FORECASTING THE NHS WAITING LIST FOR ELECTIVE PROCEDURES IN ENGLAND IN 2022-2030

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FOREWORD

Two and a half years since COVID emerged, NHS waiting lists in England continue to grow, creating a new public health crisis. Delayed diagnosis and treatment will result in patients experiencing increasing symptoms, worsening quality of life, and shorter lives. This will have significant knock-on effects on education, employment, and social activities, creating a huge impact across society.

We are focussing on the waiting list for elective procedures, which presents a particular challenge. Elective procedures encompass invasive diagnostic tests and planned operations, which are more complex to plan and deliver than outpatient appointments or drug treatments. They require multidisciplinary teams and specially equipped facilities, such as operating theatres.

In this report, we have modelled the total need for elective procedures in England, including both the known and hidden waiting lists. We have used our novel methodology to develop procedure-level and regional estimates, and to project waiting list trends through to 2030.

NHS staff are working harder than ever. Surgical teams across England are developing local solutions to restore elective services, and GPs are seeing more patients than they did before the pandemic. Innovative solutions are needed that build upon the work already started by NHS staff. In this report's conclusion, we have posed key questions to direct the conversation towards solutions.

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HIGHLIGHTS

Data

1. **4·3 million people in the England need an elective procedure**, including 3·3 million people on the 'hidden waiting list'.
2. At current capacity, **14·6 million elective procedures will be needed by 2030.**
3. 20 common procedures account for 69% of the need for elective procedures.
4. 85% of the need is for day-case procedures.
5. A minimum of **£9·2 billion is needed to address the current need** for elective procedures.

Trends

1. There is a **postcode lottery** with regional variation in NHS waiting lists.
2. NHS waiting lists are likely to continue to increase until at least 2030.
3. **Significant investment is needed** to increase NHS elective procedure capacity, including for capital investment in staff, equipment, and buildings.
4. Population health is likely to decline due to unidentified and untreated conditions deteriorating.
5. Costs are likely to increase further due to an ageing population and treatment delays necessitating more extensive surgery.

INTRODUCTION

NHS elective services were fragile pre-pandemic

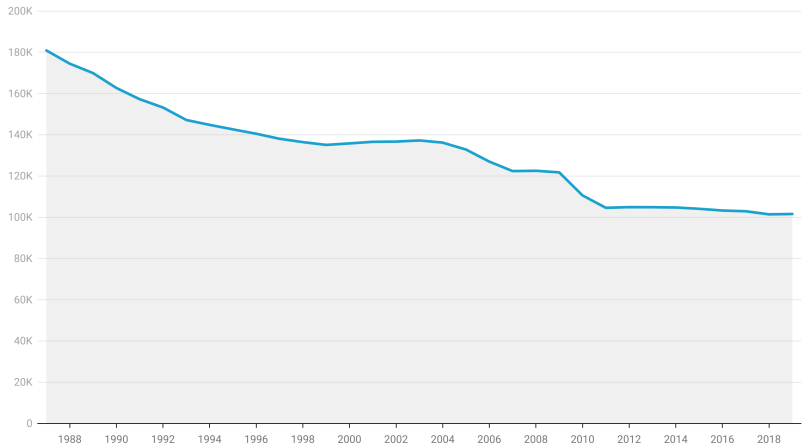
In the decade preceding the pandemic elective waiting lists were already increasing in England. The overall NHS waiting list increased from a low of 2·3 million in January 2009 to 4·4 million in January 2020. This trend reflects that:

- The density of hospital beds in England reduced by 25% from 135,794 (2.8 per 1,000 people) in 2000 to 101,565 (1·8 per 1,000 people) in 2019.
- The UK has the lowest density of doctors amongst European OECD countries (2·95 per 1,000 population versus 4·39 per 1,000 in Germany).
- A growing and ageing population resulted in increasing need for hospital treatment. Hospital admissions increased by 35% from 11·1 million in 2000 to 17·2 million in 2019.
- Recently there has been a reduction in NHS consultants undertaking additional work as a result of concerns regarding pension tax arrangements.

The diminishing resilience of the NHS to external pressures was reflected by increasing numbers of operations being cancelled due to winter pressures. Winter (January - March) cancellations of elective surgeries increased from 15,287 in 2011 to 25,502 in 2018.

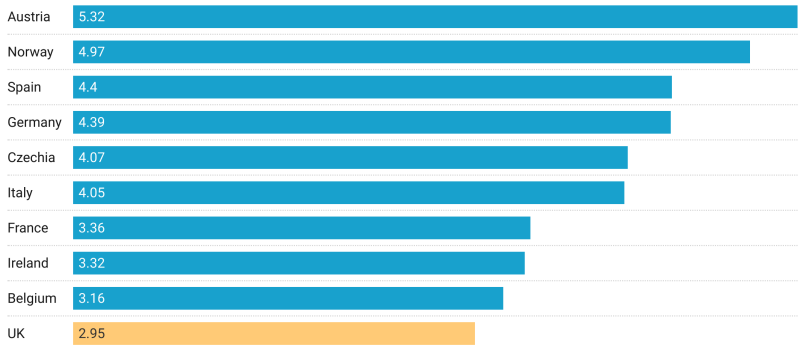
During the pandemic, these pressures were exacerbated by the effects of lockdowns and concerns regarding the risks to elective patients of hospital-acquired COVID-19. An estimated 28 million operations worldwide were cancelled in the first 12 weeks of the pandemic. There has been a sustained reduction in elective surgery capacity in England throughout the pandemic.

Number of hospital beds in England



Source: NHS Digital. Data presented for the period 1987-2019.

Number of doctors per 1,000 population



Source: Organisation for Economic Co-operation and Development. Data presented for 2019 for selected countries.

METHODOLOGY

How we developed our estimates

We estimated the total need for elective procedures in March 2022. To do this we estimated the composition of the NHS waiting list for elective procedures in December 2019 and summed this with estimates of the pandemic elective procedure shortfall.

The December 2019 NHS waiting list was used because pre-pandemic the waiting list was increasing, so if there had been no pandemic, the waiting list now would have been at least as large as it was pre-pandemic. The pandemic shortfall was the reduction in the number of elective procedures performed during the pandemic period (January 2020 to March 2022) compared to what we expected based on pre-pandemic trends.

The hidden waiting list was calculated by subtracting NHS waiting list figures for March 2022 from our estimate for total need.

Our analysis was based on publicly available hospital activity and waiting list data from NHS Digital. Calculations were performed separately for 130 procedure groups and summed to produced overall figures. The key assumptions underlying our analysis are outlined on page 21.

Our methodology is fully reported in our **methodology paper** available from medRxiv.

Key Definitions

Elective procedure: Endoscopy, interventional radiology, interventional cardiology, or surgery (operation done by a surgeon in an operating theatre) performed on a planned admission to hospital (including day-case procedures). Obstetrics is excluded.

Total need: The total number of elective procedures needed in England at a given point in time.

NHS waiting list: The number of patients in England that are on NHS waiting lists for elective procedures.

Hidden waiting list: The number of patients who need elective procedures but are not on a NHS waiting list.

Integrated Care System (ICS): A partnership of organisations that plan and deliver health services in a geographic area. There are 42 ICSs in England.

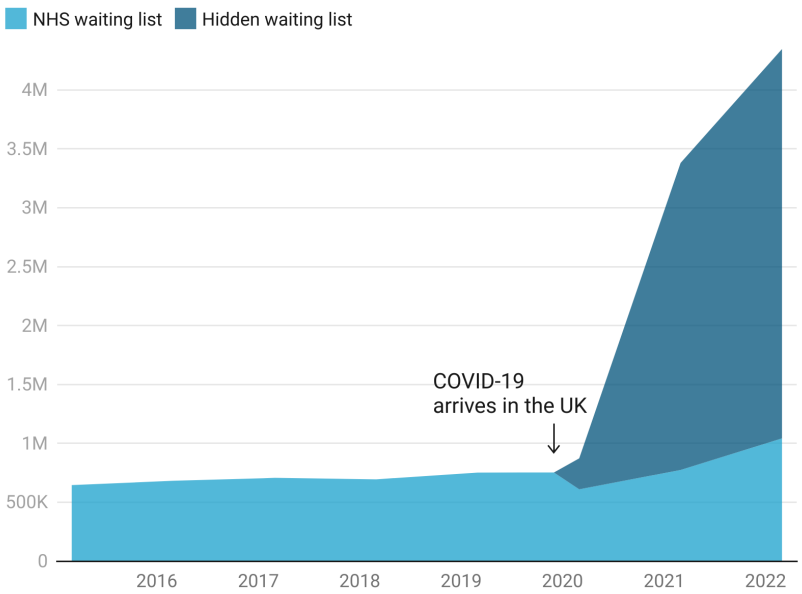
TOTAL NEED FOR ELECTIVE PROCEDURES

4·3 million elective procedures are needed in England

A total of 4·3 million elective procedures were needed in England in March 2022. This is the largest number of people needing elective procedures at any time since at least 2007.

Over 75% of the total need for elective procedures is 'hidden'. This hidden waiting list of 3·3 million people have not been added to the NHS waiting list, so they are not included in routine NHS waiting list data.

There is a major hidden need for elective procedures



How our estimate compares to other reports

The overall NHS waiting list in England in March 2022 included 6,358,050 patients. However, this figure captures patients waiting for all types of consultant-led care including outpatient clinic visits and non-surgical treatments such as drug infusions and joint injections. Analyses by groups including the NHS Confederation and Institute for Fiscal studies have used this headline figure as the basis for their waiting list estimates.

In contrast, we have used procedure-level data to produce estimates specifically for the need for elective procedures, based on a tight definition for what elective procedures are. This has enabled us to produce granular specialty-level and procedure-level estimates of need.

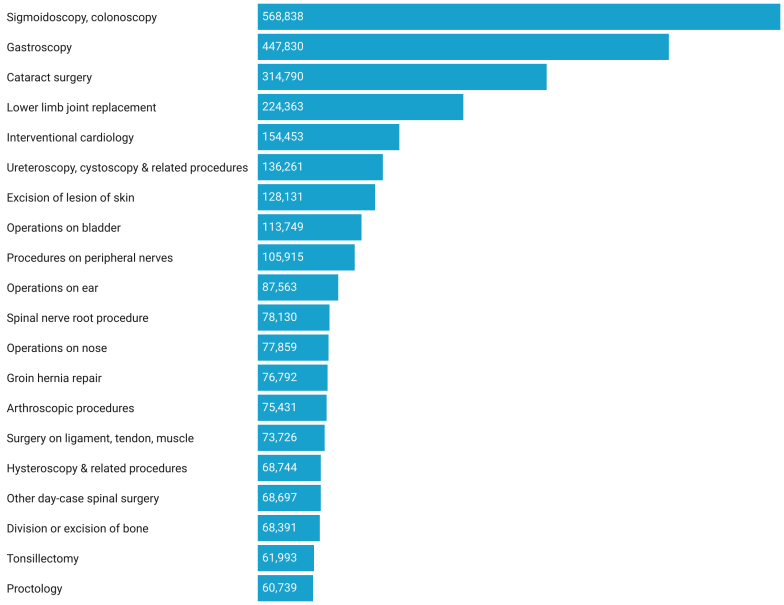
A further strength of our methodology is that our projections take into account the increase in need for elective procedures over time as a result of predicted demographic change (growing and ageing population).

TOTAL NEED BY PROCEDURE

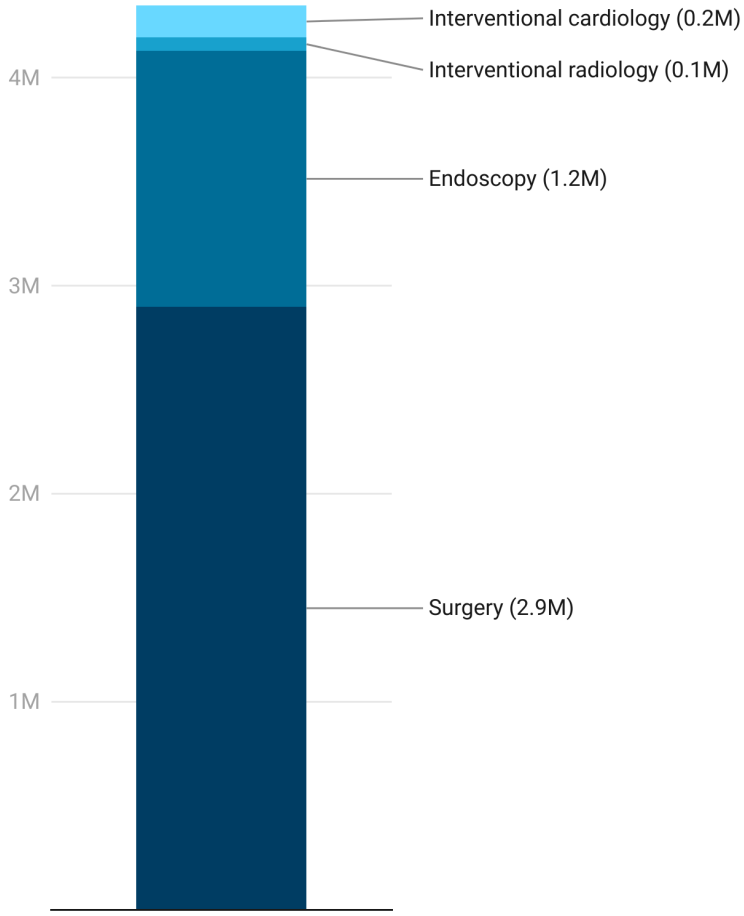
The top 20 procedures account for 69% of the total need

- The specialities with the greatest need are general surgery (1·5 million), orthopaedics (1·0 million), and ophthalmology (0·4 million).
- Most patients need surgery or endoscopic procedures.
- The top 20 procedures account for 2,992,395 patients (69% of the total need) and the top 25 procedures account for 3,266,555 patients (75%).

Total need (top 20 procedures)



Need by elective procedure type



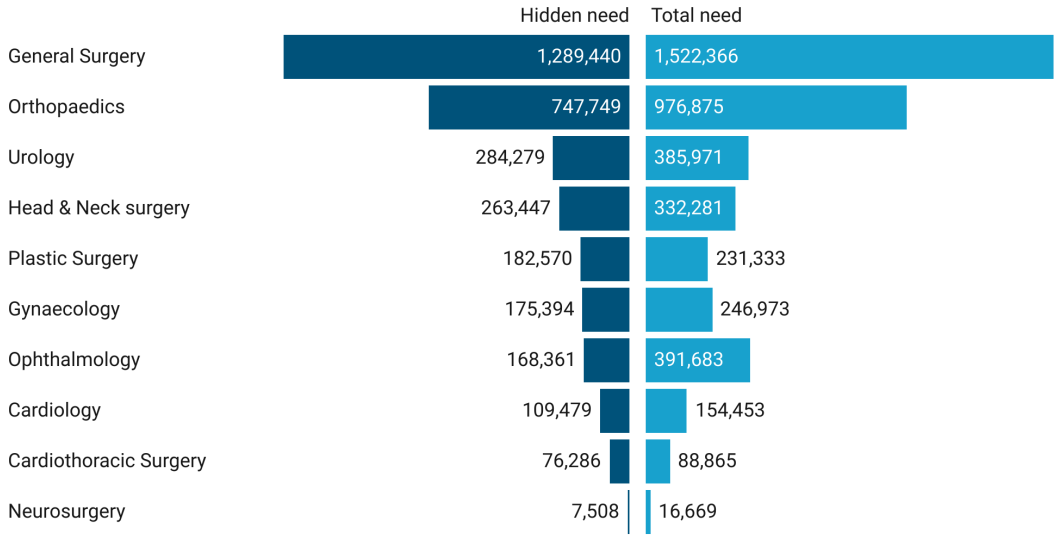
HIDDEN WAITING LIST

There are 3·3 million people on the hidden waiting list

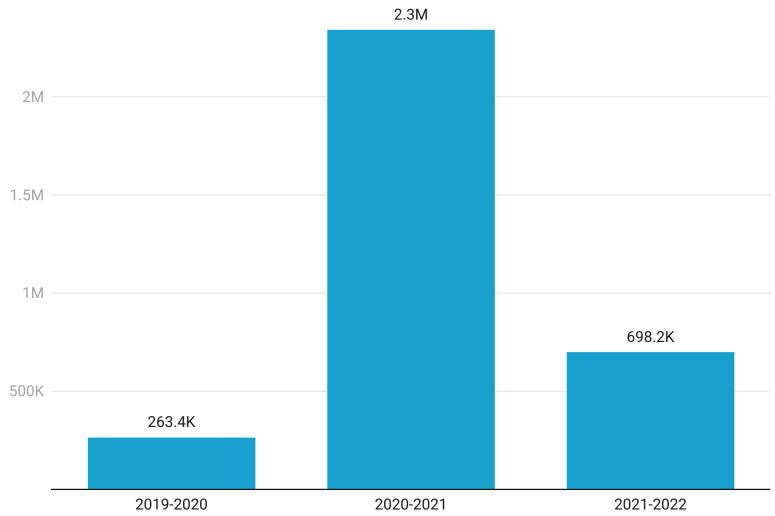
The hidden waiting list includes people who need elective procedures and would have been referred and treated pre-pandemic. However, as a result of the pandemic these patients may have not sought medical attention. The greatest hidden waiting lists are in general surgery, orthopaedics, and urology.

Patients on the hidden waiting list will be delayed in receiving treatment. Some patients will already be suffering worse health as a result of this delay. For example, patients with hip osteoarthritis needing a joint replacement are likely to experience increasing symptoms resulting in deterioration in their quality of life and their ability to complete their work and social activities. For patients with life-threatening diseases such as cancer, delayed diagnosis and treatment could reduce chances of being successfully cured.

The hidden waiting list by speciality



Patients joining the hidden waiting list by year



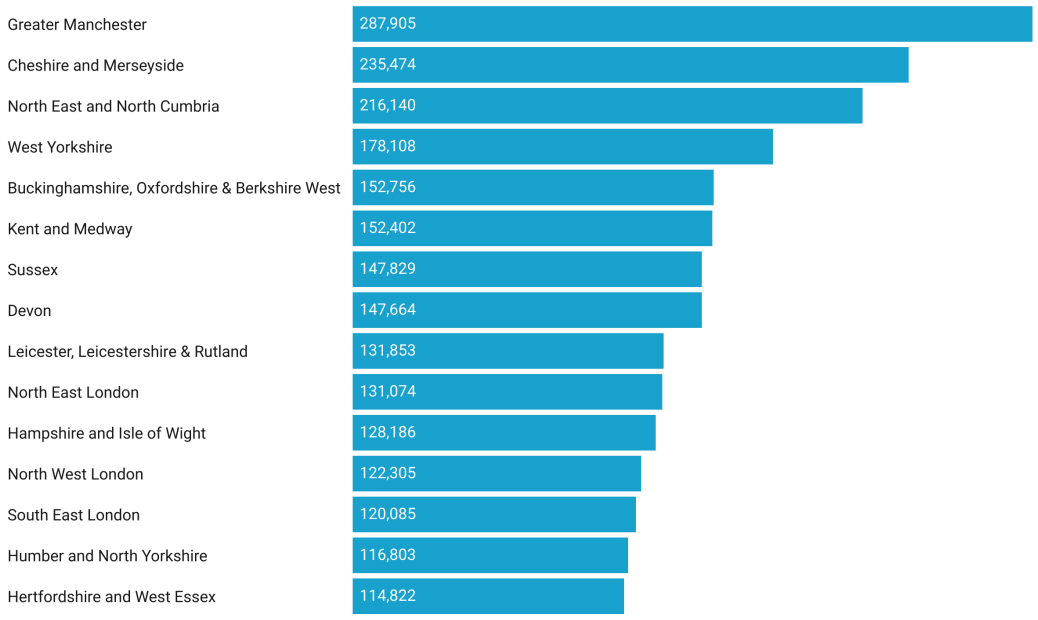
THE POSTCODE LOTTERY

Twelve ICS systems account for 47% of total need

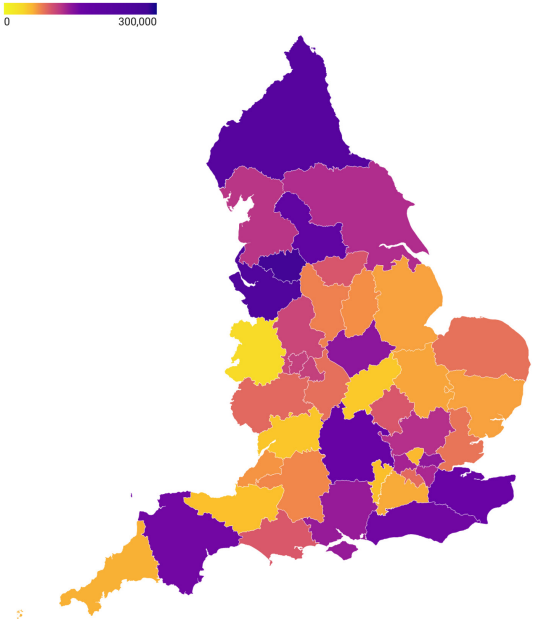
The top five ICS systems (1,070,383 procedures needed) account for 25% of total need and the top 12 ICS systems (2,031,696) account for 47% of total need. Just under half of total need is in the Midlands and North (2,130,892 [49%]).

There is also variation within regions. The ICS systems having the greatest need in each region are: Hertfordshire and West Essex in the East of England; North East London in London; the Black Country in the Midlands; North East and North Cumbria in the North East & Yorkshire; Greater Manchester in the North West; Buckinghamshire, Oxfordshire and Berkshire West in the South East; and Devon in the South West.

Total need for elective procedures (top 15 ICS systems)



Total need for elective procedures



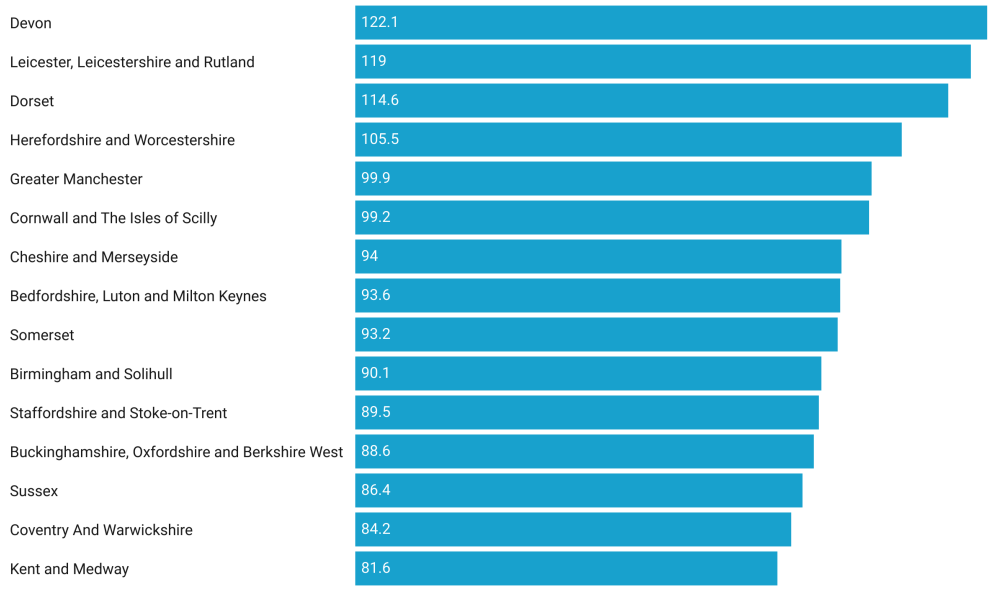
THE POSTCODE LOTTERY

The region with the greatest need is the South West

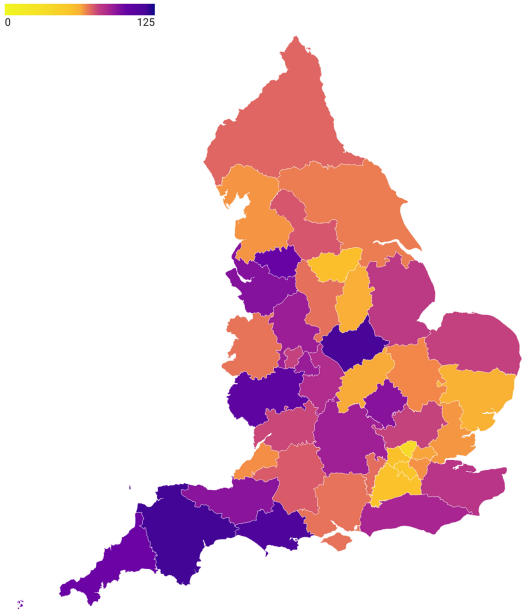
There is wide variation in the need for elective procedures relative to the size of the population. The lowest need is in London (56·7 procedures needed per 1,000 population), followed by North East & Yorkshire (69·6), East of England (73·8), South East (77·6), Midlands (83·9), North West (89·7), with the highest need in the South West (93·2).

If these differences translate into variation in waiting times for elective procedures, this could amplify health inequalities that already exist, with some patients experiencing faster care and better outcomes than others.

Need for elective procedures per 1,000 population (top 15 ICS systems)



Need for elective procedures per 1,000 population



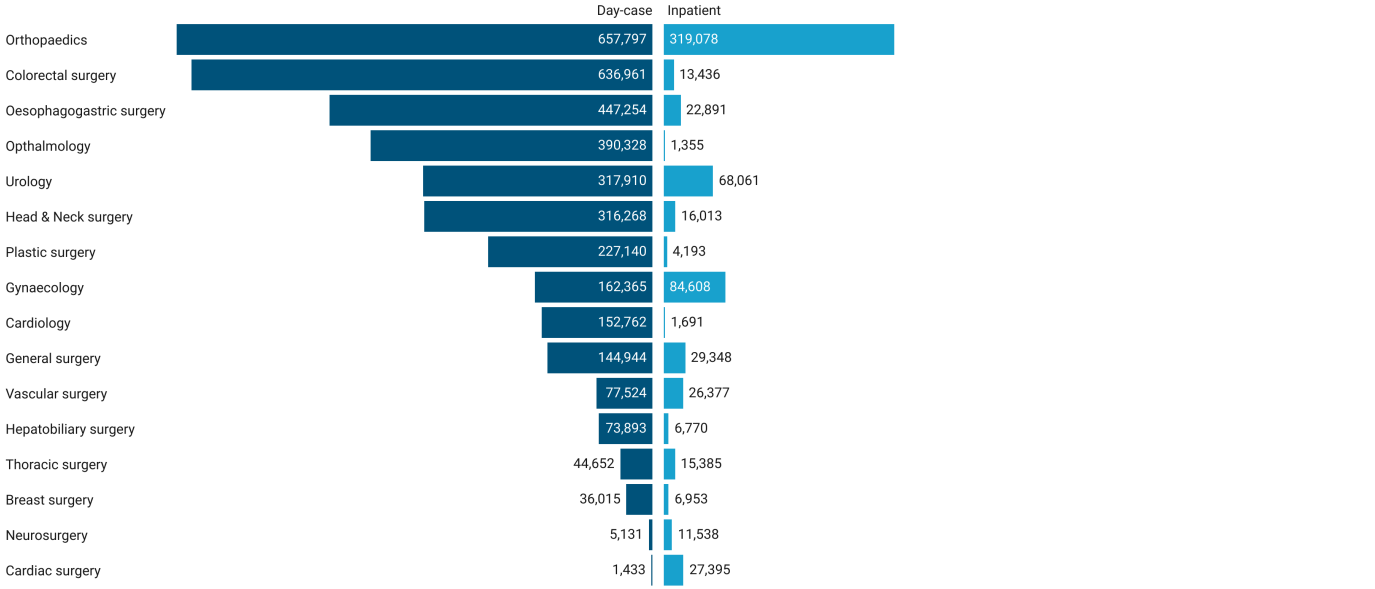
DAY-CASE PROCEDURES

85% of the total need is for day-cases

Day-case procedures are completed without an overnight stay in hospital. Day-case activity can be managed separately from inpatient elective and emergency work, since availability of hospital beds is not a constraint. This means that day-case surgery can continue to be performed even if hospitals are under pressure from emergency admissions, for example, during the winter. Staff availability remains an issue, but dedicated teams would add resilience.

In six specialties (cardiology, colorectal surgery, head & neck surgery, oesophagogastric surgery, ophthalmology, plastic surgery) over 95% of the need is for procedures typically performed as day-cases. Surgery accounts for 60% (2,227,648) of the required day-cases, whilst endoscopy, cardiology, and interventional radiology account for 40% (1,464,729).

Need for elective procedures split by specialty and admission type



AGE BREAKDOWN

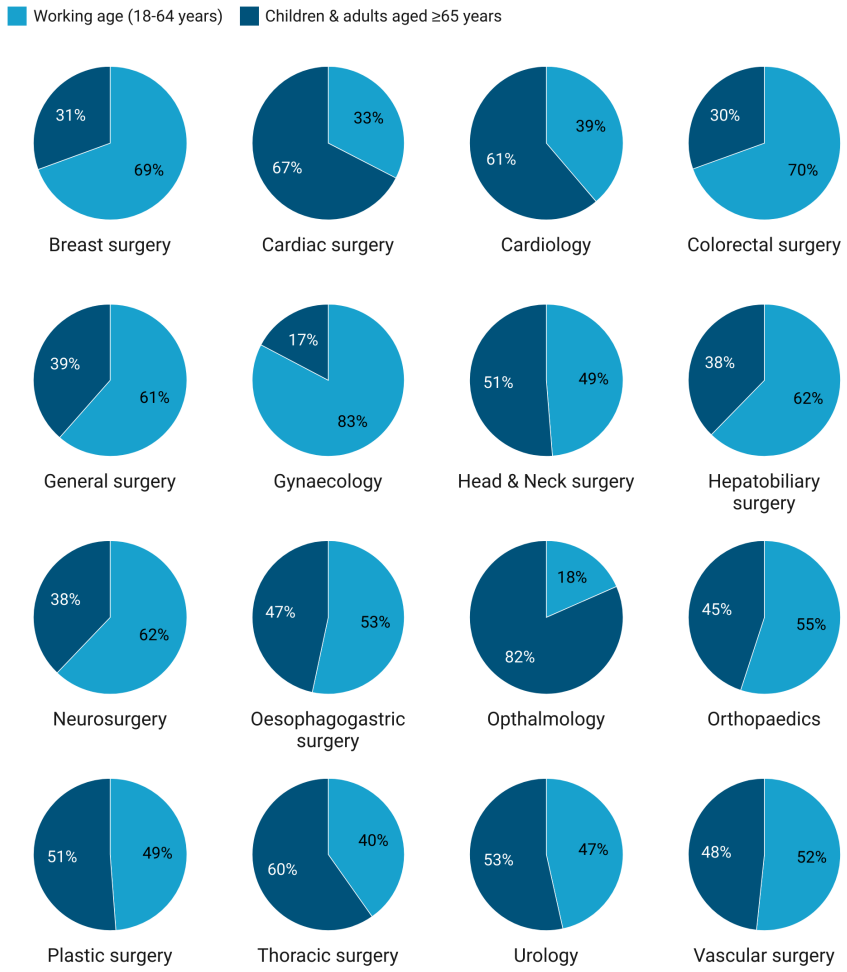
Half of need is for working age patients

Overall, 53% (2,316,527) of total need is for patients of working age (18-64 years), 41% (1,784,459) is for patients aged 65+ years, and 6% (246,481) is for children.

Specialities where the majority of need is in people of working age were: breast, colorectal, general surgery, gynaecology, hepatobiliary, neurosurgery, oesophagogastric, orthopaedic, and vascular surgery.

Delayed diagnosis and treatment for large numbers of working age patients could result increasing sickness absence rates, exacerbating labour shortages. There could also be a knock-on effect on children, the elderly, and the vulnerable who are dependent on working age household members for income or care. Consideration should be given to prioritising procedures that will have the greatest benefit in terms of returning patients to their normal economic and social activities.

Age breakdown of the need for elective procedures



ENDOSCOPY

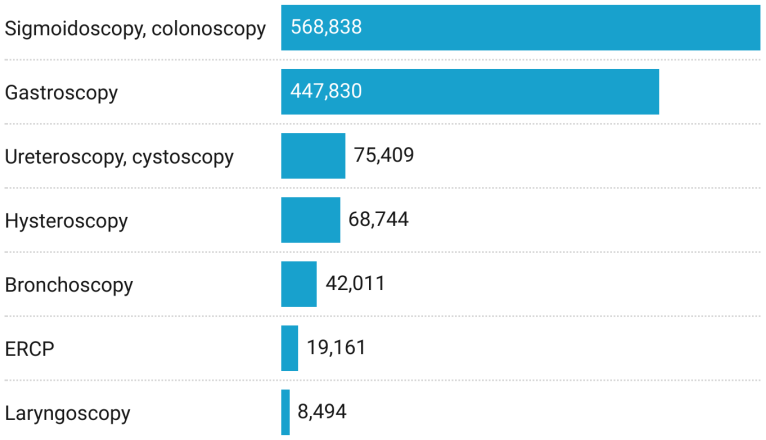
Over a million gastrointestinal endoscopies are needed

Endoscopies are camera tests which can be used to both diagnose and treat disease. Endoscopies can be used to take biopsies, which are essential for the diagnosis and treatment of many cancers. They can also be used to perform minimally invasive treatments, for example for some pre-cancer conditions or some gallstone problems.

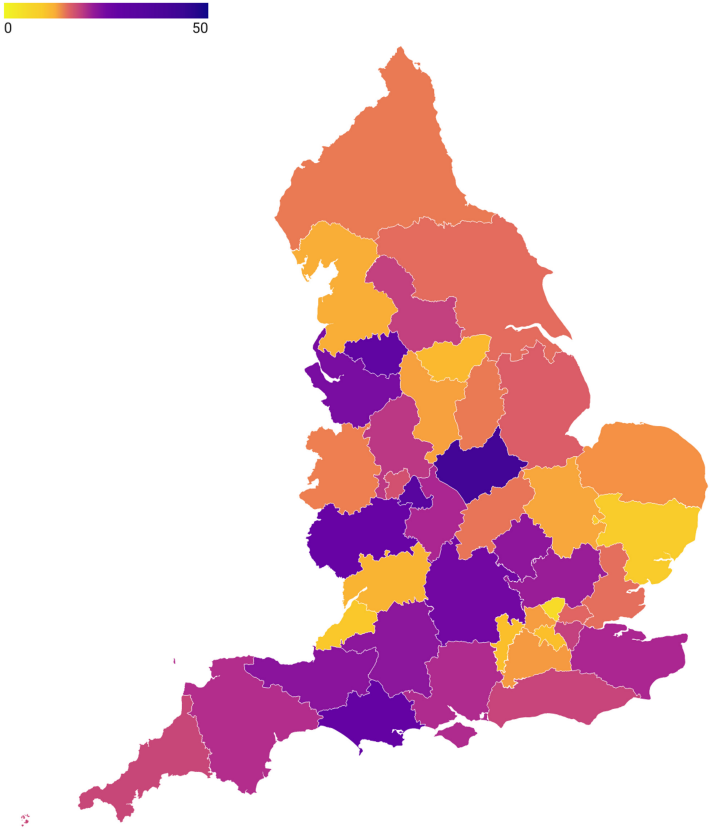
Like operations, endoscopies are challenging to deliver, as they need dedicated staff teams, specialist equipment, and support services such as sterilisation.

Most procedures (748,590 [61%]) are needed in working age patients. 54% of the need for endoscopy is in women (658,767) and 46% in men (571,710).

Need for endoscopy by procedure



Need for endoscopy per 1,000 population



JOINT REPLACEMENT

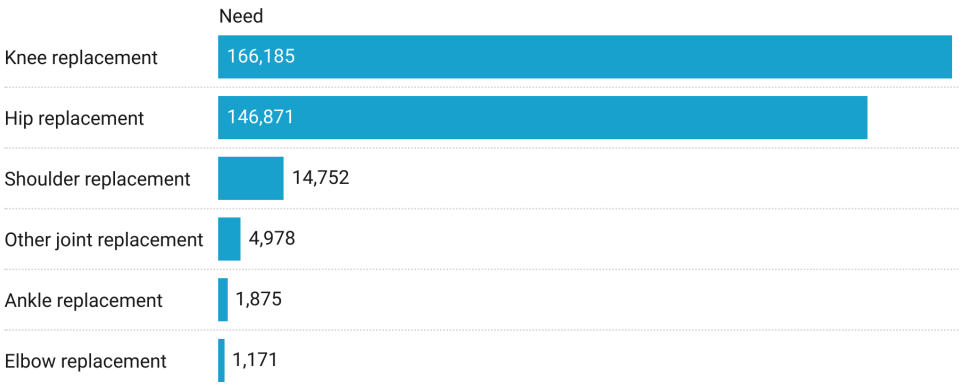
Hips are the most common joint replacement needed

Joint replacement surgery is high value and low complication, as it significantly and cost-effectively improves quality of life. It has a good and reliable safety record. As a result of prioritisation of life-saving emergency and cancer and surgery, the number of joint replacements performed by the NHS sharply decreased during the pandemic: from 172,216 in 2018-19 to 61,613 in 2020-21, a 64% decrease. This has resulted in a rapidly increasing NHS and hidden waiting lists for joint replacement.

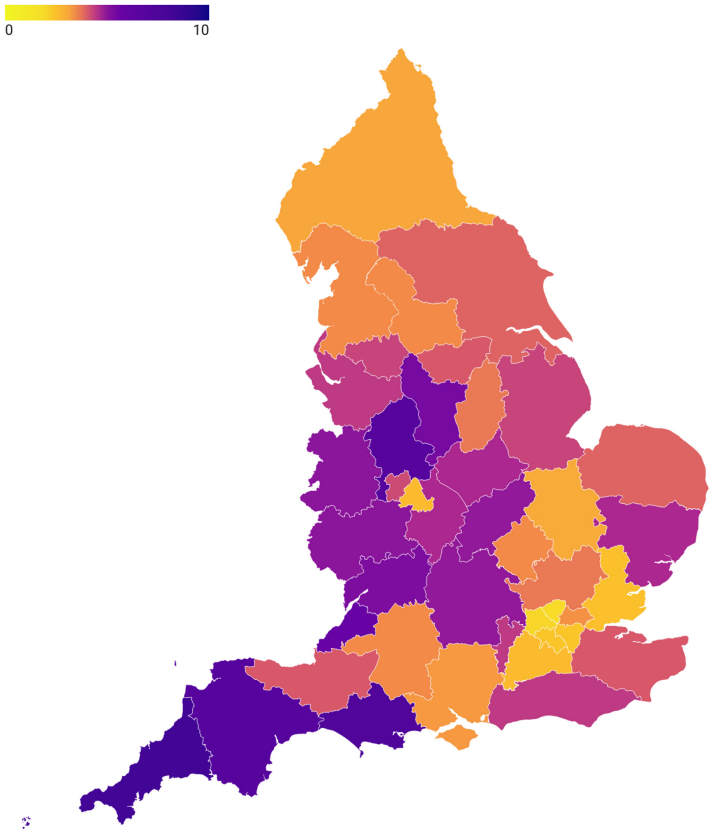
Over 70% of the need for joint replacements is in patients aged ≥65 years. England's ageing population means that that the number of joint replacement procedures needed will increase further over the coming years.

The greatest need is for knee and hip replacements. Most patients will need to stay in hospital for several nights. However, these are reproducible procedures that can be safely delivered outside of major acute hospitals.

Need by type of joint replacement



Need for hip and knee replacement per 1,000 population



HERNIA REPAIR

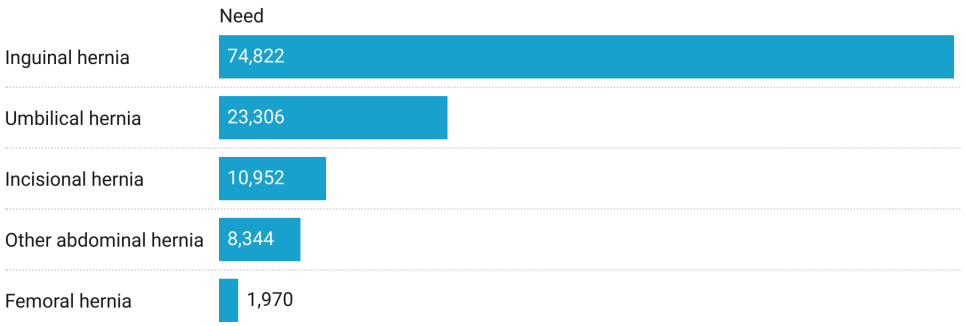
The greatest need is for inguinal hernia repair

Hernia repair is one of the most common elective general surgical operations. In recent years, the NHS has tried to reduce the number of elective hernia repairs because many asymptomatic hernias do not require treatment. In the five years from 2013-4 to 2018-19 the NHS reduced the number of elective inguinal hernia repairs from 78,463 to 71,331 (9·1% reduction).

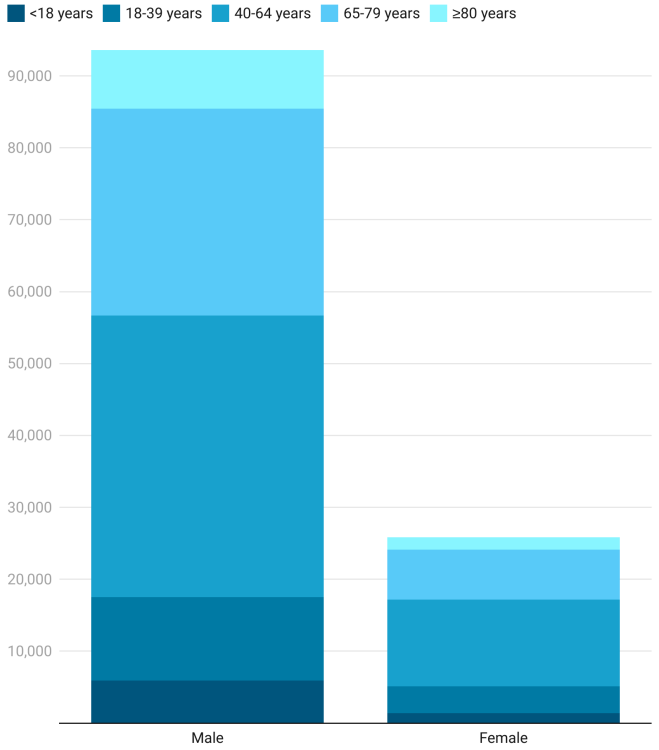
It is likely that by 2018-19 the NHS was mainly performing hernia repairs for patients with significant symptoms. Left untreated patients may find that hernias increase in size, worsening their symptoms and impacting their quality of life. Some patients may experience life-threatening hernia complications that require costly emergency surgery. Significantly, 56% of need for hernia repair is in working age adults, who may find that hernia symptoms prevent them working.

Elective hernia repair is safe, relieves symptoms, and allows patients to return to their normal activities.

Need by type of hernia repair



Breakdown of need for hernia reapir by age and sex



FUNDING REQUIRED TO ADDRESS NEED

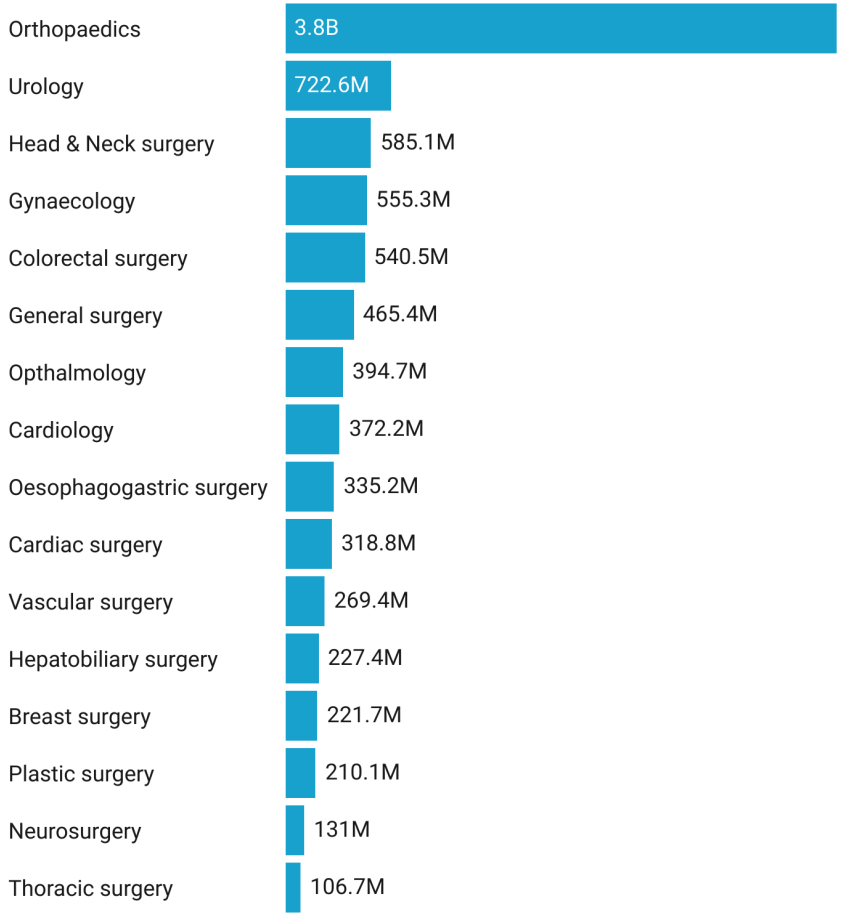
At least £9·2 billion is needed

Since patients on the NHS and hidden waiting lists effectively represent additional workload to the number of procedures the NHS would perform in an ordinary year, additional funding will be required to fulfil this need. We used the published NHS reference costs to estimate at a procedure-level the funding required to address the need for elective procedures.

We estimated that the overall funding required is £9·2bn, equivalent to £163 per person in England. The greatest cost area is orthopaedic surgery (£3·8bn), reflecting that it accounts for just under half of the total need for inpatient procedures, which are considerably more expensive than the day-case procedures. Conversely, because most of the need for colorectal surgery is for endoscopy and other day-case procedures, it is ranked second for overall need but fifth by funding requirement.

£9·2bn is an estimate of the minimum funding required, since it does not include costs of capital expenditure on surgical facilities, equipment, and staff development. Furthermore, if diagnosis and treatment are delayed, some patients will experience progression of their disease, resulting in them needing more complex and expensive treatment, raising overall costs. Finally, we have not considered the potential implication of litigation arising due to delayed treatment.

Total cost (£) to address the need for elective procedures



FUNDING REQUIRED TO ADDRESS NEED

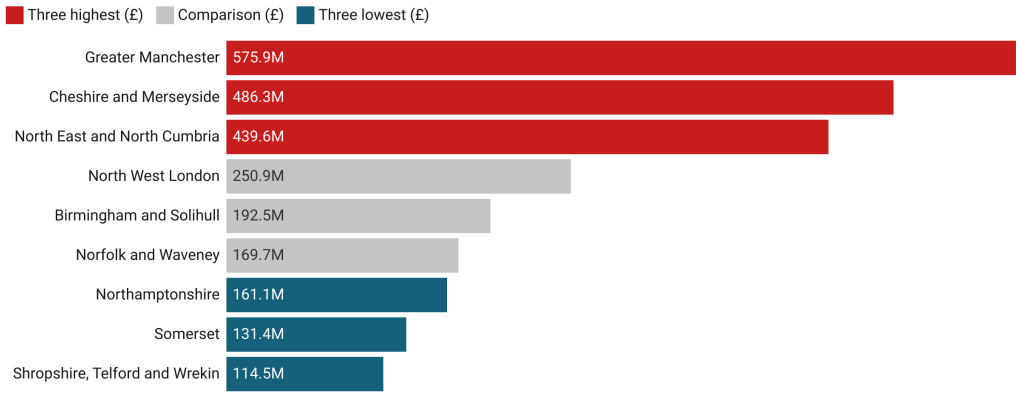
Greatest requirement is in Greater Manchester

There is wide variation in the funding required to address the need for elective surgery, ranging from £115m in Shropshire, Telford and Wrekin to £576m in Greater Manchester.

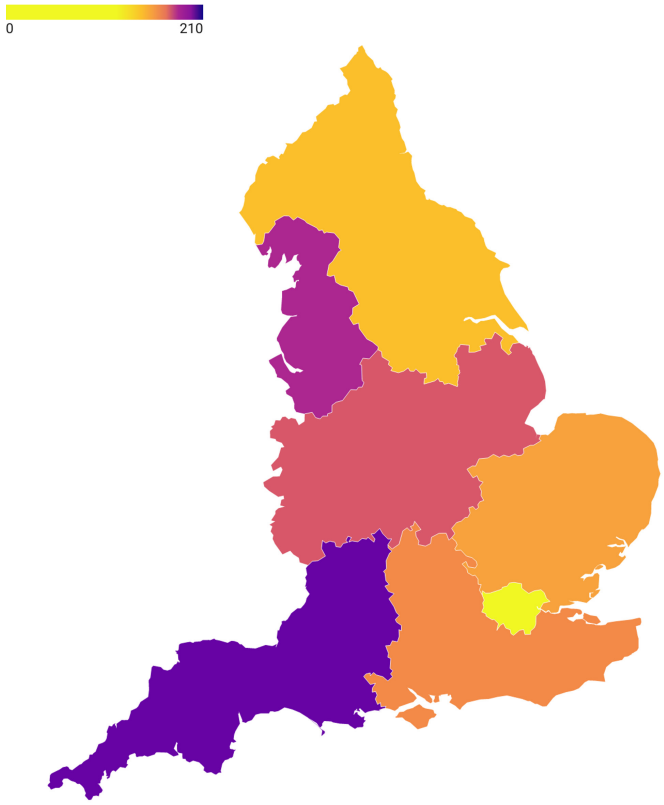
Considering per capita funding requirements, the lowest need is in London (£120 per person) and the highest need is in the South West (£209 per person). However, we have not applied market force factors to these estimates, so we may be underestimating London's funding requirement.

Targeting funding to the ICS systems according to their need will allow waiting lists to be tackled fairly across the country without further amplification of regional differences.

Highest and lowest total funding requirement by ICS system



Per capita funding required to fulfil need for elective care



PRE-COVID WAITING LIST TRENDS

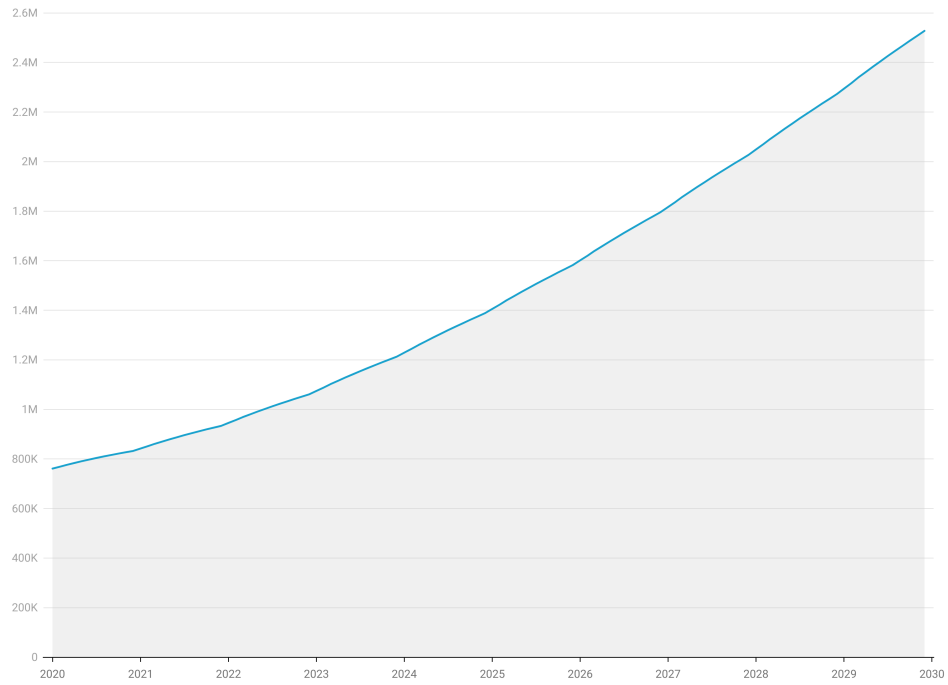
Waiting lists were already increasing before COVID

Prior to the pandemic, the NHS was gradually increasing the number of elective procedures performed each year. Total procedures increased from 5,570,248 in 2014-15 to 5,720,342 in 2018-19, an average increase of 0.67% per year. Despite increased total procedure volume, the NHS waiting list for elective procedures increased by 114,394 (18.0% increase) from 636,856 in March 2014 to 751,250 in March 2019.

Based on projected demographic changes in England, we estimated that the number of patients developing new symptoms or conditions each year that require elective procedures will increase from 5,720,342 in 2018 to 6,372,834 in 2029 (11.5% increase).

If there had been no pandemic and the NHS had continued to increase the number of elective procedures performed each year by 0.67% per year (as per the pre-pandemic trend), waiting lists would have continued to increase. This is because the number of patients needing elective procedures each year would have increased at a faster rate than than the the number of total procedures performed each year. We projected that the NHS waiting list would have increased to 968,811 by March 2022 and to 2,527,626 by 2030.

Projection for NHS waiting list for elective procedures based on pre-pandemic trends



This hypothetical scenario projects the NHS waiting list based on the anticipated increase in need for elective procedure due to a growing and ageing population, with NHS elective procedure volume increasing by 0.67% per year after 2018-19.

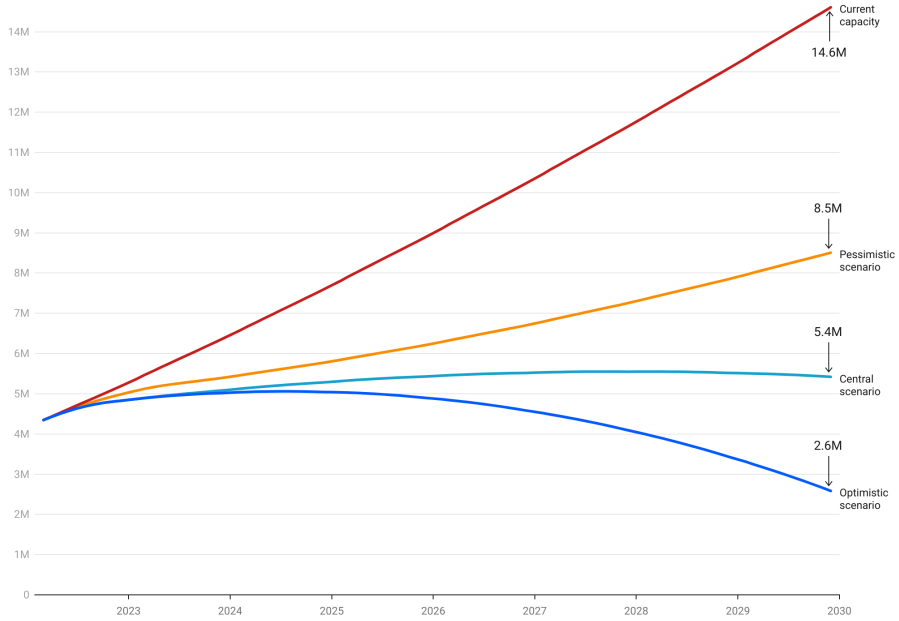
WAITING LIST PROJECTIONS TO 2030

The need for elective procedures is likely to continue increasing

We surveyed 47 surgeons and anaesthetists (14 specialties) regarding their expectations for the speed of recovery for elective services and the potential to expand beyond pre-pandemic volume. Based on this we have modelled four scenarios to estimate the number of people in England who will need elective procedures through to 2030.

These scenarios take in to account projected change in population structure in England over time. A growing and ageing population will mean that an annual increase in procedure volume would be needed just to keep pace with increasing need.

To eliminate the waiting list by the end of the decade, a 8·4% increase in elective procedure volume per year would be needed. This correlates to a 50% increase above pre-pandemic volume by December 2029.



Scenarios (elective procedures needed by 2030)

Current capacity: Elective procedure volume remains at current levels (14·6 million).

Pessimistic scenario: Elective procedure volume returns to pre-pandemic volume in July 2023 and remains at that level (8·5 million).

Central scenario: Elective procedure volume returns to pre-pandemic volume in December 2022 and then increases by 2% per year (5·4 million).

Optimistic scenario: Elective procedure volume returns to pre-pandemic volume in December 2022 and then increases by 4% per year (2·6 million).

Note: the pre-pandemic NHS waiting list was 753,116.

PRIVATE SECTOR ACTIVITY

Private sector was maintained during the pandemic

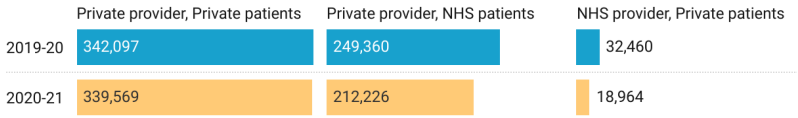
The private sector in England provides treatment for both private patients (insured or self-paying) and for NHS patients treated under contract with the NHS. In addition, NHS hospital provide a small number of procedures for private patients. During the pandemic period the NHS contracted with private hospitals to secure private capacity to deliver time-sensitive procedures such as cancer surgery which would usually be delivered by the NHS hospitals themselves.

We accessed data from the Private Health Information Network to assess the impact of the pandemic on private sector activity. Like-for-like private patient data were available for April 2019 to March 2020 and October 2020 to September 2021 for the NHS hospital system and 146 private hospitals.

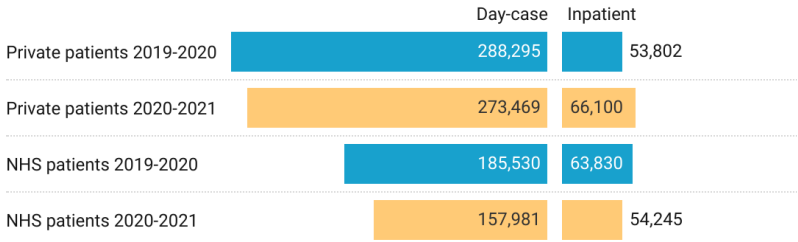
Our analysis shows that 42% fewer private procedures were performed by NHS hospitals in 2019-20 compared to 2020-21 as NHS hospitals focussed on meeting COVID-19 pandemic pressures and delivering NHS elective care. Although there was a 15% reduction in the number of NHS patients treated by private hospitals from 2019-20 to 2020-21, this may reflect a shift toward private hospitals delivering more complex and time-consuming surgeries for the NHS.

Overall, the private sector maintained the volume of procedures it performed for private patients, with inpatient procedures for these patients actually increasing by 23% during the pandemic period.

Change in private sector activity

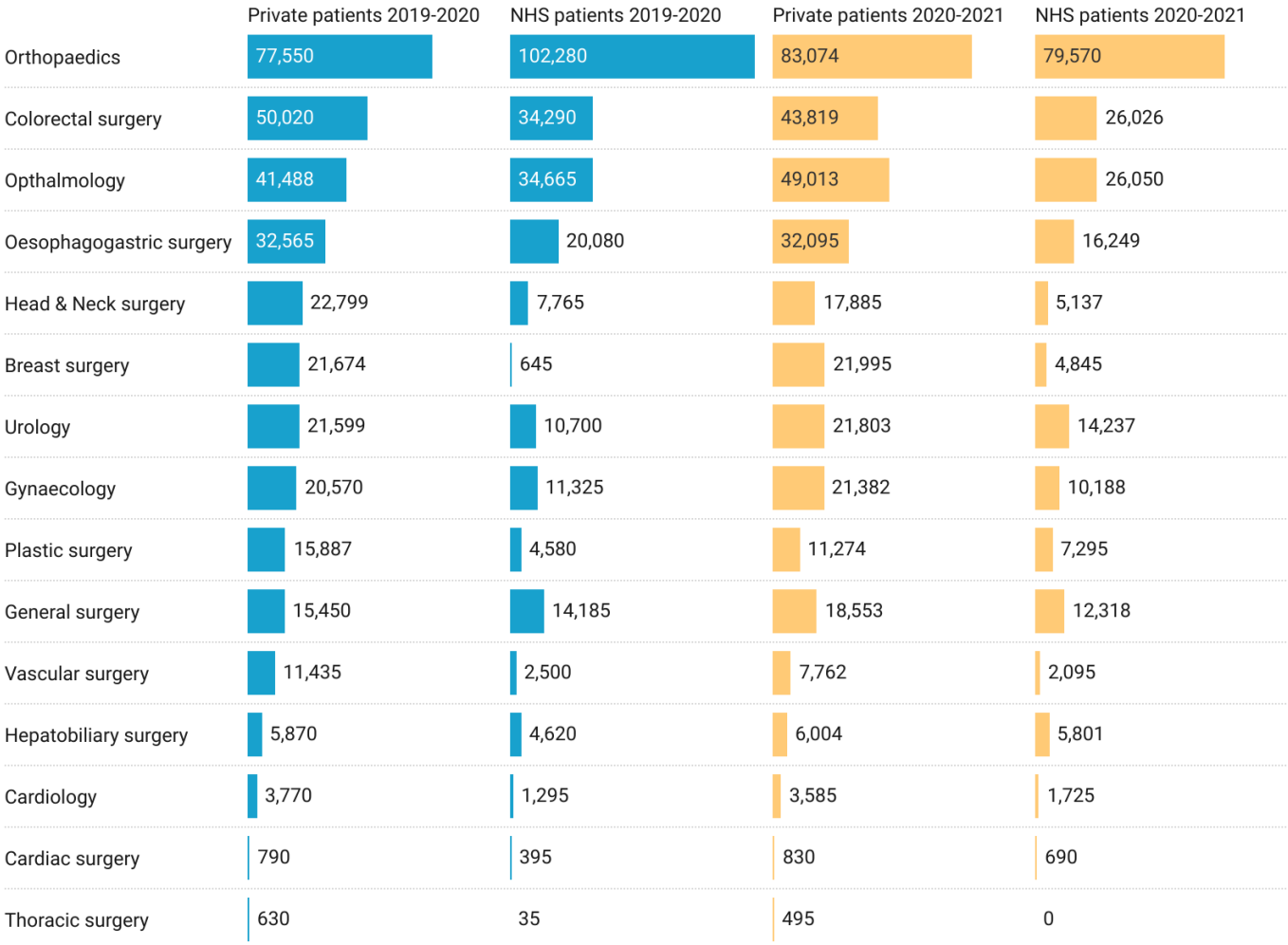


Change in private sector activity, split by day-case/inpatient



PRIVATE HOSPITAL ACTIVITY BY PAYER-STATUS

Private hospitals deliver care to both private & NHS patients



LIMITATIONS OF THIS ANALYSIS

Whilst this is the most robust and granular analysis of the need for elective procedures in England to date, it has some limitations:

- NHS waiting list data is not fully cleaned. There may be some double counting of the same patient on different waiting lists, or the counting of patients who no longer require elective treatment, for example, because they have been admitted and treated as an emergency or because they have died. This would potentially result in a small over-estimation of the total need for elective procedures. However, because most of the total need is as a result of the pandemic shortfall, rather than the pre-pandemic NHS waiting list, the impact of inaccuracies in the NHS waiting list would be minor overall.
- The hidden waiting list is based on the assumption that patients who would usually have been treated during the pandemic but were not, still need treatment. This may be over-estimating current need if some patients no longer want or need procedures.
- We have assumed that the size of the hidden waiting list relative to the NHS waiting list is consistent across all NHS systems. If some systems have performed better at capturing patients in need of procedures on their NHS waiting lists, we may be over-estimating their total need, whilst under-estimating need in other systems that have unexpectedly large hidden waiting lists. However, this would not impact the accuracy of national-level estimates.

A further limitation to this analysis is that it was based on publicly available data from NHS Digital, which is presented as aggregated statistics rather than as a patient-level dataset. This has required a series of assumptions to be made that are fully explained in our **methodology paper**.

Data for private sector activity is not available for the full pandemic period, so we were limited to analysing private activity in April 2019 to March 2020 versus October 2020 to September 2019. Furthermore, we only analysed data for private providers that submitted data to the Private Health Information Network in both the pre-pandemic and post-pandemic periods, in order to allow like-for-like comparisons. This means we are unable to determine the full extent of private sector activity, although it is likely that we do have data for a substantial proportion of the sector.

SUMMARY

The total need for elective procedures is higher than thought.

The total need is likely to continue increasing, making waiting lists inevitable in the foreseeable future.

20 key low-risk procedures account for

70% of total need

Making day-case procedures more accessible and deliverable will address

85% of need

KEY QUESTIONS

Addressing these issues will help identify solutions

1. How can innovative sustainable care models developed by NHS staff be identified and disseminated nationally?

2. How can elective hubs be designed to be resilient to future external pressures such as further COVID waves?

3. How should different patients and procedures be prioritised?

4. How can we ensure that the elective recovery is equitable and reduces health inequalities?

5. What is the role of the private sector in addressing the need for elective procedures?

6. How can communities be supported to spot cancer symptoms earlier?

7. How can patients optimise their health whilst on the waiting list?

8. How can training of surgeons, anaesthetists, and perioperative teams be embedded in the elective recovery?

FURTHER DATA AVAILABLE

Our methodology is fully reported in our **methodology paper** available from medRxiv.

Additional detailed analyses are available for all 130 procedures included in this analysis:

1. Total need at procedure level, including geographic breakdown
2. Total need with age and sex breakdown.
3. Regional hidden waiting list estimates.
4. Procedure volume in the public-private sectors.
5. Projections of future need for elective procedures based on bespoke parameters.

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Planned releases: Twice per year

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- **Report provenance:** This is an independent report from the University of Birmingham and all analyses were investigator-led.

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