

Indicator specification:

GroundsWell collection of geographical and population health indicators

Unique Property Reference Number (UPRN) indicator:
Bluespace distances [Accessibility] (UPRN_4_1)



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Overview

Indicator title

Unique Property Reference Number (UPRN) indicator: Bluespace distances [Accessibility] (UPRN_4_1)

Indicator family name

Unique Property Reference Number

Descriptor Plain English description

This indicator provides road network distances (in meters) from UPRNs to any blue space.

Technical description

This indicator provides estimated road network distances (in meters) between UPRN and any blue space. Distances were estimated using road network distances between any blue space in the area and each TOID (TOPographic Identifier, as defined by the Ordnance Survey: <https://www.ordnancesurvey.co.uk/products/os-open-toid>), then mapped to UPRNs.

Unique Identifier

UPRN_4_1

Construction

Data sources

The following open data sources were used as inputs in the creation of these methods:

- **Road network:**

The [Ordnance Survey Open Roads](#) resource was used to act as the network to estimate the accessibility between origins and destinations (data downloaded on 4th June 2024). The resource is a vector file containing the entire road network for Great Britain, including information about the nature of a road (e.g., speed limit, type of road). The resource is set up to represent lines and nodes (connections between different lines, such as junctions). While we could have used Open Street Map data here, we have found that this resource has more accurate road speed networks.

The resource does not include routes available via ferries which can be an important transport network when living on a remote island (especially for Scotland, although less relevant for Cheshire and Merseyside here). Ferry routes were accessed from [Open Street Map](#).

- **Origins:**

The origin locations are our inputs for which we want to estimate the nearest distance/time to an object of interest. In our code here, the interest is on households which we define using the Unique Property Reference Number (UPRN). UPRNs are unique identifiers for all unique properties across Great Britain. Data were downloaded on 4th June 2024 using the [Ordnance Survey Open UPRN product](#).

The population of interest for our metric is Cheshire and Merseyside. An additional [ONS lookup table](#) linked to each UPRN was used to subset only UPRNs that fall within the Local Authorities of Cheshire and Merseyside (Chester and Cheshire East, Cheshire West, Halton, Knowsley, Liverpool, Sefton, St. Helens, Warrington and Wirral). If you wanted to recreate our indicators for a different region, one would have to change this step in the code.

The methods used are computationally intensive and the density of UPRNs bring their own challenges (especially compared to postcodes). To improve the time spent processing UPRNs, we initially compute the metrics for [Topographic Identifiers](#) (TOIDs) rather than UPRNs. UPRNs are nested within TOIDs, since UPRNs will give each unique property and TOIDs give the unique building. For example, a tower block or student halls accommodation will have many UPRNs for the same TOID/building (e.g., Crown Place student halls at the University of Liverpool (UK) has ~1200 UPRNs for a single TOID). Through using TOIDs, we reduce the number of computations on the assumption that they will be similar for all UPRNs (note: there will be some small differences where TOIDs have multiple entrances, but the differences should be negligible here). The result is that using TOIDs gives us a dataset which is 23% smaller than if we use UPRNs only. In the workflow described below, we first estimate each indicator for TOIDs within Cheshire and Merseyside (using the datasets described above), then link the TOID values back to UPRNs using an [Ordnance Survey lookup table](#). If you are using the code for smaller regions of UPRNs, then you may not need to do this.

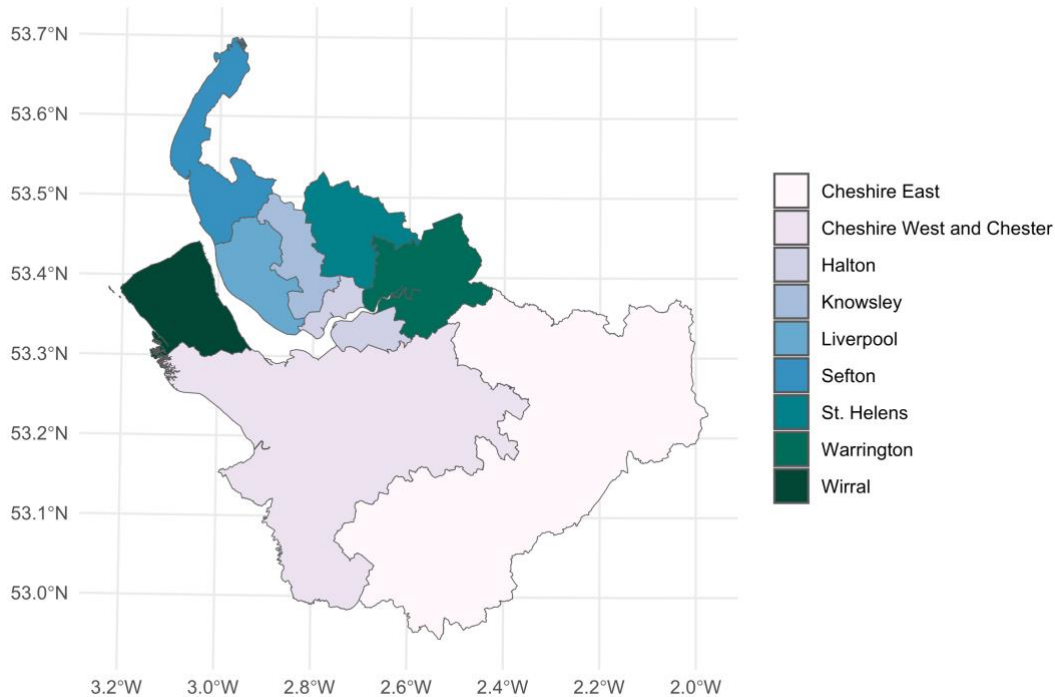


Figure 1. NHS Cheshire and Merseyside ICB region

- **Destinations:**

Destinations refers to the specific features of interest that we are interested in estimating the nearest distance/time to for each origin. The data described here are therefore flexible to the specific indicator one wants to create.

Greenspaces:

[Ordnance Survey’s Open Green Space Layer](#) resource was used to capture the locations of green spaces. The resource covers Great Britain, although we subset only green spaces for Cheshire and Merseyside in our analysis here.

The routing algorithm described below expects point locations. We therefore use the access points of each green space when estimating accessibility. Access points are the specific locations in which individuals can enter a green space (e.g., gate, road entry point). The resource also includes polygons of the spatial extent of each green space. Using these polygons, the size of each green space is calculated. We follow Geary et al. (2023) definitions of green space types for inclusion of the functional types of green space.

While the Ordnance Survey includes access points for each green space vector, they can be of mixed quality (e.g., missing access points or lack of informal routes that people may also use). To counter this, we follow the methodology outlined in Geary et al. (2023). Here we process the access points to select the north, south, east and west extents of the spatial boundaries of each green space. These are then added to the Ordnance Survey’s access points to supplement them.

The open green space layer does not include open access land which are found in rural areas (i.e., field and farmland with right of ways through them). We accessed

their spatial extents via [Natural England's open data resource](#). This follows the methodology set out by Natural England in their Green Infrastructure project. Since the files only include the spatial extent and do not include the specific access points, we process each row to estimate the north, south, east and west points to mimic this (using the same approach as described above).

Bluespaces:

There was no single source capturing all types of blue spaces available, so we combined several sources together. [Ordnance Survey's Open Rivers](#) resource was used to capture key waterways including rivers (both inland and tidal), streams and canals across Great Britain. The resource also contains some lakes but they are few in total. To address this, we supplemented the dataset with the UK Centre for Ecology and Hydrology's [UK Lakes Portal](#) dataset which contains an open spatial inventory of UK waterbodies (lakes, reservoirs, public ponds). The resource was originally created from Ordnance Survey data. Finally to capture the coastline and sea, we used the Great Britain coastlines as defined by [Ordnance Survey's open boundaries resource](#). We use the coastline since it captures the sea and those related infrastructure or physical features found at the coast - piers, cliffs, beaches, harbours, marinas, docks, promenades. The coastline was defined as the high water extent.

In contrast to the green space measures, we only have the exact spatial extents of each blue space feature (i.e., lines and polygons). There was no definition of access points to these features which would make data processing difficult. Attempting to find intersection points alongside paths was not possible, as there is no open paths dataset outside of OpenStreetMap (which may not contain all paths). Similarly, intersecting the road network would give erroneous results where blue spaces were located inside large parks (i.e., they would not intersect).

Our approach was therefore to estimate access points by sampling points every 100 meters along each line or polygon. While this likely overestimates the number of access points, since the algorithm works by matching each point to its nearest road point this will be rectified later as points would likely match to the same road. Preliminary checks seemed to suggest that this was a reasonable assumption to have.

References:

Geary, R.S., Thompson, D.A., Garrett, J.K., Mizen, A., Rowney, F.M., Song, J., White, M.P., Lovell, R., Watkins, A., Lyons, R.A., Williams, S., Stratton, G., Akbari, A., Parker, S.C., Nieuwenhuijsen, M.J., White, J., Wheeler, B.W., Fry, R., Tsimpida, D., Rodgers, S.E., 2023. [Green-blue space exposure changes and impact on individual-level well-being and mental health: A population-wide dynamic longitudinal panel study with linked survey data](#). Public Health Research 1–176.

Presentation

Breakdowns

Time period

Cross sectional based on the Ordnance Survey Open UPRN product v2024.04.

Demographic

Not applicable

Geographic

Unique Property Reference Number (UPRN) level

Disclosure control

Not applicable. Whilst UPRNs can be used to identify unique properties, on their own they cannot be used to identify a particular individual.

Outputs:

UPRN_4_1_bluespace_distances.csv

Column name	Description
UPRN	Unique Property Reference Number as per the Ordnance Survey Open UPRN product v2024.04.
distance_any_bluespace	Road network distance (in metres) from the UPRN to 'any' green space – considers all green spaces of any size.

UPRN_4_1_bluespace_distances_with_coords.csv

Column name	Description
UPRN	Unique Property Reference Number as per the Ordnance Survey Open UPRN product v2024.04.
distance_any_bluespace	Road network distance (in metres) from the UPRN to 'any' green space – considers all green spaces of any size.
latitude	latitude of the UPRN, given in decimal degrees, where N is positive and S is negative.
longitude	longitude of the UPRN, given in decimal degrees, where E is positive and W is negative.

Revision history

Version	Date	Summary of changes
1.00	2024-10-09	First release