



Congestion pricing and active transport – evidence from five opportunities for natural experiment.



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ABSTRACT

Congestion pricing schemes have been implemented in cities worldwide as a means of addressing externalities associated with inefficient price signals in transport systems. Limited evidence exists however on the secondary impacts of these schemes, which may include both environmental and health benefits associated with a resultant reduction in motor vehicle usage. There is increasing recognition that transport behaviours may play a role as opportunistic population level targets to reduce physical inactivity. Yet limited evidence currently exists on the effectiveness of transport interventions, such as congestion pricing schemes, for improving physical activity levels.

This study aims to examine the physical activity effects of congestion pricing, with the health benefits of physical activity well established. Congestion pricing schemes implemented internationally were considered as 'natural experiments' and evidence of modal shift from vehicle to active forms of transport or physical activity effect was reviewed. Twelve studies were included from a search of peer-reviewed and 'grey' literature, with overall evidence for a physical activity or modal shift effect considered weak. The quality of the available evidence was also considered to be low.

This is not to say that congestion pricing schemes may not have important secondary physical activity related health benefits. Instead, this review highlights the paucity of evidence that has been collected from real-world implementation of congestion pricing schemes. Given the growing recognition of the importance of distal mediators and determinants of health and the need for an 'all-of-government' approach more and better quality evidence of effectiveness of transport interventions for a broad range of outcomes, including health, is required. Significant barriers to the collection of such evidence exist, with strategies for overcoming some of these barriers identified. Only with a better understanding of the full range of potential health impacts can transport policy be fully utilised as a tool for population health.

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1. Introduction

Motorised transportation has increased significantly worldwide in recent decades, in both developed and developing countries. Whereas personal motor vehicles were once considered an expensive luxury, the number of cars worldwide has been estimated at over 1 billion (Tencer, 2011), with urban environments, culture, access to goods and services, economic growth and mobility inextricably linked with motor vehicle usage in most parts of the world. Increasing ownership of motor vehicles has brought with it the scourge of many modern cities – traffic congestion. The economic cost of traffic congestion is very high, with a recent report estimating that by 2030 the total cumulative cost for traffic congestion in the UK, US, France and Germany will be USD\$4.4 trillion dollars (INRIX and the Centre for Economics and Business Research, 2014).

Inadequate price signals in transport systems may create incentives for automobile dependence, leading to inefficient modal choices and externalities. Congestion pricing is a form of traffic demand management aimed at reducing the opportunity cost and loss of productivity associated with traffic congestion at peak times or on peak routes (U.S. Department of Transportation Federal Highway Administration, 2006).

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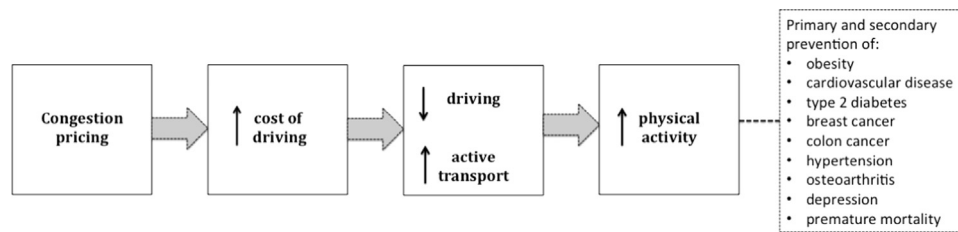


Fig. 1. Potential logic pathway, from congestion pricing to the health benefits of physical activity.

Congestion pricing was first introduced in Singapore in 1998, and various types of congestion pricing schemes have since been introduced in cities around the world including London, Stockholm, Gothenburg and Milan.

An important secondary benefit of congestion pricing schemes may be the encouragement of active transport, defined as walking, cycling and use of public transport, as the cost of motor vehicle travel rises (Krzek et al., 2009; Hysing et al., 2014; Martin et al., 2012). Transport behaviours are an opportunistic target for population health interventions aimed at reducing sedentarism, as relatively small individual level changes could lead to large population effects (McCormack and Virk, 2014). An increase in active transport may result in increased physical activity and energy expenditure across populations, with a potential impact on the growing burden of obesity and other non-communicable diseases (Hill and Peters, 1998; Hill et al., 2003; Bauman et al., 2008; Sallis et al., 1998; Saunders et al., 2013). Yet limited evidence exists on the impact of the wide range of transport interventions that may have an effect on physical activity and transport behaviours (Ogilvie et al., 2004; Mozaffarian et al., 2012; Graham-Rowe et al., 2011; Faulkner et al., 2011), with even less known about the potential physical activity related effects of congestion pricing (Faulkner et al., 2011; Li and Hensher, 2012; O'Fallon et al., 2004; Jou et al., 2007). This is despite the fact that there is a feasible logic pathway linking congestion pricing schemes with the health benefits of an increase in physical activity (Fig. 1).

To date, no review exists which specifically explores the impact of congestion pricing on modal shift to active modes of transport and physical activity using evidence from real-world examples. This paper seeks to examine the evidence by conducting a scoping review of the physical activity related effects of international congestion pricing schemes that have been implemented in London, Singapore, Stockholm, Milan and Gothenburg. Other potential effects, such as those relating to injury or air quality, are outside the scope of this paper however may also have important health considerations (Johansson et al., 2009; Atkinson et al., 2009; Noland et al., 2008).

By using evidence from implemented congestion pricing schemes we are treating these case studies as 'natural experiments', or studies of an intervention or event that have not been manipulated by the researcher (Rosenzweig and Wolpin, 2000; Craig et al., 2012). Few natural experiments have been published that assess the impacts of policy modifications on obesity related behaviours such as levels of physical activity (Mayne et al., 2015). Yet given the challenges in evaluating policy and environmental interventions the use of natural experiments is being increasingly recognised as an important tool for population health (Giles-Corti et al., 2015; Petticrew et al., 2005). This literature review will therefore add to the limited body of evidence on the impact of transportation policy specifically on health outcomes where physical inactivity is a risk factor. It will also add to the body of evidence on utilising opportunities for natural experiment to build evidence of health effect for transport interventions.

2. Methods

2.1. Inclusion criteria

To be considered for inclusion, studies had to meet the following inclusion criteria:

1. Be written in the English language in any year;
2. Be a primary study, not a synthesis or review;
3. Be in the public domain, either as an academic paper published in a peer review journal or a study from the 'grey' literature, such as a government report or commissioned document;
4. Use observed data on the effects of the congestion pricing schemes in London, Singapore, Milan, Stockholm or Gothenburg; and
5. Present data on (a) modal shift from motor vehicle to walking, cycling or use of public transport as a result of or in relation to the congestion pricing scheme; or (b) evidence of a physical activity effect as a result of or in relation to the congestion pricing scheme.

2.2. Search strategy

A comprehensive search of the literature was conducted based on Cochrane guidelines for systematically reviewing public health interventions (Higgins and Green, 2011) and Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). The following academic databases were searched: Web of Science, Scopus, EBSCOHost (including: Business Source Complete, CINAHL Complete, Health Policy Reference Centre, Health Economics Evaluation Database, MedLine Complete, PsycInfo, SportDiscus). Search strategies were developed for each of the databases (Appendix A). Reference lists of included papers were also searched.

A search of the websites of the relevant countries transport bodies was also undertaken as a search of the 'grey' literature. The websites of Transport for London (2015), Trafikverket Swedish Transport Administration (2015), Comune di Milano (2015) and the Land Transport Authority (2015) were searched for publications related to congestion pricing scheme impacts on modal shift from motor vehicle to active transport or for evidence of any physical activity effects. The database of the Transportation Research Board (TRB) was also searched.

2.3. Data extraction and review

Data on the relevant congestion pricing scheme, the method for measurement of effect and reported effects were extracted by one reviewer (VB). Meta-analysis was not possible due to the heterogeneity of included studies. Guidance on the evaluation of natural experiments was published in 2012 by the Medical Research Council in the United Kingdom (Craig et al., 2012). This guidance was used as a framework for assessing the quality of the evidence of the included studies.

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