SAVING YOUR BREATH

How better lung health benefits us all

Taskforce for Lung Health

ASTHMA+ LUNG UK

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Taskforce for Lung Health

The Taskforce for Lung Health is a coalition comprised of over 40 organisations, including patients, healthcare professionals, and industry representatives, working together to enhance lung health, save lives, and improve the quality of life for individuals with lung conditions through policy change.

September 2023

Foreword

Lung conditions are the third biggest killer in the UK, and are the biggest cause of winter pressures in the NHS. But despite this, lung conditions like chronic obstructive pulmonary disease (COPD) and asthma continue to be drastically overlooked. As a result, while other large killers such as cardiovascular disease (CVD) and stroke have seen significant progress in recent years, lung health has stood still.

The avoidable mortality rate for CVD has improved by 58% over the last 20 years. But for lung conditions, it has improved by only 14%. If lung health had improved at the same rate as CVD, there would now be around 8,000 fewer deaths each year from lung conditions. Because of this lack of action, more people are now dying from a lung condition in the UK than anywhere else in Europe.

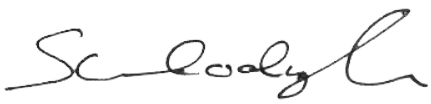
This unequal focus continues. Shortly before this report was published, NHS England announced that it was expanding blood pressure checks into local communities, including locations such as barbershops and mosques, as part of a major drive to prevent strokes and heart attacks.[1]

While this is great news for heart health, we need a comprehensive approach to lung health as well. In many areas in the country, spirometry, a key basic lung function test, has been unavailable for years. This means that many people with lung conditions are either not diagnosed, or are misdiagnosed. We wouldn't accept being diagnosed with hypertension without anyone actually checking your blood pressure – people with lung conditions deserve better.

This report makes it clear that there are also huge savings to be made by improving the diagnosis and treatment of lung disease, both in terms of direct NHS savings and by reducing hospital bed days. These changes would also have a huge positive impact on those living with lung conditions, the majority of whom do not receive best practice care.

The government recently announced £250 million in emergency funding to provide an extra 5,000 NHS hospital beds in England this coming winter.[2] If properly implemented, our recommendations would save significantly more (£307 million) each and every year, and free up over 93,500 bed days over the winter period. This kind of immediate practical action is desperately needed. Our blueprint for lung health recommendations provide the evidence base for change, and the details of how to achieve this.

Asthma + Lung UK will continue to fight for better lung health. 1 in 5 of us will get a lung condition in our lifetime. But thousands aren't getting the care they need, causing avoidable problems which cost them and the NHS. This report provides a roadmap for change. What we need now is action.



Sarah Woolnough
Chief Executive, Asthma + Lung UK

Executive summary

Lung disease, including COPD, asthma and pneumonia, is the third leading cause of death in the UK, and places a huge burden on individuals, the NHS and the UK economy. We have the worst death rate from lung disease in Europe, and hospital admissions for lung conditions have doubled in the last 20 years. Lung conditions, and their burden on the NHS, hit the headlines each and every year as winter pressures mount. But year after year not nearly enough is done to prevent these pressures building up in the first place.

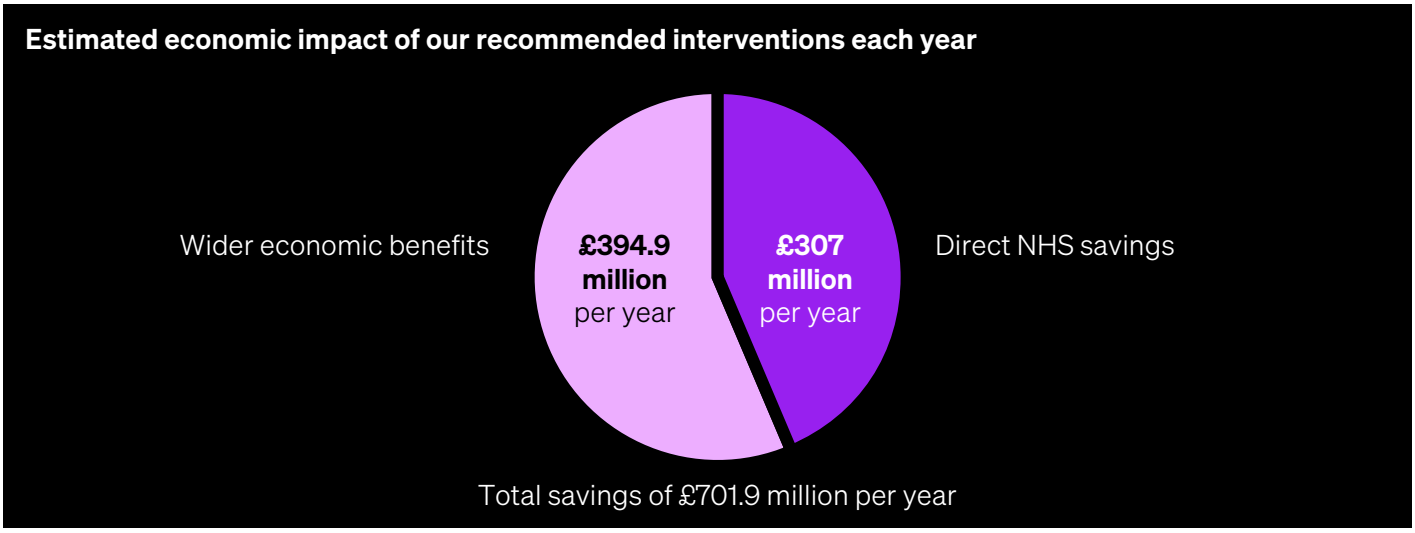
The good news is that we know what works. A significant amount of this burden could be avoided with better prevention and a more effective healthcare response. Asthma + Lung UK commissioned PwC to provide an updated analysis to quantify both the impact of lung conditions, and the positive impact of specific interventions to improve the diagnosis and care for those with asthma and COPD.

This analysis shows that lung conditions, specifically asthma and COPD:

- cost the NHS £9.6 billion in direct costs each year, representing 3.4% of total NHS expenditure
- cause wider reductions in productivity due to illness and premature death totalling £4.2 billion a year
- have an overall impact of £13.8 billion on the English economy.

If the three key measures outlined in our blueprint for change were implemented they could:

- save the NHS £307 million a year.
- produce a reduction in hospital bed days of just over 272,000 a year, 93,500 over the winter period.
- produce wider economic benefits of £394.9 million a year.



Unless specified otherwise, all data is from a report produced for Asthma + Lung UK by PwC, or our own analysis, outlined in appendix 1.

In addition, these changes would have a considerable wider economic impact by improving productivity and the wellbeing of those affected.

We are trapped in a vicious circle of late diagnosis, limited or incorrect treatments and poor support for people to take the best care of themselves. This leads to avoidable emergency hospital admissions, causing pain for patients and their families and putting a significant, avoidable strain on the NHS.

Our blueprint for lung health aims to break this cycle and put the NHS, and the 1 in 5 people who experience a lung condition, on a path to better, more sustainable health.

Recommendations

Diagnose lung disease early and accurately

Imagine being diagnosed with high blood pressure without anyone actually measuring it. That's what happens for many with lung conditions, with thousands of people across England missing out on key diagnostic tests because of local disagreements about funding and commissioning.

The analysis conducted by PwC found that:

- If Fractional exhaled nitric oxide (FeNO) were made available to all GPs across England, its use could save almost £100 million (£97,903,257) by optimising asthma treatment.
- An uptake in spirometry testing in primary care to just 40% of eligible patients would result in just over £60 million in direct NHS cost savings in reduced COPD exacerbations, a reduction of 63, 273 hospital bed days, of which 21,513 would be winter bed days saved.

In order to realise these changes we want to see:

- **Fully funded diagnostic testing**
  We want to see fully funded spirometry and FeNO testing across all settings within primary care, from practices and primary care networks (PCNs) through to Community Diagnostic Centres (CDCs). Both tests should be fully funded as a paid-for diagnostic test within the GP contract so that costs can be directly recouped.
- **Restart spirometry across the country**
  Good lung health and receiving proper care shouldn't be a postcode lottery. To ensure that everyone who needs a diagnostic test gets them in a timely way, we want all integrated care systems (ICSs) to provide evidence that they have restarted quality-assured spirometry in primary care in full by the end of the 2023/24 financial year, and to ensure that these tests are available at all community diagnostic hubs, regardless of size or classification.
- **Make full use of Community Diagnostic Centres (CDCs) AND primary care for diagnosis**
  CDCs provide a great opportunity to enhance diagnostic capacity and get people the test they need, faster. However, they cannot provide all the tests needed and in some areas this is causing confusion, with testing not being provided in the mistaken belief that CDCs will solve this problem in the future.

  To stop this confusion, NHS England should provide clear guidance that CDCs are intended to boost diagnostic capacity alongside provision in primary care and are unlikely to be able to deliver all respiratory diagnostic testing, even when fully up and running.

Keep people healthy and out of hospital

People with lung disease are not getting the support they need to manage their condition and reduce their risk of acute attacks. Self-management is essential for living well with a lung condition, but many do not receive proper instructions on how to use their inhalers effectively.

Our analysis found that:

- Prompting healthcare professionals to review patient use of inhalers would result in savings of over £7 million per year, as well as a 70% reduction in hospital bed days amongst people with asthma. Around 40% of this reduction in bed days is likely to occur over the winter months.

In order to achieve these changes, we want to see:

- **Annual reviews for all lung conditions**
  To keep people healthy and out of hospital, we want all those with lung conditions to be given an annual review and medication check every year to support their health and their ability to self-manage their condition. For those with well controlled conditions, it may be appropriate for these reviews to happen via video call, but for those with poorly controlled symptoms, this should be face-to-face.

- **Using patient data to improve their adherence to treatment**
  When conducting an annual review for a patient who uses an inhaler, the clinician should review that patient's inhaler data and the number of refills they use annually, as well as their symptoms and frequency of acute attacks, in order to assess and improve their adherence to treatment and understanding of their condition.

- **Data and monitoring on annual reviews and medication checks**
  GP practices have a vital role to play in keeping people healthy and out of hospital, and should be rewarded for doing this well.

  The implementation of annual reviews and medication checks should be incentivised and monitored through the Quality and Outcomes Framework (QOF), or any successor to this. Primary care needs the resources to spend adequate time to do this well for all patients with long term respiratory conditions, while healthcare practitioners need to appreciate that spending time on this actually plays a key role in reducing demand on healthcare and be properly incentivised for time spent on this important work.

Access to the treatment that works

Too many people living with lung conditions are missing out on the treatments they desperately need to live and stay well at home. Current access is limited, patchy and being held back by workforce shortages.

Access to pulmonary rehabilitation (PR) for all those eligible

The benefits of pulmonary rehabilitation to people with COPD and other lung conditions is substantial, both to them and to the NHS. Much more needs to be done to improve provision, uptake and completion rates.

Our analysis found that:

- The expansion of PR would result in £142.6 million of direct NHS savings related to reduced exacerbations, as well as a reduction of 194,000 bed days, 66,000 of which would be saved over the winter period.

In order to realise these changes, we want to see:

- **Introduction of a rehabilitation lead in every integrated care board (ICB)**
  ICBs should have a single accountable rehabilitation lead to oversee the expansion and transformation of rehabilitation services in their area so that this is delivered to all who are eligible consistent with NICE guidance.

- **Expand provision**
  We welcome NHS England's ongoing work to evaluate the effectiveness of online forms of PR and make these as widely available as possible. We want to see better availability of PR, both in-person and virtually, and more effective ways of explaining it to patients and encouraging them to attend.

We would like to see additional resources committed to this as part of the Major Conditions Strategy, where PR should be a key action for improving chronic respiratory conditions post diagnosis.

- In order to improve uptake, eligible patients should not be offered PR but given a direct referral on an opt-out basis.

Access to biologic drug treatments for those with severe asthma

While severe asthma accounts for only around 5% of the total asthma population, this is still around 200,000 people.[3] Such is the severity of their symptoms that this group is estimated to account for at least half of all economic expenditure on asthma – around £1 billion a year.

Biologic drugs are proven to dramatically reduce severe asthma symptoms and exacerbations, and so increasing their use should be a priority in order to reduce costs and improve the health and wellbeing of those with severe asthma.

We want to see:

- Full resourcing for the AAC Consensus pathway for managing uncontrolled asthma in adults, ensuring equitable access to biologics for all patients.

- NICE develop a single comprehensive severe asthma guideline which links effectively with other asthma guidelines.

Lung conditions are the

3rd biggest killer

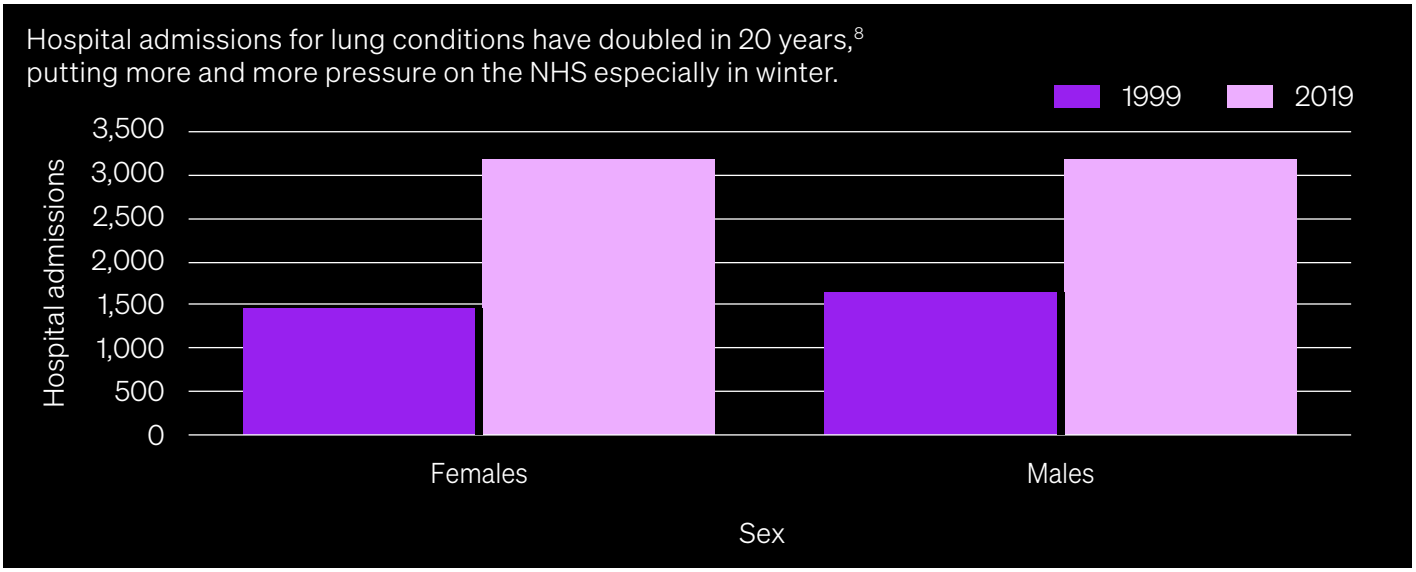
in the UK

Lung health in England – where are we now?

- Lung disease is the third biggest cause of death in England.[4]
- Lung disease costs the NHS £9.6 billion in direct costs each year (2019 prices).
- In addition, wider reductions in productivity due to illness and premature death come to £4.2 billion a year (2019 prices), making the total impact of lung conditions on the economy £13.8 billion.
- Lung conditions including COPD, asthma and respiratory infections place a huge burden on the NHS, especially in the winter months where respiratory admissions increase by 80%.[5]
- People in the poorest areas are five times more likely to die from COPD and three times more likely to die from asthma than the richest areas. There is a stronger link between respiratory deaths and deprivation than for any other major disease area.[6]

Despite the huge burden that lung disease places on the NHS and the economy, most lung conditions could be avoided by reducing exposure to risk factors such as tobacco, poor housing, child poverty, air pollution and occupational hazards such as asbestos and other dust, fumes and chemicals. Making it possible for people to adopt a healthy lifestyle and positive lung behaviours such as exercise can also greatly reduce the chances of people developing lung conditions at all stages of their life, while also improving general health and wellbeing.

Shockingly, we have the worst death rate in Europe for lung conditions, and people in the UK are three times more likely to die from lung disease than in Finland, which has the lowest lung disease death rates in Europe.[7]



Progress to improve our lung health has been extremely slow, and much slower than for other major causes of death such as cardiovascular disease. The avoidable mortality rate is the number of deaths that could be averted either by preventing disease or through effective healthcare. For lung conditions, the avoidable mortality rate has improved by 14% on average across England over the past 20 years. This pales in comparison to advances made for cardiovascular disease, where the equivalent improvement was 58%.

If the avoidable mortality for lung conditions had improved at the same rate as cardiovascular disease over this period, there would be around 8,000 fewer deaths from lung conditions now each year (reducing the annual deaths by 13%).

We are trapped in a vicious circle of late diagnosis, a limited number and lack of access to treatments, and poor support for people to take care of themselves. This leads to avoidable emergency hospital admissions, causing pain for patients and their families and putting a significant, avoidable strain on the NHS.

There are a number of key barriers to making progress on lung disease in England:

- Awareness of lung conditions and their significant impact is low, both amongst healthcare professionals and the general population.
- Underinvestment means that there are limited treatment options compared with other conditions and the implementation of NICE best practice guidelines is poor. Many people wait years, struggling with breathlessness and limited physical activity, before seeking help from their GP.
- Lung conditions often develop alongside other long-term conditions, such as high blood pressure, narrowing of the arteries (coronary artery disease) and heart failure, as well as anxiety and depression. The effects of these conditions multiply the impact of lung disease but also mean that lung diseases are missed.
- While lung conditions can affect anyone, they are strongly associated with deprivation and social and environmental factors such as smoking, poor housing and exposure to air pollution.

1 in 5 people

in the UK will experience a lung condition

The economic costs of lung conditions (2019 prices)

There are many different lung conditions, but grouped together they are the third largest killer in the UK. This section of the analysis produced by PwC covers the impact of the following lung conditions:

- asthma
- COPD
- lower respiratory infections such as bronchitis and pneumonia
- other lung conditions other lung conditions including cancers of the lung, trachea and bronchus, as well as upper respiratory infections such as tonsillitis and laryngitis.

The direct cost of lung conditions to the NHS
This includes costs to the NHS that arise from primary care GP visits, secondary care costs which arise from hospitalisations, and non-government expenditure such as out of pocket expenditure and health insurance pay-outs.

Total direct costs were estimated to be £9.6 billion in 2019.

£1.7 billion of this was estimated to be primary care, £6.3 billion attributable to secondary care and £1.7 billion to prescription charges and insured expenditure.

The additional indirect costs of lung conditions
This includes costs to productivity due to illness, causing absence from work and premature death, as well as the costs of caregiving from friends or family. Total indirect costs were estimated to be £4.2 billion in 2019.

This makes the overall total impact of lung conditions on the economy in England £13.8 billion.

Common lung conditions
Asthma and chronic obstructive pulmonary disease (COPD) are two of the most common lung conditions, but others include interstitial lung disease (ILD) and bronchiectasis. Lung cancer is also a major concern and is the third most common cancer in the UK.

Respiratory infections like flu and pneumonia are also a significant factor in winter pressures on the NHS, resulting in 400,000 people admitted to hospital each year.

Asthma
Asthma affects the airways that carry air in and out of a person's lungs. People with asthma often have sensitive, inflamed and narrowed airways. This causes symptoms like coughing, wheezing, feeling breathless or a tight chest. It impacts the daily life of people affected, including education and work. People with asthma can experience acute attacks which can cause hospitalisation or be fatal, especially if the condition is poorly controlled.

- Asthma is the most common lung condition in the UK, affecting 5.4 million people (one in every 12 adults and one in every 11 children).[9]

- Due to a lack of proper investigation, around 30% of those with a diagnosis of asthma may not actually have the condition, while others are missing out on appropriate treatment.[10]

- There are 60,000 hospital admissions and 200,000 bed days for asthma per year in the UK.[11]

- Asthma attacks kill three people in the UK every day, and someone has a potentially life-threatening asthma attack every 10 seconds.[12]

The economic costs of asthma
The updated analysis Asthma + Lung UK has commissioned from PwC found that **2023 direct asthma costs in England come to £1.2 billion**, including all NHS costs, the direct impacts of greenhouse gas emissions (from patient travel, inhaler propellant use and operation of healthcare facilities) and patient travel costs.

Case study

Jess was diagnosed with asthma when she was a child, but as she became a teenager her condition worsened. She became seriously unwell after a move to London for university due to the pollution levels in the city.

“I went from having mild asthma to developing severe uncontrolled asthma when I moved to London from Scotland seven years ago. I became so unwell, I had three or four asthma attacks within about a month of starting uni. I was regularly in hospital having to be nebulised. When it’s a muggy, foggy day, I can’t go outside. My asthma is not exercise induced; I can run, I am very sporty, but as soon as it’s foggy outside, as soon as it’s a polluted day, I’m useless.”

Despite understanding her own triggers and noticing her condition worsening, it took years until Jess could get doctors to listen to her. To this day, there are healthcare professionals that don’t take her condition seriously enough.

“It was really hard to get anyone to pay attention to it. It wasn’t until a few years later where I managed to see a locum GP, who was really good, and asked all the right questions, and got actual diagnostic tests done. But by then, I’d had five or six, maybe even seven, courses of antibiotics and prednisolone in a year. That was my normal. It took a very long time for anyone to ask, ‘Why is this happening?’”

“It’s been quite difficult to get the support I need because I am a young woman who looks very well. I’ve had people say ‘you look fine’, I’ve had asthma nurses say ‘you look alright to me’. They’re all looking at all the medication I’m taking and telling me I look fine! I shouldn’t have to be coughing my lungs up to be taken seriously, and I don’t think any of my healthcare should be based on how I look that day.”

Whilst on the outside, Jess might look like a healthy young woman, she is having to balance chronic illness with her career and social life; she explained how hard it can be to get employers to understand the challenges of living with asthma, and how living with a lung condition has impacted her quality of life.

“I think there is a lack of understanding about the impact that asthma can have on work, but as a young person, you’re not at a place in your career or hierarchy where you can be more forceful with that. Things like stress can make my asthma worse, as well as commuting into London, so there are days when I am just glued to my blue inhaler to get me through work. And that’s really frustrating. Or if I’ve been on steroids for a while, then I’m a bit more susceptible to other bugs, I can’t not work because my immune system is weakened.”

“It can impact other areas of life as well. I’m a dancer, I do ballet, but when I’m on steroids, I can’t lock my knees out properly because my joints swell. I want to go out and do things and have fun, and it’s really frustrating to have to say ‘Sorry, I actually can’t come to this because I can’t breathe.’”

Jess remains hopeful that her asthma can be brought under control using biologics, but also highlighted that care for people with lung conditions needs improving across the healthcare system.

“I’m hoping they’ll put me on the biologics so that long term I’d have to take fewer steroids, and could have better long term outcomes for my bone health and my skin. My mum has osteoporosis and osteopenia because of steroids, so if I can get to a place where that isn’t my future, that would be great. It’s very frustrating that access to biologics is age-determined rather than [determined by] severity of asthma, but it’s something my consultant and myself want [access to biologics]. Because the thing is, at my age, there is a hope for a more positive outcome, which would be fantastic.”

Chronic obstructive pulmonary disease[13]
COPD is the name for a group of conditions where the lungs are damaged by inhaling toxic materials like smoke. It includes chronic bronchitis where the airways are inflamed and emphysema where lung tissue itself is destroyed. In COPD, air cannot get out of the lungs easily because the airflow is obstructed in airways that are narrowed and collapsible. COPD can cause symptoms such as breathlessness, coughing, wheezing or coughing up more phlegm than usual.[14]

People with COPD can experience acute exacerbations which can cause hospitalisation or be fatal, especially if the condition is poorly controlled.

- More than 1.4 million people are diagnosed with COPD, but estimates suggest that when the undiagnosed population is included, the total number living with COPD could be 1.9 million.[15]

- Treating COPD costs the NHS £1.9 billion a year, and COPD is the second largest cause of emergency hospital admissions.[16]

- COPD causes 30,000 deaths and 130,000 emergency hospital admissions every year.[17]

Although the severity of symptoms with COPD can vary, COPD can impact a person's life and impose restrictions on their way of life in many ways. 27% of those with COPD who responded to our 2023 Life with a Lung Condition survey had given up work because of their breathlessness, and many others reduce their working hours, retire, or die earlier than those without the condition.[18]

The economic costs of COPD
The PwC analysis found that **2023 direct COPD costs in England come to £3.9 million**, including all NHS costs, the direct impacts of greenhouse gas emissions (from patient travel, inhaler use and operation of healthcare facilities) and patient travel costs. COPD exacerbations alone cost the NHS just under £1.4 billion a year. In addition to this, lost productivity costs account for £1.7 billion a year and the costs associated with reduced quality of life come to £2.2 billion.

1 person

every minute

is diagnosed with a lung condition in the UK

Case study

Christine lives in Lincoln and has had a lung condition for most of her life. She was diagnosed with asthma when she was a small child after a bout of pneumonia. However, it wasn't until she entered her 70s and was in hospital after having a heart attack that she finally received a diagnosis of COPD.

"I had a heart attack about nine years ago. And they did a scan and said that it wasn't just asthma anymore, it was also COPD. I was getting more short of breath but it was just treated as asthma."

Christine's condition has led to her feeling breathless and suffering with regular chest infections that require multiple courses of antibiotics and oral corticosteroids a year. Despite the side effects these drugs can have, there is no other treatment being offered to her and she has received very little education about COPD or the impact of steroids.

"Asthma really impacted my life when I was younger. Now I'm 78, I can't do as much as I used to, but I did used to get very short of breath. If I had to hurry anywhere, or if I had to push the pram up a hill when I had the kiddies, it did make it much harder then. Now it's things like stairs that I struggle with, and I have to go slower."

"My nurse knows me now, which helps. Whenever I get a flare up of my chest symptoms, I make sure I call her early so she can check my symptoms and advise me on my treatment."

Christine's experience with the NHS has mostly been positive, though she recognises the consequences of a health system that does not prioritise lung health. With earlier diagnosis and better treatments she might not be getting so many exacerbations. But the government's failure to take lung health seriously means that the NHS is putting out fires rather than preventing them.

"Last year, I had I had a bad attack. I went straight to the doctor who sent me to the hospital, and I was sorted out straight away. I was there eight hours, but they put me on a nebulizer, they gave me injections, they took me for chest x-rays. They did everything they could."

"I know I'm lucky that I have a nurse and doctors surgery that know me, and I can get what I need when I need it but there are lots of people who can't and that is scary. When you're having an attack, you need help quickly."

More details about these and other lung conditions can be found on the health advice pages on our website: Conditions | Asthma + Lung UK (**asthmaandlung.org.uk/conditions**)

Where do lung conditions have the greatest impact?

As can be seen on the map presented here, there is a stark north-south divide in respiratory outcomes in England.[19] The most deprived ICBs have much higher emergency hospital admissions and death rates for respiratory disease when compared to the least deprived ICBs.

There were twice as many emergency respiratory admissions in the winter of 2021/22 for those in the most deprived decile compared to the least deprived decile. The most deprived communities accounted for three times the number of winter admissions for asthma and four times the number of winter admissions for COPD compared to the least deprived.

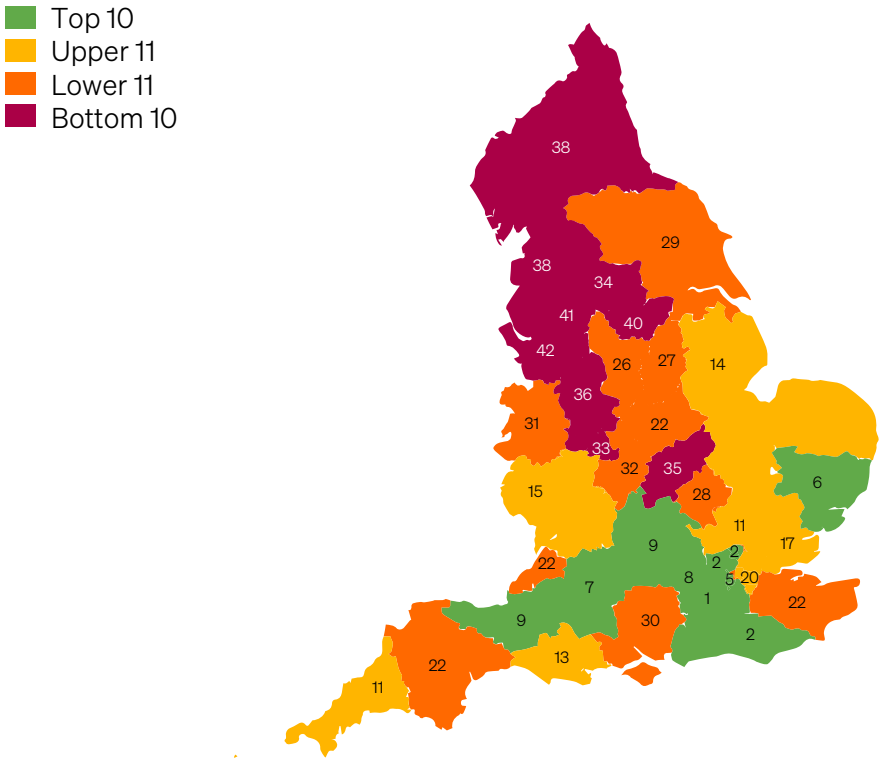
This inequality gap was even wider for asthmatic children. Children in the most deprived communities were four times more likely (and reached a high of 5.6 times more likely in February 2021/22) to end up in hospital in an emergency over winter compared to the least deprived.

This makes it clear that those living in the most deprived communities are exposed to far more of the risk factors for developing lung conditions, and are far more likely to be admitted to hospital and die from a lung condition than those in the least deprived communities.

The map below shows a ranking of respiratory hospital admissions and deaths for the 42 ICBs in England. Please see appendix 1 for a detailed ranking of the ICBs by respiratory admissions and mortality.

The North-South divide in lung health

ICB ranking
Based on respiratory admission + death rates



Deprived communities face the biggest barriers to good lung health

There are a range of reasons why those from the poorest communities have the worst lung health, including smoking, poor housing, air pollution and access to NHS services.

- Tobacco smoking is the biggest cause of preventable illness and death in the UK.[20] Two out of three people who continue to smoke will die from a smoking related disease. It is estimated to cause one in four cancer deaths and is well established as a leading cause of lung conditions including COPD, pneumonia, and obstructive sleep apnoea.

- Whilst smoking rates have broadly declined over the past 50 years, they remain disproportionately high in certain communities. In 2021, smoking was 3.5 times more prevalent among people in the lowest decile of the index of multiple deprivation compared to least deprived decile in England.[21] Those caught up in this highly addictive, intergenerational cycle need more support to quit tobacco.

- Poorer housing is closely linked to lung conditions. Indoor pollutants, including mould, damp, dust, dirt, or gases in the air, have been linked to lung conditions like asthma, COPD and lung cancer.

- Higher exposure to air pollution.[22] Long term exposure increases the likelihood of developing lung conditions and negatively impacts those with existing conditions.

- Those working in occupations that have increased rates of lung conditions due to exposure to chemicals, dust and fumes, including factory work and cleaning.

- GP practices in more deprived areas have fewer doctors, are relatively underfunded, and perform less well on a range of indicators compared with practices in wealthier areas.[23]


We have the
worst death rate
for lung conditions in western Europe

Our blueprint for better lung health

Our recommendations will help improve the diagnosis of lung conditions, and once diagnosed help people to better manage their condition and stay out of hospital. Doing this is better for everyone – for those with lung conditions and for the NHS, which will have more capacity to deal with other issues.

Impact: total cost savings

The combined impact of the four measures outlined below comes to:

- total NHS savings of £307 million a year
- a total reduction in hospital bed days of 272,623, of which 93,557 would be over the winter period
- wider economic benefits of £394.9 million a year in improved productivity.

How these figures were calculated:

We asked PwC to model the impact of the following interventions:

- increasing the availability of FeNO for use in asthma diagnosis
- increasing the use of spirometry to diagnose COPD
- improving ongoing care for those with asthma
- increasing access to pulmonary rehabilitation for all those eligible.

Diagnosing lung disease early and accurately

Those struggling with breathlessness often wait years for a formal diagnosis. Some will never receive one at all, or receive an incorrect diagnosis. In part this is because many do not understand the key symptoms, and society doesn't take breathlessness seriously or consider lung problems as worthy of attention as other diseases. But even once in contact with healthcare professionals, diagnosis is still too slow. Things were bad before the pandemic, and since COVID-19, the situation has gone from bad to worse.

Imagine being diagnosed with high blood pressure without anyone actually measuring it. That's what happens for many with lung conditions, who are given a diagnosis based on a conversation with their GP but without any testing. When this happens, the chances of being given an incorrect diagnosis are much higher, meaning that people miss out on the care they need.

Under-diagnosis can lead to people having untreated inflammation, putting them at risk of asthma symptoms and asthma attacks, for example. Overdiagnosis means that people are getting medications they do not need, with the chance of negative side effects and at a cost to the NHS.

Key lung diagnostic tests
There are significant costs associated with both routine care and exacerbations in asthma, so reducing the likelihood of exacerbations and unscheduled care (including secondary care) greatly diminishes the cost of asthma and COPD on the NHS. Getting a timely and accurate diagnosis is key to this.

What is spirometry?[24]
Spirometry is a lung function test which measures lung capacity, how much air someone can breathe out in one forced breath and how fast they can empty their lungs.[25] It is mandated by NICE guidelines for the diagnosis of both COPD and asthma.[26,27] Spirometry is often done alongside a bronchodilator reversibility test (BDR), to show if and how much a person's airways improve with bronchodilator medicines.

What is FeNO testing?[28]
FeNO stands for fractional exhaled nitric oxide. FeNO is a test that measures the levels of nitric oxide in someone's breath and is suitable for adults and most children over five. A high level of nitric oxide when they breathe out can be a sign that they have inflamed airways, due to asthma. As such, a FeNO test is used to help diagnose asthma, alongside taking a medical history, and other tests such as spirometry or peak flow tests.

Although NICE guidelines for the diagnosis of asthma[29] recommend FeNO testing, FeNO is currently optional within the Quality and Outcomes Framework (QOF),[30] but we strongly support its use as best practice.

Lung function tests in the NHS
NICE guidelines indicate that spirometry should be performed for any diagnosis of either asthma or COPD, but we know that this is often not the case. We also know that FeNO is not widely used, despite being recommended by NICE.

Spirometry was paused in primary care during the pandemic, causing at least 46,000 people to miss out on a diagnosis of COPD in 2020,[31] with it very likely that the same happened in 2021. Many others would have been given a diagnosis without a test. This means that they may be on medications that they do not need and that may cause them harm, and are missing out on treatments for the true causes of their symptoms. If around half of cancer cases went undiagnosed or misdiagnosed it would be a national scandal, but this is exactly what has happened with COPD.

Two years on, some areas have still not restarted spirometry, although no comprehensive data is available on this issue (which is itself part of the problem). This unequal situation is primarily a result of funding pressures: spirometry is not specifically funded within the GP contract. This means that alternative sources of funding must be found, something which is increasingly problematic in the current economic climate. This is not acceptable and those in need of help are being left behind.

The Wessex Academic Health Science Network (AHSN) recently delivered a national programme to expand FeNO testing within primary care. This was a big success, supporting the faster and more accurate diagnosis of 58,000 new asthmatics and giving 53% of PCNs access to FeNO testing in England.[32]

However, with the AHSN programme ending there is no more funding available, meaning that progress to expand FeNO testing could be reversed in many areas. Even when GP practices have access to existing FeNO machines, ongoing costs for consumables, maintenance and performing the tests are not being covered. Without dedicated funding these costs are a genuine barrier in some areas.

CDCs are intended to deliver additional diagnostic capacity by providing quicker and more convenient access to diagnostic testing for patients. The government aims to open 160 CDCs across England by 2025. While CDCs are very welcome, they cannot alone provide the scale of diagnostic testing needed and GPs will still need to provide spirometry and FeNo testing in many areas.

For more details and case studies on ways that local NHS areas have made progress offering diagnostic lung testing please see our recent report.[33]

The impact of increasing the availability of FeNO for use in asthma diagnosis
PwC analysed the impacts expanding the availability of FeNO to clinicians in order to support the more accurate diagnosis of asthma. FeNO is currently available in around 50% of GP practices and they found that **if it were made available to all GPs across England its use could save almost £100 million (£97,903,257) by optimising asthma diagnosis and treatment**.

These savings would come from a reduction in misdiagnosis, meaning that patients who do not actually have asthma would not be given medications, and also because patients diagnosed with FeNO incur lower maintenance costs through more tailored prescriptions. All these savings would be recovered by the NHS.

The impact of increasing the use of spirometry to diagnose COPD
PwC analysed the impacts of expanding the availability of spirometry testing in order to support increased accurate diagnosis of COPD. An uptake in spirometry testing to 40% of eligible patients in primary care was assumed, in line with the NACAP recommendation of having 40% of COPD patients receiving a diagnosis by April 2023.

The analysis found that this would **result in just over £60 million in direct NHS cost savings related to reduced exacerbations**, with this achieved by patients receiving an accurate diagnosis and then given appropriate treatment. This reduction in exacerbations, with it hospital activity, would result in **a reduction of 63,273 hospital bed days, of which 21,513 would be winter bed days saved**.

This scenario would also produce £1.56 million in productivity savings as a result of correctly diagnosed patients receiving effective treatment, meaning that they are able to continue work.

Recommendations

- **Fully funded diagnostic testing** – We want to see fully funded spirometry and FeNO testing across all settings within primary care, from primary care networks through to Community Diagnostic Centres. Both tests should be reimbursed as a paid-for diagnostic test within the GP contract so that the costs can be directly recouped. This funding should recognise all costs involved for any provider who wants to provide respiratory tests.
- **Standardised national tariff for diagnostic testing** – In the longer term, NHS England should develop a standardised national or guide tariff for diagnostic testing for different settings, in the same way as echocardiograms, where there is a national tariff embedded in the imaging unbundled tariffs.
- **Restart spirometry in all Integrated Care Systems (ICSs)** – We want all ICSs to provide evidence that all patients from each PCN have access to timely, high quality spirometry and FeNO testing by the end of the 2023/24 financial year, and to ensure that these tests are available at all community diagnostic hubs, regardless of size or classification.
- **Use both Community Diagnostic Centres (CDCs) AND primary care for diagnosis** – NHS England should provide clear guidance that CDCs are intended to boost diagnostic capacity alongside provision in primary care and are unlikely to be able to deliver all respiratory diagnostic testing, even when fully up and running. Guidelines should make PCNs aware of which and how many tests they should be providing and which patients should be referred to CDCs for diagnostic tests.

Over

twice as many

people die of lung conditions over winter than during the summer

Keeping people healthy and out of hospital

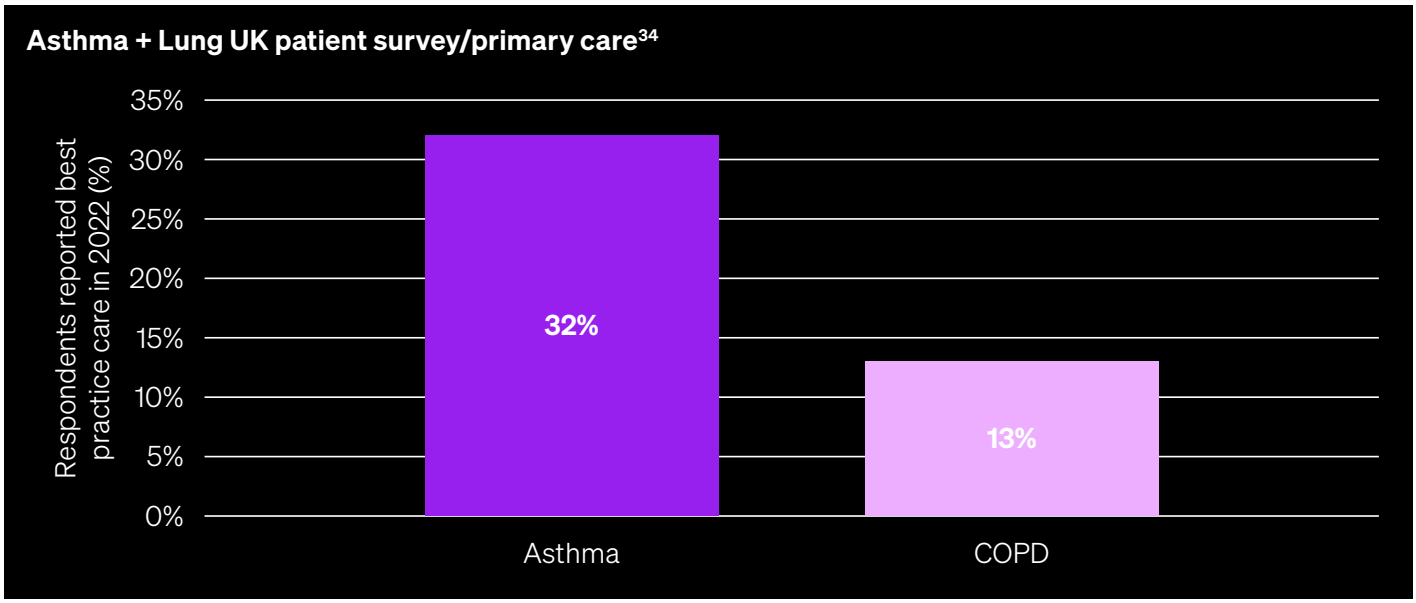
Each year the NHS faces significant challenges over the winter months, and lung conditions play a big role in driving this annual surge in demand. This increase is down to two factors: the annual winter increase in infections and viruses, and the fact that the cold weather causes those with existing lung disease to struggle more. The more that we can do to keep them healthy throughout the year, the less likely they are to experience problems over the winter.

What happens to hospital admissions for lung conditions over the winter?
Between 2019-2022, average winter asthma hospital admissions were 130% higher than summer admissions, while for COPD, winter admissions were 66% greater. This demonstrates the role that lung conditions play in placing additional demand on the NHS over the winter months. However, much of this burden is preventable with best practice diagnosis and care.

Yet despite the huge burden that these admissions place on the NHS, we know that with the right help and support, the vast majority of people with lung conditions will learn to live with and manage their condition successfully.

We know that most people with lung conditions aren't being well supported to manage their condition, and as a result far more people than necessary end up in hospital. We want to see improved help and support for those with lung conditions to improve their quality of life and to reduce this demand on the NHS, especially over the winter.

Avoiding exacerbations and hospitalisations
We know from our patient surveys that patients who receive best practice COPD care as recommended by NICE report fewer exacerbations and are better able to self-manage their condition. The majority of those with a diagnosed lung condition do not receive best practice ongoing care however, meaning that there is a huge opportunity to reduce hospital demand by better supporting patients post diagnosis.



Best practice is defined as:

- For COPD: those receiving the 'five fundamentals' of COPD care as outlined by NICE (smoking cessation, vaccinations, self-management plans, pulmonary rehabilitation, identification and optimisation of multimorbidity).

- For asthma: those receiving an annual asthma review, inhaler technique check and written action plan.

It is well known that many of those with asthma do not use their inhaler effectively as they have not been properly taught how to do this, and do not receive an annual inhaler technique check. This can lead to poorly controlled asthma which in turn leads to unplanned primary and secondary care use, the prescribing of oral corticosteroids, and in some cases, death.

This is why annual reviews and inhaler checks are so important, both for patients and the NHS. While it makes sense for this data to be used at an annual review, it could also be used proactively to identify those with poor condition management and address this at any point. Good asthma control is associated with fewer exacerbations, a lower usage of secondary care and lower all round costs.

The impact of improving ongoing care for those with asthma
In order to assess what impact the better use of inhalers could have, PwC analysed the impact of a change in guidelines to encourage GPs to look at a patient's inhaler refill data and use this to routinely monitor and improve a patients inhaler use. We also view the delivery of an inhaler technique check as a key part of this process, with both being delivered as part of an annual review which all patients should receive.

This analysis found that such a change **would result in savings of just over £7 million a year across England**. These savings would be achieved as a result of more uncontrolled asthma patients gaining control over their condition because of better inhaler use, after being given greater help and guidance by a healthcare professional.

This change could reduce the number of non-severe asthmatics struggling as a result of poor inhaler use by 45%, thereby significantly reducing their cost to the NHS while improving their quality of life and productivity. In addition, £244 million would be achieved in indirect costs such as improved productivity from this patient group, who would become significantly more economically active as a result of better health.

This intervention would **lead to reduction in unscheduled visits to primary and emergency care, and a 70% reduction in hospital bed days amongst asthmatics**, as shifting someone from poor control into good control means they are less likely to have an exacerbation and require care in hospital. Around 40% of this reduction in bed days are likely to occur over the winter months, helping to alleviate pressure on the NHS during this busy period.

As NICE guidelines state that all those with either asthma or COPD should have an annual review with a healthcare professional, and these healthcare professionals should already be able to access patient inhaler refill data, this intervention should be cost neutral to implement. The Quality Outcomes Framework (QOF) already incentivises primary care to deliver these reviews, however our patient surveys suggests that this is not being done routinely.

Avoiding readmissions to hospital
In 2017/18, the last full year for which figures are available, national 30 and 90-day readmission rates for COPD were 23.9% and 43.2% respectively[35] while other research has found that approximately 40% of COPD patients with exacerbations are re-admitted or die within 90 days of discharge.[36]

These shocking figures mean that high numbers of patients are leaving hospital only to come back and increase demand shortly afterwards. It is known that resource constraints, lack of staff engagement and knowledge, and complexity of the COPD population are some of the key barriers inhibiting effective implementation of discharge bundles of care, which include a package of evidence-based measures that are known to reduce the risk of readmission.[37]

This serious issue will only be solved by improving basic care within hospitals, such as the implementation of discharge bundles, along within improving access to pulmonary rehabilitation (see section below) in order to better support patients.

Recommendations

- **Annual reviews for all lung conditions** – We want all those with lung conditions to be given an annual review and medication check every year to support their health and their ability to self-manage their condition. While QOF already incentivises primary care to deliver these for asthma and COPD, our patient surveys make it clear that these happen in only a minority of cases, and there is significant room for improvement here.

- For those with well controlled conditions it may be appropriate for these reviews to happen via video call, but for those with poorly controlled symptoms this should be face-to-face. Those who experience poor control, including exacerbations, unscheduled care or overuse of reliever medication, should be called in for a proactive review and medication check.

- **Using patient data to improve their adherence to treatment** – When conducting an annual review for a patient who uses an inhaler, the clinician should review that patient's inhaler data and the number of refills they use annually in order to assess and improve their adherence to treatment. This process should include observation and optimisation of inhaler technique for each inhaler used by the patient.

- **Data and monitoring on annual reviews and medication checks** – The implementation of annual reviews and medication checks should continue to be incentivised and monitored through the Quality and Outcomes Framework (QOF), or any successor to this. Appropriate resources need to be applied so that more effective annual reviews can help reduce the impact on unscheduled care in primary and secondary care settings.

- **Reducing hospital readmission** – National work to reduce hospital readmission rates (e.g. sharing best practice discharge bundles of care and fully implementing NICE asthma quality statement 25 on following up those who have received emergency care) in order to help reduce hospital demand, especially over the winter months.

Providing treatments that works

Too many people living with lung conditions are missing out on the treatments they desperately need to live and stay well at home. Current access is limited, patchy and being held back by workforce shortages.

Access to pulmonary rehabilitation for all those eligible
Pulmonary rehabilitation (PR) is a physical exercise and education programme, primarily used for those with COPD and conditions such as idiopathic pulmonary fibrosis. It helps keep people's lungs heathy and is delivered in a group setting by healthcare professionals including physiotherapists, nurses and occupational therapists.[38]

90% of those who complete a PR programme report higher activity levels and an improved quality of life. Evidence has shown that PR:

- improves people's mobility and capacity to walk further, while reducing fatigue when carrying out day-to-day activities[39]
- supports better self management, provides positive mental health impacts and good opportunities for peer-to peer support
- reduces both moderate and severe exacerbations leading to fewer hospitalisations
- is proven to be cost-effective, and is substantially below the NICE threshold for cost effectiveness.[40,41]

This makes PR an important treatment and is essential in helping people manage their lung condition well. NICE guidelines state that all those at 3 or above on the MRC breathlessness scale[42] should be offered PR as one of the five fundamentals of COPD care.[43]

One study found that completion of PR led to a 22.5% reduction in moderate exacerbations per year and a 46% reduction in severe exacerbations in a year.[44] With exacerbations making up the majority of COPD costs, this makes PR an essential tool in reducing the economic burden of the disease in addition to improving the quality of life for those with the condition.

Current provision of PR in England
Unfortunately, despite its effectiveness, access to PR is extremely limited. The recently published Major Conditions Strategy[45] noted that only 36.9% of eligible patients were offered a referral to a PR service in 2021–22. Recent research by Imperial College London also found that in 2019, only 13.8% of eligible patients had been referred to PR, while only 4.3% had actually completed a course in that year.[46]

Clinical audit data from March to September 2022[47] found that in England, on average, 51% of eligible patients referred with stable COPD were offered a start date for PR within 90 days. However, an offer of PR is very different to actually starting a programme of PR and rates of those taking up PR are known to be very low, as our survey indicates. We believe that NHS England do collect data on numbers actually starting PR and we would like to see this made publicly available at ICB level.

The impact of increasing access to PR for all those eligible
PwC analysed the impacts of expanding the availability of PR to all those eligible. Current referral rates to PR were assumed to be 13.8% and completion rates were assumed to be 4.3%, making the completion rate of the referral population 31%. The analysis assumed an increase in referral rates to 80% and completion rates within the referral population to 50%.

This expansion of PR was found to result in £142.6 million of direct NHS savings related to reduced exacerbations, as well as a reduction of 194,000 bed days, 66,000 of which would be saved over the winter period.

In addition, this change would result in productivity saving of just under £4.8 million as a result of those with better controlled COPD becoming more economically active.

These figures strongly support the already well established fact that PR is an extremely cost-effective intervention.

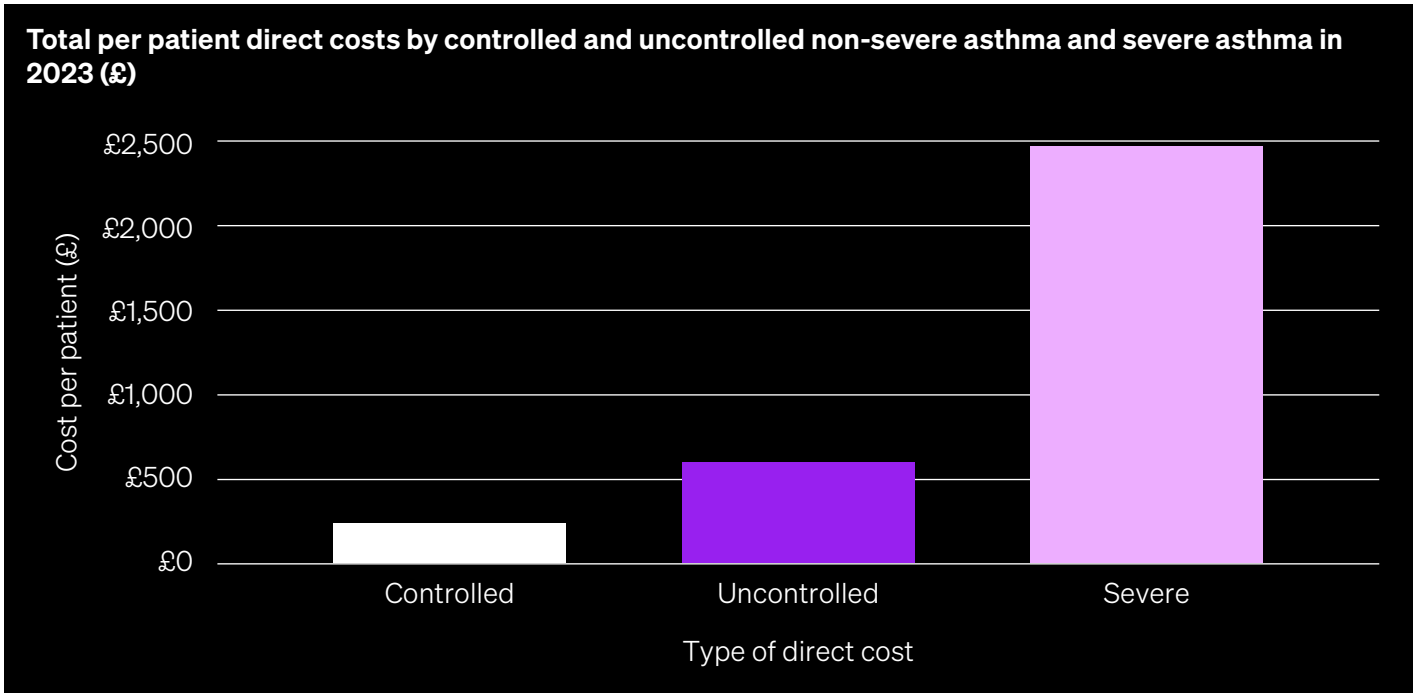
Recommendations

- **Fund workforce improvements for provision of PR** – We welcome NHS England's recent workforce strategy's commitment to expand the community rehabilitation services workforce. However, this expansion must now be fully funded in order to make it a reality.
- **Expand online PR** – We welcome NHS England's ongoing work to evaluate the effectiveness of online forms of PR and make these as widely available as possible. We would like to see additional resources committed to this as part of the Major Conditions Strategy, where PR should be a key action for improving chronic respiratory conditions post diagnosis.
- **Introduction of a rehabilitation lead in every ICB** – ICBs should have a single accountable rehabilitation lead to oversee the expansion and transformation of rehabilitation services in their area.
- **All those who fall within the PR eligibility criteria and have not yet completed a course of PR should be referred for this before the end of 2024/25.** We hope that the new QOF indicator, which has moved from "offered" to "referred" to PR, will help with this. However, it will not necessarily increase attendance or completion rates unless PR is made easier to access and better explained to patients.
- **Direct referrals for PR** – In order to improve uptake, eligible patients should not be offered PR but given a direct referral.

Access to biologic drug treatments for those with severe asthma

Severe asthma is a distinct condition which has an extremely significant impact on those affected. Over half of those with severe asthma have uncontrolled symptoms,[48] and many have to wait years receiving poor care before making any progress towards controlling their symptoms. This group also run the risk of serious side effects from extended periods on high dose steroid-based medication. While severe asthmatics tend to make up only around 5% of the total asthma population, such is the severity of their symptoms that this group is estimated to account for at least half of all economic expenditure on asthma.[49]

The analysis carried out by PwC found that costs for severe asthma patients were on average £2,477 per year, compared to £611 for non-severe asthmatics – just over 300% more.



Biologics can dramatically reduce the symptoms and number of exacerbations patients with severe asthma experience, and therefore significantly reduce the number of emergency admissions for respiratory care. Research demonstrates that biologics can reduce exacerbations by over 50%,[50] and our own 2020 patient survey found that 64% of severe asthma patients on biologics experienced reduced symptoms and 43% of these patients experienced reduced hospital admissions.[51]

However, despite their effectiveness, only small numbers of those with severe asthma are able to access these life-changing biologic treatments. Around three quarters of those with severe asthma are not currently receiving biologics,[52] and even after being referred to a specialist, the average waiting time before being initiated onto biologics is over a year.[53]

A recent report into the use of biologic drugs across Europe found that England lags significantly behind other countries.[54]

The use of biologic drugs for severe asthma in Europe

Ranking group	Ranking	2021
Upper	1	Germany
	2	Denmark
Middle	3	Sweden
	4	The Netherlands
	5	France
	6	Italy
Lower	7	England
	8	Finland

In England, the recent AAC Consensus pathway for managing uncontrolled asthma in adults has had a positive impact in expanding the uptake of biologic drugs, and has proven effective at identifying people with poorly controlled asthma who would benefit from specialist assessment and consideration of biologics/ other specialist therapies. Yet, as can be seen from the chat above, there is a very long way to go before all those eligible have access to biologic drugs. The guidelines for diagnosing severe asthma are also in need of updating.

Work commissioned by AstraZeneca suggests that the increased uptake of biologic drugs for severe asthma could result in £9.6 billion in productivity gain in England.[55] Total costs associated with the greater uptake of biologic drugs were found to be more than outweighed by the gains in labour productivity and additional tax payments to the Exchequer.[56]

Recommendations

- Full resourcing of the AAC Consensus pathway for managing uncontrolled asthma in adults, ensuring equitable access to biologics for all patients.
- NICE should develop a single comprehensive severe asthma guideline which makes clear how patients with suspected severe asthma can be recognised and referred to specialist care.

1 person

every 5 minutes

dies from a lung condition in the UK

Conclusion

Lung health in our country is in crisis. Despite costing the health service a huge amount, people are diagnosed late, do not receive the treatment they are entitled to, and far too often, end up in hospital acutely ill as a result. Much of this suffering could be prevented with consistent delivery of care in line with existing clinical guidelines.

We cannot solve these problems overnight, but the solutions are clear and evidence based. Our analysis shows they will save the NHS money and bed days, as well as benefitting the wider economy. We know what will work, but we need the will to do it.

The government must take this report seriously and implement our blueprint for change urgently. The millions of us living with a lung condition, and the many more who will develop one in future, deserve no less.

About this report

This report was written by Jon Foster, based on a technical report prepared by PwC and analysis carried out by Asthma and Lung UK. Data sources are listed in appendix 1.

Special thanks to Sarah MacFadyen, Laura Williamson, Henry Gregg, Anna Francis, Andrew Cumella, Andy Whittamore and Nick Hopkinson for their help in drafting this report.

Appendix 1: Data sources

1. The technical report produced by PwC upon which this report is based can be found **here**.

2. Respiratory emergency hospital admission age-standardised rates per 100,000 in 2020/21 were obtained from INHALE (https://fingertips.phe.org.uk/profile/inhale/data#page/4/gid/8000003/pat/159/par/K02000001/ati/15/are/E92000001/iid/93575/age/1/sex/4/cat/-1/ctp/-1/yrr/1/cid/4/tbm/1) for Clinical Commissioning Groups (CCGs). CCGs were mapped to ICBs and where multiple CCGs made up an ICB, the average of the rates was taken as the overall rate for the ICB. These were ranked from lowest to highest to create the map.

3. Respiratory mortality age-standardised rates per 100,000 in 2021 were obtained from NOMIS for local authorities (ICD-10 codes J00-J99) (www.nomisweb.co.uk/query/construct/components/stdListComponent.asp?menuopt=12&subcomp=100). Local authorities were mapped to ICBs and the death rates for all LAs with an ICB were averaged to obtain a death rate for the ICB. Respiratory death rates were not publicly available for ICB or CCG geographies and thus this method was selected as the most optimal. These were ranked from lowest to highest to create the map.

4. To create the map of ICB ranking by respiratory admissions and death rates, the average of both the respiratory admission rate rank and the respiratory death rate rank was taken. This average rank for each ICB was then ranked to provide an overall rank.

5. The English Indices of Deprivation 2019 was used to calculate the deprivation of each ICB. The Index of Multiple Deprivation is a unique measure of relative deprivation based on income deprivation; employment deprivation; education, skills and training deprivation; health deprivation and disability; crime, barriers to housing and services; and living environment deprivation. The higher the score, the more deprived the area. The scores were then ranked from lowest to highest to create the map.

Rank (1 is best)	ICB	Respiratory admissions (per 100,000)	Respiratory deaths (per 100,000)
1	Surrey Heartlands	566.75	77.20
2	North Central London	557.90	81.52
3	North West London	566.36	80.29
4	Sussex	574.03	79.80
5	South West London	584.08	80.25
6	Suffolk + North East Essex	648.87	69.80
7	Bath + North East Somerset, Swindon + Wiltshire	636.84	79.63
8	Frimley	563.53	85.39
9	Buckinghamshire, Oxfordshire + Berkshire West	603.63	82.10
10	Somerset	654.80	72.91
11	Cornwall + Isles of Scilly	553.54	90.72
12	Hertfordshire + West Essex	601.31	84.82
13	Dorset	652.03	80.45
14	Lincolnshire	650.95	82.47
15	Herefordshire + Worcestershire	638.67	87.54
16	Cambridgeshire + Peterborough	681.26	84.95
17	Mid + South Essex	606.05	96.77
18	Gloucestershire	823.25	79.79
19	Norfolk + Waveney	707.75	86.47
20	South East London	671.27	94.25
21	North East London	622.56	100.41
22	Bristol, North Somerset + South Gloucestershire	710.78	88.01
23	Devon	679.82	94.31
24	Kent + Medway	617.82	104.46
25	Leicester, Leicestershire + Rutland	733.42	86.85
26	Derby + Derbyshire	733.32	91.65
27	Nottingham + Nottinghamshire	685.28	99.39
28	Bedfordshire, Luton + Milton Keynes	742.95	95.86
29	Humber + North Yorkshire	766.40	96.56
30	Hampshire + Isle of Wight	736.02	103.88
31	Shropshire, Telford + Wrekin	805.84	99.60
32	Coventry + Warwickshire	738.59	106.22
33	Birmingham + Solihull	877.56	100.08
34	West Yorkshire	812.32	112.69
35	Northamptonshire	834.62	108.14
36	Staffordshire + Stoke-on-Trent	849.55	109.95
37	Black Country	825.60	117.12
38	Lancashire + South Cumbria	832.61	127.78
39	North East + North Cumbria	879.09	113.84
40	South Yorkshire	925.44	110.33
41	Greater Manchester	899.62	119.63
42	Cheshire + Merseyside	915.09	122.86

Appendix 2: References

1. NHS England. 2023. *Blood pressure checks at the barbers to prevent killer conditions.* Accessed **here** (August 2023).
2. BBC News. 2023. *£250 million for hospital beds in England this winter.* Accessed **here** (August 2023).
3. Asthma UK. 2019. *Living in Limbo: the scale of unmet need in severe asthma.* Accessed **here** (August 2023).
4. NHS England (2022) *Our ambition for respiratory disease.* Accessed **here** (August 2023).
5. British Lung Foundation. 2017. *Out in the Cold: lung disease, the hidden driver of NHS winter pressure.* Accessed **here** (August 2023).
6. Office for National Statistics (ONS). 2023. *Inequalities in mortality involving common physical health conditions, England: 21 March 2021 to 31 January 2023.* Accessed **here** (August 2023).
7. Eurostat. 2023. *Causes of death – standardised death rate by region of residence 2011–2018.* Accessed **here** (August 2023).
8. Naser, A.Y., Mansour, M.M., Alanazi, A.F.R. et al. 2021. *Hospital admission trends due to respiratory diseases in England and Wales between 1999 and 2019.* Accessed **here** (August 2023).
9. Asthma + Lung UK. 2021. *What is asthma?* Accessed **here** (August 2023).
10. Aaron SD, Vandemheen KL, FitzGerald JM, Ainslie M, et al. 2017. *Reevaluation of Diagnosis in Adults With Physician-Diagnosed Asthma*. Accessed **here** (August 2023) .
11. Wessex Academic Health Science Network (AHSN). 2023. *FeNO Programme Brief.* Accessed **here** (August 2023).
12. Ibid.
13. Asthma + Lung UK. 2022. COPD in the UK. *Delayed diagnosis and unequal care: the reality for people with chronic obstructive pulmonary disease (COPD) in the UK in 2022.* Accessed **here** (August 2023).
14. Asthma + Lung UK. 2023. *What is COPD?* Accessed **here** (March 2023).
15. Stone PW, Osen M, Ellis A, Coaker R, Quint JK. 2023. *Prevalence of Chronic Obstructive Pulmonary Disease in England from 2000 to 2019.* Accessed **here** (August 2023).
16. National Institute for Health and Care Excellence (NICE). 2015. *Quality standards and indicators briefing paper: Chronic obstructive pulmonary disease (COPD) update.* Accessed **here** (August 2023) .
17. Ibid.
18. Asthma + Lung UK. 2023. Results from Life With a Lung Condition survey available on request.
19. Asthma + Lung UK. 2023. *Respiratory index visualisations.* Asthma + Lung UK. Accessed **here** (August 2023).

20. Nuffield Trust. 2023. *Quality Watch: Smoking.* Accessed **here** (August 2023).
21. Ibid.
22. Logika Consultants. 2021. *Air Pollution and inequalities in London.* Accessed **here** (August 2023).
23. The Health Foundation (2022) *Tackling the inverse care law.* Accessed **here** (August 2023).
24. Asthma + Lung UK. 2023. *Spirometry and bronchodilator reversibility test.* Accessed **here** (August 2023).
25. Moore VC. 2012. *Spirometry: step by step.* Accessed **here** (August 2023).
26. National Institute for Health and Care Excellence (NICE). 2021. *Asthma: diagnosis, monitoring and chronic asthma management. NICE guideline.* Accessed **here** (August 2023).
27. National Institute for Health and Care Excellence (NICE). 2019. *Chronic obstructive pulmonary disease in over 16s: diagnosis and management. NICE guideline.* Accessed **here** (August 2023).
28. Asthma + Lung UK. 2023. *FeNO test.* Accessed **here** (August 2023).
29. National Institute for Health and Care Excellence (NICE). 2021. *Asthma: diagnosis, monitoring and chronic asthma management. NICE guideline.* Accessed **here** (August 2023).
30. NHS England. 2023. *Quality and Outcomes Framework guidance for 2023/24.* Accessed **here** (August 2023).
31. Health Foundation. 2021. *Direct and Indirect Health Impacts of COVID-19 in England: Short Paper.* Accessed **here** (August 2023).
32. Wessex AHSN. 2022. *FeNO programme impact.* Accessed **here** (August 2023).
33. Asthma + Lung UK. 2023. *Diagnosing the problem: right test, right time.* Accessed **here** (August 2023).
34. Asthma + Lung UK. 2023. Results from Life With a Lung Condition survey available on request.
35. NACAP. 2020. *Outcomes of patients included in the 2017/18 COPD clinical audi.* Accessed **here** (August 2023).
36. Echevarria C, Steer J, Heslop-Marshall K, et al. 2017. *The PEARL Score Predicts 90-Day Readmission or Death After Hospitalisation for Acute Exacerbation of COPD. Thorax.* Accessed **here** (August 2023).
37. Miravitlles M, Bhutani M, Hurst JR, Franssen FME, van Boven JFM, Khoo EM, Zhang J, Brunton S, Stolz D, Winders T, Asai K, Scullion JE. 2023. *Implementing an Evidence-Based COPD Hospital Discharge Protocol: A Narrative Review and Expert Recommendations.* Accessed **here** (August 2023).
38. Asthma + Lung UK. 2021. *Pulmonary rehabilitation (PR).* Accessed **here** (August 2021).
39. NHS England. 2023. *Pulmonary Rehabilitation.* Accessed **here** (August 2023).
40. Burns, D.K., Wilson, E.C.F., Browne, P. et al. 2016. *The Cost Effectiveness of Maintenance Schedules Following Pulmonary Rehabilitation in Patients with Chronic Obstructive Pulmonary Disease: An Economic Evaluation Alongside a Randomised Controlled Trial.* Accessed **here** (August 2023).
41. Mosher CL, Nanna MG, Jawitz OK, *et al.* 2022. *Cost-effectiveness of Pulmonary Rehabilitation Among US Adults With Chronic Obstructive Pulmonary Disease.* Accessed **here** (August 2023).
42. The Primary Care Respiratory Society. 2021. *MRC Dyspnoea Scale.* Accessed **here** (August 2023).
43. NHS England. 2021. *Quality and Outcomes Framework Guidance for 2021/22.* Accessed **here** (August 2023).
44. van Ranst D, Stoop WA, Meijer JW, Otten HJ, van de Port IG. 2014. *Reduction of exacerbation frequency in patients with COPD after participation in a comprehensive pulmonary rehabilitation program.* Accessed **here** (August 2023).
45. DHSC. 2023. *Major Conditions Strategy: case for change and our strategic framework.* Accessed **here** (August 2023).
46. Stone PW, Osen M, Ellis A, Coaker R, Quint JK. 2023. *Prevalence of Chronic Obstructive Pulmonary Disease in England from 2000 to 2019.* Accessed **here** (August 2023).

47. NACAP. 2022. *Pulmonary Rehabilitation regional reports.* Accessed **here** (August 2023).

48. Wang E, Wechsler ME, Tran TN, *et al.* 2020. *Characterization of Severe Asthma Worldwide.* Accessed **here** (August 2023).

49. Global Burden of Disease Collaborative Network. 2019. *Global Burden of Disease Study 2019.* Accessed **here** (August 2023).

50. Kauppinene, R et al. 2019. *The first year of treatment predicts the prognosis of asthma over 25 y—A prospective study.* Accessed **here** (August 2023).

51. Asthma + Lung UK. 2020. *Do No Harm: safer and better treatment options for people with asthma.* Accessed **here** (August 2023).

52. Wang E, Wechsler ME, Tran TN, *et al.* 2020. *Characterization of Severe Asthma Worldwide.* Accessed **here** (August 2023).

53. Rupani H, Rose J, Cumella A, *et al.* 2022. *What is the severe asthma patient journey to biologic initiation in UK severe asthma centres?* Accessed **here** (August 2023).

54. LOGEX & IVM (Instituut Verantwoord Medicijngebruik – The Dutch Institute for Rational Use of Medicine), (September 2023) International Comparison Biologics Uptake 2023 – Severe Asthma: **https://logex.com/uk/international-medicines-uptake-comparator**.

55. ABPI. 2022. Transforming Lives, Raising Productivity. Accessed **here** (August 2023).

56. Ibid.

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