

TRIP CHARACTERISTICS OF RURAL AND REMOTE CRASHES

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ABSTRACT

Rates of fatalities and serious injuries are higher in rural and remote crashes and have been less responsive to road safety strategies. In 2004 the research team began a study funded by Queensland Government to develop a close understanding of such crashes and to obtain data to inform targeted interventions. The study aims to recruit all persons hospitalized in North Queensland after a road crash that occurred in a non-urban site in the region.

Data is collected from patient interviews on trip experience, behavioural and social variables and attitudes to road safety. Location of crash, vehicle characteristics and medical and ambulance retrieval information are collected separately and linked to the data base.

The response rate has been high (80%+) and this paper reports on the first 150 cases. It presents the crash trip experiences, driver characteristics including their self reported use of alcohol and other licit and illicit drugs. Drivers' residential characteristics relative to crash site and type and other sociogeographical characteristics and the types and severity of injuries are also considered.

BACKGROUND

Problems with defining rural and remote

In spite of over a decade of concern and recognition of the need to examine the problem of road crashes in rural and remote Australia (Federal Office of Road Safety, 1995) there are relatively few studies dedicated to understanding the special situations and conditions that lead to the unacceptably high crash rates in these regions. A major methodological problem encountered in this area that has no doubt contributed to the reduced understanding and impact of road safety interventions is the heterogeneity of definitions used to characterise rurality in transport statistics. Classification indicators of rurality range from type of road, to speed limit, to place of crash coded by postcode or statistical local area (Parliamentary Travelsafe Committee, 2002). This confusion is not confined to Australia and in a book written on such definitions for the European community a wide variety of ways to define rurality were identified and in the main accepted as being a given in this area (Cullinane and

Stokes, 1998). The current research is intended as a challenge to the problem of high rates of rural and remote crashes and it is hoped that one of the outcomes will be a move to standardise meaningful definitions across all jurisdictions at least in Australia. The importance of such a step in providing benchmarks for the effectiveness of countermeasures should not be underestimated.

The issue of the need for such a definition is not unique to Transport Departments and in the last two decades a national code has been developed to inform Health policy and service management that has considerable relevance and applicability to transport locations. Using this model called, the Rural, Remote and Metropolitan Area classification- RRAMA (Department of Primary Industries and Energy 1994) the Australian Institute of Health and Welfare undertook a major study of hospital reported injury rates in 1998. (AIHW 1998) They identified transport related serious injuries and deaths as a major health issue and found a linear relationship along the dimension of rural and remoteness [See Table 1].

Table 1: National Fatality Rates for Motor Vehicle Crashes 1992-1996

Sex	Metropolitan		Rural			Remote		Total
	Capital Cities	Other	Large Centres	Small Centres	Other	Centres	Other	
Males	13.0	15.5	*18.7	*18.5	*27.6	*31.4	*31.0	16.2
Females	5.5	6.2	6.2	7.8	*11.2	9.7	*15.0	6.6

Source: AIHW (1998, p.21) – Extracted from AIHW National Mortality Database

*Significantly different from ‘capital cities’ at the 5% level

Note: Age-standardised to the Australian population at 30 June 1991

As can be seen using the RRAMA code, which reflects a composite of distance and access to services, degree of rurality has a strong association with the morbidity and mortality associated with road crashes.

Another issue that remains unstudied but also may have an impact on the generalisability of findings in relation to rural crashes and the specificity and applicability of countermeasures is the markedly heterogenous nature of the driving conditions experienced in rural and remote environments. The current study for example which is based in North Queensland, Australia, is concerned with crashes in the large area from approximately 20degrees 43’/latitude north to the Cape. This is a tropical region and it covers a very wide range of geographical, physical, health service and road context conditions.

Common findings

Given the proviso that definitions of rurality are not always intuitively meaningful or findings transferable from one region to another there are a number of relatively recent studies that have identified common issues in such crashes. Not surprisingly the “fatal four” of illegal alcohol levels, speeding, fatigue and failure to wear seat belts are consistently identified. A high involvement of single vehicle crashes is also well established. In a comparative analysis of Queensland Transport data on urban and rural fatalities 1994 – 2000 per 100,000 population by nature of crash the relative risk of dying as a result of a road crash in rural as compared to urban areas 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 seat belt;
- iv). 4.7 times higher for speed related crashes; and
- v). 4.3 times higher for alcohol related crashes.”

(Road Safety in Rural and Remote areas of Australia. 2002 p18)

Other causal factors that have been related to the rural and remote environment and culture include increased exposure through greater distances travelled, poorer road quality, increased diversity in types of vehicles, and delays in retrieval and accessing medical treatment.

(AIHW, 1998; Armour and Cinquegrana, 1990; Hasson, 1999; Honor, 1995; Moller, 1995; Pettit et al., 1994; Ryan et al., 1988; Ryan et al., 1992).

Victorian research based on contextual and environmental conditions that may well be very different to those in North Queensland describe a common scenario for a rural fatality as “an unrestrained young male driver [16 – 25 years] involved in a single vehicle run-off-the-road crash [hitting a pole or tree] or a vehicle overturn on a Friday or weekend between 6pm and 6am and under the influence of alcohol and/or drugs, or driving too fast for the conditions, or while fatigued (Saferoads, 1998; Haworth et al., 1997).

The vastness of rural road networks also poses obvious trauma management and retrieval problems in the event of a crash (OECD, 1999). Delay of emergency response and associated impacts on crash outcomes (Brodsky, 1990; Brodsky and Hakkert, 1983; National Road Trauma Advisory Council, 1993, Henderson 1995) present a major challenge to the medical necessity to be able to make a fast and accurate clinical assessment and rapidly institute the appropriate resuscitative and medical measures (Royal Australian College of Surgeons, 1992; Somers et al., 1997). Two phrases that are sometimes used to characterise the need to minimise retrieval time after trauma are the “Golden Ten Minutes” (Stewart, R.D., 1990) and the “Golden Hour” (Evans, R.C. & Evans, R.J., 1992). Our more recent examination of relevant literature indicates that whilst it is important to enable speedy access to service these concepts have little if any scientific validation (Lerner and Moscati, 2001).

Clearly attempts to develop effective countermeasures have been and remain relatively unsuccessful. The present study is based on the hypothesis that more detailed understanding of the particular circumstances and experiences that underlie the broadly categorised causative factors of such crashes will be needed if contributing lifestyle, environmental and medical challenges are to be addressed.

This paper reports on the early findings of a comprehensive study of rural and remote crashes in North Queensland being conducted by researchers from CARRS-Q and James Cook University. The study is supported by whole of government funding that involves all relevant state Government departments, QFleet and the Motor Accident Insurance Commission. The broader programme of research is in two parts. The first is a comprehensive review of all official statistics related to road crashes in the region/s during the previous five years (CARRS-Q, 2005). The second is an in-depth case comparison study of all serious, defined as having at least one involved person in a 24hr or longer hospitalisation or fatality, crashes that occur in the rural and remote areas of the region. It excludes the crashes that occur in the major towns of Townsville and Cairns. The study is designed to obtain data to reduce the social, medical and economic cost of such crashes by informing specialised and targeted

interventions. The focus of this paper is an exploration of some trip related data from the first year of the second study.

METHOD

All patients admitted to one of five regional catchment hospitals who have been hospitalised for 24hrs or more are approached independently, screened for location of crash and asked to participate in a standardised interview relating to their experiences in and around the index road crash. The method and data collection instruments have been approved by the relevant University and hospital Ethics Committees. The overwhelming majority of respondents are interviewed in the hospital by trained research officers. Patient consent is obtained for the collection of medical record and other crash related data. Confidential and potentially incriminating information is provided directly and privately by the patient in a series of items screened from the interviewer's observation. The full interview takes approximately 45 – 60 minutes to complete. Police, Main Roads and Emergency records will be attached to the interview records at a later date and are not included in this paper. Crashes involving fatalities are followed through coroner's records. Details of methodological issues and constraints of the study are provided in Siskind & Sheehan (2005) at this conference.

Measures

The interview is extensive and covers a very wide range of crash and road safety related issues which are not covered here. The relevant variables examined in this paper relate to trip characteristics, geographical location of crashes and medical presentations. The trip characteristics include type of vehicle, single or multiple vehicle type of crash, time of crash, experience with the road and the vehicle, day and time of crash, reason for the trip, fatigue measured by time of driving before the crash and use of rest stops, distractions before the crash, speed, use of seat belts and helmets where relevant, alcohol involvement and problem drinking measured by the AUDIT short form using the cut off score of ≥ 5 as an indicator of harmful levels of drinking for males and ≥ 4 for females (Gual et al., 2002).

Analysis

The characteristics of the driver/rider sample are considered initially and then the medical characteristics of the crash. The sample size to date precludes comprehensive analysis and the results in the main are confined to descriptive figures. An exception is that because of the unexpectedly high numbers of motor cycle crashes statistical comparisons were run on relevant variables. Significant differences are noted where they occur. To date completed medical record information is only available for 84 cases.

Participants

The total sample of respondents discussed here involves 116 hospital patients who were consecutively recorded as drivers/riders of the vehicle involved in the crash and it excludes passengers. The response rate is high at 84% of those approached agreeing to participate. The majority of respondents (56.9%) are from the Far North statistical division of the region, 21% from the Northern division and 22.4% from the Far West division. Comparable population figures based on ABS, Regional Population Growth figures, 2000-2001 (ABS, 2000 – 2001) are 54%, 26.9% and 18.7%. thus while the crashes are representative of population distribution the majority occur in the Far North region of the State. This area is characterised by a long and heavy wet season and isolated towns and properties.

The overwhelming majority (97.4%) reported Australia as their country of residence, just over three quarters of the sample are male (78.4%) and the mean age is 38.5 years with a range from 16 to 78 years. The motor cyclists were only marginally younger with a mean age of 32.8 years. The majority of respondents included tradespersons (17.8%), clerical sales and service workers (11.2%), and labourers and related workers (24.1%). The majority had completed year 10 (33.3%), year 12 (12.9%) or a trade/apprenticeship (17.2%).

RESULTS

Crash details

Half (50.5%) of the vehicles involved in the crash were motorcycles, 32.4% were passenger vehicles, utilities or vans and 9.5% were 4WD. Three quarters of the crashes were single vehicle (76.7%) crashes and in 85.2% there was only one person in the vehicle at the time of the crash. In one fifth of crashes (19.8%) a person other than the driver was also injured.

The most commonly reported day was Sunday (24.1%) and the most common time was the afternoon between 2.00pm. and 6.00pm (38%) and particularly around 5.00pm (14.6%). Just under a third (29.3%) received medical or emergency help almost immediately, however a fifth (21.6%) could not recall their retrieval and 8.9% took an hour or more to receive first assistance. One case waited for between 4 – 6 hrs before being found at the crash site.

Vehicle and driving characteristics

A majority (71%) of vehicles were less than fifteen years old and whilst one vehicle dated from 1942 the majority (89.7%) of vehicles where the date of the model was known had been built after 1979. Around one third (30.2%) were not driving a vehicle owned by themselves or their partner. 32.8% had been driving that type of vehicle for one year or less. The range of driving experience (in Australia) reported went from less than 1 year to 61 years and whilst 13% had been driving for one year or less more than three quarters (78.3%) had five or more years of driving experience. There were 14% who were driving their employer's vehicle and 31% were driving as part of their job or to or from work.

Illegal behaviours

The majority (83%) said that they were driving on or below the speed limit in the ten minutes preceding the crash.. Around one fifth (17.5%) indicated that they were non – drinkers and 42.6% reported that they had drunk alcohol in the 24 hours before the crash. The AUDIT short form scores indicated that 58.4% of the males and 28% of the females are classified as drinking at harmful levels.

Table 2: Levels of drinking by sex of drivers/riders in rural crashes using the AUDIT short form

Sex	Harmful drinkers						Total
	Non-drinker		Low-risk		Harmful		
Males	14.0%	13	26.9%	24	58.4%	52	89
Females	28.0%	7	44.0%	11	28.0%	7	25
Total	17.5%	20	30.7%	35	51.8%	59	114

Chi-square =7.33, df (2) p=.026

13.2% were not licensed to drive the vehicle involved in the crash and 14% reported that the vehicle was unregistered. 10.5% of motor cycle riders were not wearing a helmet and a similar 11.8% of drivers were not wearing a seat belt at the time of the crash. Six drivers (6.4%) reported taking illegal drugs in the 24 hrs before the crash and of these four had taken marijuana, one ecstasy and one reported using amphetamines.

Distractions

An outside object was reported as an immediate distraction by 16.4% of the drivers and of these 37% reported this as wildlife or other livestock. Crash narratives indicated that kangaroos were the most likely of these distractions. An unexpectedly small proportion (9.5%) reported feeling tired on the trip and only ten drivers (8.6%) reported driving for longer than two hours without a break just before the crash. One person (0.9%) reported that they suffered from sleep apnoea. A relatively small proportion (19.8%) was unfamiliar with the road they were driving.

Types of injuries

Of the 84 cases for whom medical information was available for analysis 5% required intensive care at the point of hospitalisation. One in five (21%) required a length of hospital stay longer than ten days and the median length of stay for the sample as a whole was four days. One other measure of the severity of the injury is the number of body regions injured in the crash. 21.6% had three or more regions injured and of these only one person was a motor cycle rider. Whilst the motor cyclists were less likely to have chest, head or neck injuries and more likely to have injured limbs the differences did not reach significance.

DISCUSSION

The most significant finding of these data is the very high representation of motor cyclists in this seriously injured sample. This contrasts with the Transport and Police figures for the comparable region over the period 1999-2002 in which they made up only 25% of the seriously injured drivers and riders (CARRS-Q,2005). There are at least two factors operating here and they include the fact that there probably is considerable under reporting of such crashes to police in situations in which riders and vehicles can be brought to hospital or managed by friends or relatives. The second is the fact that this data set includes a sizable number of crashes that did not occur on public roads. These are not included in official transport statistics but are included in hospital statistics. These crashes are of interest in the context of rural crashes because whilst some are clearly recreational or work related bush or paddock riding some include persons leaving the road and driving into the bush to avoid police or an RBT station. Others in remoter areas occurred on private through roads used in common by locals and visitors. Finally, official records for the region also indicate a meaningful increase in motorcycle fatalities and serious injuries over the period since 2002. These motorcycle figures also influence the exceptionally high levels of single vehicle and single occupant crashes found in the data.

Another important but puzzling finding is the phenomenon of a high incidence of Sunday crashes and afternoon and particularly late afternoon (5.00pm) crashes. The Sunday crash risk was noted in the recent Victorian (Symmons, Haworth and Johnson 2004) study but the present study has no evidence of the increased risk of night time crashes also identified in that study. The high risk of male drivers and riders is well known but the involvement of older (30 – 40 years) males has received limited targeting in road safety campaigns. No significant differences were found between the motorcyclists and other drivers on these variables.

Another unexpected finding of the present study is the relatively low self reported involvement of fatigue in these crashes. Whilst crash characteristics lead to a relatively high attribution of fatigue as a contributor to rural and remote crashes in the region in the 1999 – 2002 crash statistics (17.2%) (CARRS-Q 2005, Table 1.22) it receives only limited focus in these interview data and a very large majority had not been driving continuously for more than the recommended two hours. More recent reviews of fatigue (Travelsafe 2005) recognise the complexity of the phenomenon which was succinctly expressed in the following quote from a rural driver in a related north Queensland study.

“And fatigue is not a long distance turn. Fatigue can be having a cup of tea in Herberton, and by the time you get to Walkamin,(20 minutes away) you are starting to nod” (Sticher, 2005).

Further clarification may be found in the next stage of the analysis of this data which will involve comparisons between the interview record of the crash and the police report.

The rural myth of the high risk “international tourist” or the “Southern or city driver” is not supported by these findings which indicate very heavy involvement of local rural people in the crashes. On the other hand, the problem of distractions and response to them needs closer examination. In particular the involvement of kangaroos and other livestock in crashes is probably underestimated in this data having been reported as contributing to 25.2% of crashes in the 1999 – 2002 regional data (CARRS-Q, 2005).

A third (32.8%) of hospitalisations in the region during the 1999 – 2002 period (CARRS-Q, 2005, Table 1.21) were alcohol related and whilst the present self reported data does not allow for direct comparison it is consistent with alcohol involvement as a major problem. Just over half the males in these crashes would be classified as drinking at harmful levels and two fifths had been drinking within 24 hours of the crash. The combination of these findings strongly indicate the need for strategic countermeasures to focus on this problem. Illegal levels of speeding are reported at a level consistent with regional figures but an examination of the self reported crash narratives that form part of the study and have not been analysed for this paper indicates frequent retrospective awareness expressed by drivers and particularly passengers that they “were driving too fast for the conditions”. Of continued concern and replicated in this self report study as in related statistical analyses of police reports is the lowered levels of restraint and helmet wearing. Finally, there is support for the emerging issue of illicit drug use and its possible contribution to crashes in the demanding rural and remote driving situation.

The problems of retrieval time and for that matter crash identification time are clearly identifiable as objects for study and possible technological innovation. Another area of the study that remains to be developed involves using our data to examine the validity (or not) of the Golden Hour concept in a rural / remote setting by examining outcomes for those that did or did not achieve medical treatment within this timeframe (stratifying for injury severity).

REFERENCES

- Armour, M. & Cinquegrana, C. (1990). Victorian study of single-vehicle rural accidents. *Proceedings of the 15th Australian Road Research Board Conference*, Part 7, 79-91.
- Australian Institute of Health and Welfare. (1998). *Health in rural and remote Australia*. Canberra: AIHW.

- Brodsky, H. (1990). Emergency medical service rescue time in fatal road accidents. *Transportation Research Record*, 1270, 89-96.
- Brodsky, H & Hakkert, A.S. (1983). Highway fatal accidents and accessibility of emergency medical services. *Social Science and Medicine*, 17, 731-740.
- CARRS-Q. (2005) *Five year crash and area profile of North Queensland: January 1st 1998-December 31st 2002*. www.carrsq.qut.edu.au
- Cullinane, S. and Stokes, G. (1998), *Rural Transport Policy*, Elsevier Science, Netherlands
Department of Primary Industries and Energy, Department of Human Services and Health, *Rural, Remote and Metropolitan Areas Classification 1991 Census Edition (RRAMA)*, November 1994, Australian Government Publishing Service, Canberra
- Evans, R.C. & Evans, R.J. (1992) *Golden hour [two to four hours post - injury]* Accident and emergency medicine. *Postgraduate Medicine*, 68, 714 –734.
- Federal Office of Road Safety.(1995), *Rural Road Safety:Focus for the future*. NRTAC, Canberra:Federal Office of Road Safety.
- Gual, A., Segura, L., Contel, M., Heather, N. & Colom, J. (2002). AUDIT-3 and AUDIT-4: Effectiveness of two short forms of the alcohol use disorders identification test, *Alcohol and Alcoholism*, 37(6), 591-596.
- Hasson, P. (1999). Rural road safety: A global challenge, *Public Roads*, 63(2), 16-25.
- Haworth, N., Vulcan, P., Bowland, L. & Pronk, N. (1997). *Characteristics of fatal single-vehicle crashes* (Report #120, Abstract & summary only). Melbourne: Monash University Accident Research Centre.
- Honor, A.B. (1995) The nature of the enforcement problem in Rural and Remote Australia. *Paper Presented at the National Road Trauma Advisory Council Conference -"Rural Road Safety: Focus for the Future"*, Wodonga, April.
- Lerner, E.B., & Moscati, R.M. (2001) *The golden hour: scientific fact or medical "urban legend"?* *Acad Emerg Med* 2001 Jul;8(7):758-60
- Moller, J. (1995). Contrast in urban, rural and remote vehicle related deaths, *Paper Presented at the National Road Trauma Advisory Council Conference -"Rural Road Safety: Focus for the Future"*, Wodonga, April.
- National Road Trauma Advisory Council. (1993). *Report of the working party on trauma systems*. Canberra: Australian Government Publishing Service.
- Organisation for Economic Co-operation and Development. (1999). *Safety strategies for rural roads*. Paris, France: OECD.
- Parliamentary Travelsafe Committee, (2002), *Rural road safety in Queensland*, Report #36. Brisbane: Queensland Legislative Assembly.
- Pettitt, A.N., Baade, I., Low Choy, S., Darnell, R.E. & Haynes, M.A. (1994). *Analysis of single-vehicle rural crashes* (CR124). Canberra: Federal Office of Road Safety.
- Royal Australian College of Surgeons. (1992). *Early management of severe trauma*. Box Hill, Victoria: Capitol Press Pty Ltd.

Ryan, G.A., Wright, J.N., Hinrichs, R.W. & McLean, A.J. (1988). *An in-depth study of rural road crashes in South Australia*, Report Series 13/88. Adelaide: South Australian Department of Transport.

Ryan, G.A., Barker, J.M., Wright, J.N. & McLean, A.J. (1992). Human factors in rural road crashes. *Australian Journal of Public Health*, 16(3), 269-276.

Safe Roads. (1998). *Safety on rural roads*, (Vicroads Road Safety Department Report No.108), November.

Somers, G.T., Drinkwater, E.J. & Torcello, N. (1997). The General Practitioner as the first responder in a major medical emergency. *Australian Family Physician*, 26(12), 1406-1409.

Stewart, R.D.,(1990) *Golden ten minutes* in McMurdy, R.Y. & McLellan, B.A. (Eds.), *Management of Blunt Trauma*, Williams and Wilkins, Baltimore, pp. 23 - 29.

Sticher, G.(2005) *A brief intervention trial to reduce rural and remote road crashes arising from driver behaviours and attitudes*. Brisbane: QUT PhD Confirmation Submission, CARRS-Q.

Symmons, M., Haworth, N.,& Johnson, I. (2004).*Rural road safety: overview of crash statistics*. Report #212, Melbourne: Monash University Accident Research Centre.

Travelsafe (2005), Personal communication with J.Pierce, Chair, Queensland Travelsafe Parliamentary committee. 13.8.05

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