Journal of Transport & Health 6 (2017) 358–365

Contents lists available at ScienceDirect

Journal of Transport & Health

journal homepage: www.elsevier.com/locate/jth

Socioeconomic and demographic differences in walking and cycling in the Netherlands: How do these translate into differences in health benefits?

Jie Gao*, Marco Helbich, Martin Dijst, Carlijn B.M. Kamphuis

Department of Human Geography and Spatial Planning, Faculty of Geosciences, Utrecht University, Heidelberglaan 2, 3584CS Utrecht, The Netherlands

ARTICLE INFO

Keywords:
Walking
Cycling
Health Economic Assessment Tool
Health inequalities
The Netherlands

ABSTRACT

Walking and cycling are effective means to increase people's daily physical activity. Since little is known about how differences in walking and cycling translate into inequalities in health benefits on the population level, this study quantified these health benefits for demographic and socioeconomic groups in the Netherlands. Population-representative data on walking and cycling among adults (aged 20–90 years) for the period 2010–2014 were analyzed with the Health Economic Assessment Tool (HEAT). Results showed pronounced differences between subgroups, with women, senior citizens (50–79 years), higher socioeconomic groups, and native-Dutch people walking and cycling more than others. Given the relatively high mortality rates and high levels of walking and cycling among senior citizens, it was found that a large number of deaths were prevented in that age group. In lower socioeconomic groups, despite their lower walking and cycling levels, it was found that even more deaths were prevented, given their large population size and higher mortality rates. The proportion of health benefits was found to be greater among the native Dutch because their walking and cycling levels as well as their population size were higher than among non-native groups. The study suggests that policies to increase walking and cycling among lower socioeconomic groups could induce further health benefits in the aggregate and thus help mitigate socioeconomic health inequalities.

1. Introduction

The Netherlands is well known for the prevalence of walking and cycling for transportation purposes (Pucher and Buehler, 2008). Cycling accounts for approximately a quarter of all journeys and about one-tenth of all kilometers traveled (Kennisinstituut voor Mobiliteitsbeleid, 2014). Walking and cycling levels are significantly higher there than in other European countries such as Italy or France (Fishman et al., 2015a; Pucher and Dijkstra, 2003; Scheepers et al., 2013). Nevertheless, there is room for improvement, since about 30% of the commuting trips within five kilometers are still made by car (Engbers and Hendriksen, 2010). The World Health Organization (WHO) recommends more active travel (i.e., walking and cycling) in people's daily life to reduce the risk of non-communicable diseases (Arsenio and Ribeiro, 2015; World Health Organization, 2010). Therefore, policy-makers are advised to develop strategies that stimulate active travel and discourage motorized transport (Fishman et al., 2015a; Kahlmeier et al., 2010).

To make the health benefits of walking and cycling more apparent to policy-makers, the WHO introduced the Health Economic Assessment Tool (HEAT) (Kahlmeier et al., 2011). The tool provides a method to estimate the number of deaths prevented by the

* Corresponding author.
E-mail addresses: j.gao1@uu.nl (J. Gao), M.Helbich@uu.nl (M. Helbich), M.J.Dijst@uu.nl (M. Dijst), C.B.M.Kamphuis@uu.nl (C.B.M. Kamphuis).

http://dx.doi.org/10.1016/j.jth.2017.06.001
Received 28 November 2016; Received in revised form 24 May 2017; Accepted 2 June 2017
Available online 09 June 2017

beneficial health effects of both walking and cycling. Due to its transparency and simplicity, HEAT turned out to be highly appreciated, especially by non-health experts (Deenihan and Caulfield, 2014). Its value is reflected in the growing number of case studies applying the tool, especially in Western countries (Deenihan and Caulfield, 2014; Fishman et al., 2015b; Olabarria et al., 2013). These studies consistently report pronounced health benefits from walking and cycling at the general population level (i.e., all individuals in a sample without any stratification). Research on health inequalities provides solid evidence that physical and mental health varies significantly across the population taking education and age into account (Umberson and Montez, 2010; Wilkinson and Marmot, 2003). However, the literature remains inconclusive on whether the levels of walking and cycling among different demographic and socioeconomic groups also translate into differential health benefits.

A few mobility studies suggest that walking and cycling levels differ between population subgroups (Adams, 2010; Heesch et al., 2014; Kwasniewska et al., 2010; Scheepers et al., 2013). Kwasniewska et al. (2010) revealed a low prevalence of walking and cycling in high socio-economic groups (i.e., well-educated and higher-income groups) in Poland. Conversely, for the UK and the Netherlands respectively, both Adams (2010) and Scheepers et al. (2013) found that higher-educated people walk and/or cycle more than groups with low educational attainment. Beenackers et al. (2012) reviewed 11 studies related to socioeconomic inequalities in active transport in Europe. No consistent associations were found between socioeconomic indicators (e.g., income, education, occupation) and active transport or the duration of walking and/or cycling across socioeconomic groups. Additionally, Goodman et al. (2013) showed that well-developed walking and cycling infrastructure was more easily accessible by well-educated individuals with a higher income. Specifically for the Netherlands, Kamphuis et al. (2009) found that adults aged 55–75 years from lower-income and lower-educational groups were less likely to engage in recreational walking, compared to higher income and educational groups.

Regarding age differences, some European studies found that the elderly (age 65 + years) gain more benefits than younger individuals (Edwards and Mason, 2014; Fishman et al., 2015b; Mueller et al., 2015). For Greater Rotterdam, the Netherlands, Böcker et al. (2016) explored how socio-demographics, health, environmental and weather attributes were differentially associated with the walking/cycling behavior of the elderly and non-elderly. In particular, elderly women were more likely to walk and cycle than elderly men. This finding was challenged by Olabarria et al. (2013) and Woodcock et al. (2014), who reported the opposite, namely that men had higher walking and cycling levels than women, while Edwards and Mason (2014) found no gender differences in the U.S.A. Regarding ethnic differences in walking and cycling, another U.S. study found more active travel among migrants than native residents (Garni and Miller, 2008). In countries with relatively high cycling levels such as the Netherlands, however, the natives are significantly more likely to cycle than the non-native population (Pucher and Buehler, 2008).

Previous research (see above) has shown that socioeconomic and demographic differences in walking and cycling do exist. In light of these findings, it may be assumed that health benefits from active travel differ across population subgroups (Mueller et al., 2015). However, empirical evidence to support this premise is lacking so far. In a country like the Netherlands, where walking and cycling levels are high (de Vries et al., 2010; Fishman et al., 2015b; Helbich et al., 2016), differences in walking and cycling between population groups may be presumed to be considerable, which could significantly contribute to health inequalities in the population at large. To substantiate that premise, this study applied the HEAT model to estimate how the health benefits of walking and cycling in the Netherlands differ for subgroups stratified by age, gender, education, income, and ethnicity.

2. Materials and methods

2.1. Data

Data were collected on the average amount of time spent per week (in minutes) on walking and cycling per person in each population group. Furthermore, the size of population group and the average annual mortality rate of each group were determined. The demographic data were obtained from Statistics Netherlands for the years 2010–2014 (CBS, 2016a), while the data on walking and cycling were collected by *National Travel Survey in the Netherlands (NTS)* (OViN, 2015), a travel survey among a nationally representative sample carried out by Statistics Netherlands. To increase the sample size, the data were pooled for 2010–2014, raising the total to 506,933 individuals. The NTS database also contains information about transport modes, trip destinations, travel purposes (e.g. utilitarian vs. recreational trips), as well as the start and end time of the trips. Population counts and average annual mortality rates for age and gender groups were derived from Statistics Netherlands (CBS, 2016c).

Consistent with the approach of Fishman et al. (2015b), population and mortality data from Statistics Netherlands were divided into ten age categories: 20–29, 30–39, 40–49, 50–59, 60–64, 65–69, 70–74, 75–79, 80–84, and 85–90 years. For a more accurate calculation, the broad category of the elderly (aged 60–90) was divided into five-year intervals as their mortality rates are higher than for younger population. Income levels per year were divided into the following three categories (Fishman et al., 2015a): low income (< €20K), middle income (€20–€40K), and high income (> €40K). Educational attainment was stratified into low (i.e. primary school and lower general secondary school), middle (i.e. upper-division secondary school), and high (i.e. college and university) (CBS, 2016b).

2.2. The Health Economic Assessment Tool

HEAT is designed to quantify the health and economic benefit of walking and cycling among adults (Kahlmeier et al., 2011). The approach assumes a dose-response function between the number of minutes spent on walking or cycling and all-cause mortality reduction. More precisely, grounded in a meta-analysis by Kelly et al. (2014), HEAT assumes a 10% reduction in the mortality rate for each 100 min of cycling per week, and an 11% reduction for each 168 min walking per week. The following procedure is