European Commission

Science for Environment Policy

# Greener cities and more exercise could dramatically reduce urban mortality rates

**Researchers have estimated** that, annually, almost 3 000 deaths (i.e. 20% of mortality) in Barcelona, Spain, are premature, and would be preventable if residents lived in urban environments that met international exposure recommendations for physical activity, air pollution, noise, heat and access to green spaces. The results emphasise the need to reduce motorised traffic, promote active and public transport, and provide adequate green space to encourage exercise and mitigate the impacts of environmental hazards in cities.

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**Source:** Mueller, N., Rojas-Rueda, D., Basagaña X., Cirach, M., Cole-Hunter, T., Dadvand, P., Donaire-Gonzalez, D., Foraster, M., Gascon, M., Martinez, D., Tonne, C., Triguero-Mas, M., Valentín, A. & Nieuwenhuijsen, M. (2016) Urban and transport planning related exposures and mortality: a health impact assessment for cities. *Environmental Health Perspectives*. DOI: 10.1289/EHP220. This study is free to view at: http://ehp.niehs.nih.gov/ehp220/

**Contact:**
natalie.mueller@isglobal.org

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**By 2050** almost 70% of people are projected to live in urban environments globally. Certain aspects of urban living, including contemporary car-centric city designs, contribute to a sedentary lifestyle and high levels of air pollution and noise, which are known to contribute to premature death. In addition, cities experience increased heat exposure due to human activities and heat-amplifying effects of the built environment.

Green infrastructure – such as parks, urban gardens and surrounding greenness – can reduce the impacts of these environmental risks and provides well-known benefits for physical and mental health.

In this study, researchers estimated the difference between actual and recommended levels of physical inactivity, exposure to air pollution, noise, heat and insufficient access to green spaces in Barcelona. Barcelona has one of the highest air pollution and noise levels in Europe due to high traffic density, with a high proportion of diesel vehicles, and an urban design of narrow street canyons (where streets are flanked by buildings on both sides) that are shielded by dense construction. The city centre can be up to 8 °C hotter than surrounding areas during summer months and only 7 $m^2$ of green space is available per resident; green spaces provide benefits in heat reduction and can mitigate traffic noise and possibly air pollution.

The researchers modelled preventable premature mortality and the increase in life expectancy for Barcelona residents if international recommendations for performance of physical activity and exposure to air pollution, noise, heat and provision of green spaces were met.

The researchers used existing international exposure recommendations as follows: physical activity – 150 minutes of moderate intensity or 75 minutes of vigorous intensity aerobic activity per week (World Health Organization — WHO); noise – daytime noise levels not exceeding 55 decibels (dB) (WHO); air pollution – annual mean particulate matter less than 2.5 micrometers in diameter ($PM_{2.5}$) not exceeding 10 micrograms per cubic metre of air (µg/$m^3$) (WHO).

Despite no recommendation being available for temperature, it is believed that with changes to the urban plan, such as increasing urban greenery, reducing motorised traffic and improving building design, a cooling effect of up to 4 ºC can be achieved[1]. The recommendation on availability of green spaces was taken from the European Commission's working group 'Measuring, Monitoring and Evaluation in Local Sustainability[2] and the WHO, who both recommend living within 300 m of green space greater than 0.5 hectares in size.

*Continued on next page.*

1. Doick *et al.* (2014), Zhao *et al.* 2014
2. Working Groups on Measuring, Monitoring and Evaluation in Local Sustainability, Expert Group on the Urban Environment. *Towards a Local Sustainability Profile: European Common Indicators. Technical Report*. European Commission, 2001.

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## Greener cities and more exercise could dramatically reduce urban mortality rates *(continued)*

Data on current exposure levels for Barcelona residents were taken for: (1) physical activity, from the 2011 Barcelona Health Survey; (2) air pollution, from the European Study of Cohorts for Air Pollution Effects (ESCAPE LUR) 2012; (3) noise, from Barcelona's strategic noise map, 2006 (4) daily mean temperatures for Barcelona from 2009–2014, from the European Climate Assessment and Dataset (Klein Tan 2002) and (5) green space land use, from Urban Atlas, 2007.

The results indicated that over 70% of adults in Barcelona are insufficiently active. Air pollution and traffic noise levels (average current exposure is 16.6 μg/$m^3$ of $PM_{2.5}$ for air pollution and 65 dB for noise) far exceeded the recommended levels. Summer temperatures in the city exceeded the calculated threshold level on approximately 100 days per year and one third of the population did not live within the recommended distance of a green space.

The researchers estimated that 2 904 premature deaths could be prevented annually if all recommendations were met. This is almost 20% of all annual natural deaths in the city. The largest share of preventable deaths was attributed to insufficient physical activity (1 154 deaths), followed by air pollution (659 deaths), traffic noise (599 deaths) and heat (376 deaths). Access to green spaces was estimated to have the smallest impact on reducing premature mortality (116 deaths).

If these premature deaths were prevented, residents could expect to live, on average, 360 days longer. This benefit to society is valued at around €9.1 billion annually (based on the value-of-statistical-life approach (VoSL) — the amount of money people are willing to spend to save a statistical life).

The researchers acknowledge that the combined effects of the different environmental hazards were not modelled, resulting in potential double counting of deaths. On the other hand, air pollution deaths may also have been underestimated, as certain pollutants, such as nitrogen dioxides, were not considered in this study.

The researchers also acknowledge the limited scientific evidence on the adverse health impacts of noise exposure and beneficial impacts of green spaces. They also point out that the contextual setting and underlying population parameters, such as the general health of the population, personal choices, motivation for behavioural change and time lags between a change and a benefit in any given location, affect human health and the risk of death.

The research, however, does contribute to the understanding of multiple environmental exposures and associated health impacts in an urban setting. The researchers recommend fundamental changes to urban and transport planning. In particular, the use of active and public transport as a means of integrating physical activity into daily life is encouraged and is believed to provide numerous health benefits. Policies to reduce motorised traffic and promote active and cleaner modes of transport should therefore be prioritised. Reinforcement of green infrastructure can also promote engagement in physical activity, mitigate air pollution, noise and heat and has been associated with improvements in mental health, biodiversity and community benefits.