Supporting Material: Child deaths due to Asthma or Anaphylaxis

1. Background and scope

This NCMD thematic report aims to identify the common characteristics of children and young people who died due to asthma or anaphylaxis, to investigate modifiable factors associated with these deaths and identify common themes to help inform those providing services to children and young people, commissioners, and policymakers. It also aims to contribute to the existing evidence base to inform ongoing and future research in this area.

Asthma

Asthma is the most common disease among children[32]. It is a long-term disease that requires ongoing management. Asthma symptoms are caused by inflammation and narrowing of the small airways in the lungs and can be any combination of cough, wheeze, shortness of breath and chest tightness.

In England, it is estimated that 6.5% of the population have asthma, with incidence of asthma higher in children than adults[33]. Prevalence estimates vary, depending on the definition, but the Health Survey for England 2018 reported prevalence of asthma (those either with symptoms of asthma or taking medication) for 0-15-year olds at 6%[34]. The prevalence and emergency admission rates for childhood asthma in the UK are one of the highest in Europe[35].

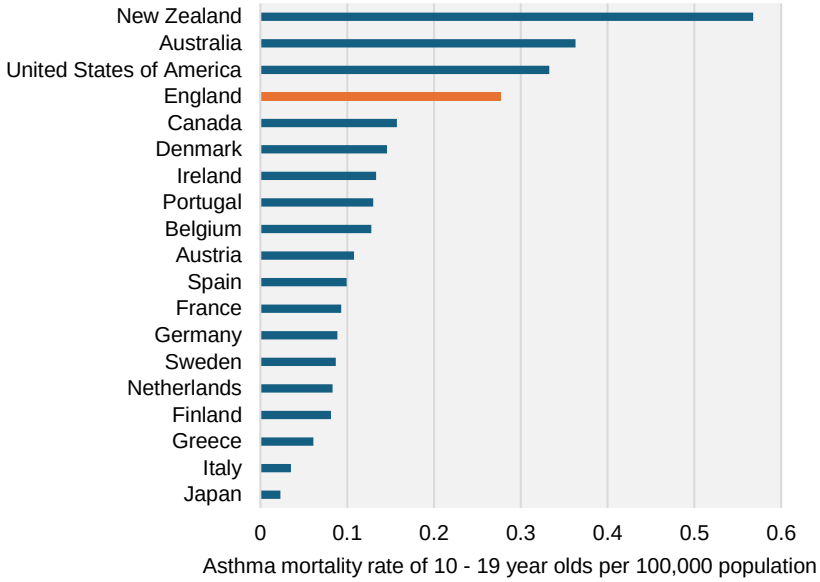
Asthma remains a significant cause of childhood morbidity and mortality and is still a common problem managed in ambulatory and emergency care settings[36]. Hospital admissions for asthma have been previously shown to be associated with socio-economic factors, with children living in the poorest 10% being four times more likely to have an emergency hospital admission than the least deprived 10%[37]. Those living in the poorest areas are more likely to be exposed to higher levels of air pollution[38], contributing to the development and worsening of asthma symptoms.

Data obtained from the Global Burden of Disease Study (GBD) 2021 show that asthma mortality rates of 10 – 19-year-olds in England continue to be the highest in Europe and fourth highest among similar comparator countries used in previous reports (Figure A). In

[32] WHO (2024)
[33] NICE (2024)
[34] NHS England (2019)
[35] NHS England (2023)
[36] BMJ Best Practice (2024)
[37] Asthma + Lung UK (2023)
[38] Fecht et al. (2015)

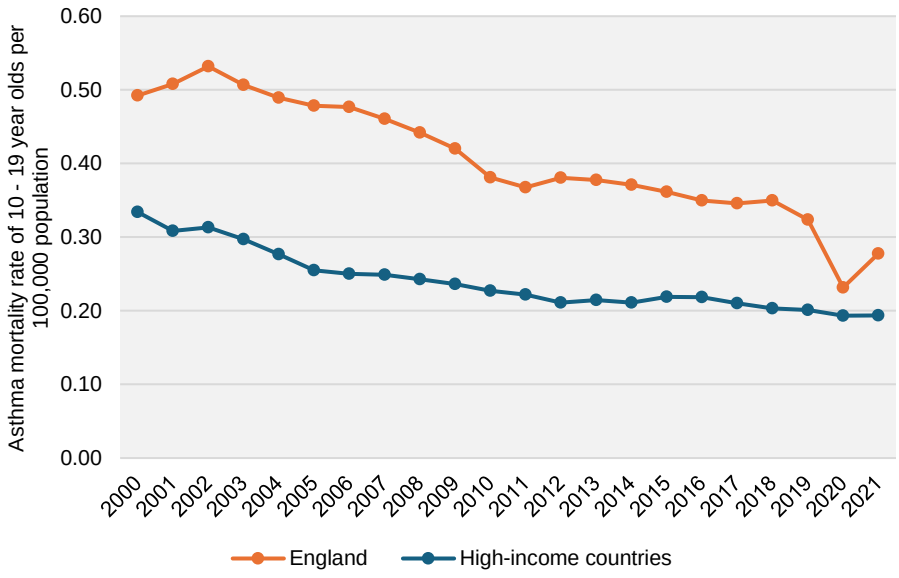
addition, despite a long-term general decline since 2000, asthma mortality rates in England continue to be higher than the average of all high-income countries (Figure B).

Figure A: International comparison of asthma mortality rates for children and young people aged 10–19 years per 100,000 population, 2021



Data source: Global Burden of Disease Study 2021 (GBD 2021) Results. Available from: https://vizhub.healthdata.org/gbd-results/ (Accessed: 21 May 2024)

Figure B: Trend of asthma mortality rates for children and young people aged 10–19 years per 100,000 population, 2000 - 2021



Data source: Global Burden of Disease Study 2021 (GBD 2021) Results. Available from: https://vizhub.healthdata.org/gbd-results/ (Accessed: 21 May 2024)

Previously, the National Review of Asthma Deaths (NRAD) confidential enquiry in 2014 found that 46% of children had received an inadequate standard of asthma care, and made several recommendations for changes to improve provision of asthma care including diagnosis, risk, education and management, to reduce the number of deaths from asthma[19]. Despite this, only one recommendation from NRAD has been implemented nationally[39] and through the child death review process, Child Death Overview Panels continue to identify a high proportion of modifiable factors in asthma deaths[40].

Anaphylaxis

Allergy is one of the most common chronic conditions in childhood and is an immune response to allergens such as food, pollen, dust mites, animal dander, insect venom and medicine. In the UK it is estimated that up to 8% of children have a food allergy, and on average most school classes will have one or two children with food allergies[41]. Allergies can have a significant impact on the child's school attendance and quality of life, with children with food allergies twice as likely to be bullied as those without (Benedict's story | The Allergy Team).

Anaphylaxis is a severe, life-threatening allergic reaction, and in children, food is a particularly common trigger of anaphylaxis. Up to 20% of anaphylaxis reactions in children happen when at school and of these, one in four occurs in children not previously deemed at risk[42].

UK studies from 2015 and 2021 have shown that hospital admissions for anaphylaxis have increased significantly over the last two decades, but there was no increase in case fatality[43,44]. However, the rate of anaphylaxis hospitalisations was higher for children and young people (0-24 years old) than adults. Additionally, admissions related to food anaphylaxis were also more common for children and young people than adults.

Deaths from anaphylaxis are rare, but it is crucial to review the circumstances behind these deaths to improve understanding and reduce the risk of future deaths.

2. Methodology and limitations

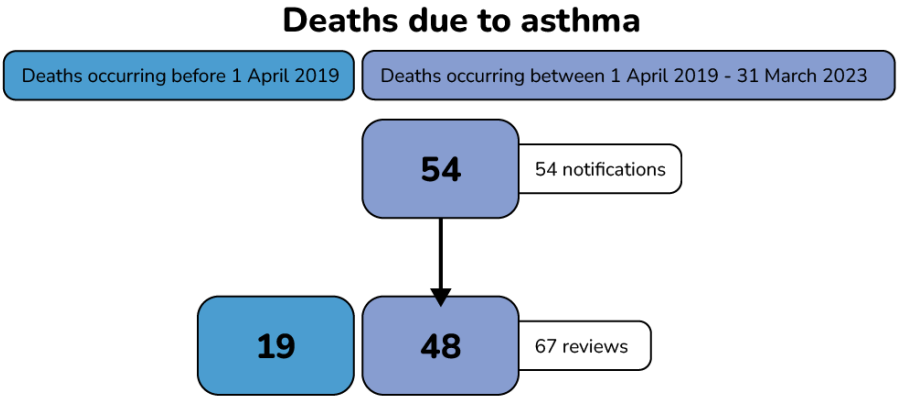
Cohort identification

All children (0 – 17 years) reported to NCMD and identified to have died due to asthma or anaphylaxis between 1 April 2019 and 31 March 2023 were included for analysis. Search

[39] Asthma + Lung UK (2021)
[40] National Child Mortality Database (2023)
[41] Allergy UK (2024)
[42] The Allergy Team (2023)
[43] Turner et al. (2015)
[44] Baseggio Conrado et al. (2021)

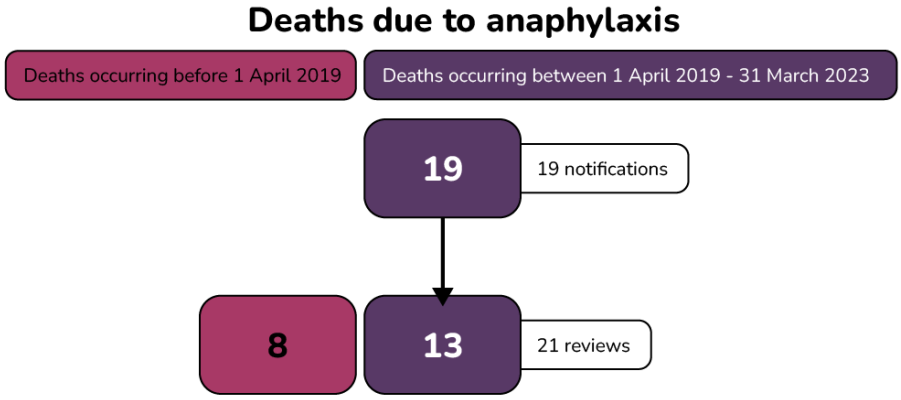
criteria was developed, and a clinical validation of returned cases took place throughout May and June 2024 to ensure appropriate inclusion:

1) Asthma: All deaths were searched for 'asthma' within the cause of death fields (including the suspected cause of death, medical certificate, and cause of death recorded by Child Death Overview Panel (CDOP)). Cases identified that had not yet been reviewed by a CDOP were reviewed by clinicians with relevant expertise to confirm inclusion. Identification of relevant deaths did not depend on the primary category of death assigned by the CDOP. A total of 54 deaths that occurred between 1 April 2019 and 31 March 2023 were identified. In 48 deaths, the CDOP had completed the review and recorded asthma as the underlying cause of death. In the remaining 6 deaths, while the CDOP review was not complete (at the time of analysis), upon clinical review there was information available in the record (e.g., completion of medical certificate of death) to include the death as being due to asthma. A further 19 deaths were identified where the child died before 1 April 2019 (earliest death included occurred in the year beginning 1 April 2016) where the CDOP had completed the review and recorded asthma as the underlying cause of death; the learning from these deaths is included in the section 'Completed reviews of child deaths due to asthma'. These earlier deaths were included to ensure all learning was included from CDOP reviews reported to NCMD; however, as NCMD only has a subset of deaths that occurred before 1 April 2019, these deaths were not included in analysis of asthma mortality rates.



2) Anaphylaxis: All deaths were searched for 'anaphy*' within the record. Cases identified that had not yet been reviewed by a CDOP were reviewed by clinicians with relevant expertise to confirm inclusion. A total of 19 deaths that occurred between 1 April 2019 and 31 March 2023 were identified. In 13 deaths, the CDOP had completed the review and recorded anaphylaxis as the underlying cause of death. In the remaining 6 deaths, while the CDOP review was not complete (at the time of analysis), upon clinical review there was information available in the NCMD record (e.g., completion of medical certificate of death) to include the death as likely being due to anaphylaxis. A further 8

deaths were identified where the child died before 1 April 2019 (earliest death included occurred in the year beginning 1 April 2016) where the CDOP had completed the review and recorded anaphylaxis as the underlying cause of death. The learning from these deaths is included in the section 'Completed reviews of child deaths due to anaphylaxis'. These earlier deaths were included to ensure all learning was included from CDOP reviews reported to NCMD; however, as NCMD only has a subset of deaths that occurred before 1 April 2019, these deaths were not included in analysis of anaphylaxis mortality rates. In a total of 5 completed reviews, CDOPs recorded both asthma and anaphylaxis in the cause of death, and following review by a clinician with relevant expertise, the reviews were included as deaths due to anaphylaxis.



Exclusions

Deaths where the child was known to have asthma, but this was not the underlying cause of death, were not included in the asthma section of this report.

Data sources

ONS census data (2021) for 0–17-year-olds (or adjusted to represent the appropriate age group) were used as a comparator for the characteristics of the total population to provide context and calculate asthma mortality rates. For deprivation measures, the child's postcode of residence was linked to the Index of Multiple Deprivation, with a lower value suggesting greater deprivation.

Hospital Episodes Statistics (HES) admitted patient care data were used to analyse the previous admissions to hospital in the year preceding death, where this was available. One admission can encompass multiple episodes of care, and therefore a total count of unique admission dates was used. Only activity where the admission method was an emergency admission were counted. Asthma was defined as an ICD-10 coded admission containing J45 or J46, either in the first diagnosis code position (primary) or in any other coded diagnoses during the spell (secondary).

Similarly, Emergency Care Dataset and A&E HES data were used to analyse previous emergency department (ED) attendances in the year preceding death. To ensure attendances where the child died in the community and was brought to the ED were not counted, attendances on the day of the death or records where the child died in ED (where this was coded) were excluded from the count. A total count of unique attendance dates was used to quantify attendances, and therefore may undercount if there were multiple attendances on one day.

Data from Medicines dispensed in Primary Care was received from NHS England and this was used to determine the number of inhalers, and inhaler type, that were dispensed in the year prior to each child death. Oral corticosteroids (prednisone/dexamethasone) were not included in the data received.

Contributory and modifiable factors

During the review, CDOPs are required to determine contributory factors across domains specific to the child, the social and physical environment, and service delivery. Each factor is then graded with a relevance, to identify any factors which 'may have contributed to vulnerability, ill health, or death of the child'. The role of the CDOP is also to determine which of these factors are assessed as 'modifiable'; factors that may, by means of a locally or nationally achievable intervention, be modified to reduce the risk of future child deaths. Many factors can be assessed as contributory to the death; however, not all will be assessed to be modifiable.

Contributory or modifiable factors recorded that 'may have contributed to ill-health, vulnerability, or death of the child' were included in the analysis. Data on both contributory and modifiable factors are presented, to show all factors which may have contributed and whether they were assessed to be modifiable by the CDOP.

Whilst completeness of at least one factor graded at a 2 (defined as 'factors identified that may have contributed to vulnerability, ill health or death) was generally good (97%), numbers and proportions should be interpreted as a minimum. This is because on some occasions, the factor could have been recorded with a relevance of 1 (defined as 'no factors identified or factors identified but are unlikely to have contributed to the death'), and therefore not included within this report, or the factor may not have been recorded at all on the analysis form. The denominator used to calculate proportions of contributory factors present was the total number of CDOP reviews completed (67 asthma and 21 anaphylaxis completed reviews).

Other limitations

The NCMD is reliant on accurate data being inputted by professionals involved in submitting information for the child death review. Due to small numbers and the lack of available data on the characteristics of children with asthma within the general population, interpretation should be cautious.

For deaths that occurred between 1 April 2019 – 31 March 2023, at the time of analyses (June 2024) 87% of deaths had been reviewed by a CDOP. This therefore may lead to an underestimation of deaths due to asthma or anaphylaxis during this period and a small number of deaths, not captured in this report, may be due to asthma or anaphylaxis once all investigations have taken place. In addition, for deaths included in sections on death notifications that had not been reviewed by a CDOP (n=12), the final underlying cause of death assigned by the CDOP may differ.

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3. Appendices

Appendix 1: Name and description for each category on the child death review analysis form in hierarchical order

Category	Name & description of category
1	**Deliberately inflicted injury, abuse or neglect** This includes suffocation, shaking injury, knifing, shooting, poisoning & other means of probable or definite homicide; also deaths from war, terrorism or other mass violence; includes severe neglect leading to death.
2	**Suicide or deliberate self-inflicted harm** This includes hanging, shooting, self-poisoning with paracetamol, death by self-asphyxia, from solvent inhalation, alcohol or drug abuse, or other form of self-harm. It will usually apply to adolescents rather than younger children.
3	**Trauma and other external factors, including medical/surgical complications/error** This includes isolated head injury, other or multiple trauma, burn injury, drowning, unintentional self-poisoning in pre-school children, anaphylaxis & other extrinsic factors. Also includes proven medical and surgical complications or errors as the primary cause of death. **Excludes** Deliberately inflicted injury, abuse or neglect (category 1).
4	**Malignancy** Solid tumours, leukaemias & lymphomas, and malignant proliferative conditions such as histiocytosis, even if the final event leading to death was infection, haemorrhage etc.
5	**Acute medical or surgical condition** For example, Kawasaki disease, acute nephritis, intestinal volvulus, diabetic ketoacidosis, acute asthma, intussusception, appendicitis; sudden unexpected deaths with epilepsy.
6	**Chronic medical condition** For example, Crohn's disease, liver disease, immune deficiencies, even if the final event leading to death was infection, haemorrhage etc. **Includes** cerebral palsy with clear post-perinatal cause.
7	**Chromosomal, genetic and congenital anomalies** Trisomies, other chromosomal disorders, single gene defects, neurodegenerative disease, cystic fibrosis, and other congenital anomalies including cardiac.
8	**Perinatal/neonatal event** Death ultimately related to perinatal events, e.g. sequelae of prematurity, antepartum and intrapartum anoxia, bronchopulmonary dysplasia, necrotising enterocolitis, post-haemorrhagic hydrocephalus, irrespective of age at death. It **includes** cerebral palsy without evidence of cause, and **includes** congenital or early-onset bacterial infection (onset in the first postnatal week).

9	**Infection** Any primary infection (i.e. not a complication of one of the above categories), arising after the first postnatal week, or after discharge of a preterm baby. This would include septicaemia, pneumonia, meningitis, HIV infection etc.
10	**Sudden unexpected, unexplained death** Where the pathological diagnosis is either 'SIDS' or 'unascertained', at any age. **Excludes** Sudden Unexpected Death in Epilepsy (category 5).

Appendix 2: Outdoor air pollution analysis

Air pollution is one of the biggest environmental threats for asthma. The National Bundle of Care for Children and Young People with Asthma includes national standards of care for professionals on air pollution and indoor air quality.

Long term exposure to traffic-related air pollution both increases the risk of children developing asthma, and more severe symptoms once it has developed. For example, Ananberg et al[1] estimated that 1.85 million new asthma cases in children were attributable to traffic-related NO_2 globally in 2019.

The case of Ella Kissi-Debrah is an individual example of the adverse effects of air pollution. In February 2013, the inner South London coroner concluded that the death of Ella, a girl with asthma who lived near the South Circular Road, was caused by acute respiratory failure, severe asthma and air pollution exposure. This was the first time that air pollution was included in the death certificate as contributing to death. Ella was exposed to traffic related pollution in excess of the World Health Organization (WHO) guideline values. The two main components of traffic-generated pollution, the most common source of outdoor exposure in the UK, are nitrogen oxides (NOx); most commonly nitrogen dioxide (NO_2) and particulate matter (PM). A component of PM is fine particulate matter (PM less than 2.5 microns in aerodynamic diameter: $PM_{2.5}$) which is 30 times thinner than a human hair. It can be inhaled deeply into lung tissue. $PM_{2.5}$ accounts for most health effects due to air pollution. Since a significant proportion of childhood asthma cases may be attributable to long-term exposure to traffic-related air pollution and these cases could be prevented, we sought to assess mean annual exposure of children who died of asthma both at the home and the school address. The 2021 WHO air quality guideline values for annual mean exposure are 5 $\mu g/m^3$ for $PM_{2.5}$ and 10 $\mu g/m^3$ for NO_2. By contrast, the current UK National air quality objectives are higher, with an annual mean limit of 20 $\mu g/m^3$ for $PM_{2.5}$, and 40 $\mu g/m^3$ for NO_2[2].

Methods

Home and school postcodes were converted into longitude/latitude and run through the Imperial College of London's UK air pollution model for a single year. Results are expressed as annual mean $PM_{2.5}$ and NO_2 exposure at the home and school addresses. Postcode data were available for 54 home and 41 school addresses.

Results

The mean value of $PM_{2.5}$ at the home address of children who died due to asthma was 9.6 (range: 5.8 to 11.24) $\mu g/m^3$ and 9.6 (range: 5.5 to 11.2) $\mu g/m^3$ at school. All children were therefore exposed to $PM_{2.5}$ above the WHO guideline at both home and school (Figure C). By contrast, exposure to $PM_{2.5}$ for all children at both home and school was below the current UK guideline value.

For NO_2 the mean annual value at home was 17.5 (range: 3.9 to 30.2) $\mu g/m^3$ and 17.6 (range: 5.1 to 33.4) $\mu g/m^3$ at school. At home, 51/55 (92%) of children were exposed to NO_2 concentrations above the WHO limit, and 39/41 (95%) were above the WHO guideline at school (Figure D). Exposure of children was below the current UK guideline value for NO_2 at both the home and school address.

Conclusion

Most of the children who died from asthma in England were exposed to long-term traffic-related air pollution above the WHO air quality guideline values. Since Mahfouz et al[3] reported 86% (126/147) of new schools in England exceeded all three WHO targets, and every location exceeded at least one, it is likely that these findings reflect exposure of a large proportion of the UK paediatric population. We conclude that UK exposure limits should be reduced as quickly as possible to WHO guideline values to protect children's health. Although annual mean concentrations of $PM_{2.5}$ at the roadside have decreased from 12.8 $\mu g/m^3$ in 2009 to 7.7 $\mu g/m^3$ in 2023[4], these findings suggest that aligning UK air pollution policy with global goals will pave the way for further health equality for the most deprived groups[5].

Figure C: Distribution of the annual mean exposure to $PM_{2.5}$ at the home and school address of the children who died due to asthma between 1 April 2019 and 31 March 2023

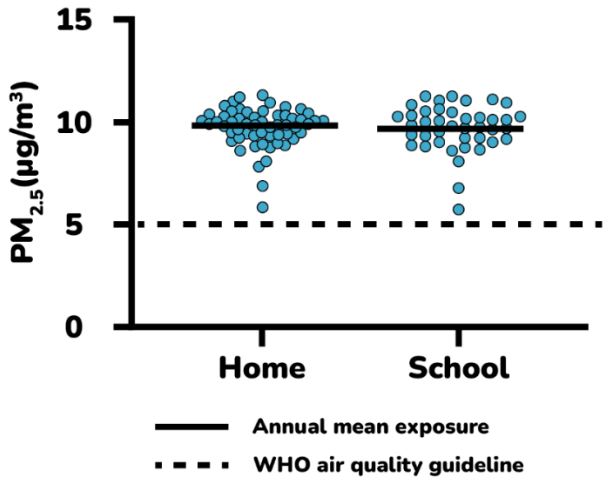
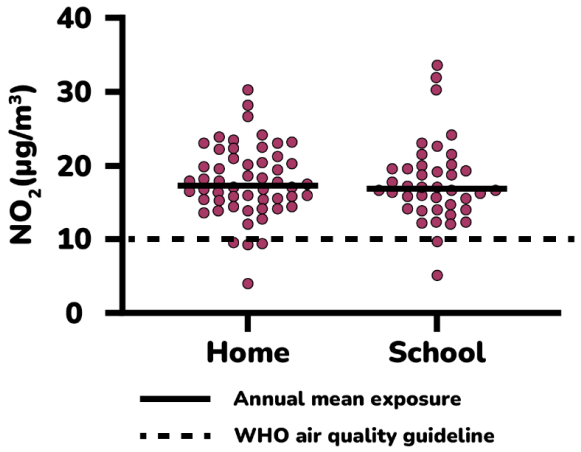


Figure D: Distribution of the annual mean exposure to NO_2 at the home and school address of the children who died due to asthma between 1 April 2019 and 31 March 2023



[1] Anenberg SC, Mohegh A, Goldberg DL, *et al*. Long-term trends in urban NO2 concentrations and associated paediatric asthma incidence: estimates from global datasets. *Lancet Planet Health* 2022; **6**: e49–58.
[2] https://uk-air.defra.gov.uk/assets/documents/Air_Quality_Objectives_Update_20230403.pdf.
[3] Mahfouz Y, Tydeman F, Robertson M. Investigating the air quality surrounding new schools in England: polluted playgrounds and school buildings are a source of avoidable harm. Arch Dis Child 2024; 109: 483–7.
[4] Particulate matter (PM10/PM2.5) - GOV.UK (www.gov.uk)
[5] Fewer children admitted to hospital for asthma as air quality improves | Nuffield Trust

Appendix 3: Pneumothorax

Pneumothorax is a condition where air leaks into the space between the lung and the ribcage, causing the lung to collapse (Pneumothorax (collapsed lung) symptoms, causes and treatment | Asthma + Lung UK (asthmaandlung.org.uk))

Pneumothorax was present in 12 (22%) deaths. In a further 6 deaths it was not possible to make a judgment. Tension pneumothorax was likely to be present if: a) there was evidence of a release of air under tension and/or manual ventilation demonstrably improved; b) extensive post mortem findings; or c) pneumothorax was listed as 1a on the Medical Certificate of Cause of Death (MCCD). From the evidence available in the records, paramedic crews routinely performed needle thoracocenteses and/or manual thoracostomies in children with asthma in cardiac arrest. Once such a procedure is carried out, it is very difficult to interpret whether or not a pneumothorax was present since the procedure itself may cause air to enter the chest.

Pre-hospital guidelines (JRACLC) advise that children with cardiac arrest due to an asthma attack are managed as per standard cardiac arrest management guidelines. Specific advice is given to regularly check and treat for reversible causes and specifically the presence of a tension pneumothorax. If the latter is suspected, the attending paramedic crew should consider performing a needle thoracocentesis and/or manual thoracostomy.

Appendix 4: Data tables

Asthma

Table 1: Number of deaths due to asthma between 1 April 2019 and 31 March 2023 (4 years), by year, age, sex, ethnicity, and prematurity

	Number (%) of child deaths due to asthma	Rate per 1,000,000 children per year
Year of death	**54**	**1.15 (0.86 - 1.50)**
2019-20	16 (30%)	1.36 (0.78 - 2.21)
2020-21	10 (19%)	0.85 (0.41 - 1.56)
2021-22	14 (26%)	1.19 (0.65 - 1.99)
2022-23	14 (26%)	1.19 (0.65 - 1.99)
Age group	**54**	
0 – 4 years	5 (9%)	0.41 (0.13 - 0.95)
5 – 9 years	11 (20%)	0.82 (0.41 - 1.47)
10 – 14 years	22 (41%)	1.61 (1.01 - 2.44)
15 – 17 years	16 (30%)	2.07 (1.18 - 3.36)
Sex	**54**	
Female	17 (31%)	0.74 (0.43 - 1.19)
Male	37 (69%)	1.53 (1.08 - 2.11)
Ethnic group	**53**	
White	35 (66%)	1.02 (0.71 - 1.42)
Asian, Black, Mixed, Other	18 (34%)	1.39 (0.82 - 2.20)
Prematurity or low birthweight	**30**	
Born before 37 weeks gestation or under 2500g	8 (27%)	-

Data source: NCMD, ONS Census (2021)

Table 2: Number of deaths due to asthma between 1 April 2019 and 31 March 2023 (4 years), by area, region, deprivation, and season

	Number (%) of child deaths due to asthma	Rate per 1,000,000 children per year
Area*	**54**	
Rural	7 (13%)	0.95 (0.38 - 1.96)
Urban	47 (87%)	1.18 (0.87 - 1.57)
Region of CDOP	**54**	
East Midlands	6 (11%)	1.51 (0.56 - 3.30)
East of England	8 (15%)	1.50 (0.65 - 2.96)
London	5 (9%)	0.66 (0.21 - 1.54)
North East	1 (2%)	0.48 (0.01 - 2.65)
North West	10 (19%)	1.60 (0.77 - 2.94)
South East	5 (9%)	0.64 (0.21 - 1.51)
South West	2 (4%)	0.46 (0.06 - 1.66)
West Midlands	10 (19%)	1.93 (0.93 - 3.55)
Yorkshire and Humber	7 (13%)	1.53 (0.61 - 3.14)
Deprivation*	**54**	
1 (most deprived)	30 (56%)	2.66 (1.79 - 3.79)
2	9 (17%)	0.94 (0.43 - 1.78)
3	5 (9%)	0.56 (0.18 - 1.32)
4	4 (7%)	0.47 (0.13 - 1.20)
5 (least deprived)	6 (11%)	0.68 (0.25 - 1.49)
Season	**54**	
Winter (Dec, Jan, Feb)	19 (35%)	1.61 (0.97 - 2.52)
Spring (Mar, Apr, May)	15 (28%)	1.27 (0.71 - 2.10)
Summer (Jun, Jul, Aug)	7 (13%)	0.59 (0.24 - 1.22)
Autumn (Sep, Oct, Nov)	13 (24%)	1.10 (0.59 - 1.89)

Data source: NCMD, ONS Census (2021)

*Derived from child's postcode of residence

Table 3: Number of deaths due to asthma between 1 April 2019 and 31 March 2023 (4 years), by place of cardiac arrest, location the death was verified, and mode of death

	Number (%) of child deaths due to asthma
Place of cardiac arrest	**54**
Abroad	2 (4%)
Home or other private residence	32 (59%)
Public place (including school)	13 (24%)
Healthcare facility	7 (13%)
Emergency Department	2
Hospital ward	2
Hospital theatre	1
GP surgery	1
Ambulance	1
Location the death was verified	**54**
Abroad	2 (4%)
Home or other private residence	5 (9%)
Public place (including school)	2 (4%)
Healthcare facility	45 (83%)
Emergency Department	23
AICU/PICU	19
Hospital ward	2
Hospital theatre	1
Mode of death	**50**
Unsuccessful cardio-pulmonary resuscitation	29 (58%)
Withholding, withdrawal, or limitation of life-sustaining treatment	11 (22%)
Brainstem death	9 (18%)
Found dead	1 (2%)

Data source: NCMD

AICU=Adult Intensive Care Unit, PICU=Paediatric Intensive Care Unit

Table 4: Emergency department attendances and hospital emergency inpatient admissions in the 12 months before death for children who died due to asthma between 1 April 2019 and 31 March 2023 (4 years)

	Number (%) of child deaths due to asthma	
	All activity	Activity where asthma was primary diagnosis code
Emergency department attendances in the 12 months before death*	**54**	**-**
No attendances	20 (37%)	-
1 attendance	17 (31%)	-
2 – 4 attendances	10 (19%)	-
5 or more attendances	7 (13%)	-
Hospital emergency inpatient admissions in the 12 months before death	**54**	**54**
No admissions	27 (50%)	39 (72%)
1 admission	16 (30%)	9 (17%)
2 – 4 admissions	8 (15%)	4 (7%)
5 or more admissions	3 (6%)	2 (4%)
Either an emergency department attendance or an emergency inpatient admission in the 12 months before death	35 (65%)	

Data source: NCMD, Hospital Episodes Statistics, Emergency Care Dataset
*excludes any ED attendances on the day of death

Table 5: Dispensed reliever and preventer inhalers in primary care in the 12 months before death for children who died due to asthma between 1 April 2019 and 31 March 2023 (4 years)

	Number (%) of child deaths due to asthma
Dispensed SABA* Inhalers (Relievers) within 12 months preceding deaths	**54**
0-2	7 (13%)
3+	47 (87%)
3-5	8
6-11	12
12+	27
Dispensed Inhaled corticosteroids (ICS) (Preventers)^	**54**
0-8	35 (65%)
0-4	23
5-6	6

7-8	6
9+	19 (35%)

Data source: NCMD, Medicines dispensed in Primary Care

*Short-acting beta$_2$ agonist

^Includes combisal preventers

Table 6: Number of completed child death reviews by CDOPs where the child died due to asthma, by case discussed with coroner, joint agency response, primary category of death and modifiable factors identified by the CDOP

	Number (%) of child death reviews completed
Total number of reviews	**67**
Discussed with coroner	
Yes, and the coroner agreed that the hospital should issue a MCCD	13/63 (21%)
Yes, and the coroner carried out an investigation	46/63 (73%)
No, and MCCD issued by medical team	4/63 (6%)
Joint agency response	50/58 (86%)
Post-mortem undertaken	43/62 (69%)
Prevention of Future Death Report	2/64 (3%)
Primary category of death assigned by CDOP	
Deliberately inflicted injury, abuse or neglect	3/67 (4%)
Acute medical or surgical condition	57/67 (85%)
Chronic medical condition	7/67 (10%)
Modifiable factors identified by CDOP	54/67 (81%)

Data source: NCMD

Anaphylaxis

Table 7: Number of deaths due to anaphylaxis between 1 April 2019 and 31 March 2023 (4 years), by year, age, sex, and ethnicity

	Number (%) of child deaths due to anaphylaxis	Rate per 1,000,000 children per year
Year of death	**19**	**0.40 (0.24 - 0.63)**
2019-20	7 (37%)	0.59 (0.24 - 1.22)
2020-21	1 (5%)	0.08 (0.00 - 0.47)
2021-22	5 (26%)	0.42 (0.14 - 0.99)
2022-23	6 (32%)	0.51 (0.19 - 1.11)
Age group	**19**	
0 – 9 years	2 (11%)	0.08 (0.01 - 0.28)
10 – 14 years	7 (37%)	0.51 (0.21 - 1.06)
15 – 17 years	10 (53%)	1.29 (0.62 - 2.38)
Sex	**19**	
Female	8 (42%)	0.35 (0.15 - 0.69)
Male	11 (58%)	0.46 (0.23 - 0.82)
Ethnic group	**18**	
White	9 (50%)	0.26 (0.12 - 0.50)
Asian, Black, Mixed or Other	9 (50%)	0.70 (0.32 - 1.32)

Data source: NCMD, ONS Census (2021)

Table 8: Number of deaths due to anaphylaxis between 1 April 2019 and 31 March 2023 (4 years), by area, region, deprivation, and season

	Number (%) of child deaths due to anaphylaxis	Rate per 1,000,000 children per year
Area*	**19**	
Rural	1 (5%)	0.14 (0.00 - 0.76)
Urban	18 (95%)	0.45 (0.27 - 0.72)
Region of CDOP	**19**	
East Midlands	2 (11%)	0.50 (0.06 - 1.82)
East of England	0 (0%)	-
London	4 (21%)	0.53 (0.14 - 1.35)
North East	1 (5%)	0.48 (0.01 - 2.65)
North West	6 (32%)	0.96 (0.35 - 2.09)
South East	2 (11%)	0.26 (0.03 - 0.93)
South West	0 (0%)	-
West Midlands	3 (16%)	0.58 (0.12 - 1.69)
Yorkshire and Humber	1 (5%)	0.22 (0.01 - 1.21)
Deprivation*	**19**	
1 (most deprived)	6 (32%)	0.53 (0.20 - 1.16)
2	3 (16%)	0.31 (0.06 - 0.91)
3	5 (26%)	0.56 (0.18 - 1.32)
4	3 (16%)	0.35 (0.07 - 1.02)
5 (least deprived)	2 (11%)	0.23 (0.03 - 0.82)
Season	**19**	

Winter (Dec, Jan, Feb)	4 (21%)	0.34 (0.09 - 0.87)
Spring (Mar, Apr, May)	4 (21%)	0.34 (0.09 - 0.87)
Summer (Jun, Jul, Aug)	4 (21%)	0.34 (0.09 - 0.87)
Autumn (Sep, Oct, Nov)	7 (37%)	0.59 (0.24 - 1.22)

Data source: NCMD, ONS Census (2021)

*Derived from child's postcode of residence

Table 9: Number of deaths due to anaphylaxis between 1 April 2019 and 31 March 2023 (4 years), by location at the onset of event/illness and place of death

	Number (%) of child deaths due to anaphylaxis
Location at onset of event/illness	**19**
Abroad	1 (5%)
Home or other private residence	10 (53%)
Public place	5 (26%)
School	2 (11%)
Hospital	1 (5%)
Place of death	**19**
Abroad	1 (5%)
Home or other private residence	4 (21%)
Public place	0 (0%)
School	0 (0%)
Hospital – ED	8 (42%)
Hospital – Other areas (PICU, AICU, hospital wards)	6 (32%)

Data source: NCMD

Table 10: Emergency department attendances and hospital emergency inpatient admissions in the 12 months prior to death for children who died due to anaphylaxis between 1 April 2019 and 31 March 2023 (4 years)

	Number (%) of child deaths due to anaphylaxis	**Activity where asthma was primary diagnosis code**
Emergency department attendances in the 12 months before death^	**19**	**-**
No attendances	10 (53%)	-
1 or more attendances	9 (47%)	-
Hospital emergency inpatient admissions in the 12 months before death	**19**	**19**
No admissions	15 (79%)	16 (84%)
1 or more admission	4 (21%)	3 (16%)

Either an emergency department attendance or an emergency inpatient admission in the 12 months before death	9 (47%)	

Data source: NCMD, Hospital Episodes Statistics, Emergency Care Dataset

^excludes any attendances on the day of death

Table 11: Number of completed child death reviews by CDOPs where the child died due to anaphylaxis, by case discussed with coroner, joint agency response, primary category of death and modifiable factors identified by the CDOP

	Number (%) of child death reviews completed
Total number of reviews	**21**
Discussed with coroner	
Yes, and the coroner agreed that the hospital should issue a MCCD	1/19 (5%)
Yes, and the coroner carried out an investigation	18/19 (95%)
No, and MCCD issued by medical team	0/19 (0%)
Joint agency response	12/12 (100%)
Post-mortem undertaken	15/18 (83%)
Prevention of Future Death Report	4/19 (21%)
Primary category of death assigned by CDOP	
Trauma and other external factors	7 (33%)
Acute medical or surgical condition	14 (67%)
Modifiable factors identified by CDOP	16/21 (76%)

Data source: NCMD