Baseline

Methodological guidelines – KPI safety belts and child restraint systems

Version 3.1, April 28, 2021

Baseline

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Any comments or feedback regarding these guidelines, should be sent to baseline@vias.be.

Version history

Version	Date	Changes
1.0	December 15, 2020	First draft version - intended as a framework to discuss methodological issues in the technical committee - draft not yet discussed in the KPI expert group on safety belts and child restraint systems
1.1	January 18, 2021	Minor corrections
1.2	March 2, 2021	Dedicated sample size specified for safety belts and for child restraint systems
1.3	March 15, 2021	Incorporated remarks from external reviews
2.0	March 17, 2021	Streamlined structure with the other KPI's guidelines, added traffic volume counts, added general introduction, corrected country list on cover page, added data format specifications
2.1	March 22, 2021	Fixed table in Annex 2
2.2	April 13, 2021	Incorporated feedback from member states
2.3	April 21, 2021	Changed minimum observation session duration
3.0	April 27, 2021	Revised structure, minor corrections and additions, new cover page
3.1	April 28, 2021	Added rationale on sample size

Contents

1 Introduction and aims

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 much clearer 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 KPIs relate to main road safety challenges to be tackled, namely: (1) infrastructure safety, (2) vehicle safety, (3) safe road use including speed, alcohol, distraction and the use of protective equipment, and (4) emergency response. The aim of the KPIs is connected to EC target outcomes.

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.

The purpose of this document is to further describe the minimal methodological requirements to qualify for the BASELINE KPIs for safety belts and child restraint systems, defined as:

Percentage of vehicle occupants using the safety belt or child restraint system correctly

The minimal requirements set by the EC for this KPI are described in the Commission Staff Working Document SWD (2019) 283. These requirements are quantified and specified in this document. This is mainly based on expert consultation (BASELINE Key Expert Group) and on the publications listed under 'References'.

Each section also includes optional supplementary methodological recommendations. Member States can decide whether to follow the minimal requirements only or to extend (part of) their methodology, depending on available means and own research questions.

The target audience of this document are the persons in the participating Member States that will collect and/or analyse the data to deliver the KPIs.

2 Methodological requirements

2.1 General principles

2.1.1 Definition of correct use, no use, and misuse

The objective is to estimate the percentage of vehicle occupants using the safety belt or child restraint system (CRS) correctly. The theoretical population refers to the total of all movements with the vehicles over the national territory. In other words, this reflects the total number of kilometres driven. Hence, the percentage of vehicle occupants using the safety belt or child restraint system correctly refers to the percentage of kilometres driven using the safety belt or child restraint system correctly.

References for correct use should consist of:

- The national traffic legislation;
- The CRS's conformity and instruction label;
- Common regulations/prescriptions.

It is not required to take into account additional (national) recommendations for the optimal use of CRS (e.g. the Swedish recommendation to use a rearward facing CRS up to and including 4 years of age). Compliance with such recommendations could be included as optional information.

'Correct use' is the complement of 'no use' and 'misuse'. As a result, both 'no use' and misuse must be detected. If there is no indication of no use or misuse, the usage is considered to be correct. If seat belt or child seat usage in the vehicle could not be observed for any of the vehicle occupants, this is an observation with a missing key variable and therefore an invalid observation. If it is possible to observe for some of the occupants, the observation is valid, and the CRS or seat belt use of the remaining occupants can be coded as 'unknown'.

Possible ***misuses*** of ***safety belts*** are (non-exhaustive):

- Belt behind the back
- Belt under arm
- Incorrect height setting of seat belt's top guidance
- Use of 'foreign objects' such as clothespins to deviate the seat belt or reduce its tension

Possible ***misuses*** (non-exhaustive) of ***CRS*** can be grouped into 3 types:

- Inappropriate use
  - Child not in CRS while it should be (= no use)
  - Child in wrong group of CRS
- Faulty fixation of CRS to vehicle
  - Incorrect seat belt guidance around CRS
  - Back tether or floor support (as complement to Isofix) not attached
  - CRS wrongly orientated
  - Frontal airbag not deactivated with rearward mounted CRS on place with frontal airbag
- Faulty fixation of child to CRS
  - Belts too loose
  - Wrong belt guidance

2.1.2 Additional observations for misuse of CRS

Given the complexity of determining the correct use of CRS, two types of observations are recommended:

1) During the seat belt observations, the number of children in the car and the presence of CRS can be observed for quantitative purposes
2) An additional detailed in-vehicle inspection of the correct use of CRS. This requires the driver's cooperation and is only possible during dedicated sessions in accessible locations.

2.1.3 Stratification and subpopulations

SWD requires taking into account the following strata:

- Road type
- Vehicle type
- Place in vehicle: front / rear
- Week day / weekend

Another stratum that could influence correct seat belt use or CSR use is the region. Member States are free to consider supplementary stratifications according to region.

Theoretically, the optimal strategy for estimating the overall prevalence of correct seatbelt and CRS use is to sample all strata according to traffic volume of each combination of all the different strata. This overall strategy would, however, be detrimental for the accuracy of specific low volume strata that are of interest. Certain road types could have a lower traffic volume than others, as do weekends compared to weekdays. As a result, strictly proportional sampling would lead to much smaller confidence intervals for certain strata.

2.1.4 Minimum sample size

A **minimum of 2000 observations overall** is recommended for both KPIs. For the first stratification level, a minimum of 500 observations per stratum is advised. In the case of seat belt use and CRS use, the observed unit is a vehicle. However, a minimum of 2000 observed vehicles with children among the occupants is difficult to attain. Therefore, the following sample sizes are requested:

- A minimum of 2000 observed vehicles overall for seat belt use, with a minimum of 500 observations per road type;
- A minimum of 200 observed vehicles with children among the occupants for road side observation of child restraint system use, with a minimum of 50 observations per road type;
- A minimum of 200 observed vehicles with children among the occupants for detailed in-depth inspection of child restraint system use, with a minimum of 50 observations per road type.

Member States not able to achieve the minimum requested number of observations need to justify this in detail.

If **regions** are to be distinguished in the reported results, the above minimum numbers of observations apply to each region. If **vehicle types** are to be distinguished in the reported results, the above minimum numbers of

observations apply to each vehicle type. If only passenger cars are considered or where there are insufficient observations of other vehicle types, the above minimum numbers of observations apply to passenger cars.

See Annex 2 for the rationale for the minimal sample requirements.

2.2 Observation method

2.2.1 Observation methods

SWD prescribes **direct observation** as the data collection method. Direct observation should preferably be carried out alongside the road.

SWD allows the use of **cameras** to collect data on seat belt use. In that case, it should be ensured that the cameras will be installed on all road types to avoid selection bias. This technology could have clear advantages compared to using observers in terms of, for example, reliability, 24/7 observation, night-time use etc. Possible disadvantages should however be evaluated (e.g. lacking variables, visibility of rear occupants etc.). Its use should be tested and validated before deployment. For privacy reasons, faces and license plates should not be caught on camera. Each Member State will have to conform with national and international requirements regarding ethics, privacy, and data protection.

Determining the correct use of CRS requires detailed **in-vehicle inspections**. These sessions can take place in accessible locations such as parking lots, rest areas, etc. and require the driver's voluntary cooperation. Selection bias is inevitable in a survey based on voluntary participation. However, it is the only option for reliably detecting the correct use of CRS.

The COVID-19 pandemic has implications for the in-depth inspection of CRS use. The current COVID-19 situation can limit the willingness to participate and to allow the observer to carry out the in-vehicle inspection. It is important to collect data in/from a sufficiently representative context in order to have representative KPIs. Therefore, it is recommended not to plan data collection for as long as some severe sanitary measures are in force, such as a lock-down, a night curfew, closed schools/day-cares, limitations of social contacts etc.

2.2.2 Coverage of road types

The indicator should cover **motorways, rural non-motorway roads (outside built-up areas), and urban roads (inside built-up areas)**. This is the minimally required categorisation. The results should be presented separately for these three different road types and also aggregated (after weighting) for the whole road network.

Where a Member State's road network does not contain motorways, the overall results are calculated using the remaining road types. Where a Member State's road network does contain all required road types, but not all road types are included in the survey, results cannot be aggregated by the remaining road types and remain disaggregated for each remaining road type.

2.2.3 Selection of locations

Since SWD requires coverage of the three road types, the proportion of observations sampled at each of the three road types mentioned above should be at least 20% to ensure a minimal number of observations for each stratum, even if this would imply disproportionate sampling. It is recommended to sample the three road types according to traffic volume, assuming each of the three road types represents a share of traffic volume above 20% based on available national data (e.g. traffic data per road type from national traffic surveys). If such data is not available, a minimal number of 10 locations per road type should be selected for the national indicator (see section 'Locations' below).

The selection of locations should be as random as possible. There are different options for random location selections: simple random, stratified random, cluster random etc. Cartographic software like ArcGIS can be used for selecting random points, e.g. https://desktop.arcgis.com/en/arcmap/latest/extensions/geostatistical-analyst/an-introduction-to-sampling-monitoring-networks.htm

The appropriate sample size should be estimated and used to determine the required number of locations or observational sessions, taking different vehicle types into account. For more information on random sampling of locations and for determination of the minimal sample size, reference can be made to the SafetyNet general recommendations for SPI (safety performance indicators):
http://www.dacota-project.eu/Links/erso/safetynet/fixed/WP3/sn_wp3_d3p8_spi_manual.pdf.

Sample size calculators can be used to calculate the required minimal number of observations: e.g. https://sample-size.net/confidence-interval-proportion/ (software determining the upper and lower bounds of the confidence interval for a proportion).

The rationale for choosing the observation locations should be documented. These include a minimum traffic flow (e.g. at least 10 relevant vehicles per hour) and a random selection of different regional locations. Ideally, a random sample of all possible locations within a designated area will be used. A random selection of locations will also include roads with low traffic volume. In that case, it is recommended to choose a nearby road with a higher traffic volume instead, if it is assumed that most drivers on the low-volume road drove or will drive on the high-volume road as well. Locations with less than 10 relevant vehicles passing per hour cannot be used. Member States can define a higher minimum.

The minimum number of observation sites for seatbelt and CRS use is 10 per stratum in the first stratification level, which means:

- at least 10 locations on urban roads;
- at least 10 locations on rural roads;
- at least 10 locations on motorways.

Each location can be used for different sessions (at different time intervals) or each location can be assigned (randomly) to a specific time interval.

The minimum number of sites for in-vehicle inspections for CRS is 2 for each combination of time period and road type (6 combinations if all road types are covered).

Basic characteristics of the locations should be documented:

- for road-side observations: coordinates (if possible), address or other geographical information, number of lanes, target lane and direction to be observed, and visibility of the traffic from the location;
- for in-depth inspections: coordinates (if possible), address or other geographical information, location type, related activity/service type (e.g. parking lot of school, shop, day-care etc.).

2.2.4 Methods for observations for different road types

Observations of safety belt use on urban and rural roads can be carried out from a safe place along the road, preferably at locations where driving speed is reduced relative to the speed limit, such as intersections. Observations of child restraint system use on urban and rural roads can be carried out at parking lots of shops or leisure activities.

Observations of safety belt use on motorways are for example possible at:

- the last intersection before on-ramps,
- the first intersection after an off-ramp,
- service stations,
- rest areas,
- toll stations etc.

In-depth investigation of child restraint system use on motorways is possible at service stations or rest areas.

For direct observations, strong wind, precipitation, and very low or high temperatures could negatively affect the observers' endurance and observation quality. The road-side observations should be performed during reasonably good weather. The same applies to the in-vehicle inspections of CRS use.

2.2.5 Observation sessions

Each observation session should last at least 30 minutes, although a duration of 1 hour is advised. It should be kept in mind that this minimal session requirement does not include the time spent on traffic volume counting (see section 'Traffic volume' below). Date and time (to the nearest hour) covered by the measurements should be indicated in the meta-data.

At a minimum, 10 locations per time period (in this case weekdays and weekend) and 2 observation sites for each combination of time period and road type should be observed (6 combinations if all road types are covered). Ideally, the same locations should be observed during weekdays and weekends.

2.3 Other requirements and options to be considered

2.3.1 Vehicle types and occupants to be considered

The road users to be observed are the front occupants and rear occupants of at least passenger cars and preferably of goods vehicles as well (light goods vehicles (LGV/vans) and heavy goods vehicles (HGV/lorries)). Since very few children are expected to be travelling in goods vehicles, it is recommended to only include passenger cars in the CRS observations. At a minimum, separate test results for passenger car front occupants and passenger car rear occupants are expected. If other vehicle categories are also included in the study, these results should be reported separately.

The different vehicle types and their specific categorization should be clearly defined and illustrated for the observers (training, briefing), e.g. some vehicles exist in passenger car and LGV versions with only limited differences such as the presence of rear windows.

Road users to be observed should be randomly selected from all the possible objects at the location where the observation is done. After coding one observation, the next passing target vehicle should be observed.

Vehicle occupants legally exempted from seat belt wearing should be excluded, e.g. postal delivery services, taxi drivers, emergency vehicles etc. The most practical solution is to exclude the whole vehicle from the data collection. Because the legislation on (and exemptions from) seat belt use and on CRS use can vary between countries, it is requested that all countries document their legislation on seat belt use and CRS use and consequently document which vehicles were excluded from the observations.

Supplementary to safety belt usage, it might be valuable to include one or more of the following occupant characteristics for further analysis:

- Gender (observed)
- Age group (observed)

Age groups are divided as follows: child: 0-18, young: 18-24, medium: 25-64, senior: 65+.

During the in-vehicle inspections on CRS use, it might be valuable to include one or more of the following trip characteristics for further analysis:

- Trip purpose (question to driver)
- Trip length/duration (question to driver)

2.3.2 Temporal requirements

Observations should be timed as follows:

- late spring or early autumn. All months are allowed except for December, January, July and August. In some Member States, the Winter or Summer holiday period could extend to other months as well, such as June, and in such cases these months should also be excluded ;
- week days (excluding bank holidays) and weekend, observed and presented separately;
- daylight – observations should cover the whole daytime;
- reasonably good weather.

There should be a balance between all combinations of road types (3) and the different time factors above, to avoid a systematic sample bias.

Where Member States have historical series of measurements, it is recommended to use the same period(s) of the year as for the earlier measurements.

Member States willing to organise more than one roadside survey to deliver the KPIs (e.g. one in spring and one in autumn) can apply the minimal sample size requirements on the combination of both measurements. The data of both measures can be combined to deliver the main and disaggregate indicators.

2.3.3 Optional breakdown by region

Optionally, Member States can decide to distinguish different regions in the survey. In that case, countries can consider collecting data from each region or from a representative selection of regions. Member States wishing to have meaningful KPIs at regional level should take into account that the national indicators on minimum sizes of the location sample (10 per road type; see section 'Selection of locations' above) and driver sample (2000 per vehicle type; see section 'Minimum ample size') should ideally be applied in each region. If stratification in regions is used, results should be weighted according to traffic volumes by region.

2.4 Data analysis

2.4.1 Data to be recorded

This section gives a preliminary overview of the variables to include in the survey. However, this will be covered in more detail by the data templates that will be provided later.

Data to collect with regard to the locations:

- Unique location ID
- Region (if applicable)
- Road type
- Road number, address
- Coordinates of exact observation spot (either here or in observation session details)
- In case of CSR inspection: related activity/service type (e.g. parking lot of school, shop, day-care etc.)
- Number of lanes
- Target lane and direction to be observed (either here or in observation session details)
- Visibility of the traffic from the location (either here or in observation session details)

Data to collect with regard to the observation sessions:

- Unique session ID
- Location (from which road type can be derived)
- Date (from which time period can be derived)
- Begin time of observations
- End time of observations
- Total duration of observation session (end time – begin time – count duration)
- Traffic count duration (not for in-depth CRS inspection sessions)
- Traffic count results per relevant vehicle type (not for in-depth CRS inspection sessions)
- Traffic count results per relevant vehicle type extrapolated to session duration (not for in-depth CRS inspection sessions)
- Short weather description

Data to collect with regard to the observations themselves (one data point = one observed vehicle):

- Vehicle type
- Driver seat belt use (correct use / misuse / no use)
- Front passenger 1 seat belt use (correct use / misuse / no use)
- Front passenger 2 seat belt use (correct use / misuse / no use)
- Rear passenger 1 seat belt use (correct use / misuse / no use)
- Rear passenger 2 seat belt use (correct use / misuse / no use)
- …

Optionally, estimated age group, gender and other additional variables can be recorded per occupant as well.

Data to collect with regard to the in-depth CRS inspections (**one data point = one observed vehicle**):

- Place of child in vehicle
- Frontal airbag on place of child (not present / activated / deactivated)
- Seat belt type on place of child (not present / 2-point / 3-point)
- Isofix on place of CRS
- Child not fixed / seat belt / in CRS
- Orientation of CRS (forward, rearward, sideways)
- CRS group
- CRS homologation label
- Length of child
- Weight of child
- Seat belt guidance (correct / false / NA)
- Seat belt tension (correct / too tight / too loose / NA)
- CRS belts guidance (correct / false / NA)
- CRS belts tension (correct / too tight / too loose / NA)

Requirements for the data delivery and data matrix for the Baseline dataset will be provided in a separate document.

2.4.2 Post stratification weights and statistical analysis

For each level of stratification, results should be weighted according to traffic volumes (see next section) by level of stratification. It is recommended to use the exact values for each combination of stratification levels considered (e.g. traffic volume of passenger cars on weekdays on motorways). If these combined data are not available, the second best option is to assume independence of all levels of stratification and use combinations of marginal totals to estimate specific combinations.

The 'observed vehicles with children among the occupants' should serve as a quantitative basis for the weighting of the qualitative data gathered with the in-depth inspections of CRS use.

Traffic volumes can either be inferred from existing national mobility data or estimated using traffic counts during the observation sessions. When traffic counts are used to infer traffic volumes per stratum, road network length by road type should also be considered in the weight calculation. If official data on network length per road type are unavailable, it is advised to request estimates from experts from the relevant public services.

Statistical analysis techniques and tools should be determined by the Member State and clearly described in the method section. Since sampling will typically be nested in locations, it is recommended to use appropriate multilevel models for two-stage stratified sampling (1st stage= road type and 2nd stage= period). Approximations assuming simple random sampling can be used as long as results are weighted according to traffic volumes.

Further instructions on weighting and statistical analysis will follow at a later stage.

2.4.3 Measuring traffic volume

For the roadside observations, traffic counts should be performed at each location and each observation session. This information is necessary to correctly calculate the confidence intervals and weighing factors. For the roadside observations. For the detailed inspections of CRS this is not necessary.

Traffic volumes should be estimated by traffic counts during the observation session: ideally either by counting all passing relevant vehicles (only the vehicle categories that are being observed) during the session, or by counting all passing relevant vehicles during a short interval in the middle, or partly before and partly after the measure. The counting should be done for the same vehicle categories at the same location and direction as the observations. The counting of all relevant vehicle categories should last at least 10 minutes. Optionally, an automatic counter can be used to determine traffic volume. Note that in that case it might not be possible to exclude certain vehicle types.

These counts should then be extrapolated to the whole duration of the session. When observing at service stations or rest areas, the traffic volume to consider is the vehicles entering the service station or rest area.

2.4.4 KPI values to provide

The main KPI value to provide is the percentage of vehicle occupants using the restraints correctly across all times and all locations. At a minimum, the percentage of correct use of safety belt by passenger car front occupant, of safety belt by passenger car rear occupants, and of child restraint systems should be provided. The equivalent percentages in goods vehicles is desired but not mandatory. Results should also include the unweighted number of drivers the result is based on.

A point estimate and a corresponding 95% confidence interval is expected for each level of the following stratification variables:

- Road type (3 levels: motorways, rural non-motorway roads, and urban roads)
- Front vs rear occupant (in case of seat belt use in passenger car)
- Period (2 levels: weekdays vs weekend)
- Vehicle type (if applicable)
- Region (if applicable)

Specific estimates for combinations hereof are not expected since some countries will not have sufficient sample sizes for each combination.

Three levels of aggregation can be considered:

1) minimal level: estimates for all levels of each level of disaggregation, including CI estimates
2) medium level: crossed-level matrix of all levels of disaggregation (+ CIs)
3) ideal level: cleaned raw data (not pure raw data).

'Cleaned data' refers to data that is corrected (if possible) when improperly formatted or incorrectly recorded and discarded from any incorrect or incomplete observations that cannot be corrected, are irrelevant or duplicate.

Together with the above estimates, a report should be submitted that describes the specificities of the methodology of the field work and the statistical techniques used to weight and analyse the results, and to calculate the CIs.

2.4.5 Confidence intervals

Assuming a simple random sampling and depending on prevalence levels, the 95% confidence intervals (CI) for n=2000, n=500, n=200 and n=50 are[1]:

	n=2000		n=500		n=200		n=50	
Prevalence	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
50%	47,8%	52,2%	45,5%	54,5%	42,9%	57,1%	35,5%	64,5%
75%	73,0%	76,9%	71,0%	78,7%	68,4%	80,8%	-	-
90%	88,6%	91,3%	87,0%	92,5%	85,0%	93,8%	78,2%	96,7%

3 Summary of requirements and recommended options

SWD requirements are:

- Percentage using correctly seatbelt and CRS
- Method: observation
- Road type: rural, urban, and motorways
- Vehicles: passenger cars; goods vehicles optional
- Front and rear seats
- Child restraints vs seatbelt
- Location: random
- Time: day
- Day: week and weekend
- Month: spring/autumn

The additional or more specific requirements are:

- Direct observation or use of a camera
- Min. 2000 observations
- Min. 10 locations per road type
- Min. 500 observations per road type
- Min. 200 vehicles with child restraints in-depth
- Percentage correct use + Confidence Interval (semi-disaggregated)

Recommended options:

- Passenger cars vs goods vehicles
- Driver vs front passenger
- Boost sample size
- Geographical coverage
- Complete disaggregated data

[1] https://sample-size.net/confidence-interval-proportion/

References

European Commission (2017). Monitoring Road Safety in the EU: towards a comprehensive set of Safety Performance Indicators. European Commission, Directorate General for Transport https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/ersosynthesis2017-detail-performanceindicators15_en.pdf

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://ec.europa.eu/transport/sites/transport/files/legislation/swd20190283-roadsafety-vision-zero.pdf

Hakkert, A.S and V. Gitelman (Eds.) (2007). Road Safety Performance Indicators: Manual. Deliverable D3.8 of the EU FP6 project SafetyNet. https://www.dacota-project.eu/Links/erso/safetynet/fixed/WP3/sn_wp3_d3p8_spi_manual.pdf

Hakkert, A.S, Gitelman, V. and Vis, M.A. (Eds.) (2007). Road Safety Performance Indicators: Theory. Deliverable D3.6 of the EU FP6 project SafetyNet. https://www.dacota-project.eu/Links/erso/safetynet/fixed/WP3/sn_wp3_d3p6_spi_theory.pdf See also https://www.dacota-project.eu/Links/erso/safetynet/content/wp_3_safety_performance_indicators_1.html

Annexes

Annex 1. KPI 2. Key Performance Indicator for the use of safety belts and CRS

Reference

Commission Staff Working Document – EU Road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero", SWD (2019) 283, https://ec.europa.eu/transport/sites/transport/files/legislation/swd20190283-roadsafety-vision-zero.pdf

Rationale

The use of the safety belt and child restraint systems is an essential element of passive safety. A significant proportion of fatally or seriously injured vehicle occupants have not used the safety belt or child restraint system correctly.

Definition of the KPI

Percentage of vehicle occupants using the safety belt or child restraint system correctly.

Minimum methodological requirements

Data collection method	Direct observation (if appropriate, using cameras).
Road type coverage	The indicator should cover motorways, non-urban roads and urban areas. The results could be presented separately for the three different road types if available.
Vehicle type	The indicator should include passenger cars as a minimum and goods vehicles (results shown separately) where possible.
Front and rear seats	For passenger cars the results should be presented separately for front and for rear seats.
Safety belts vs. child restraints systems	Safety belt and child restraint systems to be differentiated in the data collection.
Location	Random sample (methodology for Member States to decide).
Time of day	Observations to take place during daylight.
Day of week	Separate observations for week days and weekend and data to be shown separately.
Month	Late spring, early autumn.

Annex2. Rationale for the minimum sample requirements

The methodological guidelines for all KPIs are designed to ensure international comparability between KPI values while taking into account feasibility and affordability. To that end the methodological guidelines have been defined in such a way that accurate and representative results can be obtained for all parameters of interest at a reasonable cost.

Obviously, the larger the sample of observations and locations for observation, the more accurate the KPI estimates for the different strata will be (e.g. a KPI value for a particular type of road, or a particular part of the week). Increasing the number of observations and locations however implies increasing field work costs. Statistically, the required minimum sample size depends mainly on the desired accuracy of the final estimates, for which no absolute value can be determined *a priori*. Therefore, for the main KPI estimates a pragmatic evaluation was made of the expected confidence intervals at different sample sizes and population parameters. Giving priority to feasibility and affordability, as a rule of thumb the minimum total number of observations was set at 2,000, the minimum number of observations for different strata at 500. It was agreed that this should allow to identify statistically meaningful differences between countries at an affordable price. For some countries, this will imply disproportionate sampling of certain strata compared to the distribution of traffic volumes over different strata. This is however required to allow statistically meaningful international comparisons at the level of each of the strata at interest.

The same pragmatic logic was followed for determining the minimum number of 10 locations for observation for each of the required road types of interest. Once again, there is no statistical rationale for determining the required minimum number of locations to ensure representativeness of the observations for the entire country. This mainly depends on the amount of variance between locations and within a country. Giving priority to affordability, a rule of thumb was also used to define the minimum number of locations at 10 per stratum. In order to ensure representativeness for the entire country larger numbers of locations might be required for larger countries. Taking field work costs into account, it was however decided to only identify the minimum requirements and leave decisions on the final number of locations to the discretion of the member states. Equally importantly, in order to ensure representativeness of the measurement locations these should be randomly selected as far as possible.

The main objective in defining the minimum methodological requirements is to keep a balance between affordability of the field work and the requirements to make meaningful international and historical comparisons. Therefore, the emphasis is placed on the minimum requirements that can also be taken into account by smaller countries. It is however of interest to any member state to increase the accuracy of the KPI estimates by boosting the number of locations and the number of observations.