Responsibility for non-fatal collision with blood alcohol concentration less than 0.05% or below legal driving age

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Abstract

Background
In Victoria, motorists taken to hospital after a motor vehicle collision are required to provide a sample of blood for analysis. In a study of 1809 drivers injured in collision, 487 drivers (27% of the total) tested positive for alcohol.

Aim
This study aimed to test the hypotheses that low blood alcohol concentrations are associated with significant increase in responsibility for collision.

Methods
Collision data and toxicology was available from 1809 collisions were the driver was taken to hospital. Collision data was subject to responsibility analysis.

Results
47 drivers had a blood alcohol concentration less than 0.05% (mean 0.033%). 36 were responsible for the collision, 8 contributed and 3 were not responsible for the collision. These drivers with low blood alcohol concentration were 7.7 times more likely to have been responsible for the collision than drivers who had not been drinking. 82% of these collisions involved another vehicle.

Discussion and conclusions
These results support zero tolerance for alcohol. There is no rational reason to consider blood alcohol concentrations below 0.05% as ‘safe’.
Introduction

Driving under the influence (DUI) of intoxicating liquor has been an offence in Victoria since 1909. In 1955 the Crimes (Driving Offences) Act (Victoria 1955) included a presumption that if the blood alcohol concentration was less than 0.05% the driver was unimpaired. Breath analysis was introduced in 1961. It became an offence for a driver to have a blood alcohol concentration greater than 0.05% in 1966 (Boorman 1999). There is an implication that impairment starts at 0.05%. This paper refutes that assumption.

Aims

This study aimed to test the hypotheses that blood alcohol concentrations less than 0.05% increase the relative responsibility for collision in which the driver is injured.

Methods

A person over the age of 15 years, who is taken to hospital following a motor vehicle collision is required to furnish a sample of blood for analysis (Victoria 1986). The sample is divided into three aliquots: a ‘screening’ sample, a ‘patient’ sample which is given to the patient and an ‘evidential’ sample which is stored for formal analysis and potential prosecution. The screening sample was used for this study.

The first 936 samples were screened by Victorian Forensic Sciences Centre (VFSC). Subsequent blood samples (n=1801) were screened at the Victorian Institute of Forensic Medicine (VIFM). Both services are accredited by the National Association of Testing Authorities in the provision of Toxicology for Forensic Science (ISO/IEC 17025:2005).

935 samples were excluded because sample was not from a driver (i.e. pedestrian or passenger), the driver had not been injured in a collision, the collision was deliberate (driver had attempted suicide), the driver had died within 30 days due to injuries sustained in the collision, or there was insufficient information in the collision report to perform the responsibility analysis.

Toxicology results were matched against collision details by Victoria Police personnel. There is no link between this data and health records, so it is not possible to identify therapeutic agents such as morphine which were legitimately administered as part of pre-hospital or urgent hospital care.

Analysis of responsibility for collision was carried out using the method developed by Robertson and Drummer (Robertson and Drummer 1994). A value between 1 and 4 is assigned to eight factors which might explain the collision: road condition, vehicle condition, driving conditions, collision type, witness observations, compliance with road laws, task difficulty and level of driver fatigue. The higher the value given, the more the extenuating factors are likely to have contributed to the collision. A driver with a low aggregate low score (score <13) is judged to be ‘responsible’ for the collision, a driver with a mid-range score (≥13 and ≤15) is defined as ‘contributing’ to the collision, and a driver with a high score (>15) is deemed to be ‘not responsible’ for the collision. Responsibility analysis was carried out blinded to knowledge of the toxicology results to avoid expectant bias.

The control sample (n=954) was the group of drivers in whom no impairing drugs or alcohol was detected. After responsibility analysis 437 of the control group were ‘responsible’ and 345 were not ‘responsible’. The odds ratio for the control group being responsible for the
collision was defined as 1. Cases in which the driver ‘contributed’ to the collision (n=175) were excluded from final analysis.

**Results**

Injured drivers were 62.8% male with a mean age of 36.8 years (range 14-91, s.d. 16.2). There were 43 drivers (8 female) below the legal driving age of 18 years.

In the control group age was a factor for responsibility at all ages with the oldest and youngest drivers most likely to be responsible. 14 of the underage drivers were drug and alcohol free with an odds ratio of responsibility for collision of 2.5.

**Table 1: Age as a factor in responsibility in drug and alcohol free drivers**

<table>
<thead>
<tr>
<th>Age</th>
<th>Responsibility Analysis</th>
<th>Odds Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Responsible</td>
<td>Contributory</td>
</tr>
<tr>
<td>15 to 17</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>18 to 14</td>
<td>136</td>
<td>52</td>
</tr>
<tr>
<td>25 to 34</td>
<td>75</td>
<td>27</td>
</tr>
<tr>
<td>35 to 44</td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>45 to 54</td>
<td>53</td>
<td>19</td>
</tr>
<tr>
<td>55 to 64</td>
<td>42</td>
<td>25</td>
</tr>
<tr>
<td>65 to 74</td>
<td>26</td>
<td>8</td>
</tr>
<tr>
<td>75 to 84</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>85+</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>437</td>
<td>175</td>
</tr>
</tbody>
</table>

Twenty six (65%) of the underage drivers had a blood alcohol concentration (BAC) between 0.011% and 0.198% (mean of 0.091%). 38 were responsible for the collision (O.R. 10.6).

46 drivers had blood alcohol concentrations between 0.001% and 0.05%. Only 3 were not responsible for the collision, 8 contributed and 36 were responsible for the collision (Odds Ratio 7.7). 82% of these collisions involved another vehicle.

<table>
<thead>
<tr>
<th>Blood alcohol concentration</th>
<th>Responsibility analysis</th>
<th>Odd Ratio (after adding 1 to not responsible group)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Responsible</td>
<td>Contributory</td>
</tr>
<tr>
<td>0.00%</td>
<td>657</td>
<td>222</td>
</tr>
<tr>
<td>0.01%</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>0.02%</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>0.03%</td>
<td>7</td>
<td>2</td>
</tr>
<tr>
<td>0.04%</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>0.05%</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>0.06%</td>
<td>18</td>
<td>1</td>
</tr>
<tr>
<td>0.07%</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td>0.08%</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>0.09%</td>
<td>21</td>
<td>1</td>
</tr>
<tr>
<td>0.10%</td>
<td>19</td>
<td>2</td>
</tr>
</tbody>
</table>
Age was not a factor in the collisions with low blood alcohol concentrations (P=0.004).

The low number of drivers ‘not-responsible’ means it is impossible to estimate the odds ratios in most categories. In order to illustrate the exponential trend line, a nominal driver was added to the ‘not responsible’ count for each category to perform the calculation.

The blood samples were all taken after arrival at hospital. Typically this means a delay of an hour between the time of the collision and drawing the blood sample. This means that the measured blood alcohol concentration could have been lower or higher at the time of collision. In the further research the time delay should be quantified.

It must be noted that the study is subject to a bias in sample selection by hospital practitioners. In 1990 when the focus of road safety interventions was on alcohol, emergency physicians argues that blood sampling was an unacceptable clinical obligation distracting from clinical care. Police agreed that doctors could perform preliminary breath tests (PBT) on patients to determine the need for a blood sample. If the patient returned a negative PBT they were not required to furnish a sample, unless there was a clinical reason to suspect drug use. This pragmatic compromise was contrary to the legislation but encouraged cooperation with sampling for alcohol.

Since that time there has been increasing interest in the role of other drugs and screening for delta-9-tetrahydrocannabinol, methylenedioxymethamphetamine and methamphetamine.
began in 2004 (Victoria 2003). In 2009 Victoria Police formally requested hospitals and members of the College of Emergency Medicine to stop using preliminary tests and fully comply with the legislation obtaining samples from all drivers regardless of blood alcohol concentration. Since the request was made, compliance has been rising steadily, resulting in a growing proportion of alcohol negative drivers available and a more reliable control sample.

**Discussion and conclusions**

The fact that a substance is found does not mean that it caused impairment. It is necessary to ask a series of questions: Does this substance cause impairment of human skills? If so, is such impairment universal or idiosyncratic? Does the impairment occur in normal dosages or only when the drug is used in excess? The presence of a drug may not necessarily mean the driver is impaired (Maki and Linnöila 1976). Some individuals will be impaired with levels of a drug normally considered therapeutic (e.g. sedatives), whilst dangerously toxic levels of other drugs may have no effect on driving skills (e.g. paracetamol) (Pearl, Holder et al. 1989). There is no critical level of most drugs above which impairment is present or below which no impairment can be demonstrated (Starmer, Vine et al. 1988; Starmer and Mascord 1994).

The work of Terhune in the United States (Terhune, Ippolito et al. 1992) and Drummer's group in Australia (Robertson and Drummer 1994; Drummer, Gerostamoulos et al. 2003; Drummer, Gerostamoulos et al. 2004) has examined the culpability of fatally injured drivers. More recently the methodology has been used in France with similar results (Gadegbeku, Amoros et al. 2010).

Longo et al. reported data on the effect of alcohol, cannabis, stimulants and benzodiazepines on driver culpability in 2500 non-fatally injured drivers (Longo, Hunter et al. 2000). They found a clear, concentration dependent relationship between alcohol and responsibility for collision. This is in keeping with the findings of Terhune using non-fatally injured drivers (Terhune 1982) and the findings in fatally injured drivers (Terhune, Ippolito et al. 1992).

Very low levels of alcohol affect performance, and even a very small effect may be relevant in road safety (Moskowitz and Robinson 1988). A meta-analysis of acute alcohol consumption concluded that after two standard drinks the odds of injury were almost double (Taylor, Irving et al. 2010). The National Health and Medical Research Council advises that “Very low levels of alcohol can affect judgement and performance, and even a very small effect may be relevant where a high degree of skill is needed, where the risk is already high, or where the safety of others is involved” (NHMRC 2001).

The data presented here show that the odds of responsibility for collision in which the driver is injured and taken to hospital are increased at any blood alcohol concentration greater than 0.01%. This study provides further evidence that low levels of alcohol are associated with increased responsibility for collision and provides further support for zero tolerance.
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References


Gadegbeku, B., E. Amoros, et al. (2010) "Responsibility study: Main illicit psychoactive substances among car drivers involved in fatal road crashes in France." WP2, Task 2.3.3, Deliverable 2.3.2.


