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Fatal crash trends for Australian young drivers 1997-2007: Geographic and socioeconomic differentials

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ABSTRACT

Background: Little has been published on changes in young driver fatality rates over time. This paper examines differences in Australian young driver fatality rates over the last decade, examining important risk factors including place of residence and socioeconomic status (SES). *Methods:* Young driver (17–25 years) police-recorded passenger vehicle crashes were extracted from New South Wales State records from 1997–2007. Rurality of residence and SES were classified into three levels based on drivers' residential postcode: urban, regional, or rural; and high, moderate, or low SES areas. Geographic and SES disparities in trends of fatality rates were examined by the generalized linear model. Chi-square trend test was used to examine the distributions of posted speed limits, drinking driving, fatigue, seatbelt use, vehicle age, night-time driving, and the time from crash to death across rurality and socioeconomic status. *Results:* Young driver fatality rate significantly decreased 5% per year ($p<0.05$); however, stratified analyses (by rurality and by SES) showed that only the reduction among urban drivers was significant (average 5% decrease per year, $p<0.01$). The higher relative risk of fatality for rural versus urban drivers, and for drivers of low versus high SES remained unchanged over the last decade. High posted speed limits, fatigue, drink driving and seatbelt non-use were significantly associated with rural fatalities, whereas high posted speed limit, fatigue, and driving an older vehicle were significantly related to low SES fatality. *Conclusion:* The constant geographic and SES disparities in young driver fatality rates highlight safety inequities for those living in rural areas and those of low SES. Better targeted interventions are needed, including attention to behavioral risk factors and vehicle age.

1. Introduction

The over-involvement in road crashes of young drivers is a great public health concern worldwide (World Health Organization [WHO], 2007). A recent Australian study found that young driver fatality rates have significantly reduced over the last decade, with an average 5% reduction every year (Chen et al., 2010). However, despite these improvements and the implementation of a range of prevention strategies (Senserrick, 2007), young drivers continue to be over-involved in fatal crashes, representing 25% of total fatalities in 2008, but only 15% of total licensed drivers (Department of Infrastructure, Transport, Regional Development and Local Government, 2009).

While certain driving conditions, such as drink driving or night-time driving, increase crash risks for young drivers (Preusser, 2003), as is true for all drivers (Sivak et al., 2007), some subgroups of young drivers are at greater risk of crash, such as youth living in rural areas or those of low socioeconomic status (SES) (Chen et al., 2009a,b). Interventions have focused on risky behavior, including zero alcohol and night-time driving restrictions in graduated driver licensing schemes (Senserrick & Whelan, 2003; Williams, 2007). However, prevention programs aimed at at-risk youth are comparably rare. A poor understanding of, or attention to, youth who are particularly vulnerable to crashes may limit the efficacy of interventions. It is worthwhile to examine risk factors, such as drinking driving and night-time driving, by rurality of residence and SES to better understand their independent contribution. Further, interpretation of overall road safety statistics for young drivers that do not consider subgroups can potentially mask true gains and losses, especially since most driver fatalities occur in high risk subgroups (Crettenden & Drummond, 1994; Zaidel, 2001). However, trends in young driver fatality rates and associated risk factors have not been longitudinally reviewed by the important subgroups of rurality of residence and SES during the last decade, in Australia or internationally.

This study aimed to determine if disparities in young driver fatality rates exist by geographic and SES strata for drivers aged 17–25 in New South Wales (NSW), Australia between 1997 and 2007. Important risk factors for young driver fatality were also examined to inform future intervention developments.

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2. Methods

Crash fatalities for drivers aged 17–25 that occurred between January 1, 1997 and December 31, 2007 were obtained from the Roads and Traffic Authority (RTA) of NSW. According to the NSW Road Transport Act 1999, crashes on public roads are required to be reported to police and recorded in the RTA database if: (a) a person is killed or injured; (b) drivers involved in the crash do not exchange particulars; or (c) a vehicle involved in the crash was towed away. The present analyses focused on passenger vehicle crashes (i.e., not motorcycles, farm or heavy vehicles), as these are the main vehicles in which young drivers are killed or injured in crashes and therefore also the main focus of interventions. Passenger vehicles in this study included "4 wheel drive," "Car (sedan/hatch)," "Utility," "Light truck" (including panel van and utility not based on car design or mobile vending vehicle), "Panel van" (based on car design), "Passenger van" and "Station wagon." Fatal crashes were excluded if the residential postcode was invalid (n = 9, 1.4%; e.g., non-residential area or outside NSW). Police-recorded crash characteristics examined included speed zone (60 km/h or less; 70 or 80 km/h; ≥90 km/h), driver fatigue (no or unknown; yes), blood alcohol concentration (BAC: legal; illegal; unknown), seatbelt use (belted; unbelted; unknown), night-time driving (10 pm–5 am: no; yes), year of vehicle driven (1–5 years; 5–10 years; >10 years), and time from crash to death (on the scene; within 24 hours; >24 hours) to serve as an indicator for accessibility of emergency medical services (Mueller, Rivara, & Bergman, 1988).

Based on residential postcode, young drivers' residence was classified as urban (metropolitan), regional (inner regional), and rural areas (outer regional, remote, very remote), which correspond to the Australian Standard Geographic Classification (ASGC) (ABS, 2001), indicating an approximate distance to access public services or social activities. The Education and Occupation score, one of the 2001 Socio-Economic Indexes for Areas (2001 SEIFA) (Trewin, 2001), was also linked via residential postcode and used as a proxy for area SES. Drivers were then classified as three equal-sized groups to indicate drivers from high (1107.0, Stand Error (SE) = 50.38), moderate (Mean: 986.1, SE = 21.69) or low (Mean: 924.7, SE = 28.16) SES areas. The corresponding mean and median scores for the general population in NSW were 1,009 and 996, respectively (Trewin, 2001).

2.1. Statistical method

To approximate the at-risk population, the number of licensed young drivers was selected as the denominator, which was considered more suitable than the total population of young drivers or the number of registered vehicles by young drivers. The latter were considered to more grossly underestimate (not everyone has a license) or overestimate (the proportion of vehicle ownership by young drivers is relatively small) the at-risk population, respectively. The number of licensed drivers by postcode was obtained from the RTA.

While 17-25 years is a typical age range in young driver definitions (Staysafe Committee, 2008), this study classified young drivers into three age groups: 17, 18–20 and 21–25 years. Age 17 is the minimum and most common age for acquiring the first independent or "provisional" license in NSW following a supervised learner period (Senserrick, 2009). Age 21 is culturally recognized as the age of adulthood and when most drivers have graduated through the licensing system onto a full/open license, with age 18–20 therefore representing an interim period between restricted to a full license. Restrictions on the provisional license differed across the study period but typically included blood alcohol concentration (0.02% to zero) and speed (90–100 km/h) restrictions, with seatbelt use and hand-held mobile phone restrictions applying to all drivers.

Young driver fatality rates (per 10,000 licensed drivers) were estimated by rurality of residence and SES. Aggregated rates were estimated for 594 strata, generated from multiplication of the strata of sex (2), age group (3), place of residence (3), and SES (3) for each year 1997–2007 (11).

The generalized linear model was used to examine the trend of young driver fatality rates between 1997 and 2007, adjusting for age, gender, rurality of residence, and SES. Adjusted relative risks for rural versus urban drivers and drivers of low versus high SES for each year were collated into figures. The chi-square trend test was used to examine whether proportions of crash characteristics increased with increasing rurality or SES. All statistics were calculated by SAS Version 9.1 (SAS Institute Inc., 2006).

3. Results

Table 1 shows the number and rates of young driver fatalities in NSW between 1997 and 2007 by rurality of residence and SES. In total, 644 fatalities occurred during the study period, generating an average rate of 0.92 fatalities per 10,000 licensed drivers. In general, the number of young driver fatalities fluctuated but gradually decreased over time, with an exception in 2006 where 77 fatalities occurred, representing a 40% increase compared to the previous year. The overall fatality rate also fluctuated and gradually decreased over time, from 1.13 in 1997 to 0.66 in 2007 (per 10,000 licensed drivers), with the highest rate in 2006 (1.20).

The trend of fatality rates by rurality of residence and SES are presented in Table 1 and Fig. 1. During 1997–2007, fatality rates were generally higher with increasing rurality as well as with decreasing SES. Fatality rates for rural young drivers were about 2–3 times higher than that of urban drivers, but were occasionally surpassed by the rates of regional drivers (Fig. 1a). While fatality rates for regional drivers gradually increased to 2002 and then fluctuated downward, the rates for rural drivers showed considerable fluctuation. In contrast, the rate for urban drivers gradually decreased, with an average annual decrease of 5% (95% CI: 2–8%, $p<0.01$). Fatality rates for drivers of low SES fluctuated considerably between 1.32 and 2.88 per 10,000 licensed drivers, whereas the rates for drivers of high SES also fluctuated but had a gradual decrease. The rates for drivers of moderate SES were relatively stable to 2003–2004, with considerable fluctuation thereafter (Fig. 1b). None of the trends by SES was significant.

Fig. 2 presents the relative risks (RR) of young driver fatality for drivers in rural versus urban areas and of low versus high SES by year. The risk of driver fatality among rural drivers remained higher than that of urban drivers across the study period (RR: 3.6 in 1997 to RR: 6.0 in 2007), although the 95% confidence intervals fell below one in some years (Fig. 2a). Likewise, the risk of driver fatality for drivers of low SES remained higher than drivers of high SES over the study period (RR: 5.2 in 1997 to RR: 3.3 in 2007), but the 95% confidence intervals for 2003 fell below one (Fig. 2b).

Table 2 shows the associations between potential risk factors and young driver fatality risk by rurality of residence and by SES. The proportions of driver fatalities involving high posted speed limits (≥90 km/h), fatigue, illegal BAC, and non-use of seatbelts in vehicles significantly increased with increasing rurality. The proportions of driver fatalities involving high posted speed limits (≥90 km/h), fatigue, and vehicles older than 10 years were also associated with decreasing area SES, although the apparent increasing trend for illegal BAC was not statistically significant ($p = 0.34$). There were no consistent disparities for night-time (10 pm–5 am) driving and time from crash to death by either rural residence or SES. Regardless of rurality or SES, however, about 30% to 40% of fatalities occurred between 10 p.m. to 5 a.m., and more than 90% of young drivers died on the scene or within 24 hours after the crash.

4. Discussion

This study examined trends in young driver fatality rates in NSW by rurality of residence and SES, illustrating the progress of young