

Investigating the Link Between Covid-19 Case Rates and Deprivation

Business Intelligence Analyst Interview

Lancashire County Council

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Previous Covid-19 Studies

- **British Medical Journal** (June 2020):
 - People in most deprived areas of England and Wales are twice as likely to die after contracting Covid-19
- **Office for National Statistics** (July 2020):
 - Most deprived 10% in England has statistically significantly higher mortality rate than the least deprived 10%
- **Office for National Statistics** (August 2020):
 - Links between Covid-19 mortality rate and:
 - Age
 - Deprivation
 - Ethnicity
 - Gender

Previous studies have suggested a link between Covid-19 mortality rates and deprivation.

Is there a link between Covid-19 case rates and deprivation?

Deprivation in the Lancashire-14 Area

Local Authority	IMD Deprivation Score (2019)	Average Score Rank (National)
Blackpool	45.0	1
Burnley	37.8	8
Blackburn with Darwen	36.0	9
Hyndburn	34.3	16
Pendle	30.7	33
Preston	29.5	45
Lancaster	24.2	89
Rossendale	24.1	92
Wyre	20.9	129
West Lancashire	18.6	155
Chorley	16.9	177
Fylde	15.9	195
South Ribble	15.3	204
Ribble Valley	10.6	283

- Blackpool is the most deprived local authority in the Lancashire-14 area and in England
- Blackpool has lowest rankings in England for Income and Crime, though is in the least deprived 10% for Barriers to Housing and Services Rank
- Six of fourteen local authorities are in most deprived 20% of England
- Ribble Valley is least deprived local authority, and is in least deprived 20% of England
- Nine of the fourteen local authorities are in least deprived 10% of England for Barriers to Housing and Services

Covid-19 Case Rates in the Lancashire-14 Area

Local Authority	Covid-19 Case Rate (Nov 2020)	IMD Deprivation Score (2019)
Blackburn with Darwen	5778.38	36.0
Pendle	4595.49	30.7
Burnley	4510.80	37.8
Preston	4469.21	29.5
Hyndburn	4063.28	34.3
Rossendale	4002.41	24.1
West Lancashire	3714.59	18.6
Blackpool	3267.93	45.0
Ribble Valley	2992.38	10.6
South Ribble	2817.99	15.3
Chorley	2758.51	16.9
Wyre	2689.78	20.9
Fylde	2619.46	15.9
Lancaster	2590.42	24.2

- Across the area there's a broad range in Covid-19 case rates
- Blackburn with Darwen has the highest case rate, which more than doubles the case rate of Lancaster
- Generally, authorities with a higher Covid-19 case rate are more deprived than those with a lower rate

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Deprivation Groups	Average IMD Deprivation Score	Group Case Rate
7 Least Deprived	17.5	3057.8
7 Most Deprived	33.9	4155.7
3 Least Deprived	13.9	2796.5
3 Most Deprived	39.6	4554.0

- 7 most deprived local authorities have a case rate 1.4 times that of 7 least deprived
- 3 most deprived local authorities have a case rate 1.6 times that of 3 least

Covid-19 Case Rate and IMD Data Domains

- Strong linear relationship between Covid-19 Case Rates and most IMD data domains
- Implies link between case rate and deprivation
- Correlations between case rates and both Living Environment and Barriers to Housing and Services Ranks are weak and not significant at the 95% confidence level
- Deprivation Score shows a positive correlation with case rates since high score implies high deprivation
- All other significant domains show a negative correlation, since low score implies high deprivation

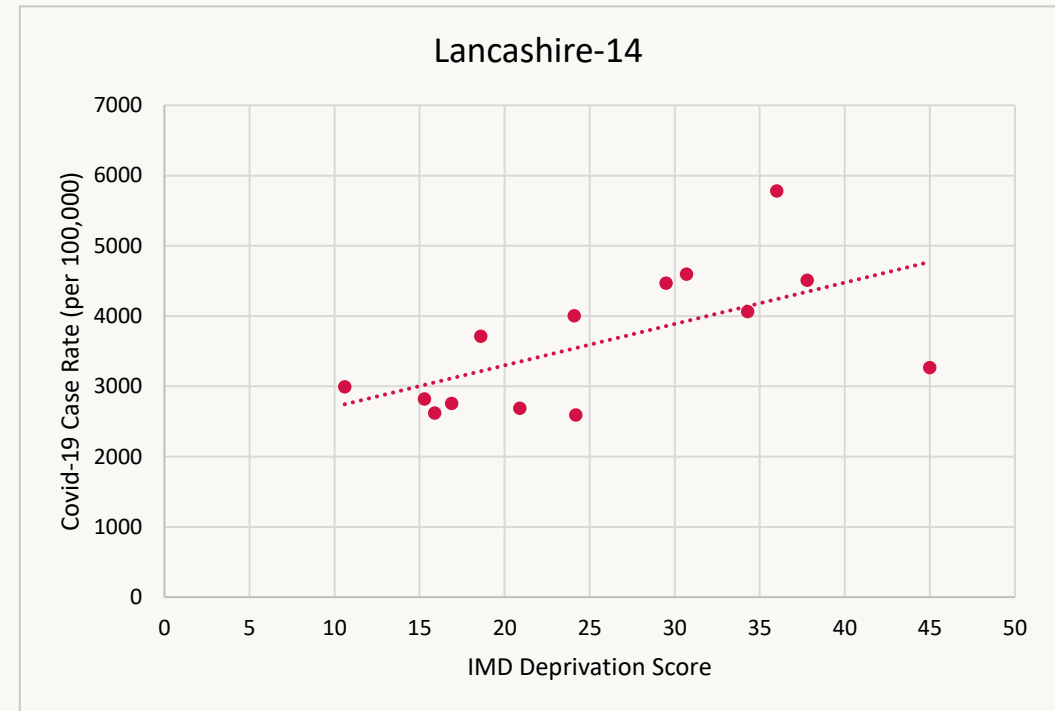
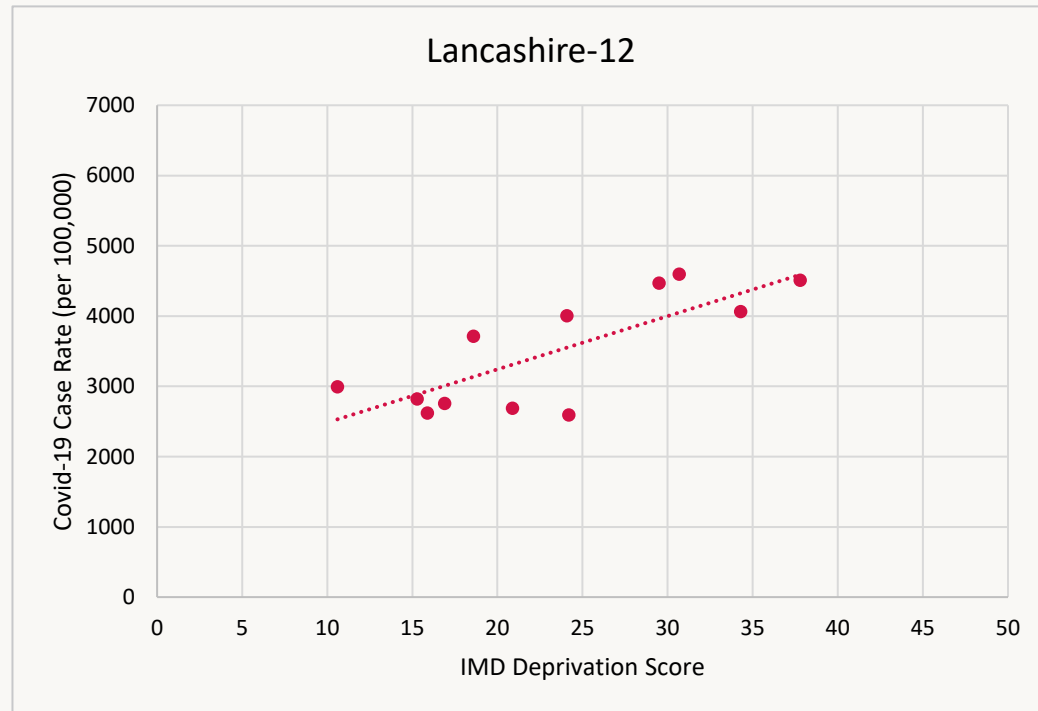
Domain (IMD 2019)	r-Value	p-Value
Education Rank	-0.73	0.003
Income Rank	-0.69	0.007
IDAOPi Rank	-0.67	0.009
Employment Rank	-0.66	0.010
LSOA Rank	-0.65	0.012
IDACI Rank	-0.64	0.013
Crime Rank	-0.63	0.015
Deprivation Score	+0.61	0.020
Health Rank	-0.56	0.039
Living Environment Rank	-0.50	0.067
H&S Barriers Rank	+0.23	0.424

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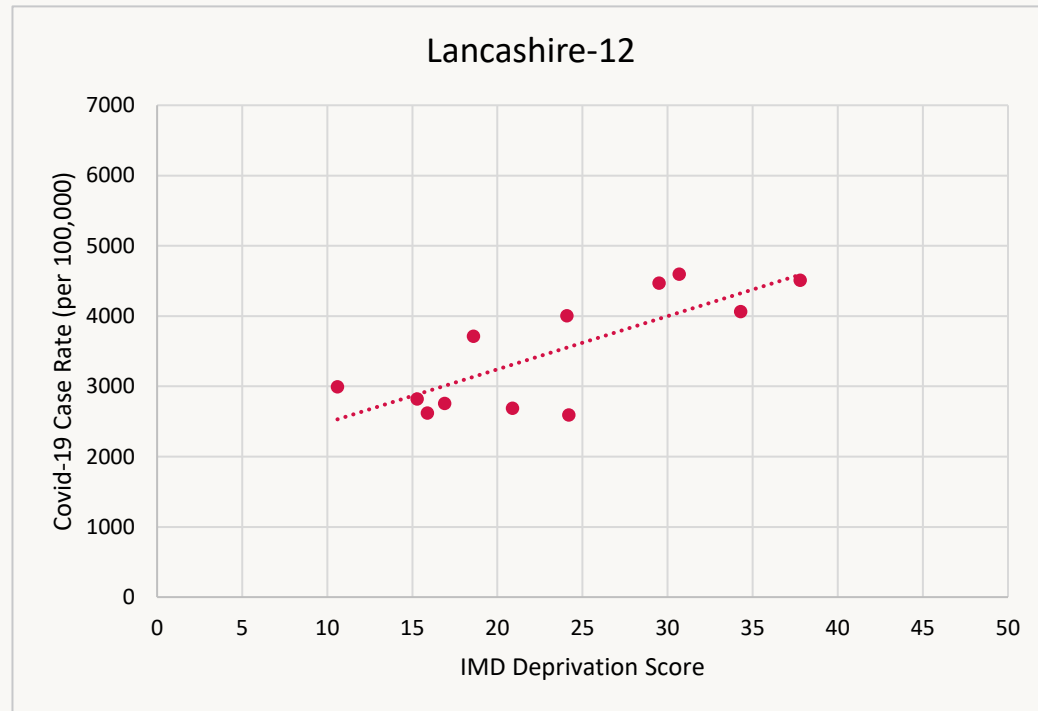
Covid-19 Case Rate and IMD Deprivation Score



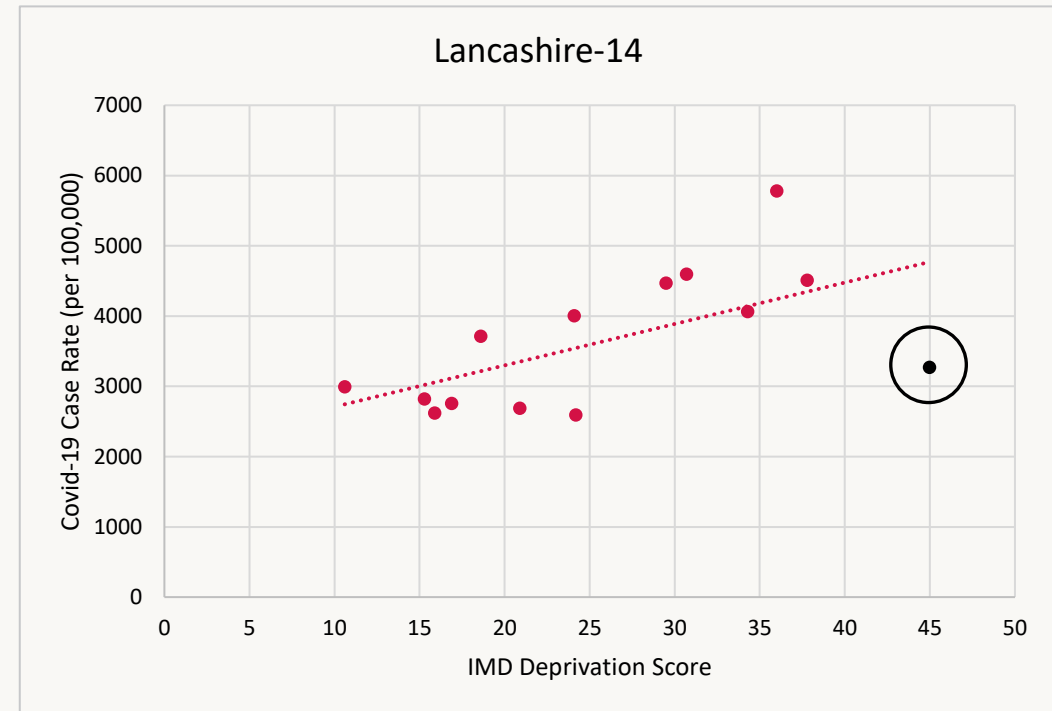
- Strong, significant, positive correlation
 - $r = 0.78$, $p = 0.003$
- Most deprived areas see highest case rates

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 - $r = 0.61$, $p = 0.020$
- Most deprived areas see highest case rates
 - Blackpool case rate lower than expected

Covid-19 Case Rate and IMD Deprivation Score

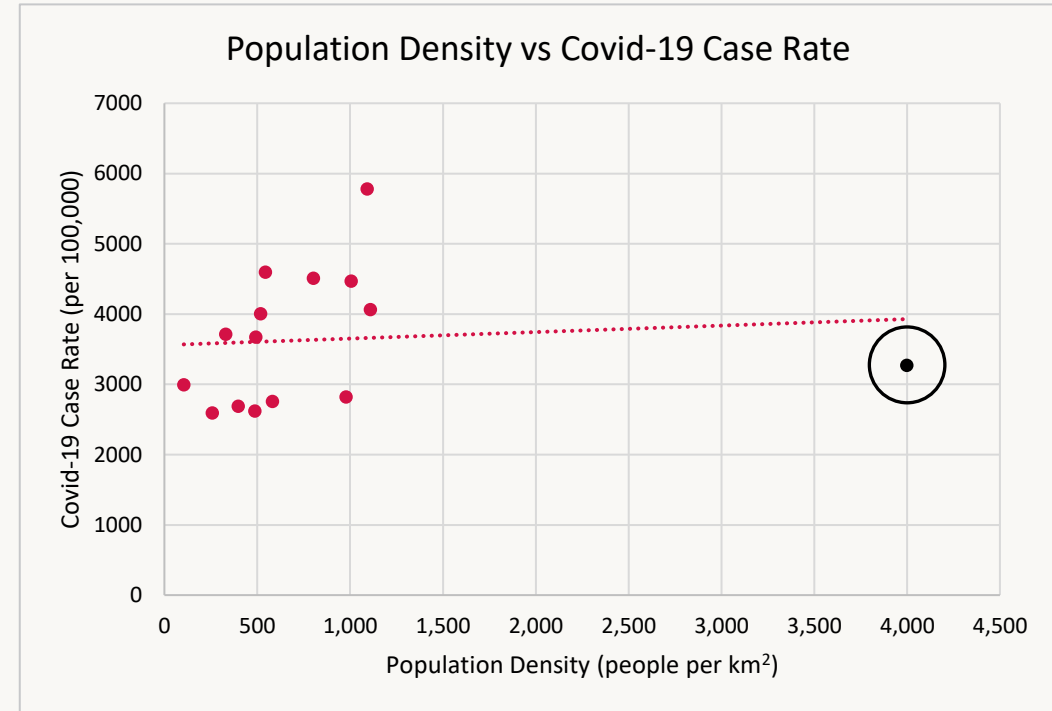
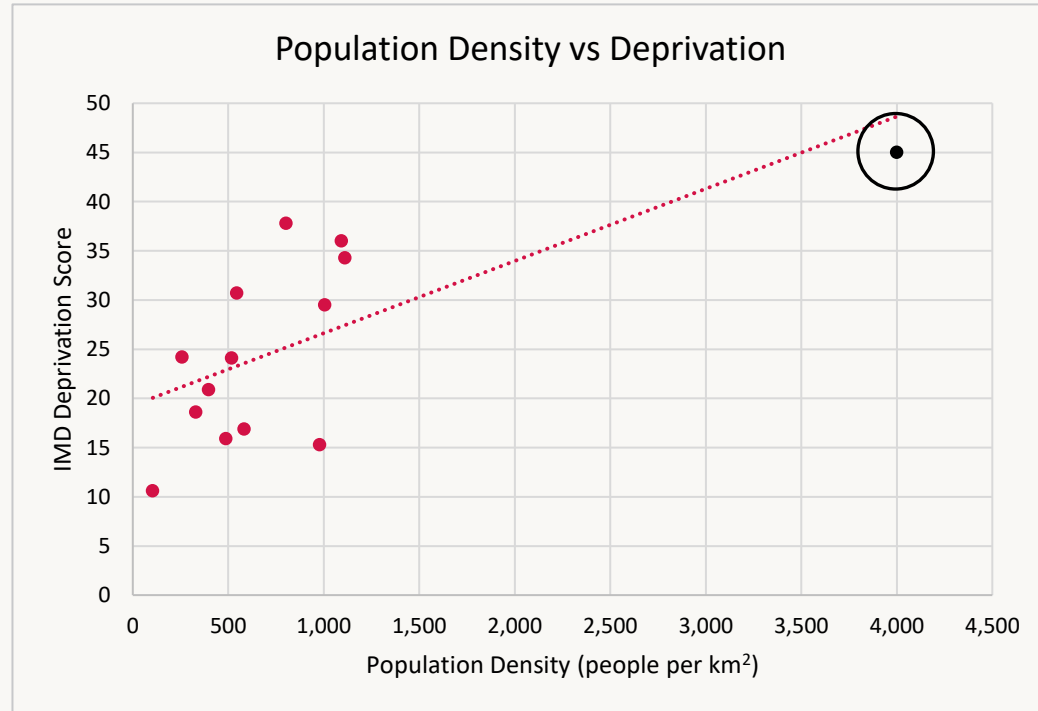


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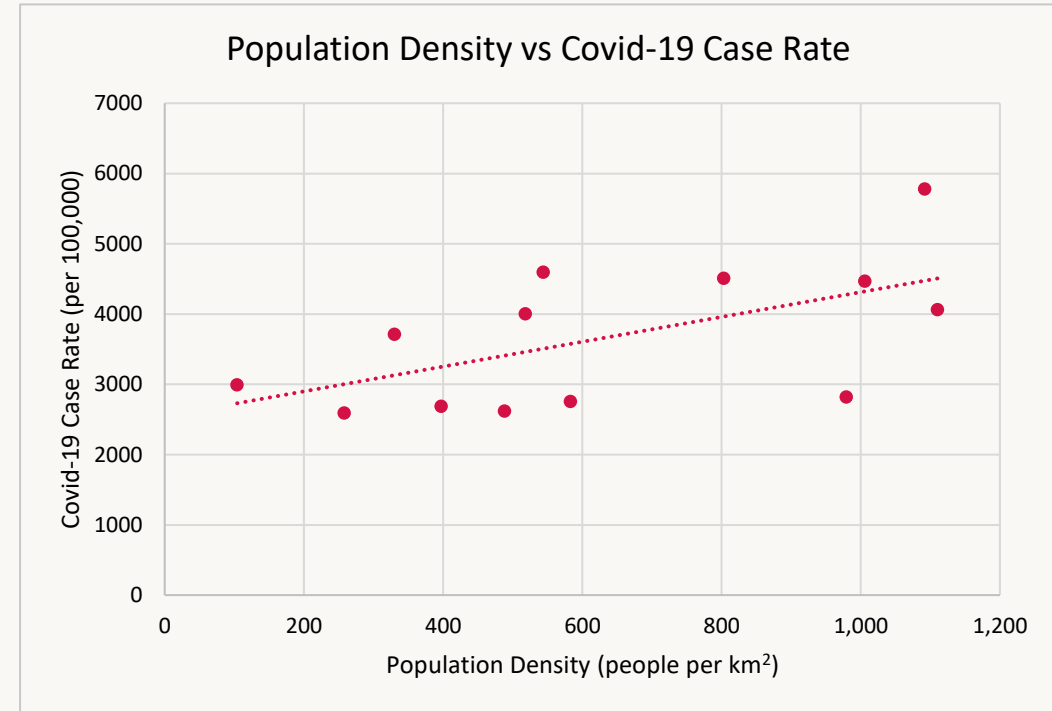
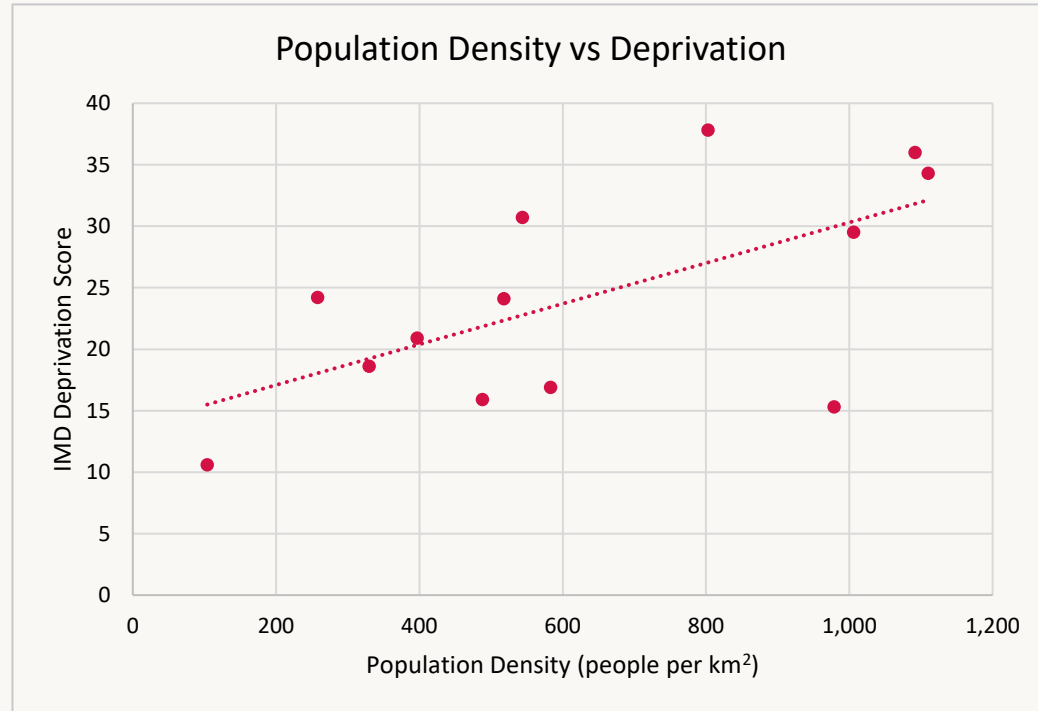
Population Density Relationships



- Strong, significant, positive correlation
 - $r = 0.69$, $p = 0.006$
- Most deprived areas have highest population density

- Weak, non-significant, positive correlation
 - $r = 0.09$, $p = 0.751$
- Blackpool has far higher population density than other local authorities

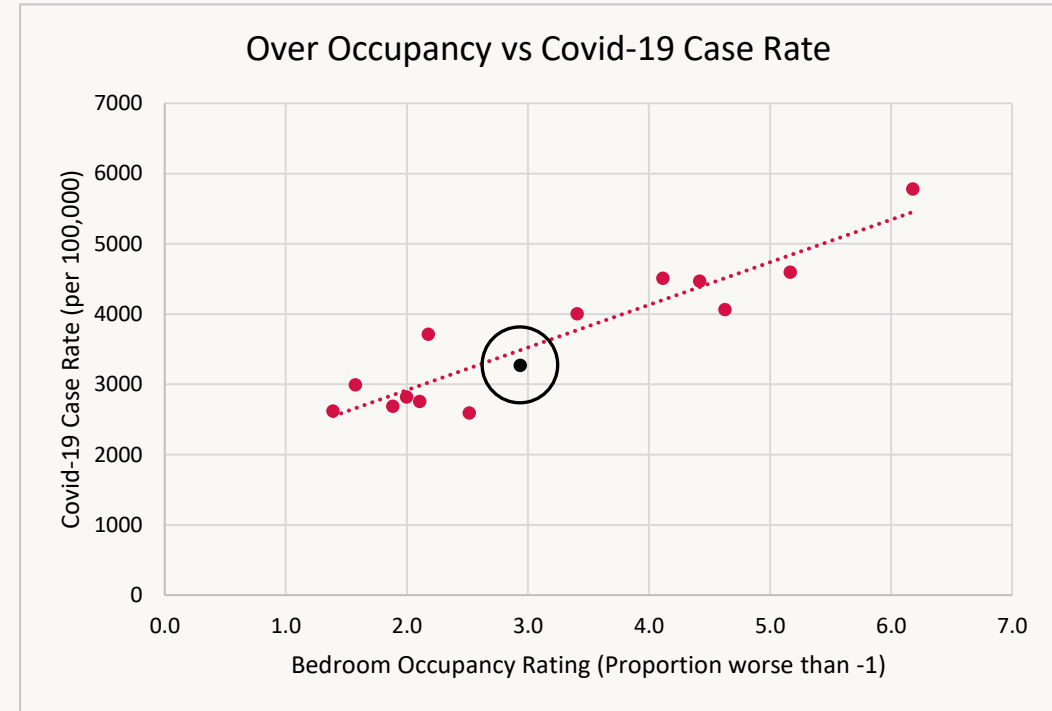
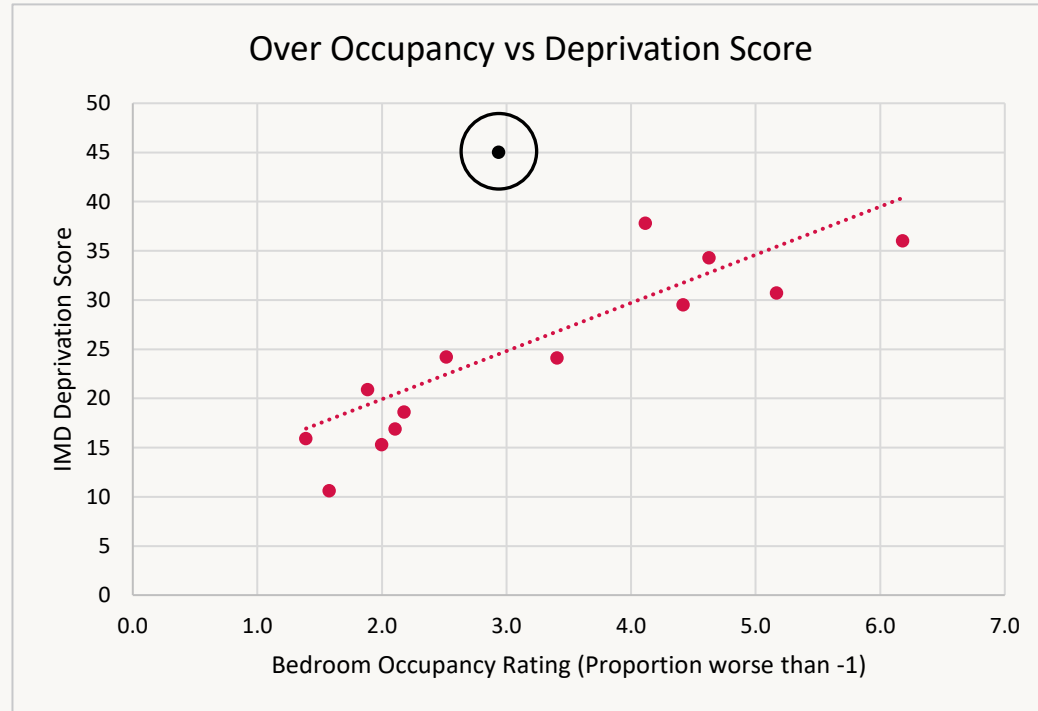
Population Density Relationships



- Strong, significant, positive correlation
 - $r = 0.62$, $p = 0.02$, ($r = 0.69$ with Blackpool)
- Most deprived areas tend to higher population density

- Moderate, significant, positive correlation
 - $r = 0.58$, $p = 0.03$ ($r = 0.09$ with Blackpool)
- Higher population density tends to higher case rates

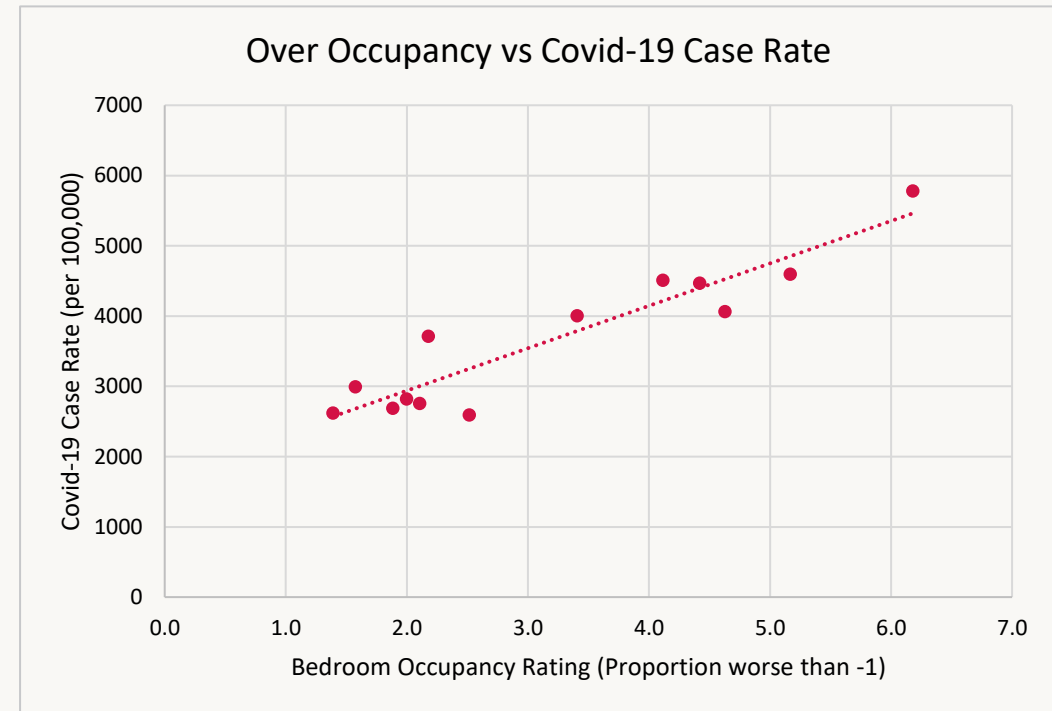
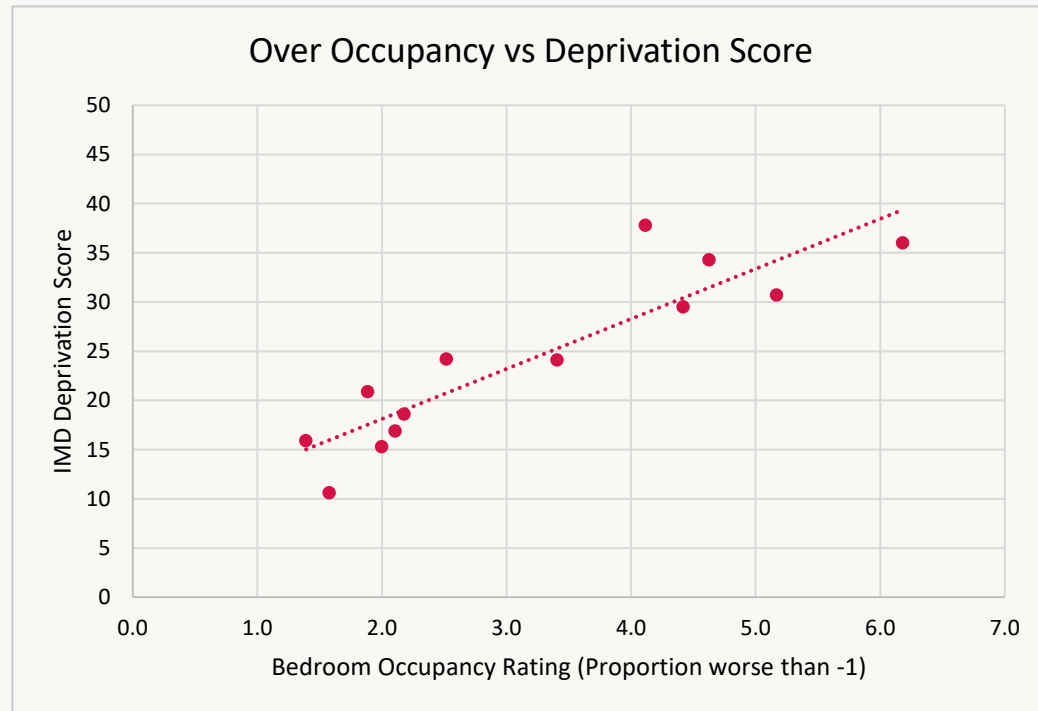
Domicile Over Occupancy Relationships



- Strong, significant, positive correlation
 - $r = 0.72$, $p = 0.003$
- Most deprived areas have largest proportion of homes over occupancy

- Very strong, significant, positive correlation
 - $r = 0.93$, $p = 1.42E-06$
- Areas with most over occupancy see highest case rates

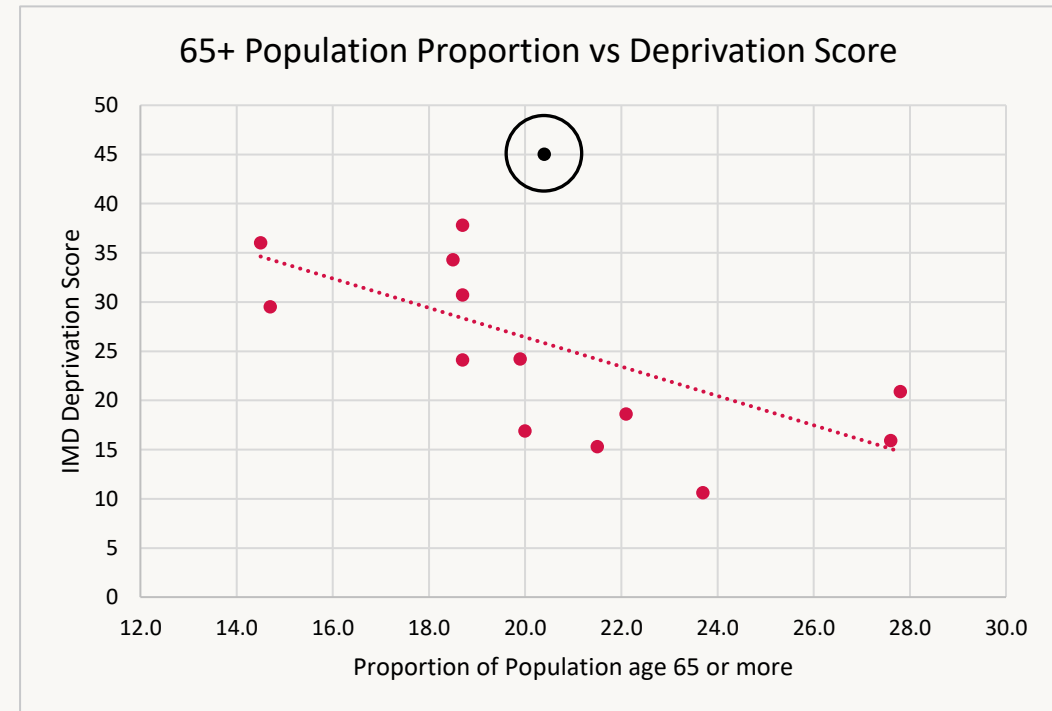
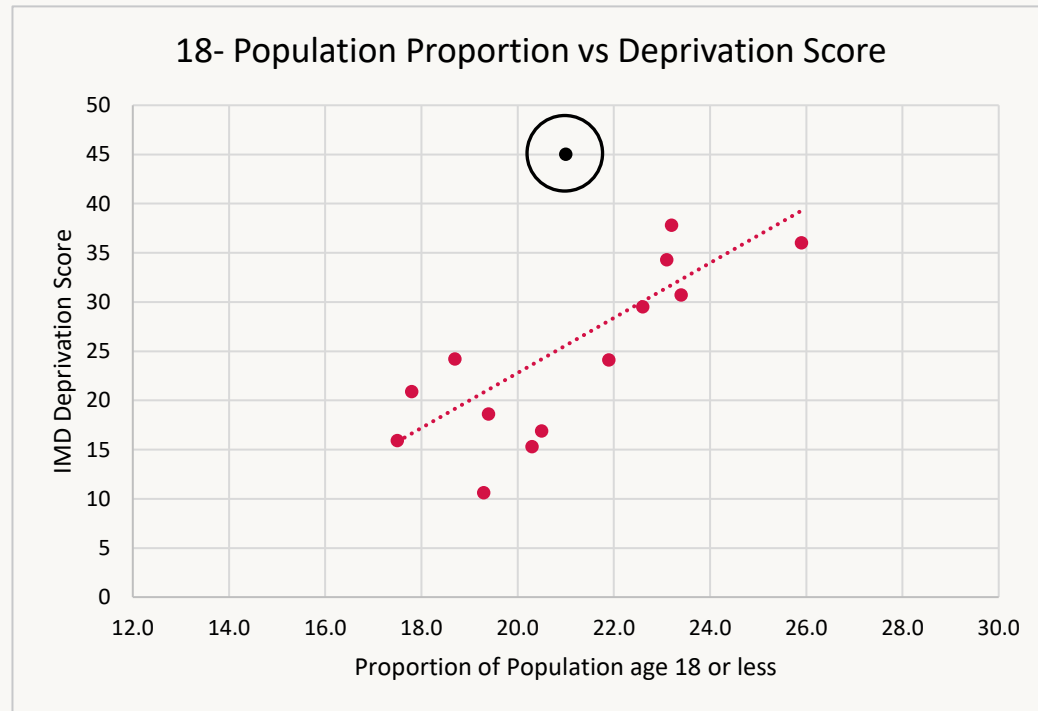
Domicile Over Occupancy Relationships



- Very strong, significant, positive correlation
 - $r = 0.89$, $p = 2.95E-05$, ($r = 0.72$ with Blackpool)
- Most deprived areas have largest proportion of homes over occupancy

- Very strong, significant, positive correlation
 - $r = 0.93$, $p = 3.61E-06$, ($r = 0.93$ with Blackpool)
- Areas with most over occupancy highest case rates

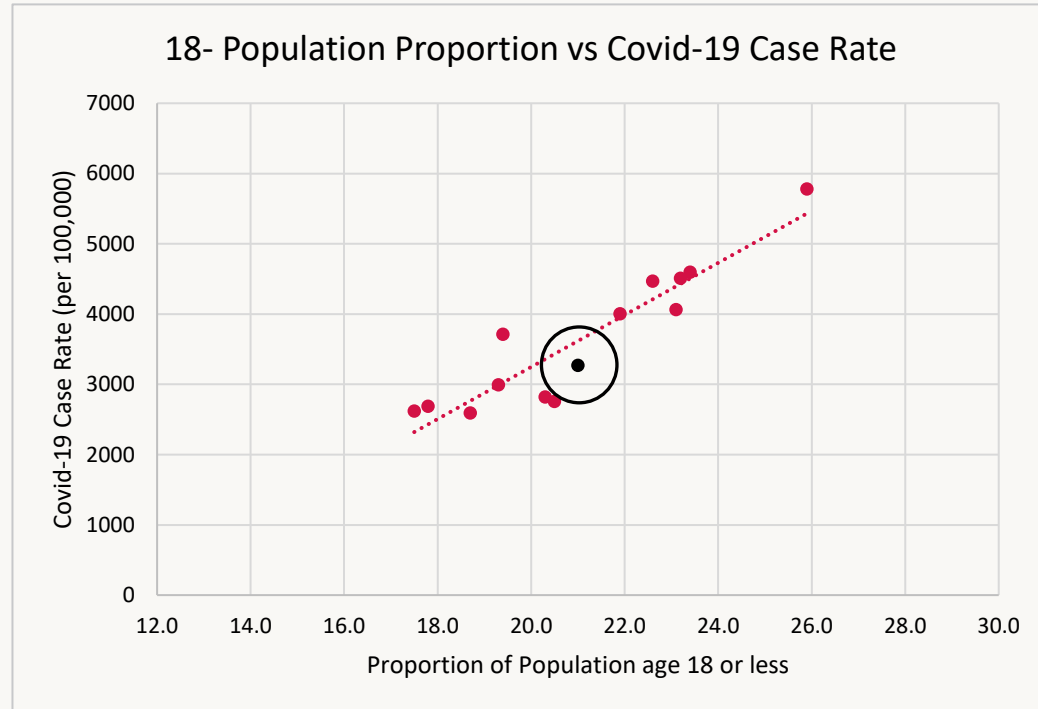
Population Age Group Proportions and Deprivation



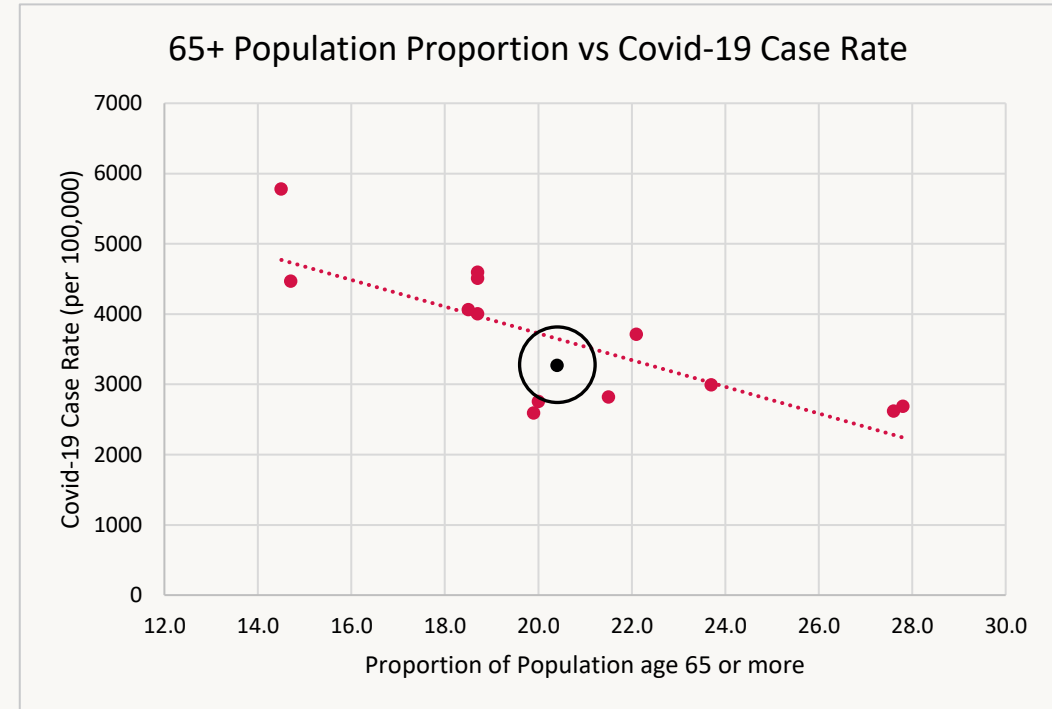
- Strong, significant, positive correlation
 - $r = 0.67$, $p = 0.008$
- Higher proportions of younger people see higher deprivation scores

- Moderate, significant, negative correlation
 - $r = 0.58$, $p = 0.029$
- Higher proportions of older people see lower deprivation scores

Population Age Group Proportions and Case Rates



- Very Strong, significant, positive correlation
 - $r = 0.92$, $p = 0.003$
- Higher proportions of younger people see higher Covid-19 case rates



- Strong, significant, negative correlation
 - $r = 0.77$, $p = 0.001$
- Higher proportions of older people see lower Covid-19 case rates

Is there a link between Covid-19 case rates and deprivation?

- Multiple studies suggest Covid-19 mortality rates are 2 times higher in most deprived areas
- The three most deprived authorities in the Lancashire-14 area see case rates 1.6 times those of the three least deprived
- We find evidence of a strong linear relationship between Covid-19 Case Rates and **most** IMD Data Domains (excluding Living Environment, and Barriers to Housing and Services)
- We find evidence for a very strong link between Covid-19 Case Rates and:
 - Proportion of population aged 18 or less
 - Proportion of households over occupied
- Blackpool appears to have a population demographic that is atypical of its deprivation score (at least locally)
- A future Blackpool-focussed case study could further explore the link between deprivation and Covid-19 case rates

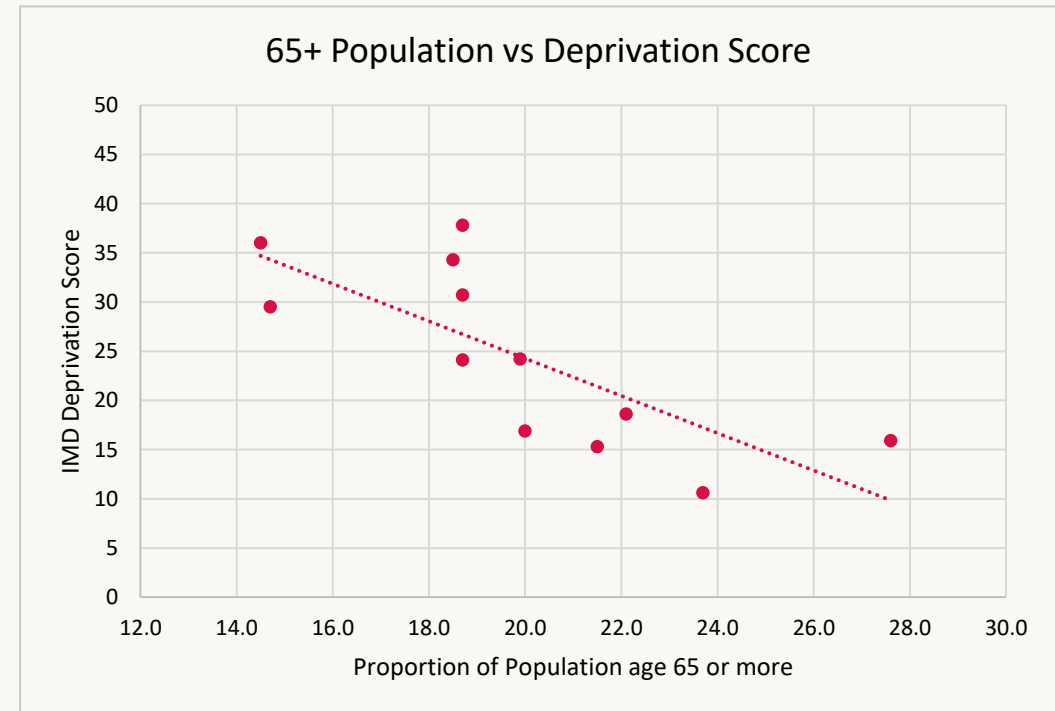
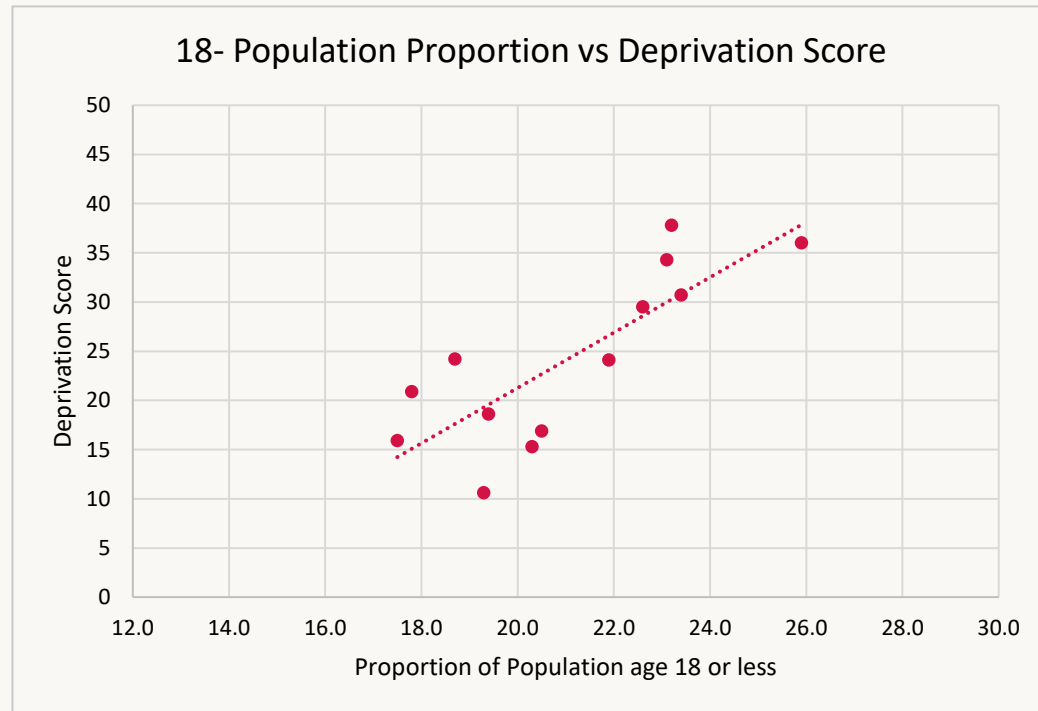
Backup Slides

Deprivation Groupings and Case Rates

- Case Rates for quintiles 1 and 2 show the strongest linear relationships with Covid-19 Case Rates for local authorities
- Quintile 5 has the weakest linear relation to local authority case rates of all quintiles, though the relation is still strong

Deprivation Quintiles (IMD 2019)	r-Value	Strength
Quintile 1	0.93	Very Strong
Quintile 2	0.96	Very Strong
Quintile 3	0.84	Very Strong
Quintile 4	0.90	Very Strong
Quintile 5	0.74	Strong

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 - $r = 0.81$, $p = 0.001$ ($r = 0.67$ with Blackpool)
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