



Statens vegvesen

Norwegian Public Roads
Administration

Special Analysis

Fatal Motorcycle Accidents 2005-2009

REPORT

Nr. 45



Photo: Knut Opeide, Norwegian Public Roads Administration

Directorate of Public Roads
Road users and Vehicles Department
Driver Training
11-2011

1. Background

The Norwegian Public Roads Administration is responsible for measures contributing to the Vision Zero goal of no accidents in the transport sector resulting in fatalities or serious injuries.

In order to find precise measures that work, the Public Roads Administration is dependent on knowing as much as possible about what causes road accidents. In order to obtain such knowledge, the Norwegian Public Roads Administration, in cooperation with the Norwegian Motorcycle Union and subsequently the National Mobile Police Service, has analysed all the fatal accidents involving motorcycles from 2005 to 2009, inclusive.

For all road accidents resulting in the loss of life, the Norwegian Public Roads Administration's accident

response groups are deployed and secure data at the accident site in cooperation with the police. The data from the accident response groups is analysed by a broad-based group, which prepares reports for all fatal road accidents. Accident reports on 153 motorcycle accidents and 157 fatalities form the basis for this special analysis.

In order to avoid searching pointlessly in reports and registers, some of the questions we wanted answered were formulated in advance. We did this in order to clarify the myths surrounding motorcycle accidents and to get answers that can contribute to the development of good traffic safety measures aimed at motorcyclists.

Examples of some of our questions:

- To what extent is the motorcyclist a victim of his/her own faulty actions or judgements?
- To what extent is the motorcyclist a victim of the faulty actions or judgements of other road users?
- How many accidents are due to extreme behaviour?
- What is the correlation between the number of accidents and type of motorcycle?
- In how many accidents is the rider under the influence of drugs or alcohol?
- In how many accidents is the accident due to illnesses or death before the accident occurred?
- In how many accidents were the fatalities of foreign descent?
- To what extent was the physical environment a cause or contributing factor to the accident?
- To what extent was a technical fault the cause or a contributing factor to the accident?

Most of these questions were answered through a review of the Norwegian Public Roads Administration's 153 accident reports.

It became clear that riders with extreme behaviour represented a significant portion of the fatal accidents.

In order to find out more about these riders, the National Mobile Police Service was contacted to study the information they have that could shed some light on the correlation between the cause of the accident and the rider's risky behaviour in other respects.

Working group

Employees from the Norwegian Public Roads Administration and Norwegian Motorcycle Union were appointed to form the working group that has conducted this analysis. Emphasis was placed on a technical motorcycle background in order to ensure that the data was assessed correctly with regard to

the special circumstances related to motorcycling. The members of the working group have altogether many years of experience as motorcyclists and have contributed to the development of rider training and voluntary further education.

Members of the working group:

Gunnar Rydland and Lars-Inge Haslie:
Norwegian Public Roads Administration
Morten Hansen: Norwegian Motorcycle Union

Torbjørn Tronsmoen and Hans Petter Hoseth from the Norwegian Public Roads Administration have made a contribution by preparing the statistical data.

The National Mobile Police Service, represented by Live Tanum Pasnin and Tore Johnsen, contributed knowledge and statistics related to riders with extreme behaviour and have been of great importance to the results of our analysis.



Definitions

The working group's definition of some of the terms that have been used in this analysis and report is given below.

Extreme behaviour

The working group has defined extreme behaviour as:

- Driving without a licence: The rider does not have the required training and thus lacks the necessary skills to drive a motorcycle
- Driving under the influence: Alcohol, narcotics and/or legal medications that have a negative impact on the rider
- Irresponsible and excessive speed: Beyond the limit for revoking a person's driving licence
- Aggressive behaviour: Aggressive driving in relation to other road users

"Responsible" for the accident

In answering the question of whether the motorcyclist was a victim of his/her own or another motorist's faulty action, the "responsibility" for the accident was assigned. The legal liability was not evaluated, but whether the rider could be blamed for the accident through his/her own behaviour.

One example is when the driver of a car has violated the duty to give way, but he/she must have had the

opportunity to observe and assess the motorcyclist. There are other accidents where the motorcyclist has held excessive speeds and driven under the influence of drugs or alcohol, where the driver of the car did not have any opportunity to make a normal assessment of the duty to give way. There are also accidents where the inattentive behaviour of the motorist has been such that the motorcyclist could not have considered it as likely.

Experience

In order to evaluate the riders' level of experience and find answers to whether it is likely that experience results in a lower risk of ending up in a fatal accident, the data on when the rider obtained a licence and how long the rider has been registered as the owner of a motorcycle is important. It is assumed then that most people who own a motorcycle use it, and that there are few people who gain experience by borrowing or renting motorcycles.

Motorcycles are different from cars in this connection, since some people obtain a motorcycle licence, but do not ride it very often. Satisfactory skills for driving a vehicle are dependent on a certain degree of continuity, and this applies to motorcycles as well.



Photo: Knut Opeide, Norwegian Public Roads Administration



2. Vehicle

2.1 Did the motorcycle have any technical faults that caused the accident?

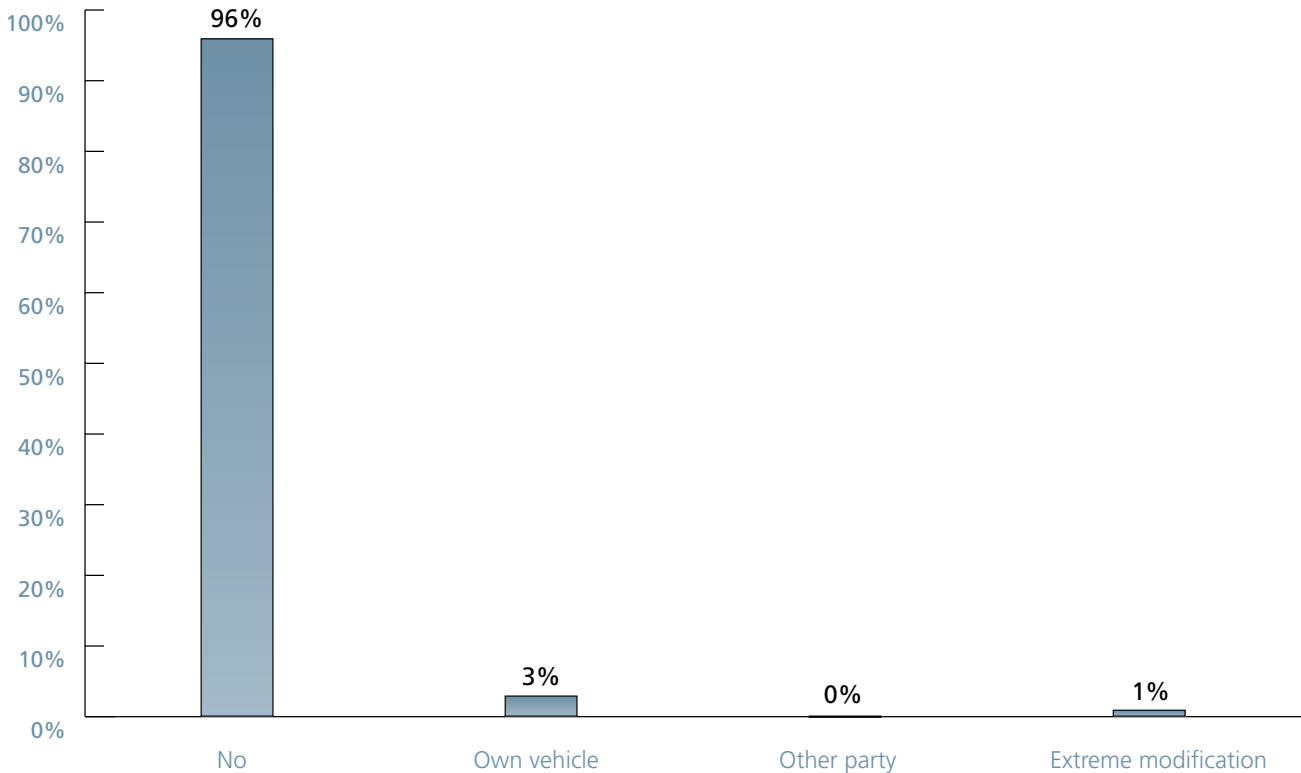


Figure 1 Motorcycles with technical faults

Motorcycles with technical faults were rarely the cause of a fatal motorcycle accident

The technical condition of the motorcycles has been part of the debate surrounding the safety of motorcycles. In our analysis technical faults have been registered as a cause or contributing factor in only 3% of the accidents. The technical faults have been associated with worn tires and incorrect air pressure. In one instance there was an engine breakdown. Two motorcycles had been modified extensively, and this may have been of significance to the accident.

Our analysis gives reason to believe that measures aimed at the technical condition of the vehicle will have a limited effect with regard to fatal accidents.



2.2 Were super sport bikes overrepresented in the fatal accidents?

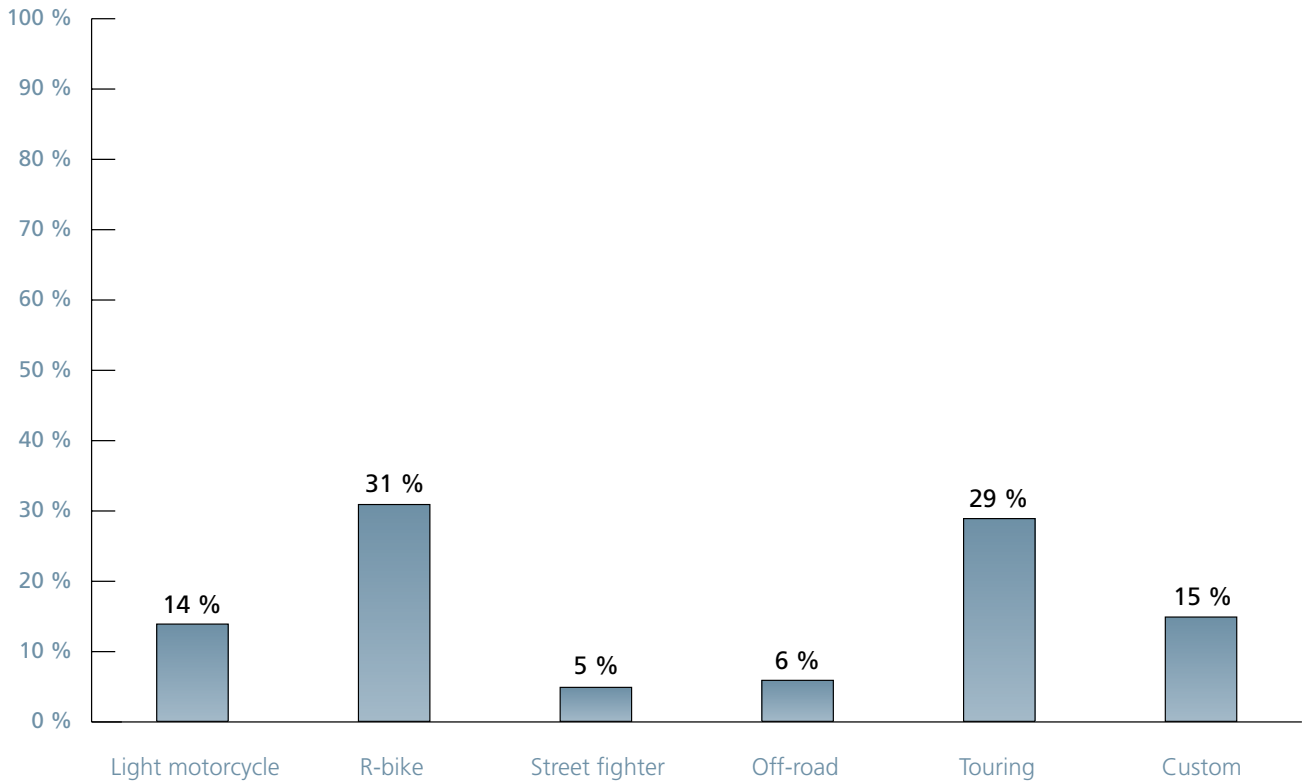


Figure 2 Type of motorcycle

Super sport bikes were overrepresented in fatal accidents

So-called super sport bikes are often characterised by high-power engines and a forward-leaning riding position. Previous surveys have shown that these types of motorcycles are overrepresented in accidents. The motorcycle models that the working group has included in the category super sport are in accordance with what the industry, insurance companies and users define as super sport bikes. This means that when a super sport bike is old enough it becomes a classic motorcycle, which is bought and used by a group less willing to take risks.

In this survey our analysis also showed that there were a higher number of motorcycles that could be categorised as super sport bikes that were involved in accidents than motorcycles in the other categories. In half of the 48 accidents in which super sport bikes were involved, the accident involved extreme behaviour.



2.3 Is the behaviour reflected in the type of motorcycle?

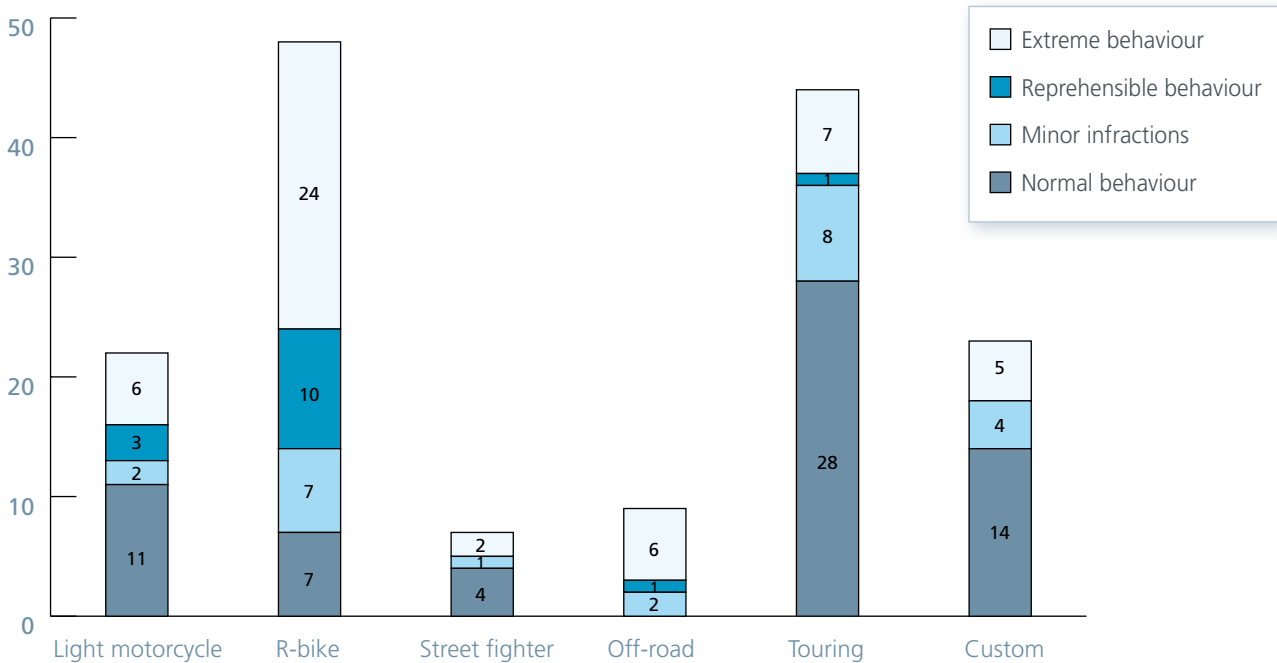


Figure 3 Type of motorcycle – behaviour

Behaviour by type of motorcycle

The figure shows that supersport and off-road motorcycles are the two types where extreme behaviour constitute a majority of the fatal accidents category. Those who have been involved in accidents with off-road motorcycles have chiefly exhibited extreme behaviour (6 out of 9). This concerns primarily the illegal riding of unregistered off-road motorcycles without a licence.

Whenever possible to define the usergroup of a particular type of motorcycle, knowledge of behaviour by type of motorcycle can be used to develop special measures and messages. For example, there are some defined super sport bike groups, and light motorcycles are mostly used by the age group from 16 to 18 years.



3. Road environment

3.1 Was the road and road environment a cause or contributing factor to the accident?

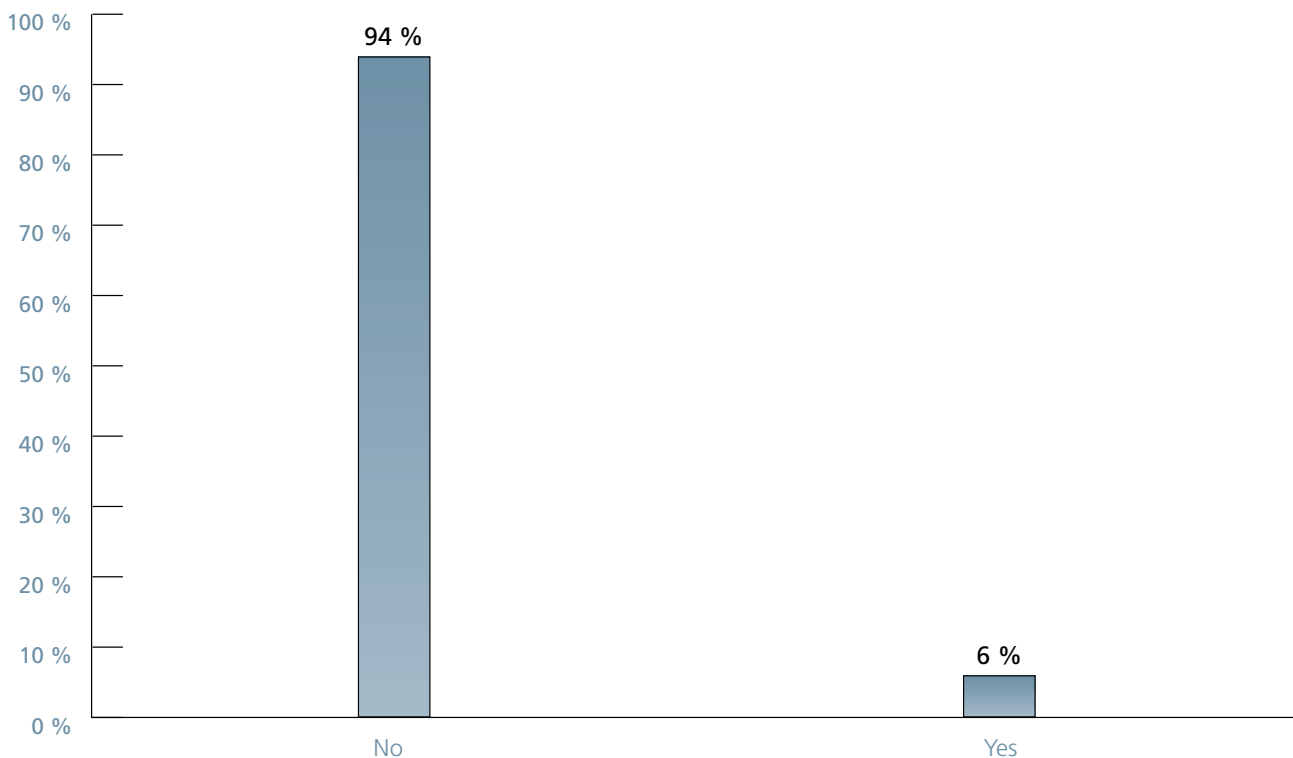


Figure 4 Road and road environment

The road and road environment were a direct cause of fatal motorcycle accidents only to a limited extent, but they were a contributing factor to some extent.

Poor roads are often described as a significant risk to motorcyclists. However, our analysis shows that roads and the road environment were the cause or a contributing factor in only 6% of the fatal accidents. Gravel or diesel spills on the road are often the causes that are attributed to the road environment.

It is important to point out that the road environment should not be the cause or a contributing factor to any accident. Nevertheless, this category must be regarded as low, since it is a cause in only 6% of the fatal accidents.

This low figure may be a result of the fact that the focus on poor roads has made motorcyclists more conscious of the hazards, and that they are particularly aware of this and reduce their speed.

In addition, as a result of the constant focus on riding skills, many Norwegian motorcyclists have obtained the technical driving and strategic skills required to handle a challenging road standard.



3.2 Was the road environment of importance to the scope of the injuries?

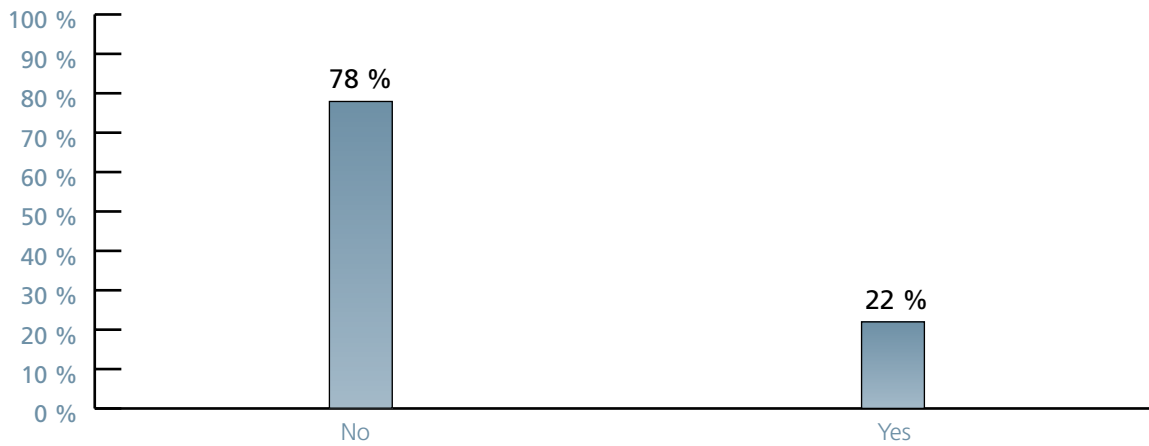


Figure 5 Road environment – scope of injury

Many who have fallen off their motorcycles have died as a result of hitting a guard rail post

The question that was asked before the analysis was: To what extent does the infrastructure around the road affect the scope of injury?

Our analysis shows that in 22% (34 out of 153 accidents) of the cases, the road environment was a cause or contributing factor to an increase in the scope of injury.

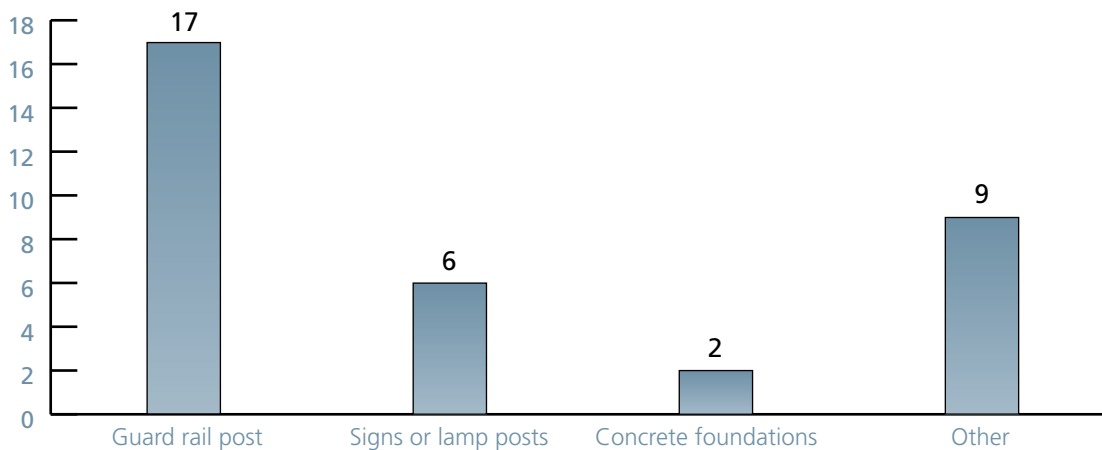


Figure 6 Road environment – road installations

In half of the 34 accidents where the road environment was a cause or contributing factor to a greater scope of injury, the victim had hit a guard rail post. Other factors included stone fences, uncleared verges inside the safety zone and fuse boxes inside tunnels.

Work to make roads safer for all groups of road users, with forgiving verges and the use of guard rails fitted with secondary rails, could make a difference when accidents occur.



4. Rider

4.1 Who was responsible for the motorcycle accident?

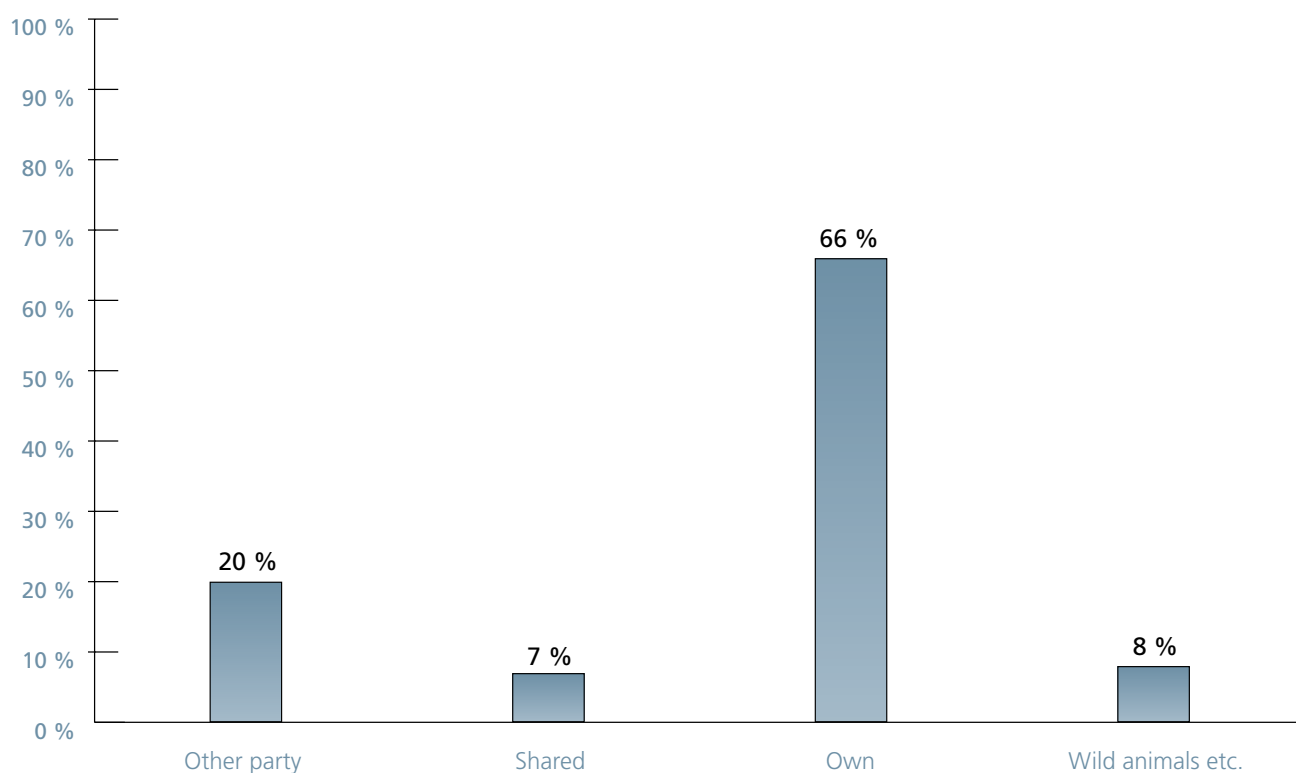


Figure 7 Triggering factor

Inattentive car drivers were not the triggering factor in most fatal motorcycle accidents

Reference is often made in other reports and the debate on motorcycle safety to the fact that the motorcyclist is often the innocent party in motorcycle accidents, and that it is the car driver who is often at fault.

Our analysis shows that the motorcyclist himself/herself was at fault in 66% of the accidents. Responsibility has been assigned based on who was the most obvious triggering party in the accident, regardless of legal liability.

A total of 8% of the accidents involved wild animals or circumstances that none of the drivers/riders could be blamed for.

In 20% of the accidents the other party was responsible for the accident in which the motorcyclist died.

When the other party was responsible for the accident, 8% were triggered by an oncoming car turning left at an intersection and failing to see the oncoming motorcyclist.

A total of 3% of the accidents were triggered by cars entering a major road and failing to see the motorcyclist.

In order to prevent accidents of this type, the measures must be aimed at both of the groups who are involved. This means increasing car driver awareness of motorcycles in traffic and making motorcyclists more aware of the need to make themselves more visible by means of their clothing and behaviour.



4.2 Were inadequate skills the cause of the accident?

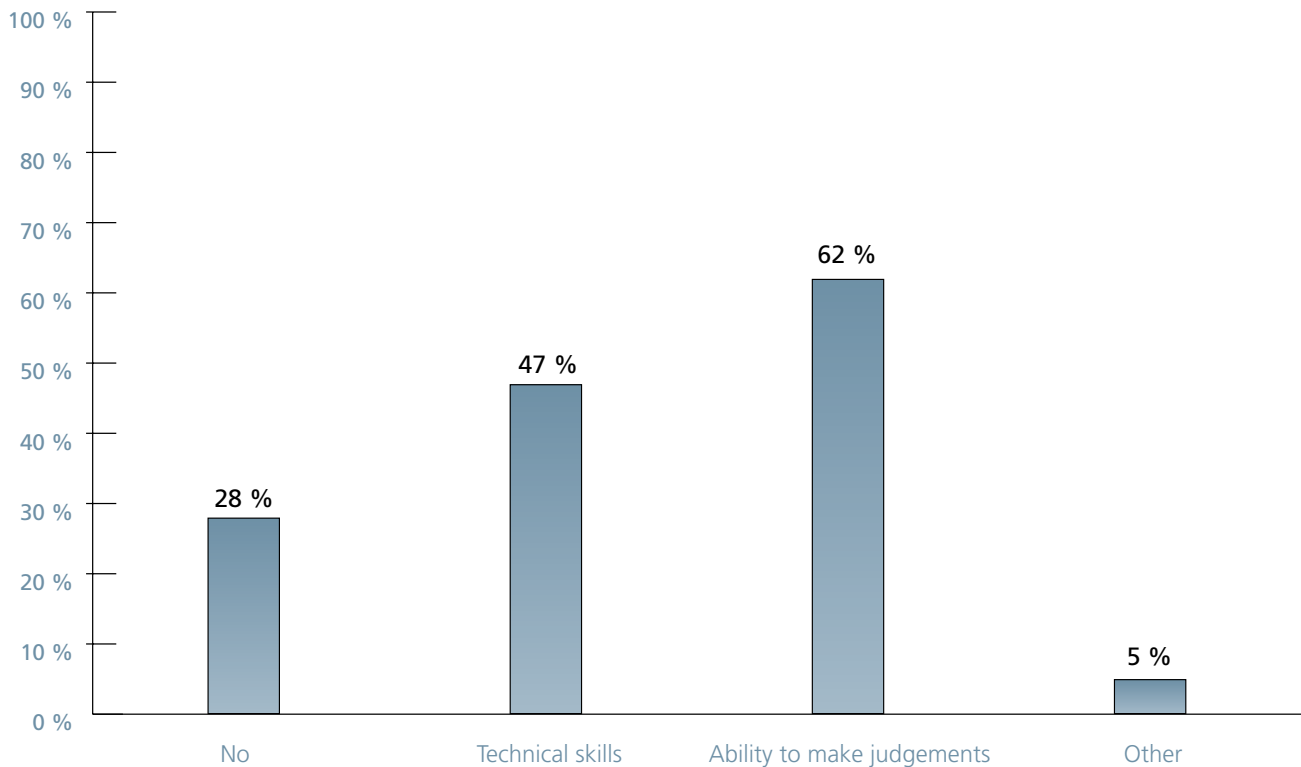


Figure 8 Inadequate skills

How many die in motorcycle accidents because they lack machine control skills or strategic skills?

Knowing how to ride a motorcycle is of great importance to traffic safety. Road traffic competence is regarded as the knowledge, skills, attitudes and motivation a rider requires to master traffic situations in a safe manner. In our analysis work it is impossible to ascertain the riders' attitudes or motivation. The inadequate skills that have been registered include machine control skills and the ability to make judgements based on the chosen action.

A triggering factor was the lack of both technical and judgement skills (both deficiencies were registered for the accident in question, which gives thus over 100% in the figure).

Incorrect judgements (62%) are more often the cause than inadequate machine control skills (47%). The rider did not have a licence in 25% of the accidents where inadequate skills were a triggering factor.

The 5% "Other" column includes accidents where there was a suspicion of driving under the influence of drugs or alcohol, illegal motor sports, etc., which makes it difficult to ascertain whether inadequate skills were involved.



4.3 Was inexperience decisive in the accidents?

Does experience have any bearing on the rider's accident vulnerability?

In connection with inadequate competence, the working group found that it was important to look at the level of experience in relation to the accident vulnerability.

By looking at the number of years the victim had been the owner of a motorcycle compared with the number of years the person had had a motorcycle licence, we claim to have some indication of the level of experience. It is assumed then that most people who own a motorcycle use it, and that there are few people who gain experience by borrowing or renting motorcycles. Experience is defined as the period of time the person has owned a motorcycle and had a licence to ride it at the same time.

Our analysis showed that in 20 of the 153 accidents the motorcycle rider had over ten years of experience and could thus be regarded as experienced. This accounted for 13% of the accidents.

In 50% of the accidents the rider had less than two years of experience.

Several surveys have shown that a car driver's experience contributes to a reduction in accident vulnerability. Our analysis shows that the same seems to apply to motorcycle riders.

How many of the fatalities were "old" licenced riders with "fresh" experience?

With an increasing average age for motorcyclists, there is a suspicion that the accident picture is marked by "returning" motorcyclists. "Returning" motorcyclists refers to those who have had a long break from riding a motorcycle or start to ride a motorcycle several years after having obtained a driving licence.

By studying when the individual obtained a licence and when the motorcycle was obtained gives a picture of whether they are "old" licenced riders with "fresh" experience.

Of the victims there were 15 who had less than 2 years of experience with a driving licence from before 2000.

There were seven who had between 2 to 5 years of experience with a driving licence from before 1995. There were 22 riders (14%) who can be assumed to be "returning" motorcyclists. This was fewer than anticipated, but shows that driving skills apparently need to be maintained in order to be adequate.



4.4 What is the age distribution of the victims?

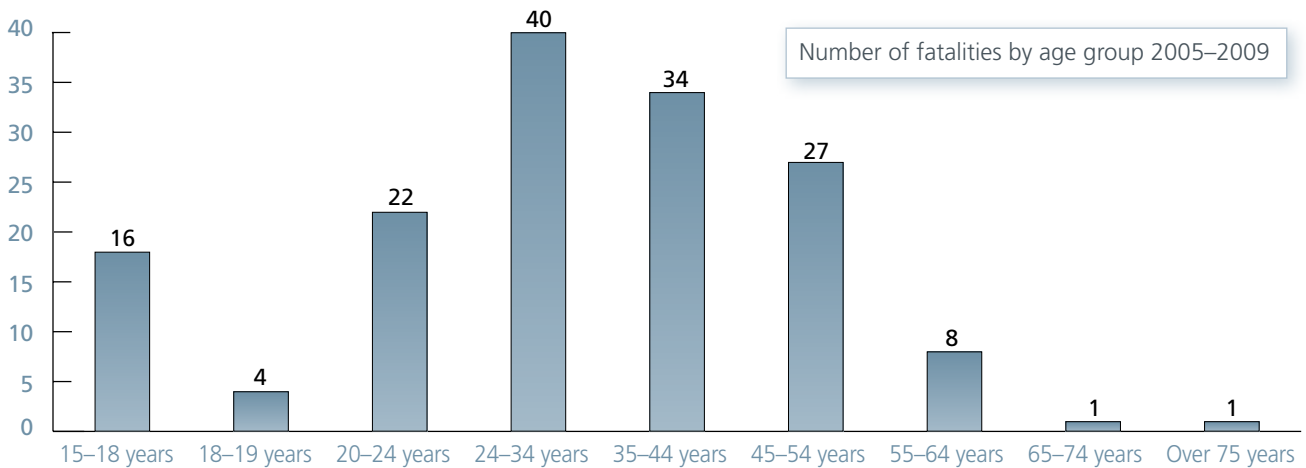


Figure 9 Accidents by age group

Most fatalities are under 34 years of age

Younger people are the most vulnerable group when it comes to motorcycles as well. Most of those who died in a motorcycle accident during this period were under 34 years of age.

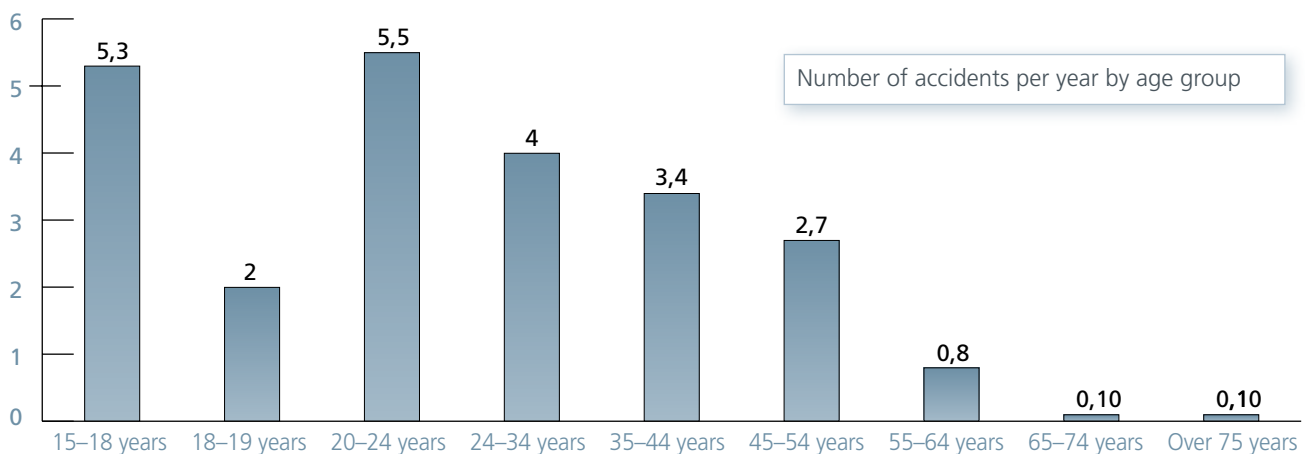


Figure 10 Accidents per year by age group

By breaking the number of accidents per year down into age groups, the age groups 15-18 years and 20-24 years stand out as the most vulnerable to accidents.



4.6 What type of behaviour characterised the fatal accidents?

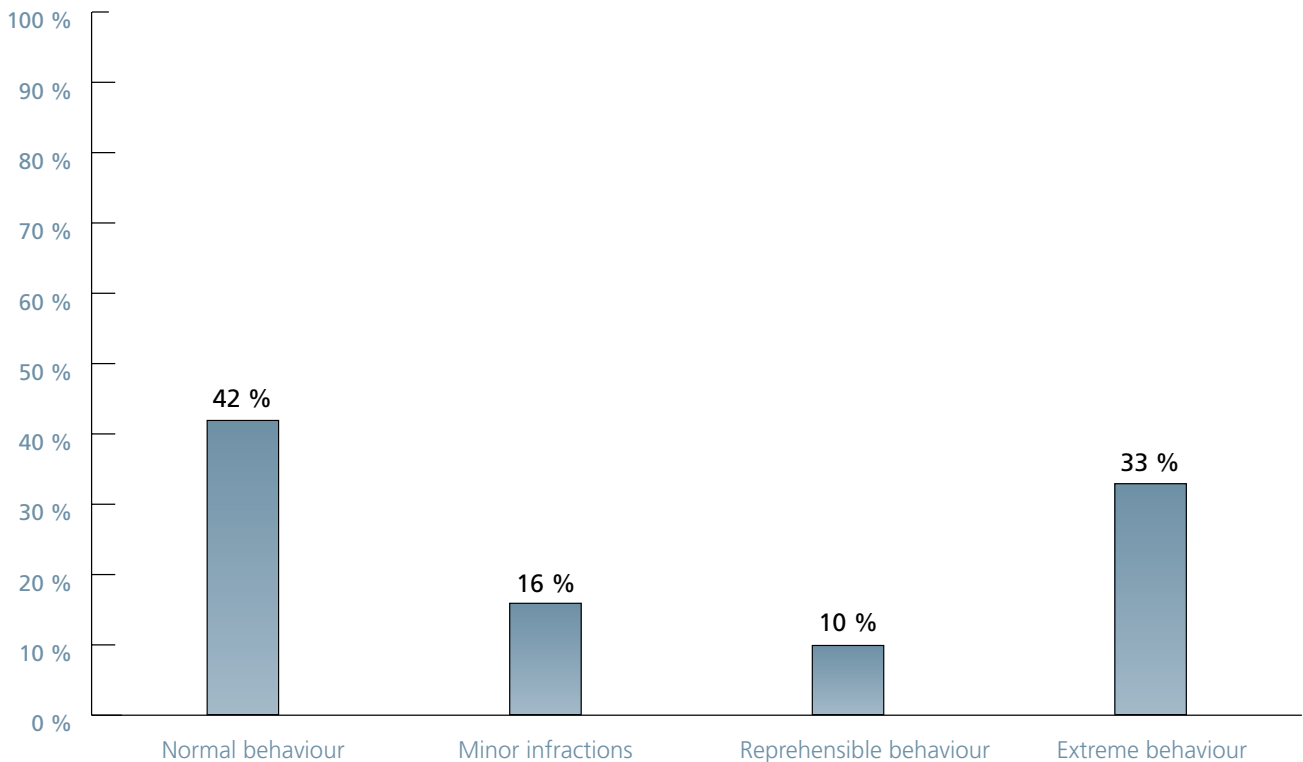


Figure 11 Behaviour

Many fatal accidents that involve extreme behaviour

In order to study the behaviour associated with the accidents, behaviour was categorised as:

- Normal behaviour – current regulations observed 42%
- Minor infractions – Infractions, but no risky behaviour 16%
- Reprehensible behaviour – Infractions and risky behaviour 10%
- Extreme behaviour – Infractions and hazardous behaviour 33%

33% of the accidents were caused by extreme behaviour.

Extreme behaviour is regarded as:

- Driving without a licence: Without a licence the rider does not have the required training and lacks therefore the necessary skills to drive a motorcycle
- Driving under the influence: Alcohol, narcotics and/or legal medications that negatively affect the rider
- Irresponsible and excessive speed: Beyond the limit for revoking a person's driving licence
- Aggressive behaviour: Aggressive driving in relation to other motorists

Such a high number of victims with extreme behaviour indicates a challenge with regard to traffic safety work. Riders with extreme behaviour can be harder to reach by means of the traditional measures used in traffic safety work. The consequences of the accidents can be reduced to some extent by technical road measures.



4.7 How does behaviour affect responsibility for the accident?

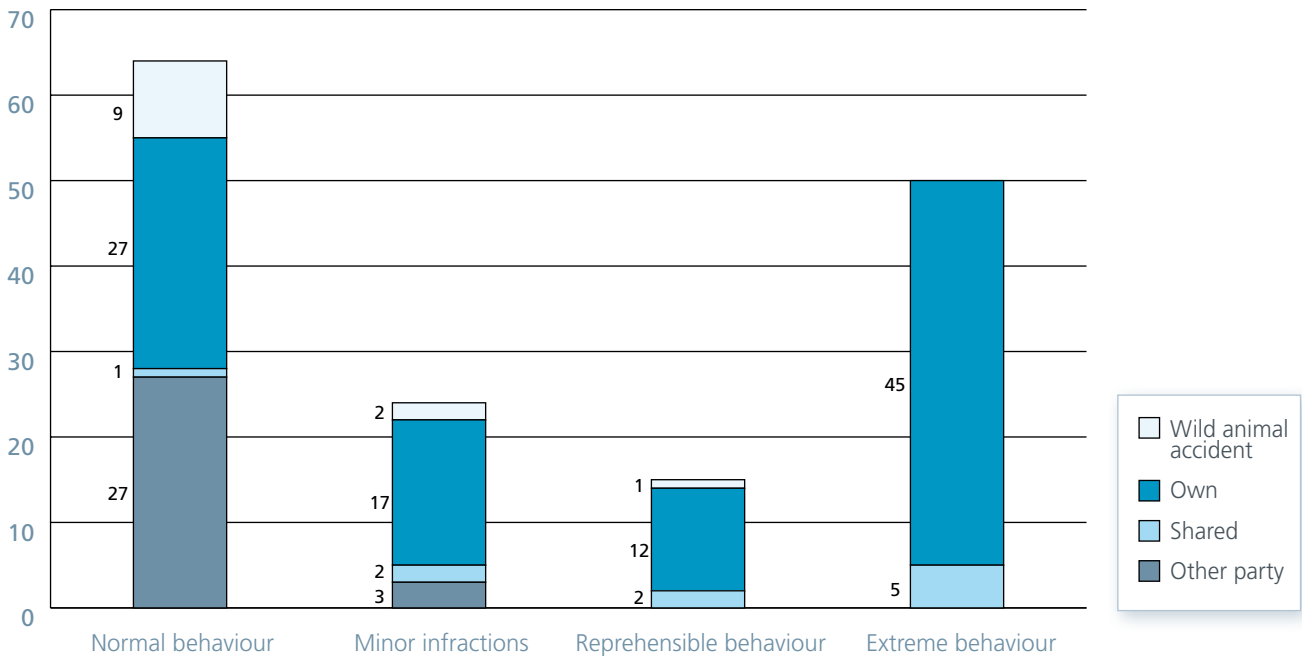


Figure 12 Triggering factor – behaviour

Motorcyclists with normal behaviour are not often the cause of their own accident

Most riders who observe the current regulations survive. However, our analysis shows that just observing the law is no guarantee of survival.

The figure shows that in 27 out of the 64 accidents where the rider was regarded as having observed the regulations, the other party had been the accident's triggering factor. Accidents involving wild animals accounted for 9 out of 64 accidents.

In the other accidents, it appears that the triggering factor was inadequate driving skills or an inadequate ability to make judgements.

In order to prevent this type of accident, the measures must be aimed at both of the groups involved. This means increasing car driver awareness of motorcycles in traffic and making motorcyclists more aware of the need to make themselves more visible by means of their clothing and behaviour. Work to establish adequate skills through good rider training and motivation for voluntary courses and training that contribute to improved skills must also continue.



4.8 How many were under the influence of drugs or alcohol?

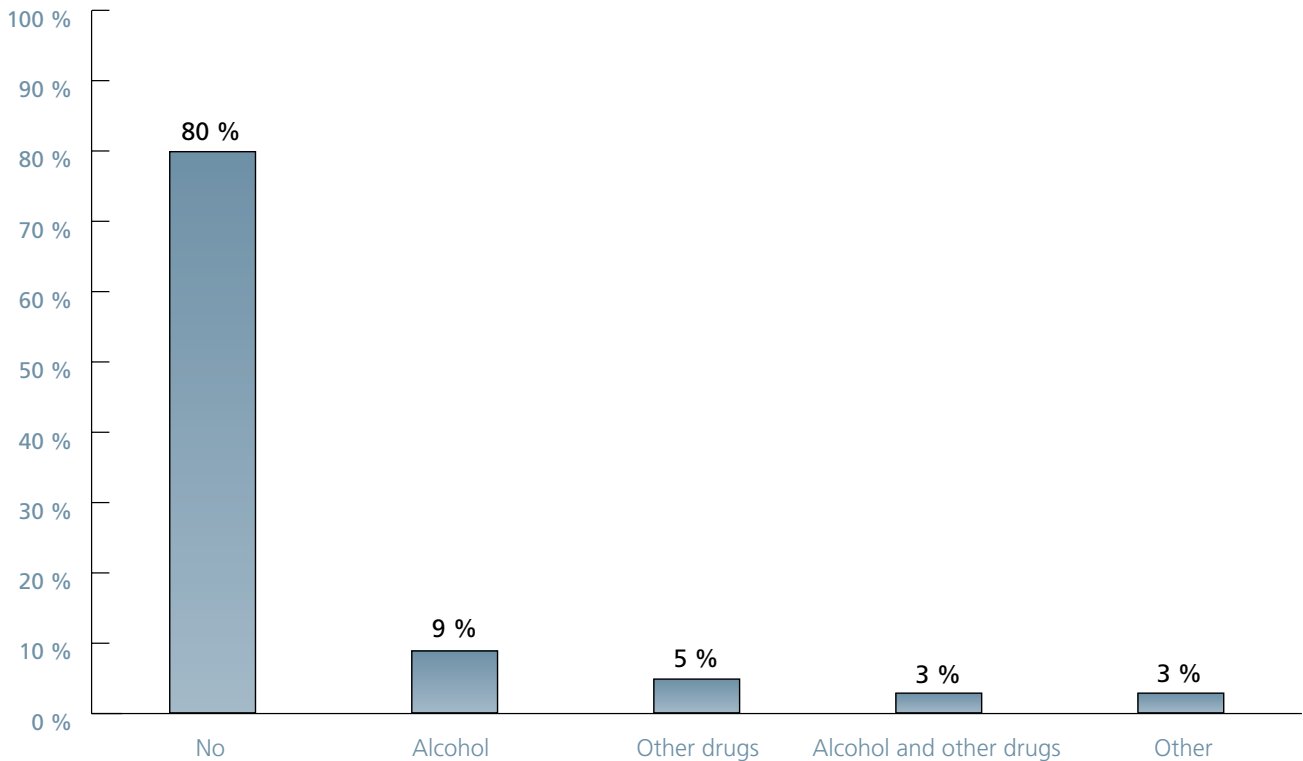


Figure 13 Under the influence of drugs or alcohol

In 20% of the accidents the rider was under the influence of drugs or alcohol

A total of 31 of the riders were under the influence of drugs or alcohol. Excessive speed is also often associated with accidents where the rider is under the influence of drugs or alcohol. The figure shows that 9% were under the influence of alcohol and 8% were either under the influence of narcotics alone, or in combination with alcohol.

The 3% Other are accidents where there is a suspicion of intoxication, but where no blood samples were taken.

Regardless of the type of vehicle, drivers/riders under the influence of drugs or alcohol represent a great risk to themselves and others. We have worked actively to combat driving under the influence of alcohol for a number of years. The increasing number of accidents where the rider is under the influence of other drugs alone, or in combination with alcohol, requires a continued development of tools and methods to identify and stop this behaviour.



4.9 How many did not have a driving licence?

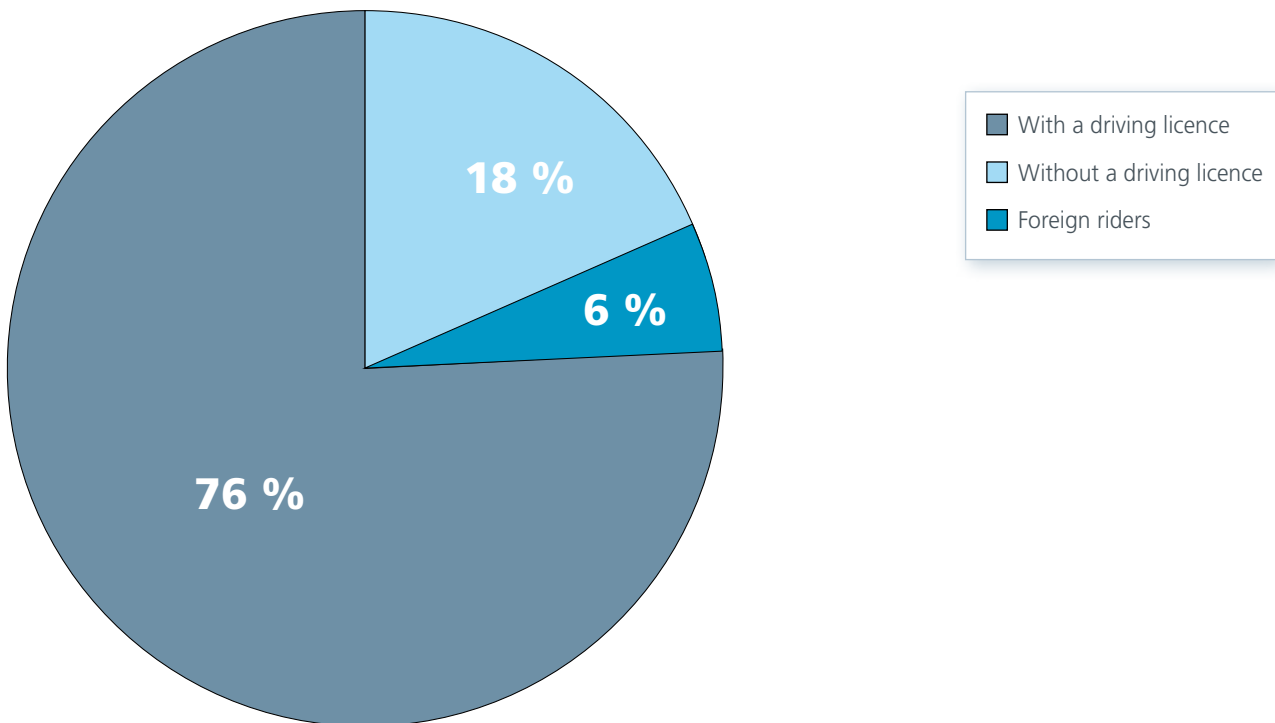


Figure 14 Driving licence

The rider did not have a driving licence in 18% of the accidents.

A total of 27 of the riders did not have a motorcycle licence. Without rider training and tests, the lack of skills is pronounced and driving is often associated with extreme behaviour. In 38% (19) of the accidents that were triggered by extreme behaviour, the rider did not have a licence.

Driving without a licence also indicates an attitude towards laws and regulations that is not very compatible with traffic safety.

Foreign nationals were involved in 6% (9) of the accidents. It has not been ascertained whether they had driving licences.

It is of great importance to traffic safety that measures are developed that can prevent motorcyclists from driving under the influence of drugs or alcohol, or without a licence.



4.10 How many riders with extreme behaviour had previously exhibited extreme behaviour in other ways?

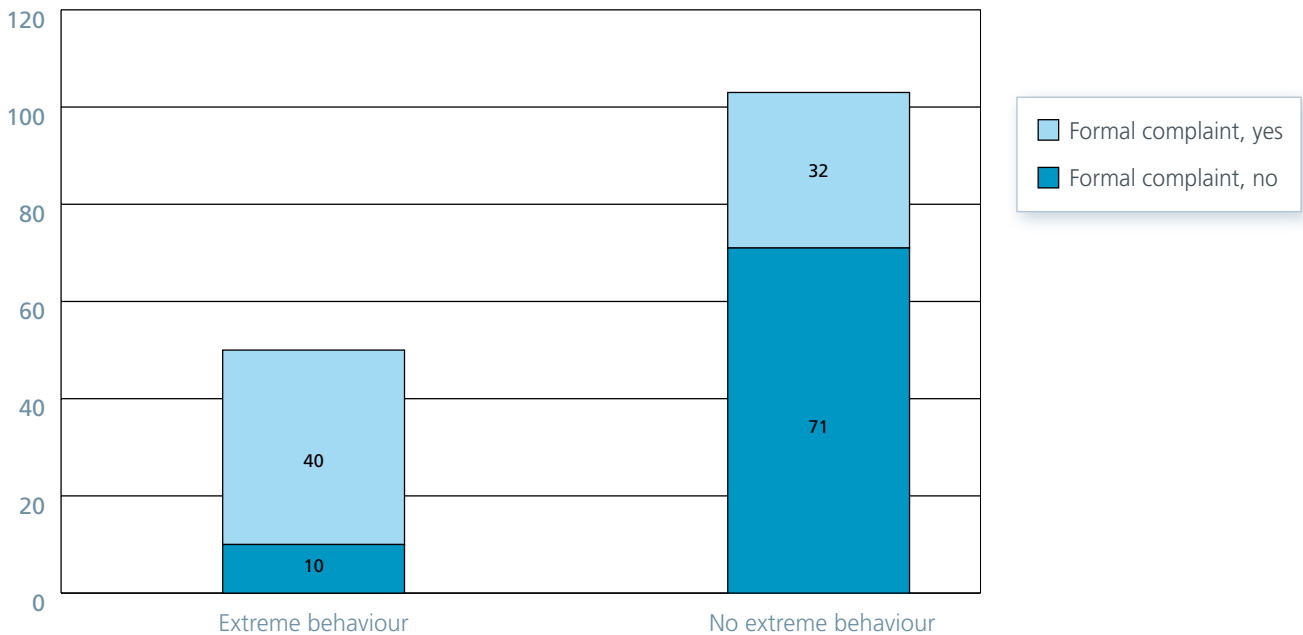


Figure 15 Behaviour – formal complaint filed

Formal complaints had been filed with the police for various offences for 80% of the riders with extreme behaviour

The fact that extreme behaviour is the cause of so many accidents made it necessary to take a closer look at this group. The National Mobile Police Service was involved in this work on the basis of their study on who deserves the attention of the police, which looks, for example, at to what extent the victims of traffic accidents already had a police record.

Of the 50 accidents that were caused by extreme behaviour, 40 of the victims had a police record for theft, narcotics, violence, vandalism, traffic violations, etc. A total of 72 riders involved in accidents had a police record. Most of the offences involved traffic violations, but 76% had a police record for other and multiple offences. Of these riders 24% only had traffic violations on their record.

Our analysis shows that there is an alarmingly high number (47%) of the fatalities who had exhibited extreme behaviour in other areas in their lives and had police records. In future traffic safety work it will be important that this knowledge is used as a basis for the prioritisation of traffic safety measures.



4.11 In how many fatal accidents were extreme behaviour and super sport bikes involved?

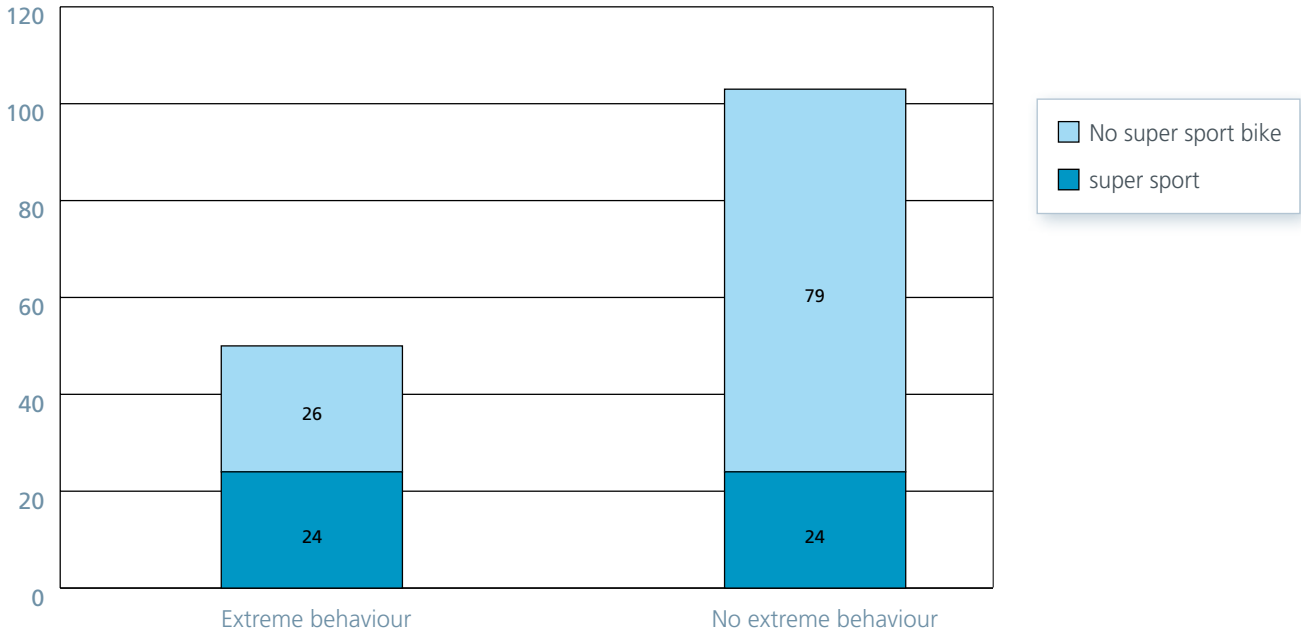


Figure 16 Extreme behaviour – R-bike

50% of the fatal accidents with extreme behaviour occurred on super sport bikes

It was questioned whether super sport bikes attract persons with a tendency to exhibit extreme behaviour.

In around 50% of the fatal accidents with super sport bikes, the cause was extreme behaviour. It appears that super sport bikes may attract persons with a tendency to exhibit extreme behaviour.

In around 50% of the accidents with extreme behaviour, super sport bikes were not involved, so extreme behaviour is not contingent solely on the type of motorcycle.



Other questions that were answered

Is there a higher risk when riding in a group of several motorcycles?

In 23% of the accidents the motorcyclist rode together in a group with others. We found only one instance where it was likely that the group dynamics could have resulted in risky behaviour, in the other accidents there were other triggering factors.

Is riding in unfamiliar areas a triggering factor for the accident?

In 14% of the accidents the motorcyclist was likely unfamiliar with the accident site. Our analysis work cannot document that the rider not being familiar with the location was a triggering factor, but it can indicate that riding in unfamiliar areas does require special attention on the part of the rider.

Was the accident caused by the rider not being familiar with the vehicle?

In 14% of the cases the motorcycle had been borrowed from others. In 6 % of the accidents the motorcycle had been stolen. In relation to previous surveys, there were fewer stolen and borrowed motorcycles in the data that we have analysed. Work to create greater awareness of the risk involved when riding an unfamiliar motorcycle and motorcycle theft protection should continue.

Was the accident caused by a medical problem?

Medical problems or acute illness were found to be the cause in only two of the 153 accidents. This cannot be regarded as a risk factor on the basis of our analysis.

Was the accident due to insufficient sleep?

In 5 out of 153 accidents it was likely that the rider had insufficient sleep prior to the accident. Other factors were regarded as the triggering factors for the accidents. Based on our analysis, the working group can therefore not find that insufficient sleep alone can be pointed out as a risk factor.



Conclusions

The number of fatal motorcycle accidents has declined slightly in recent years. Since the number of motorcycles has increased during the same period (from 103,028 registered light and heavy motorcycles in 2005 to 132,888 in 2009) the risk has been reduced. This does not mean that work on measures to prevent accidents should be reduced. With fewer accidents, however, more knowledge of the accidents is required in order to recommend measures that can be expected to have an impact.

So far in our work the working group finds that the results indicate that there is good reason to continue with much of what we are already doing to improve traffic safety for motorcycle riders.

Measures such as targeted traffic controls, SEE US campaigns, good initial rider training, voluntary rider training courses, forms for reporting road hazards and the "Full Control" booklets are presumably part of the reason why Norway was one of the safest countries in Europe to ride a motorcycle in already in 2006 according to the European Transport Safety Council's statistics.

Knowledge from our analysis work shows that measures to reduce the 42% of the accidents where the motorcyclists are regarded as having observed the current regulations must be aimed at car driver awareness of motorcycles and a further development of the motorcyclists' rider competence.

With regard to the fact that the road environment was the cause of a greater scope of injury in 22% of the fatal accidents, it is also important to implement the planned measures defined in Handbook 245 – Motorcycle Safety, such as secondary rails for guard rails and other recommended measures to improve the physical conditions for safer motorcycle traffic.

Driving under the influence of drugs or alcohol and driving without a licence, each account for around 20% of the fatal accidents. Those who drive under the influence of drugs or alcohol often drive without a licence, and they account for a major portion of the accidents where extreme behaviour was a triggering factor for the accident.

Extreme behaviour accounts for 33% of the accidents. Overall 80% of the riders in these accidents had police

records for crimes for personal gain, narcotics, violence, vandalism, traffic violations, etc. In most cases there were many offences in their police records.

The working group finds that this is important knowledge indicating that many of the measures being carried out today, such as rider training, campaign work, etc., probably will not work with the large group who died because of extreme behaviour. The police's work on control measures will increase the risk of detection, but since they already have criminal records the preventative effect of this risk of detection may be significantly less.

This knowledge should motivate the development of measures that can have an effect on this group, in cooperation with several other agencies, such as the Police, Public Health Service and Norwegian Public Roads Administration.

Possible measures

- Further development of motorcycle initial rider training focusing on strategic thinking.
- Strengthen further education, such as voluntary rider training courses and measures of the "Full Control" type.
- Making car drivers more aware of motorcycles in traffic through training and campaigns.
- Making motorcycle owners aware of the risk of lending out their vehicle and the need for motorcycle theft protection.
- Stop extreme behaviour through control measures and sanctions aimed directly at the target group.
- Through the motorcycling community, channel illegal risky behaviour on roads to legal activities at motor-sport venues through motorcycle groups.
- Control and monitoring of risk-seeking youths and persons with criminal behaviour.
- Reinforced drug and alcohol controls by introducing fixed limit values and new control methods.
- Replacement of guard rails with forgiving verges.
- Implement planned measures such as secondary rails for guard rails and other recommended measures defined in Handbook 245 Motorcycle Safety – design and operation of roads and traffic systems.





Photo: Colourbox.com



Future work

This is a summary of what the working group felt was the most important findings in our analysis work. Further work on the data from our analysis will include use of the knowledge from our analysis in our efforts to improve traffic safety for motorcyclists.

Work on the reports from the fatal accidents has been extensive and shown that there is some data that should be recorded better at the accident sites.

Data on the use of safety equipment, in addition to helmets, is not recorded well enough for all the accidents. This entails that the analysis cannot say anything specific about the use of safety equipment. Updating our database each winter will make data on development trends available at all times, and this is important knowledge in our efforts to improve traffic safety.



Photo: Colourbox.com



Development of fatal motorcycle and passenger car accidents

År	Number of motorcyclist fatalities	Registered motorcyclists	Number of car driver fatalities (passenger vehicles)	Registered passenger vehicles	Number of motorcycle fatalities/registered motorcyclists*	Number of car driver fatalities/registered passenger vehicles*
2000	40	85672	194	1 851 929	4,7	1,0
2001	28	90268	164	1 872 862	3,1	0,9
2002	37	94645	182	1 899 767	3,9	1,0
2003	28	98800	164	1 933 660	2,8	0,8
2004	32	103716	153	1 977 922	3,1	0,8
2005	31	109338	126	2 028 909	2,8	0,6
2006	34	116875	141	2 084 193	2,9	0,7
2007	32	126207	136	2 154 837	2,5	0,6
2008	31	134721	149	2 197 193	2,3	0,7
2009	26	141235	127	2 244 039	1,8	0,6
2010	26	146592	125	2 308 548	1,8	0,5

Figure 17

* Number of fatalities per 10,000 vehicles





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