

Wrong-way driving

Summary

Wrong-way driving is a phenomenon that mainly happens on motorways. Although the number of wrong-way crashes is relatively limited, their consequences are much more severe than the consequences of other motorway injury crashes. The groups most often causing wrong-way driving accidents are young, inexperienced drivers and elderly drivers. Alcohol often plays a large role with the young; processing (visual) information is especially a problem with the elderly. Improved road signs and infrastructural measures must provide a driver with clarity to limit these crashes; measures that keep the wrong-way driver separated from other traffic must protect the other road users.

Background

The term wrong-way driving is used for driving in the opposite direction along a one-way street or carriageway. This fact sheet mainly deals with wrong-way driving on motorways. Although wrong-way crashes are quite rare, the injury severity is greater than in other crashes. This fact sheet deals with the possible causes of wrong-way driving, and discusses measures that could lessen the problem.

How often does wrong-way driving occur and how serious are the consequences?

The only source of data in The Netherlands on the actual presence of wrong-way drivers on motorways is the system of Police Incident Rooms (MKS). All verbal and written reports that reach the National Police Services Agency are registered here, including the reports on wrong-way drivers. A study by Blokpoel & De Niet (2000) was aimed at determining whether this system provided reliable information about how often wrong-way driving actually occurs in the Netherlands. This study showed that the number of reported incidents steadily increased in the period 1996-1998: from 304 in 1996 to 419 in 1998. This does not mean that the number of wrong-way drivers did actually increase. The reported increase can be a consequence of the increasing numbers of mobile phones, making reporting easier. In about half the cases it was doubtful whether there really had been a wrong-way driver. Blokpoel & De Niet (2000) determined that of the 46 wrong-way driving crashes that occurred in 1996 and 1997 according to the Crashes and Network database, only 21 crashes could be found as wrong-way driving reports in the MKS. Of these 21, only 3 were reported as having resulted in a crash. The MKS is therefore incomplete and provides hardly any reliable information about how often wrong-way driving actually happens. As there are no other sources of information about wrong-way drivers, it is therefore not known how often wrong-way driving occurs.

There is however reliable data about the number of wrong-way driving crashes up till 2003. This is to be found in the Crashes and Network database. The database consists of two parts. The first part is the Road Accident Registration (VOR) database which contains information about road crashes, such as location, circumstances, driver features, and the number of casualties. The second part is the National Roads Database that contains information about the Dutch road network. The Ministry of Transport's crash analysis system IMPULS (which no longer exists) contained information about road crashes on motorways for periods of 6 years. It also contained information about wrong-way driving crashes. Blokpoel & De Niet (2000) studied the VOR and the IMPULS databases to get insight in the numbers of wrong-way driving crashes and wrong-way driving incidents on motorways. This study showed that wrong-way driving was the cause of only a small number of crashes per year. In 1991-1997, an annual average of 22 wrong-way driving crashes was registered on the Dutch motorways, 12 of which were injury crashes; this is about 0.1% of all registered Dutch motorway crashes (including Material Damage Only crashes). Wrong-way driving crashes are rather severe: in 1991-1997, 2.6% of all fatal Dutch motorway crashes were caused by wrong-way driving. During the same period about five fatalities a year were the consequence of wrong-way driving, which is about 3.7% of all fatalities on Dutch motorways.

After 1997 the number of wrong-way driving crashes seems to decrease. The VOR databases for 1998-2003 contained an average of seven wrong-way injury crashes per year. During the same

period, 1.5% of all fatal motorway crashes was a wrong-way driving crash; an average of two fatalities a year in this period were the consequence of wrong-way driving, which is 1.9% of the total number of road traffic fatalities.

In 2004 the Ministry of Transport's Road Accident Registration '(VOR) changed over to the new coding system 'BRON'. This system no longer codes whether a crash was the consequence of wrong-way driving. It is therefore impossible for the years after 2004 to determine the number of wrong-way driving crashes and their casualties. Since SWOV has access to the electronic version of the police registration sets for fatal crashes, we can use keywords to search for wrong-way driving crashes. For 2002 and 2003 this resulted in only half of the number of wrong-way driving fatalities that VOR had coded. These registration sets, therefore, do not seem suitable for determining the number of wrong-way driving fatalities. An article in a journal of the Royal Dutch Tourist Club ANWB argues that newspaper articles are a valuable source of fatal wrong-way driving crashes (Anon., 2006). The authors conclude that newspaper articles show that since 2002 the number of wrong-way crash fatalities has gone back to the old level of before 1998. SWOV urges BRON to again code if a crash was the consequence of wrong-way driving.

Where and when does wrong-way driving occur?

Blokpoel & De Niet (2000) not only studied the numbers of wrong-way driving crashes, but they also carried out extensive research into the circumstances that could have played a role in the occurrence of wrong-way driving and the resulting crash. This study used the VOR and the IMPULS databases. On motorways wrong-way driving proves occur mainly on the main carriageway. In 1983-1998, 79% of the wrong-way driving crashes took place on the main carriageway, 5% on merging lanes, and 17% on entry and exit roads. One would expect such crashes to have occurred mainly during periods of bad weather or darkness, but this was not the case. In the period 1983-1998, 80% of the wrong-way driving crashes occurred when it was dry, and more than half of them occurred when it was dark, but a considerable proportion of 40% of the crashes occurred during daytime. The nighttime share of wrong-way driving crashes (0.2%) was indeed twice as large as the daytime share (0.1%). Most wrong-way driving crashes happened during the evening and nighttime hours, although 33% took place during daytime hours, between 9h and 17h (Blokpoel & De Niet, 2000).

Are there groups of drivers who engage in wrong-way driving more often?

According to Blokpoel & De Niet (2000), there were wrong-way drivers of all ages in the years 1983-1998 (Table 1).

	Age of wrong-way driver						Total
	Unknown	18 – 24	25 – 39	40 – 54	55 – 69	70 and older	
Number	6	9	25	16	14	33	103
%	5.8	8.7	24.3	15.5	13.6	32	100

Table 1. Number of injury crashes as a consequence of a wrong-way driver in 1983-1998, by age.

From 55 years old, the share of wrong-way drivers increases. Of all those of 70 years old and older who had been involved in a crash, 0.7% were wrong-way drivers, whereas this was only 0.03% of younger drivers. In other words: the proportion of drivers of 70 years old and older who caused a crash by wrong-way driving is about 23 times higher than those of the other age groups.

The driver's gender hardly plays a role in wrong-way driving. The average proportion of women causing a wrong-way driving crash in the period 1991-1997 was 19%, but this is equal to the proportion of women drivers in all injury crashes. Of all women drivers who caused a crash in 1991-1997, 0.06% was a wrong-way driver, whereas this was 0.05% for male drivers who caused a crash during the same period.

Alcohol use is a frequent factor in wrong-way driving crashes. In the period 1983-1990 alcohol played a role in 45% of the wrong-way driving crashes. In the 1991-1998 period however, this percentage went down to 20%. During the entire period 1983-1998, 56% of the 25-54 year old wrong-way drivers were under the influence of alcohol, and 44% of the 18-24 year olds. Only one wrong-way driver in the age group 70 years and older was under the influence. For the period 1991-1997 a comparison could

be made between alcohol in wrong-way driving crashes and alcohol use in all other motorway crashes. For all age groups alcohol use played a role with about 2% of all drivers in non-wrong-way crashes, but for the wrong-way crash drivers this percentage was much higher. The figures for the 40-54 year olds in particular were striking: 38% of the wrong-way drivers was under the influence, against 22% of the other age groups. Only in the age group of 70 years and older alcohol hardly played a role.

Is there a difference between wrong-way driving in the Netherlands and in other countries?

Wrong-way driving is certainly not a typically Dutch problem. Blokpoel & Braimaister (1998) made a study of wrong-way in other countries. Unfortunately there was too little data about crash frequencies available per country to make a sound comparison of the possibility of wrong-way driving crashes and their consequences. However, the following conclusions can be drawn:

- Wrong-way driving crashes are a relatively small proportion of all injury crashes on motorways.
- The consequences of wrong-way driving crashes are much more severe than the consequences of other motorway crashes.
- The risk of wrong-way driving crashes is greater at night.
- Old drivers and young, inexperienced drivers are risk groups.
- Alcohol use plays an important role in the occurrence of wrong-way driving crashes.
- Most of the wrong-way drivers under the influence of alcohol belong to the younger age groups.

The situation in the Netherlands is no different from the situation in other countries.

What are the possible causes of wrong-way driving?

By analyzing the summons reports, information can be obtained about where and how the wrong-way driving happened. De Niet & Blokpoel (2000) examined the summons reports for 1995-1997. This study showed that the most common errors were:

- turning and driving against the traffic;
- choosing the exit road instead of the entry road when joining from a non-motorway.

Just under half of the wrong-way driving journeys began by entering the exit road and about 40% by turning on the carriageway.

Mistakes can be subdivided into errors and deliberate offences. Errors are made when planning or carrying out manoeuvres; people who make errors are unaware of their mistakes. On the other hand, someone who knows that what he is doing is not allowed, is guilty of a deliberate offence.

Driving up an exit road is usually an error and generally happens to older drivers who, when it's dark, turn left too early. The cause of this error is often a problem with processing (visual) information. The study of Davidse (2002) delves deeper into this problem. De Niet & Blokpoel (2000) visited several 'wrong-way driving exit roads' and they found situations there that increase the risk starting of a wrong-way journey. For example, if the exit road was very conspicuous and the view of the entry road was poor, drivers actually seemed to be lured to the exit road. Also, the road marking was often faded, or road signs were not present at all or incorrectly positioned, so it was not clear which actions were required. Turning off too early was sometimes invited by the road bend towards the exit road not being tight enough.

De Niet & Blokpoel (2000) concluded that it were mainly young drivers who began a wrong-way journey by turning. In general, these drivers deliberately committed an offence in order to correct a previous mistake (e.g. missing an exit road) or to shake off pursuing police. These offences may involve underestimation of the risks of wrong-way driving. Another possibility is that drivers do not recognize a dual carriageway as such, in which case they made an error.

What is being done to prevent wrong-way driving and are these measures effective?

Since 1981, in the Netherlands, road sign C2 (forbidden to enter) is positioned along motorway exit roads (see *Figure 1*). The panel placed below the road sign carries the text "go back".



Figure 1. *The traffic sign C2 (forbidden to enter).*

After this measure the number of wrong-way driving crashes declined considerably (Brevoord, 1998). In January 1997 wrong-way driving again received a lot of attention because of a very severe wrong-way driving crash. As a result of this crash, the Ministry of Transport took extra, short-term measures. Road users' advice resulted in the Ministry placing extra arrows on the road surface which point in the correct direction. At most of the locations the C2 road sign had an additional panel below with the text "go back" on it. These two road signs were then joined together with a fluorescent yellow background to make them more noticeable and visible, during the night as well as during daytime. The already-mentioned considerable decline in the number of wrong-way driving crashes was regarded as being the result of these measures. The ANWB journal article (Anon. 2006), however, argues that as the number of wrong-way driving crash fatalities is once more back to the old level, the temporary decline can be explained by the strong fluctuations that small numbers may have.

What more can be done against wrong-way driving?

Because of the previously mentioned wrong-way driving crash in 1997, long-term measures were also prepared. Brevoord (1998) described a number of these (infrastructural) measures. Most of these measures were intended to prevent a wrong-way driver from mistakenly driving onto a motorway by using the exit road. It was not only a matter of improving the layout of the entry and exit roads, such as making clear which was the entry road, but also a matter of a construction that made it impossible to enter/drive up along an exit road, such as what is known as a 'road blocker'. Another possibility is to lead any prospective wrong-way driver to the entry road via a connection road between the exit and entry road. A measure that could be taken to prevent turning on the carriageway is to clearly indicate that there is one-way traffic. No research has yet been done on the effect, implementation, or cost-effectiveness of any of these measures.

If there is a wrong-way driver on a motorway, it is important to protect other road users. Brink & Matton (1999) have given a number of possibilities to do this. Their measures are mainly aimed at separating the wrong-way driver from the other traffic, for example by stopping the other traffic in front of an open bridge or closed tunnel, or by clearing the left-hand lane on which 80% of the wrong-way drivers are driving. The effects and cost-effectiveness of these measures are also unknown.

Conclusions

- Wrong-way driving is a small problem, but the injury severity of wrong-way driving crashes is much greater than of other crashes.
- Alcohol plays a large role in wrong-way driving crashes occurring.
- Wrong-way drivers can be roughly divided into two groups: the young, who are often under the influence of alcohol, and deliberately commit offences, and the elderly who mistakenly drive up the exit road and have not used any alcohol.

Publications en sources

(SWOV reports have a summary in English)

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