The epidemiology of asthma in children between 2004 and 2021 using Livingstone®: an online, automated analytical platform

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BACKGROUND & AIMS

- Asthma is a chronic respiratory disease that affects more than 300 million people worldwide and can be influenced by environmental, genomic and social factors (1).
- It has been reported that the incidence of asthma is higher in children than in adults, with males more likely to develop asthma in childhood than females (2).
- Incidence of asthma may have peaked, with the British Lung Foundation reporting a 10% decrease in the incidence of asthma between 2008 and 2012, however the lifetime prevalence continues to increase (1-3).
- Within England, during the COVID-19 pandemic, there was a significant reduction in hospitalisations for asthma (4).
- Within Scotland and Wales, there was a 36% pooled reduction in emergency admissions for asthma during the COVID-19 lockdown (5).
- There was a spike in prescriptions in Wales in the week before lockdown, with a 121% increase in inhaled corticosteroids and 133% in oral corticosteroids (5).
- The aim of this study was to characterise the epidemiology of asthma in children using the automated analytical platform Livingstone®.

METHODS

- All analysis was performed by Livingstone®. Livingstone® is an analytical platform that uses real-world data to generate reproducible epidemiological evidence (6).
- The study was conducted by Livingstone® using the combined Clinical Practice Research Datalink (CPRD) Aurum and GOLD datasets.
- CPRD is a longitudinal, pseudonymised dataset from general practices in the UK that comprises two databases CPRD GOLD and CPRD Aurum.
- Due to its large volume, its representativeness, and the long duration of follow-up, CPRD is an excellent source of data for estimating epidemiological parameters (7,8).
- Research quality (acceptable) patients were selected if they had ≥1 medical codes indicative of asthma recorded within the datasets.
- The study period was from the 1st January 2004 to the 31st of December 2021.
- Two age cohorts were analysed; 0–4 years and 5–14 years.
- Incidence per 1,000 person years was calculated annually.
- New cases were required to have a minimum 90-day registration period.
- The aggregated observed person-time per year in eligible patients was the denominator.
- Point prevalence (%) was calculated at the midyear points (30 June) for each year within the study period.
- For point prevalence, patients exposed to asthma at each midyear point formed the numerator and the eligible CPRD population at each midyear formed the denominator.
- This study received CPRD Research Data Governance approval (22_001779).

RESULTS

- 156,928 patients with asthma were selected in the 0-4 years cohort.
- 251,868 patients with asthma were selected in the 5-14 years cohort.
- The mean age of the 0-4 years cohort was 2.8 and 60.7% were male.
- The mean age for the 5-14 years cohort was 8.6 and 56.1% were male.

Table 1: The baseline characteristics for the 0-4 years and the 5-14 years cohorts.

Characteristic	0-4 Cohort	5-14 Cohort
Total patients	156,928	251,868
Age (years)		
Mean (SD)	2.8 (1.1)	8.6 (2.8)
Median (IQR)	3.0 (2.0-4.0)	8.0 (6.0-11.0)
Gender		
Male	95,316 (60.7%)	141,330 (56.1%)
Female	61,612 (39.3%)	110,538 (43.9%)

- The prevalence of asthma showed a gradual decrease from 2004 to 2021 for both the 0-4 years and the 5-14 years cohorts.
  - The prevalence of the 0-4 years cohort decreased from 4.4% in 2004 to 0.7% in 2021.
  - For the 5-14 years cohort, the prevalence decreased from 16.4% in 2004 to 8.2% in 2021.

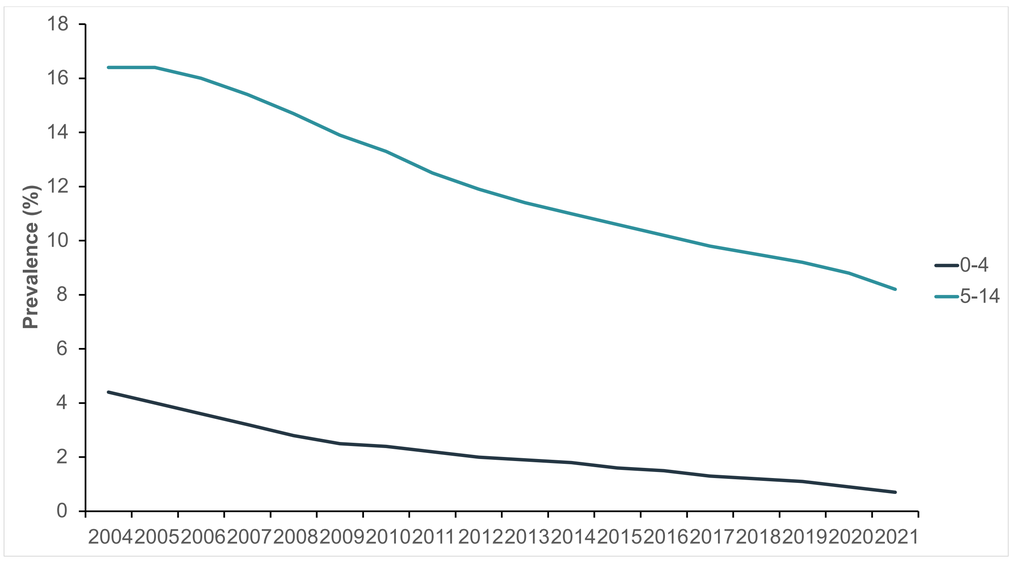

Figure 1: The prevalence (%) of asthma from 2004 to 2021 for the 0-4 years and the 5-14 years cohorts in the Clinical Practice Research Datalink.

- The incidence (per 1,000 person years) peaked for both the 0-4 years and 5-14 years cohorts in 2004 (20.24 and 10.56 per 1,000 person years, respectively).
- There was a gradual decrease in incidence from 2004 to 2019, 7.26 per 1,000 person years for 0-4 years and 7.81 per 1,000 person years for 5-14 years.
- There was a substantial decrease in incidence from 2019 to 2020, with the 0-4 years cohort incidence decreasing by 43% (7.26 to 4.17 per 1,000 person years) and the 5-14 years cohort decreasing by 37% (7.81 to 4.92 per 1,000 person years).
- Incidence increased again from 2020 to 2021, but not to pre-COVID-19 pandemic levels (4.17 per 1,000 person years to 5.76 per 1,000 person years for the 0-4 years cohort and 4.92 to 5.22 per 1,000 person years for the 5-14 years cohort).

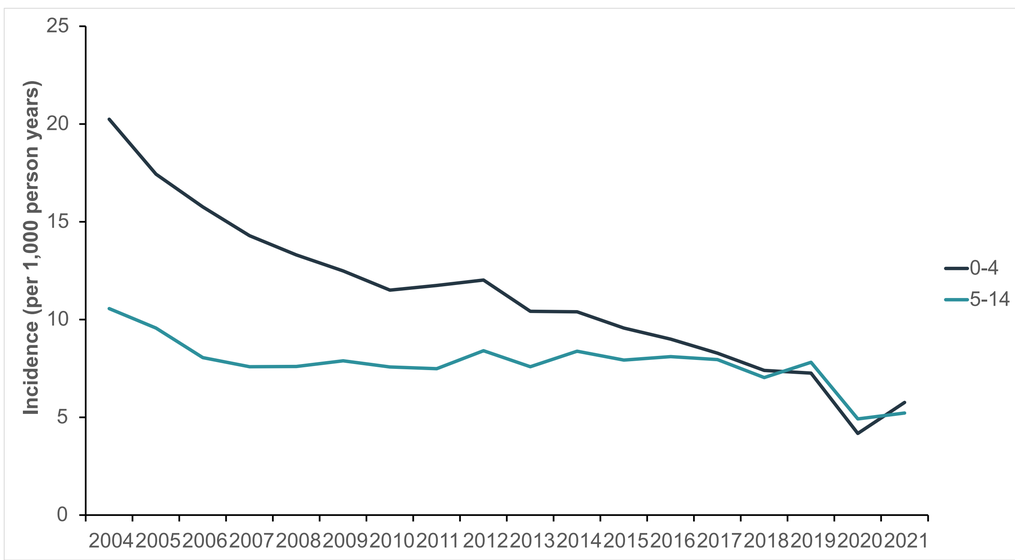

Figure 2: The incidence per 1,000 person years from 2004 to 2021 for the 0-4 years and the 5-14 years cohorts in the Clinical Practice Research Datalink.

CONCLUSION

- The prevalence of childhood asthma decreased over the study period from 2004 to 2021.
- Though incidence rates were higher early in the study period, this may be an artifact of increased reporting of diseases following the Quality Outcomes Framework in 2003.
- The decrease in 2020 may have been influenced by the COVID-19 pandemic.
- Environmental changes, specifically reduced air pollution, may have been a factor in the decrease.
- Alternatively, the decrease may be due to lower rates of presentation due to reduced provision of services and fears of exposure to COVID-19.
- This may have consequences in terms of underdiagnosis and undertreatment of childhood asthma.
- This emphasises the importance of identifying undiagnosed cases that may have been missed due to the COVID-19 pandemic.
- The addition of Hospital Episode Statistics (HES) data would provide further context to the incidence and prevalence of childhood asthma in the current study.
- Livingstone® rapidly generates insights from real-world data to expedite decision making.

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This study is based in part on data from the Clinical Practice Research Datalink obtained under licence from the UK Medicines and Healthcare products Regulatory Agency. The data is provided by patients and collected by the NHS as part of their care and support. All rights reserved. All authors are employed by Human Data Sciences. Human Data Sciences funded this study and developed the Livingstone® platform.

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