



Scottish Natural Heritage

Scotland's Greenspace Map in Action

Case study 3: Open space and health research in urban Scotland

Scotland's Greenspace Map (SGM) is a Geographical Information System (GIS) based map which provides comprehensive information on the location, extent and type of greenspace across urban Scotland.ⁱ

It was compiled from 32 individual local authority greenspace datasets. The datasets were produced using greenspace mapping characterisationⁱⁱ which involved using GIS maps and aerial photography to categorise greenspaces into 23 different open space types, based on the typology set out in Planning Advice Note 65.ⁱⁱⁱ The Map was published in September 2011 and is thought to be the first of its kind in the world.

This series of case studies provides examples of how data from Scotland's Greenspace Map has been used to inform the development of policy, practice and research at a range for scales, including local authority, regional and national.

Summary

Researchers at CRESH^{iv} wanted to investigate whether the availability of open space in urban Scotland relates to general and mental health – and whether different types of greenspace have an impact on health outcomes.

There is relatively consistent evidence that people living in neighbourhoods with more open space tend to be healthier than those in less open areas. Mechanisms such as provision of physical activity opportunities, social contact and restoration have been suggested to explain the relationship. However, 'open space' is often variably defined (e.g. does it include private spaces or beaches and other non-vegetated open spaces?), which makes the findings difficult to compare. Researchers have called for more research on which *types* of open space are beneficial for which health outcomes - this should help start to answer the 'how?' questions.

Scotland's Greenspace Map (for the first time) provides researchers with national-level data about the distribution of different types of greenspace.



Figure1: Aerial view of Glasgow suburbs. ©Lorne Gill/SNH



Study design

Open space 'availability' for respondents to the 2008-2011 Scottish Health Survey (SHeS) was calculated based on their home postcode.

Public and private open spaces were considered as being 'available', because even spaces that can't be physically accessed (e.g., private gardens) may influence health just by being viewed. Nonetheless, the researchers expected that spaces that can be physically entered and used may affect health differently (e.g. through physical activity), hence their interest in the ability to distinguish different types using SGM.

Regression analyses were conducted to test for independent associations between open space type and respondent health, after adjusting for individual-level characteristics.

Health outcome variables

One measure of general health and two measures of different aspects of mental health were selected.

Scottish Health Survey respondents reporting their health was either fair, bad or very bad (as opposed to good or very good) were coded as having bad general health.

Respondents scoring four or more on the 12-item General Health Questionnaire (GHQ12) were coded as a GHQ case – indicating minor psychiatric morbidity. Respondents' scores on the 14-item Warwick and Edinburgh Mental Wellbeing Score (WEMWBS) questionnaire were used as a continuous indicator of their mental wellbeing (higher score = better wellbeing).

Open space data

'Scotland's Greenspace Map' (SGM) was obtained in GIS shapefile format.^v

Researchers noted that open water areas are not well represented in the SGM dataset - they are typically only included if small enough to be included within a 'datazone' boundary (e.g. sea always excluded, and rivers excluded when larger than some arbitrary width). The SGM open water class was therefore supplemented with Ordnance Survey VectorMap data, indicating tidal and freshwater bodies.

The resulting dataset contained 5,511 km² of mapped open space, of which 43% was private garden, 10% was blue space, 10% was sports space, 8% was parkland, 1% was children's play space, and 28% was 'other open space'.

Measuring respondents' greenspace availability

Measuring greenspace availability within a specified distance of a respondent's home location is common in greenspace and health research. A 300 metre buffer was used in this study because of the 'Nature Nearby' guidance (Natural England) that everyone should have access to 'good quality greenspace' within 300 metres of their home.^{vi}

Percentage coverage of six open space types was calculated within 300 metre buffers of all postcodes in the urban study area (110,279 postcodes, or 51% of all Scottish postcodes).^{vii} This computationally-intensive processing was conducted in the Geographical Information System (GIS) software ArcMap 10.1 (ESRI, Redlands, CA).

The open space types were:

1. Total open space: all classes summed (includes land and water)
2. Private gardens
3. Blue space: foreshore, sea, rivers, lakes, ponds, riparian routes
4. Children's play spaces
5. Sports grounds: playing fields, golf courses, bowling greens, tennis courts, other sports
6. Other open space: parks, amenity greenspace, cemeteries, civic space, allotments, school grounds, workplace grounds, open semi-natural, woodland

The postcodes in the urban study area (51% of all Scottish postcodes) were grouped into tertiles for each open space type (1=low, 2=medium and 3=high availability) and appended to SHeS respondents based on their home postcode.



Figure 2: Wooded landscapes in an urban environment, view north from Blackford Hill, Edinburgh. ©Lorne Gill/SNH



Analyses

Regression models were constructed to assess the relationship of open space type availability tertiles with risk of reporting fair/bad general health or being a GHQ case (binary outcomes, hence logistic models), or with WEMWBS score (continuous outcome, hence linear regression model).

Each model was adjusted for demographic and health-relevant characteristics of the individual: age (continuous), sex, household income (equivalised, quintiles), highest level of educational attainment (low, medium and high), having children in the house (yes/no), current smoking (yes/no), and current alcohol drinking in excess of government recommendations (yes/no).

Subsequent models were stratified by sex and age group (4 groups: 16-44; 45-64; 65-74; 75+). Models accounted for non-independence of respondents due to the clustered sampling design (within datazones: the Primary Sampling Units (PSUs) of the SHeS). Models were run in Stata/IC 11.0 (StataCorp, College Station, TX).

Results

The findings of this study are awaiting publication and so only summary results are included in this case study.

The study found there is some indication that general health improves with increasing open space availability. After accounting for the influence of confounders researchers found that total open space availability within 300 metres of the home postcode was related to significantly better self-reported general health, but not to two measures of mental health and wellbeing.

Future research using SGM

The next steps are to analyse whether the relationships vary by type of open space.

The researchers are revisiting the classification used in the study to distinguish between open space types which are accessible and not publicly accessible spaces. This will enable them to look at whether particular types of space are particularly relevant for the improved general health relationship found, and whether particular types are related to either of the mental health measures. Being able to distinguish accessible from inaccessible spaces in this way will help researchers get a better idea of why open spaces can be good for health (e.g. is it because they can be used for physical activity, or is it just about being able to see open space?).

A major limitation to this work is that it is cross-sectional i.e. only relevant to one point in time. This means researchers cannot say whether open space availability is causally linked to general health; the opposite causal direction could be responsible, in that people in better general health might choose to move into neighbourhoods with higher open space availability. Having SGM data for more than one point in time would help analysts to investigate which causal pathway is more plausible, particularly if linked with a longitudinal dataset such as the Scottish Longitudinal Study.



Figure 3: Young mothers and their children in the playpark at the Botanic Garden, Glasgow, Strathclyde and Ayrshire Area. ©Lorne Gill/SNH



Key learning points

- The importance for research purposes of a consistent, national greenspace dataset for all settlements
- SGM provides robust data which enables researchers to undertake a range of analyses in relation to greenspace availability, type, general health and wellbeing
- SGM provides (for the first time at a national level) data about different greenspace types which enable tests for independent associations between greenspace type and health
- Open water areas are not represented well in SGM - researchers interested in blue space can supplement SGM data using, for example, Ordnance Survey VectorMap data
- SGM offers the potential for use in longitudinal studies which would enable causal pathways to be investigated - but only if SGM is maintained and updated with periodic fixed time-point archive datasets being taken



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References

- i Urban is defined as settlements with a population greater than 3000 with a 500 metre buffer applied to the urban fringe
- ii More information about Scotland's Greenspace Map and the mapping methodology can be found at <http://www.greenspacescotland.org.uk/1-scotlands-greenspace-map.aspx>
A publicly accessible version of SGM is available on the SNH website <http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/greenspace-and-outdoor-access/open-space-audits-and-strategies/dataset/> and SEWeb http://www.environment.scotland.gov.uk/get_interactive.aspx and SEWeb www.environment.scotland.gov.uk/get_interactive.aspx
- iii Scottish Government (2008) Planning Advice Note: PAN 65 Planning and Open Space (2008) <http://www.scotland.gov.uk/Publications/2008/05/30100623/0>
- iv The Centre for Research on Environment, Society and Health (CRESH) is a virtual centre joining scientists from the Universities of Edinburgh and Glasgow. Their research is focused on exploring how physical and social environments can influence population health, for better and for worse <http://cresh.org.uk/>
- v Academic users may be able to access SGM data under EDINA licence arrangements <http://www.greenspacescotland.org.uk/using-scotlands-greenspace-map.aspx>
- vi Natural England (2010) Nature Nearby - Accessible Natural Greenspace Guidance (NE265) <http://publications.naturalengland.org.uk/publication/40004>
- vii The urban study area was the SGM mapped area i.e. all settlements of 3000 population or more, with a 500 metre buffer around the settlement boundary

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