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Title: Bicycle helmet law does not deter cyclists in Finland

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Abstract

Bicycle helmet legislation (BHL) in Finland went into effect in January 2003 and applies to cyclists of all ages. There are no mechanisms to fine cyclists riding without a helmet; however, helmet wearing rates are 64% in Helsinki and 42% across Finland. Our aim was to discuss possible effects of BHL on cycling in Finland. We used data from the 1998/1999, 2004/2005 and 2010/2011 Finnish National Travel Surveys. Data across three surveys suggest cycling has declined from before to after BHL. In a 2004/2005 survey, however, only 0.063% (95% CI: 0.02-0.10%) of responders identified helmet use as their most important obstacle to cycling. It is unlikely BHL is a causal factor in the downward trend in Finnish cycling. Lack of cycling infrastructure and concerns for safety are much more common reasons given.

Key words: Enforcement, Helmet, Bicycle, Surveys, Traffic law

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INTRODUCTION

Bicycle helmet use has been shown to be an effective strategy for reducing head and face injury in a crash and the estimated benefit increases with the severity of injury (Attewell, Glase and McFadden 2001; Olivier and Creighton 2017; Thompson, Rivara and Thompson 2000). Some authors have been critical of bicycle helmet effectiveness studies while suggesting helmet use increases neck injury or rotational acceleration (Curnow, 2003); however, these hypotheses have not been supported by subsequent research (Olivier & Creighton, 2017). Accordingly, 26 countries have introduced bicycle helmet legislation (BHL) in order to increase helmet use among cyclists (Esmaeilikia, Grzebieta and Olivier 2017). These laws differ in terms of the cyclist's age and level of enforcement.

The Finnish law went into effect in January 2003 and applies to cyclists of all ages. Surveys have indicated increases in helmet use in Helsinki (prevalence of 16% in 1993, 40% in 2002, 64% in 2016; City of Helsinki 2016; Figure 1) and in the whole of Finland (4% in 1990, ~22% for 1996-2002, 42% in 2016; Finnish Road Safety Council 2017; Figure 1) following the introduction of the helmet law. Increased helmet wearing is consistent with an effective helmet law; however, other factors such as fewer cyclists cannot be ruled out.

[Figure 1 near here]

There is an ongoing international debate regarding whether BHL reduces cycling (Robinson, 2006; Olivier et al, 2014). Cycling is considered a healthy activity (Johan et al. 2010) and there is concern the benefits of cycling will be lost if it is replaced with an inactive mode of transport (Adams and Hillman 2001). The impact of the Finnish helmet law on cycling has not previously been accessed in the literature.

The Finnish helmet law includes the qualifier *yleensä* which translates to either "usually" or "in general". The wording of the law has made typical enforcement methods difficult to implement and, in 2017, a repeal of the law was proposed, in part, due to the vague wording (Finnish Government 2017). The Government also believed the law would prove problematic for existing and future bicycle-share schemes and cited research suggesting that such laws deter cycling and thus supposedly reduce the health benefits of cycling.

The aim of this brief report is to discuss possible impact of the Finnish BHL on cycling. In particular, we examine trends in estimates of cycling exposure (distance and time travelled, number of trips) before and after BHL and reported obstacles to cycling in the year following BHL.

METHODS

We used data from the 1998/1999, 2004/2005 and 2010/2011 Finnish National Travel Surveys. These surveys involve Finns over the age of six years but exclude residents of Åland (Finnish Transport Agency 2002). Data were collected by telephone interview. The initial sample was drawn from the population register and included 18,250 responders in 1998/1999, 20,075 responders in 2004/2005, and around 20,000 responders in 2010/201. Response rates were 64%, 65% and 56% for those years, respectively. Participants were chosen by stratified random sampling (e.g., sex, age and place of residence in the 2004/2005 survey) with oversampling to ensure reliable results in low population density areas with large exposure variability. Sampling weights were estimated in accordance to the survey design to ensure the results are representative of the Finnish population. More information about the survey methodology can be found in the final reports for each survey available on the Finnish Transport Agency website (http://www.liikennevirasto.fi/tilastot/henkiloliikennetutkimus/julkaisut).

For all three surveys, we extracted aggregated data on distance travelled (km/person/day), number of trips (trips/person/day), and time travelled (min/person/day) by bicycle from the PC-Axis table (HLT1KULK980410) on the Finnish Transport Agency webpage (http://www.liikennevirasto.fi/tilastot/henkiloliikennetutkimus/itsepalveluanalyysit). Additionally, as we had access to complete 2004/2005 survey data, we report results regarding questions concerning the reported primary obstacles to using various modes of transport, including cycling. Participants were asked to indicate the "most important obstacle or problem limiting travel by bicycle." Multiple responses were not allowed.

For our purposes, responses for the most important obstacle to cycling have been categorized as "no obstacles," "uncontrollable issues" (long distances, poor weather, old age, illness, injury, disability, cycling is slow), "miscellaneous" (no bicycle, bicycle broken, need to transport things, exercise makes you hot, laziness, self-comfort, other), "lack of infrastructure" (bicycle parking, lack of cycling paths/lanes, road crossings, signage for walking/cycling), "concerns for safety" (risk of injury, lack of safety, bicycle theft), and "helmet". This categorization was similar to a recent publication on obstacles to cycling (Olivier, Boufous and Grzebieta 2016).

RESULTS

Cycling exposure data for each survey are given in Table 1. The number of daily bike trips per person decreased by 23% and kilometres travelled decreased by 21% from the 1998/1999 to the 2010/2011 surveys. The results from the 2004/2005 survey are consistent with the downward trend.

[Table 1 near here]

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The estimated proportion of the Finnish population by each important obstacle to cycling from the 2004/2005 survey is given in Figure 1. Only nine out of the 13,386 people surveyed (0.063%, 95% CI: 0.02-0.10%), indicated helmet use to be their most important obstacle. Most responders (58%, 95% CI: 57.3-59.0%) reported no obstacles, but 4% and 2% cited lack of infrastructure and concerns for safety, respectively (infrastructure, 95% CI: 3.4-4.1%; safety, 95% CI: 1.9-2.3%). Curiously, although Finland has an average July temperature of 13-17°C, "exercise makes you hot" (n=12) was a more common response than helmet use.

[Figure 2 near here]

DISCUSSION

Cycling in Finland has steadily declined from the late 1990's to the early 2010's. Those opposed to helmet legislation often stress that cycling has declined in Finland while suggesting the helmet law was a causal factor. However, this claim is unsupported by the self-reported most important obstacles to cycling derived from the 2004/2005 National Travel Survey.

Immediately following the helmet law in Finland, an estimated 42% of Finns aged six years and older reported that they were deterred from cycling, but only 0.063% of all responders gave helmet use as the most important reason for not cycling. This result is consistent with findings in Australia (Olivier, Boufous and Grzebieta 2016) and Canada (Dennis et al, 2010; Macpherson, Parkin and To 2001), while a US study found mixed results (Kraemer 2016).

If the Finnish law was not responsible for the decline in cycling, there are other explanations to consider. One report found declines in both walking and cycling across all ages with the largest decline among 15-17-year-olds (Finnish Transport Agency 2002). During the study period, there were increases in moped and microcar travel for this age group (Finnish Transport Agency 2002).

On the other hand, the number of passenger cars in Finland increased by 20% between 1998 and 2005 and by 47% in 2010 (Statistics Finland 2017). Similar declines in cycling have been observed in European countries without BHL, such as the UK and Denmark (Cycling Embassy of Denmark 2010; United Kingdom Department of Transport 1999).

There are important limitations to this study. The self-reported reasons for not cycling may be inaccurate. However, the number of helmet responses would need to increase many fold for helmet legislation to be seen as a major barrier to cycling from this data. The accuracy of cycling exposure estimates is unclear as unit-record data were not available in the PC-Axis table and therefore standard error estimates could not be calculated. The surveys were conducted on only three occasions with only one pre-legislation observation. Therefore, it is unclear whether the reduction in cycling was part of an existing trend.

Regardless of possible alternative explanations, it would appear the Finnish bicycle helmet law is an unlikely reason for the reductions in cycling observed. The available Finnish data suggest other factors, such as cycling infrastructure, are more important obstacles to those who refrain from cycling.

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Table 1: Estimates of cycling exposure in Finland (1998/99, 2004/05, 2010/11)

	Cycling Exposure+		
Survey Years	Distance	Time	Trips
1998/1999	0.92	6.0	0.31
	Helmet law 1 January 2003		
2004/2005	0.84	4.7	0.27
2010/2011	0.73	3.8	0.24

+Cycling exposure measured in kilometres, minutes and number of trips per person per day

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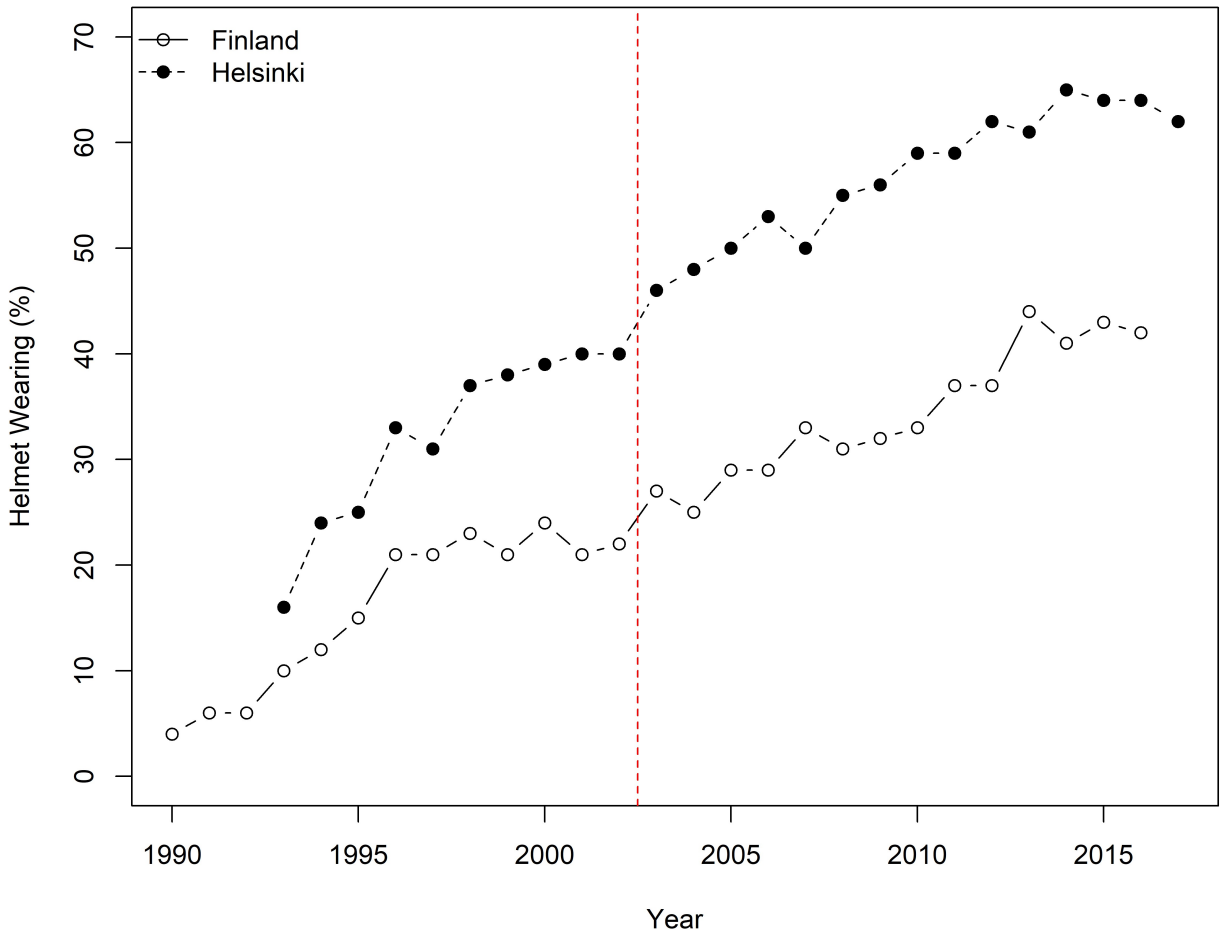


Figure 1. Prevalence of helmet use in Helsinki (Data supplied by City of Helsinki) and whole Finland (Finnish Road Safety Council, 2017).

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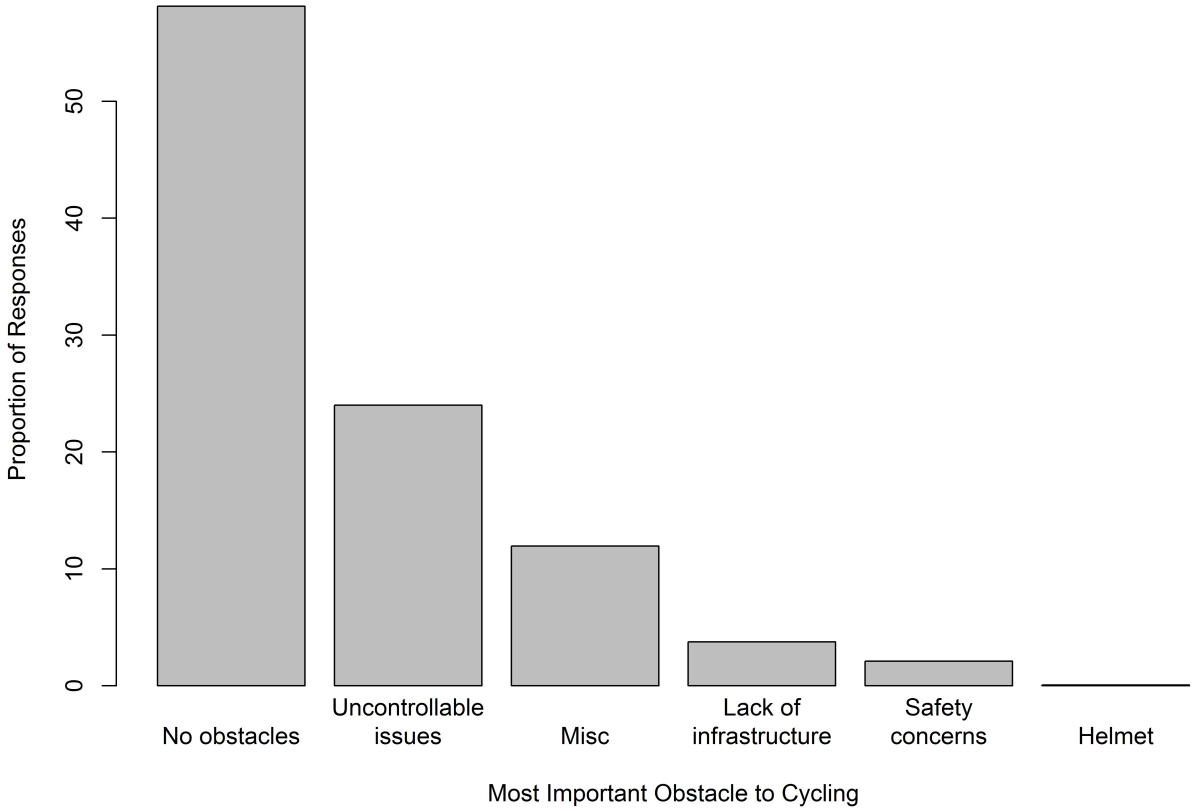


Figure 2. Proportions of responses for most important obstacle to cycling for Finnish population (6+ years)