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Evaluating the benefits of public bicycle schemes needs to be undertaken carefully

A letter in response to an article by David Rojas-Rueda, Audrey de Nazelle, Marko Tainio, Mark J Nieuwenhuijsen, The health risks and benefits of cycling in urban environments compared with car use: health impact assessment study. BMJ 2011;343:doi:10.1136/bmj.d4521 (Published 4 August 2011)

This paper sets out to compare the health benefits of the Bicing scheme (Barcelona's public bicycle share scheme) with possible risks associated with increased bicycle riding. The key variables used by the researchers include physical activity, exposure to air pollution and road traffic injury. The authors rightly identify that although traffic congestion is often a major motivator behind the establishment of public bicycle share schemes (PBSS), the health benefits may well be the largest single benefit of such schemes. Certainly PBSS appear to be one of the most effective methods of increasing the number of bicycle trips across a population, providing additional transport options and improving awareness of the possibilities bicycles offer urban transport systems.

As noted by the authors Rojas-Rueda, de Nazelle, Tainio, & Nieuwenhuijsen (2011), the number of PBSS have increased rapidly over recent years, yet little work has been undertaken to evaluate their impacts (Buttner et al., 2011; Shaheen, Zhang, Martin, & Guzman, 2011). Whilst Rojas-Rueda et al. (2011) should be commended for undertaking what is understood to be amongst the first health impact assessment on a PBSS, flawed assumptions regarding the proportion of Bicing users who have substituted a motor vehicle journey invalidates their results. Put simply, their assumption that between 90% and 100% of Bicing users would have made the trip by car had it not been for the PBSS dramatically overstates the actual rate of trip substitution. The available data demonstrates only 9.6% of Bicing trips are substituting for a car journey (City of Barcelona, 2007). Moreover, 6.3% of trips taken on Bicing were previously private bicycle journeys - neutralising any benefit to public health.

In addition to overstating the health benefits, this erroneous assumption by Rojas-Rueda et al. (2011) has also led to overstated environmental benefits of the Bicing scheme. For instance, the authors state "As a result of journeys by Bicing, annual carbon dioxide emissions were reduced by an estimated 9,062,344kg" (p. 1). Further: "Data on shifts in mode of travel as a result of the Bicing initiative could not be found" (p. 3). Data published by Anaya & Bea (2009), collected by the City of Barcelona show users of the Bicing scheme to be substituting from other modes of transport in the following proportions: Public transit 55.10%, motor vehicle 9.60%, walking 26.10%, private bike 6.30% and new trip 2.80%.

As the above figures illustrate, over one quarter of Bicing trips are replacing pedestrian journeys, and given the evidence suggesting walking trips have twice the health benefit of bicycle riding, on a per kilometre basis (New Zealand Transport Agency, 2009), the results produced by Rojas-Rueda, et al. (2011) likely overstate the health benefits of the scheme.

In addition to these aforementioned assumptions regarding the proportion of Bicing trips replacing car journeys, the total number of daily trips using Bicing also appears higher than what the available evidence suggests. The authors calculate that there are 28,251 Bicing members using the scheme daily and assume a 90% shifting from car journeys. Assuming 28,251 members use the scheme daily and 90% substituting for car use (despite evidence to the contrary), this equates to 25,426 users substituting car for Bicing. Assuming these users take two trips per day, 50,852 journeys would be made by these users. These numbers, used by the authors to determine the health benefit of the Bicing scheme conflict with the data made available by the operators (City of Barcelona, 2011) suggesting something closer to 33,000 trips per day (6000 bikes used 5.5 times per day). Even this lower figure is quite possibly higher than the actual figure, given that it is very rare for all 6000 bicycles to be in circulation at the one time.

Only those trips previously undertaken by car, as well as the 2.8% of new trips generated by Bicing should be included in the physical activity benefits of the Bicing scheme. One should also factor the health benefit lost from the pedestrians opting for Bicing, given that the literature widely regard walking to have twice the physical activity benefit of cycling on a per kilometre basis (Fishman, Ker, Garrard, & Litman, 2011; New Zealand Transport Agency, 2009). Although these assumptions made by the authors are the central flaw in the study approach, the sensitivity analysis that assumed only 10% of Bicing trips were replacing a car trip is much closer to the reality of the Bicing system, although there are no reported calculations for this analysis.

The authors have assumed that 90% of Bicing users were new to cycling when they signed up. If this was the case, it might be possible that these new cyclists have a higher road traffic injury rate than regular cyclists, yet this is omitted from the results and discussion, despite the authors using road traffic injury as one of the key measures of health impact.

The carbon dioxide emission savings stated by the authors, previously highlighted as artificially high, also fail to take into account the redistribution and manufacture of the bicycles. Most PBSS use petrol or diesel powered trucks to move their bicycles through the system and the Bicing system is no different in this regard. The manufacture of 6000 bicycles, as well as their docking stations is not without significant carbon dioxide emissions, and whilst it may well be less than the savings as a consequence of reduced car use, it must still be factored into the equation.

When calculating the health risks posed by road traffic injury, the study only uses mortality and this fails to capture serious injuries, which can be significant.

The study would have provided a valuable assessment of the benefits to risk of the Bicing system had it taking more realistic assumptions of the level to which the system was replacing motor vehicle use.

In the concluding comments, the authors note that the Bicing scheme has successfully increased the number of people cycling in Barcelona - to a much greater degree than other initiatives in the past. An unsubstantiated claim made by the authors suggests the Bicing scheme is "low cost", yet no mention of Bicing's cost is

used in the paper. Similarly, the authors conclude that other cities should follow Barcelona in creating "cost saving" transport initiatives - yet no benefit cost analysis was undertaken in order to determine if the scheme produces a net economic benefit.

Despite the assumptions compromising the findings of this study, the authors made a number of insightful points that have not been widely published in the literature on PBSS. Firstly, the authors highlight the potential for bicycle trips to replace car trips of greater distance (people choose closer destinations when they are solely under human power). Secondly, Bicing and other PBSS might be the catalyst for increasing the acceptability and legitimacy of cycling, which could act as a catalyst for more cycling generally - even outside of the scheme. With PBSS proving popular not just in continental Europe, but also in cities in the UK and the US, it appears these innovative, public transport options may help increase physical activity, reduce air and noise pollution and reduce traffic congestions. Measures aimed at increasing the substitution rates from car journeys will maximise these benefits.

Overall, the paper is a useful addition to the literature, in that it has attempted to assess the health benefits of a large scale PBSS and weighed these against potential risks related to cyclists exposure to air pollution and road traffic injuries. Unfortunately a fundamentally flawed assumption related to the proportion of Bicing trips replacing car journeys invalidates the results of this paper. A future paper with up to date data would create a significant contribution to this emerging area within the field of sustainable transport.

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