Imperial College London

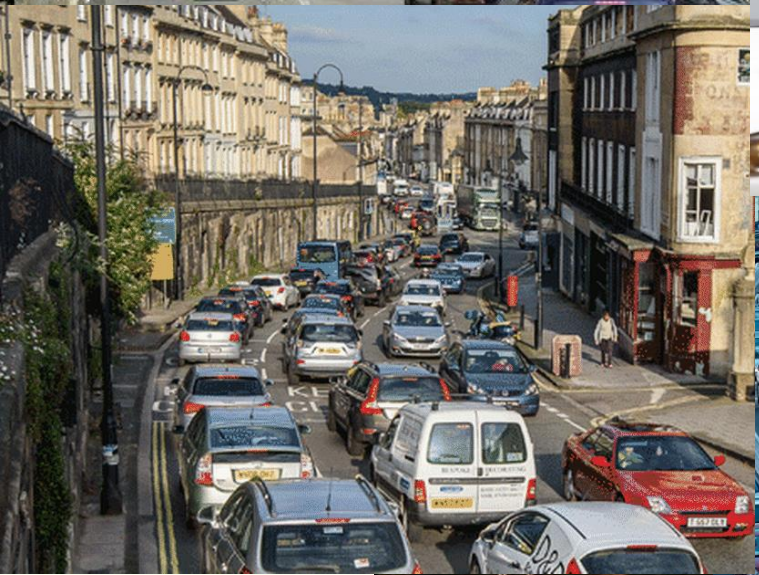
26/09/2024

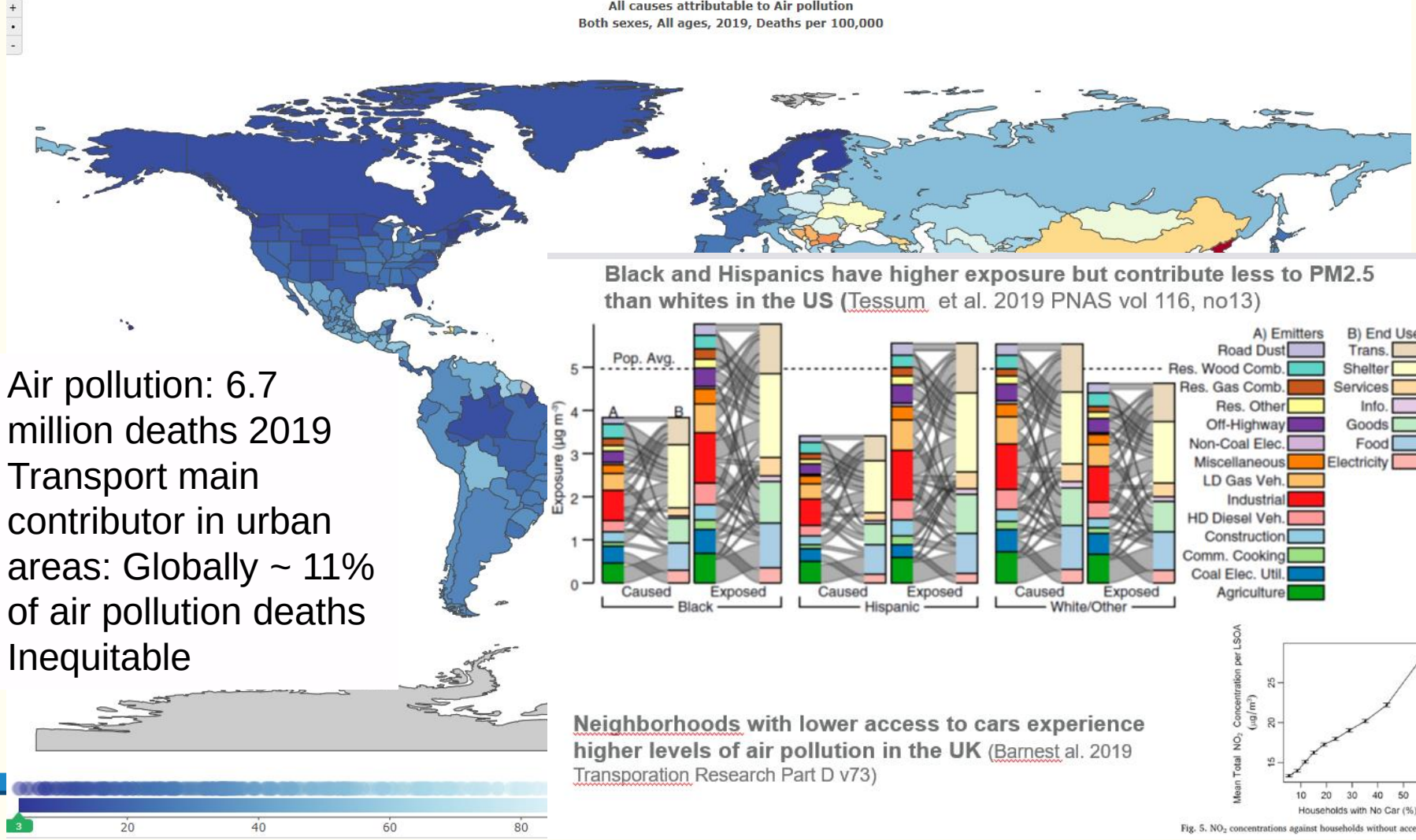
Beyond clean air: benefits of transformative air quality action in cities

UNECE Air Convention (LRTAP)
5th Expert Panel on Clean Air in Cities (EPCAC)

Audrey de Nazelle
Centre for Environmental Policy

Transport as a nuisance





- Air pollution: 6.7 million deaths 2019
- Transport main contributor in urban areas: Globally ~ 11% of air pollution deaths
- Inequitable

Black and Hispanics have higher exposure but contribute less to PM2.5 than whites in the US (Tessum et al. 2019 PNAS vol 116, no13)

Neighborhoods with lower access to cars experience higher levels of air pollution in the UK (Barnest al. 2019 Transporation Research Part D v73)

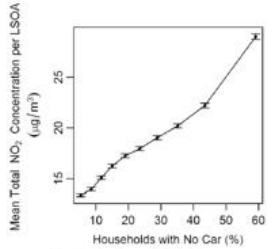
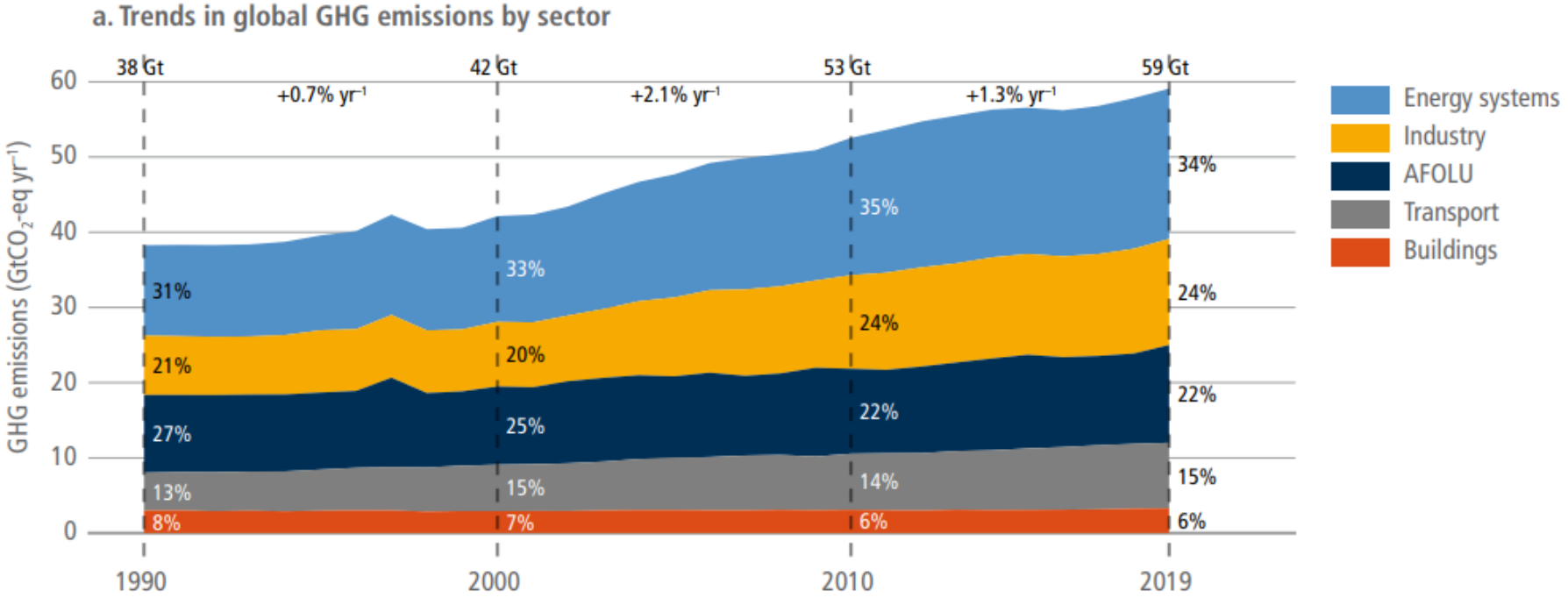
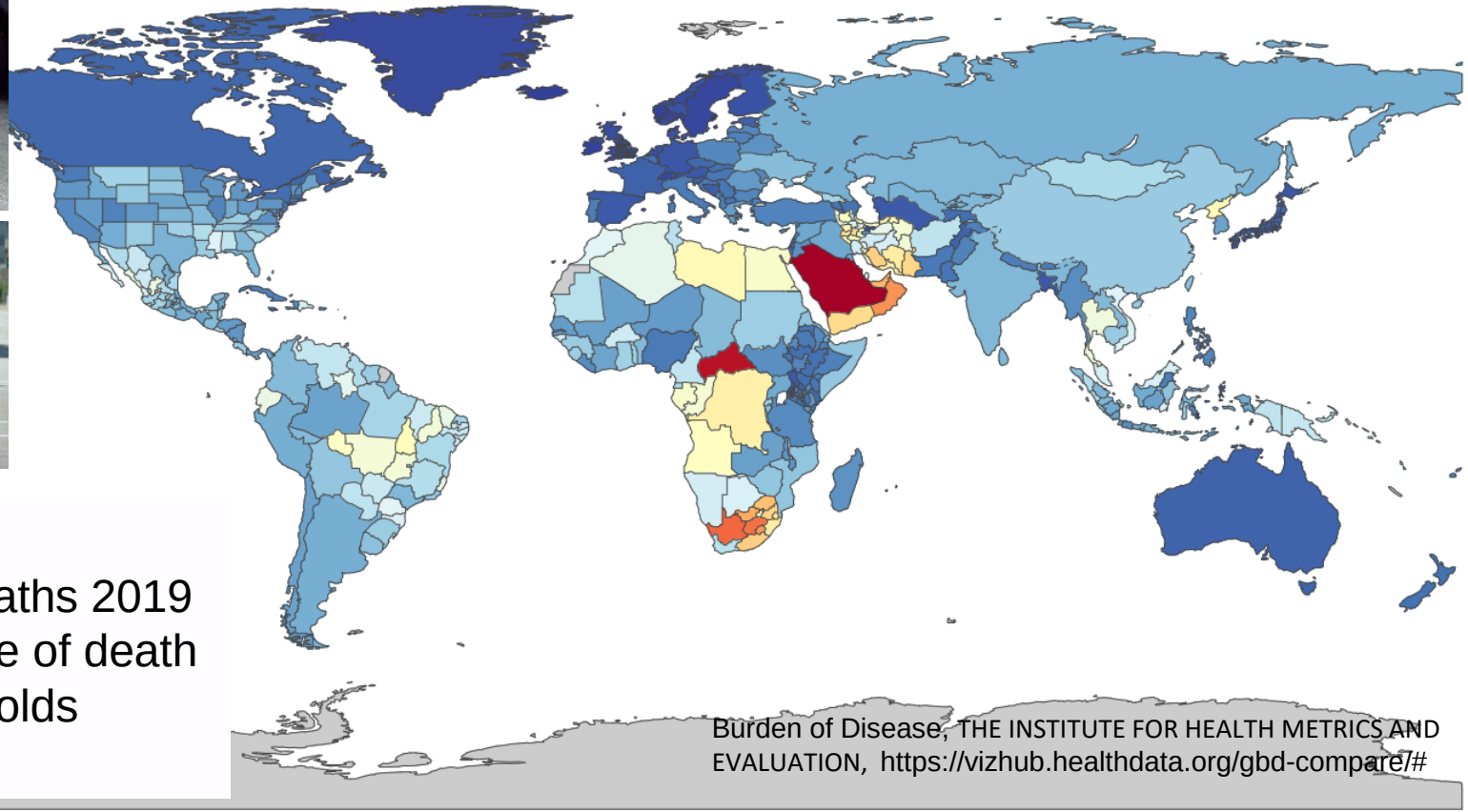


Fig. 5. NO_2 concentrations against households without access to a ca



Emissions Trends and Drivers. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) doi: 10.1017/9781009157926.004

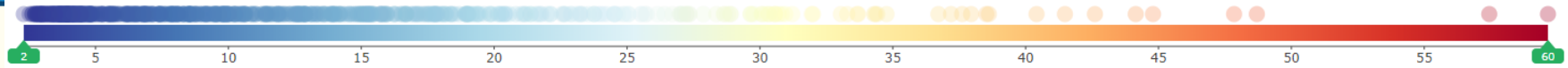
Road injuries
Both sexes, All ages, 2019, Deaths per 100,000



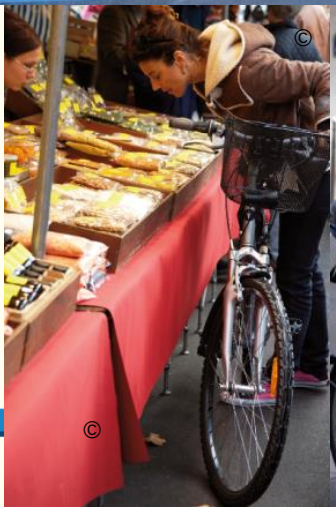
Road injuries:

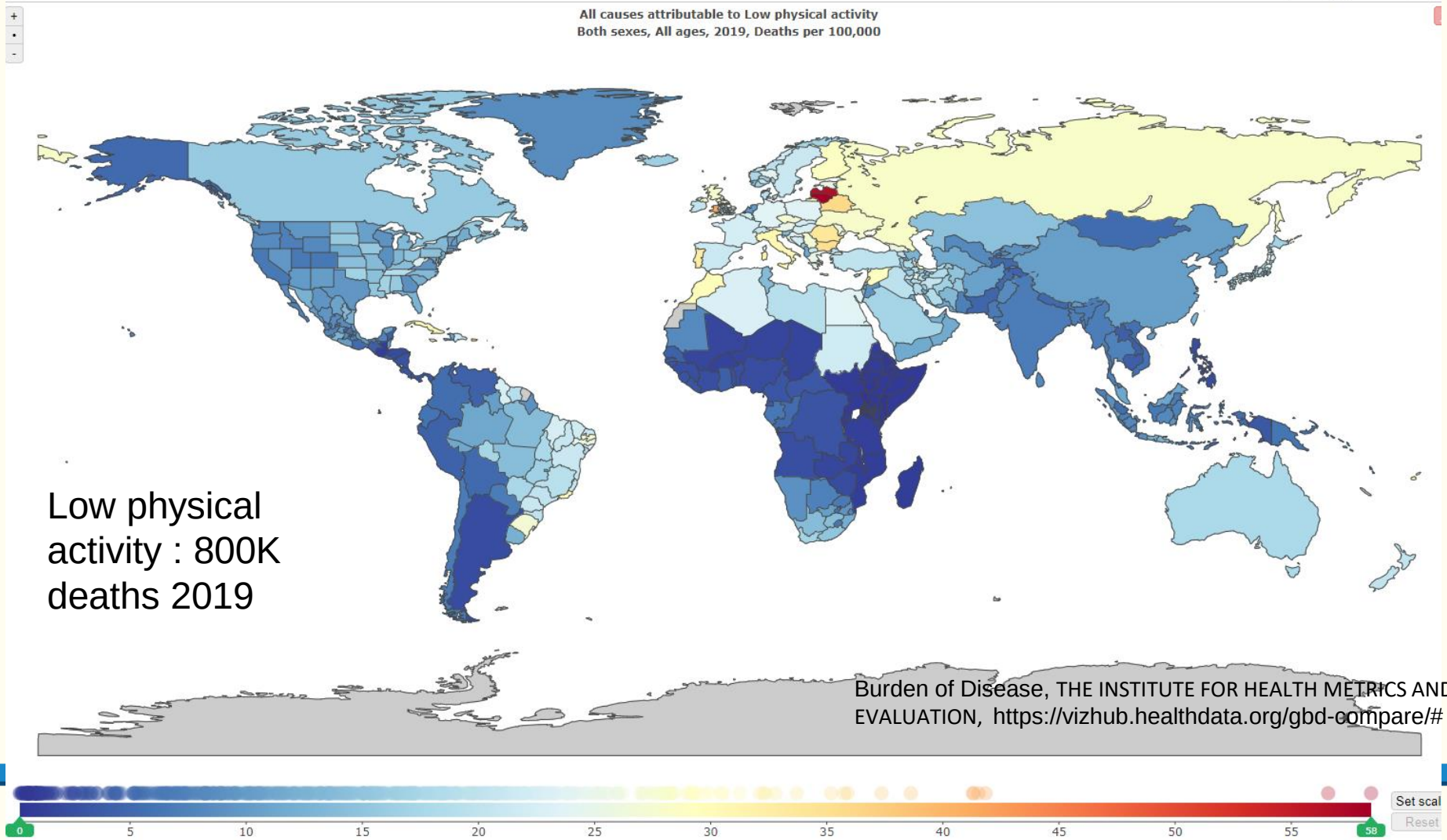
- 1.2 million deaths 2019
- Leading cause of death for 5-29 year olds

Burden of Disease, THE INSTITUTE FOR HEALTH METRICS AND EVALUATION, https://vizhub.healthdata.org/gbd-compare/#



Transport as an opportunity





Low physical activity : 800K deaths 2019

Burden of Disease, THE INSTITUTE FOR HEALTH METRICS AND EVALUATION, https://vizhub.healthdata.org/gbd-compare/#

The good news: we have good reasons

and good solutions

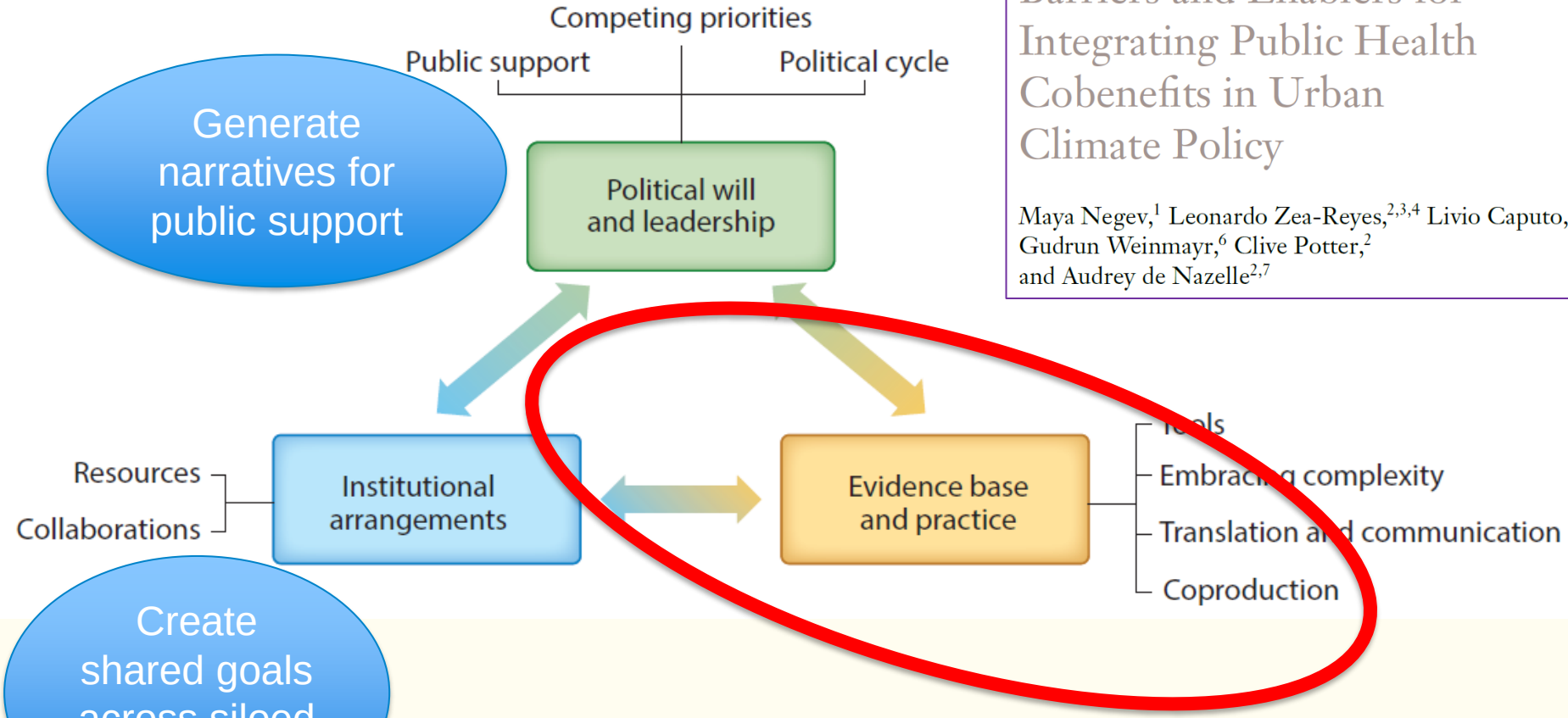
Challenges

Opportunities

Annual Review of Public Health

Barriers and Enablers for Integrating Public Health Cobenefits in Urban Climate Policy

Maya Negev,[1] Leonardo Zea-Reyes,[2,3,4] Livio Caputo,[5] Gudrun Weinmayr,[6] Clive Potter,[2] and Audrey de Nazelle[2,7]



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Examples:
evidence on co-benefits of air pollution policies

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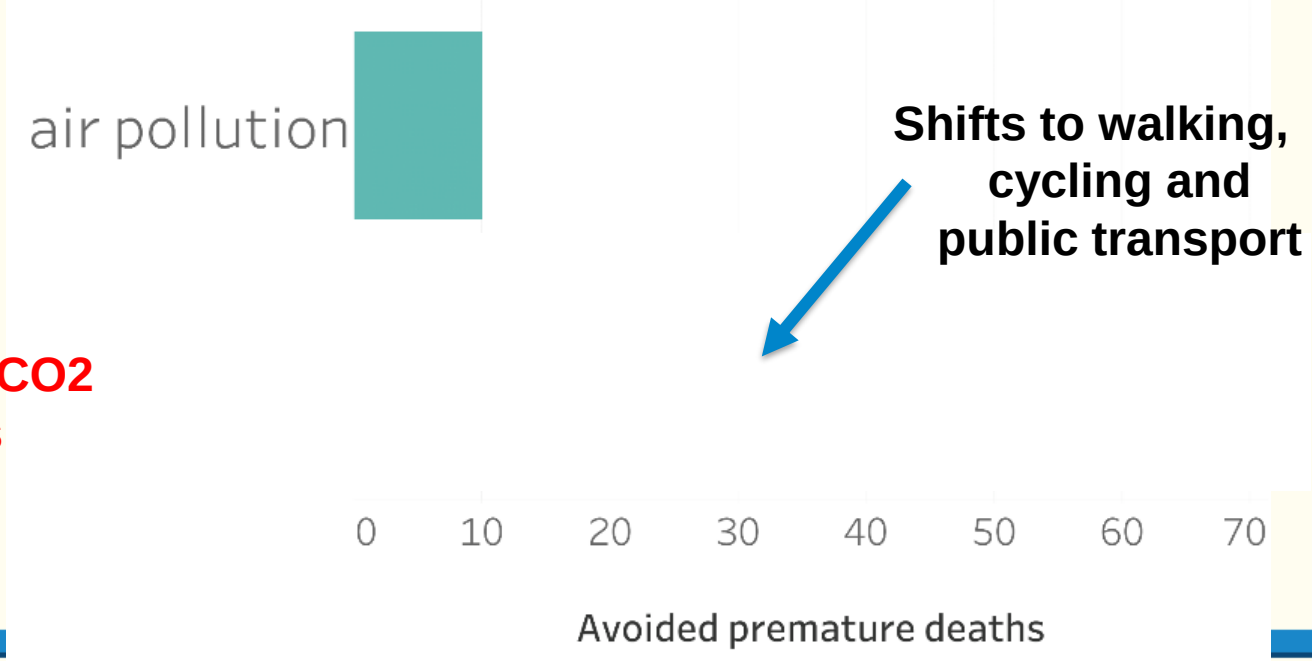
Benefits of reducing 40% of car travel, Barcelona, Spain



42,783 tons/year CO2 emissions avoided

Rojas-Rueda et al. Environment International 49 (2012) 100-109

Health assessment of transport policies for air pollution in London

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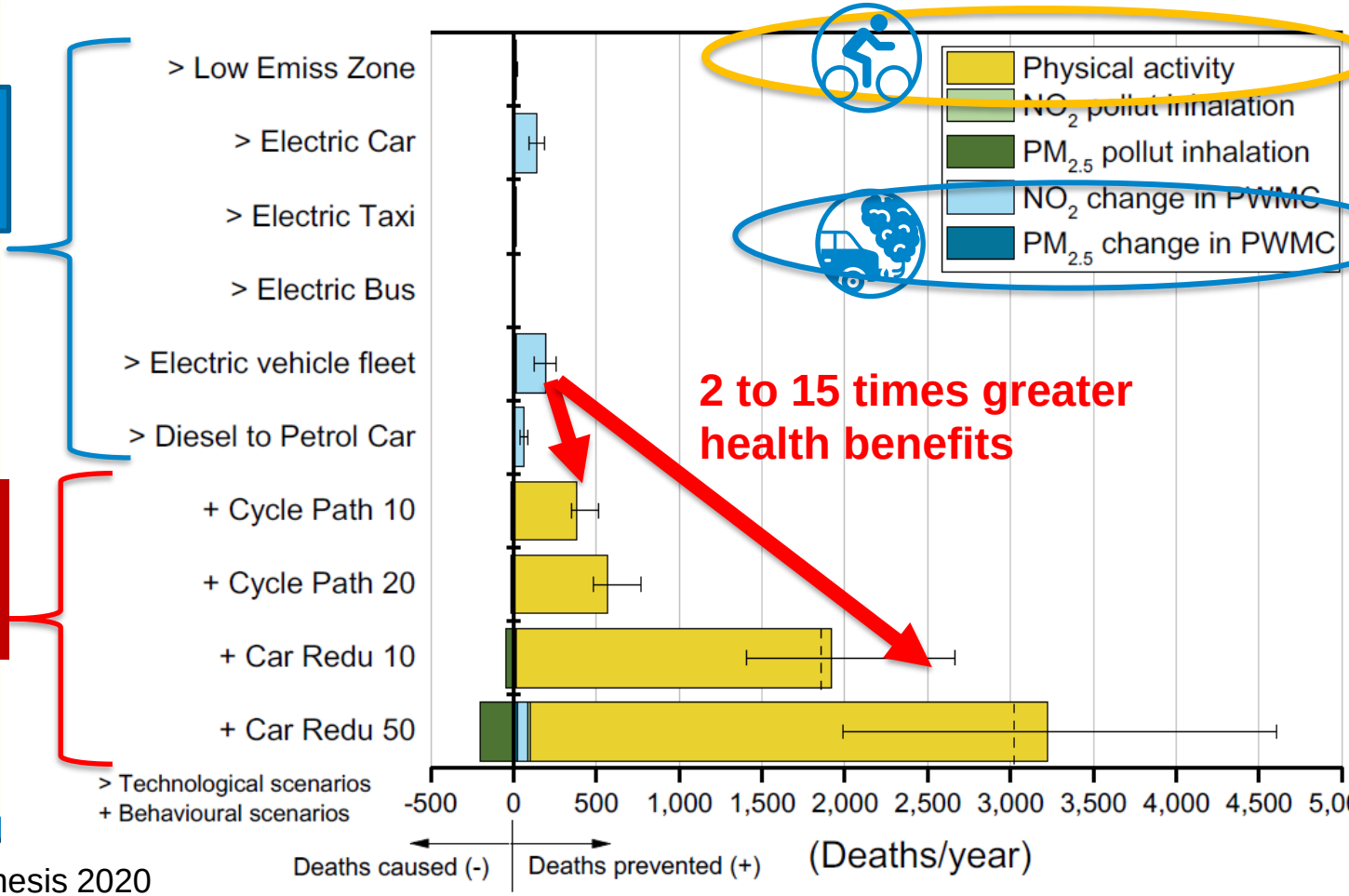
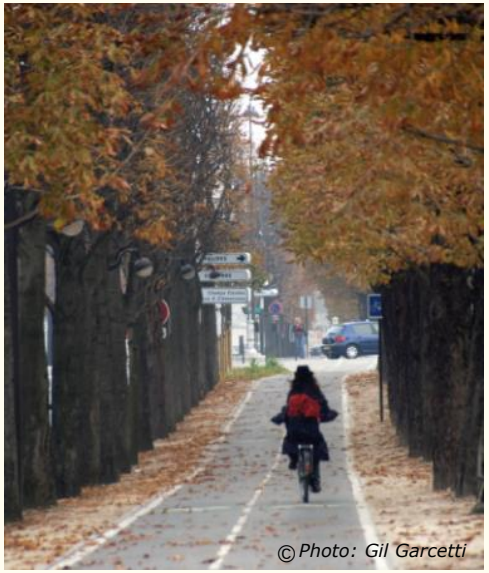
Technological solutions

Behavioural solutions (mode shifts)



Andrea Calderon PhD thesis 2020

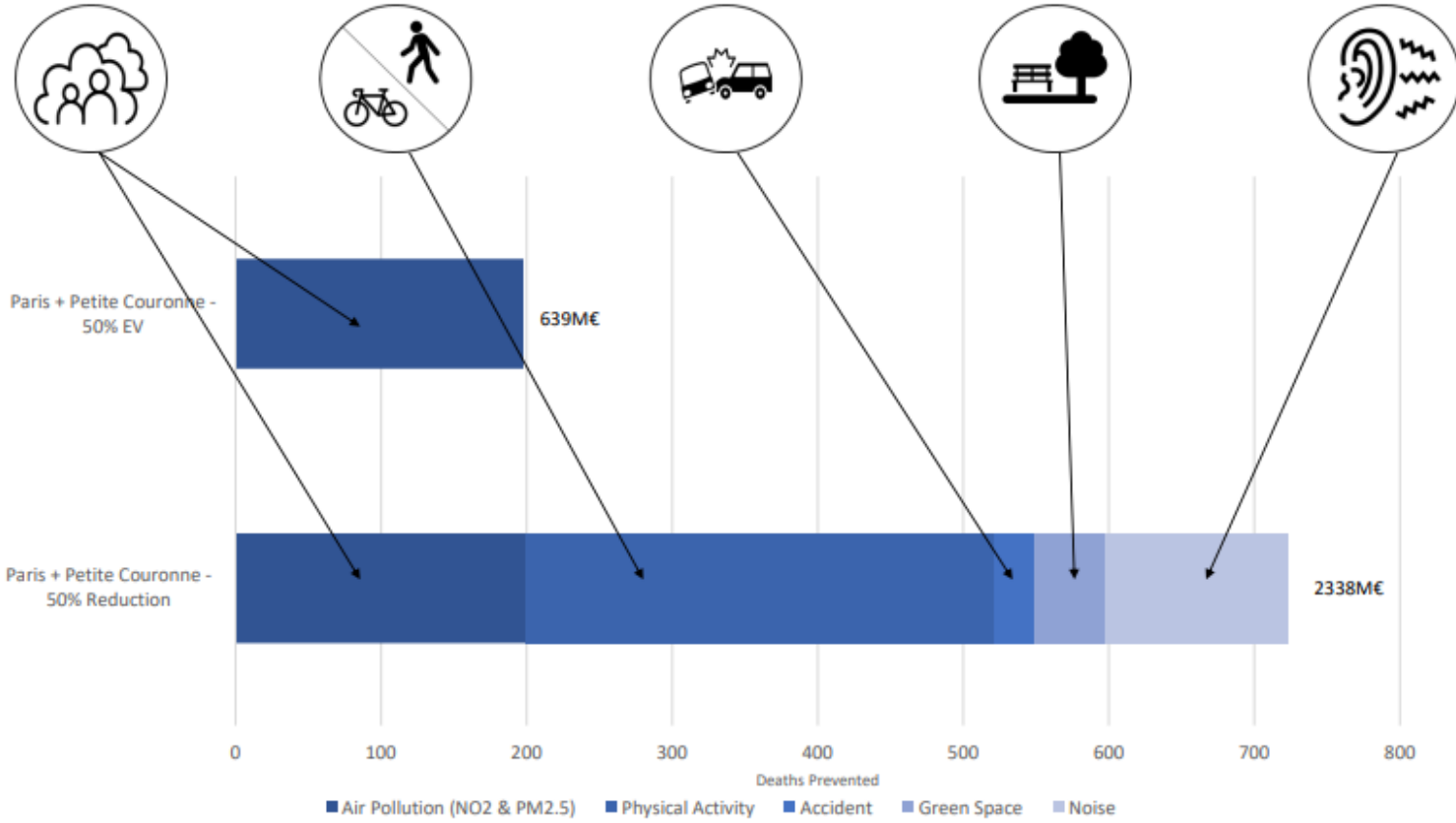

© Photo: Gil Garcetti

Health benefits (deaths avoided) of converting 50% of car travel in Paris

Replaced with

Electric Vehicles

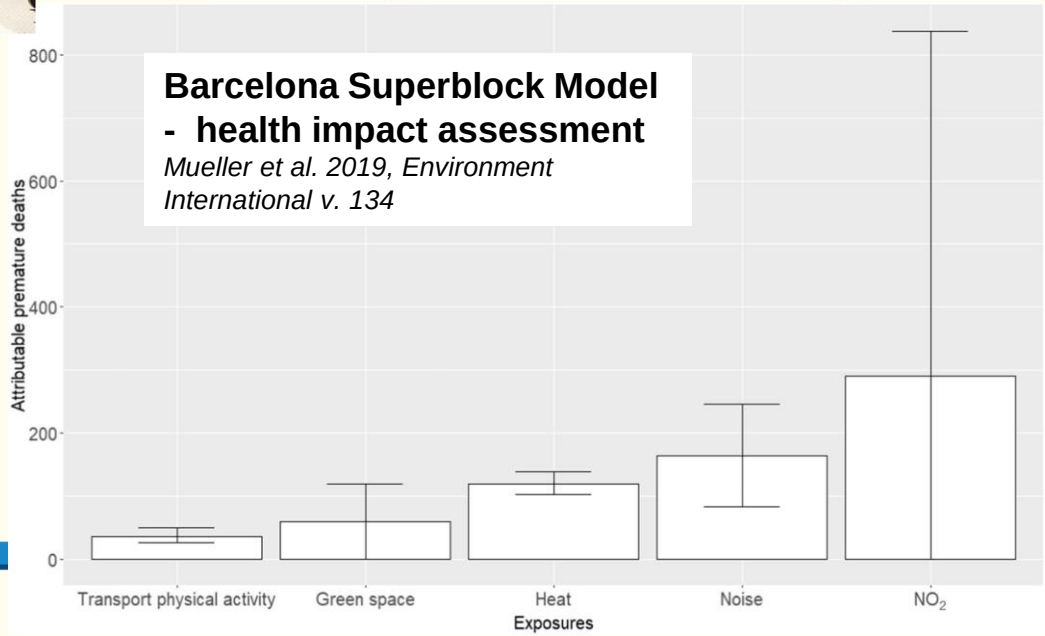
Walking, cycling, public transport



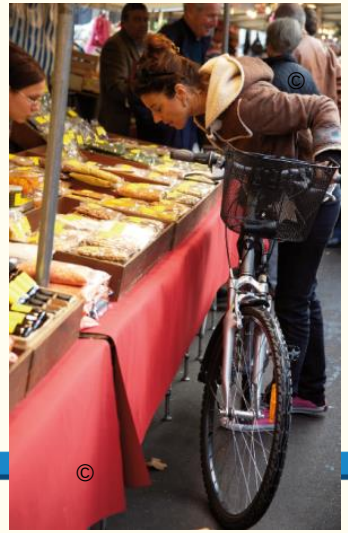
Tanguy Wasson
+ Livio Caputo

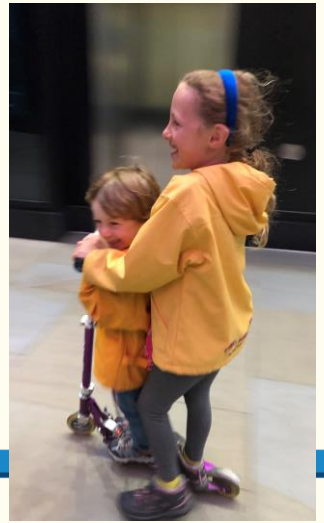
Barcelona Superblock Model - health impact assessment

Mueller et al. 2019, Environment International v. 134



Arlo age 4: "I want #CarFreeDay to never end"

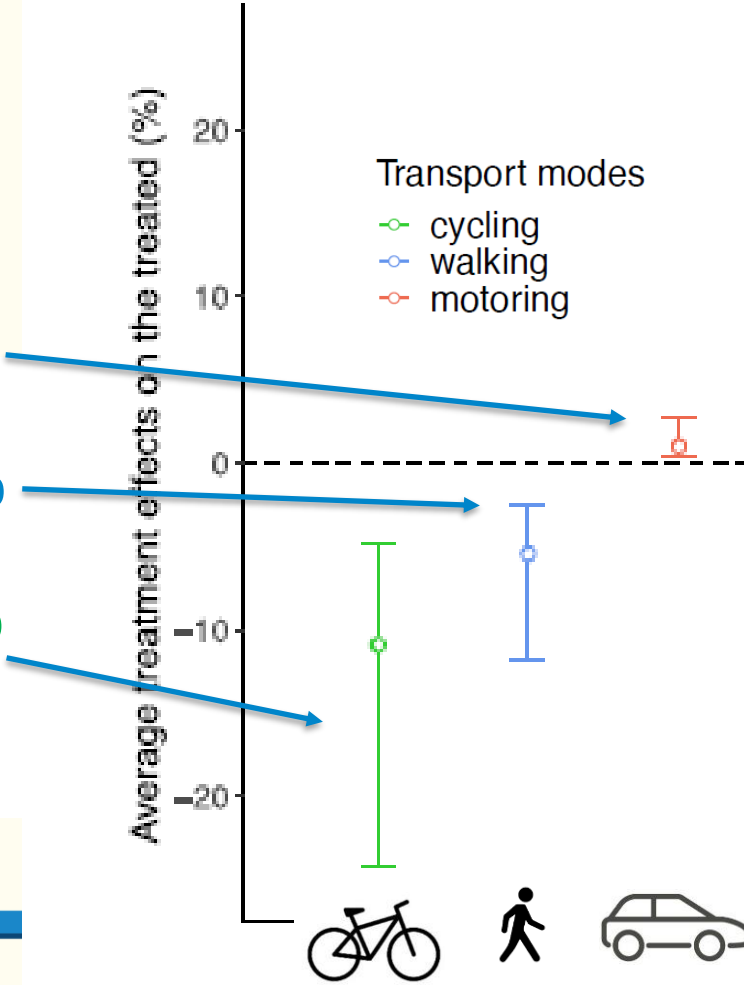




© Photos: Gil Garcetti

Travel mode choice and stress:

- Motorized transport increases stress by 1% compared other activities;
- Walking reduces stress by 5% compared to other activities;
- Cycling reduces stress by 11% compared to other activities;

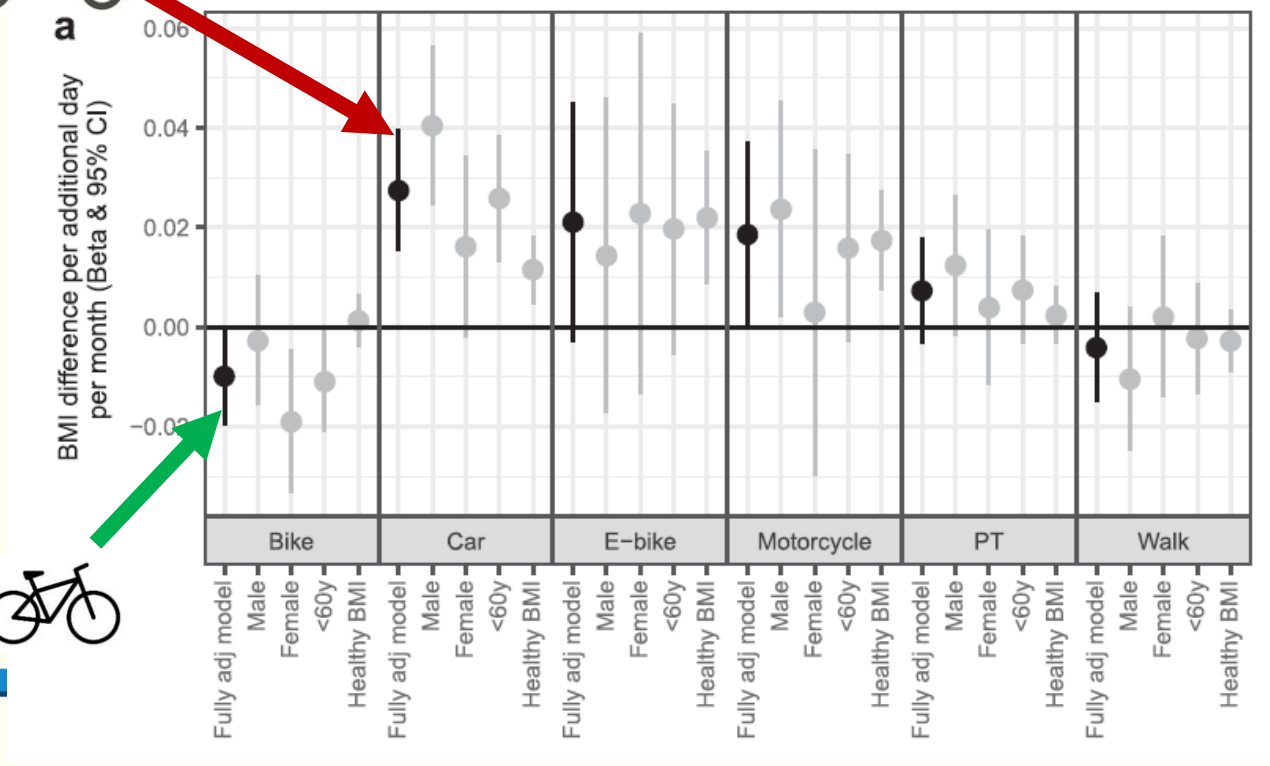


Yang et al. 2021, Environment International 156

PASTA
PHYSICAL ACTIVITY THROUGH SUSTAINABLE TRANSPORT APPROACHES

Dons et al. (2018) Transport mode choice and body mass index: Cross-sectional and longitudinal evidence from a European-wide study. Environment International 119

4 kg difference



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Transport mode use (days/month)	Self-perceived health[a] OR (CI 95%)
Car	1·00 (0·99, 1·02)
Motorbike	1·02 (0·99, 1·04)
Public transport	0·99 (0·98, 1·01)
E-bike	0·99 (0·96, 1·02)
Bicycle	**1·07 (1·05, 1·08)****
Walking	**1·02 (1·00, 1·03)***

Walking/cycling also associated with improvements in:

- Self-perceived vitality, mental health, stress
- Social interaction, social isolation

Avila-Palencia et al. (2018) The effects of transport mode use on self-perceived health, mental health, and social contact measures: A cross-sectional and longitudinal study. Environment International 120

Regression models assessing associations between the different transport modes and the health outcomes, adjusted for all the potential confounders. [a]Mixed-effects logistic regression models. [b]Linear regression models. [c]Logistic regression models. All models were adjusted by age, sex, education, nationality, employment status, and city. Sample sizes: Self-perceived health (n=8218); Perceived stress (n=3241); Mental Health (n=3243); Vitality (n=3243); Loneliness (n=3247); Contact with friends/family (n=3247). *p-values<0·05, **p-value<0·001.

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Why not?

Hard to implement?

Evening Standard

INSIDER

Cycle war? It's only just begun

The removal of the segregated bike lane on Kensington High Street sparked a wave of protests. Now, campaigners are trying to take their fight through the High Court. Robbie Smith reports

Analysis

How opponents of LTNs are adopting the climate-sceptic playbook

Simon Evans

Critical coverage in UK papers has been rising with more anti-LTN articles per day in 2023 than ever before

A vocal minority aim to sow doubt over the impacts and effectiveness of LTNs, all v
to acknowledge the harms that LTNs seek to address. Photograph: Linda Nylind/The G

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EXCLUSIVE Extra 40-minute commutes, the taste of fumes in the air and ambulances stuck in gridlock: What life is like for Londoners living in 'nightmare' LTN

- The Streatham Wells LTN has caused 'chaos' since it was first introduced

By EMILY JANE DAVIES
PUBLISHED: 08:18, 27 February 2024 | UPDATED: 11:52, 27 February 2024

UK NEWS

London LTNs: Councils that closed rat runs now have even more cars on their roads

Mail Online

Now Sadiq Khan vows to seize control of High Street Kensington to REINSTALL hated cycle lane despite weeks of traffic chaos hours after council finally starts to rip up bollards and fully restore road

The New York Times

He Wanted to Unclog Cities. Now He's 'Public Enemy No. 1.'

Researchers like Carlos Moreno, the professor behind a popular urban planning concept, are struggling with conspiracy theories and death threats.

ews Sport Money Business Opinion Israel Ukraine Royals Life Style Travel Culture Puzzles

K news Politics World Health Defence Science Education Environment Investigations Global Health Secu

South London council scraps planned LTN after huge outcry from residents

Southwark Council was forced into a U-turn after the official consultation was

The Telegraph News 2024 Elections Israel Ukraine Royals Sports Opinion Travel Health Life Entertainment Busi

LTN scrapped after three-mile bus journey took two hours

Labour-run Lambeth axes scheme at Streatham Wells, south-west London, after it caused major congestion

By Albert Tait
7 March 2024 • 5:24pm

Nick Fletcher MP @Ni

15 MINUTE CITIES

I spoke in Parliament toda
Government to hold a deb
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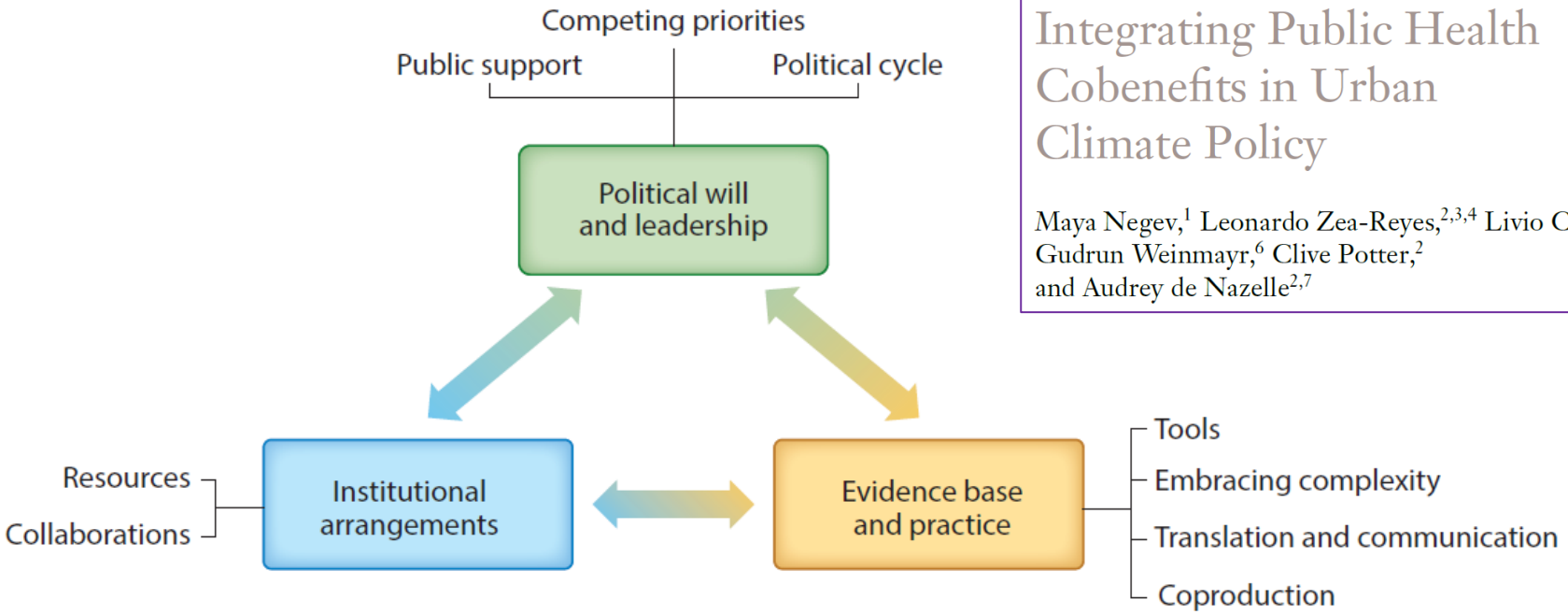


Figure 1

Barriers to and enablers for integrating health as a cobenefit in urban climate policy. Political will and leadership, evidence base and practice, and institutional arrangements were the three key domains identified in our systematic review of reviews. Addressing them and their subdomains represent important leverage points to overcome fundamental hurdles to health-promoting climate change policy making.

Quantified health co-benefits of climate/air pollution action

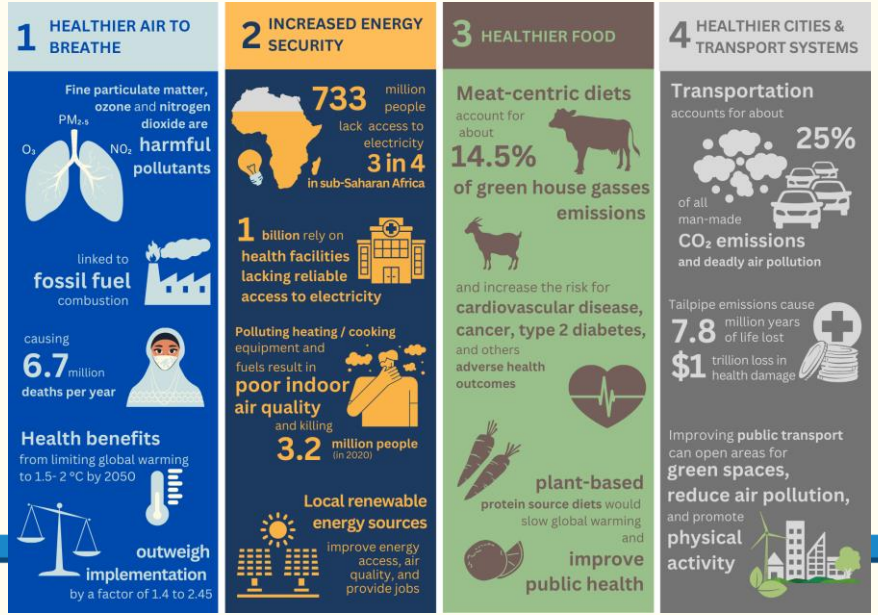
COMMENTARY

Climate action has valuable health benefits

Roca-Barceló, Aina[a]; Rice, Mary B.[b]; Nunez, Yanelli[c]; Thurston, George[d]; Weinmayr, Gudrun[e]; Straif, Kurt[f,g]; Roscoe, Charlotte[h,i]; Ebi, Kristie L.[j]; Andersen, Zorana Jovanovic[k]; de Nazelle, Audrey[l]; Negev, Maya[m,*]

Author Information

Environmental Epidemiology 8(1):p e288, February 2024. | **DOI:** 10.1097/EE9.0000000000000288



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Annu. Rev. Public Health 2022. 43:255–70

Supplemental Table 1: Studies addressing CC mitigation and relevant health co-benefits in urban settings (n = 21).

Author	Location	Mitigation Measure	Environmental Impact	Health Co-benefits
		Europe (38% of results)		
		Reduce motorized transport; promote active mobility; provide urban greening	Relative to the 2016 baseline, NO_2 concentrations (-24.3%); Temperature (-1 °C); Noise (-5.4%); Green Space (+13.1%)	Yearly premature deaths prevented: NO_2 (291); Noise (163); Heat (117); Green Space (60); Physical Activity (36)
		Green roofs to control CC induced heat waves (30 to 60% roof coverage)	Relative to a no-heatwave baseline, temperature reduction (1.5 to 3 °C).	Reduction in heatwave mortality by 2030: Spain (-18.6 to -39.5%); Hungary (-23.4 to -37.2%)
		Low-carbon policies in urban transport (increased physical activity and improved air quality)	Relative to 2010 baseline: Green Mobility scenario (-290,000 t CO_2 eq); Green Exercise scenario (-530,000 t CO_2 eq)	Deaths prevented; Green Mobility Scenario: Physical Activity (417); NO_2 (227); Green Exercise scenario: Physical Activity (891); NO_2 (477)
		Active transport - Pedestrian priority areas, increase public transport, speed limit zones, bike lanes…	Relative to 2009 baseline, GHG emissions (-120 t CO_2 eq)	Yearly premature deaths prevented: Increase in walking (86); Increase in cycling (8.5)
		Increase physical activity by replacing car trips less than 8 miles with cycling in cities	Relative to BAU, yearly GHG emissions (-0.2 to -10.6 Mt CO_2 eq)	Premature deaths prevented from increased exercise (75 to 7,648 per year)
		All car drivers living within a 30 min bicycle ride to work will shift to active transportation modes.	Relative to the 2011 base case in Inner Stockholm, NO_x concentrations (-8.4%)	Premature deaths prevented from air quality improvements (31/year)
		Scenario A = 35% of all trips done by bicycles; Scenario B = 50% of all trips done walking	GHG emissions for the 5 cities relative to the baseline (-1,139 to -24,423 t CO_2/yr)	Scenario A (cycling)/ B (walking) reduction in annual deaths: Warsaw (113.4/19.8), Prague (61/11.3), Barcelona (37.8/3), Paris (37.4/3.9), Copenhagen (113.4/3)
Woodcock et al. (2013) (94)	England and Wales	Promote sustainable transportation - Visions 2030 Walking and Cycling project	Relative to the baseline, CO_2 emissions from: Vision 1 (-26%); Vision 2 (-73%); Vision 3 (-83%)	Reduction in annual DALYs from increased physical activity: Vision 1 (-3774); Vision 2 (-6106); Vision 3 (-8606)
Rojas-Rueda et al. (2012) (77)	Barcelona, Spain	Replacing 40% of within-city car trips to cycling and public transport.	Relative to BAU, yearly GHG emissions (-42,783 t CO_2)	Yearly premature deaths avoided due to $PM_{2.5}$ improvements (10) and enhanced physical activity (44)
		North America (24% of results)		
Smargiassi et al. (2020) (81)	Montreal, Canada	Transportation mode, land use and fleet emission scenarios	Relative to 2061 BAU, GHG emissions for optimal scenario (-39%).	Optimal scenario reduction in health burden from increased walking (-33% DALYS)
MacNaughton et al. (2018) (52)	US cities	Improve energy efficiency and indoor environmental quality of buildings through LEED certification.	From 2000-2016, LEED buildings lowered emissions of CO_2 (-30.6 MT), SO_2 (-36.6 kt), NO_x (-28.2 kt), $PM_{2.5}$ (-0.4 kt)	Air quality improvements reduced premature deaths (172 to 405), hospital admissions (-171), asthma exacerbations (-11,000), respiratory symptoms (-54,000).
Tétreault et al. (2018) (86)	Montreal, Canada	Public transit investments in Montreal, with 8 and 19 new subway and train stations by 2031	Relative to 2031 BAU, NO_2 concentrations (-1%)	Reduction in the overall burden of transportation because of enhanced exercise (-2.5 DALYs per 100,000 persons)
Kheirbek et al. (2014) (43)	New York City, USA	Partial, and complete phase-out of high-sulphur heating fuels to reduce emissions in New York City	Relative to base conditions, complete phase-out reduces $PM_{2.5}$ concentrations (by 0.71 $\mu g/m^3$/yr)	Air quality improvements reduced yearly premature deaths (290); cardiovascular disease (-180); emergency visits (-550)
Maizlish et al. (2013) (53)	San Francisco, USA	Promote active transport and low-carbon driving (increased adoption of hybrids, biofuel, and EVs)	Relative to 2035 BAU, emissions from: Active transport (-14.5%); Low-carbon driving (-33.5%)	Reduction in annual DALYs: Active transport (-38,971); Low-carbon driving (-232)
		Rest of the World (38% of results)		
Kanhai et al. (2021) (41)	Accra, Ghana	Decrease environmental footprint of solid waste management	Relative to 2030 BAU, CO_2 eq. emissions from sector (-53%)	Premature deaths avoided from $PM_{2.5}$ improvements in 2030 (120)
Chapman et al. (2018) (13)	2 cities in New Zealand	Increase active travel by 30% - investment in walking and cycling facilities, shared spaces…	Relative to BAU, yearly GHG emissions (-1,149 t of CO_2)	Reductions in cardiac disease, diabetes, cancer, and respiratory disease stemming from active travel (34.4 DALYs per year)
Rashidi et al. (2017) (71)	Nairobi, Balikpapan, Colombo	Waste treatment project in Nairobi; Tram introduction in Balikpapan; Electric bus transit in Colombo	Relative to BAU case, GHG emissions: Nairobi (-111,669 t CO_2 eq); Balikpapan (-20,194 t CO_2 eq); Colombo (-3,716 t CO_2 eq)	Monetized air quality health co-benefits: Nairobi (4.35 MM USD); Balikpapan (0.72 MM USD); Colombo (0.31 MM USD)
Liu et al. (2017) (50)	Suzhou City, China	Increase industrial energy efficiency, buildings energy efficiency, and fuel economy of transport sector	Relative to BAU, CO_2 emissions in 2020 (-41.6%)	Reduction in air pollution burden of diseases measured in DALYs (-44.1%)
Stevenson et al. (2016) (84)	6 cities	Increased cities density and diversity of land; mode-shift away from private motor vehicles.	GHG emissions relative to the baseline: Melbourne (-12%); Boston (-12%); London (-10%); Copenhagen (-11%); Delhi (-3%); Sao Paulo (-5%).	Overall health gains from increased physical activity and decreased $PM_{2.5}$ (reduction of 420 to 826 DALYs per 100,000 people)
Lindsay et al. (2011) (49)	Urban New Zealand	Moving short urban car trips (≤7 km) to cycling: from 1% to 30% of vehicle km	GHG emissions for a 5% shift relative to the baseline (-50,000 t of CO_2/yr)	Annual premature deaths avoided from enhanced cycling (121.6)
Woodcock et al. (2009) (93)	London and Delhi	Lower-carbon-emission motor vehicles, increased active travel, and a combination of the two.	GHG emissions of combined scenario relative to 1990: London (-60%); Delhi (+199% - significantly lower than BAU)	Annual health benefits per million people combining active travel and lower emission: London (7349 DALYs); Delhi (12,995)

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THANK YOU!