

Summary:

Traffic accidents triggered by drivers at work - a survey and analysis of contributing factors

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This report outlines the results of a study of severe road traffic accidents in Norway, triggered by drivers at work. The goal has been to examine whether and to what extent risk factors of these triggering drivers and their vehicles can be traced back to work related factors. The study is based on data from the Accident Analysis Groups (AAG) of the Norwegian Public Roads Administration (NPRÅ), reports from The Accident Investigation Board Norway (AIBN) and interviews with nine experts. The analysis of AAG data shows that speed too high for the circumstances, failure to use seat belt and insufficient information gathering were the most important risk factors in fatal accidents triggered by drivers at work. Analysis of reports from AIBN and expert interviews brought forth the following work related factors considered central for traffic safety: follow up of drivers' speed, driving style and use of seat belt, pay systems, safety culture, risk assessments, procedures/work descriptions and training. The AIBN refers to the latter as a safety management system. The AIBN reports and the interviews indicate that the following framework conditions influence traffic safety: time pressure, competition, type of transport, accident investigations/inspections. The majority of the interviewees held that work related factors with potential implications for traffic safety are insufficiently monitored in controls and inspections.

Background and aims

Road transport often represents the greatest risk that we are exposed to during a regular work day. This is especially true for professional drivers and other employees driving during their work day. In these cases, employers have a legal responsibility to ensure that employees' traffic safety is optimal.

As 36 percent of fatal accidents in Norway involve employees driving at work (Phillips & Meyer 2012), a better focus on work related factors in organizations with employees driving at work may improve traffic safety. Knowledge is, however, lacking on the relationship between traffic accidents and work related factors in organizations with employees driving at work.

This report outlines the results of a study of severe road traffic accidents in Norway, triggered by drivers at work. The goal has been to examine whether and to what extent risk factors of these triggering drivers and their vehicles can be traced back to work related factors. The study shall serve as the basis of identifying and developing measures to reduce the number and/or severity of work related traffic accidents.

Data sources and methods

This project is based on information available in the Norwegian Public Roads Administration's (NPRA) Accident Analysis Groups (AAG) database on fatal accidents triggered by drivers at work in the period 2005-2011, 10 reports from the Accident Investigation Board Norway (AIBN) and information from nine research interviews conducted with experts from government bodies engaged in accident investigations, work site inspections and road side controls.

All fatal road accidents are investigated by the NPRA in the form of regional Accident Analysis Groups (AAG). Since 2005 every fatal accident has been documented by means of in-depth reports describing the course of the accident, road and weather conditions and relevant aspects of involved road users and vehicles. Some of the variables from the in-depth reports are transferred to an AAG database.

The AAG database provides good information on the number of accidents triggered by working drivers, and the most important risk factors related to the drivers and vehicles involved in these accidents.

The AIBN has since September 2005 investigated road traffic accidents. AIBN conducts independent investigations clarifying the causes and course of traffic accidents in order to issue safety recommendations that may improve traffic safety. We focus on the 10 (of a total of 27) AIBN reports with safety recommendations on work related factors.

The analyses of the AIBN reports provide us with rich information on the importance of work related factors as a risk factor in accidents triggered by drivers at work. They also offer good illustrations on possible links between work related factors and risk factors related to drivers and vehicles in transport companies. However, as these data are based on 10 reports, we cannot use them to draw general conclusions on the state of the Norwegian road transport industry.

We chose to interview nine experts from different organizations involved in either inspections, controls or investigations of professional drivers and other employees who drive at work. We conducted these interviews to benefit from the experience of these experts on the importance of work related factors for traffic safety. We also wanted to get their views on challenges related to controls and inspections and their suggestions on potential measures addressing work related traffic safety.

The interviewees were encouraged to present their impressions of and views on different topics. We may not use the interview data to draw general conclusions on the state of the Norwegian transport industry. The interviews are, however, fruitful as they are based on the interviewees' comprehensive experience and as they indicate topics requiring further research.

Severe road traffic accidents triggered by a driver at work

501 of the 1646 involved vehicles that we have sufficient information on were driven by a person at work. 191 of the 501 involved vehicles that were used by drivers at work were classified as the triggering part of the accidents by the AAG. 151 of the 191 vehicles were driven by professional drivers, and the remaining 40 were driven by other drivers at work

Figure S1 shows shares of triggering drivers in the different groups of drivers.

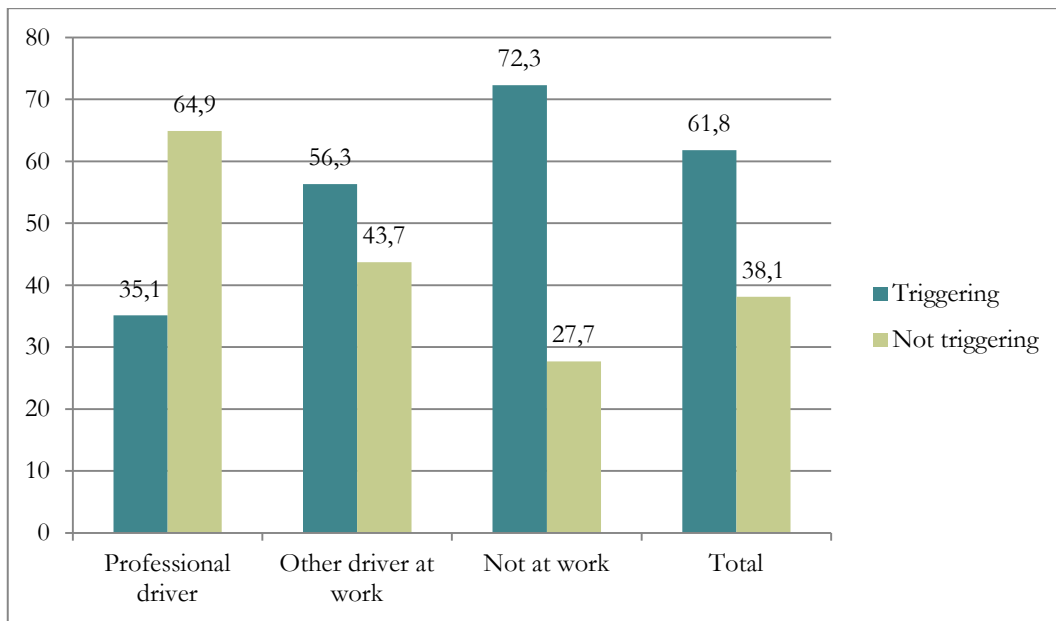


Figure S1: Vehicles involved in fatal accidents 2005-2011, based on type of driver and whether the vehicle was defined as the triggering part by the AAG. Percentages.

Figure S1 shows that the share of drivers defined as the triggering part were lowest among professional drivers, somewhat higher among other drivers at work and highest among the drivers whose driving were not work-related.

Risk factors related to drivers and vehicles

The analysis of AAG data shows that speed too high for the circumstances, failure to use seat belt and insufficient information gathering were the most important risk factors in fatal accidents triggered by working drivers on Norwegian roads 2005-2011. This conclusion was supported by the analyses of the AIBN reports.

The interviews indicate that risk factors related to vehicles are less important than risk factors related to drivers. This is supported by the fact that the AAG database identifies 315 accident factors related to drivers and 50 related to vehicles, in the accidents triggered by drivers at work.

The analyses of the AAG data shows that the two most important risk factors related to vehicles in the accidents triggered by drivers at work were obstacles to vision in or on vehicles and wheels/tyres.

Work related factors influencing traffic safety

In the following, we present the work related factors that are attributed great importance in the AIBN reports and the interviews.

Speed and seat belt as an organizational concern

Speed too high for the circumstances and failure to use seat belts are risk factors that employers may prevent by means of, e.g. organizational speed policy, organizational seat belt policy, monitoring the speed and driving style of each driver, installing maximum speed limiter and seat belt warning. This is also suggested in the AIBN reports.

The interviewees did however, say that their experience indicate that transport companies largely treat the seat belt use of their drivers as drivers' individual concern and not as the concern of the organization. The situation is somewhat different when it comes to drivers' speed and driving style, primarily as this has economical implications for the companies. We suggest that future research should examine drivers speeding and seat belt use, and identify measures that could increase seat belt use and reduce speeding among people driving at work.

Pay systems

When asked whether they had the impression that pay systems influence traffic safety in the transport industry, the majority of the interviewees said yes. They stated that most drivers have fixed salaries, salaries based on assignments, and that some element of piecework often is involved. This may motivate drivers to focus on keeping a high speed, finish assignments as early as possible, to be able to take extra trips to increase the salary, violate provisions on driving time and rest periods, and so forth.

Several interviewees indicated that recording working hours and receiving pay based on hours of work to a little extent occur among goods transport drivers. We lack information on the prevalence of different pay systems in the AAG and AIBN data, and suggest that more research should be devoted to this issue.

Safety management system

The 10 AIBN reports that we have studied often conclude that the companies employing the triggering drivers have failed to:

- 1) Conduct (and document) risk assessment of especially critical operations,
- 2) Use these risk assessments as a basis for work descriptions/procedures that the drivers could have consulted prior to work operations, or
- 3) Use these risk assessments and work descriptions/procedures as a basis for a training program for drivers to make them prepared for the risks of their work operations.

In the accidents described in the AIBN reports, the companies in question have failed in either one of these processes, or all of them. The three processes describe an ideal for how transport companies should relate to risk; how they should approach safety management.

The interviewees did not believe that most transport companies on a regular basis undertake risk analyses of especially critical operations, that they have a strong focus on work descriptions/procedures, or that they in general give drivers sufficient training. These are topics requiring more research, both to survey the occurrence of safety management systems and measures that may alleviate their implementation.

Safety culture

When asked about the most important measures that transport companies may take to prevent accidents, several interviewees stated that feelings of responsibility and attitudes among employers is a central challenge. This especially applies to goods transport. Several interviewees underlined that goods transport companies to a greater extent must recognize that they set the premises for the safety of their drivers' work.

Some interviewees suggested that there is a cultural challenge in transport of goods, as companies in practice put a lot of responsibility for traffic safety on the driver. This is done in spite of the fact that the employer has a legal responsibility to ensure that the traffic safety of employees is optimal. Some explanations were suggested by the interviewees describing this cultural challenge: 1) The Road traffic act establishes that the driver has the main responsibility for traffic safety, regardless of whether he or she is employed, 2) There is a tendency among employers to believe that professional drivers do not need training as they have a drivers license, and 3) There is a tendency among employers to treat employed drivers as self-employed drivers. We do not know the prevalence of these attitudes, but they nevertheless point to questions that could be examined in future research.

Framework conditions influencing traffic safety

The AIBN reports and the interviews indicate that work related factors in transport companies are influenced by what we may refer to as framework conditions.

Time pressure and stress from transport buyers/forwarding agents

The majority of the interviewees believed that transport buyers and forwarding agents were pressing/stressing drivers. They had, however, no clear conceptions of the scope of such pressure. This is an issue requiring more research.

Forwarding agents and transport buyers set the premises for drivers' speed and driving style as they decide when goods is bound to arrive and when drivers can start their trips. Route planning is often based on minimum time, and factors that may cause delays are not necessarily taken into consideration. Several interviewees suggested that measures adding responsibility to transport buyers and forwarding agents should be introduced.

We examined whether the professional drivers triggering fatal accidents (151) differed from the professional drivers that were not defined as the triggering part by the AAG (279). Figure S2 shows the states of triggering and not triggering professional drivers, as they are reported by the AAG.

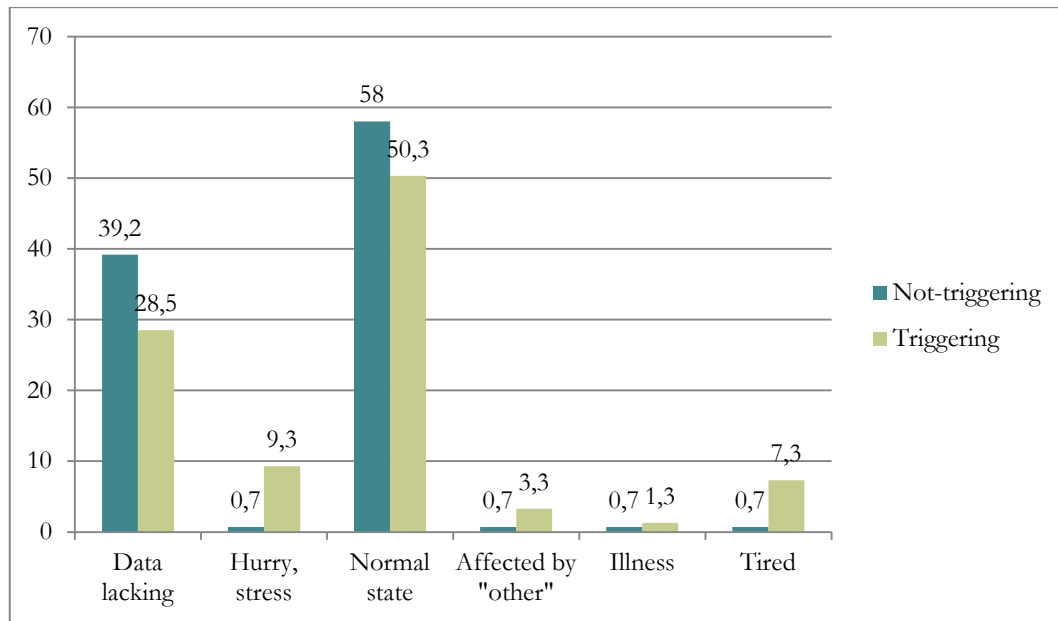


Figure S2: Shares in different states for triggering (N=151) and not-triggering professional drivers (N=279).

Comparing triggering and not-triggering professional drivers, it is evident that the triggering drivers to a greater extent were in a state of hurry/stress, tired and affected by other things. The share of professional drivers in normal state was somewhat lower among the triggering drivers than it was among the not-triggering.

The majority of interviewees underlined that time pressure is a crucial problem in the transport industry, but that transport companies not necessarily focus on stress and hurry as a possible cause of accidents. Interviewees argued that time pressure is especially prevalent in companies working under less predictable conditions, for instance: short time assignments with low predictability, little long term planning and short client relationships (e.g. 2-3 weeks). Future research should examine the prevalence of and the degree of time pressure in transport companies working with different types of transport and examine how drivers handle such pressures.

The majority of interviewees did not believe that severe violations to the driving and resting time provision are prevalent in Norwegian transport companies. This was explained by the NPRAs good control routines of driving and resting time. It was mentioned, however, that controls have indicated some quite severe violations of work time rules, as many employees work several hours loading and unloading their cars without recording this kind of work.

Competition

Interviewees stated that time pressure is especially prevalent in the segments of the goods transport market that are characterized by the hardest competition. One interviewee mentioned that transport buyers always say that they "know someone who is willing to do the job for a lower price". This may lead to drivers taking assignments with tight time margins, and make it difficult for companies and drivers focusing on delivering goods on time. Time pressures may cause high speed, and we have seen that too high speed is a very central risk factor.

Type of transport

Most interviewees held that traffic safety is better in public transportation than it is in goods transport. They explained this by stating that people is more "valuable" than goods, and that the requirements for public transport therefore are stricter. These requirements apply to both drivers and equipment, making the standards of drivers and vehicles in public transportation better than those of goods transport. Interviewees suggested that public transport generally have a better safety culture and a higher prioritization of safety.

Accordingly, interviewees stressed that transport of dangerous goods is characterized by high standards relating to drivers and vehicles, as the consequences of accidents are severe in this line of transport. Thus, this line of transport has special provisions with requirements regarding driver training, vehicles and so forth.

This illustrates how type of transport has consequences for governmental requirements, transport companies' prioritization of safety and safety level. Measures directed at improving traffic safety in goods transport may probably use transport of dangerous goods as a source of inspiration, both with regard to requirements from transport buyers, rules, and transport companies' formal safety systems and safety cultures.

Investigations and inspections

We suggest that the AAG database should include variables on work related factors and that the AIBN's understanding of the link between work related factors and risk factors related to drivers and vehicles could serve as an inspiring example.

The majority of the interviewees held that work related factors with potential implications for traffic safety are insufficiently monitored in controls and inspections. Several interviewees contended that the control of driving and resting periods are functioning well, and that the electronic database of the NPRA over control results from drivers and companies is a useful tool.

Interviewees also mentioned that the government is facing a great challenge when it comes to following up controls of foreign transport companies. It may be difficult to know how to issue obligations to these companies, and not the least ensure that they pay possible fines.

Are the tools of the government good enough?

When asked whether the government has sufficient tools versus companies at risk of experiencing traffic accidents, about half of the interviewees answered yes, while the other half said no. Interviewees answering yes largely said that the government has good enough tools at their disposal, but that they must use them more actively. Some interviewees answering no stated that the government should focus more on heavy vehicles and latent, deeper causes.

The majority agreed that the AIBN's suggestion to make it mandatory for transport companies to have a system of safety management to get transport permits could be a good way of filtering dubious companies out of the industry.

When asked how to detect transport companies at risk, before they have been involved in fatal accidents, interviewees suggested that one should focus on the

following indicators: assignment structure (regular long term contracts or casual short term jobs?), degree of unionization and tariff agreements, pay systems (hour wage or piece work), safety culture and other organizational indicators, increased control of driving and rest time and increased focus on the parties buying transport.

Suggestions for further research and possible measures

In the following, we sum up themes that require more research:

1. Speeding
2. Seat belt use
3. Time pressure and stress from transport buyers/forwarding agents
4. Pay systems in the road transport sector
5. Systems for safety management in the road transport sector
6. Drivers' vs. organizations' responsibility for traffic safety
7. Safety culture.

In the following, we sum up different measures that may strengthen the efforts directed at surveying and improving work related factors with implications for traffic safety:

1. measures directed at speed to high for circumstances and seat belt use
2. System for safety management as a requirement for transport permits
3. Increasing the responsibility of transport buyers/forwarding agents
4. Variables for work related factors in the AAG database
5. Control of and sanctions directed at foreign goods transporters
6. Focus on transport companies at risk

The road sector may learn from other sectors

Bjørnskau and Longva (2009) have developed and tested a model which explains the safety culture and safety levels in different transport sectors by referring to framework conditions as: competition, legislation, type of transport and cost of accidents. They found considerable differences in the safety culture levels of different transport sectors. The aviation industry had the highest safety culture level, followed by railway and finally bus transport. These differences were in accordance with the safety level within each industry.

We draw the following conclusions from the model:

- 1) The road sector got the lowest score of the studied sectors.
- 2) Given the higher scores of the other sectors (aviation and railways), the road sector may learn from these sectors.

- 3) The model shows that framework conditions and work related factors are of crucial importance to the safety level of each sector. This indicates that measures aiming at improving the traffic safety of drivers at work should be directed at framework conditions and work related factors.