the initial KPI value has an incorrect scope and/or does not meet all the methodological criteria, it is recommended to provide a recalculated or estimated value. In such cases the original KPI value before recalculation must also be provided and the estimation method must be documented in the metadata.

1.22 KPI values to be provided

1.22.1 Minimum requirements

1.22.1.1 Value

The minimum requirement is to provide the 95th percentile of the time elapsed between the emergency call and the arrival of the emergency services at the crash scene. The unit of measurement is minutes and seconds.

1.22.1.2 Year

The value should refer to a whole year. This should be the most recent value available. Because 2020 is an exceptional and anomalous year due to the COVID crisis, it is requested to provide the KPI for 2019 (or an earlier year of the data if 2019 is not yet available).

1.22.1.3 Breakdowns by road type or type of area

If available, the Commission proposes to make a breakdown by road type. Three types of roads are foreseen:

- Urban roads
- Non-urban roads (excluding motorways)
- Motorways.

It is recognized that the distinction between urban roads and non-urban roads differs between countries (and sometimes also between regions within a country). Therefore the Baseline partners should explain which criteria were used to differentiate between types of roads. Moreover they should ensure that the road categorisations are used in a consistent way across the different KPIs (in most other KPIs, road type is a compulsory variable).

Alternatively, if such a categorization would be available, a breakdown of the KPI value can be provided that distinguishes between areas by population density. Possible categorisations could be based on

(a) the degree of urbanization used by EUROSTAT - ***cities***, ***towns & suburbs***, ***rural areas***, or

(b) the rural-urban typology that is used by EUROSTAT for NUTS level 3 regions in the EU: ***predominantly rural*** regions, ***intermediate regions*** and ***predominantly urban regions***.

1.22.2 Possibilities for additional information and breakdowns

Although none of the possibilities that are listed under this heading are mandatory, Member States are suggested to consider to provide one or more of those values (in addition to the formal, country level KPI value), in particular if such data would be easily available.

1.22.2.1 Data

Ideally, the cleaned dataset (at record level) should be provided alongside the KPI value. This would be a table with a record for each intervention, including an ID, two or more timestamps and some other variables that can be used for making breakdowns and weighting the individual values.

The Member State should indicate via which method (including, where appropriate, weighting and extrapolation) the 95th percentile has been calculated. The data table should allow an independent researcher to calculate the KPI and compare with the value proposed by the Member State.

If for privacy reasons or other legal restrictions such record-level data cannot be provided, the Member State should provide aggregated values at the highest level of disaggregation possible.

1.22.2.2 Further breakdowns

If available, it is suggested to also provide (data for) the following breakdowns (for 2019 only):

- Location of crash
  - (1) Area type: cities, towns & suburbs, rural areas – or predominantly urban, intermediate, predominantly rural
  - (2) NUTS3 region of the location of the crash
  - (3) Municipality
  - (4) Exact crash location (if available and transferable)
- Time of arrival
  - (1) Month
  - (2) Day of week
  - (3) Hour (or at least day/night)
  - (4) Exact date and hour
- Crash severity
  - (1) Number of casualties in the crash (incl. fatalities)
  - (2) Number of fatalities in the crash
- Type of emergency services
  - (1) Medical Emergency Services, Fire and Rescue Services, or both
  - (2) EMS vehicle equipment (mobile intensive care unit, basic life support unit, regular ambulance)
  - (3) Presence of emergency physician at crash : yes/no
- Transport mode
- Crash with or without motorized vehicles involved

1.22.2.3 Additional percentiles

For analysis, research and benchmarking purposes it can be useful to also calculate some other percentile values:

- 25th percentile (1st quartile)
- 50th percentile (median)
- 75th percentile (3rd quartile)
- 85th percentile.

The calculation of this value should be relatively straightforward if a good database is available from which the 95th percentile has already been calculated, since the methods for calculating the additional percentiles are identical as the method for calculating the 95th percentile.

1.22.2.4 Rearrangement of the data

An additional or alternative way for presenting the data is to calculate which percentage of the EMS interventions arrives on the crash scene within the following time intervals:

- 10 minutes
- 12 minutes
- 15 minutes
- 20 minutes

Please note that current good practice is that 95% of the EMS units are on the crash scene in less than 15 minutes after the emergency call (Hafen et. al, 2006).

1.22.2.5 Additional years

If there is a historic database of good quality, based on consistent definitions and registrations, it is suggested to provide KPI data starting from 2010 onwards (for the 95th percentile value). Such data could be useful for further analysis and benchmarking, and could be used to estimate a value for 2019 if not available.

1.22.2.6 Possibilities for alternative indicators

Alternative, optional indicators, suggested at UN level, are

- % of severe injury crashes where no emergency care services were provided
- % of road traffic crashes resulting in serious injury where the response time did not exceed the national target

If such information would be available, it can be added to the Baseline database. However, these values should not be used as a substitute but rather as a complement for the official European KPIs.

1.22.2.7 Useful contextual information

For a correct interpretation of the response times, for benchmarking with other countries and for the selection of appropriate countermeasures, it is useful to provide the following **contextual information**:

- number of dispatching centres
- number of EMS transportation units
- number of EMS stations
- annual number of emergency calls
- annual number of emergency calls related to road crashes
- % of emergency calls relating to road crashes the in total number of emergency calls.

The following information on **data quality** is also useful contextual information:

- % of interventions for which the timestamp 'emergency call' is unknown
- % of interventions for which the timestamp 'arrival at the scene of the road crash' is unknown
- % of interventions for which both the timestamps 'emergency call' and 'arrival at the scene of the road crash' are unknown.

1.23 Sampling methodology

The previous sections covered both methods of data collection, namely the use of a national administrative database and sampling of EMS interventions. For many countries it is expected that it is possible to get data from a national administrative database for emergency calls. Consequently, sampling will not be needed and the KPI could be calculated based on the total population of emergency calls. It is recommended to use sampling only if no national database can be used for calculating the KPI. Countries that use a national database for the estimation of the KPI can skip Chapter 1.23.

1.23.1 Population

The theoretical population refers to the national total of response times between the emergency calls following a crash resulting in personal injury and the arrival of the emergency services at the scene of the crash. EMS units are not the only units arriving at the crash. Also police and fire and rescue services may arrive at the crash scene, and may in some countries provide medical pre-hospital care. So when considering response time data, one should make

sure to only use the data that refer to emergency services that provide medical pre-hospital care, be it Emergency Medical Services (EMS), Fire and Rescue Services (FRS) and/or police. Both emergency services that provide Advanced Life Support and Basic life Support are included.

1.23.2 Minimum total sample size

In line with the sampling approach proposed for other KPIs, the minimum total sample size should be 2000. For some small countries, the proposed sample size will not be feasible, e.g. due to a relatively low number of road crashes involving injuries and/or a low number of interventions. In that case, a smaller sample size is accepted.

It is likely that the distribution of response times in a country will not perfectly correspond to the normal distribution. We expect the distribution of response times to be somewhat right-skewed, with a larger spread of observations in the second half of (longer) response times than in the first half of response times. Therefore, it is difficult to estimate in advance how large the confidence intervals of the 95th percentile will be[2].

Accuracy for specific strata/subgroups, e.g. breakdowns for road types or types or areas, will by definition be lower. If higher accuracy levels are required for particular strata/subgroups (e.g. according to region of the country), it will be necessary to increase the total sample size.

1.23.3 Stratification

In order to ensure a nationally representative sample, it is recommended to stratify according to regions, e.g. the areas at NUTS1 level.

Since the overall estimate is expected to be representative for the whole country, the theoretically most optimal strategy is to sample all strata according to their proportion in the national number of (interventions related to) road crashes resulting in personal injuries. This strategy would, however, be detrimental for the accuracy of estimates for regions with a low number of interventions/traffic crashes. Hence, oversampling for such regions is allowed. By comparing the proportion of interventions by region in the sample with the proportion of interventions by region in the total population (or with the proportion of injury crashes in official statistics if the information on interventions is not available) selection probabilities and weights can be derived.

1.23.4 Sampling of EMS stations and further sampling

Within each region, either all EMS stations or a random sample of the EMS stations need to be selected. In case of a sample, it is suggested to use results from at least 10 different EMS stations within each region (if possible), to ensure that at least 5% of the total number of EMS stations is represented, and to guarantee that the minimum total sample size of 2000 interventions will be obtained.

The purpose of the random selection of EMS stations is to obtain a representative sample and to neutralise the effect of variables that may influence the KPI estimate, such as the road type and the area type in which the EMS station is mainly active and the type of emergency services that is provided by the EMS station. However, further stratification based on these and other variables is also allowed within the region strata.

As a further sub-selection of interventions in EMS stations may be an unusual task for those responsible for the data, and may be labour-intensive and cause bias in the selected data, it is recommended to select all interventions from all selected EMS stations. If this is not possible, it is recommended to perform another simple random sampling of at least 5% of all interventions in this second sampling phase.

The Commission suggests a breakdown of the KPI by road type. Regardless of whether will be stratified by this variable or not, the three road types should be well defined in the methodology, including how they are determined (e.g. typical characteristics, traffic signs, speed regimes, number of lanes…). They should be defined in the same way as is the other European KPIs (in most of them a breakdown by road type is required).

It should be specified if the sample is biased in some kind of way (area type, emergency type, time (all months, day of the week, and hour to be represented).

1.23.5 Post-stratification weights and statistical analysis[3]

To calculate the final KPI, the following procedure should be applied:

(1) Weight the observations (actual times recorded) with an appropriate weighting factor.
(2) Calculate the 95 percentile for the total weighted sample and for the weighted breakdowns separately.

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[2] In the next version of these guidelines, a method and formula will be provided to calculate this confidence interval.
[3] This section is currently mainly a placeholder. It will be developed in the next version of these guidelines.

(3) Calculate confidence intervals (for instance by using bootstrap techniques[4]).

Results should then not only include the unweighted number of cases the overall result is based on, but also the number of bootstrap samples it is based on or in general, information on how the interval is determined.

1.24 Expected results

The main KPI is the 95th percentile of response times between the emergency calls following a road crash resulting in personal injury and the arrival of the emergency services at the scene of the crash.

As a minimum, the 95th percentile for the whole country should be provided for 2019 (or an earlier year if data for 2019 is not yet available), and if possible a breakdown by road type or area type.

If feasible it is recommended to also provide the breakdowns mentioned in section 1.22.2.2 and the additional data and information mentioned in section 1.22.2. Together with the above estimates, a note or short report should be submitted that describes the specificities of the methodology.

In case sampling is used a 95% confidence interval is expected. Results should include the unweighted number of interventions the result is based on (and the unweighted number per stratum), and the statistical techniques used to weight and analyse the results.

[4] Guidance on applying bootstrap techniques will be provided in the next version of these guidelines.