

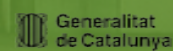
# THE POWER OF PLACE: PATHWAYS TO A HEALTHY URBAN LIVING

Mark J Nieuwenhuijsen

**ISGlobal** Barcelona  
Institute for  
Global Health



A partnership of:



# CONTEXT

**Each year world wide there are:**

- **4.2 million deaths due to ambient air pollution**
- **3.2 million deaths due to lack of physical activity**
- **1.2 million deaths due to traffic fatalities**

WHO, GBD

- **Climate crisis**
- **Population growth and ageing**
- **Urbanization (70% live in cities soon)**





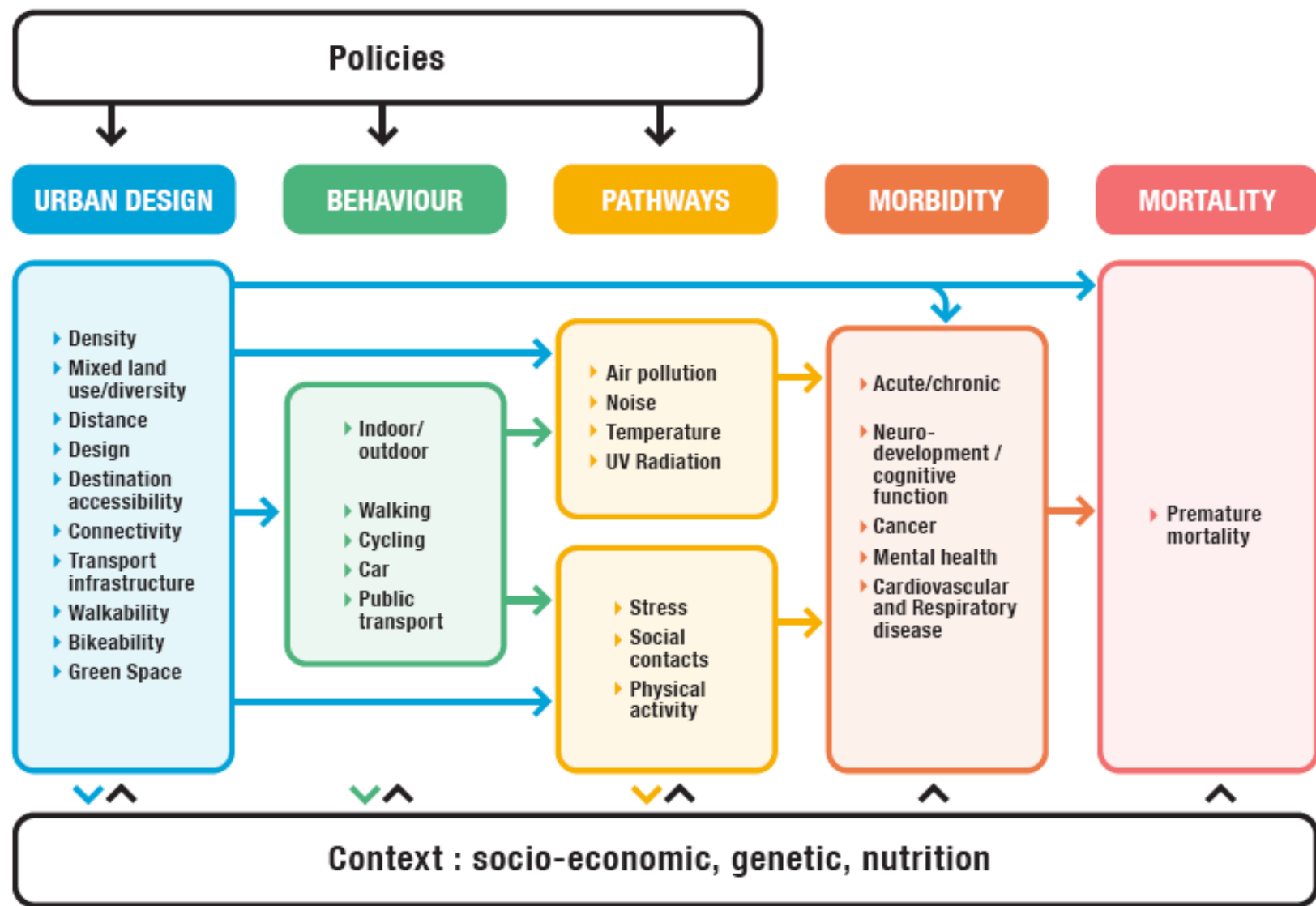














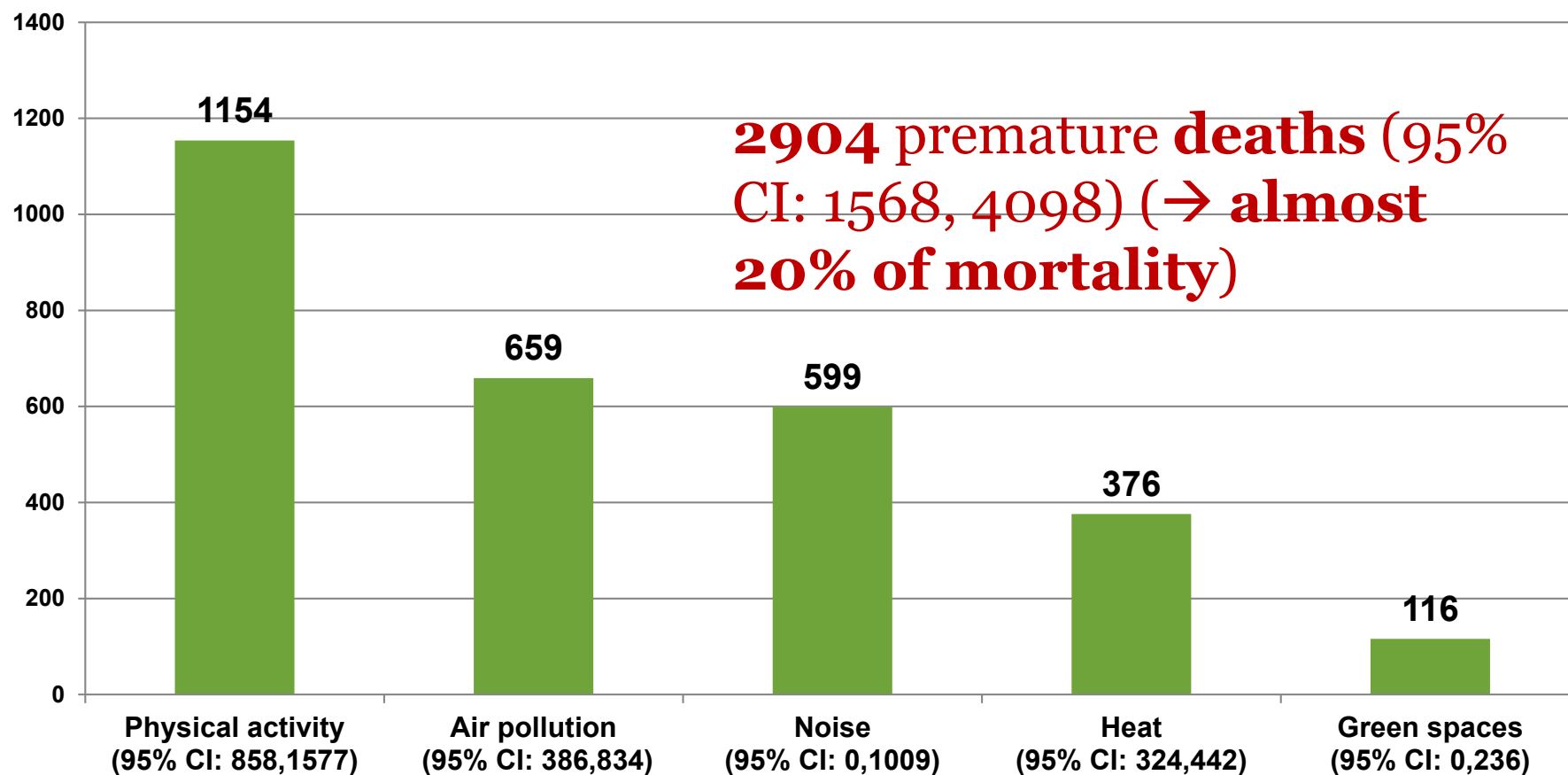
**2904 premature deaths (20%) annually in  
Barcelona due to suboptimal urban and transport planning**

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Mueller et al EHP 2017; 125: 89-96



# DEATHS DUE TO POOR URBAN AND TRANSPORT PLANNING BARCELONA



**Traffic injury deaths 30**



# SOLUTIONS

- **Land use changes**
- **Reduce car dependency**
- **Move towards public and active transportation**
- **Greening cities**

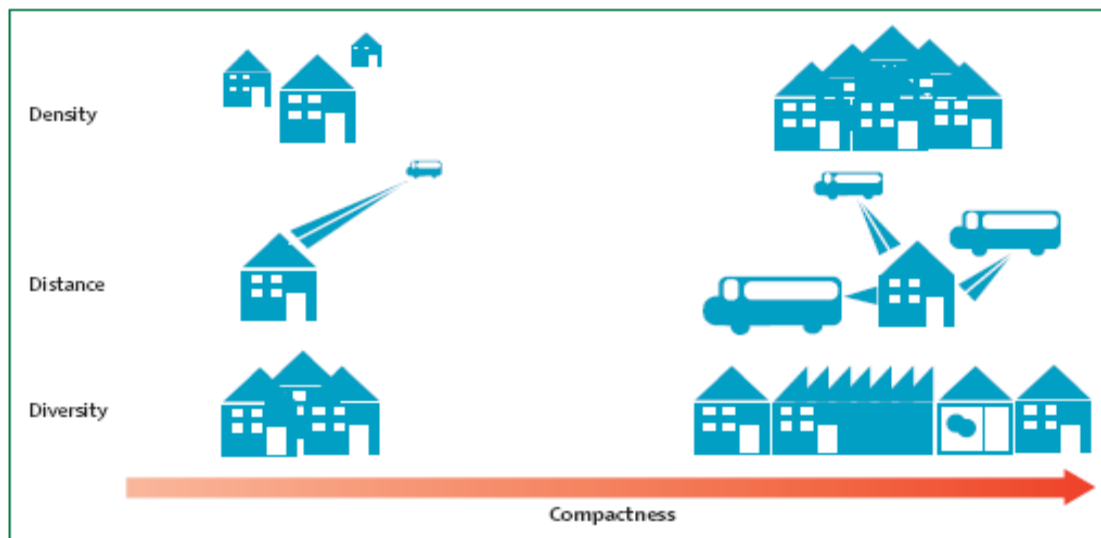


Figure 1: Illustration of the terms density, distance, and diversity as applied in the compact cities model

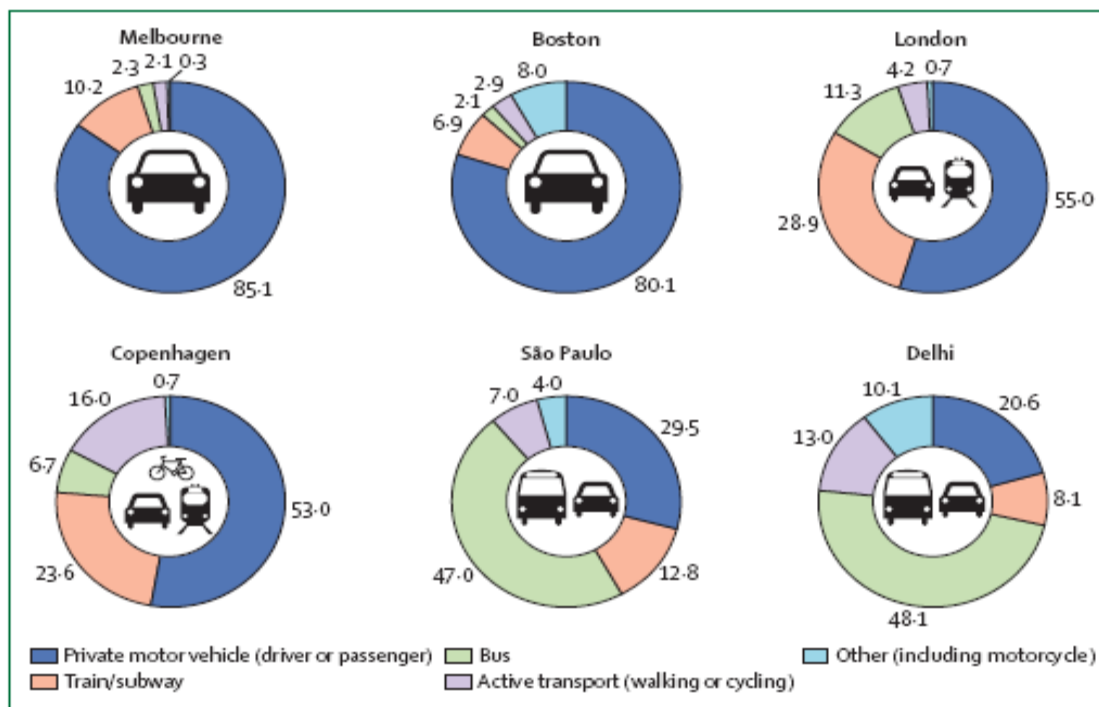


Figure 2: Percentage of vehicle kilometres travelled (VKT) by mode in each city at baseline with dominant transport modes depicted

Using a health impact assessment framework, they estimated the population health effects arising from alternative land-use and transport policy initiatives in six cities.

Land-use changes were modelled to reflect a compact city in which **land-use density and diversity** were increased and **distances** to public transport were reduced to produce low motorised mobility, namely a modal shift from private motor vehicles to walking, cycling, and public transport.



# DALYS GAINED IN COMPACT CITIES

**393 (Copenhagen) to 826  
(Boston) DALYs saved per  
100.000 people annually**

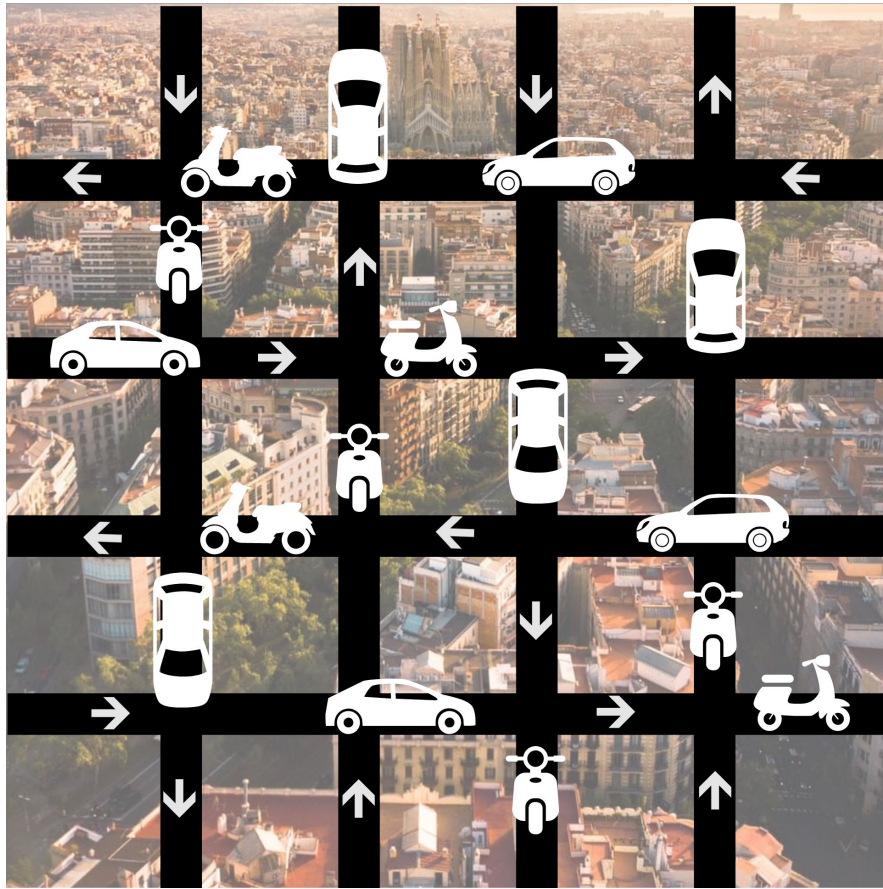
One DALY can be thought of as one lost year of "healthy" life.

DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences:

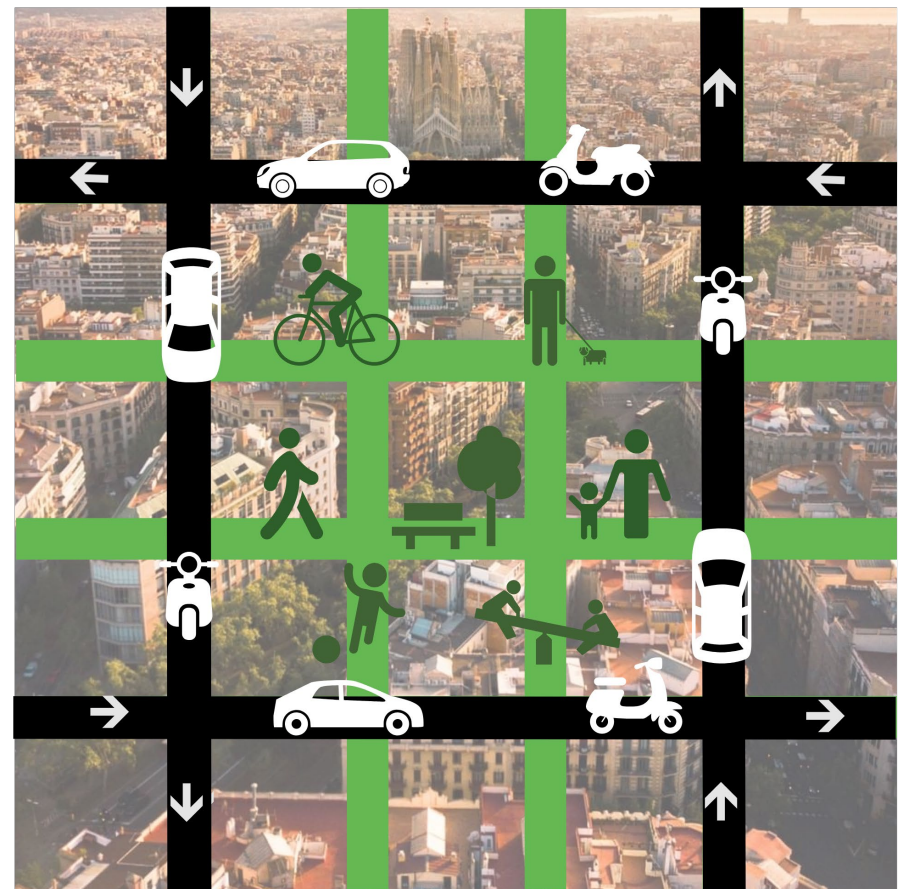








Baseline situation



Superblocks model





# Barcelona Superblock San Antoni

Before



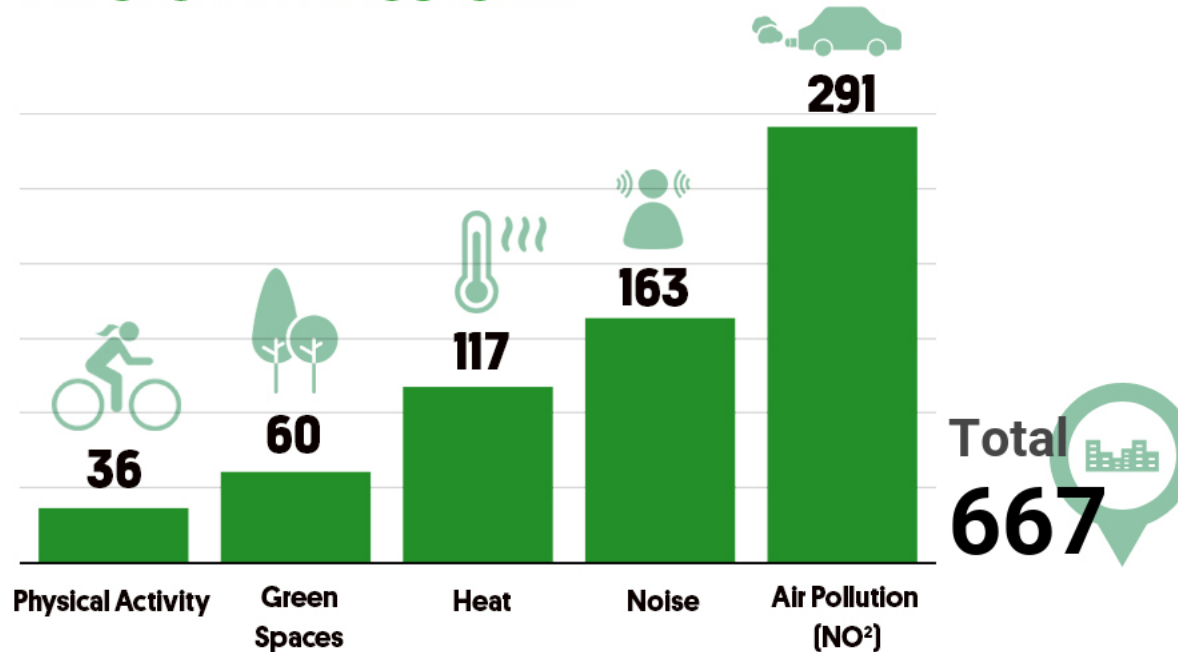
After



# BARCELONA SUPER BLOCKS

- **19.2% car reduction**
- **11.5 ug/m<sup>3</sup> (24.3%) NO<sub>2</sub> reduction**
- **2.9 dB noise reduction**
- **3 fold increase green space (6.5% to 19.6%)**
- **20% Surface temperature reduction**

# Annual Premature Deaths that the "Superblocks" Model Could Avoid in Barcelona



Source: Mueller et al. Changing the urban design of cities for health: the Superblock model. *Enviroment International*. 2019

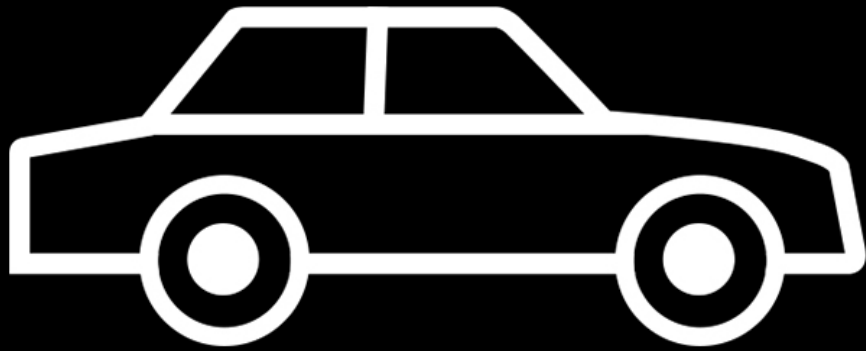
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Global Health

Mueller et al 2019, Env Int



# ELECTRIC CARS



THIS ONE  
**RUNS ON MONEY**  
AND MAKES  
YOU FAT



THIS ONE  
**RUNS ON FAT**  
AND SAVES  
YOU MONEY

**50% of car trips < 5 km**



## 7 WAYS THAT BICYCLES CAN MAKE CITIES Healthier

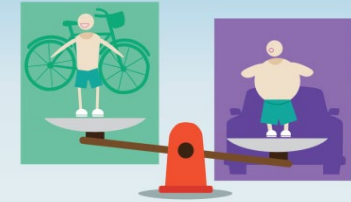
### 1 LESS RISK OF PREMATURE MORTALITY



REGULAR CYCLING IMPROVES **CARDIOVASCULAR HEALTH** AND DECREASES THE RISK FOR PREMATURE MORTALITY BY 10%

1. SOURCE: KELLY ET AL. 2014. INT J BEHAV NUTR PHYS ACT. 11:1

### 2 CYCLING COMBINES TRANSPORT WITH THE GYM



ON AVERAGE CYCLISTS WEIGH 2 KG LESS THAN CAR DRIVERS

2. SOURCE: PASTA PROJECT

### 3 LESS AIR POLLUTION

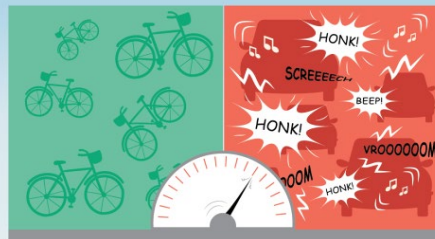
A 40% SHIFT FROM CAR TRIPS TO CYCLING IN BARCELONA'S METROPOLITAN AREA



COULD AVOID AT LEAST 28 PREMATURE DEATHS A YEAR DUE TO REDUCED AIR POLLUTION

3. SOURCE: ROJAS-RUEDA ET AL. 2012. ENVIRON. INT. 49:100-109

### 4 LESS NOISE POLLUTION



ON **CAR FREE DAYS** NOISE LEVELS CAN BE REDUCED BY UP TO 10 DECIBELS

4. SOURCE: NIEUWENHUIJSEN & KHREIS 2016

### 5 ZERO EMISSIONS TRANSPORT MODE

CYCLING DOES NOT DEPEND ON FOSSIL FUELS AND CAN HELP STOP GLOBAL WARMING

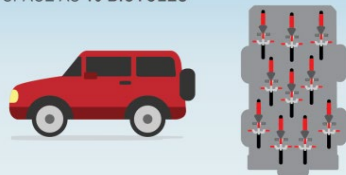


A 40% SHIFT FROM CAR TRIPS TO CYCLING CAN **REDUCE 200,000 TONS OF CO2 EMISSIONS** ANNUALLY IN BARCELONA'S METROPOLITAN AREA

5. SOURCE: ROJAS-RUEDA ET AL. 2012. ENVIRON. INT. 49:100-109

### 6 MORE PUBLIC SPACE

ONE CAR OCCUPIES THE SAME PARKING SPACE AS 10 BICYCLES



BICYCLES ARE A **DOOR-TO- DOOR TRANSPORT** THAT CAN HELP AVOID TRAFFIC JAMS AND CONGESTION IN CITIES

### 7 MORE HAPPINESS!!

ACTIVE TRANSPORT IS ASSOCIATED WITH **BETTER MENTAL AND PHYSICAL WELL-BEING, LESS STRESS AND MORE HAPPINESS!**

7. SOURCE: VANMEEREN ET AL. 2015. PREV MED. 100:100-104



*Be healthy. be happy. cycle!!!*



FOR MORE INFORMATION, VISIT  
[WWW.ISGLOBAL.ORG/EN/URBAN-PLANNING](http://WWW.ISGLOBAL.ORG/EN/URBAN-PLANNING)

GRAPHIC DESIGN: INCHES, ALL PARTNERS

ISGlobal

**Benefits of physical activity well outweigh the risks of air pollution and accidents for cyclists**





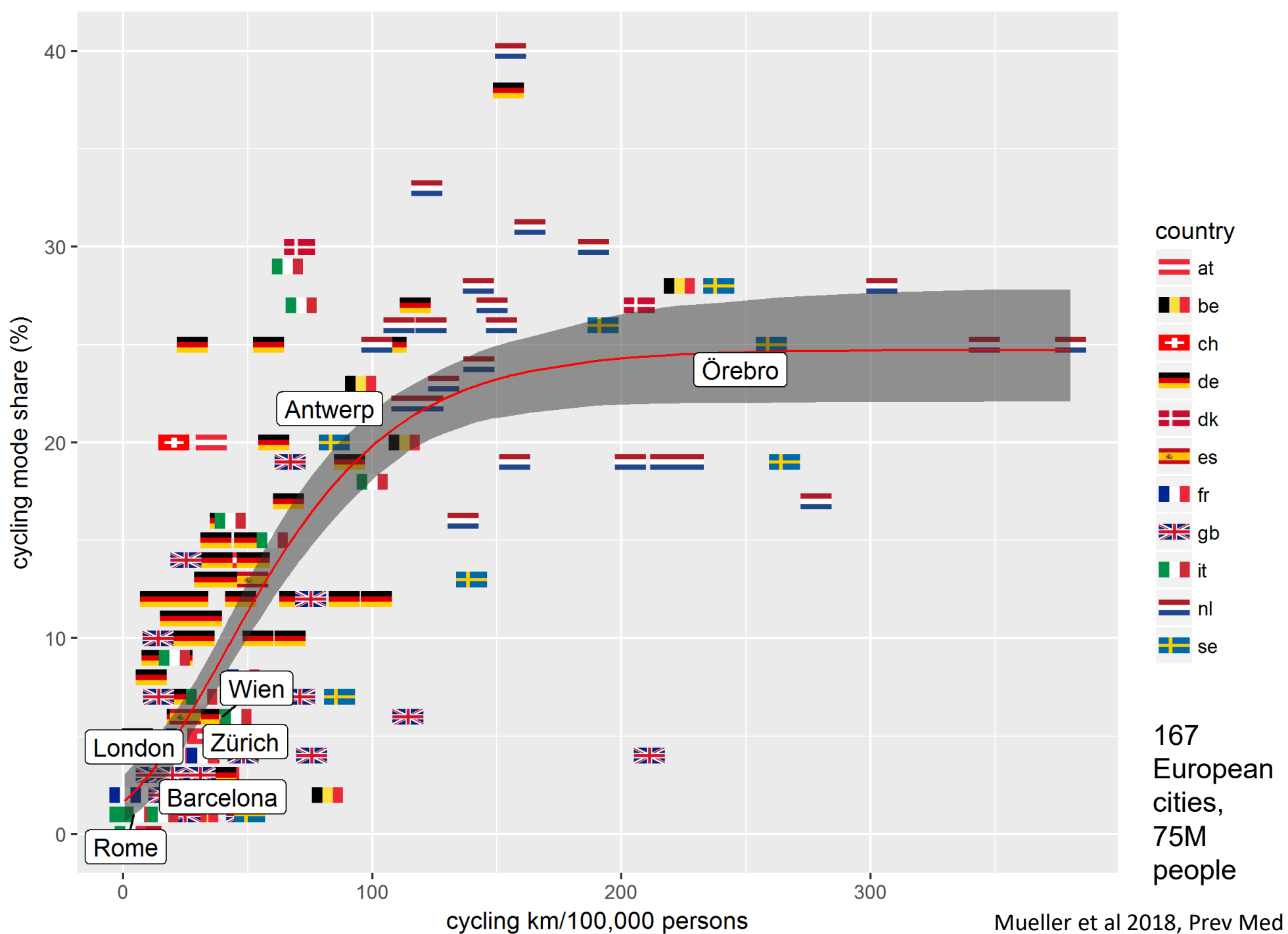
**ELECTRIC BIKE**





Utrecht, NL





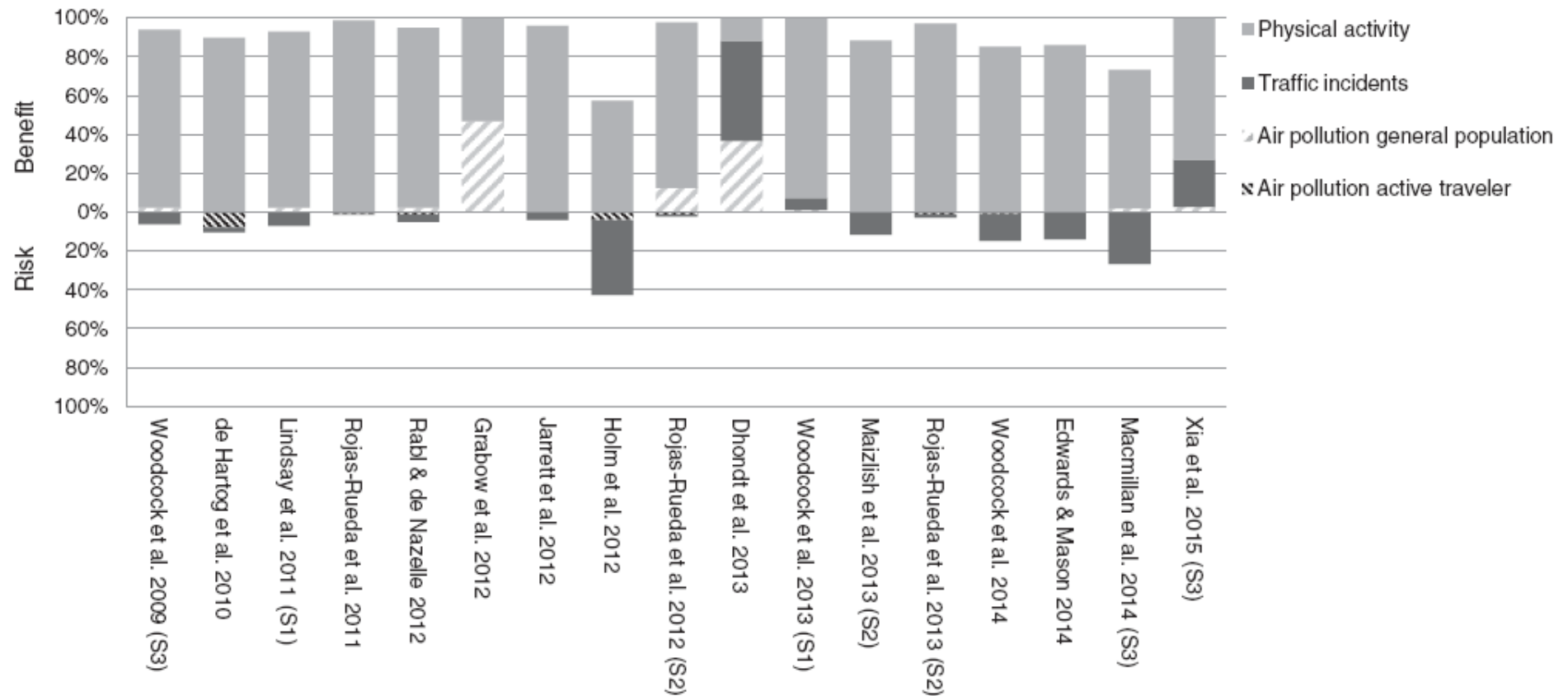


# PREMATURE DEATHS PREVENTED

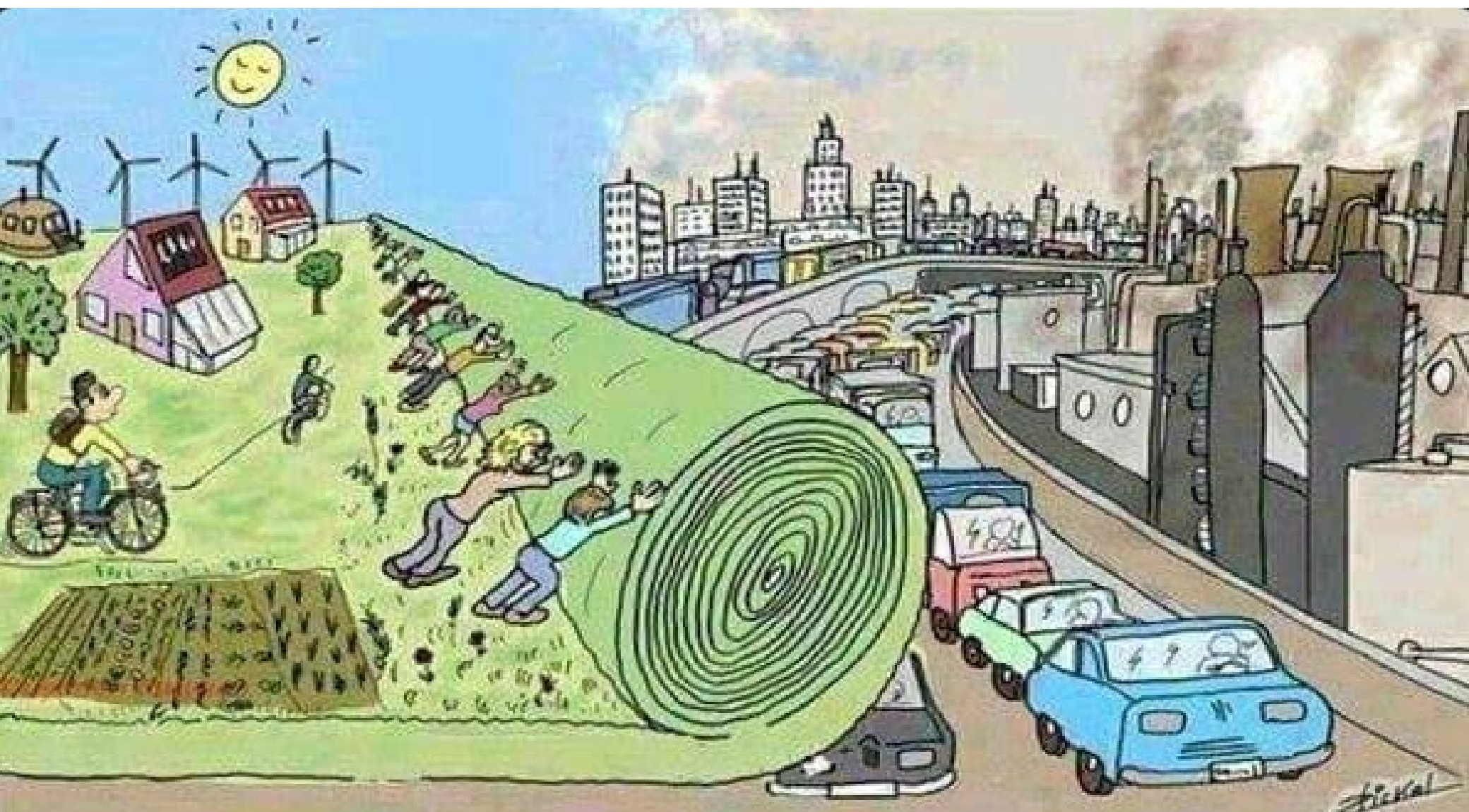
- **10,091 premature deaths prevented annually in 167 European cities (75M people) if the mode share of cycling went up to 24.7%**

# HIAs of ACTIVE TRANSPORTATION

N. Mueller et al. / Preventive Medicine 76 (2015) 103–114



Mueller et al 2015









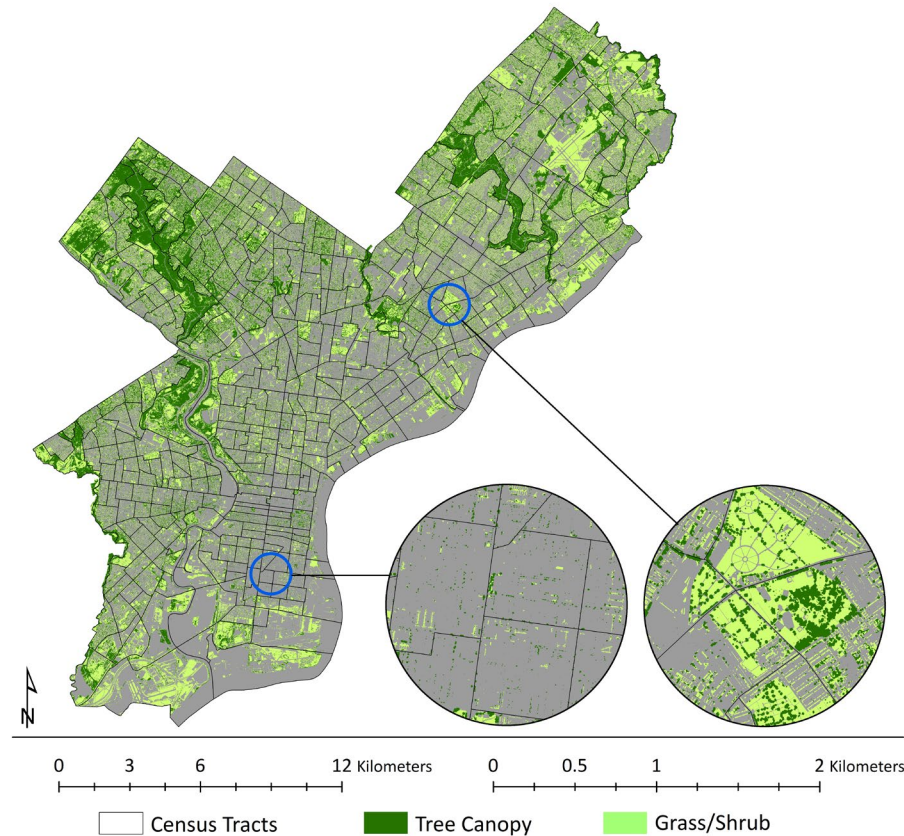


# GREEN AND LIVEABLE

- Greening cities has many health benefits including longer life expectancy, fewer mental health problems, better cognitive function, better mood and healthier babies
- It mitigates air pollution, heat and noise levels.
- CO2 sequestration
- Replacing roads and parking with green environments can be one way forward to change an environment from detrimental to beneficial.



# HEALTH IMPACT ASSESSMENT OF PHILADELPHIA'S 2025 TREE CANOPY COVER GOALS (30%)



Land cover analysis in 2008 showed that tree canopy covered 20% of land area  
Of the 155 neighborhoods, 19 already met or exceeded the 30% tree canopy goal, and 102 neighborhoods could meet the goal by planting and establishing trees in areas currently covered with grass and/or shrub. The remaining 34 neighborhoods would require removal of impervious surface to meet the 30% cover goal

# Green spaces and mortality: a systematic review and meta-analysis of cohort studies



David Rojas-Rueda, Mark J Nieuwenhuijsen, Mireia Gascon, Daniela Perez-Leon, Pierpaolo Mudu



## Summary

**Background** Green spaces have been proposed to be a health determinant, improving health and wellbeing through different mechanisms. We aimed to systematically review the epidemiological evidence from longitudinal studies that have investigated green spaces and their association with all-cause mortality. We aimed to evaluate this evidence with a meta-analysis, to determine exposure-response functions for future quantitative health impact assessments.

**Methods** We did a systematic review and meta-analysis of cohort studies on green spaces and all-cause mortality. We searched for studies published and indexed in MEDLINE before Aug 20, 2019, which we complemented with an additional search of cited literature. We included studies if their design was longitudinal; the exposure of interest was measured green space; the endpoint of interest was all-cause mortality; they provided a risk estimate (ie, a hazard ratio [HR]) and the corresponding 95% CI for the association between green space exposure and all-cause mortality; and they used normalised difference vegetation index (NDVI) as their green space exposure definition. Two investigators (DR-R and DP-L) independently screened the full-text articles for inclusion. We used a random-effects model to obtain pooled HRs. This study is registered with PROSPERO, CRD42018090315.

**Findings** We identified 9298 studies in MEDLINE and 13 studies that were reported in the literature but not indexed in MEDLINE, of which 9234 (99%) studies were excluded after screening the titles and abstracts and 68 (88%) of 77 remaining studies were excluded after assessment of the full texts. We included nine (12%) studies in our quantitative evaluation, which comprised 8 324 652 individuals from seven countries. Seven (78%) of the nine studies found a significant inverse relationship between an increase in surrounding greenness per 0·1 NDVI in a buffer zone of 500 m or less and the risk of all-cause mortality, but two studies found no association. The pooled HR for all-cause mortality per increment of 0·1 NDVI within a buffer of 500 m or less of a participant's residence was 0·96 (95% CI 0·94–0·97;  $I^2$ , 95%).

*Lancet Planet Health* 2019;  
3: 469–77

Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, CO, USA (D Rojas-Rueda PhD); ISGlobal, Centre for Research in Environmental Epidemiology, Barcelona, Spain (D Rojas-Rueda, Prof M J Nieuwenhuijsen PhD, M Gascon PhD, D Perez-Leon MD); Municipal Institute of Medical Research, Barcelona, Spain (D Rojas-Rueda, Prof M J Nieuwenhuijsen, M Gascon, D Perez-Leon); Universitat Pompeu Fabra, Barcelona, Spain (D Rojas-Rueda, Prof M J Nieuwenhuijsen, M Gascon); CIBER Epidemiología y Salud Pública, Madrid, Spain (D Rojas-Rueda, Prof M J Nieuwenhuijsen,



# **ANNUAL PREVENTABLE PREMATURE DEATHS AND AVERTED COSTS IN PHILADELPHIA**

**646 premature deaths (4.7% of total)  
prevented annually**

**Averted cost \$6,2 billion annually**



Seoul



# ALDERHEY HOSPITAL LIVERPOOL BEFORE AND AFTER







Vauban, Freiburg



# Multisectoral approach

Multi sectorial and systemic approaches are needed to address current problems and find solutions





Mark Nieuwenhuijsen · Haneen Khreis *Editors*

## Integrating Human Health into Urban and Transport Planning

A Framework

This volume brings together the world's leading experts on urban and transport planning, environmental exposures, physical activity, health and health impact assessment to discuss challenges and solutions in cities. The book provides a conceptual framework and work program for actions and outlines future research needs. It presents the current evidence-base, the benefits of and numerous case studies on integrating health and the environment into urban development and transport planning.

Within cities there is a considerable variation in the levels of environmental exposures such as ambient air pollution, noise, and temperature, green space availability and physical activity. Many of these exposures, and their adverse health impacts, are related to and are being exacerbated by urban and transport planning and policy. Emerging research suggests that urban and transport planning indicators such as road network, distance to major roads, traffic density, household density, industry, and natural and green space can explain a large proportion of the variability in environmental exposures and therefore represent important and highly modifiable factors.

The urban environment is a complex interlinked system. Decision-makers need not only better data on the complexity of factors in environmental and developmental processes affecting human health, but also an enhanced understanding of the linkages between these factors and health effects to determine at which level to target their actions most effectively. In recent years, there also has been a shift from trying to change at the national level to more comprehensive and ambitious actions being developed and implemented at the regional and local levels. Cities have come to the forefront of providing solutions for environmental issues such as climate change, which has co-benefits for health, but yet need better knowledge for wider health-centric action. This book provides the latest and most up-to-date information and studies for academics and practitioners alike.

Environment

ISBN 978-3-319-74982-2



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[mark.nieuwenhuijsen@isglobal.org](mailto:mark.nieuwenhuijsen@isglobal.org)

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Integrating Human Health into Urban and  
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# Integrating Human Health into Urban and Transport Planning

A Framework

 Springer

# URBAN TRANSITIONS 2020

Integrating Urban and Transport Planning,  
Environment and Health for Healthier Urban Living

10-12 November 2020  
Sitges, Barcelona, Spain

