

## SHRP2 Safety Frequently Asked Questions

### What are the SHRP2 safety data?

The SHRP2 safety data consist of two large databases: a naturalistic driving study (NDS) database and a roadway information database (RID). The NDS data, exceeding 2 petabytes in size—about the size of two million 1-gigabyte USB flash drives—provide a wealth of information about driver demographics and on-road behavior that will be of interest to transportation safety researchers and others. The RID is a smaller database of the roadway elements and conditions. These two databases are being linked to associate driver behavior with the roadway characteristics.

### What are “naturalistic” driving study data?

A naturalistic driving study records information about ordinary driving under real-world conditions. In the SHRP2 study, 3,147 volunteer drivers agreed to undergo a series of assessments and have their cars fitted with cameras, radar, and other sensors to capture data as they went about their usual driving tasks. Experience with earlier naturalistic driving studies demonstrates that drivers quickly forget the presence of cameras and sensors, which are as inconspicuous as possible. This allows researchers to study driving behavior that is as close to “natural” as possible: hence, a “naturalistic driving study.” This kind of study is needed because driver behavior contributes to more than 90 percent of crashes and is the primary factor in more than 60 percent of crashes. Without naturalistic data, crash causation analyses must be based on interviews with drivers or investigators’ recreation of crashes. The NDS provides objective information on what preceded crash and near-crash events, and identifies what drivers actually are doing during routine driving conditions.

### What was the study’s objective?

The central goal of SHRP2 safety research was to collect data that can be used to address the role of driver performance and behavior in highway safety. This includes developing an understanding of how the driver interacts with and adapts to: the vehicle, traffic environment, roadway characteristics, traffic control devices, and the environment. It also includes assessing the changes in crash and near-crash risk associated with each of these factors and interactions. This information will support:

- Development and deployment of new safety countermeasures
- Updates to current design guides and associated practices
- Driver training program improvements
- Vehicle design improvements
- Infrastructure improvements
- Public policy and enforcement enhancements

### Who was included in the study?

The drivers in the study were men and women of all ages, from different socioeconomic strata, drawn from six geographic areas across the United States, driving different types of light vehicles. Volunteer drivers were recruited in a variety of ways, including through a national call center and local outreach efforts. Volunteers were assessed for their visual perception, driving knowledge, reaction time, lower limb strength, and other factors so that these factors can be studied in relation to actual driving behavior under normal driving conditions.

### What is included in the naturalistic driving study database?

The naturalistic driving study database (NDS) includes video images of the view out the front and rear windshields and of the driver’s face and hands. Additionally, rates of acceleration; lateral and vertical motion; the presence of alcohol within the cabin; position information; turn signal actuation; and other

variables such as steering wheel angle, speed, seat belt use, and air bag deployment were recorded through various sensors. Radar was used to identify objects in the front of the cars, their range, and the rates at which the range changes. An incident push button allowed participants to report critical events and emergencies. See the InSight website <https://insight.shrp2nds.us> for a detailed description of the NDS study and data dictionaries for the NDS data sets. Only qualified researchers can access certain data on the InSight website; visit the website to learn more about who to become a qualified researcher.



Figure 1. Sample front, rear, and driver hand videos. Credit: TRB/SHRP2

### What is included in the roadway information database?

The roadway information database (RID) is a geo-database that contains two broad types of data. New roadway data were collected in each direction and quality assured by SHRP2 on 12,500 centerline miles across the six NDS sites (these data types are listed below). Existing roadway and other relevant information were obtained from government, public, and private sources. These data further characterize the driving environment by consolidating existing data on approximately 200,000 centerline miles within the six study sites. See <http://www.ctre.iastate.edu/shrp2-rid> and <http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/SafetyWebinars.aspx> for descriptions of the RID data.

All the RID data are referenced to a national base map that provides a consistent centerline across the six NDS sites. This design allows the users, through the process of dynamic segmentation, to produce road segments with any variable of interest from the various datasets contained in the RID. This capability of the RID makes it a very useful tool for NDS users interested in roadway characteristics and features by allowing them to focus on only those NDS trips that traversed road segments containing the items of interest.

Both data sets are geo-referenced, allowing for driver behavior to be indexed to aspects of the physical environment, such as signs, other roadside hardware, and road design details, as well as to transient elements of the driving environment such as work zones and weather.

New roadway data collected consistently across the six NDS sites include:

1. Horizontal curvature
  - a. Radius
  - b. Length
  - c. Point of Curvature
  - d. Point of Tangent
  - e. Direction of curve (left- or right-based on driving direction)
2. Grade
3. Cross-slope/super-elevation
4. Lanes in terms of the number, width, and type (e.g., turn, passing, acceleration, car pool)
5. Shoulder type/curb (and paved width if it exists)
6. All MUTCD signs
7. Guardrail/barriers
8. Intersection location
9. Intersections: number of approaches, and control (uncontrolled, all-way stop, two-way stop, yield, signalized, roundabout). Ramp termini are considered intersections.
10. Median presence, type (depressed, raised, flush, barrier)
11. Rumble strip presence, location (centerline, edgeline, shoulder)
12. Lighting presence
13. High definition video log

## **Where were the data collected?**

Six sites were selected for the roadway and NDS data collection:

1. Tampa, Florida
2. Central Indiana
3. Durham, North Carolina
4. Erie County, New York
5. Central Pennsylvania
6. Seattle, Washington

## **What are the privacy restrictions?**

The SHRP2 NDS was a human subjects research project, meaning that it was research carried out with human participants. Such research must conform to Federal requirements and be performed under the review and approval of ethics committees known as institutional review boards (IRBs). IRBs are formally designated under the Office for Human Research Protections (OHRP) of the Department of Health and Human Services to approve, monitor, and review research that involves human subjects. Collection of the SHRP2 safety data was carried out under the review and approval of six IRBs, those of Virginia Tech, the National Academy of Sciences, and four of the data collection contractors. The overall conditions for governing SHRP2 safety data sharing and privacy protection are documented in the participant consent forms and research protocols approved by these IRBs, and are binding for the life of the data.

Access to the data available through the InSight website requires users to obtain “qualified researcher” status by uploading a copy of their IRB training certificate. Future research that seeks to use personally-identifying information (PII) collected in the NDS requires IRB approval. In addition, researchers must establish a data-sharing agreement that guarantees privacy. State and local transportation agencies that want to pursue research using the NDS data and do not have IRB privacy processes in place may want to consider teaming with a research entity that has an approved IRB process. Some analysts may only need the RID data and not the NDS data and the provisions of PII do not apply to the RID data.

Researchers who are not familiar with rules regarding human subjects research and the data gathered in such research should begin by visiting the NIH website (<http://grants.nih.gov/grants/policy/hs/index.htm>) and reviewing the NIH data-sharing policies and data-sharing workbook. They are also directed to the OHRP website that addresses human subjects research at <http://www.hhs.gov/ohrp>.

## Can some NDS data be accessed directly?

NDS summary data are available to qualified researchers on the TRB InSight website. The website contains two types of data without any personally identifying information: categorical data on all trips in the NDS database, and 30-second segments of continuous data, including the forward video, on all crashes and near-crashes, as well as summary data on random baseline driving segments. As of November 2014 the website contained data on 3,066,429 trips, 668 crashes, 1,280 near-crashes, and 7,589 baseline events. The remaining data will be added in by early 2015. The InSight website is available at <https://insight.shrp2nds.us>.

## What do AASHTO and FHWA hope to achieve through SHRP2 safety implementation assistance?

AASHTO and FHWA are interested in promoting and demonstrating the use of the SHRP2 safety data. They and the Transportation Research Board believe that important new countermeasures to reduce highway crashes can be discovered by researching driver behavior through the SHRP2 safety data. AASHTO has formed a SHRP2 Safety Task Force that identified the following objectives:

1. Identify for AASHTO and FHWA the most promising strategies for capitalizing on the NDS data analysis to further the multiple efforts of various AASHTO committees to continuously reduce highway crashes.
2. Review and comment upon research proposals and research findings.
3. Lead from concept to countermeasure the coordination and cooperation among AASHTO committees for supporting research, analyzing findings, and developing promising countermeasures and strategies.
4. Select, guide, and promote early studies that demonstrate to AASHTO members and the highway safety community in general the potential of the NDS.
5. Identify strategies to accelerate the conversion of research findings into actionable strategies and countermeasures.

## Why is the SHRP2 safety implementation assistance offering called *Concept to Countermeasure*?

A countermeasure is an action or strategy to prevent, offset, or alleviate the impacts of a crash. Highway safety countermeasures could be identified in the categories of engineering, education, enforcement, or emergency services.

FHWA and AASHTO want to promote SHRP2 safety data research that identifies promising new countermeasures. IAP recipients have agreed not only to research a topic using the SHRP2 safety data but also to actively pilot and promote any countermeasures that are identified by their research. A primary—but not the only—goal is national adoption of new countermeasures. Adoption could include wide national understanding and use of the measure or its incorporation as an approved countermeasure, or strategies to improve highway safety in national manuals, guides, or policies.

## What is expected of implementation assistance recipients?

To simplify the application process and to reduce the risk and uncertainty to recipients, a three-phased process is being used. In Phase I, applicants applied for up to \$100,000 to acquire a small pilot data set of NDS and RID data and to demonstrate within nine months the proof of concept of their research proposal. Phase I reports are due September 30, 2015. The pilot data set will contain all the variables needed for the full analysis but only a small number of trips or trip segments. The pilot data set will require less time and expense to acquire and analyze than would a dataset containing all the trips or trip segments of interest. Recipients will use the pilot data set to demonstrate that a full analysis with a larger data set can answer the research question posed by the agency and its research partners. The SHRP2 database is massive, and includes complex video and other data. The pilot data set will allow recipients to gain experience with the NDS and RID data, and to refine their data request for Phase II.

Recipients must acquire on their own pilot dataset from the Virginia Tech Transportation Institute (VTTI), which is the organization that is currently hosting the NDS data. Within the nine months and with the maximum \$100,000 Phase I award budget (recipients are allowed to supplement their budgets with other funds), the recipient must acquire a pilot data set, analyze it, and produce promising preliminary findings that prove the validity of its research concept.

At the end of Phase I, the recipients must produce a brief report and meet with FHWA and the AASHTO SHRP2 Safety Task Force. The recipient must report on their findings and provide a work plan and budget for a Phase II and a possible Phase III.

There is no guarantee that Phase I IAP recipients will advance to Phase II. If Phase I is not promising, the Task Force and FHWA could decide not to provide additional support to the recipient.

If the Task Force and FHWA find the Phase I results promising, they may approve additional financial or technical support for a Phase II. In Phase II, recipients will acquire a larger dataset and study the research question in depth.

If Phase II produces meaningful results that are likely to lead to an implementable countermeasure or a new behavioral strategy, the Task Force and FHWA could provide additional financial or technical support for a Phase III, which would address implementation of the countermeasure. Implementation would not include additional research. Instead, implementation in Phase III could include engineering or other support to update national manuals, policies, or strategies to incorporate the countermeasure and endorse it for national adoption. Phase III might also include pilot testing a developed safety countermeasure in the field.

### **Are there examples of research using the SHRP2 safety data?**

Yes. The Transportation Research Board authorized a series of studies to explore potential usage of the data and to conduct pilot research projects. Four TRB-sponsored contracts began in February 2012. In Phase I, which concluded in December 2012, each contractor obtained an initial set of data, tested and refined its research plan, and developed a detailed plan for its full analysis.

The three projects selected for Phase II each obtained and analyzed a much larger data set. They submitted their final reports in late July. Information about the complete set of Phase I pilot studies conducted by TRB can be found at <http://www.trb.org/Main/Blurbs/168727.aspx>. Information about those preliminary efforts that completed Phase II research can be found at <http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/naturalisticdrivingstudy.aspx>.

In addition to these safety questions and many more that will be raised in the future, there may be still broader applications for the data, in areas such as highway operations and planning, environmental impact of vehicles, and psychological study of drivers. The SHRP2 study is not specifically designed for these uses but the databases may well be able to support more than highway safety research.

## What additional information is available?

Additional websites with information include:

- SHRP2 safety data, as well as information about how to access it, can be found at the Insight website at <https://insight.shrp2nds.us>.
- The FHWA SHRP2 Solutions safety web page at [http://www.fhwa.dot.gov/goshrp2/Solutions/Safety/NDS/Concept\\_to\\_Countermeasure](http://www.fhwa.dot.gov/goshrp2/Solutions/Safety/NDS/Concept_to_Countermeasure).
- The TRB SHRP2 naturalistic driving study page includes the preliminary research conducted to date. <http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/naturalisticdrivingstudy.aspx>
- The TRB SHRP2 safety page [http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Pages/Safety\\_153.aspx](http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/Pages/Safety_153.aspx) includes extensive background on the safety program.
- One-hour recorded webinars on the naturalistic driving study (NDS) and roadway information (RID) databases may be found at <http://www.trb.org/StrategicHighwayResearchProgram2SHRP2/SafetyWebinars.aspx>.