

Chapter 3

Evidence in support of bicycle helmet legislation

3.1 The central argument of submitters in favour of MHL was that, by reducing the risk of head injuries including traumatic brain injury (TBI), bicycle helmets protect the individual and save the community from the expensive health and social costs associated with TBI.¹

3.2 Such submitters argued that bicycle helmets are the most effective way to prevent injury and death in the event of a crash.² The Department of Infrastructure and Regional Development (department) stated:

There is clear evidence from research that helmet wearers suffer fewer head injuries and that mandatory bicycle helmet legislation leads to a reduction in reported head injuries (Carroll, Kinnear, Helman, Hynd and Cuerden, 2014). In Australian research, a case-series study by McIntosh, Curtis, Rankin, Cox, Pang, McCrory and Finch 2013 found that in the event of an accident, bicycle helmets significantly reduce the likelihood and severity of head and brain injuries for cyclists by a factor of 79 [per cent]. This study also concluded that if helmet wearing rates increased, head and brain injury reductions would be greater.³

3.3 In response to concerns regarding helmets and personal choice, the point was made that:

Even if a helmet is considered an impost or a reduction of civil liberty, the long term effect of a head and brain injury on a victim's family, carers and society are worse. For the child or adolescent with many fulfilling years ahead of them, the event may be devastating.⁴

3.4 Three key points raised in this regard were that:

- helmets reduce the risk of serious injury by approximately 60 per cent and in the case of death, by 74 per cent;

1 Professor Jeffrey Rosenfeld, Neurosurgical Society of Australasia, *Committee Hansard*, 16 November 2015, p. 28; Professor Rebecca Ivers, Australian Injury Prevention Network, *Committee Hansard*, 16 November 2015, p. 29; The George Institute for Global Health, *Submission 268*, p. 2. Traumatic brain injury (TBI) refers to brain injury acquired through a traumatic event, such as a traffic accident or a blow to the head (AIHW, 2008), as cited in Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*.

2 The George Institute for Global Health, *Submission 268*, p. 2.

3 Department of Infrastructure and Regional Development, *Submission 394*, p. 5.

4 Dr Caroline Acton cited in The George Institute for Global Health, *Submission 268*, p. 2.

- helmet wearers admitted to hospital represent a national health resource burden which is less than half that of non-helmet wearers;⁵ and
- there is strong community support for MHL.⁶

3.5 Therefore, in direct contrast to the opponents of MHL, the proponents argued that the health and societal risks associated with traffic injuries far exceed any benefits from cycling without a helmet.

Bicycle helmets and head injuries

3.6 The Neurosurgical Society of Australasia (NSA) argued that scientific evidence, both prior to and after the introduction of MHL, indicated that helmets have been effective in reducing the risk of head injuries, such as TBI to cyclists.⁷

3.7 NSA drew on a study in Queensland which found that the risk of head injury in bicycle accidents was reduced amongst children wearing a helmet by 63 per cent, while the risk of a loss of consciousness was reduced by 86 per cent.⁸ Furthermore, it argued that, following the introduction of MHL, hospital admission data in NSW revealed that head injury rates amongst cyclists had declined significantly more than limb injury rates at the time of the legislation. It concluded that, despite numerous data limitations, there was evidence of a positive effect of MHL on cyclist head injuries at a population level such that 'repealing the law cannot be justified'.⁹

3.8 Other evidence presented to the committee to demonstrate the efficacy of helmets in relation to head injuries included:

- a 2001–2009 NSW study which found that helmet use was associated with reduced risk of head injury in bicycle collisions with cars of up to 74 per cent, and the more severe the injury considered, the greater the reduction;¹⁰
- a crash simulation study in children found that the risk of death from head injury was reduced from 40 per cent to 0.3 per cent, while the risk of death

5 The median hospital costs for non-helmeted cyclists (\$47,900) were more than double those for helmeted cyclists (\$22,900). Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons Answers to questions on notice from public hearing on 16 November 2015, received 30 November 2015, p. 4.

6 Mr David Healy, Australasian College of Road Safety, *Committee Hansard*, 16 November 2015, p. 29.

7 Neurosurgical Society of Australia, *Submission 187*, p. [1].

8 Neurosurgical Society of Australia, *Submission 187*, p. [1].

9 Neurosurgical Society of Australia, *Submission 187*, p. [1].

10 Bambach, MH, et al, 'The effectiveness of helmets in bicycle collisions with motor vehicles: A case-control study', *Accident Analysis and Prevention*, 2013, cited in Neurosurgical Society of Australia, *Submission 187*; Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 13.

from a neck injury fell from 11 per cent to 1 per cent in those wearing a helmet;¹¹

- the Cochrane review, which found that helmets provide a 63–88 per cent reduction in the risk of head, brain or severe brain injury for all ages of bicyclists;¹² and
- a 1994 study in Victoria found that there had been a significant reduction in the rate of cyclists head injury claims since the introduction of MHL and a 40 per cent reduction in head injuries resulting in hospital admissions.¹³

3.9 According to studies cited by The George Institute for Global Health, non-helmeted cyclists were more than three times more likely to sustain intracranial injuries and four times more likely to sustain TBI when compared to helmeted cyclists.¹⁴ Further, it was noted that in each case-control study conducted to assess the association between helmet wearing and head injury, it was found that the 'odds of a head injury were significantly diminished for cyclists wearing helmets versus those that did not'.¹⁵

3.10 According to the Neuroscience Research Australia (NeuRA) Injury Prevention Research Centre, bicycle helmets reduce the load that is transferred from a head strike with the ground, or another object, 'via the helmet's ability to attenuate energy'.¹⁶ NeuRA continued:

Specifically, bicycle helmets protect the head by reducing the rate at which the head and brain are decelerated and by dissipating the impact energy over an increased area. The effectiveness of the helmets are therefore governed by the laws of physics, as long as helmets are designed adequately...Furthermore, there is a large body of evidence from both laboratory and real world studies that conclusively show that the use of a bicycle helmet reduces a rider's chance of head injury.¹⁷

3.11 Professor Raphael Grzebieta, Past President of the Australasian College of Road Safety, informed the committee that the Curnow hypothesis, which argues that on impact, a helmet can grip the road and twist the head, thereby causing serious brain injury, had not been substantiated through appropriate testing. He explained that

11 McNally and Rosenberg 2013 cited in The George Institute for Global Health, *Submission 268*, p. 2.

12 Thompson, DC et al., Helmets for preventing head and facial injuries in bicyclists. The Cochrane database of Systematic Review, 1999 cited in Neurosurgical Society of Australia, *Submission 187*.

13 Newstead et al, 1994 and Carr et al 1995 cited in Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 13.

14 The George Institute for Global Health, *Submission 268*, p. 2.

15 UNSW Science, *Submission 287*, p. 2.

16 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 2.

17 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 2.

testing conducted at the University of NSW had found that wearing a helmet not only reduced the acceleration that is imparted to the brain but also reduces the rotation of the head.¹⁸ Similarly, the department stated:

Although some opponents to mandatory bicycle helmet legislation have claimed that bicycle helmets contribute to rotational head injuries, a review by Hynd, Cuerden, Reid and Adams (2009) found no evidence of an increased risk of these injuries with a helmet compared to without a helmet.¹⁹

Economic, health and social costs of head injuries and road trauma

3.12 The consequences of TBI were highlighted in evidence to the committee. Dr Julie Brown, Senior Research Fellow at the NeuRA Injury Prevention Research Centre emphasised the point that TBI can change the course of someone's life, disrupt their family and reduce opportunities for education and participation in the workforce.²⁰

3.13 An Access Economics report on the economic costs of TBI in Australia detailed its impact as follows:

TBI can cause long-term physical disability and complex neuro-behavioural effects which disrupt quality of life, including neurological impairment (e.g. motor function impairment and sensory loss), medical complications (e.g. spasticity and post-traumatic epilepsy), cognitive impairment (e.g. memory impairment and problems with planning, language and safety awareness), personality and behavioural changes (e.g. impaired social and coping skills) and lifestyle consequences (e.g. unemployment, difficulty maintaining interpersonal relationships and loss of independence).²¹

3.14 NeuRA stated that head injuries can result in long-term or lifelong physical, cognitive, behavioural and emotional consequences, and that:

In the acute setting, the costs to the healthcare system from traumatic brain injuries and severe injuries are significant, making head injury one of the most expensive diagnoses in the public hospital system.²²

18 Professor Raphael Grzebieta, Australasian College of Road Safety, *Committee Hansard*, 16 November 2015, p. 39.

19 Department of Infrastructure and Regional Development, *Submission 394*, p. 5.

20 Dr Julie Brown, NeuRA Injury Prevention Research Centre, *Committee Hansard*, 16 November 2015, p. 28.

21 Access Economics, *The economic cost of spinal cord injury and traumatic brain injury in Australia*, A report by Access Economics Pty Limited for The Victorian Neurotrauma Initiative, June 2009, p. xii, <https://www.tac.vic.gov.au/about-the-tac/our-organisation/research/tac-neurotrauma-research/vni/the20economic20cost20of20spinal20cord20injury20and20traumatic20brain20injury20in20australia.pdf> (accessed 11 November 2015).

22 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 1.

3.15 The involved costs of TBI to survivors, their families and the community were highlighted in evidence to the committee. In 2009, the estimated lifetime costs per incident of TBI in Australia were \$2.5 million and \$4.8 million for moderate to severe traumatic brain injury respectively.²³ The overall burden from TBI to Australia was estimated to be \$8.6 billion annually. According to NeuRA, the majority of these cases are due to transport incidents, including bicycle injuries.²⁴ Furthermore, this cost extends for the duration of the patient's life as those with severe traumatic TBI have more frequent and longer hospital visits and require ongoing tests, investigations and follow-up.²⁵

3.16 As head injuries can result in long-term or lifelong physical, cognitive, behavioural and emotional consequences, unlike some physical consequences of severe injuries, many TBI issues fail to resolve over time.²⁶ Individuals with TBI may be precluded from obtaining an education, participating in the workforce and in society more broadly.²⁷

3.17 Submitters highlighted the stress and financial hardship of providing appropriate levels of care and support to effected families and friends with TBI.²⁸ Relatives who are carers may have to leave the workforce. Amongst parent carers of children who sustain such injuries, there are higher rates of parental separation and family breakdown along with high rates of anxiety, depression, social withdrawal and isolation, financial difficulties as well as other role changes.²⁹

3.18 Witnesses presented evidence arguing that the use of helmets by cyclists presented a significant economic saving to the community. Representing a combined membership of thousands of road safety and injury prevention experts and organisations, the Australasian College of Road Safety (ACRS), Australian Injury Prevention Network (AIPN) and Royal Australasian College of Surgeons (RACS) provided evidence to support this view. They informed the committee that data from the Victorian Injury Surveillance Unit revealed that there are over 500 hospital admissions of cyclists with head and neck injuries in Victoria every year. These are in addition to a further 1000 emergency department presentations for cyclist head, neck and facial injuries.³⁰ ACRS, AIPN and RACS argued that:

23 Neurosurgical Society of Australia, *Submission 187*, p. [1]; NeuRA Injury Prevention Research Centre, *Submission 223*, p. 1.

24 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 1.

25 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 1.

26 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 1.

27 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 2.

28 Headwest Brain Injury Association of WA, *Submission 265*, p. 4.

29 NeuRA Injury Prevention Research Centre, *Submission 223*, p. 2.

30 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 9.

The natural extrapolation is that cyclists who do not wear helmets are costing Australia's national health system three times as much as those who do wear helmets – in terms of crash costs.³¹

3.19 The point was also made in evidence that the causes and consequences of road trauma can have a serious impact on Australia's national productivity as well as its collective public health.³² According to evidence, road trauma is arguably the highest ranking public health issue the nation faces today.³³ ACRS, AIPN and RACS stated in this regard:

By the time we reach the final year of Australia's National Road Safety Strategy 2011–2020, and assuming the 30% target reduction is reached, **road trauma will still have cost the Australian economy a staggering \$264 billion dollars over this 10 year period.**³⁴

3.20 ACRS, AIPN and RACS argued, therefore, that any evidence-based measures to decrease the rate of road trauma will have a 'positive impact on Australia's collective public health as well as national productivity'.³⁵ They noted that the impact of road trauma not only left victims incapacitated for life but that communities as a whole are affected by such deaths and injuries – including workplaces, friendships and community networks – not to mention the toll on the mental health of emergency workers and ambulance workers, to name a few.³⁶

3.21 The NSA concluded that repeal of the MHL would:

...result in an enduring economic burden on our community and a needless level of personal suffering for families left caring for individuals disabled by traumatic brain injuries that will result from the inevitable accidents involving bicyclists that do not wear helmets.³⁷

3.22 Furthermore, Headwest Brain Injury Association of WA noted that rates of obesity are often used as an argument against MHL. However, it stated the view that:

31 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 11.

32 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 1.

33 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 6.

34 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 1 (emphasis in original).

35 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 7.

36 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 8.

37 Neurosurgical Society of Australia, *Submission 187*, p. [1].

...if an individual will not cycle purely on the basis of the helmet laws, there are alternative sporting activities available. There are no alternatives to a brain injury.³⁸

3.23 Dr Christian Kenfield, Chairman of the Victorian Trauma Committee of the RACS also challenged the argument that Australians at risk of obesity are not riding bicycles because of the MHL. Speaking as an obesity surgeon, Dr Kenfield continued:

Those patients who are already overweight and obese tend not to want to ride a bike. They do not feel safe on a bike, and I speak to them about this on a regular basis. When they have lost weight after the operations that I perform, many of them do take up cycling and it is one of their great joys. I dispute though that the people in society who are at risk of becoming obese are not riding bicycles because of compulsory bicycle helmet laws.³⁹

Deficiencies with cycling infrastructure not helmets

3.24 Some submitters challenged the view that cycling participation rates had not recovered since the introduction of MHL. ACRS, AIPN and RACS drew on evidence from the Monash University Accident Research Centre which found that, while there had been an initial reduction in the number of people cycling in Victoria following the introduction of MHL, within two years, the number of riders had returned to levels similar to that prior to the legislation for both adults and children.⁴⁰

3.25 MHL supporters further argued that MHL did not serve as the barrier to increased cycling participation that other submitters had suggested.⁴¹ The George Institute for Global Health argued that:

There is no known research which demonstrates a negative population health impact caused by decreased cycling due to the introduction of mandatory helmet laws in Australia.⁴²

3.26 Furthermore, the view was put that there is no evidence to uphold the argument that abolishing MHL would result in higher cycling rates.⁴³ Rather, it was argued that research had indicated that a combination of increased personal safety and

38 Headwest Brain Injury Association of WA, *Submission 265*, p. 5.

39 Dr Christian Kenfield, Royal Australasian College of Surgeons, *Committee Hansard*, 16 November 2015, p. 39.

40 Finch et al, 1993 cited in Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, p. 14.

41 Professor Rebecca Ivers, Australian Injury Prevention Network, *Committee Hansard*, 16 November 2016, p. 29.

42 The George Institute for Global Health, *Submission 268*, p. 3.

43 Professor Jeffrey Rosenfeld, Neurosurgical Society of Australasia, *Committee Hansard*, 16 November 2015, p. 30.

dedicated bike paths are the most effective way to encourage greater levels of cycling.⁴⁴

3.27 This argument was supported by market research undertaken by VicRoads along with a review of the Victorian road rules. Both sets of data revealed that perceptions of safety and safe infrastructure, rather than MHL, were a greater barrier to improving cycling participation rates.⁴⁵

3.28 According to evidence submitted to the committee, an estimated 94 per cent of Australians support helmets and safe cycling infrastructure, rather than removal of MHL, as the key to increasing cycling participation.⁴⁶ In this regard, the George Institute of Global Health stated that cycle participation rates continue to increase in the major cities which have cycle infrastructure that is conducive to personal safety.⁴⁷

3.29 The Cycling Promotion Fund Survey (2011) asked respondents who had ridden a bicycle for transport in the past month what discouraged them from riding for transport more often.⁴⁸ Out of the 158 respondents:

A common theme for not cycling more often was due to road traffic conditions or safety. Respondents were likely to rate unsafe road condition, speed/volume of traffic, lack of bicycle lanes or safety as key reasons for not cycling often.⁴⁹

3.30 Similarly, the Women and Cycling Survey 2013 by the Cycling Promotion Fund, found that, from a random sample of 1007 Australian women aged 18 years and over, the main safety concerns associated with cycling, aside from personal safety, involved traffic and cars; the speed and volume of cars and trucks; and distracted drivers.⁵⁰ Sixty per cent of the women surveyed reported they would like to cycle more than they currently do.⁵¹

3.31 Professor Rebecca Ivers, Member of the Executive Council of AIPN, noted that:

...where people are asked about whether cycle helmets stop them from cycling—if people cite cycle helmets it is a long way down the list. Even if they cite cycle helmets as being important, it is still a stretch to actually say,

44 The George Institute for Global Health, *Submission 268*, p. 3.

45 Ms Robyn Seymour, VicRoads, *Committee Hansard*, 16 November 2015, pp 55 and 58.

46 Australasian College of Road Safety, Australian Injury Prevention Network and Royal Australasian College of Surgeons, *Submission 257*, pp 16–17.

47 The George Institute for Global Health, *Submission 268*, p. 3.

48 Cycling Promotion Fund and Heart Foundation, *Riding a Bike for Transport - 2011 Survey Findings*, p. 5.

49 Cycling Promotion Fund and Heart Foundation, *Riding a Bike for Transport - 2011 Survey Findings*, p. 5.

50 Cycling Promotion Fund and Heart Foundation, *Women and Cycling Survey 2013*, p. 15.

51 Cycling Promotion Fund and Heart Foundation, *Women and Cycling Survey 2013*, p. 2.

'If we reduce helmet legislation, all of those people would cycle and would become regular transport cyclists.'⁵²

3.32 In a submission to the inquiry, Dr David Dolan further argued that:

...a lack of suitable bicycle infrastructure, a lack of suitable bicycle commuter cycle paths, a few over aggressive cyclists, a few motorists with poor awareness of cyclists and much greater average commuter distances than in many overseas cities can be considered the deterrents to more people not cycling.⁵³

3.33 Submitters and witnesses put it to the committee that the lack of safe cycling infrastructure was a major barrier to cycling in Australia, rather than MHL.⁵⁴ According to the George Institute of Global Health, the 100 per cent reported increase in the number of people cycling to work in Sydney from 2011 to 2014 can likely be attributed to the 110 km of bicycle lanes constructed in and around the central business district.⁵⁵ It argued that designing solutions which make cycling a safer experience would prove to be much more effective than the removal of MHL.⁵⁶

3.34 In regards to questions on MHL deterring bicycle use in the public bike share scheme environment, Associate Professor Jake Olivier, Member of ACRS argued that Australian bike sharing schemes have been poorly set up and are expensive to use. He stated that on the Gold Coast, the bike share scheme costs \$99 for three days. Alternatively, the tram costs \$5 a day.⁵⁷

52 Professor Rebecca Ivers, Member Executive Council, Australian Injury Prevention Network, *Committee Hansard*, 16 November 2015, p. 34.

53 Dr David Dolan, *Submission 89*, p. 1.

54 The George Institute for Global Health, *Submission 268*, p. 5.

55 The George Institute for Global Health, *Submission 268*, p. 3.

56 The George Institute for Global Health, *Submission 268*, p. 3.

57 Associate Professor Jake Olivier, Member, Australasian College of Road Safety, *Committee Hansard*, 16 November 2015, p. 37.

