

## TRANSPORTATION, AIR POLLUTION AND PHYSICAL ACTIVITY: INTEGRATED HEALTH IMPACT ASSESSMENT OF THE BIKE SHARING SYSTEM “BICING” IN BARCELONA, SPAIN

**David Rojas-Rueda**, *Center for Research in Environmental Epidemiology (CREAL), C. Doctor Aiguader, 88, 08003 Barcelona, Spain.*

**Audrey de Nazelle**, *Researcher, Center for Research in Environmental Epidemiology (CREAL), Barcelona, Spain.*

**Marko Tainio**, *Researcher, Systems Research Institute, Polish Academy of Sciences, Warsaw, Poland; Department of Environmental Health, National Institute for Health and Welfare (THL), Kuopio, Finland*

**Mark Nieuwenhuijsen**, *Research Professor, Center for Research in Environmental Epidemiology (CREAL), Barcelona, Spain.*

**Background and Aims:** Motorized transport is associated with negative impacts on health and the environment. Active travel is promoted as an alternative to mitigate such impacts and increase physical activity rates in the population. We assessed health impacts of ‘Bicing’, the bike sharing system implemented in Barcelona, Spain, in 2006.

**Methods:** We constructed a model to quantify the health risk and benefits in terms of all-cause mortality associated with traveling by Bicing compared to the car for three main domains, physical activity, air pollution and traffic accidents. Travel and safety information was obtained from institutions and agencies of local and regional government. We used dose-response functions obtained from a review of the scientific literature. We performed uncertainty and sensitivity analyses. We also conduct an economic evaluation of mortality, and quantification of CO<sub>2</sub> emissions.

**Results:** The estimated annual excess mortality in the population of regular Bicing users assumed to have shifted from car travel (n=25,426) was 0.03 deaths from traffic accidents, 0.15 deaths from PM<sub>2.5</sub> and 0.05 deaths from black smoke exposure, while 14.25 deaths were avoided due to physical activity (Benefit: risk ratio =79). The total annual number of deaths avoided was therefore 14.05 deaths, resulting in 21,088,385 million € saved per year. This represented an economic benefit greater than the initial Bicing investment and annual maintenance costs. We estimated a reduction of 9,062,344 kilograms of CO<sub>2</sub> as a result of Bicing journeys each year.

**Conclusions:** The results presented demonstrate the potential health benefits of infrastructure dedicated to encouraging active commuting. In particular, short trips within the city by bicycle have benefits not only in health, but also represent a cost savings and reduced emissions of greenhouse gases.