

Does the Australian Bureau of Statistics Method of Travel to Work data accurately estimate commuter cycling in Australia?

Jake Olivier^{1,2}, Mahsa Esmailikia^{1,2}, Marilyn Johnson^{3,4}, Ben Beck⁵, Raphael Grzebieta^{2,6}

¹*School of Mathematics and Statistics, University of New South Wales, Sydney, Australia*

²*Transport and Road Safety Research Centre, University of New South Wales, Sydney, Australia*

³*Institute of Transport Studies, Faculty of Engineering, Monash University, Melbourne, Australia*

⁴*Amy Gillett Foundation, Melbourne, Australia*

⁵*School of Public Health and Preventive Medicine, Monash University, Melbourne, Australia*

⁶*Victorian Institute of Forensic Medicine, Monash University, Melbourne, Australia*

Corresponding Author: Jake Olivier, School of Mathematics and Statistics, University of New South Wales, Sydney NSW 2052, Australia, E-mail: j.olivier@unsw.edu.au, Phone: +61 2 9385 6656

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Key Findings

- Method of Travel to Work data is collected for Australian Census Day every 5 years;
- MTWP data has been used to estimate Australian cycling;
- It is unclear if MTWP accurately estimates Australian cycling;
- No change in MTWP cycling data among active transport users from before to after bike helmet laws;
- Estimated changes after helmet laws are heterogeneous at the state/territory level.

Abstract

The Australian Census of Population and Housing includes a responder's Method of Travel to Work for Persons (MTWP) on Census Day. With some exceptions, responders can select multiple modes of transport. In Australia and overseas, this data has been used to estimate mode share and the proportion of Australians who utilize various active transport modes. This is especially true for cycling as there are scant data sources for Australian cycling exposure. The aims of this paper are to discuss weaknesses of MTWP data and the appropriateness of MTWP data to estimate cycling in Australia, and to assess changes in MTWP data relative to the introduction of bicycle helmet legislation. The use of MTWP data to estimate Australian cycling is limited due to: (1) data collection occurring on single days in winter once every five years, (2) it is not possible to identify a primary mode of transport, and (3) the 1976 data was not a full enumeration. MTWP data estimates about 1.5% of Australians cycle while other data sources are much higher ranging from 10% to 36%. With regard to bicycle helmet legislation, comparisons were made for each state/territory for the census immediately preceding helmet legislation and the following census. Overall, the proportion of cyclists among active transport users is similar from pre- to post-legislation (relative change=+1%, 95% CI: -13%, +18%), although all but two states/territories estimate an increase in cycling. In conclusion, the Australian government should invest in routinely collecting high-quality mobility data for all modes of travel to assist in the decision-making and assessment of road safety policies.

Keywords

Cycling exposure, Cycling mode share, Census data, Bicycle travel, Cycling temporal patterns, Bicycle helmet law

Introduction

The Australian Bureau of Statistics (ABS) has collected data on the Method of Travel to Work for Persons (MTWP) since 1976 with observations occurring five years apart and on a single day of the year (ABS, 2012; Mees & Groenhart, 2012). The Census Day has varied from the end of June prior to the 1991 census and then to early August for all subsequent censuses (see Table 1).

For the 2011 census, the question read "How did the person get to work on Tuesday, 9 August 2011?" (see Figure 1). Responders can mark either train, bus, ferry, tram (including light rail), taxi, car – as driver, car – as passenger, truck, motorbike or motor scooter, bicycle, walked only, worked at home, other, or did not go to work. Multiple responses are allowed and recorded in the order written on the form. The responses "did not go to work", "worked at home",

Table 1. Australian Census Day (1976-2011)

Census Year	Census Day	Day of Week
1976	29 June	Tuesday
1981	29 June	Monday
1986	30 June	Monday
1991	6 August	Tuesday
1996	6 August	Tuesday
2001	7 August	Tuesday
2006	8 August	Tuesday
2011	9 August	Tuesday
2016	9 August	Tuesday

and “walked only” are not meant to be part of a multiple response (ABS, 2012). When this occurs, a single response is recorded with preference in the order given above. For example, someone responding with “did not go to work” and “walked only” is recorded as “did not go to work”.

The MTWP data has been used to describe temporal patterns in Australian capital city commuter travel since 1976 (Mees, Sorupia & Stone, 2007; Mees & Groenhart, 2012). In these reports, cycling to work is considered negligible with the notable exception of Canberra.

Additionally, the MTWP bicycle data has been used in a cycling “league table” that compares cycling participation

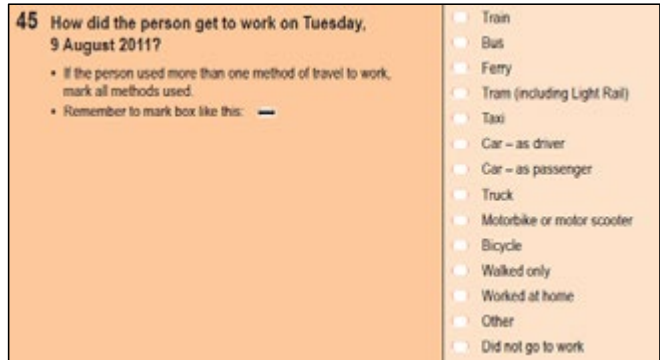


Figure 1. Question 45 from 2011 Census Household Form

between countries (Pucher & Buehler, 2008). Australian bicycle trips are presented as being uncommon compared to select European countries, while having similar cycling participation to North American countries, Ireland and the UK (see Figure 2).

On several occasions, the MTWP bicycle data has been used to advocate for the repeal of bicycle helmet legislation (BHL). Figure 3 includes examples from Wikipedia (2019), online news outlets (Alter, 2014; Rachele, Badland & Rissel, 2017), anti-helmet advocacy websites (Freestyle Cyclists, 2014; Gillham, 2019), and submissions to government inquiries (Clarke, 2015). In each instance, the message conveyed is that bicycle helmet legislation has deterred cycling in Australia.

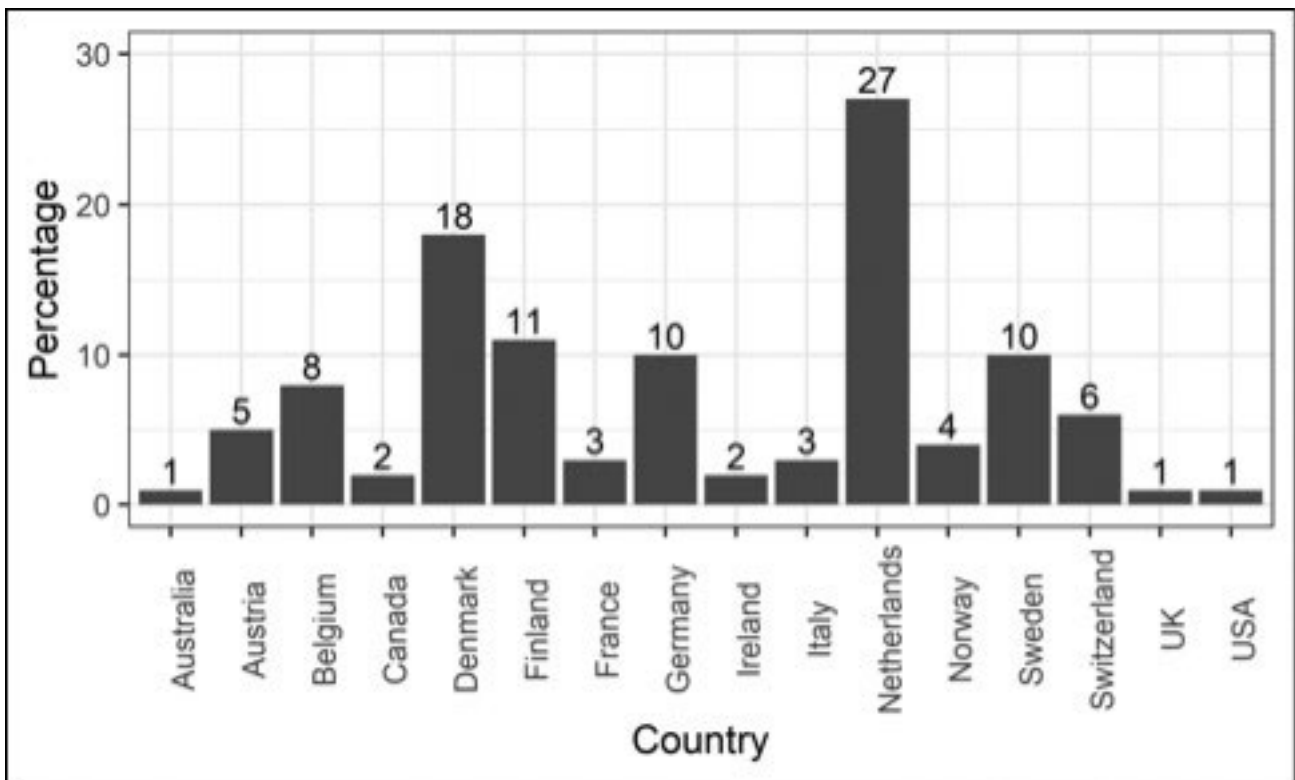


Figure 2. Reported percentage of trips by bicycle (source: Pucher & Buehler, 2008)

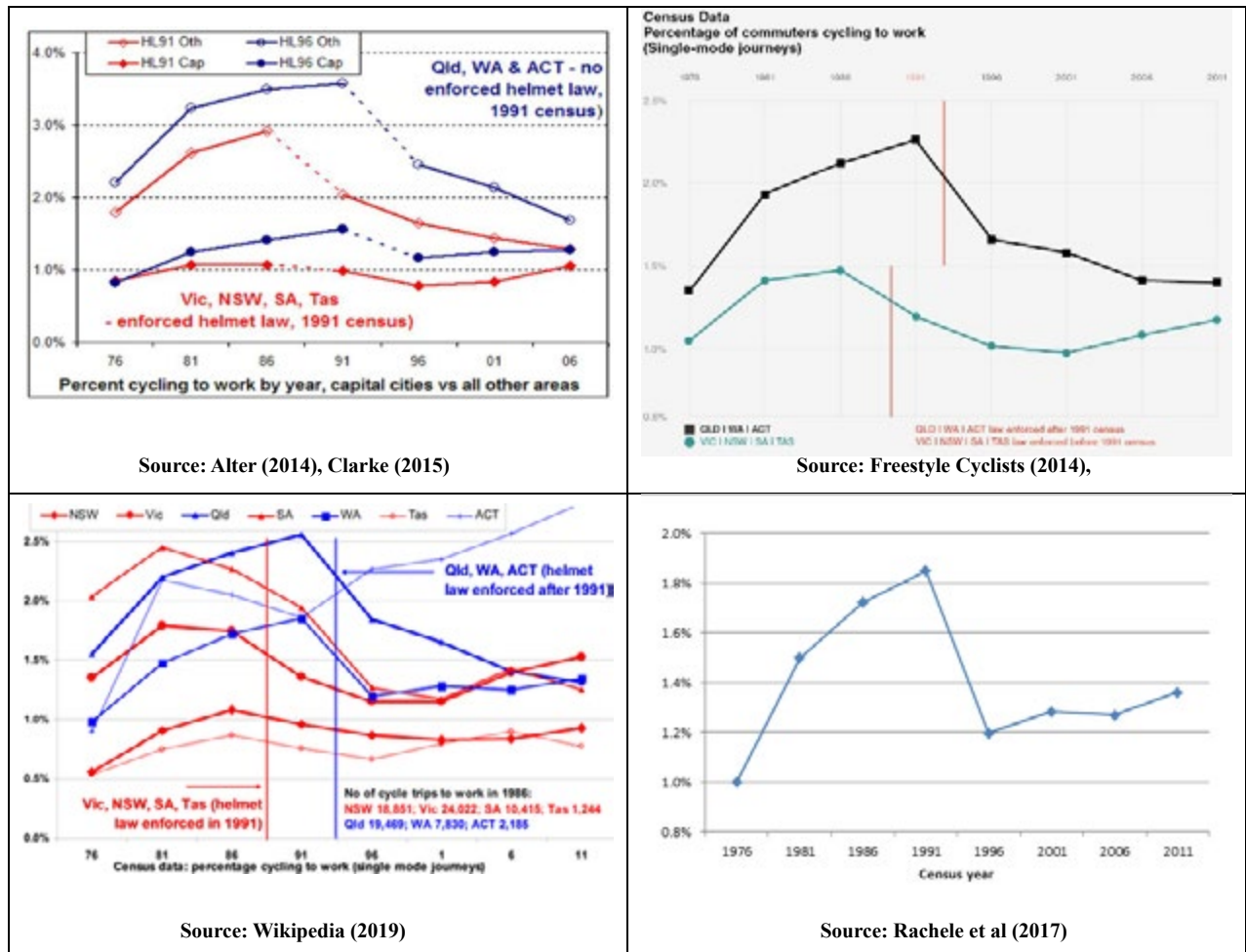


Figure 3. Examples of using MTWP data to advocate for repeal of Australian bicycle helmet legislation

Although often presented as yearly aggregated data, the MTWP data is collected for single days with repeated observations 5 years later. That is, from 1976-2016, nine days of data were collected and not 40 years' worth. The Census Day has always occurred in Australian winter, which may impact on the generalisability of the results to the adult population across an entire year. The change in Census Day from late June to early August makes comparisons between the 1976-1986 and 1991-2016 censuses tenuous. The data collection (single days in winter) make it impossible to account for day of the week, monthly or seasonal variation. Further, the MTWP captures travel to work for adult Australians and, therefore, cannot be an accurate representation of all types of cycling by all Australians.

Since MTWP allows for multiple response, it is not possible to identify a responder's "main mode" of travel (Olivier, Esmailikia & Grzebieta, 2018). For example, a person who rides their bicycle to a train station, travels on the train with their bicycle, and then cycles the remaining distance to work would always be recorded as "train, bicycle". This would be the same response for any trip where train and bicycle travel were combined irrespective of trip distance or time spent in either travel mode (e.g., ride from home to the train station and leave bicycle locked at the station). Some authors

focus on those travelling by bicycle only (e.g., Gillham, 2019); however, this approach miscategorises those who combine cycling with other transport modes as non-cyclists. Rain, temperature and wind speed could also influence MTWP data, although any analysis would have difficulty in reconciling weather data collected at approximately 900 sites to the six Australian states and two territories.

The 1976 Australian Census did not include a full enumeration or count (ABS, 2005a). Due to budgetary constraints, a full count was performed only on age, sex, marital status and birthplace (ABS, 2005b). For all other questions including MTWP, a 50% sample was processed, and a post-census assessment found undercounting was higher for the 1976 Census than previous ones. That is, it is unlikely the 1976 MTWP data is an accurate representation of those travelling to work on Census Day.

Travel modes using MTWP data are often represented as a proportion of those travelling to work on Census Day, often called modal share. Note the MTWP cannot be used as a measure of modal share in the strictest sense as not all trips are enumerated. Representing this data as a proportion can also hide temporal patterns. For example, the numbers of cyclists could increase from one Census Day to the next, but

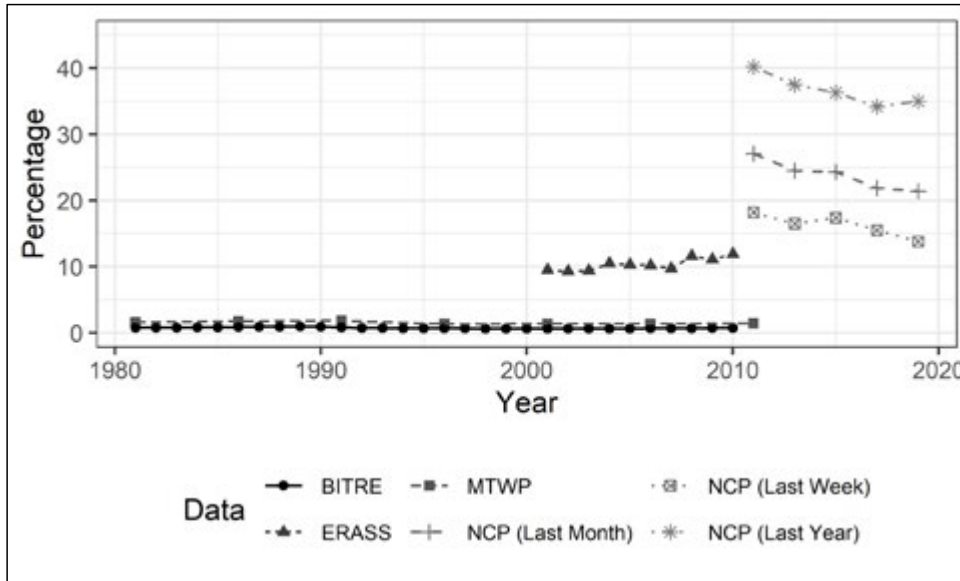


Figure 4. Estimated proportion of Australians who ride a bicycle (sources: BITRE, 2012; ABS, 2011; ASC, 2010; Munro, 2019)

the mode share could decrease if increases were larger in other travel modes. In that case, a decline in mode share does not necessarily imply less cycling but could be interpreted as an increase in cycling that did not keep pace with other travel modes.

The aims of this study are to highlight the often unreported weaknesses in the MTWP data, discuss the accuracy of MTWP data to estimate Australian cycling, and to assess the validity of whether the MTWP bicycle data supports the claims bicycle helmet legislation deters cycling.

Australian Cycling Data

MTWP data has been provided by the Australian Bureau of Statistics for years 1976-2001 while data for 2006 and 2011 were extracted from the ABS website. The 1976 data was excluded since only a 50% sample was counted.

As discussed, it is not possible to identify a responder’s “main mode” of travel, while focusing on single mode travel miscategorises those involved in multimode travel. Since the purpose of this study is to assess changes in MTWP cycling data, transport modes were defined as using a bicycle for any leg of travel (Bicycle), walking only (Walking), the use of a bus, ferry, train or tram for any leg of travel except when a

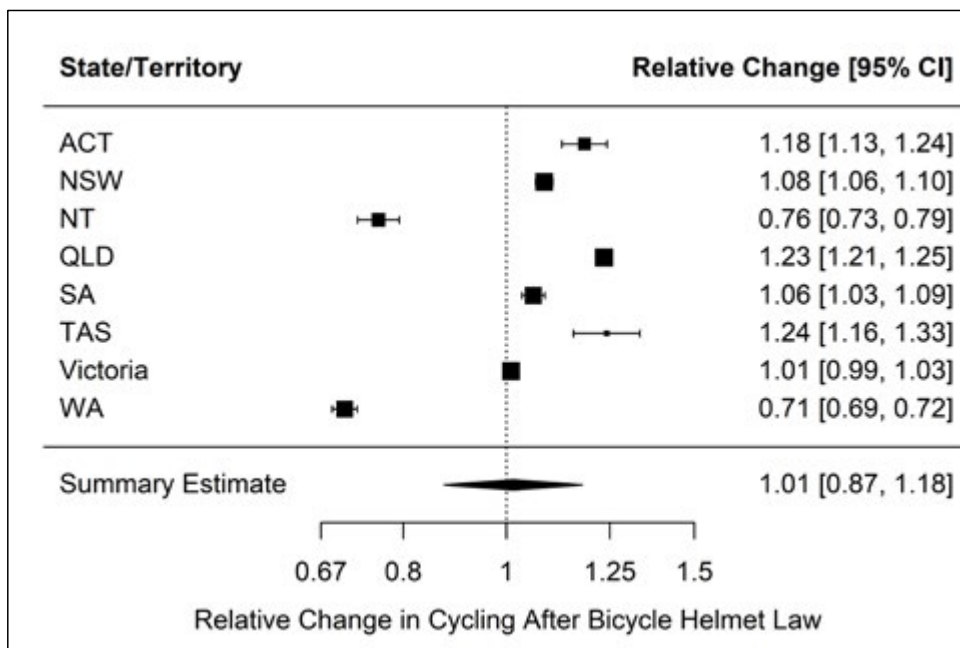


Figure 5. Forest plot of relative change in cycling to work following bicycle helmet legislation among active transport modes by state/territory

bicycle was used (Public Transport), and the use of a car or truck when neither a bicycle or public transport were used for any leg of travel (Vehicle). The total travellers exclude those who did not go to work, worked at home, or whose mode of travel was unknown.

There are very few data sources for Australian cycling, and data that does exist has not been collected routinely using a standard methodology. In addition to MTWP, the available Australian-wide data sources include the Participation in Exercise, Recreation and Sport Survey (ERASS) (Australian Sports Council, 2010), the Australian National Cycling Participation Survey (NCP) (Munro, 2019), kilometres travelled in capital cities (BITRE, 2012; Cosgrove, 2011), and Day-to-Day Travel in Australia (Adena & Montesin, 1988). For comparisons with MTWP data, ERASS, NCP, BITRE and Day-to-Day Travel in Australia summary data were extracted from their respective reports.

MTWP and Australian Cycling

Australian bicycle travel as a percentage of responses for each data source is given in Figure 4. A notable exception is the Day-to-Day Travel survey which collected data over a 13-month period in the mid-1980's and, to date, has not been repeated. The NCP data provide estimates for those cycling in the past week, month and year with each included in the figure, while ERASS data are proportions cycling in the past year for exercise, recreation or sport only. BITRE data are estimated from several data sources (Cosgrove, 2011) including MTWP data, so they are likely to provide similar estimates.

The differences in the average proportions cycling between the data sources is large. MTWP data estimates about 1.5% of Australians cycle (when cycling is examined for one day every 5 years) while other data sources are much higher ranging from 10% to 36% (when cycling is examined over extended periods such as a year). This can be partially explained by differences in data collection methods and the types of cycling that are captured. However, such differences make it difficult to accurately estimate cycling across Australia and, therefore, how Australia compares internationally. For example, when contrasted with the Pucher and Buehler (2008) league table, Australians cycling would rate highly according to ERASS or NCP (last week) surveys instead of MTWP data.

MTWP and Bicycle Helmet Legislation

The MTWP data has been organised by state or territory since bicycle helmet laws were enacted at those levels (Esmailikia, Grzebieta & Olivier, 2018). As discussed, MTWP data cannot accurately estimate temporal trends in cycling and, in particular, it is not possible to estimate the pre-helmet law trend as data exists for only two Census Days for most states. Additionally, changes in cycling may be part of other changes in active transport modes (i.e., cycling, walking, public transportation). To account for these issues, comparisons of the proportion of cyclists among active transport users are made using the census immediately preceding bicycle helmet legislation and the following

census by state/territory. The summary results are given in Figure 5.

The proportion of cyclists among active transport was similar from pre- to post-bicycle helmet legislation in Australia (RR (rate ratio) = 1.01, 95% CI: 0.87, 1.18). There was an estimated increase for all states/territories except for the Northern Territory and Western Australia. Both jurisdictions introduced BHL after the 1991 census date and their decline could be due to a general reduction in cycling across Australia as reductions were observed from the 1991 to 1996 censuses for all other jurisdictions except the ACT. Additionally, there were large increases in the use of public transportation since the 1996 census for many jurisdictions which could indicate a shifting among active transport modes. The observed reduction in WA could also be an artefact of the inaccuracies of MTWP data as stratified random sampling surveys at this time did not estimate a reduction in cycling (Olivier, Boufous & Grzebieta, 2016).

Overall, the numbers who reported using a bicycle for travel to work prior to any helmet legislation was 92,517 in 1986 which increased to 104,470 in 1991 when most of Australia had helmet legislation. Cycling mode share increased slightly between these years as well from 1.74% to 1.84%.

Discussion

There are very few data sources for cycling in Australia. The Australian Method of Travel to Work for Persons data may provide an accurate picture of travel to work on each Census Day, but this data is limited in answering other important bicycle-related questions. Further, when compared to other Australian-wide data sources, it is unclear how many Australians are cycling.

Accurate cycling data is important for health and infrastructure planning. Cycling exposure data helps us better understand the size of bicycle-related injury/fatality by helping explain changes in injury patterns that are not due to changes in injury risk. Better cycling data could be used to justify increased cycling infrastructure expenditures for areas with increased cycling. This last point highlights the need for localised data that is not possible with highly aggregated, nation-wide estimates. For example, although the MTWP data estimate 1.7% of Victorians cycled to work in 2011, an estimated 22% of City of Melbourne residents cycled in the past week in 2013 and cyclists constituted 16% of vehicle movements during morning commuting in 2017 (City of Melbourne, 2019). Although this comparison does not demonstrate the inaccuracies of MTWP data, it underscores the unsuitability of high level data for decisions made at localised levels such as building cycling infrastructure.

Routinely collected travel surveys are unfortunately not the norm. For example, Sweden has conducted only four in the past 30 years (Petersen et al, 2015), while Finland has conducted three (Radun & Olivier, 2018). In our opinion, the current best-practice country for cycling data collection is The Netherlands who have conducted yearly mobility surveys since the 1980's (SWOV, 2013). About 100 Dutch

residents per week are randomly selected and complete a travel diary over the following week. Data on trips and kilometres travelled are stratified by transport mode and age group.

Conclusions

Despite its limitations, MTWP data is often used as an estimate of cycling mode share. The use of this data is problematic for several reasons including: (1) single day observations in winter with sampling only every five years, (2) month of data collection changed when bicycle helmet laws were introduced, (3) not possible to identify a primary travel mode, (4) the 1976 data was not a census, and (5) representing the data as a proportion can hide temporal patterns.

When some of these issues are addressed (elimination of 1976 data and all bicycle travel counted), the MTWP data indicates a mixture of increasing and decreasing bicycle travel on Census Days over time. However, when contrasted with other cycling data, it is unclear whether MTWP data accurately captures cycling in Australia.

With respect to bicycle helmet legislation, the proportion of cyclists among active transport users was similar for Census Days before and after the introduction of these laws. However, caution should be exercised in interpreting these results in light of many limitations.

Australia needs to collect high-quality mobility data using a standard methodology on an annual basis. This data is vital to our understanding of how to make transport safer and to inform policymakers where often scarce resources should be applied.

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