MRC/CSO Social and Public Health Sciences Unit

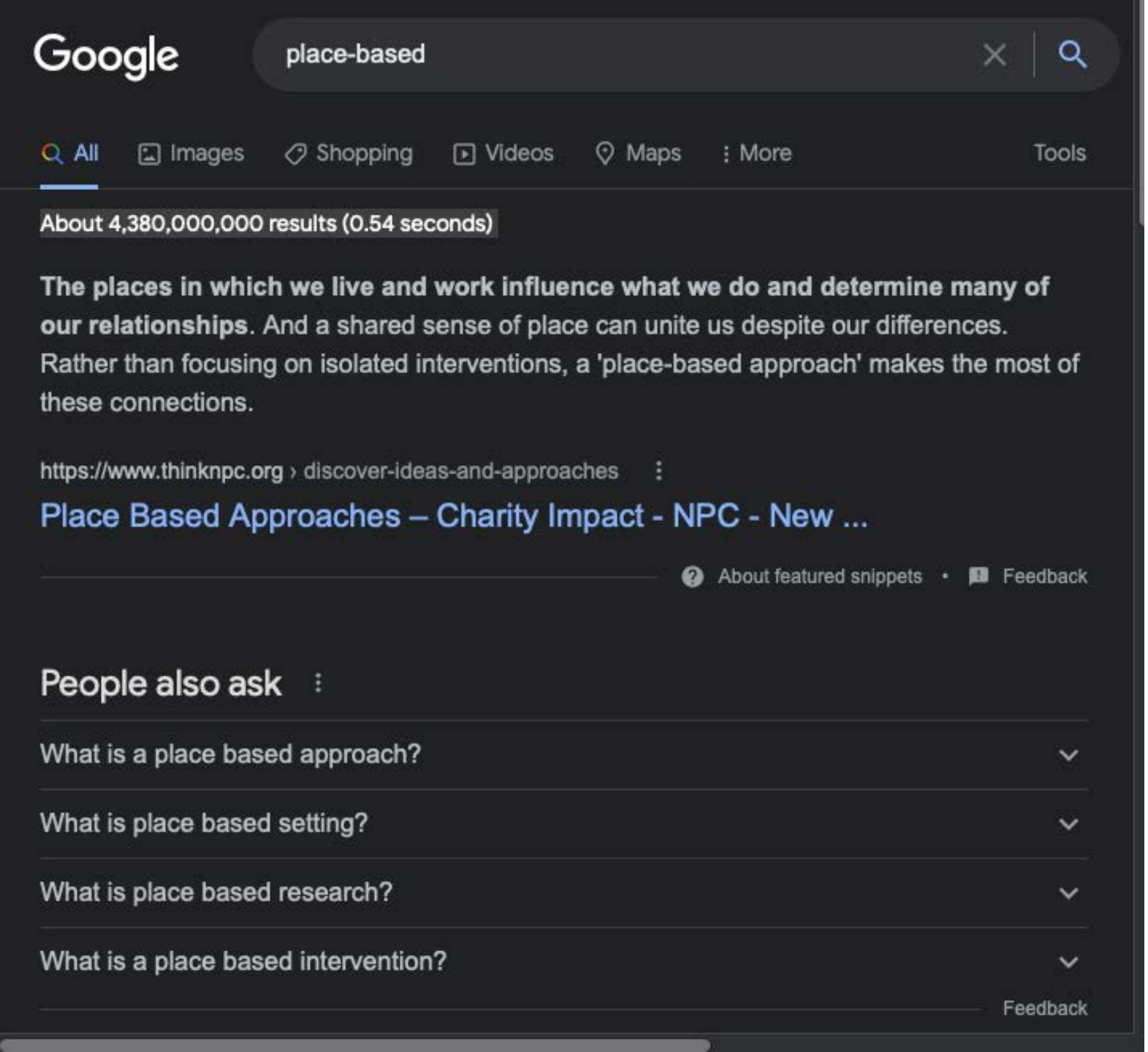



Is ‘place’ the key to better and more equal population health?

Rich Mitchell and the Places Team

MRC/CSO Social and Public Health Sciences Unit, University of Glasgow

@SPHSU_Places @CRESH_news

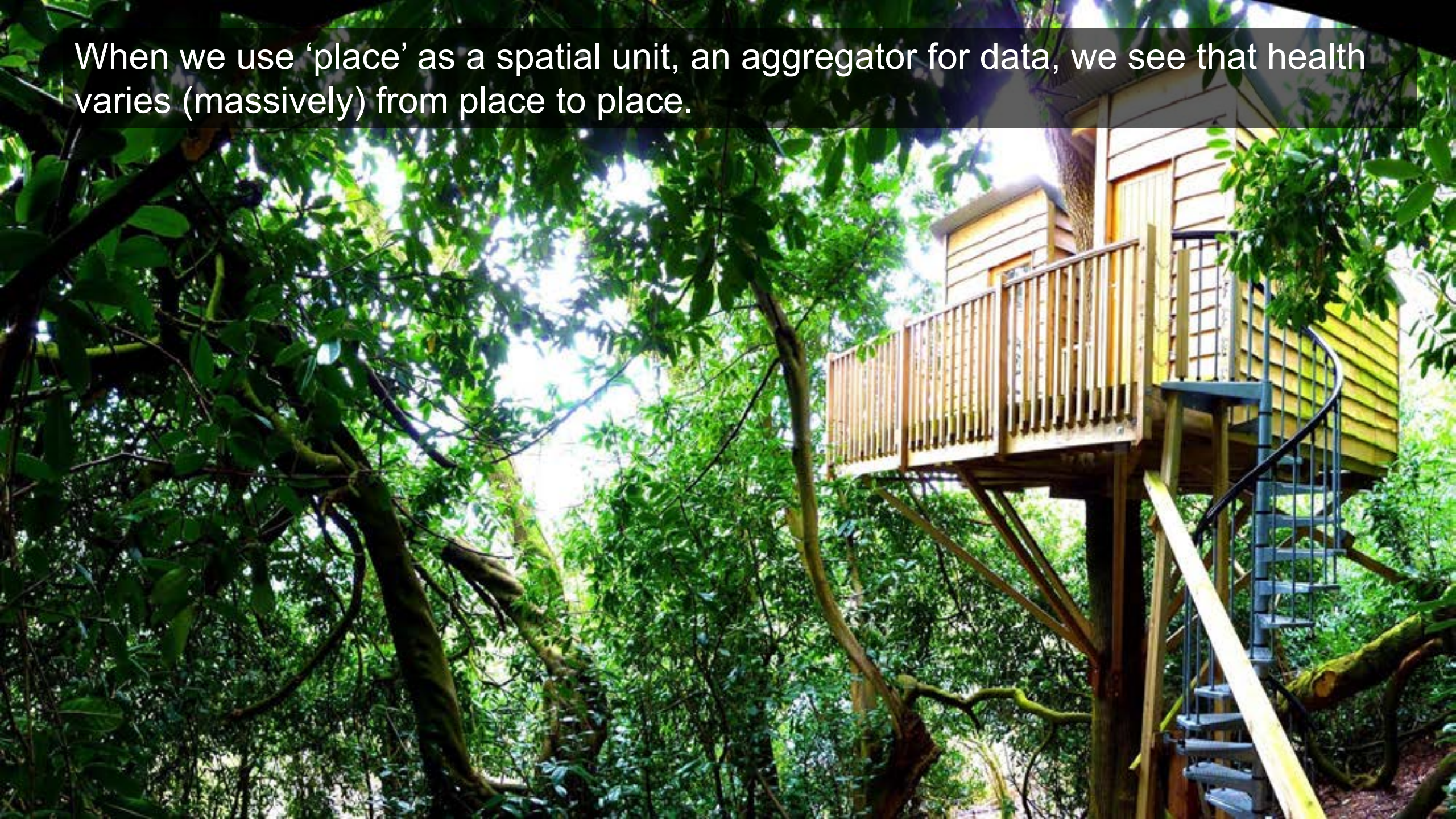


The starting point for today is that ‘place’ is a word we hear more and more. Place-based… intervention, policy, inequality, planning.

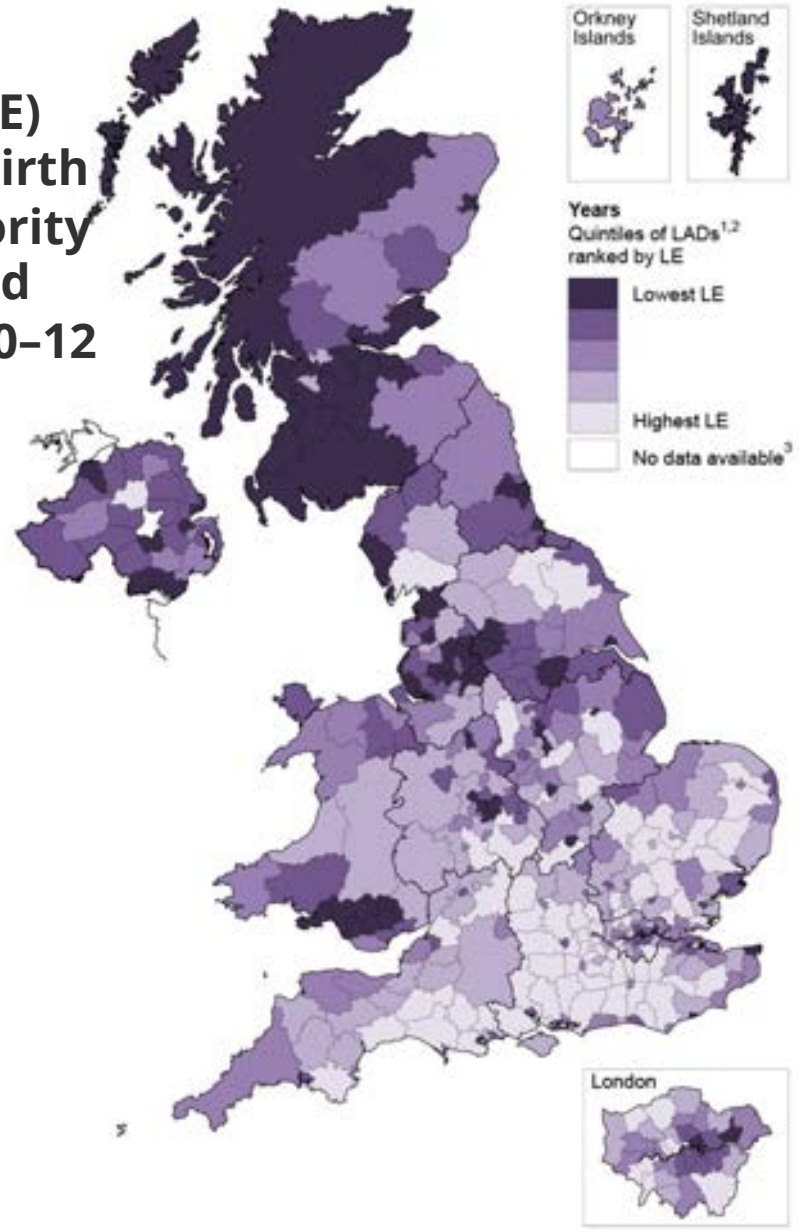
Today, I want to talk about some theory & some new ideas. There will be some results, but quite a lot of work in progress/ higher level things.

It’s a bit of a whistle-stop tour, ideas and examples rather than details and depth,

When we use ‘place’ as a spatial unit, an aggregator for data, we see that health varies (massively) from place to place.

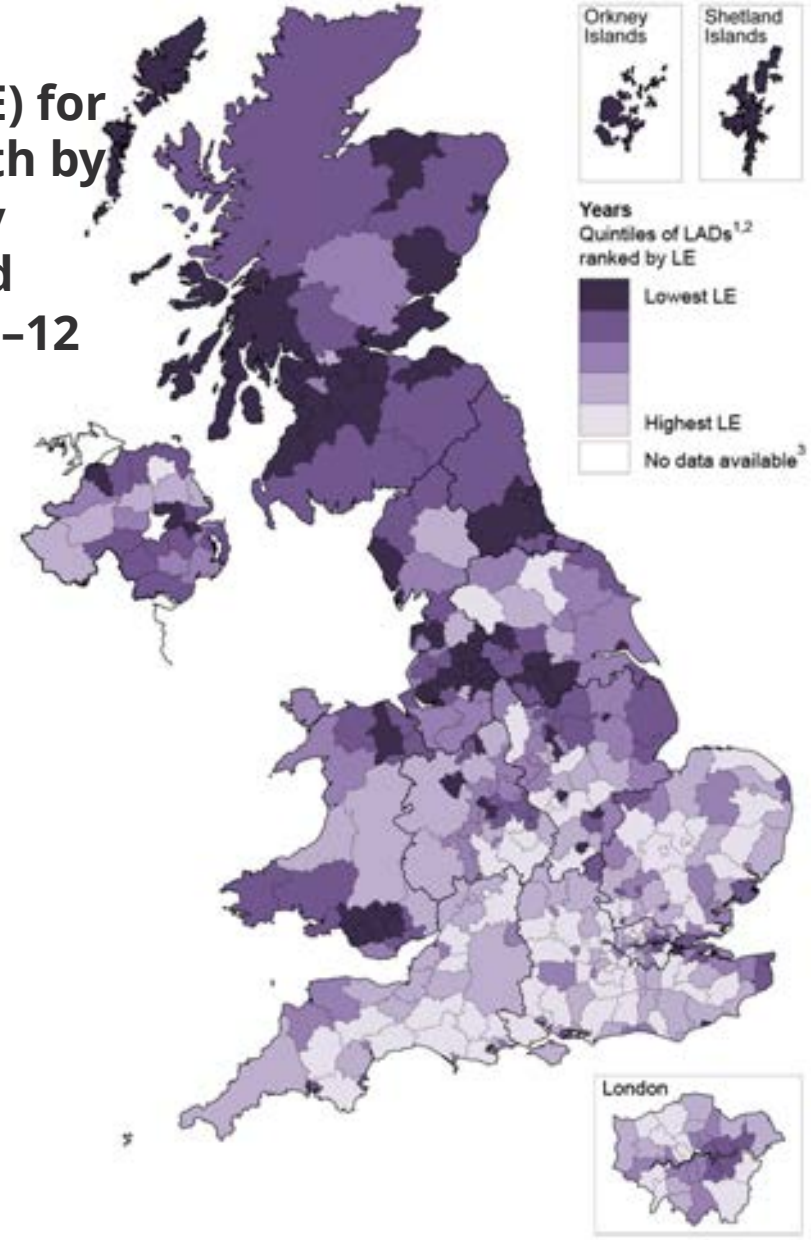


Map 1: Life expectancy (LE) for males at birth by local authority district, United Kingdom, 2010–12



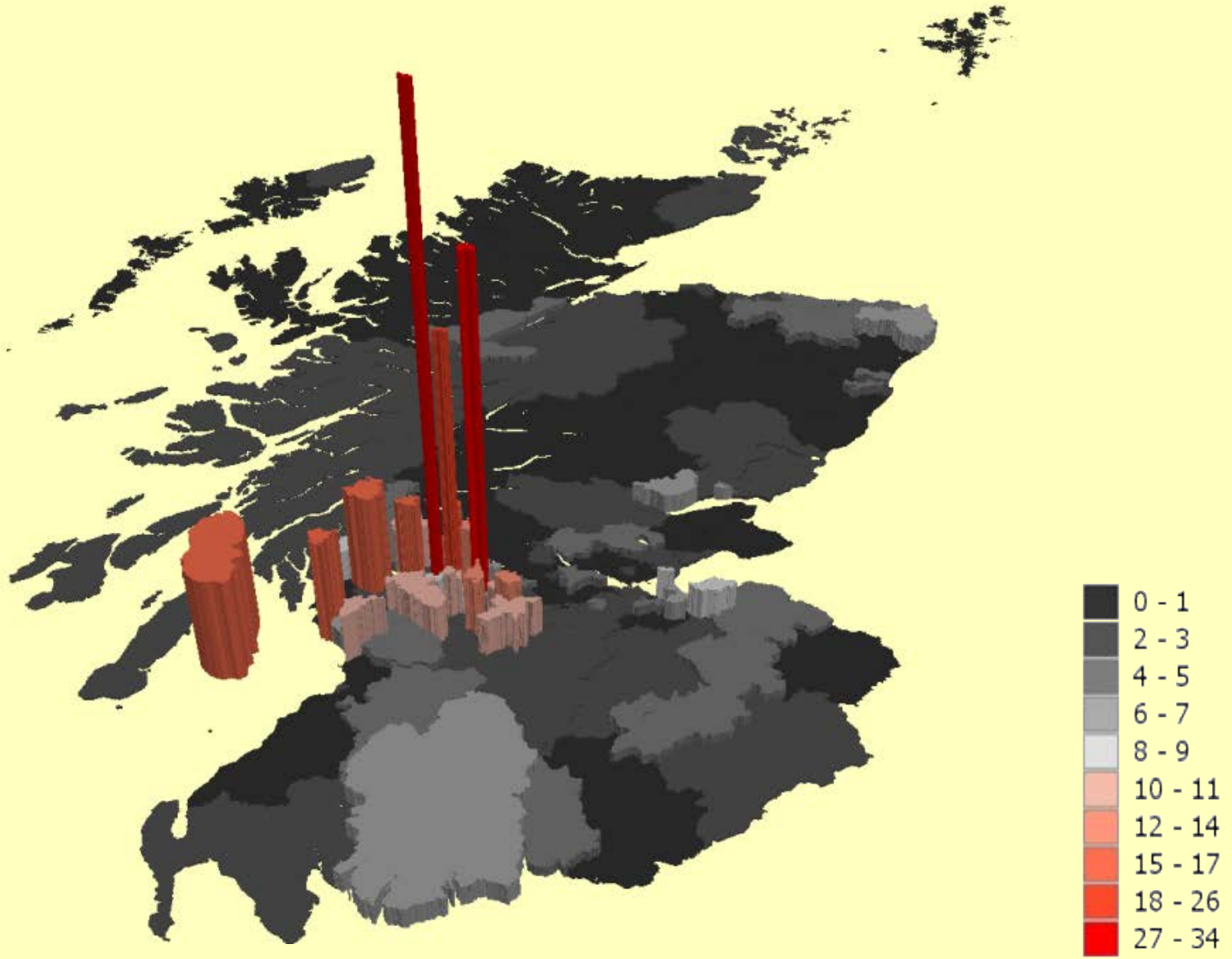
1 Local authority districts (LADs) include unitary authorities, London boroughs, metropolitan districts and non-metropolitan districts in England and Wales, council areas in Scotland and district council areas in Northern Ireland.
2 Each quintile comprises 81 LADs with the exception of the quintile with the lowest life expectancy, which has 80.
3 Life expectancy figures are not available for City of London or Isles of Scilly because of small numbers of deaths and populations.
Source: Office for National Statistics

Map 2: Life expectancy (LE) for females at birth by local authority district, United Kingdom, 2010–12



1 Local authority districts (LADs) include unitary authorities, London boroughs, metropolitan districts and non-metropolitan districts in England and Wales, council areas in Scotland and district council areas in Northern Ireland.
2 Each quintile comprises 81 LADs with the exception of the quintile with the lowest life expectancy, which has 80.
3 Life expectancy figures are not available for City of London or Isles of Scilly because of small numbers of deaths and populations.
Source: Office for National Statistics

Death rate from assault, ages <65, 1979-83 (ICD9 E960-969)

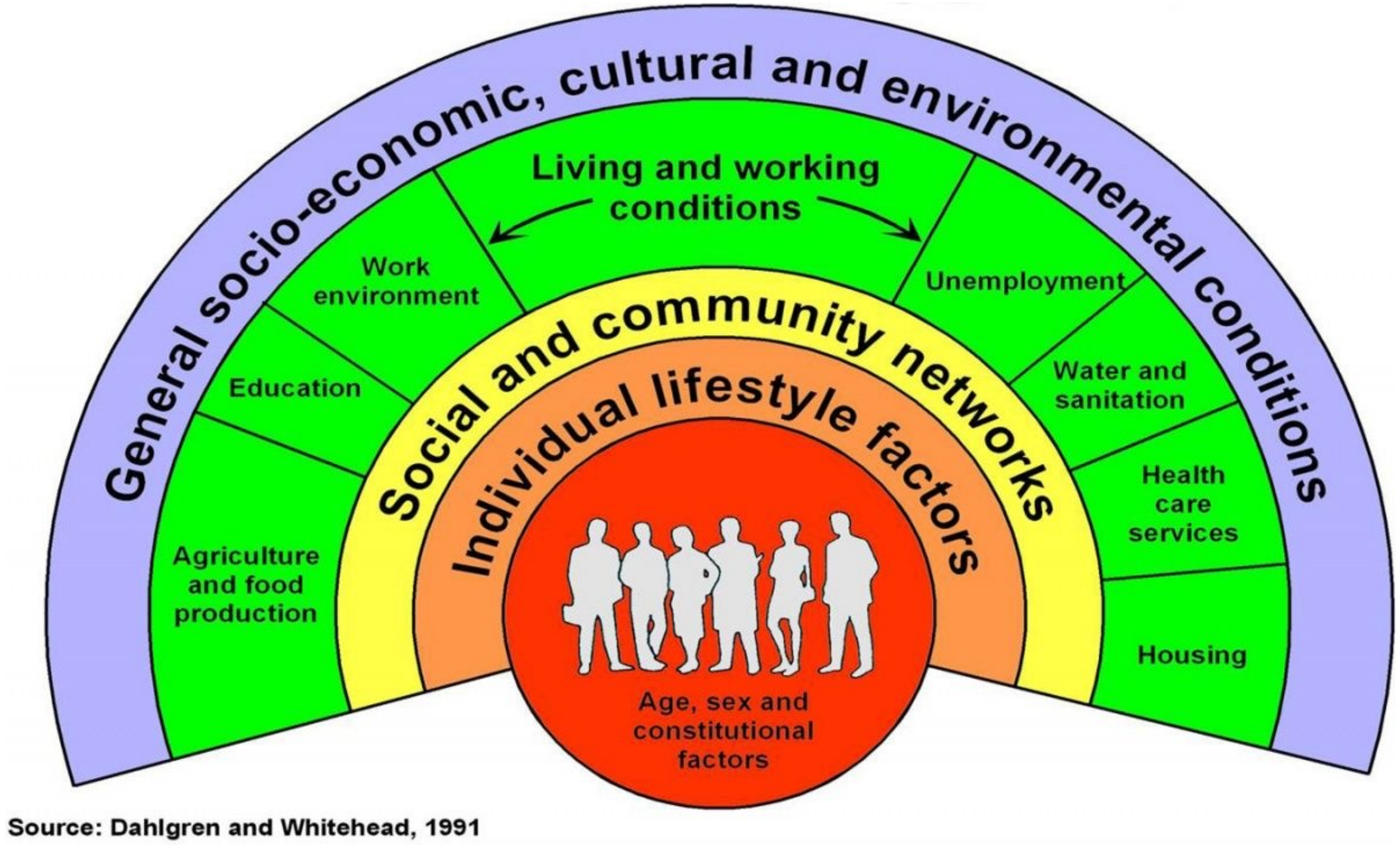


Death rate from assault, ages <65, 1999-2003 (ICD9 E960-969)

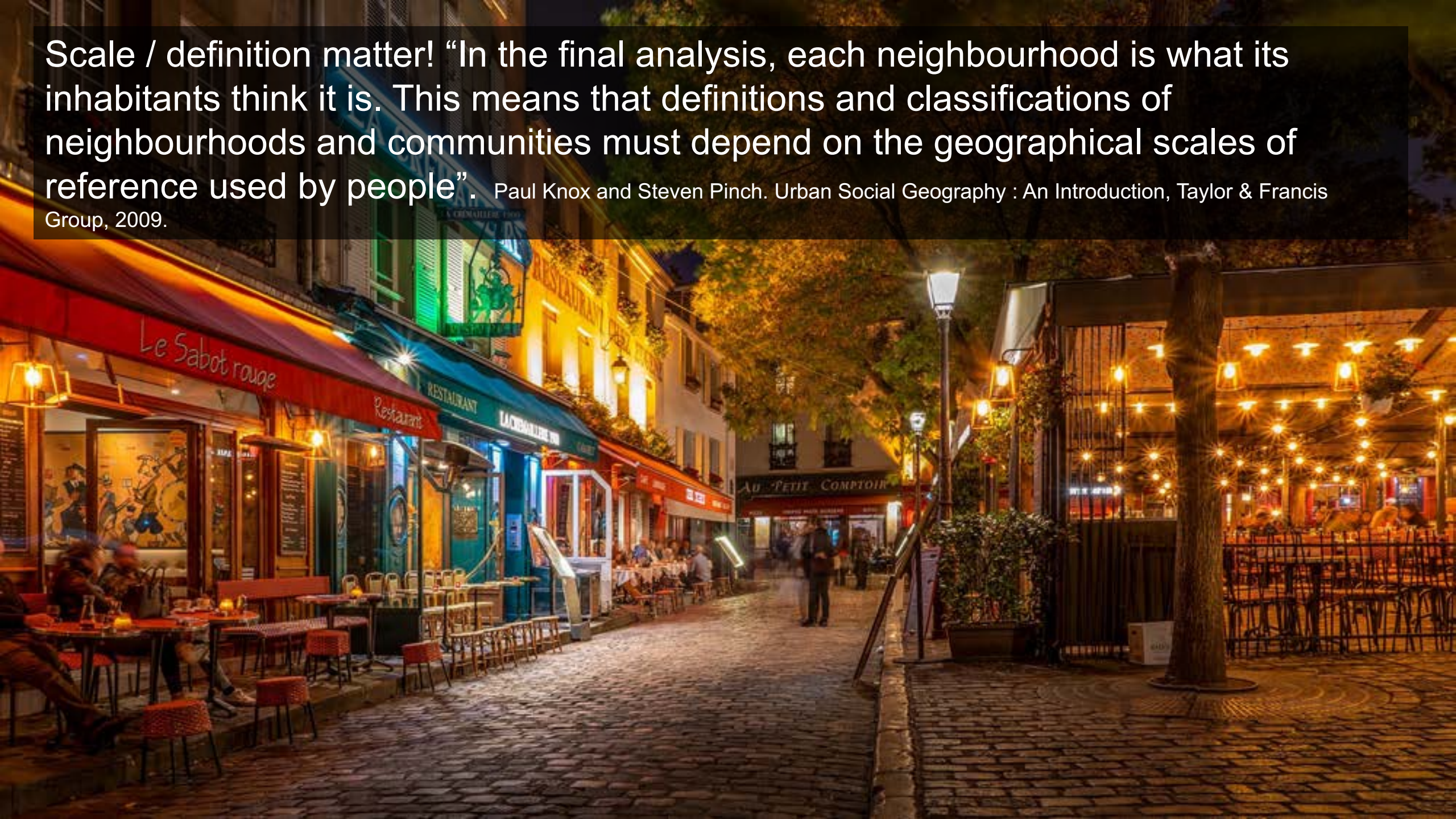
‘Place’, observes David Harvey, ‘has to be one of the most multi-layered and multi-purpose words in our language’ (Harvey, 1993, p. 4).

It is possible, for example, to think in terms of neighbourhoods'
existential functions (related to people's affective bonds and sense of belonging),
economic functions (geared to consumption),
administrative functions (geared to the organization and use of public services),
locational functions (relating to the social and material benefits of relative location),
structural functions (related to the social outcomes of urban design),
political functions (geared to the articulation of local issues) and
social reproduction functions (related to the political economy of urbanisation).

Paul Knox and Steven Pinch. Urban Social Geography : An Introduction, Taylor & Francis Group, 2009.



Source: Dahlgren and Whitehead, 1991



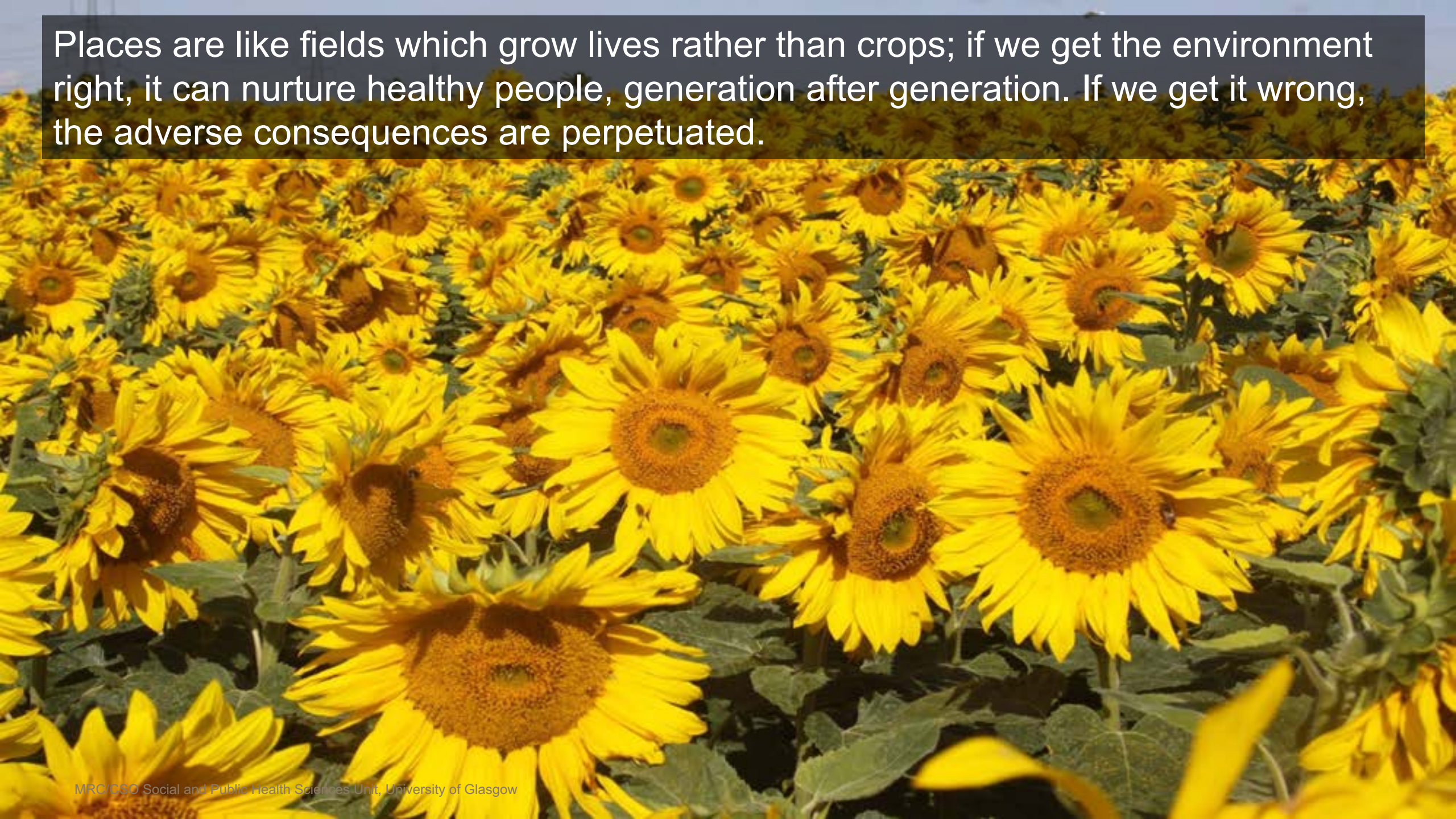
Scale / definition matter! “In the final analysis, each neighbourhood is what its inhabitants think it is. This means that definitions and classifications of neighbourhoods and communities must depend on the geographical scales of reference used by people”. Paul Knox and Steven Pinch. Urban Social Geography : An Introduction, Taylor & Francis Group, 2009.

Let’s think about aspects of place and health from a very upstream perspective


Some places change


Many, many places / aspects of place stay the same

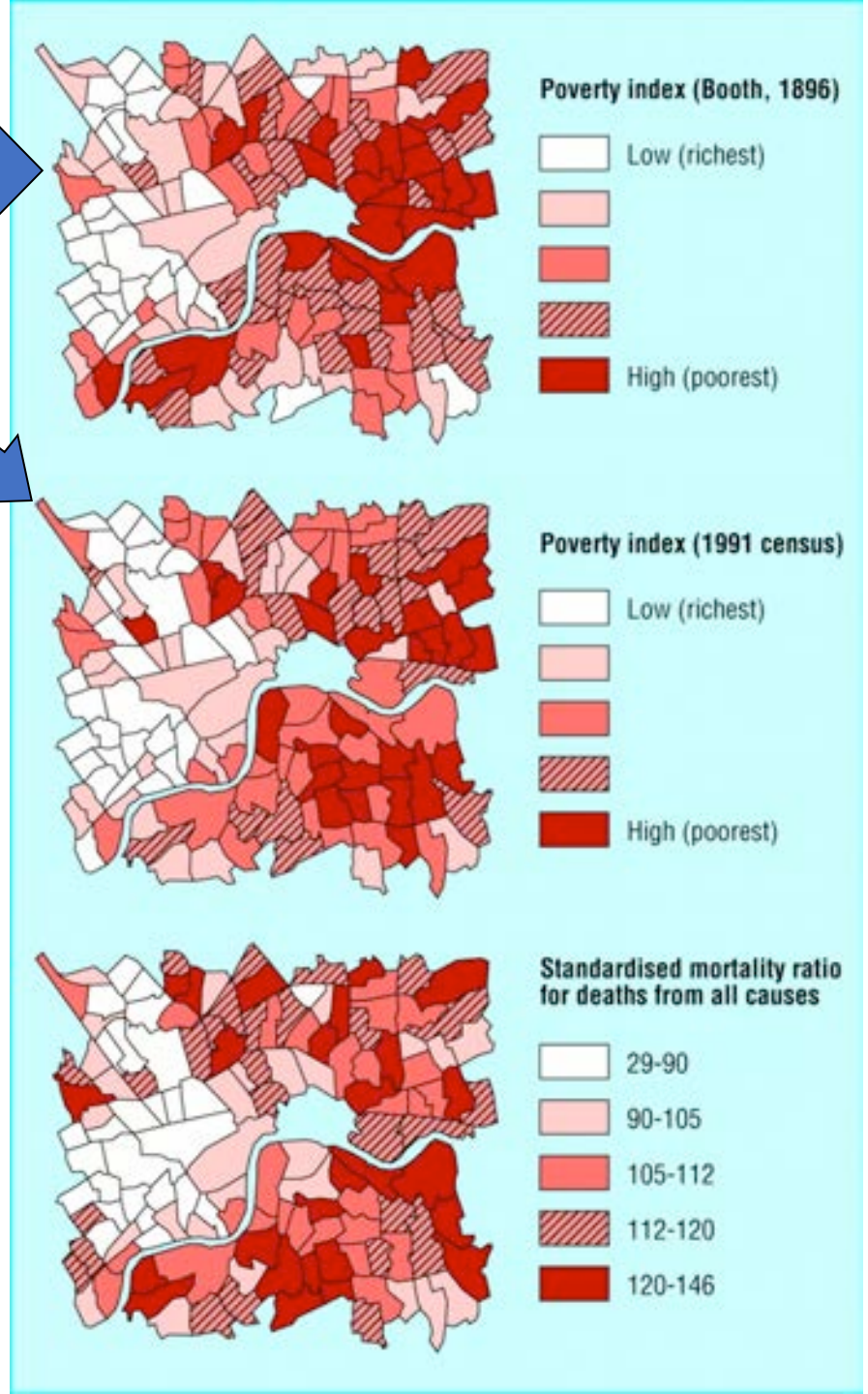
Places are like fields which grow lives rather than crops; if we get the environment right, it can nurture healthy people, generation after generation. If we get it wrong, the adverse consequences are perpetuated.



- In 1896 Charles Booth surveyed large areas of London, house by house
- He classified houses by social class

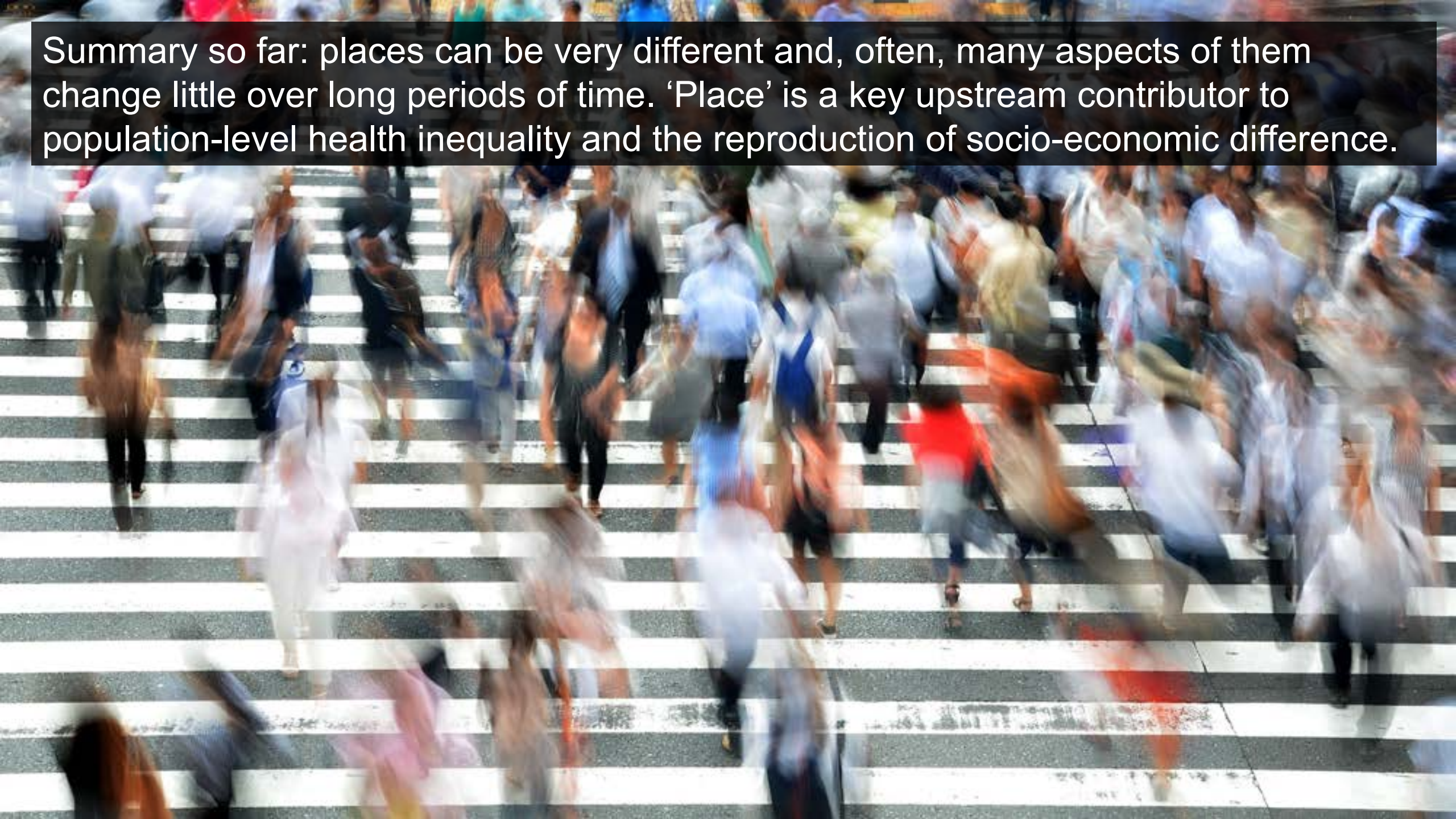
- We derived a poverty index from Booth's map of London in 1896 using GIS
- We derived a similar index from 1991 census data
- We explored how well the two indexes predicted mortality rates in London in 1991-1995

Economy, society and space write each other; the socio-spatial dialectic



Source: Dorling D, Mitchell R, Shaw M, Orford S, Davey Smith G. The Ghost of Christmas Past: health effects of poverty in London in 1896 and 1991. BMJ 2000;321(7276):1547-51.

An epidemiological analysis will tell you that ‘wealth’ matters more than ‘place’ for health. But, what geography tells us is that places *produce* society and economy. We have richer and poorer people because we have richer and poorer places. Society and space are co-authors; they write each other.



Summary so far: places can be very different and, often, many aspects of them change little over long periods of time. ‘Place’ is a key upstream contributor to population-level health inequality and the reproduction of socio-economic difference.

Let’s move a little further downstream and talk about the more immediate or direct impacts of places on health and behaviour.


Some aspects of places hurt us


Some aspects of places keep us well. (We’re particularly interested in this.)

So – if we know that place affects health quite directly then, in theory, place should be a lever we can pull.

We would like to design, build and manage places to be salutogenic and equigenic (that is, to protect and improve health and wellbeing, and to constrain or reduce inequalities).

It’s not just us that wants this! Our stakeholders are powerful; they control or can influence many aspects of the built and physical environment, at different scales. They want evidence to help them decide what to do, when, where and what to expect.

SG, PHS, Local Authorities, NatureScot, Forestry Commission, AFS, Historic England, PfA etc etc

The programme's long-term aim is to understand how urban environments do, or can be modified to, protect and improve population health and reduce health inequalities.

Open science, as far as we can. We make our data and our code publicly available.

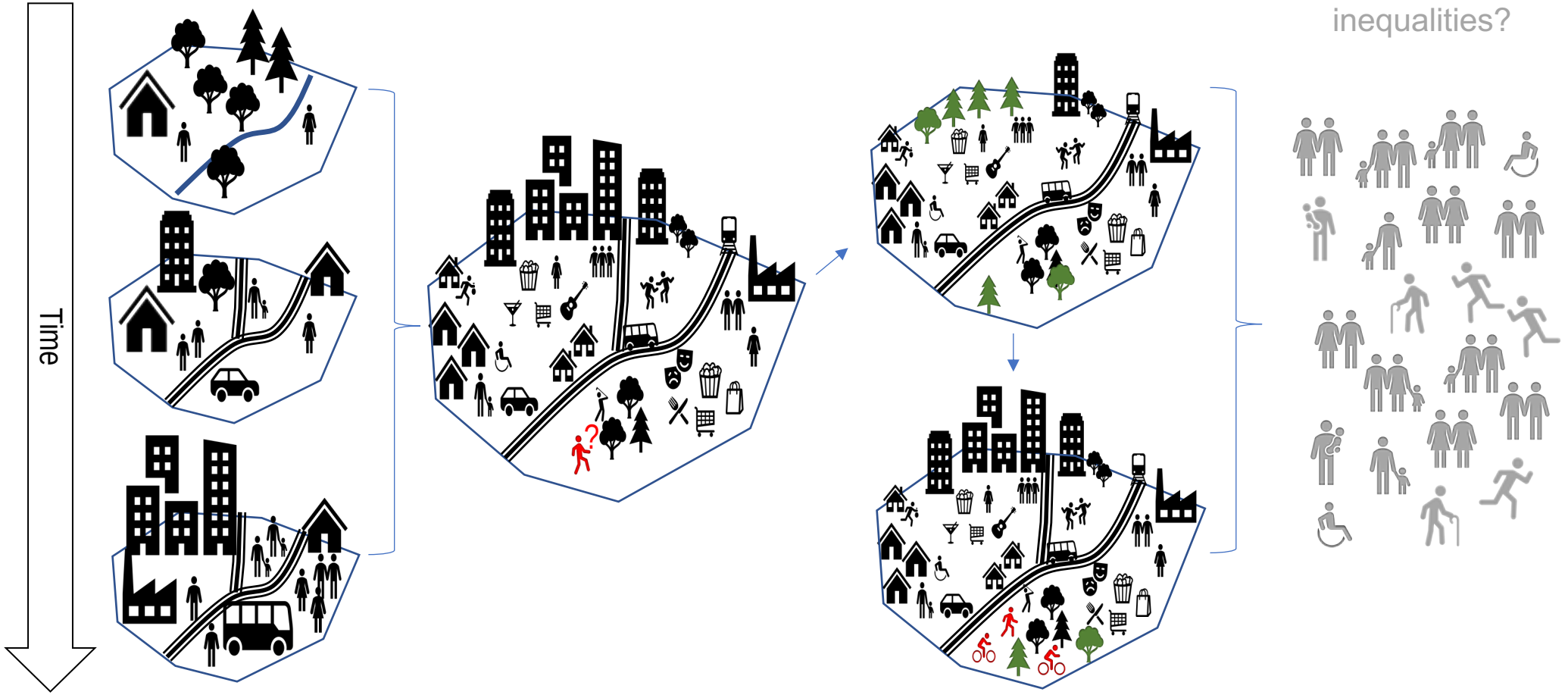
Three workstreams combine to explore and show...

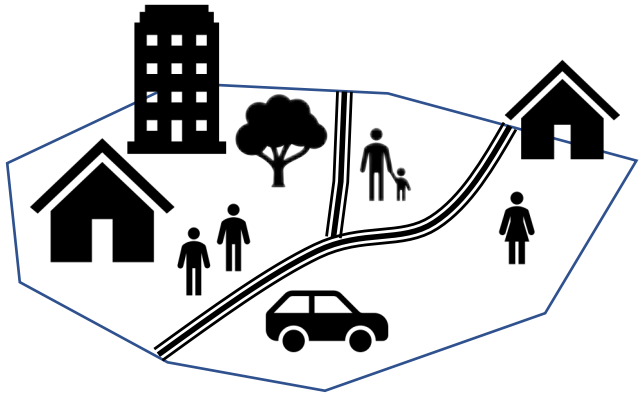
...how do places change?

…how do people use places?

…how can places be changed?

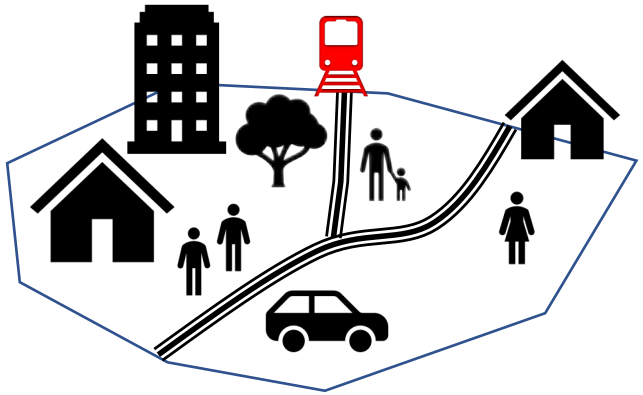
…to improve population health and reduce inequalities?





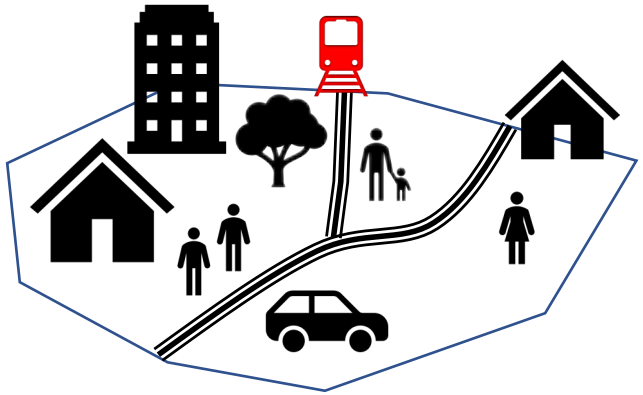
Time

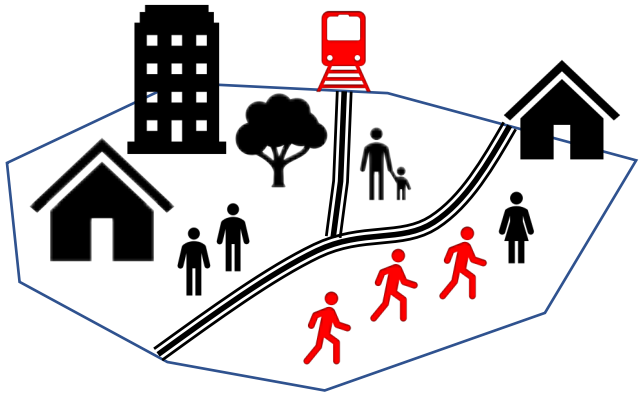
If we can observe change in the characteristics of places.



Time

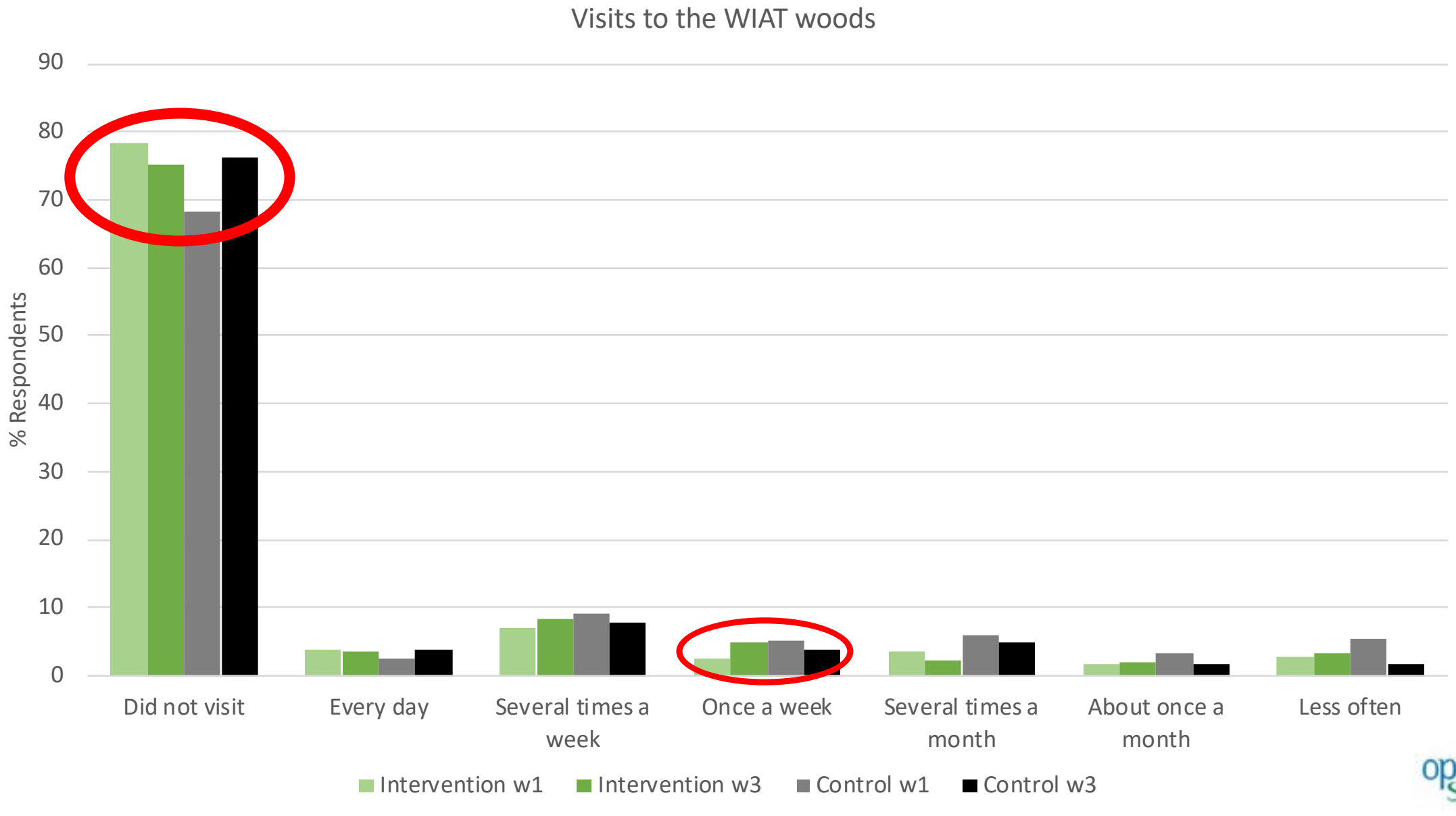
If we can observe change in the characteristics of places.



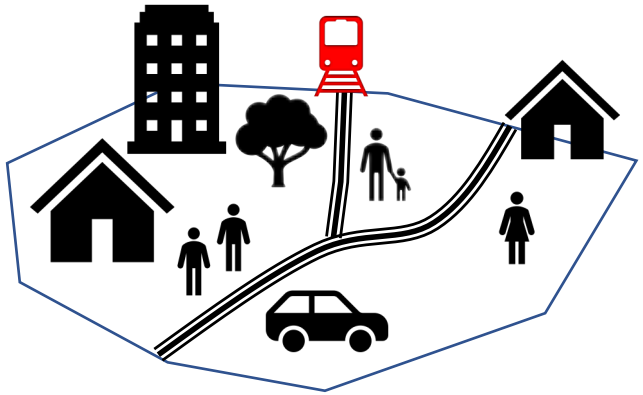


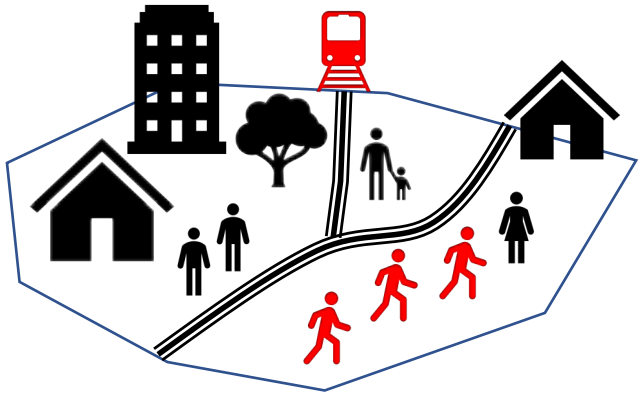
Time

…we can see the consequences for health and related behaviour.



Ward Thompson C, Silveirinha de Oliveira E, Tilley S, Elizalde A, Botha W, Briggs A, Cummins S, Leyland AH, Roe JJ, Aspinall P, Brookfield K. Health impacts of environmental and social interventions designed to increase deprived communities' access to urban woodlands: A mixed-methods study. Public Health Research. 2019 Jan 1;7(2):1-72.





Time

…we can see the consequences for health and related behaviour.

However, we need to do this in LOTS of places to properly understand the impact of context.

And it's hardly ever just one aspect of place that gets changed…

ESRC funded project – using linked data (SLS <> prescribing data / child health) to track impacts of the *entire* WIAT forest intervention programme

Built Environment Change Atlas (BECA) -

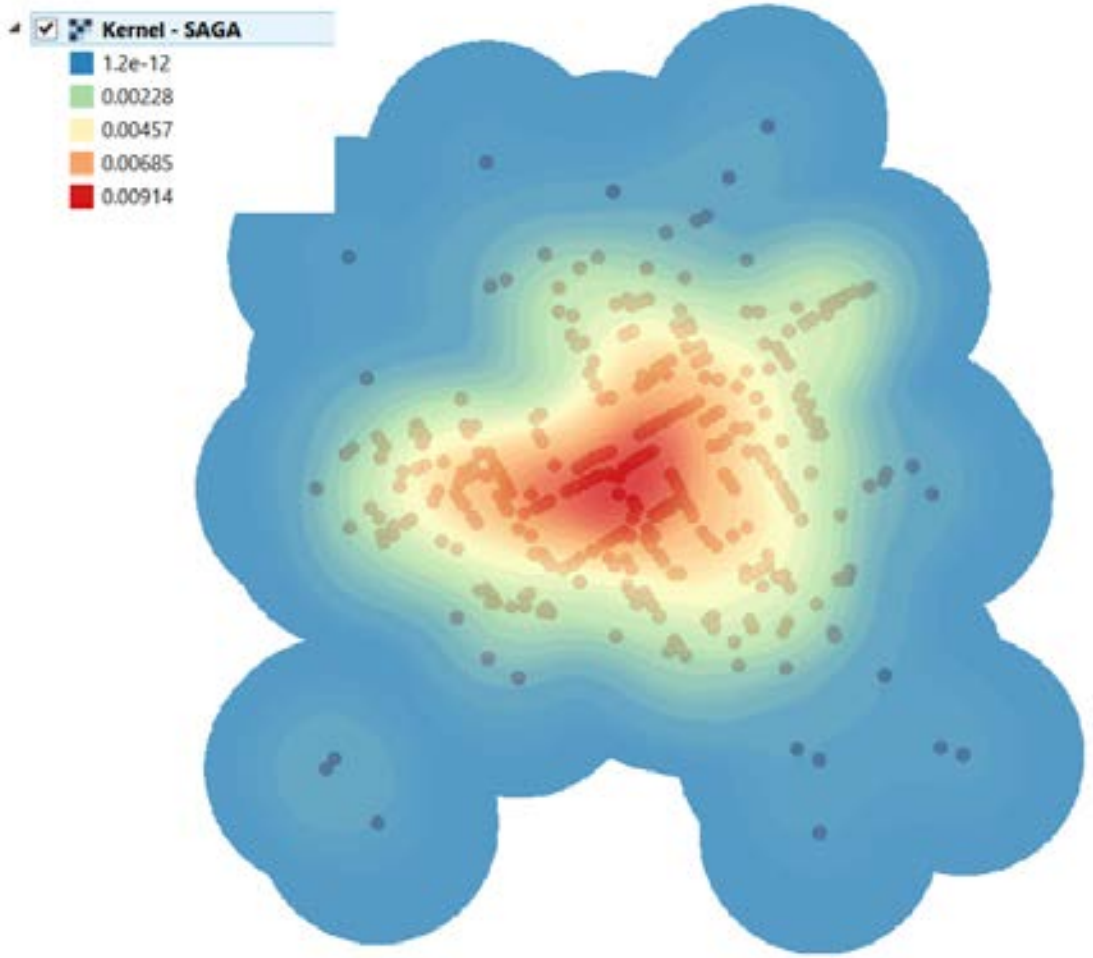
- EDINA Digimap Ordnance Survey (OS) Open Map Local (OML) data
- Available for different time points
- We extract buildings, roads, woodland
- We have a novel method for showing and quantifying change on a grid cell system
- Make the data publicly available – open science
- Now working with Cambridge and Imperial MRC Unit/Centre via MRC funding

ESRC funded work with CRESH in Edinburgh and Substance Misuse at GCU – how have alcohol and tobacco outlet numbers / densities changed over time and what's the impact on related harms?

Measurement: Availability matters

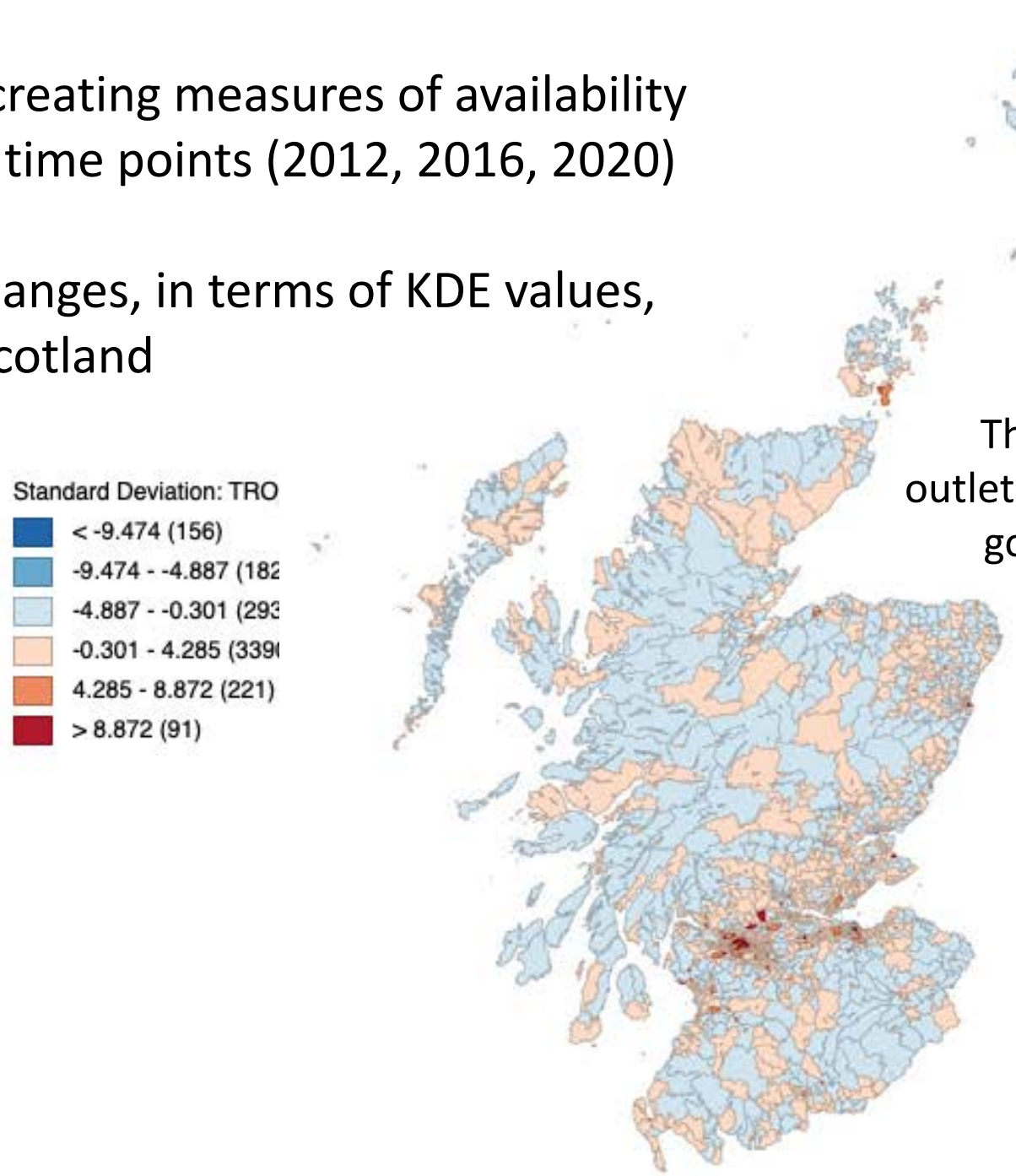
Kernel Density Estimation (KDE) is a means of combining number of outlets and distance to them to create a surface that represents ‘availability’.

Higher KDE = more availability

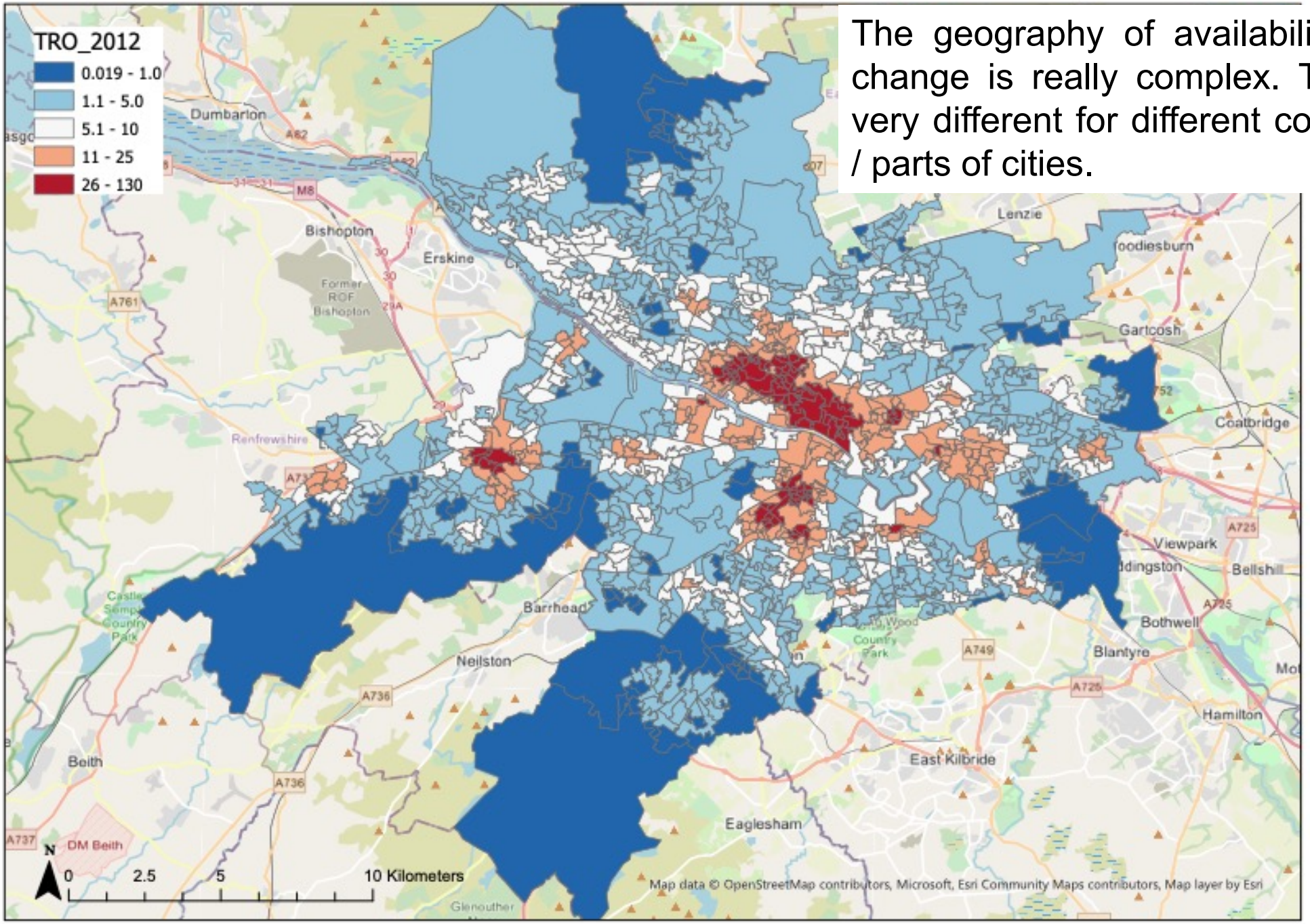


We began by creating measures of availability for 3 different time points (2012, 2016, 2020)

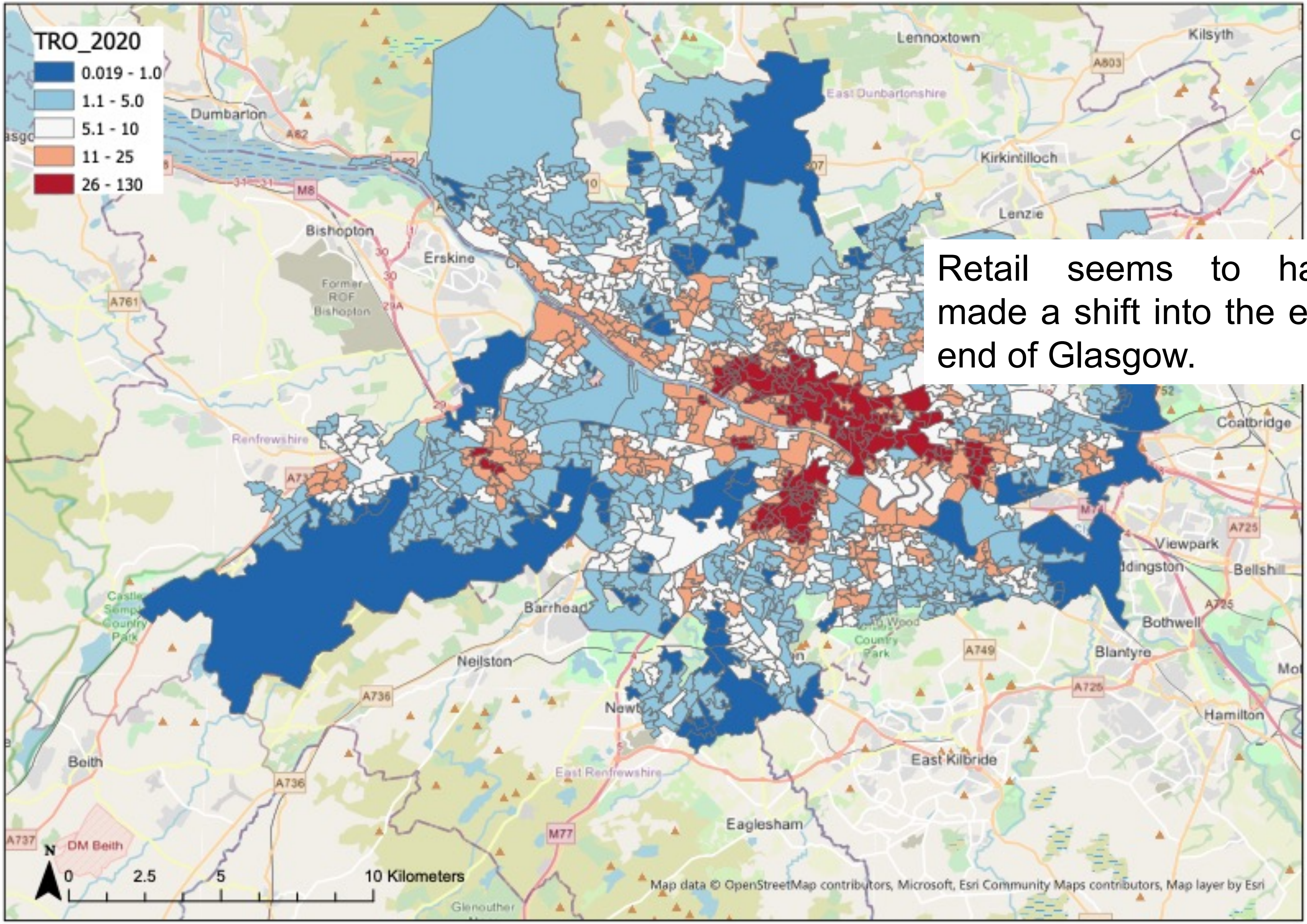
The biggest changes, in terms of KDE values, are in urban Scotland



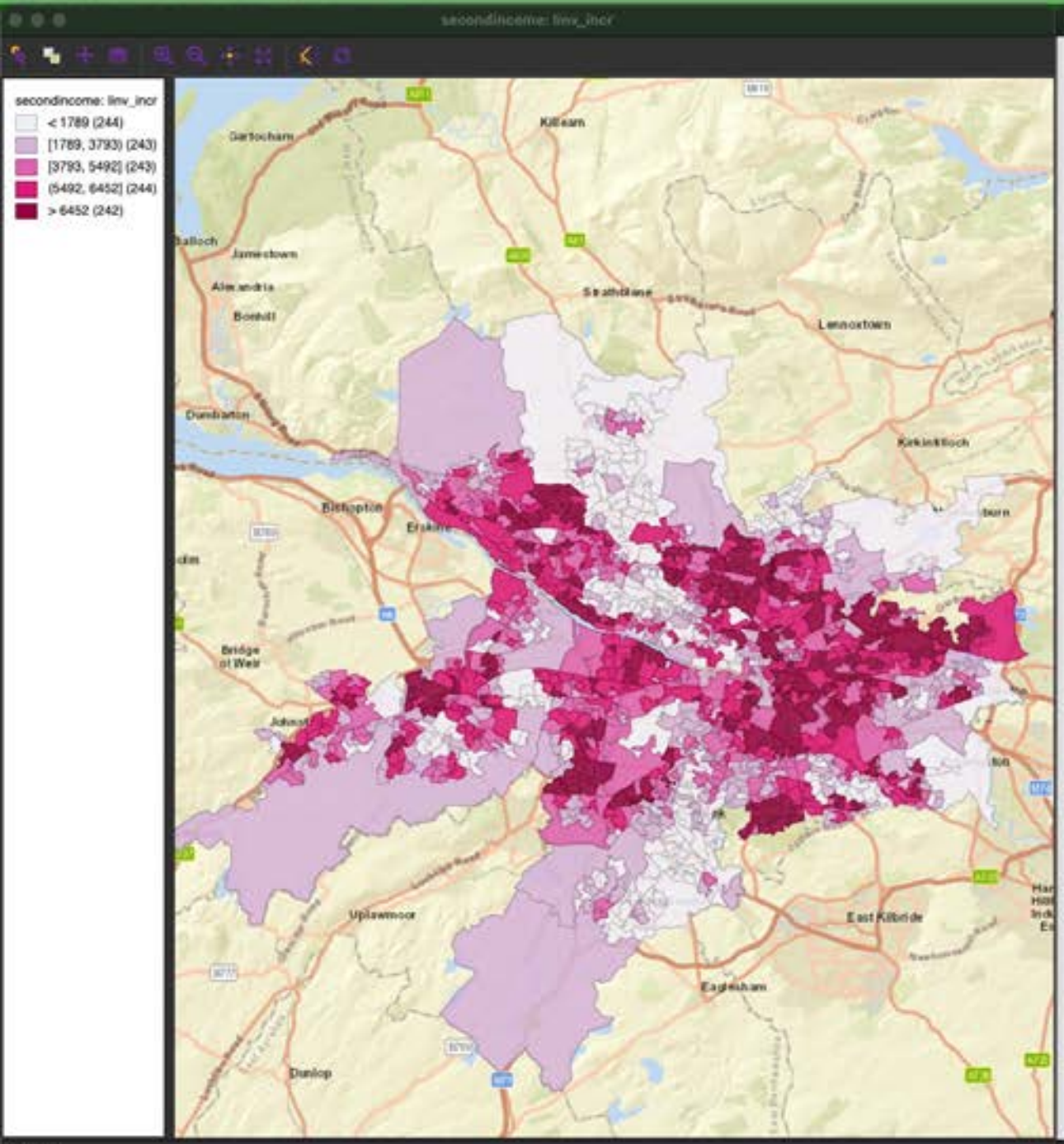
This is a map of change in tobacco outlet density, 2012 -> 2020. I am only going to talk about tobacco today.



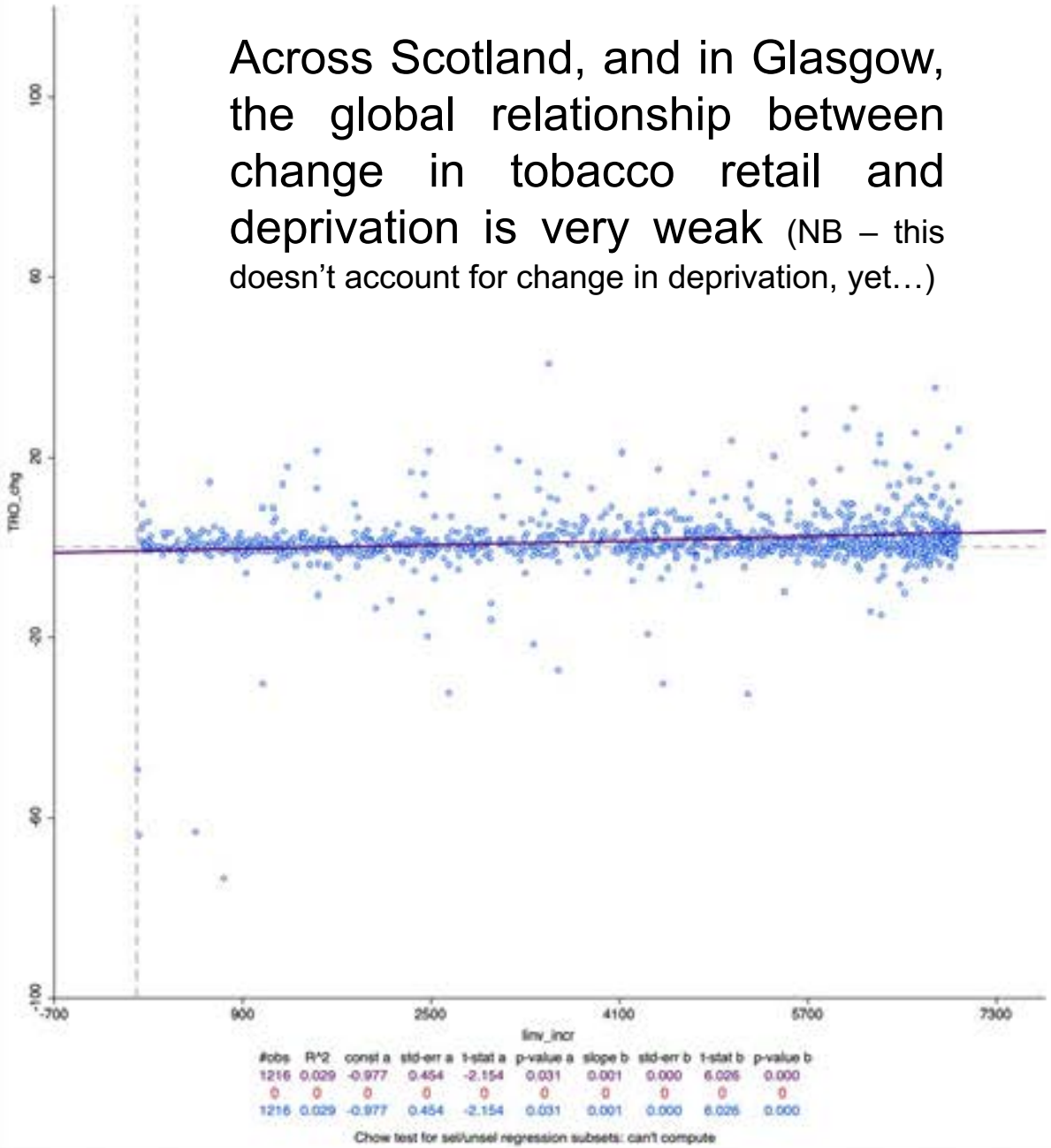
The geography of availability and its change is really complex. Things are very different for different communities / parts of cities.



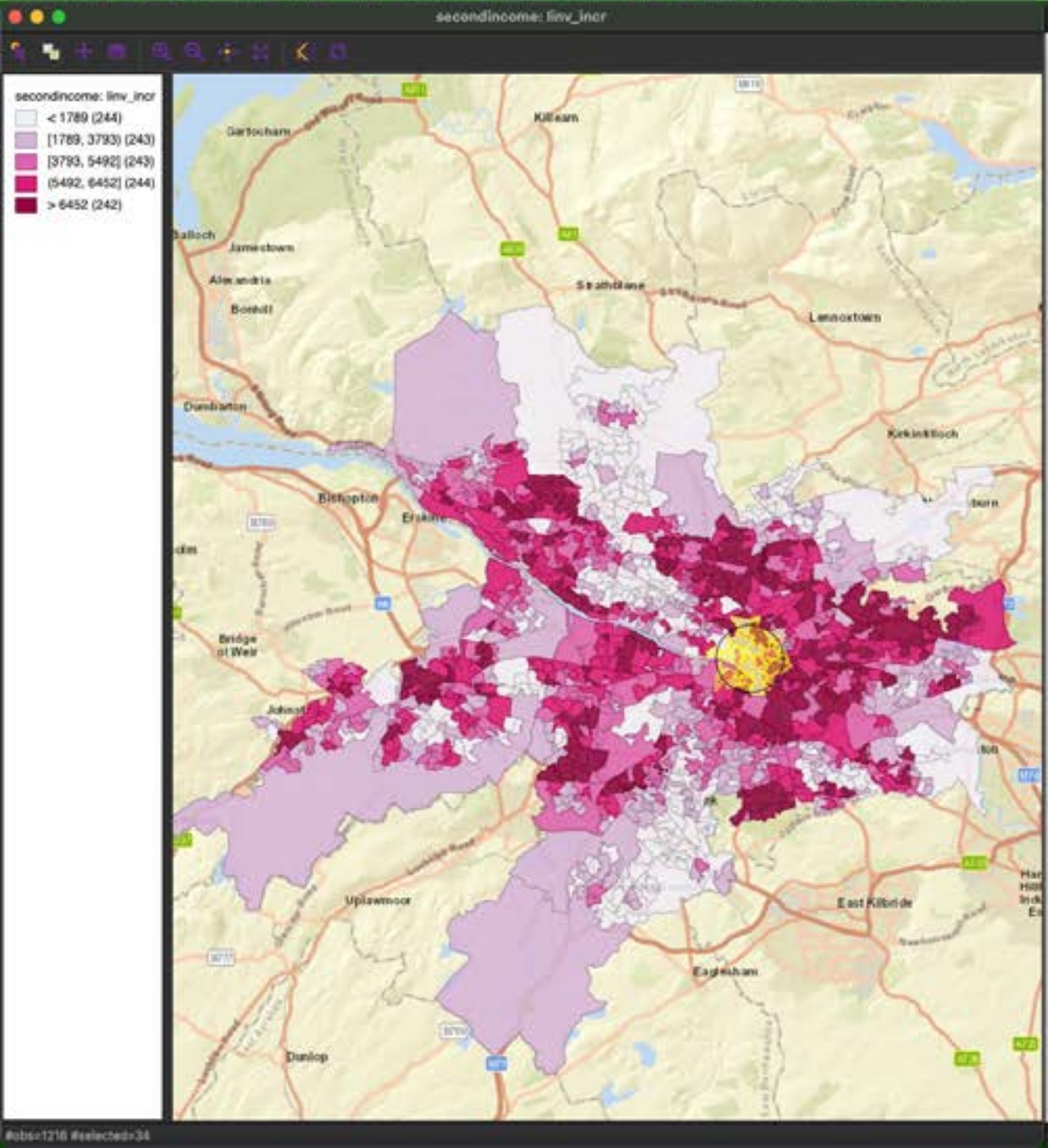
Retail seems to have made a shift into the east end of Glasgow.

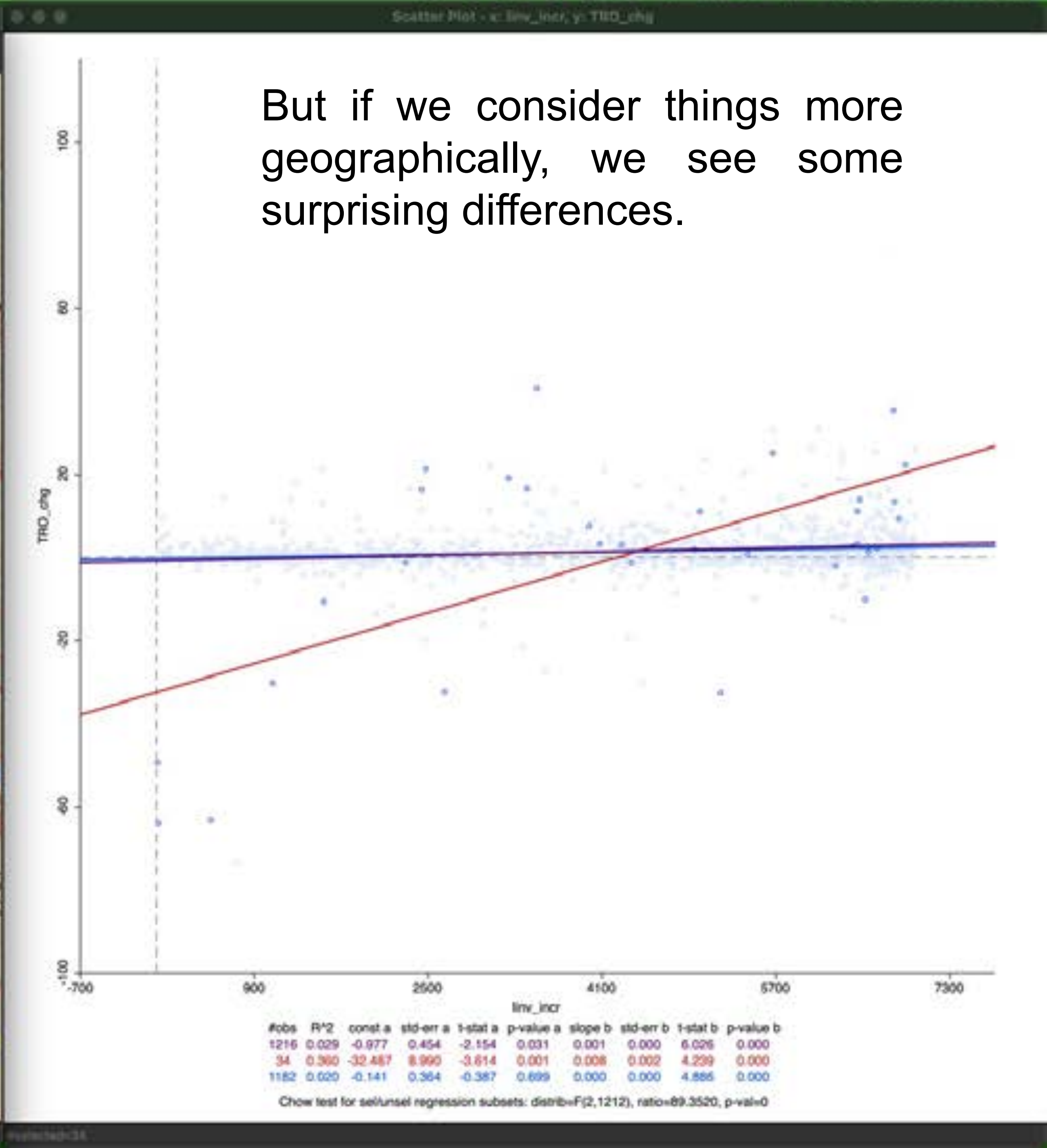


Across Scotland, and in Glasgow, the global relationship between change in tobacco retail and deprivation is very weak (NB – this doesn't account for change in deprivation, yet…)

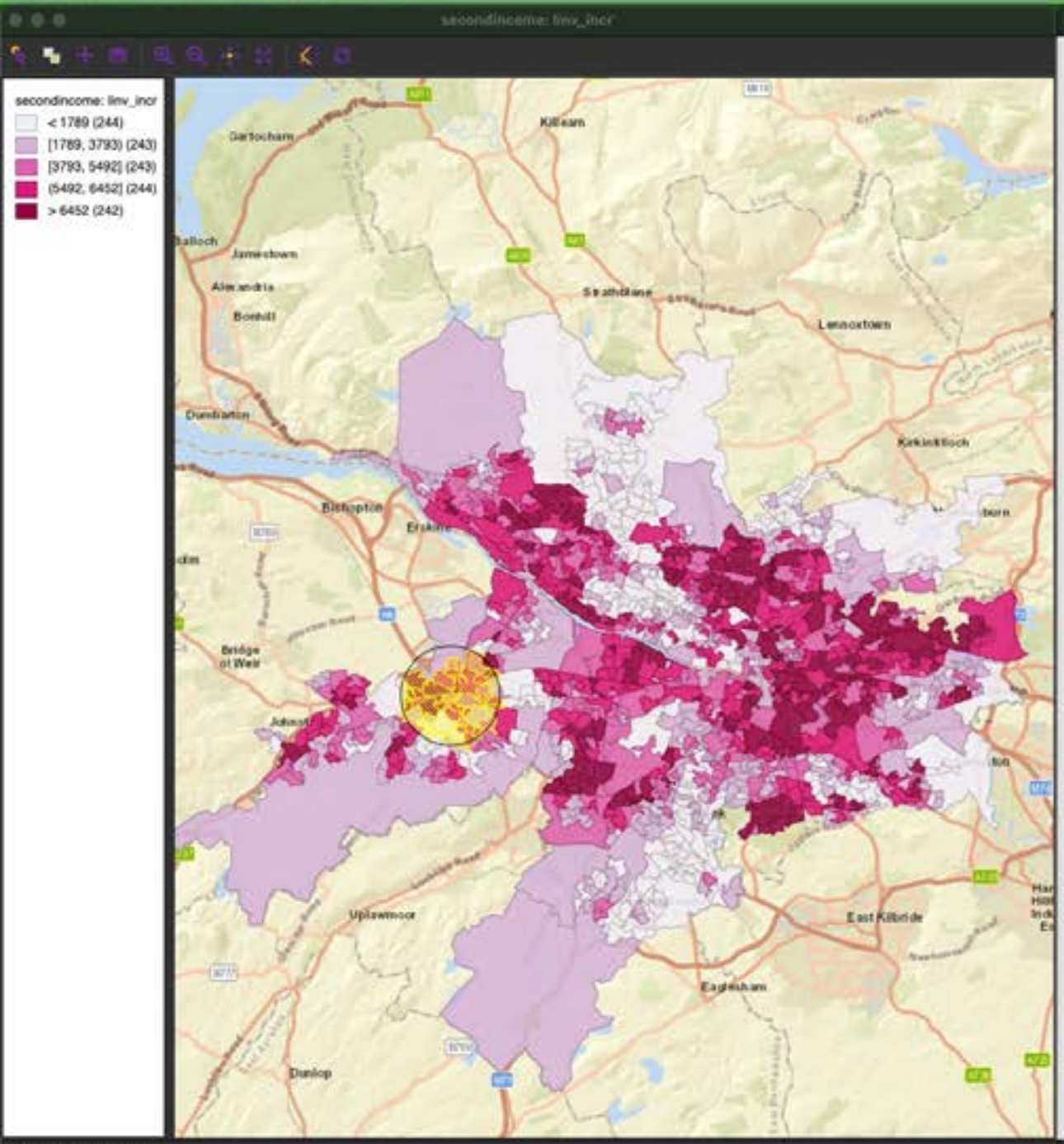


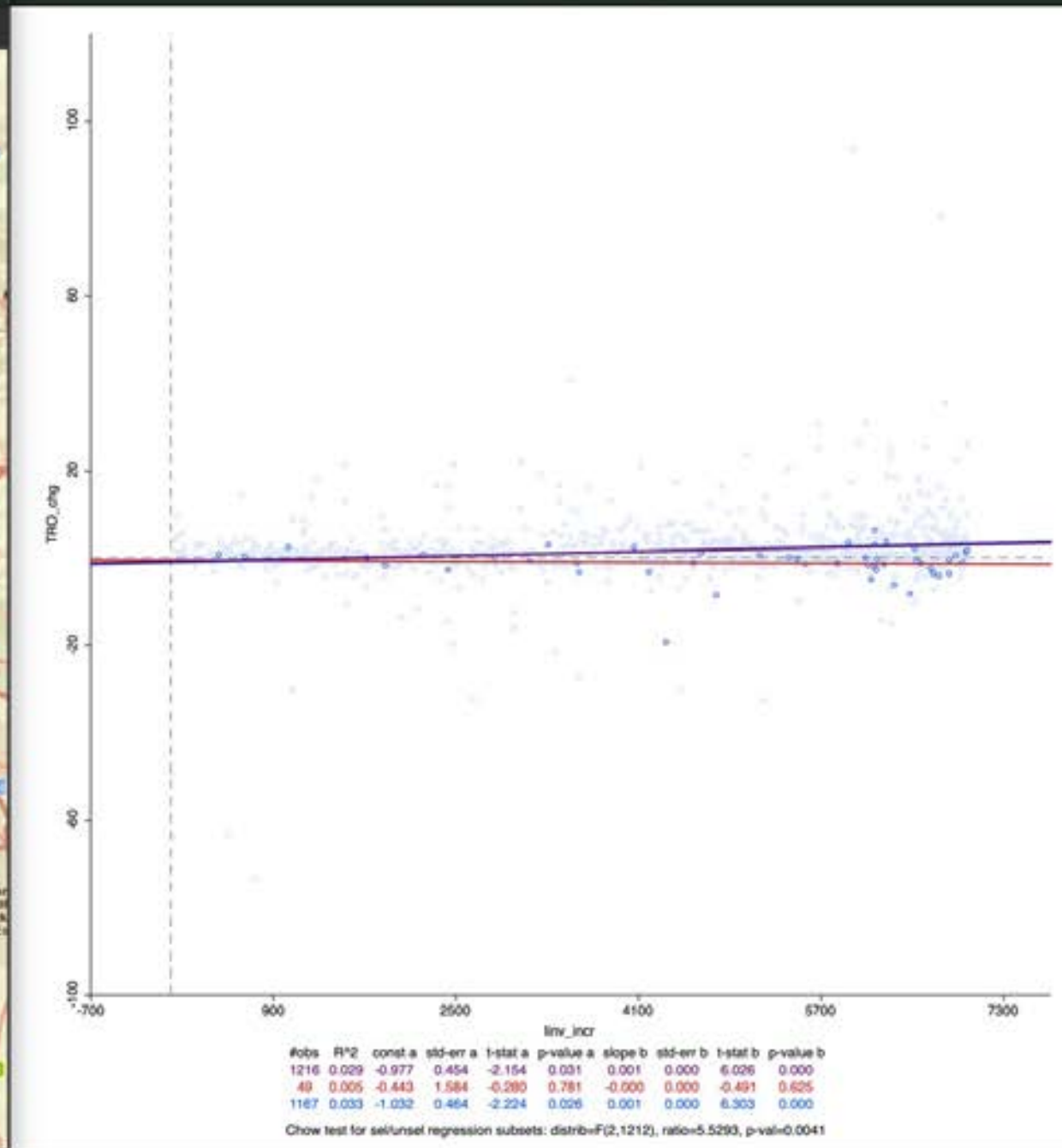
But if we consider things more geographically, we see some surprising differences.





#obs	R^2	const a	std-err a	t-stat a	p-value a	slope b	std-err b	t-stat b	p-value b
1216	0.029	-0.977	0.454	-2.154	0.031	0.001	0.000	6.026	0.000
34	0.360	-32.487	8.990	-3.614	0.001	0.008	0.002	4.239	0.000
1182	0.020	-0.141	0.364	-0.387	0.699	0.000	0.000	4.886	0.000

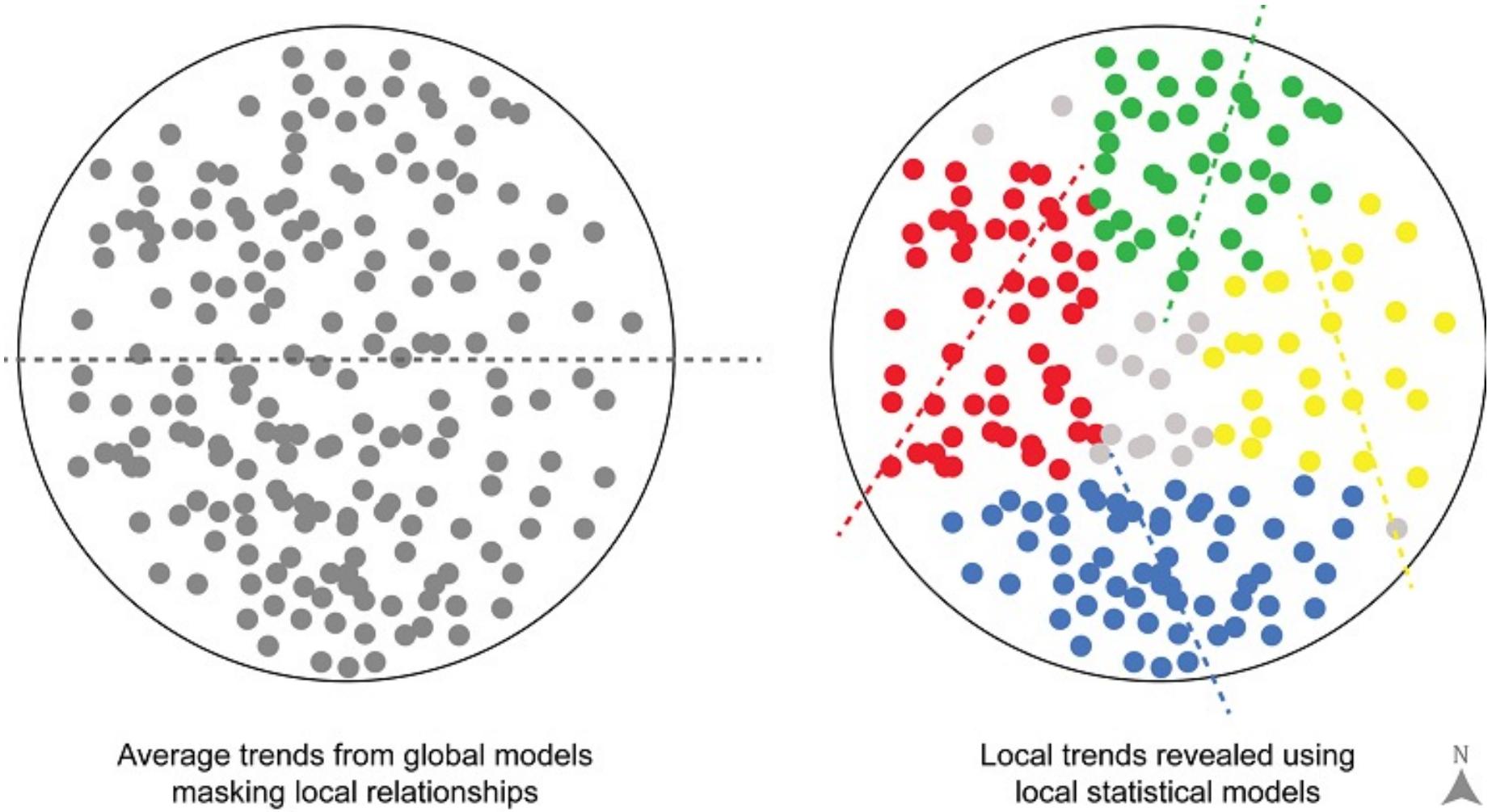


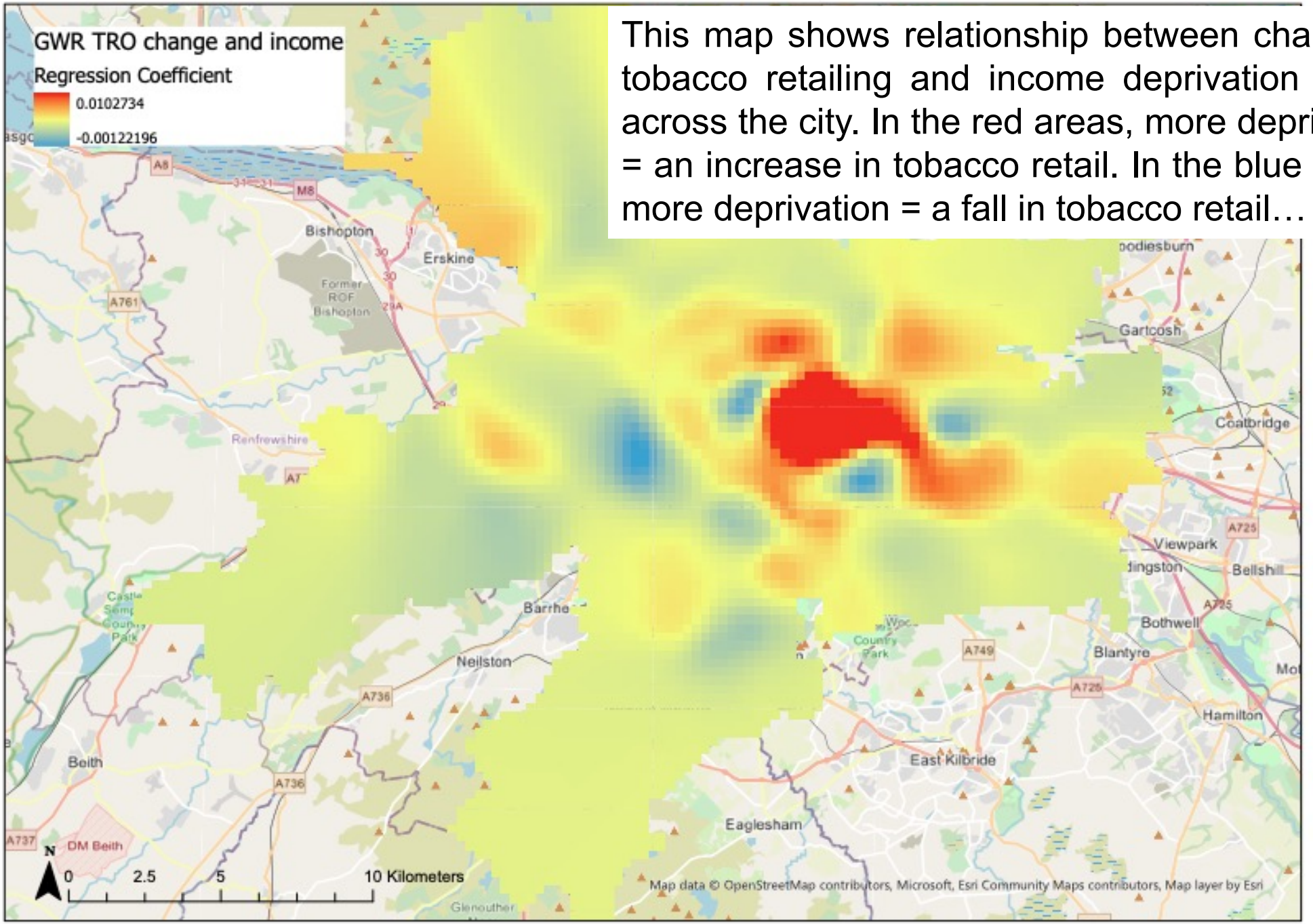


#obs	R^2	const a	std-err a	t-stat a	p-value a	slope b	std-err b	t-stat b	p-value b
1216	0.029	-0.977	0.454	-2.154	0.031	0.001	0.000	6.026	0.000
49	0.005	-0.443	1.584	-0.280	0.781	-0.000	0.000	-0.491	0.625
1167	0.033	-1.032	0.464	-2.224	0.026	0.001	0.000	6.303	0.000

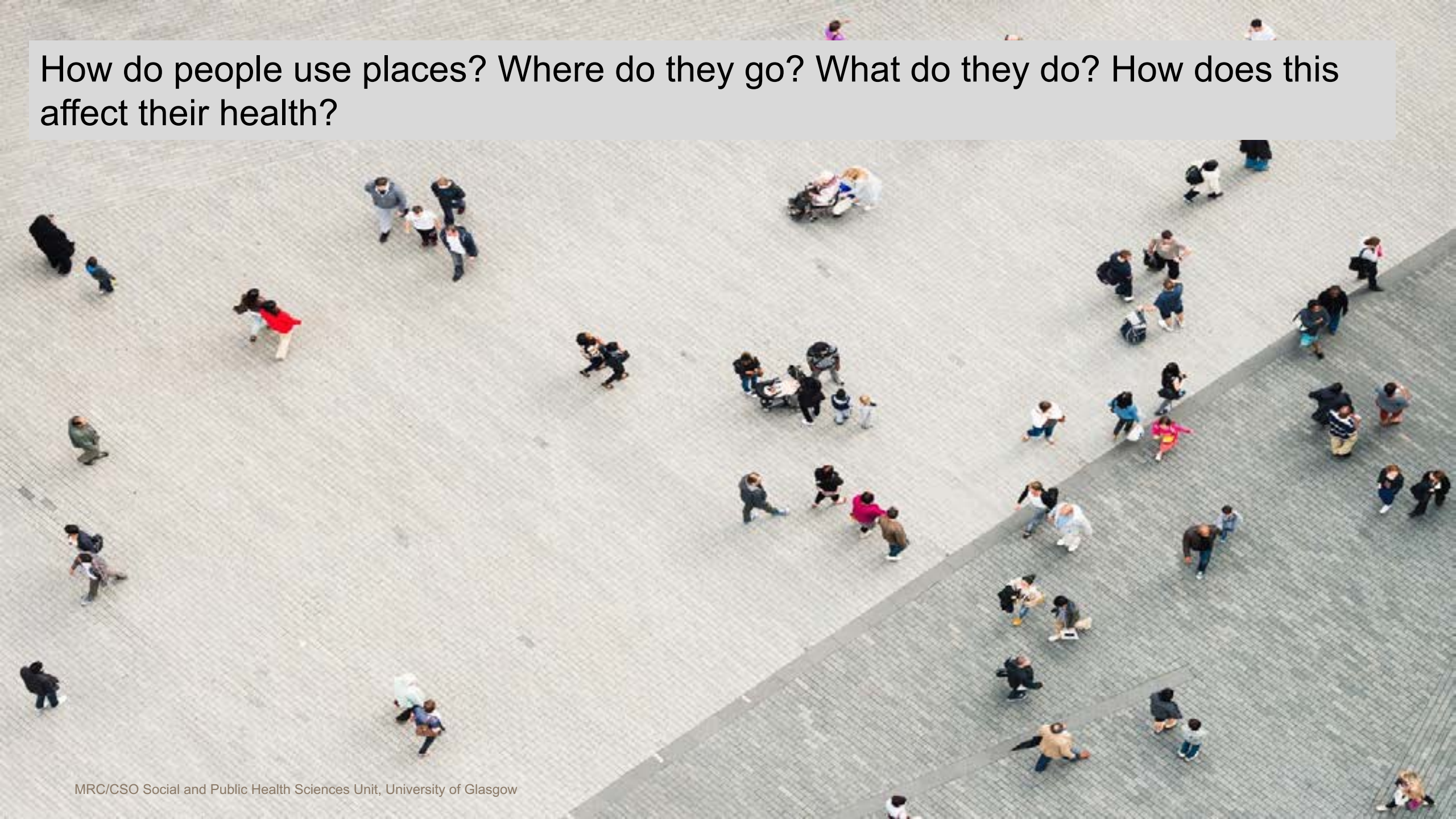
Chow test for sel/unsel regression subsets: distrib=F(2,1212), ratio=5.5293, p-val=0.0041

Geographically weighted regression is a technique which asks formally whether and how associations between variables vary across space.

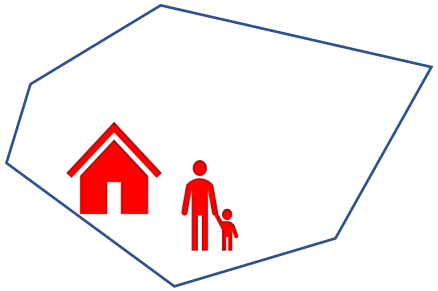



GWR TRO change and income
Regression Coefficient
0.0102734
-0.00122196
This map shows relationship between change in tobacco retailing and income deprivation varies across the city. In the red areas, more deprivation = an increase in tobacco retail. In the blue areas, more deprivation = a fall in tobacco retail…
Bishopton
Erskine
Former ROF Bishopton
Renfrewshire
Barrhead
Neilston
Beith
Gartcosh
Coatbridge
Viewpark
Bellshill
Bothwell
Blantyre
Hamilton
East Kilbride
Eaglesham
A8
M8
A761
A736
A737
A749
A725
DM Beith
N
0
2.5
5
10 Kilometers
Map data © OpenStreetMap contributors, Microsoft, Esri Community Maps contributors, Map layer by Esri

How do people use places? Where do they go? What do they do? How does this affect their health?



Too many studies still assume the neighbourhood of residence is a good proxy for the environments which affect health.



But, obviously, other places might be available to them &/or an influence on their lives.

Measuring exposure

Static boundaries

Children's daily travel behaviour

SPACES

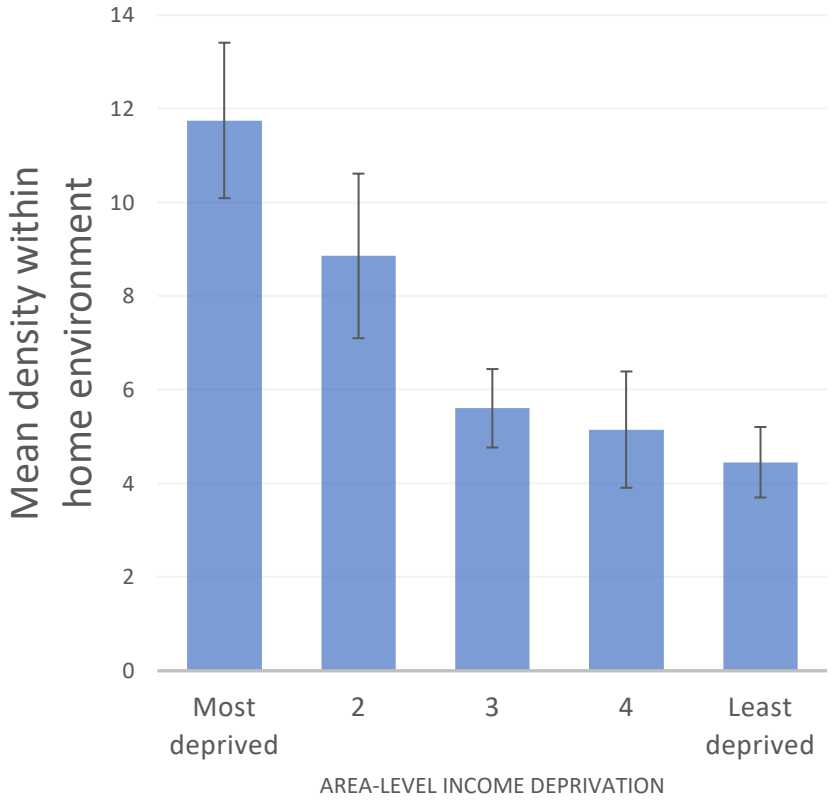
In the last QQ, we collected GPS & accelerometer data on about 800 10/11 year olds across Scotland.

SPACES2 is in the field.

Where does their mobility take them? What do they encounter?

Exposure to tobacco retail

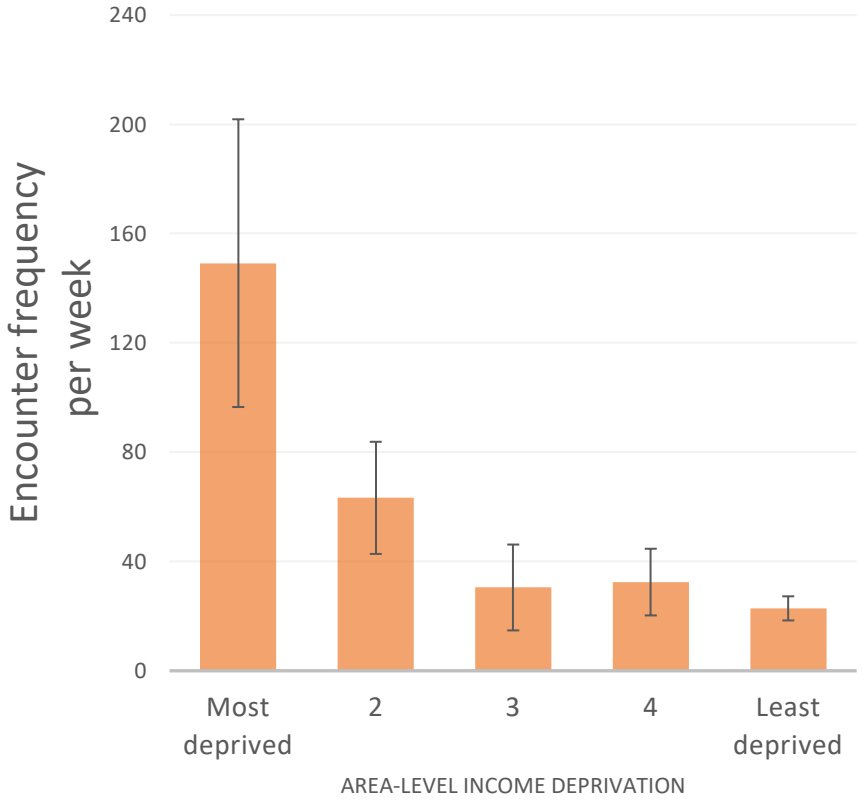
Exposure within HOME ENVIRONMENT reveals 3-fold inequality



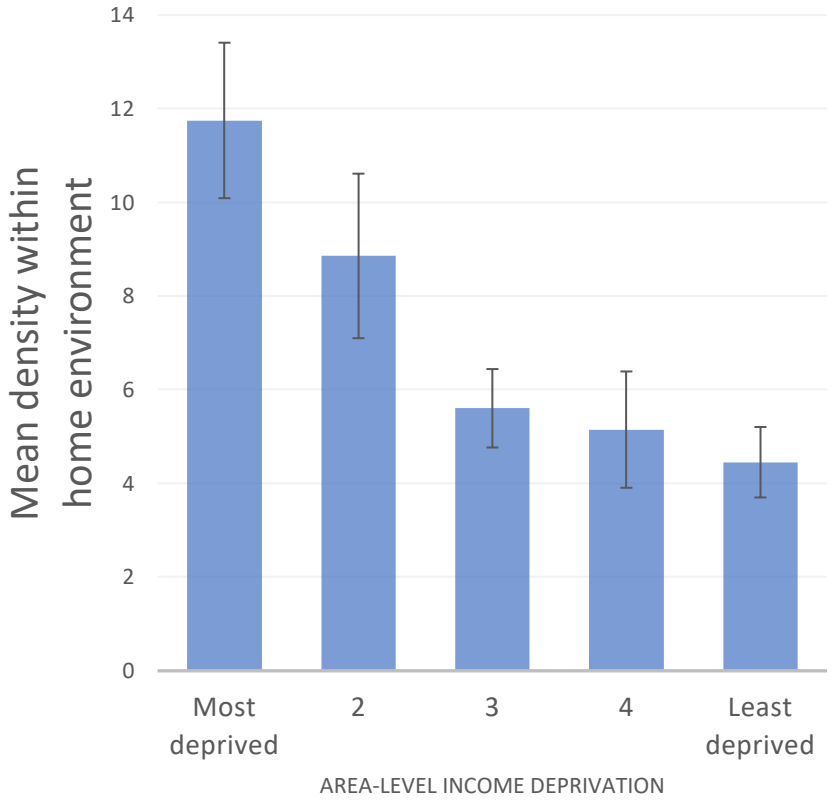
Caryl F, Shortt NK, Pearce J, *et al* Socioeconomic inequalities in children's exposure to tobacco retailing based on individual-level GPS data in Scotland *Tobacco Control* 2020;**29:**367-373.

Exposure to tobacco retail

Exposure within ACTIVITY SPACE reveals 7-fold inequality



Exposure within HOME ENVIRONMENT reveals 3-fold inequality

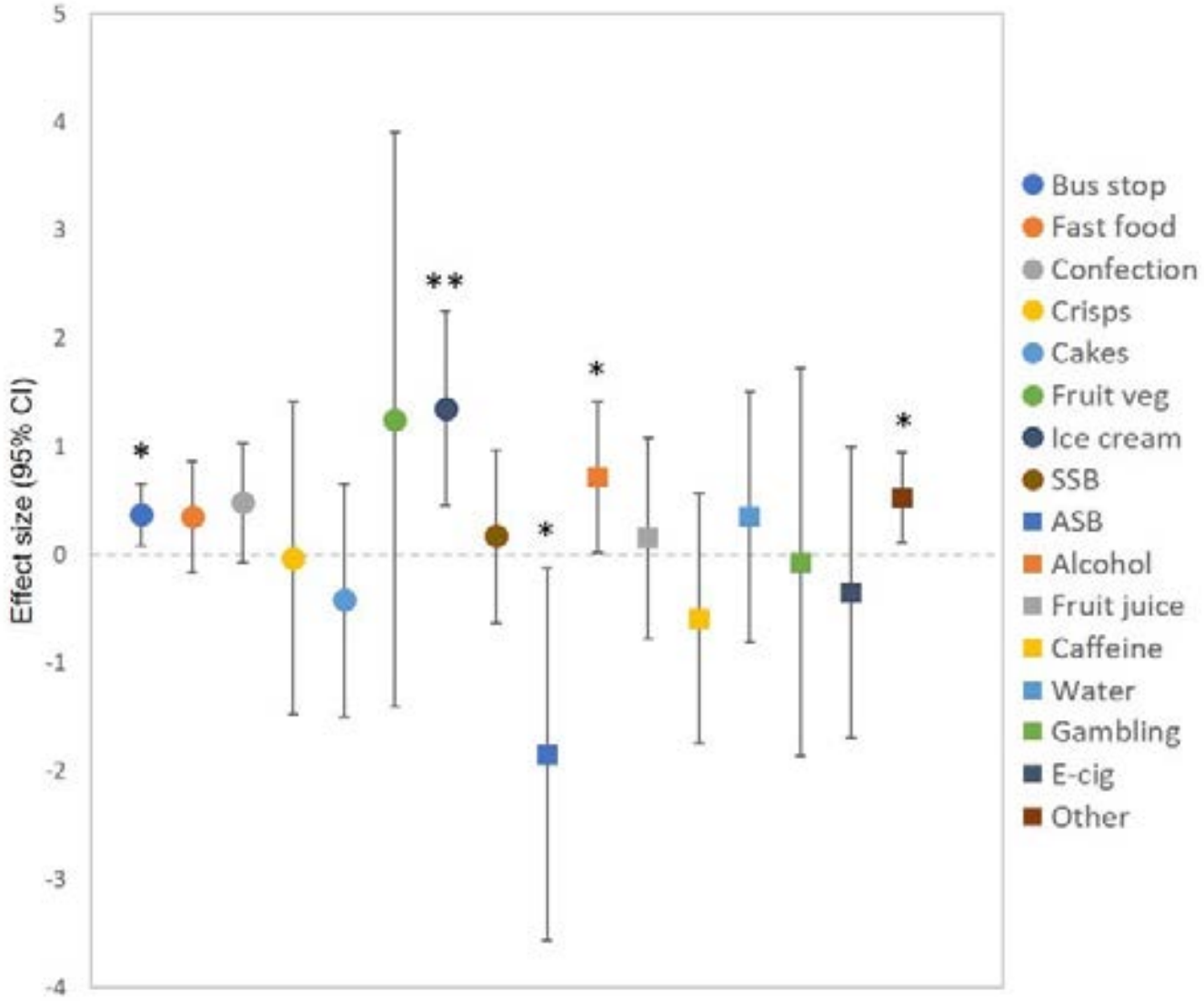


Caryl F, Shortt NK, Pearce J, *et al* Socioeconomic inequalities in children's exposure to tobacco retailing based on individual-level GPS data in Scotland *Tobacco Control* 2020;**29:**367-373.

Use Google Street view to see what is advertised at bus stops the SPACES children go past

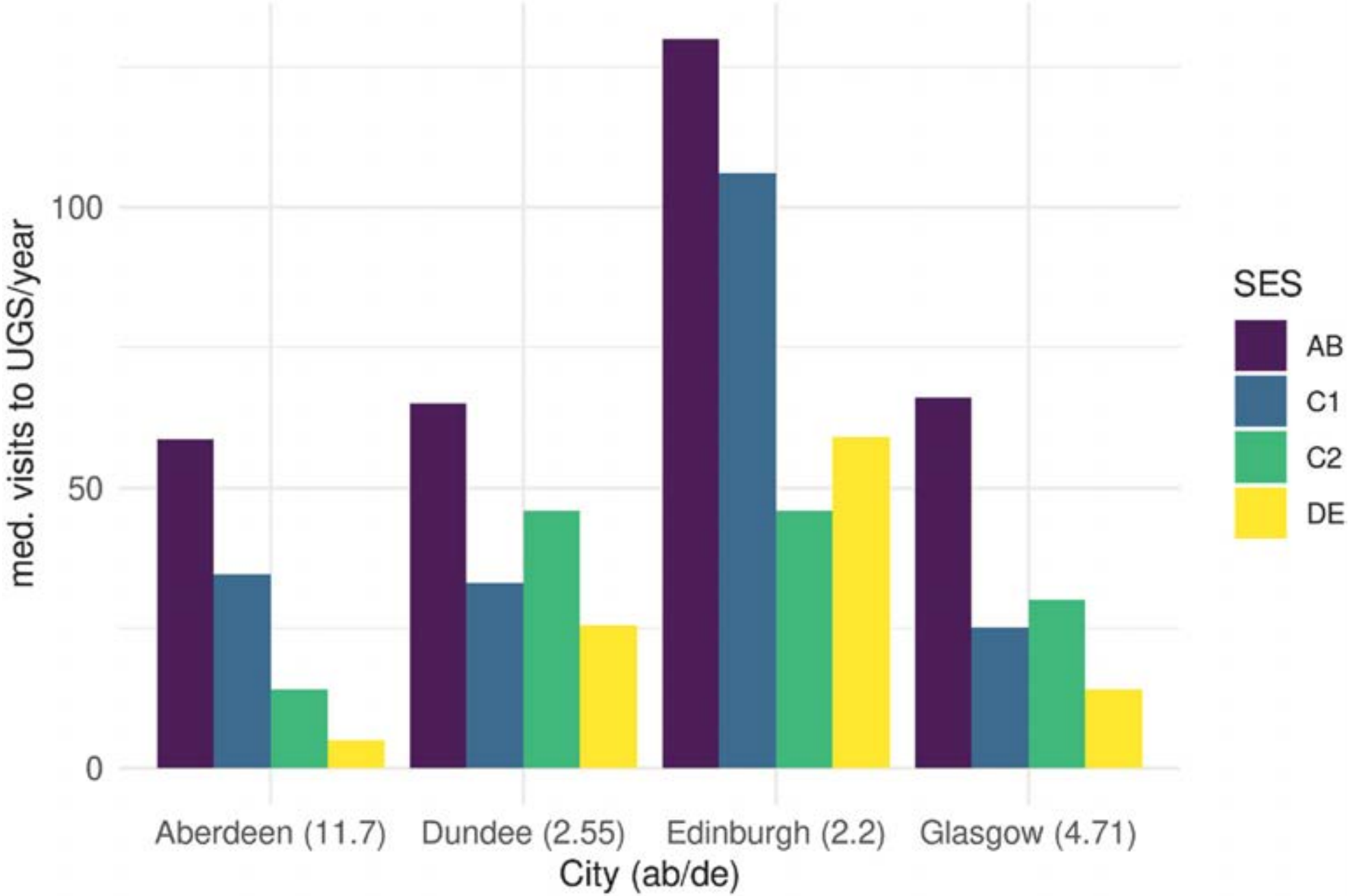
Olsen JR, Patterson C, Caryl F, Robertson T, Mooney S, Rundle A, Mitchell R, Hilton S. (in press at Health & Place) Exposure to unhealthy commodity advertising: Spatial proximity analysis to schools and socio-economic inequalities measured using Scottish Children's individual-level GPS data.

Children's exposure to bus stop advertisements by their home area-level income deprivation (reference category: least deprived).



Olsen JR, Patterson C, Caryl F, Robertson T, Mooney S, Rundle A, Mitchell R, Hilton S. (in press at Health & Place) Exposure to unhealthy commodity advertising: Spatial proximity analysis to schools and socio-economic inequalities measured using Scottish Children's individual-level GPS data.

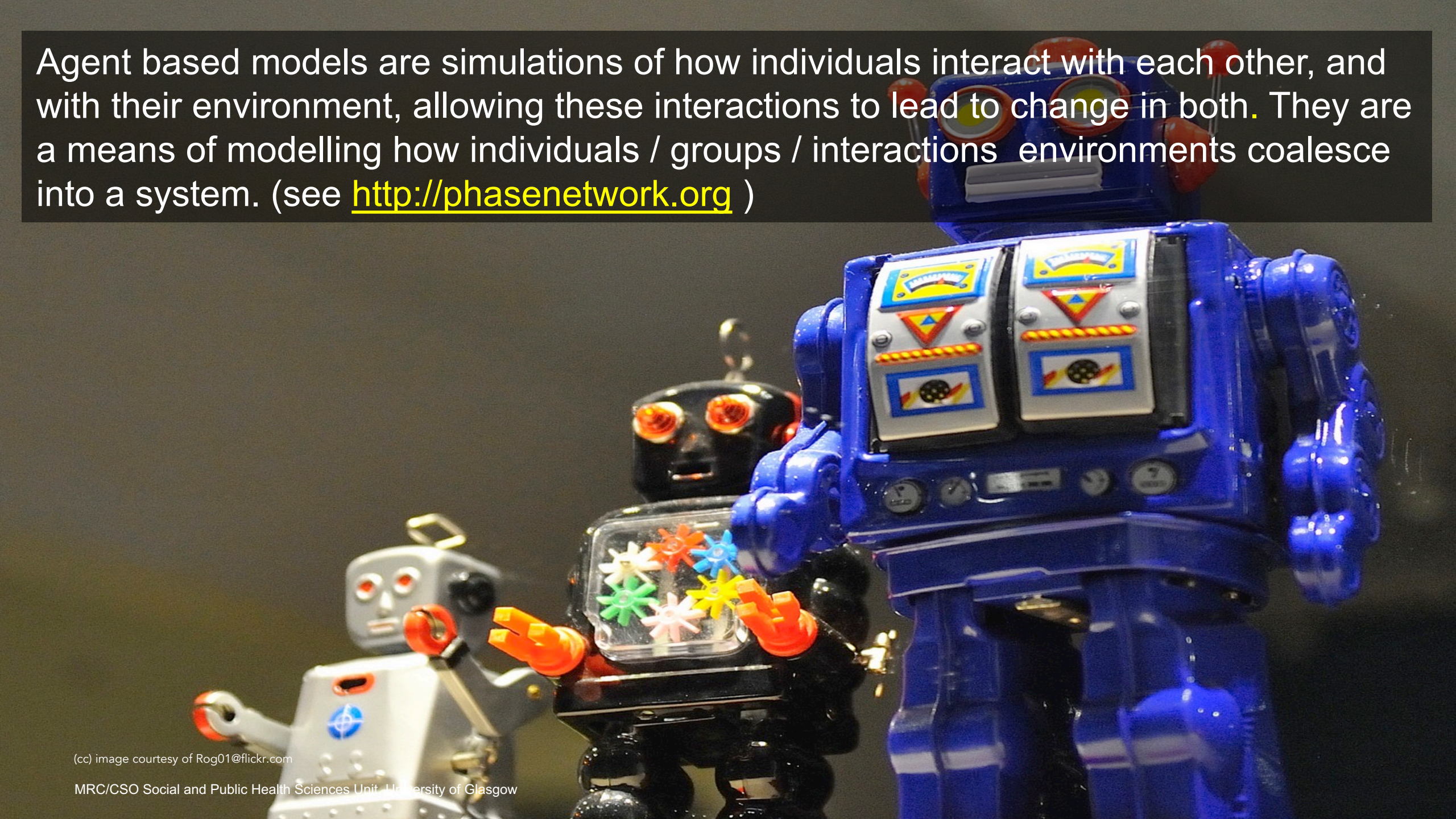

Physical activity
Microbiome
Air pollution
Social contact
Urban cooling
Stress reduction / restoration
Water management
MRC/CSO Social and Public Health Sciences Unit, University of Glasgow



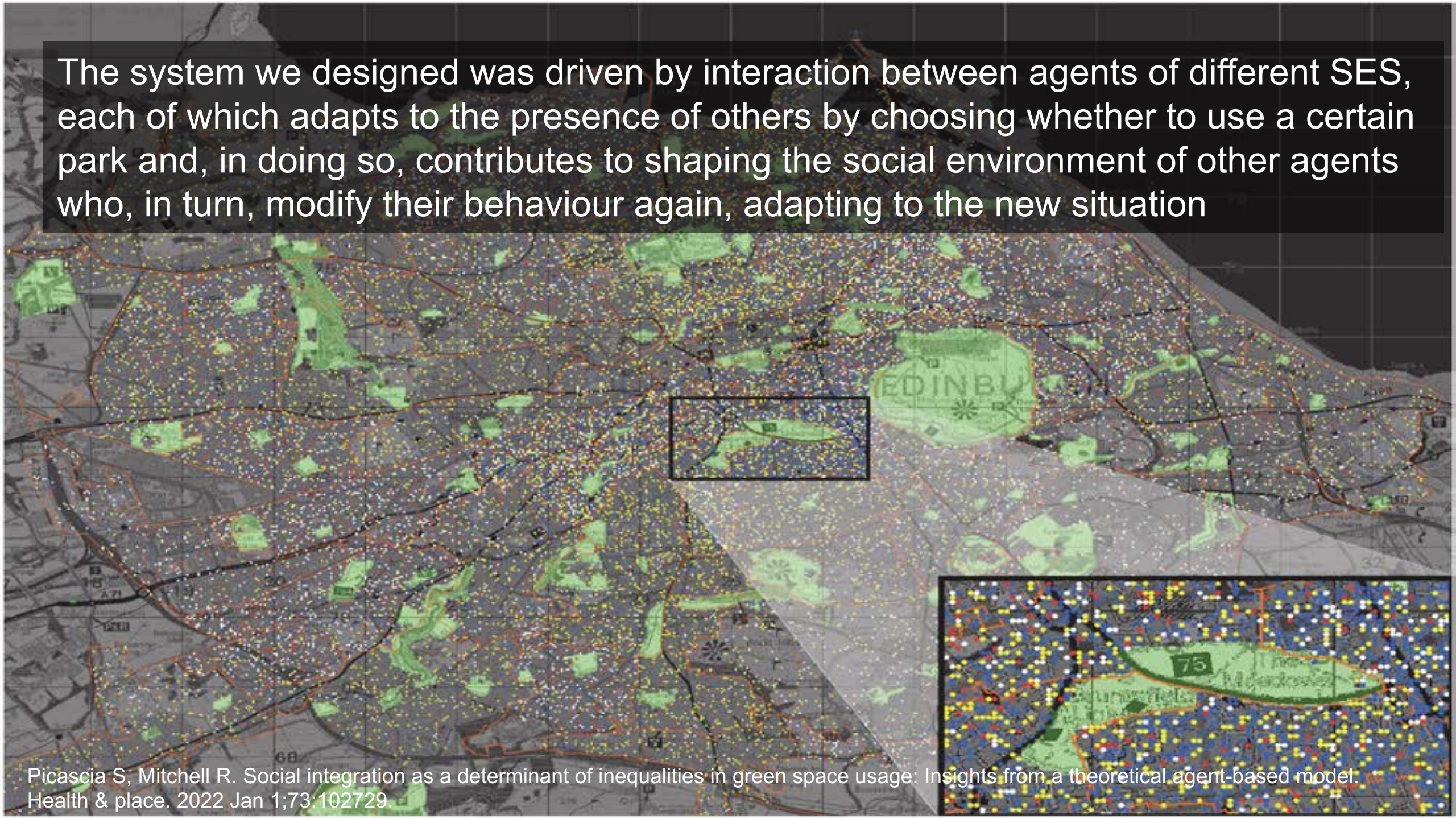
Picascia S, Mitchell R. Social integration as a determinant of inequalities in green space usage: Insights from a theoretical agent-based model. Health & place. 2022 Jan 1;73:102729.

Jones et al. (2008) and Seaman et al. (2010) found that individuals' decisions about whether to visit a particular park were strongly influenced by who else is, or might be, there. Perceived differences with other users, particularly in terms of SES, affected the reported willingness of respondents to visit a certain green space

Agent based models are simulations of how individuals interact with each other, and with their environment, allowing these interactions to lead to change in both. They are a means of modelling how individuals / groups / interactions environments coalesce into a system. (see http://phasenetwork.org)



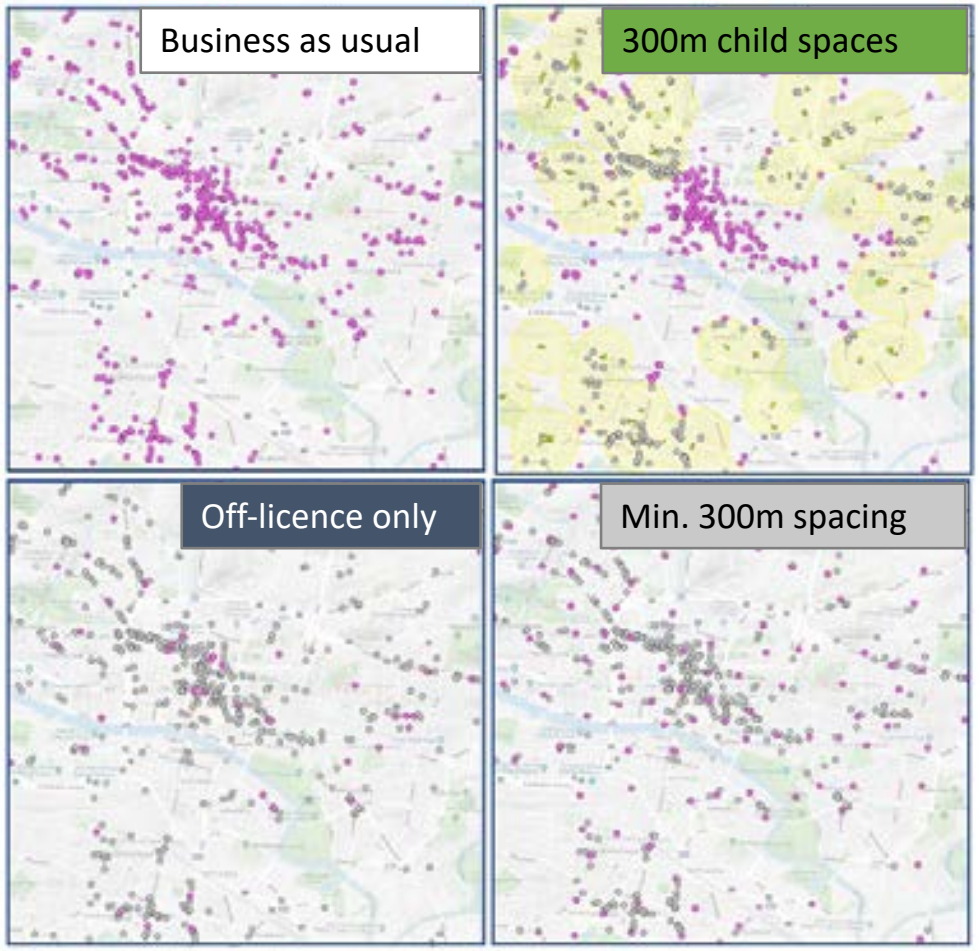
The system we designed was driven by interaction between agents of different SES, each of which adapts to the presence of others by choosing whether to use a certain park and, in doing so, contributes to shaping the social environment of other agents who, in turn, modify their behaviour again, adapting to the new situation



Picascia S, Mitchell R. Social integration as a determinant of inequalities in green space usage: Insights from a theoretical agent-based model. Health & place. 2022 Jan 1;73:102729.

How can we change places to make them salutogenic and equigenic?

Tobacco retail control



Policies:

Restricting who can sell tobacco;

Restricting where tobacco can be sold;

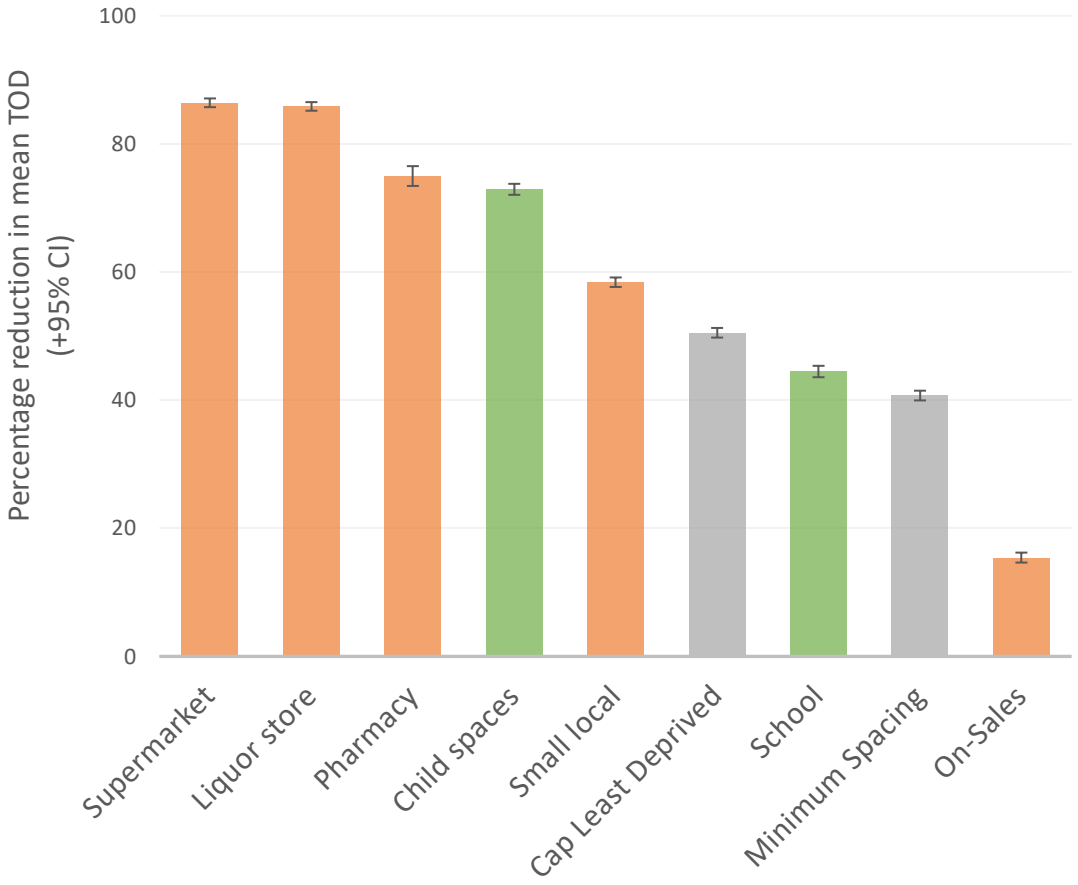
Restricting local density.

- Greatest % reduction in neighbourhood density of tobacco outlets?
- Smallest inequality in neighbourhood density?

Caryl FM, Pearce J, Reid G, *et al*. *Tob Control* Epub ahead of print: doi:10.1136/ tobaccocontrol-2020-056002

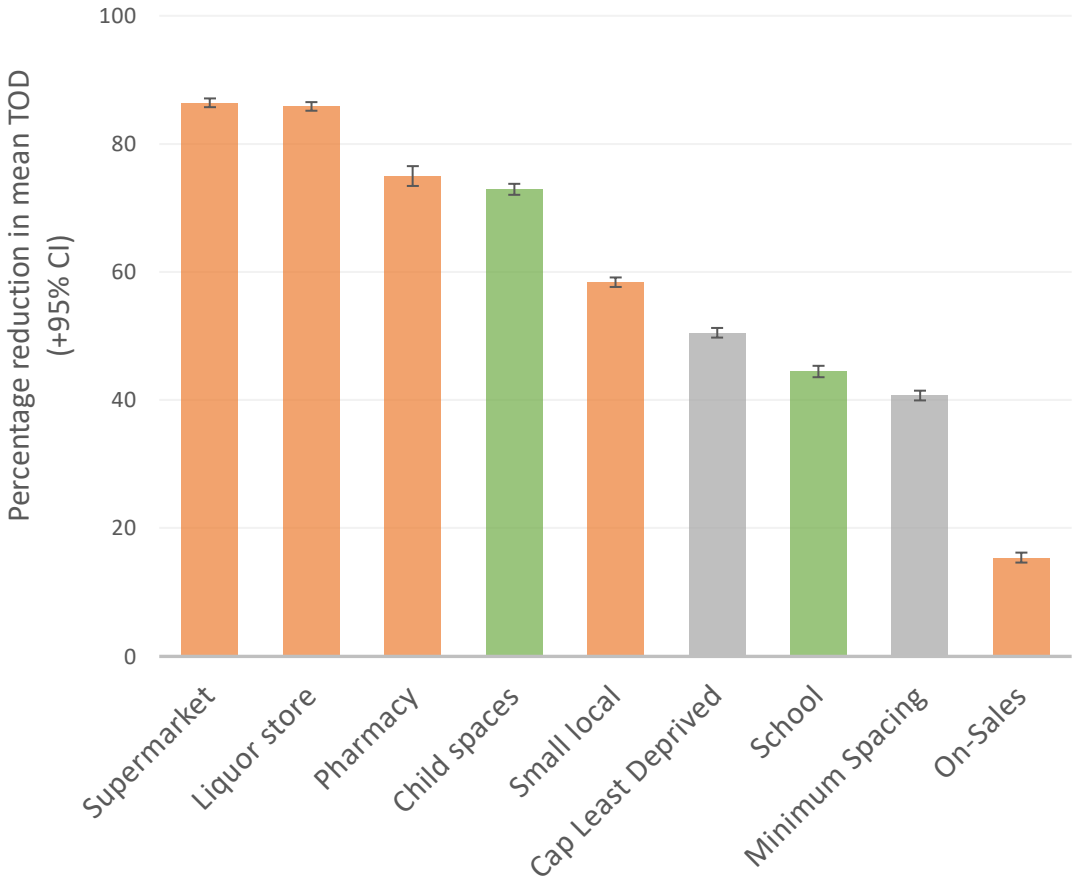
Tobacco retail control

Reduction (%) in neighbourhood density

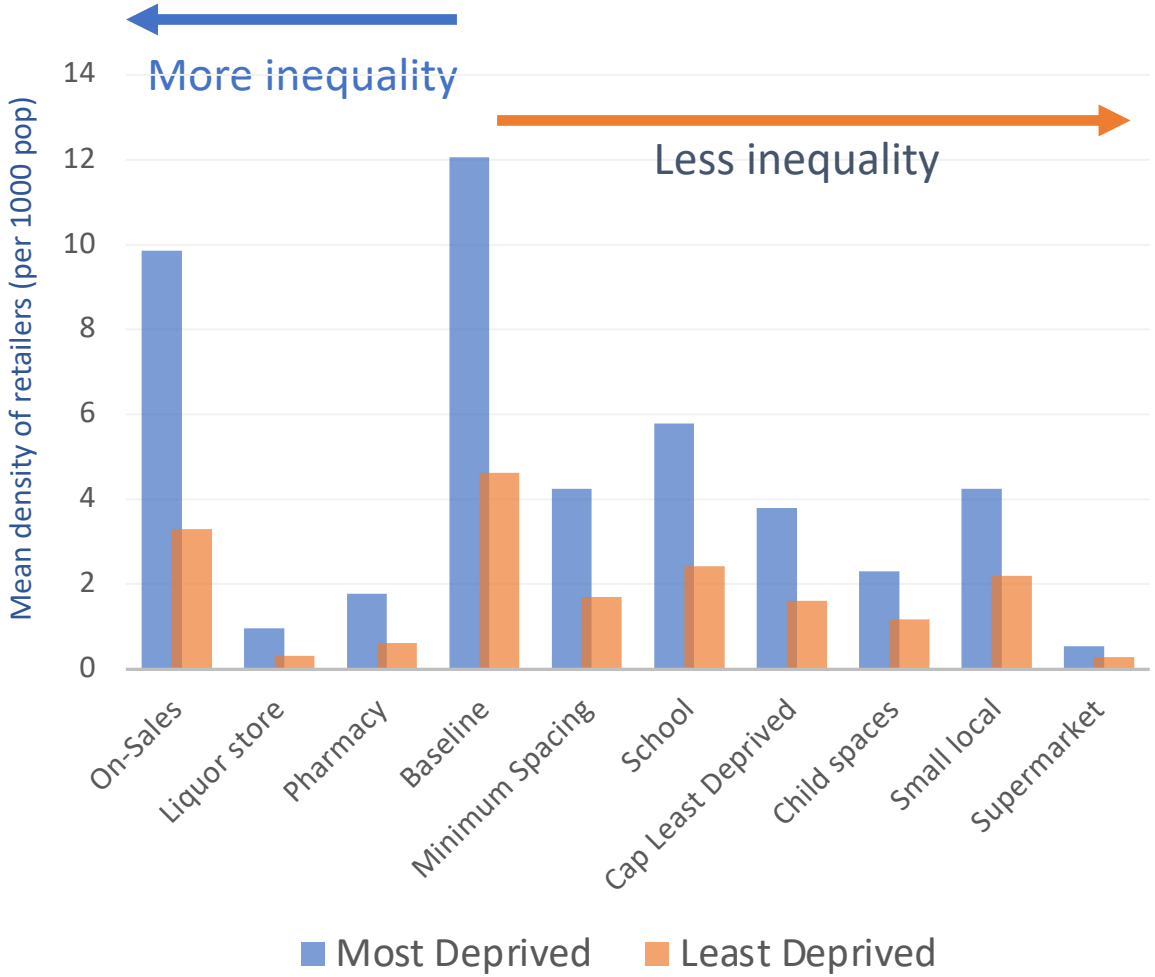


Tobacco retail control

Reduction (%) in neighbourhood density

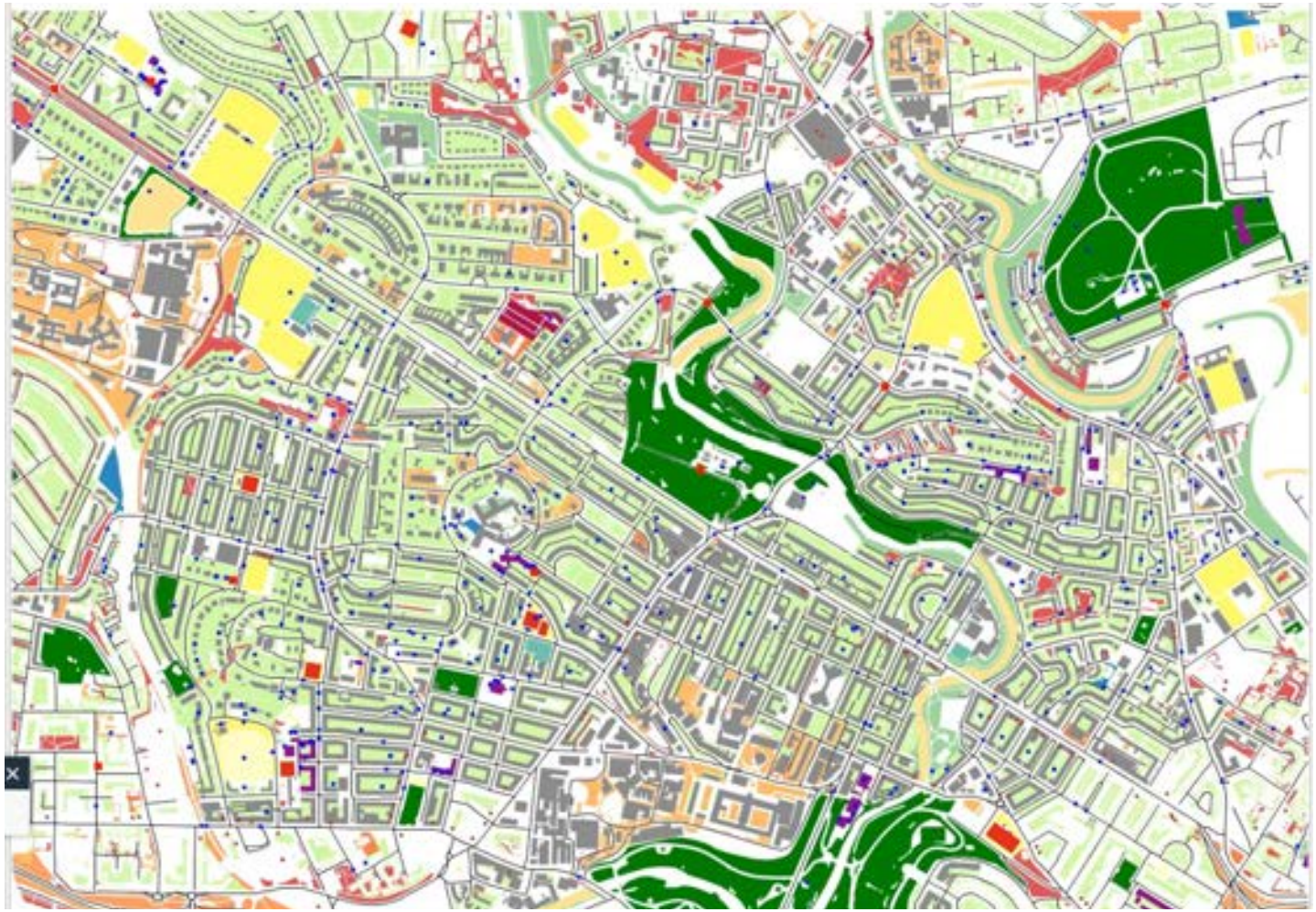


Socio-economic inequalities

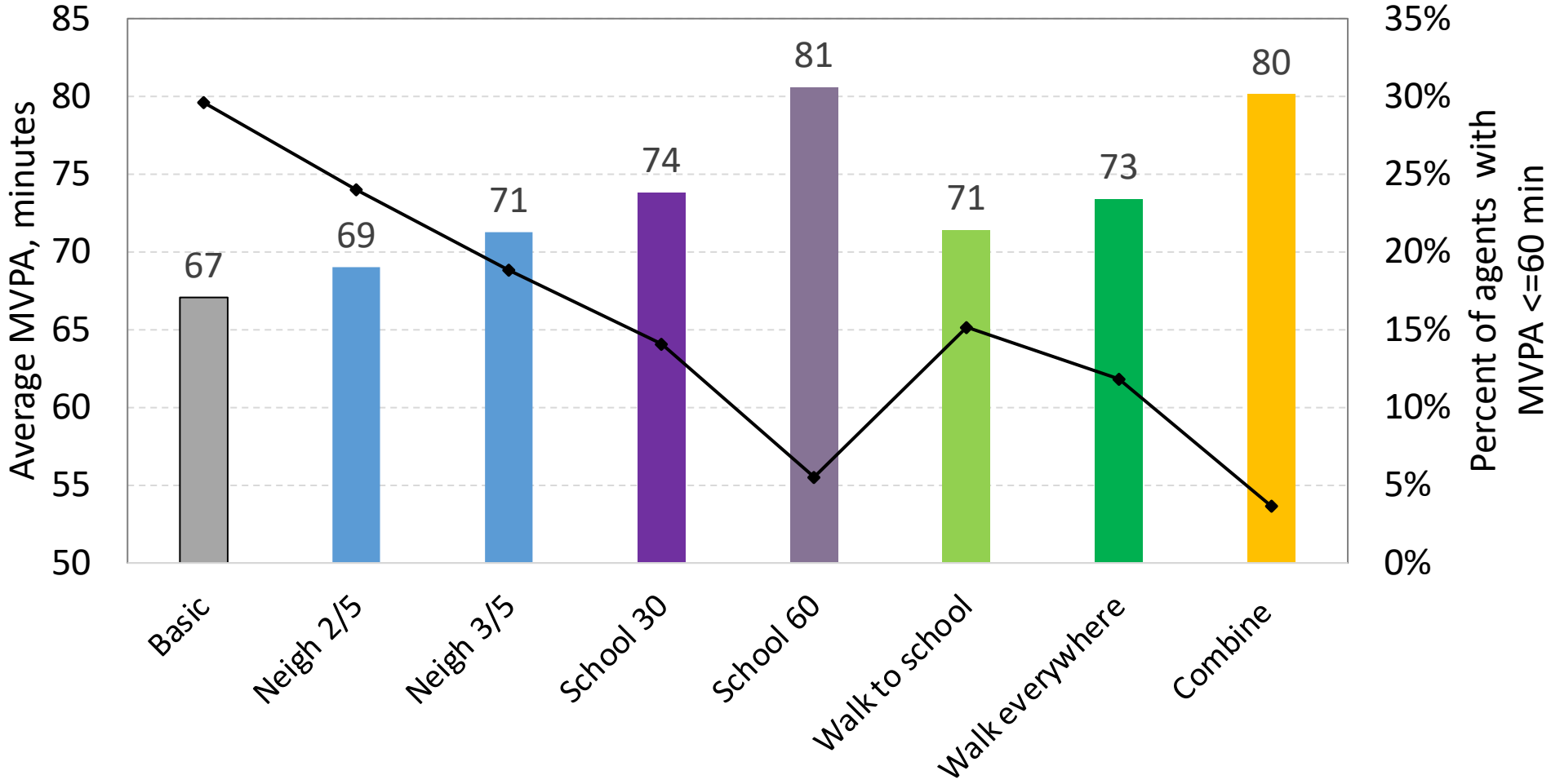


Agent-Based Model of Physical Activity

The model simulates the daily activities of children during week days in neighbourhoods across the city and estimates the level of physical activity



What is the impact of increasing activity in the neighbourhood, school, and active travel on daily MVPA?



Basic scenario: one day play in neighbourhood, two days play after school, one day meet friends
Combined scenario: 2 days neighbourhood, additional 30 minutes per day at school, walk to school

Almagor J, Martin A, McCrorie P, Mitchell R. How can an agent-based model explore the impact of interventions on children's physical activity in an urban environment?. Health & place. 2021 Nov 1;72:102688.

Your messages to take home.

Places matter for health and they both produce and reflect all kinds of inequalities.

We focus on: understanding how places / experience of places change, new methods for understanding how people interact with places, and thinking about those places could be like.

This work was funded by the UK Medical Research Council (MRC) Places and Health Programme (MC_UU_12017/10, Places MC_UU_00022/4) and the Chief Scientist Office (CSO) (SPHSU10 SPHSU19) at the MRC/ CSO Social and Public Health Sciences Unit, University of Glasgow.. The WIAT research project was funded by the National Institute for Health Research Public Health Research (NIHR PHR) Programme (project number 10/3005/18). Alcohol and Tobacco change over time work funded by ES/S016775/1. FMC is supported by an MRC Skills Development Fellowship