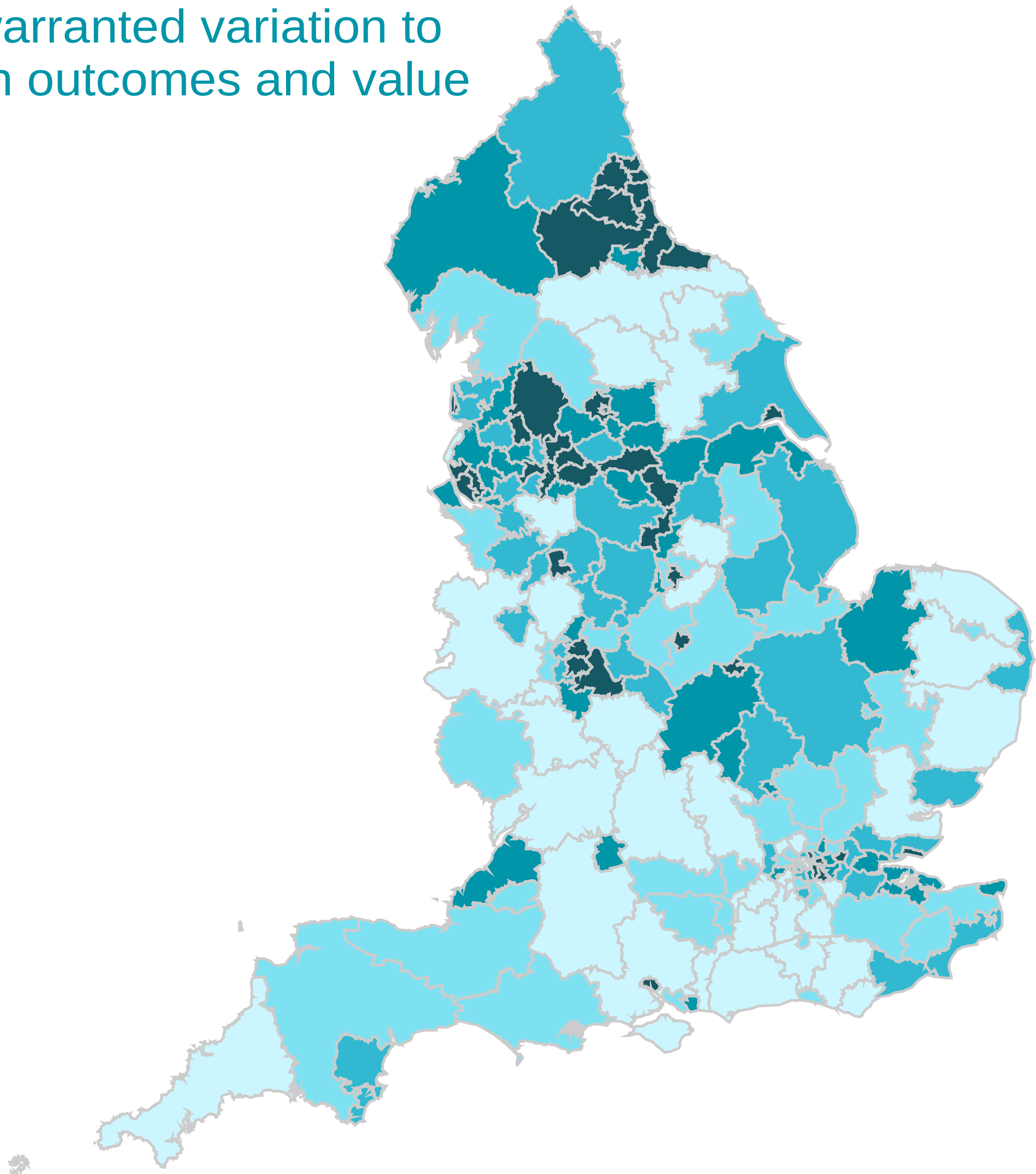
Public Health England

NHS RightCare

The 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England

September 2019

Reducing unwarranted variation to improve health outcomes and value



http://fingertips.phe.org.uk/profile/atlas-of-variation

www.england.nhs.uk/rightcare

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September 2019

The 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England

Reducing unwarranted variation to improve health outcomes and value

The 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England has been prepared in partnership with a wide range of organisations:

The following organisations contributed to the case studies presented in the Atlas:

NHS University Hospitals of Derby and Burton NHS Foundation Trust

NHS City and Hackney Clinical Commissioning Group

NHS Leicester City Clinical Commissioning Group

University Hospitals of Leicester NHS Trust – Caring at its best

King's College London

NHS North Manchester Care Organisation – Northern Care Alliance NHS Group

Leeds Community Healthcare NHS Trust

Wessex Academic Health Science Network

NHS West Leicestershire Clinical Commissioning Group

NHS Leicester City Clinical Commissioning Group, West Leicestershire Clinical Commissioning Group, East Leicestershire and Rutland Clinical Commissioning Group

Macmillan Cancer Support

Manchester Local Care Organisation – Leading local care, improving lives in Manchester, with you

supporting St Ann's Hospice – Registered charity number 258085

centre for sustainable energy

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Foreword

Respiratory disease continues to be a major cause of disability and premature mortality in the United Kingdom. It affects 1 in 5 people and is the third leading cause of death in England. The annual economic burden of asthma and chronic obstructive pulmonary disease (COPD) on the NHS in the UK is estimated as £3 billion and £1.9 billion respectively. In total, lung conditions (including lung cancer) directly cost the NHS in the UK £11 billion each year.[1]

It has been almost 7 years since the first edition of the Atlas of variation, and I welcome the publication of this 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England, which continues to demonstrate significant inequalities in the distribution and treatment of common respiratory conditions.

Robust guidance has been published by the National Institute of Health and Care Excellence (NICE) and other bodies to support evidence-based management of COPD, asthma and many other lung conditions. However, in this updated 2nd Atlas, a stark picture is still being presented of variation in the quality of care and outcomes experienced by people with respiratory disease in different parts of England. The variation observed extends to the detection of disease where late or inaccurate diagnosis is a common occurrence, consequently engendering more frequent and expensive emergency hospital admissions.

The 2nd Atlas shows that an individual's chance of being admitted or re-admitted to hospital as an emergency; of receiving appropriate treatment; of dying from lung disease or even of being diagnosed in the first place differs according to where they live. If, after adjusting for population differences, all of the CCGs in England were to achieve the COPD mortality rates of the best-performing CCGs, around 7,700 lives would be saved each year.[2] Some degree of variation may be explained by population composition, levels of deprivation or disease prevalence. However, much of the variation highlighted is unwarranted and raises important questions for consideration by local commissioners. Sharing and publishing these data helps commissioners and service providers to share best practice, develop more effective services and improve outcomes for patients

This 2nd Atlas focuses attention on where improvements are needed and can be most impactful. It offers an opportunity for clinicians and commissioners to assess their data against the best geographies and consider how local improvements could be made to raise standards to those of the highest performers. It also empowers patients to ask questions about the respiratory care they receive.

The central message of the 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England is that it is possible to achieve better outcomes for patients. The NHS Long Term Plan (LTP) identifies respiratory disease as a clinical priority, and highlights four key areas for action: ensuring more patients have early access to quality assured diagnostics; ensuring patients receive the right inhaler medication; the expansion of rehabilitation services and the improvement of the treatment and care of people who present with pneumonia. The indicators of this Respiratory Disease Atlas can be used in conjunction with ambitions and directions of the LTP to support healthcare professionals and commissioners to focus on the improvements needed to reduce unwarranted variation and improve outcomes for people with respiratory disease.

Professor Mike Morgan
National Clinical Director for Respiratory Disease NHS England and NHS Improvement

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[1] British Lung Foundation The battle for breath – the economic burden of lung disease [Accessed 08 August 2019]
[2] Analysis by PHE using ONS Mortality extract based on applying the age-specific mortality rate of the best quintile of CCGs to the populations of all CCGs

Preface

This 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England builds on 7 years of activity since the first Atlas of variation to raise awareness about the increasing and yet largely preventable toll of premature death and suffering from respiratory disease. This updated 2nd Atlas shows that in many areas of prevention, treatment and outcomes the measures for respiratory disease are simply not improving. In 2018, the Taskforce for Lung Health, a unique national collaborative partnership of 29 organisations across the lung health sector including patients, voluntary sector, health care professionals and industry published a 5-year plan for improving lung health. This plan has been endorsed across the whole respiratory community. This year respiratory disease has been recognised as one of the national clinical priorities within the NHS Long Term Plan. This 2nd Atlas will support local areas to meet these challenges and improve outcomes for people with respiratory disease.

The 2nd Atlas contains many new indicators and some updated from the NHS Atlas of Variation in Healthcare for people with Respiratory Disease: 2012. The updated 2nd Atlas presents 64 indicators. As well as the main groups covered within the 1st atlas of variation (COPD, asthma, pneumonia, bronchiolitis), the updated 2nd Atlas has expanded to cover other risk factors, such as air pollution and housing, more diseases, tuberculosis and lung cancer, and end of life care. The data is presented in a new format to show not only a map of geographical variation for each indicator's range of values but also, where appropriate, an accompanying map showing the statistical significance of this variation from the England value. Each indicator is also displayed using a column chart showing the geographical distribution for the most recent period of data and a box and whisker plot showing the degree of geographical variation. In each section the context is described for the indicator(s), options for action and a list of evidence–based resources to aid action. For 56 indicators, it is statistically possible to analyse trend data over time both for the England value and degree of variation.

Importantly for every indicator there is evidence of variation across England; emergency admissions for COPD varies 5.6 fold by CCG and emergency admissions for young people, aged 0-18 years; for asthma, they vary 7.5 fold by CCG. Not only do outcomes vary geographically but so do the prevalence of risk factors for respiratory disease and aspects of health service provision. It is therefore essential that health service providers and commissioners use the data underpinning the presentation in this 2nd Atlas, the online interactive Instant Atlas tool on RightCare and other resources referred to within the 2nd Atlas to understand more about their local picture to determine priorities for action. Following the 2nd Atlas publication, the data will be used to update the online Inhale profile, an INteractive Health Atlas of Lung conditions in England, this will enable users to explore the data alongside other datasets included in the PHE fingertips web tool.

It is important to tackle variation in respiratory disease through better prevention of disease, recognition of those at risk, better diagnosis of those with early disease and improved treatment not only to improve outcomes for individual patients but also to ensure optimal allocation and use of staff, capacity and other resources within the health system.

Professor Julia Verne BSc, MBBS, MSc. PhD, FFPH
Head of Clinical Epidemiology, Public Health England

Introduction

Respiratory disease a system wide priority

The burden of mortality associated with lung disease is substantial; around 1 in 7 deaths are caused by a variety of respiratory diseases[1] (Figure A1), making it the third most common cause of death.[2] Respiratory disease has been identified as one of the disease priority areas in the 2020-2030 NHS Long Term Plan.[3] RightCare has also selected it as a focus area for 2019/20,[4] and as part of this work is developing Asthma and Pneumonia toolkits, and Getting it Right First Time (GIRFT) has a specialist respiratory programme.[5]

Tobacco control, immunisation, antimicrobial resistance, and supporting the Clean Air Strategy are all priorities for Public Health England (PHE), as defined in the 2019/20 remit letter.[6] The annual remit letter sets out government priorities for PHE and its role across the health and care system. 'All Our Health' is a resource for healthcare professionals to help them to maximise their impact on improving health outcomes and reducing health inequalities; these include a number of relevant prevention topics. PHE will also be updating the respiratory chapter.[7]

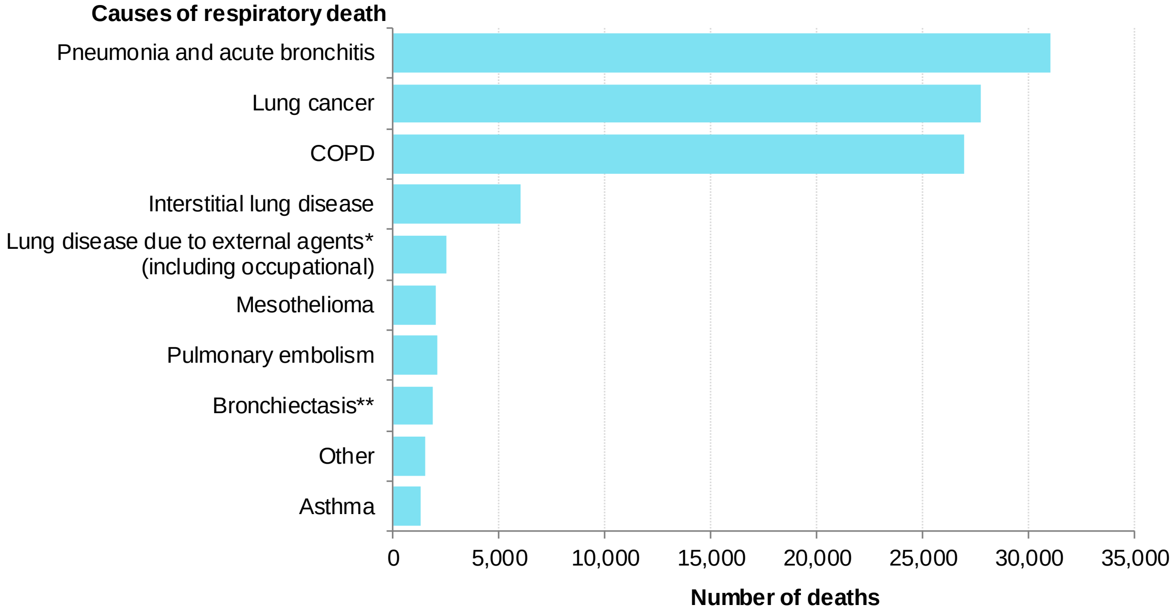
What is the burden of respiratory disease in England?

Respiratory disease covers a wide variety of conditions, including common chronic conditions such as asthma and chronic obstructive pulmonary disease (COPD), lung cancer, acute infections such as pneumonia, and less common diseases such as interstitial lung disease (ILD) and mesothelioma.

It is estimated that in the UK around 550,000 respiratory diagnoses are made annually, of which around half are for asthma and COPD.[8] Morbidity and mortality due to respiratory disease are not evenly distributed within the population but instead they are concentrated within deprived and other population groups. There is also a close association between high prevalence rates of respiratory conditions and current and past high rates of smoking.

Figure A1: **Underlying causes of respiratory death in England (2018)**[9]

Respiratory causes as defined by the Health Resource Group Respiratory System Codes (excluding: injury, poisoning and certain other consequences of external causes (ICD 10 S00-T88))



*Includes inhaled dusts, chemicals, gases, fumes and vapours, inhaled food & vomit, drug-induced disorders etc.
**Including cystic fibrosis

The economic burden of respiratory diseases is substantial; excluding intangible costs, the estimated cost to the UK is £11.1 billion per year, or 0.6% of the UK's Gross Domestic Product (GDP) in 2014. This consists of £9.9 billion of direct primary and secondary healthcare costs (including private healthcare) and £1.2 billion in indirect costs (including only value of lost labour market productivity due to the patient's illness, injury or premature death). Social care costs and state benefit payment costs are not included so this value is likely to underestimate of the true indirect costs to society.[10]

In addition to premature mortality, respiratory disease can impair quality of life through symptoms such as breathlessness, cough, fatigue, pain, and through the psychological impact of the disease and/or symptoms leading to anxiety and depression.[11,12] Respiratory disease can also reduce an individual's ability to work, with consequent social and financial implications. Disability adjusted life years (DALYs) are a combined measure of years of life lost to early death and number of years lived with disability caused by, for example respiratory disease. The global burden of disease study estimates that respiratory disease leads to 13% of all DALYs lost in England;[13] COPD, lung cancer and lower respiratory infections rank 2nd, 5th and 6th in terms of the proportion contribution to total years of life lost (YLL) in England (Table A1).[14]

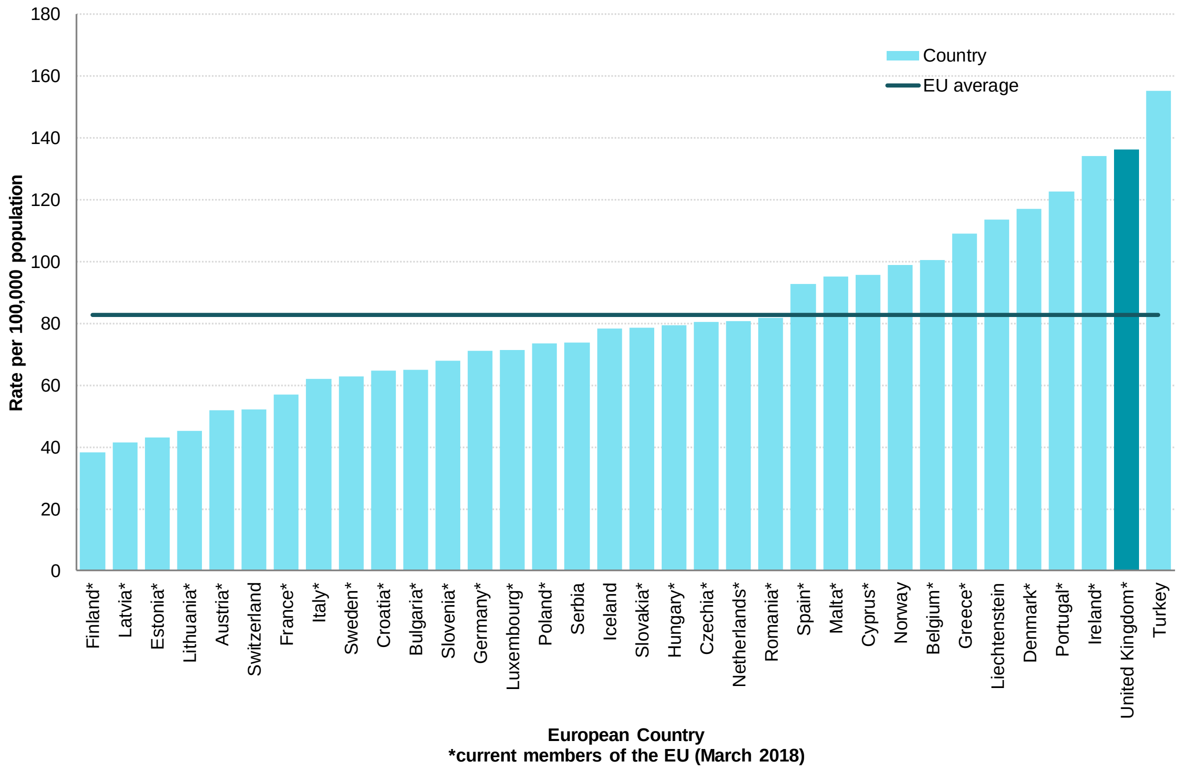
Table A1: **Top 10 causes of years of life lost (YLLs) in England (2017)**[14]

Ranking	Disease	Percentage contribution to total YLL
1	Ischaemic heart disease	12.7 (12.5-12.9)
2	Lung cancer	7.4 (7.3-7.5)
3	Alzheimer's disease	5.7 (5.7-5.8)
4	Stroke	5.6 (5.6-5.8)
5	COPD	5.5 (5.3-5.9)
6	Lower respiratory infection	4.3 (4.2-4.4)
7	Colorectal cancer	3.5 (3.4-3.6)
8	Breast cancer	3.0 (3.0-3.1)
9	Cirrhosis	2.6 (2.5-2.7)
10	Self-harm	2.5 (2.4-2.5)

While respiratory mortality in Europe has been decreasing overall for the last 40 years, the UK still has much higher mortality rates due to respiratory disease in comparison to other countries in Europe. The UK has 61% higher mortality compared to the average rate of the 28 countries in the EU (Figure A2).[15]

The NHS long term plan[3] published in January 2019 recognised both the high burden and the substantial socioeconomic and other inequalities in respiratory disease. The need to tackle risk factors (such as smoking and poor air quality), promotion of early diagnosis and low access to pulmonary rehabilitation were emphasised. Concern around increasing respiratory hospital admissions and correct use of inhaled asthma medications were particularly highlighted.

Figure A2: **Age-standardised mortality rate for respiratory disease (ICD10: J00-J99) by European Countries (2016)**[15]



What is variation and why does it matter?

Variation is simply differences between comparison groups. The reasons for variation in respiratory health are multiple which will be discussed below, but when we look at variation, specifically in healthcare, there are many reasons for variation; some is desirable, where fully informed patient choice is the driving factor, and some is justified, where variation is appropriate in response to need. However, variation is unwarranted where it:

> 'cannot be explained by type or severity of illness or by patient preference.'[16]

While interest is primarily focused on variation in treatment activities, we also need to consider variation in preventative activities such as vaccination or smoking cessation services.

Wennberg[17] suggests 3 categories of unwarranted variation:

Effective care: '…interventions for which the benefits far outweigh the risks; in this case the "right" rate of treatment is 100% of patients defined by evidence-based guidelines to be in need, and unwarranted variation is generally a matter of under-use.' For example, flu vaccination among those with chronic respiratory conditions. However, it is important in England, to acknowledge patient choice and the right to refuse intervention even where the evidence base for effectiveness is strong and therefore the "right" rate may never be 100%.

Preference-sensitive care: '…when more than one generally accepted treatment option is available, such as elective surgery; here, the right rate should depend on informed patient choice, but treatment rates can vary extensively due to differences in professional opinion.' For example, differences in treatment of lung cancer.

Supply-sensitive care: '…comprises clinical activities such as doctor visits, diagnostic tests, and hospital admissions, for which the frequency of use relates to the capacity and performance of the local healthcare system.' For example, pulmonary rehabilitation. However, as Wennberg notes, higher rates of use of supply-sensitive care do not necessarily correlate with better outcomes.

Patients may also be concerned about unwarranted variation by different risk factors or care and the subsequent impact upon their health outcomes. Box A1: Why does unwarranted variation matter to patients with respiratory disease?lists the reasons why unwarranted variation in respiratory disease matters to patients.

Box A1: Why does unwarranted variation matter to patients with respiratory disease?

- preventable disease
- late or inaccurate diagnosis
- deteriorating lung function
- inability to work or play
- diminished quality of life
- preventable exacerbations
- emergency admissions or readmissions to hospital
- premature death

This atlas focuses on variation between different geographical regions, primarily across all clinical commissioning groups (CCGs) within England, but variation can also refer to different points in time, different diseases or different groups of people. When geographical variation is identified, it may be important to explore these other types of variation to understand the reasons for the differences. There are also a wide range of indicators which can be used to examine variation, including risk factor or disease prevalence, disease incidence, access, spending, quality and outcomes. Indicators in this atlas cover different health services (primary, secondary, tertiary, and community), and aspects of the whole patient care pathway, including prevention, diagnosis, treatment and, for the first time, end of life care.

Comparison of statistically significant variation of the value in CCGs is made against the England value. However using the England average or even best performing CCGs may not be the best comparison to make. Comparing to CCGs with similar demographic characteristics or similar rates of respiratory disease may be more appropriate. Additionally, as a country we should ideally be benchmarking England's performance against other countries to ensure we identify exemplars of respiratory care across the world.

How is respiratory disease distributed within the population?

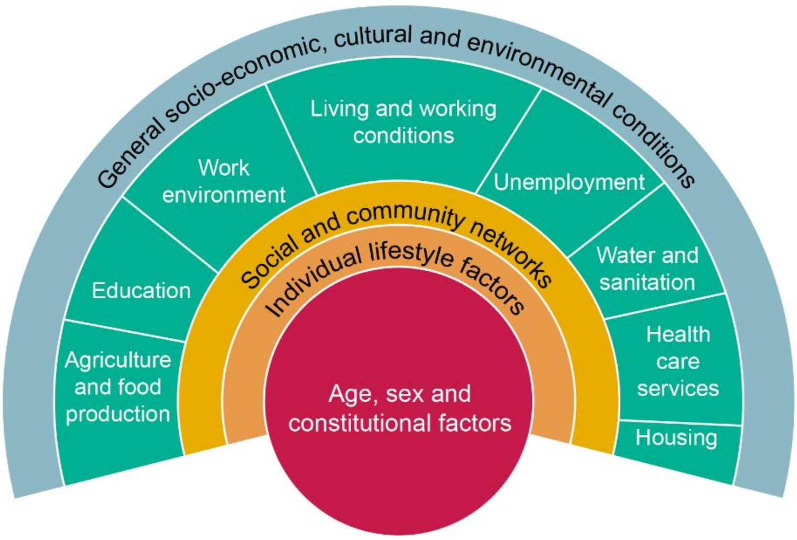
The burden and adverse impact of respiratory disease is not spread evenly across the population in England, but instead is concentrated in certain population groups. This disparity in health status is known as health inequality:

> 'Avoidable and unfair differences in health status between groups of people or communities.'[18]

Figure A3 shows the Dahlgren and Whitehead determinants of health 'rainbow';[19] it demonstrates how health determinants are a complex mixture of many different layers of influence. While many of the differences seen in respiratory health can be explained by distribution of risk factor exposure in different populations, it is important to note that exposure to risk factors in one layer is not independent of factors in other layers. These include smoking, diet, physical activity, age, sex, genetic factors, education, occupation, community, culture and peer group influences.

Even for CCGs which have relatively good respiratory health outcomes compared to the England average, it is vitally important they also act on the findings of the atlas. There will be respiratory health inequalities within these areas by socioeconomic deprivation level, and there are many other population groups in whom the risk of respiratory disease is greater, including individuals with serious mental illness,[20] those who are homeless,[21] prison populations[22] and those with substance use disorders.[22] Therefore local healthcare systems will need to consider how services can effectively reach these vulnerable groups.

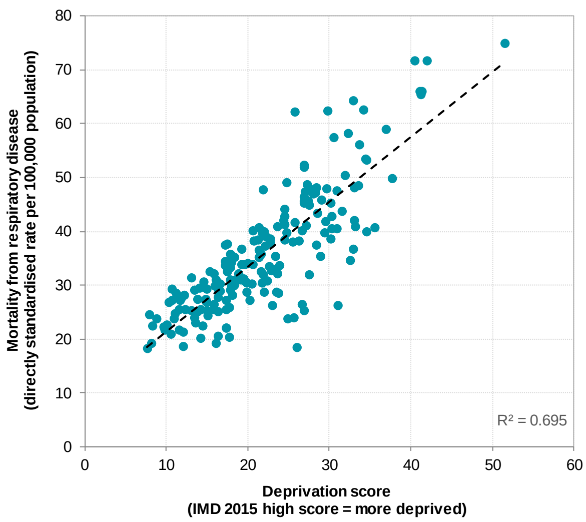
Figure A3: **Determinants of Health, from Dahlgren and Whitehead[19]**



Socioeconomic deprivation

An excess risk of premature mortality from respiratory disease is evident in communities living in areas of greater socio-economic deprivation. Figure A4 shows that there is a significant positive association between under 75 mortality rates due to respiratory disease and CCG deprivation score; 69% of the variation in mortality rate between CCGs can be explained by the deprivation score. The premature mortality rate due to respiratory disease in those CCG areas with higher deprivation scores is around 2-3 times higher than those with the lowest deprivation scores. However, differences in mortality rate cannot be entirely explained by deprivation score, suggesting that there are other important influences.

Figure A4: **Association between mortality from respiratory disease in people aged under 75 years (2015-2017) and deprivation score (IMD 2015) by CCG[1,23]**



The trend of respiratory mortality can be seen even more starkly where small area deprivation data is used; the avoidable mortality rate for respiratory disease in the most deprived decile is 6.5 times higher for men, and 8.4 times higher in women, compared to the least deprived decile (Figure A5). This inequality gap has stayed the same for men but increased by 12.6% for women since 2014 (Figure A6).[24] Men consistently have a higher rate of respiratory disease than women.

Figure A5: **Avoidable mortality for respiratory disease (excluding lung cancer) in England by deprivation decile (2017)**[24]

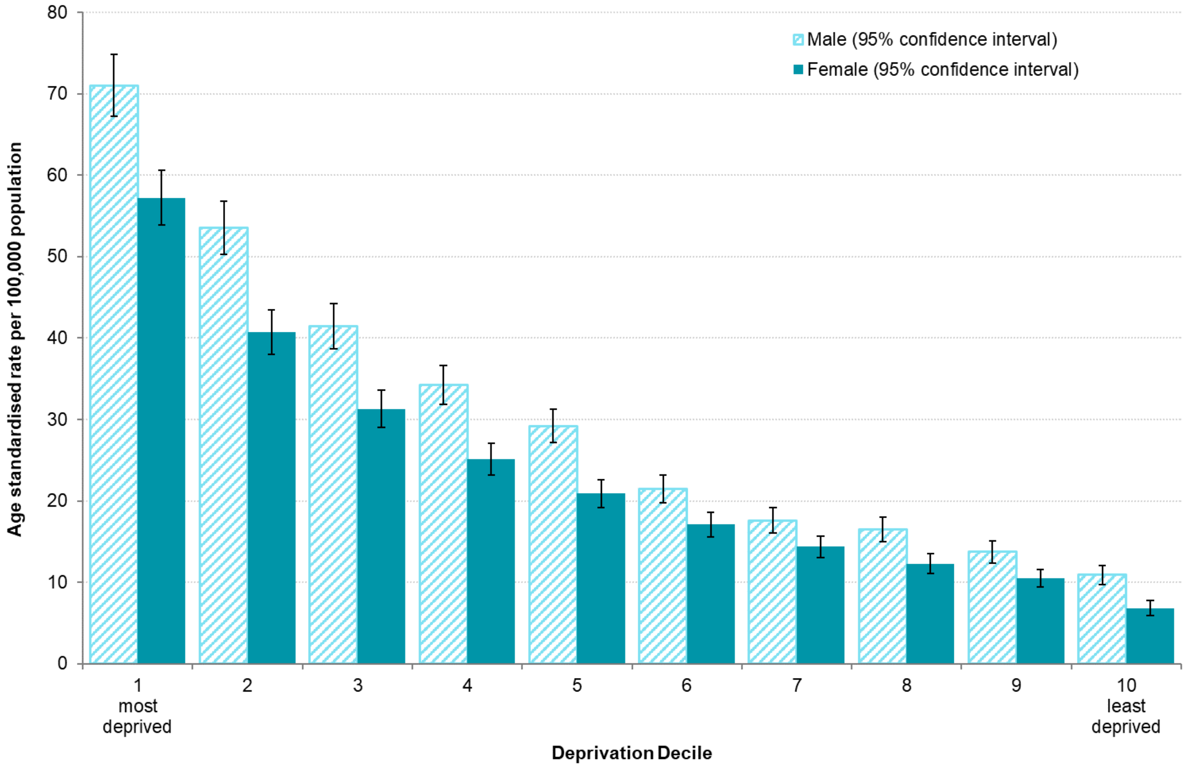
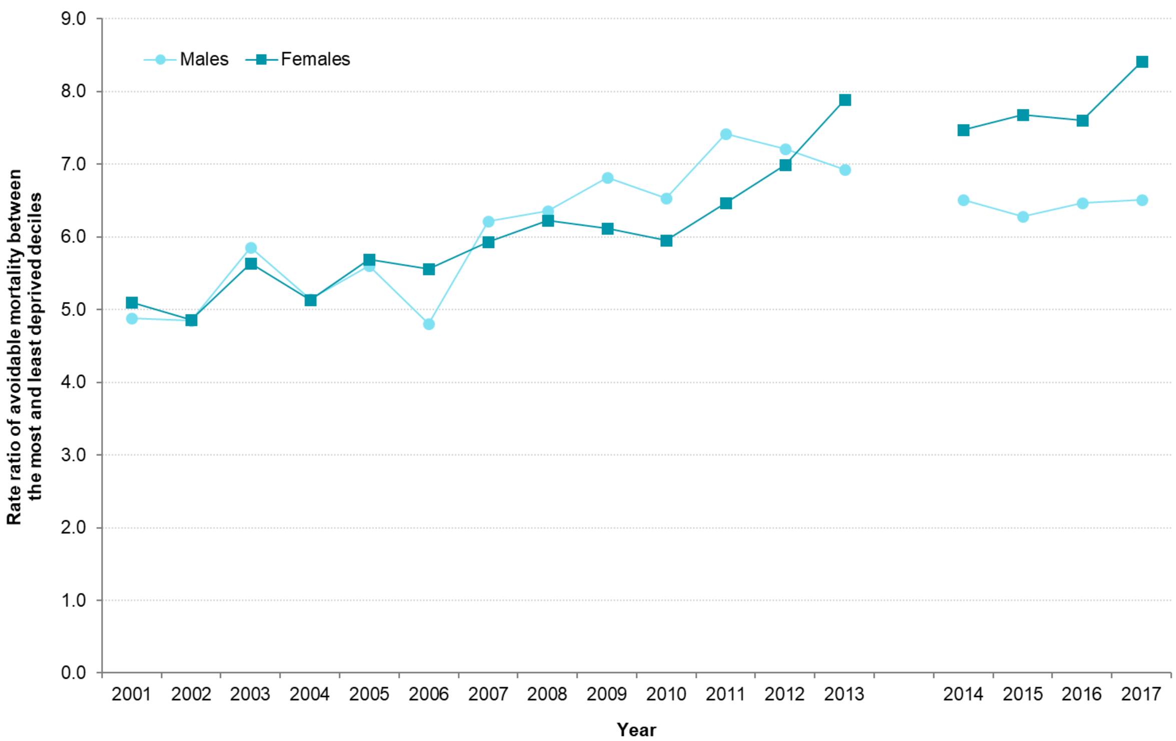


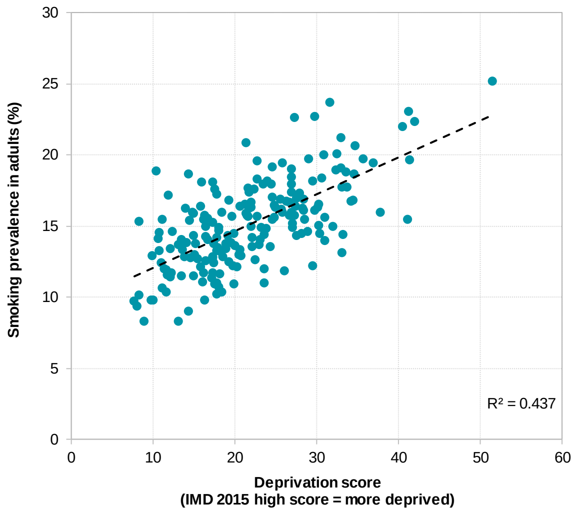
Figure A6: **Ratio of avoidable mortality in respiratory disease (excluding lung cancer) of most deprived to least deprived deciles between 2001 and 2017**[24]



NB. The Office for National Statistics (ONS) has revised and updated the definition of avoidable mortality and changes have been implemented for data years 2014 to 2017. The effect of this change on the overall respiratory diseases data for England was small; however, caution is advised when comparing data for 2001 to 2013 and 2014 to 2017.[24]

Many of the respiratory risk factors are associated with deprivation. For example Figure A7 shows that there is a significant positive association of between smoking rates and CCG deprivation score in England; 44% of the differences in smoking prevalence can be explained by CCG deprivation score.

Figure A7: Association between smoking prevalence in people aged 18 years and over (2017) and deprivation score (IMD 2015) by CCG[23,25]



However, differences in risk factor prevalence are not the only reason for health inequalities. In 1971 Tudor Hart defined the Inverse Care Law, which states that ‘the availability of good medical care tends to vary inversely with the need for it in the population served.’[26] The inverse care law has been shown in many different settings, including for COPD and lung cancer care.[27,28,29] For example a data linkage study found significant socioeconomic inequalities in lung cancer survival, and identified that these findings could be statistically explained by inequities in receipt of cancer treatment.[29] Unwarranted variation in healthcare is therefore likely to disadvantage those in the most deprived areas or in certain groups, exacerbating health inequalities. While this is not seen for all healthcare uptake and quality indicators, it is apparent for some.

Many cancer patients are diagnosed through an emergency route. Although some emergency cases are unavoidably related to the nature of the clinical presentation, others may be related to patient characteristics such as socioeconomic status. Although emergency presentation is decreasing overall, differences associated with age, gender and deprivation are still seen.[30] The degree of variation is different between cancer types, however deprived groups are consistently at greater risk of emergency presentation for most cancers,[31] for example, the proportion of people presenting for the first time, as an emergency for lung cancer, in the most deprived deprivation quintile was 34%. In comparison 29% were from the least deprived quintile. Emergency presentations for lung cancer patients are proportionally higher than smoking related and laryngeal cancer for which the most and least deprived quintile were 13% and 7% respectively.[32]

The geographical distribution of deprivation across England, recorded as the Index of Multiple Deprivation is shown in Map A1. Figure A8 suggests a relationship between increasing deprivation score of CCGs and decreasing influenza immunisation uptake among individuals with COPD, with increasing deprivation accounting for about a 3rd of the variation. Figure A9 displays the variation in emergency hospital admissions for asthma by variation in the Index of Multiple Deprivation (2015) across England. Again, factors related to deprivation account for about a 3rd of the variation. The deprivation related variation may be due to lower use of, or access to prevention and maintenance healthcare services which results in more emergency admissions. This cohort of the population may also have higher exposure to external agents such as pollutants, irritants and biological allergens, linking respiratory health with risk factors.

As has been demonstrated, an association of increasing deprivation with higher exposure to risk factors and potentially variations in healthcare provision, uptake and quality may lead to a concentration of poorer respiratory health outcomes in these areas.

Map A1: **Variation in the Index of Multiple Deprivation (IMD) population weighted average score by CCG (2015)**

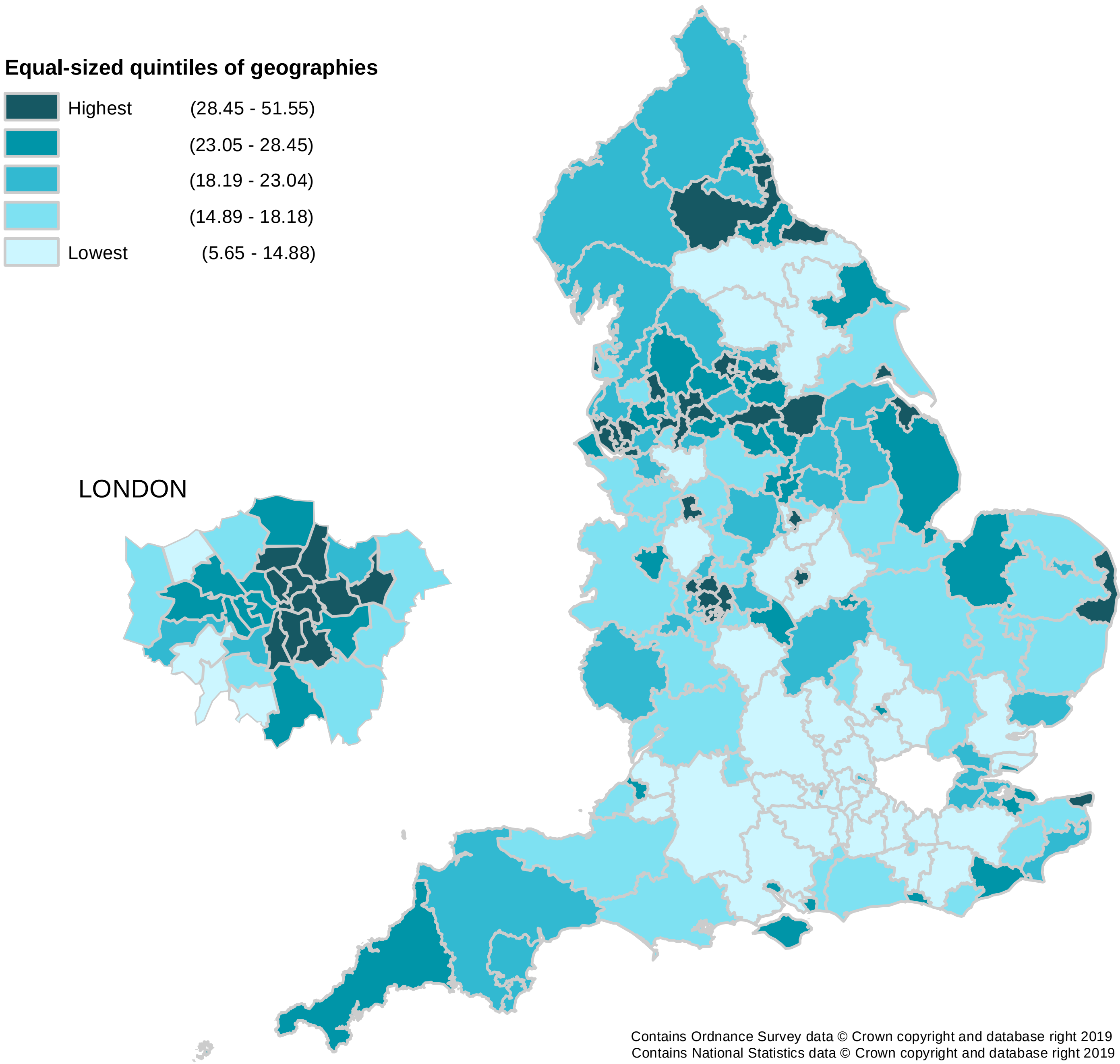


Figure A8: **Association between COPD patients receiving influenza immunisation (2017/18) and deprivation score (IMD 2015) by CCG**[23,33]

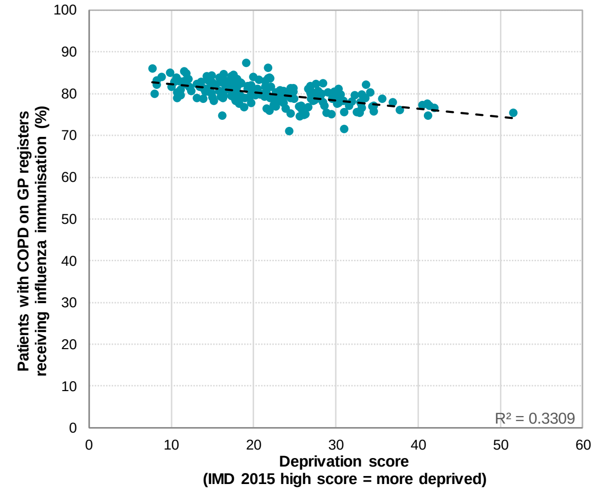
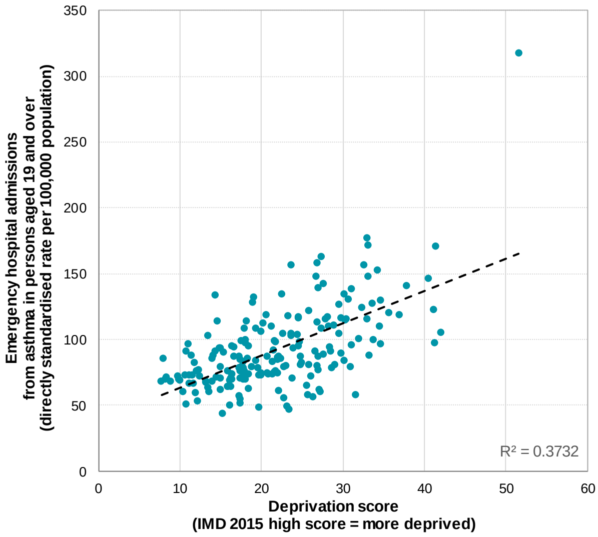


Figure A9: **Association between emergency hospital admissions from asthma in adults (2017) and depivation score (IMD 2015) by CCG**[23,34]



Disadvantaged groups

In addition to the adverse outcomes seen for respiratory disease amongst people living in the most deprived areas, there are some specific groups in society who have poorer respiratory health generally or at greater risk of specific respiratory conditions. Groups may include those with serious mental illness, those who are homeless or who live in poor quality housing, individuals who are in prison, those with learning or physical disabilities, specific ethnic groups and those who work in particular industries. For example, hospital admission risk for asthma was found to be twice as high for adults of ethnic minority background in East London, possibly due to differences in cultural, social or psychological factors.[35]

As another example, individuals with serious mental illness (SMI) often also have much poorer physical health than other people in society, and have on average 10 to 20 years reduction in life expectancy.[36] Among under 75s, those who are in contact with mental health services have 4.7 times the rate of death from respiratory disease compared with those in the general population (Table A2).[20] Individuals with SMI have an increased rate of asthma (1.2 times) and COPD (2.1 times), and this pattern is sustained even when deprivation is adjusted for.[20]

Table A2: Increased mortality rate by disease, people aged under 75 years in contact with mental health services compared with the general population in England (2014/15)[20]

Disease type	Mortality rate - times higher	Mortality rate – more deaths per 100,000 population
Liver	5	84
Respiratory	4.7	147
Cardiovascular	3.3	198
Cancer	2	142

SMI may affect both risk factors (for example, smoking) and also interaction with health services. The PHE briefing on severe mental illness (SMI) and physical health inequalities concluded that there is 'increasing evidence that disparities in healthcare provision contribute to poor physical health outcomes' among those with SMI. These patients show higher prevalence of asthma and COPD as well as other chronic conditions including obesity, diabetes, cardiovascular disease and hypertension all of which are considered preventable.[20]

People with SMI show a smoking prevalence that is around 2.5 times higher than the general population[37] with 1 in 3 cigarettes consumed smoked by this population group.[38] An assessment of smoking status is an important part of annual physical health checks in people with SMI and smoking cessation should be offered for all smokers. On average 72% of people on the SMI GP register have their smoking status recorded, however for some areas this is less than 20% of people with SMI with smoking assessment in the last 12 months.[39] In order to rectify the inequalities seen between the general population and disadvantaged groups measures must address the variation in risk factors, such as smoking, and health service provision.

What are the sources of variation?

Variation in respiratory health outcomes is due to complex interactions of many different factors, of which healthcare is only one aspect.

Data quality

When variation in an indicator for health or healthcare is found it is always important to first exclude data quality issues as a cause. Local differences in completeness, accuracy of information and coding practices are just some of the elements which can lead to variation in data.

Random variation

Differences between areas can occur through chance, even where no true difference exists. However, the larger the difference between 2 areas, the less likely that this is to have occurred by chance. Confidence intervals can provide an estimation of what variation we might expect through chance. Statistical tests can be applied, as in this atlas, to test the significance of differences to identify those less likely to be due to chance.

Risk factors

Individuals have different risks of developing respiratory disease, due to their lifestyle and exposure to risk factors. Risk factors may be more common in different populations or regions.

Unmodifiable risk factors

These include age, sex, and genetic susceptibility. The variations in age structure in different parts of the country are demonstrated in Map A2 and Map A3. Given the variation in proportions of the population who are under 19 years and over 75 years we would anticipate variations in the rate of diseases which are common in childhood (for example, asthma and bronchiolitis) or in older age (for example, COPD and lung cancer).

Modifiable risk factors

There are clear links between both behavioural/lifestyle and wider environmental risk factors and the likelihood of developing certain respiratory diseases. These risk factors are often a complex mixture of many different influences.

Smoking is the largest single risk factor for respiratory disease; 37% of deaths from respiratory disease and 22% of admissions due to respiratory disease (excluding cancer) were estimated to be attributable to smoking.[40] Specific disease-related deaths are even more highly correlated, with 79% of deaths (aged >35yrs) from cancers of the trachea, lung and bronchus, and 85% of deaths (aged >35yrs) from ‘chronic obstructive lung disease’ attributable to smoking.[41] Men who are current smokers have 23 times the risk of lung cancer compared to those who have never smoked.[41] It is therefore unsurprising that geographical variations in certain respiratory diseases are highly correlated with smoking rates.

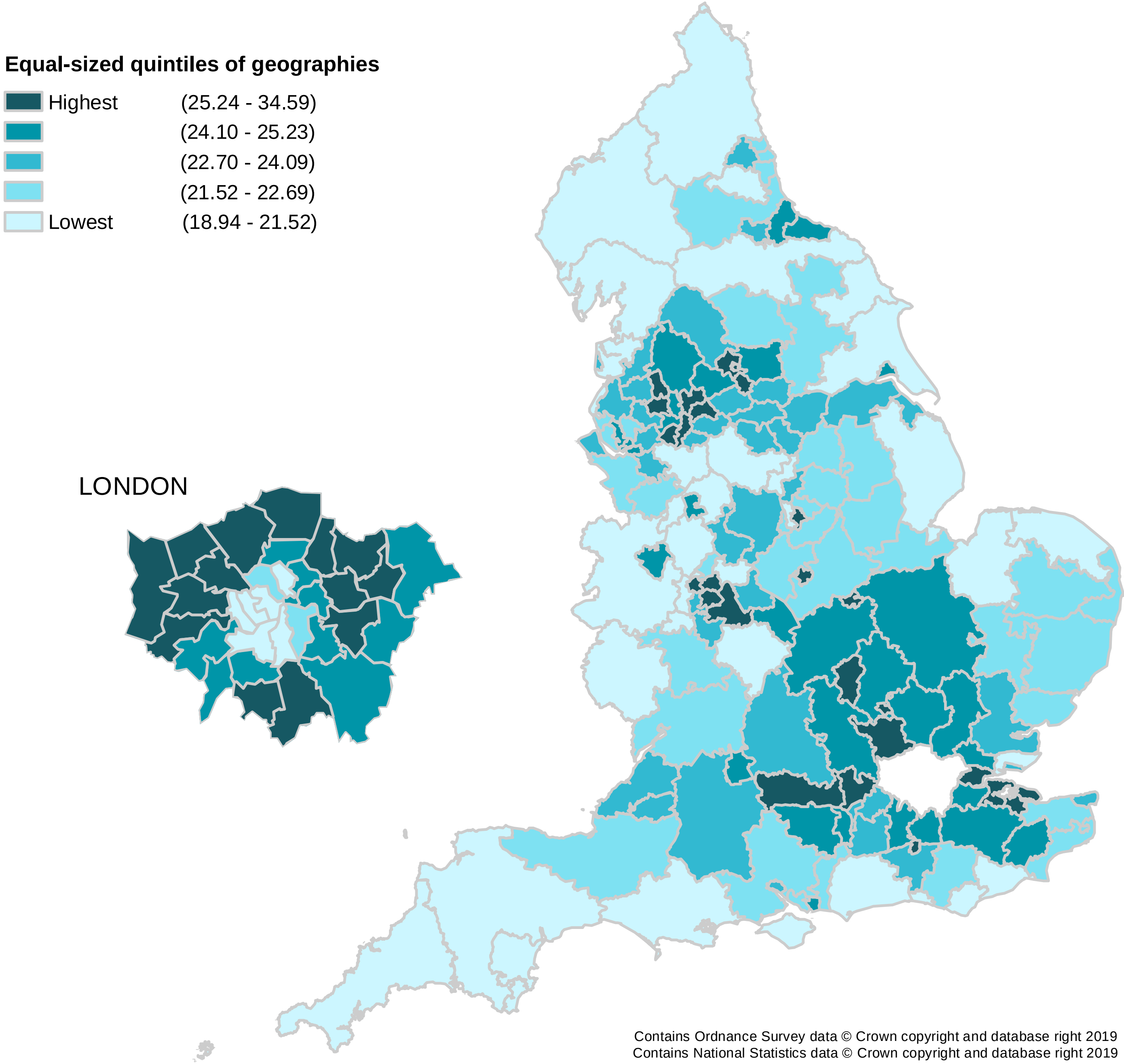
The environment in which individuals live and work also impacts on the risk of developing respiratory disease. Occupational or general environmental exposure to air pollution, toxins, second-hand cigarette smoke, allergens or ionising radiation may vary within local populations and across geographical regions.

For example, radon exposure is geographically varied, it is the largest source of radiation exposure and is estimated to cause 1,100 lung cancer deaths per year in the UK, although the majority of these are in conjunction with smoking.[42] Established methods allow radon exposure to be assessed and managed. Housing conditions can also affect respiratory disease; there is evidence that damp and mould is associated with asthma development.[43,44]

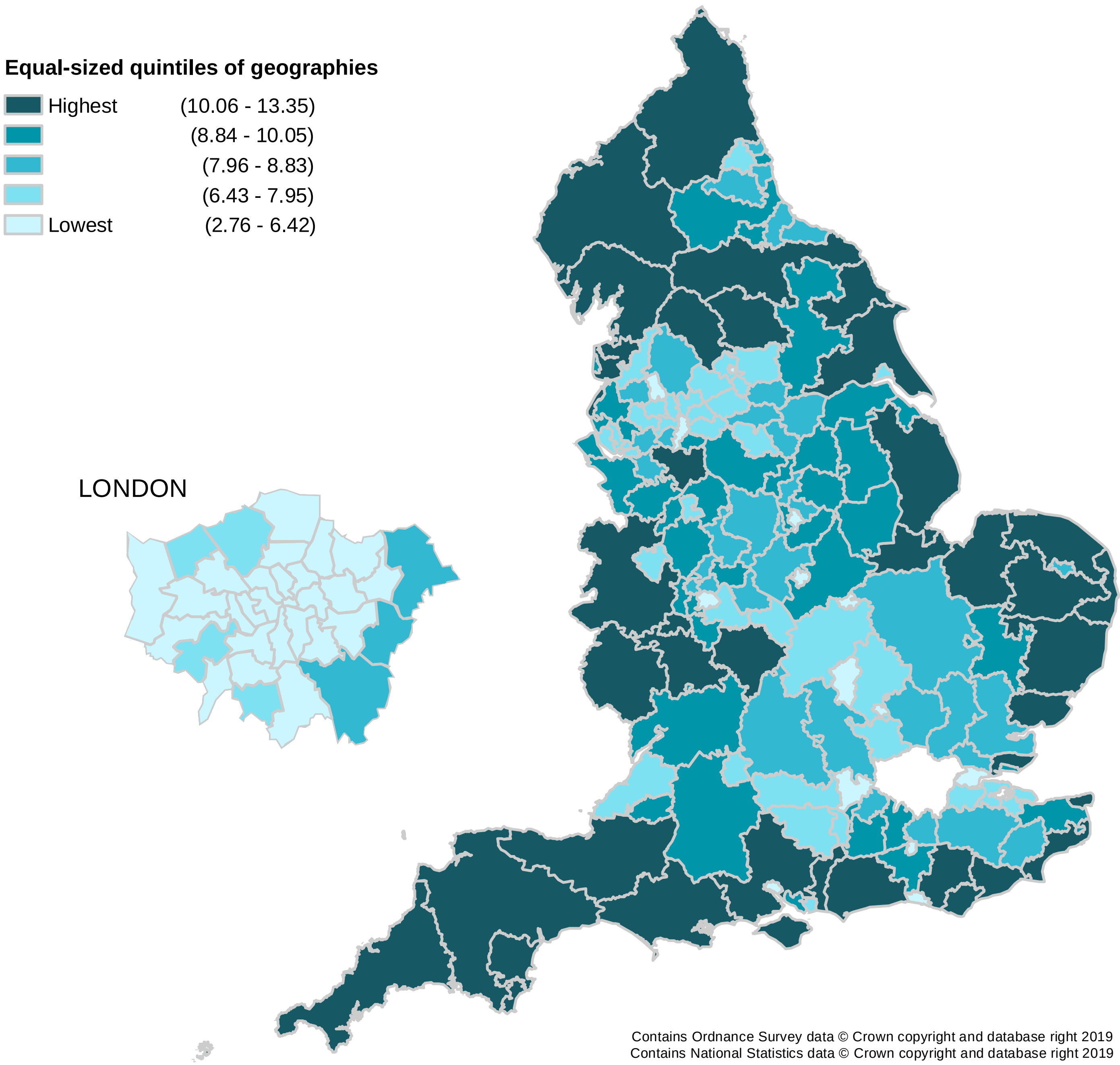
A wide variety of lung diseases can be associated with occupational exposure including conditions with a long latency period (for example, lung cancer, mesothelioma, COPD, pneumoconiosis) and the more acute allergic respiratory diseases, including occupational asthma. Map A4 displays the latest period (2015 to 2017), during which CCG values for registration of newly diagnosed mesothelioma ranged from 2.1 to 11.9 ASR per 100,000, which is a 5.6-fold difference between CCGs. There were 7,064 new mesothelioma registrations in 2015 to 2017.

The Health and Safety Executive (HSE) have estimated that there are 20,000 new diagnoses of breathing or lung problems caused or made worse by work and 12,000 lung disease deaths a year thought to be linked to past exposures at work.[45] However, there has been a shift from diseases associated with high dose exposures of mineral dusts (especially coal and asbestos) to higher levels of occupational asthma and other airway diseases thought to be connected to lower dose exposures to allergens and irritants (for example, enzymes, cleaning agents).[46]

Map A2: **Variation in percentage of people aged 19 years and under by CCG (2017)**



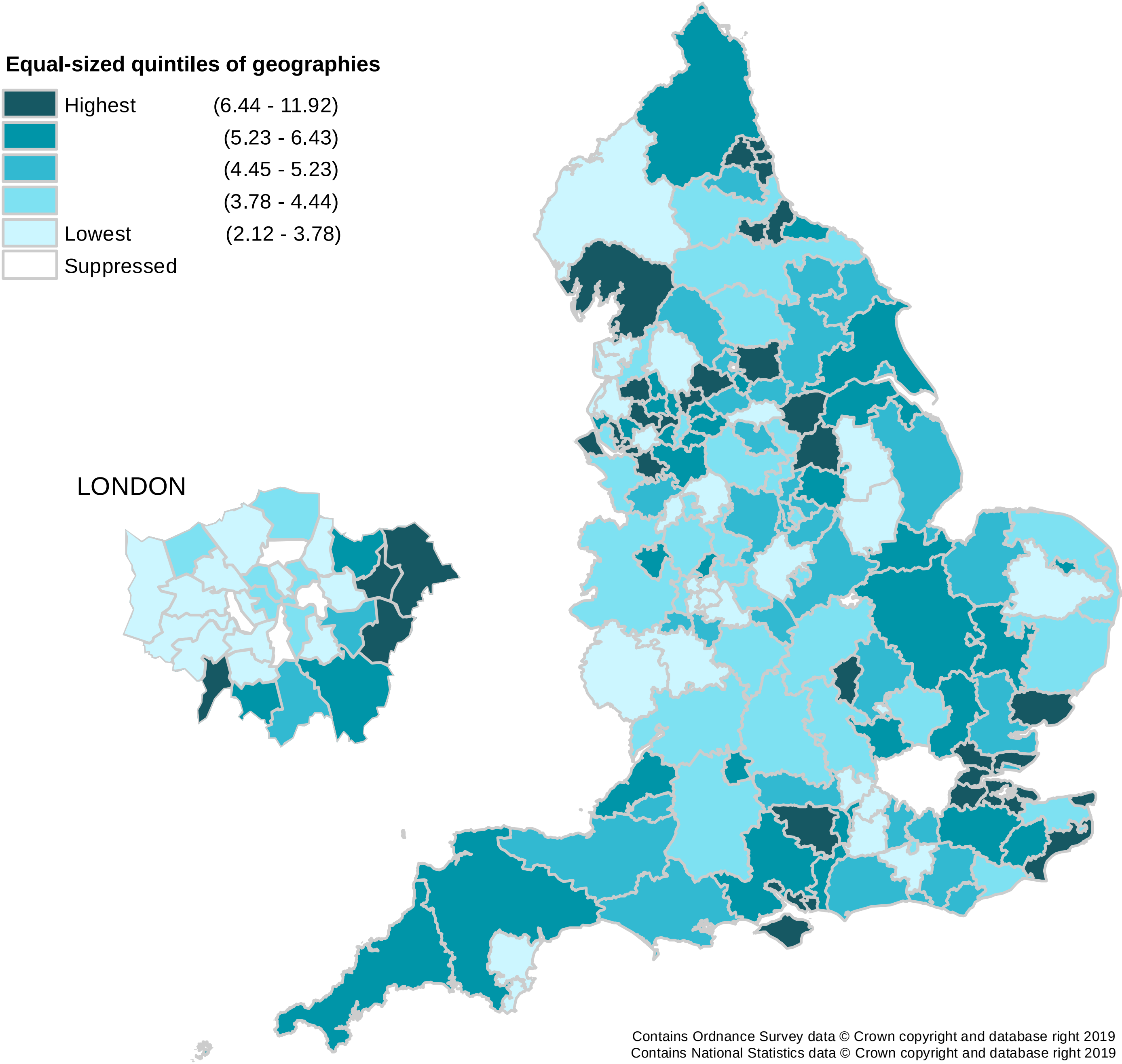
Map A3: Variation in percentage of people aged 75 years and over by CCG (2017)



Map A4: **Variation in registrations of newly diagnosed cases of mesothelioma by CCG (2015-2017)**

Age-standardised rate per 100,000 population

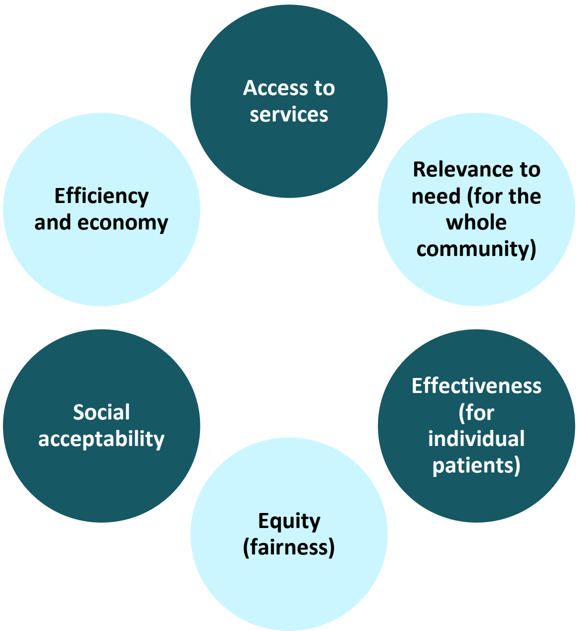
Optimum value: Low



Healthcare variation

Healthcare variation may be due to differences in preventative (for example, immunisation), primary, community, secondary and tertiary services and how they are commissioned. It is appropriate that respiratory health service provision and therefore total spend varies across the country and within communities, as the total burden of respiratory disease varies widely (equity). However, all patients, regardless of where they live, should receive respiratory health care of equal quality. There are many frameworks for measuring healthcare quality, but Maxwell (1984) developed a 6-strand model which is summarised in Figure A10.[47] Where these 6 dimensions of quality are not met patient outcomes can suffer as a result. Access to services and their importance to need is particularly relevant in relation to geographical variation; this may be access to early diagnosis, treatment, rehabilitation or end of life care. However, even where services exist, the extent to which best practice is implemented in different settings can vary widely (effectiveness).

Figure A10: Maxwell's dimensions of health care quality[47]



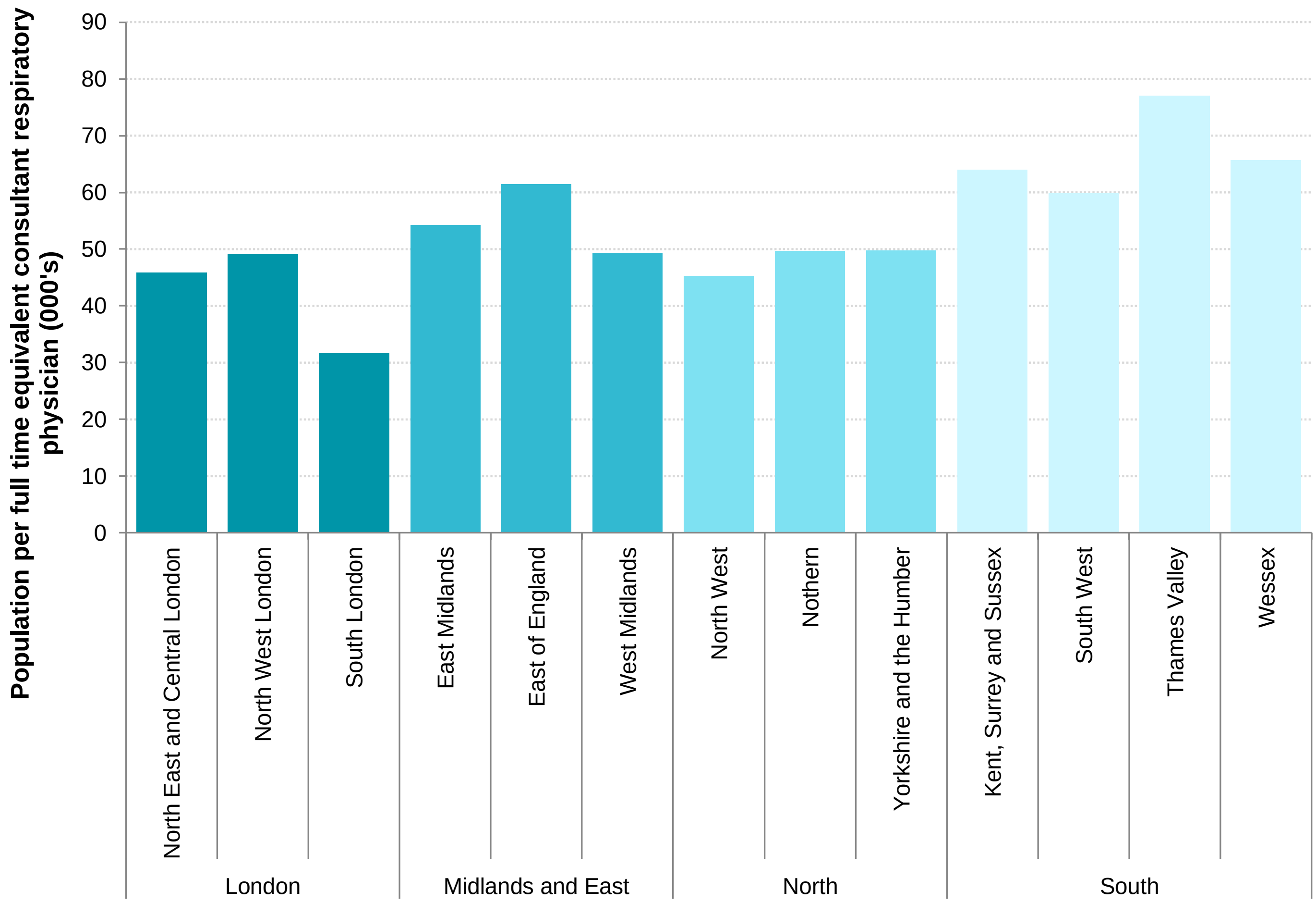
Respiratory workforce

There are a wide variety of professionals who provide care for patients with respiratory disease in the UK (Box A2). Workforce issues including scarcity and poor training can lead to reductions in availability and/or quality of services. There are reported threats for the future of the respiratory workforce; recent reports have highlighted significant problems in recruitment of consultants (50% of institutions advertising posts reported difficulties appointing, and 40% had a vacancy at the time of the British Thoracic Society Respiratory Medicine Workforce Review 2018),[48] and specialist registrars.[48] A 2016 survey of respiratory nurses indicated almost half planned to retire or were eligible for retirement within the next 10 years.[49]

Figure A11 shows that variation exists in the number of consultants practicing per patient population in different areas of England. The consultant to patient population ratio is 2.4 times higher in Thames Valley compared with South London. Some of the lower numbers of consultants are seen in subregions which experience the highest mortality and hospital admissions for respiratory disease.

Box A2: Key professional groups involved in respiratory healthcare		
Primary and community care	General practitioners Practice nurses	Community pharmacists
Secondary care	Respiratory specialist nurse	Occupational Therapists
	Hospital pharmacist	Respiratory physiologists
	Respiratory Consultants and Respiratory Specialist Registrars	Psychologists
	Thoracic surgeons	Healthcare scientists
	Radiologists	Oncologists
	Radiographers	Other medical and nursing staff
	Physiotherapists	
End of life care	Palliative care consultants	Palliative care nurses

Figure A11: Population per full time equivalent respiratory consultant by NHS sub-region (2017/18)[50]



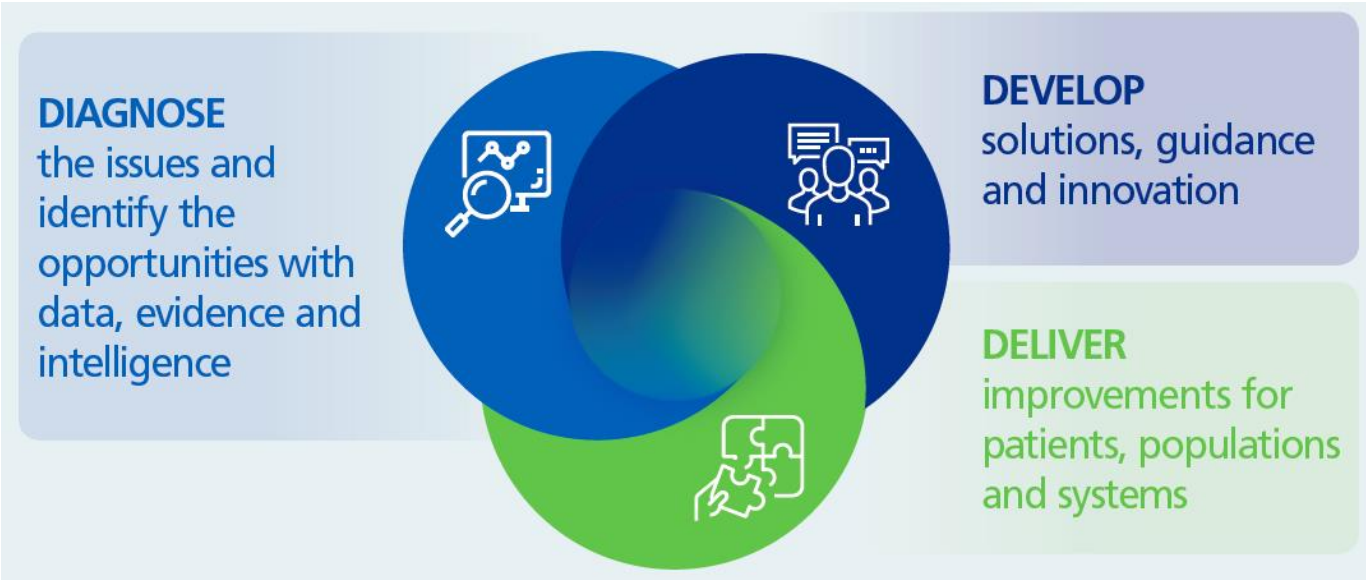
Patient choice

Finally, patient choice is an important aspect of variation, but choice is heavily influenced by personal, social and cultural factors as well as the interactions with healthcare professionals and providers. Shared decision making is a collaborative process between the patient and clinician which ensures that 'individuals are supported to make decisions that are right for them'.[51] The National Institute of Health and Care Excellence (NICE) states that within shared decision making it is important that:

> "care or treatment options are fully explored, along with their risks and benefits
> different choices available to the patient are discussed
> a decision is reached together with a health and social care professional"[52]

How should we respond to variation? The RightCare approach

Figure A12: **RightCare Model[53]**



Diagnose

RightCare's model of 'diagnose, develop, deliver' (Figure A12) outlines how local areas should respond to variation.

The information contained within this atlas is a starting point for CCGs to examine their local outcomes and quality of their respiratory services, and to benchmark themselves against other CCGs and the national average. However, to understand what the variation means and whether it is unwarranted variation, further work will be necessary. It is important not simply to just rely on comparison with the national average, but instead to consider what the appropriate figure is based on local need. RightCare highlights that in many cases comparisons between similar CCG areas rather than the national average may be more appropriate. For example, an area with a high prevalence of COPD may expect to see higher rates of hospital admissions per 1,000 population, compared to an area with a low prevalence of COPD. However, there may be cause for concern if they compare themselves to a CCG with a similar prevalence of COPD whose admission rates are substantially lower than theirs.

Furthermore, an outcome which is significantly better than the England average should not be cause for complacency, but instead provide opportunities to identify the local underserved populations who are still at risk of poor health outcomes. For example, a low overall rate of smoking prevalence may prompt increased targeting of stop smoking support services to certain populations who still have high smoking rates, such as those with serious mental illness (SMI) or those in prison. Furthermore, Figure A2 demonstrated that mortality rates in the UK are higher than in several European countries, therefore looking for good practice overseas may also be appropriate.

Where there is concern identified, further analysis of the data and consultation with stakeholders will usually be required to answer the following questions:

- what are the reasons for the variation?
- is this warranted or unwarranted variation?
- is this concentrated within certain groups or is it equal across the whole population? (Consider undertaking a health equity audit)

The information discussed earlier in the introduction will assist in answering these questions. In addition to information within this atlas, a wealth of supporting data and resources can also be obtained (see Box A3).

Box A3: Additional respiratory data and resources

- Public Health England (PHE) Fingertips public health profiles[54]
- RightCare focus packs[55]
- RightCare equality and health inequality packs[56]
- RightCare where to look packs[57]
- RightCare long term conditions packs[58]
- Royal College of Physicians national asthma and COPD audit programme,[59] and British Thoracic Society National Audits[60]
- Respiratory Futures resources[61]
- NHS Business Services Authority's Respiratory Prescribing Dashboard[62]

Develop

Once unwarranted variation has been identified and the causes explored, developing local solutions should be a key priority. RightCare products, such as the COPD pathway or long-term conditions scenarios, and other national guidelines (such as NICE guidance), should be combined with local knowledge to highlight particularly relevant areas for focus. Within this atlas, options for action are provided within the text accompanying the different indicators. Local knowledge will help to identify and refine appropriate action within the local context. There are also numerous examples of good practice to refer to within the case studies that accompany relevant chapters.

It is important to have a broad focus and to consider the whole pathway from prevention, through diagnosis, treatment, referral and rehabilitation, to end of life care, when seeking to develop successful interventions. For example, the development of an intervention to reduce COPD admissions may include a review of diagnostic pathways, stop smoking provision, hospital-at-home services, pulmonary rehabilitation capacity, protocols for admission of patients with COPD from Accident and Emergency, and end of life care planning.

Questions for consideration when developing responses to respiratory variation could include:

- are preventative services effective and available, including stop smoking services?
- are there sufficient trained staff and facilities?
- are local protocols for diagnosis, referral and treatment evidence based and consistent with best practice guidance?
- are referral pathways for diagnosis, treatment and rehabilitation efficient and functioning well?
- are services accessible for all patients?

- what would help patients to find it easier to access services?
- are local community-based services able to cater for respiratory patients and are they effective at preventing admission and/or promoting earlier discharge?
- are rehabilitation services effective and available?
- do palliative and end of life care services include patients with respiratory disease?

Deliver

Respiratory health delivery is hugely complex; much of respiratory disease is managed in primary care, however even within secondary care it is often acutely managed by accident and emergency, acute medicine and general medicine rather than specialist respiratory services. Furthermore, the offer of community services will look different in each area. Therefore, when considering delivery and implementation of change, a wide range of stakeholders from different disciplines and organisations will need to be included. This will look different in every CCG and region.

With large numbers of potentially effective options for action, having transparent and robust mechanisms for prioritisation within respiratory care is essential. Programme budgeting and marginal analysis is one common approach for selecting the most effective services locally. Service reviews and audits together with input from local patients, clinicians, and commissioners, will help to understand where the barriers are and what changes need to be made. However, ensuring the changes are implemented sustainably is vital, and any interventions must be effectively monitored and evaluated.

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Table S1: Magnitude of variation summary

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
1a	CCG18	Variation in percentage of people aged 18 and over self-reporting as smokers (2018)	Low	3.6 - 26.1	7.3	12 (from 195)	12 (from 195)	No significant change	Significant Decreasing
1b	CCG18	Variation in percentage of women who are known to smoke at time of delivery (2017/18)	Low	1.6 - 26	16	75 (from 195)	62 (from 195)	No significant change	Significant Decreasing
2	LTLA	Variation in percentage of people (aged 19+) that meet CMO recommendations for physical activity (150+ moderate intensity equivalent minutes per week) (2017/18)	High	52.1 - 80.1	1.5	35 (from 326)	31 (from 326)	No significant change	Not significant Increasing
3	LTLA	Variation in percentage of people aged 18 years and over classified as overweight or obese (body mass index greater than or equal to 25 kg/m2) (2017/18)	Low	43.4 - 77.6	1.8	43 (from 326)	37 (from 326)	No significant change	Not significant Increasing
4	UTLA	Variation in annual concentration of human-made outdoor fine particulate matter (PM2.5) adjusted to account for population exposure (2016), Micrograms per cubic metre	Low	5.8 - 12.3	2.1	Significance not calculated	Significance not calculated	Max to min range and 95th to 5th percentile gap narrowed significantly	Not significant Decreasing
5a	LTLA	Variation in percentage of households in an area that experience fuel poverty (2017)	Low	4.2 - 19.1	4.5	Significance not calculated	Significance not calculated	Trend data unavailable	Trend data unavailable
5b	LTLA	Variation in the Excess Winter Deaths Index (Aug 2014-Jul 2017)	Low	4.3 - 36.6	8.4	Significance not calculated	Significance not calculated	Trend data unavailable	Trend data unavailable

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
6	LTLA	Variation in percentage of homes in Radon Affected Areas (2019)	Low	0 - 100	Not applicable	Significance not calculated	Significance not calculated	Trend data unavailable	Trend data unavailable
7a	CCG18	Variation in mortality rate from COPD (underlying cause) per population (2015-2017), DSR per 100,000	Low	27.4 - 108.8	4	55 (from 195)	60 (from 195)	No significant change	Not significant Increasing
7b	CCG18	Variation in mortality rate from COPD as a contributory cause per population (2015-2017), DSR per 100,000	Low	26.8 - 120.8	4.5	63 (from 195)	56 (from 195)	No significant change	Significant Increasing
7c	CCG18	Variation in percentage of patients with COPD on GP registers (2017/18)	Requires local interpretation	0.8 - 3.7	4.7	92 (from 195)	81 (from 195)	Significant widening of all three measures	Significant Increasing
8a	CCG18	Variation in percentage of patients with COPD on GP registers in whom diagnosis confirmed by post bronchodilator spirometry (including exceptions) (2017/18)	High	69.2 - 86.8	1.3	49 (from 195)	27 (from 195)	95th to 5th percentile gap narrowed significantly	Not significant Increasing
8b	CCG18	Variation in percentage of patients with COPD on GP registers assessed using MRC dyspnoea score in the last 12 months (including exceptions) (2017/18)	High	69 - 90.9	1.3	76 (from 195)	54 (from 195)	Max to min range widened significantly	Not significant Decreasing
8c	CCG18	Variation in percentage of patients with COPD on GP registers with MRC dyspnoea grade >=3, with a record of oxygen saturation value within the preceding 12 months (including exceptions) (2017/18)	High	91.3 - 98.8	1.1	16 (from 195)	15 (from 195)	Max to min range narrowed significantly	Significant Increasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
9a	CCG18	Variation in percentage of patients with certain conditions, including COPD, whose notes record smoking status in the preceding 12 months (including exceptions) (2017/18)	High	91.5 - 97	1.1	87 (from 195)	59 (from 195)	No significant change	Not significant Decreasing
9b	CCG18	Variation in percentage of patients with certain conditions, including COPD, who smoke whose notes contain a record of an offer of support and treatment within the preceding 12 months (including exceptions) (2017/18)	High	88 - 98.9	1.1	110 (from 195)	37 (from 195)	No significant change	Significant Increasing
10a	CCG18	Variation in percentage of patients with COPD on GP registers receiving influenza immunisation in the preceding 1 August to 31 March (including exceptions) (2017/18)	High	71 - 87.3	1.2	53 (from 195)	48 (from 195)	Max to min range and 75th to 25th percentile gap widened significantly	Not significant Decreasing
10b	CCG17	Variation in percentage of people with COPD and Medical Research Council Dyspnoea Scale >=3 referred to a pulmonary rehabilitation programme (2014/15)	High	3.8 - 68.5	17.9	69 (from 207)	92 (from 207)	Trend data unavailable	Trend data unavailable
11a	CCG18	Variation in rate of emergency admissions to hospital for COPD per population (2017/18), DSR per 100,000	Low	112.1 - 625	5.6	64 (from 195)	74 (from 195)	No significant change	Not significant Increasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
11b	CCG18	Variation in median length of stay (days) of emergency admissions to hospital for COPD (2017/18)	Requires local interpretation	1 - 5	5	Significance not calculated	Significance not calculated	No significant change	Not significant Decreasing
11c	CCG18	Experimental Statistic: Variation in percentage of admissions to hospital for COPD that were re-admitted as an emergency within 30 days of discharge (2017/18)	Low	5.9 - 22.3	3.7	Significance not calculated	Significance not calculated	No significant change	Significant Decreasing
12a	CCG18	Variation in percentage of patients admitted to hospital for COPD receiving non-invasive ventilation (NIV) (2017/18)	Requires local interpretation	2.2 - 17.7	8	21 (from 195)	12 (from 195)	No significant change	Not significant Increasing
12b	CCG18	Experimental Statistic: Variation in mortality rate of patients who died within 30 days of an emergency hospital admission for COPD (2016-2018), DSR per 100,000 COPD hospital admission	Low	785.7 - 12167.3	15.5	0 (from 195)	22 (from 195)	No significant change	Not significant Decreasing
13a	CCG18	Variation in percentage of patients with asthma on GP registers (2017/18)	Requires local interpretation	3.4 - 7.9	2.3	108 (from 195)	62 (from 195)	Significant widening of all three measures	Not significant Increasing
13b	CCG18	Variation in percentage of patients with asthma on GP registers aged 8 years or over, in whom measures of variability or reversibility are recorded (including exceptions) (2017/18)	High	76.4 - 93.1	1.2	57 (from 195)	48 (from 195)	95th to 5th and 75th to 25th percentile gaps widened significantly	Significant Increasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
14a	CCG18	Variation in percentage of patients with asthma on GP registers who had a review in the last 12 months that included an assessment of asthma control using the 3 RCP questions (including exceptions) (2017/18)	High	58.3 - 81.1	1.4	77 (from 195)	65 (from 195)	Significant widening of all three measures	Not significant Increasing
14b	CCG18	Variation in percentage of patients with asthma on GP registers aged 14 to 19 years, in whom there is a record of smoking status in the preceding 12 months (including exceptions) (2017/18)	High	70.3 - 90.9	1.3	37 (from 195)	25 (from 195)	Significant widening of all three measures	Significant Decreasing
15a	CCG18	Variation in rate of emergency admissions to hospital for asthma in adults aged 19 years and over per population (2017/18), DSR per 100,000	Low	43.6 - 318.2	7.3	42 (from 195)	38 (from 195)	No significant change	Not significant Increasing
15b	CCG18	Variation in median length of stay (days) of emergency admissions to hospital for asthma in adults aged 19 years and over (2017/18)	Requires local interpretation	0 - 5	Not applicable	Significance not calculated	Significance not calculated	No significant change	No significant change
16a	CCG18	Variation in rate of emergency admissions to hospital for asthma in children aged 0-18 years per population (2017/18), Crude rate per 100,000	Low	60.8 - 453.6	7.5	35 (from 195)	48 (from 195)	95th to 5th percentile gap narrowed significantly	Not significant Decreasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
16b	CCG18	Variation in median length of stay (days) of emergency admissions to hospital for asthma in children aged 0-18 years (2017/18)	Requires local interpretation	0 - 2	Not applicable	Significance not calculated	Significance not calculated	No significant change	No significant change
17	CCG18	Variation in mortality rate from asthma in all ages per population (2015-2017), DSR per 100,000	Low	0.7 - 6	8.9	6 (from 195)	1 (from 195)	No significant change	Not significant Increasing
18a	CCG18	Variation in median length of stay (days) of emergency admissions to hospital for pneumonia (2017/18)	Low	2 - 7	3.5	Significance not calculated	Significance not calculated	No significant change	Not significant Decreasing
18b	CCG18	Variation in percentage of zero and one day emergency admissions to hospital for pneumonia (2017/18)	High	11.1 - 38.5	3.5	36 (from 195)	51 (from 195)	95th to 5th and 75th to 25th percentile gaps widened significantly	Significant Increasing
18c	CCG18	Variation in mortality rate from pneumonia (underlying cause) per population (2015-2017), DSR per 100,000	Low	29.5 - 83.2	2.8	38 (from 195)	29 (from 195)	75th to 25th percentile gap narrowed significantly	Significant Decreasing
18d	CCG18	Variation in mortality rate from pneumonia (all mentions) per population (2015-2017), DSR per 100,000	Low	123.4 - 305.2	2.5	59 (from 195)	58 (from 195)	No significant change	Significant Decreasing
19	CCG18	Variation in rate of emergency admissions to hospital for pneumonia per population (2017/18), DSR per 100,000	Low	299.4 - 821.2	2.7	66 (from 195)	57 (from 195)	No significant change	Not significant Increasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
20a	CCG18	Variation in rate of emergency admissions to hospital for bronchiolitis in children aged under 2 years per population (2015/16-2017/18), Crude rate per 100,000	Low	1373.6 - 6144.9	4.5	73 (from 195)	59 (from 195)	Trend data unavailable	Trend data unavailable
20b	CCG18	Variation in percentage of zero and one day emergency admissions to hospital for bronchiolitis in children aged under 2 years (2015/16-2017/18)	Requires local interpretation	20.9 - 81.3	3.9	54 (from 195)	58 (from 195)	Trend data unavailable	Trend data unavailable
21a	CCG18	Variation in mortality rate from respiratory disease in persons aged under 75 years per population (2015-2017), DSR per 100,000	Low	18.2 - 74.9	4.1	46 (from 195)	46 (from 195)	No significant change	Not significant Decreasing
21b	CCG18	Variation in mortality rate from respiratory disease considered preventable in persons aged under 75 years per population (2015-2017), DSR per 100,000	Low	7.5 - 46.4	6.2	42 (from 195)	41 (from 195)	No significant change	Not significant Increasing
22a	CCG18	Variation in rate of emergency admissions to hospital for respiratory disease per population (2017/18), DSR per 100,000	Low	994.9 - 2565.8	2.6	76 (from 195)	77 (from 195)	95th to 5th percentile gap widened significantly	Significant Increasing
22b	CCG18	Experimental Statistic: Variation in percentage of admissions to hospital for respiratory disease that were re-admitted as an emergency within 30 days of discharge (2017/18)	Low	7.1 - 12.7	1.8	Significance not calculated	Significance not calculated	No significant change	Significant Increasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
23	NHS Area Team	Variation in percentage of people aged 6 months to 65 years with chronic respiratory disease who have received the influenza vaccine according to national ambitions (2018/19)	High	44.8 - 54.6	1.2	Number of areas above 55% target: 0 (from 25)	Number of areas below 55% target: 25 (from 25)	No significant change	Not significant Increasing
24	CCG18	Variation in rate of diagnostic sleep studies undertaken per population (2018/19), Crude rate per 100,000	High	4.3 - 1312.3	305	63 (from 195)	110 (from 195)	Max to min range widened significantly	Not significant Increasing
25	CCG18	Variation in total expenditure on home oxygen therapy per population (2017/18), Spend (£) per 1,000 patients	Requires local interpretation	738.8 - 4436.6	6	Significance not calculated	Significance not calculated	No significant change	Not significant Decreasing
26	CCG18	Variation in high-dose inhaled corticosteroid items as a percentage of all inhaled corticosteroid prescription items (2018)	Low	24.5 - 57.6	2.3	91 (from 195)	93 (from 195)	95th to 5th percentile gap widened significantly	Not significant Increasing
27	CCG18	Variation in incidence rate of tuberculosis (TB) per population (2015-2017), Crude rate per 100,000	Low	0.7 - 59	87.2	40 (from 195)	111 (from 195)	95th to 5th percentile gap narrowed significantly	Not significant Decreasing
28a	CCG18	Variation in percentage of people with pulmonary tuberculosis (TB) who started treatment within four months of symptom onset (2017)	High	21.4 - 100	4.7	1 (from 195)	2 (from 195)	No significant change	Not significant Decreasing

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
28b	CCG18	Variation in percentage of people with drug-sensitive tuberculosis (TB) who completed a full course of treatment within 12 months of treatment onset (2016)	High	36.4 - 100	2.8	1 (from 195)	3 (from 195)	Significant narrowing of all three measures	Significant Increasing
29a	CCG18	Variation in incidence rate of lung cancer per population (2015-2017), DSR per 100,000	Low	41.5 - 160.6	3.9	48 (from 195)	59 (from 195)	95th to 5th percentile gap narrowed significantly	Not significant Decreasing
29b	CCG18	Variation in mortality rate from lung cancer per population (2015-2017), DSR per 100,000	Low	29.9 - 108	3.6	46 (from 195)	54 (from 195)	No significant change	Not significant Decreasing
29c	CCG18	Variation in percentage of one-year survival estimates for lung cancer patients, all adults aged 15 to 99 years, by year of diagnosis (2016)	High	30.7 - 53.8	1.8	32 (from 195)	29 (from 195)	Significant widening of all three measures	Significant Increasing
30a	CCG18	Variation in percentage of lung cancer patients diagnosed at an early stage (stage 1 and 2) (2015-2017)	High	16.6 - 37.5	2.3	13 (from 195)	18 (from 195)	No significant change	Not significant Increasing
30b	CCG18	Variation in percentage of lung cancer patients presenting as an emergency (2014-2016)	Low	24.4 - 49.8	2	15 (from 195)	14 (from 195)	No significant change	Significant Decreasing
30c	CCG18	Variation in percentage of lung cancer patients presenting via the two-week wait route (2014-2016)	High	7.8 - 44.1	5.7	44 (from 195)	41 (from 195)	No significant change	Not significant Increasing
31a	SHA	Variation in rate of lung transplant registrations per population (2017/18), Crude rate per 1,000,000	High	1.9 - 6.2	3.3	Significance not calculated	Significance not calculated	Trend data unavailable	Trend data unavailable

Map	Geography	Title	Optimum value	Range	Fold difference	Number of areas significantly higher than England (99.8% level)	Number of areas significantly lower than England (99.8% level)	Variation trend	Median trend
31b	SHA	Variation in rate of lung transplants per population (2017/18), Crude rate per 1,000,000	High	1 - 5.3	5.3	Significance not calculated	Significance not calculated	Trend data unavailable	Trend data unavailable
32a	CCG18	Variation in percentage of deaths from COPD that occurred in hospital (2015-2017)	Requires local interpretation	48.3 - 74.1	1.5	9 (from 195)	6 (from 195)	95th to 5th percentile gap narrowed significantly	Significant Decreasing
32b	CCG18	Variation in percentage of deaths from COPD that occurred at home (2015-2017)	Requires local interpretation	15.2 - 35.7	2.3	2 (from 195)	4 (from 195)	75th to 25th percentile gap narrowed significantly	Significant Increasing
32c	CCG18	Variation in percentage of deaths from lung cancer that occurred in hospital (2015-2017)	Requires local interpretation	21.9 - 59.9	2.7	20 (from 195)	22 (from 195)	No significant change	Significant Decreasing
32d	CCG18	Variation in percentage of deaths from lung cancer that occurred at home (2015-2017)	Requires local interpretation	19.2 - 50	2.6	16 (from 195)	15 (from 195)	No significant change	Significant Increasing
32e	CCG18	Variation in percentage of deaths from lung cancer that occurred in a care home (2015-2017)	Requires local interpretation	4.3 - 33.5	7.8	11 (from 195)	13 (from 195)	No significant change	Significant Increasing
32f	CCG18	Variation in percentage of deaths from lung cancer that occurred in a hospice (2015-2017)	Requires local interpretation	1.1 - 40.4	38.1	42 (from 195)	23 (from 195)	95th to 5th percentile gap narrowed significantly	Not significant Decreasing

Maps

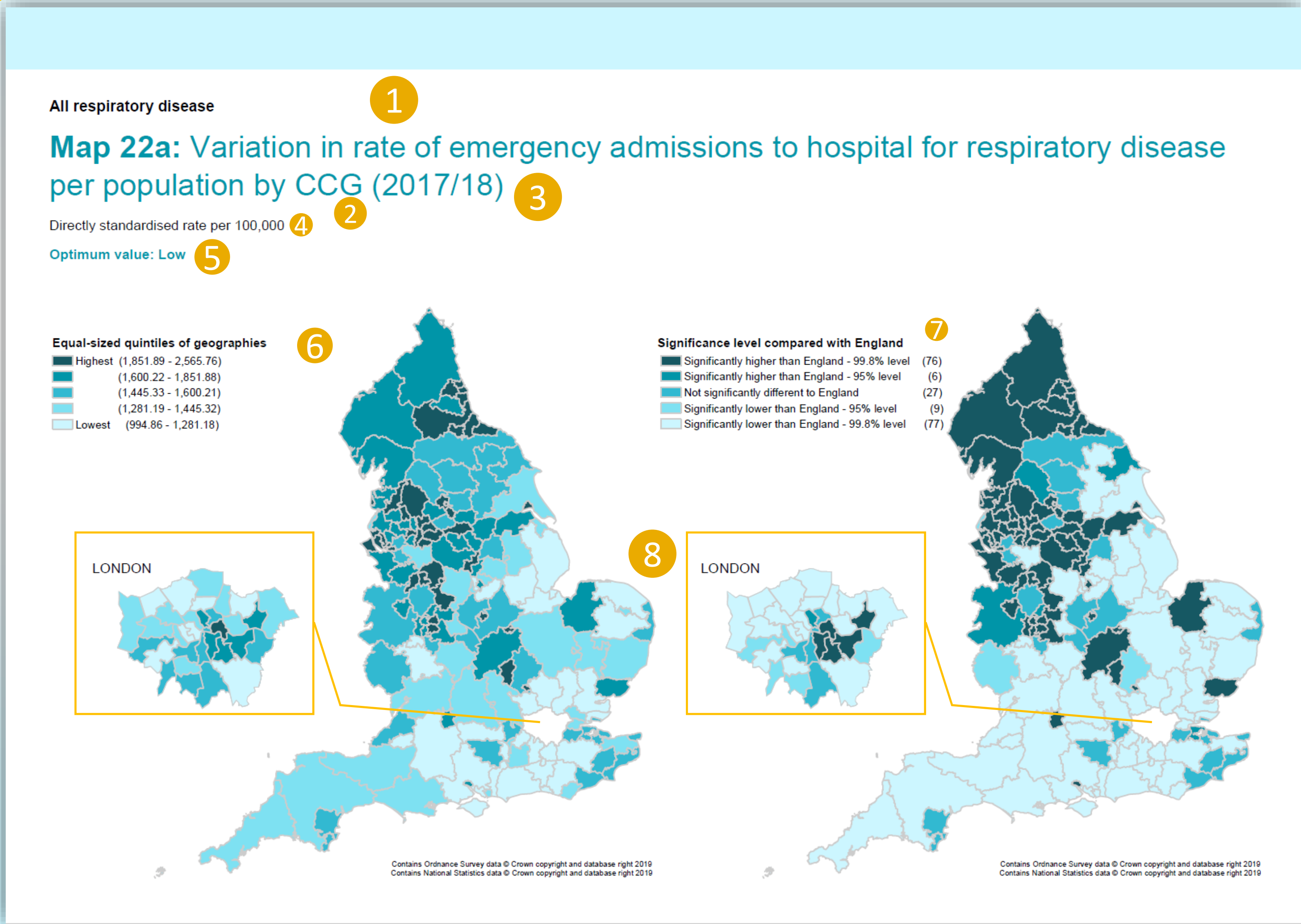
1 **Type of statistic** (e.g. rate, proportion)

2 **Geographic boundaries**

3 **Year of data presented**

4 **Rate calculated per x number of people**

5 **Optimum values** Low indicates lower values are preferential (high indicates higher values are preferential). Local interpretation maybe required for some indicators.



6 **Equal sized quintiles** The number of areas presented on the map are divided equally between the 5 categories with those with the highest values forming the 'Highest' group etc.

For example, in 2018 there were 195 CCGs, so 39 CCGs are in each category. Darker areas have the highest values.

7 **Significance level compared with England**
The darkest and lightest shading on map shows CCGs whose confidence intervals do not overlap with the England value.

The second darkest and lightest colours show areas where the England value falls between the CCG's 95% and 99.8% CI.

The number in brackets indicates the number of CCGs in each category.

8 **London** is presented as a separate zoomed in map for clarity.

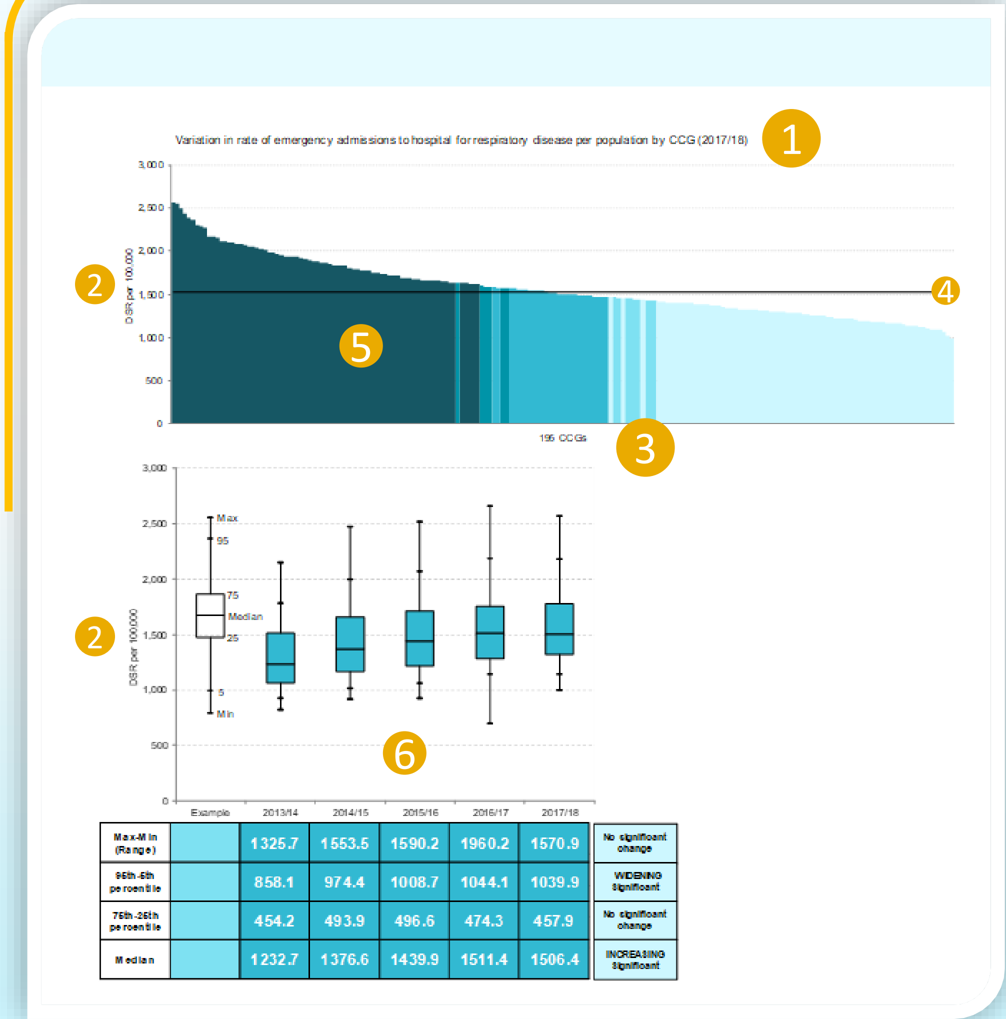
Chart, box plot and table

1. Title shows indicator details including: value type, geography and year .

2. The y-axis plots the value and gives details of the value type e.g. rate / proportion and the unit e.g. per 100,000 population.

3. The x-axis shows the geography and the number of areas on chart.

4. The line shows the England average.



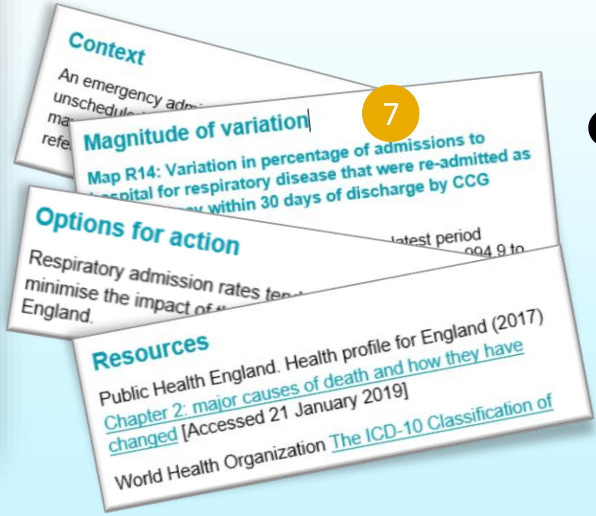
	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		1325.7	1553.5	1590.2	1960.2	1570.9	No significant change
95th-5th percentile		858.1	974.4	1008.7	1044.1	1039.9	WIDENING significant
75th-25th percentile		454.2	493.9	496.6	474.3	457.9	No significant change
Median		1232.7	1376.6	1439.9	1511.4	1506.4	INCREASING significant

5. Each bar represents an area (e.g. a CCG). The height of the bar is relative to the value for that area. Collectively, the bars show the spread of values across England.

The colour of the bar represents how significant the area's value is in relation to England based on the area's confidence interval. Areas utilise the same colours and categories as the maps.

Areas that are significantly higher than England at a 99.8% or 95% level are shown as darker bars whereas those with lower significance to England, at a 99.8% or 95% level, are lighter. The colour in the middle represents areas that are not significantly different from England.

Where the significance bar chart shows little variation across the CCGs, the equal interval map colours have been used.



6. For each indicator, data is presented visually in a time series of box and whisker plots. The box plots show the distribution of data.

The line inside each box shows the median (the mid-point, so if the 195 CCGs were sorted in order of value, the value halfway between the CCGs in the 97th and 98th position would give the median). The bottom and top of the teal box represents the values which 25% and 75% of the areas fall below. 50% of the areas have a value within this range.

The whiskers mark the values at which 5% and 95% of areas fall below. The median and maximum values are also shown.

The time series allows us to see how the median has changed over time, but also whether the gap between the extreme values has changed.

The table accompanying the box and whisker plots shows whether there has been any statistically significant change in the median, or in the degree of variation over time.

7. **Sections in the chapter**

Context – provides an overview of why the indicator is of public health interest

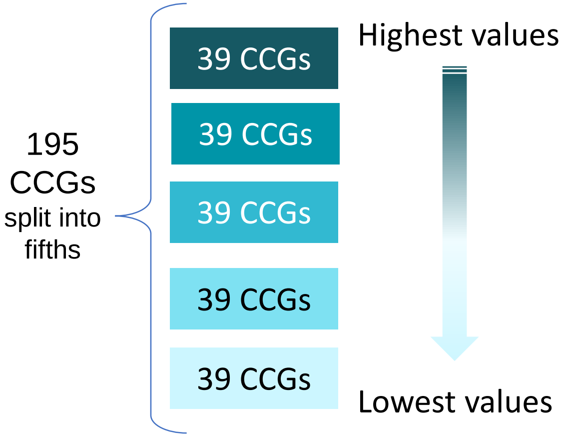
Magnitude of variation – provides commentary in relation to the chart, box plot and table

Option for action – gives suggestions for best practice

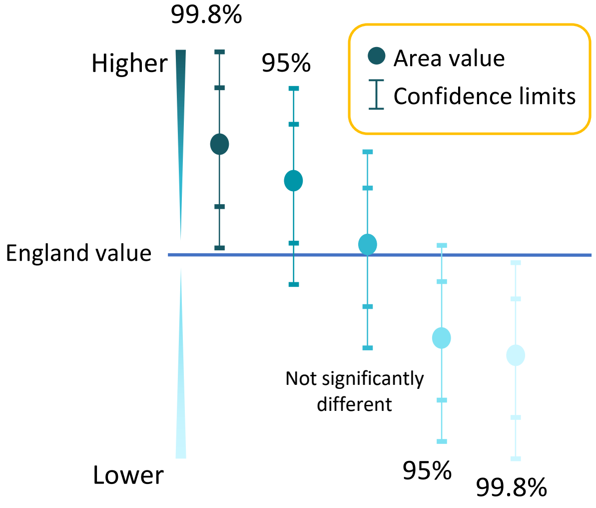
Resources – gives links to useful documents

How were the categories calculated?

Equal-sized quintiles



Significance to England



Confidence intervals give an estimated range in which the true CCG value lies.

Where the CCG's confidence interval does not overlap with the England value, the CCG is classed as being *significantly higher or lower than England at a 99.8% level*.

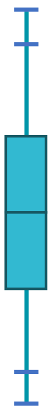
If the England value lies between the 99.8% and 95% CI, this value is classed as being *significantly higher or lower than England at a 95% level*.

Where the England value is between the upper and lower 95% CI, the CCG is classed as *not being significantly different from England*.

Box & whisker plot

Whiskers
Show the extreme values in the dataset.

Box
50% of the data values lie between the 25th and 75th percentile. The distance between these is known as the inter-quartile range (IQR).



Maximum The value of the area with the highest value.

95th percentile 95% of areas have values below this.

75th percentile 75% of areas have values below this.

Median (50th percentile) The median is the middle value of an ordered dataset. Half of the observations are below it and half above.

25th percentile 25% of areas have values below this.

5th percentile 5% of areas have a value below this.

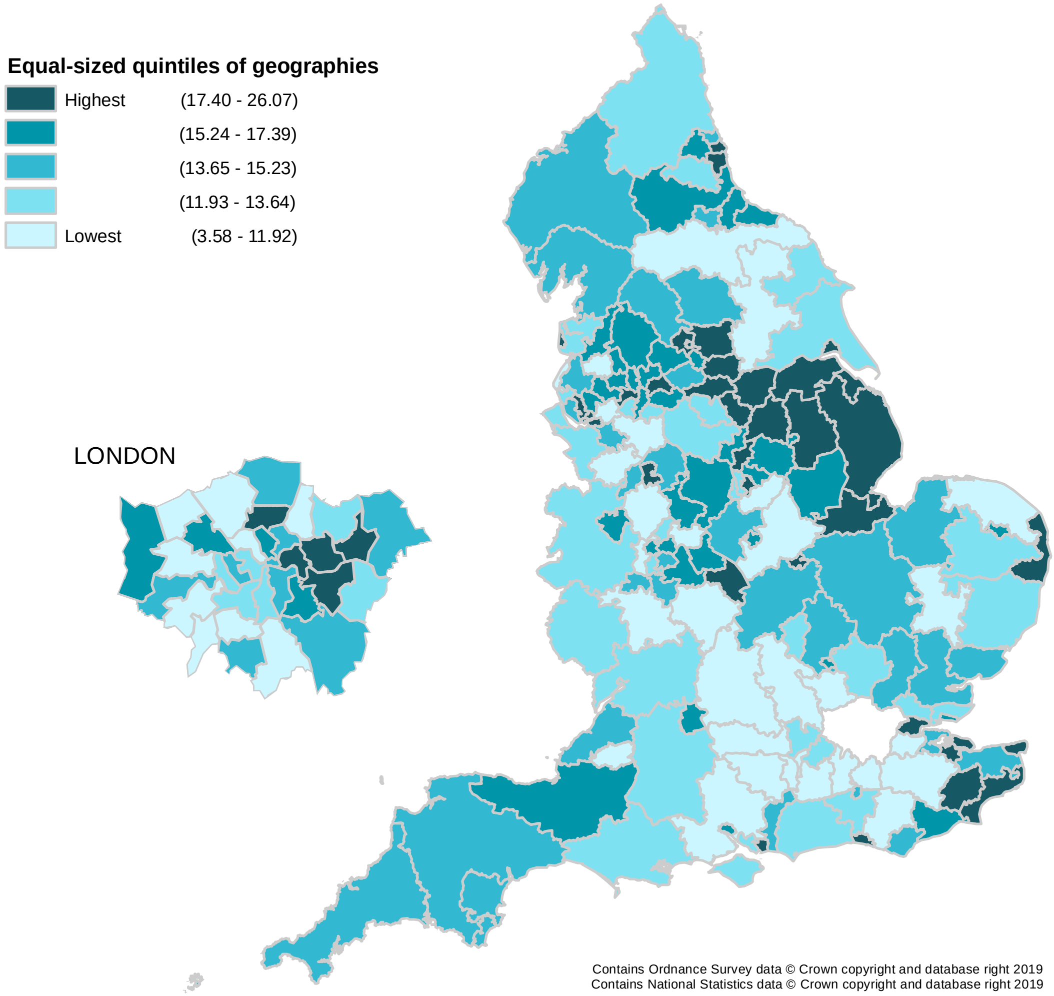
Minimum The value of the area with the lowest value.

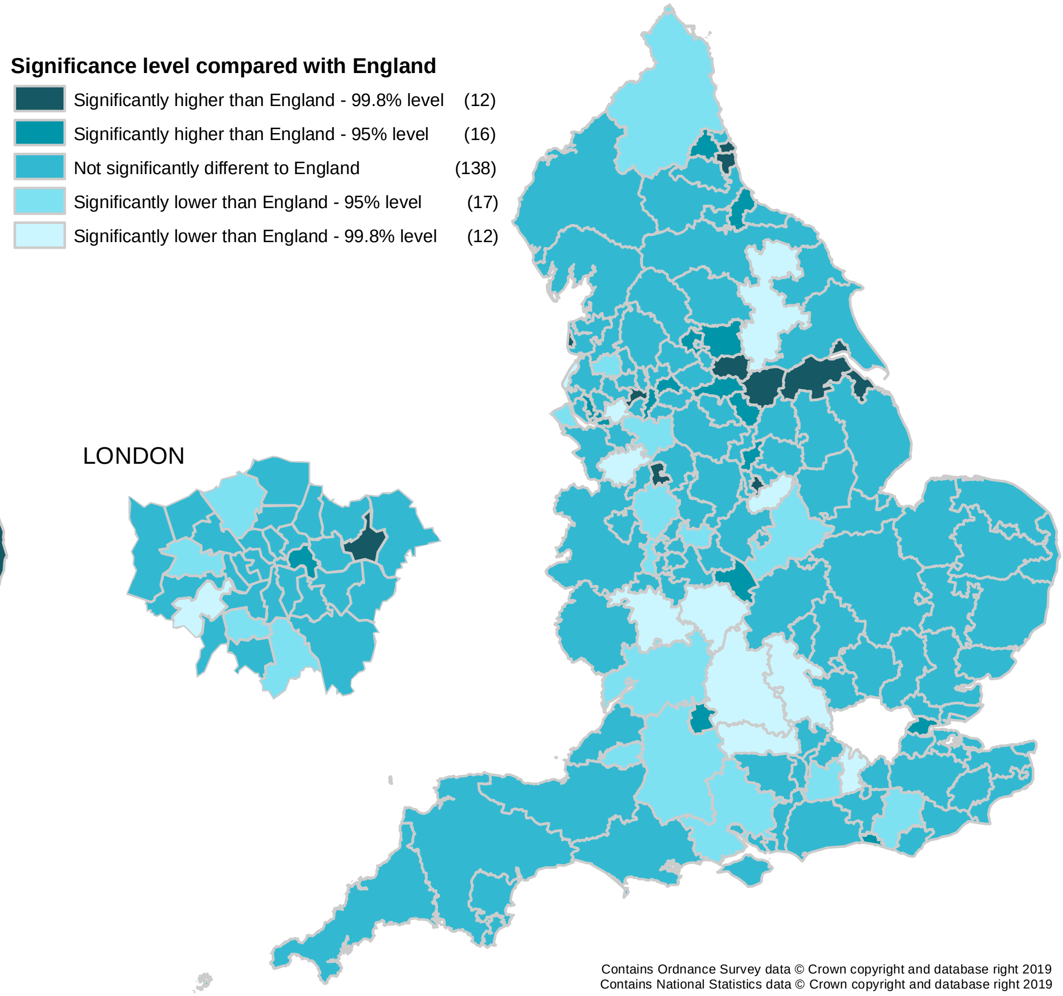
Box plot percentile	CCG rank position (195 CCGs in 2018)
Max	195
95%	Mid value between values of CCGs in ranks 185 and 186
75%	Mid value between values of CCGs in ranks 146 and 147
50% - Median	Mid value between values of CCGs in ranks 97 and 98
25%	Mid value between values of CCGs in ranks 48 and 49
5%	Mid value between values of CCGs in ranks 9 and 10
Min	1

Risk factors – Smoking

Map 1a: Variation in percentage of people aged 18 and over self-reporting as smokers by CCG (2018)

Optimum value: Low

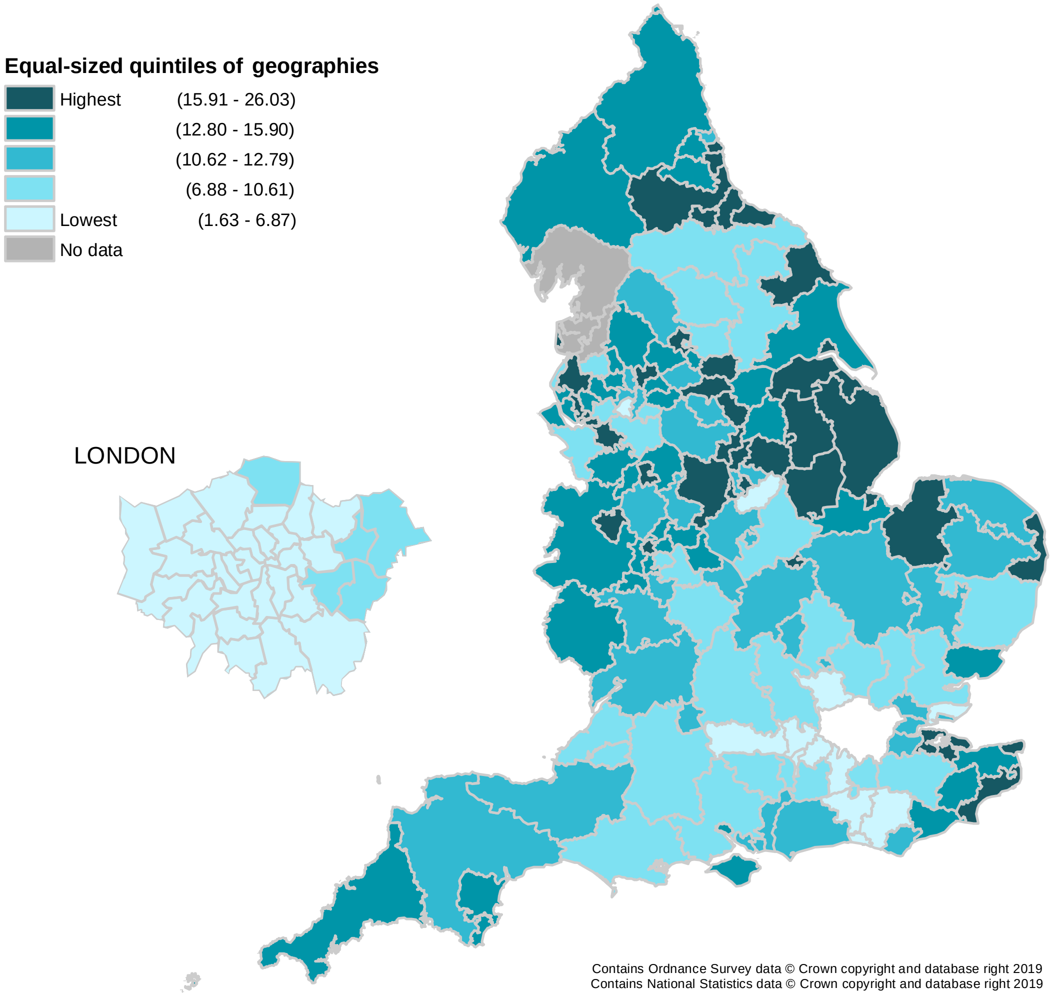


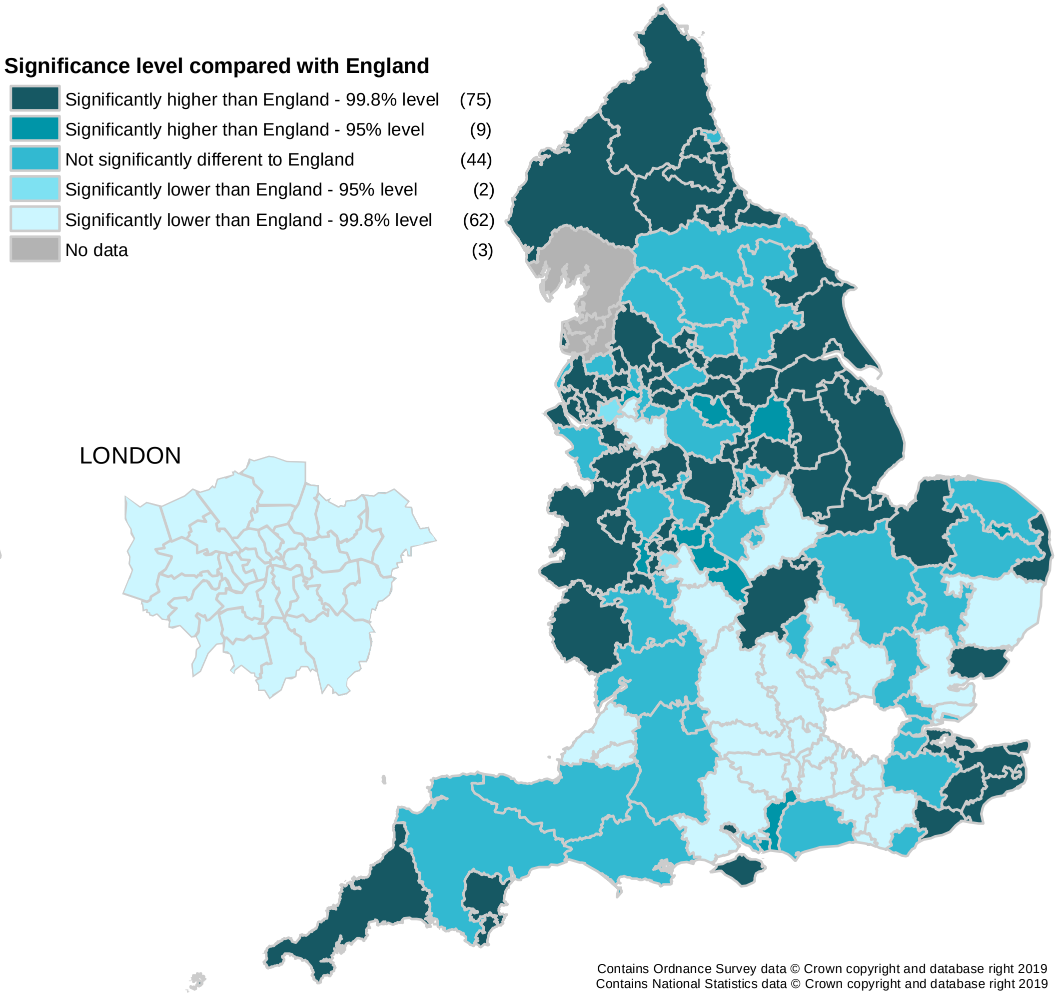


Risk factors – Smoking

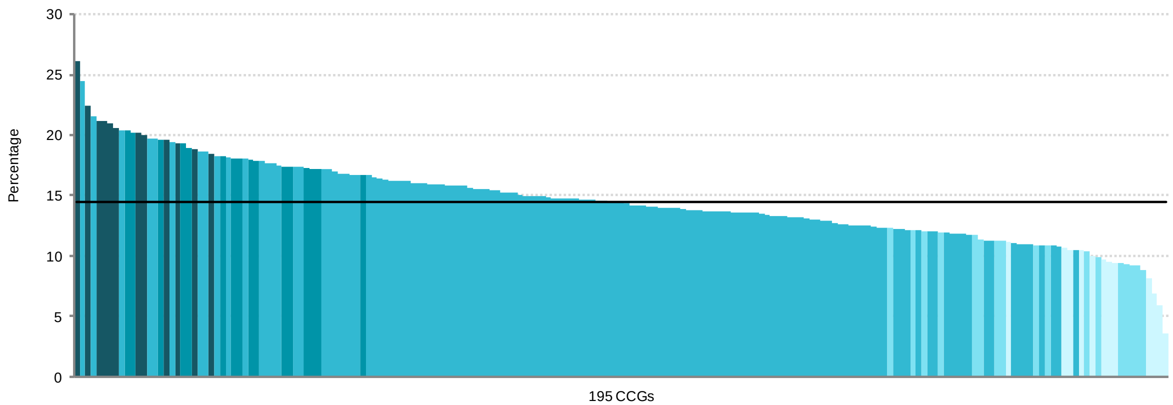
Map 1b: Variation in percentage of women who are known to smoke at time of delivery by CCG (2017/18)

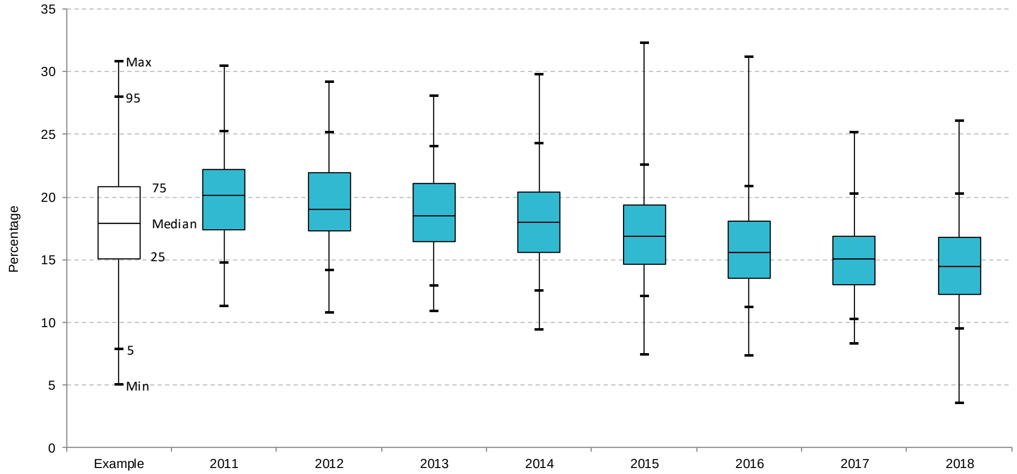
Optimum value: Low





Variation in percentage of people aged 18 and over self-reporting as smokers by CCG (2018)



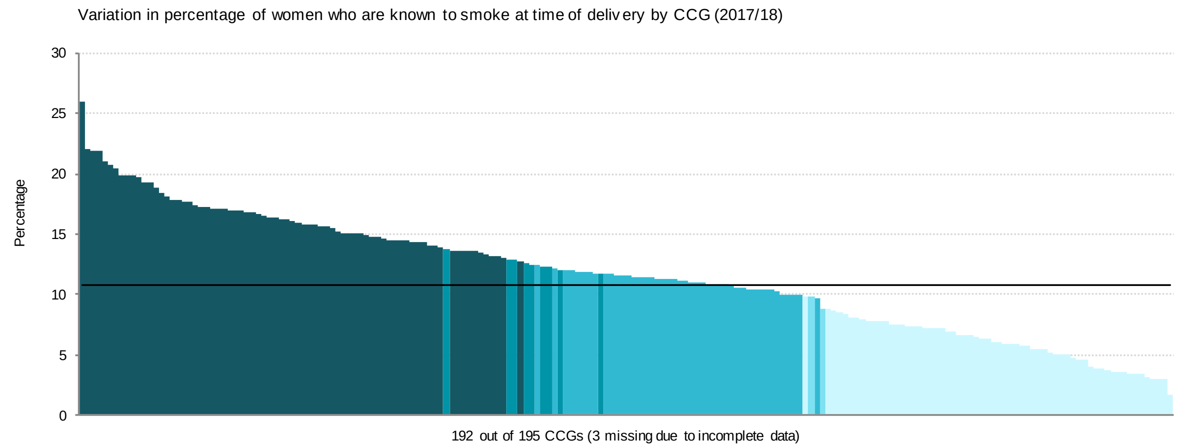


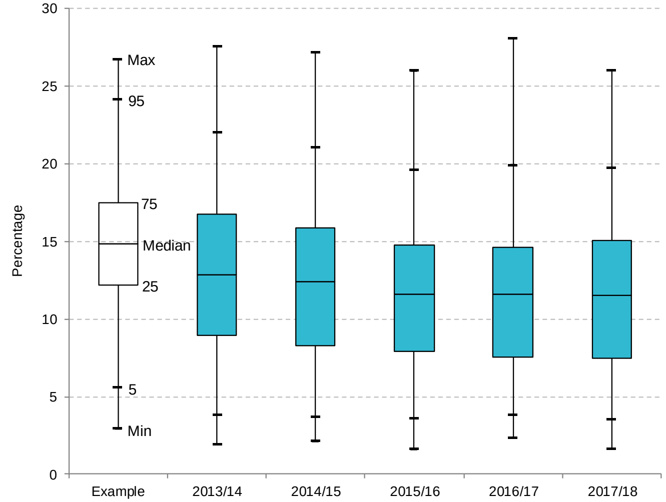
		2011	2012	2013	2014	2015	2016	2017	2018	
Max-Min (Range)		19.2	18.4	17.2	20.4	24.8	23.8	16.9	22.5	No significant change
95th-5th percentile		10.4	11.0	11.1	11.7	10.5	9.7	9.9	10.8	No significant change
75th-25th percentile		4.8	4.6	4.6	4.9	4.7	4.6	3.9	4.5	No significant change
Median		20.1	19.0	18.5	17.9	16.9	15.6	15.1	14.5	DECREASING Significant

Context

Smoking remains the leading cause of preventable illness and premature death in England.[1] Smoking is associated with many diseases, including respiratory disease, cardiovascular disease and cancers; the Royal College of Physicians' Hiding in Plain Sight report provides a useful summary of the health impacts of smoking.[2] Table 1.1 summarises the association between smoking and a variety of respiratory diseases. In England in 2016/17 22% of all hospital admissions for respiratory disease (excluding cancer) were attributable to smoking, and 37% of respiratory deaths.[3] Smoking is estimated to cost the NHS approximately £2.6 billion a year.[4]

Secondhand smoke is also associated with many diseases including respiratory disease, cardiovascular disease and cancer. Exposure to cigarette smoke pre-birth or 'in utero' is known to affect lung development,[5] and increase the risk of wheeze and asthma in children.[6] One pooled analysis of 21,600 pre-school children from 8 European birth cohorts found a 65% (95% CI 18% to 131%) increased risk of asthma among children aged 4 to 6 years whose mothers smoked during pregnancy, with the risk increasing in relation to daily cigarette consumption during the first trimester of pregnancy.[7]





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		25.7	25.1	24.4	25.8	24.4	No significant change
95th-5th percentile		18.3	17.3	16.0	16.1	16.2	No significant change
75th-25th percentile		7.8	7.6	6.9	7.1	7.6	No significant change
Median		12.9	12.4	11.6	11.6	11.6	DECREASING Significant

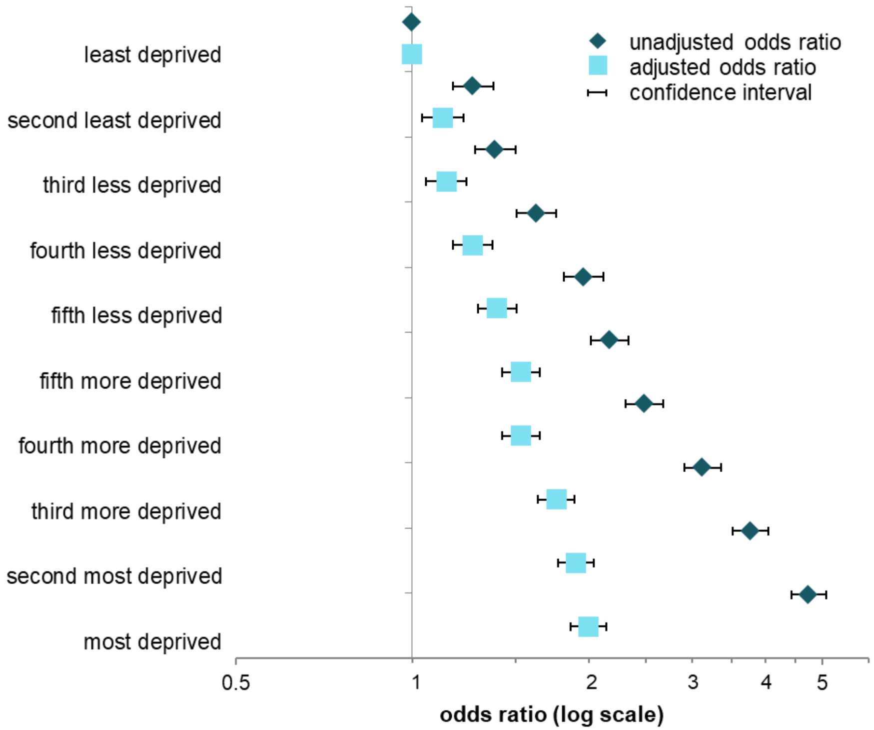
Table 1.1: Association of current smoking status with respiratory disease risk (including lung cancer)[2]

Disease	Estimated relative risk (95% CI) for current smokers relative to non-smokers
Lung Cancer	10.92 (8.28–14.40)
COPD	4.01 (3.18–5.05)
Asthma	1.61 (1.07–2.42)
Tuberculosis	1.57 (1.18–2.10)
Pneumonia	2.18 (1.69–2.80)
Influenza (clinically diagnosed)	1.34 (1.13–1.59)
Influenza (microbiologically confirmed)	5.69 (2.79–11.60)
Idiopathic Pulmonary Fibrosis	1.58 (1.27–1.97)
Obstructive Sleep Apnoea	1.97 (1.02–3.82)

Smoking prevalence in England has declined in the general population year on year and is now at a record low, with 14.9% of people aged 18 years and over who are current smokers (6.1 million people).[8] However, inequalities persist and there are still groups where smoking rates remain stubbornly high, such as among people in manual occupations (around 1 in 4 are smokers[8] and individuals who suffer with a serious mental illness (40.5%[9]). Even when other factors such as age, sex, occupation, ethnicity are adjusted for, the most deprived decile are twice as likely compared to the least deprived to smoke (Figure 1.1).

Smoking during pregnancy is also a major health inequality, with prevalence varying significantly across communities and social groups. Data from antenatal bookings found that mothers in the most deprived decile were over 5 times more likely to be current smokers than those in the least deprived decile (19.8% to 3.7%).[10] The last infant feeding survey

Figure 1.1: **Odds* of smoking by deprivation decile, England 2016**[11]



*Adjusted odds ratios accounting for age, sex, ethnicity, religion, occupation, marital status, sexual identity, general health, disability, educational qualifications, housing type and benefits status.

(2010) found that mothers in routine and manual occupations were also 5 times as likely to smoke throughout pregnancy than professional and managerial workers, while those under 20 were 6 times as likely as women aged 35 years and over.[12]

The most effective smoking cessation intervention is comprised of 2 key elements: behavioural support and medication or nicotine replacement. Those who use a combination of face-to-face, individual or group support and medication or nicotine replacement are estimated to experience improved quit rates around 2 to 3 times higher.[13] Stop smoking services in the UK are assessed to be both highly effective and provide value-for-money.[14] While some of the return on investment is long-term, there are also clear benefits and evidence of shorter term gains; a secondary care based smoking cessation service in Canada led to a 50% reduced risk of all-cause readmission within 30 days (adjusted, 95% CI 28%-66%).[15]

Commissioning of community stop smoking services in England has predominantly been by local authorities. It is however crucial that interventions to treat tobacco dependence are embedded across all primary and secondary care services, particularly considering improved health outcomes from smoking cessation. Total spend per smoker by local authorities on stop smoking interventions and tobacco control activity has reduced by 25% since 2013/14 (Figure 1.2). However, the need remains for effective tobacco dependence treatment for patients who smoke. The interventions are recommended by NICE and includes frontline health professionals discussing smoking with their patients, with stop smoking support offered on site or referrals to local services. The Royal College of Physician's recent report on treating tobacco dependency in the NHS concluded:

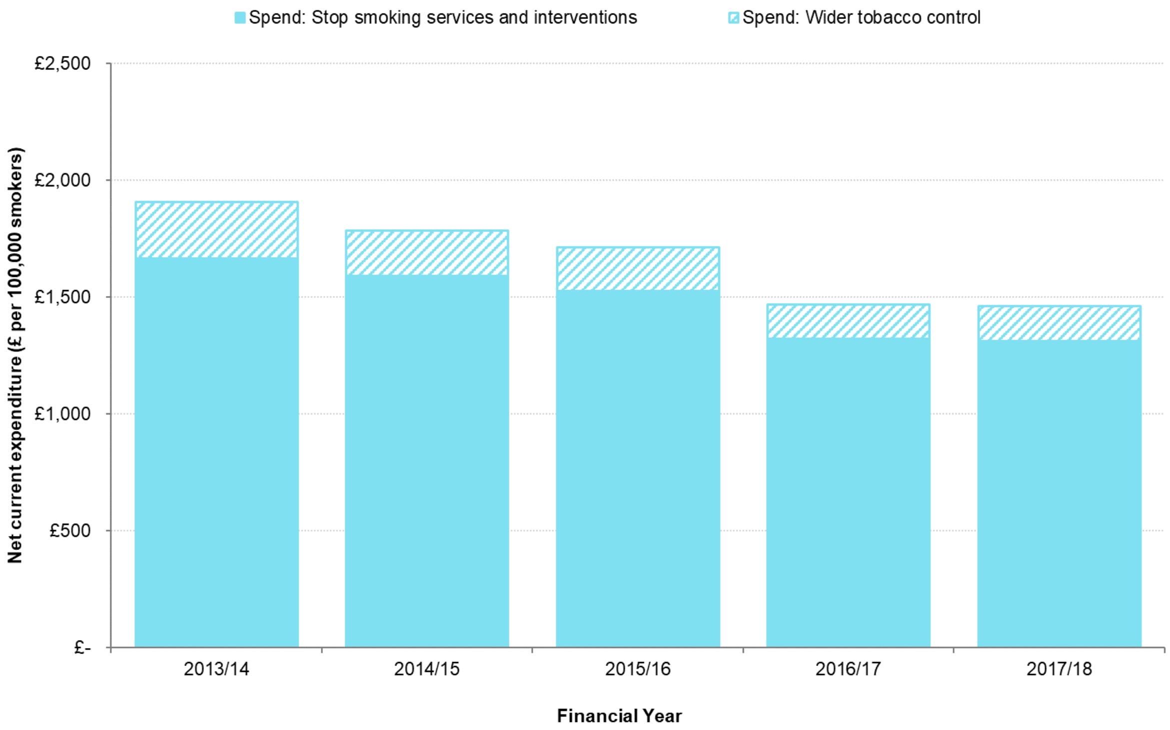
"Smoking is the largest avoidable cause of death and disability, and of social inequalities in health, in the UK. Preventing smoking should therefore be the highest priority in medicine"[2]

Magnitude of variation

Map 1a: Variation in percentage of people aged 18 and over self-reporting as smokers by CCG (2018)

The maps and column chart display the latest period (2018), during which CCG values ranged from 3.6% to 26.1%, which is a 7.3-fold difference between CCGs. The England value for 2018 was 14.4%. The box plot shows the distribution of CCG values for the period 2011 to 2018.There was no

Figure 1.2: Spend on stop smoking services and tobacco control per 100,000 smokers, local authorities in England[16]



significant change in any of the 3 variation measures between 2011 and 2018. The median decreased significantly from 20.1% in 2011 to 14.5% in 2018.

Map 1b: Variation in percentage of women who are known to smoke at time of delivery by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 1.6% to 26.0%, which is a 16.0-fold difference between CCGs. The England value for 2017/18 was 10.8%. The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18. The median decreased significantly from 12.9% in 2013/14 to 11.6% in 2017/18.

Health inequalities are preventable differences in health outcomes between different population groups. Due to the extent of harm caused by smoking, differences in smoking prevalence between populations and geographical areas translate into substantial variations in ill health and death rates.

Smoking is the single most important driver of health inequalities and much more common among unskilled, low income workers than it is in professional and more affluent groups. The more disadvantaged someone is, the more likely they are to smoke and to suffer from smoking-related disease and premature death.

Smoking is passed through generations and reinforced by social norms and attitudes. Young people living in communities where a greater proportion of their role models smoke, and where tobacco is easier to access are more likely to try smoking and become regular smokers into adulthood. Smoking is clearly associated health outcomes in different parts of the country, for example in the north of England where there are both higher rates of smoking and poorer health is observed. However, there will be variation in all local areas because smoking is higher among people with mental health conditions, prisoners, looked-after children, and in the LGBT community.[17]

To reduce this variation there is a need to implement measures that have a greater effect on smokers in higher prevalence groups. In practice, this means prioritising both population level and targeted interventions.

Options for action

NICE have published comprehensive guidance (NG92, PH48 and PH45) and effective treatment of tobacco dependence in the local health and social care system includes the following recommendations:

- use sustainability and transformation plans, health and wellbeing strategies, and any other relevant local strategies and plans to ensure evidence-based stop smoking interventions and services are available for everyone who smokes
- prioritise specific groups who are at high risk of tobacco-related harm
- set targets for stop smoking services, including the number of people using the service and the proportion who successfully quit smoking. Performance targets should include:
    - treating at least 5% of the estimated local population who smoke each year
    - achieving a successful quit rate of at least 35% at 4 weeks, based on everyone who starts treatment and defining success as not having smoked (confirmed by carbon monoxide monitoring of exhaled breath) in the 4th week after the quit date
- ensure the following evidence-based interventions are available for adults who smoke:
    - heath care professional advice (ASK, ADVISE, ACT)
    - varenicline
    - nicotine replacement therapy (NRT) – short and long acting
    - bupropion
    - support the use of e-cigarettes for stopping smoking
    - behavioural support (individual and group)

Resources

Department of Health and Social Care (2018) Tobacco Control Delivery Plan 2017-2022 [Accessed 12 February 2019]

Department of Health (2017) Towards a smoke free generation: Tobacco Control Plan for England 2017-2022 [Accessed 12 February 2019]

National Centre for Smoking Cessation and Training [Accessed 12 February 2019]

NHS England Commissioning for Quality and Innovation [2017/19 CQUIN] [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2013) Smoking: acute, maternity and mental health services (NICE public health guideline [PH48]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2013) Smoking: harm reduction (NICE public health guideline [PH45]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2015) Smoking: harm reduction (NICE quality standard [QS92]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2015) Smoking: reducing and preventing tobacco use (NICE quality standard [QS82]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2010) Smoking: stopping in pregnancy and after childbirth (NICE public health guideline [PH26]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2007) Smoking: workplace interventions (NICE public health guideline [PH5]) [Accessed 12 February 2019]

National Institute for Health and Care Excellence (2018) Stop smoking interventions and services (NICE Guideline [NG92]) [Accessed 12 February 2019]

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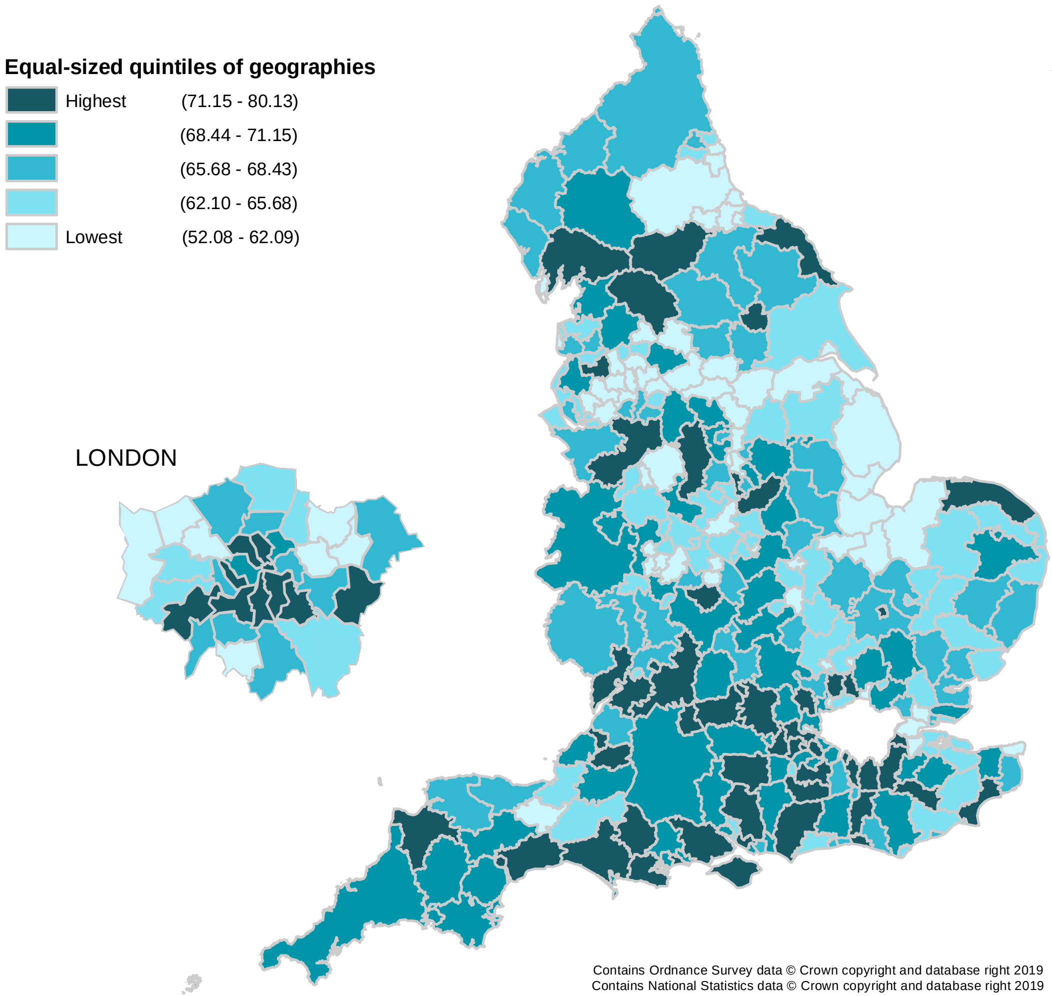
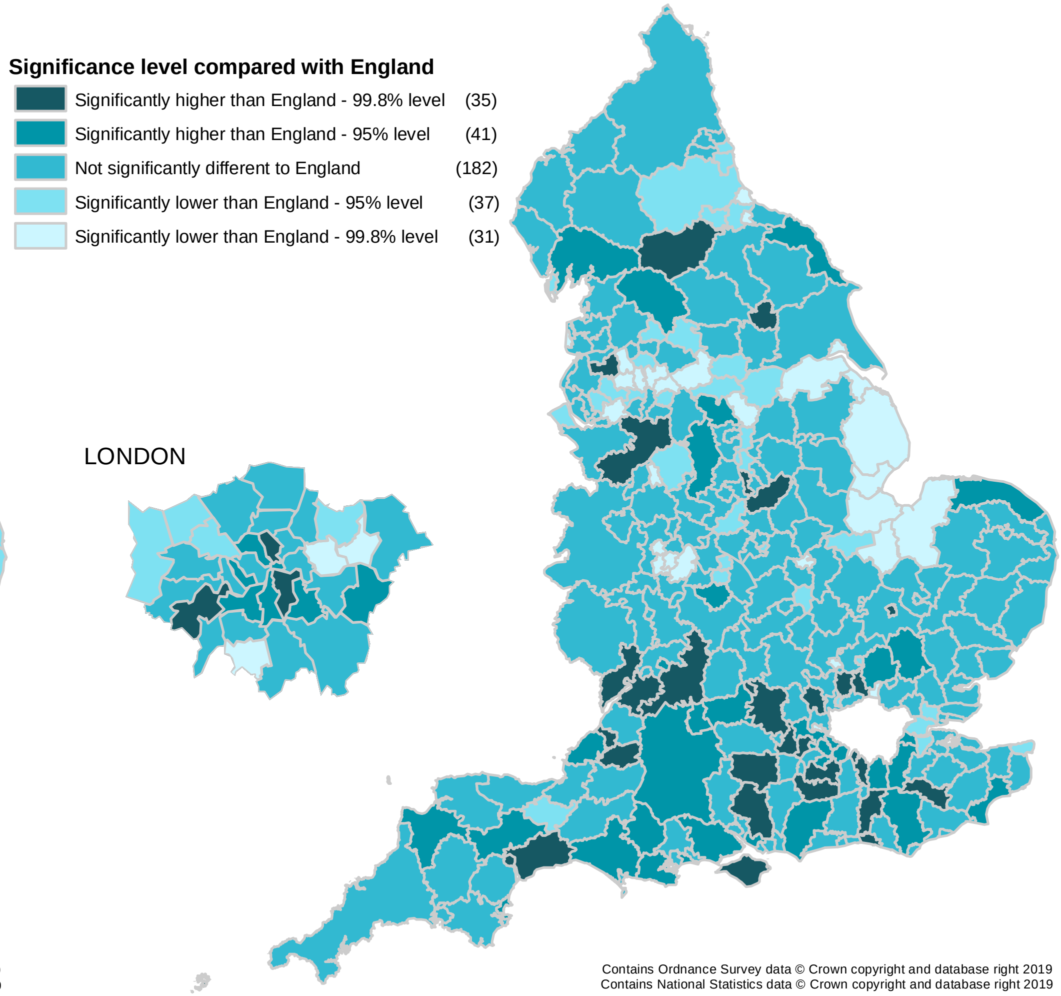
[17] Action on Smoking and Health (2016) Health inequalities and smoking [Accessed 12 February 2019]

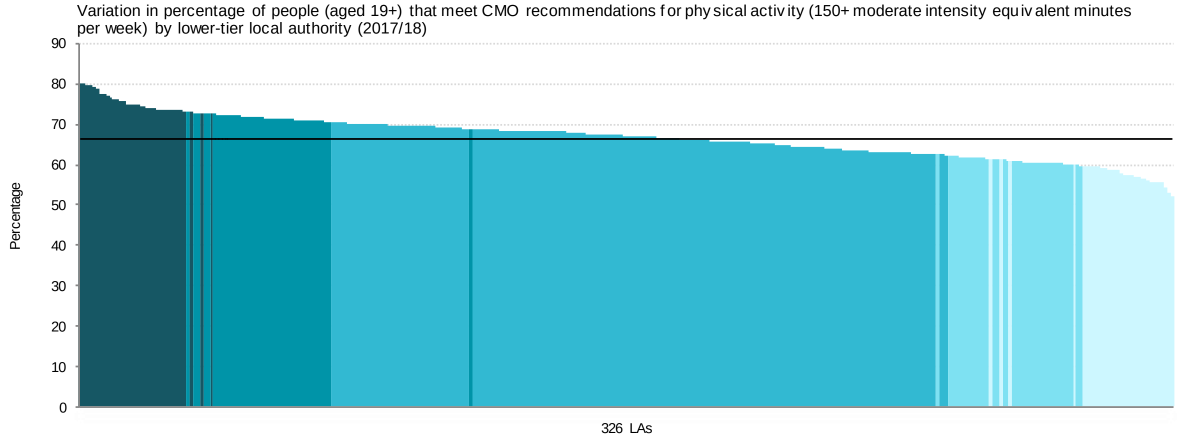
Risk factors – Physical activity

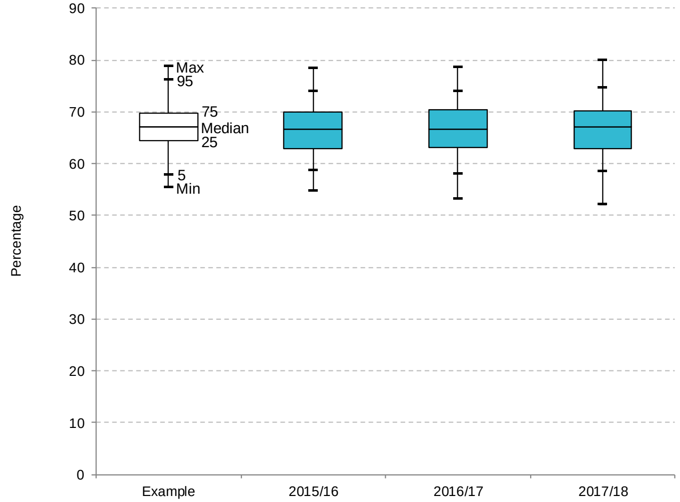
Map 2: Variation in percentage of people (aged 19+) that meet CMO recommendations for physical activity (150+ moderate intensity equivalent minutes per week) by lower-tier local authority (2017/18)

Optimum value: High









	Example	2015/16	2016/17	2017/18	
Max-Min (Range)		23.8	25.4	28.1	**No significant change**
95th-5th percentile		15.2	15.9	16.2	**No significant change**
75th-25th percentile		7.2	7.4	7.2	**No significant change**
Median		66.7	66.8	67.2	**No significant change**

Context

The UK Chief Medical Officers' recommendations are that adults undertake at least 150 minutes of moderate intensity physical activity (for example brisk walking or cycling), 75 minutes of vigorous physical activity (for example running or swimming) per week. Individuals should undertake muscle and bone strengthening activity on at least 2 days per week and reduce extended periods of sedentary (sitting) time.[1] Physical inactivity in adults is defined as less than 30 minutes of moderate intensity physical activity per week.[2]

68.5% of adult men and 64.2% of adult women met the guidelines for physical activity in 2017/18.[3] There are also low levels of activity among individuals with a disability and long-term health conditions; 50.2% of people with a disability meet the guidelines for physical activity compared to 70.7% of those without.[3]

Physical activity has a wide range of both physical and mental health benefits. Overall it is estimated that 16.9% of premature mortality (all cause) in the UK could be prevented if physical inactivity was eliminated,[4] and taking into account the costs of treating 5 major diseases (cardiovascular disease, type 2 diabetes, bowel cancer, breast cancer and cerebrovascular disease) and the impact of physical inactivity on each, physical activity is estimated to cost the NHS over £450 million per year (or £8.17 per person).[5]

There are clear inequalities in levels of physical activity with older age groups, individuals living in areas of higher deprivation, women, disabled people (including those with a long-term health condition) and members of certain ethnic groups less likely to be physically active.[2]

The impact of physical activity on respiratory health specifically is often not described when discussing the benefits of physical activity; however, there is evidence that physical activity is an important part of any treatment plan for a patient with COPD.[6] It can increase their quality of life, improve confidence, reduce symptoms and lead to fewer hospital admissions. There is also some observational evidence that physical activity is associated with reduced decline in lung function; this includes among individuals with asthma,[7] and among people who smoke where physical activity is also associated with a reduced risk among smokers of developing COPD.[8] Obesity and some respiratory diseases are known to be linked (see Map 3: Excess weight), and therefore the impact of physical activity on weight may also be a factor.

Magnitude of variation

Map 2: Variation in percentage of people (aged 19+) that meet CMO recommendations for physical activity (150+ moderate intensity equivalent minutes per week) by lower-tier local authority (2017/18)

The maps and column chart display the latest period (2017/18), during which lower-tier local authority values ranged from 52.1% to 80.1%, which is a 1.5-fold difference between lower-tier local authorities. The England value for 2017/18 was 66.3%.

The box plot shows the distribution of lower-tier local authority values for the period 2015/16 to 2017/18. There was no significant change in any of the 3 variation measures between 2015/16 and 2017/18

A number of common health inequalities exist that can prevent adults from meeting the recommended levels of physical activity. These factors such as age, socio-economic status, race, disability, health conditions, gender and religion/culture can lead to variation in physical activity rates and should be taken into consideration when designing activities to promote physical activity in adults.

Options for action

Local authorities and health and care systems should review their practice using the new NICE quality standard [QS183] ‘Physical activity: encouraging activity in the community’, published in June 2019.

Local healthcare organisations should use the NICE quality standard [QS 84] ‘Physical activity: for NHS staff, patients and carers’ to review their offer. This includes:

- brief advice to patients during NHS Health Checks
- advice on physical activity to parents and carers during the Healthy Child Programme 2 year review and as part of the National Child Measurement Programme
- having ‘an organisation-wide, multi-component programme to encourage and support employees to be more physically active’[9]

NICE guidelines NG115[10] on chronic obstructive pulmonary disease recommend:

- pulmonary rehabilitation should be available to all appropriate people with COPD, including those with recent hospitalisation for an acute exacerbation
- pulmonary rehabilitation should be offered to all patients who consider themselves functionally disabled by COPD (MRC dyspnoea grade 3 and above)
- the rehabilitation process should incorporate a programme of physical training, disease education, nutritional, psychological and behavioural intervention

Furthermore, The British Thoracic Society guidelines,[6] also includes patients with a Medical Research Council dyspnoea grading level 1-2 should also be encouraged to increase their activity to slow their decline in pulmonary function and progression of COPD[8] with evidence that community based programmes can also help.[11]

Resources

Faulty of Sport and Exercise Medicine, Public Health England, Sport England Moving Medicine Evidence and resources for patient physical activity conversations, including COPD [Accessed 18 July 2019]

NHS Digital (2017) Health Survey for England, 2016: Adult physical activity [Accessed 29 August 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guidance [NG115]) [Accessed 8 July 2019]

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National Institute for Health and Care Excellence (2014) Physical activity: exercise referral schemes (NICE public health guideline [PH54]) [Accessed 8 July 2019]

National Institute for Health and Care Excellence (2009) Physical activity for children and young people (NICE public health guideline [PH17]) [Accessed 8 July 2019]

National Institute for Health and Care Excellence (2015) Physical activity: for NHS staff, patients and carers (NICE quality standard [QS84]) [Accessed 8 July 2019]

National Institute for Health and Care Excellence (2008) Physical activity in the workplace (NICE public health guideline [PH13]) [Accessed 8 July 2019]

National Institute for Health and Care Excellence Physical activity overview - NICE Pathway [Accessed 8 July 2019]

National Institute for Health and Care Excellence (2012) Physical activity: walking and cycling (NICE public health guideline [PH41]) [Accessed 8 July 2019]

Public Health England Everybody Active, Every Day: framework for physical activity An evidence-based approach for national and local action to address the physical inactivity epidemic [Accessed 8 July 2019]

Public Health England Physical activity: applying All Our Health Evidence and guidance to help healthcare professionals embed physical activity into daily life. [Accessed 8 July 2019]

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[9] National Institute for Health and Care Excellence (2015) Physical activity: for NHS staff, patients and carers Quality Standards [QS84] [Accessed 22 March 2019]
[10] National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management Guidance [NG115] [Accessed 8 July 2019]
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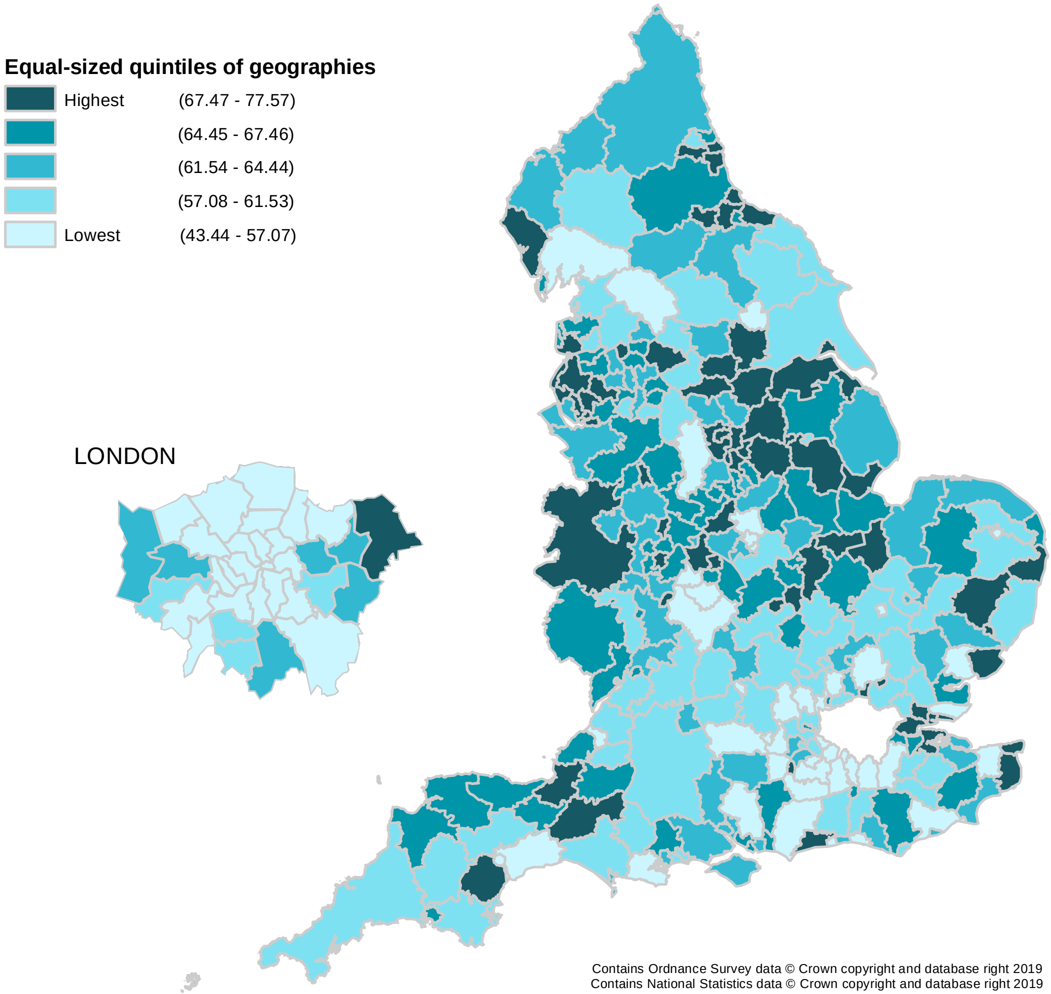
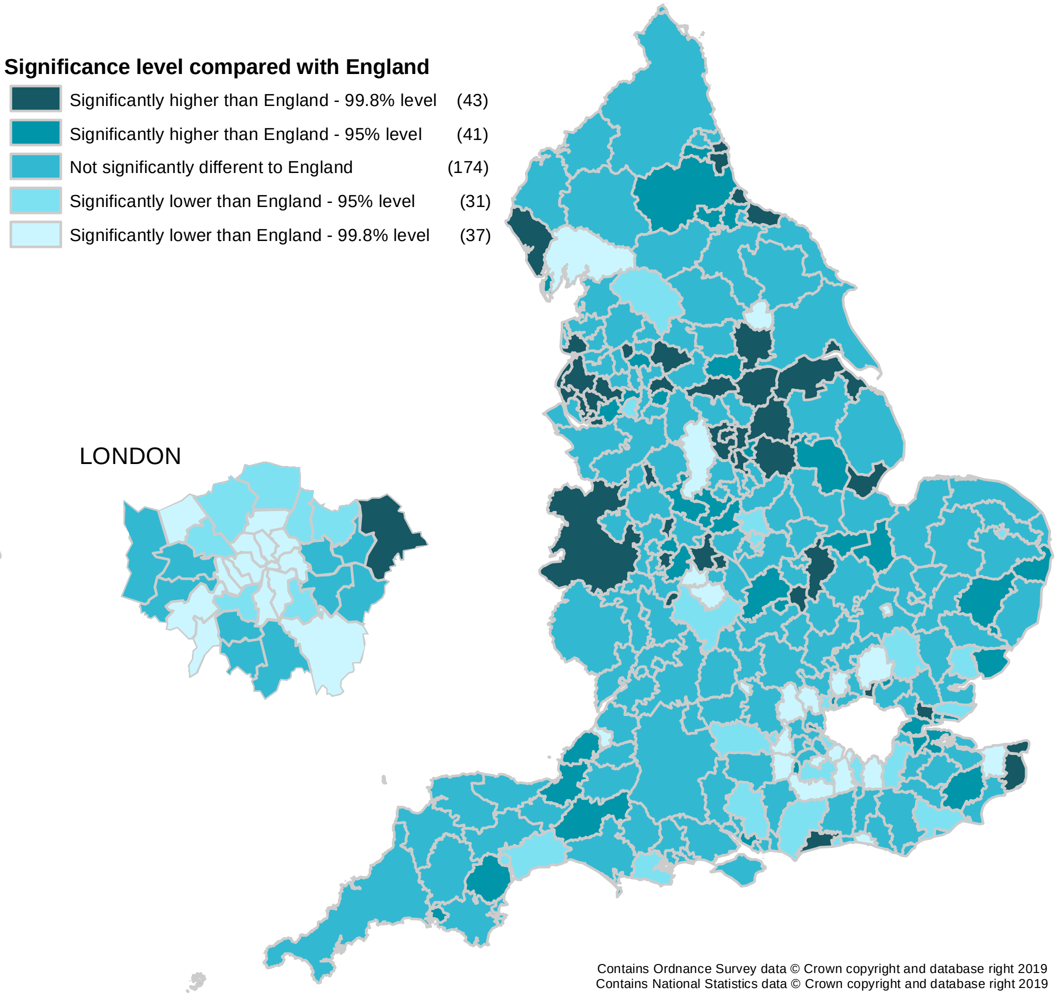
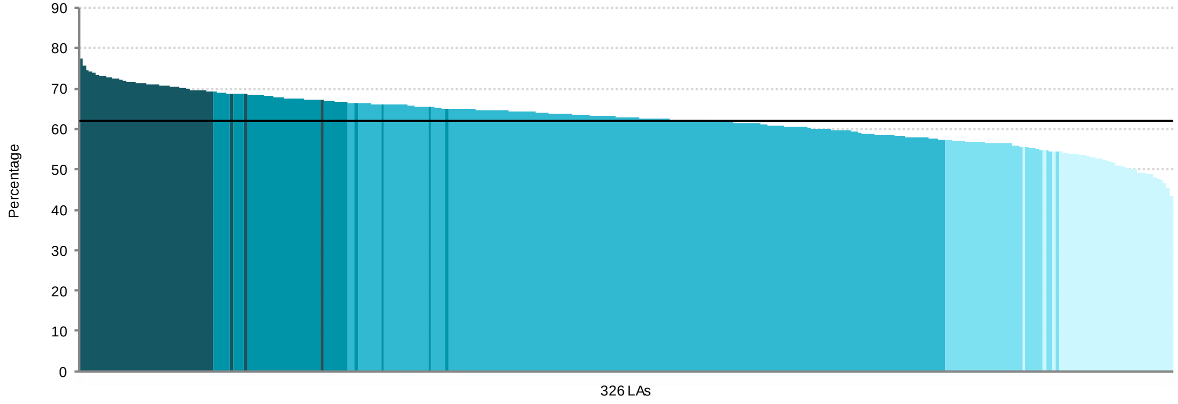
Risk factors – Excess weight

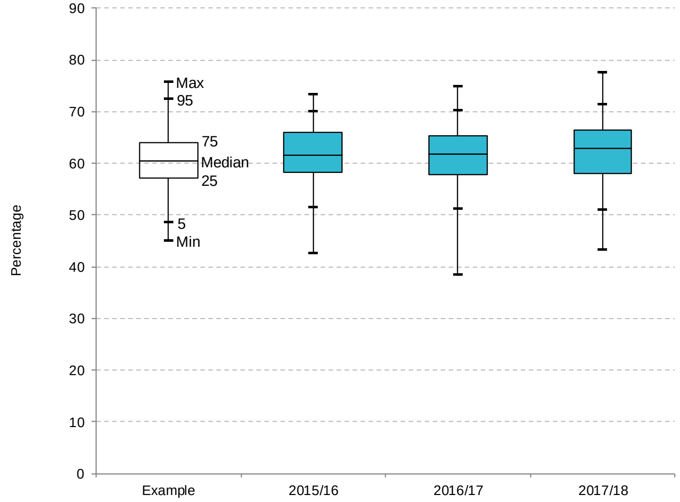
Map 3: Variation in percentage of people aged 18 years and over classified as overweight or obese (body mass index greater than or equal to 25 kg/m2) by lower-tier local authority (2017/18)

Optimum value: Low









	Example	2015/16	2016/17	2017/18	
Max-Min (Range)		30.7	36.5	34.1	No significant change
95th-5th percentile		18.6	19.0	20.4	No significant change
75th-25th percentile		7.7	7.4	8.4	No significant change
Median		61.6	61.8	62.9	No significant change

Context

Obesity is an accumulation of excess body fat when energy intake from food and beverage consumption exceeds the energy expended through metabolism and physical activity. The causes of obesity are complex, and relate to a variety of genetic, environmental, societal and behavioural factors.[1]

In England, the prevalence of adults living with obesity (Body Mass Index (BMI) ≥30 kg/m^2) was 29% in 2017. Obesity prevalence increased steeply from 15% in 1993 to around 2000 with a slower rate from 2003 to 2016, between 23% and 27%. 2017 has seen a slight increase. The proportion of men and women living with morbid obesity (BMI ≥40 kg/m^2 or higher) is 2% and 5% respectively.[2]

Table 3.1: Prevalence of overweight and obese adults, England, 2017[2]

Body Mass Index (BMI)		Men	Women
Overweight (%)	BMI >= 25 <than 30kg/m^2	39.8	31.5
Obese (%)	BMI >= 30 <than 40kg/m^2	24.9	25.4
Morbidly obese (%)	BMI >= 40kg/m^2	2.5	4.6
Total overweight or obese (%)	BMI >= 25 kg/m^2	67.2	61.5

Obesity is associated with multiple health risks including:

- type 2 diabetes
- cardiovascular disease
- some cancers
- increased risk of skeletal and joint problems

Obesity is also associated with psychological conditions and reduced wellbeing.

Along with increasing age and being male, obesity is a major risk factor for obstructive sleep apnoea/hypopnoea syndrome (OSAHS).[3] Individuals who are overweight or obese are more likely to have respiratory symptoms than those with a normal BMI, even where there is no demonstrable lung disease;[4] there are a variety of mechanisms which might contribute including fat deposition around the upper airway increasing collapsibility and a heavier thorax that reduces lung compliance.[5] Obesity is also associated with asthma with some studies, indicating that individuals living with obesity are at a higher risk when compared to individuals who are a healthy weight. One meta-analysis found a 51% (95% CI 27% to 80%) increased odds of asthma incidence among those who were overweight or obese compared to individuals with a healthy weight.[6] The reasons behind the association are not fully understood, though weight loss may bring benefit for some people.[7]

The current costs to the NHS attributable to overweight and obesity are £6.1 billion for the UK as a whole and £5.1 billion for England.[8,9] The wider costs to society and the economy have been estimated to rise to £49.9 billion per year by 2050.[10] The treatment and prevention of obesity are major public health challenges.

Magnitude of variation

Map 3: Variation in percentage of people aged 18 years and over classified as overweight or obese (body mass index greater than or equal to 25 kg/m2) by lower-tier local authority (2017/18)

The maps and column chart display the latest period (2017/18), during which lower-tier local authority values ranged from 43.4% to 77.6%, which is a 1.8-fold difference between lower-tier local authorities. The England average for 2017/18 was 62.0%.

The box plot shows the distribution of lower-tier local authority values for the period 2015/16 to 2017/18. There was no significant change in any of the 3 variation measures between 2015/16 and 2017/18.

When interpreting this data, it is important to note that the statistics presented are adjusted estimates rather than actual prevalence. These estimates, however, give the best indication of relative prevalence's of overweight and obesity currently available. It should also be borne in mind that the prevalence of obesity is high in all local authorities; obesity is a major problem even in the local authorities with the lowest prevalence.

Prevalence of obesity in adults varies by age, sex, ethnic group and disability.[2] Obesity prevalence increases with age up to approximately 70 years in both sexes. Health Survey for England data show women from Black ethnic groups have a higher prevalence of obesity when compared with that in the general population, and men and women from Asian ethnic groups have a lower prevalence. Although data are limited, people with disabilities are more likely to be obese and have lower levels of physical activity.

Obesity prevalence can vary with socioeconomic status: 38% of women in the lowest quintile of household income were obese compared with 18% of women in the highest quintile. In men, a smaller decrease is seen from the lowest income quintile to the highest but this decrease does not appear to be significantly different.[2] Potential reasons for differences seen in the degree of variation between areas are complex including the wider determinants of health.[11] Drivers of obesity in the local area include the food environment, which tends to be characterised through the density of fast food outlets.[10] Other potential reasons may include:

- higher levels of sedentary behaviour and lower levels of physical activity due to demographic, social, individual and environmental factors
- lack of access to lifestyle management services such lifestyle weight management and obesity services and exercise referral

Options for action

When planning service improvement or development to prevent and tackle obesity in adults, especially in view of the rising trend in most parts of England, commissioners, clinicians, service providers and public health departments should consider working with their local health and wellbeing boards and sustainability and transformation footprints:

- to review local prevalence and trends for obesity
- to work across the local system to understand the drivers of obesity and plan actions[12]
- to refine and develop local strategies for reducing obesity, supported by guidance from NICE (see 'Resources') and other organisations. This needs to be conducted as part of a whole-system response in conjunction with national, regional and health service responses

Resources

NHS Digital (2017) Health Survey for England, 2016: Adult physical activity [Accessed 29 August 2019]

National Institute for Health and Care Excellence Diet overview - NICE Pathway [Accessed 5 July 2019]

National Institute for Health and Care Excellence Lifestyle weight management services for overweight or obese adults overview - NICE Pathway [Accessed 5 July 2019]

National Institute for Health and Care Excellence (2016) Obesity in adults: prevention and lifestyle weight management programmes (NICE [quality standard [QS111]) [Accessed 5 July 2019]

National Institute for Health and Care Excellence Obesity overview - NICE Pathway [Accessed 5 July 2019]

National Institute for Health and Care Excellence Obesity: working with local communities overview - NICE Pathway [Accessed 5 July 2019]

National Institute for Health and Care Excellence Physical activity overview - NICE Pathway [Accessed 8 July 2019]

National Institute for Health and Care Excellence (2015) Preventing excess weight gain (NICE guideline [NG7]) [Accessed 5 July 2019]

Public Health England Adult obesity: applying All Our Health Information and resources for health professionals [Accessed 5 July 2019]

Public Health England Adult weight management: short conversations with patients Practical advice and tools to support health and care professionals make brief interventions in weight management for adults [Accessed 5 July 2019]

Public Health England Obesity Intelligence Knowledge hub website Wide-ranging authoritative information on data, evaluation and evidence related to weight status and its determinants [Accessed 5 July 2019]

Public Health England Weight management: guidance for commissioners and providers Guides to support the commissioning and delivery of tier 2 weight management services for children, families and adults [Accessed 5 July 2019]

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1 Government Office for Science (2007) Tackling Obesities: Future Choices Foresight Project Report 2nd edition [Accessed 28 July 2019]
2 NHS Digital (2018) Health Survey for England 2017 [Accessed 27 June 2019]
3 National Institute for Health and Care Excellence (2008) Continuous positive airway pressure for the treatment of obstructive sleep apnoea/hypopnoea syndrome [Accessed 11 February 2019]
4 Zammit C, Liddicoat H, Moonsie I and others (2010) Obesity and respiratory diseases Int J Gen Med 3:335-343 [Accessed 28 July 2019]

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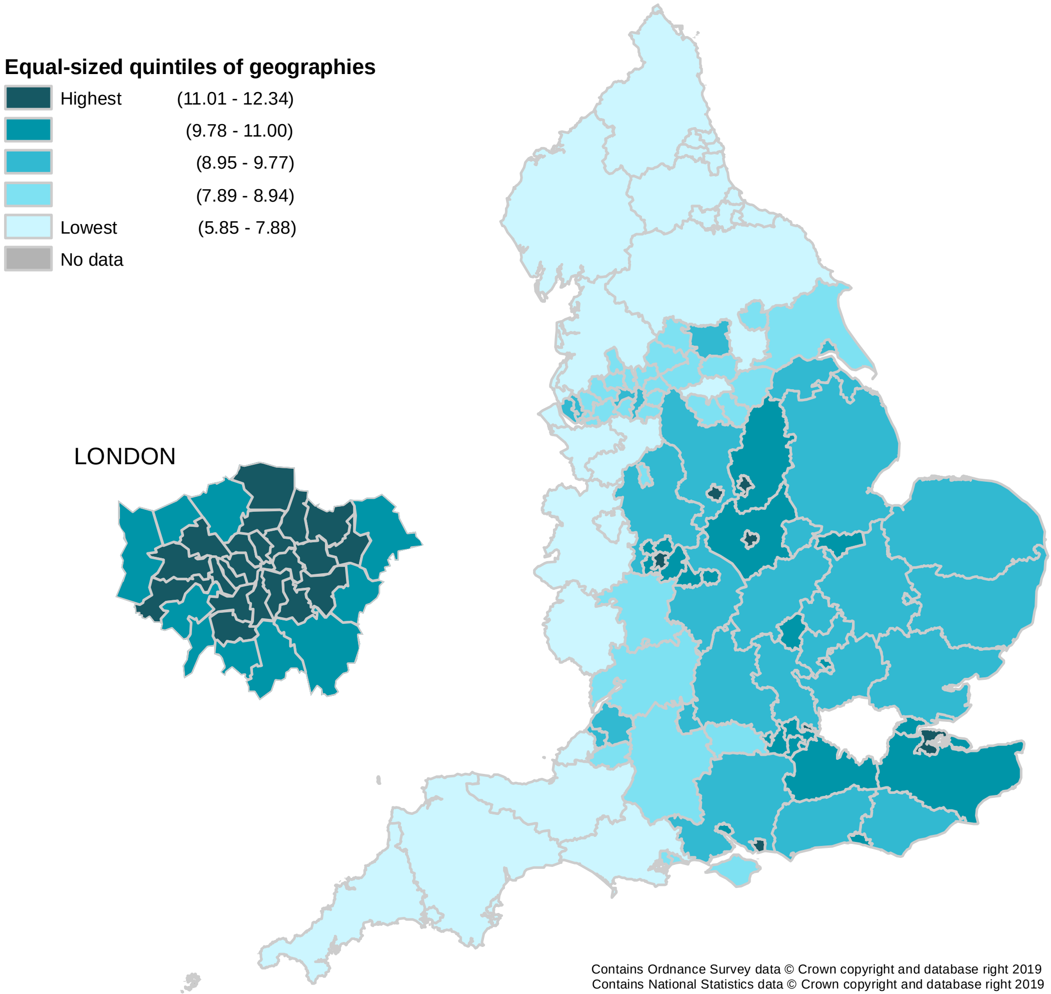
[5] Romero-Corral A, Caples S, Lopez-Jiminez F and others (2010) Interactions between obesity and obstructive sleep apnea: implications for treatment Chest 137(3):711–719 [Accessed 28 July 2019]
[6] Beuther D and Sutherland E (2007) Overweight, obesity, and incident asthma: a meta-analysis of prospective epidemiologic studies Am J Respir Crit Care Med 175(7):661-6 [Accessed 28 July 2019]
[7] Ubong P Dixon A and Forno, E (2018) Obesity and Asthma The journal of Allergy and Clinical Immunology 141 (4):1169-1179 [Accessed 28 July 2019]
[8] Scarborough P, Bhatnager P, Wickramasinghe K and others (2011) The economic burden of ill health due to diet, physical inactivity, smoking, alcohol and obesity in the UK: an update to 2006-07 NHS costs J Public Health (Oxf) 33(4):527-35 [Accessed 28 July 2019]
[9] Public Health England Making the case for tackling obesity – why invest? Including Slide 10: The annual costs of obesity [Accessed 11 February 2019]
[10] Public Health England (2017) Health matters: obesity and the food environment [Accessed 11 February 2019]
[11] Public Health England Wider Determinants of health toolkit [Accessed 11 February 2019]
[12] Tedstone A (2018) Public Health Matters: Implementing the whole systems approach to obesity Public Health England [Accessed 11 February 2019]

Risk factors – Air pollution

Map 4: Variation in annual concentration of human-made outdoor fine particulate matter (PM2.5) adjusted to account for population exposure by upper-tier local authority (2016)

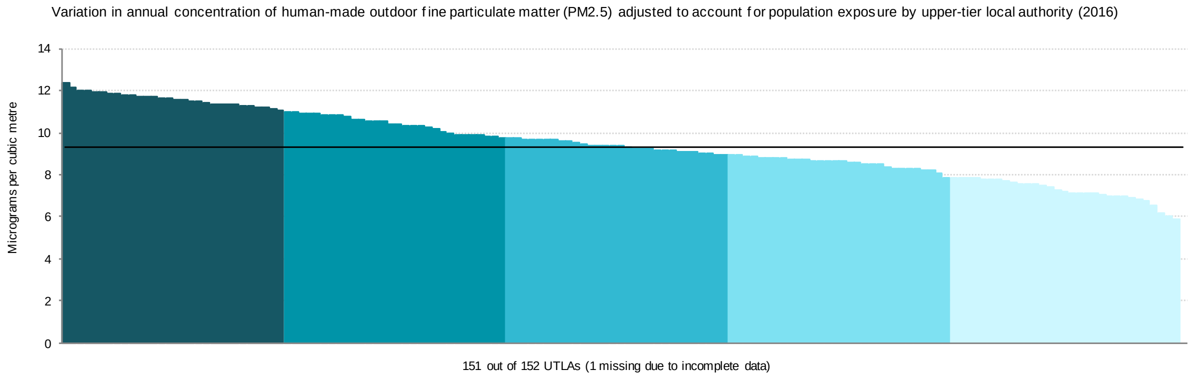
Micrograms per cubic metre (µg/m3)

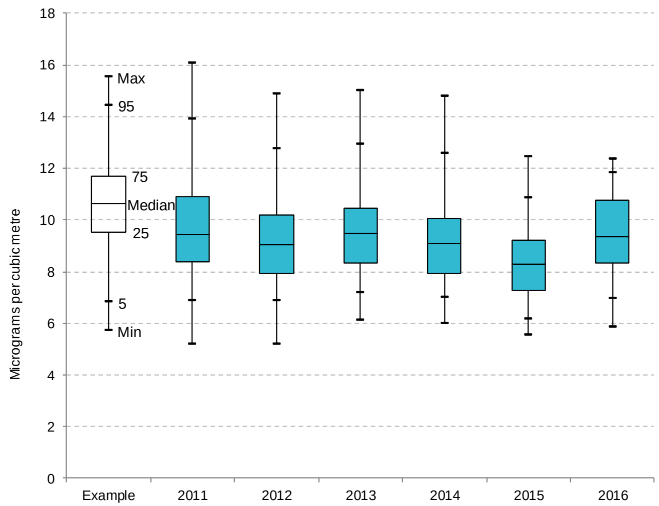
Optimum value: Low



Context

Ambient (outdoor) air pollution is a major public health concern at local, national and international levels. In the UK, poor air quality is the largest environmental risk to public health and is estimated to cost society more than 20 billion pounds every year.[1] Air pollutants are emitted from a range of both man-made and natural sources. Local and national policy seeks to influence the man-made component of these concentrations, as less can be done to reduce levels from natural sources. Population studies have shown that long-term exposure to man-made air pollution (over several years) reduces life expectancy, mainly due to cardiovascular and respiratory causes and from lung cancer. It is estimated that long-term exposure to man-made pollution in the UK has an annual effect in reducing life-years by 328,000 – 416,000, effects equivalent to 28,000 to 36,000 deaths at typical ages.[2] Short-term exposure (over hours or days) to elevated levels of air pollution can also cause a range of effects including exacerbation of asthma, reduced lung function, increases in respiratory hospital admissions and premature deaths.





	Example	2011	2012	2013	2014	2015	2016	
Max-Min (Range)		10.9	9.7	8.9	8.8	6.9	6.5	NARROWING Significant
95th-5th percentile		7.0	5.8	5.8	5.5	4.7	4.9	NARROWING Significant
75th-25th percentile		2.5	2.3	2.1	2.1	1.9	2.5	No significant change
Median		9.4	9.1	9.5	9.1	8.3	9.4	No significant change

The evidence for the effects of air pollution on health is especially strong for the fine airborne particulate matter pollution (referred to as PM2.5). When inhaled, these fine particles, measuring less than 2.5 microns in diameter, are small enough to enter deep in the lungs and cause health effects. Those most at risk include children, the elderly and those with pre-existing medical conditions, such as respiratory and cardiovascular disease.[1] Lower socio-economic status and minority populations are also often disproportionately exposed to air pollution.[3]

PM2.5 in ambient air consists of both primary (directly emitted from a source) and secondary (formed through atmospheric reactions). In the UK, the main sources of primary PM2.5 are from domestic and industrial combustion processes, and motor vehicle engines, friction from brakes and tyres, and dust from road surfaces.[4] Natural sources include pollen, soil and sand from as far as the Sahara Desert.[5] Transport and travel linked to Health and Social Care services generates a significant share of road traffic in England, and it is estimated that the NHS is responsible or can influence 3.5% of all road traffic in England.[6]

Magnitude of variation

Map 4: Variation in annual concentration of human-made outdoor fine particulate matter (PM2.5) adjusted to account for population exposure by upper-tier local authority (2016)

The maps and column chart display the latest period (2016), during which upper-tier local authority concentrations ranged from 5.8 to 12.3 micrograms per cubic metre, which is a 2.1-fold difference between upper-tier local authorities. The England annual concentration for 2016 was 9.3 micrograms per cubic metre. The UK and EU annual mean objectives for

PM2.5 are 25 micrograms per cubic metre,[7] while the World Health Organisation's annual mean guideline value is 10 micrograms per cubic metre.[8]

The box plot shows the distribution of upper-tier local authority values for the period 2011 to 2016. Both the maximum to minimum range and the 95th to 5th percentile gap narrowed significantly.

Potential reasons for the degree of variation observed include geographical variations in:

- the magnitude of local emission sources, weather conditions (such as wind speed, wind direction and air temperature) and industry and traffic infrastructure
- socio-economic status and ethnicity – low socio-economic status and minority populations are more likely to live, learn or work in densely populated areas, that are nearer to busy roads and/or industrial sources of pollution

Options for action

Multiple interventions, each producing a small benefit, can act cumulatively to produce significant overall air quality and health benefits.[9] Interventions that will have the greatest impact on reducing harm to people's health are those which reduce emissions of air pollution at source and these should be the main focus of action.

Active travel interventions, such as promoting walking and cycling, can bring multiple public health benefits, in addition to air quality improvements, such as increased physical activity and prevention of traffic collisions. The current evidence suggests that in healthy individuals, the benefits of physical activity are likely to outweigh health risks from air pollution.

Considering healthcare services, commissioners should:

1. Support large-scale national awareness campaigns aimed to change behaviour, such as the Global Action Plan National 'Clean Air Day'.[10]
2. Ensure better awareness amongst healthcare professionals of the impact of air quality on health through training and by directing employees toward useful resources, such as the 'Air quality: a briefing for directors of public health'.[11]
3. Encourage the use of NHS data (for example, hospital admissions and GP consultations) to inform research on the effects of air pollutants on the health of the UK population.

Healthcare service providers should:

1. Consider National Institute for Health and Care Excellence (NICE) guidelines 70 on Air pollution: outdoor air quality and health and its associated quality standard.
2. Consider PHE's review of interventions to improve outdoor air quality and public health.
3. Consider the recommendation actions to tackle air pollution set out in the Royal College of Physicians and the Royal College of Paediatrics and Child Health report, 'Every breath we take: the lifelong impact of air pollution'.
4. Help the public understand the health effects of air pollution (using clear, unambiguous messages) and offer their patients advice on managing their conditions, as well as actions they can take to reduce their day-to-day and lifetime exposure to air pollution. The Daily Air Quality Index (DAQI) provides information on levels of air pollution and recommended actions and health advice.
5. Use the Health Outcomes of Travel Tool. NHS organisations (provider, CCG or primary care) can measure the air pollution release from their models of care.[6]
6. Encourage the participation of their staff and patients of walking and cycling (see NICE guidelines on 'physical activity: walking and cycling')[12] and use of public transportation. However, development of effective infrastructure will be important to enable safe walking and cycling.
7. Consider air quality when procuring vehicles (ultra low emissions vehicle) and training staff in fuel efficient driving (including anti-idling), or creating no-idling zones on NHS sites and/or utilising Clean Air Zones developed by the Local Authority as per NICE guidance NG70.

8. The NHS estate should move away from burning the dirtiest fuels onsite such as coal and oil as primary heating fuel (NHS Long Term Plan).[13]

Resources

Department for Environment, Food and Rural Affairs Daily Air Quality Index [Accessed 24 May 2019]

Department for Environment, Food and Rural Affairs Short-term effects of air pollution on health [Accessed 24 May 2019]

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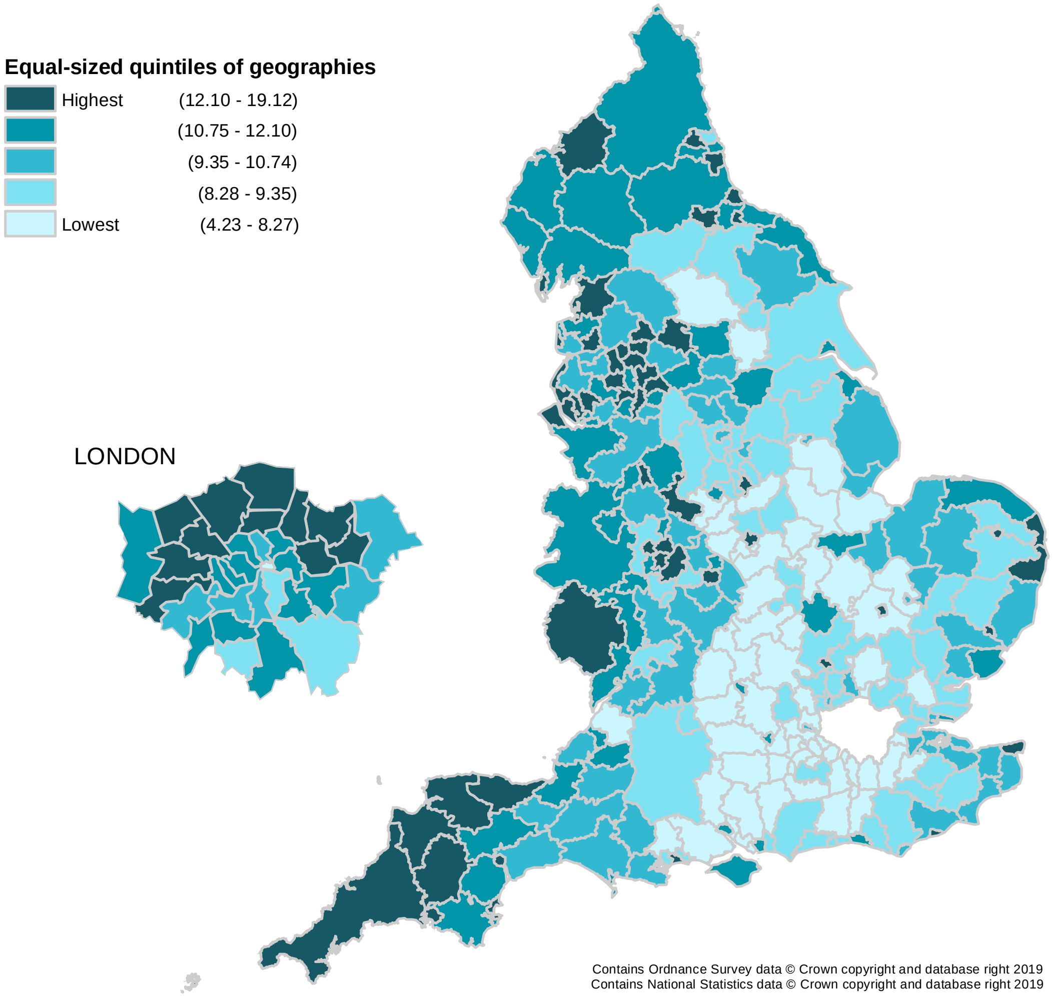
Risk factors – Housing

Map 5a: Variation in percentage of households in an area that experience fuel poverty by lower-tier local authority (2017)

Optimum Value: Low



Context

The home environment is a key determinant of both physical and mental health.[1,2] More than 90% of our time is spent indoors.[3]

The Housing Health and Safety Rating System (HHSRS) (a risk based evaluation tool for local authorities) details a number of key risks and hazards to health caused by deficiencies in dwellings, including damp and mould growth, excess heat and excess cold.[4]

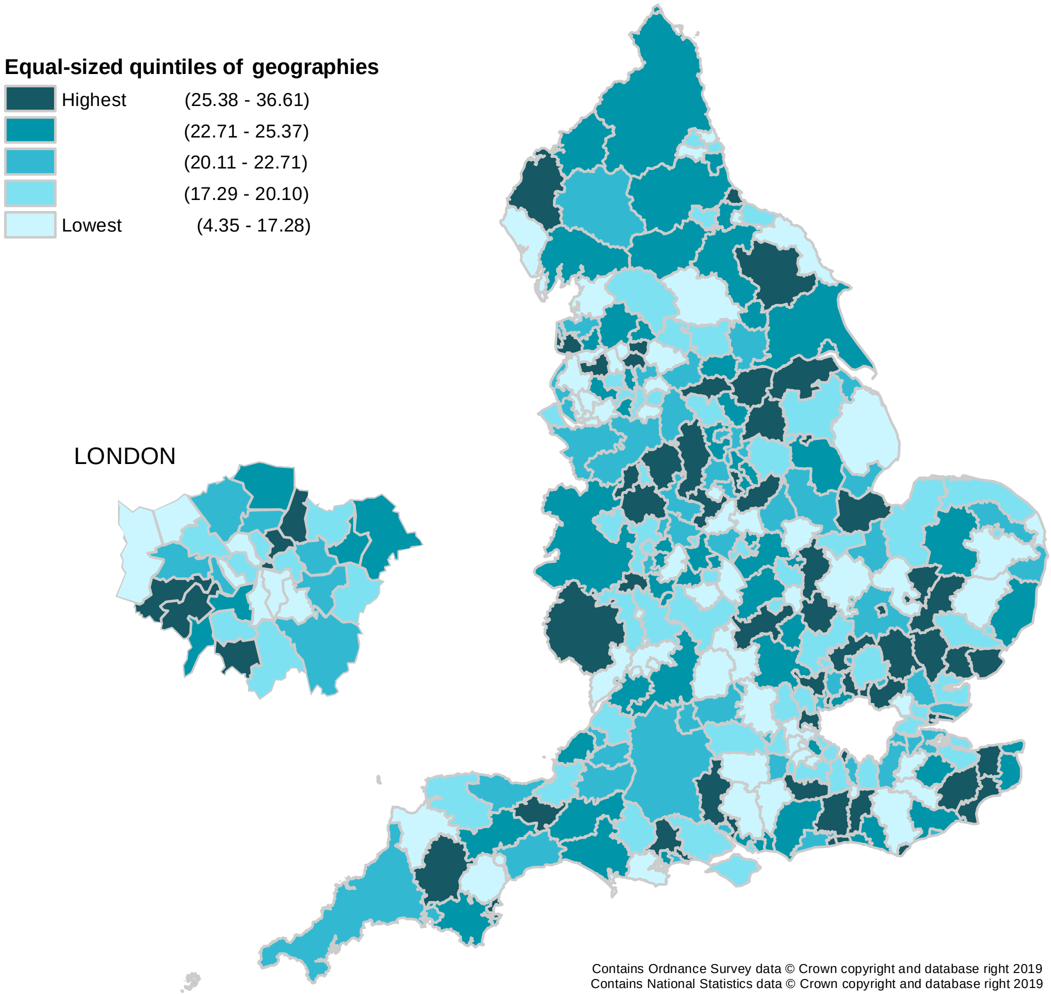
The most recent data from the English Housing Survey (2017) showed that 1 in 5 dwellings (4.5 million homes) did not meet the Decent Homes Standard, which takes into account the HHSRS as its statutory element, along with considerations around thermal comfort, state of repair and facilities.[5]

Respiratory health is particularly affected by indoor temperature (both high and low), by damp and mould, and by the presence of air pollutants within the home.[4]

Risk factors – Housing

Map 5b: Variation in the Excess Winter Deaths Index by lower-tier local authority (Aug 2014-Jul 2017)

Optimum value: Low



Cold homes and fuel poverty

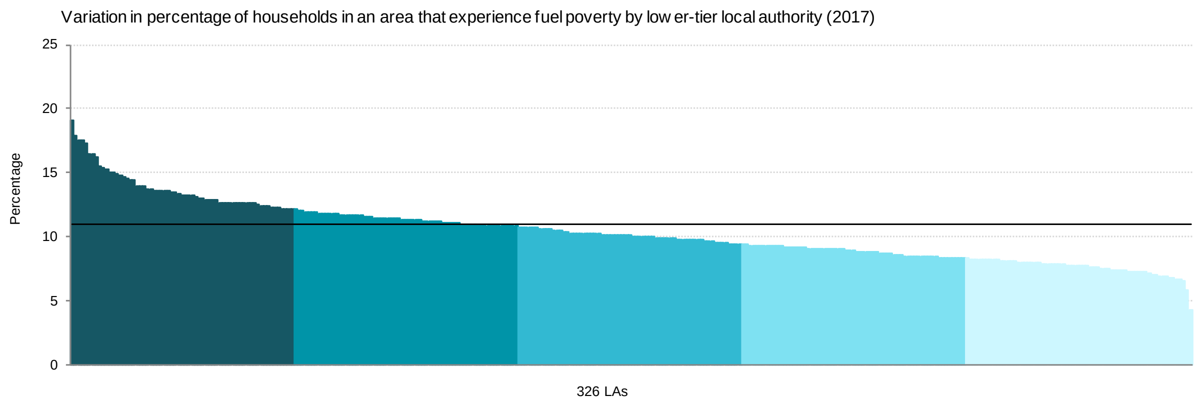
Exposure to low indoor or outdoor temperatures can lead to suppression of the immune system, increasing susceptibility to infection. Cold temperatures increase constriction of airways, which stimulates mucus production - factors associated with increased risk of bronchitis and pneumonia.[6]

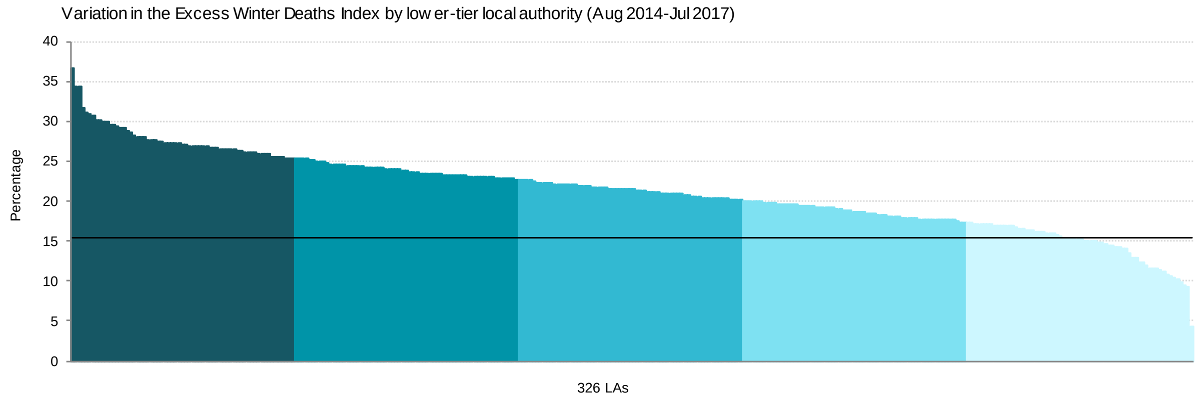
Many more people die in the winter months than the summer months; these data are captured by the Office of National Statistics (ONS) each year. The number of excess winter deaths (EWDs) is calculated by comparing the number of deaths across the winter (December to March) with the average number of deaths occurring in the preceding August to November and the following April to July.[7] ONS also publish the excess winter mortality index (EWMI), the percentage of extra deaths that occurred in the winter, to allow comparisons to be made.

Notably, EWDs are reported as an absolute number i.e. the figure is not age-standardised.

Trends in excess winter deaths

Factors contributing to EWDs include age and underlying health conditions, housing and fuel poverty and seasonal factors such as weather and the impact of influenza.





Large fluctuations in EWDs are common between years. The 5 year moving average smooths out short term fluctuations and provides a clear trend over time. Generally historical trends in England and Wales show that the steady decrease since the 1950/51 winter period has levelled off in recent years, with the latest 5 year averages showing an increase from 2013/14 (28,188) to 2015/16 (34,074).[7]

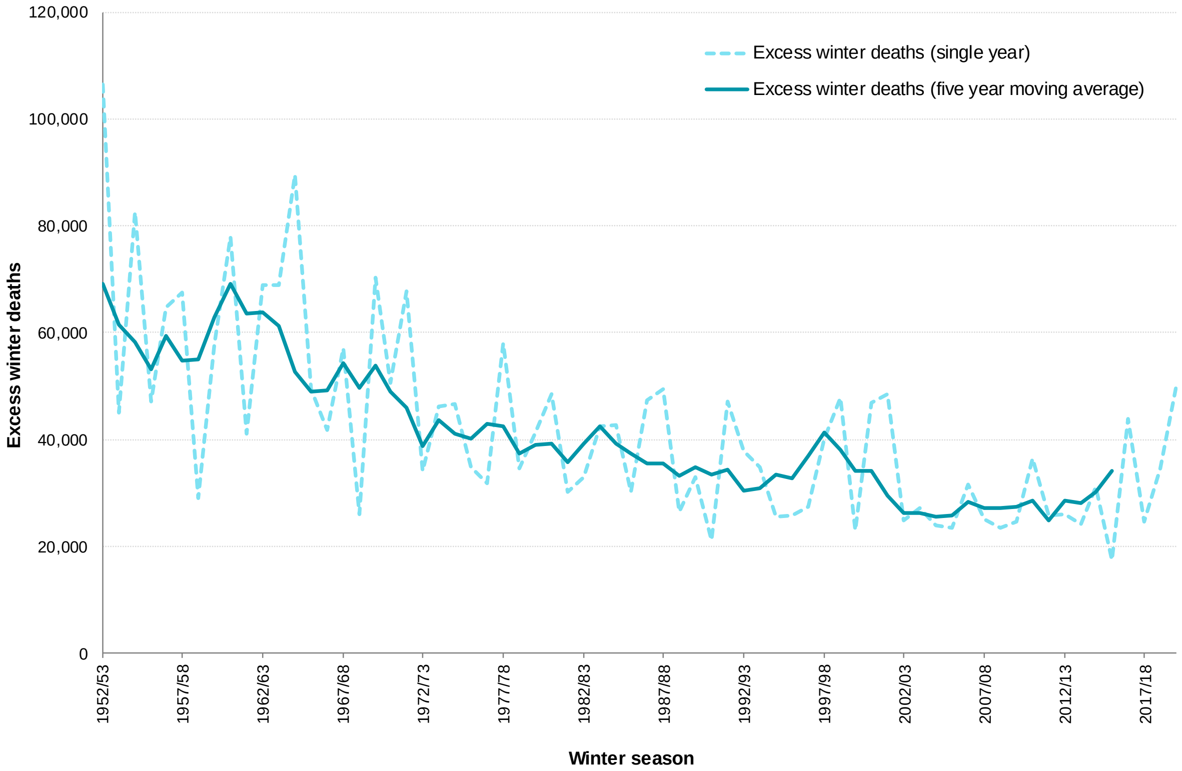
The winter of 2017/18 was unusually cold and saw moderate to high levels of influenza activity with co-circulation of influenza B and influenza A(H3). The impact of this co-circulation was predominantly seen in older adults, with increased numbers of care home outbreaks and excess mortality seen particularly in the 65 plus age group.[8]

ONS reported 50,100 EWDs in 2017/18. Over a third (34.7%) of EWDs were attributed to respiratory disease (i.e. 17,400 EWDs). Although the 85 plus age group had the highest EWMI (EWMI was 36.1% for males, 43.3% for females), all age groups were affected.[7]

Fuel poverty

The definition of 'fuel poverty' used in England is 'Low Income, High Cost' (LIHC). A household is considered to be experiencing fuel poverty if the required fuel costs are above the national median level and were they to spend that amount, they would be left with a residual income below the official poverty line.[9] Fuel poverty is one of the major contributing factors to a person living in a cold home with approximately 2.53 million households identified as experiencing fuel poverty and therefore at risk of being too cold.[9]

Figure 5.1: **Excess winter deaths 5-year central moving average England and Wales, between 1952 to 1953 and 2015 to 20167**



Mould and damp

When a cold home is also damp, mould is likely to occur. An estimated 4% of homes are affected by damp, whilst 2% (approximately 450,000 homes) have problems with condensation and mould.[5] Damp housing and mould are associated with upper respiratory tract symptoms, cough, wheeze and asthma (both current and ever diagnosed) with an estimated 30% to 50% increase in these symptoms in damp/mouldy homes.[10] There are steps that can be taken to reduce mould and damp in the homes. Landlords (private and social) have a legal obligation to ensure that a property is fit to live in.

Overheating in homes

High ambient temperatures are associated with increases in mortality and morbidity, even at relatively moderate temperatures. Many of these exposures occur in the home. There were approximately 2,000 excess deaths in England and Wales during the heatwave in 2003[11] and respiratory disease is one of the main causes of illness and death during periods of hot weather.

Older people, those with chronic health conditions and infants are most at risk. Environmental factors that increase an individual's risk during a heatwave include living in urban areas and south-facing top floor flats. An estimated 20% of properties in England are overheating and given the magnitude of the current problem as well as future impacts relative to climate change, indoor overheating has been identified as a priority risk for action in the cross-government Climate Change Risk Assessment 2017.[12]

Indoor air quality

Levels of some air pollutants in the home can be significantly higher than those outside.[13] For example, volatile organic compounds (VOCs) are emitted indoors from construction products and furniture as well as from consumer products (detergents, cleaning, air fresheners and personal care products).

Indoor levels of particulates and combustion products Nitrogen dioxide (NO_2) and Carbon Monoxide (CO) are influenced by the ingress of outdoor air, building characteristics including ventilation conditions and occupant activities such as cooking, smoking, wood burning, cleaning and use of consumer products.[14] NO_2 and CO are associated with increased risk of respiratory disease. Particulate matter has been associated with increased respiratory illness (wheezing, cough, including asthma) and chronic obstructive pulmonary disease (COPD). VOCs emitted from consumer products are associated with increased wheezing during pregnancy and wheezing among infants and their mothers.[14,15]

Inadequate ventilation results in increased concentrations of indoor generated pollutants, which have been associated with increases in allergic diseases among children.[16]

A recent modelling study estimated the burden of disease attributable to exposures to indoor air pollutants from both indoor sources and outdoor air used to ventilate homes was 23% for asthma, 11% for COPD, 5% for respiratory infections and 15% for lung cancer (due to radon exposure).[17]

Selected indicators

There are a large number of factors within the home environment that impact on health and it is worth noting that often more than one exposure may co-exist. Likewise, often there are multiple vulnerabilities that together contribute to adverse health outcomes. For example, housing and economic factors are key to cold weather vulnerability. Fuel poverty captures some of this complexity. However, additional vulnerabilities such as extremes of age and behavioural factors are also relevant.[18]

Magnitude of Variation

Map 5a: Variation in percentage of households in an area that experience fuel poverty by lower-tier local authority (2017)

The maps and column chart display the latest period (2017), during which lower-tier local authority values ranged from 4.2% to 19.1%, which is a 4.5-fold difference between lower-tier local authorities. The England value for 2017 was 10.9%.

Map 5b: Variation in the Excess Winter Deaths Index by lower-tier local authority (Aug 2014-Jul 2017)

The maps and column chart display the latest period (Aug 2014-Jul 2017), during which lower-tier local authority values ranged from 4.3% to 36.6%, which is an 8.4-fold difference between lower-tier local authorities. The England value for Aug 2014-Jul 2017 was 21.1%.

There is some regional variation in the proportion of households experiencing fuel poverty. The Annual Fuel Poverty Statistics Report, 2019[9] shows that in 2017 households living in the north-west had the highest proportion of fuel poor households. However, of households experiencing fuel poverty, those in the south-east had the highest average fuel poverty gap. This is the reduction in fuel bill that a household experiencing fuel poverty needs in order not to be classed as fuel poor.

Fuel poverty in households is determined by the interaction of 3 key drivers: energy efficiency of the household; energy prices and income.[19]

The energy efficiency[20] of a property is a key driver of fuel poverty as better energy efficiency reduces household fuel requirements and thus costs. Relevant property characteristics include floor area, wall insulation, and age of property.

Household income is another key factor as it impacts on affordability. It is worth noting that a significant number of households are clustered around the fuel poverty costs threshold. In a recent projection, the Department for Business, Energy and Industrial Strategy (BEIS) estimated that in 2016 over half a million households were within £30 of the threshold. Changes in personal circumstance and household income can result in households particularly those close to the threshold, and therefore at greater risk, moving in and out of fuel poverty.[21] This is particularly relevant when considering the potential impact of illness on income.[22]

Options for action

Cold homes and fuel poverty

The NICE guidelines NG6 'Excess winter deaths and illness and the health risks associated with cold homes'[23] have a number of recommendations for Health and Wellbeing boards, local authorities, housing providers, energy utility and distribution companies, faith and voluntary sector organisations, primary health and home care practitioners, secondary health care practitioners, social care practitioners, NHS England, universities and other training providers, Public Health England and the Department for Business, Energy and Industrial Strategy.

For secondary care practitioners:

Recommendation 7 in the NICE guideline NG6 is to ensure that as part of the discharge planning from a health or social care setting, an assessment is made of the patient's vulnerability to the cold, and where action is needed to ensure co-ordination of efforts to ensure that the home is warm enough for the individual to return to.

Patients may be unaware of how their home environment may be affecting their respiratory heath. They may also be unaware of the help that is available and how to access this. Therefore, clinicians can provide advice to patients on how best to keep their home safe and warm during colder months or refer them to the NHS Keep Warm Keep Well website.

In addition, clinicians can identify the services or referral pathways available locally to support patients who may be vulnerable to cold. Individuals may be eligible for assistance through schemes such as the Warm Home Discount Scheme and home efficiency improvements provided by energy companies.[24]

Most local authorities have programmes in place to support vulnerable people living in their area affected by fuel poverty or living in cold homes. This may include practical help and/or funding to improve the energy efficiency of properties (regardless of tenure) and provision of income support or other means tested benefits to help with energy costs. Energy companies have an obligation to engage with local authorities to identify households that would benefit from energy efficiency measures and to fund these.

NICE further recommends that primary health and home care practitioners:

- identify people at risk of ill health from living in a cold home (recommendation 4)
- make every contact count (MECC) by assessing the heating needs of people who use primary health and home care services (recommendation 5)

NICE recommends a number of strategic actions for Health and Wellbeing Boards which secondary and primary care clinicians may be able to influence directly or indirectly as part of their wider role. These include:

- developing a strategy to address the health consequences of cold homes (recommendation 1)
- ensuring there is a single point-of-contact health and housing referral service for people living in cold homes

Mould and damp

- refer patients to NHS information on how to remove damp and mould from the home[25]
- refer patients to local authority environmental health
- vulnerable patients can also be referred to Shelter for information and support, including advice for those living in social and private rented housing[26]

Overheating in homes

- refer patients to the PHE 'Beat the heat: keep cool at home' checklist and linked 'Beat the heat' resources[27]

Indoor air pollution

The NICE guideline on Indoor air quality at home[28] is expected to be published in December 2019. This will include guidance for health professionals, local authorities and members of the public to be aware of and reduce exposure to indoor air pollutants.

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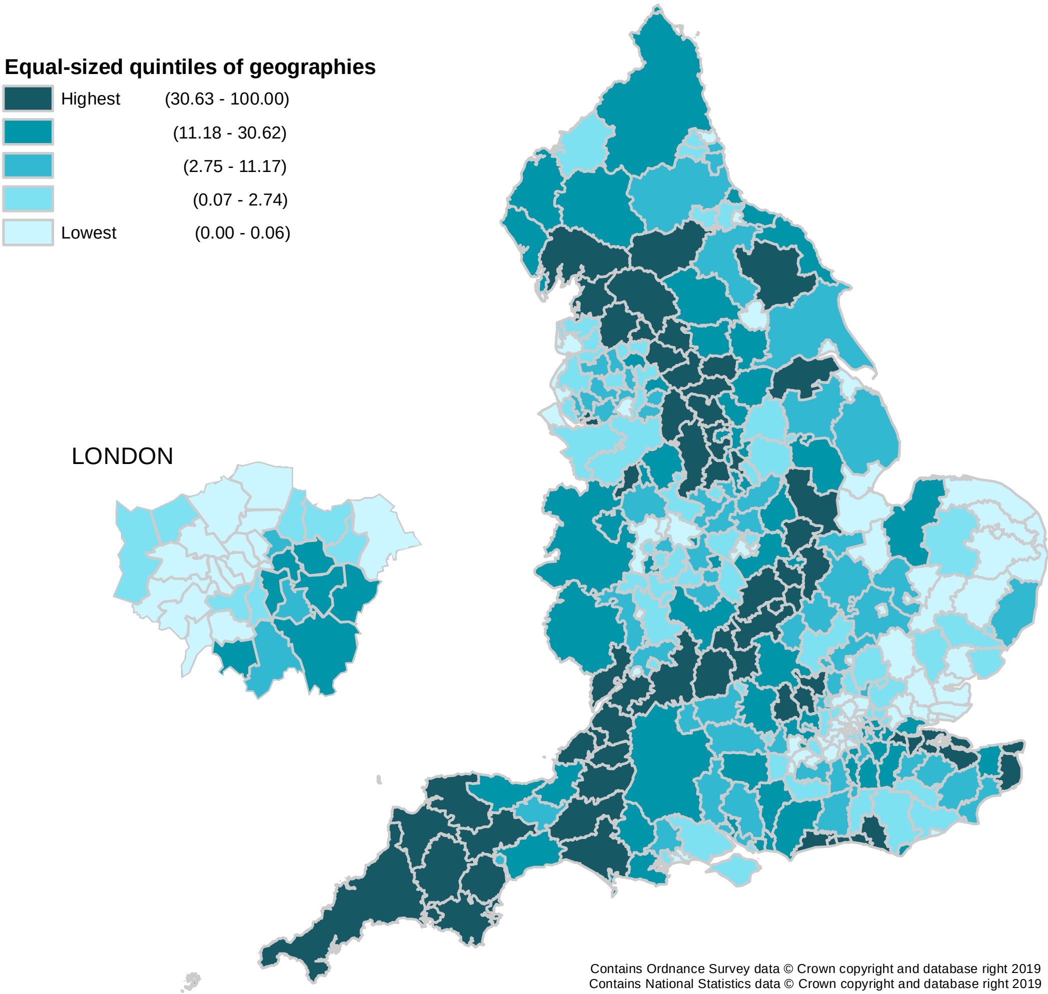
Risk factors - Radon

Map 6: Variation in percentage of homes in Radon Affected Areas by lower-tier local authority (2019)

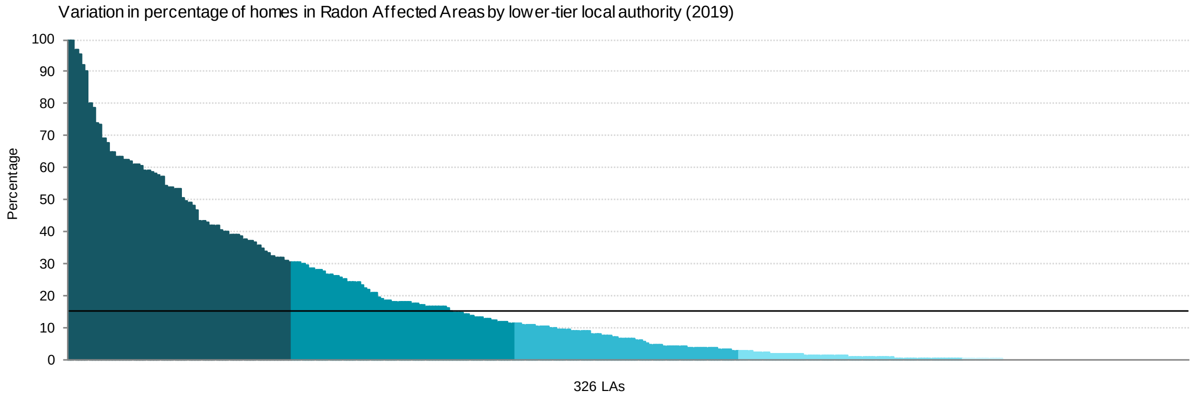
Optimum value: Low



Context

Radon is a radioactive gas released from the earth and is the single largest source of radiation exposure in UK homes and workplaces. Radon is an established lung carcinogen,[1] with good evidence that the risk is approximately proportional to long term exposure.[2] In the UK, radon is estimated to be associated with over 1,000 lung cancer deaths annually.[3] Radon is present in all buildings but at concentrations that range over 3 orders of magnitude between properties.[4] The lung cancer risk from radon has a synergy with tobacco smoking: continuing and ex-smokers are at the greatest lung cancer risk from a given radon concentration.

The level of radon in a property is expressed as the activity concentration (the number of radon atoms radioactively decaying, in 1 second, measured in unit “becquerel”, Bq) in a unit volume of indoor air (1 cubic metre). Radon concentrations can only be determined reliably by a radon measurement – preferably made over a 3 month period to reduce short term fluctuations.



Established techniques and services are available both to establish the radon levels in properties and to make the necessary changes to buildings to reduce high radon levels. Zero radon exposure is not possible since outdoor air contains low concentrations of radon.

To determine the need for action in homes, radon measurements (as an annual average) are compared with an Action Level of 200 Bq m^{-3}.[3] A separate regulatory criterion applies to workplaces. Box 6.1 gives a list of radon related terms.

Box 6.1: Radon related terms[5]

Becquerel (symbol Bq): The unit of the amount of activity of a radionuclide. Describes the rate at which the transformations (the number of radon atoms radioactively decaying) occur. 1 Bq = 1 transformation per second.

Becquerel per cubic metre of air (symbol Bq m^{-3}): The amount of radionuclide in each cubic metre of air. Often referred to as the activity concentration.

Radon Action Level: The reference level for taking action on the activity concentration of radon in UK homes. Its value, expressed as the annual average radon gas concentration in the home, is 200 Bq m^{-3}

Radon Affected Areas: Parts of the country with a 1% probability or more of present or future homes being above the Action Level.

A radon risk map and supporting data set identify areas where high radon levels are more likely and where measurement of radon should be prioritised. These are termed radon Affected Areas and are where at least 1% of the homes are expected to be above the radon action level.

The radon map assigns each Ordnance Survey 25 metre grid square to 1 of 6 bands of increasing radon potential. All bands except the lowest are radon Affected Areas. Figure 6.1 is an indicative radon map, showing the highest radon potential band present in each 1 km grid square.

The radon risk map is used to support radon prevention through building regulations. New (or significantly altered) properties in areas of elevated radon risk (areas over 3% risk) are expected to include “basic” protection – generally an impermeable membrane across the building footprint. Additional protective measures should be included in areas where more than 10% of houses are expected to exceed the Action Level.

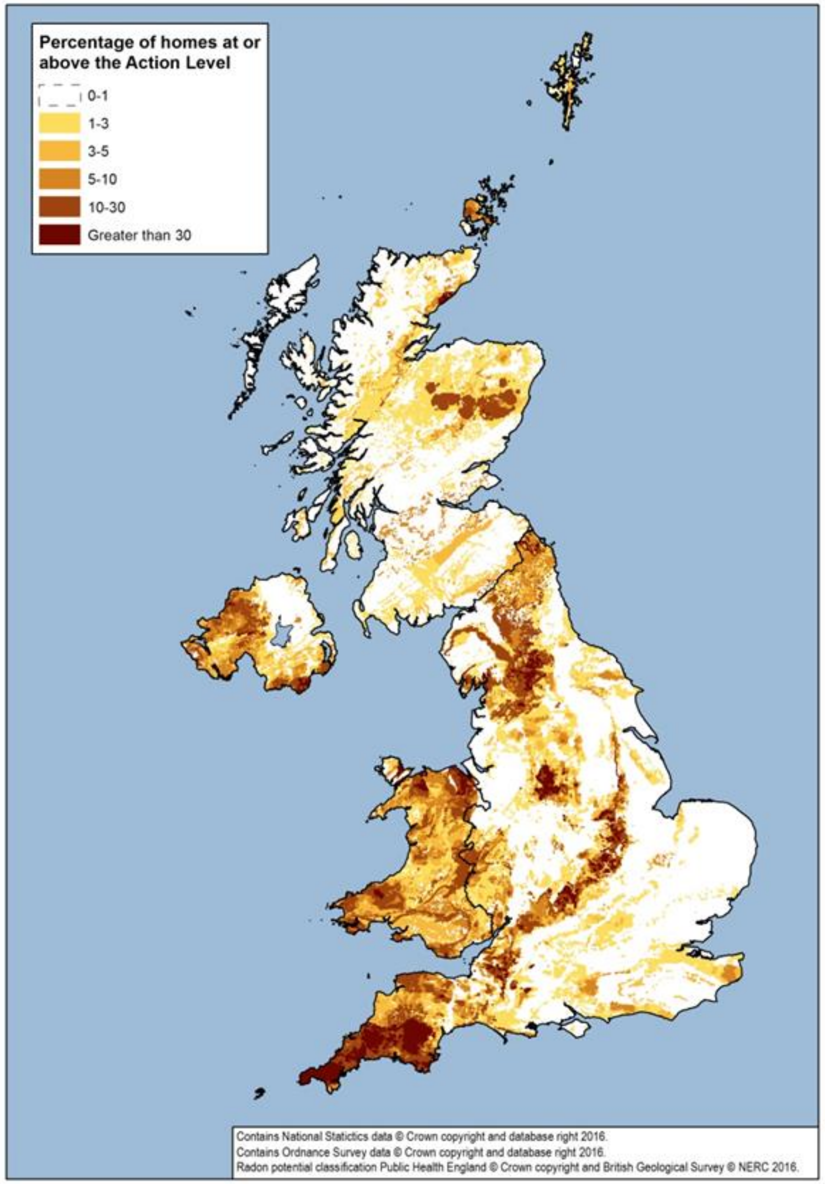
Magnitude of variation

Map 6: Variation in percentage of homes in Radon Affected Areas by lower-tier local authority (2019)

The map and column chart display the latest period (2019). The percentage of homes within Radon Affected Areas ranges from no homes to all (100%) homes.

Research has indicated that geology is the single largest source of variation in indoor radon levels. Additional sources of variation include the house type and living conditions of the occupants such as heating and ventilation. Radon levels tend to be higher in properties built over geological features that are rich in uranium (the radioactive precursor to and source of radon) and/or also have physical structures (e.g. porosity, fracturing, permeability) that allow radon to migrate with soil gas.

Figure 6.1: **Indicative radon map of the UK**[6]



Time dependency of the radon risk factor is not shown, since the local geology is static and housing stock evolves relatively slowly.

Options for action

Public Health England can work with and help local authorities and others to address radon. Consider these options for raising local awareness and action on radon through:

- media communications encouraging householders and property owners to assess the risk in their property
- targeted postal / digital campaigns, focused on areas of higher radon risk, considering options of information provision, funding of radon testing, local information events for householders and others with existing radon measurements
- encouraging social landlords with local property stock to assess the radon risk in their properties
- promoting awareness of radon in housing, estates, education and other teams in the local authority
- promoting the assessment of radon risk in local workplaces, including: local authority premises, NHS premises, private sector workplaces
- reviewing the local policy and practice around radon prevention in new properties

Contact PHE at 01235 822622 or radon@phe.gov.uk or through ukradon.org

Resources

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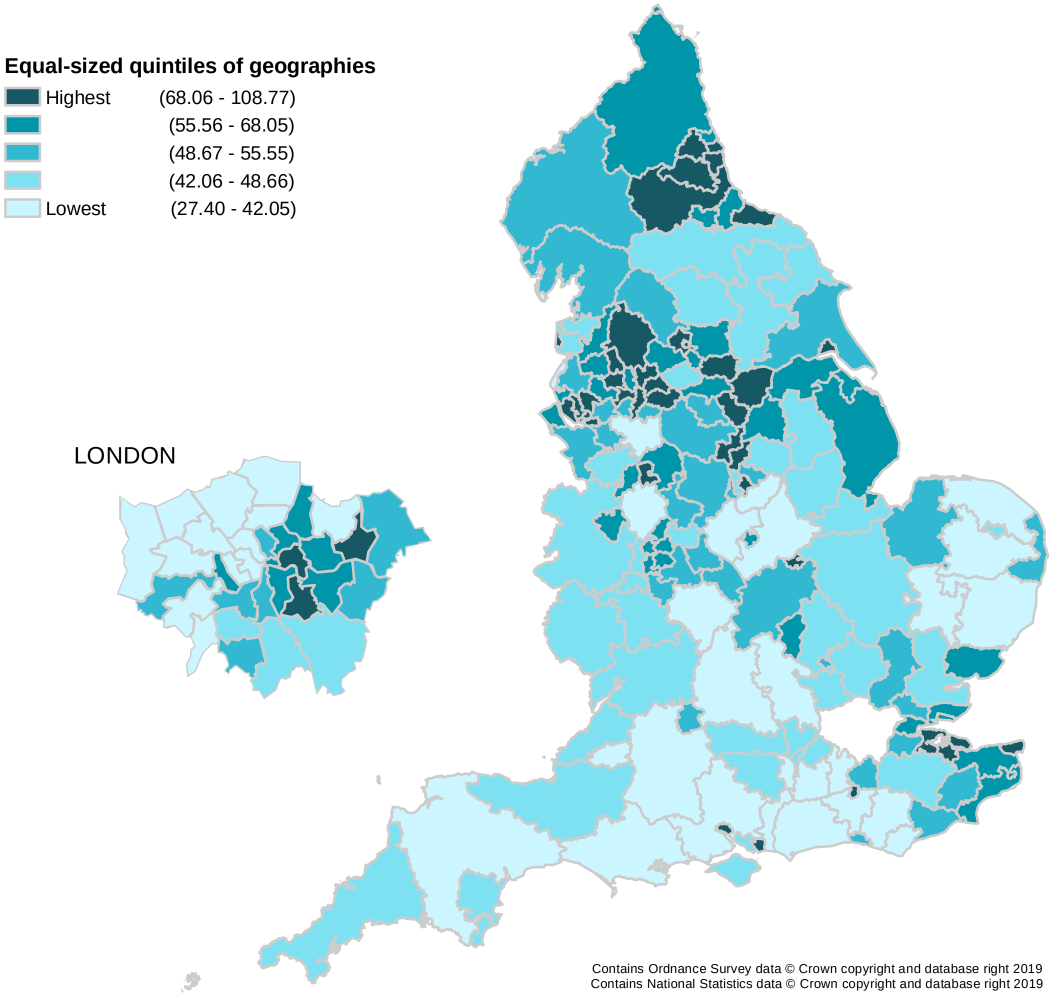
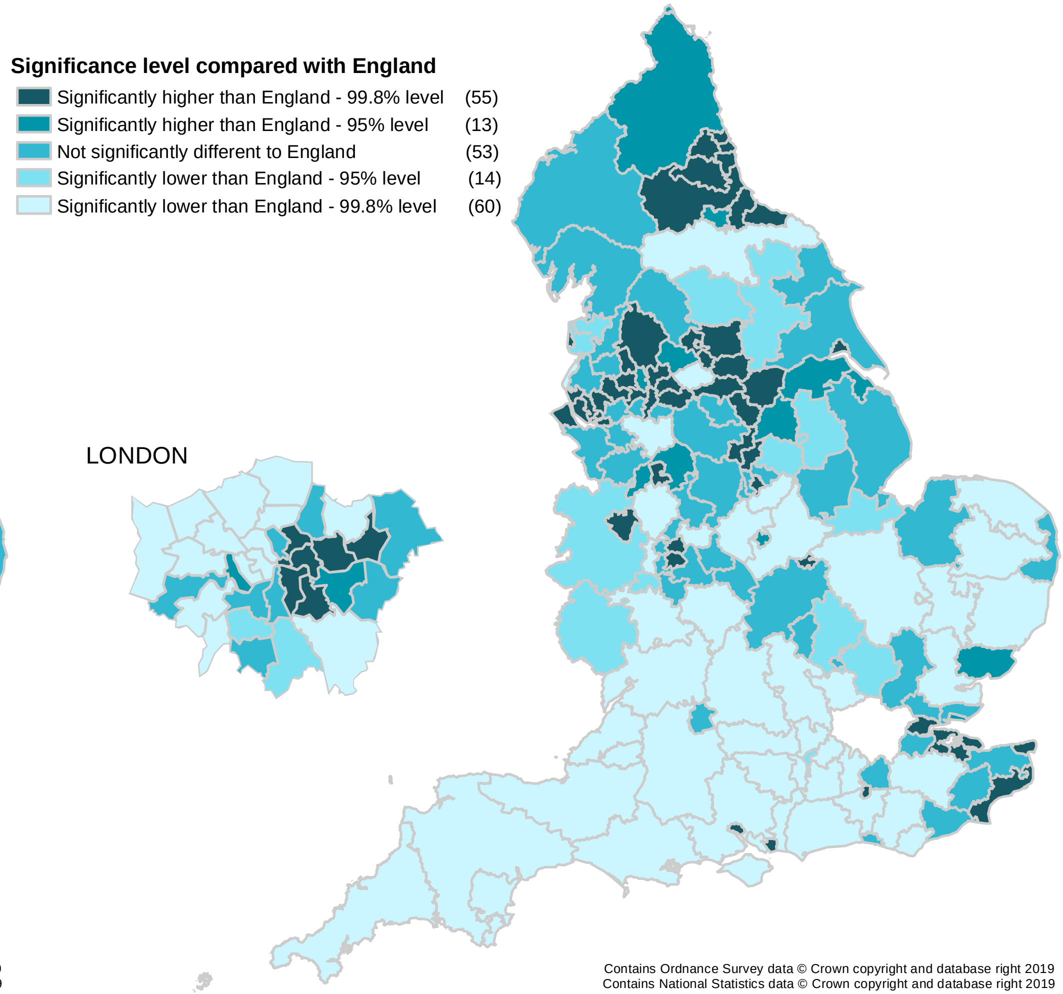
COPD – Disease burden

Map 7a: Variation in mortality rate from COPD (underlying cause) per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum Value: Low



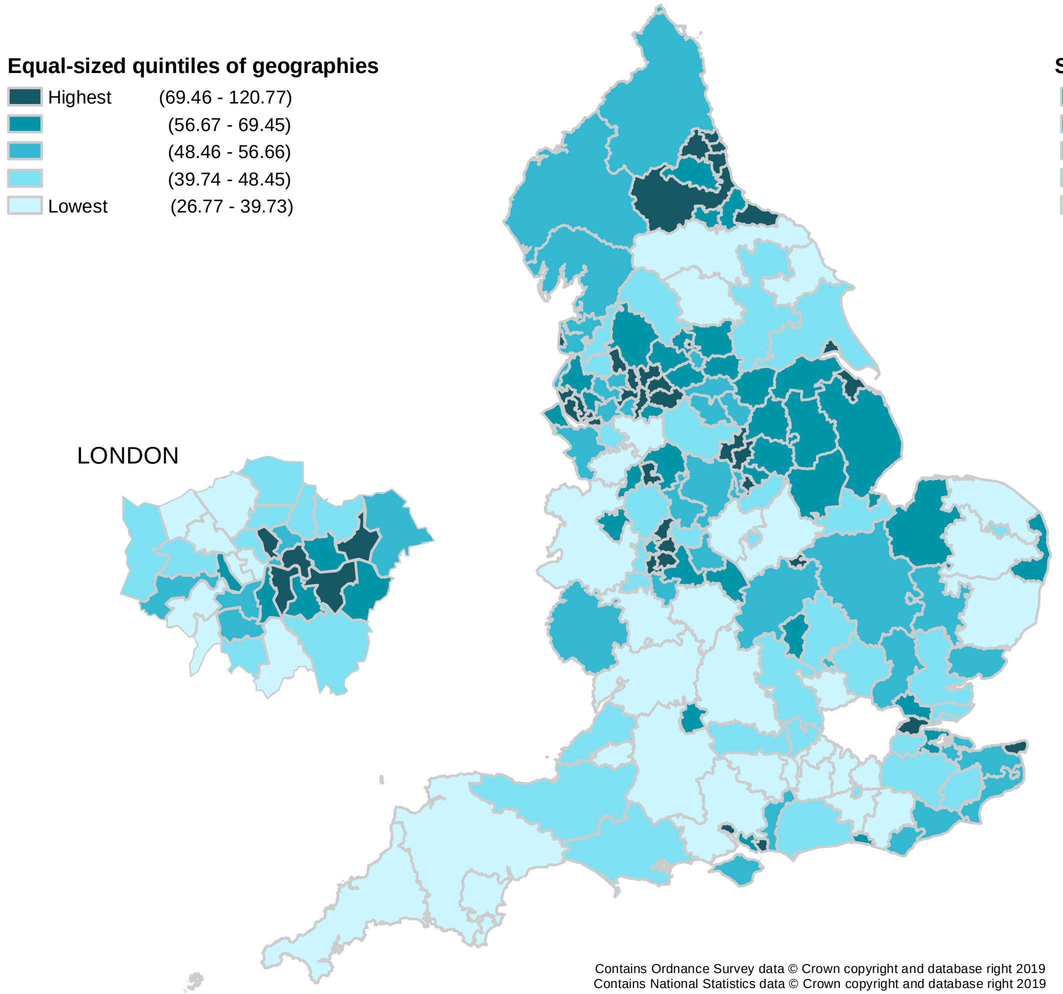


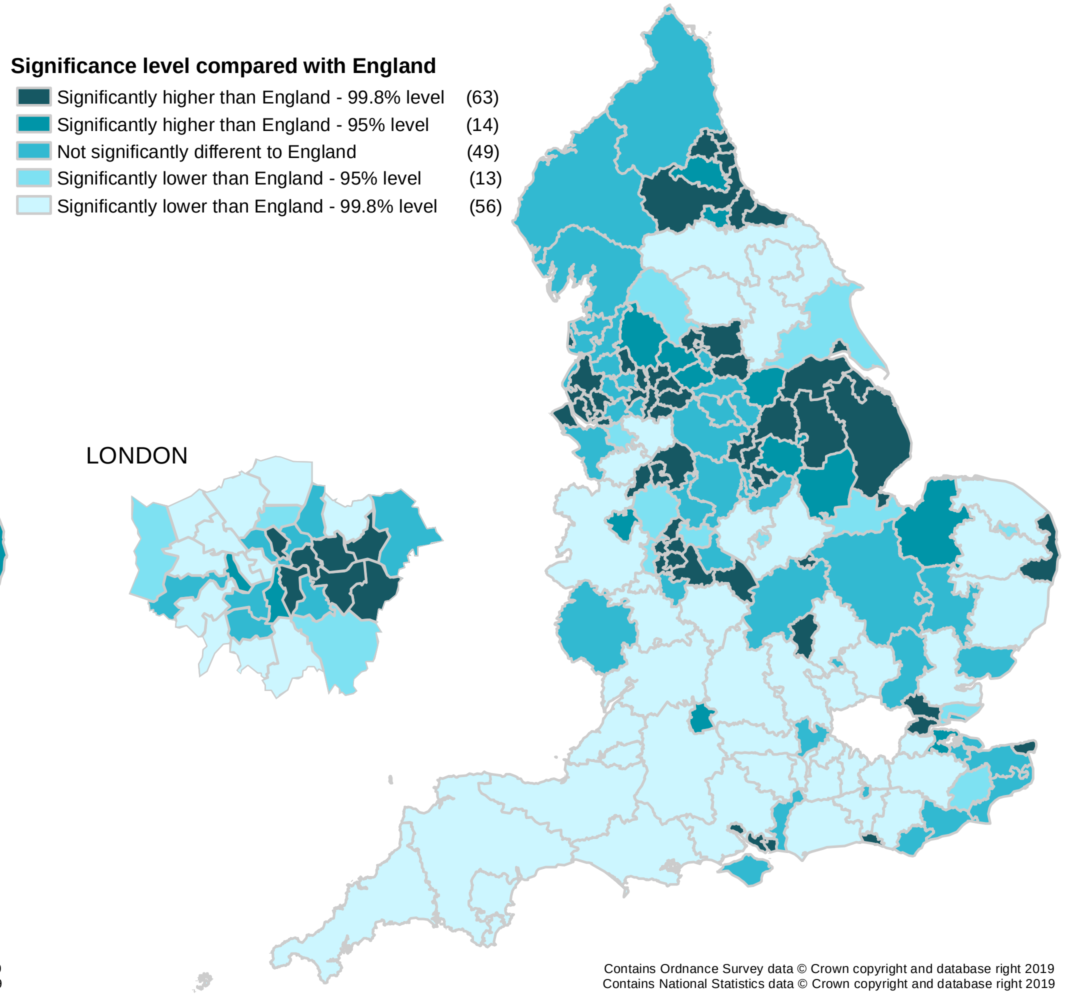
COPD – Disease burden

Map 7b: Variation in mortality rate from COPD as a contributory cause per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum Value: Low

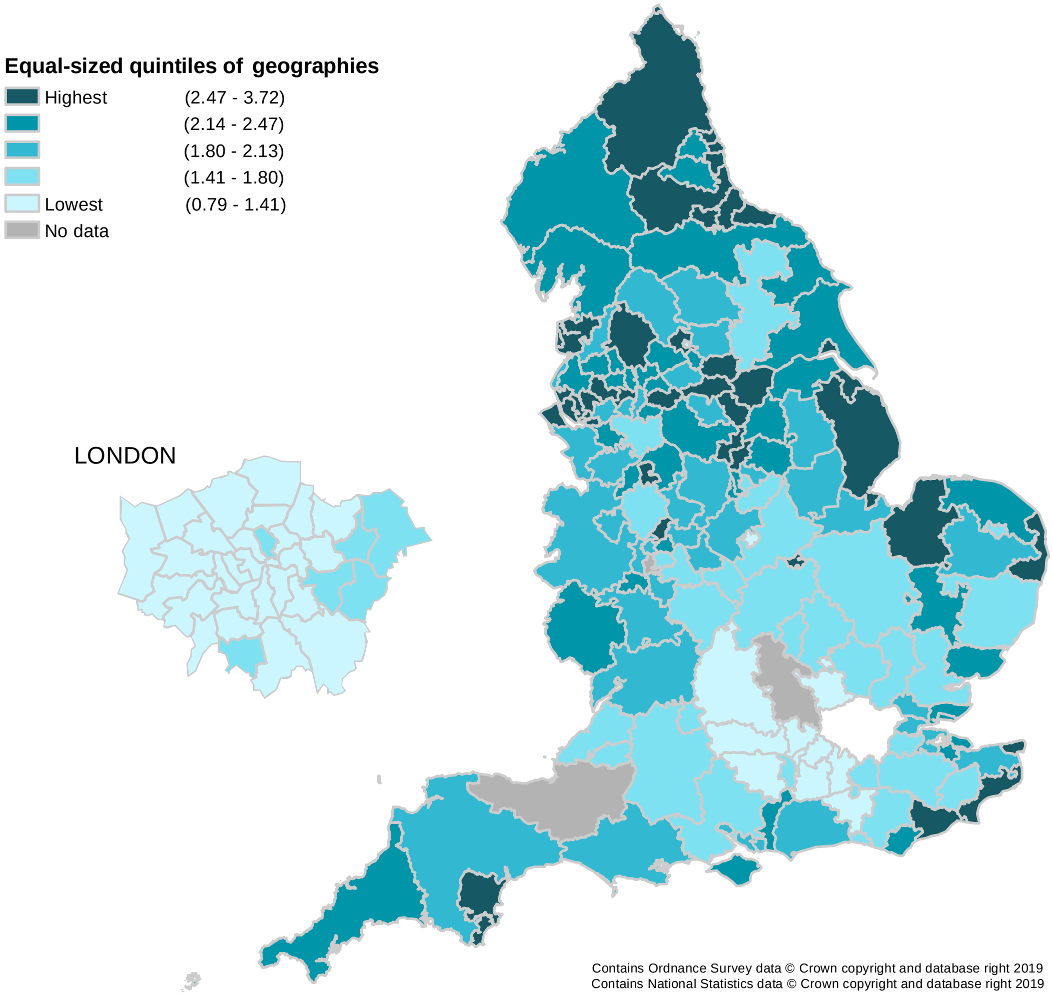




COPD – Disease burden

Map 7c: Variation in percentage of patients with COPD on GP registers by CCG (2017/18)

Optimum value: Requires local interpretation



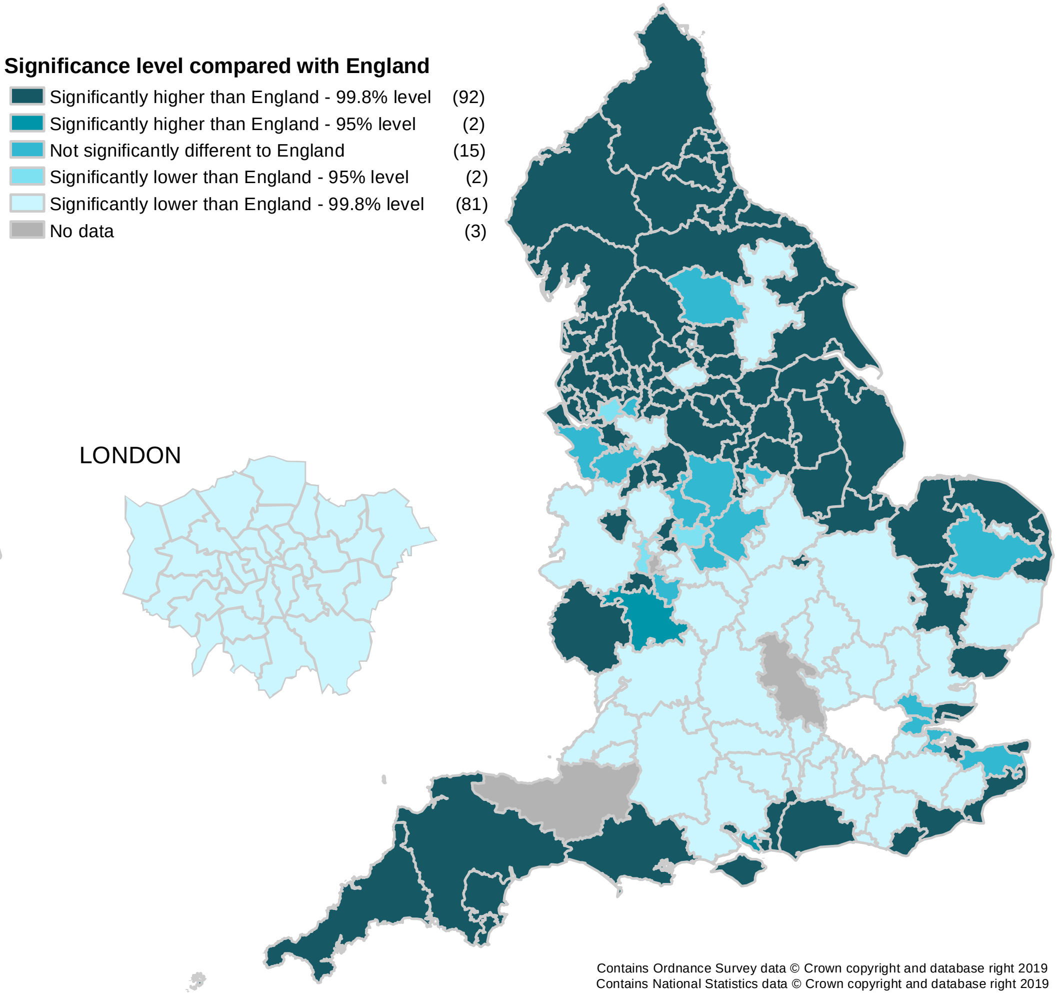


Figure 7.1: Mortality from COPD in selected EU countries[1]

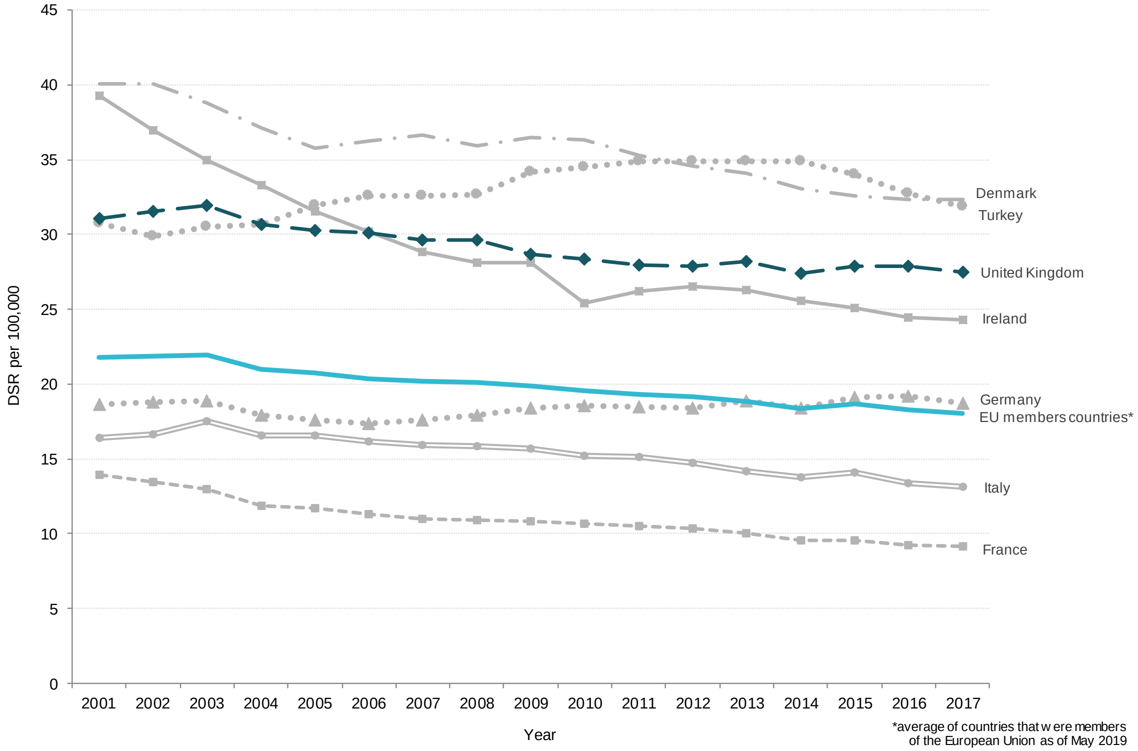
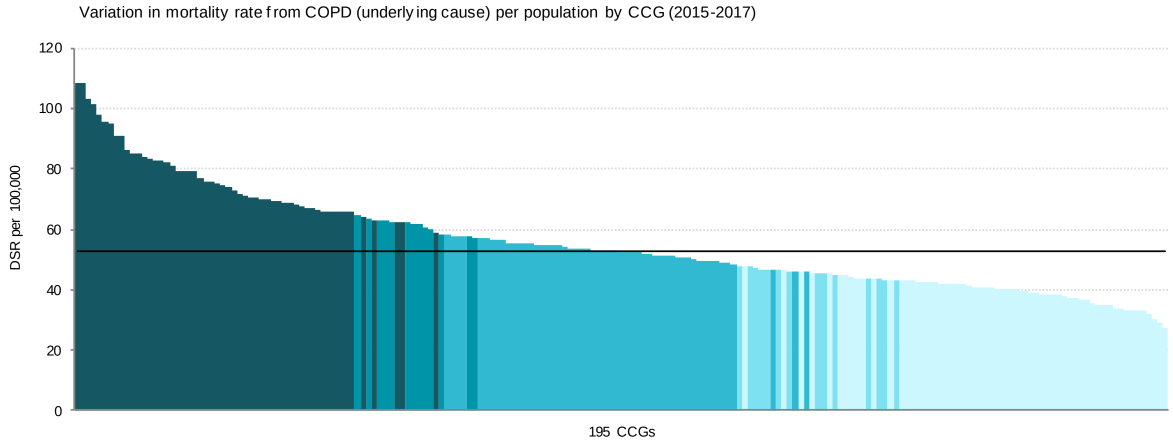


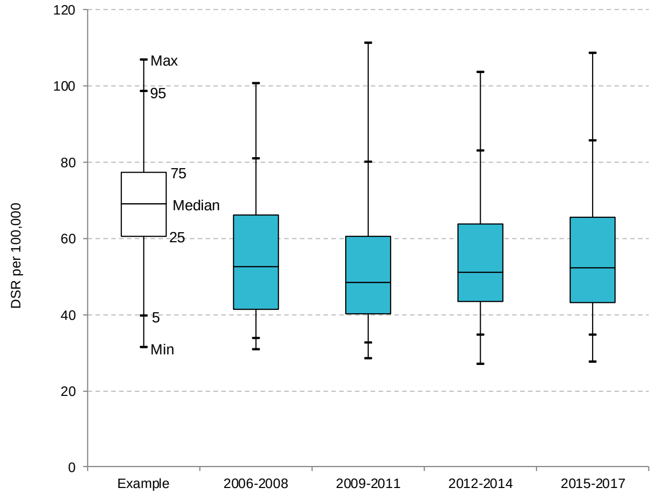
Table 7.1: Underlying cause of death for which COPD was a contributory factor in England (2015-2017)[2]	Count	Percentage
Cancer	25,830	32.4%
Acute heart disease	16,930	21.2%
Other	12,721	16.0%
Dementia	6,025	7.6%
Digestive diseases	4,516	5.7%
Chronic heart disease	4,290	5.4%
Stroke	3,999	5.0%
Genitourinary diseases	1,836	2.3%
Infections	1,387	1.7%
Liver disease	1,197	1.5%
Musculoskeletal disorders	771	1.0%
Blood diseases	176	0.2%
Pneumonia	37	0.0%
Total	**79,715**	**100.0%**

Context

Chronic obstructive pulmonary disease (COPD) is the name given to a range of lung conditions which can cause breathing difficulties. In addition to lung cancer and pneumonia, COPD is one of the 3 leading respiratory causes of death in England. COPD was responsible for more than 26,000 deaths in England in 2017.[2] Of COPD deaths 86% are estimated to be attributable to smoking.[3] Other causes of COPD include occupational exposure to fumes and dust, air pollution and genetics.[4] In many people with COPD, the underlying cause of death is related to co-existing conditions such as cardiovascular disease and cancer as shown in Table 7.1. Map 7b shows the variation in the mortality rate for COPD where it is a contributory factor on the death certificate.

The condition cannot be cured or reversed, but there is well-established evidence that healthcare and public health interventions reduce disease progression and mortality in people with COPD. Long-term oxygen therapy in appropriate patients, increases in physical activity and smoking cessation all improve survival. Non-invasive ventilation (NIV) substantially reduces mortality during COPD exacerbations complicated by acute respiratory failure, whilst long term (home) NIV reduces the risk of readmission or death in selected patients. Invasive ventilation and management in intensive care plays a key role in some severe hospitalised exacerbations. According to statistics from the British Lung Foundation, the UK is among the top 20 countries for COPD mortality worldwide.[5] The UK has one of the highest rates across Europe, with a rate 50% higher than the average across the European Union (Figure 7.1 and see also Figure A2 in the Introduction).





	Example	2006-2008	2009-2011	2012-2014	2015-2017	
Max-Min (Range)		69.8	82.8	76.6	81.4	No significant change
95th-5th percentile		47.0	47.5	48.3	51.0	No significant change
75th-25th percentile		24.7	20.3	20.3	22.6	No significant change
Median		52.5	48.5	51.2	52.4	No significant change

Many people with COPD are unaware they have the condition. More than 1 million people in England are currently diagnosed with COPD on patient registers[6] and a further 2 million are undiagnosed.[7] Failure to diagnose is not confined to people with very mild disease: more than 50% of people with moderate COPD have not been detected and around 20% of undiagnosed people have severe or very severe disease. In a national audit in 2018, only 40.5% of admissions for COPD had an available spirometry report.[8] Making a diagnosis of COPD early is important for patients because:

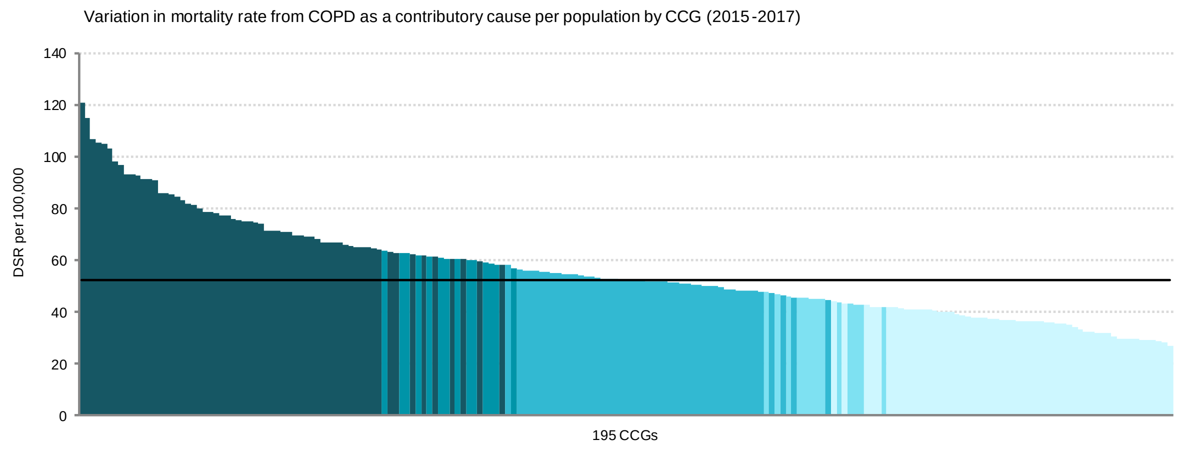
- lung function declines progressively, and the rate of decline is faster in the earlier stages of COPD
- early treatment makes a difference to symptom control, and disease impact and outcomes
- acute exacerbations are common even in moderate disease
- symptoms have a major impact on quality of life and physical and social activity

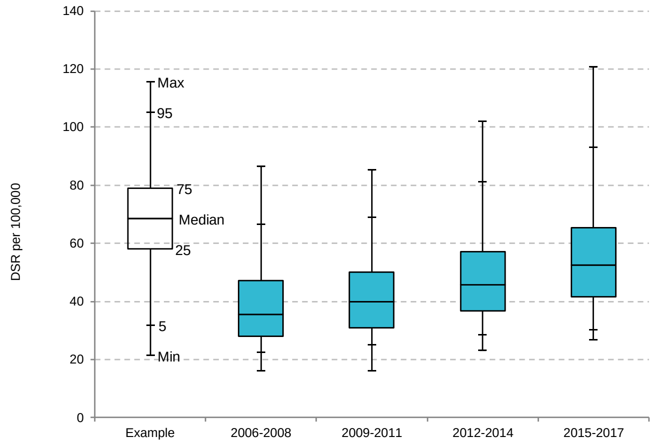
Magnitude of variation

Map 7a: Variation in mortality rate from COPD (underlying cause) per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 27.4 to 108.8 per 100,000 population, which is a 4.0-fold difference between CCGs. The England value for 2015 to 2017 was 52.7 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017. There was no significant change in any of the 3 variation measures between 2006 to 2008 and 2015 to 2017.





	Example	2006-2008	2009-2011	2012-2014	2015-2017	
Max-Min (Range)		70.4	69.2	78.8	94.0	**No significant change**
95th-5th percentile		44.1	44.0	52.7	62.7	**No significant change**
75th-25th percentile		19.1	19.1	20.2	23.8	**No significant change**
Median		35.5	39.8	45.8	52.4	**INCREASING Significant**

Analysis by PHE for this Atlas, has shown that if all CCGs improved their mortality rate from COPD (by underlying cause) to that of the CCGs with the lowest mortality, approximately 7,700 lives would have been saved each year from 2015 to 2017.

Map 7b: Variation in mortality rate from COPD as a contributory cause per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 26.8 to 120.8 per 100,000 population, which is a 4.5-fold difference between CCGs. The England value for 2015 to 2017 was 52.4 per 100,000 population.

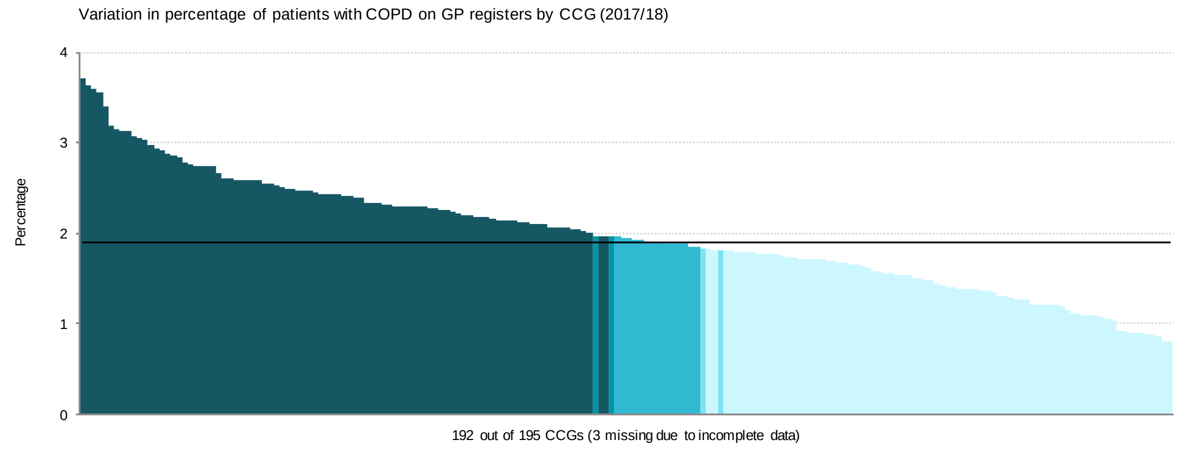
The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017. There was no significant change in any of the three variation measures between 2006 to 2008 and 2015 to 2017. The median increased significantly from 35.5 in 2006-2008 to 52.4 in 2015-2017.

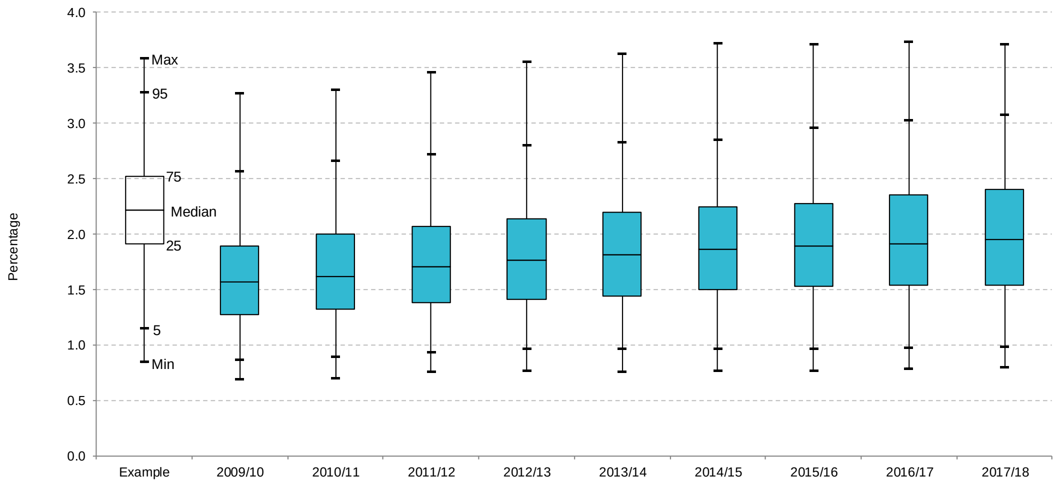
Some of the variation for mortality from COPD for both underlying and as a contributory cause of death will reflect differences in:

- smoking prevalence in local population
- levels of deprivation
- previous occupational exposures
- prevalence of COPD

Map 7c: Variation in percentage of patients with COPD on GP registers by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 0.8% to 3.7%, which is a 4.7-fold difference between CCGs. The England value for 2017/18 was 1.9%.





	Example	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		2.6	2.6	2.7	2.8	2.9	3.0	3.0	2.9	2.9	WIDENING Significant
95th-5th percentile		1.7	1.8	1.8	1.8	1.9	1.9	2.0	2.0	2.1	WIDENING Significant
75th-25th percentile		0.6	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.9	WIDENING Significant
Median		1.6	1.6	1.7	1.8	1.8	1.9	1.9	1.9	2.0	INCREASING Significant

The box plot shows the distribution of CCG values for the period 2009/10 to 2017/18.There has been significant widening of all three measures of variation.

The median increased significantly from 1.6 in 2009/10 to 2.0 in 2017/18.

Variation in recorded prevalence may be due to:

- lack of awareness of the symptoms of COPD and when people should seek medical attention
- doctors often treat patients' symptoms but do not investigate the underlying lung disease
- spirometry, the key diagnostic test, is often performed and interpreted inaccurately
- problems with accurate coding of diagnoses and test results

GP prevalence rates may also be affected by the underlying age structure of the local population. The QOF data is not age standardised. The prevalence of COPD increases with age. This is why in the maps high recorded prevalence rates of COPD are seen in CCGs with older populations as well as those with high smoking prevalence rates.

Options for action

To reduce avoidable mortality in people with COPD, commissioners and providers need to ask questions about how care is delivered across the entire patient pathway, and consider implementing the interventions shown in Box 7.1.

To reduce the variation in the proportion of patients with COPD on GP registers, it is recommended that systematic targeted case finding is carried out to identify symptomatic patients without a diagnosis of COPD. This may include an audit of GP patient registers to identify smokers or ex-smokers with a history of recurrent respiratory symptoms or infections, or patients with previous treatment with inhalers. Actively sending patients a symptom questionnaire and those with symptoms invited for spirometry testing.[9]

Box 7.1: Interventions to reduce avoidable mortality in people with COPD
• quality-assured accurate and early diagnosis
• pro-active chronic disease management with optimisation of pharmacotherapy and support for self management
• pro-active assessment and management of co-morbid conditions
• prompt integrated management of acute exacerbations with specialist input when required
• support for smoking cessation
• home oxygen therapy when indicated after structured assessment

Resources

Department of Health (2011) An outcomes strategy for people with chronic obstructive pulmonary disease (COPD) and Asthma in England [Accessed 11 July 2019]

Department of Health (2012) An Outcomes Strategy for COPD and Asthma: NHS Companion Document [Accessed 11 July 2019]

Association for Respiratory Technology and Physiology (2013) A Guide to Performing Quality Assured Diagnostic Spirometry [Accessed 11 July 2019]

NHS Medical Directorate (2012) COPD Commissioning Toolkit: A Resource for Commissioners [Accessed 07 August 2019]

National Institute for Health and Care Excellence (2016) Chronic obstructive pulmonary disease in adults (NICE quality standard [QS10]) [Accessed 11 July 2019]

NHS Improvement – Lung: National Improvement Projects (2011) Improving earlier diagnosis and the long term management of COPD: Testing the case for change [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 11 July 2019]

IMPRESS – IMProving and Integrating RESpiratory Services in the NHS [Accessed 11 July 2019]

NHS England NHS RightCare Pathways: COPD [Accessed 11 July 2019]

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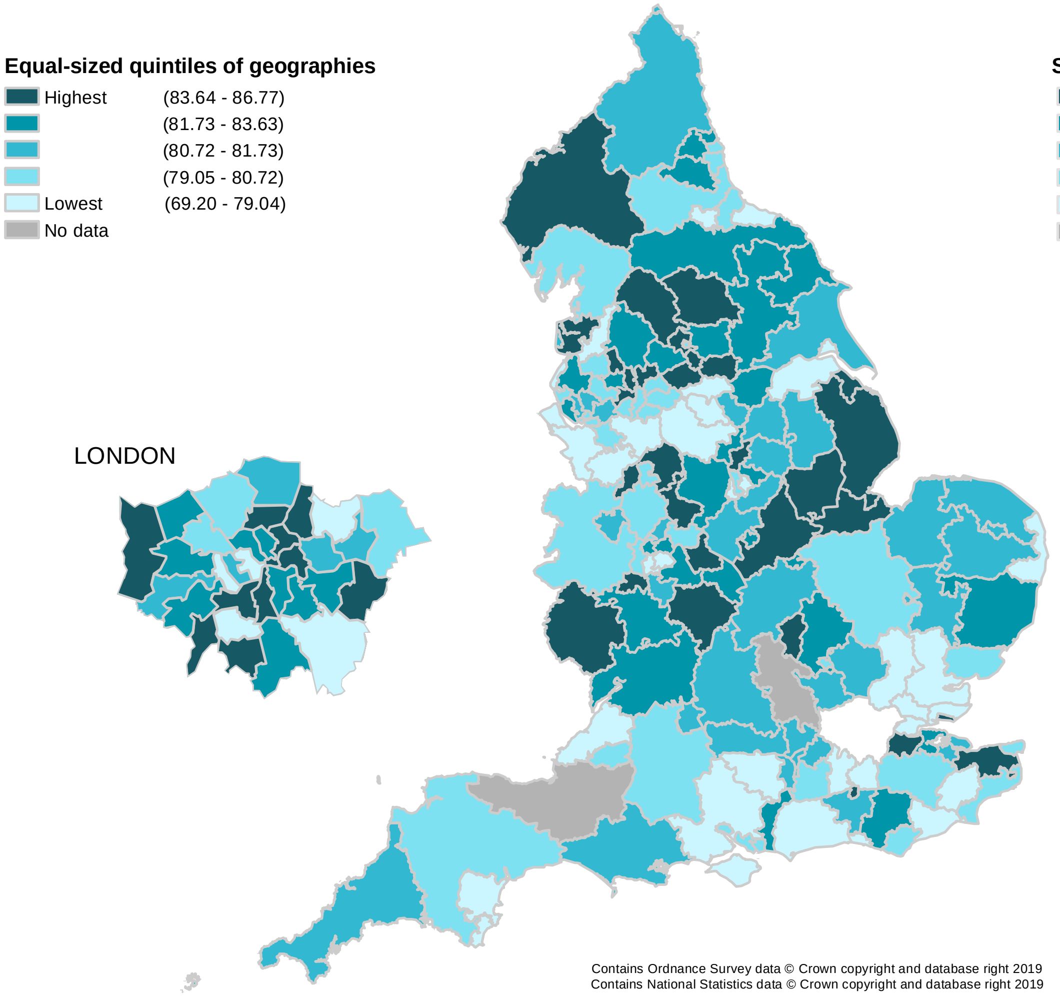
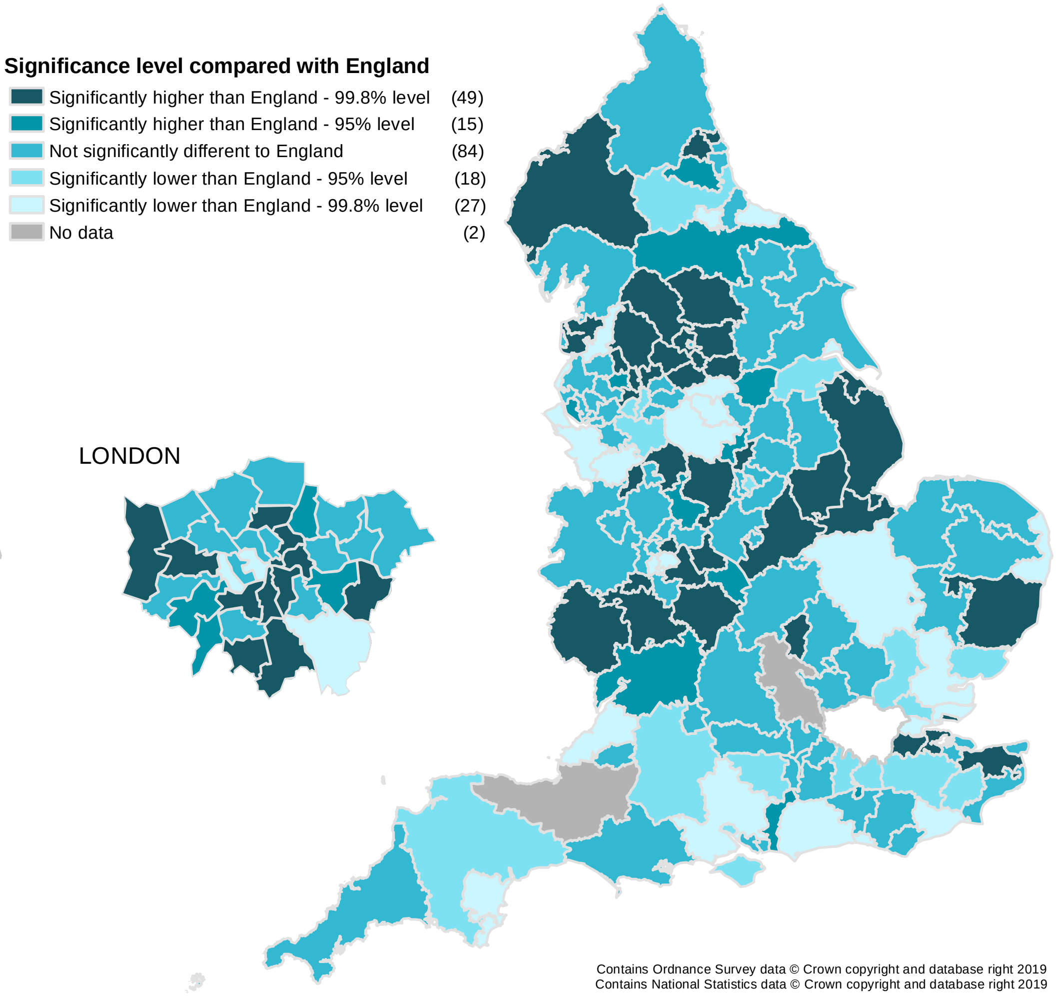
[1] WHO European Health Information Gateway [Accessed 11 July 2019]
[2] Office for National Statistics (2019) Mortality statistics: deaths registered in England and Wales Office for National Statistics, Newport, UK [Accessed 11 July 2019]
[3] Public Health England (2015) Press release: Chronic smoking-related lung disease blights over 1 million lives in England [Accessed 11 July 2019]
[4] NHS England (2016) Causes: Chronic obstructive pulmonary disease. Health A to Z [Accessed 11 July 2019]
[5] British Lung Foundation. Chronic obstructive pulmonary disease (COPD) statistics [Accessed 11 July 2019]
[6] NHS Digital Quality Outcomes Framework (QOF) 2017/18 [Accessed 11 July 2019]
[7] NICE (2016) Chronic obstructive pulmonary disease in adults Quality standard [QS10] [Accessed 11 July 2019]
[8] Hurst J, McMillan V, Mortier K and others (2019) COPD clinical audit 2017/18 (people with COPD exacerbations discharged from acute hospitals in England and Wales between September 2017 and 2018) National Asthma and COPD Audit Programme (NACAP) London: RCP [Accessed 11 July 2019]
[9] Jordan R, Adab P, Sitch A and others (2016) Targeted case finding for chronic obstructive pulmonary disease versus routine practice in primary care (TargetCOPD): a cluster-randomised controlled trial Lancet Respiratory Medicine 4:720–30 doi: 10.1016/S2213-2600(16)30149-7

COPD – Diagnosis

Map 8a: Variation in percentage of patients with COPD on GP registers in whom diagnosis confirmed by post bronchodilator spirometry (including exceptions) by CCG (2017/18)

Optimum Value: High

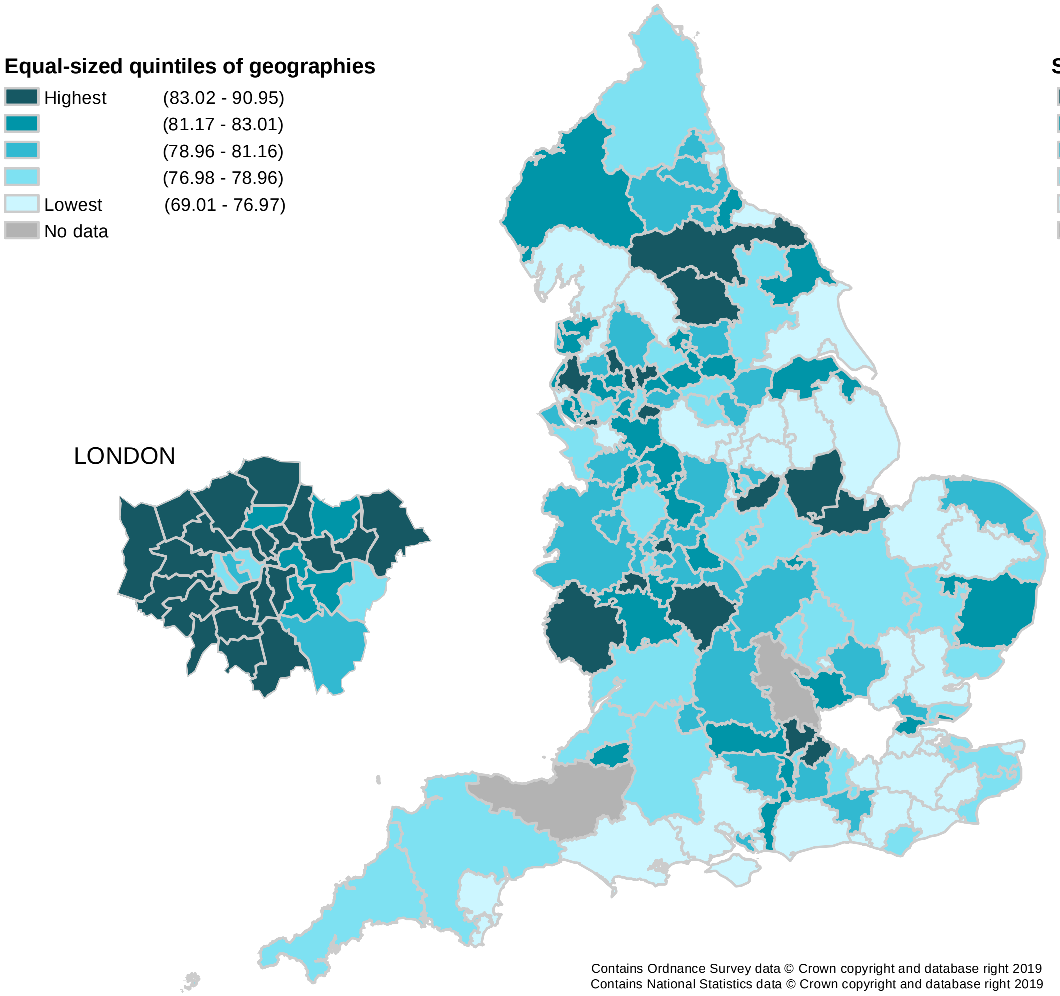


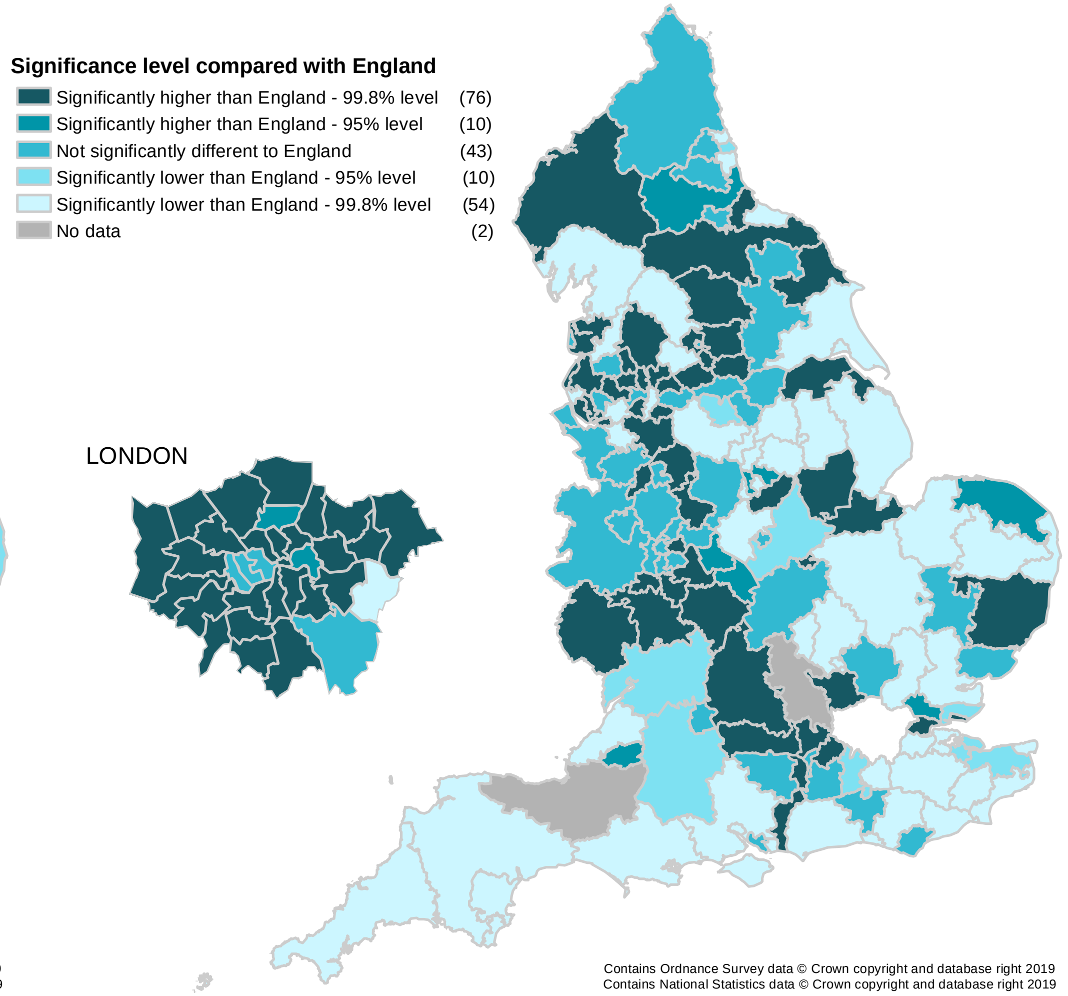


COPD – Diagnosis

Map 8b: Variation in percentage of patients with COPD on GP registers assessed using MRC dyspnoea score in the last 12 months (including exceptions) by CCG (2017/18)

Optimum Value: High

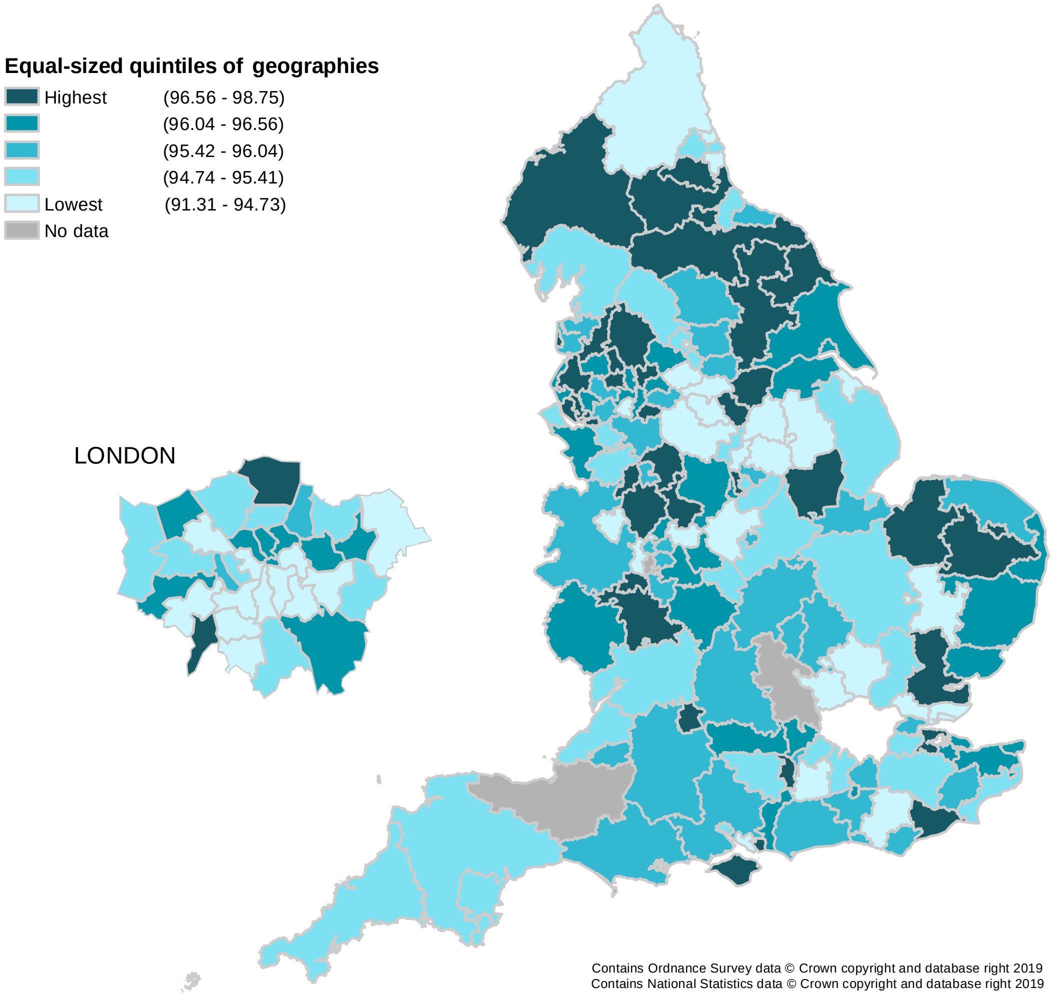


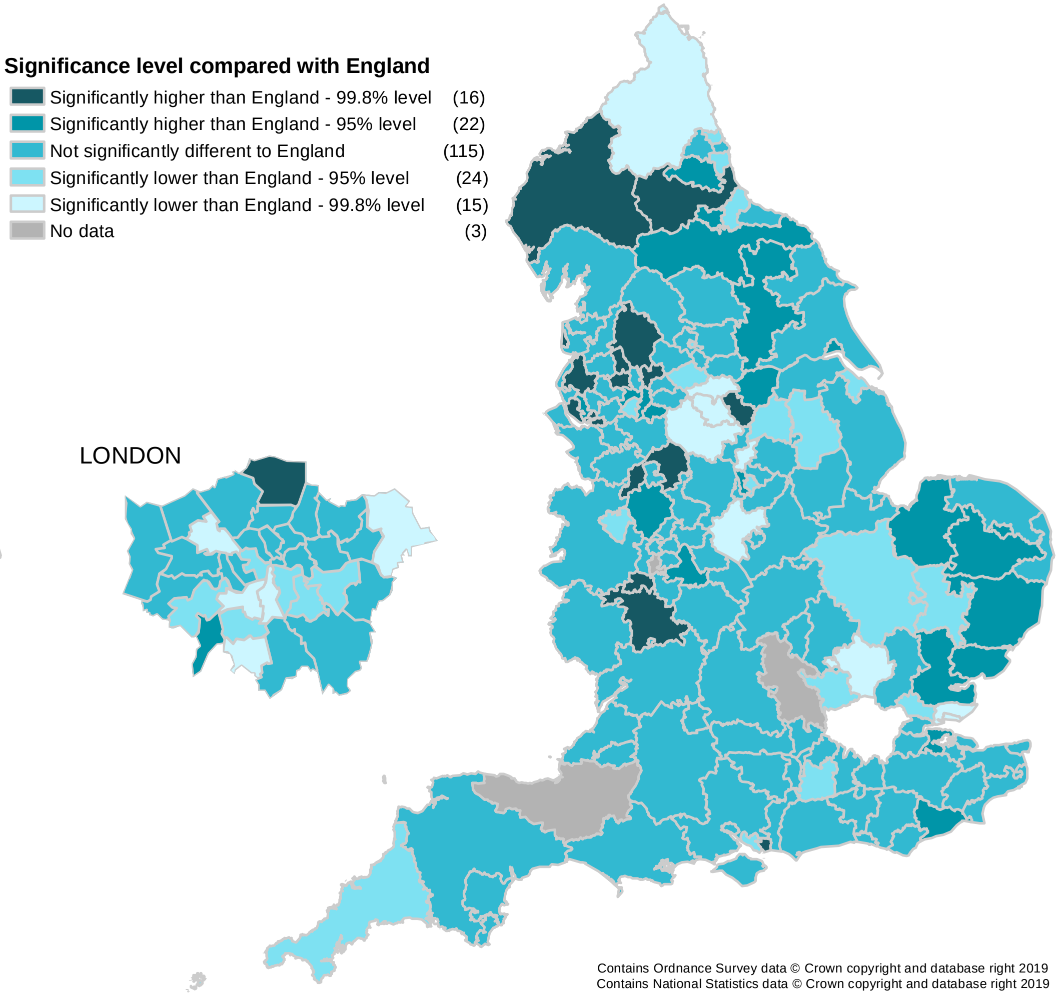


COPD – Diagnosis

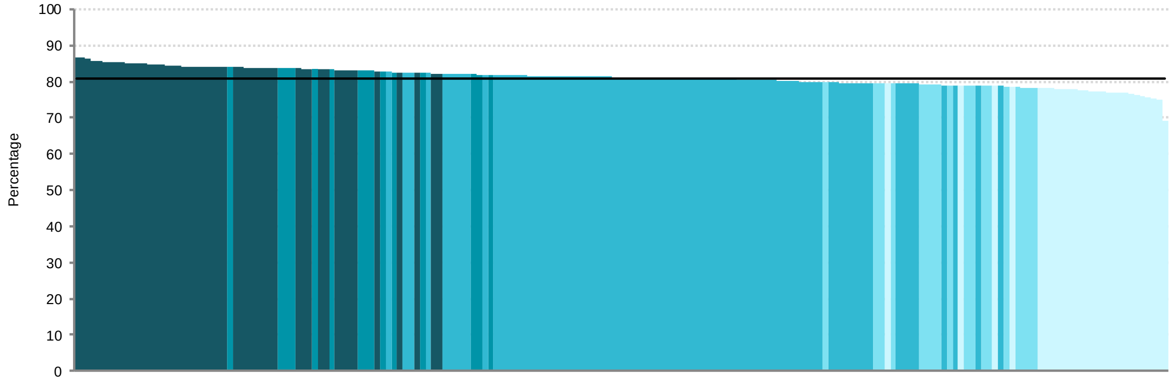
Map 8c: Variation in percentage of patients with COPD on GP registers with MRC dyspnoea grade >=3, with a record of oxygen saturation value within the preceding 12 months (including exceptions) by CCG (2017/18)

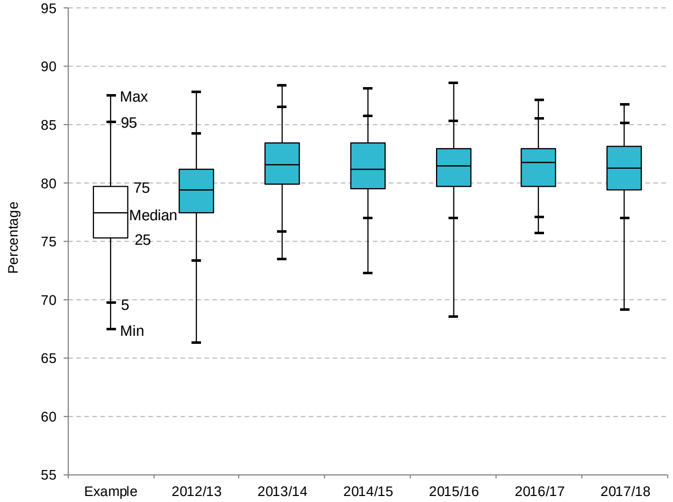
Optimum Value: High





Variation in percentage of patients with COPD on GP registers in whom diagnosis confirmed by post bronchodilator spirometry (including exceptions) by CCG (2017/18)





	Example	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		21.4	15.0	15.8	20.1	11.4	17.6	No significant change
95th-5th percentile		11.0	10.7	8.7	8.4	8.5	8.2	NARROWING Significant
75th-25th percentile		3.8	3.6	3.9	3.2	3.2	3.7	No significant change
Median		79.4	81.5	81.2	81.5	81.8	81.3	No significant change

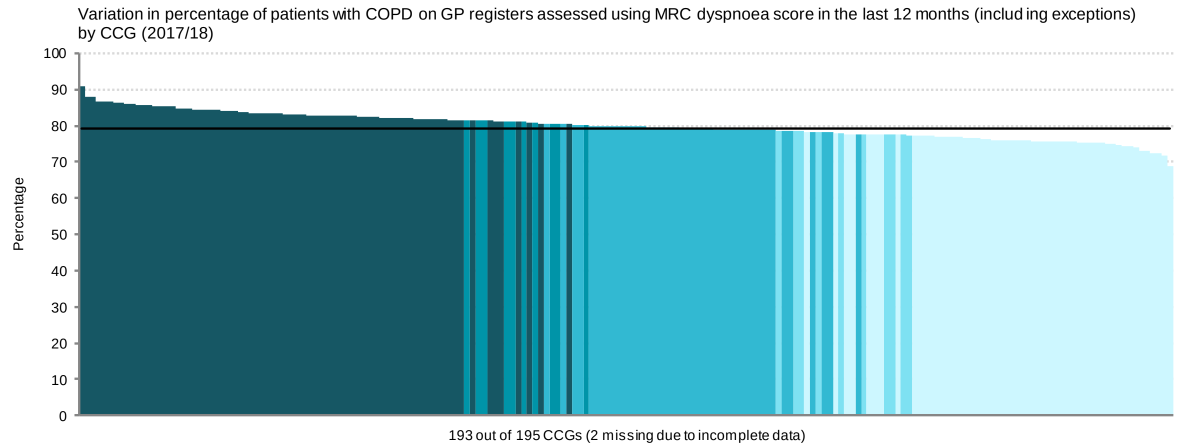
Context

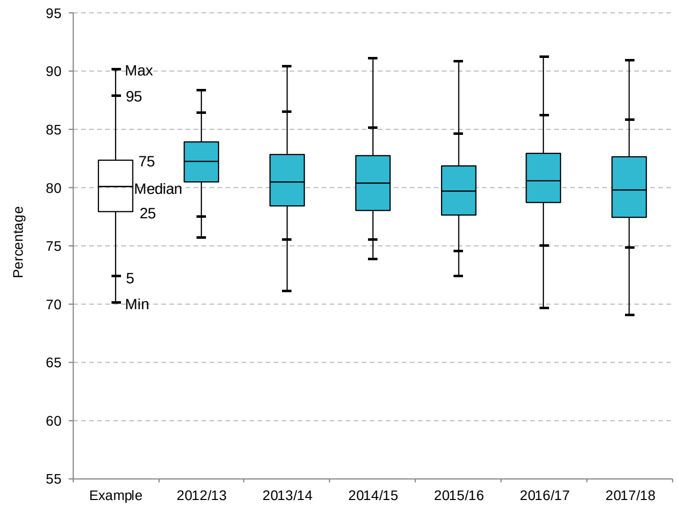
It has been estimated that up to 2 million people in the UK with COPD remain undiagnosed.[1] Late diagnosis can result in faster respiratory deterioration and a higher number of exacerbations. Many patients are also incorrectly diagnosed with COPD when they have another condition. Consequently, they may receive inadequate, inappropriate and often expensive treatment. There are several reasons for the high level of late and inaccurate diagnosis:

- people often do not recognise the symptoms of COPD because they develop gradually
- many people believe it is normal to have a cough and be short of breath, think the symptoms are due to age or smoking and that nothing can be done
- when patients present, doctors often treat the symptoms but do not investigate the underlying lung disease
- spirometry, the key diagnostic test, is often performed and interpreted inaccurately
- problems with accurate coding of diagnoses and test results in both primary and secondary care

According to the latest NICE guidance, a diagnosis of COPD should be suspected based on symptoms and signs and supported by spirometry. Post-bronchodilator spirometry should be performed to confirm the diagnosis of COPD and to reconsider the diagnosis in those who show an exceptionally good response to treatment.

Breathlessness is one of the primary symptoms of COPD. The Medical Research Council (MRC) dyspnoea scale[2] is the tool recommended by NICE to grade breathlessness according to the corresponding level of exertion.





Max-Min (Range)		12.6	19.4	17.3	18.5	21.6	21.9	WIDENING Significant
95th-5th percentile		9.0	11.0	9.7	10.1	11.2	11.0	No significant change
75th-25th percentile		3.4	4.4	4.7	4.2	4.3	5.2	No significant change
Median		82.3	80.5	80.4	79.7	80.6	79.9	No significant change

Pulse oximetry is usually used to direct referral for long term oxygen therapy assessment in stable patients, and in the assessment and management of acute exacerbations, including the decision to refer to hospital.

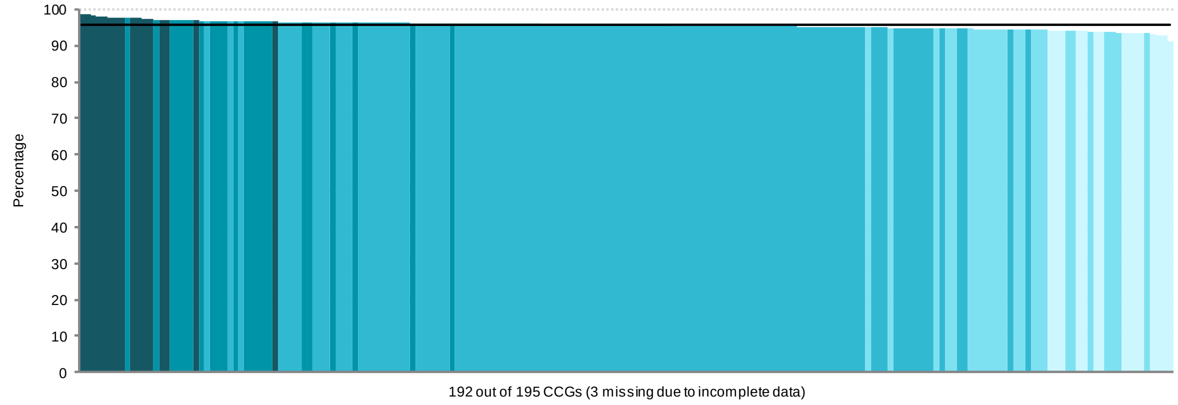
These measures can easily be performed in primary care, where the necessary equipment and expertise are usually available.

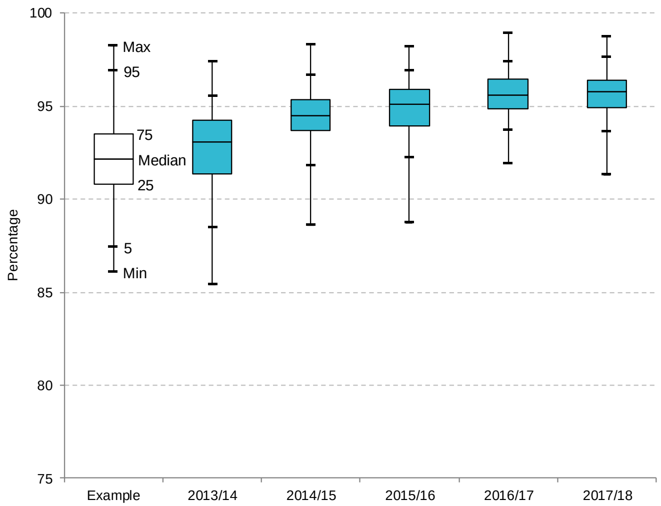
It is recommended by NICE that patients with COPD are reviewed at least annually, and more frequently if required. Annual reviews are an important opportunity to discuss with patients how they are managing their COPD, any change in severity of symptoms, review medicines, identify comorbidities, promote smoking cessation, flu vaccination, regular exercise and pulmonary rehabilitation and address any other issues in their COPD management.

Inhaler technique should be included in this review, and clinicians should also consider the environmental impact of any inhalers prescribed: metered dose inhalers (MDIs) have been found to be a source of greenhouse gases, whereas dry powder inhalers (DPIs) are not known to have this harmful effect on the environment. DPIs, although not suitable for all patients, are associated with fewer inhaler errors and, compared to MDIs used without a spacer, better deposition of the drug in the lung.

Under the QOF scheme, GPs are rewarded for achieving an agreed level of population coverage for each indicator. In calculating coverage, practices are allowed to exclude appropriate patients (known as exceptions) from the target population to avoid being penalised for factors beyond the practices' control, for example when patients do not attend for review despite repeated invitations, or if a medication cannot be prescribed due to a contraindication or side-effect.

Variation in percentage of patients with COPD on GP registers with MRC dyspnoea grade >=3, with a record of oxygen saturation value within the preceding 12 months (including exceptions) by CCG (2017/18)





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		12.0	9.7	9.5	7.0	7.4	NARROWING Significant
95th-5th percentile		7.1	4.9	4.6	3.7	4.0	No significant change
75th-25th percentile		2.9	1.7	1.9	1.6	1.5	No significant change
Median		93.1	94.5	95.1	95.6	95.8	INCREASING Significant

The exception-adjusted population coverage is reported annually by NHS Digital.[3] The analysis presented in this Atlas aims to show the intervention rate so includes exceptions within the denominators (see Introduction to the data section).

Magnitude of variation

Map 8a: Variation in percentage of patients with COPD on GP registers in whom diagnosis confirmed by post bronchodilator spirometry (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 69.2% to 86.8%, which is a 1.3-fold difference between CCGs. The England value for 2017/18 was 80.8%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

The 95th to 5th percentile gap narrowed significantly.

Map 8b: Variation in percentage of patients with COPD on GP registers assessed using MRC dyspnoea score in the last 12 months (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 69.0% to 90.9%, which is a 1.3-fold difference between CCGs. The England value for 2017/18 was 79.4%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

The maximum to minimum range widened significantly.

Map 8c Variation in percentage of patients with COPD on GP registers with MRC dyspnoea grade >=3, with a record of oxygen saturation value within the preceding 12 months (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 91.3% to 98.8%, which is a 1.1-fold difference between CCGs. The England value for 2017/18 was 95.6%.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

The maximum to minimum range narrowed significantly.

The median increased significantly from 93.1 in 2013/14 to 95.8 in 2017/18.

Reasons for variation are likely to be due to differences in primary care procedures. Some areas may provide additional staff guidance on the tests and investigations to be carried out at reviews of patients with COPD, acting as an 'aide memoire' when performing the review and ensuring that all necessary tests have been carried out.

Performing spirometry and pulse oximetry requires trained staff and available equipment. Figures may be lower in areas where there are fewer trained primary care staff who are able to carry out the investigations, or complete the MRC dyspnoea questions with their patients.

There is also likely to be variation in the frequency with which patients are labelled as 'exceptions' between practices. Whilst being labelled as an 'exception' may prevent the practice from recalling a patient to complete the investigations included here, the dataset in this report includes exceptions, and so may appear unfavourable on areas where practices have a large number of exceptions.

Options for action

Potential options to reduce the variation in the measures above include:

Quality-assured diagnostic spirometry: Ensure that diagnostic spirometry is performed only by professionals with the appropriate training, competencies and equipment; standards are clearly defined and equally applicable to primary, community and secondary care settings.

Breathlessness symptom pathway to improve the accuracy of diagnosis: to streamline and coordinate care to achieve early diagnosis and early treatment for patients suffering from non-acute breathlessness.

Quality-assured workforce trained to make accurate diagnosis of respiratory symptoms.

Public health campaigns to promote lung health and early recognition of the symptoms of COPD.

Resources

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease (NG115) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guidance [NG115]) [Accessed 19 February 2019]

NHS England NHS RightCare Pathways: COPD [Accessed 19 February 2019]

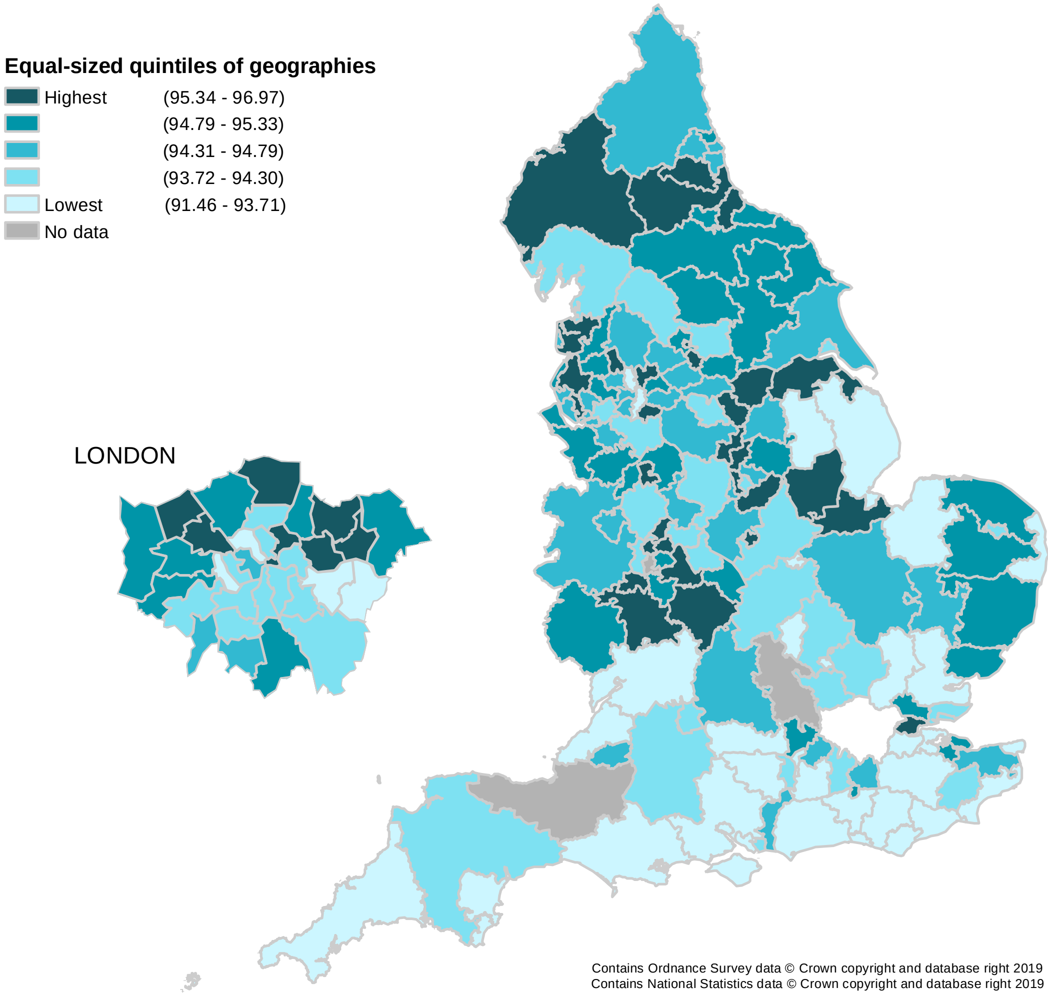
Leicester, Leicestershire, Rutland (University Hospitals of Leicester NHS Trust) (2016) Breathlessness Pathway [Accessed 19 February 2019]

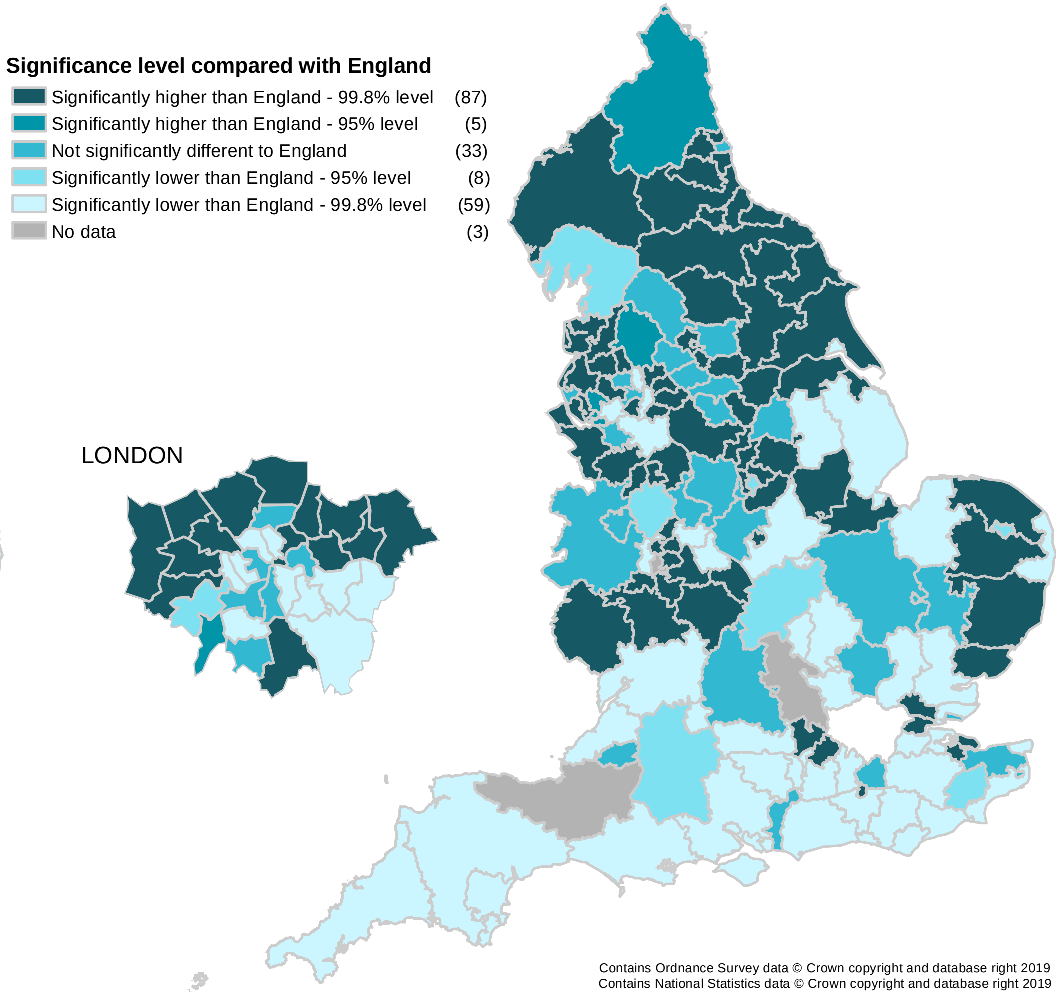
[1] National Institute for Health and Care Excellence (2016) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE quality standard [QS10]) [Accessed 30 January 2019]
[2] Medical Research Council (1959) MRC Dyspnoea scale / MRC Breathlessness scale [Accessed 19 February 2019]
[3] NHS Digital Quality Outcomes Framework (QOF) [Accessed 10 June 2019]

COPD – Tobacco dependence

Map 9a: Variation in percentage of patients with certain conditions, including COPD, whose notes record smoking status in the preceding 12 months (including exceptions) by CCG (2017/18)

Optimum value: High

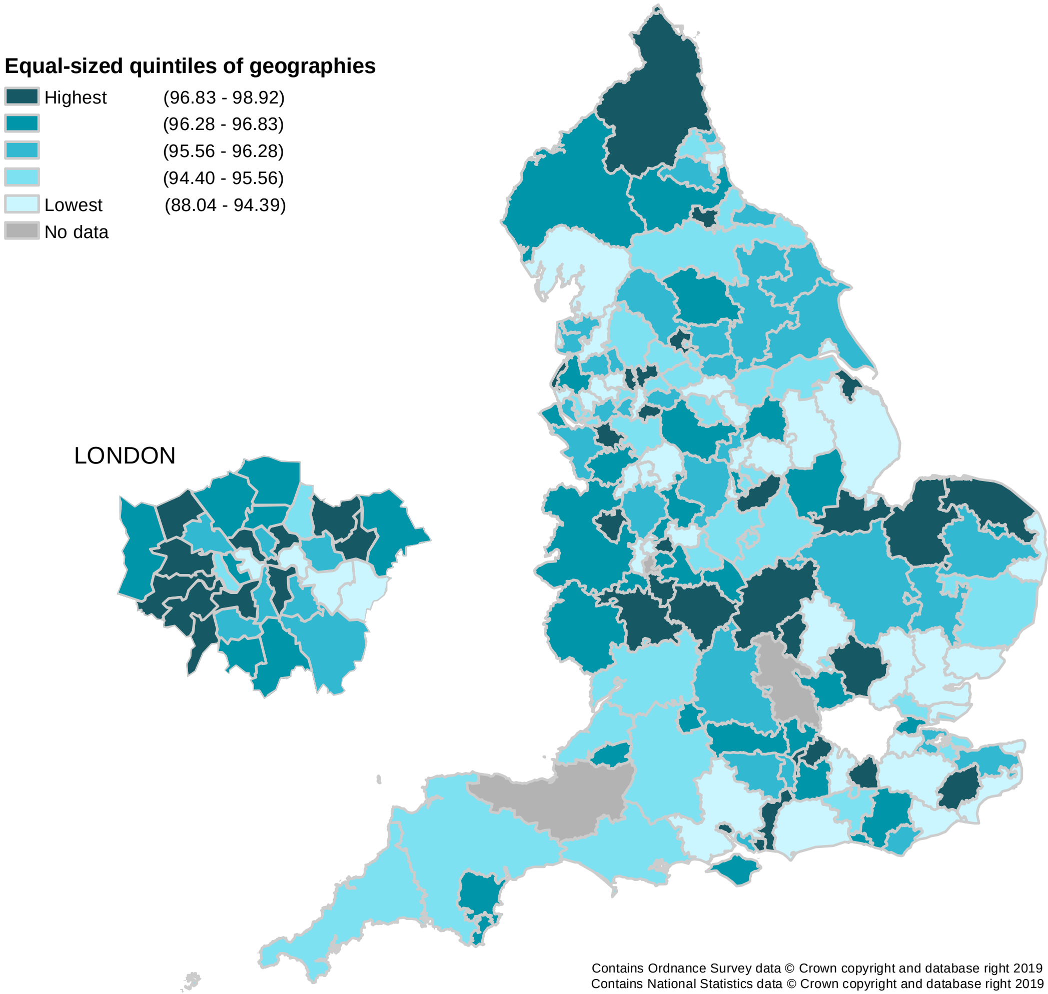


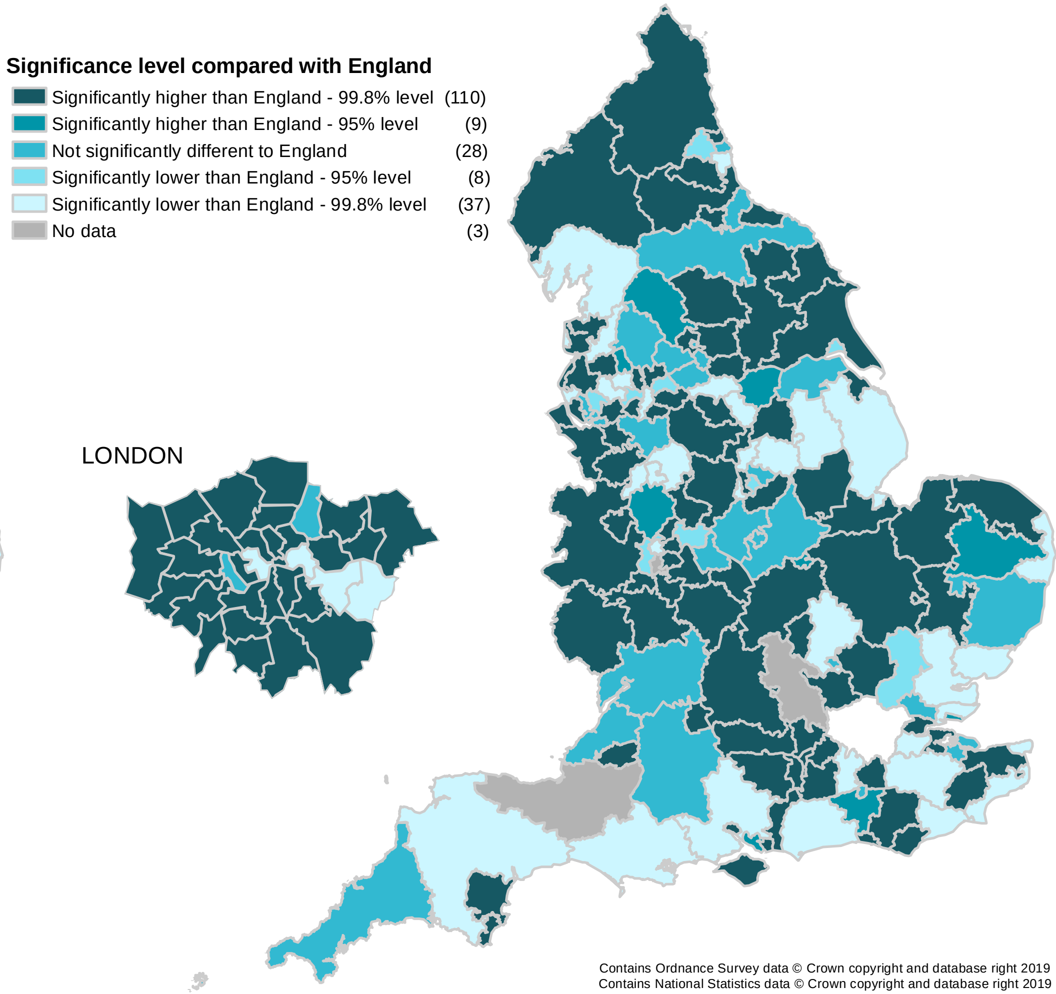


COPD – Tobacco dependence

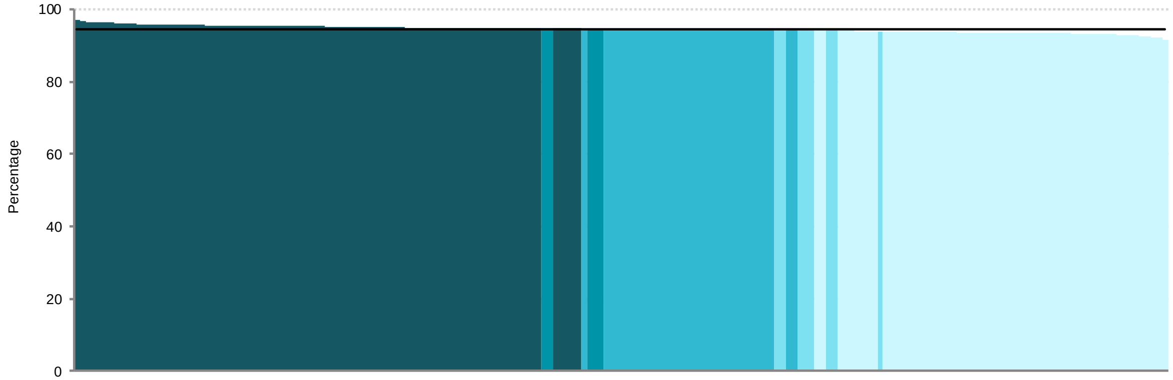
Map 9b: Variation in percentage of patients with certain conditions, including COPD, who smoke whose notes contain a record of an offer of support and treatment within the preceding 12 months (including exceptions) by CCG (2017/18)

Optimum value: High

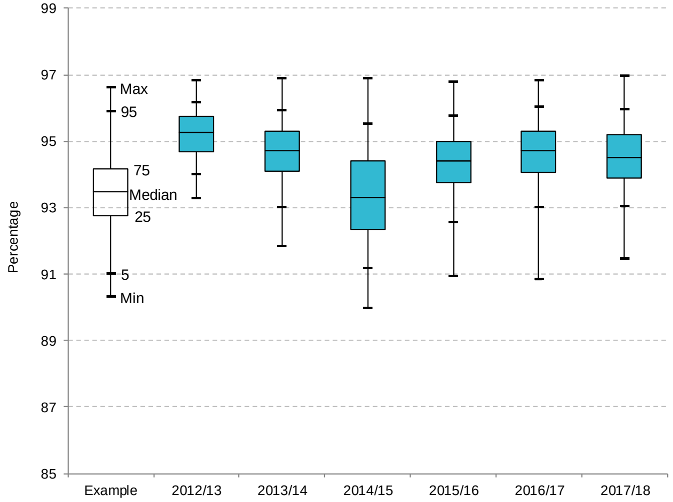




Variation in percentage of patients with certain conditions, including COPD, whose notes record smoking status in the preceding 12 months (including exceptions) by CCG (2017/18)



192 out of 195 CCGs (3 missing due to incomplete data)



	Example	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		3.6	5.1	6.9	5.9	6.0	5.5	**No significant change**
95th-5th percentile		2.2	2.9	4.3	3.2	3.0	2.9	**No significant change**
75th-25th percentile		1.1	1.2	2.1	1.2	1.2	1.3	**No significant change**
Median		95.3	94.7	93.3	94.4	94.7	94.5	**No significant change**

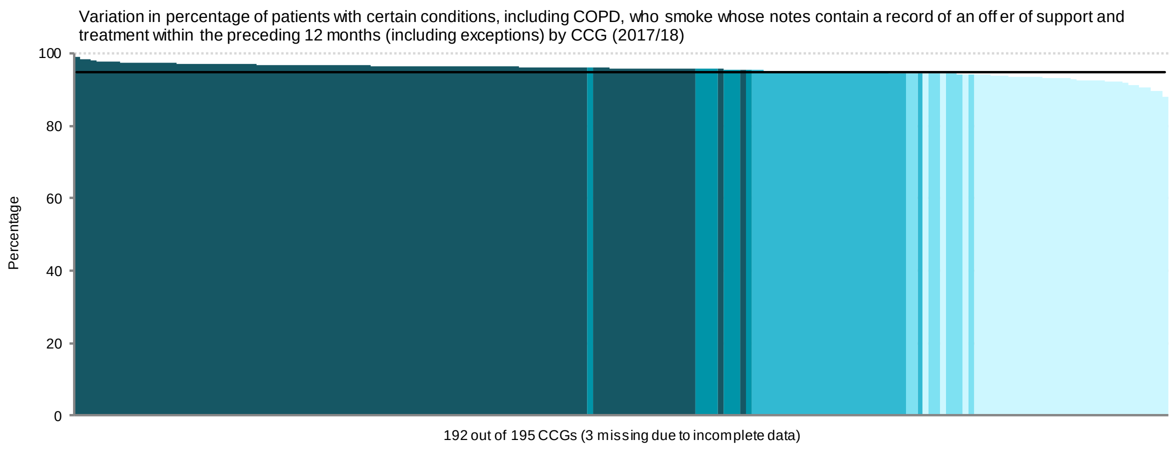
Context

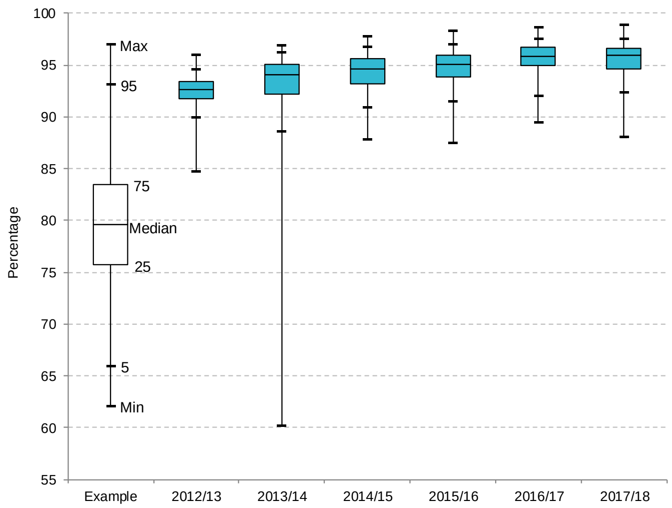
COPD is caused by destruction of the air-sacs in the lungs and inflammation and thickening of the bronchial tubes within the lungs. The most common cause for this is smoking, although the condition can sometimes affect people who have never smoked but have been exposed to outdoor and indoor air pollution, occupational exposures to certain dusts or fumes, or have a rare genetic problem. There is also evidence that smoking in pregnancy, asthma and childhood infections are associated with a higher risk of COPD.[1]

The likelihood of developing COPD increases with both the amount and duration of smoking. The main recommendation for treating COPD is to stop smoking, with the latest NICE guidance advising clinicians to encourage all those with COPD who are still smoking to stop, and offer help to do so, at every opportunity. The most effective stop smoking interventions include both the prescription of pharmacotherapy drugs and counselling support.[2]

There is no routinely collected data on how many patients with COPD smoke. One UK wide study using primary care data found that 31% of patients with COPD were current smokers and 56% ex-smokers.[3] However, it is estimated in England that 86% of chronic obstructive lung disease deaths in 2016 in people aged 35 years and over were attributable to smoking.[4]

The data presented here from the QOF monitors how many patients with coronary heart disease, peripheral arterial disease (PAD), stroke or transient ischaemic attacks (TIA), hypertension, diabetes, COPD, chronic kidney disease (CKD), asthma, schizophrenia, bipolar affective disorder or





Max-Min (Range)		11.4	36.7	9.9	10.9	9.2	10.9	No significant change
95th-5th percentile		4.6	7.6	5.9	5.5	5.6	5.2	No significant change
75th-25th percentile		1.7	2.8	2.4	2.0	1.8	2.0	No significant change
Median		92.6	94.1	94.6	95.1	95.8	95.9	INCREASING Significant

other psychoses are being asked about their smoking habits and whether they are then offered support to quit.

There is evidence that people who smoke are receptive to smoking cessation advice in all healthcare settings and that healthcare professionals are effective in helping people to stop smoking.[5]

Magnitude of variation

Map 9a: Variation in percentage of patients with certain conditions, including COPD, whose notes record smoking status in the preceding 12 months (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 91.5% to 97.0%, which is a 1.1-fold difference between CCGs. The England value for 2017/18 was 94.4%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

There was no significant change in any of the 3 variation measures between 2012/13 and 2017/18.

Map 9b: Variation in percentage of patients with certain conditions, including COPD, who smoke whose notes contain a record of an offer of support and treatment within the preceding 12 months (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 88.0% to 98.9%, which is a 1.1-fold difference between CCGs. The England value for 2017/18 was 94.9%. The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

There was no significant change in any of the 3 variation measures between 2012/13 and 2017/18. The median increased significantly from 92.6% in 2012/13 to 95.9% in 2017/18.

Reasons for variation are likely to be due to differences in primary care procedures.

There will be variation in how smoking status and treatment offers are recorded by practices to meet the QOF requirements. The QOF business rules require practices to use Read codes to record their actions. This means practices can meet the QOF measure without health care practitioners speaking face to face with patients about their smoking habits.

The recording of an offer of support and treatment does not necessarily reflect the quality of the intervention or if the patient takes up the offer. QOF figures show a high percentage of patients offered treatment, however there is evidence that this has not resulted in higher prescriptions of pharmacotherapy.[6]

Options for action

NICE have produced a quality standard on smoking cessation (QS43, Smoking: supporting people to stop). This outlines a number of strategies to increase the number of people who attempt to stop smoking.

Service providers should ensure that healthcare practitioners are trained to provide evidence based very brief advice (VBA) to patients.

Service providers should ensure that a system is in place for healthcare practitioners to ask patients if they smoke face to face and offer evidence based advice to stop smoking.

Commissioners should fund a service whereby people who smoke are offered a referral to an evidence-based smoking cessation service.

Healthcare practitioners should offer a full course of pharmacotherapy to those people who smoke and seek support to stop smoking, and who agree to pharmacotherapy. This is at least 8 to 12 weeks, depending on the pharmacotherapy used.

People who smoke are more likely to stop smoking if they are offered a combination of interventions. Services should be available which offer behavioural support to people who smoke, in addition to pharmacotherapy. This can be individual or group behavioural support.

Service providers should follow up patients to determine if they have taken up the offer of support and treatment.

However, targeting action to tackling inequalities in tobacco use is key, with smoking prevalence being significantly higher in some communities. This is associated with a higher prevalence of COPD. NICE guideline (NG92) suggests prioritising people with mental health or substance misuse problems, health conditions, and people in custodial settings or disadvantaged circumstances, who are at high risk of tobacco related harm.[7]

Resources

NHS Choices COPD [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 11 July 2019]

Department of Health (2011) An outcomes strategy for people with chronic obstructive pulmonary disease (COPD) and Asthma in England [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2013) Smoking: supporting people to stop (NICE quality standard [QS43]) [Accessed 11 July 2019]

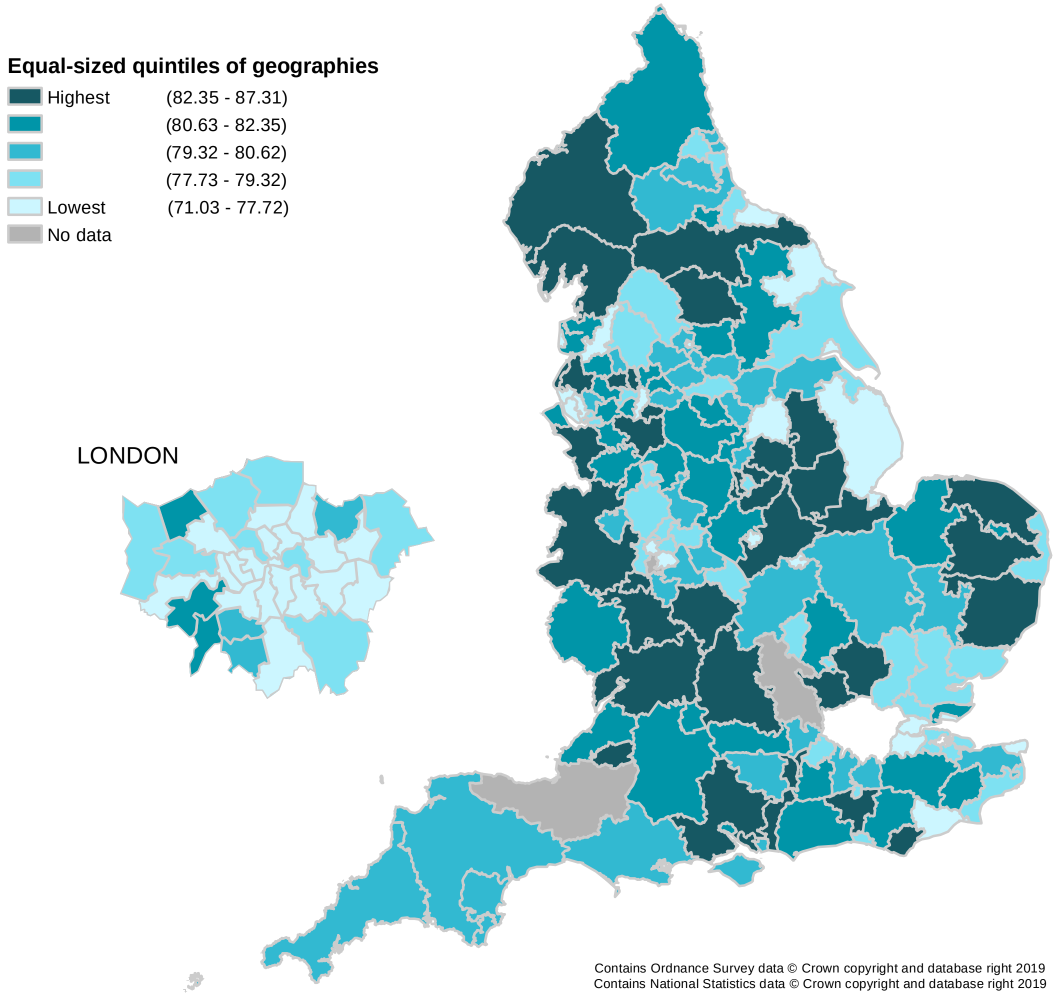
National Centre for Smoking Cessation and Training. Very brief advice training module [Accessed 11 July 2019]

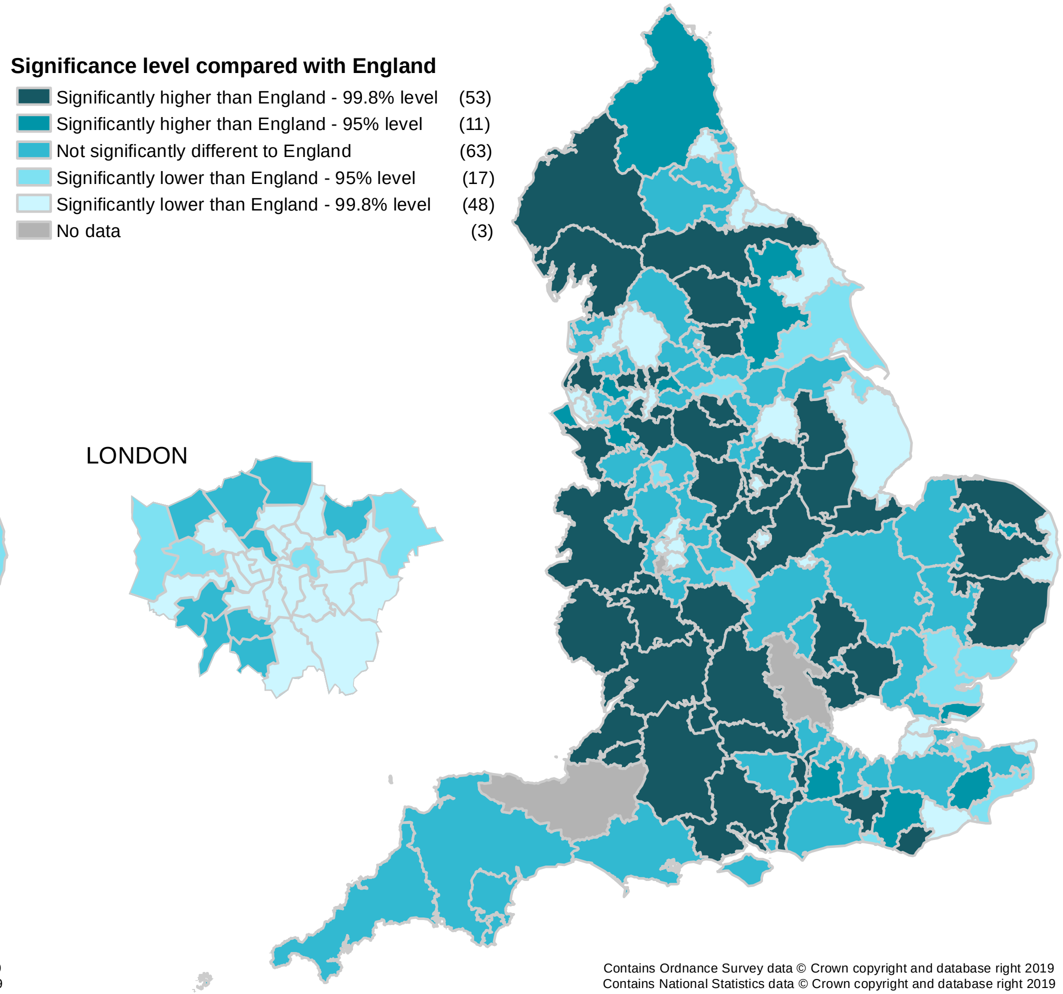
[1] Postma DS, Bush A and van den Berge M (2015) Risk factors and early origins of chronic obstructive pulmonary disease The Lancet 385:899-909. [Accessed 11 July 2019]
[2] Public Health England (2017) Models of Delivery of Stop Smoking Services [Accessed 11 July 2019]
[3] Price DB, West D, Brusselle G and others (2014) Management of COPD in the UK primary-care setting: an analysis of real-life prescribing patterns Int J Chron Obstruct Pulmon Dis 9:889-904 [Accessed 11 July 2019]
[4] NHS Digital (2018) Statistics on smoking – England 2018 [PAS] Table 3.5 [Accessed 11 July 2019]
[5] National Institute for Health and Care Excellence (2016) (updated March 2018) The percentage of patients with any or any combination of the following conditions: CHD, PAD, stroke or TIA, hypertension, diabetes, COPD, CKD, asthma, schizophrenia, bipolar affective disorder or other psychoses who are recorded as current smokers who have a record of an offer of support and treatment within the preceding 12 months (NICE quality and outcomes framework indicator [NM38]) [Accessed 07 August 2019]
[6] Szatkowski L and Aveyard P (2016) Provision of smoking cessation support in UK primary care: impact of the 2012 QOF revision Br J Gen Pract. 66(642):e10-5 [Accessed 21 May 2019]
[7] National Institute for Health and Care Excellence (2018) Stop smoking interventions and services (NICE guideline [NG92]) [Accessed 07 August 2019]

COPD – Primary care - Interventions/treatments

Map 10a: Variation in percentage of patients with COPD on GP registers receiving influenza immunisation in the preceding 1 August to 31 March (including exceptions) by CCG (2017/18)

Optimum value: High





COPD – Primary care - Interventions/treatments

Map 10b: Variation in percentage of people with COPD and Medical Research Council Dyspnoea Scale >=3 referred to a pulmonary rehabilitation programme by CCG (2014/15)

Optimum value: High

Equal-sized quintiles of geographies

Highest		(25.69 - 68.52)
		(20.40 - 25.68)
		(13.42 - 20.39)
		(10.82 - 13.41)
Lowest		(3.82 - 10.81)
Suppressed		

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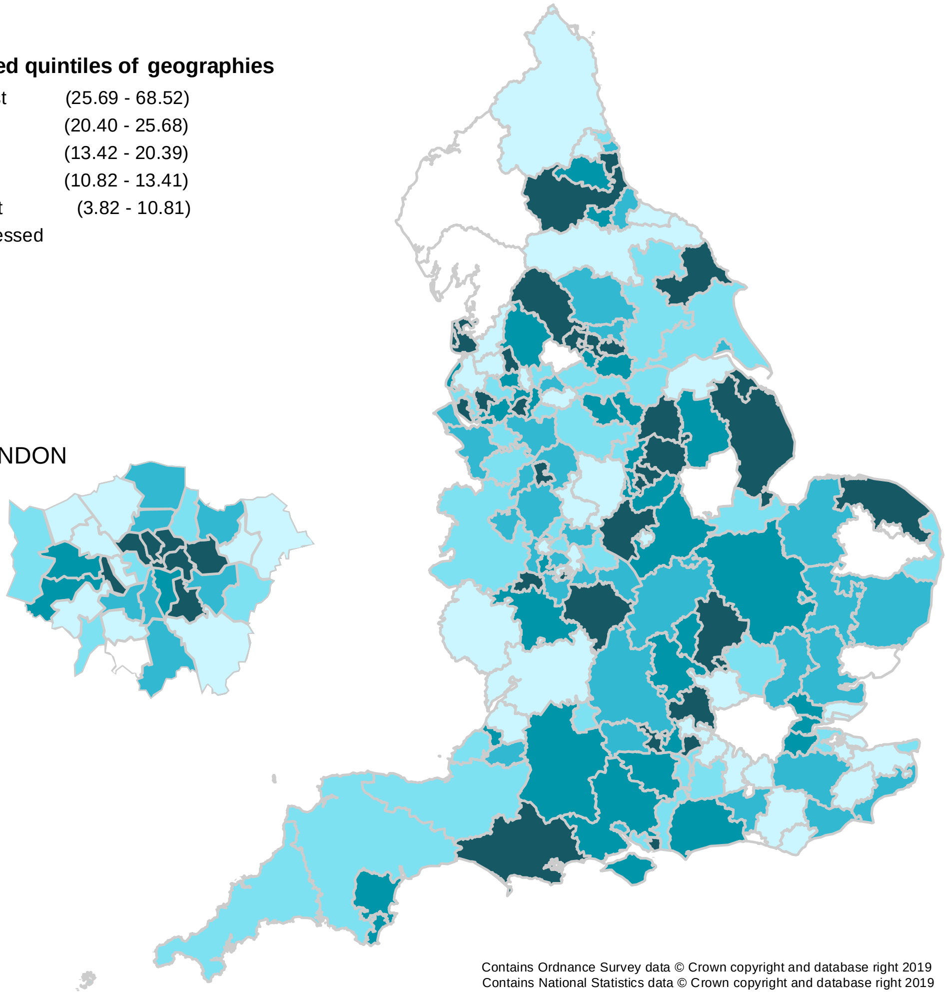

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Significance level compared with England

Significantly higher than England - 99.8% level	(69)
Significantly higher than England - 95% level	(6)
Not significantly different to England	(24)
Significantly lower than England - 95% level	(6)
Significantly lower than England - 99.8% level	(92)
Suppressed	(10)

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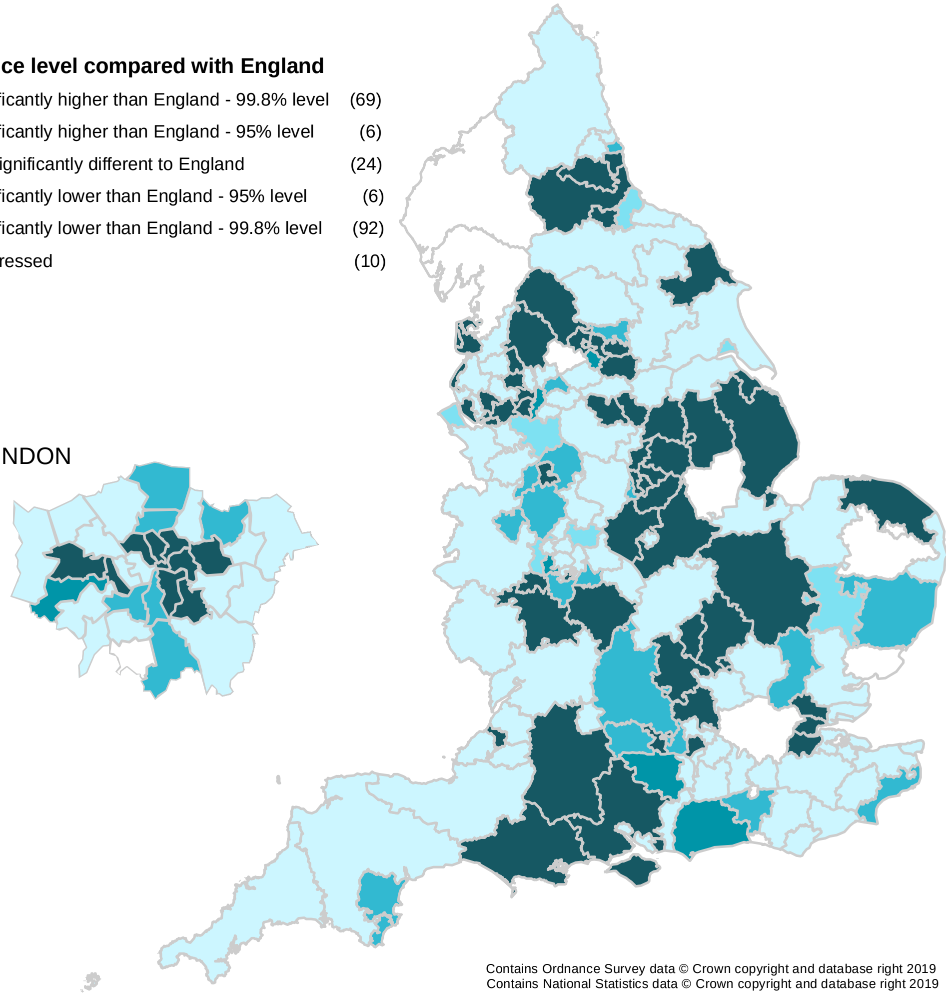

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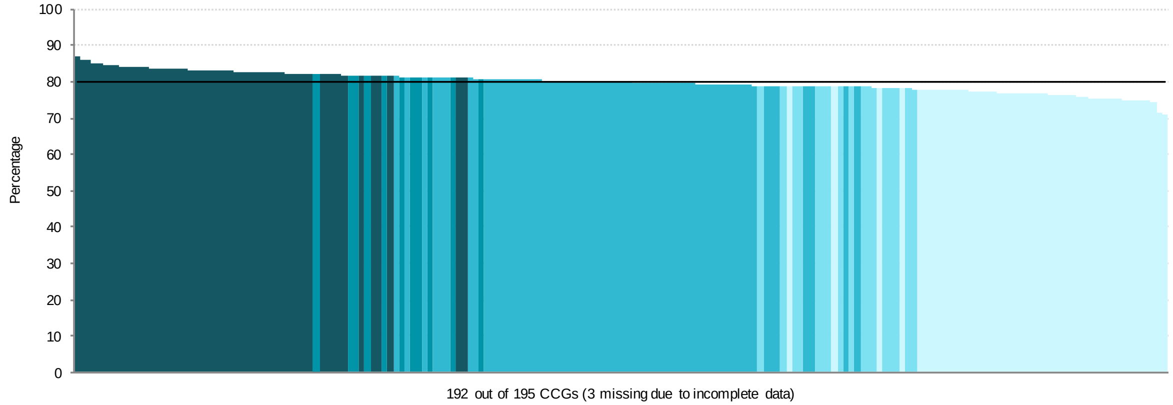
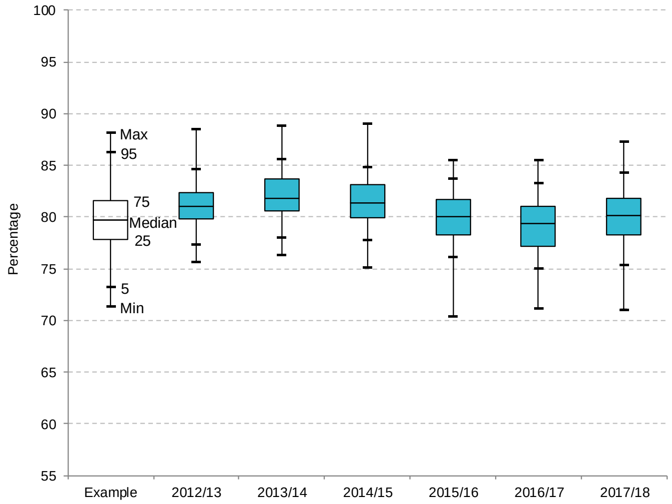
Variation in percentage of patients with COPD on GP registers receiving influenza immunisation in the preceding 1 August to 31 March (including exceptions) by CCG (2017/18)





Max-Min (Range)		12.8	12.4	13.9	15.2	14.4	16.3	WIDENING Significant
95th-5th percentile		7.4	7.6	7.0	7.6	8.2	8.9	No significant change
75th-25th percentile		2.5	3.1	3.2	3.4	3.8	3.6	WIDENING Significant
Median		81.1	81.8	81.4	80.0	79.3	80.1	No significant change

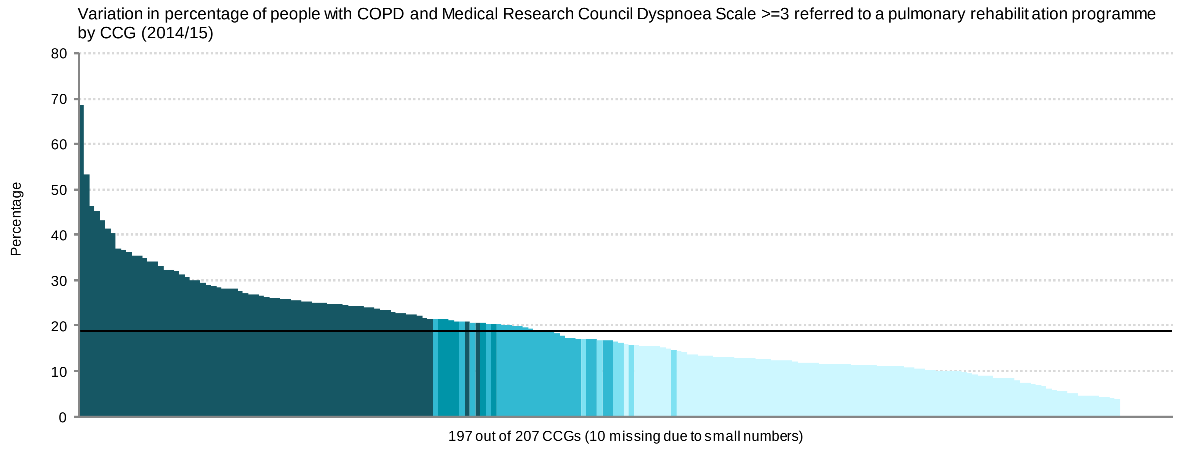
Context

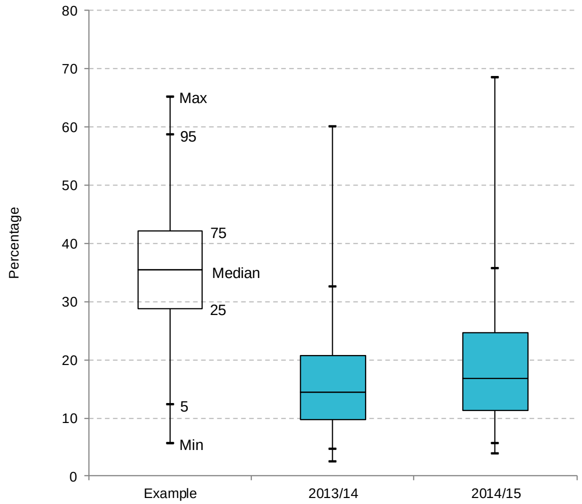
Most of the care for people with chronic obstructive pulmonary disease (COPD) is provided in primary care. Chronic disease management by GPs and nurses is likely to have a considerable impact on patient outcomes such as symptom control, quality of life, physical and social activity, admission to hospital, and mortality. The NHS London Respiratory Team found influenza immunisation of greatest value in cost per QALY for at-risk group[1] (IMPRESS has built on this work).

Indicators in the Quality and Outcomes Framework[2] (QOF) reflect the long-term disease management of COPD in primary care, including the percentage of patients with COPD who have had influenza immunisation in the preceding 15 months. People with COPD are at high risk of developing complications from influenza, and around 17% of influenza deaths each year are in people with chronic respiratory disease. Evidence shows that the influenza vaccination reduces the risk of hospitalisation for pneumonia, and death, in patients with COPD. The influenza vaccination receives a large amount of publicity and is recommended annually to all those with a diagnosis of COPD by the Joint Committee on Vaccination and Immunisation and the Chief Medical Officer.

A non-pharmacological treatment to improve symptoms of COPD is pulmonary rehabilitation. Pulmonary rehabilitation can be defined as a multidisciplinary programme of care for patients with chronic respiratory impairment that is individually tailored and designed to optimise each patient's physical and social performance and autonomy.[3]

Programmes comprise individualised exercise programmes and education.





	Example	2013/14	2014/15
Max-Min (Range)		57.7	64.7
95th-5th percentile		27.8	30.1
75th-25th percentile		11.1	13.4
Median		14.4	16.8

It is recommended that pulmonary rehabilitation is offered to all patients with MRC dyspnoea grade 3 and above, and people with COPD who have recently been hospitalised with an acute exacerbation. The programme should include components of physical training, disease education, and nutritional, psychological and behavioural intervention.

Magnitude of variation

Map 10a: Variation in percentage of patients with COPD on GP registers receiving influenza immunisation in the preceding 1 August to 31 March (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 71.0% to 87.3%, which is a 1.2-fold difference between CCGs. The England value for 2017/18 was 80.0%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

Both the maximum to minimum range and the 75th to 25th percentile gap widened significantly.

It should be noted that the indicator on influenza vaccination shows the actual population coverage for each CCG not the published QOF achievement: excepted patients have been included in the denominator. There is marked variation in exception reporting at a local and practice level, which is worthy of particular attention among CCGs and clinicians. This includes patients who decline vaccination, perhaps in the mistaken but commonly held belief that vaccination causes influenza and doubts about efficacy.

Potential reasons for the degree of variation observed include differences in:

- level of awareness among people with COPD of the need for influenza vaccination
- effectiveness of the promotion and offer of influenza vaccination to people with COPD, particularly in primary care
- access to free influenza vaccination services

Map 10b: Variation in percentage of people with COPD and Medical Research Council Dyspnoea Scale >=3 referred to a pulmonary rehabilitation programme by CCG (2014/15)

The maps and column chart display the latest period (2014/15), during which CCG values ranged from 3.8% to 68.5%, which is a 17.9-fold difference between CCGs. The England value for 2014/15 was 18.8%.

The box plot shows the distribution of CCG values for the period 2013/14 to 2014/15.

The 2014/15 data on pulmonary rehabilitation is the most recent time period measured by the Quality and Outcomes Framework (QOF). A new indicator measuring pulmonary rehabilitation is to be reintroduced to the QOF from April 2019. This follows a national review of the QOF and a stated desire to secure early progress on clinical priorities identified in the 2019 NHS Long Term Plan.[4]

The latest National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme pulmonary rehabilitation report (April 2018) found 29% of services did not offer early post-discharge pulmonary rehabilitation for patients following discharge from hospital for acute exacerbation of COPD[5]. This may be due to a lack of a clear patient pathway for acute exacerbations of COPD admitted to hospital, including a comprehensive discharge bundle of assessments and referrals where necessary. Services also estimated that 33% of patient referrals did not attend an initial pulmonary rehabilitation assessment.

Options for action

The NICE guidance [NG103] for increasing influenza vaccination uptake among those eligible recommends:

- raising awareness in health and social care staff. Staff with direct contact with COPD patients should receive training on influenza and influenza vaccination
- raise awareness in COPD patients eligible. This should be done at the earliest opportunity before the flu vaccination season starts. Provide a personal invitation to all eligible patients
- uptake rates should be audited and monitored to enable regular feedback and review of progress to identify COPD patients who have not been vaccinated

The NICE guidance [NG115] on chronic obstructive pulmonary disease recommends:

- pulmonary rehabilitation should be available to all appropriate people with COPD, including those with recent hospitalisation for an acute exacerbation
- pulmonary rehabilitation should be offered to all patients who consider themselves functionally disabled by COPD (MRC dyspnoea grade 3 and above)
- the rehabilitation process should incorporate a programme of physical training, disease education, nutritional, psychological and behavioural intervention

Resources

Department of Health (2011) An outcomes strategy for people with chronic obstructive pulmonary disease (COPD) and Asthma in England [Accessed 11 July 2019]

Department of Health (2012) An Outcomes Strategy for COPD and Asthma: NHS Companion Document [Accessed 11 July 2019]

NHS Medical Directorate (2012) COPD Commissioning Toolkit: A Resource for Commissioners [Accessed 07 August 2019]

NHS England NHS RightCare Pathways: COPD [Accessed 11 July 2019]

NHS Health Education England in partnership with Public Health England e-Learning for Healthcare Flu Immunisation [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2011, updated 2016) Chronic obstructive pulmonary disease in adults (NICE quality standard [QS10]) [Accessed 11 July 2019]

National Institute for Health and Care Excellence (2015) The percentage of patients with COPD who have had influenza immunisation in the preceding 1 August to 31 March (Inherited) (NICE quality and outcomes framework indicator [NM106]) [Accessed 07 August 2019]

National Institute for Health and Care Excellence (2018) Flu vaccination: increasing uptake (NICE guideline [NG103]) [Accessed 11 July 2019]

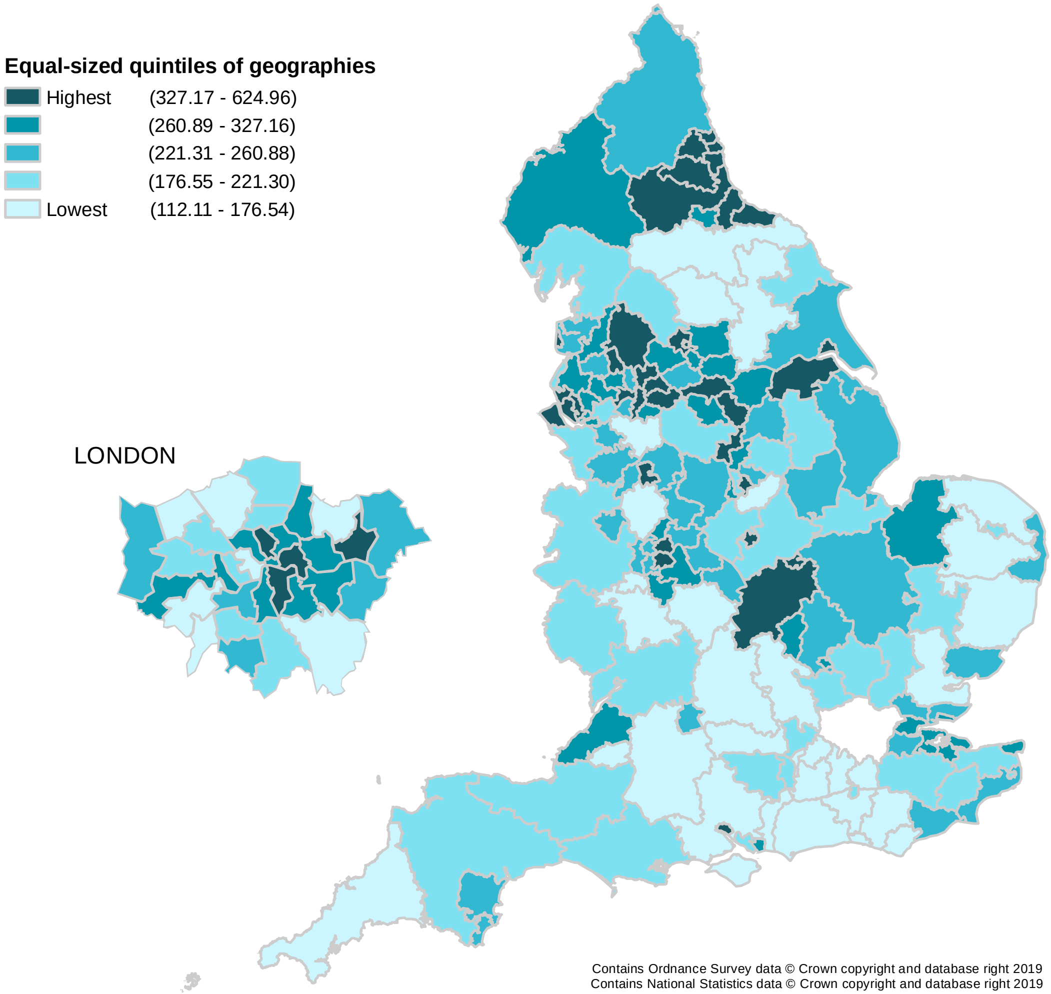
[1] Primary Care Respiratory Society (2012) IMProving and Integrating RESpiratory Services in the NHS: IMPRESS guide to the relative value of COPD interventions p17 [Accessed 08 August 2019]
[2] NHS Digital Quality Outcomes Framework Report (Note: In 2013/14, the QOF ID was COPD006; for 2014/15 and 2015/16, the QOF ID changed to COPD007) [Accessed 11 July 2019]
[3] National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 11 July 2019]
[4] NHS England and British Medical Association (2019) Investment and evolution: A five-year framework for GP contract reform to implement The NHS Long Term Plan [Accessed 11 July 2019]
[5] Steiner M, McMillan V, Lowe D and others (2018) Pulmonary rehabilitation: An exercise in improvement - National Chronic Obstructive Pulmonary Disease (COPD) Audit Programme: Clinical and organisational audits of pulmonary rehabilitation services in England and Wales 2017 London: RCP [Accessed 11 July 2019]

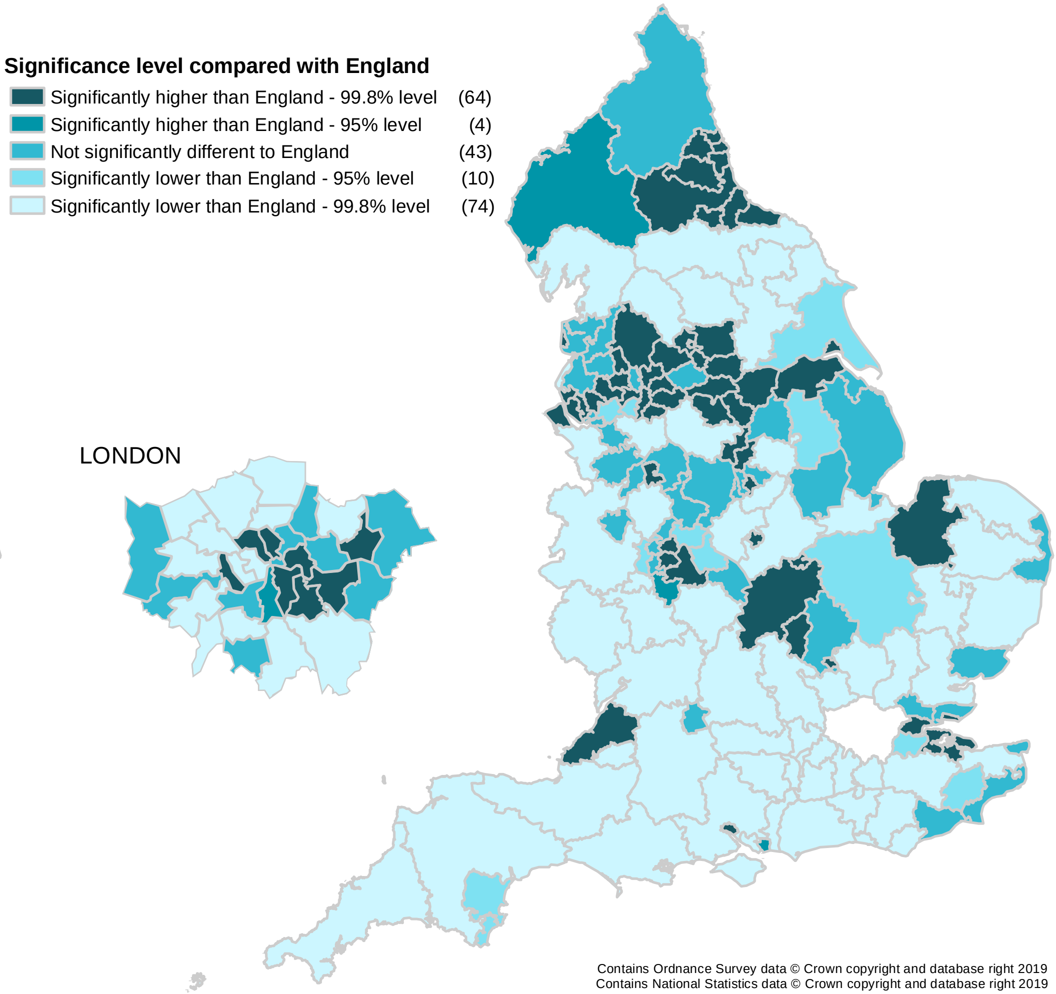
COPD - Secondary care - Hospital admissions

Map 11a: Variation in rate of emergency admissions to hospital for COPD per population by CCG (2017/18)

Directly standardised rate per 100,000

Optimum value: Low

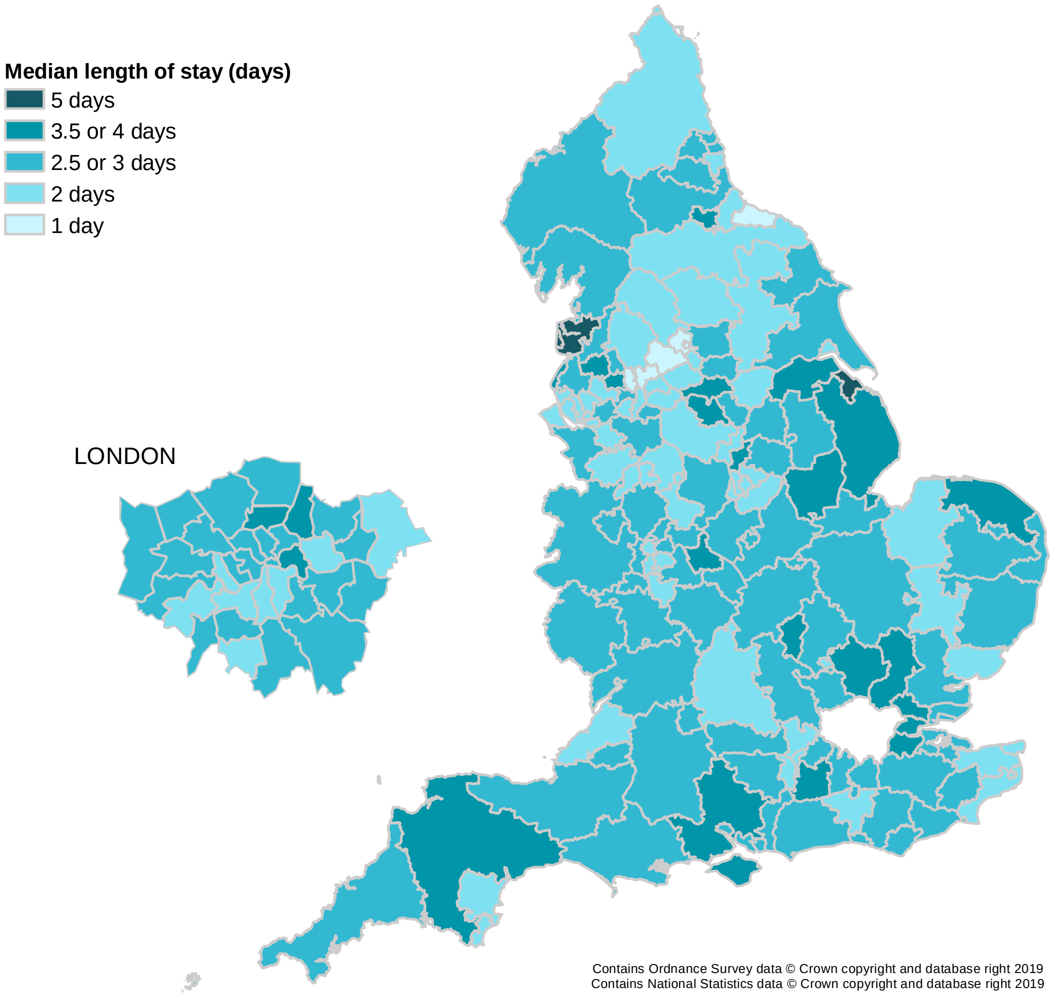




COPD - Secondary care - Hospital admissions

Map 11b: Variation in median length of stay (days) of emergency admissions to hospital for COPD by CCG (2017/18)

Optimum value: Requires local interpretation



Context

People with chronic obstructive pulmonary disease (COPD) can experience recurrent flare-ups or exacerbations that need more intensive treatment, some of which can be severe enough to require hospital admission. Indeed, COPD exacerbations are the second most common reason for all emergency admission to hospital in adults in the UK.[1] Patients with frequent exacerbations have a more rapid decline in lung function and reported worsening quality of life outcomes.[2]

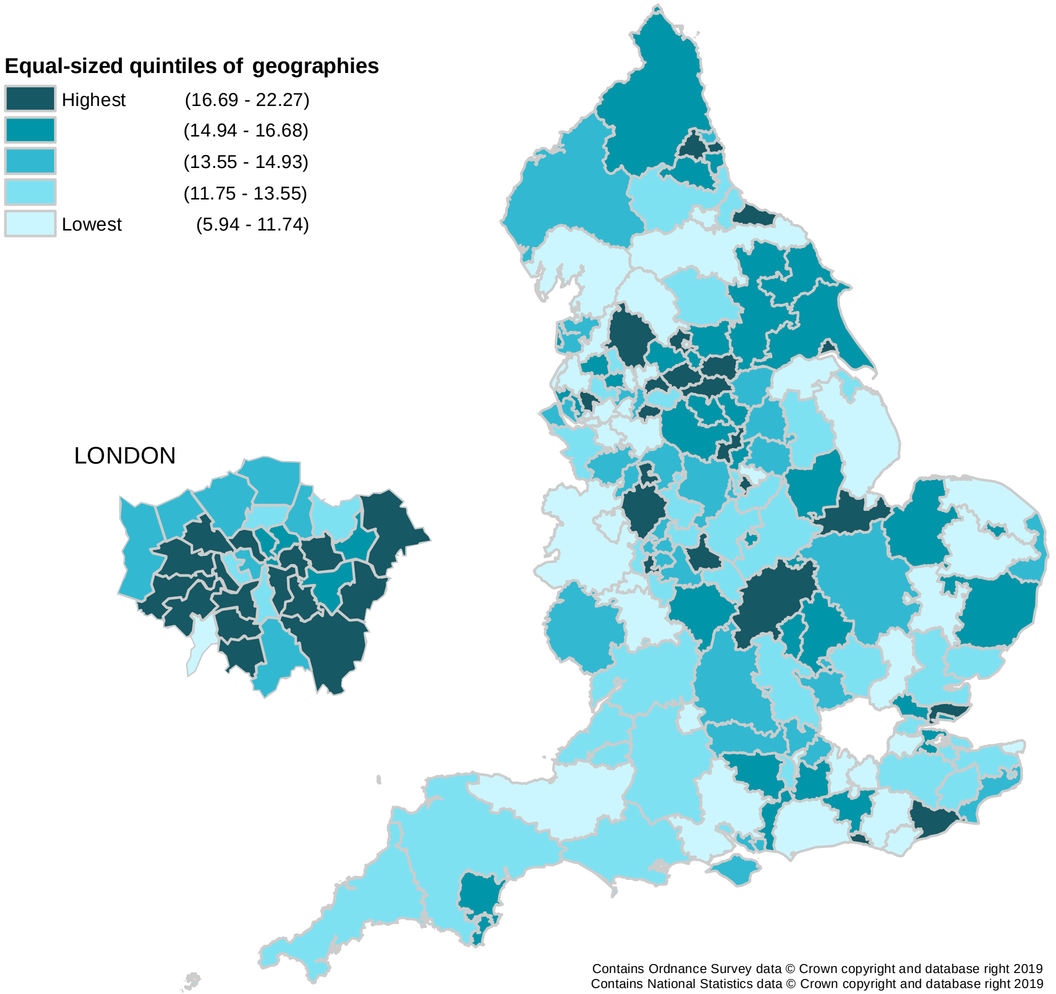
The care of people with COPD in hospital settings is costly for the NHS; RightCare have estimated that £49 million could be saved if CCGs achieved the emergency admission rate of their best 5 peers.[3]

Admission and re-admission to hospital are major adverse outcomes for patients, which place considerable demands on NHS resources. Levels of re-admissions are a substantial problem in the treatment of patients with COPD. The 2017 National COPD Audit Programme showed 24.8% of patients were readmitted within 30 days and 43.1% within 90 days.[4] Although COPD and emphysema were the most common cause of readmission for COPD patients they only

COPD - Secondary care - Hospital admissions

Map 11c: Experimental statistic: Variation in percentage of admissions to hospital for COPD that were re-admitted as an emergency within 30 days of discharge by CCG (2017/18)

Optimum value: Low



accounted for 41.3% of readmissions within 30 days and 38.6% within 90 days. A large proportion of readmissions are not due directly to COPD. The NACAP report advocated that a holistic approach to care focusing on patient comorbidities would reduce readmission rates.[4]

Magnitude of variation

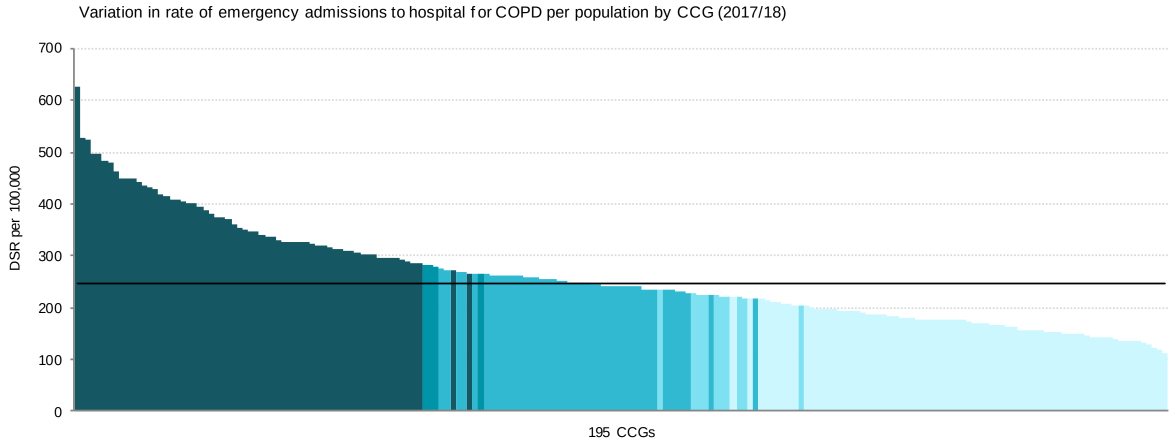
Map 11a: Variation in rate of emergency admissions to hospital for COPD per population by CCG (2017/18)

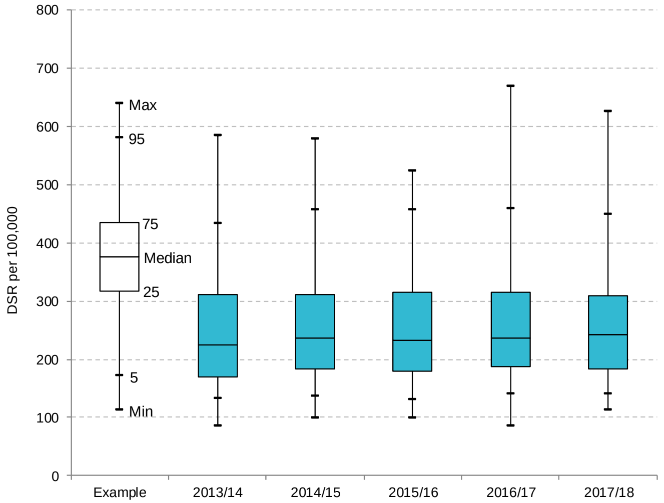
The maps and column chart display the latest period (2017/18), during which CCG values ranged from 112.1 to 625.0 per 100,000 population, which is a 5.6-fold difference between CCGs. The England value for 2017/18 was 247.6 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18.

One possible reason for the degree of variation observed is differences in the extent to which all services providing care for people with COPD are integrated into an effective system of care. In addition, deprivation and differences in public health initiatives will also impact on levels of variation





Max-Min (Range)		500.0	478.0	426.0	584.7	512.9	No significant change
95th-5th percentile		300.6	321.3	324.8	319.4	308.2	No significant change
75th-25th percentile		141.1	128.6	134.4	127.5	126.7	No significant change
Median		224.6	237.1	231.6	236.4	242.1	No significant change

observed. Following the National COPD Audit Programme report in 2015, the Royal College of Physicians called for the implementation of a discharge bundle to optimise follow up, and subsequently minimise the chance of readmission.[5]

Map 11b: Variation in median length of stay (days) of emergency admissions to hospital for COPD by CCG (2017/18)

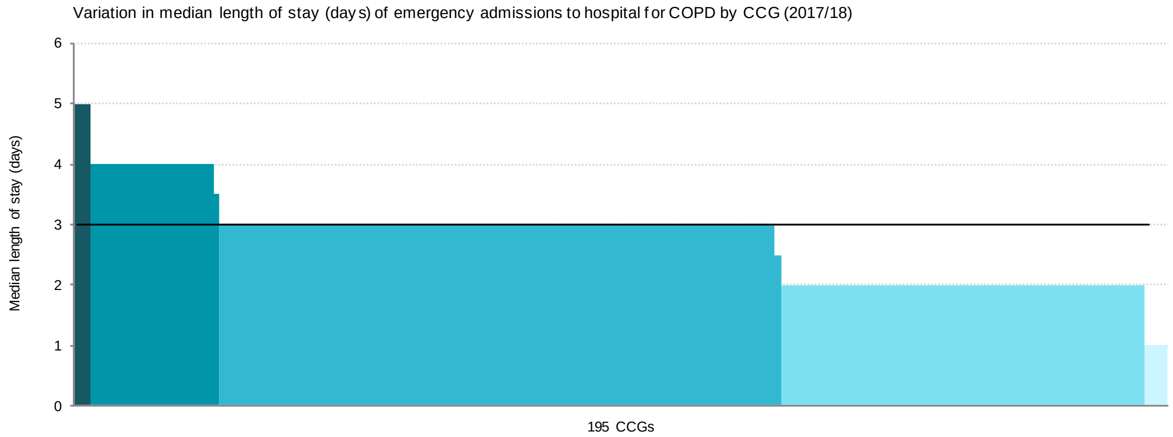
The maps and column chart display the latest period (2017/18), during which CCG values ranged from 1 to 5 days, which is a 5.0-fold difference between CCGs. The England value for 2017/18 was 3 days. The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

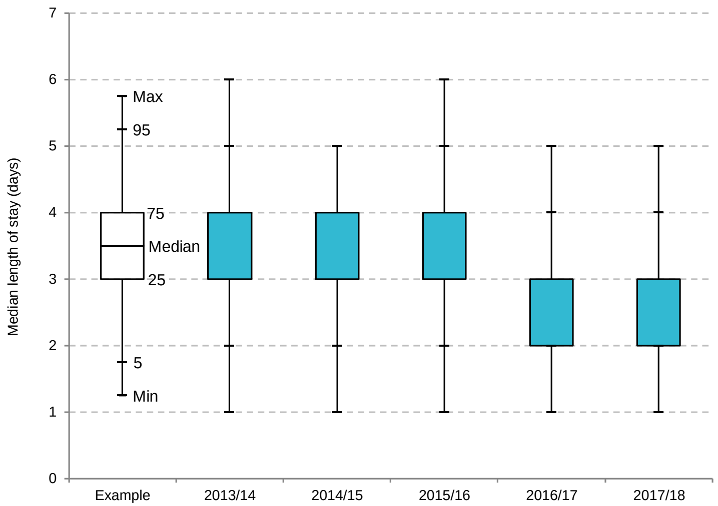
There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18. Length of stay can depend on many factors, and patients with COPD often have other co-morbidities, which can lead to a more protracted stay in hospital. Patients are likely to have a longer hospital stay if they delay treatment for exacerbations, do not respond to treatment, or have requirements such as oxygen therapy or social circumstances which delay discharge.

Map 11c: Experimental statistic: Variation in percentage of admissions to hospital for COPD that were re-admitted as an emergency within 30 days of discharge by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 5.9% to 22.3%, which is a 3.7-fold difference between CCGs. The England value for 2017/18 was 14.7%.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. There was no significant change





Max-Min (Range)		5.0	4.0	5.0	4.0	4.0	No significant change
95th-5th percentile		3.0	3.0	3.0	2.0	2.0	No significant change
75th-25th percentile		1.0	1.0	1.0	1.0	1.0	No significant change
Median		4.0	3.0	3.0	3.0	3.0	No significant change

in any of the 3 variation measures between 2013/14 and 2017/18. The median decreased significantly from 14.4 in 2013/14 to 14.2 in 2017/18.

Some emergency re-admissions are necessary and unavoidable:

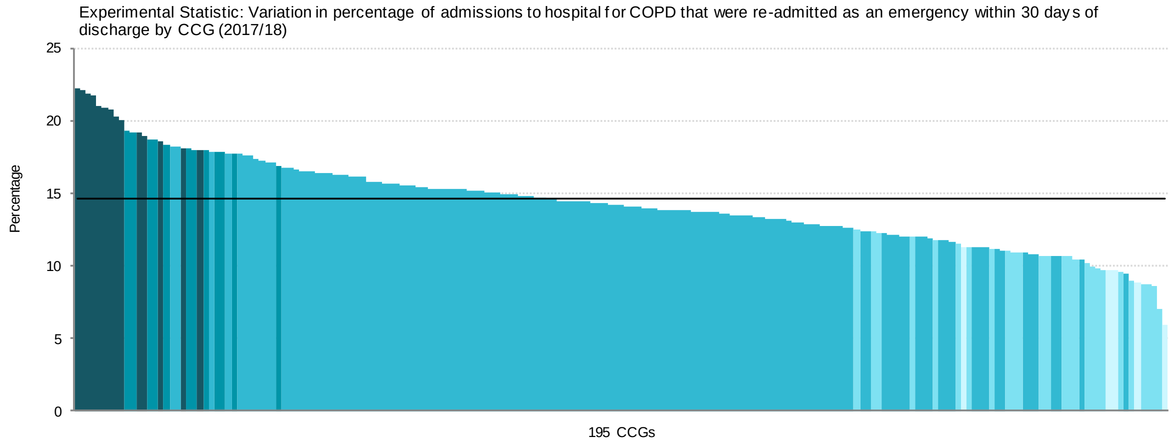
- a small number will be due to new clinical problems
- some will result from complications that could not be avoided

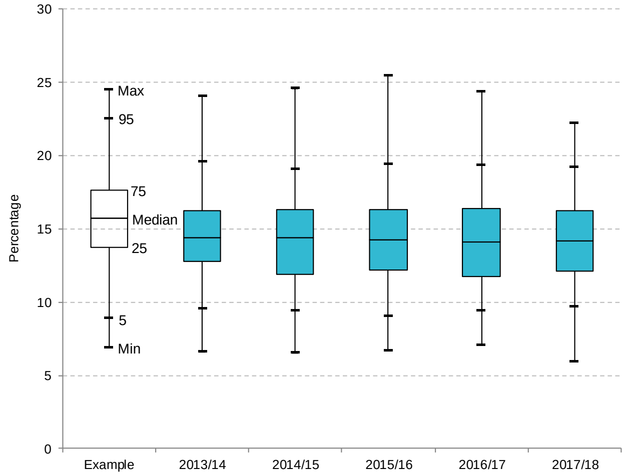
However, the degree of variation observed among CCGs shows that in many localities there is substantial scope for reducing emergency re-admissions. Action to prevent emergency re-admissions could not only improve outcomes for patients but also save money because expenditure on COPD admissions is high in every CCG.

Options for action

It is recommended by RightCare Pathways to optimise community support, and communication between hospital and community teams in order to reduce admissions, length of stay and in particular to reduce the risk of re-admission. It is also suggested that inpatient care should be delivered consistently to national standards across all hospital sites. This includes:

- standardised admission pathway for all admissions suspected to be due to COPD exacerbation, including review by a COPD specialist within 24 hours
- standardised post-exacerbation pathway, including a discharge bundle
- smooth transition between primary and secondary care during exacerbations requiring hospital treatment
- encouraging and supporting patients and their carers to complete the British Lung Foundation patient passport





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		17.5	18.0	18.8	17.3	16.3	No significant change
95th-5th percentile		10.0	9.7	10.4	10.0	9.6	No significant change
75th-25th percentile		3.5	4.5	4.2	4.6	4.1	No significant change
Median		14.4	14.4	14.2	14.1	14.2	DECREASING Significant

A new Best Practice Tariff (BPT) was introduced for COPD in 2017/18. It is acknowledged that trusts that take up the COPD BPT have better results than those that don't. The BPT aims to improve the proportion of patients that receive specialist input and discharge bundles.[6] Attainment of the BPT is measured by the National Asthma and COPD Audit Programme's continuous COPD secondary care clinical audit.[7]

Resources

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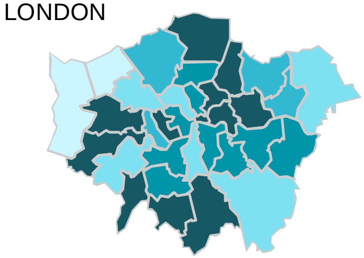
COPD - Secondary care - Treatment/outcomes

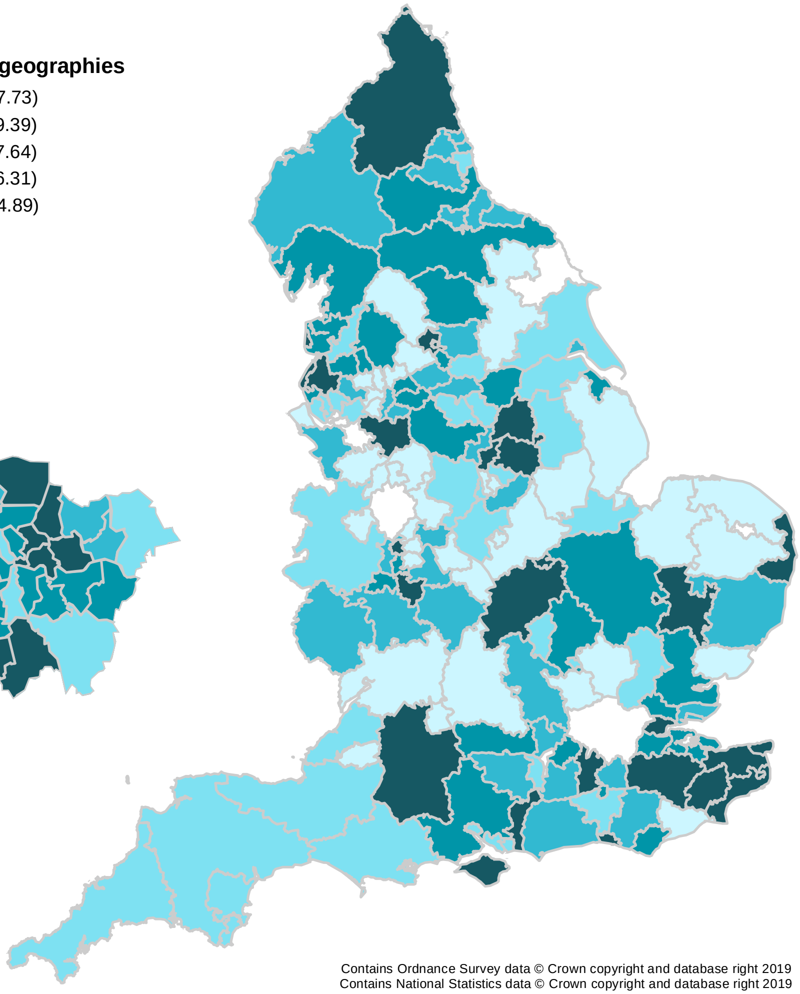
Map 12a: Variation in percentage of patients admitted to hospital for COPD receiving non-invasive ventilation (NIV) by CCG (2017/18)

Optimum Value: Requires local Interpretation

Equal-sized quintiles of geographies

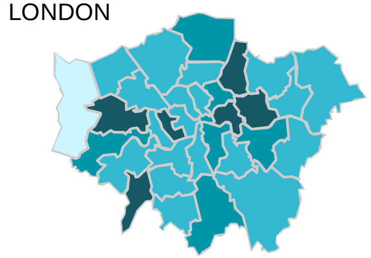
Highest		(9.40 - 17.73)
		(7.65 - 9.39)
		(6.32 - 7.64)
		(4.89 - 6.31)
Lowest		(2.22 - 4.89)
Suppressed		

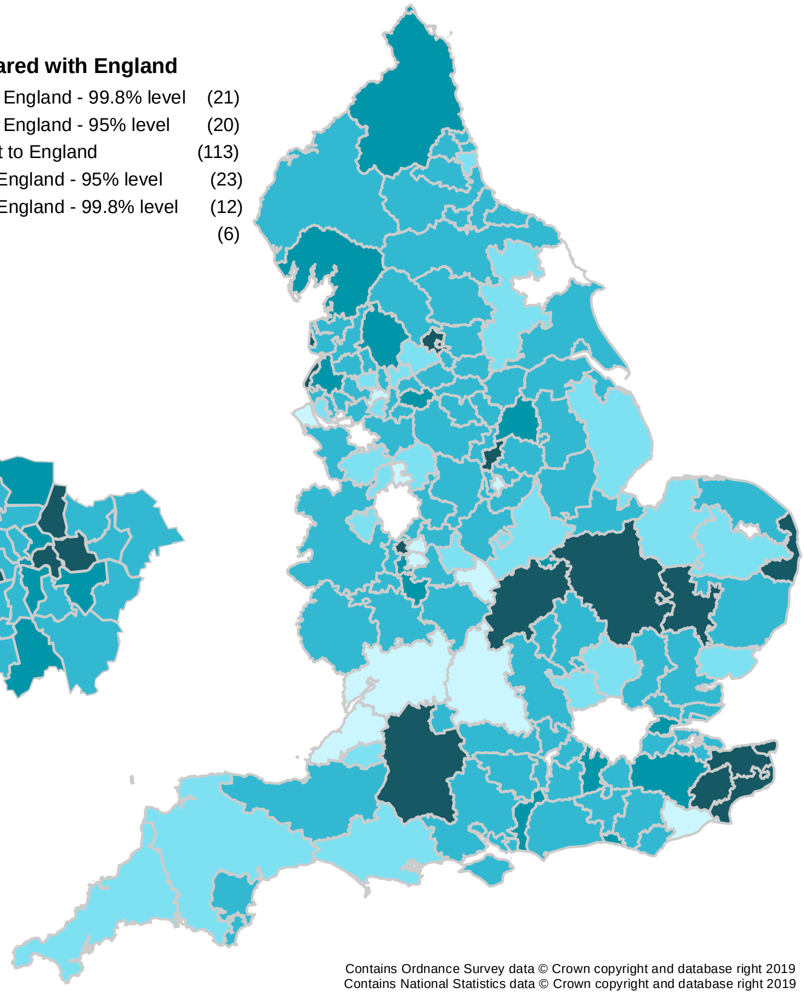




Significance level compared with England

Significantly higher than England - 99.8% level	(21)
Significantly higher than England - 95% level	(20)
Not significantly different to England	(113)
Significantly lower than England - 95% level	(23)
Significantly lower than England - 99.8% level	(12)
Suppressed	(6)



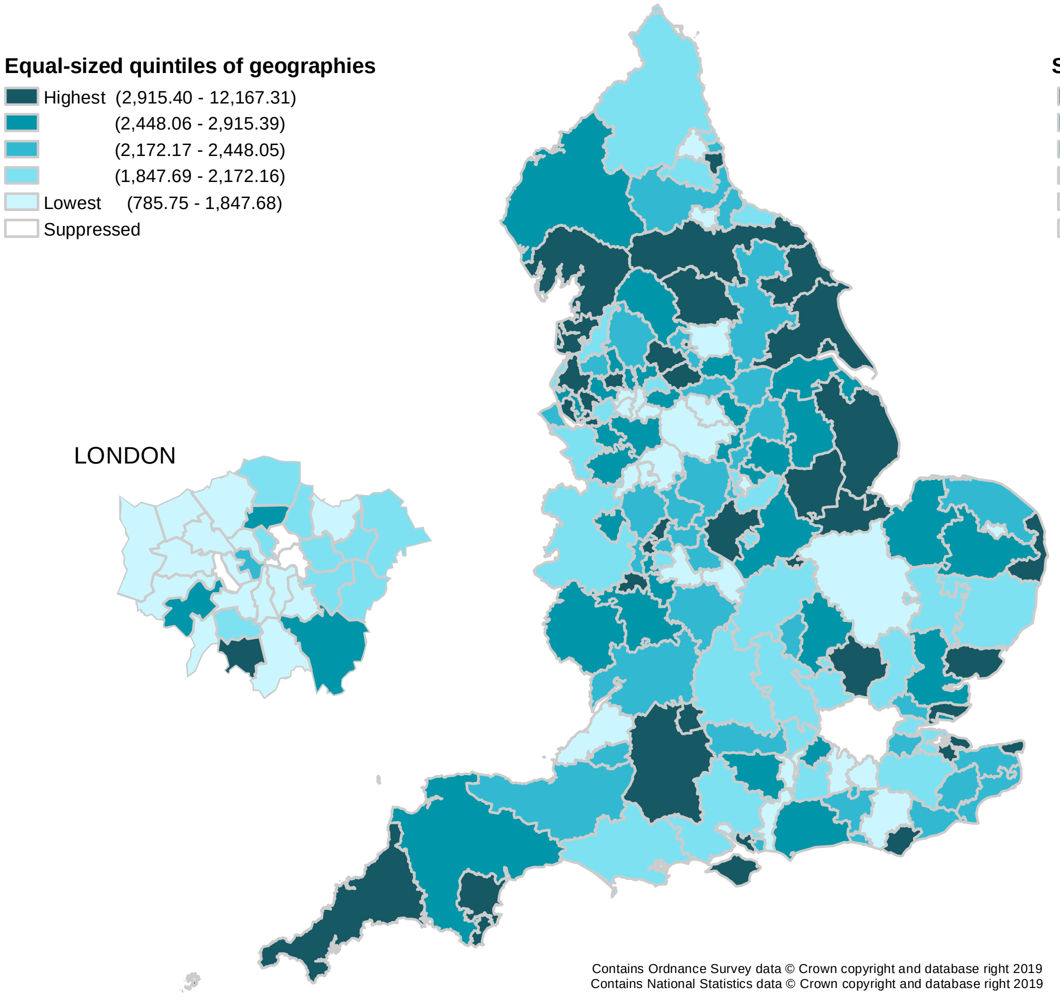


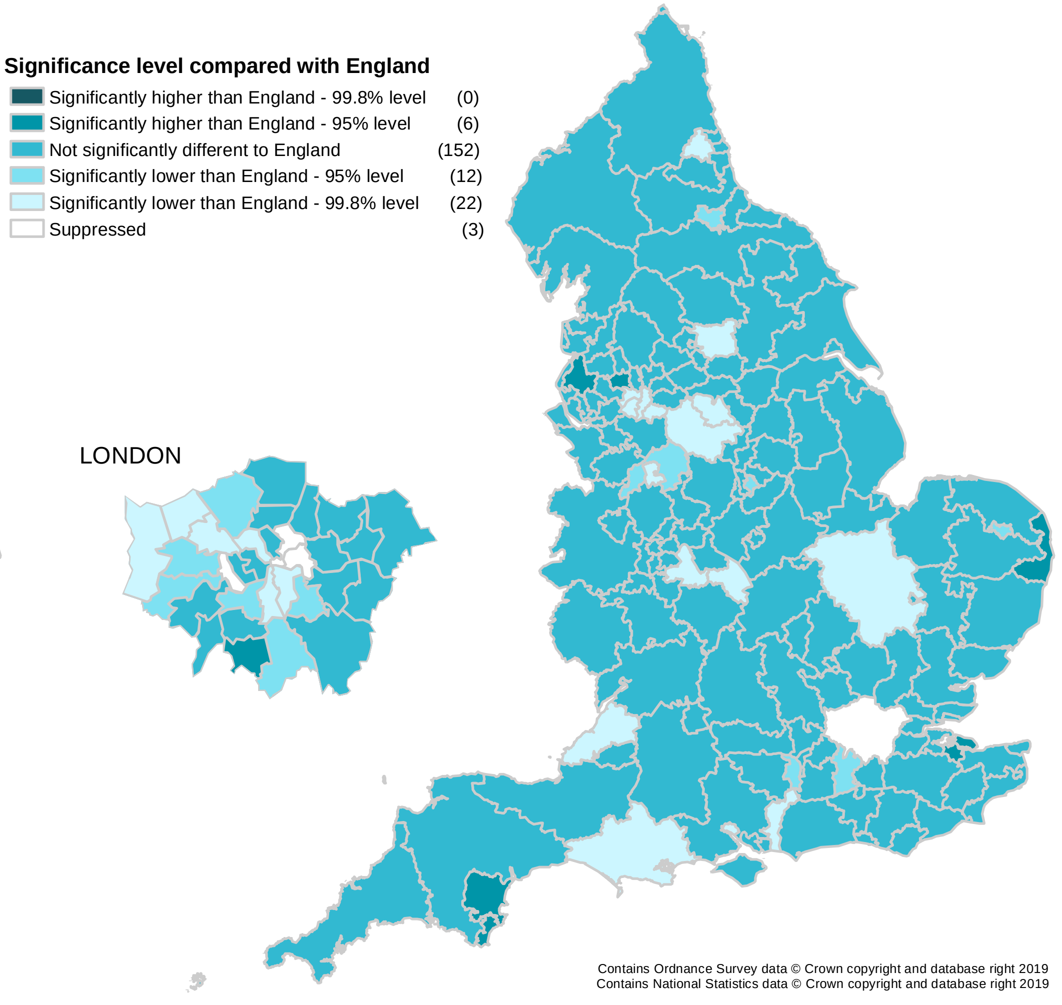
COPD - Secondary care - Treatment/outcomes

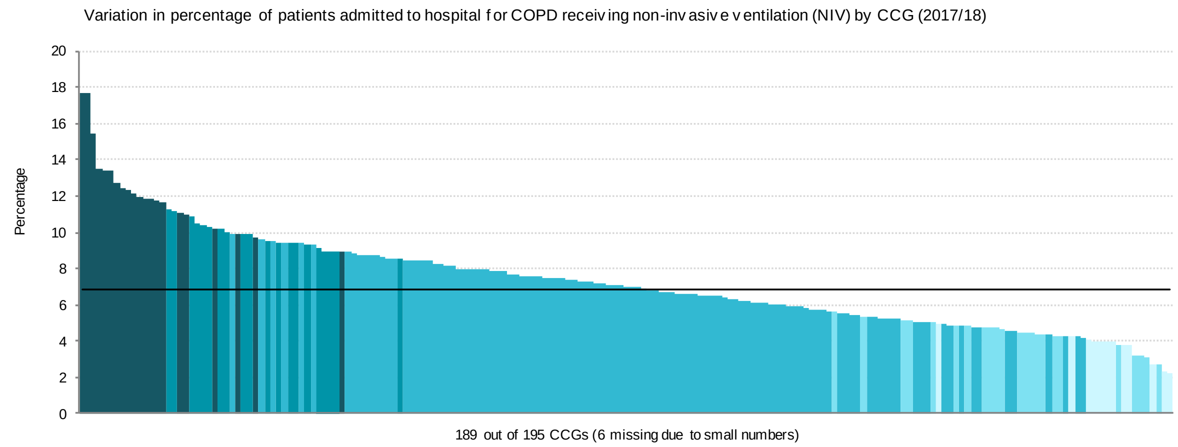
Map 12b: Experimental Statistic: Variation in mortality rate of patients who died within 30 days of an emergency hospital admission for COPD by CCG (2016-2018)

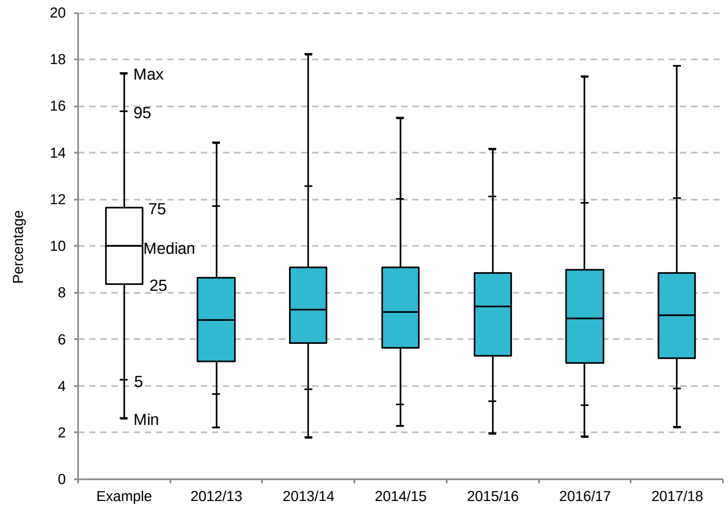
Directly standardised rate per 100,000 COPD hospital admission

Optimum Value: Low









	Example	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		12.2	16.4	13.2	12.2	15.5	15.5	**No significant change**
95th-5th percentile		8.1	8.7	8.8	8.8	8.7	8.2	**No significant change**
75th-25th percentile		3.6	3.2	3.5	3.6	4.0	3.6	**No significant change**
Median		6.8	7.3	7.2	7.4	6.9	7.0	**No significant change**

Context

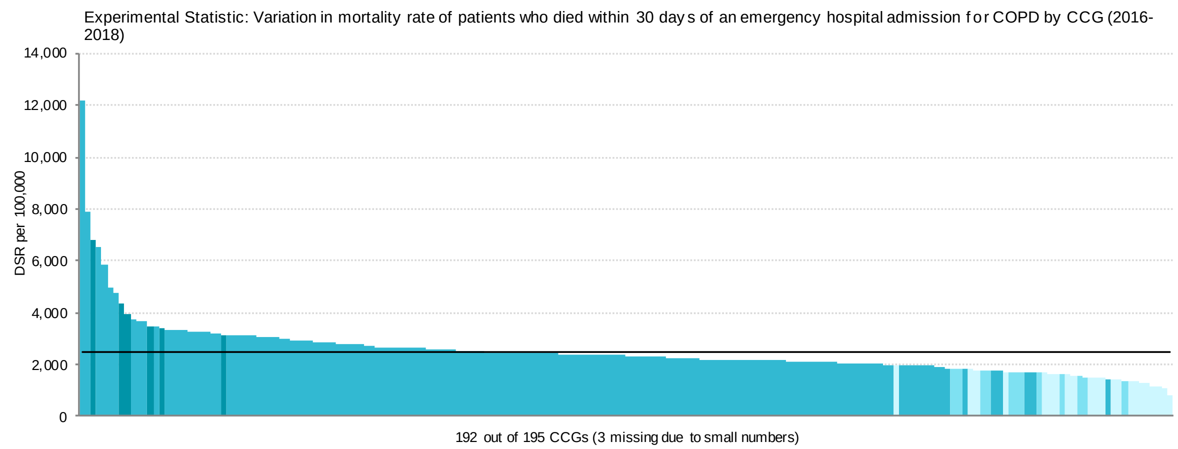
COPD is characterised by a progressive decline in lung function and in health status, accompanied by repeated acute exacerbations. Sometimes these exacerbations can be managed in primary care and recovery is fairly rapid, but some exacerbations may require more intensive management in hospital and the episode may be complicated by respiratory failure.

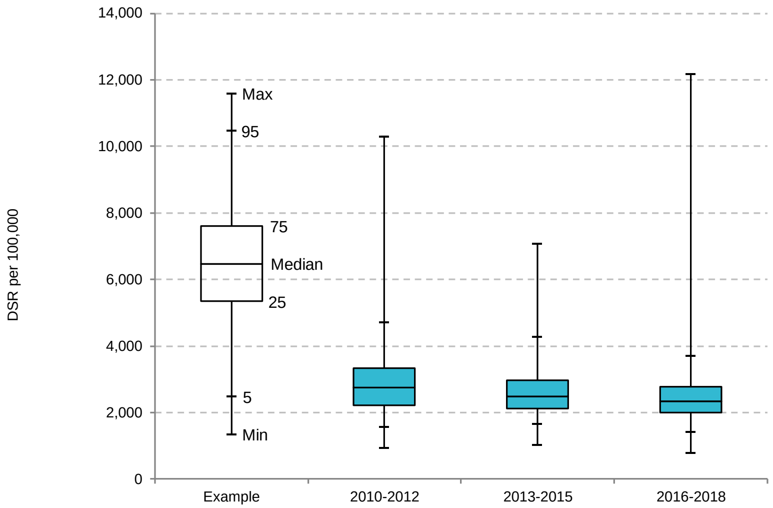
Acute exacerbation of COPD is one of the commonest reasons for hospital admission and is associated with high mortality in hospital, especially if the patient is admitted with, or develops, acute respiratory failure. Mortality is 25.1% for patients with COPD who receive non-invasive ventilation (NIV). In this patient group, mortality is 18.7% for patients with an arterial blood pH of 7.26-7.35; as the pH drops further, the mortality rate rises.[1]

Approximately one in 16 patients (6.1%) admitted because of an exacerbation will die within 30 days of their hospital stay and one in nine (11.3%) will have died within 90 days. About one-third of these deaths are due to causes other than COPD.[2] Ensuring comorbidities, especially cardiac, are identified and treated is as important as optimising long term COPD management.

Beyond treating the underlying infection and clearing sputum, supporting ventilation to reduce the carbon dioxide levels and correcting resultant acidosis is essential. Ventilatory support techniques are the preferred option. This is predominantly provided by NIV.

Non-invasive ventilation (NIV) is the preferred means of ventilation in most cases of COPD exacerbations. NIV is when a mask is used to improve ventilation by providing





	Example	2010-2012	2013-2015	2016-2018	
Max-Min (Range)		9374.8	6058.0	11381.6	No significant change
95th-5th percentile		3143.7	2628.0	2286.1	No significant change
75th-25th percentile		1115.2	845.5	780.9	No significant change
Median		2752.1	2481.0	2337.4	No significant change

positive airway pressure. In appropriate patients, outcomes are superior to invasive ventilation.

While invasive ventilation is very effective it has greater risks associated with intubation and sedation. Patients are also at risk of developing ventilator-associated pneumonia, which NIV avoids There are clear exceptions when invasive ventilation is superior, including multi-organ failure, and patients who are intolerant of the non-invasive interface.

There is strong evidence to support NIV as the treatment of choice. In a Cochrane systematic review and meta-analysis, the survival benefit of NIV in the management of acute type 2 respiratory failure was confirmed: the number needed to treat (NNT) is only eight to avoid one death.[3] However, it should be delivered in a dedicated setting with trained and experienced staff.[2]

Magnitude of variation

Map 12a: Variation in percentage of patients admitted to hospital for COPD receiving non-invasive ventilation (NIV) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 2.2% to 17.7%, which is an 8.0-fold difference between CCGs. The England value for 2017/18 was 6.9%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.

There was no significant change in any of the three variation measures between 2012/13 and 2017/18.

Despite clear, evidence-based criteria outlining patients who would benefit from NIV, the 2014 COPD audit showed that there is variation in whether patients meeting criteria received NIV; approximately a third of patients with acidaemia did not receive NIV.[4] However, patients who develop acidaemia after admission despite primary treatment have a worse outcome, thus NIV is not always appropriate. The 2008 COPD audit noted that 6% of patients with respiratory failure became acidotic later in their admission.[5] The degree of variation in the provision of NIV across the country is considerable: a patient's chance of receiving this life-saving treatment can differ substantially depending on where they live. The length of time elapsed between admission and receiving NIV can also show marked variation, as seen in the 2018 National COPD Audit by the Royal College of Physicians.[6]

The pattern of geographical variation observed suggests that it cannot be explained by:

- differences in rates and severity of COPD admissions
- distance from acute hospitals

The most likely explanations for the differences in patient experience are:

- lack of 24-hour service provision in some units
- differences in local admission policies
- access to specialist opinion
- errors in coding for NIV

Map 12b: Experimental Statistic: Variation in mortality rate of patients who died within 30 days of an emergency hospital admission for COPD by CCG (2016-2018)

The maps and column chart display the latest period (2016 to 2018), during which CCG values ranged from 785.7 to 12,167.3 per 100,000 population, which is a 15.5-fold difference between CCGs. The England value for 2016 to 2018 was 2,472.7 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2010-2012 to 2016-2018. There was no significant change in any of the three variation measures between 2010 to 2012 and 2016 to 2018.

Some of the difference in death rates within 30 days of an admission for COPD may be due to differences in:

- case-mix
- population composition
- availability of community support for patients with exacerbations of COPD

However, some of the difference in death rates is likely to be due to variation in the quality of clinical care provided before, during and following admission to hospital.

The degree of variation observed suggests there is considerable scope to achieve better outcomes for patients with COPD.

Options for action

Given the improved survival associated with NIV, it needs to be made available to all patients admitted with acute type 2 respiratory failure in a timely manner. To reduce unwarranted variation in NIV provision, commissioners and providers could consider the interventions in Box 12.1.

Box 12.1: Reducing unwarranted variation in access to NIV

- all patients admitted with acute exacerbations of COPD to undergo blood gas analysis immediately on arrival in hospital, except those with oxygen
- saturations >92% breathing room air
- patients who meet evidence-based criteria for acute NIV should start NIV within 60 min of the blood gas result associated with the clinical decision to provide NIV and within 120 min of hospital arrival for patients who present acutely, as recommended in the British Thoracic Society guidelines (see 'Resources')
- NIV supported by senior-level decision-making to be made available in acute hospitals 24 hours per day, and delivered by sufficiently-trained staff
- all patients who receive acute NIV to be coded as E85.2 procedure to ensure accuracy of data recording
- hospitals to monitor provision of and outcomes from NIV through regular clinical audit

To improve patient outcomes through the prompt and pro-active management of acute exacerbation of COPD, commissioners and providers need to consider the interventions shown in Box 12.2.

Box 12.2: Prompt and pro-active management of acute exacerbation of COPD

- structured hospital admission
- assessment within 24 hours by a respiratory specialist
- daily senior-level decision-making by a respiratory clinician
- prompt blood-gas analysis and assessment for non-invasive ventilation
- provision of non-invasive ventilation where indicated within the recommended 1 hour
- comprehensive assessment and management of co-morbid conditions
- optimisation of medical therapy
- referral for pulmonary rehabilitation
- referral for home oxygen assessment and review if indicated

Hospital-at-home and assisted-discharge schemes are also recommended by NICE as safe and effective ways of managing patients with COPD who would otherwise need to be admitted, or need to stay in hospital. In a study of home treatment of COPD, use of the DECAF prognostic score to select patients for hospital at home approximately doubled the proportion considered eligible and was shown to be safe and preferred by most patients. Mean health and social care costs over 90 days were £1,016 lower than standard care.[7] Commissioners should consider a service where a multi professional team of allied health professionals with experience of treating COPD is able to deliver care in the community. The team may include nurses, physiotherapists, occupational therapists or other health workers.

Resources

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[5] Buckingham R, Lowe D, Pursey N and others (2008) Report of The National Chronic Obstructive Pulmonary Disease Audit 2008: clinical audit of COPD exacerbations admitted to acute NHS units across the UK St Elsewhere General Hospital [Accessed 11 July 2019]

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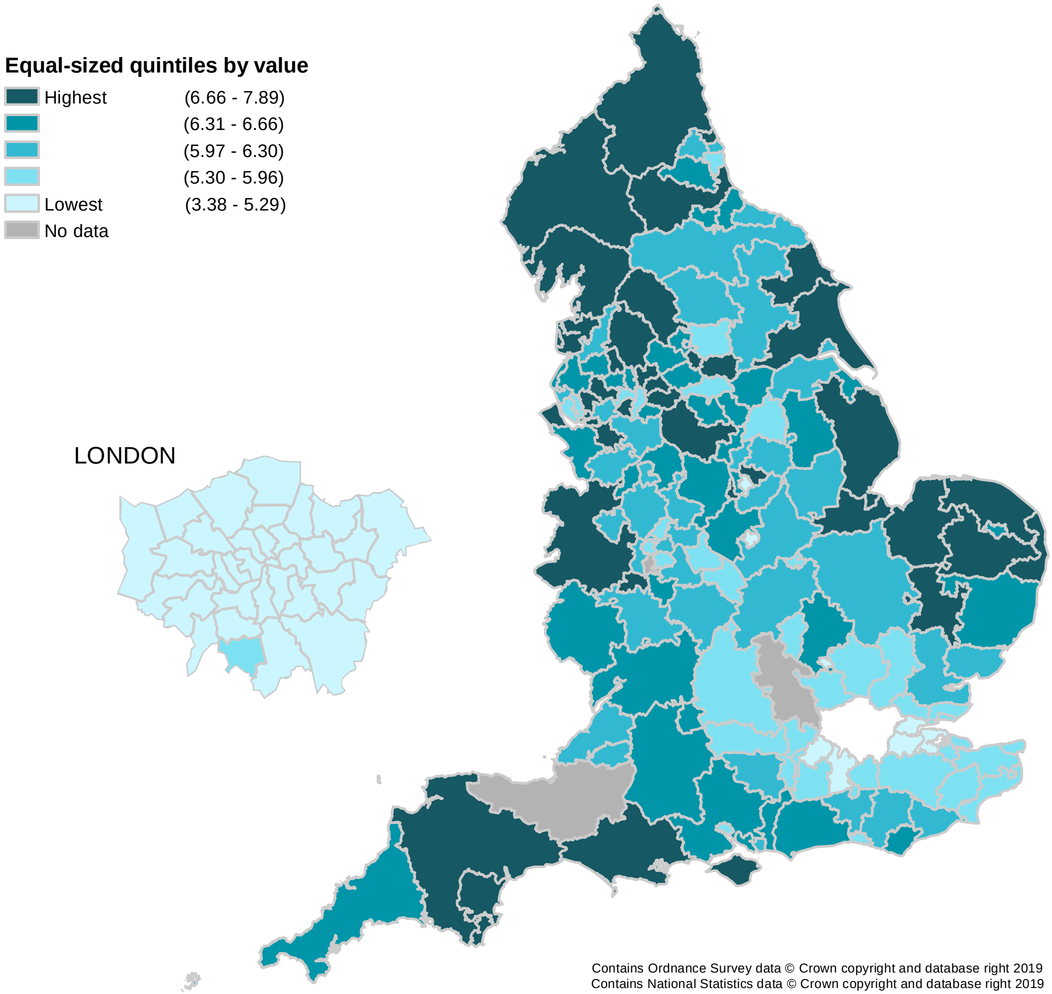
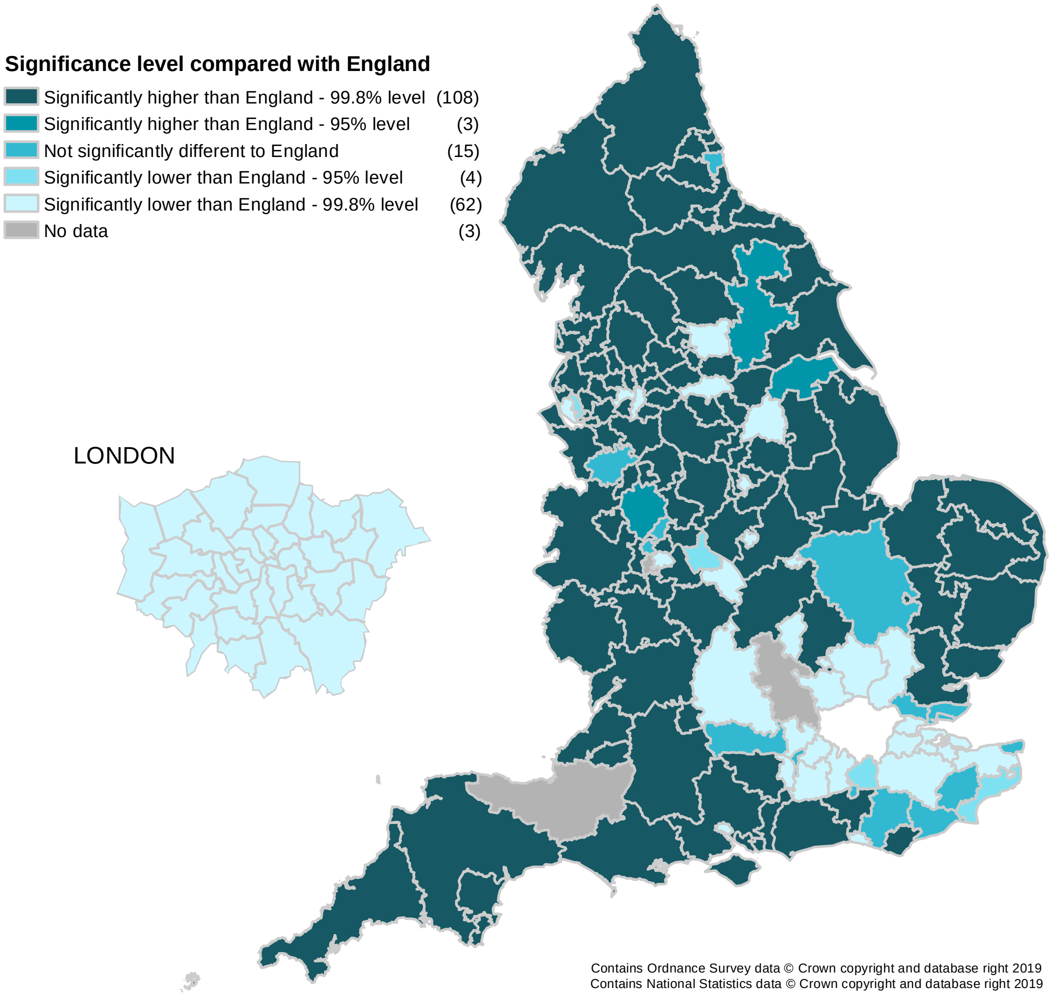
Asthma – Primary care - Diagnosis

Map 13a: Variation in percentage of patients with asthma on GP registers by CCG (2017/18)

Optimum value: Requires local interpretation

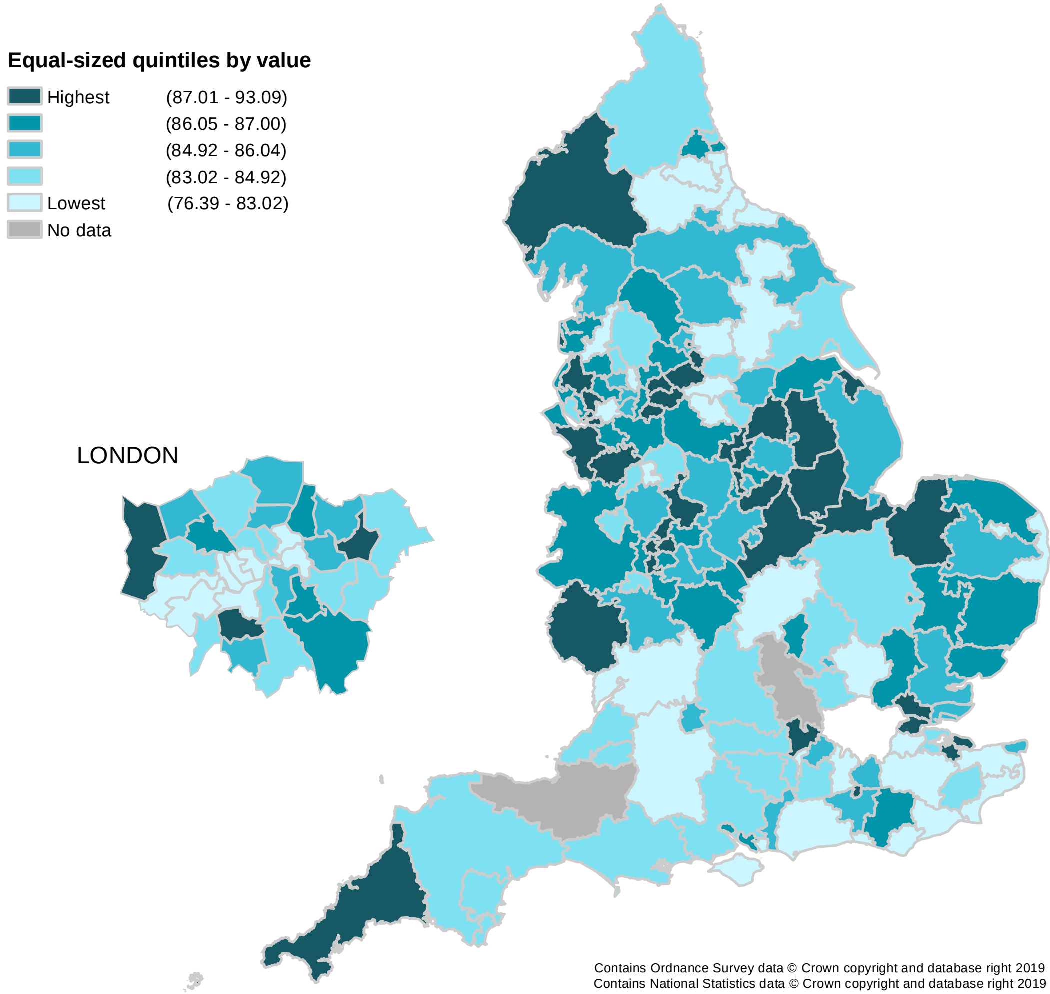


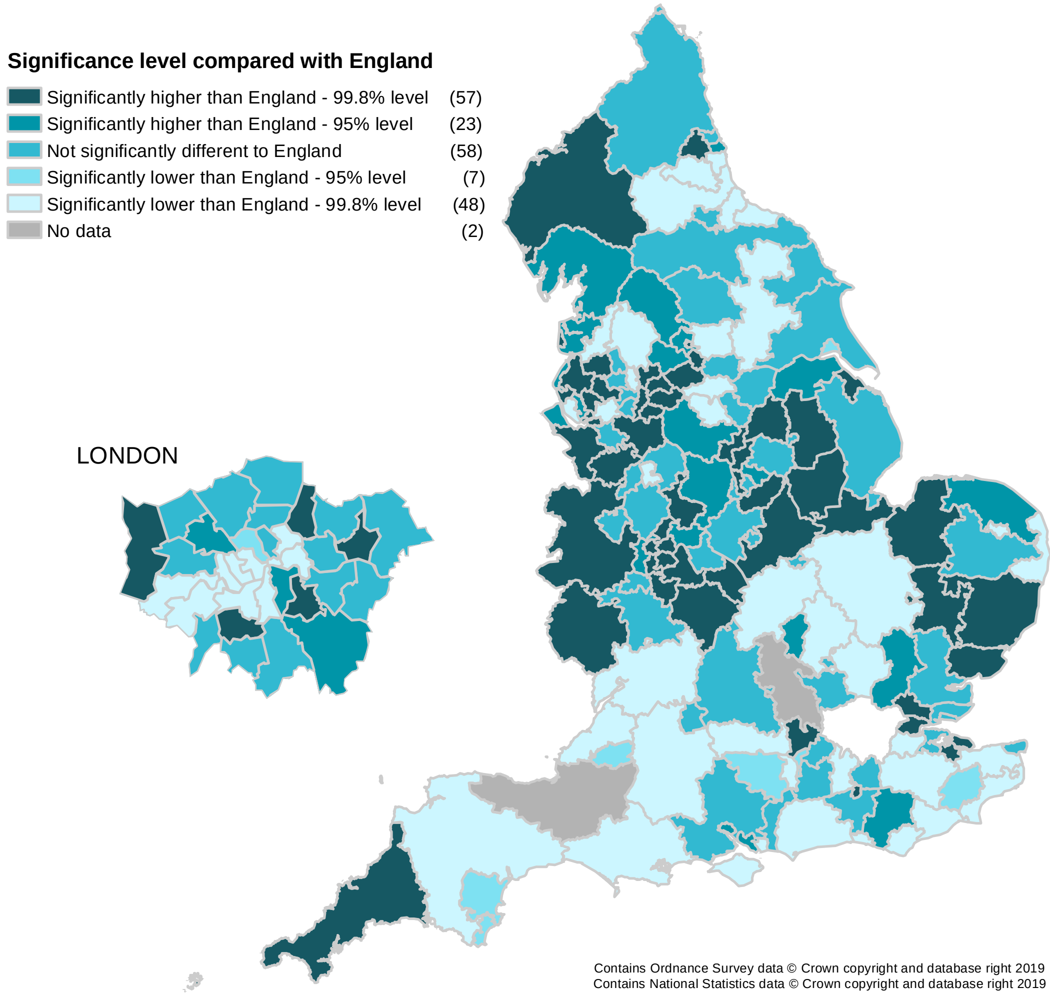


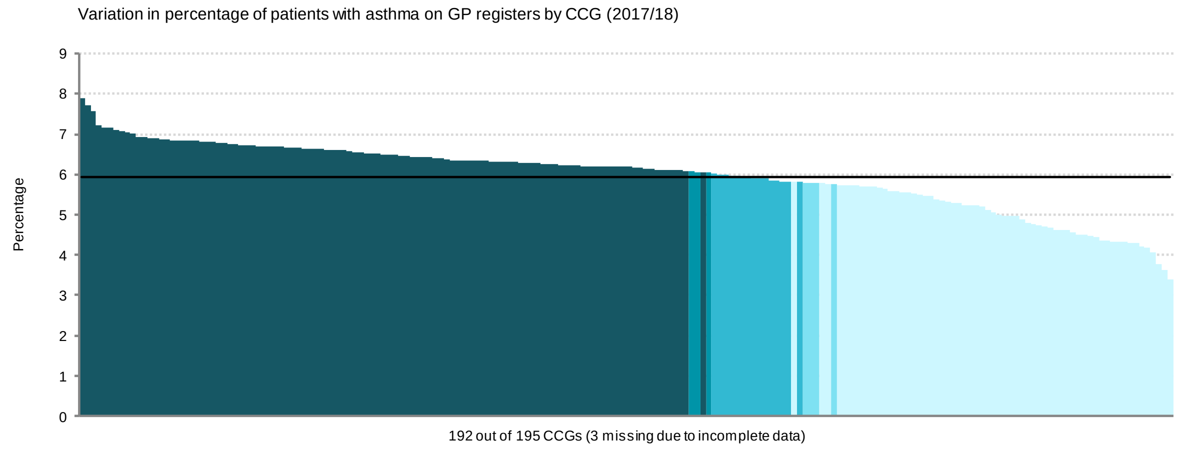
Asthma – Primary care - Diagnosis

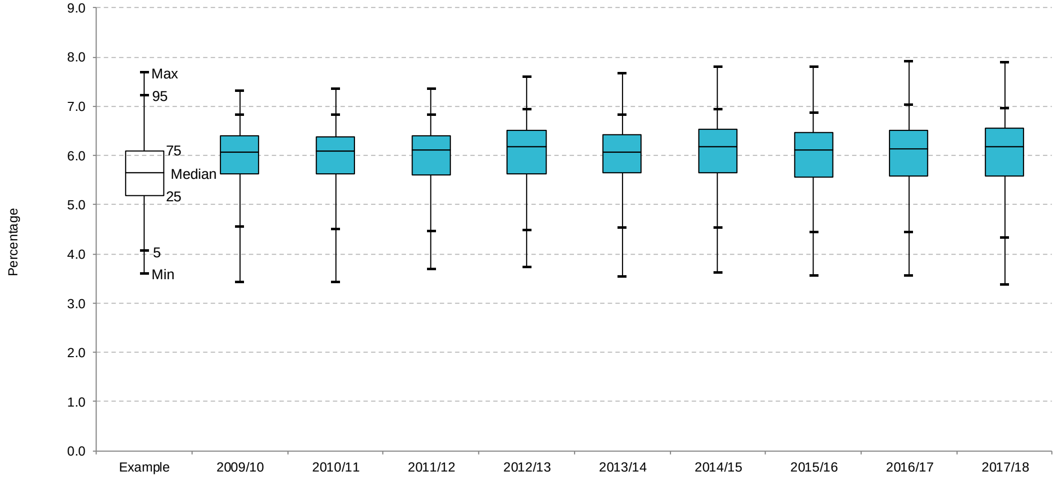
Map 13b: Variation in percentage of patients with asthma on GP registers aged 8 years or over, in whom measures of variability or reversibility are recorded (including exceptions) by CCG (2017/18)

Optimum value: High









	Example	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		3.9	3.9	3.7	3.9	4.1	4.2	4.3	4.4	4.5	WIDENING Significant
95th-5th percentile		2.3	2.3	2.4	2.5	2.3	2.4	2.4	2.6	2.6	WIDENING Significant
75th-25th percentile		0.8	0.7	0.8	0.9	0.8	0.9	0.9	0.9	1.0	WIDENING Significant
Median		6.1	6.1	6.1	6.2	6.1	6.2	6.1	6.1	6.2	No significant change

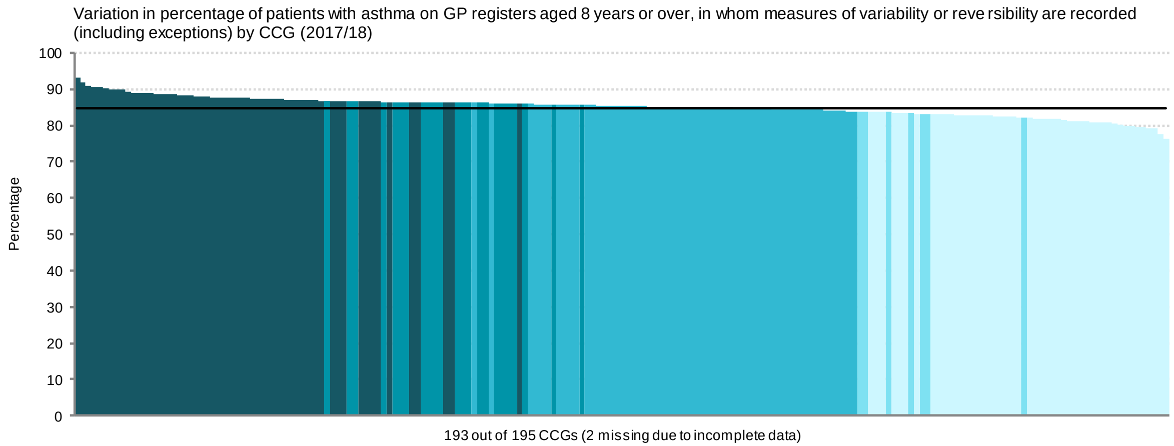
Context

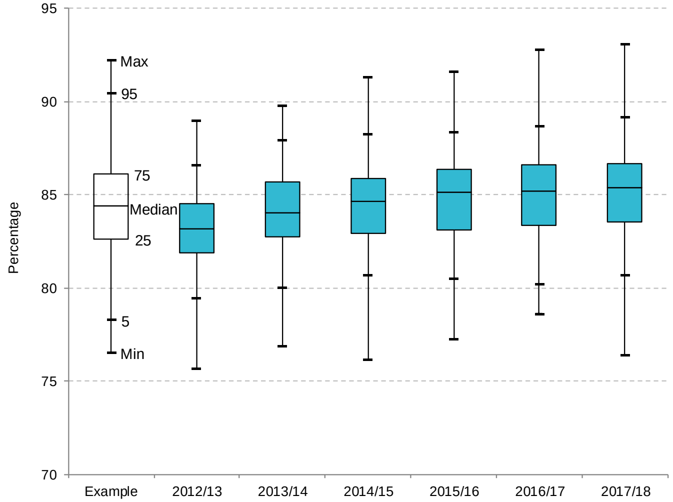
Asthma is an inflammatory disorder affecting the airways, characterised by breathlessness, wheezing and coughing particularly at night. The most common type of asthma is allergic asthma triggered by immunoglobulin E (IgE) antibodies generated in response to environmental allergens such as dust mites, pollen and moulds. Consistent platelet-activating factor (PAF%) values from many studies suggest a median of 15% of asthma can be attributable to workplace exposures.[1]

In 2017/18, the prevalence of asthma in England, defined as receiving asthma treatment in the last year, and based on data from GP QOF registers, was 6.0%.[2] It is generally accepted that this is a conservative estimate based on known under reporting. The 2010 Health Survey for England indicated 9.5% of adults and children reported having asthma according to this definition, suggesting that many people with asthma are not included in GP registers.[3]

Most of the care for people with asthma is provided in primary care. The chronic disease management delivered by GPs and nurses is likely to have a considerable impact on outcomes such as symptom control, quality of life, physical and social activity, admission to hospital and mortality. Accurate diagnosis and inclusion on disease registers in primary care are essential prerequisites for structured pro-active asthma care.

Under the QOF scheme, GPs are rewarded for achieving an agreed level of population coverage for each indicator. In calculating coverage, practices are allowed to exclude appropriate patients (known as exceptions) from the target population to avoid being penalised for factors beyond the





Max-Min (Range)		13.3	12.9	15.2	14.4	14.2	16.7	No significant change
95th-5th percentile		7.1	7.9	7.5	7.8	8.5	8.5	WIDENING Significant
75th-25th percentile		2.6	2.9	3.0	3.3	3.3	3.1	WIDENING Significant
Median		83.2	84.0	84.6	85.1	85.2	85.4	INCREASING Significant

practices' control, for example when patients do not attend for review despite repeated invitations, or if a medication cannot be prescribed due to a contraindication or side-effect. In 2017/18, 1,364 GP practices out of a total of 7,100 in England (19%) had more than 10% of their local population with asthma excepted from QOF Asthma reporting.[2]

The exception-adjusted population coverage is reported annually by NHS Digital.[4] The analysis presented in this Atlas aims to show the intervention rate so includes exceptions within the denominators (see 'Introduction to the data').

Both the British Thoracic Society/Scottish Intercollegiate Guidelines Network (BTS/SIGN) and NICE guidelines agree that no one symptom, sign or test is diagnostic for asthma. Both guidelines recommend that in the absence of unequivocal evidence of asthma, a diagnosis should be 'suspected' and that initiation of treatment (typically inhaled steroids) should be monitored carefully and the diagnosis reviewed if there is no objective benefit.

Once a diagnosis is made, both BTS/SIGN and NICE guidelines emphasise the importance of recording the basis on which the diagnosis was made. Accurate diagnosis requires careful history taking. History, in particularly asking what individuals do for a job, can identify asthma with a known cause (for example occupational asthma), and thus interventions may be possible to improve reliance on treatments and improve outcomes. Diagnosis should also be supported by objective tests including spirometry and exhaled nitric oxide. This may involve trying different therapy options and several consultations.

Spirometry is positioned as pivotal by both guidelines, but both caution that it is not useful for ruling out asthma because the sensitivity is low, especially in primary care populations. An exception to this is in children under 5 years old, where diagnosis should be based on observation and clinical judgement until the child is able to perform objective tests. Use of inhaler treatment without full assessment and follow-up may relieve some symptoms but mask the diagnosis.

Magnitude of variation

Map 13a: Variation in percentage of patients with asthma on GP registers by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 3.4% to 7.9%, which is a 2.3-fold difference between CCGs. The England value for 2017/18 was 5.9%.

The box plot shows the distribution of CCG values for the period 2009/10 to 2017/18. There has been significant widening of all 3 measures of variation.

Map 13b: Variation in percentage of patients with asthma on GP registers aged 8 years or over, in whom measures of variability or reversibility are recorded (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 76.4 to 93.1%, which is a 1.2-fold difference between CCGs. The England value for 2017/18 was 84.9%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18. Both the 95th to 5th percentile gap and the 75th to 25th percentile gap widened significantly. The median increased significantly from 83.2% in 2012/13 to 85.4% in 2017/18.

The degree of variation observed would indicate that many people with asthma are not on GP registers. As a result, such people may not receive a regular clinical review to ensure that symptoms are controlled and to support self-management. It is important to develop a personalised asthma action plan (PAAP) to prevent the consequences of poor control, which include: a disruption of daily activities, reduced quality of life, increased risk of exacerbations, increased consultation rate, increased emergency department visits, increased hospital admissions, and premature death. Risk factors for asthma (occupational and air quality for example) may also be geographically different which might explain some of the variation seen.

Options for action

In all localities, commissioners and practices need to investigate variation in the reported prevalence of asthma at practice level. Some commissioners may wish to consider establishing asthma diagnostic hubs to facilitate implementation of recommendations relating to asthma diagnosis.

Commissioners need to ensure that primary care staff are adequately trained and supported by accessible diagnostic services to diagnose asthma accurately, in line with the BTS/SIGN clinical guidelines (see ‘Resources’).

It is advisable for practices to audit their records regularly to identify patients who are on asthma medication, or who have had an emergency attendance or admission for asthma, but who do not have a diagnosis of asthma recorded in their notes. It is important to review these patients to have their diagnosis confirmed and entered into the practice records, so that appropriate treatment and self-management support can be initiated.

Resources

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[4] NHS Digital Quality Outcomes Framework, Disease prevalence and care quality achievement rates [Accessed 10 June 2019]

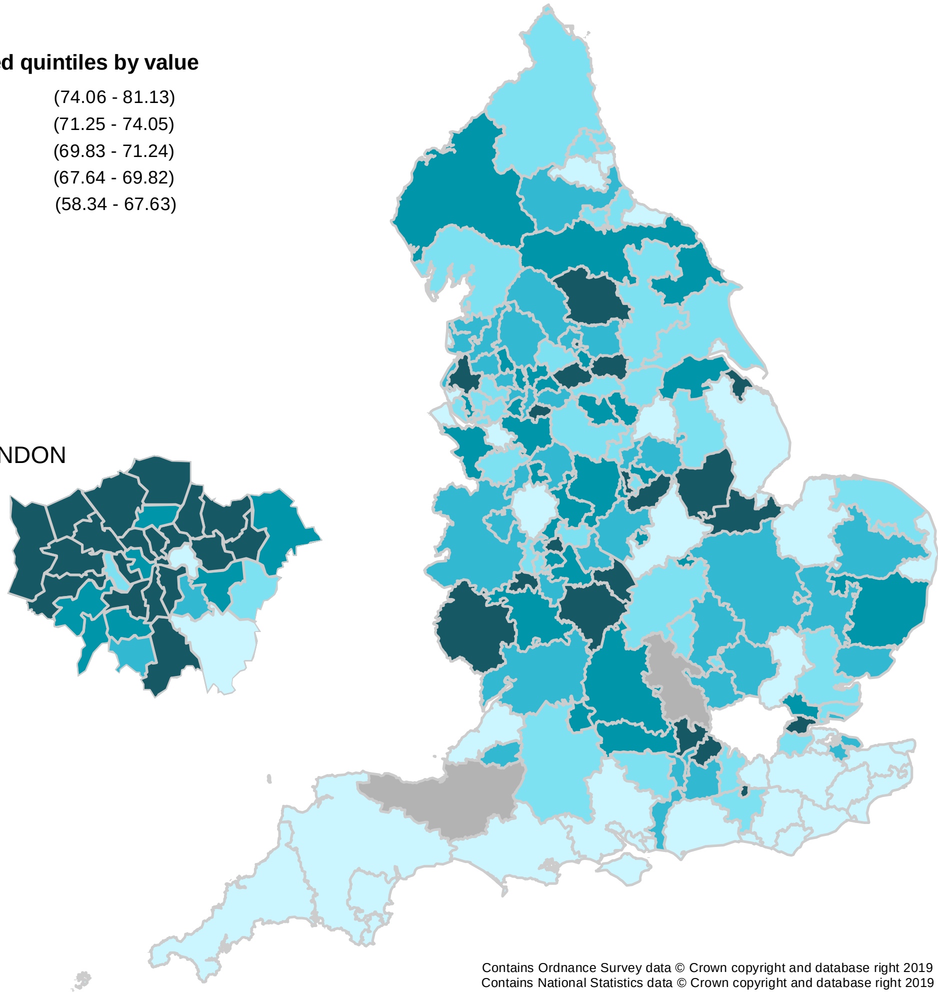
Asthma – Primary care - Review

Map 14a: Variation in percentage of patients with asthma on GP registers who had a review in the last 12 months that included an assessment of asthma control using the 3 RCP questions (including exceptions) by CCG (2017/18)

Optimum value: High

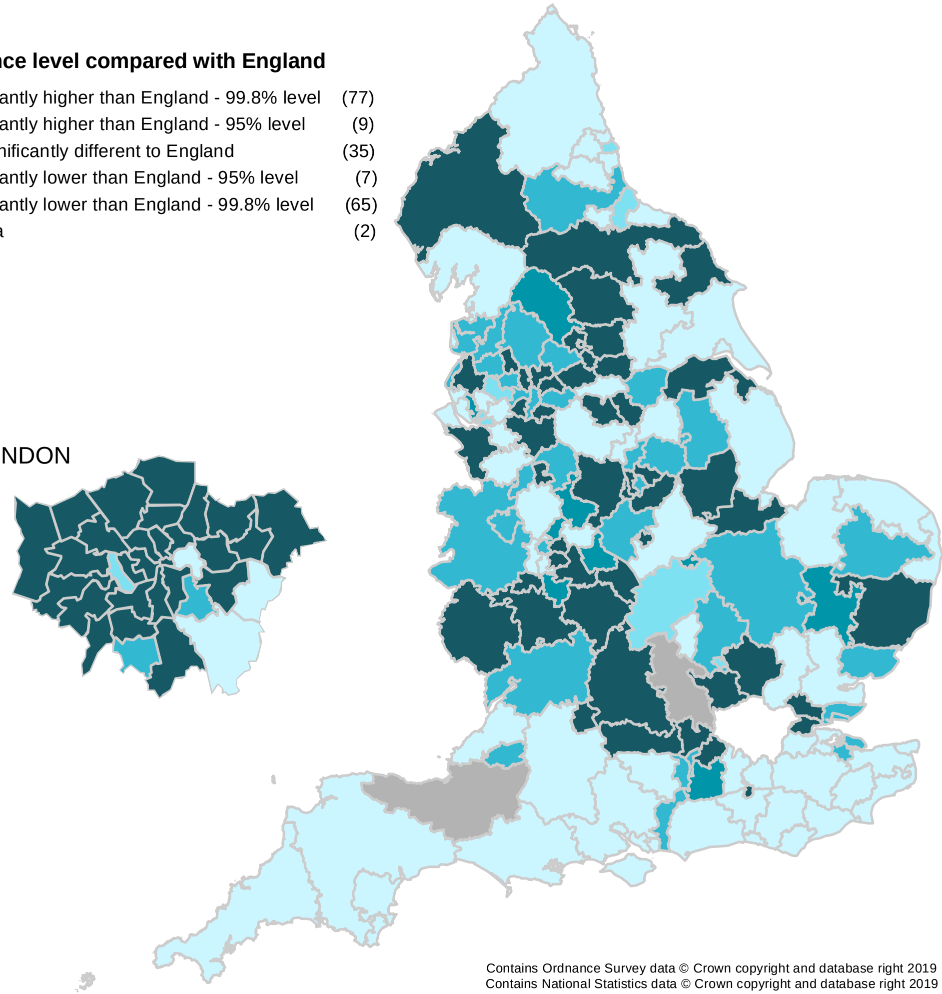
Equal-sized quintiles by value

Highest	(74.06 - 81.13)
	(71.25 - 74.05)
	(69.83 - 71.24)
	(67.64 - 69.82)
Lowest	(58.34 - 67.63)
No data	



Significance level compared with England

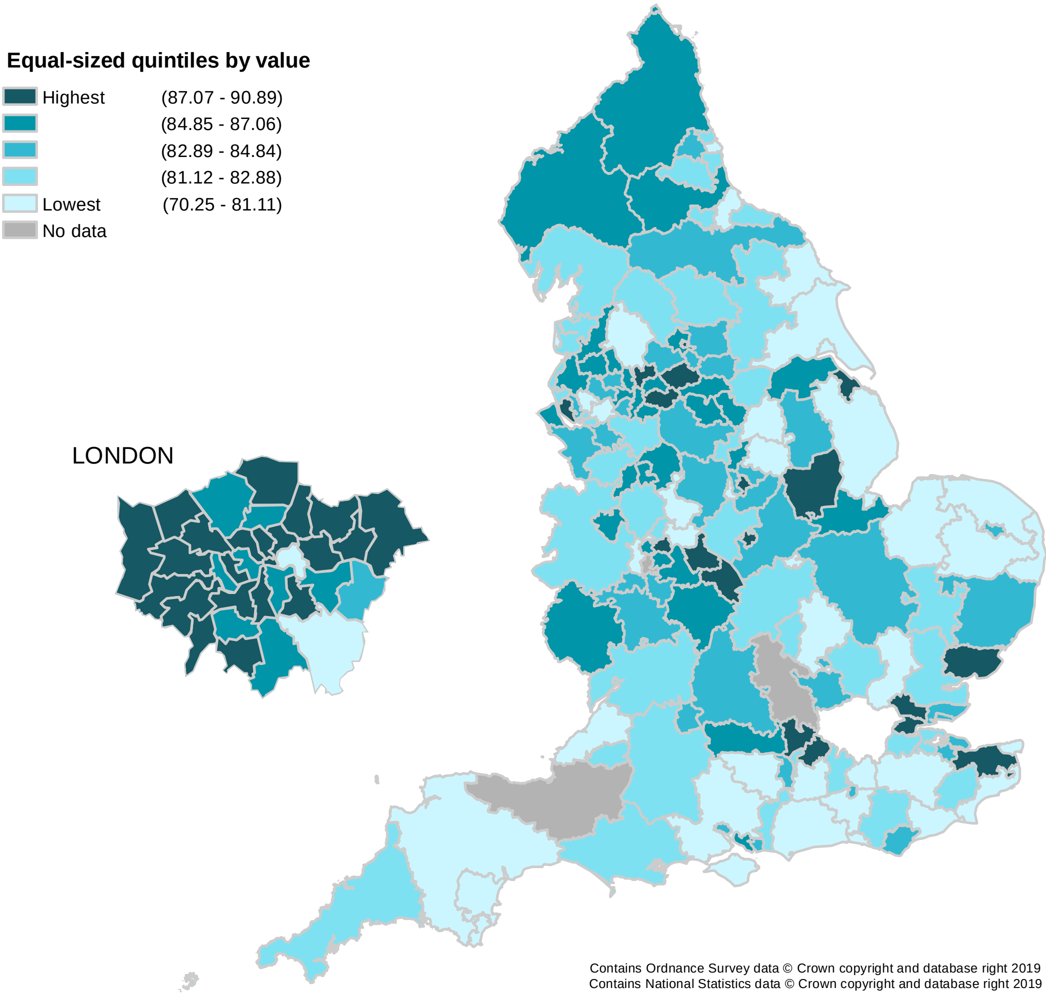
Significantly higher than England - 99.8% level	(77)
Significantly higher than England - 95% level	(9)
Not significantly different to England	(35)
Significantly lower than England - 95% level	(7)
Significantly lower than England - 99.8% level	(65)
No data	(2)

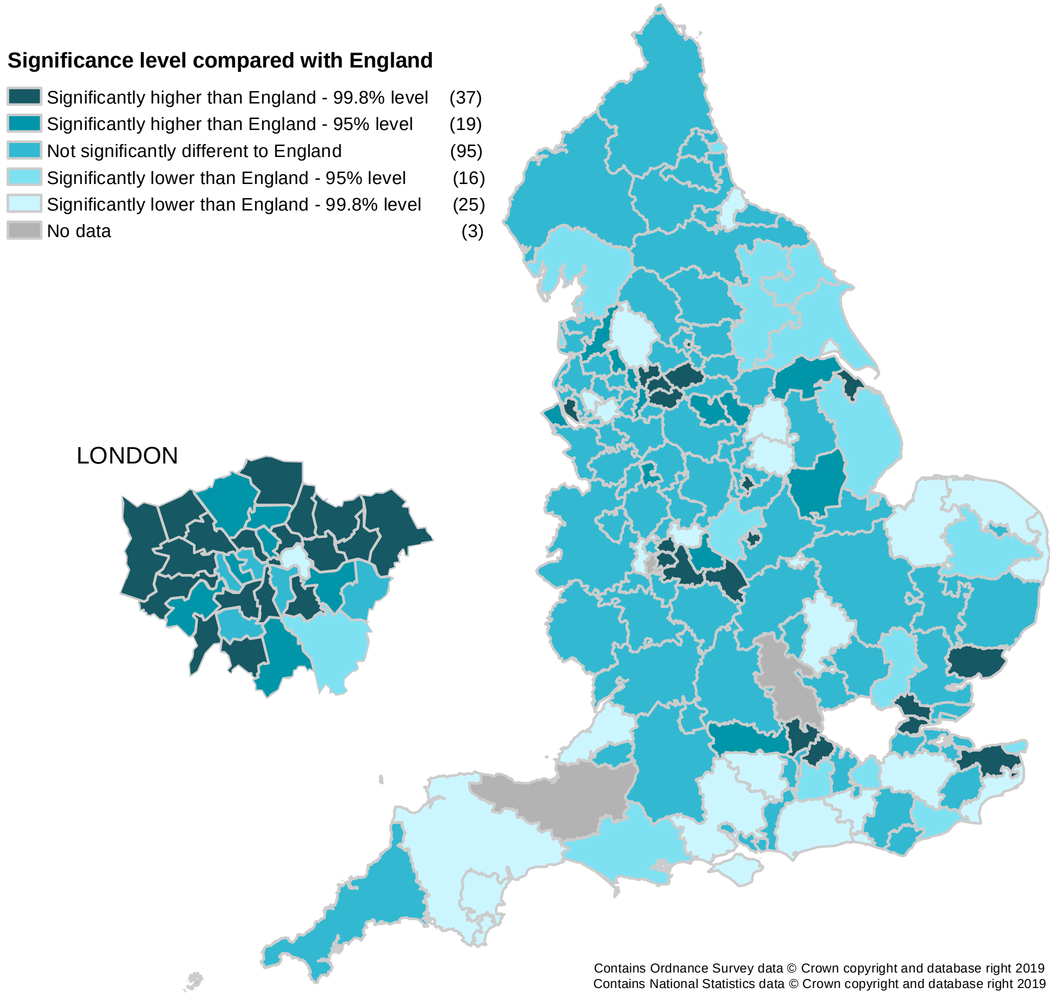


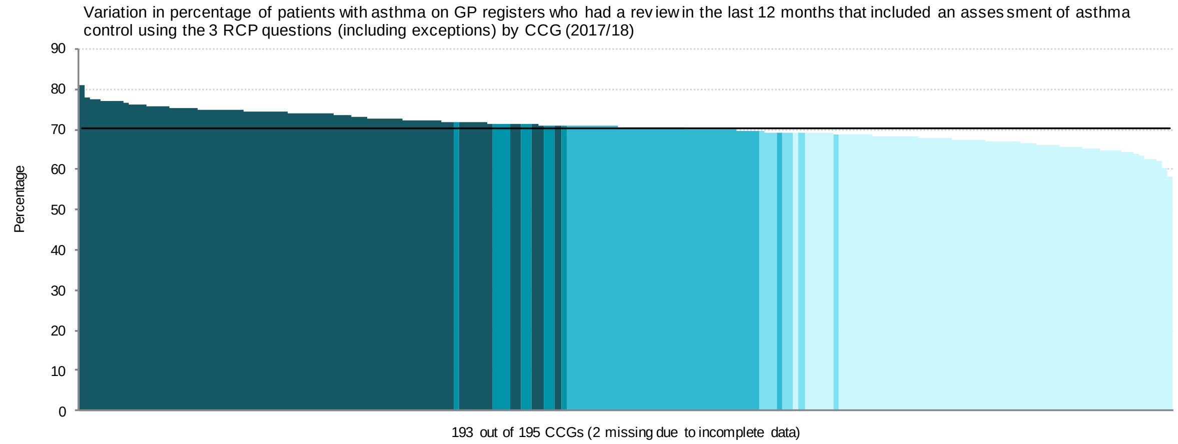
Asthma – Primary care - Review

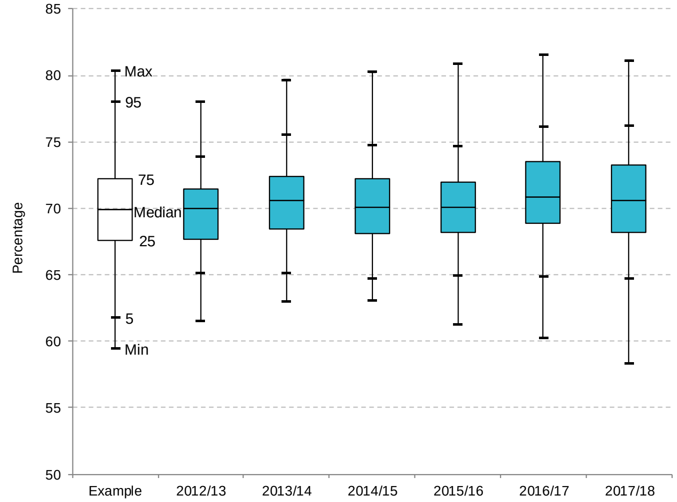
Map 14b: Variation in percentage of patients with asthma on GP registers aged 14 to 19 years, in whom there is a record of smoking status in the preceding 12 months (including exceptions) by CCG (2017/18)

Optimum Value: High









Max-Min (Range)		16.5	16.7	17.2	19.6	21.3	22.8	WIDENING Significant
95th-5th percentile		8.7	10.4	10.0	9.7	11.3	11.5	WIDENING Significant
75th-25th percentile		3.8	3.9	4.2	3.8	4.7	5.1	WIDENING Significant
Median		70.0	70.6	70.0	70.1	70.9	70.6	No significant change

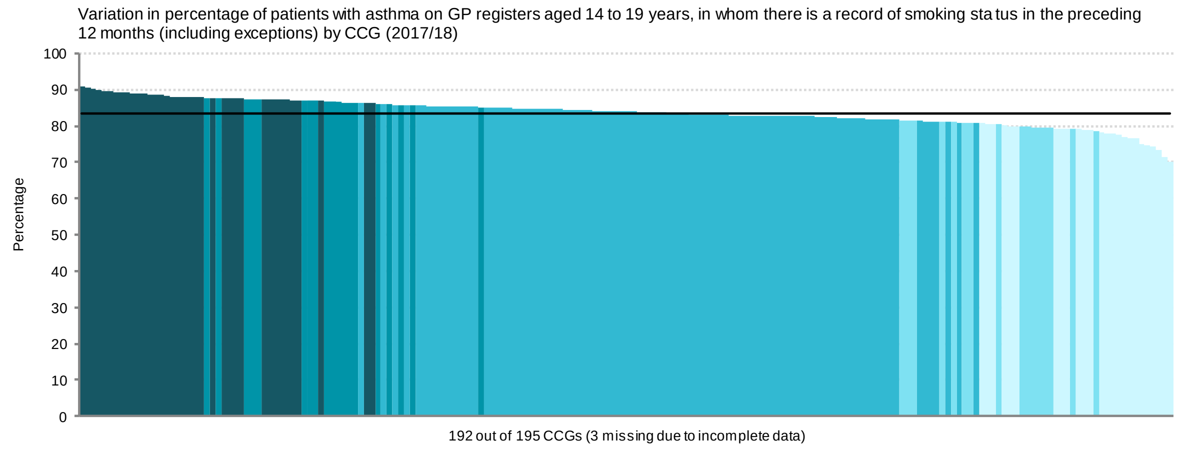
Context

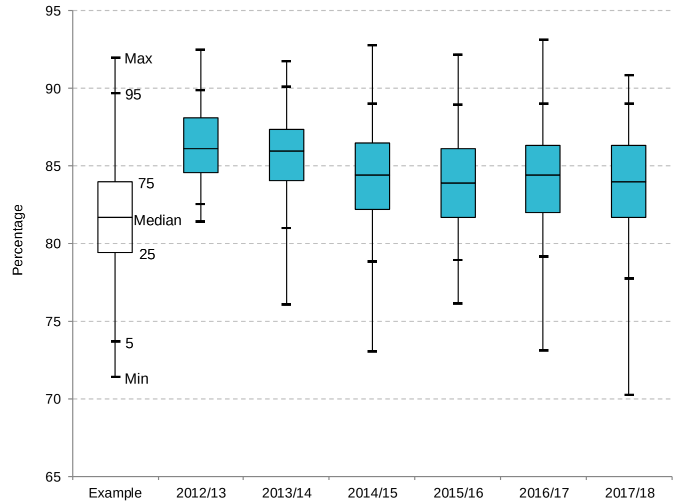
The severity of asthma varies, but it is recommended by many guidance documents (BTS/SIGN and NICE) that people with asthma should receive regular clinical reviews to ensure their symptoms are controlled and thereby minimise disruption to daily life. In England, up to one-fifth of people with asthma do not receive an annual clinical review.[1]

Pro-active structured care has benefits for patients with asthma. Important elements of structured asthma management are checking symptom levels, peak flow measurements, inhaler technique, and adherence to current treatment, in addition to supporting patients in the understanding of their condition such that they can self-manage. A recent development in chronic asthma care has been to support people with asthma to devise a personalised treatment plan. This should include pharmacological management and what to do if having an asthma attack.

When considering pharmacological treatment, clinicians should also consider the impact of inhalers on the environment: despite having a similar clinical effect, metered dose inhalers (MDIs) have been found to be a source of dangerous greenhouse gases, whereas dry powder inhalers have no similar known polluting effect. NICE have recently published a patient decision aid that will enable patients with asthma to identify which inhalers meet their needs and where several inhalers are a viable option, patients can opt for the most environmentally friendly option.

If MDIs are prescribed; Salbutamol has a larger propellant volume than similar MDIs and patients should return used MDIs to a pharmacy for climate safe disposal.





	Example	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		11.1	15.7	19.8	16.1	20.0	20.6	WIDENING Significant
95th-5th percentile		7.4	9.2	10.2	10.0	9.9	11.3	WIDENING Significant
75th-25th percentile		3.5	3.3	4.3	4.4	4.4	4.6	WIDENING Significant
Median		86.1	86.0	84.4	83.9	84.4	84.0	DECREASING Significant

One factor which can affect patients' symptoms of asthma is smoking. It is recognised that smoking (both active and passive) can lead to uncontrolled asthma.

Uptake of smoking in teenagers has been shown to increase the risk of both developing asthma, and this persisting into adulthood. Smoking can also decrease the effectiveness of certain treatments, and so it is important to record the smoking status of patients, particularly younger people. It also provides an opportunity to treat tobacco addiction and support patients to stop smoking. Across England the percentage of patients aged 14 to 19 with asthma on the asthma register who had their smoking status recorded in the past 12 months was 83.5%, 183,867 patients.[2]

Magnitude of variation

Map 14a: Variation in percentage of patients with asthma on GP registers who had a review in the last 12 months that included an assessment of asthma control using the 3 RCP questions (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 58.3% to 81.1%, which is a 1.4-fold difference between CCGs. The England value for 2017/18 was 70.2%.

The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18.There has been significant widening of all 3 measures of variation.

Map 14b: Variation in percentage of patients with asthma on GP registers aged 14 to 19 years, in whom there is a record of smoking status in the preceding 12 months (including exceptions) by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 70.3% to 90.9%, which is a 1.3-fold difference between CCGs. The England value for 2017/18 was 83.5%. The box plot shows the distribution of CCG values for the period 2012/13 to 2017/18. There has been significant widening of all 3 measures of variation. The median decreased significantly from 86.1% in 2012/13 to 84.0% in 2017/18.

The differences in exception-reporting suggest that some practices are more thorough than others at recording information on patient attendance or rationale for treatment decisions. However, it can reflect the effectiveness of the practice in reaching the local asthma population and thereby at influencing patient outcomes. The high levels of variation suggest that many people with asthma are not on GP registers and are therefore at greater risk of not receiving the appropriate assessment and treatment. There may also be some variation in how smoking status is recorded by practices to meet the QOF requirements. The QOF business rules require practices to use Read codes to record their actions. This means practices can meet the QOF measure without health care practitioners speaking face to face with patients about their smoking habits.

Options for action

Patients who are not reviewed or who are exempted from review are unlikely to receive pro-active chronic disease management and are more likely to have poorer outcomes than patients who are reviewed. It is possible that people not attending for regular review are among the high-risk patients in whom control is poor. Novel and creative strategies may be needed to reach these patients in order:

- to optimise their asthma control
- to reduce the risk of exacerbation, emergency admission and death
- to increase local population coverage of chronic disease management in asthma, commissioners could consider the interventions in Box 14.1 and help more local practices to become effective at reaching the entire local population with asthma through regular review

Box 14.1: Increasing local population coverage of chronic disease management in asthma

- calculate the actual chronic disease management coverage of registered asthma patients by including excepted patients in the denominator
- benchmark and share local exception-reporting data
- identify the systems used by the best-performing practices to maximise patient-reach
- support local practices with high exception rates to implement best-practice systems and improve patient outcomes through systematic chronic disease management

Resources

British Thoracic Society (BTS) and Scottish Intercollegiate Guidelines Network (SIGN) (2019) British guideline on the management of asthma. A national clinical guideline [Accessed 2 August 2019]

Department of Health (2011) An outcomes strategy for people with chronic obstructive pulmonary disease (COPD) and Asthma in England [Accessed 30 January 2019]

Department of Health (2012) An Outcomes Strategy for COPD and Asthma: NHS Companion Document [Accessed 30 January 2019]

National Institute for Clinical Excellence (2019) Inhalers for asthma (patient decision aid) [Accessed 06 May 2019]

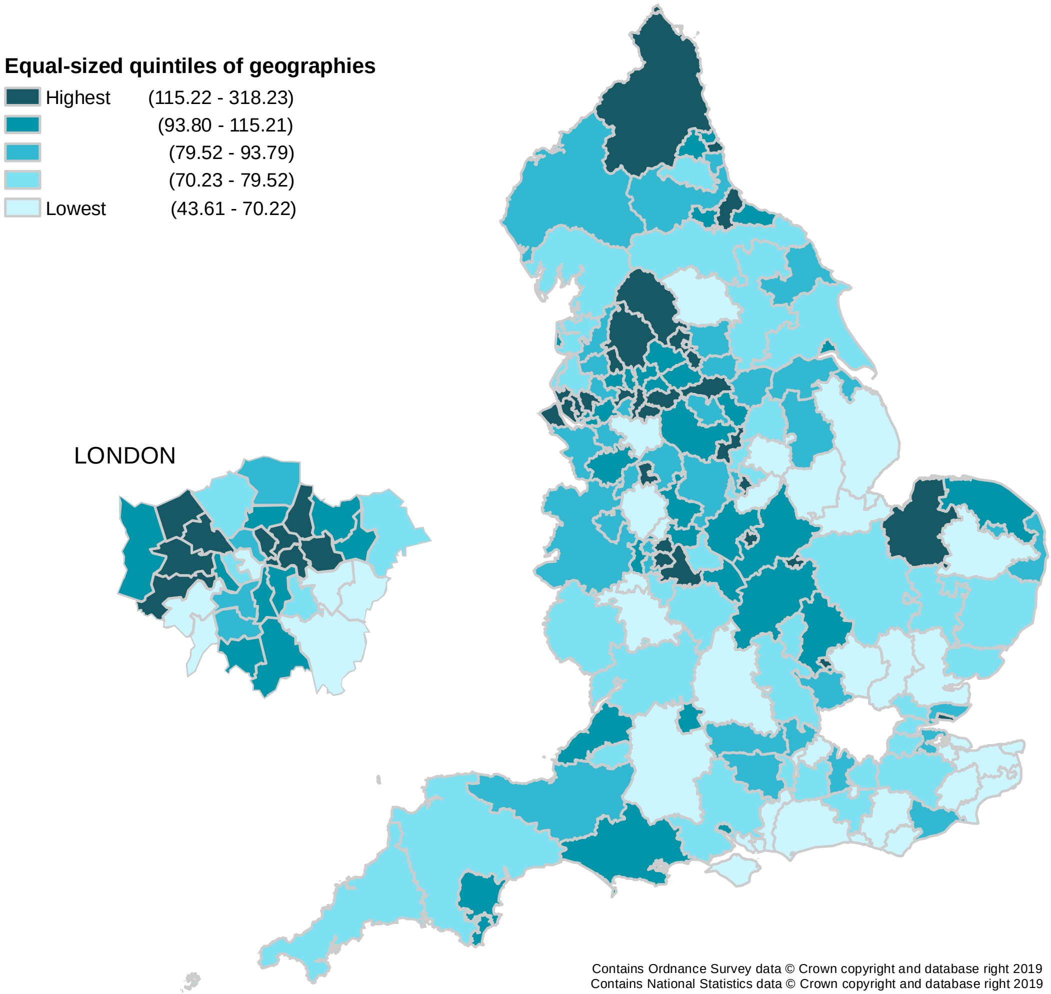
[1] Asthma UK Annual Asthma Survey 2018 [Accessed 10 June 2019]
[2] NHS Digital (2018) Quality and Outcomes Framework, Achievement, prevalence and exceptions data - 2017-18 [PAS] [Accessed 6 May 2019]

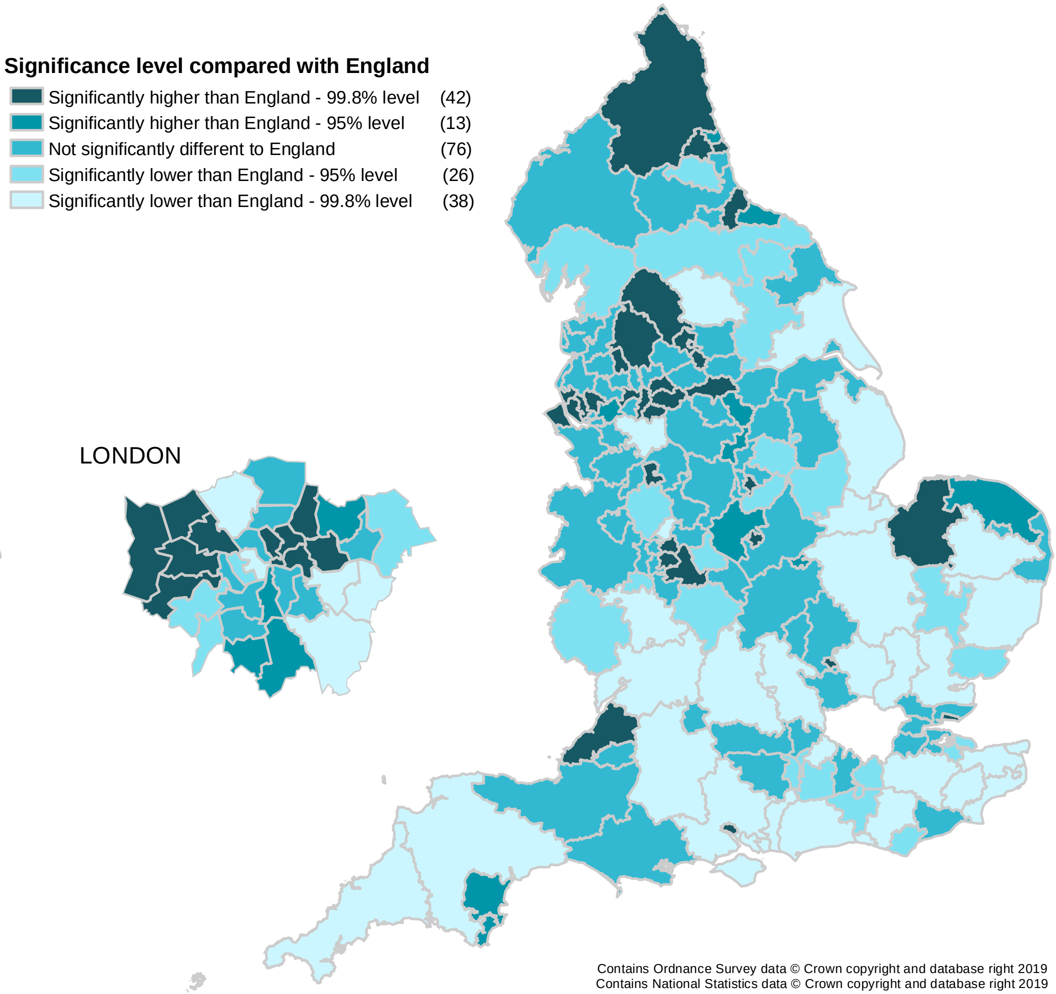
Asthma – Adult hospital admissions

Map 15a: Variation in rate of emergency admissions to hospital for asthma in adults aged 19 years and over per population by CCG (2017/18)

Directly standardised rate per 100,000

Optimum value: Low

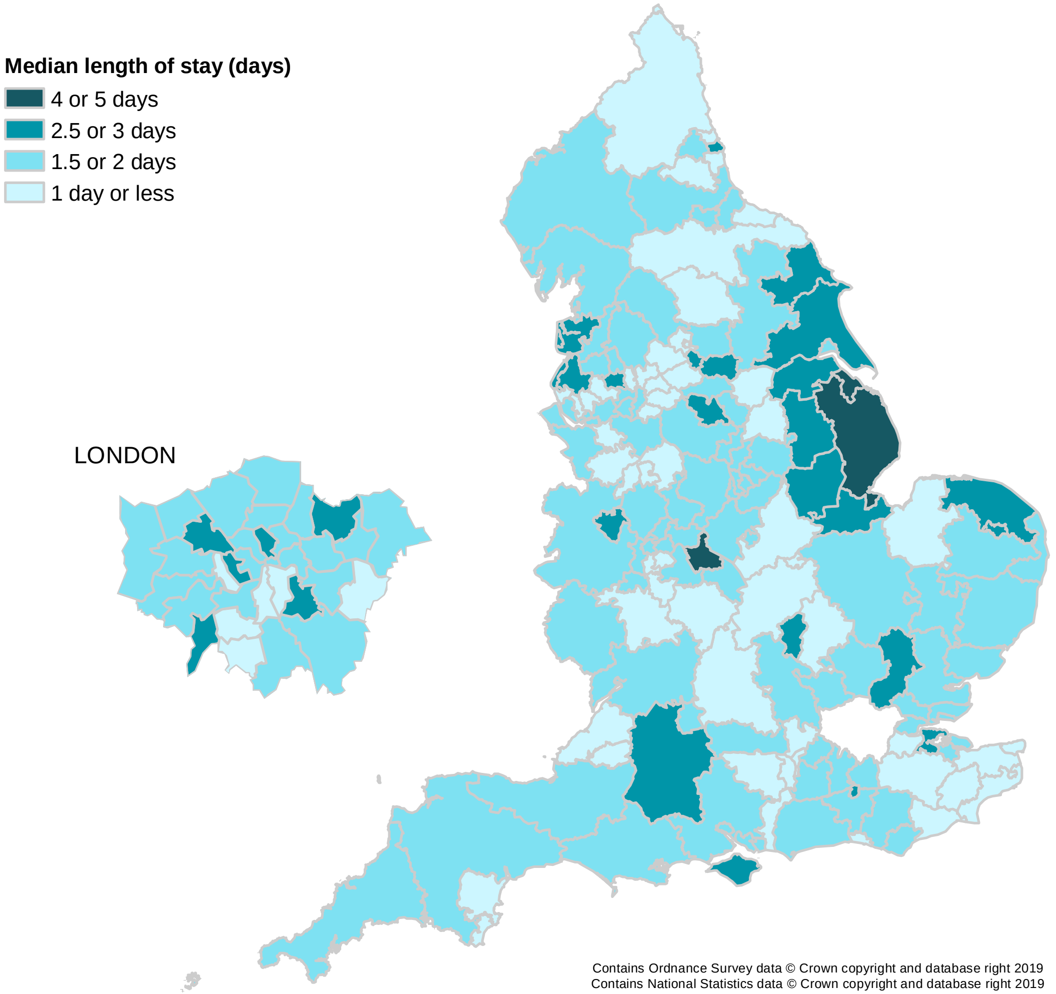




Asthma – Adult hospital admissions

Map 15b: Variation in median length of stay (days) of emergency admissions to hospital for asthma in adults aged 19 years and over by CCG (2017/18)

Optimum value: Local interpretation

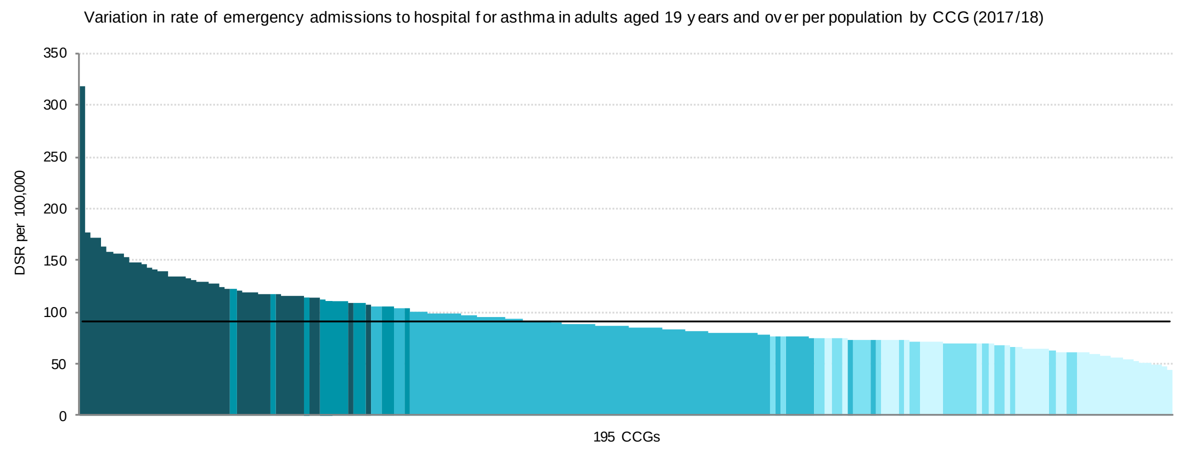


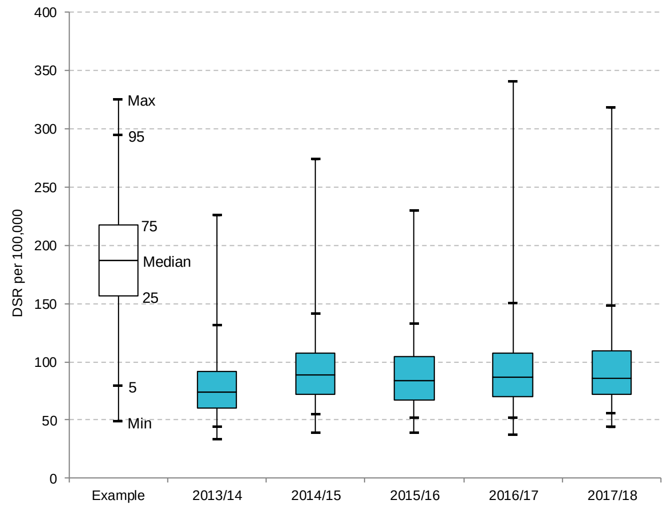
Context

With optimal treatment, good asthma control should be achievable in the majority of patients. This is echoed in national guidelines for the management of asthma,[1] which state that:

- people with asthma should be offered self-management education, a written personalised asthma action plan (PAAP) and support by regular professional review
- non-pharmaceutical management may be beneficial including avoidance of asthma triggers such as occupational exposure
- people with asthma should expect their condition to be adequately controlled by their medicine
- they should expect to be free from symptoms and restrictions on their lives
- they should not need emergency treatment if appropriate routine care is given

In the guidelines, control is described as a person having no asthma attacks, no emergency visits to doctors or hospitals, minimal or no asthma symptoms and no restrictions on their daily activities. Despite the availability of effective





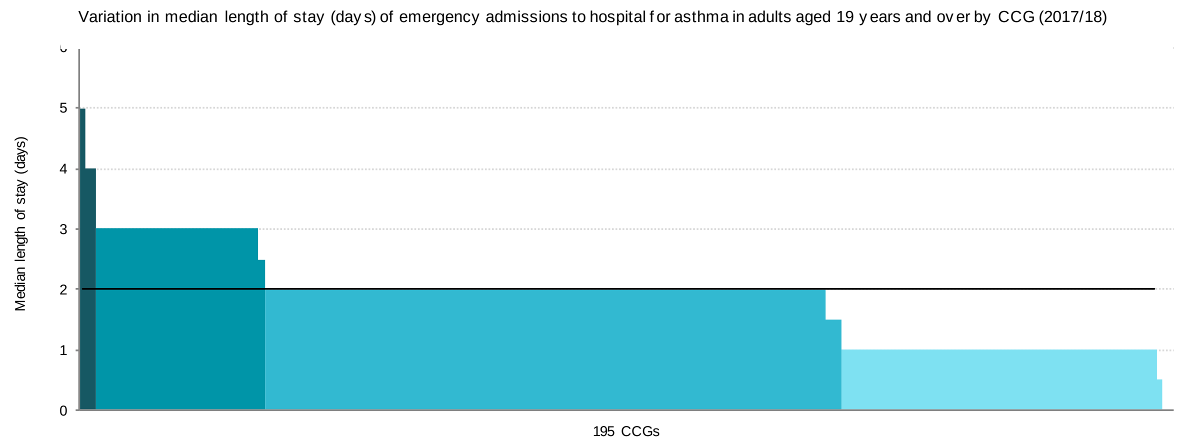
	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		192.0	235.1	190.5	303.0	274.6	No significant change
95th-5th percentile		88.1	87.0	81.1	97.7	92.1	No significant change
75th-25th percentile		31.5	35.9	37.2	37.8	36.7	No significant change
Median		74.3	88.3	84.3	87.0	85.9	No significant change

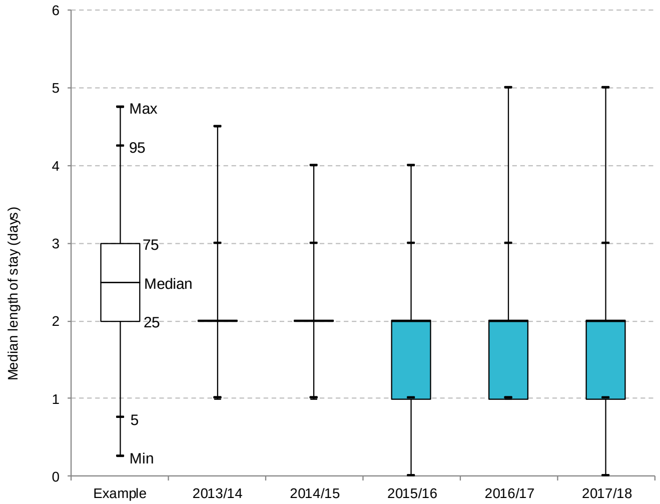
treatments, many people in England still have exacerbations or asthma that is not controlled according to the above definition.

For many patients, asthma control is sub-optimal and an emergency hospital attendance or admission represents a serious loss of control of a person's asthma which is potentially avoidable.

Many people with asthma attend accident and emergency departments without requiring admission. Emergency admission to hospital is a major adverse outcome for patients. It is estimated around three-quarters of admissions could be prevented with improved long-term management. Most people with asthma may have had symptoms for several days before an admission.[2] Structured self-management support, including a personalised asthma action plan (PAAP) and patient education, is a key element of long-term disease management in asthma. People who have a PAAP have fewer hospitalisations, fewer emergency department visits, and fewer unscheduled visits to the doctor than people who do not have such a plan.[3] Personalised care planning with appropriate follow-up support can lead to improvements in some indicators of physical, psychological and subjective health status, and people's capability to self-manage their condition.[4]

Recommendations of the National Review of Asthma Deaths[5] into asthma deaths were that all patients using more than 12 rescue inhalers in 12 months should have their asthma treatment reviewed.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		3.5	3.0	4.0	4.0	5.0	No significant change
95th-5th percentile		2.0	2.0	2.0	2.0	2.0	No significant change
75th-25th percentile		0.0	0.0	1.0	1.0	1.0	No significant change
Median		2.0	2.0	2.0	2.0	2.0	No significant change

In addition, patients with asthma must be referred to a specialist asthma service if they have required more than 2 courses of systemic corticosteroids, oral or injected, in the previous 12 months or require management using British Thoracic Society (BTS) stepwise treatment 4 or 5 to achieve control.

Follow-up arrangements must also be made after every attendance at an emergency department or out-of-hours service for an asthma attack. Secondary care follow-up should be arranged after every hospital admission for asthma, and for patients who have attended the emergency department 2 or more times with an asthma attack in the previous 12 months.

If these sensible and proportionate recommendations were to be systematically implemented evidence in the literature suggests that this should lead to fewer failures in care which result in hospital admission.

Magnitude of variation

Map 15a: Variation in rate of emergency admissions to hospital for asthma in adults aged 19 years and over per population by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 43.6 to 318.2 per 100,000 population, which is a 7.3-fold difference between CCGs. The England value for 2017/18 was 90.4 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18.

Map 15b: Variation in median length of stay (days) of emergency admissions to hospital for asthma in adults aged 19 years and over by CCG (2017/18)

The map and column chart display the latest period (2017/18), during which CCG values ranged from 0.0 to 5.0 days. The England value for 2017/18 was 2 days.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18.

Some of this variation can be accounted for by differences in local population characteristics, but much is unwarranted due to differences in:

- the quality of asthma care
- the support people receive from primary care to manage their condition

The degree of variation observed shows that in many localities there is substantial scope for reducing emergency events. What is achievable for patients in one locality should be possible in all localities if best practice is consistently adopted in the NHS.

Options for action

Action to prevent emergency admissions will save money and improve outcomes for people with asthma: caring for people who experience an asthma attack costs 3.5 times more than for those whose asthma is well managed.[6] Commissioners need to specify that service providers deliver optimal long term disease management and structured support for self-management such that patients know the appropriate action to take at the first sign of deterioration, including:

- developing a personalised asthma action plan in partnership with patients, as part of structured asthma education to help all patients identify deterioration and understand what actions to take
- reviewing asthma action plans regularly and always at the time of emergency department attendance or hospital admission
- delivering care in line with the BTS/SIGN guideline and NICE Guidance (see ‘Resources’)
- providing healthcare professionals responsible for managing people with asthma with training in asthma management, and with support on how best to deliver structured self-management support to patients
- providing a structured primary care review at least once a year to all people with asthma in line with the BTS/SIGN guideline
- conducting a review of all people attending hospital with acute exacerbations of asthma, preferably within 30 days of attendance – to be undertaken by a clinician with expertise in asthma management in line with guidance
- helping practices identify people who need more active monitoring and management and develop a register of people at risk of admission. Risk factors include a hospital admission in the previous 12 months, using excessive quantities of short acting bronchodilators, and requiring a course of oral steroids in the preceding 12 months
- all secondary care centres to participate in the National Asthma Audit to systematically measure quality of care and identify processes for improvement

Service providers could consider the introduction in the urgent-care system of a triage service run by a multidisciplinary respiratory team to manage the diversion of people with asthma to community services using direct links between the triage service and the “pick-up” of patients in the community.[7]

Resources

Asthma UK (2018) Annual Asthma Survey 2018 [Accessed 19 July 2019]

British Lung Foundation Asthma Statistics [Accessed 29 January 2019]

British Thoracic Society (BTS) and Scottish Intercollegiate Guidelines Network (SIGN) (2019) British guideline on the management of asthma. A national clinical guideline [Accessed 2 August 2019]

Department of Health (2011) An Outcomes Strategy for Chronic Obstructive Pulmonary Disease COPD and Asthma in England [Accessed 30 January 2019]

Department of Health (2012) An Outcomes Strategy for COPD and Asthma: NHS Companion Document [Accessed 29 January 2019]

NHS Improvement Improving adult asthma care: Emerging learning from the national improvement projects [Accessed 17 July 2019]

NHS Yorkshire and the Humber Asthma: Better for Less [Accessed 22 January 2019]

National Institute for Health and Care Excellence (2018) Asthma (NICE quality standard [QS25]) [Accessed 15 July 2019]

National Institute for Health and Care Excellence (2017) Asthma: diagnosis, monitoring and chronic asthma management (NICE guideline [NG80]) [Accessed 17 July 2019]

Royal College of Physicians (2014) National Review of Asthma Deaths – why asthma still kills. [Accessed 2 August 2019]

Scott S (2017) British Thoracic Society Adult Asthma Audit 2016 (Audit Period: 1 September – 31 October 2016) [Accessed 2 August 2019]

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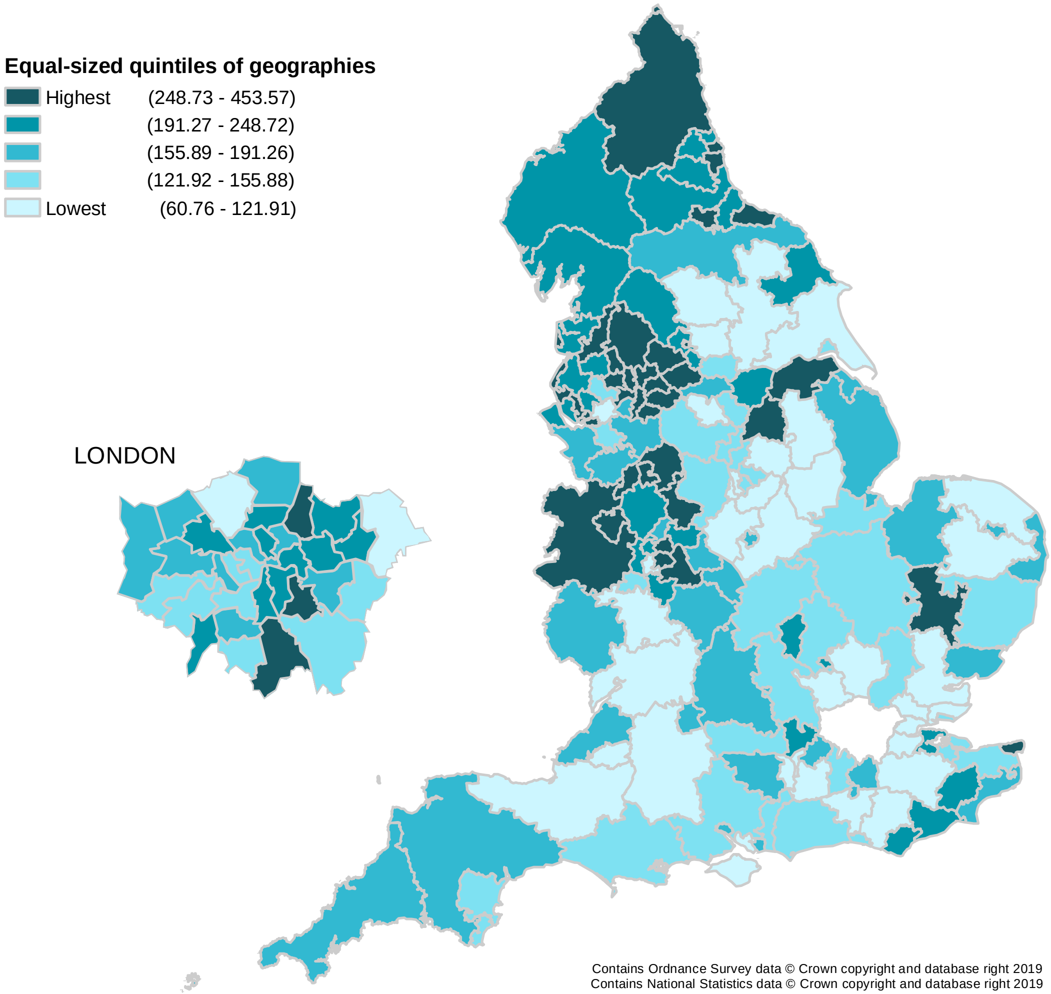
[1] National Institute for Health and Care Excellence (2017) Asthma: diagnosis, monitoring and chronic asthma management. NICE guideline [NG80] [Accessed 29 July 2019]
[2] Asthma UK (2014) Time to take action on asthma – Compare your care 2014 [Accessed 29 January 2019]
[3] Gibson P, Powell H, Wilson A and others (2002) Self-management education and regular practitioner review for adults with asthma Cochrane Database of Systematic Reviews (3):CD001117 doi: 10.1002/14651858.CD001117 [Accessed 2 August 2019]
[4] Coulter A, Entwistle V, Eccles A and others (2015) Personalised care planning for adults with chronic or long-term health conditions Cochrane Database of Systematic Reviews (3):CD010523 doi: 10.1002/14651858.CD010523.pub2 [Accessed 10 June 2019]
[5] Royal College of Physicians (2014) National Review of Asthma Deaths – why asthma still kills [Accessed 25 July 2019]
[6] Bahadori K, Doyle-Waters M, Marra, C and others (2009) Economic burden of asthma: a systematic review BMC Pulmonary Medicine 9(24) doi: 10.1186/1471-2466-9-24 [Accessed 2 August 2019]
[7] McKay C, Cripps M (2013) Delivering improved healthcare in Warrington: the NHS Right Care approach [Accessed 5 March 2019]

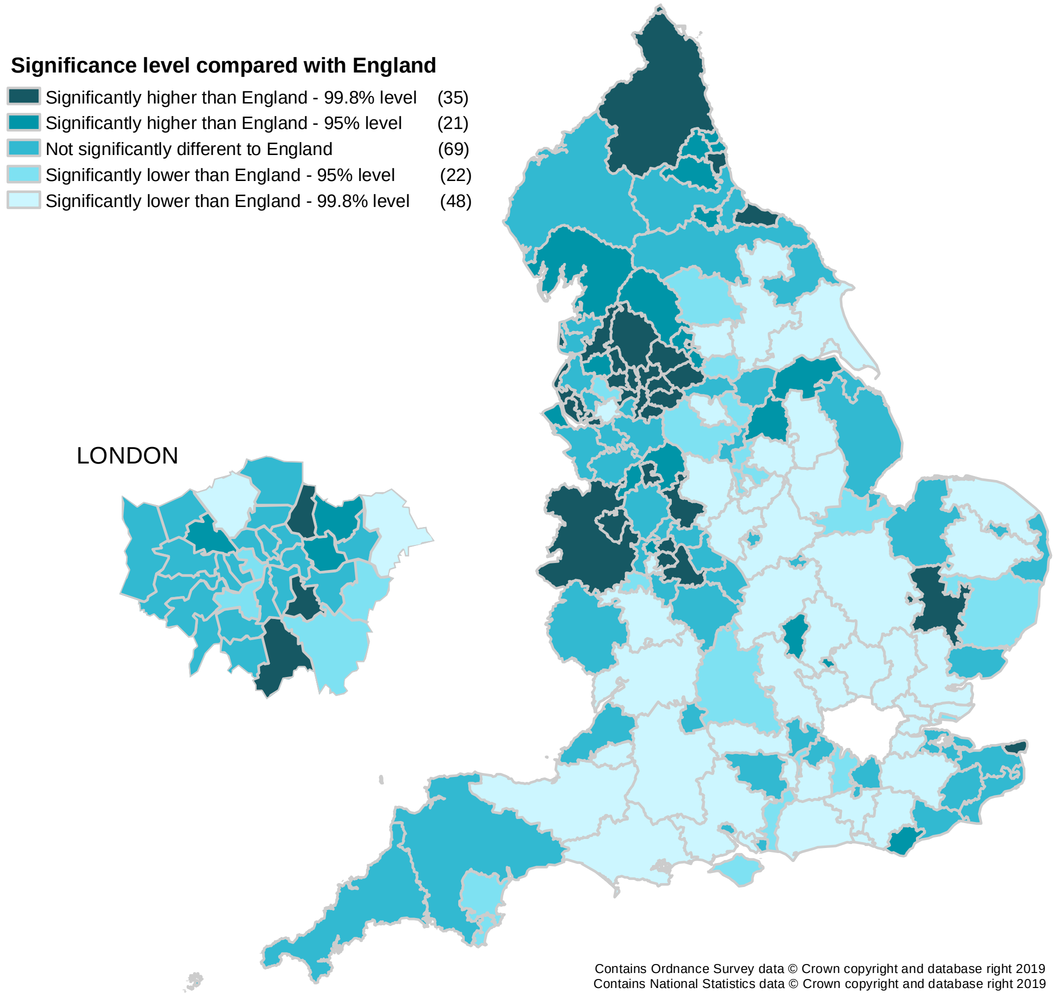
Asthma – Paediatric hospital admissions

Map 16a: Variation in rate of emergency admissions to hospital for asthma in children aged 0-18 years per population by CCG (2017/18)

Crude rate per 100,000 population

Optimum value: Low

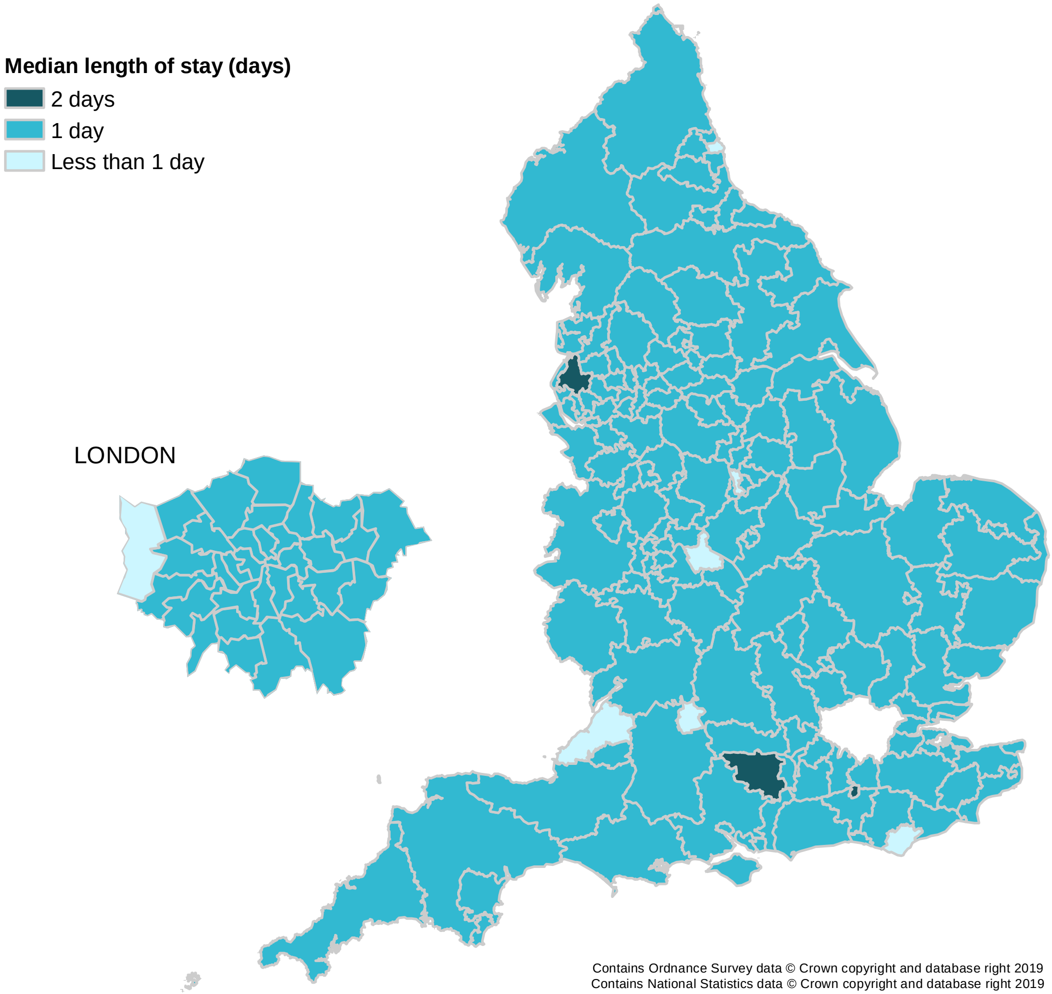




Asthma – Paediatric hospital admissions

Map 16b: Variation in median length of stay (days) of emergency admissions to hospital for asthma in children aged 0-18 years by CCG (2017/18)

Optimum value: Requires local interpretation



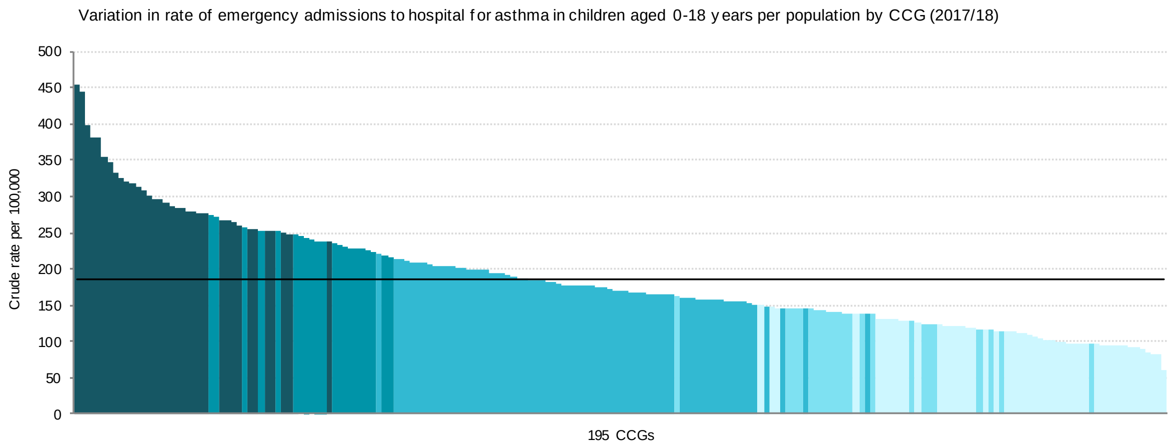
Context

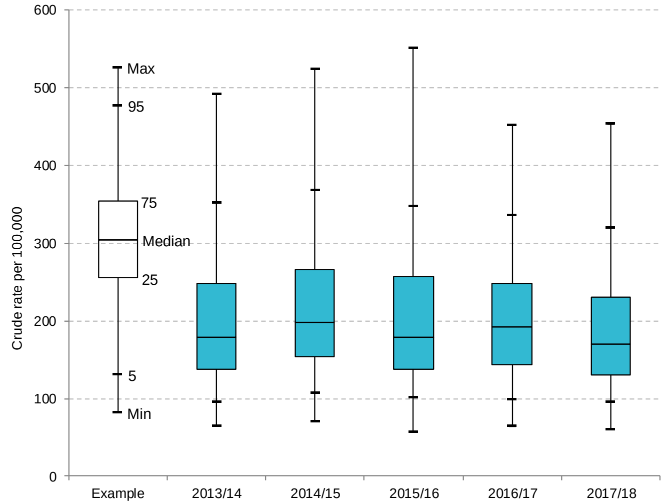
Asthma is the commonest long-term medical condition in childhood. Of the 5.4 million people in the UK currently being treated for asthma, 1.1 million are children (20%).[1]

Many children with asthma have poor control, often a consequence of poor medication compliance or poor inhaler technique. Environmental factors, such as exposure to second-hand smoke, air pollution and housing quality, also impact on control. Asthma is the most common reason for urgent hospital admissions in children and young people,[2] the analysis for this atlas shows 64 children admitted to hospital every day because of their asthma. This results in a significant number of school absences.[3]

Emergency admissions should be avoided whenever possible. Interventions that improve health outcomes for people with asthma include:

- self-management education that incorporates written personalised asthma actions plans (PAAPs)
- regular pro-active structured clinical reviews in primary care, including discussion and use of a written PAAP, and checking inhaler technique





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		427.3	454.3	493.9	388.5	392.8	No significant change
95th-5th percentile		255.5	260.7	246.7	238.5	224.8	NARROWING Significant
75th-25th percentile		111.1	111.8	120.2	105.8	99.3	No significant change
Median		179.0	198.0	179.1	192.1	170.3	No significant change

- education for clinicians
- improving environmental factors within the home, such as smoking outside

The National Review of Asthma Deaths (NRAD) found preventable factors were present in 90% of childhood deaths from asthma.[4] NHS England state that less than 25% of children with asthma have a PAAP.[2]

Unplanned hospitalisation for asthma, diabetes and epilepsy in children and young people aged under 19 years is a national quality indicator in the NHS Outcomes Framework 2019.[5]

Magnitude of variation

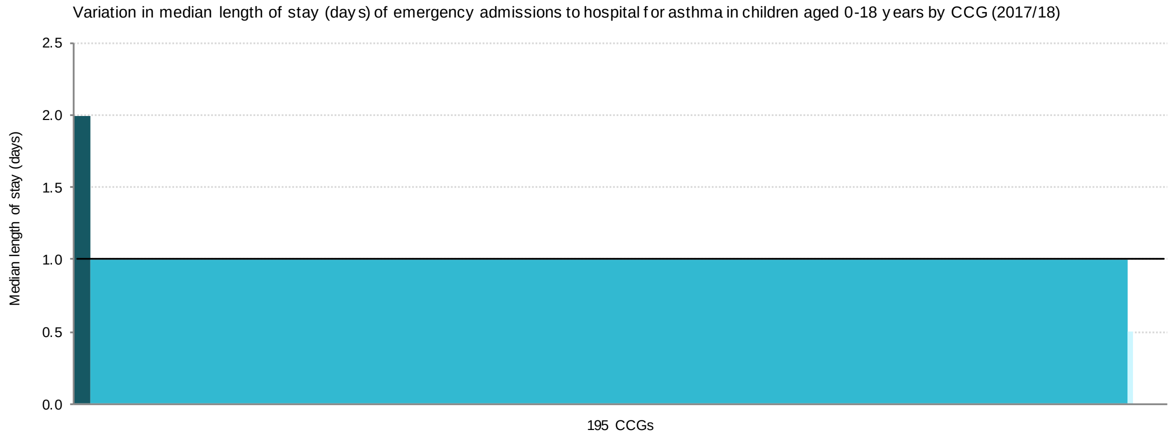
Map 16a: Variation in rate of emergency admissions to hospital for asthma in children aged 0-18 years per population by CCG (2017/18)

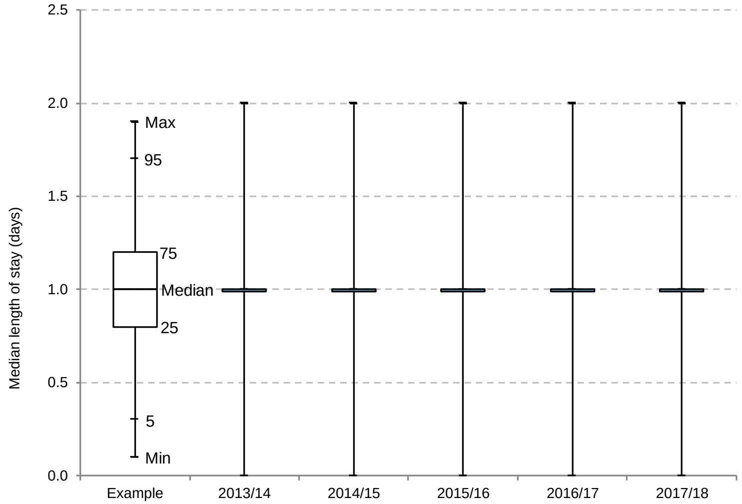
The maps and column chart display the latest period (2017/18), during which CCG values ranged from 60.8 to 453.6 per 100,000 population, which is a 7.5-fold difference between CCGs. The England value for 2017/18 was 184.8 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. The 95th to 5th percentile gap narrowed significantly.

Map 16b: Variation in median length of stay (days) of emergency admissions to hospital for asthma in children aged 0-18 years by CCG (2017/18)

The map and column chart display the latest period (2017/18), during which CCG values ranged from 0 to 2 days. The England value for 2017/18 was 1 day.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		2.0	2.0	2.0	2.0	2.0	No significant change
95th-5th percentile		0.0	0.0	1.0	0.0	0.0	No significant change
75th-25th percentile		0.0	0.0	0.0	0.0	0.0	No significant change
Median		1.0	1.0	1.0	1.0	1.0	No significant change

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18.

The degree of variation observed in the rate of emergency admission may be due to:

- suboptimal symptom management and secondary prevention in the community
- suboptimal emergency care in the accident and emergency (A&E) department
- differences in admission criteria among paediatric units
- suboptimal inhaler technique and compliance with treatment

Bed capacity could be a factor in determining admission criteria.

When compared with previous financial years, it shows that the variation observed for emergency admission rates for children with asthma is relatively high and of a similar degree. It would appear there is scope for greater equity in the provision of asthma services across England.

The degree of variation observed in length of stay in hospital may be related to disease severity. Geographically however, these data show no correlation between emergency admission rate and median length of stay, which would suggest there are other factors involved, such as differences in:

- inpatient management of asthma[6]
- discharge criteria for paediatric units

Bed capacity could also be a factor in determining discharge criteria.

Options for action

To identify unwarranted variation in the local management of long-term conditions such as asthma, commissioners can use the Disease Management Information Toolkit (DMIT).[7]

As the causes of asthma are multifactorial, action to reduce emergency admission requires a whole pathway approach, including public health, and primary and secondary care. Commissioners need to specify that all service providers use the BTS/SIGN guidance[8] as the basis of the clinical asthma pathways for which they are responsible locally and apply these consistently throughout services. Commissioners also need to implement the NICE quality standards for asthma (see Resources) that are relevant to children.

Hospital-based admission is an opportunity to review self-management skills. Service providers need to ensure that every child with asthma has a written PAAP according to the BTS/SIGN guideline on management of asthma, and the NICE quality standards for asthma; symptom-based plans are generally preferable for children. Also, every child admitted to hospital with an acute exacerbation of asthma has a structured review by a member of a specialist respiratory team before discharge, in accordance with the NICE quality standards for asthma.

Primary care service providers could audit the number and percentage of children with asthma receiving an annual review, and in particular those children who:

- over-use bronchodilators; or are on higher treatment steps
- have asthma attacks
- have complex needs
- belong to an at-risk ethnic minority group and who have attended emergency care

Commissioners need to ensure that service providers support clinicians:

- in implementing up-to-date evidence on best practice
- by providing training interventions especially for clinicians in primary care that include educational outreach visits

Commissioners may wish to consider establishing asthma diagnostic hubs to improve the feasibility of implementing BTS/SIGN guidelines consistently by Trusts and GPs participating in the National Asthma and COPD Audit Programme (NACAP).[9]

Any school-based asthma education programmes need to be targeted at the children's health professionals as well as the children themselves.

School nursing, primary care and paediatric asthma networks need to work together to optimise other vital aspects of the overall care of the child with asthma such as:

- parental education
- school medication management

Resources

British Thoracic Society (BTS) and Scottish Intercollegiate Guidelines Network (SIGN) (2019) British guideline on the management of asthma. A national clinical guideline [Accessed 2 August 2019]

NHS England Childhood asthma [Accessed 22 January 2019]

NHS Yorkshire and the Humber Asthma: Better for Less [Accessed 22 January 2019]

National Institute for Health and Care Excellence (Updated 2018) Asthma (NICE quality standard [QS25]) [Accessed 15 July 2019]

Public Health England (2015) Disease Management Information Toolkit (DMIT) [Accessed 20 June 2019]

Royal College of Physicians National Asthma and COPD Audit Programme (NACAP) [Accessed 20 June 2019]

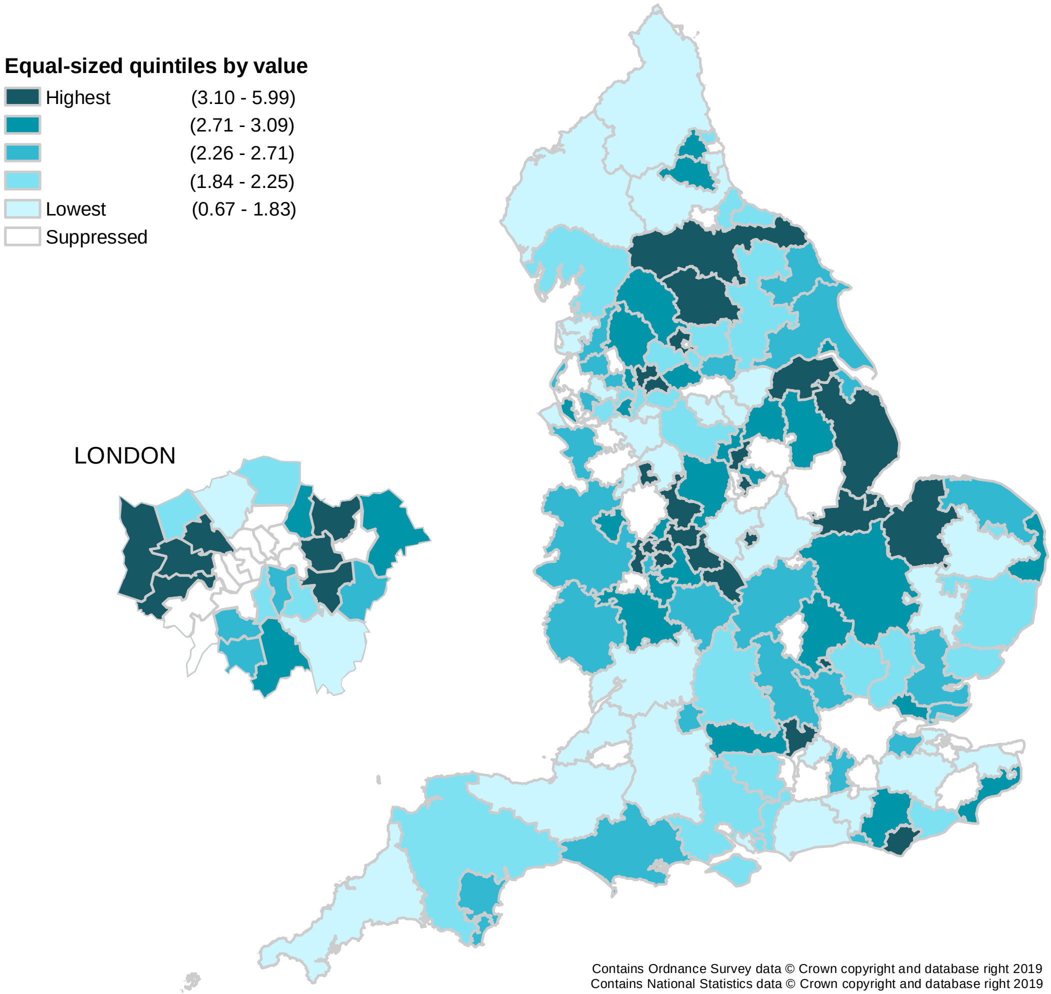
[1] Asthma UK Asthma facts and statistics [Accessed 17 July 2019]
[2] NHS England Childhood Asthma [Accessed 2 August 2019]
[3] Mukherjee M, Stoddart A, Gupta R and others (2016) The epidemiology, healthcare and societal burden and costs of asthma in the UK and its member nations: analyses of standalone and linked national databases BMC Medicine 14:113 doi: 10.1186/s12916-016-0657-8 [Accessed 2 August 2019]
[4] Royal College of Physicians (2014) National Review of Asthma Deaths – why asthma still kills [Accessed 25 July 2019]
[5] NHS Digital (2019) NHS Outcomes Framework Indicators [Accessed 22 August 2019]
[6] Lyttle M, O'Sullivan R, Doull I, and others (2014) Variation in treatment of acute childhood wheeze in emergency departments of the United Kingdom and Ireland: an international survey of clinician practice Arch Dis Child 100:121–125. doi:10.1136/archdischild-2014-306591 [Accessed 20 June 2019]
[7] Public Health England (2015) Disease Management Information Toolkit [Accessed 20 June 2019]
[8] British Thoracic Society and Scottish Intercollegiate Guidelines Network (2019) British guideline on the management of asthma. A national clinical guideline [Accessed 2 August 2019]
[9] Royal College of Physicians National Asthma and COPD Audit Programme (NACAP) [Accessed 20 June 2019]

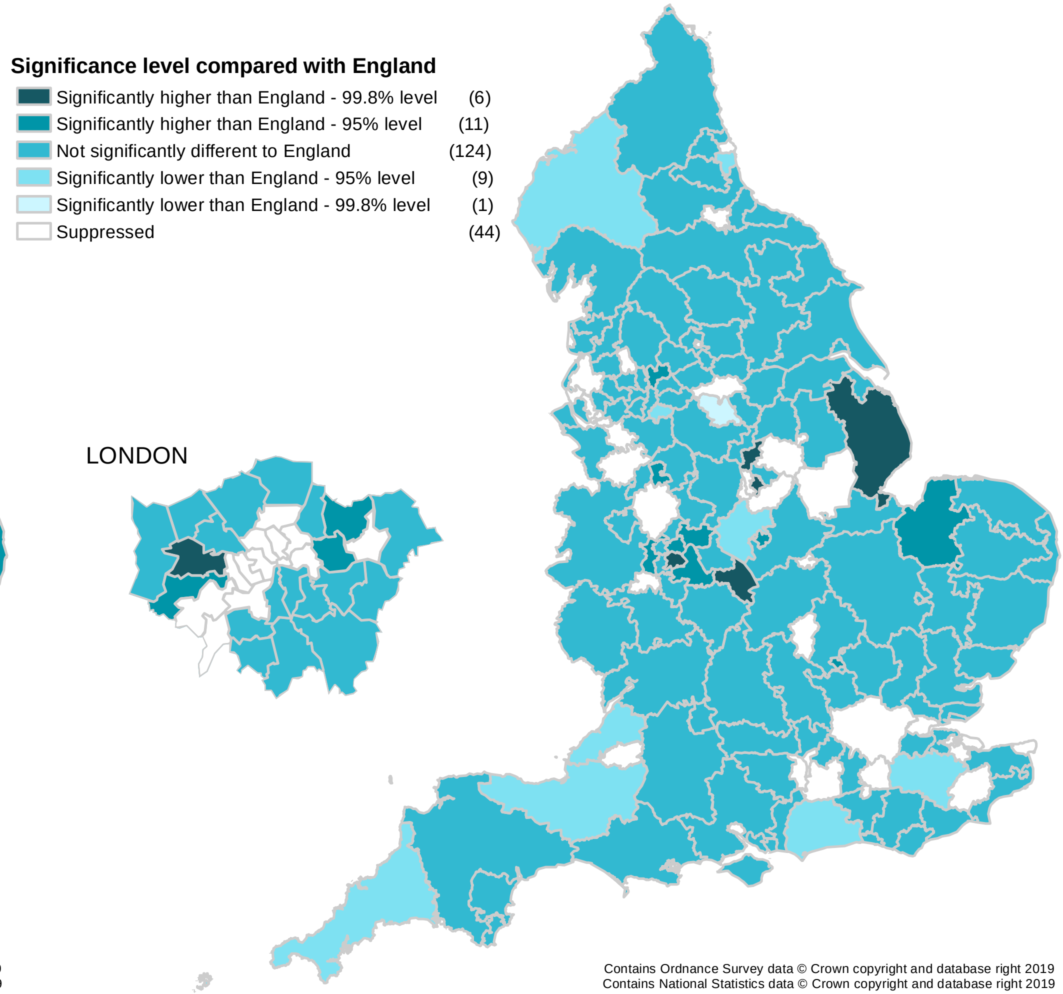
Asthma – Disease burden

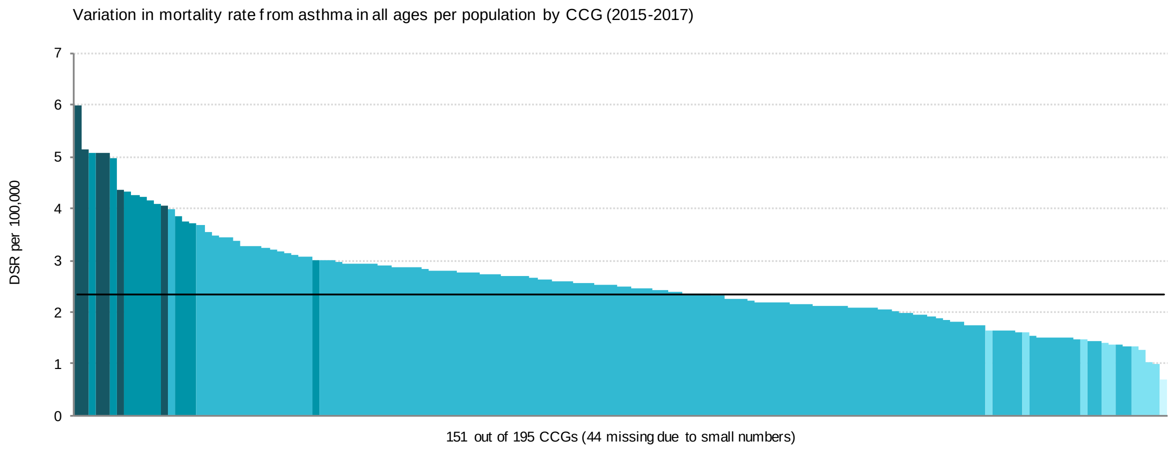
Map 17: Variation in mortality rate from asthma in all ages per population by CCG (2015-2017)

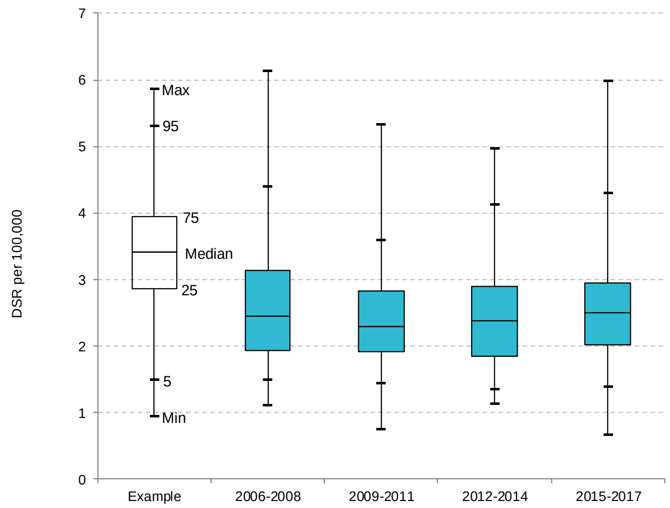
Directly standardised rate per 100,000

Optimum Value: Low









	Example	2006-2008	2009-2011	2012-2014	2015-2017	
Max-Min (Range)		5.0	4.6	3.8	5.3	No significant change
95th-5th percentile		2.9	2.2	2.8	2.9	No significant change
75th-25th percentile		1.2	0.9	1.0	0.9	No significant change
Median		2.5	2.3	2.4	2.5	No significant change

Context

Every asthma death represents a failure of management of a reversible condition. Although advances in treatments, increased research and the development of evidence-based clinical guidelines have contributed to a reduction in deaths from asthma over the past 50 years, mortality rates within the UK are among the highest in Europe, and numbers have tended to increase over recent years (Figure 1) although deaths are falling in younger people.

Asthma is a complex disease, and it is not just those with severe asthma who die. The National Review of Asthma Deaths (NRAD) was the first national investigation of asthma deaths in the UK and examined data from a cohort for whom asthma was the cause of death between February 2012 and January 2013.[1] A number of recommendations were made in order to reduce the number of asthma deaths, but there is little evidence of a systematic approach nationally to the implementation of these recommendations. There are still a significant number of deaths from asthma every year.

Nationally, asthma mortality varies between sex and age groups. Mortality rates significantly increase with age and are higher in female patients.[1,2] The NRAD report suggests that in the majority of cases there were factors, which if addressed, would have reduced the risk of death.

Magnitude of variation

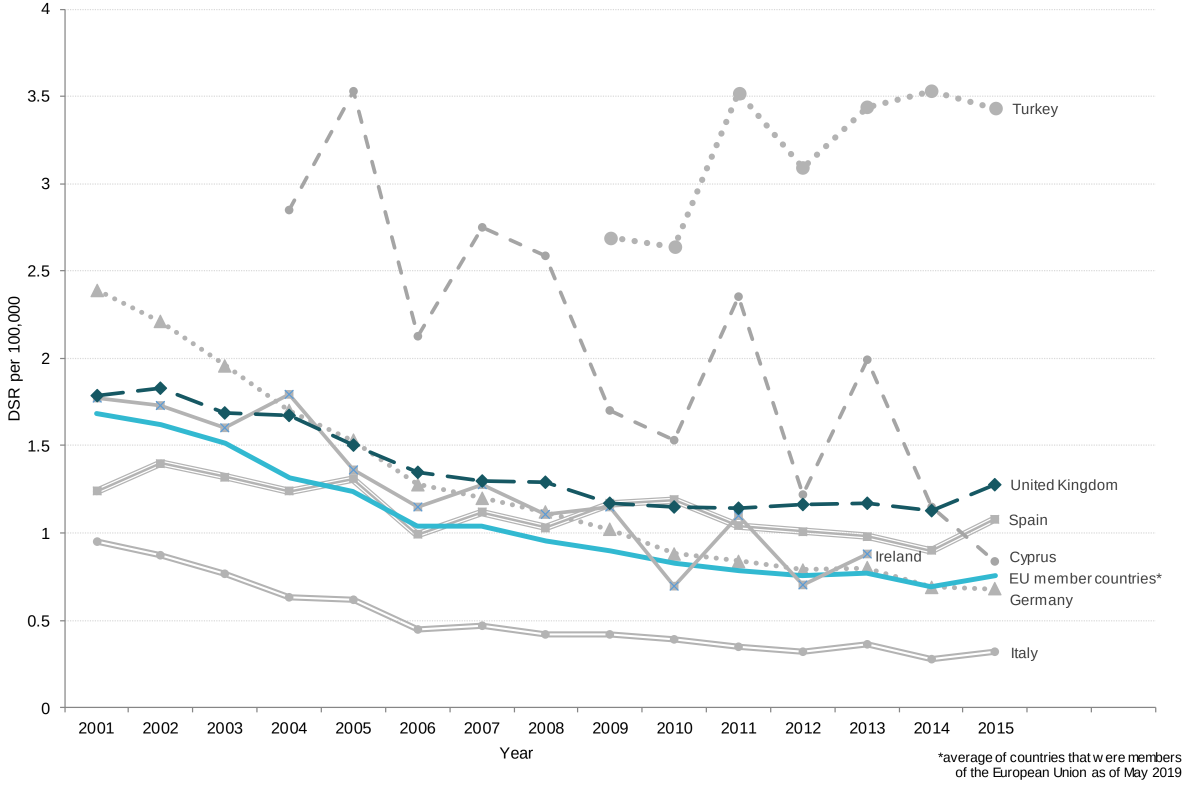
Map 17: Variation in mortality rate from asthma in all ages per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 0.7 to 6.0 per 100,000 population, which is an 8.9-fold difference between CCGs. The England value for 2015 to 2017 was 2.3 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017. There was no significant change in any of the 3 variation measures between 2006 to 2008 and 2015 to 2017.

Asthma mortality is often a result of chronic poorly managed asthma, or asthma which responds poorly to treatment. There are many potential reasons for variation of mortality rates, but possible causes are differences between admission criteria at hospitals, inadequate assessment and under use of physiological measurements, patient confidence in self-managing their asthma, the availability of support or advice for patients who are at higher risk of acute asthma attacks, and patient adherence with asthma medications. The NRAD report also identified that the severity of asthma was often not correctly classified – consequently patients were under-treated and referral for a specialist opinion was delayed.

Figure 1: Mortality from asthma in selected EU countries[3]



Options for action

In order to learn from every death caused by asthma, the National Review of Asthma Deaths recommends:

- a structured local critical incident review, following a death from asthma, be carried out in primary care (this should include secondary care additionally, if appropriate) with help from a clinician with relevant expertise
- health professionals are aware of the factors increasing the risk of death from asthma, including concurrent mental health problems

The Healthcare Quality Improvement Partnership funded, National Asthma Audit administered by the Royal College of Physicians started data collection in November 2018 and will run for at least 3 years. The audit represents the first occasion on which primary and secondary care data will be linked. This gives clinicians and commissioners a unique opportunity to:

- better integrate care for patients leading to improved outcomes
- critically examine patient pathways to identify processes of care requiring improvement

Resources

Asthma UK Asthma facts and statistics [Accessed 2 August 2019]

British Lung Foundation Asthma statistics [Accessed 2 August 2019]

Royal College of Physicians (2014) National Review of Asthma Deaths – why asthma still kills [Accessed 2 August 2019]

Royal College of Physicians National Asthma and COPD Audit Programme [Accessed 30 July 2019]

Gupta RP, Mukherjee M, Sheikh A and others (2018) Persistent variations in national asthma mortality, hospital admissions and prevalence by socioeconomic status and region in England Thorax 73:706-712 [Accessed 10 June 2019]

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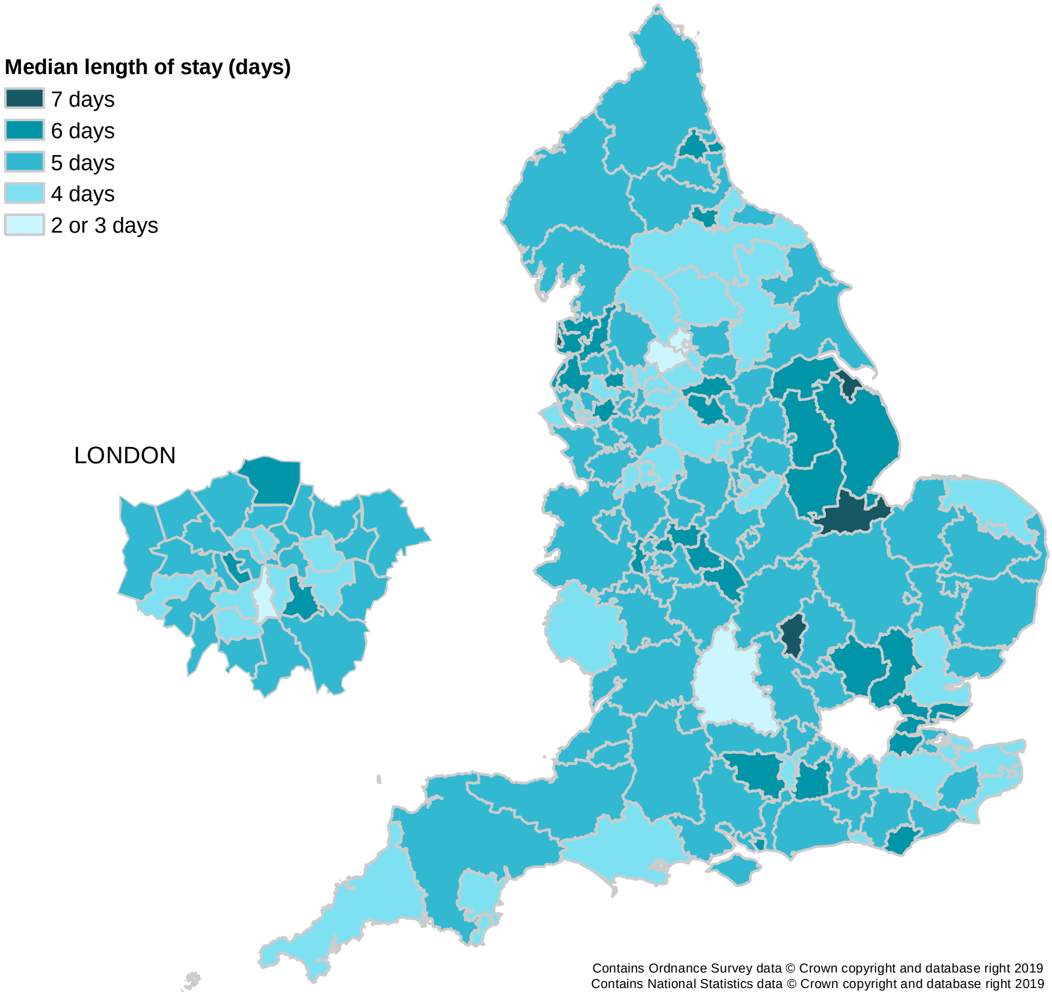
[1] Royal College of Physicians (2014) National Review of Asthma Deaths - Why asthma still kills [Accessed 30 July 2019]
[2] Watson L, Turk F, James P and others (2007) Factors associated with mortality after an asthma admission: A national United Kingdom database analysis Respiratory Medicine 101(8):1659-64 doi: 10.1016/j.rmed.2007.03.006 [Accessed 30 July 2019]
[3] World Health Organization European Health Information Gateway [Accessed 4 June 2019]

Pneumonia – Disease burden

Map 18a: Variation in median length of stay (days) of emergency admissions to hospital for pneumonia by CCG (2017/18)

Optimum value: Low



Context

The NHS Long Term Plan is committed to reducing the burden from pneumonia. Pneumonia causes a spectrum of illness severity. Most people have low severity illness and are managed at home. About 1 in 5 require hospital management.

There were 279,440 finished hospital discharges in 2017/18, of which 19.2% were zero and one day emergency admissions. A small minority (about 5%) of people hospitalised with pneumonia require intensive care management. Pneumonia accounts for about half of all cases of severe sepsis managed on intensive care units

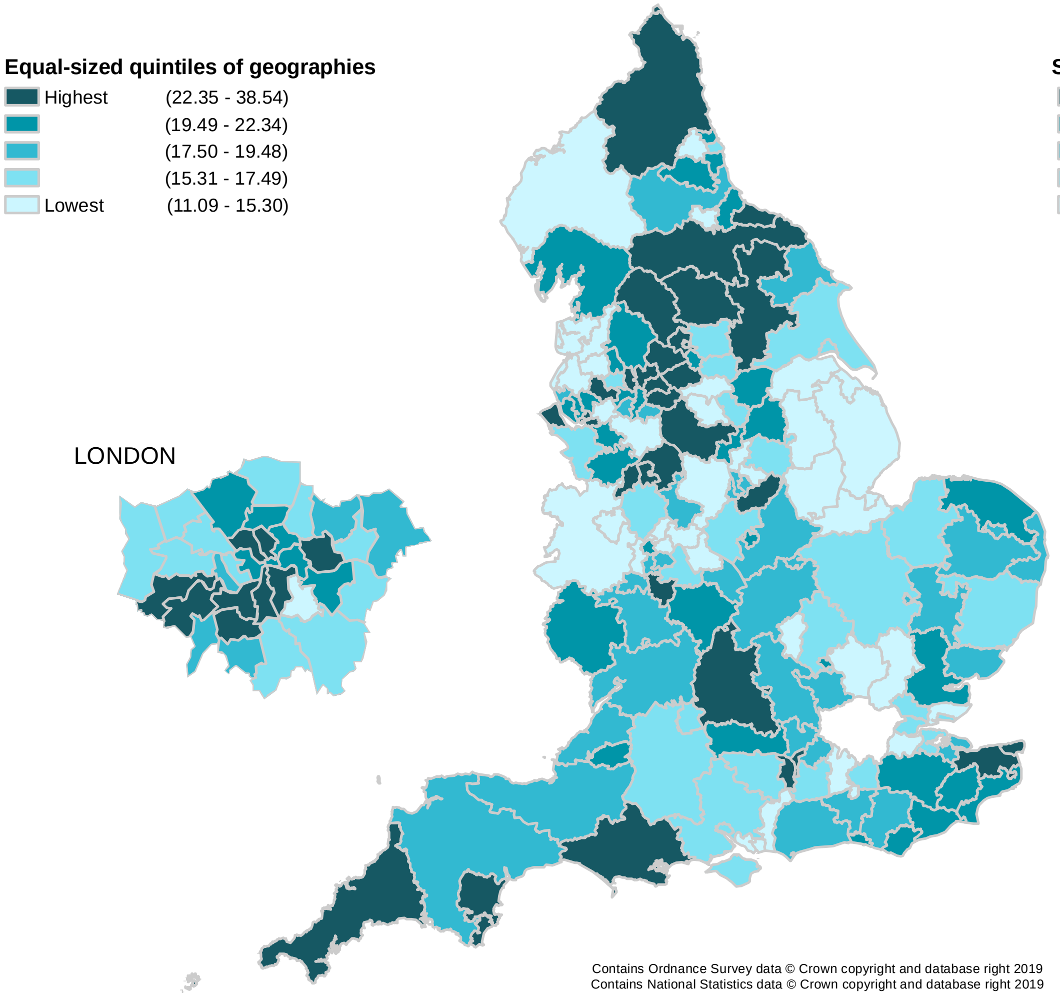
Length of hospital stay is associated with the severity of illness on admission to hospital. Though some deaths are the unavoidable outcome of the natural course of other progressive respiratory, malignant or neurological disease, other deaths may be preventable with appropriate management.

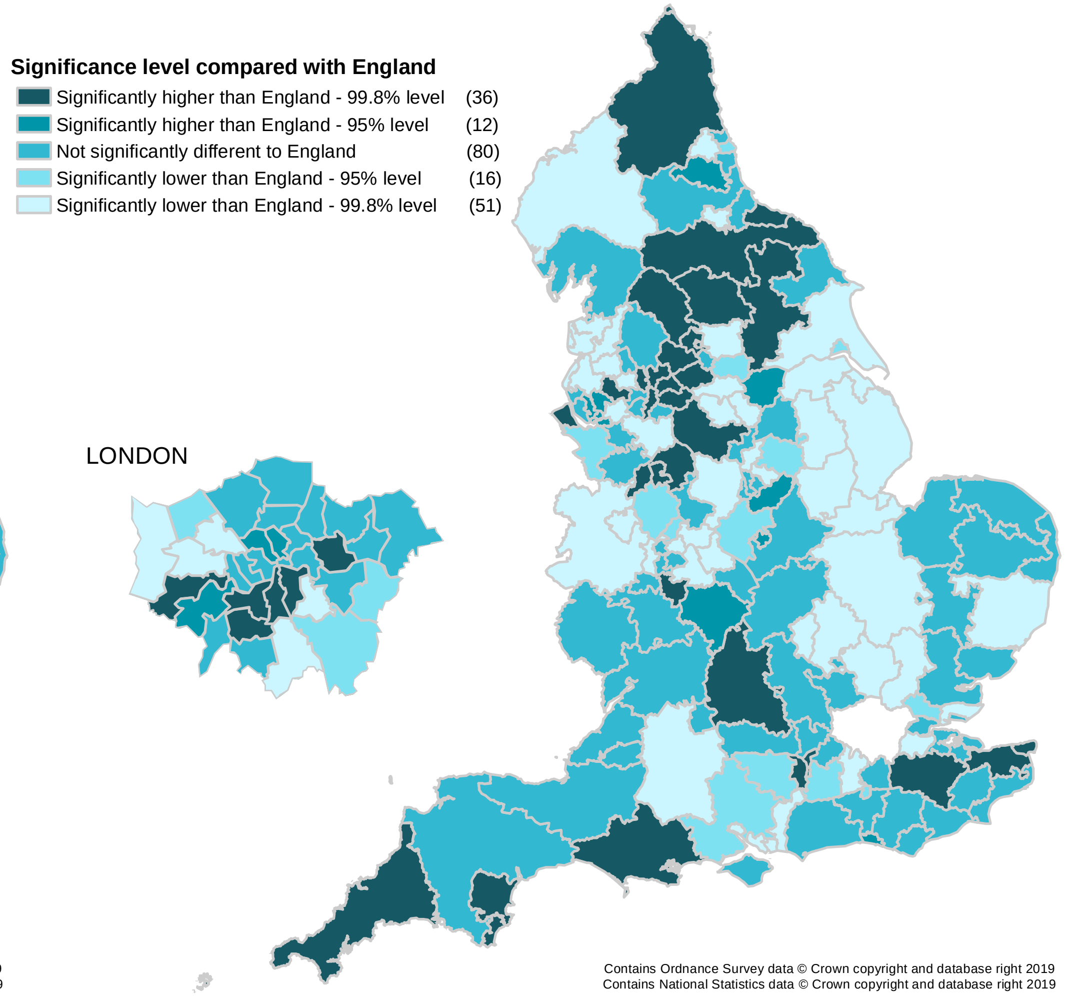
Early treatment with appropriate antimicrobials is associated with improved outcomes.

Pneumonia – Disease burden

Map 18b: Variation in percentage of zero and one day emergency admissions to hospital for pneumonia by CCG (2017/18)

Optimum value: High



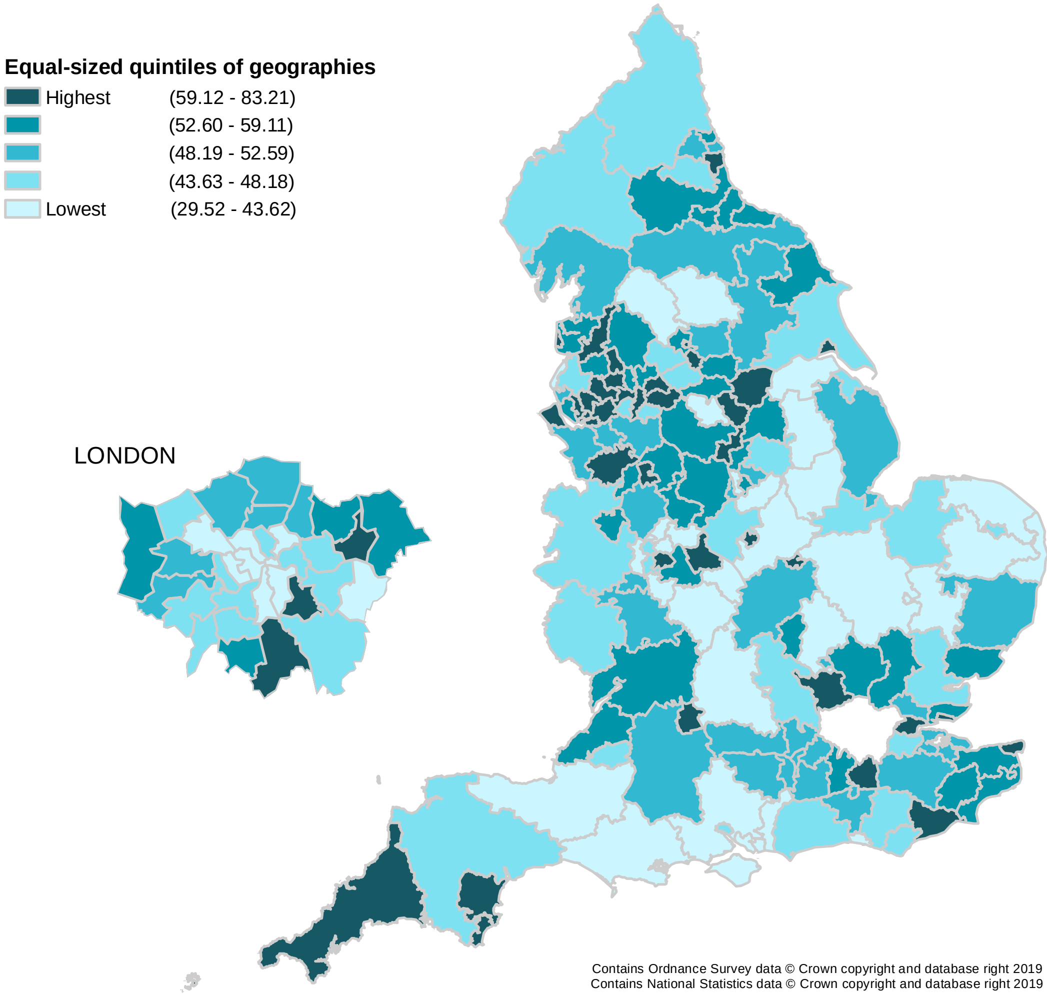


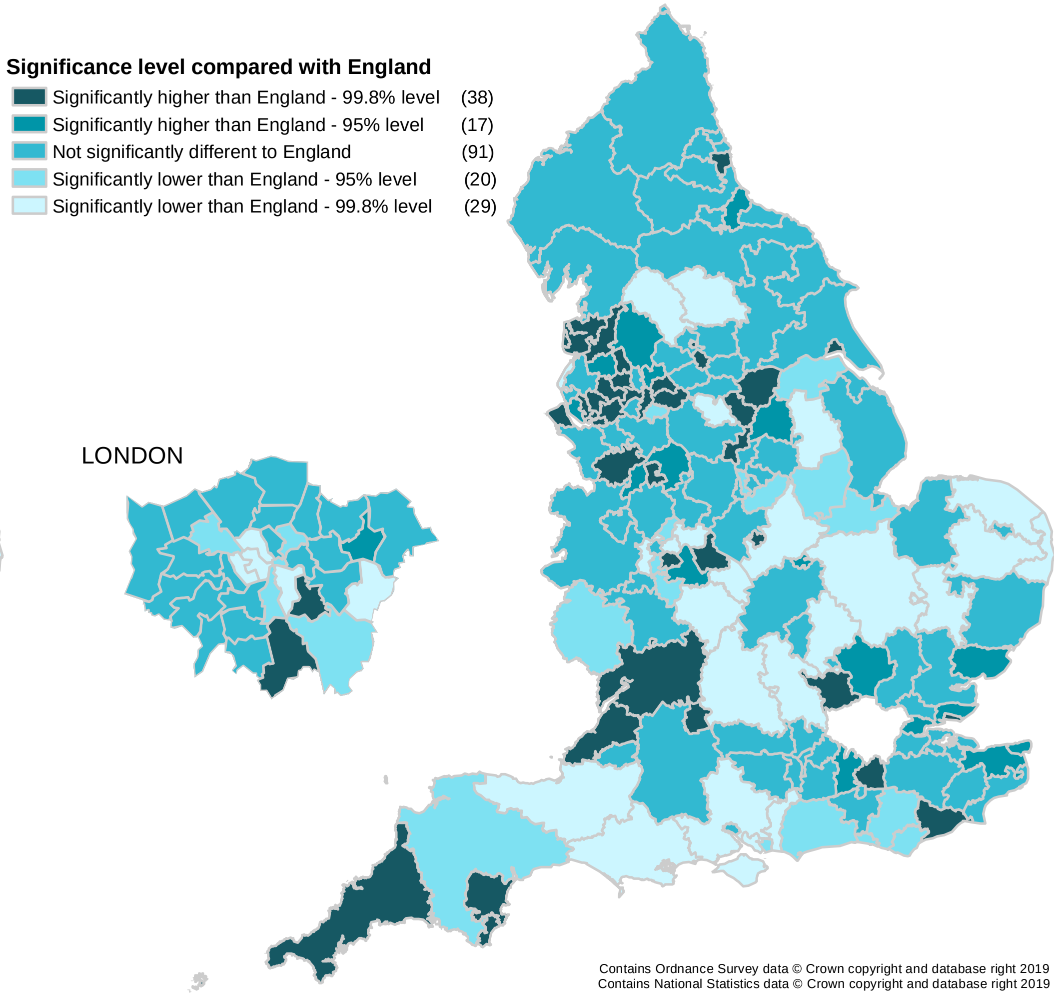
Pneumonia – Disease burden

Map 18c: Variation in mortality rate from pneumonia (underlying cause) per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum value: Low



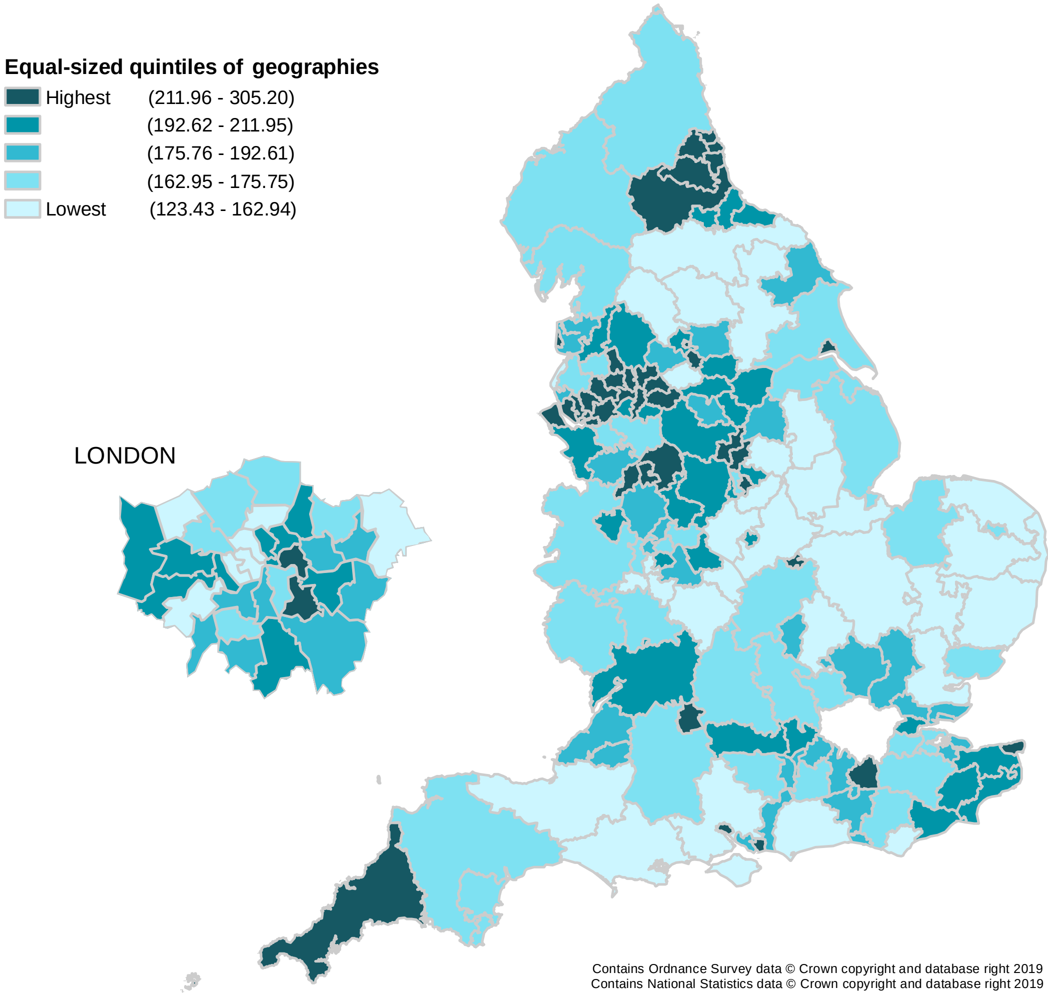


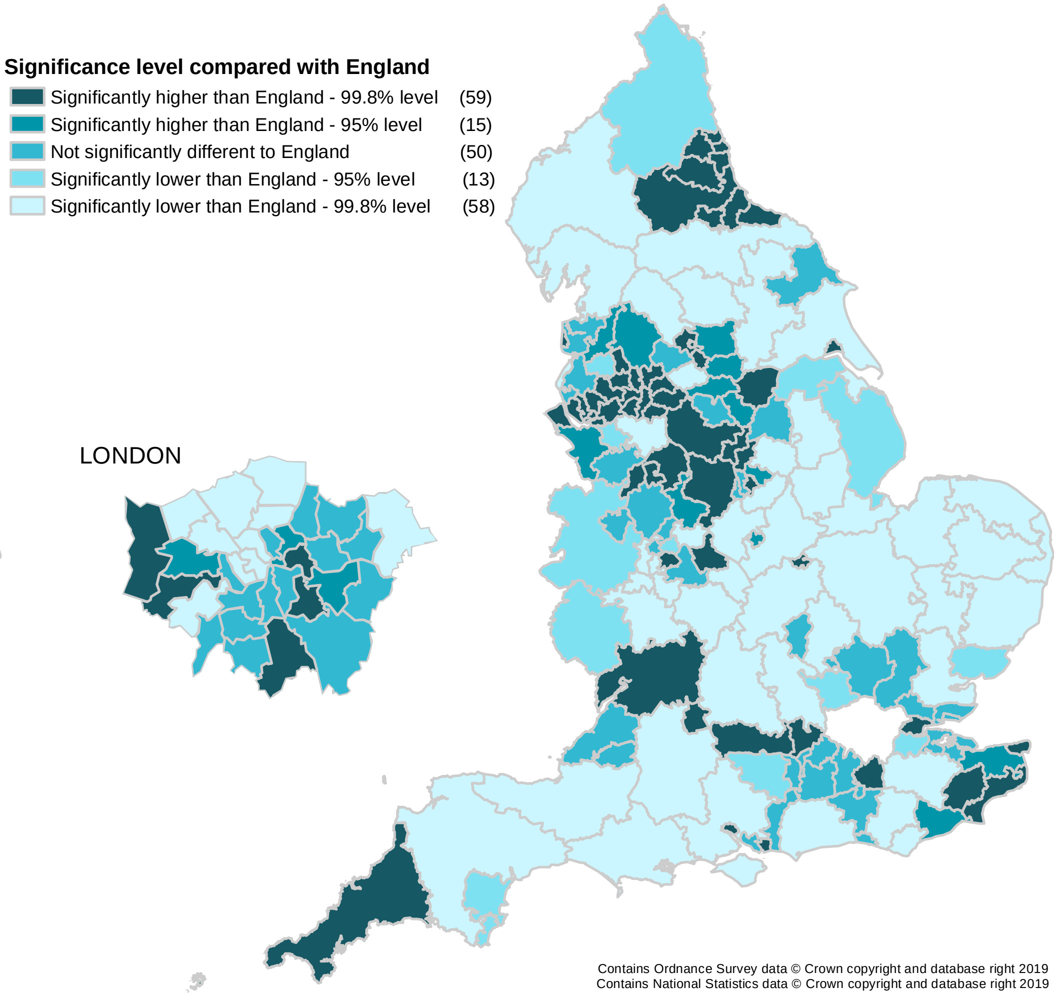
Pneumonia – Disease burden

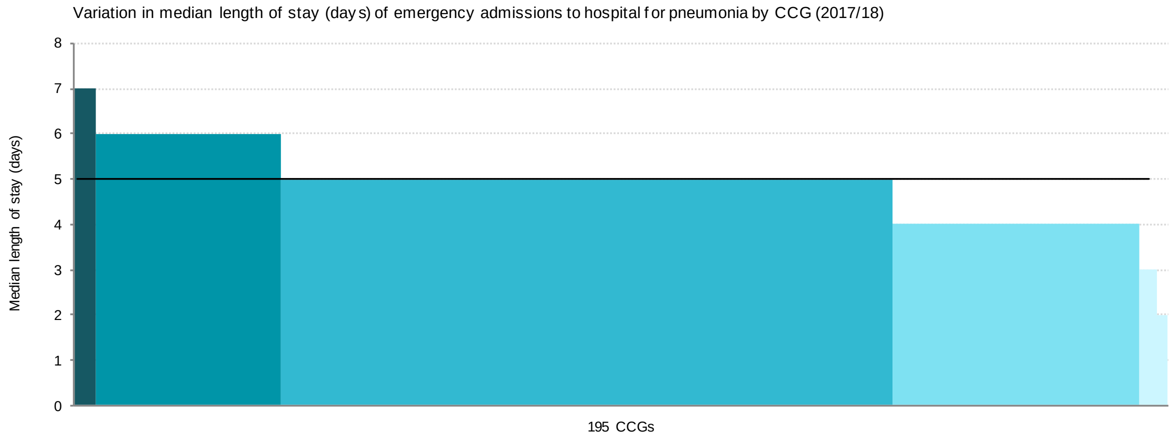
Map 18d: Variation in mortality rate from pneumonia (all mentions) per population by CCG (2015-2017)

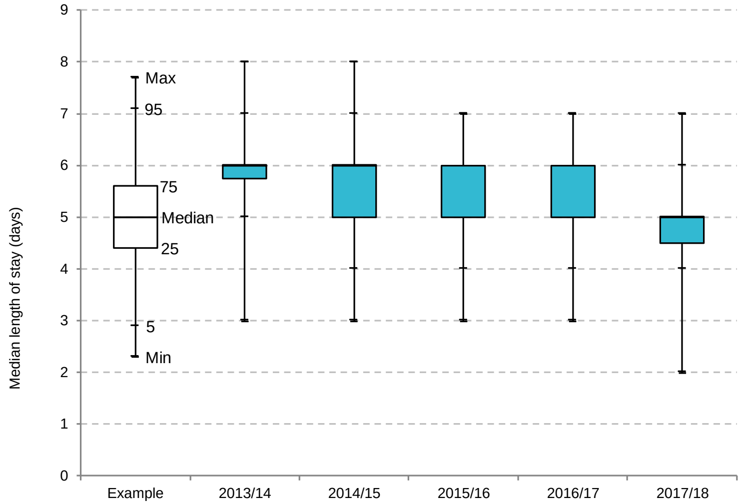
Directly standardised rate per 100,000

Optimum Value: Low









	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		5.0	5.0	4.0	4.0	5.0	No significant change
95th-5th percentile		2.0	3.0	3.0	3.0	2.0	No significant change
75th-25th percentile		0.3	1.0	1.0	1.0	0.5	No significant change
Median		6.0	6.0	5.0	5.0	5.0	No significant change

Magnitude of variation

Map 18a: Variation in median length of stay (days) of emergency admissions to hospital for pneumonia by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 2.0 to 7.0 days, which is a 3.5-fold difference between CCGs. The England value for 2017/18 was 5.0 days.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18.

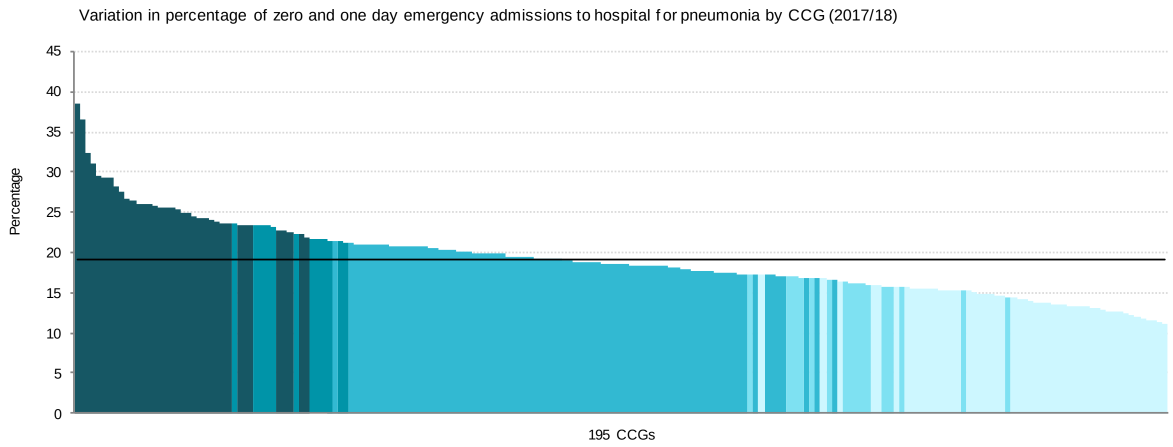
Map 18b: Variation in percentage of zero and one day emergency admissions to hospital for pneumonia by CCG (2017/18)

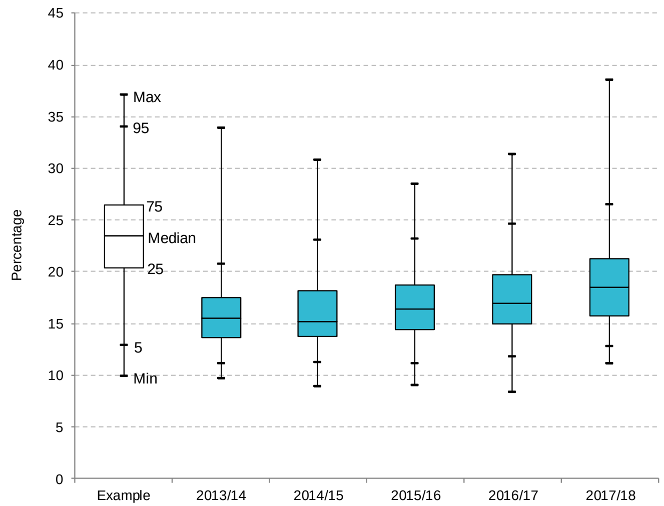
The maps and column chart display the latest period (2017/18), during which CCG values ranged from 11.1% to 38.5%, which is a 3.5-fold difference between CCGs. The England value for 2017/18 was 19.2%.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

Both the 95th to 5th percentile gap and the 75th to 25th percentile gap widened significantly.

The median increased significantly from 15.5 in 2013/14 to 18.5 in 2017/18.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		24.3	21.8	19.5	23.1	27.4	No significant change
95th-5th percentile		9.6	11.9	12.0	12.8	13.8	WIDENING Significant
75th-25th percentile		3.8	4.4	4.3	4.7	5.5	WIDENING Significant
Median		15.5	15.1	16.4	17.0	18.5	INCREASING Significant

Map 18c: Variation in mortality rate from pneumonia (underlying cause) per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 29.5 to 83.2 per 100,000 population, which is a 2.8-fold difference between CCGs. The England value for 2015 to 2017 was 50.5 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017.

The 75th to 25th percentile gap narrowed significantly.

The median decreased significantly from 74.1 in 2006 to 2008 to 50.5 in 2015 to 2017.

Map 18d: Variation in mortality rate from pneumonia (all mentions) per population by CCG (2015-2017)

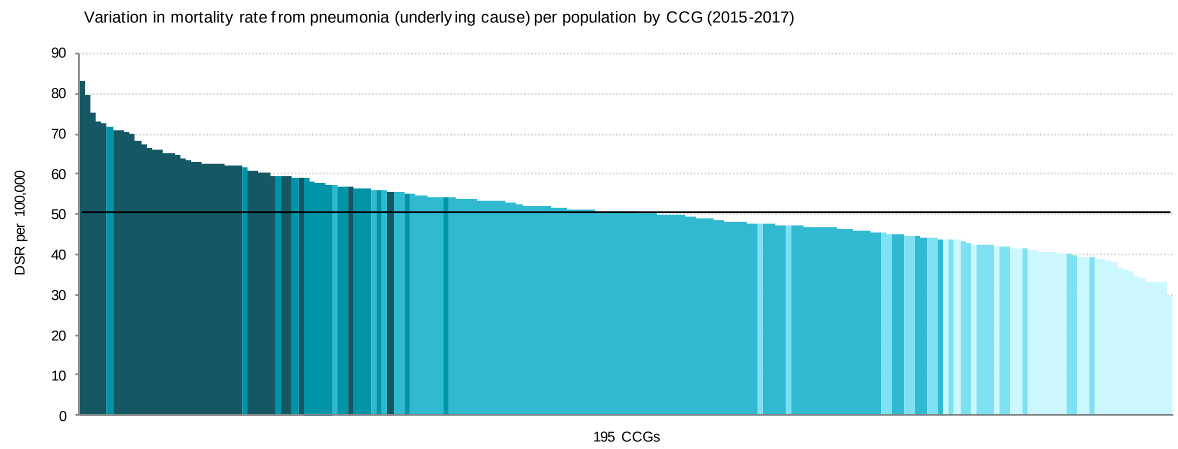
The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 123.4 to 305.2 per 100,000 population, which is a 2.5-fold difference between CCGs. The England value for 2015 to 2017 was 183.2 per 100,000 population.

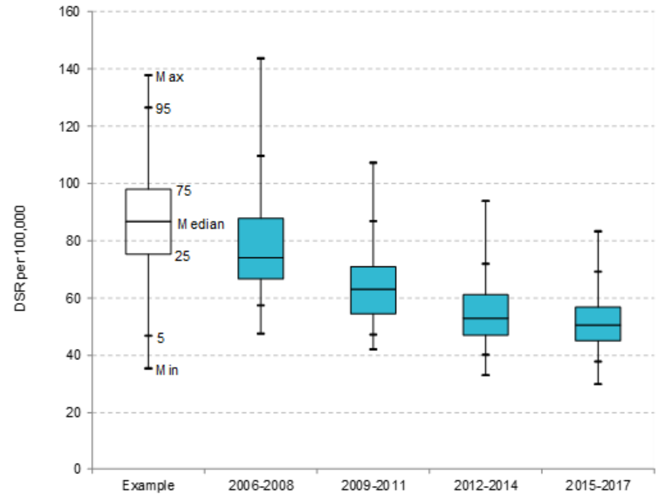
The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017. There was no significant change in any of the 3 variation measures between 2006-2008 and 2015-2017.[1]

The median decreased significantly from 222.7 in 2006 to 2008 to 185.2 in 2015 to 2017.[1]

Some of the observed variation might be explained by differences in the diagnostic coding of pneumonia.

[1] Note: The magnitude of variation statement, box plot and supporting data table for 18d mortality rate from pneumonia (all mentions) were corrected in April 2020.





Max-Min (Range)		96.1	65.2	60.8	53.7	No significant change
95th-5th percentile		52.1	39.8	31.8	31.2	No significant change
75th-25th percentile		21.2	16.3	13.9	11.7	NARROWING Significant
Median		74.1	62.9	53.0	50.5	DECREASING Significant

True variation in observed outcomes may be due to:

a) population-related factors:
- case-mix; including age of population, prevalence of comorbid illnesses
- health-seeking behaviour (illness severity at first presentation)

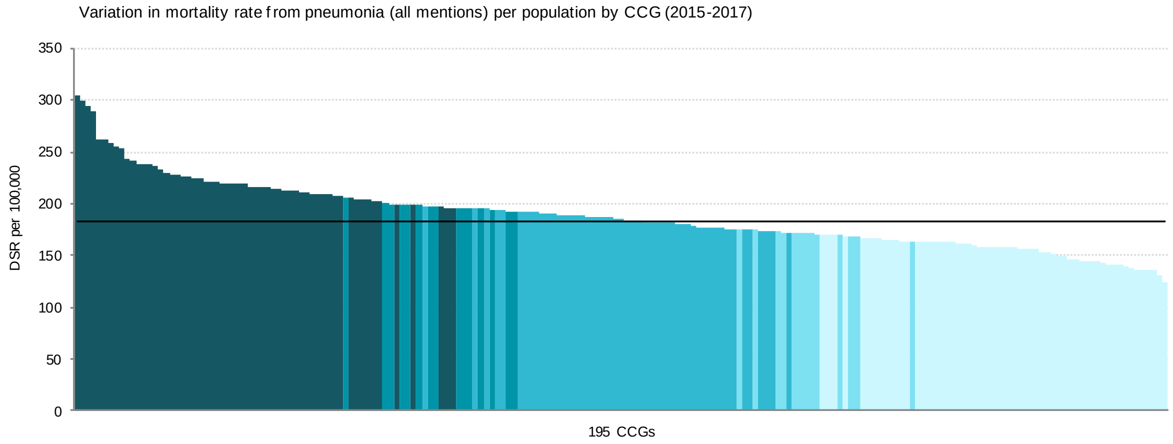
b) healthcare-related factors:
- speed of access to care; including accurate diagnosis and appropriate treatment
- availability of healthcare resources; emergency care crowding, intensive care unit support

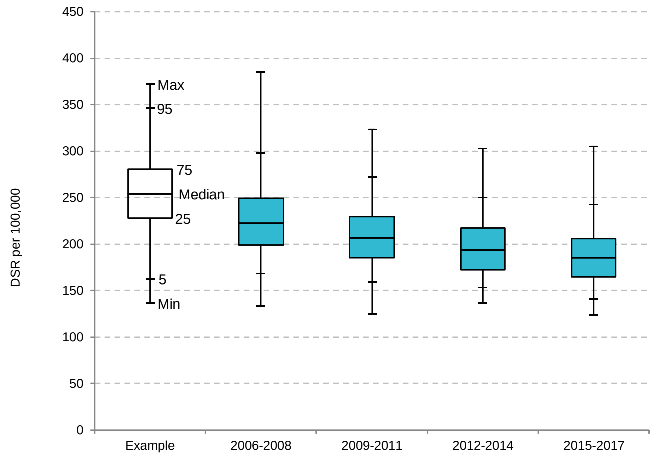
c) adherence to evidence-based clinical guidelines

Options for action

When planning service improvement or development to reduce the length of hospital stay and mortality from pneumonia, commissioners, clinicians and service providers need to:

- compare local outcomes against national benchmarks; participate in national audit
- adopt quality standards in pneumonia management
- adhere to national clinical management guidelines
- use pneumonia care bundles to support management where appropriate
- address the primary prevention of pneumonia; including smoking cessation services and vaccination initiatives





Max-Min (Range)		251.7	198.1	166.2	181.8	No significant change
95th-5th percentile		130.1	112.6	96.7	100.8	No significant change
75th-25th percentile		50.6	44.1	44.8	41.3	No significant change
Median		222.7	206.6	194.1	185.2	DECREASING Significant

Note: The magnitude of variation statement, box plot and supporting data table for 18d mortality rate from pneumonia (all mentions) were corrected in April 2020.

Resources

British Thoracic Society (2017) Care Bundle for Community Acquired Pneumonia [Accessed 26 July 2019]

Daniel P, Woodhead M, Welham S and others (2016) Mortality reduction in adult community-acquired pneumonia in the UK (2009-2014): results from the British Thoracic Society audit programme Thorax 71(11):1061-1063 [Accessed 5 March 2019]

Lim W, Smith D, Wise M and others (2015) British Thoracic Society community acquired pneumonia guideline and the NICE pneumonia guideline: how they fit together Thorax 70(7):698-700 [Accessed 5 March 2019]

National Institute for Health and Care Excellence (2014) Pneumonia in adults: diagnosis and management (NICE clinical guideline [CG191]) [Accessed 5 March 2019]

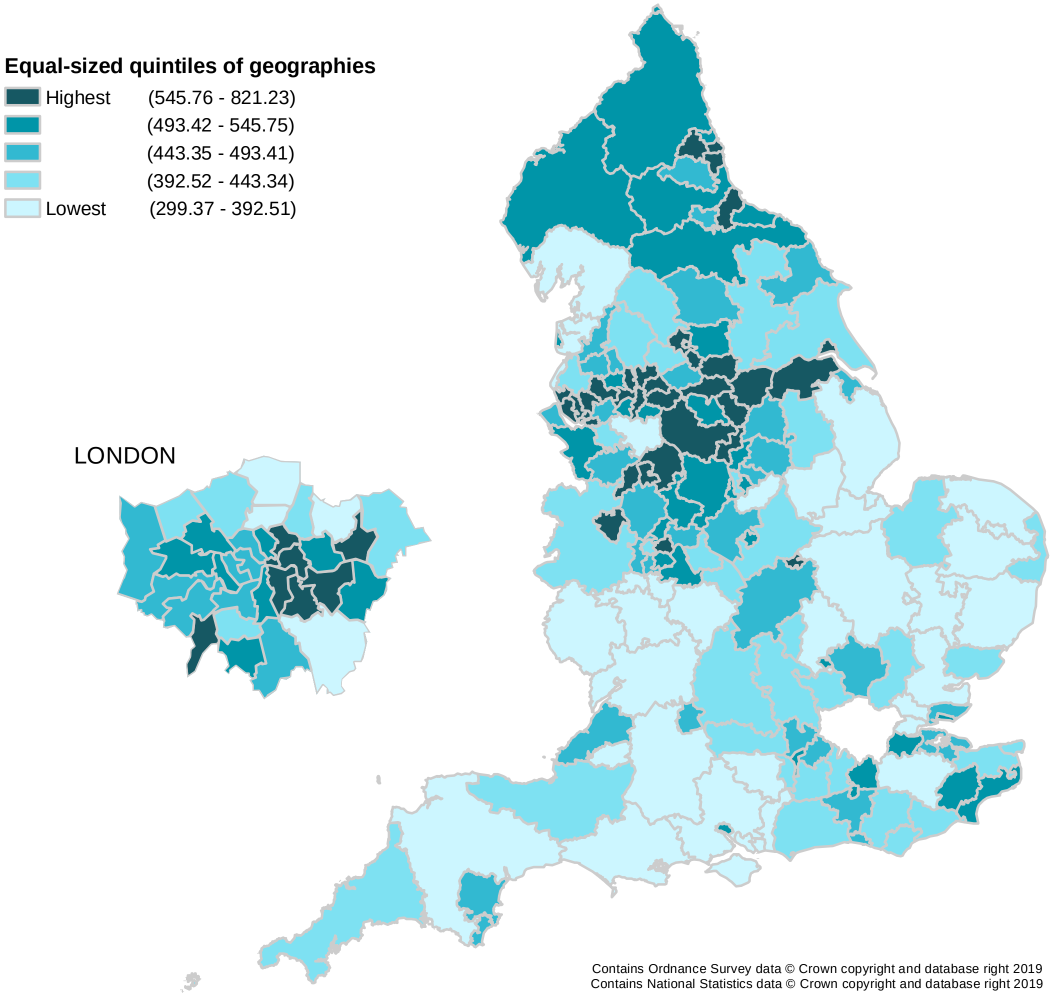
National Institute for Health and Care Excellence (2016) Pneumonia in adults (NICE quality standard [QS110]) [Accessed 5 March 2019]

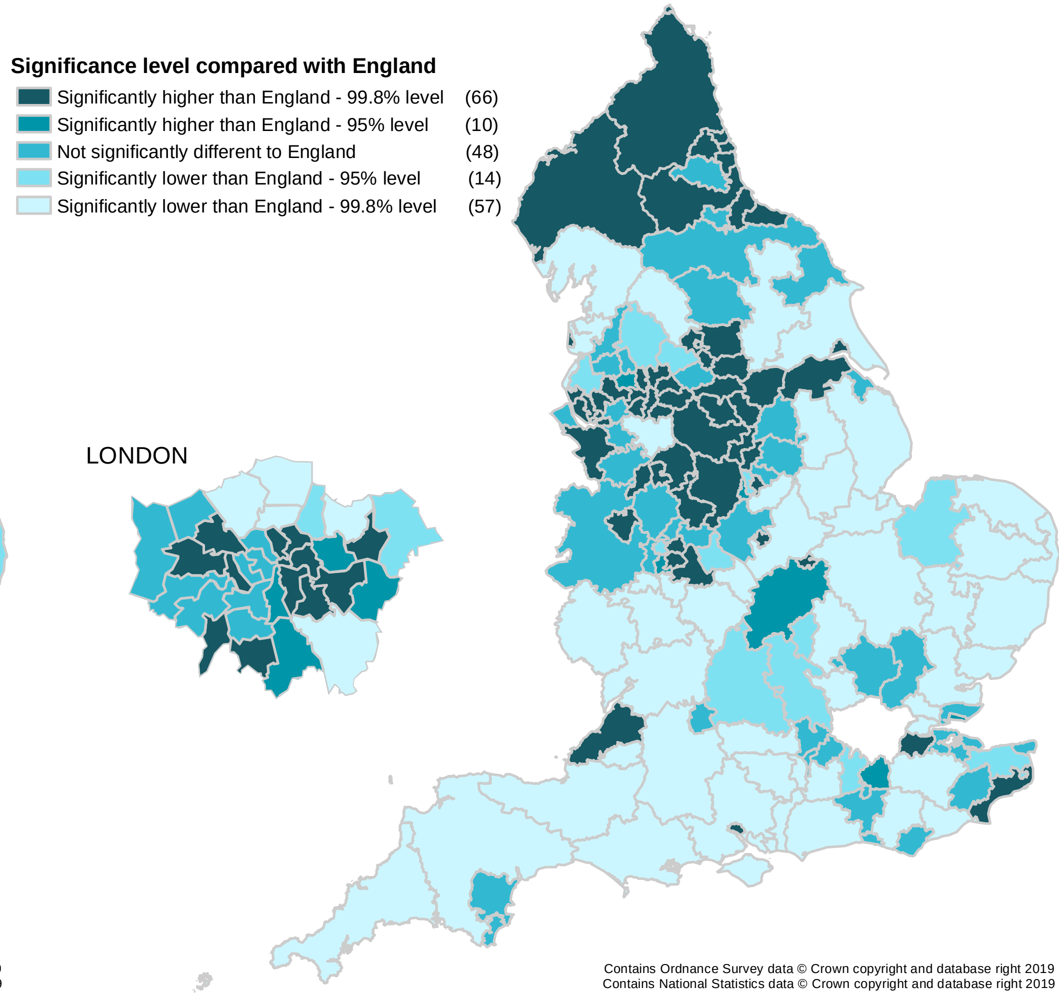
Pneumonia – Hospital admissions

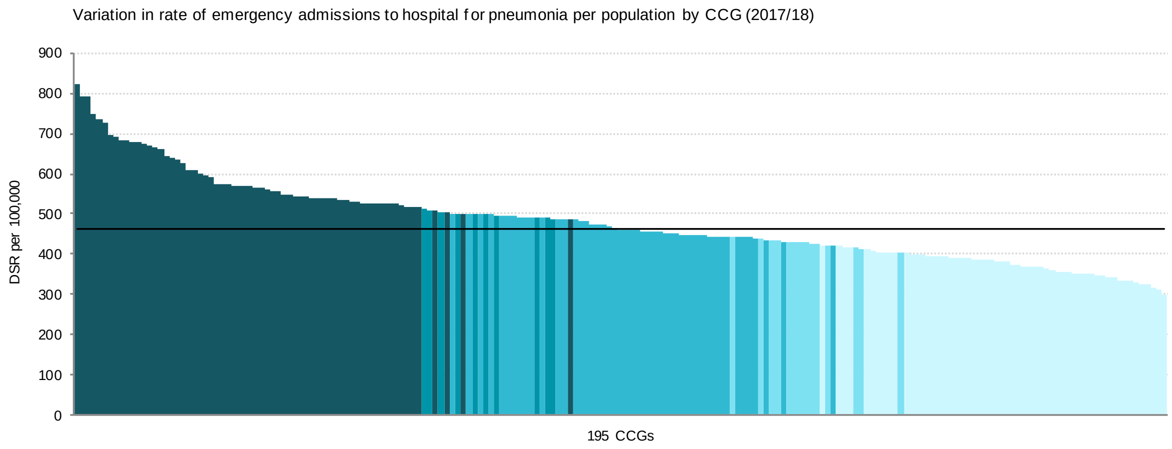
Map 19: Variation in rate of emergency admissions to hospital for pneumonia per population by CCG (2017/18)

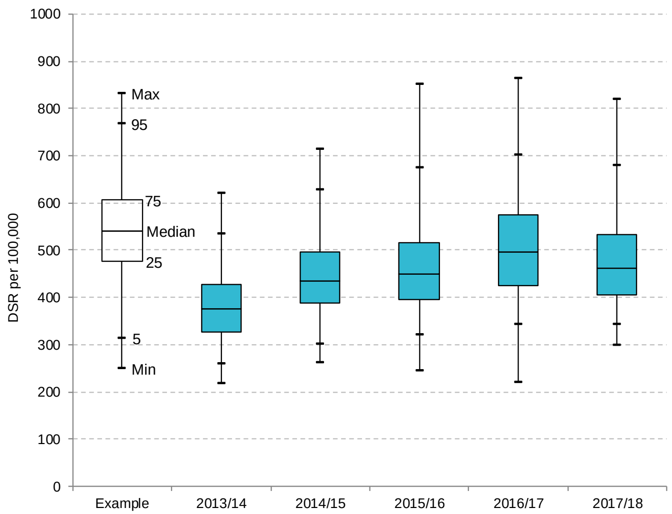
Directly standardised rate per 100,000

Optimum value: Low









	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		402.2	451.1	606.0	645.0	521.9	No significant change
95th-5th percentile		275.2	327.0	355.2	358.7	337.6	No significant change
75th-25th percentile		99.8	107.4	119.1	148.2	128.8	No significant change
Median		376.0	433.9	449.8	496.3	461.8	No significant change

Context

Pneumonia is the clinical manifestation of microbial infection within lung tissue. It is common and can affect anyone. Persons most at risk of developing pneumonia are those:

- at the extremes of age
- with an impairment of host defence

Modifiable factors that are associated with the development of pneumonia include:

- current smoking
- poor nutritional status
- alcohol overuse
- vaccination status

The pathogens causing pneumonia are commonly transmitted through person-to-person contact, either with persons who have an infection, or those who carry the pathogen asymptomatically. Regular contact with children is associated with a higher chance of developing pneumonia. Vaccination against influenza and Streptococcus pneumoniae can reduce transmission of pathogens, and protect against infection.

Pneumonia disproportionately affects older people who are both more likely to develop pneumonia and more likely to die from pneumonia. There were 245,620 hospital admissions for pneumonia in England in 2017/18. The majority of patients (85-90%) survive hospitalisation. However, full recovery from pneumonia to pre-morbid levels of fitness may take between 6 weeks and 6 months.

Magnitude of variation

Map 19: Variation in rate of emergency admissions to hospital for pneumonia per population by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 299.4 to 821.2 per 100,000 population, which is a 2.7-fold difference between CCGs. The England value for 2017/18 was 463.0 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There has been no significant change in all 3 measures of variation.

Variation in emergency admission rates may be due to differences in:

a) population-related factors

- health-seeking behaviour
- case-mix; including social deprivation, smoking prevalence
- uptake of influenza and pneumococcal immunisation programmes

b) healthcare-related factors

- provision of community-based services for diagnosis and treatment of pneumonia
- accessibility of emergency care services

Options for action

When planning service improvement or development to reduce emergency admissions for pneumonia, commissioners, clinicians and service providers need:

- to review the emergency admission rate for pneumonia in the locality
- to promote the prevention of pneumonia through appropriate vaccination, lifestyle interventions and public health messaging on infection control measures
- to review the use of medicines that might increase the risk of pneumonia, including inhaled corticosteroids in patients with COPD, taking into consideration the potential risk of non-fatal pneumonia with inhaled corticosteroids
- to identify opportunities for improving the early diagnosis and treatment of pneumonia in primary care, and at the interface with secondary care

Resources

Lim W, Smith D, Wise M and others (2015) British Thoracic Society community acquired pneumonia guideline and the NICE pneumonia guideline: how they fit together Thorax 70(7):698-700 [Accessed 15 February 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guidance [NG115]) [Accessed 12 July 2019]

National Institute for Health and Care Excellence (2014) Pneumonia in adults: diagnosis and management (NICE clinical guideline [CG191]) [Accessed 5 March 2019]

Public Health England (2013) Annual flu programme Last updated: 11 July 2019 [Accessed 26 July 2019]

Public Health England (2013) Influenza, the green book, chapter 19 Last updated: 23 April 2019 [Accessed 26 July 2019]

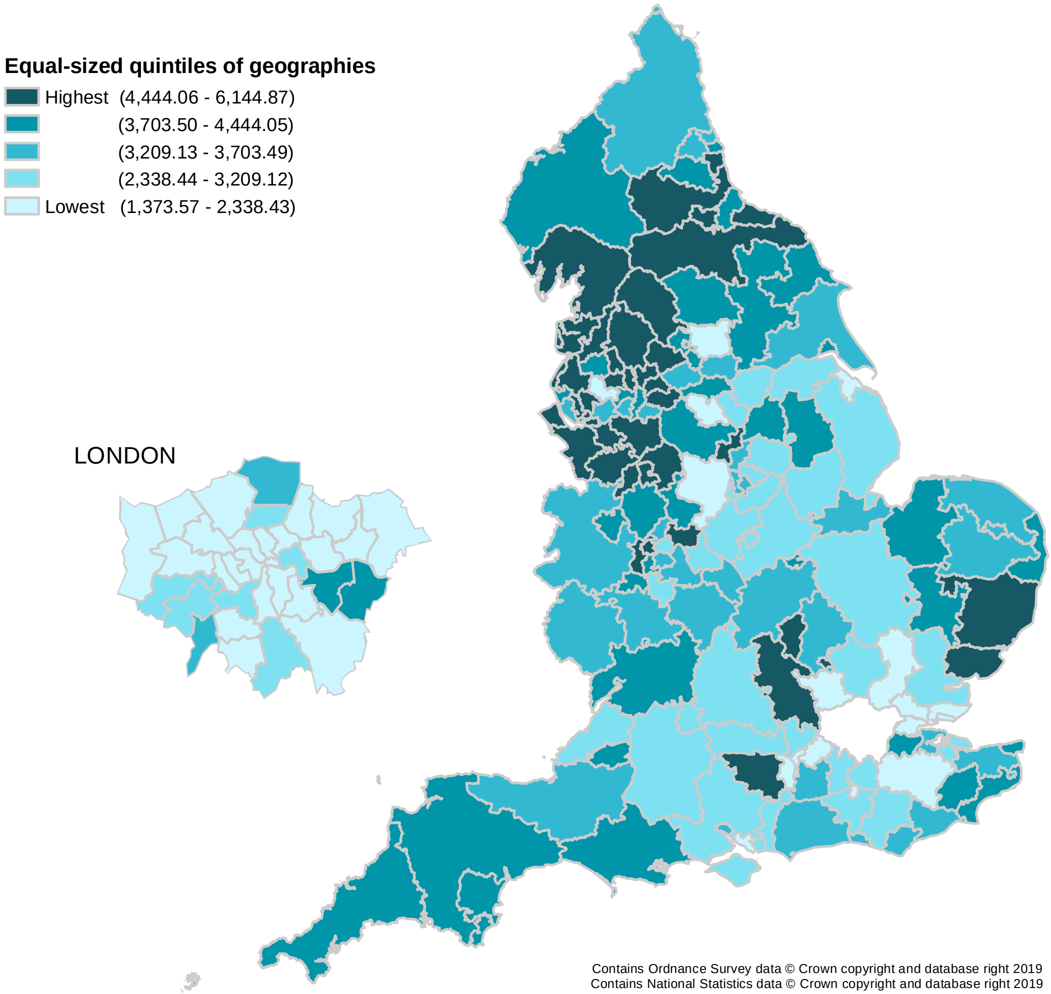
Public Health England (2013) Pneumococcal, the green book, chapter 25 Last updated: 16 January 2018 [Accessed 26 July 2019]

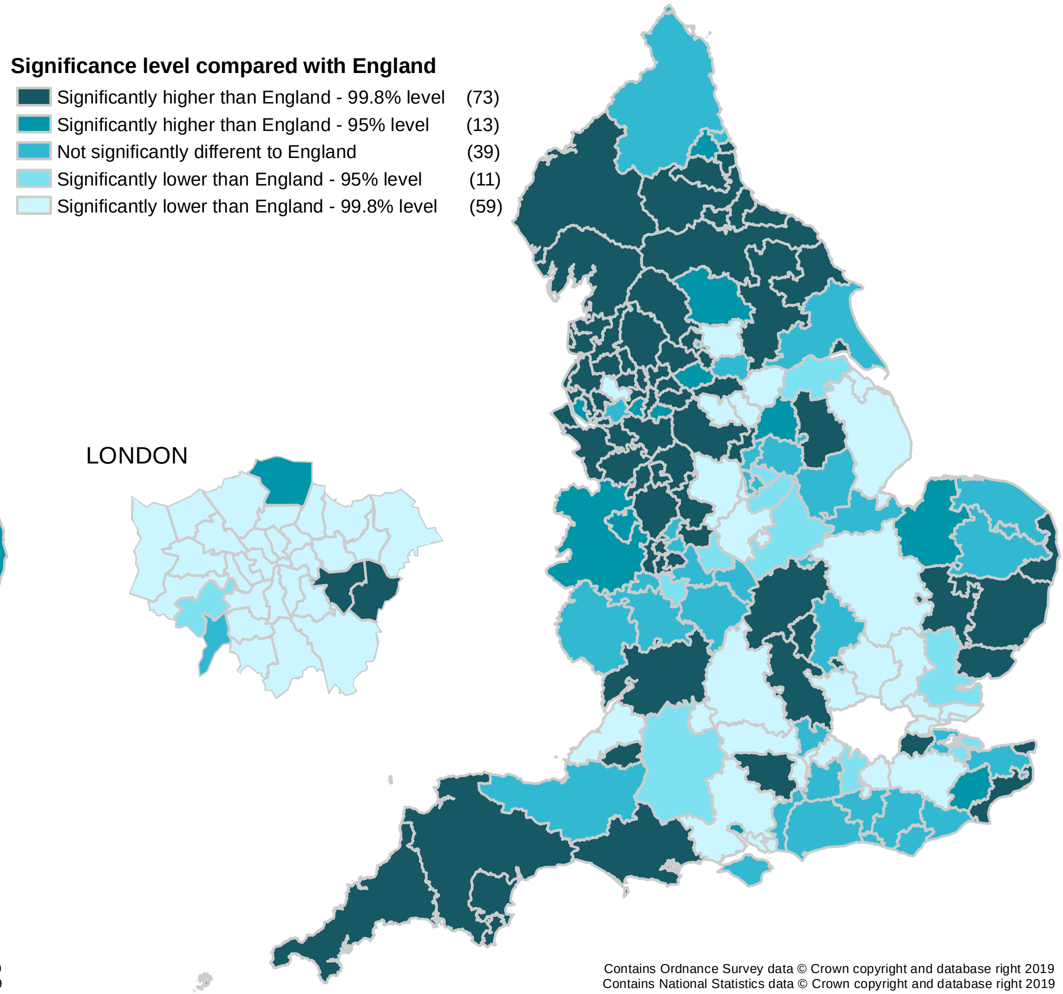
Bronchiolitis – Hospital admissions

Map 20a: Variation in rate of emergency admissions to hospital for bronchiolitis in children aged under 2 years per population by CCG (2015/16-2017/18)

Crude rate per 100,000

Optimum value: Low

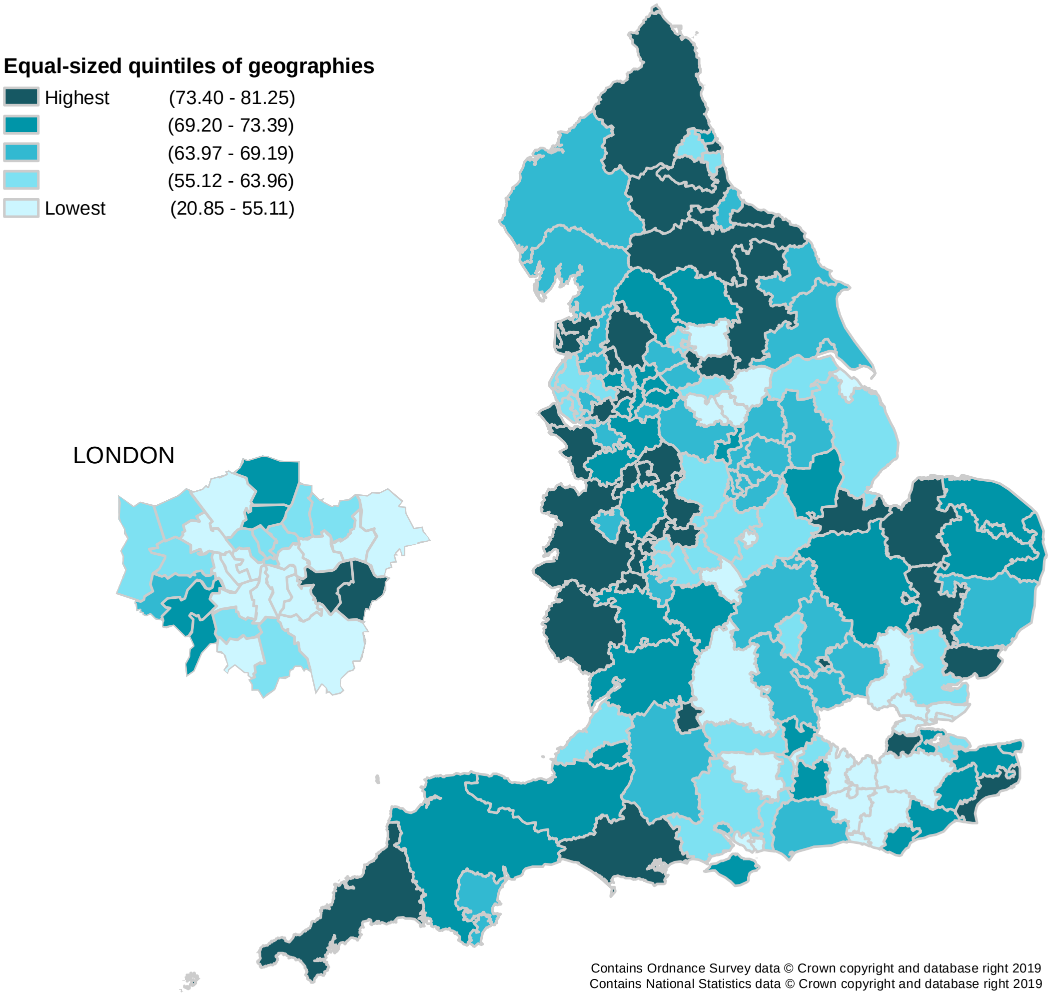


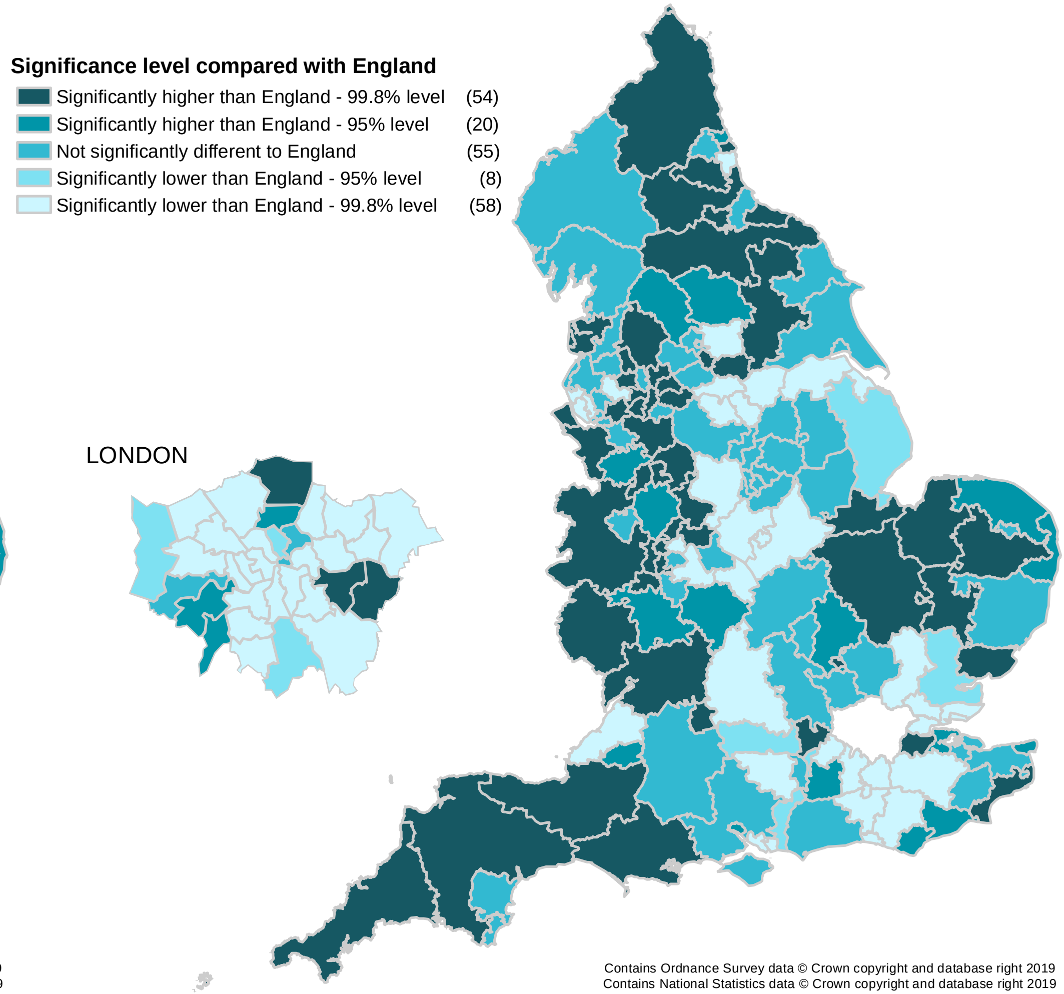


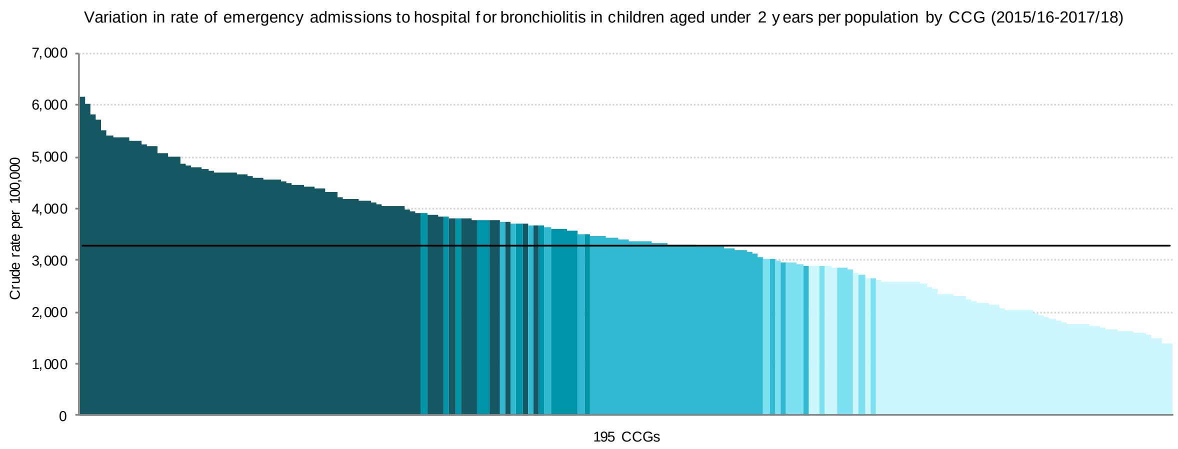
Bronchiolitis – Hospital admissions

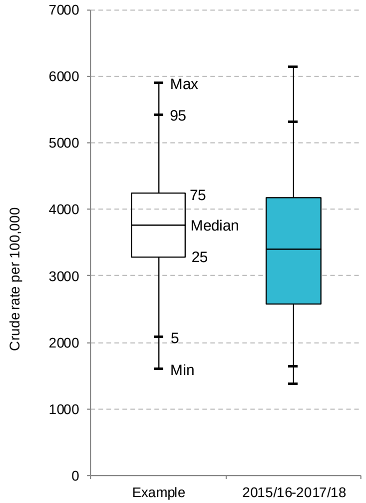
Map 20b: Variation in percentage of zero and one day emergency admissions to hospital for bronchiolitis in children aged under 2 years by CCG (2015/16-2017/18)

Optimum value: Requires local interpretation









	Example	2015/16-2017/18
Max-Min (Range)		4771.3
95th-5th percentile		3665.8
75th-25th percentile		1595.8
Median		3400.3

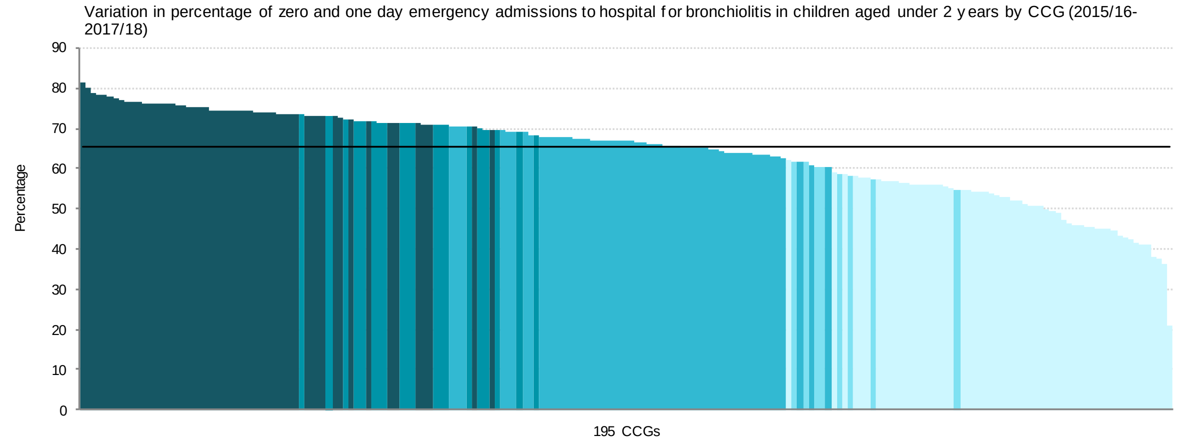
Context

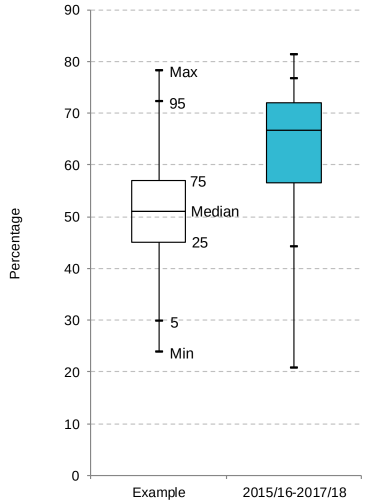
Bronchiolitis is a viral respiratory infection of the lower airways, predominantly affecting infants under the age of 1 year but occasionally infants up to the age of 2 years. In industrialised countries, 1-3% of all infants are admitted to hospital as a result of bronchiolitis.[1] Human respiratory syncytial virus (RSV) is the most common cause of bronchiolitis in infants, and RSV is the single most common cause of hospital admissions in infancy.[2] Globally RSV is the most common cause of childhood acute and severe lower respiratory tract infections and a cause of substantial mortality.[3]

The majority of children with bronchiolitis do not require admission to hospital. Indications for hospital admission include the need for feeding therapy and/or supplemental oxygen therapy. Prolonged hospital admission of young children disrupts family life, and affects the well-being of the child and their family, including the financial impact of time off work.

A family's capacity to care for a recovering infant at home may influence a clinician's decision whether to discharge a child with bronchiolitis. For selected patients, brief admission to short-stay observation units (sometimes in combination with home oxygen therapy) can be a safe means to reduce the burden to families and services of prolonged hospitalization.[4]

The seasonal epidemic nature of bronchiolitis, with most cases in England occurring in the winter, also means that unnecessarily prolonged inpatient stays place demands upon healthcare resources at a time of year when services are already stretched to their limits.





Max-Min (Range)		60.4
95th-5th percentile		32.4
75th-25th percentile		15.4
Median		66.7

Magnitude of variation

Map 20a: Variation in rate of emergency admissions to hospital for bronchiolitis in children aged under 2 years per population by CCG (2015/16-2017/18)

The maps and column chart display the latest period (2015/16 to 2017/18), during which CCG values ranged from 1373.6 to 6144.9 per 100,000 population, which is a 4.5-fold difference between CCGs. The England value for 2015/16 to 2017/18 was 3281.6 per 100,000 population.

Map 20b: Variation in percentage of zero and one day emergency admissions to hospital for bronchiolitis in children aged under 2 years by CCG (2015/16-2017/18)

The maps and column chart display the latest period (2015/16 to 2017/18), during which CCG values ranged from 20.9% to 81.3%, which is a 3.9-fold difference between CCGs. The England value for 2015/16 to 2017/18 was 65.4%.

Variations in admissions for children with bronchiolitis may reflect epidemiological factors including:

- socio-economic deprivation
- being born prematurely
- maternal tobacco smoking during pregnancy
- household tobacco-smoking status[5]

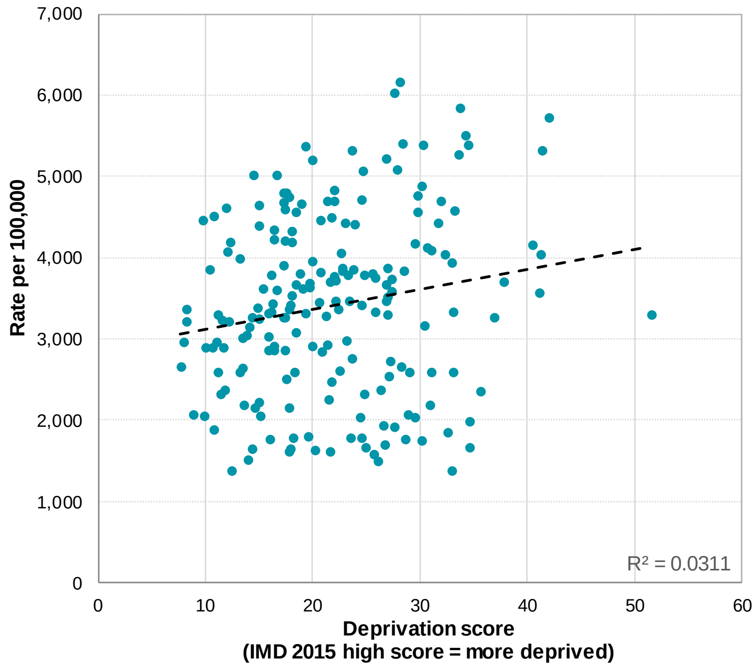
There is a complex interaction between risk factors such as prematurity, smoking or housing quality, and socio-economic deprivation (which is an independent risk factor for bronchiolitis as well as for all of the other associations listed above).

Despite this, among CCGs in England there is no correlation between the rate of admissions for bronchiolitis and socioeconomic deprivation (see Figure 20.1). Therefore, the degree of variation observed cannot be attributed purely to variation in socio-economic deprivation.

Admission rate and duration of admission is partly a function of patient factors such as severity of illness; however, hospital admissions for bronchiolitis have risen sevenfold in England over the past fifty years, but with no obvious increase in markers of disease severity such as mortality or admission to intensive care.[6] This suggests that this is not the sole reason for the variation seen, and could also be related to local differences in healthcare factors such as:

- the management and assessment of children with bronchiolitis in the emergency department
- thresholds for admission and discharge from hospital
- quality of primary, community and social care support available to families during the infant's recovery period

Figure 20.1: **Rate of emergency admissions for bronchiolitis in children aged under 2 years and deprivation, by CCG (2015/16-2017/18)**



Hospital admission rates should not be assessed in isolation. Areas which have higher admission rates are likely to have a higher proportion of short stay (zero or one day admissions), and vice versa, because a cautious approach to admission criteria setting is likely to result in greater numbers of admissions of less severely affected infants, who will be less likely to require a prolonged admission. This correlation is borne out by our data (see Figure 20.2).

Therapies for bronchiolitis are mainly supportive, involving:

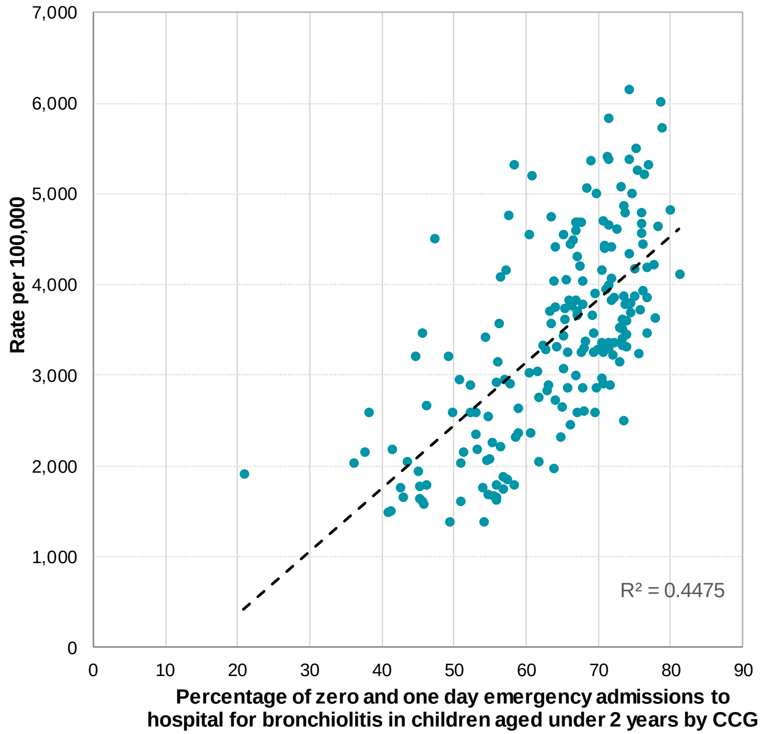
- nasogastric tube feeding
- supplemental oxygen
- in severe cases, mechanical ventilator support

Despite evidence-based national guidance[7], there are differences in the use of these treatments, particularly the criteria for starting and stopping supplemental oxygen, as well as variation in the clinical criteria for discharge for children with bronchiolitis.[8] Differences in discharge could also reflect:

- general discharge processes for all children in the local department, hospital or provider unit
- level of support available in the local community, including early supported discharge services

The level of support available locally from the extended family, community health and social services may account for some of the variation observed. Distance from home to healthcare is also an important factor, and this may explain relatively higher rates of admission for bronchiolitis, and higher proportion of zero and one day admission, among CCGs which have a predominantly rural population.

Figure 20.2: **Rate of emergency admissions for bronchiolitis and percentage of zero and one day admissions in children aged under 2 years, by CCG (2015/16-2017/18)**



Options for action

Local clinicians, in particular emergency department practitioners and paediatricians, need to apply:

- evidence-based guidance for the assessment of children with respiratory illness
- clear admission criteria for children presenting with bronchiolitis, based on national evidence-based guidelines supplemented by frequent reviews of the most recent literature

To identify factors responsible for variations in the duration of admission for bronchiolitis in the local population, commissioners and providers need to investigate differences in:

- clinical management of bronchiolitis
- wider hospital processes and patient flows

Shorter duration of hospital stay for bronchiolitis (reflected here as a higher proportion of zero or one day admissions) may increase the likelihood of readmission. Commissioners and providers should investigate this through clinical audit of local readmission rates.

Introduction of a clinical care pathway has been shown to reduce variation in treatment of bronchiolitis, and significantly reduce duration of admission.[9]

Commissioners need to ensure that vulnerable children and families have access to adequate community-based support regarding recovery after discharge.

Clinicians, supported by commissioners, need to ensure that all at-risk children (such as those with pre-existing lung disease or significant congenital heart disease) receive seasonal prophylaxis with monthly injections of monoclonal antibody against RSV in accordance with Public Health England guidance (see “Resources”). Mechanisms are required not only to deliver treatment to those who present themselves to healthcare services, but to identify and contact pro-actively the families of at-risk children to ensure the children are protected.

Resources

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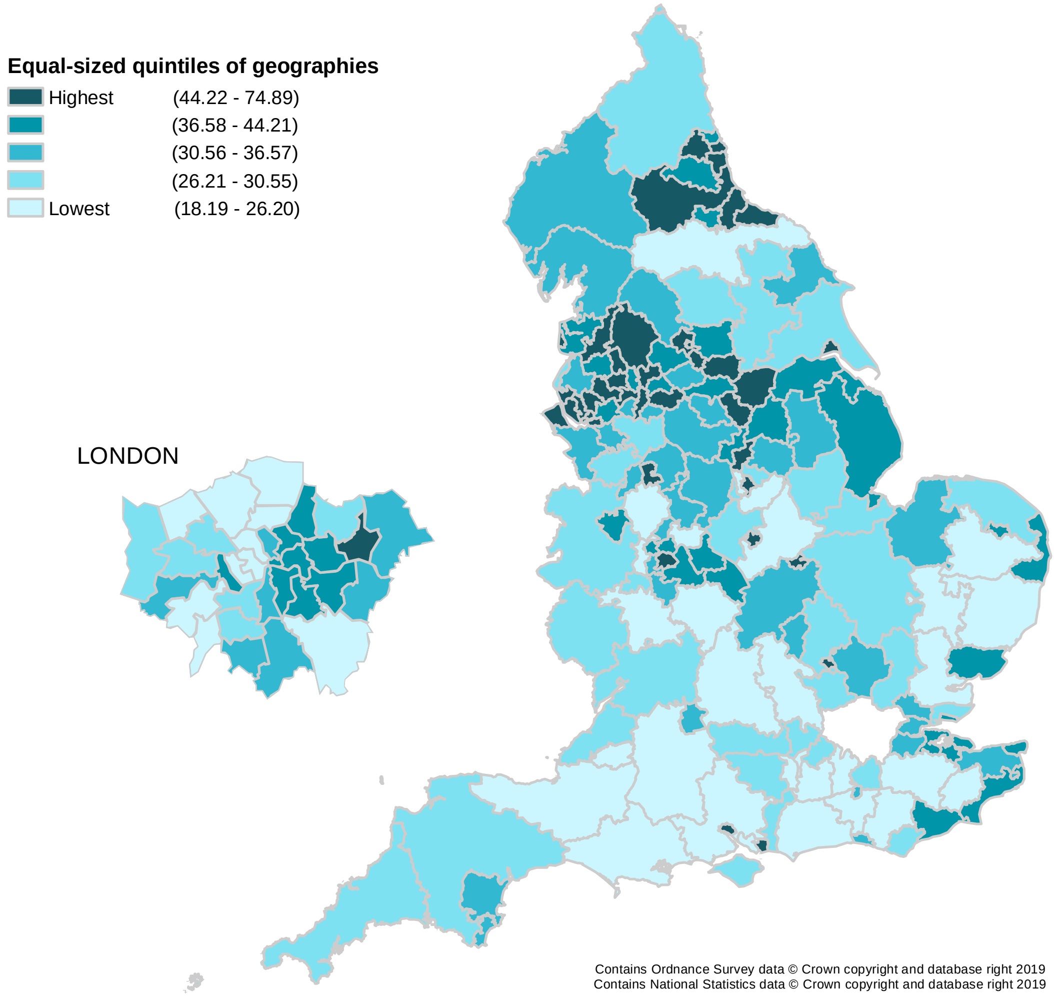
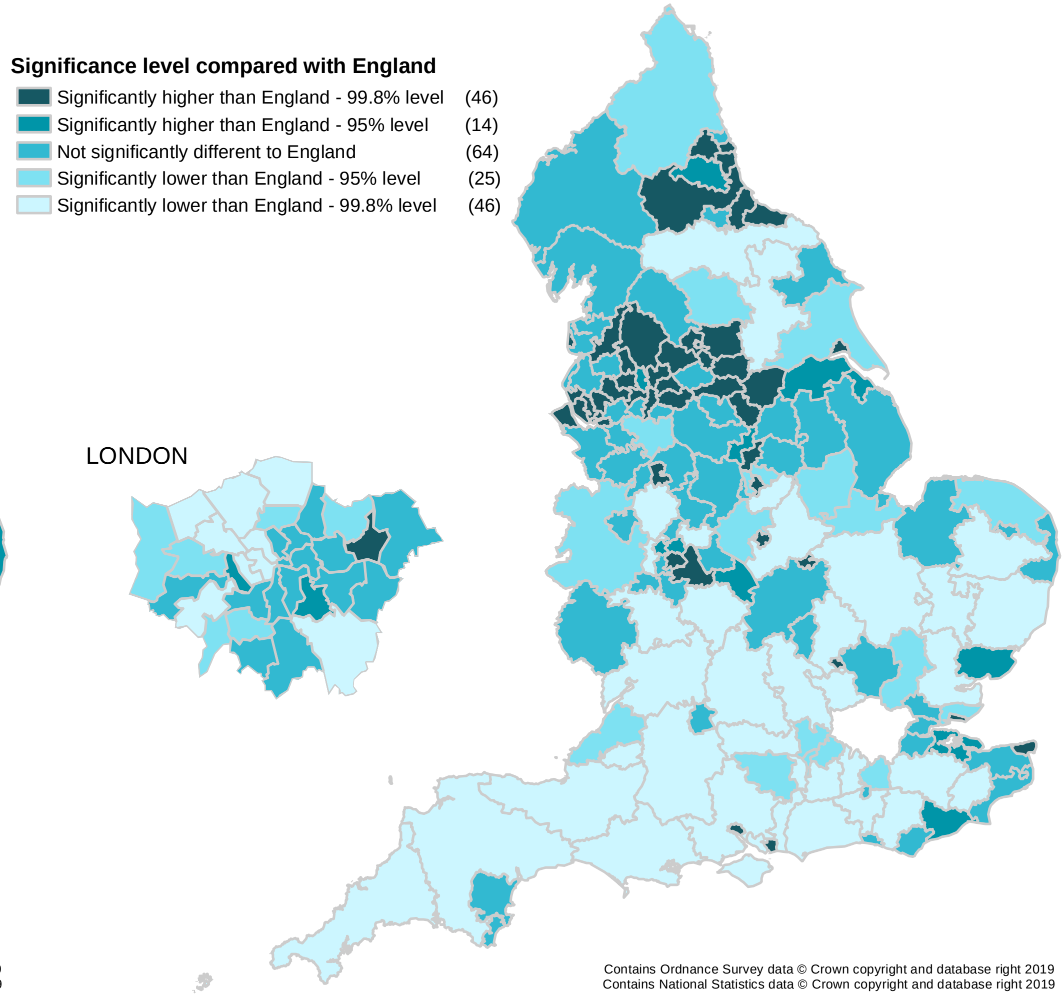
All respiratory disease – Disease burden

Map 21a: Variation in mortality rate from respiratory disease in persons aged under 75 years per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum value: Low



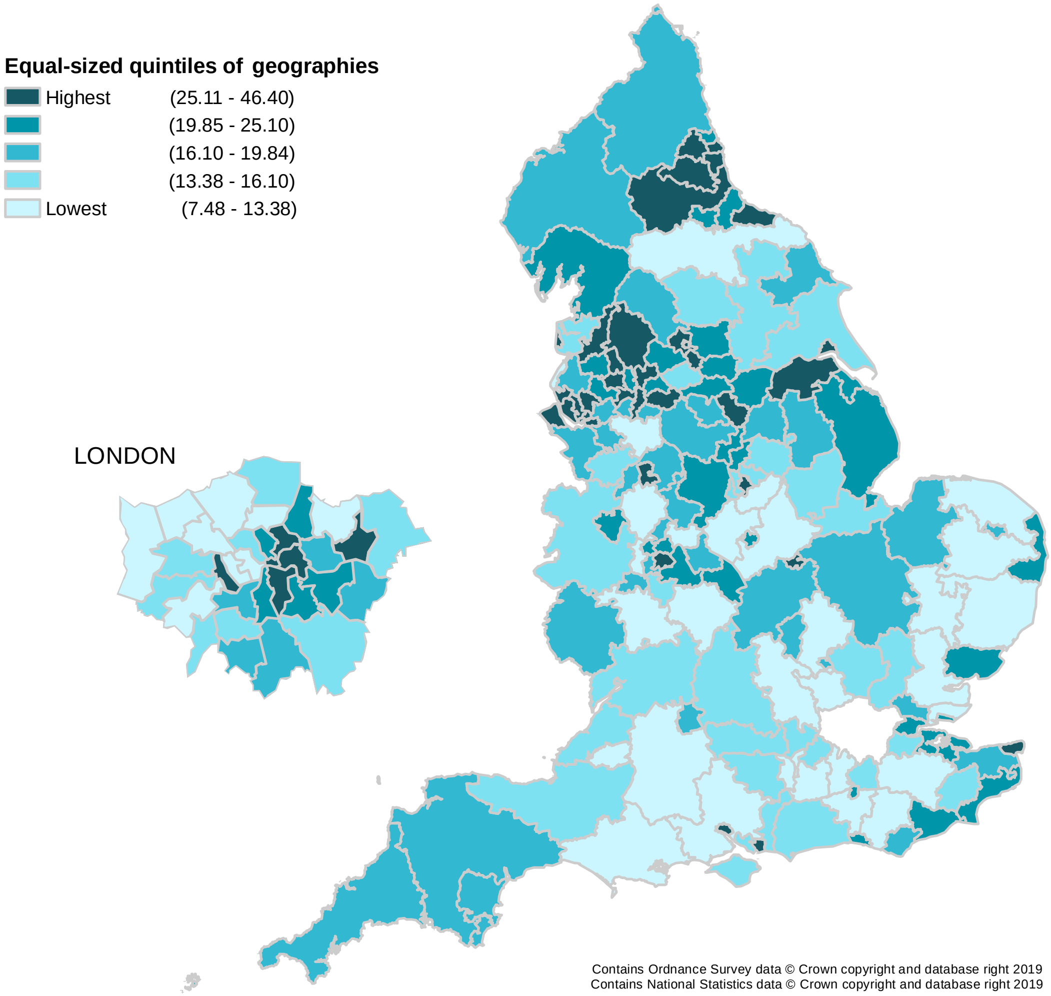


All respiratory disease – Disease burden

Map 21b: Variation in mortality rate from respiratory disease considered preventable in persons aged under 75 years per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum value: Low



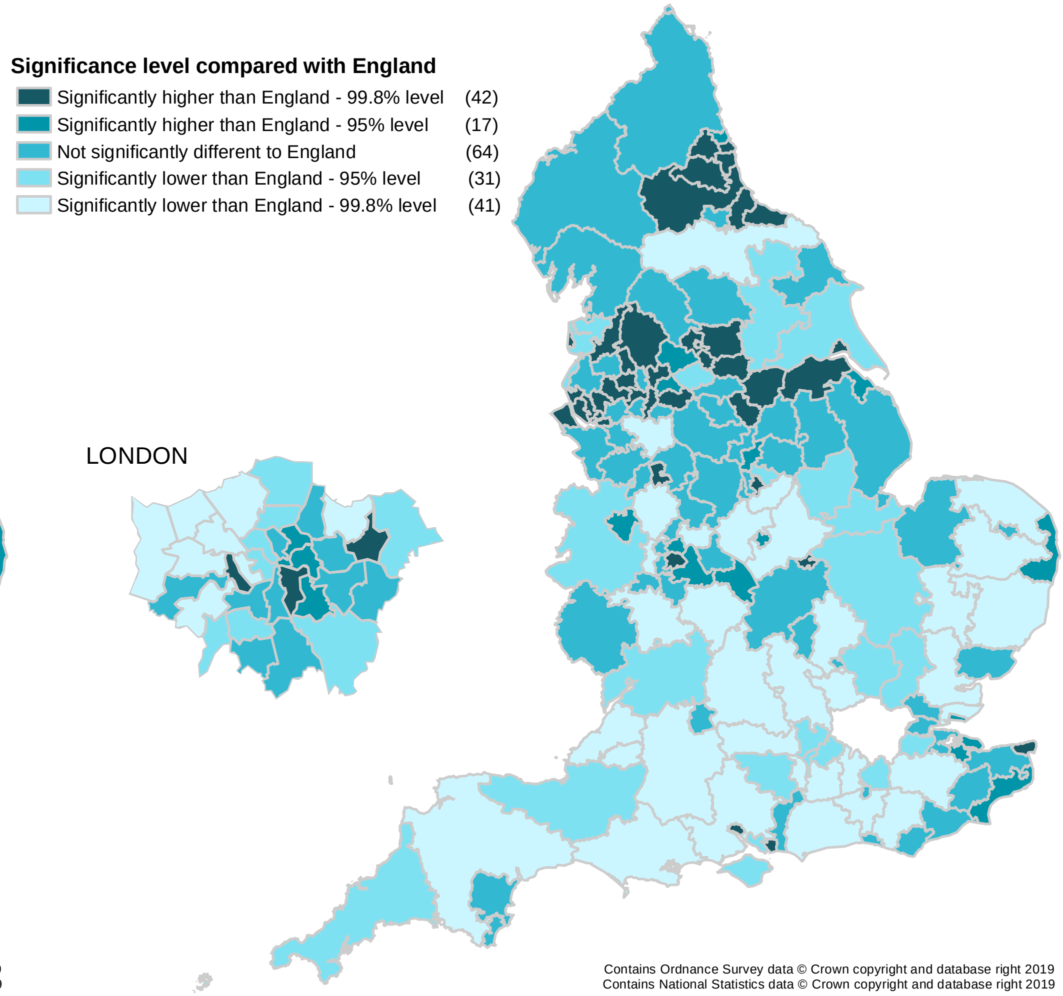
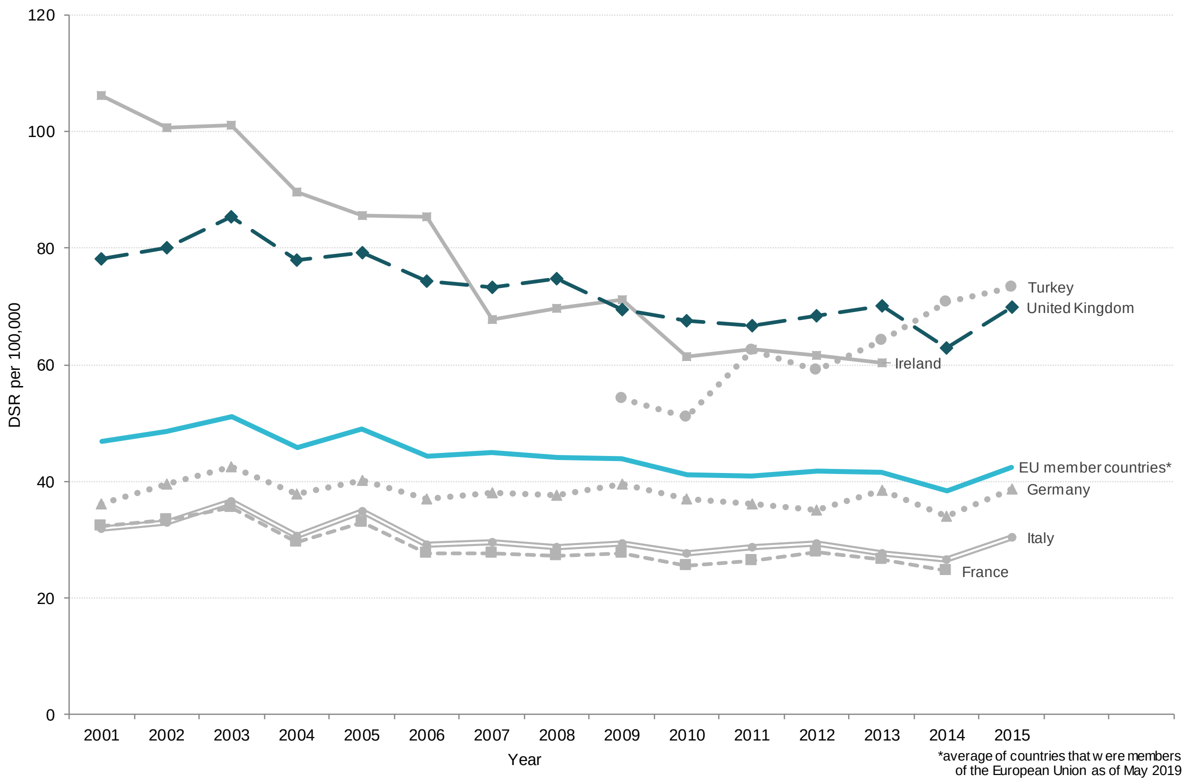


Figure 21.1: **Mortality from respiratory disease in selected EU countries[1]**



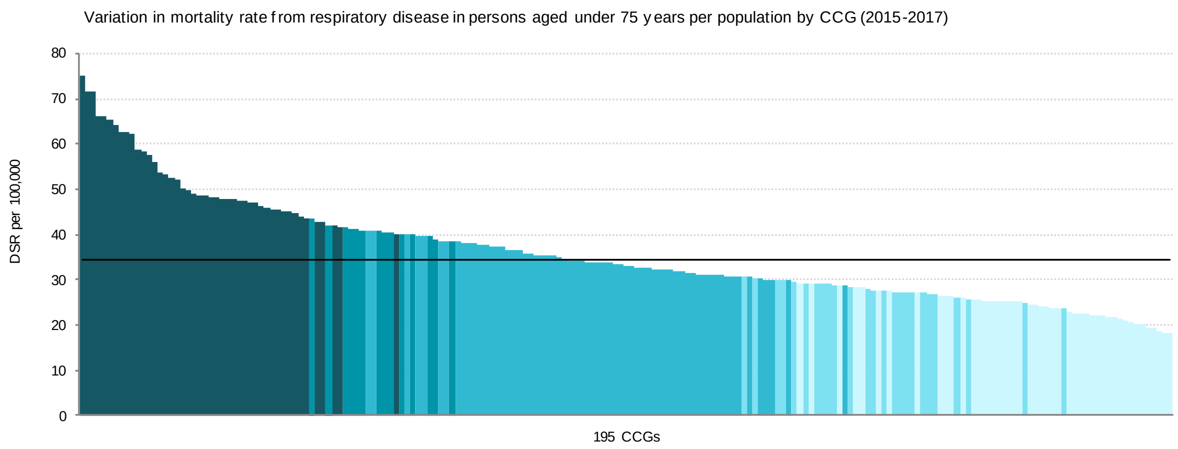
Context

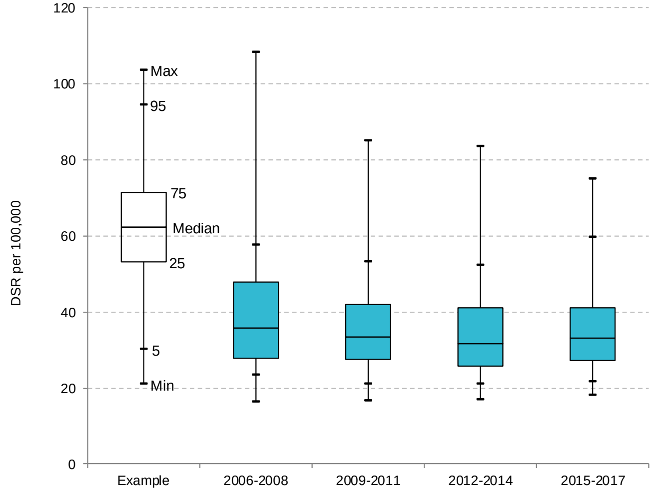
Whilst heart disease, stroke, dementia and Alzheimer's disease remain the major causes of premature death in the UK when data is standardised for age, respiratory conditions – particularly chronic respiratory disease – also contribute significantly.

Mortality rate from respiratory disease in these indicators refers to both acute and chronic upper and lower respiratory tract conditions, asthma, COPD, influenza and certain types of pneumonia. This is the definition of respiratory disease mortality monitored in the Public Health Outcomes Framework and NHS Outcomes Frameworks.[2] In this context, lung cancer and cystic fibrosis are not included as respiratory diseases.

It is recognised that some respiratory conditions can be seen to be preventable. Deaths are considered preventable if, in light of current understanding at the time of death, all or most deaths from the underlying cause could have been avoided by public health interventions.[3] Respiratory disease mortality for England in 2015 to 2017 was 34.3 per 100,000 population, the preventable mortality rate was 18.9 per 100,000. Therefore 55% of these respiratory deaths are considered potentially preventable. For example, one of the major respiratory causes of death in England is COPD. As smoking is the most common cause of COPD, it is seen as a preventable condition. It would be expected that improvements in public health policy and interventions aimed at reducing smoking would result in a decrease in the number of preventable deaths from respiratory causes.

Although mortality from respiratory disease has been falling overall over the previous 20 years in both the UK and Europe, mortality from the UK has been found to be





Max-Min (Range)		91.8	68.5	66.8	56.7	No significant change
95th-5th percentile		34.1	32.1	31.2	38.3	No significant change
75th-25th percentile		19.9	14.5	15.3	13.8	No significant change
Median		35.7	33.5	31.8	33.2	No significant change

consistently higher than most Western European countries (Figure 21.1). Within England, variations in mortality rates also exist, and are described within this section.

Magnitude of variation

Map 21a: Variation in mortality rate from respiratory disease in persons aged under 75 years per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 18.2 to 74.9 per 100,000 population, which is a 4.1-fold difference between CCGs. The England value for 2015 to 2017 was 34.3 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017.

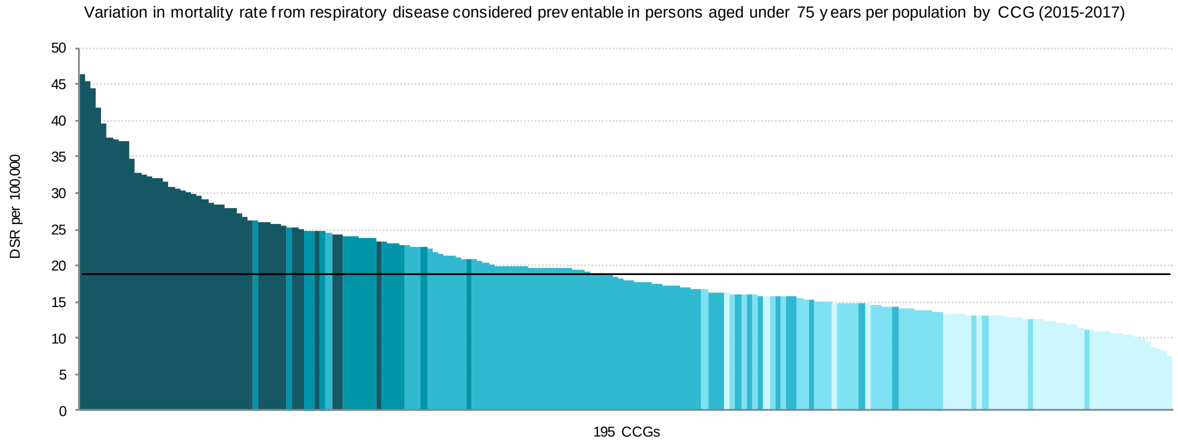
There was no significant change in any of the three variation measures between 2006 to 2008 and 2015 to 2017.

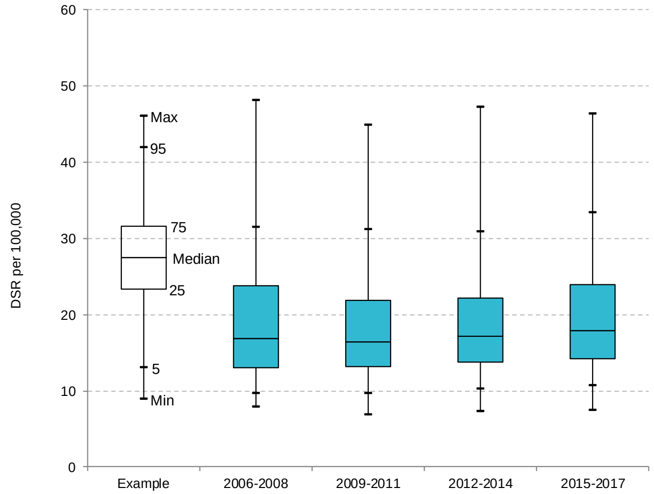
Map 21b: Variation in mortality rate from respiratory disease considered preventable in persons aged under 75 years per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 7.5 to 46.4 per 100,000 population, which is a 6.2-fold difference between CCGs. The England value for 2015 to 2017 was 18.9 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017.

There was no significant change in any of the three variation measures between 2006 to 2008 and 2015 to 2017.





Max-Min (Range)		40.3	38.0	39.9	38.9	No significant change
95th-5th percentile		21.8	21.5	20.6	22.7	No significant change
75th-25th percentile		10.9	8.7	8.4	9.7	No significant change
Median		16.9	16.4	17.2	17.9	No significant change

Reasons for variation are likely to be multifactorial, and will also depend on the underlying respiratory disease. Geographical variation in prevalence of current and historical smoking patterns is one of the most important causes of this variation across many respiratory diseases.

Deaths from more acute causes such as pneumonia may be due to differences in secondary care protocols or admission criteria, whilst mortality rates from influenza can vary depending on local outbreaks and population characteristics. However, as with all respiratory diseases, early and correct diagnosis is paramount. This can be from both primary and secondary care.

Prompt diagnosis and treatment is necessary both in the community and within emergency departments. Variations in staff expertise and equipment availability may lead to discrepancies in outcomes between areas.[4]

Management of chronic conditions is usually delivered by healthcare professionals in primary care, and any discrepancies in primary care resulting in irregular reviews of chronic diseases or reduced lifestyle advice or treatment adherence may result in poorer disease management, and increased admission and subsequent mortality.

Options for action

It is important to ensure that patients have a personalised treatment plan and are encouraged to lead a healthier lifestyle. This can include referral to services such as smoking cessation, increasing physical activity and avoiding environmental triggers. The importance of treatment adherence should also be stressed, through improving health literacy and increasing patient efficacy, increased support from patient groups, and improving access to specialised care such as respiratory physiotherapy and better drugs and devices.[5]

Commissioners should ensure that local services are delivering effective care in line with the latest national guidance for the relevant respiratory condition, and are promoting and signposting allied services.[6]

Secondary care services should have clear admission protocols for exacerbations of respiratory disease, and a low threshold for admission where secondary infection such as sepsis are a potential diagnosis.[7]

In both primary and secondary care, staff should have received training in the necessary equipment and procedures to diagnose and treat patients presenting with respiratory conditions, and refer to specialised services where necessary.[8]

In every contact with patients who have a diagnosis of a chronic respiratory condition, smoking status should be recorded and advice and encouragement to stop smoking should be offered where appropriate. Regular medication reviews should be conducted to increase compliance with the prescribed treatment regime, and discussion of potential side effects should take place.[5]

Staff should receive training in health literacy to ensure that patients understand the information being provided, and that it is in the most accessible form possible. Patients should also be aware of the symptoms of an acute exacerbation, and when they should seek medical advice.

Resources

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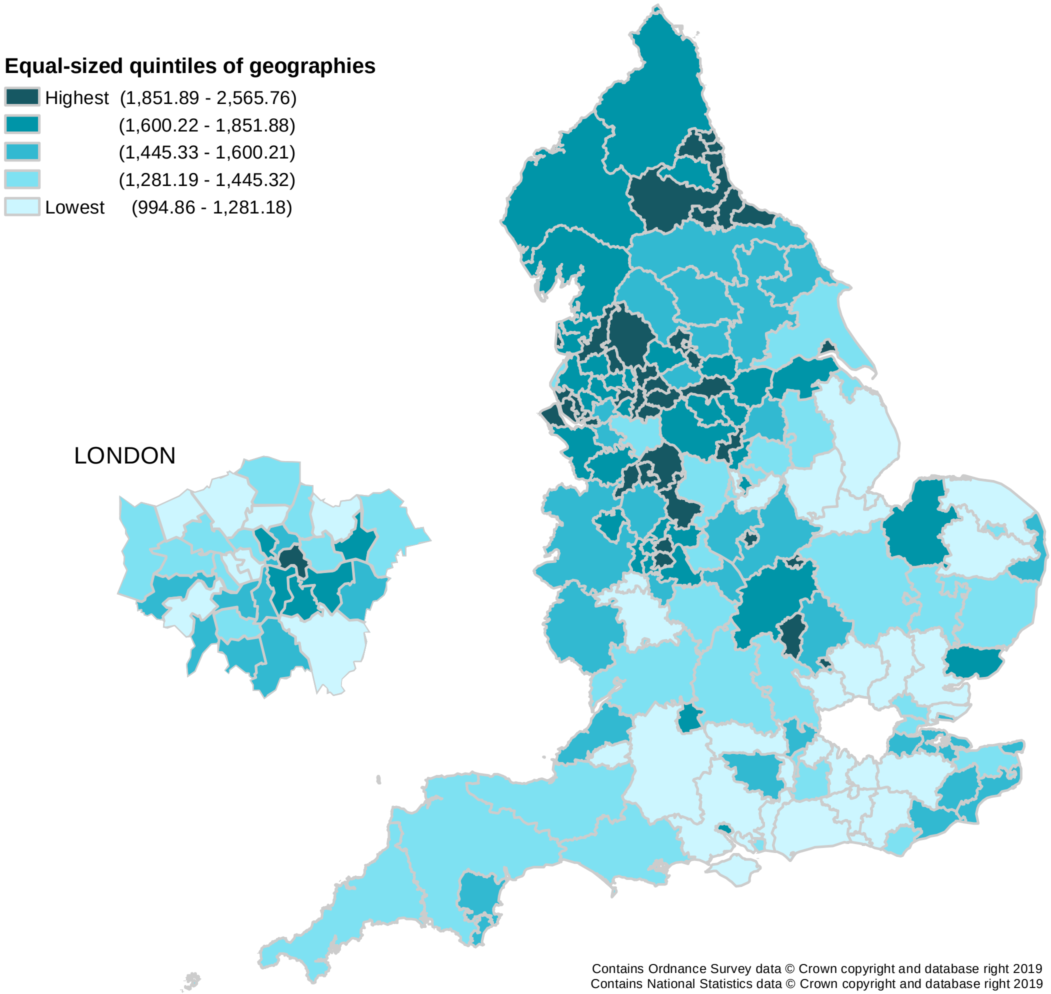
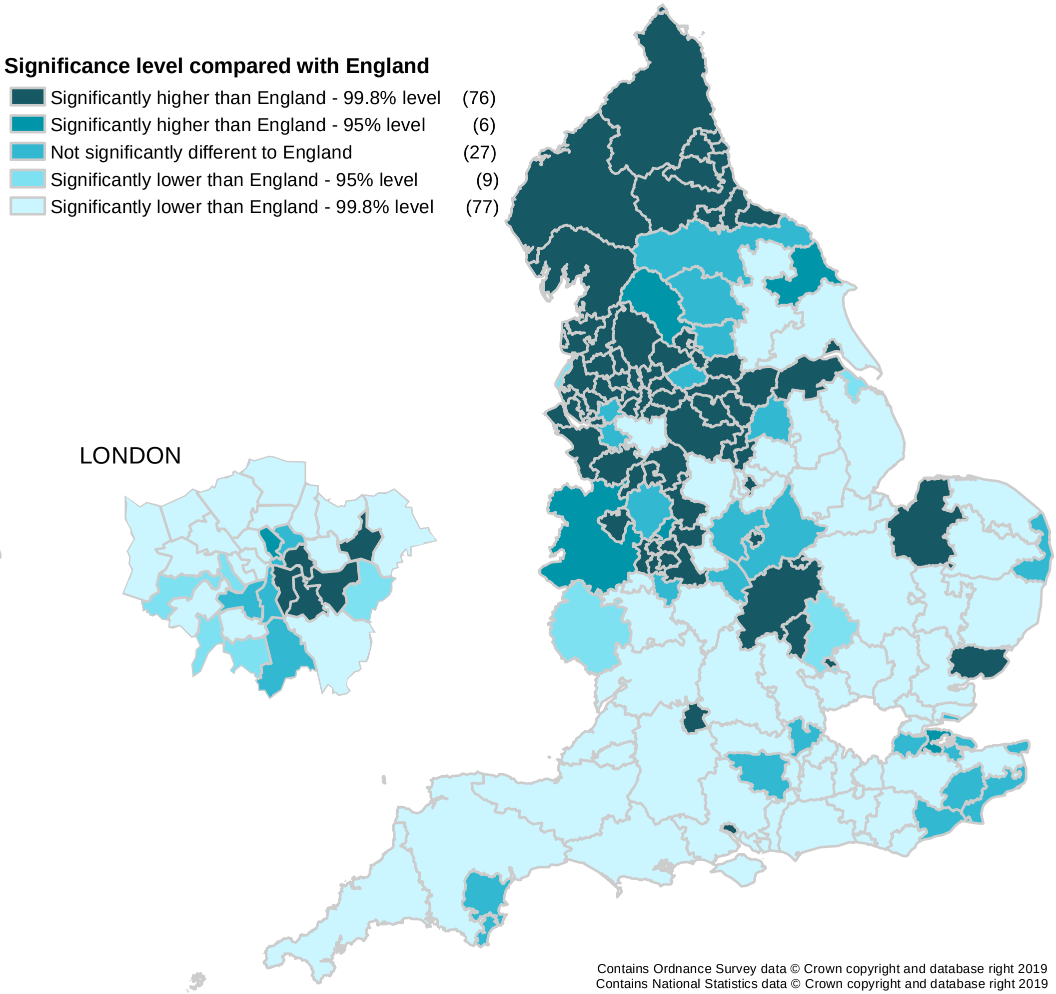
All respiratory disease – Hospital admissions

Map 22a: Variation in rate of emergency admissions to hospital for respiratory disease per population by CCG (2017/18)

Directly standardised rate per 100,000

Optimum value: Low

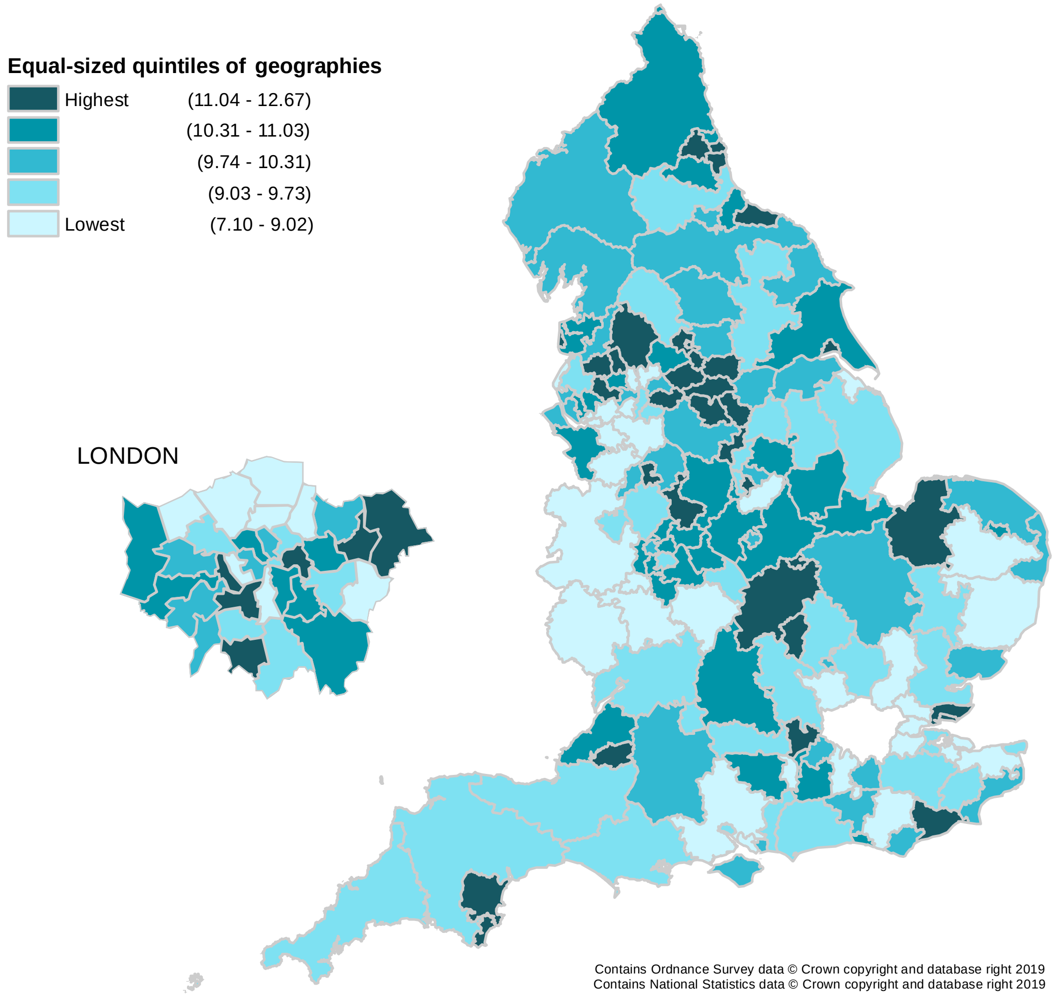




All respiratory disease – Hospital admissions

Map 22b: Experimental statistic: Variation in percentage of admissions to hospital for respiratory disease that were re-admitted as an emergency within 30 days of discharge by CCG (2017/18)

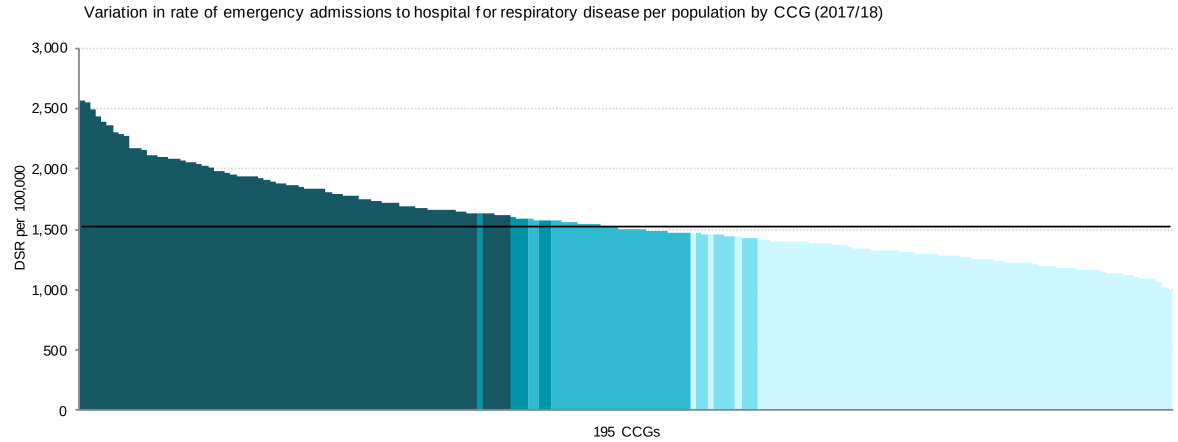
Optimum value: Low

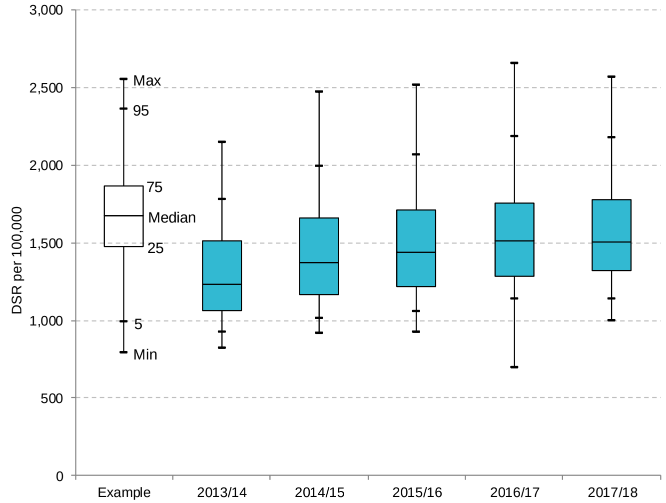


Context

An emergency admission to hospital is classified as ‘when admission is unpredictable and at short notice because of clinical need’.[1] This may result from a patient being seen in primary care and referred to hospital immediately, from patients self-presenting to hospital emergency departments, or from patients being taken to hospital by emergency services. Admissions do not represent the number of patients, as some patients will have more than one admission during the same year. Some emergency admissions are zero-day stays, where patients do not require an overnight stay.

Respiratory disease in this indicator refers to both acute and chronic upper and lower respiratory tract conditions, asthma, COPD, influenza and certain types of pneumonia. This is the definition monitored in the Public Health Outcomes Framework and NHS Outcomes Frameworks.[2] In this context, lung cancer and cystic fibrosis are not included as respiratory diseases.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		1325.7	1553.5	1590.2	1960.2	1570.9	No significant change
95th-5th percentile		858.1	974.4	1008.7	1044.1	1039.9	WIDENING Significant
75th-25th percentile		454.2	493.9	496.6	474.3	457.9	No significant change
Median		1232.7	1376.6	1439.9	1511.4	1506.4	INCREASING Significant

Readmission rates are monitored as an important measure of quality of care as they can be an indicator of where poor patient outcomes could have potentially been avoided. Emergency readmission may also be avoided due to utilisation of alternative hospital services where they are available, such as admission to an ambulatory care unit rather than onto an acute medical ward, and so figures should be interpreted within the local context.

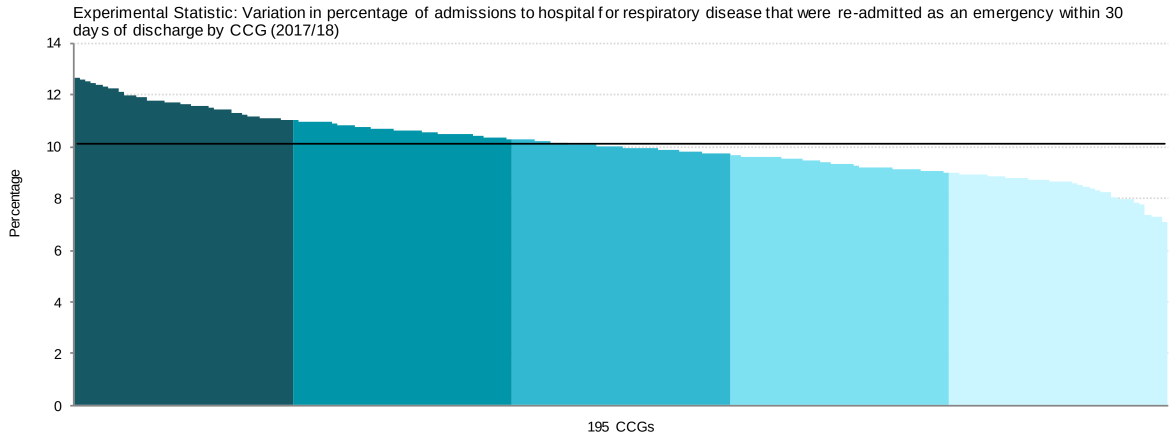
The burden of respiratory disease on hospital activity is significant. Currently for England 2017/18 there are over 850,000 hospital emergency admissions and more than 4.9 million bed days for respiratory disease. Exacerbations of COPD and asthma are significant causes of respiratory admissions, yet many episodes can be prevented by improved treatment compliance, symptom control and timely treatment of acute exacerbations.

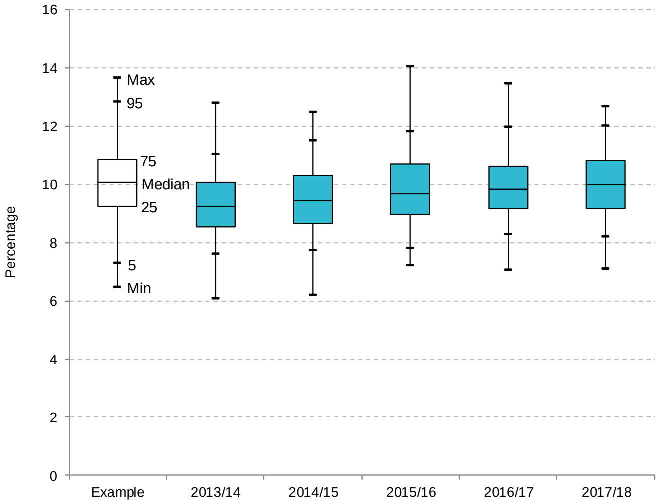
Magnitude of variation

Map 22a: Variation in rate of emergency admissions to hospital for respiratory disease per population by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 994.9 to 2,565.8 per 100,000 population, which is a 2.6-fold difference between CCGs. The England value for 2017/18 was 1,523.0 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18. Both the 95th to 5th percentile gap and the 75th to 25th percentile gap widened significantly.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		6.7	6.3	6.8	6.4	5.6	No significant change
95th-5th percentile		3.4	3.8	4.0	3.7	3.8	No significant change
75th-25th percentile		1.5	1.7	1.7	1.5	1.7	No significant change
Median		9.2	9.5	9.7	9.9	10.0	INCREASING Significant

Map 22b: Experimental statistic: Variation in percentage of admissions to hospital for respiratory disease that were re-admitted as an emergency within 30 days of discharge by CCG (2017/18)

The maps and column chart display the latest period (2017/18), during which CCG values ranged from 7.1 to 12.7%, which is a 1.8-fold difference between CCGs. The England value for 2017/18 was 10.1%.

The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There was no significant change in any of the three variation measures between 2013/14 and 2017/18. The median increased significantly from 9.2 in 2013/14 to 10.0 in 2017/18.

As previously noted, variations in readmission rates may be due to local hospital, integrated and primary care access/services. Patients may be readmitted to a frailty unit or ambulatory care suite rather than an acute medical ward, and so this may not represent poor quality of care. Readmission rates are higher in older adults who have chronic conditions, and may represent a breakdown in their social circumstances, and therefore readmission rates are likely to be higher in areas where there are a higher proportion of older adults.

However, readmission can also be due to patients being discharged prematurely from hospital. This may be due to inpatient pressures where hospitals are operating at or near full capacity. It may also be due to inappropriate or incomplete treatment, or misdiagnosis. It is therefore important that hospitals have clear admission protocols and pathways of care to ensure that patients provide the best possible care whilst admitted.

Options for action

Respiratory admission rates tend to be higher during winter. CCGs and local authorities can minimise the impact of this by utilising the cold weather plan produced by Public Health England.

Information should be shared about patient treatment and recommendations between primary, secondary and community healthcare teams. Primary care services should ensure patients who are identified as being at risk of hospital admission receive regular reviews of their respiratory disease.[3] Healthcare professionals carrying out the reviews should have received appropriate training and should be aware of the latest guidelines.[4,5] Evidence has shown that self-management plans can help reduce hospital admission rates, as well as improve quality of life.[6] Plans should be regularly reviewed, and can include an exacerbation plan if the patient is at risk of exacerbations.

Patients should be made aware of the community services available to them to support self-management plans for chronic conditions. These services are important in for enabling integrated population healthcare, reducing comorbidities and prevention of readmission.[7] Eligible patients should be encouraged to receive the annual influenza vaccination and the pneumococcus vaccine in order to reduce the complications of influenza and pneumonia, and so reduce hospital admissions.

Resources

British Lung Foundation (2016) The battle for breath – the impact of lung disease in the UK [Accessed 21 January 2019]

National Institute for Health and Care Excellence (2019) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guidance [NG115]) [Accessed 19 February 2019]

Nuffield Trust (2018) Emergency readmissions: Trends in emergency readmissions to hospital in England [Accessed 21 January 2019]

Public Health England (2018) Cold weather plan for England: protecting health and reducing harm from the cold weather [Accessed 21 January 2019]

Public Health England (2015) Respiratory disease: applying All Our Health [Accessed 21 January 2019]

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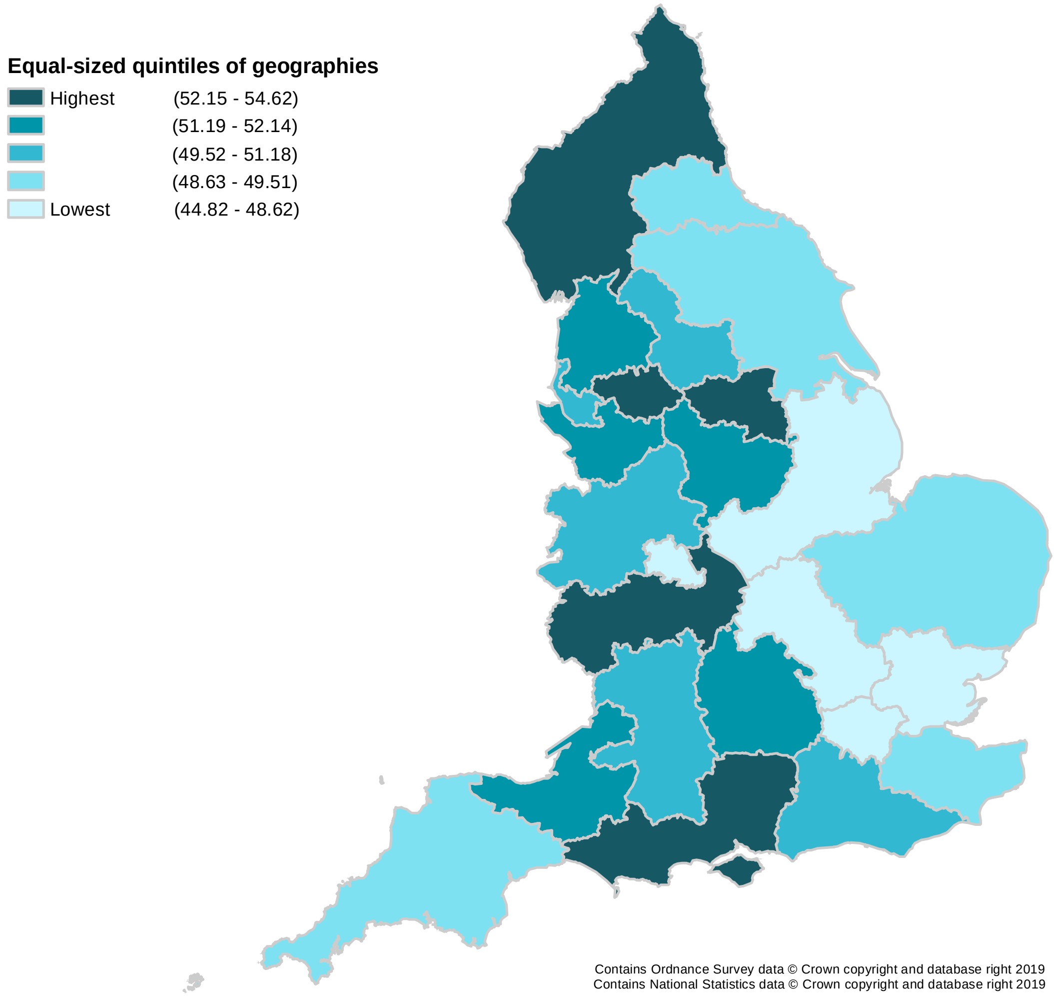
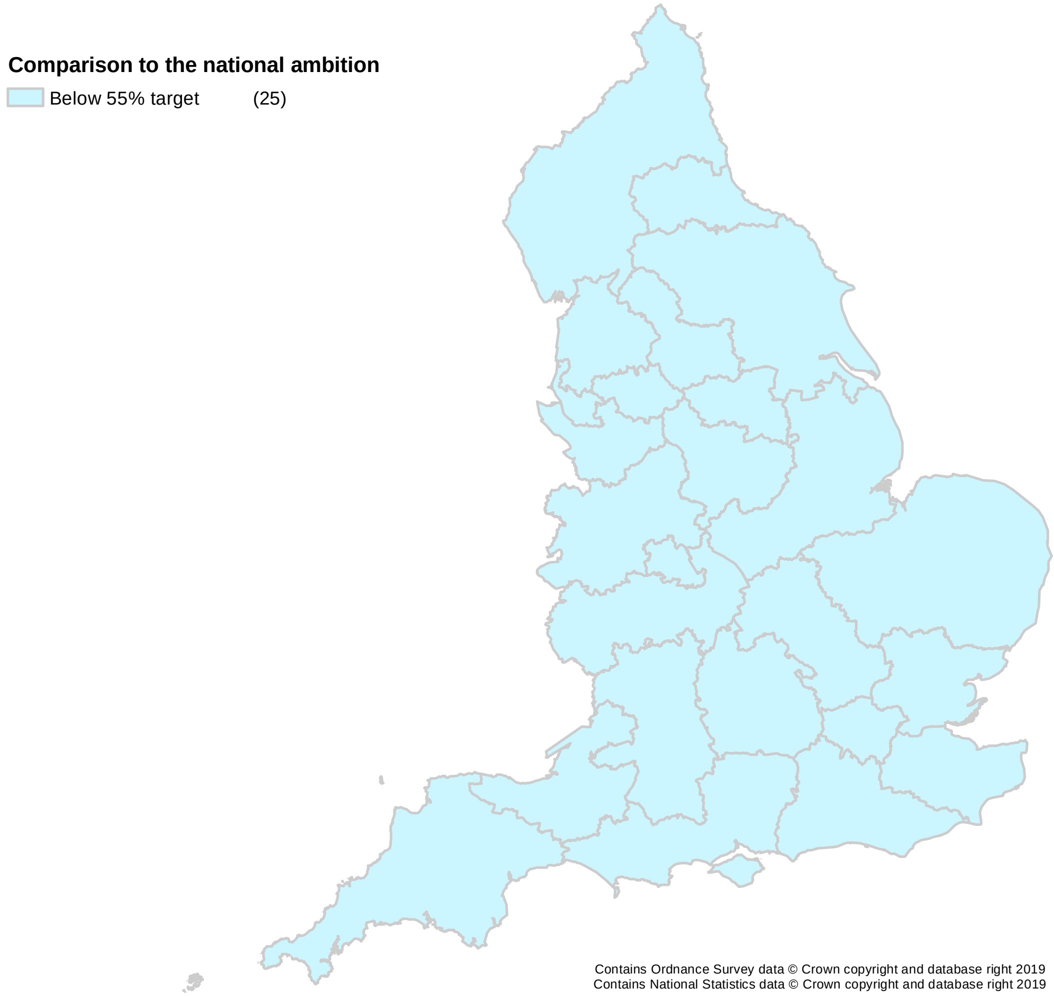
[1] NHS Digital Data Dictionary: Admission Method [Accessed 08 August 2019]
[2] Public Health England (2019) Public Health Outcomes Framework [Accessed 01 August 2019]
[3] National Institute for Health and Care Excellence (2019) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guidance [NG115]) [Accessed 19 February 2019]
[4] The Primary Care Respiratory Society Are you trained to do the job you do? [Accessed 08 August 2019]
[5] Robinson F (2016) Be trained to do the job you do: our campaign for better education Primary Care Respiratory Update 7(1):15-17 [Accessed 08 August 2019]
[6] Effing T, Monninkhof E, van der Valk P and others (2007) Self-management education for patients with chronic obstructive pulmonary disease Cochrane Database Syst Rev 4:CD002990 doi: 10.1002/14651858.CD002990.pub2 [Accessed 08 August 2019]
[7] RightCare NHS RightCare Pathway: COPD [Accessed 08 August 2019]

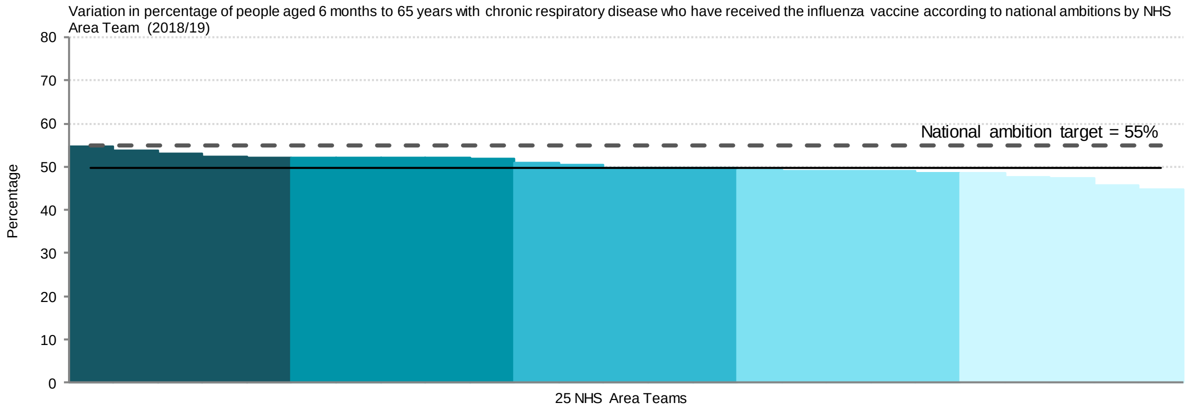
Health Service Provision – Influenza vaccination

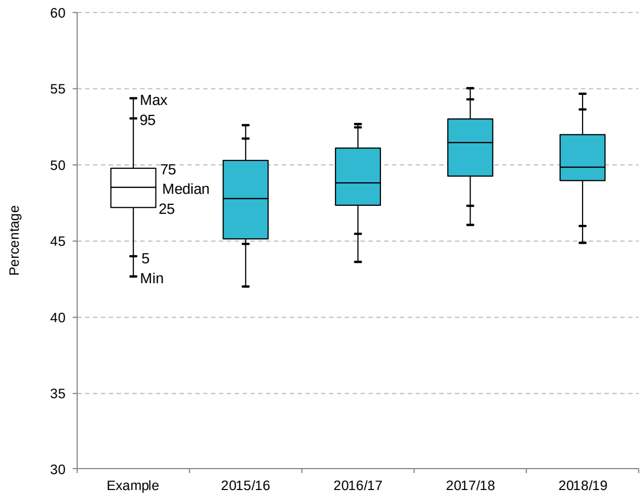
Map 23: Variation in percentage of people aged 6 months to 65 years with chronic respiratory disease who have received the influenza vaccine by NHS Area Team according to national ambitions (2018/19)

Optimum value: High









Max-Min (Range)		10.6	9.1	9.0	9.8	No significant change
95th-5th percentile		7.0	7.0	7.0	7.6	No significant change
75th-25th percentile		5.2	3.8	3.7	3.1	No significant change
Median		47.8	48.9	51.5	49.8	No significant change

Context

The common symptoms of influenza are chills, fever, nasal and sinus congestion, sore throat and extreme fatigue, however, people with chronic respiratory disease are at increased risk from the complications of influenza, such as bronchitis or pneumonia. Some of these complications can be life-threatening: every year several thousand people in England die from the complications of influenza.

In people with chronic respiratory disease, there is a higher risk of hospital admission to an intensive care unit and requirement for respiratory support. Asthma is associated with an elevated risk of pneumonia, and chronic obstructive pulmonary disease increases the risk of ventilatory support.

Vaccination every year can protect against the influenza virus, Public Health England recommends that everyone with a chronic respiratory condition should have a free influenza vaccination.[1]

The influenza vaccination season is from October to December, but most people get influenza from December onwards. To protect people with chronic respiratory disease from the influenza virus and its complications it is best to offer vaccination as early as possible in the campaign before influenza circulation starts.

Magnitude of variation

Map 23: Variation in percentage of people aged 6 months to 65 years with chronic respiratory disease who have received the influenza vaccine by NHS Area Team according to national ambitions (2018/19)

The maps and column chart display the latest period (2018/19), during which NHS Area Team values ranged from

44.8% to 54.6%, which is a 1.2-fold difference between NHS Area Teams. The England value for 2018/19 was 49.8%. No areas reached the national ambition of 55% vaccination. The box plot shows the distribution of NHS Area Team values for the period 2015/16 to 2018/19. There was no significant change in any of the 3 variation measures between 2015/16 and 2018/19.

The data shows that at best only one person in every 2 people under the age of 65 years with chronic lung disease received an influenza vaccination.

Potential reasons for the degree of variation observed include differences in:

- level of awareness among people with chronic lung disease of the need for influenza vaccination
- effectiveness of the promotion and offer of influenza vaccination to people with chronic lung disease, particularly in primary care
- access to free influenza vaccination services

Options for action

To increase the number of people with chronic respiratory disease receiving influenza vaccination, commissioners need to ensure that service providers, particularly general practitioners and community pharmacies, promote and offer the service to people with asthma, chronic obstructive pulmonary disease and other chronic lung disease.

General practitioners need to invite people with chronic lung disease for influenza vaccination using a variety of methods, such as letter, telephone call, text message or email, either for a specific appointment or to an influenza vaccination clinic. Influenza vaccination clinics need to be promoted on practice websites.

Commissioners can encourage community pharmacies to participate in free influenza vaccination programmes. Being able to access vaccination at a community pharmacy may be more convenient for some people with chronic lung disease than attending the general practice.

Commissioners could consider specifying that primary care service providers responsible for delivering the national flu vaccination programme undergo education and training in promoting the uptake of influenza vaccination (see 'Resources' for e-learning package).

All healthcare professionals responsible for the care and treatment of people with chronic lung disease need to take the opportunity of Making Every Contact Count (MECC; see 'Resources') to highlight the importance of annual influenza vaccination especially as the season approaches.

Resources

Mertz D, Kim T, Johnstone J, Lam P and others (2013) Populations at risk for severe or complicated influenza illness: systematic review and meta-analysis BMJ 23(347):f5061 doi: 10.1136/bmj.f5061 [Accessed 15 February 2019]

NHS Health Education England in partnership with Public Health England. e-Learning for Healthcare Flu Immunisation [Accessed 12 July 2019]

Public Health England Annual flu programme Last updated: 11 July 2019 [Accessed 12 July 2019]

Public Health England Influenza, the green book, chapter 19 Last updated: 23 April 2019 [Accessed 12 July 2019]

Public Health England Making Every Contact Count (MECC): practical resources Last updated: 16 July 2018 [Accessed 12 July 2019]

Public Health England The flu vaccination winter 2018 to 2019: who should have it and why Last updated 6 June 2019 [Accessed 12 July 2019]

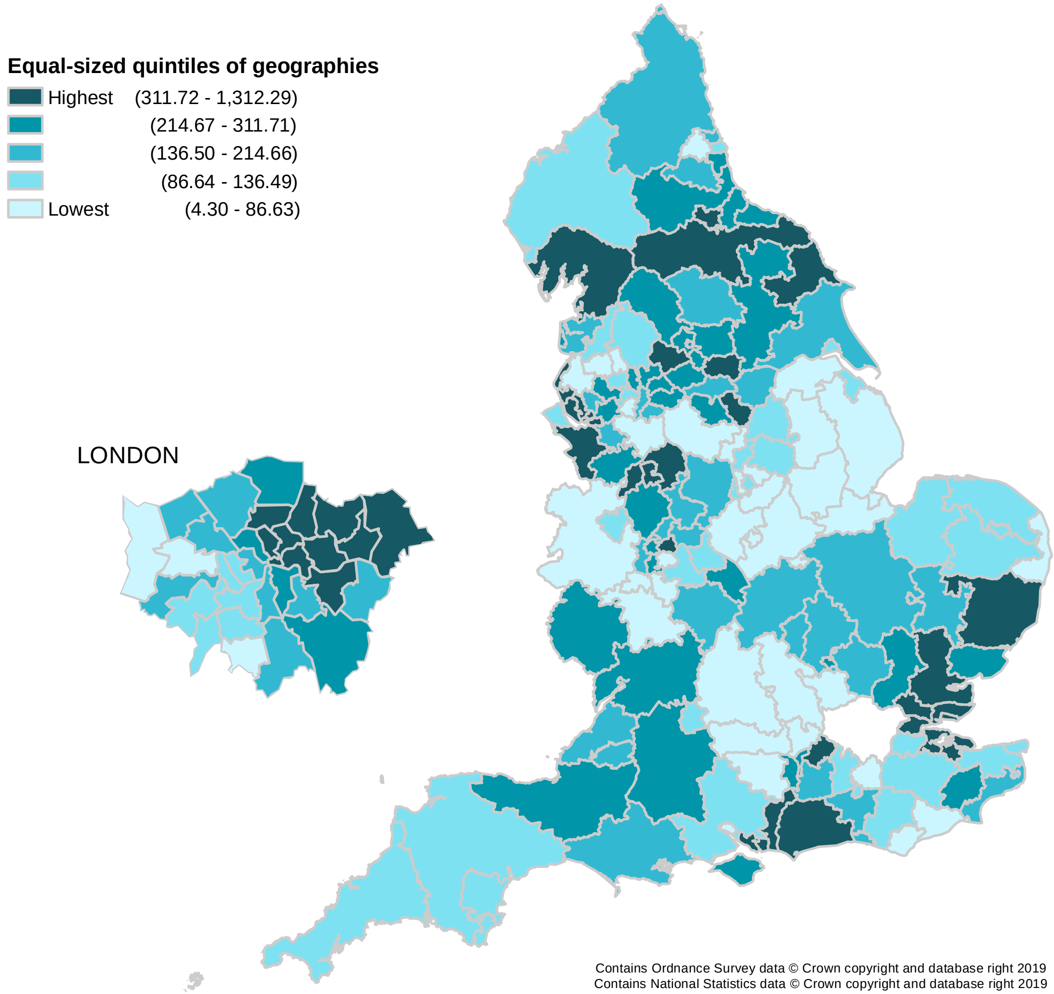
[1] NHS England, Department of Health & Social Care and Public Health England (2018) The national flu immunisation programme 2018/19 (flu letter: no.1) [Accessed 12 July 2019]

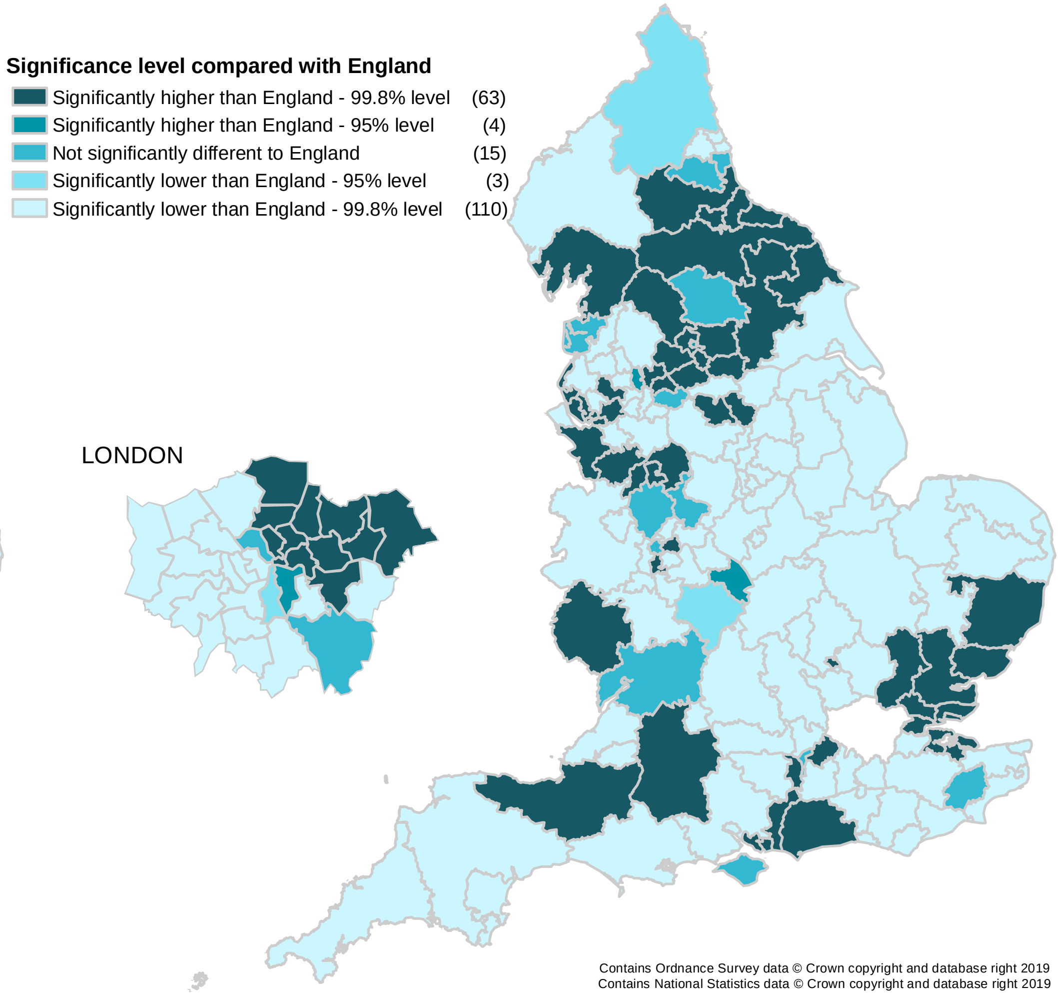
Health service provision - Sleep studies

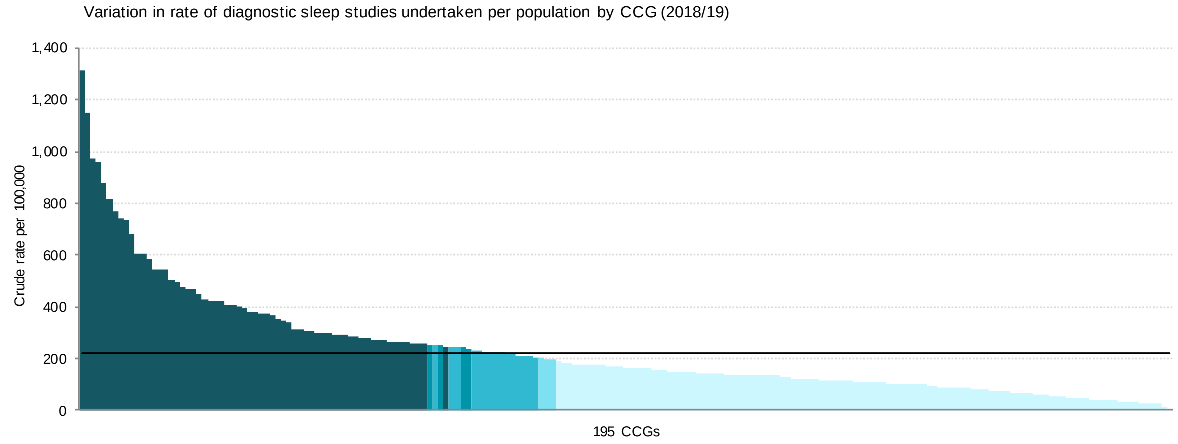
Map 24: Variation in rate of diagnostic sleep studies undertaken per population by CCG (2018/19)

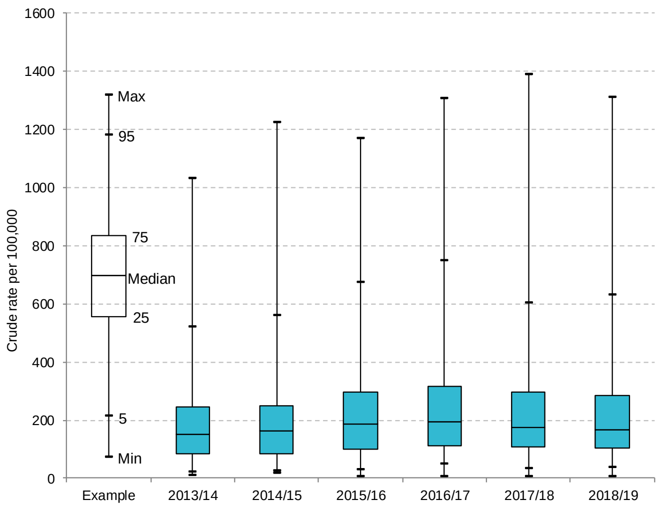
Crude rate per 100,000

Optimum value: High









Max-Min (Range)		1023.2	1205.0	1163.5	1302.1	1381.6	1308.0	WIDENING Significant
95th-5th percentile		496.3	536.4	644.0	702.8	570.3	594.0	No significant change
75th-25th percentile		160.1	164.5	195.6	206.2	188.8	181.3	No significant change
Median		149.4	162.5	188.1	192.4	173.1	165.4	No significant change

Context

Sleep studies can be considered of 2 types, the less common being full polysomnography, used to explore neurological sleep problems where brainwave recordings and eye movements together with muscle tone are monitored. The more common respiratory sleep study looks at respiratory movement, airflow, arterial oxygen saturation, pulse rate and other parameters used to identify if sleep disordered breathing is present and, if so, its severity.

Obstructive sleep apnoea (OSA) is the most common sleep disordered breathing problem with an uncertain prevalence in the UK but one that is less common in premenopausal women and increases with age. Unfortunately, it remains under diagnosed with patients still presenting with symptoms of sleep apnoea of many years duration and often have consulted clinicians on several occasions regarding their symptoms.

Following a campaign from the British Lung Foundation in 2013/14 that highlighted the key symptoms of loud snoring, witnessed apnoeas and daytime somnolence, referrals appeared to increase. The increasing recognition of the association of sleep apnoea with raised blood pressure, diabetes, atrial fibrillation and heart failure has maintained a high demand for sleep investigations. The National Institute for Health and Care Excellence (NICE) technology appraisal guidance 139[1] confirmed that continuous positive airway pressure (CPAP) is an effective treatment and has supported the increase in diagnosis, given it is such an effective therapy.

Unfortunately, there remains a variation in the number of sleep studies performed as highlighted in the bar chart. Whilst there is no norm defined for the number of sleep studies per thousand population, the magnitude of the variation should lead commissioners to review the nature of the services they commission. The tool published in 2013 by Steier remains the only tool to try and estimate prevalence.[2] The forthcoming NICE guideline on sleep disordered breathing will help delineate the best pathways of care.[3]

Magnitude of Variation

Map 24: Variation in rate of diagnostic sleep studies undertaken per population by CCG (2018/19)

The maps and column chart display the latest period (2018/19), during which CCG values ranged from 4.3 to 1,312.3 per 100,000 population, which is a 305.0-fold difference between CCGs. The England value for 2018/19 was 221.5 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2013/14 to 2018/19. The maximum to minimum range widened significantly.

Reasons for the degree of variation observed are differences in:

- availability of the service
- prevalence of risk factors and related conditions, such as obesity
- symptom recognition and appropriate referral in primary care

In localities with large sleep centres, which take many tertiary referrals, the rates of testing for sleep-related conditions tend to be higher, as they often provide limited cardiopulmonary studies for their local population but also more complex investigations, such as full polysomnography to diagnose and manage more neurological sleep problems and sleep disordered breathing that fails to respond to simple treatments.

The Steier tool, produced an overall risk map for OSA that could be used to predict relative prevalence estimates in the UK.[2] They found not only significant regional variation in predicted prevalence estimates, but also a significant mismatch between areas identified as having a high predicted prevalence estimate and the distribution of existing sleep centres.

Options for action

Commissioners together with service providers need:

- to review referral and delivery models for sleep services
- to refine understanding of expected and observed prevalence of related conditions
- to assess the demand and available capacity for local sleep services
- review services in light of the forthcoming NICE guidelines

Accreditation of sleep laboratories is to be encouraged via the IQIPS scheme, recognising that additional support is required to achieve this.

Resources

Department of Health (2009) Transforming respiratory and sleep diagnostic services to deliver 18 weeks - a good practice guide [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2008) Continuous positive airway pressure for the treatment of obstructive sleep apnoea/hypopnoea syndrome (NICE technology appraisal [TA139]) [Accessed 17 April 2019]

National Institute for Health and Care Excellence (2015) Obstructive sleep apnoea syndrome (NICE clinical knowledge summaries) [Accessed 17 April 2019]

National Institute of Health and Care Excellence Obstructive sleep apnoea/hypopnoea syndrome and obesity hypoventilation syndrome in over 16s (In development [GID-NG10098]) [Accessed 29 July 2019]

United Kingdom Accreditation Service (UKAS) Improving Quality in Physiological Services (IQIPS) [Accessed 17 April 2019]

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[1] National Institute for Health and Care Excellence (2008) Continuous positive airway pressure for the treatment of obstructive sleep apnoea/hypopnoea syndrome (NICE technology appraisal [TA139]) [Accessed 17 April 2019]

[2] Steier J, Martin A, Harris J and others (2013) Predicted relative prevalence estimates for obstructive sleep apnoea and the associated healthcare provision across the UK Thorax 69:390-392 doi: 10.1136/thoraxjnl-2013-203887 [Accessed 17 April 2019]

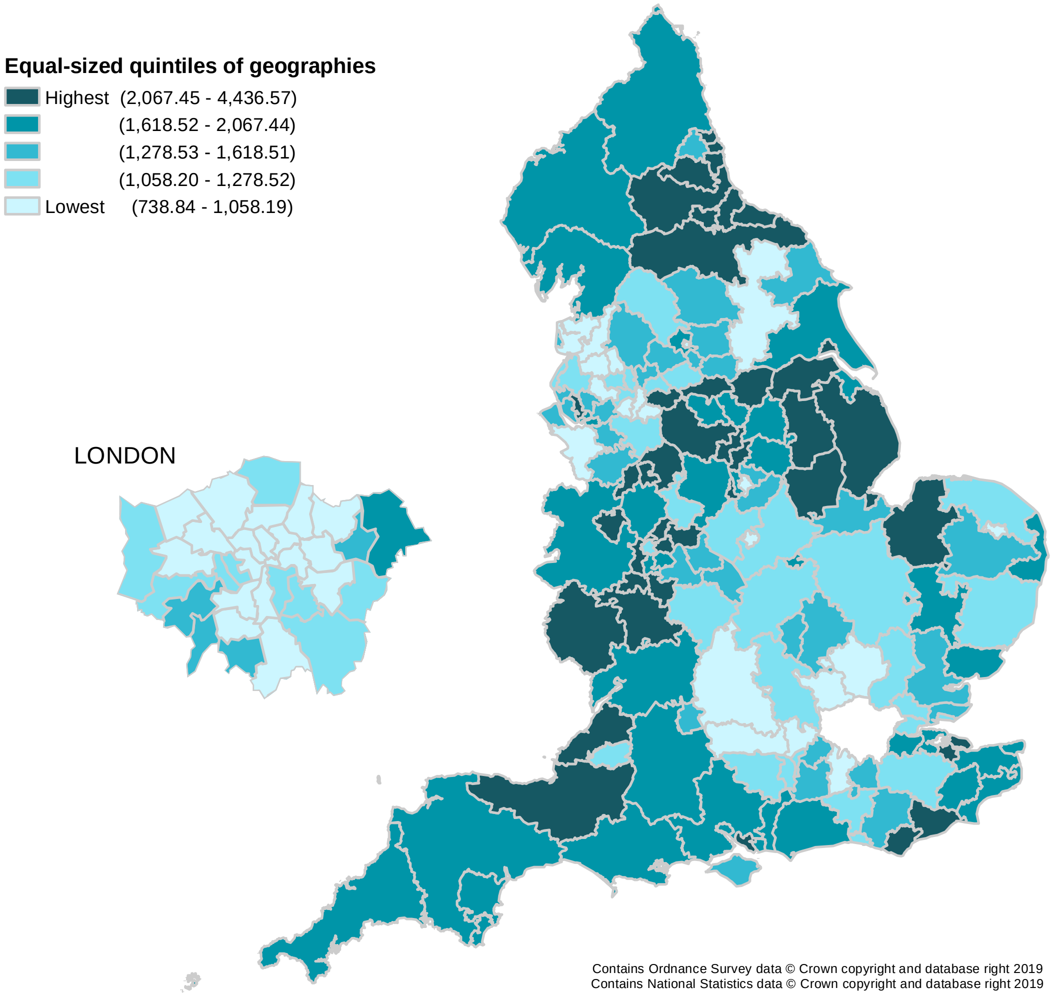
[3] National Institute of Health and Care Excellence Obstructive sleep apnoea/hypopnoea syndrome and obesity hypoventilation syndrome in over 16s (In development [GID-NG10098]) [Accessed 29 July 2019]

Health service provision - Oxygen therapy

Map 25: Variation in total expenditure on home oxygen therapy per population by CCG (2017/18)

Spend (£) per 1,000 patients

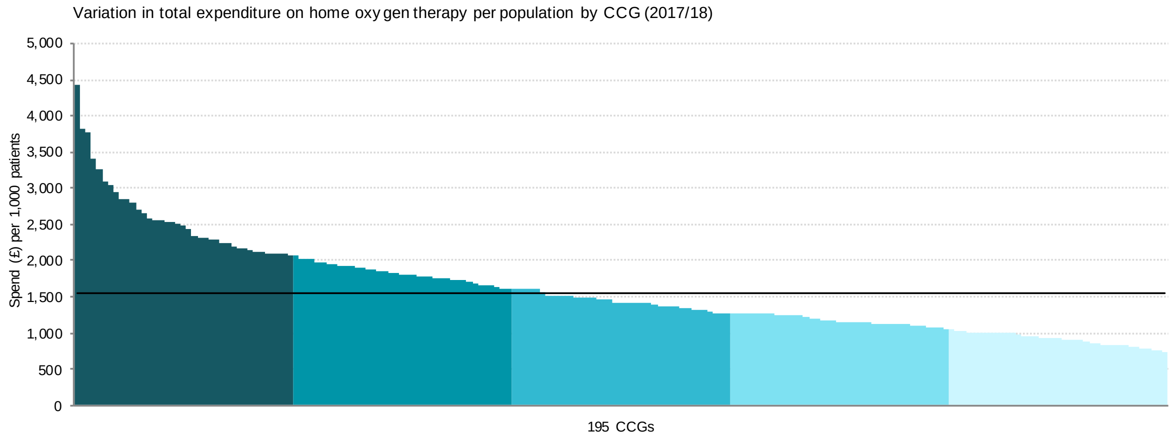
Optimum value: Requires local interpretation

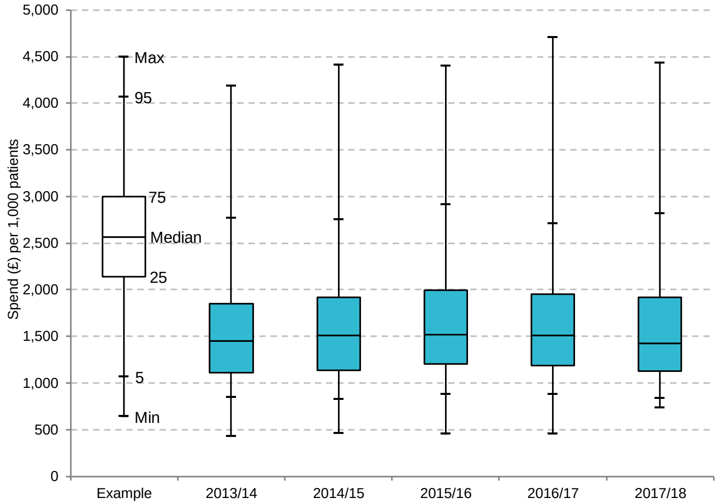


Context

Home oxygen therapy is provided to around 85,000 people in England, costing approximately £110 million per year.[1] The majority of patients prescribed home oxygen have COPD or other long-term respiratory conditions such as interstitial lung disease, chest wall deformity and pulmonary hypertension. About 4% are children. Oxygen therapy is an effective treatment for some people with cardiac or neurological conditions, pre-term babies and for end of life care.[1] Where indicated, long-term home oxygen therapy can improve survival in COPD, but it is often prescribed without appropriate clinical assessment or specialist follow-up, in which case the patient derives no clinical benefit and may come to harm. Oxygen is a treatment for low blood oxygen levels (hypoxia); it is not effective for breathlessness in the absence of hypoxia.

Internal estimates from the Department of Health and Social Care (DHSC) suggest that between 24% and 43% of home oxygen prescribed is not used and, conversely, 20% of COPD patients that could benefit do not receive it.[1] Often home oxygen is initiated by hospital doctors after an acute admission, although national guidelines advise against this.





	Example	2013/14	2014/15	2015/16	2016/17	2017/18	
Max-Min (Range)		£3,760	£3,949	£3,941	£4,259	£3,698	No significant change
95th-5th percentile		£1,922	£1,918	£2,031	£1,825	£1,979	No significant change
75th-25th percentile		£736	£781	£787	£761	£797	No significant change
Median		£1,449	£1,510	£1,518	£1,509	£1,426	No significant change

Up to 30% of COPD patients prescribed long term oxygen therapy in this setting no longer need it after 3 months,[2] but many patients do not receive appropriate follow-up, resulting in oxygen equipment remaining in place despite not being required or used.

Up to 40% of COPD patients admitted to hospital are current smokers.[3] Provision of home oxygen therapy to current smokers is not recommended due to the risk to themselves and others, and because these patients are unlikely to derive the intended mortality benefit. These patients are a clinical priority for treatment of their tobacco dependence as well as specialist respiratory assessment and follow up.

Home oxygen contracts and payment are based on provision as well as usage; costs are incurred even when oxygen is not used but also when the most cost-effective home oxygen prescription is not in place. Both of these issues can be addressed by commissioned Home Oxygen Assessment and Review Services (HOSARs).

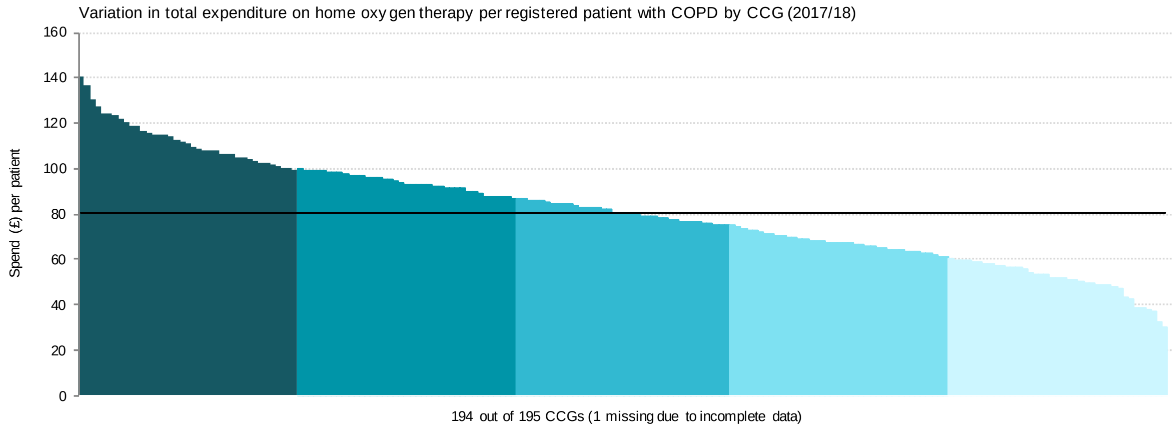
Although expenditure is high, many CCGs do not commission integrated HOSARs to undertake quality-assured clinical assessment, review and follow-up of patients' long-term home oxygen patients, thereby decreasing the quality of care and increasing the likelihood of harm and waste.

Magnitude of variation

Map 25: Variation in total expenditure on home oxygen therapy per population by CCG (2017/18)

The map and column chart display the latest period (2017/18), during which CCG values ranged from £739 to

Figure 25.1: **Total expenditure on home oxygen therapy per registered patient with COPD by CCG (2017/18)**



£4,437, which is a 6.0-fold difference between CCGs. The England value for 2017/18 was £1,539. The box plot shows the distribution of CCG values for the period 2013/14 to 2017/18.

There was no significant change in any of the 3 variation measures between 2013/14 and 2017/18. Some variation will be due to differences in population composition and disease prevalence. When adjusted for COPD prevalence, there is a 4.7-fold difference between CCGs (Figure 25.1).

Reasons for unwarranted variation include provision of oxygen for people who do not need it or who are not using it, and failure to identify all patients who would benefit from it. The degree of variation observed shows there is considerable scope for increasing the value of home oxygen therapy by improving the quality of care and reducing waste.

Options for action

The most recent Department of Health and Social Care (DHSC) internal analysis revealed that savings of up to 30% in the first year (equivalent to £45 million nationally or £300,000 per PCT) could be achieved through setting up a home oxygen service with structured clinical assessment, and regular review of requirements to ensure patients receive home oxygen only after appropriate assessment.[1] It is important that these services work within an integrated chronic respiratory disease pathway, i.e. operate across hospital and community settings.

To increase the value from home oxygen therapy, commissioners and providers should consider the following interventions:

Undertake regular pulse oximetry in all patients at risk of chronic hypoxia managed in primary or specialist care to determine oxygen saturation. These patients include those with long term respiratory, cardiac or neurological disease.

Undertake regular exhaled carbon monoxide (CO) readings in all patients at risk of chronic hypoxia managed in primary or specialist care as part of an evidence-based assessment of tobacco dependence, and offer specialist referral and pharmacotherapy.

Consider long term home oxygen therapy only in patients with oxygen saturation of less than 92% on air who are clinically stable and optimised.

Refer patients with oxygen saturation of less than 92% to a HOSAR for structured assessment and follow up.

Home oxygen therapy only to be prescribed by specialists, after a structured assessment, including exhaled CO monitoring, treatment of tobacco dependence, risk assessment, and patient and carer education.

Review patients treated with home oxygen by the HOSAR at appropriate guideline-based intervals.

Ensure commissioned HOSAR have a remit to cover all patient groups, not just COPD, including other long-term respiratory conditions such as interstitial lung disease, chest wall deformity, pulmonary hypertension, sleep disorders, sickle cell disease, neuromuscular disease, cluster headaches and palliative care.

Resources

British Thoracic Society (2015) Guidelines for Home Oxygen Use in Adults [Accessed 30 July 2019]

British Thoracic Society (2017) Home Oxygen Quality Standards [Accessed 30 July 2019]

NHS Medical Directorate (2012) COPD Commissioning Toolkit A resource for commissioners [Accessed 30 July 2019]

NHS Primary Care Commissioning (2011) Home Oxygen Service – Assessment and Review. Good practice guide [Accessed 30 July 2019]

National Institute for Health and Care Excellence (2016) Chronic obstructive pulmonary disease in adults (NICE quality standard [QS10]) [Accessed 30 July 2019]

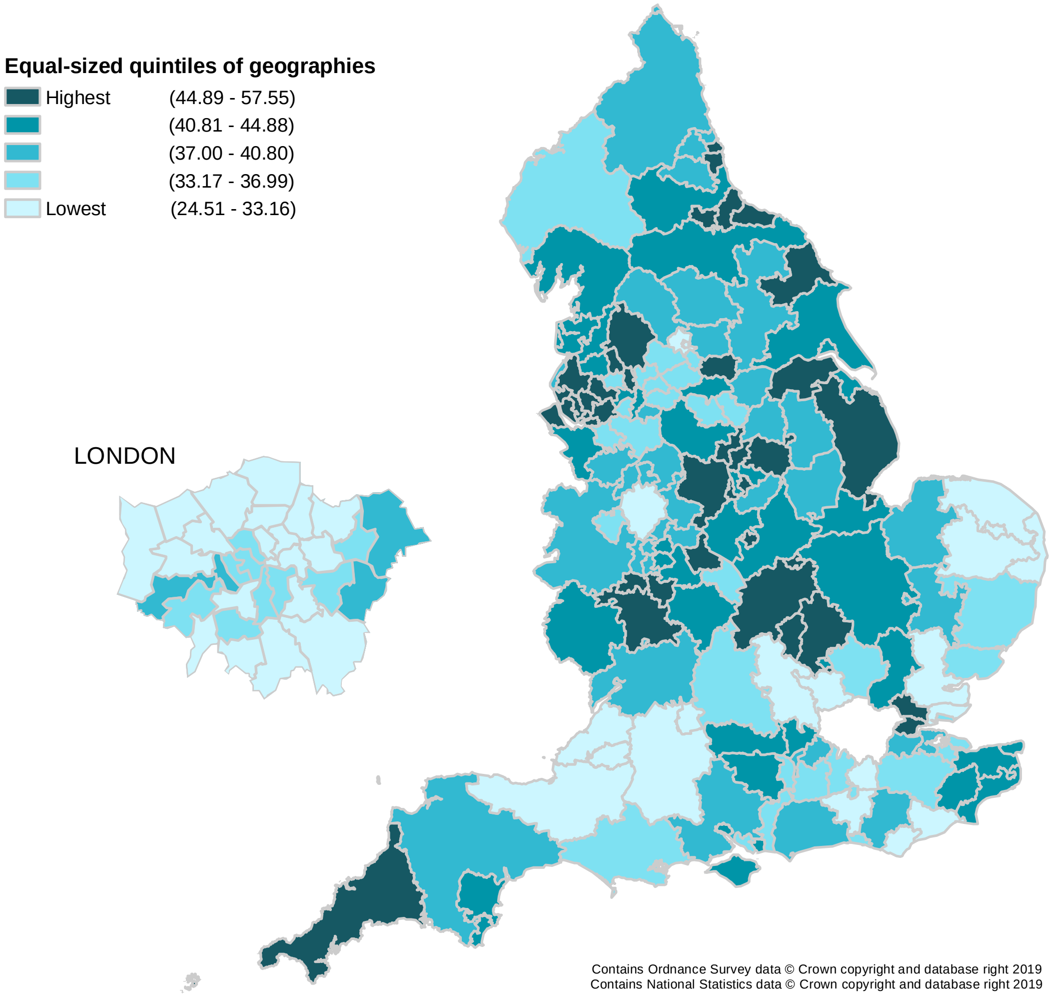
NHS Improvement – Lung (2011) Improving Home Oxygen Services: Emerging Learning from the National Improvement Projects [Accessed 30 July 2019]

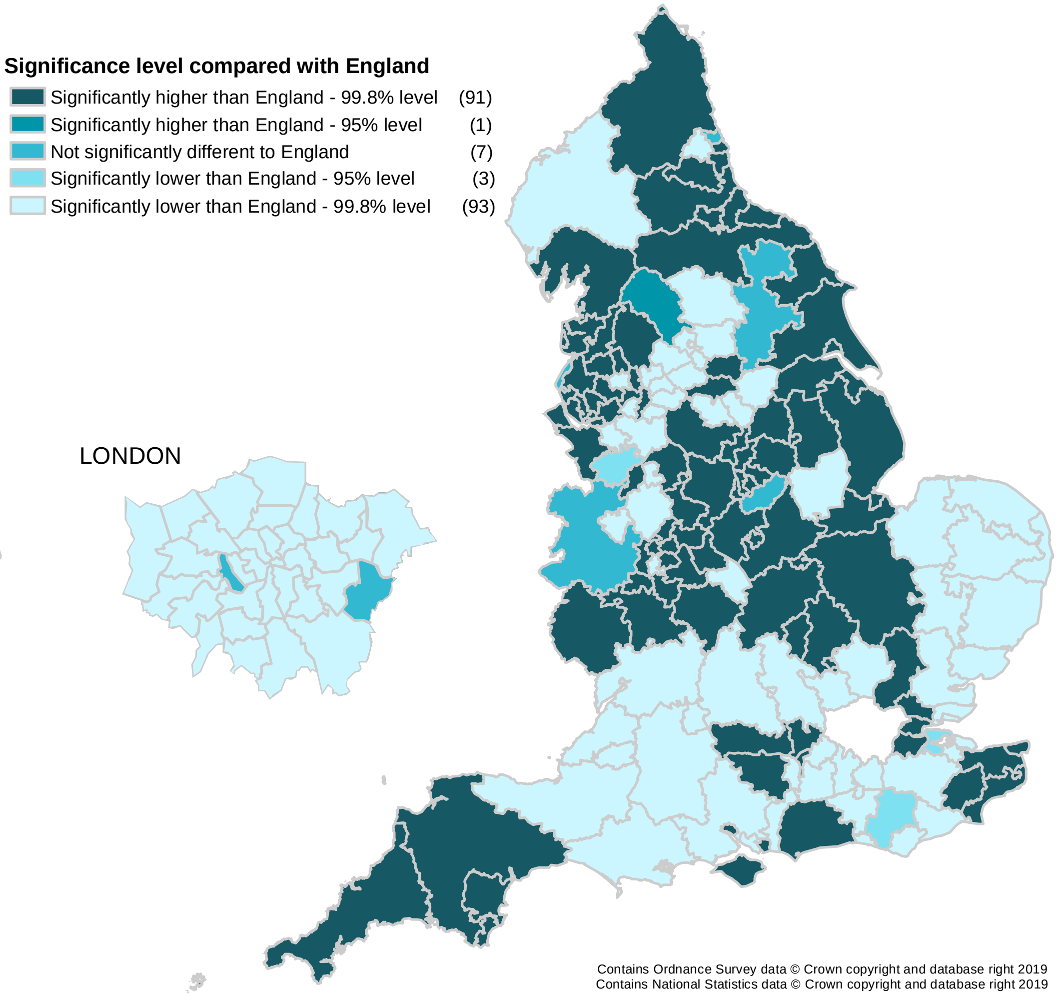
[1] NHS Primary Care Commissioning (2011) Home Oxygen Service – Assessment and Review. Good practice guide [Accessed 30 July 2019]
[2] Hardinge M, Annandale J, Bourne S, et al. British Thoracic Society guidelines for home oxygen use in adults: accredited by NICE. Thorax 2015;70:i1-i43. [Accessed 30 August 2019]
[3] Jiménez-Ruiz CA, Andreas S, Lewis KE, et al. Statement on smoking cessation in COPD and other pulmonary diseases and in smokers with comorbidities who find it difficult to quit. European Respiratory Society 2014; 46: 61-79 [Accessed 30 August 2019]

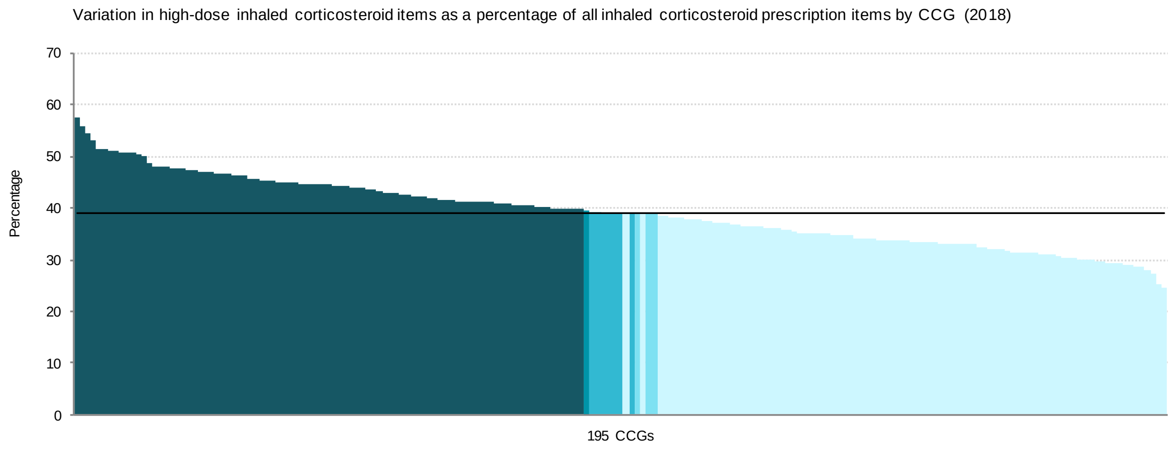
Health Service Provision – High-dose inhaled corticosteroid prescriptions

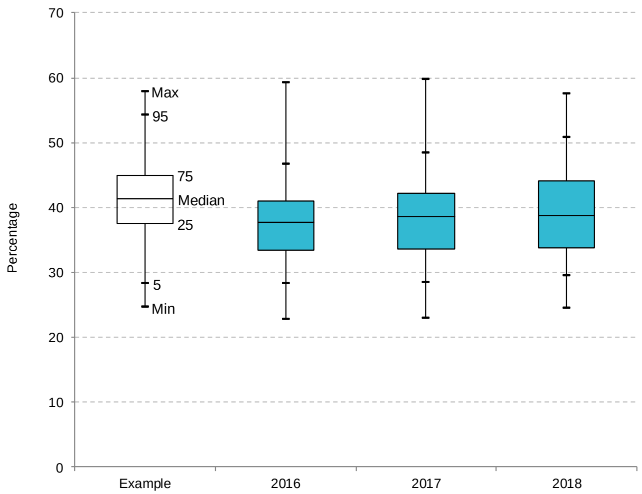
Map 26: Variation in high-dose inhaled corticosteroid items as a percentage of all inhaled corticosteroid prescription items by CCG (2018)

Optimum value: Low









	Example	2016	2017	2018	
Max-Min (Range)		36.5	36.9	33.0	No significant change
95th-5th percentile		18.5	19.9	21.3	WIDENING Significant
75th-25th percentile		7.7	8.6	10.4	No significant change
Median		37.8	38.5	38.8	No significant change

Context

Inhaled corticosteroids (ICS) are commonly prescribed for patients with asthma or COPD, often in high dosage. High dose ICS, ≥2000micrograms beclomethasone dipropionate (BDP) equivalent per day,[1] is often prescribed in combination with a long acting beta agonist. The risk of systemic side effects is greater with higher doses. High dose ICS is associated with clinically detectable adrenal suppression, increased risk of non-fatal pneumonia (in patients with COPD), type II diabetes, glaucoma and cataracts, and may increase the risk of fractures in patients already at risk of osteoporotic fractures.

Although the use of high dose ICS is recommended in clinical asthma guidelines, there is limited evidence that increasing the dose of inhaled steroids beyond 800 micrograms BDP equivalent/day is effective in improving asthma control (Grade D evidence).[2] It may be appropriate to use high dose ICS long-term in a small number of patients, but often patients can be ‘stepped-down’ again if clinically stable for a long period or not improving on high dose therapy. However, the dose of ICS is often stepped up without checking adherence or inhaler technique. National guidelines state that the patient should be maintained on the lowest effective dose of ICS possible and that adherence and inhaler technique should be reviewed regularly.

Clinical trials of combination therapy in COPD show that moderate doses of ICS (around 800 microgram BDP equivalent per day) are equally effective as high dose ICS in reducing exacerbation frequency in those who have 2 or more exacerbations a year, with improvements in quality of life.

This indicates that the use of high dose ICS for the management of COPD increases the risk of side effects (especially non-fatal pneumonia) with no additional clinical benefit.

Magnitude of variation

Map 26: Variation in high-dose inhaled corticosteroid items as a percentage of all inhaled corticosteroid prescription items by CCG (2018)

The maps and column chart display the latest period (2018), during which CCG values ranged from 24.5% to 57.6%, which is a 2.3-fold difference between CCGs. The England value for 2018 was 39.1%.

The box plot shows the distribution of CCG values for the period 2016 to 2018. The 95th to 5th percentile gap widened significantly.

Average values at CCG level mask the much greater degree of variation among practices within CCGs. There are several potential reasons for this variation:

- a large proportion of patients do not use their inhalers correctly thereby reducing effectiveness. Clinicians often respond to treatment failure by increasing the dose rather than correcting inhaler technique
- adherence to medications including inhalers is generally poor. Clinicians may respond to treatment failure by increasing the dose rather than checking adherence
- patients have inhaler doses increased to the maximum during exacerbations to achieve symptom control but doses are not reduced once patients are stable
- there is a lack of awareness that high dose ICS are not necessary to treat COPD and will only benefit a small proportion of asthmatic patients. However, the current treatment guidelines do not stress this point[3]
- there is some unlicensed use of high-potency aerosol combinations in COPD possibly due to lack of familiarity with guideline recommendations among some clinicians[4]

Options for action

The need for high dose ICS in both patients with asthma and COPD should be reviewed regularly by clinicians with a specialist interest in medicines optimisation for respiratory disease.

Patients with COPD who do not exacerbate may be able to have the ICS completely withdrawn, and patients on high dose ICS who have had a history of frequent exacerbations may be able to have the dose reduced to moderate dose ICS without any clinical detriment. The use of blood eosinophils may help identify patients in whom moderate doses of ICS may be effective in reducing exacerbations.

Many patients on high dose ICS for asthma may not even be taking their ICS regularly as adherence to inhaled therapy and inhaler technique is often poor. Improved adherence and technique may allow a much lower dose of ICS to be used. The use of fractional concentration of exhaled nitric oxide (FENO) to monitor the response to treatment may help identify patients in whom higher doses may be necessary if the patient is complaint with medication.

The appropriate use of lower doses of ICS will minimise harm from ICS side effects.

Resources

British Thoracic Society and Scottish Intercollegiate Guidelines Network (2019) British guideline on the management of asthma. A national clinical guideline [Accessed 2 August 2019]

National Institute of Health Care Excellence (2017) Asthma: diagnosis, monitoring and chronic asthma management (NICE guideline [NG80]) [Accessed 12 July 2019]

National Institute of Health Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 12 July 2019]

National Institute of Health Care Excellence (2016) Chronic obstructive pulmonary disease (NICE quality standard [QS10]) [Accessed 12 July 2019]

NHS England Guidance for Healthcare Professionals on Inhaled Corticosteroids in Adults [Accessed 12 July 2019]

NHS England Inhaled Corticosteroid Safety Information for Adults [Accessed 12 July 2019]

Primary Care Respiratory Society (2016) Getting the basics right – Inhaler technique Primary Care Respiratory Update 3(1) [Accessed 12 July 2019]

Primary Care Respiratory Society (2019) A guide to stepping down inhaled corticosteroids in COPD [Accessed 12 July 2019]

RightBreathe Pathways Inhaler prescribing information [Accessed 12 July 2019]

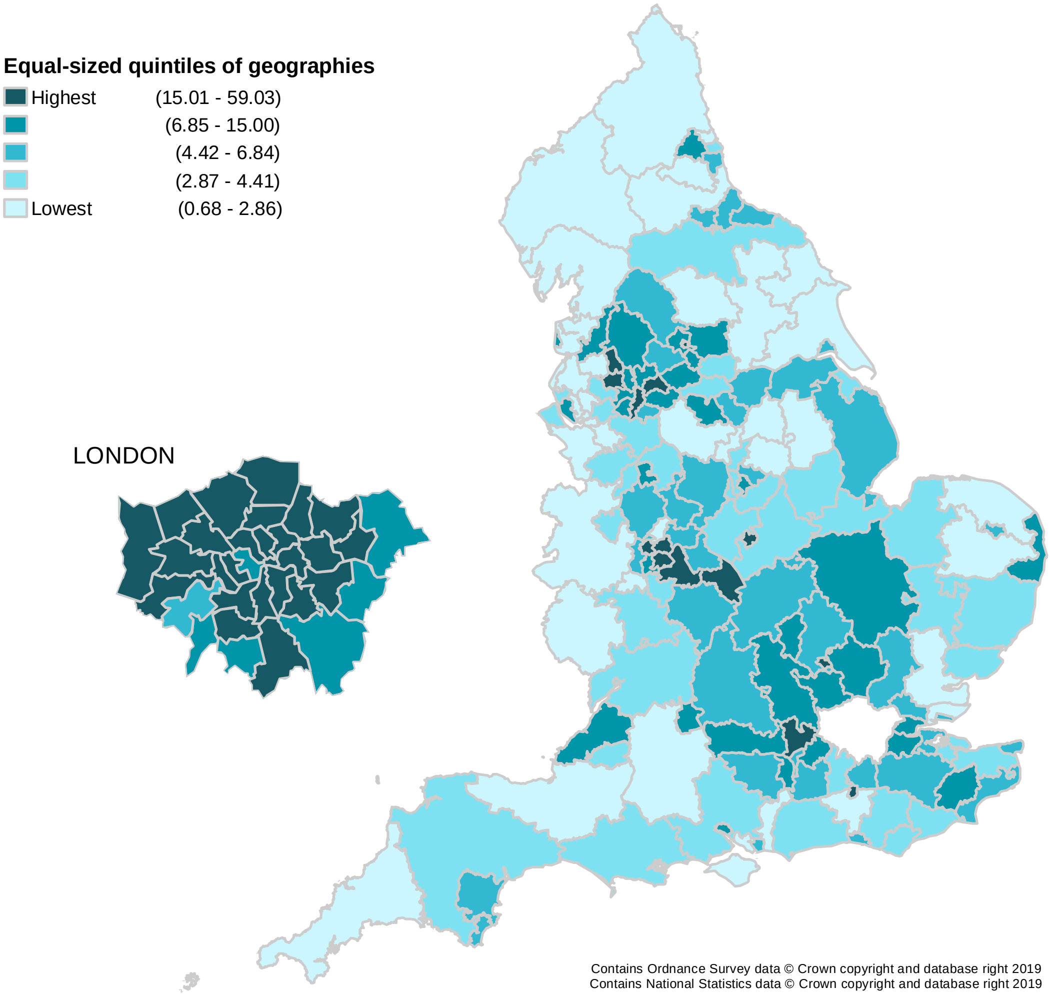
[1] British Thoracic Society and Scottish Intercollegiate Guidelines Network (2016) British Guideline on the Management of Asthma. A national clinical guideline Table 9 Adult doses of inhaled corticosteroids [Accessed 24 May 2019]
[2] British Thoracic Society and Scottish Intercollegiate Guidelines Network (2016) British Guideline on the Management of Asthma. A national clinical guideline Page 2 Grades of recommendation [Accessed 24 May 2019]
[3] Primary Care Respiratory Society (2019) Consensus guide to managing COPD - All that glitters is not GOLD, nor is it even NICE Primary Care Respiratory Update 17 [Accessed 14 August 2019]
[4] Primary Care Respiratory Society (2017) Respiratory Inhalers [Accessed 14 August 2019]

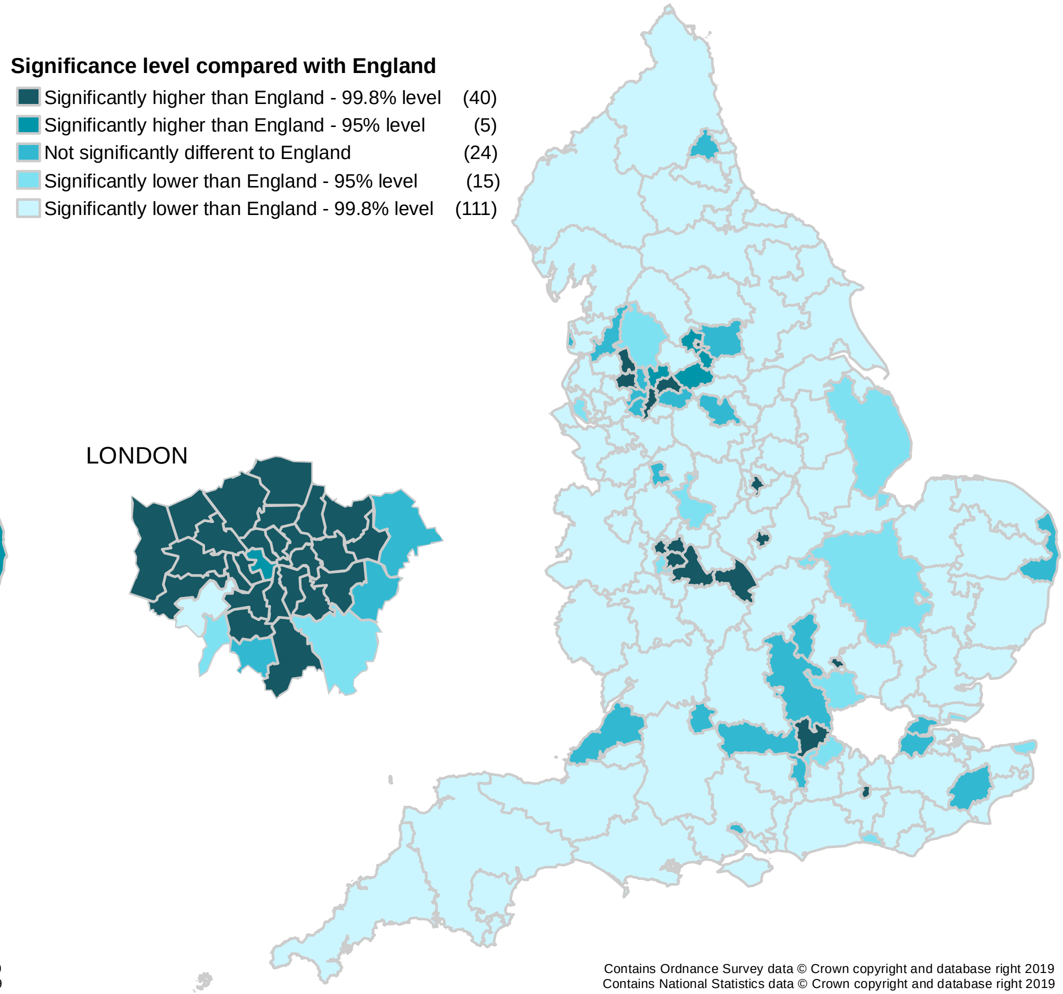
Tuberculosis – Incidence

Map 27: Variation in incidence rate of tuberculosis (TB) per population by CCG (2015-2017)

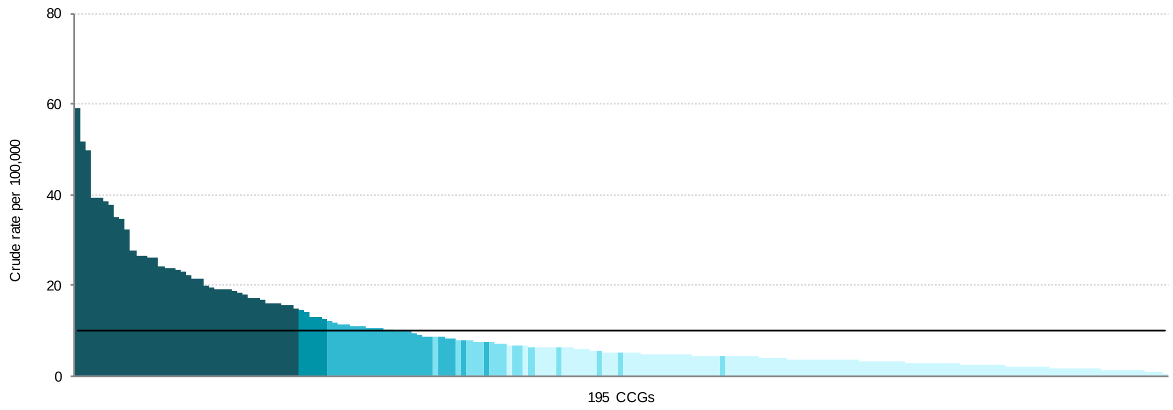
Crude rate per 100,000

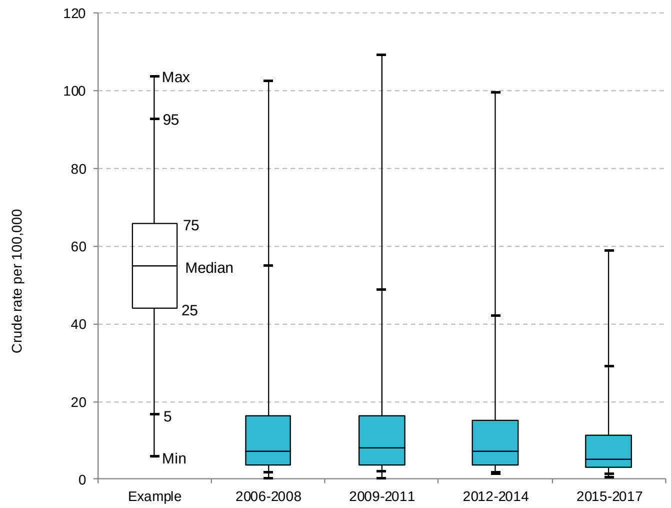
Optimum value: Low





Variation in incidence rate of tuberculosis (TB) per population by CCG (2015-2017)





Max-Min (Range)		102.2	108.9	98.3	58.4	No significant change
95th-5th percentile		53.1	46.9	40.2	27.7	NARROWING Significant
75th-25th percentile		12.9	12.8	11.3	8.2	No significant change
Median		7.2	8.0	7.2	5.2	No significant change

Context

Following major declines during most of the 20th century, in England the incidence of tuberculosis (TB) increased from the late 1980s to a peak of 15.6 per 100,000 population in 2011. The incidence has since declined to a rate of 9.2 per 100,000 population in 2017, which is the lowest incidence in England since the start of enhanced TB surveillance in 2000. For the first time, England is considered to be a low incidence country under current World Health Organisation (WHO) definitions (under 10 people diagnosed with TB per 100,000 population).

Despite these decreases, TB incidence in England is higher than many other Western European countries, and more than 3 times higher than in the USA. Because of this, and in line with a global push to improve TB control, Public Health England (PHE) has made reducing TB incidence one of its key priorities, and together with NHS England published the ‘Collaborative Tuberculosis Strategy for England 2015-2020’ (see ‘Resources’). The strategy seeks to address some of the variation in TB by providing a 10 point plan to improve TB control and reduce the incidence of TB year on year (Box 27.1). Many comparable countries have achieved consistent reductions in TB through similar concerted approaches to prevention, treatment and control.

Box 27.1: The 10 areas for action in in England's TB Strategy

1. improve access to services and ensure early diagnosis
2. provide universal access to high quality diagnostics
3. improve treatment and care services
4. ensure comprehensive contact tracing
5. improve BCG Vaccination uptake
6. reduce drug-resistant TB
7. tackle TB in under-served populations
8. systematically implement new entrant latent TB (LTBI) screening
9. strengthen surveillance and monitoring
10. ensure an appropriate workforce to deliver TB control

Magnitude of variation

Map 27: Variation in incidence rate of tuberculosis (TB) per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 0.7 to 59.0 per 100,000 population, which is an 87.2-fold difference between CCGs. The England value for 2015 to 2017 was 9.9 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2006-2008 to 2015-2017.

The 95th to 5th percentile gap narrowed significantly.

TB is particularly concentrated in large urban areas and in the most-deprived populations. In 2017, 66.7% of all people notified with TB were resident in the 40% most-deprived communities. Variations in the risk of TB depend on differences in the risks of:

- exposure to TB
- progressing from TB infection to active TB disease once infected

People at increased risk of having been exposed to TB include:

- those born in countries with a high burden of TB - people born outside the UK accounted for 71% of TB notifications in England in 2017 and the majority of these (84%) had lived in the UK for at least 2 years prior to notification
- ethnic minority groups born in the UK who have frequent contact with high TB-burden countries - in 2017, the rate of TB was highest in the black, Pakistani and Indian ethnic groups, with rates between 16 and 20 times higher than in the UK born white population
- those with certain social risk factors - in 2017, 12.6% of people notified with TB had a social risk factor. Social risk factors for TB include current or a history of homelessness, imprisonment, drug misuse, or current alcohol
- those living in overcrowded accommodation, especially when combined with one of the other factors above

People at increased risk of progressing from TB infection to active disease include:

- those with immunosuppression, HIV (even when not immunosuppressed) or diabetes
- babies and young children
- smokers
- people with poor nutrition
- people with drug or alcohol use problems

Options for action

Local stakeholders, including local authorities, CCGs, NHS service providers, PHE health protection teams and the third sector, need to work through local Health and Wellbeing Boards and their TB Control Boards (TBCBs):

- to develop a local TB control plan based on the ten evidence-based areas for action (Box 26.1) of the Collaborative TB Strategy (see 'Resources')
- to ensure appropriate commissioning, delivery and monitoring of TB services
- TBCBs and their partners are encouraged to use the Resource 'Tackling TB in Under-Served Populations' to take appropriate local action and better meet the needs of Under-Served Populations (USPs) (see 'Resources')
- TBCBs and partners to work to provide more integrated services for USPs
- local authorities are encouraged to use 'Tackling TB - local government's public health role', a joint publication from PHE and the Local Government Association to help support USPs with TB (see 'Resources')

In addition, CCGs are encouraged to use the National TB Service Specification and Clinical Policy to commission and monitor local TB service. This is particularly important in localities with the highest rates of TB.

Through collaborative working, and the use of existing accountability arrangements, local TBCBs are encouraged to work with providers and commissioners of clinical care and public services to collectively deliver better TB control.

Resources

Local Government Association (2018) Tackling Tuberculosis – Local government's public health role [Accessed 31 January 2019]

NHS England Tuberculosis strategy for England 2015-2020 [Accessed 29 July 2019]

NHS England National TB Service Specification and Clinical Policy. Soon to be available at Tuberculosis strategy for England 2015-2020 [Accessed 29 July 2019] Until then people should contact england.tbprogramme@nhs.net for copies

National Institute for Health and Care Excellence (2016) Tuberculosis (NICE guideline [NG33]) [Accessed 31 January 2019]

National Institute for Health and Care Excellence Tuberculosis overview - NICE Pathway [Accessed 31 January 2019]

Public Health England and NHS England (2015) Collaborative Tuberculosis Strategy for England 2015 to 2020 [Accessed 31 January 2019]

Public Health England (2018) Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: UK, 2000 to 2017 Official Statistics [Accessed 31 January 2019]

Public Health England (2019) Tackling Tuberculosis in under-served populations: A resource for TB Control Boards and their partners [Accessed 31 January 2019]

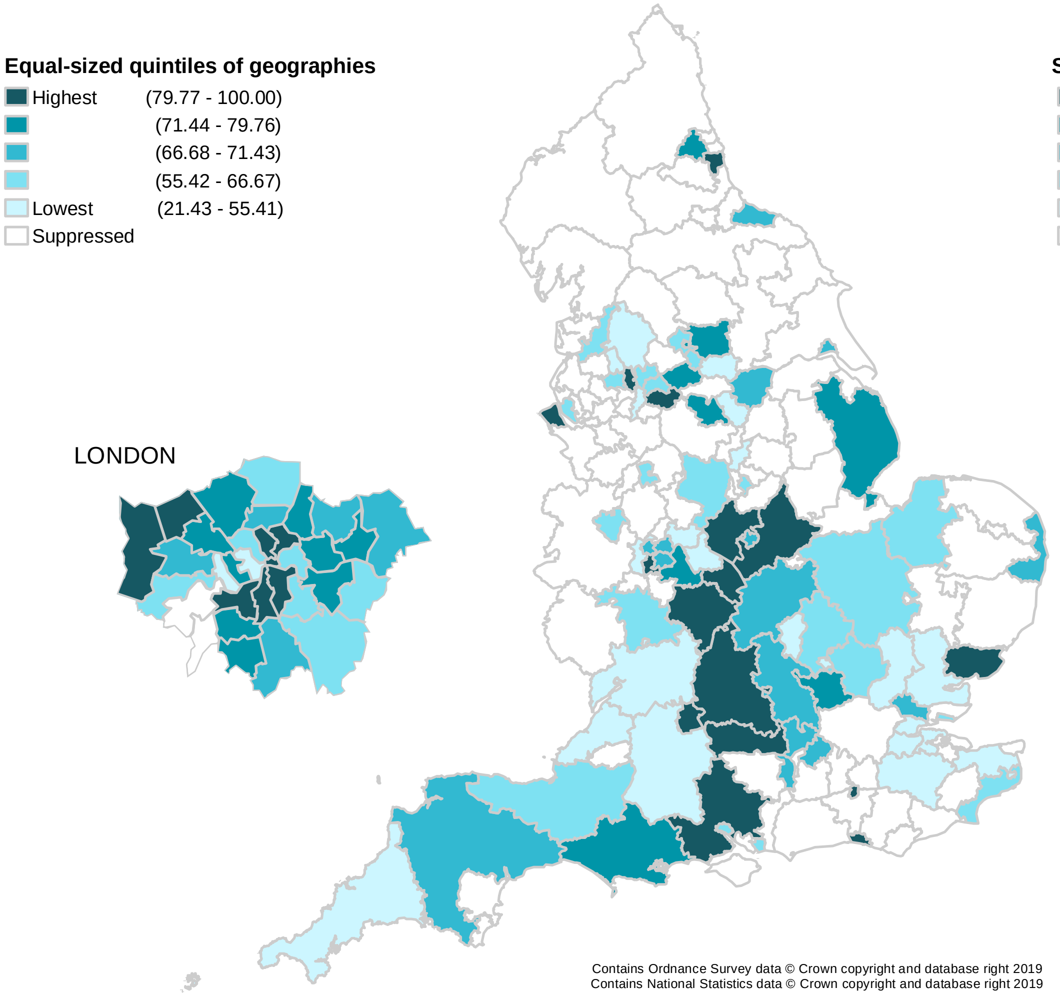
Public Health England (2018) Tuberculosis in England annual reports [Accessed 31 January 2019]

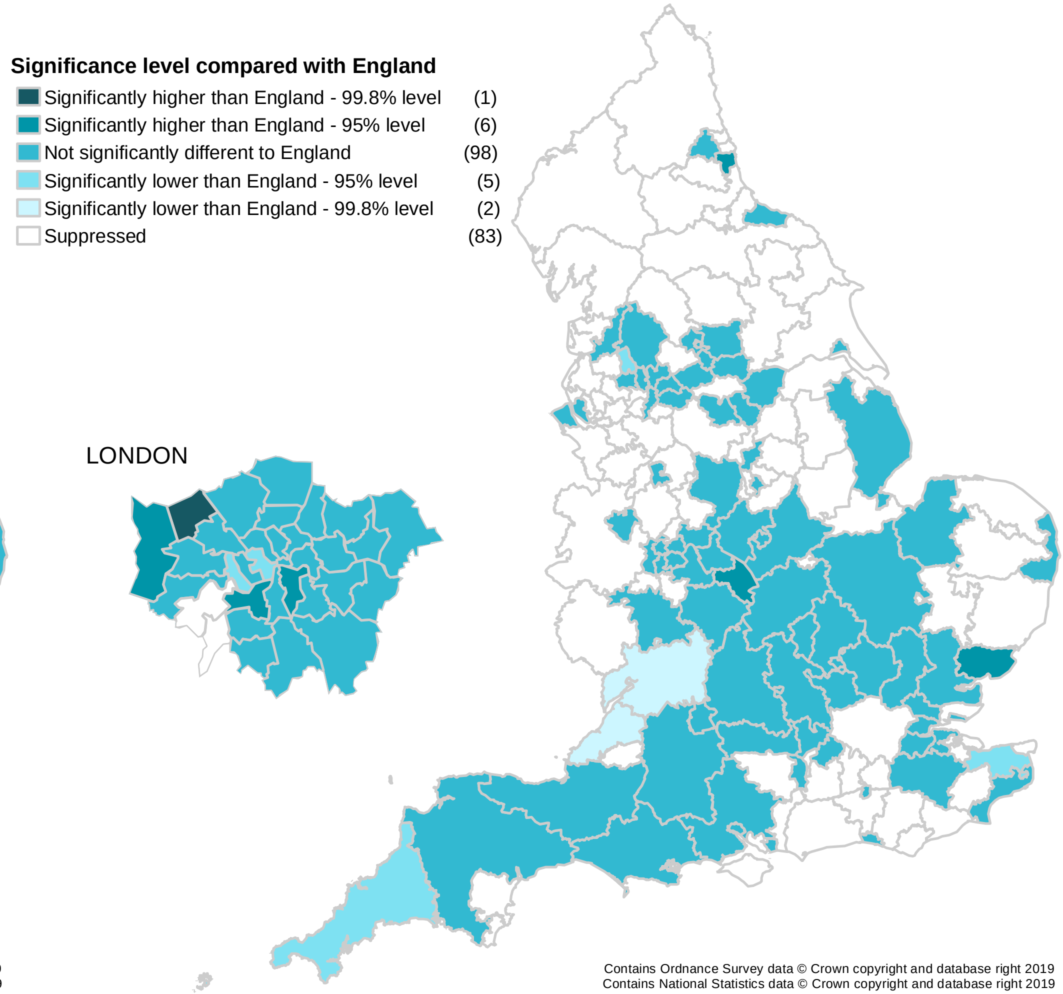
Public Health England TB Strategy Monitoring Indicators Interactive web tool with local information about the key TB monitoring indicators [Accessed 31 January 2019]

Tuberculosis – Treatment

Map 28a: Variation in percentage of people with pulmonary tuberculosis (TB) who started treatment within four months of symptom onset by CCG (2017)

Optimum value: High

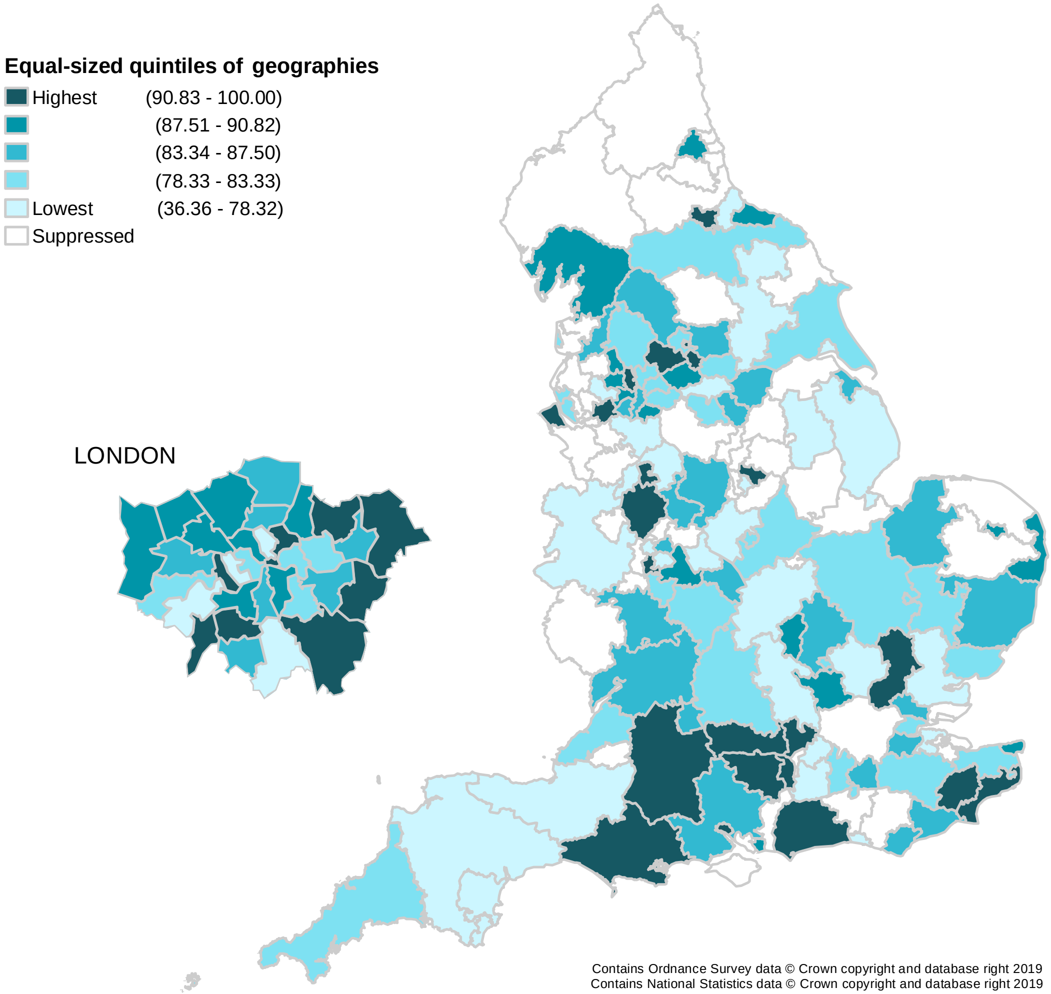


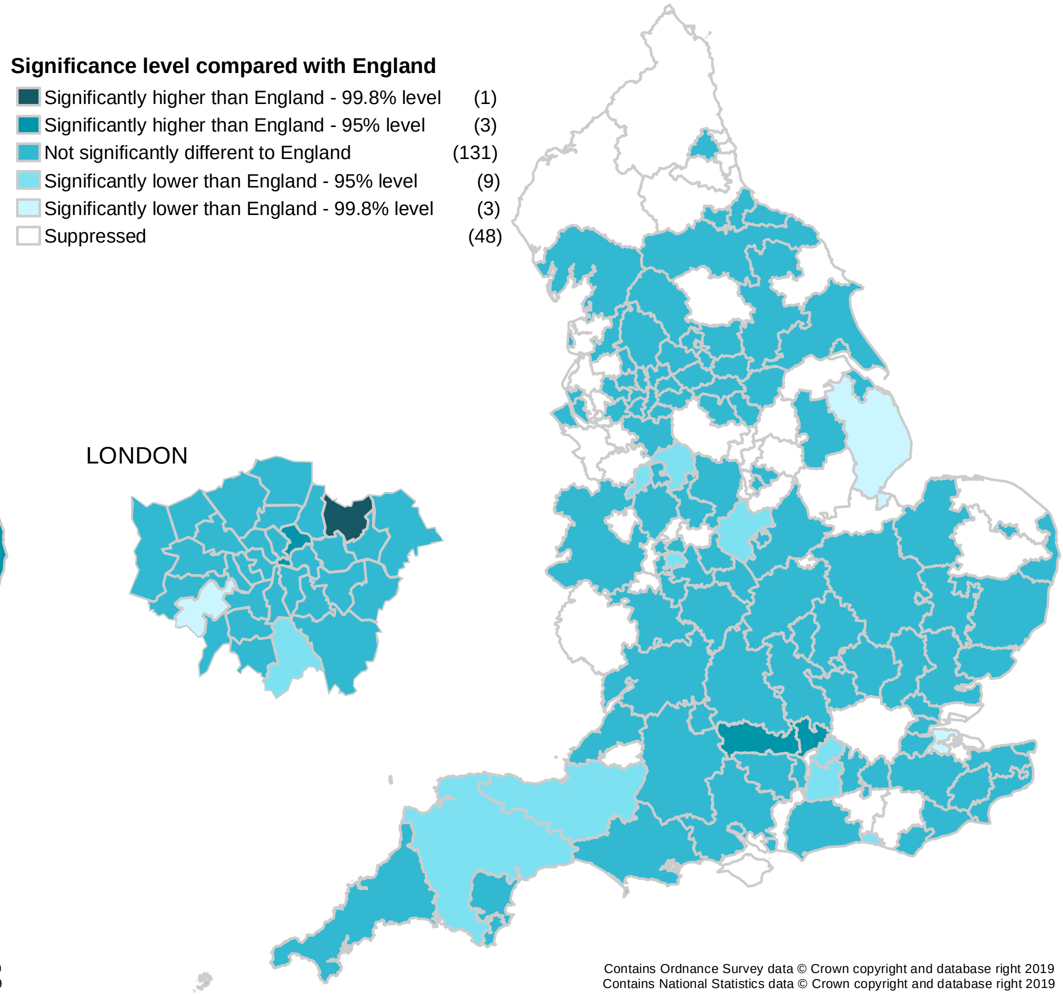


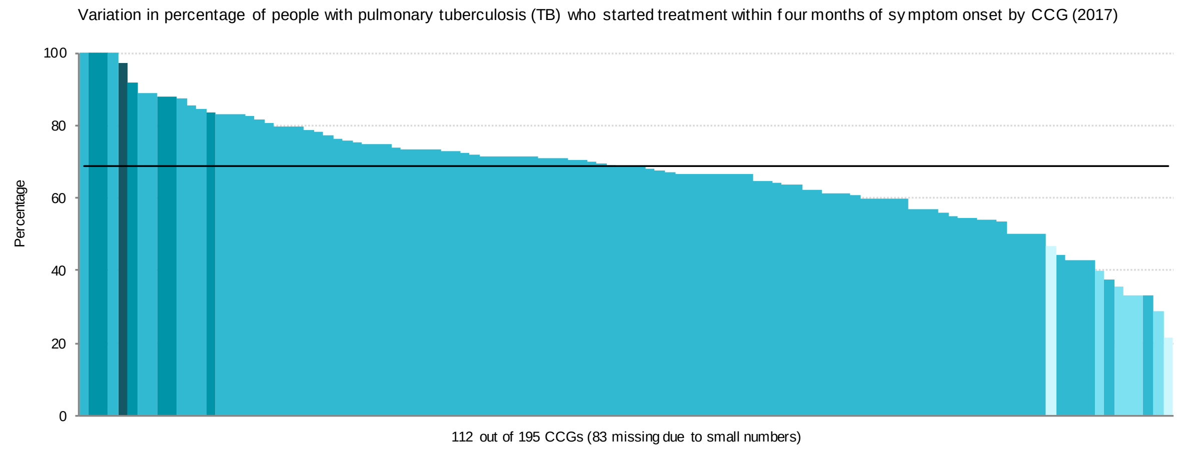
Tuberculosis – Treatment

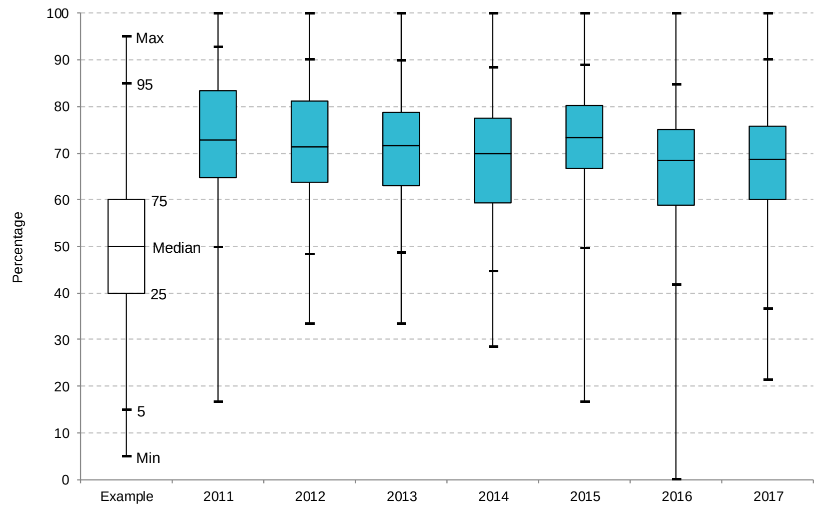
Map 28b: Variation in percentage of people with drug-sensitive tuberculosis (TB) who completed a full course of treatment within 12 months of treatment onset by CCG (2016)

Optimum value - High









Max-Min (Range)		83.3	66.7	66.7	71.4	83.3	100.0	78.6	No significant change
95th-5th percentile		43.2	41.8	41.3	43.8	39.3	43.2	53.5	No significant change
75th-25th percentile		18.6	17.3	15.7	18.2	13.5	16.2	15.7	No significant change
Median		72.7	71.4	71.7	70.0	73.3	68.4	68.8	No significant change

Context

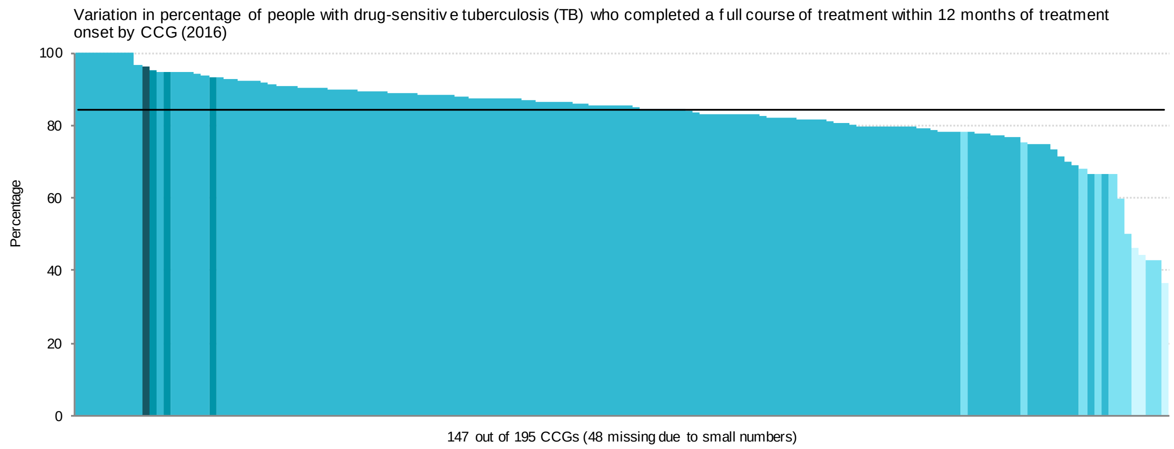
Prompt diagnosis of tuberculosis (TB) and completion of a full course of treatment are crucial:

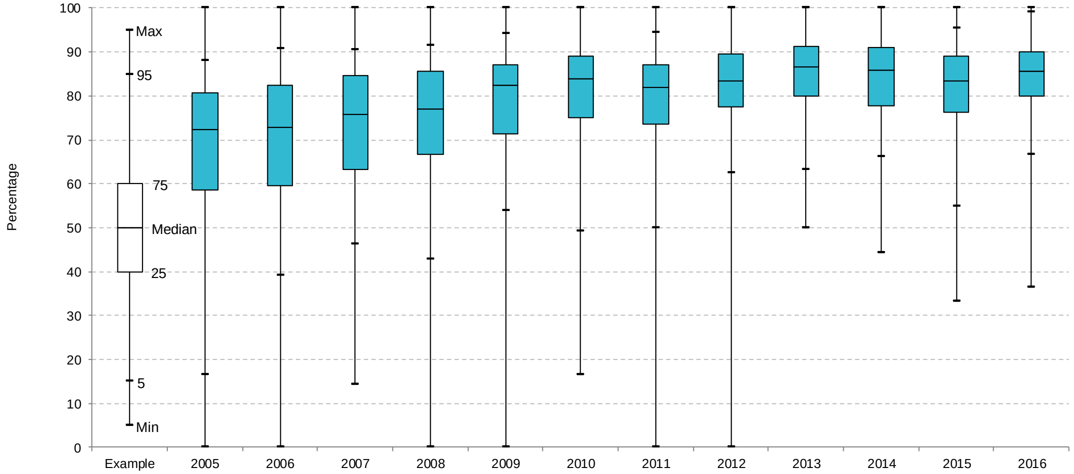
- to ensure a favourable outcome for individual patients
- to prevent ongoing transmission

In the UK, everyone is entitled to free treatment for TB, irrespective of their immigration status. TB is curable; however, if left untreated or if treated inappropriately, the disease can be fatal. Without treatment, one-third of all pulmonary TB cases die. People who experience delays in starting treatment or those who do not complete their course of treatment can develop drug-resistance, long-term health problems, and remain infectious for prolonged periods of time, presenting an infection risk to others.

Standard anti-TB treatment involves a combination of different antibiotics for a minimum of 6 months. Treatment can be either self-administered or supported specifically through directly observed therapy (DOT), which works best as part of a range of supportive measures tailored to each person’s needs. The care package should include education and counselling, incentives, enablers and psycho-social care to address housing need, substance misuse, and other problems likely to complicate recovery.

Patients with social risk factors, such as homelessness or a history of imprisonment, and drug or alcohol use, have poorer treatment outcomes at 12 months. High levels of treatment completion have been achieved in the most complex patients living in very difficult circumstances with the provision of enhanced multidisciplinary support services.





Max-Min (Range)		100.0	100.0	85.7	100.0	100.0	83.3	100.0	100.0	50.0	55.6	66.7	63.6	NARROWING Significant
95th-5th percentile		71.3	51.4	44.3	48.7	40.4	50.8	44.4	37.5	36.8	33.7	40.6	32.4	NARROWING Significant
75th-25th percentile		21.9	22.9	21.3	18.9	15.5	13.9	13.4	12.2	11.3	13.1	12.7	10.0	NARROWING Significant
Median		72.4	72.7	75.7	76.9	82.4	83.9	81.9	83.3	86.5	85.8	83.3	85.7	INCREASING Significant

Magnitude of variation

Map 28a: Variation in percentage of people with pulmonary tuberculosis (TB) who started treatment within four months of symptom onset by CCG (2017)

The maps and column chart display the latest period (2017), during which CCG values ranged from 21.4% to 100.0%, which is a 4.7-fold difference between CCGs. The England value for 2017 was 68.8%.

The box plot shows the distribution of CCG values for the period 2011 to 2017.

There was no significant change in any of the 3 variation measures between 2011 and 2017.

Late diagnosis may be caused either by delays in presentation to health services or in the diagnostic processes. The observed variation in delays to diagnosis and start of treatment may be due to:

- low levels of symptom awareness in some populations
- higher levels of TB-related stigma among certain populations (particularly under-served populations and new entrants)
- reluctance of some populations to engage with health services
- lack of TB awareness among some health professionals

Map 28b: Variation in percentage of people with drug-sensitive tuberculosis (TB) who completed a full course of treatment within 12 months of treatment onset by CCG (2016)

The maps and column chart display the latest period (2016), during which CCG values ranged from 36.4% to 100.0%, which is a 2.8-fold difference between CCGs. The England value for 2016 was 84.4%.

The box plot shows the distribution of CCG values for the period 2005 to 2016.

There has been significant narrowing of all 3 measures of variation.

The median increased significantly from 72.4% in 2005 to 85.7% in 2016.

The reasons for the degree of variation observed include differences in the numbers of people who:

- die while being treated – a higher proportion of people who die are older
- are lost to follow-up (either in the UK or abroad)
- are still on treatment due to treatment interruptions or side-effects
- have social risk factors

Other factors that may contribute to the degree of variation include differences in:

- the structure and quality of TB services across England and access to these
- the provision of specialist TB services, TB clinical nurse specialists and outreach/DOT workers to support patients with complex medical or social needs enabling them to complete treatment
- access to or participation in a TB clinical network to support expert review of complex cases
- access to specialist unit co-supervision

Options for action

As part of the Collaborative TB Strategy for England 2015-2020 (see ‘Resources’), local authorities, public health leaders, the NHS, clinical commissioners and the third sector need:

- to work with their local TB Control Board, Public Health England and NHS England to review services in their local area against the National TB Service Specification and Clinical Policy to identify gaps and take appropriate action with key partners
- to develop plans to address gaps in the provision of high quality universal clinical, public health and social care services for TB, based on NICE guidance (see ‘Resources’)
- TB commissioners, in both CCGs and local authorities, to ensure appropriate access to services, treatment and support to enable patients, particularly under-served populations, to complete treatment

Alongside this the National TB Programme needs to raise awareness of TB and its treatment in groups-at-risk through a selective awareness raising campaign, for example people from TB endemic countries or the homeless.

In addition, local partners may consider a local needs assessment would be helpful; in areas of high need, it is important to ensure that TB is part of the Joint Strategic Needs Assessment (JSNA).

Local authority overview and scrutiny committees and Health and Wellbeing Boards have a role in the oversight of TB control, including treatment completion rates. To achieve high levels of treatment completion, local authorities need to provide assistance in supporting a person’s social needs, for example, accommodation for patients who are homeless, travel to clinics, and nutrition.

In localities where there may be underserved populations:

- public health, healthcare and other professionals should follow NICE guidelines NG33 (see ‘Resources’)
- NHS and other commissioners need to consider ways of reaching these populations, such as the approach developed by the University College London Hospital “Find & Treat” service (see ‘Resources’)

Resources

Local Government Association (2018) Tackling Tuberculosis - Local government’s public health role [Accessed 31 January 2019]

NHS England Tuberculosis strategy for England 2015-2020 [Accessed 29 July 2019]

NHS England National TB Service Specification and Clinical Policy. Soon to be available at Tuberculosis strategy for

England 2015-2020 [Accessed 29 July 2019] Until then people should contact england.tbprogramme@nhs.net for copies.

National Institute for Health and Care Excellence (2016) Tuberculosis (NICE guideline [NG33]) [Accessed 31 January 2019]

National Institute for Health and Care Excellence Tuberculosis overview - NICE Pathway [Accessed 31 January 2019]

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Public Health England (2018) Reports of cases of tuberculosis to enhanced tuberculosis surveillance systems: UK, 2000 to 2017 Official Statistics [Accessed 31 January 2019]

Public Health England (2019) Tackling Tuberculosis in under-served populations: A resource for TB Control Boards and their partners [Accessed 31 January 2019]

Public Health England (2018) Tuberculosis in England annual reports [Accessed 31 January 2019]

Public Health England TB Strategy Monitoring Indicators Interactive web tool with local information about the key TB monitoring indicators [Accessed 31 January 2019]

Royal College of Nursing Public health - topics: Tuberculosis [Accessed 31 January 2019]

TB Alert The Truth about TB Professional awareness and education resources [Accessed 31 January 2019]

Case studies:

National Institute for Health and Care Excellence Shared learning database (2012) Identifying and managing tuberculosis (TB) among hard-to-reach groups - The prison setting with a high incidence of TB The Royal Free Hospital [Accessed 7 February 2019]

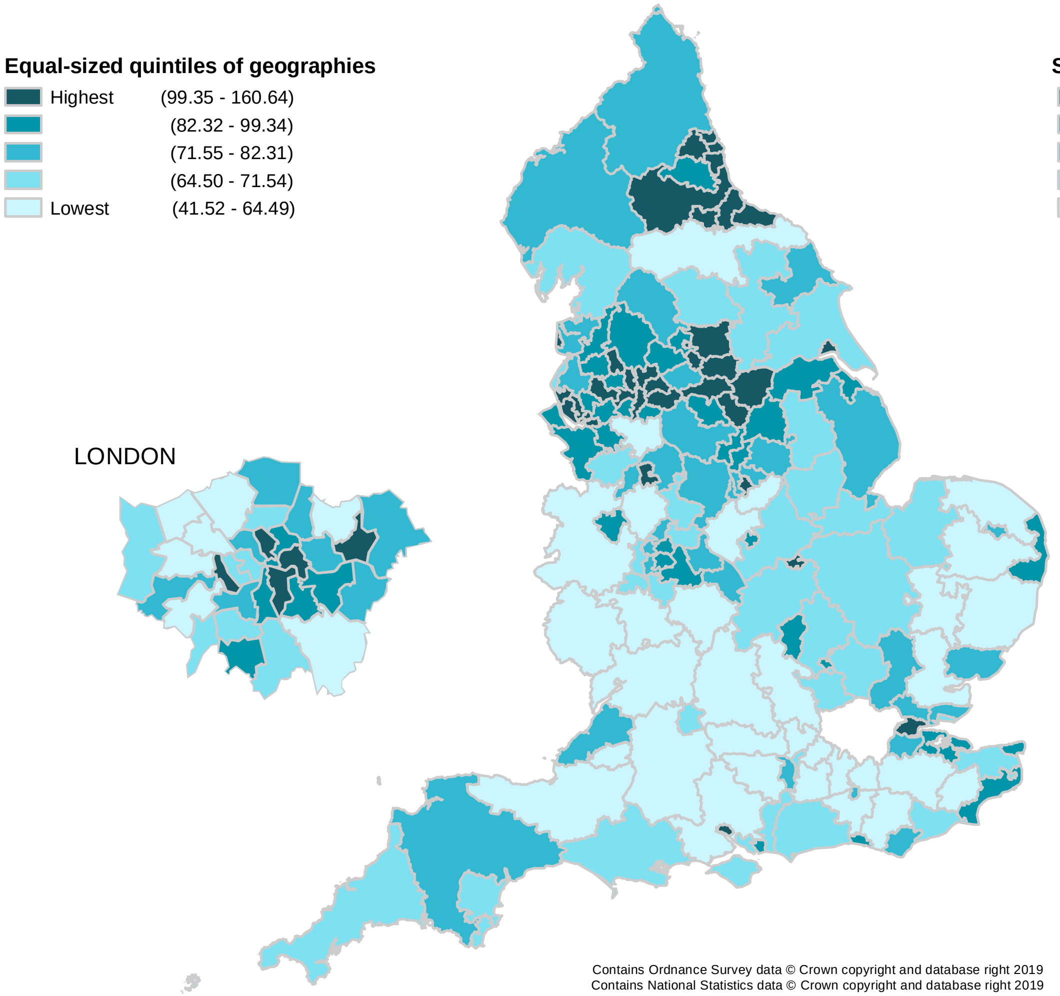
University College London Hospital (UCLH) TB research network Find & Treat service London. [Accessed 7 February 2019]

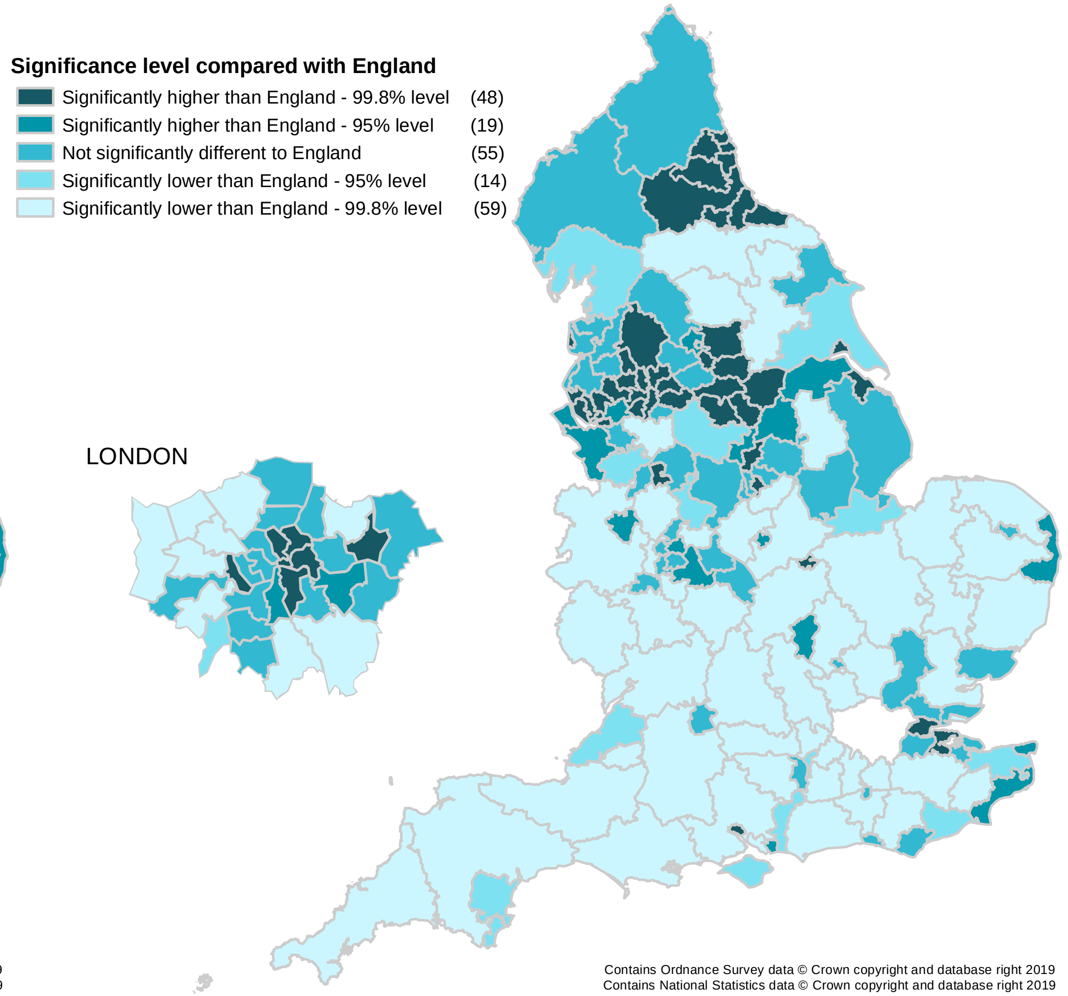
Lung cancer - Incidence, mortality and survival

Map 29a: Variation in incidence rate of lung cancer per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum value: Low





Lung cancer - Incidence, mortality and survival

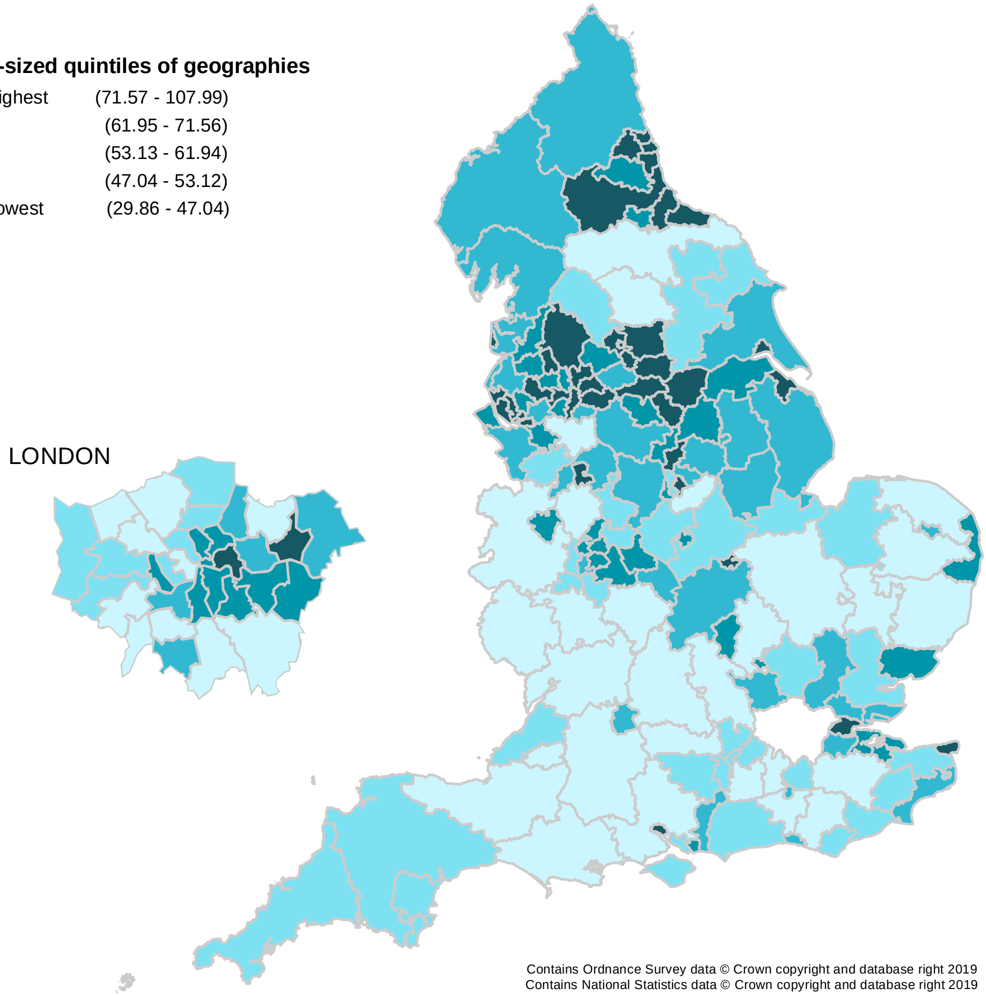
Map 29b: Variation in mortality rate from lung cancer per population by CCG (2015-2017)

Directly standardised rate per 100,000

Optimum value: Low

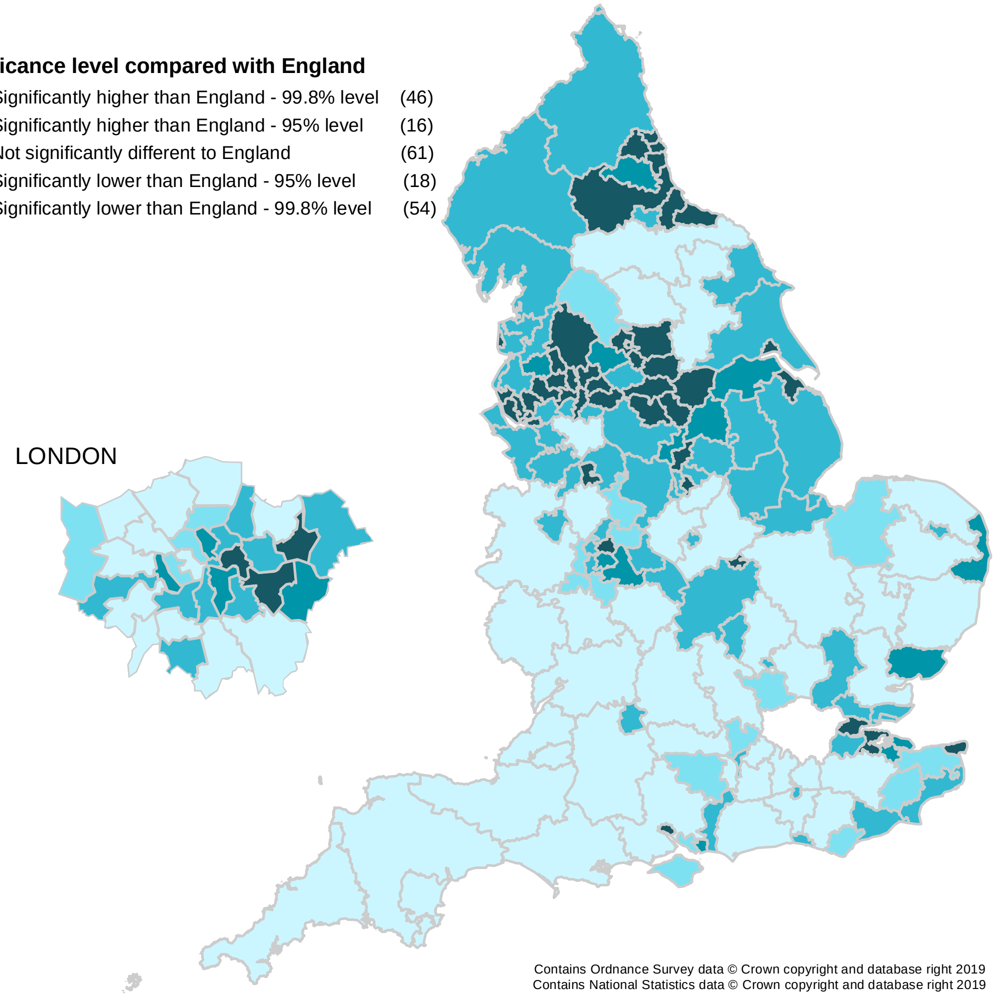
Equal-sized quintiles of geographies

Highest	(71.57 - 107.99)
	(61.95 - 71.56)
	(53.13 - 61.94)
	(47.04 - 53.12)
Lowest	(29.86 - 47.04)



Significance level compared with England

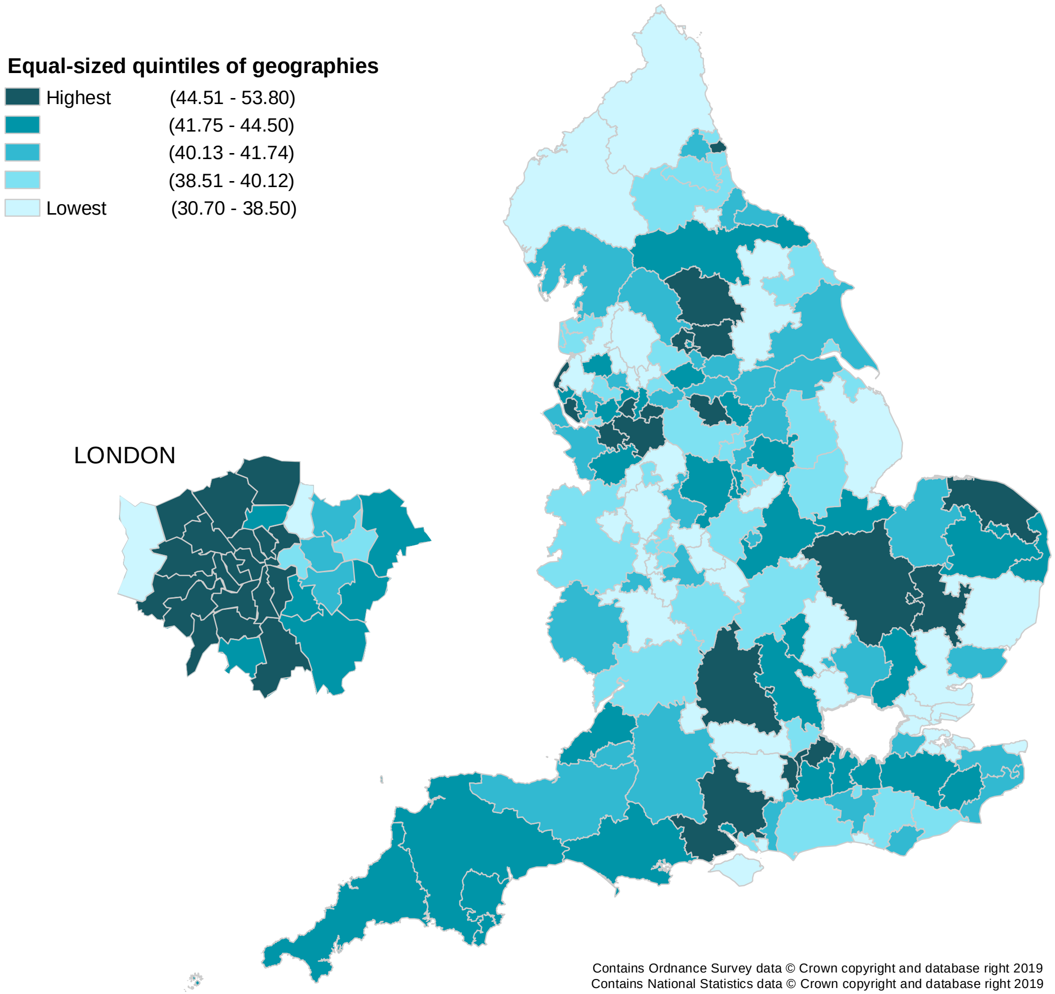
Significantly higher than England - 99.8% level	(46)
Significantly higher than England - 95% level	(16)
Not significantly different to England	(61)
Significantly lower than England - 95% level	(18)
Significantly lower than England - 99.8% level	(54)

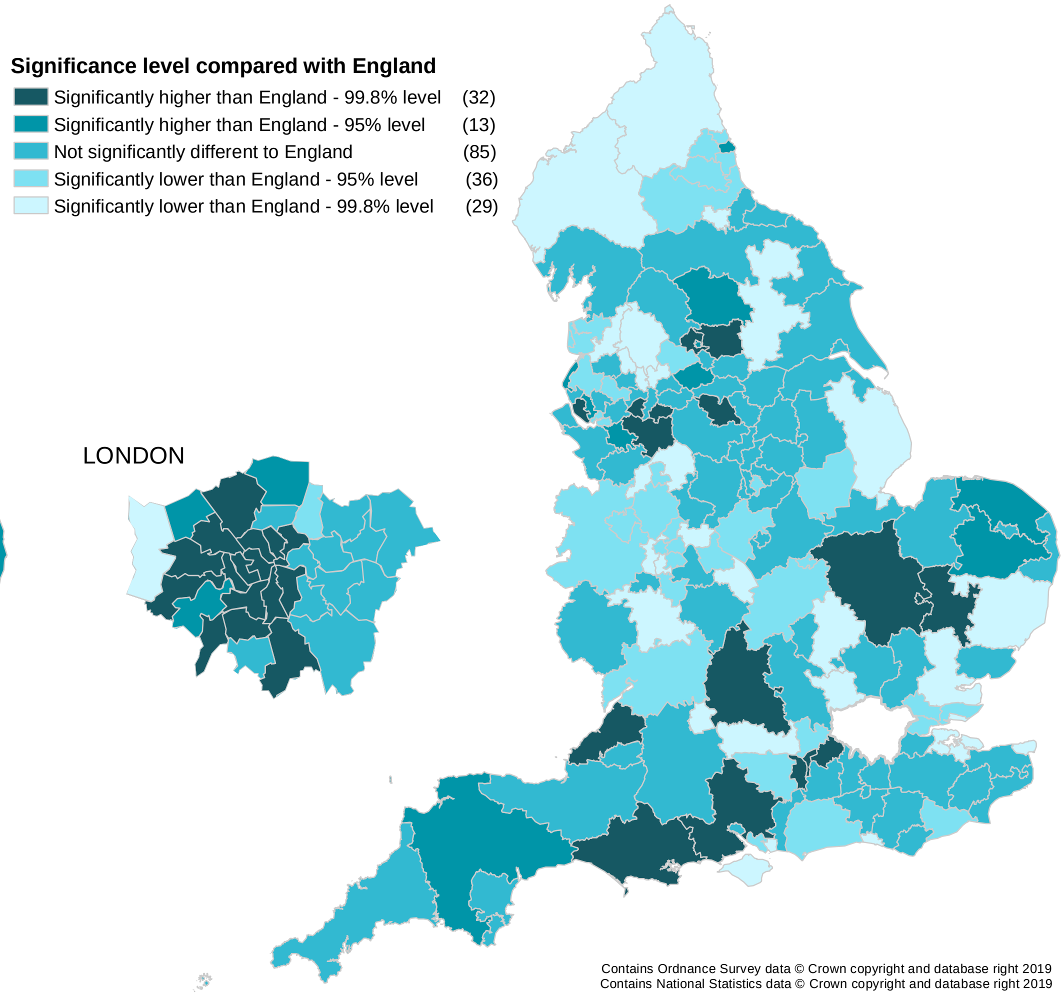


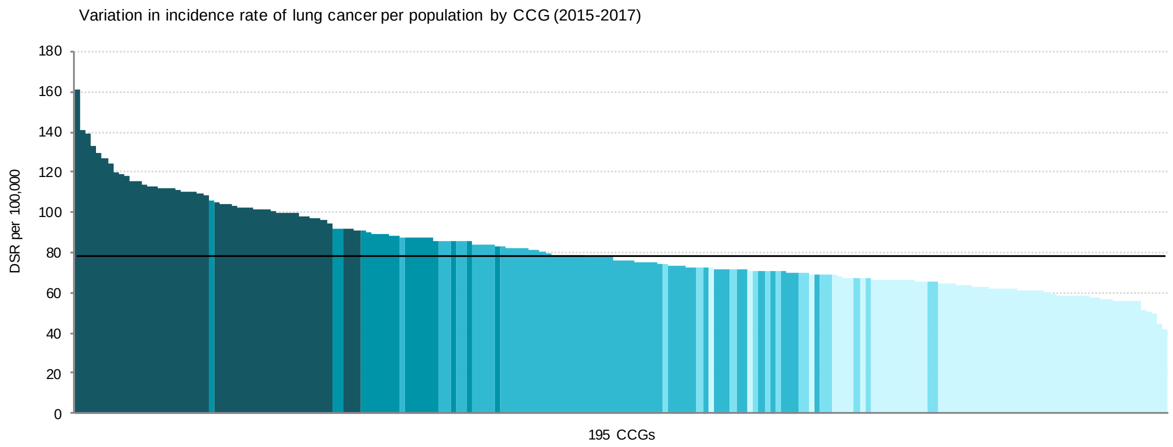
Lung cancer - Incidence, mortality and survival

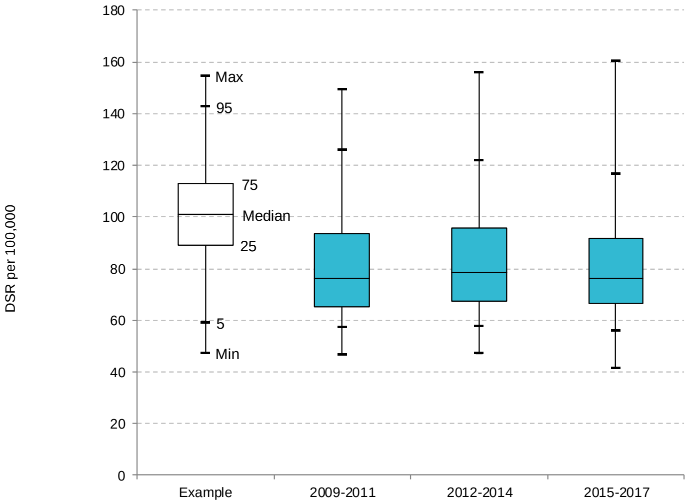
Map 29c: Variation in percentage of one-year survival estimates for lung cancer patients, all adults aged 15 to 99 years, by year of diagnosis and CCG (2016)

Optimum value: High









Max-Min (Range)		102.5	108.8	119.1	No significant change
95th-5th percentile		68.3	64.2	60.2	NARROWING Significant
75th-25th percentile		28.6	28.3	25.3	No significant change
Median		76.4	78.7	76.2	No significant change

Context

Lung cancer is the 3rd most common cancer in England with an annual average of over 38,760 people diagnosed from 2015 to 2017. Incidence rates have continued to fall since the mid-1990s, reducing by around 8%. However, this includes a decrease in male incidence rates of around 30% (from 127.9 per 100,000 population in 1995 to 86.9 in 2017) but an increase in female incidence of around 30% (51.4 in 1995 to 67.0 in 2017) (Figure 29.1).[1]

The incidence rates have fallen for males between 1995 and 2017. In contrast, the number of new diagnoses in males fell between 1995 and 2003 before increasing again.

The incidence rates and number of diagnoses in females both increased together consistently between 1995 and 2017.

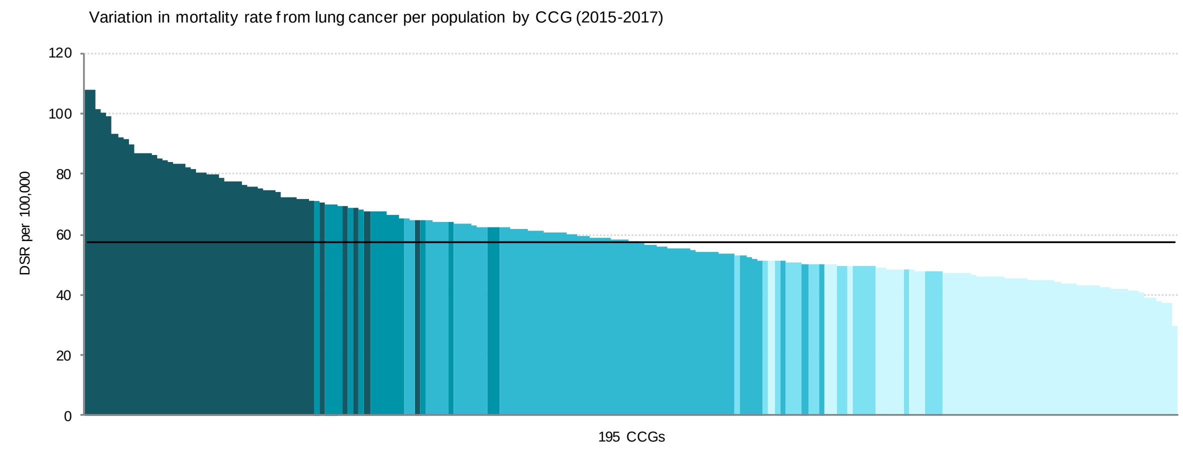
Overall the total number of people diagnosed went up from 32,751 in 1995 to 38,906 in 2017.

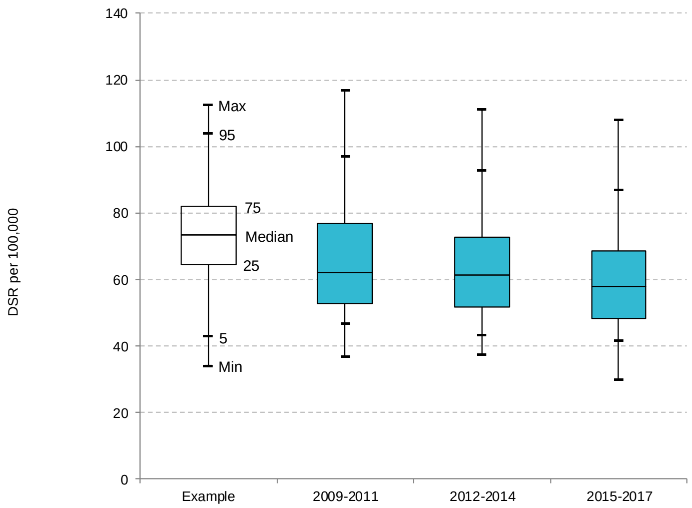
Over three-quarters of lung cancer cases are considered preventable[2] with most of these due to smoking. Other main causes of lung cancer are work place exposures and air pollution.

Lung cancer is the most common cause of cancer mortality in England with an annual average of over 28,440 deaths from 2015 to 2017.

Lung cancer survival is lower than for many other cancers in England[3] and lung cancer survival is lower in England than for many other comparator countries across Europe.[4,5]

Lung cancer survival in England has improved over the last 10 years in association with the introduction of the National





Max-Min (Range)		79.9	73.4	78.1	No significant change
95th-5th percentile		50.0	49.4	45.2	No significant change
75th-25th percentile		24.1	21.3	20.1	No significant change
Median		62.0	61.3	57.9	No significant change

Lung Cancer Audit (NLCA)[6] to focus the lung cancer community on improving their local outcomes and this is correlated with improvements in surgical resection rates.[6,7,8,9] However there remains significant variation across the country with regard to use of active treatments for all stages of disease.[10]

Major reasons for poor lung cancer outcomes nationally include, presentation with late stage (metastatic) disease that cannot be offered curative intent treatment and variation in delivery of curative intent treatment across the country to those people presenting with non-metastatic disease.[6]

Magnitude of variation

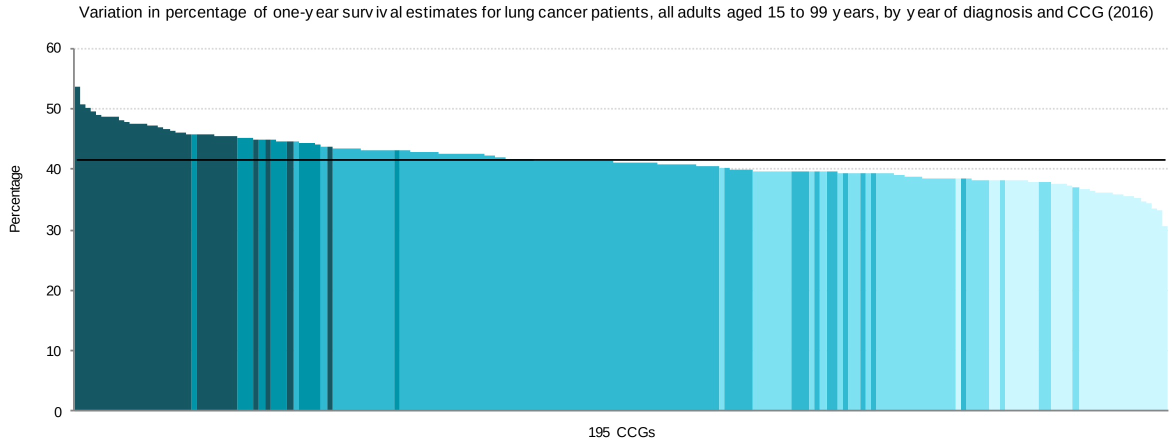
Map 29a: Variation in incidence rate of lung cancer per population by CCG (2015-2017)

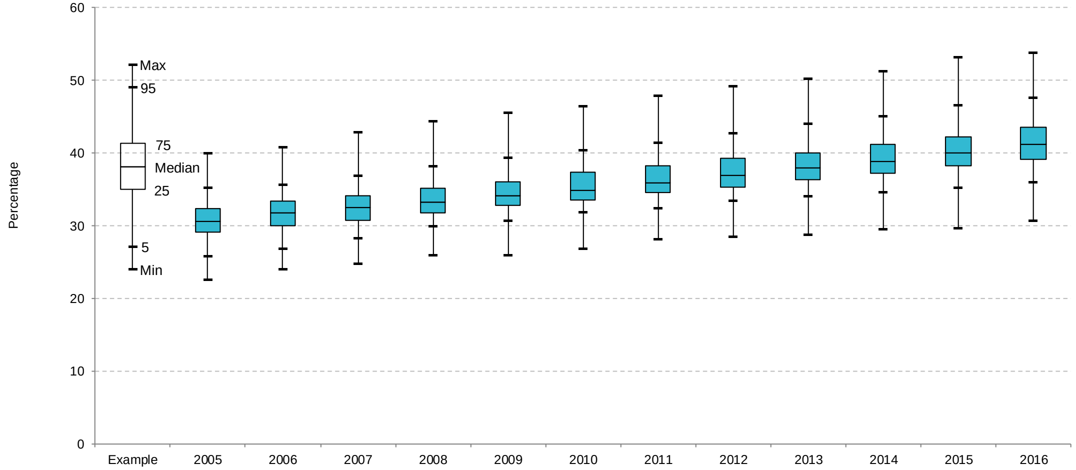
The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 41.5 to 160.6 per 100,000 population, which is a 3.9-fold difference between CCGs. The England value for 2015 to 2017 was 78.3 per 100,000 population.

The box plot shows the distribution of CCG values for the period 2009-2011 to 2015-2017. The 95th to 5th percentile gap narrowed significantly.

Map 29b: Variation in mortality rate from lung cancer per population by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 29.9 to 108 per 100,000 population, which is a 3.6-fold difference between CCGs. The England value for 2015 to 2017 was 57.7 per 100,000 population.





	Example	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	
Max-Min (Range)		17.5	16.8	18.2	18.4	19.6	19.5	19.7	20.9	21.5	21.8	23.5	23.1	WIDENING Significant
95th-5th percentile		9.3	8.8	8.5	8.2	8.7	8.5	9.0	9.3	10.0	10.4	11.5	11.6	WIDENING Significant
75th-25th percentile		3.3	3.4	3.4	3.3	3.4	3.8	3.7	4.0	3.8	4.1	4.0	4.3	WIDENING Significant
Median		30.6	31.7	32.5	33.3	34.1	34.9	35.9	36.9	37.9	38.9	40.0	41.2	INCREASING Significant

The box plot shows the distribution of CCG values for the period 2009-2011 to 2015-2017. There was no significant change in any of the 3 variation measures between 2009-2011 to 2015-2017.

Map 29c: Variation in percentage of one-year survival estimates for lung cancer patients, all adults aged 15 to 99 years, by year of diagnosis and CCG (2016)

The maps and column chart display the latest period (2016), during which CCG values ranged from 30.7% to 53.8%, which is a 1.8-fold difference between CCGs. The England value for 2016 was 41.6%.

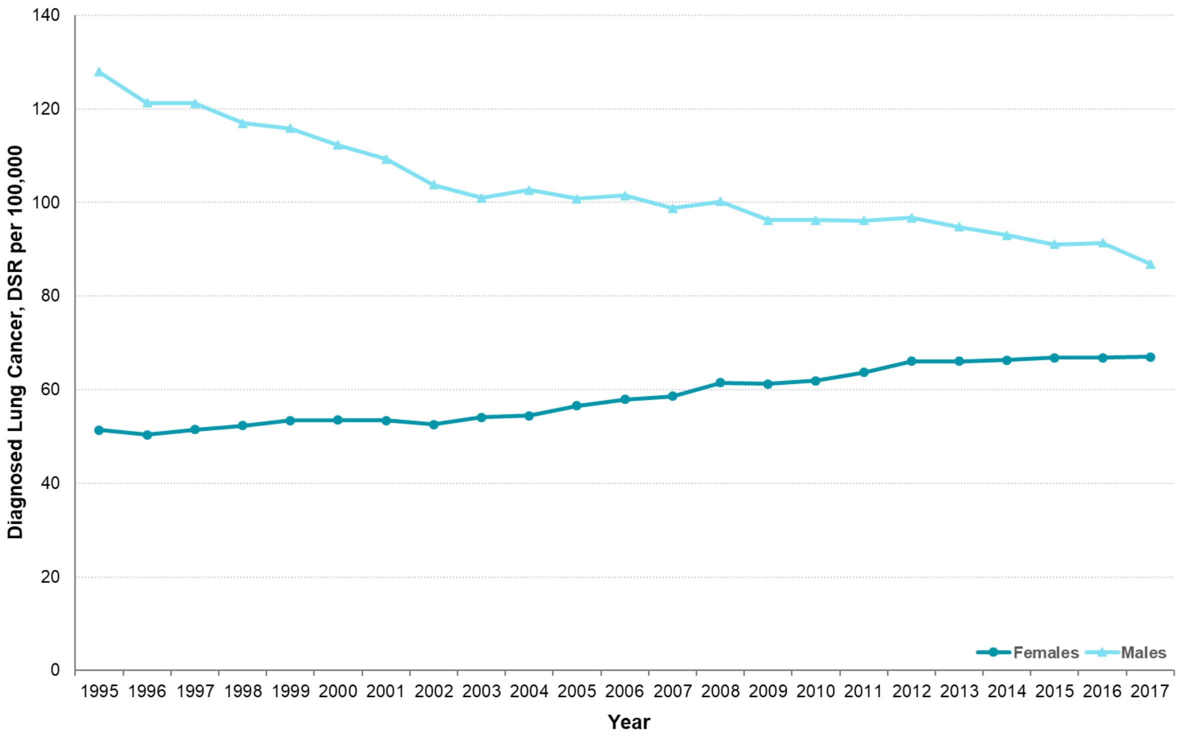
The box plot shows the distribution of CCG values for the period 2005 to 2016.There has been significant widening of all 3 measures of variation. The median increased significantly from 30.6% in 2005 to 41.2% in 2016.

Potential reasons for this degree of variation in incidence and mortality and survival include:

- smoking, current and historic smoking prevalence, social deprivation, air quality in larger towns and cities, co-morbidity
- capacity and resource availability to deliver curative intent treatments (surgery and radical radiotherapy including stereotactic ablative radiotherapy (SABR))

Whilst some variation is inevitable, much is unwarranted and all patients should receive the same care as those in best-performing CCGs. Medical teams need to have the facility to offer optimum treatments and to reduce unwarranted variation.

Figure 29.1: **Newly Diagnosed cases of Lung Cancer by sex, DSR per 100,000**[11]



Options for action

Continuing to improve lung cancer outcomes remains a major challenge for the NHS. The UK Lung Cancer Coalition (UKLCC) ten-year strategy document[12] highlights important principles to improve this.

Smoking cessation programmes and lung cancer prevention measures are vital for maintaining the global reduction in lung cancer incidence, especially within CCGs where incidence remains significantly higher than the national value. In light of the increasing incidence in women more emphasis should be directed to reducing smoking prevalence in women. The incidence of lung cancer can also be reduced by monitoring and control of radon in homes, schools, and workplaces. Responsibility for this lies across the health and social care system.

Options for action include:

- performance targets for smoking cessation services
- equitable access to evidence-based interventions for adults who smoke
- promoting assessment of radon risk in workplaces and homes
- targeted campaigns in areas of higher radon risk

Options for reducing mortality rates and continuing the improvement in one year survival relate to increasing proportion of lung cancers diagnosed at early stage and treated with curative intent treatments along the whole lung cancer pathway.

Earlier and more rapid diagnosis may be facilitated by:

- improving public awareness of signs and symptoms of lung cancer (Be Clear on Cancer campaigns)
- optimising the lung cancer diagnostic and treatment pathways within CCGs, based on national guidelines (NOLCP)
- equitable access to diagnostic imaging, including direct-to-test referrals from GPs and computerized tomography (CT)
- ensure adequate organisational service resources are available for timely diagnosis and treatment

Actions to improve treatment include:

- offering treatment with curative intent to more patients
- improving standards of care in all CCGs to the level of the best[13]
- using data from the National Lung Cancer Audit (NLCA) to self-assess institutional performance

- using findings from the Getting It Right First Time (GIRFT) programmes for cardiothoracic surgery (reported in 2018) and lung cancer (due in 2020) to remove unwarranted variation in patient care with consultants self-assessing their performance in the National Clinical Improvement Programme portal

Resources

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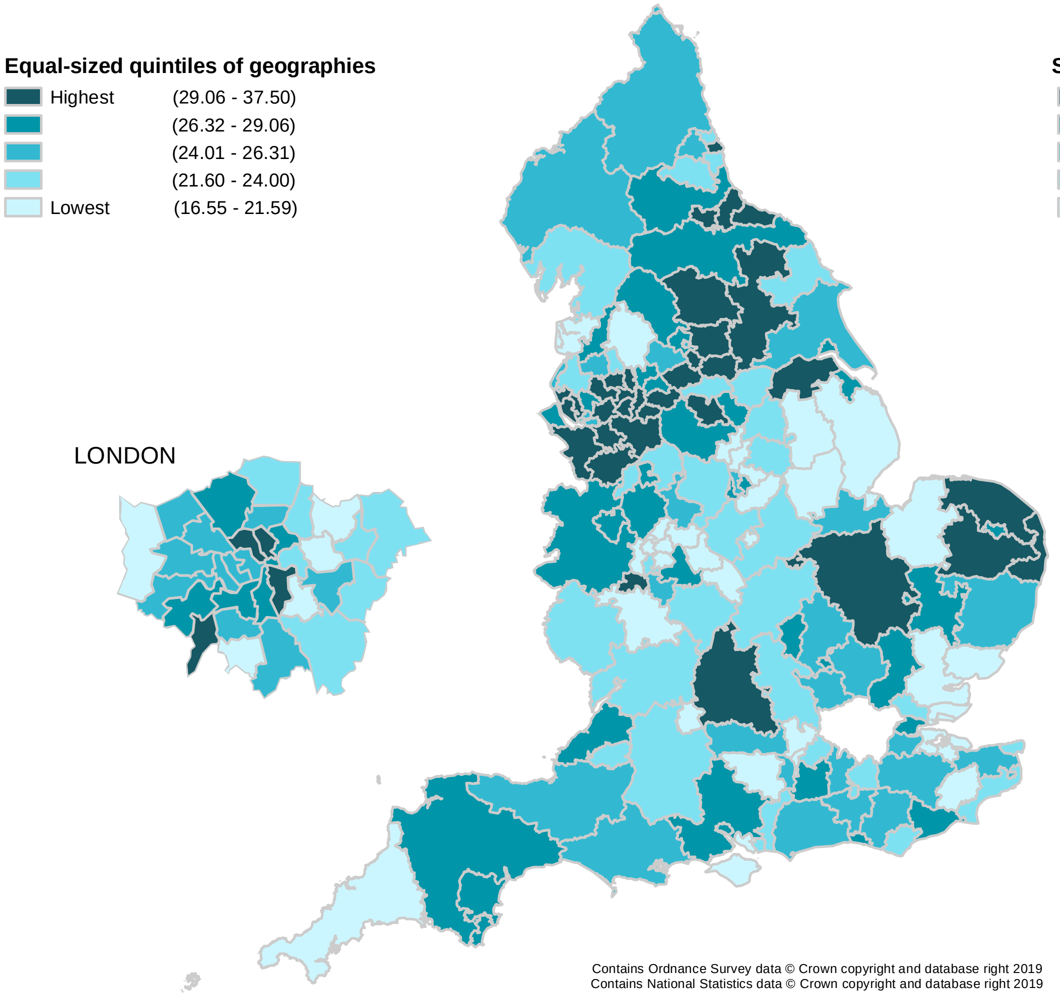
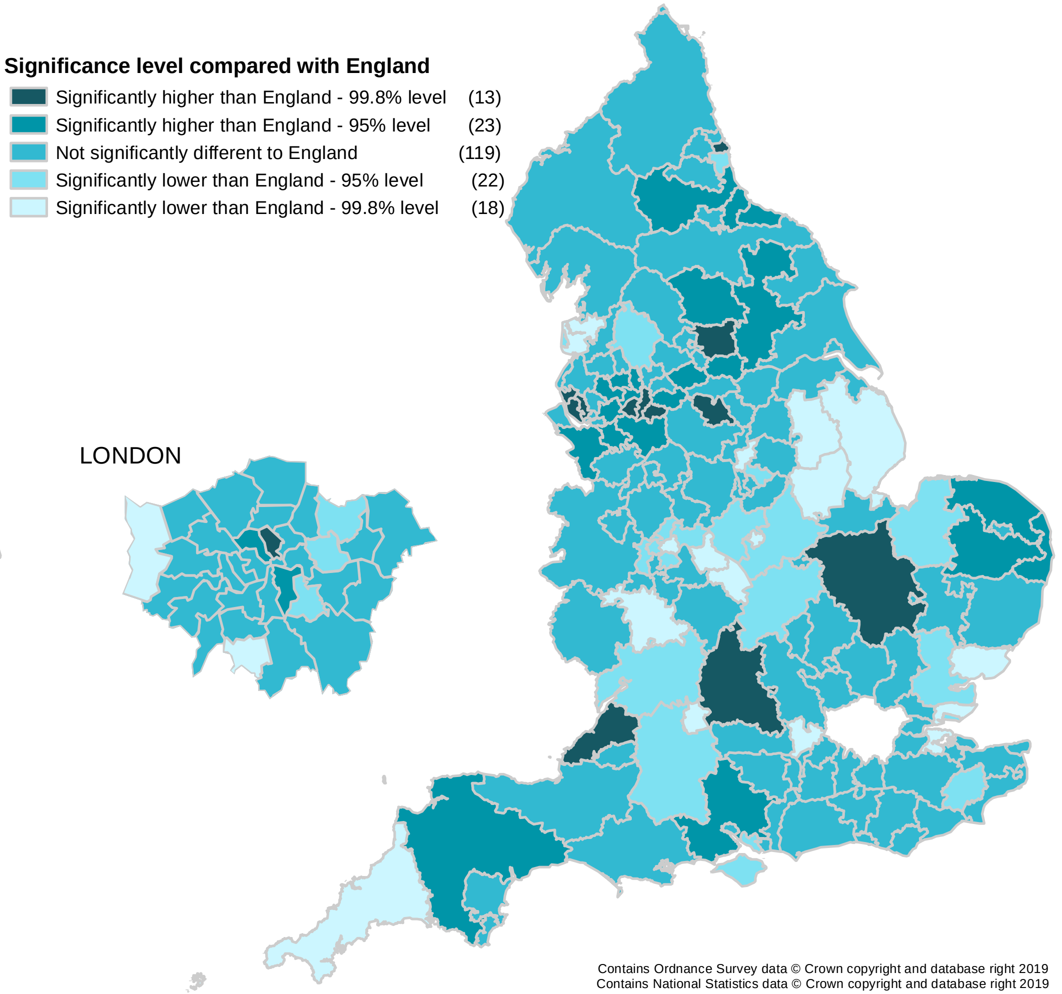
[13] Hiom S, Kumar H, Swanton C and others (2018) Lung cancer in the UK: addressing geographical inequality and late diagnosis The Lancet Oncology 19(8)1015–1017 [Accessed 8 August 2019]

Lung cancer – Diagnosis and presentation

Map 30a: Variation in percentage of lung cancer patients diagnosed at an early stage (stage 1 and 2) by CCG (2015-2017)

Optimum value: High

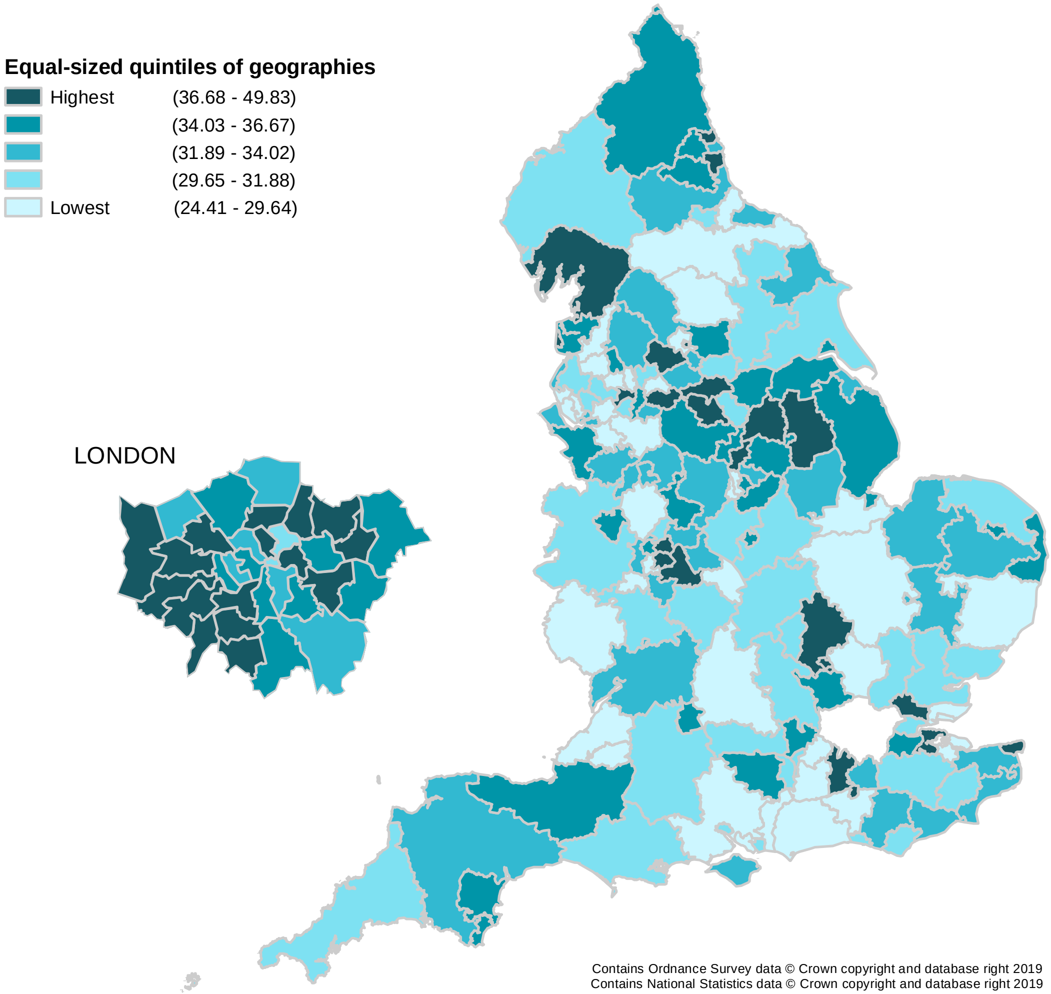


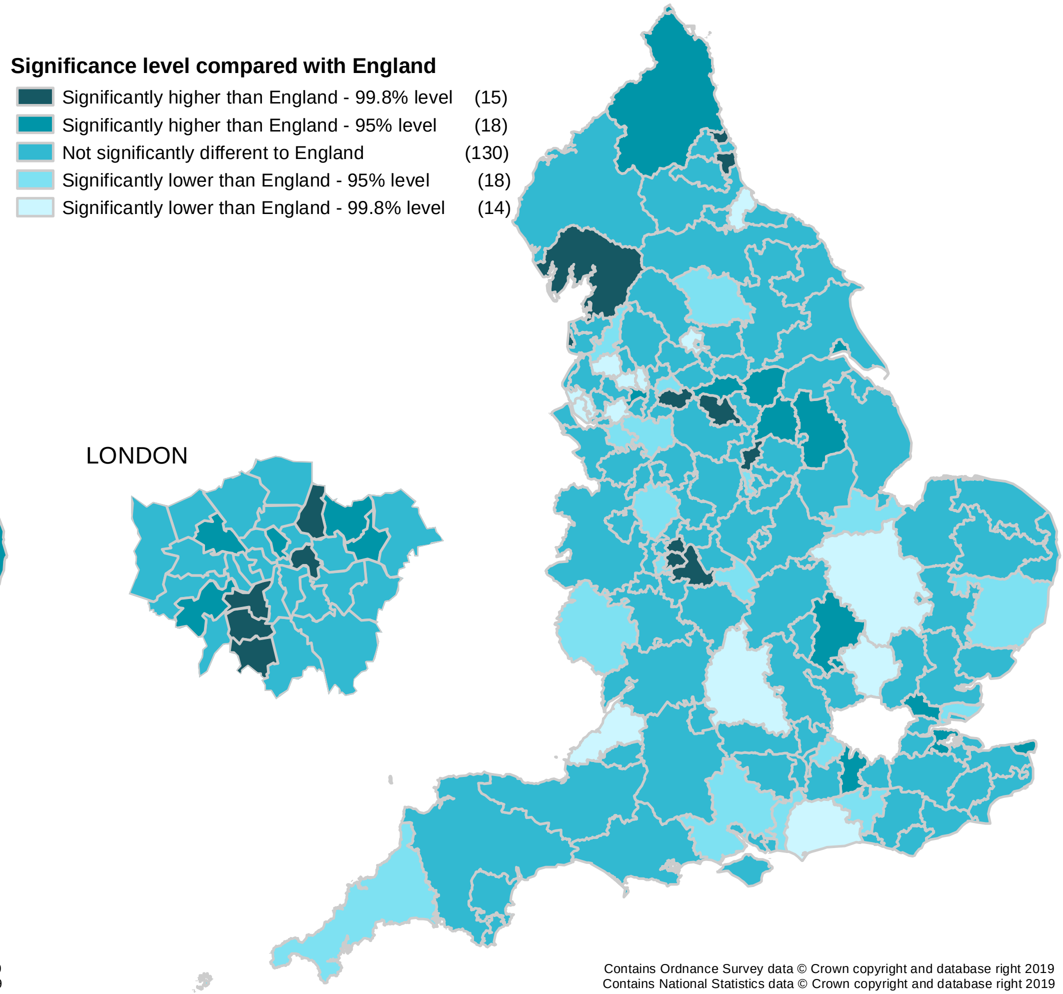


Lung cancer – Diagnosis and presentation

Map 30b: Variation in percentage of lung cancer patients presenting as an emergency by CCG (2014-2016)

Optimum Value: Low

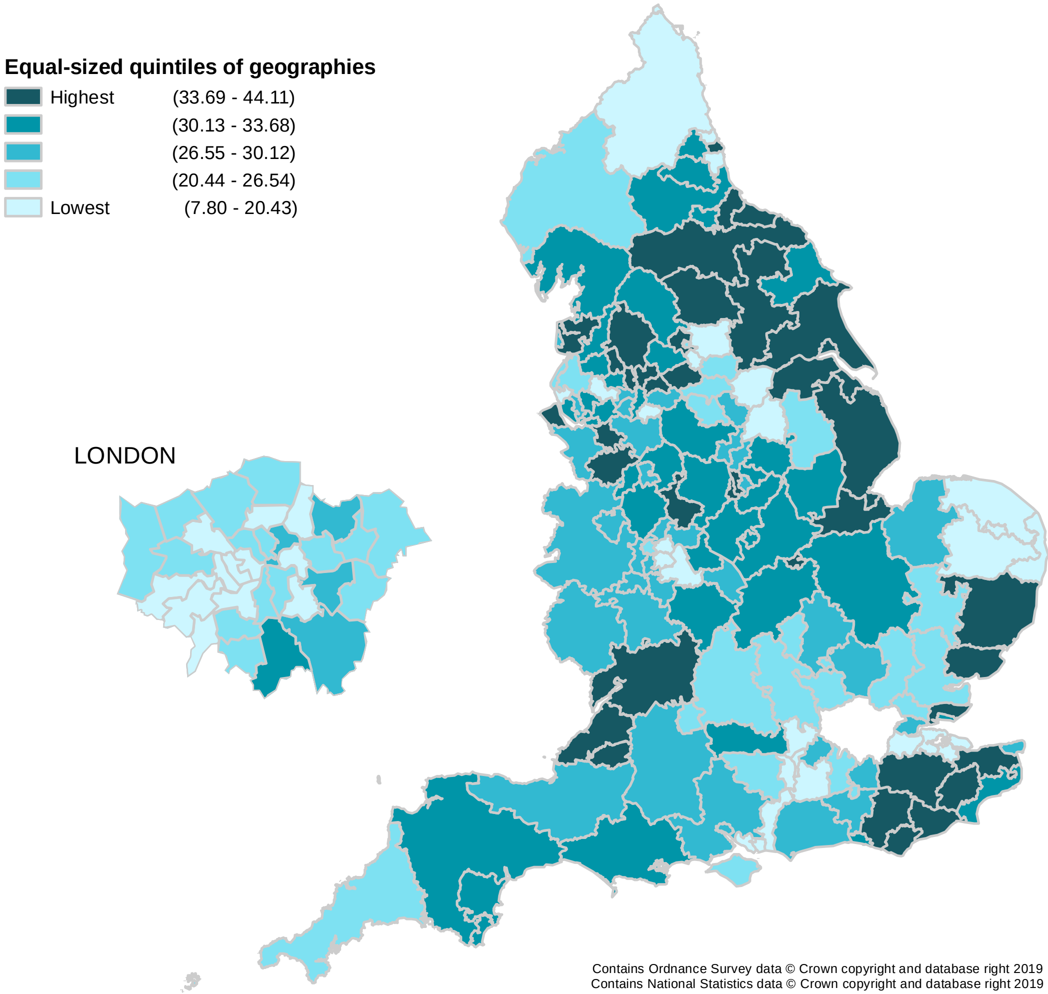


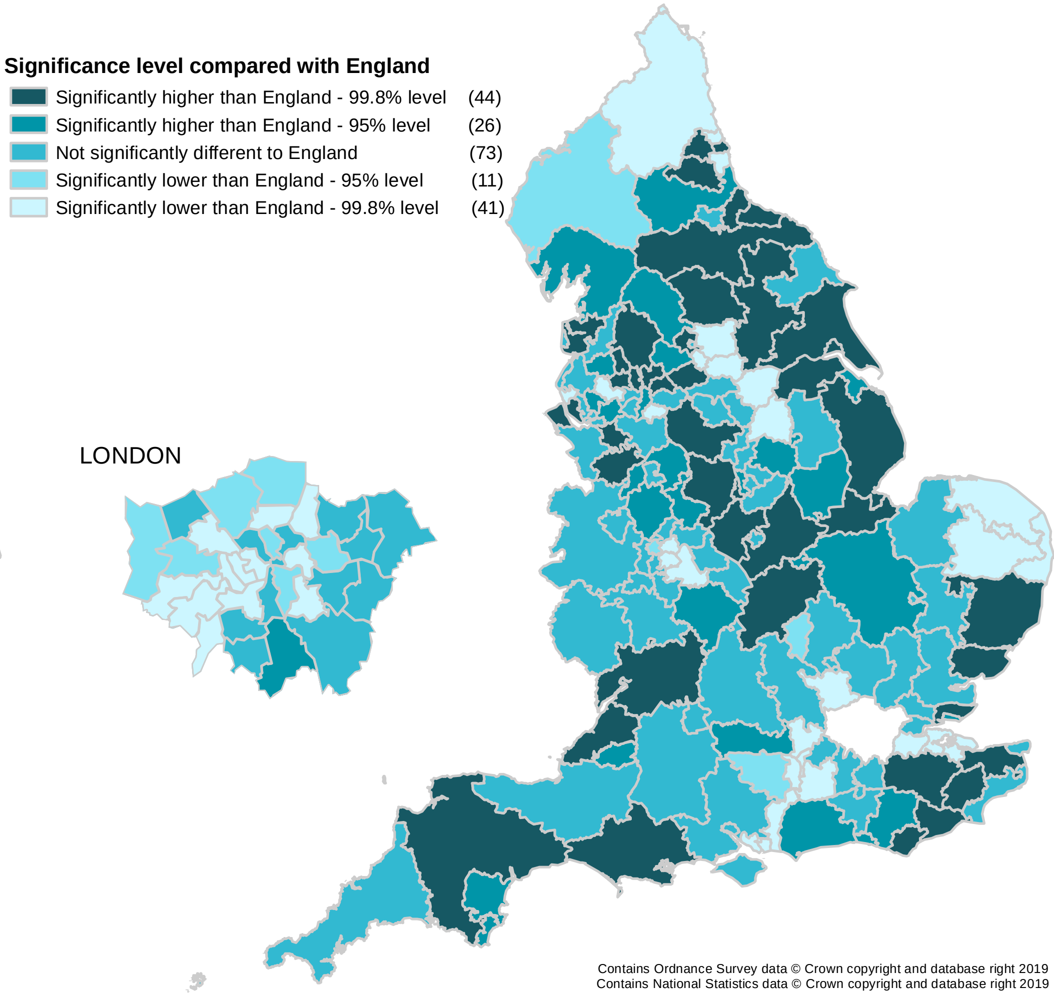


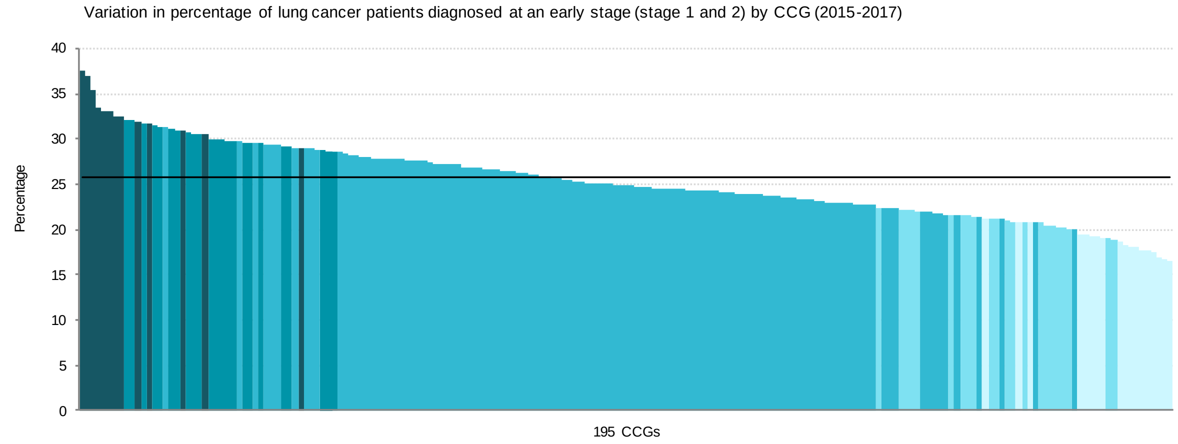
Lung cancer – Diagnosis and presentation

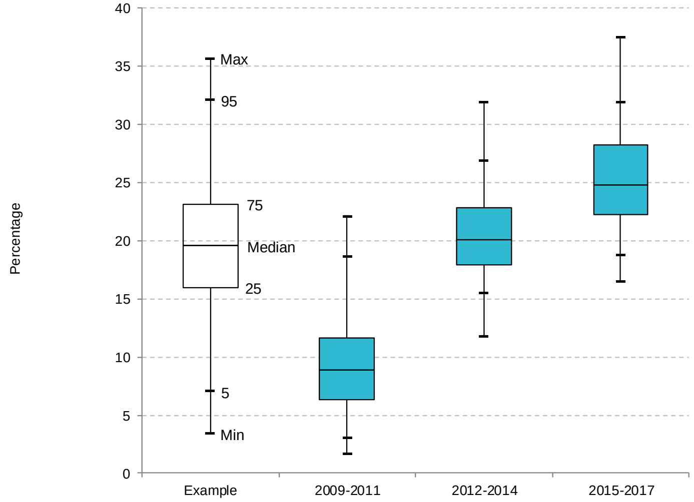
Map 30c: Variation in percentage of lung cancer patients presenting via the two-week wait route by CCG (2014-2016)

Optimum Value: High









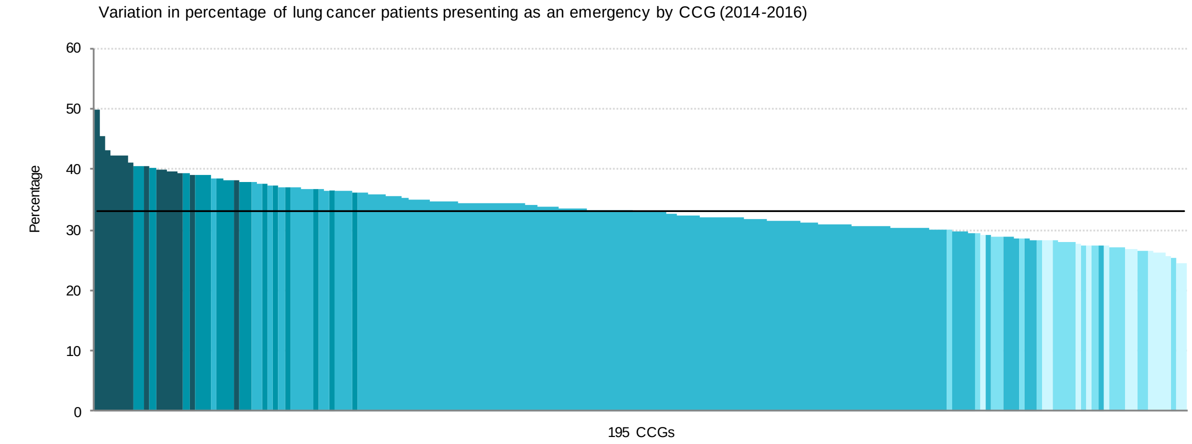
	Example	2009-2011	2012-2014	2015-2017	
Max-Min (Range)		20.5	20.2	20.9	No significant change
95th-5th percentile		15.7	11.4	13.1	No significant change
75th-25th percentile		5.3	4.9	6.0	No significant change
Median		8.9	20.1	24.8	No significant change

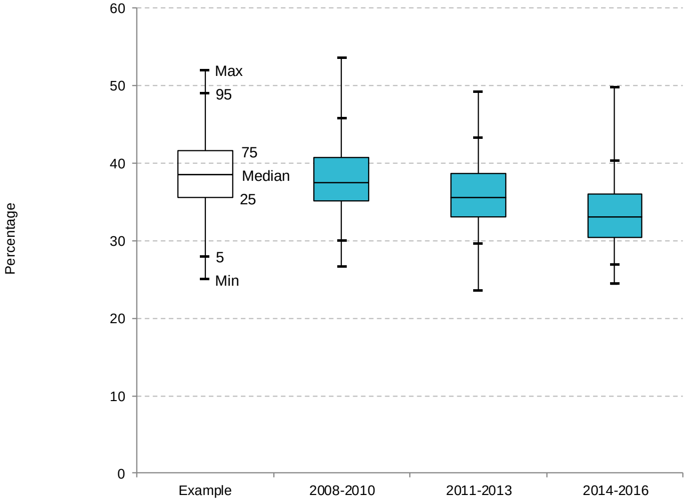
Context

There is good evidence that people diagnosed with lung cancer at an early stage do better than those presenting with more advanced disease.[1]

Patients with early stage lung cancer can be offered curative treatment with surgical resection and with radical radiotherapy, including stereotactic ablative radiotherapy (SABR). The improvements in lung cancer survival seen in England over the last 15 years correlate with increased surgical resection rates.[2] However, data from the most recent National Lung Cancer Audit (NLCA) shows that the majority of lung cancer patients are still diagnosed at later stage.[3]

Delays in starting treatment can also affect stage and fitness for treatment and therefore outcomes.[4] Currently referral via the Two Week Wait route is the most rapid and preferred pathway for diagnosis. Unfortunately, diagnosis made during an emergency presentation is still common in lung cancer,[5] with almost 35% of patients being diagnosed by this route. In the majority of cases this is emergency presentation due to symptoms from advanced lung cancer although a subset of emergency presentations are due to other causes, with asymptomatic early cancers noted as an incidental finding on computerised tomography (CT) scans. Patients diagnosed via the emergency route are less likely to receive active treatments and have a much lower one year survival rate.[5]





	Example	2008-2010	2011-2013	2014-2016	
Max-Min (Range)		26.9	25.7	25.4	No significant change
95th-5th percentile		15.8	13.6	13.4	No significant change
75th-25th percentile		5.7	5.6	5.7	No significant change
Median		37.6	35.5	33.0	DECREASING Significant

Magnitude of variation

Map 30a: Variation in percentage of lung cancer patients diagnosed at an early stage (stage 1 and 2) by CCG (2015-2017)

The maps and column chart display the latest period (2015 to 2017), during which CCG values ranged from 16.6% to 37.5%, which is a 2.3-fold difference between CCGs. The England value for 2015 to 2017 was 25.8%.

The box plot shows the distribution of CCG values for the period 2009-2011 to 2015 -2017.

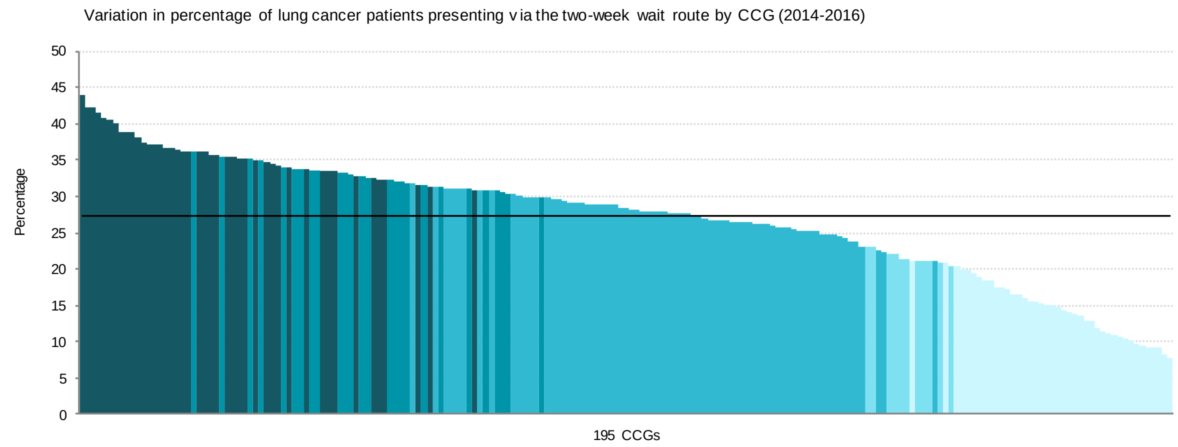
There was no significant change in any of the 3 variation measures between 2009 to 2011 and 2015 to 2017.

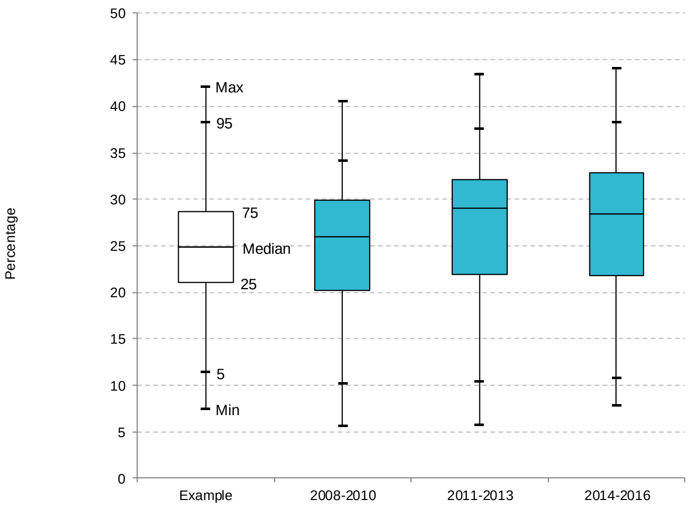
Map 30b: Variation in percentage of lung cancer patients presenting as an emergency by CCG (2014-2016)

The maps and column chart display the latest period (2014 to 2016), during which CCG values ranged from 24.4% to 49.8%, which is a 2-fold difference between CCGs. The England value for 2014 to 2016 was 33%.

The box plot shows the distribution of CCG values for the period 2008-2010 to 2014-2016. There was no significant change in any of the 3 variation measures between 2008 to 2010 and 2014 to 2016.

The median decreased significantly from 37.6% in 2008 to 2010 to 33.0% in 2014 to 2016.





	Example	2008-2010	2011-2013	2014-2016	
Max-Min (Range)		34.9	37.7	36.3	No significant change
95th-5th percentile		24.0	27.1	27.5	No significant change
75th-25th percentile		9.7	10.1	11.1	No significant change
Median		25.9	29.1	28.4	No significant change

Map 30c: Variation in percentage of lung cancer patients presenting via the two-week wait route by CCG (2014-2016)

The maps and column chart display the latest period (2014 to 2016), during which CCG values ranged from 7.8% to 44.1%, which is a 5.7-fold difference between CCGs. The England value for 2014 to 2016 was 27.3%.

The box plot shows the distribution of CCG values for the period 2008-2010 to 2014-2016.

There was no significant change in any of the 3 variation measures between 2008 to 2010 and 2014 to 2016.

Reasons for both variation in stage at presentation and route of presentation across the country can be multiple and interdependent and include:

- equity of access to GP services
- variation across CCGs in referral pathways from primary care into hospitals and rapid access to diagnostic services such as CT imaging
- variation in service provision for lung cancer
- adherence to NICE guidelines in referral for suspected cancer (NG12)
- awareness of symptoms, and overlap of symptoms with co-morbid conditions
- individual factors which may impede interaction with health services, such as health literacy, fear of diagnosis, English as a second language, or a reluctance to 'bother' health professionals

Data from the NLCA organisational audit showed that service provision levels in keeping with national commissioning guidelines were associated with improved lung cancer outcomes including survival, access to curative intent treatment and timely start of treatment.[6]

Delays in referral pathways may lead to an increase in emergency presentations. People presenting via an emergency pathway often have symptoms from more advanced disease and are less likely to receive active treatment.

Over the last 20 years, completeness of lung cancer staging across England has dramatically improved with the majority of lung cancer cases fully staged for the last 7-8 years, allowing a useful analysis on variation by CCG in early/late stage presentation for recent years.[7]

Options for action

Increasing the proportion of lung cancer patients diagnosed with early stage disease is important across the whole country, in particular for CCGs with significantly lower percentages than the national mean.

Early diagnosis campaigns such as Be Clear on Cancer[8,9,10] have led to an increased number of GP attendances and onward referrals. Repetition of such campaigns may maintain a public awareness of symptoms. Alongside such campaigns local commissioners could consider promoting NICE guidelines on cancer referral (NG12) to primary care services.

Service providers and Cancer Alliances should monitor the implementation of the National Optimal Lung Cancer Pathway (NOLCP)[11]. This pathway developed by the Lung Clinical Expert Group sets out strong recommendations for trusts and CCGs to follow with regard to optimising rapid diagnosis and start of active treatment. Where implemented this will lead to reductions in variation in the patient pathway and quicker (and hence earlier) diagnosis. A new 28-day standard for the interval between referral and diagnosis is shortly to be introduced by NHS England (NHSE).[12]

Following positive outcomes from pilots in Liverpool and Manchester, the NHS will extend lung health checks over the next two years. This will provide for an immediate low-dose CT scan to patients assessed as high risk of lung cancer. In addition, during 2019 more mobile lung CT scanners will be deployed starting in areas where cancer survival rates are at their lowest levels. Not only will this increase the number of cancers identified and reduce inequalities in cancer outcomes, but it will also identify a range of other health conditions including COPD.[6]

Resources

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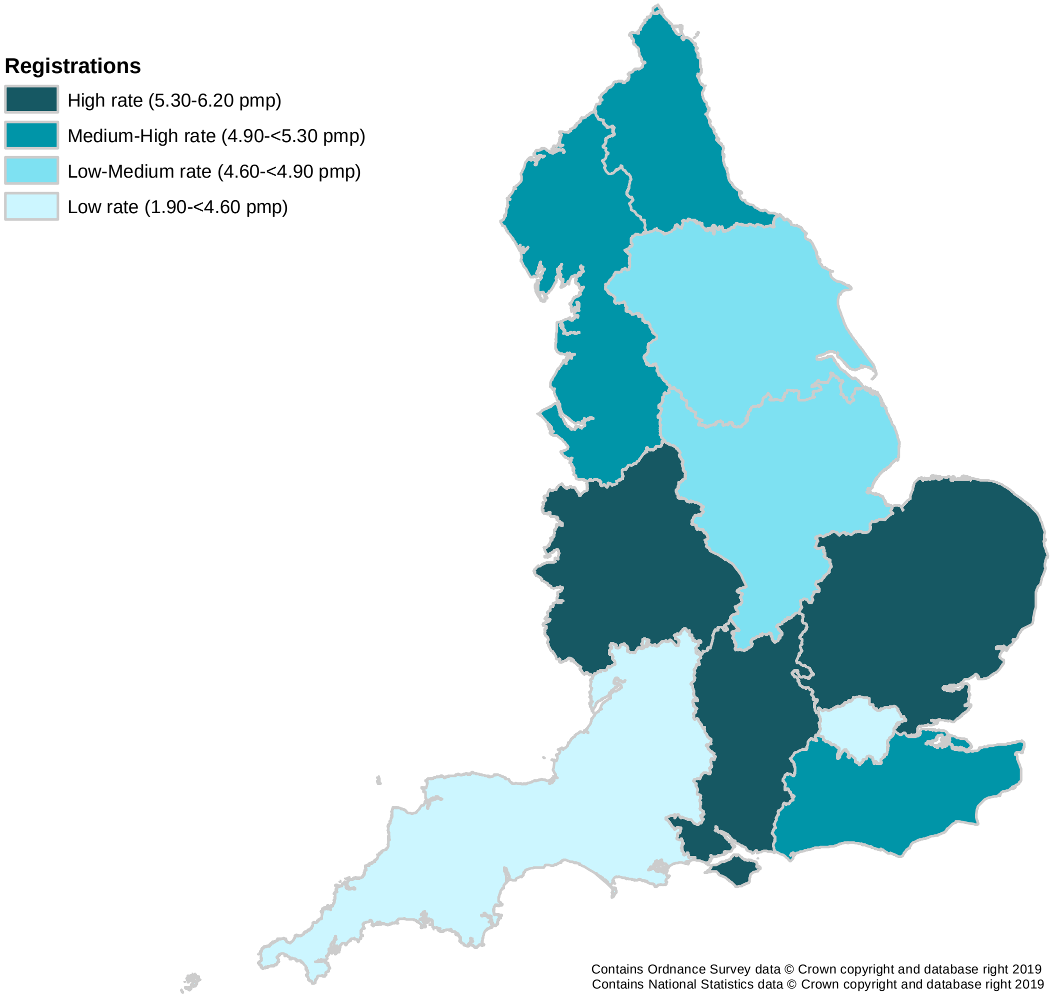
Lung transplantation

Map 31a: Variation in rate of lung transplant registrations per population by Strategic Health Authority (2017/18)

Crude rate per million population

Optimum value: High



Context

Lung transplantation is a recognised treatment for some patients with end-stage lung disease when all other medical and surgical interventions have been exhausted. A lung transplant can significantly extend a person's life expectancy as well as improving their quality of life.[1] However, the number of lung transplants performed every year remains low and about a quarter of those on the transplant list will die before receiving a transplant or be removed from the list as they become too frail.[2] Conditions that can be treated with a lung transplant include COPD, cystic fibrosis, pulmonary hypertension and idiopathic pulmonary fibrosis.[3]

The criteria for selection onto a transplant list have been defined (see 'Resources'), and are reviewed regularly by the Cardiothoracic Advisory Group for the Directorate of Organ Donation and Transplantation at NHS Blood and Transplant (NHSBT). Criteria for referral for consideration of transplantation are different from those for transplantation.

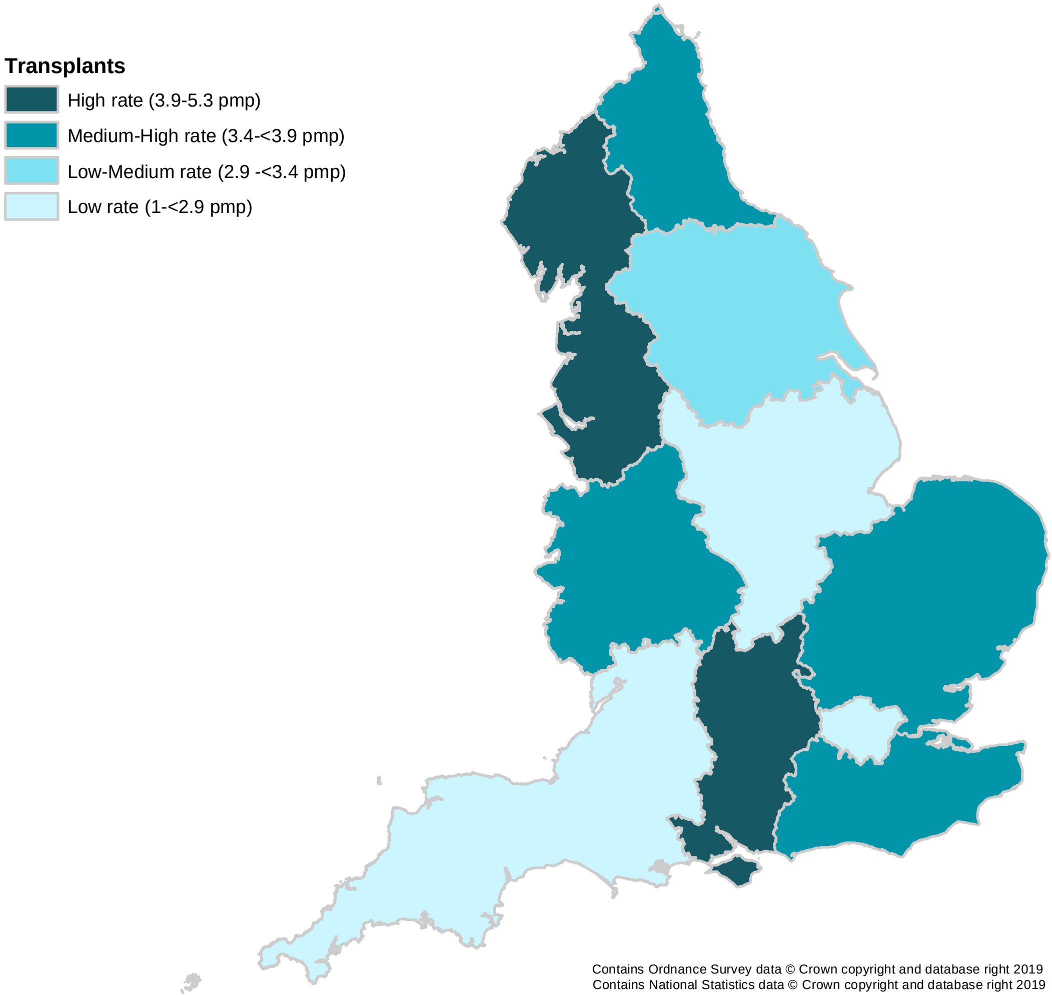
Selection for a transplant list, once referred, is carefully monitored. There are NHSBT guidelines for referral to a transplant centre (see 'Resources') to ensure that individuals

Lung transplantation

Map 31b: Variation in rate of lung transplants per population by Strategic Health Authority (2017/18)

Crude rate per million population

Optimum value: High



across the country have equal access to a transplant centre for prompt assessment of their lung disease. Donor lungs are allocated on a national basis for those on the super-urgent and urgent lists. For patients on the non-urgent list, lungs are allocated on a centre basis for local allocation. NHS Blood and Transplant have developed a universal allocation process, identical in all transplant centres (see ‘Resources’).

In the UK in 2017/18, 208 adult lung transplants were performed as part of the deceased donor lung programme. Of these, 46 were in urgent patients and 6 in super-urgent patients.

Survival following lung transplantation in the UK is good: for 706 transplants from 1 April 2013 to 31 March 2017, one-year survival for first adult lung only transplants (unadjusted) was 80.0%. This compares well internationally where studies have shown average one-year survival rates of 80%.[4]

Demand continues to exceed the availability of organs donated: in 2017/18 more patients were registered for a lung transplant than there were organs suitable for transplantation. At 31 March 2018, there were 339 adult patients on the non-urgent lung only transplant list. In 2017/18 there were 284 new registrations to the lung only transplant list. On 18 May 2017, the super-urgent and urgent lung allocation schemes were introduced and on 31 March

2018, there were no patients on the super-urgent list and 1 patient active on the urgent list.

During 2017/18, the lungs of 996 potential deceased organ donors without evidence of pulmonary consolidation, intra-thoracic malignancy or lung disease were offered for donation, with only 215 (22%) accepted for transplantation. In January 2018, the maximum age of lung donors was extended to 75 years (if a non-smoker for at least 10 years) in an attempt to increase transplants.

For adult patients listed for a lung only transplant in 2014/15, at one year post-registration 45% of patients had been transplanted, rising to 57% after 3 years. However, 19% of patients died within one year of listing and 26% of patients had died after 3 years of listing. After 3 years of listing a further 9% of patients had been removed from the list, mainly due to deteriorating condition.

Magnitude of variation

The NHSBT Annual Report on Cardiothoracic Transplantation found no evidence of geographical variation between SHAs beyond what would be expected at random.

Potential reasons for any observed differences may include:

- the prevalence of those lung diseases that are most suitable for transplantation
- access to expertise in lung disease locally
- differences in the application of the criteria for referral for assessment for lung transplant
- care pathways for people who may require a lung transplant

Options for action

When planning service improvement or development for lung transplantation, commissioners, clinicians and service providers could:

- identify whether there are high mortality rates from lung disease but low transplant rates in the locality, and review local services in relation to the adequacy of expertise in cardiothoracic medicine and of liaison with transplant centres
- review care pathways for patients with lung disease
- review criteria for selection onto a transplant list to ensure that patients who have the potential to benefit from referral for lung transplantation are considered for the intervention
- where possible, provide transplant assessment services locally rather than requiring patients to travel – this could be achieved via outreach networks from transplant and tertiary centres

Resources

Cardiothoracic Advisory Group on behalf of NHS Blood and Transplant Lung Transplantation: Donor Lung Distribution and Allocation Policy POL230/10 Effective 10/06/2019 [Accessed 2 August 2019]

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End of life care

Deaths from respiratory diseases: variation in place of death

Context

Patients with advanced respiratory diseases have a very high symptom burden near end of life, with a particularly high prevalence of breathlessness, fatigue, anxiety and depression.[1,2,3] There is evidence that the symptom burden is even higher for those with advanced non-malignant respiratory diseases (such as chronic obstructive pulmonary disease (COPD) and interstitial lung disease (ILD) than for those with advanced lung cancer.[4,5] The benefits of palliative care are very well recognised for patients with advanced lung cancer,[6] with improvements in quality of life and even increases in survival when introduced early in the disease trajectory.[7] There is also a strong body of evidence on the benefits of palliative care for patients with COPD and ILD,[2,8] including a possible survival benefit,[9] although this is less widely known.

Table 32.1: Number of deaths by recorded main cause of mortality by place of death, England, 2015-2017

Respiratory condition	Hospital	Home	Care Home	Hospice	Total Deaths
COPD	49,073	18,815	10,314	1,315	80,253
ILD	10,696	3,668	1,410	692	16,616
Lung Cancer	31,624	28,137	10,473	13,568	85,336

Table 32.2: Percentage of deaths by recorded main cause of mortality by place of death, England, 2015-2017

Respiratory Condition	Hospital	Home	Care Home	Hospice
COPD	61.1%	23.4%	12.9%	1.6%
ILD	64.4%	22.1%	8.5%	4.2%
Lung Cancer	37.1%	33.0%	12.3%	15.9%

There is limited data at national level on access to palliative care and good quality end of life care for patients with advanced respiratory diseases. A commonly used indicator of choice at end of life is place of death,[10] with evidence that with good advanced care planning patients are more likely to die in their preferred place.[11] Although place of death is only one factor of importance to patients and their families, and not necessarily the most important one,[12,13] the fact that it is routinely recorded for all deaths provides useful insights into variations in end of life care.

General surveys have found that home is the preferred place of death for most people,[14] but there is limited evidence on where patients with specific diseases, including advanced respiratory diseases, would prefer to die. In a small study from Denmark,[15] home or hospice were the most common preferred places of death for terminally ill patients with both non-malignant respiratory diseases (COPD and ILD) and cancer (41.2% and 35.8% for home and 40.7% and 33.3% for hospice respectively). However, those with non-malignant respiratory diseases were more likely to choose hospital as a preferred place to die than those with cancer (9.8% vs 1.2%).

As shown in Tables 32.1 and 32.2, there are significant differences in place of death for patients with lung cancer, COPD and ILD. At national level, 33.0% of lung cancer patients die at home and 37.1% die in hospital, compared with 23.4% and 61.1% for patients with COPD, and 22.1% and 64.4% for those with ILD. This reflects the situation internationally. A study across 14 countries showed that in almost all countries patients with COPD and ILD were significantly more likely to die in hospital, and less likely to die at home or in a palliative care institution, than those with lung cancer.[16] This study also found that the presence of co-morbidities and deprivation were independent risk factors for dying in hospital, with stronger effects for those with ILD than COPD.

There are several potential reasons why patients with COPD and ILD are more likely than those with lung cancer to die in hospital. Predicting time to death is more difficult in patients with COPD and ILD, and aggressive treatment can lead to reversal of an acute exacerbation even when a patient could be near end of life.[4] In England, the median age at death for lung cancer patients is 74 years, both COPD and ILD patients have a median age at death of 80 years. However, there is also considerable evidence that despite their higher symptom burden, and the recommendations in national and international guidelines,[8,17] patients with COPD and ILD have much poorer access to palliative care.[2,18,19]

For all patients with advanced respiratory disease, good quality palliative care should be initiated early and address the holistic needs of patients and their families, including issues of refractory fatigue and breathlessness and psychological coping mechanisms, and will require appropriate community resources to support patients who prefer to die at home.

Options for action

Commissioners and providers should review these maps and underlying data in combination with local data on the incidence of lung cancer, the prevalence of COPD and ILD, and quality metrics for patients with these conditions, with particular emphasis on the availability of:

- early access to palliative care services for all patients with advanced respiratory diseases, including fatigue and breathlessness services
- integrated respiratory disease/palliative care services for patients with COPD and ILD
- access to end of life care services, including hospices
- services for those at highest risk of poor access, especially those with co-morbidities and living in areas of deprivation

Resources

British Lung Foundation End of life Resources to support people with a lung condition [Accessed 29 July 2019]

British Lung Foundation and Marie Curie (2017) Caring for someone with long-term lung conditions at end of life Resources to support healthcare professionals [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2015) Care of dying adults in the last days of life (NICE guideline [NG31]) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2017) Care of dying adults in the last days of life (NICE quality standard [QS144]) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2018) Chronic obstructive pulmonary disease in over 16s: diagnosis and management (NICE guideline [NG115]) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2016) Palliative care – dyspnoea (NICE Clinical Knowledge Summary) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2011) End of life care for adults (NICE quality standard [QS13]) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2019) End of life care for adults in the last year of life: service delivery (In development [GIDCGWAVE0799]) [Accessed 29 July 2019]

National Institute for Health and Care Excellence (2019) Lung cancer: diagnosis and management (NICE guideline [NG122]) [Accessed 29 July 2019]

Geographical analysis

This atlas of variation shows the number and percentages of deaths for COPD, ILD and lung cancer for all CCGs within England. Data from 2006 to 2008 up to 2015 to 2017 for all CCGs, including significance comparisons to the England average, are included in the available data sheet and online interactive tools.

Tables 32.1 and 32.2 and Tables 32.3, 32.4, 32.5 show the England averages over these time periods for all 3 respiratory diagnoses and places of death.

The following pages then present the CCG statistical significance maps for lung cancer deaths for all places of death, and for COPD deaths for home and hospital deaths only.

Magnitude of variation summary

COPD deaths:

There were significant changes in the percentage of COPD deaths occurring in hospital and home between the periods 2006 to 2008 and 2015 to 2017. The CCG median percentage of deaths occurring at home increased significantly from 19.4 in 2006 to 2008 to 23.1 in 2015 to 2017. The CCG median percentage of deaths occurring in hospital decreased significantly from 67.9 in 2006 to 2008 to 61.5 in 2015 to 2017.

There was no significant change in the CCG median percentage of deaths occurring in care homes or hospices.

Interstitial lung disease deaths:

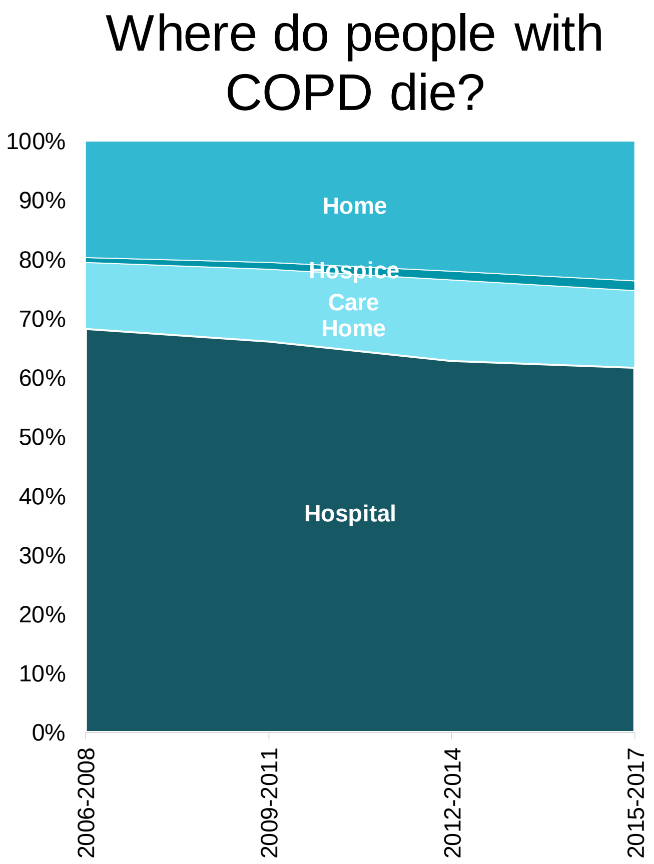
The CCG median percentage of Interstitial lung disease deaths occurring in hospital decreased significantly from 71.2 in 2006 to 2008 to 66.7 in 2015 to 2017. There was no significant change in the CCG median percentage of deaths occurring at home, at 21.3 in 2015 to 2017.

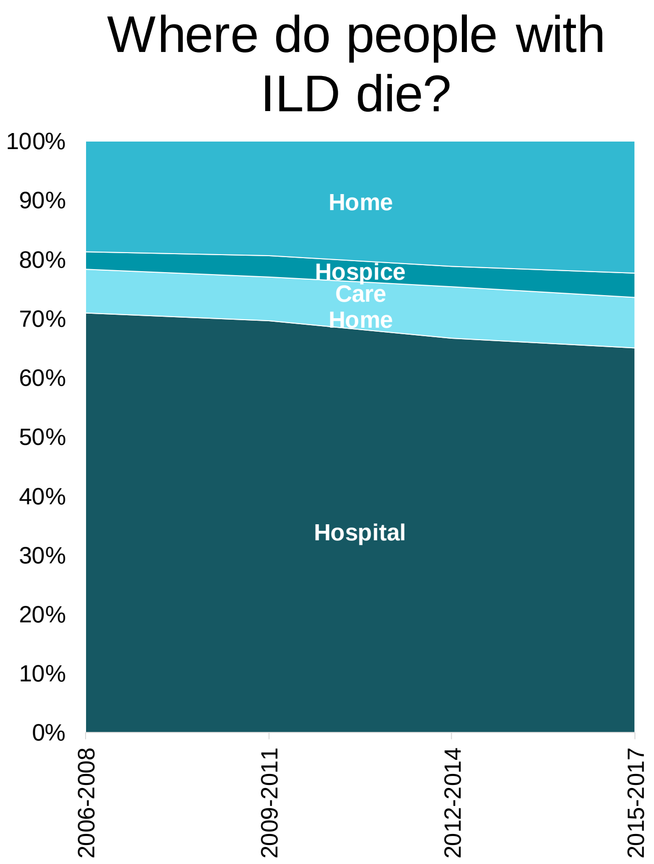
The trend analysis for ILD deaths in hospice and care homes is not robust as too many CCGs were suppressed due to low numbers. The CCG median percentage of deaths for those areas not suppressed was 5.8 for hospices and 8.7 for care homes in 2015 to 2017.

Lung cancer deaths:

There were significant changes in the percentage of lung cancer deaths occurring in hospital, home and care homes between the periods 2006 to 2008 and 2015 to 2017. The CCG median percentage of deaths occurring in homes and care homes both increased significantly; for deaths at home the CCG median increased from 27.2 in 2006 2008 to 32.1 in 2015 to 2017 and in care homes the CCG median increased from 8.2 in 2006 to 2008 to 12.2 in 2015-17. For deaths occurring in hospital, the CCG median significantly decreased from 45.9 in 2006 to 2008 to 36.7 in 2015 to 2017.

There was no significant change in the CCG median percentage of deaths occurring in a hospice, remaining constant at 16.5 in 2015 to 2017.





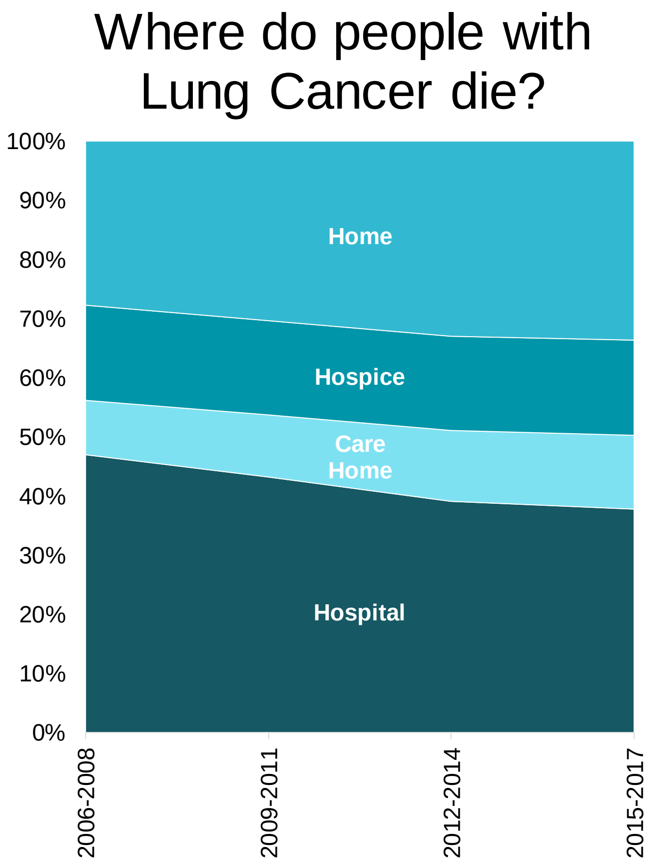


Table 32.3: **Place of death for COPD deaths 2006-2008 to 2015-2017 (%)**

	Hospital	Home	Care Home	Hospice
2006-2008	67.65	19.47	11.15	0.79
2009-2011	65.63	20.37	12.08	1.10
2012-2014	62.36	21.80	13.52	1.39
2015-2017	61.15	23.44	12.85	1.64

Table 32.4: **Place of death for ILD deaths 2006-2008 to 2015-2017 (%)**

	Hospital	Home	Care Home	Hospice
2006-2008	70.35	18.59	7.38	2.86
2009-2011	69.15	19.28	7.36	3.51
2012-2014	66.33	20.97	8.55	3.57
2015-2017	64.37	22.08	8.49	4.16

Table 32.5: **Place of death for lung cancer deaths 2006-2008 to 2015-2017 (%)**

	Hospital	Home	Care Home	Hospice
2006-2008	46.26	27.35	9.09	15.73
2009-2011	42.52	29.87	10.35	15.64
2012-2014	38.36	32.36	11.79	15.69
2015-2017	37.06	32.97	12.27	15.90

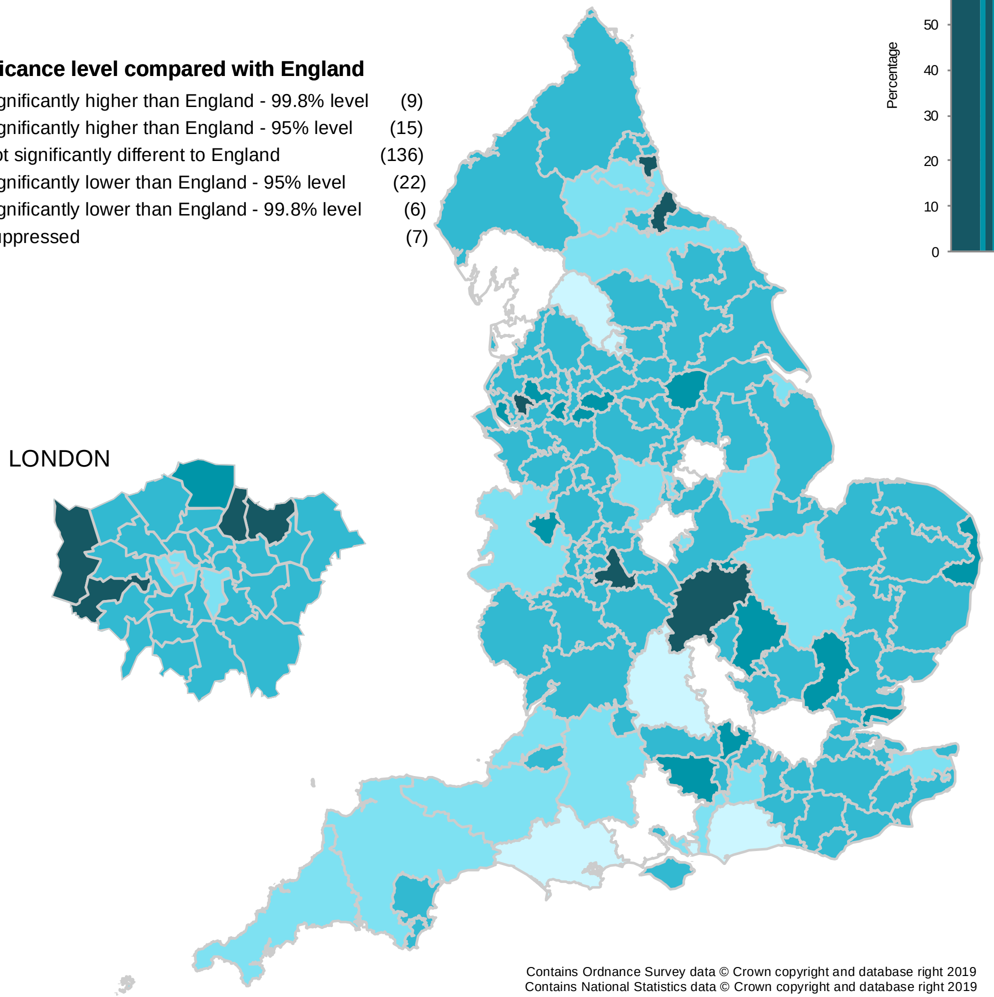
End of life care – COPD

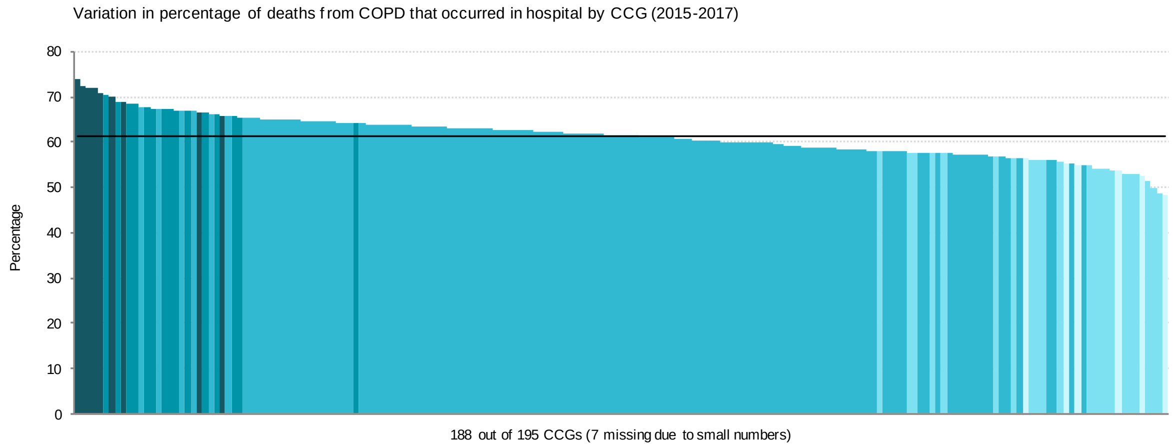
Map 32a: Variation in percentage of deaths from COPD that occurred in hospital by CCG (2015-2017)

Optimum value: Requires local interpretation

Significance level compared with England

Significantly higher than England - 99.8% level	(9)
Significantly higher than England - 95% level	(15)
Not significantly different to England	(136)
Significantly lower than England - 95% level	(22)
Significantly lower than England - 99.8% level	(6)
Suppressed	(7)





The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 48.3% to 74.1% which is a 1.5-fold difference between CCGs.

The England value for 2015 to 2017 was 61.1%.

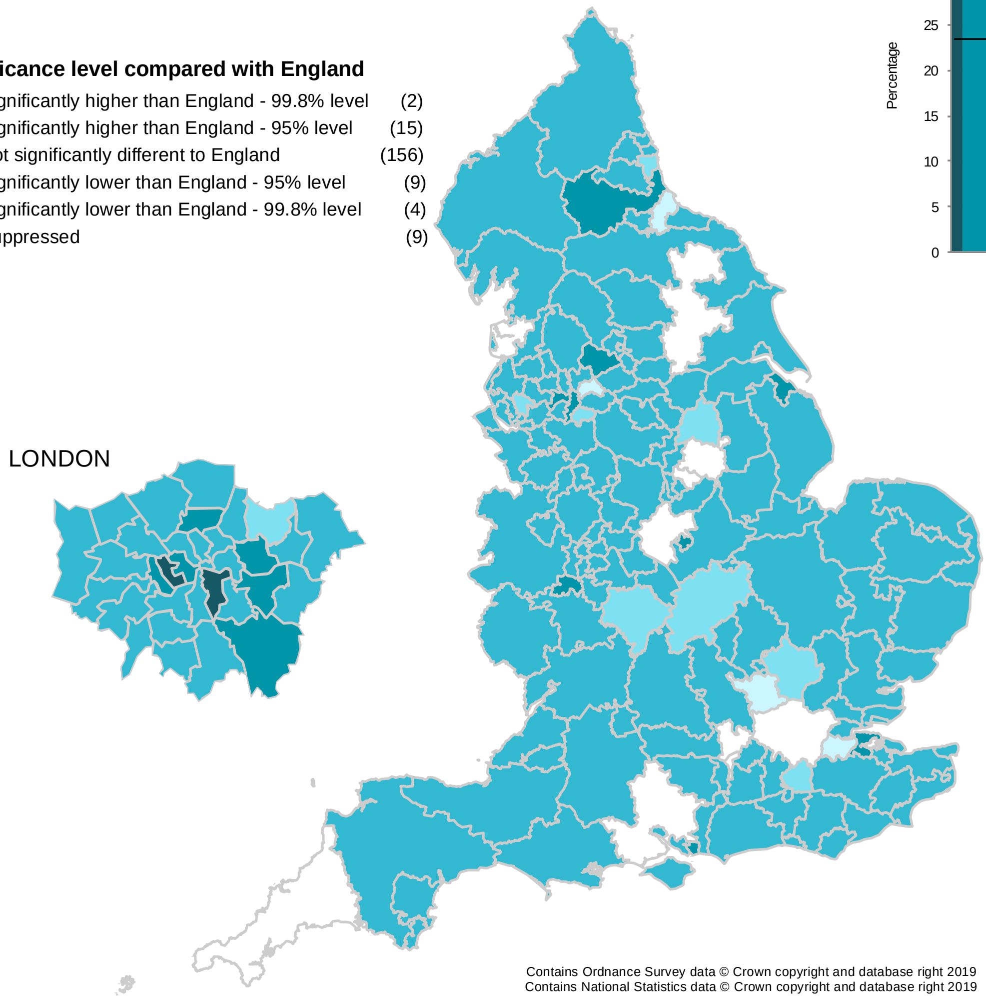
End of life care – COPD

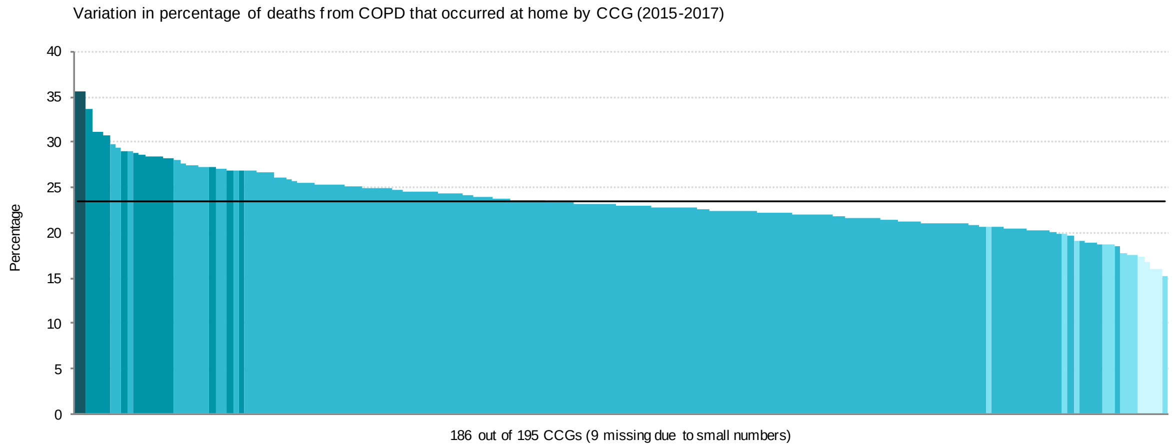
Map 32b: Variation in percentage of deaths from COPD that occurred at home by CCG (2015-2017)

Optimum value: Requires local interpretation

Significance level compared with England

Significantly higher than England - 99.8% level	(2)
Significantly higher than England - 95% level	(15)
Not significantly different to England	(156)
Significantly lower than England - 95% level	(9)
Significantly lower than England - 99.8% level	(4)
Suppressed	(9)



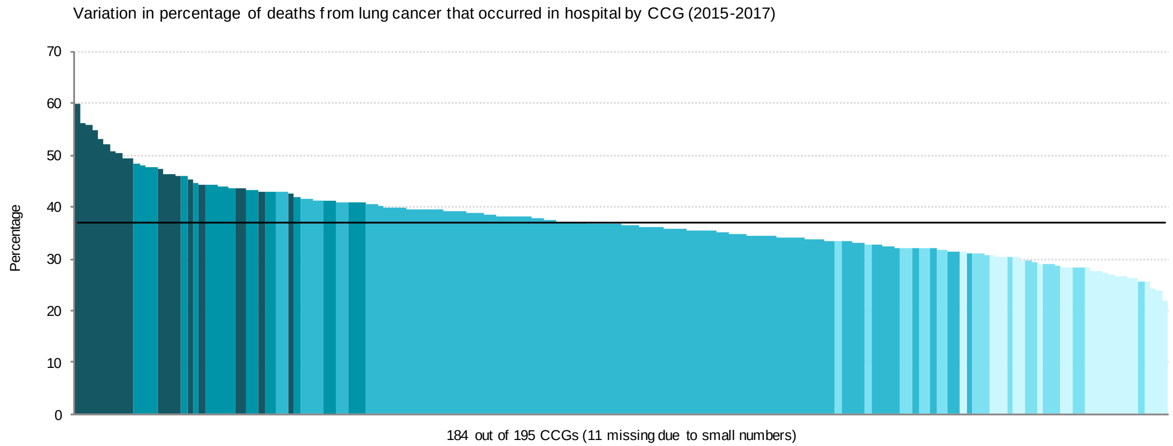


The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 15.2% to 35.7% which is a 2.3-fold difference between CCGs.

The England value for 2015 to 2017 was 23.4%.

End of life care – Lung cancer

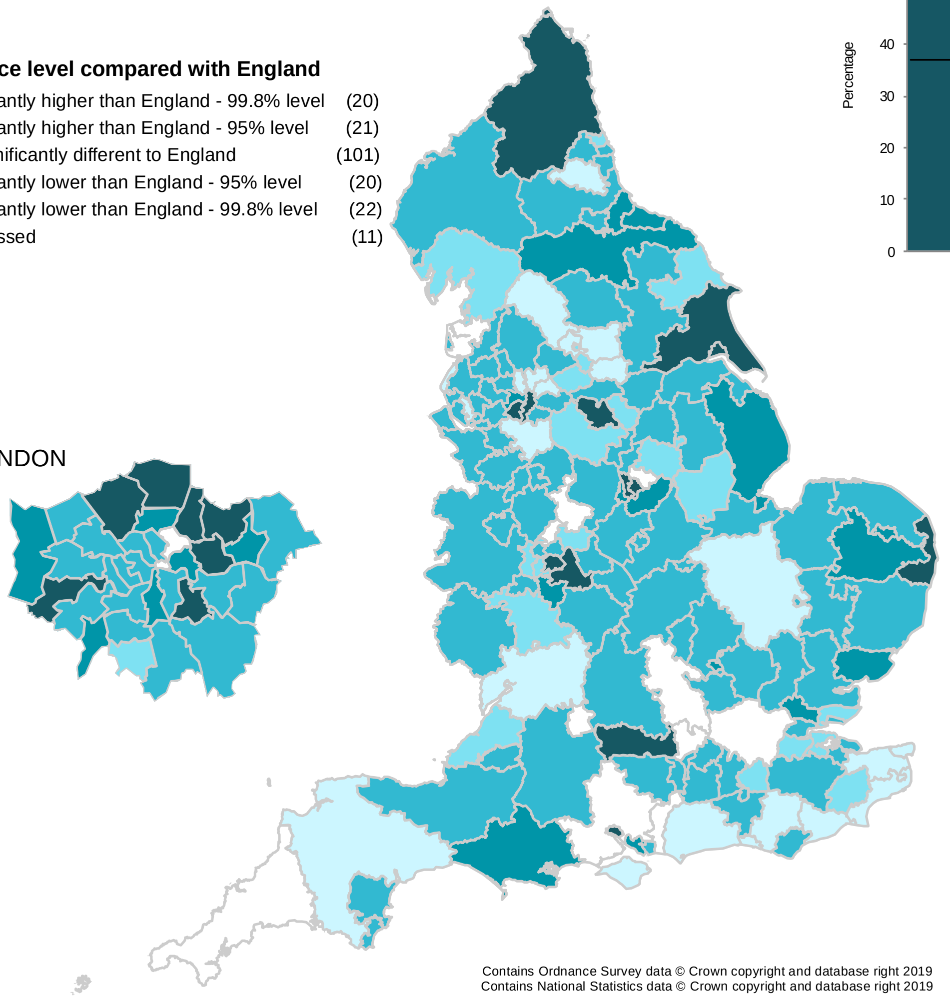
Map 32c: Variation in percentage of deaths from lung cancer that occurred in hospital by CCG (2015-2017)



Optimum value: Requires local interpretation

Significance level compared with England

Significantly higher than England - 99.8% level	(20)
Significantly higher than England - 95% level	(21)
Not significantly different to England	(101)
Significantly lower than England - 95% level	(20)
Significantly lower than England - 99.8% level	(22)
Suppressed	(11)



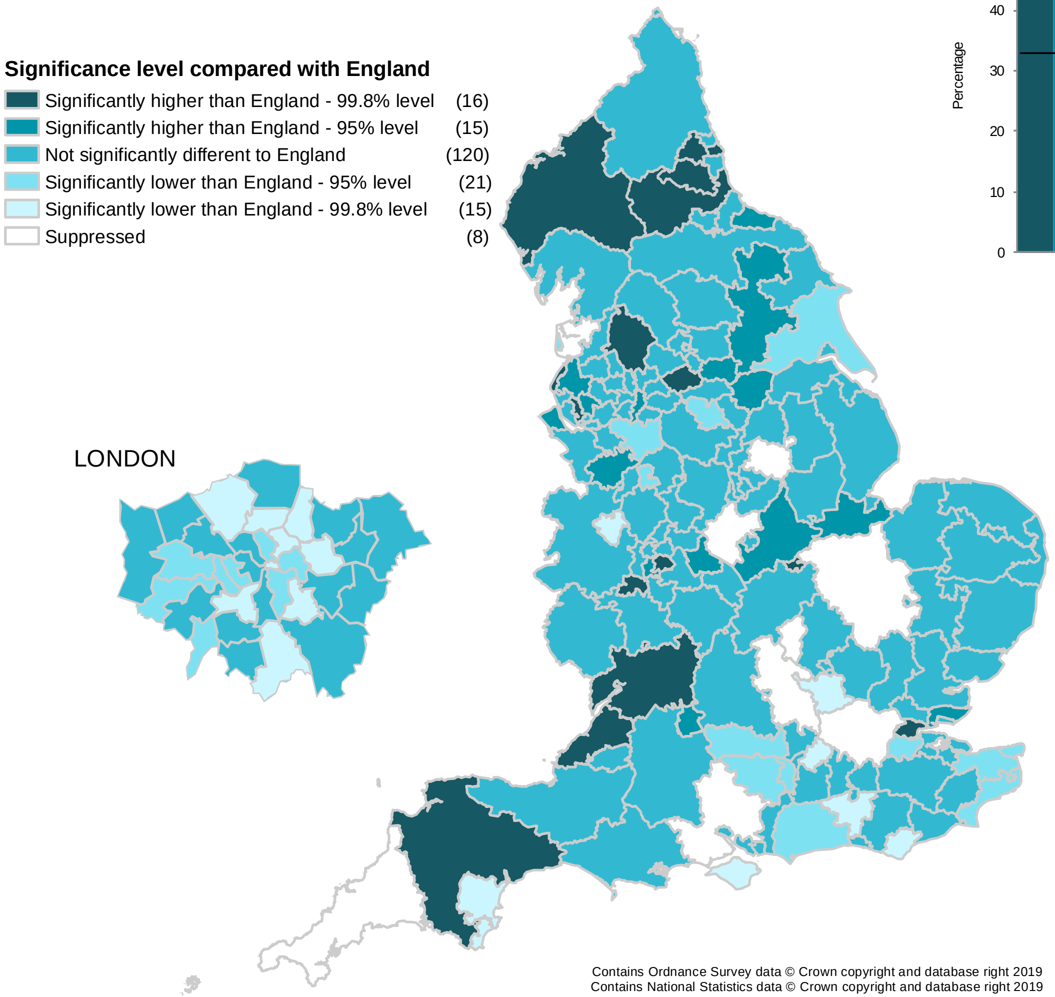
The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 21.9% to 59.9% which is a 2.7-fold difference between CCGs.

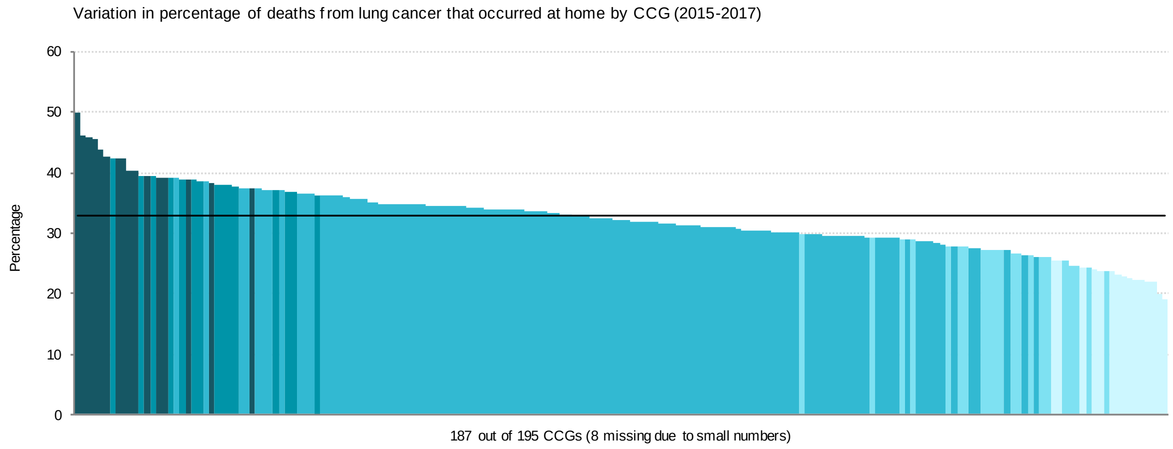
The England value for 2015 to 2017 was 37.1%.

End of life care – Lung cancer

Map 32d: Variation in percentage of deaths from lung cancer that occurred at home by CCG (2015-2017)

Optimum value: Requires local interpretation





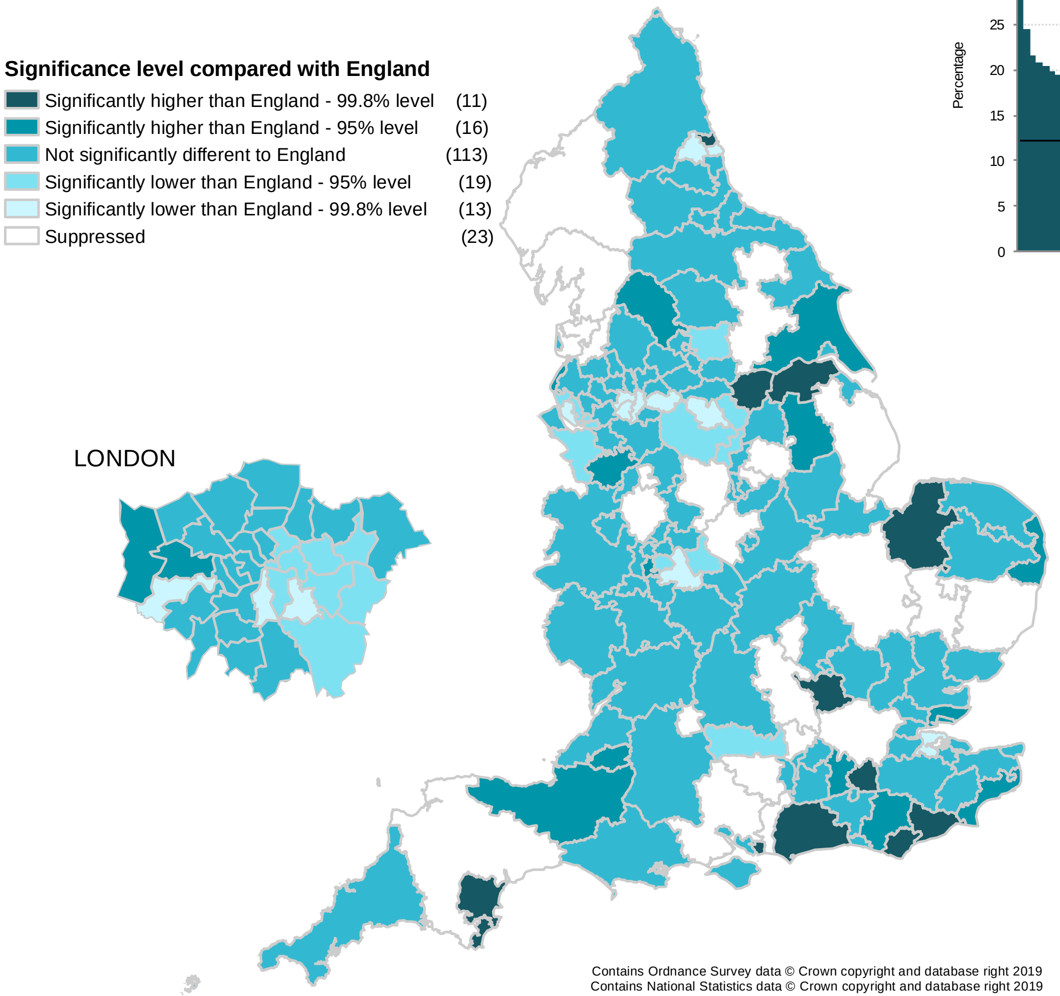
The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 19.2% to 50% which is a 2.6-fold difference between CCGs.

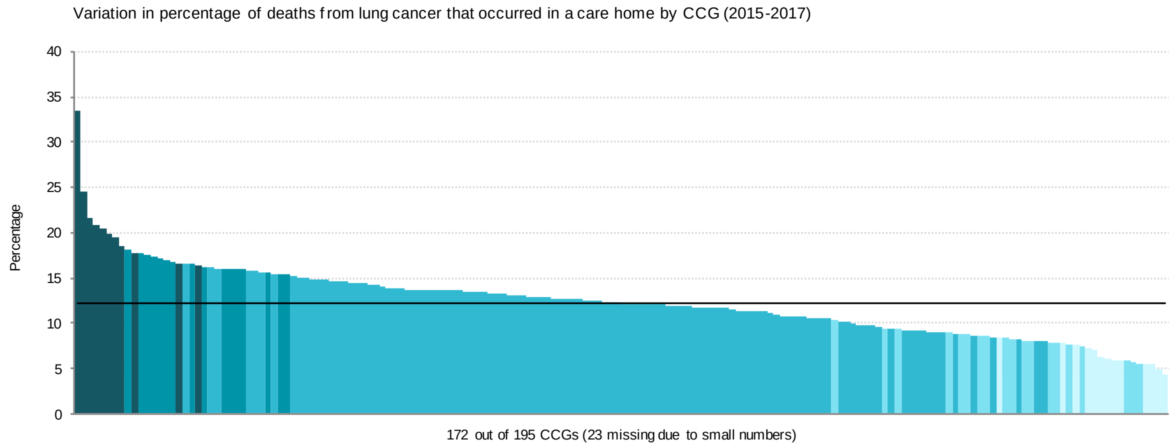
The England value for 2015 to 2017 was 33%.

End of life care – Lung cancer

Map 32e: Variation in percentage of deaths from lung cancer that occurred in a care home by CCG (2015-2017)

Optimum value: Requires local interpretation



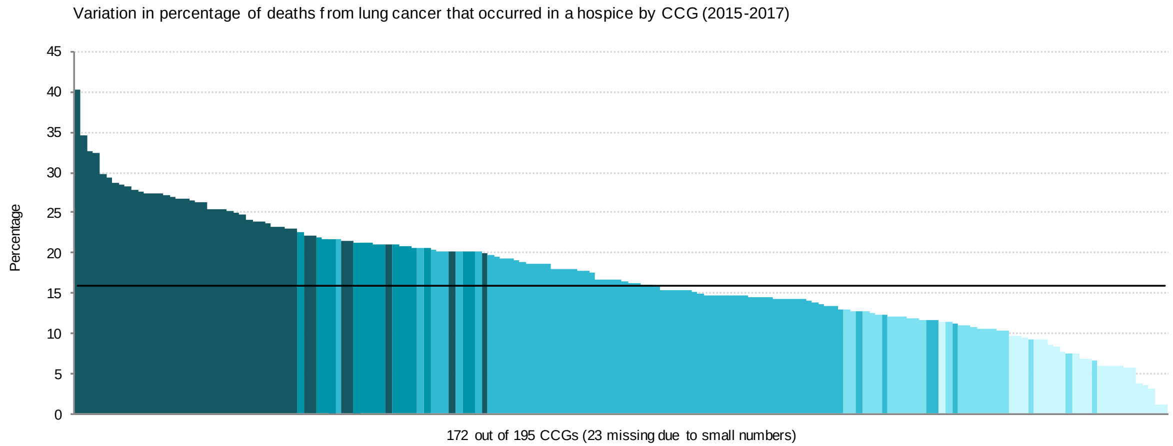


The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 4.3% to 33.5% which is a 7.8-fold difference between CCGs.

The England value for 2015 to 2017 was 12.3%.

End of life care – Lung cancer

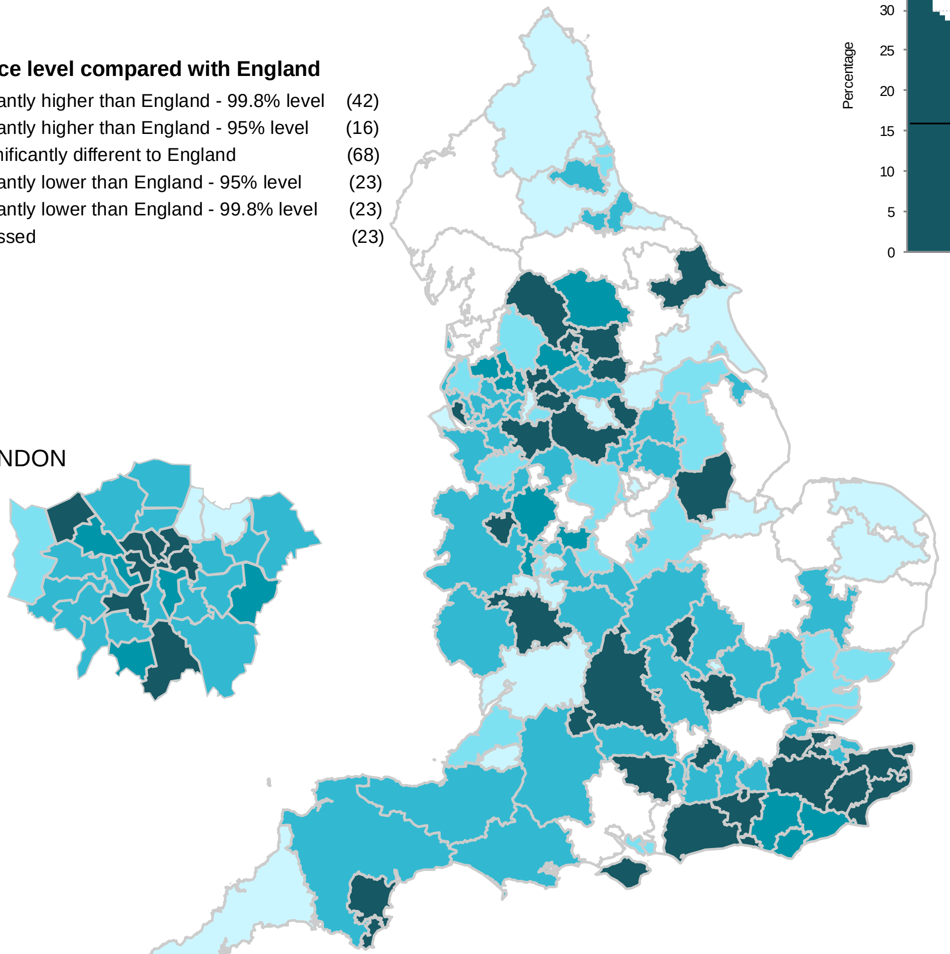
Map 32f: Variation in percentage of deaths from lung cancer that occurred in a hospice by CCG (2015-2017)



Optimum value: Requires local interpretation

Significance level compared with England

Significantly higher than England - 99.8% level	(42)
Significantly higher than England - 95% level	(16)
Not significantly different to England	(68)
Significantly lower than England - 95% level	(23)
Significantly lower than England - 99.8% level	(23)
Suppressed	(23)



The map and column chart display the latest period (2015 to 2017), during which CCG values ranged from 1.1% to 40.4% which is a 38.1-fold difference between CCGs.

The England value for 2015 to 2017 was 15.9%.

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[11] Dixon J, King D and Knapp M (2016) Advance care planning in England: Is there an association with place of death? Secondary analysis of data from the National Survey of Bereaved People BMJ Support Palliat Care 0:1-10 doi: 10.1136/bmjspcare-2015-000971 [Accessed 29 July 2019]
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Case studies

Alongside the evidence based options for actions and resources presented within each map section of the Atlas, this section includes case studies to provide some real-life examples of how local services are working to improve outcomes for patients. The 13 case studies have been selected to focus on the following areas of clinical importance and where possible supporting priorities within the NHS Long Term Plan:

- community-acquired pneumonia
- pulmonary rehabilitation
- case finding and diagnosis
- medicines management
- integrated children's services
- palliative care
- fuel poverty

The case studies included in this Atlas are not the only examples of innovative practice within respiratory disease care and these additional resources also contain useful case studies:

- case studies included in the 2012 Atlas of Variation in healthcare for respiratory disease
- NHS England Respiratory disease web page detailing the national ambitions for respiratory disease and providing links to many initiatives, including some case studies
- Respiratory Futures – a platform to support respiratory care in partnership with the British Thoracic Society and NHS England
- RightCare respiratory web page including the COPD Pathway and the National Priority Initiative work stream

Case study 1: The Derby Respiratory Infections Team

Setting

University Hospitals of Derby and Burton NHS Foundation Trust

The problem

The problems with the management of patients hospitalised with community-acquired pneumonia (CAP) are threefold:

1. Guideline adherence, care quality and patient outcomes are poor.[1]
2. Patients of low severity are managed in hospital rather than as outpatients.[2]
3. Antibiotic stewardship - and the potential for safe streamlining of regimens based on rapid microbiological testing, with earlier decision making and discharge - is limited.[3]

What action was taken?

A Respiratory Infections Team was developed at the Royal Derby Hospital, comprising 3 specialist nurses with consultant and pharmacist support. Consecutive patients admitted to the trust with CAP were reviewed.

The objectives of the team were to:

1. Implement the NICE pneumonia guidelines,[4] leading to ≥70% adherence in year 1, and 80% in subsequent years.
2. Identify patients with low severity CAP for outpatient management, implementing early telephone-supported discharge and follow-up, reducing their length of stay.
3. Facilitate streamlining of antibiotic treatment using point-of-care microbiological tests within 48 hours of admission, reducing total amount of antibiotics prescribed both in route and spectrum.

Outcomes

Over 2 years the team has reviewed 947 patients with suspected CAP; 153 had a chest radiograph reported as clear and were excluded, leaving 794 for analysis. A comparison was made with a pre-intervention CAP cohort.

Length of stay was reduced when compared with pre-intervention after adjustment for pneumonia severity (low severity, 3.4 vs 4.4 days; moderate severity, 4.9 vs 7.6 days; high severity, 7.4 vs 8.9 days), and readmission rate at 30 days was unchanged. Early supported discharge was appropriate in around one-third of patients; in this group length of stay was even shorter at 3.4 days and readmission rate reduced.

A positive microbiological diagnosis was made in 26.4% patients compared with 4.9% pre-intervention. Broad spectrum antibiotic regimens were streamlined in 13.5% patients.

To date, 100% of patients have been happy with the care they received. Clinicians have found this novel service both challenging to their current practice, but also helpful from an educational perspective.

Further project information

National Institute for Health and Care Excellence (2018) Shared Learning Database The Respiratory Infections Team – a novel paradigm in the management of community-acquired pneumonia [Accessed 11 June 2019]

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[4] National Institute for Health and Care Excellence (2014) Pneumonia in adults: diagnosis and management (NICE clinical guideline [CG191]) [Accessed 5 March 2019]

Case study 2: Improvement of patient outcomes through the implementation of a Specialist Pneumonia Intervention Nursing service

Setting

University Hospitals of Leicester NHS Trust

The problem

Community-acquired pneumonia (CAP) is the leading cause of deaths in NHS hospitals and puts huge pressure on the NHS in winter. At a national level pneumonia and flu caused 269,313 emergency hospital admissions in the UK in 2016/17 which cost the NHS an estimated £1 billion. Better health outcomes are driven by fast diagnosis, correct disease severity assessment and rapid and tailored treatment.

What action was taken?

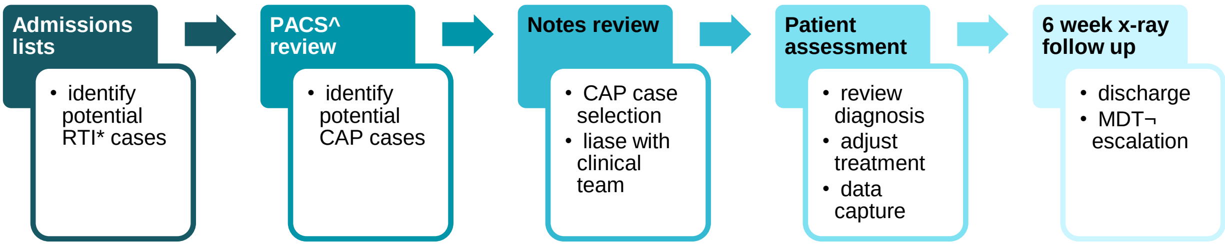
A Specialist Pneumonia Intervention Nursing (SPIN) service was set up which is dedicated to screening for potential cases from acute medical admission and implementing key evidence-based activities rapidly.

These include:

- completion of key interventions within 4 hours
- rapid confirmation by chest x-ray
- rapid scoring of disease severity
- guided antibiotic therapy

The process of assessing CAP cases is shown in Figure CS2. The service was initially comprised of 2 specialist pneumonia nurses working at 2 acute hospital sites during daytime hours. After 2 years the team was expanded to 5 nurses with the aim that all patients admitted with CAP will benefit from being seen by the specialist nurses.

Figure CS2: **Process map for admission screen for CAP patients**[1]



*RTI - respiratory tract infection
^PACS - picture archiving and communication system
¬MDT - multi disciplinary team

Outcomes

In year 1 of providing the specialist service the overall death rate from CAP (within 30 days of admission) was reduced from 23% to 17% for those seen by the SPIN team. In the second year this rate reduced even further to 11.5%. This improvement remained significant after adjustment for age and other illnesses and was confirmed as significantly better than expected for NHS patients by external NHS monitors.

Compliance with key CAP intervention factors has improved in the trust with interventions implemented in >90% of assessed admissions from 2014-2016. Through early diagnosis and administration of correct antibiotic therapy, unnecessary use of antibiotics has been reduced. Outcomes have also improved for patients not personally reviewed by the SPIN team suggesting systematic learning benefits occurred.

The nurses also provide a 6 week follow up x-ray service for more than 1,000 patients per year. This task was previously delivered by consultants in hospital outpatient clinics, these appointments can now be offered to other lung disease patients.

The SPIN team provide a nurse point of contact and telephone advice to patients once they are at home which reduces readmission by increasing patient knowledge and improving self-management. This also facilitates recognition of early symptoms which can be treated in primary care. A patient survey found that the SPIN service has improved patient experiences by increasing patient communication and education and providing a quicker service which is available 7 days a week.

If a highly focussed pneumonia intervention nursing service were rolled out across the NHS it could save thousands of lives every year. Such a service also supports medical emergency admission teams during the winter pressure period.

Further project information

Free R, Richardson M, Skeemer J and others (2018) Implementation of a specialist pneumonia intervention nurse (SPIN) service significantly improves outcomes for community acquired pneumonia (CAP) at a major NHS trust Thorax 73(S4): P23 doi: 10.1136/thorax-2018-212555.181 [Accessed 28 August 2019]

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Case study 3: Integrating patients with respiratory and cardiac disease in one rehabilitation programme

Setting

University Hospitals of Leicester NHS Trust

The context

Rehabilitation is a successful intervention for patients with pulmonary and cardiac disease, which is recommended by NICE (National Institute for Health and Care Excellence). These interventions are traditionally provided as disease-specific programmes; yet their components are largely the same. There may be a better use of staff time and resources to combine the groups.

What action was taken?

We performed a mixed methods evaluation of clinical outcomes and experiences of staff. Patients attended rehabilitation twice a week for 6 weeks to complete education sessions, aerobic and resistance exercises. Outcome measures were collected before and after the programme: exercise capacity, dyspnoea, and mood. Qualitative focus groups also took place with staff (n= 7) involved in delivering the programme to explore staff attitudes towards the new service and were evaluated using thematic analysis.

Between April and December 2018 (8 months) 99 patients went through the breathlessness programme. Of these 56 had complete pre-post data, 58% were male with a mean age 69.3 years (Standard Deviation (SD) 11.5) and Body Mass Index (BMI) 29.9 (SD 7.4). See table CS3 for clinic outcome measures recorded before and after rehabilitation.

Table CS3: Clinic outcome measures recorded before and after rehabilitation

Outcome	Pre Mean (SD)	Post Mean (SD)	Change Mean (SD)
Maximal exercise capacity (ISWT: incremental shuttle walk test m)	254.1 (142.3)	307.0 (159.6)	52.9 (58.4)**
Endurance exercise time (ESWT: endurance shuttle walking test sec)	221.1 (129.9)	661.7 (426.8)	440.6 (387.2)**
Dyspnoea (CRQ/ CHQ: chronic respiratory/ chronic heart questionnaire)	3.1 (1.1)	4.0 (1.2)	1.0 (1.2)**
Anxiety (HADS: hospital anxiety and depression scale)	7.5 (3.7)	5.8 (2.4)	-1.7 (3.1)*
Depression (HADS: hospital anxiety and depression scale)	6.2 (3.2)	4.8 (3.4)	-1.4 (2.1)*

**p<0.001

Outcomes

This is the first time that patients with respiratory and cardiac disease have been evaluated in a combined rehabilitation programme, outside of a research context. The results show that patients had a positive outcome following rehabilitation in terms of statistically and clinically significant improvements in typical outcomes. Staff focus groups suggest a positive experience of combining the programmes, which has been shaped by continuously evolving perceptions and service structures.

Further project information

University Hospitals of Leicester Pulmonary Rehabilitation [Accessed 23 September 2019]

Further information regarding the outcome measures used within the service:

University Hospitals of Leicester Pulmonary rehabilitation information for health professionals [Accessed 23 September 2019]

Case study 4: Pulmonary rehabilitation and Breathe Easy

Setting

Leeds Community Healthcare NHS Trust

The problem

Pulmonary rehabilitation is considered to be an important part of the management of chronic respiratory conditions. In Leeds, it is provided through the community respiratory service, which provides specialist advice to patients with COPD as well as other chronic respiratory diseases.

The pulmonary rehabilitation program is run in 4 venues across the city, and is an 8 week program of exercise and education sessions. There was minimal support post completion of pulmonary rehabilitation, with only one Breathe Easy group for the whole city. This was well attended in the local area but left the rest of the city without a support group post pulmonary rehabilitation.

This led to patients often being re-referred to pulmonary rehabilitation or the respiratory team, with increased exacerbations and did not support the self-management agenda.

What action was taken?

The British Lung Foundation linked in with the service to develop a more integrated approach to patient care, providing 11 Breathe Easy support groups across the city of Leeds, allowing improved accessibility to the groups.

The groups are patient led, and provides exercise maintenance classes (from exercise instructors) to ensure that people who have participated in pulmonary rehabilitation can continue to exercise and effectively self-manage their condition. They provide support for patients by patients. The group decide themselves on speakers they would like to invite, in order to keep up with local services. The groups meet weekly. People can refer themselves to the groups and referrals also come through the pulmonary rehabilitation team.

Outcomes

This project remains in its infancy and the service is working on the development of the Breathe Easy groups to allow sustainability alongside the lead volunteers for the groups. At present, 4 groups are working very well, providing support for approximately 20 people per session.

Further project information

Leeds Community Hospital Respiratory [Accessed 23 September 2019]

Leeds City Council Active Leeds Health Programmes: Pulmonary Rehabilitation [Accessed 23 September 2019]

Case study 5: MISSION ASTHMA – Modern Innovative SolutionS to Improve Outcomes iN Severe Asthma

Setting

Lead organisation: Portsmouth Hospitals NHS Trust

Partner organisation: Wessex Academic Health Science Network

The problem

In Wessex asthma is underdiagnosed, a major driver for hospitalisation, and in many areas clinical outcomes compare poorly to national averages. Wessex has 147,252 diagnosed asthma patients, of whom 2,996 were admitted to hospital in 2011/12.

The prevalence of asthma in Wessex is 6.1%, which is higher than the England prevalence of 5.9%. Patients with uncontrolled asthma are at an increased risk of death, experience reduced quality of life and have high healthcare usage.

What action was taken?

MISSION is a quality improvement and innovation project that tests the acceptability and delivery of a novel model of asthma care. care. The current journey for a patient with poorly controlled asthma in the community and hospital is convoluted and expensive requiring frequent use of out-of-hours (OOH) services. Eventually a diagnosis of severe asthma may be established by a specialist asthma Multi-Disciplinary Team (MDT), and appropriate treatments and support is initiated. This is associated with a particularly poor patient and carer experience. The aim of MISSION-Severe Asthma was to proactively identify patients with poorly controlled asthma from GP registers, to facilitate swift assessment in the community. This will be followed by rapid in hospital evaluation by a specialist asthma MDT. The intention is to dramatically reduce the length of time before severe asthma is recognised, and to reduce health costs and improve patient experience.

What does MISSION involve?

MISSION can be divided into two areas:

Novel Case Finding

Patients with poorly controlled asthma are actively sought; the majority are identified from primary care registers, with a small number of patients recently admitted with acute asthma but not known to the specialist asthma team.

A Specialist Respiratory Nurse and Clinical Research Fellow will review the asthma registers of 5 GP surgeries in Wessex to assess patient records for patients suspected of having poorly controlled and potentially severe asthma; this will include any of:

- Preventer use: high dose inhaled corticosteroid use (>500mcg BDP equivalent)
- Exacerbation history: one or more Emergency Department (ED) and/or hospital admissions in previous 12 months
- Exacerbation history; 2 or more exacerbations requiring oral corticosteroids in previous 12 months
- Bronchodilator use: frequent use of short-acting bronchodilators (>6 salbutamol or equivalent inhalers in previous 12 months)
- Use of 3 or more controller medications (any 3 of inhaled corticosteroids, long-acting bronchodilators, leukotriene receptor antagonist, long-acting muscarinic antagonist, theophylline)

- Use of maintenance oral corticosteroids
- Reduced lung function (FEV_1 or PEFR at most recent QOF <80% predicted when well)

These patients were assessed with an ACQ (6) (Asthma Control Questionnaire-6) sent by post ahead of the first rapid review clinic in the community (a mean score of >1 will be accepted as indicating sub-optimal control). Those with uncontrolled asthma were invited to a MISSION clinic. Patients with an ACQ score of <1, indicating acceptable control were still invited for a review at one of the specialist asthma clinics at Queen Alexandra Hospital (or Southampton General Hospital as appropriate), as they had one or more other criteria indicating potentially poor asthma control for example exacerbation history.

MISSION Clinics

The clinics were held in 2 stages – Rapid Access Asthma Clinics (RAAC) and Severe Asthma Assessment Clinics (SAAC).

The RAAC saw a total of 150 patients over 5 days in 5 different locations across Wessex – Winchester, Southampton, Portsmouth City, Gosport and Havant.

The SAAC saw 24 patients identified from the RAAC as having severe (BTS stage 4 or 5) asthma or uncontrolled symptoms despite review. The SAAC was held at Queen Alexandra Hospital.

Outcomes

Results of the Pilot show a reduction of:

- 24% in oral steroid courses
- 25% in non-routine GP appointments for asthma
- 30% in short acting beta agonist use
- 50% in emergency department attendances
- 100% in hospital admissions

Further project information

Wessex Academic Health Science Network MISSION Severe Asthma – Modern Innovative SolutionS to Improve Outcomes In Severe Asthma [Accessed 23 September 2019]

Portsmouth Hospitals NHS Trust (2018) NICE Shared learning database Modern Innovative SolutionS Improving Outcomes iN Asthma Breathlessness and COPD (MISSION ABC) [Accessed 23 September 2019]

Case study 6: MISSION COPD: Modern Innovative SolutionS Improving Outcomes iN COPD

Setting

Lead organisation: Portsmouth Hospitals NHS Trust

Partner organisation: Wessex Academic Health Science Network

The problem

Over 1 million people in the UK have diagnosed COPD which accounts for around 30,000 deaths annually. Cases of COPD are expected to increase by over 30% in the next 10 years, and an estimated 2 million people currently remain undiagnosed. Portsmouth has significantly higher than average rates of smokers, COPD admissions and readmissions, and deaths related to COPD.

What action was taken?

The project team from Portsmouth Hospitals NHS Trust proactively identified patients with undiagnosed or high-risk COPD from 5 GP registers. An assessment was conducted of disease control, quality of life and triggers in the practice surgery, followed where necessary by evaluation in hospital by a specialist respiratory team. Tailored education sessions were held in 3 venues.

Patients were followed up after 3 and 6 months to assess sustained health outcomes, disease control and quality of life.

MISSION-COPD assessed patients to NICE quality standards at an earlier stage of disease where intervention can yield greater results in disease control and quality of life. Reducing the length of time before uncontrolled COPD and other comorbidity is recognised, reduced cost and improved the patients experience of care.

MISSION COPD followed on from the successful MISSION Asthma project undertaken the year before, and lessons from MISSION Asthma informed the design and implementation of MISSION COPD.

In the set-up phase of the project, clinic-style mirrored the asthma model, whilst taking into account the COPD patient cohort was often older with a greater number of comorbidities. In addition, the COPD clinic included case finding requiring reversibility testing on spirometry (to clarify if their diagnosis was more likely to be asthma). This meant that we had to adapt the original clinic capacity and increase it to a maximum of 25 patients, allowing 1.5 slots for each case-finding patient.

The final rapid clinic carousel consisted of a medical review, spirometry, inhaler technique, smoking cessation and an introduction to available research projects. The carousel was followed by an education session about COPD and a physiotherapy session focussing on relieving breathlessness, chest clearance and breathing control. Each patient then had an individual feedback session and was given a personalised self-management plan and fridge magnet designed for the clinic.

The severe clinics adopted the same model as the Asthma model but with addition of echocardiography, social services and palliative care. Thirty patients were seen in the secondary care clinic, with a focus on identifying and managing comorbidity in patients with a heavy symptom burden. We initially planned to see a maximum of 24 patients, but found we could accommodate 30. The patient journey through the severe clinic was individualised, but included a medical review, revision of inhaler technique, blood sampling, advanced physiology, CT, echocardiography, dietician, psychology, palliative care, smoking cessation and social services.

The British Lung Foundation supported each clinic. This has led to a close working relationship between the teams. The local Breathe Easy Committee has offered to fund raise for equipment for the next stage of the project following our presentation of our outcomes to them.

After each encounter with the MISSION team both patient and GP received a summary of their results, treatment changes and diagnoses.

Outcomes

53 of the 72 care cohort patients remained with a diagnosis of COPD, 12 were re-diagnosed to asthma, 6 to Asthma-COPD overlap syndrome (ACOS) and one to heart failure.

Of the 36 case-finding patients 22 had asthma, 5 had COPD, 2 had ACOS and 7 had diagnoses other than airways disease (lung cancer with hypersensitivity pneumonitis, reflux, bronchiectasis, dysfunctional breathing).

Anxiety/depression and dysfunctional breathing were screened for using the Hospital Anxiety and Depression Scale (HADS) and Nijmegen questionnaires. 22% of attendees screened positive on the HADS questionnaire with more in the case finding group. 48% screened positive on the Nijmegen questionnaire; the cases where the MDT felt dysfunctional breathing was significant were referred to specialist physiotherapy in the severe clinic or separately.

We also identified several other clinically significant diagnoses:

- lung cancer
- cardiac: heart failure, pulmonary hypertension, valve dysfunction
- additional lung pathology: fibrosis, bronchiectasis
- occupational lung disease
- psychiatric issues including risk of self-harm
- vitamin deficiencies requiring treatment

Further project information

Wessex Academic Health Science Network MISSION COPD: Modern Innovative Solutions to Improve Outcomes in COPD [Accessed 23 September 2019]

The Health Foundation, Portsmouth Hospitals NHS Trust MISSION COPD: Modern Innovative SolutionS in Improving Outcomes iN COPD [Accessed 23 September 2019]

National Institute for Health and Care Excellence (2018) Shared learning database Modern Innovative SolutionS Improving Outcomes iN Asthma Breathlessness and COPD (MISSION ABC) [Accessed 23 September 2019]

Case study 7: COPD case-finding in community pharmacies in the Wirral[1]

Setting

Twenty-one community pharmacies in the Wirral area working together in the Community Pharmacy Future project.

Context

Case finding by screening people at risk of COPD is effective when conducted by GPs. The aim of this project was to deliver a COPD case finding service in a range of community pharmacies in England and estimate the cost and effects associated.

What action was taken?

The project identified 238 patients as either smokers or regular purchasers of cough medicines. These patients were screened by the pharmacies over 9 months, using a symptom questionnaire and spirometry. Pharmacy staff engaged with local GP surgeries before the project to make them aware of potential referrals and to ensure continuous patient support.

The questionnaire, using a validated disease risk assessment questionnaire, asked about age, lifetime cigarettes smoked (if>100), shortness of breath, ever coughing up mucus or phlegm, and if breathing problems affect usual activities. Each response was graded out of 2, a score of 6 or more resulted in a GP referral.

Micro-spirometry (hand-held spirometers) was used to determine the amount of air forcibly exhaled at 1 and 6 seconds (FEV_1 and FEV_6). A ratio of FEV_1 to FEV_6 of less than 0.7 or FEV_1 less than 80% of normal predictions resulted in a GP referral. All patients were either given lifestyle advice, signposted or offered smoking cessation support and/or referred to their GP.

Outputs

In total 135 patients (56.7%) were identified as at risk of COPD. Of these 88 (65.2%) were current smokers. Of these 34 (38.6%) refused smoking cessation services, 16 (18.2%) received an in-house pharmacy smoking cessation service, and 30 (34.1%) were referred to an external service.

Lifestyle advice was given to 150 people to decrease their risk of developing COPD, including advice about smoking cessations services, diet and nutrition, physical activity, alcohol and weight management, and were signposted to the GP to provide timely diagnosis.

Outcomes

As well as the significant benefits to those at risk of developing COPD, the service also found that there would be significant cost savings through case-finding by screening. If the findings were replicated in England, the service would identify more than 205,000 people at risk of COPD and save £214.7million.

The project shows community pharmacists can effectively undertake case finding of COPD and targeted screening can identify a single patient with moderate severity COPD for every 2 patients screened. The project also identified smokers without COPD who would consider accessing smoking cessation services.

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[1] Wright D, Twigg M and Thornley T (2015) Chronic obstructive pulmonary disease case finding by community pharmacists: a potential cost-effective public health intervention International Journal of Pharmacy Practice, 23, 83–85 doi: 10.1111/ijpp.12161 [Accessed 4 August 2019]

Case study 8: SIMPLE approach to managing people with asthma and COPD

Setting

Leicester, Leicestershire and Rutland (LLR) sustainability and transformation partnership (STP)

The problem

The LLR STP's 2016 draft plan highlighted respiratory disease as a priority.[1] Leicester City has very high emergency admission rates for asthma and COPD, substantially above the national average. The plan highlighted variation across the STP in mortality from respiratory disease, with poor health being driven by deprivation and exacerbated by lifestyle factors. A key solution was to enhance community-based treatment, focusing on prevention, aiming to lead to a wide range of positive health outcomes including: reduction in smoking; medicine optimisation and patient management.

With the medical treatments currently available, it is possible to achieve asthma control in most patients and reduce symptom and exacerbation burden for people with COPD. However, patients may not be prescribed appropriate medicines and/or can make wrong choices about self-management. It is well documented that inhaler technique and sub-optimal adherence are fundamental issues and support to improve both can lead to significant enhancements in health outcomes. The community pharmacist, an under-utilised resource, can support primary care services by optimising medicines, improving inhaler technique and medicine adherence. They can also promote other services that can improve asthma and COPD control and reduce healthcare utilisation.

What action was taken?

A structured comprehensive Medicines Use Review (MUR) service was developed and delivered by community Pharmacists. The service was targeted to people with asthma or COPD. The service was built on the SIMPLE approach to management to integrate community pharmacists by involving them in chronic disease management within the healthcare team, as follows:

- **S**top smoking support – very brief advice, support or refer
- **I**nhaler technique – observe and optimise
- **M**onitoring – control, symptoms, exacerbation rates and medicine adherence
- **P**harmacotherapy – optimise and provide patient information and support
- **L**ifestyle factors – promote exercise, vaccinations and highlight the benefits of pulmonary rehabilitation and Breathe Easy groups
- **E**ducation – provide self-management information and plans

People attending the pharmacy to collect a repeat prescription were invited to have a full review of their condition and medicines, including optimisation of inhaler technique and provision of a personalised self-management plan. In addition, the pharmacist delivered public health messages, signposting to stop smoking services, vaccination and other services.

An educational toolkit was developed to support pharmacists undertaking the asthma or COPD reviews. Pharmacists attended bespoke training events and follow-up resources were provided to support the service.

Outcomes

Implementation of the SIMPLE MUR service demonstrated the following outcomes:

SIMPLE asthma service

There were significant improvements in patient asthma control (measured by the Asthma Control Test (ACT) questionnaire) ($p=0.002$). Intention-to-treat analysis confirmed significance ($p=<0.001$). 40% of patient's ACT score increased by a score that would be clinically important.

The number of visits to the GP for an asthma-related issue over the study period reduced by 32% ($p=0.053$).

Inhaler technique was checked by the pharmacist in 99% of cases. Patient inhaled technique improved significantly ($p<0.001$).

Medication adherence – both self-reported and adherence scores calculated by prescription re-fill data from the pharmacy computer system showed improvements. The results showed a significant reduction in the collection of prescriptions for short-acting beta agonist (SABA) and a highly significant increase in the prescription refill of inhaled corticosteroids (ICS) ($p<0.001$). 92% of patients at the end of six months collected at least 80% of their ICS inhalers.

The pharmacist completed and provided a personalised asthma action plan for 80 patients (78%).

SIMPLE COPD service (n=125)

There was a statistically significant reduction (i.e. improvement) of 3.6 points of the overall COPD Assessment Test (CAT) score over this 6 month period ($p< 0.001$) and MRC dyspnoea score 2.60 (95% CI 2.35, 2.85) at 6 months in comparison to 2.80 (95% CI, 2.58, 3.02) at the baseline.

Inhaler technique improved (evaluated using the 7-steps framework), particularly the critical inhalation step improved from only 39% correct at baseline to 74% at 2-month ($p<0.001$) and breath-hold 52% to 80% ($p<0.001$).

Conclusion

The analysis of both services does indicate that the SIMPLE service provided by community pharmacists can improve clinical outcomes for patients with COPD and asthma. Subsequently, the SIMPLE approach to managing Asthma and COPD has been adopted as the clinical framework for MUR and New Medicine Service (NMS) services by community pharmacists in LLR STP.

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[1] Leicester, Leicestershire and Rutland Sustainability and Transformation Plan. 21 November 2016. Better Care Together Draft Plan [Accessed 26 August 2019]

Case study 9: Impact of pharmacist led asthma and COPD clinics in General Practices

Setting

City and Hackney Clinical Commissioning Group (CCG)

The problem

The NHS spends over £1bn on respiratory medicine in direct costs, but patients continue to experience exacerbations and poor quality of life. A City and Hackney audit in 2013 revealed that unused medicines were costing the local NHS approximately £1million per annum, with inhalers being the costliest proportion of returned items to pharmacies. Additionally, despite the low reported prevalence of asthma and COPD across City and Hackney, A&E attendances and admissions were significantly high.

What action was taken?

High risk patients, those highly symptomatic, on high-dose inhaled corticosteroids (ICS) and patients who were frequently exacerbating were identified by practice support pharmacists and reviewed in a specialist respiratory pharmacist clinic. The review included ensuring correct diagnosis, assessing symptom burden, lung function, inhaler technique and adherence to medication. Where applicable smoking cessation advice was given.

Patients were invited to group training sessions as well as one to one reviews with additional home visits for house bound patients by a specialist respiratory pharmacist. Training was also given to staff and patients in local nursing homes.

GPs, nurses and practice pharmacists in primary care were upskilled with respect to reviewing diagnosis and assessing inhaler technique. Ongoing support is also provided to all health care practitioners for queries and review of difficult patients identified.

City and Hackney CCG has developed integrated working to prevent hospital admissions, many patients with severe COPD are managed by the Adult Cardiorespiratory Enhanced and Responsive Service (ACERS) – a local consultant-led community respiratory team. The specialist respiratory pharmacist attends multi-disciplinary team meetings and where appropriate will discuss patients with the ACERS team to make informed decisions. The pharmacist also attends a regular pulmonary rehabilitation programme to discuss medicines related issues with the patients attending.

To ensure the whole local health economy is appropriately skilled, community pharmacists have received additional training on how to counsel patients on adherence, self-management and inhaler technique with access to local guidance and resources.

Local guidelines, inhaler flashcards and inhaler summaries have been produced and distributed to all involved in patient care to ensure consistency in prescribing and advice given to patients.

The local Quality Outcomes Framework (QoF) electronic template used in general practices has also been updated to include adherence when reviewing asthma and COPD patients, with prompts added as decision aids to improve the quality of annual reviews.

Outcomes

Approximately 3,200 patients have been reviewed by the specialist respiratory pharmacist in GP practices or in their homes. Adherence to medication was significantly improved for patients with asthma and COPD, resulting in improvements in Quality of Life (QoL) measures such as Asthma Control Test (ACT), COPD Assessment Test (CAT) and Medical Research Council (MRC) dyspnoea scores.

The dose of ICS was significantly reduced with an increase in long acting bronchodilator prescriptions for patients with COPD, reducing the steroid burden and risk of pneumonia and other adverse events. Existing medication was stopped for many patients where it was not appropriate.

Despite step down and cessation of inhalers, statistically significant improvements were found in the rates of exacerbations and emergency GP appointments. Improvements in lung function tests (measured by peak expiratory flow (PEF) and forced expiratory volume in one second (FEV_1), for asthma and COPD respectively were also demonstrated.

Inhaler technique was checked for over 90% of patients and where necessary changes made to their devices or technique.

This work continues to deliver cost savings, improve patient quality of life (QoL) and reduces exacerbations.

Further project information

To find out more about pharmacist led asthma and COPD clinics in general practice within City and Hackney CCG please click on the link below:

National Institute for Health and Care Excellence (2016) Shared Learning Database Impact of a pharmacist-led Asthma and COPD respiratory clinic in General Practice [Accessed 11 June 2019]

Case study 10: The Evelina London model of care: Children & Young People's Health Partnership

Setting

The socioeconomically diverse boroughs of Lambeth and Southwark, South London.

The problem

Asthma care for children in the UK falls below standards in health outcomes, care service quality, and service-use indicators.[1] Emergency department (ED) attendances for children in Lambeth and Southwark rose by 58% in 2007-2016, projected to increase by 50-60% by 2030. Around 75% of ED attendances are likely to be manageable in primary care, or through integrated care models. In Lambeth and Southwark ED attendances among children are significantly associated with deprivation.

Across Lambeth and Southwark, around 1 in 3 children is living in poverty. Poverty causes ill health and prevents children from reaching their full potential in life. Furthermore, ill health and deprivation are often accompanied by hidden emotional problems which can affect school, home life and access to care.

What action was taken?

The Children and Young People's Health Partnership (CYPHP), a clinical-academic group hosted by Evelina London Children's Hospital and King's College London, is implementing and evaluating a health system strengthening initiative and new model of care for children. CYPHP are improving outcomes for asthma through a population-based approach to biopsychosocial *whole child* care.

Active case-finding using the GP call-re-call system, together with parental self-referral, improves equity of access to care. CYPHP created a pre-assessment Health Check, which can be completed via a child-friendly electronic portal, so that care can be tailored to each child's physical health condition, emotional wellbeing, and social circumstances. Families receive a Health Pack with top tips for promoting health and practical "how-to" guides for self-management and mental wellbeing, parenting, and links to useful local resources. Children who need extra support receive a bespoke integrated care and support package from CYPHP's children's multidisciplinary health team, providing and coordinating care across primary, community, and hospital settings, integrating physical and mental healthcare for the child's social context.

The phased roll-out of the Evelina London (CYPHP) model allows an opportunistic evaluation using a cluster randomised controlled trial design.[2] The evaluation will measure the impact of the new model of care on child and parent health and wellbeing, healthcare quality, and health service use.

Outcomes

The first wave of active case finding reached 90% of the eligible population, with high proportions from ethnic minority families and those living in deprived conditions. Early results suggest improved healthcare quality and reductions in ED use for children with asthma: 288 fewer ED contacts for asthma per 100 patients per year. Net cost savings from the asthma service are projected from year 2 onwards.

Children, young people and families are highly satisfied with the CYPHP model: "If this was an Ofsted you'd have to say it is outstanding in terms of the health provision and probably the broad happiness it's given us just to cope with it and move on from what was fairly difficult" quote from CYPHP family.

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[1] Royal College of Physicians (2014) National Review of Asthma Deaths - Why asthma still kills [Accessed 30 July 2019]
[2] Newham JJ, Forman JR, Heys M et al (2019) Children and Young People's Health Partnership (CYPHP) Evelina London model of care: protocol for an opportunistic cluster randomised controlled trial (cRCT) to assess child health outcomes, healthcare quality and health service use BMJ Open. [Accessed 20 September 2019]

Case study 11: Community case conferences improve the palliative care needs and quality of life of patients and carers living with fibrotic lung disease[1]

Setting

Royal Brompton Hospital, London

The problem

Patients with fibrotic lung diseases experience substantial unmet symptom and psychosocial concerns that profoundly impact on patients' and carers' lives. In addition, poor communication and co-ordination of care, with little or no discussion surrounding important end of life preferences has been reported.

Recent UK government legislation promotes better integration of care to improve patient experience and outcomes, providing better continuity of individualised care at the end of life.

What action was taken?

We aimed to obtain information on whether a case conference intervention (Hospital2Home) influences the palliative care concerns of patients with advanced fibrotic Interstitial Lung Disease and their carers, and to evaluate the feasibility and acceptability of the intervention in this group. Hospital2Home was trialled at the Royal Brompton Hospital using a fast-track randomised controlled trial with qualitative interviews. We measured change in Palliative Care Outcome Scale (POS) (a measure of symptoms and concerns at 4 weeks. Other outcomes measured included symptom control, quality of life, consent and recruitment rates. Fifty-three patients and 45 carers were recruited.

Outcomes

A statistically significant and clinically relevant improvement in the primary outcome of palliative care needs [mean change in POS at 4 weeks -5.3 (95% CI -9.8 to -0.7); independent t test p=0.02; effect size (95% CI) -0.7 (-1.2 to -0.1)] was found.

The secondary outcomes of quality of life, anxiety and depression were superior in the fast-track arm.

Qualitative findings corroborated these data and indicated that patients, carers and health professionals valued the holistic assessment, individual care plans, improved communication, co-ordination of care and crisis management plans.

Patients, carers and health professionals felt empowered to manage symptoms with all stating that the symptom control guidance was helpful.

The case conference specifically addressed information needs and started discussions around advance care planning, enabling 90% of the 21 patients that died before the end of the study to achieve their preferred place of death, with only 28% of patients dying in hospital.

Qualitative work suggested that patients became less dependent on acute care services through improved community relationships, facilitating death outside of hospital.

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[1] Bajwah S, Ross JR, Wells AU and others 2015 Palliative care for patients with advanced fibrotic lung disease: a randomised controlled phase II and feasibility trial of a community case conference intervention Thorax 70: 830-839. doi:10.1136/thoraxjnl-2014-206583 [Accessed 26 August 2019]

Case study 12: COPD patients with complex lives

Setting

North Manchester Macmillan Palliative Care Support Service (NMMPCSS), Manchester

The context

This case study describes the journey of a patient with COPD and complex needs. It is based on a real patient, but the name has been changed. Julie had end stage COPD and a chaotic lifestyle, lived in homeless accommodation and was driven by her addiction to illegal drugs. She used assisted ventilation at home and had a complex medication regime due to her drug dependency. Further treatment options had been exhausted. Julie was aware of her limited prognosis and that further care would be palliative.

The problem

Julie lived alone, her only friends being other drug users that often stole from and manipulated her. Housebound and dependant on others for activities of daily living and social support, Julie remained adamant that she did not want to return to hospital for further treatment.

Julie was estranged from her mother and children due to her drug use. Her palliative diagnosis rekindled the relationship; although this was at first strained, the relationship improved with help from NMMPCSS as they became a third party present during many difficult conversations.

What action was taken?

NMMPCSS co-ordinated a complex partnership approach that included Julie, her General Practitioner, the local Drugs and Alcohol Team to manage her medication and drug regime to prevent distressing withdrawal as she approached the end of her life, as well as to oversee social and financial support, difficult family communications and advance care planning.

Julie wasn't admitted to hospital in the final year of her life, but treated at home for several exacerbations of her COPD and associated pulmonary hypertension. On these occasions NMMPCSS increased their input and liaised closely with district nurses and the other community teams. Julie's personal care was funded by the NHS through Continuing Health Care.

Julie and her Macmillan Nurse, over time, established a close and trusting relationship and had sensitive and honest conversations about her preferred place of death and wishes for her funeral. She initially wanted to stay at home, but eventually realised that this was not a viable option. Julie had had a previous "poor experience during that hospice admission and took [her] own discharge". End of life care in a hospice was not an option. Julie agreed to a nursing home for end of life care, choosing a local home – she was frightened of dying alone and withdrawing from drugs.

Key considerations

What was important to Julie?

- being normal and being treated like a young woman
- staying at home for as long as possible
- not being readmitted to hospital
- having her wishes listened to
- regaining dignity and respect at the end of her life
- not being in pain or distress due to withdrawal from drugs

Outcomes

Julie was admitted to the nursing home when it was clear she was deteriorating and she, her mother and the home's staff were supported by NMMPCSS. She died peacefully 3 days later.

Julie's case has demonstrated that, where there is a co-ordinated, comprehensive service for patients with life-limiting illnesses, including those with non-cancer diagnoses, people who don't fit society's "norms" can be supported as their conditions deteriorate and can achieve appropriate end of life care and can achieve a "good death", free from distress. Palliative care can be appropriate at any point in a patient's illness journey.

Further project information

The NMMPCSS is one of the Macmillan Cancer Improvement Partnership (MCIP) projects and was funded by Macmillan Cancer Support and North Manchester CCG. The project was developed in partnership with North Manchester Clinical Commissioning Group, North Manchester Care Organisation, which is part of the Northern Care Alliance NHS Group (NCA), St Ann's Hospice and Macmillan Cancer Support. It is based on a Macmillan Service development in Midhurst Surrey and adapted to suit the needs of North Manchester.

The team has been enhanced to include a Consultant in Palliative Medicine, a GP with special interest in palliative care, a service manager, Clinical Nurse Specialists, a dietician, a speech and language therapist, a physiotherapist, an occupational therapist, assistant practitioners, a volunteer co-ordinator, dedicated administration and a medical secretary. The service provides a single point of contact for patients and extended working hours from 8am-8pm, 7 days a week. This enhanced service was operationally launched in April 2015.

The main aims of the service are:

- to identify patients early in their palliative journey, to undertake a full assessment and provide palliative and supportive care in their preferred place of care
- to increase collaboration and integrated working between those caring for patients with a palliative prognosis resulting from any life limiting illnesses
- to increase care and support for patients and carers therefore relieving pressure, avoiding crisis and enabling patients to live life well until the end
- to reduce the number of inappropriate hospital admissions in the last year of life
- to increase the numbers of patients dying in their preferred place of death and reduce the number of deaths in hospital

During the first year of NMMPCSS being in place, GP palliative care registers increased from 380 to 826 patients with 35 out of 36 GP practices now holding these meetings. Better integrated and co-ordinated care has resulted in less crisis management of those on the caseload. The service caseload increased to 395 with all patients being contacted within 24 hours of referral. Of those patients known to the service, 83% of patients have an advance care plan in place and 82% die in their preferred place of care. Patients known to the service dying in the hospital setting has dropped from over 20% to 13%. The success of NMMPCSS has led to further Macmillan funding and a plan to extend it across the whole of Manchester.

Case study 13: Warmer Homes Advice and Money (WHAM) tackling fuel poverty in Bristol and North Somerset

Setting

A partnership of 7 advice organisations led by the Centre for Sustainable Energy, with a pool of caseworkers who rotate between organisations acting as a single point of contact. A caseworker is also based inside 3 NHS trusts within Bristol City and North Somerset unitary authorities (North Bristol NHS Trust, Weston Area Health NHS Trust, and University Hospitals Bristol NHS Foundation Trust) identifying patients at risk of returning to a cold home and referring them into the project.

The problem

In Bristol and North Somerset, like much of the UK, the main drivers of fuel poverty are poor quality housing, high energy prices and low incomes. Within the Bristol City unitary authority, 11.7% (approx. 23,000 households) of households are estimated to be in fuel poverty. In North Somerset unitary authority, the estimate is 9.5% (approx. 9,100 households).[1]

Living in a cold home and coping with unaffordable fuel bills can have significant adverse implications on mental and physical health, educational and social outcomes.[2,3,4] An estimated 21.5% of excess winter deaths can be attributed to the coldest quarter of the UK's housing, where there is a greater risk of death than in warmer housing.[2] There is also a strong relationship between cold temperatures and respiratory diseases. Children living in cold homes are at greater risk of respiratory problems and lower educational attainment.[2] Struggling to pay fuel bills also has a negative impact on mental health, people who struggle to manage their bills often experience higher levels of anxiety and depression.[5,6] An estimated 34% of fuel poor households include somebody with a disability or long term health condition.[7]

What action was taken?

WHAM aims to tackle the interconnected causes of fuel poverty through a partnership between different support organisation who can help with energy, debt, money management, income, home repairs, housing and other issues. WHAM is implementing most of NICE's recommendations from their 2015 guidance,[4] particularly ensuring there is a single-point-of-contact referral service for people living in cold homes. The project aims are to:

- improve the warmth, comfort, safety and security of the home
- improve knowledge and confidence around energy bills and managing energy more efficiently
- reduce debt and help people manage their money
- ensure households are receiving all the benefits they are entitled to
- providing advice on legal, immigration and housing issues

The project's unique strategy is having caseworkers who rotate between each partner organisation, understanding the specialisms of each organisation, becoming the single point of contact for beneficiaries and co-ordinating the work undertaken by all partners. Beneficiaries can remain in contact with their caseworkers to update them about progress, additional problems and outcomes.

Outcomes

Since the project started in winter 2017 as a partnership between 3 organisations using 2 caseworkers with funding by Bristol City Council, WHAM has supported 1,217 households. It has since received additional resource to support a further 4 caseworkers bringing the total to 6. The expanded project now includes North Somerset unitary authority, 4 additional partner organisations and has doubled the number of people it aims to reach and support. The project can now access funds for free installation of first time gas central heating systems for low incomes households through the council's Warm Home Fund.

Quantifiable outcomes are monitored continually via agreed indicators, the current results of which are shown in table CS13.

Table CS13: WHAM outcome indicators for tackling fuel poverty in Bristol and North Somerset

Outcome indicator	Total for the first 2 years
Beneficiaries will receive an income maximisation check which will ensure they are accessing all their entitlement	1106
Beneficiaries will report improved warmth & comfort at home in the winter	576
Beneficiaries will report that they are less anxious about their energy bills	1011
Beneficiaries will report that they are more confident & better able to keep their homes safe, secure & warm	623
Increased referrals generated from health/social care & VCS groups	319
Money saved or gained for beneficiaries	£323,187

As the project is currently midway through its 4 year duration, a full and final evaluation of outcomes will be completed at the end of the project. However, the first phase of the evaluation on people's health and wellbeing is planned for winter 2019/2020.

[1] Department for Business, Energy and Industrial Strategy (2019) Fuel poverty sub-regional statistics [Accessed 13 September 2019]
[2] Marmot Review Team (2011) The Health Impacts of Cold Homes and Fuel Poverty [Accessed 13 September 2019]
[3] Bridgeman T, Thumim J, Asher M and others (2016) Understanding the Characteristics of Low Income Households Most at Risk from Living in Cold Homes Final Report to the Welsh Government [Accessed 13 September]
[4] National Institute for Health and Care Excellence (2015) Excess winter deaths and illness and the health risks associated with cold homes (NICE guidance [NG6]) [Accessed 08 August 2019]
[5] Wilson T, Robertson J and Hawkins L (2012) Fuel Poverty Evidence Review: Defining, measuring and analysing fuel poverty in Scotland [Accessed 13 September 2019]
[6] Centre for Sustainable Energy (2010) You just have to get by [Accessed 13 September 2019]
[7] Centre for Analysis of Social Exclusion (2012) Getting the measure of fuel poverty [Accessed 13 September 2019]

Glossary of terms

Much of the disagreement that occurs during the commissioning or management of services arises because different people use the same term but have a different understanding of its meaning. This Glossary is provided to help develop a shared or common language. If there is a clear, short or memorable definition from the literature, the source has been given. Where definitions in the literature do not meet any of these criteria, the PHE Atlas Team have composed and provided a definition. Where definitions have been adapted from the published literature, they are presented with the source acknowledged.

Access to healthcare

Facilitating access is concerned with helping people to access appropriate healthcare resources to preserve or improve their health. Access is a complex concept and there are at least 4 aspects:

1. Availability/adequacy of supply
2. Acceptability (influenced by the health literacy of the population)
3. Relevance and effectiveness
4. Barriers to utilisation

Source adapted from: Gulliford M, Figueroa-Munoz J, Morgan M and others (2002) What does 'access to healthcare' mean? J Health Serv Res Policy 7(3):186-8 doi: 10.1258/135581902760082517 [Accessed 08 August 2019]

Appropriate

A procedure is termed appropriate if its benefits sufficiently outweigh its risks to make it worth performing…

Source: Kahan J, Bernstein S, Leape L and others (1994) Measuring the necessity of medical procedures Medical Care 32:352-365 [Accessed 08 August 2019]

Audit

See also **Clinical Audit**

Average

See **Mean** or **Median**

Box and whisker plot

See **Introduction to the data** section

Burden of disease

The burden of disease is a measurement of the gap between a population's current health and the optimal state where all people attain full life expectancy without suffering major ill-health.

Source: World Health Organization Health Promotion Glossary Update [Modified definition (WHO, 2000)] [Accessed 18 January 2019]

Care bundle

A structured way of improving the processes of care and care outcomes: a small, straightforward set of evidence-based practices that, when performed collectively and reliably, have been proven to improve patient outcomes. All aspects of a bundle:

- are necessary and sufficient
- are based on randomized controlled trials (Level 1 evidence)
- are clear-cut and straightforward; they involve all-or-nothing measurement
- occur at the same time and in a specific place

Source adapted from: Institute of Health Improvement What is a Bundle? [Accessed 18 January 2019]

Care pathway

... the expected course of events in the care of a patient with a particular condition, within a set timescale.

Source: Kitchiner D, Davidson D and Bundred P (1996) Integrated Care Pathways: effective tools for continuous evaluation of clinical practice J Eval Clin Pract 2(1):65-9 [Accessed 08 August 2019]

Clinical audit

See also **Audit**

Clinical audit is a way to find out if healthcare is being provided in line with standards and lets care providers and patients know where their service is doing well, and where there could be improvements.

The aim is to allow quality improvement to take place where it will be most helpful and will improve outcomes for patients. Clinical audits can look at care nationwide (national clinical audits) and local clinical audits can also be performed locally in trusts, hospitals or GP practices anywhere healthcare is provided.

Source: NHS England Clinical audit [Accessed 08 August 2019]

Clinical guidelines

Systematically developed statements to assist practitioner and patient decisions about appropriate healthcare for specific circumstances.

Source: Timmermans S and Berg M (2003) The Gold Standard. The challenge of evidence-based medicine and standardization in health care. Temple University Press, Philadelphia

Commissioner

... to be the advocate for patients and communities - securing a range of appropriate high-quality health care services for people in need [and] to be the custodian of tax-payers' money - this brings a requirement to secure best value in the use of resources.

Source: House of Commons Health Committee (2010) Commissioning Fourth Report of Session 2009-10. Volume 1 [Accessed 08 August 2019]

Commissioning

Commissioning in the NHS is the process of ensuring that the health and care services provided effectively meet the needs of the population. It is a complex process with responsibilities ranging from assessing population needs, prioritising health outcomes, procuring products and services, and managing service providers.

Source: Department of Health (2010) Commissioning [Archived content] [Accessed 19 January 2019]

Confidence intervals

Confidence intervals give the range within which the true size of a treatment effect (which is never precisely known) lies, with a given degree of certainty (usually 95% or 99%).

Source: Evans I, Thornton H, Chalmers I and others (2011) Testing Treatments. Better Research for Better Healthcare. Pinter & Martin Ltd. 2nd Edition

Costs

Cost is not solely financial. Cost may be measured as the time used, the carbon produced, or the benefit that would be obtained if the resources were used for another group of patients (for example the opportunity cost).

Culture

Culture is the shared tacit assumptions of a group that it has learned in coping with external tasks and dealing with internal relationships.

Source: Schein EH. The Corporate Culture Survival Guide. John Wiley & Sons. 1999, page 186.

Deprivation

See also **English Indices of Deprivation 2015**

Deprivation covers a broad range of issues and refers to unmet needs caused by a lack of resources of all kinds, not just financial.

Source: Ministry of Housing, Communities & Local Government (2015) English Indices of Deprivation 2015 [Accessed 18 January 2019]

Directly age-standardised rate

Directly age-standardised rates express an indicator in terms of the overall rate that would occur in a standard population age-structure if it experienced the age-specific rates of the observed population.

Source: Public Health England APHO Technical Briefing 3 – Commonly used public health statistics and their confidence Intervals [Accessed 18 January 2019]

Effective care

The extent to which an intervention, procedure regimen, or service produces a beneficial outcome under ideal circumstances (eg in a randomised controlled trial).

Source: Canadian Agency for Drugs and Technologies in Health (CADTH) (2008) Cost effectiveness of blood glucose test strips in the management of adult patients with diabetes mellitus Optimal Therapy Report 3(3) [Accessed 18 January 2019]

Efficiency

See also **Productivity**

Efficiency can be defined as maximising well-being at the least cost to society.

Source: Mitton C, Donaldson C (2004) Priority setting toolkit: A guide to the use of economics in healthcare decision making. BMJ Publishing Group, London

End of life

Patients are 'approaching the end of life' when they are likely to die within the next 12 months. This includes patients whose death is imminent (expected within a few hours or days) and those with:

- advanced, progressive, incurable conditions
- general frailty and co-existing conditions that mean they are expected to die within 12 months
- existing conditions if they are at risk of dying from a sudden acute crisis in their condition life-threatening acute conditions caused by sudden catastrophic events

Source adapted from: Leadership Alliance for the Care of Dying People (2014) One chance to get it right [Accessed 08 August 2019]

End of life care (EoLC)

Care that helps all those with advanced, progressive and terminal conditions to live as well as possible until they die. It enables the supportive and palliative care needs of both the individual and family to be identified and met through the last phase of life and into bereavement.

It includes the physical care, management of pain and other symptoms and provision of psychological, social care, spiritual and practical support.

Source: Department of Health (2008) End of life care strategy: promoting high quality care for adults at the end of their life [Accessed 08 August 2019]

English Indices of Deprivation 2015

See also **Deprivation**

The English Indices of Deprivation 2015 are based on 37 separate indicators, organised across 7 distinct domains of deprivation which are combined, using appropriate weights, to calculate the Index of Multiple Deprivation 2015 (IMD 2015). This is an overall measure of multiple deprivation experienced by people living in an area and is calculated for every lower layer super output area (LSOA), or neighbourhood, in England. Every such neighbourhood in England is ranked according to its level of deprivation relative to that of other areas.

Source: Ministry of Housing, Communities and Local Government (2015) English Indices of Deprivation 2015 Statistical Release [Accessed 18 January 2019]

Equity

See also **Inequalities in health**

The absence of avoidable or remediable differences among groups of people, whether those groups are defined socially, economically, demographically, or geographically.

This includes both health determinants and 'fair' distribution of health/healthcare resources or opportunities according to population need.

Source adapted from: World Health Organisation (WHO) Health Systems: Equity [Accessed 08 August 2019]

Evidence

Evidence is generally considered to be information from clinical experience that has met some established test of validity, and the appropriate standard is determined according to the requirements of the intervention and clinical circumstance. Processes that involve the development and use of evidence should be accessible and transparent to all stakeholders.

Source: Olsen L, Goolsby W and McGinnis J (2009) Roundtable on Evidence-Based Medicine Leadership Commitments to Improve Value in Health Care: Finding Common Ground: Workshop Summary The National Academies, Washington [Accessed 18 January 2019]

Health

Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.

Source: Preamble to the Constitution of WHO as adopted by the International Health Conference, New York, 19 June - 22 July 1946; signed on 22 July 1946 by the representatives of 61 States (Official Records of WHO, no. 2, p. 100) and entered into force on 7 April 1948.

Health needs

... objectively determined deficiencies in health that require health care, from promotion to palliation.

Source: World Health Organization (WHO) Health Systems Strengthening Glossary [Accessed 18 January 2019]

Healthy life-expectancy

See also **Life-expectancy**

Average number of years that a person can expect to live in "full health" by taking into account years lived in less than full health due to disease and/or injury.

Source: World Health Organization (WHO) Health statistics and health information systems Health Status Statistics: Mortality [Accessed 18 January 2019]

Inequalities in health

See also **Equity**

Inequalities in health are objectively measured differences in health status, healthcare access and health outcomes.

Input, Output and Outcome

Input is a term used by economists to define the resources used, such as the number of hospital beds, to produce the output, such as the number of patients admitted per bed per year. The economists' terminology is different from the language utilised in quality assurance, in which the terms structure, process and outcome are used. Input equates to structure and process, i.e. the number of beds and the number of admissions per bed, respectively. However, the outcome is distinct from the output. Outcome includes some measure of the effect the process has had on the patients, for example, the number of patients who were discharged to their own home.

Integrated care

Clinical integration, where care by professionals and providers to patients is integrated into a single or coherent process within and/or across professions such as through use of shared guidelines and protocols.

Source: Kodner D and Spreeuwenberg C (2002) Integrated care: meaning, logic, applications and implications – a discussion paper Int J Integr Care 2:1-6 [Accessed 08 August 2019]

International classification of diseases (ICD)

ICD is the foundation for the identification of health trends and statistics globally, and the international standard for reporting diseases and health conditions. ICD defines the universe of diseases, disorders, injuries and other related health conditions, listed in a comprehensive, hierarchical fashion that allows for:

- easy storage, retrieval and analysis of health information for evidenced-based decision-making
- sharing and comparing health information between hospitals, regions, settings and countries
- data comparisons in the same location across different time periods

Source: World Health Organization Classifications [Accessed 18 January 2019]

Interquartile range (IQR)

See also **Range**

See **Introduction to the Data** section

Life-expectancy

See also **Healthy life-expectancy**

Life-expectancy at a specific age is the average number of additional years a person of that age could expect to live if current mortality levels observed for ages above that age were to continue for the rest of that person's life.

Source: Population Division, DESA, United Nations World Population Ageing 1950–2050, Annex 1 [Accessed August 2018]

Mean (average)

The mean is the sum of values divided by the number of values. For example, the average population size is the total size of summed populations divided by the number of populations in the sample.

Median (average)

A value or quantity lying at the midpoint of a frequency distribution of observed values or quantities, such that there is an equal probability of falling above or below it.

Medical care epidemiology

... studies the use of health care services among populations living within the geographic boundaries of 'natural' health care [populations].

Source: Wennberg J (2010) Tracking Medicine: A Researcher's Quest to Understand Health Care. Oxford University Press

Needs assessment

The purpose of needs assessment in healthcare is to gather the information required to bring about change beneficial to the health of the population. It is generally, but not universally, accepted that this takes place within the context of finite resources. 'Health gain' can therefore be achieved by reallocating resources as a result of identifying four factors:

- non-recipients of beneficial interventions (that is, unmet need)
- recipients of ineffective health care (and releasing the resources for unmet need)
- recipients of inefficient health care (and releasing the resources for unmet need)
- recipients of inappropriate health care (for whom the outcomes could be approved)

Source: Stevens A and Gillam S (1998) Needs assessment: from theory to practice BMJ 316:1448 [Accessed 08 August 2019]

Network

If a system is a set of activities with a common set of objectives, the network is the set of organisations and individuals that deliver the systems.

Outcome

See **Input**

Output

See **Input**

Overdiagnosis

A condition is diagnosed that would otherwise not go on to cause symptoms or death.

Source: Elmore J and Fletcher S (2012) Overdiagnosis in Breast Cancer Screening: Time to Tackle Underappreciated Harm Ann Intern Med 156(7):536-7 [Accessed 08 August 2019]

Overuse

*See also **Underuse***

Overuse describes a process of care in circumstances where the potential for harm exceeds the potential for benefit. Prescribing an antibiotic for a viral infection like a cold, for which antibiotics are ineffective, constitutes overuse. The potential for harm includes adverse reactions to the antibiotics and increases in antibiotic resistance among bacteria in the community. Overuse can also apply to diagnostic tests and surgical procedures.

Source: Robert Wood Johnson Foundation (2013) Quality/Equality Glossary [Accessed 08 August 2019]

Patient decision aid

Patient decision aids are … intended to supplement rather than replace patient–practitioner interaction. They may be leaflets, interactive media, or video or audio types. Patients may use them to prepare for talking with a clinician, or a clinician may provide them at the time of the visit to facilitate decision making. At a minimum, patient decision aids provide information about the options and their associated relevant outcomes.

Source: Elwyn G, O'Connor A, Stacey D and others (2006) Developing a quality criteria framework for patient decision aids; online international Delphi Consensus process BMJ 333:417-27

Population healthcare

The aim of population healthcare is to maximise value and equity by focusing not on institutions, specialties or technologies, but on populations defined by a common symptom, condition or characteristic, such as breathlessness, arthritis or multiple morbidity.

Population medicine

Population medicine is a style of clinical practice in which the clinician is focused not only on the individual patients referred but also on the whole population in need.

Preference-sensitive care

… elective, or 'preference-sensitive' care, interventions for which there is more than one option and where the outcomes will differ according to the option used because patients delegate decision making to doctors, physician opinion rather than patient preference often determines which treatment patients receive. I argue that this can result in a serious but commonly overlooked medical error: operating on the wrong patients – on those who, were they fully informed, would not have wanted the operation they received.

Source: Wennberg J (2010) Tracking Medicine: A Researcher's Quest to Understand Health Care. Oxford University Press

Preference-sensitive treatment decisions

Preference-sensitive treatment decisions involve making value trade-offs between benefits and harms that should depend on informed patient choice.

Source: O'Connor A, Wennberg J, Legare F and others (2007) Toward the 'Tipping Point': Decision aids and informed patient choice Health Affairs 26(3):716-725 [Accessed 08 August 2019]

Prevalence

Prevalence refers to the total number of individuals in a population who have a disease or health condition at a specific period of time, usually expressed as a percentage of the population.

Productivity

See also **Efficiency**

Productivity is the relationship between inputs and outputs, such as the number of operations per theatre per year; efficiency is the relationship between outcomes and inputs, such as the number of successful operations per theatre per year.

Protocol

An agreed framework outlining the care that will be provided to patients in a designated area of practice. They do not describe how a procedure is performed, but why, when, where and by whom the care is given.

Source: University of Wisconsin-Madison Libraries Research Guides Nursing Resources: Standard, Guideline, Protocol, Policy [Accessed 08 August 2019]

Public health

…the art and science of preventing disease, prolonging life and promoting health through the organized efforts of society.

Source: Acheson (1988) Public Health in England. Report of the Committee of Inquiry into the future development of the public health function, HMSO, London

Quality

Quality is the degree to which a service meets pre-set standards of goodness.

Source: Donabedian A. Personal communication, cited in: Davies C (2018) Understanding Harm (& Value) If We Build It… A blog for systems thinking, leadership and collaborative healthcare management [Accessed 08 August 2019]

Quality of life[1]

… individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment.

Source: World Health Organization. Division of Mental Health and Prevention of Substance Abuse (1997) WHOQOL: Measuring Quality of Life [Accessed 08 August 2019]

[1] Examples of other quality of life definitions can be found in: Scottish Executive Social Research (2005) Quality of Life and Well-being: Measuring the Benefits of Culture and Sport: Literature Review and Thinkpiece Chapter 1.2 [Accessed 08 August 2019]

Quality Outcomes Framework (QOF)

The Quality and Outcomes Framework (QOF) is the annual reward and incentive programme detailing GP practice achievement results. It rewards practices for the provision of quality care and helps standardise improvement in the delivery of primary medical services. It is a voluntary process for all surgeries in England and was introduced as part of the GP contract in 2004. The indicators for the QOF change annually, with new measures and indicators been retired.

Source: NHS Digital Quality and Outcome Framework (QOF) [Accessed 18 January 2019]

Quintile

See **Introduction to the data** section.

Range

See also **Interquartile range** and **Variance**

The range is the difference between the highest and lowest value in the sample. The range provides a crude measure of the spread of the data.

Safety

Patient safety can, at its simplest, be defined as: The avoidance, prevention and amelioration of adverse outcomes or injuries stemming from the process of healthcare. … the reduction of harm should be the primary aim of patient safety, not the elimination of error.

Source: Vincent C (2006) Patient Safety. Churchill Livingstone

Self-management

… self-management is especially important for those with chronic disease, where only the patient can be responsible for his or her day-to-day care over the length of the illness. For most of these people self-management is a lifetime task.

Source: Lorig K and Holman H (2003) Self-Management Education: History, Definition, Outcomes, and Mechanisms Annals of Behavioural Medicine 26:1-7 doi: 10.1207/ S153124796ABM2601_01

Shared decision-making

In a shared decision, a health care provider communicates to the patient personalised information about the options, outcomes, probabilities, and scientific uncertainties of available treatment options, and the patient communicates their values and the relative importance they place on benefits and harms.

Standard deviation

See also **Variance**

The standard deviation is a measure of spread, and is the square root of the variance.

Standards

A minimum level of acceptable performance or results or excellent levels of performance or the range of acceptable performance or results.

Source: Committee on Quality of Health Care in America, Institute of Medicine (2000) To Err is Human. Building a Safer Health System Editors: Kohn L, Corrigan J, Donaldson M National Academy Press, Washington

Structure

Structure comprises the inter-relation of healthcare facilities through which health services are provided. Healthcare is a localised activity, provided by the organisations that form the general healthcare structure, including hospitals, GP practices, clinics, ambulatory care, rehabilitation centres, home care and long-term nursing care.

Supply-sensitive care

It differs in fundamental ways from both effective care and preference-sensitive care. Supply-sensitive care is not about a specific treatment per se; rather, it is about the frequency with which everyday medical care is used in treating patients with acute and chronic illnesses. Remedying variation in supply-sensitive care requires coming to terms with the 'more care is better' assumption. Are physician services and hospitals in high-cost, high-use regions overused?

Source: Wennberg J (2010) Tracking Medicine: A Researcher's Quest to Understand Health Care. Oxford University Press

Surgical signature

Surgical signatures reflect the practice patterns of individual physicians and local medical culture, rather than differences in need – or even differences in the local supply of surgeons.

Source: Dartmouth Medical School, Center for the Evaluative Clinical Sciences (1998) The Dartmouth Atlas of Health Care AHA Publishing Inc.

Underuse

See also **Overuse**

Underuse refers to the failure to provide a healthcare service or for patients to accept and take up such a service when it would have produced a favourable outcome for a patient. Standard examples include failure to provide or low uptake of, appropriate preventive services to eligible patients (eg. cervical smears, influenza vaccinations for older people, screening for hypertension) and proven medications for longterm illnesses (steroid inhalers for people with asthma; aspirin, beta-blockers and lipid-lowering agents for people who have had a recent myocardial infarction).

Source adapted from: Robert Wood Johnson Foundation (2013) Quality/Equality Glossary [Accessed 08 August 2019]

Unwarranted variation

Variation in the utilisation of health care services that cannot be explained by variation in patient illness or patient preferences.

Source: Wennberg J (2010) Tracking Medicine: A Researcher's Quest to Understand Health Care. Oxford University Press

Value

… value is expressed as what we gain relative to what we give up – the benefit relative to the cost.

Source: Institute of Medicine of the National Academies (2008) Learning Healthcare System Concepts v. 2008 Annual Report The Roundtable on Evidence-Based Medicine, Institute of Medicine

Variation

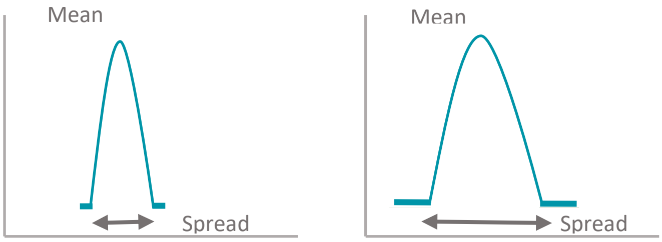
Everything we observe or measure varies. Some of this is random variation. Some variation in healthcare is desirable, even essential, since each patient and population is different and should be cared for uniquely. New and better treatments and improvements in care processes result in variation during the early phases of their introduction.

Source Adapted from: Neuhauser D, Provost L, Bergman B (2011) The meaning of variation to healthcare managers, clinical and health-services researchers, and individual patients BMJ Qual Saf 20(Suppl 1):i36-i40 doi: 10.1136/bmjqs.2010.046334

Variance

See also **Standard deviation** and **Range**

The variance is another measure of spread, which describes how far the values in the sample lie away from the mean value. It is the average of the squared differences from the mean and is a better measure of spread than the range.



This figure illustrates how 2 populations may have the same mean value, but different degrees of variation or spread: the graph on the right shows greater variation than that on the right.

Introduction to the data and methods

Data sources

The data for the indicators in the 2nd Atlas of variation in risk factors and healthcare for respiratory disease, has been provided by a range of organisations: Public Health England (PHE), The Office for National Statistics (ONS), NHS Digital, NHS England (NHSE), NHS Blood and Transplant (NHSBT), Department for Environment Food and Rural Affairs (DEFRA), and Sport England with a variety of sources:

- NHS Digital Hospital Episode Statistics (HES)
- NHS Digital Quality and Outcomes Framework (QOF)
- Linked ONS-HES mortality data
- ONS Annual Mortality statistics
- ONS mid-year population estimates
- ONS Annual Population Survey (APS)
- Ordnance Survey data
- PHE Enhanced Tuberculosis Surveillance system (ETS)
- Sport England Active Lives Survey
- NHSBT Organ donation and transplantation activity report

An Atlas data sheet with all indicator values, including quintiles and significance bandings and a metadata document which includes methodology, data extraction coding schemes and data sources for each indicator is available at: https://fingertips.phe.org.uk/profile/atlas-of-variation

The data analysis, column charts and box plots were produced using Microsoft Excel 2016. The maps were created using ArcMap version 10.5.1.

QOF dataset

Exception reporting was introduced into the QOF to allow practices to pursue the quality improvement agenda and not be penalised, where, for example, patients do not attend for review, or where a medication cannot be prescribed due to a contraindication or side-effect. The exception-adjusted population coverage is reported annually by NHS Digital. The analysis presented in this Atlas shows the intervention rate so includes excepted patients within the denominators. Exception rates vary widely between indicators so intervention rates are more directly comparable. Intervention rates provide a public health measure of all people at risk or in a specific disease group.

A small number of CCGs in England have developed their own incentive schemes for some QOF indicators. For these CCGs, where the data robustness may have been affected, this Atlas has not included data for those QOF indicators[1]:

- Buckinghamshire – no QOF data was published by NHS Digital in 2017/18
- Dudley – QOF data is included where the Dudley Outcomes for Health incorporates the QOF measure
- Somerset – no QOF data has been included in the Atlas as 75% of practices are signed up to the new scheme and achievement of QOF results has been significantly affected
- Tower Hamlets – QOF data has been included for all measures contained in the Atlas as practices must still record and allow extractions of QOF data

Denominators

Indicators have been calculated using a variety of population denominators including resident CCG populations, lower-tier local authority, upper-tier local authority, and NHS Area team populations. The HES based indicators are based on CCG of responsibility and their population denominators GP practice list sizes as provided by NHS Digital.

Innovations in statistical methods and presentation in this Atlas

In the 2nd edition of the Atlas innovations in analysis and presentation have been introduced:

For most mapping sections, there are now 2 maps, one in which the shading is based on statistical significance (difference from the England value) and one in which the shading is based on quintiles (where the number of areas in each banding is the same). However, where statistical significance is not an appropriate method for an indicator the statistical significance map is not presented.

For some indicators maps have been categorised by another method, such as length of stay in days or against a national ambition.

The introduction of time series analyses in the form of repeated box and whisker plots, revealing trends in the level and spread of local area indicator values across England.

It is important to note that due to the change in statistical presentation, maps and column charts from the first Respiratory Atlas should not be compared with those presented in this Atlas.

Statistical comparator

In the statistical significance map and column charts, the England value is used as the statistical benchmark. It is important to note that this does not imply that the England rate is the optimal or aspirational level for that indicator, as this value is often not established, but gives a sense of the performance of organisations compared with the national value.

Maps

For each indicator, data is presented visually in the form of thematic maps and a column chart. London is shown as an enlarged page inset on selected maps to show detail that might otherwise be lost.

Interpretation of the maps

Each map is a presentation of the indicator values for the latest time period. The maps assign each geographical area to a single category although variation will also exist within each area.

When 2 maps are presented they will show different approaches to categorising data, often a quintile map alongside a statistical significance map, while showing a similar picture there will be differences between them. When comparing the maps, there will be examples where on the quintile map an area will have the darkest shading indicating it has one of the highest values, but on the significance map it may have a lighter shade denoting that it is not statistically significant and vice versa.

At a local level, organisations will need to consider whether having a higher or lower value is important even if statistically they are not different to the England value. The same is true where an area is statistically significantly different to the England value, but the actual value is within the mid-range. Local decision makers will then need to decide whether this warrants further investigation.

Quintile maps

The quintile maps use a method to split the number of geographical areas into five equal groups with 20% of areas in each group. Where the number of areas are not exactly divisible by 5 (for example 207 CCGs), the classifications do not include exactly the same number of areas. The method used to create the classification was to rank order the areas from highest to lowest values, then divide the ranks into 5 equal groups using a percentile calculation in Excel.

The legend for the quintile map may appear to have overlapping boundaries between quintile groupings, this is because we have rounded the legends to 2 decimal places, whereas quintile groupings have been calculated based on the unrounded number.

A disadvantage to grouping data in quintiles is that it does not take into account the distribution of data and quintiles can be created with very different ranges between the highest and lowest values. This should be taken into consideration when comparing areas in different categories within indicators.

The classification is shaded from dark blue (highest value) to light blue (lowest value) on the quintile maps (See table B1)

Table B1: **Five shade quintile and significance bands used in the maps and column chart**

Shade	Quintile	Significance Band
	Highest 20%	Significantly higher than England at the 99.8% level
		Significantly higher than England at the 95% level
		Not significantly different from England
		Significantly lower than England at the 95% level
	Lowest 20%	Significantly lower than England at the 99.8% level

Statistical significance maps

For each indicator, individual areas are allocated to 1 of 5 groups (table B1) based on comparing its confidence interval with the England value to indicate how statistically significantly different their value is from the England value (the horizontal black line across the column charts). The significance maps are colour classified according to significance banding.

The key to the map shows the significance level for each of the 5 shades compared with the England value for that indicator. The 2 darkest shaded bars indicate that an indicator value is significantly higher than the England value at the 99.8% and 95% significance levels. The 2 lightest shades indicate that an indicator value is significantly lower than the England value at the 99.8% and 95% significance levels. Mid-shaded areas are those with an indicator value that is not significantly different to the England value. Where data is unavailable or excluded for an area/organisation, the corresponding map area/symbol is shaded grey. Data that is suppressed due to small numbers is shaded white.

Other map presentations

Some maps in the Atlas have individual areas allocated to the colour bands on alternative methods to equal quintiles or statistical significance, examples of this are:

- Median length of stay (in days): the bands presented have been determined individually depending on the distribution of the number of days
- Flu vaccination: areas have been classed as achieving or not achieving the national ambition
- Transplants: these are allocated to bandings determined by NHSBT

In each case the mapping legend clearly indicates the bandings used.

Column charts

The local area indicator values and the England value are presented in the column chart accompanying both maps. Where a statistical significance map is presented the column chart will usually show the same colour bands as the significance map. Where there is only 1 map presented the column chart will show the same colour bands as the map.

Interpretation of the column charts

For each indicator, the data presented in the column charts is for the most recent time period.

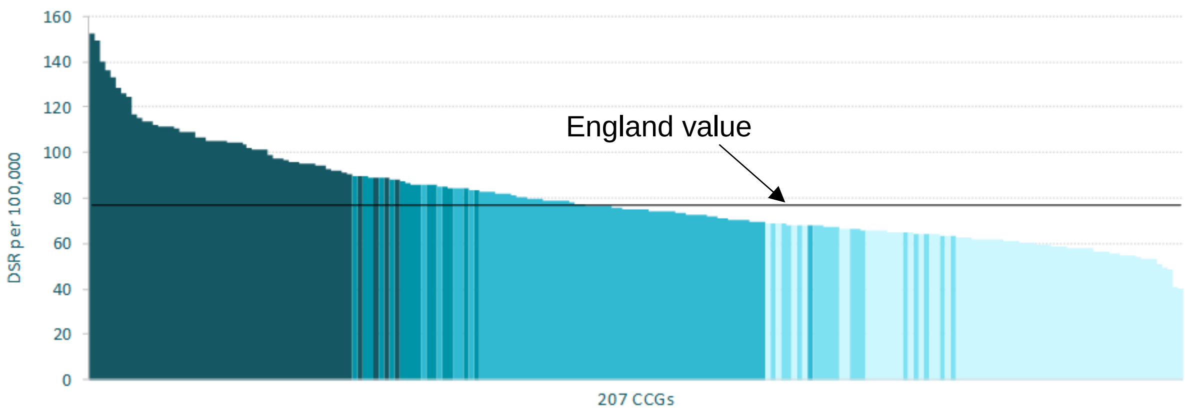
The height of each bar in the chart shows the indicator value for each geography– the columns are ordered from the highest value on the left to the lowest value on the right.

Where a statistical significance map is presented the colour shading used in the column chart is the same (figure B1). The shading of each column indicates the degree of statistical significance of each indicator value in terms of its difference from the England value (the black horizontal line across the chart). If the quintile map has been used for the column chart the shading will match that of the quintile map.

Conventional column charts display the confidence interval bar for each area to allow the reader to compare against the England value represented by a horizontal line. However, column charts in this Atlas have so many columns and use 2 sets of confidence intervals (95% and 99.8%) that the chart can become difficult to interpret. The 5 shades replace the use of displayed confidence intervals on column charts.

Figure B1 is an example presented in this Atlas. It shows that differently shaded columns are mixed at both ends of the chart, rather than same-shaded columns appearing in adjacent blocks. This is because being statistically significantly different from the England value depends not only on the size of the indicator value, but also on statistical confidence. This may be influenced by the size of the population for which the indicator value is shown, as smaller populations tend to have wider confidence intervals.

Figure B1: Example column chart to show statistical significance compared to the England value



Statistical significance interpretation

The significance band does not indicate whether a high or low value represents good or bad performance, simply whether the indicator value is significantly higher or lower than the England value, and the degree of statistical confidence that the difference is not due to random variation.

- indicator values that are not significantly different from the England value (mid-shade) are said to display ‘random’ variation alone
- indicator values that are higher or lower than the England value at the 95% significance level are deemed statistically significantly different. However, as so many indicator values (209 in the case of CCGs) are being simultaneously tested against the England value, the likelihood of finding indicator values that are significantly different from the England value is raised by chance alone. For this reason a more stringent 99.8% significance level is also applied
- there is much greater certainty that indicator values found to be different from the England value at the 99.8% significance level (the lightest and the darkest shades) are due to a systematic non-random variation that requires investigation. In these localities it is likely that the process or system of generating these values is markedly different from that in other CCGs

If many indicator values are significantly different from the national value at the 99.8% level this may be due to what is known as overdispersion, characterised by many localities having indicator values at the extremities of the distribution, and fewer indicator values around the central value of the distribution.

Overdispersion typically occurs when there are factors influencing the values that have not been accounted (or adjusted) for in the method of calculating the statistic, such as demographic risk factors, casemix or localised service configuration, which is particularly relevant to specialised services. These factors may account for the larger than expected number of areas with values greatly different from the England value. It is important to consider whether all known warranted factors have been adjusted for when assessing whether the observed variation is unwarranted.

Box and whisker plots

For each indicator, where sequential data over a number of time periods is available, this is presented visually in a time series of box and whisker plots that shows the median and spread of local area values across England at consecutive time points. Importantly, the tables accompanying the box and whisker plots show whether there has been any statistically significant change in the median, or in the degree of variation over time. It should be noted that the central value on the box plot is a median for the reported data, not the indicator value for England.

Some indicators are shown by aggregating years of data together, such as mortality for a 3 year period 2015 to 2017. For these indicators, the box and whisker plot will only display and test non-overlapping time periods.

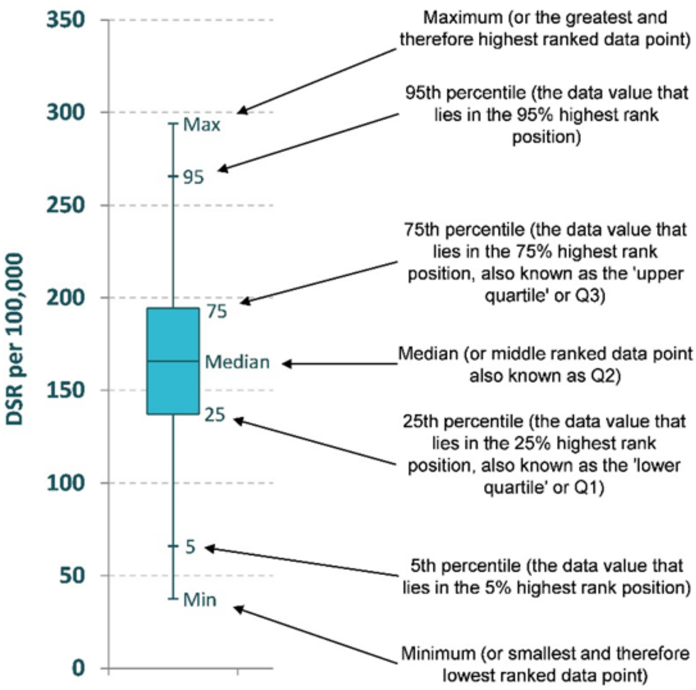
Interpretation of the box and whisker plots

Time series data is presented in the form of box and whisker plots (referred to as box plots in following sections). The purpose of the box plot is to give an impression of the level and spread, or distribution, of the data points. The box plots presented in this Atlas are a customised version of conventional box and whisker plot used elsewhere (figure B2). The box plots use a methodology which is unrelated to the method determining the significance map and column chart shading, they do not represent statistical significance. This box plot shows how variable the indicator is across all the geographical areas. A single box plot is displayed for each time period so that comparisons can be made through time of the level and spread of values.

The example box plot in figure B2 shows the data points displayed on each plot.

The 'box' runs from the upper quartile (75th percentile data point) to the lower quartile (25th percentile) and represents the middle 50% of data points. The height of the box between Q1 and Q3 is known as the interquartile range (IQR) and is calculated as Q3 minus Q1.

Figure B2: **Example box plot**



Inside the box is a horizontal line, which shows where the median (or Q2) lies. The median is the middle point of the dataset. Half of the data points are above the median and half of the data points are below it. The median is different from the value of the indicator for England, the more skewed the distribution of data the greater the difference between the median and the England value.

The 'whiskers' extend out from either end of the box and show the highest and lowest values within the dataset. The 95th percentile and the 5th percentile are also represented by tick marks on the 'whiskers'.

A box plot enables the user to obtain information about the shape or spread of the data points and whether the data points have a symmetric or skewed distribution. A dataset with a normal distribution is symmetric (non-skewed) around the mean (average), the mean and the median are equal, and each half of the distribution is a mirror-image of the other half. In a distribution that is skewed there is a lack of symmetry between the upper and lower halves of the dataset, the median and the 'box' is not centrally located between the maximum and minimum.

Box plot summary statistics table

Presented below the box plot time series is a table of statistics summarising the trend in the absolute degree of variation and the median:

- **max–min (range):** This is the absolute difference between the maximum and minimum value, the full range of the data. However, extreme outliers can heavily influence this statistic and consequently mislead about the extent of variability across the dataset. It may be more helpful to use the 95th to 5th percentile (see below)
- **95th–5th percentile:** This shows the range of the data between the 95th and the 5th percentile of the dataset; if there are extreme outliers this statistic may give a better impression of variation across the majority of data values because the highest and lowest 5% of values have been discounted
- **75th–25th percentile:** These percentiles are the upper and lower limits of the middle 50% of data values and indicates the spread of the data for the middle 50% of values. This is also known as the interquartile range (IQR). It is related to the median (see below): if the IQR is small it indicates that the central 50% of data values are close to the median; if the IQR is large it indicates that the data is spread out from the median and there is more dispersion in the middle 50% of values in the dataset

- **median:** The middle value in a dataset, identified by arranging each of the values in ascending order from the smallest value to the highest value. If there is an even number of values the median will be the average of the 2 central data points. It is not the mean or average

The final column of the table is a summary of whether each of these statistics is narrowing or widening (or median increasing/decreasing) and whether the trend is statistically significant at the 95% level. The statistical significance was determined using a two-tailed t-test on the slope of a linear regression line fitted to the values in the table over time, where the null hypothesis is that the slope equals zero. The significance test is only performed for indicators with data at 3 or more time periods. This regression line and the detailed results of the t-test are not presented in this Atlas.

Data frequency

The length of time for which data is presented directly affects the number of observations represented in the visualisations. Statistical power, that is the ability to detect true differences, tends to increase with an increasing number of observations. The 'data frequency' selected for each Atlas indicator is intended to yield a sufficiently large number of observations to reveal patterns and trends that are statistically robust.

Data are presented in annual calendar and financial years. Examples used within the Atlas are:

- 2015-2017 is aggregated data for the calendar years 2015, 2016 and 2017
- 2017/18 is the financial year April 2017 to March 2018
- 2015/16 – 2017/18 is aggregated data for the financial years 2015/16, 2016/17 and 2017/18

Standardisation

Differences in the number of events, for example incidence of disease, can be strongly related to the age structure of that population. To identify variation that is beyond that related to different patterns of need, a technique called standardisation is used. This enables the level of testing to be compared between populations with different demographic structures producing a more level playing field.

For instance, if we compare two population groups, A and B, and population A has a higher rate of deaths when compared with population B we could conclude that population A has worse mortality outcomes in comparison with population B. However, if population A has a much higher proportion of older people in it we would expect population A to have a higher mortality rate when compared with population B because mortality rates are linked to increasing age. Therefore, it would be misleading to infer that people in population A are dying at a faster rate than people in population B.

There are two main methods of calculating age-standardised rates:

- direct standardisation
- indirect standardisation

Only direct standardisation has been used within this Atlas and so only this method is discussed here.

Directly age-standardised rates may adjust for the differences in age distribution in a population and are usually expressed, for example, as a number of infections per 100,000 population. To calculate a directly age-standardised rate the observed number of cases from the study population (for example CCG) in each age-band (usually five-year age-bands) is divided by the number of the local population for that age-band and then multiplied by the standard population (in this case the European Standard Population) in the same age-band. These calculations are then summed across the relevant age-bands and usually expressed as a weighted rate per 100,000 population.

This method of direct standardisation has been used for Maps 7a, 7b, 11a, 12b, 15a, 17, 18c, 18d, 19, 21a, 21b, 22a, 29a and 29b.

Confidence intervals

Confidence intervals are used to represent the level of uncertainty of an area value. Statistical uncertainties usually arise because the indicators are based on a random sample or subset from the population of interest or over a defined time period, both of which may not be representative of the whole population. A smaller confidence interval indicates that the value is more reliable, and a larger confidence interval indicates that the value is less reliable. Confidence intervals were used to determine the shading in the significance maps and the column charts based on significance. The 2 main methods of calculating confidence intervals in this Atlas are:

- the Wilson score method for proportions[2,3]
- the Byar's method for rates[3,4]

[1] NHS Digital (2018) Report of the Review of the Quality and Outcomes Framework in England [Accessed 7 August 2019]
[2] Wilson EB. Probable inference, the law of succession, and statistical inference. J AM Stat Assoc 1927; 22: 209-212
[3] PH Technical Guidance APHO Technical Briefing 3 – Commonly used public health statistics and their confidence intervals [Accessed 16 January 2019]
[4] Breslow NE, Day NE. Statistical methods in cancer research, volume II: The design and analysis of cohort studies. Lyon: International Agency for Research on Cancer, World Health Organization; 1987: 69

The 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England has been prepared in partnership with a wide range of organisations:

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-leading science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health and Social Care, and a distinct delivery organisation with operational autonomy. We provide government, local government, the NHS, Parliament, industry and the public with evidence-based professional, scientific and delivery expertise and support.

The following PHE teams have been involved in the production of the 2nd Atlas of variation in risk factors and healthcare for respiratory disease in England:

Health Intelligence

VISION: We provide a forward-looking, innovative service, flexible to user needs, with an international reputation we highlight the potential to improve health by focusing on health inequality, prevention, healthcare variation and future threats to health and wellbeing. We provide timely support to decision-makers (data, evidence or professional expertise) leading to co-ordinated and effective action, both locally and nationally.

PURPOSE: As system leaders, we will improve the population's health and wellbeing. We produce, interpret data & evidence to identify strategic priorities and work with a range of partners to ensure effective action is taken to improve people's lives.

PHE's **National Child and Maternal Health Intelligence Network** produces a range of resources for commissioners and other health professionals to help them improve services. For further guidance and information about the tools and analysis please see the Child and maternal health data and intelligence: guide for health professionals www.gov.uk/guidance/child-and-maternal-health-data-and-intelligence-a-guide-for-health-professionals or email chimat@phe.gov.uk.

Flu Surveillance Team is part of the **Immunisation and Countermeasures Division of the National Infection Service** of PHE. It is responsible for national surveillance, advice and programmatic monitoring of seasonal and pandemic influenza and other acute respiratory viral infections. Email influenza@phe.gov.uk

National Cancer Registration and Analysis Service (NCRAS), part of PHE, is the population-based cancer registry for England. It collects, quality assures and analyses data on all people living in England who are diagnosed with malignant and pre-malignant neoplasms, with national coverage since 1971. The primary role of NCRAS is to provide near-real time, cost effective, comprehensive data collection and quality assurance over the entire cancer care pathway. www.ndrs.nhs.uk. Email NCRASenquiries@phe.gov.uk

RightCare works with systems on transformational change programmes, on a large number of priority pathways, across a wide range of conditions. RightCare Delivery Partners and their teams work collaboratively with systems to present a diagnosis of data and evidence to identify opportunities and priorities. Using nationally collected robust data, this collaborative working arrangement helps systems to make improvements in both patient outcomes and spend. Throughout this process they ensure patient care is at the top of agenda by promoting the strong clinical interventions developed with the Senior Clinical Advisors and key stakeholders.

Delivery Partners and their teams will highlight good practice, in particular at STP population, to accelerate delivery, standardise reporting and embed practices to ensure systems use optimal care pathways.

RightCare delivery methodology is based around three simple principles of working with local systems;

Diagnose the issues and identify the opportunities with data, evidence and intelligence
Develop solutions, guidance and innovation
Deliver improvements for patients, populations and systems.

RightCare's Intelligence work includes the production of data packs, pathways and implementation resources, plus a knowledge management function, ensuring local systems have the data, evidence, tools and practical support to identify opportunities to address variation and improve population health. RightCare is a national programme of NHS England and NHS Improvement.

From 1 April 2019, **NHS England and NHS Improvement** come together to act as a single organisation. Our aim is to better support the NHS and help improve care for patients.

NHS Digital is the national information and technology partner of the health and care system. Our team of information analysis, technology and project management experts create, deliver and manage the crucial digital systems, services, products and standards upon which health and care professionals depend. During the 2018/19 financial year, NHS Digital published 287 statistical reports. Our vision is to harness the power of information and technology to make health and care better. www.digital.nhs.uk

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NHS Blood and Transplant is a joint England and Wales Special Health Authority. They provide the blood donation service for England and the organ donation service for the UK. They also provide donated tissues, stem cells and cord blood. They are an essential part of the NHS, saving and improving lives through public donation.

The Sustainable Development Unit leads on the delivery of key areas of sustainable development in the NHS, health and care system in England. Areas covered by the SDU include carbon reduction, single use plastics and air pollution. The Unit is co-funded by Public Health England and sits within NHS England and NHS Improvement.

The **Primary Care Respiratory Society** (PCRS) is a UK-wide professional society dedicated to promoting knowledge and sharing information for respiratory-interested health professionals, campaigning to influence policy and set standards in respiratory medicine and disseminating primary care research into respiratory conditions to support policy and education activities.

The **Royal College of Physicians** (RCP) plays a leading role in the delivery of high-quality patient care by setting standards of medical practice and promoting clinical excellence. We provide physicians in the UK and overseas with education, training and support throughout their careers. As an independent body representing over 36,000 fellows and members worldwide, we advise and work with government, the public, patients and other professions to improve health and healthcare.
www.rcplondon.ac.uk

Respiratory Futures is the platform for resources to support integrated respiratory care, commissioning, innovation and networking. We work in partnership with the British Thoracic Society and NHS England to support the NHS England Long Term Plan's ambitions for respiratory services.
www.respiratoryfutures.org.uk

The British Thoracic Society (BTS) is the largest and most inclusive professional respiratory organisation in the UK. The Society's diverse leadership and its broad-based, multi-professional membership (around 3,600 in June 2019) provide the means by which its activities are planned, delivered and evaluated. BTS aims to meet its objectives by:

- finding ways of making the professional and patient voice more unified within its structures;
- producing world-class clinical standards and related quality improvement tools;
- promoting awareness at the highest levels of the respiratory workforce and how it contributes to patient care and innovation in delivery across the patient pathway;
- seeking more effective synergies with others; *and* developing effective communication and engagement systems.

Asthma UK's mission is to stop asthma attacks and cure asthma. We work to stop asthma attacks and, ultimately, cure asthma by funding world-leading research, campaigning for improved care and supporting people with asthma to reduce their risk of a potentially life-threatening asthma attack. We are almost entirely funded by voluntary donations.
www.asthma.org.uk

The Health and Safety Executive (HSE) is Britain's national regulator for workplace health and safety. We prevent work-related death, injury and ill health through regulatory actions that range from influencing behaviours across whole industry sectors through to targeted interventions on individual businesses. These activities are supported by globally recognised scientific expertise.
www.hse.gov.uk

The British Lung Foundation (BLF)

We're the only UK charity looking after the nation's lungs. We offer hope, help and a voice. Our research finds new treatments and cures. We help people who struggle to breathe to take control of their lives. And together, we're campaigning for better lung health. With your support, we'll make sure that one day everyone breathes clean air with healthy lungs. **BLF** Helpline: 03000 030 555 www.blf.org.uk

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University Hospitals of Derby and Burton NHS Foundation Trust, one of the largest NHS trusts in the country, covers the historic Peak District and southern Derbyshire. The Trust has five hospitals across the region, with the largest being the newly built Royal Derby Hospital. The Trust employs 12,500 staff, serves a population of more than one million and provides clinical services in 48 specialities. The last inspection of the Trust found it to be 'Good' and we have a number of services that are nationally renowned. Our other hospitals include the acute Queen's Hospital Burton, and community hospitals Sir Robert Peel in Tamworth, Samuel Johnson in Lichfield and London Road in Derby. As a teaching hospital we work closely with our partners University of Nottingham and University of Derby, and we are also a very research active trust. In addition, our Trauma and Orthopaedic service is one of the biggest in the country and the trust also comprises the Southern Derbyshire and Burton Children's Hospital.

NHS Leicester City Clinical Commissioning Group is responsible for planning and buying many of the health services needed by people living and working in the city of Leicester, including

- hospital treatment
- rehabilitation services
- the core services of GP practices
- urgent and emergency care
- community health services
- mental health and learning disability services.

We do not provide these services ourselves. We pay organisations to deliver them for patients on our behalf. Our mission is to provide the best possible care for our patients and empower them to make informed decisions about their health, so that they can live long and healthy lives.

University Hospitals of Leicester NHS Trust is one the biggest and busiest NHS Trusts in the country, serving the one million residents of Leicester, Leicestershire and Rutland – and increasingly specialist services over a much wider area. Our nationally and internationally-renowned specialist treatment and services in cardio-respiratory diseases, ECMO, cancer and renal disorders reach a further two to three million patients from the rest of the country.

Spread over the General, Glenfield and Royal Infirmary hospitals, we also have our very own Children's Hospital and work closely with partners at the University of Leicester and De Montfort University providing world-class teaching to nurture and develop the next generation of doctors, nurses and other healthcare professionals, many of whom go on to spend their working lives with us.

The **Cicely Saunders Institute** is the first purpose-built institute for research into palliative care, resulting from a partnership between the **King's College London** and the charity Cicely Saunders International.

We offer palliative care courses and other resources relevant to palliative care. Our Institute brings together academics, healthcare professionals, community organisations, patients and carers in one centre and acts as the hub for a network of international research.
We provide high quality palliative care solutions to patients, as well as providing education, patient information and support.
Our Institute is home to several distinct groupings, both clinical and academic.

- Division of Palliative Care, Policy & Rehabilitation of King's College London
- Clinical palliative care team of King's College Hospital NHS Trust
- Healthcare professionals from King's Health Partners, the UK's leading Academic Health Sciences Centre, which brings together clinical practice and research from King's College London and three NHS trusts (King's College Hospital, Guy's and St Thomas' and South London and
- Maudsley)
- Macmillan patient support and information centre

Our mission is to pioneer the very best in palliative care and rehabilitation by integrating: Cutting-edge research, Skilled multi-professional care, and Innovation in engagement and education.

The **North Manchester Community Organisation** (NMCO) is responsible for delivering safe, clean and personal care to the community it serves and focuses on strengthening relationships and joint working across health and social care with local care partners including Local Authorities, local commissioners, and the local community and voluntary sector in North Manchester.

The **Community Pharmacy Future** (CPF) project is a collaboration between the four largest community pharmacy chains, Boots UK, Lloyds Pharmacy, Rowlands Pharmacy and Well. It aims to demonstrate the value of community pharmacy in supporting patients with long-term conditions by designing and testing new pharmacy services. Results from these services are independently analysed and submitted for peer-reviewed publication. This award-winning work contributes to the growing evidence base for pharmacy.

Leeds Community Healthcare NHS Trust (LCH) provides a range of community healthcare services to the people of Leeds and some specialist care across Yorkshire and the Humber. Care is, where appropriate, provided in or as near to a person's own home as possible. Our teams work with the whole family and often the city's most vulnerable people. We work in partnership with every other part of the NHS, social care, the criminal justice system and the third sector.

Wessex Academic Health Science Network (AHSN)

Wessex AHSN identifies, grows and spreads innovation at pace and scale into the NHS; improving health using academic expertise and generating economic growth across Wessex.

West Leicestershire Clinical Commissioning Group (WL CCG) plans and purchases NHS services for a population which covers North West Leicestershire, Charnwood, and Hinckley & Bosworth. We work with patients, practices and partners to improve the health and wellbeing of our local population, the quality of our local health services and the way in which our NHS resources are used.

NHS East Leicestershire and Rutland Clinical Commissioning Group (ELR CCG) was established in April 2013 to commission, plan and manage the majority of healthcare services for people living in Blaby, Lutterworth, Market Harborough, Rutland, Melton Mowbray, Oadby and Wigston and the surrounding areas. The CCG is formed of GPs from 31 practices serving around 327,000 patients and aims to improve health by meeting patients' needs with high quality and efficient services delivered closer to home. It is led by a Governing Body comprising elected GP members, a secondary care clinician and lead nurse, independent lay members, representatives of Healthwatch and senior managers.

Macmillan Cancer Support

We are millions of people affected by cancer, supporters, professionals, volunteers, and campaigners. We all have one thing in common – our care and support for people living with cancer. From the moment you're diagnosed, through your treatment and beyond, we're right there with you, offering emotional, physical and financial support.

The new **Manchester Local Care Organisation** (MLCO) took over the running of statutory community health and social care services in North Manchester from April 2018.

In some ways, MLCO is "all the parts of health and social care which aren't a hospital" – but it will clearly be more complex than that and especially it plays a leading role in trying to change the way services and support are delivered through community based health, primary and social care services – and in how it works with the voluntary, community and social enterprise sector.

Centre for Sustainable Energy
We are an independent national charity that shares our knowledge and experience to help people change the way they think and act on energy.

St. Ann's Hospice is a charity established in 1971 providing palliative care. It operates three centres: The Neil Cliffe Centre in South Manchester and in-patient hospices at Heald Green and Little Hulton.

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