Assault-related injury among young people aged 15-34 years that occurred in public places: deaths and hospital-treated injury

Erin Cassell, Nicolas Reid, Angela Clapperton, Khic Houy-Prang, Emily Kerr

Summary

Deaths, hospital admissions and ED presentations were extracted from the National Coroners Information System (NCIS), the Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD), respectively.

Over the decade 2000/01 to 2009/10, on average there were an estimated 11 deaths of young people aged 15-34 in Victoria due to public assaults per year, taking account of incomplete data in the final four years of the decade. Because of the small number of deaths per year, all 72 public assault-related injury deaths of young people that were recorded on the NCIS for the decade were included in the dataset for detailed analysis.

For hospital-treated injury (hospital admissions and ED presentations) the data subset for detailed analysis was confined to cases that were recorded on the hospital datasets for the last three years of the decade—2007/8 to 2009/10. Over this 3-year period, 14,568 young people were treated in hospital for public assault-related injury (3,044 admissions and 11,524 ED presentations). On average, therefore, 4,856 young people were treated in hospital for assault injuries per year (1,015 hospital admissions and 3,841 ED presentations).

- Trends were not modelled for deaths due to incomplete data. There was a non-significant increase in the frequency and no change in the rate of public assault-related hospital admissions among young people aged 15-34 over the decade 2000/01 to 2009/10. However, in the youngest 5-year age group (15-19) there was a significant 35% increase in the frequency of admissions and a non-significant increase in the admissions rate over the same period. The trends in the frequency and rate of ED presentations overall and for 15-19 year olds over a shorter time period (2004/5 to 2009/10) showed a similar pattern.

- Males comprised 86% of public assault-related deaths, 91% of hospital admissions and 86% of ED presentations over the periods studied. (Note that a higher proportion of female than male assault-related deaths and hospital-treated injuries occur in the home.)

- Among deaths, counts were highest in the youngest (15-19) and oldest (30-34) age groups (29% of decedents were in each of these age groups). Among hospital admissions and ED presentations, case counts were highest in age group 20-24 (around one-third of both hospitalisations and ED presentations) followed by age group 15-19 (around one quarter of admissions and one-third of ED presentations).

- Country of birth of decedents was not consistently reported on the NCIS as this information is not always included in police reports. Young people born in Australia comprised 77% of public assault-related injury admissions and 83% of ED presentations. However, young
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people born overseas in mainly English-speaking countries were at lowest risk of assault-related injury (1360/100,000). 

• 46% of deaths and 56% of ED presentations for assault-related injury occurred on weekend days. Over half (54%) of deaths and nearly two-thirds (63%) of ED presentations occurred during ‘high alcohol hours’ over the weekend from 7pm Friday evening to 7am on Monday morning.

• Information on drug and alcohol use, mostly from toxicology reports was available for 66 decedents (92% of deaths). Of these, 57% were intoxicated (BAC 0.08-0.159gm/100mL) and 9% were highly intoxicated (BAC 0.16gm/100mL and above). The involvement of alcohol in assaultive injury cases is underestimated on the hospital injury surveillance datasets. Overall, the case records of 24% of public assault-related admissions of young people were designated as accessible by the public at the time of injury. Only a small proportion of case records of ED presentations included information on the perpetrator.

• Over half of the fatal assaults (58%) occurred on a footpath/road/street (44%) or in car parks (14%). More than one-quarter of these assaults (29% of all fatal assaults) were on footpaths, streets or car parks adjacent to licensed premises and three others (4%) were inside licensed venues. Twenty percent of the fatal assaults (n=15) were perpetrated in relatively remote locations such as scrub land or the side of a road/highway.

• The NCIS contains the richest information on the circumstances of assault-related hospitalisations. Information in coroners’ reports was analysed to explore the dynamics of the assault and contributory factors. The four major scenarios for violence that covered 94% of fatal assaults were: (1) confrontations predominantly between groups of young males that escalated from verbal or minor physical challenges to major shows of force leading to private or public violence; (2) a majority of additional recommendations are made related to injury surveillance improvements, the need for high-quality evaluations and the trial of an ultra-brief counselling and referral intervention in selected hospital emergency departments targeting injured young people who present under the influence of alcohol or drugs.

The number of young people treated in hospital for assault-related injuries that occurred in public places is underestimated in this report because about half of assaults related injury ED presentations and one-quarter of assault-related injury ED presentations in public places are not captured by ‘location unspecified’ rather than one of the specific location variables on the datasets (Table 1).

1. Introduction

There is widespread government and community concern about the rise in youth violence, not only because of the injury toll but also because fear of violence in public prevents community members from accessing healthcare provisions and venues, public transport and the streets at night. In comparison to the patterns in other countries, Victoriaw here was a higher proportion of assault-related injury to young people aged 15-34 occurs in public places such as licensed venues, food outlet and shopping centre car parks, streets and parks, stations and other premises open to the public rather than private places such as the home and vehicles.

Over the 3-year study period 2007/8 to 2009/10 there were 41,631 hospital treated-assaulted injuries to adults aged 15 years and older in Victoria—13,698 admissions and 27,933 ED presentations (Table 1). Young people were over-represented in these hospital-treated assault cases; they comprised 65% and 70% of adult assault-related admissions and ED presentations, respectively (Table 1).

About one-third (34%, n=3,048) of the assault-related hospitalisations and more than half (51%, n=1,524) of assault-related ED presentations of young people were due to assaults that occurred in public places (Table 1). There is a gender difference, however, in that males in this age group are more likely to be injured in assaults that occur in public places, whereas the female counterparts are more likely to be seriously injured in assaults that occur in the home (not shown).

Information on whether young people are over- 

represented in fatal assaults was not available as, at the time of case selection, records of the National Coroners Information System (NCIS) were not complete for all study years as some potential cases were awaiting investigation. Assault cases can remain ‘open’ for lengthy periods as the coroner’s investigation does not commence until all proceedings in other jurisdictions are complete.

Information in coroners’ reports was analysed to explore the dynamics of the assault and contributory factors. The four major scenarios for violence that covered 94% of fatal assaults were: (1) confrontations predominantly between groups of young males that escalated from verbal or minor physical challenges to major shows of force leading to private or public violence; (2) a majority of additional recommendations are made related to injury surveillance improvements, the need for high-quality evaluations and the trial of an ultra-brief counselling and referral intervention in selected hospital emergency departments targeting injured young people who present under the influence of alcohol or drugs.

The number of young people treated in hospital for assault-related injuries that occurred in public places is underestimated in this report because about half of assault-related injury ED presentations and one-quarter of assault-related injury ED presentations in public places are not captured by ‘location unspecified’ rather than one of the specific location variables on the datasets (Table 1).

2. Methods

2.1 Definition

For the purposes of this study, the term ‘public places’ was defined to include locations that were designated as accessible by the public and on categories in the International Classification of Diseases Version 10 Australian Modification—ICD-10-AM—defined location groupings:

• schools, other institutions and public administrative areas (includes hospitals, theatres, club rooms, cinemas, squares and civic buildings); 
• sports and athletics areas (includes playing fields, sports courts, gymnasiums and fitness centres); 
• roads, streets, highways (includes sidewalks, footpaths and cycle paths); 
• trade and service areas (includes shops, pubs, bars, taverns and hotels); and 
• ‘other’ specified areas (includes parking lots, parks, beaches and rail corridors).

2.2 Case selection

Assault-related injury cases for the study years were selected from three different datasets: the National Coroners Information System (NCIS), the Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD). See Box 1 for full details of case selection and inclusion and exclusion criteria.

2.2.1 Deaths

Assault-related deaths that occurred in Victoria were selected from the National Coroners Information System (NCIS) on the basis that they occurred between July 1, 2000 and June 30, 2010. Only ‘closed’ cases can be selected by NCIS and ‘unresolved’ cases are those that are ‘open’ i.e. still under coronial investigation, especially in the later years of the study period.

Cases were selected using the following variables:

1. Case jurisdiction: Victoria 
2. Age of deceased: 15 years or more 
3. Intent type (on closure of assault) 

After initial selection, NCIS standard location variables and accessible police reports were examined to identify those cases where the fatal assault occurred in a publicly accessible location consistent with the definition above and inclusion criteria used for extracting cases from the hospital admissions and emergency department presentations datasets.

2.2.2 Hospital admissions

Hospital admissions were selected from the Victorian Admitted Episodes Dataset (VAED). For the trend analysis, cases were selected from the last ten fiscal years of available data, from July 1, 2000 to June 30, 2010. For the main analysis only cases that occurred in the last three fiscal years (from July 1, 2007 to June 30, 2010) were included.

<table>
<thead>
<tr>
<th>AGE GROUP</th>
<th>PUBLIC PLACES</th>
<th>PRIVATE PLACES</th>
<th>LOCATION UNSPECIFIED</th>
<th>ALL LOCATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-34</td>
<td>8,044</td>
<td>27</td>
<td>1,093</td>
<td>9,310</td>
</tr>
<tr>
<td>35-44</td>
<td>5,841</td>
<td>22</td>
<td>657</td>
<td>7,757</td>
</tr>
<tr>
<td>45-54</td>
<td>4,254</td>
<td>16</td>
<td>327</td>
<td>5,747</td>
</tr>
<tr>
<td>55-64</td>
<td>2,034</td>
<td>9</td>
<td>152</td>
<td>2,291</td>
</tr>
<tr>
<td>65-74</td>
<td>620</td>
<td>3</td>
<td>50</td>
<td>690</td>
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<tr>
<td>ALL</td>
<td>15,689</td>
<td>70</td>
<td>1,058</td>
<td>17,457</td>
</tr>
</tbody>
</table>

Source: Victorian Admitted Episodes Dataset (VAED)—hospital admissions and Victorian Emergency Minimum Dataset (VEMD)—ED presentations (non-admissions). Note: Over the study period, 9.7% of the 92,283 injury hospital admissions of young people aged 15-34 were for assault-related injury as were 6.3% of the 31,579 injury ED presentations.
2.3 Rates and trends

Crude rates were calculated. Rates were not age-adjusted due to the limited age range and generally stable population distribution over the time period. Trends were determined using a log-linear regression model of frequency and rate data assuming a Poisson distribution. A trend was considered statistically significant if the p-value of the slope of the regression model was less than 0.05 (see box 2).

3. Results: Deaths

3.1 Case counts and trends

Over the ten-year period 2000/01-2009/10, there were 72 deaths of young people aged 15-34 due to assaults in public places in Victoria recorded on the NCIS (Table 2). This is an underestimate as there are potentially some assault-related deaths in all years that are still under investigation or awaiting investigation at the time of case selection (i.e., ‘open’ cases); especially in the last four years when between 7% and 65% of cases remain open. The delay in closing coronial investigations into assault cases is longer than for other cases, pending the conclusion of proceedings in other jurisdictions.

Because of concern about the completeness of the data, yearly assault-related injury mortality rates (and trends) were not estimated. The Australian Bureau of Statistics (ABS) is an alternative source of deaths data but due to a number of issues, the ABS has not been able to provide the 2007, 2008 or 2009 annual Victorian death data and has not published cause of death data for Victoria for these years by 5-year age group and location on its website.

3.2 Detailed analysis

3.2.1 Counts

Table 3 shows the distribution of assault-related injury deaths by gender and five-year age groups. Males were strongly over-represented (62, 86%). Case counts were highest in the youngest and oldest age groups (29% of decedents were in each of these age groups). One-quarter of decedents were aged 20-24 and a comparatively smaller proportion of decedents (17%) were aged 25-29 years.

3.2.2 Age and gender

Country of birth

Country of birth (COB) was poorly specified on NCIS case records due to inconsistent recording of COB on police reports that inform the data system. As COB was only specified for 37% of fatalities, further analysis was not conducted.

3.2.3 Country of birth

Information on employment status and job of decedents was inconsistently reported. This information was available for just over half of the fatal assaults occurred in the LGA in which the decedent lived (35, 49%). The average (mean) distance between the decedent’s place of residence and the place of occurrence was 14.4km, ranging from 0km (i.e. the street or footpath in front of the decedent’s home) to 101km (i.e. another town or city). The distance was less than 5km in one third of cases (n=24, 33%), between 15km and 15km in just over one third of cases (n=26, 35%), and greater than 15km in the remaining one third (n=22, 32%).

3.2.4 Employment status and type of work

3.2.5 Location of residence and site of assault

Local Government Area (LGA) of residence of decedents

Table 4 Time and day of public assault injury deaths (incident time) among young people, Victoria 2000/01 to 2009/10 (n=72)

<table>
<thead>
<tr>
<th>Time</th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THURS</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>00.00 - 06.00</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>10</td>
</tr>
<tr>
<td>06.01 - 11.59</td>
<td>4</td>
<td>3</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>11</td>
</tr>
<tr>
<td>12.00 - 17.59</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>18.00 - 23.59</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>7</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)

3.2.6 Distribution of deaths by season of year and day of week

Season of year

More fatal assaults occurred in winter (29%, n=21) and spring (24%, n=17) and autumn (19%, n=14).

Table 4 Time and day of public assault injury deaths (incident time) among young people, Victoria 2000/01 to 2009/10 (n=54)

<table>
<thead>
<tr>
<th>Time</th>
<th>MON</th>
<th>TUE</th>
<th>WED</th>
<th>THURS</th>
<th>FRI</th>
<th>SAT</th>
<th>SUN</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>00.00 - 06.00</td>
<td>3.6</td>
<td>2</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>24</td>
</tr>
<tr>
<td>06.01 - 11.59</td>
<td>6.2</td>
<td>4.5</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>24</td>
</tr>
<tr>
<td>12.00 - 17.59</td>
<td>5.1</td>
<td>3.7</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>24</td>
</tr>
<tr>
<td>18.00 - 23.59</td>
<td>4.2</td>
<td>3.7</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
<td>24</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)

4. Discussion

The Australian Institute of Health and Welfare’s definition of illicit drugs was used: ‘Illicit drugs include illegal drugs (such as cannabis and heroin), pharmaceutical drugs (such as pain killers and tranquilisers) that use for non-medicinal purposes (strictly an illicit behaviour) and other substances used inexpertly (such as inhalants)’ (AIHW, 2011).

The study definition of ‘intoxicated by alcohol’ was: a Blood Alcohol Concentration (BAC) of at least 0.08% (60mg/100ml) for drivers, 0.05% (50mg/100ml) if not driving, 0.02% (20mg/100ml) for non-drivers.

Forty-six percent occurred on weekends: Saturday (28%) and Sunday (18.5%). Over half (54%, n=29) occurred during ‘high risk’ hours over the weekend (i.e. from 7pm on Friday evening to 6.59am on Monday morning) peaking between 12 midnight and 5am on Saturday (Friday night revellers) and Sunday morning (Saturday night revellers).

3.2.7 Alcohol and illicit drug use by decedents

Welfare’s definition of illicit drugs was used: cannabis and heroin, pharmaceutical drugs (such as pain killers and tranquilisers) that use for non-medicinal purposes (strictly an illicit behaviour) and other substances used inexpertly (such as inhalants)’ (AIHW, 2011).

The study definition of ‘intoxicated by alcohol’ was: a Blood Alcohol Concentration (BAC) of at least 0.08% (60mg/100ml) for drivers, 0.05% (50mg/100ml) if not driving, 0.02% (20mg/100ml) for non-drivers.
There was recorded evidence of both alcohol and illicit drug involvement in 15 decedents (21%) of decedents with information on alcohol and drug use.

### 3.2.8 Perpetrator of assault

Table 5 shows the relationship between the perpetrator and the victim of the fatal assaults, specified in the case records of 82% of deaths (n=59). In the other 13 cases (18%) the Coroner concluded that the fatal assault was perpetrated by a person or persons unknown.

Among informative cases, 51% were perpetrated by known person/persons who were unknown to the victim and 48% by an acquaintance or friend of the victim. In just over half of the fatal assaults on males (55%), the perpetrator was known to the victim, comprised of single person unknown to the victim (35%) and multiple persons unknown to the victim (18%). In 43% of male deaths, the perpetrator was an acquaintance or friend of the victim. By contrast, in all fatal assaults on females the perpetrator was a person known to the victim (friend or acquaintance (70%), spouse or domestic partner (20%) or parent or other family member (10%).

### 3.2.9 Mechanism of assault: weapon used

The weapons used in the public fatal assaults are shown in Table 6. Stabbing or cutting instruments (mostly knives) (51%, n=37) were by far the most common, followed by male to male fatal assaults (60% vs. 50%).

Firearms were the next most common weapon, used in 18% of fatal assaults (n=13). Almost all firearm-related fatalities were male.

Handguns were used in close to two-thirds of firearm-related fatal assaults (n=9), shotguns and rifles in two cases each.

Bodily force was the third most common weapon used, accounting for 17% of fatalities (n=12). In three-quarters of fatal assaults by bodily force the specified cause of death (COD) was not the direct impact of the blow, but was the impact of the head hitting the ground when the victim was knocked down.

### 3.2.10 Specific place of occurrence (location) of fatal incidents

Table 7 shows the specific place of occurrence (location) of fatal assaults. Over half of the assaults (56%, n=42) occurred on a footpath/road/street (44%) or in car parking areas (14%). More than one-quarter of these assaults (n=30) involved leads to a firearm-related fatal assaults (n=9), shotguns and rifles in two cases each.

Handguns were used in close to two-thirds of firearm-related fatal assaults (n=9), shotguns and rifles in two cases each. Bodily force was the third most common weapon used, accounting for 17% of fatalities (n=12). In three-quarters of fatal assaults by bodily force the specified cause of death (COD) was not the direct impact of the blow, but was the impact of the head hitting the ground when the victim was knocked down.

**Figure 1** Blood Alcohol Level (gm/100mL) of decedents (victims of fatal assaults) by gender, Victoria 2000/01 to 2009/10 (n=66)

Source: National Coroners Information System (closed cases only)

**Table 5** Perpetrators of public assault deaths among young people, Victoria 2000/01 to 2009/10 (n=59)

<table>
<thead>
<tr>
<th>PERPETRATOR</th>
<th>MALE DECEDENTS</th>
<th>FEMALE DECEDENTS</th>
<th>ALL DECEDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Person/other person known to the victim</td>
<td>20</td>
<td>34</td>
<td>20</td>
</tr>
<tr>
<td>Friend or acquaintance</td>
<td>21</td>
<td>35</td>
<td>7</td>
</tr>
<tr>
<td>Spouse or domestic partner</td>
<td>&lt;3</td>
<td>6</td>
<td>20</td>
</tr>
<tr>
<td>Person/other family member</td>
<td>&lt;3</td>
<td>5</td>
<td>&lt;3</td>
</tr>
<tr>
<td>Other specified person</td>
<td>&lt;3</td>
<td>5</td>
<td>&lt;3</td>
</tr>
<tr>
<td>Total</td>
<td>40</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)

**Table 6** Mechanism of death (weapon used) in public assault injury deaths among young people, Victoria 2000/01 to 2009/10 (n=72)

<table>
<thead>
<tr>
<th>MECHANISM AND WEAPON</th>
<th>MALE DECEDENTS</th>
<th>FEMALE DECEDENTS</th>
<th>ALL DECEDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Stabbing/piercing</td>
<td>31</td>
<td>43</td>
<td>6</td>
</tr>
<tr>
<td>Bodily force</td>
<td>17</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Punch</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Strike</td>
<td>5</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>62</td>
<td>100</td>
<td>10</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)
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Victims were either killed during the initial melee, attacked when fleeing or in later retaliatory incidents in a small number of cases, accidentally died when fleeing. Most victims (n=9, 47%) were stabbed (eight by persons carrying knives), four were stuck by persons carrying knives), four were stuck by garden/tree stakes or poles, four were punched and/or kicked (three of whom were killed by the impact of their head hitting the pavement or road rather than the blow itself) and two drowned. Only one incident appeared racially motivated.

All but one of the victims (95%) had either used alcohol (n=12) or illicit drugs (n=6) prior to the fatal incident. Seven of those that had used alcohol were either intoxicated (5) or highly intoxicated (2). Illicit drugs used were cannabis, amphetamines/methamphetamine and benzodiazepines. Fifteen of 19 fatal group assaults (79%) occurred in the two youngest age groups (ages 15-19 years and 20-24 years).

The 15 deaths in this category (21% of all public assault fatalities), 13 males and two females, were mostly related to relationship disputes between victims and their ex-partner or family members. In the other two cases, the perpetrators were suspected to have been killed by jealous/disapproving males over their relationship with women but, in each case, there was insufficient evidence for the coroner to make firm findings implicating any person in the death.

Seven of the 15 fatal incidents (47%) occurred on or beside a road, street or highway, five occurred in isolated spots (a creek, bush track, paddock, state park and camping site) and three in commercial premises. Seven of the victims were stabbed (47%); the others were punched/pushed, shot, strangled or incapacitated. Four victims (27%) had used alcohol or drugs. Of the three who had used alcohol, one was intoxicated and another was highly intoxicated. Drugs used were heroin (1 case) and cannabis (1 case). Victims were mainly in the 20-34 year age group (47%).

Most incidents occurred on streets (37%). Other incidents happened in or outside small businesses or hotels, on public reserves, near public transport stops and in church grounds. Twelve of the victims were stabbed (63%), four were punched (all were killed by the impact of their head on the pavement) and the others were either hit by a vehicle or shot.

Seventeen of the 19 victims (89%) had used alcohol and/or illicit drugs prior to the incident. Of the 13 who had used alcohol, three were intoxicated and another three were highly intoxicated. Illicit drugs used were cannabis, methamphetamine/amphetamines, cocaine, heroin and toluene. Five victims had used both alcohol and illicit drugs. The majority of decedents were aged 15-19 years (n=8, 42%); the remainder were fairly evenly spread across the other three 5-year age groups.

Three incidents occurred between groups of strangers that met by chance in public places that escalated into a melee, attacked when fleeing or in later retaliatory incidents or, in a small number of cases, accidentally killed when fleeing (7%). Eight victims (53%) had used alcohol and/or drugs. Three victims had used alcohol, one of whom was intoxicated. Seven had used illicit drugs, alone or in combination, including benzodiazepines (4 cases), heroin (3 cases), methamphetamine/amphetamines (3 cases), cannabis (1 case) and ketamine (1 case). More than half of victims (53%) were in the oldest age group (ages 30-34 years).

The 15 deaths in this category (21% of public assault fatalities), 13 males and two females, were mostly related to relationship disputes between victims and other relations (78%). Of the 13 who had used alcohol, four were stabbed (31%); the others were punched/pushed, shot, strangled or incapacitated. Ten victims (63%) had used alcohol or drugs. Of the three who had used alcohol, one was intoxicated and another was highly intoxicated. Drugs used were heroin (1 case) and cannabis (1 case). Victims were mainly in the 20-34 year age group (47%).

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4. Results: Hospital-treated injury

4.1 Trends

The trend in the yearly frequency and rate of assault-related injury hospitalisations was plotted for the decade 2000/01 to 2009/10. Trends were plotted for ED presentations for the 6-year period 2004/05 to 2009/10 as all hospitals operating a 24-hour ED service contributed data to the ED injury surveillance system (the VEMID) from 2004 onward.

Figure 2 shows the trend in the yearly frequency of hospital admissions for public assault-related injury among young people aged 15-34 years, Victoria 2000/01 to 2009/10.

Figure 3 shows the trend in the yearly rate of hospital admissions for injury to young people due to assaults in public places, overall and by five-year age groups. Trend modelling indicated there was no change in the all-ages rate of hospital admissions for public assault injury among 15-34 year olds over the decade (9%, 95% CI -24% to +30%). However, there was a nonsignificant 17% increase in the yearly assault-related injury hospitalisation rate among 15-19 year olds. In contrast, the yearly rate of admissions decreased in the other age groups, by 3% in 20-24 year olds, 14% in 25-29 year olds and 9% in 30-34 year olds. None of these decreases was significant at the 0.05 level.

Table 8 Body region injured, public assault deaths among young people, Victoria 2000/01 to 2009/10 (n=72)

<table>
<thead>
<tr>
<th>Region</th>
<th>Male deceased</th>
<th>Female deceased</th>
<th>All deceased</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head/face</td>
<td>22</td>
<td>21</td>
<td>43</td>
</tr>
<tr>
<td>Multiple injuries</td>
<td>12</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>Neck</td>
<td>8</td>
<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Spinal cord injured</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Limb loss</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other isolated/suspended body region</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)

Figure 2 Trend in yearly frequency of hospital admissions for public assault-related injury among young people aged 15-34 years, Victoria 2000/01 to 2009/10

Figure 3 Trend in yearly rate of hospital admissions for public assault-related injury among young people aged 15-34 years, Victoria 2000/01 to 2009/10

4. Results: Hospital-treated injury

4.1 Trends

The trend in the yearly frequency and rate of assault-related injury hospitalisations was plotted for the decade 2000/01 to 2009/10. Trends were plotted for ED presentations for the 6-year period 2004/05 to 2009/10 as all hospitals operating a 24-hour ED service contributed data to the ED injury surveillance system (the VEMID) from 2004 onward.

Table 2 shows the trend in the yearly frequency of hospital admissions for public assault-related injury overall and by five-year age groups. The number of admissions fluctuated across the decade with the lowest number (n=961) in 2003/04 and the highest (n=1,098) in 2008/09.

Trend modelling indicated there was an increase of 16% in the frequency of hospitalisations over the decade, however this increase was not statistically significant at the 0.05 level (95% confidence interval -11% to +5%). Among the 5-year age groups, the only significant increase in the frequency of admissions, based on the trendline, was observed among 15-19 year olds. In this age group, hospitalisations increased by 35% (95% CI 30% to 40%) from 2004/05 to 2009/10.

Table 8 Body region injured, public assault deaths among young people, Victoria 2000/01 to 2009/10 (n=72)

<table>
<thead>
<tr>
<th>Region</th>
<th>Male deceased</th>
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</thead>
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<td>43</td>
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<td>5</td>
<td>17</td>
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<td>10</td>
<td>18</td>
</tr>
<tr>
<td>Spinal cord injured</td>
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<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Limb loss</td>
<td>4</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other isolated/suspended body region</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)

Table 8 Body region injured, public assault deaths among young people, Victoria 2000/01 to 2009/10 (n=72)

<table>
<thead>
<tr>
<th>Region</th>
<th>Male deceased</th>
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<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Other isolated/suspended body region</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Source: National Coroners Information System (closed cases only)
4.1.2 Trend in hospitalisations by gender

Males accounted for 90% of hospital admissions for public assault-related injury over the decade 2000/01 to 2009/10. The yearly frequency and rate for male admissions tended to fluctuate across the decade, while the yearly frequency and rate of female admissions showed less variability.

Trend modelling showed a non-significant upward trend (over the decade in the frequency of assault-related injury hospitalisations among both males (17% increase, 95% CI -12% to +56%) and females (7% increase, 95% CI -15% to +33%). However, there were small non-significant downward trends in the yearly assault-related injury admission rate among both males and females, by 2% (95% CI -26% to +30%) and 6% (95% CI -24% to +15%), respectively.

4.1.3 Trend in hospitalisations by mechanism of assault

Trend analysis was also conducted on the yearly frequency and rate of hospitalisations by mechanism of assault. Cases were grouped into five categories based on the cause of injury code: (1) assault by ‘bodily force’ (punch, kick, shove etc); (2) assault by sharp object (knife, razor blade, glass, needle and other sharp objects); (3) assault by blunt object (piece of wood, metal pole, etc); (4) assault by other specified means; and (5) assault by unspecified means.

Trend modelling showed that the yearly frequency of hospitalisations due to assault by sharp objects increased by 53% (95% CI -12% to +153%) and 32% (95% CI -15% to +50%) in the frequency of ED presentations, overall and by five-year age groups. The only significant increase in the frequency of ED presentations, based on the trendline, was observed among 15-19 year olds. In this age group, ED presentations for public assault-related injury increased by 39% (95% CI 4% to 80%), compared with a significant 35% increase for hospitalisations.

ED presentations also increased among 20-24 year olds (by 21%) and 25-29 year olds (by 19%), but neither of these increases was statistically significant. There was a non-significant decrease (by 10%) in ED presentations among the 30-34 year olds.

4.1.5 Trend in yearly rate of hospital ED presentations (non-admissions) for public assault-related injury overall and by 5-year age groups

Figure 5 shows the trend in the yearly rate of ED presentations for injury to young people due to assaults in public places, overall and by five-year age groups. The ED presentation rate fluctuated across the 6-year period from a low of 217.7 per 100,000 population in the first year of the period (2004/05) to a peak of 270.7 per 100,000 population in the second year (2005/06) before decreasing in the remaining years of the period.

Trend modelling showed there was small, non-significant increase in the rate of ED presentations for public assault injury among 15-34 year olds over the 6-year period to 2009/10 (7%, 95% CI -15% to +34%), compared with no change in the incidence of hospital admissions over the decade to 2009/10. The observed increase in the rate of ED presentations was driven by the non-significant 28% increase in the yearly assaultive injury ED presentation rate among 15-19 year olds (compared with a non-significant increase of 17% in the hospital admissions rate in this age group). As for hospital admissions, there were non-significant decreases in the yearly rate of ED presentations in all other 5-year age groups (by 1% in 20-24 year olds, 4% in 25-29 year olds and 10% in 30-34 year olds).

4.2 Detailed analysis: hospital-treated injury (2007/8 to 2009/10)

4.2.1 Case count

Hospital-treated injury data for the three most recently available fiscal years (July 1, 2007 to June 30, 2010) were analysed in more detail. Over this period, there were 14,568 hospital-treated public assault-related injury cases (3,044 hospital admissions and 11,524 ED presentations) among young people aged 15-34. This represents an average of 4,886 hospital-treated cases per year (1,015 admissions and 3,841 ED presentations).

4.2.2 Age and gender

Table 7 shows the numbers of cases that presented to hospital over the study period by five-year age groups. A similar age pattern was observed among hospital admissions and ED presentations. Case counts were highest among 20-24 year olds, followed by 15-19 year olds, with injury frequency reducing with age after age 24.

Males were strongly over-represented, accounting for 91% (n=2,755) of admissions and 86% (n=932) of ED presentations. Overall, the male hospital admission rate (117.0 per 100,000) was more than nine times greater than the female rate (12.7 per 100,000), while the male ED presentation rate (421.4 per 100,000) was six times greater than the female rate (70.5 per 100,000).

4.2.3 Country of birth

A different risk pattern was observed among ED presentations compared with hospitalisations. The assault-related injury ED presentation rate was highest among young people born in main English-speaking overseas countries (53.4 per 100,000). Among assault-related injury ED presentations, 8% were born in Australian i.e. English speaking (n=926). 12% were born in mainly non-English-speaking countries (n=1,387) and 4% were born in mainly English speaking countries (n=470). In 1% of ED presentations the country of birth was not specified (n=114).

A different risk pattern was observed among ED presentations compared with hospitalisations. The assault-related injury ED presentation rate was highest among young people born in main English-speaking overseas countries (242.0 per 100,000), followed by young people born overseas in mainly English speaking countries (221.0 per 100,000). As for admissions, young people born overseas in mainly English speaking countries had the highest proportion of admissions (3% of all admissions, n=83) and ED presentations (3%, n=117) of all age groups. The highest proportion of admissions (7%, n=259) and ED presentations (7%, n=117) was born in mainly non-English-speaking countries (n=3,167) and 4% were born in mainly English speaking countries (n=159). United Kingdom (1% of admissions [n=33]) and 1% of ED presentations [n=10]).

4.2.4 Proficiency in spoken English (based on country of birth)

There is no variable on the datasets to identify proficiency in spoken English so a crude indication, based on country of birth classification used by the Australian Bureau of Statistics (ABS), was utilised. Admissions and ED presentations were distributed into three groups based on whether or not English was one of the main languages spoken in the patient’s country of birth. Australian-born (English speaking). Overseas-born from mainly English speaking countries; and Overseas-born from mainly non-English speaking countries (see Box 2 for allocation of countries).

Among hospital admissions, 77% of cases were born in Australia (n=2,334, 13%) were born in mainly non-English speaking countries (n=530) i.e. English speaking overseas countries (n=114). In 6% of cases (n=166), the country of birth was not specified. Comparison of hospitalisation rates indicated that young people born overseas in mainly English speaking countries were at highest risk of hospitalisation for assault-related injury than their Australian born counterparts (3-year average hospitalisation rate 441.4 per 100,000) versus 68.8/100,000 (see Table 11).

4.1 Trend in the frequency of ED presentations, overall and by 5-year age groups

Figure 4 shows the trend in the yearly frequency of ED presentations over the 6-year period 2004/05 to 2009/10, overall and by five-year age groups. The number of ED presentations fluctuated across the 6-year period with the lowest number (n=3,104) in 2004/05 and the highest (n=4,024) in 2006/07. The observed trends in the frequency of ED presentations overall and by five year age groups were similar to those for hospital admissions. Trend modelling showed a non-significant 21% increase (95% CI -3% to +49%) in the frequency of ED presentations over the 6-year period to 2009/0 (compared with a non-significant increase of 16% for hospital admissions presented to the decade to 2009/10). As for hospital presentations, among the 5-year age groups, the only significant increase in the frequency of ED presentations, based on the trendline, was observed among 15-19 year olds. In this age group, ED presentations for public assault-related injury increased by 39% (95% CI 4% to 80%), compared with a significant 35% increase for hospitalisations.

ED presentations also increased among 20-24 year olds (by 21%) and 25-29 year olds (by 19%), but neither of these increases was statistically significant. There was a non-significant decrease (by 10%) in ED presentations among the 30-34 year olds.
4.2.5 Local Government Area (LGA) of residence

There is no variable on either of the injury datasets (VAED and VEMD) to identify the Local Government Area (LGA) where the assault happened, however, the LGAs (based on postcode of residence) in which the patient lived is recorded on the VAED.

Hospitalisations for assault-related injury were recorded among young people residing in 77 of the 79 LGAs in Victoria. The ten LGAs with the highest number of assault-related injury admissions among their young residents were: Greater Geelong (n=200, 7%), Casey (n=154, 5%), Brimbank (n=154, 5%), Greater Dandenong (n=126, 4%), Hume (n=118, 3%), Yarra Ranges (n=98, 3%), Banyule (n=99, 3%), Knox (n=86, 3%) and Mornington Peninsula (n=84, 3%). A person who had been assaulted was from interstate or overseas or there was no postcode of residence recorded.

To account for differences in population among LGAs, crude rates were calculated for each LGA of residence. Table 11 shows the ten LGAs with the highest assault-related injury admission rates among their young residents. Six of the top ten LGAs were outer metropolitan and regional areas with relatively lower LGAs in outer metropolitan and regional areas that had both a comparatively high frequency and rate of assault-related injury admissions. The four others were rural shires with comparatively low populations of young people (Hindmarsh, Queenscliffe, Moyne and Golden Plains).

### Table 10 Comparison of injury rate by proficiency in spoken English based on country of birth, public assault hospital-treated injury among young people, Victoria 2007/2008 to 2009/10

<table>
<thead>
<tr>
<th>Source</th>
<th>MALES</th>
<th>FEMALES</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australian born (English speaking)</td>
<td>140</td>
<td>169</td>
<td>259</td>
</tr>
<tr>
<td>Interior English speaking countries</td>
<td>136</td>
<td>164</td>
<td>244</td>
</tr>
<tr>
<td>Overseas born: non-English speaking countries</td>
<td>99</td>
<td>65</td>
<td>158</td>
</tr>
<tr>
<td>ALL PERSONS</td>
<td>117</td>
<td>127</td>
<td>244</td>
</tr>
</tbody>
</table>

**Table 11 Top ten Local Government Areas (LGAs) ranked by injury rate, public assault injury hospitalisations among young people aged 15-34 years, Victoria 2007/2008 to 2009/10**

<table>
<thead>
<tr>
<th>LOCAL GOVERNMENT AREA</th>
<th>FREQUENCY</th>
<th>PERCENT</th>
<th>ANNUAL RATE per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hindmarsh Shire</td>
<td>5</td>
<td>1,113</td>
</tr>
<tr>
<td>2</td>
<td>Queenscliffe Shire</td>
<td>&lt;5</td>
<td>451</td>
</tr>
<tr>
<td>3</td>
<td>Greater Geelong City</td>
<td>200</td>
<td>55,170</td>
</tr>
<tr>
<td>4</td>
<td>Frankston City</td>
<td>112</td>
<td>34,586</td>
</tr>
<tr>
<td>5</td>
<td>Greater Dandenong City</td>
<td>126</td>
<td>39,676</td>
</tr>
<tr>
<td>6</td>
<td>Morning Shire</td>
<td>10</td>
<td>5,948</td>
</tr>
<tr>
<td>7</td>
<td>Golden Plains Shire</td>
<td>10</td>
<td>3,649</td>
</tr>
<tr>
<td>8</td>
<td>Latrobe City</td>
<td>53</td>
<td>19,622</td>
</tr>
<tr>
<td>9</td>
<td>Wellington Shire</td>
<td>27</td>
<td>10,023</td>
</tr>
<tr>
<td>10</td>
<td>Mornington Shire</td>
<td>89</td>
<td>33,217</td>
</tr>
</tbody>
</table>

**Table 12 Time and day of ED presentations, public assault injury among young people, Victoria 2007/2008 to 2009/10**

<table>
<thead>
<tr>
<th>DAY</th>
<th>ED presentations</th>
</tr>
</thead>
<tbody>
<tr>
<td>MONDAY</td>
<td>403</td>
</tr>
<tr>
<td>TUESDAY</td>
<td>403</td>
</tr>
<tr>
<td>WEDNESDAY</td>
<td>393</td>
</tr>
<tr>
<td>THURSDAY</td>
<td>356</td>
</tr>
<tr>
<td>FRIDAY</td>
<td>413</td>
</tr>
<tr>
<td>SATURDAY</td>
<td>356</td>
</tr>
<tr>
<td>SUNDAY</td>
<td>356</td>
</tr>
</tbody>
</table>

**Table 13 Perpetrator of public assault injury hospitalisations among young people aged 25-34 years, Victoria 2007/2009 to 2009/10**

<table>
<thead>
<tr>
<th>PERPETRATOR OF ASSAULT</th>
<th>MALES</th>
<th>FEMALES</th>
<th>ALL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Official authority</td>
<td>52</td>
<td>3</td>
<td>55</td>
</tr>
<tr>
<td>Acquaintance or friend</td>
<td>98</td>
<td>20</td>
<td>118</td>
</tr>
<tr>
<td>Police or detective</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Other family member</td>
<td>12</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Other specified person</td>
<td>124</td>
<td>30</td>
<td>154</td>
</tr>
<tr>
<td>Unknown perpetrator</td>
<td>1256</td>
<td>1000</td>
<td>2256</td>
</tr>
</tbody>
</table>

4.2.8 Perpetrator of assault

In 52% of the assault-related hospitalisations the relationship between the victim and the perpetrator was not specified. Analysis of informative cases indicated that the perpetrator of the public assault was much more likely to be unknown to the victim than known (Table 13). In 74% of informative cases the perpetrator(s) of the public assault was known to the victim (Table 13). The perpetrator was an acquaintance or friend in 9% of cases and a spouse or domestic partner in 2% of cases.

The pattern was different for males and females in that a larger proportion of female than male cases the perpetrator was known to the victim. This was most evident in partner violence cases where a much larger proportion of female than male cases were due to partner violence (17% of informative cases vs. 0.3%). Similarly, a larger proportion of female than male cases were for assault-related injuries inflicted by an acquaintance or friend (16% of informative cases vs. 8%).

There is no variable on the VEMD that records the perpetrator of the assault. Screening of case narratives was conducted to identify cases that recorded the identity of the perpetrator in the narrative text field. Ninety-two percent of ED records did not contain any information on the perpetrator.

Note: The data in this section refers to alcohol and illicit drug use by the victim of assault (see Box 2 at end of report for details).
4.2.9 Mechanisms of assault (weapon used)

The datasets for hospital admissions (VAED) and emergency department presentations (VEMD) contain different but broadly comparable categories of the mechanisms of the assault injury (weapon used) (Table 14).

Among hospital admissions, the most common mechanism of injury was bodily force, that is, punching, kicking and shoving (63%, n=1,976) followed by assault by sharp object such as a knife, blade or broken glass (18%, n=483) and assault by blunt object such as a stick or pole (10%, n=295). Sexual assaults (>1%, n=22) and assault with a firearm (>1%, n=15) were relatively infrequent. The code ‘assault by sharp object’ includes sub-codes to identify the specific sharp object used in the assault. The most common sharp objects were knives, daggers or swords (41%, mostly knives) and glass (39%).

The gender pattern was largely similar, with a slightly higher proportion of assaults by bodily force, sharp object, blunt object and firearm among males than females. Females accounted for all but two admissions for sexual assault.

The pattern of injury mechanism for ED presentations was generally similar to admissions. The category of ‘struck by or collision with person’—broadly comparable to ‘assault by bodily force’—accounted for approximately two-thirds of ED presentations (69%), while the category of ‘struck by or collision with object’—broadly comparable to ‘assault with blunt instrument’—accounted for 14% of cases. The proportion of ED presentations due to being cut or pierced by an object during an assault (i.e. ‘assault with sharp object’) was relatively low (7%) in comparison to the pattern in hospital admissions, presumably reflecting the likelihood that stabbing injuries are generally more severe. Likewise, there was only one ED presentation for firearm assaults as firearm injuries are most likely to be serious.

4.2.10 Injury type and body region affected

Injury type

As shown in Table 15, among admissions fracture was the most common injury type (39%), followed by open wounds (23%), then intracranial injury (18%). By comparison, open wounds accounted for the highest proportion of ED presentations (25%), followed by superficial injury (21%) and fracture (13%).

Body region injured

As shown in Table 16, for both admissions and ED presentations, the head/face/neck was by far the most commonly injured body region, accounting for nearly three-quarters of admissions (77%) and nearly two-thirds of ED presentations (63%), followed by the upper limbs (10%, 14%), the trunk (8%, 4%) and the lower limbs (3%, 3%). Injury to multiple body regions comprised 8% of ED presentations.

4.2.11 Injury severity (hospital admissions)

To investigate the severity of admissions, each record was given an International Classification of Diseases (ICD)–based Injury Severity Score (ICISS). The ICISS involves estimating the probability of survival (‘threat to life’) using the ICD injury diagnosis codes recorded in the patient’s hospital record (see box 2 for more details). Under this system, an injury is defined as ‘serious’ or ‘high threat-to-life’ if the ICISS score is less than 0.941 (i.e. if the probability of survival is less than 94.1%). Only cases where assault-related injury was the primary diagnosis were included in this analysis (n=2,950).

Figure 7 shows the proportion of assault-related injury admissions classified as serious using the ICISS threat-to-life scale by gender and age group. Overall, 27% of admissions (n=796) were serious i.e. high threat-to-life. The proportion of admissions that were serious was higher among males (28%, n=745) than females (26%, n=541), and tended to increase with age. Twenty-four percent (n=184) of admissions aged 15–19 years were classified as serious, compared with 26% of admissions aged 20–24 years (n=268) and 25–29 years (n=184) and 35% of admissions aged 30–34 years (n=160).

Figure 8 shows the proportion of assault-related admissions classified as ‘serious’ using the ICISS by the mechanism of assault. Nearly half (47%) of the hospitalisations due to assault with a firearm were serious, as were 40% of hospitalisations for assault with a blunt object and 36% of hospitalisations for assault with a sharp object. By contrast, assaults that did not involve the use of a weapon were less likely to result in serious injury. Twenty-two per cent of hospitalisations due to assault by bodily force, 20% due to assaults by other specified means and 10% of sexual assault cases were clasified as serious.

4.2.12 Injury severity (emergency department presentations, non-admissions)

To investigate the severity of ED presentations, each record was given an International Classification of Diseases (ICD)–based Injury Severity Score (ICISS). The ICISS involves estimating the probability of survival (‘threat to life’) using the ICD injury diagnosis codes recorded in the patient’s hospital record (see box 2 for more details). Under this system, an injury is defined as ‘serious’ or ‘high threat-to-life’ if the ICISS score is less than 0.941 (i.e. if the probability of survival is less than 94.1%). Only cases where assault-related injury was the primary diagnosis were included in this analysis (n=2,950).

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The use of alcohol or drugs also appeared to increase the likelihood of the victim receiving life-threatening injuries. Thirty-six percent of hospitalisations with alcohol involvement were serious compared with 24% of those without alcohol involvement. Similarly, 41% of hospitalisations with drug involvement were classified as serious compared with 27% of those without drug involvement.

4.2.12 Length of stay in hospital (hospital admissions only)

Figure 9 shows the average (mean) length of stay for hospital admissions by gender and age. In all other analyses of hospital admissions data in this report, transfers between hospitals and re-admissions are excluded so that patients are not over counted. However, these cases are included in this analysis so that close to a full count of bed days is done. Only cases where injury was the primary diagnosis were included in this analysis (n=3,242).

The average (mean) number of days spent in hospital was 1.7 days (median 1 day), ranging from less than one day to seventy-one days. Eighty percent of admissions spent less than two bed days in hospital, 18% spent 2 to less than 8 days in hospital and 2% spent 8 days or more in hospital. In total, assault-related injury hospital admissions accounted for a total of 5,403 hospital bed days over the 3-year study period (1,801 bed days per year). The average length of stay for males was slightly longer than that for females (1.7 bed days compared with 1.5 bed days).

4.2.13 Cost of injury (hospital admissions only)

Figure 10 shows the average (mean) hospital costs for public assault-related hospital admissions by gender and age. Each hospital admission was assigned an Australian Refined Diagnosis Related Group (AR-DRG) which is a patient classification system that provides a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital. The National Hospital Costs Data Collection (NHCDC) produces average costs for each AR-DRG by state (for further information see Box 2).

Patient transfers and re-admissions are included in this analysis so that a full estimate of the costs of admissions is made. However, only cases where the assault-related injury was the primary diagnosis were included in this analysis (n=3,242) as there is no method of disaggregating the hospital cost of treating a patient’s injury when injury is not the primary diagnosis on admission (for example in some cases mental illness was the primary diagnosis on admission).

The types of component costs included are ward medical, ward nursing, non-clinical salaries, pathology, imaging, allied health, pharmacy, critical care, operating rooms, ED, ward supplies and other overheads, specialist procedure suites, on-costs, prosthetics, hotel and depreciation.

The total hospital costs of assault-related injury admissions among young people over the three year study period were $11.8 million or $3.9 million per year. The average (mean) cost per hospital admission was $3,649 (range: $790 to $80,466). The median cost was $1,586.

The average cost of hospitalisations of males was higher than that for females ($3,732 versus $2,756), presumably reflecting the lower proportion of serious injury among female cases.

The average cost of hospitalisations increased with age, from $3,298 for patients aged 15-19 years, through $3,644 for patients aged 20-24 years and $3,780 among patients aged 25-29 years to $4,081 for patients aged 30-34 years. Again this reflects the general increasing severity of injury as age increased.

5. Discussion

Our study showed that each year in Victoria around 11 young people aged 15-34 die and 5,000 young people are treated in hospital for injuries due to violent assaults in public places. Close to one in three victims are male. The total direct cost to the health system of the hospitalisations alone is $3.9 million per year.

Trends

Due to the high proportion of open cases, we could not determine the trend in fatal assaults. Deaths were extracted from the National Coroners Information System (NCIS) because it is the richest source of data on violent deaths, but coronial investigations for assault cases can remain open for lengthy periods as they do not commence until all other court proceedings are concluded. VISU researchers do not have access to ‘open’ cases. ABS death data for Victoria were not available for the years after 2006.

The current study found a non-significant increase in the frequency and no change in the incidence (rate) of public assault-related hospital admissions among young people over the decade 2000/01 to 2009/10, but a significant 35% increase in the frequency of admissions of patients with severe or significant injuries in the admissions rate in 15-19 year olds. ED presentations over a shorter time period (2004/05 to 2009/10) showed a similar pattern. The completeness of hospital admissions and ED presentations data is an issue of concern as, over the time period studied, more than half of hospitalisations and one-quarter of ED presentations for assault-related injury among 15-34 year olds were not coded for location (place of occurrence of injury). All trend results from this study should therefore be interpreted cautiously.

Several other studies have reported increasing trends in the frequency and rate of assaults and assault-related injury in Victoria through the 2000s. None is directly comparable to the current study due to differences in data sources, definitions of assault, inclusion criteria and study focus. Figures in the Victorian Police report Crime Statistics 2009/10 indicate that in the 5-year period 2005/6 to 2009/10 there were increases in the number of assault-related incidents and in assaults in the locations included in our study definition of public places (Victoria Police, 2010). Incidents of domestic violence were not reported for the 5-year period, nor were frequency or rate data for specific age groups.

The Australian Bureau of Statistics (ABS) has published trends in the frequency and rate of recorded crime (victims) in Victoria for the 10-year period 2000 to 2009 (ABS, 2010). The yearly number of assault victims rose in Victoria from 14,334 in 2000 to 28,298 in 2009. The assault rate also increased steadily over the decade from 86.6 per 100,000 population in 2000 to 118,110,000 in 2008 (the 2009 rate was not available). Over half the assault victims in 2009 were aged 15-34 and 56% were males. These figures are based on assaults in all locations; there were no published data on assaults broken down by location of offence (home, public place etc.). Further evidence of an increasing trend is provided by O’Mullane and colleagues (2009) who investigated the incidence and outcomes of the assault-related trauma hospitalisations of adults aged 15 years and older recorded on the population-based Victorian State Trauma Registry (VSTR). Their study found that there was a significantly increasing trend in the yearly rate of assault-related major trauma between 2001/02 and 2006/07 (incidence rate ratio [IRR], 1.21 [95% CI, 1.16-1.26]), particularly blunt trauma-related assault (IRR, 1.33 [95% CI, 1.26-1.41]). Consistent with these findings, our study showed year-to-year increases in the incidence of all assault-related hospitalisations among young people from 2002/03 through to 2008/09; however this upward trend was tempered by a sharp decrease in their incidence in 2009/10. The VSTR study reported that young adult males aged 15-34 were the highest risk group for assault-related injury. 92% of the 807 severe trauma patients studied were men and 58% were aged 15-34 years (O’Mullane et al., 2009).

One data item on the VSTR and not on the hospital injury surveillance datasets VISU holds (the VEMD) is the location (suburb/postcode) of the place where the injury occurred. This is vital information for targeting prevention efforts but VISU’s representations to the Department of Health to add this data item to the VEMD have not as yet been successful.

The VSTR study reported that 67% of the severe trauma assault cases occurred in metropolitan Melbourne, mainly in the northwest region (38%), which includes the central business district, and the southern region (22%). Regional Victoria yielded 20% of recorded severe assault-related injury cases, the highest proportion occurring in Barwon
Weapons used

In relation to weapons used to inflict injury, the current study found that the pattern was different for fatal and non-fatal cases, in part reflecting the lethality of the weapon. Knives and other sharp objects were the weapons used in just over half of the fatal assaults, firearms or bodily force was used in a further third, and blunt objects in a small proportion (6%).

The cause of death in the bodily force cases was usually head trauma due to impact of the head with the pavement rather than the blow itself. Among hospital-treated assaultive injury cases bodily force was the most common weapon used, accounting for 60% of cases, followed by blunt and sharp objects. Firearm blast injury was rare among hospital admissions and ED presentations, reflecting both the lethality of wounds from firearms and the restrictions on the availability of firearms in Victoria.

Our study provides further evidence of the role of alcohol and illicit drugs in precipitating or influencing the occurrence of physical violence but also points to the need for improved collection of data on alcohol and drug use by patients presenting with assaults-related injuries to hospitals in Victoria.

Whether or not there has been any change in the number of stabbing/piercing assaults on young people in the 2000s is of interest to the community and the government as there has been a range of legal restrictions placed on the carriage of knives in public places (in response to a perceived escalation of their use in conflict situations by young people) and firearms ownership and possession. Our study revealed that both the yearly frequency and rate of hospitalisations for assault by sharp object rose over the decade, by 53% and 32% respectively, but that neither of these increases was statistically significant at the 0.05 level. The VSTR study by O’Mullane et al. (2009) found that the rate of penetrating major trauma assaults (mostly by knives with a few by gunshot) in Victoria was stable between 2001/02 and 2006/07.

Potential risk factors

In the current study, the highest quality data on alcohol and illicit drug use by victims of assault was recorded on the coroners database (NCIS). Information on alcohol and drug use was available for over 90% of the 72% of non-fatal cases involving alcohol involvement was documented in the medical record.

The authors of the NSW study compared the levels of alcohol and drug use among victims in their study with the prevalence of daily use, using statistics for Australia from the 2004 National Drug Use Survey (AIHW, 2005). They present but not documented in the medical record.

The authors recommended that at the very least, the use of two ICD-10 codes — Y90 Evidence of alcohol involvement determined by blood alcohol level and Y91 Evidence of alcohol involvement determined by level of intoxication (assessed by the clinician based on the patient’s breath and degree of behavioural disturbance) — should be made mandatory when there is documentation of alcohol levels and/or alcohol intoxication in a medical record.

A recent study sought to quantify the extent to which illicit drug-related injuries are adequately identified in injury hospitalisations unitising relevant ICD-10-AM codes. Only 3% of the public-assault-related hospitalisations in our study contained at least one code indicating illicit drug use so it is probably safe to assume that the involvement of illicit drugs in assault-related injuries cases is underestimated in Victorian hospitals.

Likewise, we found that only 4% of the case narratives of ED presentations for assault-related injury on the VEMD in our study included text that indicated alcohol involvement and even fewer (0.1%) made reference to illicit drug involvement. Data were deemed too unreliable to analyse. By comparison, a single hospital study conducted in the emergency department of St Vincent’s Hospital in NSW and the Australian arm of a six country study that collected data in the emergency department on alcohol involvement in injury via interview and/or breath test both reported that around 60% of assault patients seen in the emergency department involved alcohol compared with 16%-19% of patients who had alcohol with a blood alcohol content of 0.14g/100mL (range 0.01-0.48g/100mL), slightly higher than the median of 0.10g/100mL, range 0.01-0.24g/mL found in the current study.

A higher proportion of decedents in our study than in the NSW study had used illicit drugs, 42% compared with 33%, but this is likely explained by the younger age of decedents in our study and its narrower focus (i.e. on fatal assaults in public places). In both the NSW and the current study, cannabis was the most commonly detected illicit drug, detected in one-fifth of decedents in both studies.

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that better explained the relationship between alcohol and violent injury and the significant dose-response relationship found (i.e. the likelihood of violent injury increased as the amount of alcohol consumed increased) all indicate that the relationship between alcohol consumption and violent injury is causal. A limitation of this study (and previous case control studies in the area of alcohol-related violence) is the use of other injured patients as the control group as they may not be representative of the population from which cases are derived.

The deficiency in reporting alcohol (and drug) involvement in injury and assault injury cases recorded on the VEMD could be remedied by ED staff entering one of the diagnosis codes indicating alcohol or illicit drug involvement into the diagnosis field on the dataset or by educating ED staff to improve the routine reporting of alcohol and illicit drug involvement in the case narrative field. A ‘carrot and stick’ approach by the Department of Health may be needed to improve reporting as a substantial proportion of the 38 VEMD hospitals in Victoria do not appear to be motivated to improve the quality of their injury surveillance data.

Circumstances (scenarios) of assaults in public places

Detailed information on the circumstances of the public assaults was only available for fatal assaults. While there is some information on the circumstances in case narratives of ED presentations, data lacked detail and consistency.

The current study found that most fatal assaults of young people in public places generally fitted well into five distinctive scenarios of violence. The four major scenarios (that accounted for about 90% of fatal assaults) were: (1) confrontational/homicides typically between groups of males of low socioeconomic status that happen in public places which are best described as ‘honour contests’ (20% of all reported homicides); (2) homicides that can be seen as a form of conflict resolution often involving males living on the margins of society (the unemployed, alcohol/drug dependent and/or those engaged in criminal activity) who have fallen out over issues as drug debts or criminal activity and see they have no recourse but violence to settle differences (10%); and (3) homicides that occur in the course of other crime such as robbery. The fifth scenario, fatal assaults by individuals affected by mental illness, was much less common.

These are very similar to the scenarios reported by Polk & Ranson (1992) in their examination of forms of masculine homicide utilising coroners’ files to construct case studies on 378 homicides reported to the Coroner of Victoria over the five-year period 1985-1989. The authors discerned three major scenarios of violence that encompass most of the male-on-male killings that comprised 51% of all homicides over the period studied: (1) confrontational homicides typically between groups of males of low socioeconomic status that happen in public places which are best described as ‘honour contests’ (20% of all reported homicides); (2) homicides that can be seen as a form of conflict resolution often involving males living on the margins of society (the unemployed, alcohol/drug dependent and/or those engaged in criminal activity) who have fallen out over issues as drug debts or criminal activity and see they have no recourse but violence to settle differences (10%); and (3) homicides that occur in the course of other crime such as robbery.

The authors conclude that any action to reduce male-on-male homicides in Australia must address the beliefs and behaviour patterns closely identified with masculinity and economic marginality that put some males at high risk of being either a perpetrator and/or a victim of violence (Polk & Ranson, 1992).

Prevention and control measures

It is beyond the scope of this report to evaluate the evidence base for violence prevention and control measures. The reader is referred to the recent reports for this information. The World Health Organisation (WHO) Violence prevention and Disability (VIP) website includes a substantial report, Violence prevention: the evidence, a set of evidence briefings based on rigorous reviews of the literature which examines scientific evidence for the effectiveness of interventions to prevent interpersonal and self-directed violence. Each briefing focuses on a broad strategy for preventing violence, and under that umbrella reviews the evidence for the effectiveness of specific interventions.

The violence prevention strategies covered in the seven briefings are: (1) Developing safe, stable and nurturing relationships between children and their parents and caregivers; (2) Developing life skills in children and adolescents; (3) Reducing the availability and harmful use of alcohol; (4) Reducing access to guns, knives and pesticides; (5) Promoting gender equality to prevent violence against women; (6) Changing cultural and social norms that support violence; and (7) Victim identification care and support.

The second useful publication is from the WHO Regional Office for Europe. The European report on preventing violence and knife crime among young people describes the burden that youth violence imposes on the European Region: risk factors for involvement in youth and knife violence, factors that can protect young people from violence, and the evidence supporting the different approaches to prevention.

The third is a local report from the recent inquiry by the Parliament of Victoria Drugs and Crime Prevention Committee which was specifically focussed on investigating strategies to reduce assaults in public places in Victoria (available at http://www.parliament.vic.gov.au/publications/committee-reports). The inquiry canvassed the range of possible prevention measures and, based on research evidence and expert opinion, made recommendations to the Victorian government and its future actions to reduce public assaults.

The report included the following recommendations to the Victorian and Commonwealth governments.

Recommendations to the Victorian government

- Policing and law enforcement: Increase liaison between the private security industry and police; further research into community policing programs to identify and implement best practice models that are culturally sensitive; and increasing training of young police officers to enable them to deal with young people from CALD, refugee and Indigenous communities.

- Regulating the availability of alcohol: Measures to require packaged liquor outlets to obtain a planning permit from relevant local councils and to allow councils to consider the impact of the licensed premises on community health, safety and wellbeing when issuing licences; a review of the impact of the growth of packaged liquor outlets on local communities with a view to regulating outlet density and support for national guidelines on alcohol outlet density to address cross border issues; and the enactment of secondary supply legislation that makes it illegal for anyone other than a parent, guardian or spouse to provide alcohol to a minor in a private setting and an associated communication and education campaign targeting parents and teenagers.

- Regulating and monitoring drinking environments: Develop and introduce a compulsory advanced responsible Service of Alcohol (RSA) course and regular refreshers courses for staff employed in venues trading liquor past 11pm (late night venues/packaged liquor outlets) and mandate the employment of an RSA monitor (who is not involved in sales) in late night venues; strengthen the role of Liquor Accords (forged between licensees, police, local government and community representatives) by making measures established through liquor accords mandatory for late night venues within the LGA area covered by the accord; modify the physical environment of venues by requiring that all new on-premise venues and venues involved in transfers/variants of an existing liquor licence adhere to Design Guidelines for Licensed Premises, and encouraging existing on-premise venues to upgrade to the guidelines, and investigate the feasibility of the mandatory use of polycarbonate or other shatterproof glass in premises that are subject to risk late/night trading fees and a requirement that all on-premise venues have food available for purchase.

- Modifying the broader environment of entertainment precincts and activities centres: Investigate the feasibility of extending hours of operation of public transport to 4.00am Saturday and Sunday mornings; provide continued support for the Taxi Rank Safety Program; and investigate the establishment of ‘safe havens’ for vulnerable people within entertainment precincts.

- Campaign for change - provision of education and education: Investigate the option of regulating alcohol advertising using tobacco advertising restrictions as a model; and provide continued support for community based education that takes
There are a number of barriers, however, to the identification and documentation of alcohol involvement in injury cases presenting to the Emergency Department and the administration of a brief intervention. Documented barriers include: the belief among medical staff that alcohol is not an issue that warrants specific recording; the perception that the ED is not the appropriate place for interventions targeting alcohol use; concern about the medical-legal implications of recording alcohol intoxication; lack of medical and nursing staff recognition of alcohol involvement in injury due to deficits in medical education and staff training; lack of a support system and capacity to intervene if ED medical staff identify a problem; the need for on-going training of ED medical staff or specialist counsellors employed in the ED; staff turnover; the cost; competing priorities; and lack of patient interest (WHO, 2009).

Newer technologies may be one way of addressing these barriers. The internet and mobile phone offer the advantage of delivering tailored alcohol interventions that can be accessed at low cost to the health care system, no cost to the patient, delivered in a setting and time of patient’s choosing, operate 24 hours a day, and are free of the geographic restrictions that hinder the reach of more intensive face-to-face counselling (Riper et al., 2011). These interventions may not be as effective as face-to-face counselling with a trained and skilled clinician or counsellor but in real-life most medical staff regard problem drinkers (especially young drinkers) will not voluntarily seek, or be able to access, face-to-face counselling.

The delivery of internet-based self-help for problem drinkers has been shown to be effective in randomised efficacy trials (Riper et al., 2011 meta-analysis; Cunningham et al., 2009; Sipkerman et al., 2010; Boon, 2010) as well as the use of mobile phone interventions for smoking cessation (Friel et al., 2011; Whittaker et al., 2009 Cochrane review). If alcohol-related injury cases were better identified by ED staff then the opportunity is created to activate ultra-brief counselling in the ED that links at-risk young people to internet- or phone-based interventions that aim to reduce alcohol use and/or harm from alcohol use. A trial is worth considering given the size of the alcohol-related violence problem among young people in Victoria.

## Recommendations (confined to injury surveillance and research)

- Improve the coding of location of injury event in injury cases recorded on the Victorian Admitted Episodes Dataset (VAED) and the Victorian Emergency Minimum Dataset (VEMD) as this information was missing for more than half of hospitalisations and one-quarter of ED presentations for assault-related injury among young people.

- Include a new variable location (suburb/postcode) of the place where the injury occurred in the VAED and the VEMD as this is vital information for the targeting of violence prevention and control measures.

- Mandate the use by hospital coders of the two ICD-10 codes on the VAED — Y90 Evidence of alcohol involvement determined by blood alcohol level and Y91 Evidence of alcohol involvement determined by level of intoxication — when there is documentation of alcohol levels and/or alcohol intoxication in a medical record.

- Encourage, train and support hospital ED staff to use the ICD-10-AM diagnosis codes indicating alcohol or illicit drug involvement into the diagnosis field on the VEMD and/or to routinely report alcohol and illicit drug involvement in the case narrative field on the VEMD.

- Fully evaluate any new public violence prevention and control measures or packages of measures of commissioning the evaluation study prior to the start of the intervention trial to ensure that pre-intervention data are collected and desired program effects can be measured.

- Conduct a trial of ultra-brief counselling in selected hospital emergency departments that links at-risk young people to internet- or phone-based interventions that aim to reduce alcohol use and/or harm from alcohol use.

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## References

### Australian Bureau of Statistics


- Australian Bureau of Statistics. Ellicit Drug Use, Sources of Australian Data, 2001 Cat no. 4808.0, ABS, Canberra.


Box 1: Data sources and case selection

Deaths

**Data source: National Coroners Information System (NCIS)**

The NCIS is a national internet based data storage and retrieval system for Australian coronial cases. Details of the data collection system and data fields are available on the NCIS website: www.ncis.org.au

The NCIS was accessed for the purposes of this report by Angela Clapperton (VISU researcher and co-author of the report) who has a user license.

**Case selection:**
- Deaths on the NCIS recorded as occurring between 1 July 2000 and 30 June 2010
- Closed cases only (i.e. not cases awaiting or still under coronial investigation)
- Intent on completion recorded as ‘assault’
- Age of deceased has a value ranging from 15 to 34 years old
- After initial selection, case records and appended documentation were examined to identify those cases where the fatal accident occurred in a publicly accessible location consistent with the definitions used for the VAED and VEMD (see below).

Hospital admissions

**Data source: Victorian Admitted Episodes Dataset (VAED)**

Hospital admissions for injury and poisoning that contain an external cause code are extracted from the VAED by the Victorian Department of Health (DH) and supplied in unit record format to VISU every six months. The dataset covers admissions to all Victorian public and private hospitals. From July 1998 cases recorded on the VAED are coded to the ICD-10-AM, the WHO International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification. The external causes chapter of the ICD-10-AM describe the causes of injury, poisoning and adverse events (complications of medical and surgical care). Adverse events and sequelae (late effects) of external causes of morbidity and mortality are usually not included in VISU reports.

**Case selection:**
- Admission recorded on the VAED that occur between 1 July 2000 and 30 June 2010 (for trends) and 1 July 2007 and 30 June 2010 (for detailed analysis)
- Mode of admission has any value except those indicating that transfer from another hospital has occurred or that the record is a ‘statistical separation’ – a change of care type within a hospital. The aim of these omissions is to reduce over-counting of cases and to provide an estimated incidence of admission
- Mode of separation has any value except that a person died while in hospital
- Age of admitted person has a value ranging from 15 to 34 years old
- First occurring external cause code has a value in the range X85 to Y09 (i.e. assault), excluding Y06 ‘neglect and abandonment’ and Y07 ‘other maltreatment syndromes’. Note that the first occurring external cause code is not necessarily the primary diagnosis code.
- Location of injury code has one of the following values: Y92.2 ‘School, other institution and public administrative area’; Y92.3 ‘Sports and athletics area’; Y92.4 ‘Street and highway’; Y92.5 ‘Trade and service area’ or Y92.8 ‘Other specified place of occurrence’

**Box 1 Continued...**

**Emergency department presentations (non-admissions)**

**Data source: Victorian Emergency Minimum Dataset (VEMD)**

Emergency Department presentations for injury and poisoning are extracted from the VEMD by the Victorian Department of Health (DH) and supplied quarterly in unit record format to VISU. From January 2004, VEMD data are collected by all 38 Victorian public hospitals that provide a 24-hour ED service.

The VEMD contains both admitted and non-admitted cases. Presentations that are treated and discharged from within the ED within 4 hours from the time patient management commenced are classified as non-admissions and cases that are treated for 4 hours or more in the ED or a short stay ward attached to the ED or depart from the ED to an inpatient bed or are transferred to another hospital campus are classified as hospital admissions. Admissions for injury and poisoning recorded on the VEMD are not usually included in VISU injury surveillance reports if admissions are also being selected from the VAED because cases would then be over-counted.

**Case selection:**
- Hospital ED presentations (non-admissions) recorded on the VEMD that occur between 1 July 2000 and 30 June 2010 (for trends) and 1 July 2007 and 30 June 2010 (for detailed analysis)
- Initial presentations only
- Age of presenting person has a value ranging from 15 to 34 years old

Estimating rates

Crude rates were calculated. Rates were not age-adjusted due to the limited age range and generally stable population distribution over the time period.

**Trend analysis**

Trends were determined using a log-linear regression model of the rate data assuming a Poisson distribution of injuries. The statistics relating to the trend curves, slope and intercept, estimated annual percentage change, estimated overall change, 95% confidence intervals around these estimated changes and the p-value, were calculated using the regression model in SAS® 9.2. A trend was considered to be statistically significant if the p-value of the slope of the regression model was less than 0.05.

**Alcohol involvement: definition of ‘alcohol-related’ using ICD-10-AM codes**

Cases were identified as involving alcohol if they contained any of the 35 ICD-10-AM diagnosis or external cause code referring to illicit drugs or related licit pharmaceuticals, following the approach outlined in the Australian Bureau of Statistics report titled ‘Illicit Drug Use, Sources of Australian Data, 2001’.

**Diagnosis Codes:**
- G72.1 Alcoholic myopathy
- G72.2 Alcoholic cardiomyopathy
- K29.2 Alcoholic gastritis
- K70 Alcoholic liver disease
- K85.2 Alcoholic acute pancreatitis
- K86.0 Alcohol induced chronic pancreatitis
- Z86.41 Personal history of alcohol use disorders
- Z71.4 Counselling and surveillance of alcohol use disorder
- Z71.2 Alcohol use

Illicit drug involvement: definition of ‘illicit drug-related’ using ICD-10-AM codes

Cases were identified as involving illicit drugs if they contained any of the 35 ICD-10-AM diagnosis or external cause code referring to illicit drugs or related licit pharmaceuticals, following the approach outlined in the Australian Bureau of Statistics report titled ‘Illicit Drug Use, Sources of Australian Data, 2001’.

**Diagnosis Codes:**
- X44/X64/Y12; Accidental/intentional/event of poisoning and exposure to narcotics and psychodysleptics (hallucinogens) (T40.0-9); poisoning by antiepileptic, sedative-hypnotic and antipsychism drugs (T42.3,4,6,7); poisoning by psychotropic drugs n.e.c. (T43.3,5,6,8)

**External causes codes:**
- Accidental/intentional/event of undetermined intent by poisoning and exposure to antiepileptic, sedative-hypnotic, antipsychism and psychotropic drugs n.e.c. (T42.3,4,6,7)
- Accidental/intentional/event of undetermined intent by poisoning and exposure to other psychoactive substances (F19); Poison cases – poisoning by narcotics and psychodepslytics (hallucinogens) (T40.0-9); poisoning by antiepileptic, sedative-hypnotic and antipsychism drugs (T42.3,4,6,7), poisoning by psychotropic drugs n.e.c. (T43.3,5,6,8)

Box 2: Special analyses - definitions and methods

Diagnosis Codes:
- External cause codes: X45 Accidental poisoning by and exposure to alcohol; X65 Intentional self-poisoning by and exposure to alcohol; Y15 Poisoning by exposure to alcohol underdetermined intent; Y90 Evidence of alcohol involvement determined by blood alcohol level; Y91 Evidence of alcohol involvement determined by level of intoxication
- External causes codes: X44 Alcohol-induced pseudo-Cushing’s Syndrome; E52 Niacin deficiency [pellagra]; F10 Mental and behavioural disorders due to use of alcohol; G31.2 Degeneration of nervous system due to alcohol use; G62.1 Alcoholpolyneuropathy; G72.1 Alcoholic myopathy; G72.2 Alcoholic cardiomyopathy; K29.2 Alcoholic gastritis; K70 Alcoholic liver disease; K85.2 Alcoholic acute pancreatitis; K86.0 Alcohol induced chronic pancreatitis; Z86.41 Personal history of alcohol use disorders; Z71.2 Alcohol use; Z86.41 Personal history of alcohol use disorders.

**Alcohol involvement: definition of ‘alcohol-related’ using ICD-10-AM codes**

Cases were identified as involving alcohol if they contained any of the 35 ICD-10-AM diagnosis or external cause code referring to alcohol, following the approach taken in a recently published Australian study by McKenzie et al (2010). Twenty-four relevant ICD-10-AM codes that mentioned alcohol in the description were used to identify alcohol involvement.

**Box 2: Continued...**

**External causes codes:**
- X45 Accidental poisoning by and exposure to alcohol; X65 Intentional self-poisoning by and exposure to alcohol; Y15 Poisoning by exposure to alcohol underdetermined intent; Y90 Evidence of alcohol involvement determined by blood alcohol level; Y91 Evidence of alcohol involvement determined by level of intoxication
- External causes codes: E52 Niacin deficiency [pellagra]; F10 Mental and behavioural disorders due to use of alcohol; G31.2 Degeneration of nervous system due to alcohol use; G62.1 Alcohol polyneuropathy; G72.1 Alcoholic myopathy; G72.2 Alcoholic cardiomyopathy; K29.2 Alcoholic gastritis; K70 Alcoholic liver disease; K85.2 Alcoholic acute pancreatitis; K86.0 Alcohol induced chronic pancreatitis; Z86.41 Personal history of alcohol use disorders; Z71.2 Alcohol use; Z86.41 Personal history of alcohol use disorders.

Illicit drug involvement: definition of ‘illicit drug-related’ using ICD-10-AM codes

Cases were identified as involving illicit drugs if they contained any of the 35 ICD-10-AM diagnosis or external cause code referring to illicit drugs or related licit pharmaceuticals, following the approach outlined in the Australian Bureau of Statistics report titled ‘Illicit Drug Use, Sources of Australian Data, 2001’.

**Diagnosis Codes:**
- X44/X64/Y12; Accidental/intentional/event of poisoning and exposure to narcotics and psychodepslytics (hallucinogens) (T40.0-9); poisoning by antiepileptic, sedative-hypnotic and antipsychism drugs (T42.3,4,6,7), poisoning by psychotropic drugs n.e.c. (T43.3,5,6,8)

**External causes codes:**
- Accidental/intentional/event of undetermined intent by poisoning and exposure to antiepileptic, sedative-hypnotic, antipsychism and psychotropic drugs n.e.c. (T42.3,4,6,7)
- Accidental/intentional/event of undetermined intent by poisoning and exposure to other psychoactive substances (F19); Poison cases – poisoning by narcotics and psychodepslytics (hallucinogens) (T40.0-9); poisoning by antiepileptic, sedative-hypnotic and antipsychism drugs (T42.3,4,6,7), poisoning by psychotropic drugs n.e.c. (T43.3,5,6,8)

**External causes codes:**
- X45 Accidental poisoning by and exposure to alcohol; X65 Intentional self-poisoning by and exposure to alcohol; Y15 Poisoning by exposure to alcohol underdetermined intent; Y90 Evidence of alcohol involvement determined by blood alcohol level; Y91 Evidence of alcohol involvement determined by level of intoxication
- External causes codes: E52 Niacin deficiency [pellagra]; F10 Mental and behavioural disorders due to use of alcohol; G31.2 Degeneration of nervous system due to alcohol use; G62.1 Alcohol polyneuropathy; G72.1 Alcoholic myopathy; G72.2 Alcoholic cardiomyopathy; K29.2 Alcoholic gastritis; K70 Alcoholic liver disease; K85.2 Alcoholic acute pancreatitis; K86.0 Alcohol induced chronic pancreatitis; Z86.41 Personal history of alcohol use disorders; Z71.2 Alcohol use; Z86.41 Personal history of alcohol use disorders.
Ethnicity: definition of ‘Mainly English speaking countries’

Mainly English speaking countries were defined using the list provided in the Australian Bureau of Statistics (ABS) report Australian Social Trends, 2008 (CAT 41020). This list contains countries from which Australia receives, or has received, significant numbers of overseas settlers who are likely to speak English. These countries comprise the United Kingdom, the Republic of Ireland, New Zealand, Canada, South Africa, and the United States of America.

Injury severity: definition of ‘serious’ injury

To examine the severity of hospital admissions due to assaults in publicly accessible places each hospital record was given an International Classification of Disease (ICD)-based Injury Severity Score (ICISS) (Davie et al., 2008). The ICISS involves estimating probability of death using the ICD injury diagnosis codes recorded in a person’s hospital record. The definition of ‘serious’ involves calculating a survival risk ratio (SRR) for each individual injury. An SRR is the proportion of cases with a certain injury diagnosis in which the patient does not die, or in other words, a given SRR represents the likelihood that a patient will survive a particular injury. Each patient’s final ICISS is the product of the SRRs associated with all the diagnoses listed on the patient hospital record. An injury is considered serious if the ICISS is less than or equal to 0.941, this is equivalent to a survival probability of 94.1% or worse — meaning the injured person has a probability of death (when admitted) of at least 5.9%.

Length of stay in hospital

To examine the duration of treatment time in hospital the total and average (mean) length of stay was calculated based on the number of whole days between the day of admission and the day of discharge. Cases admitted and discharged on the same day were counted as one day for the purposes of these calculations, even though the time in hospital may have been less than 24 hours.

In order to calculate a more complete measure of total length of stay, re-admission and transfers within and between hospitals were included.

Direct cost of admissions

The National Hospital Costs Data Collection (NH CDC) is based on the principles of casemix costing analysis which is a scientific approach to the classification of patient care whereby each hospital admission is assigned an Australian Refined Diagnosis Related Group (AR-DRG). AR-DRGs provide a clinically meaningful way of relating the types of patients treated in a hospital to the resources required by the hospital. The NH CDC contains component costs per DRG and enables DRG Cost Weights and average costs for DRGs (National and state/territorial specific) for acute in-patients to be produced.

The types of component costs included are ward medical, ward nursing, non-clinical salaries, pathology, imaging, allied health, pharmacy, critical care, operating rooms, ED, ward supplies and other overheads, specialist procedure suites, on-costs, prostheses, hotel and depreciation. For this analysis, the average Victorian cost per AR-DRG (for the relevant year of admission) was applied to each admission to estimate the hospital costs associated with assault-related injury sustained in publicly accessible places.

Acknowledgements

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Participating hospitals
From October 1995
Austin & Repatriation Medical Centre
Ballarat Base Hospital
The Bendigo Hospital Campus
Box Hill Hospital
Echuca Base Hospital
The Geelong Hospital
Goulburn Valley Base Hospital
Maroondah Hospital
Mildura Base Hospital
The Northern Hospital
Royal Children’s Hospital
St Vincents Public Hospital
Wangaratta Base Hospital
Warrnambool & District Base Hospital
Western Hospital - Footscray
Western Hospital - Sunshine
Williamstown Hospital
Wimmera Base Hospital

From November 1995
Dandenong Hospital

From December 1995
Royal Victorian Eye & Ear Hospital
Frankston Hospital

From January 1996
Latrobe Regional Hospital

From July 1996
Alfred Hospital
Monash Medical Centre

From September 1996
Angliss Hospital

From January 1997
Royal Melbourne Hospital

From January 1999
Werribee Mercy Hospital

From December 2000
Rosebud Hospital

From January 2004
Bairnsdale Hospital
Central Gippsland Health Service (Sale)
Hamilton Base Hospital
Royal Women’s Hospital
Sandringham & District Hospital
Swan Hill Hospital
West Gippsland Hospital (Warragul)
Wodonga Regional Health Group

From January 2005
Mercy Hospital for Women

From April 2005
Casey Hospital

How to access VISU data:
VISU collects and analyses information on injury problems to underpin the development of prevention strategies and their implementation. VISU analyses are publicly available for teaching, research and prevention purposes. Requests for information should be directed to the VISU Co-ordinator or the Director by contacting them at the VISU office.

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All issues of Hazard and other information and publications of the Monash University Accident Research Centre can be found on our internet home page:
www.monash.edu.au/muarc/visu

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