Unity Insights

# Polypharmacy: Getting the Balance Right

Case studies and health economic insights into the Health Innovation Network Polypharmacy Programme

# Contents

Chapter 1

# Problematic Polypharmacy

## Context

The Health Innovation Network developed and led the national polypharmacy programme between 2021 and 2025, aimed at addressing the challenges associated with the use of multiple medications, particularly in older adults and those with multiple long-term conditions. The Polypharmacy Programme has been executed via its three pillars, and included the establishment of regional and local learning systems:

- **Pillar 1 – Population Health Management**: Population health management utilising the NHS Business Services Authority (NHSBSA) 'polypharmacy prescribing comparators' dataset to highlight variation in polypharmacy prescribing at GP Practice, PCN and ICBlevel and identify patients for prioritisation for a Structured Medication Review (SMR).
- **Pillar 2 – Education and Training**: Delivering the Polypharmacy Action Learning Sets (ALS) to upskill the primary care workforce to be more confident about stopping unnecessary medicines.
- **Pillar 3 – Public Behaviour Change**: Deploying a selection of public-facing campaigns to support patients to understand and get the most from their Structured Medication Review.

## Purpose

A full review of the Polypharmacy Programme has been conducted by Health Innovation Network South London. To accompany this review, the Health Innovation Network have commissioned Unity Insights to provide additional quantitative and health economic insights into elements of the Polypharmacy Programme.

Working in collaboration with the Polypharmacy central team and regional Health Innovation Networks, a suite of case studies have been developed incorporating anecdotal evidence of HIN implementation, NHSBSA polypharmacy comparator data, and academic literature to estimate health outcomes and potential health economic savings. In addition to these case studies, efforts have been made to estimate the cost of delivering the Polypharmacy national programme.

# Programme implementation

The core principles of the Polypharmacy Programme are to support local systems to address problematic polypharmacy by identifying patients at potential risk of harm from their medicines, and to support the Structured Medication Review process. These ambitions were delivered through the following three workstreams:

## Pillar 1

### Population Health Management

Promoting the use of the NHS Business Services Authority (NHSBSA) polypharmacy prescribing comparators (EPACT2) to enable PCNs to understand their polypharmacy risks and identify patients to prioritise for a structured medication review by retrieving NHS numbers from the NHSBSA.

Unity Insights developed an extension to the NHSBSA EPACT2 Polypharmacy Prescribing Comparators tailored for Health Innovation Network (HIN) colleagues and ICBs to identify at an ICB-level polypharmacy comparators above national averages, also incorporating forecasting analysis.

## Pillar 2

### Education and Learning

The delivery of the Polypharmacy Action Learning Sets (ALSs) to upskill the primary care workforce to be more confident about stopping unnecessary medicines.

Developed by Health Innovation Wessex, this training enable primary care clinicians to explore the complex topic of polypharmacy and empower them to address complex medication issues and to stop unnecessary medicines through shared decision making with the patient. Courses are delivered as three half day sessions last three hours each.

## Pillar 3

### Patient Behaviour Change

The development of a suite of public-facing resources to change how patients perceive their medicines, and to encourage them to engage with the Structured Medication Review process and to open up about their medicines with their clinician.

Working with academic partners, a range of patient information materials were developed to better prepare people who have been invited for a structured medication review. To support the uptake of these materials, they were translated into eleven additional languages, audio versions were developed for those living with visual impairments and Easy Read for those with learning disabilities.

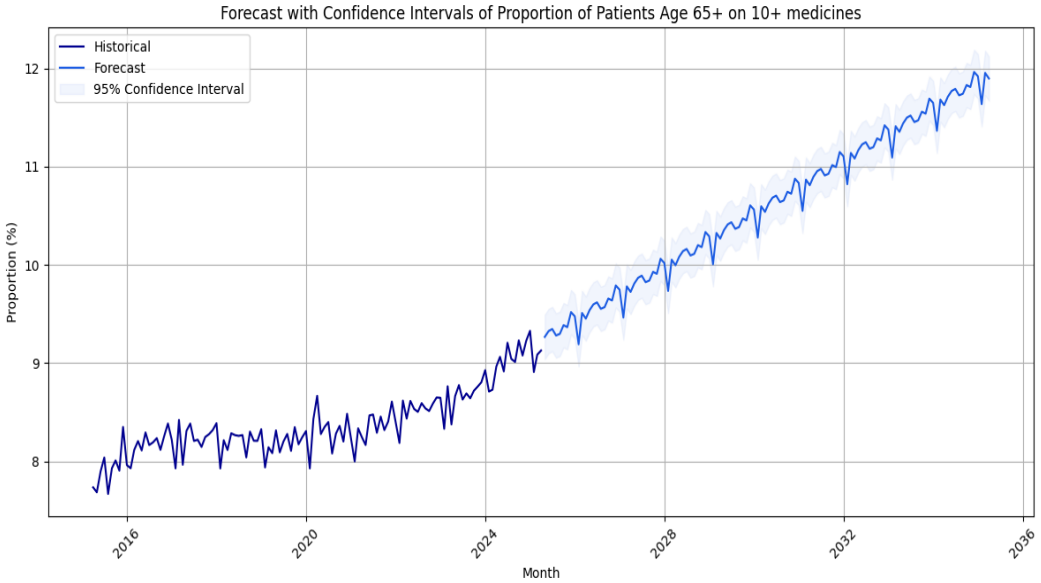
# Problematic Polypharmacy

Polypharmacy, defined as the concurrent use of multiple medications, can be both beneficial and risky. While it often reflects evidence-based care for managing chronic conditions, it can also lead to adverse drug reactions, medication errors, and reduced adherence, posing significant risks to patient safety and quality of life. It is estimated that up to 50% of prescribed medications are not taken as intended, and adverse drug reactions contribute to a significant proportion of hospital admissions, particularly in older adults (World Health Organisation, 2003).

A study produced by Payne et al. (2014) on Scottish primary care data linked to secondary care data set out to understand the association between polypharmacy and adverse outcomes. The results of the study, based on 180,815 patients, discovered that patients on 10+ medicines are significantly more likely to require an unplanned hospital admission compared to patients on 1-3 medicines (**4.19 odds ratio**).

- Data from the NHSBSA Polypharmacy Prescribing Comparators via EPACT2 revealed that in March 2025, a total of **718,577 patients aged 65 and over were identified to be receiving 10 or more medicines, equal to 9.1% of the over-65 population.**
- If current trends continue, an estimated **1,148,279 patients aged 65 and over will be prescribed 10 or more medicines in March 2035**, equal to an **additional 415,722 patients,** with significant cost, safety and workload implications.
- Applying findings from Payne et al. (2014), this population may accrue **77,703 additional unplanned admissions.** This reduces to 46,217 if patients can be safely managed at 7-9 medicines.

| Group | Odds ratio | Additional admissions |
|---|---|---|
| 7-9 medicines | 2.28 | 46,217 |
| 10+ medicines | 4.19 | 77,703 |



Chapter 2

# Methodology

# Methods

## Case study selection

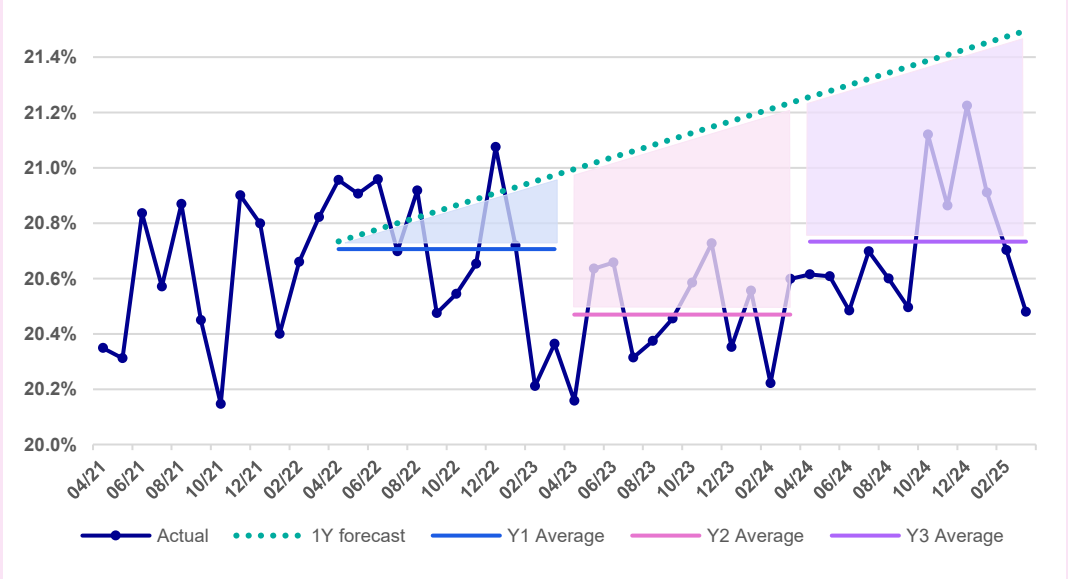
ICBs involved in the Health Innovation Network Polypharmacy Programme were required to identify a primary polypharmacy prescribing comparator for their region to focus on. ICBs that have demonstrated improvements on baseline forecasts have been identified for a case study by the Polypharmacy programme team. Case studies cover the following polypharmacy comparators:

- Multiple prescribing of anticoagulants and antiplatelet medicines
- Percentage of patients prescribed 5 or more analgesic medicines
- Percentage of patients prescribed 2 / 3 medicines with moderate to high anticholinergic burden

## Forecasting prescribing with EPACT2

EPACT2 Polypharmacy prescribing data has been extracted for all ICBs for each of the identified polypharmacy comparator case studies. For each study, a linear forecast has been developed for the period 2022 to 2025 using a one-year baseline (2021/22). The difference between the forecast and the actual prescribing data (shaded area in the chart, right) for each year has been utilised to calculate a percentage change in the number of people considered "polypharmic".

To consider the potential value had the whole of England realised similar results to the case study, linear forecasts over the same period have been developed for each ICB to show the potential opportunity. The annual percentage change realised in the case study has then been applied to each ICB and aggregated nationally to estimate the number of patients who may have avoided polypharmacy had results seen in the case study been delivered across all ICBs in England.



# Methods

## Literature review

A desktop review of academic literature, policy documentation and web-based articles has been undertaken to identify the potential improvements in health outcomes by potentially avoided adverse drug interactions in patients exceeding the polypharmacy comparator thresholds. A number of academic papers and grey literature has been utilised for the development of each case study. This literature review has been guided by the Polypharmacy Programme team.

## Health economic methodology

A retrospective review of the potential benefits realised across each of the case studies has been conducted. The appraisals were conducted in line with *The Green Book* (HM Treasury, 2022) methodology. HM Treasury guidance is applied throughout the public sector to ensure consistent estimations for costs and benefits. The benefits presented in this analysis include an assumption-specific optimism bias correction factor applied to each benefit stream – this is an adaption of a model created by the Manchester Combined Authority research team and included as supplementary guidance within *The Green Book*. Monte Carlo sensitivity analysis has been conducted to mitigate uncertainty in the estimates in each model – providing a range of estimates of the potential benefits for each case study.

Where literature has identified improvements in health outcomes, unit costs for each of these health outcomes have been derived through analysis of HRG data, NHS unit cost databases, or using published economic values found within literature sources. Costs have not been included in the analysis of each case study due to an inability to attribute costs to each polypharmacy comparator; however, supplementary analysis has been conducted showing the costs of training to deliver structured medication reviews.

## NHSBSA deprescribing cost-reduction analysis

The NHSBSA has provided a bespoke analysis to demonstrate the reduction in medicines costs for patients for the purpose of this analysis. Patients whose prescribing data suggests receiving a greater number of medicines than the polypharmacy comparator threshold for two or more months, followed by a period of two or more months prescribing below the polypharmacy comparator threshold have been identified. For qualifying patients, a review of net ingredient costs whilst above and below the threshold has been conducted to provide an average cost reduction per patient. The graphic, right, demonstrates non-exhaustive examples of passing and failing combinations.

| | Month | | | | | |
|---|---|---|---|---|---|---|
| Included? | -3 | -2 | -1 | 0 | 1 | 2 |
| Yes | >=3 | >=3 | >=3 | 1-2 | 1-2 | 1-2 |
| Yes | 0 | >=3 | >=3 | 0 | 1-2 | 1-2 |
| No | >=3 | >=3 | >=3 | 1-2 | 0 | 0 |
| No | >=3 | 0 | >=3 | 1-2 | 0 | >=3 |

*Green rows = patient meets the medicine reduction requirements to be included in cost-reduction analysis.

# Caveats and limitations

## SMR data linkage

- NHSBSA medicines cost reductions are calculated based on prescribing data and may incorporate patients who have not received an SMR. Future analyses may wish to identify NHS numbers of patients who have received a SMR to more accurately identify cost savings realised through SMRs.

## Medicine cost savings

- The medicines cost savings expressed in each case study solely incorporate the medicines relevant to the NHSBSA polypharmacy prescribing comparator being reviewed; evidence from NHSBSA suggests additional medicines savings for other drug groups may also be realised.

## Deprescribing assumptions

- It has been assumed that a patient identified as falling below a polypharmacy comparator threshold experiences this benefit for one year. This includes the reduced cost of medicines and improve health outcomes. Patient-level data would be required to avoid this assumption.

## Incorporating literature

- Where literature has been used to evidence improvements in health outcomes, best efforts have been made to ensure that the literature utilised aligns with the age of the population in each case study (65 / 75 years or older).

## Anticholinergic burden

- For the purpose of this analysis a reduction in falls has been the primary focus as a result of reducing anticholinergic burden. In older patients, reducing anticholinergic burden may realise additional benefits, including reducing dementia rates.

## Forecasting methodology

- ICBs with historic downward trends in their prescribing activity which would continue below zero if forecast forward have been capped at 0 patients exceeding the polypharmacy comparator threshold.

Chapter 3a

# Patients prescribed multiple antiplatelets and anticoagulants

# Antiplatelets and Anticoagulants – Surrey Heartlands ICB

**Definition:** Patients aged 65 and over prescribed three or more unique medicines that have an anticoagulant or antiplatelet action.
**Risk:** Triple antithrombotic therapy typically refers to the combined use of an oral anticoagulant with dual antiplatelet therapy. This combination is associated with patients managing atrial fibrillation whilst also requiring antiplatelet therapy after coronary stenting. This combination of drugs, compared to dual therapy or monotherapy, substantially raises the risk of major bleeding, resulting in hospitalisation (Hansen et al., 2010).

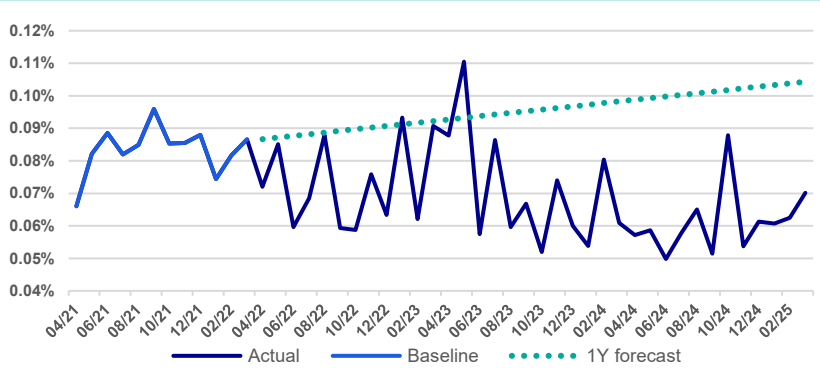
## Implementation

"Working closely with the team at Health Innovation Kent Surrey Sussex has given us the opportunity to build on work in an existing priority area. Prescribing of antiplatelets and anticoagulants was identified as a high-risk area in Surrey Heartlands and we monitor this using 6 monthly data reviews. The HIN polypharmacy programme has complemented and supported this work. The training and accreditation of 2 polypharmacy trainers as part of the HIN programme has had a local impact clinically through their peer support, demonstrated, for example, in them sharing their expertise and presenting several case studies at the Surrey Heartlands Community of Practice events.

The polypharmacy programme focus on structured medication reviews has been key in giving our clinicians access to skills and resources that can support them during conversations with patients when implementing this advice. This has helped us deliver the outcomes we can see in the polypharmacy comparator data; co-prescribing of antiplatelets and anti-coagulants has decreased, rather than the forecast increase that we might have expected to see with no intervention".

- Nikki Smith, Head of Medicines Safety and Patient Safety Specialist for Surrey Heartlands Integrated Care System

## Impact




| Year | Forecast | Actual | Change (%) | # Patients |
|---|---|---|---|---|
| 2022/23 | 0.089% | 0.073% | 18.3% | 5.53 |
| 2023/24 | 0.095% | 0.071% | 25.9% | 8.58 |
| 2024/25 | 0.102% | 0.061% | 39.6% | 14.20 |

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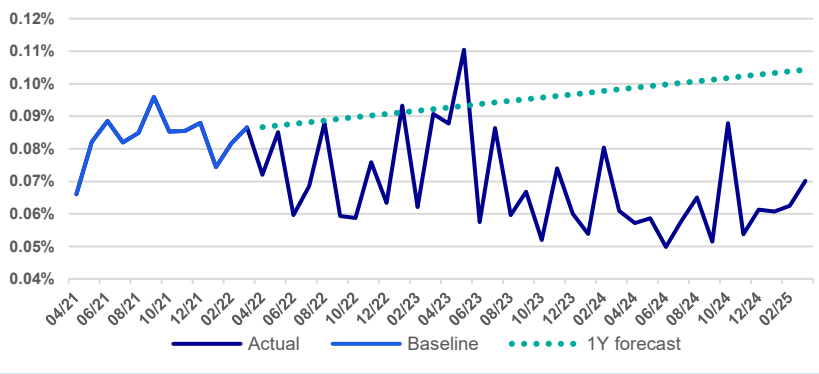


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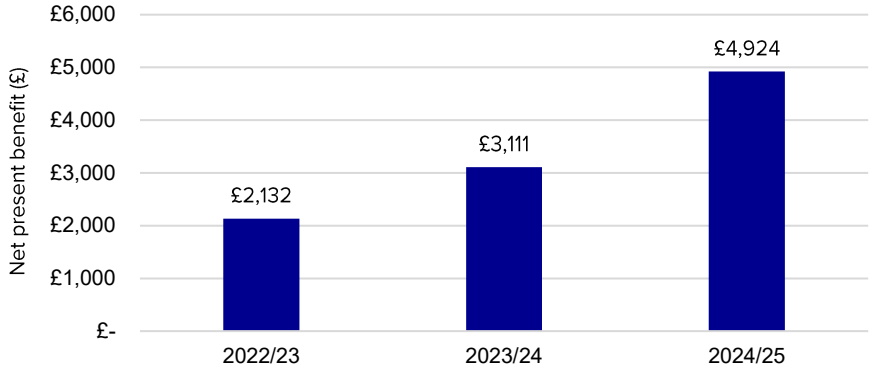
# Antiplatelet and anticoagulants – health economic benefits

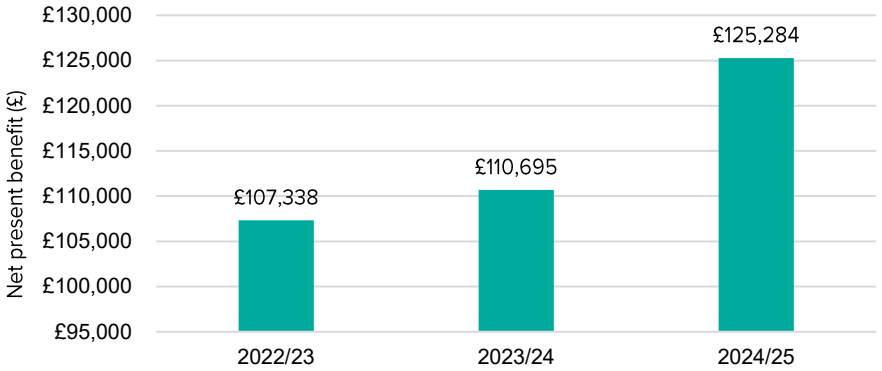
- As a result of the desktop review, the following benefits (below) have been identified as attributable to moving patients from triple therapy to dual therapy. Additionally, the NHSBSA have provided average patient medicines costs for patients who exceeded 3 or more antiplatelets or anticoagulants, whose data suggest prescribing then returned to below 3.
- These benefits are considered cash-releasing (reduction in medicines costs) or non-cash releasing (reduction in hospital admissions for bleeds, and ambulance conveyances).
- The Hansen et al. (2010) study of 118,606 patients found **that triple therapy had an annual per-patient bleed rate requiring hospitalisation of 15.7%, compared to 7% for patients on dual therapy**.
- ICD-10 codes utilised in the study have been converted to HRG codes, and a weighted HRG cost has been derived using NHS national cost collection and the frequency of bleeds at each site, as reported by Hansen et al. (2010).
- Benefit-specific optimism bias is applied to each benefit stream in the model in accordance with HM Treasury *The Green Book* principles.
- Monte-Carlo sensitivity analysis has been used on all benefit inputs to demonstrate the likely range of the monetary savings.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Reduction in medication costs** | Number of patients avoiding or deprescribed from triple therapy | x | Difference in medicines costs below polypharmacy threshold | x | Optimism bias correction | | |
| **Reduction in hospital admissions for bleeds** | Number of patients avoiding or deprescribed from triple therapy | x | Difference in bleeding events between triple and dual therapy | x | Average HRG cost for bleeding event | x | Optimism bias correction |
| **Reduction in ambulance conveyances for bleeds** | Number of patients avoiding or deprescribed from triple therapy | x | Difference in bleeding events between triple and dual therapy | x | Average HRG cost for ambulance conveyance (see-treat-convey) | x | Optimism bias correction |

# Antiplatelet and anticoagulants – health economic benefits

- The graphs presents the net present benefits for the Surrey Heartlands ICB, adjusted for optimism bias, for the period 2022 to 2025.
- An additional scenario has been calculated, presenting the estimated benefits had each ICB in England delivered the same percentage change in the proportion of patients prescribed multiple antiplatelet and anticoagulant medicines (Y1 = 18.3%, Y2 = 25.9%, Y3 = 39.6%).




The total value of the benefit streams identified amount to £10.2k across 2022/23 to 2024/25. Sensitivity analysis suggests that at a 90% confidence interval (CI), the total benefits range between £9.6k and £10.8k. When extrapolated across all ICBs, an estimated £343k could have been saved, ranging between £305k and 382k at 90% CI.

**£10k**

**Surrey Heartlands ICB** total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

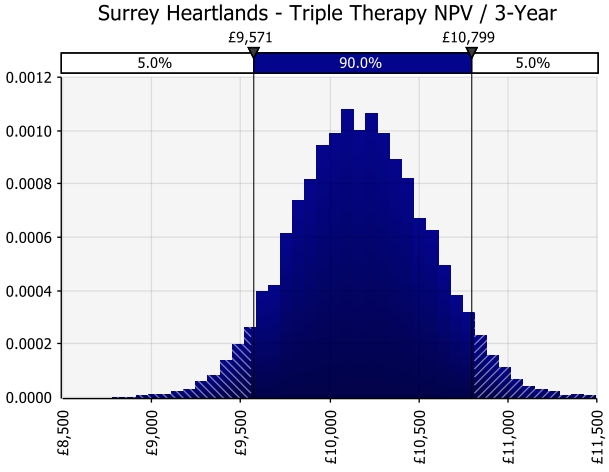
**£343k**

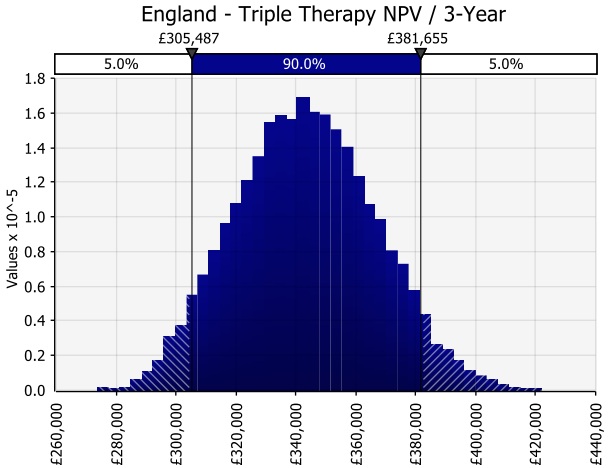
When extrapolated across **all ICBs in England**, total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

# Antiplatelet and anticoagulants – health economic benefits

The table below provides a breakdown of the estimated benefits by benefit stream. Additionally, charts for each scenario demonstrating the Monte Carlo sensitivity analysis across the three-year period have been provided.

| Benefit | Surrey Heartlands ICB | England (Opportunity) |
|---|---|---|
| Reduction in medicines costs | £4.5k | £151.5K |
| Reduction in bleeds requiring hospitalisation | £5.1k | £170.7K |
| Reduction in ambulance conveyances | £0.6k | £20.7k |
| **Total** | **£10.2K** | **£342.8K** |



Chapter 3b

# Patients prescribed 2 / 3 medicines with moderate to high anticholinergic burden

# Moderate to high anticholinergic burden – NHS Derby and Derbyshire

**Definition:** Patients aged 65 and over prescribed 3 or more medicines with moderate to high anticholinergic burden.
**Risk:** Anticholinergic burden refers to the cumulative effect of taking multiple medicines with anti-cholinergic activity. Frequently prescribed anticholinergic medicines include antidepressants, antiemetics, antipsychotics, and some medicines for urinary urgency and incontinence. Elevated anticholinergic burden is associated with dementia, cognitive impairment, and falls – a reduction in falls being the primary benefit in this analysis.

## Implementation

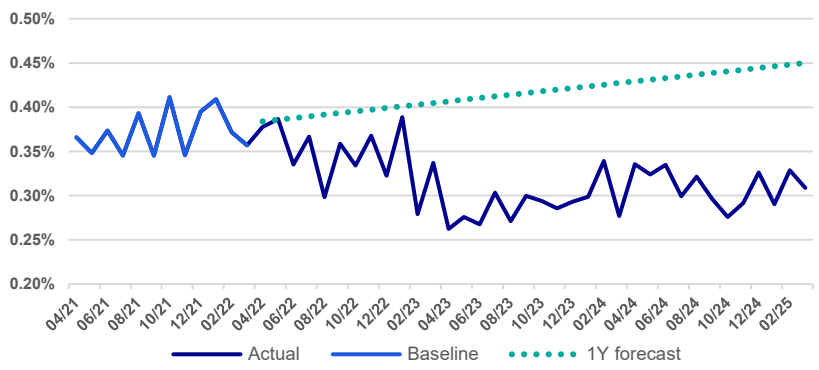
Derby and Derbyshire ICB and pharmacy leaders from across the Joined-Up Care Derbyshire (JUCD) system worked collaboratively with HI East Midlands proactively championing and promoting the programme and its offer.

132 GPs, Pharmacists and Allied Health Professionals prescribers participated in National and Local Polypharmacy Action Learning Sets. One Derby Trainer, ICB pharmacist, Jennifer Butterfield was accredited through the HIN Polypharmacy Train the Trainer programme and delivered across two local cohorts, which provided easier access for GPs and Pharmacists to attend.

“We responded to feedback from prescribers and adjusted the delivery of the local Action Learning Sets to make them more accessible to more prescribers and staff involved in repeat prescribing – it is fantastic that so many staff across our system have been able to attend the local, regional or national sessions, and then put in to practice their learning, evidenced by our improved prescribing data – this programme will have a lasting impact for our staff and patients”

- Kate Needham, Chief Pharmacist, Derbyshire Community Health Services (DCHS) NHS

## Impact




| Year | Forecast | Actual | Change (%) | # Patients |
|---|---|---|---|---|
| 2022/23 | 0.39% | 0.35% | 12.3% | 8.84 |
| 2023/24 | 0.42% | 0.29% | 30.7% | 23.46 |
| 2024/25 | 0.44% | 0.31% | 29.2% | 23.36 |

# Moderate to high anticholinergic burden – NHS Herefordshire and Worcestershire

**Definition:** Patients aged 65 and over prescribed 2 or more medicines with moderate to high anticholinergic burden.
**Risk:** Anticholinergic burden refers to the cumulative effect of taking multiple medicines with anti-cholinergic activity. Frequently prescribed anticholinergic medicines include antidepressants, antiemetics, antipsychotics, and some medicines for urinary urgency and incontinence. Elevated anticholinergic burden is associated with dementia, cognitive impairment, and falls – a reduction in falls being the primary benefit in this analysis.

## Implementation

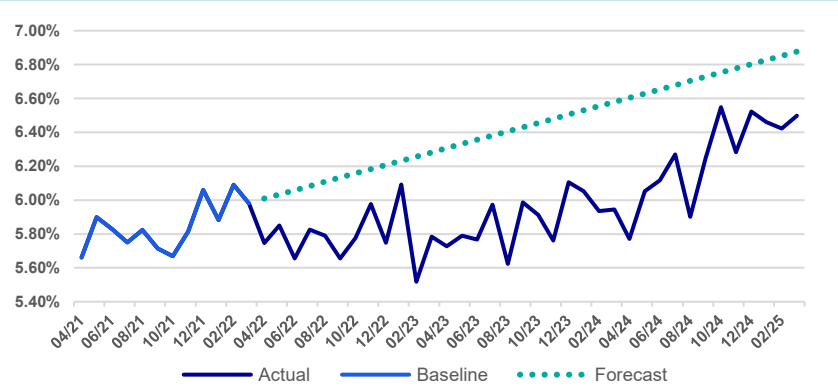
"Tackling problematic polypharmacy has always been a key priority in Herefordshire and Worcestershire ICB. We have prioritised the delivery of polypharmacy reviews and the principles of shared decision making and health literacy via recent iterations of our primary care prescribing contracts. We have also provided EMIS searches and templates to facilitate this.

The Health Innovation Network education offers were widely promoted and accessed by the system and Hereford & Worcestershire maintained a strong presence in the West Midlands Community of Practice. Across the ICB, HIN patient facingpatient-facing resources have been increasingly accessed, supporting improved patient understanding and engagement in medication management.

This work, together with the RPS/RCGP Repeat Prescribing Toolkit and the EPACT2 oversupply dashboard, has provided PCNs and practices with further evidence-based tools to achieve good prescribing outcomes for both patients and the wider NHS".

- Paul Martin, Professional Adviser – Pharmacy & Medicines, NHS Herefordshire and Worcestershire

## Impact




| Year | Forecast | Actual | Change (%) | # Patients |
|---|---|---|---|---|
| 2022/23 | 6.15% | 5.78% | 5.9% | 49.73 |
| 2023/24 | 6.44% | 5.88% | 8.7% | 78.48 |
| 2024/25 | 6.74% | 6.26% | 7.2% | 68.71 |

# Moderate to high anticholinergic burden – NHS West Yorkshire

**Definition:** Patients aged 75 and over prescribed 2 or more medicines with moderate to high anticholinergic burden.
**Risk:** Anticholinergic burden refers to the cumulative effect of taking multiple medicines with anti-cholinergic activity. Frequently prescribed anticholinergic medicines include antidepressants, antiemetics, antipsychotics, and some medicines for urinary urgency and incontinence. Elevated anticholinergic burden is associated with dementia, cognitive impairment, and falls – a reduction in falls being the primary benefit in this analysis.

## Implementation

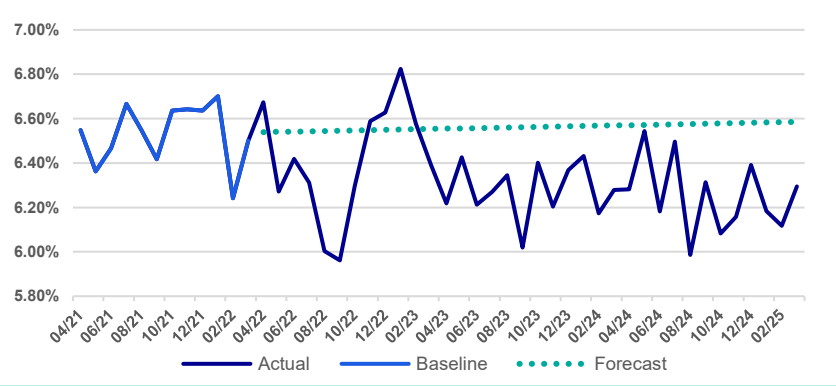
West Yorkshire was identified as a key area of focus due to significant health inequalities and high levels of deprivation. To address this, we built strong local partnerships and delivered targeted interventions tailored to community needs. With the support of Heather Smith, Consultant Pharmacist for Older People and a committed champion of the programme, we embedded ourselves in local forums and focus groups, using trusted networks to communicate the importance SMRs to GPs and Primary Care Networks.

The programme team also supported West Yorkshire's Overprescribing work delivering training, promoting resources like Me and My Medicines, and contributing to groups addressing opioid use and anticholinergic burden. Collaborative events such as targeted masterclasses, Community of Practices and one-to-one discussions with GPs and PCNs enabled the development of tailored data packs identifying where focused SMRs could have the greatest impact without adding pressure to general practice.

"We have really appreciated all the support from the Polypharmacy Programme Team at Health Innovation Yorkshire & Humber and I don't think we'd have made nearly as much progress without this."

– Heather Smith, Consultant Pharmacist for Older People

## Impact




| Year | Forecast | Actual | Change (%) | # Patients |
|---|---|---|---|---|
| 2022/23 | 6.55% | 6.41% | 2.0% | 24.29 |
| 2023/24 | 6.56% | 6.28% | 4.3% | 51.37 |
| 2024/25 | 6.58% | 6.25% | 4.9% | 59.51 |

# Moderate to high anticholinergic burden– health economic benefits

- As a result of the desktop review, the following benefits (below) have been identified as attributable to reducing a patient's anticholinergic burden. As per the previous case study, NHSBSA have also provided average patient medicines costs for patients who exceeded 3 or more medicines with a moderate to high anticholinergic burden, whose data then suggests prescribing that returns to below 3.
- NICE (2025) estimates that around a **third of people over the age of 65 fall at least once a year** – for the purpose of modelling, this is the assumed baseline risk of falling. A study by Green et al. (2020) identifies that **patients with a daily ACB score of 5 are twice as likely to experience a fall** than those with no ACB burden – an adjusted hazard ratio has been calculated to demonstrate a reduction in ACB burden by lowering the number of moderate to high anticholinergics a patient takes. It has been assumed that **12.8% of falls require hospitalisation** (Collerton et al., 2012).
- A report by Tian et al. (2013) explores the system-wide costs of falls in the over 65s in Torquay, including the **cost of the fall event (£2,850)**, and **subsequent acute (£713)**, **community (£2,375)** and **social care (£950)** costs in the following year. These have been uprated with NHS Cost Inflation Index Pay and Prices to present day prices.
- Benefit specific optimism bias is applied to each benefit stream in the model in accordance with HM Treasury *The Green Book* principles.
- Monte-Carlo sensitivity analysis has been used on all benefit inputs to demonstrate the likely range of the monetary savings.

**Reduction in medication costs**

Number of patients avoiding 3+ moderate to high anticholinergics x Difference in medicines costs below polypharmacy threshold x Optimism bias correction

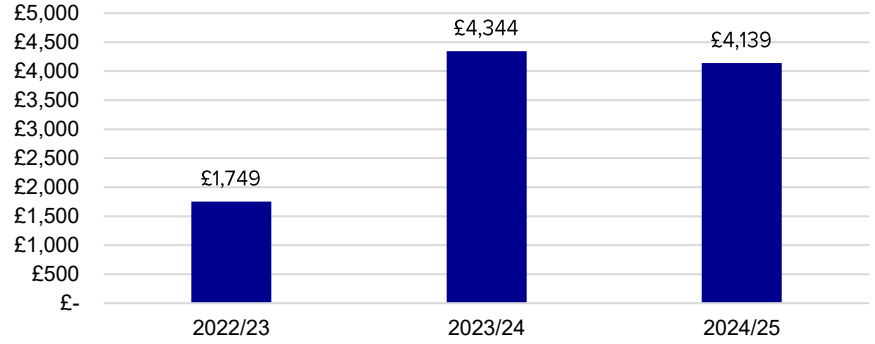
**Reduction in acute, community and social care costs***

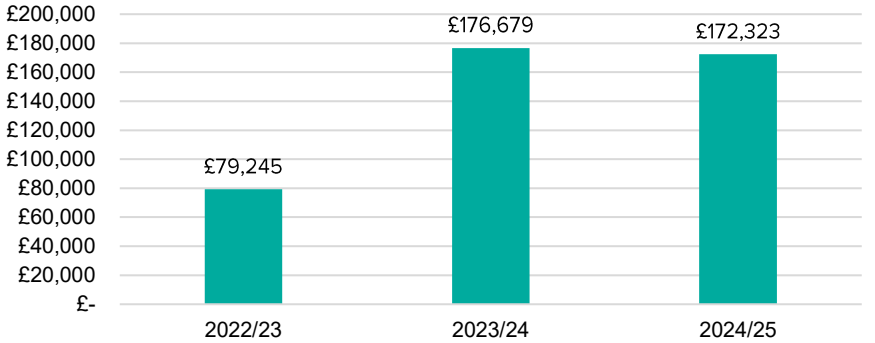
Number of patients avoiding 3+ moderate to high anticholinergics x Adjusted ACB fall risk x Percentage of falls requiring hospitalisation x System-wide costs of a fall x Optimism bias correction

* Each acute, community and social care cost is calculated as its own benefit stream to demonstrate where potential benefits may be realised within the system.

# Moderate to high anticholinergic burden – health economic benefits

- The graphs show the net present benefits for the Derby and Derbyshire ICB, adjusted for optimism bias, for the period 2022 to 2025.
- An additional scenario has been calculated, presenting the estimated benefits had each ICB in England delivered the same percentage change as Derby and Derbyshire ICB.




The total value of the benefit streams identified amount to £10.2k across 2022/23 to 2024/25 for Derby and Derbyshire ICB. Sensitivity analysis suggests that at a 90% confidence interval (CI) the total benefits range between £7.3k and £12.4k. When extrapolated across all ICBs, an estimated £428k could have been saved, ranging between £308k and 515k at 90% CI.

**£10k**

**Derby and Derbyshire ICB** total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

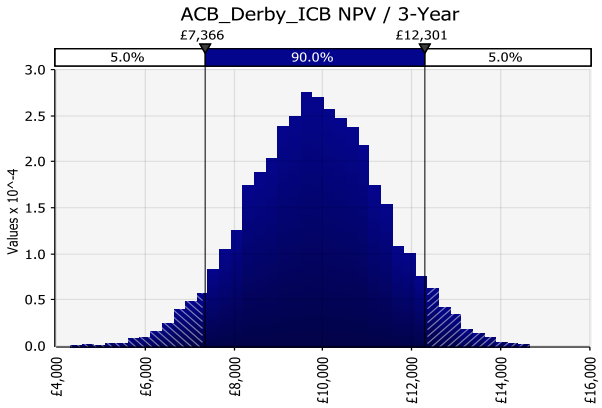
**£428k**

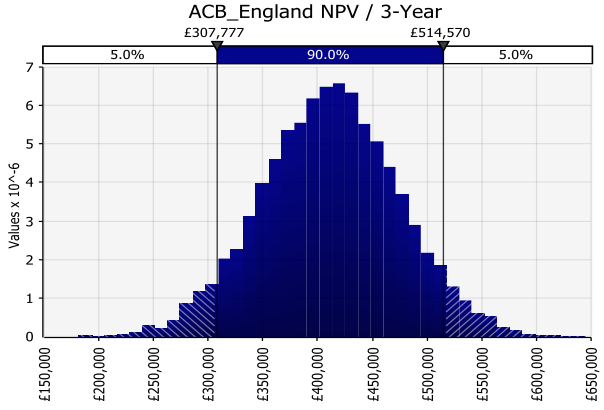
When extrapolated across **all ICBs in England**, total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

# Moderate to high anticholinergic burden – health economic benefits

The table below provides a breakdown of the estimated benefits by benefit stream. Additionally, charts for each scenario demonstrating the Monte Carlo sensitivity analysis across the three-year period have been provided.

| Benefit | Derby and Derbyshire ICB | England (Opportunity) |
|---|---|---|
| Reduction in acute hospital costs from fall | £0.9k | £36.8K |
| Reduction in additional acute care post-fall | £0.2K | £9.2K |
| Reduction in in additional community care post-fall | £0.7K | £30.7K |
| Reduction in additional social care post-fall | £0.3K | £12.3K |
| Reduction in medicines expenditure | £8.1k | £339.3K |
| **Total** | **£10.2K** | **£428.2K** |



# Moderate to high anticholinergic burden – health economic benefits

- The graphs show the net present benefits for the Herefordshire and Worcestershire ICB and West Yorkshire ICB, adjusted for optimism bias, for the period of 2022 to 2025.
- These findings have been presented separately from the previous case study as these ICBs focused on patients with 2 or more moderate to high anticholinergic medicines (compared to 3 or more previously), widening the potential patient population who could benefit.
- The reduction in falls risk value has not been adjusted across the two case studies. West Yorkshire ICB focused on the 75 and over population.


The total value of the benefit streams identified amount to £36.5k across 2022/23 to 2024/25 for Herefordshire and Worcestershire ICB. Sensitivity analysis suggests that at a 90% confidence interval (CI) the total benefits range between £28k and £46k. West Yorkshire ICB targeted a smaller population (75+ rather than 65+); however, realised benefits of £24.9k (£19k to £31k at 90% CI)

**£37k**

**Herefordshire and Worcestershire** total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

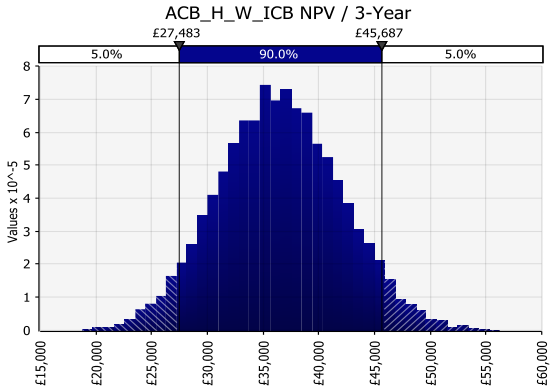
**£25k**

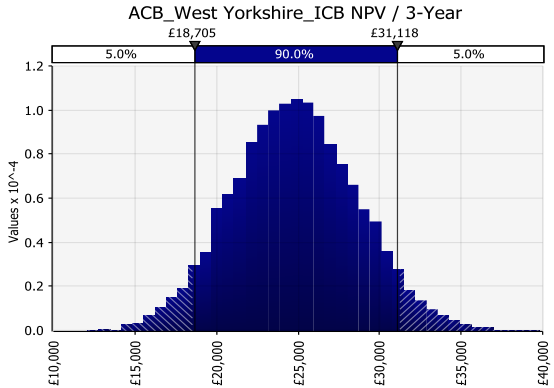
**West Yorkshire ICB** total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

# Moderate to high anticholinergic burden – health economic benefits

The table below provides a breakdown of the estimated benefits by benefit stream. Additionally, charts for each scenario demonstrating the Monte Carlo sensitivity analysis across the three-year period have been provided.

| Benefit | Herefordshire and Worcestershire ICB | West Yorkshire ICB |
|---|---|---|
| Reduction in acute hospital costs from fall | £3.1k | £2.1k |
| Reduction in additional acute care post-fall | £0.8k | £0.5k |
| Reduction in in additional community care post-fall | £2.6k | £1.8k |
| Reduction in additional social care post-fall | £1.0k | £0.7k |
| Reduction in medicines expenditure | £28.9k | £19.7k |
| **Total** | **£36.6k** | **£24.9K** |



Chapter 3c

# Patients prescribed 5 or more analgesic medicines

# 5 or more analgesics – NHS South East London

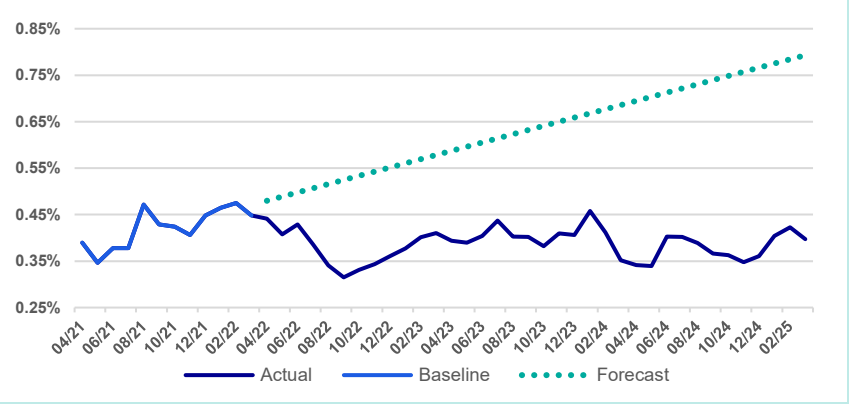
**Definition:** Patients aged 65 and over prescribed 5 or more analgesic medicines.
**Risk:** Reducing multiple prescribing of analgesics is not aimed at addressing addiction to opioids. This comparator was developed to help practices to identify how many and which of their patients are taking multiple analgesics where there may not be a pain management plan in place and where the patient should be called in for a Structured Medication Review.

## Implementation

"The HIN South London played an integral role in facilitating the Community of Practice for polypharmacy, which included patient engagement and the development of a local statement to guide future work related to problematic polypharmacy. This collaboration was highly valued and contributed to the success of the programme. Patient engagement was a significant part of the Community of Practice, with extensive efforts made to gather feedback and understand the needs and preferences of the local population.

Lelly Oboh championed the HIN National Polypharmacy Action Learning Sets and worked in partnership with the HIN South London to target promotion to 58 key individuals across. The ICB selected 'Are your medicines working?' for their local patient facing campaign. The HIN South London led on patient engagement activities, and insights gathered from the interviews were used to create patient co-designed resources, specifically tailored to address opiate use in the local population. Additionally, the Overprescribing Lead and the overprescribing group social prescribing member were active members in a HIN South London Chronic Pain Experience-based Co-design (EBCD) project, a collaboration between patients with lived experience of taking opiates and healthcare professionals. They co-designed a poster to raise awareness of non-drug alternatives to support people living with chronic pain and produced an educational film series with people living with chronic pain, supporting the focused work in reducing overprescribing across SEL ICB."

## Impact



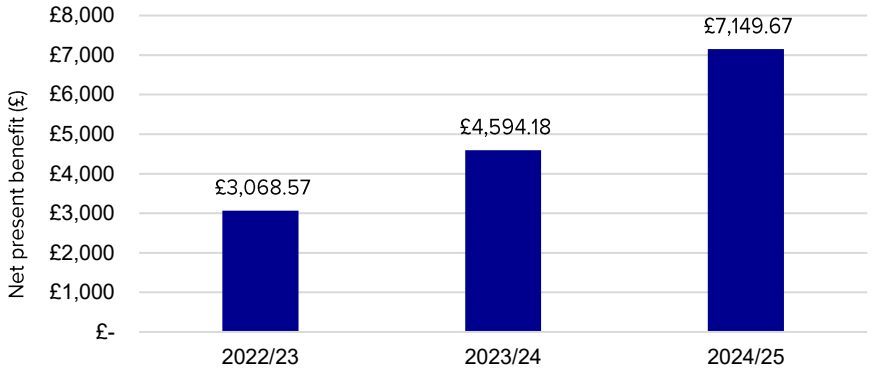

| Year | Forecast | Actual | Change (%) | # Patients |
|---|---|---|---|---|
| 2022/23 | 0.53% | 0.38% | 28.4% | 25.76 |
| 2023/24 | 0.64% | 0.40% | 36.5% | 41.20 |
| 2024/25 | 0.74% | 0.38% | 49.2% | 67.01 |

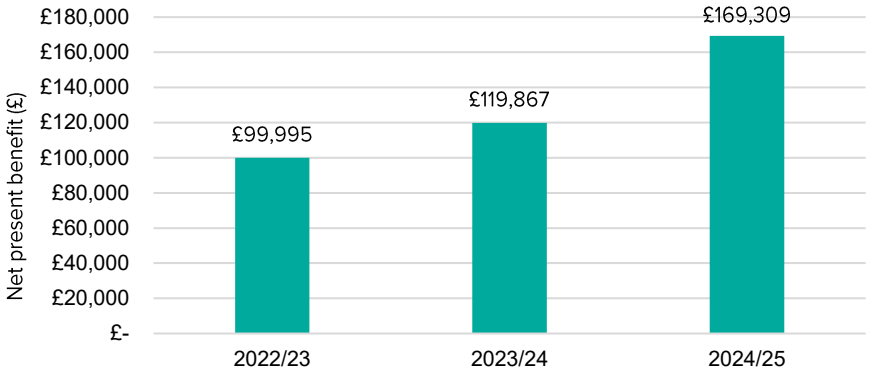
# 5 or more analgesics – health economic benefits

- The desktop review involved searching for evidence of improved healthcare outcomes following a reduction in the number of analgesics prescribed; however, little evidence has been found.
- The desktop review also involved reviewing evidence regarding avoided addiction to opiods. This benefit line was abandoned after limited available evidence and the recognition that the polypharmacy comparator was not designed to reduce opiate addiction but to identify patients potentially without pain managements plans in place.
- Additionally, the NHSBSA analysis included a list of the drugs most frequently deprescribed from patients who previously exceeded the threshold – analysis of this list revealed that few of the drugs most prescribed drugs were opioids.
- As a result, only a reduction in medication costs have been attributed to this polypharmacy comparator at this stage.
- Benefit-specific optimism bias is applied to each benefit stream in the model in accordance with HM Treasury *The Green Book* principles.
- Monte-Carlo sensitivity analysis has been used on all benefit inputs to demonstrate the likely range of the monetary savings.

# 5 or more analgesics – health economic benefits

- The graphs shows the net present benefits for the South East London ICB region, adjusted for optimism bias, for the period of 2022 to 2025.
- An additional scenario has been calculated, presenting the estimated benefits had each ICB in England delivered the same percentage change.




The total value of the benefit streams identified amount to £14.8k across 2022/23 to 2024/25 for South East London ICB. Sensitivity analysis suggests that at a 90% confidence interval (CI) the total benefits range between £13.7k and £16k. When extrapolated across all ICBs, an estimated £389k could have been saved, ranging between £359k and 420k at 90% CI.

**£15k**

**South East London** total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

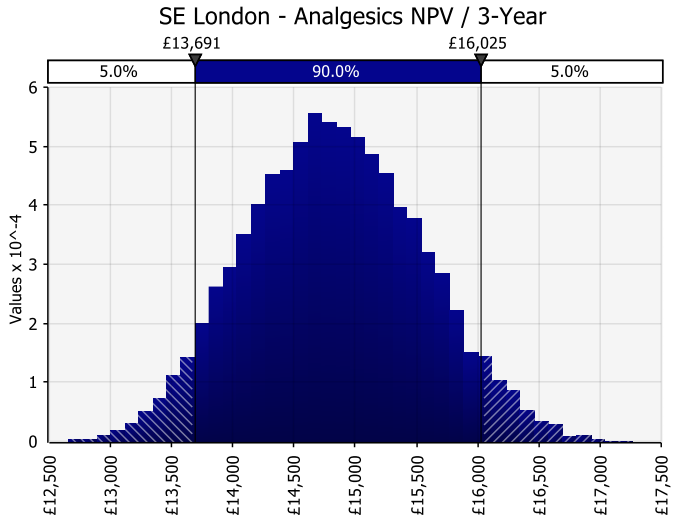
**£389k**

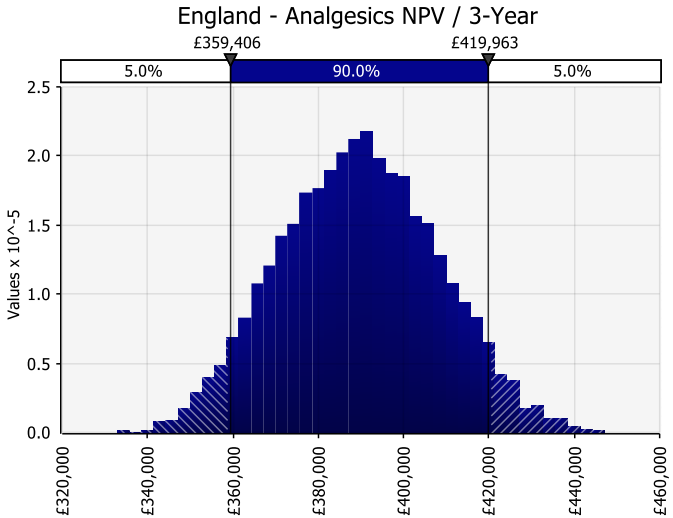
When extrapolated across **all ICBs** in England, total benefits estimated for 2022/23 to 2024/25 based on optimism-bias adjusted values.

# 5 or more analgesics – health economic benefits

The table below provides a breakdown of the estimated benefits by benefit stream. Additionally, charts for each scenario demonstrating the Monte Carlo sensitivity analysis across the three-year period have been provided.

| Benefit | SE London ICB | England (Opportunity) |
|---|---|---|
| Reduction in medicines expenditure | £14.8k | £389.2k |
| **Total** | **£14.8k** | **£389.2k** |



Chapter 4

# Aggregation of case study results

# Aggregation of case study results

To demonstrate the collective impact of the five case studies focused on for this report, and to further evidence the potential opportunity had the whole of England realised similar results, the benefits of the five case studies have been aggregated to provide an overall position. The results have been aggregated by costs saved through avoided healthcare resource utilisation (benefits related to hospital admissions and community care), and medicine cost savings.

| | Reduction in healthcare resource utilisation (2022/23-2024/25) | Reduction in medicines costs (2022/23-2024/25) |
|---|---|---|
| Case study regions | £20.4k | £76k |
| England (opportunity) | £280.4k | £880k |

- To avoid double counting, to maintain prudency, and ensure relevance to the NHSBSA reductions in medicines costs analysis, solely England figures pertaining to a reduction in anticholinergic burden as seen in the Derby and Derbyshire ICB case study have been utilised in this aggregation of benefits.
- In addition to the demonstrated reductions in healthcare resource utilisation and medicine costs, there are a series of further benefits that have not been quantified within this appraisal.
  - Medicines that are discontinued no longer require ongoing monthly review within repeat prescribing systems, or dispensing, potentially generating additional efficiency savings in clinical and pharmacy workflows.
  - As highlighted within the analysis caveats and limitations, additional clinical benefits may be experienced as a result of deprescribing that have not been included within this document. Examples such as improved cognitive improvements through a reduction in anticholinergic burden are well documented within policy documents and wider literature; however, quantitative data supporting these claims is limited – hence its exclusion from this analysis.

# Environmental Sustainability

Polypharmacy poses not only clinical and safety challenges, but also environmental ones. Every prescribed medicine carries an environmental footprint, measured largely in $kgCO_2e$ (a standardised unit of carbon dioxide equivalency). This accounts for the greenhouse gas emissions produced across the drug's life cycle: manufacturing, packaging, distribution, use, and disposal.

The average prescription item is estimated to generate around **5 $kgCO_2e$**; however, prescriptions such as inhalers can be many times higher (Walsh et al., 2024) . Beyond carbon emissions, polypharmacy can also drive increased packaging waste, water pollution from excreted drug residues, and higher consumption of energy and raw materials in the supply chain.

To estimate the potential reduction in $kgCO_2e$ in the 5 ICBs identified for case study, it has been assumed that these patients receive one fewer prescriptions on a monthly basis. This value (5 kgCO2e x 12 months) has been multiplied by the change in the number of patients considered 'polypharmic'.

| | 2022 - 2023 | | 2023 - 2024 | | 2024 - 2025 | |
|---|---|---|---|---|---|---|
| ICB | # Patients | $kgCO_2e$ | # Patients | $kgCO_2e$ | # Patients | $kgCO_2e$ |
| NHS DERBY AND DERBYSHIRE ICB | 8.84 | 530 | 23.46 | 1,408 | 23.36 | 1,402 |
| NHS HEREFORDSHIRE AND WORCESTERSHIRE ICB | 49.73 | 2,984 | 78.48 | 4,709 | 68.71 | 4,123 |
| NHS SOUTH EAST LONDON ICB | 25.76 | 1,546 | 41.20 | 2,472 | 67.01 | 4,021 |
| NHS SURREY HEARTLANDS ICB | 5.53 | 332 | 8.58 | 515 | 14.20 | 852 |
| NHS WEST YORKSHIRE ICB | 24.29 | 1,457 | 51.37 | 3,082 | 59.51 | 3,571 |
| TOTAL | 114.15 | 6,849 | 203.09 | 12,185 | 232.79 | 13,967 |

In total, **an estimated 33,002 $kgCO_2e$ has been avoided** through reduced prescriptions in the 5 ICBs selected for case study during the National Polypharmacy Programme. Using the UK Government rate of £260 per tonne of $CO_2e$, **33,002 $kgCO_2e$ is equal to £8,580**.

Chapter 5a

# Costs of tackling polypharmacy – Action Learning Set training

# Cost of tackling Polypharmacy

To drive the improvement in reducing the number of patients at risk of harm from their medicines, a significant education and learning programme was developed and delivered by the Health Innovation Network. Between 2022/23 and 2024/25, a total of **979 GPs and pharmacists have received the ALS training course**, comprising of 3 half-day sessions, each three hours in duration.

## Cost assumptions

Staff time costs for attending ALS training sessions were estimated using attendance data that recorded each participant's ICB and job role. As job roles were entered in free-text form, artificial intelligence methods were applied to categorise attendees as either clinical pharmacists or GPs, and to map each role to an Agenda for Change band. Using this classification, a weighted average hourly unit cost of £89.15 (inclusive of on-costs and overheads) was calculated, drawing on cost per working hour estimates reported in the *Unit Costs of Health and Social Care 2024* (Personal Social Services Research Unit).

| ICB | Number of people trained | Cost of training |
|---|---|---|
| NHS DERBY AND DERBYSHIRE ICB | 29 | £23,269 |
| NHS HEREFORDSHIRE AND WORCESTERSHIRE ICB | 15 | £12,036 |
| NHS SOUTH EAST LONDON ICB | 53 | £42,526 |
| NHS SURREY HEARTLANDS ICB | 26 | £20,862 |
| NHS WEST YORKSHIRE ICB | 43 | £34,502 |
| **ENGLAND** | **979** | **£785,518** |

- The estimated £786k training cost for general practitioners and pharmacists does not represent new capital costs. Instead, it reflects the notional cost of staff time spent attending the nine hours of structured training within the course of their usual working hours. As such, these costs are better expressed as costs associated with development of the existing workforce, rather than new financial outlays on physical assets, recruitment or infrastructure.

- Additionally, whilst the training directly supports safer deprescribing where patients are at risk from multiple medications, it also strengthens overall care for older people with long-term conditions. By enhancing clinicians' knowledge and confidence in managing complex multimorbidity, it is not unreasonable to expect an improvement in prescribing quality and safety across a broader spectrum of care for older adults with multiple long-term conditions. Staff trained will carry these skills forward into their routine practice and likely pass them on to less experienced colleagues, meaning the benefits are not limited to the programme period and will likely continue to improve prescribing safety and patient care in the future.

Chapter 6

# Summary

# Summary

Through its three-pillar approach, the Health Innovation Network Polypharmacy Programme has evidenced prescribing cost-savings and estimated improved health outcomes, whilst also improving prescribing safety. This report has made efforts to provide examples of impacts made by ICBs involved in the Polypharmacy Programme; and ultimately has provided a small suite of case studies out of 24 ICBs engaged with the programme. The benefits detailed within this document do not account for the entire benefit of the Polypharmacy Programme.

In the case study regions, the programme's interventions (targeted population health data, clinician training and patient engagement) prevented an estimated **£20k in hospital admissions and related care costs** (for example, avoiding bleed- and fall-related admissions) and saved **£76k in medicines expenditure** over 2022–2025.

Extrapolated across England, this equates to a potential **£280k in healthcare utilisation costs** avoided and **£880k in drug costs** saved – **over £1.1 million total** potential savings in three years, had the whole of England achieved results akin to the highlighted ICBs in this analysis.

Achieving these outcomes required upskilling nearly 1,000 GPs and pharmacists via Polypharmacy Action Learning Sets (at an estimated **£786k** in staff time cost across England, **£133k** within ICBs identified for case studies), alongside deploying patient-facing resources, but this investment has equipped the system to sustain safer deprescribing practices.

| | Reduction in healthcare resource utilisation (2022/23-2024/25) | Reduction in medicines costs (2022/23-2024/25) |
|---|---|---|
| Case study regions | £20.4k | £76k |
| England (opportunity) | £280.4k | £880k |

Chapter 6

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Chapter 6

# Appendix 1 – Full case study quotes

# Antiplatelet and Anticoagulants – Surrey Heartlands ICB

"Working closely with the team at Health Innovation Kent Surrey Sussex has given us the opportunity to build on work in an existing priority area. Prescribing of antiplatelets and anticoagulants was identified as a high-risk area in Surrey Heartlands and we monitor this using 6 monthly data reviews. The HIN polypharmacy programme has complemented and supported this work. The training and accreditation of 2 polypharmacy trainers as part of the HIN programme has had a local impact clinically through their peer support, demonstrated, for example, in them sharing their expertise and presenting several case studies at the Surrey Heartlands Community of Practice events.

In collaboration with our Surrey Heartlands CVD colleagues, we have recently updated our Primary Care 'Aide memoire for Hospital Requests for co-prescription of antiplatelet/anticoagulant therapy'. The polypharmacy programme focus on structured medication reviews has been key in giving our clinicians access to skills and resources that can support them during conversations with patients when implementing this advice. This has helped us deliver the outcomes we can see in the polypharmacy comparator data; co-prescribing of antiplatelets and anti-coagulants has decreased, rather than the forecast increase that we might have expected to see with no intervention".

**Nikki Smith**, Head of Medicines Safety and Patient Safety Specialist for Surrey Heartlands Integrated Care System

# Moderate to high anticholinergic burden – NHS Derby and Derbyshire

Derby and Derbyshire ICB and pharmacy leaders from across the Joined-Up Care Derbyshire (JUCD) system worked collaboratively with HI East Midlands proactively championing and promoting the programme and its offer.
Helen Hulme, Clinical Pharmacist and Gill Gookey, Medicines Safety Lead Pharmacist at HI East midlands provided strong clinical leadership to engage clinicians and worked collaboratively with the ICB pharmacy team to deliver and embed the programme locally, and establish collaborative partnerships across the local system.

132 GPs, pharmacists and Allied Health professionals participated in National and Local Polypharmacy Action Learning Sets. One Derby Trainer, ICB pharmacist, Jennifer Butterfield was accredited through the HIN Polypharmacy Train the Trainer programme and delivered across two local cohorts, which provided easier access for GPs and Pharmacists to attend. HI East Midlands established an effective Polypharmacy Community of Practice for the region, bringing together sector-wide stakeholders and patients to explore how to address the challenges of problematic polypharmacy locally as well as hear from Guest Speakers.  More than 70 colleagues from Derbyshire have attended these workshops.

Quote:
“We responded to feedback from prescribers and adjusted the delivery of the local Action Learning Sets to make them more accessible to more prescribers and staff involved in repeat prescribing – it is fantastic that so many staff across our system have been able to attend the local, regional or national sessions, and then put in to practice their learning, evidenced by our improved prescribing data – this programme will have a lasting impact for our staff and patients”

**Kate Needham**, Chief Pharmacist, Derbyshire Community Health Services (DCHS) NHS

# Moderate to high anticholinergic burden – NHS Derby and Derbyshire

"Tackling problematic polypharmacy has always been a key priority in Herefordshire & Worcestershire ICB. We have prioritised the delivery of polypharmacy reviews and the principles of shared decision making and health literacy via recent iterations of our primary care prescribing contracts. We have also provided EMIS searches and templates to facilitate this.

The recent Health Innovation Network Polypharmacy education offers and resources have been widely promoted throughout the system. Twenty-one colleagues completed Health Innovation Network led local Virtual Polypharmacy Workshops (vPW) or National Polypharmacy Action Learning Sets. Hereford & Worcestershire maintained a strong presence in the West Midlands Polypharmacy Community of Practice, with 26 colleagues regularly attending. Across the ICB patient-facing resources have been increasingly accessed, supporting improved patient understanding and engagement in medication management.

This work, together with the RPS/RCGP Repeat Prescribing Toolkit and the EPACT2 oversupply dashboard, has provided PCNs and practices with further evidence-based tools to achieve good prescribing outcomes for both patients and the wider NHS".
**Paul Martin, Professional Adviser – Pharmacy & Medicines,** NHS Herefordshire and Worcestershire

# Moderate to high anticholinergic burden – West Yorkshire

West Yorkshire was identified as a key area of focus due to significant health inequalities and high levels of deprivation. Working in partnership with Heather Smith, Consultant Pharmacist for Older People and a committed champion of the programme, HIN Y&H established trusted networks to communicate the importance of structured medication reviews (SMRs) to GPs and Primary Care Networks (PCNs).
HIN Y&H supported West Yorkshire's Overprescribing work delivering training, promoting patient resources and contributing to groups addressing opioid use and anticholinergic burden. Collaborative events (masterclasses, Community of Practices and 1:1 discussions with GPs and PCNs) led to the development of tailored data packs identifying where focused SMRs could have the greatest impact without adding pressure to general practice.

West Yorkshire showed strong engagement with national initiatives such as the Polypharmacy Action Learning Sets, contributing to a regional reduction in inappropriate polypharmacy against national averages.

Quote:
"We have really appreciated all the support from the Polypharmacy Programme Team at Health Innovation Yorkshire & Humber andI don't think we'd have made nearly as much progress without this."

**Heather Smith**, Consultant Pharmacist for Older People

Chapter 6

# Appendix 2 – iSympathy

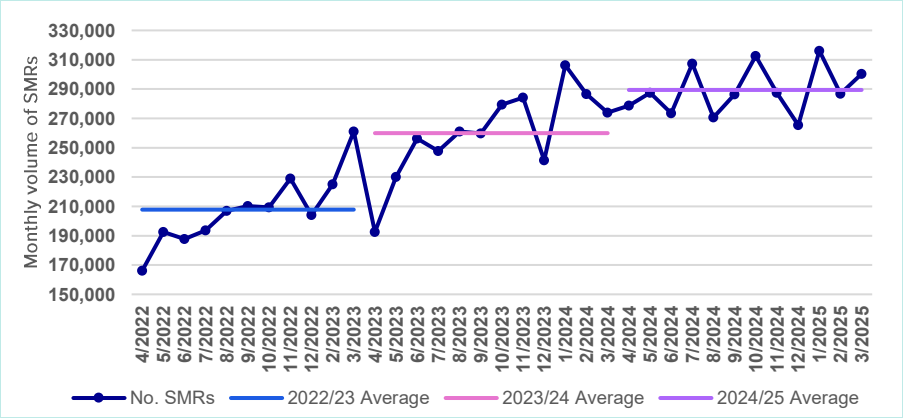
# Applying iSIMPATHY's findings to England data

iSIMPATHY was a three-and-a-half-year project, funded by the European Union, and delivered across Northern Ireland, Scotland, and the Republic of Ireland. The project involved the training of pharmacists and other healthcare professionals to deliver structured medicine reviews and deploy a shared decision-making approach to managing polypharmacy. The iSIMAPTHY evaluation report (Mair et al., 2023) reported the following health economic benefits realised per 100 structured medicine reviews:

- £7,500 to deliver
- £13,100 saved directly as a result of medication changes
- Further £6,600 in indirect savings from avoided adverse drug reaction-related hospital admissions
- 7.4 Quality-Adjusted Life Years (QALYs) gained

## SMRs in England

Considering the similarities in approaches between iSIMPATHY and the Health Innovation Network's Polypharmacy programme, an additional high-level analysis has been provided applying iSIMPATHY's findings to SMR data for England. *Appointments in General Practice* data published by NHS Digital has been sourced from April 2022 to March 2025 – within this data, SMRs are reported daily at an ICB level. Whilst attribution to the national Polypharmacy programme cannot be made completely, the annual number of SMRs has been increasing throughout the timespan of the national programme. Using 2022/23 as a baseline, **an additional 883 thousand SMRs were delivered in 2023/24**, increasing to **an additional 1.2 million delivered in 2024/25.**



Unity Insights

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