How do we get more people cycling, and do it more safely?

- Australia is one of only three countries in the world where bicycle helmets are mandatory for all cyclists. Australia also has low cycling participation.
- Mandatory helmet laws deter people from cycling by creating the impression that cycling is dangerous. They also shift the burden of safety away from infrastructure and onto personal protective equipment, which is less effective.
- Surveys show 1 in 5 people would ride more often if helmets were not mandatory, and many would ride more if they felt it was safer.
- Cycling on off-road paths is already safe enough that helmet use should be optional.
- Mandatory helmet laws should be relaxed for adult cyclists.
- More dedicated off-road cycle paths should be constructed, and on-road paths separated from motor traffic by physical barriers.
- As an interim measure while more bike paths are being constructed, adult cyclists should be allowed to ride on footpaths (this is legal in some Australian states, but not in others). Research shows this would present a negligible risk to pedestrians.

What's the best way to measure the safety of cycling?

- Accidents per participant per year
- Accidents per kilometer travelled
- Accidents per cycling journey

These three methods measure the risk to individuals.

Bad ways to measure cycling safety

- Accidents per capita
- Total accidents

These are inadequate measures, since they can be strongly affected by total population, and percentage of people who cycle (i.e. The Netherlands has more total bike fatalities per year than Australia, but far more people cycle in the Netherlands than Australia).

Assessments of safety based on hospital admission data can be useful, but this data is biased because it selects cyclists who have already had an accident, and ignores cyclists who have not.
So how safe is cycling in Australia?

Data from “Hospitalised sports injury, Australia 2002-03” Louise Flood and James E. Harrison (March 2006), Flinders University Research Centre for Injury Studies.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Hospitalisations per 100,000 participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor Sports</td>
<td>942.7</td>
</tr>
<tr>
<td>Roller Sports</td>
<td>738.6</td>
</tr>
<tr>
<td>Australian Rules Football</td>
<td>734.3</td>
</tr>
<tr>
<td>Horse Riding</td>
<td>692.7</td>
</tr>
<tr>
<td>Rugby League Football</td>
<td>677.9</td>
</tr>
<tr>
<td>Netball</td>
<td>150.2</td>
</tr>
<tr>
<td>Cricket</td>
<td>121.3</td>
</tr>
<tr>
<td><strong>Cycling</strong></td>
<td><strong>97.0</strong></td>
</tr>
<tr>
<td>Running</td>
<td>18.2</td>
</tr>
</tbody>
</table>

This puts the chance of being hospitalised due to a cycling accident, over a period of one year, at less than 1 in 1000. *Cycling is safer than netball*, a sport generally regarded as very safe.

“Cycling injuries in Australia: Road safety's blind spot?” by J. Garrad, S. Greaves, and A. Ellison, in the Journal of the Australasian College of Road Safety, August 2010, found that the rate of fatalities for cyclists in Melbourne per 100 million kilometers travelled was 1.18, while the rate of serious injuries was 315 per 100 million kilometers travelled. In Sydney the corresponding figures were 5.3 (fatalities) and 560 (serious injuries). These rates are about 5 times higher (fatalities) and 20 times higher (serious injuries) than in the Netherlands or Denmark, and between 5-30 times higher than for motorists in Sydney or Melbourne.

In South Australian there are about 23 million bike trips per year (Source: 2013 *Australian Cycling Participation Survey* by Austroads). According to the Department for Transport Energy and Infrastructure “Cycling crash fact sheet 2006-2010” there have been, on average 3 cycling fatalities, and 67 serious accidents per year in SA. **This equates to roughly 1 serious injury for every 340,000 cycling journeys, and 1 fatality in every 7.7 million cycling journeys.**

In short then, for Australia as a whole, and for several Australian cities, cycling is quite safe. However cycling is clearly not as safe as driving, or cycling in some European countries.
How can we make cycling safer?

The Hierarchy of Controls is a “system used in industry to minimize or eliminate exposure to hazards”

Applied to cycling, the highest (best) levels, namely elimination, substitution, and engineering, correspond to physically separating cyclists from cars, by the use of off-road bike paths, and physical barriers to separate cycle lanes from roadways.

The lowest (least effective) levels correspond to education campaigns and laws (i.e. “a meter matters”). The lowest level is personal protective equipment i.e. helmets.

Australian efforts to improve road safety for motorists have focussed on improving road design, better car safety standards, and catching drunk drivers (top level). Efforts to improve cycling safety have focussed on personal protective equipment and behaviour (lower level). Is it any surprise that driving is getting safer, while cycling is not?
A simple model of car-cyclist collisions

- Let the fraction (between 0 and 1) of commuters travelling by car be represented by $A$
- The total fraction of commuters is always 1, so then the fraction of commuters travelling by bicycle is $(1 - A)$
- The number of collisions between cars and cyclists is related to the number of cars multiplied by the number of cyclists (yellow rectangle)
- The number of collisions between cars is related to the number of cars, multiplied by the number of cars (orange square)
- The number of car-cyclist collisions per cyclist is related to the yellow area, divided by the number of cyclists. This is the length of the blue arrow.

From this we can see that as the fraction of commuter trips by bicycle increases (and by car decreases);
- Car-car collisions become rarer.
- The maximum number of car-cyclist collisions occurs when cars and bicycles each make 50% of the commuter journeys.
- But the risk of a car-cyclist collision per cyclist always decreases, as the fraction of cars decreases.
The South Australian Department of Planning Transport and Infrastructure “Cycling – Road Crash Fact Sheet” (July 2013) (http://www.dpti.sa.gov.au/__data/assets/pdf_file/0014/112325/Cycling_-_Road_Crash_Fact_Sheet.pdf) records a total of 356 cyclists who were fatally or seriously injured in SA between 2008-2012. Of these 191 injuries occurred at an intersection, while 165 occurred in a midblock section of road. None are recorded as occurring on off-road cycling paths.

The Monash Alfred Cyclist Crash Study (MACCS) conducted by P. Biegler, S.Newstead, M. Johnson, J. Taylor, B. Mitra, and S. Bullen, for the Monash University Accident Research Centre, July 2012 (http://monash.edu/miri/research/reports/muarc311.pdf) examined the cases of 158 cyclists admitted to the Alfred and Sandringham hospitals in Melbourne following accidents. This study found that 74% of cyclists involved in a crash were riding on a road, 13% were on off-road paths shared with pedestrians, 8.5% were on footpaths, and only 0.6% were on off-road bike-only paths (a small percentage were on mountain bike trails or other recreational areas, however these are not relevant to cycling as a form of commuter transport).

This study also modelled the factors involved in head injuries. The only factor found to be a significant predictor of head injuries was speed;

“A cyclist travelling at 30kph or over prior to the crash was estimated to have nearly 5 times the odds of sustaining a head injury in the crash compared to a cyclist travelling below 20kph. This was statistically significant. Even cyclists travelling at 20-29kmh before the crash were estimated to have 2.7 times the risk of a head injury compared to those travelling below 20kph.”

The study also found that

“The odds of the crash involving a travel speed above 20kph were over 80% lower for off-road crashes compared to those on-road.”

While these results are limited to data from south-east Melbourne, they do suggest that off-road cycling is substantially less likely to result in a crash, and results in less severe crashes with lower risk of serious injury, than on-road cycling.

Increasing the fraction of commuter journeys taken by bicycle makes both cycling and driving safer.

The safest cycling takes place when bicycles are the only vehicles, and there are no cars i.e. on off-road cycling paths, and bicycle lanes with a physical barrier between bicycles and cars. To make cycling safer, we need more and better infrastructure. Personal protective equipment may reduce the severity of a crash, but preventing crashes is better.
Are helmets beneficial?

In the early 1990s all Australian states and territories made bicycle helmets mandatory for all cyclists, regardless of age or cycling location. Australia, New Zealand, and the United Arab Emirates are the only countries in the world where Mandatory Helmet Laws (MHLs) are in effect.

Since helmets correspond to the lowest level on the Hierarchy of Controls, it is reasonable to ask if they are effective. The MACCS study found that

“It was somewhat surprising that helmet use did not emerge as a significant predictor of head injury risk in the constructed models. As a result, a separate model was fitted relating head injury risk to helmet use. This modelling showed the odds of an injured cyclist sustaining a head injury were 1.8 times higher when not wearing a helmet compared to when wearing a helmet.”

In other words, other factors are more significant than helmet use in predicting the chance of injury in a cycling accident. The results of the MACCS study suggest that if you are involved in a crash you are about 2.8 times more likely to suffer a head injury riding above 30 km/h with a helmet than you are riding below 20 km/h without a helmet! A helmet may reduce the severity of a crash, but preventing crashes in the first place is preferable.

Data from Australia and New Zealand indicates that MHLs have decreased the number of people who choose to cycle. However the rate of accidents per cyclist has not decreased (and in some cases appears to have increased), since the introduction of MHLs. For instance, the “Sustainable and safe land transport trends and indicators” report from Land Transport NZ shows that the number of cycling trips and the number of crash fatalities for cyclists both decreased by 51% between 1989 and 2006 (MHLs introduced in 1994). This suggests that helmet use has not made cycling any safer, it has only decreased the number of people cycling. ABS data indicates that in most of Australia, cycling lagged population growth between 1985/86 and 2011;

<table>
<thead>
<tr>
<th></th>
<th>% change in trips per day</th>
<th>% change in population</th>
<th>Difference in %</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACT</td>
<td>+46.8%</td>
<td>+43.8%</td>
<td>+3%</td>
</tr>
<tr>
<td>NSW</td>
<td>+9.8%</td>
<td>+34%</td>
<td>-24.2%</td>
</tr>
<tr>
<td>NT</td>
<td>+56.9%</td>
<td>+48.3%</td>
<td>+8.6%</td>
</tr>
<tr>
<td>QLD</td>
<td>+32.8%</td>
<td>+74.6%</td>
<td>-41.8%</td>
</tr>
<tr>
<td>SA</td>
<td>-26.1%</td>
<td>+22.2%</td>
<td>-48.3%</td>
</tr>
<tr>
<td>TAS</td>
<td>+75.4%</td>
<td>+16.3%</td>
<td>+59.1%</td>
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<tr>
<td>VIC</td>
<td>+32%</td>
<td>+38%</td>
<td>-6%</td>
</tr>
<tr>
<td>WA</td>
<td>+40.5%</td>
<td>+63.2%</td>
<td>-22.7%</td>
</tr>
<tr>
<td>AUS</td>
<td>+20.9%</td>
<td>+43.2%</td>
<td>-22.3%</td>
</tr>
</tbody>
</table>
The Northern Territory example
On 31st March 1994 the NT Minister for Transport announced an amendment to the law to permit cyclists over the age of 17 to ride without a helmet "along footpaths or on cycle paths which are not on roads". Data presented in “Australia Cycling the national strategy 1999-2004”, based on census data from 2001, more than half a decade after the relaxation of MHLs in the Northern Territory shows that the NT has more than triple the national average number of trips to work by bicycle (4.2% of all trips to work vs. a national average of 1.3%). South Australia had the same rate as the national average. Furthermore in the NT, 31% of people who cycle to work are female. This is around 1.5 times the national average.

The report “Serious injury due to land transport accidents, Australia 2005 – 2006” by J. Berry and J. Harrison of Flinders University found that the age-standardised rate per 100,000 population of serious injuries for pedal cyclists in the NT was 31, compared to a national average of 22. However given that the NT has more than triple the percentage of cycling trips, compared to the national average, cycling in the NT is clearly safer than the national average.

On 29 November, 2013, a Queensland inquiry into cycling issues by the Transport, Housing and Local Government Committee concluded that

• There was not “sufficient evidence of the safety outcomes of compulsory helmet wearing to justify the mandating of helmet wearing for all cyclists of all ages regardless of the situational risk.”
• “relaxing mandatory helmet laws in specific circumstances is likely to increase cycling participation rates with a range of associated health benefits and economic benefits.”
• “there is sufficient evidence provided by the Northern Territory example that a relaxation of mandatory helmet laws in lower risk situations (such as cycling on footpaths and on dedicated cycle paths), does not inevitably reduce the safety of cycling.”
• And recommended “a 24 month trial which exempts cyclists aged 16 years and over from the mandatory helmet road rule when riding in parks, on footpaths and shared/cycle paths and on roads with a speed limit of 60 km/hr or less”

In May 2014, Queensland Transport Minister Scott Emerson announced the parliamentary inquiry's recommendation for a trial repeal of adult helmet laws would be ignored, despite the research and data that went into it.

In other countries, MHLs have been considered, and rejected or scrapped. Israel enacted mandatory helmet laws and then repealed them to encourage greater use of their bikeshare scheme. Mexico City similarly repealed its MHLs to encourage the use of a bikeshare scheme. New York's helmetless bike share scheme has recorded no fatalities, and only 100 crashes after 8.75 million trips, totalling 23.5 million km of travel.
What can we do in South Australia?

All the evidence indicates that

1. Cycling on off-road paths, at low speed is the safest way to cycle.
2. In many instances cycling is sufficiently safe that helmets should not be considered a necessity.
3. The more people cycle, the safer cycling and driving become.
4. Repealing MHLs encourages more women to cycle.

Adelaide already has a well-developed series of off-road cycle-friendly paths, including the River Torrens Linear Park, as well as a generally flat geography well-suited to cycling, and a large population of university students who embrace cycling as a mode of transport. Freestyle Cyclists inc. advocate the following steps to encourage cycling in South Australia.

- Repeal mandatory helmet laws for adult cyclists on off-road paths and barrier separated bikeways (such as the Frome street bikeway).
- Allow adult cyclists to ride on footpaths where no dedicated off-road paths are available.
- Promote the further development of barrier-separated bike paths such as the Frome street bikeway. Connect existing off-road paths to create a more continuous network of off-road thoroughfares for cyclists.
- Provide better facilities (bike locking racks, showers) at locations in the CBD.
- Support and promote “helmet optional rides” along off-road paths, to build public awareness that cycling is not an inherently dangerous activity, and remind the public that not all cycling is high-speed sports cycling.

These moves would bring us into line with the Northern Territory, which is currently the safest part of the country for cycling, with the highest participation. It would also move us towards the situation in European countries like The Netherlands, where cycling accounts for approximately 1/3 of commuter journeys.

While cycling is currently not allowed on footpaths in South Australia, there is no evidence that allowing it would present a substantial risk to pedestrians. Analysis by UNSW researchers (http://acrs.org.au/wp-content/uploads/Grzebieta-McIntosh-Chong-Pedestrian-Cyclist-Collisions-Issues-and-Risk..pdf) found that in the period from 2001-2005 there were 163 pedestrian hospital admissions resulting from collision with a cyclist. This amounts to one accident per 460,000 pedestrian trips. Only four pedestrian fatalities were recorded nationwide (of which one was the result of a pedestrian being knocked over and robbed, a highly atypical event), making the chance of fatally stumbling and falling while walking over ten times greater than the risk of being killed in a collision with a cyclist.