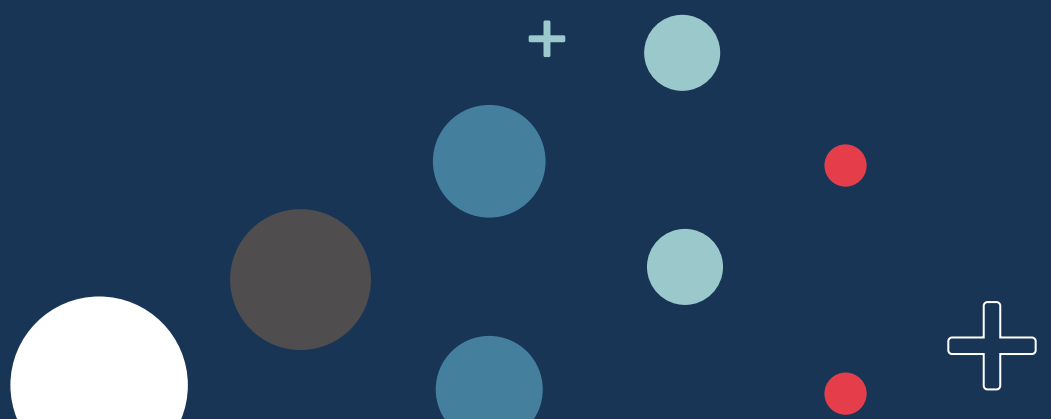


Improving asthma outcomes in partnership

- A Case for Change

The SENTINEL project is a Joint Working initiative between Hull University Teaching Hospital and AstraZeneca UK.
The SENTINEL Plus quality improvement package, has been funded by AstraZeneca and co-developed with Hull York Medical School and Hull University Teaching Hospitals NHS Trust



AstraZeneca 

GB-62392: Date of Preparation: August 2025



Background

Asthma outcomes in the UK are poor, ranking among the lowest in Europe and showing a concerning decline

Asthma has a considerable burden in the UK



1 million attacks requiring medical attention^{1*}



£3 billion is spent on asthma annually by the NHS in England²



The UK has poor asthma outcomes compared to the rest of Europe



The **worst** mortality rate in western Europe³



The **biggest** rate of life years lost to disability in Europe³

And the situation is worsening



~46% increase in asthma admissions over the last 2 decades in England and Wales⁴



Levels of basic asthma care were at their **lowest** level in 6 years⁵



Deaths from asthma attacks are the highest they have been in the last decade, increasing by more than **33%**⁶.
12,000 deaths in the 10 years since NRAD was published in 2014⁷.

*calculated from the mean number of exacerbations in a retrospective observational study (SABA use IN Asthma; SABINA) in the UK using data from the Clinical Practice Research Datalink (CRPD) database between 2007-2017 (n=574,913 of which 284,816 were adults who were accessed for outcomes). The rate was extrapolated to an adult asthma population of 4.3 million patients.¹

An exacerbation was defined as either a short course of OCS (GP managed exacerbation), an Accident and Emergency visit for asthma, a hospital admission or death secondary to asthma.

[§]For England and Wales. Asthma UK

1. AstraZeneca Data on File. REF-285951. August 2025; 2. Asthma + Lung UK. Estimating the economic burden of respiratory illness in the UK. Available at: https://cdn.shopify.com/s/files/1/0221/4446/files/PC-1601_-_Economic_burden_report_FINAL_8cdaba2a-589a-4a49-bd14-f45d66167795.pdf?1309501094450848169 (Accessed August 2025);

3. International Respiratory Coalition, Asthma, Available at: <https://international-respiratory-coalition.org/diseases/asthma/> (Accessed August 2025); 4. Alwafi, H. et al. BMC Pulm Med 23, 49 (2023);

5. FIGHTING BACK – Transforming Asthma Care in the UK. 2022. Available at: https://www.asthmaandlung.org.uk/sites/default/files/Fighting%20back_V3.pdf (August 2025); 6. Iacobucci, G. et al. BMJ 2019;366:l5108. 7. Asthma and Lung UK. Ten years gone. Available at: [ten-years-gone-asthma-care-uk-national-review-asthma-deaths-nrad-2024](https://www.asthmaandlung.org.uk/sites/default/files/Ten_years_gone_asthma_care_uk_national_review_asthma_deaths_nrad_2024.pdf) (Accessed March 2025)



Improving care in asthma aligns with NHS priorities

Improving asthma care supports with addressing the 10 Year Health Plan for England¹, and is aligned to the Green plan guidance²



Shifts to Prevention & Community

Exacerbations and primary & secondary care appointments³ are associated with prescribing **3** or more **SABA inhalers** per year

Overall annual costs are **52% higher** in those patients overall⁴



Low carbon Respiratory care

Inhaler emissions count for **13%** of the carbon footprint in **primary care⁵**

70% of the **total carbon footprint** of inhaler devices in the UK is represented by **SABAs⁶**



Health inequalities and disparities

Deprivation is linked to greater risk of⁷:

- SABA over-reliance
- A&E attendance
- Hospitalisation
- Death

SABA: Short Acting Beta-2 Agonist

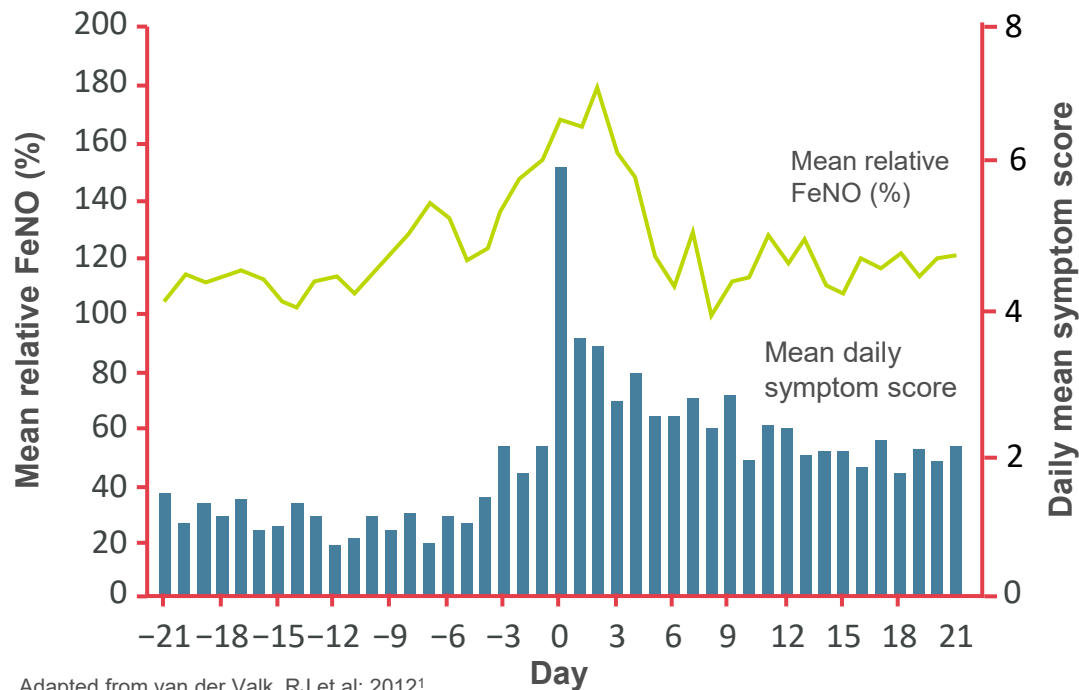
1. Department of Health and Social Care. 10 Year Health Plan for England: fit for the future. Available at: [10 Year Health Plan for England: fit for the future - GOV.UK](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/100713/10_year_health_plan_for_england_fit_for_the_future.pdf) (Accessed August 2025); 2. NHS England. Green plan guidance. Available at: [NHS England » Green plan guidance](https://www.nhs.uk/green-plan-guidance/) (Accessed August 2025); 3. Bloom, C.I., Cabrera, C., Arnetorp, S. et al. Asthma-Related Health Outcomes Associated with Short-Acting β_2 -Agonist Inhaler Use: An Observational UK Study as Part of the SABINA Global Program. *Adv Ther* 37, 4190–4208 (2020). <https://doi.org/10.1007/s12325-020-01444-5>; 4. Attar-Zadeh et al. Healthcare costs associated with short-acting β_2 -agonists in asthma: observational UK SABINA study *BJGP Open* 24 February 2023; *BJGPO*.2023.0015. DOI: <https://doi.org/10.3399/BJGPO.2023.0015>; 5. NHS England, May 2022, World Asthma Day: tackling climate change and improving respiratory care, <https://www.england.nhs.uk/blog/world-asthma-day-tackling-climate-change-and-improving-respiratory-care/> [Accessed August 2025]. 6. Wilkinson A, et al. *Thorax* 2021;76:A19; 7. Alsallakh MA, et al. Association of socioeconomic deprivation with asthma care, outcomes, and deaths in Wales: A 5-year national linked primary and secondary care cohort study. *PLoS Med*. 2021 Feb 12;18(2):e1003497.



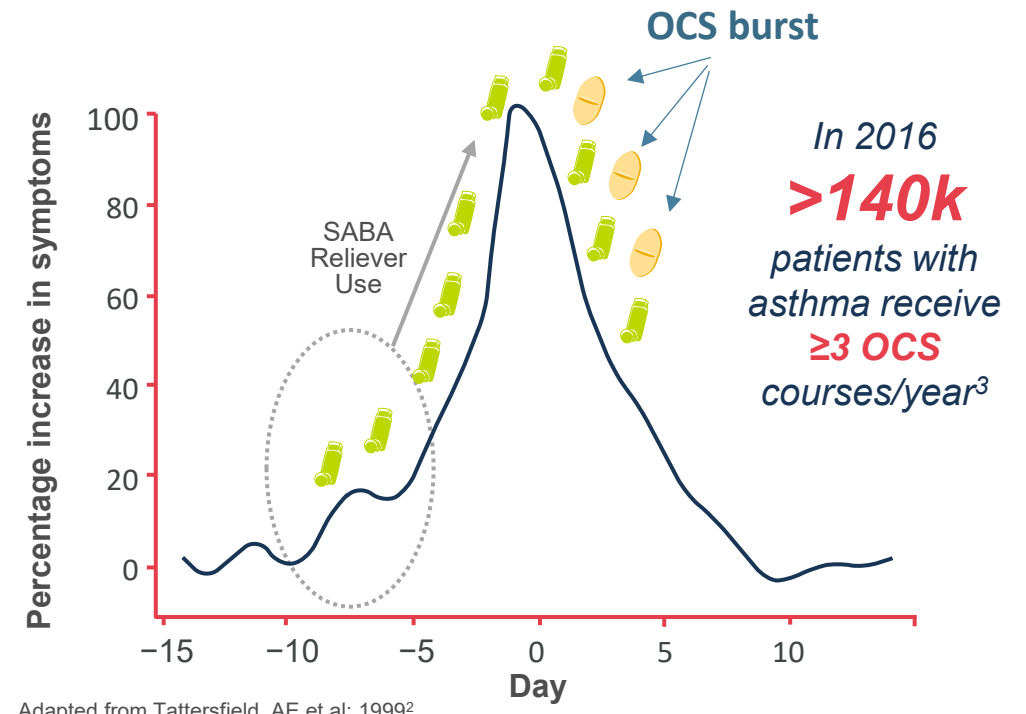
Asthma is a variable inflammatory disease requiring anti-inflammatory treatment

Inflammation, symptoms & reliever use all increase before an asthma attack

Increased inflammation before & during symptom worsening^{1*}



Asthma symptoms drive SABA use until exacerbation^{2†}



*Post-hoc analysis of FeNO data from 77 children with asthma; moderate exacerbations were defined as a pre-specified increase in symptom scores during 1 or 2 days. †A descriptive study of 425 severe exacerbations; exacerbations were defined as the need for a course of OCS or a reduction in morning PEF of >30% on 2 consecutive days.

FeNO = fractional exhaled nitric oxide; OCS = oral corticosteroid(s); SABA = short-acting β_2 -agonist.

1. van der Valk RJ, et al. *Allergy*. 2012;67:265-271; 2. Tattersfield AE, et al. *Am J Respir Crit Care Med*. 1999;160:594-599; 3. Asthma UK. Living in limbo: the scale of unmet need in difficult and severe asthma. 2019. Available from: <https://www.asthmaandlung.org.uk/sites/default/files/2023-03/living-in-limbo--the-scale-of-unmet-need-in-difficult-and-severe-asthma.pdf> (Accessed August 2025)



BTS/ NICE/ SIGN [NG 245] Guidelines: advocating a landmark change in asthma management¹



BTS/ NICE/ SIGN 2024 published management strategy in chronic asthmatics¹

- New guidelines aim to improve diagnostic accuracy, establish control of asthma, reduce risk of asthma attacks¹



Newly diagnosed asthma patients are now to be initiated on as-needed Anti-inflammatory Reliever (AIR) first or low dose Maintenance and Reliever Therapy (MART) if highly symptomatic or there are severe exacerbations¹



Low dose MART is recommended as step-up if asthma is uncontrolled on AIR regimen¹



BTS/ NICE/ SIGN 2024 recommend considering changing patients on existing SABA treatment regimes to either as-needed AIR or MART approach¹

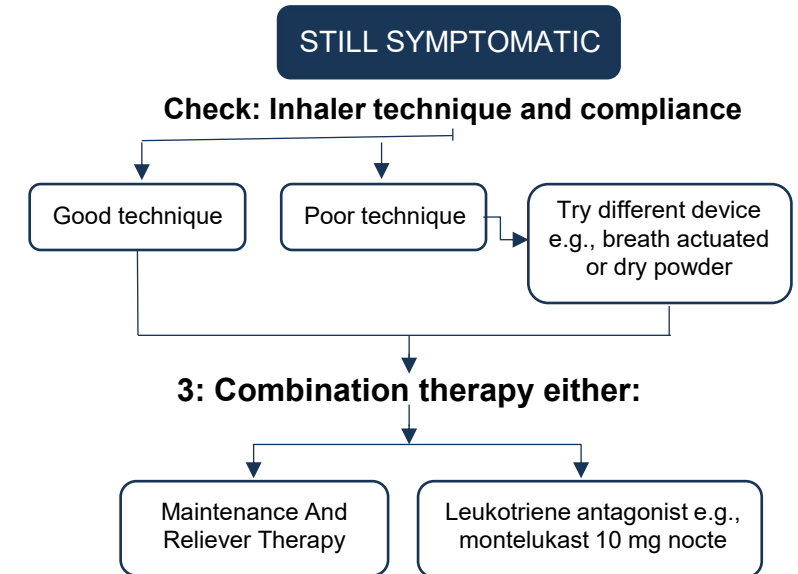
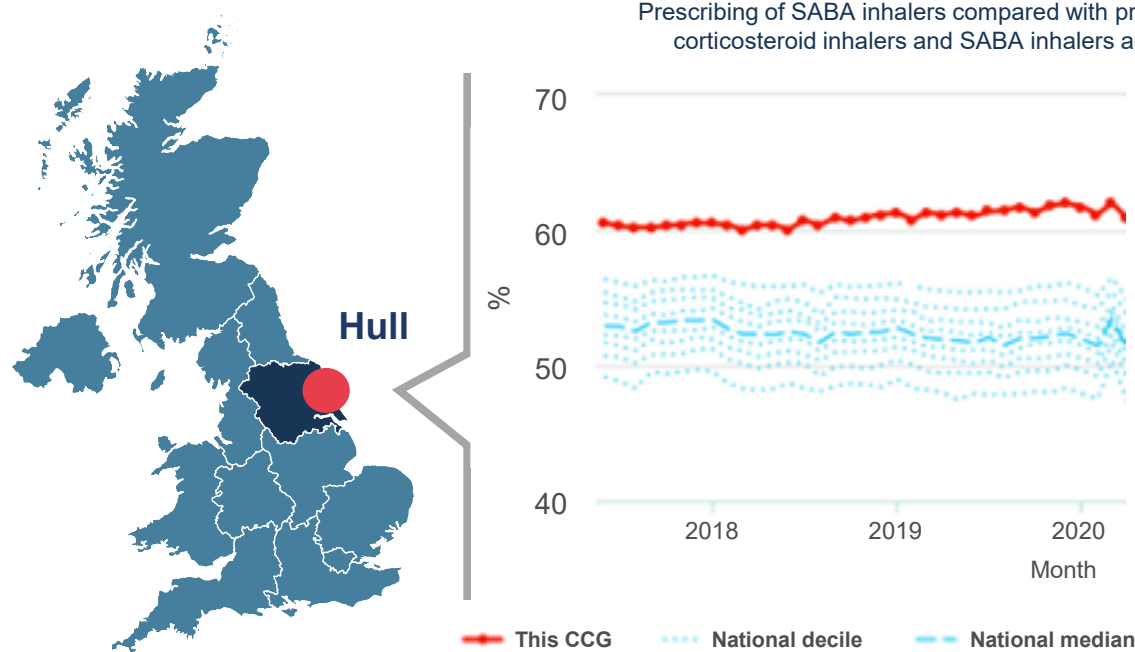
- Patients who are on SABA only should be offered as-needed AIR¹
- Patients with uncontrolled asthma whose treatment includes a SABA should be considered for change to low/ moderate dose MART¹





The SENTINEL Project

Hull and East Yorkshire CCG had a high unmet need in asthma; coupled with a MART DPI guideline



SABA prescribing **~60%** of all inhalers prescribed (versus a national median of circa 53%)¹

Pre-SENTINEL implementation, **Hull asthma admission** rates **highest** in STP in 2017/18 and 2018/19²

MART prescribing in all reviewed patients pre-SENTINEL was **<5%** in the pilot PCN³

Joint Working with AstraZeneca to implement Hull asthma guidelines (SABA-free strategy with DPI MART)

- Objectives:**
- Reduce SABA use
 - Improve asthma outcomes
 - Reduce carbon footprint

Adapted from Hull and East Riding Prescribing Committee⁴

DPI, Dry powder inhaler; MART: Maintenance and Reliever Therapy; SABA: Short Acting Beta-2 Agonist; PCN: Primary Care Network; CCG: Clinical Commissioning Group; SABA: reduction Through Implementing Hull asthma guidelines; STP: Sustainability and Transformation Plan
 1. Open Prescribing. Available from <https://openprescribing.net/pcn/U64827/measures/?tags=respiratory> (Accessed July 2023); 2. Fingertips: Public Health Data. Public health profiles. https://fingertips.phe.org.uk/search/asthma#page/4/gid/2000006/pat/220/par/E54000051/ati/167/are/E38000085/iid/285/age/1/sex/4/cat/-1/ctp/-1/yr/1/cid/4/tbm/1/page-options/car-do-0_tre-ao-1 (Accessed August 2025); 3. Crooks MG, et al. ERJ Open Research Jan 2023, 00685-2022; DOI: 10.1183/23120541.00685-2022; 4. Hull and East Riding Prescribing Committee. Treatment of Adult Asthma. www.hey.nhs.uk/wp/wp-content/uploads/2021/11/treatmentAdultAsthma.pdf (Accessed August 2025)



Partnering with HCPs to improve asthma outcomes

The SABA rEduction Through ImplemeNting Hull asthma guidELines (SENTINEL) Programme

The SENTINEL programme aimed to identify and address SABA over-use, through supported guideline implementation, in order to¹:

1. Improve asthma outcomes
2. Reduce environmental impact from asthma

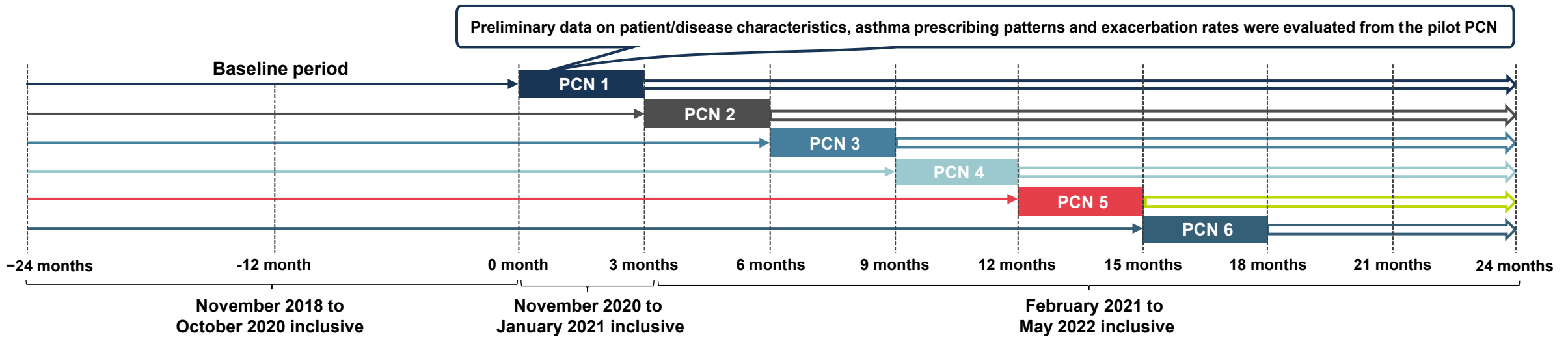
*The SENTINEL programme was approached through the process of **experience-based codesign** principles, taking into consideration perspectives from **patients and staff**, to ensure changes are not imposed on various stakeholders¹*

SENTINEL consists of the following 5 pillars^{1,2}:



The SENTINEL Programme: Design

SENTINEL used a step-wedge design and was rolled-out across 6 PCNs¹



Data source: GP data linked to NHS and SUS captured as part of routine clinical practice, with additional prescribing information from OpenPrescribing.net

The ongoing SENTINEL programme plans to assess the impact of implementing a SABA-free strategy across the 6 PCNs on change in:



Prescription patterns
(including SABA, OCS
and inhaler types)



Exacerbations



Hospitalisations



ED visits



GHG emissions

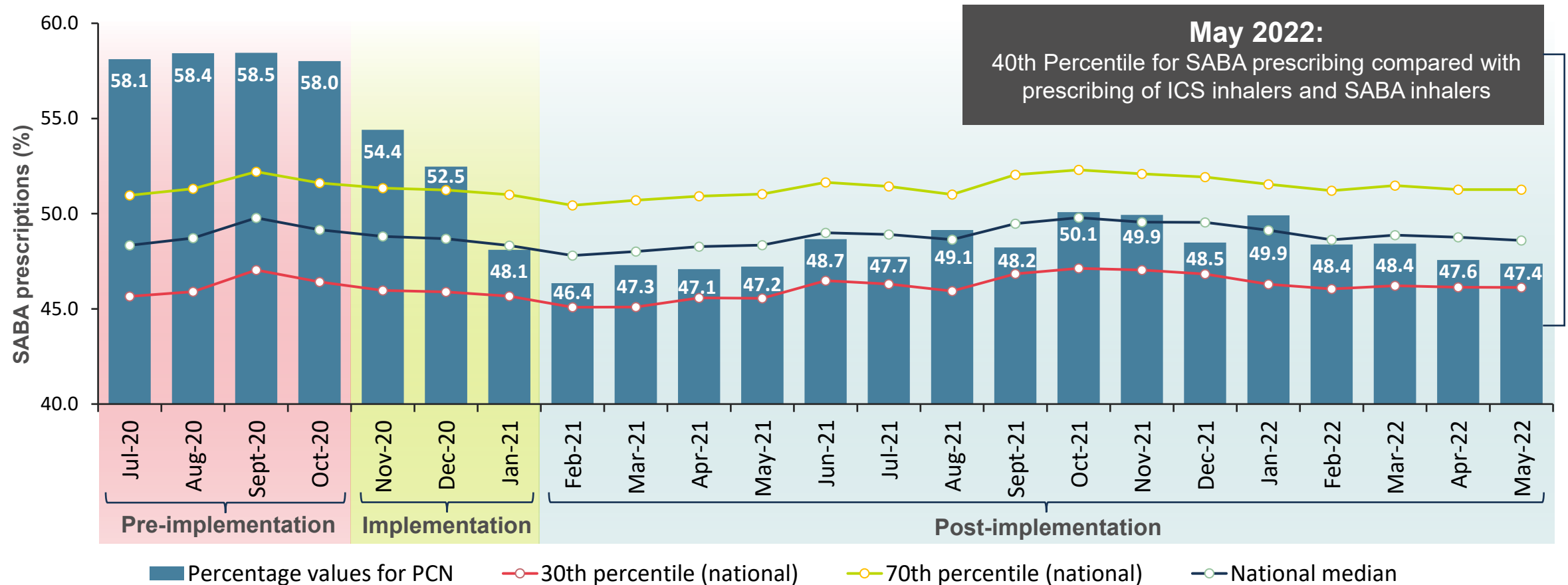
ED, emergency department; GP, general practitioner; NHS; National Health Service; OCS, oral corticosteroid; PCN, primary care network; SABA, short-acting β_2 -agonist; SENTINEL, SABA rEductionN Through ImplemeNting Hull asthma guidELines; SUS, Secondary Uses Services; UK, United Kingdom.

1. Crooks MG, et al. ERJ Open Research Jan 2023, 00685-2022; DOI: 10.1183/23120541.00685-2022



Prescription patterns improved post SENTINEL implementation

SABA prescriptions as a proportion of all inhaled therapies (%) in the pilot PCN pre-and post-SENTINEL implementation



Adapted from OpenPrescribing¹

Data available from OpenPrescribing.net. Figures are shown for SABA inhaler use across all respiratory patients and are not adjusted for changes in patient numbers during the assessment period.

ICS, inhaled corticosteroid; PCN, primary care network; SABA, short-acting β_2 -agonist; SENTINEL, SABA reduction through Implementing Hull asthma guidelines

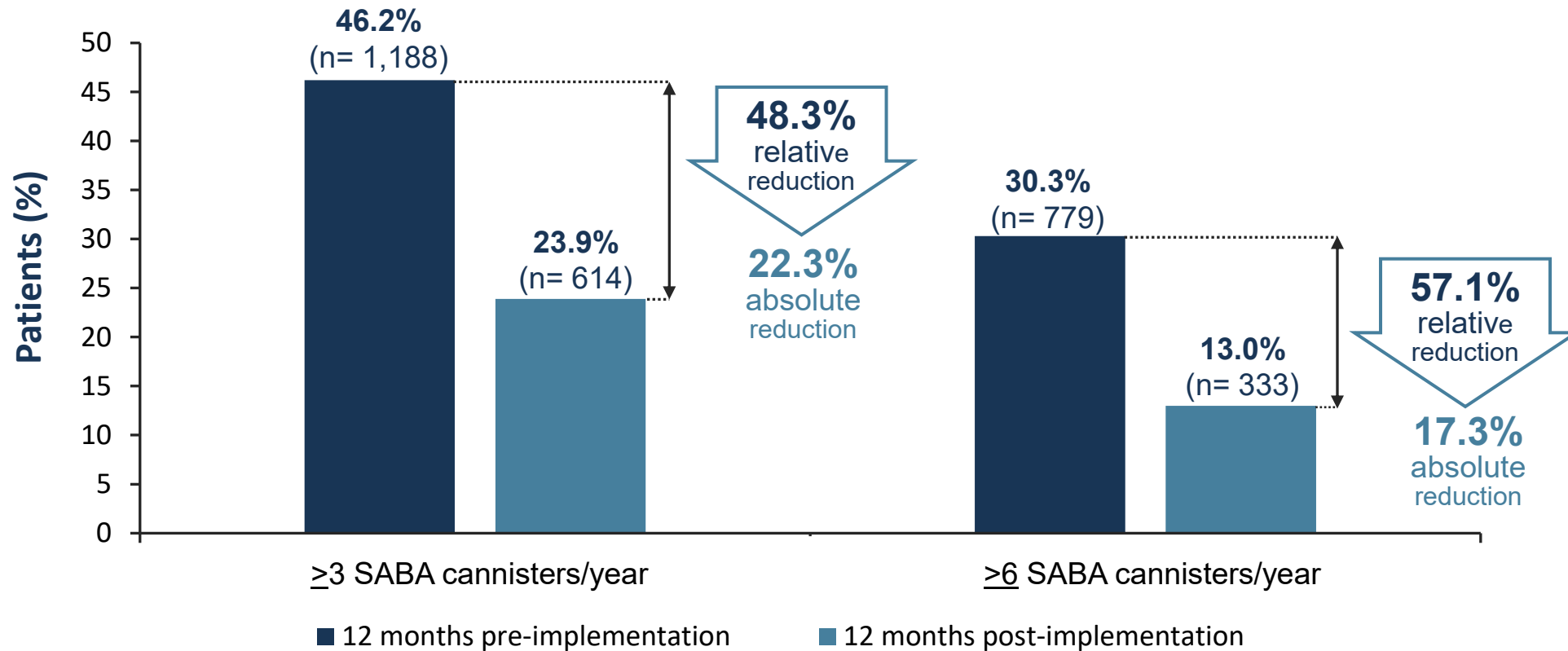
1. Open Prescribing. Short acting beta agonist inhalers: Holderness Primary Care Home PCN. Available at: <https://openprescribing.net/measure/saba/pcn/U64827/> [Accessed August 2025].

Figures are shown for SABA inhaler use across all respiratory patients and are not adjusted for changes in patient numbers during the assessment period.



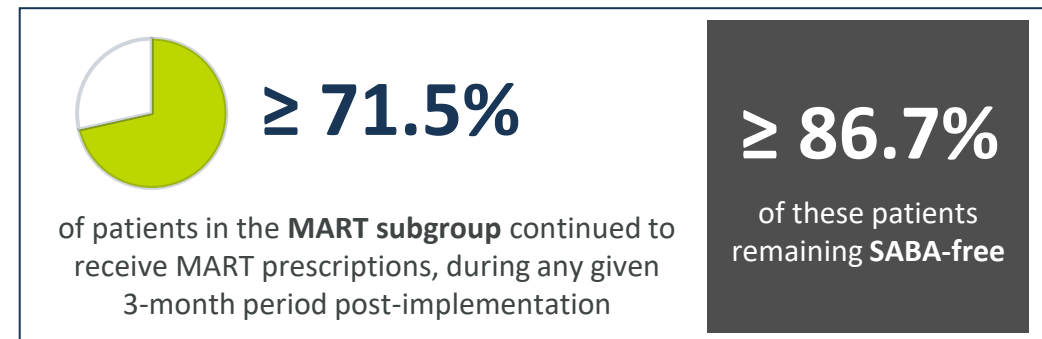
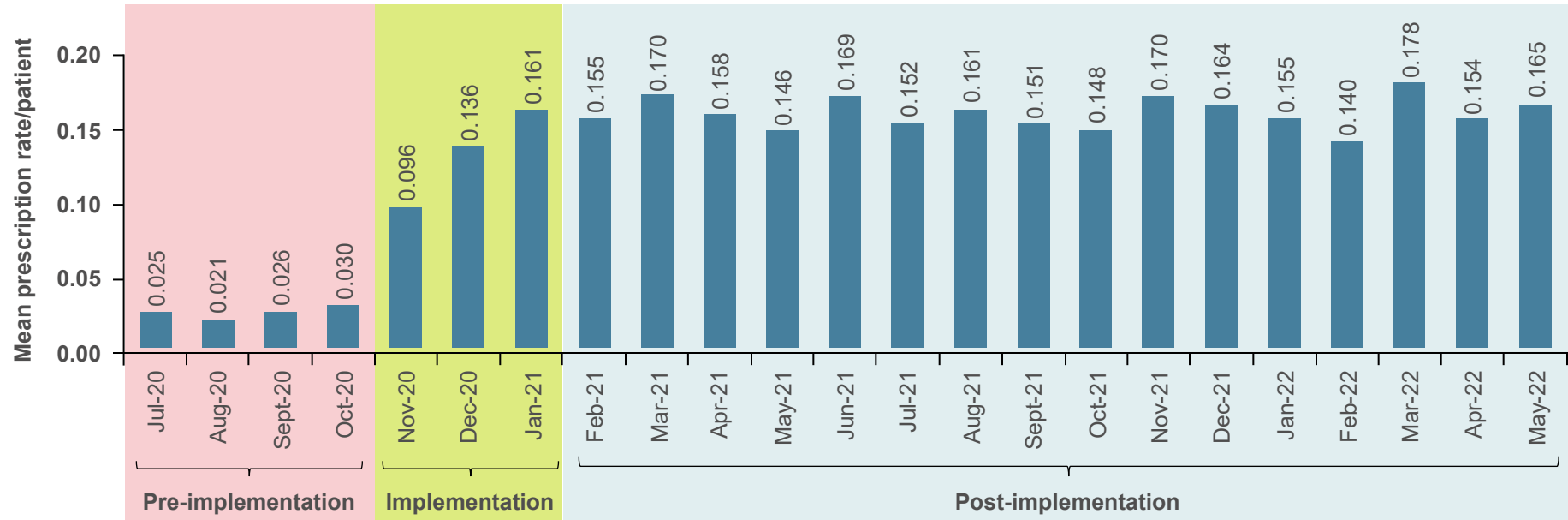
A reduction in SABA prescribing was observed post SENTINEL implementation

Proportion of patients prescribed ≥ 3 and ≥ 6 SABA canisters in the overall asthma population (N=2,571) in the pilot PCN ¹



An increase in MART prescribing was observed post SENTINEL implementation

Monthly mean prescriptions for patient from July 2020 to May 2022 for MART in the overall asthma population (N=2,571) in the pilot PCN ¹



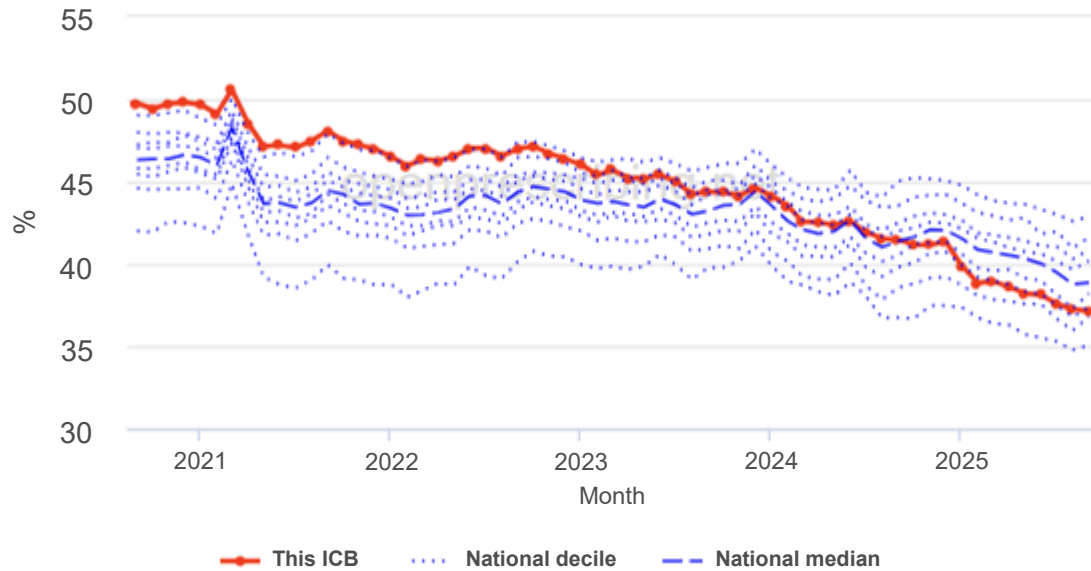
MART, maintenance and reliever therapy; PCN, primary care network; SABA, short-acting β_2 -agonist; SENTINEL, SABA reduction through Implementing Hull asthma guidelines.
 1. Crooks MG, et al. ERJ Open Research Jan 2023, 00685-2022; DOI: 10.1183/23120541.00685-2022



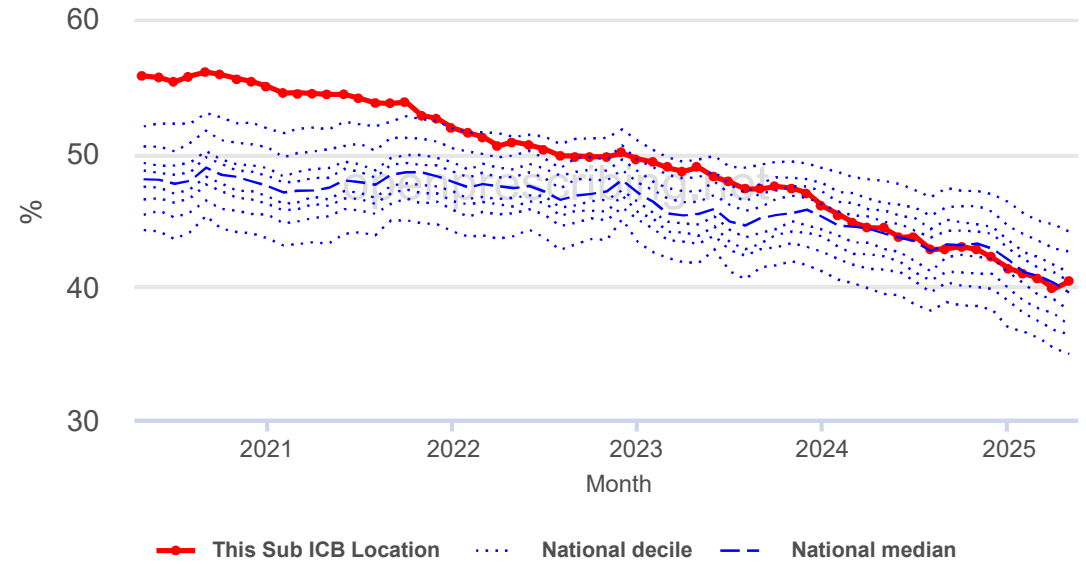
The proportion of SABA inhalers to ICS inhalers prescribed has showed sustained decrease¹

Across both the ICB and Sub-ICB SABA prescribing has decreased over time

Prescribing of short acting beta agonist (SABA) inhalers - salbutamol and terbutaline - compared with prescribing of inhaled corticosteroid inhalers and SABA inhalers



Prescribing of short acting beta agonist (SABA) inhalers - salbutamol and terbutaline - compared with prescribing of inhaled corticosteroid inhalers and SABA inhalers



SABA prescribing has continued to decrease in the Humber and North Yorkshire ICB ¹

SABA prescribing has continued to decrease in the Hull Sub-ICB ²

CCG, clinical commissioning groups; ICB, integrated care board; ICS, inhaled corticosteroid; SABA, short-acting β_2 -agonist; SENTINEL, SABA reduction through Implementing Hull asthma guidelines; SUS, Secondary Uses Services;

1. Open Prescribing. Available from <https://openprescribing.net/measure/saba/icb/QOQ/> (Accessed August 2025); 2. Open Prescribing. Available from <https://openprescribing.net/measure/saba/sicbl/03F/> (Accessed August 2025);



How SENTINEL could contribute to addressing NHS priorities

Improving asthma care supports with addressing the 10 Year Health Plan for England¹, and is aligned to the Green plan guidance²



Shifts to Prevention & Community

29.8% reduction

in the proportion of patients experiencing ≥ 1 exacerbation post-implementation vs 12 months pre-implementation, in the asthma review subgroup.

(0.48 \pm 0.97 vs 0.32 \pm 0.82

Mean number of exacerbations per patient pre & post implementation)³



Low carbon Respiratory care

38% reduction

in CO₂e from all asthma medications 12 months post-implementation **(247,431.2kg)** vs 12 months pre-implementation **(401,948.8kg)**⁴



Health inequalities and disparities

Identifies and partners with regions of:

1. High asthma **prevalence**
2. Above average **SABA overuse**
3. High **hospital admissions** rates





SENTINEL Plus Quality Improvement Project

SENTINEL Plus Quality Improvement Project

SENTINEL Plus quality improvement programme is based on the SENTINEL programme

Since rollout, SENTINEL Plus programme has been implemented in approximately 1/3 of PCNs across the UK

>10,000 less SABAs were prescribed in the first 25 SENTINEL Plus practices ^{^1}
(25,927,252 to 25,885,213 in 12 months following IIF 2022/23)

~6,000 more ICS-containing inhalers were prescribed in the first 25 SENTINEL Plus practices ^{^*2}
(204,504 predicted pre- SENTINEL vs 210,482 observed post- SENTINEL)

How SENTINEL Plus is often rolled out in local regions:

1

Current unmet need

Identification of the current **unmet need** in a locality or region.

This could include asthma **prevalence, admission and mortality** data, and **prescribing** data from national to GP practice level.

2

Education & Patient reviews

Use of SENTINEL Plus resources to support **education** of healthcare professionals on AIR and MART regimens.

Through SENTINEL Plus, asthma review services support guideline-based asthma **prescribing**.

3

Quality improvement measures

Using Open Prescribing data, change in prescribing patterns can be evaluated over time.

AIR, Anti-inflammatory reliever; GP; General Practitioner; ICS, inhaled corticosteroid; MART, maintenance and reliever therapy; SABA, short-acting β_2 -agonist; SENTINEL, SABA reduction through Implementing Hull asthma guidelines;

[^] In the first 25 practices across England to implement SENTINEL Plus ('early adopter sites') *Data for SABA-use and use of ICS-containing inhalers were obtained from the Openprescribing.net SABA inhaler dashboard datasets

1. AstraZeneca Data on File. REF-285953. August 2025; 2. Crooks MG, et al. NPJ Primary Care Respiratory Medicine April 2024;34 (1):6; DOI: 10.1038/s41533-024-00363-0.



Joint Collaborative Project: Surrey Heartlands ICB & AZ

- Improve asthma care quality, safety and patient outcomes through structured optimisation reviews
- Support achievement of asthma QOF indicators (e.g., asthma reviews, personalized asthma action plans)
- Identify patients with severe / difficult-to-treat asthma and support timely referral/escalation
- Help implement consistent recall protocols, pathways and review templates
- Reduce unplanned care by preventing exacerbations and avoidable urgent appointments
- Improve inhaler technique and adherence support, reducing over-reliance on SABA
- Standardize prescribing practice and medicines optimization (AIR/MART)
- Build practice/PCN capability via clinician education and embedded support
- Enable data-led targeting, monitoring and feedback via metrics (showing impact over time)
- Contribute to lower-carbon respiratory care through reduced high-impact inhaler overuse

What will the project deliver?

- Two Prescribing clinicians over 12 months within primary care
- 16 practices have initially been identified to approach
- Support patients by
 - Identifying high risk asthma patients
 - Running structured asthma reviews
 - Optimising inhaler therapy
 - Supporting correct inhaler technique
 - Creating personalised asthma plans
 - Flagging severe asthma for onward referral
- Benefits for practices include
 - Supporting achieve QOF asthma indicators
 - Supporting in upskilling staff
 - Improving prescribing practices