A&E Rates by LSOA

Exploration of A&E Attendance Rates for City of York Residents

Overview

- Analysis of A&E attendance rates by LSOA (small area) in CYC
- Rates are age and sex standardised
- Reviewing by geographical area allows us to look at:
  - Characteristics of the population (area classification and deprivation)
  - Properties of the area such as distance to the Hospital, a GP Site or Pharmacy

Just to note that there is an element of variation in the rates that can be impacted right at the start by questioning what counts as an attendance (type 1, type 3, streamed, high intensity users etc)

The following analysis highlights the 10 LSOAs with the highest rates.

However, there are other LSOAs with high rates that are potentially not so different.

What is an LSOA?

Output Areas and Wards within City of York

Output Areas (OA) were created in 2001 for census data.
Based on:

- **Adjacent unit postcodes**
- **Characteristics of the actual census data**

Design considerations include:

- **Similar population sizes**
- **Consist of entirely urban or entirely rural postcodes**
- **Be as socially homogenous as possible based on tenure of household and dwelling type**

Average population is about 300 people (2011)
Boundaries align to local authority districts (LAD)

637 output areas in City of York.
Too small for our analysis (confidentiality)

So, what is an LSOA?

Lower Super Output Areas within City of York

Super Output Areas (SOAs) initially introduced for use on Neighbourhood Statistics.

Built up from groups of output areas (OAs) and continue to align with local authority boundaries.

More statistics are published for Lower (LSOA) and Middle (MSOA) super output areas including deprivation and the area classifications.

The 637 output areas in the City of York are grouped into 120 LSOAs.

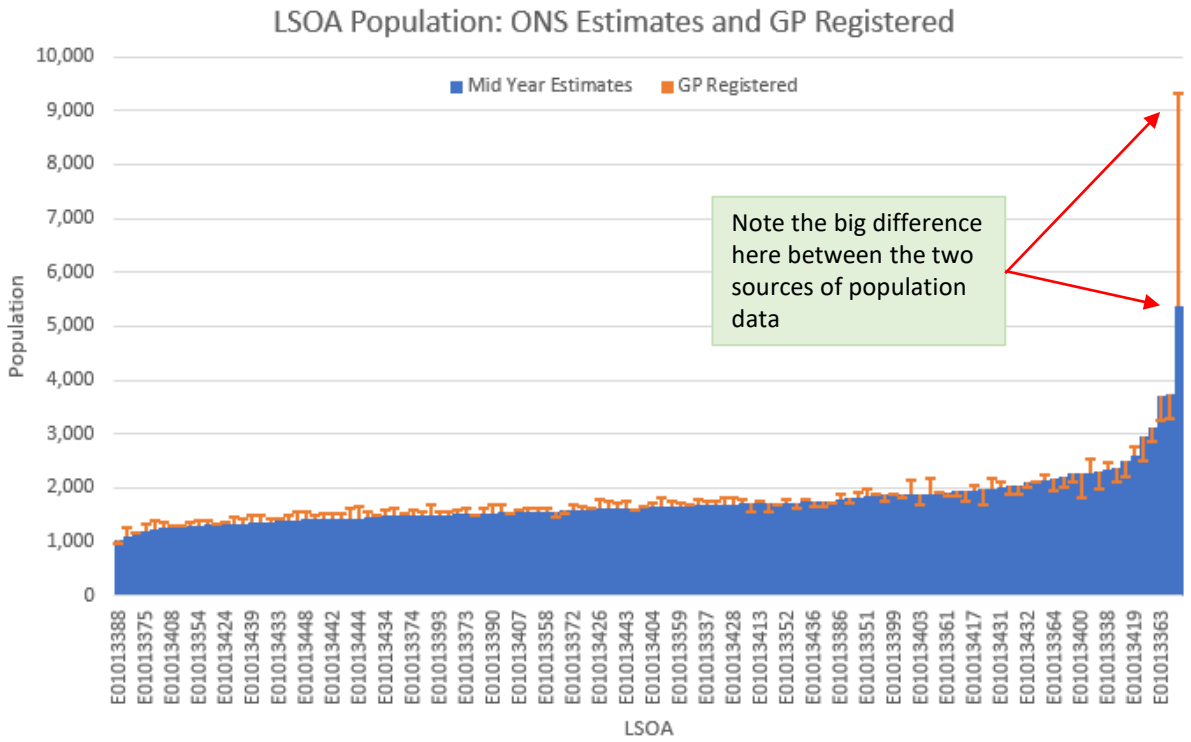
LSOA Populations

We have two sources of population figures at LSOA level:

- **GP Registered (Age/Sex monthly or LSOA quarterly)**
- **ONS Mid Year Population Estimates (Age/Sex and LSOA)**

There is some discrepancy between the two sets of figures which is further distorted by the University LSOA:

	Mid Year Estimate	GP Registered	Difference #	Difference %
Population	211,012	216,741	5,729	2.7%
exc. Uni LSOA	205,633	207,422	1,789	0.9%
Uni LSOA	5,379	9,319	3,940	73.2%
Min	1,025	965		
Median	1,639	1,680		
Mean	1,758	1,806		
Max exc. Uni	3,745	3,292		



For the purposes of age/ sex standardising the rates, we can only use the ONS mid year estimates.

Things we can do with an LSOA

Circle Position shows the population centroid
Circle Size represents the population size

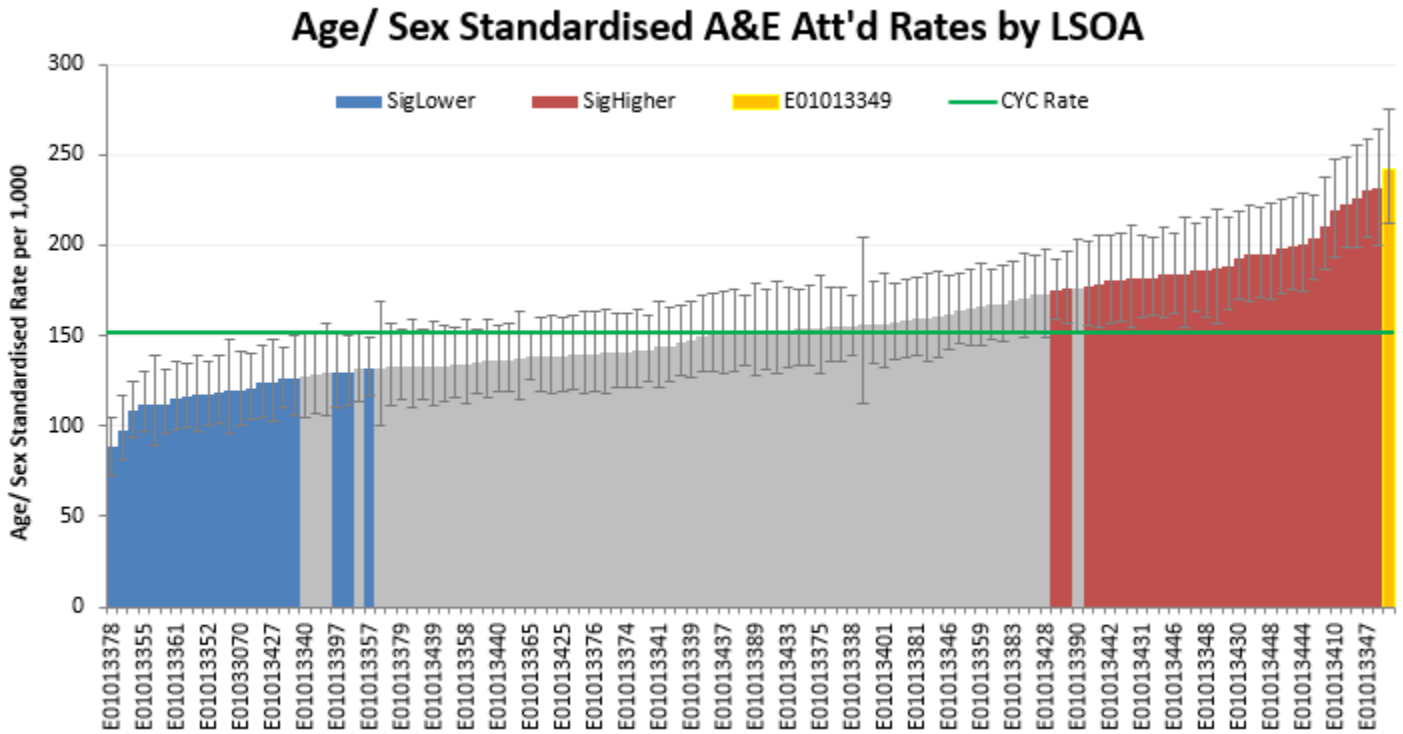
We can:

- **See if an LSOA contains, for example, a GP Practice, Care Home, or Pharmacy.**
- **Using the population centroid, calculate a simple straight line distance to e.g. York Trust, or the nearest GP Practice site**
- **Using Secondary Care Data (SUS) look at counts and rates of activity and standardise these using the population figures**
- **Align these with other statistics published at this level such as Area Classifications, Indices of Deprivation, Electricity consumption...**

A&E Attendances – What Data?

- York Trust/ Site Only – includes patients subsequently streamed
- Type 1 + Type 3 (minor injuries) since only separated from July-20
- Period is the 12 months April-20 to March-21
- Minor illness at Vocare (Type 3) not directly included due to data quality issues (inc. GP OoH, missing Apr data) but typically captured as streamed in the York data
- Removed the impact of multiple attendances (patients with more than one attendance in the period will be counted once only)
  - Noted high intensity users (e.g. individuals with 30 and 40+ attendances in some cases)

Age Sex Standardised A&E Attendance Rates



The average number of attendances across the LSOAs is 250 and ranges from 135 to 475.

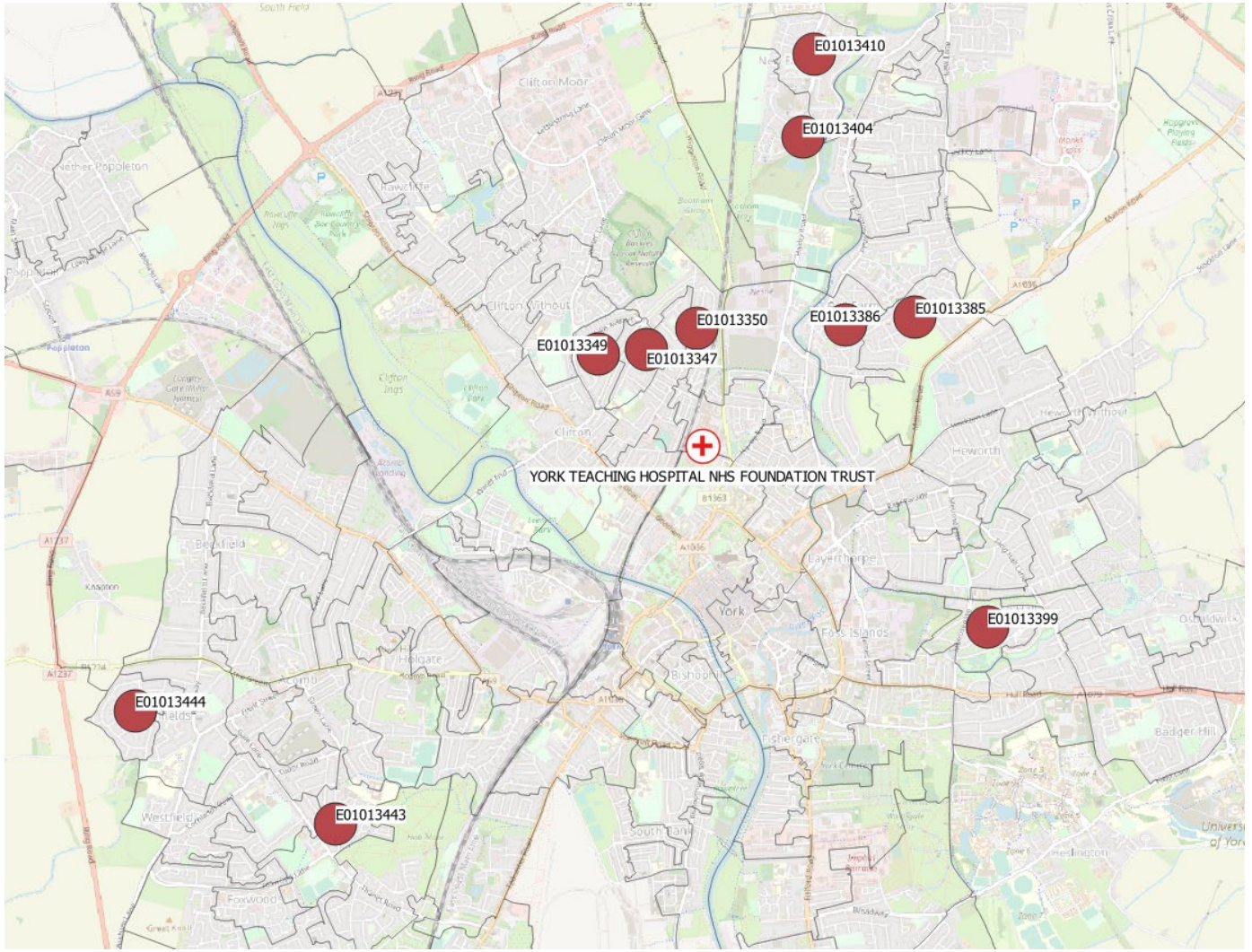
The rates, adjusted for age and sex, range from 88 to 242 attendances per 1,000

The overall CYC adjusted rate is just over 150 attendances per 1,000

The wide confidence intervals are typically observed when the activity in a given 'bracket/ strata' (e.g. male 70-75) is greater than or equal to the 'estimated' population.

10 LSOAs with the Highest A&E Attendance Rates

lsoa	activity	pop	crude	dsr
E01013349	318	1,447	220	242
E01013399	379	1,870	203	231
E01013347	359	1,680	214	230
E01013386	385	1,797	214	226
E01013443	348	1,627	214	223
E01013410	290	1,356	214	219
E01013350	335	1,679	200	211
E01013404	337	1,640	205	204
E01013444	285	1,441	198	200
E01013385	273	1,432	191	200

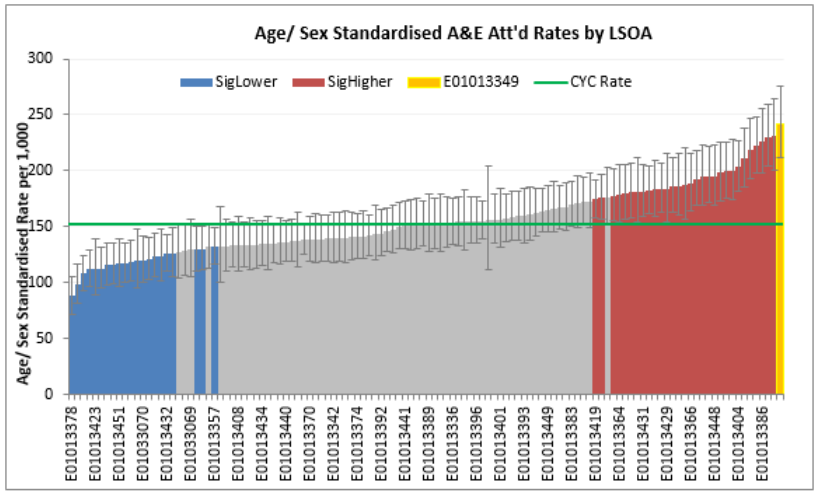


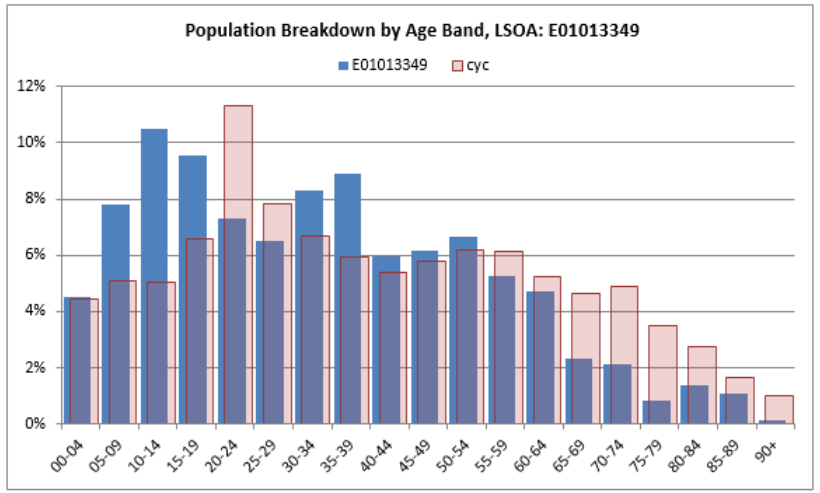
Just an observation at this stage regarding the adjacent clusters (ie. LSOAs sharing boundaries):

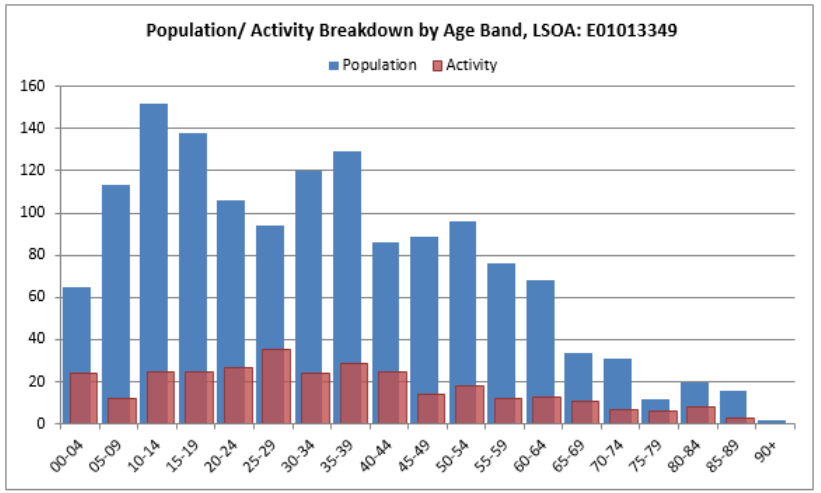
- E01013349, E01013347, E01013350
- E01013386, E01013385
- E01013404, E01013410

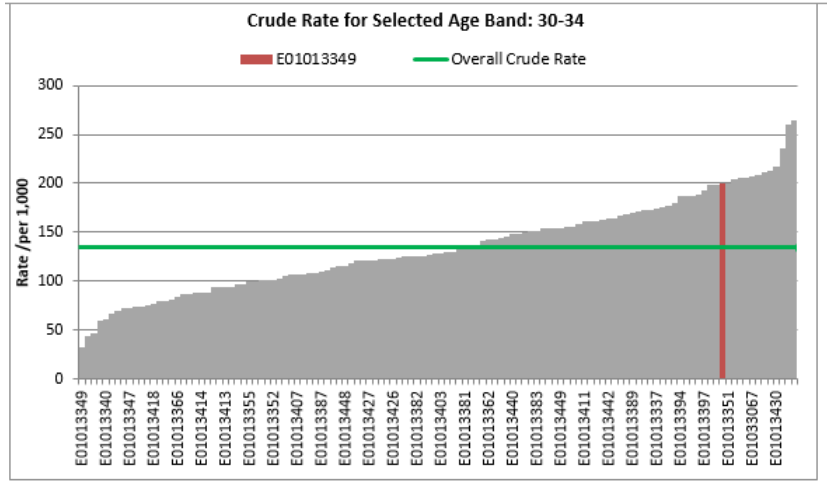
Explore individual LSOAs

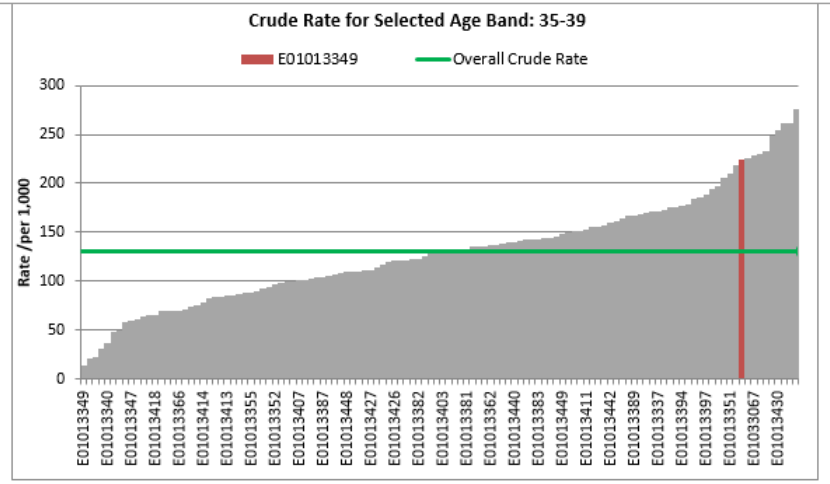
Not proposed to do here but it's possible to review any individual lsoa and look at the age specific rates.
This might, for example, suggest an age-cohort to investigate in more detail.

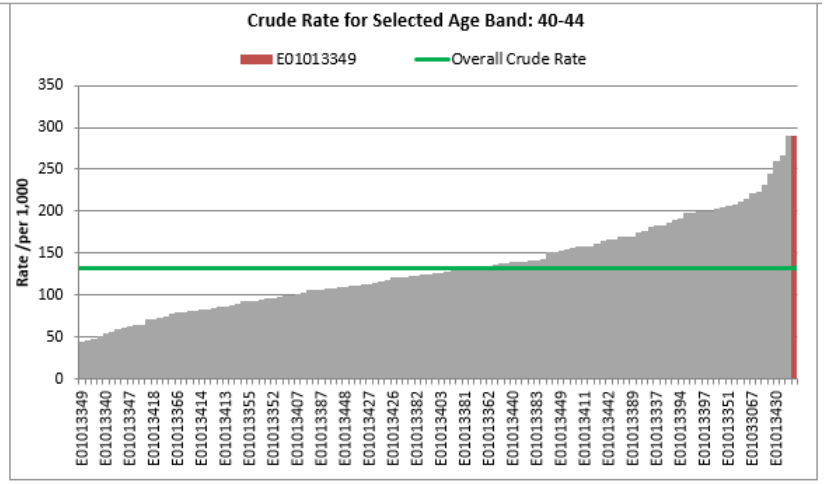




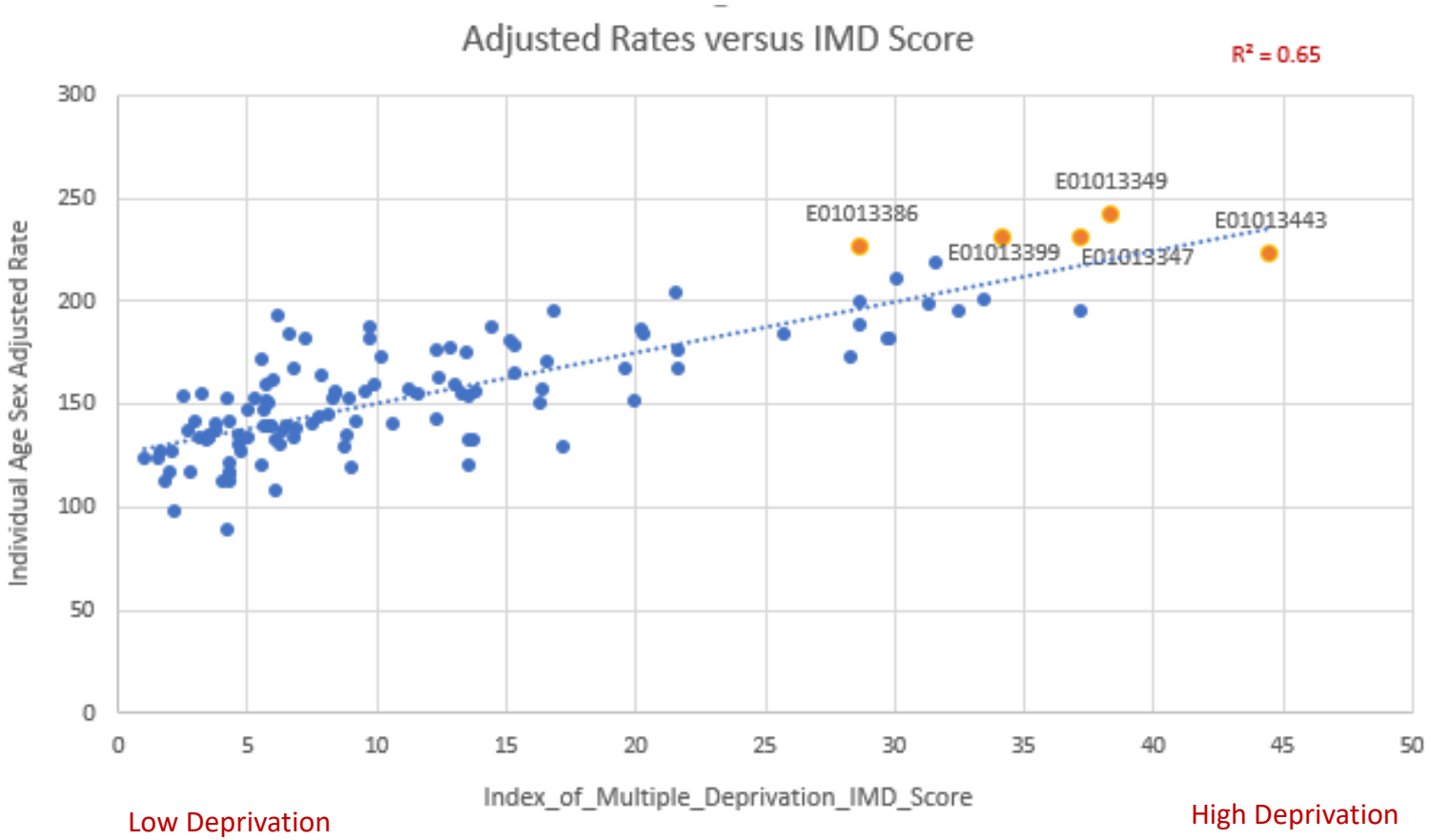








Correlation with Deprivation (IMD)



Strong correlation between deprivation and attendance rate (R = 0.81)

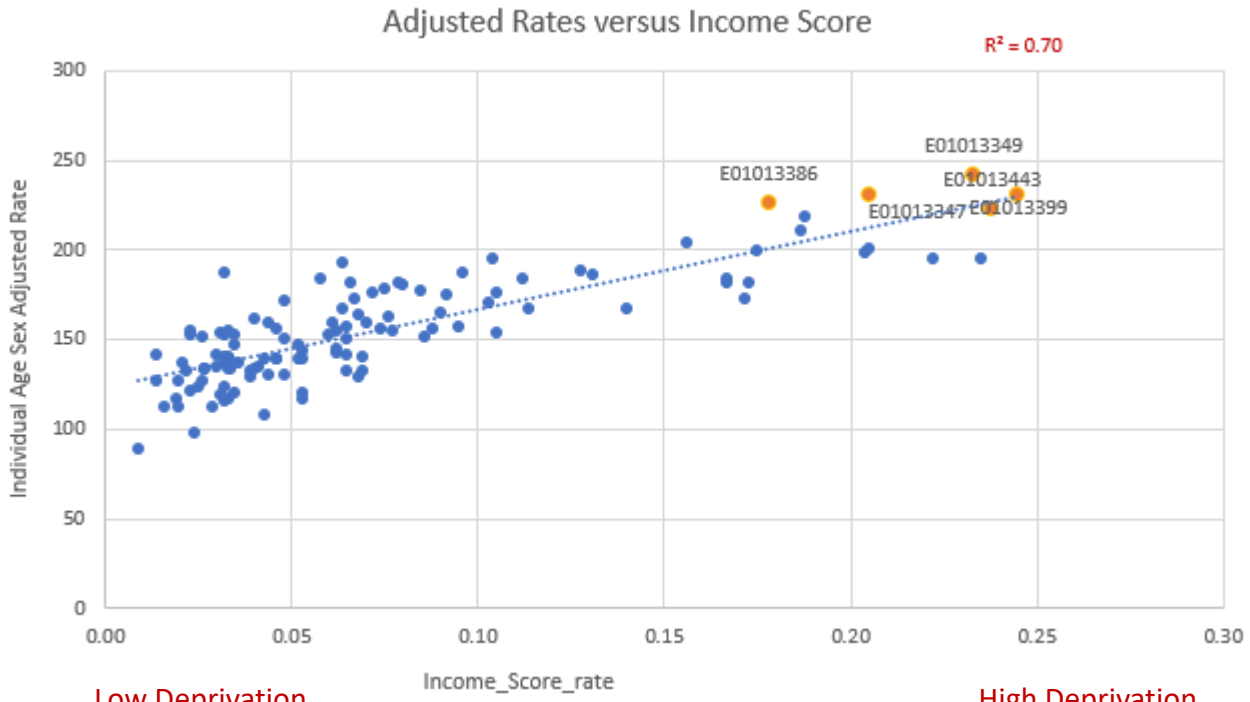
The deprivation scores are typically ranked and presented in e.g. deciles:

- **1 being the most deprived**
- **10 being the least deprived**

IMD Score above:	Decile
44	1
33	2
27	3

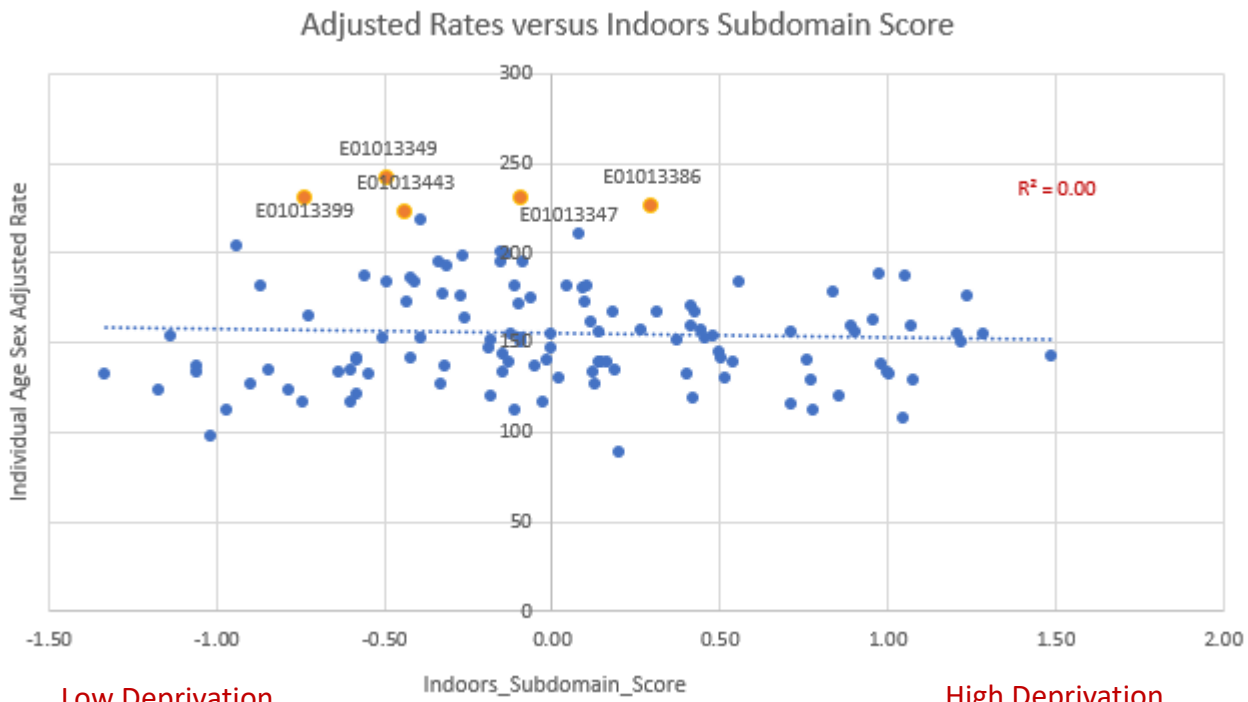
Deprivation Indices

The index of multiple deprivation (IMD) is a combination of numerous indicators across 7 domains (subsequently weighted) The charts below show that the correlation for some indicators (e.g. Income, R = 0.84) is much stronger than others (e.g. indoors, R = -0.05)



Low Deprivation

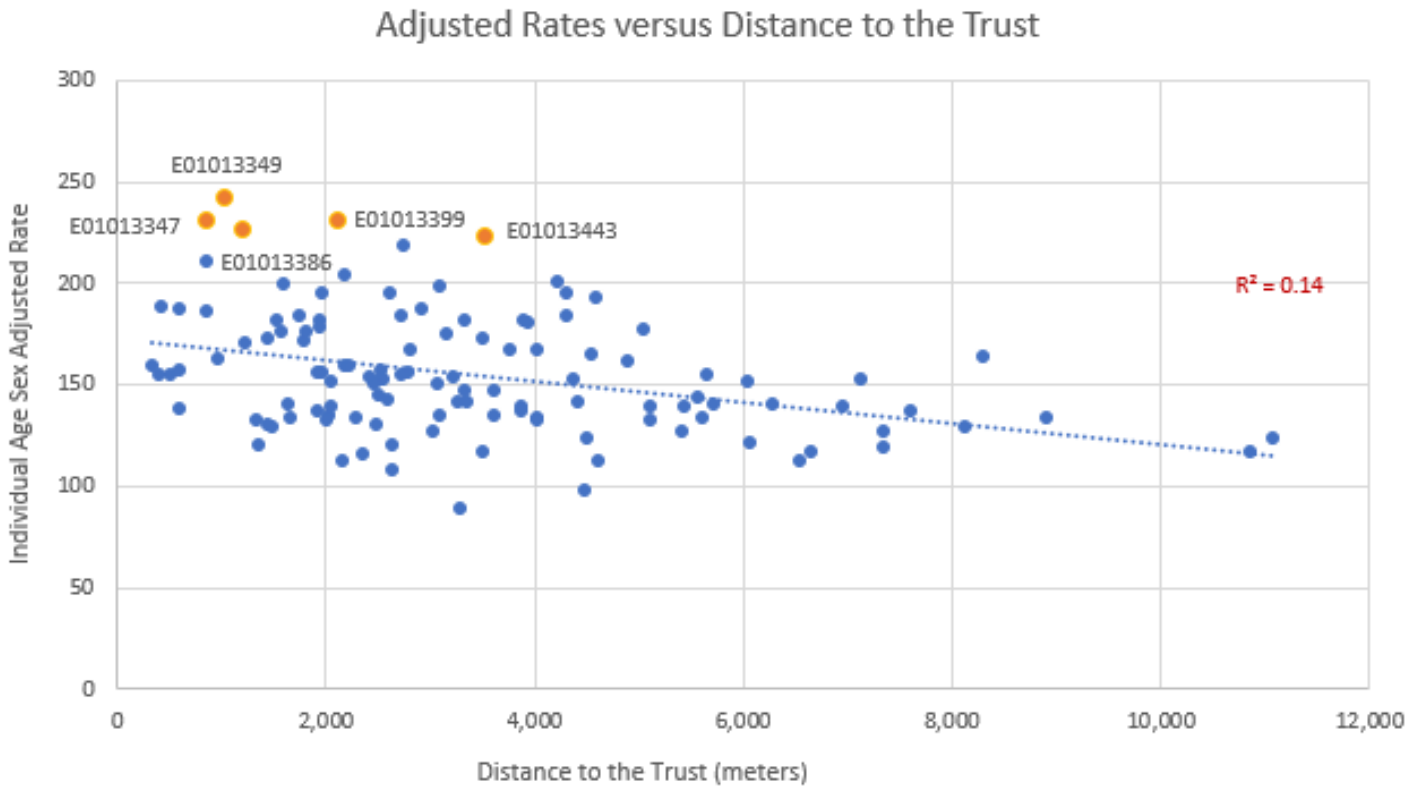
High Deprivation



Low Deprivation

High Deprivation

Correlation with Distance



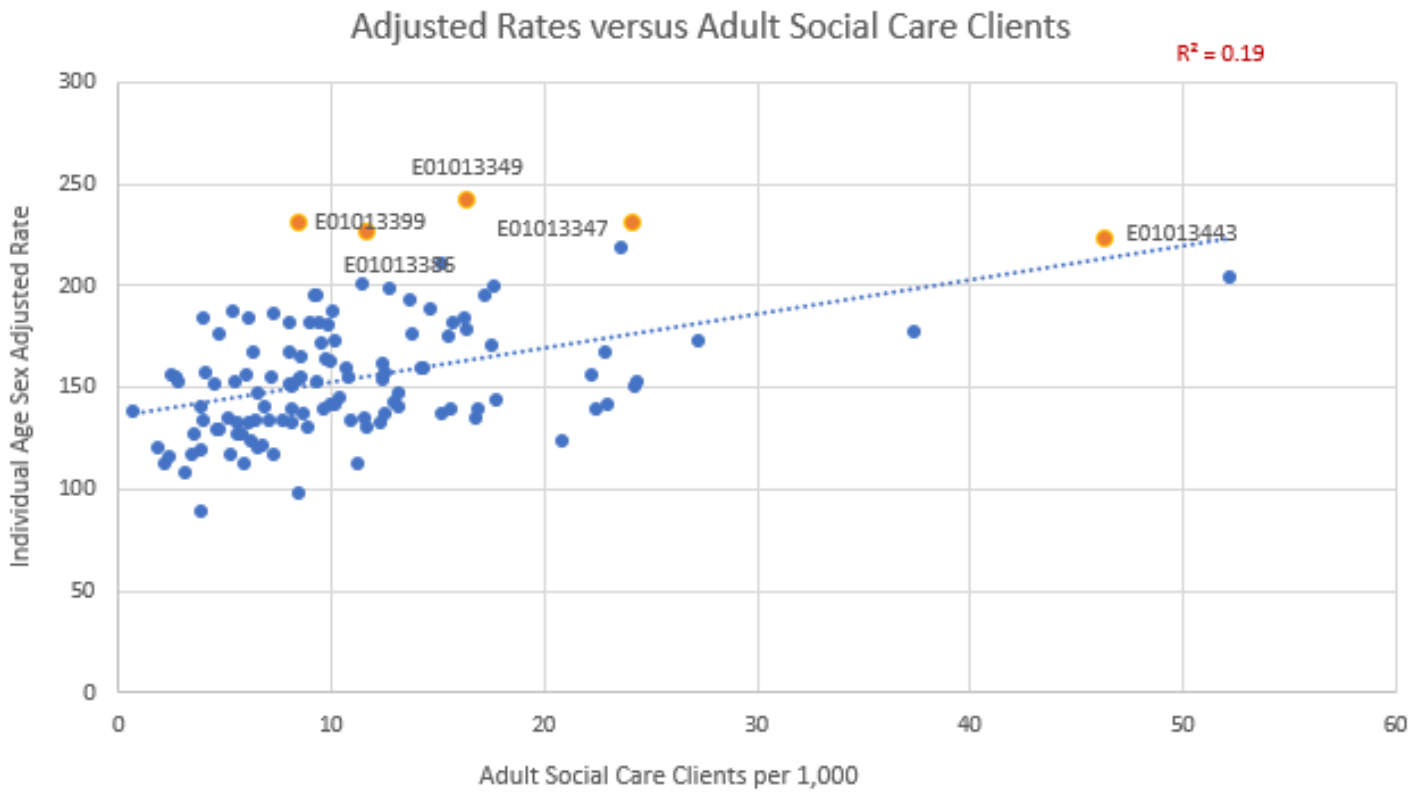
A reasonably strong degree of correlation between distance to the trust and attendance rates (R = -0.37)

Note, this is simply the straight line distance between two points ie. as the crow flies

It does not take into account, for example, ease of access such as main roads, public transport (travel times) etc

See Appendix for comparison with driving and walking times – doesn't appear to make much difference

Correlation with Adult Social Care Clients



A reasonably strong degree of correlation between Adult Social Care clients and attendance rates (R = 0.44)

A caveat here is that the A&E adjusted rates are for all ages whilst the Adult Social Care Clients are only for ages 18+

10 LSOAs with the Highest A&E Rates

Age/ Sex Adjusted

						Apr-20 to Mar-21			LSOA Characteristics								
	Population (Mid Year 2020)					A&E Activity (Unique)			IMD			Straightline distance in meters to:			within LSOA Boundary		
LSOA11CD	ONS Estimate	GP Registered	diff'n #	diff'n %	% >64years	attendances	Crude Rate	DSR	Rank	Decile	areaClassification	York Trust	GP Practice	Pharmacy	GP Practice	Care Home	Pharmacy
E01013349	1,447	1,571	124	9%	7.9%	318	220	242	4,772	2	Constrained renters	1,047	195	612			
E01013399	1,870	1,895	25	1%	8.1%	379	203	231	6,177	2	Hampered neighbourhoods	2,125	379	407			
E01013347	1,680	1,801	121	7%	10.2%	359	214	230	5,135	2	Constrained renters	853	513	734			
E01013386	1,797	1,883	86	5%	10.1%	385	214	226	8,635	3	Constrained renters	1,211	501	483		TRUE	
E01013443	1,627	1,751	124	8%	16.5%	348	214	223	3,155	1	Constrained renters	3,533	574	425		TRUE	
E01013410	1,356	1,477	121	9%	16.3%	290	214	219	7,237	3	Challenged white communities	2,746	393	661			
E01013350	1,679	1,750	71	4%	12.4%	335	200	211	7,982	3	Constrained renters	859	844	1,045			
E01013404	1,640	1,735	95	6%	23.2%	337	205	204	13,082	4	Comfortable neighbourhoods	2,192	320	337	TRUE	TRUE	TRUE
E01013444	1,441	1,655	214	15%	11.9%	285	198	200	6,469	2	Challenged white communities	4,236	721	721			
E01013385	1,432	1,527	95	7%	15.9%	273	191	200	8,680	3	Comfortable neighbourhoods	1,602	341	135			TRUE
											selected lsoas mean	*2,040*	*478*	*556*			
											selected lsoas median	*1,863*	*447*	*547*			
											CYC mean	*3,409*	*585*	*707*			
											CYC median	*2,867*	*460*	*481*			

The LSOAs in the table above are sorted with the highest age/sex adjusted rates at the top

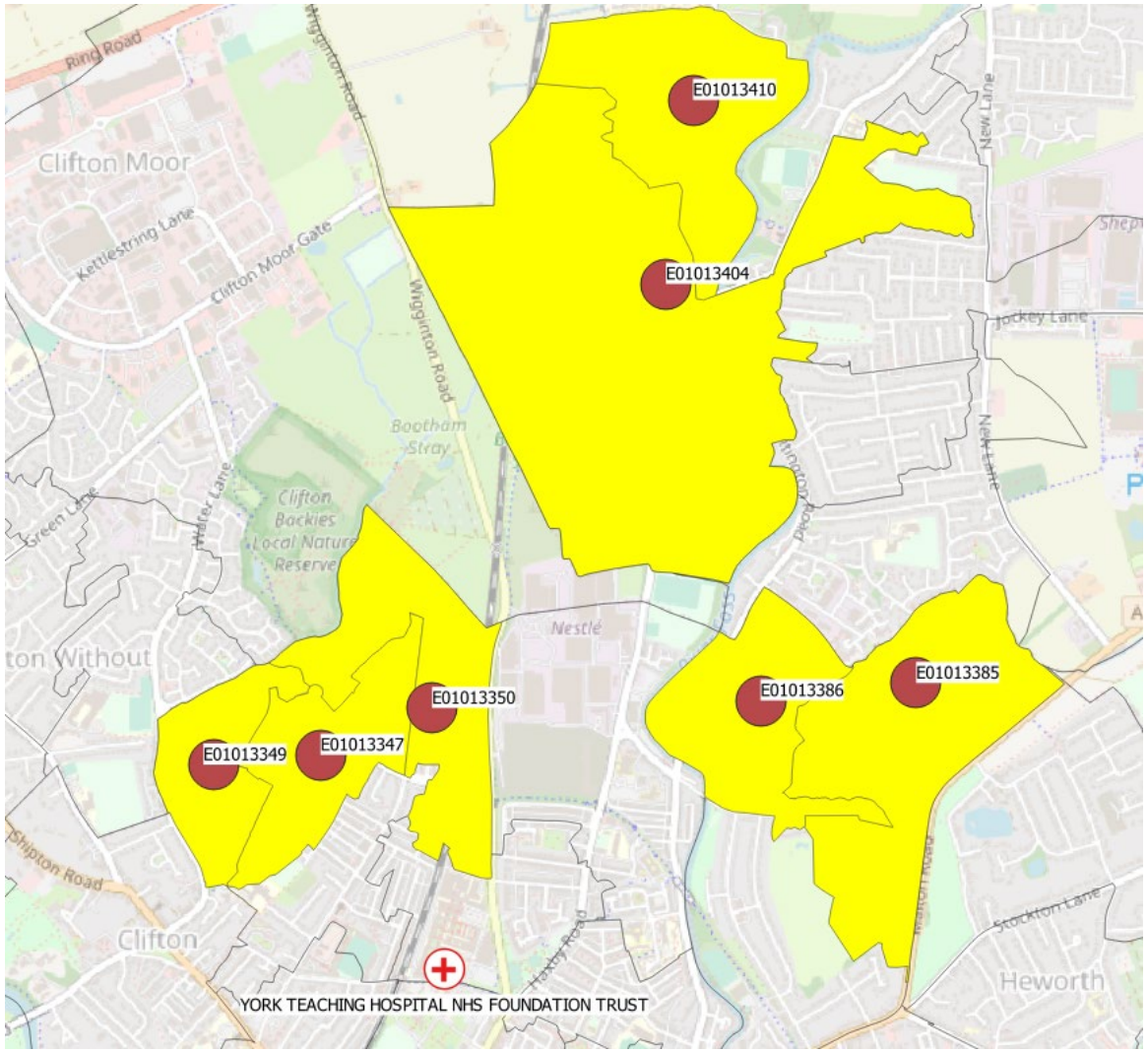
Out of the 10 LSOAs with the highest rates:

- 5 are in the top 20% most deprived (Deciles 1 and 2)
- 8 fall under the area classification of 'Hard-pressed communities' shaded orange

Noted that the first two LSOAs listed appear to have a smaller population aged over 64

- The CYC population aged over 64 is around 18%

Nice Summary Map here…



This isn't a nice summary map (in progress).

It's just to show that 7 of the top 10 LSOAs are physically very close to each other. With the addition of 1 LSOA, they would all be connected.

Is it any coincidence that these LSOAs all run along either Haxby or Wigginton Road - possibly indicating ease of access to the trust?

Not to forget about the other LSOAs but is there something worth further investigating here…

Example LSOA Investigation: E01013349

- Majority of patients are registered with either Priory (48%) or York Medical Group (45%)
- There were 318 individuals from this LSOA attending A&E in the period.
- Tables below are to give an indication of the additional detail available further description in the notes

attendanceSourceDesc	Total
Self-referral to accident and emergency department	156
Referred by ambulance service	73
Referred by National Health Service 111 service	64
Referred by member of Primary Health Care Team	21
Referral by out of hours service	1
Referred by urgent care service	1
Referred by advanced care practitioner	1
Referred by police	1
Grand Total	**318**

dischargeStatusDesc	Total
Treatment complete	260
Streamed to primary care service / GP	39
Left after assessment but before treatment complete (de	10
Streamed to Ambulatory Emergency Care service	4
Left before initial assessment	2
Left after assessment with intent to attend other health	2
Streamed to Urgent Care Centre	1
Grand Total	**318**

yearBand5	Total	
00-04	24	8%
05-09	12	4%
10-14	26	8%
15-19	25	8%
20-24	26	8%
25-29	35	11%
30-34	24	8%
35-39	32	10%
40-44	25	8%
45-49	12	4%
50-54	17	5%
55-59	12	4%
60-64	13	4%
65-69	11	3%
70-74	7	2%
75-79	6	2%
80-84	8	3%
85-89	3	1%
Grand Total	**318**	

Att'd	Individuals	Total Att'd
1	219	219
2	52	104
3	29	87
4	6	24
5	6	30
6	1	6
7	1	7
9	2	18
15	1	15
16	1	16
	318	**526**

complaintDesc	Total
Pain in hip / leg / knee / ankle / foot	26
Injury of shoulder / arm / elbow / wrist / hand	25
Abdominal pain	21
Chest pain	19
Injury of hip / leg / knee / ankle / foot	19
Short of breath	17
Head injury	15
Pain in shoulder / arm / elbow / wrist / hand	14
Localised swelling / redness / lumps / bumps	14
Wound : laceration	11
Backache (no recent injury)	9
Headache	8

diagnosisDesc	Total
NULL	50
No abnormality detected	21
Open wound : finger	7
Head injury : no LOC	7
COVID-19	6
Superficial injury of foot	6
Acute coronary syndrome (ACS)	6
Sprain / ligament injury : wrist joint	5
Sprain / ligament injury : ankle joint	5
Biliary colic	5
Closed fracture : foot	5
Stroke	4

Further Work

- So, what next?

- Probably a case of taking individual LSOAs and reviewing in-depth
- This could include:
  - Age Specific Rates investigation
  - Focus on different cohorts of patients – children? In/ Out of hours etc

- Note the clusters of LSOAs just north of the trust – almost adjacent

- High Intensity Users not included here. A separate analysis?

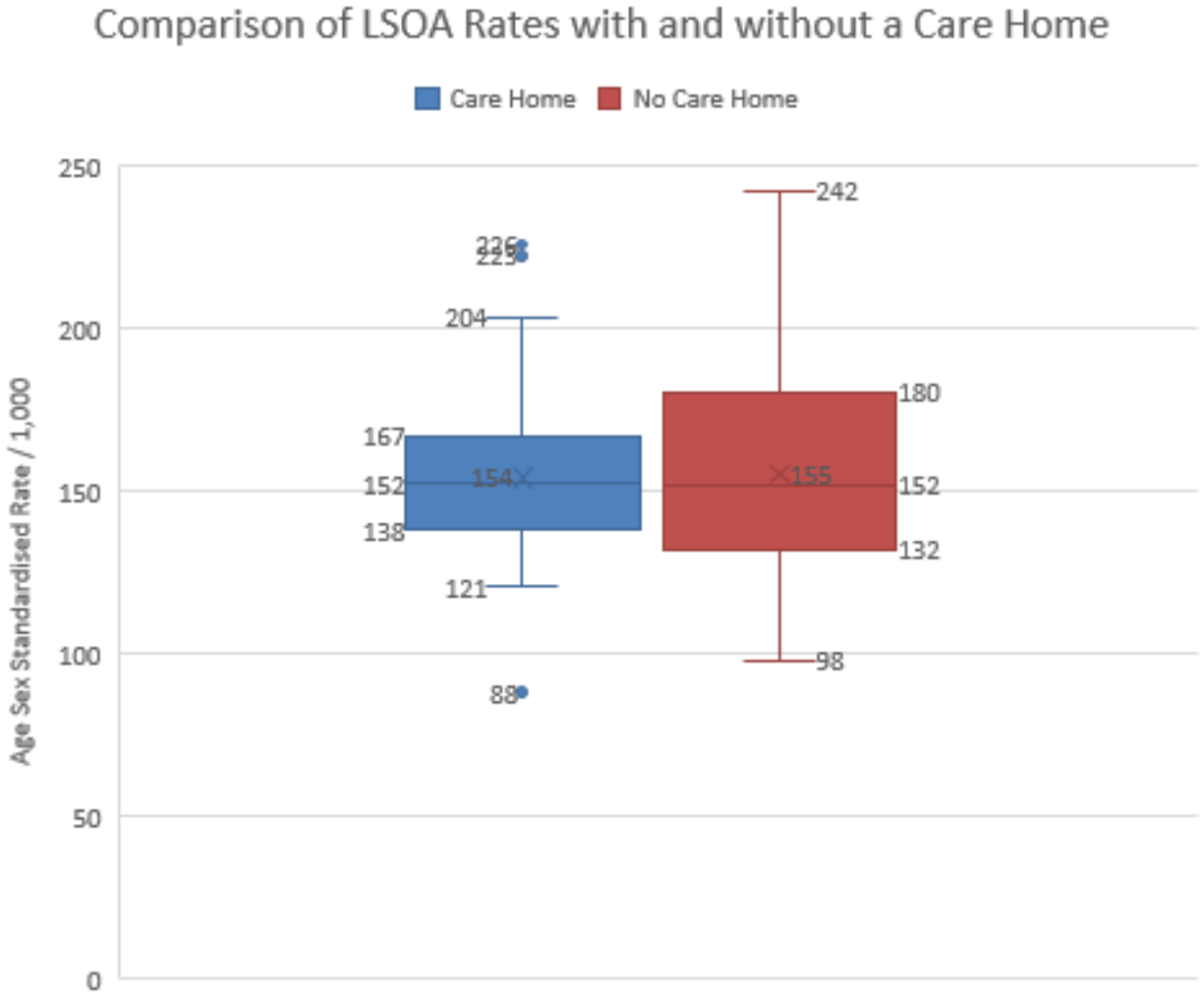
Appendices

Caveats

- Individuals with more than one attendance across the period are only counted once. The picture might look different if we were to include patients with 2 attendances or up to 5 etc
- Patients with multiple attendances often appear with different addresses across the period. For these purposes, they are assigned to their last known address.
- Population figures are estimates – so the rates are not exact

- The confidence intervals are fairly wide. It wouldn’t be surprising to see the order of the LSOAs shift just by looking at a different period

A&E Rates by LSOAs +/- Care Home

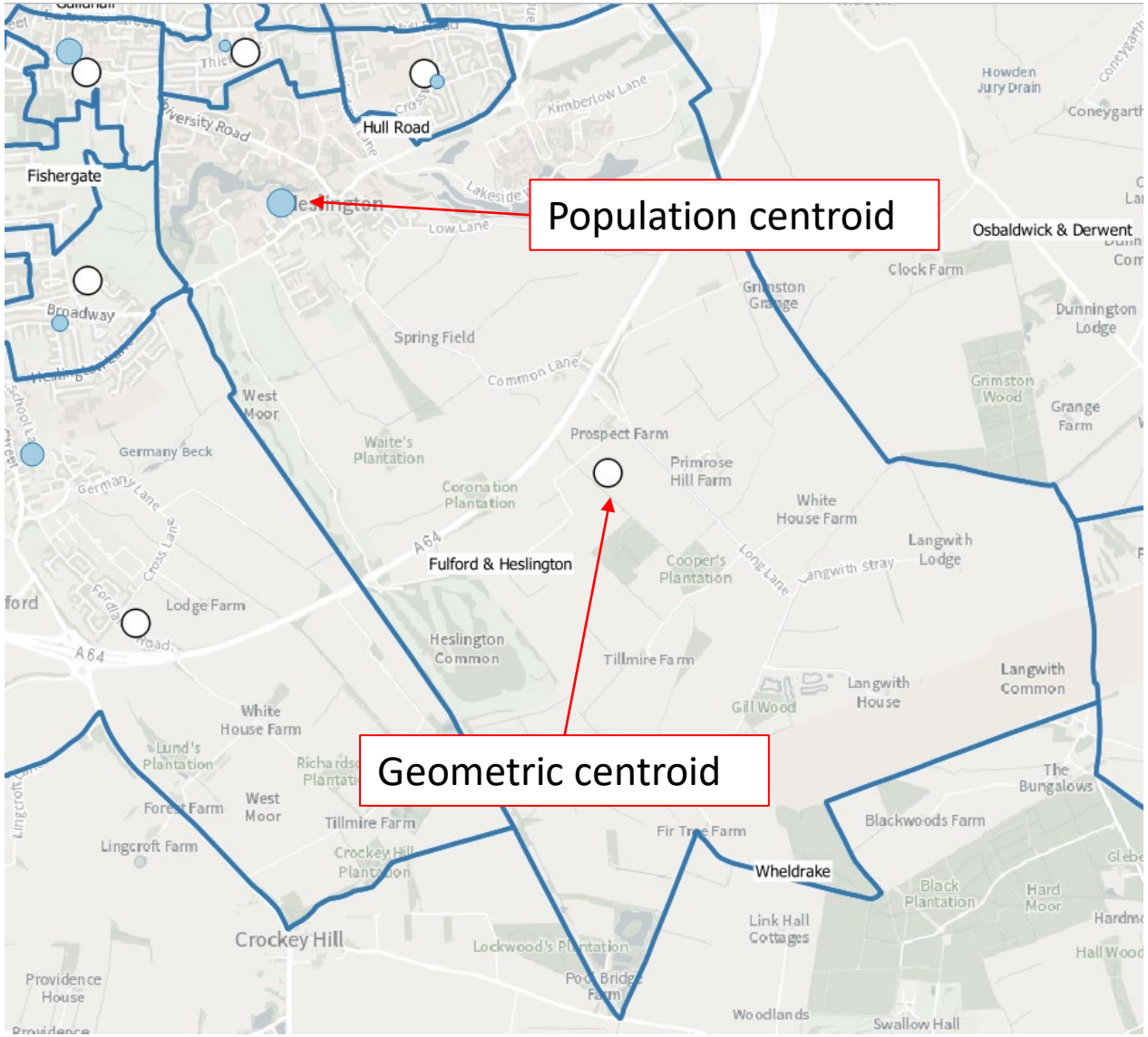


Not done any further calculations but the median and mean rates for LSOAs with (+) and without (-) a care home are almost identical.

Inter quartile range for LSOAs with care homes is much narrower (?)

34 out of 120 LSOAs have a care home

LSOA - Centroids



The map to the left shows the difference between the population and geometric centroid for the University LSOA.

In this example, the geometric centroid is the middle of farm land and quite rural. The population centroid aligns much more closely with the university residences.

Distance calculations are based on the population centroid.

For smaller areas, the distances between the two points will be smaller (can see some other LSOAs to the side).

Occasionally, a geometric centroid will fall outside its own boundary.

Rates don’t align with funnel

- Overdispersion…
- Need to understand and narrow down. Would it look any different for individual 5 year age bands.

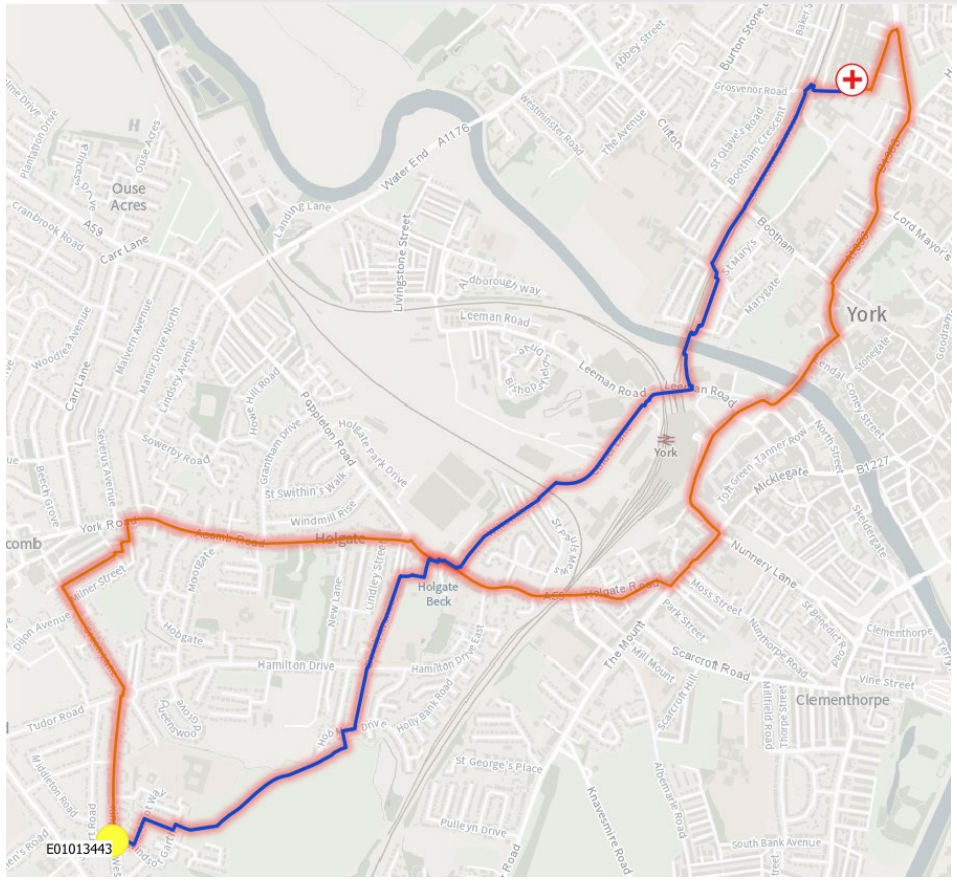
Source: SUS & Mid Year Population Estimates 2020
Note: Population is adjusted due to Standardisation Calculations

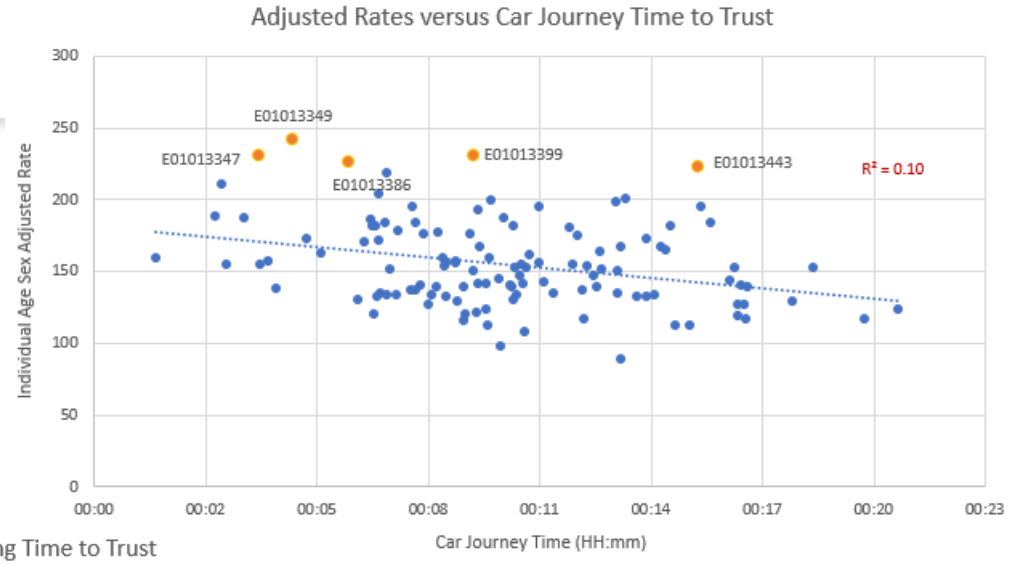
Correlation with Travel Times

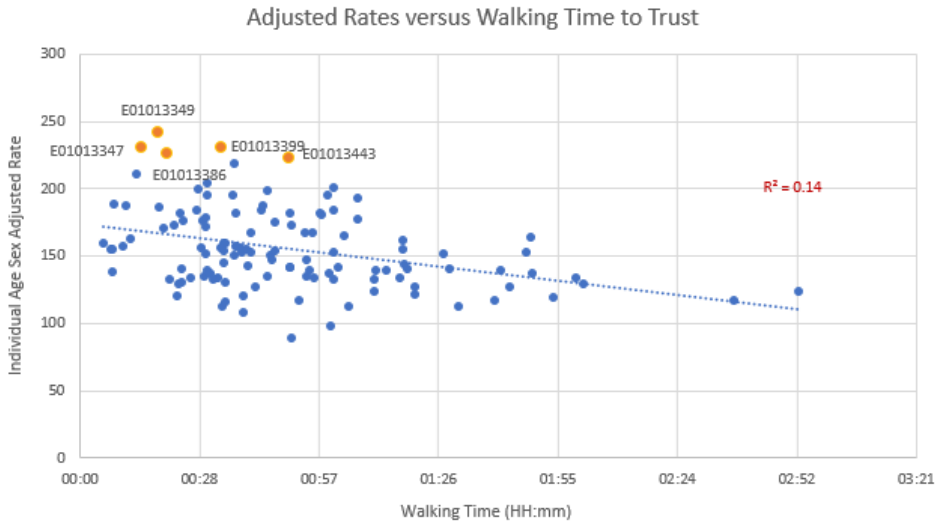
- A previous slide showed the correlation between the straight line distance from the lsoa centroid to the Trust (R=-0.37)

Using travel times instead:

- the correlation with walking is identical to the straight line distance (R=-0.37)
- For car journeys, the correlation is slightly less (R=-0.31) – all but one lsoa has a car journey time within 20 minutes







Ward Population

Although wards have recognisable names and geographies:

- their population sizes are much more varied
- It is less appropriate to assign a ‘characteristic’ to a geography on this much larger scale

- Ward population in CYC ranges from 3,000 to 17,500.
- Average is 10,300 (median is 11,000)