Social and Economic Value of Health in a Place

#ValueOfHealthInAPlace

The Health Foundation

Welcome

Helen Walters

Public Health Consultant Advisor, National Institute of Health Research Coordinating Centre (NIHRCC)

Agenda

14.30 Welcome and housekeeping

14.35 Introduction to the programme

14.40 Team presentations

15.20 Panel conversation and audience questions

15.55 Poster session

16.30 Drinks reception

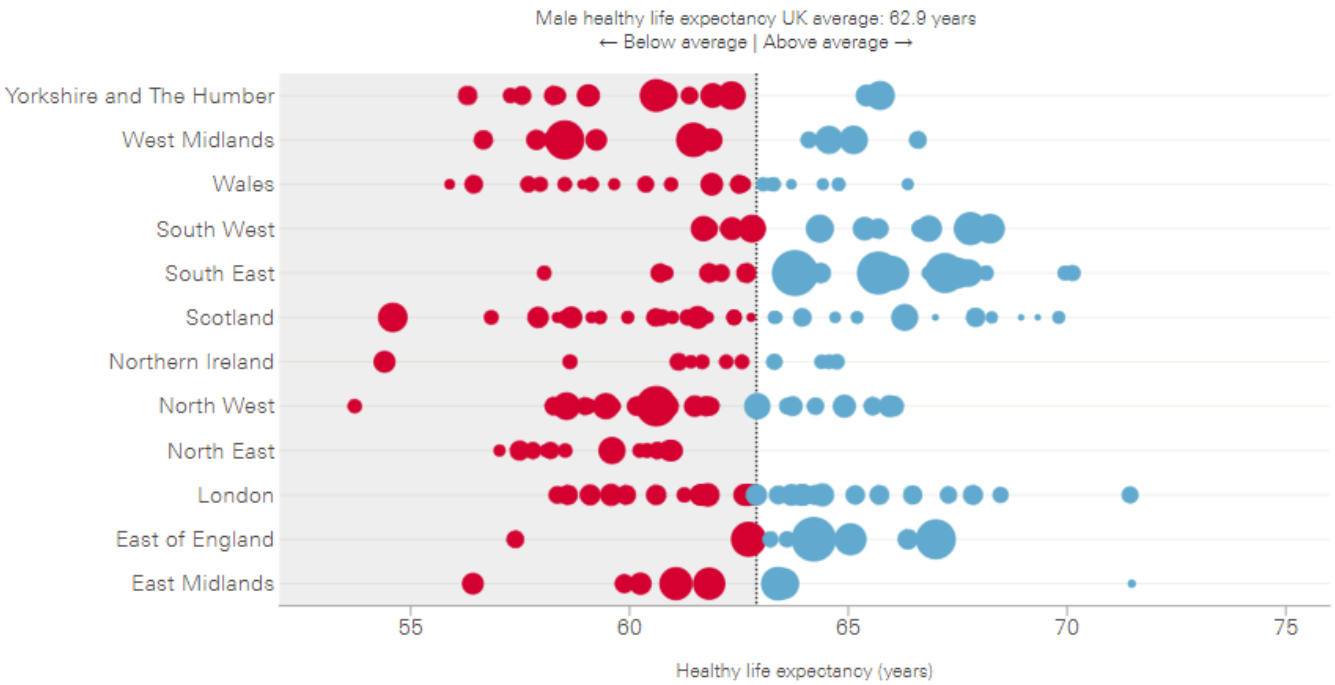
Introduction to the programme

David Finch

Assistant Director, the Health Foundation

There are wide variations in health across the UK

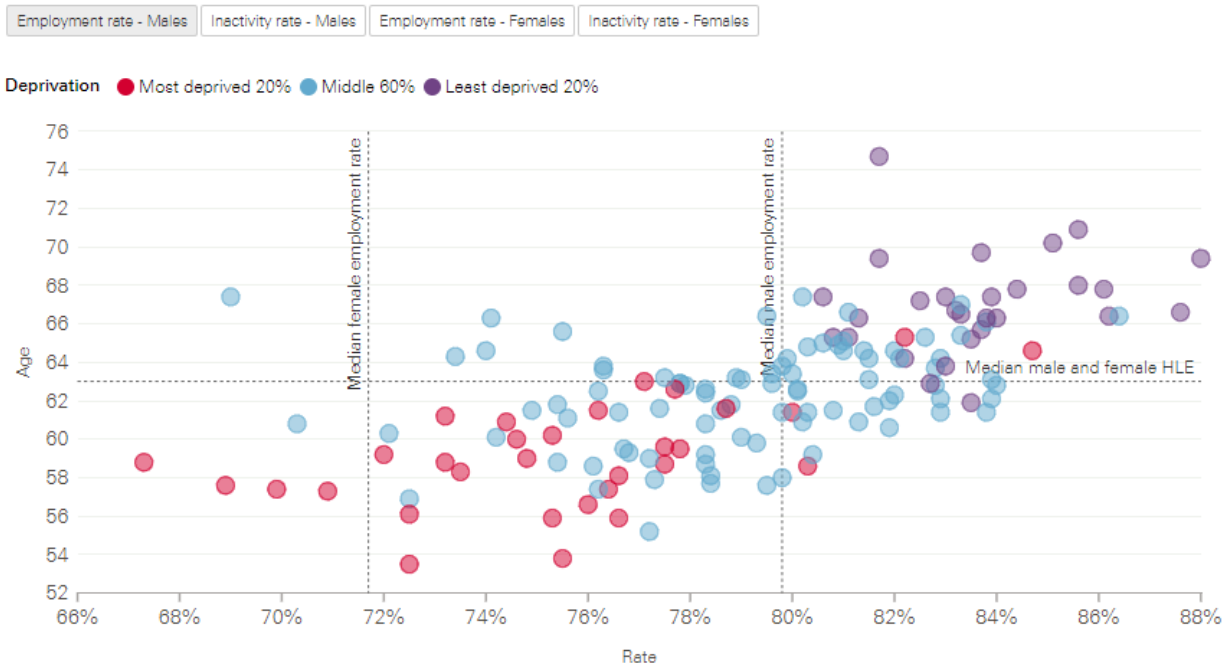
Male healthy life expectancy at birth by region, local authorities in the United Kingdom: 2017–19



Source: Office for National Statistics, Health state life expectancies, UK: 2017 to 2019 • Bubble size reflects the total population of the upper tier local authority calculated from the mid year population estimates for 2020

...and an association between health & employment

Healthy life expectancy at birth by quintile of deprivation and employment/economic inactivity rates for men and women: England, 2018-20



Source: Office for National Statistics, Annual Population Survey, 2022; Ministry of housing, communities & local government, English Indices of Deprivation, 2019; Office for National Statistics, Health state life expectancies by area, 2016-2018

Understanding how the health of a place influences social and economic outcomes of a place

- Building knowledge of the relationship between a given population's health and the health of individuals within that population
- Establishing the definitions and metrics needed to examine the relationship between the health of a population in a place and the social and economic outcomes of that place

Team presentations

Luke Munford, University of Manchester

Emily Murray, University College London

Martin Rossor, University College London

Daniela Fecht, Imperial College London

The health of places

Disaggregating measures of health and defining more equal places

Luke Munford, James Evans, Christos Grigoroglou, Evan Kontopantelis, Yiu-Shing Lau, Maria Panagioti, Rita Santos, Matt Sutton

The issue we are addressing

We need to understand the complex relationships between health and other aspects of people's lives.

We want to do this to help design policies that reduce inequalities and enable people to live the best possible lives.

To do this, we typically look at aggregate measures of health (such as life expectancy, self-reported health, mortality, etc.).

However, most measures of health are reported at very large levels – such as Local Authorities or Clinical Commissioning Groups or GP practice level.

This can hide a lot of important information about smaller places and people.

What we wanted to do/are doing:

Systematically examine the existing literature that attributes health measures reported at an aggregate level to smaller geographical areas. Then use the most appropriate technique to attribute a range of health measures (including physical and mental) to small geographic areas.

Use multidisciplinary approaches to define a new small-level place-based measure of health geography, defined in terms of more equal health *within* these new areas.

Analyse the relationship between health measures and social and economic outcomes at small geographical areas, including standard definitions and our new definition.

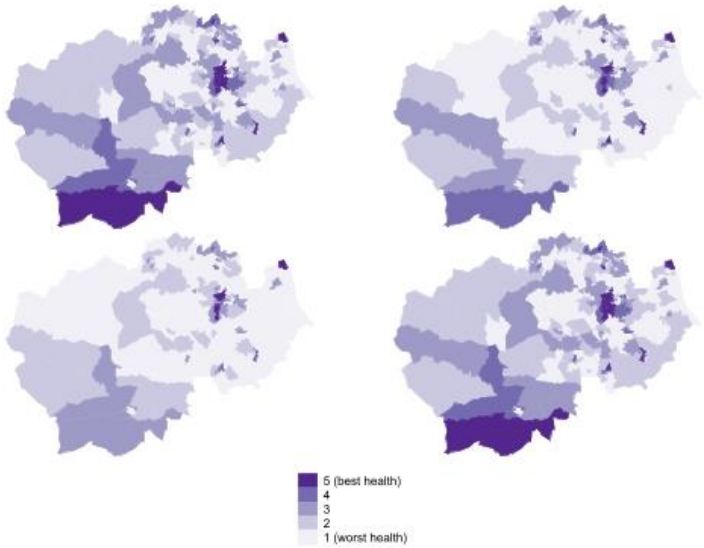
What have we found? 1

There are lots of ways to disaggregate measures of health.

They can give quite different measures of health in smaller areas.

We used real data from the 2011 Census to test which methods seemed to perform ‘best’.

It seems to be important to account for as many population characteristics as possible.

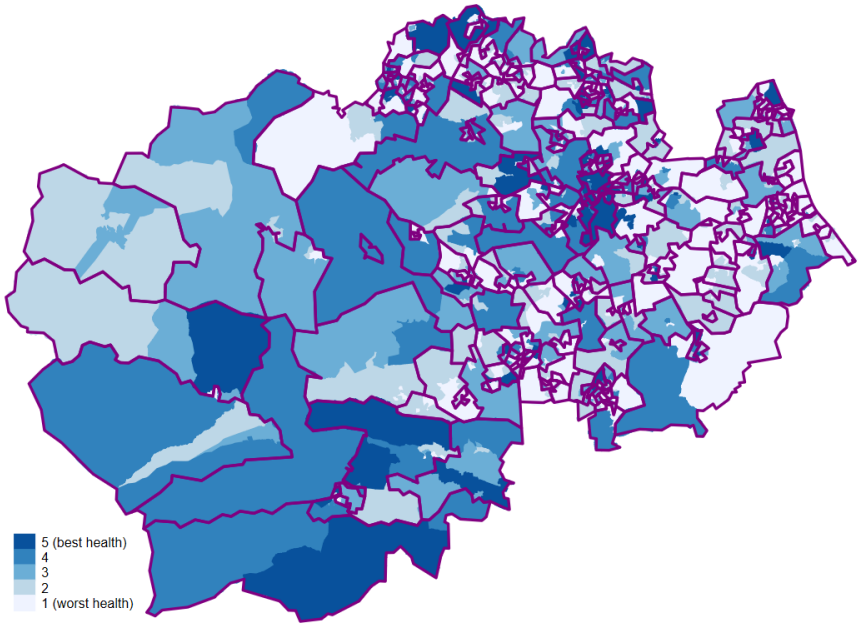


Note: top left panel = ‘true’ values obtained from Census 2011. Top right panel = when we adjust for age and gender. Bottom left panel = when we adjust for only age. Bottom right panel = when we adjust for age, gender, ethnicity, and the Index of Multiple Deprivation (IMD)

What have we found? 2

Some small areas have very unequal health within them.

Some areas contain smaller areas where the self-assessed health is amongst the worst in the country as well as some smaller areas where the health is amongst the best in the country.



Note: the solid (purple) lines are existing LSOA boundaries.

What have we found? 3

We developed an algorithm to help us combine smaller areas together in a different way such that neighbouring areas were joined together to minimise the variation in health.

Our newly defined areas outperform existing LSOAs in minimising the variation of self-assessed health.

This is important if we want to use area-based measures of health. This will not eradicate, but will help reduce the risk of ecological fallacy.

	Current LSOAs	New areas
Number (N)	34,753	31,324
Number of OAs in LSOA/new area	5.21 [Range: 2 to 13]	5.24 [Range: 4 to 7]
Population size	1,614 [Range: 983 to 8,300]	1,791 [Range: 1,224 to 9,36
Average 'health' of an area	80.7% [Range: 48.0 to 97.0]	80.6% [Range: 48.2 to 97.1
Within area standard deviation	5.15 [Range: 0.21 to 28.21]	3.17 [Range: 0.16 to 16.4

What are we doing now?

Replicating our analyses using the most up-to-date data from Census 2021.

We are also considering other measures of health, such as disease prevalence and mortality, as well as measures of health care utilisation.

We are working with some Combined Authorities and ICSs to understand the implications of our proposed new areas.

What does it mean?

It is important to correctly disaggregate measures of health to smaller geographical areas.

Health can vary substantially within small areas, to get better information on population health we need to consider more homogenous areas with respect to health.

This should allow us to better understand health inequalities.

The health of older people in places

An asset for economic and social improvement for all

Dr Emily T. Murray - University College London
Emily.murray@ucl.ac.uk | @emilytmurray
Prof Jenny Head, Dr Paul Norman & Prof Nicola Shelton

The Health Foundation

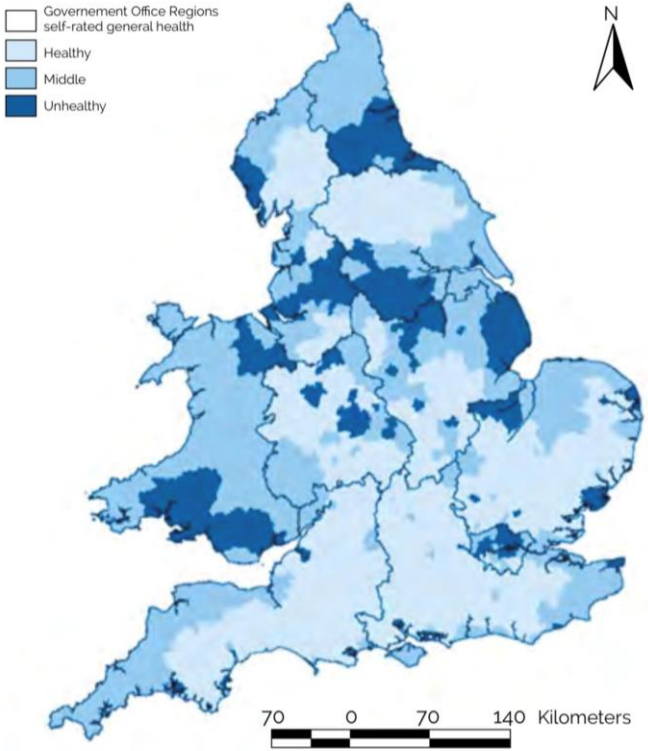
Messages

1. Community health for older people varies hugely across England and Wales
2. Inequalities in community health are entrenched
3. Community health = Community wealth
4. Levelling up older people's health in places = 250,000 more stayed in work in 2011

Message 1

Community health for older people varies hugely across England & Wales

Figure 2: Self-rated health of those aged 50–74 across local authorities i England and Wales, 2011



Note: Dark blue lines indicate boundaries of Government Office Regions.

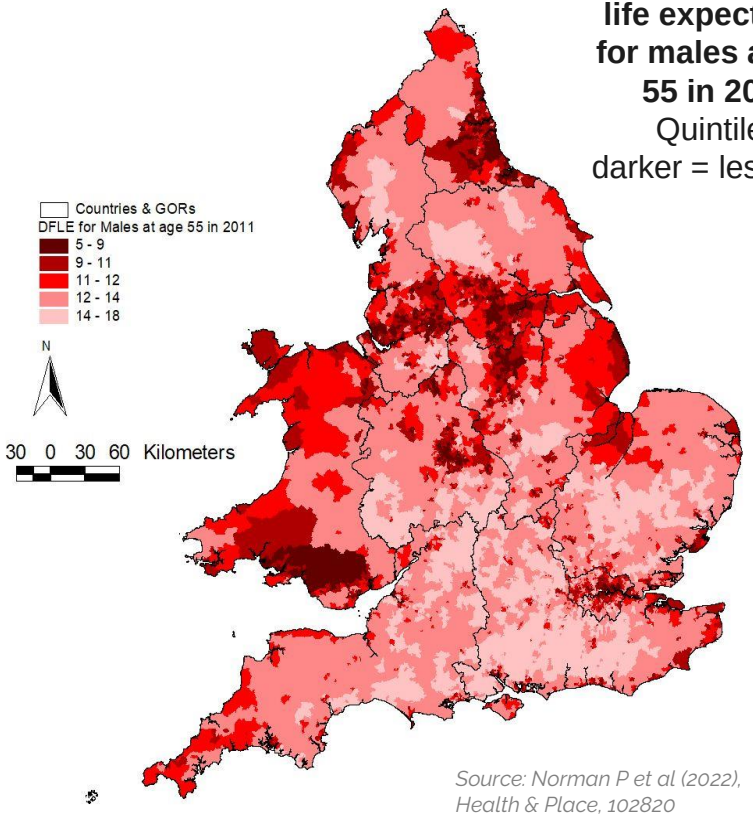
Source: 2011 Census, England and Wales (n=348 local authorities)

Message 1b

Community health for older people varies hugely across England & Wales

- For all 9 health-in-a-place measures
- At multiple geographies (RHS=small areas)

Disability-free life expectancy for males at age 55 in 2011
Quintiles
darker = less long



Source: Norman P et al (2022), Health & Place, 102820

Message 2

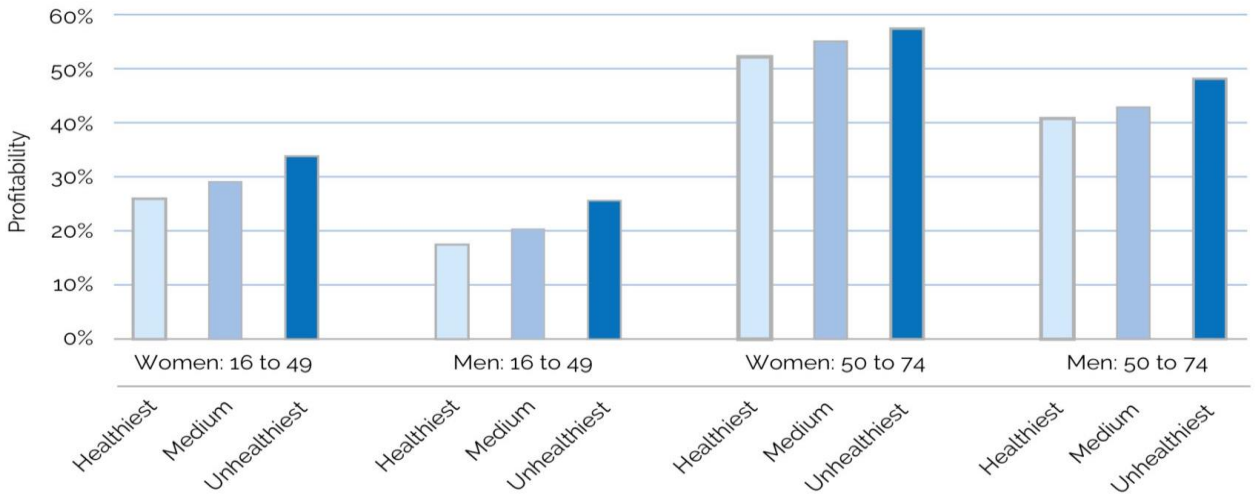
Inequalities in community health are entrenched

- From 1991 and 2011, there is an 82% correlation between Disease Free Life Expectancy (DFLE) at age 50yrs in England and Wales.
- In 2011, DFLE at 50 in the ‘unhealthiest’ area was 13.8 years, compared with 25.0 in the ‘healthiest’ area: a health gap of 11.3 years.

Source: Norman P et al (2022), Health & Place, 102820

Message 3: community health = community wealth

Figure 3: Predicted probability of not being in paid work, by tertile of local authority residents aged 50–74 who reported their own health as 'bad' and age group/gender



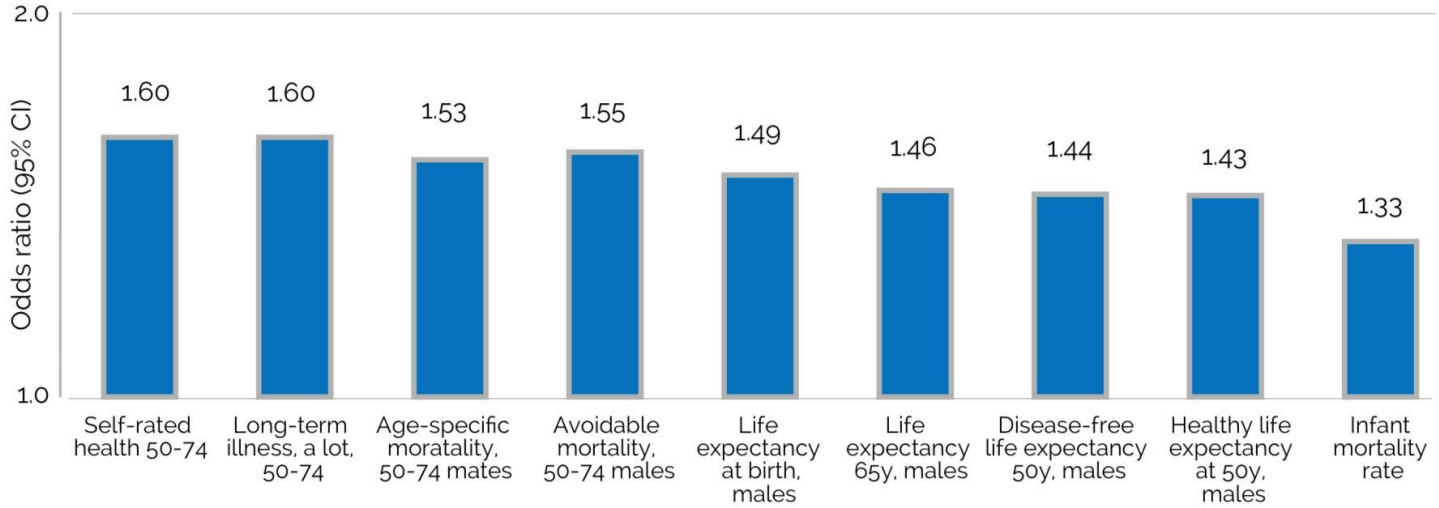
Tertiles = Light blue bars 'healthiest' third of local authorities (18.3%-27.0%), medium blue bars 'middle' healthiest of local authorities (27.1%-33.1%) and dark blue bars 'unhealthiest' third of local authorities (33.2%-49.8%). Age 16-49 (n=268,215) and age 50-74 (n=162,162).

Source: ONS Longitudinal Study (n=430,377)

Source: BMC Public Health 22(1): DOI: 10.1186/s12889-022-14661-0

Especially if we ask people about their health

Figure 4: Age-adjusted odds of not being in paid work, for the 'Unhealthiest' vs 'Healthiest' third of local authorities, 16-74yrs



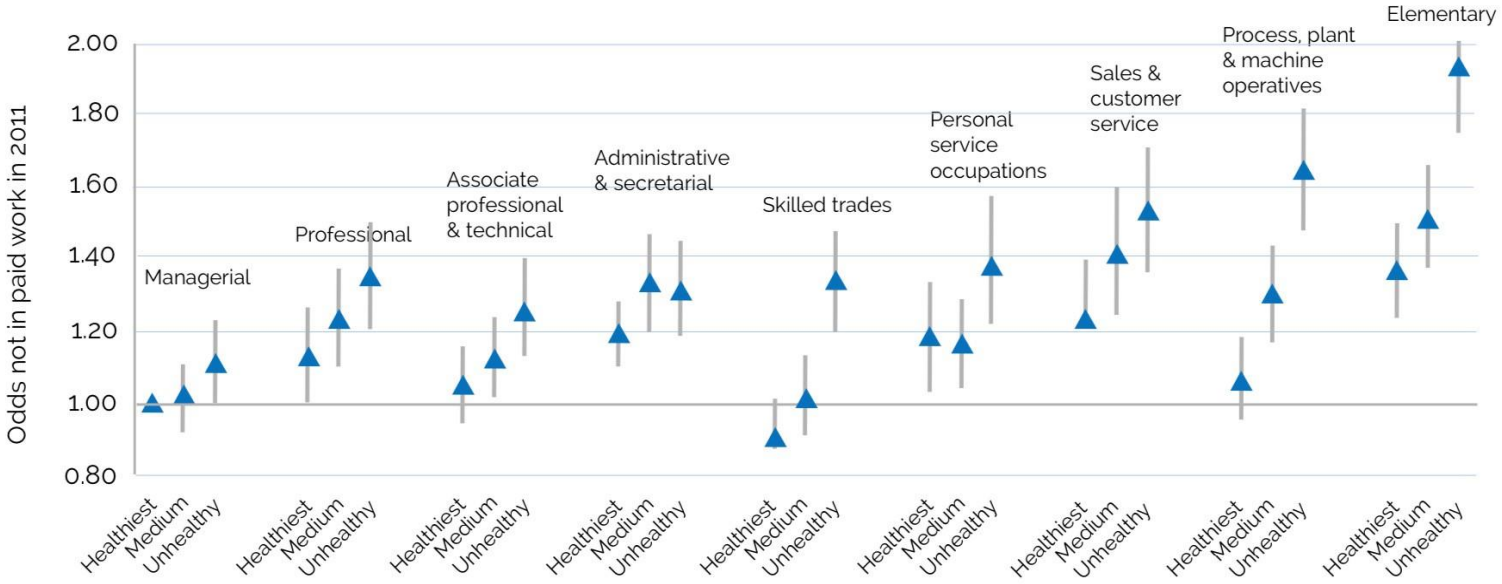
Reference group: in paid work

Source: ONS Longitudinal Study (n=430,377)

Source: BMC Public Health 22(1): DOI: 10.1186/s12889-022-14661-0

Particularly if they work in a manual job

Figure 5: Adjusted* Relative Risk Ratio of not being in paid work in 2011, as linked to interaction between self-rated health and major occupation in 2001

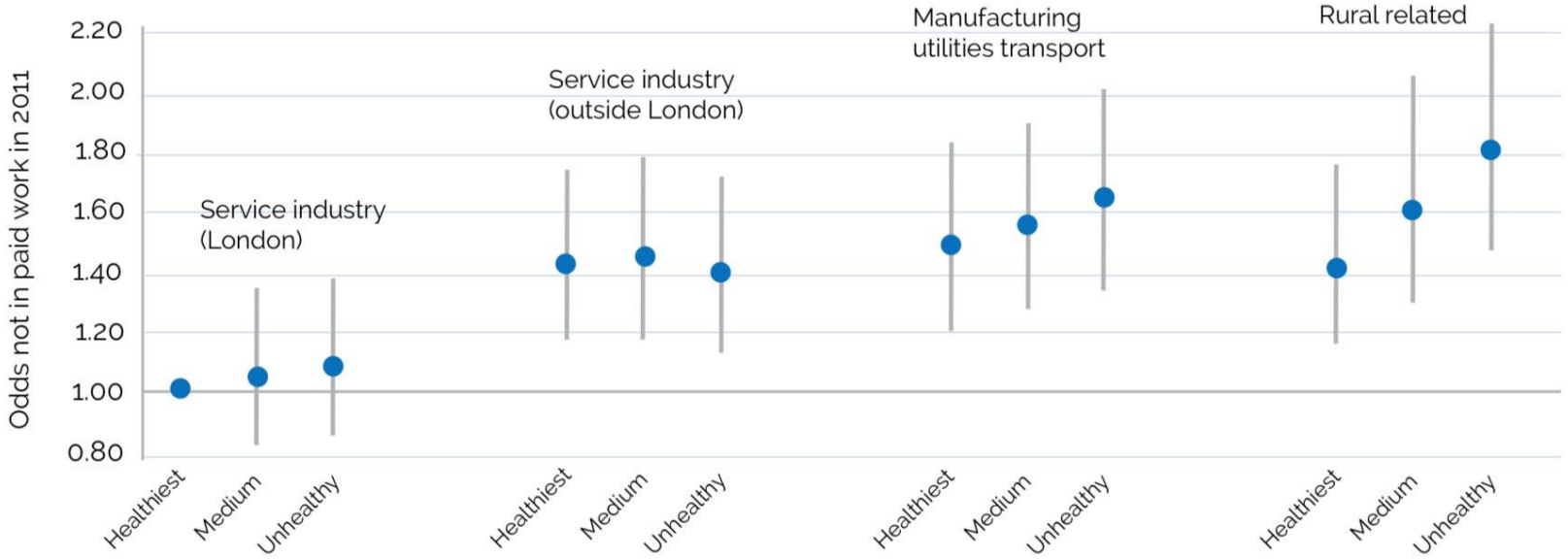


Confidence intervals = 95% Reference group: in paid work

Source: ONS Longitudinal Study, n=128,710

And if they live in areas where there are certain dominant industries

Figure 6: Adjusted* Relative Risk Ratio of not being in paid work in 2011, as linked to interaction between self-rated health and industry cluster area in 2011

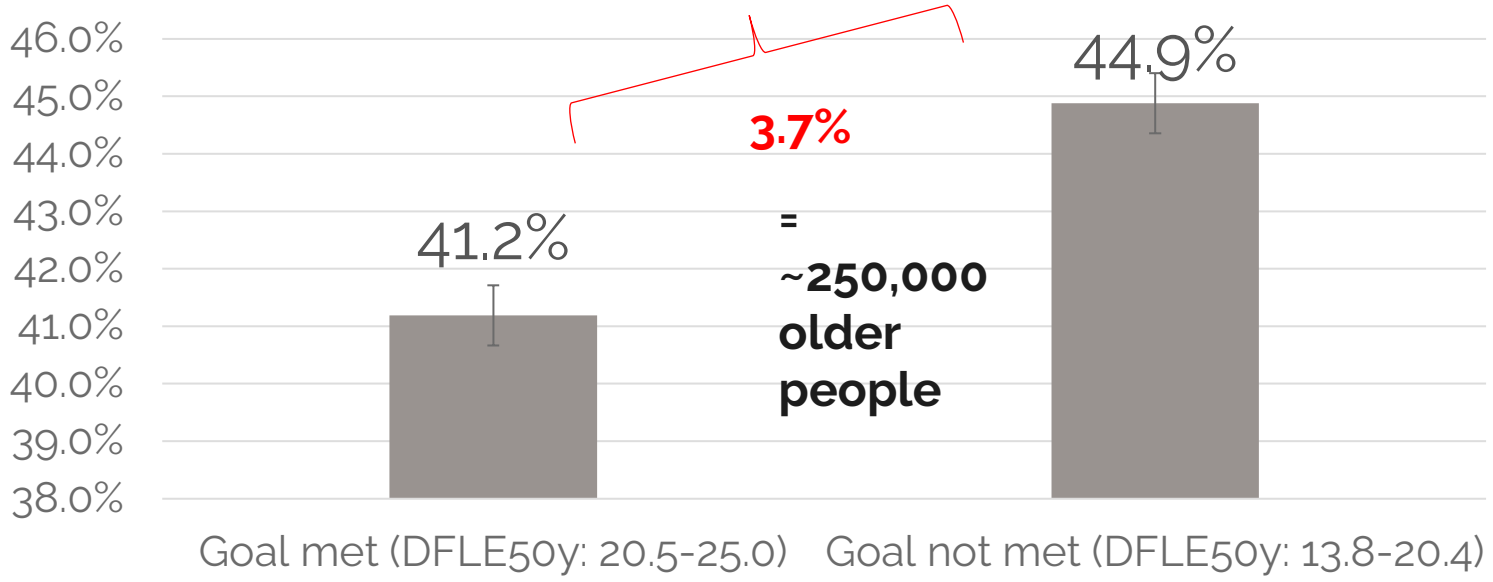


Confidence intervals = 95% Reference group: in paid work

Source: ONS Longitudinal Study, n=102,169

Levelling up the older people's health in places = more stay in work 2011

Figure 7. Probability of work exit 2001-2011 for ONS Longitudinal Study members aged 40-64yrs and in work in 2001 by resident in Local Authorities where the Levelling Up Health goal was met or not met.



Source: ONS Longitudinal Study, (N=121,778).

Messages

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4. Levelling up older people's health in places = 250,000 more stayed in work in 2011

Social and economic value of cognitive health in a place

Martin Knapp - London School of Economics
Parashkev Nachev - University College London
Martin Rossor - University College London

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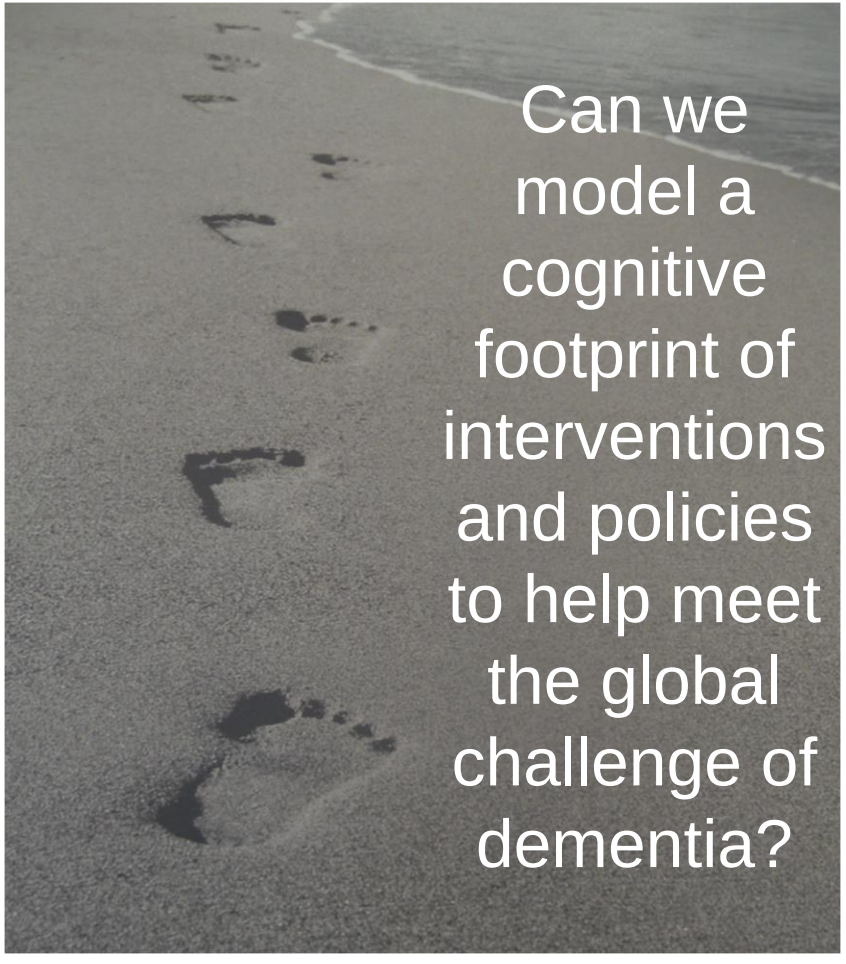


Can we model a cognitive footprint of interventions and policies to help meet the global challenge of dementia?

Viewpoint

Can we model a cognitive footprint of interventions and policies to help meet the global challenge of dementia?

Martin Rossor, Martin Knapp

Lancet 2015; 386: 1008–10
Published Online July 30, 2015
http://dx.doi.org/10.1016/S0140-6736(15)60248-3
See Editorial page 931

UCL Institute of Neurology, Queen Square, London, UK (M Rossor MD); and London School of Economics and Political Science, Personal Social Services Research Unit, London, UK (M Knapp PhD)
Correspondence to: Prof Martin Rossor, UCL Institute of Neurology, Queen Square, London WC1N 3BG, UK
m.rossor@ucl.ac.uk

The changing global demographic characteristics of dementia have led to worldwide predictions of unaffordable treatment and care costs over the coming decades. Recognition of the economic consequences has encouraged many countries to develop national dementia plans, as well as international actions such as the G8 Dementia Summit in London, UK, in 2013 and the WHO Ministerial Conference on Global Action Against Dementia in Geneva, Switzerland, in 2015.

Dementia is defined as severe cognitive impairment that interferes with activities of daily living. There is a tendency to conflate dementia with Alzheimer's disease, which is not surprising because Alzheimer's disease is the commonest form of dementia in older people (older than 65 years), progressive, and without interventions to slow that progression. Nevertheless, many diseases can be associated with severe cognitive impairment or dementia and, importantly, many more are associated with less severe cognitive impairment, some of which can progress if undiagnosed. The term mild cognitive impairment was developed to describe cognitive deterioration that does not fulfil the severity criterion of dementia, although mild cognitive impairment has tended to be used when older people present with a memory problem that might represent early Alzheimer's disease. We would argue, however, that to focus only on late-life dementia misses the societal opportunity to foster cognitive health and to preserve cognitive capital. If one considers all causes of cognitive impairment across the lifespan—including the absence of activities to develop full cognitive potential, such as education—then a deeper and broader debate is opened up. It is important, however, to appreciate that cognition here is not confined simply to memory, but to the entire range of cognitive function including language, perception, creativity, and social activity.

In reframing and extending the debate in this way, it might be helpful to borrow a concept from another major global challenge of modern times: global warming. Can we develop a so-called cognitive footprint that, as with a carbon footprint, can be either negative (impair cognition) or positive (enhance cognition)? A cognitive footprint could then be used to assess and model potential cognitive effects of medical and public health interventions through to social and wider public policies. It could be identified across many public policy areas, including health, social care, education, criminal justice, transport, sport, employment, and doubtless others. The importance of this footprint stems from links between cognitive skills and educational attainment, employment status, earnings, performance in instrumental activities of daily living, and (at national level) to income distribution and economic growth.[1] Thus a range of activities will have an effect on cognition throughout the life course that could be associated with footprints as illustrated below.

Adverse effects during pregnancy of smoking, alcohol, and many drug exposures (eg, sodium valproate) are widely recognised. More difficult to establish are effects of stress arising from adverse environments of the mother, although emerging evidence suggests that chronic exposure to stress hormones can have a lifelong detrimental effect on offspring.[2] Maternal perinatal mental illness can affect a child's cognitive development.[3] The increasing focus on epigenetic effects also suggests that ancestral environment can affect the health of offspring, and although studies have focused on cardiovascular and metabolic disease, both secondary and primary effects on cognition might be anticipated.[4]

Links between education and cognition are bidirectional: educational attainment is partly determined by prior cognitive ability, but receipt of education (both quality and duration) also affects subsequent cognitive development, even after adjustment for earlier cognition, sex, and parental socioeconomic position.[5] Those effects have a long reach: raising of the school-leaving age in England and Wales in 1947 has been associated with improved cognitive performance in old age.[6] Educational investment can thus reduce a negative subsequent cognitive footprint.

Many infectious diseases result in permanent cognitive deficits and many are associated with poor cognitive function.[7] The cognitive footprint will be greater with childhood diseases because of the potential lifelong effect. Neurocysticercosis is endemic in Latin America and southeast Asia, and is associated with poor sanitation. It is listed as a neglected tropical disease by WHO, which in July, 2014, ranked *Taenia solium* top of the list of leading food-borne parasites "with greatest global impact". Neurocysticercosis is a leading cause of epilepsy worldwide, which in itself can have secondary effects on cognition. Active neurocysticercosis is associated with cognitive impairment;[8] thus childhood exposure to *T solium* can have a major negative cognitive footprint over an individual's lifetime and partly negate educational investments in developing countries.

Exercise has well known short-term and long-term positive benefits on cognition as well as other protective effects on health.[9] But a lot of attention is now also being focused by some sports governing bodies on head injuries and their consequences.[10] Many sports (particularly contact sports such as boxing, football, and rugby) carry risks of long-term cognitive damage.[11] A major US review of youth sports reported higher rates of concussion and

Cognitive Footprint

M Rossor & M Knapp, The Lancet 2015

Unbiased mapping of cognition in geographical space

Article

Patterns

GeoSPM: Geostatistical parametric mapping for medicine

Highlights

- A framework for topological inference applicable to diverse clinical data is proposed
- Superior robustness to noise and under-sampling is observed compared with kriging
- Application to UK Biobank data is demonstrated

Authors

Holger Engleitner, Ashwani Jha, Marta Suarez Pinilla, ..., Karl Friston, Martin Rossor, Parashkev Nachev

Correspondence

h.engleitner@ucl.ac.uk (H.E.), p.nachev@ucl.ac.uk (P.N.)

In brief

We present GeoSPM, an approach to the spatial analysis of diverse clinical data that extends a framework for topological inference, well established in neuroimaging, based on differential geometry and random field theory. We evaluate GeoSPM with extensive synthetic simulations, and apply it to large-scale data from UK Biobank. Our approach is readily interpretable, easy to implement, enables flexible modeling of complex spatial relations, exhibits robustness to noise and under-sampling, offers principled criteria of statistical significance, and is scalable to large datasets.

Engleitner et al., 2022, Patterns 3, 100656
December 9, 2022 © 2022 The Author(s).
https://doi.org/10.1016/j.patter.2022.100656

high-dimensional / geospm Public

Code | Pull requests | Actions | Security | Insights

main | 1 branch | 2 tags | Go to file | Code

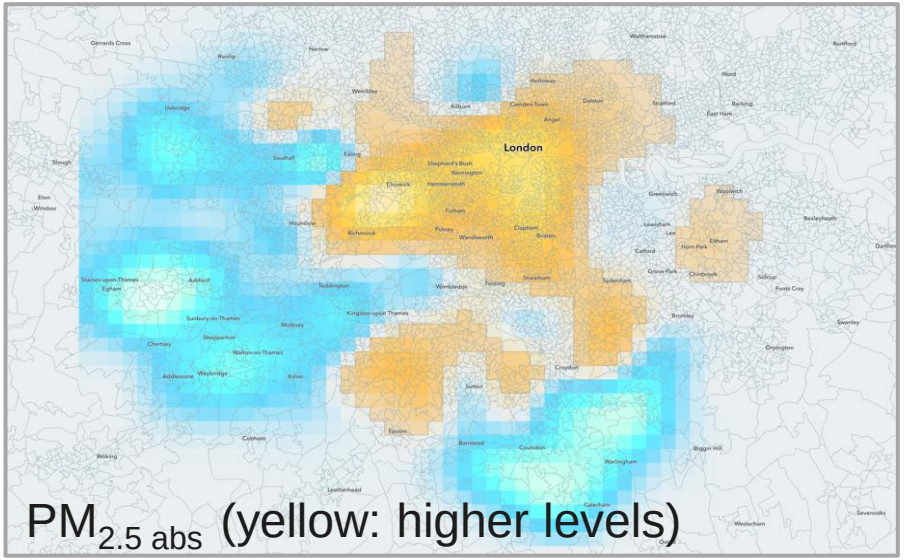
high-dimensional-admin Merge pull request #1 from high-dimensional/revisions ... 47be859 on Oct 27, 2022 17 commits

+geospm	Added geospm_analysis_template.m and geospm.Parameters. Improved...	2 months ago
+hdng	Added sum_of_squared_error and converged fields to variograms. Fixed ...	5 months ago
.gitignore	Added geospm_analysis_template.m and geospm.Parameters. Improved...	2 months ago
AUTHORS.txt	Initial public commit and release v1.0.0.	9 months ago
LICENSE.txt	Initial public commit and release v1.0.0.	9 months ago
README.md	Initial public commit and release v1.0.0.	9 months ago
geospm_analysis_template.m	Added geospm_analysis_template.m and geospm.Parameters. Improved...	2 months ago
run_geospm_example.m	Initial public commit and release v1.0.0.	9 months ago
run_geospm_tests.m	Initial public commit and release v1.0.0.	9 months ago
source_commit_paths	Initial public commit and release v1.0.0.	9 months ago

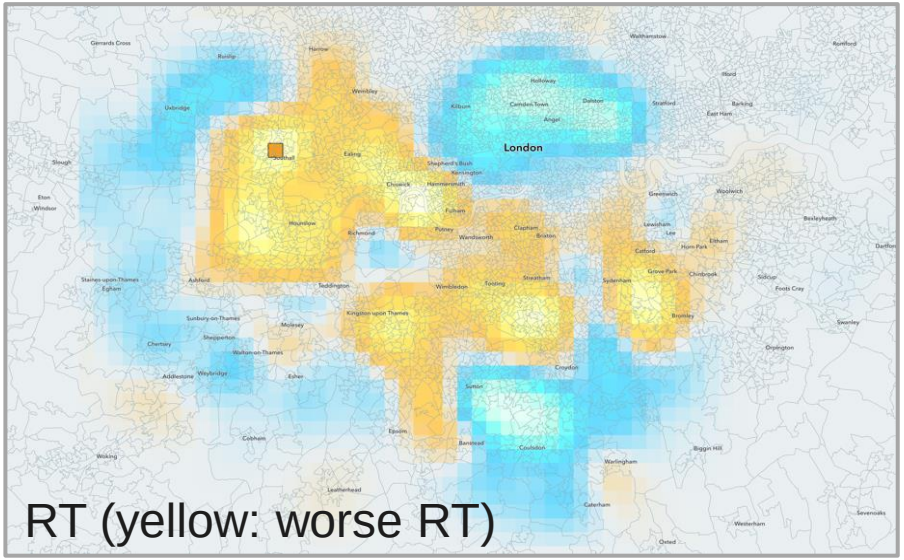
GitHub - high-dimensional/geospm: GeoSPM: Spatial analysis using statistical parametric mapping (SPM)
https://github.com/high-dimensional/geospm

Cognitive footprint of air pollution

SPM for geography



$PM_{2.5\ abs}$ (yellow: higher levels)



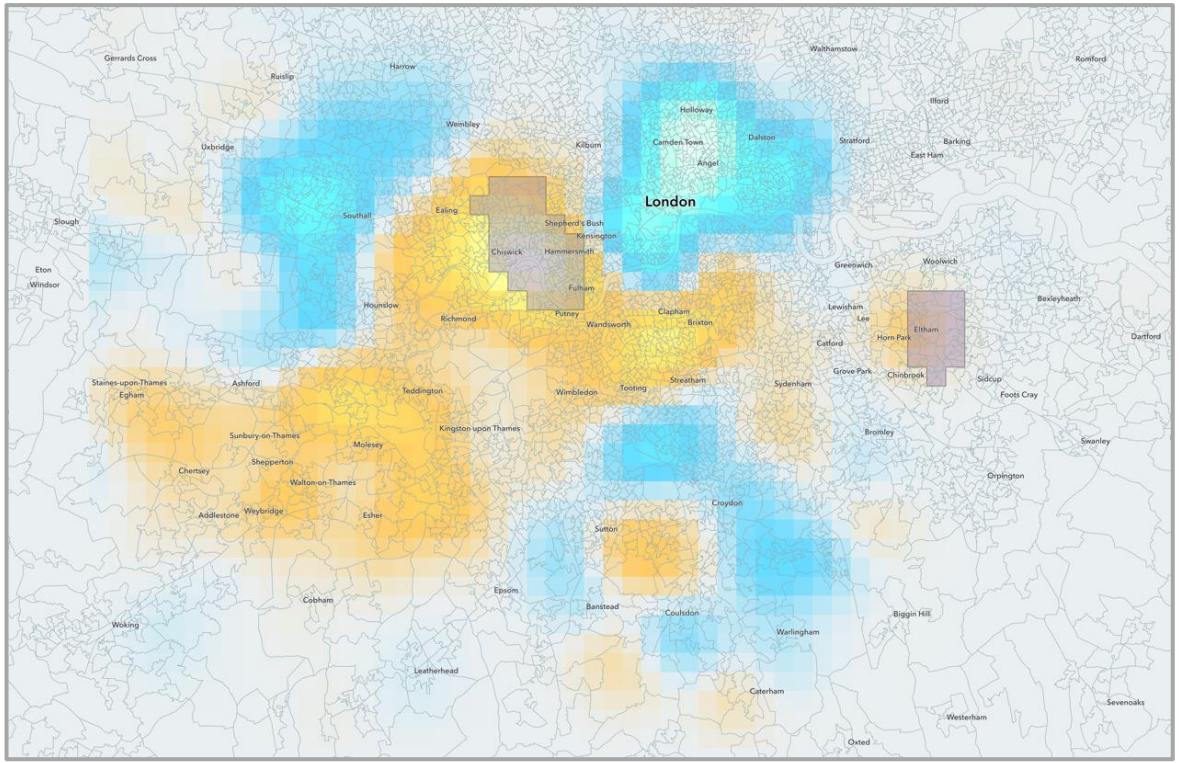
RT (yellow: worse RT)

The geostatistical distribution of $PM_{2.5\ abs}$ and RT in Greater London area shows places with

- expected positive association $PM_{2.5\ abs}$ and RT: high pollution and long RT (e.g. Chiswick) / low pollution and short RT (e.g. Coulsdon).
- counterintuitive negative association: high pollution yet short RT (e.g central London) / low pollution yet high RT (e.g. Southall).

Cognitive footprint of air pollution

SPM for geography



The map for the interaction term $PM_{2.5abs}$ X RT indicates the areas where the expected positive association is strengthened (yellow) or nullified (blue).

Key themes from focus groups with the public in four case study sites

Public perceptions of factors affecting cognition	Community, culture and social interactions
	Access to green spaces and nature
	Upkeep and safety of local area
	Pollution, traffic and noise
Public suggested solutions and perceived barriers	Better consultation with, and participation of, local populations in policy and planning
	Support for community activities and interactions
	Environment-friendly towns
	Active and public transport
	Education on cognition

Key themes from interviews with people in local policy and public health roles

Policymakers' awareness of cognition in current and future public health and neighbourhood policy	Little mention of cognition in public health and neighbourhood policy
	Barrier: definition and understanding of cognition
	Belief that there is a place for cognition as an aim of public health and neighbourhood policy
Policymakers suggested policy responses to links between neighbourhood factors and cognition	Improving public spaces, and infrastructure to encourage active transport
	Community and social interaction
	Access to green spaces and nature
Policymakers: Barriers and facilitators to implementing neighbourhood approaches that support cognitive health	Engagement with communities
	Joined up health and neighbourhood policy
	More local funding
	Research Evidence

Children's places

How they can shape health and influence social and economic outcomes

Dr Daniela Fecht, Prof Franco Sassi, Prof Mauricio Barahona

The Health Foundation

Imperial College London

Research context

- Childhood is a critical stage in life for human capital development.

"[…] from a place perspective, the most important thing to do to improve productivity, generate better jobs and greater earning power is to improve the skills of people"

"Academic success is strongly linked to children's physical and emotional wellbeing."

what works centre for local economic growth

Chief Medical Officer 2012

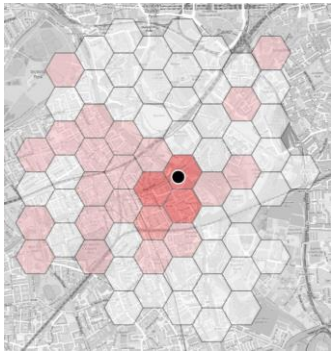
- Places and communities in which children spend their time influence their health: social norms, exposures to pollutants, environments conducive to unhealthy lifestyles.

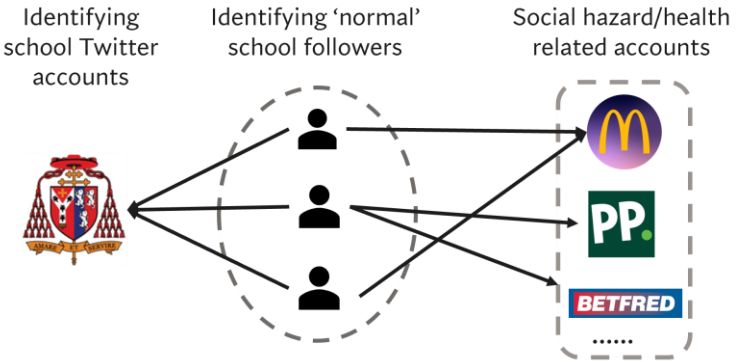
Research objectives

1. to define metrics that describe the health of a population in a certain place: environmental pollution, physical environment, food environment, social hazards.
2. to explore different conceptualisations of place:
   i. place as static concept via place of residence
   ii. place as dynamic concept reflecting activity patterns
   iii. place as a social concept reflecting social networks and online environments.
3. to identify relevant concepts and metrics that describe place-based social and economic outcomes: human capital ‘spill over’ based on educational attainment and earnings.

Conceptualisations of place

1. **Static concept** of place – residential neighbourhood (LSOA).
2. **Dynamic concept** of place – activity zones
   a. Activity zone radius reflects interquartile range of travel patterns from Time Use Survey
   b. Gravity model to establish probability of visiting a given zone.
3. **Online concept** of place – quantifying interaction in the digital realm, based on school Twitter followers.





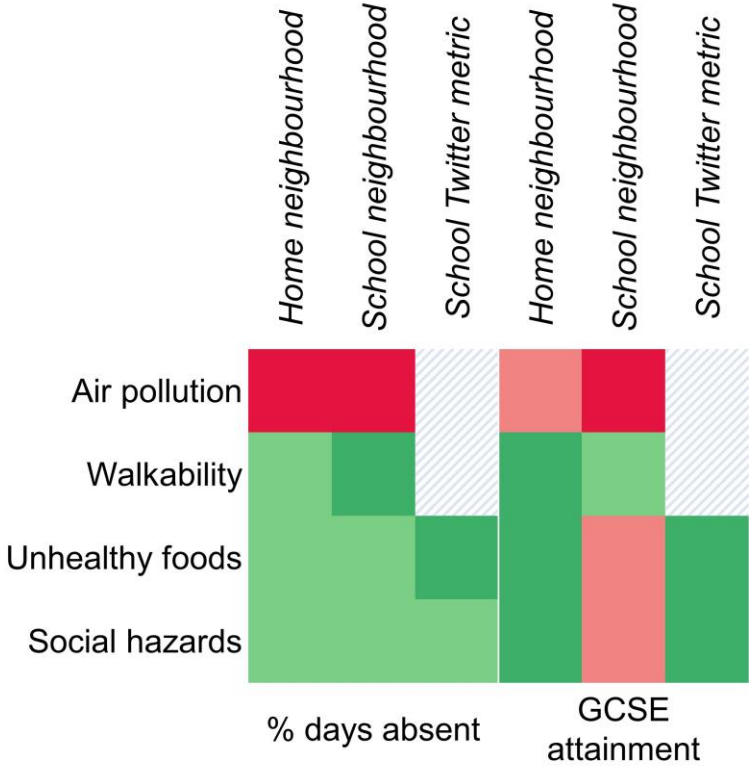
Effect of place-based characteristics on educational attainment

Study population: 510 secondary schools (~180,000 pupils) in London and Newcastle.

Outcome: i) percentage of days absent from school; ii) achievement of Level 2 at GCSE (5 or more Grade 4-9), Data source: National Pupil Database, DoE, 2018/2019.

Exposure: Place characteristics for residential and school neighborhoods, school Twitter profile.

Statistical analysis: Linear mixed effects models, adjusting for area- and individual level socio-economic status.



Effect of educational attainment on human capital

Research question: Does a higher overall level of educational attainment in an area raise the earnings of an individual residing in the area, after controlling for the individual's own educational attainment?

Study population: Understanding Society participants, 2009 – 2019

- A 1% increase in the proportion of people with a university degree in an area is correlated to 12% higher wages in that area.
- A 1% increase in university degrees is associated with 2% drop in wages, when accounting for area-level characteristics (crime rate, air pollution).
- This effect is stronger for higher paid jobs with a 3% drop in wages per 1% increase in university degrees.
- Human capital 'spill over' effect might be hampered by skill incompatibility in areas of higher education.

Take home messages

- We found important influences of place-based characteristic on children's educational attainment.
- The school, both as a physical place (school neighbourhood) and as an online place (school's social media sphere), has a crucial role in affecting children's educational outcomes.
- Place-based interventions could help to reduce the educational gap.
- School's social media presence could be used to guide public health messaging, such as local authority lead public health campaigns.
- As the online realm becomes an increasingly important medium by which public health influences are conveyed, it is important that mechanisms by which to direct and control these influences are developed in tandem.

Take home messages

- We showed a potential skill mismatch for high-paid jobs, highlighting the need for a better communication within the labour market.
- The magnitude of social returns to education is crucial to address the efficiency of public investments in education and for local development policies.
- Our results feed into the debate on the UK geographical disparities and the drivers and potential approaches to it, such as the levelling-up agenda.

Panel discussion

Chair: Helen Walters, NIHRCC

David Finch, the Health Foundation
Luke Munford, University of Manchester
Emily Murray, University College London
Martin Rossor, University College London
Daniela Fecht, Imperial College London

#ValueOfHealthInAPlace

Poster session

Rob Davidson, University College London

Luke Munford, University of Manchester

Emily Murray, University College London

Martin Rossor, University College London

Daniela Fecht, Imperial College London

Thank you

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