Safety Science 59 (2013) 106–115

Contents lists available at SciVerse ScienceDirect

Safety Science

journal homepage: www.elsevier.com/locate/ssci

Fatality trends and projections for drivers and passengers: Differences between observed and expected fatality rates with a focus on older adults

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ARTICLE INFO

Article history:
Received 5 October 2011
Received in revised form 22 March 2013
Accepted 7 May 2013
Available online 5 June 2013

Keywords:
Traffic fatalities
Older drivers

ABSTRACT

Using 1975–2008 data from the United States' Fatality Analysis Reporting System, we examined fatality trends, projected future fatality trends to 2025, and estimated the number of fatalities expected if fatalities had continued to occur at the 1975 rate. Driver and passenger fatalities were stratified by sex and age group before fitting models to the data. These models were used to perform fatality projections to 2025. Using the 1975 fatality rate, we estimated the number of fatalities expected due to increased exposure to determine whether efforts to decrease fatalities were working. Results showed that, since 1975, fatalities have decreased for younger drivers and passengers and increased for middle-aged adults. Over the past 10 years, fatalities have decreased for older adults. Expected fatalities from the 1975 rate were higher than that observed for most adults. Fatalities were projected to decrease through to 2025 for younger adults, increase for middle-aged adults, and level off for older adults. A cohort effect was found for older adults, whereby from 1975 to 2008, the oldest members of the group (85–89 years) accounted for an increasingly larger proportion of fatalities. The recent decrease in older adult fatalities is remarkable given their increased number and exposure. Observed fatalities were lower than expected after controlling for increased exposure, suggesting that efforts to decrease fatalities have been effective, although further research is needed to confirm this. The cohort effect suggests recent older drivers are involved in a smaller proportion of fatal crashes than their predecessors.

1. Introduction

The aging population of the United States and other developed countries has contributed to an increased awareness and concern about older drivers. The number of older licensed drivers is increasing (US Department of Transportation, National Highway Traffic Safety Administration, 2008); 1 in 5 drivers are expected to be aged 65+ by 2030 (Lyman et al., 2002). Exposure is also increasing, with older adults driving more miles per year (Santos et al., 2011). Older adults report using personal vehicles for almost 90% of their daily trips (Collia et al., 2003). With increasing age, older adults are more likely to be living with health conditions (physical and cognitive) that may affect their ability to drive safely, and therefore the safety of older drivers and their passengers has been an area of concern. The frailty of older adults also increases their susceptibility of sustaining fatal injuries in a crash (Bédard et al., 2002; Eberhard, 2008; Li et al., 2003). There has been a multitude of research examining older driver assessment and evaluation, retraining, crash risk, and injury and fatality rates; but is this degree of concern about aging drivers warranted?

It certainly appeared warranted from earlier research. Bédard et al. (2001) examined fatality trends and projections in the United States (US), using data from 1975 to 1998 from the Fatality Analysis Reporting System (FARS; a database containing data for all motor vehicle crashes that have occurred in the US since 1975 in which a fatality occurred). Fatalities were projected to decrease from 1998 to 2015 for drivers and passengers aged <30, and to increase for middle-aged (30–64 years) and older adults (65+ years). Bédard et al. predicted that "if current trends continue, the number of fatalities among older drivers and passengers and those aged younger than 30, may be equivalent [by 2015]...each represent[ing] 27% of all driver and passenger fatalities..." (pp. 751, 754). Fatalities involving older men were projected to increase by 271% between 1975 and 2015, while fatalities for older women were projected to increase 373%. Similarly, Lyman et al. (2002) projected that older drivers' (aged 65+) involvement in fatal

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http://dx.doi.org/10.1016/j.ssci.2013.05.005

Table 1
Driver and passenger fatalities by age group.

Year	Age (years)					Total
	16–19	20–34	35–54	55–64	65+	
1975	6483 (19.6%)	13,664 (41.3%)	6744 (20.4%)	2659 (8.0%)	3536 (10.7%)	33,086
1976	6994 (20.4%)	14,063 (41.1%)	6739 (19.7%)	2765 (8.1%)	3682 (10.8%)	34,243
1977	7245 (20.0%)	15,628 (43.2%)	6908 (19.1%)	2814 (7.8%)	3545 (9.8%)	36,140
1978	7547 (19.6%)	17,067 (44.3%)	7318 (19.0%)	2833 (7.4%)	3765 (9.8%)	38,530
1979	7551 (19.3%)	17,621 (45.0%)	7508 (19.2%)	2836 (7.2%)	3603 (9.2%)	39,119
1980	7265 (18.5%)	17,922 (45.7%)	7635 (19.5%)	2791 (7.1%)	3563 (9.1%)	39,176
1981	6309 (16.7%)	17,592 (46.5%)	7491 (19.8%)	2776 (7.3%)	3629 (9.6%)	37,797
1982	5478 (16.4%)	15,306 (45.8%)	6658 (19.9%)	2474 (7.4%)	3495 (10.5%)	33,411
1983	5106 (15.6%)	14,818 (45.4%)	6686 (20.5%)	2413 (7.4%)	3649 (11.2%)	32,672
1984	5214 (15.3%)	15,501 (45.5%)	6886 (20.2%)	2472 (7.3%)	3976 (11.7%)	34,049
1985	4990 (14.8%)	15,131 (44.9%)	7048 (20.9%)	2504 (7.4%)	4062 (12.0%)	33,735
1986	5626 (15.7%)	16,078 (45.0%)	7150 (20.0%)	2499 (7.0%)	4405 (12.3%)	35,758
1987	5547 (15.4%)	15,729 (43.6%)	7617 (21.1%)	2591 (7.2%)	4587 (12.7%)	36,071
1988	5659 (15.4%)	15,619 (42.5%)	7935 (21.6%)	2610 (7.1%)	4892 (13.3%)	36,715
1989	5266 (14.8%)	14,618 (41.0%)	8112 (22.8%)	2586 (7.3%)	5030 (14.1%)	35,612
1990	4902 (14.1%)	14,483 (41.6%)	8095 (23.2%)	2510 (7.2%)	4844 (13.9%)	34,834
1991	4382 (13.5%)	13,204 (40.6%)	7674 (23.6%)	2255 (6.9%)	5001 (15.4%)	32,516
1992	3898 (12.7%)	11,959 (39.0%)	7570 (24.7%)	2202 (7.2%)	5047 (16.5%)	30,676
1993	4049 (12.9%)	11,902 (37.9%)	7838 (25.0%)	2266 (7.2%)	5318 (17.0%)	31,373
1994	4234 (13.3%)	11,588 (36.3%)	8229 (25.8%)	2246 (7.0%)	5619 (17.6%)	31,916
1995	4235 (12.9%)	11,862 (36.1%)	8711 (26.5%)	2411 (7.3%)	5663 (17.2%)	32,882
1996	4411 (13.3%)	11,516 (34.6%)	9038 (27.2%)	2470 (7.4%)	5834 (17.5%)	33,269
1997	4332 (13.0%)	11,019 (33.1%)	9240 (27.7%)	2605 (7.8%)	6135 (18.4%)	33,331
1998	4333 (13.1%)	10,555 (31.9%)	9546 (28.9%)	2612 (7.9%)	6034 (18.2%)	33,080
1999	4510 (13.4%)	10,713 (31.9%)	9747 (29.0%)	2691 (8.0%)	5957 (17.7%)	33,618
2000	4465 (13.1%)	11,112 (32.6%)	10,140 (29.7%)	2776 (8.1%)	5623 (16.5%)	34,116
2001	4440 (12.9%)	11,265 (32.8%)	10,273 (29.9%)	2763 (8.0%)	5610 (16.3%)	34,351
2002	4715 (13.4%)	11,468 (32.7%)	10,478 (29.8%)	2952 (8.4%)	5492 (15.6%)	35,105
2003	4458 (12.7%)	11,253 (32.1%)	10,596 (30.3%)	3123 (8.9%)	5581 (15.9%)	35,011
2004	4410 (12.6%)	11,519 (32.8%)	10,473 (29.8%)	3234 (9.2%)	5481 (15.6%)	35,117
2005	4184 (11.8%)	11,766 (33.1%)	10,656 (30.0%)	3529 (9.9%)	5410 (15.2%)	35,545
2006	4105 (11.8%)	11,894 (34.1%)	10,504 (30.1%)	3468 (9.9%)	4959 (14.2%)	34,930
2007	3885 (11.5%)	11,330 (33.5%)	10,228 (30.2%)	3489 (10.3%)	4917 (14.5%)	33,849
2008	3178 (10.4%)	10,240 (33.4%)	9291 (30.3%)	3342 (10.9%)	4616 (15.1%)	30,667
Mean	5100 (14.6%)	13,441 (38.9%)	8434 (24.6%)	2723 (7.9%)	4781 (14.0%)	34,479

crashes would increase 155% from 1999 to 2030. Older drivers were projected to contribute to 15% of all fatal crashes in 2010, 20% in 2020, and 25% in 2030. This research suggested that safety initiatives directed specifically towards older adults were required.

Examining the cause of older adults' increased fatality risk, Li et al. (2003) investigated whether their increased fatality risk was due to their fragility or excessive crash involvement. Although both contributed to fatality risk, the relative contribution of fragility was higher than that of excessive crash involvement, leading the authors to conclude that safety initiatives should focus on reducing the impact of crashes (e.g., through vehicle design; Li et al., 2003). The common public concern that older drivers were hazardous road users appeared unfounded in this study, with only the oldest drivers (aged 70+) showing excessive crash involvement. Even there, subsequent research suggested that only older drivers travelling less than 3000 km per year had a higher crash risk (Langford et al., 2006). Furthermore, older drivers appeared to be predominantly a risk only to themselves and their older passengers, and not to pedestrians or other road users (Braver and Trempel, 2004; Dellinger et al., 2004; Eberhard, 2008).

The United States' fatality rates for older adults have recently (since 1997) declined in spite of the increase in the number of licensed older drivers and their driving frequency increasing (Eberhard and Mitchell, 2009). The decline from 1997 to 2006 was examined by Cheung et al. (2008), who found that "regardless of the exposure measure – whether miles driven, licensed drivers, or population – the fatal crash involvement rates for drivers 70 and older declined" (p. 261). Furthermore, Cheung and McCartt (2011) showed that in addition to fatal crashes declining, non-fatal and property-damage-only crashes declined, suggesting that "the reduced fatality risk of older drivers reflects both less likelihood of being involved in a police-reported crash and greater likelihood that they will survive when they do crash" (p. 666).

The recent reduction in fatality risk could be at least partly the result of road safety initiatives. Some initiatives have targeted older drivers specifically (e.g., Florida implemented a visual acuity licensing standard for drivers aged 80 years or older; McGwin et al., 2008), while other initiatives have targeted drivers in general (e.g., safety belt use, airbags, and driving sober). Advanced driver assistance systems have also been developed to assist drivers, particularly older drivers, with the driving task. Examples include heads-up displays, adaptive headlights, blind spot detection, intelligent parking assist, pedestrian detection, and lane departure warning systems. Although these systems may assist some drivers with driving safely, technology may also increase driver distraction or reliance on such systems, potentially creating a less-safe driving environment (Kim and Son, 2011). Similarly, benefits from safety initiatives targeting other driver cohorts (e.g., graduated driver licensing for younger drivers; Chen et al., 2006; Ulmer et al., 2000) may be affected by changes in the driving environment (e.g., global positioning systems and cell phones). Of interest is whether safety initiatives designed to decrease fatalities have been effective in light of our changing driver demographics and driving environment.

The objective of the present project was to revisit the issue of fatality trends and projections, updating Bédard et al.'s (2001) study. We have 10 more years of FARS data than were used in Bédard et al.'s study, enabling us to examine whether recent