Summary Points

- Hospitalization rates for asthma in Virginia have substantially decreased, with an overall decrease of 41.7% from 2016 to 2022. The greatest decrease, 45.3%, occurred from 2019 to 2020. Asthma hospitalizations began to rebound in 2021 and 2022, possibly due to post-pandemic factors affecting asthma management and access to care.
- Black populations in Virginia, especially Black females, had substantially higher asthma hospitalization rates than other racial groups.
- Black children aged 0-4 had the highest asthma hospitalization rates in Virginia, followed by school-aged Black children aged 5-14.
- Fewer asthma hospitalizations occurred from June to August, while most asthma hospitalizations occurred from September to December and in March.
- The Central Health Region consistently had the highest hospitalization rates, while the Northern Region had the lowest. Among localities, Cities of Emporia, Richmond, and Petersburg had the highest asthma hospitalization rates in Virginia, possibly due to environmental, demographic, and socio-economic factors.

VIRGINIA ASTHMA HOSPITALIZATION TRENDS 2016-2022

By Francis Adams, MPH, Epidemiologist

Rebecca Tomazin, MPH, Program Manager; Dane De Silva, PhD, MPH, Principal Investigator

Environmental Public Health Tracking Program

Division of Population Health Data | Office of Family Health Services

June 2025

Background

Asthma is a lung disease that causes swelling and inflammation of the airways (Asthma in Virginia, n.d.). The disease is often characterized by symptoms such as wheezing, breathlessness, tightness of the chest, and coughing at night or in the early mornings (CDC, 2024). In the United States, about 8-10% of individuals are reported to have asthma, showing a steady prevalence over recent years (CDC, 2023). The disease generally starts in childhood and is more common in males than in females until age 20. Exposure to dust mites, animal allergens, and mold can trigger asthma. Other modifiable factors that can trigger or worsen asthma include smoking and obesity. Ozone and fine particulate matter may increase non-viral asthma attacks in children; however, the causal relationship between air pollution and asthma is not well-known (Sinyor & Perez, 2023).

According to the American Lung Association, asthma prevalence in the United States varies by demographics. Among children, males were more likely than females to have asthma (7.0% vs. 5.4%) in 2022. However, among adults, women were more likely than men to have asthma (10.8% vs. 6.5%). In the United States, asthma prevalence is currently higher among Black people and Indigenous Peoples when compared to other racial and ethnic groups. In 2022, Black people (10.3%) had a 44% higher prevalence of asthma than White people (8.4%) (American Lung Association, n.d.).

There is no cure for asthma, and while treatment is available, minority populations may struggle to have access to adequate treatment. (Source: Asthma in Virginia - Asthma). Treatment and management involve avoiding triggers where possible and taking necessary medication. The Centers for Disease Control and Prevention (CDC) Asthma Control Program funds several state and territorial health departments to support surveillance and access to guidelines-based medical management for all people with asthma. This report describes Virginia's asthma hospitalization trends, identifies asthma-related disparities, and provides recommendations for additional analysis.

Methods

Asthma hospitalizations in Virginia from 2016–2022 were obtained from hospital admission data in the Virginia Patient Level Data System. Hospitalization counts and rates were also sourced from the CDC Environmental Public Health Tracking Network, which collects standardized hospitalization data from state and local health jurisdictions.

Asthma admissions were identified using ICD-10-CM code J45 as the primary diagnosis, and cases were grouped by locality and health district of patient residence, as well as by age group, sex, and race/ethnicity. Crude rates were calculated using resident population estimates from the U.S. Census Bureau.

To support public health surveillance and trend detection, aggregated hospitalization rates were calculated over multi-year intervals. Aggregating data in this way helps to stabilize rates for jurisdictions or subgroups with small populations or low event counts, allowing for more reliable comparisons and trend analysis over time. Tableau and Excel were used for data cleaning, visualization, and statistical analysis.

Results

Hospitalization by Age

From 2016-2022, asthma hospitalizations were highest among the 0-4 and 5-9 year age groups, accounting for 13% and 11%, respectively (see Figure 1). Notable peaks also occurred at ages 50-54 (8%) and 55-59 (7%). Hospitalization among teens and young adults (15-24 years old) was comparatively lower at 3%. Hospitalization rates for older adults (65 years and older) showed a steady decline. The age group 80-84 had the lowest hospitalization admission, at 2% (see Figure 1).

Hospitalization by Sex

The number of females hospitalized for asthma consistently exceeded that of males each year. In 2016, 2,671 females were hospitalized for asthma compared to 1,509 males. By 2022, hospitalizations declined for both sexes, with 1,490 females and 948 males admitted. Overall, the total number of asthma-related hospitalizations for both females and males has decreased from 2016 to 2022 (see Figure 2).

Hospitalization by Age and Race

Children (0-4 Years and 5-14 Years): Black children aged 0-4 had the highest asthma hospitalization rates in Virginia (154.0 per 100,000), followed by school-aged Black children (aged 5-14) with a rate of 141.6 per 100,000 (see Figure 3).

Adolescents and Young Adults (15-34 Years): Asthma hospitalization rates for adolescents and young adults (aged 15-34) were generally lower than for other age groups (see Figures 1 & 3).

Adults (35-64 Years): Black adults aged 35-64 had a hospitalization rate of 98.0 per 100,000, which is higher than all other adult age rates (see Figure 3).

Racial and Ethnic Disparities: Black residents were disproportionately affected by asthma across all ages and varied by sex, with Black females (114.6 per 100,000) having higher asthma hospitalization rates than Black males (73.4 per 100,000), see Figure 4. Rates among White and Hispanic populations were much lower, while Native Americans saw a 38.8% increase in hospitalizations between 2021-2022.

Hospitalization by Region and Locality

The Central Health Region localities, particularly the City of Emporia, the City of Richmond, and the City of Petersburg, had some of Virginia's highest rates, while the Northern Region had the lowest (see Figures 5 & 6).

Hospitalization by Month

Asthma hospitalizations in Virginia occurred most frequently in September, October, November, December, and March. Asthma hospitalizations occurred less frequently in the summer months. November had the most cumulative hospitalizations for asthma, with 2,209 occurring in November from 2016 to 2022 (see Figure 7).

Virginia vs Other Mid-Atlantic States

Among five states in the Mid-Atlantic Region whose data were available on the National Environmental Public Health Tracking Network, Virginia ranked favorably and had lower overall state asthma hospitalization rates than Maryland, North Carolina, and Pennsylvania during 2016-2022 (see Figure 8).

Discussion

Asthma hospitalization rates in Virginia steadily declined from 2016 to 2022, with a significant drop during the COVID-19 pandemic, potentially due to healthcare avoidance and/or limited capacity of healthcare facilities during the pandemic (see Figure 9). Seasonal patterns revealed hospitalization peaks in colder months and during March, likely driven by increased respiratory infections and weather-related asthma triggers. Hospitalization peaks during the colder months may also be driven by increased vulnerability and greater exposure to respiratory infections in group settings, such as schools, or congregate living environments, such as shelters, jails, or long-term care facilities.

We also observed differences in trends in asthma hospital admissions for certain age groups, sexes, and demographic groups. The youngest age groups (0-4 and 5-9 years) were most affected, possibly due to underdeveloped respiratory systems or environmental triggers (Miligkos et al., 2025). Age groups 50-54 and 55-59 had a notable hospitalization admission, which may be attributed to cumulative exposure to asthma triggers over time or age-related health challenges that exacerbate the condition. Young adults aged 15-24 with low hospitalization admission could be a result of improved management or a lower prevalence of severe asthma during this life stage (Yang et al., 2024). There was on overall reduction in asthma hospitalizations for both sexes from 2016 to 2022, with males showing a smaller decrease. The difference between female and male hospitalizations narrowed slightly over the years but remained highest among females. This is consistent with the global trend, which shows a pronounced sex difference. Asthma prevalence was higher in adult women and boys under 13 (Chowdhury et al., 2021).

Black populations, particularly Black females, experienced disproportionately high asthma hospitalization rates. Regional disparities were also evident, with the Central Health Region experiencing the highest rates while the Northern Health Region had the lowest. A study conducted by Lotfata et al. (2023) has shown that higher prevalence of asthma can lead to disparities in certain communities and regions. The disparities could be attributed to the complex interplay between racial, socioeconomic, and environmental factors.

Young children aged 0-4 years face the highest risks, likely due to heightened exposure to respiratory infections in daycare and school settings, as well as having underdeveloped immune systems (Vissing et al., 2018). Socioeconomic, structural, and environmental factors, such as urban density, smoke exposure, poor air quality, and limited access to health care, could be disproportionately affecting Blacks and lower-income populations. Sex differences could also play a role, with hormonal changes in women, such as puberty and menopause, contributing to higher asthma hospitalization rates among females (Chowdhury et al., 2021).

The onset of the COVID-19 pandemic appeared to have had a notable impact, with reduced hospitalizations for asthma and many other chronic diseases. Virginia residents may have experienced less exposure to respiratory triggers and pollution during the early phases of the pandemic, which may have contributed to fewer hospitalizations for asthma. The reduced exposure to common asthma triggers like allergens, pollution, and respiratory infections may have led to fewer hospitalizations. Lockdowns improved air quality and encouraged behavioral changes, such as mask-wearing and enhanced hygiene, which may have reduced exacerbations. Additionally, some individuals may have avoided healthcare settings, choosing to manage their asthma at home where possible.

Targeted interventions are necessary to address disparities, focusing on improving healthcare access, mitigating environmental risks, and tailoring asthma care to vulnerable populations to ensure equitable health outcomes.

Limitations

This report was created using data from 2016 to 2022 from Virginia-based hospitals. Information captured is for patients with asthma, with asthma diagnosis being the primary reason for the hospitalization of the patients.

For data obtained from CDC's National Environmental Public Health Tracking Data Explorer, residents of states admitted to hospitals outside their state are generally not included. Of note, there may be differences between CDC data and data from specific state or city Tracking programs because of several factors, including different estimations of populations, differences in how measures are defined, and how and when the data were updated. The data analyzed for this report are based on the date of hospital admission, which serves as a practical indicator of when the patient first presented with symptoms severe enough to warrant inpatient care. However, relying solely on the admission date has limitations. It does not capture the full clinical course or symptom onset, which may have occurred days earlier. Seasonal trends or acute exposure events might be misrepresented if there are delays between symptom onset and hospitalization. Additionally, disease classification is based on ICD-10-CM codes, which are assigned by hospital coders after discharge. This process can introduce variability due to differences in coding practices, documentation quality, or provider interpretation. The reported measures are counts and rates, which do not account for individual-level risk factors such as socioeconomic status, environmental exposures, or access to care. Also, hospital readmissions within a short timeframe might be counted as separate events, inflating the apparent burden of disease.

Aggregate rates were calculated for this report. Aggregated rates may mask short-term changes or annual variability, potentially limiting the ability to detect recent shifts in asthma burden or the effects of new interventions.

Emergency department and other outpatient data on asthma were not analyzed due to limited access to such data or the inability to identify asthma-related urgent care visits in Virginia. Future analyses could explore the All-Payer Claim Database, the Virginia Adult Health Survey data, and mortality (death) data to provide a more comprehensive picture of asthma trends in Virginia.

Suggested Interventions

Addressing asthma disparities in Black communities requires a multifaceted approach focusing on healthcare access, environmental improvements, community education, and policy changes. Intervention ideas include:

1. Healthcare Access and Management:

- Community-based asthma education programs tailored for Black populations (Woods, 2016).
- Use of mobile clinics and telemedicine to expand access to routine care.

2. Children's School and Childcare Programs:

- Asthma-friendly policies in schools, such as staff training, no idling in parking lots, and indoor allergen reduction (Mendoza et al., 2022).
- Workshops to educate parents, school staff, and caregivers on asthma management during the school year (*Managing Allergies in Schools,* n.d.).

3. Environmental Health Interventions:

- Improving housing quality (e.g., pest control, air filtration)(*Asthma Triggers In Homes Can Send Kids to the ER—This Organization Is Working to Change That,* n.d.).
- Air pollution control through local government collaboration and green initiatives (Mendoza et al., 2022).

4. Policy and Advocacy Efforts:

- Expanding Medicaid and insurance for asthma-related care.
- Supporting clean air legislation and smoke-free housing ("West Harlem Environmental Action," 2025).

5. Predictive Data Models for Future Planning:

- Utilizing time series, machine learning, and geospatial models to analyze asthma hospitalization trends, including trends at the subcounty level (Mendoza et al., 2020).
- Leveraging data on demographics, environment, and socioeconomics for targeted interventions.

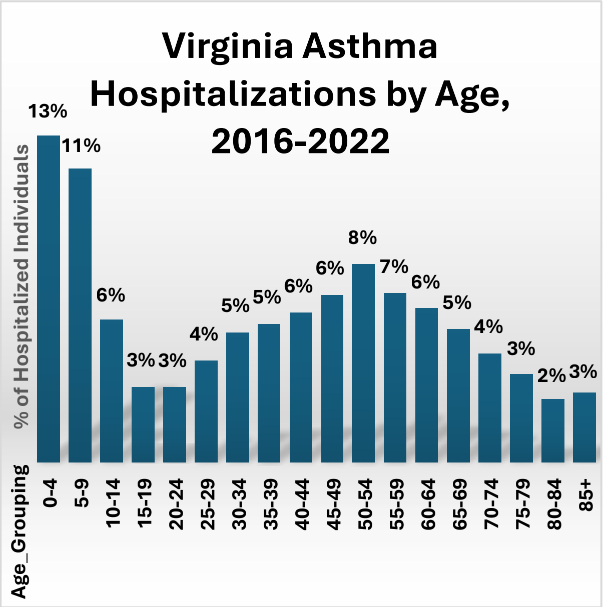
These initiatives aim to reduce disparities by addressing underlying causes and improving care, environment, and policies.

Conclusion

Asthma hospitalizations showed an overall decline since 2016, but disparities persist, particularly for Black and younger populations in Virginia. Targeted interventions related to healthcare access, school/childcare policies, and improving air quality in communities can help address these disparities. Statistical modeling and geospatial regression are recommended to predict future trends, especially when combined with demographic and environmental data, allowing public health officials to anticipate needs and allocate resources effectively.

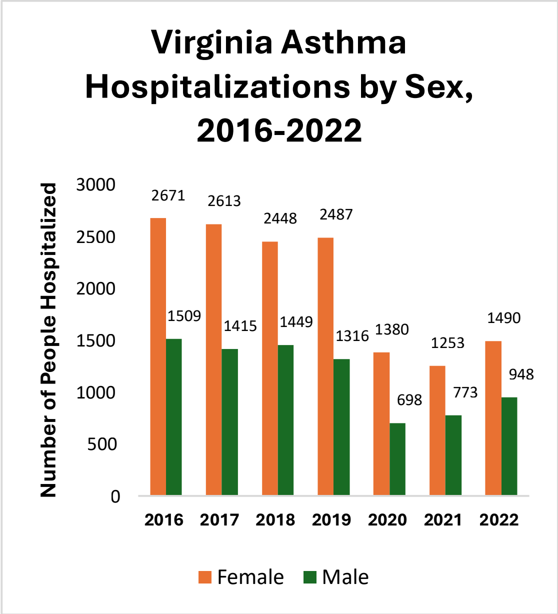
Figures

Figure 1



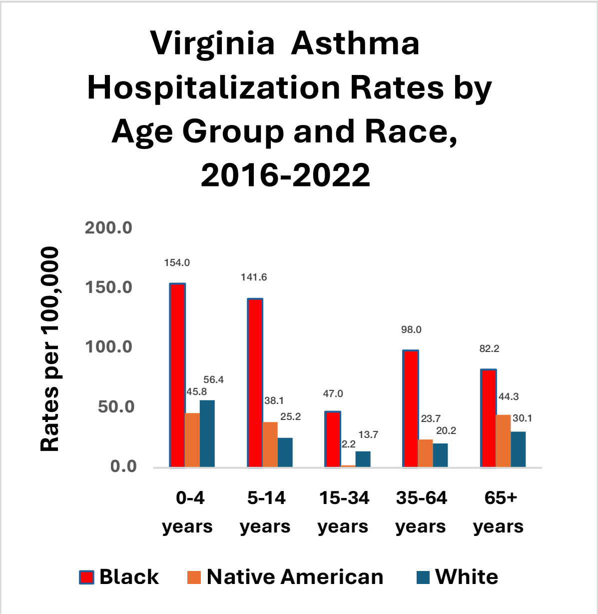
Source: Virginia Patient Level Data System

Figure 2



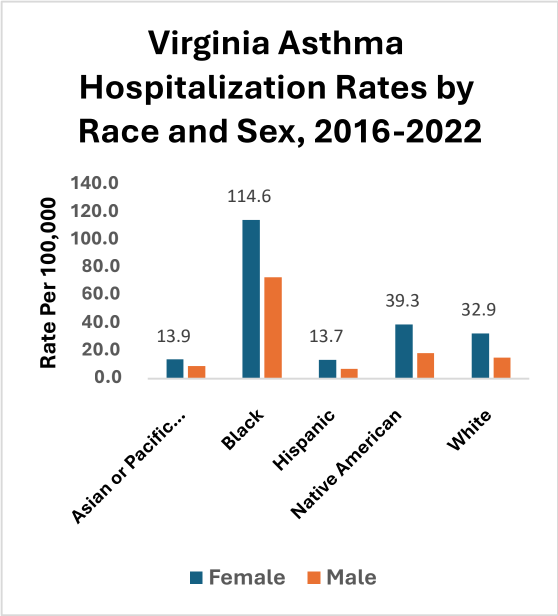
Source: Virginia Patient Level Data System

Figure 3



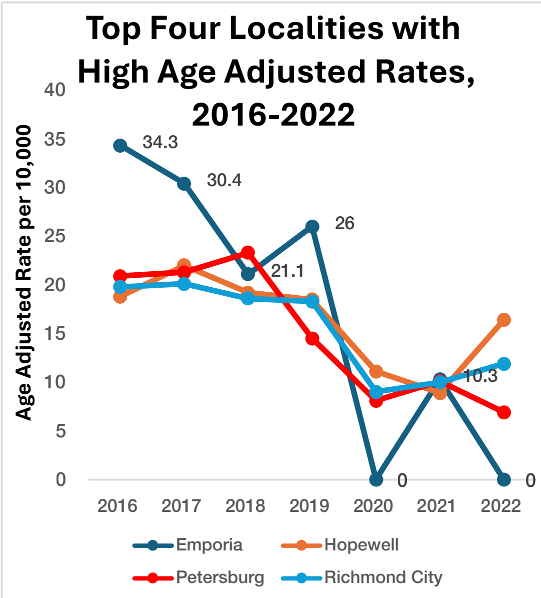
Source: Virginia Patient Level Data System

Figure 4



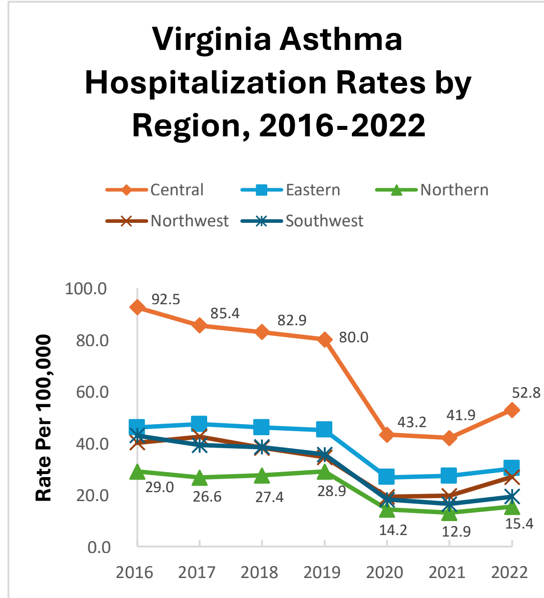
Source: Virginia Patient Level Data System

Figure 5



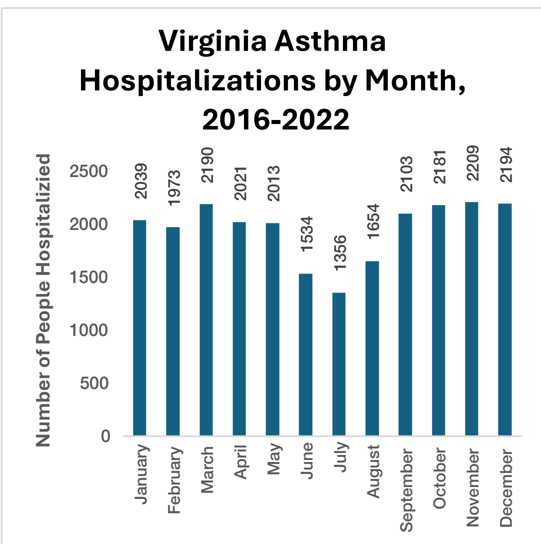
Source: Virginia Patient Level Data System

Figure 6



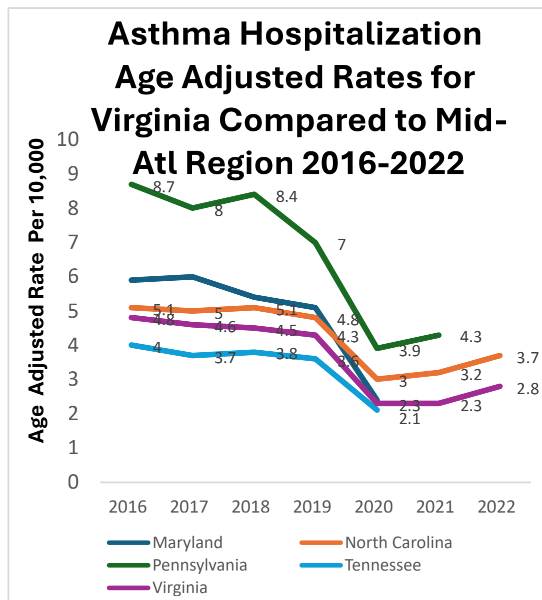
Source: Virginia Patient Level Data System

Figure 7



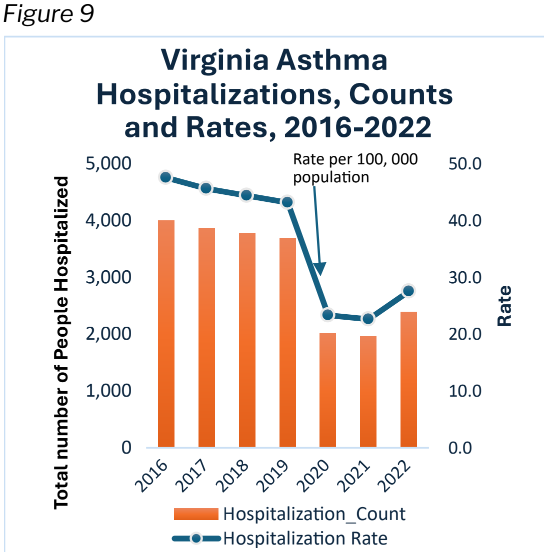
Source: Virginia Patient Level Data System

Figure 8



Source: Centers for Disease Control and Prevention. Environmental Public Health Tracking Network. Hospitalizations for Asthma

Figure 9



Source: Virginia Health Information Hospitalization Dataset

References

American Lung Association. (n.d.). *Asthma trends brief: Current asthma demographics.* Retrieved April 8, 2025, from https://www.lung.org/research/trends-in-lung-disease/asthma-trends-brief/current-demographics

Asthma in Virginia. (2022, September 27). *Virginia Department of Health.* https://www.vdh.virginia.gov/asthma/

Asthma in Virginia. (n.d.). *Virginia Department of Health.* Retrieved July 22, 2024, from https://www.vdh.virginia.gov/asthma/

Asthma triggers in homes can send kids to the ER—This organization is working to change that. (n.d.). *Health.* Retrieved July 15, 2025, from https://www.health.com/capp-plus-pediatric-asthma-home-repairs-8642215

CDC. (2024, May 14). *Asthma.* https://www.cdc.gov/asthma/index.html

CDC. (2023, May 22). *Asthma.* https://www.cdc.gov/asthma/index.html

Centers for Disease Control and Prevention. (n.d.). *Environmental Public Health Tracking Network: Hospitalizations for asthma.* https://ephtracking.cdc.gov/DataExplorer/

Chowdhury, N. U., Guntur, V. P., Newcomb, D. C., & Wechsler, M. E. (2021). Sex and gender in asthma. *European Respiratory Review, 30*(162), 210067. https://doi.org/10.1183/16000617.0067-2021

Lotfata, A., Moosazadeh, M., Helbich, M., & Hoseini, B. (2023). Socioeconomic and environmental determinants of asthma prevalence: A cross-sectional study at the U.S. county level using geographically weighted random forests. *International Journal of Health Geographics, 22*(1), 18. https://doi.org/10.1186/s12942-023-00343-6

Managing allergies in schools: A guide for staff - Allergy & Asthma Network. (n.d.). Retrieved July 15, 2025, from https://allergyasthmanetwork.org/allergies-and-asthma-at-school/managing-allergies-in-schools-a-guide-for-staff/

Mendoza, D. L., Bayles, M., Contreras, J. R., Bares, R., Olson, C. S., Crosman, E. T., & Forrest, R. T. (2022). Idle-free campaign survey results and idling reductions in an elementary school. *Vehicles, 4*(3), Article 3. https://doi.org/10.3390/vehicles4030048

Mendoza, D. L., Pirozzi, C. S., Crosman, E. T., Liou, T. G., Zhang, Y., Cleeves, J. J., Bannister, S. C., Anderegg, W. R. L., & III, R. P. (2020). Absentee and economic impact of low-level fine particulate matter and ozone exposure in K-12 students. https://doi.org/10.13140/RG.2.2.12720.17925

Miligkos, M., Oh, J., Kwon, R., Konstantinou, G. N., Kim, S., Yon, D. K., & Papadopoulos, N. G. (2025). Epidemiology of asthma across the ages. *Annals of Allergy, Asthma & Immunology, 134*(4), 376–384.e13. https://doi.org/10.1016/j.anai.2024.12.004

Vissing, N. H., Chawes, B. L., Rasmussen, M. A., & Bisgaard, H. (2018). Epidemiology and risk factors of infection in early childhood. *Pediatrics, 141*(6), e20170933. https://doi.org/10.1542/peds.2017-0933

West Harlem Environmental Action. (2025). In *Wikipedia.* https://en.wikipedia.org/w/index.php?title=West_Harlem_Environmental_Action&oldid=1268718807

Woods, E. R. (2016). Community asthma initiative to improve health outcomes and reduce disparities among children with asthma. *MMWR Supplements, 65.* https://doi.org/10.15585/mmwr.su6501a4

Yang, C., Lv, J., Li, X., Yang, X.-T., & Yin, M.-Y. (2024). Global burden of asthma in young adults in 204 countries and territories, 1990–2019: Systematic analysis of the Global burden of disease study 2019. *Preventive Medicine Reports, 37*, 102531. https://doi.org/10.1016/j.pmedr.2023.102531