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How dangerous is cycling in New Zealand?

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ABSTRACT

We compared the injury risks of typical exposures to road cycling for transport with other common activities including do-it-yourself repairs (DIY) at home, horse riding, quad bike riding, rugby union and snow sports in New Zealand. Cycling on the road half an hour three times a week was similar to DIY twice a month and safer than horse riding 1.5 h twice a week (5-fold difference in injury claims), skiing half a day for 4–5 times per year (140-fold), and playing rugby once every 3 weeks (530-fold difference). In statistical terms, based on moderate injuries, cycling is less dangerous than many recreational and every day activities. We conclude that fear of cycling in car-dependent New Zealand arises mainly from other causes than risk of injury, associated with the marginal status of cyclists on the public road.

1. Introduction

The New Zealand transport system is dominated by the use of private motor vehicles, despite heavy costs including congestion, air pollution, greenhouse emissions and poor health outcomes (Howden-Chapman et al., 2010). Many trips by motor vehicle could be replaced by walking and cycling – almost 20% of household trips are less than 2 km, and almost half under 6 km (O'Fallon and Sullivan, 2009; Povey, 2010). However cycling in New Zealand accounts for less than 2% of total time spent in travelling on roads (Ministry of Transport, 2015a) and the reason most frequently given for not using bicycles is the fear of injury (Legge and Landtroop, 2013).This is broadly true in other countries also, especially for women (Broache,2012; Garrard et al., 2008) Indeed, in the authors' experience proposals to expand cycling sometimes elicit the response that modern roads are so dangerous it is simply irresponsible to encourage use of the bicycle.

How common is injury from road crashes among those travelling by bicycle in New Zealand? And how does the risk of such injuries compare with the risk of injury due to familiar recreational and day to day activities? Fear of a bad outcome, whatever the cause, has many explanations, amongst which the statistical likelihood of an event is just one contributor. But this does not mean, in our view, that comparisons of statistical risk are irrelevant to transport planning. We suggest that close examination of the statistics may assist policy-makers and the general public to interpret and respond to risk, especially when probability of harm can be related to typical or familiar exposures.

David Nutt attempted to illustrate the wide spread of risks associated with psychotropic drugs, both legal and illegal, by comparing the probability of serious ill-effects per standard dose with the risk of injury during a typical day of horse-riding

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(Nutt, 2009). We have taken this approach further, comparing the risk of injury of cycling on the road with that due to other common activities, based on what we characterise as familiar or typical exposures in New Zealand.

2. Methods

We calculated the risk of injury per typical exposure to an activity as the number of injuries per year divided by the number of people at risk and frequency of exposure. In this study we focused on moderately severe injuries sufficient to cause a visit to a hospital emergency room. We also calculated risk in terms of the number of claims in 2013 to the government-funded Accident Compensation Corporation (ACC), which covers injury-related treatment and rehabilitation costs for everyone (including visitors) in New Zealand.

In this study, we compared cycling with do-it-yourself (DIY) activities at home, horse riding, quad bike riding, rugby union and snow sports (skiing and snowboarding). These were chosen because they are common activities in New Zealand, for which data are available on both outcome (injuries and claims) and exposure (frequency and duration).

Exposure to risk of injury was estimated from a variety of data sets. The proportion of "regular" cyclists (those who ride a bike once a week or more often) was based on an Auckland survey (Legge and Landtroop, 2013) and the New Zealand Household Travel Survey (Ministry of Transport, 2015c). The nominated common or typical "dose" of cycling (30 m, three times a week) was based on the same sources, and a cohort study of New Zealand cyclists (Thornley et al., 2008). Exposure to risk of injury in the home drew on a PhD study of "do it yourself" home improvements in New Zealand (Mackay, 2011). Information on the frequency and duration of horse-riding came from a national study of equestrian injuries (Northey, 2003). We assumed that everyone working in a farm-related occupation in New Zealand was at risk of a quad bike injury – the annual frequency of injury was estimated from a study of loss of control events in a sample of agricultural workers (Milosavljevic et al., 2011). A longitudinal study of injury among New Zealand rugby union players provided data on injury rates and playing times (Chalmers et al., 2012), while the total number at risk was estimated from a national survey of participation in sports (Sport New Zealand, 2005). The same national survey provided information on numbers exposed to risk of snow sports injury, and the typical annual "dose" of snow sports, for those who participate in such activities, came from an American study of visits to ski fields (Vanat, 2014).

Most of the injury data refer to the period between 2004 and 2013, including cycling (2013), DIY at home (2009), quad bike (2011), rugby union (2004) and snow sports (2009). Recent data for horse riding were not available. We assumed the rate of these injuries was unchanged from an earlier period (1993–2001). Data on the number of people at risk were adjusted for population change using the national census (Statistics New Zealand, 2016). We took injury hospitalization data for a particular cause (such as cycling) and estimated visits to emergency departments (ED) on a pro rata basis, according to the ratio of all ED visits due to all categories of injury to total injury hospitalizations (Ministry of Health, 2015, 2016). We contacted two ACC analysts separately in extracting the number of injury-related new claims as a quality check. The data sources and definitions of injury and exposure are shown in Table 1.

We presented the risks of injuries and ACC claims per million exposures using a log-scale diagram and calculated the 95% approximate Poisson confidence intervals (Dobson, 1991).

3. Results

The overall patterns of risks of injuries and ACC claims were more or less similar in magnitude (Table 2).

A typical exposure to cycling (which we defined as a half hour trip 3 times a week) was 1.2 to 2.2 times safer than DIY, 1.3 to 5.3 times safer than horse riding (1.5 h twice a week), 60 to 140 times safer than skiing (half a day, 4–5 times per year), and 460 to 530 times safer than rugby (one game every three weeks) (Fig. 1).

4. Discussion

The figures we report here are not precise measures. They include many approximations and assumptions, and for this reason should be treated as no more than a guide to risk relativities. It is often difficult to quantify exposure to risk of injury since frequency and duration of activities are usually not well documented and are highly variable. For example, in many sports the player's competitive level influences both the amount played and rates of injury (Parkkari et al., 2004). Our comparisons are limited to injuries in the broad categories of "sufficient to cause a vist to an ED" and "sufficient to give rise to a claim to ACC". We do not consider fatal injury, which may have an effect out of proportion to numbers, on perceptions of risk. Also, we have not accounted for other impacts on health than injury, although these mostly weigh heavily in favour of the bicycle. (Numerous studies report that health gains from increased physical activity exceed by a wide margin detrimental effects of injury and air pollution (Mueller et al., 2015)) We have not allowed, in comparisons between activities, for the effects of variables such as age and gender, which correlate with risk-taking in snow sports and road use, for instance. Better estimates of risk comparisons will come from large cohorts that include detailed assessments of cycling and other activities, coupled with standardized outcome measures.