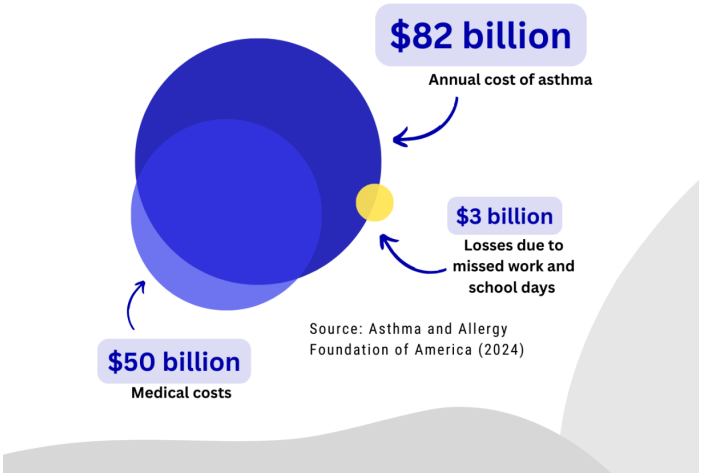
America's Indoor Air Quality Problem

Americans spend 90% of their time indoors, often in buildings with unclean air contaminated by mold, allergens, pollutants, and harmful chemicals.[1] As with the food and water we consume, the air we breathe greatly impacts our health. The average person breathes in 2000 gallons of air every day, mostly indoors, but we don't measure or fully understand what that air contains.[2] Our nation has overemphasized medical treatments while neglecting the health of the indoor environments where we live, work, and learn.

We face a chronic disease crisis. As noted in President Trump's Executive Order, asthma is twice as common in the United States as it is in many other countries. Asthma affects nearly 25 million Americans—including 5 million children—resulting in nearly one million emergency room visits each year.[3]



Exposure to indoor pollutants triggers and worsens asthma. Numerous studies have found that indoor air pollutants are associated with higher asthma rates and more frequent asthma symptoms.[4,5,6] Fine particulate matter (PM2.5) and volatile organic compounds

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[1] Klepeis, Neil E., William C. Nelson, Wayne R. Ott, John P. Robinson, Andy M. Tsang, Paul Switzer, Joseph V. Behar, Stephen C. Hern, and William H. Engelmann. 2001. "The National Human Activity Pattern Survey (NHAPS): A Resource for Assessing Exposure to Environmental Pollutants." *Journal of Exposure Science & Environmental Epidemiology* 11 (3): 231–52. https://doi.org/10.1038/sj.jea.7500165.

[2] Association, American Lung. n.d. "How Your Lungs Get the Job Done." Accessed April 20, 2025. https://www.lung.org/blog/how-your-lungs-work.

[3] U.S. Centers for Disease Control and Prevention. 2024. "Asthma." National Center for Health Statistics FastStats. July 31, 2024. https://www.cdc.gov/nchs/fastats/asthma.htm.

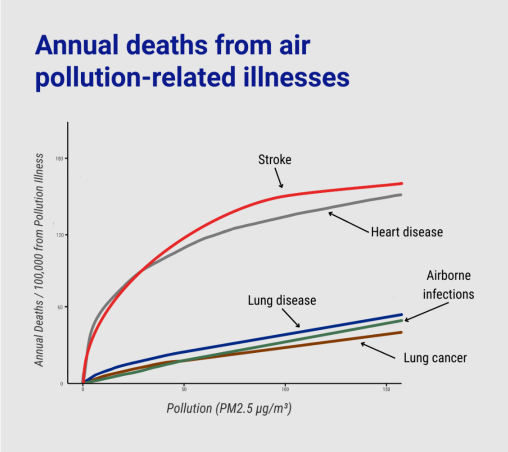
[4] "Early-Life Exposure to Air Pollution and Childhood Asthma Cumulative Incidence in the ECHO CREW Consortium | Environmental Health | JAMA Network Open | JAMA Network." n.d. Accessed April 20, 2025. https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2815586?resultClick=3.

[5] McCormack, Meredith C., Patrick N. Breysse, Elizabeth C. Matsui, Nadia N. Hansel, D'Ann Williams, Jean Curtin-Brosnan, Peyton Eggleston, Gregory B. Diette, and for the Center for Childhood Asthma in the Urban Environment. 2009. "In-Home Particle Concentrations and Childhood Asthma Morbidity." *Environmental Health Perspectives* 117 (2): 294–98. https://doi.org/10.1289/ehp.11770.

[6] Breysse, Patrick N., Gregory B. Diette, Elizabeth C. Matsui, Arlene M. Butz, Nadia N. Hansel, and Meredith C. McCormack. 2010. "Indoor Air Pollution and Asthma in Children." *Proceedings of the American Thoracic Society* 7 (2): 102–6. https://doi.org/10.1513/pats.200908-083RM.

(VOCs)—which furniture, carpets, paint, air fresheners, and cleaning supplies can release into the air—create inflammation in the lungs, restricting airways and triggering asthma symptoms. Common indoor allergens, including mouse droppings, mold, and pet dander, often induce inflammatory allergic reactions with similar effects. Repeated inflammation can cause long-term damage and lead to the development of asthma.

America's future depends on healthy children, yet polluted indoor air contributes to many childhood chronic diseases. PM2.5 particles are small enough to enter the bloodstream, causing oxidative stress and inflammation that damages the heart and circulatory system.[7] In children, exposure to air pollution is also associated with ADHD and changes in the immune and cardiovascular systems.[8,9,10] Exposure to PM2.5 during pregnancy has been linked to low birth weight, preterm births, and even autism.[11,12]



Source: Apte, J.S., Marshall, J.D., Cohen, A.J., & Brauer, M. (2015). Addressing global mortality from ambient $PM_{2.5}$. Environmental Science & Technology, 49(13), 8057–8066.

The effects of unclean indoor air are just as severe for adults. PM2.5 exposure, by impacting the cardiovascular system, increases the risk of

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[7] Krittanawong, Chayakrit, Yusuf Kamran Qadeer, Richard B. Hayes, Zhen Wang, George D. Thurston, Salim Virani, and Carl J. Lavie. 2023. "PM2.5 and Cardiovascular Diseases: State-of-the-Art Review." *International Journal of Cardiology Cardiovascular Risk and Prevention* 19 (December):200217. https://doi.org/10.1016/j.ijcrp.2023.200217.

[8] Prunicki, Mary, Nicholas Cauwenberghs, Justin Lee, Xiaoying Zhou, Hesam Movassagh, Elizabeth Noth, Fred Lurmann, et al. 2021. "Air Pollution Exposure Is Linked with Methylation of Immunoregulatory Genes, Altered Immune Cell Profiles, and Increased Blood Pressure in Children." *Scientific Reports* 11 (1): 4067. https://doi.org/10.1038/s41598-021-83577-3.

[9] Ahmad, Shamshad, Naveen K G, Arun Mani Babu, Rajeev Ranjan, and Pragya Kumar. 2024. "Association Between Ambient Air Pollution and Attention-Deficit/Hyperactivity Disorder (ADHD) in Children: A Systematic Review and Meta-Analysis." *Cureus* 16 (10): e71527. https://doi.org/10.7759/cureus.71527.

[10] Thygesen, Malene, Gitte J. Holst, Birgitte Hansen, Camilla Geels, Amy E. Kalkbrenner, Diana Schendel, Jørgen Brandt, Carsten B. Pedersen, and Søren Dalsgaard. 2020. "Exposure to Air Pollution in Early Childhood and the Association with Attention-Deficit Hyperactivity Disorder." *Environmental Research* 183 (April):108930. https://doi.org/10.1016/j.envres.2019.108930.

[11] Li, Xiangyu, Shuqiong Huang, Anqi Jiao, Xuhao Yang, Junfeng Yun, Yuxin Wang, Xiaowei Xue, et al. 2017. "Association between Ambient Fine Particulate Matter and Preterm Birth or Term Low Birth Weight: An Updated Systematic Review and Meta-Analysis." *Environmental Pollution* 227 (August):596–605. https://doi.org/10.1016/j.envpol.2017.03.055.

[12] Lin, Cheng-Kuan, Yuan-Ting Chang, Fu-Shiuan Lee, Szu-Ta Chen, and David Christiani. 2021. "Association between Exposure to Ambient Particulate Matters and Risks of Autism Spectrum Disorder in Children: A Systematic Review and Exposure-Response Meta-Analysis." *Environmental Research Letters* 16 (6): 063003. https://doi.org/10.1088/1748-9326/abfcf7.

heart disease and stroke.[13] PM2.5 and other pollutants are also associated with an increased risk of lung cancer and breast cancer.[14,15] Volatile organic compounds (VOCs) can even cause DNA damage and harm the liver, kidneys, and central nervous system.[16,17]

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[13] Basith, Shaherin, Balachandran Manavalan, Tae Hwan Shin, Chan Bae Park, Wang-Soo Lee, Jaetaek Kim, and Gwang Lee. 2022. "The Impact of Fine Particulate Matter 2.5 on the Cardiovascular System: A Review of the Invisible Killer." *Nanomaterials* 12 (15): 2656. https://doi.org/10.3390/nano12152656.
[14] Li, Ruyi, Rui Zhou, and Jiange Zhang. 2018. "Function of PM2.5 in the Pathogenesis of Lung Cancer and Chronic Airway Inflammatory Diseases." *Oncology Letters* 15 (5): 7506–14. https://doi.org/10.3892/ol.2018.8355.
[15] Le Provost, Blandine, Marie-Élise Parent, Paul J. Villeneuve, Claudia M. Waddingham, Jeffrey R. Brook, Eric Lavigne, Rose Dugandzic, and Shelley A. Harris. 2024. "Residential Exposure to Ambient Fine Particulate Matter (PM2.5) and Nitrogen Dioxide (NO2) and Incident Breast Cancer among Young Women in Ontario, Canada." *Cancer Epidemiology* 92 (October):102606. https://doi.org/10.1016/j.canep.2024.102606.
[16] Shen, Qianyong, Yalin Liu, Guiying Li, and Taicheng An. 2024. "A Review of Disrupted Biological Response Associated with Volatile Organic Compound Exposure: Insight into Identification of Biomarkers." *Science of The Total Environment* 948 (October):174924. https://doi.org/10.1016/j.scitotenv.2024.174924.
[17] "Volatile Organic Compounds | American Lung Association." n.d. Accessed April 20, 2025. https://www.lung.org/clean-air/indoor-air/indoor-air-pollutants/volatile-organic-compounds.

Sources of Pollution

Outdoors: Outdoor pollutant sources include road particles and car emissions, industrial plant emissions, wildfire smoke, and windblown dust. Particle infiltration from outdoors to indoors is hard to measure. A 2024 National Academy of Sciences (NAS) report notes, "[P]articles of both outdoor and indoor origin contribute almost equally to indoor fine PM concentrations when measured by mass. In contrast, the number concentrations for indoor [ultrafine particles] are dominated by indoor sources." Most exposure to pollutants of outdoor origin occurs indoors, so exposure can be mitigated significantly by indoor air cleaning interventions.

Indoors: Indoor pollutant sources include cleaning supplies, furnishings, natural gas combustion and particulates generated by cooking, mold, dust, cigarettes and e-cigarettes, and pet dander. Studies of 40 pollutants at over 800 homes in the 1980s found that many were 10 times more prevalent indoors. Unfortunately, many homes and buildings in the United States do not meet basic recommended ventilation rates, and no specific health-based indoor air quality standards exist. To make our children healthy again, we must ensure that homes, schools, and childcare facilities have the clean air our children need to thrive.

More detail can be found in chapters 3 and 4 of the NAS report.

Target Diseases

Due to its impact on chronic diseases, breathing in air pollution kills over 50,000 Americans annually.[18] Indoor air pollution is a contributing factor for the following diseases:

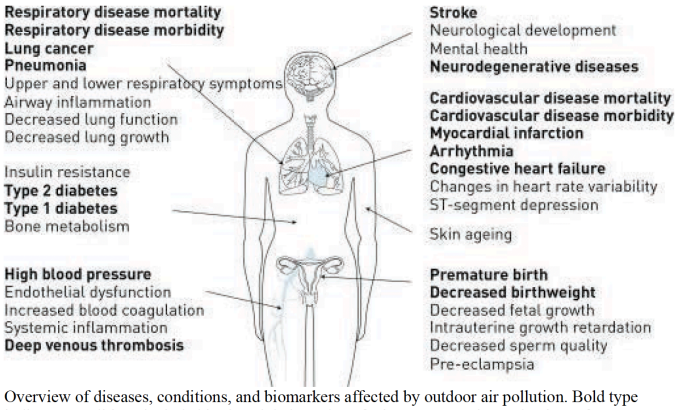
Cardiovascular Disease: Particulate (PM) exposure increases heart attacks and strokes, causing the deaths of nearly 30,000 Americans annually.[19] Pollution-related cardiovascular

[18] Global Burden of Disease Collaborative Network. 2024. "Global Burden of Disease Study 2021 (GBD 2021)." Seattle, United States: Institute for Health Metrics and Evaluation (IHME). https://vizhub.healthdata.org/gbd-results.
[19] Ibid.

disease costs us $12.6 billion in yearly healthcare spending.[20][21] In a study of former smokers with chronic obstructive pulmonary disease, using an air filter reduced symptoms and the need for rescue medication.[22]

Chronic Respiratory Disease: Each year, air pollution leads to over 20,000 American deaths through chronic respiratory disease. Chronic respiratory disease, worsened by indoor air pollution, adds another $4.6 billion in healthcare costs .[23]

Asthma: Nearly 28 million Americans suffer from asthma, including 4.9 million children. It causes over 10 million missed school days and $50 billion in medical expenses.[24] One study identified a 7–14% increase in days with asthma symptoms or rescue medication use for each 10 μg/m^3 increase in indoor $PM_{2.5}$.[25]



Overview of diseases, conditions, and biomarkers affected by outdoor air pollution. Bold type indicates conditions included in the Global Burden of Disease categories at the time of publication.
SOURCE: Thurston et al. (2017) Figure 1. European Respiratory Journal 49 (1) 1600419; DOI: 10.1183/13993003.00419-2016 Published 11 January 2017.

Autism: About one in 36 American children has been diagnosed with

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[20] Kazi, Dhruv S., Mitchell S.V. Elkind, Anne Deutsch, William N. Dowd, Paul Heidenreich, Olga Khavjou, Daniel Mark, et al. 2024. "Forecasting the Economic Burden of Cardiovascular Disease and Stroke in the United States Through 2050: A Presidential Advisory From the American Heart Association." *Circulation* 150 (4): e89–101. https://doi.org/10.1161/CIR.0000000000001258.

[21] $393 billion spent on healthcare for cardiovascular disease, from Kazi et. al., [20] multiplied by 3.2% contribution from particulate matter, from IHME Global Burden of Disease [18].

[22] Hansel, Nadia N., Nirupama Putcha, Han Woo, Roger Peng, Gregory B. Diette, Ashraf Fawzy, Robert A. Wise, et al. 2022. "Randomized Clinical Trial of Air Cleaners to Improve Indoor Air Quality and Chronic Obstructive Pulmonary Disease Health: Results of the CLEAN AIR Study." *American Journal of Respiratory and Critical Care Medicine* 205 (4): 421–30. https://doi.org/10.1164/rccm.202103-0604OC.

[23] Duan, Kevin I., Maxwell Birger, David H. Au, Laura J. Spece, Laura C. Feemster, and Joseph L. Dieleman. n.d. "Health Care Spending on Respiratory Diseases in the United States, 1996–2016." *American Journal of Respiratory and Critical Care Medicine* 207 (2): 183–92. https://doi.org/10.1164/rccm.202202-0294OC.

[24] James, John M. 2025. "Asthma Facts." Asthma & Allergy Foundation of America. April 2025. https://aafa.org/asthma/asthma-facts/.

[25] McCormack, Meredith C., Patrick N. Breysse, Elizabeth C. Matsui, Nadia N. Hansel, Roger D. Peng, Jean Curtin-Brosnan, D'Ann L. Williams, Marsha Wills-Karp, and Gregory B. Diette. 2011. "Indoor Particulate Matter Increases Asthma Morbidity in Children with Non-Atopic and Atopic Asthma." *Annals of Allergy, Asthma & Immunology* 106 (4): 308–15. https://doi.org/10.1016/j.anai.2011.01.015.

autism.[26] The causes are likely complex, but prenatal and early childhood particulate matter exposure appears to contribute. One study found that higher prenatal $PM_{2.5}$ exposure led to increased risk for an autism diagnosis in children, especially if the elevated exposure occurred in the third trimester.[27]

Metabolic Syndrome and Diabetes: Long-term exposure to particulate matter increases the risk of metabolic syndrome. One study found that an increase of 5 $\mu g/m^3$ in annual average ambient PM2.5 concentration was associated with a 14% increase in metabolic syndrome risk, and estimated that approximately 12% of metabolic syndrome risk could be attributable to ambient $PM_{2.5}$ exposure.[28]

Infectious Disease: Diseases like influenza, COVID, RSV, and tuberculosis spread through aerosols in indoor air. The flu kills 6,000-52,000 Americans each year.[29] The annual cost to society is over $11 billion, including $3 billion in healthcare costs and 20 million days of lost productivity at work.[30] COVID recently killed an estimated 25,000-42,000 Americans in the six months ending in April 2025.[31]

Further Research on Indoor Air Quality and Chronic Disease

- **Asthma:** *strong evidence of association for indoor pollutants, causal mechanisms identified;* Pulmonary health effects of VOCs (2021 meta-analysis), Indoor exposure to selected pollutants health effects (2020 systematic review), Environmental exposures and childhood asthma (2014 systematic review), PM2.5 exposure and childhood asthma (2023 short review)

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[26] U.S. Centers for Disease Control and Prevention. 2025. "Data and Statistics on Autism Spectrum Disorder." Autism Spectrum Disorder (ASD). April 18, 2025. https://www.cdc.gov/autism/data-research/index.html.

[27] Raz, Raanan, Andrea L. Roberts, Kristen Lyall, Jaime E. Hart, Allan C. Just, Francine Laden, and Marc G. Weisskopf. 2015. "Autism Spectrum Disorder and Particulate Matter Air Pollution before, during, and after Pregnancy: A Nested Case-Control Analysis within the Nurses' Health Study II Cohort." *Environmental Health Perspectives* 123 (3): 264–70. https://doi.org/10.1289/ehp.1408133.

[28] Ning, Jie, Yaling Zhang, Huaifang Hu, Wentao Hu, Lipeng Li, Yaxian Pang, Shitao Ma, Yujie Niu, and Rong Zhang. 2021. "Association between Ambient Particulate Matter Exposure and Metabolic Syndrome Risk: A Systematic Review and Meta-Analysis." *Science of The Total Environment* 782 (August):146855. https://doi.org/10.1016/j.scitotenv.2021.146855.

[29] U.S. Centers for Disease Control and Prevention. 2024. "About Estimated Flu Burden." Flu Burden. November 20, 2024. https://www.cdc.gov/flu-burden/php/about/index.html.

[30] Putri, Wayan C. W. S., David J. Muscatello, Melissa S. Stockwell, and Anthony T. Newall. 2018. "Economic Burden of Seasonal Influenza in the United States." *Vaccine* 36 (27): 3960–66. https://doi.org/10.1016/j.vaccine.2018.05.057.

[31] U.S. Centers for Disease Control and Prevention. 2025. "Preliminary Estimates of COVID-19 Burden for 2024-2025." COVID-19. March 19, 2025. https://www.cdc.gov/covid/php/surveillance/burden-estimates.html.

- **Heart Disease & Stroke:** *strong evidence of association for outdoor pollutants, causal mechanisms identified*; Air pollutants and heart disease (2024 systematic review), PM2.5 pathways for impact on heart disease (2024 systematic review), PM2.5 exposure and heart disease and stroke, including mechanisms (2018 systematic review)
- **ADHD:** *developing evidence of association*; Prenatal and postnatal air pollution exposure and ADHD (2024 systematic review), Gaseous and particulate air pollutants and ADHD (2019 systematic review), Prenatal and postnatal PM2.5 exposure and ADHD (2022 cohort study)
- **Autism:** *developing evidence of association*; Air pollution and autism (2021 meta-analysis), Maternal exposure to air pollution and autism (2020 meta-analysis), Air pollution and neuropsychological development (2015 systematic review)
- **Lung Cancer**: *strong evidence of association for outdoor pollutants, causal mechanisms identified*; Air pollution and lung cancer (2023 review), Air pollution and lung cancer, including mechanisms (2022 review), Ambient PM2.5 exposure and lung cancer (2011 cohort study)
- **Breast cancer:** *developing evidence of association*; Air pollution and breast cancer (2021 meta-analysis), Air pollution and postmenopausal breast cancer (2023 cohort study)

Comparisons to Other Countries

Although many countries monitor outdoor air quality in real-time, no such programs exist for indoor air. Indoor air quality assessments must rely on periodic measurements by government agencies or academics. Due to variations in equipment, site selection, and observational circumstances, it is difficult to generalize from and compare these results. To compare the United States to other nations, this section instead focuses on comparing indoor air quality policy approaches.

Compared to other countries in both the industrialized and developing world, the United States government has done little to systematically assess and improve the indoor air our children breathe.

The United States performed foundational work on indoor air quality in the 1980s and 1990s. The proposed Indoor Air Quality Act of 1991 marked an early federal acknowledgment of the risks associated with poor indoor air quality in environments crucial to children's well-being, including schools and childcare facilities, but the bill never passed.[32] This act would have established a national research program and mandated an assessment of indoor air pollution in those settings. Additionally, the Environmental Protection Agency's School Evaluation Program (SEP) in the early 1990s examined indoor

[32] Indoor Air Quality Act of 1991, S. 455, 102nd Cong. (1991).

radon levels in schools, indicating an early awareness of specific indoor air pollutants in educational environments.[33]

Since then, the federal government has taken limited action to improve indoor air quality for children. In 2024, an EPA grant program provided five grants totalling $34M to support the development and adoption of indoor air quality management plans.[34] The impact of these grants remains to be seen. Other U.S. initiatives with a focus on clean indoor air include the EPA's Indoor Air Quality Tools for Schools program, the Smoke-Free Home Pledge campaign, and the Healthy Schools Initiative.[35,36] The CDC and OSHA have provided guidance on indoor air quality for schools and other facilities.[37,38] The United States has also relied heavily on recommendations and guidelines from industry groups such as the American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE), which publishes widely used baseline standards for indoor air quality.[39,40] A patchwork of state-level initiatives and legislation also exists.[41]

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[33] Daisey, J. M., W. J. Angell, and M. G. Apte. 2003. "Indoor Air Quality, Ventilation and Health Symptoms in Schools: An Analysis of Existing Information." *Indoor Air* 13 (1): 53–64. https://doi.org/10.1034/j.1600-0668.2003.00153.x.
[34] U.S. Environmental Protection Agency. 2023. "Grant Funding to Address Indoor Air Pollution at Schools." Overviews and Factsheets. EPA. December 14, 2023. https://www.epa.gov/iaq-schools/grant-funding-address-indoor-air-pollution-schools.
[35] U.S. Environmental Protection Agency. 2014. "Reference Guide for Indoor Air Quality in Schools." Overviews and Factsheets. EPA. October 2, 2014. https://www.epa.gov/iaq-schools/reference-guide-indoor-air-quality-schools.
[36] U.S. Environmental Protection Agency. 2003. "America's Children and the Environment: Measures of Contaminants, Body Burdens, and Illnesses." EPA 240-R-03-001. Washington, DC: U.S. Environmental Protection Agency. https://www.epa.gov/system/files/documents/2022-10/ace_2003.pdf.
[37] CDC. 2024. "Ventilation in Schools and Childcare Programs." Ventilation. October 16, 2024. https://www.cdc.gov/niosh/ventilation/guidelines/index.html.
[38] U.S. Department of Labor. n.d. "Indoor Air Quality - Schools." Occupational Safety and Health Administration. Accessed April 20, 2025. https://www.osha.gov/indoor-air-quality/schools.
[39] ANSI/ASHRAE Standard 62.1-2022, Ventilation and Acceptable Indoor Air Quality (Peachtree Corners, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2022).
[40] ANSI/ASHRAE Standard 62.2-2022, Ventilation and Acceptable Indoor Air Quality in Residential Buildings (Peachtree Corners, GA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2022).
[41] Kulungara, Abe. 2025. "States Are Innovating to Improve Indoor Air Quality." ASTHO: Association of State and Territorial Health Officials. February 7, 2025. https://www.astho.org/communications/blog/2025/states-innovating-to-improve-indoor-air-quality/.

This puts the United States on par with the United Kingdom, which also has a patchwork of voluntary indoor air quality standards and initiatives.[42] U.K. children suffer from rates of asthma nearly as high as their U.S. counterparts.[43]

Many industrial countries have more comprehensive national standards and efforts to improve indoor air quality for children. South Korea has implemented stricter air quality controls in schools and increased air purifier installations, with required standards for several pollutants in schools and other public buildings and legislation like the Indoor Air Quality Control Act.[44,45,46] Japan's Ministry of Health, Labour and Welfare regulates levels of VOCs and other pollutants.[47] Germany has the Committee on Indoor Air Guide Values, participates in the EU's Schools Indoor Pollution & Health Observatory Network in Europe (SINPHONIE) project, and has WHO/Europe's toolbox for chemical pollution in schools.[48,49,50] France mandates ventilation system assessments and pollutant monitoring

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[42] Lewis, Alastair C, James Allan, David Carslaw, David Carruthers, Gary Fuller, Roy Harrison, Mathew Heal, et al. 2022. "Indoor Air Quality." Air Quality Expert Group. https://doi.org/10.5281/ZENODO.6523605.

[43] Global Burden of Disease Collaborative Network, "GBD 2020." Rates of asthma prevalence for ages 0-19 are 20% lower in the United Kingdom compared to the United States.

[44] Ministry of Education, Republic of Korea. 2018. "Education System - Announcement of Countermeasures against High Concentrations of Fine Dust in Schools." Ministry of Education. May 4, 2018. https://english.moe.go.kr/boardCnts/view.do?boardID=265&boardSeq=74120&lev=0&searchType=S&statusYN=C&page=11&s=english&m=03&opType.

[45] Jeong, Jee Yeon. 2006. "Recently Issues on Indoor Air Quality in Korea."

[46] Republic of Korea. Indoor Air Quality Control Act. Act No. 14486, promulgated Dec. 27, 2016, in Statutes of the Republic of Korea. https://elaw.klri.re.kr/eng_service/lawView.do?hseq=41231&lang=ENG (accessed April 20, 2025).

[47] Yoshino, Hiroshi. 2020. "Housing Performance and Equipment for Healthy Indoor Environment." In *Indoor Environmental Quality and Health Risk toward Healthier Environment for All*, edited by Reiko Kishi, Dan Norbäck, and Atsuko Araki, 267–81. Singapore: Springer. https://doi.org/10.1007/978-981-32-9182-9_14.

[48] Abelmann, Siegfried. 2013. "German Committee on Indoor Air Guide Values." Text. Umweltbundesamt. Umweltbundesamt. November 27, 2013. https://www.umweltbundesamt.de/en/topics/health/commissions-working-groups/german-committee-on-indoor-air-guide-values.

[49] European Commission. 2014. "Schools Indoor Pollution & Health Observatory Network in Europe (SINPHONIE) Final Report." Luxembourg: Publications Office of the European Union.

[50] WHO/Europe. 2023. "WHO/Europe Releases a Toolbox to Protect Children's Health from Chemical Pollution of Indoor Air in Schools and Day-Care Centres." World Health Organization Europe. June 2023. https://www.who.int/europe/news/item/13-06-2023-who-europe-releases-a-toolbox-to-protect-children-s-health-from-chemical-pollution-of-indoor-air-in-schools-and-day-care-centres.

and has ANSES's indoor air quality guidelines, which include mandatory VOC labeling.[51,52] Poland, in Eastern Europe, has the InAirQ project for indoor air quality in schools.[53]

Some countries in the developing world have also launched concerted national efforts to provide their children with cleaner indoor air. China has enacted regulations limiting VOCs from building and interior decorating materials, created comprehensive air quality monitoring and cleaning requirements for HVAC systems in public buildings, and established standards for a range of other pollutants.[54] China has also invested in a national research program for indoor air quality, including developing equipment for removing pollutants from indoor air and funded stove replacements in rural areas to reduce indoor pollution from burning solid fuels.[55,56]

Conclusion

Air pollution is a serious problem affecting the health of America's children. Because Americans spend 90% of their time indoors, cleaning indoor air is an urgent priority to reduce childhood chronic disease. There is strong evidence that indoor air pollution causes and exacerbates childhood asthma. But other research has also identified links between air pollution and a wide range of other chronic diseases including cancer, cardiovascular disease, ADHD, autism, chronic respiratory disease, and metabolic syndrome. To Make America Healthy Again, we must ensure that our homes, schools, and workplaces have the clean air our children need to thrive.

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[51] Morenton, Pascal. n.d. "News, Infographics and Scientific Mediation to Better Understand the Challenges of Indoor Air Renewal." Nous Aérons / Let's Air. Accessed April 20, 2025. https://letsair.org/.

[52] ANSES. 2013. "Indoor Air Quality." Anses - Agence Nationale de Sécurité Sanitaire de l'alimentation, de l'environnement et Du Travail. January 18, 2013. https://www.anses.fr/en/content/indoor-air-quality.

[53] Interreg Central Europe. 2019. "Indoor Air Quality Action Plan: School Environment." Interreg Central Europe. https://programme2014-20.interreg-central.eu/Content.Node/InAirQ/National-IAQ-Action-Plan-Poland.pdf.

[54] Hao, Jiming, Tianle Zhu, and Xing Fan. 2014. "Indoor Air Pollution and Its Control in China." *Indoor Air Pollution* 64 (January):145–70. https://doi.org/10.1007/698_2014_257.

[55] Ibid.

[56] Huang, Lei, Yuxin Liu, Yangyang Wu, Ziwen Ye, Futian Ren, Xinlei Liu, and Guofeng Shen. 2023. "Impact of Stove Renovation on PM2.5 Exposure, Risk Perception, Self-Protective Willingness of Rural Residents." *Toxics* 11 (3): 245. https://doi.org/10.3390/toxics11030245.