

Fatal motorcycle crashes in north Queensland: characteristics and potential interventions

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Abstract

Aims: The Rural and Remote Road Safety Study (RRRSS) addresses a recognised need for greater research on road trauma in rural and remote Australia, the costs of which are disproportionately high compared with urban areas. The 5-year multi-phase study with whole-of-government support concluded in June 2008. Drawing on RRRSS data, we analysed fatal motorcycle crashes which occurred over 39 months to provide a description of crash characteristics, contributing factors and people involved. The descriptive analysis and discussion may inform development of tailored motorcycle safety interventions.

Methods: RRRSS criteria sought vehicle crashes resulting in death or hospitalisation for 24 hours minimum of at least 1 person aged 16 years or over, in the study area defined roughly as the Queensland area north from Bowen in the east and Boulia in the west (excluding Townsville and Cairns urban areas). Fatal motorcycle crashes were selected from the RRRSS dataset. Analysis considered medical data covering injury types and severity, evidence of alcohol, drugs and prior medical conditions, as well as crash descriptions supplied by police to Queensland Transport on contributing circumstances, vehicle types, environmental conditions and people involved. Crash data were plotted in a geographic information system (MapInfo) for spatial analysis.

Results: There were 23 deaths from 22 motorcycle crashes on public roads meeting RRRSS criteria. Of these, half were single vehicle crashes and half involved 2 or more vehicles. In contrast to general patterns for driver/rider age distribution in crashes, riders below 25 years of age were represented proportionally within the population. Riders in their thirties comprised 41% of fatalities, with a further 36% accounted for by riders in their fifties. 18 crashes occurred in the Far North Statistical Division (SD), with 2 crashes in both the Northern and North West SDs. Behavioural factors comprised the vast majority of contributing circumstances cited by police, with adverse environmental conditions noted in only 4 cases.

Conclusions: Fatal motorcycle crashes were more likely to involve another vehicle and less likely to involve a young rider than non-fatal crashes recorded by the RRRSS. Rider behaviour contributed to the majority of crashes and should be a major focus of research, education and policy development, while other road users' behaviour and awareness also remains important. With 68% of crashes occurring on major and secondary roads within a 130km radius of Cairns, efforts should focus on this geographic area.

Introduction

Rates of serious and fatal injury resulting from road crashes are higher in rural and remote Australia than in urban areas. However, road safety research has tended to focus on urban areas, often overlooking issues particular to rural and remote road use and safety. The Rural and Remote Road Safety Study (RRRSS) addresses a need for greater attention to rural and remote road trauma acknowledged in national road safety action plans and strategies since the mid-1990s [1, 2].

Drawing on RRRSS data, we analysed fatal motorcycle crashes which occurred over 39 months to provide a description of crash characteristics, contributing factors and people involved. The descriptive analysis and discussion may inform development of tailored motorcycle safety interventions.

Background

Motorcyclists in Australia are up to thirty times more likely to be killed in a crash than car occupants as a function of distance travelled, and their overrepresentation in crashes causing serious injury is greater still [3]. Motorcycles account for around 4.5% of registered vehicles in Australia and approximately 15% of the total annual road toll [3, 4]. Since 2002 there has been a 3.6% annual increase in motorcyclist fatalities across Australia and an even greater increase in serious injuries [3]. The increase in crashes is almost certainly related to an increase in rider exposure (distance travelled), although precise exposure data are elusive [5, 6]. There have been concomitant increases in motorcycle sales and registrations in Australia in the last decade, with a seventy percent increase in new sales over the last five years [4, 7].

Compared with other Australian States and Territories, Queensland has seen the greatest increases in both motorcycle usage and serious motorcycle crashes. Queensland motorcyclist fatalities have effectively doubled in the last five years, rising from 38 in 2003-04 to 74 in 2008-09 (see Figure 1). In the most recent available data for the previous 12 months, motorcyclists represented over 23% of Queensland's road toll, a 41% increase over the previous 5 year average. These increases have occurred more in regional, rural and remote areas than in urban areas [8]. The latest Queensland figures may represent a temporary anomaly, and may also to some extent reflect the current popularity of motorcycles in that state, yet they nonetheless suggest a lack of progress in the area of motorcycle safety.

Recreational riding, most of which takes place outside urban areas, appears to have increased in popularity, both in Australia and elsewhere [9, 10]. In recent years there has also been a shift in the age distribution of fatally injured motorcyclists toward older riders [9, 11, 12]. While a disproportionate number of crashes still involve riders less than 25 years of age, an increasing proportion of older riders are represented in crash data. Motorcycle crashes (excluding moped crashes) in Australia involve a male rider in over 90% of cases, as is generally the case in other developed countries [13, 14]. In 2003, for example, males accounted for 95% of motorcycle rider deaths in Australia [13].



Figure 1: Increase in Queensland motorcyclist fatalities

Risk factors for motorcycle crashes and associated injury have been identified and discussed in previous research and grouped in the following categories [15]:

- Risk-taking
- Inexperience or lack of recent experience
- Driver failure to see motorcyclists
- Instability and braking difficulties
- Road surface and environmental hazards
- Vulnerability to injury

Briefly, riders with little or recent experience appear to be at greater risk than regular long-term riders. The common belief that motorcycle rider training can significantly address experience-related crash risk is not clearly supported by the research in this area, and training in some cases has actually been shown to be detrimental [11, 16, 17]. Deliberate risk-taking includes a number of behaviours, among which excessive speed is arguably the most prominent. Motorcycles are less conspicuous and more difficult for other road users to see than larger vehicles, while some research also suggests the approaching speed of motorcycles may be difficult for others to judge from some angles. Due to their inherent instability and limited contact with road surface, motorcycles are vulnerable to poor road conditions and environmental hazards. They also typically have longer stopping distances compared with cars. Alcohol and/or drug impairment is a known risk factor for motorcycle crashes, to a similar extent that it is with other vehicles. As well as all these factors influencing crash risk, motorcyclists are highly vulnerable to injury due to a general lack of physical protection, and this is often exacerbated by a lack of protective clothing.

The RRRSS found that 39.6% of all serious or fatal injury crashes involved motorcycles or all-terrain vehicles (ATVs). Over 80% of motorcycle /ATV crashes recorded in the RRRSS were single vehicle crashes and approximately 64% of motorcycle crashes occurred on a public road or public land.

Given the trends noted above, it is appropriate from a road safety perspective to explore the issue of motorcyclist fatalities in rural and remote Queensland. To this end, our objective is to analyse RRRSS data on fatal motorcycle crashes, with the aim to better understand the attendant risks and potentially inform interventions.

Methods

The Rural and Remote Road Safety Study area covered around 800,000 km² in northern Queensland - the area north and west of Bowen on the east coast - representing

approximately 40% of the state's land area (Figure 2). The study area includes the three northernmost Queensland Statistical Divisions: North, North West and Far North [18]. To retain a rural and remote focus, the urban areas of Cairns and Townsville were excluded from the study. The study included persons aged 16 years or over who were killed or admitted to Cairns, Townsville, Mount Isa or Atherton hospitals for at least 24 hours as a result of a vehicle crash. Data collection spanned 39 months from March 2004 to June 2007. Ethics approval for the study was granted by the participating hospital and university ethics committees.



Figure 2: Rural & Remote Road Safety Study area in Queensland

Data for the RRRSS were drawn from a number of sources. Queensland Transport crash data were collected for police-reported crashes, constituting about 55% of all crashes in the study. These reports provide information on vehicle types, persons involved, licence and registration status, road and environmental conditions, contributing circumstances and other variables of interest. Coroners' reports on fatal crashes were collected, when publicly available, for medical data covering injury types and severity, evidence of alcohol, drugs and prior medical conditions. Some of these reports have yet to be finalised and released. A detailed description of RRRSS methodology is available in the Final Report [19]. Fatal motorcycle crashes were selected from the RRRSS dataset and analysed for crash characteristics and contributing circumstances. Crash data were plotted in a geographic information system (MapInfo) for spatial analysis.

Results

Crash characteristics

There were 23 fatalities from 22 motorcycle crashes recorded by the RRRSS, with 22 riders and 1 pillion passenger killed. Half of all crashes involved a single vehicle. One off-road fatal crash involving a 15 year old rider was excluded from the study due to age. Crashes were concentrated in the Far North Statistical Division (86%), with 68% of crashes occurring

within 130km of the Cairns central business district (CBD) and relatively few crashes in the Townsville and Mount Isa regions (Figure 3).



Figure 3: Fatal motorcycle crash distribution

All of the recorded crashes occurred on major or secondary roads with sealed surfaces (data on road surface were missing for 2 cases), and mostly in high speed zones. The vast majority of crashes also occurred in daylight hours and in dry conditions, while most crashes also occurred on either a Saturday or Sunday (Table 1).

Table 1: RRRSS fatal motorcycle crash characteristics

Crash characteristic (n=22)	n	%
Single vehicle crash	11	50
Sealed road	20	>90
100km/h speed zone	13	59
80km/h speed zone	4	18
Daylight hours	19	86
Dry conditions	21	95
Saturday or Sunday	14	64

Age and gender

There were 22 male riders and 1 female pillion passenger killed in recorded motorcycle crashes. Nineteen (86%) riders were more than 30 years old, while 8 (36%) were also over 50 years of age. Two riders were aged between 20 and 24 years, while one rider was less than 20 years old.

Contributing factors

Police-reported data were not available for one of the 22 fatal motorcycle crashes. The following section reports on the 21 police-reported crashes. In Table 2 (below), Unit 1 is the vehicle to which primary responsibility for the crash is attributed by police. Multiple contributing factors are attributed in most cases, sometimes to multiple vehicles. A motorcycle rider was deemed primarily at fault in 76% of all cases. Of the crashes involving another vehicle (11), other vehicle drivers were primarily responsible in 45% (5) of all cases. Excessive motorcycle speed was a reported factor in 29% of cases, while 14% of riders were found to have a blood alcohol concentration (BAC) over the prescribed legal limit. In one case a rider did not wear a helmet, while helmet use was unknown in two other cases.

Table 2: RRRSS fatal motorcycle crash contributing factors

QPS-attributed factor Unit 1	Motorcycle (n=21)	Other vehicle (n=11)
Speed-related	6 (29%)	-
Carelessness, Inattention, Negligence	4 (19%)	2 (18%)
Right of Way Violation	3 (14%)	2 (18)
Road Condition	3 (14%)	1 (9%)
Alcohol/Drug	3 (14%)	1 (9%)
Animal	1 (5%)	-
Medical Condition	1 (5%)	-

Discussion

The vast majority of motorcycle riders killed during the study period were aged over 30 years. Riders older than 50 years are particularly overrepresented compared with their proportion of the state's population. This finding contrasts significantly with crash data for all vehicle types, where young riders and drivers (<25) are generally overrepresented. In fact, the proportion of young riders here is in line with their proportion of the population. The high proportion of crashes on Saturday and Sunday in daylight hours suggests that these fatalities may involve mostly recreational riders. Although there is no direct evidence for this in fatal crash data, interviews with casualties involved in non-fatal crashes support this assertion.

Half of all fatal motorcycle crashes involved another vehicle. By contrast, only 20% of non-fatal motorcycle crashes involved another vehicle. Therefore, a motorcycle crash with another vehicle appears much more likely to be fatal for motorcyclists than a single vehicle crash. While drivers of other vehicles were reported as primarily responsible for some crashes, the motorcyclist was deemed at fault by police in 76% of all reported cases.

The large proportion of crashes in high speed zones is in line with their predominance in rural and remote areas. Injuries are likely to be more severe in such zones due to the greater impacts associated with higher speeds. Excessive motorcycle speed was a factor in nearly one third of all cases, which in rural and remote areas raises particular problems in terms of speed limit enforcement. The vast majority of crashes occurred in clear dry weather, on sealed roads, during daylight hours, suggesting that environmental factors may contribute less often in comparison to behavioural factors.

Although no fatal off-road motorcycle crashes occurred during the RRRSS data collection period, there have been several fatal off-road motorcycle crashes in the study area

since data collection concluded, including some on private property. This suggests that off-road settings should not be overlooked in broader motorcycle safety strategies.

Limitations

The number of crashes analysed precluded any testing for statistical significance. Due to the low numbers involved, the statistics should be viewed with some caution. Official crash reports were not available in all cases.

Conclusions and recommendations

Increasing motorcycle sales and usage appear to be reflected in increases in rider death and injury as a result of crashes, yet the precise relationship remains unclear due to imperfect exposure data. Rider behaviour is the underlying factor in most fatal motorcycle crashes with substantial involvement in high risk behaviours such as speeding and drink riding. Although not the focus of this paper, RRRSS data suggest this is also the case for non-fatal motorcycle crashes. While there are training programs available in Queensland which attempt to address rider behaviour and attitude, there is currently a lack of evidence on which to recommend them. The relationship between recreational riding and deliberate risk-taking (as opposed to impulsive risk-taking) is a topic for ongoing research which is currently being pursued in the context of off-road riding.

The motorcycle safety consultation process undertaken in 2008 by Queensland Transport was strongly endorsed in the final recommendations from the RRRSS [20]. Queensland Transport's current efforts to further research safety issues regarding older riders, including returned and returning riders, are likewise supported. Given the concentration of motorcycle crashes around the Cairns region, this should be a primary target area for future research and intervention development in north Queensland. Interventions should primarily target rider behaviour, but also the awareness and behaviour of other vehicle drivers regarding motorcycles. Interventions of a regulatory or legislative nature need to consider the likelihood of effective enforcement as well as the extent to which they are supported by evidence.

References

1. Australian Transport Council, *National road safety strategy 1992-2000*. 1992, Australian Transport Safety Bureau: Canberra.
2. FORS, *Monograph 9: Australia's rural road safety action plan: Focus for the future 1996* Federal Office of Road Safety, Editor. 1996, Australian Transport Safety Bureau: Canberra.
3. Johnston, P., C. Brooks, and H. Savage, *Monograph 20 - Fatal and serious road crashes involving motorcyclists*. 2008, Australian Government Department of Infrastructure, Transport, Regional Development and Local Planning: Canberra
4. ABS, *Motor vehicle census, Australia*. 2008, Australian Bureau of Statistics: Canberra.
5. Paulozzi, L.J., *The role of sales of new motorcycles in a recent increase in motorcycle mortality rates*. *Journal of Safety Research*, 2005. **36**(4): p. 361-364.
6. Haworth, N. and A. Nielson, *Motor scooters and mopeds - are increasing sales translating into increasing crashes?* in *TRB 87th Annual Meeting*. 2008: Washington D.C.
7. FCAI. *A record year for motorcycle sales*. [Media Release] 2008 17 January [cited 2009 July 30]; Available from: <http://www.fcai.com.au/news/2008/all/153/a-record-year-for-motorcycle-sales->.

8. Queensland Government, *Queensland road toll weekly report 2009*, Department of Transport and Main Roads: Brisbane
9. Broughton, P. and L. Walker, *Motorcycling and Leisure: Understanding the Recreational PTW Rider*. Human Factors in Road and Rail Transport. 2009, Farnham: Ashgate Publishing.
10. Queensland Government, *Queensland motorcycle safety strategy*, Department of Transport and Main Roads. 2009: Brisbane.
11. Haworth, N., C. Mulvihill, and P. Rowden. *Teaching old dogs new tricks? Training and older motorcyclists*. in *Australasian Road Safety Research, Policing and Education Conference*. 2006. Gold Coast, Queensland.
12. Morris, C., *Bureau of Transportation Statistics Special Report: Motorcycle trends in the United States*. 2009, U.S. Department of Transportation: Washington D.C.
13. ATSB, *Monograph 16 - Female motorcyclists*, Department of Infrastructure Transport Regional Development and Local Government. 2004, Australian Transport Safety Bureau: Canberra.
14. ACEM, *MAIDS: In-depth Investigations of Accidents Involving Powered Two Wheelers - Final Report 1.2*. 2004, Association of European Motorcycle Manufacturers: Brussels.
15. Greig, K., N. Haworth, and D. Wishart, *Identifying programs to reduce road trauma to ACT motorcyclists*. 2008, Centre for Accident Research and Road Safety - Queensland: Brisbane.
16. Haworth, N. and C. Mulvihill, *Review of Motorcycle Licensing and Training*. 2005, Monash University Accident Research Centre: Melbourne.
17. Ouellet, J.V. and V. Kasantikul. *Rider training and collision avoidance in Thailand and Los Angeles motorcycle crashes in International Motorcycle Safety Conference (IMSC)*. 2006. Long Beach, California.
18. ABS. *2001 Census of Population and Housing - Geographic Areas*. 2009 [cited 2009 17 April]; Available from: <http://www.census.abs.gov.au/websitedbs/D3110124.NSF/f5c7b8fb229cf017ca256973001fecec/53bbe9630b24d6f4ca256c3a000475b8!OpenDocument>.
19. Sheehan, M., et al., *Rural and Remote Road Safety Research Project: Final Report (CARRS-Q Monograph 4)* 2008, QUT Centre for Accident Research and Road Safety - Queensland: Brisbane.
20. Sheehan, M., et al., *Rural and Remote Road Safety Program - Major Recommendations (CARRS-Q Monograph 4)* 2008, QUT Centre for Accident Research and Road Safety - Queensland: Brisbane.