# Where are we in green space and health research?

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I'd like to explore where we are in terms of the evidence around how and why green space might be good for us, what we're sure about, what we're not and where we need to go next. In 20 minutes, this is inevitably not comprehensive!

#### What is green space?

WHO – urban green space is defined as all urban land covered by vegetation of any kind and can also include small water bodies such as ponds, lakes or streams ("blue spaces").

Me – "you know it when you see it... land that humans haven't built on or covered with concrete, where things might be growing. Parks, forests, river corridors. All that stuff."

The idea is that green space is good for us – both individually (being in it, or even just seeing it), and collectively (these spaces protect populations in different ways, for e.g. air pollution, urban cooling or flood mitigation)

# Many of the health problems we face (mental health, CVD etc) seem to be helped by green space.



But at the same time, we face massively increasing urbanisation, so these spaces are both under threat and ever more valuable

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Physical activity

Social contact

Stress reduction / restoration

Microbiome

Air pollution

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Urban cooling

Water management

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Restoration / stress reduction are physiological & psychological effects, driven by the brain's perception of nature.



### The evidence for these effects comes primarily from lab and field *experiments*.

#### **Experimental evidence: field**



Park B, Tsunetsugu Y, Kasetani T, Kagawa T, Miyazaki Y. The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. Environmental Health and Preventive Medicine 2010; 15(1):18-26.

#### **Experimental evidence: field**



(c) Walking in the City Area



(d) Watching the Landscape in the City Area

Park B, Tsunetsugu Y, Kasetani T, Kagawa T, Miyazaki Y. The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): evidence from field experiments in 24 forests across Japan. Environmental Health and Preventive Medicine 2010; 15(1):18-26.



Fig. 9 Effect of a forest bathing trip on adrenaline and noradrenaline concentrations in urine. a Effect of a forest bathing trip on urinary adrenaline concentration in male subjects (n = 12), b effect of a city trip on urinary adrenaline concentration in male subjects (n = 11)

Experiments are great! Causality, mechanism etc. But external validity? Meaning for whole, free-living populations, effect moderation, and for designing interventions? Eek.

# So, what about population level effects?

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Welley Hotel

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#### The association between access to natural environments and population health.



*Figure 1:* Incidence rate ratios for all-cause mortality in groups of exposure to green space, relative to group 1 (least exposure to green space) Error bars indicate 95% CIs.

Increasingly green

Mitchell R, Popham F. Effect of exposure to natural environment on health inequalities: an observational population study. The lancet. 2008 Nov 8;372(9650):1655-60. MRC/CSO Social and Public Health Sciences Unit, University of Glasgow There are now so many observational studies and reviews that there are umbrella reviews of the meta reviews of the systematic reviews...



#### Mental health outcomes:

Stress & Anxiety: Numerous studies show that people who live near or spend time in greenspace experience reduced levels of stress and anxiety. Cognitive function: Studies on greenspace improving focus, memory, and reducing cognitive decline in older adults. Sleep: green space associated with reduction in sleep problems

#### Physical health outcomes:

Cardiovascular health: Lower risks of heart disease and hypertension associated with exposure to greenspaces. Pregnancy outcomes: lower risk of low birth weight



https://www.flickr.com/photos/lydiashiningbrightly/

Credibility of the evidence on green space and human health: an overview of meta-analyses using evidence grading approaches. (Xie Y et al, EBioMedicine. 2024:1;106.)

154 meta-analysed associations (interventional = 44, observational = 110) were graded.

Among meta-analyses from interventional studies, **none** were high, four were moderate (wellbeing, systolic blood pressure, negative affect, and positive affect) credibility.

Among meta-analyses from observational studies, one was convincing (cardiovascular disease mortality), four were highly suggestive (prevalence/incidence of diabetes mellitus, preterm birth, and small for gestational age infant, and all-cause mortality).

Causality! We remain unsure about it at a population level...and therefore unsure about what interventions will work best, and what they will achieve.

# Failure to properly understand air pollution, urban cooling, flood mitigation impacts and values

Quality vs. quantity: Quantity of greenspace may not correlate with health outcomes as much as quality (biodiversity, design, maintenance). How do you even measure quality?

### Potential for green space to have a bigger impact on less advantaged people (equigenesis)



Better access to / more contact with nature seems to benefit disadvantaged groups to a greater extent. (Equigenesis)



Source: Re-drawn from Mitchell R, Popham F. Effect of exposure to natural environment on health inequalities: an observational population study. The Lancet 372(9650):1655-1660.

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Figure 3.1 Frequency of recreation visits to the outdoors in 12 months prior to being interviewed (May 19 to Mar 20)

Base= All respondents (11,187)

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glasgow.ac.uk/sphsu

Report No. 1227



Woodlands in and around town (WIAT). A significant initiative by Scottish Forestry, aims to improve quality of life of people in deprived urban Scotland. £50m+ since 2005.

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Warning Forest Operations Perceptions and experience

Contact with nature, physical activity, use of the WIAT woods



Stress and other measures of health and wellbeing



Ward TC, Silveirinha DO, Tilley S, Elizalde A, Botha W, Briggs A, Cummins S, Leyland AH, Roe JJ, Aspinall P, Brookfield K Mitchell R. <u>Health impacts of environmental and social interventions</u> designed to increase deprived communities' access to urban woodlands: a mixed-methods study. 2019: Public Health Research 7(2)

### In terms of the science





This was, as far as we know, the first prospective, community-level natural experiment of its kind



Next time, it needs to be a bigger and longer term study (more sites, more years)



Given how hard / expensive collecting data is, we should look to routinely recorded data, such as NHS records



We need to think more about who does and does not have regular contact with nature, why, and what we can learn from that



### Why do we need a model of no/low use?

- i) calling attention to the mechanisms that drive low and nonuse of nearby nature spaces;
- ii) informing the design of studies (e.g. data collection, data analyses, systems mapping etc.) to understand more about these mechanisms;
- iii) inform researchers and policymakers on possible interventions that may reduce barriers for low and non-users and subsequently narrow health inequalities.











Zero . Low Level . Biodiversity . Amenity . High Level . Sport







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