



Travel behaviour and health: A conceptual model and research agenda



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ABSTRACT

Objectives: This paper proposes a conceptual model of the complex relationships between travel behaviour and health. In addition it gives a research agenda providing an overview of challenges for future research. **Methods:** We review the relevant literature in the areas of public health, land use and transportation that address issues related to health and travel and their underlying mechanisms. We do not aim to give a full review of the literature but to underpin the conceptual model.

Results and conclusions: We conclude that research can easily come to the ‘wrong’ conclusions if the complex causal relationships that exist between relevant factors are overlooked. In particular, ignoring contradictory effects for specific socio-demographic groups, (residential) self-selection effects, substitutions of different forms of activity, and reverse causalities may lead to overestimation of the effect of policies. For example, travel-related physical activity might interact with other physical activity, self-selection effects may influence the complex relationships between travel behaviour and health, and people’s health may influence their walking or cycling behaviour.

Based on the conceptual model we present a research agenda. A first research challenge is to explore the combined effect of travel behaviour related determinants for health effects (physical activity, air pollution intake, injuries, and subjective well-being) on health. A second challenge is exploring the interactions between travel-related physical activity and other physical activity. Thirdly, the importance of attitudes and attitude formation, specifically health-related attitudes and self-selection processes related to travel behaviour, is an important research topic. Fourthly, it is important to explore the relationship between cycling levels and injury risks, because risks seem to be correlated with cycling levels: the more people cycle, the lower the injury risks. Fifthly, we think it is important to study the relevance of walking and cycling related self-selection effects. A sixth challenge relates to transport innovations.

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1. Introduction

Over the last decade there has been increased research interest in the relationships between travel behaviour and health, partly fuelled by the recognition that an increase in the use of active modes may decrease obesity (e.g. Bassett et al., 2008), and by the wider health benefits of these modes (e.g. De Hartog et al., 2010). Indeed, the health benefits of these modes may be substantial. For example, Sælensminde (2004) concludes that of all the benefits of cycle infrastructure measures in Norwegian cities over half are health-related. Other studies, especially in the domain of epidemiology and public health, have addressed the travel-related health effects caused by exposure to pollutants during travel (e.g. Handy, 2014; Schepers et al., 2015), and traffic safety studies (e.g. Wegman, 2014) have investigated the health hazards stemming from involvement in traffic collisions and/or falls during travel. The effects of travel behaviour on health can therefore be different, both positive and negative, and vary depending on the travel mode and circumstances.

To the best of our knowledge there is as yet no comprehensive overview of the relationships and contributing factors to travel behaviour and health, despite the increasing body of knowledge about the relationships between the two. In our view, a comprehensive overview should not only describe the associations between travel behaviours and health outcomes, but also touch upon causalities, spurious effects, interaction effects and group specific effects. This paper aims to present such an overview, and shows that if important factors are not included in research, one can easily come to the ‘wrong’ conclusions. We do not aim to give a fully-fledged review of the

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literature – there is abundant literature in some of the areas we cover (see, for example, Handy (Undated) for an overview of the literature in the area of built environment impacts on physical activity, or Handy (2014) or Cohen et al. (2014) for an overview of the connections between travel and health). A full review of all the relationships covered by the model would be way too much for one journal paper. We rather confine this paper to examples which underpin the conceptual model. In addition, we aim to demonstrate how the health effects of policies and behaviours in different domains (such as exposure, physical activity or safety) are related and may reinforce or counteract each other. A second aim of this paper is to provide a research agenda for research in the area of health and travel. Our paper is limited to land transportation and excludes air travel (and the related health effects due to radiation levels and lack of movement).

This paper is structured as follows. Section 2 presents and discusses the conceptual model. Section 3 presents a research agenda. Section 4 provides a summary of the main conclusions.

2. The conceptual modal

The WHO defines health as ‘a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity’ (<http://www.who.int/about/definition/en/print.html>). We also consider health to be broader than the absence of disease or infirmity, but adopt a less broad approach than the WHO, by excluding the social dimension because it is only indirectly related to the links between travel behaviour and health. We consider mental and physical well-being as separate factors, which are however inter-related. The reason is that this approach allows us to better conceptualise the links between travel behaviour and mental well-being, and subsequently physical well-being. To be consistent with generally used terminology, we will in the remainder of the paper use the term ‘health’ to denote physical health, and ‘subjective well-being’ to denote mental well-being. There is an obvious relationship between subjective well-being and mental health. However, whereas mental health studies focus on symptoms of mental illness, such as depression or anxiety, well-being studies focus on a wider spectrum of mental states, which also differentiate between people without symptoms of mental illness. In this study we refer to the broader meaning of subjective well-being. To make the model operational we therefore conceptualise health as determined by the following components:

- Level of physical activity.
- Air pollution intake.
- Casualties.
- Subjective well-being.

These factors are interrelated: for instance, using active modes may result in increased subjective well-being (Olsson et al., 2013), but may also lead to crashes/falls which would decrease the use of these modes, for example because people become disabled or scared to use these modes (see Lee et al., 2015). As another example, high concentrations of pollutants are not only unhealthy in themselves, but may also deter people from cycling or walking, with negative health effects.

Fig. 1 presents the conceptual model. We depart from the notion that the health effects of travel arise via various paths, including physical activity (component A in Fig. 1), exposure to and intake of air pollutants (B), and involvement in collisions/falls (C). These effects on health are well documented (see, for example, Handy (2014) or Cohen et al. (2014) for an overview; we do not discuss this literature in detail in this paper). In addition, we assume that subjective well-being (D) is related to health, albeit a less straightforward relationship and the causality is debatable. Subjective well-being is commonly defined as a combination of a person’s assessment of his/her quality of life and satisfaction with life, and his/her affective state, as the net effect of positive and negative emotions. Studies of subjective well-being consistently show health to be the most important determinant of life satisfaction (e.g. Van Praag and Baarsma, 2001). On the other hand, it can be argued that a sufficient level of satisfaction with life and good mood are beneficial to one’s physical health. Diener and Chan (2011) extensively review empirical longitudinal studies in this area. They report evidence that an individual’s current affective state (induced by experimental manipulations) influences physiological health indicators measured afterwards such as blood pressure,

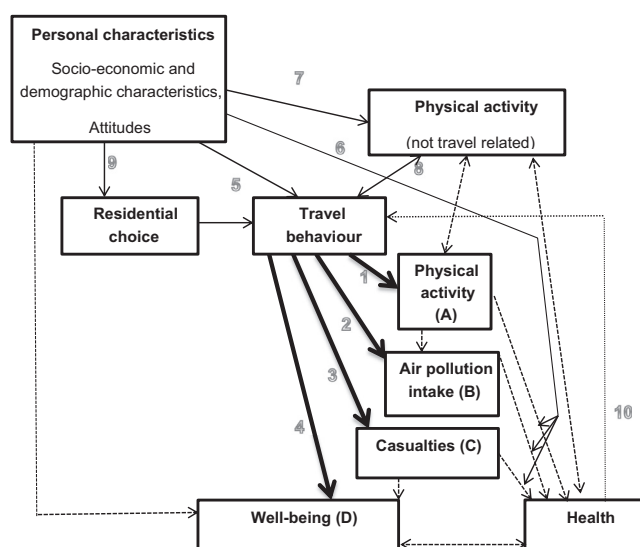


Fig. 1. Conceptual model for the relationship between travel behaviour and health.

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