Trends in head injuries and helmet use in cyclists at an inner-city major trauma centre, 1991–2010

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To the Editor: The benefits of bicycle helmet use have been the subject of recent discussion, with calls from some experts to review laws mandating the wearing of helmets.[1] The objective of this brief report is to summarise long-term trends in cyclist head injuries seen at an inner-city major trauma centre and determine the odds of any skull fracture or intracranial bleed associated with not wearing a helmet.

This was a retrospective study conducted at the Royal Prince Alfred Hospital (RPAH, Sydney, New South Wales), covering several local government areas that have the highest bicycle-use rates in NSW,[2] where the law for mandatory helmet wearing was enacted in 1991. Patient data were obtained through the hospital trauma registry, which contains data on all patients admitted to the hospital with trauma. These data included information on helmet use routinely abstracted from ambulance and medical notes. Inclusion criteria were cyclists admitted from 1991 to 2009, who were over 16 years of age and involved in an incident on a public road. We excluded patients transferred from other hospitals. Head Abbreviated Injury Scale (AIS) scores (AIS 1990, 1998 and 2005 versions[3]) were used, with a head AIS score ⩾ 3 indicating severe head injury, such as significant intracranial bleeding or depressed or comminuted skull fracture. Injuries with an AIS score of 2 included isolated concussion and simple skull fractures.

To investigate the association between helmet use and head injury, we reviewed the medical charts of all cyclists admitted with trauma from 2008 to June 2010. We compared mechanism of injury (fall off bike without collision versus collision with another vehicle or object), anatomical injury (skull fracture or intracranial bleed), helmet use and the type of road where the incident occurred (state or regional roads versus local roads), according to NSW Roads and Traffic Authority classifications. Data were analysed using Stata software, version 10.1 (StataCorp, College Station, Tex, USA). Percentages were calculated with 95% confidence intervals, and categorical data were compared using χ^2 tests. Mean ages were compared using the Student *t* test, and a logistic regression model was used to obtain odds ratios for any skull fracture or intracranial bleed associated with not using a helmet, after adjusting for mechanism of injury and road type. The study was approved by the Sydney South West Area Health Service RPAH Ethics Review Committee (RPAH Zone).

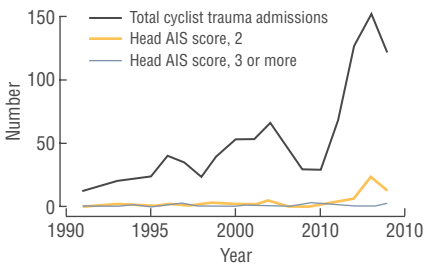
There were 979 patients who met our inclusion criteria. The long-term trend in the number of cyclists sustaining severe head injuries remained low (range, 0–3 per year) (Box 1). Cyclists as a percentage of total admissions for trauma increased from 1.3% in 2005 (29/2258 [95% CI, 0.9%–1.8%]) to 3.9% in 2009 (122/3104 [95% CI, 3.3%–4.7%]). Trends in helmet use and severe head injury are summarised in Box 2. Severe head injury rates as a percentage of total cyclists admitted decreased from 10.3% (3/29 [95% CI, 3.6%–26.4%]) in 2005 to 2.5% (3/122 [95% CI, 0.8%–7.0%]) in 2009, a relative reduction of 76%. Helmet use in admitted cyclists from 1991 to 2009 ranged from 85% to 100%.

Information was available about the location of the fall and helmet use for 287 of the 313 cyclists identified from 2008–2010 (Box 3). Their mean age was 36 years (95% CI, 34–37 years) and 81% were men. Non-helmet wearers had five times higher odds of intracranial bleeding or skull fracture compared with helmet wearers after adjusting for road type and mechanism of injury (odds ratio, 5.3 [95% CI, 1.7–17.1]; $P = 0.005$).

The increase in admissions for bicycle injury is consistent with recently reported population trends.[4] In addition, the number of cyclists sustaining severe head injuries has remained consistently low over the long term, with an apparent decline in the rate of severe head injuries in admitted patients since 2005. The odds reduction for skull fractures and intracranial bleeds in those wearing helmets is within the range reported in a Cochrane review of helmet use.[5] The benefits of helmet use need to be placed in the context of lifetime costs of severe traumatic brain injury, estimated to be around $4.8 million per incident case.[6]

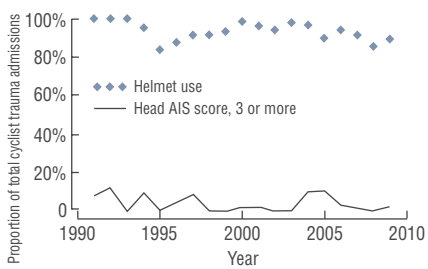
It is the opinion of the trauma service at RPAH, based on these findings, that mandatory bicycle helmet laws be maintained, and enforced as part of overall road safety strategies.

1 Trends in cyclist admissions and head injuries in admitted cyclists, RPAH, Sydney, New South Wales, 1991–2009



AIS = Abbreviated Injury Scale.
RPAH = Royal Prince Alfred Hospital. ◆

2 Trends in bicycle helmet use and severe head injury as a percentage of total cyclist trauma admissions, RPAH, Sydney, New South Wales, 1991–2009



AIS = Abbreviated Injury Scale.
RPAH = Royal Prince Alfred Hospital. ◆

3 Head injury in helmet and non-helmet users among 287 cyclists admitted to Royal Prince Alfred Hospital with trauma, 2008 to June 2010

	Helmet ($n = 241$)	No helmet ($n = 46$)	Significance†
Age, years (95% CI)	36 (34–38 years)	33 (29–37 years)	$P = 0.14$
Men (%; 95% CI)	196 (81%; 76%–86%)	39 (85%; 71%–92%)	$P = 0.60$
Fall off bicycle* (%; 95% CI)	83 (34%; 29%–41%)	13 (28%; 17%–43%)	$P = 0.75$
State/regional road (%; 95% CI)	63 (26%; 21%–32%)	11 (24%; 14%–38%)	$P = 0.75$
Skull fracture or intracranial bleed (%; 95% CI)	8 (3%; 2%–6%)	6 (13%; 6%–36%)	$P = 0.005$

*Without direct collision with another vehicle, object or person. † Two-tailed $P < 0.05$ significant. ◆

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1 Wardlow MJ. Bicycling injuries and mortality in Victoria 2001–2006 [letter]. *Med J Aust* 2009; 191: 295-296.
2 Lehmann R, Lee D, Reid I, et al. Cycling in NSW. What the data tells us. Sydney: prepared by Parsons Brinkerhoff for the Premier's Council for Active Living, 2008. http://www.pcal.nsw.gov.au/new_nsw_bikeplan_-_whats_happening#background (accessed Sep 2010).
3 Gennarelli TA, Wodzin E, editors. Abbreviated Injury Scale. Barrington, Ill: Association for the Advancement of Automotive Medicine, 2005.
4 Sikic M, Mikocka-Walus AA, Gabbe BJ, et al. Bicycling injuries and mortality in Victoria, 2001–2006. *Med J Aust* 2009; 190: 353-356.
5 Thompson DC, Rivara FP, Thompson R. Helmets for preventing head and facial injuries in bicyclists. *Cochrane Database Syst Rev* 2000; (2): CD001855.
6 Victorian Neurotrauma Initiative. The economic cost of spinal cord injury and traumatic brain injury in Australia. Geelong: Access Economics, 2009. http://www.vni.com.au/ (accessed Sep 2010). ❑