

Excerpt from:

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1.3.1 Bicycle helmet use

Australia was the first country to introduce compulsory bicycle helmet use legislation, beginning in Victoria on 1 July 1990 (Cameron et al. 1992) and implemented nationally by the end of 1992. The impact of the legislation was closely monitored to identify any changes in the injury profile of cyclists. In the years before and after the introduction of the legislation, there were numerous reports that addressed the use, effectiveness and performance of bicycle helmets (Finch et al. 1993, Cameron et al. 1994, Finch et al. 1994, Newstead et al. 1994, Carr et al. 1995).

The use of bicycle helmets by cyclists is widely supported amongst the injury prevention and health promotion communities. Health care professionals and the World Health Organisation are emphatic in their support for increased helmet use to reduce the severity of cyclist head injuries (Runyan and Runyan 1991, Liller 2000, Heng et al. 2006, World Health Organisation 2006). Even in countries with high cycling participation, where helmets are not mandatory, such as Sweden, Germany and Belgium, there is increasing support for helmet use (Oström et al. 1993, Ekman and Welanders 1998, Zentner et al. 1998, Depreitere et al. 2004, Richter et al. 2007).

Numerous review articles have been published on the efficacy of bicycle helmets. In Australia, a meta-analysis by Attewell, Glase and McFadden of 16 articles concluded that 'the evidence is clear that bicycle helmets prevent serious injury and even death' (Attewell et al. 2001:345). A Cochrane review article by Australian researchers of 5 studies reported that compulsory bicycle helmet use legislation is effective in increasing helmet use and decreasing head injuries (Macpherson and Spinks 2007). A separate Cochrane review of 5 case-control studies found that helmets provide a 63-88 per cent reduction in head injury and severe brain injury for all cyclists and are protective against cyclist head injuries in vehicle and non-vehicle crashes (Thompson et al. 2009). The need for legislation to increase helmet use was reported in research conducted in Canada (Karkhaneh et al. 2006), Singapore (Wong et al. 2002) and the US (Hailey et al. 2007).

Despite the extensive evidence of the efficacy of helmets in reducing serious head injuries, anti-helmet proponents argue that compulsory helmet use legislation causes a reduction in the number of people cycling, as cycling will be perceived as dangerous (Robinson 2006). This in turn, Robinson argued, reduces the overall health benefits of cycling and the safety in numbers effect (Robinson 2005). However, a systematic review by Karkhaneh and colleagues (2006) of 11 studies concluded that there was insufficient detail available to support the claim that helmet legislation resulted in reduced participation (Karkhaneh et al. 2006). Similarly, Macpherson and Spinks (2007) concluded that there is no evidence to support or refute the claim that helmet legislation leads to a reduction in cycling participation.

Controversy about helmet use and legislation is likely to continue and further discussion is outside the scope of this doctoral thesis. There is extensive research that addresses the efficacy of helmets in reducing the severity of head injuries and several researchers who dispute the need or efficacy of helmets. A summary of selected helmet-related publications is included in Table 1-1.

Table Error! No text of specified style in document.-1 Summary of selected bicycle helmet related research

Author(s) & Year	Location	Methods/participants	Key outcomes
Waters, 1986	UK	Hospital data n = 506 cyclists	Cyclist helmets recommended to improve survival rates from head injuries
Dorsch, Woodward & Somers, 1987	South Australia, Australia	Questionnaire n = 894 cyclists	Helmets determined to be protective in a crash involving a head strike <ul style="list-style-type: none"> 197 cyclists crash had head injury (62%) wore a helmet, estimated 90% of deaths due to head injuries would have been prevented with hard helmets
Wood & Milne, 1988	Victoria, Australia	Review of helmet campaigns, injuries, helmet use surveys	Cyclist-driver crashes, 1982/83 to 1984: helmets attributed to 20% reduction in cyclist head injuries Design standard is important, commuter helmet use ↑ 1983 (26%) to 1986 (44%)
<i>July 1990 – compulsory bicycle helmet use legislation introduced in Victoria</i>			
Sacks, Holmgreen, Smith & Sosin, 1991	US	Analysis of hospital and coronial data 1984-1988	<ul style="list-style-type: none"> Majority of fatalities involved a head injury 2,985 (62%); 87% with car No helmet = ↑ relative risk of 6.67 for head injury 84% of head injury fatalities could be prevented with helmet use
Cameron, 1992	Melbourne, Victoria, Australia	Observations, cyclist injury data	<ul style="list-style-type: none"> Helmet use ↑ pre-leg'n 1982/83: 5%; 1989/90: 31%; 1 yr post-leg'n ↑ 75% Cyclist participation changes: children ↓ 36%, adults ↑ 58% 1989 to 1991 = significant ↓ head injuries due to legislation and ↑ helmets
<i>December 1992 – compulsory bicycle helmet use legislation introduced in all Australian jurisdictions</i>			
Finch, Heiman & Neiger, 1993	Melbourne, Victoria, Australia	Manual observational study	Helmet use ↑ post-legislation all ages, adults 1990: 36%; 1991: 74%; 1992: 84% Legislation ↓ cycling participation, 2 yrs post-legislation cycling participation close to pre-legislation
Hillman, 1993	UK	Review of cycling policy and health promotion	Landmark article, 'benefits gained from regular cycling outweigh the loss of life in years in cycling fatalities by a factor of around 20 to 1' (p55) The statement does not specifically relate to helmet use or non-use, however is subsequently used as evidence to reject helmet use
Carr, Skalova & Cameron, 1995	Victoria, Australia	Analysis of hospital injury data	Four years post-legislation Hospital admissions in the 4 years post-legislation were 40% below the number expected based on the pre-legislation trends
Robinson, 1996	New South Wales, Australia	Analysis of previous cyclist helmet studies	Helmets discourage cycling; draws causal link between helmet use and reduced cycling/societal levels of obesity. No evidence of causation is provided. Claims helmet injury risk similar for unhelmeted cyclists and drivers
Scuffham, Alsop,	New Zealand	Survey helmet use, analysis	Three years post-legislation in New Zealand

Author(s) & Year	Location	Methods/participants	Key outcomes
Cryer & Langley, 2000		of hospital data	Helmet use attributed to 19% reduction in cyclist head injury
Attewell, Glase & McFadden, 2001	Australia	Meta analysis, 16 articles	Conservative risk reduction estimates for helmet use to reduce the risk of: head injury, 45%; brain injury, 33%; facial injury, 27%, and; fatal injury by 29% Cyclist helmet use analogous to car occupant seat belt use
Nolén & Lindqvist, 2002	Sweden	Evaluation of helmet use	Caution against child-focused helmet uses programs, helmets needed for all cyclists Aim of Swedish National Road Administration = 80% helmet use for all cyclists, usage rates were: children 50%, adults 10-15%
Hamilton & Stott, 2004	UK	Review of cyclist injury data and cycling risks	British Medical Association recommendation for helmet use by all cyclists Broader cyclist safety considerations needed, e.g. traffic calming, end of trip facilities
Macpherson & Spinks, 2007	Australia	Cochrane review	Legislation is effective in increasing helmet use and decreasing head injuries Insufficient evidence to support or negate claims that bicycle helmet law leads to a reduction in cycling participation
Curnow, 2003, 2005, 2006, 2007	Australia	Brief communications etc.	Anti-helmet use papers, disputes previous research. Claims: 1) researchers don't account for mechanism of brain injury; 2) case-control studies inadequate
National Highway Traffic Safety Administration (NHTSA), 2008	US	Fact sheet	Majority (70%) of all fatal cyclist crashes involved head injuries Estimates helmet use (4-15 yrs) would ↓ 39,000-45,000 head injuries annually At 2008 US state helmet laws, 14 states = no law, other states = child only
Thompson, Rivara and Thompson, 2009	US	Cochrane review article 5 articles	Helmets provide 63-88% reduction in head severe brain injury for all cyclists Helmets are protective for cyclists in vehicle and non-vehicle crashes

References

- Attewell, R. G., Glase, K. and McFadden, M. (2001). "Bicycle helmet efficacy: a meta-analysis." *Accident Analysis and Prevention* **33**(3): 345-352.
- Cameron, M., Helman, L. and Neiger, D. (1992). Evaluation of the Bicycle Helmet Wearing Laws in Victoria During Its First 12 Months. Clayton, Monash University Accident Research Centre.
- Cameron, M. H., Finch, C. F. and Vulcan, A. P. (1994). The Protective Performance of Bicycle Helmets Introduced at the Same Time as the Bicycle Helmet Wearing Law in Victoria. Clayton, Monash University Accident Research Centre.
- Carr, D., Skalova, M. and Cameron, M. H. (1995). Evaluation of the Bicycle Helmet Wearing Law in Victoria During its First Four Years. Clayton, Monash University Accident Research Centre.
- Depreitere, B., Van Lierde, C., Maene, S., Plets, C., Vander Sloten, J., Van Audekerke, R., Van der Perre, G. and Goffin, J. (2004). "Bicycle-related head injury: a study of 86 cases." *Accident Analysis & Prevention* **36**(4): 561-567.
- Ekman, R. and Welander, G. (1998). "The results of 10 years of experience with the Skaraborg bicycle helmet program in Sweden." *International Journal of Injury Control and Safety Promotion* **5**(1): 23-39.
- Finch, C., Cameron, M. H., Vulcan, A. P., Finch, C. F. and Newstead, S. V. (1994). "Mandatory bicycle helmet use following a decade of helmet promotion in Victoria, Australia--An evaluation." *Accident Analysis and Prevention* **26**(3): 325-337.
- Finch, C., Heiman, L. and Neigher, D. (1993). Bicycle use and helmet wearing rates in Melbourne, 1987 to 1992: the influence of the helmet wearing law. Clayton, Monash University Accident Research Centre.
- Haileyesus, T., Annest, J. L. and Dellinger, A. M. (2007). "Cyclists injured while sharing the road with motor vehicles." *Inj Prev* **13**(3): 202-206.
- Heng, K. W. J., Lee, A. H. P., Zhu, S., Tham, K. Y. and Seow, E. (2006). "Helmet use and bicycle-related trauma in patients presenting to an acute hospital in Singapore." *Singapore Med J* **47**(5): 367-372.
- Karkhaneh, M., Kalenga, J. C., Hagel, B. E. and Rowe, B. H. (2006). "Effectiveness of bicycle helmet legislation to increase helmet use: a systematic review." *Injury Prevention* **12**(2): 76-82.
- Liller, K. D. (2000). "The importance of obstetricians/ gynecologists in promoting children's unintentional injury prevention: a focus on bicycle helmet use." *Prim Care Update Ob Gyns* **7**(2): 60-63.
- Macpherson, A. and Spinks, A. (2007). "Bicycle helmet legislation for the uptake of helmet use and prevention of head injuries (Review)." *Cochrane Database of Systematic Reviews*(2).
- Newstead, S. V., Cameron, M. H., Gantzer, S. and Finch, C. F. (1994). Bicyclist head injuries in Victoria three years after the introduction of mandatory helmet use. Clayton, Monash University Accident Research Centre.
- Oström, M., Bjornstig, U., Naslund, K. and Eriksson, A. (1993). "Pedal cycling fatalities in northern Sweden." *Int J Epidemiol* **22**(3): 483-488.
- Richter, M., Otte, D., Haasper, C., Knobloch, K., Probst, C., Westhoff, J., Sommer, K. and Krettek, C. (2007). "The current injury situation of bicyclists--a medical and technical crash analysis." *The Journal of Trauma, Injury, Infection and Critical Care* **62**(5): 1118-1122.
- Robinson, D. L. (2005). "Safety in numbers in Australia: more walkers and bicyclists, safe walking and bicycling." *Health Promotion Journal of Australia* **16**(1): 47-51.
- Robinson, D. L. (2006). "Do enforced bicycle helmet laws improve public health?" *BMJ* **332**(7543): 722-.
- Runyan, C. W. and Runyan, D. K. (1991). How Can Physicians Get Kids to Wear Bicycle Helmets? A Prototypic Challenge in Injury Prevention. *American Journal of Public Health*: 972-973.
- Thompson, D. C., Rivara, F. P. and Thompson, R. (2009). "Helmets for preventing head and facial injuries in bicyclists (Review)." *Cochrane Database of Systematic Reviews*(4).
- Wong, E., Leong, M. K. F., Anantharaman, V., Raman, L., Wee, K. P. and Chao, T. C. (2002). "Road traffic accident mortality in Singapore." *The Journal of Emergency Medicine* **22**(2): 139-146.
- World Health Organisation (2006). Helmets: A road safety manual for decision-makers and practitioners.
- Zentner, J., Franken, H. and Lobbecke, G. (1998). "Head injuries from bicycle accidents." *Clinical Neurology and Neurosurgery* **98**: 281-285.