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Commuting by bike in Belgium, the costs of minor accidents

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ABSTRACT

Minor bicycle accidents are defined as “bicycle accidents not involving death or heavily injured persons, implying that possible hospital visits last less than 24 hours”. Statistics about these accidents and related injuries are very poor, because they are mostly not reported to police, hospitals or insurance companies. Yet, they form a major share of all bicycle accidents. Official registrations underestimate the number of minor accidents and do not provide cost data, nor the distance cycled. Therefore related policies are hampered by a lack of accurate data.

This paper provides more insight into the importance of minor bicycle accidents and reports the frequency, risk and resulting costs of minor bicycle accidents. Direct costs, including the damage to bike and clothes as well as medical costs and indirect costs such as productivity loss and leisure time lost are calculated. We also estimate intangible costs of pain and psychological suffering and costs for other parties involved in the accident. Data were collected during the SHAPES project using several electronic surveys. The weekly prospective registration that lasted a year, covered 1187 persons that cycled 1,474,978 km. 219 minor bicycle accidents were reported. Resulting in a frequency of 148 minor bicycle accidents per million kilometres. We analyzed the economic costs related to 118 minor bicycle accidents in detail. The average total cost of these accidents is estimated at 841 euro (95% CI: 579–1205) per accident or 0.125 euro per kilometre cycled. Overall, productivity loss is the most important component accounting for 48% of the total cost. Intangible costs, which in past research were mostly neglected, are an important burden related to minor bicycle accidents (27% of the total cost). Even among minor accidents there are important differences in the total cost depending on the severity of the injury.

1. Introduction

The interest of policy makers in commuter cycling as a solution to a myriad of problems such as energy demand, climate change, air pollution, congestion and physical inactivity has recently increased (e.g. de Nazelle and Nieuwenhuijsen, 2010; Lusk et al., 2010). However, policies on a modal shift to active transport are hampered by a lack of accurate data and formal risk assessments. This article is part of the SHAPES-project (Berghmans et al., 2009; Int Panis et al., 2009, 2010; Vandenbulcke et al., 2009) that aimed to quantify the health benefits and costs of commuter cycling for the cyclist and for society in order to assist policy makers with developing future transport and public health policies. For the individual cyclist, the physical activity involved in cycling can enhance the long-term health (de Geus et al., 2008, 2009; Hendriksen et al., 2000; Andersen et al., 2000), but he/she may be exposed to higher risks due to air pollution and accidents. From a societal point of view a non-marginal shift from the use of motorised vehicles to cycling is expected to realize a better general air quality, a better overall physical condition of the population, and an increased general traffic safety, due to the “safety in numbers” effect (Jacobsen, 2003; Robinson, 2005; Elvik, 2009).

The specific aim of this paper is to estimate the costs related to “minor bicycle accidents” as a step towards a complete cost–benefit evaluation of commuter cycling. In line with the national databases in Belgium, minor bicycle accidents are defined as “bicycle accidents not involving death or heavily injured persons, implying that possible hospital visits lasted less than 24 hours”. Focussing on minor accidents in this study is meaningful for three reasons: (1) they are by far the most numerous among all accidents, (2) they are

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strongly under-registered in official statistics and (3) very little is known about the related costs.

In Belgium in 2007, out of all 8048 officially *registered* victims from bicycle accidents, 7013 were due to “minor bicycle accidents”, 926 due to “major accidents” and 88 victims died within 30 days after the accident (BRSI, 2009). When considering these official statistics it is important to realize that most road accident statistics strongly underestimate the total number of cycling accidents (Aultman-Hall and Hall, 1998; Elvik and Mysen, 1999; Dhillon et al., 2001; Bickel et al., 2006; De Mol and Lammar, 2006). Especially when there is no hospitalisation and/or when the cyclist is the only party involved, accidents do not appear in accident statistics (Elvik and Vaa, 2004; Vandenbulcke et al., 2009). Veisten et al. (2007) estimated that in Norway the official statistics only cover 13% of all bicycle accidents and that light injuries in particular are strongly under-registered (only 12% of all light injuries were reported compared to 33% of the serious injuries and 71% of the severe injuries). In Belgium, only 15 to 30% of cycling accidents are officially reported (Doom and Derweduwen, 2005; De Mol and Lammar, 2006; BRSI, 2006). A top down estimation of the total cost of cycling accidents in general and for minor accidents in particular, based on the official statistics is therefore problematic. In contrast, our survey applies a bottom-up approach and is much better suited for studying the frequency and costs related to minor bicycle accidents. Earlier calculations of the cost of bicycle accidents in Belgium are therefore based on many assumptions and riddled with uncertainty (De Nocker et al., 2006).

A search on “ISI Web of Knowledge” and “Pubmed” for the terms “bicycle accidents” and “costs” in title/abstract learned that there is very limited information about the costs of bicycle accidents. Only Veisten et al. (2007) have thoroughly studied the costs of bicycle accidents. Their estimation is based on the number of bicycle accidents in different categories according to the Abbreviated Injury Scale (AIS an indicator of the severity of the injury in relation to the probability of decease). Their data were reported by hospitals in Norway in the period 1990–1997 and combined with cost figures from the US provided by Miller (1993). They calculated that the average cost for a bicycle accident resulting in a minor injury was 42,990 Norwegian Kroner (2004 prices) or approximately 5804 euro (2010 prices). According to Veisten et al. (2007) the total cost for such a minor injury is composed of costs for a reduced quality of life (57%), productivity loss (12%), administrative costs (13%), medical costs (10%), property damage (8%) and traffic delays (0.5%). Major drawbacks of the study of Veisten et al. (2007) are: (1) the cost of reduced quality of life is estimated by the willingness to pay (WTP) of individuals for reducing injury/fatality risk. This measure represents an ex ante value of risk reduction and does not measure grief and pain ex post; (2) only bicycle accidents reported by the hospitals were taken into account. Although this is a huge improvement in comparison with the official statistics, it may again result in an under-reporting because many minor bicycle accidents do not result in hospitalisation. (3) AIS is not a very good indicator of the total cost for a crash survivor, because the type of body part(s) that are affected and the possible presence of a fracture have an important influence on the costs (Zaloshnja et al., 2004).

2. Methodology

2.1. Theoretical framework

A cost of illness approach was applied to estimate the different cost categories as defined by the US Environmental Protection Agency (EPA, 2006) as presented in Fig. 1. The total cost of illness and injuries encompasses direct costs and indirect costs. Direct costs include damage to bike and clothes as well as medical costs. Indirect costs involve productivity loss, leisure time lost and costs related to suffering. Costs related to suffering, e.g. pain or psychological suffering, are also referred to as intangible costs.

2.2. Case study

Our data were collected in Belgium which is a small and highly urbanised European country (30,000 km^2, 11 million inhabitants). Belgium has a dense network of towns. Cities tend to sprawl into their peripheries. This urban spread favours car use and often leads to more and longer commuting trips, which are less convenient for cycling and walking (Vandenbulcke et al., 2009). However, bicycle use is still relatively common in Belgium, ranked fourth at the EU-level, with a bicycle share of 2.42% (in bike traveller-km/total travel km) (EU, 2003; Rietveld and Daniel, 2004).

2.3. Registration and selection

The main dataset is based on a group of 1187 regular commuter cyclists. Recruitment of this cohort was announced in the national media and by local cycling advocacy groups in 2008. Anyone could access the SHAPES website where a brief description of the survey and its objectives were given. An automatically generated mail was sent to those who registered, to check for the inclusion criteria: (1) age between 18 and 65; (2) cycle to work at least twice a week; (3) live and work in Belgium. After one year of open-access, 1849 participants had left their email address on the server. After applying the inclusion criteria, 1187 participants remained.

2.4. Weekly registration

Participants then received a questionnaire every week in the period from March 10th 2008 until March 16th 2009 (or until the participant indicated that he/she wanted to quit). This very short

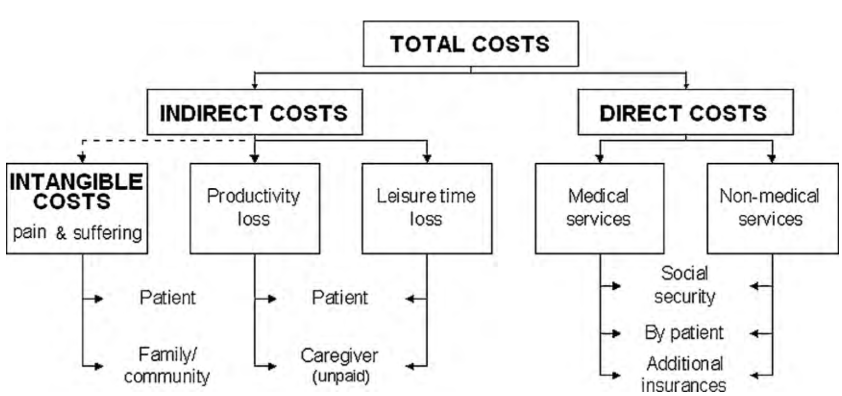

Fig. 1. Composition of the total cost for society related to illnesses and injuries, based on EPA (2006).