

Appendix 1 – Methods

An indication of inequality by geography is the Index of Multiple Deprivation (IMD). It is the official measure of relative deprivation in small areas in England. The index ranks over 30,000 neighbourhoods in England by looking at 7 distinct domains: income, employment, health deprivation and disability, education/skills training, crime, barriers to housing and services, and living environment. We chose to use the IMD as it is a well-recognised, validated measure of deprivation that incorporates many of the wider determinants discussed above and is not limited to a simple 'rich – poor' income-based dimension. The IMD scores measure *relative* deprivation and it is important to note that deprivation level does not apply to each individual living in an area.

The neighbourhood IMD scores are mapped to larger geographies, including lower and upper tier local authorities (UTLA). This analysis uses deprivation deciles based on the average IMD score for each UTLA (where 1 represents the most deprived areas and 10 represents the least deprived areas).

We also used the slope index of inequality (SII), another indication of inequality. The SII better represents the magnitude of the absolute inequality in life expectancy between the least and most deprived population groupings, as it reflects the experiences of the whole population.¹ It is more sensitive to changes in the socioeconomic profile of all areas².

UTLA was used because it could be mapped to the largest number of cardiovascular health indicators across the CVD pathway for our analysis. Where data were presented at GP level (in the cases of GP survey data and prescribing data), the dataset was mapped and aggregated at the level of UTLA. Details of the calculations can be found in the table below.

We used the following data sources:

- Quality Outcomes Framework (QOF), NHS Digital/ Office for Health Improvement and Disparities (OHID) Fingertips
- Hospital Episode Statistics (HES), NHS Digital in partnership with Imperial College Health Partners
 - April 2016 to Feb 2021
- National Audit of Cardiac Rehabilitation (NACR), in partnership with York University
- English prescribing data, NHS Business Services Authority (NHSBSA)
 - Match GP codes to UTLA; 2014-2021
 - Section 2 (cardiovascular) drug categories, British National Formulary (BNF) via openprescribing.net
- GP patient survey data, Ipsos Mori on behalf of NHS England
- Age-standardised death rates, OHID analysis of Nomis/Office of National Statistics (ONS) data

Each dataset was mapped to UTLA IMD scores and deciles using:

- English indices of deprivation 2019, Ministry of Housing, Communities & Local Government

SII is presented by sex and thus was only mapped to age-standardised death rates (which are also stratified by sex):

- Slope index of inequality, OHID

¹ ONS (2013) [Inequality in Disability-Free Life Expectancy by Area Deprivation: England: 2003–06 and 2007–10](#)

² Low and Low (2004) [Measuring the gap: quantifying and comparing local health inequalities](#)

Table of calculations

The datasets used in this analysis contained different levels of detail. Therefore, there the calculations to aggregate measures by UTLA differed. This table details the calculations for each dataset and any data anomalies appear in the 'data notes' column.

Category	Data source	Measures	Years	UTLA calculation	Data notes
Health status indicators	Quality Outcomes Framework (QOF), NHS Digital via OHID Fingertips	Prevalence of obesity/overweight, smoking, physical inactivity, hypertension, diabetes, atrial fibrillation	Varied depending on measure; through 2019 or 2019/20	Prevalence within each UTLA deprivation decile = sum of the number of people with each condition in the decile divided by sum of people on GP register list within each deprivation decile	Indicators: <ul style="list-style-type: none"> Percentage of adults (aged 18+) classified as overweight or obese Percentage of physically inactive adults Smoking prevalence in adults (18+) – current smokers (APS) Hypertension prevalence: QOF prevalence (all ages) Diabetes: QOF prevalence (17+) Atrial fibrillation: QOF prevalence
	National audit of cardiac rehabilitation (NACR) in partnership with York University	Rehabilitation pseudo-uptake	2015-2019	Data suppression for UTLA with fewer than 30 people or sub-category with fewer than 10 people. See Appendix 3 for detailed suppressed data.	Uptake is based on pseudo-eligibility, or the number of people captured in NACR who are deemed eligible for rehab. Patients were categorised into UTLA by postcode. Total count is the number of people with data for the relevant characteristic (e.g. ethnicity). IMD is aggregated for Bournemouth, Christchurch and Poole, but the NACR data analyses Bournemouth and Poole separately. For this portion of the analysis the same IMD (of Bournemouth, Christchurch and

				Poole) was used for both Bournemouth and Poole.
English prescribing data, NHS Business Services Authority	Prescribing	Fiscal years 2016/17-2018/19 Separate analysis: April 2020 to February 2021	GP practices were mapped to UTLA and then deprivation level. Prescription rate per person = sum of prescriptions within each UTLA decile divided by sum of GP lists within the UTLA decile and year	Section 2 BNF categories were based on: OpenPrescribing.net, EBM DataLab, University of Oxford, 2017 Section 2 categories There were missing UTLAs (due to practice unmapped GP practice codes or “unidentified doctors” codes) in 2.5% of all GPs.
Hospital episode statistics (HES), NHS Digital in partnership with Imperial College Health Partners (IChP)	Elective and emergency admissions (spells) for ICD codes in Chapter I	Fiscal years: 2016/17 to 2019/20	Admission rates calculated per 100,000 population Weighted average within each deprivation decile using mid-year population estimates from ONS (adults, 18+)	HES data records activity under Local Authorities outside of England if the activity took place in England but the patient resides outside of the country. These data and missing data (with unknown UTLAs) were excluded from this analysis.
GP patient survey data	Confidence in managing long-term condition	2018-2020	GP practices were mapped to UTLA and then deprivation level. Prevalence within each deprivation decile = sum of the number of responses within each decile divided by sum of people who responded to the question within each decile	Ipsos Mori analysis found that the redevelopment of the questionnaire and inclusion of 16-17 year olds mean the results are not directly comparable with data collected prior to 2018, even where question wording remains similar.
OHID Fingertips (premature CVD mortality)	Age-standardised death rates (rolling 3 year averages)	2001-03 through 2017-19	Weighted average of age-standardised death rate within each deprivation decile using denominator field from age-standardised death rate dataset	Isles of Scilly data were combined with Cornwall

	ONS via Nomis (CVD mortality - all ages)	Annual age- standardised death rates	2013-2019	Weighted average within each deprivation decile using mid-year population estimates from ONS (all ages)	
Inequality indicators	ONS	Slope index of inequality (SII)	2015	N/A	ASDR is aggregated for Bournemouth, Christchurch and Poole, but the SII includes Bournemouth and Poole separately. For this portion of the analysis the same aggregate ASDR was used for both Bournemouth and Poole.
	English indices of deprivation 2019, Ministry of Housing, Communities & Local Government	Index of Multiple Deprivation	2019	N/A	File 11: upper-tier local authority summaries

Appendix 2 – Prescription drug definitions

CVD prescription types	Definition
Anti-arrhythmic drugs	Anti-arrhythmic drugs are designed to treat an abnormality of the heart rhythm. They may be used to terminate the abnormal rhythm, prevent it happening or slow the heart rate during the abnormal rhythm to make it more tolerable.
Anti-fibrinolytic drugs and haemostatics	Anti-fibrinolytic drugs and haemostatics can be used to reduce or stop bleeding after cardiac surgery.
Anticoagulants and protamine	Anticoagulant medicines are preventative care treatments, which work by slowing down the blood clotting process. Prescriptions are on the rise due to a new class of drugs, novel oral anticoagulants (NOACs), used in the prevention of stroke for people with non-valvular atrial fibrillation (AF).
Antihypertensive and heart failure drugs	Anti-hypertensives are preventative care treatments. The number of prescriptions overall is increasing because our population is ageing, so we are living longer with significant risk factors such as hypertension. This leads to a higher risk of heart and circulatory disease such as a stroke, and by reducing blood pressure these drugs can help to prevent such life changing events.
Antiplatelet drugs	Antiplatelets medicines are preventative care treatments, which work by slowing down the blood clotting process. Prescriptions are decreasing due to the introduction of novel oral anticoagulants (NOACs), as well as the removal of aspirin from guideline recommendations for the prevention of stroke in atrial fibrillation. So as anti-coagulant prescriptions have risen, antiplatelet prescriptions have fallen with more people being switched over to NOACs.
Beta-adrenoreceptor blocking drugs	Also known as beta-blockers, these drugs are used to protect and treat heart attacks, chest pain or discomfort (angina), arrhythmias and heart failure. These are often prescribed in primary care, but could also be prescribed in specialist care facilities.
Digoxin and other positive inotropic drugs	Positive inotropic drugs are given to strengthen the force of a heartbeat. Digoxin, a type of positive inotropic drug, is used to treat atrial fibrillation, atrial flutter and heart failure.
Diuretics	Diuretics are often given to people who have high blood pressure as they reduce blood volume. Diuretics are particularly useful in treating heart failure, a condition where the body holds too much water and salt because the heart does not pump effectively.
Lipid-lowering drugs	Lipid lowering drugs (e.g. statins) are preventative care treatments. Because our population is ageing, we are living longer with additional long-term health conditions (co-morbidities). This may lead to a higher risk of heart and circulatory disease such as a heart attack or stroke, which statins have been effectively proven to reduce.
Nitrates, calcium blockers & other antianginal drugs	Nitrates are often used to treat chest pain or discomfort (angina). Nitrates dilate, or relax, blood vessels. By dilating the blood vessels of the heart, nitrates can reduce the stress on the heart by improving blood flow through the coronary arteries to the heart muscle. Calcium channel blockers are also able to treat angina and lower blood pressure by reducing the amount of calcium entering cells of the heart and blood vessel walls. This allows the blood vessels relax and provide the heart muscle with more oxygenated blood.

Appendix 3 – Suppressed NACR data

A number of UTLAs had total patient numbers of fewer than 30 which could not be broken down by demographics. Rows with a ‘-’ indicates that there was no missing data for that characteristic and UTLA, however, this isn’t a comprehensive list of all UTLAs as those with no suppression issues do not feature.

UTLA	Ethnicity data – years with suppressed data		Sex data – years with suppressed data	Marital status data – years with suppressed data	
	Minority ethnic	White	Female and male	Partnered	Single
Barnsley	2015-18	2015-17	2015-17	-	-
Barking and Dagenham	-	-	-	-	2016-17
Bracknell Forest	-	-	-	-	2015
Camden	-	-	-	-	2017
County Durham	2015-2019	2016-17	2016-17	-	-
Coventry				2017-19	-
Darlington	2015-19	2015-19	2015-2019	-	-
Doncaster	2015, 2017	-	2017	-	-
Dudley	2015	-	-	-	-
East Riding of Yorkshire	2015-17	-	-	-	-
Hartlepool	2015-19	2016-17	2016-17	-	2019
Herefordshire	2016	-	-	-	-
Isles of Scilly	2015-19	2015-19	2015-19	-	-
Kingston upon Hull	2015-17	-	-	-	-
Kirklees	2018	-	-	2016-19	-
Knowsley	2015-16	-	-	-	-
Leeds	2018-19	-	-	-	-
Lincolnshire	2019	-	-	-	-
Medway	2015-19	2017-19	2017-16	-	-
Middlesbrough	2015-19	2015-19	2015-19	-	-
Milton Keynes	-	-	-	-	2015
Newcastle upon Tyne	2015-19	2015-19	2015-19	-	-
Norfolk	2015-16	-	-	-	-
North East Lincolnshire	2015, 2018	-	-	-	-
North Tyneside	2015-19	2015-19	2015-19	-	-
North Somerset	2015-16, 2018	-	-	-	-
Northumberland	2015-19	2015-19	2015-19	-	-

Nottingham	2015-16, 2018	2015-16	2015-16	-	-
Plymouth	2015-2019	2016-19	2016-19	-	-
Redcar and Cleveland	2015-19	2015-19	2015-19	-	-
Rutland	2015-19	-	-	-	2019
Sefton	2018	-	-	-	-
Sheffield	2015-17	2015-16	2015-16	-	-
Somerset	2015-16	-	-	-	-
South Tyneside	2015-19	2016, 2018-19	2016, 2018-19	-	-
Southend-on-Sea	-	-	-	2018-19	-
St Helens	2015	-	-	-	-
Stockton-on-Tees	2015-19	2017	2017	-	2019
Stoke-on-Trent	2016-19	2016-19	2016-19	-	-
Suffolk	2015-16	-	-	-	-
Sunderland	2015-19	2015-19	2015-19	-	-
Wakefield	-	-	-	2015-19	-
Westminster	-	-	-	-	2017

Appendix 4 – Upper tier local authority by deprivation decile

Decile 1 – Most deprived	Decile 2	Decile 3	Decile 4	Decile 5
Birmingham	Barking and Dagenham	Gateshead	Brent	Bury
Blackburn with Darwen	Barnsley	Haringey	Bristol, City of	Cornwall
Blackpool	Bolton	Islington	Calderdale	Croydon
Bradford	Doncaster	Leeds	County Durham	Dudley
Hartlepool	Hackney	Newcastle upon Tyne	Coventry	Ealing
Kingston upon Hull	Halton	Newham	Darlington	Greenwich
Knowsley	Leicester	Peterborough	Derby	Isle of Wight
Liverpool	North East Lincolnshire	Portsmouth	Enfield	Kirklees
Manchester	Redcar and Cleveland	Rotherham	Lewisham	Lambeth
Middlesbrough	South Tyneside	Sefton	Luton	Lancashire
Nottingham	St. Helens	Sheffield	Plymouth	Medway
Oldham	Sunderland	Torbay	Southampton	Slough
Rochdale	Tameside	Tower Hamlets	Southwark	Southend-on-Sea
Salford	Walsall	Wakefield	Stockton-on-Tees	Telford and Wrekin
Sandwell	Wolverhampton	Wirral	Wigan	Waltham Forest
Stoke-on-Trent				
Decile 6	Decile 7	Decile 8	Decile 9	Decile 10 – Least deprived
Brighton and Hove	Bedford	Barnet	Bromley	Bath and North East Somerset
Camden	Bournemouth, Christchurch & Poole	Bexley	Cambridgeshire	Bracknell Forest
Cumbria	Cheshire West and Chester	Devon	Cheshire East	Buckinghamshire
East Sussex	Derbyshire	Dorset	City of London	Central Bedfordshire
Hammersmith and Fulham	Herefordshire, County of	Essex	East Riding of Yorkshire	Isles of Scilly
Hounslow	Hillingdon	Havering	Gloucestershire	Kingston upon Thames
Kensington and Chelsea	Kent	Milton Keynes	Hampshire	Oxfordshire
Lincolnshire	Northamptonshire	North Somerset	Harrow	Richmond upon Thames
Norfolk	Nottinghamshire	Redbridge	Hertfordshire	Rutland
North Lincolnshire	Reading	Shropshire	Leicestershire	South Gloucestershire
North Tyneside	Somerset	Solihull	Merton	Surrey
Northumberland	Suffolk	Staffordshire	North Yorkshire	West Berkshire
Stockport	Swindon	Trafford	Sutton	Windsor and Maidenhead
Thurrock	Warrington	Wandsworth	West Sussex	Wokingham
Westminster	Worcestershire	Warwickshire	Wiltshire	York