

A Comparison of Offroad and Onroad Crashes in Rural and Remote Queensland.

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ABSTRACT

Offroad vehicle use and in particular offroad motorcycling has been established as a significant source of injury both within Australia and internationally. However, Queensland's police road crash statistics typically do not report crashes that occur in off-road circumstances. The aim of the current investigation was to compare this under-reported subset of crashes with on-road crashes. The data used was sourced from interviews conducted in Northern Queensland with serious injury patients hospitalised for 24 hours or more after a rural road crash. Of the classifiable crashes, approximately half were motorcycle crashes, of which a half again were offroad crashes. Of the crashes involving cars, roughly 15% were offroad crashes. Results showed males constituted the majority of all motorcycle crashes, with younger males particularly involved in offroad motorcycle incidents. Offroad motorcycling was identified particularly with greater proportions of riding for pleasure, unlicensed riding, unregistered vehicle use and travelling on an unfamiliar track or road. In terms of illegal behaviours, just under 10% of all subgroups reported recreational drug use. Non-use of helmets and seatbelts was higher for offroad compared to onroad groups, though a notable proportion of onroad users also reported non-use. Offroad motorcyclists were more likely to be unlicensed to ride, riding unregistered vehicles and unfamiliar with the area or road. The results are discussed in relation to how this data can inform official crash data sources and the development of interventions to target specific high-risk sub-groups in rural and remote areas.

INTRODUCTION

Offroad vehicle use, and in particular off-road motorcycling has been established as a significant source of injury both within Australia and overseas. However, little published research has reported on this subset of crashes in comparison to onroad incidents. This in spite of the fact that the Australian Federal Chamber of Automotive Industries (FAI) reports figures indicating that the popularity of off-road motorcycling is increasing. The most popular selling motorcycle models in Australia for 2003 and 2004 were off-road motorcycles, while it is estimated that 350,000 of the total 750,000 motorcycles in Australia are not registered for onroad use (FAI, 2006). The aim of the current study is to compare and contrast the characteristics and contributing circumstances of onroad and offroad crashes, with a particular focus on the North Queensland rural area.

CHARACTERISTICS OF OFFROAD VEHICLE CRASHES

Previous evidence and research has focused on the large contribution of rural and remote areas to offroad crashes. Farm accidents, not including those that occur while using tractors, contribute substantially (Franklin, Mitchell, Driscoll, & Fragar, 2000). There is also anecdotal evidence that recreational use of motorcycles on unofficial dirt tracks not associated with managed sporting events accounts for a substantial number of offroad hospitalisations (Coben, Steiner, & Owens, 2001). Research has indicated that those taking part in offroad driving and riding are at greater risk of injury because of both greater risk-taking behaviours and environmental dangers inherent in the off-road environment. Risk factors identified within this group include driver immaturity, poor judgement and alcohol use (Charters & Schroedl, 1978). Research looking at offroad vehicle hospital admissions in a rural Canadian area identified that a large proportion of motorcyclists did not wear helmets or appropriately use headlights (Hasselback & Wilding, 1987). A vast quantity of research has been conducted into the safety of all terrain vehicles (ATVs), particularly in the United States (Cvijanovich, Cook, Mann, & Dean, 2001; Gittelman, Pomerantz, Groner, & Smith, 2006; Helmkamp, 2001; Krane, Ricci, Sweeney, & Deshmukh, 1988; Pomerantz, Gittelman, & Smith, 2005; Rodgers, 1993; Rodgers & Adler, 2001; Ross, Stuart, & Davis, 1999).

Although slightly different to what is considered within this study, and primarily considered a problem in regards to their use by children, the research provides some indications of the problems associated with offroad travel. Issues with stability, risky riding and inadequate use of safety equipment are cited.

DATA SOURCES

Three main data sources are utilised in this study to examine the characteristics of offroad and onroad motorcycle and car crashes. Data adapted from Berry and Harrison's (2006) report of Australian hospital separations is used to present a nationwide profile of all onroad and offroad transport-related hospitalisations. Transport-related hospital separations data for North Queensland region facilities is used to present a comparative regional profile of admissions. Lastly, detailed interview data collected as part of the Rural and Remote Road Safety Study (Veitch, Sheehan, Turner, Siskind, & Pashen, 2005) from people hospitalised as the result of a serious transport-related injury in the North Queensland rural area is presented. This self-report interview data is essentially a subset of the North Queensland hospital data. While the study interviewed only those serious injury cases as defined by an admission for 24 hours or more, the North Queensland and Australian data present all admissions, regardless of severity. The 24 hour admission criteria was adopted to focus only on those road crashes with serious injury outcomes as well as to facilitate researchers physically having an opportunity to access the patient for interview.

AUSTRALIAN HOSPITAL STATISTICS

Queensland Police road crash statistics, as well as those in several other Australian and international jurisdictions do not report on crashes that would be anecdotally considered to be 'offroad.' That is, not occurring on state or local council controlled roads or highways. As such, the majority of research within this area relies on data from hospital admissions to profile these groups of drivers and riders.

Australia

Recent research by Berry and Harrison (2006) has analysed Australia-wide hospital admissions for the 2001/02 financial year specifically taking note of factors such as age, sex, vehicle type and traffic or non-traffic status. Table 1 below presents the actual numbers of transport-related admissions attributable to cars and motorcycles as well as the proportion of non-traffic¹ incidents occurring during this period. It should be noted that the definition of non-traffic applied by hospitals using the ICD-10 (International Classification of Diseases) (World Health Organization, 2006) approach can also include incidents that occurred in areas which would not fit the definition of 'offroad' otherwise adopted for this study.

Table 1: Proportion of Non-traffic Hospital Admissions in Australian Hospitals, by Vehicle Type and Sex: 2001/02 Financial Year.^{a, b}

Vehicle Type	Male			Female		
	Non-traf	Traffic	%Non-traf	Non-traf	Traffic	%Non-traf
Cars ^c	1661	9344	15.1%	839	7718	9.8%
Motorcycles	4551	4710	49.1%	347	414	45.6%
Total	6212	14054	30.7%	1186	8132	12.7%

^a – Data adapted from Berry and Harrison (2006) – Table 2.6.3

^b – Reported figures exclude cases with an “unspecified” traffic status

^c – The “car” subgroup contains cars, pickups, vans, heavy vehicles and buses

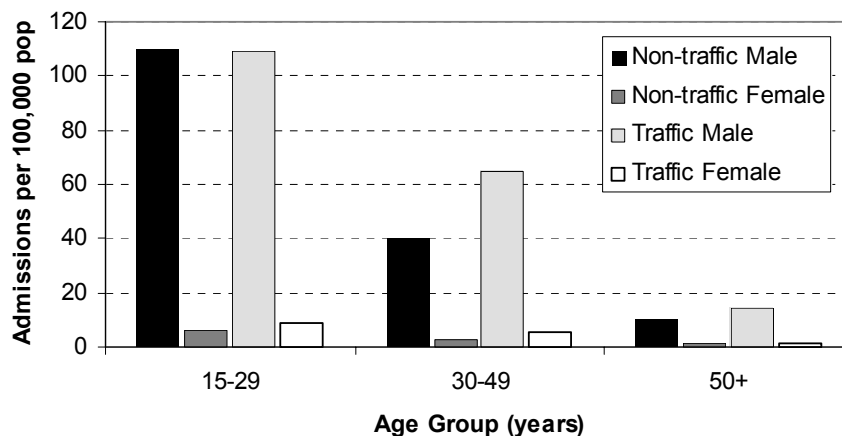
¹ Non-traffic: “Any vehicle incident that occurs entirely in any place other than a public highway, street, or road.” (National Center for Injury Prevention and Control, 2006)

As can be seen from these figures, a substantial proportion of hospital admissions relating to car or motorcycle use was ascribed to driving or riding in a non-traffic area.

While males had substantially more admissions generally, the proportion of non-traffic admissions for males was twice that of females. This difference can be attributed primarily to the fact that while the ratio of non-traffic to traffic motorcycle admissions was comparable between genders, males are disproportionately represented in motorcycle hospital admissions.

This pattern is explored in more detail in Figures 1 and 2 below which present the Australia-wide hospital admissions data for motorcycles and cars categorised by gender, age group and traffic or non-traffic status.

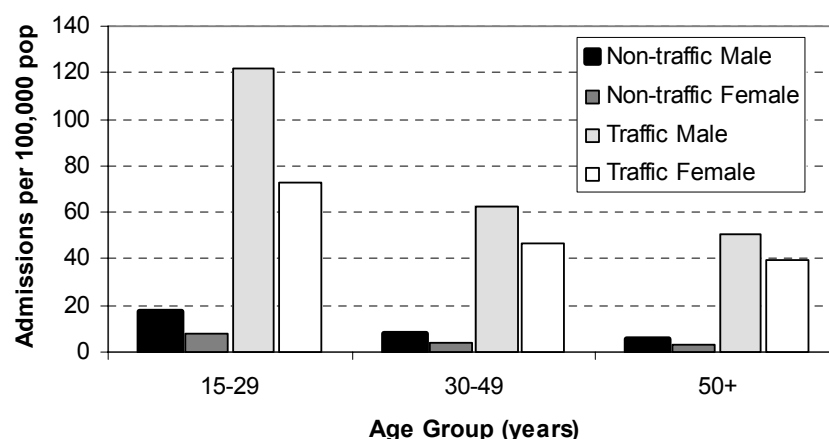
Figure 1: Traffic and Non-traffic Motorcycle Hospital Admissions in Australian Hospitals, by Age Group and Sex: 2001/02 Financial Year.^a



^a – Data adapted from Berry and Harrison (2006) – Tables 2.6.7 and 2.6.8

As can be seen from this figure, males are overrepresented in both non-traffic and traffic motorcycle crashes per head of population, with this overrepresentation being greater among the younger age groups. This pattern is in line with previous analyses of Victorian hospital data from the time period 1987-1993 which also showed a peak in hospitalisations for all motorcyclists in the younger age, declining quickly as age increased (Diamantopoulou, Brumen, Dyte, & Cameron, 1995).

Figure 2: Traffic and Non-traffic Car Hospital Admissions in Australian Hospitals, by Age Group and Sex: 2001/02 Financial Year.^{a,b}



^a – Data adapted from Berry and Harrison (2006) – Tables 2.6.7 and 2.6.8

^b – The “car” subgroup contains cars, pickups, vans, heavy vehicles and buses

A different pattern is present when considering cars with admissions resulting from traffic incidents being more common for both genders. Males are shown to be overrepresented per head of population, particularly in the 15-29 years age group.

North Queensland Study Area

As a comparison, the same statistics as calculated above for Australia were calculated for the North Queensland region.

North Queensland accounts for 38% of Queensland's land area and approximately one eighth of the total population. Those living in rural areas account for 45% of the population of the region. As a whole, the North Queensland region has a comparable population distribution in terms of age and sex with Queensland totals. Further details of a statistical profile of the North Queensland area can be found in Sheehan and Siskind (2006).

This data is drawn from medical facilities from across Queensland in the area north and west of Bowen extending to the state border and the cape, namely Atherton, Ayr, Cairns, Charters Towers, Ingham, Innisfail, Mareeba, Mount Isa, Palm Island and Townsville. These hospitals service the majority of the geographic area and are likely to record a high proportion of those seeking treatment as a result of a road crash. While the Australian data available was for the financial year 2001/02, the available North Queensland data was for the period 2002/03 - 2004/05 financial years.

Table 2: *Proportion of Non-traffic Hospital Admissions in Selected Northern Queensland Region Hospitals, by Vehicle Type and Sex: 2002/03 - 2004/5 Financial Years.*

Vehicle Type	Male			Female		
	Non-traf	Traffic	%Non-traf	Non-traf	Traffic	%Non-traf
Cars	302	1091	21.7%	241	590	29.0%
Motorcycles	561	973	36.6%	59	80	42.4%
Total	863	2064	29.5%	300	670	30.9%

These results indicate that there are a substantial number of non-traffic incidents occurring in the North Queensland region, accounting for just under 30% of all motorcycle and car hospital admissions in the region.

Figure 3: *Annual Average Traffic and Non-traffic Motorcycle Hospital Admissions in Northern Queensland Region Hospitals, by Age Group and Sex: 2002/03 - 2004/5 Financial Years.*

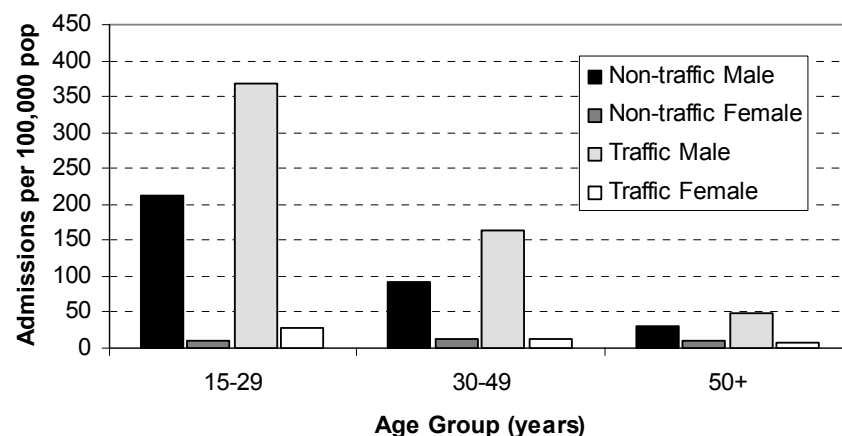
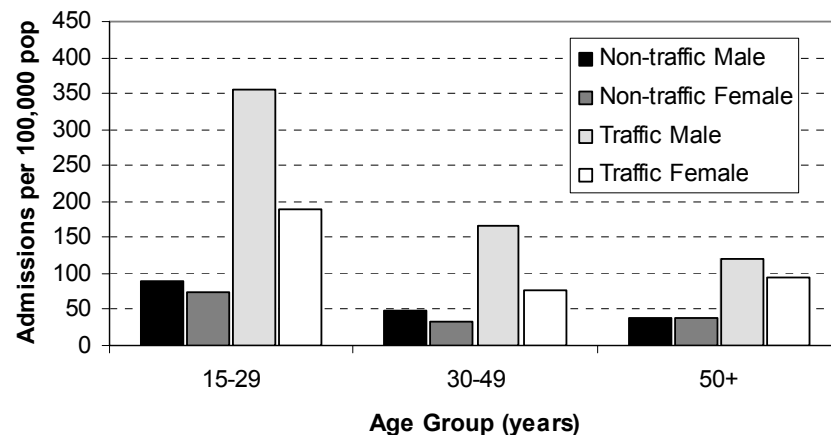


Figure 4: Annual Average Traffic and Non-traffic Car Hospital Admissions in Northern Queensland Region Hospitals, by Age Group and Sex: 2002/03 - 2004/5 Financial Years^a



^a - The “car” subgroup for this graph contains only passenger cars.

The above data indicates that there is an overrepresentation of males in traffic crashes for cars, but little difference between the two sexes for non-traffic car crashes.

SERIOUS INJURY HOSPITAL INTERVIEW DATA

As stated previously, the interview data presented below was collected from patients involved in a serious injury crash as defined by those admitted for 24 hours or more as a result of the crash. The interview data reports on those crashes which occurred in the same North Queensland region as defined for the study area hospital data, though excluding those crashes occurring within the major urban centres of Townsville, Thuringowa and Cairns. Interviews were conducted in the two major hospitals which service the entire region, Townsville and Cairns, as well as in hospitals at Mt Isa and Atherton. The data consists of self-report responses to a structured, verbally administered questionnaire regarding the demographics of participants, illegal and high risk behaviours, and characteristics of the crash. The questionnaire typically took between 30 and 60 minutes to complete.

CATEGORISATION OF OFFROAD AND ONROAD CRASHES

The categorisation of the hospitalisations into those resulting from onroad or offroad crashes was based on the crash descriptions provided by patients as part of the interview. These ‘crash narratives’ typically entail a short description of the events occurring before, during and immediately after the crash occurred. Often information was provided on the location or road on which the driver or rider was travelling at the time of the crash. Insufficient location information was available for 6 interview records and thus these records were excluded from the analysis. Offroad crashes were defined as those occurring on private properties, farms, private ‘motorcross tracks’ not open to public or sporting use, bike trails, or on minor unsealed routes which were not named roads (eg: dirt roads between private properties or in national parks). The remaining crashes were categorised as onroad. This left a total of 185 crashes able to be categorised as onroad or offroad. It should be noted that these categories do not necessarily correspond with the traffic and non-traffic categorisations used in the ICD-10 and the above hospital data. It is likely however that the offroad categorisation used in the current analysis typifies a substantial proportion of hospital admissions considered as non-traffic.

RESULTS

Demographic information

Table 3 below presents information on the basic demographic profile of those serious injury hospitalisations interviewed as part of the study.

Table 3: *Demographic Information for Serious Injury Patients of Rural and Remote Road Safety Study by Offroad Status and Vehicle Type*

Variable	Motorcycle		Other Vehicles	
	Offroad (n=57)	Onroad (n=43)	Offroad (n=14)	Onroad (n=71)
Median Age (years)	30	34	35.5	40
Gender				
Male:	93%	93%	58%	65%
Female:	7%	7%	43%	35%
Highest Education Level				
Year 10 or less:	37%	45%	43%	44%
Year 12:	16%	14%	14%	17%
Trade, Apprentice., Cert. or Dip.	40%	31%	21%	28%
Bachelor Degree or higher:	5%	7%	14%	10%
Occupation				
Tradesperson:	29%	19%	0%	10%
Clerical, Sales and Service:	9%	19%	14%	26%
Labourer and Related:	29%	21%	29%	17%
Production and Transport:	13%	19%	36%	16%
Manager and Professional:	20%	21%	21%	31%
Median Years Driving	15	20	23.5	20
Median Years Driving Crash Vehicle	6	2.5	2.6	4
< 1 Year Driving Crash Vehicle	33%	43%	29%	27%

Demographic differences between the four groups of note include the younger median age of offroad motorcyclists; the large proportion of male patients admitted as a result of a motorcycle crash; the greater proportional involvement of tradespersons in offroad motorcycle crashes and managers and professionals in onroad car crashes. The relatively high number of years driving experience in each group is offset by the relatively low number of years driving the crash vehicle or a vehicle of a similar type. Lack of experience with the vehicle among onroad motorcyclists should be particularly noted.

Illegal and High-risk Behaviours

Table 4 below presents an analysis of data collected from participants regarding illegal or high-risk behaviours related to driving and riding. This is self-report data concerning the participants' own recall of their behaviour.

Table 4: Illegal and High Risk Behaviour Involvement for Serious Injury Patients of Rural and Remote Road Safety Study by Offroad Status and Vehicle Type

Variable	Motorcycle		Other Vehicles	
	Offroad (n=57)	Onroad (n=43)	Offroad (n=14)	Onroad (n=71)
Licensed to operate vehicle	62%	91%	93%	96%
Speeding	13% ^a	16%	7% ^a	10%
Illicit Drugs	8%	0%	0%	9%
Helmet / Seatbelt Non-Use	17%	5%	36%	10%
Vehicle Registered	47%	85%	93%	99%
Alcohol Use in Previous 24hrs	53%	40%	43%	42%
AUDIT-C (Alcohol Use Scale) ^b				
Harmful Drinker:	73%	54%	50%	54%
Drinker:	21%	30%	29%	28%
Non-drinker:	5%	16%	21%	18%

^a - This question asked whether the participants' travelling speed prior to the crash was above, on or below the posted speed limit. Therefore, responses to speed-limit related questions for offroad drivers should be taken as indicative only, as no official speed-limit is likely to be posted for these areas.

^b - See Bush et al (1998) for more information on the AUDIT-C. A harmful drinker in the current context was defined by an AUDIT-C score of greater than 4 for females and greater than 5 for males.

The proportion of controllers licensed to operate the crash vehicle was notably lower among offroad motorcyclists at 60%, with the rate being above 90% for the remaining groups. Vehicle registration was similarly much lower among offroad motorcyclists. Use of restraints or helmets was lowest among offroad users of vehicles other than motorcycles, though a notable proportion in all groups reported not using such safety equipment. A higher proportion of harmful alcohol users was found among offroad riders, though the proportion was high across all groups.

Crash Characteristics

Table 5 below presents information on characteristics related to where, when and how the crash occurred.

Table 5: *Crash Characteristics of Serious Injury Patients of Rural and Remote Road Safety Study by Offroad Status and Vehicle Type*

Variable	Motorcycle		Other Vehicles	
	Offroad (n=57)	Onroad (n=43)	Offroad (n=14)	Onroad (n=71)
Single Vehicle	97%	49%	93%	65%
Trip Reason				
Work related:	26%	28%	57%	30%
Leisure:	67%	47%	29%	28%
Distraction	28%	28%	14%	18%
Familiarity of Road				
First time:	42%	21%	14%	4%
Day of Crash				
Weekday:	54%	70%	71%	66%
Weekend:	46%	30%	29%	34%
Time of Crash				
0000 – 0600:	0%	8%	0%	5%
0601 – 1200:	35%	33%	42%	34%
1201 – 1800:	65%	43%	42%	46%
1801 – 2400:	0%	18%	17%	15%
Time to Receive Help				
Immediately ^a	44%	48%	46%	33%
More than 1 hour	7%	4%	9%	9%

^a - Includes the responses of “Immediately” and all time periods of less than 5 minutes.

It is worth noting that offroad motorcycling crashes are a specific group differing substantially from the remainder of crashes. Crashes within this group are more likely to involve using the vehicle for leisure activities, to occur on weekends and to occur on unfamiliar roads or areas. Offroad crashes are also much more likely to be single vehicle crashes than both groups of onroad crashes. Levels of self-reported driving distraction prior to the crash by an external object (eg: animal) or an in-vehicle factor (eg: adjusting CD player) are consistently higher in both on and offroad motorcycle crashes as opposed to crashes involving other vehicle types. This may be attributable to the more exposed nature of motorcycle riders. One third of onroad other vehicle crashes received immediate help, a lesser figure than the near to 50% for the remaining groups. A small proportion of people in all groups had to wait for more than an hour to receive attention.

DISCUSSION

The results of this investigation draw attention to the substantial number of serious transportation related injuries which are incurred while using a vehicle in an offroad setting. Road safety research typically relies on statistics and injury data taken from police-recorded reports, and overlooks this large cause of injury. Although the current data draws largely on data collected for a rural Australia area, the pattern of injury in terms of vehicle type and offroad status are similar to Australia as a whole. Thus, it can be considered that qualitative results of this study may have applicability to rural areas across Australia, or more generally in regions where a mix of onroad and offroad vehicle use occurs.

Reviews of riding facilities within Queensland have identified that there is a substantial number of offroad riders even within the bounds of major urban centres like Brisbane and Logan (CPR Group, 2004, 2005).

A key finding of this study is the fact that the classification of crashes by offroad status and vehicle type identifies a number of distinct groups. Specifically, rural offroad motorcyclists are a high-risk group that require further attention. Regional hospital statistics and data sourced directly as part of this study note the group as almost entirely male, predominantly under 30 years of age. The results point to contributing factors to crashes being a lesser rate of specific vehicle experience and riding in high-risk, recreational contexts. A notably lower proportion of only 62% of offroad motorcyclists being licensed to ride the crash vehicle is indicative of this group containing a large casually riding subset. This hypothesis is also supported by the larger proportion of people in the offroad motorcycling group riding in an unfamiliar area when the crash occurred. The higher level of recreational use of offroad motorcycles, notably as part of a riding club or as amateur sports-practice, is in line with the previous research by Coben et al (2001) which has found dirt-track riding to be a significant contributor to motorcycle hospitalisations.

Generally, high risk behaviours were present to a degree in all four groups of road users in the current investigation. Speeding was noted as a contributing factor in between 7% and 16% of crashes within each classified group. Non-use of helmets were higher among offroad as opposed to onroad motorcyclists. This is in line with Hasselback and Wilding's (1987) finding that those injured while riding offroad in a rural Canadian area were much more likely to not be wearing a helmet. Seat belt use was proportionally higher among offroad car users, though the group has a small total size in this investigation. Further research is required to establish if this is finding is generalisable to other areas. An approximately 1 in 10 rate of seatbelt non-use among onroad car users is comparable to an 8% average among Queensland hospitalisation crashes between 1998 and 2002 (Queensland Transport, 2005). Although only a measure of alcohol use and not drink driving per se, the higher proportion of harmful drinkers in offroad motorcycle crashes is in line with alcohol use being previously identified as a risk factor for this group (Charters & Schroedl, 1978). It should be noted however that the high proportion of males and the younger age of offroad riders are both associated with higher AUDIT scores in this sample. Thus, although the risk factor of alcohol use may be of concern to this group of riders, it can be accounted for in part by the demographics of those that choose to ride.

Investigation of the demographic characteristics of those involved in crashes provides information relevant to those wishing to target at-risk populations for specific types of driving and riding. While road crashes are in general a disproportionately male problem, this is shown to particularly be the case for motorcyclists. The regional hospital statistics presented suggest that female riders are as likely to be injured in offroad motorcycling injuries if they choose to ride, though in terms of absolute numbers, injuries are predominantly among males.

Recommendations for Future Research

This current research paper provides an overview of the demographics and crash characteristics of motorcyclists and other road users by offroad status. However, this data does not provide an indication of the culture inherent in those that drive or ride in offroad settings. A further understanding of psychosocial and motivational characteristics of this road user group will allow for specific intervention development.

The collection of more detailed data on these riding groups and the crashes they are involved in is also an issue for further consideration. Offroad crashes are incidents that are generally not considered or recorded by transport departments. However, an understanding of such incidents from a transport perspective will be of great benefit in targeting elements of vehicle-user behaviour that are more readily considered by transport practitioners. Current investigations of this group of crashes rely almost entirely on hospital data that is not readily comparable to transport crash data. Future research should seek to understand offroad riding in terms of the context it occurs in as well as the characteristics of the driver or rider and vehicle.

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