Socio-economic inequalities in access to planned hospital care: causes and consequences

Prepared for the Midlands Decision Support Network

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Foreword

'Reducing health inequality' must be one of this country's most stable policy aims. With peaks and dips in emphasis, it has been featured consistently in policy statements since at least the late 1990s.

Yet outcomes have got worse. Gaps between rich and poor have widened. Defying a trend that began in late Victorian times, gains in life expectancy have stalled for poorer groups - and have even fallen for women from the poorest backgrounds. Most recently, the pandemic has exposed the radically different experiences and outcomes of different ethnic groups in the UK.

Faced with this situation, it may be tempting for those of us in the NHS to see inequality as someone else's problem. The determinants of inequality are broad and social; healthcare has only a contributory role - so the 'real solutions' lie outside the NHS. This has a ring of truth. Getting a grip on inequality does require cross-societal, cross-governmental action. Yet it would only ring true if the NHS was already doing all it could.

This analysis shows that it isn't.

The headline results are jarring. They show a consistent and growing inequality in the use of elective care. Notwithstanding some subtlety, the general pattern is of wealthier groups receiving more elective care than poorer groups. This pattern has emerged over recent years: it was not the case in 2005. And it is seen most clearly late in the 'pathway'; this is a problem of choices made once people are receiving care.

Are there reasons to hope this might change?

One such reason might be to see the pandemic as a 'teachable moment'. Inequality has been such a central part of the story; maybe the resulting attention and comment will be converted to actions and outcomes?

Another, more technical, reason is that NHS Planning Guidance demands the opposite situation to that revealed by this analysis. It demands that people experiencing the worst outcomes are prioritised for treatment. (It also demands that such prioritisation is done using robust analysis).

But there are even simpler reasons for hope. This analysis has highlighted a problem that is directly within the NHS's ability to control. Many of the solutions, which will be the subject of a further project, will also therefore be within NHS control. So this report identifies a problem that local services can do something about. Moving from analysis to action is then a question of will and practicality.

Fraser Battye

The Strategy Unit

Contents

Executive Summary

Tackling inequalities in health is a long-standing NHS policy objective. Variation in the experiences and outcomes of different communities during the COVID-19 pandemic served to bring this issue back into focus. In the Summer and Autumn of 2020, as the first wave of the pandemic subsided, concern grew about reduced access to routine hospital care: diagnostics, outpatient care and planned surgery. Waiting lists and waiting times began to grow. The network of Decision Support Units in the Midlands recognised the potential for this issue to exacerbate existing inequalities. They jointly commissioned this analysis to explore the extent, causes and consequences of socio-economic inequalities in access to planned hospital care. The recent NHS Planning Guidance emphasises the importance of identifying and tackling these inequalities.

The report has four objectives:

1. To describe socio-economic inequalities in access to planned hospital care
2. To identify where in the patient pathways these, inequalities in planned care emerge
3. To explore potential drivers of these inequalities
4. To explore whether poor access to planned care in some communities leads to increased demand for unplanned care.

The key findings are set out below.

The report builds on earlier research, advancing our understanding in some key areas. Although further analysis may certainly add benefit, this report is sufficient to support some immediate and targeted actions. We look forward to working with the network of Decision Support Units in the Midlands to improve the outcomes for people living in the most deprived parts of the region.

Describing socio-economic inequalities in access to planned hospital care

Rates of access to planned care have increased substantially in recent years.

Rates of access are higher among those living in the least deprived areas. This was not always the case.

This pattern holds for most major causes of morbidity and in most STPs.

Where in the pathway do inequities in planned hospital care emerge?

We explored four pathways: chronic obstructive pulmonary disease, heart failure, arthritis of the hip and cataracts.

Having adjusted for levels of need, activity in the early parts of each the four pathways was skewed towards the most deprived.

This pattern was reversed towards the very end of the pathway, when secondary care treatment occurs.

Possible drivers of inequalities in access to planned hospital care

The late pathway skew towards the least deprived populations that has occurred in recent years, may be a function of various policy initiatives introduced to improve or control access to secondary care treatments.

Access to NHS-funded private sector treatment is substantially higher in the least deprived populations.

As waiting times improved between 2000 and 2014, the benefits were felt disproportionately by those living in the least deprived areas.

Growth in the rates of access to new imaging technologies tends to be slower in the most deprived areas.

When the NHS seeks to limit access to certain forms of surgery, rates tend to fall more rapidly in the most deprived areas.

When the NHS introduces new screening programmes, interventions resulting from those programmes tend to increase more slowly in the most deprived areas.

Does poor access to planned hospital care increase demand for unplanned care?

There is good evidence of a relationship between levels of planned and emergency spells.

For every 10 additional elective spells, we estimate that one emergency spell will be avoided.

The effect accumulates over two years.

Increasing access to elective care for those in the most deprived areas is likely to lead to reductions in emergency care overall and to inequalities in levels of emergency care.

1. Introduction

This report explores socio-economic inequalities in access to planned hospital care. It has four primary objectives:

1. To describe socio-economic inequalities in access to planned hospital care.

2. To identify where in the patient pathways these inequalities in access emerge,

3. To explore potential drivers of these inequalities

4. To explore whether poor access to planned care in some communities leads to increased demand for unplanned care.

Reducing inequalities in health outcomes and in access to healthcare is a long-standing national policy objective, but the profile of this policy is particularly high at present. Indeed, the recent NHS Planning Guidance requires STPs to make progress on this issue as a condition for accessing the Elective Recovery Fund.

The analysis has been conducted by the Strategy Unit on behalf of the Midlands STPs network of Decision Support Units.

1.1 Planned hospital care

In contrast to urgent and emergency care, planned hospital care is arranged in advance and often follows a referral from a GP. This type of care can involve a consultation with a hospital specialist, a diagnostic test, surgery, or the administration of a specialist form of medication. Care can be provided in an outpatient or inpatient setting and may include one or more overnight stay. Activities of this type consume approximately half of all NHS hospital expenditure.

In our analysis, we focus on attendances at outpatient clinics and elective (planned) inpatient spells whether or not these involve an overnight stay. We have excluded some other similar forms of care: inpatient maternity care, planned transfers between hospitals and regular day admissions where care is delivered as a planned series of short admissions as part of an on-going regimen of repeated treatments. These are relatively small components of planned hospital services and are subject to different challenges.

1.2 Inequalities and inequities

The terms 'inequalities' and 'inequities' are used throughout this report. The terms have particular and distinct meanings within a healthcare policy context. The term 'inequalities' is used to describe differences in rates of access to a service between population subgroups; it makes no claims about the appropriateness or fairness of these differences. In contrast the term 'inequities' is used to describe unjustifiable differences in rates of access between subgroups. An equity analysis must control for levels of need within each population subgroup. Having done this, an equitable distribution of services is one where rates of access to a service or population follow the distribution of need, such that a patient with a given level of need in one subgroup has the same chance of accessing a service as their counterparts with a similar level of need in other subgroups. This is the standard that the NHS seeks to achieve.

Assessing equity is challenging. In practice it is only feasible for specific services or pathways (e.g., for hip replacements) rather than for broader sets of services (e.g., elective hospital spells), because patterns of need vary substantially between services. This report uses both inequality and inequity assessments as required.

1.3 Dimensions of inequality

Inequalities and inequities can act across many different dimensions: gender, ethnicity, geography, sexual preference, religion etc. This report is particularly concerned with differences in rates of access between socio-economic groups as defined by indices of deprivation. These indices score and rank small geographical areas (known as lower super output areas) by the relative levels of deprivation experienced by their residents. The English Indices of Deprivation 2019, the most recent release, measures deprivation across seven domains: income, employment, education, health, crime, barriers to housing and services and living environment. Because this multi-faceted definition of deprivation is used, deprivation should not be considered equivalent to poverty although it is often the case that people living in the most deprived areas have lower levels of income than people living in other areas.

Areas are often grouped in to 10 equally sized, deciles of deprivation with decile 1 representing the 10% of areas with the highest levels of deprivation and decile 10 representing the areas with the lowest levels of deprivation. Quintiles of deprivation, five equally sized groups, are also commonly used.

1.4 Measuring inequalities

There are many, well-established approaches to measuring inequalities and inequities across a population. In this report, we use the relative index of inequalities (RII) to indicate the extent to which the rate of an activity or event varies across socio-economic groups defined by deciles of deprivation. It is similar to the range (the difference between the highest and lowest rates), but takes into account the values for all deprivation deciles as well as the population size of each group, such that smaller groups do not unduly skew the results. Where the denominator of the rates assessed is the population size, the RII measures degrees of inequality. Where the denominator is a measure of need, the RII measures inequities.

1.5 Previous research

In 1971, the Lancet published a paper titled 'The inverse care law'.[1] The paper was authored by Julian Tudor-Hart, drawing heavily on his experiences as a general practitioner in Glyncorrwg, a coal-mining area in South Wales. The law states that:

> *"The availability of good medical care tends to vary inversely with the need for it in the population served."*

He observed that while this is particularly apparent where medical care is distributed according to a person's ability to pay, it also holds true in health systems where individuals are fully insured. In the 50 years since the paper was published, many quantitative and qualitative studies have confirmed this relationship between the need and supply of healthcare. We highlight four such papers.

In 2003 Anna Dixon, Julian Le Grand, John Henderson, Richard Murray and Emmi Poteliakhoff reviewed the available evidence to determine whether the NHS was equitable.[2] They concluded that most studies exploring equity of access to specific planned procedures found that utilisation rates were higher in higher-income groups after adjusting for need. Some studies pointed in the opposite direction, but the authors highlight that these studies often relied on self-reported health status as a proxy for need and that this may be subject to systematic bias, or that the studies did not distinguish between planned and emergency care.

[1] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(71)92410-X/fulltext
[2] https://journals.sagepub.com/doi/10.1258/135581907780279549

In 2010 Andy Judge, Nicky Welton, Jat Sandhu and Yoav Ben-Shlomo compared rates of need and supply of NHS-funded hip and knee replacement surgery by quintiles of deprivation in England in 2002.[3] Having adjusted for levels of need, they concluded that people living in the most deprived areas were substantially less likely to receive an NHS-funded hip or knee replacement than their counterparts in the least deprived areas.

In 2015 Martin Wenzl, Sarah McCuskee and Elias Mossialos reviewed the evidence on equity as a policy goal and the NHS's capacity to deliver equity through the process of commissioning.[4] They found that commissioners (Clinical Commissioning Groups) had limited capacity and incentives to commission for equity. They concluded that the 2012 health reforms prioritised the goal of efficiency at the expense of equity.

In 2020, Eric Brunner, Martin McKee, Martin Shipley, George Stoye and Ben Zaranko used self-reported health status from a sample of older adults, to explore socio-economic inequities in access to hospital care between 2004 and 2015.[5] They found that since 2010, gaps in rates of access to outpatient care had opened up between socio-economic groups. By 2015, individuals with higher levels of qualification received higher levels of outpatient care relative to the individual's self-reported health status.

1.6 Recent policy context

The most recent planning guidance was issued by NHS England in March 2021.[6] Two themes receive particular attention: reducing health inequalities and managing the backlog of planned hospital care that has built up over the course of the COVID-19 pandemic. An Elective Recovery Fund (ERF) has been established to ensure that local health systems have sufficient resources to deliver increased levels of planned hospital activity. To qualify for ERF monies, systems must demonstrate that their plans meet the Fund's objectives to address health inequalities. In particular, local plans must:

- *Use waiting list data (pre and during pandemic), including for clinically prioritised cohorts, to identify disparities in relation to the bottom 20% by Index of Multiple Deprivation (IMD) and black and minority ethnic populations.*

[3] https://www.bmj.com/content/341/bmj.c4092
[4] https://academic.oup.com/bmb/article/115/1/5/260428
[5] https://www.ifs.org.uk/publications/15059
[6] https://www.england.nhs.uk/operational-planning-and-contracting/

- *Prioritise service delivery by taking account of the bottom 20% by IMD and black and minority ethnic populations for patients on the waiting list and not on the waiting list, including through proactive case finding.*
- *Use system performance frameworks to measure access, experience and outcomes for black and minority ethnic populations and those in the bottom 20% of IMD scores.*
- *Evaluate the impact of elective recovery plans on addressing pre-pandemic and pandemic-related disparities in waiting lists, including for clinically prioritised cohorts.*
- *Demonstrate how the ICS's SRO for health inequalities will work with the Board and partner organisations to use local population data to identify the needs of communities experiencing inequalities in access, experience and outcomes and ensure that performance reporting allows monitoring of progress in addressing these inequalities.*

2021/22 priorities and operational planning guidance: Implementation guidance, NHS England March 2021

1.7 Report structure

This report has four substantive chapters. Chapter 2 sets out levels of planned hospital care, before moving on to describe inequalities in access to planned hospital care by activity type, condition and STP. These assessments are made at two points in time: 2005 and 2018.

Chapter 3 seeks to identify where inequities emerge along the clinical pathway from the development of symptoms to secondary care treatments. It describes four clinical pathways: those for chronic obstructive pulmonary disease, heart failure, arthritis of the hip, and cataracts. Having adjusted for levels of need, we estimate levels of inequity at six stages of each pathway: identification, primary care management, primary care prescribing, referral to secondary care, secondary care management and secondary care treatment.

Chapter 4 seeks to explain the results observed in Chapter 3 by exploring the impact of various policy and clinical interventions including waiting times targets, the roll-out of new technologies and screening programmes and processes that seek to control access to some forms of treatment.

Chapter 5 explores the relationship between inequalities in access to planned care and demand for unplanned care. We consider the credibility of this claim before subjecting the causal hypothesis to a formal test. Finally, we estimate how much unplanned care might be avoided if we addressed inequalities in access to planned hospital care.

1.8 Supplementary materials

Two additional sets of materials are provided alongside this regional report. The pathway analysis in Chapter 3 is reproduced for each STP/ICS in the Midlands region, drawing out the key messages for those systems and in particular highlighting where the results for an STP/ICS vary substantively from those for the region as a whole. These can be found in a supplementary paper made available alongside this report.

We also provide a series of technical appendices, in the form of r-markdown files, for each of the substantive chapters in this report. These files set out the data sources we relied on, the processes we used to assemble the data and the methods we used to analyse it. This material is supplied to enable other analysts to check, replicate and advance our analysis (see Appendix E for details). We welcome feedback from our fellow analysts on our approaches and methods.

2. Describing socio-economic inequalities in access to planned hospital care

Key findings

Rates of access to planned care have increased substantially in recent years.

Rates of access are higher among those living in the least deprived areas. This was not always the case.

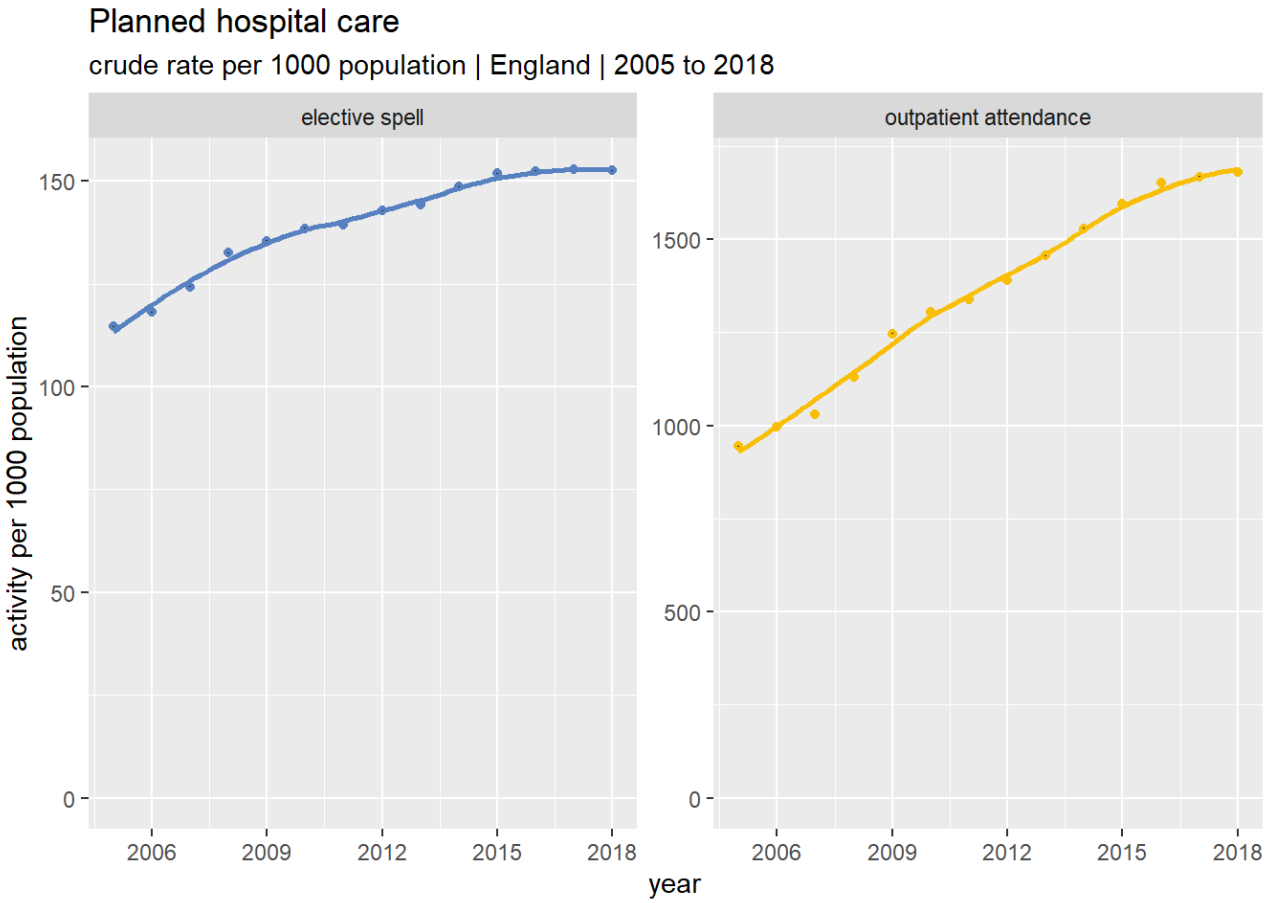
This pattern holds for most major causes of morbidity and in most STPs.

In this chapter we estimate rates of outpatient attendances and elective spells per head of population in 2018, and illustrate how these have changed since 2005. We show how activity rates vary by age, sex and health condition. We then move on to explore how rates of access to planned hospital care vary by socio-economic group, as defined by deciles of deprivation. We make these assessments for 2005 and 2018, by health condition and STP/ICS.

2.1 Activity levels and trends

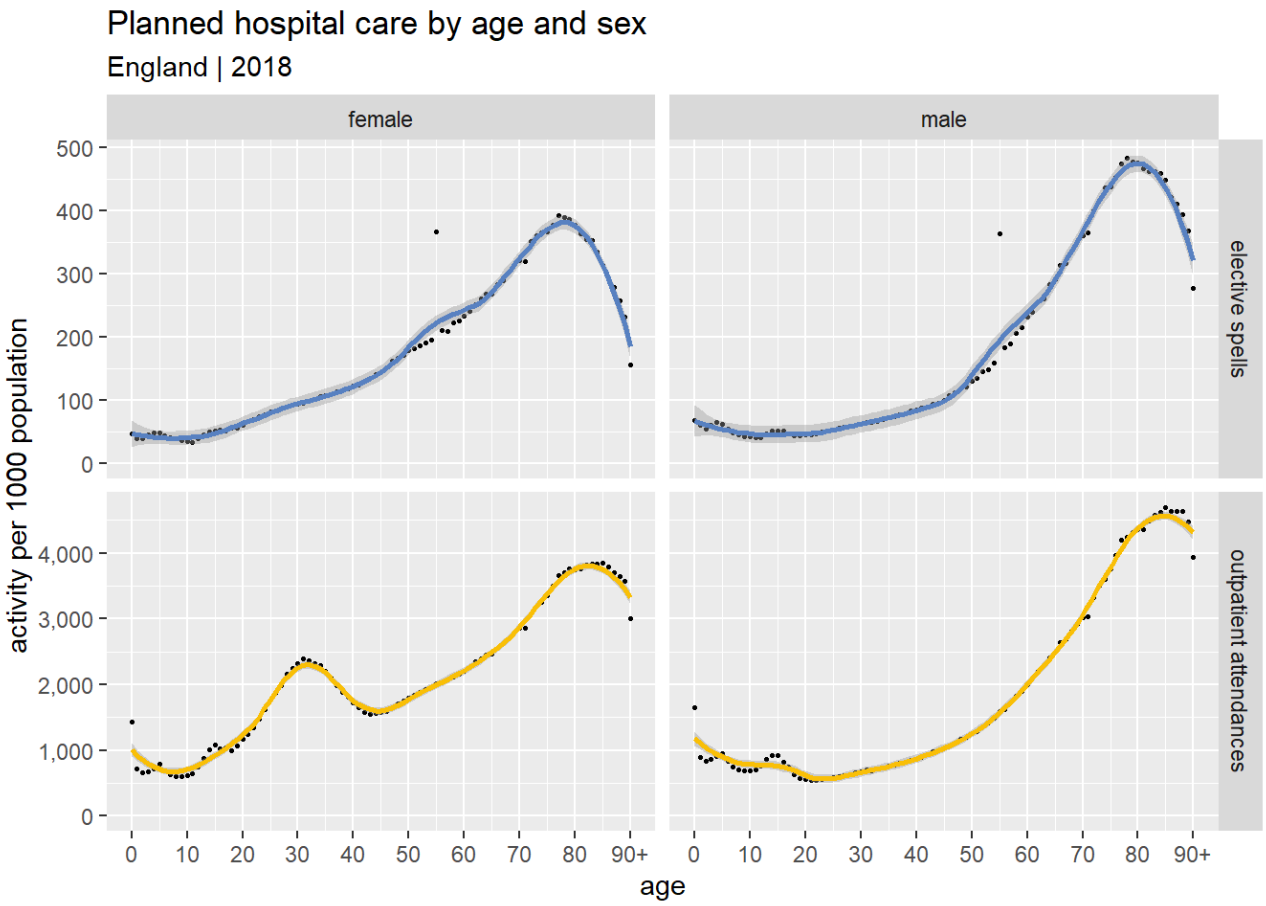
In 2018 there were 152.5 elective spells and 1,681 outpatient attendances per 1000 population in England. This emphasises the scale of this aspect of NHS provision.

The level of planned hospital care increased considerably between 2005 and 2018. Rates of elective spells per head of population increased by 33.1% in that period (2.2% per annum), while outpatient attendances per head increased by 78.1% (4.5% per annum). This occurred despite constraints on NHS funding growth in the years following the economic downturn in 2008 and 2009.



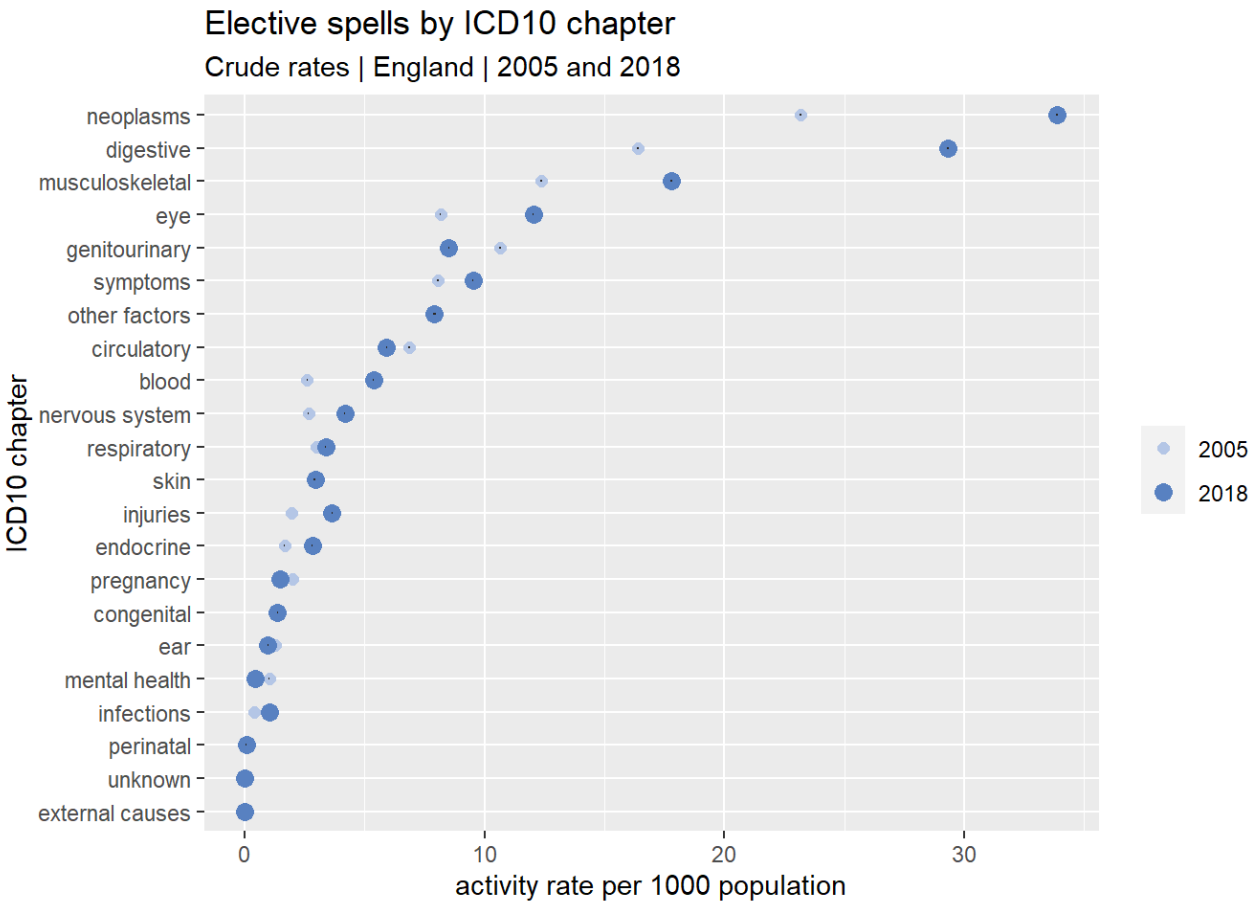
2.2 Activity rates by age and sex

Rates of planned hospital care rise slowly with age to age 50 and then more sharply to age 80, before declining. Obstetrics and gynaecology activity elevates outpatient rates for women aged 20-45. Rates of elective spells and outpatient attendances are higher in older men than in women of the same age. The bowel scope screening programme had a substantial impact on activity rates for men and women aged 55, but this screening programme was discontinued in January 2021.



2.3 Activity rates by condition

Cancer, digestive system disorders and musculo-skeletal conditions were the most common driver of elective inpatient spells. Between 2005 and 2018, absolute growth was largest for disorders of the digestive system and for cancers. In relative terms, growth was greatest for infections, blood disorders and injuries. These differential growth rates are likely to be a product of differential changes in need, treatment options, treatment thresholds and capacity.

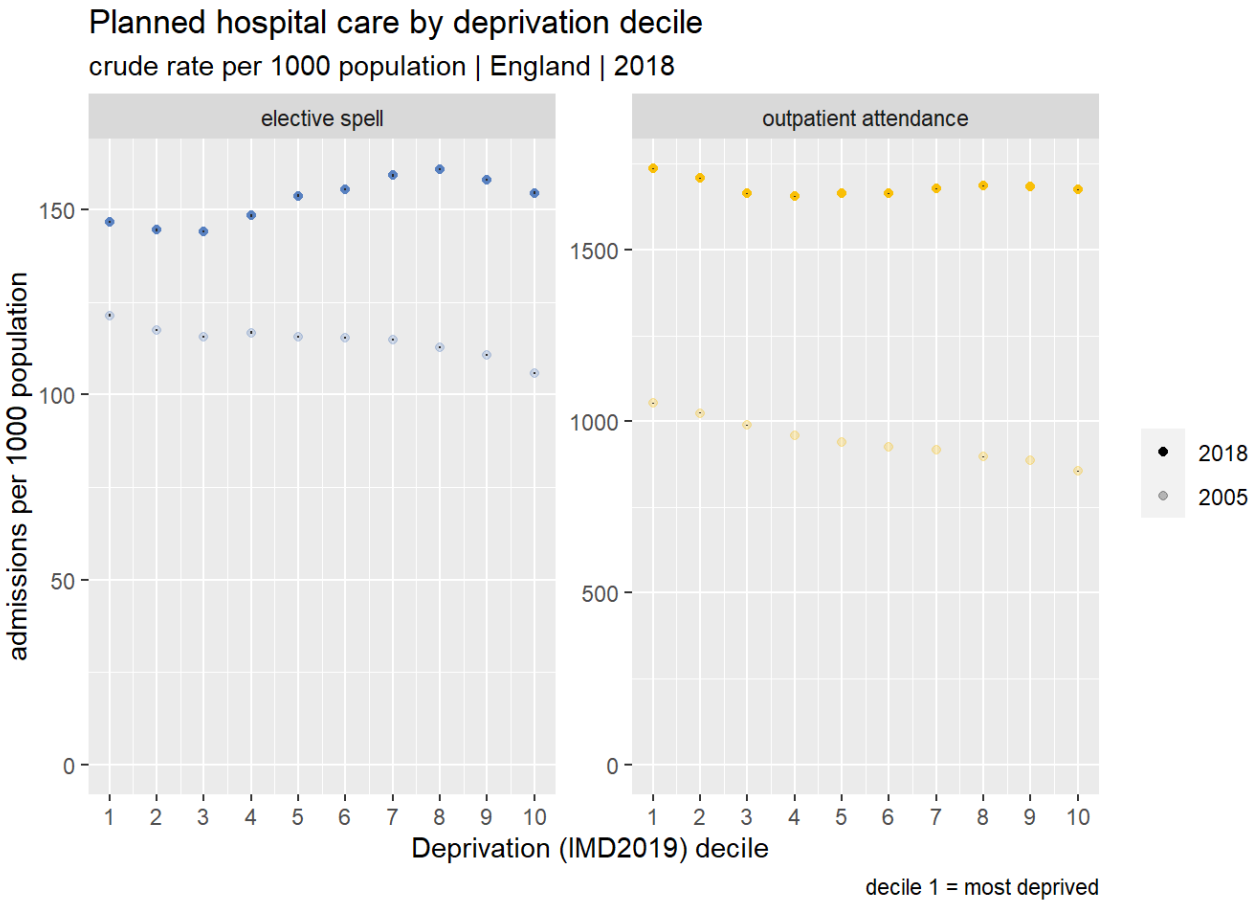


2.4 Differences in rates of planned hospital care by deprivation

Next, we move on to consider inequalities in access to planned hospital care by levels of deprivation. The charts below show rates of elective spells and outpatient attendances in 2005 and 2018. Within each chart, the rates for the 10% of areas with the highest levels of deprivation appear on the left and those for the least deprived areas on the right.

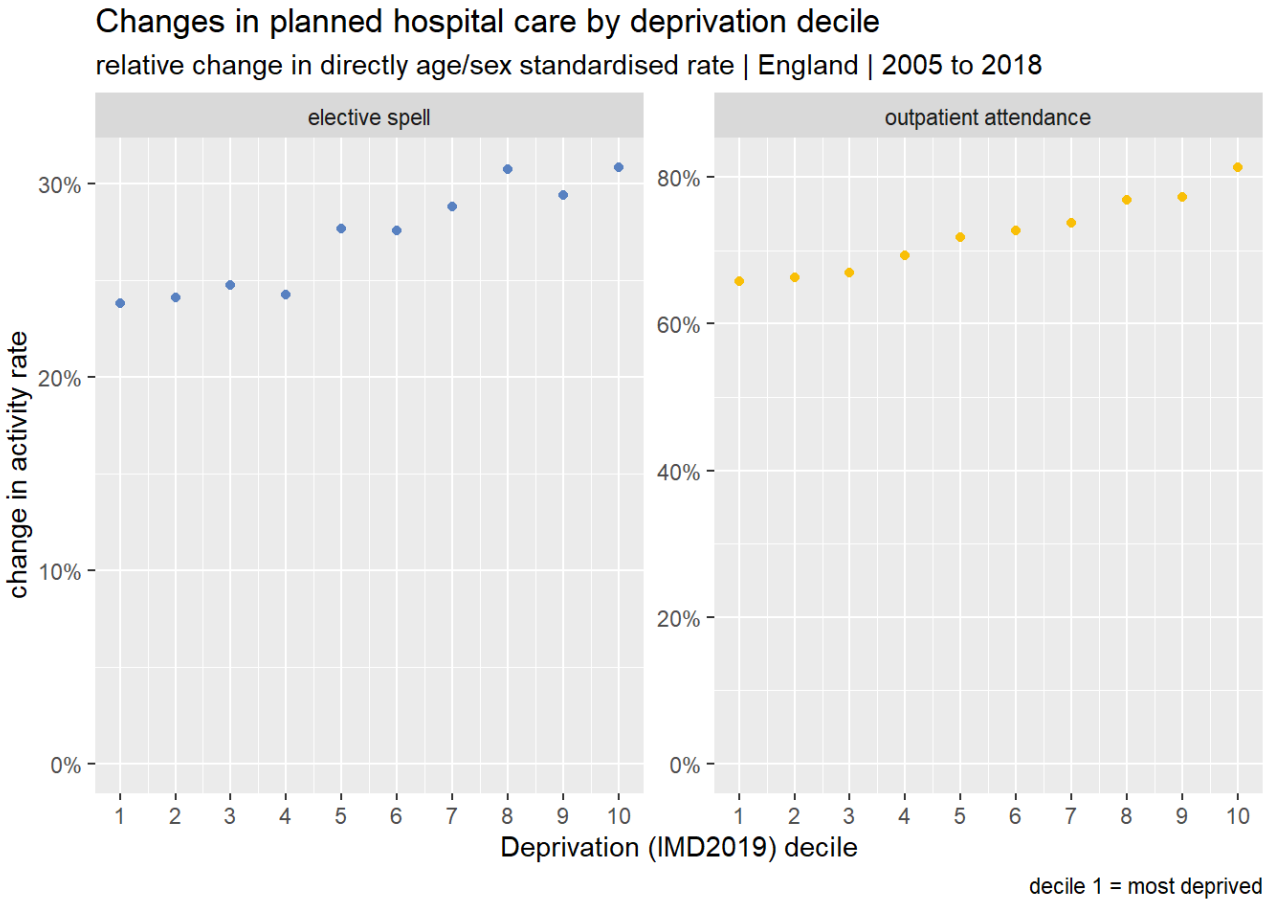
In 2005, crude rates of elective spells favoured those living in the most deprived areas. By 2018 the gradient for elective spells had reversed such that crude rates were highest amongst the least deprived populations.

There is now no observable gradient in rates of outpatient attendances, although a gradient in favour of the most deprived areas was present in 2005.



2.5 Changes in rates of planned hospital care by deprivation

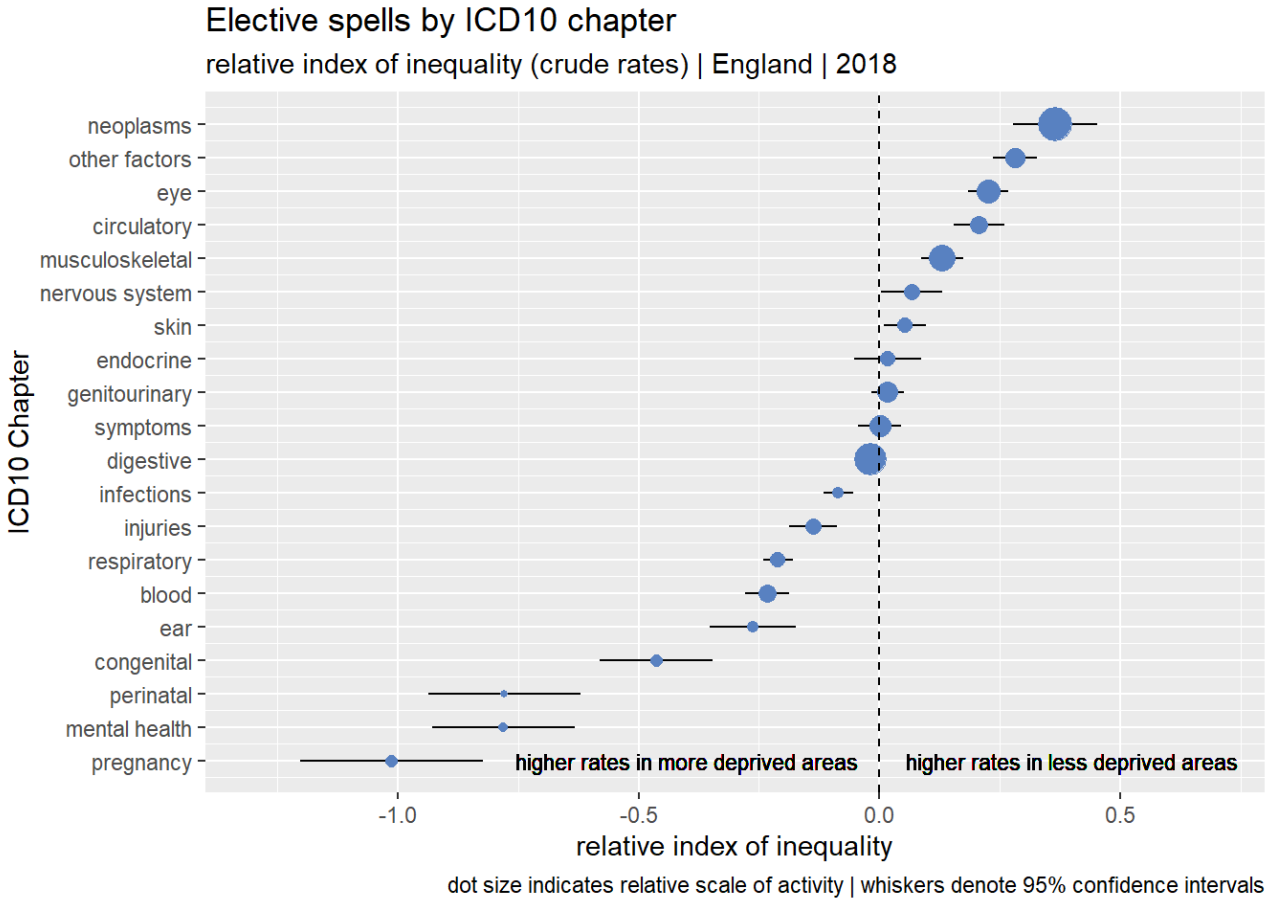
After taking account of differential changes in the age/sex structure, rates of elective spells and outpatient attendances for those living in the most deprived areas have grown at a slower rate.



2.6 Differences in rates of elective spells by deprivation and condition

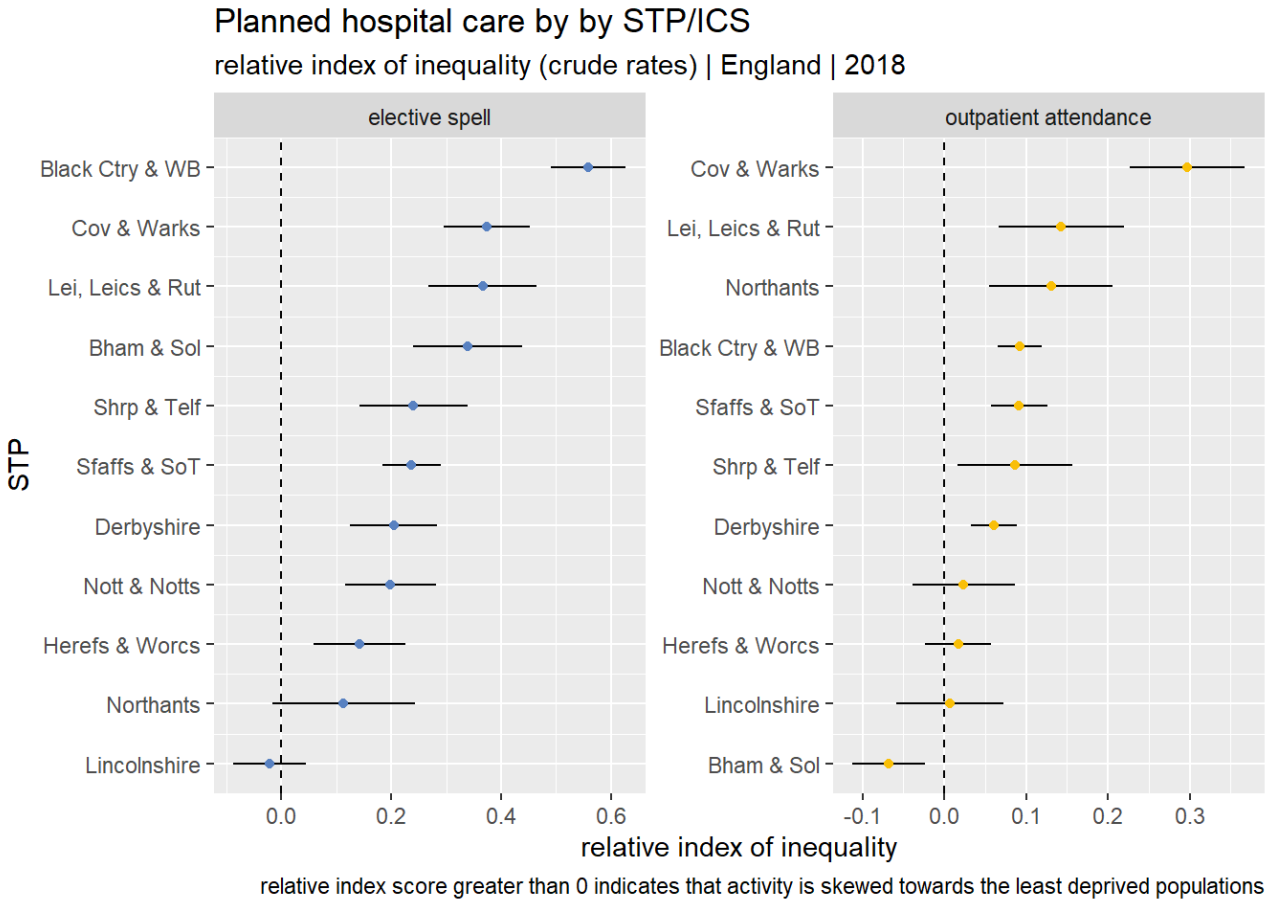
The relative index of inequality (RII) can be used to measure the direction and extent of any inequality in rates of healthcare use by people living in areas of differing levels of deprivation.

Rates of elective spells for most of the major causes of morbidity (including cancer, circulatory, ophthalmic, musculo-skeletal, nervous system and skin conditions) are skewed towards people living in the least deprived areas.



2.7 Differences in rates of elective spells by deprivation and STP

In most STPs/ICSs, rates of elective spells and outpatient attendances are skewed towards people living in the least deprived areas.



3. Where in the pathway do inequities in planned hospital care emerge?

Key findings

We explored four pathways: chronic obstructive pulmonary disease, heart failure, arthritis of the hip, and cataracts.

Having adjusted for levels of need, activity in the early parts of each the four pathways was skewed towards the most deprived.

This pattern was reversed towards the very end of the pathway, when secondary care treatment occurs.

Having established that rates of planned hospital spells are lower for those living in the most deprived areas, this chapter seeks to confirm whether these differences persist after adjustments are made for levels of need and, if so, where these inequities emerge over the planned care pathway. We make these assessments for four planned care pathways: chronic obstructive pulmonary disease (COPD), heart failure, arthritis of the hip, and cataracts. These high-volume pathways were selected in consultation with colleagues in the DSU network. Two pathways - for hip arthritis and cataracts - are predominantly surgical, requiring some form of localised intervention. Those for COPD and heart failure are predominantly medical and involve a more systemic approach to treatment.

3.1 Moving from inequalities to inequities

In Chapter 2, we saw that rates of planned hospital spells per head of population were lower among those living in the most deprived areas - but levels of need per head of population might differ between those living in more or less deprived areas. A more useful assessment would involve comparing rates of planned hospital spells across deciles of deprivation having adjusted for levels of need. An assessment of this type supports judgements not only about differences in rates of access between groups, but also about whether these differences are clinically justified.

Information about how we adjusted for levels of need can be found in Appendix A.

3.2 Pathways of care

For each of the four pathways, we identified a series of metrics for which data was available at a GP practice level. Each metric was assigned to one of six stages along the pathway: identification of a condition in primary care, primary care management, primary care prescribing, referral to secondary care, management in secondary care, and finally treatment in secondary care.

The pathway metrics are set out in Table 1. Full definitions and data sources for each pathway metric are included in Appendix B.

Table 1 – Pathway metrics

Condition	COPD	Heart failure	Arthritis (hip)	Cataracts
Identification	COPD register	HF register	Rheumatoid arthritis register	
1° care management	Annual review, flu vaccination	Diagnosis confirmed by ECG	F2F review	
1° care prescribing	Bronchodilator inhalers, steroid inhalers	ACEi, ARBs, Betablockers, Sacubitril, Digoxin		
Referral to 2° care	ERS OP referrals, offered pulmonary rehab	ERS OP referrals	Physio referrals, orthopaedic OP referrals	ERS OP referrals
2° care management	1st OP attendances	1st OP attendances	1st OP attendances, 1st OP telephone attendances	1st OP attendances
2° care treatment	Steroid tablets, lung volume reduction procedure	Pacemakers, valve repair	OP injections, hip replacements, hip revisions	OP procedures, IP procedures

The following charts for each of the pathways show the activity-to-need ratios (activity per 1,000 need) by deprivation decile for each of the activity measures detailed above. The relative index of inequalities (RII) is given for each measure.

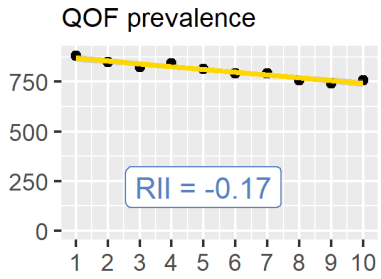
The RII represents the inequality gap across the whole population between the most and the least disadvantaged. It allows for comparison of inequity across different measures. The sign of the RII indicates the direction of the inequity: a negative RII indicates that activity-to-need ratios are higher for those in more deprived groups, whereas a positive RII indicates higher activity-to-need ratios in the least deprived groups. The absolute size of the RII (i.e., its numerical value without the sign) indicates the size of the inequity.

3.3 Chronic obstructive pulmonary disease

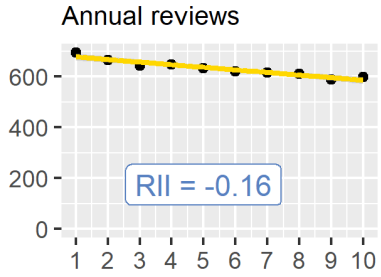
Chronic obstructive pulmonary disease is a term used to describe progressive, chronic conditions such as emphysema and chronic bronchitis that cause breathing difficulties. These conditions can be managed in primary care, but as symptoms worsen, patients are often referred to secondary care for more specialised medical treatment. In some cases, patients are offered surgical interventions to remove air pockets and damaged parts of the lung.

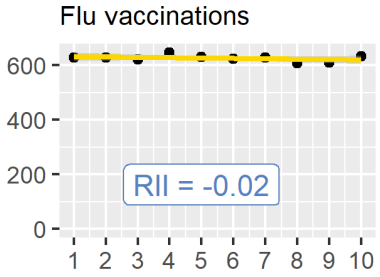
The charts that follow show the ratio of activity to need at various points on the COPD pathway. Patients with COPD in the most deprived areas are more likely to be identified by their GP and placed on a COPD register than patients in the least deprived areas. Patients with COPD in the most deprived areas are also more likely to receive primary care management (annual reviews and influenza vaccinations), to be prescribed inhalers, to be referred to secondary care and, to be seen by a specialist in an outpatient setting. However, patients with COPD living in the least deprived areas are more likely to receive treatments in secondary care, such as lung volume reduction surgery.

Identification

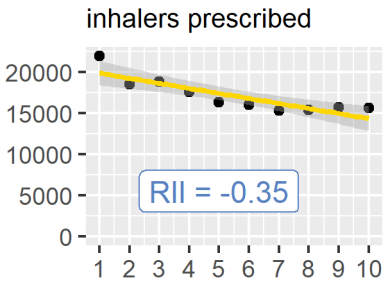


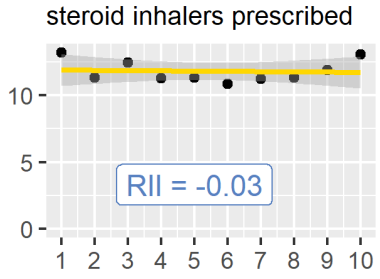
Primary care management



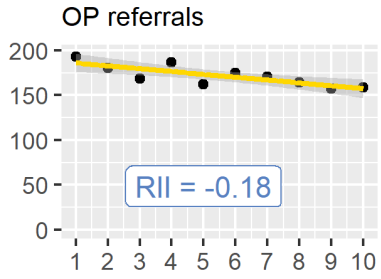


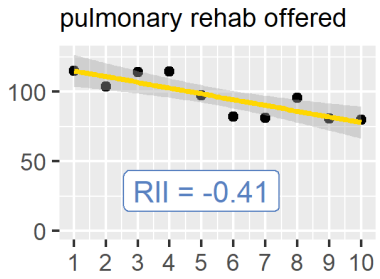
Primary care prescribing



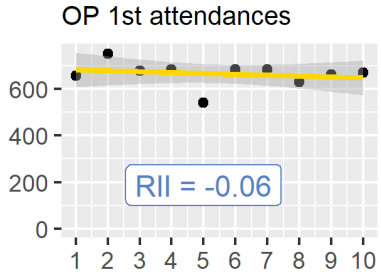


Referral to secondary care

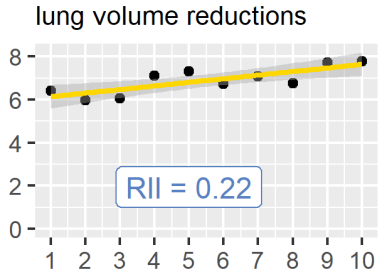


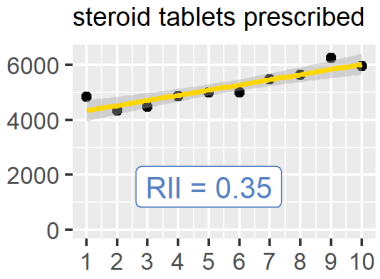


Secondary care management



Secondary care treatment

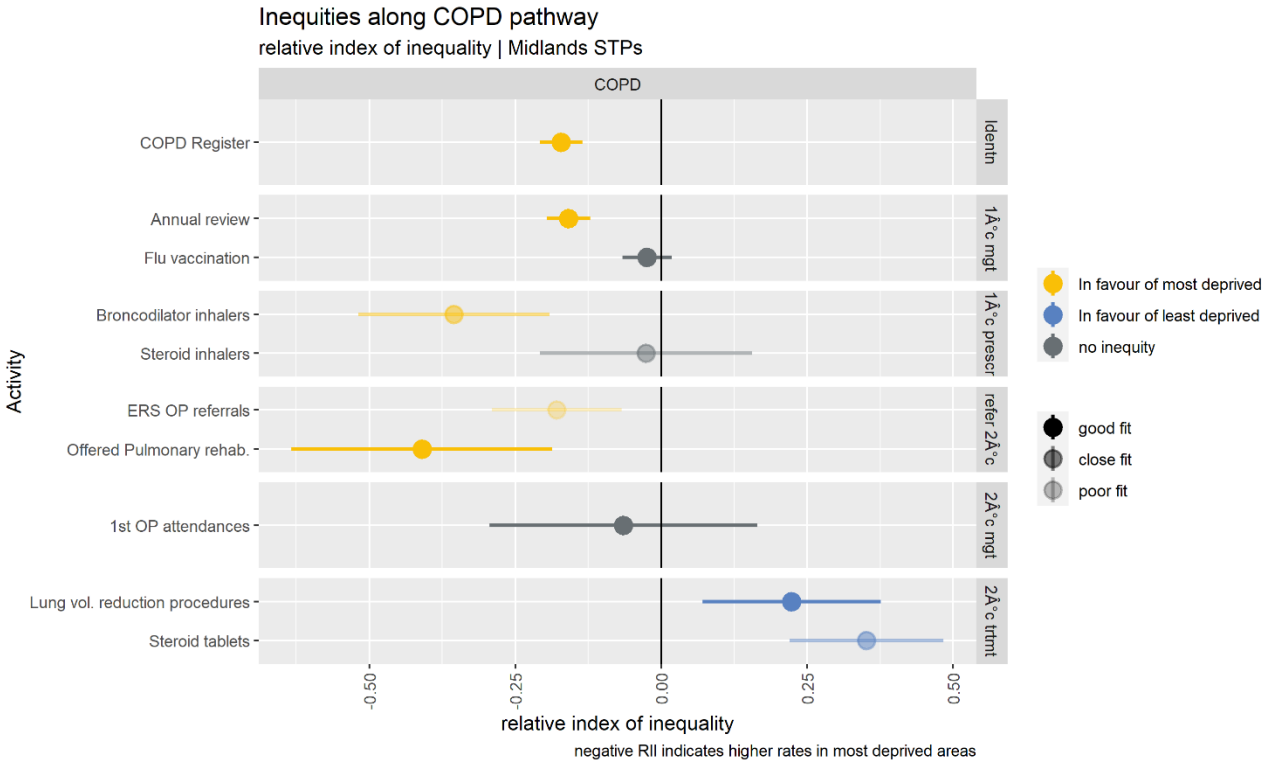




The summary chart below illustrates the RII for each metric on the COPD pathway. It includes confidence intervals indicating whether the observed inequity is statistically significant. Yellow points on the chart indicate that activity is significantly skewed towards more deprived populations, and blue points indicate that activity is significantly skewed towards less deprived populations. Grey points indicate there is no evidence of inequity at these points on the pathway.

For some metrics, the level of detail in the underlying datasets means we can be confident that the metrics relate exclusively to patients on the relevant pathway. For example, the COPD pathway metric relating to influenza vaccinations relates specifically to patients on primary care COPD registers. For other metrics, this is not the case, for example, the hip arthritis pathway metric relating to outpatient referrals, measures rates of all orthopaedic outpatient referrals, not just those for hip arthritis. We provide some indication of the degree of 'fit' between the metric and the pathway in Appendix B and the subsequent charts. This is also indicated on the charts, with the level of transparency of each dot representing the extent to which the metric fits the pathway.

It shows that at the early part of the COPD pathway, activities are skewed towards patients living in the most deprived areas, but at the end of the pathway the skew is reversed with people living in the least deprived areas being more likely to receive secondary care treatments.

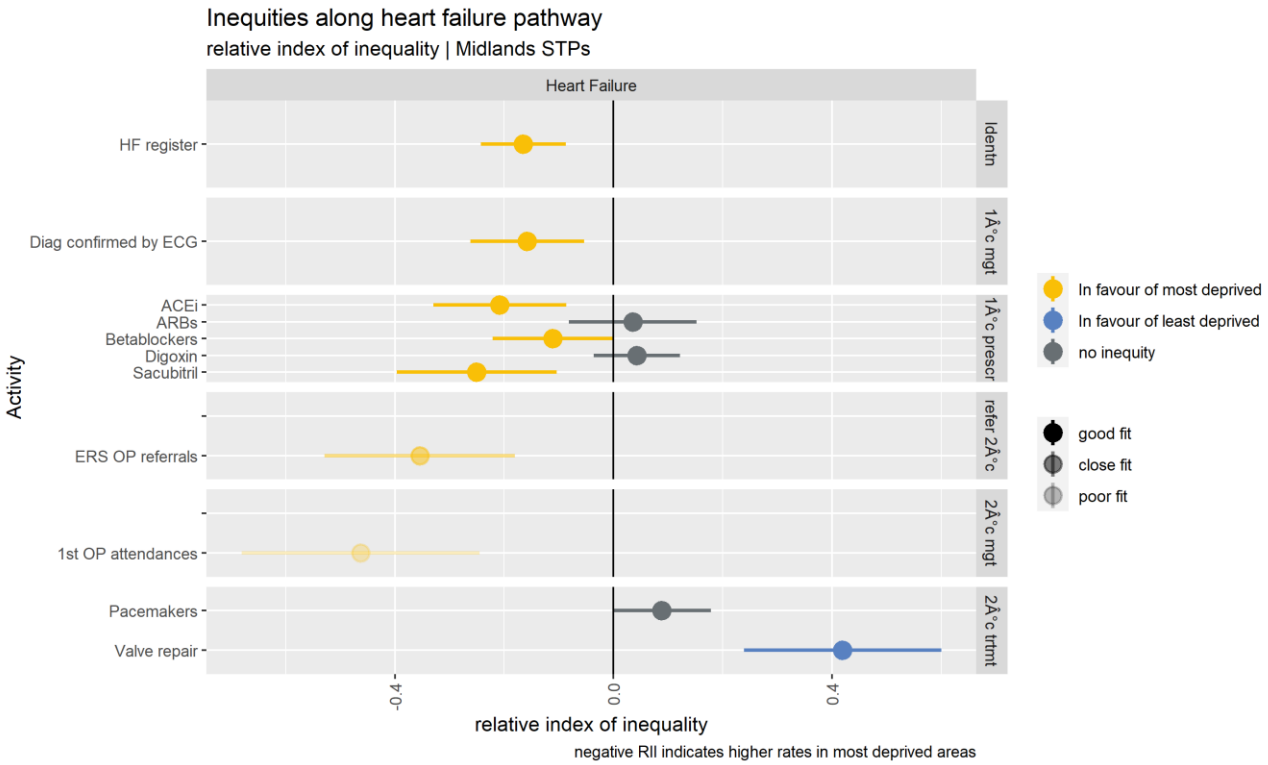


One potential explanation for this finding is that patients living in the least deprived areas are in greater need of secondary care treatments because they receive lower levels of care at earlier stages of the pathway. However, we note that having adjusted for need, emergency COPD hospital spells and deaths in hospital following an emergency COPD spell are higher among those living in the most deprived areas. This suggests that the skew towards the most deprived in the earlier parts of the pathway are not sufficient to slow disease progression relative to those living in the least deprived areas.

3.4 Heart failure

Heart failure is a chronic, progressive condition that occurs when the heart becomes too weak or rigid to effectively pump blood around the body. The early stages of the disease can be managed in primary care with the use of several forms of medication. As the condition progresses, there may be a need to fit a cardiac pacemaker or similar device or to carry out surgery to repair heart valves or clear blockages in an artery supplying the heart.

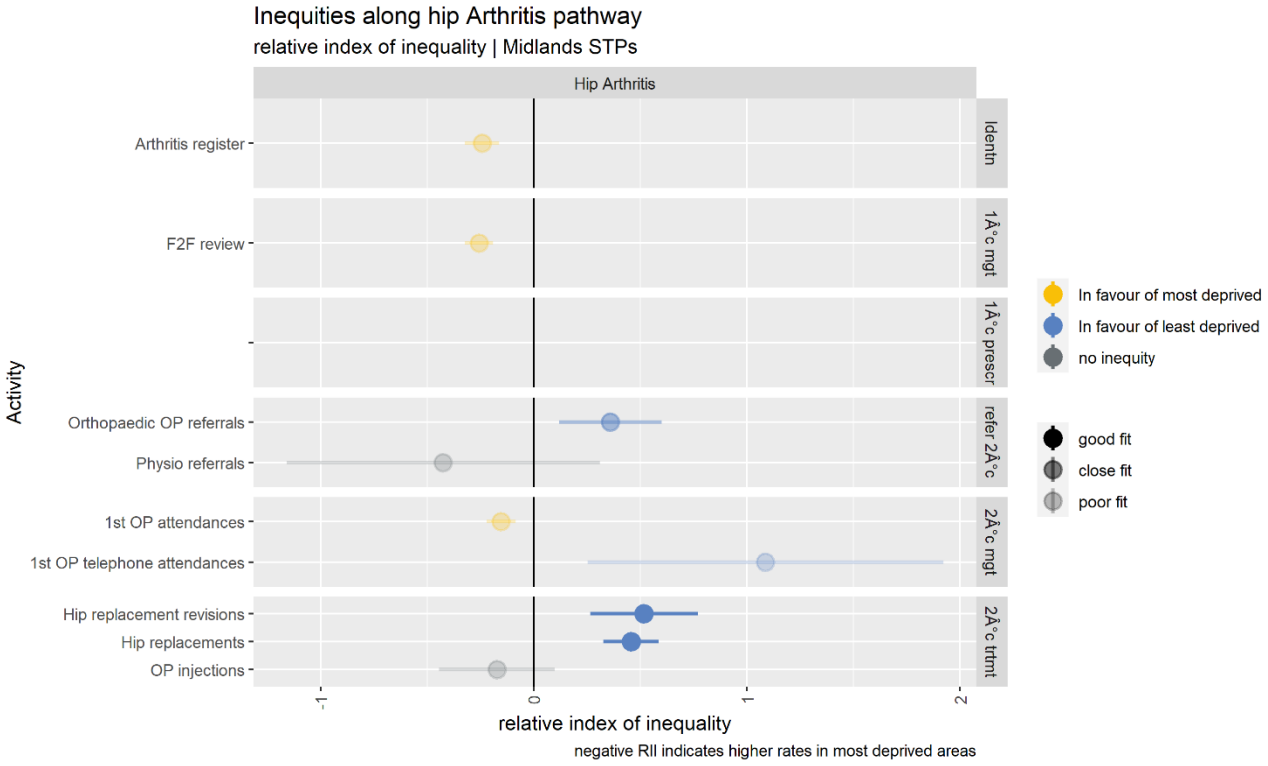
The chart below shows that heart failure patients living in the most deprived areas are more likely to be identified by GPs and placed on a heart failure register. These patients are also more likely to have their diagnosis confirmed with ECG, to receive several forms of medication (ACEs, betablockers and sacubitril), to be referred to secondary care, and to be seen by a specialist in an outpatient setting. However, patients with heart failure living in the least deprived areas are more likely to receive treatments in secondary care, such as surgical valve repair.



3.5 Arthritis of the hip

Arthritis is a term, used to describe several progressive, autoimmune disorders of the joints. Osteoarthritis and rheumatoid arthritis are two common forms of arthritis affecting the hip that cause pain and, stiffness and reduce the range of motion. Improvements to a patient's lifestyle can help, and over-the-counter medications can be used to manage pain and inflammation at the early stages of the disease. As the condition progresses, physiotherapy and prescribed medications may be required. When a patient's hip pain or mobility has deteriorated sufficiently, they are often offered surgery to replace the hip with an artificial joint. Modern hip prostheses last for many years, but surgery to replace an artificial joint with another may sometimes be required.

Compared with those living in the least deprived areas, patients with hip arthritis living in the most deprived areas are more likely to be identified by GPs and placed on an arthritis register. They are also more likely to receive a face-to-face review in primary care and to be seen by a specialist in an outpatient setting. Patients with hip arthritis living in the least deprived areas are, however, more likely to receive a telephone consultation from a specialist and to receive a hip replacement.

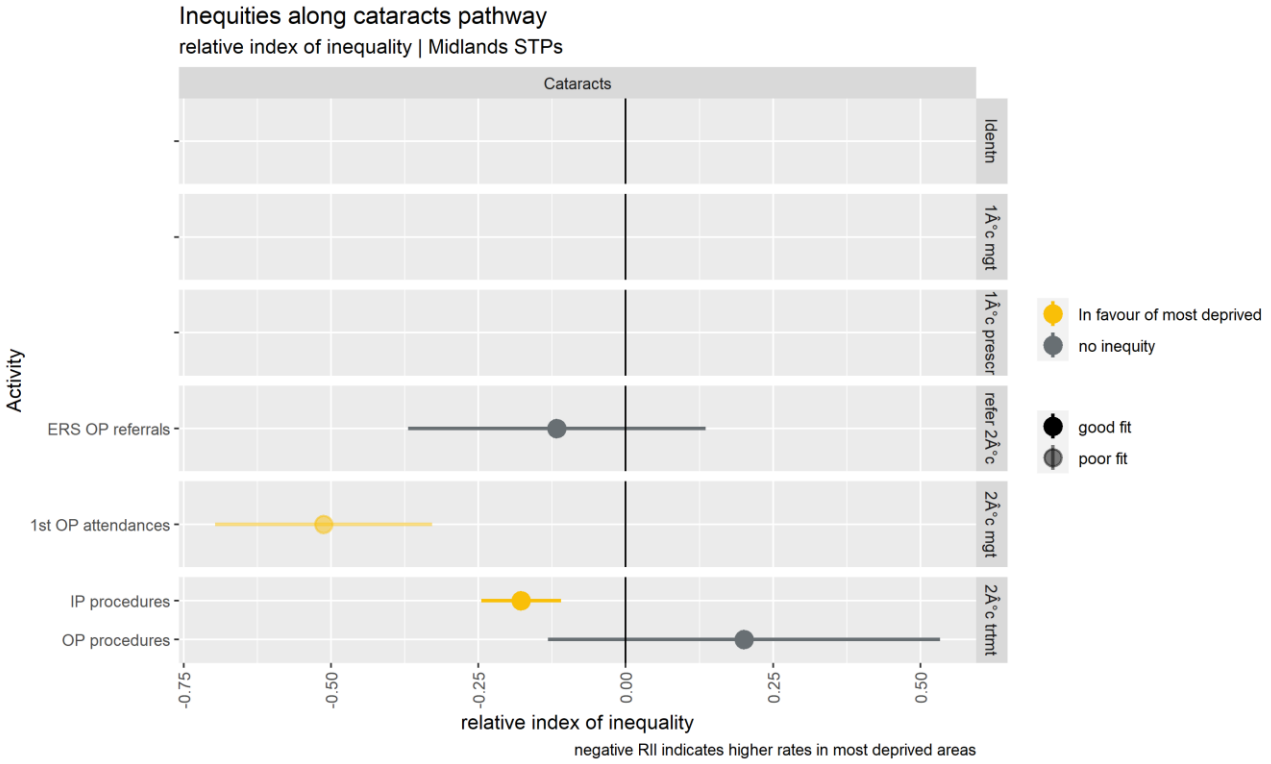


3.6 Cataracts

The term 'cataracts' describes a progressive condition in which the lens in a person's eye becomes cloudy, obscuring vision. The condition is usually diagnosed by a community optician who in turn refers a patient to a specialist ophthalmologist. Surgery to replace the lens with an artificial one is the only proven form of treatment.

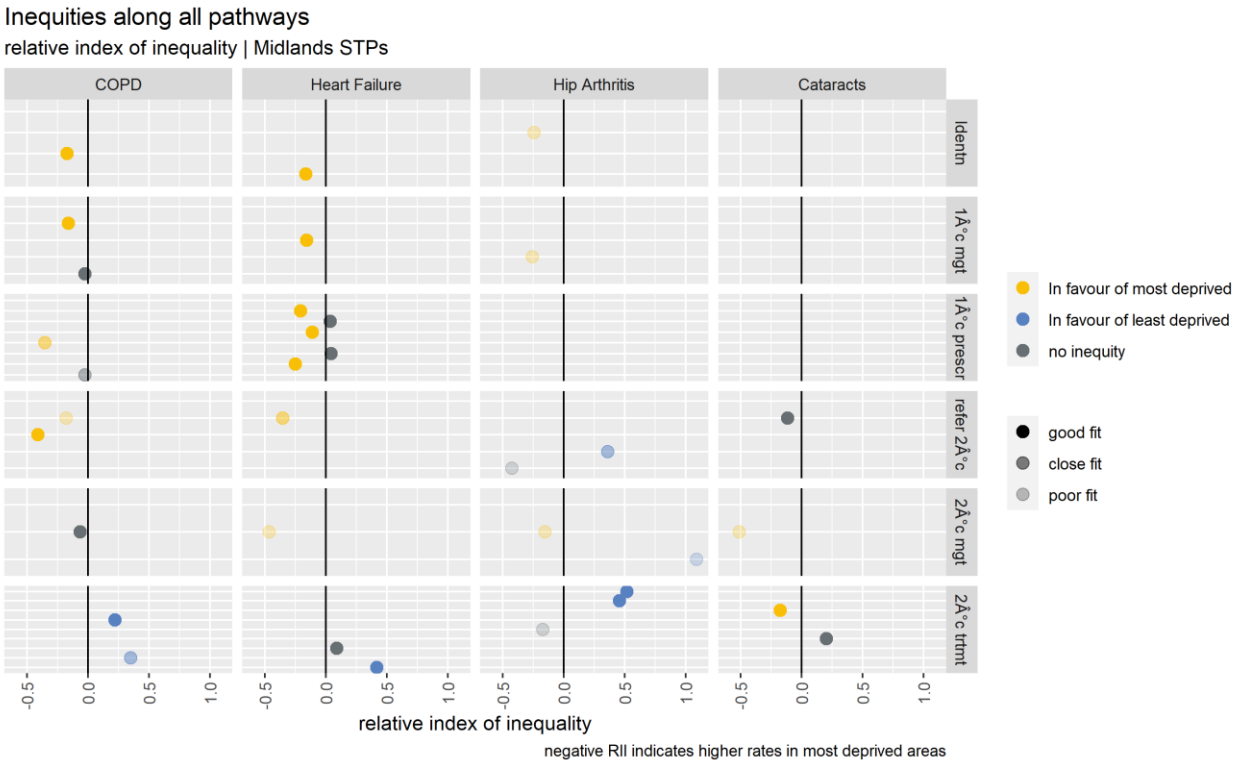
Data on the early part of the cataracts pathway is difficult to obtain in the detail required for this assessment. However, the available data, suggests that patients living in the most deprived areas are more likely to receive a first outpatient appointment with a consultant. Cataract surgery can be delivered in outpatient or an inpatient setting; the data suggests that people living in the most deprived areas are more likely to receive inpatient surgery.

Note that our method of estimating need for cataract surgery is comparatively crude. The method adjusts for some risk factors (e.g., age) but not for risk factors such as smoking, alcohol consumption, diabetes, or steroid use. This may mean that our estimates understate the level of need in the most deprived areas and overstate need in the least deprived areas.



3.7 Four pathways

When we look at the data for the four pathways together, a more general picture emerges. In the earlier parts of pathways, activity is generally skewed towards patients in need living in the most deprived areas. These patterns tend to reverse in favour of patients living in the least deprived areas only at the very end of the pathway, when secondary care treatments are provided.



The analysis in this chapter focuses on four pathways. Although these are high-volume pathways, they constitute only a small minority of all planned hospital activity. The consistency of the results should provide some confidence that the findings might generalise to other pathways; however this can only be established definitively through additional analysis. The availability of pathway metrics and suitable need data is likely to be the main barrier to such a comprehensive assessment.

4. Possible drivers of inequalities in access to planned hospital care

Key findings

The late pathway skew towards the least deprived populations that has occurred in recent years may be a function of various policy initiatives introduced to improve or control access to secondary care treatments.

Access to NHS-funded private sector treatment is substantially higher in the least deprived populations.

As waiting times improved between 2000 and 2014, the benefits were felt disproportionately by those living in the least deprived areas.

Growth in rates of access to new imaging technologies tends to be slower in the most deprived areas.

When the NHS seeks to limit access to certain forms of surgery, rates tend to fall more rapidly in the most deprived areas.

When the NHS introduces new screening programmes, interventions resulting from those programmes tend to increase more slowly in the most deprived areas.

In Chapters 2 and 3 we saw substantial and widespread inequities in access to planned hospital care. These inequities have not always been present at this scale and they tend to emerge late in the care pathway. Pinning down the causes or drivers of these changes is not straightforward. In this chapter we offer our emerging theories and provide some supporting evidence. We regard these theories as credible explanations, but further work is required to confirm them.

4.1 Differential impacts of health policies to improve or control access to planned hospital care

Improving access to planned hospital care has been a key theme of health policy since the early 2000s, reducing waiting times, maximising uptake of new diagnostic tests and, surgical procedures, and rolling out screening programmes.

As NHS budgets became increasingly constrained following the economic downturn in 2008 and 2009, NHS policy turned to controlling access to certain low-value forms of secondary care. The

policies recognised that NHS budgets were limited and that NHS resources should be spent on those activities that generate the greatest utility.

Table 2: Examples of policies to…

improve access to planned hospital care:	control access to planned hospital care:
Waiting times targets	Polices on procedures of limited clinical value
Patient choice	Referral management
NHS-funded access to private hospitals	Lifestyle-based eligibility criteria

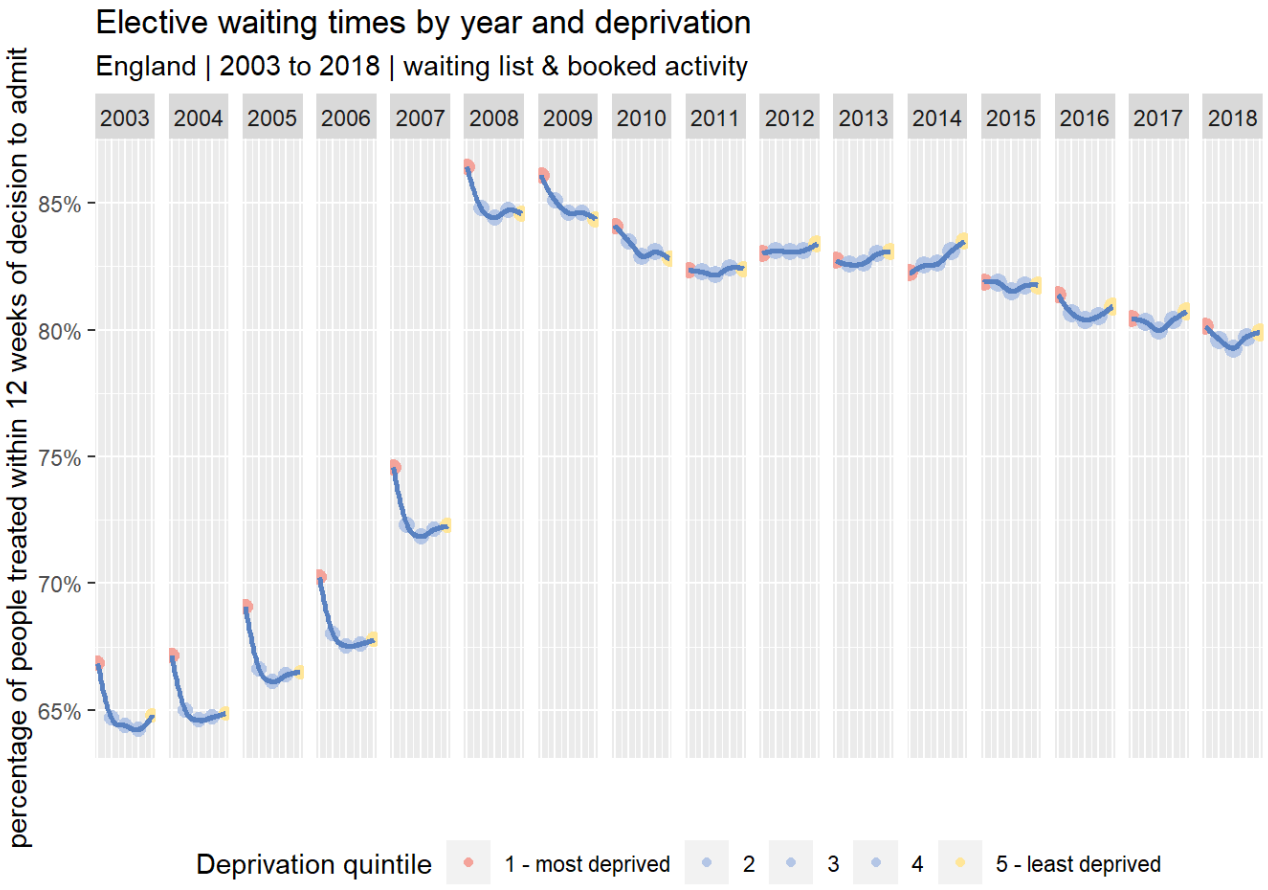
Many of these policies have been successful in their own terms, reducing average waiting times, increasing capacity, making new technologies available, reducing supply of low-value interventions, and so on.

In the remainder of the chapter, we explore whether the effects of these policies have been felt differentially across socio-economic groups, leading to more rapid growth in planned hospital care for those living in the least deprived areas. The examples given were chosen to test our theories, rather than to illustrate them; further work would be required to assess the generalisability of these results.

4.2 Waiting times targets

A series of national targets and standards have been developed to increase the proportion of patients who receive planned care in a timely manner. Initially, these targets measured the time between a decision to admit a patient and the admission itself. Targets became increasingly numerous and sophisticated, measuring the times from referral to treatment. These targets are currently the subject of a national review.

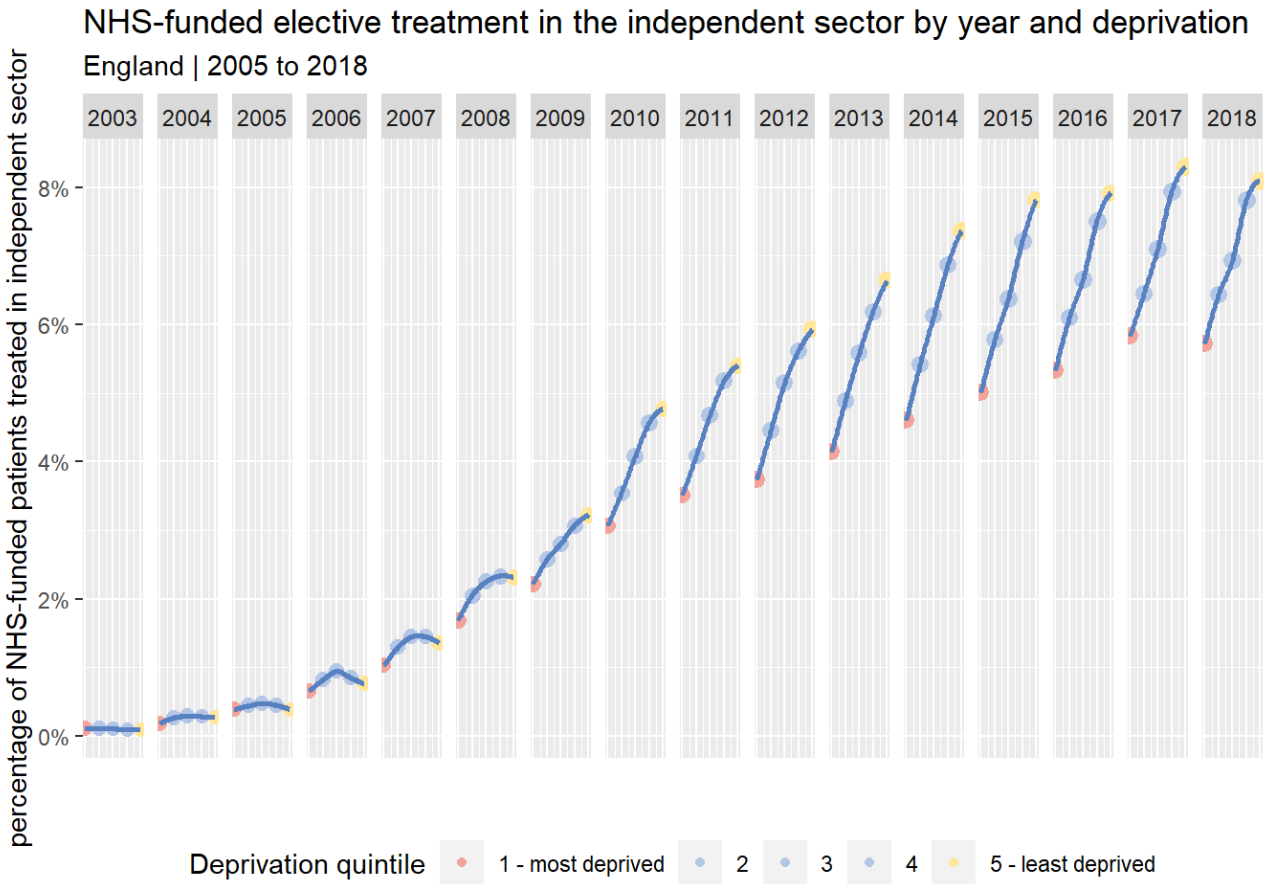
In the early and mid-2000s, people in more deprived areas were, on average, getting faster access to elective inpatient activity. Waiting times improved dramatically for all groups in the late 2000s. By 2014 the gradient in waiting times across deprivation quintiles had reversed, and those in less deprived areas were receiving faster access to care. Since 2014, waiting times have deteriorated and the gradient across deprivation quintiles has become less clear.



4.3 NHS-funded access to private hospital provision

The patient choice initiative allowed patients to choose the hospital where they would receive care and made information available to patients on the quality and timeliness of care in different hospitals. Independent Sector Treatment Centres (ISTCs) were developed to increase planned care capacity. The extended choice initiative allowed patients to elect to receive their NHS-funded care in certain independent and private hospitals.

In the early 2000s, NHS-funded access to the independent sector was negligible. The development of ISTCs in the mid-2000s and the extended choice policy initiative in 2007 resulted in a steady increase in NHS-funded independent sector activity. Access to independent sector providers is substantially higher among the least deprived populations and the disparity is increasing.

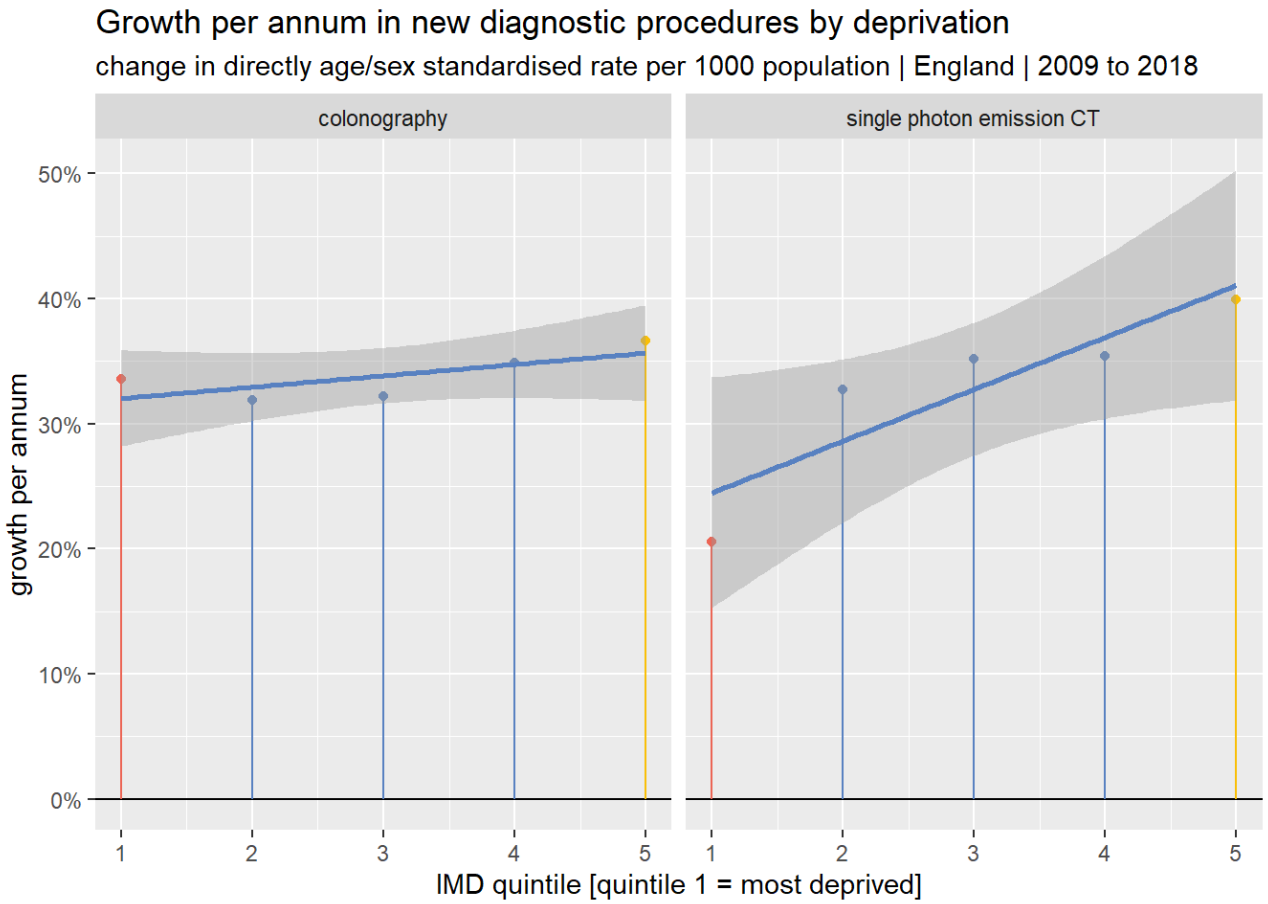


4.4 Access to new diagnostic technologies

The past two decades have seen the development and roll-out of many new forms of diagnostic imaging. Colonography - computed tomography (CT) of the colon - involves the use of specially adapted x-ray equipment to examine the large intestine for cancers, growths and other bowel disorders. It extends the coverage of diagnostic imaging of the colon to patients who would be less able to tolerate a colonoscopy, the standard but more invasive intervention.

Single photon emission computed tomography (SPECT) provides images of the flow of blood within the body. It is used to diagnose a range of conditions, including seizures, infections and cancers. It is often used as an alternative to positron emission tomography (PET), which is both very expensive and highly resource constrained.

Between 2009 and 2018, the growth in the use of colonography and SPECT has been greater for those living in the least deprived areas.

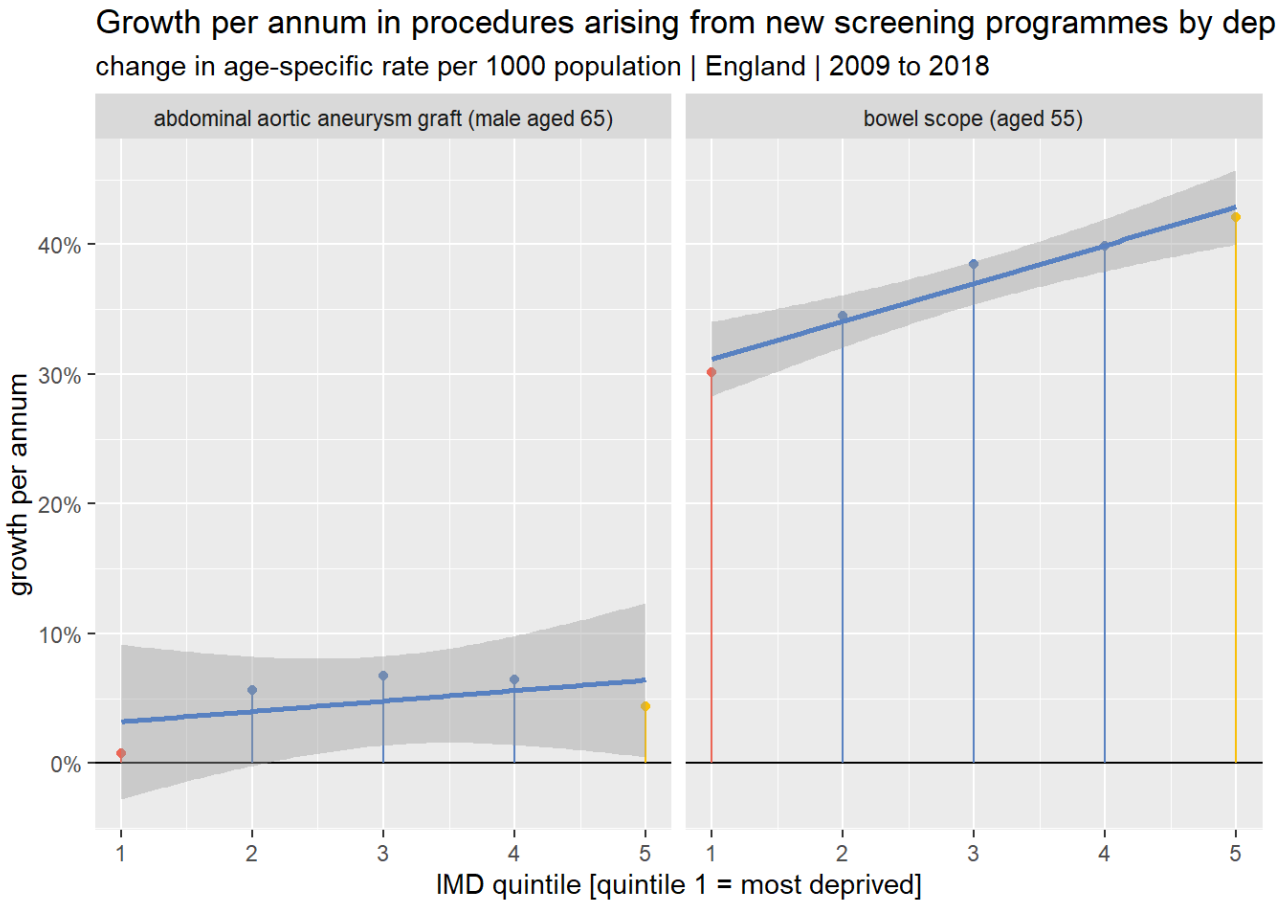


4.5 Access to procedures arising from new screening programmes

The NHS operates several population screening programmes. Screening seeks to identify people at higher risk of a disease so that treatments can be made available at an early stage, thereby improving outcomes. The NHS has introduced several new screening programmes in recent years.

The abdominal aortic aneurysm screening programme invites men to receive an ultrasound test in the year they turn 65. The scan seeks to establish the presence or absence of an aneurysm in the main blood vessel that runs between the heart and the stomach. If an aneurysm goes untreated, it may burst and result in life-threatening internal bleeding. If detected, it can be monitored or treated. Large abdominal aortic aneurysms can be repaired with surgery.

Until recently there were two bowel cancer screening programmes: the faecal immunochemical test (FIT) and bowel scope. The latter involved inviting men and women aged 55 years to receive a single endoscopic examination of the lower portion of the bowel; however this programme was discontinued in January 2021.



Between 2009 and 2018, rates of growth of elective abdominal aortic aneurysm grafts in men aged 65 and bowel scopes in men and women aged 55, increased more among those living in the least deprived areas.

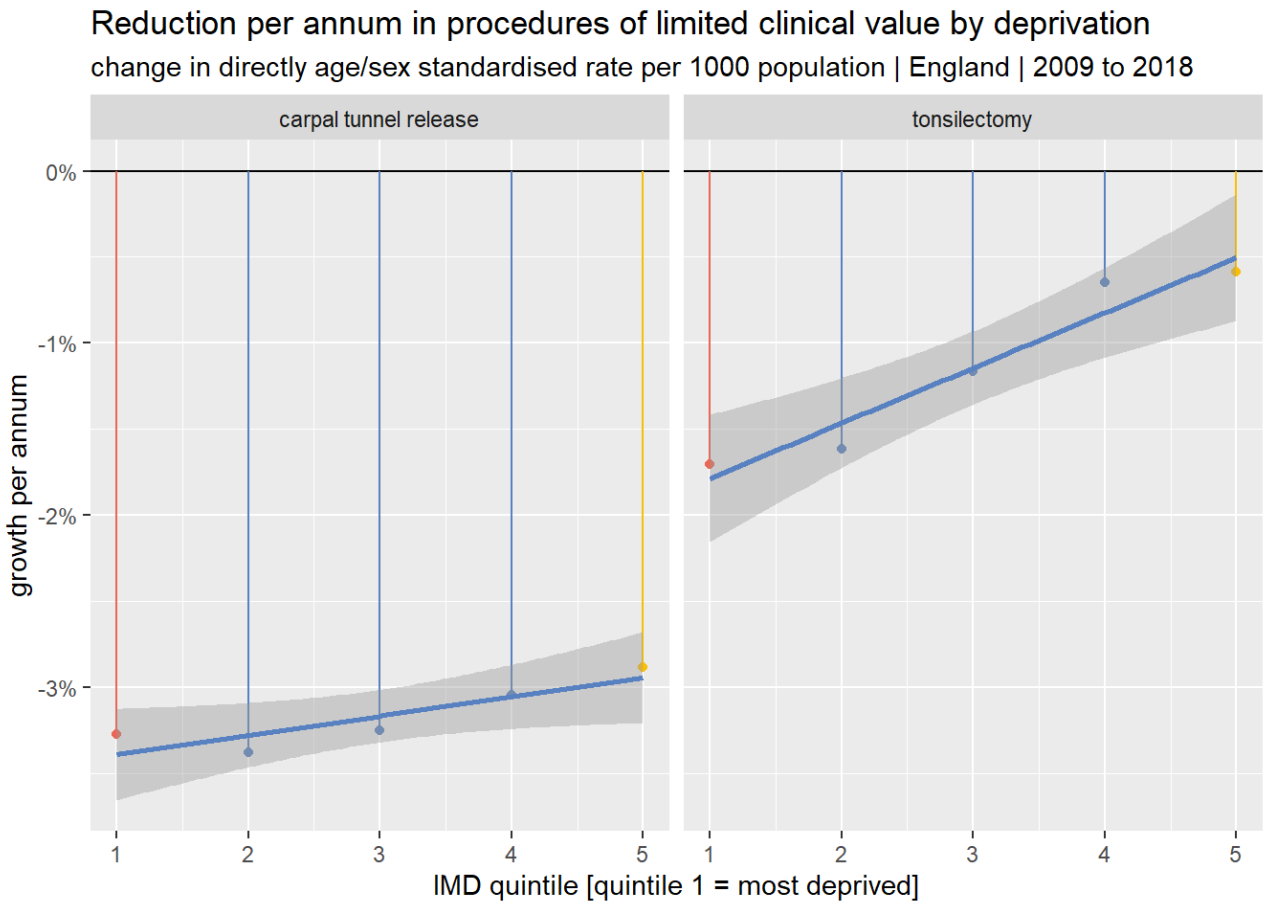
4.6 Access to procedures with extensive eligibility criteria

Commissioners developed lists of procedures of limited clinical value and set out the criteria that must be met before these procedures could be delivered. This included procedures that were predominantly cosmetic, those with a high risk-benefit ratio, those for which there was limited evidence of effectiveness, or those where more cost-effective alternatives were available. In some cases, commissioners restricted access to some forms of treatment if certain lifestyle-based criteria (e.g., body mass index or smoking status) were met. Referral management centres were set up to review the referrals of GPs to secondary care, to identify and divert patients for whom there was a view that secondary care treatment was not yet warranted.

Tonsillectomy and carpal tunnel release are forms of surgery that commonly feature on commissioner lists of 'procedures of limited clinical value'. Tonsillectomy involves the surgical removal of the tonsils in order to treat recurrent throat infections and obstructive sleep apnoea. Although historically performed in high volumes, trials revealed that many recipients did not benefit from the surgery. Over time, the eligibility criteria for tonsillectomy have been tightened to limit access to those who are most likely to benefit.

Carpal tunnel syndrome is a progressive condition that causes pain, numbness and tingling in the thumbs and fingers. Over time, pain may extend up the arm, causing weak grip and muscle wastage. The condition is caused by the compression of a nerve that runs through the wrist and carpal tunnel release is a surgical intervention to alleviate this compression. Carpal tunnel syndrome is common and mild symptoms often resolve without treatment. Eligibility criteria for surgery reflect the fact that those experiencing more severe and persistent symptoms are more likely to receive benefit from the surgery, whilst non-surgical interventions are effective for other people and carry fewer risks.

Between 2009 and 2018, having adjusted for changes in the age-sex population structure, rates of carpal tunnel release and tonsillectomy procedures have fallen fastest among those living in the most deprived areas.


Reduction per annum in procedures of limited clinical value by deprivation
change in directly age/sex standardised rate per 1000 population | England | 2009 to 2018
carpal tunnel release
tonsilectomy
0%
-1%
-2%
-3%
growth per annum
1
2
3
4
5
IMD quintile [quintile 1 = most deprived]

5. Does poor access to planned hospital care increase demand for unplanned care?

Key findings

There is good evidence of a relationship between levels of planned and emergency spells.

For every 10 additional elective spells, we estimate that one emergency spell will be avoided.

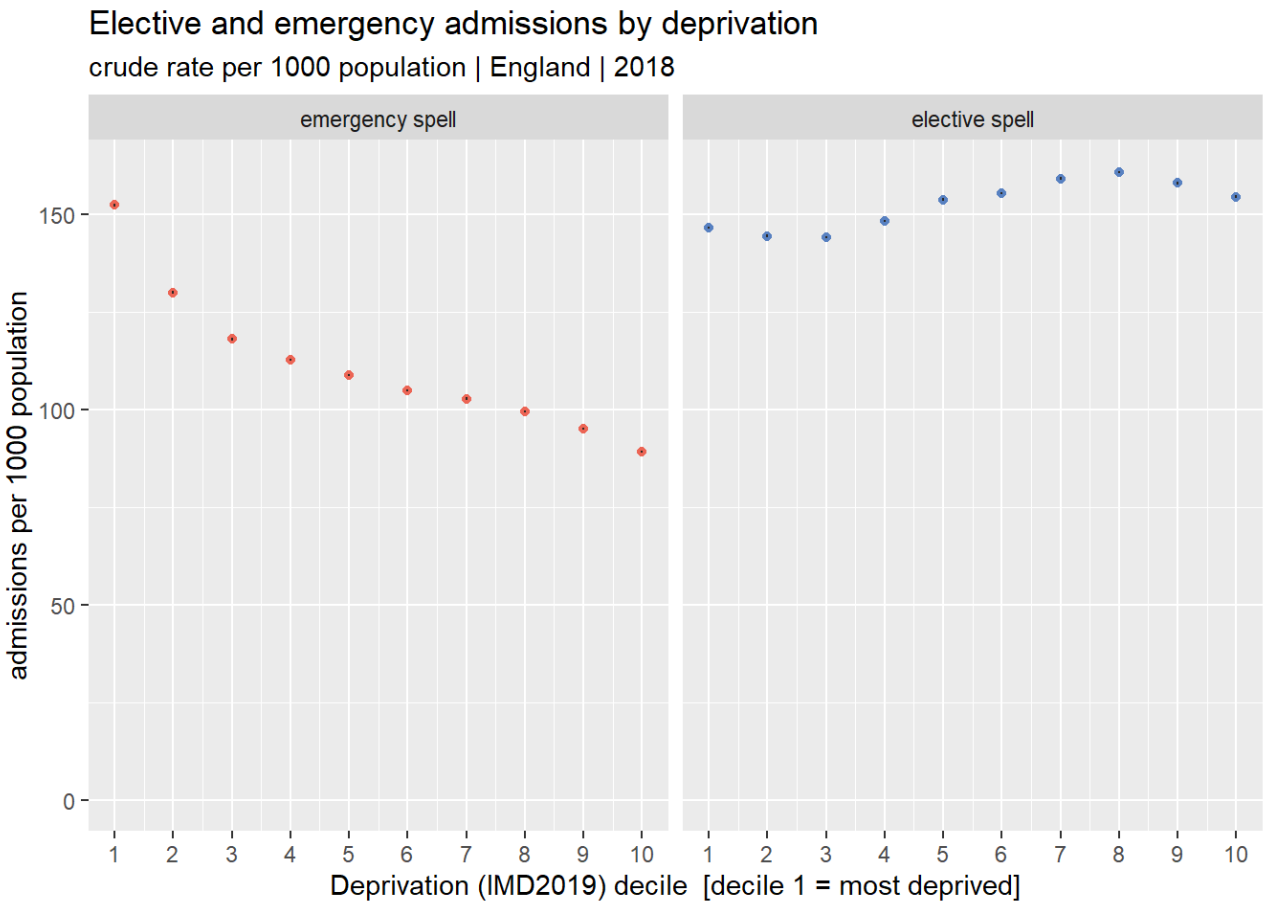
The effect accumulates over two years.

Increasing access to elective care for those in the most deprived areas is likely to lead to reductions in emergency care overall and to inequalities in levels of emergency care.

In this chapter, we explore one potential consequence of inequality in access to planned care: its impact on demand for unplanned care. The notion that levels of unplanned hospital care might be affected by levels of planned hospital care has face validity. If an individual with a treatable condition does not received planned hospital interventions in a timely manner, then we might expect their condition to deteriorate to a point where an episode of unplanned care is inevitable. We have seen that rates of elective spells are lower for those living in the most deprived areas. We seek to confirm earlier work demonstrating that rates of urgent care, including unplanned hospital admissions, are higher for people living in these areas, compared with people living in areas of lower deprivation. We then explore the credibility of a negative causal relationship between rates of planned and unplanned care. Finally, we estimate the impact of equalising access to planned care on levels of emergency spells.

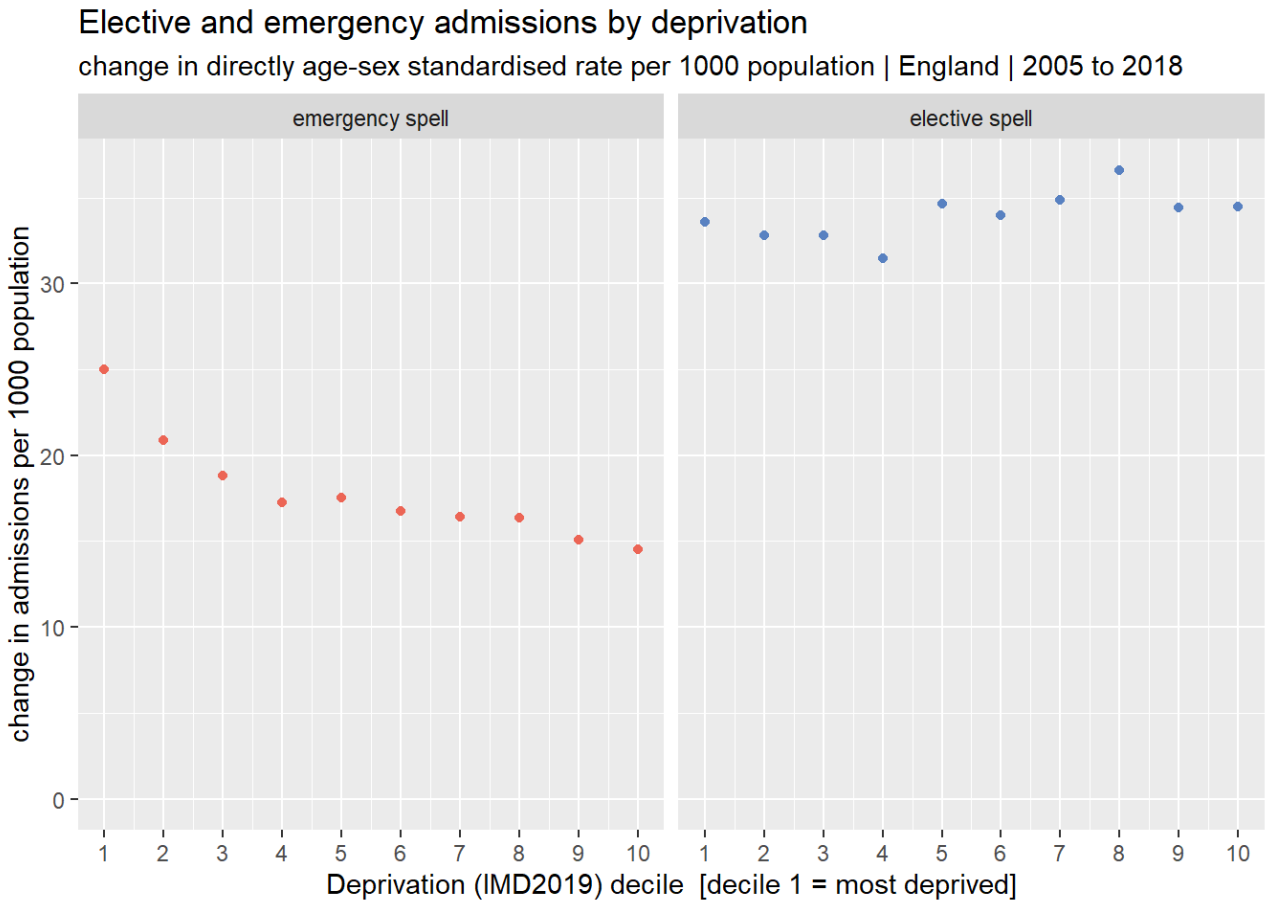
5.1 Rates of elective and emergency spells by deprivation

In Chapter 2 we saw that rates of elective spells were lower in the most deprived areas. Here we show that the opposite is the case for emergency spells: rates are higher for those living in the most deprived areas.



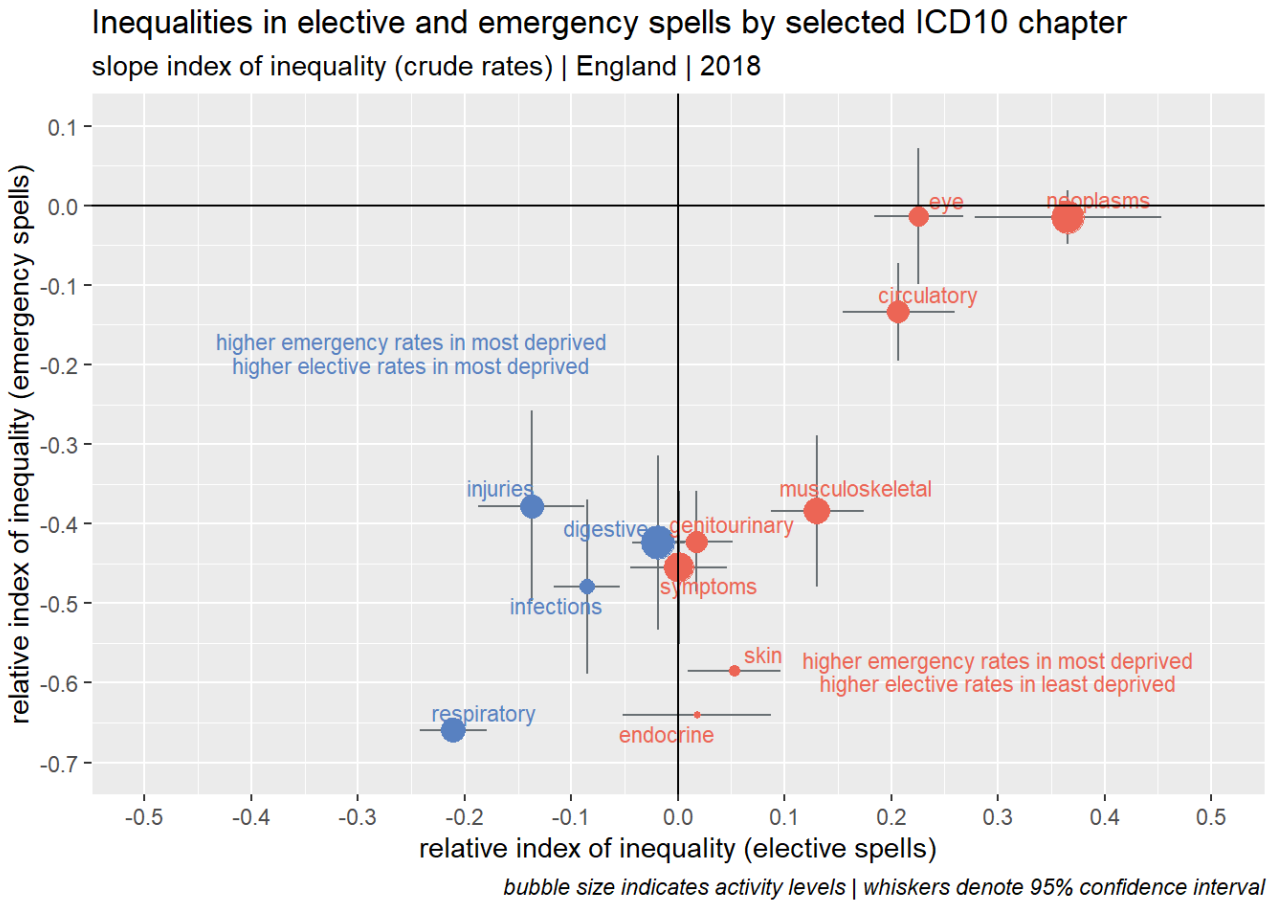
5.2 Change in rates of elective and emergency spells by deprivation

After adjusting for changes in the population structure, we can see there have been greater increases in the rates of elective spells in the least deprived areas, while the greatest growth in rates of emergency spells has taken place among populations living in the most deprived areas.



5.3 Rates of elective and emergency spells by deprivation and ICD10 chapter

These patterns appear to hold for many of the major ICD10 chapters - higher elective spell rates in the least deprived areas and higher emergency spell rates in the most deprived areas.

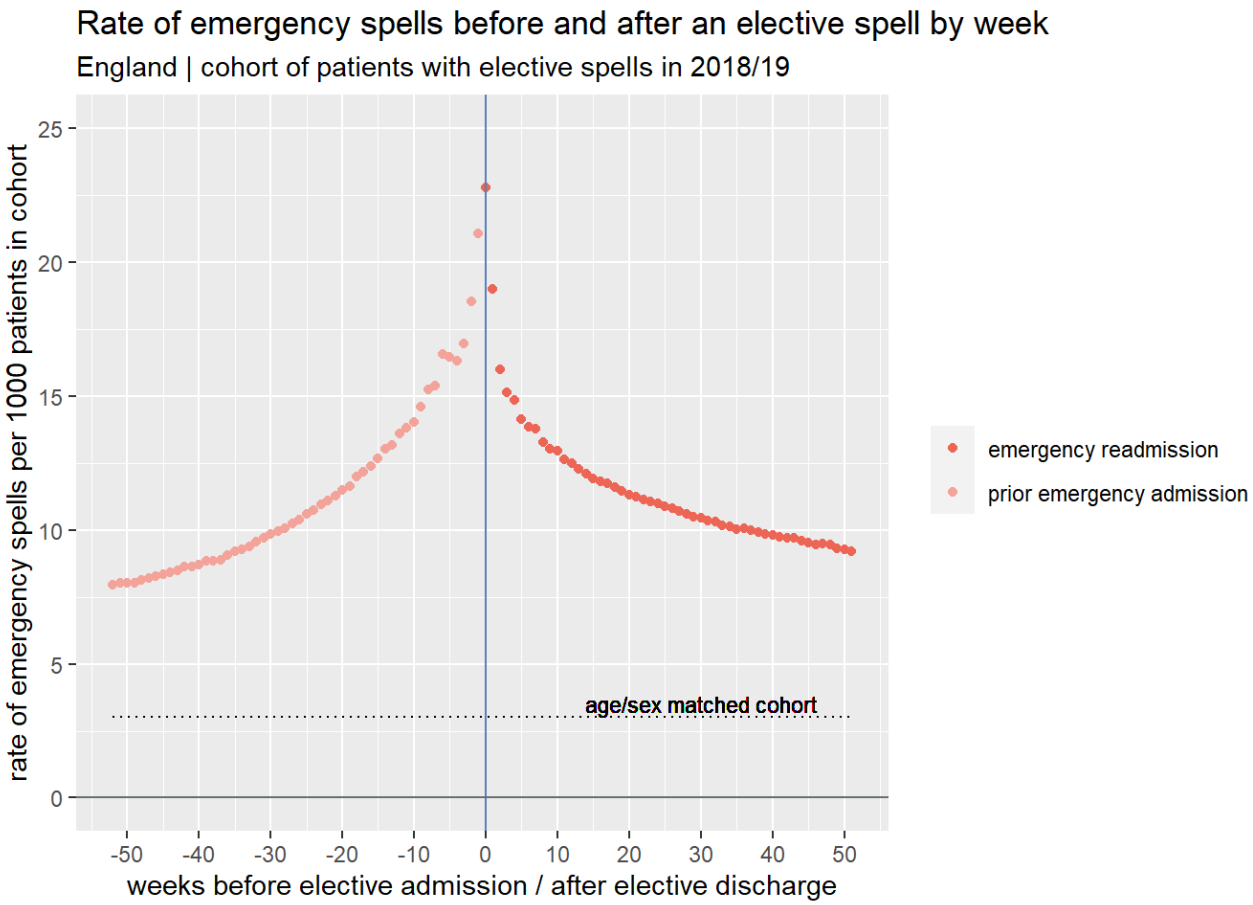


5.4 Rates of emergency spells before and after an elective spell

Rates of emergency spells increase in the weeks and months leading up to an elective admission. For every 1,000 elective spells, there are 21 emergency spells in the week before admission, 106 in the six weeks before admission and 587 in the year before admission.

Rates of emergency admissions reduce in a similar fashion after an elective spell. For every 1,000 elective spells, there are 23 emergency spells in the week after discharge, 102 in the six weeks after discharge and 602 in the year after discharge.

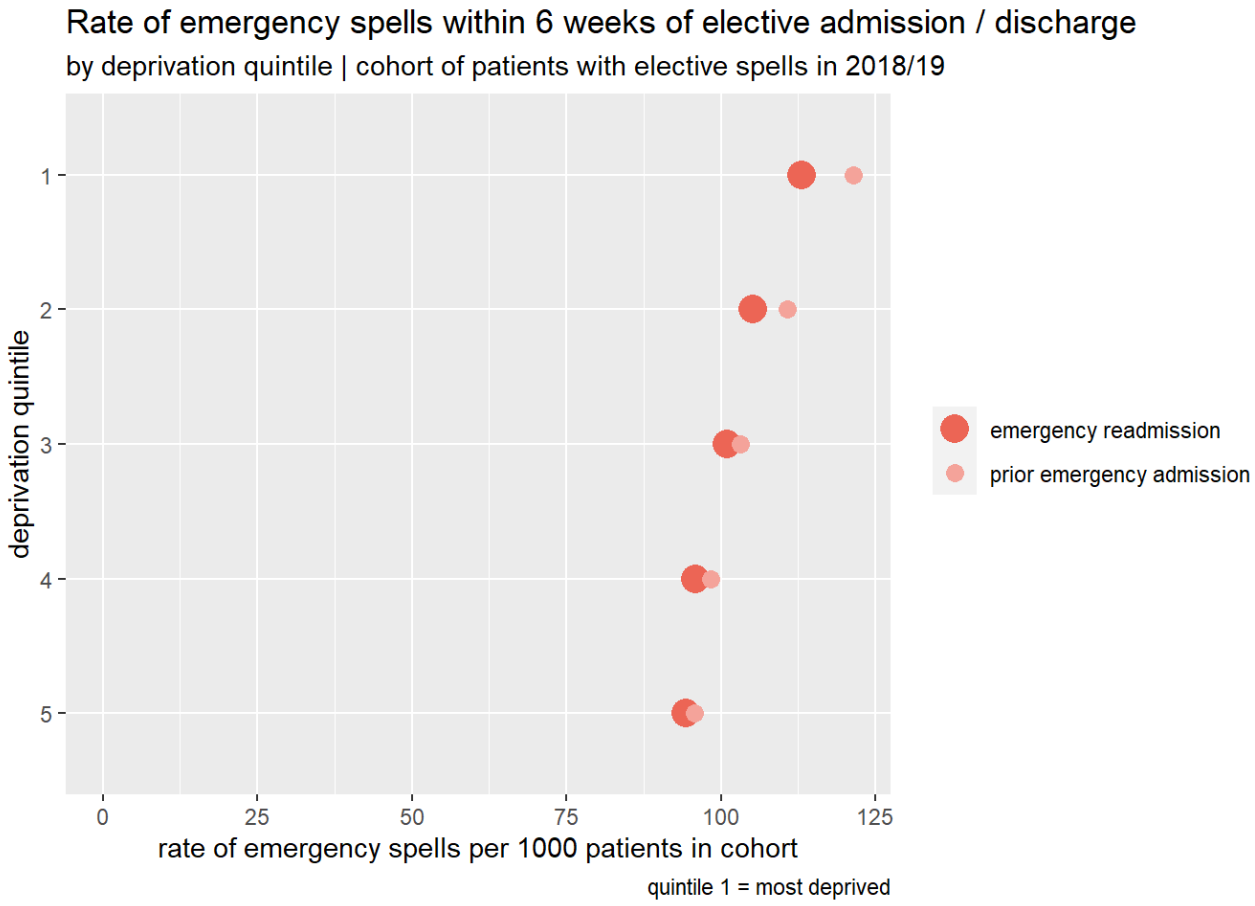
Rates of emergency admissions in the year before and after an elective spell are consistently higher than in an age and sex matched cohort who do not experience an elective admission.



5.5 Rates of emergency spells before and after an elective spell by deprivation

Rates of emergency spells are higher in the six weeks before and after an elective spell for those patients living in the most deprived areas.

Rates of emergency spells are marginally higher in the six weeks before an elective spell than in the six weeks post discharge, and the differential is greatest for patients living in the most deprived areas.



5.6 Modelling the impact of elective activity on emergency activity

The information above provides circumstantial evidence in support of a negative causal relationship between rates of planned and unplanned hospital spells. In particular:

- There is an inverse relationship between levels of planned and emergency spells across levels of deprivation.
- There have been larger increases in elective care in the least deprived areas, and smaller increases in emergency spells.
- Rates of emergency spells increase before an elective admission and then decline.
- Higher rates of prior emergency admissions and readmissions are seen in the most deprived areas.

We now formally test this potential causal relationship using a statistical method known as panel data regression.

Levels of unplanned care are likely linked with many factors. One of the key challenges in establishing the presence and scale of a causal relationship between planned and unplanned hospital spells relates to our ability to fully control for other factors that might generate unplanned hospital spells. We might speculate, for example, that levels of unplanned spells increase with the number of older people, and it may be possible to control for this factor using available data. But other factors - communicable disease outbreaks, economic circumstances, environmental conditions the availability of formal and informal care - are more difficult to pin down. Even if we were able to source reliable data on these factors, we could not be confident that we had controlled for all such factors. In any resulting analysis, we could not be confident that the measured relationship between planned and unplanned spells was not contaminated by the effect of these unobserved factors. Panel data regression offers a potential solution to this challenge. Information about the methods we have used is set out in Appendix D.

Our model suggests that increases in elective spells within a population lead to a reduction in the number of emergency spells, all other things being equal. A substantial part of this effect is felt in the first quarter after the increase in elective spells, but the effect continues to accumulate for some time afterwards. After two years, the full effects have been felt. By this time, our model estimates that for every 10 additional elective spells, one emergency spell is avoided.

While there is a clear moral justification for ensuring equal access to planned hospital care, our model suggests there may be secondary benefits. If equalising access to planned hospital care requires additional planned care activity and expenditure, then some of this expenditure will be offset by reductions in the costs associated with emergency spells. On average, emergency spells

are 25% more expensive than elective spells. The beds required to accommodate the additional elective patients will also be offset by reductions in beds occupied by emergency patients. On average, emergency spells consume overnight bed days at more than seven times the rate of elective spells. Finally, reducing the number of emergency spells will also reduce the number of attendances at emergency departments, freeing up this most pressured part of the healthcare system.

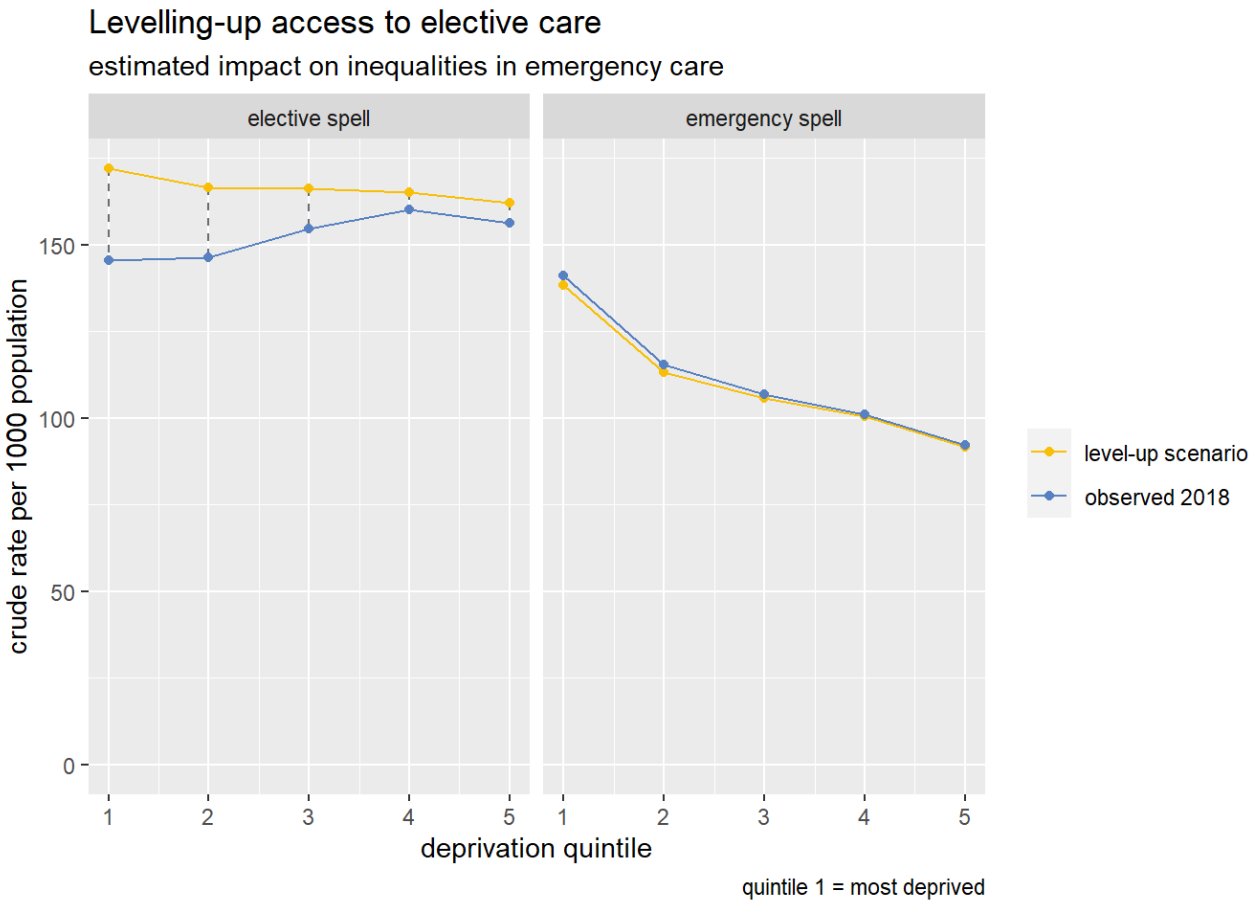
Our model also suggests there may be a relationship between levels of outpatient attendances and emergency spells, but this effect is so small and uncertain that it can reasonably be ignored.

5.7 Equalising access to elective care

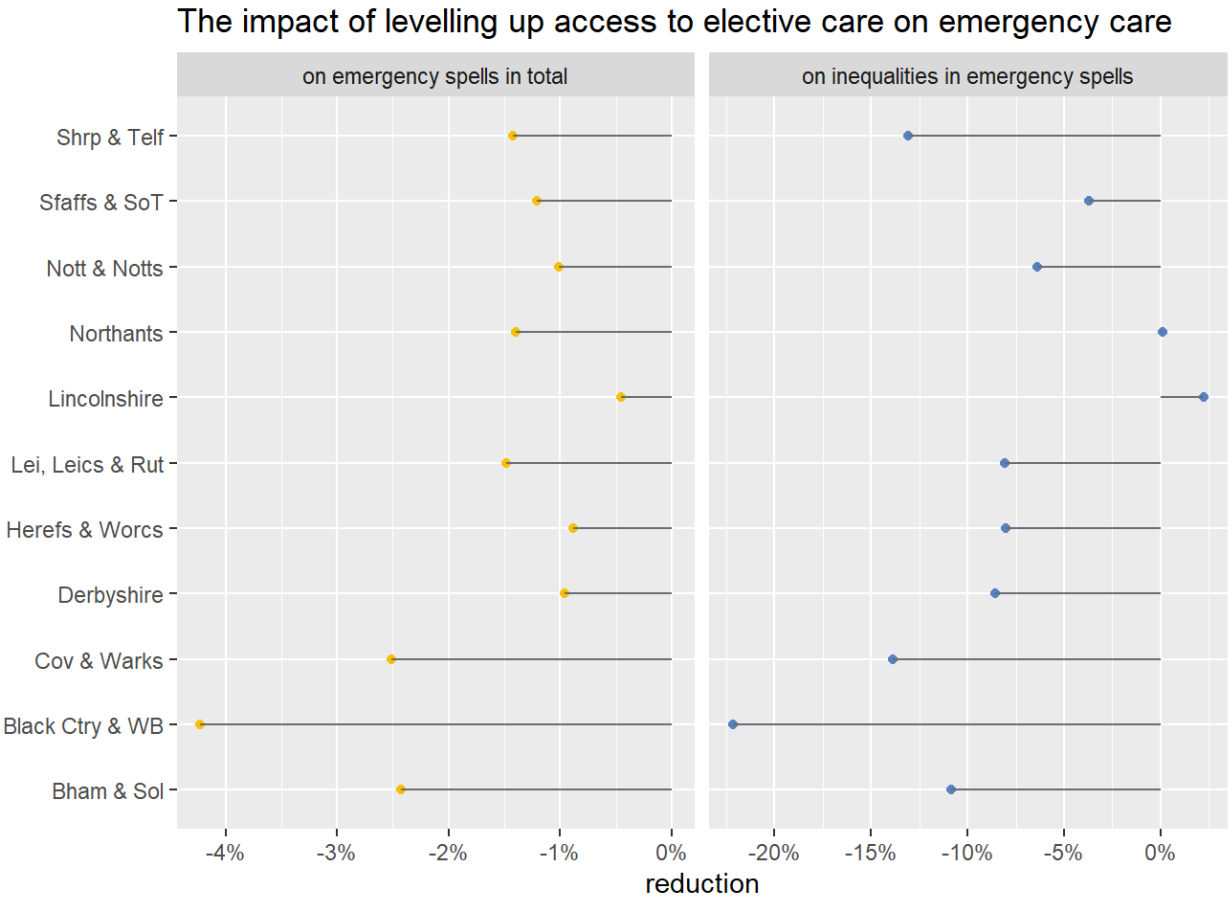
Having established and quantified the causal relationship, we can estimate the impact on emergency spells of increasing the number of elective spells so that all socio-economic groups have equal rates of access. Note that this 'levelling-up' approach to equalising access to planned care is only one of many such strategies; alternative approaches might involve 'levelling down' and '(zero-sum) activity redistribution'. Choices between these strategies will rest on moral arguments, economic constraints, and beliefs about present levels of over-supply or unmet need.

We estimate that the number of elective spells would need to increase by 9.7% in order to ensure that the rate of elective spells in each deprivation quintile was equal to the rate in the quintile with the highest rate within each STP.

Our model suggests that delivering this 'levelled-up' scenario in the Midlands for a sustained period would result in the rate of emergency admissions being cut by 1.3% per year. The level of inequality in rates of emergency spells would also be reduced.



The scale of these effects varies by STP. In the Midlands, the Black Country & West Birmingham and Coventry & Warwickshire STPs would see the greatest benefits, with more modest effects seen in the Herefordshire & Worcestershire and Lincolnshire STPs.



In this chapter we set out to explore one of the many possible consequences of unequal access to planned care. Our analysis represents compelling evidence to support the theory that increasing access to elective care for those in the most deprived areas would lead to reductions in demand for emergency care.

6. Conclusions

In this report we have provided evidence of inequalities and inequities in access to planned hospital care. These effects are significant and widespread. Our pathway analysis suggests that these inequities emerge late in the care pathway, and we highlight as potential causes policies to improve and control access to planned hospital treatments. These inequities have implications beyond the planned care system. It appears that poor access to planned care plays a part in generating demand in the unplanned care system. Increasing access to elective care for those in the most deprived areas is likely to lead to reductions in emergency care overall and to fewer inequalities in the levels of emergency care.

The report builds on earlier research, advancing our understanding in some key areas. Although further analysis may certainly add benefit, this report is sufficient to support some immediate and targeted actions. The report suggests there may be value in reviewing the policies and procedures that seek to improve or control access to elective care and the process by which decisions about treatment are taken, ensuring these processes do not inadvertently disadvantage people living in the most deprived areas.

Deciding whether and how to act on this evidence will require sound reasoning and careful consensus-building within local health systems. We look forward to working with the network of Decision Support Units in the Midlands to improve the outcomes for people living in the most deprived parts of the region.

Appendix A: Adjusting for need

Adjusting for need is not straightforward. It relies on robust estimates of the level and distribution of a disease within a population. These are usually derived from prevalence (or incidence) studies or from database studies. Prevalence and incidence studies are complex, time-consuming field exercises involving interviews and assessments of a carefully designed sample of the population. Practicalities and resource constraints mean that estimates derived from these studies are subject to both conceptual and statistical uncertainty. Database studies use anonymised data collected as part of routine clinical practice. Although less expensive, database studies are at greater risk of bias arising from the clinical or recording practices that generated the data.

Analysts and researchers often want to draw conclusions about the level of need within a population of interest based on the results of prevalence or database studies that were conducted on other populations. These synthetic estimates are calculated by applying the prevalence rate of a condition within each stratum of the study population to the same stratum in the population of interest. Strata may be defined by several variables, such as age, sex, deprivation, comorbidities, or lifestyle risk factors. The more granular the stratification, the more confident one can be in the synthesised prevalence estimate in the population of interest.

Table 3 sets out the sources of need data that we have used for each of the four conditions considered in the report.

Table 3: Need data used to make equity assessments

	COPD	Heart failure	Arthritis (hip)	Cataracts
Source of need estimates	PHE and Imperial College estimates produced for Fingertips 2015	PHE and Imperial College estimates produced for Fingertips 2015	Versus arthritis produced by Imperial College 2018	National eye health epidemiological model
Methods used to derive need estimates	Synthetic estimates at GP level (2015). Final model variables included sex, age, smoking status & deprivation	Synthetic estimates at GP level. Final model variables included age, sex, ethnicity, BMI, smoking status, CHD, hypertension, diabetes, atrial fibrillation & alcohol consumption	Synthetic estimates at MSOA level. Final model variables included age, sex, BMI, smoking status, SES & activity levels	Age specific prevalence estimates based on a population-based clinical survey (conducted in 1999) identifying those with cataracts and dissatisfaction with vision. Age-specific rates applied to GP patient lists. No adjustment made to account for potential differences in need due to deprivation.

The units of analysis in this chapter are GP practices, because we are able to estimate the levels of both healthcare activity and need at this level. For each GP practice we estimated levels of deprivation by taking the mean of the deprivation scores from the lower super output areas (LSOAs) where the GP's registrants live, weighted by the number of registrants in each LSOA. GP practices were then assigned to 10 equally sized groups (deciles) based on these mean weighted deprivation scores.

Appendix B: Pathway metrics

Hip arthritis

Metric	Data source	Year	Definition and selection criteria/codes	Assessment of fit of metric to pathway
Rheumatoid arthritis register	QOF dataset (NHS Digital)	2019/20	Number of patients on QOF RA register	poor
Patients with a face-to-face review for rheumatoid arthritis	QOF dataset (NHS Digital)	2019/20	The number of patients with rheumatoid arthritis, on the register, who have had a face-to-face review in the preceding 12 months	poor
Physio referral	M&L CSU held ERS data	2019/20	All referrals recorded on ERS dataset where specialty code = 9909 (physiotherapy)	poor
Outpatient referral	M&L CSU held ERS data	2019/20	OP referrals recorded on ERS dataset to T&O specialty where clinic type = HIP	good
OP 1st attendance	M&L CSU held HES outpatient dataset	2018/19	OP 1st attendances where treatment specialty = 111 (Orthopaedic) or 110 (T&O)	close
Steroid injections	M&L CSU held HES outpatient dataset	2018/19	OP procedures during appointments under treatment specialty 111 (Orthopaedic) or 110 (T&O) for selected OPCS codes W903, W904, X382	poor
Joint replacement	M&L CSU held HES inpatient dataset	2018/19	Hip replacement elective episodes where - opetn_01 to opertn_24 in 'W371', 'W378', 'W379', 'W381', 'W388', 'W389', 'W391', 'W398', 'W399','W461', 'W468', 'W469', 'W471', 'W478', 'W479', 'W481', 'W488', 'W489','W931', 'W938', 'W939', 'W941', 'W948', 'W949', 'W951', 'W958', 'W959', or opetn_01 to opertn_24 in ('W521', 'W528', 'W529', 'W531', 'W538', 'W539', 'W541', 'W548', 'W549' &opetn_01 to opertn_24 in('Z761', 'Z756', 'Z843')	good
Joint replacement revisions	M&L CSU held HES inpatient dataset	2018/19	Hip revision elective episodes where - opetn_01 to opertn_24 in 'W370', 'W372', 'W373', 'W374', 'W380', 'W382', 'W383', 'W384', 'W390', 'W392', 'W393', 'W394', 'W395', 'W396','W460', 'W462', 'W463', 'W470', 'W472', 'W473', 'W480', 'W482', 'W483', 'W484', 'W485','W930', 'W932', 'W933', 'W940', 'W942', 'W943', 'W950', 'W952', 'W953', 'W954' or opetn_01 to opertn_24 in ('W521', 'W528', 'W529', 'W531', 'W538', 'W539', 'W541', 'W548', 'W549' &opetn_01 to opertn_24 in('Z761', 'Z756', 'Z843')	good

Cataracts

Metric	Data source	Year	Selection criteria/codes	Assessment of fit of metric to pathway
OP referral	M&L CSU held ERS data	2019/20	Referrals recorded on ERS dataset where specialty code = 130 (ophthalmology) and clinic type = 13001 (Cataracts)	good
OP 1st attendance	M&L CSU held HES outpatient dataset	2018/19	OP 1st attendances where treatment specialty = 130 (ophthalmology)	poor
Cataract OP procedure	M&L CSU held HES outpatient dataset		OP attendances with procedure code C71-75	good
Cataract IP procedure	M&L CSU held HES inpatient dataset	2018/19	Daycase admissions with procedure code C71-75	good

COPD

Metric	Data source	Year	Selection criteria/codes	Assessment of fit of metric to pathway
COPD register	QOF dataset (NHS Digital)	2019/20	Number of patients on QOF COPD register	good
Flu vaccinations	QOF dataset (NHS Digital)	2019/20	Number of people with COPD who have had a flu vaccination during preceding 12 months	good
Annual reviews	QOF dataset (NHS Digital)	2019/20	Number of people with COPD who have had a review during the preceding 12 months	good
Inhalers - short acting bronchodilators	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of Salbutamol, Ipratropium Bromide,Bricanyl, Terbutaline, (inhaler products only)	close
Steroid inhalers if above fail to work	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of beclometasone dipropionate, formoterol with budesonide (selected licensed products), formoterol with beclomethasone (selected licensed products)	close
Steroid tablets: short course for bad flareups	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of Prednisolone	close
Pulmonary rehab: exercise and education programme - delivered by nurses, physios and dieticians	QOF dataset (NHS Digital)		Number of patients with COPD and Medical Research Council (MRC) dyspnoea scale ≥3 at any time in the preceding 12 months, with a subsequent record of an offer of referral to a pulmonary rehabilitation programme.	good
OP referral	M&L CSU held ERS data		Referrals recorded on ERS dataset where specialty code = 340 (respiratory medicine)	poor
OP 1st attendance	M&L CSU held HES outpatient dataset		OP 1st attendances where treatment specialty = 340 (respiratory medicine)	poor
Surgery: lung volume reduction,	M&L CSU held HES inpatient dataset		Elective episodes where opertn_01 to opertn_24 in E541, E542, E543,E544,E545,E546,E547,E548,E548	good

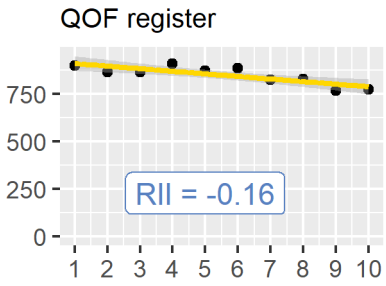
Heart failure

Metric	Data source	Year	Selection criteria/codes	Assessment of fit of metric to pathway
HF QOF register	QOF dataset (NHS Digital)	2019/20	Number of patients on HF register	good
ECG confirmed	QOF dataset (NHS Digital)	2019/20	Number of patients who have had HF diagnosis confirmed by ECG or specialist	good
Cardiology OP referral	M&L CSU held ERS data		All referrals recorded on ERS dataset where specialty code = 320 cardiology	poor
Cardiology OP 1st attendance	M&L CSU held Outpatient data		OP 1st attendances where treatment specialty = 320 cardiology	poor
ACE inhibitors	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of captopril,enalapril meleate, fosinpril,lisinopril,perindorpil erbumine, quinapril hydrochloride, ramipril	good
ARBs	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of Candesartan cilxetil losartan potassium, valsartan	good
Beta blocker	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of Bisoprolol Fumarate, Carvedilol, Nebivolol	good
Sacubitril	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of Sacubitril/Valsartan	good
Digoxin (lanoxin)	English prescribing dataset - Source Openprescribing .net	2019/20	Items prescribed of digoxin	good
Pacemakers	M&L CSU held HES inpatient dataset		Elective and non-elective episodes where opertn_01 to opertn_24 in ('K601', 'K605', 'K606', 'K607', 'K608', 'K609','K611', 'K615', 'K616', 'K617', 'K618', 'K619') or	good
Valve repair/replacement	M&L CSU held HES inpatient dataset		Elective and non-elective episodes where opertn_01 to opertn_24 in ('K29', 'K31', 'K32', 'K33', 'K34', 'K35','K36')	good

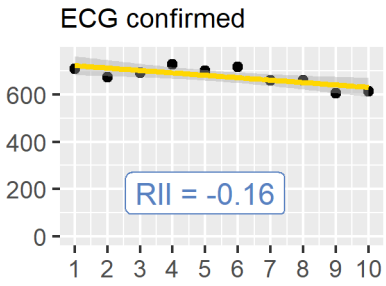
Appendix C: Additional pathway charts

Heart failure

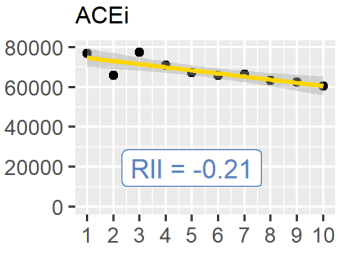
Identification

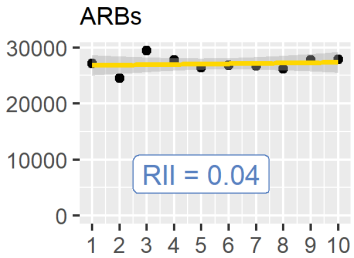


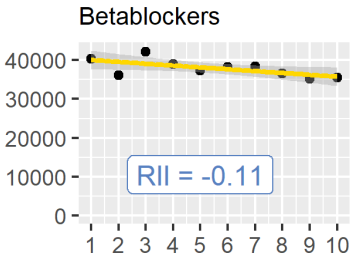
Primary care management

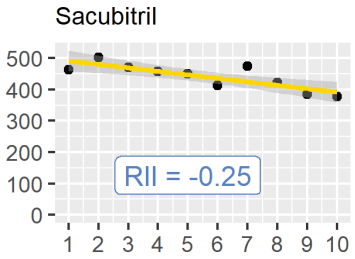


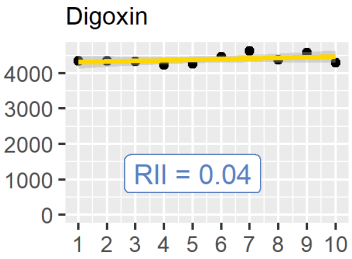
Primary care prescribing



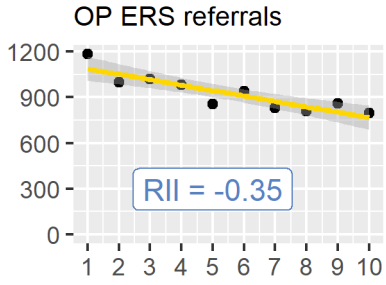




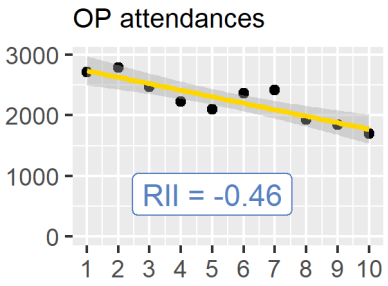




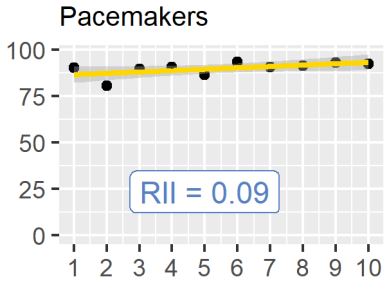
Referral to secondary care

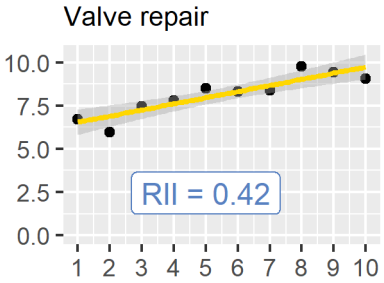


Secondary care management



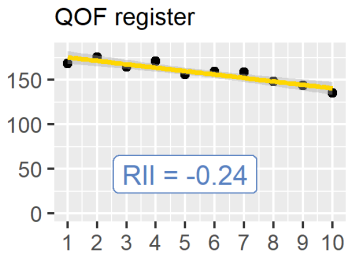
Secondary care treatment



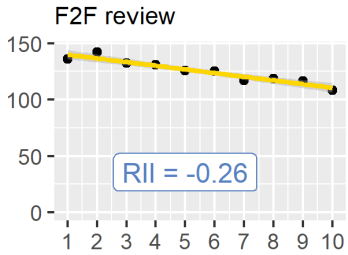


Hip arthritis

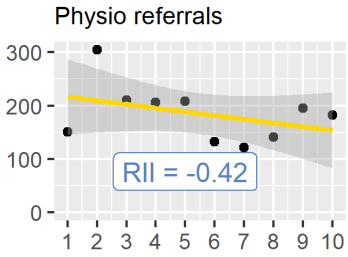
Identification

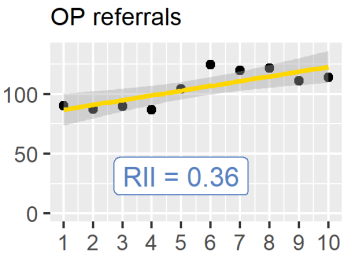


Primary care managemen

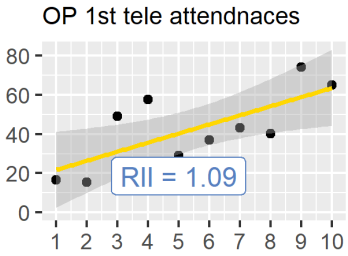


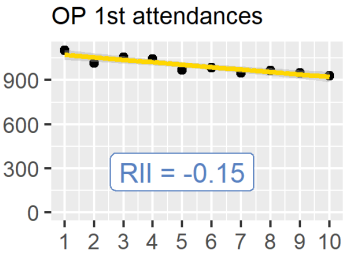
Referral to secondary care



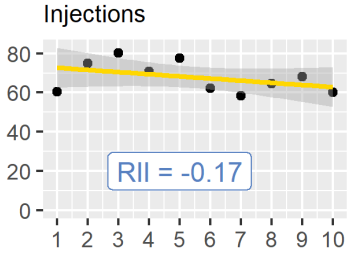


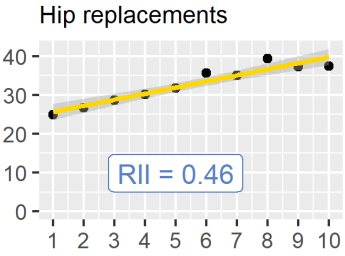
Secondary care managem

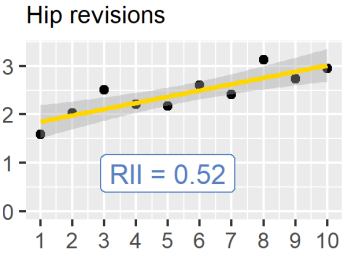




Secondary care treatment

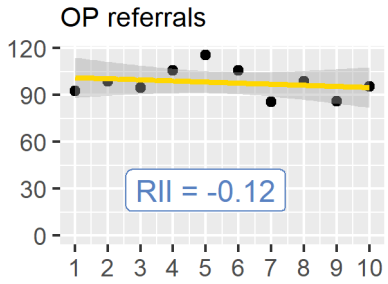




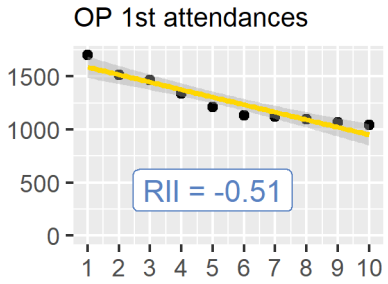


Cataracts

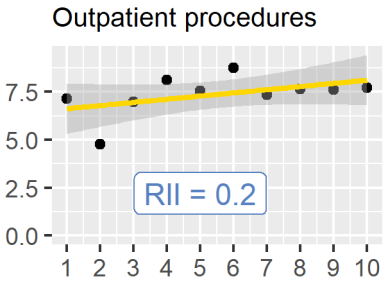
Referral to secondary care

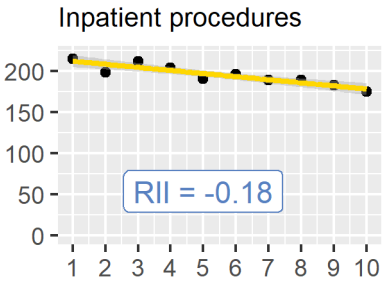


Secondary care management



Secondary care treatment





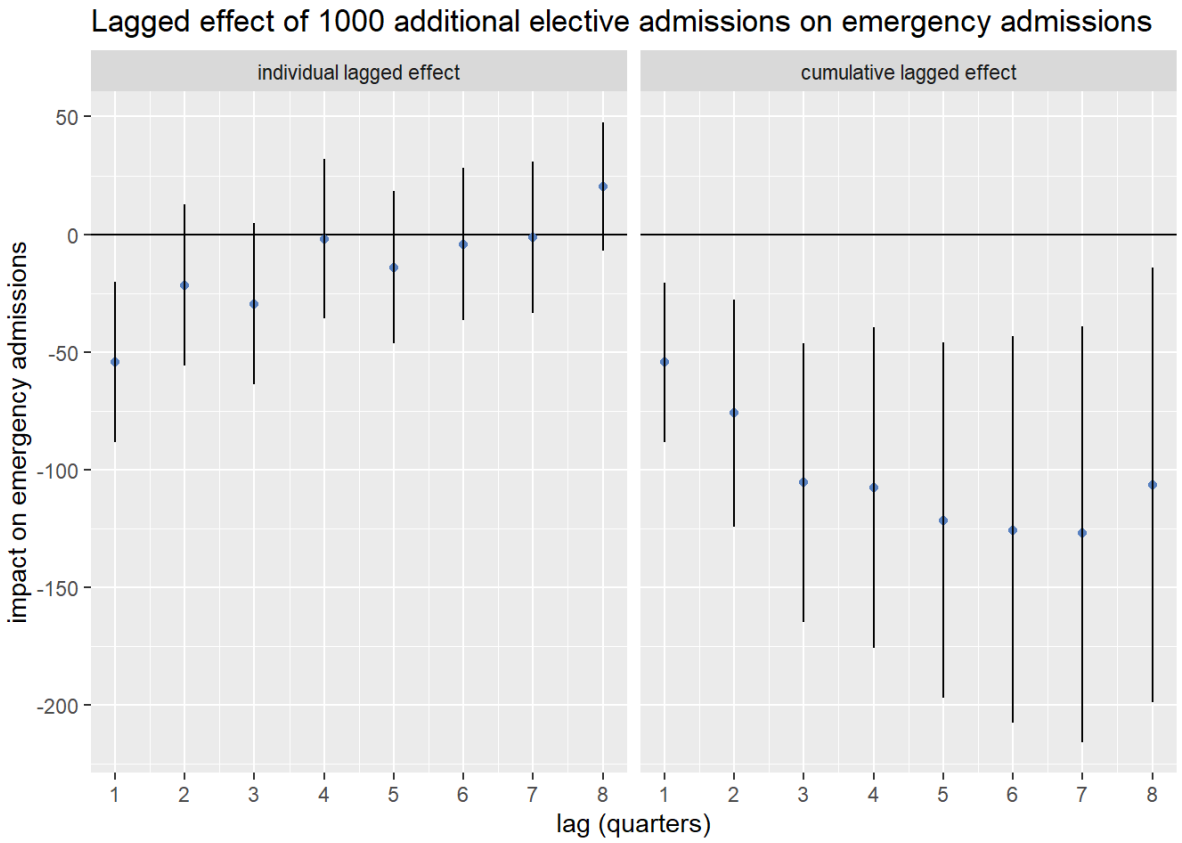
Appendix D: Methods used to explore the relationship between elective and emergency spells

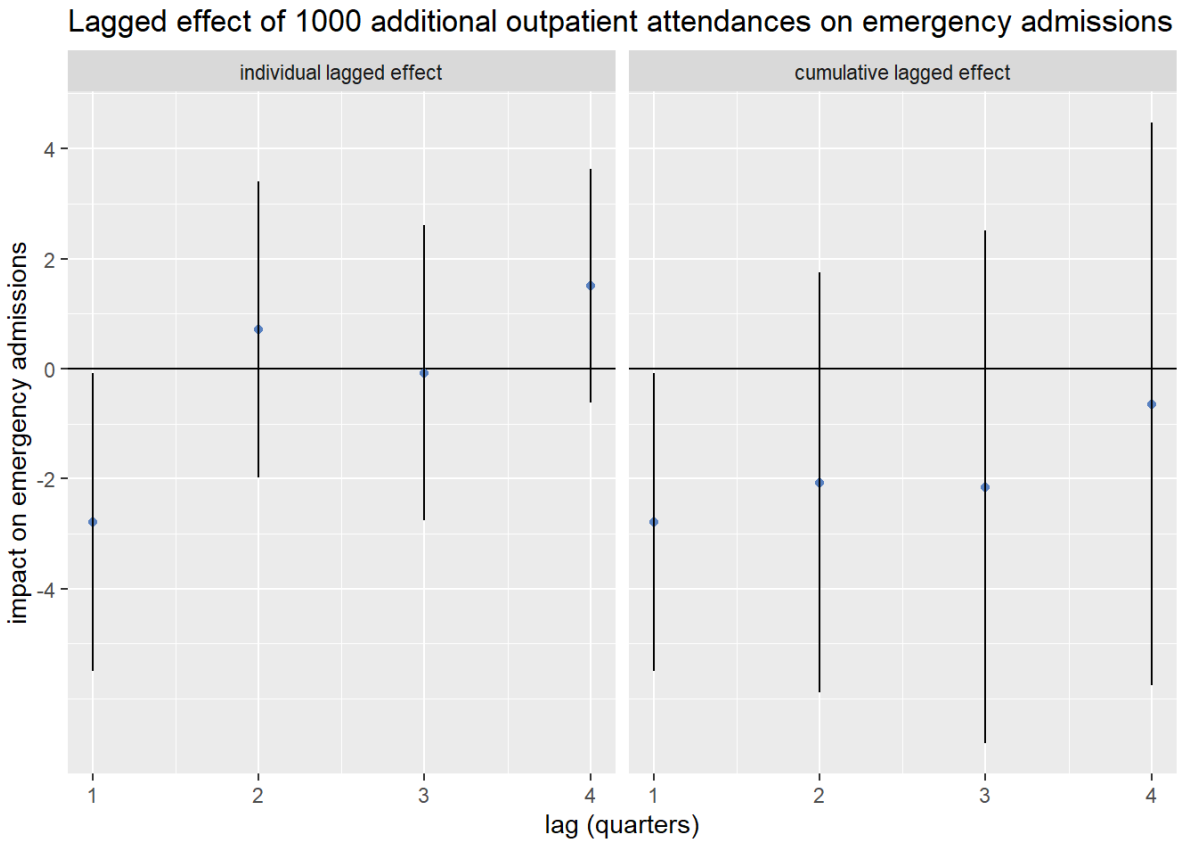
Panel data contains information measured at several time points and for several subjects of observation. In this case, our panel data includes information by quarter between the second quarter of 2004 and the fourth quarter of 2018, for each of the resident populations of 135 clinical commissioning groups.

Panel data regression attempts to measure the strength of a relationship between an outcome variable (in our case the number of unplanned admissions) and variables of interest (rates of planned admissions and outpatient attendances), having controlled for several other variables (the size of the population, the number of deaths, and the proportion of the population who are women, aged under 20, or aged over 65, 75 and 85 years). Given that we might expect the impact of levels of unplanned care to be delayed, we also include lagged versions of our variables of interest. The key assumption in this panel data model is that factors not included in the model, which differentially influence the number of unplanned hospital spells between CCGs, do not vary substantially between CCGs over time. In other words, we assume that aside from population size, age-sex structure and deaths, all other factors that influence the number of unplanned admissions in a CCG rise and fall reasonably consistently across CCGs over time. Whilst this is not unreasonable, we should note that any substantial variation from this assumption will affect the reliability of our results.

There are several forms of panel data regression model. We used several established statistical tests to select between these model forms. The LaGrange multiplier test, the F test and the Hausman test were used to determine that a fixed effects model outperformed random effects and pooled effects models.

The charts below show the individual and cumulative lagged effects of elective spells and outpatient attendances on rates of emergency spells.


Lagged effect of 1000 additional elective admissions on emergency admissions
individual lagged effect
cumulative lagged effect
impact on emergency admissions
50
0
-50
-100
-150
-200
1
2
3
4
5
6
7
8
lag (quarters)


Lagged effect of 1000 additional outpatient attendances on emergency admissions
individual lagged effect
cumulative lagged effect
impact on emergency admissions
4
2
0
-2
-4
1
2
3
4
lag (quarters)

Appendix E: Data sources and analytical methods

Alongside this report we provide a series of supplementary files, for each substantive chapter in the report (Chapters 2, 3, 4 and 5). These take the form of r-markdown files containing information about the sources of data used, the analysis carried out and the graphical outputs produced.

The data was assembled using Transact-SQL and the analysis conducted using R and selected R libraries.

The files are provided to allow other analysts to check, reproduce and improve upon our analysis.

The files can be found at the following website - https://github.com/The-Strategy-Unit/753_Inequalities_Planned_Hospital_Care

We welcome feedback from our fellow analysts on our approaches and methods.

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