Editorial

Road travel casualties

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Worldwide, up to 50 million people are injured in road crashes each year and 1.25 million are killed; 90% of these deaths occur in low and middle income countries and around a half are deaths of pedestrians, cyclists and motorcyclists (World Health Organization, 2015). The fatality rate among this group is increasing, particularly among countries with low but rising numbers of private motor vehicles and poor infrastructure (Obeng-Atuah et al. 2017). Road fatalities in low and middle income countries increase monotonically with motor vehicle ownership: the number of private cars and the amount they are driven is rising rapidly but the majority of the population still travels on foot or by bicycle in the absence of adequate infrastructure, driver training, or enforcement of traffic regulation (Koppits and Cropper, 2003). For example, in Brazil, road deaths contribute more than 2.2 years to the 8.2 years of lower life expectancy in Brazilian males compared with Canadian males (Auger et al 2016). The stark inequalities in road deaths across countries is mapped at www.worldlifeexpectancy.com/cause-of-death/road-traffic-accidents/by-country/. There are also marked variations by age: younger drivers have increased crash risk, while older drivers have higher case-fatality rates if involved in a crash (Li et al, 2003).

Older people are more prone to single-pedestrian incidents that lead to injury. While studies in different locations have found different numbers, around one-quarter of pedestrian fatalities and between three-quarters and four-fifths of pedestrian injuries are due to falls, not collisions with a vehicle (ITF, 2012; Naumann, 2011; O'Neill, 2016). However, these are not included in official road traffic casualty statistics, which include casualties only if they involve any type of vehicle (but only a motor vehicle in some countries, such as Russia) on public roads. In this issue, Methorst et al (2017) make a cogent case for including pedestrian falls in road travel casualty figures. Noland et al (2017, in press) would also include pedestrians hit by a vehicle in other places, such as car parks.

When an injury occurs, prompt and effective healthcare is important. Nicholl et al (2007) found mortality was associated with distance to trauma centre in the UK. Hu et al (2017) report here similar results for the USA: mortality increased by 0.08% for passengers and 0.21% for drivers per additional mile to the trauma centre. However, drivers admitted to a level I emergency care unit had lower mortality than those admitted to less specialist units. Overall, they found the benefits of specialist trauma centres outweighed the greater transport distances. Distance is also important for bringing medical care to the scene of a crash. In Porto, Portugal, modelling of road traffic crashes concluded that in urban areas, emergency medical vehicles should be stationed close to high speed roads, as areas with higher speeds and high traffic volumes had higher numbers of road collision emergencies (Amorim et al, 2017).

After crashes, many people are left with long-term impairments. Christie and colleagues (2017) found that social networks are important in providing support and transport for people with impairments, but those without networks or with social networks that cannot help with transport can become very isolated. This is particularly a problem where public transport [transit] options are lacking. Although taxi vouchers could help fulfil travel needs, use of taxis was not without problems. These issues parallel the problems identified in the study of Access-A-Ride in New York, a paratransit service (Murray, 2017). Higgs et al (2017) also found that the availability of public transport was important when assessing accessibility to general practice [primary care] in south Wales, particularly when assessing inequalities in accessibility.

Transport to healthcare is an even bigger problem in low income countries. In the West Wa district, a very poor, rural area in Ghana, about half the communities surveyed had access to community health services and a health centre within 5km, but only 4% of communities had good access to a district hospital. Travel to healthcare was mostly on foot. The condition of the roads was the biggest problem (Agbenyo et al, 2017).

A study in Ilesa, Nigeria also found walking to be the most common mode of travel for any purpose (Olojede et al, 2017, Editor's Choice). The most important factor for walking was not owning a personal vehicle; also important were income, trip length, travel costs for other modes, and health benefits. The main barriers were the absence of pedestrian facilities and the relative slowness of the travel mode but weather was also important.

Cycling is widely perceived by the general public as particularly hazardous. This may be because in high income countries, cycling deaths are uncommon and so receive far more media coverage than the far higher numbers of car occupants and pedestrians killed while travelling. In this issue, Chieng et al (2017) compare the risks of moderate injury from a range of causes in New Zealand: they found cycling as transport to be similar to or less risky than many everyday activities. For example, DIY (do-it-yourself) twice a month resulted in similar numbers of moderate injuries to road cycling for half an hour three times a week. Also in New Zealand, Mandic and colleagues (2017) found that although half of parents felt their teenage children had good cycling skills, three-quarters welcomed cycle skill training and felt it would increase their children's safety when cycling for travel.

Other papers in this issue also address aspects of cycling safety. Ng and colleagues (2017) explored Australian cyclists' views of unsignalized junctions and found the main concerns were drivers' behaviour. Doorley et al (2017) showed that although the population-level impacts of modal shift from motorised transport to cycling is beneficial, analysis at an aggregate level can mask some small but significant loss of disability-adjusted life years (DALYs), particularly among adults aged 20-29, who have higher injury rates. To facilitate increases around the world in bicycling, research on a wide array of barriers, particularly safety concerns, is needed.

The increase in bicycling may itself impact safety. In this issue, Elvik and Sandfør (2017) incorporate the concept of 'safety in numbers' (SiN) as one approach when including cyclist injuries in health impact economic assessments. While there is widespread acceptance that the casualty rates for pedestrians and cyclists is lower where the numbers of travellers in that mode is higher (Jacobsen 2003), published studies have generally used ecological associations and cross-sectional design across a range of locations. Such studies leave open the question of whether the safety in numbers phenomenon is causal. It could be explained, for example, by *confounding*: circumstances or interventions that lead to more people walking or cycling are also those that reduce travel danger (Bhatia and Wier 2011; Jacobsen et al. 2015). It may also be due to *reverse causality*: pedestrians (and cyclists) may choose to walk where conditions are less hazardous (Bhatia and Wier 2011).

However, causal explanations are also plausible. Pedestrians may be protected, to a limited extent, by the *herd effect*, in which individuals alert their on-street neighbours to immediate hazards, even when unacquainted with the other pedestrian (Bhatia and Wier 2011). Brown and colleagues' observations in this issue that active travel is more often in the company of strangers than friends and family is interesting, in this context (Brown et al, 2017). In addition, a large number of pedestrians or cyclists are more visible and therefore are more noticed by drivers, the *critical mass* effect. Beanland et al (2014) found that drivers took significantly longer to detect low than high prevalence road users. Jacobsen and colleagues (2015) summarised these effects on drivers' perceptions. Increases in pedestrians or cyclists also affect *drivers' behaviour*. I have been surprised by the number of acquaintances who have told me they are now much more careful when driving near cyclists 'in case it's you'. I doubt they mean 'it would be so embarrassing to injure someone I know'. I assume it is an awareness of cyclists as 'normal people': new cyclists can bring an exponential number of non-cyclists (often drivers) who consider cyclists to be 'us' not 'them'.

Johnson et al (2014) found that drivers were more likely to report safer driving behaviours near cyclists if they also cycled themselves.

It is likely that the safety in numbers phenomenon is to a large extent due to confounding by interventions that both increase the safety of cycling or walking and the numbers of cyclists or pedestrians, but it is also likely that each of the mechanisms described above contribute to a certain extent. Untangling these effects requires longitudinal studies in which changes in cycling or walking numbers are independent of road danger reduction policies. One such study found that absolute numbers of cyclist injuries recorded by hospital data systems fell by 28% in five cities in North America which introduced bike share programmes while the numbers rose minimally in five comparable cities without such schemes, a very significant difference (Fishman and Schepers, 2016). These authors also found that bike share users in Paris and London had lower casualty rates than private cycle users. However, as they point out, their studies have notable limitations, such as differential geographical spread and therefore infrastructure and driving behaviours, particularly speed, affecting the two groups.

Some propose using SiN as a policy tool to reduce injury risk, or assume that SiN is causal when modelling the impacts of modal shift (Schepers and Heinen, 2013). Bhatia and Weir (2011) caution against doing that, pointing out that not only may the relationship not be causal but also, the absolute number of casualties may rise even if the rates fall. However, the benefits of physical activity are so much greater than the risks of injury that many would accept that trade off as being beneficial for the population's health (Buekers et al, 2014) while accepting that the more that road danger can be reduced, the better, as Doorley and colleagues argue in this issue (2017). We will be publishing a special issue on road danger reduction in the next volume of this journal.

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