European Road Safety Observatory

Road Safety Thematic Report

Road Safety Performance Indicators (RSPIs)

This document is part of a series of 20 thematic reports on road safety. The purpose is to give road safety practitioners an overview of the most important research questions and results on the topic in question. The level of detail is intermediate, with more detailed papers or reports suggested for further reading. Each report has a 1-page summary.

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Contents

Summary

In this report 'road safety performance indicators' (RSPIs) are defined as measures of the operational conditions of the road traffic system which influence its safety performance. The four key dimensions of RSPIs are: the topic addressed (e.g. speeding), the geographical coverage (e.g. a country), the road type to which it applies (e.g. motorways) and the road user category concerned (e.g. motorcyclists). Criteria for selecting RSPIs are: quantifiability, causality, policy relevance, representativeness, reliability, comparability, and feasibility. RSPIs related to risky behaviour are in general based on a sample of cases. This contrasts with indicators on road crashes and fatalities, where databases can be used to construct indicators that are based on total cases.

RSPIs contribute to a better understanding of the factors that affect road safety performance. RSPIs can be used to set improvement targets, to monitor progress towards these targets and to assess whether the policy measures implemented have led to the desired results. Such approaches can be used at local, regional, national and international levels. Most RSPI sets currently in use are specific to a particular country, making it difficult to make international comparisons. There is, however, an emerging trend towards international standardisation through the WHO Global Status Reports on Road Safety and the SafetyNet, ESRA, Baseline and Trendline projects.

Roadside observation is the most common and well-known method for data collection for behavioural RSPIs. Typically, a representative sample of locations is selected where the behaviour of road users is observed and documented. The classical approach is to use trained observers along the road who note down certain characteristics of the passing road users. The main advantages of roadside observation is its objectivity and representativeness (provided an appropriate sampling strategy has been implemented). Its limitations are that often the number of variables that are observable are limited and that little information is available about the road users observed.

Technology-based approaches are also being implemented gradually. Radars, induction loops and laser guns are already used for measuring speeding, and methods based on semi-automatic analysis of video images and capturing sensor data from vehicles and smartphones are emerging. Such data can be used to systematically map road network risks – which eventually can become the foundation for the formulation of RSPIs. The advantage of such an approach is the potentially very high number of observations and access to data that cannot easily be obtained in other ways. The challenges and drawbacks include the representativeness of the data and data protection issues. An alternative or a complement to roadside observation are questionnaire surveys . They make it possible to measure past behaviour and collect data on many additional factors such as opinions and motives, perceived social norms, risk perception, and existing habits. They are relatively cheap when using internet panels. The main disadvantage is the possible bias in reporting past and socially less acceptable behaviour. A third way of creating RSPIs is to use existing databases with records that are relevant for traffic safety (e.g. police records, hospital data). The main drawback can be that the information recorded in such databases was not collected with the aim of creating RSPIs which may make it difficult to construct meaningful RSPIs from the data.

1 Highlights

- Road Safety Performance Indicators (RSPIs) are an essential part of road safety strategies.
- Four key dimensions of an RSPI are the topic considered, the geographical area covered, the road type to which it applies, and the road user category.
- Criteria for selecting RSPIs are: quantifiability, causality, policy relevance, representativeness, reliability, comparability, and feasibility
- The main data sources for RSPIs are roadside observation, questionnaire surveys, administrative databases, and vehicle or road user-related sensors.

2 What are Road Safety Performance Indicators (RSPIs) and what are they used for?

2.1 Definitions

'Indicators' are values that give information about a relevant characteristic of an object, an activity or a phenomenon. For instance, the average temperature and the annual rainfall in a country are indicators for climate in that country; or the average life expectancy in a country is an indicator of the performance of the welfare system. Indicators help to capture the complexity of phenomena in relatively simple terms, and facilitate monitoring these phenomena and communicating about them (Wegman & Oppe, 2010).

The term indicator is actually used in a wide range of contexts and policy areas (Eurostat, 2020), including public health (Segui-Gomez & Ewert, 2006) and transport. A useful way to look at indicators in road safety is provided by the '3-stage logic' shown in Figure 1.

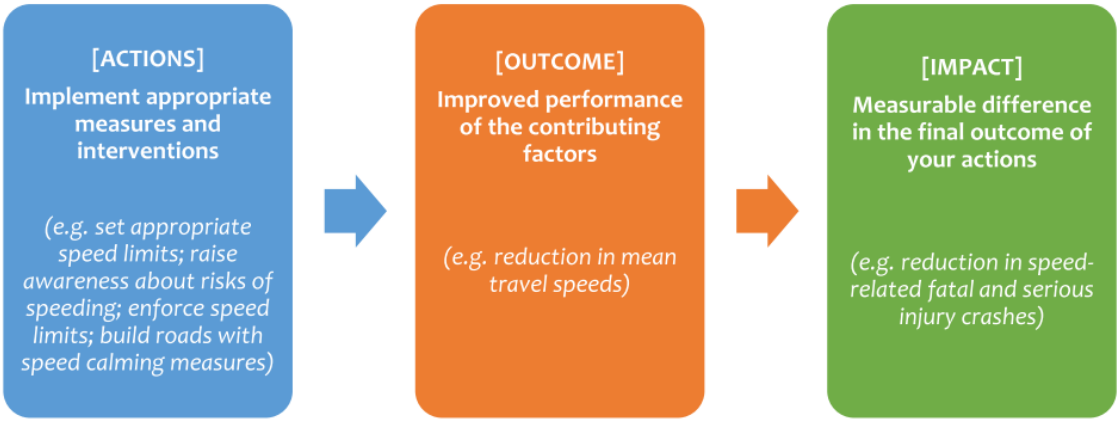

Figure 1. From Actions to Impact in Road Safety (Van den Berghe et al., 2020)

Road safety policy is based on 'Actions' to improve road safety *(e.g. enforce speed limits)*: these 'Actions' lead to one or more 'Outcomes' (*e.g. reduction in average travel speed)*, and

finally these outcomes have an 'Impact' on road safety *(e.g. reduction in speed-related road crashes)*. It is possible to define road safety indicators at each of these stages – examples are given in Van den Berghe et al. (2020). The set of voluntary road safety performance targets proposed by the United Nations (WHO, 2018) also uses indicators that are linked to different stages.

Often, the term 'safety performance indicators' is only used for indicators at the intermediate level ('Outcome' in Figure 1) that are known to be causal factors of road crashes. This was also the approach proposed by the ETSC (European Transport Safety Council, 2001) and further developed in the SafetyNet project, which defined road safety performance indicators as *"measures (indicators), reflecting those operational conditions of the road traffic system, which influence the system's safety performance"*. (Hakkert et al., 2007). This is also how RSPIs are defined in this report.

These operational conditions cover the following areas which are known to be causally related to the number of road traffic crashes, injuries and fatalities:

- the safety characteristics of the road infrastructure *(e.g. the use of median barriers)*
- the safety characteristics of the vehicles *(e.g. the availability of automatic emergency braking systems)*
- the risky behaviour of road users *(e.g. speeding, distracted driving, driving under the influence of alcohol, etc.)*
- the use of protective equipment and clothing *(e.g. seatbelts, helmets, reflective clothing*).

The term 'Key Performance Indicators' (KPIs) was introduced in the field of road safety by the European Commission (European Commission, 2019); the meaning of this term is identical to that of RSPIs as used in this report. It should be noted that some experts take a broader view and include some other activities and/or outcomes in their definition of (road) safety performance measures (Funk et al., 2021).

2.2 Arguments for using RSPIs

Impact indicators, such as the numbers of people killed or injured on the road, tell little about the causes of crashes or about emerging trends. They do not provide sufficient information to determine which interventions are needed to improve road safety. Moreover, road crash data may be difficult to interpret because they are subject to random fluctuations. To address this gap, RSPIs can help in understanding better the factors that contribute to road safety *(e.g. the percentage of car passengers wearing a seatbelt)*.

The main added value of RSPIs is their use in the **monitoring of road safety plans and strategies**. They can be used to set targets to be achieved in the medium and long term *(e.g. reduction of the numbers of speeders on rural roads by 50%)*, to monitor the progress towards targets, and to assess whether the policy measures implemented have led to the desired results (European Commission, 2019; Larsson, 2021; Van den Berghe et al., 2020).

Other purposes of RSPIs are (Funk et al., 2021; Gitelman et al., 2014; S. Hakkert et al., 2007; Thomas & Breen, 2022):

- to monitor changes in contributing factors *(e.g. the use of mobile phones)*
- to detect emerging trends at an early stage *(e.g. shifts in drink driving behaviour)*

- to identify policy measures and safety interventions that need to be taken *(e.g. increase the number of roads with section control for speeding)*
- to compare different road traffic systems *(e.g. differences between countries in the percentage of motorcyclists wearing a helmet)*
- to provide focus for the efforts of the many actors involved.

2.3 RSPIs as part of road safety policies and plans

Let us consider the example of a country in which on average two percent of car drivers are driving under the influence of alcohol. This is considered by policymakers to be unacceptable, and they set a target to reduce this percentage to 0.5 over a period of ten years. As part of the national road safety plan, several measures are implemented, such as large nationwide awareness campaigns, increased enforcement levels, higher penalties for infractions of the BAC limit, and reduced access to alcohol at night. Every two years the SPI on drunk driving is measured and there is an assessment of whether the country is on its way to achieving its target. If progress is too slow, additional measures are taken.

This logic can be applied at local, regional and international levels. At European level, the underlying purpose of the Baseline and Trendline projects (see Section 3.3.1) is to encourage EU Member States to develop RSPIs (called KPIs in EC documents) and subsequently set targets for RSPIs at national and, where appropriate, European level. This follows a logic that is already used in relation to the number of people killed or seriously injured on the road (European Commission, 2019). The UN targets have a similar purpose at global level (Van den Berghe et al., 2020).

3 What type of RSPIs exist?

3.1 Dimensions of RSPIs

There are four main dimensions of RSPIs: the topic addressed, the geographical area covered, the applicable road type, and the road user category. As an example: the percentage of car drivers *(= road user)* driving faster than the speed limit *(= phenomenon)* on rural roads *(= road type)* in France *(= geographical area)*.

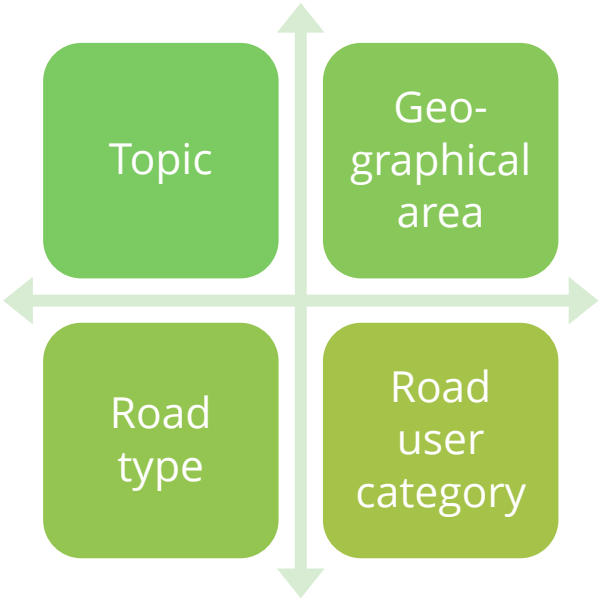

Figure 2. Four main dimensions of RSPIs

The **topic** to which the SPI refers can be any of the intermediate outcomes:

- risky behaviour of road users (speeding, driving under the influence, distracted driving, not using a seatbelt or a helmet, …)
- road infrastructure safety
- vehicle safety
- effectiveness of post-crash care.

In the broader definition of RSPIs, 'road safety management' could also be considered as an area for RSPIs. For more information and specific examples, see 'Further reading' at the end of this report.

The second important dimension is the **geographical area** to which the SPI relates. This could range from defined local, regional, and national areas to the international level. Although some indicators might be applicable to all these levels – e.g. the percentage of drivers not wearing a seatbelt – most RSPIs are optimal for a particular geographic scale, such as a country or a sub-national region.

For example, certain international RSPIs – e.g. the number of countries with national laws to restrict or prohibit the use of mobile phones while driving – do not make sense at the national level. Similarly, national or regional indicators may not be the most appropriate ones to use at local level (Owen et al., 2022; Pešić & Pešić, 2020). Local authorities need information on specific road safety issues on which they have power to act. This often requires choosing RSPIs and specific methodologies that are unique to the local environment. In the local context, it is also important that road safety targets in terms of RSPIs are embedded within wider policy objectives (Santacreu & Samsonova, 2019).

Most RSPIs currently used in Europe are country-level indicators, sometimes with subnational breakdowns. In principle, such indicators may be used for comparison and benchmarking across countries. However, because methodologies and definitions often differ considerably between countries, international comparisons are often difficult or even impossible. This was one of the reasons why the European Commission launched and supported the Baseline and Trendline projects (Section 3.3.1).

RSPIs, in particular those that refer to risky behaviour of road users, should ideally be linked to a particular **road type**, because both the behaviour and the crash risk differ considerably between road types. Most countries have more detailed categorisations which could be a basis for designing appropriate RSPIs. Road categories and related speed limits can vary substantially between countries. So, when the aim is to make international comparisons, broader road categories must be used (e.g. Boets et al., 2021). Three broad road categories used are: urban roads (or roads in built-up areas), motorways and similar roads, and rural roads (or roads outside built-up areas).

The final key dimension of behavioural RSPIs is the type of **road user** in question. RSPIs used so far have mostly been targeting car drivers, but increasingly indicators are being deployed that refer to other road users, such as helmet-wearing of motorcyclists, distracted driving of truck drivers, seatbelt-wearing of car passengers, and drunk driving of cyclists.

For most RSPIs it is useful to make further **breakdowns and segmentation** of the values (Van den Berghe et al., 2020). For instance, when analysing drunk driving, it is useful to break down the data by age group and gender, as this information may help to target

interventions. It may also be useful to calculate the values at (sub-national) regional levels, since in several countries regions have considerable power to implement policy measures. Other relevant breakdowns are: the time of day, the day of the week and/or the month or season. This is justified when it is known that the road safety risks vary considerably between different time periods. For example, driving under the influence of alcohol happens much more frequently during weekend nights, and there are far fewer motorcyclists on the road during wintertime. Again, such segmentation helps to identify the most effective and efficient interventions. These additional segmentations, however, come at a price, since in general they require a considerably larger and more complex data collection process.

3.2 Criteria for selecting useful RSPIs

A number of theoretical and practical criteria should be used when selecting RSPIs. In the literature (Fosdick et al., 2022; Funk et al., 2021; Gitelman et al., 2014; Van den Berghe, 2020; Wegman & Oppe, 2010) a number of criteria have been identified. After reformulation these have been grouped into seven categories which are summarized below (see also Figure 3):

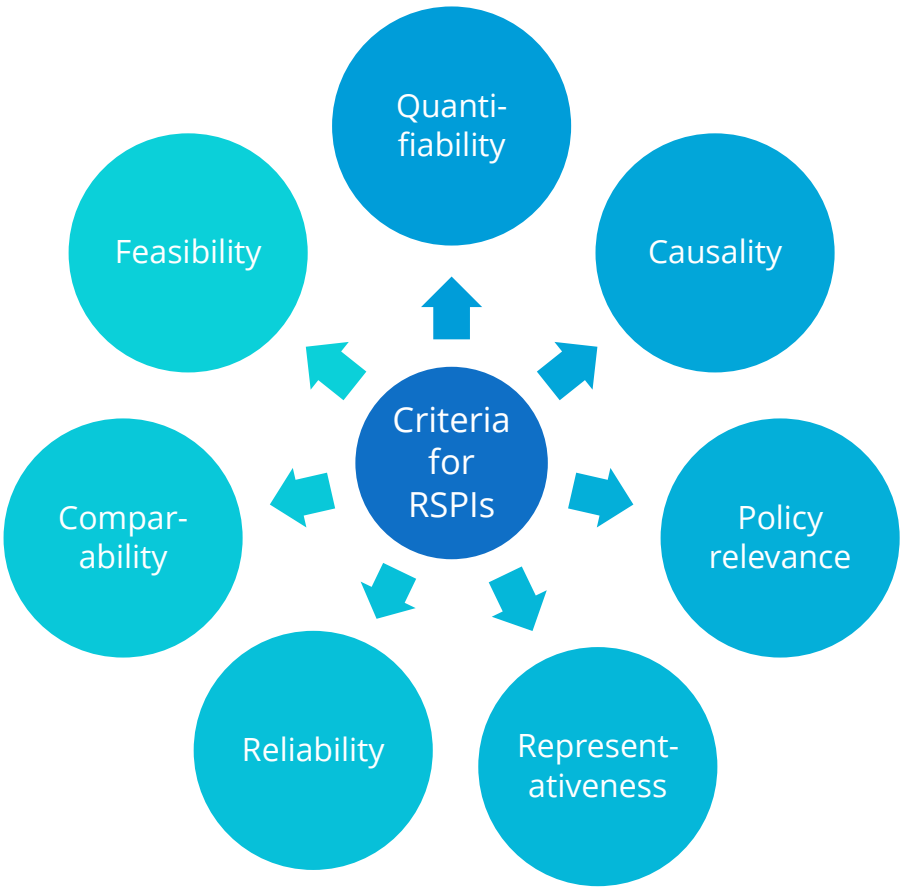

Figure 3. Criteria for selecting useful RSPIs

- **Quantifiability of the phenomenon**
  - possibility of capturing the phenomenon in a quantitative way
  - sufficiently sensitive *(changes in the phenomenon lead to observable changes in the values of the RSPI)*
- **Causal link with road crashes and injuries**
  - proven association with road crash and injury risks
  - absence or limited impact of confounding factors

- **Relevance for policymaking**
  - scale of crash and injury risks linked to the phenomenon *(e.g. not wearing a helmet)*
  - integrable in current and future transport policy measures
  - influenceable by interventions that can reduce road crash risks
  - scope for specifying medium and long term target values
  - utility in measuring the effectiveness of measures and interventions
  - significance is easy to understand *(e.g. percentage of people using their mobile phone while driving)*
- **Representativeness**[1] **for the geographical area or period considered**
  - scope for applying random sampling for observations/measurements
  - existence of appropriate weighting factors for samples (e.g. traffic volume)
- **Reliability of the values**
  - accurate initial registration of data
  - sample size sufficiently large for all breakdowns used
  - reproducible methodology
  - quality assurance of data collection and analysis
- **Comparability of the values**
  - over time
  - with other geographical areas
  - with other indicators
- **Feasibility of the methodology**
  - method not restrained by legal obstacles *(e.g. use of images, legislation on random breath testing)*
  - data providers and/or relevant authorities willing to cooperate (*e.g. police, local authorities, ministries, agencies)*
  - access to all the data needed
  - availability of sufficient financial resources
  - possibility for repetition of data collection on a regular basis in the future

3.3 International initiatives for RSPIs

3.3.1 EU KPIs – Baseline and Trendline projects

Baseline (www.baseline.vias.be) is a European Union initiative that ran from 2020 to 2022 to encourage EU Member States to develop national RSPIs, or, as the EU calls them, "Key Performance Indicators" (KPIs). Eighteen EU Member States participated in the project. At its core are eight KPIs that had been elaborated by the European Commission in collaboration with EU Member State experts (European Commission, 2019):

1. *Percentage of vehicles travelling within the speed limit*
2. *Percentage of vehicle occupants using the safety belt or child restraint system correctly*
3. *Percentage of riders of PTWs and bicycles wearing a protective helmet*
4. *Percentage of drivers driving within the legal limit for blood alcohol content (BAC)*
5. *Percentage of drivers not using a handheld mobile device*
6. *Percentage of passenger cars with a Euro NCAP safety rating equal or above a threshold*

[1] Not needed if all observations or cases for the geographical area are included.

7. *Percentage of distance driven over roads with a rating above an agreed threshold*
8. *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.*

With the Baseline project, a common framework for collecting indicator data has been developed, with methodological guidelines for each of the eight KPIs. The Baseline project has been succeeded by the Trendline project (see website trendlineproject.eu - forthcoming) running from 2023 to 2025 and in which 25 European countries take part (plus several other ones as observers), as well as. A number of additional experimental indicators is being developed.

3.3.2 United Nations' voluntary global targets on road safety

The United Nations' twelve global targets on road safety are part of the Global Plan for the Decade of Action for Road Safety 2021-2030 (WHO, 2021). These SPI-based targets have been defined as follows (a list of associated potential national indicators can be found in Van den Berghe et al., (2020)):

1. *All countries establish a comprehensive multisectoral national road safety action plan with time-bound targets.*
2. *All countries accede to one or more of the core road safety-related UN legal instruments.*
3. *All new roads achieve technical standards for all road users that take into account road safety, or meet a three star rating or better.*
4. *More than 75% of travel on existing roads is on roads that meet technical standards for all road users that take into account road safety.*
5. *100% of new (defined as produced, sold or imported) and used vehicles meet high quality safety standards, such as the recommended priority UN Regulations, Global Technical Regulations, or equivalent recognized national performance requirements.*
6. *Halve the proportion of vehicles travelling over the posted speed limit and achieve a reduction in speed-related injuries and fatalities.*
7. *Increase the proportion of motorcycle riders correctly using standard helmets to close to 100%.*
8. *Increase the proportion of motor vehicle occupants using safety belts or standard child restraint systems to close to 100%.*
9. *Halve the number of road traffic injuries and fatalities related to drivers using alcohol, and/or achieve a reduction in those related to other psychoactive substances.*
10. *All countries have national laws to restrict or prohibit the use of mobile phones while driving.*
11. *All countries to enact regulation for driving time and rest periods for professional drivers, and/or accede to international/regional regulation in this area.*
12. *All countries establish and achieve national targets in order to minimize the time interval between a road traffic crash and the provision of first professional emergency care.*

The next WHO Global Status Report on Road Safety (planned for end 2023) will likely include values in relation to these targets and indicators for European countries.

3.3.3 ESRA indicators on self-reported behaviour

ESRA (E-Survey of Road users' Attitudes – https://www.esranet.eu/) is a joint initiative by road safety institutes, research organisations, public services, and private sponsors, with the aim of collecting comparable national data on road users' opinions, attitudes, and behaviour with respect to road traffic risks (Meesmann et al., 2021; Pires et al., 2020). At the heart of the project is an extensive online panel survey using a representative sample

of the national adult population in each participating country. In ESRA2, the second version of the survey, 48 countries (including 24 European) took part. A further ESRA3 survey (https://www.esranet.eu/about-the-project#esra_3) is scheduled for spring 2023.

The survey addresses different SPI-related topics (e.g. driving under the influence of alcohol, drugs and medication, speeding, and distraction) and targets all types of road user. Part of the survey addresses the self-reported behaviour of different road users (car drivers, car passengers, motorcyclists and moped riders, cyclists and pedestrians) in relation to a range of risky behaviours, including:

- *Speeding*
- *Driving under the influence of alcohol and drugs*
- *Not using seatbelts or helmets*
- *Distracted driving and driving when tired.*

The survey also covers to what extent people feel unsafe in traffic (subjective safety) and the level of traffic law enforcement. The data collected provide a huge amount of information on which relevant RSPIs can be based. The main results are documented in the final report (Meesmann et al., 2022) and in 15 thematic reports (https://www.esranet.eu/en/publications/). The European ESRA survey data can be used as complementary to the RSPIs collected in Baseline and Trendline.

4 How to collect data for RSPIs?

RSPIs are based on systematic data collection and analysis. Although some RSPIs are based on existing national databases that include total cases (e.g. for post-crash care and vehicle safety), in most cases the RSPIs are based on a sample that ought to be representative. This contrasts with the indicators on road crashes, injuries and fatalities, where national and even international databases (such as the CARE database of the European Commission) can be used to construct indicators that are based on total cases of crashes leading to death or injury.

4.1 Roadside observations

Roadside observations and counts are the most common and best known methods for data collection for behavioural RSPIs. Typically, a representative sample of locations is selected where the behaviour of road users is observed and documented. The results of all observation sessions are weighted in order to calculate the overall indicator. In general, this weighting factor is related to the (estimated) traffic volume. Methodologies for sampling and weighting have been developed and documented in the European SafetyNet project (Auerbach et al., 2007; Hakkert et al., 2007) and further developed in the context of the Baseline project (www.baseline.vias.be/en/publications).

Because it is seldom feasible to make observations all year round, the selection of the month(s) when the observations are made is of particular importance. Periods with 'normal' or 'average' traffic are to be preferred. In many countries, therefore, data collection for behavioural measurements takes place in spring or autumn, outside school holidays. Although traffic is in general lower at night, it is important for certain RSPIs to also make

observations at night, because some risky behaviour, such as driving under the influence of alcohol or drugs, tends to be more prevalent at night.

There are several methods for making observations. The classical approach is to use trained observers along the road who note down (on paper, smartphone or laptop) certain characteristics of the passing road users. Sometimes pictures or movies are taken which are analysed at a later stage. This method is often used for observing the use of seatbelts, helmets and mobile phones, and to measure (with laser guns) the speed of motorcyclists. An emerging technology, based on machine learning techniques, is the semi-automatic detection of the use of seatbelts and handheld devices.

For measuring the speed of cars and trucks, radars and induction loops can be used. This method can lead to numbers of observations that are much larger than with the other methods. With such methods there is no observer bias, except that fixed speed cameras and induction loops tend to be placed at locations that are not representative for free-flowing traffic. A sampled network of cameras, radars and induction loops is to be preferred. An emerging approach is the use of in-vehicle data and smartphones for speeding: the challenge in this case is to secure a representative sample of vehicles that provide the data.

Some behaviours can only be measured when a car is stopped. This applies in the cases of driving under the influence of alcohol or drugs and of the appropriate use of child restraint systems.

The main advantages of roadside observation are objectivity and representativeness (Vollrath et al., 2019). But observation-based studies have also limitations (Meesmann et al., 2021). The number and nature of variables that are observable are limited. Often little information is available about the road users observed. Moreover, roadside observations require a sophisticated study design and protocol, and can be relatively expensive. Inadequate sampling design can be the cause of bias in the results.

4.2 Self-reported behaviour

An alternative to roadside observation is the use of questionnaire surveys. When properly designed and with an adequate sampling approach, such surveys can yield useful information on road safety performance and also on road safety culture. Questionnaires make it possible to measure things that cannot be observed objectively: this is particularly the case for opinions, beliefs, attitudes and past behaviour (Lajunen & Özkan, 2011). A further advantage of such surveys is that they can gather data on many additional factors and can provide insights into socio-cognitive determinants of behaviour. Lajunen & Özkan (2011) point out that questionnaires can keep costs down, that a larger number of participants can be reached, and that is easier to achieve a representative sample of respondents.

Hence, it is possible to design and use RSPIs based on online surveys, in particular when using online internet panels, which can guarantee a high degree of representativeness. This is also the approach taken by the ESRA project (see Section 3.3.3).

Self-administered web surveys are less prone to social desirability in responses compared to interviewer-administered surveys (Goldenbeld & De Craen, 2013). Although the

nature and the logic of the measurements differ with those in roadside observations, strong correlations have been observed – see e.g. Holló et al (2018).

The disadvantage of basing RSPIs on self-reporting behaviour is possible bias in reporting past behaviour (Vollrath et al., 2019), because of failure to correctly remember past behaviour and/or failure to report truthfully whether the behaviour has taken place (caused by social desirability).

4.3 Using other data sources

A third way of creating RSPIs is to use existing databases with records that are relevant for traffic safety. Databases that might be useful for that purpose include police records, hospital data, data on emergency services, road infrastructure data, traffic law enforcement data, vehicle registration data, and vehicle insurance data.

Advantages of such databases are that they may cover the whole geographical area to be considered (e.g. a country for which all data are in a national database) and that no extra costs are needed for their collection. The main drawback is often that the information recorded in such databases was not collected with a view to creating RSPIs, which may make it difficult to construct meaningful RSPIs from the data. It may be necessary to link the database to other databases in order to obtain useful RSPIs. There may also be strong restrictions for access to data, for reasons of privacy *(e.g. police and hospital records)* or because it has commercial value *(e.g. insurers' data)*. Nevertheless, within the European Baseline and Trendline projects (see Section 3.3.1), several countries have been able to use existing databases to construct RSPIs for post-crash care, vehicle safety, and road infrastructure safety.

Over the last years, new data sources have emerged that may also become useful for RSPIs (Owen et al., 2022). This is the case with data obtained from a range of roadside sensors and cameras, from vehicles (vehicle on-board diagnostics, car and bike sharing data), and from smartphones. The analysis of such data makes it possible to identify unsafe road sections and risky behaviour on the road (including driving while tired). By using machine-learning techniques such data can be used to systematically map road system risks – which eventually can become the foundation for the formulation of RSPIs. The advantage of such an approach is the potentially very high number of observations and access to data that cannot easily be obtained in other ways. Challenges and drawbacks include the representativeness of the data, data protection issues, and the lack of harmonisation of data formats. Given these challenges, it may be more feasible to develop RSPIs from such data at local rather than national level.

4.4 Challenges in using RSPIs

In practice there are several challenges and issues needing attention in relation to the deployment of RSPI methodologies, including:

- the RSPIs could be biased because the underlying dataset is not representative
- it may not be possible to create useful segmentations (e.g. by age group)
- when selecting the methodologies for RSPIs, decisions may be based on low cost rather than accuracy

- the sensitivity and accuracy of the RSPIs may be too low, making it difficult to detect real trends in a timely manner
- the data collection and analysis can be time-consuming and costly.

There is also a risk that the main purpose of RSPIs, monitoring road safety performance with a view to adequate action, cannot be achieved. Issues needing attention are:

- integrating RSPIs in road safety policy strategies and plans
- the frequency of measurement is either too high or too low to fit into the policy monitoring cycle
- the RSPIs cannot be used effectively to identify possible measures to be implemented
- topics for which no RSPIs are available may be overlooked when deciding on policy measures and safety interventions
- authorities might be reluctant to adopt RSPIs because they are held accountable for performance and for actions to improve it (Fosdick et al., 2022)
- the time lag between the measurement and the availability of the RSPI values may be too long for effective decision-making *(e.g. mortality data available more than 2-3 years after the event).*

Further reading

A number of reports developed within the **SafetyNet** project include theoretical background information and methodologies for safety performance indicators in seven areas: alcohol and drug-use; speeds; protective systems; daytime running lights; vehicles (passive safety); roads (infrastructure); and the trauma management system (Auerbach et al., 2007; S. Hakkert et al., 2007).

A strategy document from the **European Commission** includes a detailed discussion and proposal for eight KPIs: speed; restraint systems; helmets; alcohol; distraction; vehicles; road infrastructure; and post-crash care (European Commission, 2019).

Methodological guidelines for these eight KPIs have been published at the **Baseline** website (https://www.baseline.vias.be/en/publications/methodological-guidelines-kpi/). Updates are planned on the **Trendline** website (trendlineproject.eu - forthcoming).

More information about the **UN global voluntary targets** on road safety, as well as on the associated indicators for each of the twelve targets can be found in a guidance document for UN Member States (Van den Berghe et al., 2020).

Information on safety performance indicators that have been developed based on **ESRA2** can be found in the final report on ESRA2 (Meesmann et al., 2022) and in 15 thematic reports (https://www.esranet.eu/en/publications/).

References

Auerbach, K., Allenbach, R., Eksler, V., Riguelle, F., Moons, E., Wets, G., Haddak, M., Holló, P., Arsenio, E., Papadimitriou, E., Yannis, G., Duivenvoorden, K., Goldenbeld, C., Houwing, S., Louwerse, R., Mathijsen, R., Schoon, C., Vis, M. A., Weijermars, W., … Rackliff, L. (2007). *Road Safety Performance Indicators: Manual. Deliverable D3.8 of the EU FP6 project SafetyNet* (S. Hakkert & V. Gitelman (eds.)).

Boets, S., Schumacher, M., Stelling, A., Jankowska-Karpa, D., & Pavlou, D. (2021). *Methodological guidelines – KPI Distraction*. Vias institute.

European Commission. (2019). *EU Road Safety Policy Framework 2021-2030 - Next steps towards "Vision Zero"* (Commission Staff Working Document SWD (2019) 283 Final, Issue SWD(2019) 283 final).

European Transport Safety Council. (2001). *Transport Safety Performance Indicators*. European Transport Safety Council. https://etsc.eu/wp-content/uploads/Transport-safety-performance-indicators.pdf

Eurostat. (2020). Sustainable Development in the European Union. Monitoring report on progress towards the SDGs in an EU context. 2020 edition. In *EUROSTAT. Statistical books*. https://doi.org/10.2785/76551

Fosdick, T., Owen, R., & Staton, M. (2022). Developing and Measuring Safety Performance Indicators at Sub- National Level – Roundtable One. *Developing and Measuring Safety Performance Indicators at Sub- National Level – Roundtable One - 7th February 2022*, 1–23.

Funk, W., Orlowski, B., Braun, K., & Rücker, J. (2021). *Safety Performance Indicators im Straßenverkehr. Überblick und Erfahrungen aus der internationalen Praxis* (Berichte der Bundesanstalt für Strassenwesen).

Gitelman, V., Vis, M., Weijermars, W., & Hakkert, S. (2014). Development of Road Safety Performance Indicators for the European Countries. *Advances in Social Sciences Research Journal*, *1*(4), 138–158. https://doi.org/10.14738/assrj.14.302

Goldenbeld, C., & De Craen, S. (2013). The comparison of road safety survey answers between web-panel and face-to-face; Dutch results of SARTRE-4 survey. *Journal of Safety Research*, *46*, 13–20. https://doi.org/http://doi.org/10.1016/j.jsr.2013.03.004

Hakkert, S., Gitelman, V., Martijn, A. V., Auerbach-Hafen, K., Hasse, A., & Lerner, M. (2007). *Road Safety Performance Indicators: Theory. Deliverable D3.6 of the EU FP6 project SafetyNet.* (A. . Hakkert, V. Gitelman, & M. A. Vis (eds.)). https://dspace.lboro.ac.uk/dspace/handle/2134/4949

Holló, P., Henézi, D., & Berta, T. (2018). Comparison of self-reported and observed road safety performance indicators. *Periodica Polytechnica Transportation Engineering*, *46*(3), 117–121. https://doi.org/10.3311/PPtr.12127

Lajunen, T., & Özkan, T. (2011). Self-report instruments and methods. In B. E. Porter (Ed.), *Handbook of Traffic Psychology* (pp. 43–59). Academic Press. https://doi.org/10.1016/B978-0-12-381984-0.10004-9

Larsson, P. (2021). Management by objectives. *Baseline General Assembly 25th of November 2021*. https://www.baseline.vias.be/storage/minisites/experience-of-sweden-in-the-use-of-kpis-for-monitoring.pdf

Meesmann, U., Torfs, K., Wardenier, N., & Van den Berghe, W. (2021). *ESRA2 methodology. ESRA2 report Nr. 1 (updated version). ESRA project (E-Survey of Road users' Attitudes)* (Vol. 1). Vias institute. https://www.esranet.eu/storage/minisites/esra2-methodology-report-updatewave2-def.pdf

Meesmann, U., Wardenier, N., Torfs, K., Pires, C., Delannoy, S., & Van den Berghe, W. (2022). *A global look at road safety. Synthesis from the ESRA2 survey in 48 countries. ESRA project (E-Survey of Road users' Attitudes).* Vias institute. www.esranet.eu

Owen, R., Fosdick, T., Scott, S., & Staton, M. (2022). *Developing and Measuring Safety Performance Indicators at Sub-National Level Roundtables Summary Report*. *May*, 1–24.

Pešić, D., & Pešić, A. (2020). Monitoring of Road Safety Performance Indicators-Current Situation and Trends in the Republic of Serbia. *Transportation Research Procedia*, *45*(2019), 70–77. https://doi.org/10.1016/j.trpro.2020.02.064

Pires, C., Torfs, K., Areal, A., Goldenbeld, C., Vanlaar, W., Granié, M.-A., Achermann Stürmer, Y., Shingo Usami, D., Jankowska-karpa, D., Nikolaou, D., Holte, H., Kakinuma, T., Trigoso, J., Van den Berghe, W., & Meesmann, U. (2020). Car drivers' road safety performance: A benchmark across 32 countries. *IATSS Research*. https://doi.org/10.1016/j.iatssr.2020.08.002

Santacreu, A., & Samsonova, T. (2019). *Road Safety in European Cities - Performance Indicators and Governance Solutions* (International Transport Forum Policy Papers, No. 67). International Transport Forum. https://www.itf-oecd.org/road-safety-european-cities

Segui-Gomez, M., & Ewert, U. P. (2006). Injury Indicators: The IN thing these days. *APHA 134th Annual Meeting - Scientific Session*. https://apha.confex.com/apha/134am/techprogram/paper_131999.htm

Thomas, P., & Breen, J. (2022). Road Safety Strategies and Safety Performance Indicators. *Developing and Measuring Safety Performance Indicators at Sub-National Level , Round Table 7 February 2022*, *February*, 12.

Van den Berghe, W. (2020). Using safety performance indicators for monitoring and improving road safety. In Juris Kreicbergs (Ed.), *Vision Zero for Sustainable Road Safety in the Baltic Sea Region. 2-3 December 2020 (Riga - online)* (p. 23). Riga Technical University. https://visionzero.rtu.lv/wp-content/uploads/sites/35/2020/12/30_W_VandenBerghe_SPI.pdf

Van den Berghe, W., Fleiter, J. J., & Cliff, D. (2020). *Towards the 12 voluntary global targets for road safety. Guidance for countries on activities and measures to achieve the voluntary global road safety performance targets.* Brussels: Vias institute and Genève: Global Road Safety Partnership. https://www.grsproadsafety.org/wp-content/uploads/Towards-the-12-Voluntary-Global-Targets-for-Road-Safety.pdf

Vollrath, M., Schumacher, M., Boets, S., & Meesmann, U. (2019). *Guidelines for assessing the prevalence of mobile phone use in traffic* (Issue November). FERSI. https://fersi.org/

Wegman, F., & Oppe, S. (2010). Benchmarking road safety performances of countries. *Safety Science*, *48*(9), 1203–1211. https://doi.org/10.1016/j.ssci.2010.02.003

WHO. (2018). *Voluntary Global Performance Targets for Road Safety Risk Factors and Service Delivery Mechanisms and corresponding indicators*. World Health Organization. http://origin.who.int/roadsafety/Appendix_6.pdf

WHO. (2021). *Global Plan Decade of Action for Road Safety 2021-2030*. World Health Organization. https://www.researchgate.net/publication/269107473_What_is_governance/link/548173090cf22525dcb61443/download%0Ahttp://www.econ.upf.edu/~reynal/Civil wars_12December2010.pdf%0Ahttps://think-asia.org/handle/11540/8282%0Ahttps://www.jstor.org/stable/41857625


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