DRIVER SUICIDES IN FINLAND – ARE THEY DIFFERENT IN NORTHERN AND SOUTHERN FINLAND?

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ABSTRACT

Objectives. This study focused on driver suicides in Finland. The first aim was to find out what the prevalence of these suicides was during the years 1974–2006. The second aim was to find out whether there were differences between northern and southern Finland in regards to the number of cases and the backgrounds of the drivers who committed suicide this way.

Study design. All case reports of fatal motor vehicle accidents from the years 2005–2006 were investigated (n=528). Results were compared to the years previously investigated: 1974–1975, 1984–1985, 1987–1988, 1991–1992, 1993–1994 and 1997–1998 (n=3482).

Methods. As driver suicides were classified, only those crashes in which the driver’s intention had notably influenced the progress of the crash and the driver’s background information clearly supported suicide. Driver suicides in northern and southern Finland were compared. Driver suicides were related to both the number of fatal motor vehicle accidents and the number of inhabitants.

Results. Driver suicides increased during the period under study. However, both the number and the proportion of driver suicides have been quite constant since the beginning of the 1990s, averaging 20 per year, which is 8% of all fatal motor vehicle accidents in Finland. There were no differences in northern and southern Finland regarding driver suicides.

Conclusions. Driver suicides represent a small proportion (2%) of all suicides committed in Finland every year. However, the proportion of driver suicides of all fatal motor vehicle accidents is greater, around 8%–9%. As a majority of driver suicides are collisions, they affect an even larger group of people. Possible preventive measures are discussed.

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INTRODUCTION

Suicide committed by driving a motor vehicle is an area that has not been studied much. One problem has been that suicides by driving are often difficult to identify reliably. In order to distinguish a suicide from a “true” accident, information about the characteristics surrounding a physical crash itself is not enough. Background information about the driver and his/her intentions is also needed. In many countries, investigations of fatal traffic accidents are not very detailed. A representative and reliable estimate of the prevalence of motor vehicle suicides in a single country could be more easily obtained if accident investigations included the entire country and if standardized accident investigation methods were used.

A quite recent review concerning suicides (as well as natural deaths) from traffic accidents concluded that the proportion of driver suicides of all driver fatalities has varied from 1% to 7% (1). This review included 13 studies from different countries (e.g., Finland, Ireland, Norway, Scotland, Sweden and the U.S.) that reported driver suicides as a percentage of all traffic fatalities. However, these studies were each based on a different methodology and covered varying geographical areas, which makes a comparison difficult. Despite these shortcomings, these studies provide an estimate of the prevalence of motor vehicle suicides.

In Finland, a series of studies (covering the years 1974-75, 1984-85, 1987-88, 1991-94, 1997-98) has been conducted concerning the prevalence of self-destructive behaviour in fatal motor vehicle accidents (2-4). According to these studies, the rate of driver suicides in Finland has been 6% of all fatal motor vehicle accidents during the studied years.

The general suicide rate in Finland has been decreasing since 1990. In 2007, it was 27.8 per 100,000 males and 8.5 per 100,000 females (5). In Europe, the highest prevalence of suicides per 100,000 persons has been in Lithuania (males 76.5, females 12.6) (6), in the new states of Russia (highest in the Russian Federation, males 74.1 and females 13.3) and in Hungary (males 55.5, females 16.8) (7). In several countries suicide is the leading cause of death among young males (15-24 years of age) (7). The suicide rate is usually higher among males than females. In Finland there is a difference between northern (including the provinces of Lappi, Pohjois-Pohjanmaa and Kainuu) and southern Finland (the rest of the provinces in Finland). The suicide rate per 100,000 inhabitants is higher in northern Finland (Figure 1) (5). This rate is connected to several factors. For example, northern Finland is sparsely inhabited and distances between communities are long. This might lead to social isolation more easily (8). Also, if a person has to travel hundreds of kilometres to the nearest health centre, the threshold for seeking help might become high. By the time the person finally decides to get help, her/his problems may be more severe and more difficult to handle (8). The unemployment rate is also higher in the north, especially in the provinces of Kainuu and Lapland.

Suicides committed by driving a motor vehicle have not been the subject of many studies; “suicide by driving” is a method seldom used in Finland or elsewhere. In Finland, driver suicides were not included in the official statistics until 1987 (in the official statistics they are described as “suicides by crashing a motor vehicle”). In the official statistics, the proportion of driver suicides was highest in 2005, accounting for 2.1% (21 cases) of all suicides.
Driver suicides in Finland

(991 suicides) (5). It has been argued that the official statistics may underestimate the frequency of these cases (9,10). For example in 1997, Öhberg, Penttilä and Lönnqvist studied the extent to which these cases were being under-recorded in the official statistics (9). During the period of their study – 1987 to 1991 – the proportion of driver suicides in the official statistics was 2.6%, while these authors classified 5.9% of all driver fatalities as suicides (9). However, suicides committed by crashing a motor vehicle do not represent all suicides committed in traffic. For example, in Finland between the years 2000 and 2007 there were on average 56 suicides per year (males 40/year, females 16/year) committed by jumping or lying in front of a moving object (e.g., a motor vehicle or a train) (5).

Although a suicide is normally a solitary act involving only the victim, suicides committed by crashing a motor vehicle often involve other persons. For example, in the series of studies concerning the prevalence of driver suicides in Finland, it was found that 74% were collisions with other vehicles (2–4). Öhberg et al. (9) arrived at an even higher figure in their study: 82% of all driver suicides between 1987 and 1991 were head-on collisions. From this point of view, preventive measures targeting motor vehicle suicides are especially important.

Aim of the study

The aim of this descriptive study was to report the most recent rates of suicides by driving a motor vehicle in Finland. Because the general suicide rate is higher in northern Finland when compared to southern Finland, we also wanted to find out whether there were differences in driver suicides in these two parts of the country.

Figure 1. Suicide rates per 100,000 persons in northern(1) and southern(2) Finland during the years 1991–2006 (5).

(1) Provinces of Lappi, Kainuu and Pohjois-Pohjanmaa.
(2) Provinces of Uusimaa, Itä-Uusimaa, Varsinais-Suomi, Satakunta, Kanta-Häme, Pirkanmaa, Päijät-Häme, Kymenlaakso, Etelä-Karjala, Etelä-Savo, Pohjois-Savo, Pohjois-Karjala, Keski-Suomi, Etelä-Pohjanmaa, Keski-Pohjanmaa, Pohjanmaa and Ahvenanmaa.
MATERIAL AND METHODS

Material of the study

Investigation of fatal motor vehicle accidents in Finland

In Finland, all fatal motor vehicle accidents are studied in-depth by multi-professional road accident investigation teams. A motor vehicle accident is classified as fatal if a motor vehicle is involved and someone (e.g., the driver or a passenger) is killed in the accident or dies within 30 days as a result of the accident. Since November 2001 the work of the investigation teams has been based on legislation (11). Each team includes a police officer, a vehicle specialist, a road specialist, a physician and a psychologist. Teams work in each province and investigate all fatal motor vehicle accidents in their area. Members of the investigation teams use standardized investigation forms, which ensures the systematic acquisition of data throughout the country.

Drivers who survive, passengers who may have been in either of the vehicles and eyewitnesses are interviewed by the police or by the psychologist on the investigation team. If the driver is killed, then his/her family or relatives are interviewed. The road specialist investigates the site and the circumstances of the accident. His/her investigation includes, for example, different marks on the road (braking, sliding, etc.), issues related to the traffic environment and weather conditions. The vehicle specialist investigates the vehicle and assesses the damage and estimates what condition the vehicle was in before the accident. The physician gathers information on the victim’s health from different documents, estimates the injuries the victim sustained and the results of the autopsy report. Altogether there are close to 450 items that are collected during the investigation. A case report is compiled for each accident. The team’s purpose is to identify the events and the risk factors that turned an ordinary driving situation into a fatal accident and to give safety suggestions for improving traffic safety in order to prevent similar accidents from happening again (12). Most of the information of the case reports is coded into a computer database, which is maintained by the Traffic Safety Committee of Insurance Companies (VALT). A more detailed description of the accident investigation system in Finland can be found in the VALT method handbook (12).

Using the case reports of the investigation teams, we were able to follow the prevalence of self-destructive and negligent traffic behaviour in Finnish fatal motor vehicle accidents during the years 1974–1975, 1984–1985, 1987–1988, 1991–1992, 1993–1994 and 1997–1998 (altogether 3,482 case reports) (2–4). In this study, the most recent case reports that were available for the years 2005–2006 were reviewed (altogether 528 case reports) in order to find out what the situation is with driver suicides today.

Suicides committed by driving a motor vehicle

In these studies all fatal motor vehicle accidents during those time periods were investigated in detail by the authors. Same classification criteria (2–4) were used in all studies. Each and every case report was read through and, for a case to be classified as a suicide, 2 criteria had to be met. The first criterion was that the course of the events (the progress of the accident) was notably influenced by the driver’s intention. The vehicle had to be controlled by the driver up to the moment of collision (2–4). The second criterion was that the background information about the driver had to suggest a
The first criterion meant that there were no signs of braking, that is, there were no skid marks on the road. The possibilities of falling asleep, having a sudden attack of illness, attention mistakes and using alcohol were estimated by analysing the course of events as well as compiling background information about the driver. If the driver fell asleep at the wheel or had a sudden attack of illness, it would be very unlikely that he/she would speed up or suddenly steer the vehicle towards an oncoming vehicle or into the pillar of a bridge. It is more likely that the vehicle would gradually and slowly go off the road. If the driver fell asleep, it is possible, of course, that he/she could have woken up after the fact and tried to get back onto the road. In some cases, the driver might have lost control of the vehicle because of a sudden steering manoeuvre. Such manoeuvres usually leave some marks on the road’s surface or on side of the road. These are documented by the road specialist on the investigation team. Alcohol-related fatal accidents are usually single-vehicle accidents that take place during the night. Excessive use of alcohol is easily connected to falling asleep and then going off the road.

Besides the course of the crash, the possibility of falling asleep, with or without alcohol, was also estimated in relation to knowledge of how long the driver had been awake, what time of day it was (day or night), how long the driver had been driving and so on. Autopsy reports, in turn, provide information about possible attacks of illness. Attention mistakes might also be connected, for example, to using a mobile phone, changing the CD disc on a music player or trying to grab something from the back seat. In these cases, the vehicle can easily drift into the wrong lane or off the road. However, the driver usually notices that this is happening and will try to get back to her/his own lane. If this happens and he/she finds the car heading towards another vehicle, the driver will try to brake or do something else in order to avoid the crash. Also accidents in intersections were not classified as suicides, even though in a majority of these cases the vehicle was controlled by the driver up to the moment of the collision. These cases can be related easily to errors of judgement, poor observation and lack of attention.

When the case reports were reviewed, all the factors mentioned above were carefully considered. After ruling out the possibilities, there also had to be information about the driver’s background that supported suicide (i.e., mental health problems, a suicide note). Only those cases that met these 2 criteria at the same time were classified as suicides.

These cases were then coded on a separate sheet and identified from the computer database one by one. Altogether there were 3 cases missing from the computer database that were classified as suicides. There was also some discrepancy the other way around, cases were included in the database, but the actual case reports were not available at the time classifications were done (e.g., case reports were used by other researchers). For example, in 2005 there were 8 missing case reports and in 2006 none of the case reports were missing.

Excluded cases

As in previous studies (2-4), all fatalities in which the other vehicle in the accident was a train, moped or tractor were excluded. Moped accidents were excluded because they are not always classified as motor vehicle accidents. Therefore, investigations of moped accidents
Driver suicides in Finland differ from motor vehicle accidents. Train accidents were excluded because in those cases the progress of the accident makes it difficult to determine the cause of the accident. The accident might have been caused by a miscalculation, taking the wrong action or a lack of attention. Accidents involving a tractor were excluded because these accidents are typically work-related and take place away from the main roads and highways. From the 4,010 cases we reviewed, 502 were excluded (13%); thus the study material included 3,508 fatal accidents.

Northern and southern Finland
Northern Finland constitutes the 3 northern provinces of Finland: Lappi, Pohjois-Pohjanmaa and Kainuu. These 3 provinces cover 160,522 km², which is 47% of the whole of Finland. The population of northern Finland increased from about 600,000 people in 1974–1975 to 650,000 at the beginning of the 1990s. Since then the population of northern Finland has been rather constant. In 2006, it was approximately 650,000 people, which is 12% of Finland’s population (13).

Southern Finland constitutes the rest of Finland’s provinces, namely, Uusimaa, Itä-Uusimaa, Varsinais-Suomi, Satakunta, Kanta-Häme, Pirkanmaa, Päijät-Häme, Kymenlaakso, Etelä-Karjala, Etelä-Savo, Pohjois-Savo, Pohjois-Karjala, Keski-Suomi, Etelä-Pohjanmaa, Keski-Pohjanmaa, Pohjanmaa and Ahvenanmaa. The population density is much higher in southern Finland and the population has been increasing steadily. In 1974–1975, it was around 4,100,000; at the beginning of 1990s, it was 4,400,000; and in 2006, the population of southern Finland was approximately 4,600,000 (88% of Finland’s population) (13).

Data analysis
The statistical comparison in our study used the computer database of the coded case reports. The SPSS version 15.0.1 for Windows was used. The 2 groups (northern and southern Finland) were compared using cross-tabulation and chi-square tests. A significance level 0.05 was chosen. Because of the low number of driver suicides committed in northern Finland, most of the variables were compared in dichotomic classes. In addition, the rate of driver suicides per 100,000 inhabitants was investigated.

RESULTS

Driver suicides in Finland
The material in this study covered the years 2005–2006. All fatal accidents during these years (n=528) were investigated. The results of these 2 years were compared to the results of previously studied years: 1974–1975, 1984–1985, 1987–1988, 1991–1992, 1993–1994 and 1997–1998. Together, these studies give an overview of the prevalence of driver suicides over 3 decades.

Altogether there were 227 driver suicides during the years under study, which is 6.5% of the 3,508 fatal motor vehicle accidents in that period. The proportion of driver suicides had increased in 2 phases. The first increase happened between the 1970s and the 1980s when the proportion of driver suicides from all fatal motor vehicle accidents increased from 1.1% (1974–1975) to 5.8% (1984–1987). The second increase was from 5.8% in the 1980s to 8.4% in the 1990s. Since 1991, the proportion of driver suicides has remained constant at around 8%, which is approximately 20 suicides per year. The rate of driver suicides per 100,000
Driver suicides in Finland

The 14 years included in this study were divided into two seven-year time periods: 1974–1991 and 1992–2006. When these two periods were compared, it was found that driver suicides had increased both in northern (χ²=8.38, df=1, p=.004) and southern Finland (χ²=17.52, df=1, p<.001) (Table II). The increase had been similar in the north and the south, from 3%–5% to 9% (ns). The majority of driver suicides (n=200, 88% of all driver suicides) had happened in southern Finland.

The mean rate of driver suicides per 100,000 persons in the first time period (1974–1991) was 0.15 per 100,00 in northern

![Figure 2. Absolute numbers of driver suicides in northern and southern Finland. The numbers above the columns are absolute numbers of driver suicides in Finland (in bold) and in the parentheses are the proportion of driver suicides of all fatal motor vehicle accidents in Finland.](image)

| Years studied | Northern Finland | Southern Finland |
|---------------|------------------|-----------------|
|               | Driver suicides | Other fatal acc. | Driver suicides | Other fatal acc. |
| 1974–1991     | n=7             | 3 %             | n=75           | 5 %             |
|               | 231             | 97 %            | 1475           | 95 %            |
| 1992–2006     | n=20            | 9 %             | n=125          | 9 %             |
|               | 192             | 91 %            | 1318           | 91 %            |
| Total         | n=27            | 6 %             | n=200          | 7 %             |
|               | 423             | 94 %            | 2793           | 93 %            |
Driver suicides in Finland and 0.24 in southern Finland. In the second period (1992–2006), the respective rates were 0.44 in the north and 0.39 in the south. So there was a small increase both in northern and southern Finland, but no difference between the two parts of the country. In addition, if all 14 years were taken together, the mean rates were even closer to each other: 0.30 in northern Finland and 0.32 in southern Finland.

Demographic factors of suicide drivers

Sex
The majority (88%) of the drivers who committed suicide by driving a motor vehicle were males. Drivers in northern and southern Finland did not differ, in northern Finland the proportion of males was 85% and in southern Finland, 89% ($\chi^2=0.40, df=1, ns.$)

Age
The mean age for drivers was 35.1 years of age (males 35.2 and females 35.1).

The majority of drivers both in northern and southern Finland were under 35 years of age, their proportions were 69% and 54%, respectively ($\chi^2=2.08, df=1, ns.$) (Fig. 3).

Educational background
The majority of drivers in both groups had an intermediate education (i.e., comprehensive school, secondary school or vocational school). The respective proportions were 87% in northern Finland and 84% in southern Finland ($\chi^2=0.74, df=1, ns.$).

Marital status
Even though it seemed that drivers in northern Finland were more often single or divorced (72%) compared to drivers in southern Finland (56% were single or divorced), the difference was not statistically significant ($\chi^2=0.12, df=1, ns.$)

Circumstances of suicide

Accident type
Of these suicides, 73% were collisions, typically involving a heavy goods vehicle. In northern Finland the proportion of collisions was 81% and in southern Finland, 72% ($\chi^2=0.32, df=1, ns.$).

Use of alcohol at the time of the suicide
The majority (62%) of drivers were sober at the time of their suicides. The proportion of

![Figure 3. Age groups of suicide drivers in northern and southern Finland.](image)
sober drivers was almost exactly the same in northern and southern Finland, 63% and 62%, respectively ($\chi^2=0.006, df=1, ns$). Of the suicide drivers, 83 (38%) had used alcohol at the time of the crash. Use of alcohol was connected to the time of day the crash took place ($\chi^2=49.11, df=2, p<.001$), 66% of alcohol suicides (55 drivers) were committed between 10 p.m. and 6 a.m.

**Time of suicide**
Most of the driver suicides were committed during the spring and summer months (March–August), 59% in the north and 56% in the south ($\chi^2=.774, df=1, ns$).

Driver suicides in northern Finland were committed either between 6 a.m. and 2 p.m. (52%) or between 10 p.m. and 6 a.m. (41%). In southern Finland, they were distributed evenly throughout the day ($\chi^2=8.27, df=2, p=.016$).

The day of the week did not differentiate between the two groups. The majority of driver suicides were committed between Monday and Thursday: 70% in the north and 61% in the south.

**DISCUSSION**
Results of this study showed that driver suicides in Finland had increased from 1.1% in 1974–1975 to 5.8% in 1984–1987. This may seem rather big, but there are 8 years, 1976–1983, for which the situation is not known. The increase might have happened steadily year by year, but unfortunately we don’t know if that is the case. It is known that having the availability of a means to commit suicide influences its use (14), so one explanation for the increase in driver suicides may be related to the increase in the number of cars. In 1974–1975, the number of passenger cars was about 960,000, and by 1984–1985 it was 1.5 million (15).

The second increase was from 5.8% in the 1980s to 8.4% in the 1990s. Since 1991, the number of driver suicides has stayed quite constant. During the years 1991-2006 the mean was 8.3%. The small increase in relative proportions is explained by the fact that the number of fatal motor vehicle accidents has been decreasing. This automatically increases the proportion of driver suicides of all fatalities, assuming that there is no change in absolute numbers of driver suicides. The number of all suicides in Finland has been decreasing since 1990. This has meant a small increase in relative proportions of driver suicides. In 2005 and 2006 those were, for the first time, slightly over 2% (2.21% and 2.17%).

Driver suicides have not been decreasing in the same way as all other suicides have been. Not only has there been a steady increase in the number of cars on the road (15), there has also been an increase in the kilometers being driven. In 1991 in Finland the automobile kilometers travelled totalled 39,170 million, which increased to 52,150 by the year 2006 (16).

The increase in driver suicides has been similar in northern and southern Finland. Also, the variables did not differ in the people who committed driver suicide. Even though the general suicide rate is higher in northern Finland, the rate of driver suicides per 100,000 inhabitants is similar in northern and southern Finland. This may be connected to traffic density. There is less traffic in the northern parts of the country (especially in
Lapland and Kainuu) and, as we know, driver suicides are typically collisions with heavy goods vehicles. Thus the opportunities to commit suicide by this means are rarer in northern Finland.

There seems to be some differences between driver suicides and suicides by other means in Finland. For example, the proportion of males is higher among driver suicides compared to all other suicides. For the last seven years (2001–2007), the proportion of all suicides committed by males varied from 73%–77% (5), while close to 90% of driver suicides were committed by males. This could be explained by the fact that males use more violent and at the same time more lethal methods than females (e.g., 14,17,18). Driver suicides were also typically committed by people younger than 35 years of age, while, for example, in 2005 and 2006, the proportions of this age group for all suicides were 26% and 25% (5).

Validity of classification of driver suicides
There are some questions concerning the validity of classification for driver suicides. First of all, why was the classification not based on the standard classification of death? The basic reason for this is that the forensic pathologist or coroner performing the autopsy and determining the cause of the death doesn't have as much information as the road accident investigation team. In Finland, medico-legal autopsies are performed on all traffic fatalities. At that point, the information may deal only with the external circumstances of the death, for example, that the victim was killed in a traffic accident. Without information about the victim’s background, it is impossible to determine whether or not the case was an intentional act or an accident. Also, Öhberg’s et al. study (9) showed this misclassification of driver suicides in the official statistics that is based on the death certificate. Of 84 suicide cases, only 37 (44%) were classified as suicides according to the official classification of death (9).

All of the case reports compiled by the road accident investigation teams were reviewed in the classification of the driver suicides. Each case report contained documents from all members of the investigation team. Marks on the road were investigated by the road specialist, the autopsy report as well as the physician's investigations gave information about illnesses or sudden attacks of illness as well as details about previous suicide attempts. The police member or psychologist member of the team interviewed victim’s relatives and gathered background information about the victim. Eye-witnesses were also questioned because they often gave important information about the course of the crash. Witnesses might have followed and observed the vehicle’s behaviour for several kilometres and could possibly tell if there was something unusual going on before the crash. Was the vehicle, for example, drifting between the lanes? How fast was it travelling? Witnesses might have seen the vehicle under investigation, for example, sharply turn or gradually drift towards the other vehicle.

We used 2 criteria in the classification of driver suicides. First was the course of the crash; the case had to look like an intentional act. Other possibilities (like falling asleep, attack of illness) that could explain the crash were considered carefully. And if there was
evidence that the crash was due to some other factor than the driver’s intent, the case was not classified as a suicide. In addition to intentionally wanting to crash, there had to be something in the driver’s background that supported her/his intention. Only those cases that fulfilled these 2 criteria at the same time were classified as driver suicides. Our aim was not to overestimate these cases, but to try to be as sure as one could be about the classification of driver suicides based on the material compiled by the road accident investigation teams. In addition, if there were questions about the classification, the case was discussed by all of the authors in order to unanimously decide whether or not to classify that case as a suicide.

Preventive measures
As stated in the introduction, one aim of this paper was to consider possible measures to prevent suicides committed by using a motor vehicle. The means of traffic safety measures are limited in preventing these cases. However, there are some means that might be useful, for example, technical devices in vehicles such as anti-collision radar (that automatically engages the brakes if an obstacle is detected). Another and a very effective way to prevent driver suicides that are caused by colliding with oncoming traffic is to separate the lanes on the highways, for example, by building a crash barrier between them. This solution would also counteract other head-on-collisions, which is a much bigger problem in traffic than suicides by driving.

The prevention of driver suicides should be based on the same principles as the general prevention of suicides. The majority of these suicide drivers had similar factors (for example, mental health problems) in their backgrounds that were connected to suicides in general, thus the same principles are also suitable in the prevention of these suicides. The most important measures are adequate treatment of depression and good quality mental health support services; both are important when it comes to recognizing when someone is suicidal and providing adequate treatment.

At a general level, driver suicides represent a small proportion of all suicides. In 2005–2006, there were 2,056 suicides in Finland (5). During the same years there were 45 driver suicides, which is 2% of all suicides committed in Finland. The proportion of driver suicides from all fatal motor vehicle accidents in 2005–2006 was a bit larger, around 9%–10%. As motor vehicle suicides usually are collisions and often involve other persons in contrast to other suicides, driver suicides affect a larger group of people than just the suicide victim and his/her relatives. Even though these suicides represent a small proportion of all suicides, preventing them would improve traffic safety.

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