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Fatality rates associated with driving and cycling for all road users in Great Britain 2005–2013

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ABSTRACT

Fatality rates based on deaths only to the drivers themselves do not accurately portray the impact of driving on road traffic deaths. We characterised more fully the impact of driving and cycling on road traffic fatalities by including deaths to all the other road users in fatal car or cycle crashes. We used crash data from the Great Britain National Road Accident Database (STATS19) and exposure data from the National Travel Survey. Rates were estimated as the ratio of fatalities to the amount of time travelled: fatalities per million hours' use (f/mhu). Rates in 2005-07, 2008-10, and 2011-13 were calculated based on deaths to: (1) the drivers or cyclists themselves (persons 'in charge' of vehicles), (2) other, i.e. 'third-party', road users (e.g. passengers, drivers or riders of other vehicles, and pedestrians), and (3) both of these groups combined, i.e. all road users. Rates were stratified by the sex and age of the drivers or cyclists involved in the fatal crashes.

Rates based on deaths to persons in charge of vehicles were higher for cyclists than for drivers, whereas those based on deaths to third-party road users showed the opposite. The inclusion of third-party deaths increased the overall rates considerably more for drivers than for cyclists. Nevertheless, the overall rate for male cyclists (2011-13: 0.425 f/mhu; 95% Confidence Interval (CI): 0.377–0.478) exceeded that for male drivers (0.257 f/mhu; 95% CI: 0.248–0.267). A similar pattern was observed for females (cycling: 0.216 f/mhu; 95% CI: 0.158–0.287; driving: 0.127 f/mhu; 95% CI: 0.120–0.135). These differences between cars and cycles were overestimated as the safer travel on motorways could not be disaggregated in the estimates for driving. The higher rates for cycling - mainly borne by the cyclists themselves - need to be balanced against the substantially lower risks to other road users.

1. Introduction

Road traffic injuries were the ninth leading cause of Disability Adjusted Life Years (DALYs) worldwide at the turn of the 21st century, and they contribute disproportionately to deaths among young people (Krug et al., 2000). Several studies have combined data on the numbers of road crash injuries and the amount of travel exposure to compare rates of injury by travel mode (Beck et al.,

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2007; Bouaoun et al., 2015; Mindell et al., 2012; Pucher and Dijkstra, 2003; Teschke et al., 2013). The majority have found cycling to be associated with higher rates of road crash fatality than driving when calculated across all ages (Beck et al., 2007; Bouaoun et al., 2015; Mindell et al., 2012), although it has been noted in Britain that rates for persons aged 17–20 years were higher for driving than for cycling (Mindell et al., 2012; Feleke et al., 2017).

These analyses have tended to be based on injuries only to the drivers or cyclists themselves. The risks of injury for all the other road users in the same traffic collisions (hereafter referred to as other, i.e. 'third-party' road users) have to date received little attention in transport safety research (Evans, 2000). Evidence suggests that young car drivers in particular are associated with increased risk of death not only to themselves but also to their passengers (especially of similar age), and also to other persons struck by the car, e.g. pedestrians, drivers or riders of other vehicles, or cyclists (Chen et al., 2000; Department for Transport, 2012; Jones et al., 2015; McCartt and Teoh, 2015; Tefft, 2008). For example, McCartt and Teoh reported that 39% of the deaths in fatal crashes involving the drivers of passenger vehicles aged 16–19 in the United States in 2012 were the 16–19 year-old drivers themselves, 24% were their passengers, and 37% were occupants of other vehicles, cyclists, pedestrians, or other road users (McCartt and Teoh, 2015).

Fatality rates based therefore only on the deaths of the drivers themselves do not accurately portray the full impact of driving on road traffic deaths. To date, no study has used the data available on fatal car or cycle crashes to estimate road traffic fatality rates based on the deaths to all road users (i.e. not just the drivers or cyclists themselves) by the sex and the age of the drivers or cyclists involved. We addressed this gap by combining numerator data on the number of road traffic fatalities with survey-based denominator data, collected in Britain over a nine-year period (2005-13). We aimed to characterise more fully the impact of driving and cycling on traffic fatalities by estimating the magnitude of road traffic fatality rates based on deaths to: (1) drivers or cyclists themselves, (2) 'third-party' road users (e.g. passengers, drivers or riders of other vehicles, and pedestrians), and (3) 'all road users' (i.e. overall rates that combined both of these groups).

2. Methods

2.1. Road traffic crash data

Road traffic crash data were obtained from the Great Britain National Road Accident Database (STATS19). STATS19 is the national road crash database of casualties (fatal, serious, and slight injuries) reported by the police on any road where motor vehicles are allowed to travel. The present study focused on road traffic fatalities. STATS19 is generally acknowledged to accurately cover all road traffic fatalities (Keep and Rutherford, 2013).

STATS19 contains data on crashes involving personal injury that involved at least one road vehicle: the definition of 'road vehicle' includes pedal cycles. In accordance with the STATS19 convention, the types of vehicle classed in the present study as 'cars' include taxi / private hire car and minibus (less than 17 passenger seats), and excludes vans / goods vehicles. Specifically, the persons 'in charge' of vehicles in the present study were either car drivers or cyclists, whereas third-party fatalities in car or cycle crashes could include occupants or riders of any vehicle, and pedestrians. The database contains information on the characteristics of the crash, vehicle(s) involved, and the person(s) injured or killed.

The present study included both single- and multi-vehicle road traffic crashes that resulted in at least one fatality to any road user. More specifically, we focused on the subset of fatal crashes that involved ≥ 1 car or ≥ 1 cycle. For fatal crashes involving ≥ 1 car, we extracted the number of:

- driver fatalities (persons 'in charge' of the vehicle(s)); and
- fatalities to ***all*** the third-party road users travelling in or struck by cars (including car passengers, drivers or riders of any other road vehicle, pedestrians, or any other road user).

These death counts were stratified by the sex and the age of the drivers involved in the crash. For example, a fatally struck pedestrian aged 50–59 years involved in a collision with a car driven by a male aged 30–39 years would be counted as a third-party death in the estimation of the fatality rates for male drivers aged 30–39 years. Age was grouped as follows: 17–20, 21–25, 26–29, 30–39, 40–49, 50–59, 60–64, 65–69, 70–74, 75–79 and ≥ 80 years. 6% of drivers involved in fatal crashes were excluded from our analysis because of missing demographic data.

A driver fatality in a multi-vehicle collision in which at least one other car driver was killed would potentially be double-counted: as a driver themselves and as a third-party (through being the driver of another car involved in the same fatal collision). To avoid such double-counting, the number of deaths in multi-vehicle collisions were weighted by the reciprocal of the number of car drivers involved to ensure that the number of driver and third-party fatalities summed over all driver sex/age groups matched the actual total number of deaths in car crashes.

Similarly, for fatal crashes involving ≥ 1 cycle, we extracted the number of:

- cyclist fatalities (persons 'in charge' of the vehicle(s)); and
- fatalities to *all* the third-party road users riding on or struck by the cycle(s).

These death counts were stratified based on the sex and the age (using the same age bands described above) of the cyclists involved in the crash.