

ASTHMA: A HEALTH JUSTICE ISSUE IN NEW HAVEN, CT

An overview of the asthma burden in New Haven

Prepared by the Yale Global Health Justice Partnership's Asthma Working Group

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Purpose

In 2017, a group of faculty, fellows, and students across disciplines at Yale convened with a shared interest in supporting the development of high-impact, community-driven health justice project(s) focused on addressing the high asthma burden in New Haven through structural and preventative approaches. The purpose of this issue brief is to highlight the scope of this issue and its disproportionate impact on marginalized communities, synthesize information from existing research, resources, and community work, and engage academics, community members, and justice-oriented organizations that might be interested in this issue.

Introduction

As is the case with many urban areas in the United States, asthma rates in New Haven are significantly higher than those in Connecticut as well as nationally, and continue to rise. According to the 2018 Asthma Capitals report, New Haven ranks 7th amongst cities with the highest estimated asthma prevalence and 24th amongst most challenging places to live with asthma.¹

Asthma prevalence, particularly in New Haven's lowest income neighborhoods - Dixwell, Fair Haven, Hill North, Newhallville, West River/Dwight and West Rock/West Hills (Figure 1) - is alarming. According to a 2015 health survey² by Yale's Community Alliance for Research and Engagement (CARE), asthma rates between 2009 to 2015 in these six neighborhoods increased from 20% to 23% (Figure 2). In comparison, as Figure 2 indicates, 2015 averages were significantly lower for Connecticut (14%) and the US (13%). The most significant disparities in New Haven were seen across lines of gender, income and race. In general, asthma rates in New Haven were twice as high for women (31% for women vs. 15% for men). Meanwhile, individuals in the lowest income bracket (<15K) had the highest rates of asthma at 30% (Figure 3) and prevalence among those who identified as Black (23%) and Hispanic/Latinx (25%) was also notably higher as compared to white individuals (20%) (Figure 4). In light of this study, it comes as no surprise that New Haven has the highest rate of asthma hospitalizations in the state: 75 per 10,000 residents, compared to the statewide rate of 14 per 10,000 residents.³

There are a number of structural factors, in addition to any genetic causes, that contribute to the disproportionate asthma burden in New Haven. This report explores a



Figure 1: Color key for asthma rates shown in Figure 2

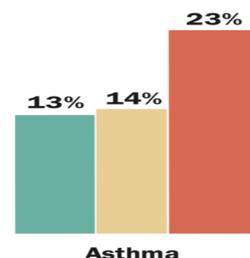


Figure 2: 2015 asthma rates in the U.S., Connecticut, and local New Haven neighborhoods²

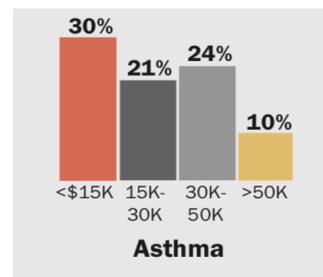


Figure 3: 2015 asthma rates in New Haven by annual income²

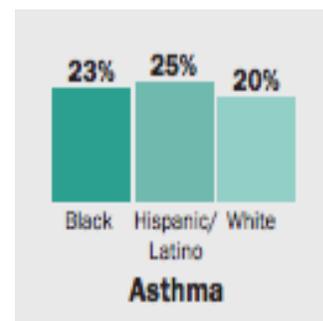


Figure 4: 2015 asthma rates in New Haven by race and ethnicity²

¹ Asthma and Allergy Foundation of America. (2018). Asthma Capitals 2018: The Most Challenging Places to Live with Asthma. Retrieved from <http://www.aafa.org/media/AAFA-2018-Asthma-Capitals-Report.pdf>

²Community Alliance for Research and Engagement (CARE). (2015). New Haven Health Survey. Retrieved from https://medicine.yale.edu/ysph/care/resources/2015%20CARE%20Survey%20Results%20April%202016%20update_246216_284_11205_v4.pdf

³ Connecticut Department of Public Health. (2012). The Burden of Asthma in Connecticut. Retrieved from <https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/hems/asthma/pdf/Fullreportwithcoverpdf.pdf?la=en>

range of environmental, housing, education, and work-related factors related to asthma that disproportionately impact the city's more marginalized communities, making asthma a critical health justice issue in New Haven. Inadequate remediation of poor housing conditions and environmental triggers, alongside lack of proper medical treatment and education, place the New Haven community, in particular communities of color and children, at high risk for asthma.

Environmental

Exposure to certain environmental triggers is known to increase incidence of asthma. Such triggers include air pollution, cigarette smoke, pollen, mold spores, mouse allergen, cockroach waste, chemical fumes, and gases or dust.⁴ According to federal monitoring, the state of Connecticut is routinely cited as being among the worst states for air pollution on the East Coast, mostly due to ozone levels.⁵ In an analysis of counties with available data in Connecticut, New Haven County was found to have the highest annual mortality rate from ozone pollution, with a rate of 54.9 people per year.⁶ Ground level ozone is created by a number of factors, including pollutants emitted by cars, industrial boilers, and power or chemical plants.⁷

Not only do direct environmental exposures contribute to asthma prevalence, but the interaction of these exposures with other health factors is of high concern. For example, research conducted by the Harvard School of Public Health has identified a strong correlation between obesity, ozone levels, and asthma.⁸ This research adds specificity to previous epidemiological studies: 7 aggregated longitudinal studies with the inclusion of 300,000 adults found a dose-response correlation between BMI and asthma prevalence.⁹ In terms of possible relevant to the New Haven context, the 2015 health survey carried out by CARE revealed that while a third of children between the ages of 2-19 on the national level are overweight or obese, children in New Haven, particularly children of color, have significantly higher rates of obesity (75% of Black and Latinx children, 50% of white children).¹⁰ Additionally, there is a growing body of research that demonstrates a link between exposure to chemicals, including heavy metals, pesticides, BPA, and other chemicals, and weight gain.¹¹ Further research is needed to evaluate whether such exposures could be contributing to obesity rates for children in New Haven. High levels of ozone in combination with overweight and obesity rates may put New Haven children in a high-risk scenario for asthma.

A large portion of air pollution in New Haven comes from motor vehicles. Vehicle emissions are concerning for residents' health due to ozone, particulate matter, acetaldehyde (which intensifies asthma), acrolein, benzene, 1,3-butadiene, formaldehyde, and diesel exhaust. Pollutants released via traffic fumes have also been linked to clustered increase of allergic symptoms.¹² Increasing allergic value of pollen grains has been linked to air pollutants such as ozone (O₃), nitrogen oxides (NO_x),

⁴ Miller, R. (2018). Trigger control to enhance asthma management. *UpToDate*. Retrieved from https://www.uptodate.com/contents/trigger-control-to-enhance-asthma-management?search=asthma%20triggers&source=search_result&selectedTitle=1~96&usage_type=default&display_rank=1

⁵ Hladky, G. B. (2016). New Study: Air Pollution Killing 168 In Connecticut Each Year. *Hartford Courant*. Retrieved from <http://www.courant.com/news/connecticut/hc-air-pollution-deaths-hartford-20160810-story.html>

⁶ Cromar, K.R., Gladson, L.A., Perlmutter, L.D., Ghazipura, M., & Ewart, G.W. (2016). American Thoracic Society and Marron Institute Report: Estimated Excess Morbidity and Mortality Caused by Air Pollution above American Thoracic Society-Recommended Standards, 2011-2013. *Annals of the American Thoracic Society*, 13, 1195-1201.

⁷ Environmental Protection Agency. (n.d.) Basic Information About Ozone Pollution. Retrieved from <https://www.epa.gov/ozone-pollution/basic-information-about-ozone#regulations>

⁸ Shore, S. A. (2017). Mechanistic basis for obesity-related increases in ozone-induced airway hyperresponsiveness in mice. *Annals of the American Thoracic Society*, 14, S357-S362.

⁹ Baffi, C. et al. (2015). Asthma and obesity: mechanisms and clinical implications. *Asthma Research and Practice*, 1.1: 1.

¹⁰ CARE. (2015). New Haven Health Survey. Retrieved from https://medicine.yale.edu/ysph/care/resources/2015%20CARE%20Survey%20Results%20April%202016%20update_246216_284_11205_v4.pdf

¹¹ Kelishadi, R., Poursafa, P., & Jamshidi, F. (2013) Role of Environmental Chemicals in Obesity: A Systematic Review on the Current Evidence. *Journal of Environmental Public Health*, 2013, Article ID 896789.

¹² Motta, A.C., Marliere, M., Peltre, G., Sterenberg, P.A., & Lacroix, G. (2006). Traffic-related air pollutants induce the release of allergen-containing cytoplasmic granules from grass pollen. *International Archives of Allergy and Immunology*, 139(4), 94-98.

and acids, which essentially damage the envelope of the grain, allowing for a greater release of allergic material.¹³

Connecticut is also downwind of coal and oil burning plants in the Midwest and south, leading to air pollution emissions coming from out of state. Connecticut has been involved in multi-state efforts urging the federal Environmental Protection Agency (EPA) to take action on this issue.¹⁴

Overall, more research is needed on the type and degree of environmental exposures, as well as localized data on air quality specific to the New Haven community, in order for targeted advocacy efforts to be developed.

Housing

In addition to outdoor air quality, housing is a main component in asthma triggering and exacerbation, and housing in New Haven has received scrutiny for poor conditions. Due to multiple levels of authority in housing complexes, improvement of housing conditions can be difficult and risky for families. Housing characteristics in New Haven ultimately precipitate significant health issues for residents: for instance, 51% of housing was built before 1940 as compared to the 13% national average, 22% of households are below the federal poverty line compared to the 11% national average, and 72% of units are renter-occupied compared to the 36% national average.¹⁵

As one case study of housing and health in New Haven, a survey of conditions at the subsidized-housing Church Street South complex revealed that 48% of children living in this complex reported physician-diagnosed asthma.¹⁶ Moreover, 67% of the adults reported respiratory conditions, including 37% with physician-diagnosed asthma. Among the adults, 100% reported onset or worsening of symptoms while at Church Street South and 74% reported improvement after leaving. Mold and moisture issues were visible to tenants in 50% of units. Aside from lead, health and safety hazards are generally paid for out-of-pocket, which poses financial barriers to healthy living conditions.

This issue is not novel to the Church Street South complex; a Healthy Homes surveillance report cataloging the prevalence of household asthma triggers (e.g., broken fans, visible mold, airborne irritants) in Connecticut from 2010 to 2016 found 20,882 deficiencies across 1,502 assessments, 44 of which were conducted in New Haven.¹⁷ This report concludes an average of 13.9 deficiencies per home. Among homes that were reassessed, only 22.6% of cases were resolved.

Finding housing that is not likely to trigger asthma can be difficult considering financial restrictions. The Urban Institute reported that among Extremely Low Income (ELI) renters in New Haven, only 47 rentable units per 100 ELI families exist.¹⁸ These data suggest an overall lack of affordable housing in New Haven, which may force families to settle for unhealthy homes and leave them with little power to control or pursue remediation of triggers that are known to cause asthma.

In addition to locating affordable housing, energy efficiency is an overlooked metric. Ambient extremities (cold, dry air or heat and humidity) are known asthma triggers, adding pressure for families to keep comfortable indoor temperatures. Connecticut has one of the highest average residential

¹³ Ouyang, Y., Xu, Z., Fan, E. Li, Y., & Zhang, L. (2016). Effect of nitrogen dioxide and sulfur dioxide on viability and morphology of oak pollen. *International Forum of Allergy and Rhinology*, 6(1), 95-100.

¹⁴ United States District Court, Southern Court of New York. (2017) Civil Case No.: 18-406. Retrieved from: http://portal.ct.gov/-/media/AG/Press_Releases/2018/20180117_Conn_NY_EPAComplaint.PDF?la=en.

¹⁵ United States Census Bureau. (2016). National Population Totals: 2010-2016. Retrieved from www.census.gov

¹⁶ Connecticut Superior Court, J.D. of Waterbury. (2018). Docket No.: X10-UWY-CV-16-6033559-S - Exhibit I. Retrieved from <http://civillinquiry.jud.ct.gov/DocumentInquiry/DocumentInquiry.aspx?DocumentNo=13950762>

¹⁷ Connecticut Department of Public Health. (2017). 2017 Healthy Homes Surveillance Report. Retrieved from: http://www.portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/environmental_health/HH/HH-Surveillance-Report/Healthy-Homes-Surveillance-Report_2017.pdf?la=en

¹⁸ Urban Institute. (2017). Mapping America's Rental Housing Crisis. Retrieved from: <http://apps.urban.org/features/rental-housing-crisis-map/>

electric pricing schemes in the country, with levels 26% above the New England average.¹⁹ Connecticut's Low Income Home Energy and Assistance Program (LIHEAP) was only able to accommodate for 14% of the energy affordability gap, with funds decreasing annually. Though the affordability gap is a state-wide issue, Connecticut's Third Congressional District, which contains New Haven, had the largest affordability gap in the state.²⁰ Families unable to keep up with monthly bills are faced with electricity shut-off. Relatedly, home weatherization is the process of updating housing characteristics to reduce energy expenditure and increase comfort. Measures taken as a part of the home weatherization process include insulation, air sealing, moisture control and ventilation. Unfortunately, homes are unable to be weatherized by the state if they contain a "hazard." New Haven reported the finding of three specific hazards in the majority of audited homes: lead paint hazards in 75.0% of units, structural issues in 68.8% of units, and asbestos in 68.8% of units. Of all audited properties, clutter and harborage issues were found in 37.5%, electrical hazards in 31.3%, and moisture/mold hazards and ventilation issues in 25.0%.²¹ As Connecticut plans to weatherize 80% of homes by 2030, it is reasonable to imagine that the majority of the 20% remaining un-weatherized will be low-income housing with compounding indoor asthma triggers.

Exposure to second-hand cigarette smoke is also a trigger for asthma, and research conducted by CARE found smoking rates in six low-income New Haven neighborhoods to be twice as high as the national average.²² Private landlords are able to create their own policies around smoking, but this does not necessarily mean that any anti-smoking policies are being enforced. Although many families are invited to abandon indoor smoking, this does not eliminate all exposure to harmful chemicals from tobacco. Thirdhand smoking, wherein constituents of tobacco smoke deposit on surfaces, can occur if an individual brings cigarette fumes inside via their clothing or by indoor/outdoor air circulation. According to one study, thirdhand smoke exposure may have greater toxicity due to oxidation and breakdown processes. Additionally, infants and young children are at a particularly higher risk as a result of spending greater time indoors, higher respiratory rates, and more hand or oral behaviors compared to older children.²³

¹⁹ National Association of Home Builders. (2015). Average Monthly Electrical Bill by State – Updated Data. Retrieved from <http://eyeonhousing.org/2015/03/average-monthly-electrical-bill-by-state-2013/>

²⁰ Colton, R. (2015). Home Energy Affordability in Connecticut: The Affordability Gap 2015. Retrieved from http://www.ct.gov/deep/lib/deep/energy/lieab/2016/2015_connecticutheag_affordability_gap_study.pdf

²¹ Norton, R.A. (2010). Identified Barriers and Opportunities to Make Housing Green and Healthy Through Weatherization: A Report from Green and Healthy Homes Initiative Sites. Retrieved from <http://www.greenandhealthyhomes.org/sites/default/files/GHHI-Weatherization-Health-and-Safety-Report1.pdf>

²² Carroll-Scott, A., Rosenthal, L., Gilstad-Hayden, K., Schwartz, D., Snow, J., & Ickovics, J.R. (2012). Adult Smoking and Neighborhood Collective Efficacy. Retrieved from https://publichealth.yale.edu/care/resources/Aim2_brief_final_158118_284_11205_v1.pdf

²³ Gibbs, K., Collaco, J. M., & McGrath-Morrow, S. A. (2016). Impact of tobacco smoke and nicotine exposure on lung development. *Chest*, 149(2), 552–561.

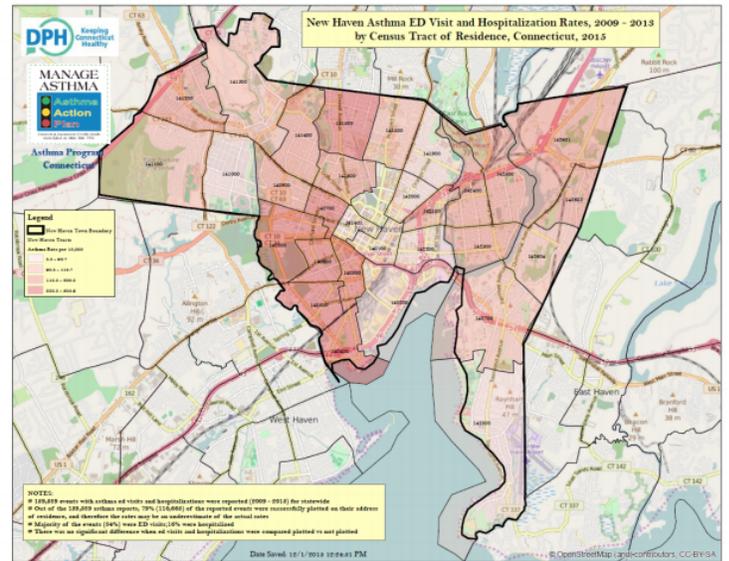
Schools

In New Haven, asthma impacts an estimated 14.6% of school-aged children, with a rate of 10.5% among non-Hispanic Black students, 10.3% among Hispanic/Latinx students, and 33.1% among other non-Hispanic students compared to 9.1% amongst non-Hispanic white students.²⁴ Though more information is needed, it is clear that the asthma burden disproportionately affects children of color.

As children spend a majority of their day in school, these built environments are crucial in understanding preventative measures. Increased air circulation and quality in schools has been linked to better performance.²⁵ Poor indoor air quality (IAQ) increases absenteeism and decreases test scores. Research on HVAC systems in schools has shown that doubling the ventilation rate (7.5 to 15 cubic feet per minute per person) led to an 8% improvement in academic performance.²⁶ There are currently no required air quality measurements in Connecticut schools, therefore the impact on students in New Haven is not known.

Schools may also function as a place for intervention by leveraging the outreach of school nurses in education, implementing asthma action plans, and administering medication. In recognition of this, the New Haven Community Transformation plan created a goal to improve the percentage of students with an asthma action plans to 100% and the percentage of schools with a public health nurse trained in asthma management to 100% by 2020 as a mechanism for enhancing school-based asthma management.²⁷ Progress toward these goals, however, is currently unavailable due to lack of publicly available data. Connecticut does not have state legislation allowing schools to stock Albuterol, an important rescue medication for asthma exacerbations. Though there are no data on the availability of Albuterol in New Haven schools, such legislation could increase accessibility by decreasing reliance on students to supply their own. A pilot trial in Arizona of schools stocking Albuterol found that the District made 20% fewer asthma related 911 calls and transported 40% fewer students to the hospital.²⁸

Additionally, it is important to consider the school's response to absenteeism as a result of asthma onset; insufficient resources could leave children with asthma behind in their educational pursuits if not given attention.



²⁴ Peng, J., Nepaul, A., Kloter, A., & Hargrove, S. (2014). Connecticut School-based Asthma Surveillance Report 2014, School Years: Fall 2009 – Spring 2012. Retrieved from <https://portal.ct.gov/-/media/Departments-and-Agencies/DPH/dph/hems/asthma/pdf/SBASR2014pdf.pdf?la=en>

²⁵ Bakó-Biró Z.S, Clements-Croome, D.J., Kochhar, N., Awbi, H.B, & Williams, M.J. (2012). Ventilation rates in schools and pupils' performance. *Building and Environment*, 48, 215-223.

²⁶ Environmental Protection Agency (EPA). (n.d.). Making the Business Case for Energy Savings Plus Health: Indoor Air Quality Guidelines for School Building Upgrades. Retrieved from <https://www.epa.gov/iaq-schools/making-business-case-energy-savings-plus-health-indoor-air-quality-guidelines-school#5>

²⁷ City of New Haven. (2015). New Haven City Transformation Plan. Retrieved from: <http://www.ctdatahaven.org/sites/ctdatahaven/files/CTP%20report5%20rfs.pdf>

²⁸ Gerald, L.B, Strother, J., Burkholder, B., & Gerald, J.K. (2018). Translating Research into Health Policy: Stock Albuterol Legislation. *Annals of the American Thoracic Society*, 15(4), 413-416.

Work-related

Work-related asthma (WRA), asthma that is either caused or exacerbated by work, is common in adult asthmatics, including New Haven asthmatics. Nationally, about 15% of adults with asthma suffer from asthma caused by their work (occupational asthma).²⁹ Further, among the many adults nationwide with asthma, approximately 20 to 30% report that their asthma is exacerbated by exposures at work (work-exacerbated asthma).³⁰ Whether caused or exacerbated by work, WRA frequently goes undiagnosed, can have substantial adverse health and socio-economic impacts, and importantly is preventable if recognized and managed appropriately. WRA can occur in any type of workplace and is prevalent in the type of non-industrial work settings common in New Haven, such as health care facilities, schools, and offices/retail establishments. Healthcare workers and cleaners are two of the highest risk occupations for WRA.³¹ Those experiencing WRA report more days with symptoms, seek more medical care, are more likely to be under-employed and have a lower quality of life compared to adults with non-work-related asthma.³²

Conclusion

The New Haven Health Department Asthma Initiative has taken some steps to reduce morbidity and mortality from asthma and improve quality of life through education and prevention. The Triggers be Gone program, which is an initiative by the New Haven Health Department to provide supplies to low-income individuals with asthma, has provided over 100 families with medical equipment and asthma trigger reduction resources in its first three years of operation.³³ A program operated by the Connecticut Department of Health, Putting on AIRS, identifies difficult to manage asthma cases, conducts in-home environmental assessments, and reviews patients' asthma action plans and medication regimens to improve disease management.³⁴ Additionally, New Haven's Healthy Homes is a program to remove in-home lead exposures with opportunity to assess other environmental hazards including mold, lead, allergens, asthma, carbon monoxide, home safety, pesticides, and radon.³⁵ Unfortunately, the scope and funding of these programs are very limited. A number of other efforts, initiatives, and projects have been undertaken to fill in the gaps; however, for most families in need of comprehensive and higher cost remediations, the resource landscape is scarce. In addition to increasing community resources dedicated to these existing programs, there is also a need to advance policies in support of high-quality, affordable housing, neighborhoods free of pollution and environmental triggers, and healthy schools and workplaces. As a result, community organizing with support of academic and other institutions may be effective in advocating for city-level or other systemic change.

²⁹ Balmes J, et al. American Thoracic Society statement: occupational contribution to the burden of airway disease. *American Journal Respiratory and Critical Care Medicine*. 2003.

³⁰ Ibid.

³¹ Henneberger K, Redlich C, et al. An Official American Thoracic Society Statement: Work-Exacerbated Asthma. *American Journal Respiratory and Critical Care Medicine*. 2011.

³² Ibid.

³³ Asthma Community Network. (n.d.). New Haven Asthma Initiative. Retrieved from <http://www.asthmacommunitynetwork.org/node/980>

³⁴ Connecticut State Department of Public Health. (n.d.). Putting on AIRS: Asthma Indoor Risk Strategies. Retrieved from <http://www.portal.ct.gov/DPH/Health-Education-Management--Surveillance/Asthma/Putting-on-AIRS--Asthma-Indoor-Risk-Strategies>

³⁵ City of New Haven. (n.d.). Healthy Homes. Retrieved from https://www.newhavenct.gov/gov/depts/environmental_health_/healthy_homes.htm