



**national network
for neighbourhood
improvement**



Social Capital Score

Technical Methodology Paper

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Introduction

About this technical report

This report presents the conceptual framework behind 3ni's Social Capital Score. The measure has been created by 3ni's research partner OCSI (Oxford Consultants for Social Inclusion) following a thorough literature review, evidencing the definitions, methodologies and indicators used across other research papers to measure social capital. The focus of this research was on different approaches to measuring Bonding, Bridging and Linking social capital and identifying any relevant indicators or proxy indicators which could be drawn on at neighbourhood level. It builds on the recent Social Capital 2025 series of papers published in partnership by 3ni, Local Trust and Demos, and the development of 3ni's discovery tool to help identify community needs and strengths at the hyper-local level.

This technical report provides an outline of the methodology for creating the Social Capital Score; the component indicators and dimensions and the decisions taken to inform the methodological approach. It also includes an analysis of the results, using visualisations to identify the neighbourhoods with low levels of social capital, including an exploration of how these areas fare on other measures of social need such as the Indices of Multiple Deprivation 2025 (IMD) and Community Needs Index 2023 (CNI).

What is social capital?

Social capital is often understood as a kind of community asset, impacting a community's capacity for resilience with a focus on neighbourhood cohesion, civic engagement and the availability of resources to maximise both. Following this widely accepted framework, social capital has been explored in this research through three interconnected dimensions:

- **Bonding social capital** refers to the strong, close-knit ties among individuals with similar backgrounds, such as family, close friends, or neighbours. These connections foster a sense of belonging, emotional support, and shared identity within relatively homogeneous groups. This form of social capital is often associated with internal cohesion and resilience at the local level (Norris et al., 2008; Ahn & Davis, 2020; ONS, 2022; Irfan et al., 2023).
- **Bridging social capital** captures the relationships that span across diverse social groups, linking people from different ethnic, socio-economic, or cultural backgrounds. These ties are characterised by more distant but broader networks that promote the exchange of information, increase tolerance, and support inclusive community participation (McCulloch, 2003; ONS, 2022; Irfan et al., 2023). Bridging ties are particularly important for social mobility and cross-community collaboration.
- **Linking social capital** refers to the vertical connections between individuals or communities and institutions, such as local government, public services, or other centres of power and authority. These relationships enable access to resources, opportunities, and influence beyond the immediate community, and are critical for navigating systems, improving outcomes, and addressing structural disadvantage (Szreter & Woolcock, 2004; Norris et al., 2008; Irfan et al., 2023; ONS, 2022).

Based on the above definitions, high levels of social capital generally suggest a stronger ability for collective action, mutual support and resilience in the face of challenges (like economic shocks, health crises, or environmental risks). Conversely, low social capital can indicate neighbourhood fragility, social isolation or barriers to accessing services and opportunities – all of which can undermine community wellbeing and resilience.

Creating the Social Capital Score at neighbourhood level

The Social Capital Score has been created as a measure of social capital that can be explored at the neighbourhood level using indicators and proxy indicators derived from established literature and available data sources. This approach captures the multi-dimensional nature of social capital (as defined above), while remaining sensitive to local context and the need for small-area measurement to support local level change. The sections below outline the steps taken to develop the score.

Identifying dimensions to measure social capital

In order to develop this measure, each of these broad concepts of social capital have been constructed as a 'dimension' including a set of indicators or proxy indicators that were drawn out from the literature review. These dimensions have then been combined to create an overall measure of social capital at neighbourhood level. The dimensions can be summarised as follows.

- **Bonding:** Capturing multiple dimensions of local social capital including socio-economic diversity, income inequality, neighbourhood relationships and support, crime levels and residential stability.
- **Bridging:** Reflecting civic engagement and community capacity through the presence of civic assets, third sector organisations, volunteering levels, unpaid care provision and occupational diversity.
- **Linking social capital:** Highlighting connections (or lack thereof) between communities and formal institutions of power and influence such as voter turnout, civic engagement, high social grade and public or third sector employment.

Selecting the geographic unit of analysis

This section explores the approach for selecting the geography to use as the building block in constructing the Social Capital Score. In the absence of data at the level of individuals or households, a measure that identifies social capital should be constructed from data on small geographic units of a standard population size. This measure has therefore been developed as an area-based indicator. An area can be characterised as having low social capital relative to other areas on the basis that a higher proportion of people in the area are experiencing barriers to social capital (e.g. poor social relationships or low civic engagement) or if the area as a whole is lacking in infrastructure to address low social capital (e.g. third sector organisations, occupational diversity). In other words, both the experience of the people in an area and the areas' infrastructure gives the area its Social Capital Score.

The selection of the unit of geography to use in an area-based analysis is important as it affects both the data we can draw from, and crucially, the focus areas for intervention and resource allocation which are identified as an outcome of the research.

The following key principles have been considered when selecting the appropriate unit of geography for the measure:

- It should be possible to align the geography units to statistical geography boundaries in order to link key socio-economic indicators to the geography units.
- Geography units should be of sufficient size in order to ensure they are not smaller than the smallest standard statistical geographies (Output Areas), so that it is possible to obtain key socio-economic indicators to be used in the analysis.
- Geography units should be at a neighbourhood (sub-Local Authority) level in order to capture inequalities in social infrastructure provision and participation.
- Geography units should be relatively homogenous in population size so that it is possible to make direct comparisons between communities in terms of their relative needs and community and civic strength.
- Geography units should be meaningful and recognised as areas by the people residing in them.

LSOAs were identified as the preferred unit of measure for a number of reasons:

- They only change after every census, so they are more consistent over time. Even when changes are made following census updates, these changes are capped, with a minimum of 95% of boundaries remaining unchanged. They therefore represent a more stable geography than wards.
- LSOAs are designed to be fairly homogenous in size (averaging at 1,700 people). They also nest directly with smaller statistical geographies (Output Areas).
- To support the identification of rural pockets of need, which tend to be revealed at smaller geographical scales. By contrast, single MSOAs and wards can encompass multiple villages with very different characteristics.
- Finally, LSOAs are a more commonly used geography and are increasingly used to disseminate key statistics releases.

Producing the Social Capital Score at LSOA level would therefore enable users to benchmark the performance of areas with low social capital against a wider range of socio-economic measures. This should increase the utility and analytical value of the indicator.

Identifying indicators

We have identified a set of measurable indicators and proxy indicators relevant to each dimension. The selection was guided by studies that examined how social capital can be assessed using data available at small-area geographies. The table below summarises the dimensions and corresponding indicators used in this measure, alongside references to the key research sources that informed their inclusion.

Indicators were only selected if they fulfilled the following criteria:

- ✓ Indicators have full national coverage and are collected on a consistent basis at national level.
- ✓ Indicators are available at sufficient granularity in order to make meaningful comparisons between neighbourhoods.
- ✓ Indicators represent the most up-to-date measure of this particular theme.
- ✓ Indicators are non-disclosive and abide by the conditions of the data protection act and GDP.
- ✓ Indicators are sufficiently statistically robust to be included in a measure intended for use in resource allocation.

The following table provides an overview of each of these indicators with metadata concerning:

- **Indicator name and description**
- **Timepoints the data is available for**
- **Data source**
- **Geographical unit at which the data is published**
- **Methodology notes**
- **Social capital source**

Bonding

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Socio-economic diversity	This measure of socio-economic diversity captures the balance between high and low skills within a population. It calculates the difference between the percentage of people with higher level qualifications (Level 4 and above) and those with no qualifications (calculated as = % with Level 4+ qualifications – (% with no qualifications). For example, if 25% of people have Level 4+ qualifications and 10% have no qualifications, the calculation would be: 25 – (–10) = 35%. A higher result indicates a greater imbalance between the two groups – typically a high proportion of highly educated individuals and a high proportion with no qualifications. In contrast, a lower result suggests that the area is less polarised in terms of skill levels, indicating greater social similarity (reinforcing bonding capital).	Census 2021	2021	Output Area	Calculated by taking % of those with level 4+ qualifications as a positive value and subtracting the percentage of those with no qualifications as a negative value and calculating the difference e.g. if in area A 25% of people had level 4+ qualifications and 10% had no qualifications the calculation would be 25 – (–10) = 35%.	Norris, Stevens, Pfefferbaum, Wyche, and Pfefferbaum (2008) cited in Capturing Bonding, Bridging, and Linking social capital through Publicly Available Data December 2019 Risk, Hazards & Crisis in Public Policy
	Income inequality	This measure captures income inequality within local areas by calculating the difference between the 90th and 10th percentile of net individual incomes at the Lower-layer Super Output Area (LSOA) level. The data is sourced from the Admin-based Income Statistics, which include income from PAYE employment, self-employment (via Self-Assessment), and benefits. A higher value indicates a wider gap between high and low earners, reflecting greater income inequality within the area. This suggests a more polarised income distribution, with a significant divide between the wealthiest and the least well-off residents. A lower value, by contrast, suggests a narrower income range, indicating a more equal income distribution where individuals' earnings are more similar, regardless of overall income levels.	ONS https://www.ons.gov.uk/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/datasets/peoplepopulationandcommunity/personalandhouseholdfinances/incomeandwealth/datasets/	2016	LSOA		Cited in Capturing Bonding, Bridging, and Linking social capital through Publicly Available Data December 2019 Risk, Hazards & Crisis in Public Policy

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Neighbourhood relationships	The Community Life Survey contains key indicators of Neighbourhood relationships. The 2017/18, 2018/19, 2019/20 and 2020/21 iterations of the Community Life Survey are published with the associated Output Area Classification of each respondent in the survey. Using the Output Area Classification it is possible to apportion response rates to Output Area level, allocating response rates (%) to each Output Area based on their Output Area Classification group membership. Data is then aggregated from Output Area to provide estimated rates for key indicators. The following indicators are included: • People never chat to their neighbours • Self-reported levels of loneliness	Community Life Survey: DCMS/Output Area Classification 2011: ONS Licensed data – access via UK data archive https://www.data-archive.ac.uk/	2017/18, 2018/19, 2019/20 and 2020/21	Output Area	Data are constructed from a survey with a small sample size. Data has been apportioned down to Output Area level using Output Area Classification group membership – (which groups together Output Areas based on their shared socio-economic characteristics). Caution should be applied when interpreting these results at small-area level because of the small sample size of the survey. Four years of data were used to increase the size of the response rate.	Cited in Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022
	Neighbourhood support	The Community Life Survey contains key indicators of Neighbourhood cohesion. The 2017/18, 2018/19, 2019/20 and 2020/21 iterations of the Community Life Survey are published with the associated Output Area Classification of each respondent in the survey. Using the Output Area Classification it is possible to apportion response rates to Output Area level, allocating response rates (%) to each Output Area based on their Output Area Classification group membership. Data is then aggregated from Output Area to provide estimated rates for key indicators. The following indicators are included: • People who borrow and exchange favours with neighbours • People feel fairly or very comfortable with asking a neighbour to keep a set of keys to their home for emergencies • People feel fairly or very comfortable with asking a neighbour to collect a few shopping essentials if they were ill and at home on their own	Community Life Survey: DCMS/Output Area Classification 2011: ONS Licensed data – access via UK data archive https://www.data-archive.ac.uk/	2017/18, 2018/19, 2019/20 and 2020/21	Output Area	Data are constructed from a survey with a small sample size. Data has been apportioned down to Output Area level using Output Area Classification group membership – (which groups together Output Areas based on their shared socio-economic characteristics). Caution should be applied when interpreting these results at small-area level because of the small sample size of the survey. Four years of data were used to increase the size of the response rate.	Cited in Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Estimates of social trust	Proportion of people who state that they who always or usually trust their neighbours. FocalData surveyed 42,696 adults across England. Respondents were asked how much they trust other people, using a standard question from the British Social Attitudes survey: "Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?" Respondents were asked to say whether they think that people can almost always or usually be trusted or that you usually or almost always can't be too careful in dealing with people. FocalData then ran a multilevel regression and post-stratification (MRP) to estimate average levels of trust in each neighbourhood, which we defined as a Middle-layer Super Output Area (MSOA). The model included individual and area characteristics, including: overcrowded housing, ethnicity, health, qualification levels, housing tenure, social grade, age and gender.	UK Onward	2022	MSOA	These are not direct estimates. Data is modelled from sample survey data using a multilevel regression and post-stratification (MRP) to estimate average levels of trust in each neighbourhood. Variation in levels of social trust at MSOA level are influenced by the areas socio-demographic characteristics.	Cited in Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022 and Irfan, M., Buckley, K., Cheung, S.Y. et al. Mapping social capital across Wales (UK) using secondary data and spatial analysis. SN Soc Sci 3, 56 (2023). https://doi.org/10.1007/s43545-023-00639-1
	Belonging and perception of the neighbourhood	The Community Life Survey contains key indicators of Neighbourhood cohesion. The 2017/18, 2018/19, 2019/20 and 2020/21 iterations of the Community Life Survey are published with the associated Output Area Classification of each respondent in the survey. Using the Output Area Classification it is possible to apportion response rates to Output Area level, allocating response rates (%) to each Output Area based on their Output Area Classification group membership. Data is then aggregated from Output Area to provide estimated rates for key indicators. The following indicators are included: • People who feel they belong very strongly to neighbourhood • People agree that people in their neighbourhood pull together to improve the neighbourhood	Community Life Survey: DCMS/Output Area Classification 2011: ONS Licensed data – access via UK data archive https://www.data-archive.ac.uk/	2017/18, 2018/19, 2019/20 and 2020/21	Output Area	Data are constructed from a survey with a small sample size. Data has been apportioned down to Output Area level using Output Area Classification group membership – (which groups together Output Areas based on their shared socio-economic characteristics). Caution should be applied when interpreting these results at small-area level because of the small sample size of the survey. Four years of data were used to increase the size of the response rate.	Ahn MY, Davis HH (2020) Sense of belonging as an indicator of social capital. Int J Sociol Soc Policy 40(7/8):627–642 Cited in Irfan, M., Buckley, K., Cheung, S.Y. et al. Mapping social capital across Wales (UK) using secondary data and spatial analysis. SN Soc Sci 3, 56 (2023). https://doi.org/10.1007/s43545-023-00639-1

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	IoD Crime domain	The Indices of Deprivation (IoD) 2025 Crime Domain measures the risk of personal and material victimisation at local level. The following indicators are included: Violence with injury (including homicide); Violence without injury; Stalking and harassment; Burglary; Theft (including robbery, but excluding shoplifting); Criminal damage (including arson); Public order and possession of weapons; Anti-social behaviour. All indicators are presented as a rate per 1,000 at risk population. A higher score indicates that an area is experiencing higher levels of deprivation.	Ministry of Housing, Communities and Local Government (MHCLG)	2025	LSOA		Cited in Irfan, M., Buckley, K., Cheung, S.Y. et al. Mapping social capital across Wales (UK) using secondary data and spatial analysis. SN Soc Sci 3, 56 (2023). https://doi.org/10.1007/s43545-023-00639-1
	CDRC Residential Mobility Index	Shows the proportion of households that have changed between 2000 and the beginning of 2025. The Residential Mobility Index provides an estimate of the churn of the residential population in the UK. The estimates were built from linking administrative and consumer data, including electoral registers, consumer registers and land registry house sale data. Residential mobility ("Population Churn") is estimated at the household level. Households' start and end dates are extracted from individual level data by combining individuals that at any point in time have shared time together in the same property or have a shared surname in the same property. First household member determines the 'start' date (household identified as moving in), last household member determines the 'end' date (household identified as moving out).	Consumer Data Research Centre https://data.cdrc.ac.uk/dataset/cdrc-residential-mobility-index	2000 -2025	LSOA		McCulloch, A. (2003). An Examination of social capital and Social Disorganisation in Neighbourhoods in the British Household Panel Study. Social Science & Medicine. https://www.researchgate.net/publication/10875273_An_Examination_of_Social_Capital_and_Social_Disorganisation_in_Neighbourhoods_in_the_British_Household_Panel_Study

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Facebook Support Ratio	This indicator takes each person in the area, looks at all of their Facebook friends (even if those friends live elsewhere) and for each friend, checks whether that friend shares at least one other friend in common with the original person. This is then computed into a fraction of friends who do share a friend in common with the original person. This creates a "support ratio" for each person in the area and the indicator is the average of that support ratio across all people in the area.	Facebook	2025	MSOA / Super Data Zone	This is included as a measure of local social cohesion and network embeddedness, capturing the extent to which residents are connected through mutually reinforcing social ties.	

Bridging

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Civic assets	This is conceptualised as the number of assets inside the local area or within 1km of the local area boundary, divided by the number of people living inside the local area. Rate is expressed per 100,000 population. Assets included are: • Community assets (community support and welfare services, voluntary and non-profit organisations, religious institutions, social clubs, town halls, public amenities and services supporting families, youth, older people, and vulnerable groups) • Educational assets (schools (primary, secondary and specialist), higher and further education institutions, libraries, childcare and early years provision, vocational and professional training centres, tutoring services, and adult learning facilities) • Leisure assets (entertainment venues, hospitality and food outlets, recreational attractions, parks and natural spaces, sports facilities, gyms and fitness centres, outdoor activity providers and tourism and visitor attractions) • Cultural assets (museums, galleries, theatres and performance venues, cultural centres, historic landmarks, monuments, festivals, architectural and heritage attractions and organised cultural tours) • Retail assets (food retailers and markets, convenience and grocery stores, clothing and fashion outlets, home and hardware stores, specialist and independent shops, shopping centres and a wide range of comparison retail services)	Point of Interest data for the United Kingdom	2024	Point Location	Does not take into account the size of the retail unit or how accessible it is to the local community. The UK Point of Interest (POI) dataset has been subject to academic peer review and external validation on a subset of the data, demonstrating good overall accuracy. However, further checks are recommended to fully assess completeness, representation and potential bias. Further details are available at: https://data.geods.ac.uk/dataset/point-of-interest-data-for-the-united-kingdom	Cited in Capturing Bonding, Bridging, and Linking social capital through Publicly Available Data December 2019 Risk, Hazards & Crisis in Public Policy

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	AE5: Third sector organisations	Third sector organisations per 100,000 population. Figures are taken from the UK Third Sector Database. The database is the project of an ESRC funded (Project Reference: ES/X000524/1) group of collaborators seeking to improve data infrastructure surrounding the UK's third sector and civil society. The database utilises relevant extant data sources that are generated and shared by UK bodies with regulatory oversight of third sector organisations. Additionally incorporating data generated by membership bodies such as Co-operatives UK where available. Sources include; Companies House, Charity Commission, Office of Scottish Charity Regulator, Charity Commission for Northern Ireland, Cooperatives UK, FCA Mutuals Public Register, Care Inspectorate Scotland, Care Quality Commission, Scottish Housing Regulator, Regulator of Social Housing. Rate Calculated as: (Third Sector Organisations/ Total Population) *100000	The UK Third Sector Database	Dec 2025	Postcode	This is based on the location of organisations rather than on their area of operations (some will have a global focus). Larger charities are excluded from this measure. This indicator is included in this theme to capture the level of third sector activity in the local area. Organisations with an exclusively national or international focus have been excluded, to ensure only organisations with a local focus are included. Some organisations appear on multiple registers – duplicate records have been stripped so only unique records remain. This will exclude smaller companies not registered and exclude co-operatives, community benefit societies, associations, trusts and partnerships (of varying types).	Cited in Disentangling social capital – Understanding the effect of bonding and bridging on urban activity participation Divyakant Tahlyan a,* , Amanda Stathopoulos b, Michael Maness c

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Volunteering	The Community Life Survey contains key indicators of volunteering and civic participation. The 2015/16, 2017/18, 2018/19, 2019/20 and 2020/21 iterations of the Community Life Survey are published with the associated Output Area Classification of each respondent in the survey. Using the Output Area Classification it is possible to apportion response rates to Output Area level, allocating response rates (%) to each Output Area based on their Output Area Classification group membership. Data is then aggregated from Output Area to provide estimated rates for key indicators. The following indicators are included: • Civic activism at least once in the last 12 months • People have taken part in community groups, clubs or organisations in the last 12 months e.g. children's education/schools, youth/children's activities, education for adults, Sport/exercise (taking part, coaching or going to watch), religion, politics, health, disability and social welfare, older people, safety, first aid, the environment, animals, justice and human rights, local community or neighbourhood groups, citizens groups, hobbies, recreation/arts/social clubs • People have taken part in formal or informal volunteering in the last 12 months	Community Life Survey: DCMS/Output Area Classification 2011: ONS Licensed data – access via UK data archive https://www.data-archive.ac.uk/	2015/16, 2017/18, 2018/19, 2019/20 and 2020/21	Output Area	Data are constructed from a survey with a small sample size. Data has been apportioned down to Output Area level using Output Area Classification group membership (which groups together Output Areas based on their shared socio-economic characteristics). Caution should be applied when interpreting these results at small-area level because of the small sample size of the survey. Four years of data were used to increase the size of the response rate.	Cited in Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022. Exploring the role of social capital influence variables on travel behaviour. Author links open overlay panel Florie Di Ciommo a, Julio Comendador a, María Eugenia López-Lambas b, Elisabetta Cherchi c, Juan de Dios Ortúzar d
	People providing no unpaid care	Shows the proportion of people providing no unpaid care. Figures are based on self-reported responses to the 2021 census. A person is a provider of unpaid care if they give any help or support to family members, friends, neighbours or others because of long-term physical or mental health or disability, or problems related to old age. The figures include all people of all ages providing unpaid care.	Census 2021	2021	Output Area		Cited in <i>Creating stable and healthy communities: How does social capital generate social and economic outcomes for individuals and communities? Paper 1b The stock of social capital in the UK today DRAFT – EDITED 2ND October 2024</i>

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Occupational diversity	This measure captures the diversity of employment sectors within a local area by counting the number of distinct industries that have a significant employment presence. Specifically, it tallies the number of industries with 10 or more employees in each Middle-layer Super Output Area (MSOA), based on data from the UK Business Counts dataset. The dataset includes 87 detailed industry categories, classified according to the UK Standard Industrial Classification (SIC) system. These industries fall within the following broader categories: agriculture, mining, manufacturing, utilities, waste and water services, construction, wholesale and retail, transport and storage, hospitality, information and communication, finance, real estate, professional and technical services, administration, public administration, education, health and social care, arts and recreation, and other services.	Census 2021	2021	MSOA		Cited in Disentangling social capital – Understanding the effect of bonding and bridging on urban activity participation Divyakant Tahlyan a,* , Amanda Stathopoulos b, Michael Maness c
	Facebook volunteering: Participate in volunteering group on Facebook / Number of volunteering groups per 1,000 people on Facebook	The proportion of people in this area who participate in at least one volunteering group on Facebook. + Considering all volunteering groups in which anyone from the area participates on Facebook, this indicator shows the number of such groups there are per 1,000 people in this area based on Facebook activity.	Facebook	2025	MSOA		

Linking social capital

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Low voter turnout at local elections	Valid voter turnout (%) at the most recent Local Council Elections.	Electoral Commission https://www.electoralcommission.org.uk/who-we-are-and-what-we-do/elections-and-referendums/past-elections-and-referendums/european-parliamentary-elections/report-may-2019-european-parliamentary-elections-and-local-elections	2016/ 2017/ 2018/ 2019/ 2021/ 2022	Ward	There is some local variation in the frequency and dates of local elections, with different parts of the country going to the polls at different times and at different intervals. Caution is therefore advised when drawing direct comparisons between local areas, as the socio-political context and weather conditions vary from year to year with associated impacts on turnout rates. Another factor affecting turnout is whether the local election is concurrent with other elections (for example, turnout is generally higher when general elections coincide with local ones). We have suggested steps to mitigate against this by adjusting estimates from previous years to the 2019 average turnout.	Cited in Irfan, M., Buckley, K., Cheung, S.Y. et al. Mapping social capital across Wales (UK) using secondary data and spatial analysis. SN Soc Sci 3, 56 (2023). https://doi.org/10.1007/s43545-023-00639-1 and Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Lack of civic engagement or participation	The Community Life Survey contains key indicators of volunteering and civic participation. The 2015/16, 2017/18, 2018/19, 2019/20 and 2020/21 iterations of the Community Life Survey are published with the associated Output Area Classification of each respondent in the survey. Using the Output Area Classification it is possible to apportion response rates to Output Area level, allocating response rates (%) to each Output Area based on their Output Area Classification group membership. Data is then aggregated from Output Area to provide estimated rates for key indicators. The following indicators are included: • People have taken part in a consultation about local services or issues in their local area • People are a member of a local decision-making group e.g. group set up to regenerate the local area, tackle crime problems, making decisions on local health or education services, tenants' group decision making committee, group making decisions on local services for young people or the local community • People have taken part in any civic engagement • People definitely or tend to agree that they can influence decisions in their local area	Community Life Survey: DCMS/Output Area Classification 2011: ONS Licensed data – access via UK data https://www.data-archive.ac.uk/	2015/16, 2017/18, 2018/19, 2019/20 and 2020/21	Output Area	Data are constructed from a survey with a small sample size. Data has been apportioned down to Output Area level using Output Area Classification group membership – (which groups together Output Areas based on their shared socio-economic characteristics). Caution should be applied when interpreting these results at small-area level because of the small sample size of the survey. Four years of data were used to increase the size of the response rate.	Cited in Office for National Statistics, Report about social capital in the UK 2015, 2017, 2020 and 2022
	High Social Grade	Shows the proportion of people in employment (aged 16+) in the Approximated Social grade (N-SEC) category: 1 Higher managerial, administrative and professional occupations. An individual's approximated social grade is determined by their response to the occupation questions in the 2021 census. Rate calculated as = (Higher managerial, administrative and professional occupations (census KS611))/(All usual residents aged 16 to 74 (census KS611))*100	Census 2021	2021	Output Area		Cited in Disentangling social capital – Understanding the effect of bonding and bridging on urban activity participation Divyakant Tahlyan a,*, Amanda Stathopoulos b, Michael Maness c

		Description	Source	Date	Geography	Methodology notes	Social capital source
Indicator	Public and third sector employment	The proportion of businesses operating within the public sector and third sector in a given area. This includes local business units classified as non-profit bodies or mutual associations, public corporations, central government, or local authorities. The data is drawn from the UK Business Counts dataset, sourced via Nomis, and reflects active business units rather than individual employment counts. The rate is calculated as a proportion of all active local businesses in the area, providing insight into the relative scale and presence of public and third sector organisations within the local economy.	ONS	2025	MSOA		Cited in Capturing Bonding, Bridging, and Linking social capital through Publicly Available Data December 2019 Risk, Hazards & Crisis in Public Policy
	Facebook activism: Participate in activism group on Facebook	The proportion of people in this area who participate in at least one activism group on Facebook. + Considering all activism groups in which anyone from this area participates on Facebook, this indicator shows the number of groups there are per 1000 people in the area based on Facebook activity.	Facebook	2025	MSOA		

Overview of the methodology used to construct the Social Capital Score

This section provides an overview of the methodology used to construct the Social Capital Score, which (as outlined above) has been developed following a data driven evidence review of related literature on the subject.

The construction of the Social Capital Score broadly consists of the following seven stages. These stages fulfil the purpose of defining the data inputs and data processing procedures and then producing the final measure.

- Dimensions of the Social Capital Score are identified
- The unit of geography is selected
- Indicators are chosen to provide the best possible measure of each dimension at the specified unit of geography
- ‘Shrinkage estimation’ is used to improve reliability of the small area data¹
- Indicators are combined to form the dimensions
- Dimension scores are ranked and the dimension ranks are transformed to a specified exponential distribution²
- The exponentially transformed dimension scores are combined using appropriate dimension weights to form an overall Social Capital Score at small area level. This stage completes the construction of the measure

The following steps outline the methodology of data processing used to construct the Social Capital Score.

Step 1: Convert all indicators to LSOA geography

The Social Capital Score has been produced at Lower-layer Super Output Area (LSOA) geography (using the updated 2021 version of the LSOA boundaries which were developed as part of the Census 2021 outputs). However, a number of the indicators in the measure are not published at 2021 LSOA level. It is therefore necessary to convert these indicators to 2021 LSOA geographies. The table below outlines our approach to converting indicators to 2021 LSOA level:

¹ See Methods for data processing: Applying shrinkage to improve the robustness of indicators and Appendix A for description of the shrinkage technique.

² See Methods for data processing and Appendix B for description of the exponential transformation.

Geography	Indicators	Approach to conversion
2021 Output Area	• Socio-economic diversity • Neighbourhood relationships • Neighbourhood support • Belonging and perception of the neighbourhood • Volunteering • People providing no unpaid care • Lack of civic engagement or participation • High Social Grade	Use the Output Area to LSOA level lookup table from the ONS Census 2021 geography products to aggregate to LSOA.
MSOA	• Estimates of social trust • Occupational diversity • Public and third sector employment • Facebook activism: – Participate in activism group on Facebook • Facebook volunteering: – Participate in volunteering group on Facebook – Number of volunteering groups per 1,000 people on Facebook – Facebook Support Ratio	Use the 2011 Output Area to 2011 MSOA look-up table to apportion data to 2011 Output Area. Overlay the 2011 and 2021 Output Area boundaries with individual residential postcode data from the ONS Postcode directory. Apply a point-in-polygon method to calculate the number of postcodes that fall within each 2011 and 2021 Output Area boundaries. Use this to weight the extent of overlap between 2011 and 2021 Output Areas. Apply this weighting to generate 2021 Output Area estimates. Aggregate from 2021 Output Area to 2021 LSOA using the Output Area to LSOA level look-up table from the ONS Census 2021 geography products.
Ward	• Low voter turnout at local elections	Use the LSOA (2021) to Electoral Ward (2024) to LAD (2024) Best Fit Lookup table to apportion data to 2021 LSOAs.
Postcode	• AE5: Third sector organisations	Use the Postcode to OA (2021) to LSOA to MSOA to LAD with 2011 Classifications (May 2024) Best Fit Lookup to aggregate from Postcode to OA to LSOA.

Step 2: Quality assurance of the data

The next step was to comprehensively check the distributions of all the indicators at LSOA level to ensure that all indicators have passed the relevant fitness tests and are “fit for purpose”. These tests include excluding indicators with high numbers of zeros or equal upper limits (for example where a large number of areas have values of 100%) which would distort the measure. All of the indicators selected above passed these quality assurance tests.

Step 3: Producing composite indicators

All indicators listed in the previous section are included in the final Social Capital Score. However, a small subset of conceptually related indicators were first amalgamated into composite indicators before being combined with the remaining indicators to create the dimension scores. The purpose of producing these composite indicators was to improve robustness and capture multiple facets of the same underlying concept. The table below therefore shows only the subset of indicators that were grouped together into composite measures; all other indicators from the full framework remain included individually within the index.

Dimension	Composite indicator	Indicators combined
Bonding	Neighbourhood relationships	• People never chat to their neighbours. • Self-reported levels of loneliness.
	Neighbourhood support	• People disagree that they can borrow things or exchange favours with neighbours. • People feel fairly or very uncomfortable with asking a neighbour to keep a set of keys to their home for emergencies. • People feel fairly or very uncomfortable with asking a neighbour to collect a few shopping essentials if they were ill and at home on their own.
	Belonging and perception of the neighbourhood	• People do not feel that they belong very strongly to neighbourhood. • People disagree that people in this neighbourhood pull together to improve the neighbourhood.
Bridging	Volunteering	• People have not been personally involved in helping out with local issue/activity. • People have not taken part in community groups clubs or organisations e.g. children's education/schools, youth/ children's activities, education for adults, Sport/exercise (taking part, coaching or going to watch), religion, politics, health, disability and social welfare, older people, safety, first aid, the environment, animals, justice and human rights, local community or neighbourhood groups, citizens groups, hobbies, recreation/arts/social clubs. • People have not been engaged in formal or informal volunteering in the last month.
Linking social capital	Lack of civic engagement or participation	• People have not taken part in a consultation about local services or issues in their local area. • People are not a member of a local decision-making group e.g. group set up to regenerate the local area, tackle crime problems, making decisions on local health or education services, tenants' group decision making committee, group making decisions on local services for young people or the local community. • People have not taken part in any civic engagement. • People definitely or tend to disagree that they can influence decisions in their local area.

Step 4: Applying shrinkage to improve the robustness of indicators

Where a rate or other measure of social capital for a small area is based on small numbers, the resulting estimate may be unreliable, with an unacceptably high standard error. The technique of shrinkage estimation is used to 'borrow strength' from larger areas to increase the reliability of small area data; the impact of shrinkage will tend to move an LSOA's score towards that of their parent higher-level area. Shrinkage moderates the levels of unreliability in the dataset and reduces the impact of chance fluctuations from year to year. Such scores occur most commonly where numbers are small at LSOA level and the event is thus relatively rare. This may be the case for the indicator as a whole or only for particular LSOAs. In shrinkage estimation the score for a small area is estimated as a weighted combination of that small area's score and the mean value for a larger area from which the smaller areas within the larger area borrow strength. We have used the most up to date set of Local Authority Districts as the larger area in the shrinkage calculation for this measure. LSOAs within a single Local Authority District share issues relating to local governance. To a certain extent, they may also share issues relating to labour market sub-climates. Shrinkage has been applied to all indicators in the measure. Further details about the shrinkage technique are given in Appendix A.

Step 5: Ensuring that all indicators are "pointing in the same direction"

To combine the indicators into dimensions, it is necessary for each of the indicators to be orientated in the same direction. However, for some of the indicators included in the Social Capital Score, a high value indicates high levels of social capital – for example an area with higher voter turnout would be measured as having higher levels of social capital. By contrast, for other indicators, a high score denotes low social capital – for example areas with high income inequality or residential mobility. It is necessary therefore to 'reverse the polarity' for some scores to ensure that a high value is negative for all indicators – so they can be consistently combined.

Step 6: Standardisation

When combining measures, it is important to ensure that indicator scores are comparable and that the weighting of dimensions is not distorted by the variation in distribution across different indicators. The indicators in the Social Capital Score are based on different metrics and each indicator in the measure needs to be standardised to ensure that they have a common distribution, so that indicators can be combined without a single indicator dominating due to having a wide distribution. Indicators in the Social Capital Score have therefore been standardised by ranking each of the indicators and then transforming to a normal distribution.

Step 7: Weighting

Because the Social Capital Score measure is a composite measure, decisions must be made as to the weight given to the various indicators and dimensions of the measure. There are a number of possible approaches to weighting the indicators in a dimension. Option 1 is to provide equal weightings to each of the indicators in a dimension. Option 2 is to apply different weights depending on theoretical judgements regarding the suitability of indicators in the model. Examples of this approach include applying higher weightings to indicators which are constructed from more robust administrative data sources and lower weightings to data from modelled data sources. Alternatively, higher weightings can be applied to indicators which more closely match the issue that is being captured – this can be ascertained through a Discrete Choice Experiment (DCE) – a survey of key stakeholders and people from impacted communities identifying the relative importance of indicators. Option 3 is to introduce a statistical technique called Maximum Likelihood Factor Analysis to determine the weights of the indicators within each dimension. Factor analysis works most effectively where there is a single overwhelming factor which explains the performance on a set of indicators within a dimension and where indicators within a dimension exert an influence on one another. A key advantage of using factor analysis is that it considers 'double counting' within dimensions.

However, if there is no underlying factor common among the indicators in a dimension, factor analysis is less effective. Factor analysis is also not statistically robust with very few indicators (e.g. only two within a sub-dimension).

Having reviewed the indicators in each dimension, it was determined that an equal weighting would be applied to all of the indicators in each of the dimensions as well as when combining dimensions to create the overall social capital measure. This is largely due to the simplicity and transparency of applying equal weightings and because there is no clear rationale for assigning differential weightings within each dimension or to the overall score. Equal weights also reflect the equal importance afforded to each of the indicators within each dimension and the overall score.

Step 8: Standardising dimensions

The three-dimension scores are then combined to produce the overall Social Capital Score. However, each of the dimensions will be on a different scale to one another. It was therefore necessary to standardise the dimension scores before combining. The method of standardisation was to transform the dimensions to a specified exponential distribution using an exponential transformation function (see Appendix B for details). The exponentially transformed dimension scores were then combined to form an overall 'Social Capital Score' at LSOA level.

The exponential transformation method of standardisation differs from the normal distribution method as it gives more emphasis on the top end of the distribution (the areas with the highest scores) and so facilitates identification of the areas with the lowest social capital, in order to control cancellation effects (e.g. low social capital in one dimension is not completely cancelled out by high levels of social capital in a different dimension) and ensures that areas that perform particularly badly on one aspect of social capital are moved closer to the low end of the Social Capital Score spectrum even when they show positive outcomes on other indicators.

Step 9: Combining dimensions

Having standardised the dimensions, they were then combined to produce the overall Social Capital Score. The combination process involves summing each of the standardised dimension scores together to produce an overall Social Capital Score.

Analysis and outcomes

The maps below show the outcome of the Social Capital Score at Local Authority level, presenting the overall score. The map on the left shows the score as a comparison across all Local Authorities in England. The 'Hotspots' map on the right is based on the top 20% of areas across England only, specifically highlighting the Local Authorities with the lowest social capital.

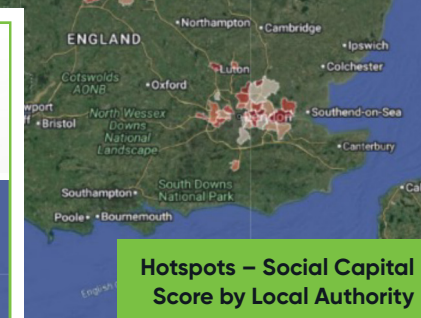
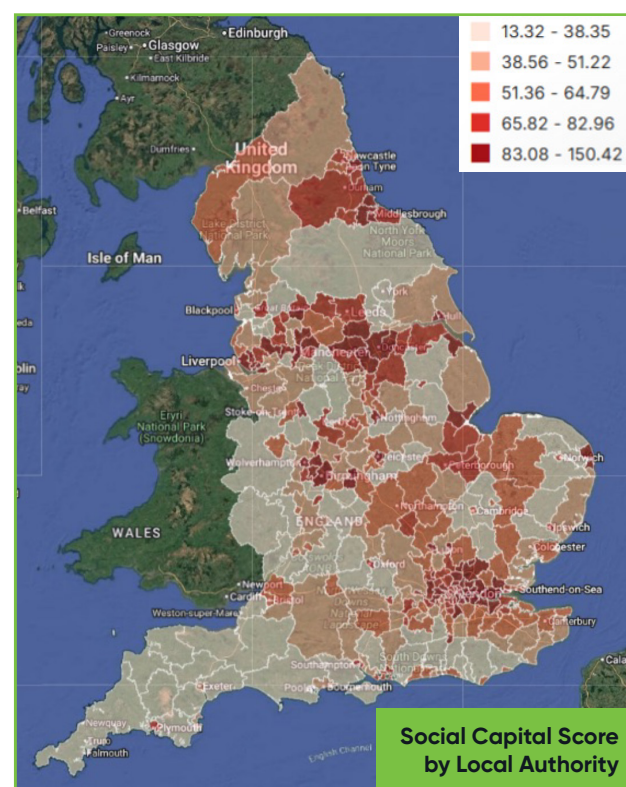
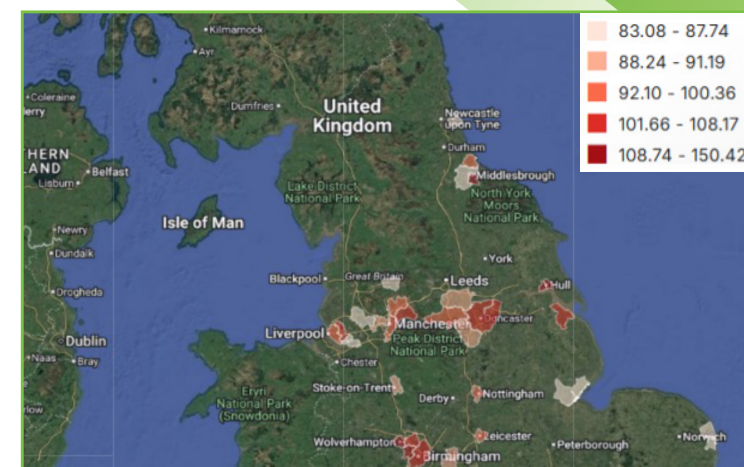
Social Capital Score

Local Authority analysis

As highlighted in the map below, there are clear regional disparities in social capital across Local Authorities in England, with darker areas indicating lower levels of social capital. These areas are largely concentrated in the North of England, particularly around post-industrial urban centres such as Liverpool, Manchester, Sheffield and Middlesbrough, as well as parts of the Midlands, including Birmingham and Nottingham. While these patterns remain most pronounced in major urban areas, lower levels of social capital are also evident across a wider range of surrounding local authorities in these regions.

Coastal communities also feature prominently among the areas with the lowest levels of social capital, especially along the East and South coasts in places like Great Yarmouth, Thanet and Portsmouth. In contrast, rural areas across the South West, South East, and Welsh border regions tend to have higher levels of social capital, reflecting stronger community ties and more stable populations.

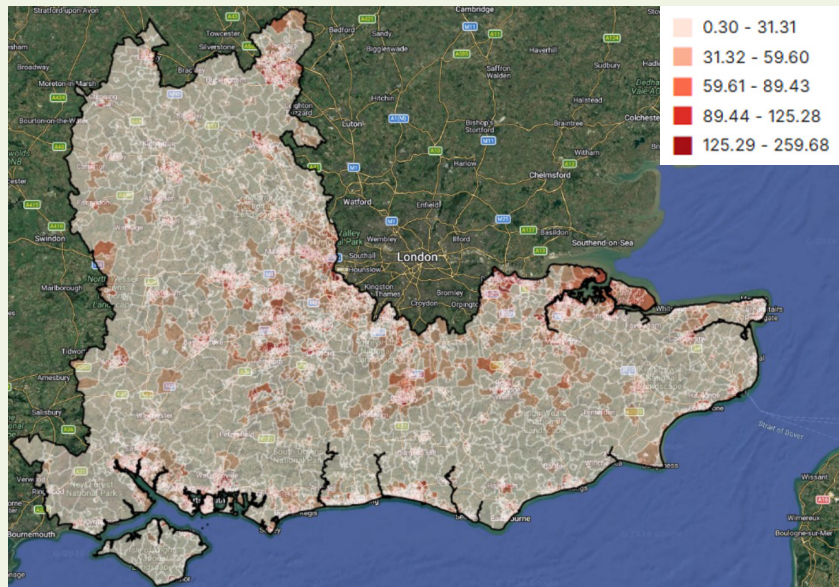
These geographic patterns highlight where efforts to rebuild trust, civic participation, and community engagement may be most urgently needed to support long-term wellbeing and resilience.



LSOA analysis by region

The visualisations below show the Social Capital Score mapped at LSOA level by region across England.

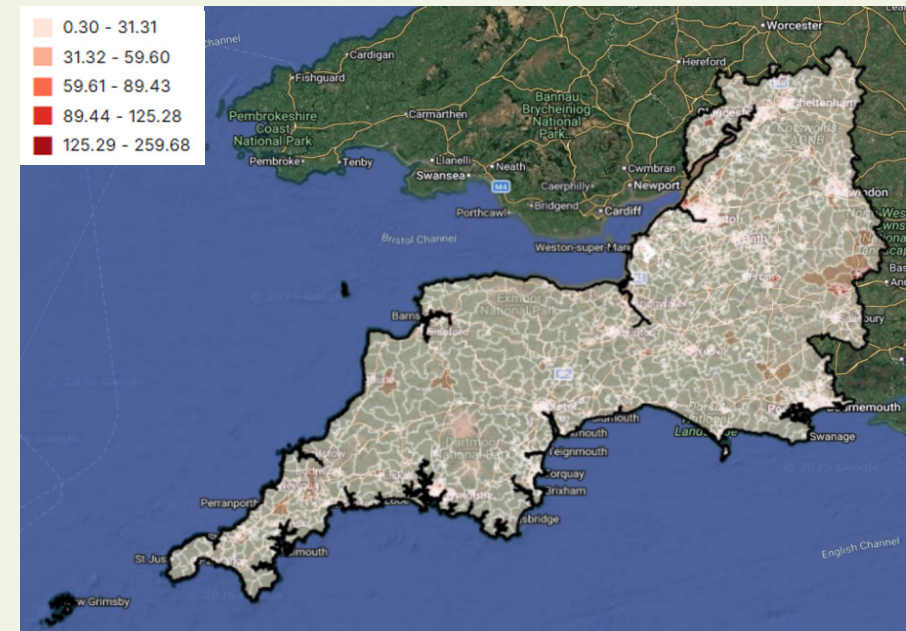
South East: Social Capital Score by LSOA



Across the South East, most areas exhibit relatively higher levels of social capital compared to other regions. However, there are still distinct pockets of lower social capital, most notably in coastal communities such as Thanet, Hastings, Portsmouth, and parts of the Isle of Wight, as well as urban centres like Southampton, Reading, and parts of Medway and Slough. These areas are not confined to a small number of locations but are distributed across a wider range of neighbourhoods within the region.

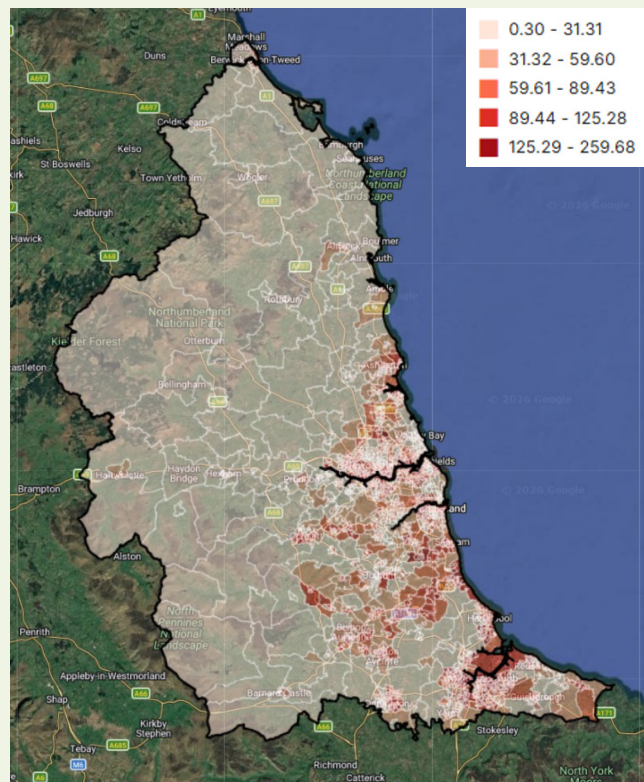
In contrast, much of the rural South East, including the South Downs, West Sussex, Surrey Hills, and the outskirts of Oxfordshire, display higher levels of social capital, likely reflecting stronger social networks, lower population turnover and greater local participation in community life.

South West: Social Capital Score by LSOA



The South West also exhibits higher levels of social capital compared to other regions, with the majority of areas shaded in lighter tones on the map. This is particularly evident across rural and coastal parts of Devon, Dorset, Somerset, and Wiltshire, as well as in the National Park areas such as Exmoor and Dartmoor. However, there are some notable pockets of lower social capital, especially in and around larger urban centres such as Bristol, Plymouth, and parts of Gloucester, Swindon and Torbay. Isolated areas of lower social capital also appear in more rural locations like parts of North Devon and West Cornwall, likely linked to issues of remoteness and access to services.

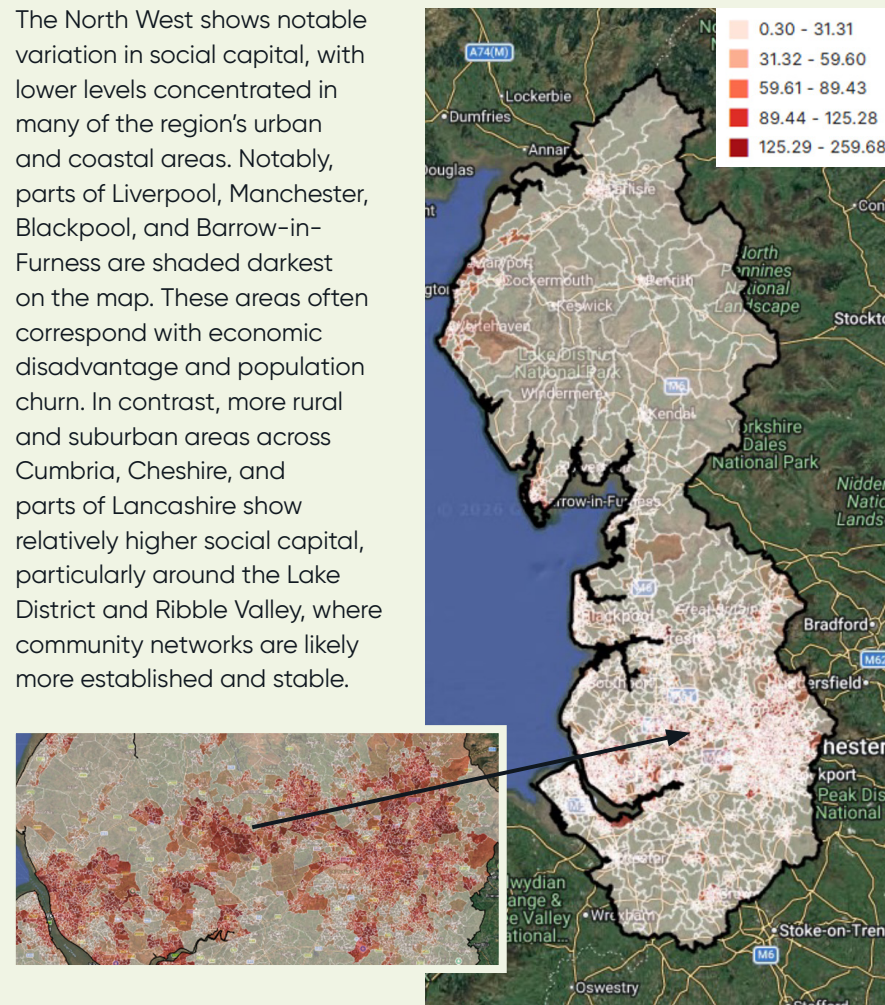
North East: Social Capital Score by LSOA



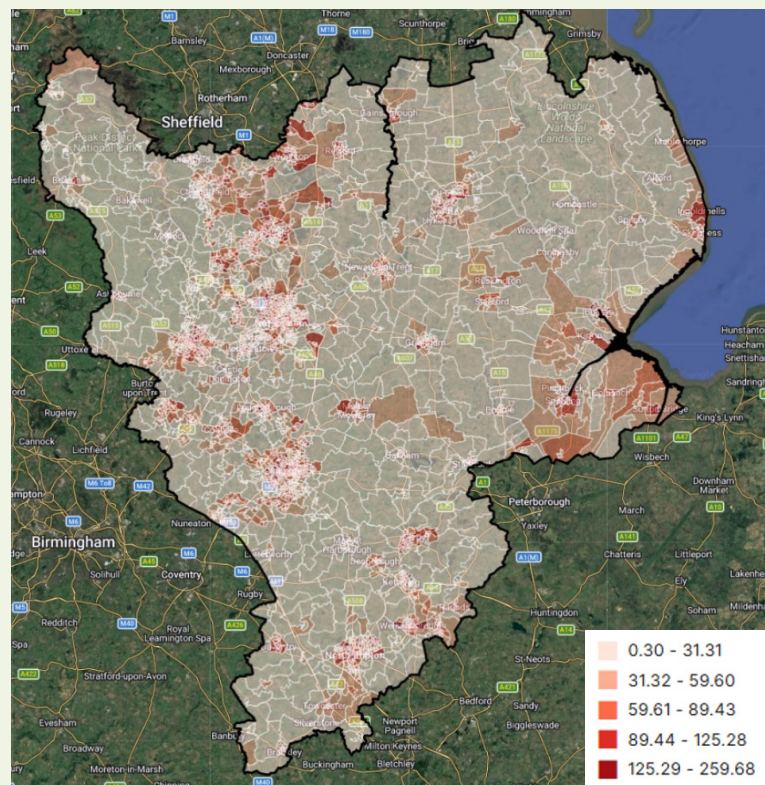
The North East shows some of the highest concentrations of low social capital in England, particularly across coastal and urban areas such as Middlesbrough, Hartlepool, Sunderland, and South Tyneside. These areas are shaded darkest on the map, reflecting weaker community ties and lower levels of civic engagement. In contrast, inland rural areas of Northumberland and County Durham display relatively higher social capital.

North West: Social Capital Score by LSOA

The North West shows notable variation in social capital, with lower levels concentrated in many of the region's urban and coastal areas. Notably, parts of Liverpool, Manchester, Blackpool, and Barrow-in-Furness are shaded darkest on the map. These areas often correspond with economic disadvantage and population churn. In contrast, more rural and suburban areas across Cumbria, Cheshire, and parts of Lancashire show relatively higher social capital, particularly around the Lake District and Ribble Valley, where community networks are likely more established and stable.

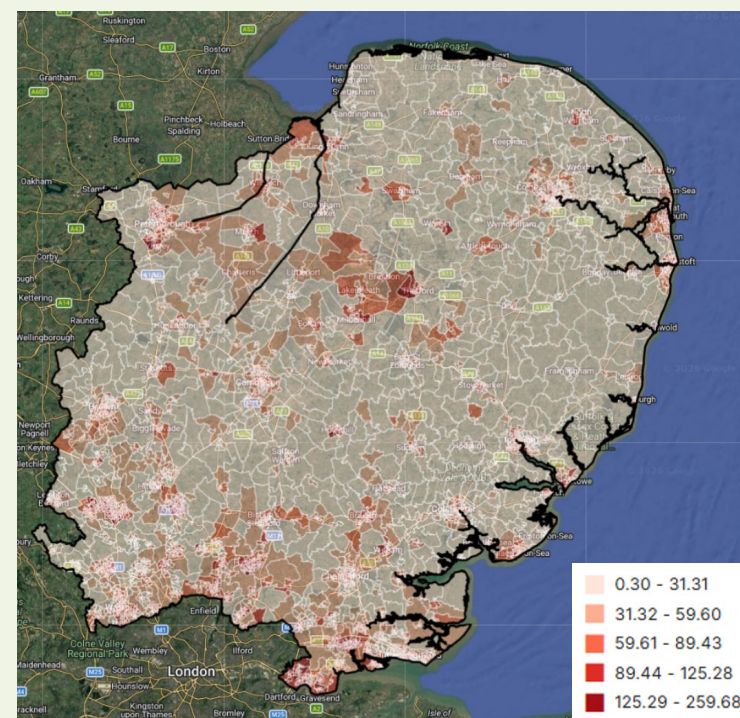


East Midlands: Social Capital Score by LSOA



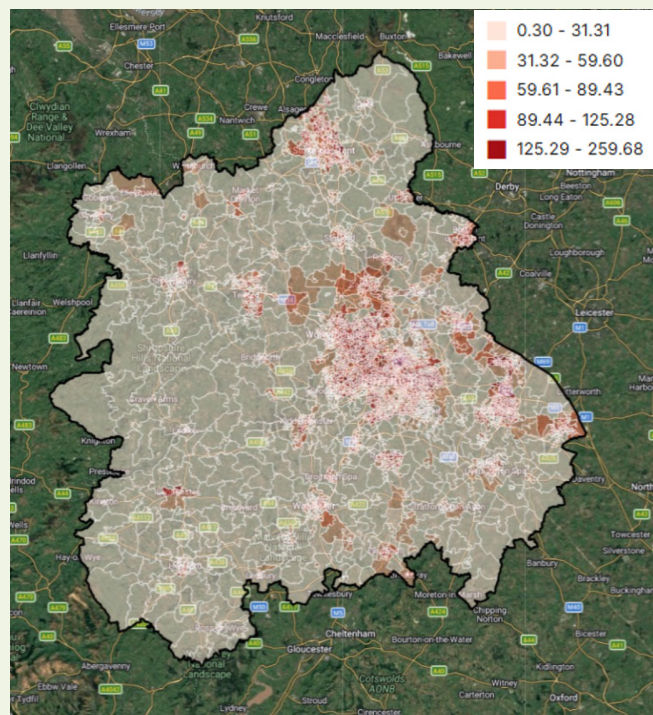
The East Midlands presents a mixed picture of social capital, with lower levels concentrated in and around major urban areas such as Nottingham, Leicester, and parts of Derby, as well as smaller towns like Mansfield and Boston. In contrast, much of the surrounding rural and semi-rural areas, particularly across the counties of Lincolnshire, Rutland, and Northamptonshire, show relatively higher levels of social capital.

East of England: Social Capital Score by LSOA



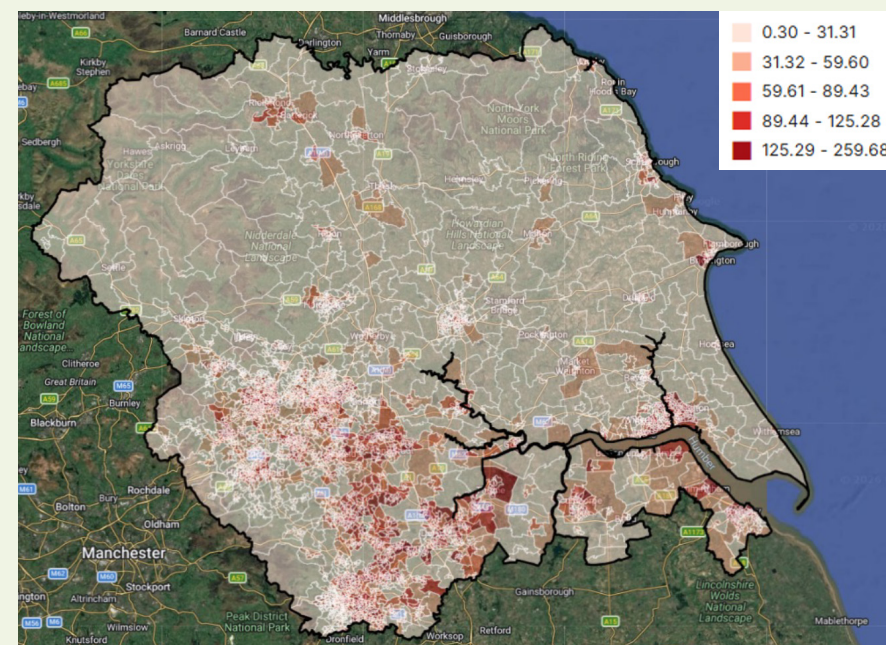
The East of England displays a varied pattern of social capital, with the lowest levels concentrated in a number of coastal and rural areas. Notable clusters of low social capital appear in coastal communities such as Great Yarmouth, Lowestoft, Clacton-on-Sea, and Jaywick, as well as more rural parts of Norfolk and west Suffolk. Several market towns and urban centres, such as Peterborough, Luton, and parts of Bedfordshire, also show lower scores. In contrast, many areas across Hertfordshire, Cambridgeshire, and Essex's commuter belt show relatively higher levels of social capital.

West Midlands: Social Capital Score by LSOA



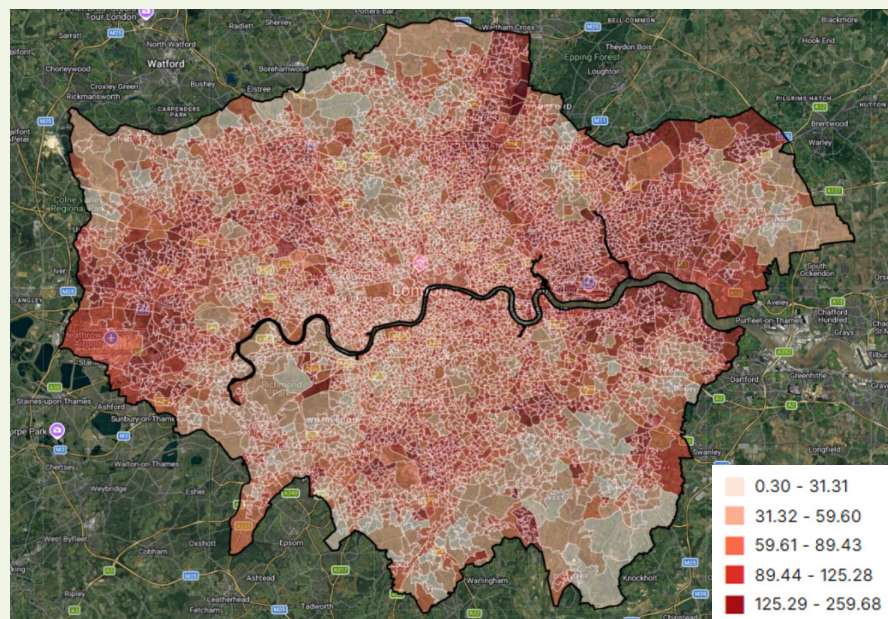
The West Midlands shows notable concentrations of low social capital, particularly across the urban core of the region. Birmingham, Wolverhampton, and the Black Country stand out with notable areas shaded dark red, indicating weaker community networks and lower civic engagement. Similar patterns extend into parts of Coventry and Stoke-on-Trent. In contrast, rural and semi-rural areas across Shropshire, Herefordshire, Warwickshire, and the Malvern Hills exhibit comparatively higher levels of social capital, reflecting more cohesive, stable communities.

Yorkshire and the Humber: Social Capital Score by LSOA



Yorkshire and the Humber shows some of the most extensive areas of low social capital in the country, particularly concentrated across South and West Yorkshire. Urban centres such as Leeds, Bradford, Sheffield, Doncaster, Barnsley and Wakefield are shaded darkest on the map, indicating weaker social capital. Coastal towns such as Bridlington and Scarborough also exhibit low social capital. In contrast, many rural and upland areas, especially across North Yorkshire and the Yorkshire Dales, show relatively higher levels of social capital.

London: Social Capital Score by LSOA

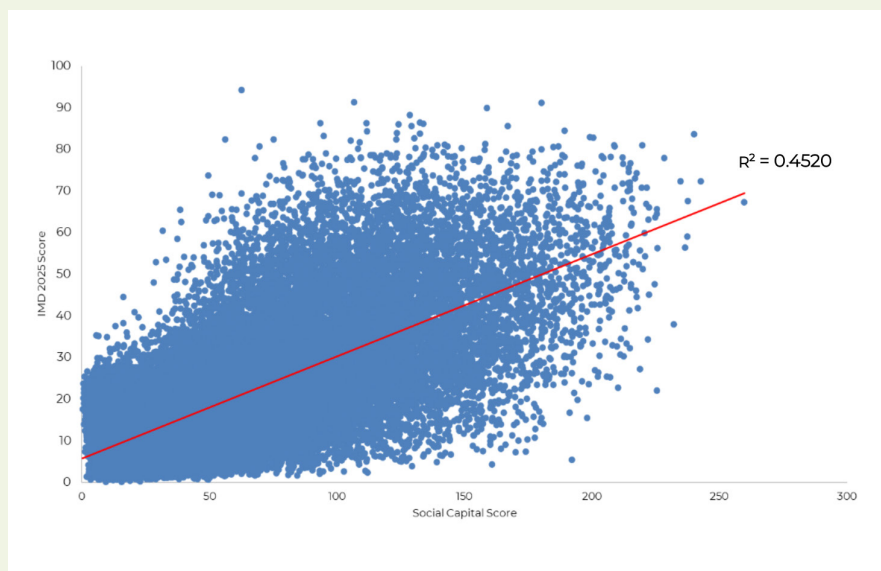


London shows widespread variation in levels of social capital across the city, with many neighbourhoods experiencing relatively low social capital compared to other parts of the country. The areas with the lowest levels of social capital are concentrated in East London, including Barking, Dagenham, and Newham, as well as parts of North London such as Enfield, Haringey and Tottenham. South London also contains several large clusters of low social capital, particularly across Croydon, Lewisham, and Southwark, while areas of West London such as Brent and Hounslow display similar patterns. In contrast, pockets of higher social capital are more visible in outer London suburbs, including parts of Richmond, Kingston, Sutton and Bromley, reflecting more stable, less transient communities with stronger local networks.

Lower social capital and higher need

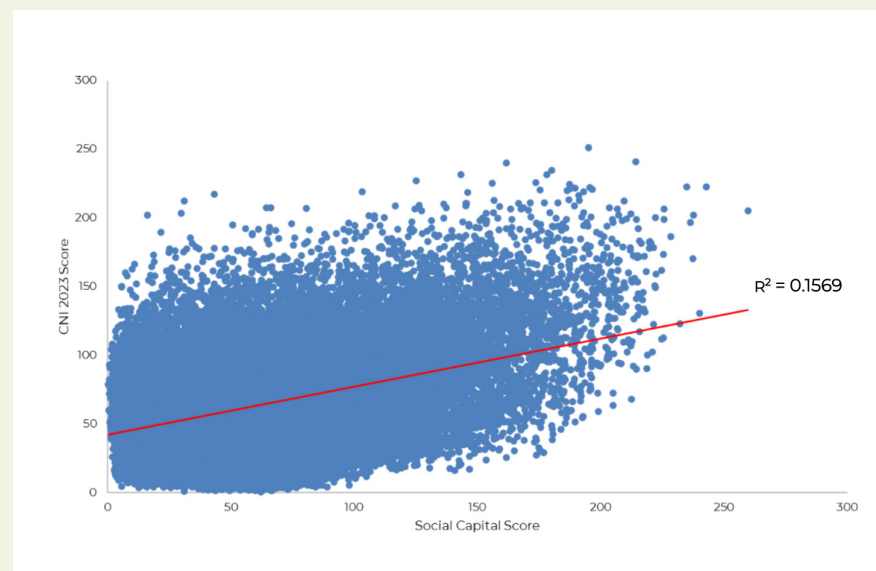
The scatter plot charts below explore the correlation between the Social Capital Score and the Indices of Deprivation 2025 score and the Social Capital Score vs the Community Needs Index 2023 score.

Corelation at LSOA level between Social Capital Score and IMD 2025 score



Comparing the Social Capital Score with the IMD 2025 Score gives a **correlation coefficient of 0.672**, indicating a **moderate to strong positive relationship** between the two variables. The **R² value of 0.4520** suggests that approximately **45% of the variation** in one variable can be explained by the variation in the other. This provides evidence of a moderate linear association between these two measures meaning that they are likely capturing similar underlying social or structural conditions in the neighbourhoods they cover.

Corelation at LSOA level between Social Capital Score and CNI 2023 score



The Social Capital Score compared to the CNI 2023 Score gives an **R² value of 0.1569**, indicating that around **16% of the variation** in one variable can be explained by the variation in the other, while the **correlation coefficient of 0.396** shows a **moderate positive relationship** between the two variables. This provides evidence of some degree of linear association between the two measures, but also suggests that while the variables are related, other factors may also be influencing the patterns observed in the neighbourhoods they cover.

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Appendix A

Shrinkage estimation

Improving the reliability of small area data values using shrinkage estimation

The shrinkage technique is designed to deal with the problems associated with small numbers in an LSOA. In some areas – particularly where the at-risk population is small – data may be ‘unreliable’, that is more likely to be affected by sampling and other sources of error.

The technique of shrinkage estimation (in other words empirical Bayesian estimation) is used to ‘borrow strength’ from larger areas to avoid creating unreliable small area data. Shrinkage estimation involves moving LSOA scores towards another more robust score, often relating to a higher geographical level. All LSOA scores will move somewhat through shrinkage, but those with large standard errors (in other words the most ‘unreliable’ scores) will tend to move the most. The LSOA score may be moved towards a ‘higher need’ or ‘lower need’ score through shrinkage estimation. Without shrinkage, some LSOAs would have scores which do not reliably describe the community need in the area due to chance fluctuations from year to year.

It could be argued that shrinkage estimation is inappropriate for administrative data which are, in effect, a census. This is not correct. The problem exists not only where data are derived from samples but also where scans of administrative data effectively mean that an entire census of a particular group is being considered. This is because such censuses can be regarded as samples from ‘super-populations’, which one could consider to be samples in time.

All the data from administrative sources and the 2021 Census are treated as samples from a super-population in this way, and the shrinkage technique was applied to indicators which use this data. The exceptions are the indicators supplied at Local Authority District level.

Selecting the larger areas from which unreliable small area data can borrow strength

The principle for selecting the larger area should be that the LSOAs within them share characteristics. In the current shrinkage methodology, Local Authority Districts are used. The LSOAs within a single district share issues relating to local governance and possibly to economic sub-climates. To a certain extent, they may also share issues relating to labour market sub-climates.

The shrinkage calculation

The actual mechanism of the shrinkage procedure is to estimate deprivation in a particular LSOA using a weighted combination of (a) data from the LSOA, and (b) data from another more robust score (in the case of the Indices, this is the Local Authority District score). The weight attempts to increase the efficiency of the estimation, while not increasing its bias. All LSOA scores are adjusted to some degree through the shrinkage process, but the magnitude of the adjustment will be greatest for areas with the least reliable scores. The amount of movement depends on both the size of the standard error and the amount of heterogeneity amongst the LSOAs in a Local Authority District.

The 'shrunk' estimate of a LSOA level proportion (or ratio) is a weighted average of the two 'raw' proportions for the LSOA and for the corresponding District. The weights used are determined by the relative magnitudes of within-LSOA and between-LSOA variability.

If the rate for a particular indicator in LSOA j is r_j events out of a population of n_j , the empirical logit for each LSOA is:

$$m_j = \log \left[\frac{(r_j + 0.5)}{(n_j - r_j + 0.5)} \right]$$

whose estimated standard error s_j is the square root of:

$$s_j^2 = \frac{(n_j + 1)(n_j + 2)}{n_j(r_j + 1)(n_j - r_j + 1)}$$

The corresponding counts r out of n for the district in which LSOA j lies gives the district-level logit:

$$M = \log \left[\frac{(r + 0.5)}{(n - r + 0.5)} \right]$$

The 'shrunk' LSOA level logit is then the weighted average:

$$m_j^* = w_j m_j + (1 - w_j) M$$

where w_j is the weight given to the 'raw' LSOA- j data and $(1 - w_j)$ the weight given to the overall rate for the district. The formula used to determine w_j is:

$$w_j = \frac{1/s_j^2}{1/s_j^2 + 1/t^2}$$

where t^2 is the inter-LSOA variance for the k LSOAs in the district, calculated as:

$$t^2 = \frac{1}{k-1} \sum_{j=1}^k (m_j - M)^2$$

Thus large LSOAs, where precision $1/s_j^2$ is relatively large, have weight w_j close to 1 and so shrinkage has little effect. The shrinkage effect is greatest for small LSOAs in relatively homogeneous districts.

The final step is to back-transform the shrunk logit m_j^* using the 'anti-logit', to obtain the shrunk LSOA level proportion for each LSOA:

$$z_j = \frac{\exp(m_j^*)}{1 + \exp(m_j^*)}$$

Appendix B

Exponential transformation

In order to combine the dimensions into an overall measure of need, the dimension scores first need to be standardised. Any standardisation and transformation should meet the following criteria:

- **Standard distribution:** It must ensure that each dimension has a common distribution, so that dimensions can be combined, without one dimension dominating due to a much larger distribution.
- **Identify areas of need:** It must facilitate the easy identification of the areas with highest levels of need.
- **Scale independent:** It must not be scale dependent (in other words confuse population size with level of need).

One possible standardisation approach involves each of the dimension scores being ranked, and then the ranks are transformed to an exponential distribution. The exponential distribution has a number of properties that satisfy the criteria above.

Standard distribution

The exponential distribution transforms each dimension so that they each have a common distribution, the same range and identical maximum/minimum values. The process starts by ranking the scores in each dimension to standardise the dimension scores (from 1 for the lowest need to 33,755 for the most highest need), before applying the exponential transformation procedure to create a standardised dimension score ranging from 0 (lowest need) to 100 (highest need).

Cancellation

The exponential transformation procedure gives control over the extent to which lack of need in one dimension cancels or compensates for high need in another dimension. It allows precise regulation, although not elimination, of these cancellation effects. The scaling constant (23) used produces roughly 10 per cent cancellation. This means that in the extreme case, an LSOA which was ranked most deprived on one dimension but least deprived on another would overall be ranked at the 90th percentile in terms of levels of need. This compares to the 50th percentile if the untransformed ranks or a normal distribution had been used instead.

Identify deprived areas

The exponential transformation effectively spreads out that part of the distribution in which there is most interest – that is the ‘tail’ which contains the areas with the highest levels of need in each dimension. The scaling constant ensures that the most deprived 10 per cent of areas cover 50 per cent of the distribution of scores (in other words, scores between 50 and 100 after exponential transformation).

Scale independent

The transformation is not affected by the size of the LSOA's population.

The exponential transformation calculation

The transformation used is as follows:

For any LSOA, denote its rank on the dimension R, scaled to the range [0,1].
 $R=1/N$ for the least deprived and $R=N/N$ (in other words $R=1$) for the most deprived, where N =the number of LSOAs in England.

The transformed dimension score X is given by:

$$X = -23 \ln(1 - R(1 - \exp^{-100/23}))$$

where 'ln' denotes natural logarithm and 'exp' the exponential or antilog transformation.



**national network
for neighbourhood
improvement**



3ni is a social value partnership, bringing together policy, practice, evidence and data to transform neighbourhoods across the country. By creating a space for collaboration and innovation, we're working with local government and the wider public sector to drive meaningful, lasting change where it's needed most. At 3ni, we believe that real transformation starts from the ground up.

Through our national network for neighbourhood improvement, we're sharing and shaping the best and next practices that help rebuild disadvantaged communities. Our research, events, and activities are designed to support local government and public sector partners in learning what works – and, more importantly, putting it into action.

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