

The SPACE Project: The impact of place on cognitive health

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SPACE

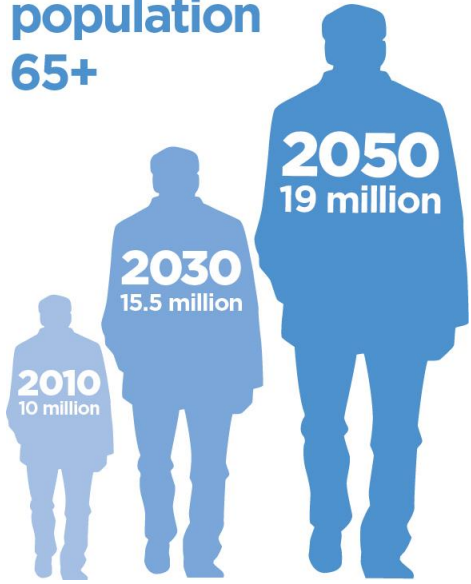
SUPPORTIVE ENVIRONMENTS FOR
PHYSICAL & SOCIAL ACTIVITY,
HEALTHY AGEING & COGNITIVE HEALTH

SPACE event
8th February 2024

This work was supported by **UK Research and Innovation** [ES/V016075/1]



UK
population
65+



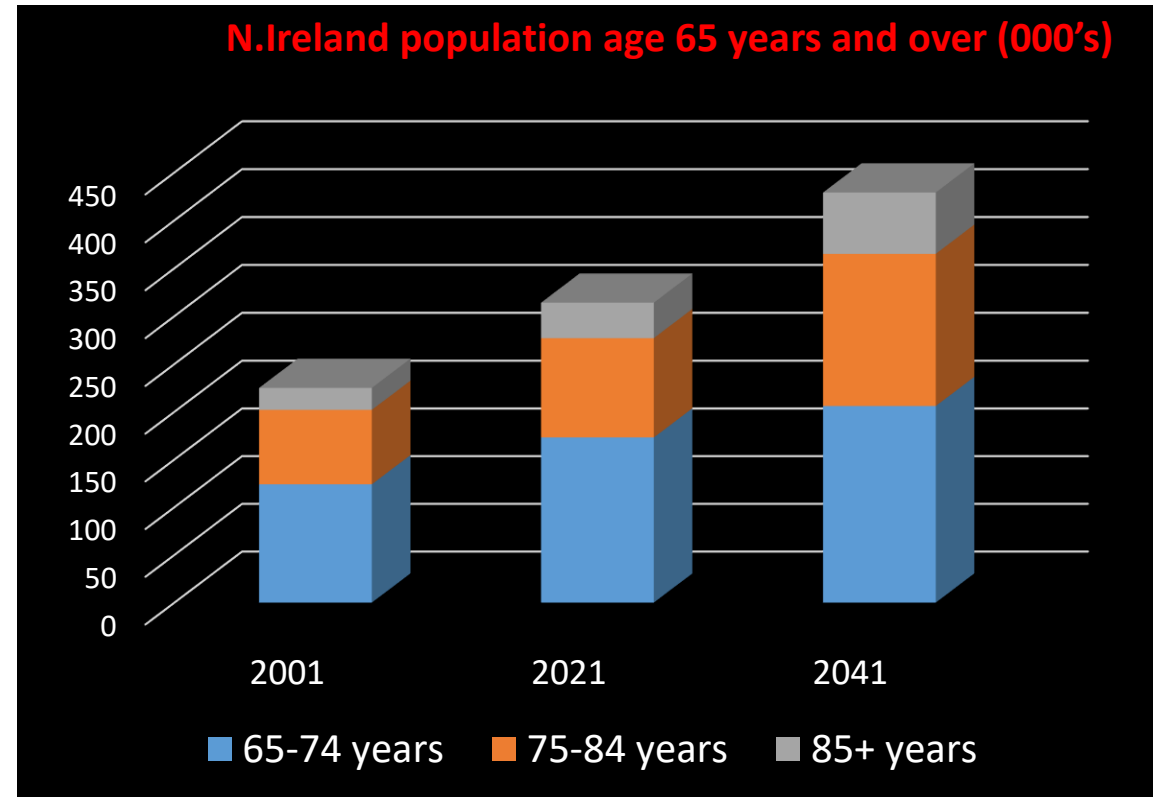
Societal Transformation

Third of UK babies 'will live to 100'

© 26 March 2012



N.Ireland population age 65 years and over (000's)



Source: NISRA, Annual Abstract of Statistics, 2003

2001: 200,000 → 2021: 300,000 → 2041: 400,000



Cognitive Health

- Globally, about 47 million people were living with dementia in 2015
- projected to triple by 2050

- 40% of dementia cases could be prevented or delayed by targeting 12 risk factors throughout life
- Air pollution

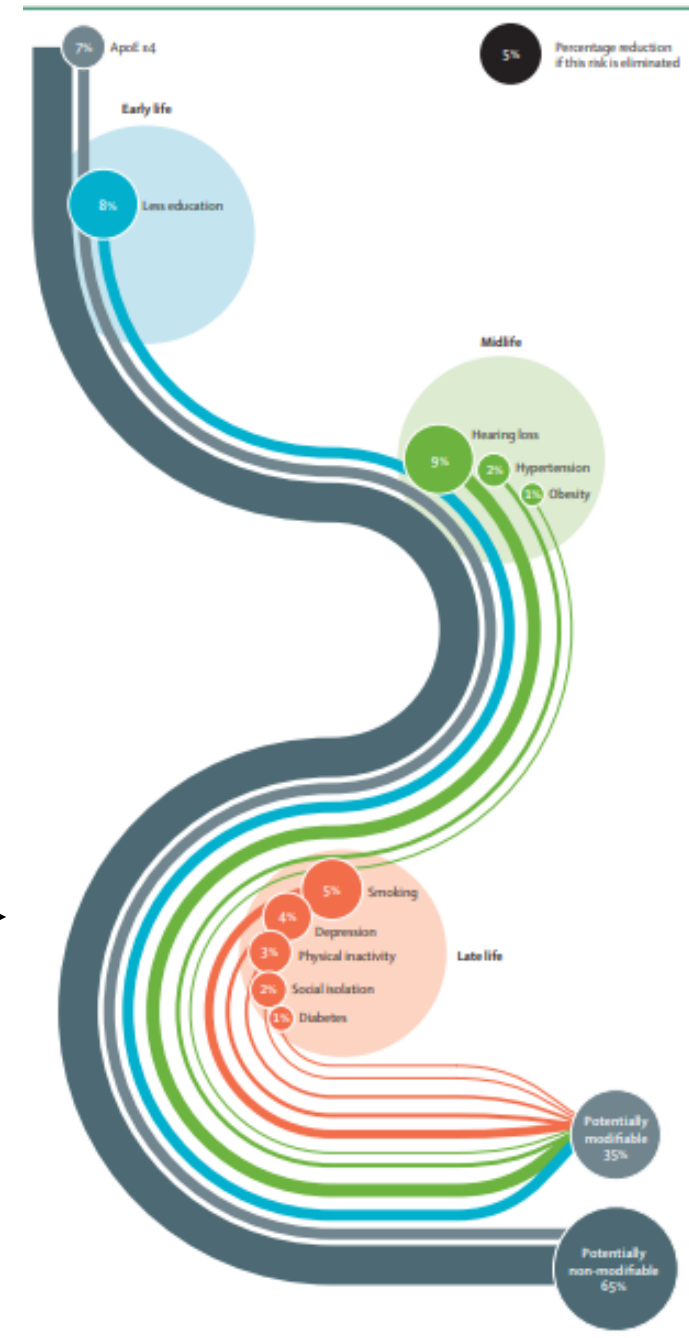


Figure 4: Life-course model of contribution of modifiable risk factors to dementia
Numbers are rounded to nearest integer. Figure shows potentially modifiable or non-modifiable risk factors.



OUR HEALTH IS LINKED TO THE ENVIRONMENT where we are born, live, and work

- *Key research questions:*

- What environmental factors influence healthy ageing and cognitive health ?
- What are the best policies and interventions for promoting healthy ageing and cognitive health?

- *Aim:* Integration of:

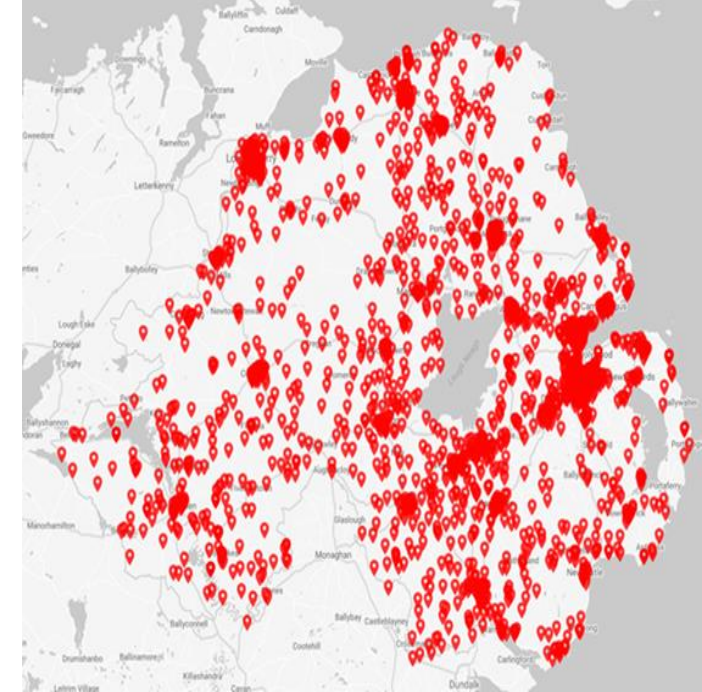
- environmental exposures
- lifestyle behaviours
- biological data





NICOLA is the...Northern Ireland Cohort for the Longitudinal Study of Ageing

- Launched in 2013 as N. Ireland's largest public health study of ageing
- Random sample of ~8500 men / women aged 50 years and over
- Longitudinal: interviews every 2-3 years, health assessment every 4-5 years
- Explores why and how social, economic and biological factors are changing the lives of older people
- Unique focus: Legacy of “The Troubles”, nutrition, eye health, cognition and the environment – connected studies



<https://www.qub.ac.uk/sites/NICOLA/AboutNICOLA>



Environmental Data Linkage



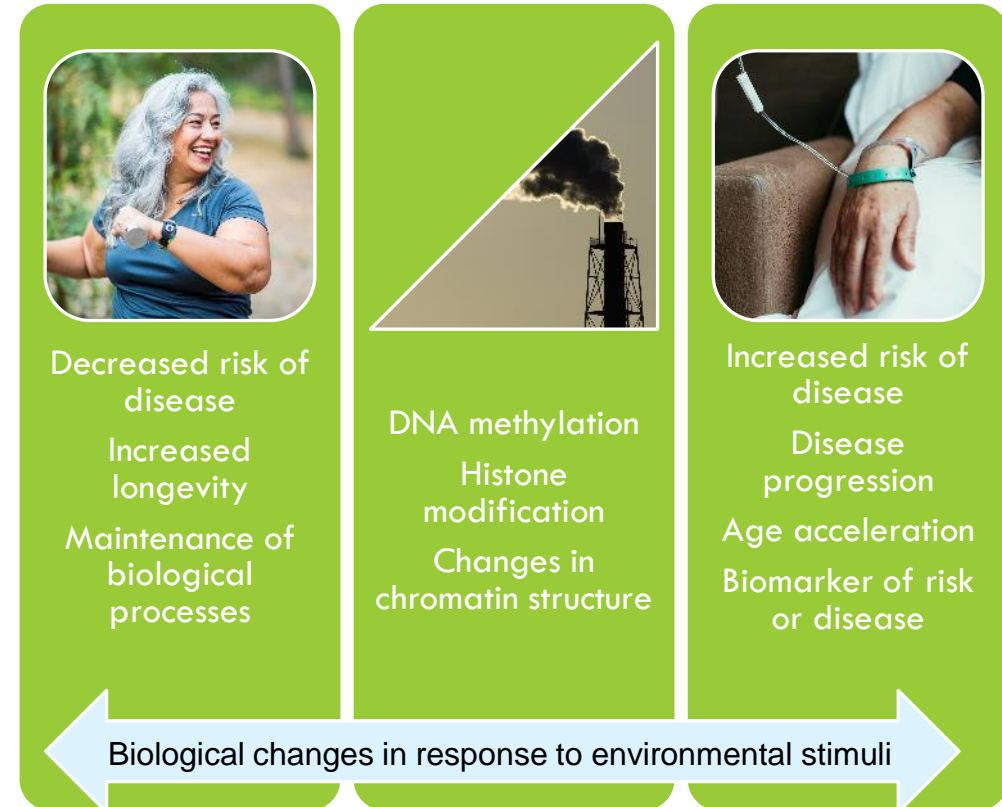
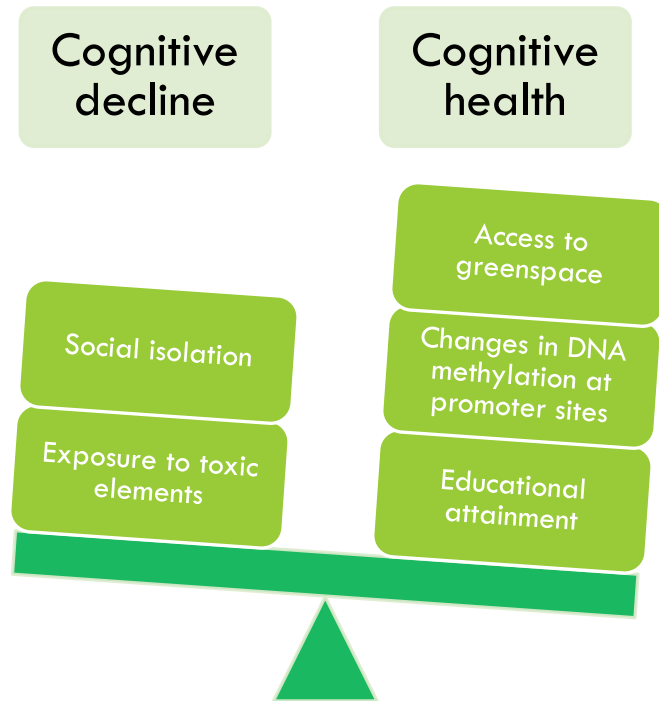
Urban environment data	
Densification	Housing density; population density
Infrastructure	Walkability indices (based on density, land use mix, connectivity, retail plot ratio) for the 500m/1000m hinterlands of the older adult participants in extant cohorts.
Land use	Land use mix; land use type (area and distance to commercial, residential, agricultural, industrial, transport, hospital/medical, educational, 'other land use')
Natural environment	Normalised Difference Vegetation Index (NDVI); access to green space and blue space (water); impervious surfaces
Transportation	Road line, bus stop and train station densities (proxies for air and noise pollution); road speed and traffic collisions
Air, noise and light pollution	Estimates of exposure to ambient air pollution (NO2 and PM2.5), noise and light pollution
Soil geochemistry	Urban geochemical data including soil urbanisation tracers (Co, V, Cr, Ni, Zn, Sn, Pb, Sb, As and Mo)**



**** Climate change: flooding, heat, forest fires, UVA and sun exposure, biodiversity**

Biological Responses

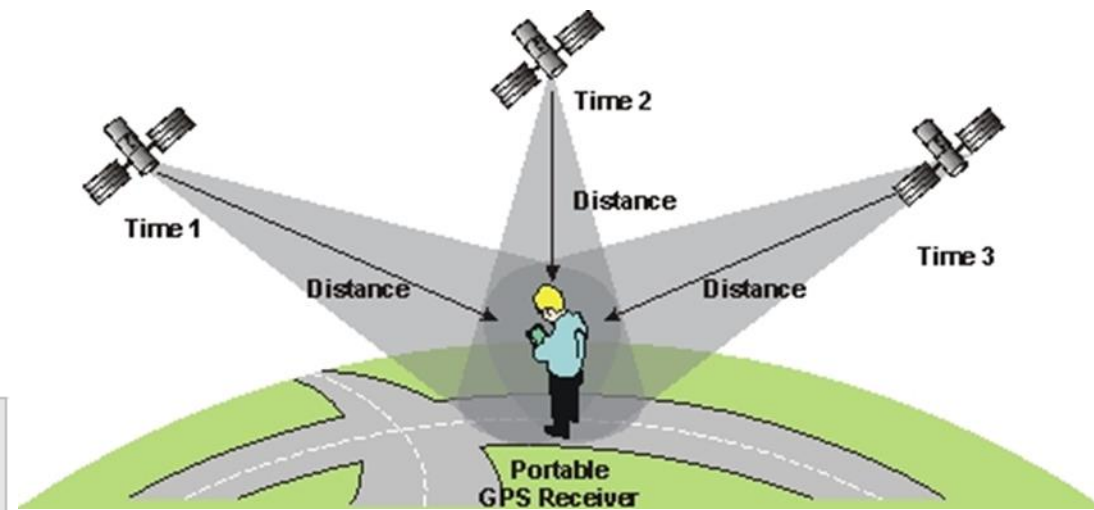
How do external impacts get under our skin to influence disease?



Epigenetic changes can be risk factors or protect against disease...**some damage is reversible!**



GPS and Accelerometer Data



HHS Public Access

Author manuscript

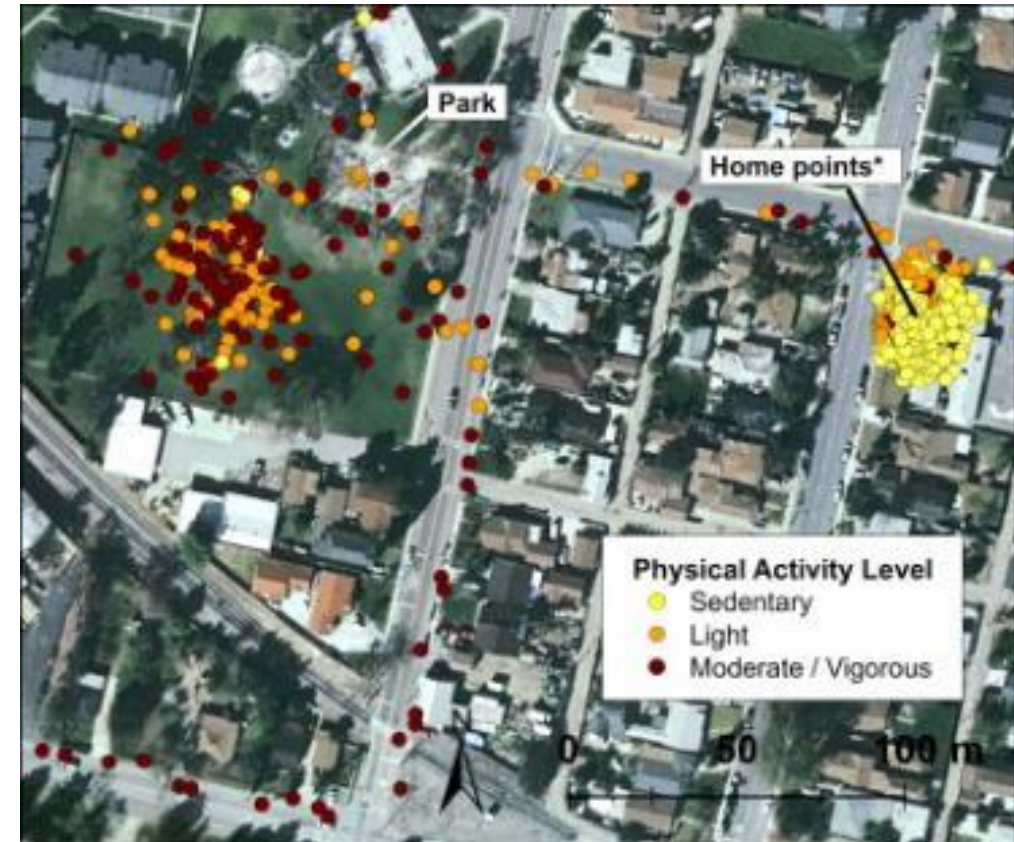
Neuroepidemiology. Author manuscript; available in PMC 2021 January 01.

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Neuroepidemiology. 2020 ; 54(1): 64–74. doi:10.1159/000503004.

The Health and Retirement Study Harmonized Cognitive Assessment Protocol (HCAP) Project: Study Design and Methods

Kenneth M. Langa^{a,b,c,d,*}, Lindsay H. Ryan^c, Ryan McCammon^c, Richard N. Jones^e, Jennifer J. Manly^f, Deborah A. Levine^{a,d,g}, Amanda Sonnega^c, Madeline Farron^a, David R. Weir^c





Video series

5 themes:

1. Air & Soil pollution
2. Light & Noise pollution
3. Green & Blue space
4. Urban planning
5. Planetary health & Climate change

qub.ac.uk/sites/space/VideosandFactsheets



Factsheets

Green and blue space	Noise pollution	Light pollution	Soil pollution	Epigenetics	Air pollution	Urban planning	Planetary health and climate change
<p>Green space is any natural space that contains trees, grass or any other green vegetation. Blue space is any natural space that contains water, rivers, lakes, and the sea.</p>	<p>1 in 5 people in Europe are exposed to high noise levels considered harmful to their health.</p>	<p>Over 80% of the world's population is living under light-polluted night skies.</p>	<p>Soil pollutants play a role in the environment and can impact how we live and age. Inputs from potentially toxic elements can impact cognitive health, such as mercury and lead.</p> <p>Hg Pb</p>	<p>Our genes carry information. Environmental factors affect how our genes are expressed. Epigenetics is the study of the environment's effect on gene expression. For example, in two people with the same genetic code, one may be affected by an environmental factor.</p>	<p>Air pollution is the biggest environmental health crisis. 99% of global population breathes air that contains high levels of pollutants and is estimated to cause 6.7 million premature deaths each year.</p>	<p>Urban design has been historically important for public health. Cities with a compact and walkable design, with a mix of services available in shorter distances, can have lower levels of air pollution and better health outcomes.</p>	<p>Human health depends on flourishing natural systems. By harming our natural systems, we harm ourselves and future generations. Climate change is a context that creates unprecedented situations.</p>
<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"When you're out there walking, you feel a sense of freedom"</p> <p>"Outdoor space is the best place to be"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"People in cities don't notice the noise anymore"</p> <p>"Places are so noisy and noise reflects the building to let you don't have a quiet moment"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"Recently, I haven't been able to see as many stars"</p> <p>"I always sleep better when I'm somewhere that doesn't have light pollution"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"I notice if there's something different with smells in the air or if the soil is contaminated, especially living on a coast you can see the dirt coming from the scum on the water"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"It's so interesting that we could be affected by disease and through interacting with the environment we could be switching something on or off"</p> <p>"There are so many factors at play when we approach behaviour change"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"When traffic does build up, you feel the fumes from the cars affecting you, particularly when walking along a country road"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"Sometimes we don't think about it, we just hop in our cars and go"</p> <p>"Traffic has gotten a lot more noticeable, even in the outskirts"</p>	<p>We asked members of our Healthy Ageing Advisory Group what they thought...</p> <p>"I did notice this year has been warmer, and it can be a bit uncomfortable at times"</p> <p>"We should think about it - what are we doing to our lovely planet?"</p> <p>Our stakeholders said... Bringing together a range of bodies in partnership from across the public, private and third sector to raise awareness, guide good policymaking, and create actions is crucial.</p>
<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>A better environment for physical and social activities. A better environment for physical and social activities.</p>	<p>Understanding how all planetary, environmental and health factors interact can help inform planners and citizens of the many components affecting how we live and age.</p>
							<p>The health of citizens and the planet is central to create conditions where everyone can live and age well.</p>
<p>SPACE logo and QR codes for each factsheet.</p>							<p>Members of the public representing older persons who helped shape our research and ensured we considered their lived experiences, insights and opinions. This work was supported by UK Research and Innovation [ES/V016075/1].</p> <p>Healthy Ageing Challenge Social, Behavioural and Design Research. UKRI. Economic and Social Research Council.</p>



Policy and Practice



- Cognitive health lacking on the policy agenda
- Addressing the root causes of poor-quality environments will have benefits across a range of policy areas

Addressing:

Poor transport infrastructure,
absence of good-quality
green space, poor housing

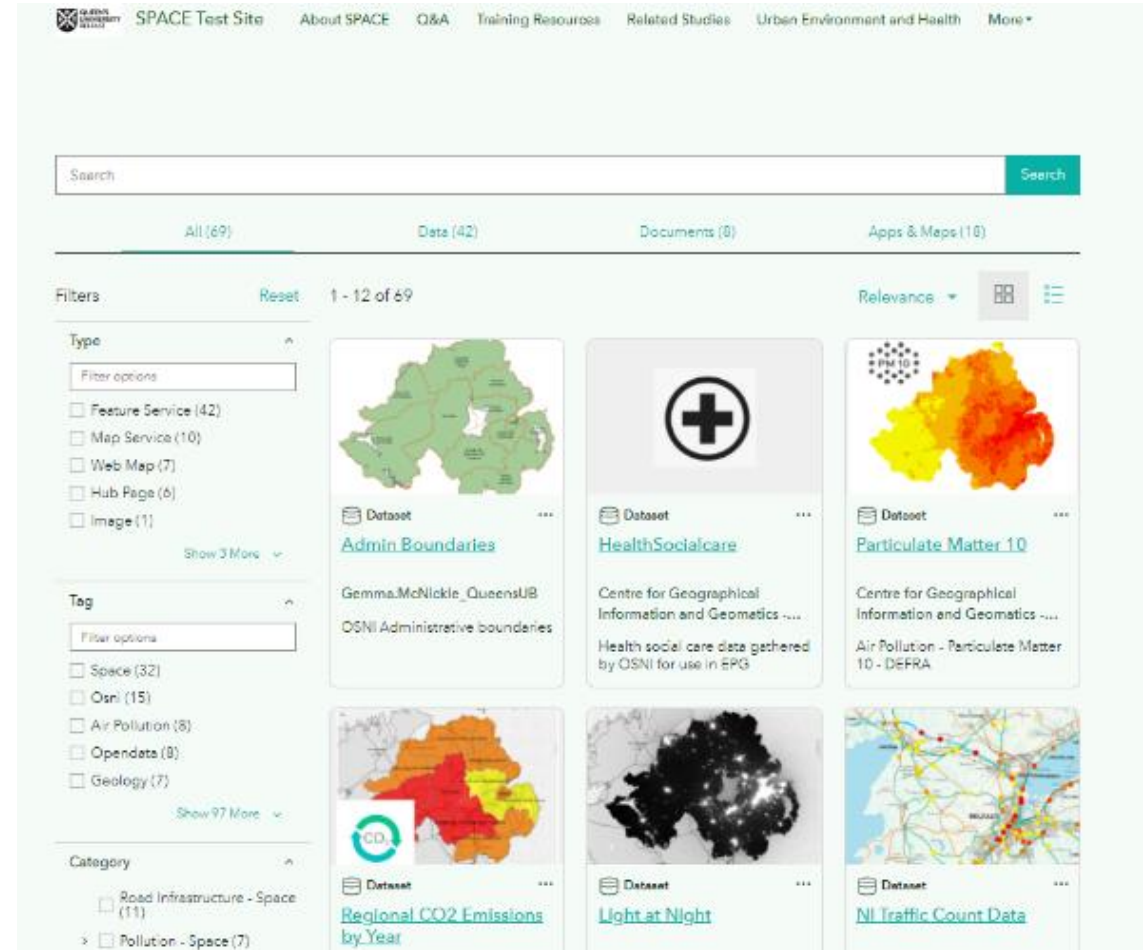
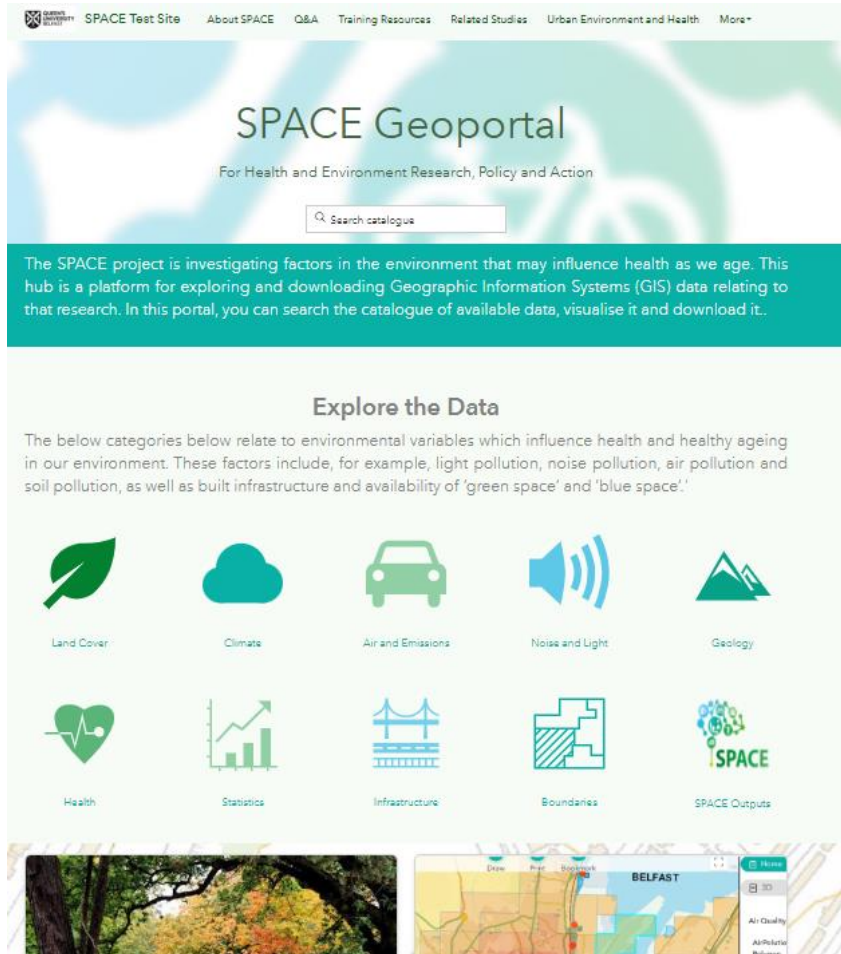


Will impact:

Ageing, health, cognitive
decline, liveable communities,
environment, climate crisis

- Agreed set of policy recommendations for how to achieve success in this issue
- Report that can be used to support local action
- New collaborations, raised awareness of issue etc.
- Practice-oriented outputs – policy briefs, evidence summaries etc





The SPACE project explores the important role that the environment plays in supporting healthy ageing and cognitive health. Over the past year, in collaboration with Land & Property Services, we have been developing a platform for exploring and accessing geospatial data across Northern Ireland. Our geoportal can be used to search the catalogue of available data, visualise it, and download it.






Capacity Building



Early Career Researcher 2-day workshop, Belfast, August 2023 led by Dr Claire Cleland



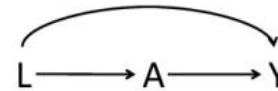
Introduction to Directed Acyclic Graphs (DAGs) for Causal Inference

Session 1
Ione Avila-Palencia, PhD, MPH
Hüseyin Küçükali, MD, PhD
11th May 2023

Introduction to causality DAGs: the essentials Confounder, mediator, collider SPACE example d-separation rules Work with examples DAGitty demonstration

What is a DAG?

14



- DAG: Directed Acyclic Graph
- Mathematical object built from letters and arrows
- Visual representation of qualitative causal assumptions

<https://www.qub.ac.uk/sites/space/Resources/#an-introduction-to-directed-acyclic-graphs-dags-for-causal-inference-online-training-1844834-1>



Healthy Ageing Advisory Group

- Videos
- Factsheets
- Rural environments focus
- Policy workshops



Thank you



SPACE Partners



the paul hogarth company

- Videos
- Factsheets
- Webinar series
- Policy workshops
- Policy briefs
- Practice-oriented reports
- Policy report



Studio idir

Thank you

What next?

Other environmental factors:

- Climate change: flooding, heat, forest fires, UVA and sun exposure, biodiversity
- microplastics
- novel environmental exposures associated with net zero transition
- food environment

Other health conditions:

- mental health
- chronic respiratory conditions
- cancer
- eye health

Policy and Practice:

- Report on the role of the environment and prevention
- Extension of geoportal and case studies to support policy and practice
- WHO Healthy Ageing Taskforce
- Practice-oriented outputs



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It represents a collaboration between Queen's University Belfast and partnering organisations from across health, government, third sector, private and public organisations, the NICOLA Advisory Research Group and the SPACE Project Team, without whom the research would not have been possible. Full details are available on our website: qub.ac.uk/sites/space

THE SPACE TEAM

✕ @spacequb



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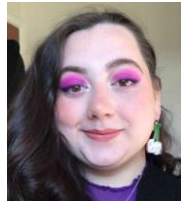
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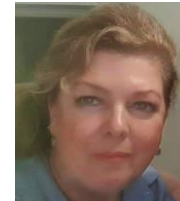
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