Rural and Remote Road Safety Study
Final Report

Centre for Accident Research & Road Safety - Queensland (CARRS-Q)

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Contributing Authors

Chief Investigators	Mary Sheehan Victor Siskind Richard Turner Craig Veitch
Other Contributors	Teresa O'Connor Dale Steinhardt Ross Blackman Colin Edmonston Gayle Sticher

Acknowledgements	Frith Hatfield Hilary Waugh Patrick McShane Brian Richardson Michael Hannigan Jon Douglas Jill Newland Andrew Johnson
Special Thanks	Lesley Anderson

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Executive Summary

Introduction

Concern and action for rural road safety is relatively new in Australia in comparison to the field of traffic safety as a whole.

In 2003, a program of research was begun by the Centre for Accident Research and Road Safety - Queensland (CARRS-Q) and the Rural Health Research Unit (RHRU) at James Cook University to investigate factors contributing to serious rural road crashes in the North Queensland region.

This project was funded by the Premier's Department, Main Roads Department, Queensland Transport, QFleet, Queensland Rail, Queensland Ambulance Service, Department of Natural Resources and Queensland Police Service. Additional funding was provided by NRMA Insurance for a PhD scholarship. In-kind support was provided through the four hospitals used for data collection, namely Cairns Base Hospital, The Townsville Hospital, Mount Isa Hospital and Atherton Hospital.

The primary aim of the project was to:

> *Identify human factors related to the occurrence of serious traffic incidents in rural and remote areas of Australia, and to the trauma suffered by persons as a result of these incidents, using a sample drawn from a rural and remote area in North Queensland.*

The data and analyses presented in this report are the core findings from two broad studies: a general examination of fatalities and casualties from rural and remote crashes for the period 1 March 2004 until 30 June 2007, and a further linked case-comparison study of hospitalised patients compared with a sample of non-crash-involved drivers.

Method

The study was undertaken in rural North Queensland, as defined by the Australian Bureau of Statistics (ABS) statistical divisions of North Queensland, Far North Queensland and North-West Queensland. Urban areas surrounding Townsville, Thuringowa and Cairns were not included.

The study methodology was centred on serious crashes, as defined by a resulting hospitalisation for 24 hours or more and/or a fatality. Crashes meeting this criteria within the North Queensland region between 1 March 2004 and 30 June 2007 were identified through hospital records and interviewed where possible. Additional data was sourced from coroner's reports, the Queensland Transport road crash database, the Queensland Ambulance Service and the study hospitals in the region.

This report is divided into chapters corresponding to analyses conducted on the collected crash and casualty data.

Chapter 3 presents an overview of all crashes and casualties identified during the study period. Details are presented in regard to the demographics and road user types of casualties; the locations, times, types, and circumstances of crashes; along with the contributing circumstances of crashes.

Chapter 4 presents the results of summary statistics for all casualties for which an interview was able to be conducted. Statistics are presented separately for drivers and riders, passengers, pedestrians and cyclists. Details are also presented separately for drivers and riders crashing in off-road and on-road settings. Results from questionnaire data are presented in relation to demographics; the experience of the crash in narrative form; vehicle characteristics and maintenance; trip characteristics (e.g. purpose and length of journey; periods of fatigue and monotony; distractions from driving task); driving history; alcohol and drug use; medical history; driving attitudes, intentions and behaviour; attitudes to enforcement; and experience of road safety advertising.

Chapter 5 compares the above-listed questionnaire results between on-road crash-involved casualties and interviews conducted in the region with non-crash-involved persons. Direct comparisons as well as age and sex adjusted comparisons are presented.

Chapter 6 presents information on those casualties who were admitted to one of the study hospitals during the study period. Brief information is given regarding the demographic characteristics of these casualties. Emergency services' data is used to highlight the characteristics of patient retrieval and transport to and between hospitals. The major injuries resulting from the crashes are presented for each region of the body and analysed by vehicle type, occupant type, seatbelt status, helmet status, alcohol involvement and nature of crash. Estimates are provided of the costs associated with in-hospital treatment and retrieval.

Chapter 7 describes the characteristics of the fatal casualties and the nature and circumstances of the crashes. Demographics, road user types, licence status, crash type and contributing factors for crashes are presented. Coronial data is provided in regard to contributing circumstances (including alcohol, drugs and medical conditions), cause of death, resulting injuries, and restraint and helmet use.

Chapter 8 presents the results of a comparison between casualties' crash descriptions and police-attributed crash circumstances. The relative frequency of contributing circumstances are compared both broadly within the categories of behavioural, environmental, vehicle related, medical and other groupings and specifically for circumstances within these groups.

Chapter 9 reports on the associated research projects which have been undertaken on specific topics related to rural road safety.

Finally, Chapter 10 reports on the conclusions and recommendations made from the program of research.

Major Recommendations

From the findings of these analyses, a number of major recommendations were made:

Male drivers and riders

- Male drivers and riders should continue to be the focus of interventions, given their very high representation among rural and remote road crash fatalities and serious injuries.
- The group of males aged between 30 and 50 years comprised the largest number of casualties and must also be targeted for change if there is to be a meaningful improvement in rural and remote road safety.

Motorcyclists

- Single vehicle motorcycle crashes constitute over 80% of serious, on-road rural motorcycle crashes and need particular attention in development of policy and infrastructure.
- The motorcycle safety consultation process currently being undertaken by Queensland Transport (via the "Motorbike Safety in Queensland - Consultation Paper") is strongly endorsed. As part of this process, particular attention needs to be given to initiatives designed to reduce rural and single vehicle motorcycle crashes.
- The safety of off-road riders is a serious problem that falls outside the direct responsibility of either Transport or Health departments. Responsibility for this issue needs to be attributed to develop appropriate policy, regulations and countermeasures.

Road safety for Indigenous people

- Continued resourcing and expansion of The Queensland Aboriginal Peoples and Torres Strait Islander Peoples Driver Licensing Program to meet the needs of remote and Indigenous communities with significantly lower licence ownership levels.
- Increased attention needs to focus on the contribution of geographic disadvantage (remoteness) factors to remote and Indigenous road trauma.

Road environment

- Speed is the ‘final common pathway’ in determining the severity of rural and remote crashes and rural speed limits should be reduced to 90km/hr for sealed off-highway roads and 80km/hr for all unsealed roads as recommended in the Austroads review and in line with the current Tasmanian government trial.
- The Department of Main Roads should monitor rural crash clusters and where appropriate work with local authorities to conduct relevant audits and take mitigating action.
- The international experts at the workshop reviewed the data and identified the need to focus particular attention on road design management for dangerous

curves. They also indicated the need to maximise the use of audio-tactile linemarking (audible lines) and rumble strips to alert drivers to dangerous conditions and behaviours.

Trauma costs

- In accordance with Queensland Health priorities, recognition should be given to the substantial financial costs associated with acute management of trauma resulting from serious rural and remote crashes.
- Efforts should be made to develop a comprehensive, regionally specific costing formula for road trauma that incorporates the pre-hospital, hospital and post-hospital phases of care. This would inform health resource allocation and facilitate the evaluation of interventions.
- The commitment of funds to the development of preventive strategies to reduce rural and remote crashes should take into account the potential cost savings associated with trauma.
- A dedicated study of the rehabilitation needs and associated personal and healthcare costs arising from rural and remote road crashes should be undertaken.

Emergency services

- While the study has demonstrated considerable efficiency in the response and retrieval systems of rural and remote North Queensland, relevant Intelligent Transport Systems technologies (such as vehicle alarm systems) to improve crash notification should be both developed and evaluated.

Enforcement

- Alcohol and speed enforcement programs should target the period between 2 and 6pm because of the high numbers of crashes in the afternoon period throughout the rural region.

Drink driving

- Courtesy buses should be advocated and schemes such as the Skipper project promoted as local drink driving countermeasures in line with the very high levels of community support for these measures identified in the hospital study.
- Programs should be developed to target the high levels of alcohol consumption identified in rural and remote areas and related involvement in crashes.
- Referrals to drink driving rehabilitation programs should be mandated for recidivist offenders.

Data requirements

- Rural and remote road crashes should receive the same quality of attention as urban crashes. As such, it is strongly recommended that increased resources be committed to enable dedicated Forensic Crash Units to investigate rural and remote fatal and serious injury crashes.

- Transport department records of rural and remote crashes should record the crash location using the national ARIA area classifications used by health departments as a means to better identifying rural crashes.
- Rural and remote crashes tend to be unnoticed except in relatively infrequent rural reviews. They should receive the same level of attention and this could be achieved if fatalities and fatal crashes were coded by the ARIA classification system and included in regular crash reporting.
- Health, Transport and Police agencies should collect a common, minimal set of data relating to road crashes and injuries, including presentations to small rural and remote health facilities.

Media and community education programmes

- Interventions seeking to highlight the human contribution to crashes should be prioritised. Driver distraction, alcohol and inappropriate speed for the road conditions are key examples of such behaviours.
- Promotion of basic safety behaviours such as the use of seatbelts and helmets should be given a renewed focus.
- Knowledge, attitude and behavioural factors that have been identified for the hospital Brief Intervention Trial should be considered in developing safety campaigns for rural and remote people. For example challenging the myth of the dangerous ‘other’ or ‘non-local’ driver.
- Special educational initiatives on the issues involved in rural and remote driving should be undertaken. For example the material used by Main Roads, the Australian Defence Force and local initiatives.

Acknowledgements

The Rural and Remote Road Safety Study was funded by the Motor Accident Insurance Commission (MAIC) and the Centre for Accident Research and Road Safety - Queensland (CARRS-Q) with additional financial contributions from the Premier's Department, Main Roads Department, Queensland Transport, QFleet, Queensland Rail, Queensland Ambulance Service, Department of Natural Resources and Queensland Police Service. The Far North Queensland Hospital Foundation provided funding for research assistant employment. NRMA Insurance provided scholarship funds for a PhD student.

In addition, numerous individuals and organisations contributed to the study. The staff of the Cairns, Townsville, Atherton and Mount Isa hospitals provided advice about the ethics applications, identified and approached potential study participants, facilitated data collection from patients and patient records and provided clinical benchmarking and costing data. Without their assistance the study would not have been possible. Staff of smaller north Queensland hospitals and health facilities regularly provided data about crash casualties transported from their institutions to the study hospitals.

The Queensland Ambulance Service's communication sections in the Northern and Far Northern Regions regularly provided data regarding the transport of casualties from crash sites to hospitals.

The Queensland Police Service in the Northern and Far Northern Regions provided information about fatal crashes and supported the study in numerous ways. The State Traffic Support Branch of the QPS also regularly provided information regarding fatal crashes. The Queensland State Coroner's Office provided access to coroner's reports.

The Queensland Department of Main Roads undertook safety assessments and access and egress plans for roadside interview sites.

The Data Analysis Unit of Queensland Transport provided access to the Queensland Road Crash Database and assisted with access to data and mapping of crashes. The Northern, Far Northern, Tablelands and Western Road Safety Working Parties chaired by Queensland Transport provided ongoing support and ideas to the researchers.

Service station proprietors from Mossman to Innisfail and across the Atherton Tablelands allowed access to motorists for the study on a regular basis. Without this access one of the major components of the study, the roadside comparison, would not have been completed. Coca-Cola Amatil provided refreshments for participants in the roadside data collection.

Local ABC radio and newspapers within North Queensland provided consistent media coverage of the project and supported calls for participants and input into the study.

Finally, the contribution of all participants who took part in the study should be acknowledged. This includes those who agreed to be interviewed in hospital after a crash, at roadside collection sites and at community events. Thanks also to those participants who took part in related focus groups and community forums.

Developing, implementing and completing the study took over five years. During this time the team of research staff changed. The contributions of all those who worked directly and indirectly on the study are acknowledged. These include staff of the Rural Health Research Unit and Mount Isa Centre for Rural and Remote Health at James Cook University and CARRS-Q at Queensland University of Technology.

Glossary

ABS – Australian Bureau of Statistics

AUDIT – See *Alcohol Use Disorders Identification Test*

Alcohol Use Disorders Identification Test – A ten item questionnaire developed by the World Health Organisation as a “simple method of screening for excessive drinking and to assist in brief assessment”. It can be used to “identify persons with hazardous and harmful patterns of alcohol consumption” (Babor, Higgins-Biddle, Saunders & Monteiro, 2001).
See *AUDIT-C*.

AUDIT-C – A shortened three-item version of the AUDIT questionnaire constituting only those questions regarding alcohol consumption levels.
See *AUDIT*

Indigenous – A person identifying as either an Aborigine and/or Torres Strait Islander.

Crash nature – A descriptive category for classifying road traffic crashes into logical groups of similar type. Examples of crash nature are hit parked vehicle, angle, rear-end, head-on, sideswipe, overturned, hit fixed obstruction, fall from moving vehicle, hit pedestrian or hit animal. Crash nature is determined by the initial event in any sequence of events in a road traffic crash. Subsequent events have no bearing on the determination of the crash nature (Queensland Transport, 2007).

Hospital(-ised) sample – The sample of casualties involved in a serious crash within the study region from which interview data was collected, either through a face-to-face interview in hospital, telephone interview or mail-back response.

Roadside sample – The sample of road users from which interview data was collected within the study region. Interviews were collected at roadside collection sites, service stations and other similar areas.

Comparison sample – See Roadside sample.

First hospital – the first medical facility to which an injured casualty is taken. Includes rural hospitals, major hospitals and remote clinics.

Serious crash – one in which a person was killed or injured to the extent of requiring immediate hospitalisation for a period of 24 hours or longer.

Eligible crash – a crash that occurred within the study area and which resulted in the death or immediate hospitalisation for a period of 24 hours or longer of a person aged 16 years or older.

Casualty – person aged 16 years or older involved in a crash within the study area who was killed or injured to the extent of requiring immediate hospitalisation for a period of 24 hours or longer. May also refer to a child under the age of 16 killed in a crash in which a person aged 16 years or older was also either killed or injured.

Child – A person under the age of 16 years.

Fatal crash – a crash in which a fatality resulted.

Fatality – person killed in a crash or dying as a result of that crash.

On-road – see *Public road*.

Off-road – an area other than a public road, can be divided into public land and private property.
See *On-road, Public road, Public land, Private property.*

Public road – a designated road where "the entire way (is) devoted to public travel where that way is in a surveyed road reserve. It includes the entire width between abutting property boundaries where the way is open to the public for travel purposes as a matter of right or custom" (Queensland Transport, 2007).

Public land – forests, parkland, beaches and common areas to which the public has access.

Private property – property belonging to private individuals or companies including agricultural properties.

Queensland Transport Road Crash Database – "A Queensland Transport database (developed in ORACLE) containing information relating to road traffic crashes. Primarily contains information gathered by the Queensland Police Service, but may also contain information from other sources such as the coroner, pathologist or Government Chemical Laboratory (GCL)" (Queensland Transport, 2007).
See *Webcrash.*

Unit – A unit is any motor vehicle, pedal cycle, other road cycle, pedestrian conveyance, trailer or animal (Queensland Transport, 2007). In the context of the current study, references are typically made to units in relation to their involvement in a road crash.

Non-urban – an area corresponding to a RRMA category of 3 or greater, referring to an area classified as either 'rural' or 'remote.'
See *RRMA, Statistical Local Area*

Rural Remote and Metropolitan Area Classification (RRMA) – A 1-7 numeric classification scheme developed to attribute an SLA as either Metropolitan (1-2), Rural (3-5) or Remote (6-7). SLAs in capital cities and metropolitan centres (population > 100,000) are considered metropolitan. SLAs are classified as Rural or Remote on the basis of population density and distance to urban centres of varying size (AIHW, 2004).

Statistical Local Area (SLA) – "The Statistical Local Area (SLA) is an Australian Standard Geographical Classification (ASGC) defined area which consists of one or more Collection Districts (CDs). SLAs are Local Government Areas (LGAs), or parts thereof. Where there is no incorporated body of local government, SLAs are defined to cover the unincorporated areas. SLAs cover, in aggregate, the whole of Australia without gaps or overlaps" (Australian Bureau of Statistics, 2006).
See *Statistical Division, North Queensland, Northern Queensland, North-West Queensland, Far North Queensland*

Statistical Division
"A Statistical Division (SD) is an Australian Standard Geographical Classification (ASGC) defined area which represents a large, general purpose, regional type geographic area. SDs represent relatively homogeneous regions characterised by identifiable social and economic links between the inhabitants and between the economic units within the region, under the unifying influence of one or more major towns or cities. They consist of one or more Statistical Subdivisions (SSDs) and cover, in aggregate, the whole of Australia without gaps or overlaps. They do not cross state or territory boundaries and are the largest statistical building blocks of states and territories" (Australian Bureau of Statistics, 2006).
See *Statistical Local Area, North Queensland, Northern Queensland, North-West Queensland, Far North Queensland.*

Far North Queensland – The area contained by the ABS Statistical Division of Far North Queensland.

Northern Queensland – The area contained by the ABS Statistical Division of Northern Queensland.

North-West Queensland – The area contained by the ABS Statistical Division of North-West Queensland.

North Queensland – The area contained cumulatively by the ABS Statistical Divisions of Far North Queensland, Northern Queensland and North-West Queensland.
See *Study Area*

WebCrash (aka WebCrash2) – An internet based front-end to accessing the Queensland Transport Road Crash Database.
See *Queensland Transport Road Crash Database.*

Study Area – The area within the Statistical Divisions of Northern Queensland, North-West Queensland and Far North Queensland excluding the metropolitan areas encompassed by the SLAs of 'Townsville Part A', 'Thuringowa' and 'Cairns City Part A.'
See *Statistical Local Area, Statistical Division, North Queensland, Northern Queensland, North-West Queensland, Far North Queensland.*

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Abbreviations

ABS	Australian Bureau of Statistics
AIHW	Australian Institute of Health and Welfare
ARRB	Australian Road Research Board
ASGC	Australian Standard Geographical Classification
ATSB	Australian Transport Safety Bureau
ATV	All-Terrain Vehicle
BAC	Blood Alcohol Content
CARRS-Q	Centre for Accident Research and Road Safety – Queensland
CD	Collection District
CDEP	Community Development Employment Projects
CI	Confidence Intervals
DALY	Disability Adjusted Life Years
DHSH	Department of Human Services and Health
DPIE	Department of Primary Industries and Energy
FORS	Federal Office of Road Safety
GCL	Government Chemical Laboratory
ICADTS	International Council on Alcohol, Drugs, and Traffic Safety
ICD	International Classification of Disease
ICU	Intensive Care Unit
IQR	Inter-quartile Range
JCU	James Cook University
LGA	Local Government Area
MAIC	Motor Accident Insurance Commission
MICRRH	Mount Isa Centre for Rural and Remote Health
QAS	Queensland Ambulance Service
QEMS	Queensland Emergency Medical System
QH	Queensland Health
QPS	Queensland Police Service
QT	Queensland Transport
RBT	Random Breath Test
RFDS	Royal Flying Doctor Service
RHRU	Rural Health Research Unit
RRMA	Rural Remote and Metropolitan Area
RRRSS	Rural and Remote Road Safety Study
SD	Statistical Division
SD	Standard Deviation
SLA	Statistical Local Area
SPSS	Statistical Package for the Social Sciences
SSD	Statistical Subdivision
TTH	The Townsville Hospital
VKT	Vehicle Kilometres Travelled

1. Introduction

Project background

Concern and action for rural road safety is relatively new in Australia in comparison to the field of traffic safety as a whole.

In 1995, the Federal Office of Road Safety (FORS, to become the Australian Transport Safety Bureau, ATSB) published its second monograph on *Trends in Fatal Crashes on Rural Roads* (FORS, 1995) which found that the decline in fatal road crashes was significantly slower in rural as opposed to urban areas.

The profile of rural road safety was raised further when, in 1996, the National Road Safety Strategy Implementation Taskforce put forward Australia's Rural Road Safety Action Plan (FORS, 1996). The plan was given the support of transport ministers from all states, territories and the federal government at an Australian Transport Council meeting. The next major review of the area *Road Safety in Rural and Remote areas of Australia* (Tziotis, Mabbot, Edmonston, Sheehan & Dwyer, 2005), was funded by Austroads and conducted by the Centre for Accident Research and Road Safety - Queensland (CARRS-Q) and the Australian Road Research Board (ARRB) as an examination of the literature and of the implementation of the action plan.

Among other findings and recommendations it found that implementation had not been consistent and that jurisdictions had developed their own safety action plans. It recommended renewed focus on safety in rural and remote areas and the development of a new national rural and remote road safety action plan.

Classification of rural and remote areas

One of the key pertinent findings of this review and others was the lack of a consistent definition of remote and rural regions. For example, at the time Queensland varied the definition used depending on the particular issue being examined. The most frequent usage was for roads with 100 km or higher speed zones. The major outcome of this lack of consistency is that state classifications are unique to each state with resultant problems establishing base line statistics or comparing effectiveness of relevant state countermeasures.

The Rural and Remote Metropolitan Area (RRMA) classification system is an attempt to bring a common definition of health statistics across Australian jurisdictions (Commonwealth Department of Primary Industries and Energy (DPIE) & Department of Human Services and Health (DHSH), 1994). The use of this system in transport statistics was strongly recommended by the 2005 review report. The lack of common definitions has meant that the linking of crash data or the carrying out of cross-boundary jurisdictional analysis cannot be undertaken.

The development and application of national standard definitions would enable a more objective approach to analysis of the crash problem, the identification of contributing factors, and ultimately the development and implementation of cost-effective safety measures. The program reported here used the RRMA classification system.

The research program

The research findings reported here build on the program's first stage, a report on the *Five year crash and area profile of North Queensland: January 1st 1998 - December 31st 2002* (CARRS-Q, 2006). The report provided a comprehensive review of socio-demographic and transport statistics in order to develop a baseline data set on the region and its road safety for the five years before the prospective study.

This report presents the core findings of the second and third stages of a major research program which aimed to develop the information base required to reduce the unacceptably high rates of fatalities and serious injuries that occur in rural regions due to road crashes. Background research had shown that not only were rural people at much higher risk of death and injury on the roads but also that there had been very little work done to learn from their experience and knowledge (Tziotis et al. 2005). The project reported here is the first comprehensive study of its kind and it aims to clarify the issues underlying rural and remote road crashes through a program of quantitative and qualitative, medical and road safety research and interventions.

The data and analyses presented in this report are the core findings from two studies: a general examination of fatalities and casualties from rural and remote crashes for the period 1 March 2004 until 30 June 2007, and a further linked case-comparison study of hospitalised patients compared with a sample of non-crash-involved drivers.

The study was undertaken by the staff from CARRS-Q at Queensland University of Technology in Brisbane and from the Rural Health Research Unit (RHRU) in the Medical Faculty at James Cook University, Townsville. The primary aim was to:

> *Identify human factors related to the occurrence of serious traffic incidents in rural and remote areas of Australia, and to the trauma suffered by persons as a result of these incidents, using a sample drawn from a rural and remote area in North Queensland.*

The study was supported by whole of Government funding and central and regional in-kind support provided by the following Queensland Departments for the years 2003–2008.

- Premier's Department
- Queensland Transport
- Queensland Police Service
- Main Roads Department
- Queensland Emergency Services
- Motor Accident Insurance Commission

Queensland Health also provided major in-kind support that made the project possible. In particular, the following hospitals and their staff were involved in and supported the data collection over the extended study period:

- The Townsville Hospital
- Cairns Base Hospital
- Mt Isa Hospital
- Atherton Hospital

This was a prospective program of research and was designed to identify factors related to the occurrence, in rural and remote areas, of serious traffic incidents as defined by a resulting casualty either being killed or hospitalised for a period of 24 hours or more. The program was innovative because particular attention was given to the characteristics, experiences and attitudes of the persons involved in these incidents and the circumstances of the incident in order to develop targeted education, deterrence and other prevention strategies. The program was designed to be proactive and research findings will be used to develop and implement intervention strategies and to inform related research and policy development.

The North Queensland region

The North Queensland study area exists within the combined ABS Statistical Divisions of Northern Queensland, Far North Queensland and North-West Queensland, collectively referred to herein as 'North Queensland.' This area is situated in the north-easternmost reaches of Australia as depicted below in Figure 1.1.

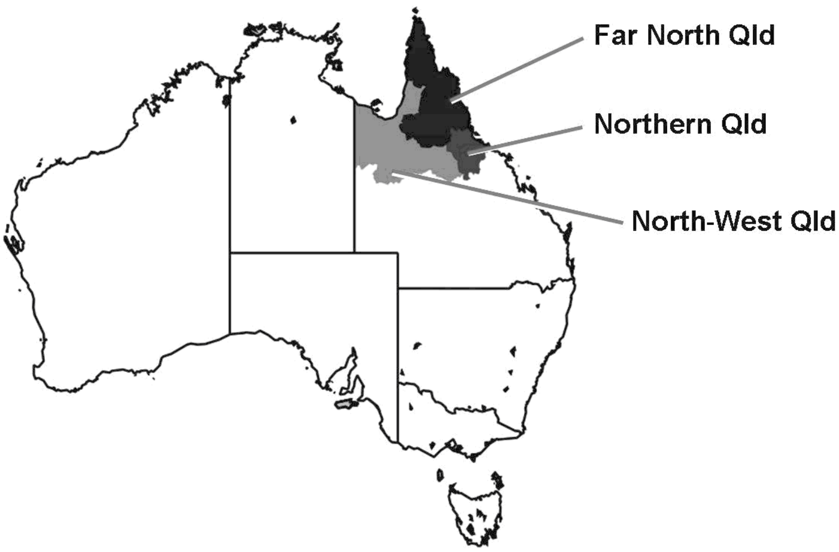

Figure 1.1. North Queensland region within Australia

The study area included only rural areas within this greater region, excluding the metropolitan centres of Cairns and Townsville (RRMA 2).

The rural and remote areas were defined by the exclusion of Cairns City Part A, Thuringowa City Part A and Townsville City Part A, as defined by the ABS. The balances of the regions are thus classified as 'rural' or 'remote' areas. Mount Isa and surrounding areas are classified as rural and remote for this study. This is consistent with the RRMA classifications of 3–7. This study area covers 99.9% of the land area of North Queensland, but only 45.1% of the population (0.3 people per square kilometre). Figure 1.2 below depicts the North Queensland region, along with locations of these major centres.

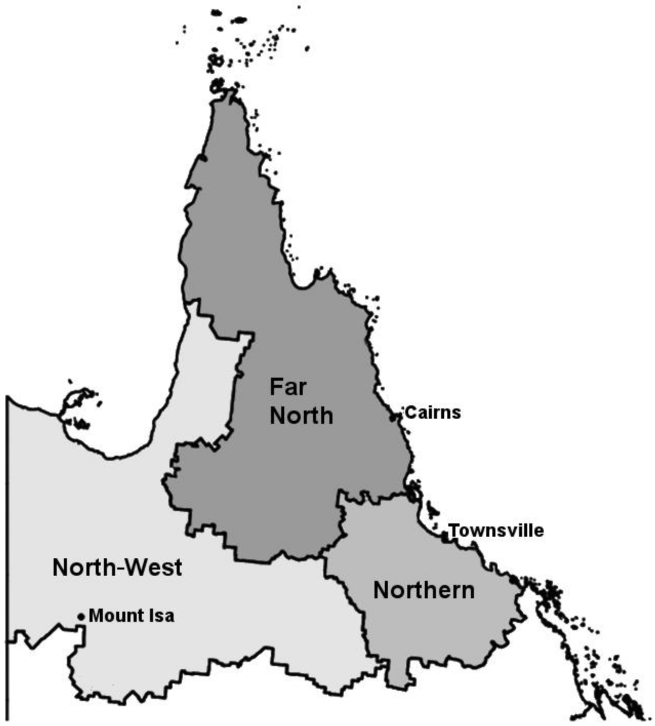

Figure 1.2. North Queensland region with locations of major centres

For comprehensive information on base line population social and geographical characteristics and crash records the reader is referred to the aforementioned crash and area profile (CARRS-Q, 2006). The following is a general introductory summary of social and demographic characteristics of the project region.

North Queensland includes 11.7% of the Queensland population and 38.1% of the Queensland land mass with 0.69 persons per square kilometre (ABS, 2006a).

Table 1.1. *Estimated resident population (as at 30 June 2006) and land area of North Queensland regions by urban and rural classifications*

Region	Estimated resident population	Land area km^2	Persons per km^2
Far North	231,049	269,223.9	0.86
Urban areas	122,731 (53.1%)	488.1 (0.2%)	251.45
Rural areas	108,318 (46.9%)	268,735.8 (99.8%)	0.40
North-West	30,941	312,052.3	0.09
Northern	196,665	80,059.2	2.46
Urban areas	143,329 (72.9%)	454.4 (0.6%)	315.42
Rural areas	53,336 (27.1%)	79,604.8 (99.4%)	0.67
North Queensland	458,655	661,335.4	**0.69**
Urban areas	266,060 (58.0%)	942.5 (0.1%)	282.29
Rural areas	192,595 (41.9%)	660,392.9 (99.9%)	0.29
Queensland Total	3,904,532	1,734,189.6	**2.25**

Source: Australian Bureau of Statistics, 2006a

There are more males than females (47.8%) in the rural North Queensland study area and slightly more females (50.5%) than males in Queensland as a whole. This trend was observed within all statistical divisions, but was more marked in the North-West region where the difference was 10% (except Indigenous persons where there is a predominance of females in all divisions). The median age in urban areas (33 years) was lower than the median age in rural areas (36 years). According to census data the proportions of the population that are indigenous in the three regions are 6.9% in the Northern region, 15.4% in the Far North and 25.3% in the North-West. Considering only rural areas within these regions, the proportions are 9.1%, 23.2% and 25.3% respectively. Overall, 10.8% of the study region's population are Indigenous, rising to 19.5% for rural areas alone.

Road traffic crashes in North Queensland

The terms used in reporting crash data in the reports of this program, reflect those in the Queensland Transport (QT) and Queensland Police Service (QPS) road crash database. For example, 'units' are any unit type that may be involved in a road crash, which can include cars, utilities, vans, trucks, articulated vehicles, omnibuses, motorcycles, special purpose vehicles (such as tractors), towed devices, bicycles, four-wheel drives, road trains and pedestrians. 'Casualties' in the Rural and Remote Road Safety Project are defined as fatalities and hospitalisations of more than 24 hours resulting from a road crash. 'Road User Type' is a term used to describe different groups within the population who are utilising roads and their surrounds. Road user types include drivers, passengers, pedestrians, motorcycle riders and pillion passengers and bicycle riders and pillion passengers.

One of the anomalies of the data in this area is that there are discrepancies between the figures available through Transport/Police statistics and those provided through Health statistics. This is most evident for data on hospitalisations. These differences have been quantified by research in Western Australia which found that between 40 and 45% of police-reportable hospital admissions did not have a matching police report (Rosman, 2001). The level of matching was found to decrease as casualty severity decreased, for those casualties under 17 years of age and for certain road user types such as motorcyclists.

Analysing police-reported crash data only, North Queensland crashes resulted in 250 fatalities, or 16.1% of all Queensland fatalities and 13.9% of hospitalisations in 1998–2002 (CARRS-Q, 2006). The highest proportion of North Queensland casualties were related to crashes in the Far North region, followed by the Northern and North-West regions.

Table 1.2. *Fatalities and hospitalisations in North Queensland by road user type, 1998–2002 (percentage of totals in parentheses)*

	Fatalities		Hospitalisations	
Road user type	n	%	n	%
Driver	92	36.8	1460	42.8
Passenger	86	34.4	983	28.8
Pedestrian	44	17.6	241	7.1
Motorcycle rider	19	7.6	490	14.4
Motorcycle pillion	1	0.4	40	1.2
Bicycle rider	8	3.2	198	5.8
Bicycle pillion	0	0.0	1	0.03
Other controller	0	0.0	1	0.03
Total	**250**	**100.0**	**3414**	**100.0**

Source*:* Queensland Transport, WebCrash2 (2004)

Table 1.2 outlines the road user type of all fatalities and hospitalisations that resulted from road traffic crashes on North Queensland roads between 1998 and 2002 and that were recorded in the Transport database. As can be seen, the largest proportions of fatalities and hospitalisations were drivers, followed by passengers of motor vehicles. The next most common road user group was pedestrians for fatalities, and motorcycle riders for hospitalisations.

Group risk factors

The broader context of the road-using population of the North Queensland region is also important to consider. Table 1.3 below details the total number of registered vehicles in North Queensland compared to the state as a whole.

Table 1.3. *Vehicles registered in North Queensland compared with all Queensland registrations*

	North Qld.		Queensland	
Road user type	n	%	n	%
Campervans	538	0.3	8449	0.3
Light rigid trucks	1576	0.9	23490	0.8
Heavy rigid trucks	5044	2.9	60410	2.1
Prime movers	1058	0.6	15802	0.5
Buses	1572	0.9	16516	0.6
Motorcycles	8673	5.0	110501	3.8
Passenger vehicles	108852	62.8	2138364	73.8
Light commercial vehicles	45780	26.4	520070	17.9
Non-freight carrying trucks	128	0.1	4265	0.1
Total	**173221**	**100.0**	**2897867**	**100.0**

Source: Motor Vehicle Census (ABS, 2006b)

Vehicles registered in the region represent 6% of all Queensland registrations. While passenger vehicles make up the majority of the fleet at 62.8%, the region's registrations of passenger vehicles and non-freight carrying trucks are underrepresented in comparison to Queensland as a whole. Buses, light commercial vehicles, heavy rigid trucks and motorcycles make up higher proportions of the fleet. It should be noted, however, that these registrations are not necessarily indicative of the Vehicle Kilometres Travelled (VKT) in the region by each vehicle type.

One of the goals of this research program was to determine whether there were any particular groups who could be considered at 'high risk' of crash involvement. The associated aim was to identify any associated attitudinal, knowledge or behavioural characteristics that could contribute to this risk and to inform prevention initiatives to target them.

The earlier comprehensive report on the research and associated literature had explored the concept of high risk road users. Local state statistics and discussions with key stakeholders were used to determine if there was any consistency in groups identified. Considerable variation was found between the priorities of each of the relevant state departments. However, a number of key points were able to be put forward by the report as summarised in Table 1.4 below.

Table 1.4. *Nominated 'at risk' groups of rural and remote drivers and vehicles by state, 2002*

Nominated factors	
Behavioural crash risk factors	**Vehicle crash risk factors**
- Driving under the influence of alcohol or drugs	*- Motorcycles*
- Speeding	*- Articulated trucks*
- Fatigue	*- Rigid trucks*
- Failure to wear seat belts	**Environmental crash risk factors**
- Failure to wear helmets	*- Road condition*
'At risk' groups	*- Road design*
- Local residents	*- Roadside environment*
- Young male drivers	*- Speed limits*
- Truck drivers	**Post-crash risk factors**
- Indigenous Australians	*- Emergency response and retrieval times*
- Pedestrians	*- Rehabilitation services in rural areas*

Source: Tziotis et al. (2005)

While these factors do present a number of generic areas for intervention development to improve rural road safety, they also cover a number of region-specific concerns. The current study seeks clarification on those factors which have the greatest potential impact while also presenting detailed analyses which can be used as a means to target specific issues.

Behavioural risk factors

There is considerably more consensus in the literature on behavioural factors contributing to the high levels of fatalities. The earlier Austroads study found international consensus and consistent replication across state studies and reports on the role of speeding, drink driving, fatigue and failure to wear a seat belt or helmet as major contributing factors.

In a submission by Queensland Transport (2001) to the Queensland Travelsafe inquiry into rural and remote crashes in this state, albeit using the 100 km speed limit criteria to determine rurality, these findings are replicated.

"In 2000 the relative risk of dying as a result of a road crash in rural as compared to urban areas of Queensland was:

> i) 12.1 times higher for fatigue related crashes
> ii) 6.4 times higher for single vehicle crashes
> iii) 5.2 times higher for crashes where the victim was not wearing a safety belt
> iv) 4.7 times higher for speed-related crashes
> v) 4.3 times higher for alcohol related crashes."
> (Tziotis et al., 2005, p. 20)

Whilst it is unlikely that the present program of research will change these disturbing statistics the study reported here is designed to provide information about the contributing, attitudinal, cultural and knowledge factors in order to inform targeted interventions.

Potential countermeasures

The final stage of this project involved conducting an international symposium. A panel of Australian and international experts was invited to a two-day workshop at which the preliminary findings of the study were reported. Recommendations to address the identified issues were sought. Based on the background literature review and the summary of different experiences the underlying assumption for the workshop was that there were generic interventions that would be useful for all rural and remote driving conditions. The project also indicated a clear need for targeted approaches to respond to particular issues encountered in rural and remote driving situations in North Queensland. The findings from this final phase of the research program are summarised in the last chapter of this report. Where relevant, the findings of the earlier review are noted in context.

Plan of the report

This first chapter gives the background and context of the project. The following two core chapters describe the full study design and methodology (Chapter 2) and review the findings from the comprehensive study of all crash and casualties occurring in the region during the study period (Chapter 3). The next two chapters are concerned with the interview findings from the studies with hospitalised crash casualties and compares the data with the same material covered in the interviews with the roadside sample (Chapters 4 and 5). The next chapter presents the medical data obtained in relation to the injuries experienced by the hospitalised cases (Chapter 6). The next two chapters present the findings from the coroner’s reports on fatalities that occurred in the region during the study (Chapter 7) and a systematic comparison of the reports on crashes obtained in the police records and the same crashes reported by the interviewees (Chapter 8).

The penultimate chapter (Chapter 9) describes a number of interventions which were undertaken by the team as the project continued. It also documents the media and related dissemination activities undertaken through the period. Finally, it describes the wide variety of linked research programs that have been developed as part of the focus on rural and remote road safety issues.

The last chapter summarises the key findings of the project and describes the outcome of the international workshop. Recommendations are documented and the limitations of the present work identified. Finally, possible areas for future research are presented (Chapter 10).

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2. Study Design and Methods

Study design

The Rural and Remote Road Safety Study was designed to be an in-depth examination of factors present in non-urban traffic crashes leading to the hospitalisation of at least one road user and of attitudes held by the affected road users. A geographically defined subset was to be compared in a case-control study with a series of appropriately chosen road users not involved in a traffic crash. It had initially been intended to collect a minimal amount of data on all crashes occurring in urban areas during screening for eligibility, but in practice this was found to add substantially to the workload. A retrospective medical chart audit of all patients admitted to the major participating hospitals following a non-urban traffic crash, whether enrolled in the Road Safety Study or not, began some time after the main study had been under way.

Some associated intervention trials and studies involving focus groups are described elsewhere.

Selection of cases

All crashes in Northern Queensland that resulted in a serious injury and/or fatality in the period from 1 March 2004 to 30 June 2007 were eligible for inclusion in the in-depth injury and case-comparison studies if they met the following criterion:

- The vehicle crash occurred in the study catchment area (i.e. north and west from Bowen, excluding the Australian Bureau of Statistics 'Part A' Statistical Local Areas of Thuringowa, Townsville and Cairns) and resulted in at least one road user 16 years or older being killed or admitted to hospital for at least 24 hours. The admitted person could be a vehicle occupant (driver or passenger), motorcycle rider or pillion passenger, pedal cyclist or pedestrian.

Exceptions:

- Patients transferred to a psychiatric or other unit for a non-injury related condition within 24 hours were not considered to meet the eligibility criterion.
- Those fatal crashes which resulted in children only fatalities and no adults being admitted to hospital were excluded from the study.

Identification of cases

Research staff in Townsville and Cairns undertook daily scans of The Townsville Hospital and Cairns Base Hospital to identify patients admitted to hospital following vehicle crashes. In Mount Isa and Atherton, hospital staff would contact the appropriate research assistant to alert them to the admission of a patient following a traffic crash. Patients from these crashes were then screened to ensure that their crash was in the study area, that they spoke English, were at least 16 years of age and had not been discharged or transferred for other reasons within 24 hours of admission.

In addition, local media reports were reviewed daily to identify potential crashes. Queensland Police reports and the Queensland Police media releases were used to identify fatal crashes. The Queensland Transport's road crash database was searched regularly to identify eligible crashes that may have been missed at time of crash. From mid-2006 on, a chart audit of all transport-related admissions to the Townsville and Cairns hospitals was undertaken at six-monthly intervals to identify eligible crashes that were not picked up at time of admission.

Eligible patients, i.e. those meeting the criteria listed above, were approached by a health care professional in the hospital (not associated with the care provided to the patient) who gave them written information about the study and asked if they were willing for a research staff member to approach them to undertake an interview. No patient was approached until deemed by clinicians to be non-critical (stabilised) and emotionally able to give consent.

After patients were approached by a research assistant and had provided written consent to participate in the study, the research assistant administered the questionnaire. Patients were given the option of completing a confidential section of the questionnaire themselves and placing it in a sealed envelope linked to the remainder of the questionnaire by a unique code number. If the patient became too tired or was interrupted for treatment the research assistant arranged to return at a later time to complete the interview.

Questionnaires

The following topics were covered by the questionnaire:

- Demographics
- Experience of the crash in narrative form, recorded verbatim (including experience of the road environment and emergency response)
- Vehicle characteristics and maintenance
- Trip characteristics (e.g. purpose and length of journey; periods of fatigue and monotony; distractions from driving task)
- Driving history
- Alcohol and drug use
- Medical history
- Driving attitudes, intentions and behaviour
- Attitudes to enforcement
- Experience of road safety advertising.

Questionnaires were developed using a number of validated tools (listed in the references at the end of this chapter) for each road user type: drivers/motorcyclists; passengers including pillion passengers; pedal cyclists; and pedestrians. They were piloted in late 2003 and early 2004, prior to the commencement of the study proper. Some modifications to the questionnaires, on the whole minor, were made on the basis of this pilot. Finalised copies of all questionnaires are appended.

Confidentiality

Some topics covered in the interview inevitably touched on sensitive issues of potentially illegal driving behaviour, including speeding and substance abuse, in the lead-up to the crash. To increase compliance this section could be completed by the interviewee, where applicable, out of sight of the interviewer and placed in a sealed envelope linked by a unique code number to the remainder of the instrument. All questions in this section had pre-coded answers to minimise effort. It was recognised that problems could arise with illiterate subjects or those unable to record their responses by reason of injury and that Indigenous persons could sometimes be understandably mistrustful of authority and disposed to baulk at revealing sensitive information even with the proposed mechanism – or indeed to participate at all.

A more troublesome consideration was the possibility of legal action to access this information on the part of outside parties such as insurance companies or the police. While admissions made during such an interview are unlikely to be regarded as evidentiary on their own, it is conceivable that they could be compromising if taken together with other sources of evidence. Apart from ethical considerations it was important that those being interviewed could be assured of total confidentiality to maximise the chances of accurate reporting. Consultations with a variety of legal sources could not establish definitively whether information collected in the course of research was protected against court subpoena. The solution arrived at was to sever all connection between subjects' names and study code numbers as soon as possible, despite any inconvenience to the process of linking interview data to external sources of information. Names of participants would still of necessity be retained on consent forms, but it seemed unlikely that courts would allow litigants to trawl through these in an attempt to identify (perhaps by date and site of crash) any specific individual.

Fatalities

No survivors of a crash in which someone died were interviewed. Data pertaining to fatal crashes occurring in the study region and period were obtained from Queensland Police and Coroner's reports. Approval had been obtained early in the study to obtain coroner's reports on named decedents when finalised. All variables with information comparable to that in the in-hospital questionnaires were coded in similar format to the latter. There was a delay of up to twelve months for the release of these reports. As of the end of February 2008, 86 such reports of 130 fatalities have been obtained and processed.

In order to request a coroner's report the name of the deceased person was needed. A variety of processes was employed to ascertain names of persons who had died in crashes in the catchment North Queensland region. From early 2006 a list of names and crash details was forwarded from police sources in Townsville to study research staff. Additional sources were newspaper reports, which sometimes reported the identity of victims or at least the location, date and time of the crash, as did the Police Media Release website. On the basis of these details, a request to the QPS for names could be made.

Queensland Transport Road Crash database

Access to Queensland Transport's road crash database, which contains police reports of crashes attended by Queensland Police Service, was obtained. On the basis of data and information from patient interviews, chart reviews and Queensland Ambulance Service data, each crash was mapped using MapInfo.

Queensland Ambulance Service (QAS) data

QAS reports were used mainly in connection with retrieval variables. In many instances QAS reports were found in the patients' medical charts, but if not, or if the crash was a fatal one, the QAS Communications Section in Townsville or Cairns was contacted. Unless the crash in question was a fairly recent one, there were difficulties in identifying the correct record pertaining to it; in some instances this proved not to be possible. From December 2005 until the end of data collection the requests to the QAS Communications Section were made on a weekly basis which maximised the chances of matching a crash to its associated QAS record.

Queensland Police Service (QPS) data

QPS data was used in connection with fatal crashes (see above) and to determine time, place and circumstances of crashes (see Queensland Transport Road Crash database above).

Selection of a comparison group (controls) for the case-control study

Case-control design requires that the reference group, to whom the set of cases – those experiencing the event under study – are to be compared, be representative of the population from which the cases are drawn. In the present instance, the population from which individuals involved in traffic crashes (other than passengers) were drawn would optimally be individuals of similar road user type passing the crash site at or near the same time and in the same direction. As a surrogate, drivers passing the crash site at or near the same time one week later, i.e. on the same day of the week, and in the same direction, could serve. It was originally intended to recruit such control drivers only for enrolled crashes occurring within 100 km (roughly an hour's travel) of Townsville, Charters Towers, Cairns, Atherton and Mount Isa to whom the same questionnaire as for the cases would be administered, excluding the specific crash-related items. The aim was to undertake four to six interviews per eligible crash. Here only the methods actually employed to recruit a comparison driver group are presented. The evolution of the recruitment methodology from its initial design is set out in an appended draft discussion paper (Appendix C).

Comparison group data collection

A primary consideration in selecting sites for roadside data collection was safety. Motorists should be able to pull over and re-enter traffic without danger. This imposed limitations on site selection.

In the Townsville and Mount Isa regions the sites were often designated rest areas or vehicle inspection sites. Motorists were invited to pull over to the side of the road for an interview by way of erected signs placed 100 metres before the data collection site. Motorists who did so were informed of the study and invited to participate. Verbal consent was gained prior to undertaking the interview. Once this was gained, the research assistant administered the questionnaire, recording the answers in the questionnaire script. As in the hospital interviews, participants were asked to fill in the confidential section of the questionnaire themselves out of sight of the interviewer, and place it in a sealed envelope linked by a unique code number to the remainder of the questionnaire. However, only a small proportion of passing motorists were willing to stop solely for the purpose of taking part in a research project, leading to the potential for appreciable volunteer bias.

Due to limited areas for roadside pull off and associated safety concerns in the Cairns and the Atherton Tablelands region, roadside data collection was undertaken at refuelling outlets on the roads near to where the crashes had occurred. Here, motorists were approached while fuelling their vehicles, were informed about the study and its aims and asked if they would be prepared to participate. This procedure initially took at least 20 minutes and many potential interviewees were reluctant to devote that amount of time, once again raising the possibility of volunteer bias. When this was reported to the principal investigators, the roadside questionnaire was pared down, as was the introductory explanation. Coupled with a streamlined approach on the part of the interviewers, this resulted in a lower refusal rate (< 10%) at the last few collection sites.

Timing

It had been hoped to undertake the comparison group interviews one week after the crash at a time similar to the crash time. There were limitations associated with this in that it took some time to organise Main Roads' permissions to use the roadside for data collection in the Townsville and Mount Isa regions. Similarly, it took time to initially gain access to service stations and return visits for crashes that occurred in the vicinity later in the study had to be negotiated regularly. Where practicable, the comparison group data was collected within six weeks of the eligible crash.

Collecting data at the same time of day as the crash proved difficult as safety issues precluded collections during the evening or night on the roadside and service stations had preferred times for data collection to ensure that their business was not disrupted by the research assistants.

Location

The location for the comparison group data collection was as close as was safely possible to where the crash had occurred. In practice, data collection was limited to roadside rest areas in the Mount Isa district, to a limited number of pull off locations in the Townsville region and to service stations willing to participate in the Cairns and Atherton Tablelands regions.

Electronic Database

Information from hospital and roadside questionnaires was entered into a SPSS (Statistical Package for the Social Sciences) database as soon as practicable after arrival at the North Queensland study headquarters in Townsville. Comparable information regarding fatal crashes was also entered into the database (see above).

In-depth study of injury and retrieval

Patients admitted to hospital

Medical data was collected from the patients' charts and the clinical information services for all patients aged 16 and over and deemed to have been involved in an eligible crash. The collection period was from March 2004 to June 2007. These included admission vital signs, regular medications taken prior to the crash, information about safety equipment use (seatbelts and helmets) and alcohol use from admission notes, clinical benchmarking data providing type of injury and clinical interventions using International Classification of Disease, version 10 (ICD-10), length of stay and admission outcome (i.e. discharge, transfer to another facility, transfer to rehabilitation service or death).

Emergency service response times were collected from patients' charts where it was available. The Queensland Ambulance Service (QAS) provided long trip sheets for cases where QAS had been involved and there was no record in the patient's chart.

Fatalities

In the absence of a hospital record, autopsy data and retrieval information from coroners' reports were used, supplemented where necessary from police reports.

Cost estimations

Transport costs

Emergency retrieval occurred by road and air. Road transport costs were determined using QAS figures. Air transport figures were determined from data provided by Emergency Management Queensland for rotary wing transport and by Royal Flying Doctor Service Queensland for fixed wing transport (Mathews, Elcock & Furyk, 2007).

Distance between crash sites and the hospitals, and between hospitals (in cases of inter-hospital transfers) were estimated using MapInfo and a road atlas. Straight line distances were used for flights and road distances for road transport. All air transport costs included travel to crash sites and to transferring hospital sites from the base of the emergency service undertaking the retrieval.

Air transport is costed per engine hour. Engine hours were determined in two ways:

a) Fixed wing engine hours – The Royal Flying Doctor Service Queensland (Townsville office) provided engine hours on which costs are based for flights between locations in North Queensland. Fixed wing retrieval costs are $2400 per engine hour (including a nurse).
b) Emergency Management Queensland stated that Bell 412 Helicopters fly at 120 knots per hour in conditions of no wind and full sunlight. An estimate of 200 km per hour was suggested as a reasonable figure from which to determine engine hours, given that many of the flights occurred at night.

Additional costs

a) Fixed wing transport – casualty hospital records showed that in the majority of cases a medical officer was also involved in the retrieval or transfer. A cost of $1800 was added to the total cost per fixed wing retrieval for the medical officer (figure provided by Emergency Management Queensland). An additional $841 for transport from the transferring hospital to the local airport and $841 for transport from the airport to the receiving hospital was added to cover Queensland Ambulance Service costs (figures based on average cost QAS charges Queensland Health in 2007–2008 for transfers).
b) Rotary wing transport – helicopters travel with one doctor and one paramedic. Cost of doctor per trip is $1800 and cost of paramedic per trip is $800 (figures provided by Emergency Management Queensland).

Road transport retrievals were costed per retrieval at the rate of $1104. This figure was determined using the 1996 QAS study which determined the average cost of emergency retrievals at $800 per case (source: Professor Michele Clark personal communication 12 November 2007) and adjusting for CPI (38.1% from 1996–2007).

In-hospital costs

Actual costs for 253 of the study casualties treated at The Townsville Hospital (TTH) were provided by the Clinical Information Services of TTH. An average cost per bed day was determined from these costs and applied to the remaining casualties in the study.

Limitations

Case recruitment

Patients were only interviewed in four hospitals, Townsville, Cairns, Mount Isa and Atherton, although the latter two hospitals did not provide more than a small proportion of participants. Persons admitted for at least 24 hours to other hospitals in the area and not transferred to Townsville or Cairns would not have been enrolled in the study. Were there many such patients, this could have been a serious methodological limitation. However anecdotal evidence and current clinical practice, which emphasises use of sophisticated diagnostic and or/clinical procedures for all but the most minor trauma, suggests that this may not have been the case. Such patients as remained for the requisite time in smaller facilities will have been at the less serious end of the injury spectrum. Nonetheless, the study's inability to collect data on eligible patients not transferred to study hospitals is a limitation. The extent of the problem could be investigated when up-to-date hospital morbidity data for the region become available. One effect of non-recruitment of substantial numbers of patients from smaller facilities would be an underestimate of the incidence of serious vehicle crashes and possible bias with respect to causative factors and the spectrum of injuries encountered.

An additional source of bias may have been engendered by the fact that not all eligible cases at the four study hospitals underwent an interview. To ascertain the impact of such omissions, a clinical audit was conducted at The Townsville Hospital and Cairns Base Hospital to identify all eligible patients, i.e. those admitted for at least 24 hours following a non-fatal traffic incident, whether interviewed or not. The researchers extracted all the information available in the patient record on the circumstances of the incident. A total of 641 individual records were identified of whom 391 (61%) were reported as having been interviewed for the study; in the case of 2 patients this information was absent, leaving 639 for the purpose comparing the interviewees with those not interviewed.

The variables available for the comparison were age, sex , indigenous status, region, time, month and day of week of the incident, crash and vehicle type, road user type and whether the incident occurred on- or off-road. Statistical analysis used principally contingency table ("chi square") tests, plus a t-test for age.

The results may be summarised as follows:

Minor and non-significant differences

a) a slightly lower proportion of females were interviewed;
b) a higher proportion of occupants of 4WDs and a slightly lower proportion of pedal cyclists and occupants of trucks and ATVs were interviewed, but there were no other major differences in respect of vehicle type;
c) multiple vehicle crashes were slightly over-represented compared to single vehicle crashes;
d) a slightly lower proportion of occupants of vehicles travelling off-road were interviewed;
e) Mondays and Tuesdays were over-represented and Saturday under-represented among interviewees;
f) July and August were over-represented, January and February under-represented;
g) the proportion interviewed declined from 67% in 2004 to 56% in 2007.

Larger, significant differences

h) Pedestrians were greatly under-represented among interviewees, with only 34% being in the interview sample compared to 61% overall;
i) a higher proportion (72%) of patients involved in daylight morning crashes (6 am – noon) were interviewed compared in particular to those involved in night-time crashes (55%);
j) a higher proportion (77%) of patients from the North-West region were interviewed compared to patients from the Far North (60%) and Northern (54%) regions;
k) the mean age of interviewed patients was 38.5 years compared to 34.9 in the remainder; under 50% of patients aged 16 to 19 years were interviewed, compared to almost three-quarters of those aged from 50 to 69 years.

For most variables the differences in distribution between those interviewed and those not are quite modest, even if statistically significant due to the samples involved being quite large.

Reasons for failure to interview

These can be grouped into five main categories plus an "unknown" category (2.4%):

i) Discharged or transferred out prior to interview (19.2%);
ii) No medical clearance (12.8%);
iii) Refusal, explicit ("not interested") or implicit ("mailback not received") (30.4%);
iv) English inadequate (3.2%);
v) Missed and picked up in chart audit (32.0%).

Significant differences among these categories were apparent for sex, age, region, year, crash type, off-road driving, vehicle type and road user type. Refusals comprised a higher proportion of reasons for non-interview among males than among females, although in those approached (interviewees plus refusals) refusal rates, at about 16%, were very similar. Those with inadequate English skills were appreciably older than the rest of the sample, while patients discharged early were somewhat younger; there was little difference among the remaining categories. The proportion of patients refusing to be interviewed, both among all those not interviewed and those approached were highest in the Far Northern region (FNR) at 37% and 20% respectively compared to 25% and 18%, respectively, in the Northern region (NR) and 5% and 1% in the North West region (NWR). A smaller proportion of patients were missed in the FNR - 22% of those not interviewed - compared to 48% in the NR and 68% in the NWR.

Potential participants involved in crashes on Fridays, Saturdays and Sundays, were less likely to be missed, but more likely to refuse (21% versus < 10% for other days). Refusal rates were similar at all times of day; they varied unsystematically by month.

Refusal rates were lowest in drivers, passengers and pedal cyclists (10% - 13%), higher in motorcyclists (19%) and highest in pedestrians (39%). Indigenous persons were somewhat more likely to refuse than other patients approached (23% versus 16%).

In summary, results from interviewed pedestrians should be treated with caution, as they may be unrepresentative of typical hospitalised pedestrians. Only 11 pedestrians were interviewed (of 32 identified), a number too small for useful analysis. For other road users, serious bias is unlikely, although a degree of unrepresentativeness cannot be excluded.

Comparison group recruitment

The problems of recruiting a representative series of drivers using North Queensland roads in areas and at times comparable to the hospital series have been extensively discussed elsewhere. It is theoretically possible to design a more satisfactory system of recruitment, interviewing during both during daylight and night-time hours at a wide variety of fuel outlets or in conjunction with several police-controlled RBT stops in rural areas. However in practice this would be virtually impossible to achieve. The series actually recruited may therefore be unrepresentative due to the volunteer nature of the majority of drivers or the rather restricted locations and times of intensive recruitment at fuel outlets.

In addition, the imperative to delay drivers as little as possible meant that information on attitudes to road safety, in particular, was only obtained on a small proportion of the sample. However certain questions covering the most important beliefs about and attitudes to road safety were retained.

If it is borne in mind that the roadside sample obtained may represent a somewhat more safety conscious and law-abiding segment of the North Queensland driving community, its characteristics may still be used with a degree of caution as a benchmark against which the hospital sample may be compared.

Misclassification and missing data

Certain issues to be discussed here are also discussed in the relevant chapters.

How one defines "rural" or "remote" is the subject of on-going debate throughout the world. In the current study we have elected to define rural as everywhere in the region outside of the urban area (designated “Part A” by the Australian Bureau of Statistics) of the major cities of Cairns and Townsville, without considering at this stage the issue of remoteness. This definition places the city of Mount Isa on an equal footing to the smaller regional towns such as Ingham or Mareeba, which is arguably not too inappropriate. A problem would arise if our findings were to be compared with other research reports on supposedly rural areas, but this would be the case whatever definition of rurality were used.

There may be inaccuracies in the attribution of indigenous status, particularly in hospital records, where a patient’s identification as indigenous was not always requested. The extent of such misclassification is unknown, and may have led to underestimation of the proportion of indigenous persons injured in traffic incidents. It is however unlikely that many of the interviewed patients would have identified themselves incorrectly.

All the information from the hospitalised sample is self-report, which has known imperfections. For instance, it might be expected that drivers or riders describing their crashes and their actions prior to them would attempt to minimise their culpability and place themselves in a favourable light. This clearly happens to some extent, but the experience of the interviewers has been that in most cases the interviewees have been remarkably open about these issues and were far less self-serving than might be expected. A certain proportion of patients had, or claimed to have, no memory of the crash.

For information on fatalities the study relied on coroners’ reports, not all of which were forthcoming. There is no evidence to suggest that the missing reports would be systematically different from the ones supplied.

In summary, the study has suffered from many of the flaws inherent in population-based observational research, none of which are large enough to invalidate any of its findings. The one possible exception is overall costings, depending as they do on rough estimates, little better than anecdotal, of average retrieval and inter-hospital costs.

References

Mathews, K.A., Elcock, M.S., & Furyk, J.S. (2007). The use of telemedicine to aid in assessment of patients prior to aeromedical retrieval to a tertiary referral centre. *Paper presented at the Spring Seminar of Emergency Medicine*, Alice Springs.

3. Crash and Casualty Overview

This chapter presents an overview of the characteristics of the serious crashes within the North Queensland region and basic details of those casualties involved in the crashes.

Scope of the crash study

All crashes in Northern Queensland that resulted in a serious injury and/or fatality in the period from 1 March 2004 to 30 June 2007 were eligible for inclusion in the study if they met the following criteria:

The vehicle crash occurred in the study catchment area (i.e. north and west of Bowen, excluding the Australian Bureau of Statistics ‘Part A’ Statistical Local Areas of Thuringowa, Townsville and Cairns) and resulted in at least one road user older than 15 years being killed or admitted to hospital for at least 24 hours. The admitted person could be a vehicle occupant (driver or passenger), motorcycle rider or pillion passenger, pedal cyclist or pedestrian.

An exception was that patients transferred to a psychiatric or other unit for a non-injury related condition within 24 hours were not considered to meet the eligibility criteria.

Overview

Table 3.1 below presents basic statistics on the number of crashes by crash severity. Crash severity is defined by the most severely injured casualty in a crash. That is, if both a fatality and a hospitalisation resulted from a crash, it is considered a fatal crash.

Table 3.1. *Total crashes by crash severity*

Crash severity	n	%
Fatal	119	16.3
Hospitalisation	613	83.7
Total	**732**	**100.0**

There were a total of 732 crashes, 119 (16%) of which resulted in at least one road user being fatally injured. There were 814 serious casualties, either fatally injured or admitted for 24 hours or more, which resulted from the 732 crashes, as shown in Table 3.2 below.

Table 3.2. *Total casualties by casualty severity*

Crash severity	n	%
Fatality	130[1]	16.0
Hospitalisation	684	84.0
Total	**814**	**100.0**

[1] - 10 of these 130 recorded fatalities died after arrival to hospital, but are considered throughout this report as fatalities and not hospitalisations.

Casualty data

The following analyses refer to the characteristics of the casualties resulting from crashes included in the study.

Demographic characteristics

Further analyses were conducted to determine the demographic characteristics of the seriously injured sample. Table 3.3 below presents the numbers of casualties by gender.

Table 3.3. *Total casualties by gender*

Gender	n	%
Male	607	76.1
Female	191	23.9
Valid Total	**798**	**100.0**
Unknown	16	2.0
Total	**814**	**100.0**

Males accounted for three out of every four serious casualties. Further analyses were conducted to determine if this effect interacted with crash severity, as shown in Table 3.4 below.

Table 3.4. *Total casualties by gender and casualty severity*

	Crash severity			
Gender	Fatality		Hospitalisation	
Male	102	78.5	505	75.6
Female	28	21.5	163	24.4
Valid Total	**130**	**100.0**	**668**	**100.0**
Unknown	0	0.0	16	2.3
Total	**130**	**100.0**	**684**	**100.0**

The predominance of males was evident for both fatalities and hospitalisations, with no interaction effect present.

The mean age of those injured was 36.9 years (SD = 16.5 years), with a median age of 34.0 years (IQR = 23-47). Table 3.5 below presents the proportion of each age group within each gender.

Table 3.5. *Total casualties by gender and age group*

Age Group	Male	%	Female	%	Total	%
Under 16[1]	1	0.2	2	1.1	3	0.4
16-19	80	13.3	19	10.0	99	12.5
20-24	95	15.8	29	15.3	124	15.7
25-29	79	13.1	19	10.0	98	12.4
30-34	73	12.1	24	12.6	97	12.3
35-39	52	8.7	14	7.4	66	8.3
40-44	61	10.1	14	7.4	75	9.5
45-49	42	7.0	12	6.3	54	6.8
50-54	27	4.5	12	6.3	39	4.9
55-59	33	5.5	16	8.4	49	6.2
60-64	21	3.5	10	5.3	31	3.9
65-69	13	2.2	4	2.1	17	2.1
70-74	6	1.0	7	3.7	13	1.6
75-79	12	2.0	5	2.6	17	2.1
80 and over	6	1.0	3	1.6	9	1.1
Total	**601**	**100.0**	**190**	**100.0**	**791**	**100.0**

1 - There were 3 child fatalities resulting from crashes in which adults (16 years or above) were also killed.
2 - In 23 cases, either age or gender was not known.

There was a wide distribution of ages present in the casualties, with a greater number of casualties present in the age groups representing 16 to 34 years with a peak present in the 20 to 24 years age group. Figure 3.1 below presents the population distribution for those aged 16 years or older in rural North Queensland, while Figure 3.2 presents the relative numbers of casualties by gender, across all severities.

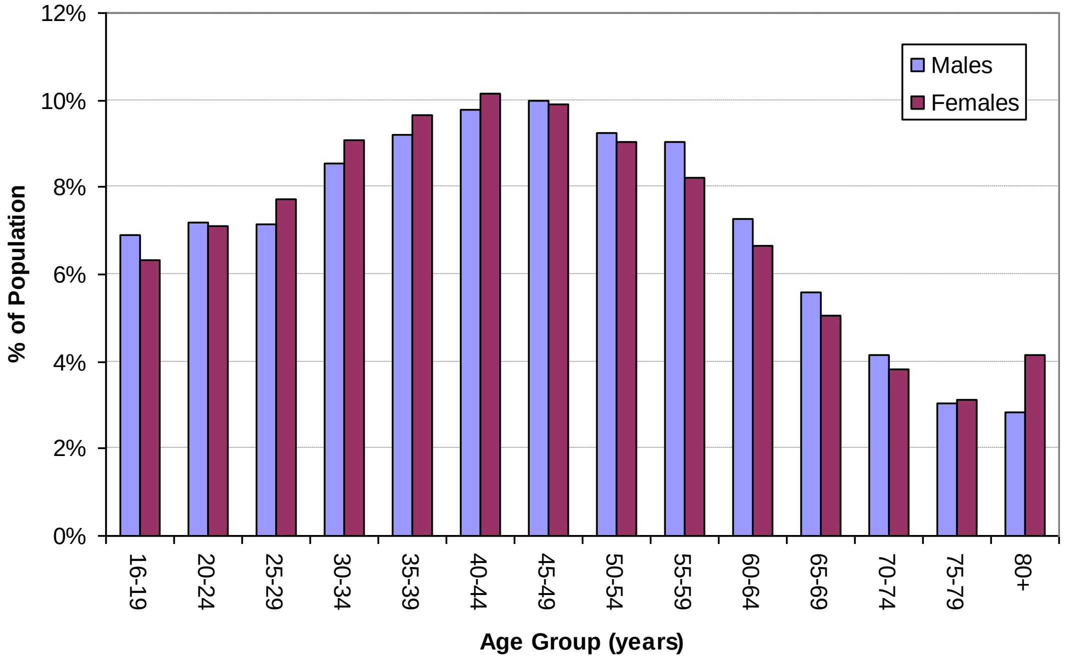


Figure 3.1. Percentage of population greater than 16 years of age, rural North Queensland (ABS data)

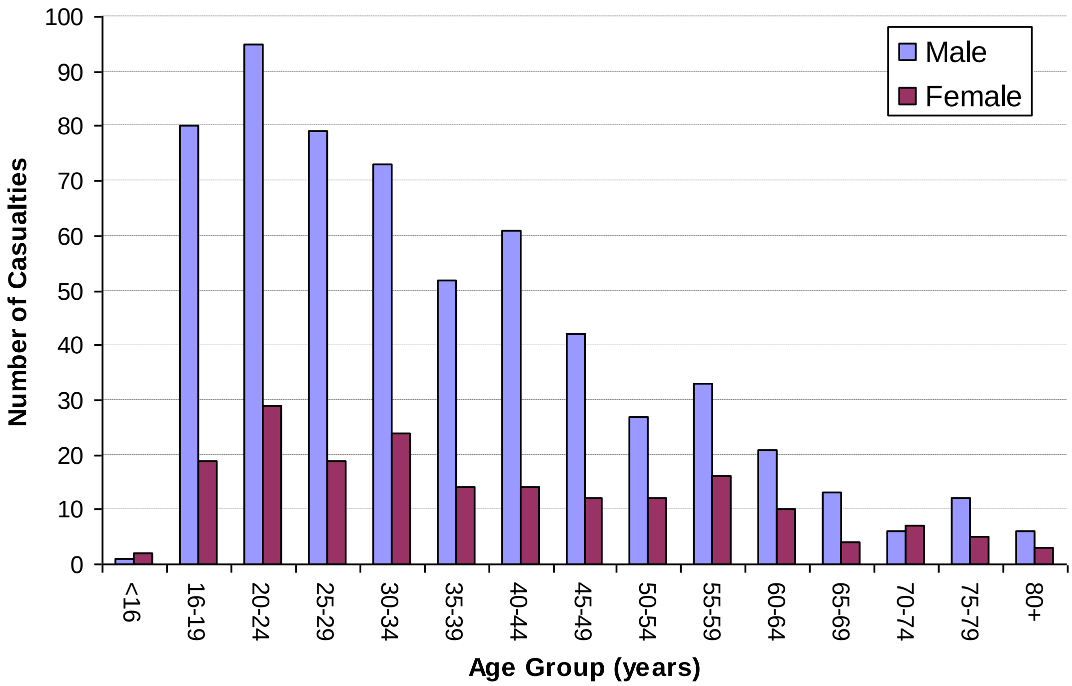


Figure 3.2. Total casualties by gender and age group

Figure 3.3 below presents the distribution of fatalities by gender and age group.

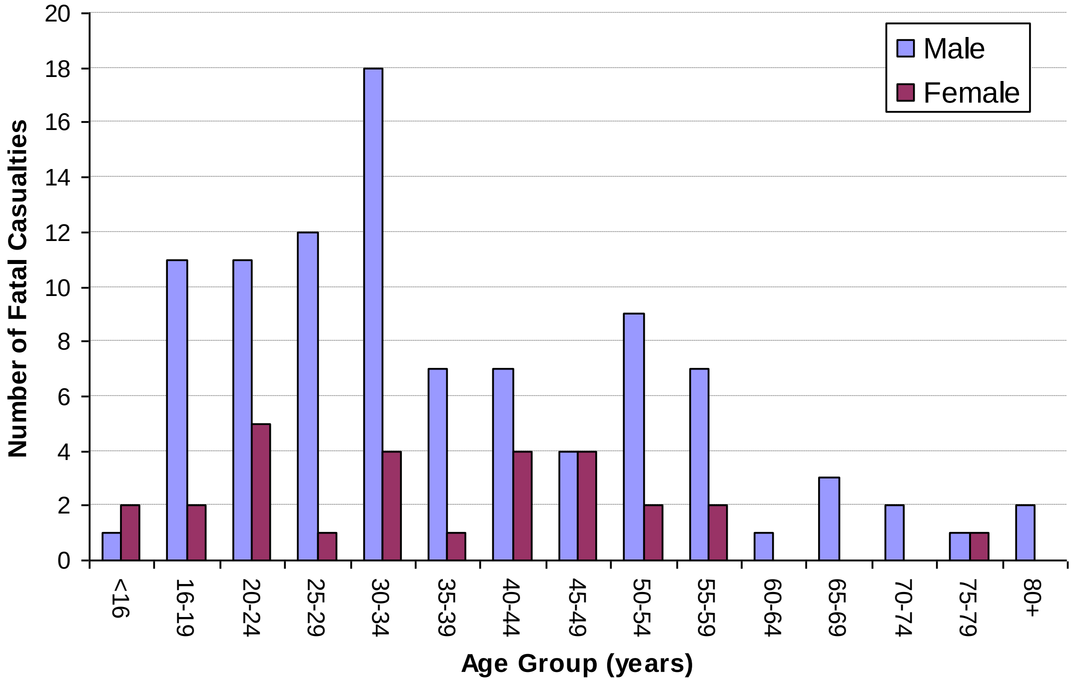


Figure 3.3. Fatal casualties by gender and age group

The Indigenous status of the serious casualties in the study is presented in Table 3.6 below.

Table 3.6. *Total casualties by Indigenous status*

Indigenous status	n	%
Non-Indigenous	744	92.7
Indigenous	88	10.9
Valid Total	**803**	**100.0**
Unknown	11	1.4
Total	**814**	**100.0**

Indigenous people represented 7.3% of those injured. This is compared to 10.8% for the whole population of North Queensland and 16% in the study area specifically (ABS, 2007). However, these population figures may not be representative of the on-road population.

Road user types

Table 3.7 below presents the relative numbers and proportions of different road user types as represented in the total casualties.

Motorcycle riders and car/truck drivers were the most prominently represented road user types, each accounting for a third of all casualties. Passengers represented one in five of all casualties. Pedestrians accounted for 5% of casualties and cyclists 2.5%. Table 3.7 provides more details on the road user type of casualties, grouped by crash severity.

Table 3.7. *Total casualties by road user type and casualty severity*

	Fatalities		Hospitalisations		Total	
Road user type	n	%	n	%	n	%
Car/Truck driver	67	24.9	202	75.1	269	33.5
Pedestrian	9	21.4	33	78.6	42	5.2
Car/Truck passenger	28	17.6	131	82.3	159	19.8
Cyclist	2	10.0	18	90.0	20	2.5
Motorcycle rider	23	8.7	240	91.3	263	32.7
Motorcycle pillion	1	8.3	11	91.7	12	1.5
Cyclist pillion	0	0.0	0	0.0	0	0.0
Quad bike rider	0	0.0	36	100.0	36	4.5
Quad bike pillion	0	0.0	3	100.0	3	0.4
Total	**130**	**16.2**	**674**	**83.8**	**804**	**100**

[1] - The road user type was unknown for 10 casualties.

Car/truck drivers had the highest rate of fatalities at 24.9%, followed by pedestrians at 21.4%. It should also be noted that 44% of motorcycle rider casualties occurred off-road, of which only 1 resulted in a fatality.

Crash data

The following analyses refer to the characteristics and circumstances of the study crashes.

Crash locations

Table 3.8 below presents the number of crashes by the ten most highly represented Statistical Local Areas (SLAs) within the study region. These SLAs accounted for 68% of all crashes with known SLAs during the data collection period. Seven of the SLAs fall within the Far North sub-region.

Table 3.8. *Crashes by 10 most represented SLAs*

10 most represented SLAs	n	%
1. Mareeba[1]	87	12.1
2. Cook (excl. Weipa) [1]	63	8.8
3. Douglas[1]	60	8.4
4. Dalrymple incl. Charters[1]	43	5.9
5. Mount Isa[3]	41	5.7
6. Atherton[1]	39	5.4
7. Johnstone[1]	34	4.7
8. Herberton[1]	33	4.6
9. Bowen[2]	31	4.3
10. Cardwell[1]	30	4.2
10. Eacham[1]	30	4.2
…		
Valid Total	**717**	**100.0**
Unknown	15	1.4
Total	**732**	**100.0**

[1] - Far North Queensland
[2] - Northern Queensland
[3] - North-West Queensland

Table 3.9 below presents the rates of serious and fatal crashes per 100,000 daily vehicle-kilometres for lengths of state-controlled road within the study region. Denominators were calculated from average Department of Main Roads daily vehicle counts along each road segment multiplied by the length of the road segment in kilometres, then scaled. Note that the 95% Confidence Intervals (95% CI) are calculated from numerators only, ignoring the variability in the denominators. The three highest rates arise from the same road network – the Hervey Range Development Road links to the Lynd Highway/Development Road at Battery, then to The Lynd where the Kennedy Highway Development Road intersects.

Table 3.9. *Crash risk for roadway lengths*

Road name	Dist. (km)	Crashes	Fatal	Rate (All)	95% CI	Rate (Fatal)
Bruce						
Bowen – Ayr	116	15	5	4.7	2.6 - 7.8	1.6
Ayr – Townsville	74	13	3	7.6	4.0 - 12.9	1.7
Bowen – Townsville	*190*	28	8	5.7	3.8 - 8.3	1.6
Townsville – Ingham	88	11	3	4.7	2.3 - 8.4	1.3
Ingham – Innisfail	145	29	13	9.1	6.1 - 13.1	4.1
Innisfail – Cairns	65	13	3	6.2	3.3 - 10.7	1.4
Townsville – Cairns	*298*	*53*	*19*	*7*	*5.2 - 9.0*	*2.5*
Captain Cook Highway						
Cairns – Mossman	41	21	5	18.5	11.4 - 28.2	4.4
Flinders Highway						
Townsville – C. Towers	120	10	4	7.3	3.5 - 13.4	2.9
C. Towers – Hughenden	248	6	0	7.6	2.8 - 16.6	0
Hughenden – Richmond	117	2	1	4.9	0.6 - 17.8	2.4
Richmond – Julia Creek	153	2	0	7.8	0.9 - 28.3	0
Julia Creek – Cloncurry	140	1	0	2	-	0
Townsville – Cloncurry	*778*	*21*	*5*	*6.3*	*3.9 - 9.6*	*1.5*
Hervey Range Development Road						
Townsville – Battery[1]	104	8	2	43.3	18.5 - 78.6	10.8
Barkly Highway						
Cloncurry – Mt Isa	121	7	2	7.4	3.0 - 15.2	2.1
Mt Isa – Border	203	9	1	9.2	4.2 - 17.5	1
Cloncurry – Border	*324*	*16*	*3*	*8.3*	*4.8 - 13.5*	*1.6*
Landsborough Highway						
Kynuna – Cloncurry	185	0	-	-	-	-
Winton – Kynuna	165	0	-	-	-	-
Kennedy Highway/Development Road						
Cairns – Mareeba	45	15	2	22.4	12.5 - 36.9	3
Mareeba – Ravenshoe	85	10	0	7.9	3.8 - 14.4	0
Ravenshoe – Mt Garnet	44	4	3	21.1	5.7 - 53.9	15.8
Mt Garnet – Lynd Junction	164	6	3	31.3	11.5 - 68.0	15.6
Lynd Junction – Hughenden	267	2	0	32.8	3.9 - 118.4	0
Hughenden – Winton	213	2	0	10.3	1.2 - 37.2	0
Mareeba – Winton	*773*	*24*	*6*	*12.6*	*8.1 - 18.7*	*3.1*
Ravenshoe – Winton	*688*	*14*	*6*	*22.0*	*12.0 - 36.9*	*9.4*
Gillies Highway						
Gordonvale – Atherton	50	13	2	30.7	16.4 - 52.6	4.7
Palmerston Highway						
Innisfail – Ravenshoe	88	2	0	3.5	-	0

Development Roads – Peninsula						
Mareeba – Mt Molloy	40	3	0	8.1	1.7 - 23.6	0
Mt Molloy – Laura	207	5	3	12.9	4.2 - 30.0	7.7
Laura – Coen	245	3	1	15.6	3.2 - 45.7	5.2
Mareeba – Coen	*492*	*11*	*4*	*11.6*	*5.8 - 20.7*	*4.2*
Bowen						
Bowen – Collinsville	86	1	0	3.0	-	-
Collinsville – Mt Douglas	176	0	-	-	-	-
Burke						
Cloncurry – Normanton	383	2	1	6.8	0.8 - 24.7	3.4
Normanton – Dimbulah	645	4	1	10.4	2.8 - 26.7	2.6
Cloncurry – Dimbulah	*1028*	*6*	*2*	*8.9*	*3.3 - 19.3*	*3.0*
Cooktown						
Cooktown – Butcher Hill	75	2	1	6.3	-	3.2
Gregory Crossing						
Belyando Xing – C. Towers	204	3	1	8.3	1.7 - 2.2	2.8
C. Towers – Lynd Junction	252	2	1	3.9	0.5 - 14.1	2.0
Lynd Junction – Quartz Blow Ck	118	0	-	-	-	-
Gulf						
Normanton – Croydon	154	1	0	9.9	-	0
Croydon – Georgetown	148	2	1	14.2	1.7 - 51.2	7.1
Georgetown – Mt Garnet	215	2	1	8.0	1.0 - 29.0	4.0
Normanton – Mt Garnet	*517*	*5*	*2*	*10.2*	*3.2 - 23.8*	*4.1*
Wills						
Julia Creek – Burketown	498	1	1	5.6	-	5.6
Total		**232**	**64**	**8.4**	**7.4 - 9.5**	**2.3**

[1] - Includes 11.6 km of road forming the boundary of Thuringowa Part A; 4 of the 8 crashes were along this stretch.

Further analyses were conducted to examine the locations where different vehicle types were being used at the point of the crash.

Table 3.10. *Crash area type of all crashes*

Crash area type	n	%
Public road	532	77.8
Private property	124	18.1
Public land	28	4.1
Valid Total	**684**	**100.0**
Unknown	48	6.6
Total	**732**	**100.0**

The majority of crashes occurred on-road (i.e. public roads), though as noted earlier, particular vehicle types such as motorcycles were highly represented in areas other than public roads. Figure 3.4 below presents the percentage of crashes constituted by each vehicle type within each crash area type.

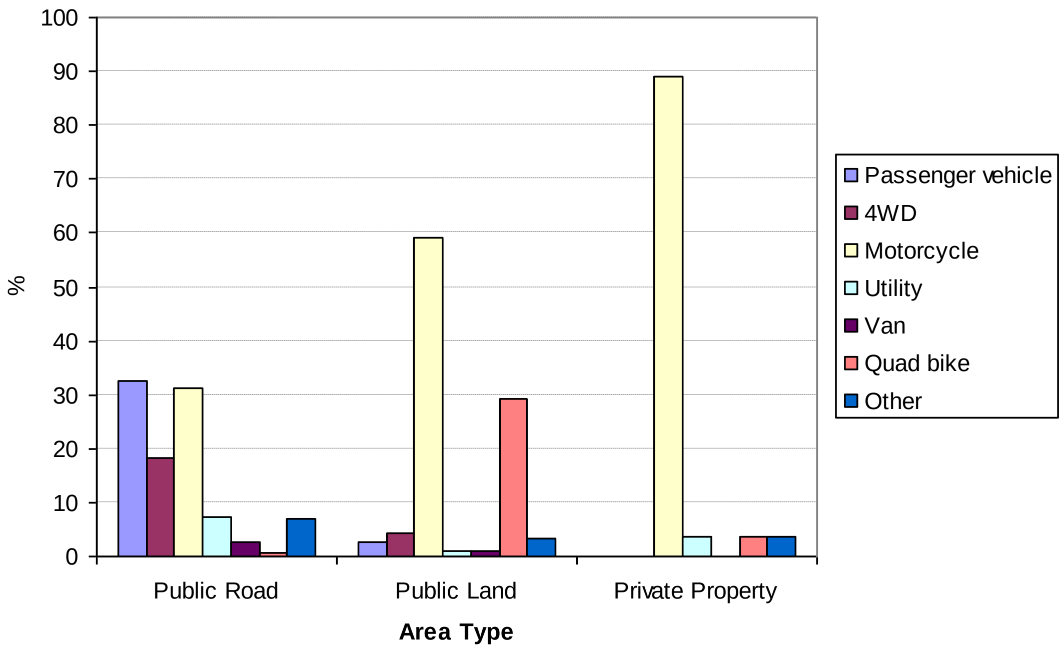


Figure 3.4. Crash vehicle type by crash location

There was also an interaction present between the road user type and the location of the crash, with passenger vehicles and 4WDs predominant on public roads. Motorcycles were highly represented on public roads, but constituted the vast majority of road users on private property. Quad bikes crashes were also represented highly in locations other than public roads.

Using mapping data for 708 crashes, it was determined that 9% (64) of all crashes occurred within a 2 km radius of RRMAs classified 5 and 6 rural centres within the study area. These included Mt Isa (21 crashes), Mareeba (10 crashes) and Ayr (5 crashes). In terms of road user types, pedestrians and motorcyclists were the most represented vehicle types in these near built-up areas. Nearly half of all hit-pedestrian crashes occurred within these areas.

Table 3.11. *Crash type of crashes occurring within 2 km radius of rural centres*

Road user type	n	%
Motorcycle	21	32.8
Pedestrian	20	31.3
Car/Truck	18	28.1
Bicycle	5	7.8
Total	**64**	**100.0**

Crash type

Table 3.12 below presents the total crashes in the study broken down by the crash type. Single vehicle crashes account for three-quarters of all crashes recorded during the data collection period.

Table 3.12. *Crash type*

Crash type	n	%
Single vehicle	543	75.1
Two vehicle	120	16.6
Hit pedestrian	42	5.8
Multiple vehicles	13	1.8
Fell from vehicle	5	0.7
Valid total	**723**	**100.0**
Unknown	9	1.2
Total	**732**	**100.0**

Time of crash

Different levels of analysis are presented below in regard to the numbers of crashes occurring each month, day of week, and hour of day. The total number of crashes for each month since the start of the study in March 2004 through until the end of June 2007 is presented below in Figure 3.5.

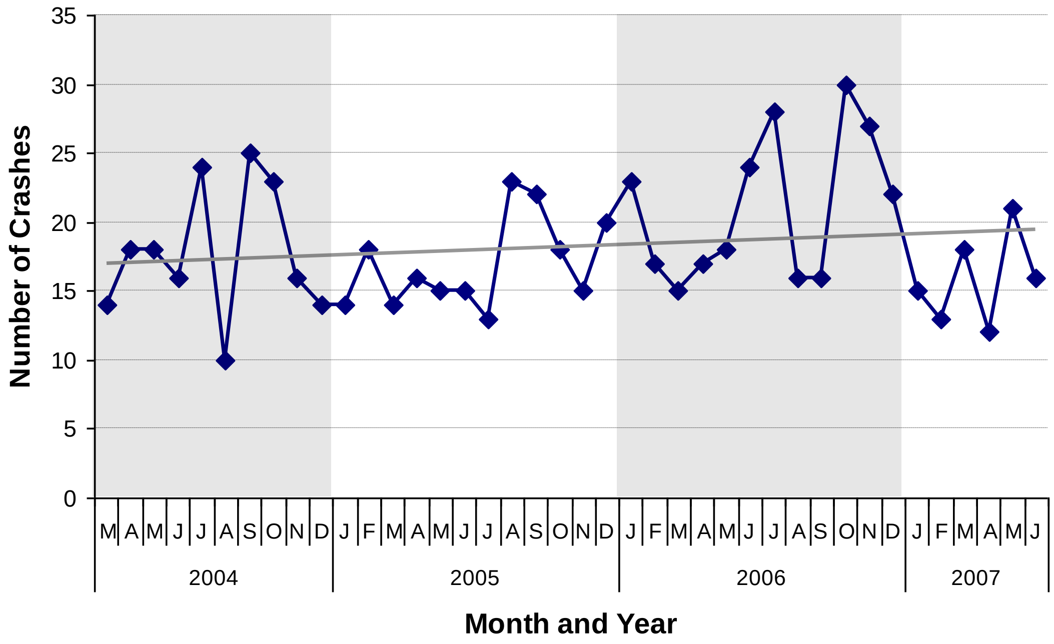


Figure 3.5. Numbers of crashes by month and year, March 2004–June 2007

As can be seen, a relatively steady number of crashes occurred from month to month across the entire period of the study. Figure 3.6 below presents these monthly crash figures looking at the comparative trends across each study year.

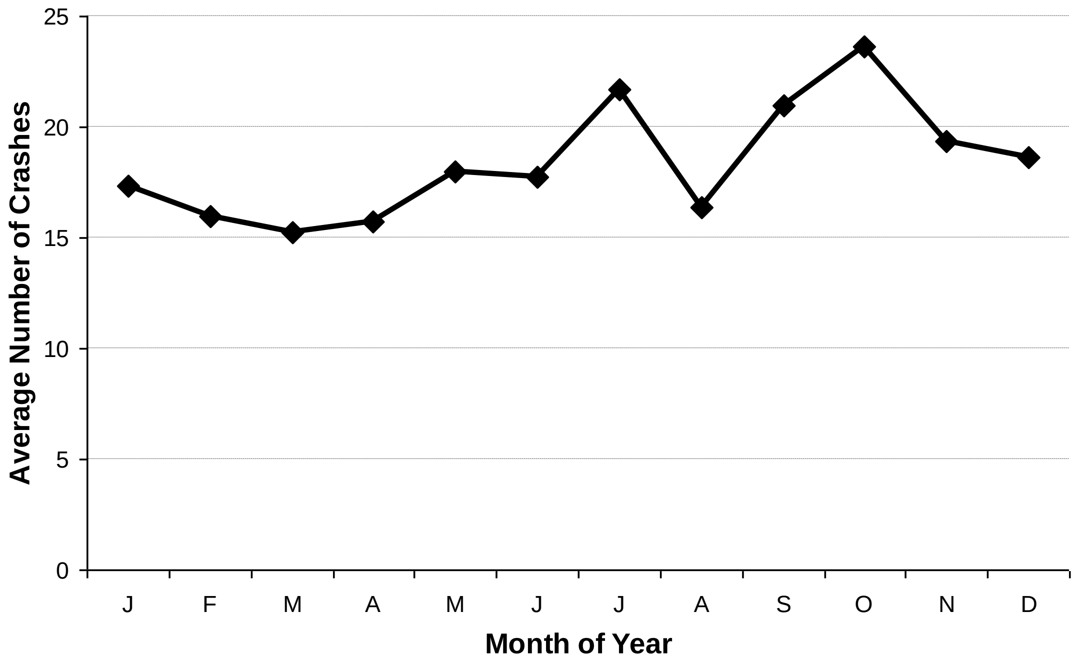


Figure 3.6. Numbers of crashes by month for each year, March 2004–June 2007

A trend was present in that crashes generally showed a larger degree of variability between July and December. Peaks in crashes were found in the months of July and October.

Table 3.13. *Total crashes by day of week*

Day of week	n	%
Sunday	142	19.5
Monday	77	10.6
Tuesday	81	11.1
Wednesday	86	11.8
Thursday	88	12.1
Friday	104	14.3
Saturday	151	20.7
Valid Total	**729**	**100.0**
Unknown	3	0.4
Total	**732**	**100.0**

Crashes occurring across the two days of the weekend accounted for 40% of all crashes. The weekdays of Monday to Thursday were consistent in their contribution, representing between 11 and 12% of all crashes. A slight increase to 14.6% was present leading into the weekend on Friday. A more detailed analysis of the number of crashes per 6 hour block across the week is shown below in Figure 3.7.

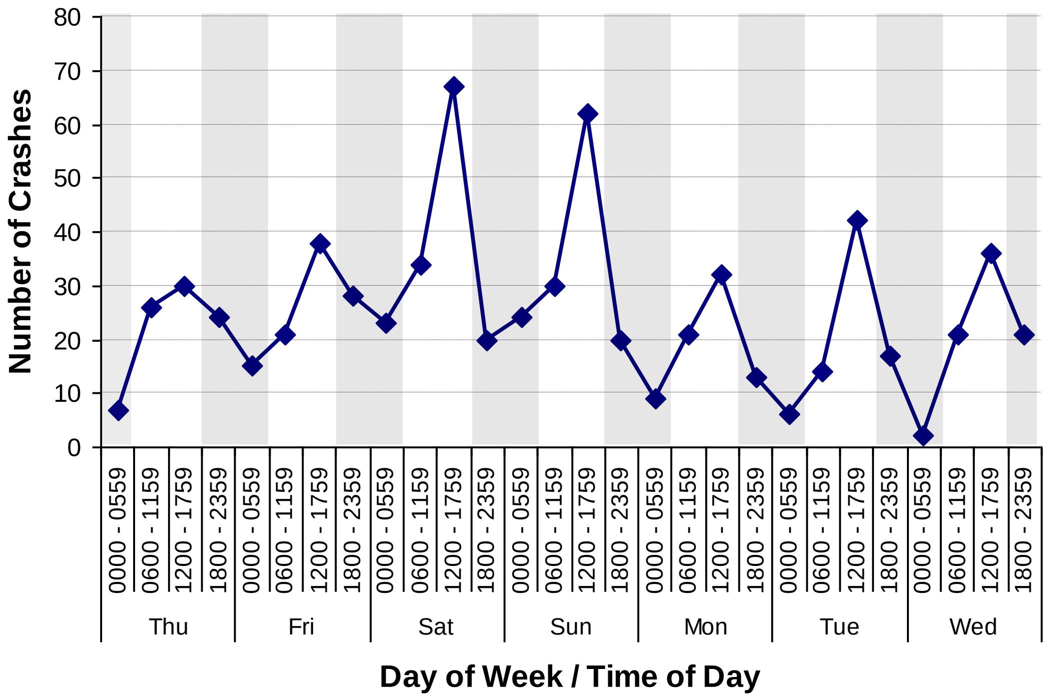


Figure 3.7. Numbers of crashes by day of week and time of day

Figure 3.8 below depicts the relationship between the relative proportions of serious study crashes, hospitalisation crashes and traffic volume in the North Queensland region across the week.

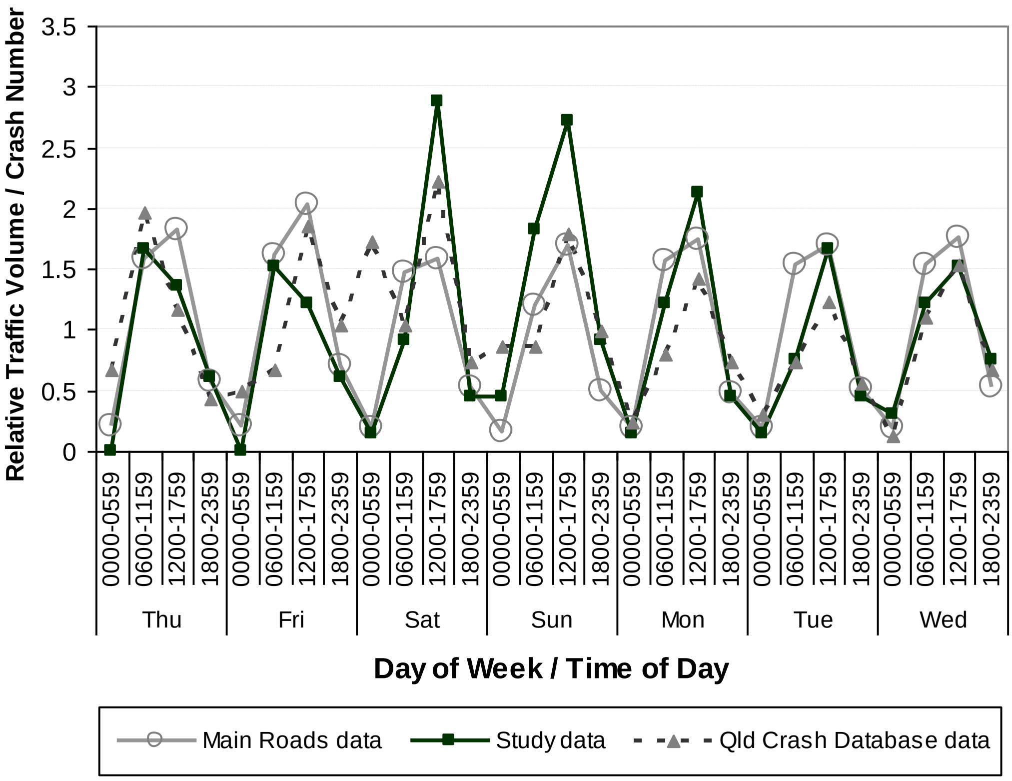


Figure 3.8. Relative proportions of crashes and traffic volume by day of week and time of day

Environmental crash risk factors

The information presented below is taken from police reports of on-road vehicle crashes, for a total of 414 matched crashes.

Table 3.14. *Police-reported crashes by roadway feature*

Roadway feature	n	%
No roadway feature	339	81.9
T-junction	39	9.4
Crossroad	17	4.1
Bridge/Causeway	9	2.2
Roundabout	4	1.0
Railway crossing	4	1.0
Forestry/National Park Road	2	0.5
Total	**414**	**100.0**

Roughly four out of every five crashes occurred on a stretch of road with no roadway feature present.

Table 3.15. *Police-reported crashes by traffic control present*

Traffic control	n	%
No traffic control	385	93.0
Give-way	19	4.6
Stop sign	4	1.0
Railway – lights only	2	0.5
Pedestrian crossing	2	0.5
Flashing amber traffic lights	1	0.2
Police	1	0.2
Total	**414**	**100.0**

Likewise, the vast majority of crashes had no traffic control present.

Table 3.16. *Police-reported crashes by traffic control present*

Roadway surface	n	%
Sealed – Dry	311	75.5
Unsealed – Dry	47	11.4
Sealed – Wet	46	11.2
Unsealed – Wet	8	1.9
Total	**412**	**100.0**
Unknown	2	0.5
Total	**414**	**100.0**

About 13% of the roads where crashes occurred were wet, with 13% being unsealed. However, over three quarters of the crashes occurred on both dry and sealed roadways.

Table 3.17. *Police-reported crashes by lighting condition*

Lighting condition	n	%
Daylight	251	61.1
Darkness – unlighted	113	27.5
Dawn/Dusk	24	5.8
Darkness – lighted	23	5.6
Total	**411**	**100.0**
Unknown	3	0.7
Total	**414**	**100.0**

The majority of crashes also occurred during daylight conditions, though a notable 33% occurred in darkness.

Table 3.18. *Police-reported crashes by atmospheric condition*

Atmospheric condition	n	%
Clear	369	89.1
Raining	37	8.9
Fog	4	1.0
Smoke/Dust	4	1.0
Total	**414**	**100.0**

Nearly 90% of the crashes occurred during clear weather, with the majority of remaining crashes occurring during rain.

Table 3.19. *Police-reported crashes by horizontal alignment of roadway*

Horizontal alignment	n	%
Straight	249	60.1
Curved – view open	107	25.8
Curve –view obscured	58	14.0
Total	**414**	**100.0**

Table 3.20. *Police-reported crashes by vertical alignment of roadway*

Vertical alignment	n	%
Level	290	70.0
Grade	74	17.9
Crest	26	6.3
Dip	24	5.8
Total	**414**	**100.0**

The alignment of the road surface was more often than not straight and level.

Table 3.21. *Police-reported crashes by prevailing speed zone*

Speed limit (km/h)	n	%
≥100	252	60.9
70-90	70	16.9
≤60	92	22.2
Total	**414**	**100.0**

Just over 60% of the crashes occurred in speed zones of 100 km/h or more, while nearly a quarter occurred in 60 km/hr zones.

Analyses were conducted on available police-reported casualty data to ascertain the potential relationship between casualty severity and use of restraints or helmets. The results are presented below in Table 3.22.

Table 3.22. *Police-reported casualties by injury severity and protective equipment use*

	Fatality		Hospitalisation	
Protective equipment	n	%	n	%
Seatbelt				
Worn	40	47.1	159	65.9
Not worn	28	32.9	27	11.2
Unknown	17	20.0	55	22.8
Total	**85**	**100.0**	**241**	**100.0**
Helmet				
Worn	17	73.9	78	87.6
Not worn	2	8.7	6	6.7
Unknown	4	17.4	5	5.6
Total	**23**	**100.0**	**89**	**100.0**

The results presented above suggest that those fatally injured in a crash were substantially more likely to not be wearing a seatbelt. Although a slightly higher proportion of non-use of helmets was noted in those fatal casualties, this was not a significant difference.

Police-reported crash unit level data

The data presented below relates to the 592 crash units, vehicles or non-motorised road users such as pedestrians and cyclists, involved in crashes reported to police (which includes units from which no serious casualty was recorded). Thus, this data takes into account the characteristics and actions of all vehicles, drivers and road users involved in serious study crashes, regardless of at-fault status or resulting injuries.

The licence status of controllers of vehicles was noted in these reports and is presented below in Table 3.23. This licensing data does not include road user types such as pedestrians and cyclists as they do not have any licensing requirement. As can be seen, approximately 10% of all controllers' vehicles involved in these serious crashes were unlicensed, of which the greatest proportions were found in the 'cancelled/disqualified' and 'never held a licence' sub-categories. Provisional licence holders represented a similar proportion – just under 10% of all controllers of vehicle units. Learner drivers were rarely involved, representing just 3%.

Table 3.23. *Police-reported crash units by unit controller's licence status*

Licence status	n	%
Licensed	454	76.7
Open	*384*	*64.9*
Provisional	*55*	*9.3*
Learner	*15*	*2.5*
Unlicensed	55	9.3
Cancelled / Disqualified	*18*	*3.0*
Never held a licence	*13*	*2.2*
Inappropriate class	*5*	*0.8*
Expired	*3*	*0.5*
Other unlicensed	*16*	*2.7*
Not licensed Australia	16	2.7
Not known	28	4.7
Total	**592**	**100.0**
Not applicable	39	-

Data is presented below regarding the crash contributing circumstances for the 592 units, vehicles or non-motorised road users, such as pedestrians and cyclists, involved in crashes reported to police (which includes units from which no serious casualty was recorded).

Table 3.24. *Police-reported crash units by presence of alcohol*

Alcohol	n	%
Attributed[1]	105	17.7
Not attributed	487	82.3
Total	**592**	**100.0**

[1] - 'Condition - Under influence of liquor/drug'
'Violation - Over prescribed concentration of alcohol'

Table 3.25. *Police-reported crash units by BAC >.05*

Drink driving (BAC > .05)	n	%
Attributed[1]	77	13.0
Not attributed	515	87.0
Total	**592**	**100.0**

[1] - 'Violation - Over prescribed concentration of alcohol'

Nearly a fifth of all units involved a controller influenced by alcohol, with the majority of these instances being controllers with a BAC of greater than 50 mg/100 ml.

Table 3.26. *Police-reported crash units by speeding involvement*

Speeding related	n	%
Attributed[1]	57	9.6
Not attributed	535	90.4
Total	**592**	**100.0**

[1] - 'Excessive speed for circumstances'
'Violation - Exceeding speed limit'

Table 3.27. *Police-reported crash units by travelling over the posted speed limit*

Travelling over speed limit	n	%
Attributed[1]	14	2.4
Not attributed	578	97.6
Total	**592**	**100.0**

[1] - 'Violation - Exceeding speed limit'

Approximately 10% of units were noted with speed as a contributing factor to a crash. However, only 2% were noted as travelling at a speed over the posted speed limit.

Table 3.28. *Police-reported crash units by involvement of road condition*

Any road conditions	n	%
Attributed[1]	76	12.8
Not attributed	516	87.1
Total	**592**	**100.0**

[1] - 'Road - Gravel/dirt'
'Road - Narrow'
'Road - Potholes'
'Road - Rough shoulder(s)'
'Road - Rough surface'
'Road - Temporary object on carriageway'
'Road - Water covering'
'Road - Wet/Slippery'
'Road conditions - Miscellaneous'

Road conditions were noted as a contributing factor for 13% of all crash units.

Table 3.29. *Police-reported crash units by involvement of fatigue*

Fatigue related	n	%
Attributed[1]	75	12.7
Not attributed	517	87.3
Total	**592**	**100.0**

[1] - 'Driver - Fatigue/Fell Asleep'
'Driver - Fatigue Related by Definition'

Table 3.30. *Police-reported crash units by identified fatigue*

Fatigue/Fell Asleep	n	%
Attributed[1]	27	4.6
Not attributed	565	95.4
Total	**592**	**100.0**

[1] - 'Driver - Fatigue/Fell Asleep'

Table 3.31. *Police-reported crash units by involvement of distraction/inattention*

Distraction/Inattention	n	%
Attributed[1]	143	24.2
Not attributed	449	75.8
Total	**592**	**100.0**

[1] - 'Driver - Distracted'
'Violation - Undue care and attention'
'Driver - Inattention / Negligence'

Table 3.32. *Police-reported crash units by involvement of vehicle factors*

Vehicle factors	n	%
Attributed[1]	15	2.5
Not attributed	577	97.5
Total	**592**	**100.0**

[1] - 'Vehicle defects - Miscellaneous'
'Vehicle - Tyres (i.e. low tread; puncture/blow out)'
'Vehicle - Load shift'
'Vehicle - Lights (headlights/tail lights)'
'Lighting - Headlights off/no lights on vehicle'

Table 3.33. *Police-reported crash units by involvement of road rule violations*

Road rule violation	n	%
Attributed[1]	82	13.9
Not attributed	510	86.1
Total	**592**	**100.0**

[1] - 'Violation - Fail to keep left'
'Violation - Turn in face of oncoming traffic'
'Violation - Improper overtaking'
'Violation - Illegally parked'
'Violation - Fail to give way on pedestrian crossing'
'Violation - Fail to give way'
'Violation - Disobey traffic sign'
'Violation - Disobey red traffic light'
'Violation - Disobey give way sign'
'Violation - Cross double line'

Table 3.34. *Police-reported crash units by involvement of atmospheric conditions*

Atmospheric condition	n	%
Attributed[1]	30	5.1
Not attributed	562	94.9
Total	**592**	**100.0**

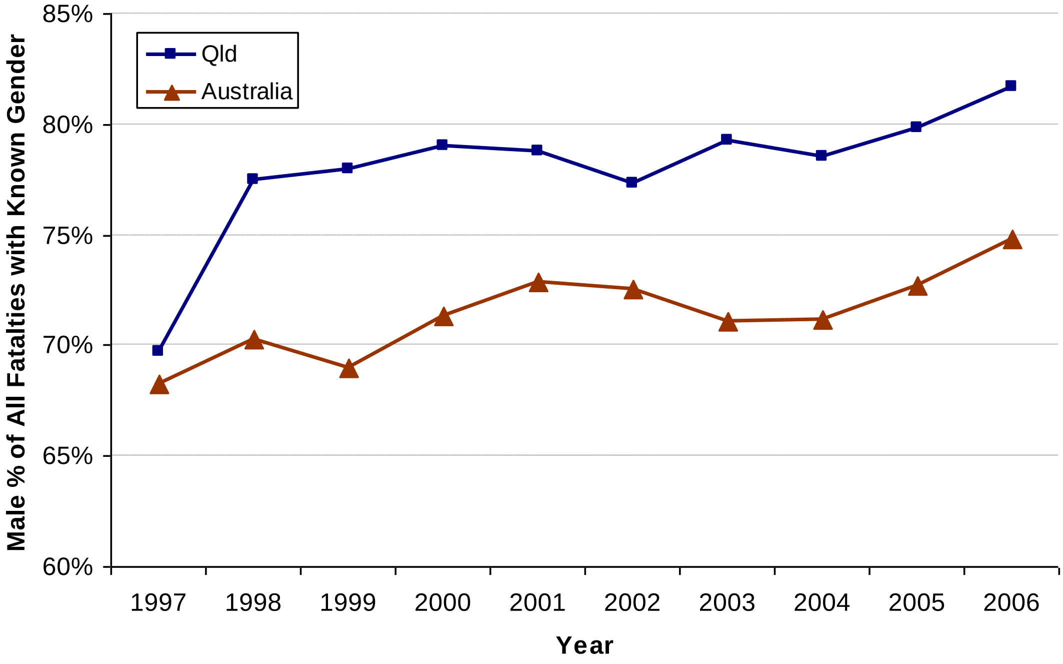
[1] - ‘Lighting conditions - Miscellaneous’
‘Lighting conditions - Sunlight glare (Dawn/dusk/reflection)’
‘Lighting conditions - Wearing dark clothing’
‘Lighting conditions - Not attributed street lighting’
‘Atmospheric conditions - Miscellaneous’
‘Atmospheric conditions - Heavy rain’
‘Atmospheric conditions - Fog’
‘Atmospheric conditions - Dust’

Discussion

This chapter presented an overview of the characteristics of the serious crashes within the North Queensland region and basic details of those casualties involved in the crashes. There were a substantial number of serious crashes during the study period, March 2003 through June 2007 inclusive, averaging just over 18 crashes a month for a total of 732 crashes resulting in 814 casualties. A total of 130 fatalities from 119 fatal crashes was also noted. A number of findings and trends which provide a profile of rural crashes were noted.

Demographic characteristics

Males were represented highly among all casualties and fatalities. Similar proportions were noted within both serious and fatal crashes at a rate of 3 males to every 1 female casualty. The vast overrepresentation of males in road crashes has been consistently noted and there is no indication that the proportion of males found in the current study is any different from previous studies. In fact, the proportion of fatalities which are male in both Queensland and Australia as a whole has remained relatively constant for many years.



Source: Queensland Transport (2007); Australian Transport Safety Bureau (2007).

Figure 3.9. Proportion of fatalities with known gender that are male, Queensland and Australia, 1997-2006

As can be seen in Figure 3.9, males have constituted around 70% of all road crash fatalities in Australia over the last 10 years (with the exception of 1997). This rate has been consistently 5 to 9% higher in Queensland over this same period.

Those in the age groups 16-19 and 30-34 years contributed the majority of all casualties and fatalities, with the latter group contributing the highest proportion of fatalities. This may well be a reflection of both a greater exposure to vehicle use and a greater tendency towards risky behaviour.

Indigenous status

The proportion of Indigenous casualties recorded was lower than the overall population proportion for the region. However, there are several possible interpretations for this result. Firstly, it has been thought that Indigenous people may not feel at ease being admitted to a major hospital (Moller, Thomson & Brooks, 2003). While this may be the case for minor injuries, the current study's review of hospital charts indicated that all seriously injured surviving road crash casualties were transferred to one of the major catchment hospitals, namely Townsville or Cairns base hospitals.

Secondly, the 'officially recorded' proportion of the population may not be a true representation of the vehicle-using population of Indigenous persons. Indeed, the roadside surveys conducted as part of this study (see Chapter 5) indicate a lower proportion of Indigenous drivers in North Queensland at 4.6%. The Queensland Indigenous Licensing Project has likewise indicated that "*as at June 2006, the average licence ownership rate per licence-eligible population in predominantly*

Indigenous LGAs was 41.3%. In stark contrast the average licence ownership rate per licence-eligible population in predominantly non-Indigenous LGAs was 92.1%" (Edmonston, 2007).

Lastly, in cases where no interview was conducted, Indigenous status was often collected from hospital sources. However, indications from medical staff are that Indigenous status is routinely asked and noted on documentation at the time of admission (Personal Communication, R Turner, 2008).

Road user types

While it was expected that car and truck drivers as a combined group would represent a significant proportion of all road users involved in serious crashes, motorcyclists also represented a comparable proportion. This is despite their clearly lower representation among the vehicle fleet. Queensland Transport vehicle registrations for rural areas of North Queensland note motorcyclists as constituting only 4.5% of all vehicles registered for on-road use (CARRS-Q, 2006). This does not take into account that approximately half of the injured motorcycle casualties occurred in an off-road setting. There are, however, no similar registration or exposure statistics for off-road riding that can be used as a baseline measure. However, it is clear from the findings of the current study, that at a minimum on-road motorcycle riders are associated with a high risk of serious injury for their relative amount of road use. This has been noted previously in regard to research on a national level, with the relative risk of a motorcycle fatality being 29 times higher for motorcyclists than those in a passenger vehicle (ATSB, 2002).

While pedestrians constituted only just over 5% (n=42) of all casualties, nine of these cases were fatalities. This again highlights the greater probability of serious injury among these vulnerable road user groups.

Relative road length risks

The analysis of relative serious crash risks for road lengths identified a number of roads within the Far North region as having the highest relative risks. Particularly, the Kennedy Highway/Development Road stretches showed high risk relative to the number of vehicles using these routes and road length. That is, while the Bruce Highway was the site of many crashes, this highway also carries a relatively large amount of traffic in the North Queensland region.

Off-road crashes

The presence of a significant proportion of off-road crashes (>20%) is worth noting in the current context. Little information is available on the characteristics, nature and circumstances surrounding off-road crashes. While a wealth of research has examined All Terrain Vehicle crashes, particularly among paediatric casualties, it is only recently that the number of injuries resulting from such crashes has been highlighted (e.g. Meuleners, Lee & Haworth, 2007).

A related project is currently in progress to specifically assess injuries occurring to off-road riders of both motorcycles and All-Terrain Vehicles in the North Queensland region. This project will review the off-road riding injury data collected within the current study; analyse Queensland and Australian hospital data, and survey riders within North Queensland. Possible interventions to reduce injury will be put forward as a result of this study.

In-town crashes

Few of the total crashes (9%) were found to occur in the immediate vicinity of a rural town. This is to be expected given the generally higher travelling speeds and greater vehicle kilometres travelled outside of these centres. However, the built-up area within the town centres was associated with nearly half of the hit-pedestrian incidents, presumably a function of the greater exposure of pedestrians to traffic flow in these areas.

Crash type

The clearest finding from the analysis of crash types was that three-quarter of crashes were single vehicle incidents. This is in direct contrast to previous focus group discussions which have tended to blame the ‘other road user’ for the incident. The predominance of single vehicle crashes has been a regularly noted fact in regard to rural as opposed to urban crashes. The relatively low traffic density of rural areas provides a partial explanation for this finding.

Temporal factors

The number of crashes occurring across each month of the year was relatively steady, though increases were generally seen in July and between September and October. Potentially, the greater on-road population due to school holidays in these months may be in part responsible for the increase in crashes. These months are peak tourist months, not only during school holiday breaks but also more generally as the weather is more equitable. It is also likely that during this time that recreational travel and off-road vehicle use would also increase.

Although increases in traffic during holiday periods has been previously associated with reduced crash risk due to increases in congestion (Van den Bossche, Wets & Brijs, 2006), this may not be the case on North Queensland roads where congestion may be considerably less likely. The impact of increased tourist traffic, if any, may be only to increase traffic rates, as relatively few non-local road-users were involved in serious crashes.

The day of the week of crashes showed a particular trend towards a greater representation on weekends. This is a pattern that has been noted previously both in Australia and internationally.

Time of day analyses showed the greatest representation of crashes during the early afternoon hours between midday and 6 pm. This corresponds to the periods during which road traffic is heaviest.

Overall, the analysis of temporal factors indicates that crashes are often a result of exposure to driving or riding, with the exception of weekend crashes which are considerably higher than rates of vehicle use.

Weekend crashes have been found to be associated with unlicensed drivers (Watson, 1997), an increase in kilometres travelled by males (Ginpil & Attewell, 1994) and an increase in young driver drinking levels (Coulon et al., 1992). Australia-wide fatality statistics similarly indicate that weekend crashes are highly-represented (ATSB, 2007).

Protective equipment use

Fatal casualties were shown to be three times more likely to be unrestrained as opposed to serious hospitalisation casualties. This suggests that seat belts provide protection in terms of preventing serious crashes from resulting in a fatality.

Road environment factors

Data collected in the current study regarding the road environment was only reliably recorded for those crashes reported to police, typically occurring on public roads. Roads with no definable feature or traffic control were present in the overwhelming majority of the crashes in the current study. This may well be a reflection of the fact that the roads within the study area would not commonly have had features such as roundabouts and or traffic signals. Sealed roads constituted just under 90% of all crashes. However, there is no information available in relation to the condition of these sealed roads on which crashes occurred.

Unlicensed road users

The proportion of unlicensed vehicle controllers was in line with previous findings as to their degree of involvement in serious crashes (Watson, 1997; Watson & Steinhardt, 2006; Watson & Steinhardt, 2007). This group has consistently been noted as having an elevated crash risk and a greater presence of risk factors such as alcohol and speeding.

Alcohol

Alcohol was noted in a significant proportion of crashes at around 1 in 5 of the units. It is also worth noting that the majority of those with alcohol detected were over the .05 BAC limit. This highlights again the exponential increase in crash risk associated with an increase in BAC.

Speeding

Speeding was less frequently noted in police reports as compared to the self-report data, and more often than not was noted as specifically to do with an excessive speed for the circumstances rather than an exceeding of the posted speed limit. The large proportion of single vehicle crashes may, however, make the police attribution of exceeding the speed limit difficult. A key point worth noting is that while speeding over the limit is well recognised as an issue, driving to the demands and conditions of the road should continue to be highlighted as well. This also raises the issue of variable speed limits as circumstances change or as road environments alter substantially. Studies of variable speed limits that are reactive to the weather (Rämä, 2001) and seasonal changes (Peltola, 2000) have been shown to be effective in reducing travelling speeds and crash risk while being relatively cost-effective.

Conclusions

- Male drivers and riders should continue to be the focus of intervention, given their high representation among road crash casualties.

- While younger drivers and riders contributed substantially to the total number of casualties, there is a need to recognise that many fatalities and injuries also occur to those aged in their thirties or older.

- Motorcyclists continue to be highly represented among transport injuries in comparison to their relative exposure.

- Identified high risk roads in terms of casualties per vehicle volumes should be focused on as sites for intervention.

- Crashes and injuries occurring from transport use off-road are substantial, but relatively under-researched. Further research should examine such settings.

- Attention should be drawn to the fact that most rural crashes are single vehicle crashes that occur in relatively good conditions. This information should be used to combat the myth of the dangerous 'other driver.'

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4. Interviewed Crash Casualties

This chapter reports on the details of those casualties who were interviewed after admission to one of the study hospitals for 24 hours or more as a direct result of a transport crash. These interviews were conducted to collect additional information regarding the details of the crash, as well as behavioural and attitudinal data for each casualty.

Table 4.1 below presents the total number of interviews conducted by road user type.

Table 4.1. *Summary of interviews by road user type*

Road user type	No.	%
Driver/Rider	307	75.9
Passenger	76	18.8
Pedestrian	11	2.7
Cyclist	10	2.5
Total	**404**	**100.0**

The majority of those interviewed were drivers or riders in control of the vehicle at the time of the crash. Passengers of vehicles constituted 19% of the total interviewees, consisting mostly of passenger vehicles (89%). The remaining 5% of interviews were pedestrians and cyclists.

Table 4.2. *Number of interviewed casualties by crash region*

Region	No.	%
Northern	86	21.3
Far North	242	59.9
North-West	76	18.8
Total	**404**	**100.0**

Table 4.3. *Number of crashes from which interviews were taken by region*

Region	No.	%
Northern	82	21.1
Far North	232	59.8
North-West	74	19.1
Total	**388**	**100.0**

Summary statistics for drivers and riders

The figures below relate to *all* crashes for which an interview was conducted including both on-road and off-road crashes. Later analyses within this chapter provide details separately for each of the on-road and off-road crashes.

Table 4.4. *Crash region of interviewed driver or rider casualty*

Region	No.	%
Northern	67	21.8
Far North	180	58.6
North-West	60	19.5
Total	**307**	**100.0**

Table 4.5. *Crashes from which interviews were taken by region*

Region	No.	%
Northern	66	21.7
Far North	178	58.5
North-West	60	19.7
Total	**304**	**100.0**

Nearly 60% of the total interviews were conducted in the Far North Queensland region, with an approximately even number of the remaining cases interviewed in the Northern and North-West regions.

Table 4.6. *Total interviews by gender*

Gender	No.	%
Male	253	82.4
Female	54	17.6
Total	**307**	**100.0**

As with the high proportion of males represented in the total number of casualties, just over 80% of those interviewed were male. The mean age of those interviewed was 37.9 years (SD =15.5) with the median being 35.0 years.

Table 4.7. *Total interviews by gender and age group*

Age group	Male	%	Female	%	Total	%
16	5	2.0%	0	0.0%	5	1.6%
17	5	2.0%	0	0.0%	5	1.6%
18	7	2.8%	3	5.6%	10	3.3%
19	9	3.6%	2	3.7%	11	3.6%
20	6	2.4%	0	0.0%	6	2.0%
21-24	31	12.3%	7	13.0%	38	12.4%
25-29	32	12.6%	4	7.4%	36	11.7%
30-39	57	22.5%	8	14.8%	65	21.2%
40-49	53	20.9%	11	20.4%	64	20.8%
50-59	24	9.5%	11	20.4%	35	11.4%
60-69	17	6.7%	6	11.1%	23	7.5%
70+	7	2.8%	2	3.7%	9	2.9%
Total	**253**	**100.0**	**54**	**100.0**	**307**	**100.0**

Figures 4.1 and 4.2 below depict the relative age and gender distributions for those casualties interviewed in the current study and the overall population of the North Queensland region.

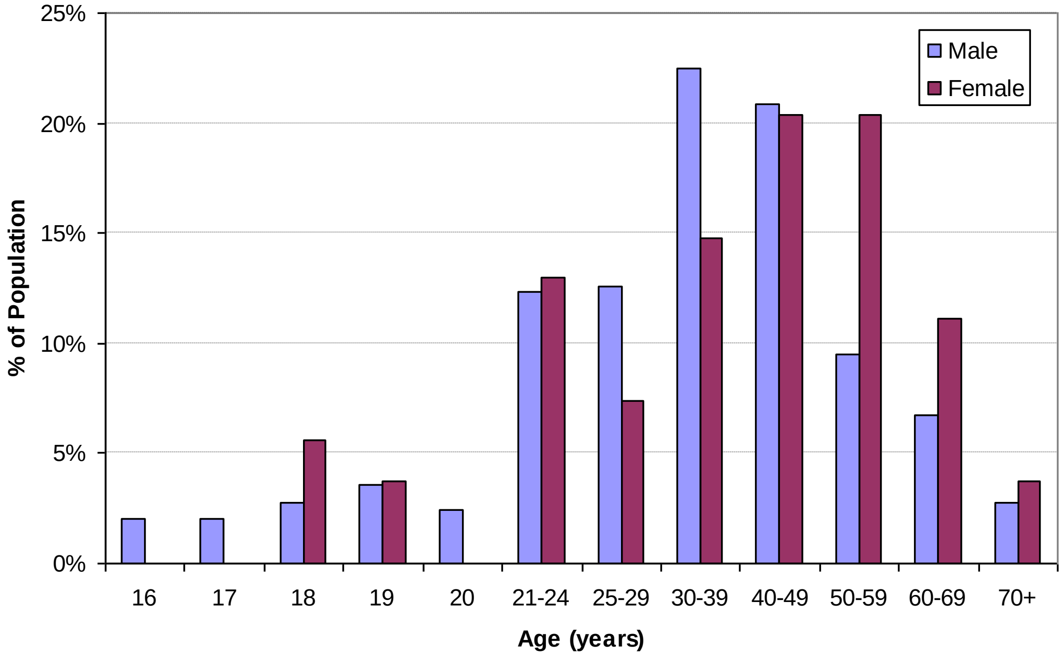

Figure 4.1. Proportion of all crashes within gender by age

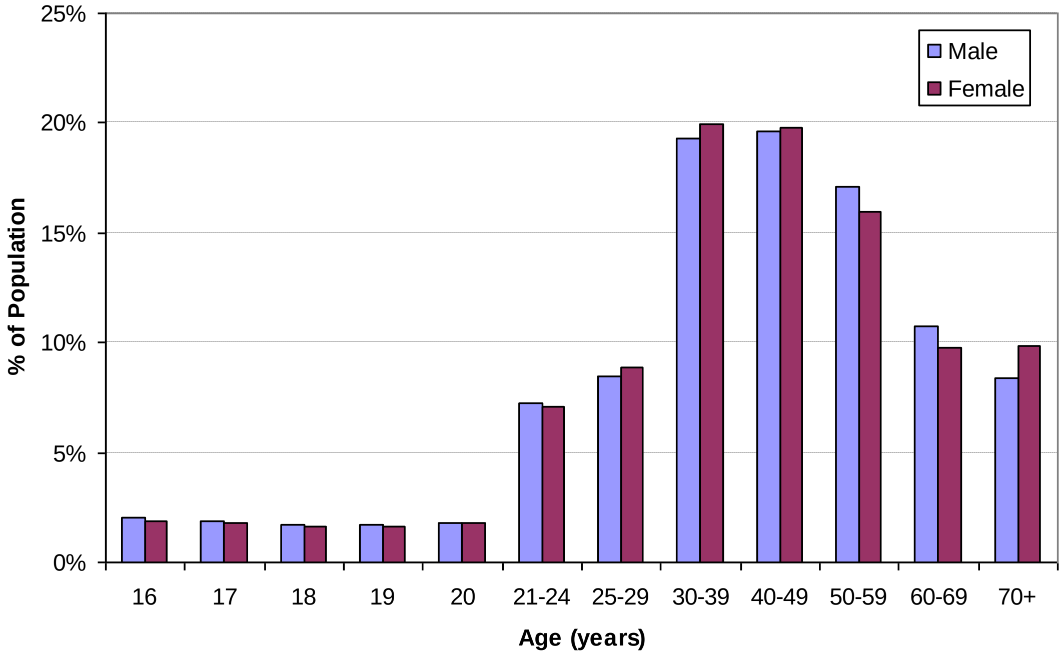

Figure 4.2. Proportion of all North Queensland resident population by gender and age

Compared to the resident population of North Queensland noted as part of the 2006 Census, younger males were represented to a greater degree as those interviewed following a road crash.

Table 4.8. *Total interviews by Indigenous status*

Indigenous status	No.	%
Non-Indigenous	288	94.1
Indigenous	18	5.9
Valid Total	**306**	**100.0**
Unknown	1	0.3
Total	**307**	**100.0**

Indigenous people represented 5.9% of the total sample of drivers and riders interviewed. This is compared to a representation of 10.8% for the whole of North Queensland, with this figure rising to 16% in the rural areas of North Queensland (ABS, 2007).

Table 4.9. *Total interviews by location of normal residence*

Residence	No.	%
North Queensland	244	82.4
Queensland – other areas	23	7.8
Interstate	22	7.4
International visitor	6	2.0
Transient	1	0.3
Valid Total	**296**	**100.0**
Missing	11	3.6
Total	**307**	**100.0**

Over 80% of driver/rider casualties interviewed were residents of North Queensland. Interstate and international drivers and riders represented less than 10% of this group of casualties.

Table 4.10. *Total interviews by time taken for casualty to receive help*

Time to receive help	No.	%
<10 minutes	169	69.3
>10 – 30 minutes	37	15.2
>30 minutes – 1 hour	17	6.9
> 1 hour – 2 hours	5	2.0
> 2 hours – 3 hours	4	1.6
> 4 hours – 6 hours	1	0.4
> 6 hours – 10 hours	3	1.2
Took self to hospital/assistance	8	3.3
Valid Total	**244**	**100.0**
Do not know/missing	63	20.5
Total	**307**	**100.0**

In the context of the interviews, 'help' referred to assistance provided by anyone, including friends and passers-by. This does not specifically refer to the time waited for response by emergency or medical staff. Further details of these response times are presented in Chapter 6. The data does, however, indicate that the majority of those involved in a crash received some form of assistance quickly.

Table 4.11. *Total interviews by driving experience in Australia*

Driving experience	No.	%
1 year or less	28	9.4
> 1 year – 5 years	24	8.0
> 5 years – 10 years	45	15.1
> 10 years – 15 years	35	11.7
> 15 years – 20 years	40	13.4
> 20 years – 25 years	25	8.4
> 25 years – 30 years	26	8.7
> 30 years – 35 years	19	6.4
>35 years – 40 years	24	8.0
> 40 years – 45 years	15	5.0
> 45 years – 50 years	9	3.0
Over 50 years	9	3.0
Valid Total	**299**	**100.0**
Non-resident	7	2.3
Missing	1	0.3
Total	**307**	**100.0**

A median experience of 19 years driving in Australia was found among those interviewed. There was, however, a broad range of experience with driving, with 10%

having a year or less of driving experience while 25% had 30 years or more of experience.

Table 4.12. *Total interviews by driving experience with crash vehicle type in Australia*

Driving experience	No.	%
1 year or less	87	29.0
> 1 year – 5 years	64	21.3
> 5 years – 10 years	45	15.0
> 10 years – 15 years	22	7.3
> 15 years – 20 years	35	11.7
> 20 years – 25 years	8	2.7
> 25 years – 30 years	13	4.3
Over 30 years	26	8.7
Valid Total	**300**	**100.0**
Missing	7	2.3
Total	**307**	**100.0**

A median experience of five years driving the crash vehicle was found.

Table 4.13. *Total interviews – overall driving experience in Australia by experience with crash vehicle type*

	Driving experience in Australia (years)							
Crash veh. exp (years)	1 or less	%	>1 – 5	%	>5 – 10	%	>10	%
1 or less	25	89.3	10	43.5	14	31.8	34	17.2
>1 – 5	3	10.7	12	52.2	16	36.4	33	16.7
>5 – 10	0	0.0	1	4.3	11	25.0	31	15.7
>10	0	0.0	0	0.0	3	6.8	100	50.5
Total	**28**	**100.0**	**23**	**100.0**	**44**	**100.0**	**198**	**100.0**

Those drivers with little overall driving experience also, by definition, had little experience with the vehicle. It should be noted that low levels of experience were also relatively well represented amongst those with between five and ten years of driving experience.

Table 4.14. *Total interviews by occupation type*

Occupation type	No.	%	ABS Comparison[1]
Managers and professionals	72	25.7	30.7
Production and transport	47	16.8	9.4
Labourers and related	65	23.2	15.6
Clerical, sales and service	45	16.1	25.7
Tradesperson	51	18.2	18.6
Valid Total	**280**	**100.0**	**100.0**
Unknown/missing	27	8.8	7.8
Total	**307**	**100.0**	**100.0**

[1] Australian Bureau of Statistics (2007) - 2006 Census Data, Northern, North-West, Far North Regions, excluding 'Part A' urban SLAs.

A broad range of occupation types were represented within the hospitalised sample, though a higher representation of labourers and managers was found. Compared to 2006 ABS Census data, labourers and those involved in 'Clerical, sales and service' work were represented more highly among those interviewed.

Table 4.15. *Total interviews by employment status*

Employment situation		No.	%
Employed		**249**	**81.4**
	Full-time	*185*	*60.4*
	Part-time	*22*	*7.2*
	Casual	*42*	*13.7*
Unemployed		**30**	**9.8**
	Unemployed/welfare	*28*	*9.2*
	CDEP[1]/work for dole	*2*	*0.7*
Retired		**23**	**7.5**
Other		**4**	**1.3**
Valid Total		**306**	**100.0**
Missing		1	**0.3**
Total		**307**	**100.0**

[1] Community Development Employment Projects

Of the 242 employed respondents, 78 (32.2%) were involved in shiftwork..
The 2006 ABS *Working Time Arrangements* report notes that by comparison, 17.0% of the Australian population works shiftwork (ABS, 2007).

Table 4.16. *Total interviews by highest education level*

Highest education level	No.	%
Completed Year 8 or less	27	8.9
Completed Year 10	88	28.9
Completed Year 12	44	14.4
Trade/apprenticeship	48	15.7
Certificate/diploma	63	20.7
Bachelor's Degree or higher	26	8.5
Other	9	2.9
Valid Total	**305**	**100.0**
Missing	2	0.7
Total	**307**	**100.0**

According to the ABS 2006 census, 8.3% of those surveyed in the North Queensland region have a highest education level of Year 8 or lower while 10.0% have a Bachelor's degree or higher. Thus, the interviewed sample is relatively representative in terms of education level.

Table 4.17. *Total interviews by average travelling speed in last 10 minutes*

Average travelling speed	No.	%
Below speed limit	152	58.7
On speed limit	71	27.4
< 15 km/hr above limit	18	6.9
15 – 30 km/hr above	14	5.4
> 30 km/hr above	4	1.5
Valid Total	**259**	**100.0**
Missing	48	15.6
Total	**307**	**100.0**

Just under 60% of those interviewed reported travelling under the speed limit, with a further 27% reporting travelling on the speed limit. Approximately 14% of all those interviewed said that they were travelling above the speed limit. However, these statistics include both on and off-road cases, and should be interpreted with some caution.

Table 4.18. *Total interviews by harmful drinking status on the basis of AUDIT-C scores*

Drinking status	No.	%
Harmful drinker	183	61.2
Drinker	81	27.1
Non-drinker	35	11.7
Valid Total	**299**	**100.0**
Missing	8	2.6
Total	**307**	**100.0**

A large proportion of those interviewed scored in the harmful drinking range on the basis of their AUDIT-C scores.

Table 4.19. *Total interviews by involvement in a road crash in last 5 years*

Previous crash history	No.	%
Yes	66	21.9
No	236	78.1
Valid Total	**302**	**100.0**
Missing	5	1.6
Total	**307**	**100.0**

Approximately one in five of those people interviewed reported involvement in a crash in the last five years. Of these 66 cases, 23 (34.8%) involved at least one person hospitalised for 'more than a day' and 54 (81.8%) were controlling the vehicle (driver/rider) at the time of the crash.

Table 4.20. *Total interviews by licence suspension in last 5 years*

Previous licence suspension	No.	%
Yes	54	18.1
No	245	81.9
Valid Total	**299**	**100.0**
Missing	8	2.6
Total	**307**	**100.0**

Table 4.21. Total interviews by whether booked for traffic offence in last 5 years

Previous traffic booking	No.	%
Yes	169	56.5
No	130	43.5
Valid Total	**299**	**100.0**
Missing	8	2.6
Valid Total	**307**	**100.0**

In terms of any traffic booking, just over half of all drivers and riders interviewed had been booked for a offence.

Table 4.22. *Total interviews by type of booking in previous 5 years within those with previous offence*

Booking type	No.	% of Positive Respondents	% of Total Sample
Speeding	128	75.7	42.8
Drink driving	31	18.3	10.4
Unlicensed	18	10.7	6.0
Other offence	52	31.0	17.4

Speeding was the most common of these offences, present in 75% of all those who reported a booking of any kind, or 43% of the total sample. There were 48 multiple offenders. Table 4.23 below details further information on those booked for multiple offences.

Table 4.23. *Total interviews by combination of booking in previous 5 years*

Booking combination	Number
Speeding *and* other offence	25
Speeding *and* drink driving *and* unlicensed	6
Speeding *and* drink driving	3
Speeding *and* unlicensed	3
Drink driving *and* unlicensed	3
Drink driving *and* other offence	2
All: Speeding *and* drink driving *and* unlicensed *and* other offence	2
Unlicensed *and* other offence	2
Speeding *and* drink driving *and* other offence	1
Speeding *and* unlicensed *and* other offence	1
Total	48

Most often, the multiple offenders were those with a speeding offence and another general traffic offence.

Table 4.24. *Total interviews by whether driven after more than 2 drinks in previous hour in last month*

DD in last month	No.	%
Yes	61	20.4
No	238	79.6
Total	**299**	**100.0**
Missing	8	2.6
Total	**307**	**100.0**

Table 4.25. *Total interviews by whether been a passenger of a driver with more than 2 drinks in previous hour in last month*

DD passenger	No.	%
Yes	57	19.1
No	241	80.9
Total	**298**	**100.0**
Missing	9	2.9
Total	**307**	**100.0**

A comparative proportion to those taking part in drink driving directly also reported being a passenger of a drink driver in the last month.

Table 4.26. *Total interviews – road safety related scale means and medians*

Question	Mean	SD
People in other vehicles following too closely is a safety problem	1.35	0.81
If someone I knew had been drinking a bit too much I'd try to stop that person driving/riding	1.39	0.96
If I'm tired when I'm driving/riding I pull over for a rest	1.71	1.01
Driving/riding at a safe speed for the conditions is more important than staying under the speed limit	1.72	1.16
Sharing the road with trucks is no problem for me	1.80	1.24
Bicycles and motorcycles are very hard to see on the road	2.10	1.24
I think I'm a better driver/rider than most others I see on the road	2.73	1.09
If I was sure I wasn't going to get caught I'd drive over the speed limit	3.25	1.51
Sometimes you have to keep driving/riding when you're tired, even though you know you shouldn't	3.44	1.48
I find that the faster I drive/ride, the more alert I am	3.76	1.47
Driving/riding after taking prescription medications is safer than driving after drinking	3.77	1.23
I sometimes find myself driving/riding too close to the vehicle in front	3.81	1.33
I often ignore lower speed limits in small towns and for road works	4.19	1.23
Driving/riding after using illegal drugs is safer than driving/riding after drinking	4.45	1.01

1 = strongly agree; 5 = strongly disagree

Table 4.27. *Total interviews – drink driving related scale means and medians*

Question	Mean	SD
People who drink and drive should lose their driver's licence	1.50	.94
My friends would think I was really stupid if I drove after drinking	1.73	1.15
Drinking and driving is common in my area	2.93	1.40
Everybody drinks and drives once in a while	2.95	1.46
People who drink and drive should go to jail	2.97	1.36
Where I live needs stricter laws against drink driving	3.01	1.38
It's OK to drive after drinking so long as you are not drunk	3.76	1.34
Most of my friends think it's OK to drink and drive	3.96	1.34
The police spend too much time hassling drink drivers	4.28	1.12
The dangers of drinking and driving are overrated	4.42	1.05
It's OK to drink and drive as long as you don't get caught	4.66	.78

1 = strongly agree; 5 = strongly disagree

The majority of the responses regarding attitudes towards drink driving showed that there were negative attitudes towards the behaviour.

Table 4.28. *Total interviews – perceived effectiveness of interventions*

Question	Mean	SD
Courtesy buses from pubs and clubs	1.53	.79
Better roads	1.64	.99
Identifying and fixing road/traffic hazards	1.68	.95
Overtaking lanes	1.68	.92
Roadside rest facilities	1.89	.97
Loss of licence for serious offences	1.90	1.09
Improved mobile phone range to get help	1.93	1.17
Road-based fatigue initiatives, e.g. audible edge lines	1.97	.96
Safety programs for heavy vehicle and fleet drivers	2.11	.99
Driver education on how to share the road safely	2.16	1.07
Random breath testing	2.20	1.02
Policing riding in the back of utes	2.20	1.09
Police patrols	2.22	1.01
Special programs for serious and/or repeat offenders	2.28	1.21
Road safety and public education campaigns	2.29	1.03
Policing overloading in cars	2.42	1.12
Losing points for traffic offences	2.53	1.18
Restrictions for learner and provisional drivers	2.58	1.22
Random check for un-roadworthy vehicles	2.59	1.21
Fines for traffic offences	2.80	1.16
Speed cameras	2.82	1.27

1 = very effective; 5 = not effective at all

Aside from courtesy buses, road-related interventions were seen as the most effective. Policing initiatives and fines were, however, rated the least effective countermeasures.

Table 4.29. *Total interviews – suggested measures to improve road safety*

Question		Number
Improve road infrastructure, signage, rest areas, vegetation		108
	Fix roads – details unspecified	*43*
	Widen roads	*16*
	More overtaking lanes	*7*
	Seal dirt roads	*7*
	Fix pot holes	*5*
	...	...
Driver behaviour, education, training and licensing laws		70
	Focus on education of youth	*11*
	Unspecified education	*9*
	Restrictions to L and P plate drivers	*4*
	Defensive driving for all new drivers	*4*
	More ads on TV	*4*
	...	...
Changes to regulations, policing and enforcement		58
	Target drink driving	*13*
	Target speeding	10
	Increase police presence on roads	8
	Reduce speed limits	5
	Increase penalties	5
	…	…
Vehicle design improvements and changes		11
Changes to trucking regulations and enforcement		3
Controls of livestock		7
Changes to lifestyle and attitudes towards living/working		2
Gain public awareness and ideas, comm. leadership on road safety		2
Educate people in First Aid/CPR/Crash rescue awareness		1
Set aside areas for young people to learn and practise driving		1
Government or other agency issues/assistance/changes/funding		2
Not up to me/Nothing I can do		3
Nothing can be done/No single answer out there		4
Missing/No response/Don't know		33

Measures put forward to improve road safety by those interviewed again showed a trend towards the frequent suggestion of road-based initiatives.

Table 4.30. *Total interviews – relative concern for events*

Events	Mean	SD
Road crashes	1.73	0.69
Crime rate	1.83	0.85
Health care	1.84	0.81
Environment	1.95	0.81
Unemployment	2.22	0.98

1 = very concerned; 4 = not concerned at all

Compared to other common concerns, road crashes were rated as the most concerning by the group as a whole. Comparative data collected though the European SARTRE-2 and -3 attitudinal surveys similarly showed that road crashes were considered to be the most important concern of respondents.

Table 4.31. *Proportion of interviewed drivers and riders gaining or renewing first aid certificate in last 12 months*

First aid certificate	No.	%
Yes	75	25.3
No	221	74.7
Valid Total	**296**	**100.0**
Missing	11	3.6
Total	**307**	**100.0**

Summary statistics for passengers

Seventy-six passengers who were injured in crashes were also interviewed. A summary of basic statistics for this group is presented below.

Table 4.32. *Interviewed passengers by region*

Region	No.	%
Northern	14	18.4
Far North	50	65.8
North-West	12	15.8
Total	**76**	**100.0**

As for the drivers and riders, the majority of passenger interviews were also conducted with those people crashing in the Far North Queensland region.

Table 4.33. *Interviewed passengers by gender*

Gender	No.	%
Male	45	60.8
Female	29	39.2
Valid Total	**74**	**100.0**
Unknown	2	2.6
Total	**76**	**100.0**

The mean age of those passengers interviewed was 34.7 years (SD =16.2) with the median being 29.5 years.

Table 4.34. *Interviewed passengers by Indigenous status*

Indigenous status	No.	%
Non-Indigenous	63	84.0
Indigenous	12	16.0
Valid Total	**75**	**100.0**
Unknown	1	1.3
Total	**76**	**100.0**

Compared to interviewed drivers and riders, a greater proportion of passengers in crashes were Indigenous. As for drivers and riders, the majority of passengers were residents of North Queensland.

Summary statistics for pedestrians

Eleven pedestrian casualties were interviewed. Summary statistics are presented below for this group.

Table 4.35. *Interviewed pedestrians by region*

Region	No.	%
Northern	3	27.3
Far North	5	45.5
North-West	3	27.3
Total	**11**	**100.0**

Table 4.36. *Interviewed pedestrians by gender*

Gender	No.	%
Male	7	63.6
Female	4	36.4
Total	**11**	**100.0**

The mean age of those interviewed was 46.7 years (SD =20.6) with the median being 49.0 years.

Table 4.37. *Interviewed pedestrians by Indigenous status*

Indigenous status	No.	%
Non-Indigenous	6	54.5
Indigenous	5	45.5
Total	**11**	**100.0**

Even taking into account the small number of interviews, it is clear that pedestrian casualties show a disproportionate number of Indigenous people. All pedestrian casualties interviewed were residents of North Queensland.

Summary statistics for cyclists

Eleven cyclist casualties were interviewed. Summary statistics are presented below for this group.

Table 4.38. *Interviewed cyclists by region*

Region	No.	%
Northern	2	20.0
Far North	7	70.0
North-West	1	10.0
Total	**10**	**100.0**

Table 4.39. *Interviewed cyclists by gender*

Gender	No.	%
Male	8	80.0
Female	2	20.0
Total	**10**	**100.0**

The mean age of those interviewed was 46.7 years (SD =20.6) with the median being 49.0 years.

Table 4.40. *Interviewed cyclists by Indigenous status*

Indigenous status	No.	%
Non-Indigenous	9	90.0
Indigenous	1	10.0
Total	**10**	**100.0**

All cyclist casualties interviewed except one interstate rider were residents of North Queensland.

On-road drivers and riders

The following analyses refer only to those interviews with drivers and riders where their crash occurred on a public road within the study region. Further analyses below will contrast with those occurring in off-road settings such as private properties.

Table 4.41. *On-road driver and rider interviews by region of driver or rider casualty*

Region	No.	%
Northern	47	22.7
Far North	128	61.8
North-West	32	15.5
Total	**207**	**100.0**

Table 4.42. *On-road driver and rider interviews by gender*

Gender	No.	%
Male	164	79.2
Female	43	20.8
Total	**207**	**100.0**

The mean age of those interviewed was 39.9 years (SD =16.1) with the median being 39.0 years.

Table 4.43. *On-road driver and rider interviews by time to receive help*

Time to receive help	No.	%
<10 minutes	110	70.9
>10 – 30 minutes	20	12.9
>30 – 1 hour	13	8.4
> 1 hour – 2 hours	3	1.9
> 2 hours – 3 hours	2	1.3
> 4 hours – 6 hours	1	0.6
> 6 hours – 10 hours	2	1.3
Went to hospital next day/later	1	0.6
Self managed	3	1.9
Valid Total	**155**	**100.0**
Do not know/missing	52	25.1
Total	**207**	**100.0**

Table 4.44. *On-road driver and rider interviews by gender and age group*

Age Group	Male	%	Female	%	Total	%
16	3	1.8%	0	0.0%	3	1.4%
17	4	2.4%	0	0.0%	4	1.9%
18	5	3.0%	2	4.7%	7	3.4%
19	6	3.7%	1	2.3%	7	3.4%
20	4	2.4%	0	0.0%	4	1.9%
21-24	16	9.8%	4	9.3%	20	9.7%
25-29	15	9.1%	3	7.0%	18	8.7%
30-39	36	22.0%	7	16.3%	43	20.8%
40-49	38	23.2%	10	23.3%	48	23.2%
50-59	16	9.8%	10	23.3%	26	12.6%
60-69	14	8.5%	5	11.6%	19	9.2%
70+	7	4.3%	1	2.3%	8	3.9%
Total	**164**	**100.0**	**43**	**100.0**	**207**	**100.0**

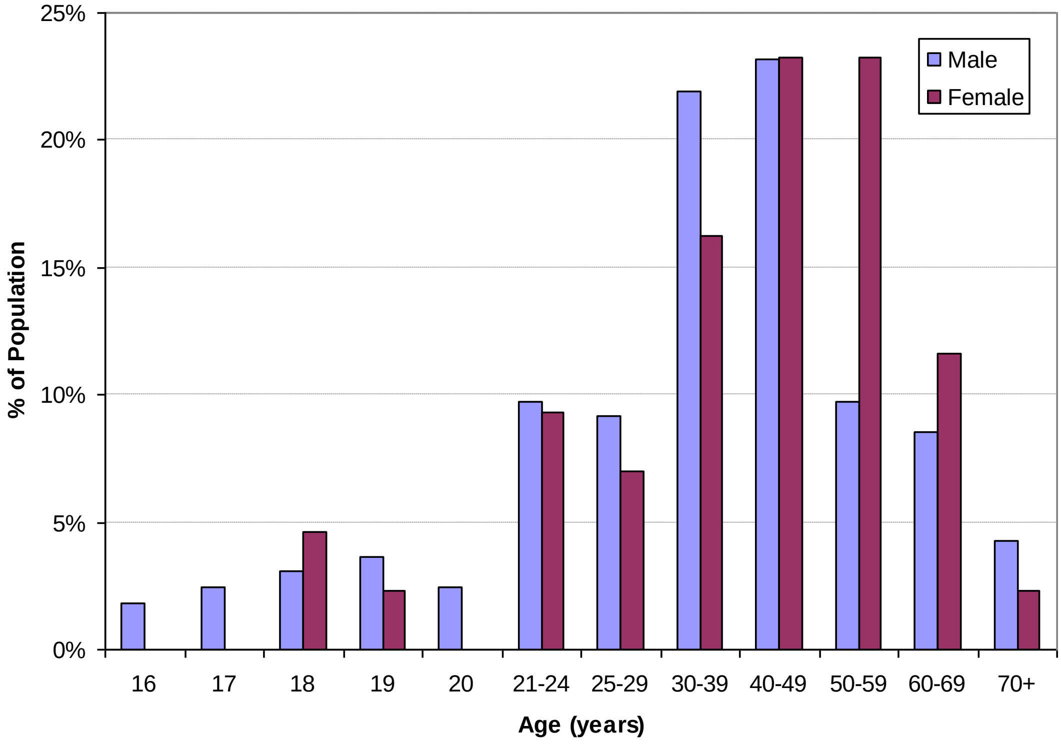

Figure 4.3. Proportion of all on-road driver and rider interviews by gender and age

Table 4.45. *On-road driver and rider interviews by Indigenous status*

Indigenous Status	No.	%
Non-Indigenous	193	93.2
Indigenous	14	6.8
Total	**207**	**100.0**

Table 4.46. *On-road driver and rider interviews by vehicle type*

Vehicle type	No.	%
Passenger vehicle	56	27.1
4WD	23	11.1
Motorcycle	84	40.6
Road motorcycle	*40*	
Trail motorcycle	*44*	
Utility/van	29	14.0
Quad bike/three wheeler	3	1.4
Truck	7	3.4
Other	5	2.4
Scooter	*3*	
Campervan	*1*	
Outrider	*1*	
Total	**207**	**100.0**

Table 4.47. *On-road driver and rider interviews by vehicle age at time of crash*

Vehicle age	No.	%
Current model	18	9.2
1 year	18	9.2
2 years	16	8.2
3 years	14	7.2
4 years	10	5.1
5 years	11	5.6
6 – 10 years	44	22.6
11 – 15 years	26	13.3
16 – 20 years	19	9.7
>20 years	19	9.7
Valid Total	**195**	**100.0%**
Unknown	12	5.8%
Total	**207**	**100.0%**

The median crash vehicle age was 7 years, with a mean of 8.7 years.

Table 4.48 *On-road driver and rider interviews by vehicle registration status*

Registration status	No.	%
Registered	181	91.4
Not registered	17	8.7
Valid Total	**198**	**100.0**
Unknown	9	4.4
Total	**207**	**100.0**

Table 4.49. *On-road driver and rider interviews by vehicle insurance status*

Insurance status	No.	%
Insured	118	63.8
Not insured	67	36.2
Valid Total	**185**	**100.0**
Unknown	22	10.6
Total	**207**	**100.0**

Table 4.50. *On-road driver and rider interviews by when tyre pressure last checked*

Tyre pressure checked	No.	%
< 3 months	180	94.2
> 3 months	9	4.7
Never	2	1.0
Valid Total	**191**	**100.0**
Unknown	16	7.7
Total	**207**	**100.0**

Table 4.51. *On-road driver and rider interviews by when vehicle last serviced*

Time since service	No.	%
< 3 months	150	78.9
3 – 6 months	27	14.2
6 months – 2 years	12	6.3
> 2 years	1	0.5
Valid Total	**190**	**100.0**
Unknown	17	8.2
Total	**207**	**100.0**

Table 4.52. *On-road rider interviews by motorcycle engine size*

Engine size (cc)	No.	%
<50	1	1.1
50 –125	4	4.4
126 –250	20	22.2
251 –500	21	23.3
501–750	19	21.1
>750	25	27.8
Valid Total	**90**	**100.0**
Not applicable	107	8.2
Total	**207**	**100.0**

Table 4.53. *On-road driver and rider interviews by ownership of crash vehicle*

Ownership	No.	%
Self/partner	160	78.4
Friend/family	20	9.8
Employer	14	6.9
Hire/lease	10	4.9
Valid Total	**204**	**100.0**
Other	3	1.4
Total	**207**	**100.0**

Table 4.54 *On-road driver and rider interviews by driving experience in Australia*

Vehicle experience	No.	%
1 year or less	20	9.7
> 1 year – 5 years	18	8.7
> 5 years – 10 years	27	13.0
> 10 years – 15 years	22	10.6
> 15 years – 20 years	20	9.7
> 20 years – 25 years	16	7.7
> 25 years – 30 years	20	9.7
> 30 years – 35 years	14	6.8
>35 years – 40 years	19	9.2
> 40 years – 45 years	13	6.3
> 45 years – 50 years	7	3.4
Over 50 years	7	3.4
Non-resident	4	1.9
Total	**207**	**100.0**

There was a median of 20 years driving experience in Australia.

Table 4.55 *On-road driver and rider interviews by driving experience with crash vehicle type*

Vehicle experience	No.	%
1 year or less	58	28.0
> 1 year – 5 years	50	24.2
> 5 years – 10 years	28	13.5
> 10 years – 15 years	11	5.3
> 15 years – 20 years	17	8.2
> 20 years – 25 years	6	2.9
> 25 years – 30 years	10	4.8
Over 30 years	21	10.1
Unknown	6	2.9
Total	**207**	**100.0**

The median driving experience with the crash vehicle was considerably less than overall vehicle experience though with a median of five years experience.

Table 4.56. *On-road driver and rider interviews – overall driving experience in Australia by experience with crash vehicle*

	Driving experience in Australia (years)							
Crash veh. exp (years)	1 or less	%	>1 5	%	>5 - 10	%	>10	%
1 or less	18	90.0	6	35.2	9	36.0	23	22.1
>1 – 5	2	10.0	10	58.8	8	32.0	30	28.8
>5 – 10	0	0.0	1	5.9	6	24.0	20	19.2
>10	0	0.0.	0	0.0	2	8.0	31	29.8
Total	**20**	**100.0**	**17**	**100.0**	**25**	**100.0**	**104**	**100.0**

Table 4.57. *On-road rider interviews by whether started riding again after a break*

Returned rider	No.	%
Yes	15	21.4
No	55	78.6
Valid Total	**70**	**100.0**
Not applicable	137	66.2
Total	**207**	**100.0**

Table 4.58. *On-road driver and rider interviews by occupation*

Occupation type	No.	%
Managers and professionals	54	28.9
Production and transport	31	16.6
Labourers and related	37	19.8
Clerical, sales and service	34	18.2
Tradesperson	31	16.6
Valid Total	**187**	**100.0**
Unknown/missing	20	9.7
Total	**207**	**100.0**

Table 4.59. *On-road driver and rider interviews by employment status*

Employment situation		No.	%
Employed		**155**	**74.9**
	Full-time	*113*	*54.6*
	Part-time	*16*	*7.7*
	Casual	*26*	*12.6*
Unemployed		**27**	**13.1**
	Unemployed/welfare	*25*	*12.1*
	CDEP/work for dole	*2*	*1.0*
Retired		**21**	**10.1**
Other		**4**	**1.9**
Total		**207**	**100.0**

Some 37%, reported being involved in shiftwork.

Table 4.60. *On-road driver and rider interviews by highest education level*

Occupation type	No.	%
Completed Year 8 or less	21	10.2
Completed Year 10	58	22.3
Completed Year 12	28	13.6
Trade/apprenticeship	28	13.6
Certificate/diploma	46	22.3
Bachelor's Degree or higher	18	8.7
Other	7	3.4
Valid Total	**206**	**100.0**
Missing	1	0.5
Total	**207**	**100.0**

Table 4.61. *On-road driver and rider interviews by whether licensed to drive crash vehicle*

Licensed to drive crash vehicle	No.	%
Yes	188	92.2
No	16	7.8
Valid Total	**204**	**100.0**
Missing	3	1.4
Total	**207**	**100.0**

Table 4.62. *On-road driver and rider interviews by average travelling speed in last 10 minutes*

Average travelling speed	No.	%
Below speed limit	106	55.2
On speed limit	59	30.7
< 15 km/hr above limit	16	8.3
15 – 30 km/hr above	8	4.2
> 30 km/hr above	3	1.6
Valid Total	**192**	**100.0**
Missing	15	7.2
Total	**207**	**100.0**

A total of 13% of people reported travelling over the speed limit prior to the crash.

Table 4.63. *On-road driver and rider interviews by usage of recreational drugs in previous 24 hours*

Drug use	No.	%
No	191	94.1
In last hour	1	0.5
1– 6 hrs before	7	3.4
6 – 12 hrs before	3	1.5
12 – 24 hrs before	1	0.5
Valid Total	**203**	**100.0**
Missing	4	1.4
Total	**207**	**100.0**

Of the 12 respondents that had reported taking recreational drugs in the previous 24 hours, 7 (58.3%) had taken marijuana or cannabis, 2 (16.7%) had taken ecstasy, and 1 each (8.3%) had taken amphetamines, speed and MS Contin (time-release form of morphine).

Table 4.64. *On-road driver and rider interviews by restraint and helmet use*

Safety equipment use		No.	%
Helmet			
	All occupants	78	88.6
	No one	9	10.2
	Rider wore for part of trip	1	1.1
Seatbelt			
	All occupants	90	84.9
	Passenger only	2	1.8
	No one	14	13.2
	Don't know	1	-
Valid Total		**195**	**100.0**
Missing		12	6.2
Total		**207**	**100.0**

Table 4.65. *On-road driver interviews by whether enough seatbelts available for all driver and passengers*

Enough belts available for everyone	No.	%
Yes	99	98.0
No	2	1.9
Total	**101**	**100.0**

Table 4.66. *On-road driver and rider interviews by harmful drinking status on the basis of AUDIT-C scores*

Drinking status	No.	%
Harmful drinker	115	56.4
Drinker	59	28.9
Non-drinker	30	14.7
Valid Total	**204**	**100.0**
Missing	3	1.4
Total	**207**	**100.0**

For the 3-item AUDIT-C questionnaire, a mean of 4.56 (median = 5, out of a possible 12) was found. For the full 10-item AUDIT, a mean of 5.89 (median = 5, out of a possible 40) was found.

Table 4.67. *On-road driver and rider interviews by alcohol use in the previous 24 hours*

Alcohol use	No.	%
Yes	89	43.2
No	117	56.8
Valid Total	**206**	**100.0**
Missing	1	0.5
Total	**207**	**100.0**

Of the 79 cases with valid data on the amount of alcohol consumed in the previous 24 hours, the mean was 4.9 standard drinks and the median 3.2.

Table 4.68 *On-road driver and rider interviews by whether involved in road crash in last 5 years*

Previous crash history	No.	%
Yes	36	17.7
No	167	82.3
Valid Total	**203**	**100.0**
Missing	4	1.9
Total	**207**	**100.0**

Within the 36 that responded that they had been involved in a crash, 29 (80.6%) were driving or riding at the time of the crash, and 10 (27.8%) reported someone as being hospitalised for more than a day as a result.

Table 4.69. *On-road driver and rider interviews by licence suspension in last 5 years*

Previous licence suspension	No.	%
Yes	35	17.2
No	168	82.8
Valid Total	**203**	**100.0**
Missing	4	1.9
Total	**207**	**100.0**

Table 4.70. *On-road driver and rider interviews by whether booked for a traffic offence in the last 5 years*

Previous traffic booking	No.	%
Yes	120	59.1
No	83	40.9
Valid Total	**203**	**100.0**
Missing	4	1.9
Total	**207**	**100.0**

Table 4.71. *On-road driver and rider interviews by type of booking in previous 5 years within those with a previous offence*

Booking type	Yes	%	No	%
Speeding	90	75.0	30	25.0
Drink driving	20	16.7	100	83.3
Unlicensed	8	6.7	112	93.3
Other offence	37	31.1	82	68.9

Table 4.72. *On-road driver and rider interviews – general health rating*

General health	No.	%
Poor	0	0.0
Not so good	0	0.0
Average	25	12.1
Good	104	50.2
Excellent	78	37.7
Total	**207**	**100.0**

Table 4.73. *On-road driver and rider interviews by how often experienced certain emotions in the month before the crash*

Emotion	Mean
Calm	2.1
Downhearted and blue	4.1
Depressed	4.6
Happy	2.0
Nervous	4.5
Total	**207**

1 - always, 3 - about half the time, 5 - never

When these questions were combined together to form the SF-36 General Mental Health Scale, the mean was 4.2, with 1 being poor mental health and 5 being good mental health.

Table 4.74. *On-road driver and rider interviews by whether been booked for drink driving in the last 5 years*

DD booking	No.	%
Yes	20	9.8
No	183	90.1
Valid Total	**203**	**100.0**
Missing	4	1.9
Total	**207**	**100.0**

Table 4.75. *On-road driver and rider interviews by whether driven after more than 2 drinks in previous hour in last month*

DD in last month	No.	%
Yes	33	16.2
No	171	83.8
Valid Total	**204**	**100.0**
Missing	3	1.4
Total	**207**	**100.0**

Table 4.76 *On-road driver and rider interviews by whether been a passenger of driver with more than 2 drinks in previous hour in last month*

DD passenger	No.	%
Yes	40	19.7
No	163	80.3
Valid Total	**203**	**100.0**
Missing	4	1.9
Total	**207**	**100.0**

Table 4.77. *On-road driver and rider interviews – whether booked for drink driving in last 5 years by drink driven in the last month*

	Drink driven in last month			
Booked for DD	Yes	%	No	%
Yes	13	65.0	7	90.0
No	20	11.0	162	10.0
Total	**33**	**16.3**	**169**	**100.0**

Odds Ratio = 5.9 (95% CI: 3.5 - 9.9)

Table 4.78. *On-road driver and rider interviews – whether booked for drink driving in last 5 years by been a passenger of a drink driver in the last month*

	Been passenger of DD in last month			
Booked for DD	Yes	%	No	%
Yes	11	55.0	9	45.0
No	29	16.0	152	84.0
Total	**40**	**19.9**	**161**	**80.1**

Odds Ratio = 3.4 (95% CI: 2.0 - 5.8)

Those with a previous booking were much more likely to report being involved in drink driving behaviour in the last month.

Table 4.79. *On-road driver and rider interviews by how long driving continuously before the crash*

Continuous driving time	No.	%
Less than 1 hour (short trip)	115	74.7
1 hour – less than 2 hours	24	15.6
2 hours – less than 3 hours	8	5.2
3 hours – less than 4 hours	6	3.9
Less than 1 hour, but had been driving all night	1	0.6
Total	**154**	**100.0**
Missing/Not applicable	53	25.6
Total	**207**	**100.0**

Table 4.80. *On-road driver and rider interviews by how long stopped for (last driving period > 1 hour)*

How long stopped for	No.	%
1 – 10 mins	24	29.6
11 – 20 mins	8	9.9
21 – 30 mins	14	17.3
31 – 40 mins	2	2.5
41 – 50 mins	2	2.5
51 – 60 mins	4	4.9
> 1 hour – 2 hours	9	11.1
> 2 hours – 3 hours	1	1.2
> 4 hours – 6 hours	2	2.5
Overnight/8 hours or more	10	12.3
Did not stop/Just commenced work/left work	5	6.2
Valid Total	**81**	**100.0**
Missing/Not applicable	126	60.9
Total	**207**	**100.0**

Table 4.81. *On-road driver and rider interviews by whether drive part of a longer journey*

Longer journey	No.	%
Yes	47	56.6
No	36	43.4
Valid Total	**83**	**100.0**
Missing/Not applicable	124	59.9
Total	**207**	**100.0**

Table 4.82. *On-road driver and rider interviews by whether felt tired on the trip*

Feel tired	No.	%
Yes	22	11.2
No	175	88.8
Valid Total	**197**	**100.0**
Missing/Not applicable	10	4.8
Total	**207**	**100.0**

Of the 20 respondents to the question regarding taking measures against being tired, 9 (45%) took no action, a further 7 (35%) stopped for a break, while one each planned to stop at the next opportunity, washed their face or went riding. One respondent fell asleep at the wheel.

Table 4.83. *On-road driver and rider interviews by whether felt bored on the trip*

Bored on the trip	No.	%
Yes	16	8.1
No	181	91.9
Valid Total	**197**	**100.0**
Missing/Don't know	10	4.8
Total	**207**	**100.0**

Of those who reported being bored, 6 (37.5%) made no adjustment to their driving, 4 (25%) tried to be more alert to avoid crashing, 4 (25%) used distractions such as the radio or talking, 1 (6.3%) made the motorcycle ride more exciting by riding on the back wheel (a 'mono') and 1 made general adjustments to driving.

Table 4.84. *On-road driver and rider interviews by reason for the trip*

Reason for the trip	No.	%
Part of your job	23	11.1
To/from work	32	15.5
To/from another activity	50	24.2
Leisure/holiday	78	37.7
Other	22	10.6
Don't know	2	1.0
Total	**207**	**100.0**

Table 4.85. *On-road driver and rider interviews by frequency of driving on the crash road*

Frequency of driving on road	No.	%
At least daily	61	29.5
At least weekly	50	24.2
At least monthly	25	12.1
At least yearly	22	10.6
Less than once a year, but not first time	15	7.2
First time	33	15.9
Don't know	1	.5
Total	**207**	**100.0**

Table 4.86. *On-road driver and rider interviews by type of distraction*

Distraction type	No.
Outside the vehicle	40
Other occupant	2
Moving object	3
Mobile phone, CB radio	2
Radio, CD etc.	3
Other equipment	8
Emotional upset/relationship issues	3
Inattention	8
Cigarette	1
Other issue	11
Total	**81**

Of the 207 interviewed 72 (34.8%) reported being distracted by something leading up to the crash.
Furthermore, 40 (55.6%) people reported distractions outside the vehicle, and 18 (25.0%) at least one type of distracter inside the vehicle.

Off-road drivers and riders

Table 4.87. *Off-road driver and rider interviews – by region of interviewed casualty*

Region	No.	%
Northern	20	20.4
Far North	50	51.0
North-West	28	28.6
Total	**98**	**100.0**

Table 4.88. *Off-road driver and rider interviews by gender*

Gender	No.	%
Male	87	88.8
Female	11	11.2
Total	**98**	**100.0**

The mean age of those interviewed was 33.7 years (SD =13.3) with the median being 31.0 years.

Table 4.89. *Off-road driver and rider interviews by time to receive help*

Time to receive help	No.	%
<10 minutes	57	65.5
>10 to 30 minutes	17	19.5
>30 to 1 hour	4	4.6
> 1 hour – 2 hours	2	2.3
> 2 hours – 3 hours	2	2.3
> 4 hours – 6 hours	0	0.0
> 6 hours – 10 hours	1	1.1
Took self to hospital/assistance	4	4.6
Valid Total	**87**	**100.0**
Do not know/missing	11	11.2
Total	**98**	**100.0**

Table 4.90. *Off-road driver and rider interviews by gender and age*

Age Group	Male	%	Female	%	Total	%
16	2	2.3%	0	0.0%	2	2.0%
17	1	1.1%	0	0.0%	1	1.0%
18	2	2.3%	1	9.1%	3	3.1%
19	3	3.4%	1	9.1%	4	4.1%
20	2	2.3%	0	0.0%	2	2.0%
21-24	15	17.2%	3	27.3%	18	18.4%
25-29	16	18.4%	1	9.1%	17	17.3%
30-39	21	24.1%	1	9.1%	22	22.4%
40-49	14	16.1%	1	9.1%	15	15.3%
50-59	8	9.2%	1	9.1%	9	9.2%
60-69	3	3.4%	1	9.1%	4	4.1%
70+	0	0.0%	1	9.1%	1	1.0%
Total	**87**	**100.0**	**11**	**100.0**	**98**	**100.0**

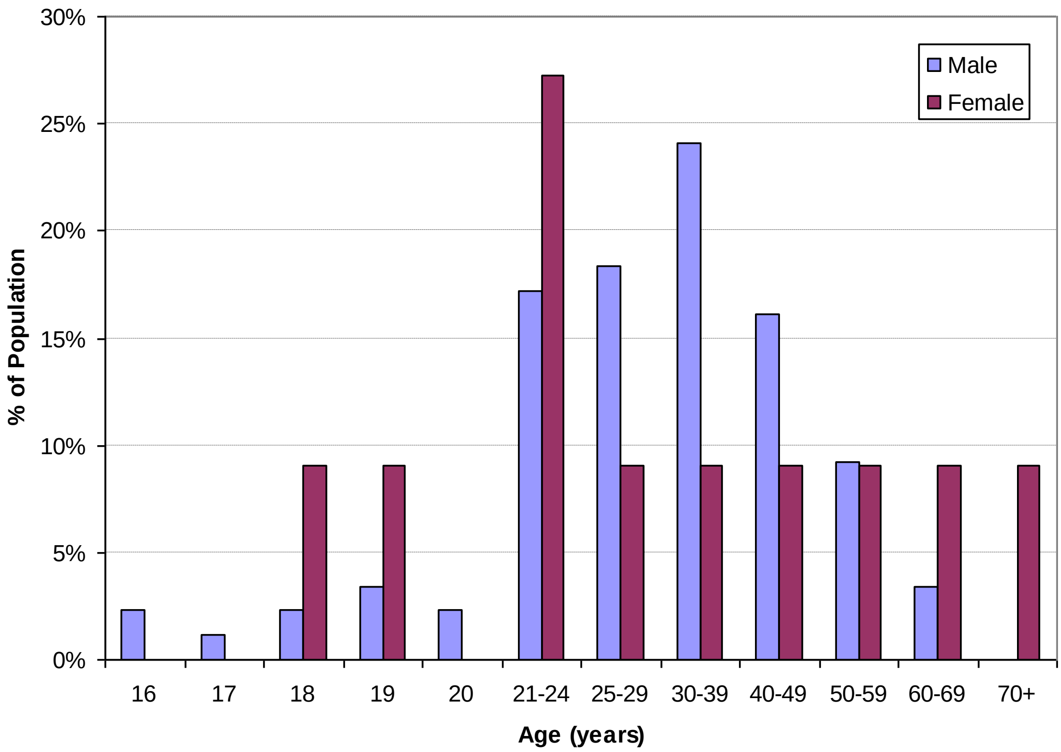

Figure 4.4. Proportion of all off-road driver and rider interviews by gender and age

Table 4.91. *Off-road driver and rider interviews by Indigenous status*

Indigenous status	No.	%
Non-Indigenous	93	95.9
Indigenous	4	4.1
Valid Total	**97**	**100.0**
Unknown	1	1.0
Total	**98**	**100.0**

Table 4.92. *Off-road driver and rider interviews by vehicle type*

Vehicle type	No.	%
Passenger vehicle	1	1.0
4WD	4	4.1
Motorcycle	70	72.2
Road motorcycle	*3*	3.1
Trail motorcycle	*67*	69.1
Utility	1	1.0
Quad bike/three wheeler	18	18.6
Truck	2	2.1
Dune Buggy	1	1.0
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Table 4.93. *Off-road driver and rider interviews by vehicle age at time of crash*

Vehicle age	No.	%
Current model	16	16.3
1 year	14	14.3
2 years	5	5.1
3 years	7	7.1
4 years	2	2.0
5 years	4	4.1
6 – 10 years	10	10.2
11 – 15 years	9	9.2
16 – 20 years	6	6.1
>20 years	4	4.1
Unknown	21	21.4
Total	**98**	**100.0**

Table 4.94. *Off-road driver and rider interviews by vehicle registration status*

Registration status	No.	%
Registered	35	42.7
Not registered	47	57.3
Valid Total	**82**	**100.0**
Unknown	16	16.3
Total	**98**	**100.0**

Table 4.95. *Off-road driver and rider interviews by vehicle insurance status*

Insurance status	No.	%
Insured	32	45.1
Not insured	39	54.9
Valid Total	**71**	**100.0**
Unknown	27	27.6
Total	**98**	**100.0**

Table 4.96. *Off-road driver and rider interviews by when tyre pressure last checked*

Tyre pressure checked	No.	%
< 3 months	80	95.2
> 3 months	4	4.8
Valid Total	**84**	**100.0**
Unknown	14	14.3
Total	**98**	**100.0**

Table 4.97. *Off-road driver and rider interviews by when vehicle last serviced*

Time since service	No.	%
< 3 months	74	90.2
3 – 6 months	3	3.7
6 months – 2 years	4	4.9
> 2 years	1	1.2
Valid Total	**82**	**100.0**
Unknown	16	15.3
Total	**98**	**100.0**

Table 4.98. *Off-road rider interviews by motorcycle engine size*

Engine size (cc)	No.	%
<50	1	1.3
50 – 125	3	3.8
126 – 250	29	37.2
251 – 500	33	42.3
501–750	12	15.4
>750	0	0.0
Valid Total	**78**	**100.0**
Not applicable	8	8.2
Missing	12	12.2
Total	**98**	**100.0**

Table 4.99. *Off-road driver and rider interviews by ownership of crash vehicle*

Ownership	No.	%
Self/partner	160	77.3
Friend/family	20	9.7
Employer	14	6.8
Hire/Lease	10	4.8
Other	3	1.4
Total	**207**	**100.0**

Table 4.100. *Off-road driver and rider interviews by driving experience in Australia*

Vehicle experience	No.	%
1 year or less	8	8.2
> 1 year – 5 years	6	6.2
> 5 years – 10 years	18	18.6
> 10 years – 15 years	13	13.4
> 15 years – 20 years	19	19.6
> 20 years – 25 years	9	9.3
> 25 years – 30 years	5	5.2
> 30 years – 35 years	5	5.2
> 35 years – 40 years	5	5.2
> 40 years – 45 years	2	2.1
> 45 years – 50 years	2	2.1
Over 50 years	2	2.1
Non-resident	3	3.1
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Table 4.101. *Off-road driver and rider interviews by driving experience with crash vehicle type*

Vehicle experience	No.	%
1 year or less	29	29.9
> 1 year – 5 years	14	14.4
> 5 years – 10 years	17	17.5
> 10 years – 15 years	11	11.3
> 15 years – 20 years	17	17.5
> 20 years – 25 years	2	2.1
> 25 years – 30 years	2	2.1
Over 30 years	5	5.2
Valid Total	**97**	**100.0**
Unknown	1	1.0
Total	**98**	**100.0**

Table 4.102. *Off-road rider interviews by whether started riding again after a break*

Returned rider	No.	%
Yes	16	23.2
No	53	76.8
Valid Total	**69**	**100.0**
Not applicable	29	29.6
Total	**98**	**100.0**

Table 4.103. *Off-road driver and rider interviews by occupation*

Occupation type	No.	%
Managers and professionals	17	18.5
Production and transport	16	17.4
Labourers and related	28	30.4
Clerical, sales and service	11	11.9
Tradesperson	20	21.7
Valid Total	**92**	**100.0**
Unknown/missing	6	6.1
Total	**98**	**100.0**

Table 4.104. *Off-road driver and rider interviews by employment status*

Employment situation		No.	%
Employed		**92**	**94.8**
	Full-time	*70*	*72.2*
	Part-time	*6*	*6.2*
	Casual	*16*	*16.5*
Unemployed		**3**	**3.1**
	Unemployed/welfare	*3*	*3.1*
Retired		**2**	**2.1**
Valid Total		**97**	**100.0**
Missing		1	1.0
Total		**98**	**100.0**

Table 4.105. *Off-road driver and rider interviews by highest education level*

Occupation type	No.	%
Completed Year 8 or less	6	6.2
Completed Year 10	29	29.9
Completed Year 12	16	16.5
Trade/apprenticeship	19	19.6
Certificate/diploma	17	17.5
Bachelor's Degree or higher	8	8.2
Other	2	2.1
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Table 4.106. *Off-road driver and rider interviews by highest education level*

Licensed to drive crash vehicle	No.	%
Yes	56	66.6
No	28	33.3
Valid Total	**84**	**100.0**
Missing/Not applicable	14	14.3
Total	**98**	**100.0**

Table 4.107. *Off-road driver and rider interviews by usage of recreational drugs in previous 24 hours*

Drug use	No.	%
No	84	90.3
In last hour	2	2.2
1 – 6 hrs before	4	4.3
6 – 12 hrs before	2	2.2
12 – 24 hrs before	1	1.1
Valid Total	**93**	**100.0**
Missing/Not applicable	5	5.1
Total	**98**	**100.0**

Of the 9 people reporting drug use in the previous 24 hours, 8 (88.9%) had used marijuana or cannabis, with 1 using an unknown drug.

Table 4.108. *Off-road driver and rider interviews by restraint and helmet use*

Safety equipment use		No.	%
Helmet			
	All occupants	65	77.4
	No one	19	22.6
Seatbelt			
	All occupants	4	50.0
	No one	4	50.0
Total		**92**	**100.0**

Table 4.109. *Off-road driver interviews by availability of enough seatbelts for all drivers and passengers*

Enough belts available for everyone	No.	%
Yes	6	75.0
No	2	25.0
Total	**8**	**100.0**

Table 4.110. *Off-road driver and rider interviews by harmful drinking status on the basis of AUDIT-C scores*

Drinking status	No.	%
Harmful drinker	66	70.9
Drinker	22	23.7
Non-drinker	5	5.4
Valid Total	**93**	**100.0**
Missing	5	5.1
Total	**98**	**100.0**

For the 3-item AUDIT-C questionnaire, a mean of 5.5 (median = 5.5, out of a possible 12) was found. For the full 10-item AUDIT, a mean of 7.4 (median = 6.0, out of a possible 40) was found.

Table 4.111. *Off-road driver and rider interviews by alcohol use in the previous 24 hours*

Alcohol use	No.	%
Yes	54	56.3
No	42	43.8
Valid Total	**96**	**100.0**
Missing	2	2.0
Total	**98**	**100.0**

Of the 79 cases with valid data on the amount of alcohol consumed in the previous 24 hours, the mean was 5.1 standard drinks and the median 3.0.

Table 4.112. *Off-road driver and rider interviews by whether involved in a road crash in the last 5 years*

Previous crash history	No.	%
Yes	29	29.9
No	68	70.1
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Among the 29 that responded that they had been involved in a crash, 24 (82.7%) were driving or riding at the time of the crash, and 12 (41.3%) reported someone as being hospitalised for more than a day as a result.

Table 4.113. *Off-road driver and rider interviews by licence suspension in last 5 years*

Previous licence suspension	No.	%
Yes	19	20.2
No	75	79.8
Valid Total	**94**	**100.0**
Missing	4	4.1
Total	**98**	**100.0**

Table 4.114. *Off-road driver and rider interviews by whether booked for a traffic offence in last 5 years*

Previous traffic booking	No.	%
Yes	49	52.1
No	45	47.9
Valid Total	**94**	**100.0**
Missing	4	4.1
Total	**98**	**100.0**

Table 4.115. *Off-road driver and rider interviews by type of booking in previous 5 years within those with previous offence*

Booking type[1]	Yes	%	No	%
Speeding	38	79.1	10	20.8
Drink driving	11	22.9	37	77.1
Unlicensed	10	20.8	38	79.1
Other offence	15	31.2	33	68.8

1 - Booking type was unknown for one respondent

Table 4.116. *Off-road driver and rider interviews by whether driven after more than 2 drinks in previous hour in last month*

DD in last month	No.	%
Yes	26	27.9
No	67	72.0
Valid Total	**93**	**100.0**
Missing	5	5.1
Total	**98**	**100.0**

Table 4.117. *Off-road driver and rider interviews by whether been passenger of driver with more than 2 drinks in previous hour in last month*

DD passenger	No.	%
Yes	15	16.1
No	78	83.9
Valid Total	**93**	**100.0**
Missing	5	5.1
Total	**98**	**100.0**

Table 4.118. *Off-road driver and rider interviews by how long driving continuously before the crash*

Continuous driving time	No.	%
Less than 1 hour (short trip)	57	73.1
1 hour – less than 2 hours	13	16.7
2 hours – less than 3 hours	3	3.8
3 hours – less than 4 hours	2	2.6
4 hours or more	3	3.8
Valid Total	**78**	**100.0**
Missing/Not applicable	20	20.4
Total	**98**	**100.0**

Table 4.119. *Off-road driver and rider interviews by how long stopped for*

How long stopped for	No.	%
1 – 10 mins	7	20.6
11 – 20 mins	7	20.6
21 – 30 mins	5	14.7
31 – 40 mins	0	0.0
41 – 50 mins	0	0.0
51 – 60 mins	4	11.8
> 1 hour – 2 hours	0	0.0
> 2 hours – 3 hours	0	0.0
> 4 hours – 6 hours	1	2.9
Overnight/8 hours or more	5	14.7
Did not stop/Just commenced work / left work	5	14.7
Valid Total	**34**	**100.0**
Missing/Not applicable	64	65.3
Total	**98**	**100.0**

Table 4.120. *Off-road driver and rider interviews by whether drive was part of a longer journey*

Longer journey	No.	%
Yes	15	39.5
No	23	60.5
Valid Total	**38**	**100.0**
Missing/Not applicable	60	59.9
Total	**98**	**100.0**

Table 4.121. *Off-road driver and rider interviews by whether felt tired on the trip*

Feel tired	No.	%
Yes	13	13.5
No	83	86.5
Valid Total	**96**	**100.0**
Missing/Not applicable	2	2.0
Total	**98**	**100.0**

Table 4.122. *Off-road driver and rider interviews by whether felt bored on the trip*

Bored on the trip	No.	%
Yes	3	3.1
No	93	96.9
Valid Total	**96**	**100.0**
Missing	2	2.0
Total	**98**	**100.0**

Table 4.123. *Off-road driver and rider interviews by reason for the trip*

Reason for the trip	No.	%
Part of your job	28	28.9
To/from work	0	0.0
To/from another activity	6	6.2
Leisure/holiday	57	58.8
Other	6	6.2
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Table 4.124. *Off-road driver and rider interviews by frequency of driving on the route*

Frequency on route	No.	%
At least daily	7	7.2
At least weekly	20	20.6
At least monthly	13	13.4
At least yearly	12	12.4
Less than once a year, but not first time	8	8.2
First time	37	38.1
Valid Total	**97**	**100.0**
Missing	1	1.0
Total	**98**	**100.0**

Of the 98 interviewed, 39 (39.8%) reported being distracted by something leading up to the crash. Furthermore, 30 (30.6%) people reported distractions outside the vehicle, and 8 (8.2%) at least one type of distracter inside the vehicle.

Table 4.125. *Off-road driver and rider interviews by distraction type*

Distraction type	No.
Outside the vehicle	30
Other equipment	5
Inattention	4
Eating/drinking	3
Radio, CD etc.	1
Other issue	7
Total	**50**

Discussion

Introduction

The current chapter reported on the subset of all casualties with which interviews were conducted. This forms a total of 404 interviews of the complete 804 casualties who met the study's inclusion criteria. General trends regarding the vehicle being driven at the time of the crash, the road user type of the casualty and the ages will not be discussed in detail here. Full details for these variables are presented in Chapter 3 for all hospitalised casualties.

Interview sample differences

It is worth highlighting the differences between the characteristics of the total sample and the sample of those interviewed. Those interviewed were more likely to be motorcyclists (50% of interviews compared to 34% overall), who also constituted 75% of all off-road incidents. The proportion of males interviewed was also slightly higher than the overall sample at roughly 80%, in part due to this bias in vehicle type.

Considerable further information was, however, collected through the interviews which would not otherwise have been known through hospital or transport records of crashes and injury. Particularly, information regarding the attitudes of drivers and riders and their broader demographic characteristics provides a level of information otherwise not readily available.

Demographic data

The available data does suggest that labourers and those involved in 'Clerical, Sales or Service' work are over-represented in crashes compared to the proportion of people in the general population. The analyses presented in the following chapter comparing hospital and roadside cases seem to indicate that this is the case even when considering the potentially differing levels of driving undertaken by those working in different occupations. This is interesting when considered in terms of highest education level in that the proportions of those interviewed with the lowest and highest education levels (Year 8 and Bachelor degree) are comparable to the proportions reported in census data for the overall population (ABS, 2007). This may indicate that certain types of employment are associated with involvement in high-risk activities or even that the job itself may contribute to crashes indirectly. The relatively high proportion of those who work shiftwork may be an indication of an area for future research.

Previous crash involvement

Around one in five of those interviewed reported being involved in a crash in the previous five years. This is suggestive of involvement in a road crash being predictive of future crashes. However, an analysis of roadside interviews to be reported in Chapter 5 serves as a comparison with a non-crash sample.

Traffic offences

In terms of reported traffic offences, just under one in five of those interviewed reported a previous licence suspension in the last five years. However, more than half of all respondents reported a traffic booking of any kind in the last five years. As noted in the following chapter comparing hospital and roadside respondents, bookings were common among both samples, though licence suspension was considerably higher.

The different prevalences of the types of bookings is also worthy of note. Speeding was by far the most common offence among those interviewed with over 40% of the total sample reporting being issued with an infringement in the past five years. This may be indicative of both the automated enforcement of speeding through cameras as well as the generally higher offence rate of the driving population for speeding (Queensland Police Service, 2006).

In terms of drink driving, 10% of those interviewed reporting being booked for a drink driving offence in the last five years. However, when asked in terms of driving after having more than two drinks in the previous hour, the reported rate was nearly double this. Similarly, involvement as a passenger of a drinking driver in the last month was also represented at a similar rate. This may be indicative of an involvement in drink driving behaviours, which depending on the occasion, may present as either drink driving personally or travelling as the passenger of a drink driver. Regardless, these figures do suggest that involvement in drink driving may be substantially higher than the roughly 1% of Random Breath Tests that return a positive result (Queensland Police Service, 2006). Recent research has in fact highlighted the large effect on drink driving re-offending of punishment avoidance, that is, taking part in the behaviour without being detected (Freeman & Watson, 2006).

Road safety attitudes

General attitudes

Participants' responses to questions regarding road safety provided an indication of what people believe are the key issues in driving safely. Responses generally showed that people were in support of actions that may improve road safety, such as resting when tired, and unsupportive of unsafe behaviours such as ignoring speed limits.

However, responses were more diverse in regard to questions such as "If I was sure I wasn't going to get caught I'd drive over the speed limit" and "I think I'm a better driver/rider than most others I see on the road". These questions together potentially indicate that opinions about road safety may relate to avoiding punishment and presenting an image of a good driver.

Drink driving behaviour

It is now accepted that drink driving is perceived negatively among the vast majority of drivers. This is a shift that has occurred gradually over the last 30 years with the introduction of countermeasures (Homel, Carseldine & Kearns, 1988; Sheehan, 1994). This was also the case among the interviewed crash-involved drivers. The vast majority of respondents acknowledged that the dangers of drink driving are not overrated and that drink driving is not 'OK', regardless of whether being caught by police or not. Likewise, the statements with the greatest support were in relation to licence loss for drink drivers and being considered stupid by friends for drink driving.

Responses were less clear for some questions. Two of these questions related to jail sentences for drink drivers and the perceived need for stricter laws against drink driving. Disagreement with these questions may, however, not represent an approval of drink driving but rather a disagreement with the severity of punishment and enforcement required to police the behaviour.

Intervention effectiveness

Ratings of the relative effectiveness of interventions also identified a number of interesting trends. Four of the five most highly rated interventions related to improving roads and surrounding facilities. However, the most highly rated intervention was the community-based intervention of the provision of courtesy buses to transport patrons from pubs and clubs. Enforcement-based interventions were often not rated highly. These included speed cameras, fines and losing points. The exception to this rule was the loss of licence for serious offences. Thus, this may indicate a perception that policing of less serious or infrequent offending is not effective, but that removal of serious offenders from the road will have a greater effect.

On-road driver/rider specific issues

Registration and insurance

The vast majority of vehicles that crashed in an on-road setting were registered for use on the road. However, it is notable that 17 of the 207 (8.7%) people interviewed were travelling in an unregistered vehicle. A much larger proportion of one third of all vehicles was reported to not be insured. While being uninsured or unregistered may not have a direct relationship to crash risk, it is worth noting in terms of the potential financial cost that can be caused by a road crash if assistance through an insurer is not available, and thus impose an additional and unnecessary burden on the crash victim.

Vehicle upkeep

In terms of vehicle upkeep, over 90% of the interviewees reported that the vehicle had been serviced in the previous six months and had checked the tyre pressure in the previous three months. This is indicative of a high level of vehicle upkeep and highlights that risk-taking in terms of a poorly maintained vehicle does not appear common. This is also reflected in the fact that vehicle-related factors are not highly represented at just 3% attributed involvement for crashes in Queensland (Queensland Transport, 2007).

Driving and vehicle-experience

Although the level of overall experience with driving or riding in Australia was high, with a median of 20 years driving experience, considerably less experience was noted in terms of the crash vehicle type. Particularly, this was most notable in those with less than one year of driving experience. While only 10% reported less than a year overall driving experience, 30% reported less than a year's experience with the crash vehicle type. While research has not established a link between vehicle specific experience and crashes, there has been some indication that those driving a vehicle in its first 500 km may be at a significantly increased crash risk (Perel, 1983; Hoxie, 1984). This may be a particular factor in terms of those injured who have been driving a car or passenger vehicle for a substantial period but have not ridden a motorcycle for as long a period.

In the context of this experience issue, it is also worth noting the substantial numbers of interviewed riders returning to motorcycle riding after a break of five or more years. This has been recently highlighted as an issue and may correspond to the same characteristics as those people taking up riding for the first time (Mulvihill & Haworth, 2005).

Restraint use

Restraint use has been noted consistently in the literature investigating vehicle crashes. The safety benefits of seatbelts are well established with estimates predicting that occupants face a two to three times greater risk of being killed in a crash if an occupant is not wearing a belt (Rivara, Thompson, & Cummings, 1999; Cummings, Wells, & Rivara, 2003). While the majority of those interviewed were wearing seatbelts, 13% of drivers reported that they were unrestrained. A number of factors have been suggested as to the continued non-use of seatbelts among a small proportion of the driving population despite their wide acceptance. It has been noted by rural drivers that they feel the value of seatbelts is not large when travelling on minor routes away from traffic or relatively short distances (Sticher, 2005). This finding may also be indicative of a small group of 'problem drivers' who are generally deviant across a large number of traffic behaviours (Jessor, 1987; Moller, 2004). The collected data did not suggest that non-restraint use could be accounted for substantially by vehicles which were not equipped with seatbelts as only 2% of those interviewed reported that there were not enough seats provided for all occupants.

Fatigue

Travelling long distances has been acknowledged frequently in the field of traffic safety as contributing to fatigue and ultimately crashes. Within the current sample, 11% reported feeling tired on the trip while approximately 1 in 4 of those interviewed who gave a valid response reported that they had been driving for longer than an hour continuously before the crash. Just under 10%, however, had been driving for a period of two hours or more. Thus, while intervention messages regarding long trips may be effectively reaching the audience of rural drivers, there is still a notable group that are driving for relatively lengthy continuous trips.

Stopping and taking rest breaks was frequently reported – a factor that is encouraging in light of recent campaigns targeting fatigue’s contribution to crashes. This is particularly positive in light of the high reported proportion of people who reported their crash trip as being part of a longer journey.

Purpose of trip

In terms of the reason for the crash trip, it was noted that a mixture of driving activities was being undertaken during the crash trip. Particularly of note was that driving for leisure or a holiday accounted for 38% of all crash cases. It has been noted that non-goal directed driving is associated with a greater chance of crashing (Gregersen & Møller, 2008).

Familiarity

Questions regarding familiarity with the road also presented some interesting findings. While substantial proportions of drivers reported infrequent travel on the crash road, nearly 30% also reported traveling on the stretch daily. Thus, while unfamiliarity with a road can be highlighted as a potential contributor, over-familiarity may also be a concern in terms of lack of concentration on usual travelling routes. It should also be taken into account that a large number of trips and crashes in general have been found previously to occur within a small radius of a home address (Stevenson & Palamara, 2001). However, this also serves to highlight the point that it is often local drivers that are crashing on local roads.

Distraction

Distraction was also a major issue, noted in about one third of all drivers and riders. Distractions external to the vehicle were particularly noted as an issue. In interpreting these results though, it may be that respondents may have considered an instance when an external factor such as an animal on the road was present, that this was a distraction when in fact it may have been general inattention to the driving condition that resulted in a crash involving an animal or an external distraction.

Off-road driver/rider specific issues

Registration insurance /licensing

Registration and insurance levels for vehicles crashing in an off-road setting were, as expected, considerably lower than for those crashing on-road. It is interesting to note that 40% of all such vehicles were registered, potentially indicating their dual use in road settings. A nearly identical proportion of the vehicles that were registered were also insured, which again may be indicative of their dual-use in on-road and off-road settings. Compared to the on-road sample, a considerably higher proportion of those crashing in an off-road setting did not hold a licence to drive or ride the crash vehicle.

Driver experience

Again, vehicle specific experience was identified as an issue, though this varied consistently along with overall driving experience again as well.

Vehicle upkeep

Vehicle upkeep was again at a high level, with a high proportion of vehicles being serviced and tyre pressure checked within the last three months.

Helmet use

Levels of non-use of helmets among those riders crashing off-road was of concern, with this figure being considerably higher than those crashing in an on-road setting (23% against 11%). A lack of any formal requirement of helmet use within these settings may go some way in explaining this finding. Indeed, non-use of helmets has been consistently noted as an issue for off-road riders (e.g. Sibley & Tallon, 2002; Carr et al., 2004; Mullins et al., 2007).

Trip characteristics

Those crashing in an off-road setting were typically only riding short trips with roughly 70% riding for less than an hour at the time of the incident. The majority of trips were also undertaken for the purposes of recreation. Thus, the characteristics of those riding are markedly different from on-road drivers and riders, and this should be kept in mind when considering potential interventions for this group.

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5. Roadside and Hospital Comparison

Previous chapters have presented the characteristics of the crashes and resultant casualties in the study. The current chapter presents the data collected from the interviews with *on-road* drivers and riders involved in a crash along with comparable data collected from drivers and riders at roadside collection sites within the North Queensland region.

Methodology

Details regarding the methodology used in the collection of data for both the hospital and roadside samples are presented in Chapter 2.

The results of the current analyses are presented in two forms: a basic analysis comparing the relative responses of the hospital and roadside samples and a stratified analysis taking into account the differences in age and gender between the samples. This process was completed by dividing each of the samples into six groups corresponding to two levels of gender (male, female) and three levels of age (<40 years, 40 to 59 years, 60 years or greater). A Mantel-Haenszel chi-square statistic was calculated for those categorical variables to take into account these between-group differences.

Results

Demographics

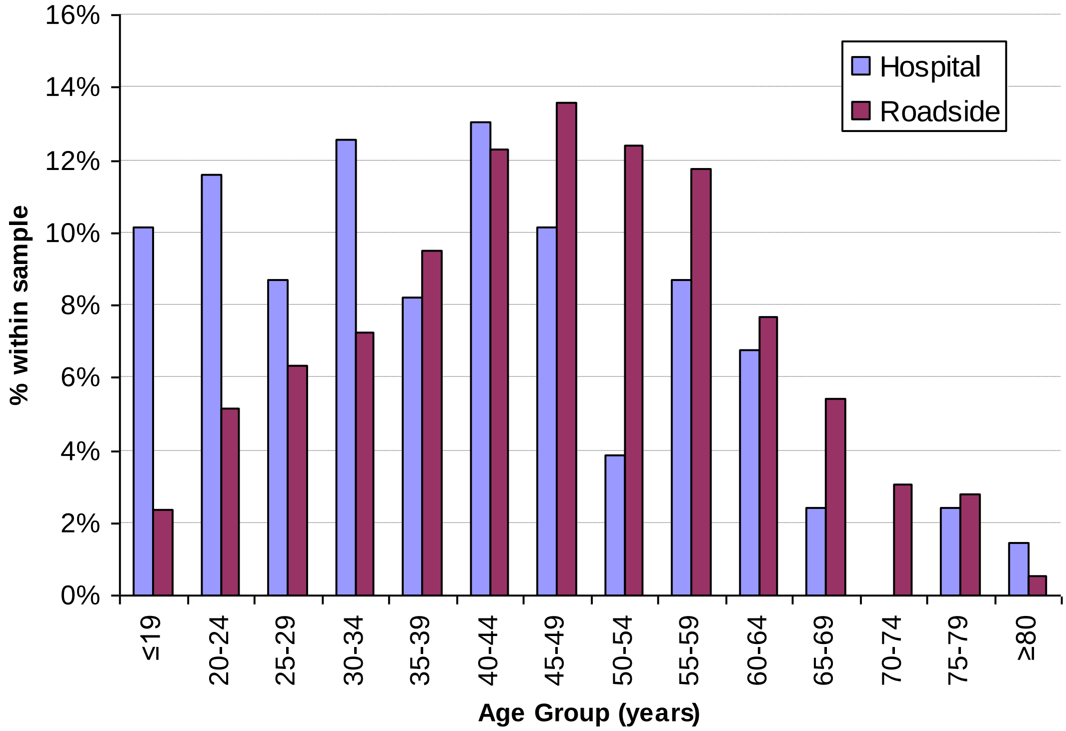


Figure 5.1. Age distribution of hospital and roadside samples

The mean age of those in the hospital sample (39.9 years, SD=16.1, median=39) was significantly lower (p <.001) than the roadside sample (46.8 years, SD=14.6, median=47). Males were highly represented in the gender distribution of both samples, constituting 79.2% of hospitalised driver/riders and 67.7% of those participants in the roadside sample. This difference was statistically significantly, $\chi^2(1) = 10.4$, $p = .001$.

Table 5.1. *Country of residence by sample type*

	Hospital		Roadside	
Country of residence	No.	%	No.	%
Australia	201	97.1	743	96.7
International	6	2.9	25	3.3
Total	**207**	**100.0**	**768**	**100.0**

An analysis of country of residence identified that across both samples the majority of drivers and riders were Australians. A comparable proportion of international drivers was noted in both samples, with no significant difference found, $\chi^2(1) = 0.07$, $p = .795$. No difference was found adjusting for age and gender, $\chi^2(1) = 0.52$, $p = .47$.

Table 5.2. *Indigenous identification by sample type*

	Hospital		Roadside	
Indigenous identification	No.	%	No.	%
Non-Indigenous	193	93.2	704	95.4
Indigenous	14	6.8	34	4.6
Total	**207**	**100.0**	**738**	**100.0**

A slightly higher proportion of Indigenous drivers and riders was represented among the hospital sample, though this difference was not significant, $\chi^2(1) = 1.6$, $p = .21$. No difference was found adjusting for age and gender, $\chi^2(1) = 0.24$, $p = .63$.

Table 5.3. *Employment status by sample type*

	Hospital		Roadside	
Employment status	No.	%	No.	%
Employed	155	76.4	533	74.5
Unemployed	27	13.3	54	7.6
Retired	21	10.3	128	17.8
Total	**203**	**100.0**	**715**	**100.0**

While the proportion of participants within each sample who reported being employed was comparable, those in the hospital sample were less likely to be retired and more likely to be unemployed, $\chi^2(1) = 11.6$, $p = .003$. This difference remained, albeit weaker, after adjusting for age and gender, $\chi^2(1) = 6.9$, $p = .03$.

Table 5.4. *Occupation type by sample type*

	Hospital		Roadside	
Occupation type	No.	%	No.	%
Managers and professionals	54	28.9	267	39.1
Production and transport	31	16.6	91	13.3
Labourers and related	37	19.8	72	10.5
Clerical, sales and service	64	18.2	138	20.2
Tradesperson	31	16.6	115	16.8
Total	**187**	**100.0**	**683**	**100.0**

More specifically in terms of the category of employment of those interviewed, those in the hospitalised sample were more likely to be labourers and less likely to be managers or professionals, $\chi^2(4) = 15.6$, $p = .004$. This effect was diminished slightly, but remained significant after adjusting for age and gender, $\chi^2(4) = 10.2$, $p = .037$.

Table 5.5. *Shift work involvement by sample type*

	Hospital		Roadside	
Shift work	No.	%	No.	%
Yes	56	36.8	129	25.6
No	96	63.2	375	74.4
Total	**152**	**100.0**	**504**	**100.0**

Those within the hospital sample were also significantly more likely to be involved in shift work than those in the roadside sample, $\chi^2(1) = 7.3$, $p = .007$.
This effect remained significant adjusting for age and gender, $\chi^2(4) = 10.2$, $p = .037$.

Table 5.6. *Highest education level by sample type*

	Hospital		Roadside	
Highest education level	No.	%	No.	%
Left before year 8	5	2.4	30	3.9
Year 8	16	7.8	50	6.5
Year 10	58	28.2	186	24.3
Year 12	28	13.6	113	14.7
Trade/apprenticeship	28	13.6	104	13.6
Certificate diploma	46	22.3	153	19.9
Bachelor's degree or higher	18	8.7	128	16.7
Other	7	3.4	3	0.4
Total	**206**	**100.0**	**767**	**100.0**

While most levels of education were comparable between the hospital and roadside, nearly twice as large a proportion of the roadside sample reported having a tertiary qualification, $\chi^2(7) = 24.1$, $p = .001$. This effect was robust to accounting for age and gender, $\chi^2(7) = 30.6$, $p = .001$

Table 5.7. *Completed or renewed first aid certificate in previous 12 months by sample type*

	Hospital		Roadside	
First aid certificate	No.	%	No.	%
Yes	47	23.3	175	23.4
No	155	76.7	573	76.6
Total	**202**	**100.0**	**748**	**100.0**

The proportion of those in each sample who had completed or renewed a first aid certificate in the last 12 months was also compared, with no difference found between the two groups, $\chi^2(1) = .001$, $p = .969$. No change to the results was present adjusting for age and gender, $\chi^2(1) = 1.18$, $p = .28$.

Alcohol and Drugs

Table 5.8. *Level of self-reported drinking by sample type*

	Hospital		Roadside	
Drinking level	No.	%	No.	%
Harmful drinker	117	56.8	304	41.2
Drinker	59	28.6	310	42.0
Non-drinker	30	14.6	124	16.8
Total	**206**	**100.0**	**738**	**100.0**

Reported drinking levels identified that the hospital sample was more likely to be classed as a harmful drinker on the basis of AUDIT-C score than was the case for the roadside sample, $\chi^2(2) = 16.6$, $p = .0002$. It should, however, be noted that over 40% of the roadside sample also reported drinking at harmful levels. This effect was lessened but still present after accounting for age and gender, $\chi^2(2) = 7.57$, $p = .023$.

Table 5.9. *Alcohol consumption in previous 24 hours by sample type*

	Hospital		Roadside	
Alcohol previous 24 hrs	No.	%	No.	%
Yes	89	43.2	276	37.5
No	117	56.8	460	62.5
Total	**206**	**100.0**	**736**	**100.0**

Similar proportions of both the hospital and roadside sample reported drinking alcohol in the 24 hours before the crash or interview, $\chi^2(1) = 2.2$, $p = .137$. This pattern did not vary adjusting for age and gender, $\chi^2(1) = 1.37$, $p = .24$.

Table 5.10. *Recreational drug consumption in previous 24 hours by sample type*

	Hospital		Roadside	
Drugs previous 24 hrs	No.	%	No.	%
Yes	12	5.9	25	3.4
No	191	94.1	709	96.6
Total	**203**	**100.0**	**734**	**100.0**

Usage of recreational (non-prescribed) drugs was relatively low in both samples, though slightly and insignificantly more common among the hospital sample, $\chi^2(1) = 2.6$, $p = .105$. No change was found after adjusting for age and gender, $\chi^2(1) = .057$, $p = .45$.

Two questions were also asked in both samples regarding the levels of both drink driving in the last month and riding as a passenger of a drink driver.

Table 5.11. *Self-reported driving after more than 2 drinks in previous hour in last month by sample type*

	Hospital		Roadside	
DD last month	No.	%	No.	%
Yes	33	16.2	24	11.6
No	171	83.8	183	88.4
Total	**204**	**100.0**	**207**	**100.0**

Although levels of drink driving were higher among the hospital driver/rider sample, this difference was not significant, $\chi^2(1) = 2.0$, $p = .36$, even after adjusting for age and gender, $\chi^2(1) = .01$, $p = .92$.

Table 5.12. *Self-reported passenger of driver who had more than 2 drinks in previous hour in last month by sample type*

	Hospital		Roadside	
Passenger of DD last month	No.	%	No.	%
Yes	40	19.7	24	11.6
No	163	80.3	183	88.4
Total	**203**	**100.0**	**207**	**100.0**

The reported involvement of travelling as a passenger of a drink driver was, however, significantly higher among the hospitalised sample, $\chi^2(1) = 5.1$, $p = .024$. This effect was not present when accounting for age and gender, $\chi^2(1) = .82$, $p = .37$.

Vehicle Factors

Table 5.13. *Vehicle type by sample type*

	Hospital		Roadside	
Vehicle type	No.	%	No.	%
Passenger vehicle	55	26.6	322	44.8
4WD	23	11.1	188	26.1
Motorcycle	84	40.6	21	2.9
Utility	24	11.6	111	15.4
Van	5	2.4	24	3.3
Quad/three wheeler	3	1.4	0	0.0
Other	13	6.3	53	7.4
Total	**207**	**100.0**	**719**	**100.0**

The analysis of vehicle type identified that the major difference between the hospital and roadside samples lies in the proportions of motorcyclists. While motorcyclists made up under 3% of all roadside surveys completed they constituted just over 40% of all on-road hospitalisations interviewed. Excluding motorcyclists reduced the differences between the groups.

Table 5.14. *Experience with vehicle type by sample type*

	Hospital		Roadside	
Vehicle type	No.	%	No.	%
1 year or less	58	28.9	118	16.8
>1 – 5 years	50	24.9	171	24.4
>5 – 10 years	28	13.9	122	17.4
>10 – 15 years	11	5.5	56	8.0
>15 – 20 years	17	8.5	68	9.7
>20 – 25 years	6	3.0	32	4.6
>25 – 30 years	10	5.0	47	6.7
>30 years	21	10.4	87	12.4
Total	**201**	**100.0**	**701**	**100.0**

Those with the least vehicle-specific experience were more represented in the hospital driver/rider sample, $\chi^2(7) = 16.5$, p = .021. This effect was, however, shown to be due to age and gender differences between the two samples, with no significant difference found after accounting for these factors, $\chi^2(7) = 1.09$, p = .30.

Table 5.15. *Vehicle ownership by sample type*

	Hospital		Roadside	
Vehicle ownership	No.	%	No.	%
Self/partner	160	77.3	578	75.2
Friend/family	20	9.7	45	5.9
Employer	14	6.8	100	13.0
Hire/lease	10	4.8	43	5.6
Other	3	1.4	3	0.4
Total	**207**	**100.0**	**769**	**100.0**

While the majority of drivers and riders in both samples reported either themselves or their partners as the owner of the vehicle, vehicles owned by a friend were more represented among the hospital sample while vehicles owned by an employer were less so, $\chi^2(4) = 12.2$, p = .016. This finding was not changed by accounting for age and gender differences, $\chi^2(4) = 13.02$, p = .011.

Table 5.16. *Vehicle registration by sample type*

	Hospital		Roadside	
Vehicle registered	No.	%	No.	%
Yes	181	91.4	190	99.5
No	17	8.6	1	0.5
Total	**198**	**100.0**	**191**	**100.0**

Vehicle registration levels were high among both samples, though non-registered vehicles were significantly more likely to have been involved in the hospitalised crash sample, $\chi^2(1) = 14.3$, $p \approx 0$.

Table 5.17. *Vehicle insurance status by sample type*

	Hospital		Roadside	
Vehicle insured	No.	%	No.	%
Yes	118	63.8	160	87.4
No	67	36.2	23	12.6
Total	**185**	**100.0**	**183**	**100.0**

Levels of vehicle insurance were lower than vehicle registration in both samples, though significantly lower in the hospital sample, $\chi^2(1) = 27.8$, $p \approx 0$. This difference was still present after accounting for age and gender, $\chi^2(1) = 18.91$, $p = .001$.

Table 5.18. *Time since vehicle was last serviced by sample type*

	Hospital		Roadside	
Time since last service	No.	%	No.	%
<3 months	150	78.9	121	73.3
3 – 6 months	27	14.2	28	17.0
6 months – <2 years	12	6.3	16	9.7
2 years or more	1	0.5	0	0.0
Total	**190**	**100.0**	**165**	**100.0**

Table 5.19. *Time since tyre pressure checked by sample type*

	Hospital		Roadside	
Time since tyre pressure checked	No.	%	No.	%
<3 months	180	94.2	154	93.9
3 months or more	9	4.7	10	6.1
Never checked	2	1.0	0	0.0
Total	**191**	**100.0**	**164**	**100.0**

Vehicle maintenance was also assessed through the time elapsed since the last vehicle service and the last date of tyre pressure being checked. No difference was found between the crash and roadside vehicle groups for either vehicle servicing, $\chi^2(1) = 2.9$, $p = .40$, or tyre pressure, $\chi^2(2) = 2.0$, $p = .36$. These findings were robust to adjustments for age and gender for both vehicle servicing - $\chi^2(1) = 0.79$, $p = .38$ and tyre pressure, $\chi^2(1) = 0.23$, $p = .63$.

Table 5.20. *Age of vehicle by sample type*

Age of vehicle (years)	Hospital (n=192)	Roadside (n=735
Mean	8.6	9.1
Standard deviation	7.7	7.4
Median	6.5	8.0
Range	0-34	0-39

Vehicle age was, however, not shown to be significantly different between the two samples. Respective mean vehicle ages were 8.6 years for the hospital sample and 9.1 years for the roadside sample, $F(1,925) = 38.9$, $p = .40$.

Driver Factors

Table 5.21. *Driver's licence status by sample type*

	Hospital		Roadside	
Licensed to drive vehicle	No.	%	No.	%
Yes	188	92.2	734	99.9
No	16	7.8	1	0.1
Total	**204**	**100.0**	**735**	**100.0**

While the vast majority of those in the roadside sample reported that they were licensed to control the vehicle they were driving, nearly 8% of the hospital sample reported that they were not licensed, $\chi^2(1) = 53.4$, $p \approx 0$. This effect was still present after adjusting for age and gender, $\chi^2(1) = 27.9$, $p \approx 0$.

Table 5.22. *Travelling speed in previous 10 minutes by sample type*

	Hospital		Roadside	
Travelling speed	No.	%	No.	%
On or below limit	165	85.9	700	94.5
Over limit	27	14.1	41	5.5
Total	**192**	**100.0**	**741**	**100.0**

Participants in the hospital sample were considerably more likely to report driving over the speed limit in the previous ten minutes than those in the roadside sample, $\chi^2(1) = 16.4$, $p \approx 0$. This difference remained present accounting for age and gender, $\chi^2(1) = 7.65$, $p = .006$.

Table 5.23. *Seatbelt usage by sample type*

	Hospital		Roadside	
Seatbelt status	No.	%	No.	%
Worn	90	84.9	665	97.4
Not worn	16	15.1	18	2.6
Total	**106**	**100.0**	**683**	**100.0**

Participants in the hospital sample were much more likely to report not wearing their seatbelt on the trip, $\chi^2(1) = 34.5$, $p \approx 0$, a finding which did not vary after accounting for age and gender, $\chi^2(1) = 33.32$, $p \approx 0$.

Table 5.24. *Helmet usage by sample type*

	Hospital		Roadside	
Helmet status	No.	%	No.	%
Worn	79	88.8	21	100.0
Not worn	10	11.2	0	0.0
Total	**89**	**100.0**	**21**	**100.0**

Likewise, levels of reported helmet non-use were higher in the hospital as opposed to the roadside sample, where no riders reported non-use of a helmet. This finding does not reach statistical significance, $\chi^2(1) = 2.6$, p = .107. Similar results were found accounting for age and gender, $\chi^2(1) = 1.37$, p = .24.

Driving offences

Table 5.25. *Licence suspension in previous 5 years by sample type*

	Hospital		Roadside	
Licence suspension	No.	%	No.	%
Yes	35	17.2	55	7.5
No	168	82.8	679	92.5
Total	**203**	**100.0**	**734**	**100.0**

An analysis of licence suspension rates showed that those in the hospital sample were more than twice as likely to have had a suspended licence than the roadside sample, $\chi^2(1) = 17.4$, $p \approx 0$. This effect remained present accounting for age and gender, $\chi^2(1) = 8.76$, p = .003.

Table 5.26. *Booked for any traffic offence in past 5 years by sample type*

	Hospital		Roadside	
Booked for traffic offences	No.	%	No.	%
Yes	120	59.1	86	42.0
No	83	40.9	119	58.0
Total	**203**	**100.0**	**205**	**100.0**

A number of questions were asked of interviewees regarding their traffic history. It was initially identified that those in the hospital sample were significantly more likely to report being booked for a traffic offence in the last five years, $\chi^2(1) = 12.1$, p = .001.

Table 5.27. *Booked for drink driving in past 5 years by sample type*

	Hospital		Roadside	
Booked for drink driving	No.	%	No.	%
Yes	20	9.9	4	2.0
No	183	90.1	200	98.0
Total	**203**	**100.0**	**204**	**100.0**

Significantly higher levels of being booked for drink driving were noted in the hospital sample, $\chi^2(1) = 11.4$, p = .001. This effect did not vary accounting for age and gender, $\chi^2(1) = 7.52$, p = .006.

Table 5.28. *Booked for driving without a licence in the past 5 years by sample type*

	Hospital		Roadside	
Booked for driving without a licence	No.	%	No.	%
Yes	8	3.9	3	1.5
No	195	96.1	201	98.5
Total	**203**	**100.0**	**204**	**100.0**

Though only small numbers in both samples reported being booked for driving without a licence, the hospitalised sample contained a higher proportion of such drivers. This difference was, however, not statistically significant, $\chi^2(1) = 2.4$, p = .124. After stratifying for age and gender, this result did not change, $\chi^2(1) = .03$, p = .85.

Table 5.29. *Booked for speeding in the past 5 years by sample type*

	Hospital		Roadside	
Booked for speeding	No.	%	No.	%
Yes	90	44.3	65	31.9
No	113	55.7	139	68.1
Total	**203**	**100.0**	**204**	**100.0**

The most commonly reported booking was for speeding above the posted limit. A significantly higher proportion of respondents in the hospital sample reported such a booking, $\chi^2(1) = 6.7$, $p = .010$. This finding was present after adjusting for age and gender, $\chi^2(1) = 3.48$, $p = .06$.

Table 5.30. *Booked for any other traffic offence in the past 5 years by sample type*

	Hospital		Roadside	
Booked for any other offence	No.	%	No.	%
Yes	37	18.3	20	9.8
No	165	81.7	184	90.2
Total	**202**	**100.0**	**204**	**100.0**

Bookings for other non-specified offences were also significantly more common among those in the hospital sample, $\chi^2(1) = 6.1$, $p = .014$. This effect did not remain after adjusting for age and gender, $\chi^2(1) = 0.94$, $p = .33$.

Overall, the hospital group reported a higher proportional level of booking for all offence types except 'other' offences, with these differences being statistically significant for all except driving without a licence.

Road crash involvement

Table 5.31. *Involvement in a road crash in the last 5 years by sample type*

	Hospital		Roadside	
Road crash in last 5 years	No.	%	No.	%
Yes	36	17.7	33	19.5
No	167	82.3	136	80.5
Total	**203**	**100.0**	**169**	**100.0**

Previous involvement in a road crash was also compared between both groups. Little difference in involvement was identified, $\chi^2(1) = .196$, $p = .658$. Adjusting for age and gender did not affect this finding, $\chi^2(1) = 0.91$, $p = .34$.

Within this crash involved group, further analyses were conducted to identify if any injuries resulted from the previous crash and if the respondent had been the driver at the time.

Table 5.32. *Hospitalisation resulting from crash in past 5 years by sample type*

	Hospital		Roadside	
Hospitalisation in previous crash	No.	%	No.	%
Yes	10	27.8	7	21.2
No	26	72.2	26	78.8
Total	**36**	**100.0**	**33**	**100.0**

Although the crashes among the hospital sample were reported to more frequently result in a hospitalisation, this was not significant $\chi^2(1) = .400$, $p = .527$. Adjusting for age and gender did not change this result, $\chi^2(1) = 0.37$, $p = .55$

Table 5.33. *Driving status for crash in past 5 years by sample type*

	Hospital		Roadside	
Driving at time of previous crash	No.	%	No.	%
Yes	29	87.9	23	69.7
No	4	12.1	10	30.3
Total	**33**	**100.0**	**33**	**100.0**

Respondents in the hospital sample were more likely to report driving at the time of the previous crash, though this difference was not found to be significant in this small subsample, $\chi^2(1) = 3.26$, $p = .071$. Accounting for age and gender did not vary this result, $\chi^2(1) = 2.88$, $p = .09$.

Road safety attitudes

An averaged measure of fatalism towards road crashes was calculated from the three items - “Road crashes just happen, there is little one can do to avoid them”; “Road crashes are unavoidable because you can’t control other road users” and “Road crashes seem inevitable despite the efforts of government authorities to prevent them.”

Table 5.34. *Fatalism towards road crashes by sample type*

Fatalism score	Hospital (n=204)	Roadside (n=743)
Mean[a,b]	2.8	3.1
Standard deviation	1.0	0.9
Median	2.7	3.0
Range	1-5	1-5

[a] - 1 = strongly agree, 2 = agree a little, 3 = neutral, 4 = disagree a little, 5 = strongly disagree
b - Lower scores indicate a more fatalistic attitude towards road crashes

Respondents in the hospital sample were found to have significantly more fatalistic attitudes towards road crashes, $F(1,945) = 8.3$, $p = .004$. This effect did not vary after adjusting for age and gender, $\chi^2(1) = 8.62$, $p = .003$.

A set of four questions was also asked comparing the concern of respondents towards road crashes, the environment, the crime rate, the state of health care and unemployment. The relative concern of road crashes to the other issues was compared, with two groups of those that rated road crashes as the most important and those that did not.

Table 5.35. *Relative concern towards road safety by sample type*

	Hospital		Roadside	
Relative road safety concern	No.	%	No.	%
Most important	67	33.7	299	40.0
Not most important	132	66.3	448	60.0
Total	**199**	**100.0**	**747**	**100.0**

No significant difference was found between the two groups, $\chi^2(1) = 2.7$, $p = .102$, though the roadside sample more frequently responded that road safety was their most important concern.

Each group of interviewees was also asked to provide an answer to the question “If you could do one thing to reduce the road toll in rural North Queensland, what would it be?”

Table 5.36. *Suggested measures to improve road safety – hospital sample*

Question		Number
Improve road infrastructure, signage, rest areas, vegetation		108
	Fix roads – details unspecified	*43*
	Widen roads	*16*
	More overtaking lanes	*7*
	Seal dirt roads	*7*
	Fix pot holes	*5*
	...	...
Driver behaviour, education, training and licensing laws		70
	Focus on education of youth	*11*
	Unspecified education	*9*
	Restrictions to L and P plate drivers	*4*
	Defensive driving for all new drivers	*4*
	More ads on TV	*4*
	...	...
Changes to regulations, policing and enforcement		58
	Target drink driving	*13*
	Target speeding	10
	Increase police presence on roads	8
	Reduce speed limits	5
	Increase penalties	5
	…	…
Vehicle design improvements and changes		11
Changes to trucking regulations and enforcement		3
Controls of livestock		7
Changes to lifestyle and attitudes towards living/working		2
Gain public awareness and ideas, comm. leadership on road safety		2
Educate people in First Aid/CPR/Crash rescue awareness		1
Set aside areas for young people to learn and practise driving		1
Government or other agency issues/assistance/changes/funding		2
Not up to me/Nothing I can do		3
Nothing can be done/No single answer out there		4
Missing/No response/Don't know		33

Table 5.37. *Suggested measures to improve road safety – roadside sample*

Question	Number
Driver behaviour, education, training and licensing laws	233
Focus on education of youth	*35*
Education – unspecified details	*18*
Education in schools	*17*
Restrictions to L and P plate drivers	*14*
Defensive driving courses for all	*12*
Defensive driving for all new drivers	*12*
...	...
Improve road infrastructure, signage, rest areas, vegetation	221
Fix roads – details unspecified	*120*
Widen roads	*33*
More overtaking lanes	*13*
Resurface roads	*6*
Improve signage	*4*
Other – divide roads	*4*
...	...
Changes to regulations, policing and enforcement	121
Increase police presence on roads	*23*
Target speeding	*22*
Increase penalties	*12*
Reduce speed limits	*11*
Target drink driving	*7*
...	...
Vehicle design improvements and changes	18
Changes to trucking regulations and enforcement	5
Controls of livestock	4
Provide more public transport	2
Educate people in First Aid/CPR/Crash rescue awareness	3
Improve access to, and communication with, Emergency Services	1
Offer prayers for safety of travellers	1
Research ways to address peer pres. assoc. with driving behaviour	1
Reduce population and number of vehicles on road	1
Changes to operations of breweries pubs	5
Funding issues	3
Move all young people with hoon instincts to a desert island	1
Government assistance/changes	1
Set aside areas for young people to learn and practise driving	1
Need to do more than one thing	1
Nothing I can think of – roads and drivers good	1
Missing/No response/Don't know	58

While the three main groupings of responses were similar for both groups, focusing on driver behaviour measures, road improvements, and changes to regulations and policing, a greater proportion of those in the hospital sample reported improvement of the roads as a concern.

Participants were also asked to provide ratings from ‘not effective at all’ to ‘very effective’ for each of 21 potential road safety interventions.

Table 5.38. *Hospital interviews – perceived effectiveness of interventions*

Question	Mean	SD
Courtesy buses from pubs and clubs	1.53	.79
Better roads	1.64	.99
Identifying and fixing road/traffic hazards	1.68	.95
Over-taking lanes	1.68	.92
Roadside rest facilities	1.89	.97
Loss of licence for serious offences	1.90	1.09
Improved mobile phone range to get help	1.93	1.17
Road-based fatigue initiatives, e.g. audible edge lines	1.97	.96
Safety programs for heavy vehicle and fleet drivers	2.11	.99
Driver education on how to share the road safely	2.16	1.07
Random breath testing	2.20	1.02
Policing riding in the back of utes	2.20	1.09
Police patrols	2.22	1.01
Special programs for serious and/or repeat offenders	2.28	1.21
Road safety and public education campaigns	2.29	1.03
Policing overloading in cars	2.42	1.12
Losing points for traffic offences	2.53	1.18
Restrictions for learner and provisional drivers	2.58	1.22
Random check for un-roadworthy vehicles	2.59	1.21
Fines for traffic offences	2.80	1.16
Speed cameras	2.82	1.27

1 = very effective; 5 = not effective at all

Table 5.39. *Roadside interviews – perceived effectiveness of interventions*

Question	Mean	SD
Courtesy buses from pubs and clubs	1.61	.965
Over-taking lanes	1.67	1.05
Roadside rest facilities	1.76	1.06
Better roads	1.85	1.32
Identifying and fixing road/traffic hazards	1.87	1.24
Loss of licence for serious offences	1.88	1.13
Random breath testing	2.04	1.07
Improved mobile phone range to get help	2.15	1.19
Driver education on how to share the road safely	2.16	1.13
Police patrols	2.19	1.11
Road safety and public education campaigns	2.32	1.16
Road-based fatigue initiatives, e.g. audible edge lines	2.36	5.96
Losing points for traffic offences	2.45	1.23
Policing riding in the back of utes	2.49	1.27
Random check for un-roadworthy vehicles	2.55	1.24
Special programs for serious and/or repeat offenders	2.74	5.98
Speed cameras	2.79	1.27
Restrictions for learner and provisional drivers	2.84	5.94
Safety programs for heavy vehicle and fleet drivers	3.27	8.25
Fines for traffic offences	3.30	5.92
Policing overloading in cars	3.59	8.24

1 = very effective; 5 = not effective at all

The provision of courtesy buses was found to be the intervention with the highest perceived effectiveness for both the hospital and roadside groups. Interventions associated with improvement of the roads and related infrastructure were generally rated highly, while fines, police enforcement and speeding cameras were less highly rated.

Discussion

The current chapter sought to identify some of the key differences between those interviewed in hospital after a serious road crash and those interviewed at the roadside within the North Queensland region. A number of key differences were identified.

Demographic characteristics

The hospital sample was generally younger compared to the sample of those at the roadside. A gender imbalance was also noted, with a considerably higher proportion of males in the hospital sample even in comparison to the greater representation in the roadside sample. These findings are both well-established in road safety literature that addresses the increased crash involvement of younger drivers and male drivers (e.g. Arnett, 2002; Turner & McClure, 2003; Williams, 2003).

Employment characteristics tended to suggest that a wide variety of professions is represented in road crashes, as well as in the general driving population. There is some indication that blue collar workers, such as labourers, may be over-represented in the hospital sample while those in managerial positions may be under-represented. Previous research has identified the possible over-involvement of blue collar workers in road crashes (Ryan, Barker, Wright & McLean, 1992). In line with this finding, the highest education levels were comparable between the hospital and roadside samples apart from a lesser representation of those with a bachelor degree or higher among the hospital sample.

Alcohol and drink driving

Drinking levels as measured by the AUDIT-C instrument indicated that there may be a substantial drinking culture within the North Queensland region in both the crash-involved and general road user populations. Previous research has indicated that this, however, may be a characteristic of Australia as a whole. Chikritzhs et al. (2003) identified that 80% of all alcohol consumed in Australia is consumed "in ways that put the drinker at risk of acute and/or chronic alcohol-related harm" (Chikritzhs et al., 2003, p. xiv). The results of the current study, however, tend to suggest that harmful levels of drinking are particularly concentrated among those involved in serious crashes.

Drink driving behaviours in the last month were in line with the finding of a significant proportion of both samples drinking at harmful levels. While those in the hospital sample reported higher involvement in either drink driving or riding as a passenger of a drink driver in the last month, a significant difference was only found between the two groups in passenger behaviour. This higher involvement was not found after adjusting for age and gender though, suggesting that potentially the difference in drink driving behaviours can be attributed to greater drinking involvement among male and younger drivers rather than having a direct relationship to crash involvement. These statistics do, however, highlight the continued need for interventions to reduce drink driving, given that over 10% of those surveyed in the roadside sample reported taking part in these behaviours as well.

Research has noted that those drivers who have recorded previous convictions for drink driving are much more likely to die in an alcohol-related crash compared to other crash-involved drivers (Brewer et al., 1994). Drivers involved in high BAC fatal crashes have also been identified much more frequently as problem drinkers, suggesting that high levels of drinking may be associated with frequent drink driving and higher crash risk (Baker, Braver, Chen, Li & Williams, 2002).

Drug use

Usage of recreational drugs in either sample did not show a marked difference. Generally, low levels of drug use were present across all respondents. It is, however, unlikely that a significant difference would be noted between the two groups given such small numbers of positive cases. Previous research on the driving risks of drug use should be consulted for those seeking additional information (Kelly, Drake & Ross, 2004).

Licence status

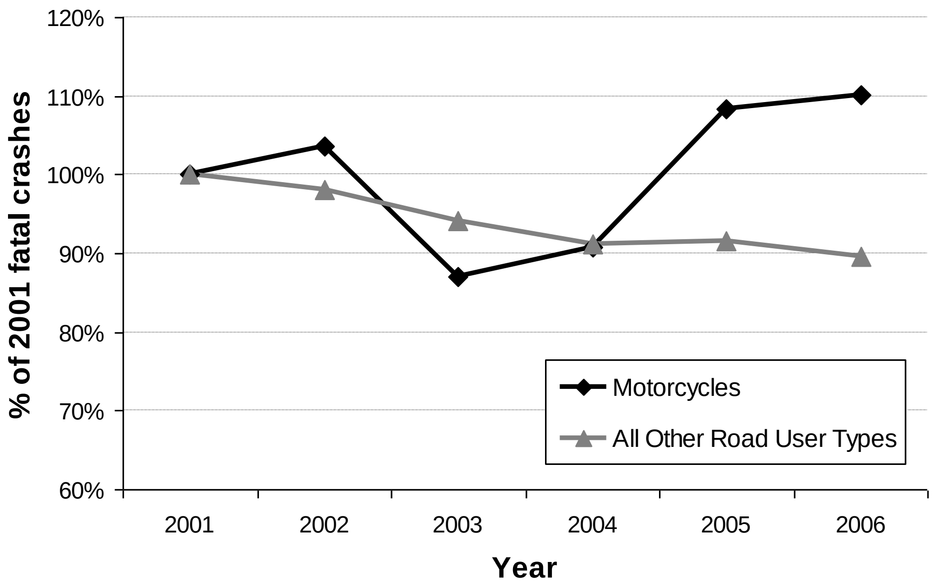
Analysis of licence status identified that those in the hospitalised crash sample were more likely to be unlicensed than the roadside participants. The 8% proportion found in the current study is also in line with previous studies that have linked unlicensed vehicle use with greater risk taking, road rule breaking and an overall elevated crash risk, particularly for serious and fatal crashes (Watson, 1997; Watson & Steinhardt, 2006; Watson & Steinhardt, 2007).

Vehicle type

Although over-sampled in terms of interviews in the current study, motorcyclists were found to be vastly over-represented in the crash data at 41% compared to only 3% of those roadside interviews. This can be attributed to a number of reasons most notably the increased vulnerability to injury inherent in motorcycle rider crashes. However, it should also be noted in the current study that motorcyclists may have been recruited less at roadside interview sites based at service stations due to a smaller stopping time for refuelling.

Chapter 6 of this current report, which outlines the medical outcomes of casualties, highlights the relatively high proportion of lower limb injuries in motorcyclists. These injuries regularly require a stay in hospital of greater than 24 hours while leaving the casualty in a physical state that is also relatively conducive to interviewing (i.e. no head injuries).

Motorcyclists continue to be an issue for road safety, with recent trends in Australia showing that the rate of fatalities resulting from all other road user types have remained stable over the last five years, while motorcyclists have shown a steady increase from 2004 through to 2006 (ATSB, 2007). This trend is illustrated in Figure 5.2 below.



Source: Australian Transport Safety Bureau, 2007

Figure 5.2. Proportion of 2001 fatalities by road user type, Australia, 2001-2006

Vehicle condition

The comparative characteristics of vehicles in both samples identified few differences in either the age of the vehicles involved, the time since last service or checking of tyre pressure. This is a reflection of the fact that vehicle defect related crash circumstances are noted in only 3% of all Queensland crashes for the period 2001–2006 (Queensland Transport, 2006).

Illegal behaviours

A number of human factors were identified, specifically in the hospital sample, that may have contributed to crash causation or increasing crash severity. Those in the hospital sample were significantly more likely to report speeding. Speed has been a consistently recognised factor in increasing crash risk (Kloeden, McLean, Moore, Ponte, 1997; Aarts & van Schagen, 2006).

Previous driving behaviours and crash history has been consistently linked to future risk taking and crash involvement. The current analyses identified a greater proportion of those in the hospital sample reporting a driver's licence suspension in the last five years. In fact, bookings for drink driving, speeding and other offences were all significantly more common in the hospital sample. This suggests a clustering of risk-taking behaviours that are associated with crash risk, which has been noted before in road safety literature (Graham, 1993).

However, the current results did not find a significant difference in the proportion of people who had been involved in a road crash in the last five years. Non-significant trends did, however, suggest that those in the hospitalised sample were more likely to be involved in previous crashes resulting in a hospitalisation and that they were more likely to be driving at the time of the crash.

Restraint and helmet use

The use of restraints and helmets was also considerably lower in the hospital sample. While practically all those interviewed at the roadside reported using seatbelts and helmets, 15% and 11% of the hospital sample reported not wearing a seatbelt or helmet respectively. This is particularly worrying given the well-established impact of seatbelts on decreasing crash severity (Evans, 1996; Campbell, 1987; O'Dea & Scott, 1984). The rates of seatbelt wearing in serious crashes have been previously shown to be lower in rural as compared to urban areas of Queensland (Steinhardt & Watson, 2007).

Establishing the casual direction of the link between crash involvement and seatbelt wearing is difficult given the 'selective recruitment hypothesis' which states that those who choose not to wear a seatbelt are also those who are most likely to take risks that are most likely to lead to crashes (Graham, 1993). Support for this link has been found in Queensland crash statistics with those casualties not wearing a seatbelt being more likely to result from crashes where alcohol or speeding was also present (Steinhardt & Watson, 2007). This selective recruitment may also present a bias in that those within the general road using population may have been less likely to pull over or take part in a survey if they had not been wearing a restraint.

Attitudes

In terms of attitudes towards road safety and related initiatives, some key differences and similarities between the two samples were noted. Firstly, respondents in the hospital sample showed a somewhat greater degree of fatalism towards road crashes. They responded with a greater agreement towards statements that road crashes are unavoidable or inevitable. It could be possible that high-risk drivers are more likely to believe that external forces have a greater impact on their potential involvement in crashes than they do themselves and consequently take less action to improve the safety of their driving (Sticher & Sheehan, 2006).

The relative level of concern regarding road safety as compared to other issues was similar in both groups. This may potentially be put down to the similar level of reported involvement in a previous road crash in both samples. However, the reported concern for road crashes showed a trend towards being more frequently considered important in the roadside sample. This is an interesting finding in that the group of those who had been very recently involved in a road crash were still less likely to report road safety as being a key issue.

In terms of suggested measures to improve safety, both groups frequently reported driver behaviour and road environment changes, though there was a greater tendency for those in the hospital sample to favour infrastructure changes.

A similar pattern of responses was noted in the comparative ranking of interventions to improve road safety within both samples. Aside from courtesy buses, road improvements and treatments as a group constituted the interventions perceived as most effective. Enforcement-related interventions constituted those rated the lowest in both samples.

Conclusions

A number of conclusions can be drawn from the data presented above:

- Young male drivers continue to be an at-risk group.

- Problem drinking and alcohol involvement is a concern, with a positive correlation between regular alcohol consumption and subsequent drink driving behaviours.

- Unlicensed drivers are represented in the studied rural crashes at similar levels to the whole state of Queensland.

- A significant proportion of the general population is involved in road crashes, though increased involvement in traffic offences is positively associated with crash involvement.

- Promotion of basic safety behaviours such as the use of seatbelts and helmets continue to have merit given the significant proportion of crash casualties reporting non-use.

- Despite evidence that human factors are often identified among crash-involved casualties, interventions focused on improving the road environment continue to be well-supported. Interventions seeking to highlight the human contribution to crashes should be pursued.

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6. Injuries – Hospitalised Casualties

Six hundred and ninety-six casualties were admitted to one of the study hospitals during the period 1 March 2004 to 30 June 2007. Full data on injuries and procedures was available for 690 of these casualties. This chapter will consider the demographic characteristics, emergency retrieval and injury profile of the casualties, as well as an estimation of the costs of retrieval and clinical treatment.

Most of the following information was retrieved from casualty hospital notes at time of admission to hospital. At the end of the study a full casualty chart audit was undertaken to retrieve missing data, particularly in relation to seatbelt and helmet use, and the use of alcohol noted by emergency department medical staff. Eighty-seven hospital charts were not available for chart audit as only charts from The Townsville Hospital or Cairns Base Hospital could be audited.

Characteristics of casualties

Casualties ranged in age from 16 to 96 years, with 8 casualties being 80 years or over. The mean age of the casualties was 36.9 years, with the median of 33.0 years. The majority (76%) of the casualties were male. As can be seen from Figure 6.1 below, young casualties predominated.

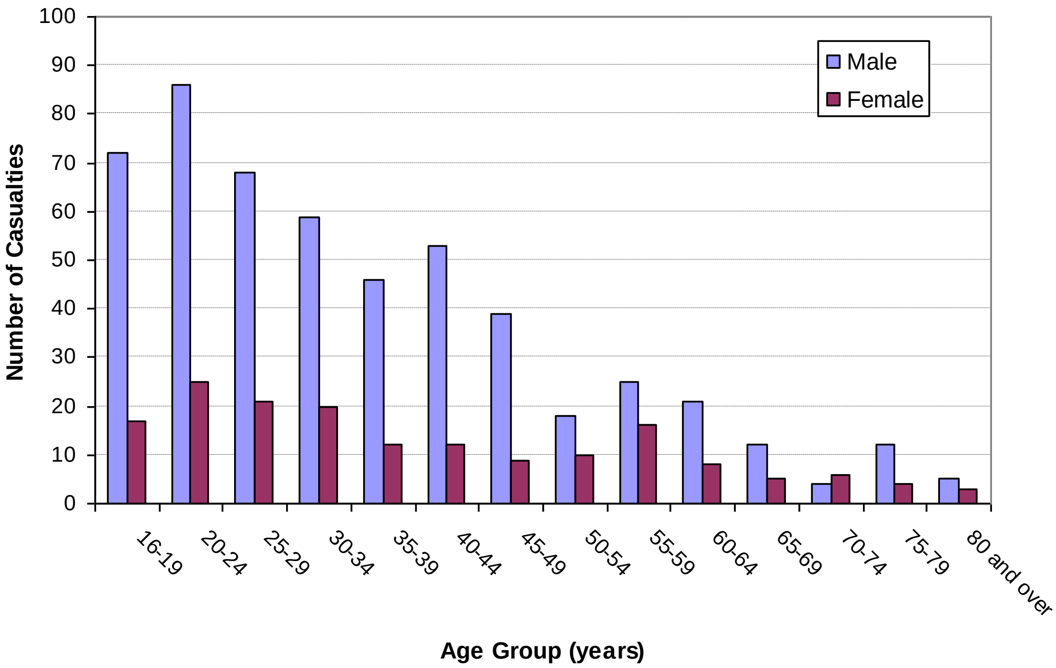

Figure 6.1. Casualties by age and gender – cases with medical data

The characteristics of casualties with regard to the crashed vehicle type and their occupation of the vehicle are presented in Table 6.1. Motor cycle riders comprise over one-third of the casualties.

Table 6.1. *Vehicle occupant type among casualties*

Motor vehicle type	Occupant type	n	%
Car/truck	Driver	207	30.0
	Passenger	134	19.4
Motor cycle	Rider	242	35.1
	Pillion passenger	10	1.4
Quad bike (ATV)	Rider	39	5.7
	Quad pillion	3	0.4
Bicycle	Rider	22	3.2
Not in vehicle	Pedestrian	33	4.8
Valid Total		**690**	**100.0**
Unknown		6	0.9
Total		**696**	**100.0**

Emergency retrieval of casualties

Retrieval transport data was available for 614 of the 696 admitted casualties. The Queensland Ambulance Service provided the initial emergency retrieval of the majority of casualties by road to the nearest hospital (72.6%). Helicopter services airlifted some casualties directly to one of the major hospitals (Townsville and Cairns) and the Royal Flying Doctor Service was used to transport about 5% of the casualties to a major hospital in Mt Isa, Townsville or Cairns. The mode of transport from the site of the crash to the nearest hospital is outlined in Table 6.2.

Table 6.2. *Mode of transport from crash site to first hospital*

Mode of transport	n	%
Road ambulance	446	72.6
Private transport	80	13.0
Helicopter	59	9.6
Fixed wing plane	29	4.7
Valid Total	**614**	**100.0**
Unknown	82	11.8
Total	**696**	**100.0**

Because of the nature of the injuries incurred and the limited services available in small rural hospitals 449 (73%) of all casualties were transferred from the first hospital to one of the major hospitals (primarily Cairns or Townsville). A large proportion of these transfers was provided by fixed wing (34.4%) and helicopter services (18.2%), while the QAS road service was still considerable (40.3%) (Table 6.3).

In seven cases casualties were initially transported by air to the first hospital and then transferred by air to another hospital. This occurred in three instances in Mt Isa where casualties were flown to Mt Isa initially and then transferred to Townsville. Two casualties were transported to Thursday Island from smaller Torres Strait islands and then transferred by air to Cairns. Two casualties were transported by air to Cairns and then transferred by air to Townsville.

Table 6.3. *Mode of transport from first hospital to major hospital*

Mode of transport	n	%
Road ambulance	171	40.3
Private transport	19	4.5
Helicopter	86	18.2
Fixed wing plane	145	34.4
Valid Total	**421**	**100.0**
Unknown	28	4.0
Not transported	247	35.5
Total	**696**	**100.0**

Response times

Retrieval times were obtained from the long trip sheets provided by QAS (either from the casualty's hospital notes or from the Communications Section of QAS) and from RFDS and QEMS reports in the casualty's hospital notes. These were obtained for 446 casualties (65% of all casualties). These times have been divided into two components: the time from notification to arrival at the crash site and the time between arrival at the crash site and arrival at first hospital.

The first category gives some appreciation of the time it takes emergency services to arrive at the crash scene once notified of the crash. The average time between the emergency service being notified of the crash and the emergency service arriving at the crash site was 25 minutes. On eight occasions the emergency services did not arrive at the site of the crash for more than two hours following notification.

The second category gives some indication of the time taken for extraction, resuscitation and transport to the nearest facility (first hospital). The average time between the emergency service arriving at the crash site and arriving with the casualty at the first hospital was 79 minutes. This was over three times the time required to reach the crash site, giving some indication of the extraction and resuscitation tasks faced by emergency services in these settings. On 81 occasions it took more than two hours from when the emergency services arrived at the crash site for them to arrive at the first hospital.

The average time between the emergency services being notified of the crash and arriving at the first hospital with the casualty was 100 minutes. Twenty-seven casualties arrived at the first hospital between two and three hours after the emergency services were notified of the crash, while 24 casualties arrived at the first hospital more than three hours after the emergency services had been notified of the crash.

Table 6.4. *Emergency response times (in minutes)*

Time intervals	Mean	Median	Inter-quartile range
Notification till emergency vehicle arrived at crash site	25	13	8–27
Arrival at crash site till arrival at first hospital	79	60	37–60
Notification of crash till arrival at first hospital	100	78.5	49–130

While over a third of the casualties had no available information, there is no reason to believe that their omission will lead to any systematic bias. Another study of unrelated retrieval time data in North Queensland demonstrated shortcomings in accuracy and reliability of such information and so should be treated with caution and perhaps used as indicative only (McDonell, 2005). In most instances, accurate information about the actual times of crashes was not available.

Retrieval costs

The cost of retrieving the casualties was estimated as described in the Methods section. Using these figures it is estimated that the cost for emergency retrieval and transport was over $1 million as outlined in Table 6.5. Casualties transported by private vehicles are not included in these estimates. As outlined in Table 6.2 above over 70% of casualties were transported by road ambulance. In addition, those casualties transported by air were attended by road ambulances in the first instance and therefore 95% of casualties were attended by Queensland Ambulance Service at the crash site. The average cost of retrieval for each of the 534 casualties attended by the emergency services was $2,150. The annual cost of emergency services retrievals over the project was $355,000.

Table 6.5. *Estimated cost of retrieval of casualties to first hospital.*

Transport type	Cost
Air transport	$650,000
Road transport	$495,000
Total	**$1,145,000**

As stated above, over 60% of all casualties required transfer from the first treating hospital to one of the major hospitals in the region. Over 50% of the transferred casualties were transported by air, adding to the cost considerably as outlined in Table 6.6. The average cost of transferring the 405 patients who used emergency services transport was $6,300 and the annual cost of transferring patients between hospitals was $785,000.

Table 6.6. *Cost of inter hospital transfers*

Transfer type	Cost
Air transport to second hospital	$1,900,000
Air transport to third hospital	$170,000
Road transport to second hospital	$145,000
Road costs associated with fixed wing flights	$335,000
Total	**$2,550,000**

Major injuries of casualties

Injury data was collected for 690 casualties. These data came from clinical benchmarking reports provided by the major hospitals which accounted for the overwhelming majority of casualties resulting from serious road crashes in North Queensland.

The proportion of casualties with injuries to the major body sites are outlined in Figure 6.2. Lower limb injuries were noted in more than 45% of the casualties, with 30% of all casualties sustaining fractures to the lower limb. Over 30% of the casualties had some form of head or neck injury, with 12% having a fracture of the skull or facial bones. It is likely that superficial and associated soft tissue injury is generally under-reported in the clinical benchmarking reports.

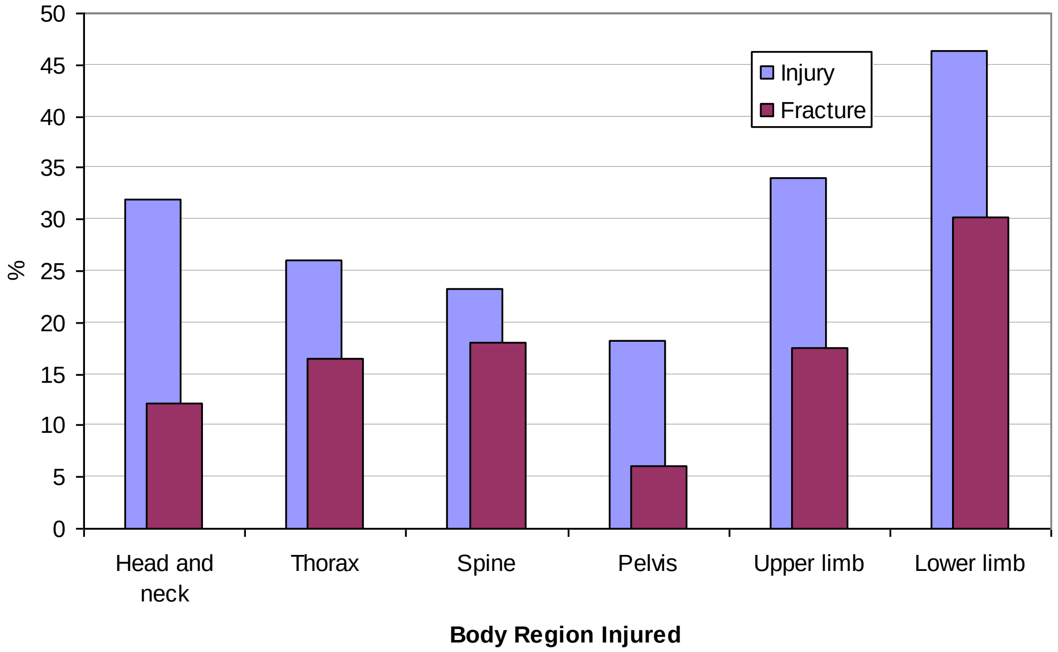

Figure 6.2. Comparison of injuries and fractures to different regions of the body for the whole casualty group

Injuries by type of vehicle occupant

All vehicle occupant groups sustained injuries across the major body sites, as demonstrated in Figure 6.3.

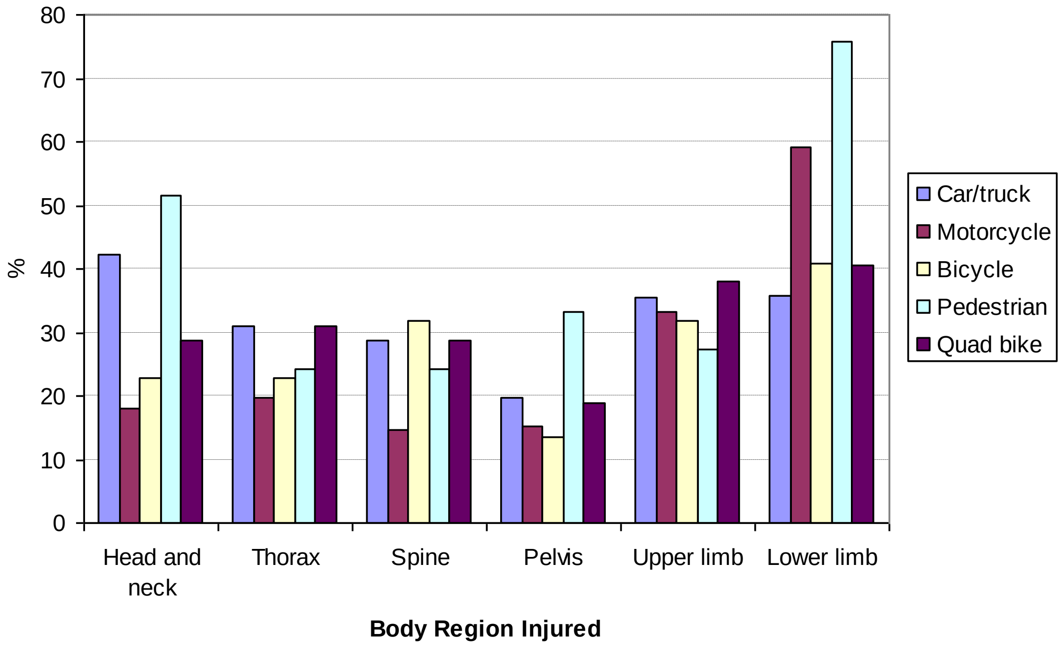

Figure 6.3. Comparison of injuries to different regions of the body for different road users

The vulnerability of pedestrians is further demonstrated when fractures only are considered (see Figure 6.4). Pedestrians have higher rates of lower limb fractures (66%), fractures to the head (18%) and pelvis (24%). Over 40% of motorcyclists have lower limb fractures.

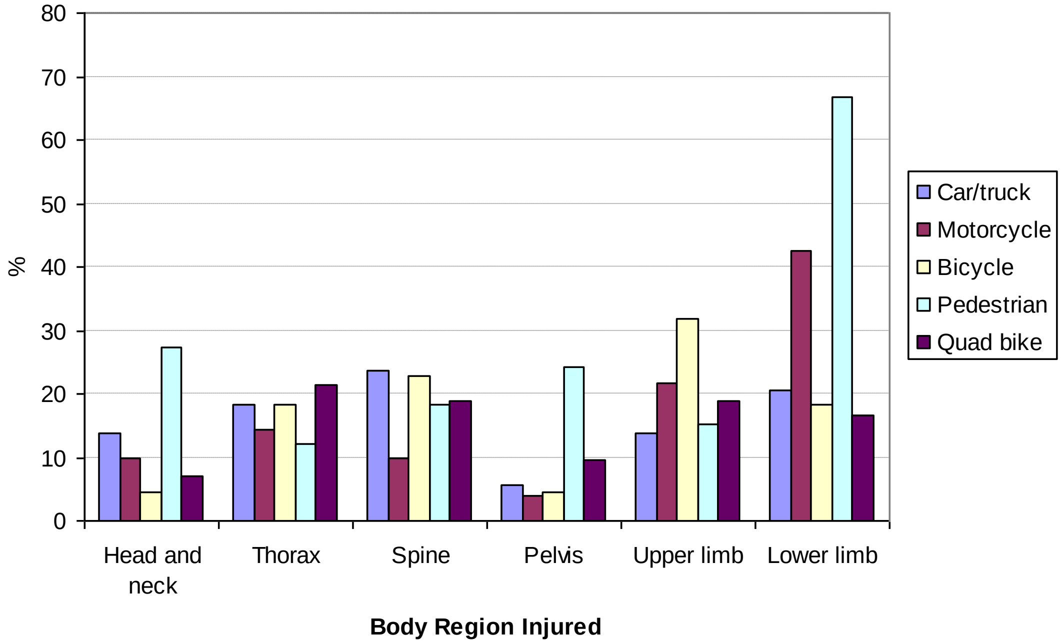

Figure 6.4. Comparison of fractures to different regions of the body for different road users.

Head injuries

Fractures to some part of the head occurred in 12% of casualties. These have been divided into skull and facial fractures in Table 6.7. Twenty-four casualties (3.5%) had fractures to both skull and facial bones. Overall, 7.8% of casualties had fractures to the skull with 57.4% of these being fractures to the base of the skull. In addition, 7.8% of casualties had fractures to the facial bones, 46.3% being multiple fractures to the facial bones, and 16.7% being fractures to the orbit of the eye.

Table 6.7. *Proportion of casualties with skull and facial fractures by vehicle type*

Vehicle occupant	n	Skull fractures	Facial fractures
Car/truck (n=341)	341	8.8%	8.8%
Motor cycle (n=252)	252	6.3%	5.6%
Bicycle (n=22)	22	4.5%	0%
Pedestrian (n=33)	33	18.2%	18.2%
Quad bike (n=42)	42	2.4%	7.1%

Just over 8% of casualties had brain injuries with the majority of these (84%) being haemorrhages. The percentage of road users with brain injuries is presented in the figure below. Over 20% of pedestrians had a brain injury. No quad bike riders or passengers suffered a brain injury.

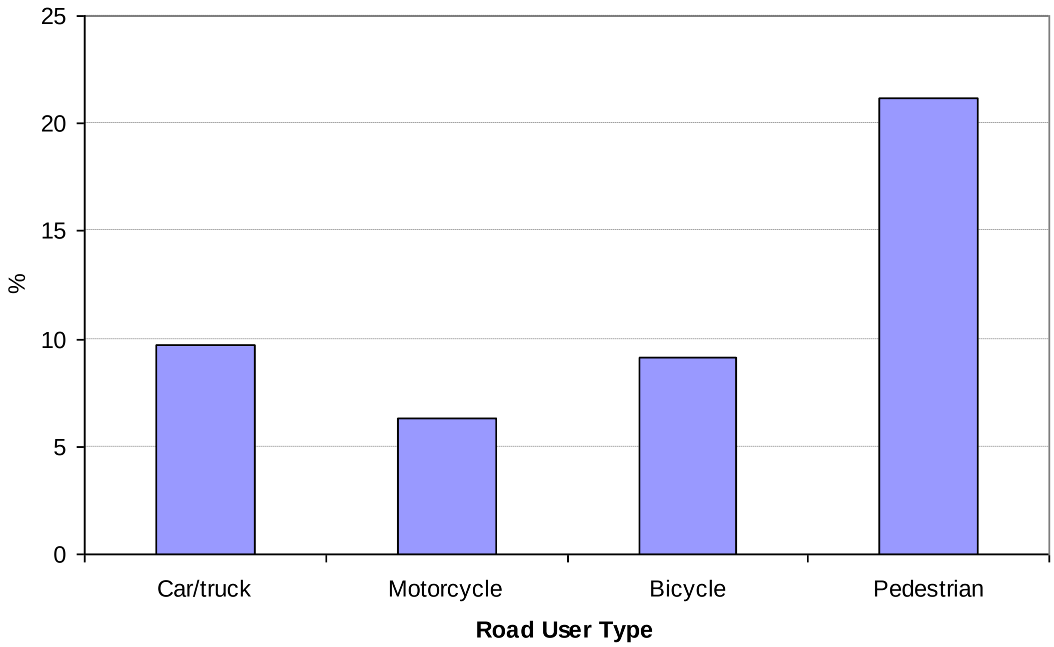

Figure 6.5. Proportion of brain injuries by road user type

Chest injuries

Chest wall fractures were recorded in one-sixth of casualties, and 50.4% of these were fractured ribs alone with another 24.3% involving multiple chest wall bones. Most casualties with multiple fractures had fractured ribs.

Other significant injuries to the chest are displayed in Table 6.8. Over 10% of casualties had either air or blood in the pleural cavity. Fifty-one (7.4%) casualties had injuries to the lung with the majority (88%) being contusion of the lung tissue. Twenty-one casualties (3%) suffered pulmonary collapse and 12 (1.7%) had a pleural effusion as a result of their injuries.

Table 6.8. *Significant chest injuries*

Chest injury	n	% of all casualties
Flail chest	16	2.3
Pneumothorax	29	4.2
Haemothorax	14	2.0
Haemopneumothorax	27	3.9
Subcutaneous or interstitial emphysema	11	1.6

Four casualties (0.6%) had injuries to the heart, all of them contusion. Four casualties (0.6%) had injuries to the major blood vessels of the chest; two of these casualties died soon after admission following injury to the inferior vena cava and aorta respectively.

Spinal injuries

One hundred and twenty-five casualties (18%) had spinal fractures. Where casualties had multiple spinal fractures the highest level of the fractures was recorded. There were 48 cervical spine fractures, 34 thoracic spine fractures, 39 lumbar spine fractures and 4 fractures of the sacrum.

Spinal cord injuries were suffered by 11 casualties (1.6%) with 5 at the cervical level, 2 at the thoracic level and 2 at the lumbar level. The level of spinal cord injury was not specified in 2 cases.

Abdominal and pelvic injuries

One hundred and twenty-seven casualties (18.4%) had injuries to the abdomen and or pelvis. The majority of these injuries were to soft tissue as outlined in the following table. Car occupants suffered the majority of each of these injuries except for kidney injury where 63.6% of those with this injury were motorcyclists.

Table 6.9. *Abdominal organs injured*

Abdominal organ injured	n	% of all casualties
Abdominal wall	56	8.1
Spleen	20	2.9
Liver	20	2.9
Bowel	13	1.9
Kidneys	11	1.6
Pancreas	2	0.3

No injuries were recorded to female reproductive organs. Four males (2 motorcyclists, a quad bike rider and a pedestrian) had injuries to the external genitalia. Fractures to the pelvis occurred in 42 casualties (6.1%). These figures include 20 casualties with fractures to the pubis only. Car occupants comprise almost half of those with a fractured pelvis. Almost a quarter of all pedestrians (8/33) suffered a fracture to the pelvic region.

Upper limb injuries

One hundred and twenty-two casualties (18%) had fractures of the upper limb. The specific areas fractured are provided in the following table. Fractures of the forearm predominate with 85 casualties having a fractured radius, ulna or both. Fifty per cent of these were motorcyclists and 33% were car occupants. Soft tissue injuries reported were mainly lacerations.

Table 6.10. *Upper limb fracture areas*

Area fractured	n	% of all casualties
Humerus	34	4.9
Elbow	2	0.3
Radius/ulna	85	12.3
Wrist	15	2.2
Hand	17	2.5
Fingers	10	1.4

Lower limb injuries

Two hundred and ten casualties (30%) had fractures of the lower limb. The breakdown of areas fractured is provided in Table 6.11. Motorcyclists sustained 57% of the fractures to the tibia and fibula and 56% of the ankle fractures.

Table 6.11. *Lower limb fracture areas*

Area fractured	n	% of all casualties
Hip	12	1.7
Femur	71	10.3
Patella	18	2.6
Tibia/fibula	95	13.8
Ankle	45	6.5
Foot	33	4.8
Toes	9	1.3

Injuries sustained by seatbelt wearing status

A record of whether the casualty was wearing a seatbelt or not was recorded in 232 (68%) of car and truck occupants' hospital notes. The body areas injured and fractured by seatbelt wearing are outlined in the following tables. Of interest is the higher proportion of head injuries and fractures among those not wearing seatbelts.

Table 6.12. *Injuries among car and truck occupants by seatbelt wearing*

		Area of body injured (% of all casualties)					
Seatbelt worn	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	142	38.0	31.7	29.6	22.5	35.9	32.3
No	90	54.0	36.7	32.0	16.7	36.7	41.0

Table 6.13. *Fractures among car and truck occupants by seatbelt wearing*

		Area of body fractured (% of all casualties)					
Seatbelt worn	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	142	14.8	19.7	24.6	6.3	14.8	19.0
No	90	18.9	22.2	26.7	5.6	13.3	23.3

Injuries sustained by helmet-wearing status

A record of whether the casualty was wearing a helmet or not was recorded in 195 (77.4%) of motorcyclist, bicycle and quad biker riders' hospital notes. Motorcyclists comprise 51.7% of those not wearing helmets with quad bikers making up 43%. The body areas injured and fractured against whether the casualty was wearing a helmet or not are outlined in Tables 6.14 and 6.15. As expected, head and neck injuries and fractures are higher among those not wearing helmets.

Table 6.14. *Injuries among motorcyclists, bicyclists and quad bikers by seatbelt wearing*

		Area of body injured (% of all casualties)					
Helmet worn	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	136	15.4	25.7	16.2	15.4	36.0	56.6
No	58	44.1	30.5	27.1	18.6	32.0	47.5

Table 6.15. *Fractures among motor cyclists, bicyclists and quad bikers by seatbelt wearing*

		Area of body fractured (% of all casualties)					
Helmet worn	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	136	6.6	19.9	11.8	3.7	25.7	40.4
No	59	22.0	20.3	18.6	8.5	20.3	25.4

Injuries sustained when alcohol intoxication considered

Alcohol intoxication was noted by emergency physicians in 105 of 609 casualty charts (17.2%) reviewed by chart audit. Males comprised 83.8% of this group. Alcohol use among the different road users is presented in the following table. Young casualties dominate this group with 35.2% being under 25 years and 22.9% aged between 25 and 34 years.

Table 6.16. *Intoxicated casualty numbers and rates of road user type*

Road user type	n	n intoxicated	% of road user type
Car or truck driver	180	34	18.9
Car passenger	118	25	21.2
Motorcycle rider	211	20	9.5
Pillion passenger	8	2	25
Bicyclist	20	3	15
Pedestrian	30	13	43.3
Quad bike rider	39	6	15.4
Quad bike passenger	3	2	66.7

The body areas injured and fractured against whether the casualty was noted to be intoxicated or not are outlined in Tables 6.17 and 6.18. Head injuries and fractures were higher among those intoxicated. Twenty-four of the 90 casualties (27%) not wearing seat belts were intoxicated and 22 of the 59 casualties (37%) not wearing helmets were intoxicated. The likelihood of not wearing a seatbelt or helmet is doubled if intoxicated.

Table 6.17. *Injuries among casualties by intoxication*

		Area of body injured (% of all casualties)					
Intoxication	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	105	48.6	29.5	22.9	20.0	36.2	20.0
No	504	29.8	25.2	24.4	17.9	35.1	11.5

Table 6.18. *Fractures among casualties by intoxication*

		Area of body fractured (% of all casualties)					
Intoxication	n	Head and neck	Thorax	Spine	Abdomen pelvis	Upper limb	Lower limb
Yes	105	20.0	14.3	15.2	5.7	15.2	31.4
No	504	11.5	17.5	20.4	6.5	19.0	32.2

Injuries sustained by nature of crash

For 240 cases Queensland Transport's Roadcrash database provided details of the types of crashes. The injuries according to the nature of crash for the top six types of crash (n=227) are outlined in Figure 6.6. Over 50% of casualties involved in crashes with more than one vehicle (head-on, angle and sideswipe crashes) and motorcycle riders had injuries to the lower limbs.

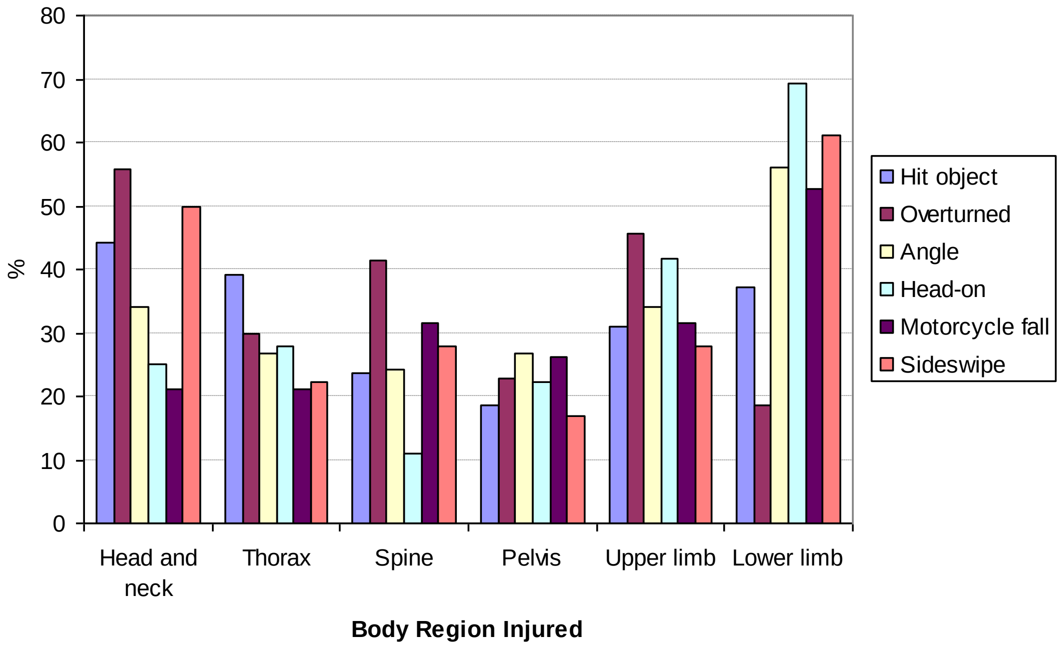

Figure 6.6. All injuries to different regions of the body by nature of crash

Fractures of the lower limb again occurred in crashes involving more than one vehicle and among motorcyclists as seen in Figure 6.7. Single vehicle crashes resulted in spinal fractures (overturned vehicle) and skull fractures (hit fixed object).

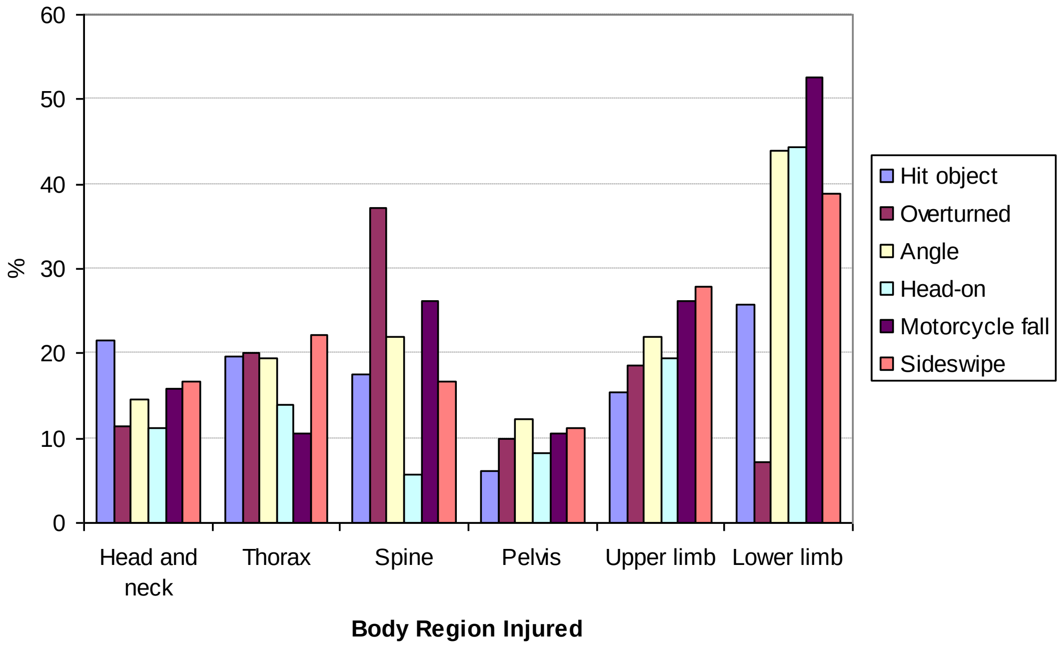

Figure 6.7. Fractures to different regions of the body by nature of crash

The injuries occurring among the 40 casualties in this group who were not wearing seatbelts are outlined in Figures 6.8 and 6.9. The only casualty from a head on collision among this group had injuries to all areas of the body and fractures to all areas except the pelvis. Over 40% of all those not wearing seatbelts had some injury to the head and lower limbs.

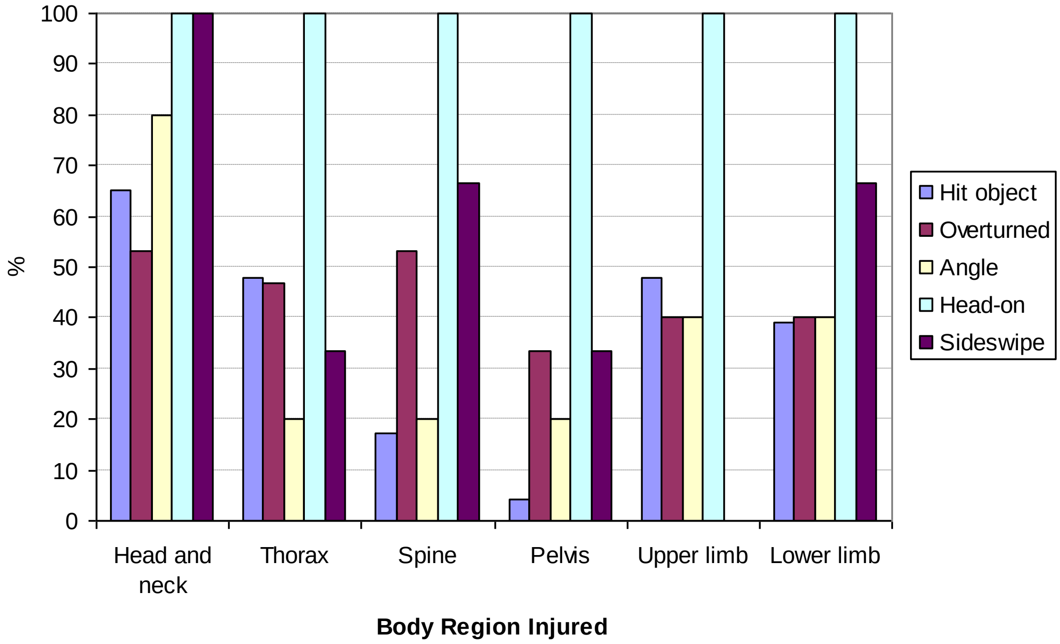

Figure 6.8. All injuries to different regions of the body by nature of crash for those not wearing a seatbelt

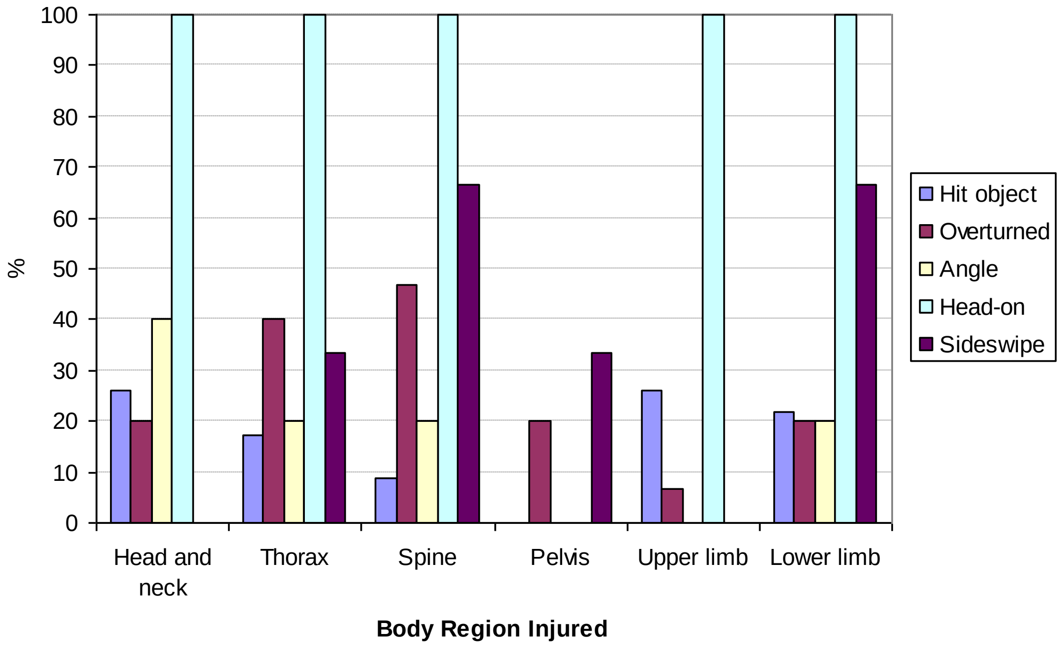

Figure 6.9. Fractures to different regions of the body by nature of crash for those not wearing a seatbelt

Characteristics of hospital treatment

Length of stay

Data on the length of stay for the initial acute admission for each casualty was collected. While this includes any admissions to the Intensive Care Unit (ICU) during the initial admission following a crash it does not include time spent in rehabilitation facilities. Casualties in the study occupied a total of 6360 acute bed days in the four hospitals within the study area. Of these, 734 were ICU bed days.

The average length of stay for all casualties was 9.35 days. The median length of stay for each type of vehicle occupant is provided in Table 6.19. Pedestrians had longer stays in hospital than any other group of road user.

Table 6.19. *Median length of stay for each vehicle occupant type*

Type of road user	Median	Interquartile range
Car/truck driver	6.0	3–13
Car/truck passenger	5.0	3–8
Motorcycle rider	5.0	2–10
Pillion passenger	6.5	1–11
Bicyclist	6.0	3–8
Pedestrian	7.0	4–13
Quad bike rider	4.0	2–8
Quad bike pillion	4.0	1–7
All casualties	5.0	3–10

Intensive Care Unit admissions

One hundred and eight casualties (15.6%) were admitted to an ICU and their median length of stay was 4 days (IQR 2-9). The longest stay in ICU of 39 days was required by a quad bike rider. The total number of ICU bed days was 734. Car occupants comprised 53.7% of those admitted to ICU with motorcyclists making up 30.6% of the group. Seven pedestrians, 6 quad bike riders and 4 bicyclists were also admitted to ICU.

Interventions

Sixty-five (60.2%) of those casualties admitted to ICU required mechanical ventilation. Seventy-one (10.3%) of all casualties were transfused with blood products during the hospital admission. Three hundred and eighty-four casualties (56%) underwent surgery under general anaesthetic with some patients requiring up to 11 general anaesthetics.

Allied health services were provided to 470 casualties (68%). The services included physiotherapy, occupational therapy, social work, speech therapy and dietetics. Some casualties required all five services and many had numerous occasions of service from each allied health service.

Patient outcomes

Outcome data was available for 674 casualties. The majority of these casualties (78.6%) were discharged home, with another 9.6% being transferred to their local hospital for further treatment and recuperations. Information was not available on out-patient rehabilitation services. Of those transferred to an in-patient rehabilitation or other health service, 9 were transferred to a specialist Spinal Unit in Brisbane or interstate, 26 were transferred to a rehabilitation unit in either Townsville or Cairns, 12 went to private hospitals and 4 were transferred to another tertiary hospital either in Brisbane or interstate. Eight casualties were transferred to another health service (e.g. mental health service) and 7 casualties left hospital against medical advice. The following table provides information about the casualties' outcomes following treatment at one of the study hospitals.

Table 6.20. *Outcomes of casualties admitted to the study hospitals*

Outcome	n	%
Discharged home	530	78.6
Transferred to local hospital	65	9.6
Sent to rehabilitation or another health service	59	8.8
Died	10	1.4
Left hospital against medical advice	7	1.0
Unable to determine	3	0.4

Ten casualties died following admission to one of the study hospitals. These comprised eight males and two females aged from 17 to 80 years. Six of these casualties were transferred from a rural hospital to a major hospital.

Four of these casualties died before reaching the ICU. These included a motorcyclist with severe brain injuries, a pregnant female driver with multiple injuries, a female passenger with a tear in the aorta and a male driver with multiple injuries to the lower trunk and legs.

Three other casualties (a driver and two car passengers) died within 24 hours of admission. All of these casualties had brain injuries. The remaining three casualties, all 45 years or older, died within 5–11 days of admission. Two died from concurrent medical conditions (a car driver and a motorcyclist) and the third (a pedestrian) had brain injuries and sepsis.

Cost of in-hospital care

Actual costs

The actual cost of the initial acute admission for 253 casualties admitted to The Townsville Hospital was obtained from the Clinical Information Services of TTH. The total cost of the initial acute admission for these 253 casualties was $3,138,316.

Table 6.21. *Cost of care at TTH for 253 casualties*

Item	Cost
Total cost (n=253)	$3,138,316
Average cost for each admission	$12,404
Average cost per bed day (n=3001)	$1,045

Sixty-eight of the 253 casualties received ICU care during their admission. The cost of this care is outlined in Table 6.22.

Table 6.22. *Cost of ICU care at TTH for 68 casualties*

Item	Cost
Total cost ICU admission (n=68)	$860,066
Average cost for each ICU admission	$12,837
Average cost per ICU bed day (n = 362)	$2,376

Pathology services were used by 200 of the casualties and the details of these costs are outlined in Table 6.23.

Table 6.23. *Cost of pathology services at TTH for 200 casualties*

Item	Cost
Total cost pathology services (n=200)	$80,366
Average cost per admission	$402

Imaging services were used by 222 of the casualties and the details of these costs are outlined in Table 6.24.

Table 6.24. *Cost of imaging services at TTH for 222 casualties*

Item	Cost
Total cost pathology services (n=222)	$118,027
Average cost per admission	$532

Estimated total costs

The actual costs for bed days were then used to estimate the total costs for the initial acute admission for casualties in this study. There were a total of 6360 bed days and 734 ICU bed days. The total estimated costs are outlined in Table 6.25. These costs may be slightly overestimated as all patients with head injuries were transferred to TTH. The average length of stay for the 253 casualties admitted to TTH was 11.86 days while the average length of stay for the entire cohort was 9.35 days.

Table 6.25. *Estimated initial acute admission costs for study cohort (n=690)*

Item	Cost
Total costs for bed days (n=6360)	$6,650,000
Cost for ICU bed days (n=734)	$1,743,900

Discussion

This section discusses salient points that have emerged from the injury analysis, in the context of the data collection methods used. It also makes suggestions for areas of further research that have become apparent when considering the results.

Issues with data collection

The data collected effectively represents a population-based study for the defined catchment area. Cases were identified from the patient databases of the major participating hospitals, and because only clinical records were relied upon, volunteer bias was not an issue. Some cases that were solely treated by the smaller rural hospitals in the region may have been missed. However, this number is likely to minimal, as most cases deemed serious would have been transferred to the major hospitals for definitive care.

Certain aspects of the data were missing for some cases, due to incomplete or unavailable records (e.g. comments on the use of safety accessories, response and retrieval times). Although this could be rectified by a more labour-intensive prospective data collection methodology, such an approach would not be logistically feasible. Furthermore, it is unlikely that this missing data would be associated with any systematic bias.

Demographics

The age-sex distribution of casualties largely reflected the crash driver-rider characteristics described in the section on crashes. In absolute terms, there was a predominance of young males, with peak representation by the 20–24 age group and a progressive decline with age thereafter. By contrast, there was a lower and more even distribution across age groups for females. Such data provides useful information with regard to impact on health and welfare resources. While a predominantly younger cohort of crash casualties are more likely to successfully undergo the necessary acute care, given a relative lack of co-morbidities, they will subsequently impose a greater financial burden due to the increased number of Disability-Adjusted Life-Years (DALYs) incurred. This implies an increased demand on rehabilitation services (whose capacity is already limited in rural and remote areas) and loss to the workforce (with subsequent demand on welfare budgets).

The data, as presented, draws fewer conclusions about the relative risk of injury for particular demographic groups, such as young males. For this to be estimated, an appropriate denominator would need to be sought that more accurately reflects exposure. This is not simply the age-sex distribution of the local population, but also the road use of particular age-sex groups. While licensing data obtained from Queensland Transport may be a reasonable proxy measure of the latter, it neglects the fact that 22% of injuries occurred on private property (where licensing is irrelevant) and road crash casualties include passengers (21%) and pedestrians (4.8%) as well as driver-riders. To determine the road use exposure across the age-sex demographic would be a worthy focus of future research. This may take the form of population-based surveys or other composite means of data collection. Moreover, determining the relative risk for road crash injury for particular age-sex cohorts may prove to be of benefit when tailoring targeted educational programs.

Overall injury profile

In general, the range and severity of injuries described tends to validate the original case definition of a 'serious crash' (i.e. incurring admission to hospital for >24 hours).

All major body sites were represented in the whole study group, with injuries to the lower limb being the most commonly encountered. The majority of these, as expected, were attributed to fractures. It should nevertheless be noted that soft tissue injuries *per se* may have been under-reported when a co-existing fracture was present.

Twenty-four per cent of casualties sustained a back injury, of which 75% had a vertebral fracture. Only 1.6% of casualties, however, had an injury of the spinal cord. The total proportion of back injuries may nonetheless be a source of considerable chronic disease burden in terms of long-term morbidity and disability.

Influence of vehicle or road user type

As well as having implications for the causation of crashes *per se*, vehicle or road user type have also been seen to influence the overall incidence of injuries, the profile of injuries incurred, and clinical outcomes.

Cars and trucks accounted for almost half of the casualties, while motorcycles accounted for just over one-third. The latter is of particular interest given that these vehicles are relatively less represented in terms of overall road use, but may be explained by the fact that 22% of crashes occurred on private property of which the majority involved motorcycles (100 motorcycles in 152 crashes). Of note, also, is that those in charge of a vehicle (i.e. drivers or riders) accounted for 74% of casualties.

When considering the injury profiles for the various types of road user, certain tendencies become apparent, which can be assumed to be due to the specific mechanisms of injury involved. The relatively high proportion of motorcyclists and pedestrians with lower limb injuries are indicative of the exposed nature of these body parts in such crashes. Pedestrians are similarly at a high risk of head and neck injury, whereas motorcycle riders, the majority of whom would be wearing helmets, have a low risk. These injury tendencies for motorcycles and pedestrians can largely be attributed to fractures. However, pedestrians were further noted to have the highest proportion among all groups of brain (i.e. intracranial) injuries, reflecting both the high impact of the injury and the lack of protective headwear. Motorcyclists have the lowest proportion of back and thorax injuries, suggesting that the upper torso is relatively 'protected' in motorcycle crashes compared to other vehicles. Of interest also is the fact that the proportion of head and neck injuries is relatively high for car/truck users, but this does not appear to be attributable to fractures. It could be surmised that this discrepancy is largely accounted for by whiplash injuries due to rapid deceleration. The advent of vehicle safety features such as airbags may reduce the incidence of this type of injury in the future. Moreover, detailed knowledge of injury profiles, along with proposed mechanisms of injury, may ultimately inform a variety of specific vehicle safety modifications.

Despite the different injury profiles for each of the vehicle or road user types, no particular trend was evident in the median length of hospital stay, which varied narrowly between 4 and 7 days. A similar lack of trend was also found for other clinical benchmarks measured, such as ICU admission, and the proportion of casualties requiring blood transfusion, general anaesthesia (operative intervention) and allied health consultation. Although beyond the scope of this study to calculate individual measures of injury severity (e.g. TRISS, Trauma Injury Severity Score), it can be assumed that in light of the foregoing proxy data, no one vehicle or road user type is associated with more severe injuries than any other (within those casualties who survive the initial trauma).

Impact of safety accessories

Data analysis did not set out to specifically determine the impact of seatbelts and helmets on the incidence of death or severe trauma per se, but certain trends in injury profile became evident when examining the data in terms of whether or not these safety devices were being worn. It should be noted that outcome data was only analysed for casualties where safety accessory status was conclusively recorded in the clinical record. While this may have led to some reporting bias, it is difficult to see how this would have had a net positive or negative effect on the results.

When car/truck drivers were noted not to have worn a seatbelt, there was an increased proportion of head and neck injuries. This difference did not appear to be due to fractures, inferring that the residual was due to soft tissue injuries, including brain injuries.

As might be expected, motorcyclists not wearing helmets had a markedly increased proportion of all head and neck injuries, as well as head and neck fractures. There also appeared to be a higher proportion of back injuries, but these were not largely attributable to fractures alone. In this case, it may be that those not wearing helmets may undergo torsion injuries while falling from the vehicle and trying to protect their head.

Emergency retrieval issues

Relevant data was available for 88.2% of casualties. It is unlikely that the relatively small number of missing cases would have led to any systematic bias in the results.

In terms of response and retrieval times, there appeared to be reasonable compliance with the generally accepted ‘Golden Hour’ of best practice trauma care, despite the rural and remote location of the crashes. What is lacking, however, is the additional time from the occurrence of the crash to the notification of emergency services. Such a time interval remains unknowable for many cases, given their isolation and the sole occupant status of vehicles, and may behove the development of technical solutions to this problem (e.g. vehicle alarm systems, improved telecommunication networks). It remains to be seen what impact time to notification, and indeed total retrieval time, have on the ultimate clinical outcome (including death). This would be fruitful ground for further research.

Clinical outcomes

Due to the retrospective nature of data collection, evaluation of clinical outcomes was limited, for convenience, to certain hospital-generated benchmarks. These pertained only to the episode of acute care. Issues related to long-term rehabilitation outcomes were beyond the scope of this study.

The median length of hospital stay of five days once again validated the case definition of a serious crash, in that few casualties were admitted to hospital for just over 24 hours. Similarly, those admitted to an ICU were usually not there for a brief duration. The majority of casualties also required at least one major operative intervention, with many requiring more than one operation under general anaesthesia.

When considering the ultimate disposition of crash casualties, it can be seen that the vast majority were dealt with by public hospitals within the region. Despite the documented severity of the injuries, access to dedicated rehabilitation of any description appeared somewhat limited. While no information was gathered on those receiving outpatient rehabilitation, it seems unlikely that this was particularly common, given the relative lack of allied health professionals in all but the major urban centres of the region.

The death rate following definitive medical attention was extremely low, affirming the quality of acute care both in transit and in hospital. The few casualties that did die in hospital either had injuries that were incompatible with long-term survival or adverse pre-existing co-morbidities.

Health cost implications

As can be seen from the data provided, the total cost of acute care (i.e. retrieval and in-hospital management) for severe crash casualties in rural and remote North Queensland is a considerable burden on the public health budget. It must also be realised that because of the retrospective and composite nature of this aspect of the data collection, costs are likely to have been underestimated. In addition, no attempt has been made to address the economic and human costs of post-hospital rehabilitation (either actual or ideal) and long-term disability. This should be the subject of further research.

A large proportion (30%) of the acute costs was due to retrieval and transportation, as would be expected for crashes occurring in rural and remote locations. The necessity of such services is obviously unavoidable, as is the in-hospital treatment. The costing data, along with the methodology that has been devised for calculating it, are nevertheless invaluable tools for future research into more efficient trauma management systems. The total estimated acute health care costs for serious crashes also provide a useful resource for local health managers when allocating annual budgets.

Conclusions

- The absolute disease burden posed by serious road crashes in rural and remote North Queensland is not inconsiderable, with young adult males bearing the brunt. The exposure-adjusted risk of specific age-sex groups merits further research.

- Certain types of vehicle and road user type are associated with distinct injury profiles. This should provide impetus for further research into the mechanisms of injury, and the development of specific safety innovations and/or educational interventions.

- While time to definitive care will never equal that of more densely populated urban areas, the study has demonstrated considerable efficiency in the response and retrieval systems of rural and remote North Queensland. However, further research is warranted in the time from crash to notification, both in terms of its impact on clinical outcome and possible means by which it can be reduced in rural and remote locations.

- There are substantial financial costs associated with the acute management of trauma resulting from serious rural and remote crashes. These should be taken into account when planning local health budgets, and also used as a baseline when evaluating primary and secondary preventive strategies.

- Information on rehabilitation and long-term disability outcomes for casualties resulting from rural and remote crashes is lacking. Further research is indicated in order to identify gaps in service delivery and the means by which this can be addressed.

References

McDonell, A. 2005, The effects of targeted interventions on trauma patient notification time by rural hospitals to a tertiary receiving hospital. Honours Thesis, JCU.

7. Fatal Crashes and Fatalities

This chapter will describe the characteristics of the fatal casualties and the nature and circumstances of the fatal crashes. The final section of the chapter will consider the fatal casualty injuries and crash characteristics for 76 casualties (from 73 crashes) for which police and medical reports to the coroner were available.

Characteristics of fatalities

During the study period there were 119 fatal crashes resulting in 130 fatal casualties. Over 78% of the group were male and the average age was 37.4 years with a median of 34 years (SD 16.4; IQR 24–48.5). There were three child fatalities included in the study as these crashes resulted in either someone 16 years or over being killed or hospitalised for over 24 hours. Fatalities in which only children were killed and no adults were admitted to hospital were excluded from the study. See Table 7.1 and Figure 7.1 below.

There were 22 Indigenous fatalities (16.9%) and the ethnic origin of 6 fatal casualties was not known.

Table 7.1. *Total fatal casualties by age and gender*

Age group	Male	%	Female	%	Total	%
Under 16	1	1.0	2	7.1	3	2.4
16–19	11	11.5	2	7.1	13	10.5
20–24	11	11.5	5	17.9	16	12.9
25–29	12	12.5	1	3.6	13	10.5
30–34	18	18.8	4	14.3	22	17.7
35–39	7	7.3	1	3.6	8	6.5
40–44	7	7.3	4	14.3	11	8.9
45–49	4	4.2	4	14.3	8	6.5
50–54	9	9.4	2	7.1	11	8.9
55–59	7	7.3	2	7.1	9	7.3
60–64	1	1.0	0	0.0	1	0.8
65–69	3	3.1	0	0.0	3	2.4
70–74	2	2.1	0	0.0	2	1.6
75–79	1	1.0	1	3.6	2	1.6
80 and over	2	2.1	0	0.0	2	1.6
Total	**96**	**100.0**	**28**	**100.0**	**124**	**100.0**

[1] - There were 3 child fatalities resulting from crashes in which adults (16 years or above) were also killed.
[2] - In 6 cases, either age or gender was not known.

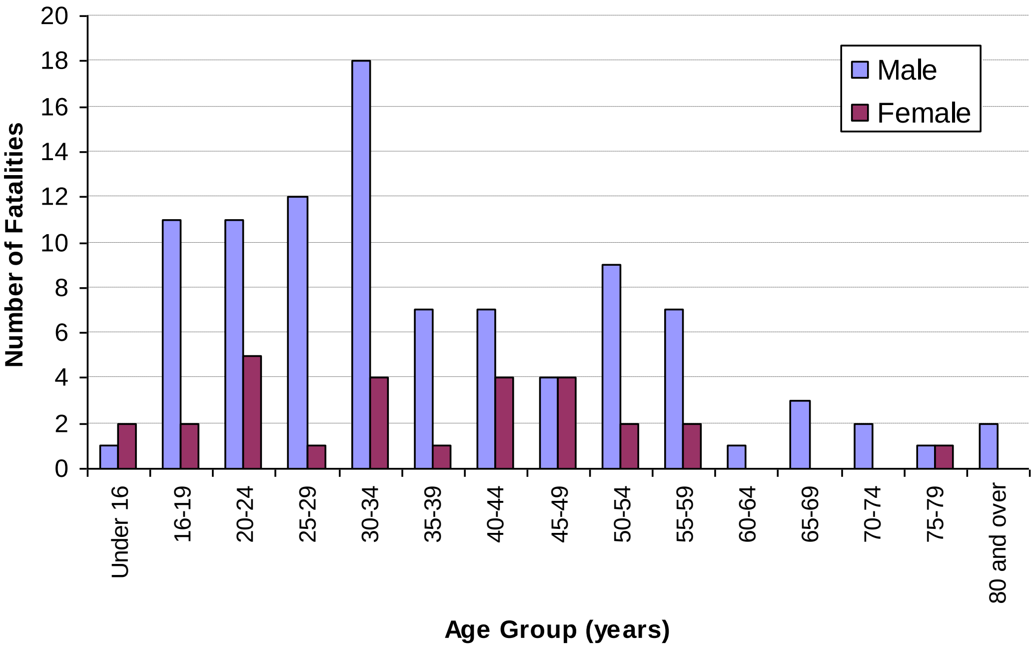

Figure 7.1. Total fatal casualties by age and gender

Over fifty per cent of the fatal casualties were drivers of cars or trucks, and 22% were riding motorcycles at the time of the crash. See Table 7.2.

Table 7.2. *Total fatal casualties by road user type*

Road user type	No.	%
Car/truck driver	67	51.5
Car/truck passenger	23	17.7
Motorcycle rider	28	21.5
Motorcycle pillion	1	0.8
Cyclist	2	1.5
Pedestrian	9	6.9
Total	**130**	**100.0**

The licence status of the vehicle operators involved in the fatal crashes is shown in Table 7.3. Fifteen per cent of the vehicle operators were unlicensed.

Table 7.3. *Police-reported fatal crash units by unit controller's licence status*

Licence status	No.	%
Licensed	108	77.7
Open	*89*	*64.0*
Provisional	*17*	*12.2*
Learner	*2*	*1.4*
Unlicensed	21	15.1
Cancelled/Disqualified	*5*	*3.6*
Never held a licence	*5*	*3.6*
Inappropriate class	*2*	*1.4*
Expired	*1*	*0.7*
Other unlicensed	*8*	*5.8*
Overseas	2	1.4
Not known	8	5.8
Total	**139**	**100.0**
Not applicable	9	-

Characteristics of fatal crashes

Vehicles

The number of vehicles involved in the crashes is outlined in Table 7.4. The majority of crashes involved only one vehicle (65.5%). There were only four crashes involving three or more vehicles. Table 7.5 describes the types of vehicles involved in the crashes. The majority were passenger vehicles (74.6%), including four wheel drive vehicles and utilities.

Table 7.4. *Total fatal crashes by crash type*

Type of crash	No.	%
Single vehicle	78	65.5
No other event/object involved	*73*	*61.3*
Hit by other vehicle after crash	*2*	*1.7*
Hit animal	*2*	*1.7*
Crashed avoiding animal	*1*	*0.8*
Two vehicle	27	22.7
Hit pedestrian	10	8.4
Multiple (3+) vehicle	4	3.4
Total	**119**	**100.0**

Table 7.5. *Total fatal casualties by vehicle type*

Vehicle type	No.	%
Sedan/wagon	48	40.7
4WD	28	23.7
Motorcycle	24	20.3
Utility	12	10.2
Van	1	0.8
Other	5	4.2
Valid Total	**118**	**100.0**
Not applicable	9	6.9
Unknown	3	2.3
Total	**130**	**100.0**

Road conditions

All the crashes except for one occurred on public roads. This one crash occurred in a public park when an unlicensed motorcyclist hit a fixed object and suffered severe chest injuries. Queensland Transport road crash database information was available for 103 (86.6%) crashes. Table 7.6 outlines the road surface for these 103 crashes.

Over 85% of crashes occurred on sealed roads, and the majority of these occurred on dry roads.

Table 7.6. *Police-reported fatal crashes by roadway surface type*

Road surface		No.	%
Sealed		89	86.4
	Dry	*81*	*78.6*
	Wet	*8*	*7.8*
Unsealed		14	13.6
	Dry	*14*	*13.6*
	Wet	*0*	*0.0*
Total		**103**	**100.0**

Table 7.7 provides details of the horizontal alignment of the road.

Table 7.7. *Police-reported fatal crashes by horizontal alignment of roadway*

Horizontal alignment		No.	%
Straight		54	52.4
Curved		49	47.6
	View obscured	*31*	*30.1*
	View open	*18*	*17.5*
Total		**103**	**100.0**

Most crashes occurred in level conditions as outlined in Table 7.8.

Table 7.8. *Police-reported fatal crashes by vertical alignment of roadway*

Vertical alignment	No.	%
Level	79	76.7
Grade	14	13.6
Crest	5	4.9
Dip	5	4.9
Total	**103**	**100.0**

In the majority of crashes there were no discernable road features noted at the crash site as shown in Table 7.9.

Table 7.9. *Police-reported fatal crashes by roadway feature*

Road feature	No.	%
Not applicable	90	87.4
T-junction	8	7.8
Bridge/causeway	2	1.9
Cross	2	1.9
Railway crossing	1	1.0
Total	**103**	**100.0**

Well over 90% of crashes occurred in road conditions where there was no traffic control as shown in Table 7.10.

Table 7.10. *Police-reported fatal crashes by traffic control present*

Traffic control	No.	%
No control	96	93.2
Give-way sign	5	4.9
Flashing amber lights	1	1.0
Police	1	1.0
Total	**103**	**100.0**

Table 7.11 outlines the speed limit at the crash sites.

Table 7.11. *Police-reported fatal crashes by prevailing speed zone*

Speed limit	No.	%
100 – 110 km/hr	74	71.8
70 – 90 km/hr	19	18.4
50 – 60 km/hr	9	8.7
40 km/hr	1	1.0
Total	**103**	**100.0**

Lighting and atmospheric conditions

Table 7.12 provides details of the lighting conditions.

Table 7.12. *Police-reported fatal crashes by lighting condition*

Lighting condition		No.	%
Daylight		55	53.4
Darkness		43	41.7
	Unlighted	*39*	*37.9*
	Lighted	*4*	*3.9*
Dawn/dusk		4	3.9
Unknown		1	1.0
Total		**103**	**100.0**

This is, however, in comparison to Main Road statistics which note only 18.7% of all traffic on state controlled roads occurs during those hours associated with darkness (6 pm to 6 am). It is therefore evident that crashes are much more likely during night-time hours when accounting for the relatively fewer cars on the road.

Table 7.13 provides details of the atmospheric condition at the time of the fatal crash.

Table 7.13. *Police-reported fatal crashes by atmospheric condition*

Atmospheric condition	No.	%
Clear	96	93.2
Raining	6	5.8
Fog	1	1.0
Total	**103**	**100.0**

Nature of crash

Table 7.14 outlines the nature of the crash for the 103 crashes for which Queensland Transport road crash database information was available.

Table 7.14. *Police-reported fatal crashes by crash nature*

Crash nature	No.	%
Hit fixed obstruction or temporary object	40	38.8
Overturned	23	22.3
Head-on	18	17.5
Hit pedestrian	8	7.8
Angle	5	4.9
Sideswipe	3	2.9
Rear-end	2	1.9
Motorcycle or pedal cycle overturn, fall or drop	2	1.9
Fall from moving vehicle	1	1.0
Collision – miscellaneous	1	1.0
Total	**103**	**100.0**

Motorcycles

There were 23 crashes involving motorcycles with the crash types presented below in Table 7.15.

Table 7.15. *Fatal motorcycle crashes by crash type*

Type of crash	No.	%
Single vehicle	12	52.1
No other event/object involved	*11*	*47.8*
Hit animal	*1*	*4.3*
Two vehicle	9	39.1
Multiple (3+) vehicle	2	8.7
Total	**23**	**100.0**

One multiple vehicle crash involved 3 motorcycles and a car. There was one motorcyclist killed in this crash and 2 hospitalised with serious injuries.

Temporal characteristics

When the day and time of crashes is considered the greatest number of crashes and fatalities occurred on Saturday with the least on Wednesday. Table 7.16 and Figure 7.2 provide further detail.

Table 7.16. *Total fatal crashes by day of week*

Day of week	No.	%
Sunday	13	10.9
Monday	11	9.2
Tuesday	13	10.9
Wednesday	8	6.7
Thursday	17	14.3
Friday	23	19.3
Saturday	34	28.6
Total	**119**	**100.0**

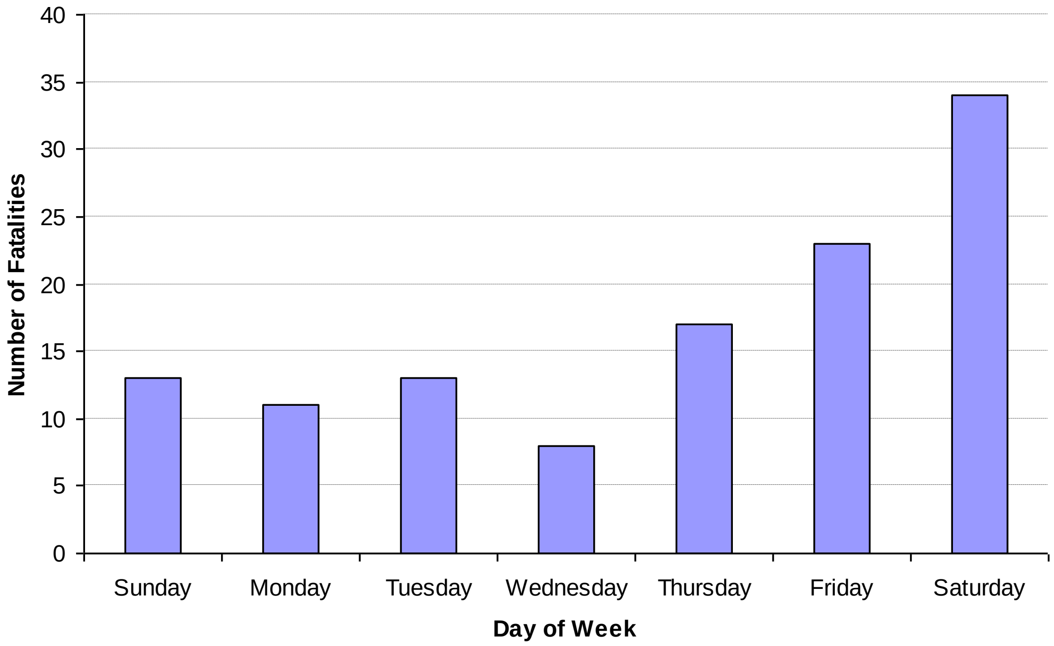

Figure 7.2. Number of fatalities for each day of the week

Figure 7.3 displays the number of fatalities by the time of day. Again, the majority of fatalities occurred between midday and 6 pm.

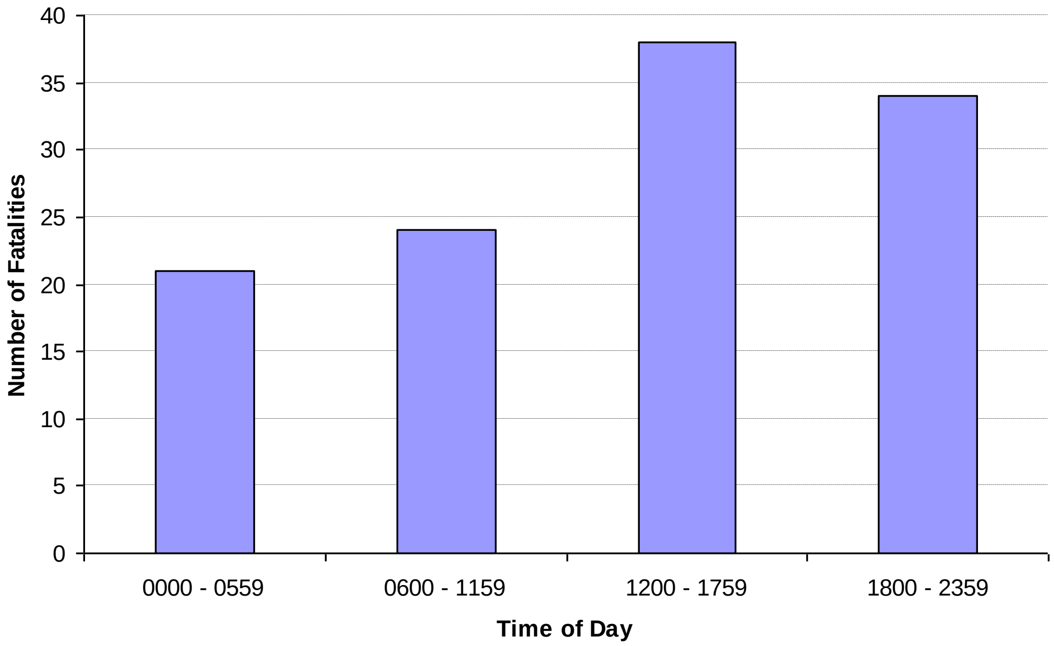

Figure 7.3. Number of fatalities by time of day

Figure 7.4 demonstrates the time of fatalities by time of day and day of week. The highest number of fatalities occurred between midday Friday and midnight Saturday.

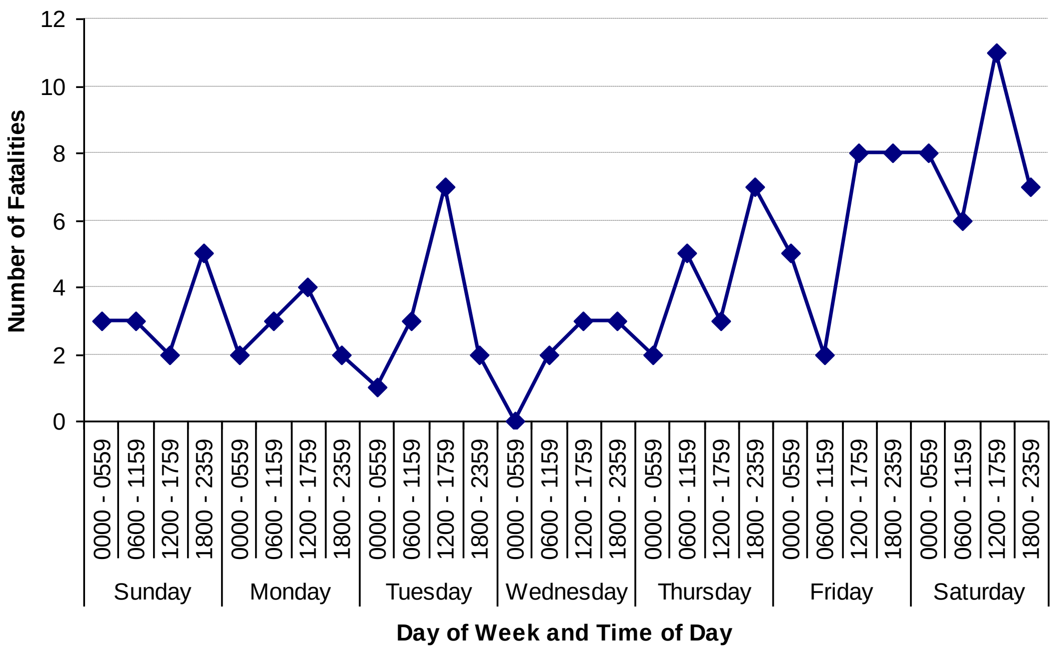

Figure 7.4. Number of fatalities by time of day and day of week

Contributing factors (at a unit level)

The Queensland Transport road crash database provides data on contributing factors the contributing factors that Queensland Police Service attributes to the crashes. For the 103 crashes with 148 vehicle controllers for which this data was available the contributing factors of alcohol, speed and road conditions were observed, as demonstrated in the following tables.

Alcohol was considered a factor in 29.1% of vehicle operators (See Table 7.17) and a blood alcohol reading of greater than 0.05 (50 mg/100 ml) was found in 23.6% of operators (see Table 7.18).

Table 7.17. *Police-reported crash units in fatal crashes by presence of alcohol*

Alcohol	No.	%
Attributed	43	29.1
Not attributed	105	70.9
Total	**148**	**100.0**

[1] - 'Condition - Under influence of liquor/drug'
'Violation - Over prescribed concentration of alcohol'

Table 7.18. *Police-reported crash units in fatal crashes by BAC >.05*

Drink driving (BAC > .05)	No.	%
Attributed	35	23.6
Not attributed	113	76.4
Total	**148**	**100.0**

[1] - 'Violation - Over prescribed concentration of alcohol'

Speed was considered to be a factor in 18% of the cases as outlined in Table 7.19. This included instances when operators were travelling too fast for the conditions. A third of these speed-related crashes were attributed as travelling over the speed limit for the road on which the crash occurred (See Table 7.20).

Table 7.19. *Police-reported crash units in fatal crashes by speeding involvement*

Speeding related	No.	%
Attributed	27	18.2
Not attributed	121	81.8
Total	**148**	**100.0**

[1] - 'Excessive speed for circumstances'
'Violation - Exceeding speed limit'

Table 7.20. *Police-reported crash units in fatal crashes by travelling over the posted speed limit*

Travelling over speed limit	No.	%
Attributed	9	6.1
Not attributed	139	93.9
Total	**148**	**100.0**

[1] - 'Violation - Exceeding speed limit'

Road conditions were considered to be a contributor to the crashes for 11 operators (7.4%) as outlined in Table 7.21.

Table 7.21. *Police-reported crash units in fatal crashes by involvement of road condition*

Any road conditions	No.	%
Attributed	11	7.4
Not attributed	137	92.6
Total	**148**	**100.0**

[1] - 'Road - Gravel/dirt'
'Road - Narrow'
'Road - Potholes'
'Road - Rough shoulder(s)'
'Road - Rough surface'
'Road - Temporary object on carriageway'
'Road - Water covering'
'Road - Wet/Slippery'
'Road conditions - Miscellaneous'

Coroners' reports

The medical report to the Coroner was available for 76 fatalities (from 73 crashes) at the time of this report. From these reports the following information was available.

Age, gender and ethnicity

Table 7.22 provides details of the gender and ethnicity of this group of fatal casualties for each of the four road user types seen in this set of data. Males comprised 76.3% of this group.

Table 7.22. *Gender and ethnicity of fatal casualties by road user type - cases with Coroner's report*

Gender		Road user type				
		Driver	Car passenger	Motor-cyclist	Pedestrian	Total
Male	Whole group	33	9	13	3	58
	(Indigenous)	(6)	(4)	(1)	(1)	(12)
Female	Whole group	14	1	0	3	18
	(Indigenous)	(1)	(0)	(0)	(3)	(4)
Total Indigenous		*(7)*	*(4)*	*(1)*	*(4)*	*(16)*
Total		**47**	**10**	**13**	**6**	**76**

The age range of this group is similar to that of the entire fatal casualty group. The under 16 years casualty was a female child who died in a fatal crash with her mother. See Figure 7.5.

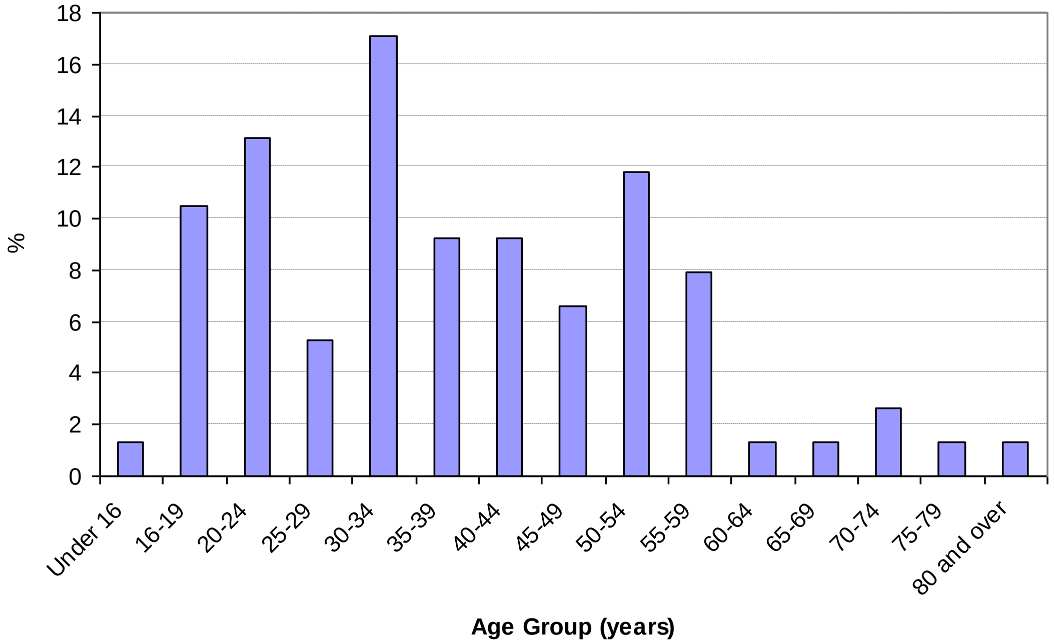

Figure 7.5. Ages of fatal casualties (group with Coroner's report)

Crash characteristics

This group of 73 fatal crashes is similar to the entire group of 119 fatal crashes with respect to the type of crash. Single vehicle crashes comprised 67.0% of the crashes (entire group 66.1%), pedestrian crashes accounted for 8.2% of crashes (entire group 7.6%) and there were 21.9% two vehicle crashes (entire group 22.9%). Three or more vehicles were involved in 2.7% of this group of fatal crashes (entire group 3.4%).

Sixty-five of the crashes occurred on sealed roads with seven on unsealed roads and one in a public park. Forty-five per cent of the crashes occurred on straight sections of road. Of the remaining crashes 15 occurred on curves where the view was obscured. Four of these involved more than one vehicle.

Thirty-one of the crashes (42.5%) occurred at night, mostly in unlit areas. Five crashes occurred at dusk or daybreak and five crashes occurred in rain (three of these were also in darkness).

One vehicle in a single vehicle crash was unregistered and another was noted to have no seatbelts. Licence details were available for 66 of the crashes. The details of these are provided in Table 7.23.

Table 7.23. *Licence details of unit operators in fatal crashes – cases with Coroner's reports*

Licence type	n	%
Open licence	50	75.8
Provisional licence	7	10.6
Learner's permit	1	1.5
Overseas licence	1	1.5
No licence or inappropriate class	7	10.6
- includes never held licence (2), disqualified licence (1)		
Total	**66**	**100.0**

The police reported that excessive speed for the conditions was a factor in 21 crashes (28.8%). Driver inexperience was a factor in 11 (15.1%) crashes and the use of a mobile phone by the driver at the time of the crash was suspected in two instances. Eight drivers were reported to have fallen asleep at the time of the crash while another seven crashes met the fatigue by definition causation. Three drivers were reported to have had medical conditions that led to the crash. These included a seizure, a myocardial infarction and cardiac arrhythmia. One male driver committed suicide by driving straight at a tree. Thirty of the vehicle operators had high levels of blood alcohol and two were affected by other mood-altering drugs (alcohol and drugs are discussed in detail later in this section).

Time of death

The majority of casualties died at the scene of the crash with a smaller proportion dying during transport to the first hospital or clinic as shown in Table 7.24. Most of those who died before emergency services arrived at the scene had injuries that would not sustain life. Similarly, many of those who died after emergency services had commenced resuscitation had injuries that were not amenable to treatment.

Table 7.24. *Time of death of fatal casualties – cases with Coroner's reports*

Time of death	n	%
Before emergency service arrived at scene	55	72.4
At scene or during transport to hospital	11	14.5
Within 24 hours of admission to hospital	9	11.8
After 24 hours in hospital	1	1.3
Total	**76**	**100.0**

Ten of the 76 casualties for which Coroners' reports were available died after reaching hospital. Seven of these reached a major hospital with three of the seven having been transferred from a smaller facility. Of the seven who died at a major hospital four died before reaching the ICU. These included a motorcyclist with severe brain injuries, a pregnant female driver with multiple injuries, a female passenger with a tear in the aorta and a male driver with multiple injuries to the lower trunk and legs. Two other casualties, both with brain injuries, died within 24 hours of admission. The seventh person died several days after admission from brain injury and sepsis.

Three other casualties died at the remote clinic or rural hospital to which they were first taken. All were conscious on arrival at the hospital. An eighty-four-year old male died at a remote health clinic following a car crash in which he sustained a lacerated liver. A seventy-three-year old male died at a rural hospital from a cardiac condition some hours after crashing his car. It appears that he had some form of cardiac event that led to the crash, resulting in multiple injuries. A thirty-one-year old male motorcyclist died three hours after crashing and two hours after admission to a remote clinic from bilateral haemothorax (ie: internal bleeding) with blood loss of 3000 ml.

Cause of death

Forty-five per cent of the 76 casualties died from multiple injuries while a further 29% died from head injuries. The cause of death is outlined in Table 7.25.

Table 7.25. *Cause of death for fatal casualties – cases with Coroner's reports*

Cause of death	n	%
Multiple injuries	34	44.7
Head injuries	22	28.9
Chest injuries	7	9.2
Blood loss	7	9.2
Spinal injuries	3	3.9
Abdominal injuries	1	1.3
Airway obstruction	1	1.3
Cardiac event	1	1.3
Total	**76**	**100.0**

When the cause of death is considered for each road user type 45% of drivers died from multiple injuries and another 30% died of head injuries. Most pedestrians died from multiple injuries (83%). See Figure 7.6.

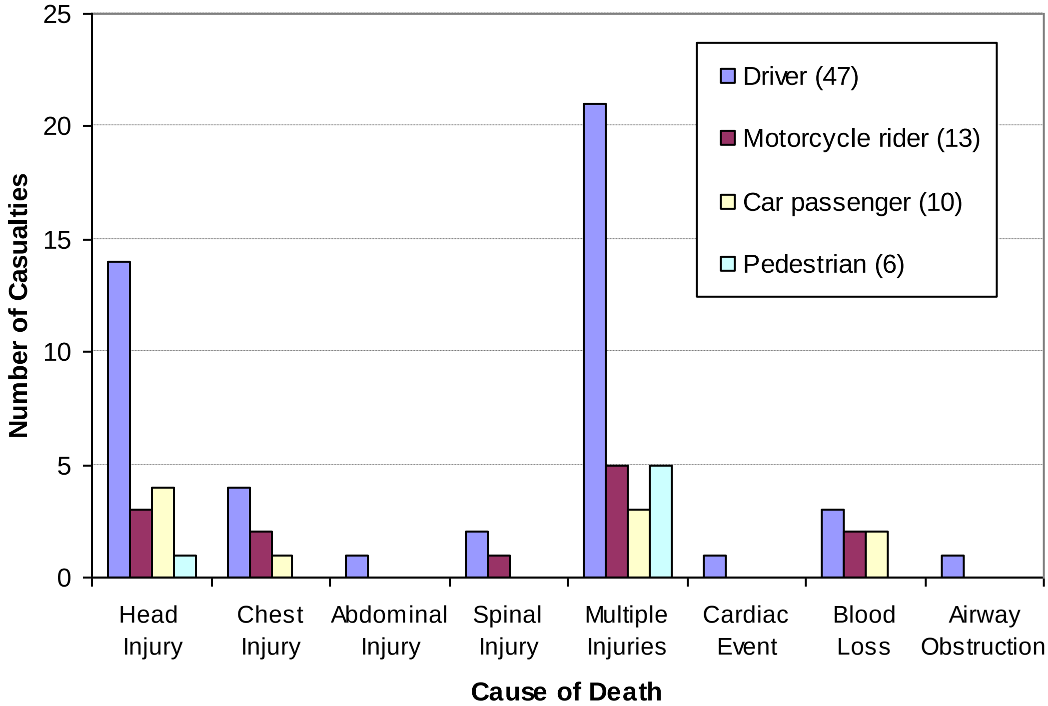

Figure 7.6. Cause of death for fatal casualties by road user type – cases with Coroner's reports

For 64 of the 76 fatal casualties considered in this section data was available from Queensland Transport's road crash database about the nature of the crash. The cause of death for the three most common forms of crash is displayed in Figure 7.7.

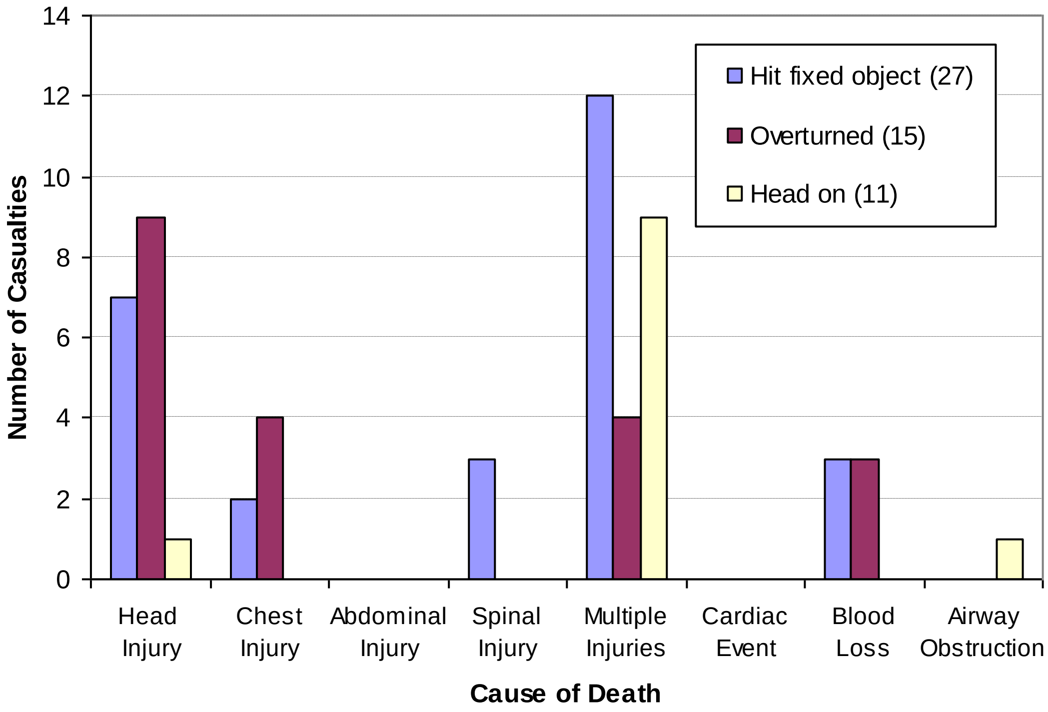

Figure 7.7. Cause of death for fatal casualties by nature of crash – cases with Coroner’s reports

When comparing the cause of death of those wearing seatbelts and those not wearing seatbelts, little difference can be seen except for death from spinal injury and abdominal injury. The large number of motor vehicle occupants for whom seatbelt wearing status was unknown (15 of 57) make the interpretation of these figures difficult. See Figure 7.8 below. Only one motorcyclist was not wearing a helmet and he died from chest injuries after hitting a concrete structure.

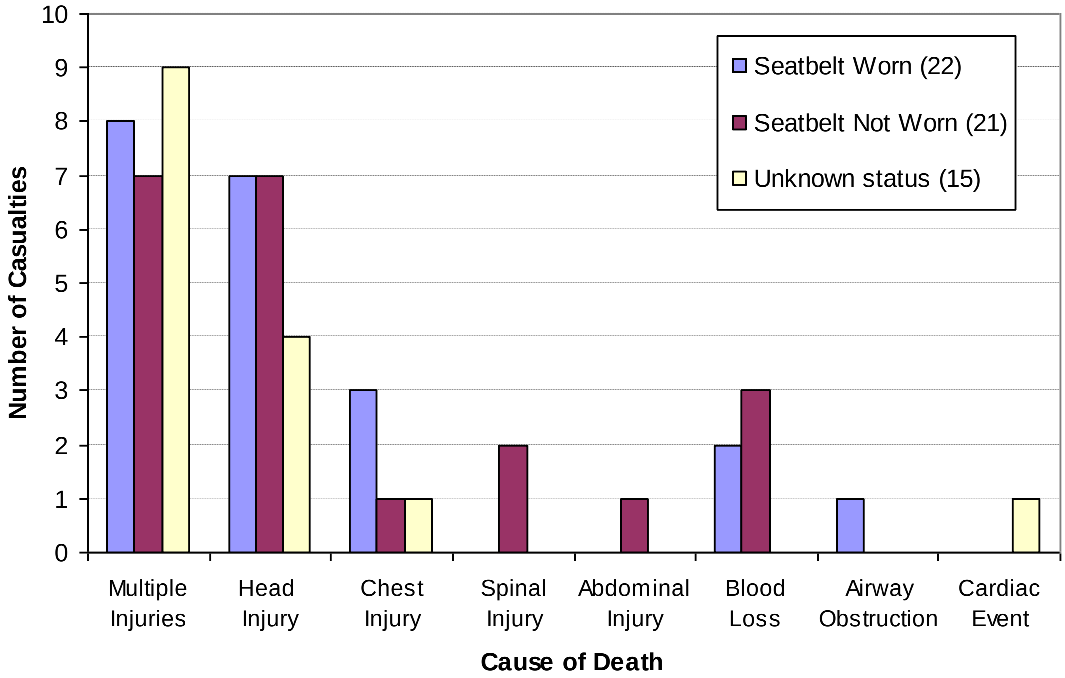

Figure 7.8. Cause of death according to whether wearing seatbelt or not – cases with Coroner's reports

Injuries

The majority of the fatal casualties suffered head (71.1%) and chest (69.7%) injuries as demonstrated in Figure 7.9. Fractured femurs occurred in 31.6% of casualties with fractures to other limbs occurring in 38.2%. Almost one-third of people suffered abdominal injuries.

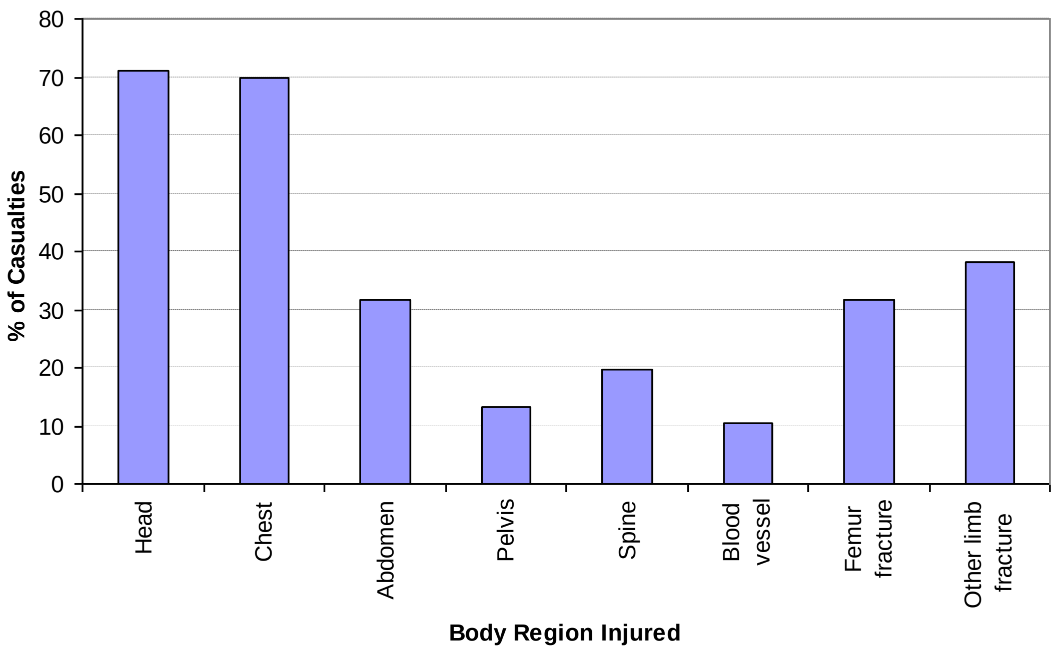

Figure 7.9. Percentage of fatal casualties suffering injuries to body areas

The injuries for each of the four road user types are demonstrated in Figure 7.10. There was a high proportion of head and chest injuries for all the road user categories.

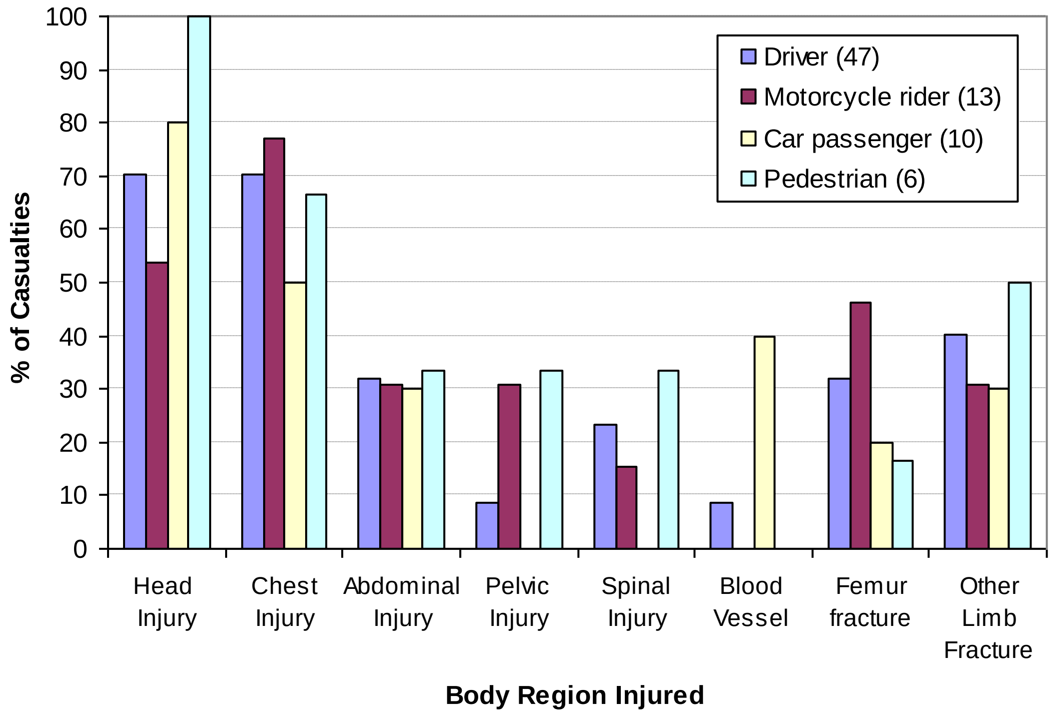

Figure 7.10. Injury by road user type

Injuries for the top three crash types (hit fixed object, overturned and head-on) are displayed in Figure 7.11. All three types of crash lead to significant head and chest injuries.

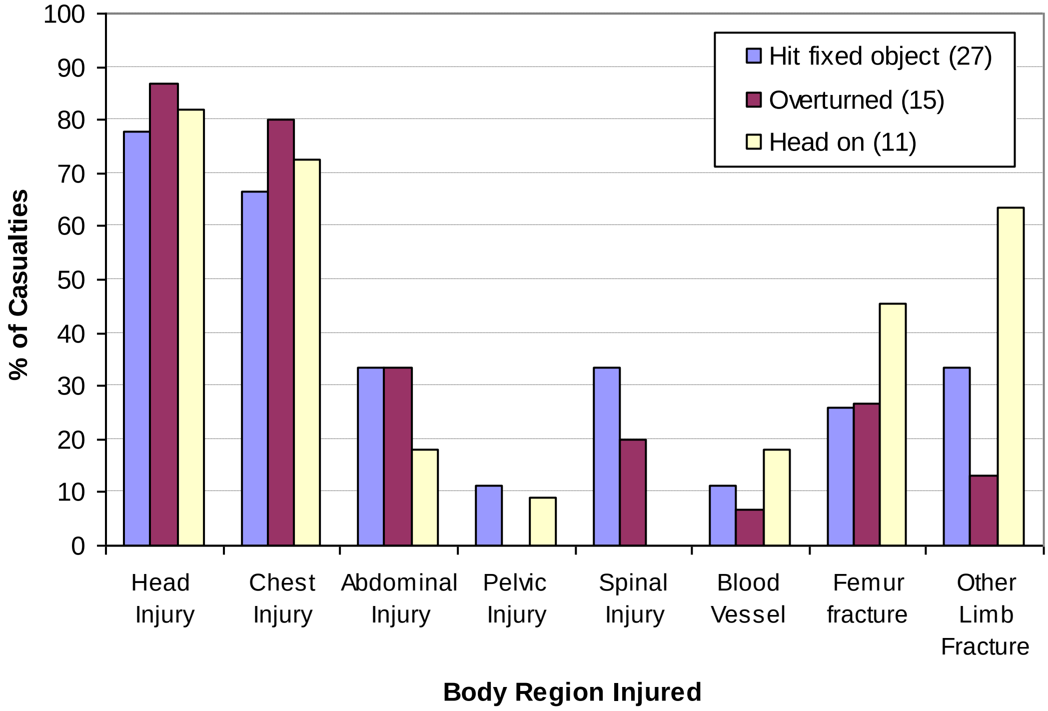

Figure 7.11. Injury by nature of crash

As noted when considering the cause of death, little difference in injury profile can be seen between those wearing seatbelts and those not wearing seatbelts. See Figure 7.12. The only motorcyclist not wearing a helmet had only chest injuries.

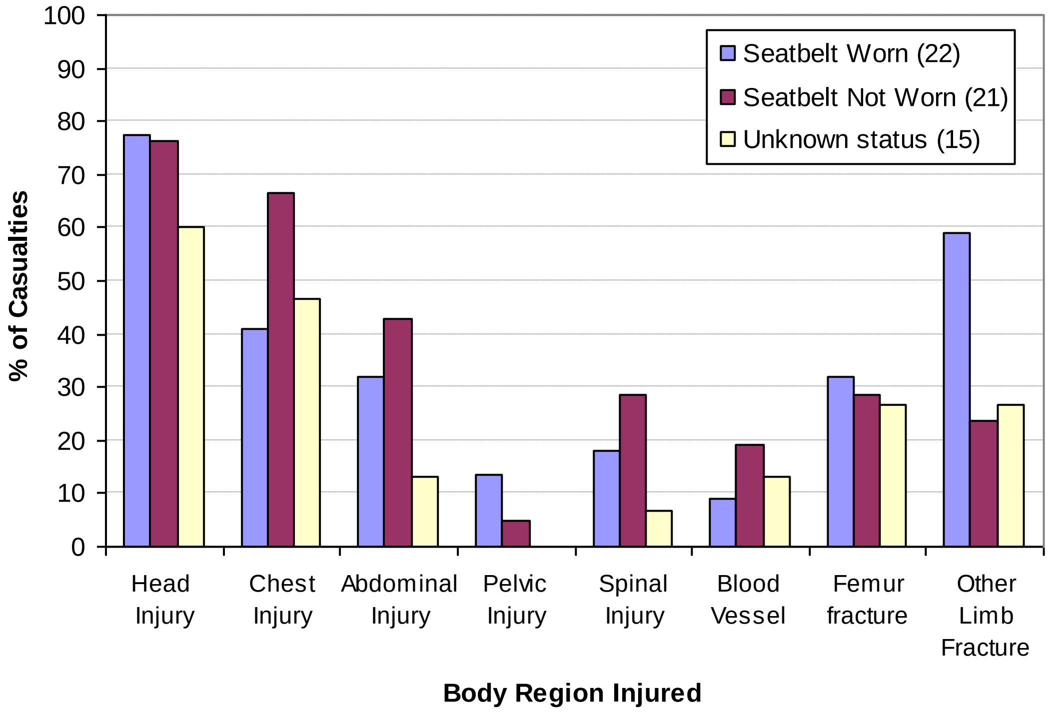

Figure 7.12. Injuries by seatbelt wearing status

Alcohol and drug use

Thirty-four of the fatal casualties had a blood alcohol concentration of greater than 0.05% (50 mg/100 ml). The mean BAC among this group was 0.211% (211 mg/100 ml range 67-510) and the median was 0.210% (210 mg/100 ml).Vehicle controllers or pedestrians had blood alcohol levels over 0.05% (50 mg/100 ml) in 30 of the 73 (41%) crashes of this cohort. Twenty-four of this group were males. All the passengers with high BAC were males. See Table 7.26.

Table 7.26. *Alcohol use by road user type*

Type of road user	n	n (male)	% of road user type
Driver	20	17	42.6
Motorcyclist	3	3	23.1
Car passenger	6	6	60.0
Pedestrian	5	2	83.3
Driver (not fatally injured – passenger killed)	2	2	4.3

Blood alcohol levels of greater than 0.05% (50 mg/100 ml) were found in 18 of the 21 people (85.7%) not wearing seatbelts and 24 of the 31 crashes (77.4%) that occurred in darkness had operators (including pedestrians) with blood alcohol levels over 0.05% (50 mg/100 ml). Among the group with BAC over 0.05% (50 mg/100 ml), other drugs were also found. These are outlined in Table 7.27.

Table 7.27. *Other drugs found in those with BAC > 50 mg/100 ml*

Drug	Driver	Car passenger	Pedestrian
Amphetamines		1 (male)	
Benzodiazepines	2 (1 male)		
Cannaboids	8 (8 male)		2 (2 male)
Opiates	1 (1 male)		1 (1 male)

The two individuals who had high BAC and had taken opiates also had cannaboids detected. Four other drivers not affected by alcohol were under the influence of other drugs. This included one truck driver who had amphetamines detected, with his seatbelt status unknown. A car driver had taken both benzodiazepines and opiates was not wearing a seatbelt. Two drivers (one male) had cannaboids detected.

Discussion

Data collection

As with the injuries of hospitalised patients, a number of informing sources were utilised in order to maximise the detail and robustness of the data. These included police and ambulance reports, the Queensland Transport road crash database, and Coroner's reports. The latter were largely informed by the other reports, and augmented by the results of autopsies when performed. Police reports for fatal crashes are typically produced by a dedicated Forensic Crash Unit that aims to investigate the circumstances of the crash and attribute causality. However, it should be noted that in regional and rural areas, due to resourcing issues, investigation teams are often convened from members of the local police who may not have the same degree of training and expertise as their metropolitan counterparts. Therefore, although there is likely to be internal consistency among police reports for the fatal crashes in this study, the results may not be entirely comparable to such crashes occurring in South-East Queensland.

At the time of writing this report, only 76 of 130 Coroner's reports were available for analysis, due to the time needed to prepare each report and then apply for and obtain it. The principal benefit of Coroner's reports was the injury data afforded by the autopsy. A large part of the information on the circumstances and attributed cause of all fatal crashes was obtainable from the other informing sources. The Coroner's reports seem to be representative of the fatality group as a whole, as suggested by their demographic and crash characteristics.

Demographics

Fatal casualties were seen to be reasonably comparable to non-fatal casualties in terms of age-sex profile, as well as the proportions of drivers/riders, passengers and pedestrians. As with non-fatal casualties, the male predominance can be partly accounted for by increased risk exposure in terms of road use. It may also be partly attributed to certain at-risk behaviours among male vehicle operators, as suggested in Chapter 4. While the age distribution of female fatalities was relatively even, male fatalities markedly peaked in the 30–34-year age group. This is ten years older than the peak group noted in non-fatal casualties. Most of the males in this group would have been vehicle operators with 10–15 years of on-road experience. In concordance with this is the fact that in only 15.1% of fatal crashes reported by the Coroner was driver inexperience deemed to be a contributing factor.

Compared to non-fatal casualties, for the entire group of fatal casualties there was a greater representation of Indigenous people (16.9% vs 9.6%). While this may suggest that factors associated with indigeneity predispose them to more adverse crash outcomes, further research would be required to elucidate the true nature of this observation. The absolute proportion of Indigenous fatalities may still be an under-representation if considering the population of rural and remote North Queensland as the comparison figure. However, there may in fact be considerable over-representation if assuming risk exposure to be indicated by road use or licensing rate, although reliable information on these indicators is not readily available for the region's Indigenous population.

Crash characteristics

For fatal crashes, it was ascertained that at least 15% of vehicle operators were unlicensed. This compares to 5% in the non-fatal crashes. Because of the small numbers involved, it is not possible to identify specific demographics to which targeted interventions could be directed.

Of the 119 fatal crashes 118 (99.2%) occurred on public roads, compared to 77.6% for the non-fatal crashes. This suggests that public roads are more conducive to fatalities, possibly due to the fact that higher speeds, and thus greater impact forces, can be attained. Indeed, over 70% of crashes were also noted to occur in high speed sections of road (with a posted speed limit 100–110 kph). The crashes themselves may nevertheless have been precipitated by factors such as monotony, inattention and over-familiarity.

The data also suggest that what would traditionally be seen as adverse road conditions were not particularly associated with fatal crashes. The majority in fact took place on sealed, dry, straight, level roads, once again inferring that such conditions may facilitate higher speeds, as well as hypovigilance. In a similar vein, most fatal crashes occurred where there were no road features or traffic controls, and in clear atmospheric conditions. The Queensland Transport road crash database also indicated that road conditions were contributory in only 7.4% of fatal crashes (Queensland Transport, 2007). Crashes were more or less evenly divided between daytime and night-time whereas traffic volumes are considerably smaller at night.

With regard to vehicle type, motorcycles were less represented in fatal crashes compared to non-fatal crashes.

Fatal crashes appeared to have broadly similar characteristics over the week to non-fatal crashes, in that there was a peak incidence on weekends. From this it may be inferred that alcohol is once again a precipitating factor due to assumed community drinking patterns. Crash analysis provided by Queensland Transport based on police reports also implicated alcohol in almost 30% of fatal crashes. By contrast, speed was only seen to be a causative factor in 18.2%, although this increased to 28.8% with the further analysis afforded by Coroner's reports. In light of some of the above indirect evidence, it is important to note the distinction that needs to be made between what causes a crash to occur and what causes a death to occur as the result of a crash.

Injury analysis

The fact that 92% of fatal casualties died in the pre-hospital phase suggests that the injuries sustained may have been largely unsurvivable. However, this hypothesis cannot be confirmed due to the unavailability of information on the time taken to notify emergency services. Further analysis of injuries afforded by autopsy reports showed that 82.2% of fatalities sustained multiple, head or chest injuries, all of which are conceivably incompatible with life or a non-vegetative state. By contrast, the considerably smaller proportion of deaths from other causes such as blood loss, abdominal injuries and airway obstruction may have been averted with earlier access to medical attention.

The overall predominance of head and chest injuries in the fatal group is in contrast to the injury profile seen in non-fatal casualties. For vehicle occupants, this may be a function of speed on impact, but also lack of restraint compliance. As previously shown in Chapter 3 (see Table 3.22), fatal vehicle occupant casualties were approximately three times less likely to be wearing a seatbelt than those in the seriously hospitalised group.

Conclusions and recommendations

The rationale for separately analysing fatal crashes is largely to ascertain those factors that lead to fatality as opposed to the crash per se.

From the data obtained a number of salient points emerge:

- Internal (or driver-related) factors play a greater role than external (or environmental) factors.

- Speed would appear to be the 'final common pathway' leading to a fatal outcome in most road crashes. Precipitating factors such as alcohol and fatigue are probably of similar import as in non-fatal crashes.

- Based on injury profiles, lack of restraint may contribute to death in a considerable proportion of fatal crashes.

- Most fatal road crash injuries appear to be unsurvivable at the outset. Any benefit from more rapid emergency response times could not be determined from the available data.

- More comprehensive data collection and documentation would greatly improve the quality of research into fatal road crashes. Increased resources enabling dedicated Forensic Crash Units to investigate rural and remote crashes is one means of achieving this.

- Further study examining the multiple possible factors leading to fatalities in severe rural and remote road crashes, and the significance of their contribution, is warranted.

8. Police Report – Interviewed Casualty Crash Description Comparison

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The study recorded 732 eligible crashes. There were Queensland Police Service (QPS) crash reports entered into the Queensland Transport (QT) road crash database for 399 of these crashes and 404 casualties were interviewed. Comparison of the 399 crashes for which police reports were available with the 404 casualty interviews found 200 matched cases. However, 43 of the interviewed casualties stated they had little or no memory of the crash and were therefore unable to provide a description of events and circumstances. This left 157 cases for which both police reports and casualty descriptions of the crash were available. These cases are the main focus of analysis and discussion here, while the 43 cases for which the casualty claimed no memory of the crash are discussed separately later in this section.

Preparing data for analysis

Police data

QPS data includes contributing circumstances (factors) for each unit involved in the crash (vehicle, pedestrian or animal, where Unit 1 is generally considered most at fault). The majority of the crashes in the study involved only one unit (75.1% single vehicle crashes and 0.7% fell from vehicle crashes).

There can be several contributing factors attributed to each unit. For ease of analysis the first three contributing factors for Units 1 and 2 were selected and the first contributing factor for Unit 3 (in the few cases in which a third unit was involved). These yielded 56 contributing factors in total across all collected QPS reports (see Appendix 8.1).

Casualty interview data

Study participants were asked during interview to describe in their own words what happened immediately before, during and after the crash in which they were injured, this data constituting the casualty description or patient narrative. Of casualties interviewed, road user types in the 200 cases analysed included 152 drivers/riders, 40 passengers and 8 pedestrians. The casualty descriptions were manually analysed to identify explicit references which could be matched with and subsequently coded according to any of the 56 original contributing circumstances identified in QPS/QT reports. Two additional codes were added to accommodate cases where casualties cited insufficient or no memory of events (excluded from main analysis) or attributed primary causes to a unit other than Unit 1.

Collapsing data

The 56 contributing circumstances were collapsed into 20 broader categories to assist with analysis and these 20 categories placed into 5 main groupings: Behavioural, Environmental, Vehicle related, Medical and Other (See Table 8.1).

The major categories 1 – 4 are largely self explanatory. The fifth grouping, ‘Other’, contains contributing circumstances which are deemed here to be less useful for comparative analysis, although they are commonly included in other (QT/QPS) datasets. These contributing circumstances include: *Driver-Fatigue related by definition*, generally cited for crashes occurring on 100 km/h roadways between the hours of 10 pm and 6 am and 2 to 4 pm (note that this differs from *Fatigue-Fell asleep*, cited where there is evidence for such occurring); *Driver-Inexperience/Lack of expertise*, commonly attributed where a driver is 16 years of age or younger, regardless of other circumstances; and *Driver-Age (Lack of perception; Power or Concentration)*, used commonly where a driver exceeds an age threshold of 70 years.

Table 8.1. *Categorisation of contributing circumstances*

Major category		Subcategory	
1	Behavioural	101	Care and attention
		102	Alcohol/drug
		103	Speed (over limit, or excessive for circumstances)
		104	Fatigue (fell asleep)
		105	Disobey signal/marker
		106	Fail to give way
		107	Violation – other
		108	Avoiding other road user
2	Environmental	201	Road condition
		202	Atmospheric condition
		203	Lighting condition
		204	Animal
3	Vehicle related	301	Vehicle related (mechanical failure or defect)
4	Medical	401	Driver condition (medical)
5	Other	501	Miscellaneous
		502	Driver-Fatigue related by definition (time dependent)
		503	Driver-Inexperience/Lack of expertise (age dependent)
		504	Driver-Underage (Inexperience)
		505	Driver-Age (Lack of perception; Power or Concentration)
		506	Driver Condition-Miscellaneous

Data from both the QPS reports and casualty interviews was entered into an SPSS database and analysed.

Results

QPS attributed causes to Unit 1 in all of the 200 cases analysed (including the 43 'no memory' cases), as well as to Unit 2 and Unit 3 in 14 and 2 cases respectively. Given the low number of cases where factors were attributed to multiple units by QPS, this analysis focuses on data for Unit 1 only. Seven (4.5%) casualty descriptions differed from QPS by attributing causality to a unit other than Unit 1.

Level of agreement on causation (cross tabulations)

Using the five main categories developed for classification of contributing circumstances, cross tabulation of the contributing factors first cited in QPS/QT reports and casualty interviews revealed both similarities and differences. The highest level of concordance occurred in relation to environmental factors. Of the 51 crashes where QPS cited environmental factors first, casualties were in agreement in 36 (70%) of cases. Greater differences were seen within the behavioural category, casualties agreeing in 90 (61%) of cases where QPS cited behaviour first.

For both sources, environmental factors were attributed as a first contributing circumstance in approximately one third of all cases. After behavioural and environmental factors, the remaining three categories each represent a small minority of contributing circumstances first cited by police and casualties alike.

Cross-tabulation of the results under the five main categories is displayed in Table 8.2. There is a moderate level of agreement between police and casualty reports for Table 2 (Kappa value = .482), which is strengthened with the exclusion of the 'Other' category in cross-tabulation (κ = .614).

Table 8.2. *Contributing circumstances cross tabulation (Unit 1, factor 1)*

		Casualties					
	Circumstance	Beh.	Envir.	Vehic.	Medic.	Other	Total
QPS	Behavioural	55	13	3	1	14	86
	Environmental	9	36	0	0	4	49
	Vehicle related	0	0	3	0	1	4
	Medical	0	0	0	3	0	3
	Other	1	2	0	1	4	8
	Total	**65**	**51**	**6**	**5**	**23**	**150**

When the full range of factors first cited was considered (see Appendix for list), the highest category of contributing circumstance from QPS records was for *Violation – Undue care and attention.* This was cited first by police in 45 cases, while corresponding references were found in 12 casualty descriptions (the two sources were in agreement in 9 of those cases). This is the most commonly cited of all 56 contributing circumstances encountered during QPS/QT data collection, and is frequently found in association with speed and alcohol-related offences, but also in isolation. The same process found that *Road – Wet/slippery* was cited in 14 casualty descriptions and 22 QPS/QT reports, with direct agreement between the two sources in 11 cases for first contributing circumstance. *Animal uncontrolled – On road* was cited 9 and 14 times by police and casualties respectively, with direct agreement in 7 cases. Police cited *Violation – Over prescribed concentration of alcohol* in 13 cases, compared with only 3 cases in casualty descriptions (all concordant).

Overall causation

Frequency analysis was performed for all contributing circumstances for Unit 1 from each source. At the broadest level of categorisation (Figure 8.1), 56.7% of all contributing circumstances cited by police were behavioural, compared with 49.3% in casualty descriptions. Conversely, 28.6% of casualties cited environmental factors compared with 19.9% in QPS contributing circumstances.

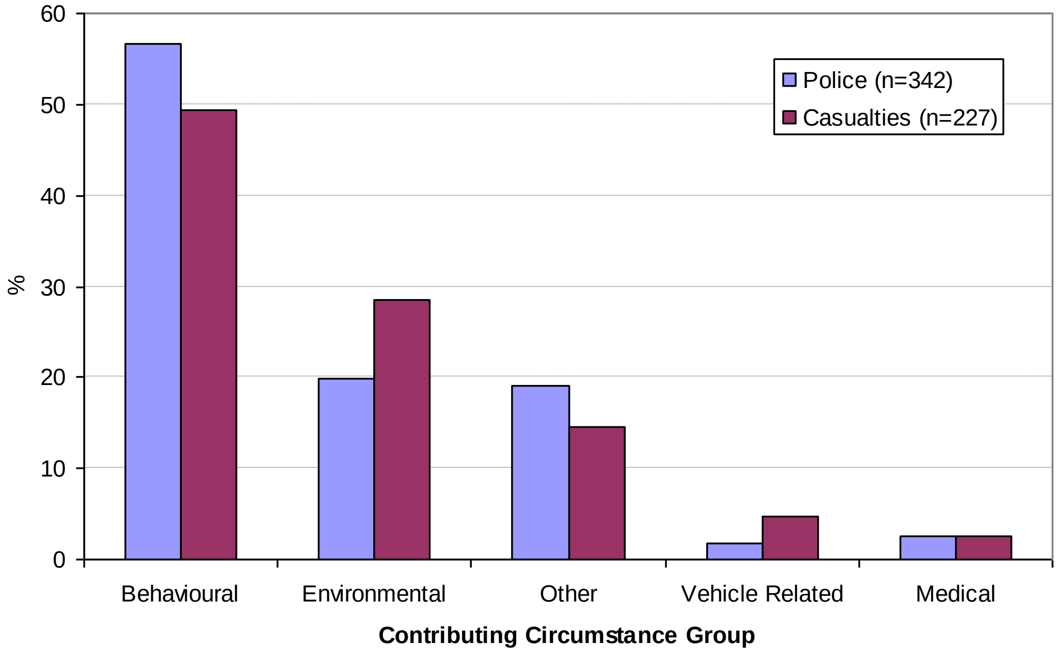

Figure 8.1. Crash causation within 5 broad categories

Figure 8.2 presents the fourteen contributing factors into which the original 56 categories were collapsed (excluding 'Other'). For QPS, *care and attention* was the major factor while the casualty interviews showed *road conditions* as being the highest single factor in cause of crash.

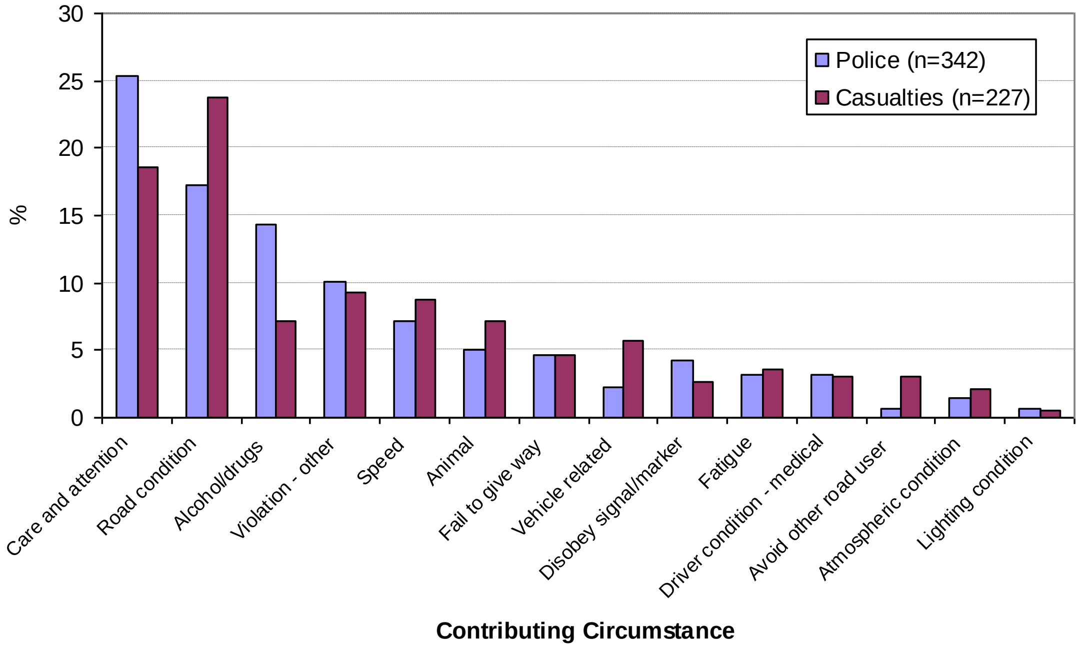

Figure 8.2. Crash causation within 14 categories of contributing factors (excludes Other, No memory and Other Unit from analysis).

Figures 8.3–8.5 illustrate the contributing factors within three of the five main categories used in Figure 8.1 (Behavioural, Environmental and Other). Vehicle related and medical categories did not have sub-categories for analysis. Figure 8.3 shows that both QPS and interviewed casualties acknowledged *care and attention* as the major behavioural factor leading to crashes, though the agreement within each case is not as high as it is across all cases. Prominent differences between the two sources are seen in relation to alcohol/drugs, speed and avoiding other road users.

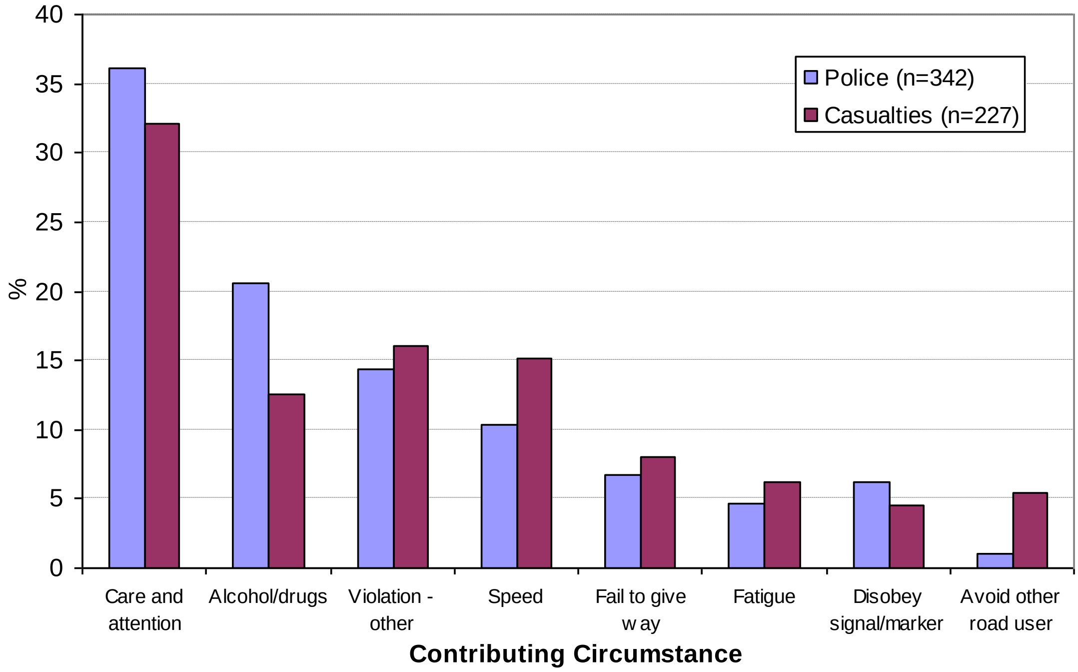

Figure 8.3. Contributing circumstances within 'Behavioural' category

Road conditions were acknowledged by both sources to be the major contributing factor among environmental causes (70%), with animals accounting for a further 20% of the contributing factors within this category. Atmosphere and lighting were seen as contributing in very few cases. See Figure 8.4.

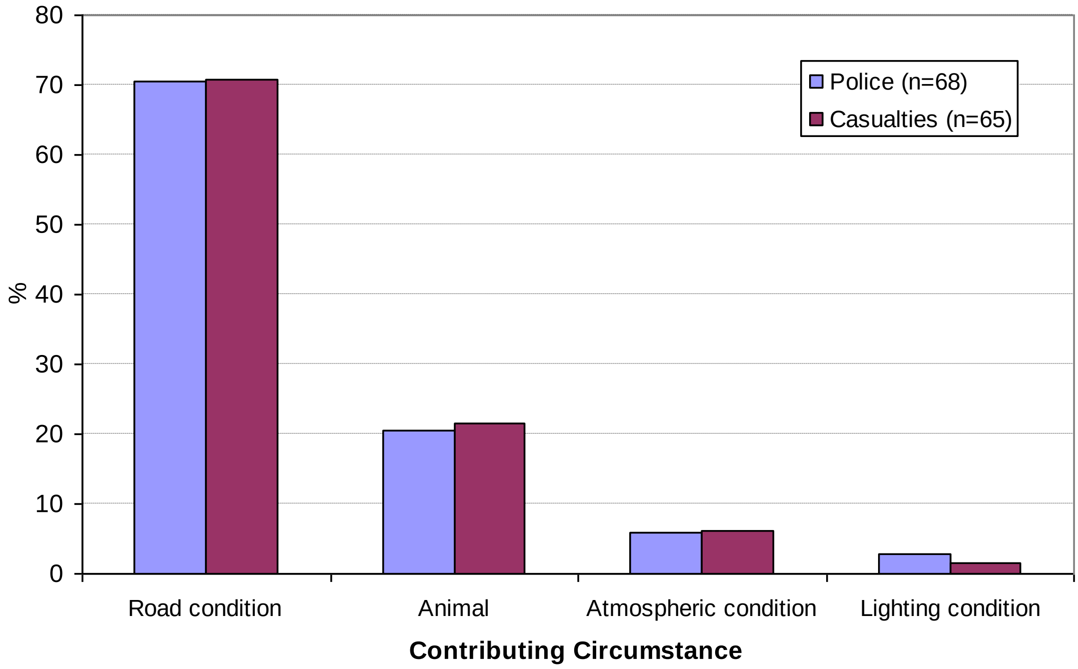

Figure 8.4. Contributing circumstances within 'Environmental' category

Other factors accounted for less than 20% of contributing circumstances and these are displayed in Figure 8.5. Within this category, *Miscellaneous* is a contributing circumstance as defined in QPS reports, while for casualty descriptions this was assigned where no particular causes were clearly attributed by interviewees. Also in this category are factors relating to driver age and also driver condition which, being arbitrarily defined, tend to reduce clarity of findings, as mentioned earlier.

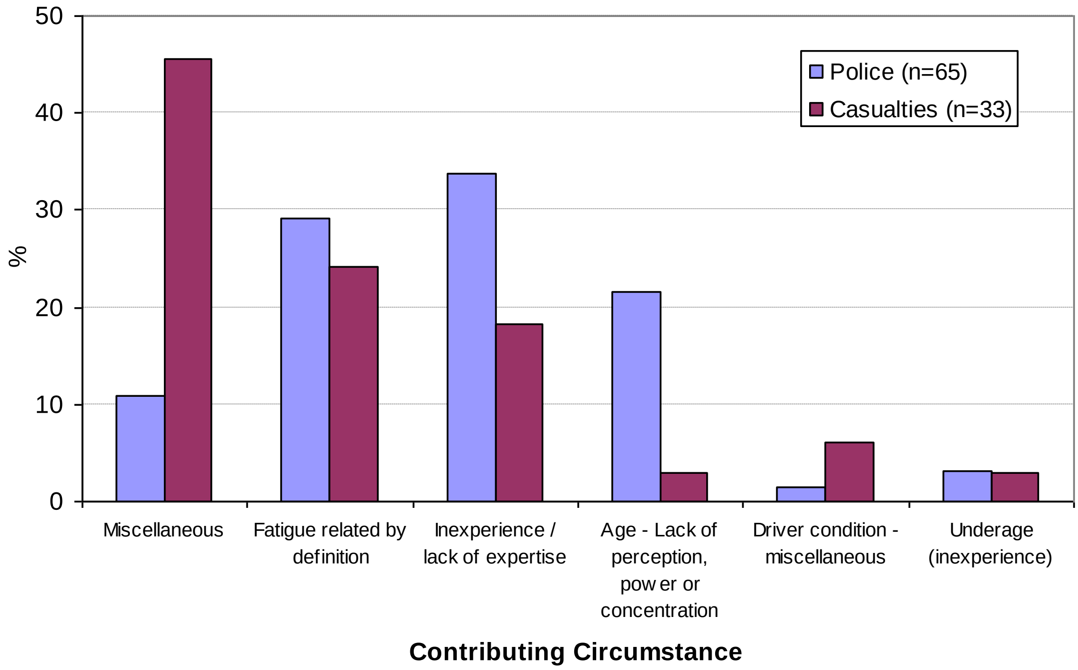

Figure 8.5. Contributing circumstances within 'Other' category

No memory cases

While 43 of the interviewed casualties stated they had little or no memory of the circumstances of the crash the majority of these 'no memory' crashes had behavioural factors (most notably high BAC) cited as contributing circumstances in QPS/QT reports. The contributing circumstances according to QPS are displayed in Figure 8.6.

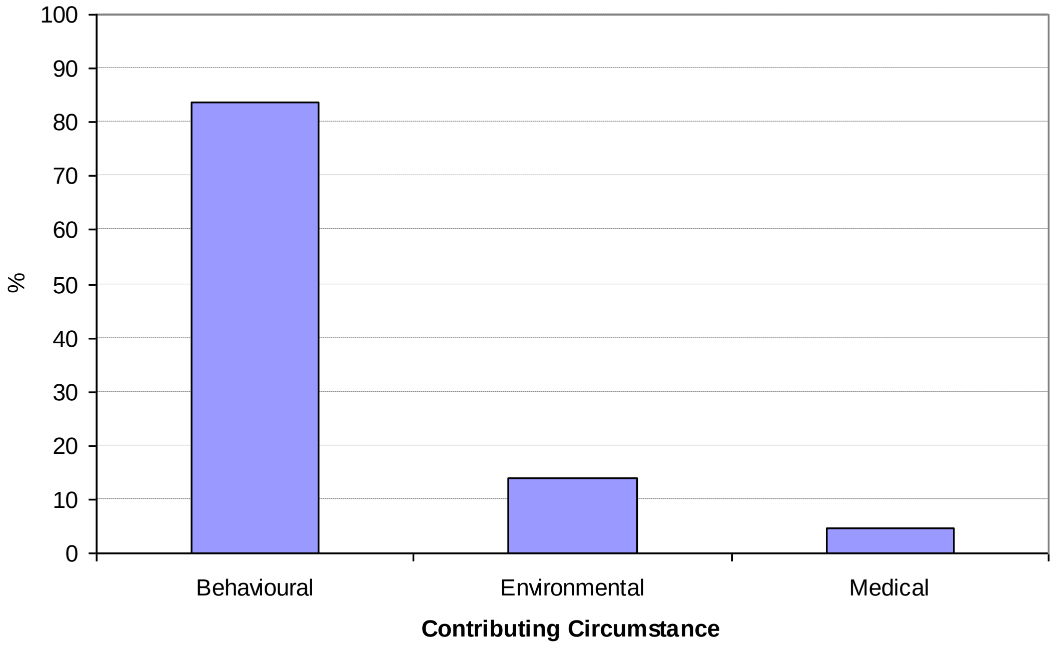

Figure 8.6. QPS contributing circumstances for 'No memory' cases

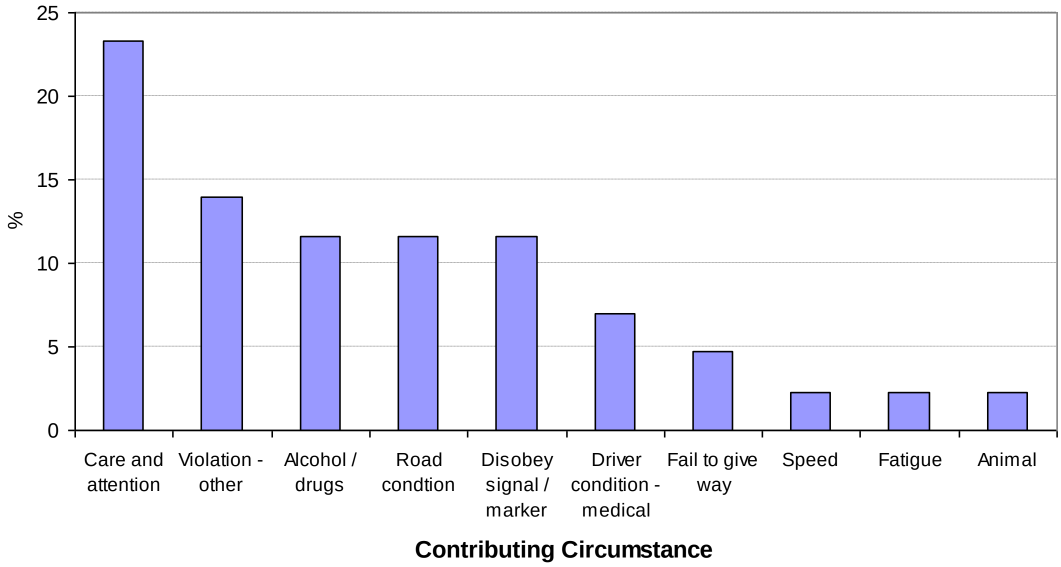

Figure 8.7. Contributing circumstance sub-categories for 'No memory' cases

Limitations

The comparison of QPS/QT reports with casualty descriptions must be considered with caution due to a number of limitations surrounding evidence-based assessments by police and stated recollections of experience by patients interviewed.

It can be reasonably assumed that some participants in the study will have deliberately withheld information for a variety of reasons, including but not limited to cases where casualties claimed to have little or no memory of events surrounding their crash. Socially desirable responses are likely to have been offered in some instances. In other cases it is possible that false or misleading information was provided by casualties during interviews due to concerns about liability, despite assurances of confidentiality and anonymity. However, a number of casualties did report engagement in illegal and risky behaviours at the time of their crash.

The subjective position of the patient is likely to have influenced recollection and description of events in some cases. Additionally, it cannot be assumed that the attribution of contributing circumstances by QPS officers is entirely accurate in all cases, as numerous factors may impact upon the depth, rigour and accuracy of particular crash scene analyses. Resource constraints, particularly in remote areas, prevent some serious crashes being investigated at all, evidenced by a lack of QPS reporting for several RRRSS cases on public roads.

QPS investigation of one particular two vehicle collision produced "conflicting versions of what happened and no independent witnesses". The QPS description proceeds as follows: "... the rear vehicle attempted to overtake the front vehicle. The two vehicles have collided rear to front and the front vehicle has gone into a spin spinning down a slope on the right side of the road and overturning and resting on its roof". *Miscellaneous* contributing circumstances were attributed to both Units in this case.

In another case for which QPS attributed *Medical condition* and *Miscellaneous* as contributing circumstances, the casualty description reveals that the driver was in fact adjusting the car stereo system and thus distracted.

Reliably assessing the involvement of alcohol in crashes requires timely police attendance and testing, which is not always possible for logistical and/or medical reasons. One casualty description revealed the involvement of alcohol and excessive speed in a case where QPS attributed *Road – Rough surface* as the only contributing circumstance.

A casualty description in another case indicates that the crash happened several hours before the time stated on the QPS/QT report, and that drink driving and other inappropriate behaviours were likely contributors to the eventual injuries sustained. In this case QPS determined that the driver was not intoxicated, attributing *Miscellaneous* as the only contributing circumstance.

While limiting in some respects, inherent biases are also central to this comparison which seeks to understand perceived as well as actual events and behaviours, and to articulate the differences between them.

Discussion

Similarities/agreement

There is relatively high agreement between the two sources on the extent to which environmental factors were influential, including *road condition* (gravel, uneven, wet and/or slippery) and *animal(s)* on roadways. Similarly, there was general agreement on the proportion of crashes contributed to by *speed* (exceeding limit and/or excessive for circumstances), although this represents a slightly higher proportion of factors cited by casualties when compared with QPS. While speed is often difficult for police to assess accurately post-crash, perhaps helping to explain this difference, in casualty descriptions it represents the greatest single contributor among all behavioural factors outside *care and attention*. This attribution of excessive speed in seventeen casualty descriptions reinforces justification for related campaigns and enforcement measures in the face of frequent public criticism.

Differences

Differences between the two data sources in relation to some contributing circumstances may be partly explained by QPS reliance on physical evidence. In some cases, casualties described the driver taking *action to avoid other road users* or *animals*, evidence for which has seemingly been absent upon QPS investigation. It cannot be assumed on the basis of QT/QPS reports that these factors did not contribute to those crashes simply because they have not been cited. Nor can it be assumed that such factors did contribute to a crash just because a patient said so – some crashes where an animal or other road user were mentioned in casualty descriptions are known to have involved alcohol, and/or thought to have involved fatigue, carelessness and other factors. There is also a notable difference in the attribution of vehicle-related factors in crashes similarly influenced in some cases by other factors not vehicle-related (although there were few such cases).

More generally, the difference between police and casualties in the overall attribution of behavioural factors suggests externalisation of responsibility by some of the patients interviewed. This apparent reluctance to accept responsibility may also be reflected in the higher proportion of casualties citing environmental factors when compared with QT/QPS reports.

The greatest differences between the two sources were observed in relation to (lack of) *care and attention* and *alcohol/drugs*. The range of behaviours included under the definition *care and attention* render this category somewhat ambiguous and therefore difficult to analyse. The criteria used by police to identify this contributing circumstance is unclear, while in patient narratives it has been identified by explicit references to carelessness or distraction, as well as by admissions of speeding, drink driving and other unlawful or risky behaviours.

In regard to alcohol/drugs, the difference is not simply a result of casualties withholding information or not remembering events, as in some cases participants have conceded the involvement of alcohol to interviewers yet have been able (deliberately or otherwise) to conceal this from police (thus narrowing the difference). However, there are few such cases and, as stated above, police attribution of alcohol features prominently in cases where interviewed patients claimed little or no memory of events.

Other factors

As previously noted, there are difficulties in analysis of those contributing circumstances categorised as 'Other'. These include *Driver – Fatigue related by definition*, which relates more to the time the crash occurred than to the wakefulness or otherwise of the driver/rider involved. Factors relating to age and experience are similarly assigned in many cases where a vehicle controller meets set criteria, such as being above or below a certain age threshold. This comparison, therefore, does not address age or experience as factors in crashes in any detail. However, a number of casualty descriptions (6) do concede inexperience as a contributing factor in cases involving younger drivers. For elderly drivers, only one casualty was willing to concede that age was a contributing factor, although this factor was cited by QPS in fourteen cases. Where *Miscellaneous* is attributed by QPS as a sole contributing circumstance it can only be assumed that details pertaining to crash causality are unknown, despite official investigation. For those contributing circumstances included here in the 'Other' category, the current coding used by QPS/QT may benefit from some revision.

No memory crashes

Observing the 43 cases where casualties claimed no memory of their crash, it is evident that alcohol/drugs were involved in a higher proportion of those crashes (17%) when compared with those for which casualties gave a description (12%). Road condition, the most frequently cited environmental factor for both sources, is noticeably less prominent in these cases according to QPS reports. Perhaps even more telling is that over 80% of all factors attributed by police for these crashes were behavioural in nature.

Conclusions

In summary, this analysis demonstrates the predominance of behavioural factors in crashes, clearly recognised by police and only slightly less so by interviewed casualties. While environmental factors represent between 20 and 29 per cent (depending on the data source) of all contributing circumstances in crashes analysed, in many cases these could arguably have been negated by more appropriate behaviour. Vehicle related and medical factors represent a negligible proportion of contributing circumstances overall.

Police and interviewed casualties appear to agree in general that through greater attentiveness, awareness and caution, most crashes are avoidable. With the exception of alcohol/drug-related factors, the differences observed between sources were only slight, suggesting that policy informed by QPS/QT crash data should be concordant with community needs and expectations.

Appendix 8.1

	QPS-reported contributing circumstance	Sub-category	Category
1	Miscellaneous	501	5
2	Driver – Fatigue related by definition	502	5
3	Violation – Over prescribed concentration of alcohol	102	1
4	Excessive speed for circumstances	103	1
5	Violation – Dangerous driving	107	1
6	Road – Wet/slippery	201	2
7	Condition – Under influence of liquor/drug	102	1
8	Violation – Undue care and attention	101	1
9	Violation – Turn in face of oncoming traffic	106	1
10	Road Conditions – Miscellaneous	201	2
11	Violation – Illegally parked	107	1
12	Violation – Fail to give way	106	1
13	Animal Uncontrolled – On road	204	2
14	Vehicle – Tyres (Low tread; Puncture/Blowout)	301	3
15	Violation – Follow too close	107	1
16	Driver – Inexperience/Lack of expertise	503	5
17	Driver – Fatigue/Fell asleep	104	1
18	Driver – Inattention/Negligence	101	1
19	Vehicle – Load shift	301	3
20	Driver – Medical condition (Heart attack; Epilepsy etc.)	401	4
21	Road – Gravel/Dirt	201	2
22	Driver – Underage (Inexperience)	504	5
23	Atmospheric – Dust	202	2
24	Vehicle defects – Miscellaneous	301	3
25	Violation – Fail to keep left	107	1
26	Road – Narrow	201	2
27	Driver – Taking avoiding action to miss another road user	108	1
28	Violation – Fail to give way on pedestrian crossing	106	1
29	Driver– Age (Lack of perception; Power or Concentration)	505	5
30	Violation – Improper overtaking	107	1
31	Violation – Disobey give way sign	105	1
32	Vehicle entering driveway	101	1
33	Driver – Distracted	101	1
34	Violation – Exceeding speed limit	103	1
35	Violation – Unsafe lane change	107	1
36	Vehicle – Towing attachment	301	3
37	Vehicle – Suspension	301	3
38	Road – Potholes	201	2
39	Violation – Cross double lines	107	1
40	Lighting – Sunlight glare (Dawn/Dusk/Reflection)	203	2
41	Road – Rough surface	201	2
42	Violation – Disobey red traffic light	105	1
43	Violation – Disobey stop sign	105	1
44	Driver Condition – Miscellaneous	506	5
45	Violation – Tested for drugs only	102	1
46	Atmospheric – Heavy rain	202	2
47	Road – Water covering	201	2
48	Road-Temporary object on carriageway	201	2

49	Lighting condition – Miscellaneous	203	2
50	Lighting – Wearing dark clothing	101	1
51	Lighting – No street lighting	203	2
52	Atmospheric – Fog	202	2
53	Road – Rough shoulders	201	2
54	Violation – Disobey traffic sign	105	1
55	Lighting – Headlights off/no lights on vehicle	107	1
56	Road – Crest/dip – view obscured	201	2
66	No memory (casualty descriptions only)	601	6
77	Cited other unit (casualty descriptions only)	701	7

9. Research Outcomes and Interventions

The collaborative nature of the Rural and Remote Road Safety Study has enabled stakeholders and government agencies to use the research findings to improve transport-related service delivery and road safety initiatives in rural Queensland. This chapter specifically outlines the ways in which the research has directly and indirectly informed rural and remote road safety policy and practice in Queensland. In addition to discussing applied interventions and contribution to policy, this chapter documents the comprehensive communication and public education strategy embodied in the study and several associated research projects designed to increase the knowledge base around rural and remote road safety.

Applied Interventions

The overall program goal of study was 'to reduce the incidence and economic, medical and social costs of road crashes in rural and remote Queensland'. As such, the research team was strongly committed to using the findings and collaborative networks developed through the study to inform applied interventions in the target region.

Development and Trial of a Brief Intervention to Reduce Rural and Remote Road Crashes arising from Five Fatal Lifestyle Behaviours and Attitudes
(Funded through an NRMA Insurance Scholarship.)

This applied research project aimed to investigate road user factors contributing to the higher road toll in rural areas, including attitudes held by drivers towards road safety, crash risks and their own driving practices. This information was used to develop a brief intervention strategy which was trialled on a sample of patients who had been hospitalised after their involvement in a road crash.

The primary objective of the project was to increase the understanding of rural drivers' receptivity to road safety information with a view to developing more effective countermeasures for this population.

The research project comprised five studies/stages.

Study One

Study One investigated the attitudes of rural drivers towards crash risks, their own perceptions of their driving safety and their receptivity to intervention formats. Focus groups were conducted with rural drivers, including commercial drivers, motorcycle riders, young drivers and older drivers. Participants were asked about their perceptions of:

- the factors involved in crashes in rural areas
- the persons likely to be involved in rural crashes
- their own skills, vulnerabilities and behaviours as a rural driver
- their preferences and opinions about receiving road safety information in different mediums.

The findings suggested that rural road users had an inaccurate knowledge of rural road safety issues, a high level of optimism regarding their own safety and driving skill, and an external locus of control for crashes. Participants generally believed that road safety information was a positive and necessary step towards achieving road safety and an effective means of improving the road toll. However, this positive attitude was primarily for information targeted at 'other road users', rather than at themselves.

Study Two

Study Two reviewed data gathered from drivers who had been hospitalised after their involvement in a rural crash. This data on the factors associated with their crash, their self-reported driving patterns and their attitudes towards driving safety was compared to data gathered from other rural drivers who had not been involved in a road crash. Consistent with the findings of Study One, this study showed that crash-involved drivers maintained a quite positive perception of their own driving ability, and held inaccurate views of the factors associated with rural road crashes. Although they believed that road safety information was a positive countermeasure, they had little recall of such information and often believed that it was not relevant to drivers such as themselves.

Study Three

Study Three used this information to develop a brief intervention aimed at reducing rural drivers' risk of being involved in a crash. The aim of this study was to develop an intervention that was relevant to rural road users at all stages of the change process, targeted both attitudinal and behavioural aspects of rural road safety, and presented road safety information in a format that was accessible and relevant to rural road users.

A video and booklet were developed for use in a brief intervention, entitled *Potholes, Tourists and Bloody Idiots: Deadly Driving Myths of Rural Australia.* The format presented five 'myths', based on incorrect beliefs about rural driving that had been prominent during Study One. An initial myth emphasised the risks of country driving as opposed to city driving. The next four sections addressed myths that rural crashes were due to road conditions; other drivers; tourists or city drivers; or drivers of a certain age group.

It was intended to address the inaccurate risk perceptions, by juxtaposing the inaccurate beliefs with reality. This motivational interviewing technique is intended to raise a disparity for participants, with the intention of challenging their pre-motivational stage of change. Such information also provides accurate information to start to correctly evaluate risk and formulate strategies for their own behaviour. Following the presentation of the five 'myths', a transitional section focused on dispelling the belief that rural crashes were due to external factors, and highlighted the role of individual behaviour. This was intended to encourage a shift from external to internal locus of control for driving safety.

In the second half of the video, information on the 'Fatal Four' was presented. Each of the 'Fatal Four' (speeding, drink driving, fatigue, non-use of seatbelts) was included, given lower level of compliance in rural areas, and likelihood of overlap in high risk behaviour. The format included a statement of incorrect belief, which was countered with factual information. This included statistics on the reality of rural road crashes or statements from reputable persons (e.g. police, experienced motorcycle rider, nurse). This was intended to create a disparity between the incorrect beliefs typically observed in a pre-motivational stage of change, and reality. Comments were then given by a variety of persons in rural settings outlining their own behaviour, which served as a 'menu of options' for change, consistent with motivational interviewing procedures.

Consistent with the focus group findings in Study Two regarding the format of interventions, it was produced as a short video. The participants were all rural residents, and volunteered their participation without payment. An accompanying booklet was produced, which gave a permanent product of the concepts raised in the video.

Study Four

Study Four tested the intervention methodology including the receptivity of rural drivers to road safety information in this format. Twenty-two crash-involved persons and 22 non-crash-involved persons were recruited from Cairns Base Hospital for involvement in this pilot study. Persons presenting to Cairns Base Hospital after their involvement in a road crash or other non-road trauma were considered for inclusion. Patients recruited to the study completed a questionnaire about their driving behaviour and road safety attitudes, then viewed the intervention video. After the video, they gave verbal feedback to the research staff about their perceptions of the video, using a semi-structured interview format. Three prompt questions were used, including their general thoughts about the video, what they liked or disliked about it, the degree to which it may influence their attitudes or behaviour, and whether they would watch it again. All patients were re-contacted at three months to complete the initial questionnaire.

The majority of participants gave positive feedback regarding the intervention, including its content and technical production. Patients who had been involved in a road crash were more likely to state that the information was not new to them when compared with patients who had been involved in other forms of trauma. Road crash patients were also more likely to state that they would not voluntarily watch the video again. At this time, data analysis is ongoing regarding changes in attitude and behaviour after the three month follow-up period.

Study Five

Study Five consisted of gathering data from two further groups of road crash and non-crash patients, who served as control groups for the brief intervention. One group completed the questionnaire at the time of hospitalisation and after three months, but did not receive the brief intervention. A second group was recruited to the study but did not complete the questionnaire until a three month follow-up period. This group was intended to control for the effects of completing a questionnaire that may independently raise awareness of road safety behaviours and attitudes. Study Five is ongoing and due for completion in mid-2008.

For more information on the ‘Fatal Five’ Brief Road Safety Intervention contact Ms Gayle Sticher (CARRS-Q, PhD Scholar) at g.sticher@qut.edu.au

Queensland Aboriginal and Torres Strait Islander Driver Licensing Program
(Funded through the Department of Premier & Cabinet CBRC Scheme.)

Unlicensed driving is a major road safety, health and social justice problem for Indigenous Australians. In the North Queensland region, licence ownership among the driver licence eligible population in Indigenous SLAs is 41% compared to 92% in non-Indigenous SLAs. In 2003, CARRS-Q (Researcher: Mr Colin Edmonston) and Queensland Transport began a long-term applied research project to better understand the cultural, access and practical barriers impacting on the capacity of Indigenous people to obtain and retain appropriate drivers’ licences. The end goal was develop a culturally-appropriate approach to licensing training and testing.

The primary project (research phase)

A comprehensive consultation and research process was used to inform the development of a new licensing scheme. An in-depth discussion of the research process included:

- focus groups in many of the Indigenous communities throughout Queensland and the Torres Strait, along with informal discussions at major cultural and sporting events (community perspective)
- semi-structured interviews with more than 50 Indigenous persons serving sentences for driver licensing offences in Queensland correctional facilities (offender perspective)
- a series of interagency forums with government and key Indigenous and non-Indigenous stakeholder groups (government perspective).

A number of barriers and issues were raised during the consultation process including:

- *cultural and historical issues* including fear of police, cross-cultural issues and a perceived low priority for driver licensing
- *testing issues* such as the use of 'urban' concepts and language differences and difficulties
- *information, education and training needs* including lack of available vehicles and lack of provision of relevant information regarding rules
- *justice issues* including the high incidence of Indigenous incarceration for licensing offences, and misconceptions about licence loss periods
- *cost and access issues* including a lack of training visits to communities and the high costs associated with travelling to be tested or renewed for a licence.

Applied outcome (development and piloting phase)

Faced with the challenge of increasing licence ownership in Indigenous communities by nearly 300 per cent, key Queensland Government Departments, in partnership with Indigenous communities and CARRS-Q developed a new mobile driver licensing and education program for Indigenous and remote communities. The new program focuses on the theory component (Learners) and directly addresses issues borne out of the research phase and is aligned with Indigenous learning styles. Instruction leading up to the test can take up to six or seven hours, using an interactive, oral and hands-on (using toy cars) method of presentation. At the end of this period, the group is ready to sit the test, which can be given and answered orally.

Impact

1. Ongoing delivery and expansion of the program

   - More than 20,000 copies of the newly developed licensing booklet distributed to Queensland communities and other jurisdictions.
   - Improvement of processes for identification where formal documentation may not exist.
   - Delivery of 900 new licences (in the first 18 months of operation) corresponding to an 8.1% increase in licence ownership in Indigenous LGAs compared to a 2.7% increase in non-Indigenous LGAs.
   - Securing of recurrent funding for five years at $1.2 million per annum to develop a new Aboriginal and Torres Strait Islander Road Safety Mobile Driving Licensing Unit.
   - Appointment and comprehensive training of seven new Indigenous driving examiners.

- Development of a long-term process and outcome evaluation framework to monitor the impact of the program looking at a wide variety of indicators regarding road trauma, licensing, employment, offences and justice outcomes.
- Various other road safety training undertaken with Indigenous groups including remote schools, community police and in correctional facilities.
- Working with local (mining) industry to coordinate sponsorship of road infrastructure upgrades to facilitate community-based testing.
- Working with Queensland Transport on reviewing novice driver materials (i.e. logbooks) for use in remote communities.
- Transfer of material and methods developed as part of the Queensland program to other states and territories.

2. National involvement in Indigenous road safety policy and practice

- Mr Edmonston is the invited Queensland delegate on the National Aboriginal and Torres Strait Islander Road Safety Working Group chaired by the Australian Transport Safety Bureau.
- Mr Edmonston was the primary researcher on both National Indigenous Road Safety Reviews (CARRS-Q and ARRB Transport Research Ltd, 2003; 2006) conducted to date.
- CARRS-Q are a major contributor to the development and maintenance of the Aboriginal and Torres Strait Islander Road Safety Clearinghouse – Australian Indigenous HealthInfoNet. The online clearinghouse provides community members, practitioners and policymakers with current research findings, promising road safety initiatives and key contacts in Australia and overseas.
- CARRS-Q has developed a handbook for road safety professionals working in the Indigenous context - '*Living Knowledge': A practical cycle of engagement for working with remote Indigenous communities.* The handbook (to be published by Ashgate publishing in 2009) highlights the skills and knowledge needed to conduct ethical research and work in partnership with Indigenous communities. It is designed to be a practical companion for the National Health & Medical Research Council's Guidelines for Ethical Conduct in Aboriginal and Torres Strait Islander Health Research (2003) but will also contain international perspectives on working with Indigenous communities.

For more information on the Queensland Aboriginal and Torres Strait Islander Driver Licensing Program or other Indigenous road safety initiatives discussed contact Mr Colin Edmonston (CARRS-Q, PhD Scholar) at c.edmonston@qut.edu.au

National Fleet Safety Program
(Funded through corporate sponsorship and competitive research grants).

Over the past five years, CARRS-Q has developed a program of applied fleet safety research with several major national and state-wide employers including Johnson & Johnson, Telstra, Ergon Energy, QFleet, IAG Insurance, Queensland Taxi Council and a number of local councils/shires. Many of these projects have an emphasis on regional and rural driving with a primary focus on 'safety climate within organisations' and fleet safety policy development. The major interventions offered include: (i) crash recording and reporting processes; (ii) fleet benchmarking; (iii) workplace seminars and educational workshops (toolbox talks); (iv) online driver profiling; (v) driver diaries; (vi) tailored resources (e.g. posters and fact sheets); and (vii) road safety screen savers for workplace workstations.

For more information on fleet safety interventions offered by CARRS-Q contact Mr Darren Wishart (CARRS-Q, Program Manager – Fleet Safety) at d.wishart@qut.edu.au

Contribution to road safety policy and decision making

The Rural and Remote Road Safety Project is funded and supported by nine Government Departments and the Motor Accident Insurance Commission. As such, all major road safety stakeholders in Queensland have been extremely interested in the findings and how they can inform education, enforcement and engineering practices to improve road safety in our jurisdiction.

At the State level, the findings have been presented to the funding agencies every six months and at each annual Queensland Road Safety Summit to inform the drafting of the Queensland Road Safety Strategy and associated Action Plan. Furthermore, the findings have formed the basis of submissions and expert testimony to several Parliamentary Travelsafe Committee Inquiries:

- Inquiry into the Q-RIDE Rider Training Program (Parliamentary Travelsafe Committee, 2007)
- Inquiry into vehicle impoundment for drink drivers (Parliamentary Travelsafe Committee, 2006)
- Fatigue Inquiry (Parliamentary Travelsafe Committee, 2005)
- Inquiry into provisional driver and rider licence restrictions (Parliamentary Travelsafe Committee, 2003a)
- Reducing the road toll for young Queenslanders - is education enough? (Parliamentary Travelsafe Committee, 2003b)
- Rural road safety in Queensland (Parliamentary Travelsafe Committee, 2002)
- Symposium: Work-related road trauma and fleet risk management in Australia (Parliamentary Travelsafe Committee, 2001)

Comprehensive communication and public education strategy

Backed by the Queensland Government, the Rural and Remote Road Safety Study was a high-profile research initiative and received quite a lot of exposure through the media. Research staff were also strongly committed to promoting the study, raising the agenda of road safety at the community level and presenting findings in both academic and non-academic forums.

General and targeted media

Preliminary findings and publicity regarding the study were reported in the media many times over the last five years. This was made up of a combination of targeted media releases (e.g. Community Service Announcements developed in partnership with WIN television, Ten Days of Towers release, regular appearances on Murri Voices radio, holiday media releases with key road safety messages) and general media (e.g. requests to comment on specific road safety issues often in response to a crash or spate of crashes in a particular region). A summary of the media exposure is presented in Table 9.1 below while specific examples of project media are shown in Appendix A.

Table 9.1. *Summary of project media exposure, 2003–2008*

Year	Media Reports
2003	47
2004	35
2005	28
2006	52
2007	17
2008	10
Total	**189**

Queensland Transport Northern Region are currently working with police and community groups in Mt Isa to develop local media campaigns targeting local road safety issues based on the findings of the study reported through regional road safety working groups.

Road safety promotion through the study

In collecting a comparison sample, the research team interviewed more than 700 road users by the roadside at recent crash sites, petrol stations and at community, sporting and cultural events (e.g. Laura Cultural Festival, Mt Isa Rodeo, Ten Days of Towers). While impossible to measure, it is hoped that the presence of researchers on the ground has raised road safety awareness in the target region. In addition, the research team conducted a mail-out to all North Queensland households and promoted the study at major shopping centres, service stations and through the Queensland Hotelier’s Association.

Government reports and academic publications

A number of publications including government reports and conference presentations were prepared by staff during the progression of the study. A full list of these publications is presented in Appendix B.

Associated research to inform the rural and remote road safety knowledge base

Profiling the behaviours, attitudes and perceptions of off-road motorcycle riders in North Queensland

(Funded by the Commonwealth Department of Health & Ageing).

CARRS-Q has commenced a multi-method research project to profile the behaviours, attitudes and perceptions of off-road motorcycle riders (including all-terrain vehicles, or quad bikes) in North Queensland to inform the development of appropriate road safety interventions for this high-risk group. The research design is focused around four main parts:

1) A literature review of relevant national and international research into crashes and injuries occurring due to off-road riding
2) Detailed secondary data analysis specifically of the off-road cases within the Rural and Remote Road Safety Study as well as other existing hospital admission data for the North Queensland region and other areas
3) Focus groups with off-road riders in North Queensland to establish a profile of the attitudes and characteristics of those involved in the recreation
4) An assessment of currently available facilities for off-road riding and related issues.

On the basis of the collected quantitative injury data and qualitative interviews, recommendations as to the development of appropriate interventions for the group will be made.

For more information on this project contact Mr Dale Steinhardt (CARRS-Q, Senior Research Assistant) at d.steinhardt@qut.edu.au

Impact of road crashes on General Practitioner workloads

(Funded by the Royal Australian College of General Practitioners and the Royal Australasian College of Physicians.)

Background: There is twice the morbidity and mortality resulting from vehicle-related trauma in rural and remote areas than in metropolitan areas. Little is known about Australian rural general practitioners' management of those affected.
Methods: Seventeen rural GPs in North Queensland participated in semi-structured interviews for this exploratory study of the management of patients presenting with acute or chronic vehicle-related trauma. Responses were analysed quantitatively and thematically.
Results: General practitioners reported more presentations of chronic than acute vehicle-related trauma. Common injuries were soft tissue injury, whiplash and chronic pain syndromes. Vehicles most often involved were motorbikes, passenger cars and bicycles. Surgeons and physiotherapists were the most difficult service providers to access. Better coordination of rehabilitation and community support services is required.
Discussion: General practitioners in rural North Queensland manage patients with chronic vehicle-related trauma without adequate access to specialised rehabilitation

services. More training of GPs and practice staff and improved coordination of these services are required (Cheffins, Blackman & Veitch, 2007).

This summary is the abstract from a peer-reviewed article published in the *Australian Family Physician* (Vol. 36). For more information on this project contact Dr Tracy Cheffins (JCU School of Medicine & Dentistry) at tracy.cheffins@jcu.edu.au

Determinants of adverse clinical outcomes in serious road crashes in a regional Australian setting
(JCU School of Medicine, Honours Project.)

This research project is a case-case study that aims to identify the determinants of injury severity and adverse clinical outcomes in serious road crashes occurring in the Far North Region of Queensland. It will also establish the extent to which each determinant impacts on injury severity and adverse clinical outcome. All people aged 16 or older that are involved in a car crash in the Far North Region of Queensland from 01/03/2006 to 28/02/2007 inclusive that resulted in a hospital stay for greater than 24 hours due to injuries sustained in the road crash or death will be included in the study.

The determinants that will be collected and analysed for each case in the study can be sub-grouped into personal factors e.g. age; gender; medical/social factors (e.g. did the person involved have alcohol in their system at the time of the crash); environmental (e.g. date and time of crash, location of crash); vehicular (e.g. type of vehicle), and service provision (e.g. time between ambulance on scene and ambulance at destination). A validated injury severity score (TRISS) will be used as a tool to assess injury outcomes, both as an outcome measure in itself, as well as a possible determinant of other adverse clinical outcomes.

The clinical outcomes that will be used to analyse the determinants of adverse clinical outcomes against include length of stay, length of stay in ICU, number of general anaesthetics, blood transfusion, number of allied health interventions the patient had, outcome status of the patient e.g. discharged home, discharged to another hospital, died, left hospital against medical advice, and fatality versus hospital admission. In addition, descriptive statistics will be generated from all of the cases involved to provide an injury profile for serious vehicle crashes in the region. This will allow interesting comparisons to be made between the injuries sustained in urban versus rural and remote crashes, for example.

In summary, the study will identify the determinants of injury severity and adverse clinical outcomes. This will help with the development of evidence-based prevention strategies and public policy and will enhance police and health service delivery in the area of road crashes.

For more information on this project contact Ms Nicole Harris (JCU School of Medicine, Honours Student) at nicole.harris@jcu.edu.au

Evaluation of the 'Skipper' Designated Driver Program
(Funded by Queensland Transport.)

In 2006/7, the Queensland Government Steering Committee developed a designated driver program named 'Skipper'. The 'Skipper' program is an 'in premises program' in which patrons agree to stay sober and drive their friends home in exchange for free soft drinks. The project is supported by media in the intervention area including radio and press as well as advertising in premises (e.g. posters).

Due to a lack of research into the effectiveness of designated driver programs, the current evaluation aims to provide a better understanding of whether designated driver programs are effective in reducing drink driving, and knowledge about the processes that facilitate and/or impede their effectiveness. The primary objective is to determine whether any changes have occurred in the drink driving behaviour of the target group, as evidenced by measures such as self-reported drink driving behaviour and drink driving detection rates in the intervention area (i.e. proportion of detections per breath test administered).

In addition, there are a number of secondary (or intermediate) outcomes of interest that provide insights into the behavioural mechanisms underpinning possible changes in behaviour. These include awareness of designated driver programs; awareness of designated driver practices; and preparedness and intentions to use designated drivers.

Surveys were conducted at baseline (pre-implementation) in Mackay (intervention area) and Rockhampton (comparison area), and then again four months after implementation. RBT, offence and crash data have also been requested for the two areas. Focus groups were also conducted with patrons, staff, and licensees for a more detailed understanding of the program's processes.

For more information on this project contact Ms Angela Neilson (CARRS-Q, Senior Research Assistant) at a.neilson@qut.edu.au

Profiling Indigenous and non-Indigenous road trauma in North Queensland
(Funded by NHMRC and Smart State Scholarships.)

This PhD project addresses the lack of rigorous investigation into the causes of Indigenous road trauma using a multi-method research design to profile the unique and shared characteristics of crashes involving Indigenous people compared to other road users in rural and remote areas. To achieve these aims, the PhD candidate is firstly undertaking a comprehensive review of hospital, crash, offence and corrections databases and consulting key researchers and practitioners in the area, as part of the 2005–06 National Review of Indigenous Road Safety (Study 1). Secondly, the candidate is collecting crash experiences of Indigenous and non-Indigenous road users in both rural and remote regions using personal reports of persons recruited through health services of trip characteristics, behaviours and retrieval factors contributing to their crash involvement and subsequent injuries (Studies 2a and 2b). The research includes Indigenous co-researchers involved in the recruitment of participants (i.e. community clinic nurses and Indigenous Liaison Officers in larger facilities) and an Indigenous Reference Group to ensure that the research is 'value-adding' for those involved and conducted in a culturally-sensitive manner. The PhD research is predominantly exploratory. While there are no specific or detailed hypotheses per se, '*the general hypothesis is that the crash characteristics of Indigenous road trauma will be different to the crash characteristics of non-Indigenous road trauma in rural and remote areas*'. Identified meaningful differences will ultimately be used by road safety stakeholders to inform intervention development.

This project is due for completion in 2008. For more information on this project contact Mr Colin Edmonston (CARRS-Q, PhD Scholar) at c.edmonston@qut.edu.au

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10. Conclusions and Recommendations

Overview and summary of studies

This major report has summarised the analyses of the data from a comprehensive associated series of studies. These were undertaken to provide information for understanding and action to reduce the high rates of crashes in rural and remote regions. It has described the largest and most far-ranging data collection of its kind undertaken.

The reported chapters present the first and general descriptive stage of the analyses. Conclusions and recommendations presented in this final chapter are those that arise unequivocally from the clearest and most readily apparent aggregate findings. Second stage explanatory and exploratory analyses remain to be undertaken and while some are clearly evident and noted at a later section of this chapter others will be sought and undertaken in consultation with stakeholders.

A brief summary of the studies undertaken as part of the research program is given below in Figure 10.1.

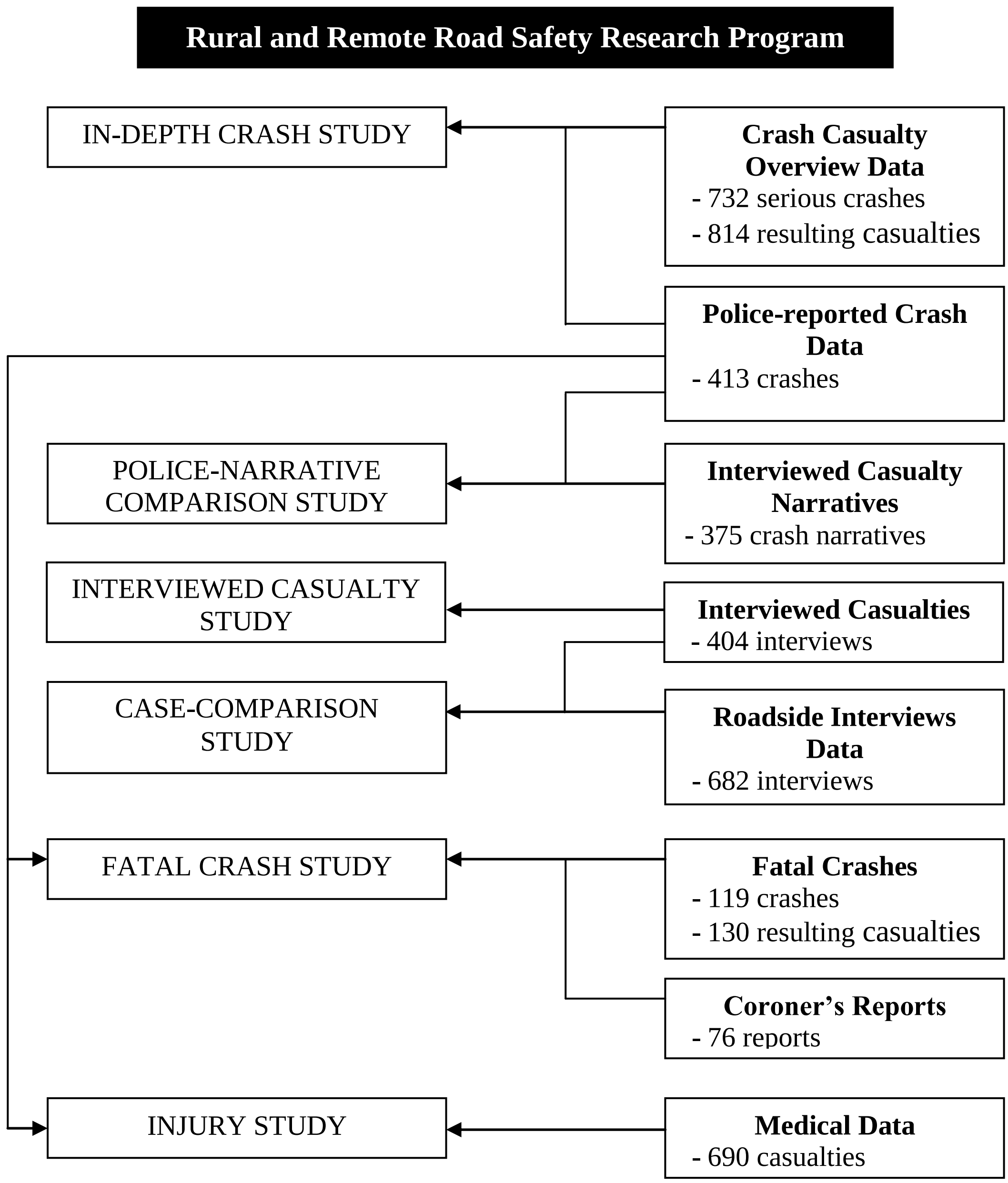

Figure 10.1. Overview of research program

As can be seen in the figure above, each of the studies undertaken as part of this research project utilised differing and overlapping data sources. Basic information was collected for all crashes and casualties that met the study's inclusion criteria as described in Chapter 2 to present an in-depth crash study (see Chapter 3). Of this total sample, a further 404 interviews were conducted with serious casualty cases to form an interviewed casualty study (see Chapter 4). These interviewed cases, along with 682 interviews conducted with non-crash-involved persons were used to conduct a case-comparison study to identify specific characteristics associated with serious crash involvement (see Chapter 5).

Medical data for 696 casualties, sourced from hospital records, was used to provide detailed information regarding the injuries resulting from crashes (see Chapter 6). A separate analysis was undertaken regarding the subset of fatal crashes from the in-depth crash study (see Chapter 7). Detailed information sourced from available

Coroner's reports was used to provide additional information on a proportion of these fatal incidents.

The in-depth crash, fatal and injury studies were all supplemented by police-reported crash data as matched to cases by the researchers. Finally, a comparison was conducted between patients' narrative descriptions of crashes and police-reported crash circumstances (see Chapter 8).

The major findings

The reported chapters present the first and general descriptive stage of the analyses. The conclusions and recommendations which are presented in this final chapter are those that arise unequivocally from the clearest and most readily apparent aggregate findings. Second stage explanatory and exploratory analyses remain to be completed and while some are clearly evident and noted in a later section of this chapter others will be sought, identified and developed in consultation with stakeholders.

A summary of major findings is provided below with relevant chapter references for further details.

Characteristics of drivers/riders

- Male drivers and riders have very high representation among rural and remote road crash fatalities and serious injuries. This should, however, be interpreted in relation to greater road use by male drivers generally.
- While young male drivers and riders were highly represented among all serious casualties, males aged between 30 and 50 years of age constitute the largest group of both fatalities and casualties.
- The overwhelming representation of local drivers and riders in crashes was once again demonstrated. This occurs in a context of rural mythology about visitors and strangers.

Types of crashes/vehicles

- Motorcyclists continue to be highly over represented among transport injuries in comparison to their reported level of vehicle registrations and road use.
- Most rural crashes are single vehicle crashes that occur in relatively good road and climatic conditions.

Behaviours

- Driver-related factors play a greater role than environmental factors in the overwhelming majority of crashes.
- Analyses of all data sources indicate that speed would appear to be the 'final common pathway' leading to a fatal outcome in most road crashes.
- A significant proportion of crash casualties reported non-use of seat belts or helmets. Levels of non-use, particularly for seat belts, increased for fatal casualties.

- Problem drinking and alcohol involvement is a serious contributor to rural and remote crashes. The clearest finding is the strong positive association between regular alcohol consumption and subsequent self-reported drink driving behaviours. This pattern emerged for both the hospitalised and roadside non-crash involved samples.
- Unlicensed drivers are represented in the studied rural crashes at similar levels to reported serious crashes in the whole state of Queensland.
- A significant proportion of the general and crash-involved samples report past involvement in road crashes.
- Increased involvement in traffic offences is positively associated with a history of crash involvement.
- Interventions focused on improving the road environment continue to be given the highest priority by rural and remote respondents despite evidence that human factors are often identified among crash involved casualties.
- There is a strong rural and remote driver/rider belief in the myth of the dangerous 'other driver'.
- Alcohol is particularly noted as a contributing factor in fatal crashes, at approximately twice the rate of other serious crashes.

Types of roads/locations/time

- There are some high risk sites that could be identified as carrying clusters of crashes.
- Crashes and injuries occurring from vehicle use off-road are substantial, but relatively under-researched.
- A greater number of crashes occur in the afternoon as compared to other time periods.
- There is an increased number of crashes occurring on weekends, with the afternoon increase also remaining across these days. This holds true for both on-road and off-road crashes.

Medical/retrieval issues

- The absolute disease burden posed by serious road crashes in rural and remote North Queensland is not inconsiderable, with young adult males bearing the brunt.
- Certain types of vehicle and road user types are associated with distinct injury profiles. Specifically, lower limb injuries are prevalent among motorcyclists, while head and neck injuries are more prevalent for car and truck occupants.
- While time to definitive care will never equal that of more densely populated urban areas, the study has demonstrated considerable efficiency in the response and retrieval systems in rural and remote North Queensland.
- Most fatal road crash injuries appear to be unsurvivable at the outset. Any benefit from more rapid emergency response times could not be determined from the available data.

- There are substantial financial costs associated with the management of acute trauma resulting from serious rural and remote crashes.
- Based on injury profiles, lack of restraint may contribute to death in a considerable proportion of fatal crashes.

Police reports

- Crash information provided by face-to-face interviews was generally comparable to that provided by official crash reports, suggesting the former method provides details of useful accuracy.
- With the exception of alcohol/drug-related factors which were more frequently noted in police reports, the differences observed between sources of data were only slight.
- The predominance of behavioural factors in crashes is clearly recognised by police and only slightly less so by interviewed hospital casualties.
- Environmental factors represent between 20 and 29 per cent (depending on the data source) of all contributing circumstances in the crashes analysed, and in many cases these could arguably have been negated by more appropriate behaviour.
- Vehicle-related and medical factors represent a negligible proportion of contributing circumstances overall.
- A consistent finding is that through greater attentiveness, awareness and caution, most crashes are avoidable.
- QPS/QT crash data appears accurate in terms of being able to inform legislation and policy.

Interventions

A number of interventions were trialled through the period of data collection. To date none of these have had the time, breadth of access or intensity of implementation to enable measures of outcome effectiveness.

Two in particular though may have particular promise for further development and distribution. They are the *Licensing Intervention for Indigenous people* and the *Rural health promotion video and booklet specifically targeting rural knowledge, attitudes and behaviours.*

Recommendations

The recommendations presented here are based on the team's experience and the findings of the international symposium.

Male drivers and riders

- Male drivers and riders should continue to be the focus of interventions, given their very high representation among rural and remote road crash fatalities and serious injuries.
- The group of males aged between 30 and 50 years comprised the largest number of casualties and must also be targeted for change if there is to be a meaningful improvement in rural and remote road safety.
  [See Figure 3.2, Figure 3.3]

Motorcyclists

- Single vehicle motorcycle crashes constitute over 80% of serious, on-road rural motorcycle crashes and need particular attention in development of policy and infrastructure.
- The motorcycle safety consultation process currently being undertaken by Queensland Transport (via the "Motorbike Safety in Queensland - Consultation Paper") is strongly endorsed. As part of this process, particular attention needs to be given to initiatives designed to reduce rural and single vehicle motorcycle crashes.
  [See Table 3.7, Table 3.12]
- The safety of off-road riders is a serious problem that falls outside the direct responsibility of either Transport or Health departments. Responsibility for this issue needs to be attributed to develop appropriate policy, regulations and countermeasures.
  [See Figure 3.4]

Road safety for Indigenous people

- Continued resourcing and expansion of The Queensland Aboriginal Peoples and Torres Strait Islander Peoples Driver Licensing Program to meet the needs of remote and Indigenous communities with significantly lower licence ownership levels.
- Increased attention needs to focus on the contribution of geographic disadvantage (remoteness) factors to remote and Indigenous road trauma.

Road environment

- Speed is the 'final common pathway' in determining the severity of rural and remote crashes and rural speed limits should be reduced to 90km/hr for sealed off-highway roads and 80km/hr for all unsealed roads as recommended in the Austroads review and in line with the current Tasmanian government trial.
  [See Table 3.21 for proportion of crashes in high speed zones]

- The Department of Main Roads should monitor rural crash clusters and where appropriate work with local authorities to conduct relevant audits and take mitigating action.
  [See Table 3.9]

- The international experts at the workshop reviewed the data and identified the need to focus particular attention on road design management for dangerous curves. They also indicated the need to maximise the use of audio-tactile linemarking (audible lines) and rumble strips to alert drivers to dangerous conditions and behaviours.

Trauma costs

- In accordance with Queensland Health priorities, recognition should be given to the substantial financial costs associated with acute management of trauma resulting from serious rural and remote crashes.
- Efforts should be made to develop a comprehensive, regionally specific costing formula for road trauma that incorporates the pre-hospital, hospital and post-hospital phases of care. This would inform health resource allocation and facilitate the evaluation of interventions.
- The commitment of funds to the development of preventive strategies to reduce rural and remote crashes should take into account the potential cost savings associated with trauma.
  [See Tables 6.5 - 6.6, 6.21 - 6.25]
- A dedicated study of the rehabilitation needs and associated personal and healthcare costs arising from rural and remote road crashes should be undertaken.

Emergency services

- While the study has demonstrated considerable efficiency in the response and retrieval systems of rural and remote North Queensland, relevant Intelligent Transport Systems technologies (such as vehicle alarm systems) to improve crash notification should be both developed and evaluated.
  [See Tables 6.2 - 6.4]

Enforcement

- Alcohol and speed enforcement programs should target the period between 2 and 6pm because of the high numbers of crashes in the afternoon period throughout the rural region.
  [See Figure 3.7]

Drink driving

- Courtesy buses should be advocated and schemes such as the Skipper project promoted as local drink driving countermeasures in line with the very high levels of community support for these measures identified in the hospital study.
  [See Tables 5.38 - 5.39]

- Programs should be developed to target the high levels of alcohol consumption identified in rural and remote areas and related involvement in crashes.
  [See Table 5.8]

- Referrals to drink driving rehabilitation programs should be mandated for recidivist offenders.

Data requirements

- Rural and remote road crashes should receive the same quality of attention as urban crashes. As such, it is strongly recommended that increased resources be committed to enable dedicated Forensic Crash Units to investigate rural and remote fatal and serious injury crashes.
- Transport department records of rural and remote crashes should record the crash location using the national ARIA area classifications used by health departments as a means to better identifying rural crashes.
- Rural and remote crashes tend to be unnoticed except in relatively infrequent rural reviews. They should receive the same level of attention and this could be achieved if fatalities and fatal crashes were coded by the ARIA classification system and included in regular crash reporting.
- Health, Transport and Police agencies should collect a common, minimal set of data relating to road crashes and injuries, including presentations to small rural and remote health facilities.

Media and community education programmes

- Interventions seeking to highlight the human contribution to crashes should be prioritised. Driver distraction, alcohol and inappropriate speed for the road conditions are key examples of such behaviours.
  [See Tables 3.24, 3.25, 3.28, 3.31, 4.91, 4.131, 7.18 - 7.21]

- Promotion of basic safety behaviours such as the use of seatbelts and helmets should be given a renewed focus.
  [See Tables 3.22, 4.69, 4.113, 6.12-6.15]

- Knowledge, attitude and behavioural factors that have been identified for the hospital Brief Intervention Trial should be considered in developing safety campaigns for rural and remote people. For example challenging the myth of the dangerous 'other' or 'non-local' driver.
  [See Chapter 9]

- Special educational initiatives on the issues involved in rural and remote driving should be undertaken. For example the material used by Main Roads, the Australian Defence Force and local initiatives.

Future Research

- Certain types of vehicle and road user types are associated with distinct injury profiles. This should provide impetus for further research into the mechanisms of injury, and the development of specific safety innovations and/or educational interventions.
- The exposure-adjusted crash risk of specific age-sex groups in rural areas merits further research.
- Further research is warranted in the time from crash to notification, both in terms of its impact on clinical outcome and possible means by which it can be reduced in rural and remote locations.
- Information on rehabilitation and long-term disability outcomes for casualties resulting from rural and remote crashes is lacking. Further research is required to identify gaps in service delivery and the means by which this can be addressed.
- Indigenous crash involvement and the unique aspects of vehicle safety for remote Indigenous populations.
- The identification and development of content and processes for a model road safety campaign for rural and remote people.
- Safety issues for shift workers.
- Further study examining the multiple possible factors leading to fatalities in severe rural and remote road crashes, and the significance of their contribution, is warranted.

Appendix A - Media Log

2008

Newsprint

Teens hurt in quad bike accident
• Ayr Advocate, 26/03/08, p. 1

Highways dangerous so take care
• Townsville Bulletin, 24/03/08, p. 12

Off-road motorbike riders wanted for safety survey
• Townsville Bulletin, General News, 17/01/08, p. 10
• Courier-Mail, Cars guide, 30/01/08, p. 49
• Cairns Post, 31/01/08, p. 11

Radio

Researchers wishing to survey off-road riders
• ABC Far North (Cairns), 07:30 News, 17/01/08 07:33
• ABC Far North (Cairns), 06:30 News, 17/01/08 06:32
• ABC North Queensland (Townsville), Rural Report, 17/01/08 06:50

Child fatalities in off-road riding. Helmet use encouraged.
• ABC Western Queensland (Longreach), 08:30 News, 15/01/08 08:33
• ABC Wide Bay (Bundaberg), 06:30 News, 15/01/08 06:30

Television

Child fatalities in off-road riding. Helmet use encouraged.
• Seven Bundaberg (Bundaberg), Seven Local News, 15/01/08 18:03

2007

Newsprint

Serious crash occurs almost every week: Dangers on rural off-roads
• Townsville Bulletin, 10/11/07, p. 21

Apply road rules: Off-road riders warned about reckless driving
• Townsville Bulletin, 26/11/07, p. 3

Quad bike rider injuries
• Home Hill Observer, 29/11/07, p. 1
• Ayr Advocate, 12/12/07, p. 10
• Townsville Bulletin, 17/12/07, p. 3

North Queensland riders more at risk
• Ayr Advocate, 14/12/07

North Queensland riders more at risk
• North Queensland Register, 15/02/07
• Ayr Advocate, 14/02/07
• Cairns Post, 17/02/07
• Townsville Bulletin, 21/02/07

Radio

North Queensland off-road riders four times more likely to be injured.
• ABC Far North (Cairns), 12:30 News, 13/02/07 12:33
• ABC Far North (Cairns), 08:30 News, 13/02/07 08:31
• ABC North Queensland (Townsville), 07:30 News, 13/02/07 07:32
• ABC North Queensland (Townsville), 06:30 News, 13/02/07 06:32
• 4BC Morning Show (Brisbane), 10:30 News, 12/02/07 10:31
• ABC North Queensland (Townsville), 19/03/07
• ABC Tropical North, 19/03/07

Television

2006

Newsprint

Young men high risks: males on motorbikes in most serious crashes
• Cairns Post, General News, 01/01/07, p. 9

Bike school bid to slash bike deaths
• Cairns Post, General News, 09/01/07, p. 4

Rules for summer safety
• Western Star, General News, 20/12/06, p. 5
• Herbert River Express, General News, 02/01/07, p. 3
• Proserpine Guardian, General News, 10/01/07, p. 14

Rural people blame city drivers for crashes
• Border Mail, 10/06/06, p. 4
• Daily Liberal, 10/06/06, p. 3
• Launceston Examiner, 10/06/06, p. 18
• Townsville Bulletin, 10/06/06, None, p. 4
• Daily Advertiser, 10/06/06, p. 6
• Daily Telegraph, 10/06/06, p. 17
• West Australian, 10/06/06, p. 61
• Adelaide Advertiser, 10/06/06, p. 19
• Sunshine Coast Daily, 10/06/06, p. 5
• Herald Sun, 12/06/06, p. 15
• South Burnett Times, 16/06/06, p. 9

- Cairns Post, 10/06/06, p. 4
- Burnie Advocate, 10/06/06, p. 6
- Northern Downs News, 15/06/06, p. 6
- Northern Daily Leader, 10/06/06, p. 9
- Warrnambool Standard, 10/06/06, p. 5
- Geelong Advertiser, 10/06/06, p. 38
- Forbes Advocate, 20/06/06, p. 8

Distractions and in-car technology
- Northern Downs News, General News, 12/04/06, p. 2

Community Forums (boring roads, alcohol, other factors)
- North West Star, General News, 24/05/06, p. 3
- North West Country, 24/05/06, p. 6
- Townsville Bulletin, General News, 25/05/06, p. 9

Radio

Distractions leading to crashes
- ABC North Queensland (Townsville), 06:30 News, 05/10/06, 06:31
- ABC Southern Queensland (Toowoomba), 08:30 News, 05/10/06, 08:30
- ABC North Queensland (Townsville), 07:30 News, 05/10/06, 07:31
- ABC Southern Queensland (Toowoomba), 12:30 News, 05/10/06, 12:33

Rural people blame city drivers for crashes
- ABC Coast FM - Gold Coast (Gold Coast), Drive, 09/06/06 15:30
- Radio National (Canberra), Bush Telegraph, 08/06/06 11:13
- 2CC (Canberra), Breakfast, 16/06/06 06:13
- ABC 612 Brisbane (Brisbane), 16:00 News, 09/06/06 16:03
- ABC North & West SA (Port Pirie), Morning Show, 15/06/06, 09:08
- ABC North Queensland (Townsville), 06:30 News, 13/06/06, 06:32
- ABC North Queensland (Townsville), The Afternoon Show, 09/06/06 16:10
- ABC North West WA (Karratha), Statewide Drive, 13/06/06 16:10
- ABC South East SA (Mt Gambier), Morning Show, 14/06/06 09:08
- ABC Southern Queensland (Toowoomba), 12:30 News, 09/06/06 12:31
- ABC Tropical North (Mackay), 06:30 News, 13/06/06 06:32
- ABC Tropical North (Mackay), 07:30 News, 13/06/06 07:31
- ABC Tropical North (Mackay), Rural Report, 19/06/06 06:19
- ABC Western Queensland (Longreach), 12:30 News, 13/06/06 12:30
- ABC Wide Bay (Bundaberg), 06:30 News, 12/06/06 06:34
- ABC Wide Bay (Bundaberg), 12:30 News, 12/06/06 12:32
- GWN (Regional West Australia), Golden West News, 14/06/06 17:34

Distractions and in-car technology
- ABC North Coast NSW (Lismore), Morning Show, 13/04/06 10:38
- Radio National (Canberra), Australia Talks Back, 13/04/06 18:48
- ABC 666 Canberra (Canberra), Drive, 13/04/06 17:10

Television

Complacency when driving
• Seven Local News (Cairns), 6.00 pm News, 20/12/06, 18:07

2005

Newsprint

Man hurt as roo and moped collide
• Townsville Bulletin (Townsville) 28/04/05

Rules ignored, enforcement risk low for traffic violations
• Cairns Post (Cairns) 07/06/05
• North West Star (Mt Isa) 07/06/05
• Northside Chronicle (Chermside) 08/06/05
• Queensland Times (Ipswich) 07/06/05
• Gympie Times (Gympie) 07/06/05
• Sunday Mail (Brisbane) 19/06/05

Northern roads redevelopments
• Northside Chronicle (Chermside) 08/06/05

Young male drivers risky in rural areas
• Townsville Bulletin (Townsville) 24/08/05

Country drivers in country crashes
• Cairns Post (Cairns) 30/08/05
• Courier-Mail (Brisbane) 24/08/05
• North West Star (Mt Isa) 26/08/05
• Dalby Herald (Dalby) 26/08/05
• Western Sun (Cunnamulla) 31/08/05
• Brisbane Valley-Kilcoy Sun (Kilcoy) 01/09/05
• Courier-Mail (Brisbane) 03/09/05
• Tablelander (Atherton) 04/10/05
• Courier-Mail (Brisbane) 15/10/05

Radio

Rural drivers - less care/greater accidents
• ABC Northwest QLD - Pat Hession 25/08/05
• Cairns 846AM - John McKenzie 29/08/05

Rural & Remote Project - QUT Smart Train Forum
• ABC North Queensland Radio News, 02/06/05
• ABC North Queensland Radio News, 02/06/05
• ABC North Queensland Radio News, 02/06/05

Call for improved driver education at road safety forum in North Queensland
• Townsville 4TO Radio News, 05/06/05
• 612 ABC Brisbane Radio News, 06/06/05

• ABC Sunshine & Cooloola Coasts Radio, News 06/06/05
• ABC Sunshine & Cooloola Coasts Radio, News 06/06/05
• ABC Tropical Queensland Radio, News 06/06/05

Television

North Queensland roads being used in study
• Townsville Win TV State Television News 02/06/05

2004

Newsprint

Radio

Roadside survey into road crashes in rural and remote areas
• ABC North Queensland The Morning Show, 27/01/04

Study into rural road accidents
• 612 ABC Brisbane Radio News, 16/02/04
• ABC Wide Bay Qld Radio News, 16/02/04
• ABC Wide Bay Qld Radio News, 16/02/04

Regional stakeholder meetings for rural road safety study
• ABC North Queensland Radio News, 16/05/04
• ABC North Queensland Radio News, 18/05/04
• 4TO Radio News, 19/05/04
• Mackay Sunshine TV State Television News, 18/05/04
• Townsville TV State Television News, 18/05/04

Rural road safety and avoiding animals
• ABC Western Queensland, 28/07/04

A new study is helping Aboriginal people to get their driver's licence
• ABC North Coast NSW Radio News, 08/08/04
• ABC North Coast NSW Radio News, 08/08/04

Researchers finding out why the road toll is so high in rural areas
• ABC North Coast NSW Radio News, 08/08/04
• ABC North Coast NSW Radio News, 08/08/04
• ABC North Coast NSW Radio News, 08/08/04
• ABC North Coast NSW Radio News, 08/08/04

Rural people asked to devise education strategies for rural road safety
• Horsham 3WM Radio News, 08/08/04
• Horsham 3WM Radio News, 08/08/04
• Horsham 3WM Radio News, 08/08/04
• Horsham 3WM Radio News, 08/08/04

New research into the rural road toll
• ABC Central West NSW, 10/08/04
• ABC NSW Regional West, 11/08/04

Researchers, Queensland Transport, aim to reduce Indigenous road accidents
• ABC Northwest Queensland Radio News 13/10/04
• ABC Darwin, 13/10/04
• ABC Darwin, 13/10/04
• Darwin Mix 104.9FM, 13/10/04
• ABC Tropical Queensland, 13/10/04
• ABC Northwest Queensland, 13/10/04
• ABC Southern Queensland, 14/10/04
• SBS Radio (Sydney), 15/10/04

Television

Study into the number of traffic accidents in North Queensland
• Cairns Win TV State Television News, 02/08/04
• Townsville Win TV State Television News, 02/08/04
• Seven Cairns State Television News, 02/08/04

Chance of being killed in a car accident higher on remote roads
• Mackay Sunshine TV State Television News, 03/08/04

2003

Total media contacts by month

Month			Quarter Total
January • 15	*February* • 17	*March* • 1	33
April • 2	*May* • 3	*June* • 4	9
July • 2	*August* • 1	*September* • 0	3
October • 0	*November* • 1	*December* • 1	2
		Total	47

Appendix B - Publications

2007

Publications/Conference Papers

Blackman, R., Veitch, C., O'Connor, T., Hatfield, F., & Steinhardt, D. (2007). **Attitudes to North Queensland road use: do hospitalised drivers/riders appear different by comparison to those not involved in crashes?** Paper presented at the 2007 Road Safety Research, Policing, Education Conference, Melbourne.

Cheffins T., Blackman, R., & Veitch, C. (2007). **Rural GPs' management of vehicle-related trauma**. Australian Family Physician, *36*, 782–784.

Steinhardt, D., & Watson, B. (2007). **Night time seatbelt non-use in serious crashes: a comparison of contributing factors in rural and urban areas of the United States and Queensland, Australia.** Paper presented at the 2007 Road Safety Research, Policing, Education Conference, Melbourne.

Veitch, C., O'Connor, T., Steinhardt, D., Sheehan, M., & Siskind, V. (2007) **Rural and remote road crashes: piecing together the story**. National Rural Health Conference, Albury, New South Wales.

Presentations/Facilitations

Hatfield, F. (2007). **The characteristics of rural and remote road crashes in a three year study in North Queensland**. Poster presentation at the 2007 Road Safety Research, Policing, Education Conference, Melbourne.

Veitch, C. (2007). **Road crashes in rural and remote north Queensland: some lessons for rural Scotland?** Population-based medical sciences research seminar series, School of Medicine, University of Aberdeen, Aberdeen, 31 January, 2007.

2006

Publications/Conference Papers

Blackman, R., O'Connor, T. and Veitch, C. **This is what happened: A narrative analysis of what was happening immediately prior to and during road crashes**. Paper presented at the 2006 Road Safety Research, Policing, Education Conference, Gold Coast.

Blackman, R., O'Connor, T., Sheehan, M. **Risk and rural road use: all in a day's work and play**. Social Change in the 21st Century conference, 27 October 2006, QUT Carseldine.

Steinhardt, D. **A Comparison of Self Report Measures of Alcohol Use in a Rural and Remote Road Safety Study**. Paper presented at the 37th Public Health Association of Australia Conference, Sydney.

Steinhardt, D., Sheehan, M., & Siskind, V. (2006). **A comparison of adult off-road and on-road crashes in rural and remote Queensland**. Paper presented at the 2006 Road Safety Research, Policing, Education Conference, Gold Coast.

Sticher, G, Sheehan, M. **Assessment of personal crash risk among rural drivers: Perception versus reality**. Paper presented at the 2006 Road Safety Research, Policing, Education Conference, Gold Coast.

Presentations/Facilitations

Edmonston, C. Acted as a chair for sessions at the **3rd Indigenous Road Safety Forum,** Broome.

Edmonston, C. **Summary of key points from the 3rd Indigenous Road Safety Forum,** Presentation to the 2006 Road Safety Research, Policing, Education Conference, Gold Coast.

Veitch, C., Sheehan, M., Turner, R., Siskind, V., O'Connor, T., Sticher, G., Edmonston, C. **Rural and remote road safety project.** Presentation to the funding consortium, October 2006.

2005

Publications/Conference Papers

Edmonston, C. Dwyer, J. & Sheehan, M. **Road Safety in Rural and Remote Areas of Australia.** *Austroads Publication* (AP-R273/05).

Edmonston, C. **Safety interventions among Australia's Indigenous people.** Invited paper at the *84th Annual Meeting of the Transportation Research Board*, Washington DC, USA, January 2005.

Sheehan, M., Siskind, V., Veitch, C. & Turner, R. **Trip characteristics of rural and remote crashes.** Paper presented at the 2005 Australasian Road Safety Research, Policing and Education Conference, Wellington, New Zealand, November 2005.

Sheehan, M. **Characteristics of crash-involved drivers in rural and remote areas.** Invited paper at the *84th Annual Meeting of the Transportation Research Board,* Washington DC, USA, January 2005.

Siskind, V. & Sheehan, M. **Methodological challenges in rural road safety case-control studies.** Paper presented at the 2005 Australasian Road Safety Research, Policing and Education Conference, Wellington, New Zealand, November 2005.

Veitch, C, Sheehan, M, Turner, R, Siskind, V & Pashen, D. (2005). **The economic, medical and social costs of road traffic crashes in rural north Queensland: a 5-year multi-phase study**. Paper presented at the 8th National Rural Health Conference. 10-13 March 2005, Alice Springs

Presentations/Facilitations

Edmonston, C. **Trip characteristics, attitudes and behaviour contributing to the over-representation of Indigenous and remote populations in road trauma.** Presentation at the School of Psychology and Counselling Research Symposium, August 2005.

Edmonston, C. **Facilitation of Queensland Transport Workshop to develop an evaluation framework for the Indigenous Licensing Project**, August 2005.

Edmonston, C**. Facilitated meeting between James Cook University and Queensland Transport for the submission to conduct a Community Road Safety Officer trial in Queensland Indigenous communities**, November 2005.

Edmonston, C. **Indigenous Trip Characteristics Data**. Presentation of research at the CARRS-Q Stakeholder's Showcase, December 2005.

Sheehan, M., Siskind, V., Edmonston, C. & Rowden, P. **Rural and remote road safety project.** Presentation to the funding consortium, February 2005.

Sheehan, M. **Regional road safety: Meet the experts and have your say.** Presentation at the QUT Smart Train, Townsville, June 2005.

Sticher, G. **Facilitation of focus groups for the Rural and Remote Road Safety Project**, April & June 2005.

Sticher, G. **A brief intervention trial to reduce rural and remote road crashes.** Presentation at the School of Psychology and Counselling Research Symposium, August 2005.

Turner, R. **The economic, medical and social costs of road crashes in rural north Queensland: a 5-year multi-phase study**. Centre for Rural and Northern Health Research, Laurentian University, Sudbury, Ontario, Canada, 14 June , 2005. Broadcast to isolated rural communities in northern Ontario.

2004

Publications/Conference Papers

Edmonston, C. **Using Culturally-Appropriate Methods and Self-Determination to Improve Driver Licensing Protocols in Indigenous Communities**. Paper presented at the 7th World Bioethics Conference, Sydney, 2004.

Macaulay, J., Thomas, R., Mabbott, N., Edmonston, C., Sheehan, M. & Schonfeld, C. **Australian Indigenous Road Safety.** ATSB Report, Canberra: Australian Transport Safety Bureau, 2004.

Presentations/Facilitations

Edmonston, C. **Participated in Indigenous Licensing Interagency Workshop**, November 2004.

Edmonston, C. **Chaired the Indigenous Licensing Project Quality Assurance and Evaluation Group Meeting**, November 2004.

Edmonston, C. **Protocols for research and engagement in Aboriginal and Torres Strait Islander communities.** Facilitated Indigenous Workshop, Cairns, October 2004.

Edmonston, C. **Trip characteristics, attitudes and behaviour contributing to the over-representation of Indigenous and remote populations in road trauma.** Presentation at *Postgraduate Research Symposium*, QUT, September 2004.

Edmonston, C. **Indigenous Licensing Project.** Presentation at the National Indigenous Road Safety Forum, Alice Springs, September 2004.

Sheehan, M. & Edmonston, **Case study: rural and remote.** Presentation at the *International Workshop on Monitoring Hypovigilance in Monotonous Conditions*, QUT, October 2004.

Sheehan, M. **Progress against key performance indicators, Overview of the hospital study/roadside study, Local promotion of the project, Road safety interventions.** Presentation to stakeholders, July 2004.

Sticher, G. **An intervention to reduce rural and remote road crashes.** Presentation at the *Postgraduate Research Symposium*, QUT, September 2004.

2003

Presentations/Facilitations

Edmonston, C. **AFL KickStart Program (Weipa).** Participated and presented to children from a number of communities the importance of heeding safety messages, September 2003.

Edmonston, C. Conducted road safety sessions with Indigenous children in the Cape, Gulf and Torres regions while visiting communities as part of the Indigenous licensing project, July – December 2003.

Edmonston, C. **Improving driver licensing in remote Indigenous communities.** Presentation to Queensland Transport Driver Assessment Forum, June 2003.

Edmonston, C. **Indigenous licensing project.** Presentation to the Queensland Indigenous Justice Forum, September 2003.

Edmonston, C. **Indigenous licensing project.** Presentation to the Queensland Transport Driver Assessment Forum, July 2003.

Edmonston, C. **Indigenous road safety.** Facilitated session at the Queensland Transport Mt Isa Road Safety Forum, May 2003.

Edmonston, C. **Interim progress report on rural and road safety project.** Presentation to MAIC, February 2003.

Edmonston, C. **Road safety in Indigenous communities.** Presentation at the Australian College of Road Safety (Queensland Chapter), December 2003.

Edmonston, C. **Rural road safety and indigenous road safety research directions.** Presentation at the Cairns Regional Road Safety Working Group, January 2003.

Sheehan, M. & Edmonston, C. **Development of a national rural road safety action plan.** Workshop with CARRS-Q, Queensland Transport and ARRB, June 2003.

Sheehan, M. & Edmonston, C. **Rural and remote road safety.** Facilitated workshop for the 21st ARRB & 11th REAA Conference, Cairns, May 2003.

Sheehan, M. **Rural and remote road safety.** Presentation to Queensland Rural Medical Support Agency (QRMSA) Emergency Medicine Workshop, March 2003.

Sheehan, M. **Rural and remote road study.** Presentation to Queensland Police Service, July 2003.

Sheehan, M. **Rural road safety.** Presentation to Day Surgery Nurses Association of Queensland Inc., March 2003.

Sheehan, M. **Saving lives on country roads.** Presentation to Holden representatives, September 2003.

Siskind, V. & Sheehan, M. **A program of research to reduce road trauma in rural and remote regions.** Presentation at the School of Psychology and Counselling Research Symposium, May 2003.

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Schonfeld, C. & Sheehan, M. **Drink driving rehabilitation: Rural and urban issues.** Road Wise (2002), 13(4), 3–7.

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Appendix C - Selection of a reference series for a case-control study of rural traffic crashes: a discussion paper

It seems generally accepted that in the developed world traffic crash rates are higher in rural than in urban areas, whether per head of population or per vehicle kilometres travelled (OECD, 1999). With this observation in mind, the Centre for Accident Research and Road Safety, Queensland (CARRS-Q) was motivated to plan a study of serious traffic crashes in a rural area of Queensland, funded by a consortium of governmental instrumentalities.

One well established method of obtaining insight into the aetiology of traffic crashes is a case control study in which cases (drivers) are recruited subsequent to a crash, perhaps while being treated for injuries sustained therein. This was the design chosen, with eligible case drivers being those admitted to a designated hospital for at least 24 hours whose crash occurred outside the urban area of one of two major regional cities (Siskind, Sheehan, 2005). Controls matched for site, day and time of crash were to be recruited at the roadside. Here and throughout the term, 'driver', is taken to include motorcyclists.

There are numerous issues involved in recruitment of a case series, among them questions of ethics, ascertainment, access, confidentiality, consent and eligibility. Many of these issues would be specific to the facility or facilities concerned. Provided problems of this nature can be overcome and competent interviewers engaged, response rates are typically high and volunteer bias small. Potential subjects may be missed for logistic reasons, especially at both ends of the injury severity spectrum, but they are unlikely to differ systematically from included subjects in respect of the antecedents and circumstances of their crashes. We have discussed our experience with case recruitment elsewhere (Siskind, Sheehan, 2005).

Recruitment of comparable uninjured drivers to form a reference series, usually designated controls, is a more complex matter. Case-control design requires that the control series, to whom the set of cases – those experiencing the event under study – is to be compared, be representative of the population from which the cases are drawn. Unless a study is nested within an already available population sample, this is usually a counsel of perfection, seldom completely achievable in practice. When the method of recruitment of the reference group falls short of the ideal, the researcher must either demonstrate effective representativeness or attempt to correct for the biases introduced by whatever elements of non-representativeness can be identified.

In the present case, the population from which individual drivers involved in traffic crashes are drawn would optimally be those passing the crash site at or near the same time and in the same direction. As acceptable surrogates, drivers passing the crash site at or near the same time one week later, i.e. on the same day of the week, and in the same direction, could serve. As mentioned above this, in principle, was the design we initially adopted, with restriction of roadside recruitment to an area within an hour's travel from participating hospitals. We discuss here some of the more difficult issues which arose. Note that for crashes occurring off public roads, which form a non-negligible proportion of vehicle crashes in rural Queensland, controls are clearly impracticable if not impossible to obtain, with the possible exception of private roads connecting large mine sites to the public road system.

According to the original design, research assistants were required to determine early in the hospital interview whether the crash in question fell outside the designated urban areas but within the catchment area for the case control study – not always straightforward even with detailed area maps being provided. Local residents should be able to describe the crash location with accuracy, but travellers from a distance may not. This information might be able to be confirmed with police and ambulance staff if privacy considerations could be overcome, perhaps using vehicle characteristics rather than names to identify the crash site.

Once it is clear that the site of the crash is within the area for control recruitment, a roadside area safe for stopping and interviewing must be determined. Many roads in the region are winding and/or without wide, firm verges. Research into road safety cannot reasonably endanger road safety – and would not be permitted to do so by police and local authorities. Thus suitable data collection sites could well be some distance away from the location of the index crash. However, distance of recruitment site from crash site is of little consequence if the majority of vehicles passing the latter would of necessity also pass the former. This implies that there should not be a well-used public road intersecting the road on which the crash occurred between crash and recruitment site, nor a large number of entrances to private property. Recruited vehicles which turn out not to have passed the crash site can be screened out, but vehicles passing the crash site which do not reach the recruitment area would be lost. While it would be possible in theory to estimate the extent of the loss, in practice it would be very difficult to achieve, and would in any case say little about most of the relevant characteristics of the lost drivers. A further complication would arise in the case of multiple-vehicle crashes, when controls would sometimes have to be sought in opposite directions. Ideal sites would in some areas be the exception rather than the rule.

A more intractable issue relates to the recruitment process itself. It was originally hoped to use the police to stop drivers at the selected site and invite them to participate, emphasising the voluntary nature of the exercise. One ethics committee was apprehensive that having the police stop drivers was tantamount to ‘coercion’, but had tentatively sanctioned the practice conditional on the results of preliminary on-site research demonstrating that recruited drivers had not felt under undue pressure to participate. However, while some local police authorities were prepared to take part, later scrutiny of the legislation determining police powers revealed that police were not permitted to stop vehicles for purely research purposes.

Being able to oblige all or most passing vehicles to stop would almost certainly have been conducive to obtaining the maximum response rate. Even drivers anxious to continue their journeys might have agreed to return a completed questionnaire by post or take part in a telephone interview at some convenient later time. If drivers could not be obliged to stop, could they be persuaded by other means to participate? Various alternative strategies were considered. It had been thought at one time that the presence of an ambulance (preferably one no longer in routine service) and (off-duty) ambulance personnel would encourage drivers to stop, possibly together with ‘slow’ signs wielded by traffic controllers. (These are persons with some training who are empowered to direct and slow traffic at, for instance, road works or near major sporting events.) Political and rostering considerations soon led to the abandonment of this option.

An examination of the location of crashes during the pilot phase revealed the prevalence in the area of service stations, suggesting that their operators be requested to allow their forecourts to be used as recruitment areas. This proved acceptable to most. To encourage participation a $10 voucher redeemable at site was offered. Recruitment also took place at designated rest or vehicle inspection areas and similar public access sites. Drivers were invited to stop and participate by means of fixed signboards and, for a time, an electronic variable message sign hired for the occasion. These indicated that a university research site was ahead.

All these procedures yielded an unacceptably low response rate, estimated to be of the order of 10%, in terms of passing vehicles actually stopping and their drivers interviewed. Research staff reported that the length of the questionnaire was one factor. (This was initially modelled on the in-hospital questionnaire and took approximately 20 minutes to complete.) It could not be assumed that responses from compliant drivers were free of volunteer bias and representative of the source driving population. It was eventually decided to abandon the matched study design. However, a valid comparison series of drivers and motorcyclists was still needed.

It was suggested by some members of an advisory group of stakeholders that drivers of vehicles brought to halt at scheduled road works could be approached to agree to a short interview with possible telephone follow up. Fresh ethics approval and the consent of the authorities responsible for the road works would need to be sought for this tactic. Subsequent discussions revealed a lack of official and research team enthusiasm for this procedure.

There have been other studies that have recruited vehicle controllers at the roadside. Several North American studies involving roadside interviews have reported employing police personnel to bring passing motorists to a stop (Dussault et al., 2000; Brault et al., 2004; Belton et al., 2003; Blomberg et al., 2005), with satisfactory response rates. As mentioned above, we were debarred from so doing. Two from Australasia (Haworth et al., 1997; Wells et al., 2004) have stopped motorcyclists for the purpose of interview, but their published reports do not describe in sufficient detail the procedures for persuading motorcyclists to come to a halt. Both studies photographed all passing motorcyclists including those who failed to stop. This was in order to "record basic data for all" in one instance, and to note the conspicuity (sic) of their clothing in the second. Recent Queensland and Australia-wide privacy legislation would now preclude the use of license plates as a means of identification and subsequent contacting of passing drivers.

It is clear that case-control studies for which a police presence at the roadside was not possible have had to resort to less satisfactory means to recruit controls. This raises the question as to whether the resulting samples could be in any sense "representative of the population from which the cases are drawn". On the other hand it can be argued that, whatever disclaimers attendant police officers may give to drivers, the relative proximity of police may colour responses to sensitive questions about driving practices. Different law-enforcement cultures, including rules about admissibility of evidence, may elicit different reactions to police presence. Nonetheless, even with this caveat, a high response rate is surely preferable to the volunteer bias inherent in recruiting drivers either stopped for the purpose of rest or those prepared to stop at the roadside for research purposes. For instance, one study of the prevalence of illicit drug use in drivers in North Queensland was conducted by CARRS- Q downstream from an urban police random breath testing site. A brief questionnaire concerning illicit drug use was administered to drivers and salivary swabs were collected. No names or other identifying information was recorded. A highly satisfactory response rate was achieved, suggesting that Australian drivers would be open about their driving practices in these circumstances, provided the questionnaire took no longer than about ten minutes to administer. Some form of monetary incentive, "to compensate for the interviewee's time", would need to be offered. Unfortunately, we were unable to arrange a satisfactory date and site for this exercise during the course of the study.

Another approach to assembling a control series matched only on region as defined by the area surrounding each participating hospital is suggested by the consideration that all motorists or motorcyclists need to refuel periodically, usually at service stations. (In more remote areas, some drivers might maintain bulk fuel stores on their properties.) The necessity to refuel could be taken to be to some extent a random event in time, although not necessarily in location. A relatively brief questionnaire with minimal preamble, taking little longer to administer than the time needed to refuel (and by persuasive interviewers), would be needed to maximise response rates.

If refusal rates could be kept to only 10 – 20% volunteer bias would be minimised, although new sources of bias might be introduced. For instance, respondents who set out from base only to refuel might need to be excluded. Even then a disproportionate number of local residents might be recruited. One crucial item of information to be collected from drivers is the average amount of time they spent on the roads, local and remote, in a unit period, to enable re-weighting during subsequent analysis: vehicle operators driving longer distances have a higher probability of being sampled. Questions about average weekly hours of driving or time between refuelling should be included. In the present instance drivers were asked about the number of hours in an average week they drove a vehicle of the type they were currently refuelling, whereas what is strictly required is the average hours driven in all vehicle types.

For a number of operational reasons only 102 drivers were interviewed using this intensive approach compared to 664 drivers previously recruited at the roadside by other methods. Of refuelling drivers approached only 9 refused, mainly on grounds of haste, giving a refusal rate of 8.1%. A large proportion of drivers refuelling during the recruitment period (79 of 190, 42%) could not be approached as only a limited number of interviewers were available; provided selection was on the basis of arrival, no bias should be introduced.

We present in Table C.1 a comparison of these two series. Where a suitable population reference is available, it has been shown. In the 'Other Roadside' series the percentage of male drivers is rather higher than that in the 'Service Station' series. From the Australian Survey of Motor Vehicle Use conducted by the Australian Bureau of Statistics an Australia-wide estimate based on the relative distances driven by males in passenger and light commercial vehicles (that is excluding trucks and motorcycles) is 63%, intermediate between the percentages noted in these two series. The occupational distribution of the Service Station series was also somewhat closer to the population reference than the Other Roadside series, although the difference is not large. It is also worthy of note that a quarter of drivers in the Other Roadside series gave their reason for travel as leisure or vacation, much higher than the 11% in the Service Station series. While there are no population-based figures on this proportion in North Queensland, it seems implausible that one in four drivers on North Queensland roads would be in this category. Correspondingly, a higher proportion of drivers in the Other Roadside series gave their place of residence as outside North Queensland, 2.6% being from abroad and 11.9 % from more southerly regions of Australia compared to only one overseas driver and 8 (7.8%) from elsewhere in Australia in the Service Station series.

On the other hand, the two series are similar in many respects, notably in median age, drinking habits, illicit drug use, recent speeding, self-reported general health and confidence in own driving ability. Drivers in the Other Roadside series reported a higher proportion of medical condition which could affect their driving and a somewhat lower level of agreement with the proposition that crashes were unavoidable. They also reported a lower proportion of short journeys, reflecting perhaps the circumstances of their recruitment.

It seems probable that both recruitment methods are subject to biases, but of different types and moreover that the recruitment sites themselves may be a source of bias. It is regrettable that there was insufficient experience with the intensive recruitment-during-refuelling method to provide a thorough evaluation.

From comments recorded by interviewers it is clear that pressure of time was responsible for failure to complete the questionnaire schedule in an appreciable proportion of drivers in both series. This is clearly an issue for questionnaire design and data collection procedures. It is important that the order of the questions and design of the instrument be such as firstly to garner and retain the most important items of information and secondly to facilitate later completion and return of the remainder. Sections uncompleted during initial contact could perhaps be easily detachable from completed sections and designed to be readily returnable in reply paid envelopes or packages. All pages of the questionnaire would need to be printed with an arbitrary but non-identifying code number to enable items mailed back to be matched with those retained.

Table C.1. *Comparison of characteristics of roadside interview samples*

	Service Station (intensive)	Other Roadside Population reference	North Queensland
	(n = 102) %	(n = 664) %	%
Male	59	67	
Age (years)			
17 – 29	19.0	13.0	24.0[1]
30 – 39	15.0	17.0	20.8
40 – 49	21.0	26.6	19.5
50 – 59	25.0	24.0	15.7
60 – 69	17.0	12.5	10.4
≥ 70	3.0	6.8	9.5
Median	47	47	
Occupation			
Professional/manager	29.9	40.6	34[1]
Production/transport	11.3	13.7	10
Labourer	14.4	9.9	11
Clerical/service	25.8	19.3	29
Tradespersons	18.6	16.6	14
Reason for travel			
Work-related	12.9	21.2	
To or from work	15.8	12.1	
Leisure or vacation	10.9	25.0	
Other activity	60.4	41.7	
Average hours driven weekly			
≤ 5	30.9	40.8	
6 – 10	26.8	23.3	
11 – 15	13.5	11.7	
16 – 20	9.2	5.8	
> 20	19.5	18.4	
Place of Residence			
Same area	87.3	81.2	
Elsewhere in Nth Qld	3.9	4.3	
Elsewhere in Australia*	7.8	11.9	
Overseas	1.0	2.6	

(* includes ‘itinerant’)

Previous licence suspension	10.3	7.1
Travelling speed before interview		
Above speed limit	3.1	5.9
On or below speed limit	96.9	94.1
Continuous driving before interview		
Less than one hour	90.2	83.0
1 – 2 hours	4.9	10.6
More than 2 hours	4.9	6.4
Drove without seatbelt	6.3	2.0
Drank in past 24 hours	37.1	37.6
Average frequency of drinking		
Never	14.4	17.2
Less than weekly	38.1	34.2
2 – 4 times/week	19.6	22.8
4 or more times/week	27.8	25.9
Illicit drugs in past 24 hours	3.5	3.1
General health		
Good/excellent	86.0	84.6
Medical condition possibly affecting driving		
Present	12.0	18.5
Interviewee a safe driver?		
Agree/strongly agree	93.9	94.4
Crashes unavoidable?		
Agree/strongly agree	60.2	54.3

[1] Australian Bureau of Statistics, Census Data (2001)

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