ORAL ARGUMENT NOT YET SCHEDULED

No. 24-1129 (and consolidated cases)

UNITED STATES COURT OF APPEALS
FOR THE D.C. CIRCUIT

STATE OF NEBRASKA, et al.,

Petitioners,

v.

U.S. ENVIRONMENTAL PROTECTION AGENCY, et al.,

Respondents,

ALLIANCE OF NURSES FOR HEALTHY ENVIRONMENTS, et al.,

Intervenors.

On Petition for Review from the U.S. Environmental Protection Agency
No. EPA-HQ-OAR-2022-0985

BRIEF FOR *AMICI CURIAE* THE AMERICAN THORACIC SOCIETY, AMERICAN COLLEGE OF CHEST PHYSICIANS, NATIONAL ASSOCIATION OF PEDIATRIC NURSE PRACTITIONERS, AMERICAN ASSOCIATION FOR RESPIRATORY CARE, AMERICAN COLLEGE OF PHYSICIANS, AMERICAN ACADEMY OF FAMILY PHYSICIANS, MEDICAL SOCIETY CONSORTIUM ON CLIMATE AND HEALTH, THE AMERICAN ACADEMY OF PEDIATRICS, AND THE AMERICAN ACADEMY OF ALLERGY, ASTHMA, AND IMMUNOLOGY IN SUPPORT OF RESPONDENTS

ANDREW C. MERGEN
ROSA HAYES
SHANNON NELSON
SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorneys for Amici Curiae

January 21, 2025

CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

Pursuant to D.C. Circuit rule 28(a)(1)(A), the American Thoracic Society, American College of Chest Physicians, National Association of Pediatric Nurse Practitioners, American Association for Respiratory Care, American College of Physicians, American Academy of Family Physicians, Medical Society Consortium on Climate and Health, the American Academy of Pediatrics, and the American Academy of Allergy, Asthma, and Immunology submit this certificate as to parties, rulings, and related cases.

A. Parties and *Amici*

All petitioners, respondents, intervenors, and *amici* appearing here are listed in the petitioners' opening briefs and the respondents' proof answering brief except *amici* the National Parks Conservation Association, the Constitutional Accountability Center, and Margo T. Oge and John Hannon.

B. Rulings Under Review

The action under review is EPA's rule, "Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3," 89 Fed. Reg. 29,440 (Apr. 22, 2024).

C. Related Cases

There are no related cases within the meaning of Circuit Rule 28(a)(1)(C).

/s/ Sommer H. Engels

SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School

6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorney for Amici Curiae

CORPORATE DISCLOSURE STATEMENT

Pursuant to Federal Rules of Appellate Procedure 26.1 and 29(a)(4)(A), the American Thoracic Society, American College of Chest Physicians, National Association of Pediatric Nurse Practitioners, American Association for Respiratory Care, American College of Physicians, American Academy of Family Physicians, Medical Society Consortium on Climate and Health, the American Academy of Pediatrics, and the American Academy of Allergy, Asthma, and Immunology state that they do not have parent companies and that no publicly held company has a 10% or greater ownership interest in their organizations.

Dated: January 21, 2025

/s/ Sommer H. Engels

SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorney for Amici Curiae

D.C. CIRCUIT RULE 29(d) STATEMENT

Counsel for *amici curiae* the American Thoracic Society, American College of Chest Physicians, National Association of Pediatric Nurse Practitioners, American Association for Respiratory Care, American College of Physicians, American Academy of Family Physicians, Medical Society Consortium on Climate and Health, the American Academy of Pediatrics, and the American Academy of Allergy, Asthma, and Immunology certifies pursuant to Circuit Rule 29(d), that a separate brief is necessary to provide the Court with the medical and scientific expertise held by these organizations, which is directly relevant to the agency action under review. Thus, *amici curiae*, through counsel, certify that it would not be practicable to file a joint brief.

Dated: January 21, 2025

/s/ Sommer H. Engels

SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorney for Amici Curiae

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STATEMENT OF INTEREST

Greenhouse gases and traffic-related air pollutants from truck emissions endanger to public health. *Amici*, a coalition of public health organizations, medical societies, and non-profit organizations, submit this brief to highlight the strong evidence demonstrating the public health effects of climate change and traffic-related air pollutants on all populations, and especially on communities that are disproportionately exposed to truck emissions. They also submit this brief to explain the health costs that can come from failing to adequately regulate such pollutants and to underscore the importance of EPA's new Greenhouse Gas Emissions Standards for Heavy-Duty Vehicles—Phase 3, 89 Fed. Reg. 29,440 (Apr. 22, 2024) ("the Rule").

Given *amici's* medical, scientific, and policy expertise, they support implementation of the new standards and urge the Court to recognize EPA's authority under the Clean Air Act to regulate truck emissions in this manner.

- American Thoracic Society (ATS): ATS is an international non-profit organization of more than 16,000 physicians, scientists, nurses, and healthcare professionals dedicated to the detection, prevention, treatment, and cure of respiratory disease, critical care illnesses, and sleep-disordered breathing. ATS and its members lead cutting-edge scientific research, advance public health, and transform patient care through advocacy and the publication of four peer-reviewed journals on pulmonary health and critical care medicine. ATS also implements programs to address historical and contemporary health injustices, eliminate healthcare disparities, and achieve respiratory health equity. ATS's members provide direct clinical care to patients uniquely susceptible to the adverse effects of traffic-related air pollution, including children and persons with chronic respiratory disease.

- American College of Physicians: The American College of Physicians is the largest medical specialty organization in the United States with members in more than 172 countries worldwide, including 161,000 internal medicine physicians, related subspecialists, and medical students. Internal medicine physicians are specialists who apply scientific knowledge and clinical expertise to the diagnosis, treatment, and compassionate care of adults across the spectrum from health to complex illness.

- National Association of Pediatric Nurse Practitioners (NAPNAP): NAPNAP is an IRC Section 501(c)(6) nonprofit professional membership association, representing more than 8,000 healthcare practitioners as the nation's only professional association for pediatric nurse practitioners and their fellow pediatric-focused advanced practice registered nurses. NAPNAP members treat millions of patients a year in a wide variety of healthcare settings, including pediatric offices, hospitals, specialty clinics, and public or school-based healthcare facilities. Its mission is to empower pediatric-focused advanced practice registered nurses and key partners to optimize child and family health.

- American Association for Respiratory Care (AARC): AARC, founded in 1947, is a non-profit, 501(c)6 and the nation's oldest and largest professional association dedicated to respiratory therapists and health care providers involved in respiratory and cardiopulmonary care. AARC provides excellence in leadership and education through the creation and dissemination of professional education on topics such as asthma and COPD care, along with the *Respiratory Care* journal. The Journal is the leading scientific research publication for respiratory issues, disease, and patient care. AARC members also have a keen interest in the adverse effects of traffic-related air pollution, as they are often the direct care providers to patients uniquely susceptible to air pollution, including children and persons with chronic respiratory disease.

- American Academy of Family Physicians: Founded in 1947, the American Academy of Family Physicians is one of the largest national medical organizations, representing 130,000 family physicians and medical students nationwide. The Academy seeks to improve the health of patients, families, and communities by advocating for the health of the public and by supporting its members in providing continuous comprehensive health care to all.

- Medical Society Consortium on Climate and Health: The Medical Society Consortium on Climate and Health, a program of the George Mason University Center for Climate Change Communication, organizes major medical societies representing over 1 million physicians and health professionals. As consistently trusted messengers to the public, health professionals have a crucial role to play in raising public awareness, and the Consortium supports their climate advocacy with messaging guides, policy education, and knowledge sharing.

- American Academy of Pediatrics: The American Academy of Pediatrics is dedicated to promoting optimal health and well-being for every child as well as helping to ensure that Academy members practice the highest quality health care and experience professional satisfaction and personal well-being.

- American Academy of Allergy, Asthma and Immunology: The Academy is a professional association with more than 7,000 members in the United States and beyond. This membership includes allergist/immunologists, other medical specialists, allied health and related healthcare professionals with a special interest in the research and treatment of patients with allergic and immunologic diseases.[1]

INTRODUCTION

The standards under review are consistent with the purpose and mandates of the Clean Air Act and are necessary to protect public health—particularly in those communities most exposed and most likely to be harmed by air pollution from trucks and other heavy-duty vehicles (together, "trucks").

Trucks contribute substantially to air pollution that is harmful to human health. "Downstream" emissions arise from combustion, engine crankcase exhaust,

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[1] No party's counsel authored this brief in whole or in part, and no party nor party's counsel contributed money that was intended to fund preparation or submission of this brief. No other individual or organization contributed money that was intended to fund preparation or submission of this brief. This brief is filed with a motion, in compliance with Federal Rule of Appellate Procedure 29(a)(3).

vehicle evaporative emissions, and vehicle refueling emissions. "Upstream" emissions arise from electricity generation and the refining and distribution of fuel. Truck emissions include greenhouse gases like carbon dioxide and nitrous oxide, criteria pollutants like particulate matter and ozone, and air toxics like benzene and formaldehyde, all of which can endanger human health.

The standards under review will yield meaningful—and crucial—reductions in those emissions. Climate change is associated with higher levels of ambient air pollution and more frequent heatwaves and woodland fires, all of which are associated with exacerbations of respiratory disease. Reducing greenhouse gas emissions, by contrast, mitigates climate change and improves respiratory health.

Although the Rule does not target criteria pollutants or air toxics, its implementation is expected to substantially reduce emissions of those pollutants too. These reductions will also yield meaningful health benefits, since exposure to criteria pollutants and air toxics is associated with greater risks of developing and experiencing severe respiratory diseases like asthma and chronic obstructive pulmonary disease ("COPD"). Further, the groups that typically suffer the most from air pollution—including children and people living in communities near high-traffic roadways—also stand to benefit the most from the standards, rendering them even more important to public health.

Given the importance of the Rule and the danger of the pollutants implementation of the Rule is expected to reduce, *amici* respectfully request that the pending petitions be denied.

ARGUMENT

I. The Rule will achieve significant emissions reductions, consistent with the purpose and mandates of the Clean Air Act.

Congress passed the Clean Air Act to protect public health and welfare. 42 U.S.C. § 7401(b)(1). In keeping with that statutory objective, Congress further directed the Administrator of the EPA to set and periodically revise standards for the "emission of any air pollutant from any class or classes of new motor vehicles" that "in [the Administrator's] judgment cause, or contribute to, air pollution which may reasonably be anticipated to endanger public health or welfare." *Id.* at § 7521(a)(1).

EPA has long recognized that greenhouse gas emissions, including those emitted from vehicles, endanger public health and welfare. *See* 74 Fed. Reg. 66,496 (Dec. 15, 2009). The Rule is therefore the third in a series of greenhouse gas emissions standards for trucks and other heavy-duty vehicles (collectively, "trucks"). *See* 76 Fed. Reg. 57,106 (Sep. 15, 2011) ("Phase 1"); 81 Fed. Reg. 73,478 (Oct. 25, 2016) ("Phase 2"). Its implementation is expected to meaningfully reduce emissions of greenhouse gases and other air pollutants dangerous to human health. 89 Fed. Reg. at 29,455, 29,669.

A. The Rule will achieve significant decreases in greenhouse gas emissions.

Transportation accounts for the largest share of greenhouse gas emissions in the United States, and truck emissions alone amount to a quarter of transportation sector emissions. *Id*. at 29,675. Without further regulation, these emissions are likely to continue to rise, since truck traffic is likely to increase through at least 2050.[2]

EPA projects that the standards under review will achieve notable reductions in several greenhouse gases, including carbon dioxide, methane, and nitrous oxide. 89 Fed. Reg. at 29,454. By 2055, for example, EPA expects implementation of the standards to reduce net carbon dioxide equivalent emissions by more than 1.025 billion metric tons. *Id.* These net reductions will meaningfully contribute to climate change mitigation efforts and the reduction of adverse health impacts. *Infra* Part II.

B. Implementation of the Rule will also reduce other harmful air pollutants.

Although the Rule does not directly target non-greenhouse gas emissions, its implementation is projected to result in meaningful reductions in emissions of several other pollutants harmful to human health, namely criteria pollutants and air toxics. 89 Fed. Reg. at 29,455, 29,592 n.814, 29,675–77.

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[2] U.S. Dep't of Transp. Bureau of Transp. Statistics, *Freight Transportation System Extent & Use*, https://data.bts.gov/stories/s/Freight-Transportation-System-Extent-Use/r3vy-npqd (last visited Dec. 12, 2024) (explaining that long-haul freight traffic on the National Highway System is "projected to increase dramatically" by 2050).

"Criteria pollutants" include sulfur oxides, nitrogen oxides, ground-level ozone, particulate matter, and carbon monoxide, 42 U.S.C. § 7408(a); 40 C.F.R. §§ 50.4–13 (2024), all of which are either directly or indirectly associated with the development or exacerbation of respiratory disease, *see infra* Part II. EPA expects implementation of the standards to reduce net emissions of nitrogen oxides, sulfur dioxide, and volatile organic compounds (ozone-forming pollutants) by 2055. 89 Fed. Reg. at 29,592–93, 29,671.[3] The reductions in emissions of nitrogen oxides and sulfur dioxide—two particulate matter-forming pollutants—are also expected to yield health benefits specific to particulate matter. *Id.* at 29,455, 29,592–93.[4]

Those changes reflect substantial reductions in downstream emissions from all criteria pollutants modeled, including fine particulate matter, nitrogen oxides, sulfur dioxide, volatile organic compounds, and carbon monoxide. *Id.* at 29,455. By 2055, EPA expects downstream emissions of fine particulate matter to fall by 5%, downstream emissions of nitrogen oxides, sulfur dioxide, and volatile organic compounds to fall by around 20% each, and downstream carbon monoxide emissions to fall by 19%. *Id.* at 29,669.

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[3] Here, "net" refers to aggregate changes in upstream and downstream emissions. *Id.* at 29,670.

[4] Ambient fine particulate matter consists of primary particles and secondary particles. 89 Fed. Reg. at 29,676. Primary particles are emitted directly from combustion-related sources, and secondary particles form when other pollutants react in the atmosphere. *Id.*

EPA likewise projects that implementation of the Rule will substantially reduce downstream emissions of "air toxics," including carcinogenic pollutants like benzene and formaldehyde. *Id.* at 29,669, 29,675–77; *see* 42 U.S.C. § 7412 (discussing air toxics). Downstream benzene emissions are expected to fall by 25% by 2055, and downstream emissions of formaldehyde are expected to fall by 15%. 89 Fed. Reg. at 29,699.

These reductions will particularly benefit near-roadway communities, where air pollution from truck emissions is often especially concentrated. *Id.* at 29,455, 29,697, 29,686–89. As explained below in Part III, these disproportionately exposed communities are often "more likely to be of a non-White race, Hispanic ethnicity, and/or low socioeconomic status," *id.* at 29,455, and tend to experience worse health outcomes due to a variety of social forces.

II. The anticipated emissions reductions are expected to benefit human health.

Greenhouse gas emissions contribute to climate change, which causes and exacerbates a variety of respiratory diseases and can elevate the risk of mortality. Several criteria pollutants and air toxics found in truck emissions also endanger respiratory health and are associated with the development of cancer and cardiovascular disease.

A. Climate change threatens respiratory health.

Climate change poses numerous risks to respiratory health. Two primary risks are increasing concentrations of ground-level ozone and the rising frequency and severity of both heatwaves and wildfires.

Researchers have established a clear connection between higher temperatures caused by climate change and higher levels of ground-level ozone.[5] Ozone forms when nitrogen oxides and volatile organic compounds react in the presence of sunlight and heat. 89 Fed. Reg. at 29,676. As temperatures rise, concentrations of ozone tend to rise too.[6] Public health experts have therefore warned that "the impact of continued climate change on ozone-related asthma [emergency department] visits, a key marker for poor asthma control and a predictor of mortality, may be pronounced" as global temperatures increase.[7]

Indeed, exposure to ozone has been strongly associated with a variety of health impacts, including an increased risk of mortality from all causes, even at

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[5] *See* J.J. West et al*., Air Quality*, *in* U.S. Global Change Rsch. Program, *Fifth National Climate Assessment* (2023); Kristie L. Ebi & Glenn McGregor, *Climate Change, Tropospheric Ozone and Particulate Matter, and Health Impacts*, 116 Env't Health Persps. 1449, 1450–51 (2008).

[6] *See* Ebi et al., *supra* note 5, at 1450–51.

[7] Nicholas Nassikas et al., *Ozone-Related Asthma Emergency Department Visits in the U.S. in a Warming Climate*, 183 Env't Rsch. 1, 1 (2020).

levels below the EPA national standard.[8] Increases in ozone concentration have also been linked to an increase in emergency room visits and hospitalization, especially for people with underlying lung disease.[9]

Children are particularly susceptible to harm from ozone pollution. This is in part because their lungs and immune systems are not yet fully developed, their respiratory systems are more affected by even marginal levels of pollution, and children tend to be more active and spend more time outside than adults.[10] Not only are children's respiratory systems more vulnerable to ozone pollution than those of adults, children also have a higher prevalence of asthma in the first place.[11] Children with asthma are therefore particularly susceptible to the harms of ozone exposure.[12]

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[8] *See, e.g.*, Michael Jerrett et al., *Long-Term Ozone Exposure and Mortality*, 360 New Eng. J. Med. 1085, 1092 (2009); Qian Di et al., *Air Pollution and Mortality in the Medicare Population*, 376 New Eng. J. Med. 2513, 2518–20 (2017).

[9] *See* Kelly Moore et al., *Ambient Ozone Concentrations Cause Increased Hospitalizations for Asthma in Children: An 18-Year Study in Southern California*, 116 Env't Health Persps. 1063, 1069 (2008); Heather M. Strosnider et al., *Age-Specific Associations of Ozone and Fine Particulate Matter with Respiratory Emergency Department Visits in the United States*, 199 Am. J. Respiratory & Critical Care Med. 882, 883, 886 (2019).

[10] *See* Nassikas et al., *supra* note 7, at 1.

[11] Shyamali C. Dharmage et al., *Epidemiology of Asthma in Children and Adults*, 7 Frontiers in Pediatrics 1, 2 (2019).

[12] *See* U.S. EPA, EPA/600/R-20/012, *Integrated Science Assessment for Ozone and Related Photochemical Oxidants* IS-57 (2020) [hereinafter *Integrated Science Assessment for Ozone*].

In fact, studies have demonstrated a consistent relationship between exposure to ground-level ozone and severe asthma exacerbations among children, including exacerbations requiring emergency department visits and hospitalization.[13] A recent study, for example, demonstrated that short-term ozone levels below the current ambient ozone standard were associated with severe asthma exacerbations in children.[14] This study focused specifically on exacerbations that occurred even in the absence of viral disease.[15] Other studies have found associations between chronic long-term ozone exposure and pediatric hospitalizations for asthma symptoms.[16] Such exacerbations are costly and often require children to miss school and their caregivers to miss work.

Further, a recent review found that exposure to even low levels of ozone pollution is associated with decreased lung function in children, including children

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[13] *Id.* at IS-28–29.

[14] Matthew C. Altman et al., *Associations Between Outdoor Air Pollutants and Non-Viral Asthma Exacerbations and Airway Inflammatory Responses in Children and Adolescents Living in Urban Areas in the USA: A Retrospective Secondary Analysis*, 7 Lancet Planetary Health e33, e41–e42 (2023).

[15] *Id.*

[16] *See, e.g.*, Shao Lin et al., *Chronic Exposure to Ambient Ozone and Asthma Hospital Admissions Among Children*, 116 Env't Health Persps. 1725, 1728 (2008); Mary C. White et al., *Exacerbations of Childhood Asthma and Ozone Pollution in Atlanta*, 65 Env't Rsch. 56, 56 (1994); Steven M. Babin et al., *Pediatric Patient Asthma-Related Emergency Department Visits and Admissions in Washington, DC, from 2001–2004, and Associations with Air Quality, Socio-Economic Status and Age Group*, 6 Env't Health 1, 10 (2007).

without asthma.[17] Yet another study demonstrated an association between short-term ozone exposure and emergency department visits for upper respiratory tract infections and pneumonia in children.[18] That finding is notable, because pneumonia early in life has been associated with decreased lung function in adulthood.[19]

In addition to exacerbating respiratory disease in children, ozone exposure in childhood can have enduring effects into adulthood. Long-term exposure to ground-level ozone pollution is associated with an increased odds of developing asthma, for example.[20] One study demonstrated that children who played multiple outdoor sports in regions with high concentrations of ground-level ozone had a more than three-fold increased odds of developing asthma five years later than did children who did not participate in sports.[21]

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[17] Stephanie M. Holm & John R. Balmes, *Systematic Review of Ozone Effects on Human Lung Function, 2013 Through 2020*, 161 Chest 190, 198 (2022).

[18] Lyndsey A. Darrow et al., *Air Pollution and Acute Respiratory Infections Among Children 0-4 Years of Age: An 18-Year Time-Series Study*, 180 Am. J. of Epidemiology 968, 973–74 (2014).

[19] Johnny Y. C. Chan et al., *Pneumonia in Childhood and Impaired Lung Function in Adults: A Longitudinal Study*, 134 Pediatrics 607, 610–11 (2015).

[20] Malcolm R. Sears et al., *A Longitudinal, Population-Based, Cohort Study of Childhood Asthma Followed to Adulthood*, 349 New Eng. J. Med. 1414, 1414 (2003).

[21] Rob McConnell et al., *Asthma in Exercising Children Exposed to Ozone: A Cohort Study*, 359 Lancet 386, 388–90 (2002).

Ozone exposure is not the only danger to respiratory health that climate change is likely to worsen. Climate change also leads to more extreme heatwaves, 89 Fed. Reg. at 29,674, which are associated with increased mortality and hospitalization from a variety of respiratory issues. For example, one study analyzing data from twelve U.S. cities determined that hotter temperatures predicted increases in deaths from respiratory conditions.[22] Numerous other studies demonstrate that higher temperatures consistently correlate with higher risks of hospitalization and death for people with COPD, as well as asthma exacerbation.[23]

Climate change also increases the severity and frequency of wildfire events in the United States, resulting in more frequent poor air quality days. 89 Fed. Reg. at 29,674–75. Exposure to wildfire smoke, which can include fine particulate matter and other pollutants, is also associated with acute respiratory infections, asthma and

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[22] Alfésio L. F. Braga et al., *The Effect of Weather on Respiratory and Cardiovascular Deaths in 12 U.S. Cities*, 110 Env't Health Persps. 859, 861–62 (2002).

[23] *See* Nadia N. Hansel et al., *The Effects of Air Pollution and Temperature on COPD*, 13 COPD: J. Chronic Obstructive Pulmonary Disease 372, 375 (2016); *see also* Azhu Han et al., *Asthma Triggered by Extreme Temperatures: From Epidemiological Evidence to Biological Plausibility*, 216 Env't Rsch. 1, 1 (2023).

COPD exacerbations—including those requiring emergency care[24]—and a greater risk of death.[25]

B. Pollutants in truck emissions also pose serious risks to respiratory and cardiovascular health.

Although the Rule targets greenhouse gas emissions, its implementation is also expected to reduce emissions of other dangerous pollutants, including those associated with a higher risk of death, the exacerbation of asthma, the development of other chronic lung diseases, and higher risks of developing cancer and cardiovascular disease.

1. Exposure to pollutants emitted by trucks is associated with a higher risk of death.

As explained above in Part I.B, implementation of new standards is expected to reduce tailpipe emissions of fine particulate matter and pollutants that form particulate matter and ozone. These reductions are crucial because exposure to fine particulate matter and ozone is associated with a higher risk of death.

As EPA recognized in the preamble to the Rule, evidence "supports a causal relationship between both long-and short-term exposures to [fine particulate matter]

[24] Justine A. Hutchinson, *The San Diego 2007 Wildfires and Medi-Cal Emergency Department Presentations, Inpatient Hospitalizations, and Outpatient Visits: An Observational Study of Smoke Exposure Periods and a Bidirectional Case-Crossover Analysis*, PLOS Med., July 2018, at 16.

[25] Colleen E. Reid et al., *Critical Review of Health Impacts of Wildfire Smoke Exposure*, 124 Env't Health Persps. 1334, 1336–38, 1340 (2016).

and premature mortality." 89 Fed. Reg. at 29,678 (internal citation omitted). Indeed, a trio of studies provides strong epidemiological evidence that exposure to even levels of fine particulate matter pollution generally considered "low" can increase the risk of mortality in adults.[26] As noted above at pages 11–12, moreover, even short-term exposure to ground-level ozone pollution is associated with adverse respiratory effects, cardiovascular effects, and deaths from all causes.[27] Long-term exposure to ozone pollution also increases the risk of death from all causes.[28]

2. Exposure to pollutants emitted by trucks can also exacerbate asthma symptoms, especially among children.

Implementation of the Rule is also expected to reduce nitrogen dioxide emissions, which are associated with the development and exacerbation of asthma

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[26] Di et al., *supra* note 8, at 2518; Yan Wang et al., *Long-term Exposure to PM2.5 and Mortality Among Older Adults in the Southeastern United States*, 28 Epidemiology 207, 210 (2017); Liuhua Shi et al., *Low-Concentration PM2.5 and Mortality: Estimating Acute and Chronic Effects in a Population-Based Study*, 124 Env't Health Persps. 46, 50 (2015).

[27] *Integrated Science Assessment for Ozone*, *supra* note 12, at IS-28–29.

[28] Michelle C. Turner et al., *Long-Term Ozone Exposure and Mortality in a Large Prospective Study*, 193 Am. J. Respiratory Critical Care Med. 1134, 1139 (2016).

in children.[29] The estimated cost of childhood asthma attributable to nitrogen dioxide exposure is greater than $178 million per year.[30]

The link between exposure to nitrogen dioxide and other traffic-related air pollution and asthma is well documented. Long-term exposure increases the risk of developing asthma as a child,[31] and short-term exposure to high levels of nitrogen dioxide can induce asthma attacks in children.[32]

This association persists even when accounting for other asthma risk factors. A study conducted in Southern California, for example, tracked changes in asthma prevalence among more than 4,000 children and determined that decreases in ambient concentrations of nitrogen dioxide and fine particulate matter over a twenty-

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[29] George D. Thurston et al., *Outdoor Air Pollution and New-Onset Airway Disease: An Official American Thoracic Society Workshop Report*, 17 Annals of the Am. Thoracic Soc'y 387, 388–90 (2020).

[30] Minaal Farrukh & Haneen Khreis, *Monetizing the Burden of Childhood Asthma Due to Traffic Related Air Pollution in the Contiguous United States in 2010*, 18 Int. J. Envi. Res. Public Health 7864 (2021).

[31] *See, e.g.*, Thurston et al., *supra* note 29, at 388–90; U.S. EPA, EPA/600/R-15/068, *Integrated Science Assessment for Oxides of Nitrogen*, *supra* note 32, at lxxxiv; Haneen Khreis et al., *Exposure to Traffic-Related Air Pollution and Risk of Development of Childhood Asthma: A Systematic Review and Meta-Analysis*, 100 Env't Int'l 1, 23–24, 28 (2017).

[32] U.S. EPA, EPA/600/R-15/068, *Integrated Science Assessment for Oxides of Nitrogen – Health Criteria* lxxxiii (2016) [hereinafter *Integrated Science Assessment for Oxides of Nitrogen*].

year period were associated with lower rates of asthma.[33] The relationship between developing asthma during childhood and exposure to these pollutants remained significant even when the researchers controlled for exposure to smoking and parental history of asthma.[34]

3. Exposure to pollutants emitted by trucks is associated with other chronic lung diseases and impaired breathing.

Extensive research shows that long-term exposure to nitrogen oxides, ozone, and other traffic-related air pollutants is associated with higher rates of COPD, a leading cause of death in the United States.[35] COPD includes various respiratory conditions that affect breathing, such as emphysema, or damage to lung air sacs, which results in chronic shortness of breath.[36] One study conducted in six different states linked participants' exposure to nitrogen oxides, ozone, and other traffic-related air pollutants with worsened emphysema over a ten-year period.[37]

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[33] Erika Garcia et al., *Association of Changes in Air Quality with Incident Asthma in Children in California, 1993-2014*, 321 JAMA 1906, 1906, 1911 (2019); *see id.* (explaining that the findings specific to nitrogen dioxide were more robust).

[34] *Id.* at 1909.

[35] Meng Wang et al., *Association Between Long-Term Exposure to Ambient Air Pollution and Change in Quantitively Assessed Emphysema and Lung Function*, 322 JAMA 546, 547 (2019).

[36] *Id.*; *see also* U.S. Centers for Disease Control and Prevention, *About COPD* (May 15, 2024), https://www.cdc.gov/copd/about/.

[37] Meng Wang et al., *supra* note 35, at 550–51.

Researchers have also found that the development of COPD in adulthood is strongly associated with long-term exposure to nitrogen dioxide and other nitrogen oxides, even when controlling for other risk factors, such as smoking history.[38]

Exposure to air pollutants from truck emissions can also worsen general respiratory health. As explained in more detail below in Part III, children exposed to nitrogen oxides and particulate matter near roadways tend to exhibit diminished lung function over time compared to children who live elsewhere.[39] This is likely a result of pollutant exposures during "critical windows" for lung development, which can result in permanent changes in lung function, thereby potentially increasing the risk of developing chronic diseases like COPD in adulthood.[40]

Conversely, reductions in ambient nitrogen dioxide and particulate matter concentrations have been associated with "measurable improvements" in lung function among children.[41] Just as continued exposure to air pollutants in truck

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[38] Zorana J. Andersen et al., *Chronic Obstructive Pulmonary Disease and Long-Term Exposure to Traffic-Related Air Pollution: A Cohort Study*, 183 Am. J. Respiratory & Critical Care Med. 455, 456–60 (2011).

[39] *See* Robert Urman et al., *Associations of Children's Lung Function with Ambient Air Pollution: Joint Effects of Regional and Near-Roadway Pollutants*, 69 Thorax 540, 543–45 (2014).

[40] *Id.* at 540; *see also* Zhuyi Lu et al., *Air Pollution As An Early Determinant of COPD*, 31 Eur. Respiratory Rev. 1–13 (2022).

[41] W. James Gauderman et al., *Association of Improved Air Quality with Lung Development in Children*, 372 New Eng. J. Med. 905, 910 (2015).

emissions worsens children's respiratory health and increases their risk of developing various illnesses later in life; decreases in those same pollutants can improve health and reduce those risks.[42] Research provides "strong evidence" that reductions in particulate matter benefit adults too, particularly regarding mortality[43].

4. Exposure to pollutants in truck emissions can increase the risk of developing cancer and cardiovascular disease.

Exposure to diesel engine exhaust is also associated with an increased risk of developing other illnesses like lung cancer and cardiovascular disease. This impact is particularly notable because lung cancer is the leading cause of cancer-related deaths in the United States.[44] In fact, EPA, the National Toxicology Program at the National Institutes of Health, and the International Agency for Research on Cancer, a global organization tasked with locating cancer-causing hazards, have deemed diesel engine exhaust a carcinogen.[45]

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[42] *Id.*

[43] Kevin P. Josey et al., *Air Pollution and Mortality at the Intersection of Race and Social Class*, 388 New Engl. J. Med. 1396, 1401–02 (2023).

[44] U.S. Centers for Disease Control and Prevention, *Lung Cancer Awareness* (Oct. 29, 2024), https://www.cdc.gov/cancer/features/lung-cancer.html.

[45] U.S. EPA, *Integrated Risk Information System: Diesel Exhaust* (Feb. 28, 2023), https://iris.epa.gov/ChemicalLanding/&substance_nmbr=642; U.S. Dep't of Health & Human Servs, National Toxicology Program, *Report on Carcinogens Profile: Diesel Exhaust Particulates* (Dec. 23, 2021), https://ntp.niehs.nih.gov/sites/default/files/ntp/roc/content/profiles/dieselexhaustparticulates.pdf; Dana Loomis et al., *The International Agency for Research on*

The risks associated with exposure to truck exhaust are well documented. Indeed, one study identified a "consistent increase in the risk for lung cancer among workers with exposure to diesel exhaust" even when accounting for other risk factors, such as participants' smoking practices.[46] Other studies have also demonstrated an association between exposure to specific pollutants commonly found in truck emissions and the risk of developing lung cancer. One, for example, identified a positive association between lung cancer risk and exposure to nitrogen oxides, fine particulate matter, carbon monoxide, and benzene.[47]

Pollutants in truck emissions are also associated with the development of cardiovascular disease—the leading cause of death in adults in the United States.[48] Studies have also concluded that exposure to several traffic-related air pollutants,

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Cancer Evaluation of the Carcinogenicity of Outdoor Air Pollution: Focus on China, 33 Chinese J. Cancer 189, 189 (2014).

[46] Rajiv Bhatia et al., *Diesel Exhaust Exposure and Lung Cancer*, 9 Epidemiology 84, 88 (1998).

[47] Iona Cheng et al., *Traffic-Related Air Pollution and Lung Cancer Incidence: The California Multiethnic Cohort Study*, 206 Am. J. Respiratory Critical Care Med. 1008, 1009 (2022); *see also* Ghassan B. Hamra et al., *Lung Cancer and Exposure to Nitrogen Dioxide and Traffic: A Systematic Review and Meta-Analysis*, 123 Env't Health Persps. 1107, 1110–11 (2015).

[48] Seth S. Martin et al., *2024 Heart Disease and Stroke Statistics: A Report of U.S. and Global Data From the American Heart Association*, 149 Circulation e347, e348 (2024); Joel D. Kaufman et al., *Guidance to Reduce the Cardiovascular Burden of Ambient Air Pollutants: A Policy Statement from the American Heart Association*, 142 Circulation e432, e432 (2020).

including sulfur dioxide, carbon monoxide, and nitrogen dioxide, is positively associated with a higher risk of suffering a stroke.[49]

III. The Rule stands to benefit communities and social groups that are disproportionately burdened by air pollution.

Truck emissions affect human health nationwide, but they often inflict the most harm on communities that "face relatively greater cumulative impacts associated with environmental exposures of multiple types, as well as impacts from non-chemical stressors," like poverty. *See* 89 Fed. Reg. at 29,691.[50] These communities, sometimes called "environmental justice" communities, are often disproportionately exposed to air pollution from truck emissions, leading to worse health outcomes. They also bear greater relative costs as a result of exposures. The standards are expected to alleviate some of those harms and are therefore critically important in the pursuit of achieving equitable health outcomes—outcomes that ensure that every person has the same fair opportunity to attain their full health potential without regard to social position or circumstance.[51]

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[49] Wan-Shui Yang et al., *An Evidence-Based Appraisal of Global Association Between Air Pollution and Risk of Stroke*, 175 Int'l J. Cardiology 307, 307–13 (2014).

[50] *See generally* Robert D. Bullard, *Dumping in Dixie: Race, Class, and Environmental Quality* (1990).

[51] U.S. Centers for Disease Control and Prevention, *What is Health Equity?* (June 11, 2024), https://www.cdc.gov/health-equity/what-is/index.html.

A. Environmental justice communities are disproportionately exposed to harmful truck emissions.

Ambient air pollutants tend to be disproportionately concentrated near environmental justice communities in part because many environmental justice communities are located near roadways. 89 Fed. Reg. at 29,455, 29,695–96. Indeed, numerous studies have also collected "overwhelming evidence" showing that "in almost every U.S. county, people of color and lower-income residents are significantly overrepresented in areas near high-volume roadways or where there is more vehicle traffic."[52] This remains true even after controlling for region, county characteristics, population density and household structure.[53] Ultimately, race, ethnicity, and income are significant determinants of whether someone lives near a truck route. 89 Fed. Reg. at 29,695.

Unsurprisingly, schools that serve children in these communities also tend to be located near major roadways. Millions of children attend schools located within 250 meters of a major roadway—a zone most likely to experience high levels of traffic-related air pollution—but schools serving predominantly Black children and

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[52] Brittany Antonczak et al., *2020 Near-Roadway Population Census, Traffic Exposure and Equity in the United States*, 125 Transp. Rsch. Part D: Transp. & Env't 1, 11 (2023).

[53] *Id.* at 12.

schools serving students living in poverty are even more likely—in fact, 18% more likely—to be in that zone.[54]

B. Environmental justice communities are more likely to experience severe health outcomes and consequences from disproportionate exposure to air pollution.

The disparities in exposure to traffic-related air pollution seen in environmental justice communities are particularly troubling because research suggests that people living in these communities are more likely to experience severe health outcomes and collateral consequences from these exposures than are other exposed groups.

One study examining inflammation caused by particulate matter, for example, found that "near-roadway [particulate matter] produced greater inflammatory response than urban background [particulate matter]."[55] Another study on air pollution and asthma in children found that children living within 100 meters of a major road were nearly three times more likely to have asthma in mid-childhood

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[54] Samantha Kingsley et al., *Proximity of U.S. Schools to Major Roadways: A Nationwide Assessment*, 24 J. Exposure Sci. & Env't Epidemiology 253, 254 (2014).

[55] Weidong Wu et al., *Inflammatory Response of Monocytes to Ambient Particles Varies by Highway Proximity*, 51 Am. J. Respiratory Cell & Molecular Biology 802, 802 (2014); *see id* at 806–07 (calling near-roadway particulate matter "substantially more toxic" than ambient particulate matter).

than those who lived farther away.[56] As noted above, *see supra* Part II.B.2, children are particularly susceptible to respiratory harms from exposures to air pollutants because their lungs are still developing and they tend to spend more time outside than adults do, rendering proximity to roads and traffic-related air pollutants particularly harmful to their health and well-being.

Evidence also highlights links between lower incomes and adverse outcomes from pollutant exposures. One study found that U.S. veterans living in neighborhoods with relatively high poverty, underemployment, housing instability, and lack of education, faced substantially higher death rates associated with exposure to fine particulate matter than did veterans living in communities without those characteristics, even after adjusting for age-related factors.[57] Other studies have observed that older people eligible for Medicaid experience more severe health outcomes from exposure to airborne pollutants than do other groups.[58]

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[56] Mary B. Rice et al., *Lifetime Air Pollution Exposure and Asthma in a Pediatric Birth Cohort*, 141 J. Allergy & Clinical Immunology 1932, 1932 (2018); *see also* Mary B. Rice et al., *Lifetime Exposure to Ambient Pollution and Lung Function in Children*, 193 Am. J. Respiratory & Critical Care Med. 881, 881–82 (2016).

[57] *See* Benjamin Bowe et al., *Burden of Cause-Specific Mortality Associated with PM2.5 Air Pollution in the United States*, 2 JAMA Network Open 1, 11 (Nov. 2019) (explaining that disparities in death rates reflected differences in exposure as well as sensitivity to exposure).

[58] *See, e.g.,* Di et al., *supra* note 8, at 2518.

Studies have also identified associations between exposure to air pollutants and disproportionately adverse health outcomes based on race.[59] One study of Medicare beneficiaries, for example, concluded that Black men are among those people with "a much higher risk of death associated with exposure to air pollution than other subgroups."[60] Other studies have reached similar results, calculating that Black people experience a higher death rate associated with exposure to airborne fine particulate matter in particular than do people in other groups.[61] Likewise, compared to non-Hispanic White children, Black and Hispanic children appear to be "more vulnerable to short-term increases in ambient pollution, particularly [ozone]."[62]

Such findings likely reflect inequities in the social determinants of health, which cause some communities to experience greater environmental exposures and chronic disease burdens, with fewer available resources for coping. 89 Fed. Reg. at

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[59] To be clear, these differences in health outcomes reflect only social and structural forces, not innate biological differences. *See* Josey, *supra* note 43, at 1401; *see infra* pp.25–26 (discussing the social determinants of health).

[60] Di et al., *supra* note 8, at 2518.

[61] Bowe et al., *supra* note 57, at 11; *see also* Yan Wang et al., *supra* note 26, at 211.

[62] Brooke A. Alhanti et al., *Ambient Air Pollution and Emergency Department Visits for Asthma: A Multi-City Assessment of Effect Modification By Age*, 26 J. Exposure Sci. & Env't Epidemiology 180, 184 (2015).

29,693–94.[63] For example, studies have demonstrated that the association between exposure to fine particulate matter and mortality is stronger for people who have previously been hospitalized for diseases like COPD or admitted to an intensive care unit.[64] Similarly, research demonstrates that childhood asthma is a health inequity, over-burdening Black, Puerto Rican, and Dominican children compared to non-Hispanic White children.[65]

The exclusionary policies of the past also continue to impact the respiratory health of the present. Historical red-lining practices, for example, continue to result in inequitable exposure to air pollution today.[66] Residents currently living in historically redlined census tracts tend to experience higher exposure to diesel exhaust particles, higher exposure to fine particulate matter, and worse asthma

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[63] *See* U.S. Centers for Disease Control and Prevention, *Social Determinants of Health* (May 15, 2024), https://www.cdc.gov/public-health-gateway/php/about/social-determinants-of-health.html (defining the social determinants of health to include "non-medical factors that affect health outcomes," including "the conditions in which people are born, grow, work, live, and age" and the "broader forces and systems that shape everyday life outcomes").

[64] Yan Wang, *supra* note 26, at 211.

[65] *See* Torie Grant et al., *Asthma and the Social Determinants of Health*, 128 Annals Allergy, Asthma & Immunology 5, 7 (2022).

[66] Alexander C. Bradley et al., *Air Pollution Inequality in the Denver Metroplex and Its Relationship to Historical Redlining*, 58 Env't Sci. & Tech. 4226, 4228–29 (2024).

outcomes.[67] Likewise, a study conducted in Cincinnati found that hospital re-admissions in Black children were mostly explained not by race, but by insurance type, area-level socioeconomic deprivation, outdoor mold, and exposure to fine particulate matter, underscoring the contribution of both fine particulate matter exposure and socioeconomic factors to childhood asthma health inequities.[68]

As noted above in Part I, EPA anticipates that implementation of the Rule will substantially reduce a variety of pollutants harmful to human health and expects meaningful reductions to occur near major roadways and truck freight routes. *Id.* at 29,455, 29,686–92. The Rule must be implemented to ensure that all communities—and particularly already overburdened communities—can benefit from those reductions.

CONCLUSION

For all these reasons, the pending petitions should be denied.

Respectfully submitted,

/s/ Sommer H. Engels
ANDREW C. MERGEN
ROSA HAYES
SHANNON NELSON

[67] Alexander J. Schuyler & Sally E. Wenzel, *Historical Redlining Impacts Contemporary Environmental and Asthma-Related Outcomes in Black Adults*, 206 Am. J. Respiratory Critical Care Med. 824, 833–34 (2022).

[68] Esteban Correa-Agudelo et al., *Understanding Racial Disparities in Childhood Asthma Using Individual-and Neighborhood-Level Risk Factors*, 150 J. Allergy & Clinical Immunology 1427, 1432–34 (2022).

SOMMER H. ENGELS
Emmett Environmental Law & Policy
Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorneys for Amici Curiae[69]

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CERTIFICATE OF COMPLIANCE

This brief complies with the word limitation of Federal Rules of Appellate Procedure 29(a)(5) and 32(a)(7)(B). The brief contains 6,293 words, excluding the portions exempted by Federal Rule of Appellate Procedure 32(f) and D.C. Circuit Rule 32(e)(1).

This brief complies with the typeface requirements of Federal Rule of Appellate Procedure 32(a)(5) and the type style requirements of Federal Rule of Appellate Procedure 32(a)(6). The brief has been prepared in proportionally spaced typeface using Microsoft Word 365 and 14-point Times New Roman font.

Respectfully submitted,

/s/ Sommer H. Engels

ANDREW C. MERGEN
ROSA HAYES
SHANNON NELSON
SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorneys for Amici Curiae

January 21, 2025

CERTIFICATE OF SERVICE

I hereby certify that on January 21, 2025, a copy of the foregoing document was served on all registered counsel through the D.C. Circuit's CM/ECF system.

/s/ Sommer H. Engels

SOMMER H. ENGELS
Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett St., Suite 5116
Cambridge, MA 02138
sengels@law.harvard.edu
(617) 384-0464

Attorney for Amici Curiae