Motorcyclist killed as a percentage of the total road toll in Australia, NZ and USA

Source:
Road Safety Branch, Infrastructure and Surface Transport Policy, Department of Infrastructure, Transport, Regional Development and Local Government, NZ Transport Agency and FARS website and NZ Transport Agency data
Australian Motorcycle Fatalities
Motorcycle Registrations

![Graph showing the increase in motorcycle registrations from 1999 to 2009. The number of registrations has steadily increased over the years.]
<table>
<thead>
<tr>
<th>Road deaths by road user group and crash type</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>Change: last two years relative to first two years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle occupant single vehicle crash</td>
<td>577</td>
<td>648</td>
<td>604</td>
<td>658</td>
<td>634</td>
<td>598</td>
<td>594</td>
<td>619</td>
<td>645</td>
<td>3%</td>
</tr>
<tr>
<td>Vehicle occupant multiple vehicle crash</td>
<td>670</td>
<td>654</td>
<td>579</td>
<td>548</td>
<td>532</td>
<td>524</td>
<td>527</td>
<td>473</td>
<td>486</td>
<td>-28%</td>
</tr>
<tr>
<td>Pedestrian</td>
<td>299</td>
<td>287</td>
<td>290</td>
<td>249</td>
<td>232</td>
<td>220</td>
<td>225</td>
<td>227</td>
<td>202</td>
<td>-27%</td>
</tr>
<tr>
<td>Motorcyclist: single vehicle crash</td>
<td>66</td>
<td>80</td>
<td>89</td>
<td>101</td>
<td>61</td>
<td>80</td>
<td>94</td>
<td>112</td>
<td>103</td>
<td>47%</td>
</tr>
<tr>
<td>Motorcyclist: multiple vehicle crash</td>
<td>110</td>
<td>111</td>
<td>127</td>
<td>123</td>
<td>127</td>
<td>115</td>
<td>139</td>
<td>126</td>
<td>135</td>
<td>18%</td>
</tr>
<tr>
<td>Bicyclist: single vehicle crash</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>10</td>
<td>11</td>
<td>4</td>
<td>4</td>
<td>–</td>
</tr>
<tr>
<td>Bicyclist: multiple vehicle crash</td>
<td>38</td>
<td>28</td>
<td>43</td>
<td>33</td>
<td>22</td>
<td>33</td>
<td>30</td>
<td>35</td>
<td>37</td>
<td>9%</td>
</tr>
<tr>
<td>Articulated truck single vehicle crash</td>
<td>20</td>
<td>25</td>
<td>18</td>
<td>31</td>
<td>20</td>
<td>26</td>
<td>28</td>
<td>23</td>
<td>32</td>
<td>22%</td>
</tr>
<tr>
<td>Articulated truck multiple vehicle crash</td>
<td>154</td>
<td>165</td>
<td>142</td>
<td>153</td>
<td>138</td>
<td>110</td>
<td>116</td>
<td>124</td>
<td>121</td>
<td>-23%</td>
</tr>
<tr>
<td>Articulated truck pedestrian crash</td>
<td>17</td>
<td>18</td>
<td>18</td>
<td>16</td>
<td>13</td>
<td>14</td>
<td>11</td>
<td>21</td>
<td>19</td>
<td>14%</td>
</tr>
<tr>
<td>All road users</td>
<td>1,764</td>
<td>1,817</td>
<td>1,737</td>
<td>1,715</td>
<td>1,621</td>
<td>1,583</td>
<td>1,627</td>
<td>1,598</td>
<td>1,612</td>
<td>-10%</td>
</tr>
</tbody>
</table>

Source: Road Safety Strategy Panel
Road Safety Branch, Infrastructure and Surface Transport Policy, Department of Infrastructure, Transport, Regional Development and Local Government
Motorcycle impacts into roadside barriers
IRMRC research project

Partners

- WA Office of Road Safety & WA Main Roads
- Australian Automobile Association
- NSW Centre for Road Safety (RTA)
- NSW Motor Accidents Authority
- New Zealand Land Transport Agency
Motorcycle impacts into roadside barriers
IRMRC research project

Research Investigators

- Raphael Grzebieta (barriers)
- Andrew McIntosh (biomechanics)
- Rena Friswell (causation & epidemiology)
- Hussein Jama (analysis & modelling)
- Jake Olivier (biostatistics)
- Rob Smith (motorcycle expert)
Motorcycle impacts into roadside barriers
IRMRC research project

Scientific Advisory Committee (includes researchers)

Dr. Soames Job – NSW Roads and Traffic Authority
Mr. Iain Cameron – West Australian Office of Road Safety
Mr. Fabian Marsh – New Zealand Land Transport Agency
Mr. John Metcalfe – Australian Automobile Association
Mr. Jan Karpinski – West Australian Main Roads
Ms Dimitra Vlahoporitros – NSW Motor Accidents Authority
Ms Nadine King – NSW Motor Accidents Authority
Motorcycle impacts into roadside barriers
IRMRC research project

**Methodology**

- Statistics (fatalities & serious injury)
- Determine causal factors (other vehicle, speed, alcohol, fatigue, bad cornering, inexperience, human error?, etc)
- Determine biomechanical injury causal mechanism
Motorcycle impacts into roadside barriers
IRMRC research project

Methodology

- Determine survivable and non-survivable impact envelopes
- Reconstruct crashes & computer simulation
- Develop / investigate injury mitigation strategies and assess their effectiveness
- Carry out crash tests
Motorcycle into Barrier Fatalities

2001 - 2006 National Coroners Information System data

In-depth investigation of fatal crashes where information is available

In-depth investigation of serious injury crashes through trauma centres & recruitment will also be carried out if sufficient funds available
Motorcycle into Barrier Fatalities

NCIS data compared to Gov published figures

- MC total fatalities - DITRL
- Motorcycle total fatalities - ABS
- MC total fatalities - NCIS

Period of study
Motorcycle barrier crashes

*National Coroners Information System - preliminary findings*

Motorbike Crashes 2001-2006
Motorcycle into Barrier Fatalities

National Coroners Information System data 2001-2006

N= 67

Age Bracket (Years)

0 - 16  17 - 25  26 - 39  40 - 49  50 - 59  60+
Motorcycle into Barrier Fatalities

- NCIS - preliminary findings – weekends!

![Graph showing the number of fatalities by day of the week. Saturday and Sunday have significantly higher numbers of fatalities compared to the other days.]
Motorcycle into Barrier Fatalities

- NCIS - preliminary findings – dry weather

![Bar chart showing frequency of different weather conditions during motorcycle fatalities. The chart indicates the highest frequency of unknown conditions with N=69.]
Motorcycle into Barrier Fatalities

National Coroners Information System data
2001-2006 (n=67 fatalities)

• Gender
  Male 61  Females 6

• Rider & Pillion
  Rider & pillion 6 (fatal crashes)
  (4 female pillions killed)
  Rider only - 61
Motorcycle into Barrier Fatalities

NCIS data 2001-2006

- Steel Barrier
- Concrete
- Wire Rope
- Unknown

N=67
Motorcycle into Barrier Fatalities

National Coroners Information System data

Australian totals
Motorcycle into Barrier Fatalities

Road type – predominantly bends (N=67)

![Bar chart showing the number of fatalities by road type. The majority of fatalities occurred at bends (N=35), followed by unknown and straight sections.]
Motorcycle into Barrier Fatalities

Cause of fatality – Autopsy reports

<table>
<thead>
<tr>
<th>Location of Injury</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Head</td>
<td>25</td>
</tr>
<tr>
<td>Chest</td>
<td>8</td>
</tr>
<tr>
<td>Multiple</td>
<td>25</td>
</tr>
<tr>
<td>Decapitation</td>
<td>2</td>
</tr>
<tr>
<td>Spine</td>
<td>2</td>
</tr>
<tr>
<td>Unknown</td>
<td>6</td>
</tr>
</tbody>
</table>

N=67
Motorcyclist - What is a survivable impact?

see:http://www.vti.se/nordic/default.htm
Motorcyclist - What is a survivable impact?

**Motorcycle Crash Severity by Collision Speed**

- **Probability of Fatal Injury in Motorcycle Collision**
- **Collision Speed (km/h)**

The graph illustrates the relationship between collision speed and the probability of fatal injury in motorcycle collisions. The graph shows that the probability of fatal injury increases significantly with increasing collision speed, reaching near certainty at higher speeds.
Motorcyclist - What is a survivable impact?

Hitting an object at 30 km/h is equivalent to jumping off the roof of a house.

At 40 km/h is equivalent to jumping off a 2 story building and hoping you will survive.

At 50 km/h it is equivalent to jumping off a 3 storey building.

At 60 km/h, jumping off a 4-5 story building.
Motorcycle into Barrier Fatalities

Infrastructure only addressing 5% of fatalities!

- **Other**
  - 147
  - 11.7%

- **Barrier Crashes**
  - 67
  - 5.3%

- **Unknown**
  - 1047
  - 83.0%
Motorcycle into Barrier Fatalities

USA Gabler

- 39% of guardrail fatalities & 24% of concrete barrier fatalities but only 3% of registered vehicles
- Motorcycle guardrail impact 80 times higher risk than car/LTV
- Motorcycle concrete barrier 68 times higher risk than car/LTV
- $0.5 million dollar US “in-depth” TRB study of barrier fatalities

Motorcycle into Barrier Fatalities

Other studies – Berg et al

DEKRA – Germany (2005)

• 82% involved a steel barrier

• 51% of 57 cases analysed: motorcycle impacted the barrier while driving in an upright position

• 45% occurred where the motorcycle slid on its side on the road surface before it first struck the barrier.

Car barrier crashes.

Concrete at 80 km/hr @ 45° – Not survivable
Concrete at 80 km/hr @ 45° – Not survivable
Wire-rope Barriers with tactile line marking

Very effective protection against tree impacts, hazards, drains, culverts, and for median cross overs when installed in medians
Car barrier crashes.

Wire-rope at 80 km/hr @ 45° – Survivable
Wire rope 80 km/hr @ 45° – very survivable and soft crash – airbags did not fire
Wire-rope barrier installation – Sweden
Torsten Bergh & Anna Carlsson

2000 km installed WRB

Cars
• 55 to 60% reduction in severe injuries
• 75 to 80% reduction in fatalities

Motorcycles
• 50% reduction in severe and fatal injuries for unchanged motorcycle volumes

Wire-rope barrier installation

- RTA – reductions of around 70-80% in fatalities – road fatalities dropping as a result in part of wire rope and tactile line marking – 5.6 per 100,000 in 2008.
Cross median fatalities on Interstate 70 in Missouri and the cumulative miles of wire rope median barrier installed (source: after Chandler, 2007)
Summary

- Motorcycle fatalities resulting from roadside barriers crashes are low at around 5% which is currently around 15 per year nation wide of 245 fatalities. But it is rising.

- Guardrail impacts are the most dangerous.

- Four (4) wire-rope rider impacts found, 1 was excessive speed striking another vehicle before striking barrier. Most likely died on impact with vehicle. 2 – rider did not hit the barrier. 3 – exceeded alcohol limit + speed.
Concrete barrier impacts can also be dangerous but very low – 6 fatalities

Guardrail impacts are the most dangerous and often struck.

Wire-rope impacts are low. 70 – 80% reduction in road fatalities wherever installed which is why they are being installed.

Solutions exist to reduce motorcycle fatalities – but credible science must be used so as not to effect all road users and gains to date.
Summary

- Cheese cutter effect is a Myth that needs to be strongly rebutted.
- Cutting a tensioned cable will cut you in half is a Myth (myth busters ‘pig test’)
- Posts should be painted white. It provides a means of identifying road curvature and distance.
Acknowledgements

Authors would like to thank the funding partners for their valuable contributions.

WA Office of Road Safety & WA Main Roads
Australian Automobile Association
NSW Centre for Road Safety (RTA)
NSW Motor Accidents Authority
New Zealand Land Transport Agency
Acknowledgements

The authors would also like to thank the Victorian Institute of Forensic Medicine (VIFM) as the source organisation of the National Coroners Information System from which the motorcycle crash data was extracted for the statistical analysis presented in the paper.

Marde Hoy’s assistance from VIFM is also greatly appreciated.