Cycling injuries in Australia: Road safety's blind spot?

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Abstract

Cycling rates are relatively low in Australia, but cyclists comprise about 1 in 40 traffic crash fatalities and about 1 in 7 serious injuries. While it appears that cyclists are over-represented in traffic injuries relative to their exposure to injury risk, the magnitude of this excess risk in Australia is currently unknown. The relationship between cycling rates and injury rates over time is also unknown, though the subject of considerable speculation. This paper addresses these two issues, drawing on available traffic injury and travel distance data principally for the greater metropolitan areas of Melbourne and Sydney.

Acknowledging data limitations and the need to interpret findings with caution, the evidence suggests that based on fatality and serious injury rates per kilometre travelled in Melbourne and Sydney, the relative risk of fatality for cycling compared with driving is between 5 and 19. The relative risk of serious injury for cycling compared with driving in Melbourne is 13 based on police data, and 34 based on hospital data, while the relative risk of all injuries (minor plus serious) is 19 in Sydney based on police data. Cyclist injuries appear to be increasing sharply in Melbourne (109% increase from 2000 to 2008), although the picture is less clear in Sydney due to data limitations. We argue that the evidence suggests that while road safety counter-measures have undoubtedly led to a safer operating environment for vehicle occupants, the (arguably) car-centric nature of many of these measures appears to have done little to improve cyclist safety.

Keywords

Bicyclist, Car occupant, Fatality rate, Injury rate, Relative risk

Introduction

Cycling rates are relatively low in Australia [1], but cyclists comprise about 1 in 40 traffic crash fatalities [2] and about 1 in 7 serious injuries [3]. While fatalities and serious injuries for car occupants (drivers and passengers) have declined over time, cyclist fatalities have remained steady, and serious injuries have increased [2, 3].

In the six years between 2003 and 2008, traffic-related fatalities for cyclists in Australia ranged between 26 and 43. On average there were 36 deaths per year, representing 2.3% of all road deaths for this time period. Passenger, pedestrian and driver deaths showed average annual decreases of 5.2%, 3.2% and 0.9%, respectively, but no trend was apparent for cyclist deaths [2].

Serious injuries followed a similar pattern. In 2007, pedal cyclists comprised 14.6 percent of serious injuries in road-based traffic crashes in Australia [3]. Over the period 2000 to 2007, based on data from the Australian Institute of Health and Welfare (AIHW) National Hospital Morbidity Database, serious injury rates for cyclists (per 100,000 population) increased by 47%, while for all other modes (motorcycles aside), rates either remained steady or declined [3]. The extent to which the increase in cyclist serious injuries is attributable to increased rates of cycling is currently unknown, though there appears to have been no commensurate increase in bicycle travel in Australia [4, 5].

International comparative data show large variations in cyclist fatality and injury rates between countries [6]. Large variations also occur in the relative risk of injury for cyclists compared with car occupants. A survey of Toronto commuter cyclists found that bicycle accident rates per kilometre cycled were between 26 and 68 times higher than similar rates for car travel, and the authors reported much lower cyclist accident rates for a similar survey conducted in Ottawa, Canada [7]. These large geographical variations in cyclist injury rates and in relative risks for cyclists and car occupants indicate substantial differences in driving/cycling conditions, including road infrastructure and driver/cyclist behaviour.

Substantially lower cyclist fatality and injury rates in countries such as the Netherlands, Germany and Denmark have been attributed to better cycling infrastructure; national cycling education, skills and promotion programs; widespread traffic calming, including lower speed limits (30km/hr) in urban areas; and driver licensing and road safety systems that place greater responsibility on drivers for the safety of cyclists and pedestrians [6, 8, 9].

Christie et al. report a clustering among OECD countries into those that have achieved high rates of relatively safe cycling for young people, and those where cycling rates are low and fatality rates relatively high [9, 10]. Australia currently falls into the latter group of countries – achieving relatively low child cycling fatality rates per child population1 largely through low and declining levels of cycling [10, 11].

After several decades of declining rates of cycling for transportation purposes (as opposed to social/recreational purposes) in Australia, there are some indications that cycling among adults, particularly in inner city areas, is now increasing, at least in terms of numbers if not per capita rates [4, 12]. In view of the multiple health, environmental, transport and community liveability benefits of a mode shift from car use to cycling, policies and strategies for increasing transportation cycling have been developed within all levels of government (local, state and federal) across several sectors (health, transport, environment, urban planning and community) [13]. It is important that the substantial benefits of increased levels of cycling are not diluted by increased injury rates. A recent editorial in the *Medical Journal of Australia* recommended action to increase both the prevalence and safety of cycling in Australia [14].

The aim of this paper is to compare the incidence rate and relative risk of cyclist and car occupant casualty crashes in Sydney and Melbourne. First, we address the crucial issue of the computation of reliable injury rates, highlighting the need for an exposure metric based on distance cycled, as well as the practical challenges involved in doing this. Second, we estimate the relative risks, for traffic fatalities and injuries, of cycling compared with car travel based on distance travelled. Third, we explore the relationship between cycling rates and cyclist fatality and injury rates in Sydney in an attempt to examine the 'safety in numbers' theory [15] in an Australian setting. The study draws on available traffic injury and travel distance data, principally for the greater metropolitan areas of Sydney and Melbourne.

Methods

The risk of being injured in an accident is simply the number of injuries occurring per some measure of exposure (e.g., distance travelled, population) and is computed as follows:

$$R_{ijk} = \frac{A_{ijk}}{D_{ijk}} \qquad [1]$$

where

A = annual number of injuries

D = exposure (annual distance travelled, population, etc.)

i = demographic grouping

j = mode of transport (car, public transport, bicycle, etc.)

k = situational circumstance (time of day, speeding, etc.).

The implications are that computation of injury rates requires a) a source of crash/injury information and b) a comparable (across time and space) source of travel/exposure information.

From a road safety perspective, the two metrics of exposure most widely used are i) population/per capita and ii) kilometres of travel. Per capita exposure is appealing because it is easy to derive, it gives the actual number of people (per capita) affected, and it is broadly comparable across risk contexts (e.g., road safety, cigarette smoking) and countries.

However, it has two serious limitations in the context of the current paper. First, it does not indicate the magnitude (i.e., time, distance) spent exposed to a particular risk situation, which is highly variable across demographic/modal sub-groups. Second, when running relative comparisons between (say) car occupants and cyclists, use of a single 'population' metric will tend to understate the risk to cyclists by virtue of the fact that the actual 'at risk' population of cyclists is much lower than car occupants (ideally one would need the population of car occupants, population of cyclists, etc., to run the relative comparison). Kilometres of travel (potentially) overcome both these issues, but the main downside is that there are relatively few sources of such data and the data requirements are much more demanding, particularly when analyzing small sub-groups such as cyclists.

Police-reported crash data (TADS and CrashStats)

In New South Wales, the main source of crash information is the Traffic Accident Database System (TADS) maintained by the Roads and Traffic Authority [16]. TADS provides detailed information of all accidents reported to the police involving one moving road vehicle on a public road in which a person was killed or injured or at least one motor vehicle was towed away. Within the TADS database, a fatality is defined as someone who dies within 30 days of an accident as a result of injuries sustained in the accident, while an injury is defined as a person who is injured as a result of the accident but who did not die within 30 days of the accident. Injuries are not differentiated by severity.

In Victoria, the main source of crash information is CrashStats, which is maintained by VicRoads and provides summary information relating to all traffic collisions reported to Victoria Police. Fatalities are defined in the same way as TADS, but injuries are differentiated into serious injuries and minor injuries. Serious injuries are those requiring hospital treatment and possibly admission. CrashStats data from 1987 to 2009 are available through the Internet [17].

Hospital-reported crash data (VISU - Victoria)

Road user injuries for residents of the Melbourne Statistical Division (MSD), which covers the Greater Melbourne Metropolitan Area, were provided by the Victorian Injury Surveillance Unit (VISU), which is the injury subset of the Victorian Admitted Episodes Data Set covering all admissions to Victorian hospitals. Data on traffic accidents for car drivers, car passengers and cyclists were provided for the financial year 2007-08 (1 July 2007 to 30 June 2008) to enable comparison with police-reported CrashStats data for this year (the most recent available). In VISU, traffic accidents are those occurring on a 'public highway', which is defined as 'land open to the public as a matter of right or custom for purposes of moving persons or property from one place to another', and includes bike paths and cycle ways.

Travel data

While Australia has not embraced a national travel survey since the early 1970s, most of the major cities have conducted or are conducting regional travel surveys including the two largest cities, Sydney and Melbourne. In the case of Sydney, the

Sydney Household Travel Survey (SHTS) has been running since 1997 [18]. The SHTS is a continuous survey (covering all days of the year) of around 5000 households per annum drawn from the Sydney Greater Metropolitan Area2, providing a unique longitudinal database for studying travel trends.

In Melbourne, the Victorian Activity and Travel Survey (VATS) was conducted from 1994-1999 for the Melbourne Statistical Division (Greater Melbourne Metropolitan Area), and data from the more recent Victorian Integrated Survey of Travel and Activity (VISTA) are available for the period from May 2007 to June 2008. Both VATS and VISTA are continuous surveys that cover all days of the data collection period (like the SHTS), but they are not directly comparable, so longitudinal data are not available at present for Melbourne.

Computation of fatality and injury rates and relative risk

For Sydney, five calendar years of TADS data were made available from 2002 to 2006, while six financial years of SHTS data were available from July 2001 to June 2007. To ensure compatibility, four financial years were used in the analysis, 2002 (corresponding to 1/7/02 – 30/6/03), 2003, 2004 and 2005, and crashes were selected for the Sydney GMA to match the area covered by the SHTS data. Injuries were derived from the TADS by age/gender groupings for four travel modes – namely, motor vehicle, motorcycle, bicycle and pedestrian.

The SHTS data were manipulated to provide weighted person kilometres of travel by the age/gender/modal groupings using five years of pooled data up to and including the current financial year. SHTS (five-year pooled) data for 2006 show that the average total distance traveled per day was 32.2 km, comprising 26.6 km (81.8%) by car and 0.11 km (0.3%) by bicycle. Injury data for cyclists and car occupants (drivers and passengers) from TADS and travel data from SHTS were used to calculate injury rates based on distance travelled.

For Melbourne, travel data for the period May 2007 to June 2008 were obtained from the VISTA 07 Summary Report [19]. The average daily total distance travelled by all surveyed household members (11,400 households in the Melbourne metropolitan area), together with the proportion of distances travelled by car and bicycle, were used to estimate the total number of kilometres travelled by car and bicycle in Melbourne for the 2007-08 financial year. VISTA data show that the average total distance travelled per day by householders in the Melbourne metropolitan area during 2007-08 was 33km, comprising 28.2 km (85.4%) by car and 0.26 km (0.8%) by bicycle. Distances were similar for the total sample, which included metropolitan Melbourne and regional Victoria. This corroborates recent evidence showing that cycling levels are around double in Melbourne compared to Sydney [20]. Comparable data from VATS for 1994-99 are not currently available, so it is not possible to document changes over time in bicycle and car travel distances in Melbourne.

Injury data for cyclists and car occupants (drivers and passengers) from VISU and CrashStats for the Melbourne Statistical Division for the financial year 2007-08 were used to calculate injury rates based on distance travelled.

Relative risk was used in this study to indicate the risk of a cyclist being killed or injured relative to a car occupant. It was computed by dividing the relevant rate for cyclists by the relevant rate for car occupants.

Results

Results are calculated and presented separately for Melbourne and Sydney. Trends in fatalities and injuries for car occupants and cyclists are presented, followed by fatality and injury rates, and relative risks (bicycle:car) of fatality and injury.

Melbourne fatalities

Based on VicRoads CrashStats data, fatalities for car occupants in the Melbourne metropolitan area (Melbourne Statistical Division) decreased between 2000 and 2008, while cyclist fatalities show no apparent trend (Figure 1). For the years 2000 to 2008, cyclists and car occupants (drivers and passengers) comprised 2.8% and 59.7%, respectively, of road fatalities in the Melbourne metropolitan area. For the financial year 2007-08 there were four cyclist fatalities in the Melbourne metropolitan area (Table 1).

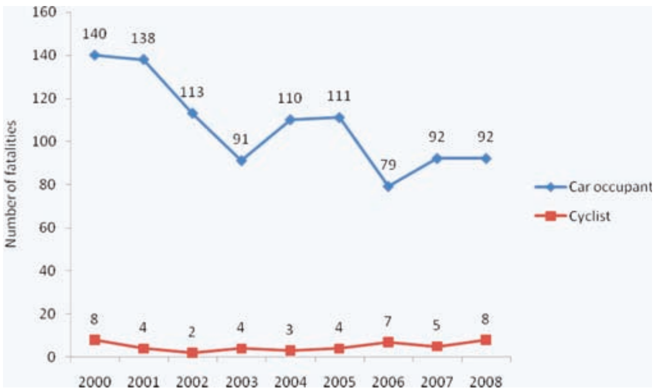

Figure 1. Cyclist and car occupant road traffic fatalities, Melbourne metropolitan area, 2000 to 2008
(Source: VicRoads CrashStats online)

Melbourne serious injuries

For the Melbourne metropolitan area, VicRoads CrashStats data show that cyclist serious injuries increased from 201 in 2000 to 421 in 2008, an increase of 109%. Over the same time period (2000 to 2008), the proportion of police-reported serious injuries among cyclists increased from 4.7% to 8.2%, while the proportion of serious injuries among car occupants decreased from 69.5% to 64.9% [17].

Injury data for the year 2007-08 from both CrashStats and VISU (Table 2) show that the number of police-reported serious cyclist injuries is substantially lower than the number of hospital-

Table 1. Fatality risk for cyclists and car occupants in the Melbourne metropolitan area

Data source	Financial Year	Fatality count		Average daily distance travelled (2007-08)[a]		Fatality rate (per 10^8km)		Relative risk (Bicycle: Car)
		Car occupant	Bicycle	Car occupant	Bicycle	Car occupant	Bicycle	
Crash Stats	2007-08	96	4	101,322,600	934,180	0.26	1.18	4.54

[a]Based on MSD population of 3.593 million on 30 June 2008.

Table 2. Serious injury risk for cyclists and car occupants in the Melbourne metropolitan area

Source of injury data	Year	Serious injury count		Average daily distance travelled (2007-08)		Injury rate (per 108km)		Relative risk (Bicycle: car)
		Car occupant	Bicycle	Car occupant	Bicycle	Car occupant	Bicycle	
VISU	2007-08	3488	1075	101,322,600	934,180	9.4	315.3	33.5
Crash Stats	2007-08	3538	440	101,322,600	934,180	9.6	123.5	12.9

reported serious injuries. This finding is consistent with other Australian studies [21]. One of the primary reasons for the difference is likely to be that CrashStats data is focused on on-road accidents, whereas many cycling injuries occur on bike paths and cycle ways. These locations are included as 'traffic accidents' in VISU, but are probably less likely to be reported to police.

While the number of police-reported serious cyclist injuries is substantially lower than the number of hospital-reported serious injuries, this is not the case for car drivers and passengers, where police-reported and hospital-reported serious injuries are similar (Table 2).

Melbourne fatality and injury rates and relative risk

In the Melbourne metropolitan area in 2007-08, the fatality risk for a cyclist travelling the same distance as a car driver or passenger was four and a half times that of a car occupant (Table 1). This relative risk needs to be interpreted cautiously as annual cyclist fatalities are low and highly variable. For example, for the *calendar year* 2008, there were eight cyclist fatalities in the Melbourne metropolitan area, which would have resulted in a relative risk of nine times that of a car occupant. The cyclist/car occupant relative risk based on distance travelled was substantially higher for serious injuries than for fatalities: 34 based on VISU injury data and 13 based on CrashStats injury data (Table 2). This is due to the hospital database (VISU) recording about two and a half times the number of serious cyclist injuries than the police database (CrashStats). This finding is consistent with other Australian studies, which have also reported large differences in police and hospital records of serious cyclist injuries [21].

Sydney fatalities

In the Sydney GMA, fatalities for car occupants declined by 9% between 2002 and 2005, while cyclist fatalities show no apparent trend (Figure 2). For the years 2002 to 2005, cyclists and car occupants comprised 3.1% and 51.4%, respectively, of road fatalities in the Sydney GMA.

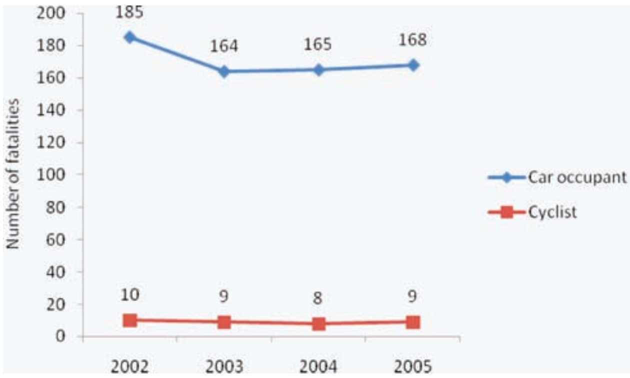

Figure 2. Cyclist and car occupant road traffic fatalities, Sydney metropolitan area, 2002-2005 *(Source:* TADS data)

Sydney serious injuries

For Sydney, over the period for which TADS data were made available (i.e., 2002-03 to 2005-06), injuries declined by 1666 (-10%) for motor vehicle occupants and 66 (-6%) for cyclists (Figure 3).

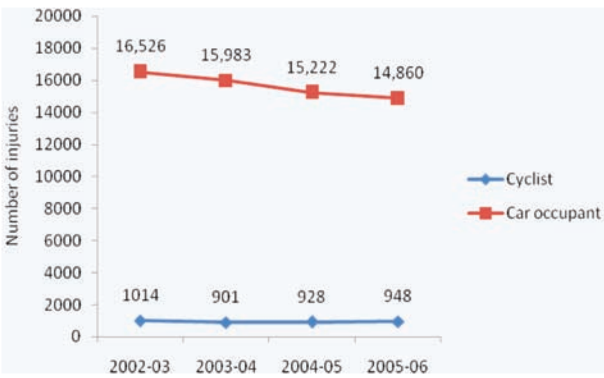

Figure 3. Number of injuries, bicyclists and car occupants, Sydney metropolitan area

Sydney fatality and injury rates and relative risk

Over the period 2002-2005 the SHTS data show that kilometres travelled by car occupants increased by 7% (Table 3). Over the corresponding period, bicycle kilometres of travel increased by 29%, but this should be interpreted with caution due to low cycling trip numbers. Each wave records around 20,000 car occupant trips and 250 bicycle trips, so using five-year pooled data implies around 100,000 car occupant trips and 1250 bicycle trips.

Over this four-year period, injury rates declined for car occupants (Table 4). Injury rates appear to have decreased for bicyclists, but as noted above, these data need to be interpreted cautiously. Nevertheless, even allowing for sampling issues, the relative risk of injury on a bicycle is around 13-19 times higher than in a car over the four-year period, which is broadly comparable to the results from Melbourne based on CrashStats data. Again, interpreting results with caution, it also appears that fatality risk may be greater for cyclists in Sydney, with more cyclists killed despite cycling rates of around half those of Melbourne. Note that because injuries include minor as well as serious injuries, the injury rate figures cannot be directly compared to those for Melbourne.

Discussion

Road safety improvements in Australia since the 1970s have been substantial [2]. However, these improvements have not been equitably distributed across all road user groups, with cyclists in particular experiencing a higher burden of fatalities and serious injuries than car occupants after adjusting for distance travelled. The traffic-related fatality and serious injury rates for cyclists in this study are high in comparison with many other wealthy countries [6, 22].

While sample sizes preclude a direct comparison with other locations, the cyclist fatality rate of between 4 and 7 per 10^8km in Sydney[3] is several times greater than in the Netherlands (1.1 per 10^8 km), Denmark (1.5) and Germany (1.7), though comparable to the USA (5.8) [6]. The cyclist serious injury rate in Melbourne of between 124 (police data) and 315 (hospital data) per 10^8km cycled[4] is very much greater than in the Netherlands (14), Denmark (17) and Germany (47), though, once again, comparable to the USA (375) [6]. A recent analysis reported a killed or seriously injured cyclist casualty rate of 54 per 10^8km in Britain in 2008 based on police crash reports [22].

The 'safety in numbers' theory has been proposed as a possible explanation for these large international differences in cycling fatality and injury rates [15], but countries and cities with high levels of safe cycling also have far better conditions for cycling. It is likely that good cycling infrastructure, policies that treat cycling as a legitimate form of transport, lower urban speed limits, national driver and cyclist education, skills and training programs, and stricter levels of liability for drivers in car/cyclist interactions [8] all contribute to improved cyclist safety [6].

The large difference in cycling safety between Australia and many other wealthy nations, as well as the large and increasing

Table 3. Fatality risk for cyclists and car occupants in Sydney GMA (2002-2005)

Year	Fatality count		Average daily distance travelled (5-yr pooled)		Fatality rate (per 10^8km)		Relative risk (Bicycle: car)
	Car occupant	Bicycle	Car occupant	Bicycle	Car occupant	Bicycle	
2002	185	10	121,983,414	487,687	0.42	5.62	13.52
2003	164	9	122,087,060	360,147	0.37	6.85	18.60
2004	165	8	130,962,527	452,459	0.35	4.84	14.03
2005	168	9	130,262,321	630,420	0.35	3.91	11.07

Table 4. Injury[a] risk for car occupants and cyclists in Sydney GMA (2002-2005)

Year	Injury count		Average daily distance travelled (5-yr pooled)		Fatality rate (per 10^8km)		Relative risk (Bicycle: car)
	Car occupant	Bicycle	Car occupant	Bicycle	Car occupant	Bicycle	
2002	16,526	1,014	121,983,414	487,687	37.12	569.64	15.35
2003	15,983	901	122,087,060	360,147	35.87	685.41	19.11
2004	15,222	928	130,962,527	452,459	31.84	561.92	17.65
2005	14,860	948	130,262,321	630,420	31.25	411.99	13.18

[a]For Sydney, TADS records all injuries, including serious and non-serious

gap between cyclist and car occupant safety in Australia, suggest that there may be a 'cycling blind spot' in road safety in Australia. Interventions that reduce speeding, drink and drug driving, fatigue, and distracted driving potentially benefit all road users. However, other 'passive' traffic safety measures, such as seat belts, air bags and safer vehicle interior design, while of benefit to car occupants in the event of a crash, are of no benefit to vulnerable road users such as cyclists, pedestrians and motorcyclists. In addition, some factors that improve the safety of motor vehicle occupants may actually increase the risk to vulnerable road users (e.g., larger and heavier vehicles, bull bars) [23]. It has also been argued that 'as people in cars are made to feel safer, the standards of driving experienced by those on the outside decline' [24].

Cyclists, as well as car drivers, are largely responsible for their own safety and the safety of other road users. Nevertheless, road safety strategies that are based on the 'Vision zero' principle [25, 26] acknowledge that road conditions are not always optimal and that road users who occasionally make mistakes should not have to pay for their mistakes with their lives or their health. Passive road safety measures such as seat belts, air bags and safer car interior design are not available to cyclists, who are therefore more dependent on external conditions and the behaviour of other road users.

While road conditions affect both driver and cyclist safety, road hazards can have a greater impact on cyclists because bicycles, unlike cars, are single-track vehicles. It is important to acknowledge these basic differences, rather than 'blaming' cyclists for what are often perceived to be erratic or dangerous behaviours. It seems that in Australia, there is a low tolerance for cyclist mistakes and relatively little protection when they occur. A key factor for cyclist safety is vehicle speed, but Australia's urban speed limits are high by international standards [27], and the safety of cyclists and other vulnerable road users is afforded a lower priority than the achievement of small improvements in motor vehicle travel time [27, 28].

Another factor that may be contributing to the 'cycling blind spot' in road safety in Australia is the lack of reporting of cyclist serious injuries to the police as identified in this study and in other Australian studies [21]. In Victoria, the organisations with the principal responsibility for road safety (Victoria Police, VicRoads and the Transport Accident Commission) may be more aware of road user serious injury data reported in CrashStats (police records) than in VISU (hospital records). This might in turn contribute to underestimating the magnitude of serious injuries among cyclists.

Cyclist serious injuries that do not involve a motor vehicle (and are therefore less likely to be reported to police), such as falling off the bicycle, hitting an object, or colliding with a pedestrian or animal, tend to be labelled as 'cyclist mistakes'. Poor cycling infrastructure can also contribute to these types of cycling accidents. As noted above, single-vehicle serious injuries among car occupants are more likely to be reported to police, and the contribution of road infrastructure to single-vehicle accidents is well-recognised.

International experience demonstrates that cycling safety can be improved markedly using the same sort of strategic planning that has been used to improve safety for car occupants [6]. Improved cycling conditions that are likely to contribute to increased cycling safety include:

- more extensive, high quality and well-maintained cycling infrastructure, including separated cycling facilities
- basing priority systems on needs of vulnerable road users (where appropriate), rather than car occupants
- improved interactions between cyclists and drivers in the form of mutual respect, courtesy and willingness to share public road space
- education and training for drivers and cyclists aimed at improving skills, attitudes and behaviours
- urban speed limits based on human tolerance to injury in collision with a motor vehicle
- placing greater responsibility for traffic safety through the legal system on those road users who have the potential to cause the most harm to others.

This study aimed to answer some important questions related to cycling safety in Australia. As indicated in the text, some findings are relatively robust, but others are uncertain. In particular, it is not clear whether increased cycling participation accounts for the increases in cycling injuries that have occurred in recent years in Australia and in Melbourne. Sydney was the only location where longitudinal injury and cycling distance were available, but the findings were constrained by small sample sizes. A longitudinal, custom-designed survey of cycling accidents and travel behaviour is probably the best way to answer this important question definitively. In addition, the causes of cyclist injuries in Australia are not well-understood, and further research in this area should be a priority for road safety research.

Conclusions

While road safety counter-measures have undoubtedly led to a safer operating environment for vehicle occupants, the (arguably) car-centric nature of many of these measures has in fact done little to improve cyclist safety. Cyclists appear to be over-represented in terms of fatalities and serious injuries relative to their exposure to traffic, but under-represented in interventions aimed at reducing traffic fatalities and injuries.

Our attempts in this paper to document the magnitude of and trends in cycling injuries can be categorised as 'problem-focused' research, and while we acknowledge that more research is needed to better understand 'the problem', there is nevertheless sufficient evidence and a good case for 'solution-focused' research and 'solution-focused' action. International experience demonstrates that cycling can be made safer [6].

Strategies that have been implemented successfully overseas should be modified, trialled and evaluated in Australia so that the benefits of improved road safety in Australia are extended to all road user groups, thereby addressing the strategic objective of the Australian National Road Safety Strategy of 'Improving equity among road users' [29].

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Notes

1. Child cycling fatality rates per km cycled are not known.
2. The Sydney GMA comprises the Sydney and Illawarra Statistical Divisions and the Newcastle Statistical Subdivision, which extends from Port Stephens in the north to Shoalhaven in the south to the Blue Mountains in the west.
3. The Melbourne rate was low (1.2 per 10^8km) for the year 2007-08, but cyclist fatalities in Melbourne vary considerably by year.
4. The wide range is due to the use of different injury data sources.

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