

Liveable, sustainable and healthy cities

Mark J Nieuwenhuijsen

ISGlobal Barcelona
Institute for
Global Health



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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 change
- Population growth and ageing
- Urbanization

CITIES

“ Cities have long been known to be society’s predominant engine of innovation and wealth creation, yet they are also its main source of crime, pollution, and disease ”

Bettencourt et al 2007



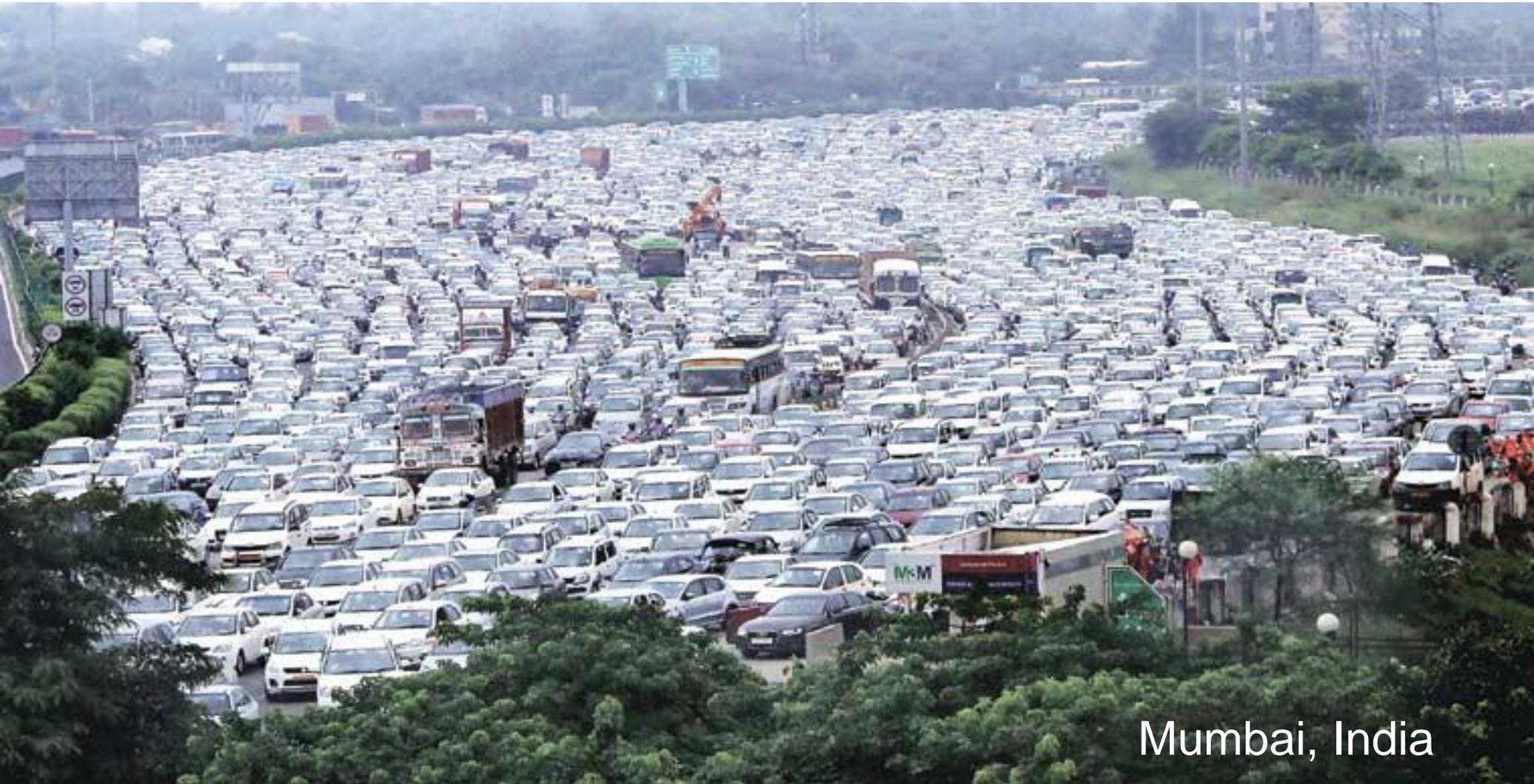
SHENZHEN, CHINA





Tehran, Iran

Tehran, Iran, 15 November 2016. Habib Kashani, a member of Tehran's municipal council, said on Tuesday that pollution in Tehran had led to the death of 412 citizens in the past 23 days, according to the state news agency, Irna. City authorities announced that all schools would be closed on Wednesday. The concentration of ultra-fine airborne particles (known as PM2.5) reached more than 150 this week, setting a new record. These particles of less than 2.5 micrometres in diameter can penetrate the lungs and pass into the bloodstream and have been linked to increased rates of chronic bronchitis, lung cancer and heart disease. (Guardian newspaper)



Mumbai, India



Paris, France

ENTREVISTA | CARLOS DORA

“Toda la planificación urbana del mundo es para los coches; la gente no importa”

El coordinador de Salud Pública y Medioambiente de la OMS apuesta por desarrollar modelos sostenibles de ciudades para mejorar la salud



JESSICA MOUZO QUINTÁNS

Barcelona - 30 JUN 2017 - 09:40 CEST



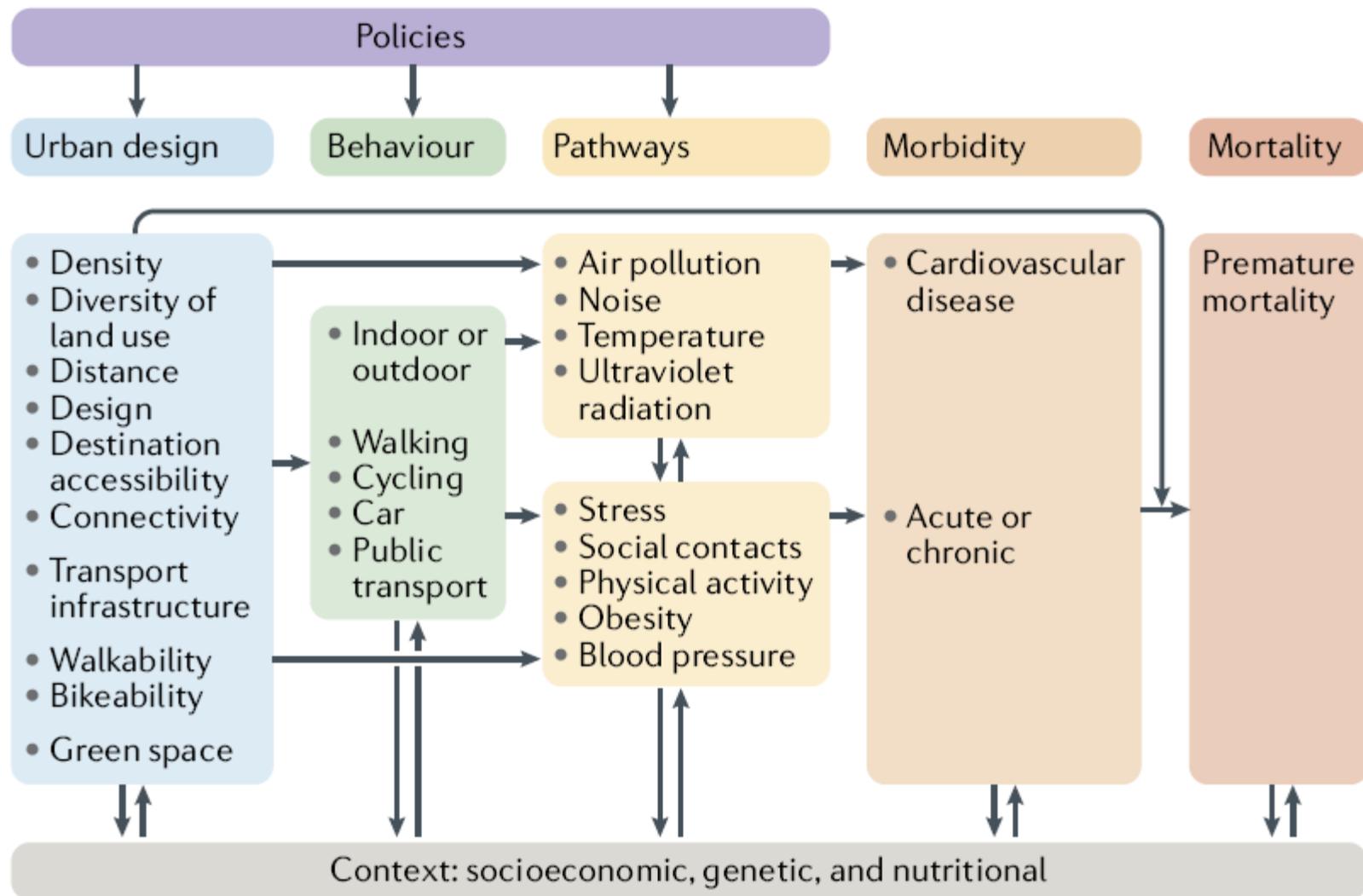
Carlos Dora, coordinador de Salud Pública y Medio Ambiente de la Organización Mundial de la Salud (OMS), el miércoles en Barcelona. ALBERT GARCIA

"All the urban planning in the world is for cars; People do not matter "

Jan Gehl **Cities for People**

Jan Gehl: “Life happens on foot. Man was created to walk, and all of life’s events large and small develop when we walk among other people. There is so much more to walking than walking. There is direct contact between people and the surrounding community, fresh air, time outdoors







**Urban Planning,
Environment and
Health Initiative**

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How Urban Environment Impacts our Health

Respiratory tract

- lung cancer
- asthma
- respiratory diseases

Breast

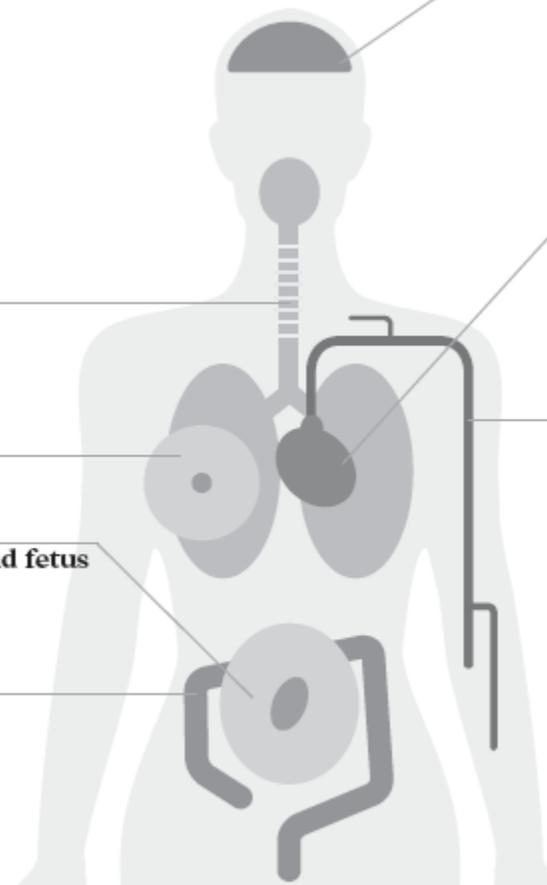
- breast cancer

Reproductive system and fetus

- low birth weight
- preterm birth
- lower sperm quality

Digestive system

- colon cancer



Head

- stroke, cerebrovascular diseases
- mental health
- neurodegenerative diseases
- autism, child behaviour problems
- cognitive impairment

Heart

- myocardial infarction
- arrhythmia
- cardiovascular diseases

Arteries

- hypertension

General

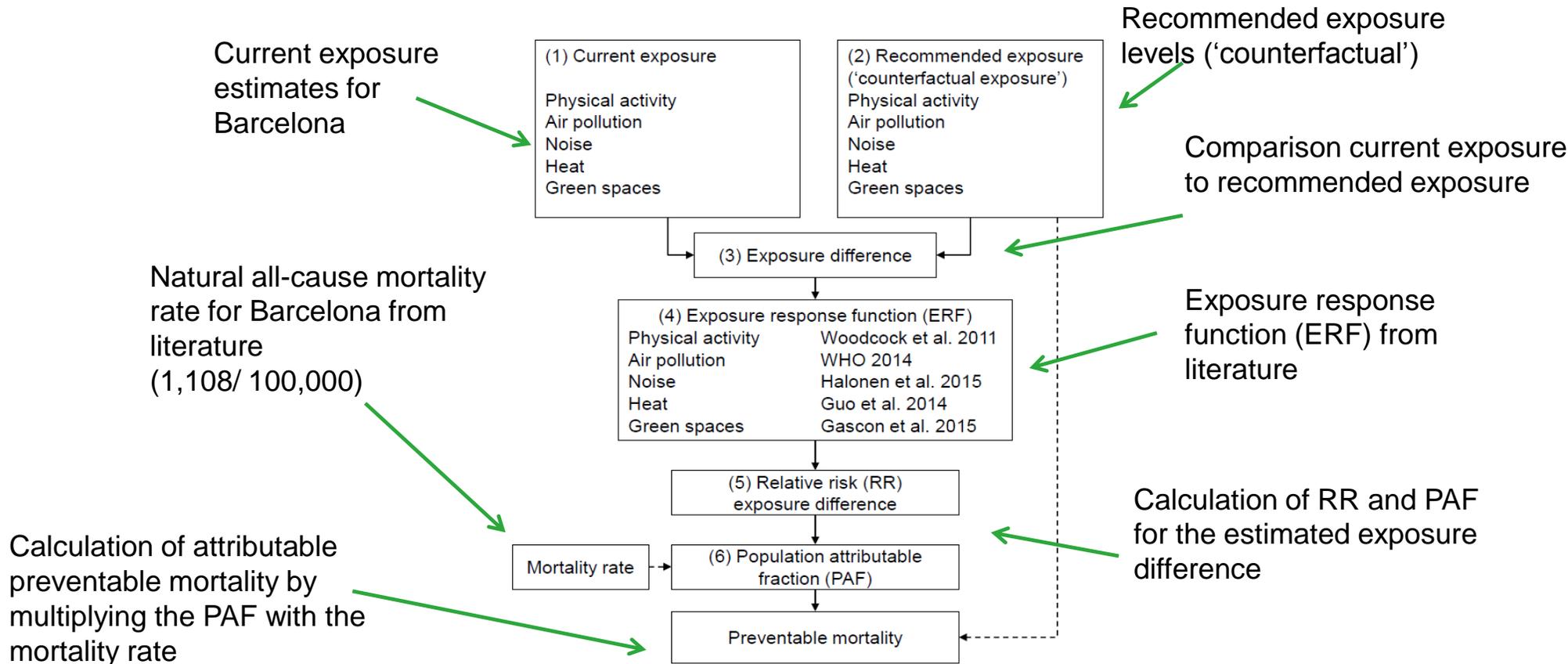
- sleep disturbance and annoyance
- labour and traffic incidents with injury
- obesity
- diabetes
- thrombosis
- systemic inflammation
- increase in mortality

Health conditions associated with ● air pollution ● noise ● temperature
and a lack of ● physical activity ● natural spaces

<https://www.isglobal.org/urban-planning>

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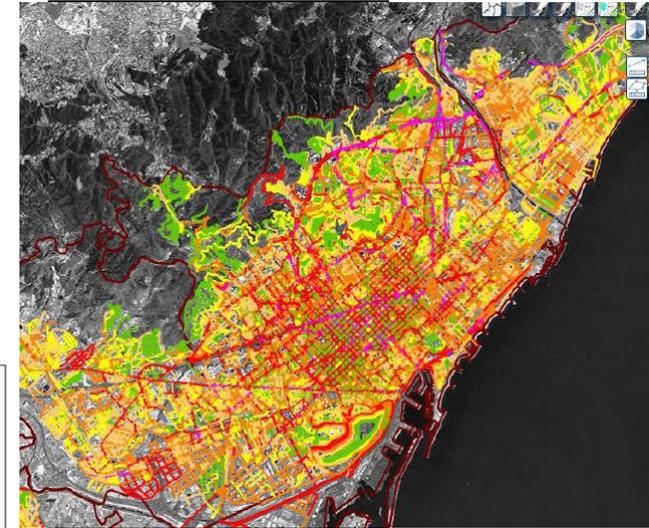
Urban and TranspOrt Planning Health Impact Assessment tool (UTOPHIA)



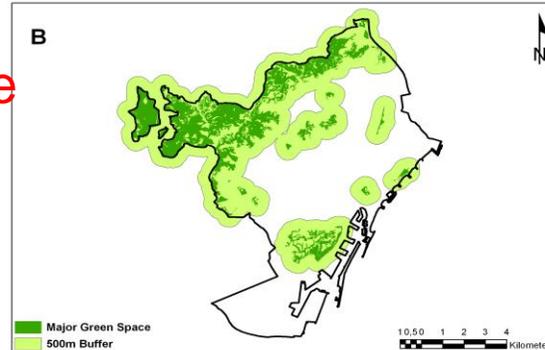
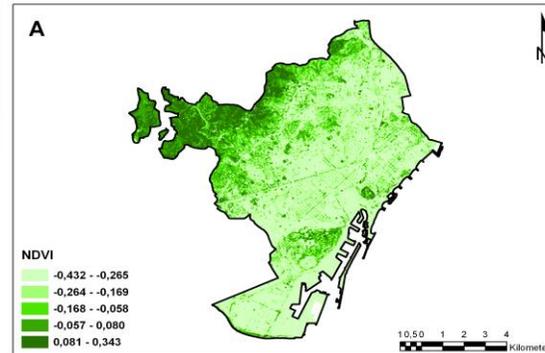
EXPOSURE PATTERNS IN BARCELONA



Air pollution

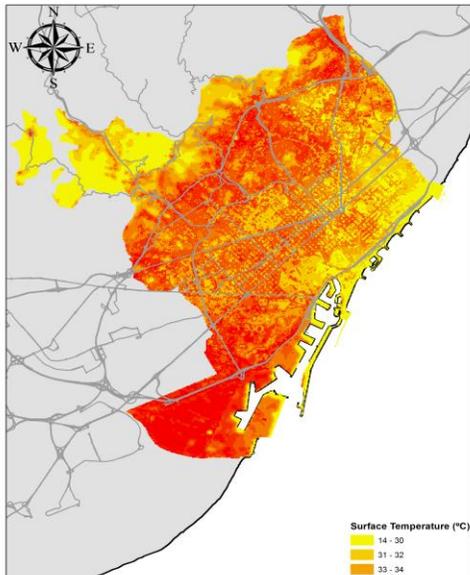


Noise

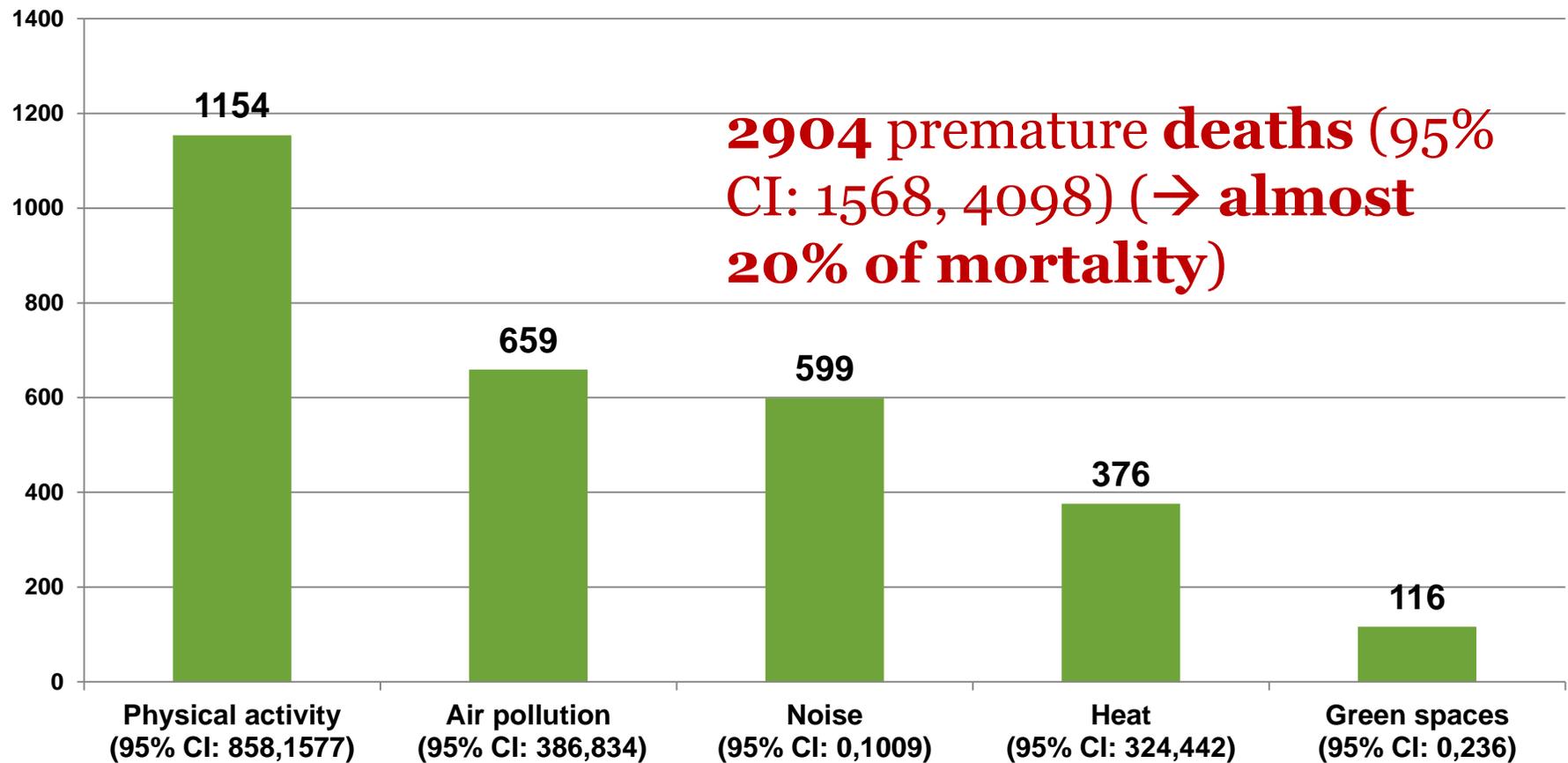


Temperature

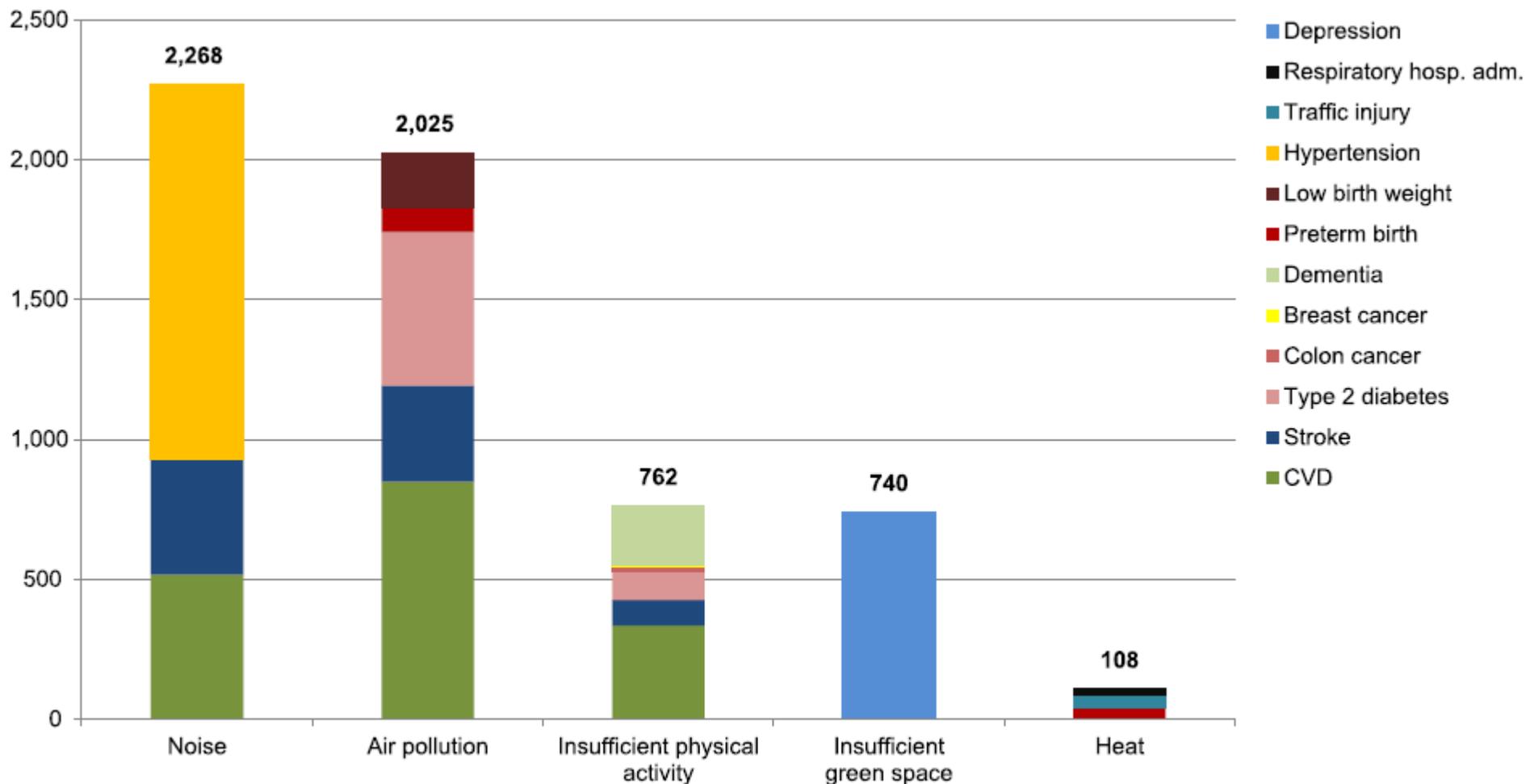
Green space



DEATHS DUE TO POOR URBAN AND TRANSPORT PLANNING BARCELONA



Traffic injury deaths 30



CVD=cardiovascular disease; hosp.adm=hospital admissions

Noise-related annoyance and sleep disturbance (i.e. 178,773 persons and 99,603 persons, respectively) are not considered.

52,001 DALYs (95% CI: 42,866–61,136)



SOLUTIONS

- Land use changes
- Reduce car dependency and move towards public and active transportation
- Greening of cities
- Visioning
- Collaboration
- Leadership and investment

LAND USE CHANGES



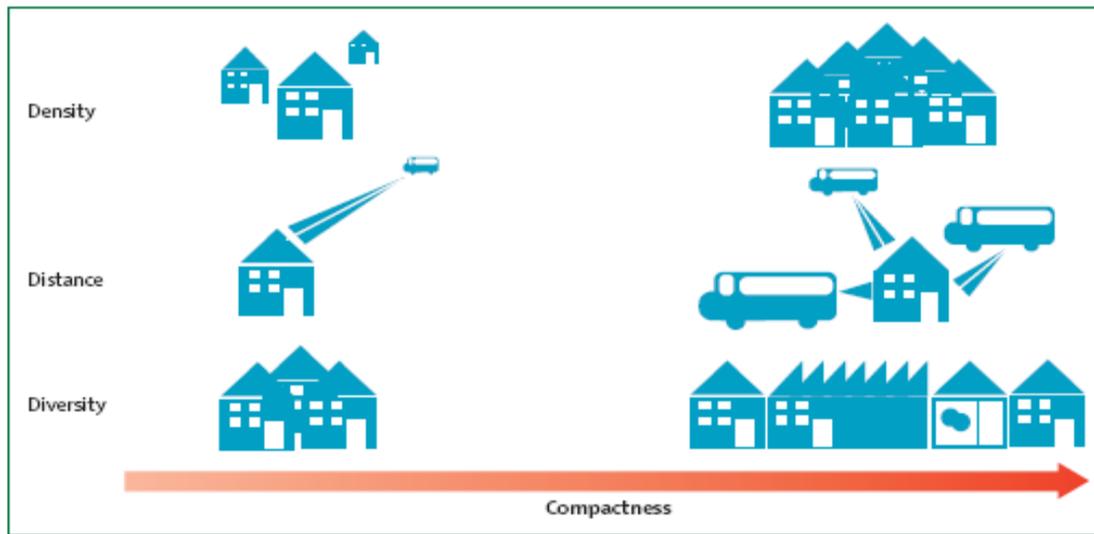


Figure 1: Illustration of the terms density, distance, and diversity as applied in the compact cities model

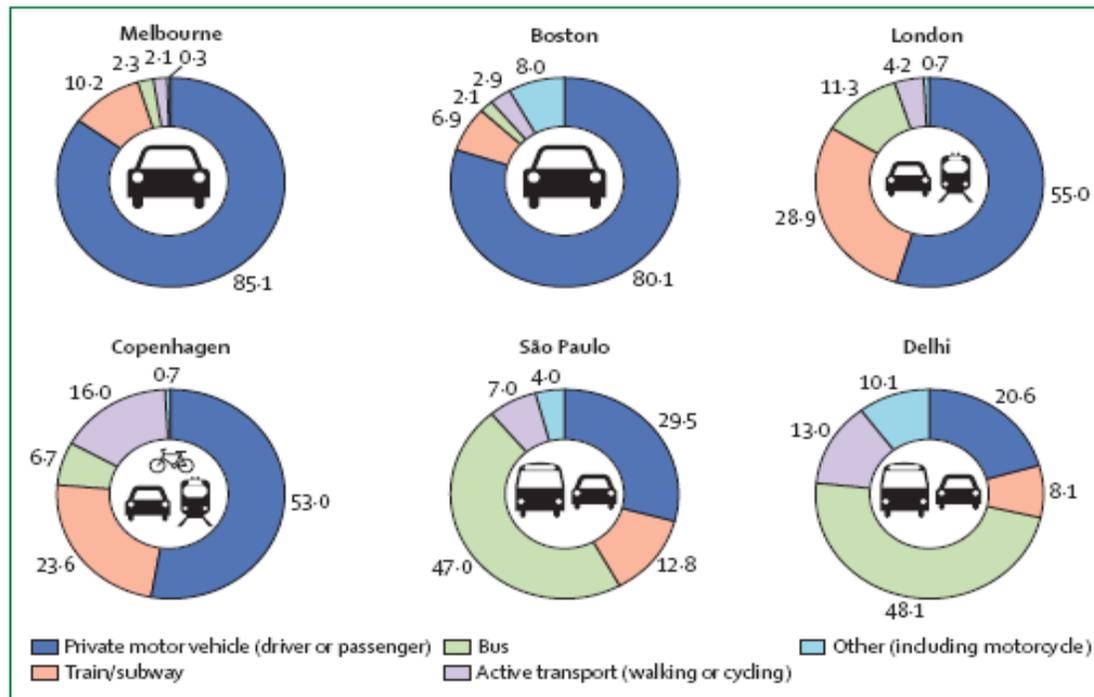


Figure 2: Percentage of vehicle kilometres travelled (VKT) by mode in each city at baseline with dominant transport modes depicted

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

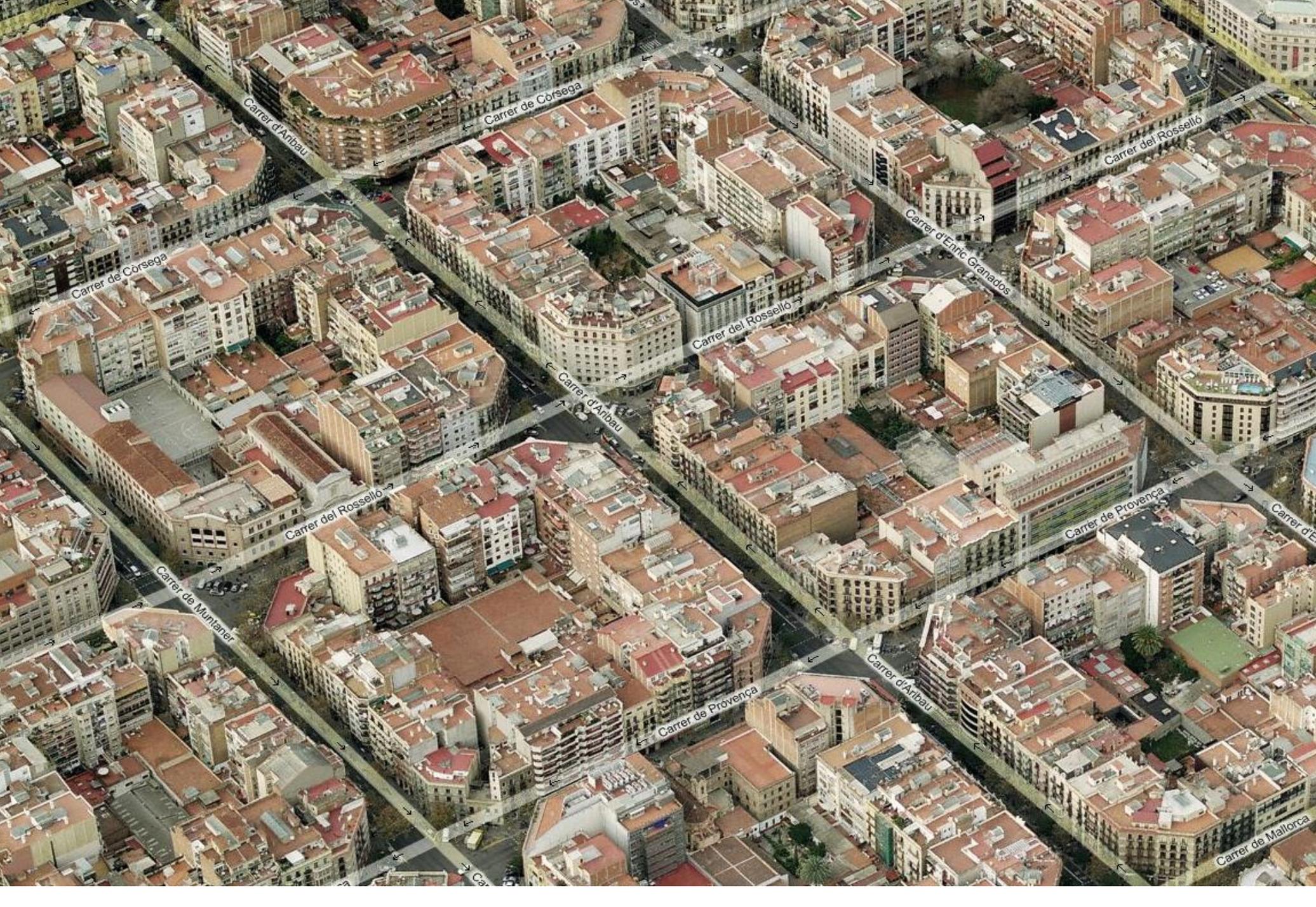
	Melbourne	São Paulo	Delhi	London	Boston	Copenhagen
Cardiovascular disease (ICD-AM I00-I99)	622 (312 to 1071)	363 (14 to 915)	565 (169 to 1117)	582 (244 to 1053)	765 (355 to 1386)	337 (4 to 832)
Type 2 diabetes (ICD-AM E10-E14)	86 (40 to 159)	55 (-9 to 155)	28 (-10 to 91)	27 (7 to 61)	94 (41 to 189)	53 (-4 to 146)
Respiratory disease (ICD-AM J30-J98)	2 (1 to 4)	3 (1 to 5)	22 (8 to 42)	8 (4 to 14)	3 (-1 to 5)	2 (1 to 4)
Road trauma (ICD-AM V00-V89)	-34 (-64 to -7)	-4 (-71 to 62)	2 (-48 to 51)	-41 (-64 to -19)	-34 (-66 to -1)	-1 (-22 to 20)
Total	679 (330 to 1181)	420 (12 to 1029)	620 (167 to 1233)	581 (216 to 1084)	826 (352 to 1553)	393 (5 to 967)

Data are 50th percentile estimates (95% CI). Aggregated individual estimates may not equal the total due to rounding and Monte Carlo estimation. ICD-AM=International Classification of Diseases, Australian modification.

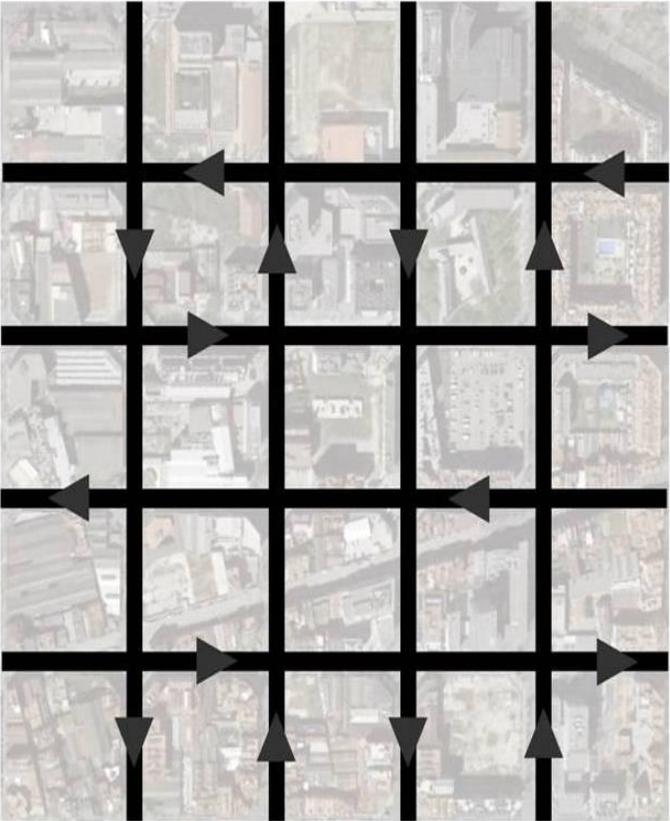
Table 4: Disability-adjusted life-years (DALYs) gained per 100 000 population under the compact cities model

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

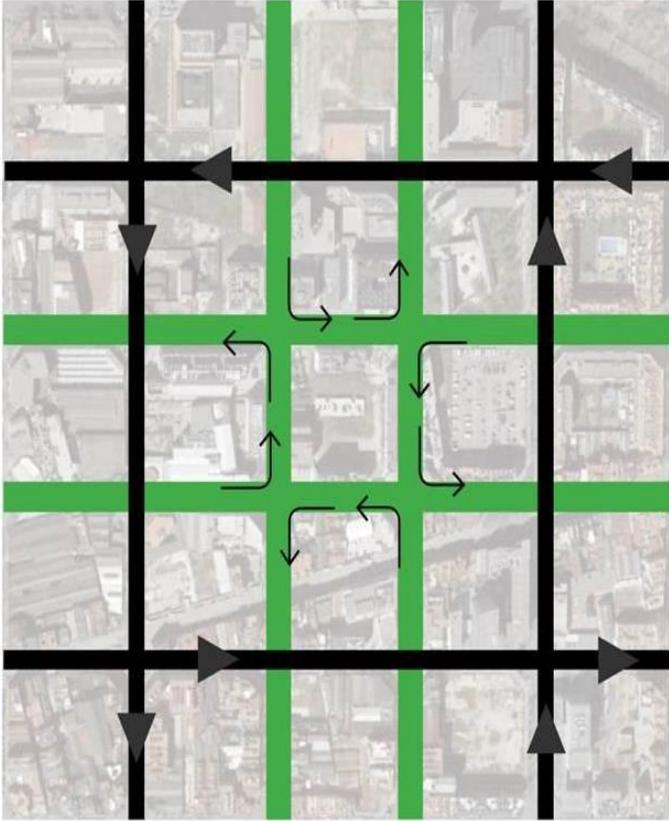
DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences:



Baseline



Superblock



BARCELONA SUPER BLOCKS

- 19.2% car reduction
- 11.5 ug/m³ (24.3%) NO₂ reduction
- 2.9 dB noise reduction
- 3 fold increase green space (6.5% to 19.6%)
- 20% Surface temperature reduction

IMPACTS ON MORTALITY

681 premature deaths preventable (95% CI: 245-1,113)

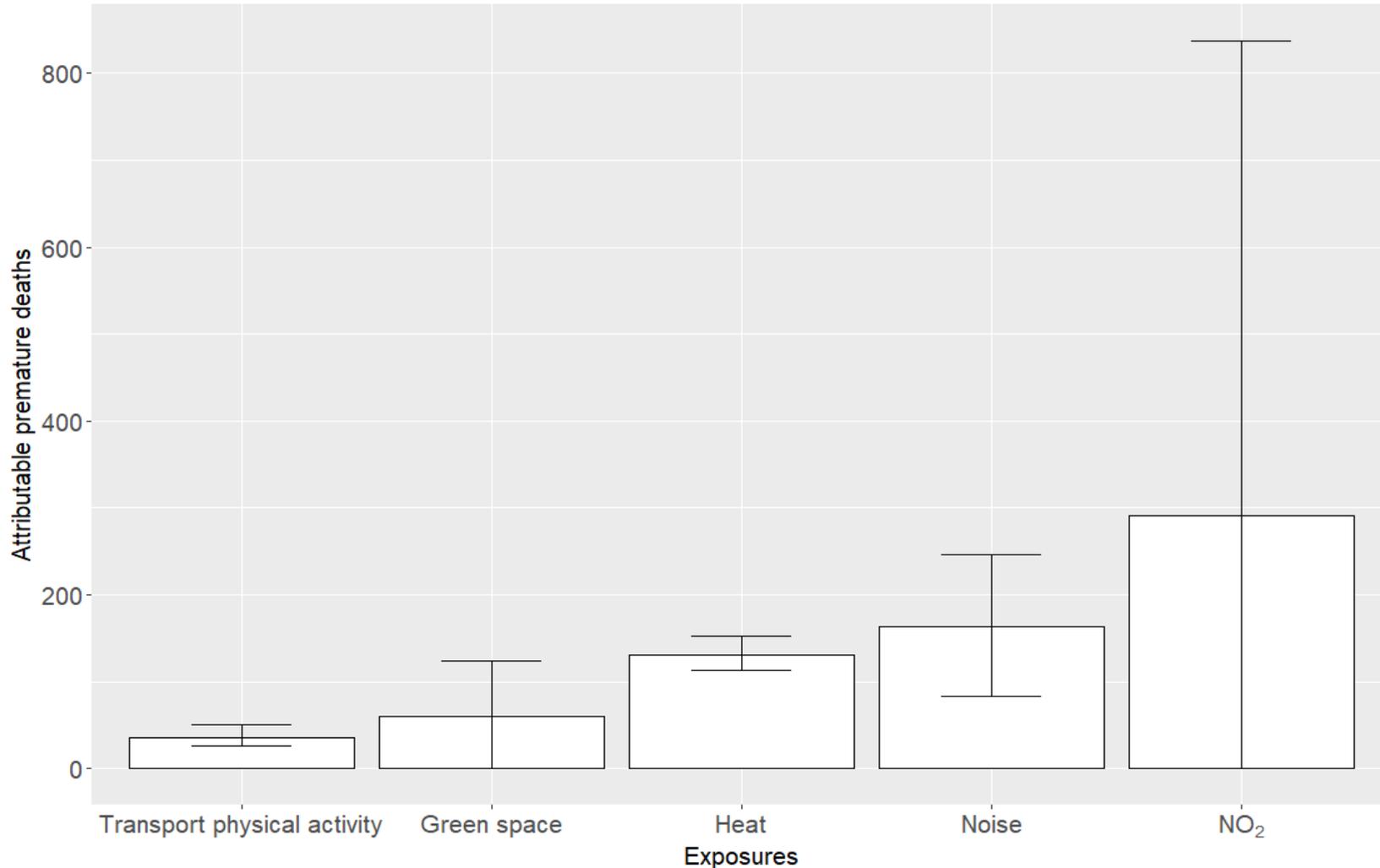
36 deaths
95% CI: 26-50

61 deaths
95% CI: 0-123

131 deaths
95% CI: 114-153

163 deaths
95% CI: 83-246

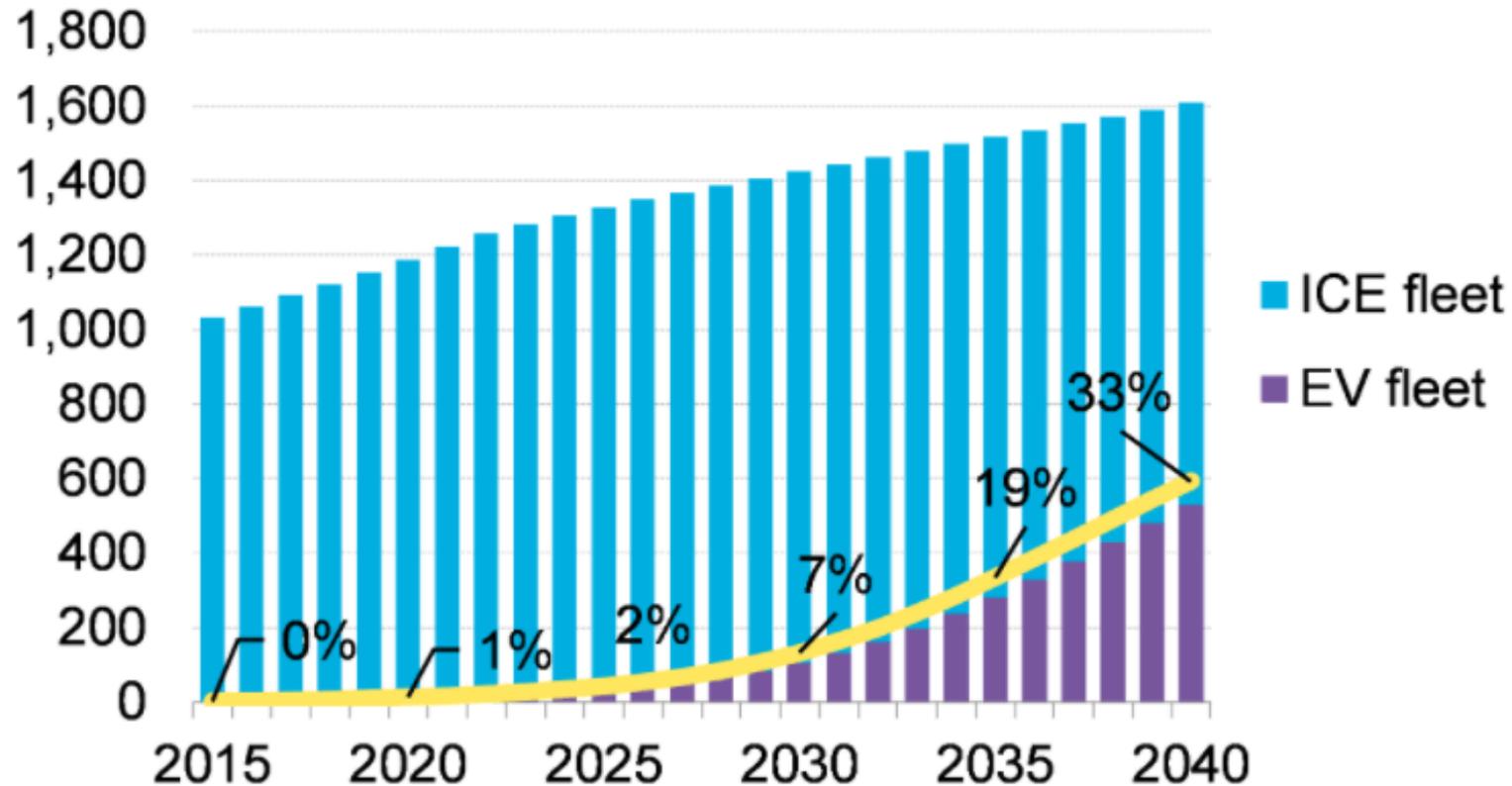
291 deaths
95% CI: 0-838



TRANSPORT CHANGES

PREDICTIONS FOR CARS

million cars on the road



Bloomberg New Energy
Finance (BNEF)

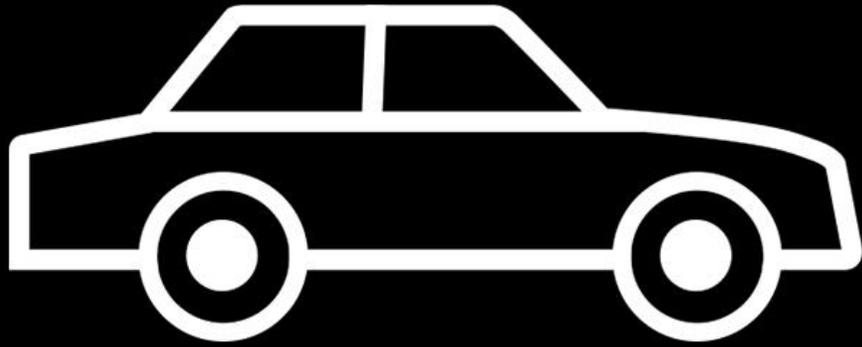
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ELECTRIC CARS

AUTONOMOUS VEHICLES





THIS ONE
RUNS ON MONEY
AND MAKES
YOU FAT



THIS ONE
RUNS ON FAT
AND SAVES
YOU MONEY

50% of car trips < 5 km



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 &P; KHREIS 2016

5 ZERO EMISSIONS TRANSPORT MODE

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

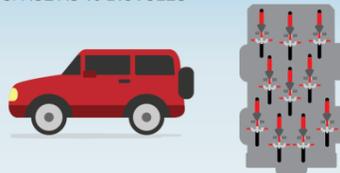


A 40% SHIFT FROM CAR TRIPS TO CYCLING CAN **REDUCE 200,000 TONS OF CO2 EMISSIONS** ANNUALLY IN BARCELONA'S METROPOLITAN AREA

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: VANMEERBEEK ET AL. 2013. PREV MED. 53:2-324



FOR MORE INFORMATION, VISIT WWW.ISGLOBAL.ORG/EN/URBAN-PLANNING

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



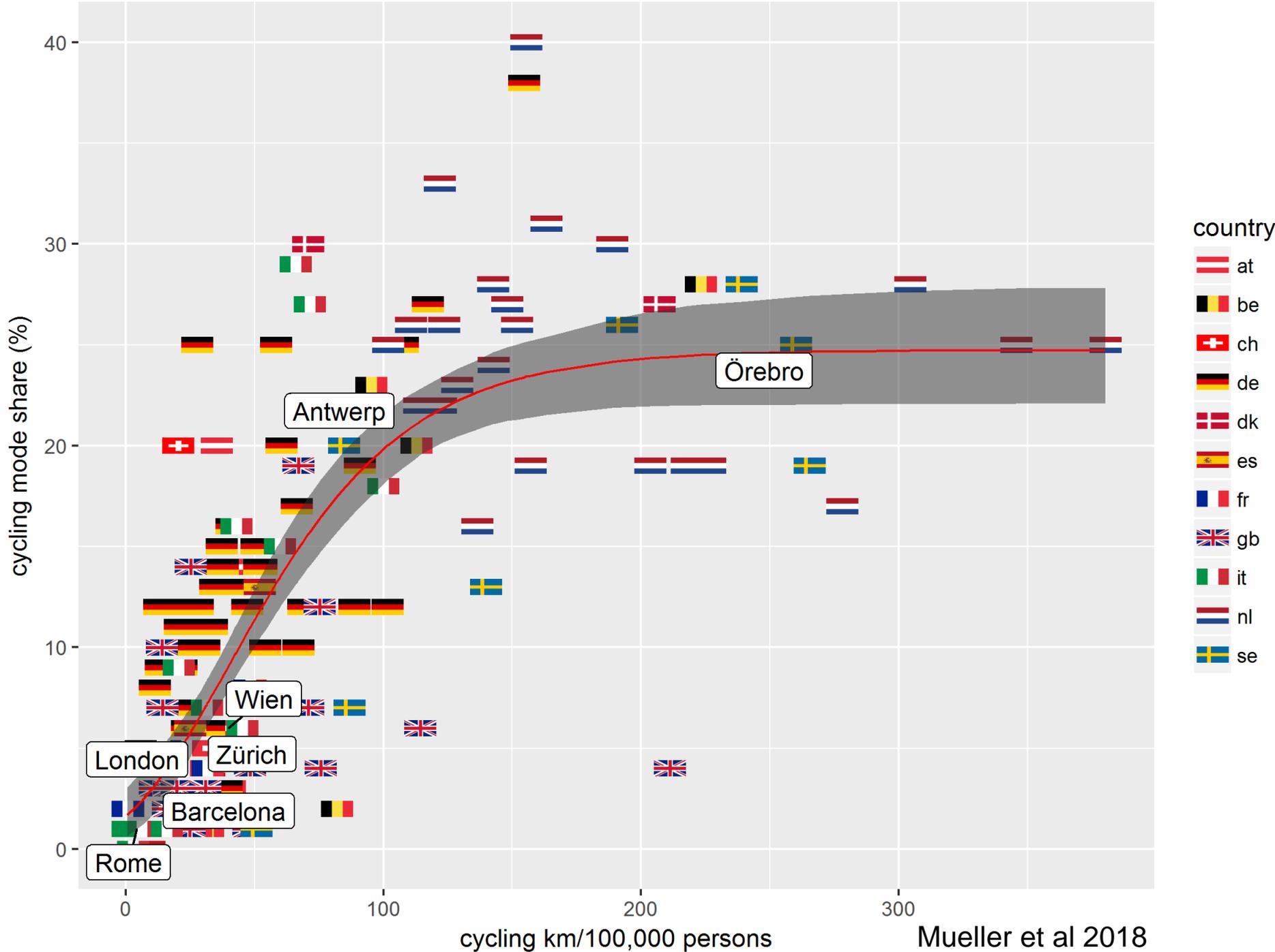


ELECTRIC BIKE

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CYCLING

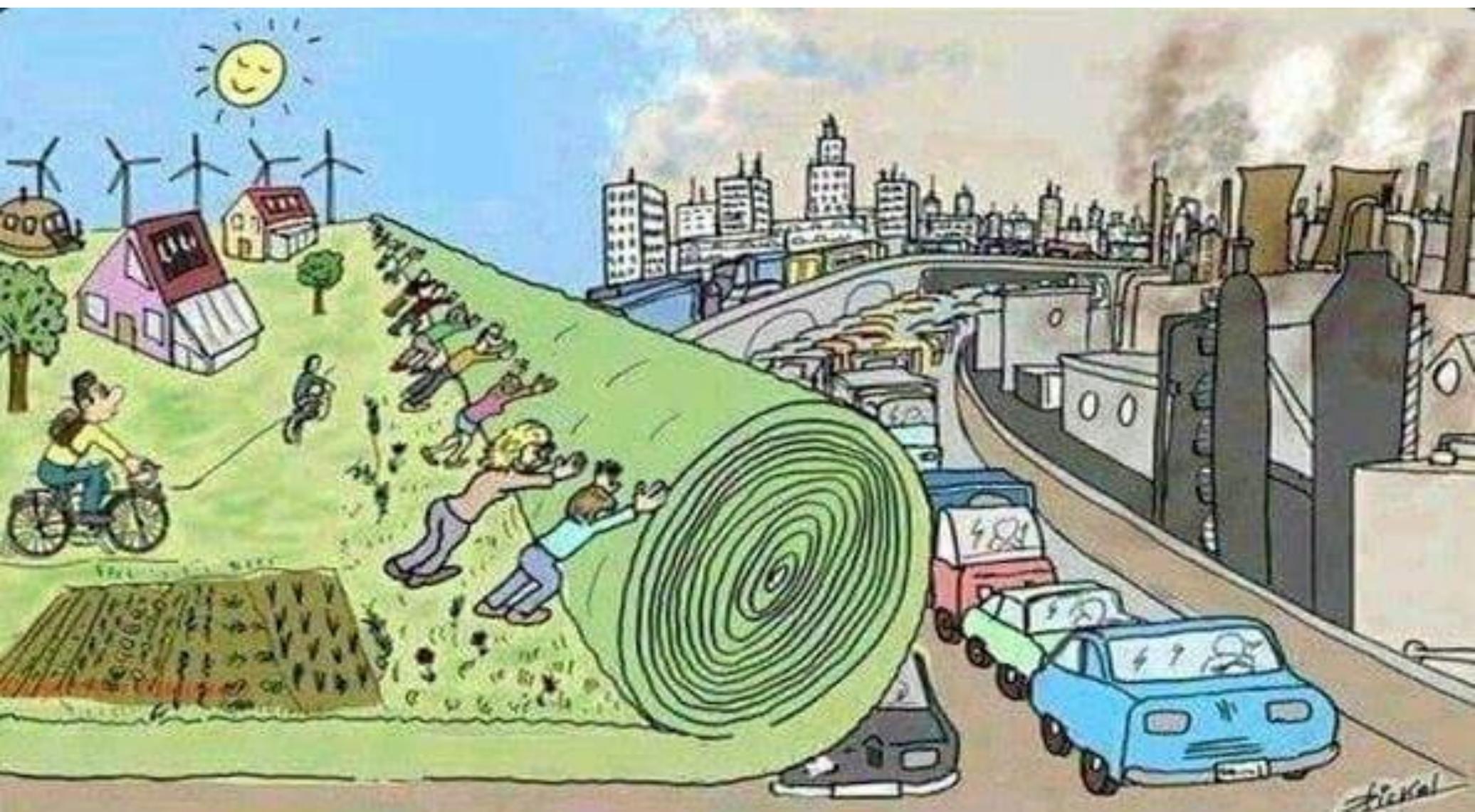
- When there are more cycling lanes, do people cycle more?
- Can cycling more prevent premature deaths?
- Health impact assessment study in 167 European cities (75M people)



PREMATURE DEATHS PREVENTED

- 10,091 premature deaths prevented annually in 167 European cities if the mode share of cycling went up to 24.7%

GREENING OF CITIES





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.
- Replacing roads and parking with green environments can be one way forward to change an environment from detrimental to beneficial.



Seoul

Fifty Shades of Green

Pathway to Healthy Urban Living

*Mark J. Nieuwenhuijsen,^{a,b,c} Haneen Khreis,^d Margarita Triguero-Mas,^{a,b,c} Mireia Gascon,^{a,b,c}
and Payam Dadvand^{a,b,c}*

Abstract: Currently half the world population lives in cities, and this proportion is expected to increase rapidly to 70% over the next years. Over the years, we have created large, mostly grey cities with many high-rise buildings and little green space. Disease rates tend to be higher in urban areas than in rural areas. More green space in cities could reduce these rates. Here, we describe the importance of green space for health, and make recommendations for further research. Green space has been associated with many beneficial health effects, including reduced all-cause and cardiovascular mortality and improved mental health, possibly through mediators, such as reduced air pollution, temperature and stress, and increased physical activity, social contacts, and restoration. Additional studies are needed to strengthen the evidence base and provide further guidelines to transport planners, urban planners, and landscape architects. We need more longitudinal studies and intervention studies, further understanding of the contribution of various mechanisms toward health, and more information on susceptible populations and on where, when, how much, and what type of green space is needed. Also needed are standardized methods for green space quality assessments and evaluations of effectiveness of green prescriptions in clinical practice. Many questions are ideally suited for environmental epidemiologists, who should work with other stakeholders to address the right questions and translate knowledge into action. In conclusion, a growing evidence base supports the hypothesis that greener cities are healthier cities.

(Epidemiology 2017;28: 63–71)

It is remarkable that when you talk to people about green space they tend to have positive experiences to tell. They remember their childhood climbing a tree, a long hike in the forest, a barbecue with friends in the garden, or some time spent with their beloved in a park (Figure 1). Perhaps this is not so surprising as for tens of thousands of years humans have lived in forests and savannahs surrounded by nature, and only during the past few thousand years they have moved into cities, where nature is often less available. Our bodies and minds may be best adapted to living with nature, a concept Wilson¹ described with the term biophilia: people's innate affinity for the natural world.

Currently half the world's population live in cities, and this proportion is expected to increase rapidly to 70% during the next 20 to 30 years.² This rapid increase is particularly happening in low- and medium-income countries; 80% to 90% of people already live in cities in high-income countries.

Cities have long been known to be society's predominant engine of innovation and wealth creation, yet they are also its main source of crime, pollution, and disease.³ Over the years, we have created large, mostly grey cities with many high-rise buildings and little green space. (Shenzhen, China; Beirut, Lebanon; Buenos Aires, Argentina; Kuwait City, Kuwait; and Athens, Greece are a few examples.) It is therefore not surprising that only 23% of the residents of Athens are very or rather satisfied

VISIONING



Figure 1. Visualisations for a typical urban terraced street. The four figures are taken from the visualisations used in the Visions 2030 Walking and Cycling Project <http://www.visions2030.org.uk/>. Each vision represents four different possibilities for urban transport in 2030 in the UK. These visualisations are of a 'typical' Victorian terraced street. Visualisations created by the School of Computing at the University of East Anglia. doi:10.1371/journal.pone.0051462.g001

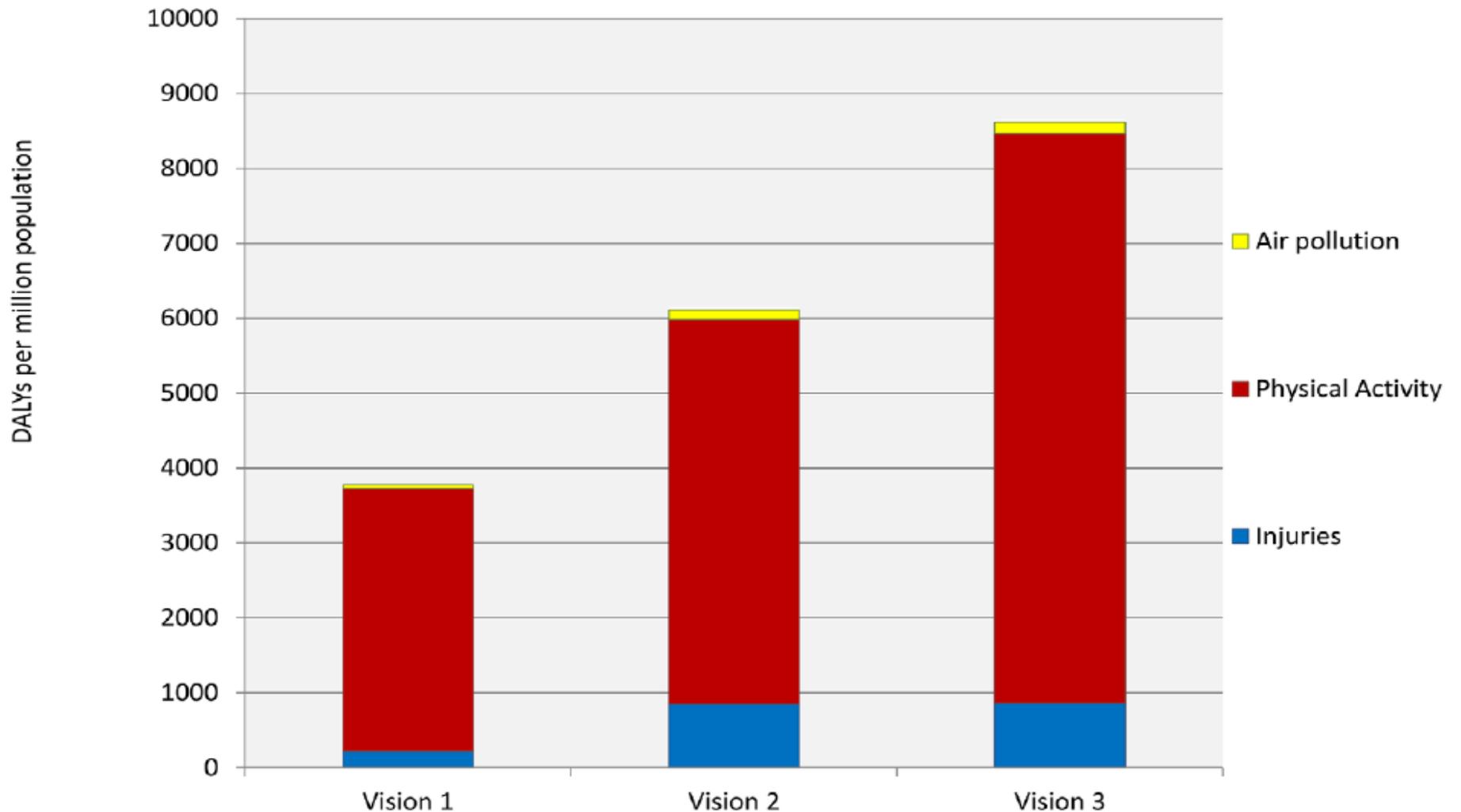


Figure 3. Health gains by Vision and risk factor. Disability Adjusted Life Years gained per million population under each of the three visions, broken down into the proportions attributable to improvements from air quality, increased physical activity and decreased road injuries. See Table 7 for full results.

doi:10.1371/journal.pone.0051462.g003



(Photo: Marcia Taylor)

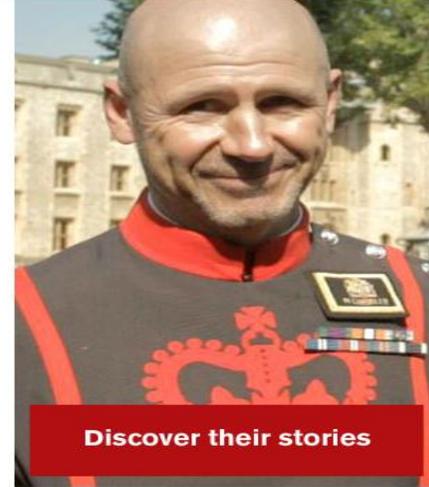
Hamburg Plans to Become Car-Free By 2034

But should there really be zero cars?

By Rachel Nuwer
SMITHSONIANMAG.COM
FEBRUARY 17, 2014



Hamburg, Germany, recently announced plans to convert 40 percent of the city into car-free pedestrian zones within the next two decades. According to Inhabitat, existing green spaces



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Contents lists available at [ScienceDirect](#)

Environment International

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Review article

Car free cities: Pathway to healthy urban living

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ABSTRACT

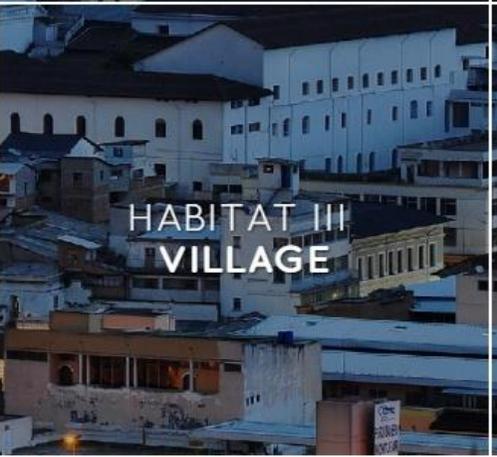
Background: Many cities across the world are beginning to shift their mobility solution away from the private cars and towards more environmentally friendly and citizen-focused means. Hamburg, Oslo, Helsinki, and Madrid have recently announced their plans to become (partly) private car free cities. Other cities like Paris, Milan, Chengdu, Masdar, Dublin, Brussels, Copenhagen, Bogota, and Hyderabad have measures that aim at reducing mo-



On September 25th 2015, countries adopted a set of goals to **end poverty, protect the planet, and ensure prosperity for all** as part of a [new sustainable development agenda](#). Each goal has specific targets to be achieved over the next 15 years.

For the goals to be reached, everyone needs to do their part: governments, the private sector, civil society and people like you.

Do you want to get involved? You can start by telling everyone about them. We've also put together [a list of actions](#) that you can take in your everyday life to contribute to a sustainable future.



Pulsa **F11** para salir del modo de pantalla completa



00 DAYS 00 HOURS 00 MINUTES 00 SECONDS

more inclusive cities 10 /20 /2016 Habitat III, the United Nations Conference on Housing and Sustainable Urban Development, adopts the New Urban Agenda



NEW URBAN AGENDA

23 PAGES, 175 ACTIONS

- 37.** We commit to promote safe, inclusive, accessible, green, and quality public spaces, including streets, sidewalks, and cycling lanes, squares, waterfront areas, gardens, and parks that are multi-functional areas for social interaction and inclusion, human health and well-being, economic exchange, and cultural expression and dialogue among a wide diversity of people and cultures, and which are designed and managed to ensure human development, to build peaceful, inclusive, and participatory societies, as well as to promote living together, connectivity, and social inclusion.
- 55.** We commit to foster healthy societies by promoting access to adequate, inclusive, and quality public services, a clean environment taking into consideration air quality guidelines including those elaborated by the World Health Organization (WHO), social infrastructure and facilities, such as health-care services, including universal access to sexual and reproductive health-care services to reduce newborn child and maternal mortality.
- 114.** We will promote access for all to safe, age- and gender-responsive, affordable, accessible, and sustainable urban mobility and land and sea transport systems, enabling meaningful participation in social and economic activities in cities and human settlements, by integrating transport and mobility plans into overall urban and territorial plans and promoting a wide range of transport and mobility options, in particular through supporting:
- (a) a significant increase in accessible safe, efficient, affordable, and sustainable infrastructure for public transport as well as non-motorized options such as walking and cycling, prioritizing them over private motorized transportation;
 - (b) equitable Transit-Oriented Development (TOD) that minimizes the displacement in particular of the poor and features affordable, mixed-income housing and a mix of jobs and services;
 - (c) better and coordinated transport-land use planning, leading to a reduction of travel and transport needs, enhancing connectivity between urban, peri-urban, and rural areas, including waterways and transport and mobility planning, particularly for small islands developing States and coastal cities;
 - (d) ...

VISION

- Build long term visioning of healthy urban future
- Cities for people, not cities for cars
- Clean, green and active
- Healthy, sustainable, liveable, vibrant, equitable, happy, economically viable cities

COLLABORATION

SYSTEMIC APPROACHES

- It is important that we have a more systemic approach to our cities,

Tackling

- Air pollution
- Noise
- Heat islands
- Lack of green space
- Lack of physical activity

Multisectoral approach

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



HOLISTIC APPROACHES

- It is important that we have a more holistic to our cities,

Addressing

- Health
- Livability
- Sustainability
- Climate change
- Equity

LEADERSHIP AND INVESTMENT

- Political leadership from the top
- Investment

UK TRANSPORT INVESTMENT

- £30bn of funding for new roads and road repairs
 - £0.68 cycling, buses and trams

RAC spokesman Simon Williams told *The Independent*: “It’s great news for motorists. We know from research that there has been a big increase in dependency on the car so roads are important for the country.

- “We found 59 per cent of drivers said they would be very keen to take public transport if it was better, but it’s not as affordable, comfortable or frequent as it should be, and many people in rural areas have not choice of how to get to work.”
- He said motorists were suffering too much damage to their vehicles from potholes, which also posed a safety risk to others when drivers swerved to avoid the holes.

The Independent 28/10/2018

PORT LOUIS (MAURITIUS) INVESTMENT

- Government wants investment in large infrastructure projects like roads (ring road, link road, tunnel), metro-express (light rail) and bus renewal.
- Citizens want side walks, public spaces, pedestrianize strategic areas and green space

Meelan Thondoo 2018







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



► springer.com

Nieuwenhuijsen · Khreis *Eds.*



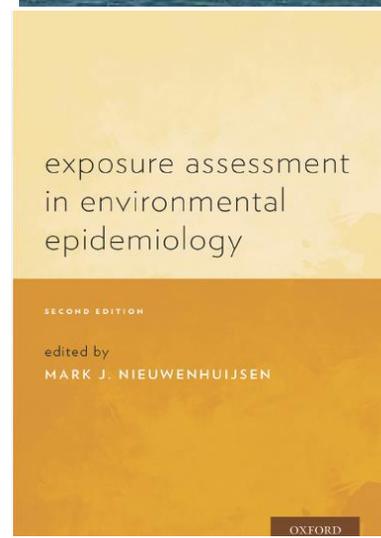
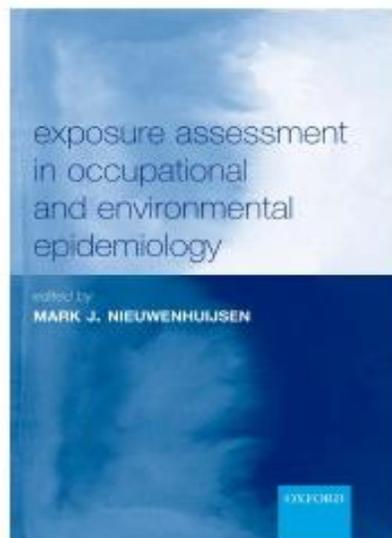
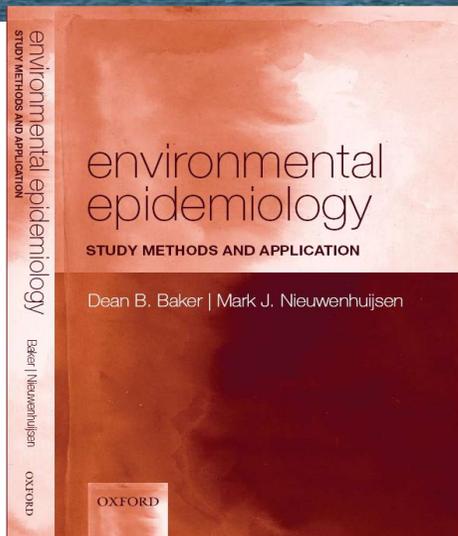
Integrating Human Health into Urban and
Transport Planning

Mark Nieuwenhuijsen
Haneen Khreis *Editors*

Integrating Human Health into Urban and Transport Planning

A Framework

 Springer



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Green cities, healthy people

Active cities, healthy people,

Clean cities, healthy people

Social cities, healthy people