Driver suicides

ANNAKATRI OHBERG, ANTTI PENTTILA and JOUKO LONNQVIST

Background To study driver suicides, all motor vehicle driver fatalities in Finland from 1987 to 1991 were analysed.

Method Cases were collected from all driver fatalities (n=1419), as those that accident investigation teams considered possible suicides (n=99). Drivers committing suicide classified according to ICD–9 by two forensic pathologists were selected as cases (n=84). Drivers of unintentional motor vehicle fatalities served as the control group.

Results While 5.9% of all driver fatalities were classified as suicides, the figure given in the official statistics was 2.6%. Driver suicides accounted for 1.2% of all suicides. Fifty per cent of driver suicides were committed by men aged between 15 and 34 years. The victims had often suffered from life-event stress, mental disorders and had alcohol misuse problems. The cases were usually head-on collisions between two vehicles with a large weight disparity.

Conclusions Misclassification of driver suicides does not significantly influence the total suicide rate. However, people who commit suicide by this method could often be recognised, and prevention of these events would improve traffic safety.

Non-fatal traffic accidents have sometimes been claimed to be unrecognised suicide attempts (Grossman *et al*, 1993), and single-car fatalities in particular may distinguish suicides (Phillips, 1977). The proportion of suicides in motor vehicle driver fatalities has been estimated to be less than 5% (Noyes, 1985).

The aim of this study was to examine the proportion of suicides among driver fatalities and the extent of under-recording resulting from any misclassification, and its effect on suicide rate. Additionally, features and background factors associated with driver suicides were analysed.

METHOD

The assumption that some driver fatalities are misclassified was studied by comparing findings based on data collected by accident investigation teams with the number of driver suicides reported in the official statistics. The study involved all motor vehicle driver fatalities in Finland between 1987 and 1991.

Accident investigation teams

Finnish traffic safety authorities and insurance companies have been maintaining accident investigation teams since 1968. Altogether, 13 centrally coordinated teams cover the whole country, one in each province and one in the city of Helsinki. The team consists of a police officer, a vehicle engineer, a road specialist, a physician, and other specialists if needed, such as a psychologist or a railway specialist. By using a standard format, the teams investigate all motor vehicle accidents involving the death of a driver or passenger. The team collects detailed information on all participants, vehicles, roads and circumstances to analyse their involvement in the accident (Hantula, 1992).

The police member summons the team to the site, and gathers information on the accident by interviewing the occupants and witnesses. He or she also collects information from police records and interviews relatives about the victim, his or her health and life events. The physician, usually a forensic pathologist, collects medical records of those involved. The vehicle engineer inspects the vehicles' technical condition, examines the marks left by the vehicles and carries out the reconstruction calculations with the road safety specialist. The road specialist examines the condition and geometric features of the road, sight distances, and attention is also paid to current circumstances.

The team produces a final report including a description of the course of events, the key occurrence defined as the last essential event (or events) occurring before an accident, and its consequences, and risk factors, and then makes safety proposals.

Present data

Data for this study came from files of the accident investigation teams and comprised all traffic fatalities in which the team considered driver's intention the probable or possible key occurrence in the accident (n=99). Passenger and pedestrian fatalities were excluded.

Background factors

In addition to the information on vehicles, driving conditions and the sequence of events in the accident, the present data included the victim's recent life events (death or loss of next of kin, divorce, problems with personal relationships, legal problems, difficulties with work, loss or change of job, moving, beginning of studies, loss of property, financial difficulties, change in health), presence of any mental disorder for which the victim had received treatment from a psychiatrist (detailed diagnoses were not available), physical diseases and history of problems with use of alcohol (informed by a relative/next of kin or stated in medical records), and probable state of mind at the time of accident if clearly unusual or deviant behaviour shortly before the accident was noticed. A previous suicide attempt, expression of suicidal thoughts, suicide notes, hopelessness or other clearly suicidal behavior, such as making preparations for death, demonstrating or rehearsing suicidal acts, were considered as showing an intention to die.

https://doi.org/10.1192/bjp.171.5.468 Published online by Cambridge University Press

Death certificate and autopsy findings

The official classification and cause of death and forensic toxicological findings of alcohol were recorded from the death certificate and autopsy report. Autopsy was performed in all of the cases. Relevant acute use of alcohol was defined here as blood alcohol concentration (BAC) of 0.05% (weight by weight) which is the legal limit for driving in Finland. The official investigation of death was always carried out separately and independently from the investigation team's survey.

Cases

Based on the information collected in the 99 cases considered possible or probable suicides by the teams, the manner of death (suicide, unintentional, undetermined) was assessed by two forensic pathologists according to ICD-9 (World Health Organization, 1978). In cases of disagreement, classification was agreed by common consent, and those cases finally classified as suicides were included in the study (n=84). The excluded 15 cases, involved 10 that were considered to be undetermined and five considered to be unintentional deaths.

Controls

A control driver for each case driver was randomly selected from all traffic fatalities in which the accident investigation team did not suspect suicide intention as the key occurrence of the accident. Similar data were collected for these drivers as for the cases. Drivers of motor vehicle fatalities that were considered certainly unintentional by one forensic pathologist (A.O.) became the control group. Controls were matched with the cases by age (±2.5 years), gender, marital status, occupation (five classes) and the time of the year (season) when the accident took place (±1.5 months).

Driver suicides in the official statistics

Over the study period, 37 driver fatalities were officially classified suicides. All of these deaths were also considered suicides in the present study. The cases included in the present study that had not been officially classified suicides (n=47) were compared with the official driver suicides.

Statistical methods

Cases were divided into age groups: 15–24, 25–34, 35–64 and 65+. The proportion of suicides among all driver fatalities and the proportion of driver suicides among all suicides in each age group were calculated. Suicide rate by vehicular crash for each age group was calculated by relating number of suicides to the mean same-age population per 100 000 inhabitants between 1987 and 1991. For the proportions and the rates, 95% confidence intervals based on the Poisson distribution were calculated (Gardner & Altman, 1992). The measure of association between driver suicides and variables of interest was the McNemar's test for matched pair analysis. The cases that had not been officially classified suicides were compared with the official driver suicides by using Fisher's exact four-fold table χ^2 test (Campbell & Machin, 1992).

Table 1 The proportion (95% CI) of driver suicides of all driver fatalities by age and gender in Finland from 1987 to 1991

Age group	Men n/n	% (95% CI)	Women n/n	% (95% CI)	Total n/n	% (95% CI)
15–24	25/397	6.3 (4.1–9.2)	4/64	6.3 (1.7–15.2)	29/461	6.3 (4.3–8.9)
25–34	17/211	8.1 (4.8–12.6)	4/45	8.9 (2.5–21.2)	21/256	8.2 (5.2–12.3)
35–64	32/407	7.9 (5.4–10.9)	2/95	2.1 (0.3–7.4)	33/502	6.6 (4.6–9.1)
65+	1/187	0.5 (0.02–3.0)	0/13	0	1/200	0.5 (0.02–2.8)
Total 15+	74/1202	6.2 (4.9–7.7)	10/217	4.6 (2.2–8.3)	84/1419	5.9 (4.8–7.3)

Table 2 Mean (95% CI) annual driver suicide rate and other driver fatality rate per 100 000 population for various age groups in Finland in 1987–1991

Age group	Suicide rate by vehicular crash	Other driver fatality rate
15–24	0.9 (0.18–1.6)	12.9 (10.2–15.6)
25–34	0.52 (0.01–1.0)	6.13 (4.4–7.9)
35–64	0.37 (0.09–0.64)	4.9 (3.9–5.9)
65+	<0.1 (0–0.45)	6.1 (4.2–8.0)
Total 15+	0.42 (0.22–0.63)	6.7 (5.9–7.5)

RESULTS

Between 1987 and 1991, 1419 motor vehicle driver fatalities took place in Finland (Central Statistical Office of Finland, 1989–1992). Of these victims, 99 were considered probable or possible suicides by the accident investigation teams, and 84 were classified here as suicides. Annually, on average, 17 such cases (range 13–21) took place. Seventy-four (88%) of the victims were male and 10 (12%) female. These 84 cases accounted for 5.9% (95% CI 4.8–7.3%) of all drivers who died over the study period, the proportion being highest for 25- to 34-year-olds (Table 1). Suicide rate by vehicular crash as well as other driver fatality rate was highest for the young, aged 15–24 (Table 2). Accordingly, the proportion of suicides by this method declined by age (Table 3).

The official classification of death for the 84 cases involved 37 (44%) suicides, 27 (32%) unintentional and 20 (24%) undetermined deaths, suggesting that 2.6% (95% CI 1.8–3.6%) of drivers who had died in motor vehicle fatalities had committed suicide. These officially reported cases accounted for only 0.5% (CI 95% 0.35–0.68%) of all suicides over the study period. All driver fatalities over the study period that were officially classified suicides were also considered suicides here. Among the study cases that were not officially classified suicides, 15- to 24-year-olds and drivers under the influence of alcohol were less frequent than in the official driver suicides. Otherwise no significant differences between the two groups were apparent (Table 4).

https://doi.org/10.1192/bjp.171.5.468 Published online by Cambridge University Press

Table 3 The proportion (95% CI) of driver suicides of all suicides by age and gender in Finland in 1987–1991

Age group	Men n/n	% (95% CI)	Women n/n	% (95% CI)	Total n/n	% (95% CI)
15–24	25/750	3.3 (2.2–4.9)	4/130	3.1 (0.8–7.7)	29/880	3.3 (2.2–4.7)
25–34	17/1170	1.5 (0.7–1.5)	4/200	2.0 (0.5–5.50)	21/1370	1.5 (0.9–2.3)
35–64	32/2992	1.1 (0.7–1.5)	2/875	0.23 (0.03–0.8)	33/3867	0.9 (0.6–1.2)
65+	1/745	0.13 (0.01–0.8)	0/304	0	1/1049	0.1 (0.01–0.5)
Total 15+	74/5657	1.3 (1.0–1.6)	10/1509	0.6 (0.3–1.2)	84/7166	1.2 (0.9–1.4)

Table 4 Study cases not officially classified suicides (A) compared with officially recorded driver suicides (B)

		A n=47 %	B n=37 %	χ^2	P
Gender:	men/women	87/13	89/11	0.004	1
Age group:	15–24	23	49	5.84	0.029
	25–34	26	24	0.02	1
	35–64	49	27	4.17	0.0689
	65+	2.1	0	0.02	1
Passenger car		91	92	0.11	1
Single-car crash		13	19	0.60	0.635
Head-on collision		83	81	0.05	1
Large weight disparity[1]		81	78	0.08	0.990
Passengers involved		2.1	5.4	0.05	0.820
Life event stress		81	78	0.06	1
Mental disorders		45	41	0.53	0.620
Previous suicide attempt		8.5	19	0.92	0.338
Problems with alcohol		15	11	0.14	0.717
BAC ⩾0.05% (w/w)		19	46	6.63	0.019
Confused state of mind		19	46	1.04	0.457
Physical illness		11	5.4	0.33	0.573

1. Collision between a passenger car/van (less than 3500 kg) and a truck (over 3500 kg).
BAC, blood alcohol concentration.

Vehicles and circumstances

The majority of the suicide victims (92%) were driving a passenger car (registered for a maximum of eight passengers). The head-on collisions between two vehicles with a large weight disparity (a passenger car/van less than 3500 kg and a truck over 3500 kg) were evidently more common than single-car fatalities comprising a collision with a stationary object or driving off the road. There was in only two of the 84 cases a passenger in the victim's car; in both, two young men had decided to commit suicide together. The driver or a passenger of the participant vehicle died in 3.6% of the cases (Table 5).

Background factors

Life event stress and mental disorders were associated with 75% and over 40% of the cases, respectively; the difference from control drivers being highly significant. Moreover, 13% of the case drivers but none of the controls had previously attempted suicide. A history of problems with the use of alcohol was slightly although not significantly more common among the case drivers than the controls. Acute use of alcohol was frequently found in both groups. Moreover, no significant differences between the two groups were noticed regarding confused or angry state of mind at the time of the accident, or in physical illness (Table 5).

DISCUSSION

Suicides among driver fatalities

To our knowledge, this is the first nationwide controlled study of driver suicides. The results imply that at least 5.9% of motor vehicle driver fatalities over the five-year period were suicides, a frequency of 32 per million driving licences. This proportion is significantly greater than the 2.6% given in the official statistics. Our findings suggest that less than half (44%) of these suicides are recorded. An obvious explanation for this difference is much more thorough information gathered by the investigation teams than by officers in regular investigation of death. Therefore, in the present study, more driver fatalities met the ICD–9 criteria for suicide. According to several variables, these 'additional' suicides resembled the officially classified driver suicides, but involved more middle-aged and sober drivers.

The present figure for driver suicides is higher than those reported from Baltimore (1.7%; Schmidt *et al*, 1977), the UK (2.7%; Jenkins & Sainsbury, 1980), and Norway (2.3%; Morild, 1994), which may be due to higher total suicide mortality in Finland than in those countries. Our finding is consistent with a previous study from Finland (also based on data collected by the accident investigation teams), which suggested an increasing trend in driver suicides between the middle of the 1970s (1.1%) and the mid-1980s (6.8%) (Keskinen & Pasanen, 1990). The proportional increase in driver suicides may, however, be partly explained by the declining motor vehicle fatality rate over the same period, rather than simply by an increased number of suicides (Central Statistical Office of Finland, 1992).

Driver suicides among all suicides

The annual suicide rate in Finland over the five-year period studied was on average 28.9 per 100 000 population, and the figure for 15- to 34-year-olds was 31.4 (Central Statistical Office of Finland, 1989–1992). According to our results, vehicular crashes

https://doi.org/10.1192/bjp.171.5.468 Published online by Cambridge University Press

Table 5 Driver suicides compared with control fatalities

	Suicides $n=84$ %	Controls $n=84$ %	χ^2	P
Passenger car	92	80	4.17	0.041
Single-car crash	16	29	3.27	0.071
Head-on collision	82	36	22.0	<0.0001
Large weight disparity[1]	80	18	33.0	<0.0001
Passengers involved	2.4	44	31.4	<0.0001
Driver or passenger of the other vehicle died	3.6	61	42.7	<0.0001
Life event stress	76	25	35.3	<0.0001
Mental disorders	43	1.2	31.2	<0.0001
Previous suicide attempt	13	0	9.1	0.003
Problems with alcohol	16	8.3	1.8	0.180
BAC ≥0.05% (w/w)	35	24	1.65	0.199
Confused state of mind	26	17	1.78	0.182
Physical illness	8.3	7.1	0.08	0.782

1. Collision between a passenger car/van (less than 3500 kg) and a truck (over 3500 kg).
BAC, blood alcohol concentration.

account for only 1.2% of all suicides and 2.2% of those committed by the young (aged 15–34). Our figures are twice those presented in the official statistics, 0.5 and 1.2%, respectively, but not large enough to affect significantly either the age-related or the total suicide rate.

Misclassification of driver suicides

Investigation of all motor vehicle fatalities by using a standard format in Finland offers unique data covering the whole country. Some suicides, however, may have been excluded from the study if the investigation team did not suspect intention in the accident. In its final report, the team suggested several possibilities for the key occurrence in the accident, with driver's intention included in the list (and in the study) even if it was not the most probable alternative. On the other hand, in our choosing controls from fatalities in which intention was not listed, 12 out of 99 cases had to be abandoned because of insufficient information to consider them certainly unintentional. However, none of these could have been classified as suicide according to ICD–9. It is thus very unlikely that the number of unidentified suicides is large enough to invalidate our conclusions.

Circumstances in driver suicides

Our findings do not support the picture of single-car accidents as typical driver suicides (Phillips 1977; Schmidt *et al*, 1977; Jenkins & Sainsbury, 1980; Connolly *et al*, 1995; Peck & Warner, 1995). Cushman *et al* (1990) reported that drivers with psychiatric diagnoses and depression did not more frequently have single-car accidents than did control cases, although suicide attempts and suicidal ideas were several times more common in those causing motor vehicle accidents than among the general population. The most common event in our cases was a head-on collision between a passenger car and a substantially heavier vehicle, usually a truck. Presumably, these suicide victims did not intend to harm anyone else, but in almost 4% of the cases the crash lead to the death of some other person involved in the accident. As a result of the collision, the truck driver usually lost control of his vehicle. In one case, this resulted in the death of the truck driver, and in two other cases, a third vehicle was hit by the swerving and falling truck.

Mental disorders and life events

In the present study, most victims (76%) had experienced life event stress and 43% had received treatment for mental disorders, significantly higher proportions than among the control fatalities. Our findings thus suggest similar background factors accompanying driver suicides and suicide in general. In a previous psychological autopsy-based suicide study from Finland, life event stress was reported in 80% of suicide victims (Heikkinen *et al*, 1994) and 93% had suffered from mental disorders (Henriksson *et al*, 1993). The lower prevalence of mental disorders among the present suicides may be due to the fact that only those who had received treatment could have been recorded. On the other hand, previous suicide attempts were less prevalent (13%) in the suicides of the present study than reported in the Finnish suicides (47%) (Lönngvist *et al*, 1992). Driver suicides may, especially in the presence of alcohol, involve acute suicidality and impulsive acts rather than a long-standing suicide process.

Alcohol

Tsuang *et al* (1985) reviewed the literature of psychopathology and personality variables in traffic accidents and concluded that alcoholism, although frequently a correlate of various psychological and psychiatric conditions, is clearly the most important determinant of traffic accidents. The present results imply that history of problems with use of alcohol was even more common (although not significantly) in the intentional crashes (16%) than in the control fatalities (8%). In the earlier suicide study from Finland, alcohol dependence or misuse was found in 43% of suicide victims (Henriksson *et al*, 1993), and 36% of all suicides were committed under the influence of alcohol (Ohberg *et al*, 1996). Consistently, acute use of alcohol was found in 35% of the suicides in the present study, but not surprisingly, alcohol was also prevalent (24%) in the unintentional fatalities. Use of alcohol, either long-term dependence or acute influence, is evidently a risk for all kind of traffic fatalities. This has been emphasised by the European authorities, who have recommended against issuing a driving licence to a person who is dependent on alcohol (European Commission, 1991).

In conclusion, our findings suggest that over half of driver suicides are misclassified. However, because of the a low number of these cases in relation to all suicides, underrecording does not significantly affect the reported suicide rate. Driver suicides frequently involved young men driving alone and the accident was usually a head-on collision between two vehicles with a large weight disparity. The victims had often experienced stressful life events, suffered from mental disorders, had long-term problems with the use of alcohol and were currently under the influence of alcohol.

https://doi.org/10.1192/bjp.171.5.468 Published online by Cambridge University Press

Individuals exhibiting self-destructive behaviour are potentially dangerous for other road-users, which offers a challenge to authorities involved both with traffic safety and suicide prevention. General traffic safety measures are not likely to reduce intentional crashes; therefore, recognition and prevention focused on young men at risk would be more beneficial. Prevention of these suicides may not noticeably reduce the suicide rate, but its effect on traffic safety would be important.

ACKNOWLEDGEMENT

The authors gratefully acknowledge Lasse Hantula, Road Safety Manager, for providing data.

CLINICAL IMPLICATIONS

- While 5.9% of motor vehicle driver fatalities were found to be suicides, the proportion given in the official statistics was 2.6%. The under-recording does not significantly affect the reported suicide rate.
- Fifty per cent of driver suicides were committed by young men aged 15–34. The victims had often suffered from life event stress, mental disorders and had problems with the use of alcohol.
- Driver suicides were usually head-on collisions between two vehicles with a large weight disparity. Preventive measures may not significantly reduce suicide mortality, but the effect on traffic safety would be important.

LIMITATIONS

- Some suicides may have been excluded from the study because of missing or concealed information.
- Detailed diagnoses of mental disorders for the cases could not be assessed.

ANNAKATRI OHBERG, MD, ANTTI PENTTILA, MD, Department of Forensic Medicine, PO Box 40, 00014 University of Helsinki; JOUKO LONNQVIST, MD, Department of Mental Health and Alcohol Research, National Public Health Institute, Mannerheimintie 166, 00300 Helsinki, Finland

Correspondence: Dr Annakatri Ohberg, Depratment of Forensic Medicine, PO Box 40, 00014 University of Helsinki, Finland. Fax: +358-9-19127518; e-mail: annakatri.ohberg@helsinki.fi

(First received 12 November 1996, final revision 7 May 1997, accepted 12 May 1997)

REFERENCES

Central Statistical Office of Finland (1989–1992) *Causes of Death 1987–1991*, Helsinki: State Printing Office.

—— (1992) Road traffic accidents and persons killed and injured, 1960–1991. In *Statistical Yearbook of Finland 1992*, p. 243. Helsinki: State Printing Office.

Campbell, M. J. & Machin, D. (1992) Paired-comparisons in contingency tables, McNemar's test, the chi-square test. In *Medical Statistics: A Commonsense Approach* (eds M. J. Campbell & D. Machin), pp. 72–75, 139–141. Chichester: Wiley.

Connolly, J. F., Cullen, A. & McTigue, O. (1995) Single road traffic deaths – accident or suicide? *Crisis*, **16**, 85–89.

Cushman, L. A., Good, R. G. & States, J. D. (1990) Psychiatric disorders and motor vehicle accidents. *Psychological Reports*, **67**, 483–489.

European Commission (1991) Directive 91/439, appendix III: Minimum requirements of physical and mental health for driving a motor vehicle. *Official Journal of the European Communities* L 237/20 24.8.1991.

Gardner, M. J. & Altman, D. G. (1992) Calculating confidence intervals for proportions and their differences. In *Statistics with Confidence – Confidence Intervals and Statistical Guidelines* (eds M. J. Gardner & D. G. Altman), pp. 28–33. London: BMJ.

Grossman, D. C., Soderberg, R. & Rivara, F. P. (1993) Prior injury and motor vehicle crash as risk factors for youth suicide. *Epidemiology*, **4**, 115–119.

Hantula, L. (1992) Road accident investigation teams in Finland. In *Road Accident Investigation Teams: Report on Case Investigations in Finland*, pp. 4–5. Finland: F. G. Lönnberg.

Heikkinen, M., Aro, H. & Lönnqvist, J. (1994) Recent life events, social support and suicide. *Acta Psychiatrica Scandinavica*, **377**(suppl.), 65–72.

Henriksson, M. M., Aro, H. M., Marttunen, M. J., *et al* (1993) Mental disorders and comorbidity in suicide. *American Journal of Psychiatry*, **150**, 935–940.

Jenkins, J. & Sainsbury, P. (1980) Single-car road deaths – disguised suicides? *British Medical Journal*, **281**, 1041.

Keskinen, E. & Pasanen, A. (1980) Self-destruction in motor vehicle accidents: the proportion of suicides and negligent drivers in fatal motor vehicle accidents in 1974–75 and 1984–85 in Finland. *Traffic Medicine*, **18**, 179–185.

Lönnqvist, J., Aro, H., Marttunen, M., *et al* (1993) Itsetuhokäyttäytyminen. *Itsemurhat Suomessa 1987 – projekti* (Suicidal behaviour. In *Suicides in Finland 1987 – project*) (eds J. Lönnqvist, H. Aor & M. Marttunen), pp. 37–44. Gummerus, Finland: STAKES Studies 25.

Morild, I. (1994) Traffic deaths in western Norway. A study from the county of Hordaland 1986–1990. *Forensic Science International*, **64**, 9–20.

Noyes, R. (1985) Motor vehicle accidents related to psychiatric impairment. *Psychosomatics*, **26**, 569–580.

Ohberg, A., Vuori, E., Ojanperä I., *et al* (1996) Alcohol and drugs in suicides. *British Journal of Psychiatry*, **169**, 75–80.

Peck, D. L. & Warner, K. (1995) Accident or suicide? Single-vehicle car accidents and the intent hypothesis. *Adolescence*, **30**, 463–472.

Phillips, D. P. (1977) Motor vehicle fatalities increase just after published suicide stories. *Science*, **196**, 1464–1465.

Schmidt, C. W., Shaffer, J. W., Zlotowitz, H. I., *et al* (1977) Suicide by vehicular crash. *American Journal of Psychiatry*, **134**, 175–178.

Tsuang, M. T., Boor, M. & Fleming, J. A. (1985) Psychiatric aspects of traffic accidents. *American Journal of Psychiatry*, **142**, 538–546.

World Health Organization (1978) *The Ninth Revision of the International Classification of Diseases, Injuries and Causes of Death* (ICD–9). WHO: Geneva.

https://doi.org/10.1192/bjp.171.5.468 Published online by Cambridge University Press