Investigating the impact of the environment on health using spatially-linked data

DATE
5th April 2019

VENUE
ESRI

AUTHORS
Philip Carthy
Seraphim Dempsey
Seán Lyons
Ciarán Mac Domhnaill
Anne Nolan

Environmental Protection Agency
An Ghníomhaireacht um Chaomhnú Comhshaoil

Seirbhís Sláinte Níos Fearr á Forbairt | Building a Better Health Service

tilda
Staidéar Fadaimseartha na hÉireann um Dhul in Aois
The Irish Longitudinal Study on Ageing

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Introduction

- Physical environment an important component of the 'social determinants of health' (WHO, 2008)
- Direct and indirect effects of environmental conditions on health and wellbeing
- But there are methodological challenges

Our Approach

- Link spatially-coded individual-level micro-data with data on environmental exposures
- Survey micro-data from The Irish Longitudinal Study on Ageing (TILDA)
  - And now also Healthy Ireland
- Environmental exposure data on radon, green and blue spaces, noise, *etc*.

Journal of Environmental Radioactivity 182 (2018) 12–19

Contents lists available at ScienceDirect

Journal of Environmental Radioactivity

journal homepage: www.elsevier.com/locate/jenvrad

High Radon Areas and lung cancer prevalence: Evidence from Ireland

Seraphim Dempsey[a], Seán Lyons[a,b], Anne Nolan[a,b,c,*]

[a] The Economic and Social Research Institute, Sir John Rogerson's Quay, Dublin 2, Ireland
[b] Department of Economics, Trinity College Dublin, Ireland
[c] The Irish Longitudinal Study on Ageing, Trinity College Dublin, Ireland

SSM - Population Health 4 (2018) 206–215

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Article

Urban green space and obesity in older adults: Evidence from Ireland

Seraphim Dempsey[a], Seán Lyons[a,b], Anne Nolan[a,b,c,*]

[a] Economic and Social Research Institute, Sir John Rogerson's Quay, Dublin, Ireland
[b] Department of Economics, Trinity College Dublin, Ireland
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Health and Place 54 (2018) 110–117

Contents lists available at ScienceDirect

Health & Place

journal homepage: www.elsevier.com/locate/healthplace

Coastal blue space and depression in older adults

Seraphim Dempsey[a], Mel T. Devine[b], Tom Gillespie[c], Seán Lyons[a,d], Anne Nolan[a,d,e,*]

[a] Economic and Social Research Institute, Sir John Rogerson's Quay, Dublin, Ireland
[b] Energy Institute, School of Electrical and Electronic Engineering, University College Dublin, Ireland
[c] Socio-Economic Marine Research Unit, National University of Ireland, Galway, Ireland
[d] Department of Economics, Trinity College Dublin, Ireland
[e] The Irish Longitudinal Study on Ageing, Trinity College Dublin, Ireland

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[a] Economic and Social Research Institute, Sir John Rogerson's Quay, Dublin, Ireland
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Urban Green Space and Obesity

- Increasing urbanisation → health and well-being effects
- Obesity a major public health concern
- Causes of obesity multi-faceted, but increasing focus on environmental factors
- Literature on association between green space and obesity presents mixed evidence (Lachowycz and Jones, 2011)

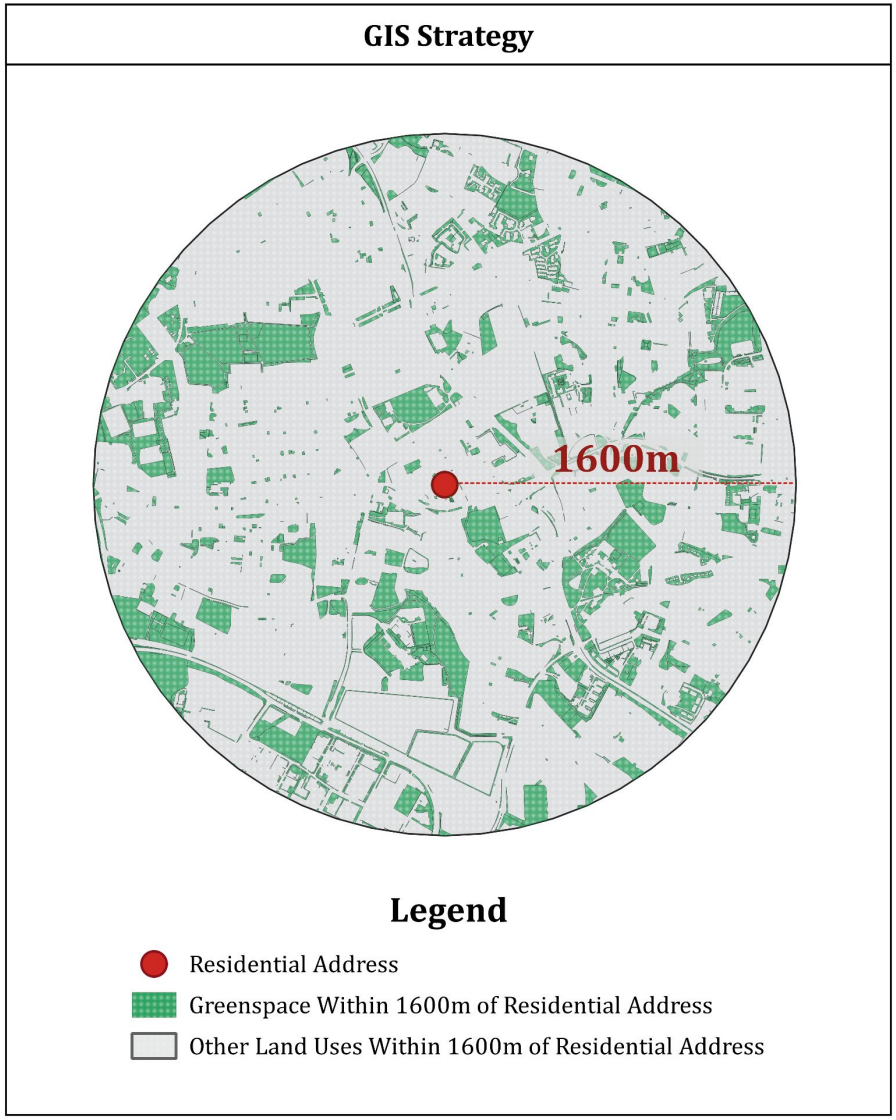
TILDA

- Nationally-representative longitudinal survey of the over 50s
  - Surveyed every 2 years since 2010
  - Economic, social and health components
  - Data collected from face-to-face interviews, self-completion questionnaires and clinical health assessments
  - Approximately 8,000 observations

Calculating Green Space Exposure

- Satellite imagery used to create highly detailed land-use maps of urban areas within the EU
- Circular 1.6km buffer drawn around each TILDA residence
- Greenness of locality = amount of green space within this buffer zone as a proportion of the total buffer zone area

Calculating Green Space Exposure



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Calculating Green Space Exposure

- Satellite imagery used to create highly detailed land-use maps of urban areas within the EU
- Circular 1.6km buffer drawn around each TILDA residence
- Greenness of locality = amount of green space within this buffer zone as a proportion of the total buffer zone area
- Divided into quintiles to protect anonymity

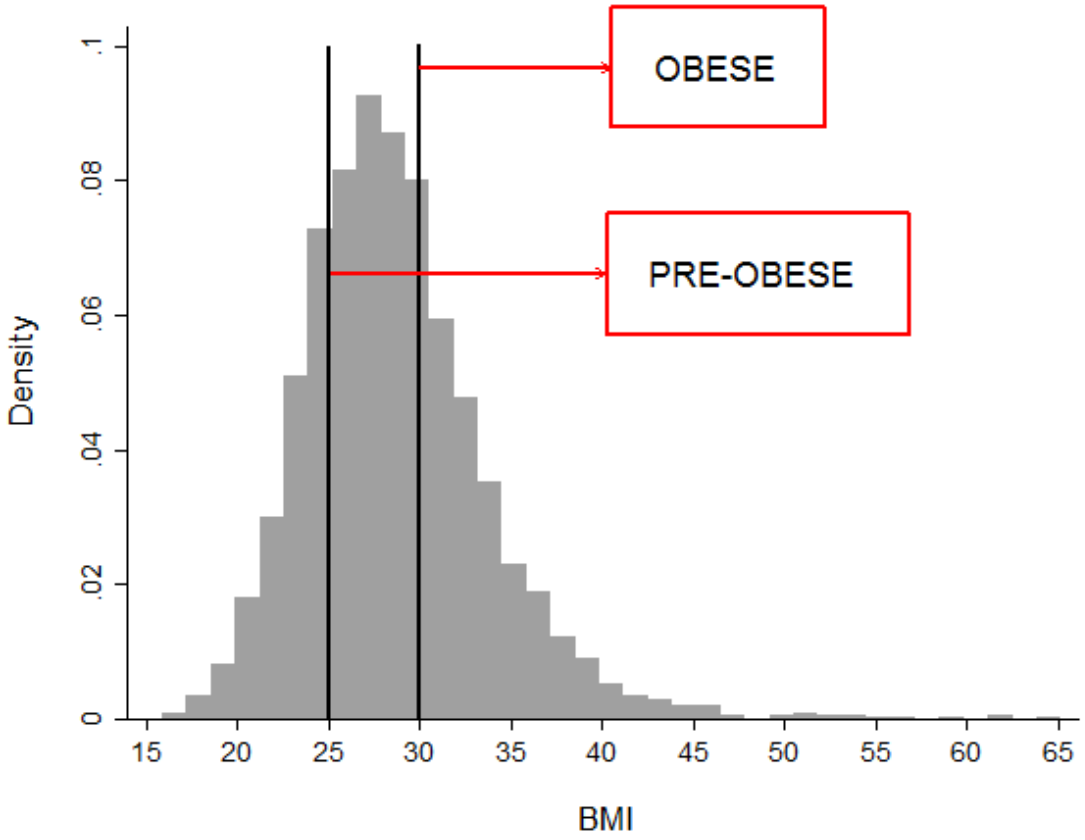
Methods

- Estimate a binary probit model of BMI>=30 (i.e., obese):

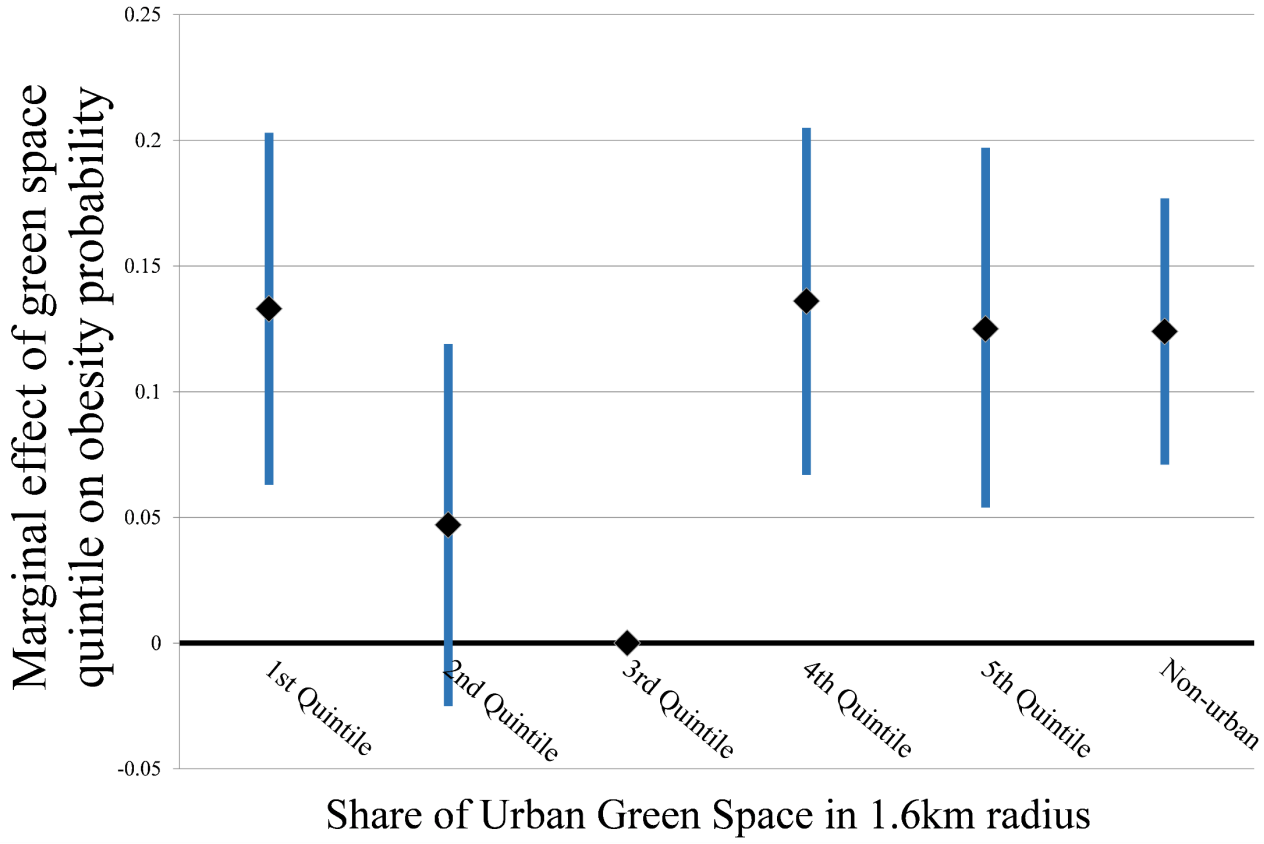
$$\Pr(obese_i = 1,0|\, green_i, X) = \Phi(\alpha + \beta_0 green_i + \sum \beta_k X_{ki})$$

- $green_i$ is quintile of green space
- X_k is a vector of other controls (age, sex, marital status, income, education, employment status, public health insurance cover, smoking status, mobility)

Distribution of BMI



Results


Marginal effect of green space quintile on obesity probability
0.25
0.2
0.15
0.1
0.05
0
-0.05
1st Quintile
2nd Quintile
3rd Quintile
4th Quintile
5th Quintile
Non-urban
Share of Urban Green Space in 1.6km radius

Robustness Checks

- Alternative model specification (i.e., ordered probit)
- Stratification by sex

Discussion

- What might explain our findings?
  - Selection

Discussion

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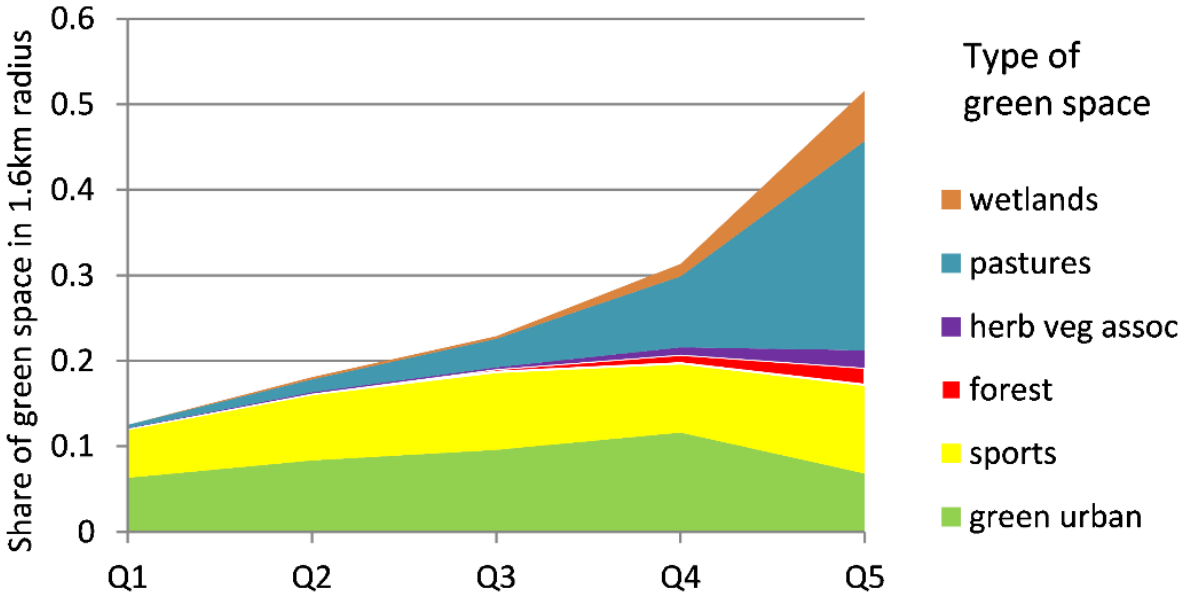
  - Selection
  - Type of green space

Discussion



Type of green space across quintiles measuring share of green space in 1.6km radius

Discussion

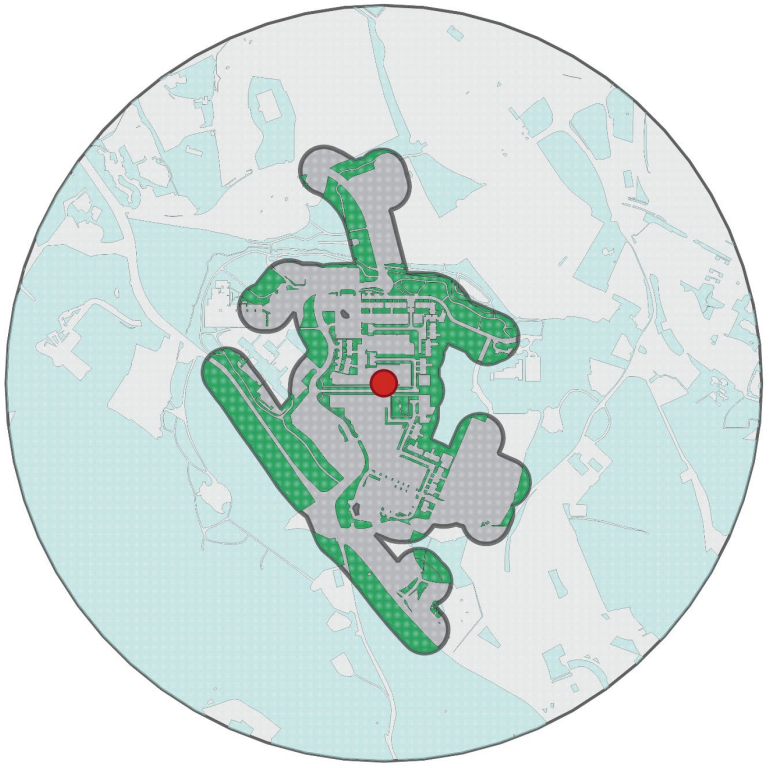
- What might explain our findings?
  - Selection
  - Type of green space
  - Accessibility of green space

Step A: Establish Buffer Around 'Walkable' Roads

Legend A

- Residential Address
- Walkable Roads Within 800m of Residential Address
- Other Roads with Network Distance >800m from Residential Address
- 50m Buffer Around Walkable Roads Within 800m of Residential Address
- 800m Radial Buffer

Step B: Restrict Greenspace Analysis to 'Walkable' Buffer



Legend B

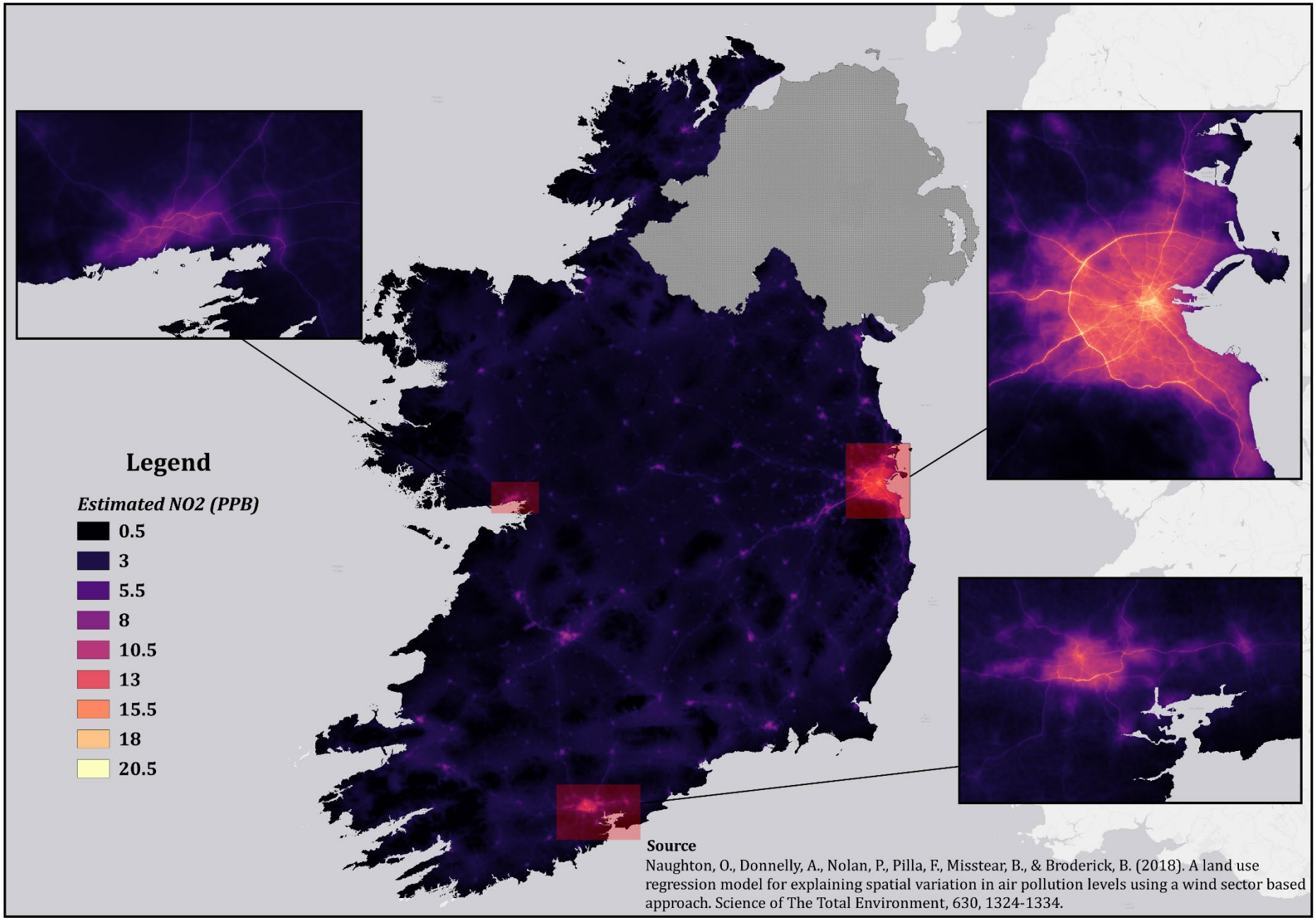
- Residential Address
- Greenspace Included in Analysis
- Greenspace Excluded from Analysis
- 50m Buffer Around Walkable Roads Within 800m of Residential Address
- 800m Radial Buffer

Summary/Next Steps

- Green space associated with obesity in the older population
  - U-shaped relationship highlights importance of accessibility as well as availability
  - Further analysis of possible mechanisms (e.g., physical activity, gait, *etc*.)
  - Attempt to identify causality

Future Work

- Effects of other environmental exposures on human health
  - Noise (EPA-funded NOISE-HEALTH)
  - Air Pollution (collaboration with TCD Engineering)



Source

Naughton, O., Donnelly, A., Nolan, P., Pilla, F., Misstear, B., & Broderick, B. (2018). A land use regression model for explaining spatial variation in air pollution levels using a wind sector based approach. Science of The Total Environment, 630, 1324-1334.

Future Work

- Effects of other environmental exposures on human health
  - Noise (EPA-funded NOISE-HEALTH)
  - Air Pollution (collaboration with TCD Engineering)
- Scoping out new survey data sources
- Assessing the health and wellbeing impacts of being a citizen scientist (biodiversity data recorder), in collaboration with the NBDC

Funders and Collaborators

Extra Slides

Radon