Building the European Road Safety Observatory. SafetyNet. Deliverable 5.9: WP5 Methodology workshop report

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Deliverable 5.9: WP5 Methodology Workshop Report

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Integrated Project, Thematic Priority 6.2 “Sustainable Surface Transport”

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Executive summary

SafetyNet Work Package 5 (WP5) organised a workshop in Gothenburg June, 18th 2008. The aim of this workshop was to consult with a variety of road safety stakeholders on the investigation techniques and data gathering methods used in the creation of two European accident databases. The workshop was attended by 26 persons including those directly involved in WP5. 19 attendees were not involved in the work package and out of these 18 questionnaire responses were returned.

The Workshop was split into 4 sessions, each designed to cover a different facet of the task. The first session introduced the Safetynet project, the need for in-depth data and the role of WP5 within this. Following this, an introduction to the data collection sources and sampling used in WP5.1 was presented. The second session introduced WP5.2 and the method used for on-scene accident causation data collection. Additionally an overview of the reliability of variables was discussed for both WP5.1 and WP5.2. Following this, the final session of the day concerned the SafetyNet Accident Causation System (SNACS) and its development for use in this project.

Each session was concluded by a general discussion covering the topics raised in the presentations and workshop attendees were invited to question the panel of speakers. Workshop participants were requested to complete a questionnaire containing questions relevant to each session of the workshop after the discussion period so that the views of the participants could be taken into account.

The majority of the work completed in work package 5 was judged appropriate for the type of study being conducted with positive feedback received through questionnaire responses and associated remarks supporting the methodologies and working practices. Only one area of the study received less favourable support among the workshop participants and this will need to be addressed in future work within the WP5 partnership.
1. Introduction

WP5 of the SafetyNet project aims to design, develop and complete two European accident databases concerning (1) Fatal accidents and (2) Accident Causations. The combination of these two databases will contribute a major advance in in-depth knowledge of accidents at an EU level despite having different characteristics.

The first database (Task 1 of Work package 5) relates to a European Fatal Accident Database, and involves the collection of data from approximately 1,300 fatal accidents from 7 European member states. The second database (Task 2 of Work package 5) relates to a European Accident Causation Database and involves the collection of data from approximately 1,000 on-scene in-depth accident investigations across 6 European member states.

As a first step the two components of the project, (tasks 5.1 and 5.2) completed a thorough methodology development stage. This period included the determination and development of the basic data variable list, the team structures including the investigation processes and procedures and the method of recording, storing and using the data. This preliminary stage formed the basis for all the data collection work completed in the project and is reported in Deliverables D5.1 (WP.1) and D5.3 (WP5.2), however before full scale data collection commenced a pilot stage was conducted.

Between the first step (the Methodology Development), and the second step, (the Pilot Phase) a specific SafetyNet work package 5 database was designed and developed by a team based at the Department of “Idraulica, Trasporti, Strade”, University of Rome, (DITS). This database was designed in two sections - one for task 5.1 and the second for task 5.2, with a common ‘spine’ of data collected by both work packages. This database was also designed for remote data transfer to enable all partners to upload or download case information across the internet.

The Pilot data collection phase consisted of the respective partners in both task 5.1 and task 5.2 collecting a small sample of data using the full scale data collection protocols. This process involved utilising the prototype database version for case input in order to ‘iron out’ any problems experienced by the teams whilst collecting or processing the data. This process was also used as preparation for the full scale activities to determine where possible difficulties were evident. A full report of this section is available in Deliverable D5.2 and Deliverable D5.4 (for task 5.1 and task 5.2 respectively).

A final iteration of the data variables and associated database modifications was made in accordance with recommendations arising from the pilot phase. These final modifications proceeded full-scale data collection for both the Fatal Accident and Accident Causation data sets.
The first external consultation on the activities conducted and procedures used within work package 5 consisted of a workshop held on the 18th June 2008 in Gothenburg, Sweden. This activity was designed to gather feedback from road safety stakeholders on the key decisions and subsequent working practices employed in the work package. The workshop dealt predominantly with the methods used for data sampling, data sourcing and representivity to both partner Member States and European Union as a whole. In addition to this, a section was dedicated to the SafetyNet Accident Causation System (SNACS) as this was a significant undertaking of the task 5.2 data collection activities.

During the workshop, presentations were given on the major areas of project work including both tasks within WP5 of the SafetyNet project. The day was split into 4 distinct sections with each section dealing with a different facet of the task. A full version of the agenda including the sessions and associated presentations is available in Annex A.

Feedback from the workshop on the subjects covered by the presentations was collected in a number of different ways. Firstly an open discussion period was conducted after each session allowing the attendees to question the panel of presenters on the work undertaken. Following this, a section of the workshop questionnaire was used to collect additional comments and determine whether the practices used in the task were seen as valid when reviewed externally to the SafetyNet partnership. A copy of the full workshop questionnaire is available in Annex C. Attendees were also encouraged to ask further question of the presenters and WP5 members during the inter-session breaks.

1.1. Structure of the Report

The main body of the workshop report is organised to reflect the workshop Programme. Sections 2 to 5 cover each of the four sessions of the workshop in turn. Each of these chapters includes a summary of the presentations followed by a record of the corresponding questionnaire section and associated discussion session. Section 6 introduces the combined conclusions of the workshop and highlights any issues that need addressing for the completion of future WP5 work. An Appendix is included and contains information on the Questionnaires, Agenda and Attendance list.
1.2. Workshop attendee information

The breakdown of the 26 workshop attendees is shown by nationality in figure 1, in total 10 European countries were represented.

The split of attendees between those associated with SafetyNet, either generally or directly involved with WP5, and those external to SafetyNet was exactly equal with 13 participants representing each side.
Almost two thirds of the attendees worked in the field of research. These were primarily University departments or research institutes. The remaining third of the attendees were split almost equally between national road administrations or national road safety bodies and Industry. The industry participants were predominantly from vehicle manufacturers or safety equipment manufacturers.

A full list of the Workshop attendees, with a tabulated breakdown of the data used above, is included in Annex B.
2. Session 1

2.1. Introduction to SafetyNet and the European Road Safety Observatory

The opening presentation of the day covered the background behind the SafetyNet project and the input that SafetyNet will make to the creation of the European Road Safety Observatory (ERSO).

To begin with a section on the types of road safety data was introduced. This covered areas where these data exist and how, in this case, it can be collected. The needs of the data in terms of the end-users and the areas of data applications were also discussed.

Following this, the presentation related the knowledge of data types and users to the needs outlined in the EC White paper of 2001. This paper provided the cornerstone to all subsequent work completed by the SafetyNet project and in the development of ERSO. The details of ERSO including the partners involved, the data collected, the data uses and the storage and access to the data was outlined.

2.1.1. Discussion Session

It was stated in the presentation that SafetyNet looked at the reliability of exposure data across Europe in SafetyNet work package 2, is this available yet?
A: Prof Pete Thomas, Vehicle Safety Research Centre (VSRC), UK.
The approach taken by work package 2 was a 2 step approach. Step 1 assessed the availability of data and step 2 presented a capture of the data. It was found that some data was readily available in the EU27 (through Eurostat) on, for example, population indicators, fleet composition and roadway data. Work Package 2 wanted to go further for exposure and risk and therefore needed more detail on this exposure to achieve a higher level of consistency across Europe.

A pilot study was conducted with the involvement of 6 countries focusing on 7 areas of detail. The aim of this process was to receive a high level of consistency. The outcome will be a list of recommendations and a common approach which could possibly be merged with a national approach. Also to use exposure data for In-depth studies we need more information in order to compare the common variables in the data with the exposure data.

2.2. Introduction to the need for In-Depth data

![Image](https://www.erso.eu)

*Figure 5: Presentation, In-Depth Data*

The second presentation of the day introduced the topic of In-depth data and In-depth accident investigation. The types of in-depth data that exist were discussed along with the research activities specifically designed to collect this varied data.
The ways in which in-depth data can be used and its applications in the real world were presented along with a description of where work package 5 sits amongst the variety of other studies. Work package 5 was described in terms of both tasks 5.1 and 5.2 and the purpose of each task was explained along with the respective objectives of each task. Finally the purpose of the workshop was outlined in order to inform the attendees of the day’s activities.

2.2.1. Discussion session

Q: Luca Persia, Department ‘Idraulica Transporti Strade’ University of Rome (DITS), Italy.
As a first impression of the data in SafetyNet work package 5 it seems there is more information available from the activities within WP5.2 compared to WP5.1? Is the data collected for WP5.1 to be used for predominantly for in-depth analysis or low level statistical analysis? Additionally can this data be used for cost benefit analysis?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
There is, at present, no standard method across Europe for the review of fatal road accidents; therefore this task in Safetynet addresses this issue on a European level with the aim of eventually being representative of EU Fatal accidents. This is only the first step in understanding fatal accidents across Europe and will create a strong resource for policy making with the aim of an eventual reduction in fatal accidents. The collected data is designed to be used for In-depth analysis and comparisons with national data will be made. Considering the issue of cost benefits, both studies can be used to offer support to policy makers in such analyses. Both tasks are different with task 5.1 providing a cheaper method due to the use of existing investigation material whereas task 5.2 has the additional cost of conducting investigations. An analysis of the cost benefits has not been addressed in the scope of this project.

Do you think Field Operational Trials (FOT’s) and in-depth data will complement each other or compete against each other?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
I think they are different approaches to a similar problem. However, with FOT’s we are only looking at avoidance actions in order to determine whether differences in the scenario can change an accident to a near miss.
Do you see the Field Operational Trial (FOT) replacing in-depth studies?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
There is still a requirement for an in-depth approach for injury and vehicle dynamic information, this will allow us to determine why and what went wrong. The project type used will always be dependent on the user's requirements.

A: Pete Thomas, Vehicle Safety Research Centre (VSRC), UK.
Field Operational Trials have limitations concerning the numbers of low energy collision events. It takes a comparatively long time and expense to collect the required amount of interesting collision data - compare this to in-depth accident data where you have the majority of required information over a much shorter time period. There is still a lot of work and development required for Field Operational Trials before they could be seen as a replacement for in-depth accident investigations.

Q: Dimitris Margaritis, Hellenic Institute of Transport (HIT). EL.
Will the data collected within WP5.2 and WP5.1 be open to the public for use in the scientific world for research and policy development?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
We are still looking into this issue due to complexities between different partners having different data protection issues. This issue will hopefully be resolved in the near future.

Comment: Dimitris Margaritis, Hellenic Institute of Transport (HIT). EL.
The approach used in MAIDS is a letter of request is sent to the owners of the data outlining any data queries external parties may want to know. Has WP5 thought who will own and manage the data from Safetynet as there is a continuing cost associated with this role?
### 2.3. Methods used in WP5.1

The final presentation of this session covered the procedures used in work package 5.1 for the sampling and data source issues. WP5.1 uses a number of different methods for both the sourcing and sampling of data across the 7 member states. These differences were explained in detail with the use of case examples. In the interests of transparency and openness, all the issues with the data sourcing and sampling were covered including where problems with the data exist or where limitations apply.

A brief overview of the outputs of WP5.1 in terms of analysis was also presented to give the attendees additional information on where and how this data could be used or applied.

The results from the questionnaire are shown below with their respective comments.

#### 2.3.1. Questionnaire

**Q1 - Do you think it is reasonable to combine data on fatal accidents from different countries?**

This question was answered overwhelmingly ‘yes’ with all 18 questionnaire responses showing a positive result. Comments from this section indicate that the positive coding comes with some provisos; “It is reasonable, but the differences in the data availability and reliability are still significant” sums up a number of comments alluding to the need to fully understand the data used in...
terms of representativity and reliability. A thorough review of the suitability of data to the task is to be completed both within WP5 and in terms of an external review which should alleviate concerns that the data should be “OK once comparability of coding and sampling has been demonstrated”

**Q2 - Do you think it is reasonable to treat different data sources on fatalities as equivalent sources of data?**

![Figure 7: Questionnaire results, Question 2](image)

A fairly equal split to the responses recorded for question 2 (Fig 7) shows that there is a degree of uncertainty within the attendee group in terms of using different sources of information in the compilation of a fatal accident database. A positive reply accounts for 10 of the responses while a ‘no’ response records 8 occurrences.

Comments, both positive and negative, show similar concerns with respect to the comparability and reliability of the data “Not reasonable unless there has been a statistically based comparison and validation” demonstrates a comment for a negative response while “If demonstrated through pilot to be of equal value/depth/quality” shows a positive response. These two comments indicate that WP5 needs to be open with its data collection sources and case sampling procedures to alleviate the concerns of external parties. The WP5 partnership presented statistical comparison tables for 5.1 showing the different data collection sources and will continue to publish this data in publicly available Deliverables including the final report.

Other areas where comments were made concerned the independence of the data; again these comments occurred for both positive and negative results. “Each source may have a different focus as well so have to be checked for bias” and “one has to be aware that different sources have their own objective/agenda with their specific investigation” indicates that the WP5 partnership need to demonstrate that the data is collected to a comparable level of quality and depth. Work has already been conducted in this area.
including a thorough pilot phase to determine that the data collected meets this brief.

Q3 - Do you think the mixture of sampling methods affects the overall analysis reliability?

![Figure 8: Questionnaire results, Question 3](image)

Out of the 18 responses for question 3 a total of 12 respondents were concerned that the sampling methods would affect the overall reliability of the analysis (Fig 8), this is the largest share of responses for this question and indicates to the WP5 partnership the need to fully evaluate the methods and associated data for use in final analysis.

Concerns were raised about the types of sampling method employed in the study and in particular the “Mixture of sampling methods…… could be a major problem for some analyses”. It is well understood that the differences across Europe as a whole (EU27) can be substantial. However, it is necessary to determine how smaller but no less significant differences may affect the sample across the 7 countries involved, one respondent remarking that “Representivity seems to vary wide in-between countries”

Other comments show that the steps taken by the WP5 partnership with respect to completing a statistical sampling plan have been a valuable exercise. WP5 can demonstrate that “if regional samples are good enough the reliability is not affected too much” and that the data collected will be “OK once a comparison has been done on a statistical basis with relevant details”

5 respondents were satisfied that the mixture of sampling methods would not affect the reliability of the analysis. The comments reflect some of the concerns raised in the section above such as “As long as the regional sampling is representative of the national average”. This, again, is something that will need to be fully clarified in further WP5 reports.
Q4 - Do you think the data on fatal accidents can be considered representative of Europe as a whole?

![Figure 9: Questionnaire results, Question 4](image)

Information on the partner countries and their respective collection areas were given in the presentation and this question relates directly to this information in terms of its representivity to Europe as a whole. It is perhaps unsurprising that 13 of the 18 respondents thought the data was not representative of an EU 27 Europe with the majority of comments citing a lack of participating countries as the major reason for this. “To be representative, it needs the involvement of other countries” and similar comments referring to “Only 7 countries from Western Europe on the database” highlight where the concerns arise.

Aside from the issues presented by the number of countries involved are the comments concerning the difficulty in collecting comparable data. This issue manifests itself in a number of ways, be it through different data collection systems using different classifications, geographical/social differences or differing legal/authority status employed throughout the 7 partner countries or further afield across the rest of Europe. This issue has been addressed in the sample of seven WP5 countries by the review of pilot cases and subsequent development of a coordinated glossary that allows identical data to be collected. This approach, to some extent, “Take[s] into account that every country has a different situation” therefore reducing the impact in the data of “how much driving vehicles differs between countries”.

WP5 asked for participant opinion on this subject to gauge the desire for a more representative European dataset involving a higher proportion of countries. Although WP5 cannot retrospectively change the partner countries to include additional members in this task, a future activity will hopefully involve more of the EU Member States. The comments received support this view and show that a long term goal should be to secure higher European involvement and representivity.
Q5 - Do you think it is important to gather the fatal accident data at European Level?

Do You think it is important to gather the fatal accident data at European level?

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Figure 10: Questionnaire results, Question 5

The answer to this question was overwhelmingly positive with 16 of the 18 respondents agreeing with this statement. Only one attendee disagreed while another could see the benefits/disadvantages of a number of systems and selected both yes and no.

Of the positive comments most centred around the need for the data to be collected across Europe to make it more representative, reliable and standardised. A number also cited political reasons for the need for Europe wide data.

One interesting point raised was that “Regions in Europe could be more equivalent to each other than regions within one country.” This could make the data even more valuable as certain factors multiply across Europe. Geographical similarities could be combined across Europe to match, for example, low lying coastal regions, or particularly mountainous areas. Data on these from one country could be quite sparse but the multiplication effect across Europe could make the data much more valuable.

Q6 - If you had access to the fatal accident database would you use it in your research/work?

17 of the 18 respondents replied that they would like some access to the WP5 data in order for use in their specific field of research or work - the one remaining workshop participant responded ‘Unknown’
This result is encouraging as it demonstrates the need for this kind of data at a European level or at the very least that there is interest in the subject of fatal road accidents.

A number of examples were given by the attendees as to where the fatal accident data could be used in research. These comments, where appropriate, will be developed by the WP5 partnership and displayed in the final analysis report.

2.3.2. Discussion Session

Q: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
In the Work Package 5.1 fatal accident database are there several data variables where unknown values are recorded or were there specific countries that were not able collect data on certain variables?

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
When establishing the protocols for the data collection we initially identified what each partner could supply and collect through the completion of a pilot data collection phase. This allowed the partnership to reduce the number of values recorded as ‘unknown’. Variables that contained excessive missing information in the pilot were kept to a minimum. Obviously the information source or data collection situation in each country could change. The amount of information available for certain variables could in, some situations, be at different levels, an example of this being alcohol involvement; involvement of alcohol could be identified in many cases but the amount of alcohol was unknown.

By using different data sources from different countries could you derive a common collision classification such as GDV?

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
The accident classification system, GDV, used in Work Package 5 is derived from the accident scenario. The only problem that arose involved the acceptance of right hand drive situations in the UK. Mirroring the code image gave us the equivalent code to fit the UK cases. Other than this minor issue it is a consistent approach for in depth analysis.

Looking at the analysis presented, France showed a larger proportion of driving accidents compared to the other countries; do you have any thoughts on why this is?

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
We have been working on this subject but, unfortunately, are still working on the analysis and haven't looked into the break down of GDV codes as yet; further analysis will be available as basic fact sheets and in the final report.

Has it been considered that using data from different sources the emphasis of the original investigation may be different, for example the different emphasis applied for prosecution or insurance purposes. Does this affect the amount and level of data available?

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
We believe that this will have a small effect on a very limited number of cases; we also believe that the information held in the database is reliable and accurate.

Q: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
Does getting the data from different sources result in a bias in the data? For example the prosecution records used would normally proportion blame.

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
There is only one country which uses prosecution records and they sampled their cases randomly from the records for the years of study. Again we believe that the data is reliable and accurate.

Q: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
Do you think some data sources or countries are weaker than others and have more missing or unknown information?

A: Steve Reed, Vehicle Safety Research Centre (VSRC), UK.
No, I think that all the partners supplied cases to a similar standard and quality providing consistently reliable levels of data. The source data is investigated in a comparable way with the same amount of effort, attention to detail and quality put into each case investigation.

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
An extensive pilot study was conducted for the data collection in both Work Package 5.1 and 5.2; this was to ensure that all partners could collect the high level of required data before the main data collection task began.

Q: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
Would you have achieved a high level of consistency and data collection without a pilot study? Or do you think a longer pilot study was required?
A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
Ideally the Work Package 5 partnership would have preferred a long pilot study however this is not always possible. We strongly believe that our pilot study was very successful in establishing the consistent capabilities of each partner.

3. Session 2

3.1. Methods used in WP5.2

This Presentation covered the work conducted in WP5.2, In-depth accident causation database. The presentation built on the information supplied during the WP5.1 presentation but added additional information on the 5.2 project and its on-scene methodology.

The basic of WP5.2 were explained, including information on case numbers, the variables collected and an introduction to the SNACS methodology used to collect accident causation data. This will be covered in more detail in a subsequent section. Following on from the introduction to WP5.2 a section explaining the on-scene methodology was introduced. This section contained detailed information on the exact sampling areas used by the partners involved, the sampling criteria used to select the cases and details on the notification system and subsequent type of investigation conducted.

The results from the questionnaire are shown below with their respective comments.
3.1.1 Questionnaire

Q7 - Do you think it is reasonable to combine data on accidents from different countries?

WP5.2 worked extensively on both pilot phases and training to produce an on-scene data set that was realistic and achievable for all 6 partner countries involved. This was explained in the presentation and subsequent panel session and the results of this question suggest that the attendees agree that this was achieved. 17 of the 18 respondents stated that it is reasonable to combine on-scene accident data from different countries. Only one participant disagreed with this question.

In a similar way to the related WP5.1 question, a number of the positive responses came with a proviso; “If the collection method is harmonised” succinctly covers most of the comments received on this subject while others commented that it could be considered reasonable “As long as there is similar data for all of them and 90% of the fields are completed”.

The comment associated with “no response” covers the fact that the coding should be guaranteed equal (harmonised) but adds that this “seems to be very hard” to achieve.
Q8 - Do you think it is reasonable to treat different data collection methods as equivalent sources of data?

The differences between on-scene investigation techniques were explained in detail and question 8 collected participant responses on these differences. The question split opinion within the group with just under half (fig 12) disagreeing with the different data collection methods being considered equal. Comments on this point included “Each method provides different level/quality of data”, “I believe that they should be considered separately” and “It could be OK to mix them, but they are not equivalent”.

Positive responses to the question, which totalled 6, also provided comments with certain reservations attached. The main point raised was that “on-scene data collection includes perishable data, e.g. skid marks that might not be included in retrospective data collection methods”. The question of recording volatile or perishable data through a retrospective study was echoed by a number of other positive respondents.

The number of negative responses indicates that the WP5.2 partnership will need to alleviate concerns by conducting some form of critical validation exercise to show how equivalent the different data collection methods can be.

Q9 - Do you think it is important to have a European in-depth accident investigation programme?

This question resulted in a completely positive response as all 17 respondents agreed that this is important.

Certain reservations were once again mentioned in the comments as earlier it had been demonstrated that getting complete compliance and harmonisation between just 6 countries was difficult. Factors such as complete European
representivity and the use of only one accident causation system caused some concern.

**Q10 - If you had access to the Accident Causation database, would you use it in your research/Work**

All of the 18 respondents replied that they would like some access to the WP5.2 data in order for use in their specific field of research or work. This result is very encouraging as it demonstrates the need for this kind of data at a European level.

A number of examples were given by the attendees as to where the fatal accident data could be used in research; these comments, where appropriate, will be developed by the WP5 partnership and displayed in the final analysis report.

**3.1.2 Discussion Session**

**Q: Irene Isaksson Hellman, Volvo Technology, Sweden.**
With reference to the two different collection methods used; on-scene and retrospective, do you have any views on the reliability of the interview data and which do you think, is the best method for interview techniques?

**A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.**
While conducting numerous and extensive on-scene investigations in the UK it has been observed that people can react in different ways at accident scenes mainly due to emotional reasons and shock. Therefore it can be said that a retrospective method for conducting interviews may yield more accurate results.

**A: Helen Fagerlind, Chalmers University of Technology, Sweden.**
It is sometimes impossible to get a long interview on scene due to time constraints. Therefore a better result can often be achieved from a retrospective interview a day or so after the incident.

**Q: Irene Isaksson Hellman, Volvo Technology, Sweden.**
In your opinion do people involved in accidents get influenced by other people that distort their version of events?

**A: Helen Fagerlind, Chalmers University of Technology, Sweden.**
People start to reconstruct the accident in their mind immediately after the event and this can start to distort the events straight away. Distortion of the facts can also happen after talking to people. It is therefore best practice to interview the persons as soon as possible, perhaps a day later.
Comment: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.

The true version of accident events may get confused with the person’s own perspective. This may cause the recollection of accidents events to change over time. The closer you are in time to the accident event the more reliable the recorded version of events will be as the driver or passengers will try to reconstruct the events themselves and thus will not be affected by social implications. The longer the time after the incident the more people think about what to tell friends, family or colleagues, therefore a change in the story may be recorded to fit social expectations or according to proportioning blame.

In some cases, memories may be blocked due to shock; these memories can come back over time – for example, interviews a day or so later may yield a better recollection of events; however these may be filtered through social implications.

A fine balance of data and interview material should be used alongside more traditional investigation methods such as physical evidence.

The best method is to build up a relationship with the subject as soon as possible, for example at the scene. Thereafter, a day or so later a telephone interview can be conducted with a bond already in place.


Therefore is it best to conduct an interview in person or over the telephone?

Comment: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.

More information is gathered by allowing the subject to speak freely instead of following a set of strictly formulated questions. Telephone interviews tend to be less personal due to the lack of body language. Ideally it is best to make contact with the involved persons at the scene of the accident in order to obtain information which could then be built on during a telephone interview a day or two later.


Do you have a structured or non-structured interview procedure within Safetynet?

A: Helen Fagerlind, Chalmers University of Technology, Sweden.

There exists a basic set of guidelines for questions to be covered during the interview. However approaching the questions more as a conversation rather than an interview is more appropriate. At the beginning of the project there existed little experience within the partnership with regards to interviewing persons involved in road traffic accidents. A varied approach was needed due to the differing work practices employed by each partner and the willingness of different involved persons wanting to talk to the investigators.
How do you store the information you obtain from the interviews? Is it structured so it can be used for further analysis in the future or just for SNACS?

A: Helen Fagerlind, Chalmers University of Technology, Sweden.
It is extremely difficult to store the interview data due to the restriction some countries apply for data protection purposes, therefore it was only used for SNACS analysis.

One reason for retaining the interview information is if any concerns arise regarding the reliability of the analysis. In this case it is good to have access to the original interview material to be able to recode the SNACS analysis.

Is it important to have the interview material to understand the SNACS?

A: Gabriele Giustiniani, Department ‘Idraulica Transporti Strade’ University of Rome (DITS), Italy.
Comments are supplied for each SNACS chain to help explain why the link has been made. In addition to this a confidence level can be attributed to the whole link.

Q: Magdalena Lindman, Volvo Technology, Sweden.
Is there confidence in the reliability of common values due to the number of review meetings? Or do you think more could have been done to improve this?

A: Karolina Bjorkman, Chalmers University of Technology, Sweden
Ideally a common sampling plan in combination with common case selection criteria between the partners would have helped to achieve a more reliable dataset. However as this was a Pan-European study involving different countries and focusing specifically on causation, the review methods employed were an effective way of ensuring a consistent approach to the coding.

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
By employing a consistent approach using extensive case reviews and training we have achieved 80% conformity in coding. This level of conformity is an exceptionally good return rate considering the number of partners involved and the new methodology employed. Ideally 100% of cases would receive a review and quality check by a different partner as this would
undoubtedly improve the quality of the data. However this would be an extremely costly method in terms of time and resources.

Q: Luca Persia, Department ‘Idraulica Transporti Strade’ University of Rome (DITS), Italy.
The situation in Italy with regards to interviews differs in that they believe only a trained psychologist should conduct the interviews and complete the SNACS analysis - not the accident investigators.

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
I believe that experience counts for a lot in this field regardless of background. All the teams conducting the research for Work Package 5.2 are multidisciplinary so could easily draw on people with different backgrounds and experiences where and when help is required.

A: Helen Fagerlind, Chalmers University of Technology, Sweden.
I believe it is dependent on the person and how they interact with people rather than their background and formal training.

I agree that the Interviewer should come from a professional background. If psychologists are performing the telephone interviews and therefore dealing with involved persons you need to create a relationship with people without conducting the interview in a damaging way

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
In order to conduct an interview successfully you still need to know the basic concepts of collision dynamics and what is happening with possible investigation methods. Educating people in how to conduct an interview correctly, in order to understand how people think, will always be advantageous to a project like this. However I don’t think it requires a psychologist to perform all the interviews and SNACS analysis.

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
SNACS is based on all the information collected from the scene and not just the interview data, therefore interviewers have to understand accidents including the dynamics in a collision and the investigations that follow.

I would still like to see the involvement of a psychologist, for example, to be used regularly for quality checks and the monitoring of interviews.

Q: Luca Persia, Department ‘Idraulica Transporti Strade’ University of Rome (DITS), Italy.
In Italy a psychologist can be called to give evidence in court as an expert witness and as a result any interview data they were aware of would also be included. Would a project such as SafetyNet Work Package 5 want this?

A: Helen Fagerlind, Chalmers University of Technology, Sweden.
This would differ from country to country - this issue would have to be addressed at a country or partner level.

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
This would also have certain ethical issues regarding the research and the purposes of the project.

A: Helen Fagerlind, Chalmers University of Technology, Sweden.
Interview data is a large part in modern accident investigation, certainly one which includes accident causation data, so it is something which needs to be further investigated in the future.

4. Session 3

4.1. Variable Reliability

The fifth presentation introduces the variables used within the two databases with respect to their reliability and quality. Initially the database structure was introduced with information provided on the common variables - those used by both WP5.1 and WP5.2 - further to this, a section was also included on the coding of the SNACS accident causation system.
The steps taken by the WP5 partnership in terms of improving the data reliability were discussed, included within this was an explanation of the methodology training, the compilation of a database glossary and the methods used when reviewing and “quality-checking” completed cases. In order to be as open as possible, information was provided on difficulties experienced in coding and analysis of the SNACS variables.

4.1.1. Questionnaire

Views on the variable reliability section were sought by means of comments, the majority of which were positive about the steps taken to ensure data reliability. A number of constructive comments provided areas where further work could be considered or expressed reservations until analysis could formally guarantee the data reliability. For example “It seems that good methods have been applied even if reliability is not yet guaranteed” Indicates that further work with the variable set or the use of analysis needs to be conducted to determine whether reliability was achieved. Another comment highlights areas where further work could be conducted in this area, specifically “Look at inter-coder variability….. Inter-team variation, inter-sampling etc.” This participant concludes by encouraging the WP5 partnership to think to future projects by “develop[ing a] checklist for validation for further studies”.

4.1.2. Discussion Session

Q: Prof Pete Thomas, Vehicle Safety Research Centre (VSRC), UK.
Different approaches are used for data collection in each partner state; considering a long term vision using all EU 27 countries, is there any scope for a movement in each country to merge methods so there is one common approach across Europe?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
It will be a very long process. It took four and a half years to get the 6 countries involved in Work package 5.2 working; therefore a step procedure may need to be considered, bringing a few countries in at a time to achieve a common approach to the investigations. Perhaps the next step would be to have extra observers to the task and common training methodologies.

Q: Prof Pete Thomas, Vehicle Safety Research Centre (VSRC), UK.
Different methods were used in work package 5; sampling regionally or nationally and obtaining raw data from a variety of sources. Could a legal or government framework be used to facilitate or help this?

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
SafetyNet Work Package 4 – Independent accident investigation recommendations - produced a comprehensive list of recommendations specifically for this objective which can be used in order to outline what is required for a joint methodology.
Q: Erik Rosén, Autoliv, Sweden.
Is there a way of knowing or identifying whether a system, which can autonomously take over or avoid the collision, has activated? If this information is available why not include this in the database?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
This is a complex issue needing an understanding of whether a collision would occur and at what point the system should intervene. Unfortunately this is also a legal matter as the vehicle or system manufacturer could be prosecuted if a system intervened inappropriately or altered the outcome of the event.

Q: Karolina Bjorkman, Chalmers University of Technology, Sweden.
There are common database variables between Work package 5.1 and 5.2; could these variables be used together and in what sort of analysis?

A: Helen Fagerlind, Chalmers University of Technology, Sweden.
These common variables used for both work package 5.1 and 5.2 are simply objective facts. In this sense there is no reason why we couldn't combine or compare these variables.

A: Andrew Morris, Vehicle Safety Research Centre (VSRC), UK.
Work package 5 is currently collaborating with work package 7 of the SafetyNet project to look at the data from both WP5.1 and WP5.2 in order to determine further analysis.
5. Session 4

5.1. SNACS Methodology Development

Session 4 was opened by a presentation on the SafetyNet accident causation system (SNACS). This system provides the cornerstone of data collected in WP5.2.

The presentation introduced SNACS, its development from a tool used in industrial accident investigation into a specific road accident causation system and its purpose within the 5.2 task. A brief overview of how the system works was also demonstrated along with where the current version sits among its previous and related versions.

In order to demonstrate the reliability of this system, an overview of the validation and pilot phase was presented including information on the reliability testing.

A section on the proposed analysis system currently being trialled within the WP5 partnership was also introduced as an example of where the collected causation data may be applied. One question related to SNACS followed the presentation.

(Note: The final method outcome from SafetyNet WP5 is now published as D5.6 – manual for DREAM)
5.1.1. Questionnaire

Q12 - what do you think is the most appropriate way of undertaking accident causation case studies?

Figure 15: Questionnaire results, Question 12

15 of the 18 respondents believe the contributing factors associated with accident causation should be pre-described in the coding system; this is the case with the SNACS coding used in work package 5.2. The remaining 3 respondents who selected ‘Other’ left comments that suggest that the overall method of predefining contributing factors is generally sound although modifications could be made. “Pre-define a core group of factors but give the possibility for investigators to describe factors on a deeper level” summarises the comments received. It was also noted by the respondents that selecting or using pre-defined options would simplify the analysis considerably but hamper the detail by restricting the responses. A possible method of combining the two approaches, by using pre-defined options and allowing free choice, was suggested as an approach that could provide the best results.

5.1.2. Discussion Session

Q: Deniz Atalar, Vehicle Safety Research Centre (VSRC), UK.
With regard to the correlation of the SNACS links, did you consider the correlation of these links at the beginning of the project or use other accident causation systems to define these?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
The CREAM causation system that forms the basis of SNACS was based on investigation of industrial accidents. Following this came the development of
the DREAM system for studying the causes of road accidents. The links that exist in SNACS were based on previous experience in using the CREAM system. SNACS is the first causation coding methodology like this to look at a wide range of literature and to justify why contributing factors link together, looking specifically at the correlation of the links themselves rather than the causes between them.

Q: Erik Rosén, Autoliv, Sweden.
Have you considered applying the ‘37 crash’ methodology to the WP5.2 cases?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden
The ‘37 crash’ method by GES in the USA identifies 37 common collision types. We could analyse those accident types to see how the SafetyNet data compares. This is achievable as we can disaggregate the work package 5.2 data in any way we want.

Q: Erik Rosén, Autoliv, Sweden.
Looking at the data collected it seems that you can stratify on a vehicle level. You say SNACS is a system level so is it possible to do the same on a system level?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
You can stratify at any level, for example road type or any specific cause in the SNACS coding. All the cases in the system with that specific cause can then be selected and analysed separately.

Q: Erik Rosén, Autoliv, Sweden.
The method you suggest, one that you can select subjects you are interested in, sounds like a good system in general, however it seems like some links have a higher probability of being selected over others depending on accident type?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden.
There is a possibility that this is the case, however all information used to select the links is based on interview and scene data; as a result the relevant contributing factors should always be coded whether these are ‘common’ links or not.

It seems difficult to establish certain links used in SNACS as involved persons will not always admit exactly what happened and, if appropriate, what they were doing at the time of the collision?

A: Mikael Ljung Aust, Chalmers University of Technology & Volvo Technology, Sweden

The SNACS system was developed to some extent through literature reviews, as such if no support for the link was found in the literature then it was removed from SNACS, if support was found for the link then we can continue using it or include it in SNACS.
5.2. DREAM methodology

The final presentation of the day introduced the topic of the Driving Reliability and Error Analysis Method (DREAM) in more detail. Information was provided on the development from the CREAM methodology into the DREAM method and illustrated how the system operated with the use of case study examples. This presentation offered further information on the scientific background that underpins both methodologies and which provides the cornerstone of the SNACS coding system used in Work Package 5.2.

Figure 16: Guest Presentation, DREAM Method
6. Discussion and Conclusions

It can be seen in the questionnaire and discussion sections detailed after each presentation session in (sections 2 -5) that a number of issues were raised during the course of the workshop.

The issues discussed cover all facets of the project from the wide-reaching comments concerning general methodologies used in (for example) case sampling to small detail points concerning individual data variables collected. All of these comments need to be reviewed and, as appropriate, addressed by the WP5 partnership for the final report or other published deliverables.

A number of positive comments were received that cover the general work practices used in the determination of the basic dataset and subsequent data collection processes. It was generally accepted by the workshop attendees that the approach taken for the development of the data variables and the use of regular case review or training sessions was a good method of achieving high quality data that is both reliable and accurate.

The Pilot phase of WP5, both 5.1 and 5.2 was well-received and was considered a highly important process in the development of two consistent and reliable data collection processes working to meet tight data collection deadlines.

The consideration of variable reliability (Section 4) was seen as a positive step in determining both the level of data and the specific data variables. By including this process, the WP5 partnership could guarantee that the maximum value could be drawn from the different sources of data used while minimising the amount of unnecessary or unreliable variables. The conclusions of the variable selection process and final variable list will be available in the WP5 database glossary deliverable (D5.5) which will be available on work package completion.

The process of transferring an existing accident causation methodology (DREAM) into the SafetyNet project for the use of WP5.2 was deemed very successful; this development has resulted in the formation of the SNACS methodology. The processes used by WP5.2 to ensure good reliability and comparability were considered highly important for the collection of this type of data, specifically the types of training and review processes employed. Good support was received from the attendees for the use of regular review sessions where SNACS coding could be peer-assessed by other members of the partnership. This process combined with a number of other significant steps helped to ensure conformity between partners. Another process which received support was the use of reliability tests. This process involved the SNACS coding of an identical accident causation case by all 6 partners involved, this allowed the partnership to test the coding for similarities or discrepancies that could be addressed by specific training. A figure of 80% reliability on the very first test indicates that this test procedure provided the results necessary for good conformity. Finally the use of an intensive SNACS training session (held in Gothenburg in 2005) provided thorough training for all
the partners involved and ensured that the results from the reliability test and peer review sessions would be of a high standard.

Areas of the work package which caused concern centred on the issues of representivity and sampling. These two areas are notoriously complex for simple regional studies (for example), so it was perhaps somewhat unsurprising that concerns were raised when these processes were expanded across a European field.

At the most basic level, the attendees agreed that the data collected from the 6 or 7 countries (depending on task) could not be representative of the EU27. The presentations that detailed each Member State’s sampling methodology outlined that each could be considered representative of that specific Member State only. This work ensured that however the sampling was conducted in that Member State it would be representative of the nation as a whole. Unfortunately this does not guarantee that the combined dataset including all partner countries is representative of anything more that the Member States participating in WP5.

Positive comments were received concerning the representivity of individual sampling plans set out for each partner country; these plans demonstrate that the data samples could be considered reliable for each partner country. Initial data outlining the reliability of the sampling plans for task 5.1 supported these views. The final figures, based on road user class, show that a very good sample has been achieved despite the apparent difference in the sampling methodologies between partner countries.

One comment that was reiterated by a number of workshop attendees on the subject of European representivity was the need for more European Member States to be involved in such a study. Of course, the involvement of more Member States does not automatically guarantee additional representivity, accuracy, reliability or overall quality - indeed, it could be argued that these may be adversely affected. However, this measure was considered necessary by the attendees in order to make the issue of European representivity more achievable. SafetyNet work package 5 could be considered a pilot study for the development of larger scale European fatal and causation studies in the future and as such many difficulties have needed to be overcome, not least of which is the complexity involved in getting 6 or 7 countries collecting data to the same level. It is therefore useful to understand how these complexities could multiply as more countries are added to future studies. A legacy of SafetyNet work package 5 should be the methods and working practices used to complete the task. There is no scope for new countries to be added to the remainder of the WP5 study. Therefore any of the lessons learnt should be documented for future reference in similar projects where additional countries could be more easily accepted into a framework.

Another method for determining the European representivity of the collected data could be through the use of statistical studies. It was recorded in the questionnaires that if WP5 could demonstrate that the sample collected from the partner countries was statistically representative of other countries or
regions then the data could be applied more widely than the WP5 participating Member States. This statistical comparison could also be used on a finer level similar to the approach used in SafetyNet work package 1 where corresponding regions were compared to enhance road safety data where there was historically little information. This approach could also improve the usefulness of the WP5 as, for example, data collected on fatal accidents at ‘T’ junctions could be used across Europe once comparability was statistically proven.

Another area which raised concerns, and one which is related to the representivity issue, is the use of different sampling regions between the different partners. This issue is due to the use of different data collection areas, in the case of WP5, national or regional data sampling. National data collection could be recognised as the ideal method of collecting data for this study. However this is not possible for all countries involved in 5.1 and becomes even less common in 5.2 where on-scene accident investigation is employed. The method used for both studies is to show that, where regional sampling is used, it is representative of the nation as a whole. Comments received on this subject show that this approach is the ideal method of verifying whether a regional sample should be used to represent a fatal or causation sample for the whole country.

An additional issue is the use of different data collection methods employed by partners involved in Task 5.2. The differences occur due to some partners collecting data purely on-scene whilst others employ a combination of on-scene and retrospective data collection. Comments on this subject received in the discussion period after session 2 (P 19) discussed whether this is the appropriate method due to the different data collection needs. For example retrospective accident investigation will not necessarily be able to collect data on volatile information such as skid marks or vehicle positions (something that is considered vital when conducting investigations with an on-scene approach).

One final concern raised in the questionnaire and discussion sessions was the use of mixed source data by WP5. The raw data sources were outlined in Session 1 and vary between Police reports, Judiciary records, Road authority data and Insurance reports. This varied approach caused a number of concerns about the independence of the data. Task 5.1 began by setting a level of data to be collected from a sample of source material and this approach ensured that all partners could collect fatal accident case data to the same level. The effect of bias on the data is therefore considered minimal by the task 5.1 partnership.

As a final remark, it was very encouraging to find that the overwhelming majority of workshop attendees agreed that they would like access to the data. This shows that there is both the apparent need for the two types of data collection activities that form WP5 of SafetyNet and that there is significant confidence that these two activities will provide useful and reliable data for research purposes.
Annex A

Workshop Programme

Venue
Manegen, Lindholmen Science Park,
Lindholmspiren 5, Gothenburg

Date
18th June 2008

Presenting
Investigation methods focusing on accident causation and fatal accident data collection
Programme

09.00 Registration and Refreshments

09.30 Introduction to the day
   Irene Isaksson Hellman, Volvo Car Corporation, Sweden

09.35 Introduction to SafetyNet and the European Road Safety Observatory
   Pete Thomas, Project coordinator, VSRC, UK

09.50 Types of in-depth data collection in Europe and where SafetyNet WP5 fits in
   Andrew Morris, Leader Work package 5, VSRC, UK

10.20 Methods used in Work Package 5.1, Fatal accidents
   Steven Reed, VSRC, UK

11.20 Coffee Break

11.40 Methods used in Work Package 5.2, Accident Causation
   Karolina Björkman, Chalmers, Sweden

12.40 Lunch Break

14.00 Reliability of the variables
   Helen Fagerlind, Chalmers, Sweden

14.30 Methodology development for analysis of accident causation in Europe
   Mikael Ljung Aust, Volvo Car Corporation and Chalmers, Sweden

15.30 Coffee Break

16.00 A methodological study of the Driving Reliability and Error Analysis Method (DREAM)
   Fridulv Sagberg, TØI, Norway

16.30 Discussion and Closing remarks
   Irene Isaksson Hellman, Volvo Car Corporation, Sweden

17.00 Close
## Annex B

### List of Attendees

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<th>Name</th>
<th>Organisation</th>
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<tr>
<td>Andrew Morris</td>
<td>VSRC</td>
<td>UK</td>
<td>SafetyNet WP5</td>
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<td>Anna Zielinska</td>
<td>Motor Transport Institute (ITS)</td>
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<td>Cristina Monleon</td>
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<td>David Wilde</td>
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<td>Deniz Atalar</td>
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<td>Dimitris Margaritis</td>
<td>Hellenic Institute of Transport (HIT)</td>
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<td>Emma Johansson</td>
<td>Volvo Technology</td>
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<td>Kalle Parkkari</td>
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<td>Sylvia Schick</td>
<td>Medical University of Munich (LMU)</td>
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<td>Ulrich Sander</td>
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Annex C

SafetyNet WP5 Workshop Questionnaire

Following ‘Methods used in Work Package 5.1, Fatal accidents’:

1. Do you think it is reasonable to combine data on fatal accidents from different countries?
   □ Yes    □ No
   Comments
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

2. Do you think it is reasonable to treat different data sources on fatalities (such as insurance documents, police reports and court cases) as equivalent sources of data?
   □ Yes    □ No
   Comments
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

3. Do you think the mixture of sampling methods (national/regional) affects the overall analysis reliability?
   □ Yes    □ No
   Comments
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
4. Do you think the data on Fatal Accidents can be considered representative of Europe as a whole?

☐ Yes  ☐ No

If no, please comment:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

Other comments
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

5. Do you think it is important to gather the fatal accident data at a European level?

☐ Yes  ☐ No

Please Comment:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

6. If you had access to the Fatal accident database, would you use it in your research/work?

☐ Yes  ☐ No

If yes, could you please give us an example of how you would use it:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
**Following ‘Methods used in Work Package 5.2, Accident Causation’:**

7. Do you think it is reasonable to combine data on accidents from different countries?

- [ ] Yes  
- [ ] No

Comments
__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________

8. Do you think it is reasonable to treat different data collection methods (such as on-scene and retrospective) as equivalent sources of data?

- [ ] Yes  
- [ ] No

Comments
__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________

9. Do you think it is important to have a European in-depth accident investigation programme?

- [ ] Yes  
- [ ] No

Comments
__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________

10. If you had access to the Accident Causation database, would you use it in your research/work?

- [ ] Yes  
- [ ] No

If yes, could you please give us an example of how you would use it:
__________________________________________________________
__________________________________________________________
__________________________________________________________
__________________________________________________________
**Following ‘Reliability of the variables’**

11. Please give a short comment about how SafetyNet has approached the reliability of the variables collected in the two tasks?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

**Following ‘Methodology development for analysis of accident causation in Europe’**

12. What do you think is the most appropriate way of undertaking accident causation case studies?

☐ Contributing factors should be pre-defined as in SNACS

OR

☐ Investigators should make their own definitions as they think appropriate on case by case basis

☐ Other, define:
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

13. How do you think the analysis of the accident causation data can be used to improve safety?
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

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