

# Urban and transport planning related exposures and mortality: a health impact assessment for cities

Natalie Mueller

Centre for Research in Environmental Epidemiology (CREAL)

[nmueller@creal.cat](mailto:nmueller@creal.cat)

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# Public Health definition

## Public Health - Winslow 1920

- “the science and art of preventing disease, prolonging life and promoting health and efficiency through organized community efforts...”

## Objectives:

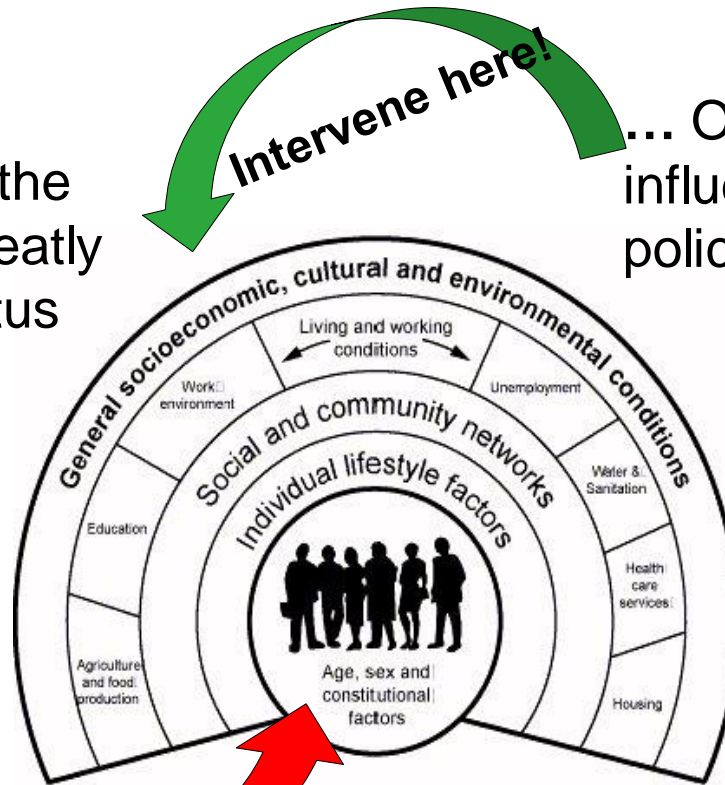
- Health promotion and protection among communities and populations
- Identification of causes of disease and disability
- Implementation of large scale solutions that may target other policy sectors



# Determinants of Health Framework

Personal factors occupy the core of the model and greatly determine our health status

... however, are out of reach of public policies



... Overarching factors influenceable through public policies

... such as urban and transport planning

Out of reach!

# Continuing urbanization

By 2050 it is predicted that almost 70% of the world's population will live in urban environments

As the world continues to urbanize ...

... sustainability **opportunities** and **challenges** emerge



# Continuing urbanization

Urban life provides us with ...



## Opportunities

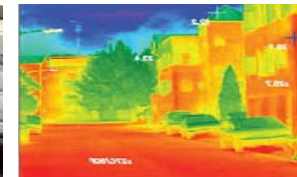
- Innovation and progress
- Access to goods and services
- Social interaction



But also exposes us ...

## Challenges

- Sedentary lifestyle
  - Air pollution
  - Noise
  - Urban heat islands
  - Lack of green and open spaces
- Mortality and Morbidity





# Urban environmental health burden

## Physical inactivity



- Leading risk factors in GBD Study
- Cause  $\geq 5$  million deaths globally

## Air pollution

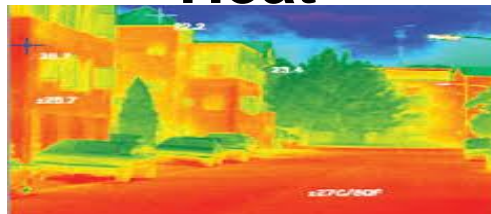


## Noise



- Motorized traffic exposes 40% of Europeans to  $\geq 55$  dB(A)

## Heat



- Emissions cause anthropogenic heat that together with re-radiation of construction contribute to urban heat islands



**All 5 exposures have been associated with mortality and morbidity**

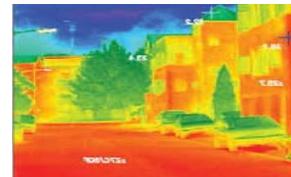
# Health Impact Assessment

## Objective:

We aimed at estimating

- **Preventable all-cause mortality**
- **Life expectancy impact**
- **Economic impact**

under compliance with international exposure recommendations for performance of physical activity, exposure to air pollution, noise and heat and access to green spaces for Barcelona



# Health Impact Assessment

## Methodology:

### All-cause mortality

- Risk assessment methodology
- Population attributable fractions (PAF)

### Life expectancy impact

- Life table analysis to estimate average change in life expectancy
- Standard life table methods

### Economic impact

- Economic assessment following value of statistical life (VoSL) approach
- VoSL = 3,202,968 € for Spain (2012)



# Health Impact Assessment

## International exposure recommendations:

### Physical activity (WHO)

150 minutes of moderate-intensity aerobic PA or 75 minutes of vigorous-intensity aerobic PA weekly

Adults 18-64 years 600 MET-minutes

Adults  $\geq 65$  years 400 MET-minutes

### Air pollution (WHO)

$PM_{2.5} = 10 \mu g/m^3$

### Noise (WHO)

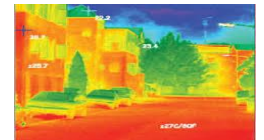
Day time (7:00-23:00 hr) outdoor activity noise = 55 dB(A)

### Heat (no recommendation available)

Modifying urban plan may provide cooling of up to 4 °C

### Green spaces (EC working group)

Access to green space  $\geq 0.5$  ha within 300 m linear distance



# Health Impact Assessment

## Study setting: Barcelona

### Population

- N=1.6 million residents

### Area

- 101 km<sup>2</sup>

### Climate

- 18 °C mean temperature, hot summers, mild winters
- Low precipitation

### Vehicle fleet

- 500,000 cars and 300,000 motorcycles

### Urban design

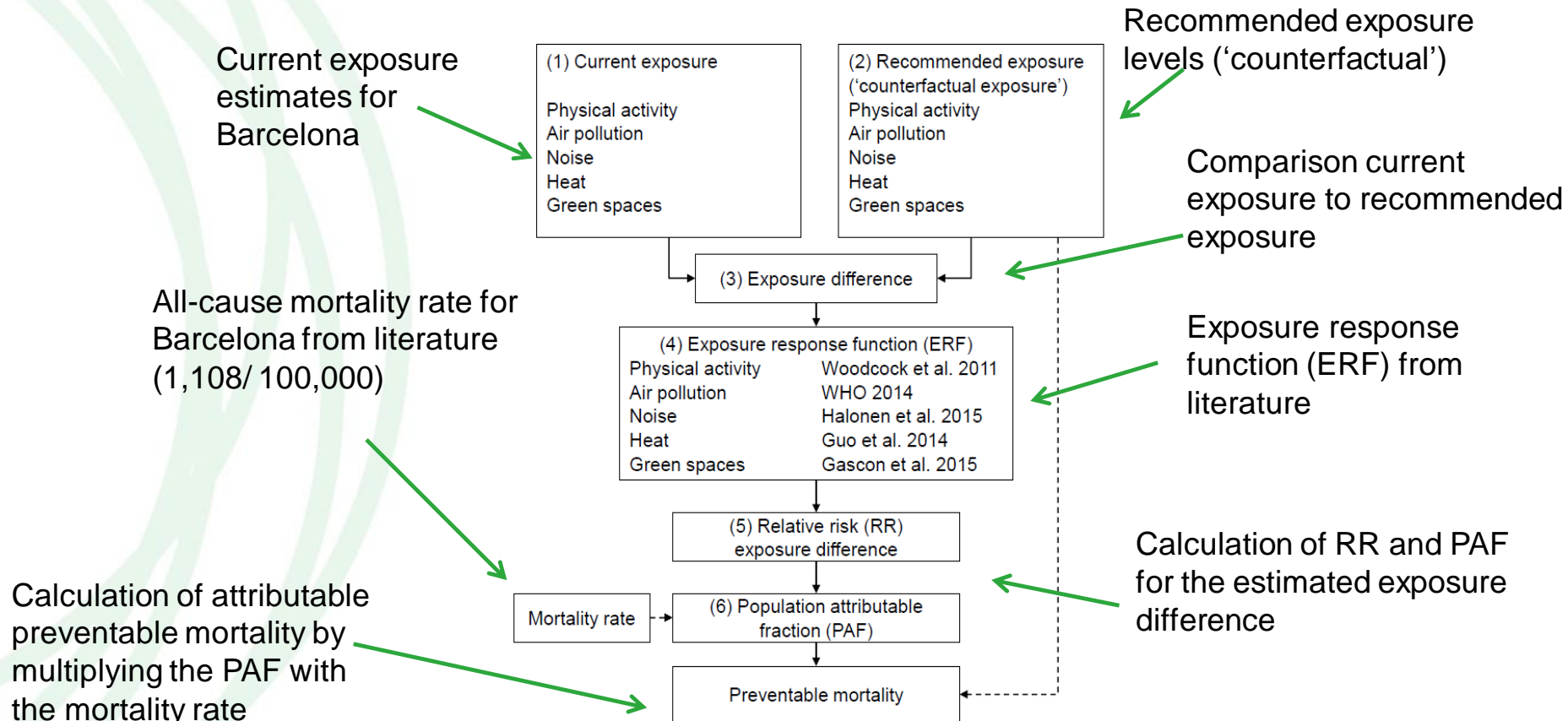
- Narrow street canyons, dense construction of semi-tall buildings (5-6 stories)
- High population and traffic density → high air pollution and noise levels

### Green spaces

- 6.8 m<sup>2</sup> per resident (mainly on hilly west site)



# Urban and Transport Planning Health Impact Assessment tool (UTOPHIA)



# Health Impact Assessment

## Results:

### Physical activity

70% of population insufficiently active

### Air pollution

$PM_{2.5} = 16.6 \mu g/m^3$

### Noise

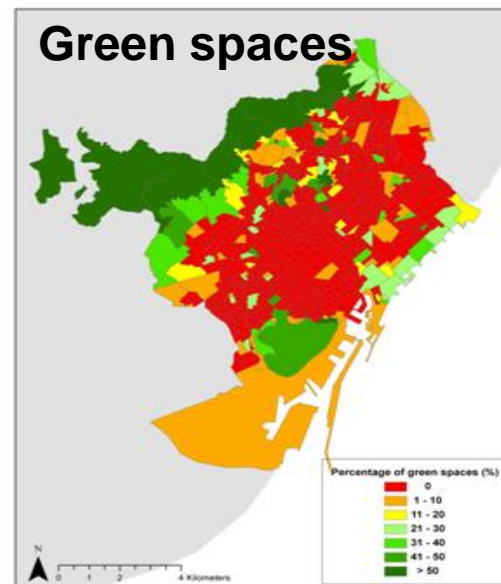
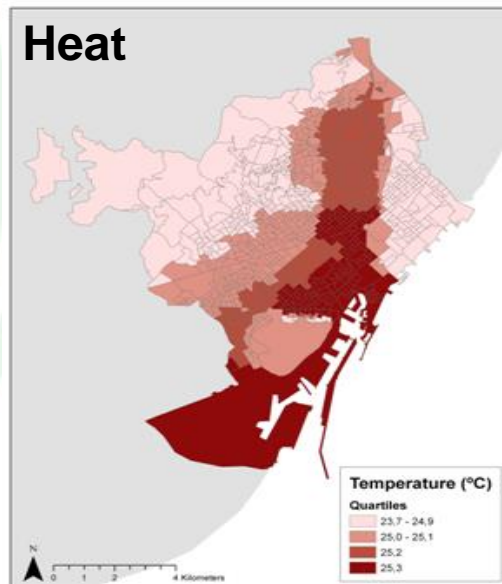
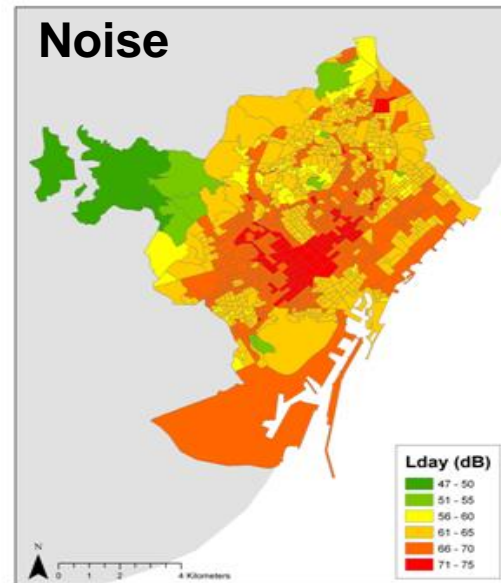
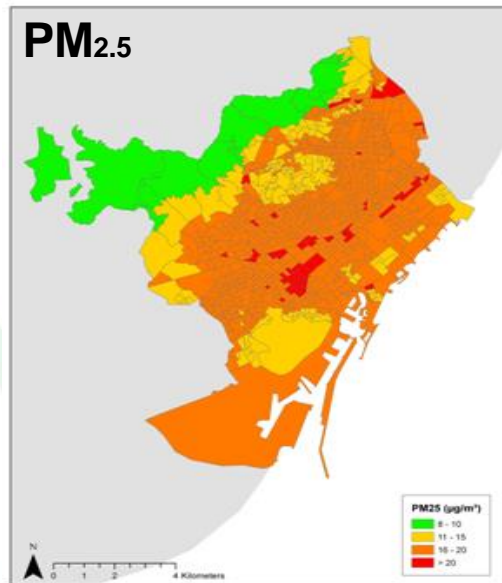
Day time (7:00-23:00 hr) outdoor activity noise = 65.1 dB(A)

### Heat

≥100 days exceeded 'minimum mortality temperature percentile' of 21.8 °C daily mean temperature

### Green spaces

≥30% of residents does not live within 300 m linear distance to green space ≥0.5 ha



**Current environmental exposure levels in Barcelona**



# Health Impact Assessment

## Health Impacts:

Under compliance with exposure recommendations...

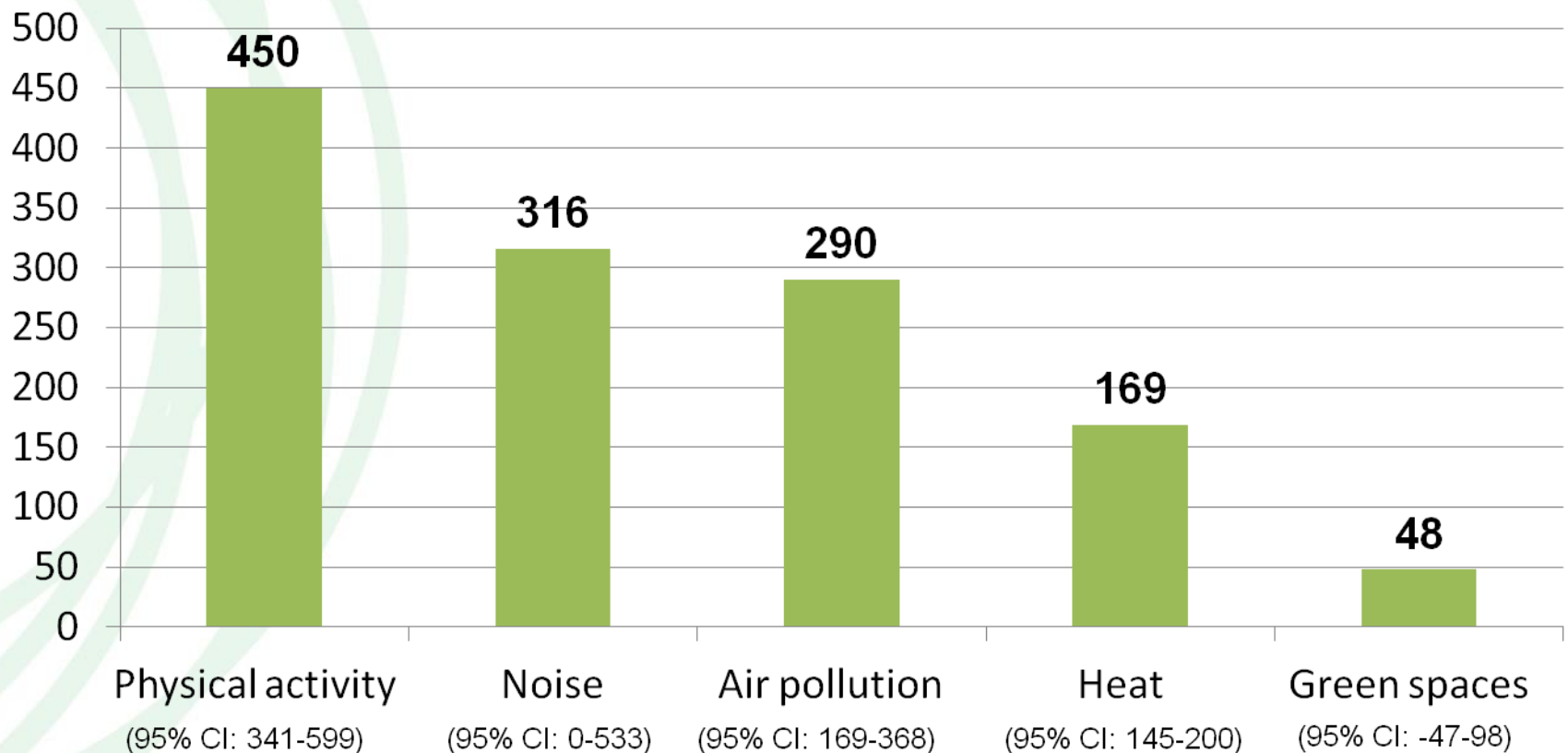
- **1273 deaths preventable (95% CI: 608-1798)**
- **Increase in average life expectancy by 187 days (95% CI: 72-242)**
- **Economic savings of 4.0 bn € (95% CI: 2.1-5.7)**

All natural deaths adults  $\geq 20$  years  $N=15,049$  (2012)

**→ 8.5% of mortality in Barcelona is attributable to urban and transport planning related exposures**

# Health Impact Assessment

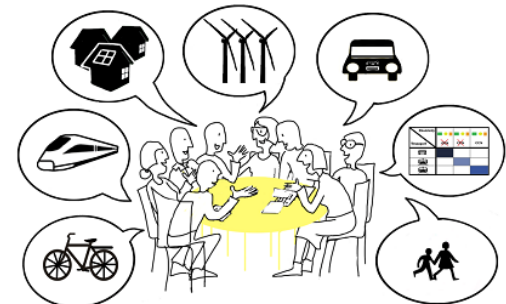
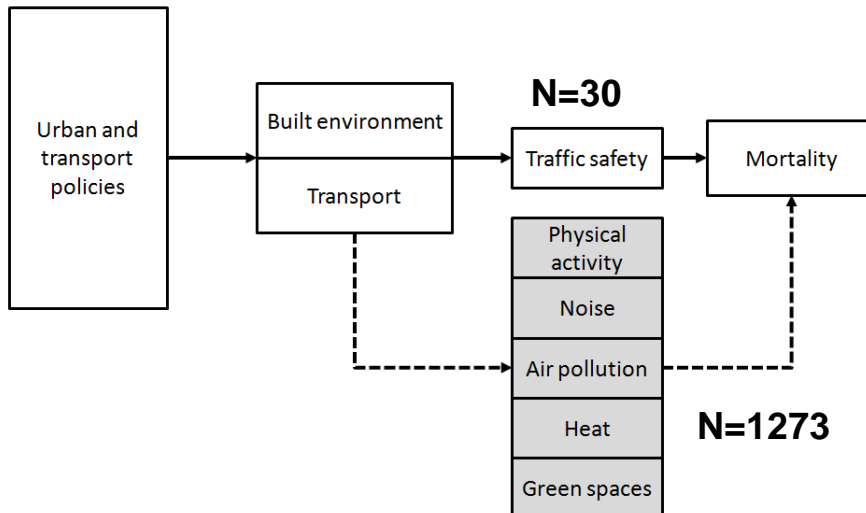
## Attributable deaths



# Solutions in Urban and Transport Planning

## Discussion:

- Solutions to environmental exposure mortality burden can be found in changes to urban and transport planning
- Number of estimated preventable deaths (N=1273) is much larger than annual number of traffic fatalities in Barcelona (N=30, 2012)
- Need for multidisciplinary approach to urban environmental quality and associated health benefits



<http://lowcarbon.inforse.org/>

# Solutions in Urban and Transport Planning

## Discussion:

Increasing active transport (i.e. walking and cycling for transport) and public transport, while simultaneously facilitating sufficient urban greening can provide mutual health benefits



# Solutions in Urban and Transport Planning

## Discussion:

Increase in active and public transport can improve physical activity levels and can help overcome car-dependency and its emissions

Reduction in motorized traffic implies feasibility to reduce grey infrastructure and reinforce green infrastructure

Green infrastructure provides opportunities for physical activity (i.e. active transport) and helps reduce traffic associated emissions (i.e. air pollution, noise and heat)



 **Healthy City**



# Solutions in Urban and Transport Planning

## Conclusions:

In Barcelona, almost **1300 premature deaths** are attributable to non-compliance of recommended exposure to physical activity, air pollution, noise, heat and access to green spaces

We appeal to consider health impacts when designing cities and emphasize

- (1) The reduction of motorized transport through the promotion of active and public transport
- (2) The provision of urban greening as suggested to provide opportunities for physical activity as well as air pollution, noise and heat mitigation



# Physical Activity Through Sustainable Transport Approaches (PASTA) Project

- Aims at studying how active transportation can lead to a happier more physically active population while at the same time improving air quality
- Longitudinal study in 7 European cities (Antwerp, London, Zurich, Vienna, Rome, Oerebro, Barcelona)
- 14,000 people reporting their transport behaviors and experiences

[http://survey.pastaproject.eu/barcelona\\_ca](http://survey.pastaproject.eu/barcelona_ca)



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**Generalitat  
de Catalunya**



**Universitat  
Pompeu Fabra**  
*Barcelona*

Parc de Recerca  
Biomedica de Barcelona  
Doctor Aiguader, 88  
08003 Barcelona (Spain)

Tel. (+34) 93 214 73 00  
Fax (+34) 93 214 73 02

[info@creal.cat](mailto:info@creal.cat)  
[www.creal.cat](http://www.creal.cat)