Temporal trends in the associations between age, sex and socioeconomic status after death from motor vehicle collisions in England and Wales: 1960–2009

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ABSTRACT

Objective To determine the trend in the associations between socioeconomic status and gender with median age at death in England and Wales, from 1960 to 2009.

Methods Annual cross-sectional studies of all registered deaths from a motor vehicle collision in England and Wales, 1960–2009.

Results There were 1647 deaths from a motor vehicle collision in 1960 and 964 deaths in 2009. The number of children aged 14 years or less who died in 1960 was 66 and this figure had reduced to 20 deaths by 2009. Individuals in non-manual occupations were consistently more likely to die above the median age of death than those in manual occupations during 1960–1963 (OR 1.66; 95% CI 1.50 to 1.84) and also during 1990–2000 (OR 1.54; 95% CI 1.44 to1.65). For 1960–1969, women had a higher risk of dying at above the annual median age of death (OR 1.72; 95% CI 1.62 to 1.82); for 2001–2009 the corresponding OR was 1.80 (95% CI 1.68 to 1.94).

Conclusions There has been a 41% decrease in annual deaths after motor vehicle collisions in England and Wales over the past 50 years. The number of individuals over the age of 74 years dying in motor vehicle collisions has increased slightly, while the number of children's deaths decreased by 70% over the same time period despite driving becoming more common. Involvement in motor vehicle collisions may contribute to the sex and social class gradients in life expectancy observed in England and Wales.

INTRODUCTION

Road traffic injuries are a major global public health issue, killing approximately 1.3 million people per year[1] and are the leading cause of major trauma. With current trends, road traffic collisions are predicted to become the fifth leading cause of death by 2030.[1] The impact of road traffic injuries is particularly marked in the young, being consistently one of the top three leading causes of death for people between 5 and 44 years old worldwide. Even in high income countries where death rates have been in decline over the past four decades, road traffic injuries remain a leading cause of death and disability.[2 3] The WHO has highlighted the need for better understanding of the risk factors involved in motor vehicle collision (MVC).[4]

It is well known that there is a socioeconomic gradient regarding the impact of road traffic deaths, with people from lower socioeconomic backgrounds being disproportionally more affected, regardless of the income status of their countries.[5–11] However, few studies are available on the change in this gradient over time. Edwards *et al*[12] reported that there has been a 30% decrease in the risk of injury in children (including pedestrians and cyclists) over the past two decades, although rates of death have not fallen in families with no adults in paid employment, suggesting differential benefits stratified by socioeconomic status (SES) from environmental changes over this time period.

We have used routinely collected data over five decades to investigate the trends in annual risk of death from road traffic injuries in England and Wales, and in particular, to investigate changes in the risk of dying at above the annual median age of death for those from less affluent sectors of society and men compared to women. We also explored trends of numbers of deaths from road traffic injuries in older individuals over this time period.

METHODS

Mortality data attributed to MVCs were obtained for England and Wales for 1960–2009 from the Office for National Statistics stratified by sex and SES. Cause of death was coded using the International Classification of Diseases applying to road traffic collisions involving cars. Using ICD7, this category was E810, E811, E816–820, E822–825 from 1960 to 1967[13]; with ICD8–9, this category was E810–E819 with 5th digit 0 or 1 from 1968 to 2000[14]; and using ICD10, the code was V30–V79 with 4th digit 4, 5, 6, 7, 9 from 2001 to 2009.[15]

SES was classified for the years when these data were available. From 1960 to 2000, SES was coded as 'manual' or 'non-manual' using the Registrar General's Social Class.[16] From 2001, the National Statistics Socio-Economic Classification was implemented and SES was condensed into three classes: 'managerial and professional', 'intermediate' and 'routine and manual'. Married women were coded by their own occupation, however if this was unclassified, their husband's occupation was used. Throughout the study period, unmarried and single women were coded by their own social class when available. Children under 15 years were classified by their father's occupation and if not classified, their mother's occupation was used. SES was recorded as 'unclassified' for adults who were permanently sick, long term unemployed, had never worked or were in full time education, or if occupation was not stated or was inadequately described.

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Table 1 Association of gender with risk of death at an age greater than the median age of death from a motor vehicle collision in England and Wales, 1960–2009

Year	Total no. of deaths	Male deaths OR	Unadjusted OR for female deaths>median age at death OR (95% CI)	Adjusted* OR for female deaths>median age at death OR (95% CI)
1960–1969	23 487	1.00	1.72 (1.62 to 1.82)	1.68 (1.58 to 1.78)
1970–1979	26 437	1.00	1.62 (1.53 to 1.70)	1.58 (1.50 to 1.67)
1980–1989	20 407	1.00	1.62 (1.53 to 1.72)	1.50 (1.41 to 1.60)
1990–1999	17 675	1.00	1.88 (1.76 to 2.01)	1.73 (1.62 to 1.85)
2000–2009	14 190	1.00	1.80 (1.68 to 1.94)	1.71 (1.58 to 1.84)

*Adjusted for socioeconomic status.

To protect anonymity, age at death for each individual was provided by the Office for National Statistics within a 5-year age range. Age at death was estimated as the midpoint of the corresponding age band and was not normally distributed for any year. Median age at death was estimated for each year and each individual death was categorised as above, or not above, the median age for the year of interest. The impact of gender and SES on the OR for death above the median age at death for each decade was calculated by logistic regression using STATA V.11. As both exposures were associated with the outcome, mutually adjusted models are presented.

RESULTS

From 1960 to 2009 there were 102 196 deaths attributable to MVCs (table 1), with 1647 deaths in 1960 and 964 deaths in 2009. For any given year, more men died than women, with a total number of male deaths in 1960 of 1182, decreasing to 689 in 2009, and a total number of female deaths in 1960 of 465, decreasing to 275 in 2009 (figure 1). The number of deaths in adults aged 75 years or over increased from 68 deaths in 1960 to a maximum value of 231 deaths in 1990, before decreasing to 109 deaths in 2009. Sixty-six children aged 14 years or less died in 1960 after an MVC, and this figure had reduced to 20 deaths by 2009 (figure 2).

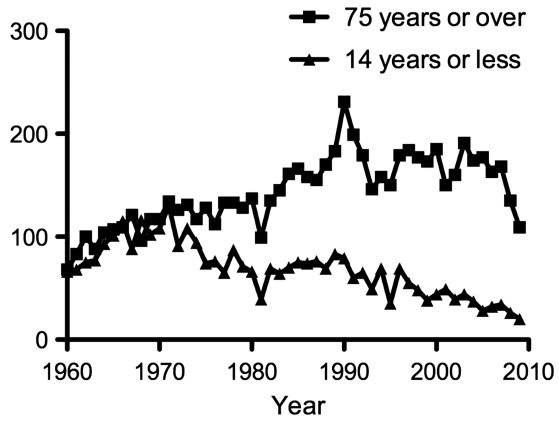

Figure 2 The annual number of deaths from motor vehicle collisions in England and Wales, stratified by age, 1960–2009.

For every year from 1960 to 2009, women had a higher risk of dying at an age greater than the annual median age of death (figure 3). From 1960 to 1969, the adjusted OR of death at above the median age of death for a woman was 1.68 (95% CI 1.58 to 1.78), while the comparable OR for the period 2000–2009 was 1.71 (95% CI 1.58 to 1.84).

For all years with comparable data, those individuals who were coded as having a non-manual job had a higher risk of dying at above the median age of death than those who had a manual job (figure 4, table 2). During 1960–1963, the OR for this observation was 1.66 (95% CI 1.50 to 1.84) and during 1990–2000 the comparable OR was 1.54 (95% CI 1.44 to 1.65). From 2001 to 2009 individuals coded as having a managerial or professional occupation also had a higher risk of dying at an age of death higher than the median value (OR 1.66; 95% CI 1.50 to 1.84) compared to those in manual occupations.

DISCUSSION

We present data spanning half a century assessing the demographic changes in those who were registered as having died from an MVC in England and Wales from 1960 to 2009. Our data demonstrate a decrease in the total number of deaths over this time period, despite an increase in car ownership,[17] with a 70% reduction in deaths in infants and children; while the number of deaths in individuals aged 75 years or older has increased from a low baseline (68 deaths) to a peak value in

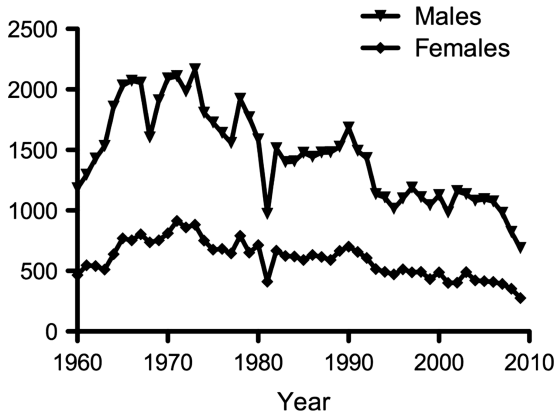

Figure 1 The annual number of deaths from motor vehicle collisions in England and Wales, 1960–2009.

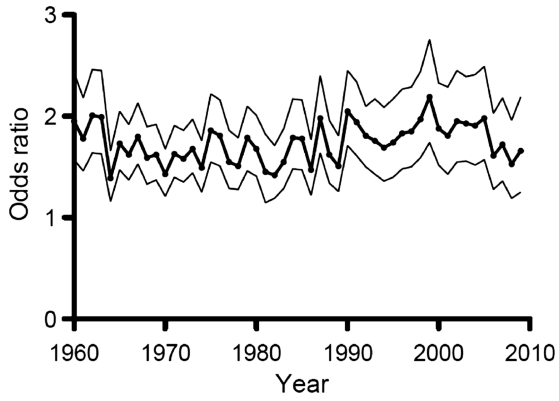

Figure 3 OR with 95% CI of women dying at above annual median age of death.

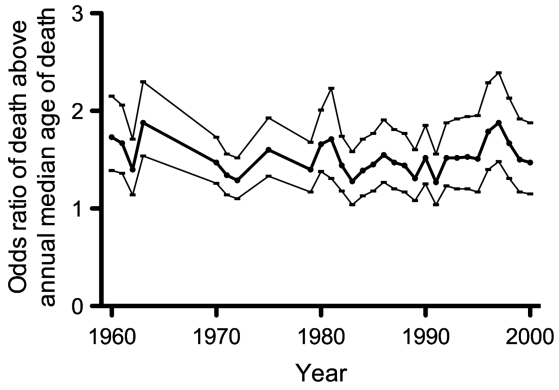

Figure 4 OR with 95% CI of non-manual individuals dying at above annual median age of death.

1990 (231 deaths), before decreasing to 109 deaths in 2009. There are less female deaths each year compared to male deaths, and women have a consistently higher risk of dying at above the annual median age of deaths than men for all years in our dataset. Individuals in the more affluent socioeconomic groups have a higher risk of dying at above the annual median age of death over the time span of our data.

The strengths of these data include the long time period studied, which covers five decades, when many societal, regulatory and technological changes will have impacted on the experience of driving in England and Wales; and the fact that the data will have been collected in a standardised manner by the Office for National Statistics (ONS). A catastrophic event such as a death from an MVC is unlikely to be misclassified, so we are confident that the associations reported from this dataset are likely to involve deaths from MVCs. However we cannot exclude the possibility that a small number of deaths that occur long after the MVC are misclassified to the more proximate cause of death.

The use of national datasets with routinely collected data have a number of weaknesses that require consideration. First, although we are confident that the sex and age of individuals studied in this dataset will be correct, we are reliant on the ONS coding the socioeconomic status of those who died in an MVC. The coding system used by the ONS generates a 'non-classified' category of individuals who represent a composite group including those who were permanently sick, long term unemployed, had never worked or were in full time education, or if occupation was not stated or was inadequately described. The existence of this heterogeneous group allows us to be confident that our primary comparisons between 'non-manual' and 'manual' occupations are valid, but may limit the comparability of these data with other datasets that lack this form of categorisation. It is also important to clarify that our data consist of all those who were recorded as dying in an MVC, and hence do not permit any conclusions to be drawn as to the risk of either being involved in an MVC, or, for those who are involved in an MVC, the risk of subsequent death.

The striking observations for us from this dataset are as follows. First, there was a decrease in the total number of deaths from MVCs in England and Wales from 1960 to 2009. Second, we noted the absence of a large increase in the number of deaths in those aged over 75 years, despite an aging population where there may be a larger number of older drivers continuing to drive into their ninth decade. Third and finally, despite safety innovations, women and those from more privileged sectors of society have a consistently higher risk of dying at an older age than men and those who are less affluent.

In the recent decades that our data span, the number of cars on the road in the UK has increased by an average of 3% per annum,[17] and despite this, the number of deaths has decreased from a maximum of 3049 in 1973 to a minimum of 964 in 2009. This is undoubtedly a consequence of a complex number of developments that will include regulatory changes such as the introduction of compulsory seatbelts in 1983, legislation limiting alcohol consumption introduced in 1981, the obligation for child restraints from 2006, and a number of interventions that aimed to reduce excessive driving speed such as traffic cameras and a points system introduced in 1982, such that the accumulation of 12 or more points results in disqualification from driving. The introduction of regional trauma centres and systems is also likely to have contributed to a reduction in the number of deaths from MVCs.[2 18 19] However, it is possible that while these interventions have resulted in a reduction in the absolute numbers of deaths from MVCs in England and Wales, they have not modified the relative differential in age of death between sexes or socioeconomic groups in those who die after an MVC.

We report for the first time, data of all deaths from involvement in an MVC in England and Wales over a 50-year time period. While the absolute numbers of deaths have decreased by 41% and those of children reduced by 70%, and the number of deaths in older individuals have not appreciably increased over this time, despite concerns about an increase in the number of elderly drivers,[20] involvement in MVCs may contribute to the

Table 2 Association of socioeconomic status with risk of death at an age greater than the median age of death from a motor vehicle collision in England and Wales, 1960–2009

Year	Total no. of deaths	'Manual' deaths, OR	Adjusted OR for 'non manual deaths'>median age of death (95% CI)		Adjusted OR for 'unclassified' deaths>median age of death (95% CI)
1960–1963*	7503	1.00	1.66 (1.50 to 1.84)		1.55 (1.35 to 1.77)
1970–1979*	13 591	1.00	1.41 (1.31 to 1.52)		0.74 (0.67 to 0.83)
1980–1989	20 407	1.00	1.46 (1.37 to 1.56)		1.21 (1.13 to 1.31)
1990–2000	19 288	1.00	1.54 (1.44 to 1.65)		1.27 (1.18 to 1.37)
Socioeconomic status coding changed after 2000					
		'Routine/manual' deaths	Adjusted OR for 'intermediate' deaths>median age of death (95% CI)	Adjusted OR for 'professional/managerial' deaths>median age of death (95% CI)	OR for 'unclassified' deaths>median age of death (95% CI)
2001–2009	12 577	1.00	1.10 (0.98 to 1.22)	1.66 (1.50 to 1.84)	1.31 (1.20 to 1.43)

Model adjusted for sex.
*In 1964–1969, 1973–1974 and 1976–1978 socioeconomic status was not recorded.

well recognised sex and social class gradients in life expectancy observed in England and Wales.[21] This is an important area of study, as identifying the factors that are responsible for these differentials will inform interventions that have the potential to improve road safety in the future.

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Contributors AWF conceived the study, obtained the data and did the first analysis. Both authors contributed to interpretation and writing of the manuscript.

Competing interests None.

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Data sharing statement These data are available on application to the ONS, UK.

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