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Accident rates amongst regular bicycle riders in Tasmania, Australia

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ABSTRACT

Purpose: To characterise the demographics, cycling habits and accident rates of adult cyclists in Tasmania.
Methods: Volunteers ≥18 years of age who had cycled at least once/week over the previous month provided information on demographics; cycling experience; bicycles owned; hours/km/trips cycled per week; cycling purpose; protective equipment used; and major (required third-party medical treatment or resulted ≥1 day off work) or minor (interfered with individuals' regular daily activities and/or caused financial costs) accidents while cycling.
Results: Over 8-months, 136 cyclists (70.6% male) completed the telephone survey. Mean (standard deviation) age was 45.4 (12.1) years with 17.1 (11.4) years of cycling experience. In the week prior to interview, cyclists averaged 6.6 trips/week (totalling 105.7 km or 5.0 h). The most common reason for cycling was commuting/transport (34% of trips), followed by training/health/fitness (28%). The incidence of major and minor cycling accidents was 1.6 (95% CI 1.1–2.0) and 3.7 (2.3–5.0) per 100,000 km, respectively. Male sex was associated with a significantly lower minor accident risk (incidence rate ratio = 0.34, $p = 0.01$). Mountain biking was associated with a significantly higher risk of minor accident compared with road or racing, touring, and city or commuting biking ($p < 0.05$).
Conclusions: Physical activity of regular cyclists' exceeds the level recommended for maintenance of health and wellbeing; cyclists also contributed substantially to the local economy. Accident rates are higher in this sample than previously reported in Tasmania and internationally. Mountain biking was associated with higher risks of both major and minor accidents compared to road/racing bike riding.

1. Introduction

Over half of Australian adults are not achieving the daily physical activity target of 30 min per day, recommended by the Australian Government's Department of Health & Ageing (Econtech, 2007). Cycling is a practical, cost-effective way of achieving the 30 min of daily physical activity target (DHA, 1999). Throughout Australia, state and local governments have conveyed a desire to increase the rate of cycling participation as a means of increasing physical activity, improving the general health of the population and reducing the $1.5 billion per year costs to the health system attributed to physical inactivity (Austroads, 2010; Premier's Physical Activity Council (PPAC), 2011). In addition, increased use of cycling for transport and reduction in the number of car journeys would have a beneficial effect on the environment by reducing carbon emissions (Hartog d et al., 2010).

Australian studies that have investigated bicycle accident rates to date have typically reported accident rates on a *per capita* exposure basis, and have recognized the limitations of not being able to calculate accident rates as a factor of risk exposure, expressed as accident rates per kilometre or hour cycled (Sikic et al., 2009; Gavin et al., 2005). *Per capita* exposure is attractive due to ease of derivation and comparability across risk settings, but limitations include failure to indicate the magnitude of time/kilometres exposed to a particular risk, as well as failure to account for the number of people in the population who are at risk. It is also recognized that there are relatively limited sources of this denominator data and the data requirements are much more demanding, especially when investigating small groups such as cyclists (Garrard et al., 2010).

The purpose of this study was to gather information on the demographics and key behaviours of Tasmanian adults who cycle regularly, and to subsequently calculate accident rates expressed per kilometre/hour or trip exposed. The results will establish baseline values to which future studies can be compared to assess the impact of changes in cycling infrastructure, built environment, driver education/attitudes or other interventions that may affect the safety of cycling on cycling accident rates.

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2. Methods

A survey of regular Tasmanian cyclists was conducted over an 8-month period from July 2011 to March 2012, inclusive. A regular cyclist was defined as someone who had cycled at least once a week for the month prior to participation in the study.

2.1. Sources of data

Volunteer study participants were recruited through e-mails and newsletters from cycling clubs, cycling organisations and cycling event organisers, and by advertising in bicycle shops. Approximately 700 emails were sent directly to cyclists requesting participation.

Participants completed a telephone interview and computer-assisted questionnaire, developed in collaboration with key stakeholders (including Hobart City Council, Tasmanian State Government Department of Infrastructure, Environment and Resources) and local interest groups, including Cycling South and Bicycle Tasmania (Tasmanian bicycle advocacy groups), and members from 3 Tasmanian cycling clubs. The questionnaire was custom designed using Limesurvey (Pucher and Dijkstra, 2003) software. The information provided was de-identified and stored in a database on a password protected secure-server.

2.2. Survey

In addition to basic information on participant demographics (age, sex and income bracket) participants provided information on their cycling experience: age when they first acquired a bicycle, years they had been cycling regularly (≥once per week) and the purpose of their cycling trips (commuting, recreation, exercise, racing, mountain biking (downhill), mountain biking (cross-country), distances and trips and other) and how many bicycles they owned. They were also asked whether they had a licence for and/or owned a motor vehicle.

For each bicycle owned, participants provided information on the type of bicycle, the trips taken, the purpose of the trip (transport/commuting, training/racing, or recreational), the distance (km), and time (hours) spent cycling in (1) the week prior to interview, (2) a typical week 12 months prior to the interview, and (3) a typical week 5 years prior to the interview. A trip was defined as an uninterrupted journey regardless of the distance, e.g. a ride to and from work would be 2 trips. If the participant made a stop on the way home from work (gym/supermarket etc.), this would count as an additional trip, as per the Cycling Data and Indicator Guidelines and cycling participation surveys (Cook and Sheikh, 2003; Austroads, 2011). Information was also collected on the type of personal protective equipment worn when each bicycle was used and the costs associated with each bicycle, such as insurance and the cost of maintenance and equipment for each bicycle in the year preceding the survey.

Participants were asked for details of any major or minor accidents, in the 5 years or 12 months prior to the survey, respectively. A major accident was classified as being one that required third-party medical treatment (e.g. visits to a general practitioner, physiotherapy, emergency department or hospitalisation) and/or resulted in the participant taking time off at least one full day work as a direct result of the accident. A minor accident was classified as an accident that interfered with the individuals' regular daily activities and/or gave rise to some financial costs without requiring medical treatment or days off work. As such, a cycling accident that caused the individual to be late to work without missing a full day of work was classified as a minor accident.

Accident rates were stratified by sex and age of the participant, type of bicycle used, and the purpose of the trip at the time of the accident. The survey instrument was piloted on an initial group of 10 volunteers.

2.3. Statistical analysis

Descriptive statistics for demographics and cycling habits of participants are presented. Incidence rates for minor and major accidents are expressed as the number of accidents per 100,000 km cycled.

Poisson regression analysis model was used to determine the association between the risk factors and minor or major accidents (Frome and Checkoway, 1985). Due to the low sample number, the bicycle types were grouped into 3 categories in order to fit a Poisson regression model: (1) road or racing bike, touring bike, city or commuting bike; (2) mountain bike; and (3) other bikes. Specifically, BMX was not included in the regression analysis because there was no self-reported accident occurred. Incident rate ratio (IRR) along with 95% confidence intervals (CI) were calculated, with statistical significance was defined as a p-value ≤ 0.05 (two-tailed). All statistical analyses were conducted using Stata, version 12.0 (StataCorp, College Station, Tex, USA).

2.4. Ethics review

The study was approved by the Tasmanian Social Science Human Research Ethics Committee.

3. Results

3.1. Study participants

Demographics of study participants are presented in Table 1. The majority of participants were male, aged 40–49, owned a registered car, had a driver's license, and rode their bicycle to work/school/university. About half had competed in a cycling race, and one-third had completed a training course, such as bicycle maintenance, riding technique or road safety course.

The mean number of bicycles owned was 2.5 (SD *1.2; range 1–6*) per person, with a mean value of $1954 (SD *2009; range 0–12,000*) per bicycle. The most common types of bicycles owned were road or racing bikes (n = 134; 39.1%), followed by mountain bikes (n = 111; 32.2%), touring bikes (n = 23, 6.7%), city/commuting bike (n = 18, 5.2%) and BMX bikes (n = 4, 1.2%). The remaining 15.7% (n = 54) included hybrid, time trial and folding bikes.

3.2. Cycling behaviours

Weekly and monthly cycling habits of study participants are presented in Table 2. Based on the time spent cycling, the most common reason for cycling was for commuting/transport, followed by training for health and fitness, then recreation. At the time of the survey, participants spent an average of 45.1 min (SD *43.2*; *range 2–341*) minutes riding per day.

The time, distance cycled at the time of the survey was less than that reported in a typical week 12 months prior to taking the survey, but more than 5 years prior (Table 2). Participants mostly rode alone, but when riding in company, cyclists were most often configured in single file. The proportion of participants who used a bicycle to get to work/school/university was inversely associated with the distance travelled. Participants who cycled 90% or more of the time lived on average 12.0 km (SD *8.1; range 4–50*) from work/school/university, compared to 18.9 km (SD *12.7 km; range 4–70*) for participants who cycled between 50% and 90% of the time and 23.1 km (SD *12.5 km; range 5–52)* for participants who cycled less than 50% of the time. Those who never cycled to work/school/university lived on average 26.0 km (SD *28.2 km;*