The Baltic Everyday Accidents, Disaster Prevention and Resilience Project

BaltPrevResilience, Task 1 – Action 2, 3 and 4
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General context
The EU-funded project BaltPrevResilience (The Baltic Everyday Accidents, Disaster Prevention and Resilience Project, 2014-2015) aims to improve the prerequisites for feedback, with focus on collection and analysis of impact and response data (monitoring), as decision support at the local level for local, national or EU interstate safety work. Feedback is here regarded as the basic mechanism in many different types of controlling systems. Monitoring is a key activity in building capacity to control community risks, but reporting systems are not coherent in an international comparison and always afflicted with limitations, varying in different geographical contexts. Reporting systems can be described and related according to different criteria, e.g. coverage, completeness, timeliness, relevance, accessibility and user friendliness.

Through time, different strategies for risk management, seen here as a control problem, have evolved for different categories of hazards (c.f. Rasmussen & Svedung (2000) about industrial work systems in figure 1). In a general view, accidents that are very frequent, called everyday accidents in this project, gathers a very large volume of data which guides safety activities that, to some extent, is controlled empirically by epidemiological analyses of past accidents.

Less frequent accidents, more or less disastrous, with more complex cause-effect relationships over a widespread geographical area, have a totally different amount and type of data, requiring more analytical approaches with focus on case studies as knowledge base. Recurrent, but rare, hazards may potentially lead to evolutionary adaptation to newly learned facts. For very rare, large scale accidents, the strive to control problems normally also include future risk scenarios, based on scientific modelling of change, e.g. within economic growth, urbanization or climate, something that is not as common in empirical safety strategies of everyday accidents.

Figure 1. Illustration of basic features of different hazard categories and the related hazard sources that entail different risk management strategies, focusing on technical work systems. From Rasmussen & Svedung (2000).
In practice, approaches for collection of impact and response data after accidents are shaped due to demands on resolution and completeness. The large volume of data after everyday accidents (basic data in figure 2) is splintered into many sector based information systems, but overall there is a societal strive to achieve a comprehensive picture of all accidents and injuries (figure 2) to guide the target setting of safety promotion and accident control activities. Basic data on everyday accidents are normally restricted to answer simple questions like how often and how many, enabling statistical analyses over time. However, in preventive safety work, the basic statistics rapidly pose more in-depth questions about consequences, coping capacity and why things happened. The level of resolution for basic data varies for different types of accidents depending on actors’ risk awareness, interest and willingness to document and report, available economic resources and political priorities in relation to relative risk profile.

![Figure 2. Comprehensive view of everyday accidents](image)

Data collection after accidents that are unexpected, widespread, disastrous and less frequent provide more qualitative, analytical and enhanced data. The volume of evaluations and their thematic focus are related to scale and type of impacts and societal disturbances. Without any clear systematic control or guidance, data capture after such high learning value events will be of ad hoc type and tend to float around in the middle of the diagram (figure 3), limiting possible analyzing of data trends across several events. The EU Disaster Prevention Framework (De Groeve et al, 2013) highlights the need to establish standard data variables for analytical reasons within disaster loss accounting, disaster forensic and risk modelling.

The first task in the BaltPrevResilience project was named Knowledge base and data. The objective of the first task was “to gain a common understanding of statistics and evaluation of experiences and a mutual system for sharing evidence based knowledge and best practices”. Three independent, but linked, actions were performed. The goal of the first action was to provide a report that will give a picture of evidence based accident data as well as practices and present general national data management procedures in each Baltic Sea State participating in the project. The goal for the second action was to present a scientific literature overview concerning implementation of evidence based accident data. In the third action data sources covering escalating accidents were studied.
Present procedures for gathering, dissemination and use of evidence based accident data in Denmark, Estonia, Finland, Latvia, Poland and Sweden

Guidelines and theoretical frameworks about data collection on everyday accidents guide the development of these systems. Each BaltPrevResilience project partner described the kind of information sources they have for accident and injury control and prevention. Traditionally the injury monitoring has meant capability to answer epidemiological questions such as numbers and types of injuries and to whom the accidents happen. A wider perspective is to extend the monitoring to the underlying risk factors affecting the numbers of accidental injuries. Furthermore in order to understand the relation of preventive efforts to the results and development achieved, systems providing data on injury prevention activities are needed.

While epidemiological data systems of the first type were generally well available in all six collaborating countries, the systems providing risk data and data on prevention activities were scarcer and less available or unknown. Also epidemiological data systems suffered from bias concerning the overall picture of injury situation. These systems have typically been built sector wise to tackle problems such as traffic safety, occupational safety or fire safety. Healthcare registers were generally available in all six countries and they often offer a good general view on injury situation. However, these registers mostly provide information on the medical consequences of accidents while they lack information on causes and circumstances surrounding the event leading to injury.

The results of this study clearly show that there are plenty of information systems regarding everyday accidents and injuries. Still, the overall picture is difficult to get as these systems are scattered across different sectors and thus biased towards these same sectors. Also while epidemiologic data is widely available, the other kind of data is scarce and more difficult to obtain.

While no information system can be perfect, it is important to identify these gaps in order to develop the injury monitoring systems in the areas that are needed the most. One of the widest gap lies between the information systems and their utilization. While local practitioners are the main driving force on practical safety promotion, hazard reduction and injury control work, they often possess the least possibilities to work with injury information systems. Obstacles hindering this may include lack of time for such work among current employees, lack of resources to hire new people for such activities or lack of skilled personnel for data analytical work.
Accident and injury surveillance – a review of theoretical frameworks and practical difficulties

Systematic and effective prevention of accidents and injuries presuppose regular reporting and analysis of accidents and injuries that occur in a given setting – so called accident and injury surveillance. This review of the literature summarize guidelines and recommendations on how to design and operate a well-functioning surveillance system, as well as obstacles and difficulties met in practice as emerge from studies where such systems have been scrutinized and evaluated. It appears that most established ways of collecting accident and injury data suffer from serious limitations. This includes police-reported traffic accidents and injuries; compensation-based reporting of occupational accidents and injuries, and fire-brigade reported fires and injuries, to mention typical examples. Underreporting is often extensive in existing systems, with skewed and misleading statistics as a result. Other problems relate to costs, systems management and up-to-datedness of statistics produced. Thus, there are few or no ideal ways of conducting accident and injury surveillance. The health sector is generally shown to provide more accurate statistics on injuries in a given population than sector-wise data collection systems, but lack details on when, where and how these events occur, as needed for sufficient guidance of preventative efforts. One solution, often pointed at in the literature, is linking existing data from several sources on a defined risk problem and thereby gain advantages from each source at the same time as disadvantages are compensated for.

Evaluation of possible data sources for learning from small scale disasters – a Swedish case study

Smaller disasters seldom result in evaluations on national level, hence damage and loss data often have to be comprised from publicly available sources, not originally designed for this purpose. Nevertheless, small disasters have frequent negative influence on excluded, marginal groups (Lavell, 1994; Wisner et al, 2004) and the importance of their accumulated economic, social and human impacts have been underlined in the UN Global Assessment Report on Disaster Risk Reduction (UNISDR, 2013). This study presents an inventory of possible data sources and subsequent content analysis for 14 extreme rainfall events in Sweden 2000-2012, following the DesInventar (www.desinventar.net) methodological approach. Useful data were only found in incident reports from local rescue services, gathered in a database at the Swedish Civil Contingencies Agency, and in newspapers stored in media archives. Previous studies (Marulanda et al, 2010; López-Peláez & Pigeon, 2011) have concluded that media archives often may be the only source of information for small disasters, but also accentuated problems with verification and reliability of this type of data (www.desinventar.net). The use of free-text fields in official reporting systems and questionnaires, primarily designed for basic data capture from daily occurring accidents, is highlighted here as important to achieve enhanced data that can be used to verify information from non-official sources.


2. Action 2

Report on present procedures for gathering, dissemination and use of evidence based accident data in the Baltic Sea States.

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2.1 Introduction

There has been a significant increase in the number and severity of natural and man-made disasters in recent years. Due to the climate change, it is likely that future disasters will be more extreme and more complex with far-reaching and long-term (social and economic) consequences. Due to this, it is very important to improve the effectiveness of systems that are used for preventing, preparing for and responding to natural disasters.

The quality of statistics plays an important role in determining the effectiveness of these systems. The usefulness of statistics as well as the knowledge base in general can be improved by complementing them with experiences and results of careful evaluation, analysis and documentation of past incidents and events. The statistics could be improved by learning from each other and by comparing statistical information systems between countries and actors in different fields.

Accidents are often very different from each other. They can be different, for example, in terms of type and magnitude. Despite this, they can also have similar features. This means that the same principles of collecting, analysing and using data for prevention can be applied. The transfer from everyday accident to disaster is dependent on scale, coping capacity and exposure of vulnerable people or objects. The transition is a sliding scale with many different types of accidents in between the two extremes.

Disasters often provide enhanced data which gives a lot of detailed and specific information about one particular type of event and the circumstances around it. In other words, this information has a high resolution. Even though these data are valuable in terms of accident prevention, it might not tell as much about other accidents that are different, for example, in terms of type and magnitude. Due to this, it is important to also gather information about accidents that happen on a smaller scale. Indeed, everyday accidents can give a lot of general information which is more applicable to all accidents independent on the scale. This basic data can be used to complement the enhanced data, which helps us to gather more valuable information that can be used to improve the effectiveness of the response and to enhance preventive and preparedness measures for all kinds of accidents and disasters. This could also be described as a perfect system.

According to our understanding, safety culture can be developed further by using the experiences of both large scale and small scale events. This encompasses a wide variety of risks, and provides a lot more information about the effectiveness of systems used for prevention and minimising the consequences of harmful events. This information can then be used for achieving a higher level of protection and resilience against both disasters and everyday accidents.
2.2 Aims of the study

The study focused on mapping the existing data and to create a comprehensive image of the situation and differences in the present procedures for gathering, dissemination and use of evidence based accident data in Baltic Sea States (Denmark, Estonia, Finland, Latvia, Poland, and Sweden). The main aim of the study was to gain information about the collection and management procedures as well as data contents regarding information systems on everyday accidents in each participating country.

The study was conducted by collecting and analysing data about information systems used to monitor everyday accidents and their prevention. Particular attention was paid to the reliability, relevance and usability of the data and data sources. These aspects were fully addressed, in order to identify the ways in which these data management procedures could be developed to support evidence based safety promotion particularly at the local level. Furthermore, the study enables the development of a shared understanding of statistics and methods to monitor everyday accidents. This includes the creation of more specific and well-defined concepts that can be used in the future. Ultimately, Task 1 Action 2 of the BaltPrevResilience project aims to create a knowledge base that guides the establishment of a common platform which will be developed in Task 2 of the project.

2.3 Methods

2.3.1 Data Collection

Development of the questionnaire

A data collection questionnaire was developed in order to gather information on existing data sources on everyday accidents in each participating country. Initial phone discussion was conducted with Swedish Civil Contingencies Agency (MSB). The discussion helped to understand the importance of clear structure and prompt questions. After the phone discussion, the questionnaire was reformulated. It was decided to include questions that were referring to a specific type of accident since it would be easier for respondents to understand and answer.

The questionnaire consisted of 6 parts which included:

1. Data sources on everyday accidents
2. Data sources on risk factors for everyday accidents
3. Data sources on safety promotion practices and activities
4. Data processing and utilising the data in practice at the local level
5. Accident and injury data dissemination
6. Areas of interest not covered by current information systems

In order to test the usability of the questionnaire, the questionnaire was sent to the partners in Estonia and Sweden by email. Both partners started to fill in the preliminary questionnaire, and they were given an opportunity to comment on it through online discussions.

It was found out that clear and precise definitions were particularly important in order to establish a common understanding between the partners. For instance, everyday accident was defined as an accident that involves an injury or death. In other words, it was chosen to focus on data sources on accidental, unintentional
injuries and on those valuable for their prevention. Due to the limited resources, the questionnaire excluded topics on information systems and data sources on damages to property and environment that did not involve human damage as well as injuries caused by violence.

It was also found out that our two partners who tested the questionnaire had difficulties to understand our questions and our objectives. It also became evident that some partners were not familiar with the concepts introduced in the study. This was inevitable due to the different backgrounds of each partner. These difficulties, however, made it possible to develop the questionnaire in a way that facilitated the data collection process. Additional guidelines and examples were provided to all partners in order to clarify the objectives of the study. This also highlighted the importance of communication.

The questionnaire delivered to all partners
The reformulated questionnaire was then sent to each partner. At this stage, the partners had also an opportunity to ask questions regarding the questionnaire. After the surveys were completed, in-depth discussions were held with each partner based on the questionnaires in order to further develop the ideas emerged. The main aim of this stage was to clarify the answers and identify problems and opportunities that might promote or hinder the creation and use of accident data in Baltic Sea States. These discussions provided general guidelines for how to improve the collection and analysis of impact and response data from everyday accidents. After the discussions, the partners were asked to complete the questionnaires and send the final versions back to the National Institute for Health and Welfare (THL).

2.3.2 Data analysis
Summary tables were conducted in THL by injury monitoring experts whose understanding influenced the data analysis. The received data was treated as factual statements. However, it could not provide a comprehensive picture of all the information systems used in each country because the answers were given from a particular point of view. In other words, the received data reflects the subjective values and ideologies of each organisation. Thus, the data is not fully comparable. Despite this, the survey enhanced our understanding of existing information systems for injury monitoring in Baltic Sea States. This also helped to identify the strengths of existing information systems and also to identify the needs to improve them.

2.3.3 Respondents
Respondents for the survey were coordinators from each participating organisation. Most of them used experts in order to fill in the questionnaires. The organisations in the BaltPrevResilience-project vary from municipal organisations to national actors.

2.4 Results
Our study collected information on data sources for everyday accidents in Baltic Sea States. In this section, the summary tables, compiled in order to compare the results more easily, will be presented.
2.4.1 Data sources on everyday accidents and their usability

Traffic accidents (tables 1.1a and 1.1b)
All respondents were aware of the fact that there are multiple data sources available for traffic accident monitoring. According to the answers, in most countries information about traffic accidents is collected in the registers of the police and rescue service authorities. This data forms the basis for national statistics and is made available for monitoring via various forms of reports and electronic portals. In addition, the hospital care register collects information about the victims of the accident. This data source was mentioned by Finland and Sweden. In Sweden the nationwide information system STRADA combines the data from the police and hospital care register. This has been proven to reduce the under-reporting that exits when the police have not received information about the accident. The data regarding traffic accidents is not easily available for local practitioners. Statistics are not published by municipality on a regular basis, instead information needs to be requested from the data owner. This makes it extremely time-consuming for local authorities to collect and analyse data. In some cases, the information is available online for the general public as a summary statistics. This information, however, is often too general for local authorities who need detailed information on the accident circumstances and the place of occurrence.

Occupational accidents (tables 1.2a and 1.2b)
All countries have specific registers for occupational accidents. Many countries have also registers that are based on insurance compensations. These registers often include more detailed and comprehensive information about the accident compared to other information sources. Due to this they are particularly useful in terms of accident prevention. Insurance based registers, however, have limited access for external users. Polish partner also indicated that this data may be expensive to acquire. The accessibility to other registers varies between countries. Denmark, Poland and Sweden reported that the data are available on the Internet as an open access information source. According to the Danish experts, the data they have are particularly well presented. Estonia, Finland and Latvia reported that the data are not generally accessible and it is often provided only on request.

Fire related accidents (tables 1.3a and 1.3b)
According to the answers, the rescue service authorities maintain the most comprehensive registers for fire related accidents in each participating country. They collect detailed information on the rescue service response and the accident itself. In all participating countries there are also other, complementary data sources for fire related accidents. For instance, the hospital care register which contains all hospital treated injuries caused by fire was mentioned by Finland. In addition, the police register was mentioned by the experts from Estonia and Latvia.

According to the answers, the availability of the information varies between countries and data sources. In Denmark, Finland, Latvia, Poland and Sweden there are registers that have information which is made available for the general public. This information is often rather detailed and made available on a regular basis. In some cases, the data are made available in annual statistics reports. These reports are not always useful for accident prevention because they lack detailed information about the accident circumstances. In addition, the data are not always available due their confidentiality. In Denmark, Estonia, Finland and Poland, there are also registers that are not entirely accessible for the public.
The information is provided on request. In addition, there is no guidance for how to use the data which complicates the data collection process in Estonia. This information would be useful for accident prevention if made more available.

**Drownings and other water related accidents (tables 1.4a and 1.4b)**
In all participating countries the police and rescue service authorities collect data on drownings and other water related accidents. In addition, many countries have information in the hospital Care registers. In Finland and Sweden there are also monitoring systems that are based on news surveillance.

In general, the information regarding drownings and other water related accidents is not easily accessible. In many cases, the data are only available for professionals. Even when the data are available for the public (in a forms of statistical reports), the information is not specific enough. Local practitioners need more detailed information about the accident circumstances and the place of occurrence. In addition, it is sometimes difficult to get local level information due data confidentiality.

**Data sources on other accidents (tables 1.5a and 1.5b)**
According to the answers, Estonia, Finland, Latvia, Poland and Sweden have data sources for other accidents. In most participating countries these data sources utilised information from the hospital care register and the cause of death register.

In general, these statistics are accessible online for the general public. In some cases, the more detailed data are available on request. In Poland, the National Institute of Public Health publishes reports that include information that is particularly detailed and comprehensive, due to which it is very useful for accident prevention. In Latvia, these information sources could be used more often as a complimentary information source for other data registers.

On top the data sources mention above, The Centre for Disease Prevention and Control (CDPC) of Latvia gathers information about diseases and their prevention. These data are used to inform the public, for example, through campaigns. In Sweden injury prevention experts can also use material from deviation (negative events) reports. These reports concern pharmaceutical events, events with medical products, information transfer failures or other events or other events in connection with health and social care interventions.

### 2.4.2 Data sources on risk factors on everyday accidents

Data sources for monitoring risk factors were not as common as data sources for accident and injury surveillance. Indeed, it became obvious that the respondents understood the concept of risk factors differently. This can also be seen in the answers given in table 2 which gathered information about data sources on risk factors for everyday accidents in each participating country. The respondents answered very differently to each other. Some described a number of helplines that record information that is processed as statistics while others described information systems, surveys or different procedures for data collection/monitoring.

Risk data collected through surveys was particularly poorly known by the agencies/partners in this project. Despite the large amount of surveys most likely conducted in each participating country, the respondents were not able to identify them. This illustrates the fact that information on such data sources often is not widely known even among professionals and practitioners of safety promotion. Rather than more different surveys, a better and more comprehensive knowledge of them is needed outside the organisations conducting such surveys.
Accident Investigations (tables 2.1a and 2.1b)
Most of the countries conduct accident investigations in case of serious and/or high profile accident. Such accidents often include fatal road traffic accidents, multiple vehicle collisions, and accidents in mass transportation, significant building fires and other events that have created potential threat to large number of people. Accident investigations make it possible to gather detailed data on circumstances, causes and actions related to accident and provide valuable information regarding how such similar accidents could be prevented. Most of the countries, however, had problems with accessing the investigation reports. Thus, these kinds of in-depth investigations would be very useful in terms of accidents prevention even when looking at small scale accidents if the data was made more available.

Rescue Service (tables 2.2a and 2.2b)
According to the answers, in most countries the rescue service authorities collect information through automatic fire alarm system that receives information from objects which are connected to the Emergency Response Centre. This information is then collected to a database and used for accident prevention purposes. In addition to this, Poland reported on collecting data on risk factors in high risk places (e.g. railway stations). According to the Swedish experts, an accident report is made after every incident. These reports contain information about the accident and the actions of the rescue service. In addition to this, many municipalities in Sweden collect additional information concerning the accident. In a case of a fatal accident, the investigation is made more thoroughly.

The data are generally inaccessible for local practitioners outside the rescue services. At the national level the data are sometimes available but in some cases the access needs to be requested. This information is highly under used despite its relevance for accident prevention.

Police (tables 2.3a and 2.3b)
Police performs traffic control and monitors traffic behaviour and thus collects data relevant for accident risk monitoring. According to the answers, in Estonia, Finland and Poland the police collects data on driving under the influence of alcohol and drugs. In addition to this, Latvia reported on collecting information about aggressive driving and driving without driver’s licence and car insurance. The Swedish experts mentioned the National security survey that aims to get an idea of the public’s perceptions of insecurity and gather information about victims of crime.

The availability of the data sources varies a lot between countries and registers. In some cases the data are available online as annual reports or statistics and in some cases the data needs to be requested. Latvia reported that the data collected by the municipal police is available on a daily basis but it is not used for accident prevention as effectively as it could. In addition, the accessibility of the data for local practitioners varies. For example in Finland, some data sources provide local level data while others do not.

Data reported by citizens or professionals (tables 2.4a and 2.4b)
The answers indicated that all/most countries have either internet, email or telephone based feedback system that enables the interaction between citizens and local and national level practitioners. According to the Latvian expert, the internet based interactive map is particularly useful tool for giving an overview of the condition of the city’s infrastructure.
The data reported by citizens and/or professionals is available for both local and national level practitioners. The data are often available online. These kinds of data sources provide an opportunity for people to participate in improving the development and safety of their everyday environment. Due to this, these systems should be developed further.

**Data from surveys (tables 2.5a and 2.5b)**

The answers indicate that all participating countries collect risk data from various surveys. These surveys include topics such as the seatbelt use, helmet use and speeding as well as different kinds of social aspects such as life quality and well-being of different social groups.

According to the answers, these data are often available for the general public as annual reports or summary statistics. Surveys are often reported widely through media channels. Sometimes, however, it is difficult to identify whether this information has reached local authorities and whether it can be applied to these local settings.

**Other data sources on risk data (tables 2.6a and 2.6b)**

On top of the data sources mentioned above, Latvia reported on collecting data concerning seasonal accident prevention. As a result, the State Police gives away light reflecting items in order to protect the vulnerable road users during the dark period. In each spring, the State Fire and Rescue Service informs the public about the high risk of forest fire.

**2.4.3 Data sources on safety promotion practices and activities**

Respondents provided answers on information systems that are relevant for monitoring resources available and activities conducted for safety promotion. These kinds of data are important in assessing the effectiveness of safety promotion work in general. In the questionnaire it was asked whether the participants are aware of any data sources that could be used to measure and monitoring safety promotion activities. Again, it became evident that the respondents did not have a common understanding of what was meant by information systems for safety promotion activities. Respondents answered very differently. Many respondents described different campaigns that had been established to promote safety in different circumstances. Estonia, Finland and Latvia gave examples of different safety promotion programmes. From the 1990s, the national systems for producing comparative information have been developed in Finland. The results are published in TEA-viisari. TEA-viisari is an online service that presents municipalities’ activity in promoting their inhabitants’ health. The service supports the planning and management of municipal and regional health promotion.

**2.4.4 Data processing, utilisation and dissemination at the local level**

According to the answers in tables 4, 5, and 6 injury monitoring is particularly challenging at the local level due to the restrictions of the information systems. There are several problems with data processing, utilisation and dissemination in practice at the local level. In general, a lot of information is gathered but the data are poorly available for local level practitioners. All the partners agreed that statistics should be available online more often since it is extremely time-consuming to request data through information inquiries. The respondents also highlighted the importance of interaction between the citizens. According to the Polish experts, it would be useful to have an accessible database where citizens...
could upload information regarding safety issues and objects needing repair. This information could then be used for safety promotion campaigns in the municipalities. The Latvian expert also underlined that companies providing utilities often collect information regarding their activities and could provide valuable information for accident prevention for the municipal organisations.

In some cases the information is available for national level decision makers and professionals but due to the low level of data dissemination, local practitioners do not have an access to this data. Collaboration with local actors exists but it goes mainly through few channels. In many cases, however, it could be done without violating data security regulations. Generally knowledge on data is not sufficient and advisory is needed at the local level.

Data on injuries is also collected at the local level. However, the work at the local level is sporadic and varies between regions. In some municipalities the work is been done very systematically while other municipalities lack any systematic/specific approach. In general, there are a lot of data available but the data are collected based on different criteria, stored in different places and sometimes extremely difficult to access. In addition, the information collected at the local level often stays in the organisations (police, hospital district, rescue services) and is not used for preventive purposes. In other words, locally produced and local level data in general can be seen as an under used resource.

People working with accident prevention often come from different sectors. These people do not necessary have the required skills or knowledge needed for utilising the data sources. In addition to this, people who work with accident prevention might not be familiar with the IT-systems that may be difficult to use without expertise. Locally a variety of software is used for data collection and storing at the local level. These systems are rarely designed for reporting and analysing a large amount of data, which makes them unsuitable for accident prevention purposes.

### 2.5 Discussion of the results

Everyday accidents and injuries are like any other major health and safety issue. In order to understand the scale and the relevance of injuries a complete image of the problem is needed. With relevant data and information derived from this data the actors working on injury prevention and risk reduction may direct their efforts in the most efficient way.

This study was conducted by conducting a survey to the collaborating parties of BaltPrev Resilience project in six countries. The main aim of the survey was to gather information regarding systems collecting data related to everyday accidents. Survey and following interviews with partners revealed several gaps in the injury monitoring systems in all countries. There also were differences between countries and organisations in knowing and understanding the data sources for everyday accident prevention and processing this information for injury control activities. This study was based on subjective views of collaborating parties in each country. While the results are not strictly comparable and not the only possible point of view regarding to each participating country they give us a general view on the situation of different level municipal and governmental organisations working on everyday accident prevention.
One aim of the study was also to motivate the collaborating parties to improve their own understanding of these systems and the need for them in their own country. By answering the survey participants were encouraged to gather information on data systems outside their own field and to learn how monitoring of everyday accidents is done in their country.

Traditionally the injury monitoring has meant capability to answer epidemiological questions such as numbers and types of injuries and to whom they happen. A wider perspective is to extend the injury monitoring to the underlying risk factors affecting the numbers of injuries. This approach is more common in large scale accidents and disasters and should be utilized more efficiently in everyday accident prevention. Furthermore in order to understand the relation of preventive efforts to results and development achieved, systems providing data on injury prevention activities are needed.

While epidemiological data systems of the first type were generally well available in all six collaborating countries the systems providing risk data and data on prevention activities were scarcer and less available or unknown. Also epidemiological data systems suffered from bias concerning the overall picture of injury situation. These systems have typically been built sector wise to tackle problems such as traffic safety, occupational safety or fire safety. Healthcare registers were generally available in all six countries and they often offer a good general view on injury situation. However these registers mostly provide information on the medical consequences of accidents while they lack information on causes and circumstances surrounding the event leading to injury.

Additionally to the existence of information system there was the question of accessibility. While plenty of information systems may exist in these countries, many actors were unaware of them or were not allowed to access it. In the local level where large part of injury prevention work takes place, in municipalities, local rescue and police departments and NGOs, relevant information often was the most difficult to get.

The results of this study clearly show that there are plenty of information systems regarding everyday accidents and injuries. However the overall picture is difficult to get as these systems are scattered across different sectors and thus biased towards these same sectors. Also while epidemiologic data is widely available the other kind of data is scarce and more difficult to obtain.

Currently information systems are concentrated around sectors of traffic, work and rescue services where clear responsibilities of directing work and its data collection exist. This still leaves a major part of monitoring of everyday accidents outside of centralised responsibility or guiding legislation. While hospital and mortality data are generally used to monitor the total amount of accidents these data often lack detailed information on causes of the accident.

While no information system can be perfect it is important to identify these gaps in order to develop the injury monitoring systems in the areas which are needed the most. One of the widest gap lies between the information systems and their utilisation. While local practitioners are the main driving force on practical safety promotion, hazard reduction and injury control work they often possess the least possibilities to work with injury information systems. Obstacles hindering this may include lack of time for such work among current employees, lack of resources to hire new people for such activities or lack of skilled personnel for data analysis work.
On national level more centralised approach for developing information systems regarding everyday accidents is needed. There should be clear responsible organisations for whole accident field with incentive to improve current information systems on everyday accidents across different sectors. Also more emphasis should be put on bringing these systems more accessible and available for those who would mostly benefit from them.

Meanwhile also local-level bottom-up approach for data collection need to be encouraged as national data sources typically can have only limited usability in communities. Also timeliness of national data sources is typically weaker than in local sources of information. When local practitioners of injury prevention recognise the possibilities of local data sources the quality and utilisation is likely to improve.
Appendix
Action 2
## Appendix A: Respondents from participating countries

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>ORGANISATION</th>
<th>LEVEL/SECTOR</th>
<th>MAIN AREAS OF RESPONSIBILITY</th>
</tr>
</thead>
</table>
| **Denmark** | Frederikssund-Halsnæs Fire & Rescue Service, Denmark (FHFRS). | Local (= the municipal Fire and Rescue Service). | • Hurricanes  
• Strong storms rains and cloudbursts  
• Pandemic flu  
• Diseases  
• Transport Accidents  
• Accidents involving hazardous substances on land  
• Maritime pollution incident  
• Nuclear accidents, acts of terrorism, cyber attacks |
| **Estonia** | Estonian Rescue Board, Estonia (ERB). | National/ The Ministry of Interior. | • Emergency response  
• Fire safety supervision  
• Civil protection  
• Rescue work  
• Explosive ordnance disposal |
| **Finland** | National Institute for Health and Welfare (THL), Injury Prevention Unit. | National /The Ministry of Social Affairs and Health. | • Monitoring of injury situation in Finland  
• Prevention of Injuries of children and adolescents  
• Prevention of elderly stumbles and falls  
• Alcohol, drugs, medicines and injuries |
| **Latvia** | Jelgava City Municipality, Latvia (JCM), The department of infrastructure and maintenance, Municipality operative information center (=Structural unit). | Local. | • Inhabitant complaint and suggestion reception for 24/7  
• 24/7 Monitoring of systems for (street light; pumping stations; meteorological stations; intelligent traffic light management system; etc.)  
• Public territory and object video surveillance  
• Civil protection  
• Infrastructure maintenance |
| **Poland** | Main School of Fire Service Warsaw, Poland (SGSP). | National/The Ministry of Internal Affairs. | • Emergency response  
• Fire safety supervision  
• Civil protection  
• Rescue work |
| **Sweden** | Swedish Civil Contingencies Agency (MSB). | National/The Ministry of Defence. | • Emergency management  
• Public Safety  
• Civil protection  
• Civil defence |
### Appendix 1: Data Sources on Everyday Accidents and Their Usability

#### TABLE 1.1A: DATA SOURCES TRAFFIC ACCIDENTS

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark | 1. The Danish Road Directorate shows statistics of all traffic accidents. Much information about where the accident occurred, but nothing about the means of transport.  
2. The Council of Safe Traffic uses the data from The Danish Road Directorate, but shows the means of transport.  
3. Statistics Denmark covers all accidents recorded by the police. A lot of information including the means of transport.  
4. The police register includes all the accidents where the police have been present. Covers well car crashes, poorly pedestrian and bicycle accidents. Includes a lot of information on how the accident occurred but lack information on human damage.  
5. The Online Data Registration and Report System (ODIN). Provided by the Danish Emergency Management Agency. Requires user creation. Contains information about every alarm call for the Fire and Rescue Services in Denmark. |
| Estonia | 1. Statistical database of traffic accidents (MALIS) operated by the Estonian Road Administration (ERA). Basic data is received from the Police and Border Guard Board (PBGB). If the police have not received information about the traffic accident where a person has been injured and admitted to the hospital, the hospital delivers accident information to PBGB. This database includes all accidents with human victims. Includes the GPS-coordinates of the scene, information about the victims and accident circumstances, possible driving under the influence of alcohol and drugs, the use of safety equipment, injuries asserted by physician etc. MALIS is not linked to the database of healthcare. |
| Finland | 1. Statistics Finland/Statistics on road traffic accidents. It is based on the information system of police affairs (PATJA). Supplemented with data from other sources like statistics of causes of death.  
2. Traffic accidents in police register (PATJA). Information recorded by the police, includes all accidents where the police have been present. Covers well car crashes, poorly pedestrian and bicycle accidents. Consists of information on how the accident occurred but lack detailed information on human damage.  
3. National hospital care registers (HILMO) is nationwide register covering all inpatient care and large parts of outpatient care. Covers all medically treated traffic accidents cases including pedestrians and two wheelers.  
5. Rescue services resource and accidents statistics (PRONTO). Covers all accidents where rescue service authorities have been present (includes almost the same information as the police register). |
Latvia
1. Traffic accidents in Latvia’s State Fire and Rescue Service (SFRS) register (IRRVIS). Information recorded by SFRS, includes all accidents where SFRS has been present. (Mainly major accidents e.g. oil spills, explosions).
2. Traffic accidents in The State Police of Latvia (SP) register (IMIC). Information is recorded by SP and it includes all accidents where police have been present. (Even minor accidents).
3. Traffic accidents in State Emergency Medical Service of Latvia (SEMS) register (VNMPKVMVIS (joint emergency medical and disaster management information system)), includes all accidents where SEMS has been present. (If someone has been hurt in the accident).
4. Traffic accidents in Jelgava city municipality police (JMP) register (NUS), information recorded by JMP, includes all accidents where JMP have been present.
5. Traffic accidents in Jelgava city municipality operative information center (OIC) register (PUKS), includes all accidents which have been informed through Jelgava joint communication channels (Those join communication channels are shared Police radio frequencies. Services are also connected with local optical fiber net which provides better internet speed and virtual safety).

Poland
1. Traffic accidents in State Fire Service (SFS) registers, includes all accidents where SFS and Voluntary Fire Brigade have been present. Includes the number of injured/dead and actions taken, other resources (police, ambulances etc.), probable cause of the event, coordinates and address.
2. Public database of traffic accidents. Includes data about the number of accidents by year, location, victims, accident circumstances and causes.
4. The Polish Traffic Safety Observatory is a public database based on national scientific project. The portal comprises reports, statistics and an interactive map of Poland. Themes include youth, alcohol, children, speeding, cyclists, motorcyclists, pedestrians and elderly.
5. General Directorate of National Roads and Motorways reports on traffic accidents on national roads including information on month, location, circumstances and victims, cause, type of vehicle, driver’s behavior, pedestrian behavior.

Sweden
1. Nationwide information system STRADA, operated by the Swedish Transport Agency, contains data on injuries and accidents (police & hospitals). Reduces under-reporting that existed when the police were not aware of all the accidents.
2. Cause of Death Register (DOR) at the National Board of health and welfare contains data about all deceased persons in a calendar year. Traffic accidents are registered as a part of the external cause of the injury. Data on the accident itself is not registered.
3. Patient Register (PAR) at the National Board of health and welfare contains information on all admissions to hospital where the patient is discharged from a Swedish hospital during the current year. Traffic accidents are registered as a part of the external cause of the injury. Data on the accident itself is not registered.
4. Rescue services response data at the Swedish Civil Contingencies Agency (MSB). It focuses on the rescue service response to traffic accidents and not the injury and accident itself.
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark  | The statistics from the Danish Road Directorate, The Council of Safe Traffic and Statistics Denmark have public access and are well illustrated at websites.  
4. Data in police registers is not easily accessible. Data is provided for local authorities on request only.  
5. Fire and Rescue services are only called in case of entrapped person or a bigger cleanup at the scenes. Thus, the representativeness is poor.                                                                                                                                 |
| Estonia  | 1. The statistics are forwarded monthly to the Statistics Estonia for publishing at their homepage. More statistics may be found at Estonian Road Administration’s (ERA) homepage, which is refreshed once in a month as well.  
ERA data is only accessible for ERA personnel. The system allows to make queries and to see outcome on the map. The outcome in Excel is available to the user for additional calculations.  
The data is available for (a) those who are allowed to use and correct the data and (b) those who are allowed to only make queries and who do not see the personal data of interested parties.  
There are plans to make the data accessible for users outside of the ERA (e.g. research centres, universities).                                                                                                                                 |
| Finland  | 1. Traffic accident data in police registers is not easily accessible. Data is provided for local authorities on request only. Data from the police records is delivered to the national Statistical Office that is responsible for national statistics. They do not publish statistics by municipality on regular basis. This information could be very relevant for local accident prevention if made available, since it contains information on the accident circumstances and the place of occurrence.  
3. The hospital care register contains the medical consequences of the accident. Cause of accident by ICD-10 but no other information on accident itself. Reveals several accidents not covered by police registers. Data reported in many forms. For local level actors there are regional and municipal level reports made annually.                                                                                                                                 |
| Latvia   | For someone who works in the municipality the data from the state Police and Fire and Rescue Service are not easily available.  
Local data sources from (Jelgava city municipality police & municipality operative information system) are easily accessible for local authorities.  
Data sources that are not easily accessible would be useful for accident prevention because they contain more detailed information on the accident circumstances and the place of occurrence.                                                                                                                                 |
### Poland

1. Traffic accident data in the State Fire Service registers is partly accessible for general public as an annual summary statistics published on HQ SFS website. Data is also provided for local authorities and for other interested organizations on request. This information could be relevant for local accident prevention if it was made more available. The lack of detailed information about the type and scale of injury may be a problem.

2. The traffic accident database is an open access information source. It could be very useful in preventive operations as it includes diversified accident determinants.

3. The reports are available online for the public. This information could be relevant for local accident prevention. The data for the particular month do not include the victims who died during hospitalization after accidents. The yearly reports include also people who died within 30 days after the accident. The reports are the most useful data source when it comes to road accidents. The reports also mention the time of the day and the locations which are especially prone to accidents.

4. The Observatory is available online for the public. Information could be relevant for both local and national level of preventive activities. It is free of charge and completely accessible for all registered users (representatives of all organizations making research in the area of traffic safety). It could be very useful since it includes information about traffic risks and economic factors.

5. General Directorate of National Roads and Motorways yearly reports are public available online. They are worth-to-mention information sources in complex traffic safety analysis.

### Sweden

1. Users can access the database via STRADA’s website or by ordering data from the Transport Agency. It is accessible for practitioners in the municipalities, but you have to be vetted for access. The information is relevant for accident and injury prevention at local level.

2. Users can order data from the National Board of health and welfare. Statistics on accidents based on Cause of Death Register can be downloaded via Information system IDA at the Swedish Civil Contingencies Agency (MSB).

3. Users can search in Statistics Database for external causes of injury and poisoning at the National Board of health and welfare or statistics can be downloaded via IDA. Due to statistical confidentiality it is not possible to give detailed data for the municipalities.

4. Users can access the database of Rescue services response data in Information system IDA. It contains detailed data at municipality level. All the information is useful for accident and injury prevention.
## Table 1.2A: Data Sources on Occupational Accidents

<table>
<thead>
<tr>
<th>Country</th>
<th>Data Sources</th>
</tr>
</thead>
</table>
| Denmark    | 1. Danish Working Environment Authority has information about every reported accident divided in different topics.  
2. The National Research Centre for the Working Environment. Research of how to prevent and avoid accidents and how improve the working environment. |
| Estonia    | 1. Database created especially for monitoring occupational accidents. Includes health damage that has happened at work from easy cases to difficult and also death cases.                                                   |
| Finland    | 1. Insurance compensations (Federation of accident insurance institutions) includes all occupational accidents where compensation has been paid due to sick leave, injury or death.  
2. Occupational accident register (Statistics Finland) contains compensated accidents from Federation of accident insurance institutions and farmer’s social insurance institution.  
3. Occupational accidents from farmer’s social insurance institution.                                                                 |
| Latvia     | 1. Insurance compensations (The State Social Insurance Agency) include all occupational accidents where compensation has been paid due to sick leave, injury or death.  
2. Accidents statistics (The State Labor Inspectorate) includes all occupational accidents which have been reported (includes occupational and safety violations, injuries & deaths). |
| Poland     | 1. Occupational accidents at The Central Statistical Office (CSO) includes information about the number of accidents and absence days by administration area, industry, public/private sector, accident place, type of external cause and type of injury. Includes employees contracted for work. There are no references to temporary workers.  
2. National Labor Inspectorate (nLI) is the most important, operational and preventive, Polish institution dedicated to occupational accidents. They publish reports with information about the number of accidents, type of accident, work position, injury, place & cause. The causes are divided into organizational, human and technical groups. Reports include all investigated accidents (all injured employees, not only those contracted for work).  
3. Insurance institutions publish reports for insurance needs. Information is much more detailed and complex than public information sources.  
4. Agricultural Social Insurance Office (KRuS) is a public body responsible for investigations and compensations’ payments for farm workers. The Office publishes reports about accidents in agricultural environment. The information contains the number of accidents, reasons and causes. |
| Sweden     | 1. The Swedish Work Environment Authority collects and presents data on occupational injuries and diseases among Swedish employed in the Information System for Occupational Injuries (ISA). Register is based on injuries reported to the Insurance Agency. |
### TABLE 1.2B: THE USABILITY OF THE DATA SOURCES FOR MONITORING OCCUPATIONAL ACCIDENTS

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1-2. The data is available for the public and shows reported accidents in an illustrated way and gives insight into preventive suggestions.</td>
</tr>
<tr>
<td>Estonia</td>
<td>1. Accessible mainly through statistics. The database is for the use of Labour Inspectorate, not for the use of outside visitors. There are leaflets about the causes of work incidents at their homepage, and information about how to prevent them. This data could be used more for preventive purposes.</td>
</tr>
</tbody>
</table>
| Finland  | 1. Not generally accessible. Available on request. Includes information of location, type and cause of injury, and general information on circumstances.  
2. Can be accessed in tabulated forms. Individual level data mostly for research only. Subject to charge. |
| Latvia   | For local authorities the data sources could be relevant or very relevant but not generally accessible. At the moment, the data is only available on request. |
| Poland   | 1. The data is available in The Central Statistical Office’s (CSO) webpage as an open access information source. It is useful in determining general situation of occupational accidents in Poland. Legislation is the main obstacle to use CSO databases as comprehensive information source about all occupational accidents in Poland. They only give a realistic view of serious and deadly ones.  
2. National Labor Inspectorate (NLI) reports are available online. They comprise analysis of the accident, corresponding conclusions, recommendations and preventive operations.  
3. The information is generally inaccessible or expensive for external users. It could be useful for preventive purposes.  
4. Agricultural Social Insurance Office (KRUS) reports are available online. The documents base on accidents reported by victims or witnesses. In some circumstances, farmers do not want to report the accident, which makes the data less representative. However, the data is representative on national level and thus helpful in prevention work and risk analysis. |
<p>| Sweden   | 1. The Information System for Occupational Injuries (ISA) is available on the internet at The Swedish Work Environment Authority. You can carry out searches to obtain occupational injuries or diseases on county or industry level. It is useful in the accident and injury prevention work. |</p>
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark    | 1. The Online Data Registration and Report System (ODIN). (See above)  
2. Statistics provided by the Danish Emergency Management Agency.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Estonia    | 1. Operative information system PÄVIS and supervision information system JÄIS (building fires) provided by Estonian Rescue Board (ERB). Includes all the accidents where the rescue team has been present. Includes information about data concerning the rescue.  
2. Police and Border Guard Board (PBGB) statistics, containing additional information about the causes of the deaths and other circumstances.  
Casually note (memo), Estonian Cause of Death Register. If someone dies in the accident, the data collected is more in-depth, containing also descriptions of situation, evaluations etc. which could help to avoid such events in the future.  
Event is registered starting with the call to the Emergency Response Centre, where preliminary data related to the event is registered. Data about these events, where rescue team participated, is further registered in PÄVIS and it is carried out by the operative person on duty who fills in the table parts concerning rescue. Data inserted into the information system is not altered later on. This information system has to be the most trustworthy information system for operative inquiries, incl. older periods.                                                                                                                                                                                                                                                                 |
| Finland    | 1. The nationwide database on fires rescue tasks is available (PRONTO). Data is provided both nationally and locally. Covers all emergency responded fires. Others are not covered.  
| Latvia     | 1. Fire accidents are stored at the State Fire and Rescue Service (SFRS) register IRRVIS. Covers all fires.  
2. Fire accidents are stored at the State Police (SP) register IMIC. Covers emergency responded fires where the police have been present.  
3. Fire accidents are stored at the State Emergency Medical Service (SEMS) register VNMPKMVIS. Covers emergency responded fires where SEMS has been present.  
4. Fire accidents are stored at the Jelgava city municipality police (JMP) register NUS. Covers all emergency responded fires where JMP have been present.  
5. Fire accidents are stored at the Jelgava city municipality operative information center (OIC) register PUKS. Covers all emergency responded fires which have been informed through Jelgava joint communication channels.  
6. Fire accidents are stored at JSC Latvian natural Gas company (Latvijas Gāze) register ARŽ. Covers all emergency responded fires where LG has been present (e.g. houses where their products have been installed).                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
### Poland

1. Fires in State Fire Service registers, information recorded by SFS, includes all fires where SFS and Voluntary Fire Brigade have been present. Includes information about the number of injured and/or killed, actions taken on site, equipment used by rescuers, resources involved in actions (fire, police, ambulances, etc.), probable cause of the event, coordinates and address.

2. Insurance institutions have their own reports concerning fire accidents for insurance needs. Information is mostly much more detailed and complex than in case of public information sources.

3. The National HQ of the State Fire Service publishes yearly bulletins which are documents gathering basic, statistical information about State Fire Service activities. Rescue and firefighting operations as well as preventive operations are taken into consideration there. The characteristic actions in particular months are more complex described (e.g. burned area, number of firefighters and fire engines engaged, hour of fire notification). All accidents are shared into fires and local threats. Data is implemented from the State Fire Service registers.

### Sweden

1. Cause of Death Register (DOR) (See above)

2. Rescue services response data at MSB contains data about fires. It contains detailed data on the rescue service response and accidents or incidents, for example where the fire started, the cause of the fire, how much the fire spread. There is a lack of quality in data on fire injuries. The purpose of the data collection is to provide a picture of accidents and incidents that led to a response from the municipal rescue services agency.

3. Fatal fire database at MSB contains information from all fires where at least one person was killed by the fire. MSB collects data about the fire, about the building or place where the people died and the circumstances surrounding the death in collaboration with the municipal Rescue Services, the Police, the Swedish Transport Administration, Healthcare and Forensic Medicine.
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| **Denmark** | 1. The Online Data Registration and Report System (ODIN) requires user creation and a login. Not public available.  
               2. Has public access and provides a more easily overview with an option to lookup a specific request. |
| **Estonia** | Public access to the data is denied. User rights are given in accordance with need. There is no user manual (no guidance to use the data). These data sources are the most important ones for carrying out analyses. |
| **Finland** | 1. Public online statistics on regional level. Further access needs personal login. The information is provided upon request on national and local level. The accessibility may vary on local level. The information is both relevant and useful, but is not used as effectively as it should on accident prevention.  
               2. Medical consequences and cause of accident in ICD-10. For local level actors there are regional and municipal level reports made annually. |
| **Latvia**  | 1. Information from the State Fire and Rescue Service (SFRS) is provided upon request at national and local level. The information could be relevant and useful for prevention purposes if made more available. At the moment this data source doesn’t provide enough information about the causes and circumstances of the accident.  
               2. Available as periodical statistical reports. The information as it is right now isn’t useful for accident prevention since there are really strict terms on information sharing and also when criminal investigation case is open information isn’t available. So some changes should be made in bureaucratic system in order to extract information which could be relevant for accident prevention.  
               3. Fire accidents are stored at the State Emergency Medical Service register by event distribution (ICD-10). The information isn’t useful for accident prevention and it might not become since SEMS receives injured or fatally injured accidents out of the scene of the accident.  
               4. Available in a daily basis. The information is both relevant and useful since it provides a description of the overall situation according to municipality civil protection terms.  
               5. Available in a daily basis. The information is both relevant and useful because it provides a description of the overall situation and includes some situation (weather conditions etc.) analysis.  
               6. Information is not available, but it includes a technical description of the failure of natural gas provision net or its misuse if that is reason of the fire. |
| **Poland**  | 1. Fires data in SFS registers is partly accessible for general public as an annual summary statistics published on the HQ SFS website. Data is also provided for local authorities and for other interested organizations on request. This information could be relevant for local accident prevention if made more available. The lack of detailed information regarding to type and scale of injury may be a problem.  
               2. The information is generally inaccessible or expensive for external users. It could be useful for preventive purposes.  
               3. The bulletins are public available online. The internet site comprises documents presenting data for 2005-2013. They have “.pdf” forms. They are basic and detailed information sources with great usefulness in the light of common safety analysis. |
| **Sweden**  | 1. Users can order data from the National Board of health and welfare. Statistics on accidents based on DOR can be downloaded via Information system IDA at the Swedish Civil Contingencies Agency (MSB).  
               2-3 Data is available in the Information system IDA. It contains detailed data at the municipal level. All of this information can be used for accident and injury prevention. |
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark   | 1. The police register. (See above)  
            | 2. The Online Data Registration and Report System (ODIN). (See above)  
| Estonia   | Excel table that contains information about drowning accidents. Data concerning the drowned person and the circumstances of the accident is collected by the police (no specific form of memo). If rescue service is involved, it is also marked in the PÆVIS. The Excel table (containing time-series) is composed by the Information Monitoring Department of the Ministry of Interior. The table is sent out at least once a month to the Development Department of the ERB where the table is complemented with the PBGR statistics (=supplementary information concerning the causes of death of the drowned people and other circumstances.) Sources: drowned person’s memo and Estonian Causes of Death Register |
| Finland   | 1. Finnish Swimming Teaching and Lifesaving Federation gathers up-to date drowning statistics based on news surveillance  
            | 2. Otherwise dependent on activity and outcome. May be included in rescue data, police data, care register or cause of death statistics. |
| Latvia    | 1. Drowning and other water accidents are stored at SFRS register IRRVIS. Covers all emergency responded water accidents where SFRS has been present.  
            | 2. Drowning and other water accidents are stored at SP register IMIC. Covers all emergency responded water accidents where the State Police have been present.  
            | 3. Drowning and other water accidents are stored at SEMS register VNMPKMVIS. Covers all emergency responded water accidents where SEMS has been present. |
| Poland    | 1. Water Volunteer Rescue Service statistics contain data about the number of drownings in particular years (1998-2012) as well as special reports related with drowning rate (1 victim per 100 000 inhabitants) in years 1962-2012, number of drowned people in relation with gender, a body of water and sobriety.  
            | 2. Police database contains statistics regarding to drownings number in particular months and days in years 1999-2014. |
| Sweden    | 1. Cause of Death Register (DOR) (See above)  
            | 2. Patient Register (PAR) (See above)  
            | 3. Rescue services response data at MSB contains data about drowning and near-drowning accidents. It contains data on the rescue service response and the accidents, for example where it took place, water temperature, time.  
<pre><code>        | 4. Swedish Life Saving Society collects data about drowning and drowning incidents. The information is collected through press clippings, police, emergency services and the Transport Agency. |
</code></pre>
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark   | 1. The police reports may not be fully published. Therefore you’ll need to get access.  
2. ODIN requires user creation and a login. Not public available.  
3. Has public access and provides a more easily overview with an option to lookup a specific request.  
Municipality based rescue service point of view – data source are not easily available. |
| Estonia   | Estonian Rescue Board Development Department compiles an analysis of drowned persons according to need and it is one of the inputs for the planning of prevention work.                                           |
| Finland   | 1. Basic statistics available online by region, month and cause. No individual information.  
2. According to each data source.                                                                                                                      |
| Latvia    | This data is available as periodical statistical reports. At the moment, this information is not relevant for local accident prevention because it doesn’t provide enough detailed information on the accident circumstances and the location. |
| Poland    | 1. Water Volunteer Rescue Service statistics are available online for the public. Statistics have forms of tables and graphs. They are useful in creating a basic point of view on water safety in Poland.  
2. Police database is available online for the public. The data could be useful for accident prevention because it would enable further analysis (e.g. the number of drownings in relation to week days, weekends and holidays). |
| Sweden    | 1. Users can order data from the National Board of health and welfare. Statistics on accidents based on DOR can be downloaded via Information system IDA at the MSB.  
2. Users can search in Statistics Database for external causes of injury and poisoning at the National Board of health and welfare. Statistics can also be downloaded through IDA. Due to statistical confidentiality it is not possible to get detailed data at the municipal level.  
3. Data is available in the IDA. It contains detailed data at the municipal level.  
4. Drowning statistics and incident statistics are available at the national level – PDF or Word format on the Swedish Life Saving Society website.  
All this information is useful for accident and injury prevention. |
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1. National Institute for Health Development (Tervise Arengu Instituut-TAI) is responsible for these other accidents. Data can be acquired from the Estonian Causes of Death Registry. PBGB receives data also from the Estonian Forensic Science Institute.</td>
</tr>
<tr>
<td>Latvia</td>
<td>Above mentioned operative institution registers are also available for other information on different kinds of accidents.</td>
</tr>
<tr>
<td>Poland</td>
<td>1. National Institute of Public Health – National Institute of Hygiene publishes yearly reports regarding poisonings and infectious diseases in Poland. The information source comprises breakdowns of poisonings and infectious diseases in relation with morbidity, number and percent of hospitalized people in particular provinces, gender, age and environment, number of infected people in relation with gender, age and environment, morbidity in relation with gender, age and environment, percentage of infected people in relation with gender, age and environment, number of infected people and morbidity in relation with environment and number of people in towns.</td>
</tr>
<tr>
<td>Sweden</td>
<td>2. Injury Database (IDB) from the National Board of health and welfare is a subset of the patient register and contains detailed information on injury events among patients who sought care at a selection of accident and emergency departments at hospitals in Sweden. It is based on data both from patients and from health professionals. IDB contains individual-level data on activities, products and context when injuries occurred. There is no obligation for health boards to participate in IDB, which covers about 10 percent of the population. The objective of the IDB is to provide detailed injury data for injury prevention purposes. IDB is part of a pan-European database (EUROIDB). EUROIDB is currently the only data source that contains comparable data on loss events in home and leisure sector.</td>
</tr>
</tbody>
</table>
### TABLE 1.5B: THE USABILITY OF THE DATA SOURCES FOR MONITORING OTHER ACCIDENTS

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Various data is accessible at the webpage of the Statistics Estonia (SE) as well as in the databases of the National Institute for Health Development (NIHD) and in the database of the World Health Organization.</td>
</tr>
<tr>
<td>Estonia</td>
<td>1. Statistics and theme reports available online. Tabulated data available on request free of charge. Individual level data only for researchers.</td>
</tr>
<tr>
<td>Finland</td>
<td>There are also other accidents that are depended on seasonal (weather and occupational, schooling) situation and that information could be relevant for local accident prevention.</td>
</tr>
<tr>
<td>Latvia</td>
<td>1. National Institute of Public Health – National Institute of Hygiene reports are available online for the public. Data is detailed and comprehensive, very useful during safety analysis in Poland.</td>
</tr>
<tr>
<td>Poland</td>
<td>1. The National Board of health and welfare compiles annual statistics reports based on the IDB. These can be ordered or downloaded via the website. MSB annually produce analyzes and fact sheets for different injury categories based on the IDB. Reports and analysis at the national level are useful for accident and injury prevention at both national and local levels. It is problematic to do meaningful analysis at the local level due to the low frequency of injury events in individual municipalities and a lack of resources for the work.</td>
</tr>
</tbody>
</table>
TABLE 1.6: OTHER DATA SOURCES NOT LISTED ABOVE

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>The Centre for Disease Prevention and Control (CDPC) of Latvia. Gathers information on diseases and informs population about them (e.g. campaigns). General information about current diseases and their prevention.</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>“In all municipalities in the study there is reporting on deviations in local health and social care. “Deviations” here means negative events and incidents under »Safer care, handbook of basic patient safety work« (SKL 2011). A deviation report can also be the basis for a Lex Maria or Lex Sarah-notification. Deviations are reported via forms, sometimes computerized and sometimes on paper. They concern pharmaceutical events, events with medical products, falls and fall injuries, information transfer failure or other events in connection with health and social care interventions.”</td>
</tr>
</tbody>
</table>
Appendix 2: Data Sources On Risk Factors On Everyday Accidents

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| **Denmark** | 1. Occupational accident investigations.  
3. Police investigation.  
4. Fire investigation.  
5. The Accident Investigation Board (AIB). |
| **Estonia** | 1. Fire accident investigation data base within rescue services.  
2. Road traffic accident investigation by the Police.  
3. Occupational accident investigation.  
4. Police accident investigation (drowning, criminal acts).  
5. Police and Border Guard Board investigates traffic accidents with injured people, major fires, poisonings, suicides and water deaths in order to find out whether it was a case of accident or crime. PBGB carries out its proceedings in its own information system (POLIS). Data is forwarded to the e-File system on the basis of what the national statistical data is made public by the Estonian Ministry of Justice. |
| **Finland** | 1. Fire accident investigation data base within rescue services.  
2. Major accident investigation by the Safety Investigation Authority. The Safety Investigation Authority investigates all major accidents regardless of their nature as well as all aviation, maritime and rail accidents and their incidents.  
3. Road traffic accident investigation boards.  
4. Occupational accident investigations.  
5. Police accident investigation. |
| **Latvia** | 1. The State Fire and Rescue Service (SFRS) fire accident investigation data base.  
2. The State Police of Latvia Criminal record and Latvia State Centre for Forensic Medical Examination. |
| **Poland** | 1. Major accidents where State Fire Service (SFS) and Voluntary Fire Brigade have been present has additional analysis including time, calls, etc. |
| **Sweden** | 2. National Accident commission (SHK) is responsible for investigating all types of serious accidents on land, at sea or in the air. An incident may also be examined whether it could lead to a serious accident. The purpose of the investigations is to make recommendations for safety improvements.  
3. Traffic accident investigations.  
### TABLE 2.1B: THE USABILITY OF THE DATA SOURCES ON RISK FACTORS FOR EVERYDAY ACCIDENTS (ACCIDENT INVESTIGATIONS)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Most investigations are of more fatal incidents. Not all reports are being published.</td>
</tr>
<tr>
<td>Estonia</td>
<td>Generally these are for single severe accidents, accidents leading to fatalities, and major accidents. Results are reported by variable channels.</td>
</tr>
<tr>
<td></td>
<td>1. Completed reports are freely available at the webpages.</td>
</tr>
<tr>
<td></td>
<td>Non-personalized statistical data collected by the PBGB is available for the public through the communication office, through analytical surveys (categorized and periodical) and in the form of data request.</td>
</tr>
<tr>
<td>Finland</td>
<td>Generally these are for single severe accidents, accidents leading to fatalities, and major accidents. Results are reported by variable channels.</td>
</tr>
<tr>
<td></td>
<td>2. Ready reports are freely available from the webpages.</td>
</tr>
<tr>
<td>Latvia</td>
<td>Information is available with delay of several months or not available at all.</td>
</tr>
<tr>
<td>Poland</td>
<td>1. Not easily accessible for the public.</td>
</tr>
<tr>
<td>Sweden</td>
<td>2. Investigation reports are searchable through the online database. You can also subscribe to investigative reports through newsletters.</td>
</tr>
<tr>
<td></td>
<td>3. Traffic accident investigations are not searchable.</td>
</tr>
<tr>
<td></td>
<td>4. Municipal accident investigations are available online at MBS.</td>
</tr>
<tr>
<td></td>
<td>The purpose of the investigations is to make recommendations for safety improvements particularly for the municipal fire and rescue services.</td>
</tr>
</tbody>
</table>
### TABLE 2.2A: DATA SOURCES ON RISK FACTORS FOR EVERYDAY ACCIDENTS (RESCUE SERVICE)

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>1. Surveillance of buildings with automatic fire alarm systems collected by rescue service authorities.</td>
</tr>
<tr>
<td>Estonia</td>
<td>At the Estonian Rescue Board (ERB): 1. Fires in buildings (collected by ERB Regional Rescue Centers Fire Safety Divisions Investigation Offices; cooperation with the Police and Environmental Inspectorate). The information is being entered into national database of building fires JÄIS. 2. Automatic fire alarm systems (ATS) in buildings. Information is received from the objects which are connected to the Emergency Response Centre (ERC). Information concerning alarms, false reports and maintenance procedures moves into the ERC database called SOS. ERC publishes only statistical data like the number of ATS alarms. Fire safety supervision database JÄIS receives ATS data from the ERC database automatically. Fire Safety Supervision Department of ERB analyses the data profoundly. In case of need, initiates a fire safety supervision proceeding.</td>
</tr>
<tr>
<td>Finland</td>
<td>1. Surveillance of buildings with automatic fire alarm systems collected by rescue service authorities.</td>
</tr>
<tr>
<td>Latvia</td>
<td>1. Surveillance of Buildings with automatic fire alarm systems collected by the State Fire and Rescue Service (based on the alarms). 2. Surveillance of Buildings with automatic fire alarm systems collected by private security companies. 3. Inspections reports of high risk places and buildings of increased danger (e.g. kindergarten, railway stations, big shopping malls etc.).</td>
</tr>
<tr>
<td>Poland</td>
<td>1. Surveillance of buildings with automatic fire alarm systems collected by rescue service authorities.</td>
</tr>
<tr>
<td>Sweden</td>
<td>2. In all municipalities, the fire and rescue service fills in a report after every incident they attend. The report contains details about the event and the actions of the rescue service. Data from these reports are sent to MSB who produce national statistics. 3. Many municipalities collect additional information over and above that, which is reported in incident reports. 4. At all fatal accidents and accidents that are considered interesting to examine deeper than in the routine incident report, an accident investigation is carried out by personnel with the relevant expertise. Another example of this is the investigation of home fires carried out by a few large brigades.</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>DATA SOURCES</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>Denmark</td>
<td>1. Provides a high security level, but false alarms may occur.</td>
</tr>
</tbody>
</table>
| Estonia | 1. Fire safety supervision database JÄIS is relevant and useful for preventive purposes as it shows exactly, what are the main causes of fires. Prevention Department uses it in its work and Development Department produces analyses on the basis of JÄIS data and makes information available to the Communication Department. Fire safety campaigns are carried out in dense cooperation with the Communication Department.  
2. The public has no access to the input data due to its confidentiality. Input data can be used by the employees of the Estonian Rescue Board (ERB) and Emergency Response Centre (ERC) who have access to the databases. Input data is analyzed and used in the fire safety supervision and prevention work of the ERB. Statistical data is issued to the publicity by the ERC and ERB. |
| Finland | 1. The information is available upon request and is highly under used. Easy-access version is not available on local level. This information is both relevant and useful. |
| Latvia | 1. At this moment information is not available. This information could be very relevant for local accident prevention if made available.  
2. Information from private companies is not available. It should be studied and investigated in order to find out whether the data could be made available and whether it could be used to evaluate the situation.  
3. At this moment information is not available. This information could be very relevant for local accident prevention if made available. |
<p>| Poland | 1. The information is available only on request on local level. |
| Sweden | |</p>
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
</table>
| Denmark | 1. Crime known to police. Includes drivers suspected for driving under the influence of alcohol and drugs. Contains all suspects and their confirmed alcohol and drug results.  
2. Driving under the influence of alcohol and drugs. Police and Border Guard Board processes in its information system called POLIS. Data is collected into e-file information system on the basis of what national statistics is made available by the Estonian Ministry of Justice. |
| Estonia | 1. Crime known to police. Includes drivers suspected for driving under the influence of alcohol and drugs. Contains all suspects and their confirmed alcohol and drug results.  
2. Driving under the influence of alcohol and drugs. |
| Finland | 1. Crime known to police. Includes drivers suspected for driving under the influence of alcohol and drugs. Contains all suspects and their confirmed alcohol and drug results.  
2. Alcohol and drugs in traffic flow study (R-tutkimus). Systematic ongoing study registering alcohol and drugs from general traffic flow. Performed on same localities annually. |
| Latvia  | 1. Aggressive driving.  
2. Driving without driver’s license, car insurance or/and MOT.  
3. Municipal police – Information on social abuses cases, hooliganism and public order offenses |
<p>| Poland  | 1. Police database contains information about driving under the influence of alcohol and drugs. |
| Sweden  | 1) National security survey (NTU) by National Crime Prevention Council. NTU is an annual national survey that measures how many people are victims of crime, feelings of safety, confidence in the judiciary and the experience of contact with the justice system. The aim is to get an idea of the public’s perceptions of insecurity and gather information about victims of crime. The results are used to assess crime trends. |</p>
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Non-personalized statistical data, collected by the Police and Border Guard Board, is available for the public through the communication office, analytical surveys (categorized and periodic) and in the form of data request. PBGB considers data analysis very important for the prevention activities. Data is used for the planning and implementation of prevention activities.</td>
</tr>
</tbody>
</table>
| Estonia | 1. Numbers available through criminal justice statistics on municipal level. Statistics online.  
2. Gives information of impaired drivers in general traffic flow. No local-level data. |
| Finland | 1-3. At this moment information is available on request. This information could be very relevant for local accident prevention if made available.  
4. Information is available on a daily basis and in some cases used for accident prevention. |
<p>| Latvia  | 1. Police database is available online for the public. Full information on request (e.g. accidents caused driving after drug or alcohol) |
| Poland  | 2. The results of the National Security Survey (NTU) are presented annually in a report that can be downloaded from the web. |</p>
<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Internet, email or telephone based feedback systems.</td>
</tr>
<tr>
<td>Estonia</td>
<td>The following systems record information that is processed for statistics: Emergency Response Centre, Police Emergency Aid, Rescue area information line, Estonian Road Administration information line, Tallinn information line, Nation-wide Family Doctor Advise information line (medical advise 24-h in Estonian and Russian languages), Intoxication information line, The Environmental Inspectorate information line, Eesti Energia fault clearance information line, Kids Aid information line (inform about lost kids, how to behave in the situation, prime crisis consulting. This information line cooperates with PBGB), Inevitable Psychological Aid (Life line) information line (in Estonian and Russian) gives emotional support, aid and necessary information to victims.</td>
</tr>
<tr>
<td>Finland</td>
<td>1. Internet based reporting system for Helsinki (&quot;Pitäiskö fiksata?&quot;). Citizens may freely report things that need to be fixed and mark the location on map. Feedback will go to Helsinki municipal services.</td>
</tr>
<tr>
<td>Latvia</td>
<td>Jelgava city municipality operative information centre (OIC) gathers information from citizens and professionals through a) free of charge phone 8787; b) binteractive map c) mobile application “Jelgavas pilsētsaimnieks“ (Google play; iTunes; Windows Phone). OIC is works with small problems and accidents (mostly with city infrastructure) in a daily basis in order to be ready for disasters. At the centre, there are many monitoring and management systems (flood gate system, rain water sewerage pumping system, street light, traffic light system, local meteorological system, video surveillance, geographical information system etc.) that are used to get an overview of the city’s infrastructure.</td>
</tr>
<tr>
<td>Poland</td>
<td>1. Various authorities have email addresses for citizens to report appropriate dysfunctions 2. Warsaw has web map to point location and fill the form to report failure/accident alternative way to report is to call to 19155 phone number</td>
</tr>
<tr>
<td>Sweden</td>
<td>“A large proportion of municipalities in Sweden gather the same kind of data concerning damage, faults and other disturbances in the municipal administrations. In some communities this has only been within a few departments, as school or social services, while in others this reporting concerns all departments and everything from accidents to burglaries are reported. There are examples of municipalities where risk management teams with participants from all departments gather regularly to review recent incidents.”</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>DATA SOURCES</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>Denmark</td>
<td>Big availability resulting in quicker and better service.</td>
</tr>
<tr>
<td>Estonia</td>
<td>Information is made available for the practitioners at the local level. The data can be found online or from information materials which are circulated through media channels. This data supports prevention work at the national and local level. Sometimes includes collaboration with the EU.</td>
</tr>
<tr>
<td>Finland</td>
<td>1. Generally available on internet. Map with reported problems and their descriptions. Fixed problems appear in green and ones waiting to be fixed with red.</td>
</tr>
<tr>
<td>Latvia</td>
<td>This information is gathered from daily information reports and distributed to city management. Also there are periodical reports and this information is used to clarify accident trends with city infrastructure and some minor accidents which are not directly related to the State Fire and Rescue Service, the State Police or the State Emergency Medical Service.</td>
</tr>
<tr>
<td>Poland</td>
<td>2. In case of web map if you point only location without email there will be no feedback. The system needs to be developed.</td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2.5A: RISK DATA FROM SURVEYS

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td>Police and Border Guard Board (PBGB) uses various surveys. PBGB also orders surveys according to need.</td>
</tr>
<tr>
<td>Finland</td>
<td>1. There are many surveys on risk data about different kinds of social aspects of life quality and well-being of different social groups.</td>
</tr>
<tr>
<td>Latvia</td>
<td>1. National Board of Traffic Safety publishes reports on their website that present research results concerning speed limits the usage of seats belts, car safety seats and helmets in 2013. 2. Municipal Police Warsaw has a threat maps presents number of interventions in three areas: 200m around schools in working hours, general number of interventions in Warsaw, number of interventions connected with cyclists.</td>
</tr>
<tr>
<td>Poland</td>
<td>1. The Road Safety survey by the Swedish Transport Agency. The questions concern individuals’ attitudes to road safety and has been implemented since 1981. It focuses on changes in public attitudes to key road safety issues over time. The questions deal with attitudes towards the vision of zero deaths and serious injuries, safer traffic, drink driving, speed, seat belts, bicycle helmets and visibility. 2. National security survey (NTU) by National Crime Prevention Council. NTU is an annual national survey that measures how many people are victims of crime, feelings of safety, confidence in the judiciary and the experience of contact with the justice system. The results complement data on reported crimes, and they are used to assess crime trends. They are also used to get an idea of the public’s perception of insecurity and increased knowledge on the victims of crime. 3. National Survey about safety and security by MSB. The main objective of the study is to contribute to better knowledge of how people in different parts of Sweden, of different ages and backgrounds, look at their own safety and security and what they perceive as threats and risks. The questions in the survey concern the area of safety and security and include everything from every day accidents to disasters. The survey is conducted every four years.</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>DATA SOURCES</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>Denmark</td>
<td>Due to the different kind of medias the message succeeds in spreading out wider.</td>
</tr>
<tr>
<td>Estonia</td>
<td>Reported widely, variably on local level.</td>
</tr>
<tr>
<td>Finland</td>
<td>1. Since data of these surveys is on risk data about different kinds of social aspects and not exactly about accidents (circumstances, cause and consequences) it won’t be easy to match them with everyday accident prevention activities. But if a much deeper scientific approach is developed then of course social behavior and different social aspects of citizen’s well-being can be related to accident appearance.</td>
</tr>
<tr>
<td>Latvia</td>
<td>1. General information (seat belt use, car safety seats, helmets) in 2013 and an overview of the information based on research according to speed limit observance. 2. Maps show the location and cause of municipal police intervention (e.g. alcohol consumption/ drugs in public area, robbery).</td>
</tr>
<tr>
<td>Poland</td>
<td>1. The results are published annually in a report on the agency’s website. 2. The results are presented annually in a report that can be downloaded from the web. 3. The results are presented in a report that can be downloaded from the web. Data is also presented in the Information System IDA.</td>
</tr>
<tr>
<td>Sweden</td>
<td>1. The results are published annually in a report on the agency’s website. 2. The results are presented annually in a report that can be downloaded from the web. 3. The results are presented in a report that can be downloaded from the web. Data is also presented in the Information System IDA.</td>
</tr>
<tr>
<td>COUNTRY</td>
<td>DATA SOURCES</td>
</tr>
<tr>
<td>---------</td>
<td>--------------</td>
</tr>
<tr>
<td>Denmark</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>For a couple of years the State Police and the State Fire and Rescue Service have organized activities concerning seasonal accident prevention.</td>
</tr>
<tr>
<td>Poland</td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td></td>
</tr>
</tbody>
</table>
### TABLE 2.6B: THE USABILITY OF OTHER DATA SOURCES ON RISK DATA

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>DATA SOURCES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Denmark</td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td></td>
</tr>
</tbody>
</table>
| Latvia  | 1. From October till March is so called dark period on the roads of Latvia when the day is shorter than the night and even the late day or early evening is already dark and many parts of roads are without street lights and even without pedestrian and bicycle pavements. So the State Police is making periodical activities with light reflecting item giveaways.  
2. Each spring the State Fire and Rescue Service informs the population about risk of fire and the unsafe period and the consequences of last year’s grass burning. |
| Poland  |             |
| Sweden  |             |
Action 3
3. **Action 3**

A report presenting a scientific overview of implementation of evidence based accident data.

Syed Moniruzzaman, Ragnar Andersson
Centre for Public Safety, Karlstad University

3.1 **Introduction**

For all systems subjected to control, feedback of relevant information is essential. If the system is a community and the intent is to prevent adverse events in that community, information on such events needs to be properly and systematically collected, analyzed and taken into account as part of an ongoing learning and improvement process. All information being collected and reported needs to be valid in the sense of reflecting the “true” situation, in order not to mislead policy and decision makers towards poor and resource-wasting priorities.

Accident and injury prevention is a field with longstanding experience in data collection and analysis as part of regular safety work. This holds for sectors such as occupational and traffic safety, but also to some extent for fire safety in many countries. However, since accidents nowadays increasingly tend to strike individuals and groups outside these traditionally risk related sectors; additional sectors need to be addressed for risk analysis and systematic safety work.

It is also important to review the practices already established in traditional sectors, regarding data collection and analysis, to determine whether these really meet current scientific standards in the field. Although improvements have occurred in many countries in certain sectors, international research still indicate serious limitations with regard to validity and usage practices in many countries and sectors.

3.2 **Aims, methods and definitions**

This paper aims to:

1. Present a brief overview of theoretical principles on accident and injury surveillance, as described in the scientific literature, and
2. Review the state of the art in practice, based on evaluative and/or comparative research.

To meet these aims, a literature review was conducted. Literature databases, such as ISI Web of Science, Google Scholar, PubMed, Scopus and Safety Lit, were searched for terms like “surveillance”, “registration”, “data collection”, etc. combined with “accident” or “injury”, in order to identify a set of publications relevant to the current topic. All related reference lists were scrutinized as an extra check for completeness.

Accidents are usually described as sudden and unintentional harmful events. Accidents causing massive devastation are often denoted as disasters. In some sectors, the term accident may also include intentional events.
Injuries are human health consequences from accidents (Holder & World Health Organization, 2001). In many fields, injuries represent the principal concern of accidents, often leading to confusion between the two terms. Some accidents, however, result in broader spectrums of harm, which points towards the need of a conceptual separation between the event and its consequences. This is also important from a preventative view, since this distinction implies two separate approaches to prevention: preventing the event/exposure or mitigating its consequences. Besides injuries from accidents, injuries may also result from intentional events, such as acts of violence and suicide.

Accident and injury surveillance refers to the ongoing collection, processing and feedback of data on accidents and injuries to those in need of this information for their systematic preventative work (Holder & World Health Organization, 2001; Klaucke et al., 1988). Accident and injury registration is a narrower term, not identical with surveillance, limited to the collection and recording of accident and injury data. The term surveillance includes registration but also the subsequent analysis and utilization of data.

### 3.3 Results, part 1: Models, principles and guidelines, as recommended in the literature

Accident and injury surveillance is a topic attracting considerable attention among safety researchers and practitioners, and several guidelines exist in the literature.

The World Health Organization has published guidelines for injury surveillance (Holder & World Health Organization, 2001). The process of surveillance is presented in the form of an eight step model:

1. Defining the problem
2. Collecting the data
3. Entering and processing the data
4. Interpreting the data
5. Reporting the results
6. Using the results to plan prevention/treatment
7. Evaluating the surveillance system
8. Keeping the system up to date

For the development of new surveillance systems, the following steps are recommended:

1. Identify stakeholders
2. Define system objectives
3. Define “a case”
4. Identify data sources
5. Assess available resources
6. Inform and involve stakeholders
7. Define data needs
8. Collect data
9. Establish a data processing system
10. Design and distribute reports
11. Train staff and activate system
12. Monitor and evaluate
A complementary section presents important attributes for a good surveillance system, useful as criteria for evaluation:

- Simplicity
- Flexibility
- Acceptability
- Reliability
- Utility
- Sustainability
- Timeliness
- Security and confidentiality

### 3.4 Sources of injury data

Sources of mortality data (deaths) may differ between countries. Vital statistics based on death certificates is one common source, while medical examiner and forensic pathology records might be another. The former source usually provides fairly complete overviews of all deaths by main cause of death in the form of diagnoses, while the latter contribute with details on substance use and other circumstances of importance from a legal perspective. Some sectors collect data on deaths from other sources as well, such as the police, fire brigades, and newspaper clips.

Morbidity data (non-fatal injuries) is usually collected from the health services. An increasing number of countries provide regular information on hospitalizations based on hospital discharge records. These typically include diagnoses for patients that have been admitted and treated at hospitals. Some countries also have certain trauma registers based on cases treated at more qualified and specialized trauma units for severe cases. Most patients, however, return home after having their injuries attended to without being admitted to hospital wards. Their injuries are covered by an EU initiative called Injury Data Base (IDB). Unfortunately, IDB is still a very incomplete and uncertain source of injury data in most European countries. Besides the health sector, collection of data based on compensation claims, call-outs, and the like, is a widespread practice in many countries.

The type of data obtainable differs largely by sources. Medical records are largely used in injury research and regarded as the most reliable source of information (Graitcer, 1987). It usually focuses on medical information such as diagnoses and basic background information such as sex and age. Data from sector-based agencies are often more rich in information on what happened, where, when and sometimes even contributing factors. The strength, however, with medical records is the coverage of relevant cases. Sector-based statistics usually lack validity due to an inability to capture large proportions of the intended cases. An overview of sources commonly referred to for accident and injury surveillance is presented in table 1.
<table>
<thead>
<tr>
<th>SOURCES</th>
<th>DATA TYPE</th>
<th>INJURY TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accident &amp; Emergency department data (A&amp;E)</td>
<td>Non-fatal</td>
<td>All injuries, minor</td>
</tr>
<tr>
<td>Active data collection</td>
<td>Non-fatal</td>
<td>Sports injuries</td>
</tr>
<tr>
<td>Ambulance reports</td>
<td>Fatal, non-fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Coroner records</td>
<td>Fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Hospitalized inpatient records</td>
<td>Non-fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Household survey data</td>
<td>Fatal, non-fatal</td>
<td>All injuries</td>
</tr>
<tr>
<td>Insurance reports</td>
<td>Fatal, non-fatal</td>
<td>Traffic, occupational, sports</td>
</tr>
<tr>
<td>Labor statistics annual survey</td>
<td>Fatal, non-fatal</td>
<td>Occupational injuries</td>
</tr>
<tr>
<td>Mortuary data</td>
<td>Fatal</td>
<td>All injuries</td>
</tr>
<tr>
<td>Newspaper clippings</td>
<td>Fatal, non-fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Occupational safety reports</td>
<td>Non-fatal</td>
<td>Occupational injuries</td>
</tr>
<tr>
<td>Outpatient records</td>
<td>Non-fatal</td>
<td>All injuries</td>
</tr>
<tr>
<td>Police report</td>
<td>Fatal, non-fatal</td>
<td>Traffic accidents</td>
</tr>
<tr>
<td>Post-acute care data</td>
<td>Fatal, non-fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Transport department reports</td>
<td>Fatal, non-fatal</td>
<td>Traffic accidents</td>
</tr>
<tr>
<td>Trauma registry data</td>
<td>Non-fatal</td>
<td>Severe injuries</td>
</tr>
<tr>
<td>Vital records</td>
<td>Fatal</td>
<td>All injury types</td>
</tr>
<tr>
<td>Workers compensation reports</td>
<td>Non-fatal</td>
<td>Occupational injuries</td>
</tr>
<tr>
<td>Workplace reports</td>
<td>Non-fatal</td>
<td>Occupational injuries</td>
</tr>
</tbody>
</table>

Table 1. List of major data sources used in literature on fatal and non-fatal injuries.

3.5 Coding systems

In order to complement medical records with similar prevention-oriented information, the International Classification of Diseases (ICD), issued by the World Health Organization (WHO) is used by most countries as a standard for national classification practices (World Health Organization, 2004; World Health Organization, 2012). Besides the injury diagnosis, the ICD also includes an additional code to categorize the external cause of injury (E-codes), for example traffic accident, fire, fall, etc. The list of external causes is quite extensive and detailed in many respects, capturing circumstances, environments of the injury event, such as the place of occurrence (e.g. home, school, etc.), the activity (e.g. playing, working, etc.) and the intent of the victims (e.g. accidental, self-harm, etc.). However, in some respects, the system is fairly rough and less useful. For instance, traffic injuries are separated in detail between different types of accidents and occupant categories while occupational injuries are not distinguishable at all by this classification. E-codes have been faced with substantial criticism due to its partial inadequacy for prevention purposes (Gallagher, Finison, Guyer, & Goode-
ough, 1984; Sniezek, Finklea, & Graitcer, 1989). To avoid the limitation of ICD E-codes, some countries Australia and Nordic countries have even proposed their own coding systems and used them in their national statistics (National Injury Surveillance Unit, 1995; Ytterstad, 1995).

The NOMESCO classification is an alternative to the ICD coding system. It was first published in 1984 for registration of external causes of unintentional injuries, with the aim of using a multiaxial structure for monitoring emergency room patients (NCECI, 2007). The NOMESCO coding system also allows systemizing free text in association with the injury mechanism, and has been successfully used in for example Norway (Ytterstad, 1995).

3.6 Data linking and integration

The strengths and weaknesses typically associated with different sources of information have given rise to the idea of data-linkage between sources (Cercarelli, Rosman, & Ryan, 1996; Cryer et al., 2001; Horan & Mallonee, 2003; Lopez, Rosman, Jelinek, Wilkes, & Sprivilis, 2000; Sorock et al., 1997). For example, linking police and hospital data on traffic injuries can pool the coverage quality of hospital data with the preventative quality of police data, leading to more correct and complete information on traffic injuries than either hospital or police records can alone. Further, while medical data is aimed to report health related information, police data lacks health information but provides supplementary information concerning the event, its causes and relevant environmental circumstances. To better understand injury mechanisms and risk factors, the linking of data sources is important. Several papers have been presented using data linkage and have shown the importance and usefulness in understanding the injury spectrum in elderly falls (Lauderdale, Furner, Miles, & Goldberg, 1993), road traffic accidents (Dischinger, Cushing, & Kerns, 1993) and occupational hazards (Lipscomb, Kalat, & Dement, 1996).

3.7 Results, part 2: State of the art in practice

Many scientific publications present injury surveillance programs at local and national levels, and report findings produced through evaluation studies on injury surveillance systems. Both the descriptive and evaluation studies on injury surveillance provide information on how injury control and prevention programs often are organized. Since establishing and administrating surveillance program may appear expensive; consuming time, financial and human resources on a long-term basis, there is a further need to scrutinize such programs. Assessing injury surveillance programs to identify its importance, effectiveness and usefulness are important and well documented (Graitcer, 1988a). Yet, findings from these evaluation studies claim a number of limitations that injury surveillance programs usually face. Limitations identified by this literature include systematic errors in capturing injury data, problems in coding, human errors, incompleteness in reporting, lack of resources, etc.

The public health concern related to injuries has been recognized by many research and organizational reports (Krug, Mercy, Dahlberg, & Zwi, 2002; Morrison & Stone, 2000). Injuries kill people in all age- and social-groups, and give rise to huge financial and social burdens at all levels of society. Programs designed to control injuries are often based on nationally available information. This information is usually unable to reflect specific injury problems, as well as to charac-
terize the priority areas that are needed to be targeted in injury control initiatives (Bell, Schuurman, Hameed, & Caron, 2011). Systematically collected local injury surveillance data are essential for evaluation purposes and, as Pless (2008) recognizes, surveillance is a “prerequisite for prevention programs” (Pless, 2008). Generally, health and injury information can be collected in different ways (Parrish & McDonnell, 2000). Data can be collected through individual contact by telephone or sending out questionnaires or through health care providers based on their routinely collected records. Also, different organizations such as fire services; police departments and occupational health and safety inspectors routinely collect data for their own purposes.

3.8 Population-based injury surveillance programs

In the injury surveillance literature, a majority deals with determining whether existing programs have the ability to monitor injury problems. Yet, literature on describing successful surveillance, and the structures and strategies used in these surveillance programs, is limited. The literature presenting injury surveillance programs is usually meant to be published to present findings from the evaluation of the surveillance programs. The surveillance programs include: the Canadian Hospitals Injury Reporting and Prevention Program (CHIRPP) (Mackenzie & Pless, 1999); The Yorkhill CHIRPP (Shipton & Stone, 2008); Injury Surveillance in Australia (Harrison & Tyson, 1993); Injury Surveillance in Victoria, Australia (Watson & Ozanne-Smith, 2000); Shantou injury surveillance in China (Liu, Li, Cui, Liu, & Jackson, 2009a); The National Electronic Injury Surveillance System-Cooperative Adverse Drug Event Surveillance Project in the USA (NEISS-CADES) (Jhung et al., 2007); The Aboriginal Community-Centered Injury Surveillance System (ACCISS) in Canada; The South African National non-natural mortality surveillance system (Butchart et al., 2001a). These programs have gained vast scientific attention and some of these programs have been considered exemplary models for injury surveillance. A majority of these injury surveillance programs are based on emergency department (ED) information. Although these programs have been routinely monitoring injury incidence, stimulating prevention programs and regarded as ideal models for further injury surveillance initiatives, these programs suffer a number of limitations that require further consideration and discussion.

The Canadian CHIRPP, for example, is an accident and emergency (A&E) department-based (also termed as Emergency department, ED-based) injury surveillance system that collects data for all injured children attending the A&E in 16 different hospitals (pediatric and general) and provides information on the magnitude of the injury problem (e.g. injury occurrence, severity). When evaluating the CHIRPP program (Macarthur & Pless, 1999), sensitivity differed from 30%-91%, systematic errors were identified and representativeness was insufficient (as it only involves three communities in Canada). Severe and fatal injuries, injuries presenting overnight and poisonings were more likely to be missed in the CHIRPP records. However, the CHIRPP data was considered as high quality. Similar validity problems were observed in other A&E based surveillances (Adirim, Wright, Lee, Lomax, & Chamberlain, 1999; Jhung et al., 2007). For example, National Electronic Injury Surveillance System (NEISS) that collects nationally representative data on non-fatal injuries using A&Es in the USA (Jhung et al., 2007), was unable to capture patients treated in other healthcare settings (ambulatory clinics, urgent care centers) and suffered from weaknesses of flexibility
and stability. Both the CHIRPP and NEISS have a further weakness in providing timely results, as is recommended by the CDC guidelines for ideal surveillance (Centers for Disease Control and Prevention, 2001). Both programs seem to be delayed in reporting of data coding, at least 1 year behind the scheduled reporting time (Pless, 2008). Accuracy and completeness have often been problematic for many surveillance programs. In other instances, surveillance programs struggle with lack of sensitivity (Liu et al., 2009a), low or incomplete reporting by physicians (Adirim, Wright, Lee, Lomax, & Chamberlain, 1999), and wrongly coded cases (Beattie, 1996).

An evaluation study carried out by Liu et al. (2009) to assess an emergency department-based injury surveillance project in China using WHO evaluation guidelines found that half of the injury cases were not recorded by the hospital surveillance system (Liu, Li, Cui, Liu, & Jackson, 2009). Liu et al. findings are also similar to other studies in Canada (Macarthur & Pless, 1999), South Africa (sensitivity of the South African National Non-Natural Mortality Surveillance System, 65-95%) (Butchart et al., 2001b) and Jamaica (sensitivity of a Jamaican injury surveillance system, 29.7-97.1%) (Arscott-Mills, Holder, & Gordon, 2002).

<table>
<thead>
<tr>
<th>LITERATURE</th>
<th>SURVEILLANCE</th>
<th>SETTINGS</th>
<th>DATA</th>
<th>EVALUATION/IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Brussoni, Olsen, &amp; Joshi, 2012)</td>
<td>Aboriginal Community-Centered Injury Surveillance System (ACISS).</td>
<td>Community-Centered Injury Surveillance System.</td>
<td>Injured patients from reserved based community.</td>
<td>Leadership, staff contribution, collaborations between and within communities, training responsive to community needs are important factors for a successful IS.</td>
</tr>
<tr>
<td>(Chow et al., 2012)</td>
<td>Electronic ED based geo-information injury surveillance system in Hong Kong.</td>
<td>Acute hospital in Safe Community setting, Hong Kong.</td>
<td>ED collected on name, sex, address, injury categories. Data were collected and entered in 4 phases.</td>
<td>Introduction of a geo spatial IS at ED is useful and identify and engage key stakeholders are important.</td>
</tr>
<tr>
<td>(Zhou, Wu, &amp; Wu, 2012)</td>
<td>The primary and secondary school students injury surveillance system (PSSISS).</td>
<td>School based surveillance, China.</td>
<td>All Injury.</td>
<td>Combining qualitative and quantitative method was good for evaluation purposes.</td>
</tr>
<tr>
<td>(Liu, Li, Cui, Liu, &amp; Jackson, 2009b)</td>
<td>The Shantou-Emergency Department Injury Surveillance Project (S-EDISP).</td>
<td>Two ED of Shantou City Hospitals and three township hospitals, China.</td>
<td>Patient demographics, date and time of admission, injury, location, injury intent, severity, procedures, diagnoses, discharge information.</td>
<td>Identified problem is useful in developing national surveillance system.</td>
</tr>
<tr>
<td>Source</td>
<td>Description</td>
<td>Details</td>
<td>Notes</td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>(Mitchell, Williamson, &amp; O’Connor, 2009)</td>
<td>Proposed standard guidelines to evaluate injury surveillance systems.</td>
<td>Australian study.</td>
<td>18 characteristics are proposed – five to assess data quality, nine to the system’s operation and 4 to assess practical capability of IS. A standard evaluation framework is useful to evaluate surveillance performance and to improve data collection procedures.</td>
<td></td>
</tr>
<tr>
<td>(Nakahara et al., 2008a)</td>
<td>Evaluated the prospect of data sharing and comparing between four Asian countries and discussed the possibility of establishing an internet-based common data management system.</td>
<td>Thailand, Cambodia, Sri Lanka and Japan.</td>
<td>Global data management system is feasible and make accessible through net and benefit for resource-constrained countries.</td>
<td></td>
</tr>
<tr>
<td>(Jhung et al., 2007)</td>
<td>The National Electronic Injury Surveillance System-Cooperative Adverse Drug Event Surveillance Project (NEISS-CADES).</td>
<td>National representative data, ED based, The USA.</td>
<td>All external causes of non-fatal injuries and poisonings/ Adverse drug event. This program provides detailed and timely information, identifies specific problem with adverse drug events (ADEs).</td>
<td></td>
</tr>
<tr>
<td>(Adirim et al., 1999b)</td>
<td>Injury Surveillance in Pediatric Emergency Department.</td>
<td>Children hospital based, The USA.</td>
<td>All injury. Low reporting by emergency physicians, reporting depend on day of the week.</td>
<td></td>
</tr>
<tr>
<td>(Lyons, Lo, Heaven, &amp; Littlepage, 1995)</td>
<td>West Glamorgan Injury Database.</td>
<td>A&amp;E in three hospitals, West Glamorgan, UK.</td>
<td>Centralized database of A&amp;E attendees are accountable for severe injuries, closer the home to healthcare greater the attendances for child injuries.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Summary of major injury surveillance programs, published from 1990.
### 3.9 Road traffic injury surveillance programs

Regarding cause-specific injury surveillance systems, epidemiological evidence on road traffic injuries is mainly based on data collected by police accident reports. Data on traffic fatalities in police reports are usually clearly defined and well documented in high-income countries. However, non-fatal cases still suffer from underreporting problems to a larger extent. Many studies have highlighted the problems with underreporting with the aim to explore the factors behind the incompleteness and inconsistency in different reporting databases on road traffic injuries (Alsop & Langley, 2001a; Amoros, Martin, & Laumon, 2006; Harris, 1990a; Hatamabadi, Vafaee, Haddadi, Abdalvand, & Soori, 2011; James, 1991; Tsui, So, Sze, Wong, & Leung, 2009; Yamamoto, Hashiji, & Shankar, 2008). Underreporting on traffic injuries in police records is documented in many countries such as in Australia (Rosman & Knuiman, 1994a), in France (Aptel et al., 1999a), in the UK (Teanby, 1992), in New Zealand (Alsop & Langley, 2001b). Underreporting of road traffic injuries was investigated in Netherlands by comparing police records with data from a household survey covering 24,000 households (Harris, 1990b). When comparing hospital records with police records, Aslop and Langley (2001) found underreporting in the police records of the traffic accident victims, especially among those who needed to be admitted to hospitals (Alsop & Langley, 2001a). Police records identified only half of the traffic-related deaths, compared to hospital-based surveillance data (Razzak et al., 2012).

In measuring health consequences of road crashes, Rossi et al. (Rossi et al., 2005) reported a six times higher injury incidence due to road crashes than national official statistics based on police report in Lazio, Italy. When using a linked database of police crash reports and hospital admission records to examine data consistency between the sources in Western Australia, police records of hospital admissions reported by A&E department underestimated the total by 15% (Cercarelli et al., 1996). Inconsistency in reporting by sources was also found between police records and hospital discharge data (Rosman & Knuiman, 1994), with underreporting of hospitalized injury cases compared to police records in Australia. The problems in police reported traffic injuries was also found in a data linkage study in France (Aptel et al., 1999a), where underreporting varied by injury severity, type of vehicles, time of the accident, as reported in other studies. Representativeness over time is also found to be a limitation in the Road Crash and Victim Information system (RCVI) (Parker et al., 2014).
As A&E surveillance is regarded the most reliable source of injury information (Beattie, 1996b) and often provides comprehensive information on mechanisms and risk factors for injuries (Graitcer, 1988b), the A&E is commonly used to collect traffic injury information. However, A&E data suffers from a number of limitations in reporting traffic injuries. A meta-analysis reviewed a number of hospital-based studies showing variability in reporting levels influenced by fatal vs. non-fatal conditions and high vs low severity. Differences between countries were also observed (Elvik & Mysen, 1999). Differences in reporting was found by
types of transport where reporting was highest for car occupants and lowest for cyclists. In similarly, Hauer and Hakkert found a low reporting of lower severity injuries (Hauer & Hakkert, 1988). Further, according to the US National Highway Traffic Safety Administration estimation, one-fourth of the minor injury crashes and half of no-injury crashes have been suspected to be underreported in their estimation (National Highway Traffic Safety Administration, 2009).

3.10 Occupational Injury surveillance programs

Occupational injuries, sometimes denoted as work-related injuries, is a major public health problem resulting in more than half a million deaths and 100 million injuries per year, globally (Leigh, Macaskill, Kuosma, & Mandryk, 1999). Still, most countries do not have a national surveillance system for occupational injuries. In the absence of such a system at a national level, different types of data sources have been used to assess the magnitude of occupational injuries including household surveys, workers’ compensation claims, A&E records, labor office data and active worksite surveillance (Froines, Wegman, & Eisen, 1989; Hanrahan & Moll, 1989). Surveillance records on occupational injury vary in quality by severity of injuries, types of occupation (Biddle & Marsh, 2002), level of employment status, and geographical locations (Stout & Bell, 1991).

A difference in coverage of occupational injuries is also found between types of data collection systems. When reporting the magnitude and leading causes of farming injury events, the leading causes were different between the ambulance reporting, hospital records, and community surveillance, and the hospital records were found to be the key source of recording farming injury followed by the ambulance report and community survey (Earle-Richardson, Jenkins, Scott, & May, 2011a). In the USA, the overall capture rates were found to be highest in death certificates followed by medical examiner records, worker compensation records, and occupational safety and health administration reports when identifying occupational fatal injuries in 10 state-based studies in the USA (Stout & Bell, 1991). The effectiveness of capturing cases of fatal occupational injuries varied by states, sectors and between the data sets. However, trauma registries are seen as most valuable source with detailed information on those occupational injuries that are most severe (Friedman & Forst, 2007).

There is a concern of the level of completeness in workers’ compensation claims data. A Canadian study showed A&E data as more valid than workers’ compensation claims data for occupational injuries (Mustard, Chambers, McLeod, Bielecky, & Smith, 2012). However, compensation claims data can be used as a good proxy information source (Sorock, Smith, & Hall, 1993), with occasionally detailed and useful data. In occupational injury surveillance, the engagement of multiple sources found to useful that count larger level of occupational injury cases than single and independently used sources (Biddle & Marsh, 2002; Pollack, Griffin, Ringen, & Weeks, 1996).
<table>
<thead>
<tr>
<th>VALIDITY</th>
<th>INJURY TYPE</th>
<th>SOURCE OF DATA</th>
<th>FINDINGS</th>
<th>LITERATURE</th>
<th>IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comparison of Incidence and injury type among data sources</td>
<td>Farm injury, non-fatal.</td>
<td>Ambulance report, hospital and community surveillance data. Farm injury. 10 NY counties.</td>
<td>Differences found in reporting injury, community surveillance reported the smallest number.</td>
<td>(Earle-Richardson et al., 2011a).</td>
<td>Single source to cover injury is insufficient. Electronic resources is needed.</td>
</tr>
<tr>
<td>Larger count of data</td>
<td>Fatal injury, the USA.</td>
<td>National traumatic occupational fatalities, Census of fatal occupational injuries.</td>
<td>No systematic over/undercounting between sources. Multiple sources count larger data.</td>
<td>(Biddle &amp; Marsh, 2002).</td>
<td>Single source provides less information on injury.</td>
</tr>
<tr>
<td>Underreporting</td>
<td>Retrospective severe injury.</td>
<td>Trauma register vs. workers’ compensation claims, bureau of labor statistics.</td>
<td>Underreporting in bureau of labor (BLS) statistics.</td>
<td>(Forst, Hryhorczuk, &amp; Jaros, 1999).</td>
<td>Recommended ‘occupation’, ‘type of industry’ and ‘nature of injury’ be added in TR.</td>
</tr>
<tr>
<td>Underestimate injuries, low level of E-coding</td>
<td>The USA.</td>
<td>Hospital discharge data.</td>
<td>Workers’ compensation is a good proxy measure but underestimate injuries.</td>
<td>(Sorock et al., 1993).</td>
<td>Low level of reporting may bias in understanding the causality.</td>
</tr>
</tbody>
</table>

Table 4. Summary of major injury surveillance programs (on occupational injuries) measuring validity.

### 3.11 Sport injury surveillance programs

Due to the recognition of unwanted adverse effects on sports participants, as well as the importance of the WHO’s policy on “health for all”, the reduction and control of sports injuries should have a high national priority (van Mechelen, 1997). In similarity to other cause-specific injury surveillance initiatives, sports injury surveillance provides information on incidence and severity of sports injuries in various subsets of a population, that remain essential for the prevention purposes. Although various sources have been used to collect information, certain places of treatment, such as sports medicine clinics, provide clear and detailed information on sports injuries (Finch, 1997). However, the validity of sport injury
surveillance system depends on the methodology used and resources provided. Within sport medicine clinics, differences in surveillance methodologies affect data quality. Finch and Mitchell highlighted a set of indicators that influence system sensitivity and data completeness including format of data collection form, staff training and commitment, process assessment, and financial incentives to the project officers (Finch & Mitchell, 2002). Simplified versions of data collection forms with less resources involved found problems in collecting accurate and complete data.

The quality of sports surveillance data depends on the reporters’ role in the system. When examining the validity of injury surveillance in adolescent soccer, Emery el al. (2005) found reporting error of 40% in recording injury identity number when conducting a prospective cohort study (Emery, Meeuwisse, & Hartmann, 2005). In providing detailed information about sports injuries, insurance data have been found to be a potential source for different sports (Åman, Forssblad, & Henriksson-Larsén, 2014; Forssblad, Weidenhielm, & Werner, 2005; Otago & Peake, 2007). Åman et al. (2014) found that insurance data in reporting sports injuries at Swedish national level was of high quality, with 93% of suggested data items presented in the database. A number of studies have also compared data quality by various types of informants. Differences in injury reporting by informants have been found to be problematic, with more reliable data provided by the athletic trainers (ATs). When comparing ATs and coaches, reporting on sports injuries at 18 high schools, reports submitted by ATs were found to be more consistent than reports submitted by coaches, with differences in the reporting of injuries and the data quality. In community settings, injury data provided by sports trainers were found to be of good quality in understanding the injury profile within community clubs (Åman et al., 2014). Athletic trainers’ reports of exposure and injury are considered to be the most reliable source of sports injury data (Braham, Finch, & McCrory, 2003; Shrier et al., 2009).

<table>
<thead>
<tr>
<th>VALIDITY</th>
<th>SETTINGS</th>
<th>SOURCE OF DATA</th>
<th>PREVIOUS RESEARCH</th>
<th>IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data quality</td>
<td>National level.</td>
<td>Insurance data, Sweden.</td>
<td>(Åman et al., 2014).</td>
<td>Insurance data are reliable for sports injury.</td>
</tr>
<tr>
<td>Reporting differences Completeness</td>
<td>Community football clubs.</td>
<td>Trainer and player reports, Australia.</td>
<td>(Beggren, Gabbe, &amp; Finch, 2014).</td>
<td>Underestimates the true injury rates.</td>
</tr>
<tr>
<td>Reporting differences by coaches and athletic trainers (ATs)</td>
<td>18 US high schools.</td>
<td>Coaches and Athletic trainers reports, Prospective study, the USA.</td>
<td>(Yard, Collins, &amp; Comstock, 2009).</td>
<td>Differences in reporting level and mechanism of injury, and completeness. ATs as better reporters.</td>
</tr>
<tr>
<td>Recording errors and reporting difference between team therapist and physician</td>
<td>Football clubs.</td>
<td>Prospective cohort study, Canada.</td>
<td>(Emery et al., 2005).</td>
<td>Important to have standard and consistent injury definitions. Time loss should be standardized.</td>
</tr>
</tbody>
</table>

Table 5. Summary of major injury surveillance programs (on sports injury) measuring validity.
3.12 Other injury surveillance programs

Literature on injury surveillance programs regarding falls, burns, drowning and violence is very limited. When assessing newspapers as a source on drowning incidence at a national level, Barss et al. (2009) identified newspapers as a useful source for drowning prevention (Barss, Subait, Ali, & Grivna, 2009). Drowning incidence reported through newspaper clippings were found to be higher than those reported by Ministry of Health in the United Arab Emirates (UAE). The newspapers are also resourceful when collecting details of factors associated with drowning cases. Poison center data is another useful source of information that provides undocumented data on poisonings at local and national levels (Moore, 2013a). The Northern New England Poison Center (NNEPC) is an example of such surveillance programs that provides data on the number of cases, route of exposure, management site, and medical outcome of work-related poisonings in England.

Very few studies presented surveillance programs that have routinely collected data on falls, fall-related injury and violence. The National Electronic Injury Surveillance System All Injury Program (NEISS-AIP) was retrospectively used to analyze the demographics and incidence of unintentional fall related fractures among older adults in the USA (Orces, 2013). In another study, routinely recorded data by the ambulance service provided information regarding the characteristics of fall-related injuries (Thomas, Muscatello, Middleton, & Zheng, 2011). These findings on the characteristics and risk factors of fall-related injuries are found to be useful in developing national health policies and the hospital services. Surveillance programs that are centered to a certain group are generally given more space in the literature and are able to collect specific information on a particular injury problem. For example, a tribally mandated surveillance system was found to be effective in collecting information on non-suicidal self-injury in the White Mountain Apache Tribe (Cwik et al., 2011). It appears that this surveillance program has its importance as it focused on an unaddressed problem within a specified group, and is likely to be used in other reservation communities.

A comprehensive surveillance program comprising of A&Es, hospitals, ambulance and helicopter services, the fire department, the health department, and paper records from coroner and fire offices, was found to be effective in the UK to identify residential fire injury cases (DiGuiseppi, Edwards, Godward, Roberts, & Wade, 2000). Additionally, medical examiner reports and interviews with fire officials were used to identify the risk factors of fire fatalities and evaluate intervention programs for fire injury prevention (Marshall et al., 1998). However, single data sources were found to underestimate a substantial number of injuries and fatalities due to residential fires in Australia, with 25% of cases being missed by the A&E data and 44% of the hospitalizations by the hospital discharge data (Nolan & Penny, 1992).
3.13 Injury data coding

Although E-codes provide information on the circumstances and characteristics leading to an injury (Guyer, Berenholz, & Gallagher, 1990), accurate coding is vital to distinguish the cases by cause and mechanism. However, the usage of the coding has been inconsistent and incomplete across injury surveillance programs (Guyer, Berenholz, & Gallagher, 1990; Marganitt, MacKenzie, Smith, & Damiano, 1990; Walker et al., 2012). Factors influencing the quality of injury data are coding practices, case definitions, coder characteristics, and communication between staff and victim. The injury coding system follows a number of steps that make the process vulnerable to any type of error (O’Malley et al., 2005). Inadequacy of ICD E-codes of classifying non-traffic pedestrian collisions were found when studying pedestrian injury among children using trauma center based data in California in the USA (Rice et al., 2012a).
**Table 7. Literature on injury coding by injury type and country.**

<table>
<thead>
<tr>
<th>VALIDITY</th>
<th>INJURY TYPE</th>
<th>SOURCE OF DATA</th>
<th>COUNTRY</th>
<th>PREVIOUS RESEARCH</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-code</td>
<td>Childhood injury.</td>
<td>Hospital discharge data.</td>
<td>The USA.</td>
<td>(Guyer et al., 1990).</td>
</tr>
<tr>
<td>E-code</td>
<td>Non-traffic pedestrian injury.</td>
<td>Trauma center.</td>
<td>The USA.</td>
<td>(Rice et al., 2012b).</td>
</tr>
<tr>
<td>ICD-9CM and ICD-10CA</td>
<td>Hospital person orient-ed information (HPOI).</td>
<td>Hospital discharge.</td>
<td>Canada.</td>
<td>(Walker et al., 2012).</td>
</tr>
<tr>
<td>ICD-10 E-code</td>
<td>Bicycle and pedestrians injuries.</td>
<td>ED based data.</td>
<td>Canada.</td>
<td>(Karkhaneh et al., 2012).</td>
</tr>
</tbody>
</table>

*International Classification of Diseases, 9th revision, Clinical Modification (ICD-9CM), **International Classification of Diseases, 10th revision, Canada (ICD-10CA)

Missing or unspecific E-codes can be another problem in documenting injuries. An overall reporting rate for specific E-codes was 38% for hospitalized injuries in Rhode Island, but Langlois et al. (1995) showed that it was possible to assign a specific E-code for 80% of the hospitalized injuries using available cause-of-injury documentation (Langlois, Buechner, O’Connor, Nacar, & Smith, 1995). Few studies have investigated coder roles and characteristics of coding data (Hennessy, Quan, Faris, & Beck, 2010; Lorenzoni, Da Cas, & Aparo, 1999; O’Malley et al., 2005). O’Malley et al. (2005) listed a major source of errors related to the “patient trajectory” including amount and quality of information at admission, communication between patients and hospital staffs, the clinicians’ knowledge and experience, and the clinicians’ attention to details.

Coding practices may differ by type of material and the revisions of ICD. When comparing coding between the death certificates literal text and toxicological reports, literal text alone miscoded deaths due to specific drugs or combination of drugs (Creppage, 2013). Walker et al. studied whether the implementation of ICD-10 from ICD-9 in 2001 in Canada has impacted on diagnosis and comorbidity coding (Walker et al., 2012). While some coding variations in the average number of diagnosis per hospital visit were found across provincial hospitals, implementation of the new coding system (i.e. ICD-10) did not markedly influence the coding practices in the Canadian provincial hospitals. Bicycle injuries were coded in correctly in the ICD-9 and ICD-10 when examining coders’ validity and reliability in applying E-codes in ICD-9 and ICD-10. However, pedestrian injuries were occasionally miscoded as falls (Karkhaneh et al., 2012).
At an international level, when comparing the collection of information between four Asian countries, Nakahara et al. (Nakahara et al., 2008b) identified differences in both information classes and code choices when examining the data comparability between the countries. The authors have suggested standard guidelines and core datasets permitting comparison between countries. A significant proportion of injuries coded as undetermined intent was found to be a problem in a number of countries, especially concerning unintentional drowning cases in Australia, Denmark, England, France, Israel, the Netherlands, New Zealand, Sweden and the USA (Harrison & Langley, 1996).

3.14 Discussion

There is a need for deeper knowledge in understanding the principles of injury surveillance frameworks/guidelines and in recognizing major factors that impair the validity of injury surveillance. To meet these goals, a large proportion of the literature published on injury surveillance programs (since 1990) have been reviewed and reported in this work. The importance of the review is two-fold. Firstly, the report illustrates the basic principles of successful injury surveillance program that can become usable when a future surveillance program is planned. Secondly, the report identifies and reflects the key validity and related problems that injury surveillance programs often suffer at national and local levels and in different country settings. This report may serve as the basis for more in-depth analysis of injury surveillance programs and promote further discussions between various stakeholders involved.

A set of broad criteria have been proposed to promote successful accident and injury surveillance, including appropriate methodology addressing population-based surveillance; adequate resources; clear leadership and political will; and easy and timely access to surveillance data (Pressley & Mello, 2010). While the importance of data accessibility, data use and sustainability of injury surveillance is of great concern, the existing literature has overlooked to explain how these issues should be evaluated and considered. The WHO surveillance guidelines and CDC’s evaluation guidelines raise these issues, still leaving greater space to discuss the significance and interpretation of these aspects (Auer, Dobmeier, Haglund, & Tillgren, 2011).

A surveillance program is a dynamic process combining human resources, infrastructure and sets of scientific and working guidelines. It intends to provide injury estimates, detect clusters of injury occurrences, identify risk factors, and evaluate the effectiveness of prevention measures (Thacker, Parrish, & Trowbridge, 1988). However, the multi-phased structure of surveillance makes the process sensitive to a number of systematic errors. These include: unclear inclusion criteria, under-reporting, reporting delays, limited relevance of information, lack of resources, inconsistencies over time and long-term maintenance and sustainability.

Information on occupational injuries are in many countries collected from compensation claims related to social insurance policies provided by the public or labor market organizations. This means that injuries to individuals not covered by compensation schemes, as well as injuries not valid for compensation, are unlikely to be reported and thus remain unknown at national agencies on occupational health and safety. Underreporting may also occur as a result of weak incentives to report. The aggregate effect of these circumstances on the validity of official occupational injury statistics is often considered problematic.
Information on road traffic accidents and injuries are in many countries based on police records. However, the extent to which traffic accidents and related injuries are reported to, and thus known by, the police, vary between countries and between traffic occupant categories. Among researchers, police reports are generally considered a poor source of information due to extensive underreporting, especially among non-motorized road users. Police records usually focus on accident circumstances, while their content related to the resulting injuries and their severity is weaker.

Information on fires and fire-related deaths and injuries are often based on fire brigade turn-outs. This means that a fire, to become registered and appear in statistics, must be reported to the fire brigade and result in a turn-out. Many fires are in fact extinguished without the assistance of fire brigades, or cease by themselves, leaving considerable room for underreporting. Here is a potential for over-reporting as well, since many turn-outs are triggered by false alarms. In some countries, the fire brigades also collect data on fatalities and injuries from fires. These data, however, are usually limited to what was known at the time of the fire and are rarely updated with subsequent information from health providers or other potential sources of relevant information on injury consequences. Hence, fire brigades typically constitute an unreliable source of information on fires, as well as on fire-related deaths and injuries.

Besides these sector-wise examples, accident and injury surveillance initiatives are sparse. This is worrying since a majority of all injuries, both fatal and non-fatal, occur in other sectors. Falls, drowning, sport injuries, scalds, poisonings, home injuries, suffocation, etc., represent common types of injuries, occurring on an everyday basis and resulting in extensive societal costs and human suffering.

With regards to the limitations in existing sector-wise surveillance systems, the health sector has been put forward as an alternative and more general source of information on injuries of all types. Injuries, if not minor and trivial, are usually seen by doctors or nurses, at least in more well-developed countries. Amongst immediate fatalities, forensic pathologists or similar experts are usually involved in confirming causes of death. Fatal injuries depending upon country and level of severity, non-fatal injuries, are classified and recorded according to the ICD and published by the World Health Organization, allowing for comparisons between sectors and countries.

Single injury surveillance programs have a reduced capacity to capture a substantial proportion of non-fatal cases in any settings. Glazner et al. (1998) have discussed the differences in occupational injury reporting between a single workers’ compensation plan, an on-site medical clinic and Bureau of Labour statistics (BLS) among construction workers during the construction of an airport in Denver. Injuries determined by the workers’ compensation plan and the medical clinic were higher than those reported by the BLS for the same site. The authors have indicated a definition problem between the sources to explain these differences. Definitions of what constitute a ‘case’ may influence the data validity of a surveillance program. The concise and clear definition of case is also suggested for comparison and prevention purposes (Wharton, Chorba, Vogt, Morse, & Buehler, 1990). In criticisms of the Chinese injury surveillance program (Liu, Li, Cui, Liu, & Jackson, 2009c), Johnston (Johnston, 2009) has highlighted the issues of restricted concern to the purpose of a specific surveillance program (why a surveillance?), the end-users (Who are target users?), and the exact process of using information. Without having an understanding on this information it is diffi-
cult to distinguish how an ‘injury’ is defined and/or assess the adequacy of case definition? However, little attention has been given to standardization of data collection methodologies and definitions of different terms that are fundamental for comparison and interpretation purposes (Finch, 1997).

Since the injury pattern is largely dependent on the subset of injuries examined (Welch & Hunting, 2003), surveillance programs that have focused on a specific community or special target group becomes vital for preventative programs. An excess of injuries reported by the CHIRPP in the northern communities in Canada could be useful information for identifying strategies needed to reduce the problems (Do et al., 2013), or A&E based information on animal bites could be useful for public health veterinarians (Rhea et al., 2014). Other vulnerable groups such as migration workers are more likely to be excluded in the traditional worksite surveillance reports. Medical based surveillance systems with continuous focus on such groups can be valued to be effective and less costly to acquire information (Earle-Richardson et al., 2003).

The country that does have proper medically based surveillance system often depends on other kind of reporting systems. Mortuary data is considered to be an important source that provides additional information on fatal injury data, especially in low-income countries. However, the challenges still remain in the consultative process of developing standard guidelines for mortuary data surveillance. Consultation with different stakeholders has been found to be effective to establish such data collection process (Grills, Ozanne-Smith, & Bartolomeos, 2011).

One key aspect that the existing studies generally did not discuss is how to adapt or create a balance between local and national injury priorities when starting a program. Local injury surveillance is important in order to identify very specific problems in a defined population (Robertson, 1992). Locally collected data are of importance to characterize the priority problems, to identify control measures and to evaluate the control measures of injury. Even though locally collected data is seen as a motivator for local action, priorities and progress at national level given by the local programs are also needed (Langley & Simpson, 2009). If the locally oriented programs ignore the national priorities, which are the part of the national injury framework, this can weaken the national action against injury control and prevention.

International comparison of injury data faces substantial problems. Collaborations between countries are problematic since standard data collection methods for international comparison is lacking in terms of data recording, coding and reporting. Another problem in comparing international programs is a lack of nationally based surveillance system in low-income countries. The local oriented surveillance system that often systematically collect data in low-income settings also suffer from quality problems. For example, very few countries in Africa have nationally representative mortality data. Instead, data on the burden of injuries is mostly collected through household surveys or locally oriented data collection programs. To secure and maintain data quality, Lund et al (2004) have emphasized three aspects of the surveillance system: details of information, representativeness and sample size. To meet these principles of surveillance system, several propositions have been made. Adirim et al. (1999) have suggested a systematic approach to report injury information in medical records. Combining the physician’s report with the next day review of patient records was found to be a valid method to collect accurate and complete information of injury cases (Adirim et al., 1999). Morrison and Stone (Morrison & Stone, 1998) have recommended a systematic sampling strategy that can produce as valid data on the pattern of injuries pre-
senting to accident and emergency departments as total population surveillance. Analyzing the CHIRPP data retrospectively the CHIRPP group has proposed a sampling strategy that can generate as valid data as the total population and is found to be economically suitable (Morrison & Stone, 1998). Furthermore, it appears that economic and logistic supports have a role to play in a successful surveillance program. The success of the Oslo Injury register within the medical care system was dependent on the provision of resources for continuous quality control and feedback to personnel involved in the registration of data (Lund, Bjerkedal, Magne Gravseth, Vilimas, & Wergeland, 2004).

### 3.15 Conclusions

The past few decades have resulted in considerable progress in setting up new injury surveillance programs globally. These programs have been a basis for initiated injury prevention programs, injury control and policy development as well as scientific research. However, most of the injury surveillance programs suffer from a number of limitations that should be known and considered when prevention programs are organized. To allow for international comparisons of injury data, standard methods including definition, recording, coding and reporting should be adapted in planning future new injury surveillance programs.


Action 4
4. Action 4

Presentation of available data sources covering escalating accidents.

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The study was presented and discussed with all project partners at the 2nd Steering Group Meeting 17 June 2014 in Copenhagen. It has been submitted as a manuscript to a scientific journal and is summarily depicted in this report.

4.1 Introduction

Efforts to systematically collect and comprise data from incidents and accidents need to be reasonable in some practical sense. Basic injury data from daily accidents are often collected within most sectors in society, but limited to answer statistical questions like how often and how many. In the view of preventive safety work, the basic statistics rapidly pose more in-depth questions about impacts and causes, which require specific data with higher resolution. In a perfect system all variables are collected and analyzed for all types of accidents in society, but the task to do so is very resource demanding and practically unfeasible. Instead enhanced data are normally only collected to complement our knowledge for accidents that are unusual in some way, severe or widespread. This can be done systematically with a possible statistical scale up of results, e.g. as the case with the European Injury Database (EuroSafe, 2013), but is generally hard to achieve when historical data are to be comprised from sources not originally designed for this purpose (Dilley et al, 2005; Gall et al, 2009; Wirtz et al, 2014). The connection between basic data and enhanced data may thus often be more indicative and qualitative, but certainly not without relevance for learning and prevention.

For small size disasters, associated with natural hazards like extreme precipitation or storms, data of losses and relief are normally incomplete and infrequently registered, or not at all, by official emergency management agencies or sectorial institutions (Lavell, 2002; Marulanda et al, 2010; De Groeve et al., 2013; Wirtz et al, 2014). Nevertheless, the accumulated economic, social and human impacts contribution to the yearly sum may be substantial, as shown in the Global Assessment Report (GAR) 2013 (UNISDR, 2013). Often, written media releases may be the most comprehensive, and only, source of information (DesInventar, 2014). Media archives contain articles and information many years backwards and are often readily accessible, but the data are many times estimations on-the-spot account and in need of some type of validation. Databases with focus on major disasters, like the Emergency Events Database (EM-DAT) (www.emdat.be) or databases held by international reinsurance companies like NatCatSERVICE (www.munichre.com) and Sigma (www.swissre.com), normally treat media content with very low priority and focus on official reports solely (De Groeve, 2013).
In this study, relevant publicly accessible data sources have been identified and data on consequences and responses compiled for the most extreme rainfalls, with subsequent pluvial flooding, in Sweden during the years 2000-2012 (n=14 for >90 mm/day over at least 1000 km²), as a pilot case study.

4.2 Case study context

Historically, extreme rainfalls have caused severe problems in many European countries (EEA, 2010). According to EM-DAT (2010), floods in Europe caused 1100 deaths and affected more than 3 million people during 1998-2009 (EEA, 2010). The great flood 2002 in the Elbe Basin caused alone economic losses exceeding EUR 20 billion (EEA, 2010). The root causes for floods to occur varies and are often the result of complex interactions between natural phenomenon and human activities. Intense or extreme rainfall does not automatically imply severe impacts to society, rather it’s the combined result from conditions of vulnerability and exposure to present rainfall that will determine output of an event (UNISDR, 2009).

In a Swedish context, 90 mm/24 hours is regarded as extreme rainfall from a meteorological point of view (SMHI, 2014). The Swedish Meteorological and Hydrological Institute (SMHI) has registered 140 such rainfalls in Sweden during 1961-2011 (SMHI, 2014). If such rainfall take place over urban areas, small-scale disasters from direct effects and subsequent pluvial flooding’s are very likely to occur. Intense rainfall during a short period may result in flooding of streams, landslides, undermined and eroded road- and railways, filling of urban storm water system and other impacts with negative effect on societal functions and human health. In connection with passages of intensive weather systems, SMHI (2014) also reports 61 events since 1930 with more than 90 mm/24 hours over an area of 1000 km² (figure 1). Normally, a decade brings around 6-8 such rainfalls, but there is a noticeable increase since year 2000 in their frequency. Seasonal (summer) precipitation extremes over Northern and Central Europe are also expected to rise in frequency, as shown in climate models (Nikulin et al, 2011), indicating emerging numbers of such damaging events.

![Figure 1. Extreme rainfalls in Sweden 1930-2012, with at least 90 mm rain/24 hour over 1000 km². Data from Swedish Meteorological and Hydrological Institute (SMHI).](image-url)
The 14 events during 2000-2012, with at least 90 mm rain/24 hour and 1000 km², are used as case studies in this report. Historically in Sweden, the efforts in meteorological data storage and statistical processing from extreme rainfalls are not met with corresponding data coverage about societal impacts. Intense rainfall, 40-50 events/year, with consequences that are negative and grave in some respect, have been described from newspapers for the years 2009-2013 (Nilsson, 2012; Bergelin & Knutsson, 2013; Hakkarainen, 2013). A similar approach has been done by Alexandersson (2005) for 1996-2005, but very briefly.

4.3 Data sources
In the GAR 2013, national disaster loss data have been compiled from many countries following an initiative and UN support (UNDP and UNISDR) to build national databases, by implementing the methodology once developed in Latin American countries – the DesInventar method (DesInventar, 2014). Common sources of information for disaster data, including small-scale disasters, that should be included in a national inventory have been ordered due to quality and verification considerations as follows:
1. Official emergency management agencies
2. Official sectorial institutions
3. Relief or aid organizations
4. Academic and scientific institutes
5. Media

Since media may be the only data source for small disasters, the team behind the development of DesInventar holds this source high, although with the notion that a database never will be more accurate than its sources (DesInventar, 2014). Only a few other tools within risk management emphasize the use of media content as a way to compile data for an overall picture, e.g. the Local Climate Impacts Profile framework (UKCIP, 2009). This study uses the above prioritized list of sources adopted from the DesInventar methodology.

4.4 Results
In principle, two different sources provide applicable data in our study; the national media archive (Swedish: mediarkivet/retriever) and the national incident report database (Swedish: insatsdatabasen). This means that the extreme rainfalls in some sense were invisible at the national level. No reports could be found at official emergency management agencies, official sectorial institutions, relief or aid organizations or academic institutes.

Municipalities in Sweden are required by law to document incidents that cause rescue operations (Law 2003:778). This is normally fulfilled in a report, or questionnaires, focusing on basic data covering accident cause (tentatively), direct and indirect consequences, and response actions (MSB, 2014). MSB collects incident reports from local rescue services, around 115 000 reports/year. The reports are maintained in a database, analyzed and communicated as statistical trends to support preventive measures. In total, 487 different incident reports were found for the 14 extreme rainfalls in 2000-2012, for a period of 48 hours after each event. The questionnaires design of the template in the incident report implies categorization of data to a large extent, but the pre-defined choices are
sometimes accompanied with free text boxes. The free text fields are voluntary to use, of very diverse substance and detail, but open an opportunity to capture also enhanced data on occasions. Such information are concisely compiled for the 6 of the 14 events in table 1. In general, the rescue services report several simultaneous flooding in basements of private houses, water treatment plants and industry, which strained or exceeded their resources for a certain time, normally counted in hours. Stop in urban storm water system, flooded and undermined roads and railway embankments are other frequent consequences from the pluvial flooding that require their acute response. Most acute and severe were probably the quickly raised alert levels from overflown dams of different sizes that occurred at 5 occasions, forcing the rescue service to prioritize their resources to prevent dam failures. Cancelled train departures and redirected road traffic are impacts experienced by the great majority of the affected public.

<table>
<thead>
<tr>
<th>AREA (COUNTY)</th>
<th>DATE</th>
<th>INCIDENT REPORTS (NR)</th>
<th>ARTICLES IN NEWSPAPERS (NR)</th>
<th>IMPACTS AND RESPONSE CONCISELY DESCRIBED FROM INCIDENT REPORTS</th>
<th>IMPACTS AND RESPONSE CONCISELY DESCRIBED FROM NEWSPAPERS (VERIFIED INFORMATION IN BOLD FONT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smålend coast 02-07-2003</td>
<td>28</td>
<td>12</td>
<td>Pumping industrial, residential, hotel and museum. Flooded parking, bike lanes, streets. Stop in urban storm water system caused flooding. The waters caused damage to the roadway, and switchboards for railway crossing.</td>
<td>Some 50 alarms for two days, Flooded basements in retirement homes, villas and apartment buildings, two cottages were moved by flood waters, flooded farmlands, playgrounds, parks and soccer fields, protective sand dikes were built, train cancellations, 1,000 telephone subscribers off.</td>
<td></td>
</tr>
<tr>
<td>Region</td>
<td>Date</td>
<td>Code</td>
<td>Action</td>
<td>Description</td>
<td>Result</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------</td>
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<td>--------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Värmland</td>
<td>04-08-2004</td>
<td>33</td>
<td>13</td>
<td>Pumping basement of private houses, apartment buildings, industrial and hotels. Road closure isolated 1,600 people. Traffic control and roadblocks. Flooded road work (excavation).</td>
<td>Turned off County Road 240, 924, 921, 824, 817, and Highway 62 and partly 63. 100 residents isolated, redirection of traffic on forest roads. Two people injured in traffic accident. 6000 telephone subscribers off.</td>
</tr>
</tbody>
</table>

Table 1. Six of the 14 inventoried events, shown as example on type of data and possible validation of media content using information in incident reports from local rescue services. (bold text)

In all 14 cases, media (written newspapers selected only) report about damages and response the very same day as the rainfalls occur. Articles were searched for a period of 14 days after each event, and in total 127 articles were found. Eyewitness accounts of damages alternate with statements from interviewed rescue staff or other officials. Local newspapers clearly contain more detailed information than national dailies, who mostly repeat information originally found in local papers and in addition only depict the data concisely. National dailies also tend to spin information towards sensationalism and headline-grabbing, while local dailies often try to favor a more simple coherent approach of reporting. Presence of several articles in different newspapers for the same event permit a comparison of multiple editions of information, but most useful for verifica-
tion purposes are recurrent articles in the same local newspaper. Additional in the present case-studies, the enhanced data compiled from the voluntary free text fields in the incident reports, could be used to verify some information mentioned in newspapers (table 1). Of the two data sources, media information provided the most comprehensive descriptions for all 14 events, although not all data could be verified against official data or other media editions.

4.5 Discussion and conclusions

The importance of free text fields in templates for reporting of incidents is highlighted in this study as a way to acquire enhanced, more detailed data. It also opens a possibility to verify media information in some respect when no other official data sources are available, which most often is the case for smaller disasters. However, a study of European fire statistics (Hocken, 2012) shows that only 3 out of 24 EU member states use free text fields in their incident reports as a complement to pre-defined standard choices to describe the cause of fire, indicating that this possibility in general might be absent. Free-text fields as such are advisable to include in questionnaires as an opportunity for data providers to report unforeseen accident related facts, but are often seen as complicated to use in statistical analyses and hence opted out.

We emphasize that successful, but restricted, validation could be used as an indicator on certain newspapers credibility. High credibility and “good reputation” of a newspaper can rise the reliability of their data, collected and compiled for learning and preventive purposes.

The results from our study even promotes inventories where non-validated media information, from sources with good reputation, are used in absence of any other official data.
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