A scenic landscape featuring a calm lake in the foreground with several ducks swimming. The background is filled with trees in vibrant autumn colors (yellows, oranges, and greens). A utility pole with power lines is visible in the upper right corner. The sky is a clear, pale blue. The overall atmosphere is peaceful and natural.

The Wider Determinants of Health Inequality in Lincolnshire

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1 Key findings

Health inequalities are defined as the '*differences between people or groups due to social, geographical, biological or other factors. These differences have a huge impact, because they result in people who are worst off experiencing poorer health and shorter lives.*'¹

It is estimated that the social and economic impact of health inequality costs the NHS in excess of £5.5 billion each year as well as costing £20-32 billion per year in lost taxes and higher welfare payments and £31-33 billion per year in lost productivity.

In this report we have quantified the impact of wider determinants such as deprivation, education, environment and individual lifestyle behaviours on health outcomes, and identified the following key findings. Full findings can be found in the analysis and key findings chapters ([page 20 onwards](#)).

This report looks at geographical associations between health outcomes and wider determinants, not on individuals.

Demographics and deprivation

- Both life expectancy and healthy life expectancy are strongly associated with income deprivation.
- In the most income deprived decile of Lincolnshire, life expectancy is 5.1 years less and healthy life expectancy is 11.2 years less compared to the least income deprived decile.
- Between the most and least income deprived deciles, the gap in male life expectancy is 6.5 years, and for healthy life expectancy is 11.8 years. For women, the gap in life expectancy is smaller at 4.8 years and for healthy life expectancy is 10.8 years.
- Preventable mortality rates in the most income deprived decile are 1.7 times higher than in the least deprived decile.
- For each decile reduction in income deprivation, the following associations are seen:
 - Average life expectancy could increase.
 - Average healthy life expectancy could increase.
 - Preventable mortality rates could be reduced.
 - Alcohol-specific hospital admission rates could be reduced.
 - Mental health related hospital admission rates could be reduced.

Education and aspiration

- There is a strong geographical association between measures of education and aspiration and healthy life expectancy and childhood obesity.
- There is a moderate geographical association between GCSE achievement and preventable mortality rates.
- Between the highest and lowest deciles for GCSE attainment, life expectancy varies by 4.8 years and healthy life expectancy by 10.1 years.
- Between the highest and lowest deciles for persistent school absence, preventable mortality rates vary by 124.3 deaths (per 100,000 population).
- For each decile where GCSE attainment improves, the following associations are seen:
 - Alcohol-specific hospital admission rates could be reduced.
- For each decile where persistent school absence decreases, the following associations are seen:
 - Preventable mortality rates could be reduced.
 - Mental health related hospital admission rates could be reduced.

Economy

- Measures of economy are strongly associated with life expectancy and healthy life expectancy and mental health-related, alcohol-specific and drug-related hospital admissions.
- Between the highest and lowest deciles for unemployment benefit claimants, the inequality gap for alcohol-specific hospital admissions is 331.3 admissions (per 100,000 population).
- Between the highest and lowest deciles for Pension Credit claimants, the inequality gap for life expectancy is 5.3 years; healthy life expectancy is 10.7 years.
- For each decile where unemployment benefit claimant rates decrease, the following associations are seen:
 - Alcohol-specific hospital admission rates could be reduced.
 - Mental health related hospital admission rates could be reduced.
- For each decile where Pension Credit claimant rates decrease, the following associations are seen:
 - Healthy life expectancy could increase.
 - Alcohol-specific hospital admission rates could be reduced.

- Mental health related hospital admission rates could be reduced.

Environment and community

- There is a strong geographical association between measures of economy and life expectancy, healthy life expectancy and mental health-related, alcohol-specific and drug-related hospital admissions.
- There is a strong geographical association between areas with a high proportion of pensioners who live alone and high rates of drug-related hospital admissions.
- Between the highest and lowest deciles for households with no access to a car, the inequality gap for life expectancy is 4.8 years; healthy life expectancy is 9.1 years and alcohol-specific hospital admissions is 313.5 admissions (per 100,000 population).
- For each decile where the proportion of households with access to a car increases, the following associations are seen:
 - Alcohol-specific hospital admission rates could be reduced.
 - Mental health related hospital admission rates could be reduced.

Health and wellbeing

- There is a moderate geographical association between binge drinking adults and smoking-related hospital admissions, premature cancer mortality and adult obesity.
- There is a strong geographical association between mental health related hospital admissions and life expectancy and alcohol-specific and drug-related hospital admissions.
- There is a strong geographical association between smoking-related hospital admissions and preventable mortality, premature cancer mortality and lung cancer mortality.
- There is a strong geographical association between measures of wellbeing (healthy eating adults and physically active adults) and life expectancy, healthy life expectancy and preventable mortality, as well as child and adult obesity.
- Between the highest (worst) and lowest (best) deciles for healthy eating, life expectancy varies by 4.7 years; healthy life expectancy by 10.7 years and preventable mortality rates by 114 deaths (per 100,000 population).
- Between the highest (worst) and lowest (best) deciles for physical activity, preventable mortality rates vary by 128.5 deaths (per 100,000 population),

premature CVD mortality rates by 62.9 deaths (per 100,000) and adult obesity by 4.3%.

- For each decile where the proportion of physically active adults increases, the following associations are seen:
 - Preventable mortality rates could be reduced.
 - Premature CVD mortality rates could be reduced.
 - Smoking-related hospital admission rates could be reduced.
 - The proportion of obese adults and children could be reduced.
- For each decile where smoking-related hospital admissions decrease, the following associations are seen:
 - Preventable mortality rates could be reduced.
 - Premature cancer mortality rates could be reduced.
 - Lung cancer mortality rates could be reduced.

Cohort comparison

The cohort study measured the variation in health outcomes and wider determinants between two cohort areas in Lincolnshire. Cohort 1 represents the areas with the worst overall health outcomes and cohort 2 represents the best overall health outcomes.

Between cohort 1 and cohort 2, the following gaps in health outcomes were identified:

- Life expectancy is **6.2 years lower**.
- Healthy life expectancy is **12.3 years lower**.
- Preventable mortality is **3.2 times higher**.
- Premature cancer mortality is **2.4 times higher**.
- Premature CVD mortality is **3.6 times higher**.
- Lung cancer mortality is **4.4 times higher**.
- Mental health related hospital admissions are **2.5 times higher**.
- Alcohol specific hospital admissions are **3.6 times higher**.
- Smoking related hospital admissions are **2.3 times higher**.
- Drug related hospital admissions are **3.4 times higher**.
- Childhood obesity is **1.9 times higher**.

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- Between cohort 1 and cohort 2, the following gaps in wider determinants were identified:
- Income deprivation is **3.4 times higher**.
- The proportion of pupils achieving at least 5 A-C's at GCSE is **1.4 times lower**.
- Persistent school absence is **2.4 times higher**.
- The proportion of young people aged 16-18 who are NEET (not in education, employment or training) is **5.5 times higher**.
- The proportion of working age adults in receipt of unemployment benefits is **4.7 times higher**.
- The proportion of adults working in managerial and professional occupations is **2.1 times lower**.
- The proportion of adults working in intermediate and routine occupations is **twice as high**.
- The proportion of households in fuel poverty is **1.3 times higher**.
- The proportion of households with no access to a car is **2.5 times higher**.
- The proportion of healthy eating adults is **1.5 times lower**.
- The proportion of physically active adults is **1.9 times lower**.

2 Introduction

There are statutory responsibilities upon the Director of Public Health to protect and improve the health of the population of Lincolnshire, reduce premature mortality and reduce health inequalities. However, these cannot be delivered in isolation and addressing the wider determinants of health must be delivered through influencing others.

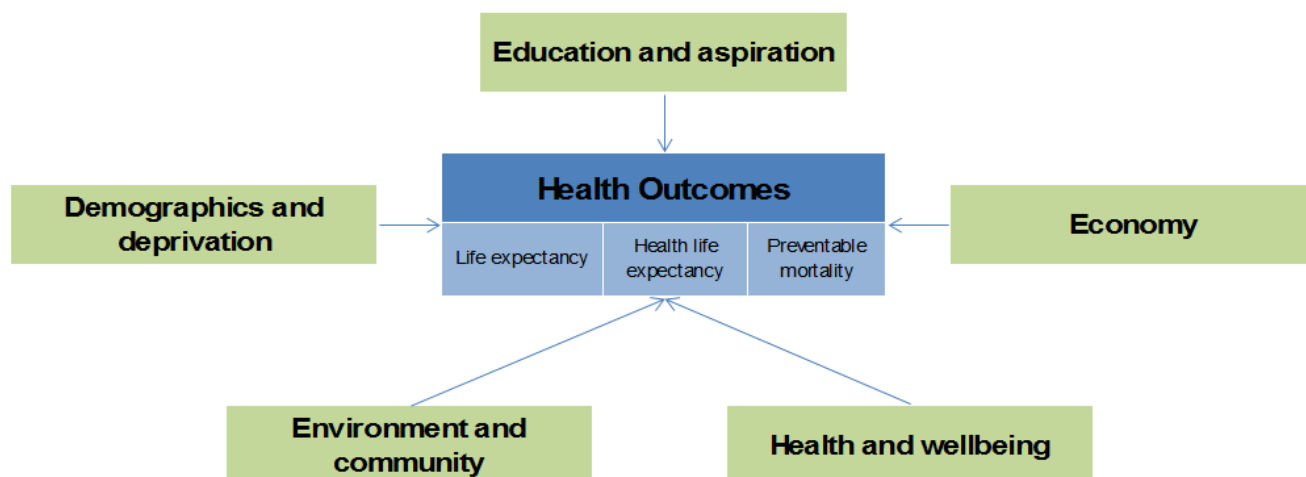
There are also finite resources and if money is spent in one area it is not available to be spent elsewhere. This means we must effectively target resources where they are most needed, and in a way that best meets the needs of the audience. It is easy to overlook the issue of health inequalities and risk not addressing inequalities or, even worse, increasing them, particularly where services are only accessed by those most able to engage with them.

Health inequalities are typically measured by differences in average life expectancy between different populations. In 2010, Sir Michael Marmot identified that *'health inequalities result from social inequality; however, to reduce the steepness of the social gradient, actions must be universal, rather than being focused solely on the most disadvantaged. This is known as proportionate universalism.'*²

Previous reports primarily focus on how health outcomes vary across a social gradient, using income deprivation as the measuring scale. Whilst this can provide valuable insight, it does not investigate the complex relationships between the wider determinants of health and health outcomes. Public Health England (PHE) and the Marmot Review in 2010 both provide analysis of health inequalities across the socio-economic scale using overall deprivation to determine the most and least disadvantaged populations.

This report seeks to support those influencing the wider determinants of health in understanding the links with health, and the potential impacts of change, by looking at fewer health outcomes but a wide variety of determinants. **Figure 2.1** shows the key health outcomes and broad wider determinants measured.

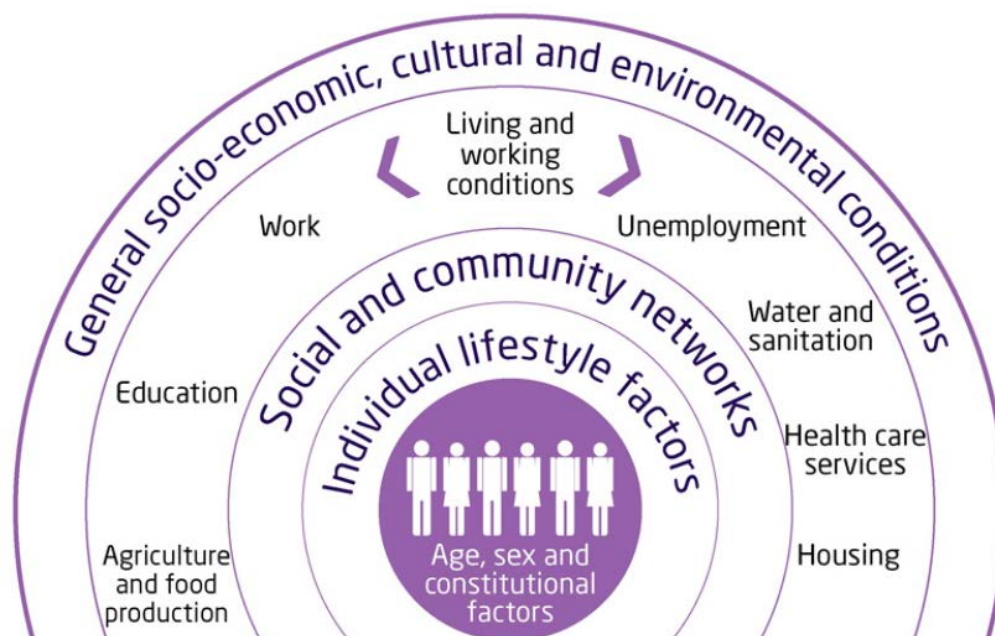
Figure 2.1: Broad themes of wider determinants and health outcomes examined



2.1 Health inequality

The Dahlgren and Whitehead model (**Figure 2.2**) shows the potential impacts of determinants on health outcomes.³

Figure 2.2: Model of the determinants of health: G. Dahlgren and M. Whitehead, 1991



The Wider Determinants of Health Inequality in Lincolnshire

The National Institute for Health and Care Excellence (NICE) defines health inequalities as:

*'...differences between people or groups due to social, geographical, biological or other factors. These differences have a huge impact, because they result in people who are worst off experiencing poorer health and shorter lives.'*¹

In 2008, the WHO's Commission on Social Determinants of Health published '*Closing the gap in a generation*', which sought to collect and synthesise global evidence on the social determinants of health and their impact on health inequity. It surmised that health and illness follow a pattern across the social gradient, whereby the lower a person's socio-economic position, the worse their health will be.

The publication highlighted significant inequities globally, caused by unequal distribution of power, income, goods, and services; directly impacting access to health care, schools and education, conditions of work and leisure, homes and wider communities.

The commission aspired to close the health gap, by:

- Improving daily living conditions for everyone, regardless of their social position;
- Tackling inequitable distribution of power, money and resources, such as addressing equal pay for men and women;
- Measuring and understanding the problem, to expand the knowledge base, develop a workforce trained in the social determinants of health, and raise public awareness about the social determinants of health.⁴

In 2010, The Marmot Review (Fair Society, Healthy Lives) developed a strategy for reducing health inequalities in England. This concluded that reducing health inequalities would require action across six policy objectives:

1. Give every child the best start in life
2. Enable all children, young people and adults to maximise their capabilities and have control over their lives
3. Create fair employment and good work for all
4. Ensure a healthy standard of living for all
5. Create and develop healthy and sustainable places and communities
6. Strengthen the role and impact of ill-health prevention

PHE introduced the Public Health Outcomes Framework (PHOF) in 2013, which set out a framework of desired outcomes and indicators to understand how well Public

Health is being improved and protected. Since its release, PHOF has evolved to include a wider range of indicators based on the six Marmot Review objectives, and with more focus on measuring and tackling health inequalities.⁵

2.2 Costs of health inequality

Findings from the Marmot Review estimate that *'inequality in illness accounts for productivity losses of £31-33b per year; lost taxes and higher welfare payments in the range of £20-32b per year, and additional NHS healthcare costs associated with inequality are well in excess of £5.5b per year. If no action is taken, the cost of treating the various illnesses resulting from inequalities in the level of obesity alone will increase from £2b per year to nearly £5b per year in 2025.'*¹

Action on Smoking and Health (ASH) provide a tool which estimates there were 103,214 adult smokers in Lincolnshire in 2016, based on a smoking prevalence of 17.5%. Each year in Lincolnshire, it is estimated that smoking costs society approximately £195m (equivalent to £1,894 per smoker per year), early deaths due to smoking result in 2,856 years of lost productivity at a cost of £48m, and work-related smoke breaks cost Lincolnshire businesses £78m.⁶

In a report by PHE it is suggested that the total economic cost of alcohol is 2.5% of the UK's GDP, or around £47b in 2016. The majority of these costs (72%) are indirect costs such as lost productivity due to absenteeism, unemployment or decreased output. Health care accounts for 13% of alcohol related costs, and crime accounts for 3% of the economic burden.⁷

In July 2017, the Home Office published its new Drug Strategy which estimates the social and economic cost of drug supply in England and Wales to be £10.7b a year, with over half from drug-related acquisitive crime. Research from PHE has shown that for every £1 spent on drug treatment services £2.50 is saved in costs to society, which could save the NHS £1b per year and through reduction in drug-related crimes, would save a further £1b to society.^{8, 9}

Physical inactivity is one of the top ten risk factors for premature mortality and is responsible for one in six deaths in the UK. Sport England estimate that in 2009/10, the health costs of physical inactivity in England were £945m. In Lincolnshire, it is estimated to amount to £15.5m.¹⁰

The Obesity Health Alliance have estimated that excess weight in the UK costs the economy £27b each year and identifies obesity as one of the top three global social burdens caused by humans, second to smoking and armed conflict. The NHS spends £5.1b on obesity each year (the annual salary of around 163,000 nurses, 85,000 hospital doctors or 959 fully kitted out air ambulances). It is suggested that if levels of obesity could be reduced by 1% every year from the predicted trend between 2015 and 2035, £300m could be saved in direct health and social care costs in the year 2035 alone. As well as direct financial costs, obesity causes avoidable illness which leads to reduced productivity and that makes people unable to work.¹¹

3 Methodology

The Wider Determinants Model in **Figure 2.2** was used to group wider determinants into five thematic groups: **'Demographics and Deprivation'**, **'Education and Aspiration'**, **'Economy'**, **'Environment and Community'**, and **'Health and Wellbeing'**. Datasets were chosen to best represent each theme.

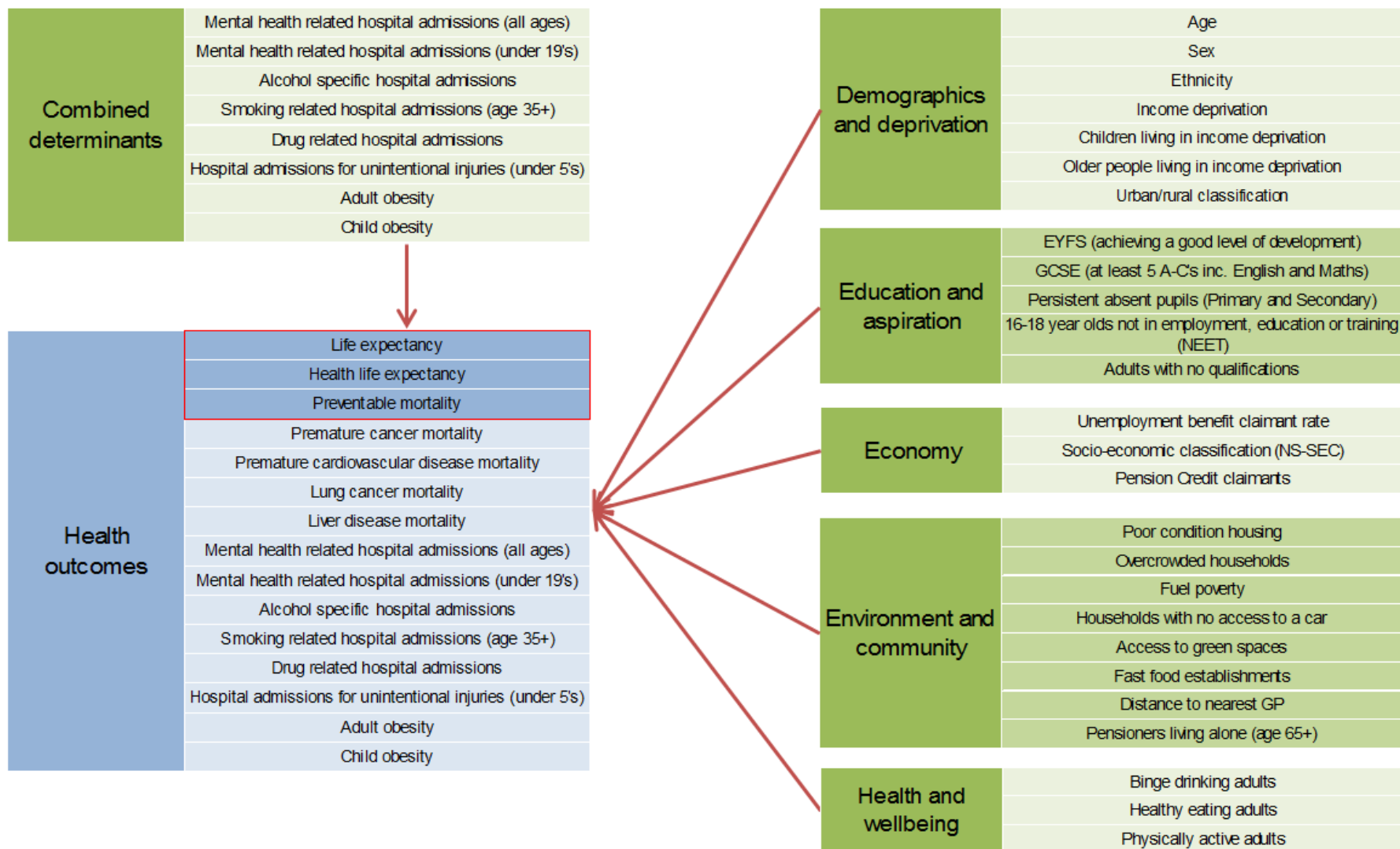
Data was collected for 15 health outcomes and 28 wider social determinants at the lowest common geographical level; Middle Super Output Area (MSOA), of which there are 88 in Lincolnshire. The list of health outcomes incorporates three core indicators: life expectancy; healthy life expectancy from birth; and preventable mortality. We also included leading causes of morbidity and mortality.

Indicators derived from Hospital Episode Statistics (HES) and Primary Care Mortality Data (PCMD, now termed Civil Registration data), were standardised by age and sex using Office for National Statistics (ONS) mid-year population estimates from 2014-2016. **Figure 3.1** provides a summary of all wider determinants and health outcomes measured.¹²

The analyses in this report covered two different approaches, first a detailed analysis determined significant relationships between wider determinants and health outcomes. Appropriate health outcomes were measured across the scale of each wider determinant by decile. A number of the health outcomes were also considered as determinants of broader outcomes in their own right, for example, obesity.

Secondly, a cohort study measured the variation in health outcomes and wider determinants between two cohort areas in Lincolnshire. Cohort 1 contains the five MSOA's with the worst overall health outcomes and cohort 2 contains the five MSOA's with the best overall health outcomes.

Figure 3.1: Map of health outcome and wider determinants, by broad theme



Across all analyses, the following statistical methods were used:

- Correlation
- Regression
- Slope Index of Inequality (SII)
- Significance testing (where significance was measured at a p-value of 0.05)
- Inequality gap (calculated using the linear regression equation from the SII, to estimate potential change to a health outcome if the wider determinant was altered by a given amount)
- Rank aggregation

For correlation tests:

- Strong association has an r-value between 0.70 and 1 **or** -0.70 and -1.
- Moderate association has an r-value between 0.4 and 0.69 **or** -0.4 and -0.69.
- Weak association has an r-value between 0 and 0.39 **or** 0 and -0.39.

The closer the r-value (correlation coefficient) is to 1 or -1, the greater the strength of the relationship between the two variables.

For linear regression modelling:

- Strong variation has an R^2 between 70% and 100%
- Moderate variation has an R^2 between 50% and 69.9%.
- Weak variation has an R^2 between 30% and 49.9%

Linear regression measures variance and shows how one variable is affected by another variable. The R-squared (R^2) value represents the strength of the linear relationship. The closer the R^2 value is to 100%, more of the variation between one variable can be explained by the other.

4 Results

Figure 4.1: Correlation testing – results

	KEY														Total strong correlations
	Strong correlation				Moderate correlation				Weak correlation						
	Life expectancy	Healthy life expectancy	Preventable mortality	Premature cancer mortality	Premature CVD mortality	All-age lung cancer mortality	All-age liver disease mortality	Mental health admissions	Under 19 mental health admissions	Alcohol specific admissions	Smoking related admissions	Drug related admissions	Adult obesity	Childhood obesity	
BAME population	-0.30			-0.35				0.48		0.34	-0.48	0.57	-0.23		0
Income deprivation	-0.76	-0.92	0.67	0.33	0.62	0.43	0.36	0.60		0.62	0.24	0.67	0.42	0.64	2
Children in income deprivation	-0.75	-0.91	0.66	0.34	0.62	0.46	0.37	0.56		0.63	0.22	0.62	0.35	0.62	2
Older people in income deprivation	-0.82	-0.90	0.57		0.48	0.35	0.25	0.71	0.22	0.70		0.76	0.22	0.57	5
EYFS attainment	0.39	0.47	-0.38		-0.35	-0.26		-0.45		-0.34		-0.50	-0.32	-0.49	0
GCSE attainment	0.68	0.81	-0.51		-0.42	-0.32	-0.27	-0.55		-0.55		-0.59	-0.45	-0.57	1
Persistent absence	-0.62	-0.77	0.56	0.24	0.54	0.33		0.57	0.34	0.50		0.59	0.44	0.70	2
NEET	-0.35	-0.39	0.32	0.26	0.34	0.23		0.31		0.29				0.23	0
Adults with no qualifications														-0.25	0
Unemployment benefit claimant	-0.73	-0.80	0.60	0.27	0.53	0.32	0.41	0.67		0.68		0.64	0.27	0.54	2
Pension credit claimant	-0.80	-0.87	0.55		0.46	0.31	0.25	0.73		0.70		0.77	0.24	0.54	5
Poor condition housing			0.21												0
Overcrowded households	-0.23	-0.23						0.26		0.24	-0.25	0.40		0.23	0
Households with no access to a car	-0.72	-0.76	0.42		0.32	0.21	0.24	0.76	0.21	0.74		0.82		0.47	5
Distance to nearest GP				0.22											0
Older people living alone	-0.53	-0.50						0.67		0.59	-0.32	0.72			1
Mental health admissions	-0.71	-0.63	0.43		0.32		0.23		0.39	0.75		0.76		0.44	3
Under 19 mental health admissions								0.39		0.22		0.28			0
Alcohol specific admissions	-0.65	-0.67	0.63	0.34	0.52	0.40	0.51	0.75	0.22		0.25	0.65		0.45	1
Smoking related admissions	-0.21	-0.34	0.70	0.77	0.69	0.70	0.54			0.25			0.34	0.33	3
Drug related admissions	-0.61	-0.64	0.41		0.30		0.21	0.76	0.28	0.65				0.53	1
Adult obesity		-0.38	0.37		0.30	0.22					0.34			0.45	0
Childhood obesity	-0.55	-0.70	0.64	0.37	0.56	0.44	0.31	0.44		0.45	0.33	0.53	0.45		1
Binge drinking adults			-0.27	-0.50	-0.30	-0.39		0.35		0.26	-0.61	0.35	-0.45		0
Healthy eating adults	0.66	0.86	-0.67	-0.31	-0.60	-0.46	-0.35	-0.49		-0.50	-0.31	-0.55	-0.64	-0.69	1
Physically active adults	0.48	0.71	-0.75	-0.58	-0.71	-0.62	-0.44	-0.24		-0.34	-0.65	-0.32	-0.72	-0.68	4
Total strong correlations	7	11	2	1	1	1	0	5	0	4	0	5	1	1	39

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From correlation tests, the following wider determinants showed no significant association and were removed from further testing:

- Hospital admissions due to unintentional and deliberate injuries (0-4's)^a
- Fuel poverty^b

Figure 4.2: Regression testing – results

	KEY											
	Strong variation				Moderate variation				Weak variation			
	Life expectancy	Healthy life expectancy	Preventable mortality	Premature cancer mortality	Premature CVD mortality	All-age lung cancer mortality	Mental health admissions	Alcohol specific admissions	Smoking related admissions	Drug related admissions	Adult obesity	Childhood obesity
BAME population										33.0%		
Income deprivation	58.4%	85.0%	45.0%		39.0%		37.0%	39.0%		45.0%		42.0%
Children in income deprivation	57.3%	84.0%	44.0%		39.0%		32.0%	40.0%		39.0%		39.0%
Older people in income deprivation	67.0%	82.0%	33.0%				51.0%	50.0%		58.0%		33.0%
GCSE attainment	47.0%	66.0%					31.0%	31.0%		36.0%		34.0%
Persistent absence	38.0%	60.0%	32.0%				33.0%			36.0%		49.0%
Unemployment benefit claimant	53.8%	64.8%	36.0%				45.3%	47.5%		41.4%		
Pension credit claimant	63.9%	76.5%	30.8%				54.0%	59.9%		59.7%		
Households with no access to a car	52.0%	58.0%					59.0%	56.0%		68.0%		
Older people living alone							45.0%	35.0%		53.0%		
Mental health admissions	51.0%	41.0%						57.0%		58.0%		
Alcohol specific admissions	43.0%	46.0%	41.0%				57.0%			43.0%		
Smoking related admissions			50.0%	60.0%	49.0%	49.0%						
Drug related admissions	38.0%	42.0%					58.0%	43.0%				
Childhood obesity	31.0%	50.0%	42.0%		32.0%							
Binge drinking adults									38.0%			
Healthy eating adults	44.0%	75.0%	46.0%		37.0%					31.0%	41.0%	48.0%
Physically active adults		52.0%	57.0%	34.0%	51.0%	39.0%			43.0%		53.0%	46.0%

^a Source: Hospital Episode Statistics, Copyright © 2016, re-used with the permission of The Health & Social Care Information Centre. All rights reserved.

^b Source: BEIS, Fuel poverty sub-regional statistics

Figure 4.3: Worst (Cohort 1) and best (Cohort 2) health outcomes, by MSOA and in indication of their rural/urban classification

MSOA	Cohort	District	Urban/Rural
E02005433	1 - worst outcomes	East Lindsey	Urban city and town
E02005437		East Lindsey	Urban city and town
E02005428		East Lindsey	Urban city and town in a sparse setting
E02005429		East Lindsey	Urban city and town in a sparse setting
E02005438		East Lindsey	Urban city and town
E02005449	2 - best outcomes	Lincoln	Urban city and town
E02005453		North Kesteven	Rural town and fringe
E02005487		South Kesteven	Rural village
E02005501		West Lindsey	Rural town and fringe
E02005460		North Kesteven	Rural hamlet and isolated dwellings

Figure 4.4: Location map of Cohort 1 (worst health outcomes) and Cohort 2 (best health outcomes), by MSOA

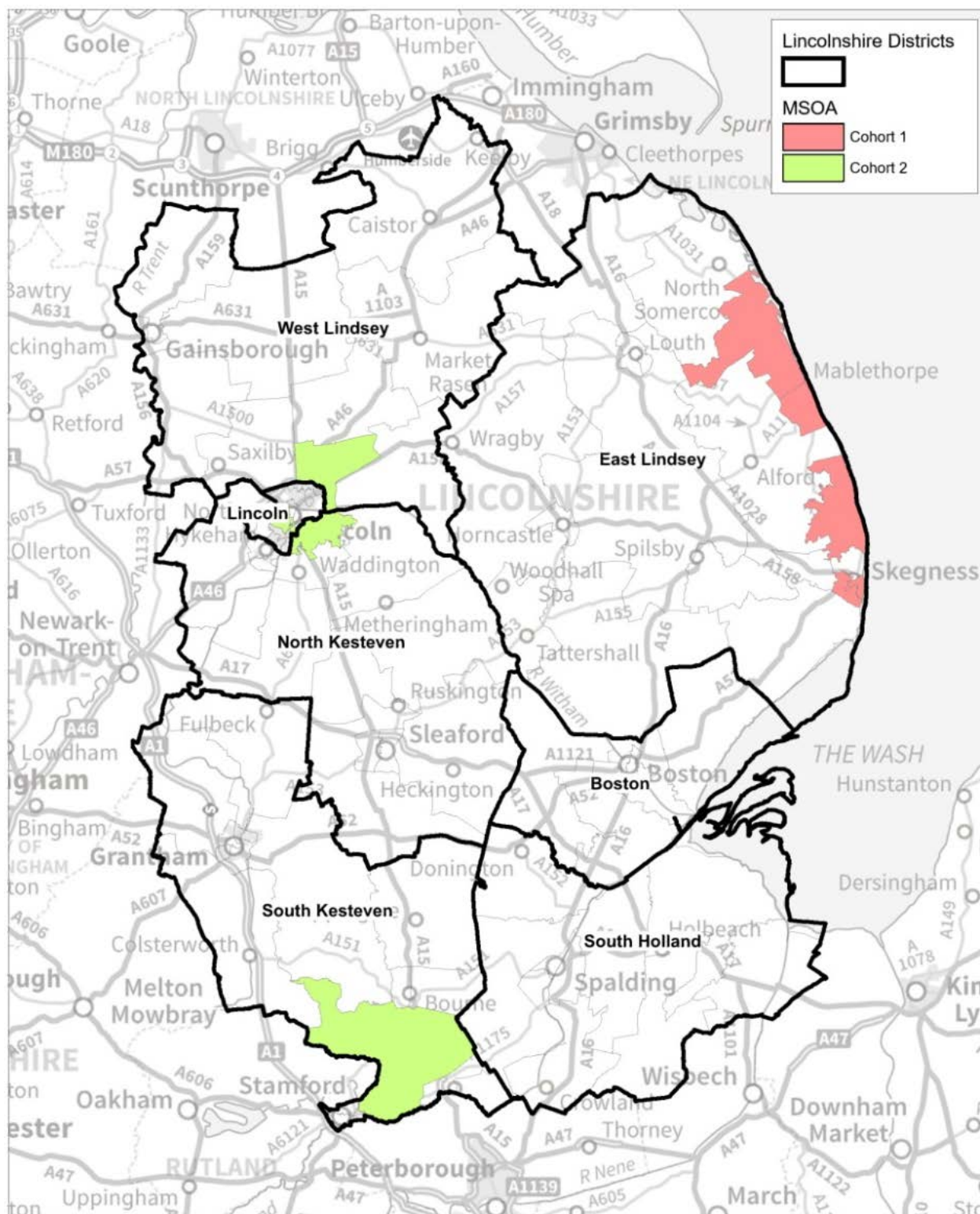


Figure 4.5: Comparative summary of Cohort 1 (worst health outcomes) and Cohort 2 (best health outcomes)

Theme	Indicator	Polarity	Cohort 1	Cohort 2	Inequality gap	Difference (ratio)
Health outcomes	Life expectancy	Low is worse	77.4	83.7	6.2	1.1
	Healthy life expectancy	Low is worse	56.1	68.3	12.3	1.2
	Preventable mortality	High is worse	414.1	127.9	286.2	3.2
	Premature cancer mortality	High is worse	263.8	111.2	152.7	2.4
	Premature CVD mortality	High is worse	189.0	53.2	135.8	3.6
	Lung cancer mortality	High is worse	140.1	31.8	108.3	4.4
	Mental health admissions	High is worse	310.4	122.1	188.3	2.5
	Alcohol specific admissions	High is worse	692.4	192.6	499.8	3.6
	Smoking related admissions	High is worse	7,927.2	3,464.2	4,463.0	2.3
	Drug related admissions	High is worse	63.0	18.6	44.4	3.4
	Adult obesity	High is worse	25.6	22.3	3.3	1.1
	Child obesity	High is worse	15.2	8.0	7.2	1.9
Demographics and deprivation	Ethnicity	Not applicable	1.6	2.7	1.1	1.7
	Income deprivation	High is worse	25.2	6.5	18.7	3.9
	Children in income deprivation	High is worse	33.5	9.2	24.3	3.6
	Older people in income deprivation	High is worse	24.0	9.2	14.8	2.6
Education and aspiration	EYFS attainment	Low is worse	68.0	73.4	5.4	1.1
	GCSE attainment	Low is worse	51.6	72.6	21.0	1.4
	Persistent absence	High is worse	5.7	2.4	3.4	2.4
	NEET	High is worse	2.8	0.5	2.3	5.5
	Adults with no qualifications	High is worse	33.0	37.8	4.7	1.1
Economy	Unemployment benefit claimants	High is worse	3.8	0.8	3.0	4.7
	Pension Credit claimants	High is worse	18.8	6.8	12.0	2.8
	NS-SeC management occupation	Low is worse	17.1	36.9	19.8	2.2
	NS-SeC intermediate and routine occupation	High is worse	41.1	20.4	20.7	2.0
Environment and community	Poor condition housing	High is worse	33.6	34.9	1.3	1.0
	Overcrowded households	High is worse	3.7	5.9	2.2	1.6
	Fuel poverty	High is worse	10.7	14.1	3.4	1.3
	Households with no access to a car	High is worse	28.2	11.1	17.1	2.5
	Distance to nearest GP	High is worse	2.3	2.5	0.2	1.1
	Older people living alone	High is worse	29.7	25.3	4.3	1.2
Health and wellbeing	Binge drinking adults	High is worse	14.3	20.0	5.7	1.4
	Healthy eating adults	Low is worse	21.6	33.6	11.9	1.6
	Adult physical activity	Low is worse	14.1	26.7	12.6	1.9

5 Analysis & key findings

5.1 Demographics and deprivation

The following indicators were tested against health outcomes:

- Gender
- Black and Minority Ethnic (BAME) resident population ^c
- People living in income deprivation ^d
- Children living in income deprivation ^d
- Older people living in income deprivation ^d

Key findings for Lincolnshire

- In Lincolnshire, health inequalities exist between levels of income deprivation and gender.
- Between the most and least income deprived deciles, the gap in male life expectancy is 6.5 years, and for healthy life expectancy is 11.8 years. For women, the gap in life expectancy is smaller at 4.8 years and for healthy life expectancy is 10.8 years.
- Life expectancy, premature cancer mortality, mental health-related, smoking-related, alcohol-specific and drug-related hospital admissions all show a moderate association with BAME.
- Both life expectancy and healthy life expectancy are strongly associated with income deprivation.
- Regression testing highlights a high level of variation in healthy life expectancy can be explained by income deprivation.
- Regression testing highlights moderate levels of variation in mental health-related, alcohol-specific and drug-related hospital admissions can be explained by income deprivation in older people.
- In the most income deprived decile of Lincolnshire, life expectancy is 5.1 years less and healthy life expectancy is 11.2 years less compared to the least income deprived decile.
- Preventable mortality rates in the most income deprived decile are 1.7 times higher than in the least deprived decile.

^c Source: ONS, 2011 Census, via NOMIS

^d Source: DCLG, English Indices of Deprivation 2015

The Wider Determinants of Health Inequality in Lincolnshire

- For each decile reduction in income deprivation, the following associations are seen:
 - Average life expectancy could increase by six months.
 - Average healthy life expectancy could increase by over a year.
 - Preventable mortality rates could reduce by 21.3 deaths (per 100,000 population).
 - Alcohol-specific hospital admission rates could reduce by 50.6 admissions (per 100,000 population).
 - Mental health related hospital admission rates could reduce by 26.5 admissions (per 100,000 population).
- In the most income deprived decile, the gap in life expectancy between men and women is widest at 4.7 years, and narrows to 3 years for the least income deprived decile.
- The gap in preventable mortality between men and women is widest in the most income deprived areas, where rates are 1.7 times higher for men than women.
- Thematic mapping shows the areas of Lincolnshire where both life expectancy and healthy life expectancy are lowest are predominantly in and around Skegness on the east coast and within Lincoln, Gainsborough and Grantham.
- The geographical distribution of preventable mortality is more closely aligned to the most income deprived areas with the highest rates seen along the east coast as well as around the larger market towns of Lincolnshire such as Lincoln, Boston, Grantham, Sleaford, Gainsborough and Spalding.

Figure 5.1: Statistical summary of demographic and deprivation determinants

		Life expectancy	Healthy life expectancy	Preventable mortality	Premature CVD mortality	Mental health admissions	Alcohol specific admissions	Drug related admissions	Childhood obesity
Income deprivation	Correlation R value	-0.76	-0.92	0.67	0.62	0.60	0.62	0.67	0.64
	Regression R ² value	58.4%	85.0%	45.0%	39.0%	37.0%	39.0%	45.0%	42.0%
	Inequality gap (SII)	5.1	11.2	-167.6	-77.3	-223.6	-409.8	-62.9	-6.3
	Potential change per decile	0.5	1.1	-21.3	-10.2	-26.5	-50.6	-8.4	-0.8
Children in income deprivation	Correlation R value	-0.75	-0.91	0.66	0.62	0.56	0.63	0.62	0.62
	Regression R ² value	57.3%	84.0%	44.0%	39.0%	32.0%	40.0%	39.0%	39.0%
	Inequality gap (SII)	5.1	11.0	-120.8	-59.6	-134.8	-273.3	-50.9	-4.6
	Potential change per decile	0.5	1.1	-15.2	-7.4	-16.2	-34.0	-5.9	-0.5
Older people in income deprivation	Correlation R value	-0.82	-0.90	0.57	0.48	0.71	0.70	0.76	0.57
	Regression R ² value	67.0%	82.0%	33.0%	-	51.0%	50.0%	58.0%	33.0%
	Inequality gap (SII)	5.3	11.2	-120.9	-	-138.4	-283.1	-52.6	-4.2
	Potential change per decile	0.5	1.1	-15.0	-	-18.7	-36.3	-6.7	-0.5

Figure 5.2: Inequality gap between healthy life expectancy and income deprivation

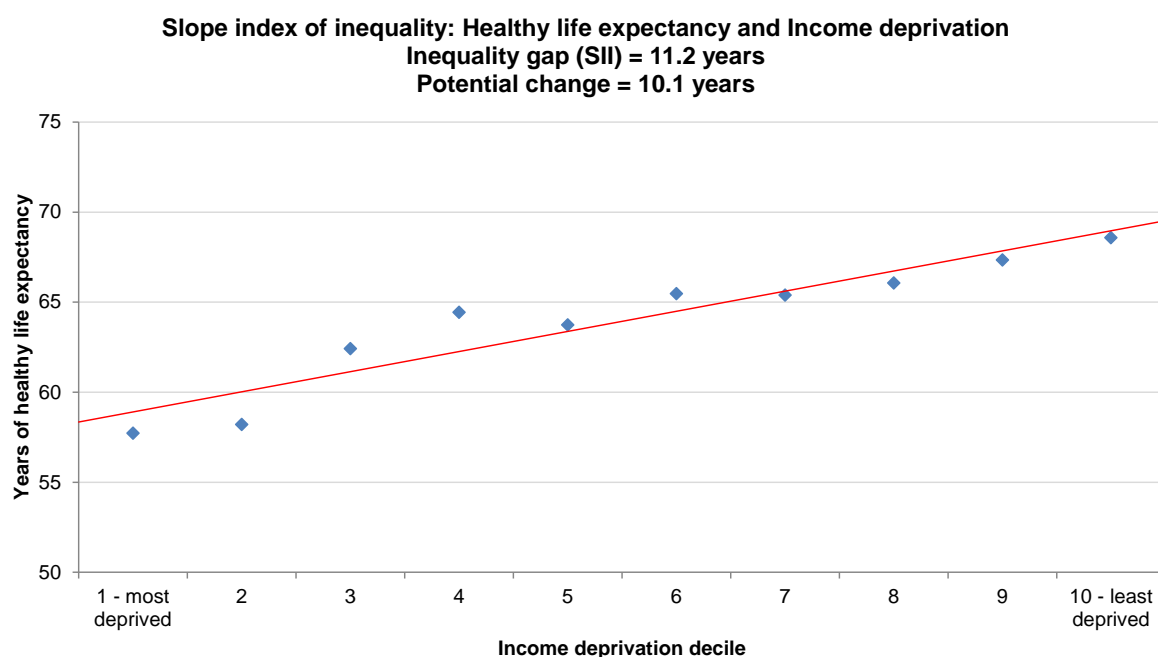


Figure 5.3: Gender inequalities between life expectancies and income deprivation

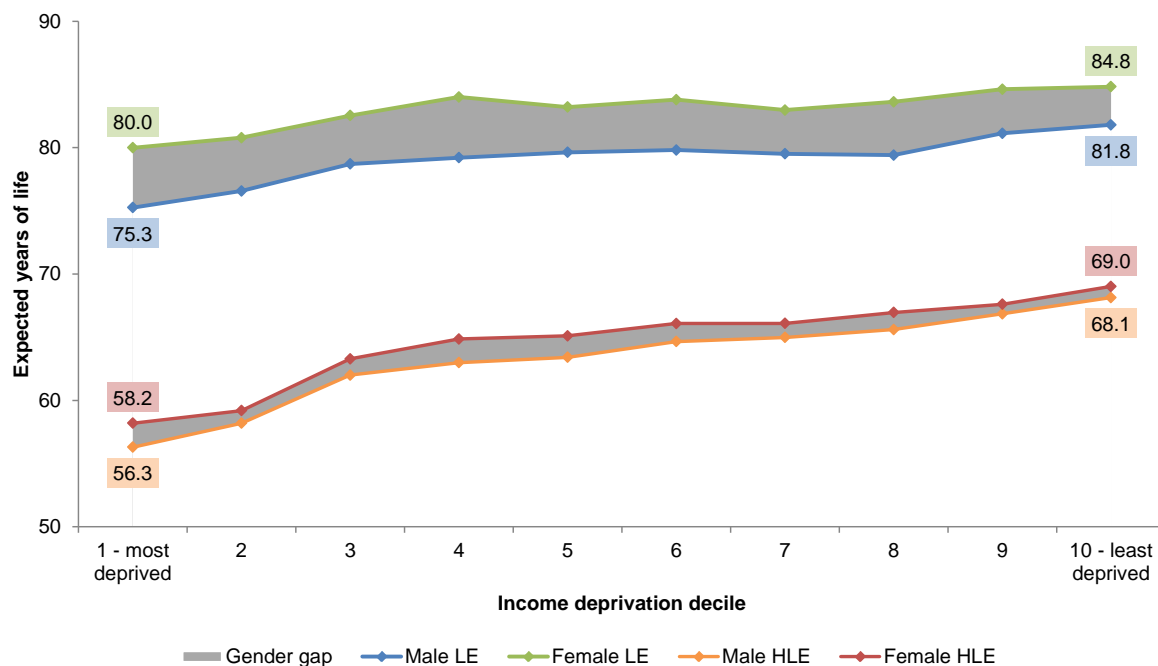


Figure 5.4: Gender inequalities between preventable mortality and income deprivation

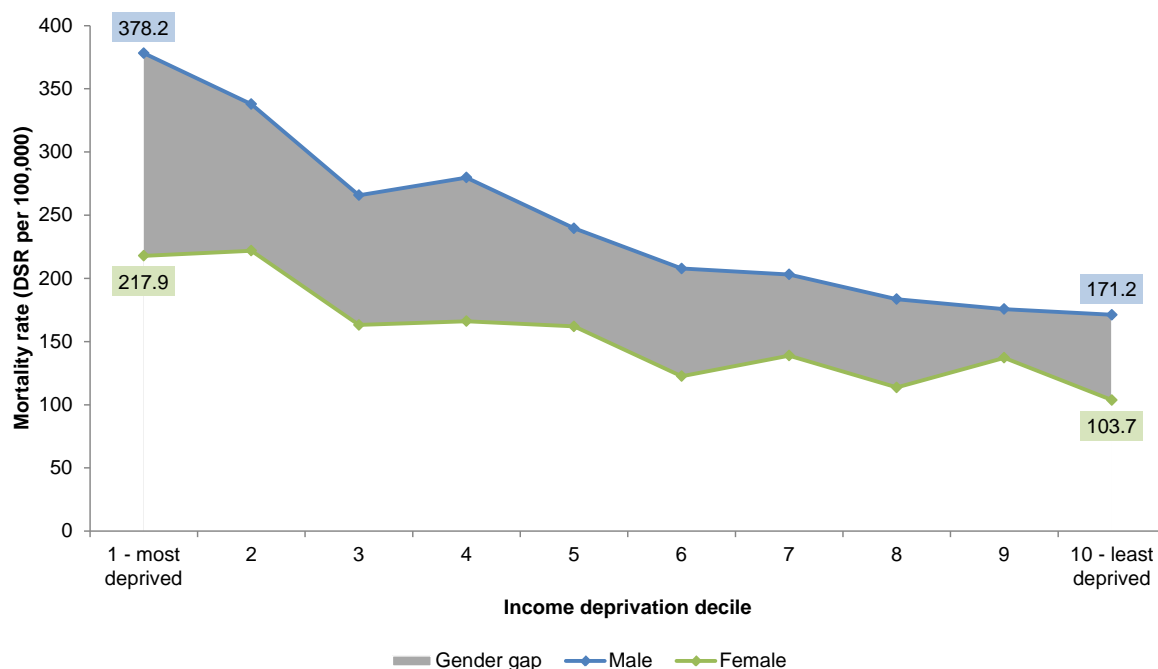
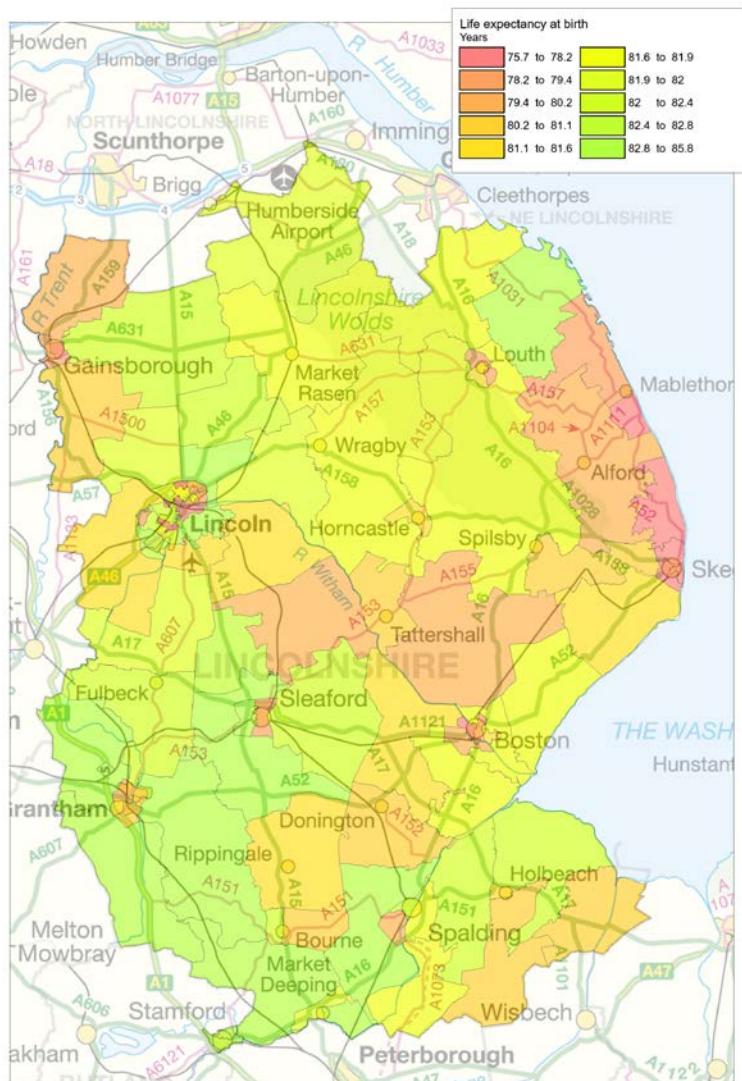
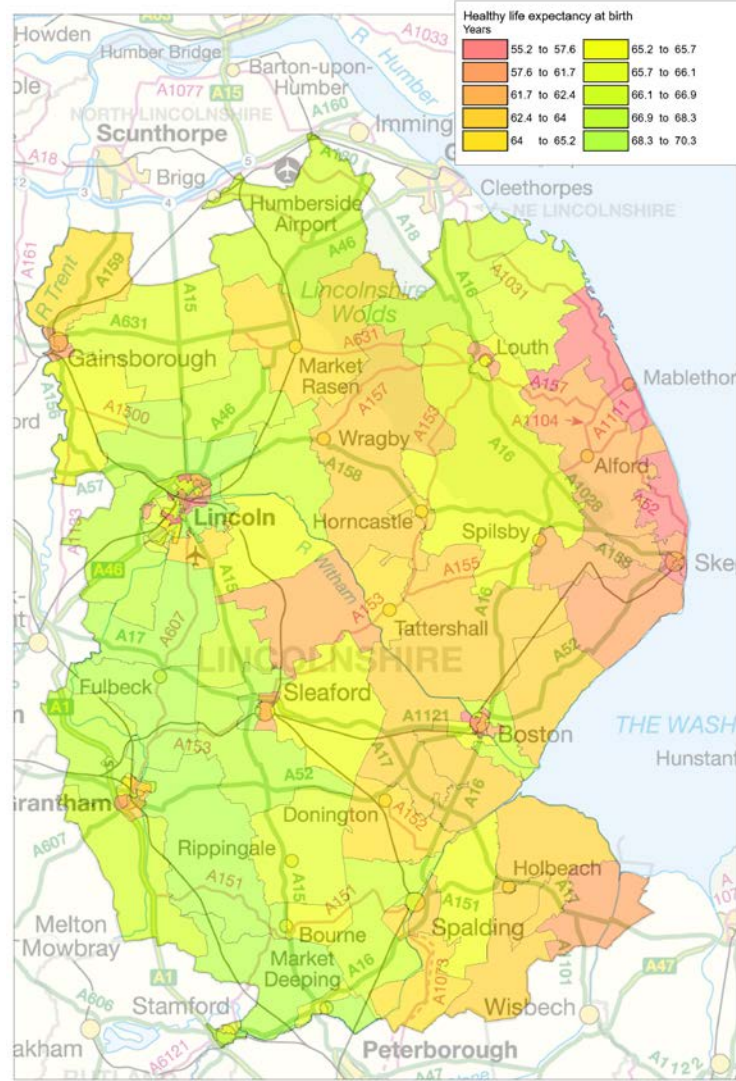


Figure 5.5: Life expectancy in Lincolnshire, by MSOA



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Figure 5.6: Health life expectancy in Lincolnshire, by MSOA



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Figure 5.7: Preventable mortality in Lincolnshire, by LSOA

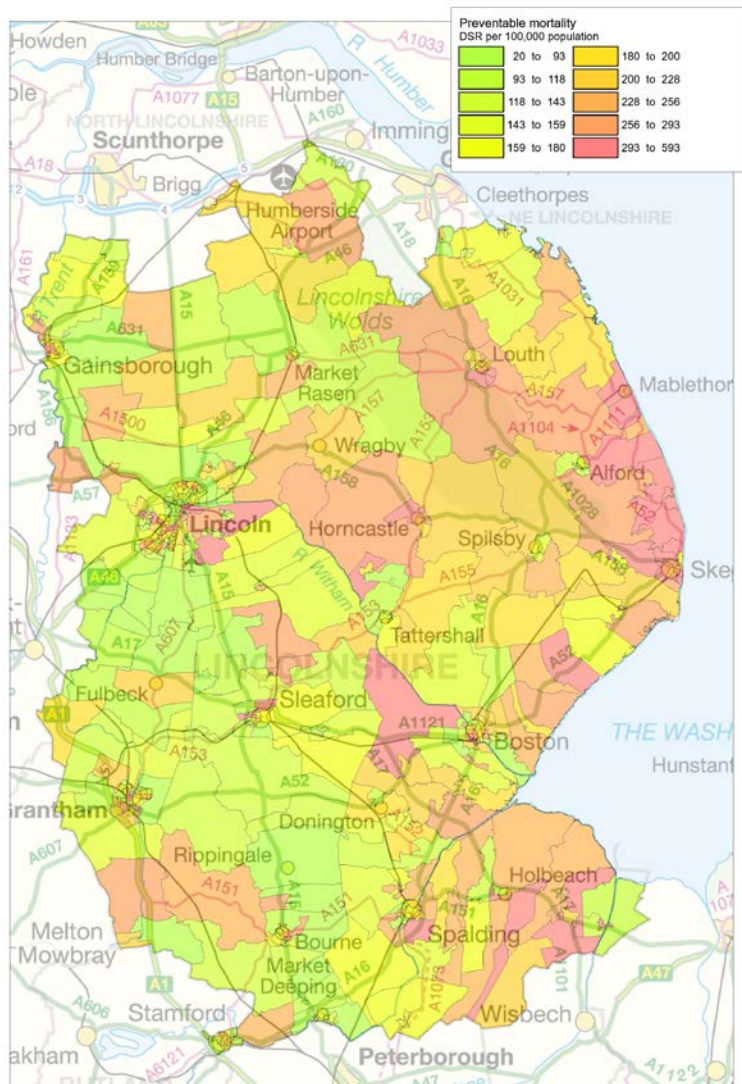
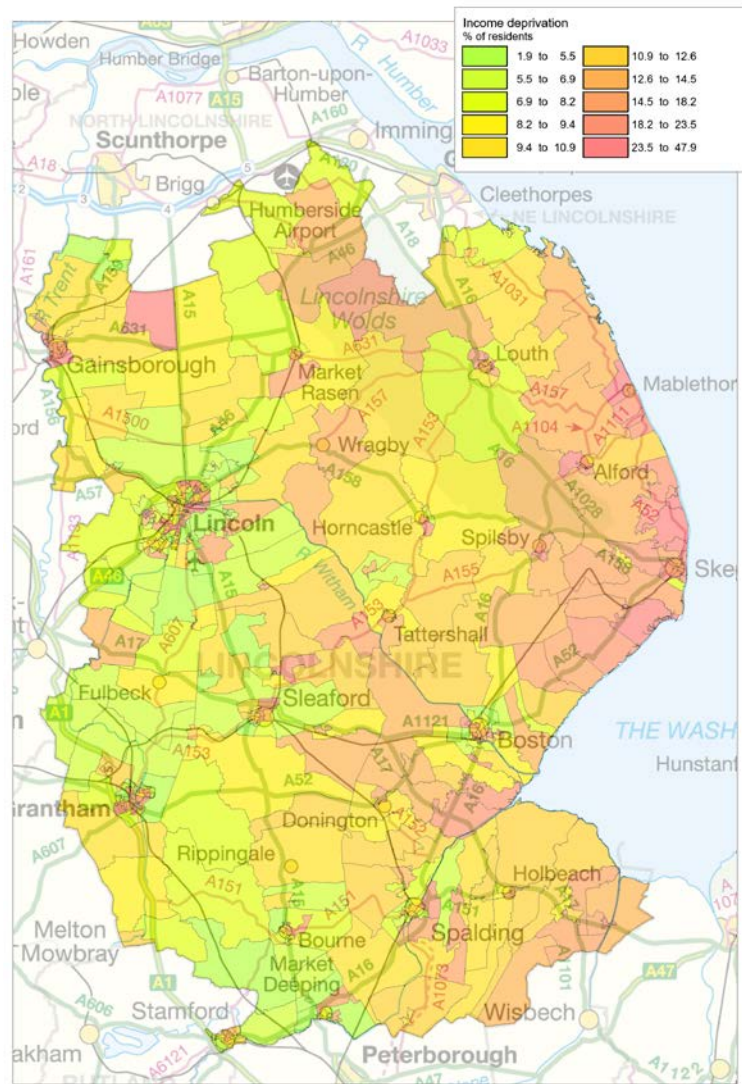


Figure 5.8: Income deprivation in Lincolnshire, by LSOA



5.2 Education and aspiration

The following indicators were tested against health outcomes:

- Early Years pupils achieving a good level of development ^e
- Pupils achieving at least 5 GCSE's at grade A-C ^e
- Persistently absent pupils (primary and secondary) ^e
- Young people aged 16-18 not in education, employment or training (NEET) ^e
- Adults with no formal qualifications ^f

Key findings

- Health inequalities can exist based on level of education; however there was insufficient evidence to confidently state that inequality gaps are as a result of poor levels of education and aspiration.
- Analysis showed no significant correlation between health outcomes and Early Years attainment, NEET or adults who have no qualifications.
- There is a strong geographical association between measures of education and aspiration and healthy life expectancy and childhood obesity.
- There is a moderate geographical association between GCSE achievement and preventable mortality rates.
- Regression testing highlights a moderate level of variation in healthy life expectancy can be explained by GCSE attainment and persistent absenteeism.
- Between the highest and lowest deciles for GCSE attainment, life expectancy varies by 4.8 years and healthy life expectancy by 10.1 years.
- Between the highest and lowest deciles for persistent school absence, preventable mortality rates vary by 124.3 deaths (per 100,000 population).
- For each decile where GCSE attainment improves, the following associations are seen:
 - Alcohol-specific hospital admission rates could reduce by 32.3 admissions (per 100,000 population).

^e Source: LCC, Children's Services Performance Team

^f Source: ONS, 2011 Census, via NOMIS

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- For each decile where persistent school absence decreases, the following associations are seen:
 - Preventable mortality rates could reduce by 14.2 deaths (per 100,000 population).
 - Mental health related hospital admission rates could reduce by 16.4 admissions (per 100,000 population).
- The gap in life expectancy between the lowest and highest areas for GCSE attainment in Lincolnshire is 5.7 years for men and 4.9 years for women. For healthy life expectancy, this gap widens to 10.5 years for men and 10.2 years for women.
- Areas with the lowest GCSE attainment are around Mablethorpe and Skegness as well as Gainsborough, Spalding and Boston. These areas are predominantly urban and also have high levels of socio-economic deprivation.
- The highest levels of persistent absenteeism are in Gainsborough, Lincoln, Mablethorpe, Boston and Spalding.
- There is a clear pattern along the east coast from Mablethorpe to Spalding having low levels of adult educational attainment, with many of these areas showing high proportions of adults who have no formal qualifications.

Figure 5.9: Statistical summary of educational determinants

		Life expectancy	Healthy life expectancy	Preventable mortality	Mental health admissions	Alcohol specific admissions	Drug related admissions	Childhood obesity
GCSE attainment	Correlation R value	0.68	0.81	-0.51	-0.55	-0.55	-0.59	-0.57
	Regression R ² value	47.0%	66.0%	-	31.0%	31.0%	36.0%	34.0%
	Inequality gap (SII)	4.8	10.1	-	-122.5	-246.3	-41.4	-4.4
	Potential change per decile	0.5	1.0	-	-16.9	-32.3	-5.5	-0.5
Persistently absent children	Correlation R value	-0.62	-0.77	0.56	0.57	0.50	0.59	0.70
	Regression R ² value	38.0%	60.0%	32.0%	33.0%	-	36.0%	49.0%
	Inequality gap (SII)	4.5	10.0	-124.3	-137.3	-	-47.4	-5.4
	Potential change per decile	0.4	1.0	-14.2	-16.4	-	-5.6	-0.6

Figure 5.10: Inequality gap between preventable mortality and persistent school absenteeism

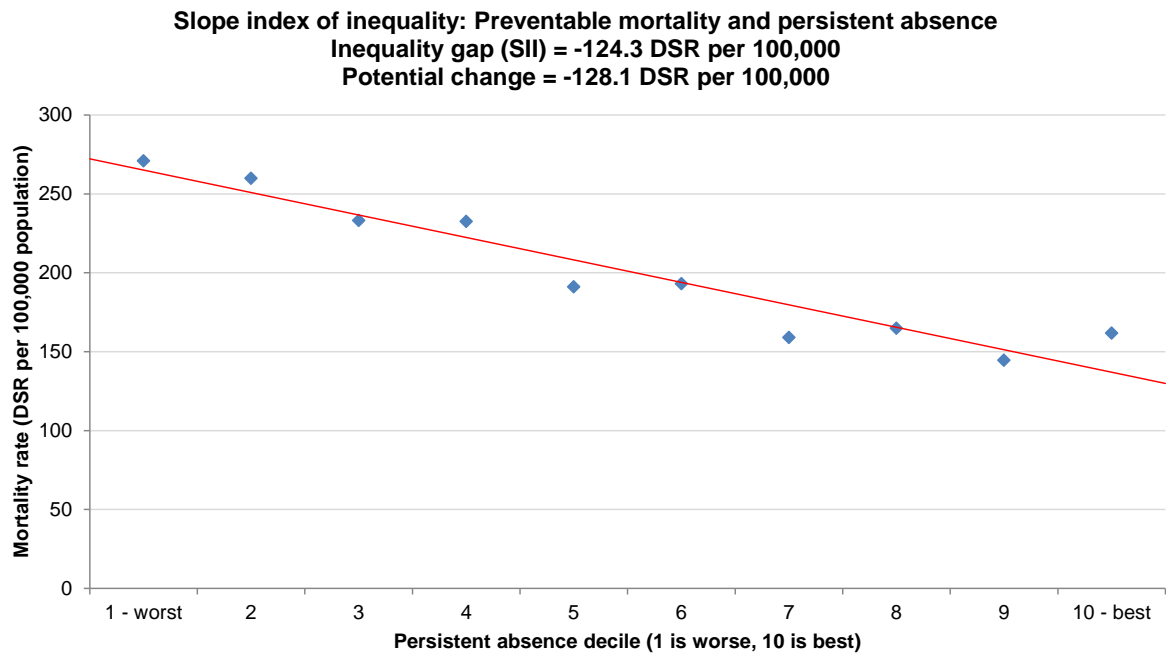


Figure 5.11: Gender inequalities between life expectancies and GCSE attainment

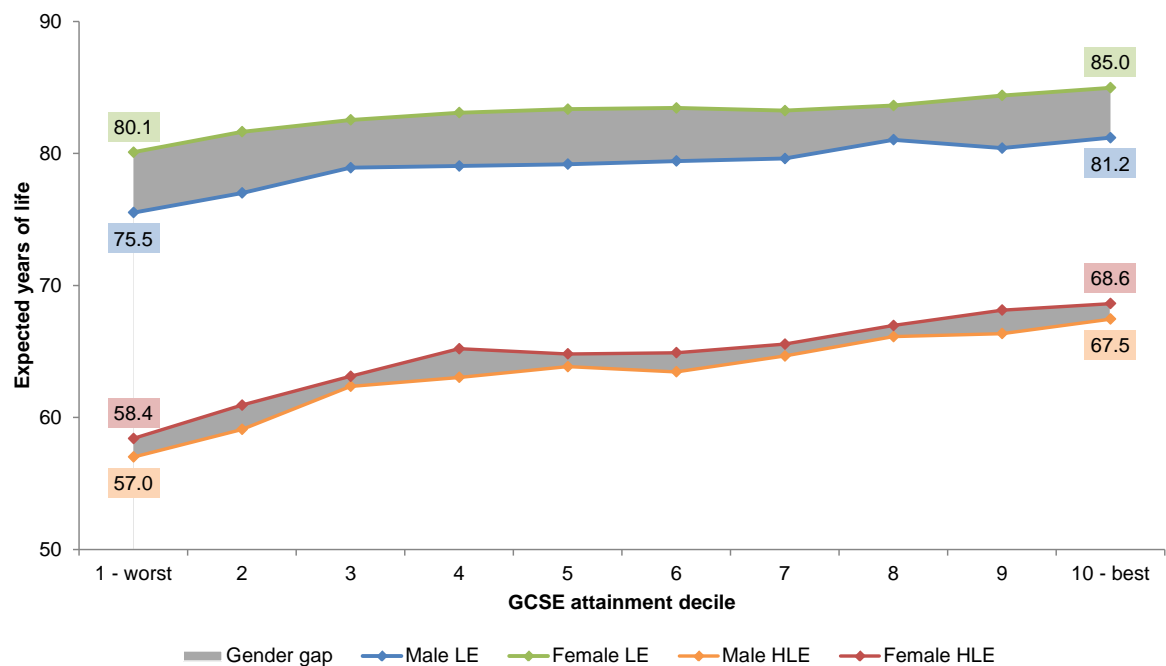


Figure 5.12: GCSE attainment in Lincolnshire, by LSOA

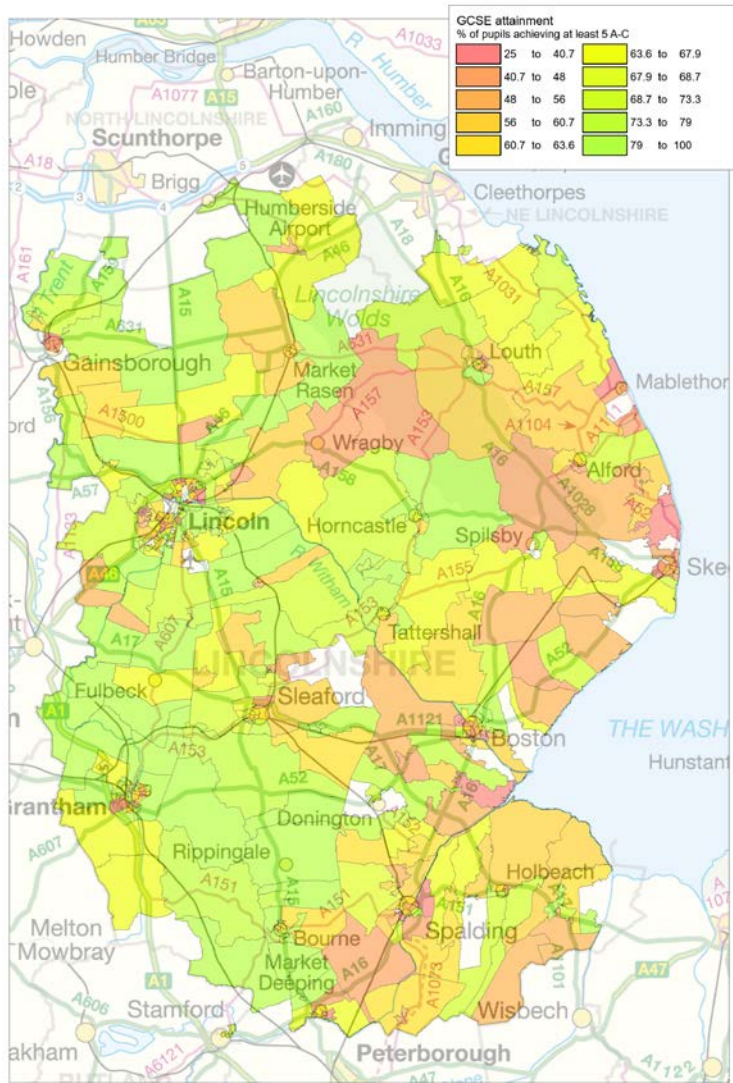


Figure 5.13: Persistently absent pupils in Lincolnshire, by LSOA

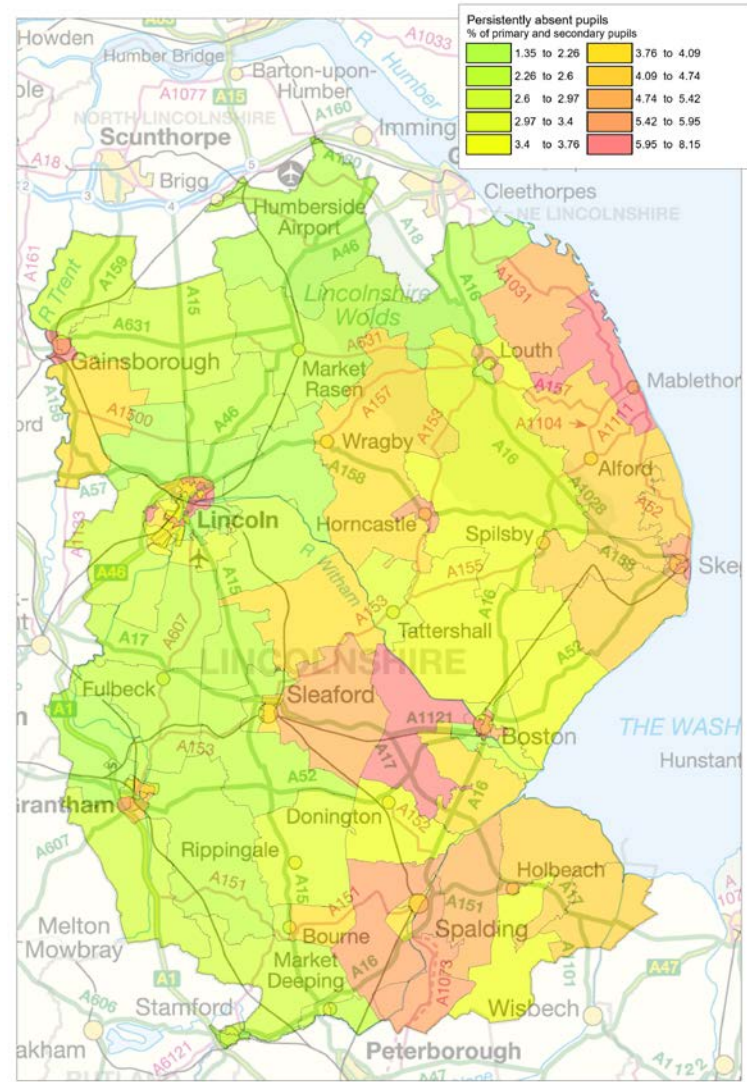


Figure 5.14: NEET's in Lincolnshire, by MSOA

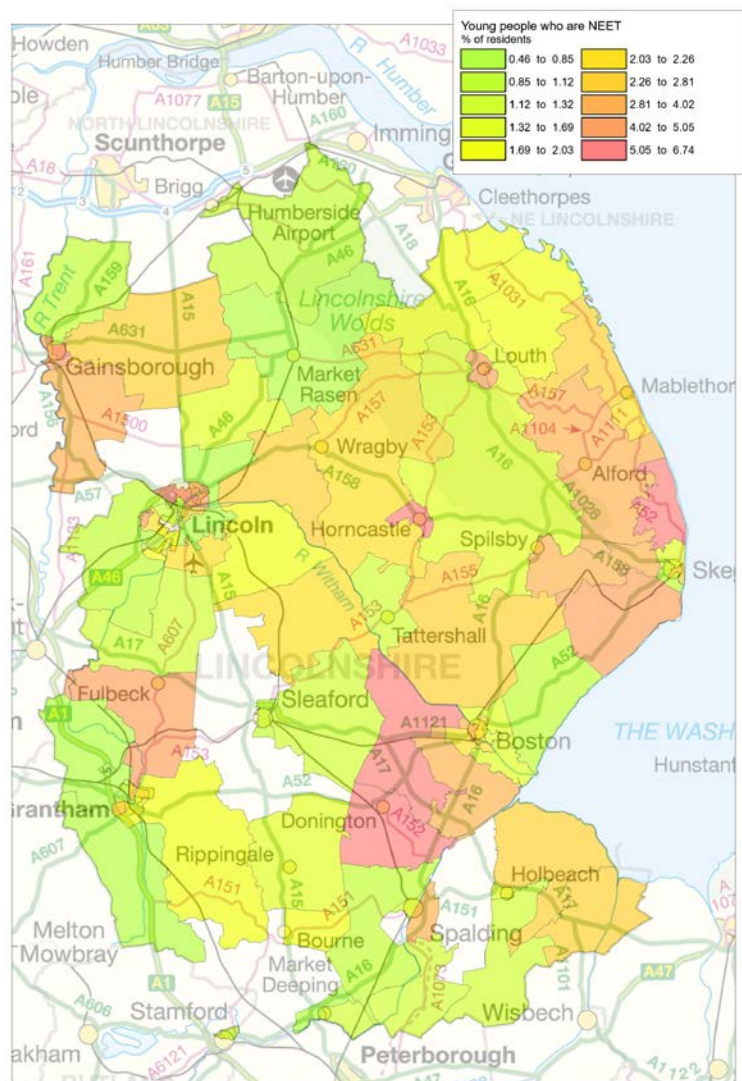
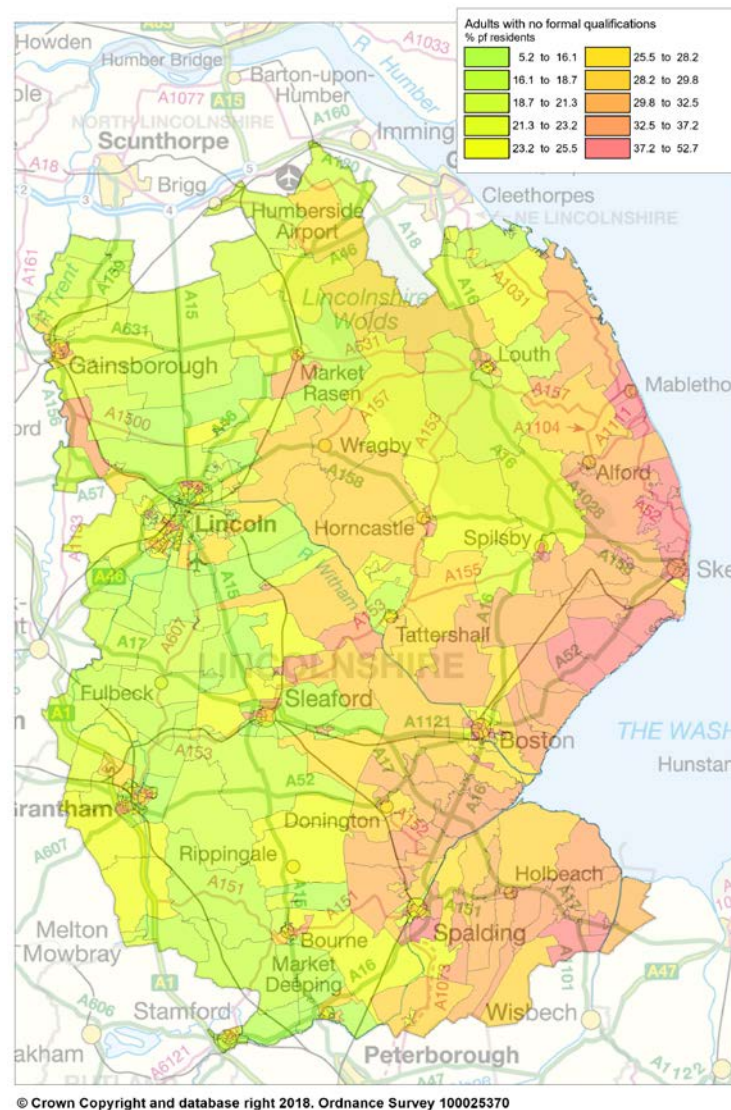


Figure 5.15: Adults with no qualifications in Lincolnshire, by LSOA



5.3 Economy

The following indicators were tested against health outcomes:

- Unemployment benefit claimants (adults aged 16 to 64 years) ^g
- Pension Credit claimants (adults aged 60(F)/65(M) years and over) ^h

Key findings

- There is a strong geographical association between measures of economy and life expectancy, healthy life expectancy and mental health-related, alcohol-specific and drug-related hospital admissions.
- Between the highest and lowest deciles for unemployment benefit claimants, the inequality gap for alcohol-specific hospital admissions is 331.3 admissions (per 100,000 population).
- Regression testing shows that moderate levels of variation in life expectancy and healthy life expectancy can be explained by unemployment benefit claimants.
- Regression testing shows that a high level of variation in healthy life expectancy can be explained by Pension Credit claimants; and can also explain moderate levels of variation in mental health-related, alcohol-specific and drug-related hospital admissions.
- Between the highest and lowest deciles for Pension Credit claimants, the inequality gap for life expectancy is 5.3 years; healthy life expectancy is 10.7 years.
- For each decile where unemployment benefit claimant rates decrease, the following associations are seen:
 - Alcohol-specific hospital admission rates could reduce by 38.5 admissions (per 100,000 population).
 - Mental health related hospital admission rates could reduce by 18.7 admissions (per 100,000 population).
- For each decile where Pension Credit claimant rates decrease, the following associations are seen:
 - Healthy life expectancy could increase by over a year
 - Alcohol-specific hospital admission rates could reduce by 36.7 admissions (per 100,000 population).

^g Source: ONS, Claimant Count, via NOMIS

^h Source: ONS, DWP Benefits, via NOMIS

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- Mental health related hospital admission rates could reduce by 19.9 admissions (per 100,000 population).
- The proportion of unemployment claimants is higher along the coast of Mablethorpe and Skegness, as well as around Grantham, Wragby, Gainsborough and Lincoln.
- Areas of Skegness, Lincoln, Boston, Grantham and Gainsborough showing the highest proportions of Pension Credit claimants in Lincolnshire.
- It is likely that some of these geographical differences can be explained by the different age groups that underpin each of these determinants, with unemployment relating to the working age population (aged 16 to 64 years) and Pension Credit relating to an older population (aged 60(F)/65(M) years and over).

Figure 5.16: Statistical summary of economy determinants

		Life expectancy	Healthy life expectancy	Preventable mortality	Premature CVD mortality	Mental health admissions	Alcohol specific admissions	Drug related admissions
Unemployment benefit claimants	Correlation R value	-0.73	-0.81	0.60	0.54	0.67	0.69	0.64
	Regression R ² value	53.8%	64.8%	36.0%	-	45.3%	47.5%	41.4%
	Inequality gap (SII)	4.9	10.3	-118.4	-	-152.4	-331.3	-61.1
	Potential change per decile	0.5	1.0	-14.6	-	-18.7	-38.5	-7.0
Pension Credit claimants	Correlation R value	-0.80	-0.88	0.56	0.47	0.74	0.71	0.77
	Regression R ² value	63.9%	76.5%	30.8%	-	54.0%	59.9%	59.7%
	Inequality gap (SII)	5.3	10.7	-108.0	-	-151.4	-283.7	-53.1
	Potential change per decile	0.5	1.1	-13.6	-	-19.9	-36.7	-6.6

Figure 5.17: Inequality gap between preventable mortality and unemployment

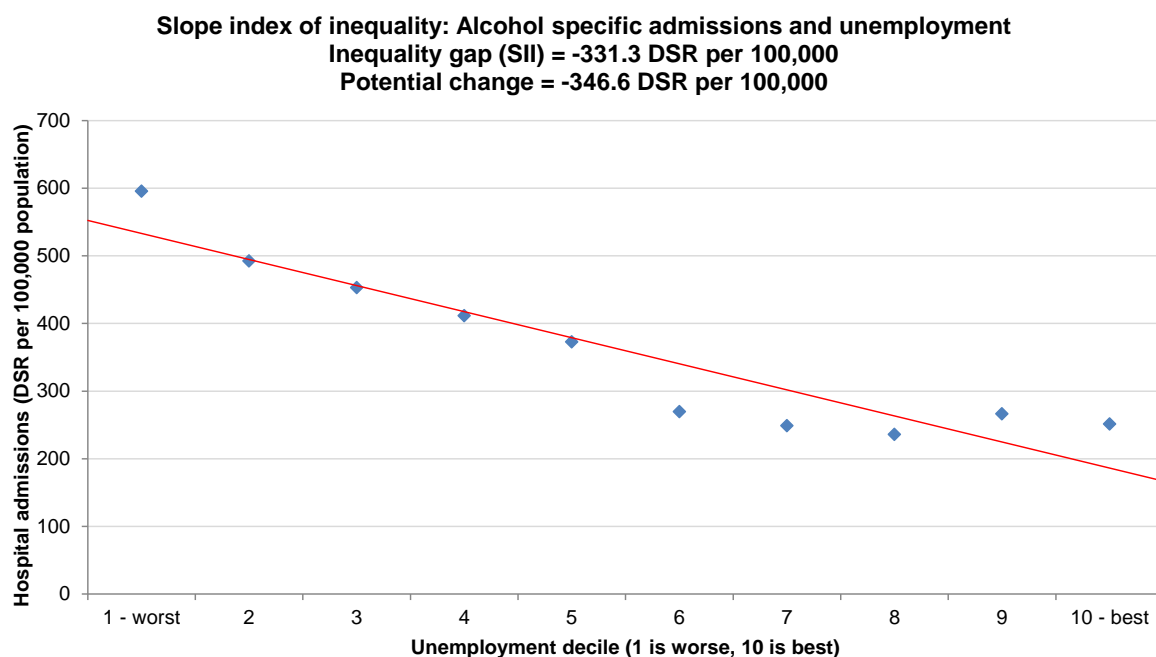


Figure 5.18: Unemployment in Lincolnshire, by LSOA

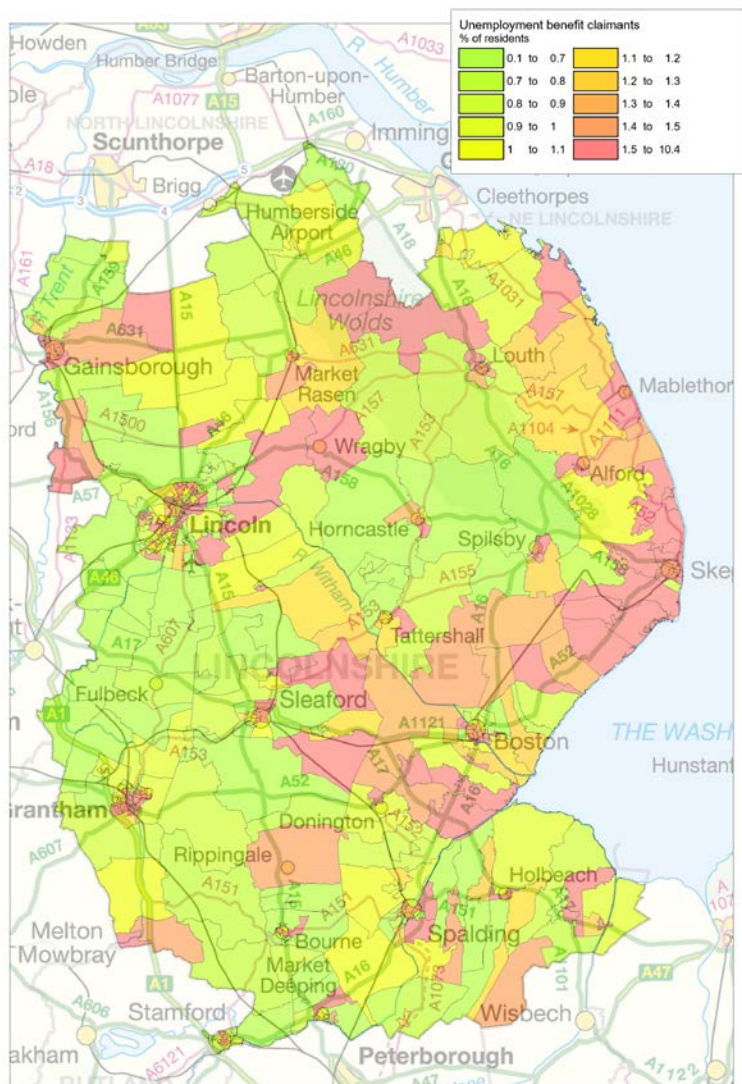
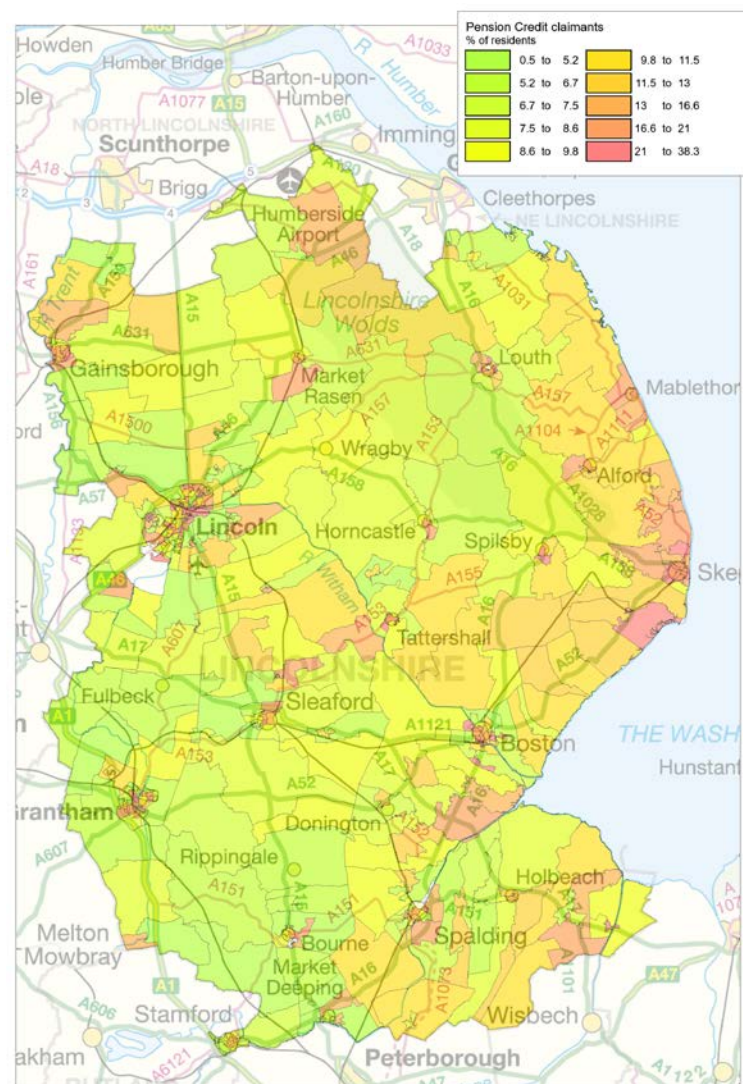


Figure 5.19: Pension Credit claimants in Lincolnshire, by LSOA



5.4 Environment and community

The following indicators were tested against health outcome:

- Poor condition housing ⁱ
- Overcrowded households ⁱ
- Households living in fuel poverty ^j
- Households with no access to a car ⁱ
- Distance (in Km) to the nearest GP surgery ^k
- Pensioners living alone ^l

Key findings

- There is a strong geographical association between environmental measures and life expectancy, healthy life expectancy and mental health-related, alcohol-specific and drug-related hospital admissions.
- There is a strong geographical association between areas with a high proportion of pensioners who live alone and high rates of drug-related hospital admissions.
- Regression testing shows that households with no access to a car can explain moderate levels of variation in life expectancy, healthy life expectancy, mental health-related, alcohol-specific and drug-related hospital admissions.
- Regression testing shows a moderate level of variation in drug-related hospital admissions can be explained by pensioners who live alone.
- Between the highest and lowest deciles for households with no access to a car, the inequality gap for life expectancy is 4.8 years; healthy life expectancy is 9.1 years and alcohol-specific hospital admissions is 313.5 admissions (per 100,000 population).
- For each decile where the proportion of households with access to a car increases, the following associations are seen:
 - Average life expectancy can improve by six months.
 - Average healthy life expectancy can improve by 0.9 years.
 - Alcohol-specific hospital admission rates could reduce by 39.7 admissions (per 100,000 population).

ⁱ Source: ONS, 2011 Census, via NOMIS

^j Source: BEIS, Fuel poverty sub-regional statistics

^k Source: DCLG, English Indices of Deprivation 2015

^l Source: Public Health England, Local Health tool

The Wider Determinants of Health Inequality in Lincolnshire

- Mental health related hospital admission rates could reduce by 21.5 admissions (per 100,000 population).
- Rural areas of Lincolnshire have lower proportions of households with no access to a car, higher levels of fuel poverty and poorer quality housing.
- By comparison, urban areas of Lincolnshire have higher proportions of pensioners living alone and of overcrowded accommodation.

Figure 5.20: Statistical summary of environmental determinants

		Life expectancy	Healthy life expectancy	Mental health admissions	Alcohol specific admissions	Drug related admissions
Households with no access to a car	Correlation R value	-0.72	-0.77	0.77	0.75	0.82
	Regression R ² value	52.0%	58.0%	59.0%	56.0%	68.0%
	Inequality gap (SII)	4.8	9.1	-166.4	-313.5	-54.9
	Potential change per decile	0.5	0.9	-21.5	-39.7	-7.4
Pensioners living alone	Correlation R value	-0.54	-0.51	0.67	0.60	0.73
	Regression R ² value	29.0%	26.0%	45.0%	35.0%	53.0%
	Inequality gap (SII)	3.4	6.1	-159.5	-270.6	-49.3
	Potential change per decile	0.3	0.6	-19.8	-33.0	-6.6

Figure 5.21: Inequality gap between healthy life expectancy and households with access to a car

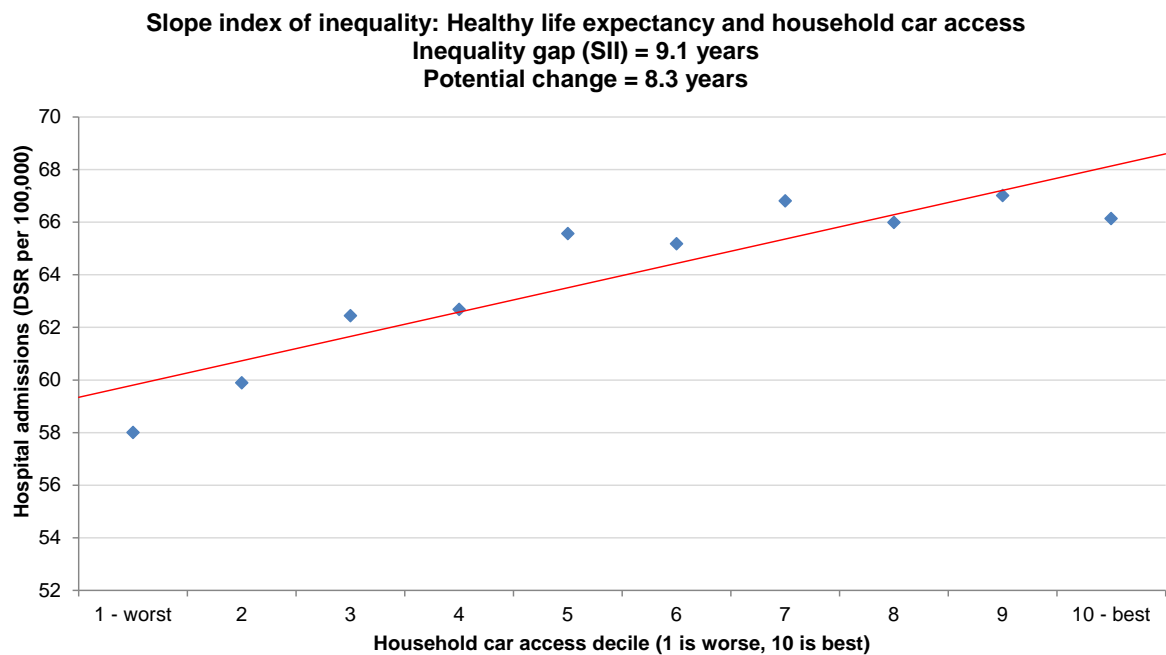


Figure 5.22: Inequality gap between drug-related hospital admissions and households with access to a car

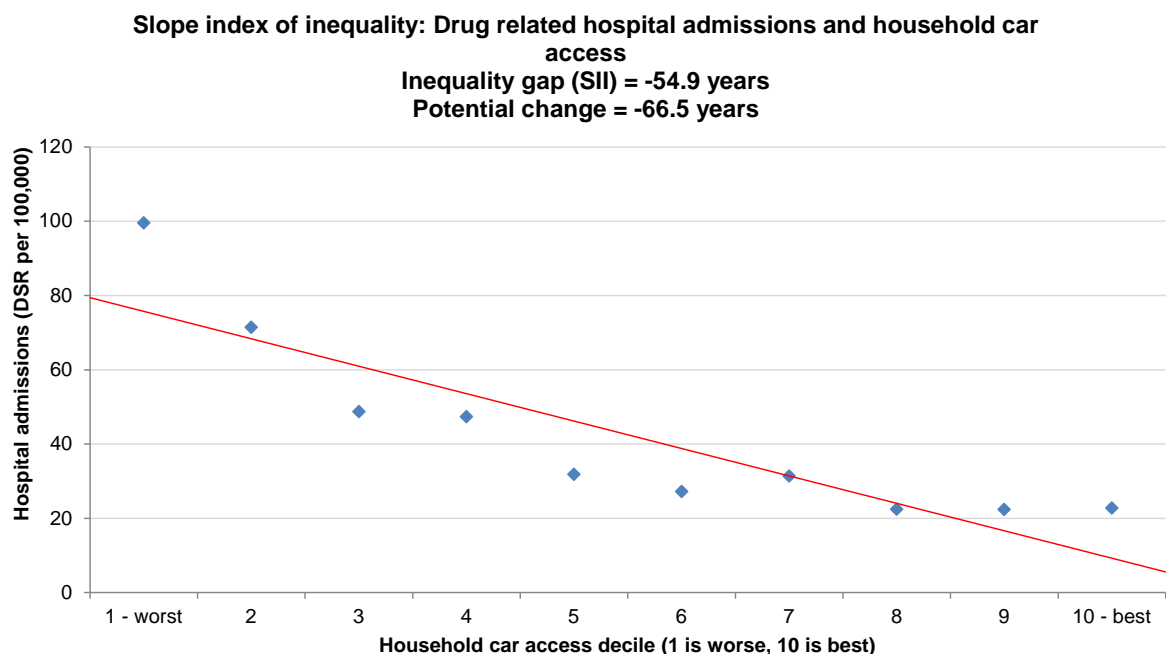


Figure 5.23: Households with access to a car in Lincolnshire, by LSOA

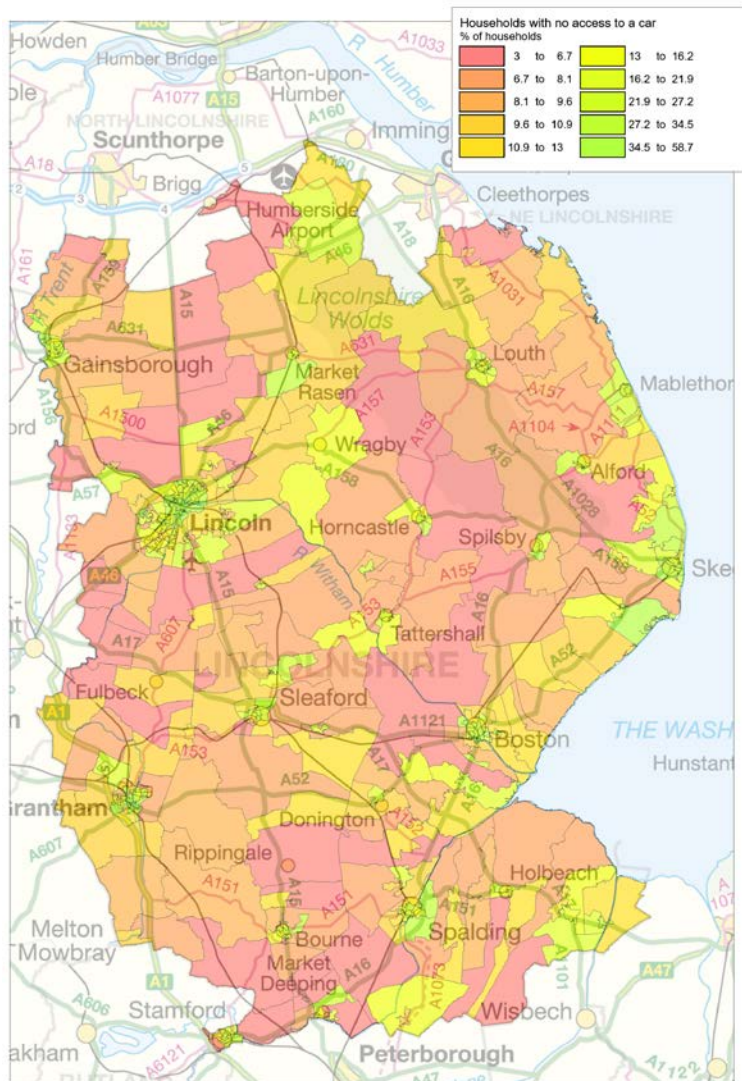


Figure 5.23: Pensioners living alone in Lincolnshire, by LSOA



Figure 5.24: Poor quality housing in Lincolnshire, by LSOA

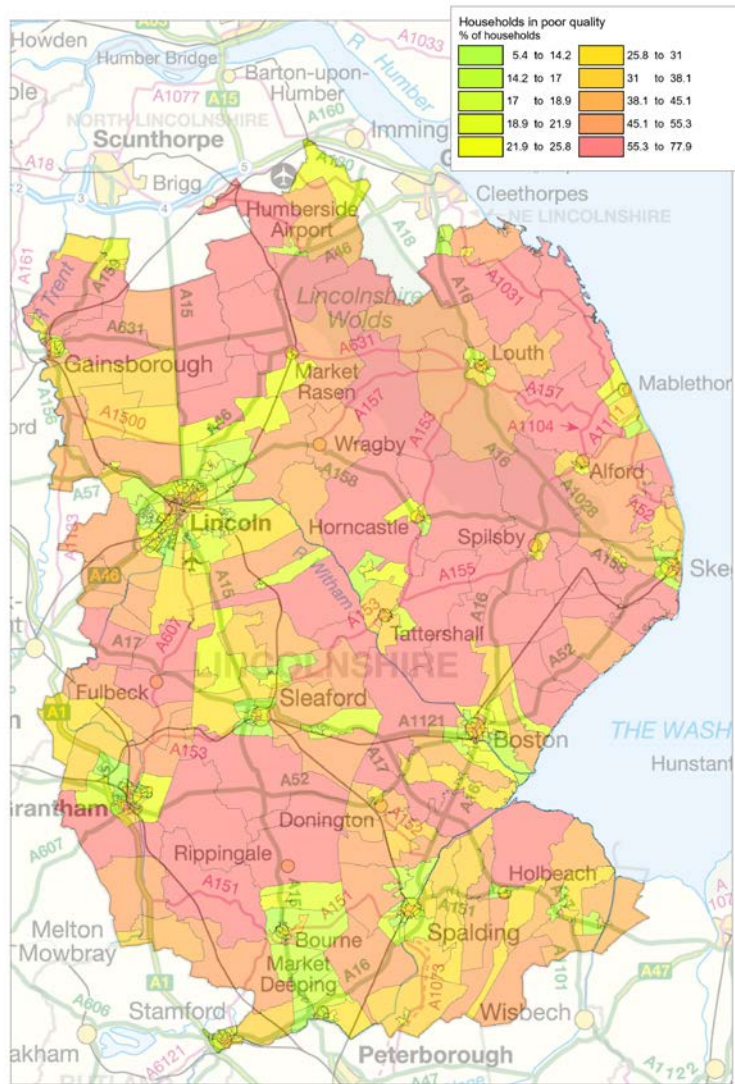


Figure 5.25: Overcrowded households in Lincolnshire, by LSOA

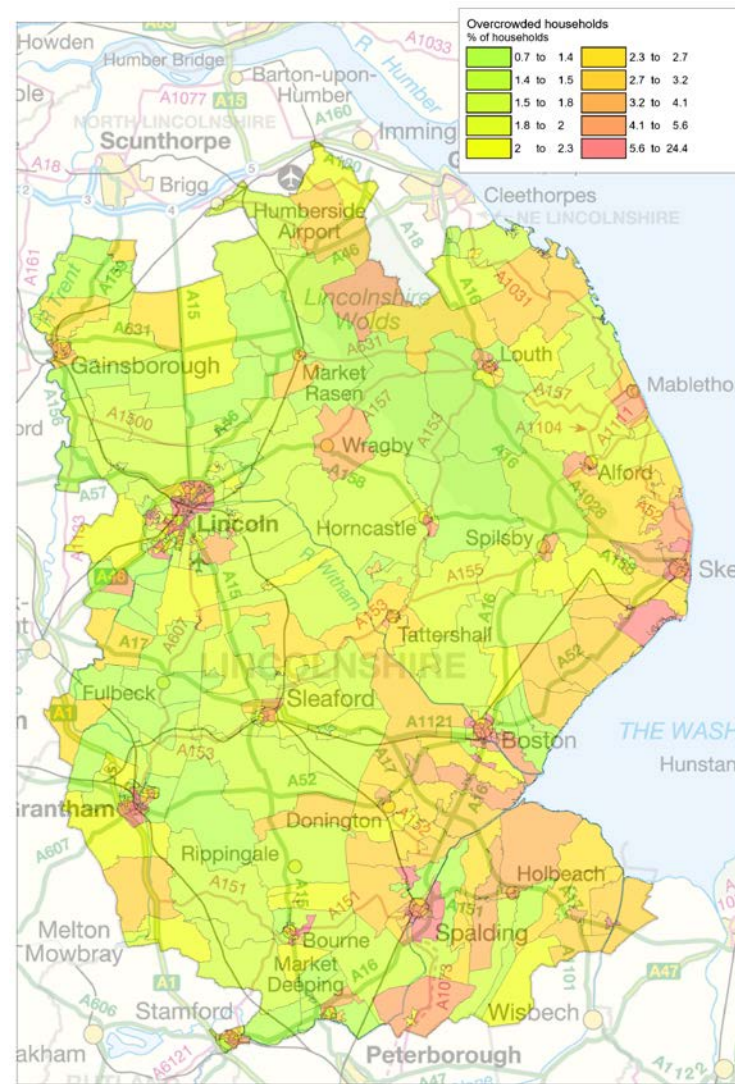


Figure 5.26: Fuel poverty in Lincolnshire, by LSOA

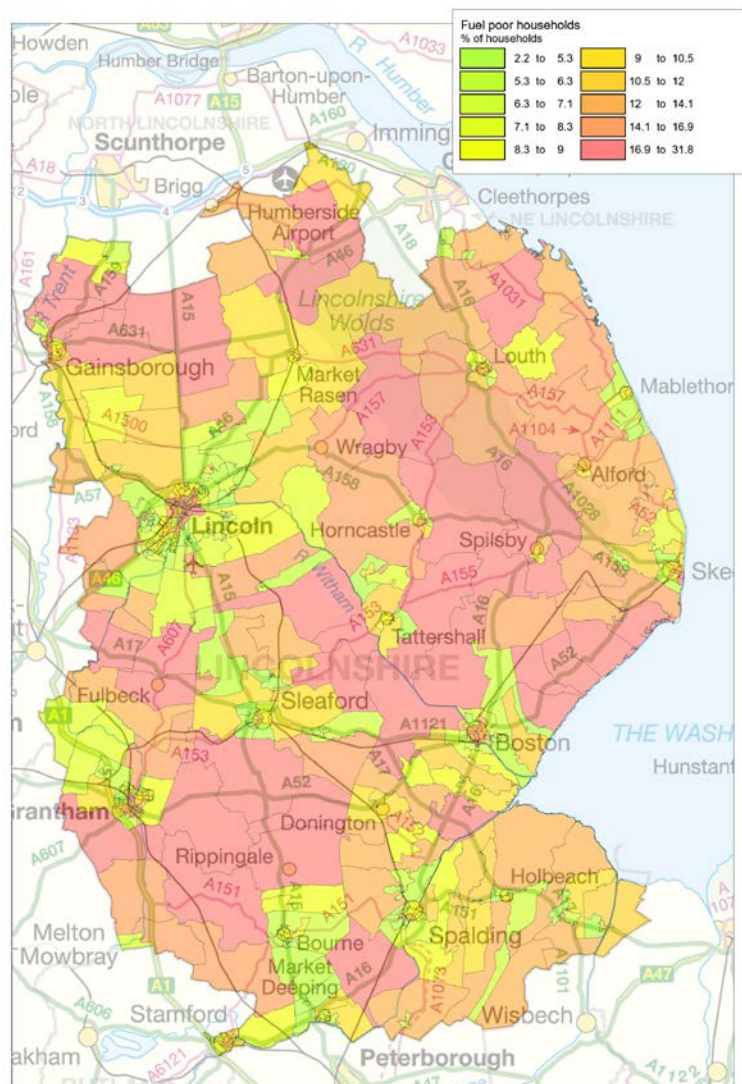
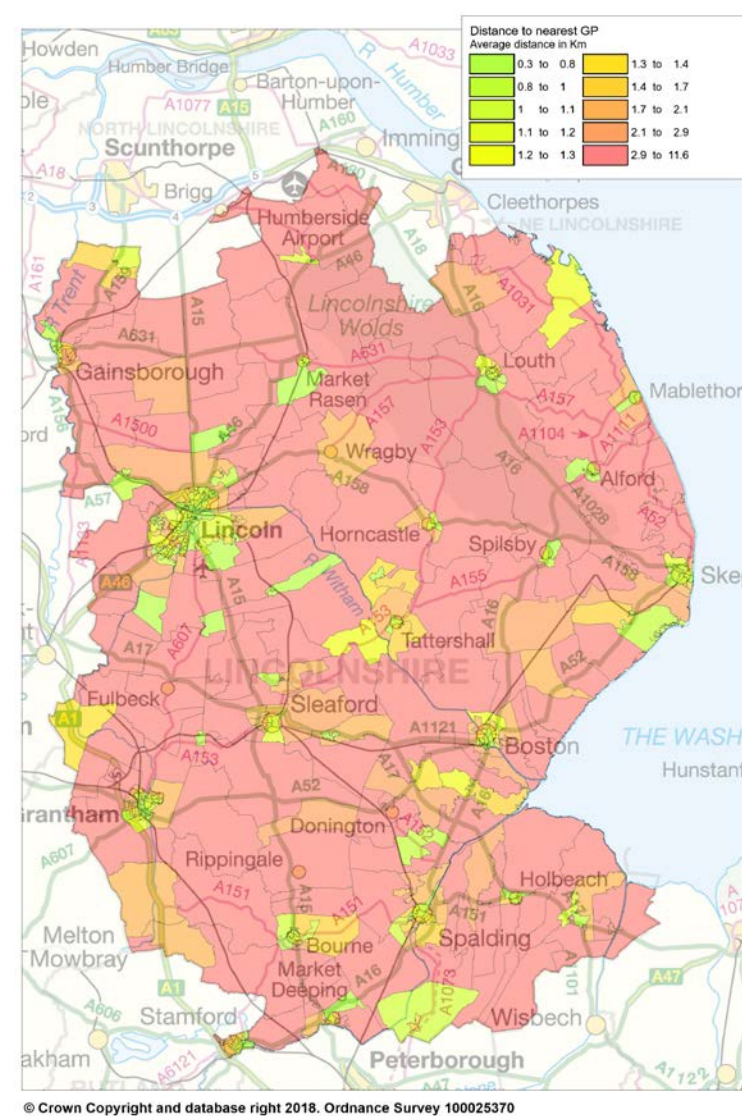


Figure 5.27: Distance to nearest GP in Lincolnshire, by LSOA



5.5 Health and wellbeing

The following indicators were tested against health outcomes:

- Binge drinking adults ^m
- Healthy eating adults (those who eat 5 portions of fruit/veg a day) ^m
- Physically active adults (those who participate in at least 30 minutes of activity per week) ^m

In addition, the following variables have been considered twice, as both a health outcome and a wider determinant of health.

- Mental health related hospital admissions ⁿ
- Alcohol specific hospital admissions ⁿ
- Smoking attributable hospital admissions ⁿ
- Drug related hospital admissions ⁿ
- Obese adults ^m
- Obese children ^o

Key findings

- There is a moderate geographical association between binge drinking adults and smoking-related hospital admissions, premature cancer mortality and adult obesity.
- Conversely, there is no association between binge drinking and life expectancy, healthy life expectancy, preventable mortality or liver disease mortality.
- There is a strong geographical association between mental health-related hospital admissions and life expectancy and alcohol-specific and drug-related hospital admissions.
- There is a strong geographical association between smoking-related hospital admissions and preventable mortality, premature cancer mortality and lung cancer mortality.

^m Source: Public Health England, Local Health tool

ⁿ Source: Hospital Episode Statistics, Copyright © 2016, re-used with the permission of The Health & Social Care Information Centre. All rights reserved.

^o LCC, Children's Services Performance Team

The Wider Determinants of Health Inequality in Lincolnshire

- There is a strong geographical association between measures of wellbeing (healthy eating adults and physically active adults) and life expectancy, healthy life expectancy and preventable mortality, as well as child and adult obesity.
- Between the highest and lowest deciles for healthy eating, life expectancy varies by 4.7 years; healthy life expectancy by 10.7 years and preventable mortality rates by 114 deaths (per 100,000 population).
- Between the highest and lowest deciles for physical activity, preventable mortality rates vary by 128.5 deaths (per 100,000 population), premature CVD mortality rates by 62.9 deaths (per 100,000) and adult obesity by 4.3%.
- For each decile where the proportion of physically active adults increases, the following associations are seen:
 - Preventable mortality rates could reduce by 17.6 deaths (per 100,000 population).
 - Premature CVD mortality rates could reduce by 8.5 deaths (per 100,000 population).
 - Smoking-related hospital admission rates could reduce by 262.1 admissions (per 100,000 population).
 - The proportion of obese adults and children could reduce by 0.6%.
- For each decile where smoking-related hospital admissions decrease, the following associations are seen:
 - Preventable mortality rates could reduce by 12.1 deaths (per 100,000 population).
 - Premature cancer mortality rates could reduce by 9.5 deaths (per 100,000 population).
 - Lung cancer mortality rates could reduce by 4.9 deaths (per 100,000 population).
- The lowest levels of healthy eating and physical activity are situated in areas along the east coast and around Lincoln, Gainsborough, Grantham and Boston.
- There are a number of larger towns such as Skegness, Boston, Grantham, Sleaford and Spalding and the city of Lincoln that have the highest levels of admission rates for mental health, smoking, alcohol and drugs misuse in Lincolnshire.

Figure 5.28: Statistical summary of lifestyle determinants

		Life expectancy	Healthy life expectancy	Preventable mortality	Premature cancer mortality	Premature CVD mortality	All-age lung cancer mortality	Drug related admissions	Adult obesity	Child obesity
Healthy eating	Correlation R value	0.66	0.87	-0.68	-0.31	-0.61	-0.47	-0.56	-0.64	-0.64
	Regression R ² value	44.0%	75.0%	46.0%	-	37.0%	-	31.0%	41.0%	41.0%
	Inequality gap (SII)	-4.7	-10.7	114.0	-	51.3	-	55.2	4.5	5.0
	Potential change per decile	-0.5	-1.0	15.4	-	7.0	-	5.4	0.5	0.6
Physically active	Correlation R value	0.49	0.72	-0.76	-0.58	-0.72	-0.63	-0.32	-0.73	-0.73
	Regression R ² value	-	52.0%	57.0%	34.0%	51.0%	39.0%	-	53.0%	53.0%
	Inequality gap (SII)	-	9.5	-128.5	-58.6	-62.9	-39.2	-	-4.3	-5.2
	Potential change per decile	-	1.0	-17.6	-8.4	-8.5	-5.7	-	-0.6	-0.6

Figure 5.29: Statistical summary of combined determinants

		Life expectancy	Healthy life expectancy	Preventable mortality	Premature cancer mortality	Premature CVD mortality	All-age lung cancer mortality	Mental health admissions	Alcohol specific admissions	Drug related admissions
Mental health admissions	Correlation R value	-0.71	-0.64	0.43	-	0.33	-	-	0.76	0.77
	Regression R ² value	51.0%	41.0%	-	-	-	-	-	57.0%	58.0%
	Inequality gap (SII)	5.1	8.1	-	-	-	-	-	-338.5	-49.7
	Potential change per decile	0.5	0.8	-	-	-	-	-	-41.6	-6.7
Alcohol specific admissions	Correlation R value	-0.66	-0.68	0.64	0.34	0.53	0.40	0.76	-	0.66
	Regression R ² value	43.0%	46.0%	41.0%	-	-	-	57.0%	-	43.0%
	Inequality gap (SII)	4.0	7.4	-87.4	-	-	-	-170.2	-	-46.0
	Potential change per decile	0.4	0.7	-12.1	-	-	-	-21.0	-	-6.0
Smoking related admissions	Correlation R value	-0.21	-0.34	0.71	0.78	0.69	0.70	-	0.25	-
	Regression R ² value	-	-	50.0%	60.0%	49.0%	49.0%	-	-	-
	Inequality gap (SII)	-	-	-78.9	-66.2	-44.4	-31.6	-	-	-
	Potential change per decile	-	-	-12.1	-9.5	-6.5	-4.9	-	-	-
Drug related admissions	Correlation R value	-0.62	-0.65	0.41	-	0.31	-	0.77	0.66	-
	Regression R ² value	38.0%	42.0%	-	-	-	-	58.0%	43.0%	-
	Inequality gap (SII)	4.1	8.1	-	-	-	-	-178.7	-269.1	-
	Potential change per decile	0.4	0.8	-	-	-	-	-22.4	-37.8	-
Child obesity	Correlation R value	-0.56	-0.71	0.65	0.37	0.56	0.45	0.44	0.45	0.53
	Regression R ² value	31.0%	50.0%	42.0%	-	32.0%	-	-	-	-
	Inequality gap (SII)	3.8	8.5	-123.3	-	-62.9	-	-	-	-
	Potential change per decile	0.4	0.9	-14.7	-	-7.0	-	-	-	-

Figure 5.30: Inequality gap between preventable mortality and physically active adults

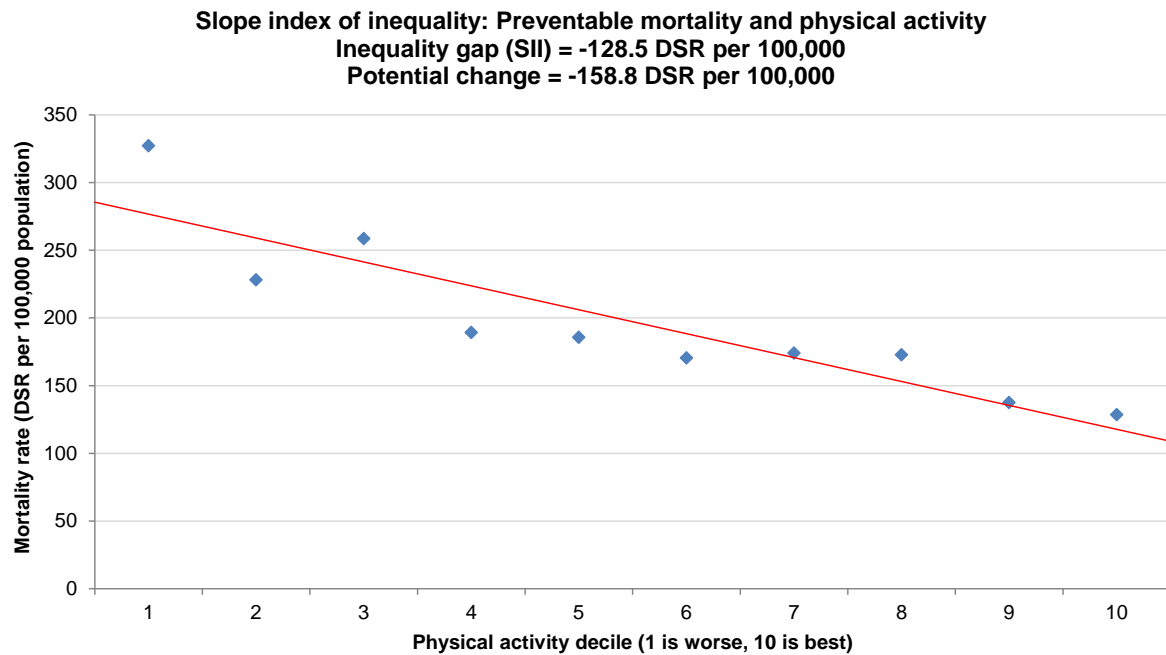


Figure 5.31: Inequality gap between adult obesity and physically active adults

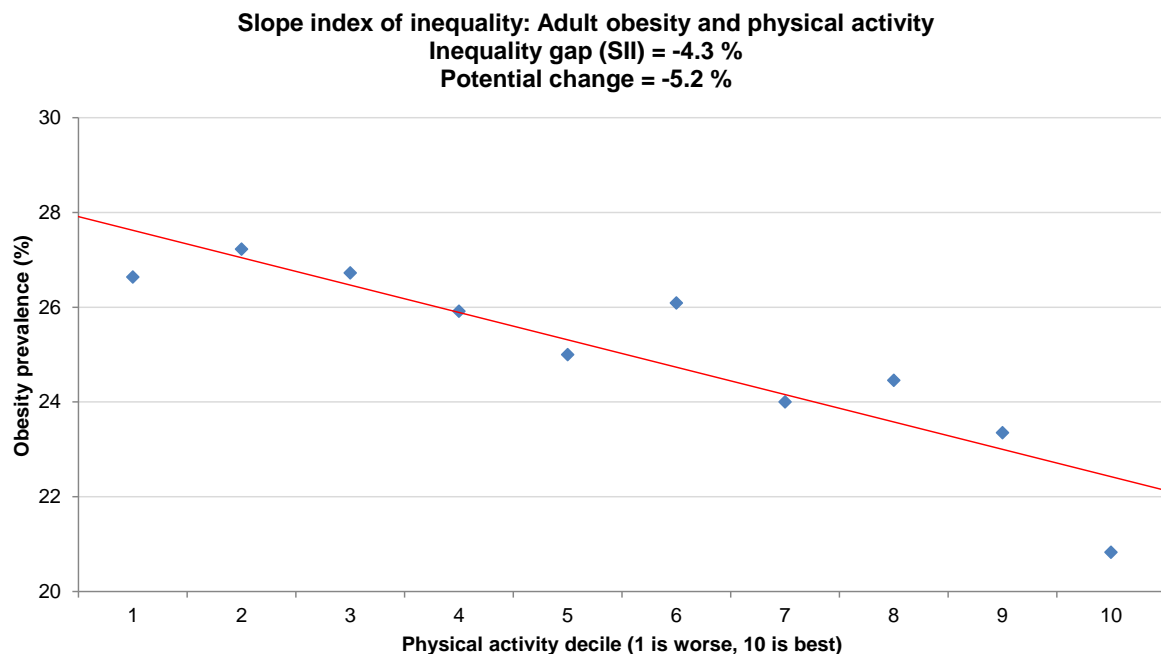


Figure 5.32: Inequality gap between mental health and drug related hospital admissions

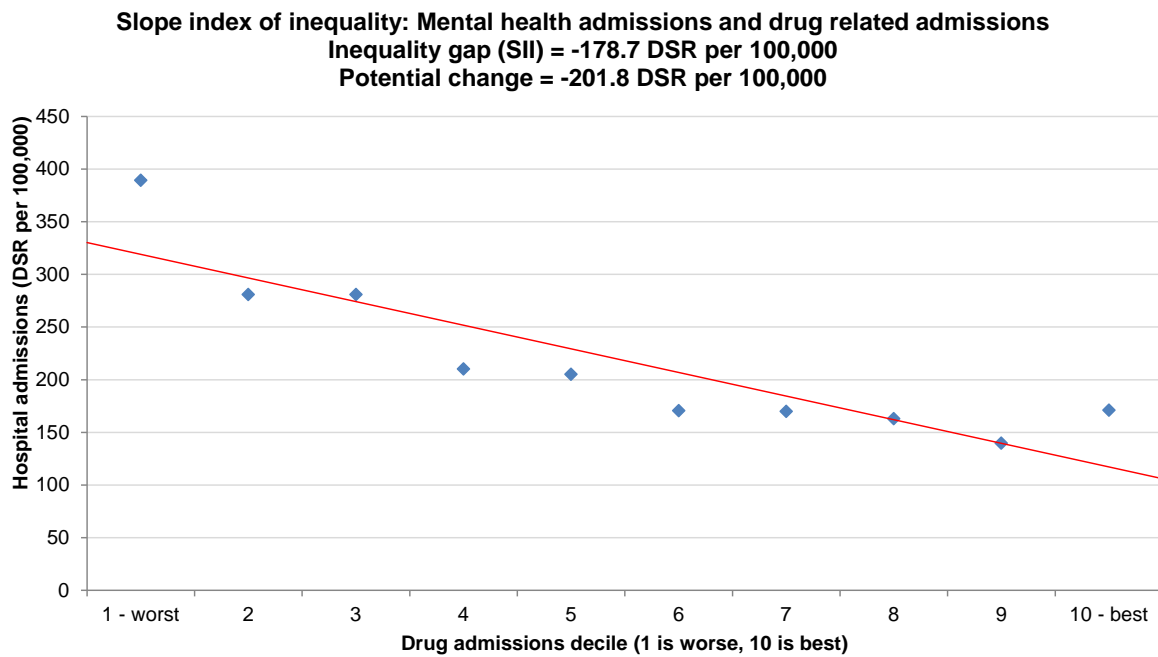


Figure 5.33: Inequality gap between premature cancer mortality and smoking related hospital admissions

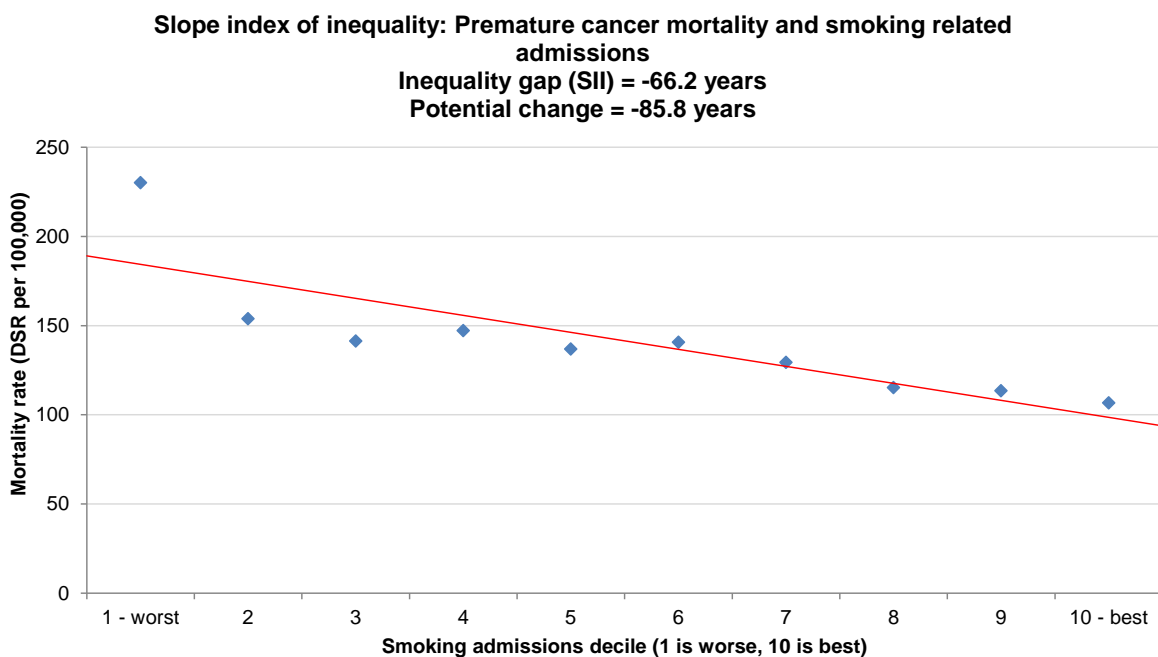


Figure 5.34: Healthy eating adults in Lincolnshire, by MSOA

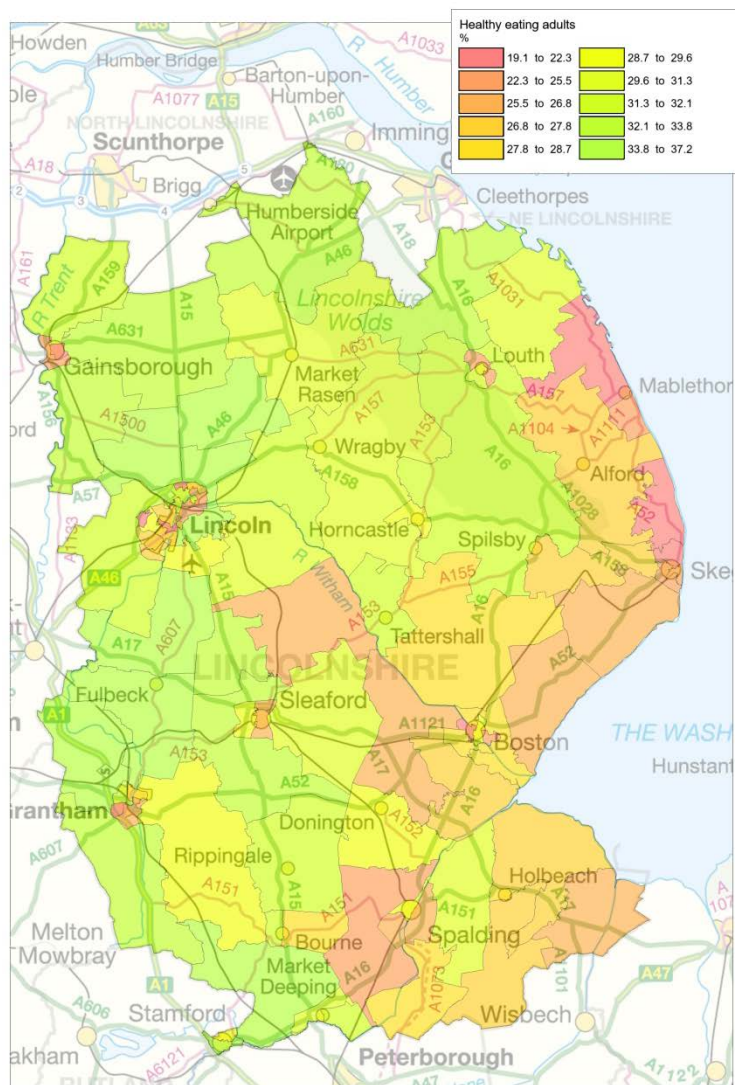


Figure 5.35: Physically active adults in Lincolnshire, by MSOA

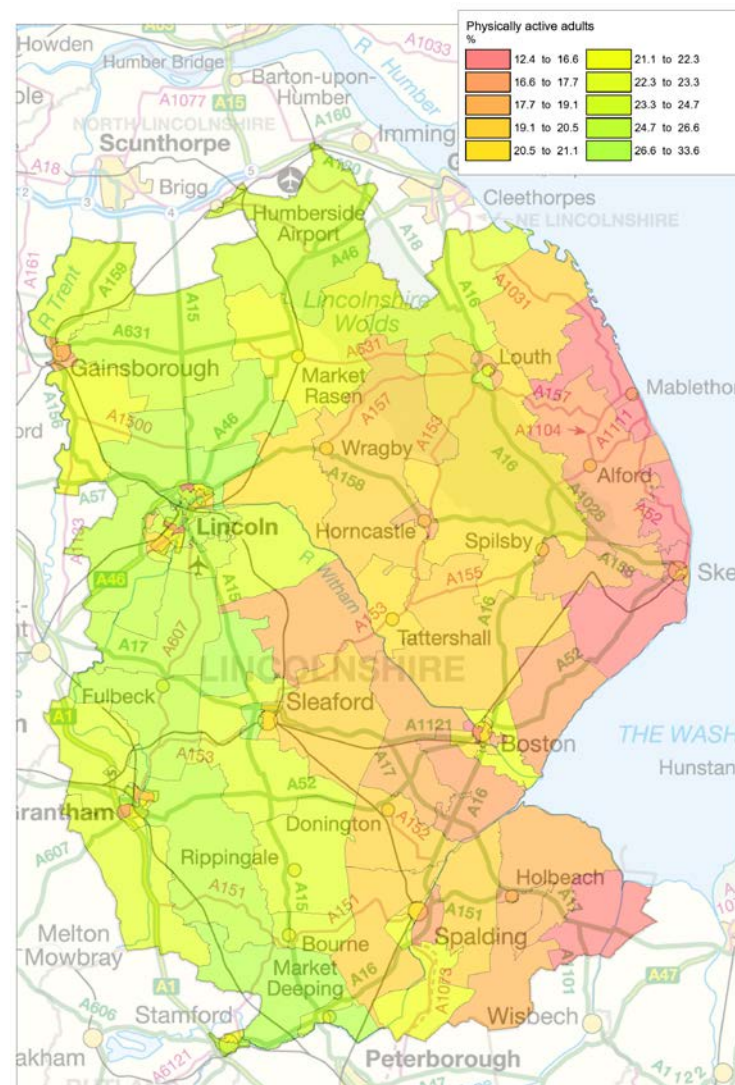
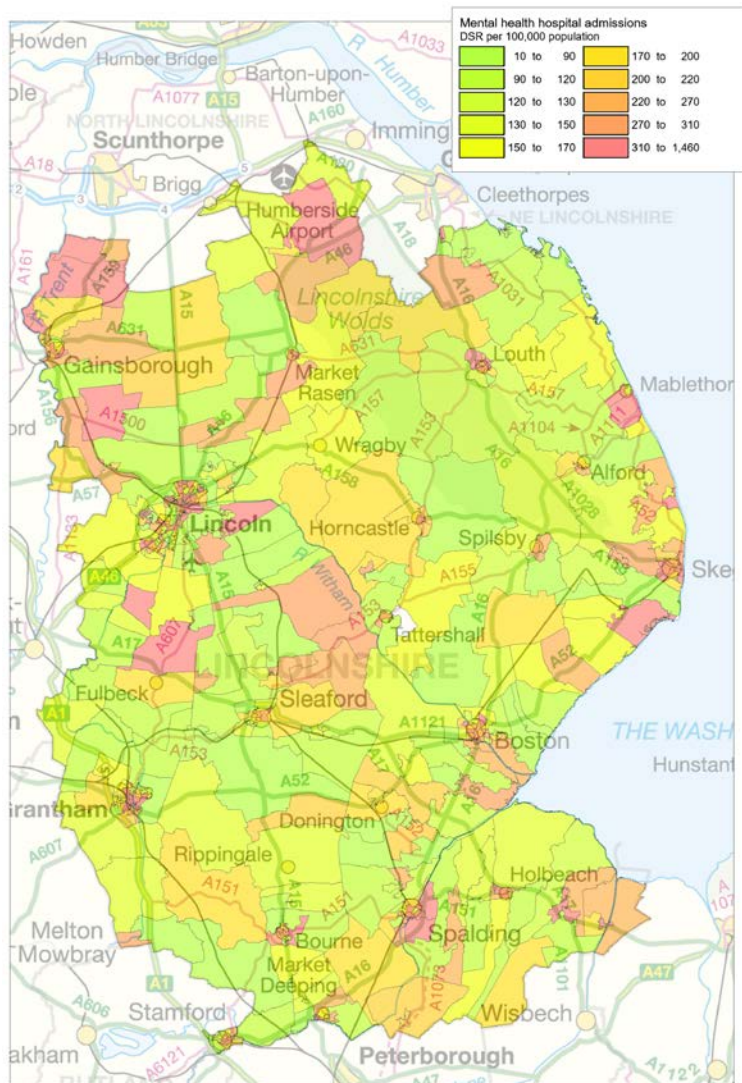
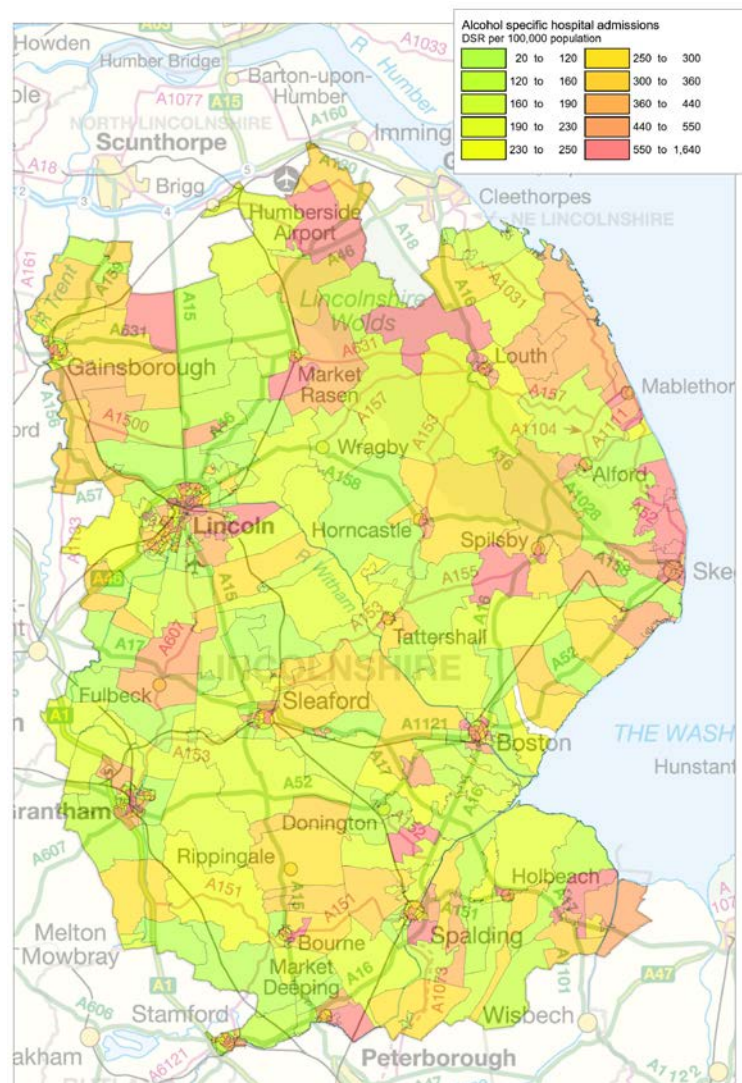


Figure 5.36: Mental health hospital admissions in Lincolnshire, by LSOA



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Figure 5.37: Alcohol specific hospital admissions in Lincolnshire, by LSOA



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Figure 5.38: Smoking related hospital admissions in Lincolnshire, by LSOA

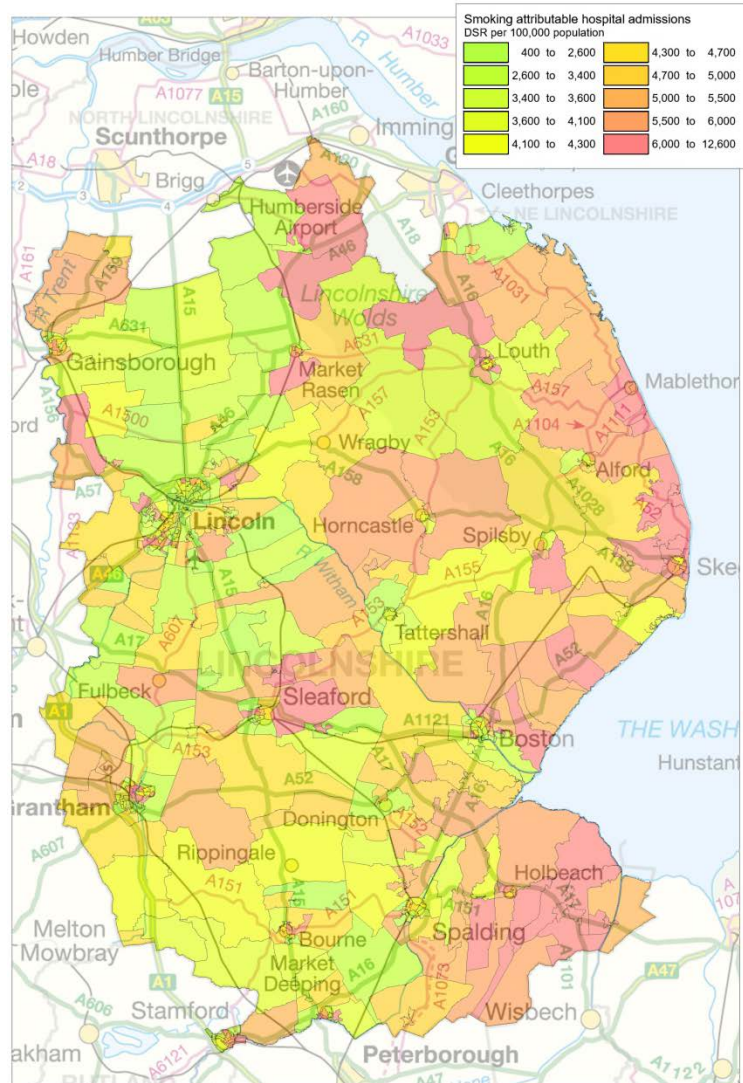
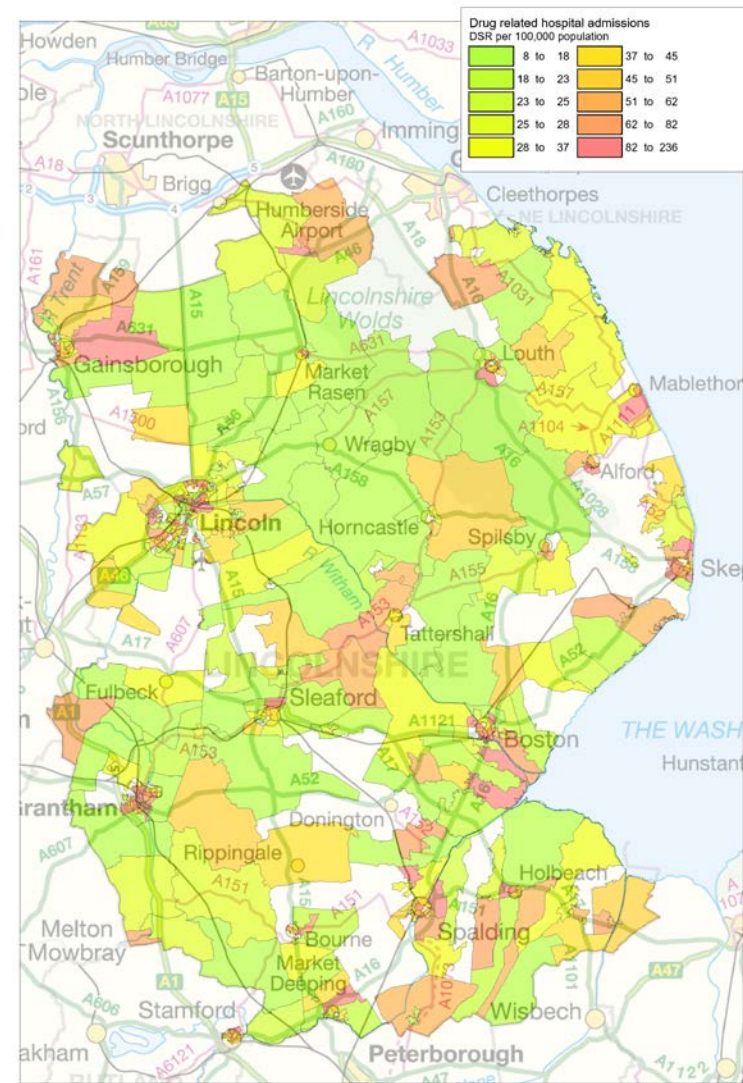


Figure 5.39: Drug related hospital admissions in Lincolnshire, by LSOA



6 Discussion

Demographics and deprivation

There are various studies that have identified inequalities among ethnic populations such as from the Joseph Rowntree Foundation and Public Health Matters. These focus on the wider social and economic determinants that affect people from BAME backgrounds, such as deprivation, poorer education, employment and housing and higher crime levels; and how these can contribute to health inequalities.^{13, 14}

A 2015 report from the King's Fund found there to be conflicting patterns in life expectancy across ethnic groups, which was likely as a result of how BAME data is captured in the 2011 Census. Local analysis revealed a non-linear relationship between the areas with the highest proportion of BAME residents and the areas with the lowest proportion of BAME residents. The gap in life expectancy is 1.5 years between the two areas and the gap in healthy life expectancy is 0.9 years.

Looking at the link between drug related admissions and ethnicity, it was found that in the 2013/14 Crime Survey for England and Wales, use of cannabis and illicit drugs was significantly higher among adults from mixed ethnic backgrounds, compared to adults from non-ethnic backgrounds. Local analysis has shown BAME to have a moderate association with a number of health outcomes, including life expectancy, mental health-related hospital admissions and drug-related hospital admissions. Drug-related hospital admission rates were 2.6 higher in areas with the highest BAME resident population, compared to areas with the lowest BAME resident population.^{15, 16}

Results from the cohort study found that income deprivation was found to be a key driver of inequality between the two cohorts. Income deprivation was 3.4 times higher for those living in cohort 1, where overall health outcomes were worst. Insufficient income can impact the ability to purchase the material goods needed to live a healthy life, can increase stress and anxiety and can lead to unhealthy behaviours and lifestyle choices. Subsequently, being in poorer health can impact education and employment opportunities, further influencing income.

Results show that income deprivation and health outcomes are closely correlated, with those living in the most income deprived areas of Lincolnshire having much poorer health outcomes than those in the least deprived areas. This association was also highlighted in the Marmot Review and in a recent PHE bulletin; however the latter measured overall (multiple) deprivation rather than income deprivation.¹⁷

Average male life expectancy in the most income deprived decile in Lincolnshire is 75.3 years, higher than the national equivalent of 73.9 years, while average female life expectancy is 80.1 years, higher than the national average of 78.8 years.¹⁸

Education and aspiration

Results from statistical testing revealed that GCSE attainment and persistent absence are the best available indicators of education and aspiration to measure against health outcomes.

Little evidence was found to suggest that poor early education affected health outcomes; however published evidence suggests that a child's experiences in the early years (0-4's) can have a major impact on their health and life chances, both as children and adults. This may be due to the geographical level at which the data in this report was analysed. At lower geographical areas, some of the data was suppressed due to small numbers.¹⁹

The relationship between education and life expectancy has been explored in a study by Lutz and Kebede (2018), where data from 174 countries between 1970 and 2015 plotted life expectancy against years of schooling among the adult population. The study concluded that education is a better predictor for life expectancy than income. Local analysis reveals a close link between educational attainment and life expectancy and healthy life expectancy, with GCSE attainment accounting for a moderate level of variation in healthy life expectancy in Lincolnshire.²⁰

The relationship between obesity and absenteeism has been observed in more than one study (*Geier. A et al 2007, Pan. L et al 2009*), however these studies surmise that absenteeism is the outcome and obesity is the cause and the two are not interchangeable. Both studies concluded that a statistically significant relationship exists between obese children and school absence, with absenteeism being higher among obese children compared to healthy weight counterparts. Analysis of local data supports these conclusions, with childhood obesity prevalence being 1.6 times higher in areas with the highest persistent absence rates, compared to areas with the lowest persistent absence rates.^{21, 22}

Results from the cohort study revealed that by the end of reception year, 68% of children in cohort 1 will achieve a good level of development considered ready for school, compared to 73.4% of children in cohort 2. By the end of formal education, the inequality gap widened noticeably, with 51.6% of pupils in cohort 1 achieving at least 5 GCSE's at grade A-C compared to 72.6% in cohort 2, an attainment gap of 21%. Reported persistent absence rates in mainstream primary and secondary schools were 2.4 times higher for pupils in cohort 1.

The proportion of young people aged 16-18 not in education, employment or training (NEET) was 5.5 times higher in cohort 1. Young people who are NEET are at greater

risk of a range of negative outcomes, including poor health, depression or early parenthood. The Government recognises that increasing participation of young people in learning and employment makes a lasting difference to lives, and is central to ambitions to improve social mobility and stimulate economic growth.²³

Economy

Economy underpins much of how we perceive deprivation. Within the English Indices of Deprivation, economical variables are embedded across many domains, including income deprivation and employment deprivation. Those who are living in low income or excluded from the Labour Market are considered to be economically disadvantaged.

Evidence suggests that being out of work is bad for health, and that unemployed people are likely to have poorer physical and mental health, consult their GP more, are admitted to hospital more and have higher mortality rates. Results from the cohort study revealed that among the working age population (16-64 years), the gap in unemployment benefit rates was 4.7 times higher in cohort 1 compared to cohort 2.²⁴

The National Statistics Socio-Economic Classification (NS-SeC) provides a measure of the proportion of the working age population in higher occupations (such as managerial and professional positions) and those in intermediate and routine positions. Those in higher occupations tend to have better health outcomes than those in intermediate and routine occupations. Local analysis shows a lower proportion of the population in cohort 1 (worse health outcomes) work in managerial and professional roles (17.1%) compared to cohort 2 (36.9%). Cohort 1 (worse health outcomes) also had a higher proportion of people who work in intermediate and routine roles (41.1% compared to 20.4%).

The Marmot Review further demonstrates the link between unemployment and poor health outcomes, stating *'being in good employment is protective of health and conversely, unemployment leads to poor health'*. The report also highlights the complex relationship between work and health. Unemployed people are at higher risk of developing a limiting long term illness, mental illness and cardiovascular disease and have been linked with increases in overall mortality and particularly suicide.¹

The World Health Organisation state that as people age, they become more susceptible to disease and disability. There are a number of identified risk factors that increase that susceptibility, including poverty, social isolation and exclusion, injury and lifestyle choices. Pension Credit is an additional retirement benefit for pensioners who have low income from their State Pension. Local analysis showed a strong association between Pension Credit claimants and life expectancy and mental

health-related, alcohol-specific and drug-related hospital admissions. The areas with the highest proportion of Pension Credit claimants had worse health outcomes compared to areas with a lower proportion of Pension Credit claimants.²⁵

Environment and community

The topic of housing and health has been covered in detail as part of the Lincolnshire Joint Strategic Needs Assessment, where a number of inequalities resulting from poor housing standards are identified. These include increased risk of respiratory and infectious diseases as well as the impact on socio-emotional development, psychological distress, behavioural problems, and educational outcomes of children and young people. Local analysis highlighted strong associations between environmental determinants and life expectancy and healthy life expectancy and mental health-related, alcohol-specific and drug-related hospital admissions.²⁶

The Lincolnshire JSNA highlights that fuel poverty can affect many groups in society, mostly the elderly but also children who live in cold, damp homes which can cause deterioration in both their health and educational attainment as they may struggle to concentrate in poor environmental conditions. The differences between urban and rural areas are not significant however there are great financial inequalities, with heating costs in some rural areas being much higher due to houses having no grid connection and being oil heated. This could be explained by the poorer, older housing stock found in rural areas. Results from the cohort study highlighted in terms of environmental determinants, cohort 2 had higher proportions of houses in poor condition, and higher levels of overcrowding and fuel poverty than cohort 1.²⁷

Having no access to a car and living alone could be considered as factors in social isolation and loneliness. Social isolation and loneliness can be key contributors to poor physical and mental health in later life, can lead to stress and anxiety and may be predictors for cognitive decline, impairment and dementia. Older people who experience social isolation are at higher risk of mortality than those who are socially connected. Various studies recognise rural deprivation and the inequalities that exist within rural communities. Factors such as fuel poverty, travel time to services and adults and children in need of social care can all contribute to increasing rural deprivation within communities. One study (Fecht D et al. 2017) found that car ownership is a poor measure to use for rural disadvantage over urban disadvantage as rural households might own a car but lack the means to keep it operational, and in addition to a lack of alternative transport options, continues to limit access to services and contribution to social life. Results from the cohort study highlighted that people living in cohort 2, which is predominantly rural, are 2.5 times more likely to live in a household with access to a car than someone living in cohort 1, which is predominantly urban. People living in rural towns and villages in Lincolnshire will likely not be on a main route for the rail or bus network, and of those that are,

transport times are often sparse, which will lead to car ownership being a necessity for getting around the county.²⁸

The Office for National Statistics observed that between 2002 and 2004, all-cause mortality rates across England and Wales were 15% lower in rural areas compared to urban areas, however when the study adjusted for deprivation, the difference was reduced to 3%. The study also found lung cancer mortality rates to be significantly higher in urban areas before and after adjustment for deprivation, and were considered a serious public health concern. A report from DEFRA stated that men living in predominantly rural areas live on average 1.4 years longer than men living in predominantly urban areas, while women live an average of 1 year longer, and potential years of life lost (PYLL) are lower among those living in rural areas (386 years per 100,000) compared to urban areas (455 years per 100,000).^{29, 30}

Across Lincolnshire, access to services such as supermarkets, health services and education/training courses can differ greatly, and there are still some of the more rural communities that experience a feeling of being 'cut-off' or 'isolated'. This places an increased importance upon the sustainability of market towns to support, and maintain, the projected population growth through their provision of services. Limitations in access to these services are likely to be more acute for the more vulnerable members of society such as people with long term health issues, lone pensioners, and those without their own transport.³¹

Health and wellbeing

Individual behaviour and lifestyle choices are intrinsically linked with health. People who have poor diet, low physical activity and alcohol, cigarette or drug use tend to have worse health outcomes as a result.

NHS define binge drinking as '*drinking lots of alcohol in a short space of time, or drinking to get drunk*'. A 2005 Parliament paper on binge drinking and Public Health identified that binge drinking is predominantly seen in younger populations, and associated incidents are more likely to occur on weekends in urban areas. The impacts of binge drinking vary from other forms of alcohol abuse due to the immediate and short-term nature of the behaviour and can lead to accidents, falls, self-harm. Severe intoxication can result in heart irregularities, stroke, and hypothermia and can lead to death. Local analysis reveals that binge drinking is associated with smoking-related hospital admissions, premature cancer mortality and adult obesity; yet there is no association with life expectancy, healthy life expectancy, preventable mortality or liver disease mortality.³²

Data for binge drinking captures adults who had consumed more than 6 units in one drinking session in the week leading up to the survey. This in itself presents limitations around the validity of this data, as this kind of behaviour can range from once a

month to daily and there is no way to capture if the binge drinking behaviour is long term and sustained.

Making healthier choices such as changes to diet and increasing physical activity can have a long term positive impact on health, as it can lower levels of obesity which in turn can reduce a person's risk of developing type-2 diabetes, coronary heart disease, some cancers and stroke, as well as improving quality of life and reducing the potential onset of mental health problems such as depression and anxiety. Current NICE guidelines suggest that physical activity can help prevent more than 20 chronic health conditions and the economic impact of being physically inactive is a societal cost of around £7.4b each year, including £1b cost to the NHS. Healthy eating and physical activity however are strongly correlated with health outcomes. Between areas in Lincolnshire where healthy eating and physical activity were lowest and highest, there was a high level of variation in health outcomes.^{33, 34}

According to the British Lung Foundation, 50.8% of lung disease deaths, 86% of lung cancer deaths and 77% of chronic obstructive pulmonary disease (COPD) deaths are all attributable to smoking. The health benefits of quitting smoking are significant and can range from decreasing shortness of breath, reducing the risk of various heart and respiratory diseases, improving fertility in both men and women and reducing the chance of premature births, miscarriage and babies with low weight. Smoking is also known to cause 1 in 4 cancer deaths and 3 in 30 cancer cases in the UK each year, therefore reducing smoking across the population will have far reaching benefits to improving health and preventing death. Local analysis highlights a strong association between smoking-related hospital admissions and preventable mortality, premature cancer mortality, lung cancer mortality and cardiovascular disease mortality and liver disease mortality.^{35, 36, 37}

There is potential for overlapping benefits in health inequalities through reducing mental ill health and/or drug related admissions. People who report both mental health and drug related problems are termed to have a 'Dual Diagnosis'. NICE estimate that between 20-37% of patients in secondary mental health services and 6-15% in substance misuse services has a dual diagnosis. Local intelligence however provides a different picture. In Lincolnshire, 18% of those seeking help for opiate dependence receive support from mental health services, however estimates suggest that up to 75% of all those seeking treatment may have some degree of mental health problem. These disparities in estimating dual diagnosis prevalence suggest that further work is required at a local level to more effectively use local intelligence to better understand the complexities of those people who are receiving support for either mental health or substance misuse. Local analysis reveals a strong association between mental health and drug misuse. In areas of Lincolnshire where drug related admissions were highest, mental health related admissions were also high.^{38, 39}

7 Conclusion and next steps

The key findings from this report should be used as a guide to both inform and highlight existing health inequality gaps, as well as to generate an ongoing local discussion on how these can be tackled locally through effective service provision.

Whilst the use of intelligence and statistical analysis in this report has been statistically robust, the analytical methods are not a measure of causality and as such, any interpretation should be treated with an element of caution. Careful consideration has been given to ensure that the messages from this report do not mislead in any way, but rather highlight a bigger picture.

What we have tried to address is the potential impact that wider determinants could have on health outcomes across Lincolnshire, by looking at broad themes of determinants.

One of the key limitations within this project was the strength and appropriateness of the data used. Because of the granular level of analysis, we had to try to find the best available data at small geographical areas, which proved challenging. For some of our broad themes, there are definite gaps that were not able to be filled due to the data not being readily available or at the correct geography, such as disease prevalence, earnings, transport and accessibility.

We also aimed to look for health inequality gaps across demographic characteristics, such as gender and ethnic groups, however further work could look to identify gaps across the full range of protected characteristics under the Equality Act including disability, gender reassignment, marriage and civil partnership, pregnancy and maternity, race, religion and belief and sexual orientation.⁴⁰

The Joint Strategic Needs Assessment is the shared evidence base for health and wellbeing in Lincolnshire and is reviewed and updated on an annual basis. Each topic area assesses the current picture in Lincolnshire, existing services and looks ahead to potential future level of need to support effective service planning and commissioning, including identifying any gaps and inequalities that may exist.

In June 2018, the Health and Wellbeing Board signed off the Joint Health and Wellbeing Strategy (JHWS) for Lincolnshire, using the JSNA as its evidence base. The strategy identified a number of priority areas that have been covered within this project, including mental health, physical activity, housing and health and obesity. The strategy identifies the need for the development of better analytical data to identify need and target service provision more effectively, undertake robust local insight analysis and improve understanding of local intelligence to influence and shape preventative measures.

The Wider Determinants of Health Inequality in Lincolnshire

Throughout the course of this project, parity of esteem and the relationship between how physical and mental health was intended as a key area to look at in more detail, specifically around health inequality. As the project progressed, it became clear that from the data and the statistical methods used, it would not be possible to provide an analysis of parity of esteem.

Public Health England published a report which concluded that people with severe mental illness suffer worse physical health than the general population. NHS Digital provide a data linkage service, which would enable us to look in more detail at Lincolnshire health datasets, with the aim of reproducing similar analyses.⁴¹

Going forward, this project could be used to identify additional inequality gaps in Lincolnshire. The statistical methodology and analytical framework was set up so that any robust and appropriate dataset could be applied and statistically analysed.

There is potential for the findings and analytical methods within this report to support and feed into the ongoing review of the JSNA as well as to support the identified objectives within the JHWS.

8 References

- ¹ National Institute for Health and Care Excellence, [Health inequalities and population health](#), October 2012
- ² Institute of Health Equity, Fair Society Healthy Lives, [The Marmot Review](#), February 2010
- ³ Kings Fund, [Broader Determinants of Health](#), January 2018 (accessed)
- ⁴ World Health Organisation, Commission on Social Determinants of Health, [Closing the Gap](#)
- ⁵ Public Health England, [Public Health Outcomes Framework, June 2017 \(accessed\)](#)
- ⁶ Action on Smoking and Health (ASH), Information and resources, [Local resources – Ready reckoner tool](#), January 2017 (updated)
- ⁷ Public Health England, [The Public Health burden of alcohol and the effectiveness and cost-effectiveness of alcohol control policies](#), December 2016
- ⁸ HM Government, [2017 Drug Strategy](#), July 2017
- ⁹ Public Health England, [Health Matters: preventing drug misuse deaths](#), September 2017
- ¹⁰ Sport England, [Local Sport Profile tool](#), February 2017 (updated)
- ¹¹ Obesity Health Alliance, The Costs of Obesity, [OHA Briefing Paper](#)
- ¹² Office of National Statistics, LSOA mid-year population estimates 2016, [ONS MYE](#)
- ¹³ Joseph Rowntree Foundation, L. Platt, Inequality within ethnic groups, May 2011, [JRF](#)
- ¹⁴ Public Health England, A.M Connolly et.al, Understanding health inequalities in England, July 2017, [Public Health Matters](#)
- ¹⁵ The King's Fund, Buck. D, Maguire D, Inequalities in life expectancy, August 2015
- ¹⁶ Office of National Statistics, Drug misuse: findings from the 2013/14 Crime Survey for England and Wales, [CSEW 2013/14](#)
- ¹⁷ Public Health England, E. Osborn, Health state life expectancies by national deprivation deciles, England and Wales: 2014 to 2016, [PHE](#)
- ¹⁸ Public Health England, Public Health Outcomes Framework, [PHOF](#)
- ¹⁹ The Kings Fund, The Best Start in Life, [Kings Fund](#), December 2013
- ²⁰ Wiley Online Library, Education and Health: Redrawing the Preston Curve, [Wiley](#), April 2018
- ²¹ PubMed, The relationship between relative weight and school attendance among elementary schoolchildren, Geier AB et.al, [PubMed](#), August 2007
- ²² NCBI, The Association of Obesity and School Absenteeism Attributed to Illness or Injury Among Adolescents in the United States, Pan L et.al, [NCBI](#), 2009
- ²³ Public Health England, Public Health Outcomes Framework, [PHOF](#)
- ²⁴ Royal College of Psychiatrists, Is work good for your mental health? [RCPSYCH](#)
- ²⁵ World Health Organisation, Risk factors of ill health among older people, [WHO Older People](#)
- ²⁶ Lincolnshire Research Observatory, Housing and Health, [JSNA Housing](#)
- ²⁷ Lincolnshire Research Observatory, Excess Seasonal Deaths and Fuel Poverty, [Fuel Poverty](#)
- ²⁸ British Medical Association, Briefing paper: Older people and the social determinants of health
- ²⁹ Office for National Statistics, Health Statistics Quarterly 39: Autumn 2008
- ³⁰ DEFRA, Statistical Digest of Rural England 2018, [DEFRA](#)
- ³¹ Lincolnshire Research Observatory, Lincolnshire Economic Assessment 2011, [LRO](#)

³² Parliamentary Office of Science and Technology, Postnote 244, Binge Drinking and Public Health, July 2005

³³ NHS Choices, Obesity, [NHS](#)

³⁴ NICE, Guideline [NG90] Physical activity and the environment, [NICE](#)

³⁵ British Lung Foundation, Briefing: Health inequalities and lung disease

³⁶ World Health Organisation, Tobacco Free Initiative, [WHO](#)

³⁷ Cancer Research UK, How smoking causes cancer, [Smoking](#)

³⁸ NICE, Severe mental illness and substance misuse (dual diagnosis): a systematic review, December 2015

³⁹ Lincolnshire Research Observatory, Substance Misuse, [Substance Misuse](#)

⁴⁰ Equality and Human Rights Commission, Protected Characteristics, [Equality](#)

⁴¹ Public Health England, Severe mental illness and physical health inequalities, [PHE](#)