

Road traffic injury – a global public health scourge: a review for World Health Day 2004 (April 7)

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The World Health Organization (WHO) recognises road traffic injury (RTI) as the leading cause of unintentional injury death and the ninth leading cause of all deaths world-wide¹. Road traffic injuries are projected to become the third leading cause of disability-adjusted life years lost world-wide by 2020, surpassed only by heart disease and major depression.¹

In 2000, about 12,600,000 persons were killed in road crashes. In addition, 10-15 million people are injured every year in road traffic collisions. According to WHO, the breakdown of the 1.26 million deaths by region reveals that:

- 35% occur in South East Asia;
- 24% in the Western Pacific;
- 13% in Africa;
- 11% in the Americas;
- 10% in Europe; and
- 7% in the Eastern Mediterranean Region.¹

Importantly, about 90% of all road traffic injury deaths occur in low- and middle-income countries.²

Death from RTI accounts for 2.5% of the global mortality for all age groups. More than 50% of the global mortality due to RTI occurs among young adults aged between 15 and 44 years. This represents a major loss of much needed human resources and productivity. In some low- and middle-income countries, road crash victims occupy up to 10% of hospital beds.¹ Resultant disabilities further exacerbate economic and social problems. It has been estimated that RTI costs countries between 1 and 2% of their Gross Domestic Product.¹

Regional road traffic-related mortality

rates are of particular interest to Australasia. In 2000, the RTI mortality rate in the Western Pacific Region was 25.3/100,000 population for males and 10.4/100,000 for females and in the South East Asian Region the rates were males 42.4/100,000 and females 13.6/100,000.² By comparison, the Australian rates in 2000 were male 13.6/100,000 and female 5.5/100,000.³

World Health Day is a timely reminder that RTI remains a major cause of death in Australia with an over-representation of young people and disadvantaged groups. Importantly, Australasian road traffic death and injury rates are declining, while rising rates are expected in regional countries as rapid motorisation continues.¹ In China, for example, the number of cars is expected to increase from the current two million in 2004 to three million by 2008⁴ in Beijing alone.

This article reviews RTI issues addressed by the *Australian and New Zealand Journal of Public Health (ANZJPH)* in the past five years, from 1999 to 2003, and their relevance to wider regional concerns.

Method

The editorial staff of the *ANZJPH* provided details of 10 potentially relevant articles published from 1999 to 2003. Articles were included in the review where the primary focus was motor vehicle injuries that occurred on roads and met the WHO definition of road traffic injury.¹ According to the WHO definition, "an RTI is any injury due to crashes originating, terminating or involving a vehicle partially or fully on a public highway".¹

Abstract

Objective: Globally in 2000, 1.2 million deaths resulted from road traffic injury (RTI) and about 10 times this number were injured. Because of the size of the problem, its expected growth and its preventability, World Health Day 2004 (April 7) was devoted to RTI. This review highlights attention to RTI by the ANZJPH and investigates relevance to the developing world, where 90% of all RTI deaths now occur.

Method: All articles published by the ANZJPH over the five-year period 1999-2004, which met the World Health Organization definition of RTI, were reviewed.

Results: The eight studies selected and reviewed focused particularly on young drivers, alcohol use and Indigenous Australians, using a range of research and evaluation methods. Risk factors identified including widespread risky driving behaviour by young males and alcohol involvement. Intervention successes included legislative change regarding utility passengers, current vehicle inspection certificate and effects associated with the lead-up to New Zealand's 1992 Transport Act.

Conclusions: The dramatic and continued reduction in Australia's road toll following peak rates in the 1960s has relied on scientific research, such as that reviewed here, for its effective evidence base. This review indicates that RTI is established on the public health agenda in Australia – a key aim of WHO's five-year strategy, for emulation by developing regions and nations.

Implications: High-income countries such as Australia and New Zealand have the knowledge, expertise and also the responsibility to assist regional low- and middle-income countries to counter the growing scourge of RTI that accompanies rapid motorisation.

(*Aust N Z J Public Health* 2004; 28: 109-12)

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Submitted: March 2004
Accepted: March 2004

The results of the review were tabulated according to their main research questions, study population, methods and findings. The relevance of these articles to the wider population, and public health in Australasia and the Western Pacific and South-East Asian Regions is considered.

Results

Two articles were excluded because the location of injury was a farm rather than a roadway, leaving eight articles for review. Overviews of the studies and their main findings are summarised in Table 1.

Research from New Zealand and from Western Australia is prominent. The research and evaluation methods employed are predominantly epidemiological and biostatistical, reflecting the focus of the *Journal*.

The published articles focused on vehicle occupants, especially young drivers and risk taking behaviour, utility truck passengers, trauma outcomes, vehicle-related risk factors for crashes, evidence for the effectiveness of intervention and occupational functioning following trauma.

Risk factors identified including widespread risky driving behaviour by young males, alcohol involvement among designated drivers, and as a predictor of future alcohol related hospitalisation. Intervention successes included legislative change regarding open load space utility passengers in the Northern Territory, current vehicle inspection certificate and effects associated with the lead-up to the New Zealand Transport Act of 1992 (see Table 1). Indigenous Australians were over-represented in open load space passenger deaths in the Kimberley region of Western Australia and in future alcohol-related hospitalisation following alcohol-related crash involvement as a driver.

Discussion

The diverse set of RTI articles published in this journal in the past five years is indicative of the complex and wide-ranging public health problem that road trauma represents, reflecting something of the breadth of the RTI problem overall.

Although the majority of the study populations were in New Zealand and Western Australia, the findings are of general interest, with wider public health implications. Issues such as risk taking behaviour among young males and alcohol as a risk factor for RTI are virtually universal, and transport of unprotected passengers in open vehicles is a well-recognised problem in developing countries.

Methodologically, a number of the studies were limited by their study design (under-powered longitudinal studies, descriptive review, self-reported data and convenience sampling). Future longitudinal studies should include relevant injury questions from the study design stage and case control studies should be powered to answer the research questions of interest. The potential bias of convenience samples is well known^{13,14} and this study design should generally be avoided.

Much road safety research remains in the 'grey' literature. Its contribution to global road safety would be greater if it were to be published in the peer reviewed and indexed literature to avoid costly duplication of time and resources. Emerging literature combines epidemiological and biomechanical methods to effectively describe and quantify risk factors for injury.^{15,16} These new methods have much to offer the further development of RTI prevention globally.

One of the issues to be addressed by future research is the different traffic mix in developing countries and the extent to which high income country solutions are relevant to low- and middle-income countries. One certainty is that skills transfer and capacity building in the South East Asian and Western Pacific Regions and beyond will be essential and these articles demonstrate potential for the transfer of research skills and a large knowledge base.

Finally, it may be timely, with the current focus on RTI, to also review the continued use of the term 'accident' in *ANZJPH*, at a time when other major journals dealing with this topic, such as the *BMJ* and *Injury Prevention*, have rejected the term. The WHO World Health Day 2004 slogan captures the fact that injuries are systematically preventable (and not accidental): *Road Safety is No Accident*.

Conclusion

The dramatic and continued reduction in Australia's road toll following peak rates in the 1960s has relied on scientific research, such as that reviewed here, for its effective evidence base. Translation of the evidence to practice has required strategic policy development, implementation and enforcement by government, accompanied by evaluation. This review demonstrates that RTI is established on the public health agenda in Australia – a key aim of WHO's five-year strategy, for emulation by developing regions and nations of the world.

Implications

Regional RTI is predicted to increase dramatically in low and middle-income countries in the next few years. There is much to be learned and translated from the Australasian approach to reduce the effects of the apparently inevitable consequences associated with motorisation in the region. High-income countries such as Australia and New Zealand have the knowledge, expertise and also the responsibility to assist regional low- and middle-income countries to counter the growing scourge of RTI that accompanies rapid motorisation.

Acknowledgements

WHO is acknowledged for background material. Monash University Accident Research Centre research staff, Angela Clapperton and Virginia Routley provided data, and Andrew Short assisted with preparation of the manuscript. The author's time was funded by the Victorian Department of Human Services.

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Table 1: Summary of review articles.

Author, year, publication type	Topic	Main findings	Study design	Study population
Garrow ⁵ 1999 Letter to editor	Comparison of utility truck open load space (OLS) passenger deaths in the Western Australian Kimberley and the Northern Territory (NT) and the effect of 1994 legislative change in NT.	NT OLS passenger deaths fell from 10.3% of all motor vehicle crash deaths pre the 1994 legislation to 2.1% post; all deaths post legislation involved non-compliance. Kimberley OLS deaths fell from 20% to 11%. In Kimberley region 86.7% of crash deaths were Indigenous Australians.	Pre- post-study. Numbers were small in the Kimberley and there was no statistical analysis of results.	All motor vehicle and OLS passenger crash deaths in Kimberley region and NT, 1990-1997.
Matthews ⁶ 1999 Brief report	Review article highlighting lack of research on impact of Post Traumatic Stress Disorder (PTSD) on occupational functioning following road trauma.	Absence of an empirically supported theoretical framework hinders the development of appropriate interventions and tailored vocational rehabilitation for PTSD following road trauma.	Literature review for period 1980-1998.	Paid workforce, not otherwise specified.
Tay ⁵ 2001 Article	In the context of a decade of road safety interventions targeting young male drivers in New Zealand, to determine the approximate time when a decrease in fatal crashes occurred.	Most likely turning point, where average number of monthly crashes reduced, was when the Transport Act 1992 was debated and passed in parliament – associated with much media attention, but prior to program implementation.	Time series analysis of crash data using a Poisson change-point estimator.	New Zealand drivers under the age of 25 years involved in fatal crashes Jan 1990 – Dec 1997.

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Table 1: Summary of review articles (continued).

Author, year, publication type	Topic	Main findings	Study design	Study population
Stevenson et al. ⁸ 2001 Brief report	This paper aims to determine to what extent designated drivers (the skipper) are driving alcohol or drug free.	26% of designated drivers aged average 21 years drove while feeling the effects of alcohol. Similarly, 18% drove as skipper while feeling effects of drugs.	Questionnaire on drug and alcohol use while driving as designated skipper completed by students during lecture time. Response rate 96%. Sampling process adopted may have resulted in greater homogeneity and higher alcohol and drug use rates compared with other studies.	Convenience sample of WA university students, mean age 21 years (n=286) from cross-section of faculties.
Stevenson and Palamara ⁹ 2001 Article	Behavioural factors as predictors of motor vehicle crashes: differentials between young urban and rural drivers.	Incidence of motor vehicle crashes was marginally higher for urban versus rural drivers (urban 4.2/10,000 driving days; rural 3.7/10,000 driving days). No significant difference in time to crash. Higher frequency of driving before obtaining learner's permit and driver's level of risk taking were significantly associated with a crash in first year of driving.	Cohort study: newly licensed drivers followed for first 12 months by self-report. Cox proportional hazard analysis was used to assess driver and behavioural factors for prediction of crash likelihood. Validation of crashes was attempted and sample of non-respondents was contacted. Potential bias exists, e.g. from lack of specific exposure data.	WA-based cohort study of newly licensed drivers aged 17 or 18 years. 1,796 of 7,133 approached (1,277 urban and 517 rural). Recruited Jan. 1997 – July 1998.
Stevenson et al. ¹⁰ 2003 Article	Cohort study of drivers in drink-driving motor vehicle crashes and subsequent alcohol-related hospital admission.	Findings suggest twofold increased risk associated with alcohol-related crash and future alcohol-related hospitalisation (OR 1.96, 95% CI 1.06-3.61) especially for Indigenous Australians (OR 8.07, 95% CI 4.53-14.3) and males. Could not discriminate time from alcohol crash, and specific alcohol-related disease.	Population based prospective cohort study of injured drivers. Cases (217) of which 95 were Indigenous Australians had BAC>0.05 gm/100 mL and subsequent diagnosis of alcohol caused hospital admission (n=104)	Cohort of 3,286 drivers involved in a motor vehicle crash 1988-1992 and followed over 8-13 years.
Blows et al. ¹¹ 2003 Article	Case-control study of drivers involved and not involved in casualty crashes in Auckland, NZ, where vehicles are required to undergo six monthly safety inspections.	Reductions in crash rates where vehicle had a current inspection certificate, after adjustment for age, sex, marijuana use, ethnicity and licence type (OR 3.08, 95% CI 1.87-5.05). Vehicles with no tyre pressure check in past three months also had significantly greater odds of crash. Research suggests vehicle inspection tests are warranted.	Case-control: participants completed structured interview. <i>Strengths:</i> community controls; and ability to adjust for multiple confounding variables. <i>Limitations:</i> self-reports not validated. Assumptions in coding missing data may have biased tyre pressure findings.	571 case drivers from crashes in which occupant killed or injured and 588 control drivers from population based Auckland Car Crash Injury Study.
Fergusson et al. ¹² 2003 Article	Prevalence of risky driving behaviour in young people.	More than 90% of drivers engaged in risky driving behaviour from 18-21 years. Significant factors were male, alcohol /cannabis abuse, crime, peers.	Longitudinal/self-report.	907 members of a NZ birth cohort of 1,265 at the age of 21 years.