Alcohol in Fatal Road Crashes in Ireland 2003 to 2005

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Contents

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Alcohol in Fatal Road Crashes in Ireland 2003 to 2005

Executive Summary

Introduction

Alcohol has been recognised as a major factor in road crashes. However, no official data are provided in Ireland to indicate what proportion of the deaths on Irish roads has alcohol as a contributory factor. Irish drivers do drink alcohol and drive. A study on fatal crashes in 2003 showed that over a third of fatal crashes were alcohol related. The aim of this study was to build on the data for 2003 and provide information on the extent of the relationship between drink driving and fatal crashes in 2004 and 2005.

Methods

The National Traffic Bureau of the Garda Síochána gather data on all fatal road crashes and individual paper files are compiled and kept on each fatal crash. The files were examined in the offices of the National Traffic Bureau by two of the authors.

The legal limit for alcohol in blood samples for driving in Ireland is 80 mg/100ml, for urine it is 107mg/100ml. The legal limit for breath testing for alcohol undertaken by the Garda Síochána is 35ug/100ml of breath. International research indicates that a person's ability to drive is effected by alcohol if there is a level of alcohol in the blood of 20mg/100 ml or greater. In this study a crash was considered to be alcohol related if the blood alcohol concentration (BAC) was ≥20mg/100ml (or the equivalent in urine and breath tests) in a driver. Whether alcohol was considered to be a contributing factor in a pedestrian death was based on the circumstances of the crash and their BAC. The fact that a crash may be alcohol related does not indicate that other factors were not also relevant (e.g. speeding).

Results

There were 995 fatal crashes from 2003 to 2005 killing 1,105 persons. The results of the analysis shall be described under two separate headings. Firstly, there will be a profile of the 995 crashes and a description of the role of alcohol in these crashes. This will be followed by a profile of those killed in the crashes and their alcohol levels.

Profile of the crashes

- 559 (56.2%) crashes were single vehicle crashes.
- Over half (611, 55.3%) of those killed in all crashes were drivers (this includes those driving motor cycles), 249 (22.5%) were passengers, 205 (18.6%) were pedestrians, 34 (3.1%) were cyclists, with 6 (0.5%) classified as other.

Crashes where alcohol was a factor

- Alcohol was a factor in 309 (31.0%) fatal crashes and not a factor in 346 (34.8%). An alcohol test was not available or not done for 340 (34.2%) crashes.
- There were 110 (36.5%) alcohol related fatal crashes in 2003, 95 (28.4%) in 2004 and 104 (28.9%) in 2005. Differences between years were not statistically significant.
- Alcohol related crashes were twice as likely to occur on Saturdays or Sundays than other days of the week (Odds ratio: 2.1; CI:1.6-2.8, P<0.00001).
- Almost two-thirds (199, 64.4%) of alcohol related crashes occur between 22.00 hours on Friday night and 08.00 hours on Monday mornings and are almost three times more likely at these times than other times of the week (Odds ratio: 2.7; CI:2.0-3.6, P<0.00001).

Profile of those killed and their alcohol levels

Drivers

- 222 (36.3%) of killed drivers had BACs ≥ 20 mg/100ml.
- 187 (30.6%) of the killed drivers were over the legal limit.
- Males were more likely than females to be over the legal limit.
- The mean or average BAC level was 88.9mg/100ml.
- The mean BAC for males was 95.6mg/100ml and for females was 56.0 mg/100ml.
- Age specific rates per 100,000 population for those with BAC levels ≥ 20 mg/100ml and those with BAC levels >80mg/100ml (the legal limit for driving) were calculated. The rates in both categories were highest for those aged 20 to 34 years and lowest for those aged 60 to 69 years.
- Motorcycle drivers were no more likely or less likely than other killed drivers to be over the legal limit.

Pedestrians

- 205 (18.6%) of those killed in 2003-2005 were pedestrians, of whom 129 (62.9%) were male and 76 (37.1%) were female. The mean age was 49.1 years.
- Pedestrian alcohol was considered to be a contributory factor in 50 (24.2%) of the fatal pedestrian road deaths or 4.5% of all fatal road deaths. Forty one (82.0%) occurred between 8 pm and 8 am.
- The mean BAC level was 113.3 mg/100ml (S.D. 147.7). For adults (aged 18 years and over), males were more likely to have tested positive for alcohol than females.
- Where pedestrians own alcohol was a factor in the pedestrian death, over half (28, 56%) were aged 40 years and over.
- More than 1 in 10 pedestrians had a blood alcohol concentration in excess of 240mg/100ml.

Passengers

- 46 (18.5%) of passengers had BACs > 80mg/100ml.
- The mean BAC was 83.1mg/100ml.
- Male passengers were significantly more likely to be killed than female passengers in a crash where driver alcohol was a factor. Fifty one (36.1%) of the male passengers were killed in such crashes.
- In the age group "15-24", which had the highest mortality rate, driver alcohol was no more or no less likely to be a factor in the crash.

Conclusions

This study has provided a national picture of the role of alcohol in fatal road crashes. This study has shown that alcohol plays a major part in fatal road crashes with 31% of fatal road crashes being alcohol related in 2003-2005 inclusive. This figure is high when compared to Australia and Finland where alcohol is a factor in 25% of fatal crashes, particularly given that these results are at best an under-estimate, as approximately one third of the blood alcohol levels were either not done or not available for analysis. It should also be noted that this study was carried out prior to the introduction of random breath testing which has had a dramatic and sustained impact on reducing road deaths. Male drivers, particularly those aged 20-34, were most likely to be killed whilst under the influence of alcohol. There is ample evidence that the drink-driving policies that are going to have an impact in reducing drinking and driving fatalities are those that lower blood alcohol concentrations, random breath testing and the graduated licensing system. Therefore, a maximum blood alcohol concentration limit of 50mg/100ml should be introduced in Ireland without delay with the eventual introduction of a lower limit of 20mg/100ml. Although the introduction of the random breath testing has had a positive impact in reducing road traffic accidents, to continue to be effective, the public must be continually informed about random breath testing together with highly visible enforcement. Furthermore, the introduction of a graduated licensing system with a zero blood alcohol level for drivers whilst learning and during their first two years of holding a drivers license, as recommended by the Road Safety Authority should have a positive impact among the drink-driving deaths among our younger drivers.

Ireland has a very serious problem with alcohol consumption. The more a population consumes the greater the harm that population suffers. The high level of alcohol related road crashes are just one of the manifestations of that harm. The level of harm can be reduced if the recommendations of the Strategic Task Force on Alcohol are implemented and we reduce our overall level of consumption and our pattern of binge drinking.

Introduction

Alcohol has been recognised as a major factor in road crashes. However, no official data are provided in Ireland to indicate what proportion of deaths on Irish roads has alcohol as a contributory factor. Irish drivers do drink alcohol and drive. During 2003, in 57.1% of the samples of blood or urine taken from drivers on behalf of An Garda Síochána, the alcohol level was twice the legal limit[1]. The first national study on drinking and driving in Ireland**,** *Alcohol in fatal road crash deaths in Ireland in 2003* [2] was published in 2006. This study showed that alcohol was a factor in over a third of all fatal crashes. The methodology used in that report was repeated to build on the data from 2003 and provide information on the role alcohol played in fatal crashes in 2004 and 2005.

Methods

The National Traffic Bureau of An Garda Síochána gather data on all fatal road crashes and individual paper files are compiled and kept on each fatal crash. The data include initial data from the scene of the crash. Further information from the Garda Síochána investigations are added to the file including witness statements, technical evidence on the vehicles involved and reports from the courts if there is a case taken. Also included in the files are reports from coroners and from pathologists which may or may not contain test results on the presence or absence of alcohol and drugs in blood and urine of the deceased. If available, blood and urine tests taken by the Garda Síochána on drivers not killed in these crashes are also documented in the files.

Permission was sought and received from the Garda Commissioner to access all the fatal road crash files. As it takes some considerable time for the files to be completed it was considered at the time of field work for this study that 2004 and 2005 were the latest years where sufficient data were available in the files to complete the study. The files were examined in the offices of the National Traffic Bureau by two of the authors. Data recorded from the files included day, date and time of crash, number of vehicles involved, number killed, circumstances of the crash, biographical information on the deceased and data on alcohol tests done as part of the post-mortems or Gardaí investigations. The anatomical site where the blood samples were taken for blood alcohol concentrations (BACs) was not collected as it was not recorded in the files in the vast majority of cases. Based on the information in the files the authors were able to attribute the major responsibility for a crash in most cases to one party (e.g. one of the drivers, a pedestrian, etc). The names or addresses of any person mentioned in the files were not recorded.

The legal limit for alcohol in blood samples for driving in Ireland is 80 mg/100ml, for urine it is 107mg/100ml. The legal limit for breath testing for alcohol undertaken by the Garda Síochána in Ireland is 35ug/100ml of breath. International research indicates that a persons ability to drive is effected by alcohol if there is a level of alcohol in the blood of 20mg/100 ml or greater [3,4,5]. In this study a crash was considered to be alcohol related if the blood alcohol concentration (BAC) was 20mg/100ml or greater (or the equivalent in urine and breath tests) in a driver. Whether alcohol was considered to be a contributing factor in a pedestrian death was based on their circumstances of the crash and their BAC. The fact that a crash may be alcohol related does not indicate that other factors were not also relevant (e.g. speeding).

In several files, witness statements indicated that a driver involved in a fatal crash had consumed significant amounts of alcohol prior to driving. These crashes were not included in those considered to be alcohol related unless there were blood, urine or breath tests available as outlined above. However, in cases where there was a conviction for refusal to take a test, such cases were considered alcohol related.

The data collected were analysed using JMP and EPI-info, statistical software packages. Age specific population rates were calculated using denominator data for 2003, 2004 and 2005 in the Public Health Information System (PHIS v10). The data collected in the previous study for 2003 [2] was reanalyzed with the data for 2004 and 2005. Where appropriate Standard Deviations (SD) and confidence intervals (CI) are shown.

Ethical approval was given by the Research Ethics Committee in the Health Service Executive (Dublin North East).

Results

There were 995 fatal crashes from 2003 to 2005 killing 1,105 persons. The results of the analysis shall be described under two separate headings. Firstly, there will be a profile of the 995 crashes and a description of the role of alcohol in these crashes. This will be followed by a profile of those killed in the crashes and their alcohol levels.

Profile of the crashes and the role of alcohol

Table 1 outlines the number of vehicles and the number killed in the 995 fatal car crashes. As seen in the table, 559 (56.2%) of the crashes were single vehicle crashes.

Table 1. The number of vehicles involved in fatal crashes and the number killed by number of vehicles involved in fatal crashes 2003 to 2005

No. of vehicles involved	No. of crashes	One person killed in crash	Two persons killed in crash	Three or more persons killed in crash	Total Killed
One	559	531	21	7	596
Two	382	335	39	8	441
Three	46	39	6	1	54
Four	6	5	1	0	7
Five	1	0	0	1	3
Six	1	0	0	1	4
Total	995	910	67	18	1,105

Table 2 outlines the status of persons killed in the crashes. Over half (611, 55.3%) of those killed were drivers.

Table 2. Status of the deceased

Status of the deceased	Total	
	No.	%
Driver*	611	55.3
Passenger	249	22.5
Pedestrian	205	18.6
Cyclist	34	3.1
Unknown/other	6	0.5
Total	1,105	100

**Includes drivers of motor cycles*

Crashes where alcohol was a factor

Alcohol was a factor in 309 (31.0%) of fatal crashes and not a factor in 346 (34.8%) as summarised in Table 3. In 2003, alcohol was a factor in 110 out of 301 (36.5%) crashes, in 2004 alcohol was a factor in 95 out of 334 (28.4%) crashes and in 2005 alcohol was a factor in 104 crashes out of 360 (28.9%) crashes. Differences between the years were not statistically significant.

Table 3. The role of alcohol in fatal road crashes

Alcohol in fatal road crashes	2003		2004		2005		Total	
	No.	%	No.	%	No.	%	No.	%
Alcohol not a factor	91	30.2	139	41.6	116	32.2	346	34.8
Alcohol test not available/not done	100	33.2	100	29.9	140	38.9	340	34.2
Driver alcohol	86	28.6	82	24.6	86	23.9	254	25.5
Pedestrian alcohol	22	7.3	7	2.1	15	4.2	44	4.4
Pedestrian and Driver alcohol	2	0.7	3	1.0	2	1.0	7	0.7
Other alcohol	0	0	3	1.0	1	0.3	4	0.4
Total	301	100	334	100	360	100	995	100

Table 4 outlines the number of drivers and pedestrians who were tested positive for alcohol (BAC ≥20 mg/100ml or equivalent levels in urine or breath samples) or were above the drink driving legal limit in the 309 alcohol related fatal crashes. As seen in the table, in 222 (71.8%) crashes a driver was above the legal limit, of these 187 (84.2%) were killed and 35 (15.8%) were not killed.

Table 4. Drivers and pedestrians positive for alcohol* and with levels of alcohol above the legal limit in the 309 alcohol related crashes 2003 to 2005

	Blood	Urine	Breath	Refused	Total
	No.	No.	No.	No.	No.
Killed drivers					
*Alcohol positive but below legal limit	34	1	-	-	35
Alcohol level above legal limit	182	5	-	-	187
Sub-Total	*216*	*6*	-	-	*222*
Drivers not killed					
Refused test	-	-	-	4	4
*Alcohol positive but below legal limit	2	-	3	-	5
Alcohol level above legal limit	18	4	13	-	35
Sub-Total	*20*	*4*	*16*	*4*	*44*
Killed Pedestrians					
*Alcohol positive but below legal limit	4	-	-	-	4
Alcohol level above legal limit	45	2	-	-	47
Sub-Total	*49*	*2*	-	-	*51*
Killed Cyclists					
*Alcohol positive but below legal limit	1	-	-	-	1
Alcohol level above legal limit	3	-	-	-	3
Sub-Total	*4*	-	-	-	*4*
Total	**289**	**12**	**16**	**4**	**321****

*Alcohol positive = Where BAC is ≥20 mg/100ml or equivalent level in urine or breath samples. **In 7 of the 309 crashes, alcohol was a factor for both drivers and pedestrians. In 1 of the 309 crashes alcohol was a factor for both driver and cyclist. In 4 of the 309 crashes, alcohol was a factor for both killed and not killed drivers.

Of the 266 drivers whose alcohol was a contributory factor, 238 (89.5%) were male and 28 (10.5%) were female. Of the 995 crashes, 218 (21.9%) were single vehicle, single occupant crashes which involved no other parties (e.g. no pedestrians or no passengers) other than the driver. In 116 (53.2%) of these, driver alcohol was a factor, with 104 (89.7%) being male.

Alcohol related crashes were twice as likely to occur on Saturdays or Sundays than other days of the week (Odds ratio: 2.1; CI:1.6-2.8, $P<0.00001$). Almost two-thirds (199, 64.4%) of alcohol related crashes occur between 22.00 hours on Friday night and 08.00 hours on Monday mornings and are almost three times more likely at these times than other times of the week (Odds ratio: 2.7; CI:2.0-3.6, $P<0.00001$). Alcohol related crashes were most common late at night and early in the morning.

Month, day and time of crashes

Figure 1 outlines the month of occurrence of alcohol related fatal road crashes. The months with the lowest fatalities were January and April. The months with the highest fatalities were February and May.

Figure 1. Month of alcohol related fatal crashes 2003 to 2005

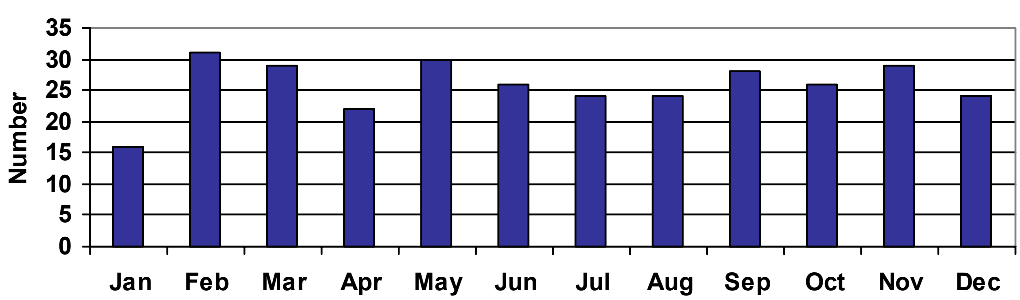


Figure 2 outlines the month of occurrence of non alcohol related fatal road crashes. The months with the lowest fatalities were March, April and September. The months with the highest fatalities were July and December.

Figure 2. Month of non alcohol related fatal crashes 2003 to 2005

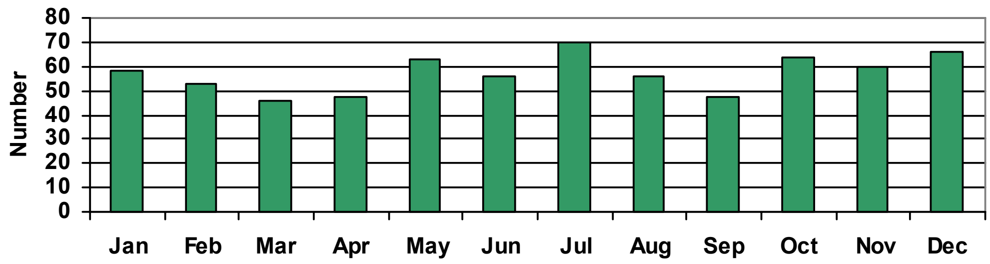
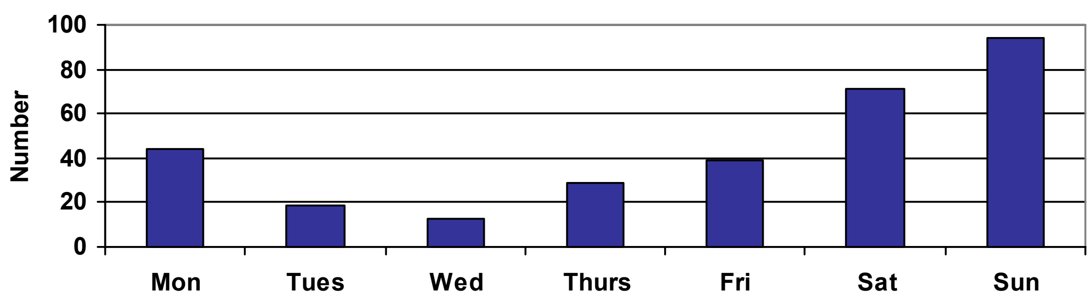


Figure 3 outlines the day of occurrence of alcohol related fatal road crashes. As seen the number of crashes rise from Thursday and peaks on Sunday. Of the 44 crashes that occurred on Monday, 26 (59.1%) occurred before 8AM.

Figure 3. Day of alcohol related fatal crashes 2003 to 2005



Alcohol related crashes are twice as likely to occur on Saturdays or Sundays than other days of the week (Odds ratio: 2.1; CI:1.6-2.8, P<0.00001).

Figure 4 outlines the day of occurrence of non alcohol related fatal road crashes. Most crashes occur on Friday, Saturday and Sunday. Of the 80 crashes that occurred on Monday, 26 (32.5%) occurred before 8AM.

Figure 4. Day of non alcohol related fatal crashes 2003 to 2005

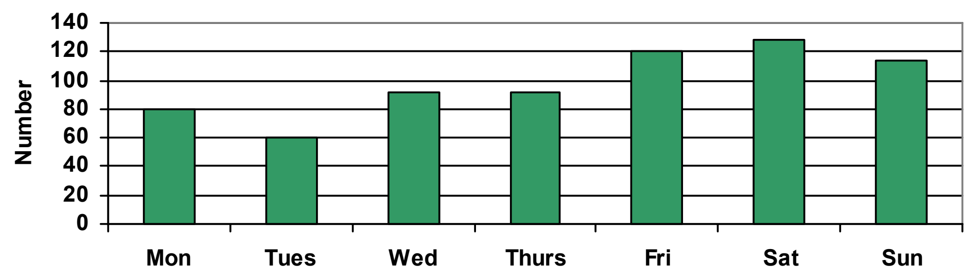
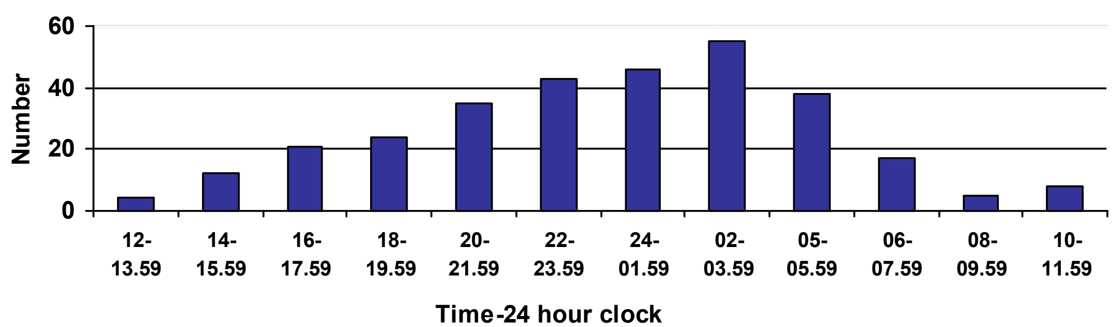


Figure 5 outlines the time of day of occurrence of alcohol related fatal road crashes. As seen alcohol related crashes were commonest late at night and early in the morning. Fifty-five (17.9%) of these crashes occurred in mornings between 04.00 and 08.00

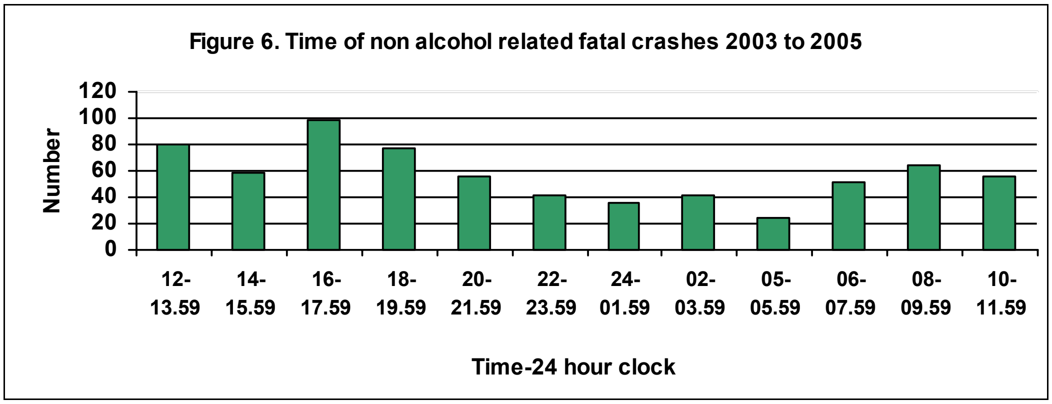
Figure 5. Time of alcohol related fatal crashes 2003 to 2005



(Total = 308 crashes, one crash time unknown)

Almost two-thirds (199, 64.4%) of alcohol related crashes occur between 22.00 hours on Friday night and 08.00 hours on Monday mornings and are almost three times more likely at these times than other times of the week (Odds ratio: 2.7; CI:2.0-3.6, p<0.00001).

Figure 6 outlines the time of day of occurrence of non-alcohol related fatal road crashes. As seen, late morning, through to early evening was the commonest time for non-alcohol related fatal road crashes.



(Total = 685 crashes, one crash time unknown)

Profile of those killed and their alcohol levels

Table 5 outlines the number of persons killed in the crashes. Over half (611, 55.3%) of those killed were drivers.

Table 5. Status of the deceased

Status of the deceased	Total	
	No.	%
Driver*	611	55.3
Passenger	249	22.5
Pedestrian	205	18.6
Cyclist	34	3.1
Unknown/other	6	0.5
Total	1,105	100

**Includes drivers of motor cycles*

Drivers

Of the 611 drivers who were killed during the study period of 2003-2005, the majority 503 (82.3%) were male and 108 (17.7%) were female with no gender differences between the years. One hundred and eighty-eight were killed in 2003, 202 were killed in 2004 and 221 were killed in 2005. The mean age of all 611 drivers killed in 2003-2005 inclusive was 35.6 years (S.D. 18.1) and the median was 31.0 years (range 15-88 years) with a mortality rate for all drivers per 100,000 population aged 17 years and over of 9.1 per 100,000 (95% CI 8.4-9.8) population. The mean age of male drivers was significantly lower than that of female drivers (36.4 years versus 43.4 years, $p<0.004$). The mortality rate per 100,000 population aged 17 years and over for male drivers was 15.7 per 100,000 (95% CI 14.1 – 16.8) population. The mean age of female drivers was 43.4 years (SD: 19.8) and the median was 41.5 years. The mortality rate per 100,000 population for the female drivers was significantly lower than that for the male drivers at 3.3 per 100,000 (95% CI 2.7 – 3.9) population aged 17 years and over. Table 6 and Figure 7 outline the age distribution of the deceased male drivers and the age specific death rates in 5 year age groups.

Table 6. Age distribution (in 5 year age groups) of deceased male drivers and age standardised rate per 100,000 population.

Age groups	No	%	Rate /100,000 population	95% CI
15-19	58	11.5	12.5	9.5-16.2
20-24	98	19.5	19.2	15.6-23.4
25-29	74	14.7	14.7	11.6-18.5
30-34	68	13.5	14.1	10.9-17.8
35-39	41	8.2	9.1	6.5-12.3
40-44	38	7.6	9.0	6.3-12.3
45-49	26	5.2	6.7	4.4-9.8
50-54	20	4.0	5.6	3.4-8.5
55-59	19	3.8	5.8	3.5-9.1
60-64	11	2.2	4.4	2.2-7.8
65-69	9	1.8	4.4	2.0-8.4
70-74	12	2.4	7.4	3.8-12.9
75+	29	5.8	12.8	8.6-18.4
All ages 15+	503	100.0	10.3	9.7-11.0

As shown in Figure 7, when compared to the rate for all males aged 15 years and over, the rate is higher in all the younger age groups (i.e. 15-34 years inclusive) and also in one older age group (i.e. 75+ years). The rate was lowest in the middle aged years (i.e. 45-69 years inclusive). The highest rate was in male drivers aged 20-24 years.

Figure 7. Mortality rate per 100,000 population aged 15 years and over for male drivers by age-group

Table 7 outlines the age distribution of the female drivers. Due to the smaller numbers broader age categories are only available. As shown in the table the overall rate was much lower in female drivers compared to males (2.2 per 100,000 population versus 10.3 per 100,000 population). The highest rate in female drivers was in the 15-24 year age group (2.6 per 100,000 population, 95% CI 1.7-3.9).

Table 7. Age distribution of deceased female drivers and rate per 100,000 population.

Age groups	No	%	Rate /100,000 population	95% CI
15-24 years	25	23.1	2.6	1.7-3.9
25-44 years	36	33.3	1.9	1.3-2.7
45-64 years	30	27.8	2.3	1.5-3.3
65+ years	17	15.7	2.2	1.3-3.6
All ages 15+	108	100.0	2.2	1.8-2.6

Alcohol levels of killed drivers

Of the 611 drivers killed, 184 (30.1%) were over the BAC legal limit. This equates to 61/188 (32.5%) in 2003, 61/202 (30.2%) in 2004, and 62/221 (28.1%) in 2005 with not statistically significant differences over the 3 year study period. For those drivers who had a BAC recorded and available (450, 73.6%), 184 (40.9%) were over the legal limit. The mean alcohol level for those who had BACs recorded and available was 88.9 mg/100ml (S.D. 108.1).

As shown in Table 8, BACs were available for just 397 (64.9%) of drivers. Table 9 outlines the various BAC levels. As can be seen from the table, 165 (32.8%) of the males killed were over the BAC legal limit and 19 (17.6%) of the killed female drivers were over the BAC legal limit. Two hundred and twenty (36.0%) of all the killed drivers had BAC levels ≥20mg/100ml. Of the 397 drivers who had their BACs recorded 184 (46.3%) had a BAC over the drink-drive limit of 80mg/100ml.

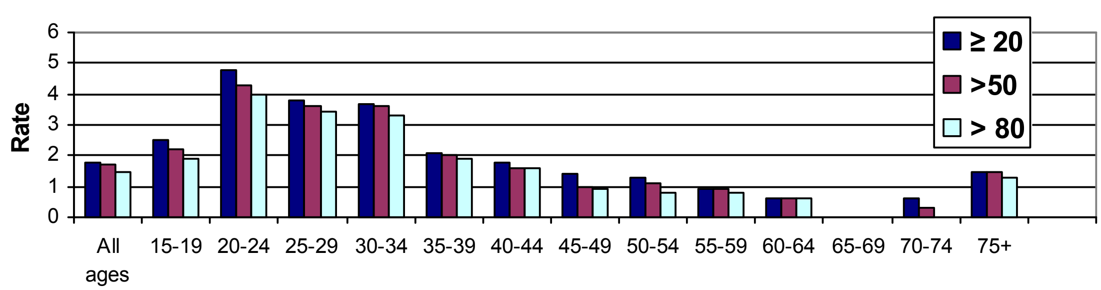
Table 8. BAC levels on killed drivers

Blood Alcohol Level	Male		Female		Total	
	No	%	No	%	No	%
Not recorded as done/not available	169	33.6	45	41.7	214	35.1
Zero	132	26.2	33	30.6	165	27.0
1-19	7	1.4	5	4.6	12	2.0
20-49	12	2.4	6	5.6	18	2.9
50-80	18	3.6	0	0.0	18	2.9
81-159	50	9.9	5	4.6	55	9.0
160-239	65	12.9	9	8.3	74	12.1
240+	50	9.9	5	4.6	55	9.0
Total	503	100.0	108	100.0	611	100.0

The mean BAC for male drivers killed was 95.6mg/100ml (S.D. 109.1). The mean BAC for female drivers killed was 56.0 mg/100ml (S.D. 97.5). This was significantly lower than the male level ($p<0.02$).

Figure 8 outlines the age specific rates per 100,000 population for those with BAC levels ≥20mg/100ml and those with BAC levels above 50mg/100ml and above 80mg/100ml (i.e. over the legal limit for driving). The rates for BAC levels over the legal limit for driving are highest for those aged 20 to 24 years and then falls off in the older years but rises again in those aged 75+ years.

Figure 8. Rate per 100,000 population for drivers with BAC ≥20mg/100ml, >50mg/100ml and >80 mg/100ml



Urine alcohol levels

In the case of 7 drivers where there were no BACs available, urine alcohol levels were available with a mean of 146.2mg/100ml (SD: 136.9) ranging from 0 mg/100ml to 459mg/100ml, with 5 over the legal limit of 107 mg/100ml.

Combining the BACs and these urine sample results, the overall number of killed drivers whose alcohol was a factor (BAC≥20mg/100ml or equivalent in urine) was 222 (36.3%).

Of the total drivers killed, 187 (30.6%) were over the alcohol legal limit for driving.

Vehicle type

Table 9 outlines the vehicles the deceased drivers were driving. As seen in the Table 9 a quarter of all killed were on motorbikes.

Table 9. Vehicle driven by deceased drivers

Vehicle Type	No.	%
Car	381	62.4
Motorcycle	152	24.9
Van	28	4.6
Jeep	18	2.9
Truck	10	1.6
Other	9	1.5
Lorry	7	1.1
Tractor	6	1.0
Total	611	100.0

Females were more likely to be the driver of a car than any other vehicle when compared to males ($p<0.001$) and males were more likely to be riding a motorbike ($p<0.001$) compared to females. The mean age of motorbike drivers who were killed was significantly lower than the drivers of all other vehicles (31.4 years versus 39.6 years, $p<0.001$). Motorbike drivers were no more likely or less likely than other killed drivers to be over the legal limit.

Pedestrians

Two hundred and five (18.6%) of those killed in 2003-2005 were pedestrians, of whom 129 (62.9%) were male and 76 (37.1%) were female. The mean age was 49.1 (SD: 25.4) and the median 53.0 years. The mean age of the male pedestrians killed was significantly lower than that of the female pedestrians killed (44.6 versus 56.5 years, $p<0.001$). Table 10 and Figure 9 outline the age distribution of the killed pedestrians which shows that the mortality rate per 100,000 population increases with age, being highest in those aged 75 years and older.

Table 10. Age distribution of killed pedestrians

	No	%	Rate per 100,000 population
< 15	18	8.7	0.7
15-24	33	16.5	1.8
25-34	19	9.2	1.0
35-44	15	7.3	0.9
45-54	23	11.2	1.5
55-64	26	12.6	2.3
65-74	30	14.6	3.9
75+	41	19.9	6.9
All ages	205	100.0	1.7

Figure 9. Mortality rate per 100,000 population for pedestrians

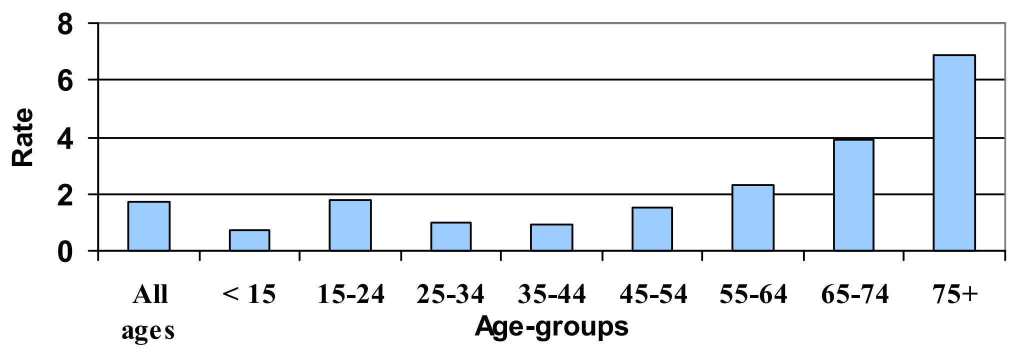


Table 11 outlines the BAC levels of the killed pedestrians. The mean level was 113.3 mg/100ml (SD: 147.7). For adults (aged 18 years and over), males were more likely to have tested positive for alcohol than females ($p<0.001$). More than 1 in 10 pedestrians had a blood alcohol concentration in excess of 240mg/100ml.

Table 11. Blood Alcohol Concentration (BACs) in pedestrians

Blood Alcohol Level	No	%
Not available	101	49.5
0	51	24.8
1-19	3	1.5
20-50	2	1.0
51-80	2	1.0
81-160	9	4.4
161-240	15	7.3
241+	22	10.7
Total	205	100.0

Pedestrians with positive blood alcohol levels (≥ 20mg/100ml) were 3.4 times more likely to be killed from 10 PM on Friday night to 4AM on Monday morning than during the rest of the week (Odds ratio = 3.4 95% CI: 1.7 – 6.5 p=0.001).

From the circumstances of the crashes as outlined in the Garda Síochána files and the BACs of the deceased pedestrians, pedestrian alcohol was considered to be a contributory factor in 50 (24.2%) of the fatal pedestrian road crashes or 4.5% of all fatal road deaths. Of those 50 pedestrians where alcohol was considered to be a contributory factor, 41 (82.0%) occurred between 8PM and 8 AM. For 37 (17.8%) pedestrians the BAC level was in excess of 160mg/100ml. Where pedestrians own alcohol was a factor in the pedestrian death, over half (28, 56%) were aged 40 years and over.

Passengers

Two hundred and forty-nine (22.5%) of all those killed were passengers, 141 (56.6%) of whom were male and 108 (43.4%) were female. The mean age of the passengers was 30.3 (SD: 18.7) and the median age was 22.0 years (range 3 months - 90 years). Table 12 and Figure 10 outlines the age distribution and the mortality rate per 100,000 population. As seen in the table and the figure there is a high rate for those aged 15-24 years.

Table 12. Age distribution of killed passengers

Age-group	No.	%	Rate per 100,000 population
0-15	15	6.0	0.6
15-24	126	50.6	6.6
25-34	38	15.3	1.9
35-44	24	9.6	1.4
45-54	15	6.0	1.0
55-64	6	2.4	0.5
65-74	15	6.0	2.0
75+	10	4.0	1.7
All ages	249	100.0	2.0

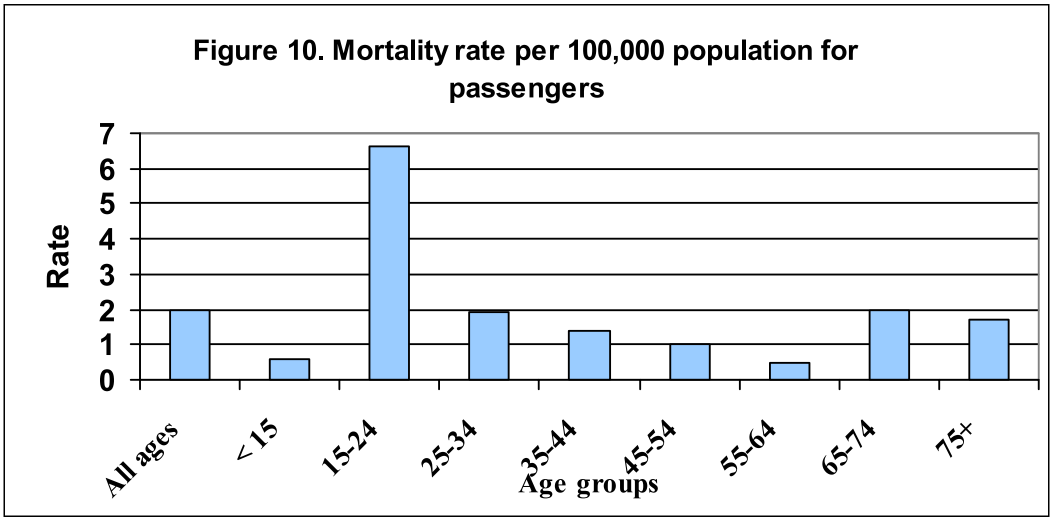


Table 13 outlines the BACs of passengers killed. The mean BAC was 83.1mg/100ml (SD: 100.7) and the median was 43.1 mg/100ml (range 0-368mg/100ml). BACs were done on 14 of the 44 passengers aged less than 18 years. Of those, 6 had a BAC level of zero while 8 has a positive BAC recorded with 4 having a BAC of 80mg/ml or greater.

Table 13. BACs in passengers.

	No.	%
Not recorded as being done/Not available	130	52.2
0	51	20.5
1-80	22	8.8
81-160	19	7.6
161-240	13	5.2
241+	14	5.6
Total	249	100.0

Of the 249 passengers killed, 58 (23.3%) were killed in alcohol related crashes. Male passengers were 2.1 times more likely to be killed than female passengers in a crash where driver alcohol was a factor (OR 2.7, 95% CI: 1.5-5.2, p<0.001). Fifty one (36.1%) of the 141 male passengers were killed in such crashes.

Of the 27 passengers with BACs at 161mg/100ml or greater, 12 (44.4%) were aged thirty years or over. In the age group "15-24", which had the highest mortality rate, driver alcohol was no more or no less likely to be a factor in the crash (P>0.07).

Alcohol related Road Traffic Crashes by region of occurrence:

Due to small numbers it was not possible to show a statistical pattern of occurrence of alcohol related crashes by county. However, of the 352 alcohol-related road traffic deaths, 88 (25.0%) occurred on roads in the counties that border Northern Ireland. Alcohol related road traffic deaths were 1.5 times more likely to occur in border counties compared to non-border counties (OR 1.5, 95% CI 1.1-2.1).

Discussion and Conclusions

Approximately 1 in 4 of all road fatalities in Europe are alcohol related[6]. As the Blood Alcohol Concentration (BAC) in the driver increases, the crash rate also rises[7]. Males, young drivers, and drivers with bad past driving records are all more dangerous than other drivers but the impact of these factors is far less than that of alcohol[8].

The European Union has set itself a target of halving the number of people killed in road traffic accidents between 2000 and 2010 through harmonisation of penalties and the promotion of new technologies[9]. In the most recent report of the European Transport Safety Council (ETSC) Ireland was ranked in 9th place out of the 27 EU countries. This represents a move of seven places up the safety rankings on Ireland's position in 2005, when the country was ranked 16th [10]. In Ireland the risk of death on the road is the same as the EU average of 4 deaths per billion vehicle-kilometres. However in Switzerland, Denmark, the Netherlands and Great Britain less than three people are killed on average for every billion vehicle-kilometres[11].

This study provides evidence of the role alcohol plays in fatal road crashes nationwide from 2003 to 2005 inclusive. It is worth noting that although a crash was alcohol related it does not mean that other factors such as speeding were not also involved. Furthermore it should be noted that this study was done prior to the introduction of random breath testing (RBT) which came into force in July 2006, following which a reduction in road crashes occurred. For example, the total number of people killed on our roads for the whole of 2007 was 336 compared to 365 in 2006 representing a decrease of 29 (or 8%). Nonetheless this study provides evidence of the large role alcohol plays in road deaths in Ireland.

Although this study showed that the proportion of crashes that were alcohol related had decreased from 37% in 2003 to 29% in 2005, this decrease was not statistically significant. In fact although the percentage decrease was 8% the actual drop in the number of people killed was 6. Thus, this figure is still unacceptably high as during the period of this study (i.e. 2003-2005) a total of 352 or 32% of all road traffic deaths were alcohol related. This figure is very high when compared to countries such as

Australia where alcohol is a factor in approximately 26% of road traffic deaths, and Finland, where alcohol is a factor in approximately 25% of car crashes[12-13]. It must also be taken into account that in a third of cases the blood alcohol levels were either not done or not available for analysis. Therefore these results are at best an under-estimate of the role of alcohol in fatal car crashes. Over half of those killed were drivers with a very high proportion (80%) of the drivers killed being male. As drink driving was not confined to the younger age groups, there is an urgent need for a nationwide reduction in the BAC level.

All drivers need to be made aware that any drinking, even below the legal drink drive limit, impairs driving and significantly increases the risk of a crash. Whilst having a BAC of 80mg/100ml blood may mean the driver is not committing an offence, it does not necessarily mean that he/she is capable of driving safely. It is estimated that drivers with any alcohol in their blood are more likely to cause a fatal crash. Drivers at the legal limit pose a risk at least 15 times greater than sober drivers[14]. The relative risk of a drink-drive accident increases significantly after 50mg/100 ml BAC[15]. Several countries have reported studies indicating that lowering the BAC limit from 80mg/100ml to 50mg/100ml reduces alcohol-related fatalities[16-17]. A time-series analysis by Henstridge et al[18] showed that the effects of lowering BAC from 80mg/100ml to 50mg/100ml in Queensland and New South Wales in Australia reduced the rate of serious collisions and fatal collisions significantly and over a long-term, showing that the effect of lowering the BAC is not just short-term but rather can be sustained in the longer term[18]. Thus, lowering the BAC level to 50mg/100ml in Ireland should be implemented immediately. Indeed the European Commission has recommended that all countries adopt a standard authorised level not exceeding 50mg/100ml. More and more countries are heeding this advice with the UK, Ireland and Malta being the only EU countries still having the 80mg/100ml limit[19]. The Road Safety Strategy 2007-2012 recommends that the reduction in the legal BAC from 80mg/100ml to 50mg/100ml be made a priority and recommend it be introduced for drivers by the 2nd quarter 2009.[20]

Random breath testing is another strategy that has proven to be successful in reducing alcohol-related road traffic crashes. Random breath testing checkpoints are traffic stops where law enforcement officers systematically select drivers to assess their level

of alcohol impairment. The goal of these interventions is to deter alcohol-impaired driving by increasing drivers' perceived risk of arrest. Random breath testing was introduced in Ireland on 21st July 2006, and since then road fatalities have significantly decreased. Current figures from the Garda National Traffic Bureau show that the number of deaths decreased from 396 in 2006 to 368 in 2006 and to 338 in 2007. Since the commencement of RBT by An Garda Síochána, over 30,000 drivers are tested each month[21]. A recent survey of lifestyle, attitudes and nutrition (SLAN) found that the percentage of those who reported driving a car after consuming 2 or more standard alcoholic drinks in the previous 12 months has decreased from 16% in 2002 to 12% in 2007. However, there was no decrease among male drivers aged 18-29 years whereby the proportion remained the same at 18%[22]. Furthermore male Irish drivers have stated that being caught by the Gardai is the only deterrent to drink driving, not their own safety or the safety of others[23]. Therefore enforcement of the RBT must remain high and be a priority for Gardai.
A systematic review of sobriety tests (i.e. random breath testing) in the US showed that sobriety checkpoints consistently reduced alcohol-related crashes, typically by about 20%[24].

Another strategy that is effective in reducing crash rates among young drivers is the introduction of a graduated licensing system for young drivers[25]. The Road Safety Strategy recommends that a graduated licensing system should be introduced whereby a range of measures would be applied to learner and new drivers with learner permits with some measures continuing to apply for the first two years after acquiring a driving licence. Some of these measures would include the application of a zero alcohol limit for learner drivers, all learner drivers being accompanied by a person who has a full driving licence for a period of no less than 2 years and that this accompanying driver will be subject to drink driving legislation and mandatory alcohol testing.[20]

Pedestrian alcohol was considered to be a contributory factor in 50 of the 205 (24.4%) pedestrian deaths. Other factors may also have contributed to these alcohol related crashes including darkness, lack of footpaths and driver error with pedestrians being at increased risk with increasing age irrespective of alcohol consumption. Given that pedestrians with positive blood alcohol levels were almost 10 times more likely to be killed at the weekend, this again is probably reflecting the high binge drinking at weekend that occurs in Ireland. Efforts to highlight the danger of excessive drinking among pedestrians should be addressed. All road users, be they drivers, cyclists or pedestrians need to be aware that their alcohol intake can be a factor in reducing their safety on the roads. The fact that more than 1 in 10 pedestrians had a BAC of greater than 240mg/100ml blood is again reflecting the binge drinking culture in Ireland.

Alcohol was also detected in 28% of passengers killed with 18% having a BAC level over 80mg/100ml. Again, there were more male deaths among passengers with the mortality rate highest in those age 16-24 years. Given that a total of 58 passengers died in alcohol related crashes during the study period, the dangers of riding with a drinking driver need to be highlighted. A review by Elder et al in 2005 showed that educational programmes providing information to students about the risks associated with drink driving and riding with a drinking driver had resulted in reductions in riding with drinking drivers[26].

Ireland has a very serious problem with alcohol consumption. The more a population consumes the greater the harm that population suffers. Given that alcohol was a factor in such a high proportion of deaths and the high prevalence of high alcohol levels among all road crash fatalities, a population wide approach to the reduction of alcohol consumption is required urgently. Research has shown that population-wide approaches that limit the sale and supply of alcohol have an impact on alcohol related harm. Increasing the price of alcohol has been associated with reductions in alcohol related harm and in motor vehicle deaths[27]. Restricting off-licence sales, monitoring and preventing underage access to alcohol have all been shown to reduce alcohol-related harm including alcohol-related crashes[28]. Interventions to reduce alcohol availability and increase substance abuse treatment in the community have been shown to reduce alcohol related fatal road crashes[29]. Thus, population wide approaches such as these should be seriously considered in order to reduce all alcohol related road deaths in drivers, pedestrians and in passengers.

Given that the fear of being caught is the only real deterrent for male drivers in particular, there should be mandatory alcohol testing of drivers involved in all injury and fatal crashes.

Overall it is clear that in order to save lives it is essential that the BAC limit is lowered, RBT is vigorously enforced and a graduated licensing system is introduced for young drivers. The sale and supply of alcohol should be limited, the price of alcohol increased, off-licence sales restricted and underage drinking prevented. If we fail to tackle this problem the devastating impact of alcohol on road fatalities will not change and many more people will lose their lives needlessly in a road crash.

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