BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	R.2024-017
	)	(Rulemaking – Air)

NOTICE OF FILING

TO:

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Please take notice that I have today filed with the Illinois Pollution Control Board the following documents: Rule Proponents' Pre-Filed Testimony List; Joint Supplemental Testimony of Kathy Harris and Muhammed Patel; Pre-Filed Testimony of Tom Cackette; Pre-Filed Testimony of Dr. Peter Orris; Pre-Filed Testimony of Dr. Daniel E. Horton; Pre-Filed Testimony of Juliana Pino; Pre-Filed Testimony of Brian Urbaszewski; Pre-Filed Testimony of Myrna Salgado; Pre-Filed Testimony of Justin Flores; and Certificate of Service, a copy of which is served upon you.

Dated: September 16, 2024

Respectfully submitted,

/s/

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IN THE MATTER OF:	)	
	)	R.2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

RULE PROPONENTS' PRE-FILED TESTIMONY LIST

The following testimony has been pre-filed in support of Rule Proponents' proposed Illinois Clean Car and Truck Standards:

1. Joint Testimony of Kathy Harris and Muhammed Patel (Including Supplemental Testimony)
2. Testimony of Tom Cackette
3. Testimony of Dr. Peter Orris
4. Testimony of Dr. Daniel E. Horton
5. Testimony of Juliana Pino
6. Testimony of Brian Urbaszewski
7. Testimony of Myrna Salgado
8. Testimony of Justin Flores

Rule Proponents' pre-filed testimony relates to the sections of the Statement of Reasons as follows:[1]

[1] This table provides a reference and is consistent with the descriptions provided in the section entitled "Witnesses and Synopsis of Testimony" submitted together with Rule Proponents' regulatory proposal on June 27th, 2024, with one modification. The Statement of Reasons stated that José Acosta, of the Little Village Environmental Justice Organization, would testify to "the disparate impacts of air pollution on EJ communities throughout the state as described in section III of the Statement of Reasons," as well as "the disproportionate share of vehicle emissions concentrated in EJ communities in Chicago and how those vehicle emissions affect the health and quality of life of residents of those communities," and "the need for the Board to promptly consider and adopt the regulations." Statement of Reasons at 68. These issues will instead be addressed in the testimony of Juliana Pino, Deputy Director the Little Village Environmental Justice Organization. Mr. Acosta will not be testifying.

Listing of a witness in relation to a section of the Statement of Reasons in this table does not indicate that witness is the only source of information related to the section indicated; this table is intended only as a reference to facilitate navigation of the topics covered in the pre-filed testimony.

Statement of Reasons Section	***Witnesses***
Section II	
Section II.a	Kathy Harris and Muhammed Patel
Section II.b	Brian Urbaszewski
Section II.c	Juliana Pino
Section III	
Section III.a	Dr. Peter Orris
Section III.b	Dr. Daniel Horton and Brian Urbaszewski
Section III.c	Dr. Peter Orris, Dr. Daniel Horton, and Brian Urbaszewski
Section III.d	Dr. Peter Orris, Dr. Daniel Horton, Juliana Pino, and Brian Urbaszewski
Section IV.a	
Section IV.a.i	Kathy Harris, Muhammed Patel, and Tom Cackette
Section IV.a.ii	Kathy Harris and Muhammed Patel
Section IV.a.iii	Kathy Harris and Muhammed Patel
Section IV.a.iv	Tom Cackette and Brian Urbaszewski
Section IV.b	
Section IV.b.i	Kathy Harris, Muhammed Patel, and Tom Cackette
Section IV.b.ii	Kathy Harris and Muhammed Patel
Section IV.b.iii	Kathy Harris and Muhammed Patel
Section IV.b.iv	Tom Cackette and Brian Urbaszewski
Section IV.c	
Section IV.c.i	Kathy Harris, Muhammed Patel, and Tom Cackette
Section IV.c.ii	Kathy Harris and Muhammed Patel
Section IV.c.iii	Kathy Harris and Muhammed Patel
Section IV.c.iv	Tom Cackette
Section IV.e	Kathy Harris and Muhammed Patel

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	R2024-017 (Rulemaking – Air)

JOINT SUPPLEMENTAL TESTIMONY OF KATHY HARRIS AND MUHAMMED PATEL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Joint Supplemental Pre-Filed Testimony of Kathy Harris and Muhammed Patel in support of Rule Proponents' regulatory proposal for presentation at the December 2-3 hearing in the above-captioned matter.

TESTIMONY OF KATHY HARRIS AND MUHAMMED PATEL

I. Introduction

Kathy Harris and Muhammed Patel submit this Supplemental Pre-filed Testimony to address how the Illinois Pollution Control Board's consideration of the Proposed Rules may be affected by the hearing schedule for this proceeding set on August 13, 2024, and to express continuing support for adoption of the Proposed Rules.

II. Qualifications

Kathleen Harris is the Director of Clean Vehicles at the Natural Resources Defense Council ("NRDC"). Muhammed Patel is the Senior Midwest Transportation Advocate at NRDC. Their qualifications are described in their initial Joint Pre-Filed Testimony, which appears at pages 207-218 of the Rule Proponents' Rulemaking Petition filed on June 27, 2024. Their

resumes are attached as Rule Proponents' Exhibits 11 and 12 to the Rulemaking Petition, respectively.

III. Purpose of Testimony

We are submitting this pre-filed testimony in support of Rule Proponents' regulatory proposal, which requests that the Illinois Pollution Control Board adopt the ACC II, ACT, and Low-NOx regulations (collectively referred to as the "Clean Car and Truck Standards" or simply the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code.

Specifically, our supplemental testimony will address how the Board's consideration of the Proposed Rules may be affected by the hearing schedule for this proceeding. This schedule may result in the Proposed Rules taking effect in model year ("MY") 2029, rather than MY 2028 as proposed in the Rulemaking Petition. Whether the Proposed Rules take effect in MY 2028 or MY 2029, the Rule Proponents have provided substantial evidence that they will be feasible and highly beneficial for Illinois' air quality, climate objectives, and economy.

IV. Effect of Hearing Schedule on Proposed Rules

The Rule Proponents filed their Rulemaking Petition on June 27, 2024. All three of the Proposed Rules are vehicle emission standards subject to the requirements in Section 177 of the federal Clean Air Act.[1] One of these requirements is to provide at least two years' lead time between a state's adoption of the rules and the start of the first model year for which the rules are effective in that state.[2] In light of this requirement, the Board must finalize adoption of the

[1] The Proposed Rules satisfy all of the requirements in Clean Air Act Section 177, as discussed at pages 17-18 of the Statement of Reasons and pages 214-215 of our contemporaneously-filed Joint Testimony.
[2] 42 U.S.C. § 7507.

Proposed Rules by January 2, 2025 for the rules to go into effect in MY 2028, which may begin as early as January 2, 2027.[3]

On August 13, 2024, the Board scheduled a first hearing on the Proposed Rules for December 2-3, 2024. In light of the Board's rulemaking procedures and its intention to schedule a second hearing at some point after the first hearing, it is very unlikely that the Board will complete its consideration of the Proposed Rules until after January 2, 2025. If this happens, the Proposed Rules will not be able to take effect until MY 2029.

However, even if the Rules do not go into effect until MY 2029, they will remain feasible and will significantly benefit Illinois' air quality, climate objectives, and economy. Moreover, the Rule Proponents have provided sufficient evidence to support adoption of the rules with a MY 2029 implementation date. Environmental Resources Management ("ERM") included scenarios reflecting MY 2029 implementation dates in its modeling analyses of the Proposed Rules and their expected benefits. The results of these modeling analyses were filed as Exhibits 3 and 4 to the Rulemaking Petition. ERM's analysis shows that by 2050, an ACC II rule with a MY 2029 effective date would avoid up to 185 premature deaths (a 4% reduction compared to a rule starting in MY 2028), over 48,000 metric tons of NOx emissions (a 5% reduction), over 4,650 metric tons of PM2.5 (a 3% reduction), and 174 million metric tons of greenhouse gas emissions (a 3% reduction), yielding over $80 billion in cumulative net benefits (a 3% reduction).[4] Similarly, by 2050 an ACT rule with a MY 2029 effective date would avoid up to 35 additional premature deaths (an 8% reduction compared to a rule starting in MY 2028), over 16,500 metric tons of NOx emissions (an 8% reduction), over 300 metric tons of PM2.5 (a 6%

[3] 40 C.F.R. §§ 85.2302, 85.2303.
[4] Exhibit 4, *ERM, Analysis Update: Illinois Advanced Clean Cars II Program* at Health page, Emissions page & CumulNetBenefits page.

reduction), and 18 million metric tons of greenhouse gas emissions (a 7% reduction), yielding over $3.5 billion in cumulative net benefits (a 7% reduction).[5] Additional results for a MY 2029 implementation date are included in Exhibits 3 and 4. In summary, the vast majority of the Proposed Rules' enormous benefits would still be realized with a MY 2029 implementation date.

The Proposed Rules would also remain feasible with a MY 2029 implementation date (adoption before January 2, 2026), even though they require higher sales percentages for zero-emitting vehicles ("ZEVs") in MY 2029 than in MY 2028. The rules would remain feasible thanks to the two-year lead time to ramp up Illinois' ZEV sales, the rules' substantial compliance flexibilities,[6] and the suite of policies and funding supporting ZEV adoption in Illinois.[7]

To be sure, adopting the Proposed Rules in time for implementation in MY 2028 would allow Illinois to begin realizing the rules' benefits sooner, phase the rules in more gradually before 2035, and avoid additional emissions of health-harming pollution and greenhouse gasses throughout the lifespan of MY 2028 vehicles. That would include avoiding premature deaths, hospital visits, and millions in cost savings for consumers. It also benefits the overall ZEV market: expanding the number of new ZEVs in the fleet will accelerate the growth of a secondary market, increasing access and maximizing the benefits of the Proposed Rules for all. For these reasons, we urge the Board to promptly adopt the Proposed Rules and capture the greatest number of model years possible. But as this testimony and ERM's analysis have shown,

[5] Exhibit 4, *ERM, Analysis Update: Illinois Clean Trucks Program* at Health page, Emissions page & AnnNetBenefits page.
[6] The Proposed Rules' compliance flexibilities are discussed in Sections IV.a.i, IV.a.iv, IV.b.i, IV.b.iv, and IV.c.iv of the Statement of Reasons, as well as in the Pre-Filed Testimony of Tom Cackette.
[7] The policies and incentives that will support the rules' implementation are discussed in Sections IV.a.iv and IV.b.iv of the Statement of Reasons, as well as in the Pre-Filed Testimony of Tom Cackette.

starting implementation of the Proposed Rules in MY 2029 remains a viable and highly beneficial option.

VI. Conclusion

Adopting the Proposed Rules will put Illinois on a path towards a healthier, more prosperous, and more equitable transportation future, whether the rules take effect in MY 2028 or MY 2029. The rules will increase the amount of zero emission cars and trucks on Illinois' roads, dramatically reduce tailpipe emissions, and improve air quality for millions of Illinois residents that breathe unhealthy air. For these reasons, we support the petition requesting that the Pollution Control Board adopt the rules without delay.

Thank you for the opportunity to testify. We are prepared to answer any questions from hearing participants regarding this testimony, ERM's analysis of the Proposed Rules, our joint testimony filed on June 27, 2024, and the sections of the Rule Proponents' Statement of Reasons that are related to our testimony, including Sections II.a, IV.a.i, IV.a.ii, IV.a.iii, IV.b.i, IV.b.ii, IV.b.iii, IV.c.i, IV.c.ii, IV.c.iii, and IV.e.

Dated: August 30, 2024.

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF TOM CACKETTE
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Tom Cackette in support of Rule Proponents' regulatory proposal for presentation at the December 2-3 hearing in the above-captioned matter.

TESTIMONY OF TOM CACKETTE

I. INTRODUCTION

My name is Tom Cackette. I am a technical and policy consultant in the areas of advanced vehicle emission control technologies and alternative fuel vehicles, including zero-emission vehicles (ZEVs). I have 50 years of work experience in the field of vehicle emission control technologies, including more than thirty years as a Chief Deputy Executive Officer of the California Air Resources Board and eight years with the United States Environmental Protection Agency. Since 2013, I have worked as an independent consultant, providing analysis and strategic advice on the implementation of advanced emission control technologies and alternative fuel vehicles.

My resume was submitted as Exhibit 10 in the Rule Proponents' regulatory proposal.

II. QUALIFICATIONS

My educational background is in engineering. I hold a B.S. in aeronautics and astronautics from the University of Washington, and a M.S. in engineering from California State University, Northridge.

I have 50 years of work experience in the field of vehicle emission control technologies. From 1974 to 1982, I worked at the U.S. Environmental Protection Agency, where I developed emission control regulations for aircraft and motorcycles. Later I served as Chief of Vehicle Inspection Programs. In that role, I developed policy and analyses to support implementation of over 25 vehicle inspection programs implemented by states with serious air pollution problems, and represented the EPA at numerous state and local government hearings.

From 1982 until 2012, I served as a Chief Deputy Executive Officer at the California Air Resources Board (CARB). In that role, I managed and directed the work of 500 professional staff developing, implementing and enforcing emission control programs for all types of vehicles and mobile equipment. During my time at the Air Resources Board, I directed the development and implementation of the following emissions control programs: Low Emission Vehicle (LEV) program, which set standards for smog-forming emissions; the Zero Emission Vehicle (ZEV) program, which set standards for production of zero-emission vehicles; the nation's first greenhouse gas emission standards for passenger vehicles; the Advanced Clean Cars I program, which included both LEV and ZEV standards for passenger vehicles; the on-board diagnostics program; heavy-duty vehicle emission standards including those that resulted in the use of catalytic aftertreatment and large reductions of oxides of nitrogen (NOx) and fine particulates; greenhouse gas emission reduction program for tractor-trailers; emission standards for off-road vehicles (from lawn mowers to construction equipment); and the Board's policy for the state's

vehicle smog inspection program. I also managed large financial incentive programs in support of the Board's vehicle emission programs, including technical and fiscal assessments of projects that have resulted in accelerated adoption of ultra-low and zero emission heavy diesel trucks. I was recognized internationally as an expert in emission control technology and policy.

In 2013, I began to provide consulting services to public- and private-sector clients on the topics of advanced emission controls for light-, medium-, and heavy-duty vehicles; zero-emission vehicles, including electric vehicles and vehicle charging infrastructure; and regulatory programs for motor vehicle emissions control. As examples, I supported the World Bank on development of a plan for zero emission charging infrastructure in Wuhan, China, and helped several NGOs prepare analyses and comments on USEPA emission rulemakings on light and heavy-duty vehicles. In addition to my consulting work, from 2013 to 2019 I served as a Member of the National Academies of Sciences Research Council panel on fuel economy and emission improvements for medium-duty and heavy-duty (M/HD) trucks.

I am very familiar with the design and requirements of the Advanced Clean Cars II (ACC II), Advanced Clean Truck (ACT), and Heavy-Medium Duty Low-NOx Omnibus (Low NOx) regulations proposed in this proceeding. In my consulting practice, I have testified before states considering adoption of the Rules and have supported analyses concerning their effects. In addition, I directed the development and implementation of all of the predecessor standards to the ACC II, ACT, and Low NOx rules during my time at the California Air Resources Board.

III. PURPOSE OF TESTIMONY

I am submitting this pre-filed testimony in support of Rule Proponents' regulatory proposal, which requests that the Illinois Pollution Control Board adopt the ACC II, ACT, and Low NOx regulations (collectively referred to as the "Clean Car and Truck Standards" or simply

the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code.

Specifically, my testimony will address topics related to the Rules' technical and economic feasibility, including the market readiness of low- and zero-emission technologies, cost considerations related to such technologies as compared to conventional combustion technologies (including total cost of ownership and upfront cost parity), the impact of federal incentives and grants on vehicle costs, and relevant compliance flexibilities contained in the Rules, as discussed in sections IV.a., IV.b., and IV.c. of the Rule Proponents' Statement of Reasons. My testimony is presented in three sections, with one section for each of the three Rules.

IV. THE ADVANCED CLEAN CARS II RULE

There are over three million ZEVs on the road in the U.S. today. These vehicles are reliable and can meet the vast majority of driving needs, so feasibility is not a technological issue. Rather, the feasibility of a transition to 100% new ZEV sales by MY 2035 mostly depends on the market, *i.e.*, the supply of ZEVs, charging and refueling infrastructure, and consumer demand. In my opinion, the trends and reliable forecasts for vehicle model availability, vehicle sales, and vehicle cost all support a growing and sustainable ZEV market that can support successful implementation of the ACC II rule.

First, there is a large and growing number of ZEV models that can meet the diversity of consumer needs and sustain the growth of the ZEV market. As explained in the Statement of Reasons, in 2023, there were more than 110 EV models available for sale including cars, utility

vehicles, pickup trucks, and vans.[1] And all five of the top-selling vehicles in Illinois in 2023 have comparable ZEV models available.[2] Research by EDF and ERM projects that there will be 197 ZEV models available by the end of 2025.[3] This rapidly increasing model availability is supported by manufacturers' commitments to significantly expand ZEV models and production in the next few years.[4]

Fast growth of EV sales reflects strong consumer demand for clean vehicles. In 2023, EV sales represented 9.1% of all new light-duty vehicle sales nationwide, outpacing even recent projections and exceeding 85% of the forecasts published from 2019-2022.[5] In Illinois, the 2023 EV market share was 7.8%, eighteenth highest in the country, illustrating both the strength of consumer demand and the opportunity for Illinois to accelerate ZEV sales through adoption of the ACC II rule.[6] Rapid EV sales growth is expected to continue, with numerous analytic models projecting at least 50% baseline ZEV penetration by 2030 nationwide even absent new

[1] Rule Proponents' Statement of Reasons at 37 (citing Alliance for Automotive Innovation, *Get Connected: EV Quarterly Report Q3*, (2023), https://www.autosinnovate.org/posts/papers-reports/Get%20Connected%20EV%20Quarterly%20Report%202023%20Q3.pdf) ("Statement of Reasons").
[2] According to Edmunds, the top-selling vehicles in Illinois in 2023 were the Honda CR-V, the Tesla Model Y (which is itself a ZEV), the Toyota RAV4, the Ford F-Series, and the Chevrolet Silverado. Edmunds, *Most Popular Cars in America*, (last visited Aug. 15, 2024), https://www.edmunds.com/most-popular-cars/. Comparable ZEV models for these vehicles are the Honda CR-V e:FCEV (Honda also offers the Prologue electric SUV), the PHEV RAV4 Prime, the BEV F-150 Lightning, and the BEV Chevrolet Silverado EV. Honda notes that the CR-V e:FCEV is currently available at select dealerships in California. Honda, *2025 CR-V E:FCEV*, (last visited Aug. 27, 2024), https://automobiles honda.com/cr-v-fcev. This demonstrates that the ZEV *technology* needed to implement ACC II is commercially available, but the market needs to be developed so that manufacturers make this technology available in Illinois. Adopting the Proposed Rules will play a key role in advancing this market development, as discussed in this testimony and in the Statement of Reasons.
[3] Statement of Reasons at 37-38 (citing EDF, *Electric Vehicle Market Update: Manufacturer & Commercial Fleet Electrification Commitments Supporting Electric Mobility in the United States*, (Apr. 2023), https://www.edf.org/sites/default/files/2023-05/Electric%20Vehicle%20Market%20Update%20April%202023.pdf, at 7).
[4] Statement of Reasons at 38.
[5] *Id.* (citing EDF, "Electric vehicle sales are going further, faster than experts predicted," (Mar. 2024), https://www.edf.org/sites/default/files/2024-03/Actual%202023%20EV%20sales%20compared%20to%20forecasts.pdf).
[6] *Id.* (citing Alliance for Automotive Innovation, *Get Connected: EV Quarterly Report Q4* at 6, 19).

regulation.[7] These high projected baseline ZEV sales, which real world sales have consistently outperformed, show the ACC II rule to be readily achievable.

The ACC II rule's feasibility is also supported by fast-moving ZEV adoption in response to similar regulations in other jurisdictions. In response to new regulation in Europe, ZEV sales in Germany went from 3.01% in 2019 to 26% in 2021, an increase of more than 20 percentage points in two years.[8] Similarly, in California, ZEV sales doubled from 12.4% in 2021 to 25% in 2023,[9] far exceeding the previously expected MY 2025 ZEV sales requirement of 7-8% of the Advanced Clean Cars I Rule and putting the state on track to achieve the 35% MY 2026 ZEV sales requirement under ACC II. These examples illustrate how the pace of the ZEV transition can be accelerated with strong policies like the ACC II rule.

Vehicle cost is also a critical consideration. If the costs associated with a new ZEV exceed those of new internal combustion engine vehicles, ZEV sales will grow slower. But numerous studies show that ZEVs already have a lower total cost of ownership (TCO) than gas-powered vehicles, and are expected to be cheaper on an up-front purchase price basis than gas-powered vehicles by MY 2027, before ACC II would take effect in Illinois.[10]

EVs purchased today will already save money for Illinois drivers over the life of the vehicle due to their significant fuel and maintenance savings. Electricity is less expensive (and less price volatile) than gasoline; and, because ZEVs have fewer moving parts, they are significantly less expensive to maintain than gas-powered vehicles. ERM's analysis finds that a

[7] *Id.* at 39.
[8] *Id.* at 39–40 (citing International Energy Agency, *Global EV Outlook 2022*, https://iea.blob.core.windows net /assets/ad8fb04c-4f75-42fc-973a-6e54c8a4449a/GlobalElectricVehicleOutlook2022.pdf).
[9] *Id.* (citing California Energy Commission, *New ZEV Sales in California*, (2024), https://www.energy.ca.gov/data-reports/energy-almanac/zero-emission-vehicle-and-infrastructure-statistics/new-zev-sales).
[10] *Id.* at 40–41 (citing Peter Slowik, et al., *Assessment of Light-duty Electric Vehicle Costs and Consumer Benefits in the United States in the 2022-2035 Timeframe*, (Oct. 2022), https://theicct.org/wp-content/uploads/2022/10/ev-cost-benefits-2035-oct22.pdf).

ZEV purchased in MY 2028 will save about $20,000 in lifetime vehicle costs compared to a combustion engine vehicle.[11] As explained in the Statement of Reasons, these findings are corroborated by several other recent studies:

- A March 2024 study performed by Atlas Public Policy finds that, when comparing EVs to the five most popular gas-powered models, an equivalent EV purchased today will save owners money—in most cases thousands of dollars—over a seven-year span, the average amount of time a driver keeps a new vehicle.[12]

- A July 2023 study by EDF and WSP Global likewise found that certain EV models purchased today can result in lifetime savings of up to $18,440 over a ten-year period.[13]

- A May 2023 Roush Industries study finds that, by 2025, EV savings can total up to $19,000 for compact cars, midsize cars, small SUVs, and midsize SUVs, across both base and premium segments.[14] In the 2030 timeframe, the savings range from $14,000 to $27,000 across all vehicle classes, including large SUVs and pickups.[15]

ZEVs will also soon reach purchase price parity with internal combustion engine vehicles. ERM's analysis further estimates that, by MY 2030, a ZEV is expected to cost $3,000 less than a gas-powered vehicle, yielding upfront savings even with charger costs added and without federal purchase incentives. Purchase incentives also significantly advance the date by which upfront vehicle price parity is achieved. The Roush study finds that by MY 2025, it will be cheaper to purchase an electric car or small or medium electric SUV than a comparable

[11] *Id.* (citing Exhibit 2: ERM, *Analysis Update: Illinois Advanced Clean Cars II Program* at ZEV owner page).
[12] *Id.* (citing Atlas Public Policy, "Comparing the Cost of Owning the Most Popular Vehicles in the United States," (Mar. 2024), https://atlaspolicy.com/wp-content/uploads/2024/03/Comparing-the-Cost-of-Owning-the-Most-Popular-Vehicles-in-the-United-States.pdf).
[13] *Id.* (citing EDF, *Electric Vehicle Total Cost of Ownership Analysis: Summary Report*, (July 2023), https://www.edf.org/sites/default/files/2023-07/WSP%20Total%20Cost%20of%20Ownership%20Analysis%20July%202023.pdf).
[14] *Id.*(citing Himanshu Saxena, et al., *Electrification Cost Evaluation of Light-Duty Vehicles for MY 2030*, (2023), https://www.edf.org/sites/default/files/2023-05/Electrification_Cost_Evaluation_of_LDVs_for_MY2030_Roush.pdf).
[15] *Id.*

gasoline vehicle. By MY 2030, ZEVs will be affordable across all classes of light-duty vehicles—including large SUVs and pickup trucks.[16]

For leased vehicles, ZEVs are already the most cost-effective option. In an August 2023 study, Energy Innovation found that "falling EV lease prices, new federal tax incentives for leased EVs, and rising interest rates, coupled with the lower operating and maintenance costs of EVs, make leasing a new EV the most affordable way to get into a new car."[17] Taken together, the findings of the ERM report and the numerous corroborating studies demonstrate, in my opinion, that consumer demand and ZEV sales will continue to grow, and ZEVs will save Illinois' drivers money, particularly during the timeframe when the ACC II rule would be in effect.

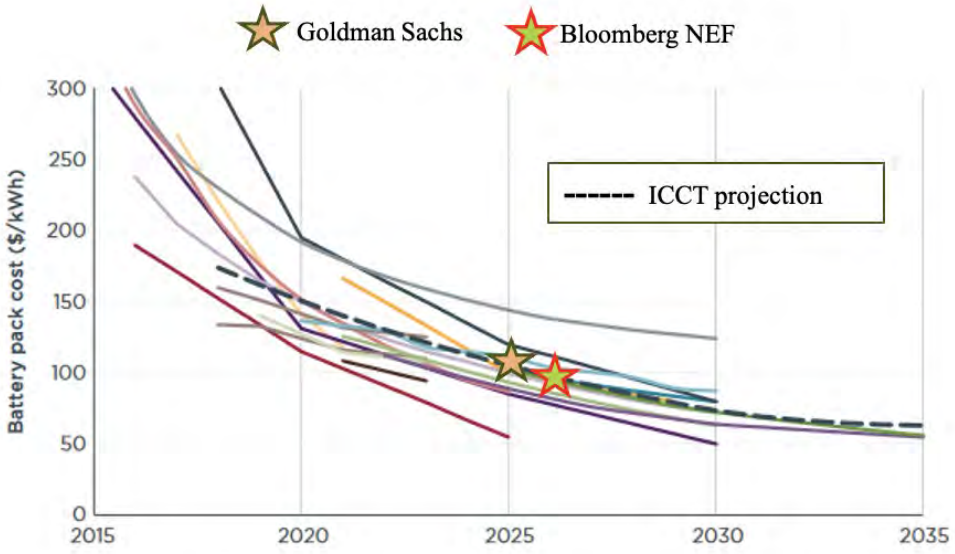
The predicted rapid decline in battery pack cost plays a major role in achieving price parity. Battery costs have already fallen by 90%, from over $1,000/kilowatt-hour (kWh) in 2010 to below $100/kWh in 2023,[18] earlier than analysts had predicted. As detailed in the Statement of Reasons, this steep decline is likely to continue as a result of federal support, technology advancements, manufacturing improvements, and increased volume and competition, including significant investments in EV manufacturing capacity.

The graph below shows 18 projections of battery pack cost made between 2019 and 2022, illustrating the steep decline and expected continued decrease. The heavy black dashed

[16] *Id.* (citing Himanshu Saxena and Sajit Pillai, *Impact of the Inflation Reduction Act of 2022 on Light-Duty Vehicle Electrification Costs for MYs 2025 and 2030*, (2023), https://www.edf.org/sites/default/files/2023-05/Impact_IRA_LDV_Electrification_Costs_for_MYs_2025_and_2030_Roush.pdf).
[17] *Id.* (citing Rachel Goldstein, et al., *Electric Vehicle Leasing: The Cheapest Option for New Car Buyers*, (Aug. 2023), https://energyinnovation.org/wp-content/uploads/2023/08/Electric-Vehicle-Leasing-The-Cheapest-Option-for-New-Car-Buyers_8.25.23.pdf, at 1).
[18] *Id.* at 41–44 (citing BloombergNEF, "Battery Pack Prices Fall to an Average of $132/kWh, But Rising Commodity Prices Start to Bite," (Nov. 30, 2021), https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/; Benchmark Source, "Global Cell Prices Fall Below $100/kWh for First Time in Two Years," (Sept. 6, 2023), https://source.benchmarkminerals.com/article/global-cell-prices-fall-below-100-kwh-for-first-time-in-two-years).

line is ICCT's battery cost estimate used in the ERM analysis presented in the Statement of Reasons.[19] For reference, two recent projections of battery pack costs for 2025 and 2026 fall on ICCT's lines, shown by the colored stars. If these trends continue, purchase price parity with conventional vehicles will be achieved well before 2030 for most vehicle types. And battery technology only continues to advance, focusing on cheaper material costs, and increased energy capacity. These advancements are likely to reduce battery pack cost even more than shown in the graph.

18 Estimates of Battery Pack Costs, $/kWh



Source: International Council on Clean Transportation (reference points added)

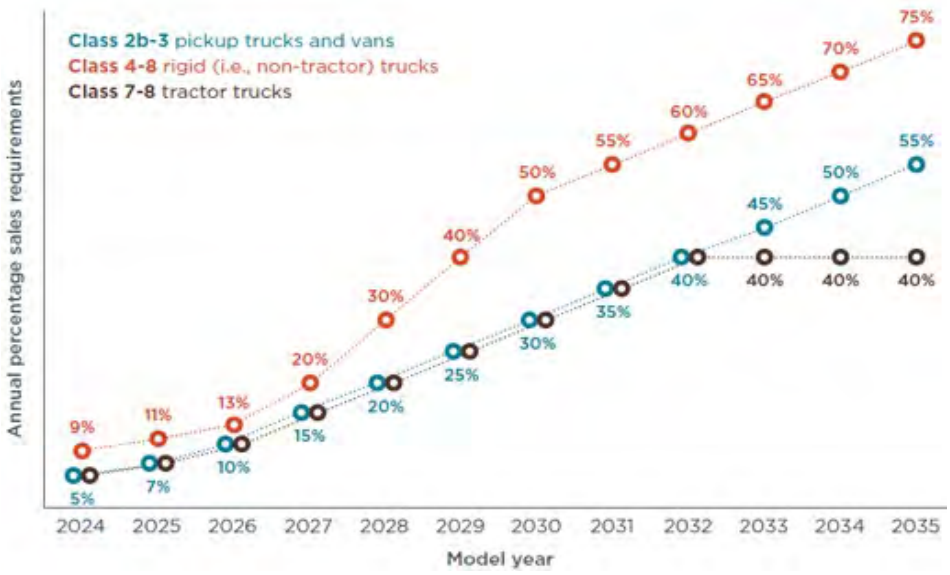
[19] *See* ERM, *State Advanced Clean Cars II Programs: Technical Report–Methodologies and Assumptions*, (Feb. 2023), at 15 (explaining that ZEV costs used in ERM's analysis "were estimated based on an analysis by ICCT (Slowik et al. 2022), assessing U.S. light-duty electric vehicle costs using a bottom-up vehicle component-level approach for both BEV and PHEVs across the major light-duty utility vehicle classes"), https://www.erm.com/contentassets/0ea3b193115448cd9dd5c7e3622373a0/state-advanced-clean-cars-ii-programs-report_2023.pdf.

V. THE ADVANCED CLEAN TRUCKS RULE

In my opinion, the design of the ACT rule and M/HD ZEV market trends make the Rule's standards readily achievable in Illinois. The rule's ZEV sales requirements increase gradually, providing lead-time for models to develop and prices to decline. In MY 2028, the first potential compliance year in Illinois, only 20-30% of new M/HD vehicle sales would need to be ZEVs, depending on vehicle class.[20] Forecasted nationwide ZEV sales levels for vehicle classes covered by the rule are on par with or close to the rule's sales requirements.[21]

In addition, the rule is deficit- and credit-based, which provides flexibility to manufacturers to choose the compliance pathway that works best for them. Each ZEV sale generates a credit which can be stored for future use for up to five years, traded, or sold. Manufacturers may also shift credits between vehicle classes, enabling manufacturers to produce more or fewer ZEVs in a given group. For example, a manufacturer may over-comply in one year and then bank excess credits for use to show compliance in a later year, or trade or sell the excess credits to another manufacturer. Or a manufacturer may develop and sell more ZEV models in one weight class and fewer in another class, compared to what is shown in the chart below.[22] Compliance is achieved if the resulting ZEV sales mix meets the sales requirements on average.

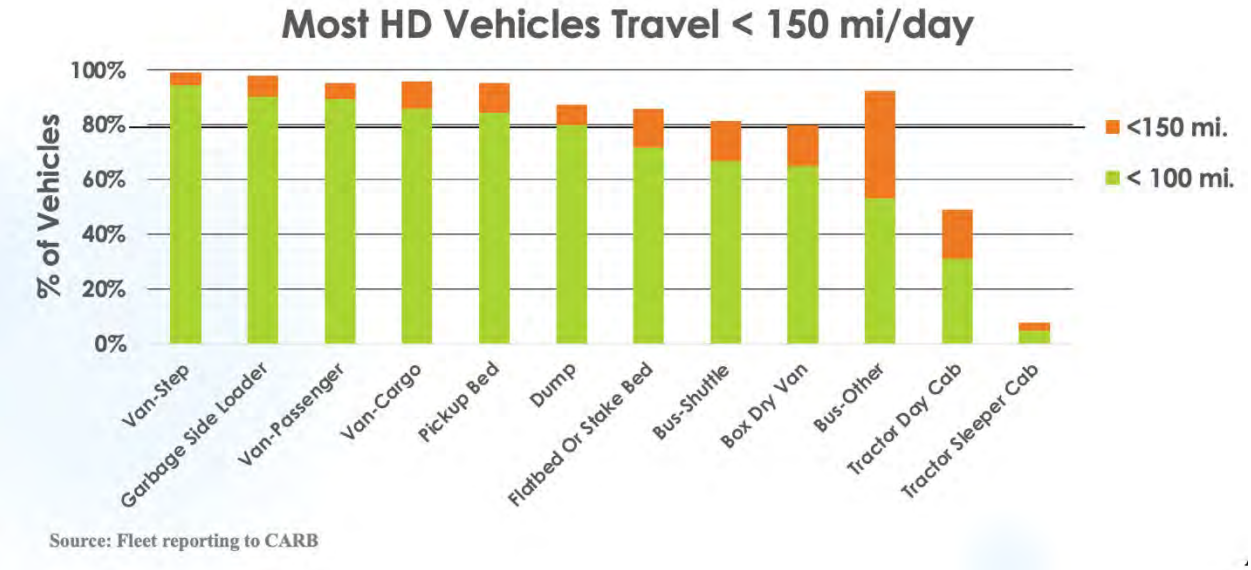
[20] If the Proposed Rules take effect in MY 2029, 25-40% of vehicle sales would need to be ZEVs.
[21] Statement of Reasons at 53 (citing ICCT IRA and EVs Report at 29).
[22] The exception is compliance for Class 7-8 tractor trucks, which must be demonstrated using Class 7-8 credits without reliance on credits from other vehicle classes.



Zero-emission technologies are commercially available in all vehicle classes—from shuttle buses and cargo vans to school buses and tractor trailers. Trucks are commonly divided into 7 classes, by gross vehicle weight. There are zero-emission trucks available for purchase today in all weight classes and in many different configurations. As explained in the Statement of Reasons: as of January 2024, there are more than 160 models available from more than 40 manufacturers, including all legacy manufacturers, with more models available for the vehicle types that make up the largest share of the M/HD on-road fleet, including MD trucks (with 73 ZEV models available); HD trucks (32 ZEV models); and cargo vans (23 ZEV models).[23] After rapid proliferation of models in the last few years (in 2019, there were just 20 models across the entire range of Class 2b-8 ZE vehicles, from MD trucks to HD tractor-trucks), many manufacturers are focused on increasing sales of current models and refining those models for second- or third-generation versions.[24]

[23] Statement of Reasons at 53–55.
[24] *Id.*

In assessing ZE M/HD models, an important question is whether these trucks have enough driving range to meet operational needs of their owners. The answer is "yes" for most applications. The bar chart below presents survey results showing the percent of trucks in 12 categories that travel 150 miles or less daily, as represented by the top of each bar. Within each bar in green is the percent that travel 100 miles or less each day. Looking across the bars you can see that at least 80% of trucks in most weight categories travel less than 150 miles per day, and many of those travel less than 100 miles per day. Most ZE trucks available today have a driving range of at least 150 miles, and nearly all have a driving range of 100 miles or more. These ZE trucks will satisfy the driving range requirement of most urban or regional truck users.



Longer haul tractors are the exception, traveling an estimated 500 miles per day.[25] Battery advancements, upcoming availability of fuel cells and an expanded highway charging

[25] *See, e.g.*, California Trucking Association, *Begin a Career as a Driver*, (last visited Aug. 27, 2024), https://www.caltrux.org/driver-faqs/. A truck driver's maximum hours of service under federal regulations are frequently cited as a limiting factor for daily mileage. *See, e.g.*, *Anderson Trucking Service, How Many Miles Is a Truck Driver Allowed to Drive in One Day?*, (last visited Aug. 27, 2024), https://www.atsinc.com/blog/how-many-miles-truck-driver-allowed-drive-day. Because some of these requirements apply specifically to time spent driving, shippers may be able to maximize daily miles traveled in a long-haul ZEV by incorporating charging times into

and refueling network are expected to allow these tractors to satisfy longer distance needs. And, as shown above, the ZEV sales requirements for Class 7-8 tractor trailers grow slowly and do not exceed 40%. This leaves flexibility for most of the Class 7-8 sales requirements to be met by regional-haul vehicles, which travel less than 150 miles per day on average and whose duty cycles can more readily be met with currently-available equipment.[26]

M/HD ZEV vehicle cost considerations are also favorable. A major consideration for truck owners and fleet operators is total cost of ownership, which includes the purchase price, fuel cost, maintenance required, and charging infrastructure cost, evaluated over the vehicle's lifetime. Like light-duty ZEVs, M/HD ZEVs have categorically lower fuel and maintenance costs than combustion engine vehicles and, as a result, provide significant economic benefits for their operators. The ERM analysis estimates that savings for fleet operators from the ACT rule to be $209 million annually by 2050.[27]

As explained in the Statement of Reasons, ERM's findings are directionally consistent with numerous other studies. A February 2022 analysis performed for EDF by Roush Industries, a firm working primarily in the automotive industry, rigorously assessed the costs[28] of electrifying a range of M/HD vehicles that are commonly used in urban areas, including Class 8 transit buses, Class 7 school buses, Class 3-7 shuttles and delivery vehicles, and Class 8 refuse haulers. Roush's technical analysis found that, by 2027—the earliest calendar year the ACT rule could potentially take effect in Illinois—battery electric vehicles have a lower total cost of

required driving breaks or the total daily time that can be spent working (which is 3 hours longer than the time that can be spent driving).

[26] *See* MJ Bradley & Associates, *Medium- & Heavy-Duty Vehicles: Market Structure, Environmental Impact, and EV Readiness*, (July 2021), at 30 (reporting 35,332 miles per year driven by the average regional haul tractor, which equates to 135 miles per day assuming 5 days of use per week), https://www.edf.org/sites/default/files/documents/EDFMHDVEVFeasibilityReport22jul21.pdf.

[27] Statement of Reasons at 55–57.

[28] The study considered all of the costs of vehicle ownership, including purchase price, maintenance, energy/fuel, and infrastructure costs.

ownership (TCO) across all vehicle classes compared to their diesel counterparts.[29] If the ACT rule takes effect later than 2027, there will be more time for the market to develop, bringing down the TCO for battery electric vehicles even further.

TCO parity occurs sooner when factoring in the substantial incentives included in the Inflation Reduction Act (IRA). An updated Roush study, published in May 2023, found that IRA incentives would make the electric urban trucks and buses assessed in the earlier report as or less expensive than their combustion engine counterparts on a TCO basis, in most categories, by 2025.[30] IRA incentives similarly apply to assessing TCO for long-haul trucks. An April 2023 study by ICCT finds that, with the benefit of IRA incentives, the TCO of battery electric long-haul trucks will likely be lower than that of their diesel counterparts by the end of the decade in all states considered in the analysis, which includes Illinois.[31]

Purchase price parity is also imminent. The February 2022 Roush Study found that, "when considering upfront purchase price alone, by 2027 electric freight trucks and buses will be less expensive than their combustion engine counterparts in all categories except shuttle buses (which are close to price parity)."[32] When IRA incentives are considered, which can absorb the near-term higher upfront cost of ZEVs, all segments analyzed will meet purchase price parity with their diesel counterparts as early as MY 2024.[33]

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[29] ZEVs outperformed diesel vehicles by a significant margin across all vehicle types: at the lower end, the total cost of ownership of an electric Class 7 delivery truck is 12.7% lower compared to its diesel equivalent, while the total cost of owning an electric Class 5 delivery truck or a Class 8 delivery truck is about 30% lower than the diesel alternative.

[30] Statement of Reasons at 41 (citing EDF, *Impact of the Inflation Reduction Act of 2022 on Medium- and Heavy-Duty Electrification Costs for MYs 2024 and 2027*, (2023), https://www.edf.org/sites/default/files/2023-05/Impact_of_IRA_MHD_Electrification_Costs_MYs_2024_and_2027_Roush.pdf, ("EDF IRA M/HD Report")).

[31] *Id.* at 56 (citing ICCT, *Total Cost of Ownership of Alternative Powertrain Technologies for Class 8 Long-Haul Trucks in the United States*, (Apr. 2023), https://theicct.org/wp-content/uploads/2023/04/tco-alt-powertrain-long-haul-trucks-us-apr23.pdf, at 3–4).

[32] *Id.* at 56-57 (citing EDF, *New Study Finds Rapidly Declining Costs for Zero-Emitting Freight Trucks and Buses*, (Feb. 10, 2022), https://www.edf.org/media/new-study-finds-rapidly-declining-costs-zero-emitting-freight-trucks-and-buses#:~:text=The%20study%20finds%20that%2C%20when,are%20close%20to%20price%20parity).

[33] EDF, IRA M/HD Report.

There is a wide variety of commercially available ZE technologies for M/HD vehicles and those technologies are highly competitive with their diesel analogues on both a TCO and upfront purchase price basis. I expect that market conditions and cost considerations will only improve before implementation of the ACT rule.[34] Moreover, Illinois' adoption of the rule will accelerate lower production costs by increasing sales and production volumes and driving technology advancements that could further reduce already-favorable ZEV technology costs. For all these reasons, the ACT rule's standards are clearly achievable in Illinois.

VI. THE LOW NOx RULE

The Low NOx rule establishes nitrogen oxides (NOx) and particulate matter (PM) standards new heavy-duty combustion engines, with different emission standards for different engine load cycles. These standards, which have been adopted by ten states, will reduce engine emissions during the gradual transition to zero-emission heavy-duty trucks. In my opinion, the existing research and testing shows the Low NOx rule's standard to be readily achievable.

As explained in the Statement of Reasons, years of development and extensive testing at the nation's premier diesel research facility Southwest Research Institute (SwRI), sponsored by CARB in partnership with the manufacturers of emissions controls and the U.S. EPA, found the Low NOx rule's emissions standards to be technically feasible, with reasonable costs of reducing emissions (roughly 5.8% increase in average new truck price) that are comparable to other NOx control measures.[35]

[34] Statement of Reasons at 57 (citing *Energy Innovation, Fast-Falling Battery Prices Boost Heavy-Duty Vehicle Electrification*, (Feb. 2024), https://energyinnovation.org/wp-content/uploads/2024/02/Fast-Falling-Battery-Prices-Boost-Economic-Benefits-Expected-from-Heavy-Duty-Vehicle-Electrification.pdf).

[35] Statement of Reasons at 62–63 (citing CARB, *Appendix I: Current and Advanced Emission Control Strategies and Key Findings of CARB/SwRI Demonstration Work*, (June 23, 2020), https://ww2.arb.ca.gov/sites/default/files/barcu/regact/2020/hdomnibuslownox/appi.pdf and CARB, *Low NOx Research Update*, https://www.4cleanair.org/wp-content/uploads/NACAA-MS-Committee-Bill-Robertson-2-22-2022.pdf, (Feb. 22, 2022), at slide 9).

The table below shows the results from additional rigorous testing performed by SwRI to demonstrate the technical feasibility of the Low NOx rule.[36] The "Low NOx Rule Requirement" columns represent the CARB-adopted NOx emission standards for larger heavy-duty diesel engines for MY 2031 and beyond.[37] There are different standards for three different types of driving, and at two different mileages representing half and full engine useful life. The "SwRI Results" columns represent the NOx emission test results, all lower than the standards, that demonstrate the feasibility of compliance, for both types of driving and throughout the engine's life, with a margin of safety.

Low NOx Standards Compared to Southwest Research Institute's Emissions Testing (NOx g/hp-hr)

	Low NOx Rule Requirement	**SwRI Results**	**Low NOx Rule Requirement**	**SwRI Results**
Test Cycle	Mixed Driving at 435k miles		Low/Speed/Load Driving at 800k miles	
FTP	0.020	0.014	0.040	0.031
LLC	0.050	0.021	0.100	0.024
SET	0.020	0.011	0.040	0.023

As further noted in the Statement of Reasons, the members of the Manufacturers of Emission Controls Association have stated that its members are developing numerous aftertreatment technologies and engine technologies "to simultaneously meet future NOx and GHG emission standards," including "electrification, advanced turbochargers, EGR systems, cylinder deactivation, advanced catalysts and substrates, novel aftertreatment architectures, and

[36] The data in the table is from Southwest Research Institute (SwRI), *Demonstration of Low NOx Technologies and Assessment of Low NOx Measurements in Support of EPA's 2027 Heavy Duty Rulemaking*, (Dec. 9, 2022), at 67, Fig. 70, https://downloads regulations.gov/EPA-HQ-OAR-2019-0055-2964/content.pdf.

[37] For MY 2027-2030, slightly different standards apply. These standards apply only through 600,000 miles, compared to the standards for MY 2031 and beyond, which apply through 800,000 miles. Earlier SwRI analysis produced similar results for these MY 2027-2030 standards, finding they could feasibly be achieved with a comfortable margin of safety. *See* Statement of Reasons at 62 (citing CARB, *Low NOx Research Update*).

dual urea dosing with optional heating."[38] And truck manufacturers are also developing compliant engine technologies that may also cut costs for fleets and manufacturers. One demonstration project, noted in the Statement of Reasons, deployed a Class 8 Peterbilt tractor that could meet the MY 2027 NOx emission limit while also improving fuel economy by 10%.[39] This technology—"opposed piston engines"—is expected to cost *less* than current engines. The Low NOx rule is designed to drive innovation of this kind while affording lead time for commercialization. In Illinois, the Low NOx rule would not take effect until MY 2028 or MY 2029, which further supports compliance and successful implementation.

I note that, in July 2023, CARB announced a "Clean Truck Partnership" with ten major U.S. truck manufacturers and the Truck and Engine Manufacturers Association.[40] As one of the terms of the partnership, CARB agreed, with certain reservations, "to harmonize" the Low NOx rule's standards with EPA's Clean Truck Program-NOx regulation that was finalized in January 2023 and is set to take effect in MY 2027.[41] CARB has not yet taken formal action to align the Low NOx rule's standards with EPA's Clean Truck Program, and at present it does not plan to issue a rulemaking notice until the third quarter of 2025.[42] In my opinion, the most prudent course is for Illinois to continue to pursue adoption of the Low NOx rule, as adoption of the standards allows the state to start the clock on the Clean Air Act's lead-time requirements, which in turn positions the state to implement the most protective NOx emission controls for heavy-

[38] Statement of Reasons at 62–63 (citing Mfrs. of Emission Controls Ass'n, *Statement on the U.S. EPA's Notice of Proposed Rulemaking*, Docket No. EPA-HQ-OAR-2019-0055, (May 16, 2022), at 1, https://www.regulations.gov/comment/EPA-HQ-OAR-2019-0055-1320).
[39] *Id.* at 63 (citing Achates Power, "In-Use Emissions Report for Heavy-Duty Diesel Engine," (Apr. 2022), https://achatespower.com/wp-content/uploads/2022/04/Achates-Power-In-Use-Emissions-Measurements.pdf).
[40] *Id.* at 60 (citing CARB, Clean Truck Partnership Agreement, (July 6, 2023), https://ww2.arb.ca.gov/sites/default/files/2023-07/Final%20Agreement%20between%20CARB%20and%20EMA%202023_06_27.pdf).
[41] *Id.*
[42] CARB, "Clean Truck Partnership Commitments – Status and Outcome," (last updated June 17, 2024), https://ww2.arb.ca.gov/clean-truck-partnership).

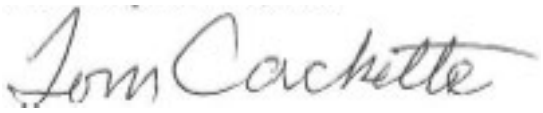
duty trucks if policy or regulatory changes impacting the federal standards or CARB's partnership were to occur.[43]

VII. CONCLUSION

For the reasons given above and in the Statement of Reasons, I urge the Illinois Pollution Control Board to adopt the proposed Clean Car and Truck Standards. These standards are technically and economically feasible to implement, and they will accelerate Illinois' ZEV market while bringing economic, air quality, and climate benefits to all its residents.

Thank you for the opportunity to testify. I am prepared to answer any questions from hearing participants regarding my testimony above as well as the sections of the Rule Proponents' Statement of Reasons identified above.

Dated: September 9th, 2024.



Tom Cackette
Tom Cackette Consulting

[43] As noted in the Statement of Reasons, if CARB does take rulemaking action to align the Low NOx rule with EPA's Clean Truck Program, the Rule Proponents intend to update the rulemaking proposal to reflect those changes. Statement of Reasons at 60.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF DOCTOR PETER ORRIS
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Doctor Peter Orris in support of Rule Proponents' regulatory proposal for presentation at the December 2 and 3, 2024, hearing in the above-captioned matter.

TESTIMONY OF DOCTOR PETER ORRIS

I. QUALIFICATIONS

My name is Peter Orris; I am a medical doctor and practice in the Occupational & Environmental Medicine Department for the University of Illinois Health System. I am a fellow of the American College of Physicians, the American College of Occupational and Environmental Medicine, and the Institute of Medicine of Chicago. I hold professorships at University of Illinois—Chicago's School of Public Health, Northwestern University's Feinberg School of Medicine, and Rush University's Medical College. As detailed in my attached curriculum vitae, amongst other topics, I teach classes at these schools on air pollution, climate change, and health, as well as at other universities, scientific meetings, and medical schools internationally. In

addition, I have served as an expert consultant to the World Health Organization and other agencies concerning air pollution and climate change.

I have published research papers on trends in asthma rates across racial groups in Chicago and on the health effects of exposure to diesel exhaust. Previously, I have served as the Midwest Regional Medical Officer for the National Institute for Occupational Safety and Health (NIOSH) of the U.S. Centers for Disease Control (CDC); the Medical Director of the Mount Sinai Hospital and Northwest Community Hospital Occupational Medicine Programs; and as a general internal medicine attending physician at Cook County Hospital. I hold a Bachelor of Arts in Biology from Harvard University and a Masters of Public Health from Yale University. I received my M.D. from Rosalind Franklin University's Chicago Medical School. My curriculum vitae is attached hereto.

II. PURPOSE OF TESTIMONY

I provide this pre-filed testimony in support of Illinois' adoption of the Advanced Clean Cars II (ACC II), Advanced Clean Truck (ACT), and Heavy-Medium Duty Low-NOx Omnibus (Low-NOx) regulations (collectively referred to as the "Clean Car and Truck Standards" or simply the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code. Specifically, I testify on the public health impacts of air pollution associated with vehicle emissions (as described in Part III.C), explaining how long-term exposure to air pollutants associated with vehicle emissions can cause or exacerbate various adverse health effects like respiratory diseases, cardiovascular diseases, and premature death. I will also testify to the adverse effects of extreme heat on public health (as described in Part III.A). Finally, drawing on my experience as a clinician, I will speak to the disparate impacts of air pollution on communities of color in Chicago (as described in Part III.D). As cited in the Statement of Reasons and further elaborated below, my testimony incorporates the following of my publications:

- Kaplan, S., et al., *Green Commuting in the Health Care Sector Obstacles and Best Practices*, JOEM Vol. 58, No. 2, e34-8 (Feb. 2016).

- Wang, J.S., et al., *From Extraction to Renewal: A Global Campaign for Healthy Energy*, New Solutions, 25:559-566, doi:10.1177/1048291115610433 (2015).

- Burt, E. and Orris, P., *Air Pollution: a New Concern. Polycyclic Aromatic Hydrocarbon Endocrine Disrupting Chemicals in Urban Outdoor Air and Children's Health: A Brief Public Health Overview of Recent Literature*, World Medical Journal, 57/6, 220-2 (Dec. 2013).

- S. Buchanan, E. Burt, and P. Orris, *Beyond black lung: Scientific evidence of health effects from coal use in electricity generation*, Journal of Public Health Policy, Vol. 35, No. 3, 266-277 (Aug. 2014).

- Demers, M., and Orris, P., *Occupational Aspects of Asthma Mortality in Chicago* (Letter), JAMA, 272(20): 1575 (Nov. 1994).

- Targonsky, P., et al., *Trends in Asthma Mortality Among Blacks and Whites in Chicago, 1968-1991*, Am. J. Public Health, 84(11): 1830-3 (Nov. 1994).

- Marder, D., et al., *Effect of Racial and Socioeconomic Status on Asthma Mortality in Chicago*, Chest, 101 (6 suppl): 426S-429S (June 1992).

- Kahn, G., Orris, P., and Weeks, J., *Acute Overexposure to Diesel Exhaust: Report of 13 Cases*, Am J Ind Med., 13(3): 405-6 (1988).

- Rosenstock, L., and Orris, P., *Research Colloquium on Occupational Respiratory Diseases: A Conference in Cuba (1984)*, Arch of Environ Health, 41(4): 266-268 (July 1986).

III. PUBLIC HEALTH IMPACT OF VEHICLE EMISSIONS

I support the proposed rules because they will reduce both local air pollution and greenhouse gas emissions in our atmosphere; both of which trigger and aggravate serious public health problems. As explained in Section III.C of the Statement of Reasons, motor vehicles produce half of U.S. air pollution, well-linked in the medical literature with both causation and

exacerbation of asthma, bronchitis, cancer, and heart disease.[1] Emissions from motor vehicles can have other effects on the cardiovascular systems, as well as cause abnormal neurological development in children, poor growth of the fetus before birth and low birth weight, and multiple types of cancer. The scientific literature of health impacts caused by vehicular pollutants is robust, documenting profound effects on the health especially on vulnerable individuals including children, the elderly, pregnant women, and those suffering from asthma, heart, and lung disease.

Vehicles with diesel engines emit oxides of nitrogen, carbon, sulfur, respirable particulate matter, aldehydes, unburned hydrocarbons, pyrenes, and nitropyrenes.[2] Particulate matter is particularly concerning, with particulates smaller than 2.5 micrometers in diameter ($PM_{2.5}$) being the most dangerous to health. Additionally, sulfur oxides and nitric oxides have negative implications for people's health. Exposure to pollutants from diesel exhaust causes injury to the airways and lungs via oxidative stress and leads to inflammation, cytotoxicity (direct harm to cells), and cell death. Exposure significantly increases the risks for cardiovascular and respiratory diseases, cancer and adverse birth outcomes, and premature death.

Both light- and heavy-duty motor vehicles' emissions of oxides of nitrogen, such as nitrogen dioxide (NO_2), are well-established to be associated with various negative health outcomes.[3] When asthmatic children are exposed to NO_2, they can experience increased wheezing and coughing. Even at low concentrations (0.2–0.5 ppm), NO_2 has been found to result

[1] Kaplan, S., et al., *Green Commuting in the Health Care Sector Obstacles and Best Practices*, JOEM Vol. 58, No. 2, e34-8 (Feb. 2016).
[2] Kahn, G., Orris, P., and Weeks, J., *Acute Overexposure to Diesel Exhaust: Report of 13 Cases*, Am J Ind Med., 13(3): 405-6 (1988).
[3] S. Buchanan, E. Burt, and P. Orris, *Beyond black lung: Scientific evidence of health effects from coal use in electricity generation*, Journal of Public Health Policy, Vol. 35, No. 3, 266-277 (Aug. 2014).

in lung function decrements in asthmatic patients. Exposure to NO_2 also increases susceptibility to viral and bacterial infections, and at higher concentrations (1–2 ppm) can cause airway inflammation.[4] Ambient NO_2 levels (i.e. at levels from 3–50 ppb) are linked to increases in hospital admissions and emergency department visits for respiratory problems, particularly asthma.

Motor vehicles emit other pollutants, like ethylene oxide and benzene, that are not directly addressed in the Proposed Rules, but that also have negative public health impacts that would be reduced if the Proposed Rules were implemented.

Individual susceptibility to these health effects of vehicle emissions depends on age, underlying medical conditions, and use of medications. Populations that are especially vulnerable to health effects from air pollution from motor vehicles include children, the elderly, pregnant women, and people with lung conditions like asthma and chronic obstructive pulmonary disease. The extent of suffering an individual person will experience from negative health impacts from motor vehicle emissions also depends, of course, on the proximity of that person to motor vehicle emissions and the volume of such emissions to which they are exposed.

IV. ADVERSE EFFECTS OF EXTREME HEAT ON PUBLIC HEALTH

Because vehicles emit greenhouse gases like carbon dioxide, which contributes to global climate change and associated increases in extreme heat, it is also important to consider the public health impacts of extreme heat.[5] As also described in Section III.C of the Statement of Reasons, vehicle air pollution contributes to higher ambient air temperatures in Illinois, which adds to public health harms on a global scale. A warming world affects the health of Illinoisians in several ways:

[4] *Id.*
[5] It should be noted that global climate change will also increase public health problems associated with extreme cold air temperatures and winter precipitation.

First, the higher heat and the increased intensity and duration of extreme heat events can increase the regularity of the occurrence of wildfires, which produce extraordinary levels of particulate matter pollution. As Chicagoans experienced in the summer of 2023, particulate matter pollution and air quality harms caused by wildfires throughout North America create and exacerbate public health problems in Illinois, particularly for those who already suffer from existing respiratory health conditions.

Second, the rising severity and frequency of extreme weather events will elevate threats to health systems that are not currently well-equipped to deal with these types of weather-related emergencies. One example is the flooding in New York City from Hurricane Sandy, which cut off power to the NYU Medical Center. Another, more recent example is the increase in traumatic injuries related to extreme weather like prolonged heat or cold spells, which disparately impact the homeless and others without adequate AC systems.

Third, warmer seasons and warmer water mean the range for illnesses carried by ticks, mosquitoes and fleas will expand, exposing more Americans to diseases such as Lyme disease, West Nile, and possibly even Zika.

Fourth, higher ambient air temperatures will increase the formation of ozone and, therefore, contribute to the worsening of the public health impacts of ground-level ozone. Ground-level ozone is a major component of smog. It is formed from photochemical reactants with pollutants such as carbon monoxide and nitrogen oxides emitted from vehicles. These photochemical reactions occur more readily in higher temperatures. Exposure to excessive ozone can cause problems with breathing, trigger asthma, reduce lung function, and lead to lung disease.

Finally, there is also medical evidence to support a correlation between hotter temperatures and mental health and cognitive issues, increases in kidney diseases, preterm births, and respiratory

diseases, heat exhaustion, and the advance of antibiotic-resistant bacteria. While the precise relationships between increased ambient air temperature and these negative public health impacts is still being explored in scientific literature, there is already sufficient basis to conclude that these problems will be made significantly worse by increased temperatures caused by global climate change, to which greenhouse gases from motor vehicles contribute.

V. DISPARATE IMPACTS OF AIR POLLUTION ON LOW INCOME COMMUNITIES AND COMMUNITIES OF COLOR IN CHICAGO

I have spent my career working in communities throughout Chicago, including treating patients from communities of color and low-income backgrounds for over 30 years. I have seen first-hand how low-income communities and communities of color experience the worst effects of climate change and local air pollution. Thus, I can testify to the negative effects of air pollution on these communities as laid out in Section III.D of the Statement of Reasons.

Initially, low-income communities and communities of color in Chicago are exposed to the highest concentrations of air pollution and to the most extreme heat. Then, social determinants of health make low-income communities and communities of color most vulnerable to the negative health effects of climate change and local air pollution and least able to adapt. I use the term "social determinants of health" to refer to the conditions in which people are born, grow, live, work, and age. Conditions include poverty, poor diets, exposure to confounding health stressors like indoor air pollution and disease-bearing vermin, living in areas that experience inadequate responses to medical emergency calls, and lack of consistent access to health care services, among many others.[6] These factors significantly influence health outcomes.

[6] Marder, D., et al., *Effect of Racial and Socioeconomic Status on Asthma Mortality in Chicago*, Chest, 101 (6 suppl): 426S-429S (June 1992).

Asthma is a problem throughout Chicago, but particularly among its residents of color. This has been established for decades. Indeed, in a 1992 publication, my co-authors and I cited previous literature finding, at a national level, that asthma mortality and hospitalization rates in general are greater among nonwhites and persons with low income.[7] One of the most important drivers of racial and socioeconomic differences in asthma is that truck traffic is more often concentrated near communities of color, and the close proximity of low-income housing to truck traffic.[8]

Our study looked at asthma rates in Chicago specifically and found that asthma mortality in Chicago for persons aged 5 to 34 years was three- to four-times higher than that of the nation as a whole, with rates being particularly high for communities of color and for persons of low socioeconomic status.[9] People of color with low income could be at high risk for asthma deaths for a variety of reasons, though one of the most important appears to be proximity of their homes to mobile sources of air pollution, like highways and freight yards.[10] Another crucially important factor is that they lack adequate and equitable access to health care. This lack of access results in lack of continuity of care, ineffective use of asthma medication, difficulties in compliance with treatment, failure to recognize severity of illness, and inadequate medical response to emergency calls.[11] In addition, people of color with a low socioeconomic status are also more likely to be exposed to a variety of other environmental conditions, which could contribute to asthma exacerbations leading to fatal episodes alongside their disproportionate exposure to air pollution, including dust mites, cigarette smoke, pets, indoor molds, cockroaches, and occupational

[7] *Id.*
[8] *Id.*
[9] *Id.*
[10] *Id.*
[11] *Id.*

exposures. The importance of decreased access to care is supported by the fact we found that one half of asthma deaths in Chicago were out-of-hospital deaths.[12] That remarkably high rate of out-of-hospital deaths suggests that even if exposure to air pollution was distributed evenly among the population—which it most certainly is not—the negative effects of such air pollution would still be experienced most severely by those with inferior access to medical care.[13]

VI. CONCLUSION

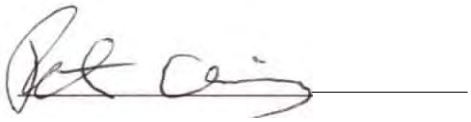
Over the past 45 years as a medical clinician, I have seen first-hand how air pollution from motor vehicles negatively impacts people's health and quality of life. For 35 years, I practiced inpatient and outpatient general internal medicine at a Cook County Hospital in Chicago. I have extensive experience working with patients who are low-income, belong to communities of color, and are immigrants. I have seen people be heavily affected by the impacts of vehicle pollution. Some people are so affected that they cannot be saved by medical interventions: prescribing a proper asthma inhaler is simply inadequate to allow an asthmatic child to play freely at their neighborhood park if that park is surrounded by diesel truck traffic. It is my opinion that the current levels of air pollution from vehicles in Illinois constitute an immediate and significant public health hazard that should be remedied to save lives and allow current and future generations of Illinoisians to live longer and healthier.

For the reasons given above and in the Statement of Reasons, I strongly support adoption of the Rules in Illinois. The passage of the Advanced Clean Cars II (ACC II) regulation, the Advanced Clean Trucks (ACT) regulation, and the Heavy-Duty Low-NOx Omnibus (Low-NOx) regulations in Illinois stand to improve air quality, public health, and to concentrate those

[12] *Id.*
[13] *Id.*

improvements in the very communities in Illinois that have historically suffered the most from poor air quality and its attendant health harms.

Dated: September 16, 2024.



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CURRICULUM VITAE

September 6, 2024

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BIRTH DATE October 7, 1945

BIRTHPLACE Los Angeles, California

EDUCATION

Undergraduate	1967	B.A.	Harvard College
Graduate	1970	M.P.H.	Yale University
	1975	M.D.	Rosalind Franklin University Chicago Medical School
Residencies	1975-8	Internal Medicine	Cook County Hospital
	1977-9	Occupational Med.	Cook County Hospital
Additional	1965	Bio-medical Electronics	Harvard U.
	1968	Advanced Circuit Theory	Harvard U.

CERTIFICATION AND LICENSES

1976- State of Illinois, Physician and Surgeon, #36-53014
1979- Certified, Amer Board of Preventive Medicine in Occupational Medicine
2001-20 Certified Medical Review Officer #01-04536 (Recertified 2005,8,14)

CURRENT POSITIONS

2022- Senior Attending Physician, Occupational and Environmental Medicine, University of Illinois Hospital and Health Sciences System, at UI Health's Occupational Health Services Institute
2009- Consultant, Employee Health, Cook County Health
2010- Physician, Employee Health, Rush University Medical Center
2007- Voluntary Attending Physician, Occupational Medicine Clinic, Cook County Health

ACADEMIC APPOINTMENTS

- Clinical Professor of Environmental & Occupational Health Sciences University of Illinois at Chicago School of Public Health with affiliate appointment at the Global Health Center, UI Abraham Lincoln School of Medicine
- Adjunct Professor of Preventive Medicine, Northwestern University Feinberg School of Medicine
- Adjunct Professor of Internal Medicine, Rush University College of Medicine

CURRENT HOSPITAL STAFF APPOINTMENTS

2005- Rush University Medical Center (Attending)
1999- U. of I. Hosp & Health Sciences System (Attending)

1979- Cook County Hospital (Attending)

CURRENT APPOINTED OR ELECTED POSITIONS

Professional Societies:

2023- Expert Advisor, World Medical Association Working Group on Environment (Chemicals)
2022- Board Member, Institute of Medicine Chicago
2022- Board Member, Physicians for a National Health Program
2012- Liaison to the World Federation of Public Health Associations for the APHA
1992- Member, Environment Working Group of the World Federation of Public Health Associations (Chair 1992-2018)
1999- Member, Policy Committee, World Federation of Public Health Associations
1993- Delegate, Illinois State Medical Society
1992- Councilor, Chicago Medical Society

Community or Government:

2024 Observer for the World Federation of Public Health Associations at the Intergovernmental Negotiating Committee Meeting 4 to prepare an international legally binding instrument on plastic pollution, United Nations Environment Program
2020 Representative of Health Professional Civil Society Groups in negotiations for the extension of the **S**trategic **A**pproach to International Chemicals Management (SAICM), UNEP
2016 Grant Reviewer, South African National Research Foundation
2011- Member, National Occupational Research Agenda Healthcare and Social Assistance Sector Council, NIOSH, CDC, USPHS, DHHS, US Government
2013-16 Representative of Health Professional Civil Society Groups in negotiations of the Minamata Convention On control of mercury.
2002-6 Representative of Health Professional Civil Society Groups in negotiations of the **S**trategic **A**pproach to International Chemicals Management (SAICM), UNEP
1998-01 Representative of Health Professional Civil Society Groups in Negotiations of Stockholm Convention, International Treaty to control Persistent Organic Pollutants.
1998- Advisor, Health Care Without Harm
1991- Hazmat Education Project Adv Bd, International Brotherhood of Teamsters
1975- Advisor, Community Organizations in Chicago, Mossville Norco, and New Sarpy Louisiana, Durban South Africa, Chennai and Bilaspur India, Nairobi Kenya and others

AWARDS AND HONORS

2023 Illinois Department of Aging Senior Hall of Fame for Labor Force activities.
2021 40 Year Award, Health & Medicine Policy Research Group 40 Anniversary
2020 Union Hall of Honor, Illinois Labor History Society
2017 Lifetime Achievement Award, World Federation of Public Health Associations
2016 Elected to Alpha Omega Alpha, Medical Honor Society
2016 Emeritus Status, Illinois State Medical Society
2015 Alice Hamilton-Tony Mazzocchi Award, Occupational Health Section, Amer Pub Hlth Assoc
2015 Paul Cornely Award, Health Activist Dinner at APHA
2014 Environmental Health Hero Award, Health Care Without Harm
2013- Fellow, Institute of Medicine Chicago
2012- Miembro Correspondiente, La Sociedad Cubana de Salud Publica
2012 Selection as the only Occupational Medicine “Top Doctor” in the Chicago Magazine
2011 Selection as a US News and World Report “Top Doctor” in the US

2011 Distinguished Alumnus, Chicago Medical School, Rosalind Franklin University of Medical Sciences
2009 Teacher of the Year, University of Illinois Occupational Med. Residency
2009 Public Service Honor Role, Yale School of Public Health
2009 Selection as one of America's Top Physicians, Consumer Res Council Of America
2007 Letter of Congratulations from the Governor of Illinois
2006 Certificate of Appreciation, World Federation of Public Health Assoc.
2005 Selection as a "Best Doctor" in the United States, Castle Connelly LtD
2005 Outstanding Service Award, Executive Medical Staff of Stroger Hosp.
2004 Certificate of Appreciation, University of the Philippines, Manila
2003 Certificate of Appreciation, Illinois State Medical Society
2001 Certificate of Appreciation, Arab Community Center for Economic and Social Services Community Health and Research Center, Dearborn, MI
2001- 18 Selection as a "Top Doctor" in Midwest, Castle-Connolly Ltd
2000 Certificate of Appreciation, World Federation of Public Health Assoc. 9th International Congress, Beijing, China
1999 Certificates of Appreciation, American Medical Student Association, APHA Occupational Health & Safety Section, Mt. Sinai Family Practice, Air and Waste Management Association, Certificates of Appreciation- Greenpeace USA, Peace Corps, Chicago Medical Society
1992- Fellow, American College of Physicians
1988- Fellow, American College of Occupational and Environmental Medicine
1984-8 Fellow, American Academy of Occupational Medicine
1981 Certificate of Appreciation, Nat'l Safety Council
1980-9 Fellow, American College of Preventive Medicine
1973 Ciba Community Affairs Award

PROFESSIONAL JOURNAL ACTIVITIES

Journal of Scientific Practice and Integrity (Member, Editorial Board)
MEDICC Review (Member, Editorial Board)
American Journal of Industrial Medicine (Contributing Editor)
Journal of Public Health Policy (Member, Editorial Board)
Revista Cubana De Salud Y Trabajo (Member, Editorial Board)
New Solutions (Member, Editorial Board)
Hektoen International Journal (Member, Editorial/Advisory Board)
Journal of Occupational and Environmental Medicine (Reviewer)
Proceedings National Academy of Sciences (Reviewer)
Environmental Research (Reviewer)
JAMA (Reviewer)

PROFESSIONAL SOCIETY MEMBERSHIPS

Institute of Medicine Chicago (Elected Fellow & Board Member 2022-)
American College of Occupational and Environmental Medicine
American College of Physicians
American Medical Association
American Public Health Association
Association of Occupational and Environmental Health Clinics
Central States Occupational Medical Association
Cook County & Illinois State Medical Societies
Illinois Public Health Association

International Commission on Occupational Health
Physicians for a National Health Program (Elected Board Member 2022-)
Physicians for Social Responsibility
World Medical Association

RESEARCH GRANTS/CONTRACTS:

2016 World Bank Contract #7177859 for a criteria document "Climate Mitigation in the Health Care Sector" to advise its staff on support of health care in low and middle income countries.
2010-11 Grant for a study of the cost effects of greening health care from The Commonwealth Fund
2008-11 Contract with Health Care Without Harm to Direct Research Collaborative Funded by a Grant from the Robert Wood Johnson Foundation,
2004 Contract 200-199-00058, peer review for ATSDR
2002 Contract X97523001-0, peer review for EPA Central Office

TEACHING:

Medical and Public Health School

2023 Cuba: Background to Government Structure Philosophy and Health Care System, UIC IPHS 594
2023 Grand Rounds Chicago Medical School of Rosalind Franklin University "Structure and History of US Health Care System"
2023 Keynote, "Climate Change and Health", seminar Chicago Medical School of Rosalind Franklin University
2022 Northwestern University Feinberg School of Medicine, "Climate Change and Health"
2022 Epi/Bio Division Seminar UICSPH Lecture: Medical Care's Roles in Creating Air Pollution & Ending It.
2022- Seminar Sessions for Global Health Program, UIC SPH
2020-1 Monthly mini-series on careers in public health, within the IPHAM seminar series at Northwestern U. Feinberg School of Medicine
2018- Yearly lectures at Northwestern Preventive Medicine and UIC School of Public Health
1998-18 Course: Environmental & Occupational Health, Northwestern U. Feinberg School of Medicine
2017 Preceptor, Rush Medical School Continuity Experience
2010-14 Direct Course: Topics In Public Health, Northwestern Feinberg Sch. Of Medicine
2007-13 Co Direct Course: Ethical Issues in Clinical Research, Northwestern U. Feinberg School of Medicine,
2002-3 Co Direct Course: International Comparison of Health Care Systems, Northwestern U. School of Medicine
1996,7 Occupational Medical Practice Seminar, Rush Medical College
1998 Director, Occupational Disease Course, UIC School of Public Health
1995-7 Annual lecture, Health Administration Program of Rush Medical School
1993-15 Annual lectures in Occupational Epidemiology Course, UIC School of Pub. Health
1990-99 Co Director Occupational Health Weekly Seminar, University of Illinois
1990- Regular lectures on Occupational Health, Environmental Toxins, Global Warming, Health Care Organization, and Epidemiology in several courses, UIC Sch. of Pub. Health, Northwestern U. Feinberg School of Medicine, University of Chicago School of Medicine, Rosalind Franklin University Chicago Medical School, Rush University School of Medicine
1981-94 Director Course: Occupational Health Practice, Northwestern U. Medical School
1980-93 Co Director Course: International Comparison of Health Care Systems, Northwestern U. Medical School
1979, 80, 91 Director: Cuban Health Care System Research Seminar, ten day field study course, American Medical Student Association
1978 International Health Care Systems, U of Illinois School of Medicine
1977 The Epidemiology of Cardiovascular Disease, UIC School of Medicine

Industrial Hygienists, Nurses, & Physicians

2019 Co-Director, Urban Air Pollution, Human Exposure Assessment and Public Policy, Indian Institute of Technology – Madras, October 7-17, Chennai, India
2018 Community Environmental Epidemiology for Policy, Community Monitoring Program India, June 24, 2018
2004 Environmental Health and Nursing, CEI Course APHA Annual Meeting, 11/6/04
2000 Co-Direct Medical Research Ethics, Collaborative Seminar with the Institute for Occupational Hygiene, Russian Academy of Sciences, Moscow
2000 Co-Direct Medical Waste Toxicity, Seminar on Medical Waste, sponsored by the Institute of Occupational Health, Ministry of Public Health, Havana, Cuba as part of the Caribbean Medical Society Meeting
2000-10 Lectures, Research Ethics, Cook County Bureau of Health Services

Residents

1979- Regular lectures to UIC Occupational Medicine residents on topics in occupational medicine
1979- Grand Rounds or formal departmental lectures at Medical Schools, and teaching Hospitals
1979- Regular supervision of the Occupational Medicine consultation Service and Clinic, Stroger Hospital of Cook County and UIC
1979-'07 Several months a year general medicine ward attending, Cook County Hospital

Continuing Medical Education

2022 Central States Occupational & Environmental Medical Association "Climate Change & Health: Current Status"
2019 Opthalmology Grand Rounds Panel, Northwestern Memorial Hospital, Greening the OR, August 30, 2019 Chicago, IL
2018 Primary Care Physicians and the Environment, Seminar, residents, students, practitioners, Chennai, India June 23, 2918
2018 Hospitalist Grand Rounds Rush University, Climate Change and Health
2014 Central States OEMA, Health Impact of Coal Energy Generation
2005 Central States OEMA, Medical Waste Incineration: Point Counter Point
2004 Rush University, Department of Medicine Grand Rounds, "Malaria Control & DDT Toxicity: A Public Health Dilemma" Mar. 26, 2004
2004 Midwest Clinical Conference, "Fish Consumption: Advise for the General Internist", 3/25/04
2004 Grand Rounds, Evanston Northwestern Hospital, "Mercury Implications for Office Practice", Mar 5, 2004
2004 Mercury, Low Dose Effects, Medical Directors Club of Chicago, Mar 4, 2004
2003 Lecture, Ethics of Occupational Medical Practice: International Codes Institute for Occupational Medicine, Ukrainian Academy of Sciences, Kiev, Dec 9, 2003
2003 Research Ethics of Special Populations at Ethical Issues in Health Research Workshop, June 3-6, Sofia, Bulgaria
2000 Lecture, Persistent Organic Pollutants, Orlando County Medical Society and Florida Physicians for Social Responsibility, Orlando, FL
2000 The Physician's Role Under The Americans With Disabilities Act, Midwest Clinical Conference of the Chicago Medical Society
1999 Monthly Departmental Lectures on Research Ethics at Cook County Hospital and the Cook County Bureau of Health Services
1999 Lecture Series on Occupational and Environmental Health, Roseland Community Hospital
1998 Lecture Series on Occupational Medicine, Holy Cross Hospital
1998 Clinical Management of Toxic Exposures, Michigan State University Kalamazoo Center for Medical Studies, Oct. 15. Three seminars for healthcare providers.
2022-24 Educational Program Director, Chicago Medical Society's Occupational & Environmental Seminar Series

(1996 – 2022) Medical Directors Club of Chicago)

1995,6 Rendering a Medical Opinion in a Legal Case, One day seminar at The American College of Occupational and Environmental Medicine

1994 Clinical Aspects of Environmental Exposures, Bloomington Hospital, Bloomington, IN, ATSDR, US Public Health Service

1990-2 The Physician and the Law, UIC School of Public Health

1991,2 Occupational Medicine for the Primary Care Physician, UIC School of Public Health

1992 Epidemiology for Non-Epidemiologists, Applied Statistics Training Institute, National Center For Health Statistics, CDC, USPHS

1992 Worksite Evaluation & Pre-Placement Screening Schwab Rehab Institute

1983-7 Meet the Professor Sessions, to review the Self Assessment Examination at The American College Of Occupational and Environmental Medicine Annual Conference

PAST POSITIONS:

1993-18 Medical Advisory Com., International Brotherhood of Teamsters

2018-23 Member, Environmental Caucus, World Medical Association (Co-Chair 2018-22)

2010-22 Physician Advisor, Chicago Policemen's Annuity Benefit Fund

2000-13 Director, Global Chemicals Policy Center, Great Lakes Centers For Occupational & Environmental Safety & Health, UIC School of Public Health,

2000-22 Chief of Service, Occupational and Environmental Medicine University of Illinois Hospital and Health Sciences System

1999-22 Director, University of Illinois at Chicago Occupational Health Services Institute

2006-16 Member, State of Illinois Board of Health

2008-18 Chair, Research Collaborative, Health Care Without Harm

1994-14 Professor of Preventive Medicine, Rush Medical College, Rush University 1994-14(dates approx.)

1982-19 Institutional Review Board, Cook County Health and Hospitals System (Co-Chair, 1991-4, Chair, 1994-2007)

1979-07 Attending Physician, Div. of Occupational Medicine, Cook County Hospital

1992-00 Director, Health Hazard Evaluation Program, University of Illinois School of Public Health and Illinois Dept. of Public Health

1990-9 Director, Research & Interdisciplinary Projects, Great Lakes Center for Occupational and Environmental Health and Safety, University of Illinois School of Public Health

1993-9 Medical Director, Corporate Health Services, Northwest Community Healthcare

1990-9 Internal Medicine, U. of I. Hospital & Medical Center (attending)

1993-6 Associate Professor of Medicine, University of Illinois at Chicago School of Medicine

1983-97 Internal Medicine, Mercy Hospital & Medical Center (consultant)

1984-93 Medical Director, Managed Care Occupational Health Program, Mt. Sinai Hospital, Chicago

1982-95 Attending Physician Dept. Of Internal Medicine Mt Sinai Hospital, Chicago, Illinois

1980-86 Medical Officer, Region V, Nat'l Institute For Occupational Safety & Health, U.S.PHS,

1980-88 Attending Physician, Division of General Medicine, Cook County Hospital

1979-80 Medical Director, Southeast Health Plan, Chicago, Illinois

1979-80 Attending Physician, Div. of Emergency Medicine, Cook Cty Hospital

1972-75 Research Assist, Div. of Emergency Medical Svcs, IL Dept. of Health

1971-72 Nurse Technician, Trauma Unit, Cook County Hospital, Chicago, IL

1970 Administrative Intern, Hill Health Center, New Haven, Connecticut

1967-68 Research Assist to Dr. J. Hobson, Harvard Med School, Boston, MA

1966-67 Research Assist to Dr. David T. Denhardt, Harvard U, Cambridge, MA

Consultancies:

2020-23 Consultant, COVID Work Issues, Cook County Sheriff's Department
2023 Health and Equity in a Green Transition, FXB Center for Health and Human Rights Harvard University, Health Care Without Harm, Stanley Center for Peace and Security, May 8, 2023
2019 Expert Consultant, Air Pollution, WHO, Public Health Environment & Social Determinant Dept,
2010-13 Consultant, United Nations Development Program Medical Waste Project
2008-11 Member, Technical Committee Challenge Advisory Panel, Health Canada, Ottawa
1991-10 Hazmat Education Project Advisory Board, American Fed. of State, County, & Muni Employees
2008- 9 Scientific Committee 12th World Congress on Public Health
2009-10 National Research Council Committee "Research on the Health and Wellness of Commercial Truck and Bus Drivers: A Conference", Transportation Research Board of the National Academies.
2008-9 Technical Advisory Group: Chemicals, Global Environment Facility, Washington DC
2008-9 National Commission of Inquiry into the Worker Health and Safety Crisis in the Solid Waste Industry
2005-6 Advisor, United Nations Development Program/Global Environmental Facility
2012-16 Consultant, Health Care Division, Service Employees International Union
2012-5 Consultant, Illinois Department of Public Health
2012-5 Consultant, Health Promoting Hospitals Task Force on the Environment
2011-3 Expert Consultant, Region V, USEPA
2007-10 Member, Scientific Advisory Committee, World Trade Center Medical Programs, Mount Sinai School of Medicine, New York
2006-16 Consultant, Doctors Council, Service Employees International Union
2000- Medical Advisor, AFSCME Council 31
2000-07 Medical Advisor, Midwest Generation, LLC
2005-6 International Reviewer, 11th World Congress on Public Health/8th Brazilian Congress on Collective Health, Rio de Janeiro, Brazil
2002- 4 International Planning Committee, 10th WFPHA International Congress April 19, 2004, Brighton, England
2004 Consultant, National Academy of Science's Board on Global Health, Malaria Control: A Reconsideration of the Role of DDT, Washington, DC, July 21-22, 2004
2003 Advisor, World Health Organization at the Workshop in Preparation of a GEF-Funded Global Medical Waste Project, New Delhi, India,
1999-01 Scientific Program Committee, Global Conference on Children's Environmental Health, HHS/EPA/Health Canada/Env. Canada
1998-02 Cleaner Technologies Substitutes Assessment: Professional Fabricare Processes Technical Peer Review Panel, USEPA (EPA 744-B-98-001)
1997-02 Director, World Federation of Public Health Associations Persistent Organic Pollutants Project – Human Health Effects of Chemicals Project.
1996-98 Senior Medical Advisor, Greenpeace, USA
1995-07 Rush-Cook County Affiliation Research Committee (Chair, 1996)
1995 Med Advisory Committee, John Redmond Foundation, International Association of Firefighters, AFL-CIO
1991-14 Hazmat Education Project Adv Bd, Service Employees International Union, AFL-CIO
1993-5 Task Force on Environmental Health, University of Toronto
1995 Advisor, Office of Global & Integrated Environmental Health, WHO Geneva, Switzerland
1994 Advisor, Occupational Health Program, WHO, Moscow, Russian Republic
1994 Occupational Medical Advisor, Health & Safety Com., Local 974, United Automobile Workers Union, AFL-CIO, Peoria, Illinois

Officer or Board Memberships:

2022- Board of Directors, Physicians for a National Health Plan
2022- Board of Directors, Institute of Medicine of Chicago
1995-14 Health Professionals Advisory Board, International Joint Committee of the US and Canada (US Co- Chair 1995-2009)
2000-22 Executive Committee, Medical Staff, University of Illinois Medical Center
2004-6 Healthy Schools Campaign
2004-9 Board of Directors, Safer Pest Control Project
2002-9 Chair, Public Health and Environment Committee, World Fed of Public Health Associations
2001-6 Executive Board, Illinois Safety Council
2001-10 Board of Directors, Hecktoen Institute For Medical Research
2001-9 Member, Working Group on Occupational Health and Safety Intergovernmental Forum on Chemical Safety (IFCS)
2011-5 President, District 6, Chicago Medical Society
2012-16 Consultant, Health Care Division, SEIU
2005-9 Immediate Past President, Stroger Hospital Medical Staff
2001-6 Member, Technical Committee on Epidemiology and Air Quality Monitoring (TCEAQM), Department of Health, Republic of South Africa
2003- 6 President, Wood Street Branch, Chicago Medical Society, AMA
2001-5 President, Medical Staff, Cook County Hospital
2004-6 Member, State of Illinois Panel on Health of Hispanic Workers
1992-05 Global Health Task Force Occupational Health Advisory Com. American Medical Student Association
2002-7 Chair, Public Health Committee, Chicago Medical Society
2004-6 Board Member, Physicians for Responsible Negotiations, SEIU
1997-03 Member, Government Affairs Committee, IL State Medical Society
1993-01 Internal Medicine, Northwest Community Hospital (consultant)
2000-1 President, Wood Street Branch, Chicago Medical Society
1999-01 Secretary, Medical Staff, Cook County Hospital
1998-9 Vice President, Medical Staff, Cook County Hospital
1998-0 Scientific Committee, World Federation of Public Health Association's 9th International Congress, Beijing,
1997-8 Chair, Ad Hoc Committee on Physician Unionization, Chicago Medical Society
1995-8 Clinical Advisory Committee, Del Amo Occupational Health Clinic, U of California, Irvine
1996-7 President, Wood Street Branch, Chicago Medical Society
1987-97 Executive Medical Staff, Cook County Hospital
1992-6 Executive Board, Assoc. of Occupational and Env. Clinics (President 1994-5)
1983-96 Self-Assessment Cttee, American College of Occupational and Env Medicine
1996 Consultant, United States Peace Corps
1992-3 Nominating Committee, Amer Public Health Association, (Chair-1993)
1991-2 Governing Council, American Public Health Association
1991-2 Ad Hoc Task Force on Expert Witness Testimony, Chicago Med. Soc.
1990-2 Alternate Councilor, Chicago Medical Society
1990-1 Consultant, SOYUZMEDINFORM, Ministry of Health, USSR
1989 Consultant, United Steelworkers of America, AFL-CIO, Local 1010,
1988-92 Atomic Radiation & Dioxin Poisoning Victims Advisory Council, State of Illinois
1988-90 AIDS Proj Adv Bd, Service Employees International Union, AFL-CIO
1987-89 Nat'l Sanitation Fdn Drinking Water Additives Health Effects Task Group
1987-9 Health Advisory Committee, National Safety Council, Am Occupational Med Association
1987-8 Consultant, United Association of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry of the U S and Canada, AFL & CIO

1986-9 Executive Board, Nat'l Union of Hospital & Health Care Employees/1199, AFL-CIO
1986-8 Governing Council, American Public Health Association
1986-7 Consultant, Local 75, United Assoc of Journeymen & Apprentices of the Plumbing & Pipe Fitting Industry of US & Canada AFL/CIO
1985-7 Advisory Committee, Health Policy Agenda for the American People for the APHA
1985-8 Advisory Committee, Hospital Occupational Safety and Health Program, American Hospital Association
1984-5 Chairman, Program Committee, Occupational Health Section, APHA
1984-7 Research Committee, Dept. of Medicine, Cook County Hospital
1982-4 Action Board, American Public Health Association
1982-4 Joint Policy Committee, American Public Health Association,
1979-82 Program Committee, Medical Care Section, APHA
1978-86 Occupational Health Committee, Cook County Hospital
1978-80 Resolutions Committee, Illinois Public Health Association
1977-80 Com. on Nat'l Health Proposals, Med Care Sect, APHA
1976-9 Chairman, National Health Insurance/Service Com, The Physicians Nat'l House Staff Association
1975-9 Executive Medical Staff, Cook County Hospital
1972-5 Founding member, Chicago Area Cttee on Occupational Safety and Health

BIBLIOGRAPHY

Peer Reviewed Journal Papers:

1. Chad Zawitz, Sharon Welbel, Isaac Ghinai, et. al Outbreak of COVID-19 and interventions in a large jail — Cook County, IL, United States, 2020, American Journal of Infection Control, March, 2021 1-7 ISSN 0196-6553, https://doi.org/10.1016/j.ajic.2021.03.020.
2. Kırbıyık U, Binder AM, Ghinai I, et al. Network Characteristics and Visualization of COVID-19 Outbreak in a Large Detention Facility in the United States — Cook County, Illinois, 2020. MMWR Morb Mortal Wkly Rep 2020;69:1625–1630. DOI: http://dx.doi.org/10.15585/mmwr.mm6944a3external icon.
3. Kaplan, S. Ai, N. Orris, P. Sriraj, P.S. Green Commuting in the Health Care Sector Obstacles and Best Practices JOEM Volume 58, Number 2, February 2016 e34-8
4. Wang, JS Rico Euripidou, Fiona Armstrong, Génon K. Jensen, Josh Karliner , Renzo R. Guinto, Ang Zhao From Extraction to Renewal: A Global Campaign for Healthy Energy New Solut 2015; 25:559-566 doi:10.1177/1048291115610433
5. Bassil, K , Sanborn, M, Orris, P , Lopez, R Integrating Environmental and Human Health Databases: Themes, Challenges and Future Directions *Int. J. Environ. Res. Public Health* 2015, *12*, 3600-3614; doi:10.3390/ijerph120403600
6. Buchanan, S., Burt, E. Orris, P. Beyond black lung: Scientific evidence of health effects from coal use in electricity generation Journal of Public Health Policy 35, 266–277. 5/15/2014
7. Burt, E. Orris, P. Air Pollution: a New Concern. Polycyclic Aromatic Hydrocarbon Endocrine Disrupting Chemicals in Urban Outdoor Air and Children's Health: A Brief Public Health Overview of Recent Literature, World Medical Journal, 57/6, December 2013, P. 220-2 also in Policikliskie aromatiskie ogludeprai pilsetu atmosfera ka endokrinas sistemas graveji un bernu veseliba Latvi'as arsts Nacionalais Medictnas Zurnals, Jan 2014, P 70-1
8. Karliner, J. Cohen, J. Orris, P. Lessons in Forging Global Change, Stanford Social Innovation Rev, Winter 2014
9. S. Kaplan, B. Sadler, K. Little, C. Franz, and P. Orris, Can Sustainable Hospitals Help Bend the Health Care Cost Curve? New York: Issue Brief: The Commonwealth Fund, November 2, 2012, http://www.commonwealthfund.org/Publications/Issue-Briefs/2012/Nov/Sustainable-Hospitals.aspx
10. Evans, V, Orris P. The Use of Alcohol-Based Hand Sanitizers by Pregnant Health Care Workers (Letter) JOEM, Volume 54, Number 1, January 2012
11. Buchanan, S. Orris, P. Karliner, J. Alternatives to the mercury sphygmomanometer, J Public Health Pol, , 32:

Nov 25, 2010, 107-120

12. Buchanan, S. Vossenas, P. Shimek, J, Frumin, E. Krause, N. Orris, P. Punnett, L. Occupational injury disparities in the U.S. hotel industry, American Journal of Industrial Medicine, 2010 Feb;53(2):116-25.

13. Karliner, J. Harvie, J. Orris, P. Mercury Free Healthcare World Medical Journal May, 2008, 24:2
14. Aguilar, J. Mas, Pedro, Romero, M. Garcia, R. Sardinas, O. and Orris, P. Niveles de plomo en sangre y factores asociados, en ninos del municipio de Centro Habana, Rev Cubana Hig Epidemiol 2003, 41:2
15. Higgins, P, Orris P. Providing Employer-Arranged Occupational Medical Care: Conflicting Interests State of the Art Reviews in Occupational Medicine, Oct –Dec, 2002, 17:4, P. 601-6
16. Higgins, P., Ezike, C., Orris, P. Occupational Health Services for Municpal Employees, State of the Art Reviews in Occupational Medicine, Jan. 2001, 16:1, P. 11-23
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Orris P The Environmental Injustice of Mercury: Challenges & Opportunities for Addressing Mercury in Cosmetics and Dental Amalgam meeting hosted by the USEPA "The Safety of mercury-free fillings".

Orris, P. International Medical Legal Litigation in Environmental Health, Panelist, World Federation of Public Health Associations World Health Congress, May 4, 2023, Rome, Italy

Orris, P. Air Quality and Human Health, Air Quality Management Lecture (AQML) series. At the Indian Institute of Technology Madras (IITM), GCRF-Clean Environment and Planetary Health in Asia (CEPHA) and Indian International Conference on Air Quality Management (IICAQM). January 21, 2022

Orris, P. Health Care's Impact on Sustainable Development, 6th International Symposium for Sustainable Development August 6, 2021

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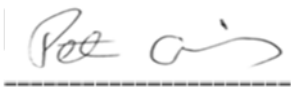
I, the undersigned, certify that to the best of my knowledge and belief, these data correctly describe my qualifications, my experiences, and other relevant information about myself.



Signature of Personnel

7/15/2024

07 May 2019

Date (Day/Month/Year)

Green Commuting in the Health Care Sector

Obstacles and Best Practices

Susan Kaplan, JD, Ning Ai, PhD, Peter Orris, MD, MPH, and P.S. Sriraj, PhD

Objective: Fossil fuel transportation by health care providers contributes to the prevalence of diseases they treat. We conducted an exploratory study to understand obstacles to, and best practices for, greener commuting among health care providers. **Methods:** We surveyed staff of three hospital clinics as to how they commute and why, and interviewed key staff of five hospital leaders in green commuting about their programs. **Results:** Factors that might change respondents' commuting choices from driving alone included financial incentives, convenience, and solutions to crime and safety concerns. Successful green commuting programs offer benefits including free or reduced transit passes, shuttle buses to transit stations, and free emergency rides home. **Conclusions:** Exemplary programs throughout the country demonstrate that modifying those factors within reach can impact the amount of fossil fuel energy used for health care provider transportation.

While attention has been focused on the impact of the provision of health care on the environment—in areas such as green building design, waste reduction, and elimination of mercury—health provider commuting has escaped consideration. Fossil fuel transportation by health care providers contributes to the prevalence of diseases they treat. Motor vehicles produce half of US air pollution,[1] well-linked in the medical literature with both causation and exacerbation of asthma, bronchitis, cancer, heart disease, and low birth weight.

Health care personnel's use of fossil fuel for commuting is significant for several reasons. The health care sector is large, constituting more than 17% of the US economy.[2] Health care sector jobs are projected to grow significantly.[3] Historically, there is a high rate of single-driver commuting among health care employees.[4,5] Finally, the health care sector is in a natural position to model environmentally sustainable practices that benefit public health.

Such practices, however, have been underdeveloped in the area of transportation. Commonly perceived obstacles to collective or public transportation by health care providers, such as variable work shifts and locations and the lack of comprehensive, reliable transit systems in many areas, have remained without significant investigation.

Meanwhile, emerging federal incentives for quality care and positive patient interactions, and efficiency-driven policies, make environmentally sustainable initiatives particularly timely as most produce cost savings[6] and improve employee/patient morale.[7] The Affordable Care Act emphasizes improving population health and addressing upstream conditions so as to prevent rather than just treat disease. A recent Internal Revenue Service ruling allows nonprofit hospitals to report the cost of some environmental improvement activities that benefit communities as community benefit or community building activities.[8]

METHODS

Study Design

We conducted a two-part exploratory study to better understand obstacles to greener commuting among health care providers and best practices for green commuting programs in the sector. First, we developed a standardized survey with questions focused on the respondent's travel mode, time spent commuting, knowledge and usage of employer-sponsored commuter benefit programs, and factors that might change their commuting behavior. Most questions were multiple choice; comment boxes were provided for additional feedback.

We selected three Chicago-area hospitals for survey administration in their outpatient clinics. Green transportation programs and benefits offered by the employer (eg, pre-tax transit pass purchases, showers for bicyclists, shuttle buses) varied between institutions. Hospitals 1 and 2 are located in urban areas, while 3 is in a suburb. Hospital 1 has the most convenient access to public transit. Hospital 2 has limited transit options, and a high crime incidence in the surrounding neighborhood seems to pose a challenge. Hospital 3 is located in a safe neighborhood but has very limited transit access. A typical setting representative of the hospital's outpatient services was selected in each hospital. Surveys were administered in person during different shifts and on different days.

Second, in order to better understand characteristics of the leading green commuting programs in the health care sector, we developed a list of interview questions to ask of the key contacts at each of five best practice hospitals around the country. They focused on the impetus for development of the programs, metrics applied, financing mechanisms, challenges, and results. We identified the case study hospitals through consultation with staff of the organization Health Care Without Harm and of Seattle Children's Hospital (SCH), widely considered the national leader in this area.

Data Collection

We administered the commuting survey to a total of 135 hospital staff. Across the three hospitals, one-quarter to one-third of the respondents were health care professionals; about half to two-thirds were supporting staff; and the remaining quarter did not specify their job titles. Unexpectedly, most of the respondents were female, which may influence travel mode choice due to family needs and safety concerns.[9,10]

Of the five best practice case study hospitals, four are located on the west coast and one on the east coast. All are academic teaching hospitals. We used the structured interview script to elicit information from the key sustainable transportation contacts at each hospital. Four of the interviews were conducted by telephone and one via email.

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TABLE 1. Summary Answers to Selected Survey Questions

Hospital ID	1	2	3
Total respondents	57	29	49
Transportation mode (% of respondents)			
Drive alone	65%	93%	80%
Carpool, car share, or taxi	19%	0%	14%
Public transit (Metra train, CTA train/bus, and/or Pace bus)	30%	7%	20%
Bicycle and/or walk	7%	3%	2%
Other	7%	0%	2%
Influential factors for transforming car-dependent activities to alternative transportation modes (% of respondents)			
Less crime/increased safety near the hospital and/or home	64%	44%	27%
Financial savings (such as cost of gas/parking vs transit fare, etc.)	64%	81%	45%
Financial incentives from the employer	56%	69%	32%
Flexible work shift hours	56%	38%	27%
Quicker trips on public transportation (eg, more frequent service, fewer transfers)	56%	63%	23%
Better quality of sidewalks or pedestrian paths	44%	63%	14%
Discounted or free rides home on weather-prohibitive days	44%	38%	23%
Better quality of service of bus or train (eg, cleanliness, comfort)	48%	50%	5%
Hospital shuttle to/from public transit	44%	50%	23%
Better quality of bicycle lanes	48%	50%	9%
More parking at transit station close to your home	40%	50%	14%
Increased availability of storage/showers in close proximity to work site	44%	38%	18%
Better service of car-sharing programs (eg, more cars when you need it, better location of parking spots)	36%	44%	9%
Employer assistance identifying others with whom to share rides	44%	56%	18%
More accessible information about options, schedules, and/or routes	24%	44%	36%
Other	28%	6%	9%
Employer-sponsored Transportation Benefit programs			
% of Employees Aware of at least one program	42%	26%	54%
% of informed Employees using at least one program	35%	0%	57%
Average distance between home and hospital (miles)			
One-way trip—shortest distance on road	9.92	7.75	11.46

Notes: (1) transportation mode split adds up to over 100% because respondents may use multiple modes; (2) influential factor split adds up to over 100% because respondents may choose multiple factors.

Data Analysis

For the survey, responses to multiple choice answers were tallied; additional written and oral comments were categorized by question or as general comments. Responses to the best practice interview questions were combed through in order to identify typical program elements, outcomes, and lessons learned.

RESULTS

Chicago Surveys

We found that while most respondents drive to work alone (ranging from 65% to 93%)—as is typical nationally[11]—a far lower percentage did so at Hospital 1, with the most bus and train options, suggesting transit accessibility as an influential factor in mode choice. Staff on the overnight shift at Hospital 1, who were on average older and had longer commutes, were more likely to carpool or take the bus, citing financial considerations as a primary factor. For health care facilities whose workforce cluster and have commuting needs during off-peak hours, carpooling and car sharing programs seem to have been adopted on an individually organized basis. (See Table 1 for summary answers to selected Chicago hospital survey questions.)

While the sample size was not large enough for a formal correlation analysis, the survey results indicated that many of the respondents were traveling to many locations within a work shift, thereby necessitating driving their car to work.

When single car drivers were asked about factors that might change their commute choice, they prioritized financial incentives, and respondents of the two urban hospitals prioritized less crime and increased safety near the hospital and/or home. Consistency and convenience were also identified as important factors by survey respondents, especially female and night-shift workers. One respondent at Hospital 1 expressed concerns about losing her preferred parking spot if cancelling her regular parking permit and seasonally shifting her commuting mode from driving to bicycling. In general, the existing ''park and ride'' programs in the Chicago area do not provide adequate incentives for suburban commuters' use of transit. The complexity and inconsistency in parking fees and rules across jurisdictions, the limited availability of parking structures close to transit stations, and the costs of parking near transit stations all serve as disincentives to taking transit. These factors affecting commute choice apply across all job categories.

The proportion of survey respondents who were aware of the existing green commuting programs and benefits provided by their employer ranged from about one-quarter to just over one-half.

Nationwide Case Studies

Three of the most comprehensive programs were located at SCH, Oregon Health & Science University (OHSU), and Princeton HealthCare System's Plainsboro Medical Center. (See Table 2 for the major elements of the alternative commuting programs of the five best practice case study hospitals.)

Comprehensive Program

SCH remains the gold standard for such programs. Responding to state and city mandates, as well as neighborhood pressure to reduce congestion, it has developed a unique combination of economic incentives for public transit use and other nondrive alone commuting modes and disincentives for driving-alone trips. There is

TABLE 2. Case Study Hospital Major Elements of Alternative Commuting Programs

Alternative Commuting Programs	OHSU	SCH	UCSFMC	UMCP	UWMC
Transit					
Hospital-provided shuttle	✓	✓	✓	✓	✓
Ability to track online and with app		✓	✓		✓
Free or discounted transit passes	✓	✓			✓
Transit information desk and/or personalized plans	✓	✓			✓
Bicycle/Walk					
Secure bicycle parking or valet	✓	✓	✓	✓	✓
Lockers and/or shower facilities	✓	✓	✓	✓	✓
Free or subsidized bicycle repair services	✓	✓	✓		
Bikeshare stations and/or loaner bicycles	✓	✓			✓
Cash bonus for cycling/walking	✓	✓			
Free or discounted bicycle (eg, lights, reflectors) and walking (eg, umbrellas) accessories	✓	✓			✓
Security guards available for walking at night	✓				✓
Carpool/vanpool					
Reserved parking	✓	✓	✓		✓
Free or discounted parking	✓		✓		✓
Incentives for vanpool drivers		✓	✓		✓
Online ride matching tool	✓		✓		✓
Free transit pass for holders of parking or carpool permits					✓
Carshare					
Free or discounted membership	✓	✓	✓		✓
Other					
Commute bonus each day employee does not drive alone		✓			
Emergency ride home	✓	✓	✓		✓
Parking and/or charging stations for electric vehicles	✓	✓	✓	✓	✓
Online exercise tracking; reduced health insurance rates based on exercising	✓				✓
Disincentives to driving alone					
Higher parking rates for single occupant vehicles		✓			✓
Raised higher during peak arrival times		✓			
Daily parking only		✓			
Paid parking 24/7		✓			
Campus design elements					
Sitting of facilities for alternative transportation access and trip reduction	✓			✓	
Improved pedestrian and/or bicycle routes/access	✓	✓		✓	✓

Case study hospitals are Oregon Health & Sciences University (OHSU), Seattle Children's Hospital (SCH), University of California-San Francisco Medical Center (UCSFMC), University Medical Center of Princeton at Plainsboro (UMCP), and University of Washington Medical Center (UWMC).

no free parking on site. Monthly parking was eliminated. Daily parking rates have been raised over time. Employees receive $4 per day each day they do not drive to work alone.

SCH provides programs and benefits similar to the other hospital green commuting leaders: deeply discounted transit passes (others provide deeply discounted or free transit passes), carpool matching assistance, shuttles to regional transportation hubs, emergency ride homes (taxi reimbursement should an employee who did not drive to work need to unexpectedly get home, to a day care, etc.), a yearly gear bonus for bicycle and walk commuters, bicycle parking, showers and lockers with towel service, and more.

SCH worked with local and regional public transportation agencies to improve bus service to the hospital area. Transportation staff provides a 30-min orientation on alternative transportation options and a personalized commute plan for all new hires. Parking revenue covers most of the hospital's commute trip reduction programs, and operational funds cover the rest.

Connecting Commuting Choices With Health Insurance Costs

OHSU offers a bike program web application that tracks miles, calories, and more, and automatically uploads to other websites that track employee health indicators and exercise, which in turn can lower employees' insurance costs. Walking and other forms of exercise can also earn points that can lead to lower health insurance rates.

Location Designed for Access to Public Transportation

When the University Medical Center of Princeton at Plainsboro was seeking a new site, it incorporated a goal of trip reduction. The new site is closer to the homes of 70% of the hospital's patients and employees than the previous location. The site design also reflects ''smart growth'' characteristics including mass transit accessibility and bike and pedestrian paths that connect to the public park and town center. Further, the hospital is building a ''health campus'' that aims to reduce driving needs by co-locating a fitness center, medical research building, day care and senior care facilities, and other uses.

Metrics and Results

Most of the case study hospitals track employee commuting modes and often additional program outcomes as well. In addition to commute modes used, OHSU calculates the decrease in total miles driven per year, gallons of oil saved, and pounds of carbon dioxide removed from the atmosphere—using a combination of public transit data on transit miles employees rode and employee bicycle and tram distances—resulting from its green commuting programs.

The University of Washington (which includes the University of Washington Medical Center) measures participation rates in its ''U-PASS'' discounted transit pass program and publishes annual U-PASS summaries that include the percentage of commuting trips that are ''green'' and reduction in metric tons of carbon dioxide equivalent (CO_{2e}, a measure that incorporates the relative global warming potential of greenhouse gas emissions in addition to CO_2) per year as a result of the program. University of Washington also monitors commute habits by conducting an annual traffic count, examining parking sales numbers, and tracking bicycle parking usage.

Forty percent of OHSU employees drive to work alone—23% lower than the city's goal of 63%. Seattle Children's Hospital's employee drive-alone rate—73% in 1995, prior to the implementation of its green commuting programs—is currently 38%. The University of California–San Francisco Medical Center's drive-alone rate is 41.2%, with slightly higher single-occupancy vehicle use, higher carpool/vanpool use, and lower public transit use than the campus as a whole—consistent with shift work inherent in hospitals, according to a University of California–San Francisco Medical Center report.[12]

University of Washington saw a 16% decrease in vehicle trips to campus and increase in carpools and vanpools following introduction of the U-PASS, which also provides discounts and other benefits for carpools and vanpools. The University Medical Center of Princeton at Plainsboro anticipates reduced travel distances of staff and patients due to the greater proximity and smart growth characteristics of its new campus.

DISCUSSION

Given the size of the health care sector and growing demand for workers in the sector, the location of health care providers and potential for green commuting programs and incentives clearly have important implications for both public health and transportation planning. This preliminary investigation suggests the following:

- Alternative commuting programs need to consider employee input into which programs and incentives would be most appealing in each specific setting. The most efficient and effective programs may not be one-size-fits-all. For example, hospitals located in urban areas have more serious concerns about safety and crime, while hospitals located in suburban areas may have challenges of transit accessibility. Surveys and other forms of outreach can be a useful tool in determining which alternative transit options may best suit a hospital's unique situation.
- Alternative transportation options such as carpooling and car sharing hold promise for broad implementation and reducing commuting-related impacts, especially for facilities with a large number of night-shift workers. Online ride-matching programs have made such options easier to implement than in the past. Where neighborhood safety and crime concerns are an impediment to alternative modes of commuting, employer-facilitated carpooling, car sharing, and shuttle services may help.
- Improving education and outreach about programs increases participation.
- Expanding and subsidizing parking at train stations is key.
- Policy designs should incorporate different factors for daytime and nighttime commuting.
- Hospitals should work with local transit agencies to make service convenient for employees.
- For employees who travel between different facilities during a shift, a fleet of vehicles available for their use can reduce their need to drive to work.
- Monthly parking passes provide an incentive to drive every day. Consider daily parking passes/fees instead.
- For a hospital selecting a new site, consider proximity to employee and patients and availability of transit and other non-single car driving commuting options.
- Ensure that facilities that support green commuting programs are in a convenient and accessible location. For example, bicycle parking is better located on the ground floor of a building, through automatic double doors, than in an underground parking garage.
- Integrating technology helps employees track commuting choices and feel connected.
- Consistent two-way communication between green commuting staff and executives and colleagues throughout the institution about needs and solutions can strengthen executive support for alternative commuting programs.

This initial survey and case studies demonstrate the role of creative incentives and community collaboration in increasing sustainable commuting in the health care sector. By and large, these programs have little capital expenditure associated, although they often require outreach to nontraditional partners.

Similar factors influence hospital staff's and professionals' choices of commuting modalities. Some of these are beyond the scope of individual institutional capabilities, but exemplary programs throughout the country demonstrate that modifying those factors within reach can impact the amount of fossil fuel energy used for health care provider transportation. Further involvement of health care institutions in societal planning around this central goal may add important support to this general effort. This has occurred in other areas within health care, such as the multibillion dollar hospital supply industry, in which the preference of a number of hospitals for more sustainable products, expressed in some cases through ''sustainability scorecards'' and the leverage of hospital group purchasing organizations, is encouraging suppliers to develop them.[13]

Further studies would be helpful. A larger sample size for survey studies would control for the variables of income, job duties, and gender in terms of transportation mode choice. It would be helpful to study whether offering onsite child care could provide an opportunity to reduce employees' commuting-related carbon footprint by reducing and simplifying daily travel needs. The cost-effectiveness of each alternative transportation program offered by the best practice case study hospitals should be further examined.

As air pollution, and climate change pollution in particular, rise to the top of the Federal policy agenda and continue to concern states and cities, hospitals have an important role in reducing commuting emissions among their own employees while serving as a model to others. An increasing array of programs and policy options—and best practice models—points the way.

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From extraction to renewal: a global campaign for healthy energy

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Abstract

A global movement is emerging in the health sector to engage in discourse and advocacy on the health impacts and health costs of energy choices – specifically the health harms of extractive, climate-disrupting energy sources such as coal and gas. Individuals and organizations in the health sector have begun to address climate and energy issues at multiple levels of engagement, including with others in the health sector, with pollution-affected communities, with policy-makers, and with the media. We present recent examples of health sector advocacy and leadership on the health impacts of energy choices, and opportunities for broadening and deepening the movement.

Keywords

Climate change, coal, fossil fuels, health impact assessment, renewable energy, advocacy

Two burdens, one culprit

Around the world – in countries ranging from India to South Africa, Turkey to the Philippines, Australia, the United States, and China – health voices have begun to emerge in support of the abandonment of extractive, polluting, unhealthy energy sources such as coal, and the shift to clean, renewable, healthy alternatives. The voices have sprung up in reaction to the unequivocal evidence of coal and other fossil fuels' contribution to both local and global health threats, coupled with the fact that health is not yet a standard consideration in energy and climate policy decisions.

According to the World Health Organization, more than 7 million people died in 2012 from air pollution, roughly double the mortality rate for HIV/AIDS, malaria, and tuberculosis combined.[1] About half of these deaths were attributable to ambient or outdoor air pollution, much of it created by the combustion of fossil fuels – mainly coal, oil, and gas – for energy generation. While all forms of fossil fuels have health and climate impacts, coal is the dirtiest form of energy generation, producing air, water, and climate pollution in the course of its lifecycle. Its use is already declining in the United States and much of Europe as a result of regulatory and market forces. However, growing demand for electricity generation in developing countries has catalyzed a rapid and ongoing expansion in coal use in many parts of the globe, particularly in China and India, Southeast Asia, Southern Africa, Turkey, parts of Eastern Europe including the Balkans, as well as in Japan.[2] The consequences are self-evident with air pollution levels in these countries among the highest in the world.[3] Deteriorating air quality has led to serious health impacts in many of these countries. Further, while the evidence on health effects of air pollution from the combustion process is the most robust and startling among documented health threats associated with coal use in electricity generation, other concerns include occupational health risks to coal miners, coal dust pollution affecting communities surrounding coal storage yards and transportation hubs, diesel air pollution during coal transport, and water contamination from mining (including legacy and abandoned mines) and fly ash disposal.

At the same time, the growing demand for energy and the rapid expansion of coal, and shale gas

and oil, play a central role in the upward trend in global concentration of atmospheric CO_2 (which in March 2015 exceeded 400 parts per million for the first time in millions of years) and other greenhouse gases (GHGs) such as methane. Accounting for 40 percent of anthropogenic CO_2 emissions, coal is a major contributor to climate change, and worldwide coal capacity is expected to expand by more than 50 percent as of early 2015. The trend in consumption of coal and other fossil fuels contributes significantly to the current and anticipated health impacts of climate change, which has been widely accepted by health scientists as "the greatest global health threat of the 21st century".[4]

As the health and economic burdens of fossil fuel-based energy generation have become increasingly clear, so have the significant health and economic co-benefits of a transition away from fossil fuels and toward clean, renewable energy. For example, according to "The New Climate Economy", a report by a group of prominent economists, "health damage from air pollution averaged over 4% of GDP in the 15 largest CO_2 emitters in 2010. Measures that reduce GHGs and air pollution together in these countries would yield health benefits of US $73 per tonne of CO_2 abated".[5] In addition to preventing many deaths attributable to poor air quality, many cases of chronic lung disease, including bronchitis and asthma, and heart conditions can be avoided. There are also multiple co-benefits from low carbon clean energy policies. Promoting active transport such as walking and cycling can provide substantial reductions in many non-communicable diseases such as cardiovascular disease, stroke, obesity, and diabetes associated with sedentary lifestyles. The financial savings associated with avoided ill health from implementing low carbon policies could also offset the cost of cleaner, low carbon energy systems and policies. For example, a 2014 study by researchers at the Massachusetts Institute of Technology found the health benefits associated with an emissions trading scheme aimed at cutting carbon emissions could deliver savings in healthcare spending more than ten times the cost of the scheme.[6]

A campaign for healthy energy

The health implications of energy policy are largely not considered in policy decisions – neither in allocation of energy sector subsidies, decisions regarding new energy infrastructure projects, plans for our energy future, nor in energy trade. As health arguments are both dire and persuasive to the public and policy makers, there is a need for health professionals and organizations to bring their voices and expertise to the debate. The health sector – with its economic, political, and moral standing – has an opportunity to serve as a liaison on energy and climate issues with policymakers, the media, the health and energy sectors, and communities.

Indeed, the health sector around the world is beginning to take actions and stances advocating transition from fossil fuels toward a healthy energy future. In the United States, for example, the American Lung Association has led strategic campaigns to defend the Clean Air Act to protect public health from air pollution. Another group, Physicians, Scientists & Engineers for Healthy Energy, has reached out to the public and policymakers both in the US and abroad on renewable energy and climate change. We focus here on a few international examples from the Healthy Energy Initiative, a program of Health Care Without Harm (HCWH), an organization that promotes environmental health and justice in the health sector worldwide:

A call to action (global)

At the close of their international conference in Kolkata, as part of a broad "Call to Action for Public Health", the World Federation of Public Health Associations (WFPHA) advocated "a rapid phase-out of coal" to limit further global warming and prevent illnesses and deaths associated with air pollution. The Kolkata Call to Action points to the "contribution of fossil fuels and coal in particular to climate change as well as to detrimental impacts on the health and wellbeing of local communities". Efforts are ongoing to engage WFPHA's member public health associations around the world to heed the call.

Community health skill share (India)

Communities impacted by pollution from the coal industry are often unaware of the environmental health risks in their homes, communities, and workplaces; regulatory frameworks are often inadequate to protect them; and medical care, when available, is often given in ignorance of environmental risk factors. To address these gaps, a group of NGOs including Community Environmental Monitoring, an environmental justice program based in Chennai, organized a three day workshop connecting health professionals with coal-impacted communities from across India to share knowledge and skills on the documentation of local health and environmental conditions, and the use of such documentation for community mobilization to demand responses from government and industry.

Meeting at the same table (China)

To open up communication between public health and energy policy experts – two groups traditionally disconnected from one another – Rock Environment and Energy Institute, an independent think tank, hosted a group of researchers from both fields to discuss challenges and research priorities in coal and health. The roundtable led to the creation of an informal network for continued cross-fertilization and future collaboration.

Amplifying voices through film (Australia)

Recognizing that demand greatly exceeded supply for health experts to speak about the health impacts of coal and gas in affected communities, the Climate and Health Alliance, a health sector alliance advocating for policy action on climate change, and the Public Health Association of Australia produced an acclaimed film called “the Human Cost of Power,” featuring public and environmental health experts speaking on the climate and health risks from the massive expansion of coal and gas industries in Australia.

Health engagement to stop coal (Europe: Poland and Turkey)

Poland and Turkey are the two key countries defying the downward trend in coal in Europe. The Health and Environment Alliance (HEAL), a leading European not-for-profit addressing how the

environment affects health, is successfully deploying the health argument with the help of evidence from the first-ever health economic assessment provided in their report, "The Unpaid Health Bill".[7] For example, health evidence has been used in campaigns to shut down or stall projects in Poland. In one case, HEAL provided expert consultation – using a more current model of health effects and air pollution dispersion than that originally used by the authorities – for a lawsuit that led to the overturning of the environmental permit for the 1 gigawatt Czeczott power plant in a coal mining region already experiencing poor air quality. In Turkey, HEAL teamed up with the Turkish Medical Association, the leading health professional organization, and six specialized medical associations, to call on the Turkish government to abandon plans for a massive coal power investment. Currently, Turkey is set to become the third highest investor in the world.

A challenge to two presidents (Philippines)

When French President Francois Hollande visited the Philippines to meet with Philippine President Benigno Aquino III with a stated purpose of "highlighting the Philippines as a partner in the fight against climate change," Health Care Without Harm-Asia, HCWH's Asia regional office, deployed a media campaign calling on the two presidents to "not forget public health as a central element in climate action – climate justice is health justice". As part of this media campaign, HCWH-Asia urged the governments of France and the Philippines to "not just lead the way to COP 21, but to lead by example", saying, "our two countries should commit to phasing out coal and other fossil fuels and to shift towards healthy renewable energy".

Defending clean air rules (South Africa)

In light of efforts by electricity utilities and other fossil fuel companies' attempts to gain exemptions from upcoming clean air rules, GroundWork, a multicity community oriented environmental advocacy group, partnered with health researchers and community members to publish a study on the health impact of coal and produce media releases and community training videos to build public awareness.

Building the movement

As the renewable energy economy grows, and the lifecycle impacts of coal and gas are better understood and quantified, so does the opportunity for the health sector to serve as stewards of public health during the transition to a clean energy future. In the course of our efforts to date, we have come to realize a few ways in which the movement for health sector engagement on energy and climate can be broadened beyond the core of environmental and occupational health specialists, deepened beyond a one-dimensional advocacy platform, and ultimately made more effective and impactful.

The following are suggestions from one network's experience:

- Seek out direct connections with communities affected by coal and other extractive energy industries to understand their health challenges, whether through informal conversations, site visits, community-based participatory research, or other means.
- Engage a broad cross section of health sector actors in developing and advocating for healthy energy policy. Build capacity for a larger and more diverse group of health sector voices to articulate the rationale for the energy transition. Seek out partnerships with complementary global health movements, such as those addressing non-communicable diseases, social determinants of health, and health systems strengthening.
- Use the WHO frame of 'Health in All Policies' to highlight the need for health in energy policy decisions to protect local communities as well as global health. Advocate for health impact assessment and health economic evaluations to be integrated in decision-making on energy projects and energy policy. Ensure that as renewable energy production becomes increasingly feasible economically and politically, we evaluate their health implications using a similar rubric as we have for coal, oil, and gas, i.e., with considerations for worker safety and health; environmental impacts; air, soil and water pollution; displacement of communities; economic and social disruption; health equity concerns; and contribution to

climate change. Embed the principles of health equity, environmental justice, and human rights in all health considerations related to energy choices.

- Lead by example by investing in clean energy solutions for our workplaces, health centers, hospitals and health systems, and using our purchasing power to decarbonize the health care supply chain. Where our institutions have financial resources invested in the market, consider freezing and/or divesting these resources from fossil fuels.

We welcome the thoughts of allies and critics alike.

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The Healthy Energy Initiative is mobilizing the health sector to play a central role advocating for a move away from fossil fuel-based power generation—particularly coal—and toward clean, renewable healthy energy options. The Initiative is coordinated by Health Care Without Harm, with campaign partners in several countries working with local and national health organizations and academics to support healthy energy policies. For more information, including opportunities to get involved, visit www.healthyenergyinitiative.org.

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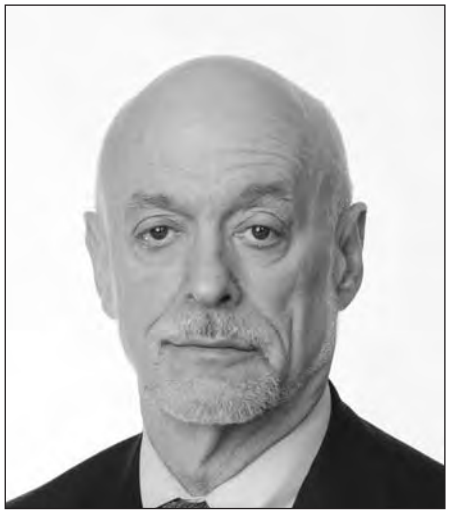
Air Pollution: a New Concern. Polycyclic Aromatic Hydrocarbon Endocrine Disrupting Chemicals in Urban Outdoor Air and Children's Health

A Brief Public Health Overview of Recent Literature



Peter Orris

Erica Burt

Polycyclic Aromatic Hydrocarbons

Endocrine disruptors are chemicals that interfere with hormone signaling systems in the human body, potentially affecting reproductive, metabolic, nervous, and immune system functions (1,2). Endocrine disrupting chemicals (EDCs), natural or synthetic, can be found in many different environmental media: food, water, soil, and air. Most indentified EDCs are produced by indoor sources, and therefore indoor air concentrations may better predict a person's exposure to EDCs than outdoor air concentrations (3). However, outdoor air is a significant source of exposure to one group of EDCs, the Polycyclic Aromatic Hydrocarbons (PAHs). The health consequences of these exposures for children include neurodevelopmental disruption, DNA damage leading to increased cancer risk, and epigenetic changes that are potentially the basis for other diseases, including asthma.

What are PAHs?

PAHs are a family of chemicals formed as a by-product of incomplete combustion. PAHs are created when organic material combusts, such as when fuel is burned, food is cooked, or cigarettes are smoked. Significant outdoor urban sources are coal-fired power plants, incinerators, furnaces in residential buildings, and the internal combustion engines of automobiles, trucks, buses, and trains. PAHs can be found in gaseous form or adsorbed onto particulate matter, with the tendency of each PAH to do so depending on its molecular weight.

The PAHs which are suspected endocrine disruptors based on animal or human studies include: acenaphthylene, benzo (a) pyrene, benzo (b) fluoranthene, benzo (k) fluoranthene, 3-methylcholanthrene, chrysene, dibenzo (a,h) anthracene, indeno (1,2,3-cd) pyrene, naphthalene, phenanthrene (1,4,5).

Health Effects of Prenatal and Childhood Exposures to PAHs

Exposure to PAHs is a concern throughout an individual's life; however, gestational and childhood exposures have been the focus of several studies, and have revealed several important health consequences in this population. Perera et al. have studied prenatal PAH exposure and its effects on cognitive and behavioral development for a cohort of children in New York City.

They found that prenatal exposure to PAHs above the median of 2.26 ng/m^3 was positively associated with developmental delay at three years, reduced IQ at five years, and symptoms of anxiety/depression and attention problems at seven years (6–9). A similar study in Tongliang, China, did not find an independent association between PAH exposure and impaired IQ, but found an inverse correlation between PAH-DNA adducts in cord blood, a biomarker of prenatal exposure to PAHs, and motor, language, and overall development in children at two years old (10,11).

Studies in Krakow, Poland, similarly found a decrease in IQ for 5 year olds exposed in utero to average air concentrations of PAHs above the median of 17.96 ng/m^3 (12). Prenatal PAH exposures in Krakow, New York

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City, and Tongliang were also associated with decreased fetal growth: birthweight, length, and/or head circumference in Polish-Caucasian, African-American, and Chinese populations (11,13,14). Studies in the Czech Republic support these associations (15,16).

Human evidence also suggests that despite an approximate 10-fold lower dose of PAHs received by a fetus relative to the mother, the amount of carcinogenic DNA damage caused by the exposure is greater to the fetus (17). This damage is a covalent bond between the PAH and DNA, known as a DNA-adduct, and is a known biomarker for cancer risk. The exact relationship between this carcinogenic damage and carcinogenesis is not clear in humans, but animal studies clearly demonstrate a relationship between in-utero PAH-induced DNA damage and cancer of the liver, lung, nervous system, and lymphatic system of the offspring (17–19).

It is hypothesized that not only is a child's DNA affected by in-utero exposure to PAHs, but his/her gene expression may also be altered. Such changes are associated with cancer and other diseases, and may have transgenerational effects. Evidence for these epigentic changes have come through studies looking at the methylation and demethylation by PAHs of cord-blood cells (20,21).

One health end-point suspected to be a result of such PAH-induced epigenetic changes is childhood asthma. Asthma is one the most common chronic health problems facing children today, with approximately 14% of 13–14 year olds worldwide experiencing symptoms in the last year (22, 23). PAHs may help to initiate, exacerbate, and hinder treatment of asthma. Initiation of asthma could occur in several ways, one of which is alteration of epigenics contributing to asthma biomarkers.

A case control study in Saudi Arabia found significant associations between serum levels of PAHs and biomarkers of asthma (24). Another possible mechanism for initiation of asthma by PAHs, which may also contribute to continued asthma symptoms, is through increasing a child's sensitivity to certain allergens (25,26). There is some evidence for exacerbation of asthma symptoms by PAHS; a study in California of the United States showed a mild trend of increased wheeze in 6–11 year old children with asthma after ambient exposure to PAHs increased, but other studies have not seen an association (26,27). Another New York study showed respiratory symptoms and probable asthma are more prevalent among children exposed to PAHs and environmental tobacco smoke in early childhood (28). Relatedly, prenatal exposures to PAHs are suspected to increase the occurrence and duration of respiratory symptoms (29). Furthermore, in vitro evidence suggests that exposure to PAHs may decrease the responsiveness of lung tissue to asthma medication (30).

Prevention

While this paper has not highlighted the sources of airborne PAHs in the indoor environment, reduction of these is often easier than tackling the job out of doors. Proper venting or reduction of the use of organic fuel use for cooking and heat within living quarters is an important intervention in much of the world where the indoor smoke pollution often rivals that generated communally. The elimination of cigarette smoking by adult family members is well known to reduce the incidence of both asthma and cancer in children.

Minimizing exposure to PAHs outdoors in urban areas is of great importance despite its difficulty. The generation of energy utilizing fossil fuels and the incineration of wastes are major sources of PAHs that are able to be eliminated through sustainable urban planning. PAH concentrations emanating from major roadways train tracks, or water transportation routes are again susceptible to reduction through urban planning that distance housing units and accommodates the prevailing winds.

Factories and homes themselves are major sources of outdoor PAHs when organic heating fuel is used. Reduction or elimination of this ubiquitous exposure is reachable only through the substitution of wind, water, or solar energy generators. Such a substitution has been demonstrated to be adequate for the world's energy needs through 2030 and at approximately the same cost as allocated today (32). However, there may be some relevant policy solutions, and here is a list of ideas for further exploration and research:

The immediate effect of such an intervention is documented in Tongliang, China, where the closing of a coal fired power plant reduced the health effects associated with prenatal PAH exposure in the community (32).

Conclusion

Through the disruption of the endocrine system and DNA damage, PAH exposure from combustion sources such as power plants, vehicles, and home-heating and cooking systems can cause negative health consequences to the most vulnerable in our community, our children. PAH air pollution is associated with developmental delay, decreases in IQ, behavioral problems, increased cancer risk, and asthma. While indoor exposures can be minimized through family choices, outdoor exposures cannot be reduced with such ease. Community, state, and national policy changes are necessary to reduce community air pollution exposures to this class of compounds.

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Beyond black lung: Scientific evidence of health effects from coal use in electricity generation

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Original Article

Beyond black lung: Scientific evidence of health effects from coal use in electricity generation

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Abstract While access to electricity affects health positively, combustion of coal in power plants causes well-documented adverse health effects. We review respiratory, cardiovascular, reproductive, and neurologic health outcomes associated with exposure to coal-fired power plant emissions. We also discuss population-level health effects of coal combustion and its role in climate change. Our review of scientific studies suggests that those we present here can be used to inform energy policy.
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Keywords: coal; electricity generation; air pollution; health effects

Introduction

Access to electricity has a positive effect on the health and well-being of people worldwide.[1] The use of coal to generate energy, however, has negative health consequences.[2] Evidence suggests an impact on health at every stage in its use for electricity generation – from mining to post-combustion disposal.[2] The combustion of coal has been well-studied, with compelling evidence of widespread health effects on the population. Air pollution produced by coal power plants can affect the respiratory and cardiovascular systems, and coal used for heating and cooking indoors generates pollutants known to cause respiratory ailments and cancer. Coal combustion also contributes to climate change, which can harm human health on a global scale.

We review scientific evidence of health effects from the use of coal for electricity generation, focusing primarily on air emissions from coal combustion. We compile recent evidence of health effects from coal mining, transport, and combustion from the peer-reviewed literature as

well as from governmental, international agency, and research institute reports. We searched biomedical research databases (Ovid Medline and PubMed) for articles using the search terms *coal* or *solid fuel* and *health* or *burden* or *economic* or *cost*. We included only English language articles published in the past 10 years. We also reviewed articles mentioned in the references and included them if appropriate. We gave priority to articles examining coal use in power plants. We generally excluded studies of exposures produced by alternative uses of coal.

Background

When coal is burned in power plants it produces air-borne pollutants: particulate matter (PM), sulfur dioxide (SO_2), oxides of nitrogen (NO_X), carbon dioxide (CO_2), mercury, arsenic, chromium, nickel, other heavy metals, acid gases (HCL, HF), hydrocarbons (PAHs), and varying amounts of radioactive uranium and thorium in fly ash particles.

In 2011, the World Health Organization (WHO) compiled air quality data from 1100 cities in 91 countries and found that residents living in many urban areas are exposed to persistently elevated levels of fine particle pollution.[3] The report states,

> In both developed and developing countries, the largest contributors to urban outdoor air pollution include motor transport, small-scale manufacturers and other industries, burning of biomass and coal for cooking and heating, as well as coal-fired power plants.[3]

Forty per cent of the electricity produced in the world is generated from burning coal, and the number of power plants burning coal is likely to rise in the next two decades as energy demand increases worldwide.[4,5] The World Resources Institute estimates that, globally, 1200 new power plants have been proposed, with 76 per cent of them in China and India.[6] Most of coal's health burden results from burning it in power plants. The remainder results from other steps of coal's life cycle – extraction, transport, and disposal.[7,8]

Health Effects from Coal-fired Power Plants

In their 2007 article in *The Lancet*, Markandya and Wilkinson summarized the health burden of electricity generation using coal and lignite

(the softest and most polluting form of coal). The authors estimate that for every Terawatt-hour (TWh) of electricity produced from coal in Europe, there are 24.5 deaths, 225 serious illnesses including congestive heart failure and chronic bronchitis, and 13,288 minor illnesses.[9] When lignite is used, each TWh of electricity produced results in 32.6 deaths, 298 serious illnesses, and 17,676 minor illnesses.[9] The International Energy Agency reports that worldwide coal-based energy production was 8572 TWh in 2010.[5] On the basis of per TWh estimates by Markandya and Wilkinson, the worldwide health toll from air pollution due to coal combustion is about 210,000 deaths, almost 2 million serious illnesses, and over 151 million minor illnesses per year. These estimates do not include the effects of climate change.

This calculation of health burden used European pollution levels and population density. In countries with weaker air pollution controls, higher use of coal, lower quality coal, or higher population density close to power plants, the health burden is greater. A study in China, reported by Markandya and Wilkinson in 2007,[9] estimated 77 deaths per TWh from a coal-fired power plant that met Chinese environmental standards[9] – more than three times the estimate of deaths per TWh for coal combustion in Europe. For all of China, this would result in an estimated 250,000 deaths per year, based on estimates of coal combustion in China.[5]

Respiratory effects

Specific pollutants from burning coal harm the respiratory system: PM, SO_2, and NO_X and others. Injury to the airways and lungs via oxidative stress leads to inflammation, cytotoxicity (direct harm to cells), and cell death.

Particulate matter

Particulates generated by burning coal are characterized by size – particles up to 10 micrometers called PM_{10}, and smaller particles less than 2.5 micrometers ($PM_{2.5}$), a subset of PM_{10}. $PM_{2.5}$ travels deeper into airways and is believed to cause more harm. A study of many power plants in China found that of the total mass of PM emitted, PM_{10} comprised 62–84 per cent and $PM_{2.5}$ comprised 8–44 per cent.[10]

In a report evaluating over 40 studies on the health effects of exposure to small PM ($PM_{2.5}$), the US Environmental Protection Agency (US EPA) concluded that $PM_{2.5}$ likely causes respiratory symptoms, the development of asthma, and decrements in lung function in children.[11] The EPA concludes that a 10 $\mu g/m^3$ increase in $PM_{2.5}$ is associated with a 1–3.4 per cent decrease in forced expiratory volume in 1 sec (FEV_1).[11] EPA also concluded that exposure to $PM_{2.5}$ increases emergency department visits and hospital admissions for respiratory-related symptoms such as infections and chronic obstructive pulmonary disease. Epidemiological evidence from Australia and New Zealand,[12] Mexico,[13] Canada,[14] and Europe[15] confirm that these effects on the respiratory system are seen wherever communities are exposed to $PM_{2.5}$. In addition to respiratory illnesses, current evidence suggests that long-term exposure to $PM_{2.5}$ is causally linked to the development of lung cancer.[11]

Sulfur dioxide

Exposure to SO_2 emitted by coal burning power plants increases the incidence and severity of respiratory symptoms of those living nearby, particularly children with asthma. For adults and children who are susceptible, inhalation of SO_2 causes inflammation and hyperresponsiveness of the airways, aggravates bronchitis, and decreases lung function.[16] Community-level SO_2 concentration is associated with hospitalizations for asthma and other respiratory conditions, as well as emergency department visits for asthma, particularly among children and adults over 65 years.[16] A review of epidemiological studies in cities in Italy, Spain, France, and the Netherlands found that low concentrations of SO_2 (less than 10 ppb 24-hour average) are associated with increased risk of death from heart and lung conditions.[16] For every 10 ppb increase in SO_2 concentration there is a 0.4–2 per cent increased risk of death.[16] Fortunately, ambient concentrations of SO_2 in many countries have declined over the last few decades owing to installation of pollution control technologies at coal-burning power plants. Countries with weaker pollution standards put their populations at risk of SO_2 health effects. The ambient concentrations of SO_2 in China, for example, increased from 2000 to 2006 at an annual rate of 7.3 per cent, mainly because of emissions from power plants. But in 2005, new policy in China increased the use of flue-gas desulfurization technologies, and SO_2 concentrations have begun to decline.[17]

Oxides of nitrogen

Oxides of nitrogen (NO_X) are by-products of fossil fuel combustion in automobiles and coal-fired power plants, and other places. NO_X react with chemicals in the atmosphere to create pollution products such as ozone in smog, nitrous oxide (N_2O), and nitrogen dioxide (NO_2). NO_2 and ozone are of particular concern. When asthmatic children are exposed to NO_2, they can experience increased wheezing and coughing.[18] At low concentrations (0.2–0.5 ppm), NO_2 has been found to result in lung function decrements in asthmatics.[18] Exposure to NO_2 also increases susceptibility to viral and bacterial infections, and at high concentrations (1–2 ppm) can cause airway inflammation.[18] Increases in ambient NO_2 levels (3–50 ppb) are linked to increases in hospital admissions and emergency department visits for respiratory problems, particularly asthma.[18]

Cardiovascular effects

Coal-fired power plants contribute to the global burden of cardiovascular disease primarily through the emission of PM. $PM_{2.5}$ has been causally linked to cardiovascular disease and death.[11] The WHO estimates that worldwide, 5 per cent of cardio-pulmonary deaths are due to PM pollution.[19] The mechanism of cardiovascular injury is the same as for the respiratory system: vascular oxidative stress leads to vessel inflammation and cytotoxicity. Long-term exposure to $PM_{2.5}$ has been shown to accelerate the development of atherosclerosis and increase emergency department visits and hospital admissions for ischemic heart disease and congestive heart failure. The US EPA reports that a majority of the studies it reviewed found a 0.5–2.4 per cent increase in emergency department visits and hospital admissions for cardiovascular diseases per each 10 $\mu g/m^3$ increase in $PM_{2.5}$ concentrations.[11] A 2007 scientific review of the health effects of combustion emissions reported an 8–18 per cent increase in cardiovascular deaths per 10 $\mu g/m^3$ increase in $PM_{2.5}$ concentration in the United States.[20] Recent studies conducted in China and Latin America confirm the significant link between outdoor air pollution and cardiovascular events.[21,22]

Reproductive health

Research has documented that exposure to air pollution during pregnancy can cause low birth weight.[23] Studies that investigated the effects

of SO_2 and PM (China, South Korea), and NO_2, CO, and ozone (South Korea), concluded that air pollution containing these constituents was associated with low birth weight.[23] In studies evaluating the association between electricity generation at coal-fired power plants and infant mortality, infant mortality was shown to have increased with increased use of coal in countries that had mid to low infant mortality rates at baseline (1965), such as Chile, China, Mexico, Thailand, Germany, and Australia, although this effect was not seen in those countries with high baseline infant mortality rates.[24]

Neurologic effects

Mercury

When coal is burned, mercury vapor is released into the atmosphere. The United Nations estimates that 26 per cent of global mercury emissions (339–657 metric tons/year) come from burning coal in power plants.[25] The mercury from coal-burning power plants is deposited into waterways, converted to methyl-mercury, and passed up the aquatic food chain.[26,27] Local, regional, and distant mercury emissions contaminate fish. Methyl-mercury-contaminated fish, when eaten by pregnant women, can cause developmental effects in their offspring, such as delayed neurodevelopment, plus subtle changes in vision, memory, and language.[28] Epidemiological studies suggest that many newborns and children around the world have levels of mercury in their bodies that put them at risk of these adverse effects. Data from the United States suggest that more than 300,000 newborns each year are born at risk for these effects.[29] A study in Spain found 42 per cent of the pre-school or newborn children tested had mercury levels in their hair above the EPA reference concentration for safety, 1 μg Hg/g. A study in Hong Kong estimates that a majority of children exceed safety levels of mercury because of consumption of mercury-contaminated fish.[30,31]

Life expectancy

A study modeling the effect on life expectancy of coal power generation predicted a decrease in life expectancy in countries with moderate life expectancy at the baseline year (1965), including Poland, China, Mexico, and Thailand. In India and China, years of life lost were estimated to be up to 2.5 years and 3.5 years, respectively.[24]

Climate change

Global climate change is caused by the accumulation of greenhouse gases in the Earth's atmosphere. Two of the major greenhouse gases contributing to climate change are products of coal combustion: CO_2 and N_2O. As the concentrations of these gases in the atmosphere increase, the average global temperature slowly increases, setting in motion a host of consequences that further promote climate change such as melting of polar ice and thawing of arctic permafrost.

As the average global temperature increases, researchers predict public health will suffer, particularly in low-income countries that have fewer resources to respond and adapt to the changes brought on by warmer global temperatures.[32] A higher average global temperature and warmer oceans are already increasing the occurrence of extreme weather events such as floods, hurricanes, and droughts that, in-turn, increase disease and injury, and adversely affect water quality and food security.[33,34] Warmer average temperatures alter ecosystems, decreasing some key food-chain supporting species such as corals, and increasing the growing ranges of some weeds, grasses, and trees that may further increase the severity and prevalence of allergies.[33,34] Other consequences include: the spread of climate-sensitive diseases such as tick- and mosquito-borne diseases and of food- and water-borne pathogens; an increase in ground-level ozone and smog, which aggravate asthmas and increase hospital visits; and an increase in the number of extremely hot days, which can cause heat-related mortality.[32–36] The mass migration of people to avoid these climate-related consequences may cause conflict and further stress on water, food, shelter, sanitation, and health-care resources.[32]

Other Health Effects

While this review focuses primarily on the health effects from the combustion of coal for electricity, it should be noted that other health burdens arise from the use of coal, two of which we review below.

Indoor coal combustion

Using solid fuels such as coal for heating and cooking is estimated to cause 910,000 deaths from acute lower respiratory infections in children under 5 years and 693,000–1 million deaths from chronic obstructive

pulmonary disease per year worldwide.[37,38] Approximately 0.4 billion people worldwide, many of them in China, use coal to cook and heat their homes. In 2000, the WHO conducted a meta-study on the use of solid fuels for heating and cooking and reported that 12.9 per cent of adults in East Asia and 2.1 per cent of adults in South Asia are exposed to coal smoke from heating and cooking, causing over 16,000 deaths from lung cancer per year.[38]

Coal miners

The occupational health impacts of mining coal are well-known and must be considered when reviewing the effects of electricity generation with coal. In a 2002 review of 250 studies on coal mining, Stephens and Ahern[39] calculated that up to 12 per cent of coal miners develop coal workers' pneumoconiosis and silicosis (potentially fatal lung conditions) because of the inhalation of dust during mining operations.[39] Miners are also at higher risk for chronic bronchitis and accelerated loss of lung function. Most research on the health effects of coal mining has been undertaken among miners in large mines in Europe and North America.[39] Small scale mines, many of which are found in developing countries, are often more hazardous, resulting in higher rates of accidents and injuries. They often employ less experienced workers and children – populations with increased vulnerability to occupational disease and injury.[39]

The Cost of the Health Burden from Use of Coal for Electricity Production

The impacts of burning coal can be described in economic terms, and several papers have attempted to estimate the cost of using coal by assigning value to the environmental and public health damage caused during coal's extraction, transportation, combustion, and disposal. One such study by Epstein *et al*[40] estimated that the external costs of coal-fired electricity production in the United States add an extra US$0.178 to each kWh of electricity produced; an amount that would triple its cost to consumers.[40] Another US report by Machol *et al*[41] estimated US$0.19 – 0.45 per kWh as the cost of the health burden and environmental damages from coal combustion. As part of an analysis for the European Commission in 2005, Rabl *et al* estimated the external life-cycle costs of fossil fuels (the most expensive of which was coal) to be 0.016–0.058 €/kWh.[6]

In 2011 the US EPA estimated the benefits and costs of the Clean Air Act, a law that regulates emissions of SO_2, NO_X, carbon monoxide, and PM in the United States. The EPA calculated that the ratio of health-care cost savings to compliance costs was 25:1 in 2010[42] meaning that for every dollar spent complying with the Clean Air Act, 25 dollars were saved in welfare, ecological, and health-care costs owing to lower disease burden, including a reduction in premature deaths, bronchitis, asthma, and myocardial infarction.[42]

Summary

Pollutants generated by coal combustion can affect the health of local communities, especially vulnerable individuals including children, the elderly, pregnant women, and those suffering from asthma and lung disease. On a global scale, coal emissions can travel long distances affecting populations living far from power plants. Moreover, coal combustion contributes to climate change, whose health impacts are already significant and growing. The use of coal results in health consequences throughout the span of its use – from mining to transport to combustion to waste disposal.

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Occupational Exposure and Asthma Mortality

To the Editor.—There has been speculation in the literature about the cause of the rising mortality rates from asthma. Several recent analyses have focused on increases in deaths from asthma in metropolitan areas. Two studies looked at Cook County, Illinois, and found up to 16.4 deaths attributable to asthma per million population for persons aged 5 to 34 years (1980 through 1988)[1] compared with national asthma mortality rates for persons 5 to 34 years of 2.6 to 4.2 per million (1980 through 1987).[2] It is theorized that occupational exposures in metropolitan areas may be one of the factors increasing death rates from asthma in the inner cities.

We studied death certificates for the given occupation of those who died in Chicago between 1980 and 1988, with asthma listed as the cause of death or a contributing cause of death. The ages examined were 20 to 35 years. One painter and one bus driver, both 35 years old, were excluded to more closely align our numbers with national averages. Certain occupations known to have higher rates of occupational asthma were also found to have higher rates of mortality among the 184 death certificates examined. The working populations for the city of Chicago were estimated from the 1980 and 1990 censuses.[4,5] Bakers appear to have markedly higher mortality rates than expected, with almost nine times the age- and race-adjusted rates for the city of Chicago and 41 times the national rate. The painters' and bus drivers' mortality rates are closer to the city rates; however, these rates are still 14 and 11 times the national rate.

Death certificates have been evaluated in earlier studies that noted the occupation of the deceased was correctly identified 48% of the time while the industry was correctly identified 62% of the time. The accuracy of our findings is affected by this lack of validity. However, we feel the numbers of specific occupations may be found to be higher since over 30 of these persons were listed as students (who may have low-paying, part-time jobs involving exposures) and over 40 were listed as general laborers. Flour, paint solvent, and diesel fuel are known to cause or exacerbate asthma. The prevalence of asthma in West German bakers was found to be 20%, while the prevalence of workers exposed to isocyanates in paints and other products is found to be 5% to 10%.[6] It may be that these workers suffer early mortality because of continued work exposures. This work suggests that specific occupational exposures may contribute to higher rates of asthma mortality in metropolitan areas.

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Salmeterol Xinafoate in Asthma

To the Editor.—Dr Bone[1] highlighted some important points regarding the indicated uses of salmeterol xinafoate, a new long-acting inhaled bronchodilator. This selective β_2-adrenoceptor agonist is intended for use twice daily as a maintenance therapy and, based on a relatively slower onset of action than short-acting β_2-adrenoceptor agonists, should not be used for the treatment of acute asthma symptoms.

However, we feel Dr Bone's comments concerning the potential for accumulation and toxicity need clarification. Following the treatment of asthma patients for 2 to 10 months with 42 μg of salmeterol xinafoate twice daily, a single inhaled dose of 42 μg resulted in detectable plasma levels within 5 to 10 minutes and very low peak plasma concentrations (150 pg/mL), consistent with the low systemic exposure expected from an inhaled drug.[2] Plasma concentrations determined 12 hours after dosing were close to or below the limit of quantification of the assay (25 pg/mL). There was no evidence to suggest the accumulation of salmeterol after repeated twice-daily dosing. As with all other β_2-adrenoceptor agonists, salmeterol does have dose-dependent extrapulmonary effects at doses above the therapeutic level. These include increases in pulse rate, tremor, and blood glucose concentration and a decrease in blood potassium concentration. In volunteers who inhaled up to eight times the therapeutic dose of salmeterol, these extrapulmonary effects were observed, but were not serious in nature.[3] Thus, the safety margin of salmeterol appears to be quite acceptable.

Bone calls for long-term studies to evaluate the effectiveness of salmeterol as a maintenance treatment for patients not using anti-inflammatory therapy. In fact, the majority of patients enrolled in the two large clinical trials conducted in the United States were not receiving anti-inflammatory therapy when using salmeterol.[4,5] These patients did not demonstrate a deterioration of asthma over the 12-week treatment period. Similar results were obtained in a large clinical trial conducted in the United Kingdom.[6] Over the course of 12 months, patients using salmeterol twice daily showed no evidence of deterioration of asthma control irrespective of concurrent glucocorticoid use. These studies indicate that twice-daily use of salmeterol is not detrimental to asthma control when used with or without corticosteroids for periods of up to 12 months.

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In Reply.—My Editorial notes that salmeterol provides more effective bronchodilation than albuterol in patients requiring maintenance therapy for asthma. The Editorial, however, goes on to state that salmeterol should not be used more than twice daily at recommended doses. The drug is approved only for use this way. The package insert[1] for Serevent (salmeterol xinafoate) Inhalation Aerosol states: "Do Not Exceed Recommended Dose: The bronchodilator action of salmeterol usually lasts for at least 12 hours. Therefore, it should not be used more

Trends in Asthma Mortality among African Americans and Whites in Chicago, 1968 through 1991

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ABSTRACT

Death certificate data were used to examine asthma mortality among African Americans and Whites aged 5 through 34 years in Chicago from 1968 through 1991. African Americans experienced consistently higher asthma mortality throughout the period. Asthma mortality remained stable among Whites from 1968 through 1991 but increased by 337% among African Americans from 1976 through 1991 ($P < .001$). The increase was greatest among 20- through 34-year-olds. Between 1979 and 1991, outpatient and emergency department deaths increased significantly, while the proportion of dead-on-arrival cases remained stable at 51%. This shift to non-inpatient deaths suggests that lack of access to health care may play a role in increasing asthma mortality. (*Am J Public Health.* 1994;84:1830–1833)

Introduction

From 1982 through 1986, asthma mortality among 5- through 34-year-olds in the United States increased by 6.2% annually.[1] High mortality rates relative to the rest of the country[2–4] and a greater increase in mortality (10.2% annually) were noted for New York City and Chicago (Cook County, Illinois) during the same period.[4]

Although concomitant increases in asthma prevalence and hospitalization were reported throughout the 1980s,[5,6] the very rapid increase in mortality suggests that other factors may be involved. Limited health care access,[7] a lack of recognition of asthma severity by patient or physician,[8] psychosocial dysfunction of patient and family,[9] and overuse or inappropriate use of asthma medication leading to toxicity or delays in accessing appropriate medical treatment[10] have been identified as possible contributing factors.

This study of asthma mortality in Chicago from 1968 through 1991 was undertaken to extend previous research examining characteristics of asthma deaths in Chicago.[2]

Methods

Death certificate data for all 5- through 34-year-old residents of Chicago with asthma as the underlying cause of death from 1968 through 1991 were collected from the Illinois Department of Public Health. The Eighth Revision of the *International Classification of Diseases* (ICD), used from 1968 through 1978, was replaced by the Ninth Revision in 1979. According to National Center for Health Statistics reports, 96% of deaths coded for asthma using ICD-8 were also coded for asthma using ICD-9.[11]

Demographic information used in this study included sex, race (White or African American), age at death, hospital status at death (inpatient, emergency department patient or outpatient, dead on arrival [DOA], other), and secondary causes of death. Hospital status was recorded on death certificates from 1979 through 1991. Four persons of Chinese origin were excluded because the small number precluded detailed analysis.

Statistical analysis included chi-square comparisons of hospital status by race, sex, age, and combinations of these variables. Trends in the proportion of patients who were DOA, who died in the emergency department or as outpatients, or who died as hospital inpatients from 1979 through 1991 were examined with linear regression for the complete Chicago population as well as for race- and age-specific groups.

Age-, sex-, and race-specific populations for 5- through 34-year-olds in Chicago were obtained from the City of Chicago Department of Planning. Yearly asthma mortality rates were calculated and adjusted to the 1980 US population.[12] Separate analyses of trends in mortality were performed by linear regression for the periods 1968 to 1976 and 1976 through 1991, which exhibited distinctly different temporal patterns.

Results

From 1968 through 1991, asthma was listed as the underlying cause of death for 344 Chicago residents aged 5 through 34 years, including 4 Chinese persons who were excluded from the analysis. The number of deaths per year ranged from 2 through 27 overall, from 0 through 6 for Whites, and from 1 through 24 for African Americans. Of the 340 deaths examined,

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292 (85.9%) were among African Americans, a proportion that did not vary significantly over time. Proportions of deaths by sex (50.3% of deaths occurred among females) did not differ by race ($\chi^2 = 0.04$, $P = .84$) or age group ($\chi^2 = 0.01$, $P = .96$). The death certificates of 2 Whites listed Mexico as the country of citizenship, and 11 deaths occurred among Whites who had been born in Mexico, Puerto Rico, or "other Spanish" countries. These persons were considered Whites in this analysis.

No significant differences in hospital status by sex, race, or age group were detected (Table 1). There were higher proportions of DOA cases among 20- through 34-year-olds than among 5- through 19-year-olds (54% vs 44%) and higher proportions of inpatient deaths among females than among males (24% vs 14%), but these differences were not significant. Autopsies were performed on 62% of deaths, including 78% of DOA cases from 1979 through 1991.

Cardiac dysrhythmias were the most commonly cited accompanying causes of death, occurring in 36 (11%) of the cases. For 11 deaths, medicinal or recreational drug poisoning was listed as an accompanying cause; all of these deaths occurred among African-American persons aged 20 through 34 years. Ten of the 11 drug poisoning deaths occurred between 1980 and 1991, representing 7% of deaths among 20- through 34-year-old African Americans during that period. No differences in hospital status were found between cardiac dysrythmias or drug poisonings and other deaths.

All measures of asthma mortality among 5- through 34-year-olds declined insignificantly from 1968 to 1976 in Chicago. Overall asthma mortality declined at a rate of 0.024 deaths per 100 000 persons annually ($F = 1.16, P > .05$). The decline was greater among African Americans than among Whites (0.063 vs 0.017 deaths per 100 000 persons annually) but remained insignificant within race groups, as did the decreases among age-specific groups (5 through 19 years, 20 through 34 years) within races.

From 1976 through 1991, overall asthma mortality increased significantly, at a rate of 0.039 deaths per 100 000 persons annually (Table 2). Asthma mortality rates among Whites ranged from 0 deaths in 1971, 1973, 1978, and 1989 to 1.33 deaths per 100 000 persons in 1985, with no significant trends during this period.

TABLE 1—Hospital Status, by Race, Age Group, and Sex, 1979 through 1991[a]

	Dead on Arrival		Emergency Department/ Outpatient		Inpatient		Other		
	No.	%	No.	%	No.	%	No.	%	P
Race									
African American	111	52	59	27	40	19	5	2	.19
White	15	48	7	23	6	19	3	4	
Age group									
5–19 y	31	44	21	30	17	24	1	1	.27
20–34 y	95	54	45	26	29	16	7	4	
Sex									
Female	64	52	28	23	29	24	2	2	.08
Male	62	50	38	31	17	14	6	5	

[a]Hospital status data were not recorded on death certificates from 1968 through 1978.

TABLE 2—Linear Regression: Annual Increases in Asthma Mortality Rates[a] among Persons Aged 5 through 34 Years, Chicago, 1976 through 1991

	Annual Increase[a]	SE	P
Citywide	0.039	0.021	NS
Whites			
5–19 y	0.019	0.031	NS
20–34 y	0.021	0.032	NS
Overall	0.020	0.023	NS
African Americans			
5–19 y	0.076	0.029	<.03
20–34 y	0.261	0.057	<.001
Overall	0.170	0.031	<.001
African-American males			
5–19 y	0.051	0.047	NS
20–34 y	0.237	0.093	<.03
Overall	0.146	0.058	<.03
African-American females			
5–19 y	0.102	0.060	NS
20–34 y	0.285	0.078	<.003
Overall	0.195	0.044	<.001

Note. NS = not significant.
[a]Deaths per 100 000 population.

Asthma mortality among African Americans increased from a nadir of 0.77 to 0.86 deaths per 100 000 persons between 1976 and 1978 to a peak of 3.63 deaths per 100 000 persons in 1991 (Figure 1). The increase from 1976 to 1991 (0.83 to 3.63 deaths per 100 000 persons) was 337% over a 15-year period, or 22.5% annually. This significant increase (0.170 deaths per 100 000 persons per year) occurred among both males and females, regardless of age classification. Age-specific increases were significant among 5- through 19-year-old and 20- through 34-year-old African Americans (Figure 2) but were approximately 3.5-fold greater in the older age group (Table 2). Examination of data from 1979 through 1991, during which only ICD-9 codes were used, did not significantly alter the magnitude of any regression estimates calculated above.

Annual changes in hospital status were examined for 1979 through 1991, the years for which such data were collected. Among persons aged 5 through 19 years, a significant overall increase in the proportion of patients dying in emergency departments or outpatient clinics (2.4% annually, $P < .01$) was seen (from 1979

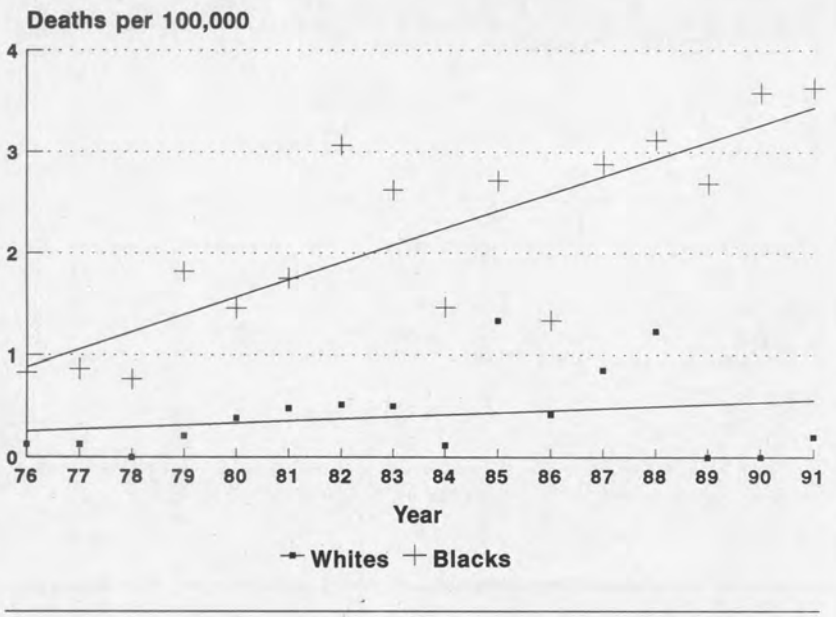

FIGURE 1—Annual asthma mortality rates for persons aged 5 through 34 years in Chicago, 1976 through 1991, by race (adjusted to 1980 US population).

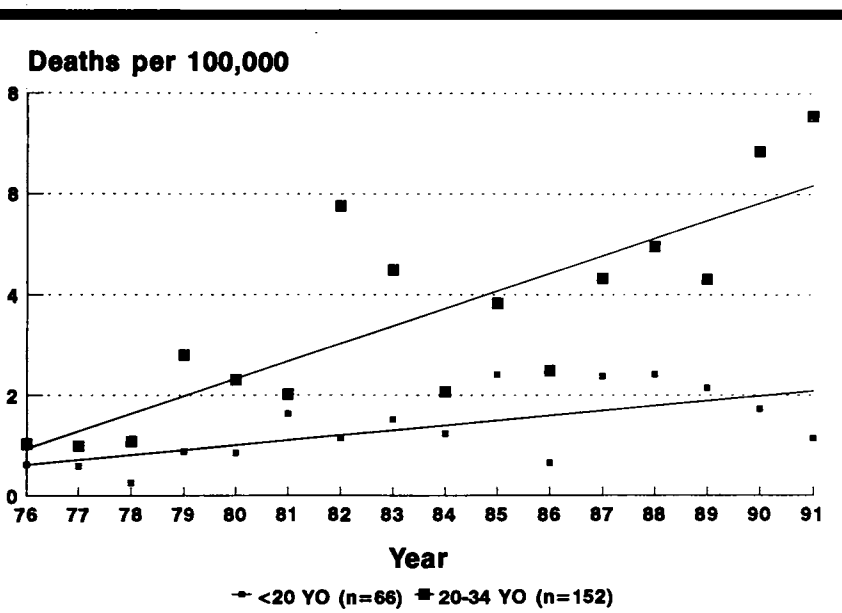

FIGURE 2—Annual asthma mortality rates for Blacks in Chicago, 1976 through 1991, by age group (sex-adjusted to 1980 US population).

through 1991), but this increase was nonsignificant within race groups. Among persons aged 20 through 34 years, there was a significant annual increase in the proportion of deaths occurring in emergency departments and outpatient clinics overall (3.3%, $P < .004$) as well as for African Americans (2.8%, $P < .006$) and Whites (4.1%, $P < .02$) as groups. No other significant changes in hospital status occurred over time among 20- through 34-year-old Whites, but a significant decrease occurred during this period in the proportion of African-American 20- through 34-year-olds who died as inpatients (1.3% annually, $P < .05$).

Discussion

Asthma mortality trends among African Americans in Chicago are similar to those seen internationally,[13,14] and overall decreases in asthma mortality observed from 1968 through 1976 were consistent with national trends for that period.[1] The disproportionate increases among African-American adults aged 20 through 34 years in Chicago, however, have not been previously reported, although several authors have noted increasing mortality from asthma among children in the United States.[1,15] In 1990 and 1991, asthma mortality rates in Chicago were 3.58 to 3.63 and 0.00 to 0.20 per 100 000 persons among African Americans and Whites, respectively, resulting in African American:White mortality rate ratios far in excess of the two- to four-fold increases seen in previous studies.[2,3,16] The fact that 13 deaths were among persons recorded as White but for whom other information indicated Hispanic origin suggests that racial differences in asthma mortality may be even larger than reported here.

We have previously shown that mortality from asthma is inversely correlated with measures of income and that African Americans, in general, suffer worse socioeconomic conditions than Whites in Chicago.[2] An inverse association between socioeconomic status and asthma mortality has also been reported in New York City.[3]

Trends in asthma mortality can reflect trends in prevalence, severity of disease, treatment, or access to and utilization of health services. Previous studies indicate that asthma prevalence and incidence increased during the 1980s.[5,17,18] Factors that may be contributing to higher prevalence or greater severity of disease include increased survival of low-birthweight children, who are at higher risk for development of asthma, and increased exposure to environmental allergens and irritants. The magnitude of the increases in prevalence was much less striking than that noted here for asthma mortality, particularly among 20- through 34-year-old African Americans, suggesting that characteristics affecting severity of disease, treatment, or health care access may be etiologically related to death from asthma.

Among Michigan residents younger than 45 years, the number of prescription asthma medications and prescribed metered dose inhalers per person increased significantly faster among Medicaid recipients than among the non-Medicaid popu-

lation annually from 1981 through 1985.[19] Previous studies have suggested that inhaled bronchodilator medications may increase the risk of asthma mortality[20] or morbidity[21] and that tolerance to beta-agonists may develop over time among persons with mild asthma.[22,23] It is not clear, however, why use of beta-agonists would differentially affect 20- through 34-year-old African Americans, unless improper instruction for, use of, and/or compliance with the medication interacts with other factors, such as poverty or lack of access to health care.

Interpretation of accompanying causes of death in this study is limited by the use of three-digit ICD codes, which prevent the identification of specific drugs listed as contributing to the deaths of 11 African-American 20- through 34-year-olds. It is notable that the use of beta-agonists,[24] as well as crack cocaine,[25] aspirin,[26] and other drugs,[27] has been postulated in death from asthma. Identification of asthma as a cause of death in this study was limited to primary diagnosis in persons aged 5 through 34 years to minimize misclassification.[28,29]

Lack of access to health care has been proposed as a contributor to the increase in mortality from asthma.[2,3,16] From 1979 through 1987, 48.6% of White and 46.7% of African-American asthma deaths occurred in hospital nationally,[1] whereas in this Chicago study only 19.4% and 18.6% of asthma deaths among Whites and African Americans, respectively, were recorded as inpatient deaths. Half of the uninsured in Chicago are between the ages of 18 and 34,[30] and uninsured persons and Medicaid recipients may be at higher risk for substandard care in hospitals and emergency departments.[31] Among 20- through 34-year-old African Americans in Chicago, for whom asthma mortality is increasing most rapidly, the proportion of inpatient deaths declined, while emergency department and outpatient clinic deaths significantly increased and DOA cases remained stable at a high rate (51%), suggesting that access to care is an issue in increasing asthma mortality in Chicago.

More detailed information on asthma deaths in Chicago is necessary to explore further the possible influence of specific factors on increasing asthma mortality, particularly differences in health care access between race- and income-specific groups, the contribution of low-birthweight survivors, and recreational and medicinal drug use. Although the development of effective therapies for the treatment of asthma may be considered a medical success story, death from asthma continues to be a preventable tragedy in which social, cultural, and economic conditions conspire to undermine the best clinical efforts. □

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Effect of Racial and Socioeconomic Factors on Asthma Mortality in Chicago*

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Asthma is a chronic disease affecting nearly 10 million persons[1] and leading to 500,000 hospitalizations annually.[2] During the 1980s, mortality from asthma in the United States increased by 6% per year.[3] Weiss et al[3,4] previously noted that Cook County, Illinois has one of the highest mortality rates from asthma in the country, with most of the deaths occurring within the city of Chicago. Several studies have found that asthma mortality and hospitalization rates in general are greater among nonwhites[5,6] and persons with low income,[7,8] with possible explanations for the racial and socioeconomic differences in asthma rates including differential access to care, exposure to environmental pollutants, and crowded conditions leading to increased exposure to allergens and infections.[9-13] Although Chicago has one of the highest asthma mortality rates in the United States, there has not been a thorough analysis of demographic variables and circumstances surrounding asthma deaths in the city. The current study was undertaken in an effort to define in more detail the magnitude and parameters of asthma mortality in Chicago and to suggest factors which might be amenable to further research and prevention.

Materials and Methods

Mortality data were abstracted from death certificates obtained through the Illinois Department of Public Health. All death certificates with asthma as underlying or contributing cause of death (ICD-9 code 493.0 to 493.9) among persons aged 5 to 34 years and during the period from 1980 to 1988 within the city of Chicago were used for this analysis. Persons aged 5 to 34 years were chosen since previous studies have indicated that death certificate coding of asthma is more accurate for persons aged 5 to 34 years than for persons <5 or >34 years of age.[14,15] For those years, demographic data and circumstances surrounding death, including age, race, sex, neighborhood of residence, neighborhood of death, date of death, hospital status at time of death (inpatient, outpatient, dead on arrival [DOA], or other), underlying cause of death, other conditions at death, and autopsy status (performed, not performed) were abstracted from the death certificates.

Population estimates for the city and for each of the 77 established community areas were derived from the 1980 Chicago Statistical Abstract (CSA),[16] which was compiled from the 1980 US Census for Chicago. The community areas are defined by the city of Chicago as groups of census tracts. They were first identified in the 1930s as recognized neighborhoods and have remained with little change over the ensuing years. Total and race-specific Chicago and Chicago community area mortality rates for 1980 to 1988 were calculated.

Currently, 20% of the city of Chicago is Hispanic, yet during the 1980s, there was no Hispanic designator on Illinois death certificates precluding analysis by ethnic breakdown. Country of origin was examined, with persons born in Mexico, Puerto Rico, or "other or unknown Spanish country of origin" counted as a rough approximation for Hispanic. During the 1980s, there was a massive immigration of Hispanic people to Chicago. Since age-specific 1990 census data are not yet available and population estimates for Hispanic persons are unstable, asthma mortality rates for Hispanic subjects were not calculated.

Neighborhood socioeconomic status (SES) was defined as the median community area income in 1980 as listed in the CSA.[16] Neighborhoods were divided into 4 SES classes based on quartiles of the median income distribution (SES class 1 = <$14,500, 2 = $14,500 to $20,199, 3 = $20,200 to $23,999, and 4 = $≥24,000).

National asthma mortality rates for 5- to 34-year-old white and nonwhite subjects for 1979 to 1987 were adapted from Weiss et al[3] by weighting sex-specific rates by US male and female population sizes. Original data for that paper were obtained from US Vital and Health Statistics and the US Bureau of Census. This information is presented for comparison with asthma mortality rates in Chicago during the same time period.

Asthma mortality rates were determined for the total Chicago population and by age group, race, and year of death. Distributions of sex, age, autopsy status, and hospital status by race among persons dying of asthma in Chicago were examined by χ^2 analysis. Differences in autopsy rates for asthma deaths between Chicago and the United States were tested with a Z score for the difference between proportions. Associations between asthma mortality and median income among community areas were examined with weighted linear regression analysis, with the weights for each community area defined as the population of that community. Community areas were also combined into quartiles by median income and the relationships between asthma mortality and quartile (coded 1 to 4) were examined with weighted linear regression analysis. Statistical analyses were performed using Statistical Analysis Software (SAS) Version 6.1 on an IBM mainframe at the University of Illinois at Chicago.

Results

A total of 217 persons aged 5 to 34 years died with asthma (ICD-9 code 493.0 to 493.9) as an underlying or contributing condition at death in the city of Chicago between 1980 and 1988. Of these, 11 were nonresidents and 1 was a resident without data on neighborhood of residence, leaving 205 persons 5 to 34 years of age who died between 1980 and 1988 for this report. For a total of 80.5% of the deaths, asthma was listed as the underlying cause of death. There were no differences in the distributions by age, race, sex, year of death, or hospital status between persons in whom asthma was coded as an underlying vs contributing cause of

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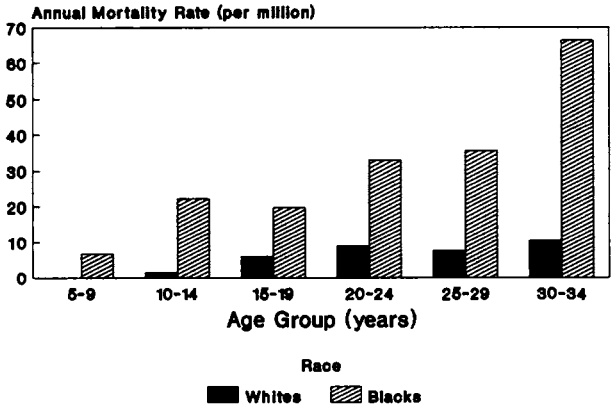

FIGURE 1. Annual asthma mortality rates by race and age group, Chicago, 1980-1988.

death. Of the 19.5% of the persons in whom asthma was listed as a contributing cause of death, heart attack was the most common underlying cause, accounting for 4.4% of total deaths.

The overall annual asthma mortality rate for persons aged 5 to 34 years from 1980 to 1988 in Chicago was 16.42 deaths per million, a rate approximately 3 times the rate for the United States.[3] Examination of country of origin revealed that, among the persons who died of asthma, 3 were born in Mexico, 8 in Puerto Rico, and 1 in an "other or unknown Spanish country of origin." All 12 of these individuals were coded as "white" on the death certificates. Black patients accounted for 170, or 82.9% of the deaths, with overall mortality rates from asthma for black and white subjects aged 5 to 34 years being 27.84 and 5.48 per million, respectively. The black/white patient ratio in mortality was 5.08, slightly higher than the ratio of 4.44 previously seen for the United States.[7]

Age and sex distributions were similar for black and for white subjects, with women accounting for 49.8% of the total asthma deaths and with asthma death rates increasing among both black and white individuals from childhood to the young adult years (Fig 1). Autopsy rates were performed on 57% of white and 74% of black subjects (χ^2 for the racial difference $=3.02$, $p=0.083$). The overall proportion of autopsies in Chicago (70.7%) is significantly higher than that previously reported for the United States from 1979 to 1987 (55.9%)[3] ($Z=4.49$, $p<0.001$). A total of 51.2% of the deaths (49% of white subjects and 52% of black subjects) were "dead on arrival," a proportion which appears to be higher than that previously reported for persons aged 5-34 years in the United States during the 1980s.[5]

The overall annual asthma mortality rate by race and year of death for Chicago and the United States is presented in Table 1. For comparison with the United States, Chicago rates are presented with asthma listed as an underlying and contributing cause of death and with asthma listed as only underlying cause of death. For each year and for white as well as black/nonwhite subjects, death rates for asthma were higher in Chicago than in the United States overall, with the differences being greater for black/nonwhite individuals than for white persons. Overall, there was an increase in deaths from 1980 to 1988 within both Chicago and the United States, although the numbers of deaths per year in Chicago were small and the estimates therefore unstable. When deaths were examined by month of death for all 9 years combined, the highest numbers of deaths occurred in the months of May ($n=23$) and July ($n=23$), followed by January ($n=21$), October ($n=20$), November ($n=20$), and December ($n=19$).

Asthma mortality rates from 1980 to 1988 by community area for the total group is presented in Figure 2. Asthma deaths occurred disproportionately on the South and West Sides of the city, areas in which black persons and persons of lower income reside. The highest asthma mortality rate, 52 deaths per million persons aged 5 to 34 years old, was in the Woodlawn Community, area number 42 on the south side of Chicago.

Asthma mortality by race and quartile of median community income is presented in Figure 3. There was a striking inverse association between SES quartile and asthma mortality when white and black subjects were analyzed together ($p=0.0412$ for coefficient on regression analysis). The association was not significant when black individuals were analyzed alone ($p=0.581$ for coefficient on regression analysis), although there was a suggestion of an inverse relationship between SES and asthma mortality in the highest 3 income groups. When the community area income was

Table 1—*Asthma Death Rates in the United States and Chicago**

	Total Persons			White			Black/Nonwhite		
		Chicago			Chicago			Chicago	
Year	US Underlying	Underlying	Any	US Underlying	Underlying	Any	US Underlying	Underlying	Any
1979	2.2	. . .	. . .	1.5	. . .	. . .	6.3	. . .	. . .
1980	2.6	8.7	14.4	1.6	2.8	4.2	8.0	14.7	25.1
1981	2.9	10.1	16.6	2.1	2.8	4.2	7.8	17.7	29.5
1982	3.5	16.6	17.3	2.3	2.8	4.2	9.5	31.0	32.4
1983	3.6	14.4	16.6	2.3	2.8	2.8	9.9	26.5	31.0
1984	3.2	7.9	10.1	2.3	1.4	4.2	8.0	14.7	16.2
1985	3.8	17.3	19.5	2.4	7.1	7.1	10.3	28.0	32.4
1986	3.9	8.7	10.8	2.6	4.2	5.6	10.1	13.3	16.2
1987	4.2	15.9	18.7	2.8	4.2	7.1	10.9	28.0	31.0
1988	. . .	19.5	23.1	. . .	8.5	9.9	. . .	31.0	36.9

*For patients aged 5 to 34 years old by year of death using asthma as underlying cause of death or any cause of death (per million).

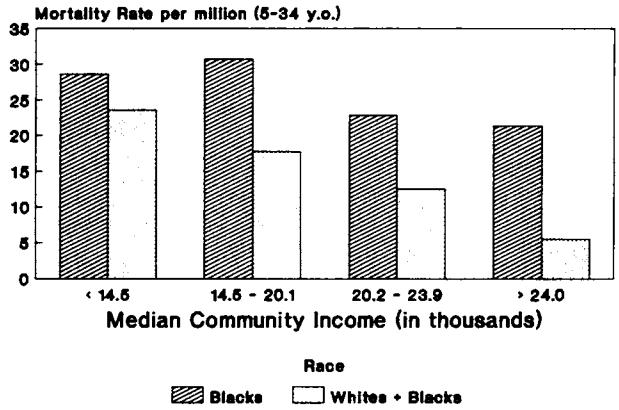

FIGURE 3. Annual asthma mortality rates by race and median community income, Chicago, 1980-1988.

related to asthma mortality among the 77 Chicago neighborhoods in weighted regression analysis, there was a significant inverse association between SES and asthma mortality ($p = 0.0001$). When black subjects were analyzed separately, the relationship, although still inverse, was no longer significant.

DISCUSSION

The current study confirms previous reports in noting that asthma mortality in Chicago for persons aged 5 to 34 years is 3 to 4 times that of the nation as a whole, with rates being particularly high for black subjects and for persons of low socioeconomic status. Separation of the effects of race, SES, and residential location in the city of Chicago is not feasible, since all 3 factors are interrelated. Poor black people tend to live in the areas of the city in which asthma

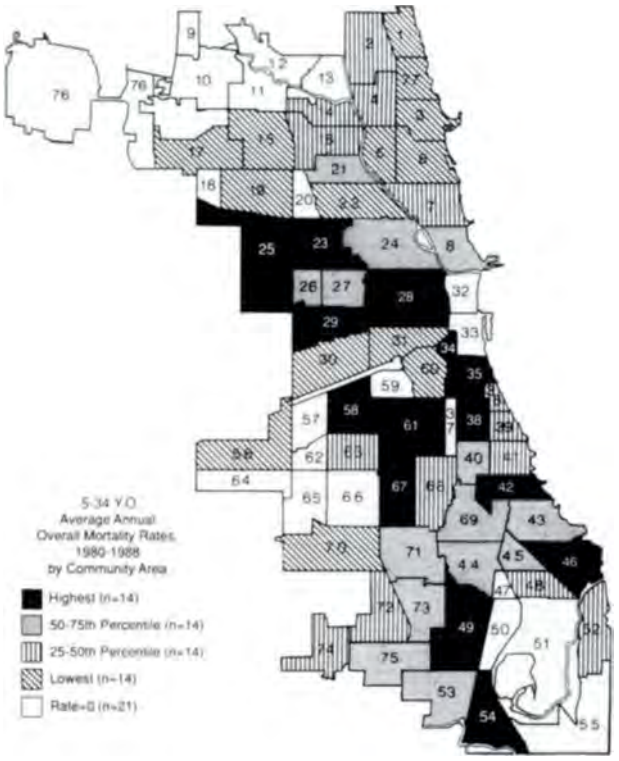

FIGURE 2. Annual asthma mortality rates by community area, Chicago, 1980-1988.

mortality is particularly high. The suggestion of an inverse association between asthma mortality and SES among black persons in the higher income groups indicates that there may be an income effect independent of race, although the 2 effects cannot be separated with the current data.

Black subjects with low income could be at high risk for asthma deaths for a variety of reasons. Perhaps the most likely explanation involves decreased access to health care, resulting in lack of continuity,[5,17,18] ineffective use of asthma medication,[10,19] difficulties in compliance with treatment,[17,20,21] failure to recognize severity of illness,[17,20] and inadequate medical response to emergency calls.[20] The importance of decreased access to care is supported by the fact that one half of the asthma deaths in Chicago are out-of-hospital deaths.

Black people in Chicago also live in more crowded households, with an average of 3.11 persons in black vs 2.09 persons in white households.[16] Increased crowding could affect frequency of upper respiratory infections associated with attacks of asthma.[13] In addition, black persons of low SES may be exposed to a variety of environmental conditions which could contribute to asthma exacerbations leading to fatal episodes, including ambient air pollution,[11,12,22] dust mites,[23] cigarette smoke,[24] pets,[25] indoor molds such as alternaria,[26] cockroaches,[27] and occupational exposures.[28,29]

The current study is consistent with previous reports showing increases in asthma mortality since 1979, as well as seasonal variations with higher death rates in the spring during pollen season.[30] The second seasonal peak in the winter is somewhat later than that previously noted in the United States[30] for persons aged 5 to 34 years. The reason for this difference is not clear.

This descriptive study is subject to the limitations inherent in any study which rely on death certificate data. Since Hispanic designator was not available on death certificates in the 1980s, and there was a massive migration of Hispanic people to Chicago during that time period rendering population estimates of Hispanic people unstable, asthma death rates for Hispanic subjects could not be calculated. Nevertheless, it appears from examination of country of origin on death certificates that at least 34% of the deaths attributed to white subjects may have been in Hispanic subjects, suggesting that the racial differences in asthma deaths reported here for Chicago were conservative. Accuracy of asthma coding varies, with older asthmatic patients being confused with persons with chronic obstructive pulmonary disease and with very young asthmatic patients being confused with children with bronchiolitis. Limiting the current study to persons aged 5 to 34 years is an effort to minimize this bias, since previous studies have noted greater accuracy of diagnosis of asthma in death certificates of 5 to 34 year olds.[14,15] In this study, all persons with asthma, rather than only persons with asthma as the underlying cause of death, were included in the analyses. Since most (80.5%) of the persons who died with asthma had asthma listed as the underlying cause of death, biases inherent in overreporting should be small.

Determination of SES in this study through median income of community area of residence is fraught with potential problems, including those inherent in any ecologic study. Previous literature has suggested that income can

serve as an approximation of SES.[31] Income was determined in the current study, however, from group rather than individual data and could be confounded by other variables associated with area of residence. In addition, variation in income among community areas could affect the results. The fact that the association between asthma mortality and median community income is stronger for the overall population than for black individuals alone could be attributed to smaller variation in income among predominantly black communities than among all 77 communities or to collinearity between race and income, *ie*, the greater proportion of white people, who experience lower asthma mortality overall, in the higher income groups. If the effects of poverty on asthma mortality are eventually shown to be related to environmental agents which are geographically specific, however, residential designation could prove to be an important indicator.

The small numbers of persons in each age, race, income, and year of death group and the interrelationships between race, income, and residence precluded adequate separation of individual risk factors for mortality. Nevertheless, general patterns of risk could be delineated among groups. More detailed analysis will require inclusion of more years or analysis of morbidity, such as hospitalizations, to allow for sufficient numbers of events.

Despite the limitations of this study, the consistently high rates of asthma deaths in Chicago disproportionately affecting poor black persons residing in the south and west sides of the city highlight the importance of investigations into the etiology of the deaths in this group of individuals. Asthma deaths are preventable with appropriate diagnosis and treatment. Further studies concerning risk factors for asthma mortality are needed. In addition, however, increased access to health care for persons at high risk is crucial if we are to have an impact on this increasingly important cause of mortality.

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American Journal of Industrial Medicine 13:405–406 (1988)

BRIEF COMMUNICATION

Acute Overexposure to Diesel Exhaust: Report of 13 Cases

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Key words: underground mines, central nervous system, acute toxicity

Diesel-powered equipment is commonly used in industrial operations, including mining. Diesel emissions include oxides of nitrogen, carbon, sulfur, respirable particulate matter, aldehydes, unburned hydrocarbons, pyrenes, and nitropyrenes [Breslin et al, 1976]. Combustion mixtures that burn an inefficiently high concentration of fuel produce more hydrocarbons, particulate matter, and carbon monoxide, but fewer oxides of nitrogen [Henderson, 1975; Johnson, 1975]. Fuels with high sulfur or aromatic hydrocarbon content and low cetane number produce more noxious emissions [Miller et al, 1986]. Diesel engines operating at idle, during acceleration, with heavy loads, or which are poorly maintained, produce more total emissions [Cernasky, 1983; Paas and Hambright, 1979].

In the occupational environment the carcinogenic and pulmonary effects of work shift and longer exposures to diesel exhaust have been studied [Ames et al, 1982; Reger et al, 1982; Steenland, 1986]. It is known that eye irritation is a sensitive indicator of acute short duration diesel exhaust exposure [Cernasky, 1983]. In underground mining little attention has been directed toward other acute health effects of overexposure to diesel exhaust. In order to determine whether such incidents have occurred, risk factors for their occurrence, as well as the patterns and severity of health effects, we conducted a review of United Mineworkers of America records to locate reported cases of overexposure. All incidents in the records were identified. No attempt was made to ascertain the comprehensiveness of this list or to assess the frequency of occurrence.

The identified incidents occurred at five underground coal mines in Utah and Colorado between 1974 and 1985. The principal author conducted interviews in 1986

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with 13 miners involved in the incidents: these revealed 12 with symptoms of mucous membrane irritation, headache, and light-headedness. Eight miners reported nausea and 4 reported symptoms of a sensation of unreality ("being high") and heartburn. Weakness, numbness and tingling in extremities, and vomiting affected 3 subjects. Two of the miners reported chest tightness and another 2 reported wheezing, although one of these complained of recurrent wheezing without exposure. All incidents produced lost work time due to these symptoms, which resolved within 24 to 48 hours. Conditions reported in mines where these incidents occurred included poor engine maintenance, poor maintenance of emission controls, prolonged idling of machinery, engines pulling heavy loads, use of equipment during times when ventilation was disrupted (such as during a move of longwall machinery), use of several pieces of equipment exhausting into the fresh-air intake, and use of poor-quality fuel.

While there has been little recognition of these symptoms in the occupational medicine literature and the pathophysiologic characteristics have not been defined, acute toxicity from diesel exhaust has been severe enough to cause individual miners to leave work and seek medical aid. We suggest that a systematic approach is needed to define the clinical picture of acute diesel exhaust intoxication, and attention should be directed toward controlling the predisposing environmental conditions associated with these incidents.

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Research Colloquium on Occupational Respiratory Diseases: A Conference in Cuba (1984)

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ABSTRACT. At an international conference in Havana, Cuba, March 19-21, 1984, health professionals from the United States, Canada, and Cuba participated in a research colloquium on occupational lung diseases. Participants and speakers discussed the state of the art of knowledge, research, and management of key occupational lung diseases, and suggested directions for future efforts. Differences among the three countries in terms of the medical, economic, and social aspects of defining, treating, and compensating occupational diseases were also considered.

IN MARCH, 1984, 33 health professionals from the United States and Canada visited Cuba to participate in a research colloquium with Cuban health professionals on occupational lung diseases. Invited papers were presented by 16 of the visiting United States/Canadian delegation and by 15 of the Cuban participants. United States sponsors of the colloquium included the Department of Social Medicine, Montefiore Hospital and Albert Einstein College of Medicine, the Division of Occupational Medicine of Cook County Hospital, the Occupational Health Program of the Harvard University School of Public Health, and the Department of Medicine of the University of Washington, in cooperation with the Occupational Health Section of the American Public Health Association. Cuban sponsors were the Occupational Health Institute and the Ministry of Public Health. Most of the delegation to Cuba visited health care facilities in Havana as well as in Cienfuegos, an industrial city to the south. This colloquium was the outgrowth of an earlier international research colloquium on pesticides and was designed to further exchange between North American and Cuban research scientists interested in occupational lung disease.

Background on health care in Cuba

The Cuban health care system, which emerged following the Cuban revolution of 1959, was based on a Czech model.[1] The main source of health care delivery in the ambulatory setting is the polyclinic, of which there are about 400 serving the island's population of 10 million persons. The polyclinics provide rural and urban health care, and are physician-dominated with a core staff of an internist, a pediatrician, and an obstetrician/gynecologist. There have been significant improvements in the health status of the country in the past 25 yr with life expectancy now approaching that of the United States, and the infant mortality rate of 17.3 per 1,000 live births,

a marked improvement from 41.7 per 1,000 live births in 1962, the year in which reliable statistics were first available. The leading causes of death, which previously had been from infectious diseases, are now the same as those of western industrialized countries, i.e., cancer, heart disease, and stroke. Although Cuba would be considered a developing country in terms of its economic status, significant efforts have been made in health and education; about 8% of Cuba's GNP is devoted to education[2] and about 15% to its health care system.[1] Paralleling the development of the health care system have been developments in health and safety regulations and training, research, and medical care in occupational health.[3]

The conference

Antonio Granda Ibarra, M.D., Director of the Occupational Health Institute and Chairman of the Cuban Society of Hygiene and Epidemiology, opened the conference with a description of the Cuban health care system, and identified the role of centralization and a public health infrastructure as significant contributors to the development of occupational health practice in Cuba. In 1963, a new social security law encompassing health and safety coverage was passed which included, for the first time, the country's 250,000 agricultural workers. Legislative actions and policies occurred over the next several years, including regulations that defined allowable exposure levels for many work processes and industries. Training for occupational health personnel began in 1970 with education of health inspectors. There are now over 2,000 general sanitary inspectors and 89 specialized sanitary inspectors in the country. Since 1974, physicians may specialize in occupational health by completing a 2-3 yr training program. There are 105 occupational medicine specialists in the country and an additional 65 in training.

Granda described that although all Cuban workers have full access to health care through the National Health System, specialized efforts for health care to workers have been undertaken. One new program involves the development of occupational clinics which will provide medical care to identified working populations in conjunction with the community polyclinic. Current large surveillance and case detection programs for workers exposed to identified toxic substances include lead screening, radiographic detection of pneumoconiosis, mercury detection, and a large-scale blood cholinesterase testing program to screen for the health effects of pesticide exposures. In 1982, over 50,000 blood cholinesterase examinations were performed on pesticide-exposed workers; pesticide intoxication was found among 17 of those examined.

Dr. Stuart Brooks, Professor of Medicine at the University of Cincinnati, reviewed the mechanisms of occupational respiratory disease, summarized the concepts of pathophysiology and reviewed the syndrome RADS, reactive airways dysfunction syndrome, in which workers develop persistent bronchial hyperreactivity following acute inhalational exposures. Dr. Moira Chan-Yeung of the University of British Columbia reviewed the clinical evaluation and long-term sequelae of occupational asthma. From evaluating large occupational cohorts with high rates of occupational asthma, particularly longitudinal studies of workers exposed to red cedar, she has found that a significant number of workers who develop occupational asthma may have long-term respiratory dysfunction following removal from the workplace, and that early removal from exposure will mitigate and may prevent long-term sequelae.

Other papers reviewed platinum asthma among platinum refinery workers, the epidemiology of isocyanate disease, and industrial bronchitis. Chronic beryllium disease was reviewed by Dr. Mark Cullen, of Yale University, including the findings of a recent outbreak of berylliosis among workers in a secondary refining industry, in which the lymphocyte blast transformation test appeared to be sensitive and specific in making the diagnosis. A number of papers addressed the pneumoconioses, including a review of the health effects of fibrous glass and the pleural manifestations of asbestos exposure. Investigators from the Cuban Occupational Health Institute reviewed the results of case detection for silicosis in Cuban workers manufacturing dental prostheses, and the clinical, pulmonary function and radiographic findings of silicosis among long-term underground miners. The surveillance of employees exposed to Cuban asbestos cement and nonasbestos cement in manufacturing plants was also presented, as were the criteria being established in Cuba for a national program on pneumoconiosis. Included are diagnostic and follow-up criteria for workers exposed to inorganic dust, in addition to environmental dust monitoring levels, and recommendations for periodic chest x-rays and spirometry.

A number of papers addressed the use of pulmonary function tests in the clinical and epidemiologic evaluation of occupational lung diseases. Dr. Ellen Eisen of Harvard University suggested that adverse effects of exposure on pulmonary function are underestimated by eliminating from analysis individuals with unacceptable tracings at different points in longitudinal studies. Dr. Sambasiwa Lakshminarayan of the University of Washington reviewed the pathophysiologic basis and application of exercise testing in occupational lung disease.

Agricultural respiratory hazards were addressed by a number of speakers. Dr. James Merchant of the University of Iowa reviewed farmer's lung and other forms of hypersensitivity pneumonitis, febrile syndromes from contaminated grain and silage, occupational asthma, reversible and nonreversible airway obstruction from cotton and grain dusts, and endotoxin and ammonia exposure in animal confinement housing. A Cuban surveillance program for pulmonary histoplasmosis using skin test reactivity was also described; 29% of 70 workers in a national poultry farm were reactors.

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF PROFESSOR DANIEL HORTON IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Professor Daniel Horton in support of Rule Proponents' regulatory proposal for presentation at the December 2 or 3, 2024, hearing in the above-captioned matter.

TESTIMONY OF PROFESSOR DANIEL HORTON

I. QUALIFICATIONS

My name is Daniel E. Horton, and I am an associate professor at Northwestern University's Weinberg College of Arts and Sciences in the Department of Earth and Planetary Sciences. I also hold a courtesy appointment in the McCormick School of Engineering's Department of Civil & Environmental Engineering. I lead Northwestern's Climate Change Research Group, a group of postdocs and students focused on using numerical models, environmental observations, statistical analyses, and machine learning techniques to ask and answer pertinent questions to understanding Earth's climate. I also teach four university courses related to understanding climate and air quality.

I hold a Bachelor of Science in Physics from Tulane University and a Bachelor of Science in Atmospheric Sciences from Texas A&M University. I received my PhD in Geological Sciences from the University of Michigan. Combined, I have more than 27 years of experience in Earth and climate science research. My curriculum vitae/resume is attached hereto.

II. PURPOSE OF TESTIMONY

I provide this pre-filed testimony in support of Illinois' adoption of the Advanced Clean Cars II (ACC II), Advanced Clean Truck (ACT), and Heavy-Medium Duty Low NOx Omnibus (Low-NOx) regulations (collectively referred to as the "Clean Car and Truck Standards" or simply the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code. I support the adoption of the Proposed Rules because, as described in detail below, my research suggests that electrifying vehicles in Illinois even to a lesser extent than would occur under the Proposed Rules would prevent hundreds of premature deaths in Illinois every year.

Specifically, I testify on the current state of air quality in Illinois, with a particular focus on the role that vehicle emissions play in creating unhealthy air quality in many high-density areas of the state (as described in Parts III.b and III.c of Rule Proponents' Statement of Reasons), and these emissions' disproportionate impacts on public health and air quality in communities of color (as described in Part III.d of Rule Proponents' Statement of Reasons). Additionally, I discuss potential benefits of projected vehicle electrification if the Rules are adopted in Illinois, including air quality improvements and a reduction in adverse health outcomes associated with air pollution, by drawing on my research and modeling.

In general, evaluating the concentration of local air pollution at a particular location requires understanding both the level of specific pollutant emissions and the specific meteorological conditions, because those factors can combine to allow primary air pollutants

(e.g., nitrogen dioxide (NO_2) and fine particulate matter ($PM_{2.5}$)) to accumulate in the near surface atmosphere and can drive the formation of secondary pollutants like ozone (O_3). My research team uses an EPA-developed model, which underlies most of our publications listed below. The model is the two-way coupled Weather Research and Forecasting and Community Multiscale Air Quality Model (WRF-CMAQ). We run the model at a very fine spatial resolution (1.3 km). We use meteorological data from the National Oceanic and Atmospheric Administration as boundary conditions. We take emissions data from the U.S. EPA's National Emissions Inventory, which provides emissions data at the county-level. We then use surrogates provided by the Lake Michigan Air Directors Consortium to distribute those county-level emissions data across the landscape at the finer spatial resolution. U.S. EPA uses a similar model, including the use of these surrogates, but at a 4 km spatial resolution.

By modeling emissions at a finer degree of spatial resolution, my team is able to make more nuanced and focused evaluations of local impacts of air pollution. We use emissions and meteorological data to model the spatial distribution of emissions for one month of each season and run our model in 15-second time-steps in order to see and evaluate emissions patterns. We have archived data for every hour for four months of each modeled year. We then compare our modeling results for fine particle pollution ($PM_{2.5}$), ozone (O_3), and nitrogen dioxide (NO_2) against data the U.S. EPA collects at its network of regulatory air monitors to validate our model. In other words, we validate by comparing the specific level of a specific pollution that U.S. EPA recorded at a particular moment in the past to the level of that pollutant that our model predicts for that location at that moment in time.

As cited in the Statement of Reasons and further elaborated below, my testimony is centrally based on and incorporates the following of my past and ongoing research projects and publications:

- Montgomery, A., et al., (2023). *Simulation of neighborhood-scale air quality with two-way coupled WRF-CMAQ over southern Lake Michigan-Chicago region*, Journal of Geophysical Research: Atmospheres, 128, e2022JD037942. https://doi.org/10.1029/2022JD037942.

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[1] The analysis in this paper is not based on the WRF-CMAQ model described above.
[2] The analysis in this paper is not based on the WRF-CMAQ model described above.

III. DISPARATE IMPACTS OF MOBILE SOURCE AIR POLLUTION ON LOW-INCOME COMMUNITIES AND COMMUNITIES OF COLOR AND CORRESPONDING BENEFITS OF VEHICLE ELECTRIFICATION

As discussed in Parts III.b and III.c of the Statement of Reasons and supported by extensive, established scientific literature, exposure to poor air quality caused by traffic-related air pollution in the U.S. has been found to exacerbate respiratory diseases, drive disparate health burdens in racial minority populations, and contribute to tens of thousands of premature deaths annually.[3] Pollutant exposure in densely populated areas, that is, urban environments, can vary widely, which can contribute to disparities in health outcomes on a neighborhood-by-neighborhood basis across individual cities. Applying our WRF-CMAQ model to Chicago, my research team has found that parts of Chicago have two- to five-times higher NO_2 and $PM_{2.5}$ concentrations than nearby rural areas. Within city limits annualized pollutant concentrations between neighborhoods can vary by a factor of 1.8. Results such as these suggest that summarizing city-wide air quality using limited observations could be problematic as it would not capture the substantial spatial heterogeneity.

To evaluate compliance with National Ambient Air Quality Standards (NAAQS) set under the Clean Air Act, U.S. EPA monitors NO_2 and $PM_{2.5}$ at fixed locations, including only a handful of such monitors in Chicagoland. Our modeling—which is validated using data from those monitors—provides a much more complete and detailed understanding of localized air pollution in the region. Indeed, public health literature points out that the use of high-fidelity, high-resolution air quality characterizations—like my team's model—are better at capturing pollution-related health impacts. Considering U.S. EPA's NAAQS is important to evaluate the impacts of mobile sources of air pollution, however it is also important to note that there is ample scientific literature

[3] S.F. Camilleri, et al., (2023). *Air quality, health and equity implications of electrifying heavy-duty vehicles*, *Nature Sustainability*, https://doi.org/10.1038/s41893-023-01219-0 (opening paragraph referencing various other studies).

to support the conclusion that levels of air pollution that are emitted by mobile source tailpipes, like NO_2 and $PM_{2.5}$, that are beneath the NAAQS still produce significantly deleterious public health effects.

Vehicle emissions have particularly pronounced negative impacts on air quality in highly populated areas, largely because densely populated areas experience high levels of vehicle traffic and, therefore, emissions. For example, our modeling shows that, within Chicago, hotspots of NO_2 and $PM_{2.5}$, pollutants known to be harmful to health, are concentrated along major roadways.

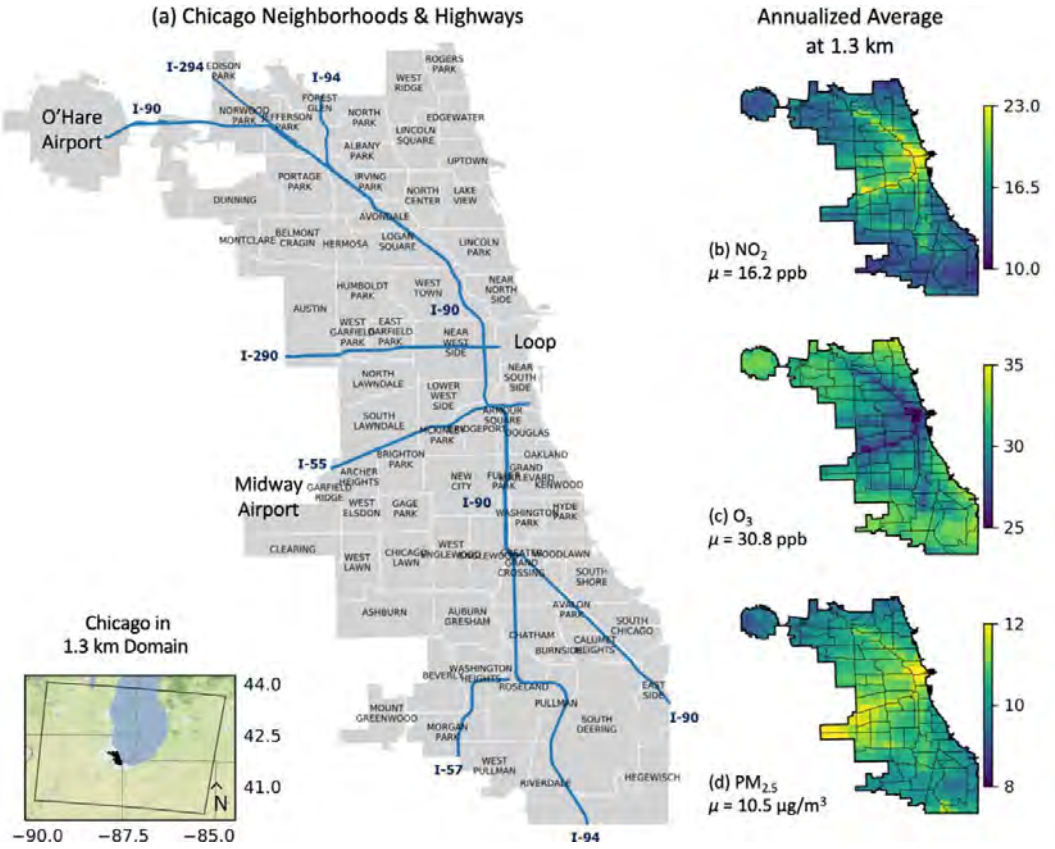

Figure 4 from Montgomery, A., et al., (2023). Simulation of neighborhood-scale air quality with two-way coupled WRF-CMAQ over southern Lake Michigan-Chicago region, Journal of Geophysical Research: Atmospheres, 128, e2022JD037942. https://doi.org/10.1029/2022JD037942.

I can also speak in support of the facts discussed in Part III.d of the Statement of Reasons, as my research specifically addresses how vehicle emissions disproportionately impact air quality and health outcomes in low-income communities and communities of color. In the Chicago metropolitan area, roughly 60% of the population tracts with the highest NO_2-related mortality rates is Black.[4] Moreover, estimated NO_2 health impacts do not depend solely on pollutant concentrations but also on the underlying susceptibilities of exposed populations.[5] One of my studies built upon and concurred with several previous studies that confirm the unjust burden of NO_2 exposure on marginalized communities, but used more granular census-tract data to capture wider and more representative variability in underlying population subgroup susceptibilities and associated disparities in NO_2 mortality burdens.[6]

One of my studies illustrates the public health burdens on low-income communities and communities of color in Chicago by projecting health benefits if a portion of diesel-powered heavy-duty vehicles on the roads were replaced by electric-powered equivalents. Heavy-duty vehicles (HDVs) disproportionately contribute to the creation of air pollutants and emission of greenhouse gases—with marginalized populations unequally burdened by the impacts of each. In one of my studies, we use our high spatial resolution (~1.3 km) air quality model to evaluate air pollution, public health and equity implications of a hypothetical 30% transition of diesel HDVs to electric HDVs in the region surrounding North America's largest freight hub, Chicago, IL.[7] We find there would be significant decreases in NO_2 and fine $PM_{2.5}$ concentrations, but note that O_3 levels could slightly increase, particularly in urban settings.

[4] S.F. Camilleri, et al., (2023). *All-cause NO_2-attributable mortality burden and associated racial and ethnic disparities in the U.S.*, Environmental Science & Technology Letters, https://pubs.acs.org/doi/10.1021/acs.estlett.3c00500.
[5] *Id.*
[6] *Id.* at 1163.
[7] S.F. Camilleri, et al., (2023). *Air quality, health and equity implications of electrifying heavy-duty vehicles*, Nature Sustainability, https://doi.org/10.1038/s41893-023-01219-0.

Alongside pollutants directly emitted from mobile and other sources, like $PM_{2.5}$ and NO_2, O_3 is a key pollutant of concern in assessing health outcomes, however O_3 forms in the atmosphere from the interaction of sunlight with emissions from vehicles and other sources, so its levels in the atmosphere are not linearly related to the volume of its precursor emissions. Over our simulation domain, NO_2 and $PM_{2.5}$ reductions translate to hundreds of avoided premature deaths every year. We project that NO_2 reductions would result in avoiding approximately 590 premature deaths annually and $PM_{2.5}$ reductions would result in avoiding approximately 70 premature deaths annually. We predict that increases in O_3 would add approximately 50 premature deaths per year.

The largest pollutant and health benefits simulated are within communities with higher proportions of Black and Hispanic/Latino residents, highlighting the potential for eHDVs to reduce disproportionate and unjust air pollution and associated air-pollution attributable health burdens within historically marginalized populations. In sum, and considering various caveats to our analysis, this study demonstrates that transitioning 30% of HDVs to eHDVs has robust air quality and health benefits, including reduced NO_2 and $PM_{2.5}$ concentrations and associated health benefits, reduced air pollution disparities among population subgroups, and reduced CO_2 emissions.[8] Because the Proposed Rules are projected to result in a 56% zero-emitting medium and heavy-duty vehicle fleet in Illinois by 2050,[9] my analysis of the health benefits from a 30% electric HDV fleet in Chicago suggests that implementation of the Proposed Rules could eventually prevent hundreds of premature deaths in Illinois per year.

Another of my studies examined the impact of a transition of a one-to-one transition of internal combustion engine (ICE) vehicle miles traveled (VMT) to electric VMT (eVMT) across

[8] *Id.*
[9] Statement of Reasons at 21.

both HDVs and LDVs.[10] In the study, we again used the Weather Research Forecast and Community Multiscale Air Quality Modeling System air quality model, discussed above, to simulate the interplay between weather and atmospheric chemistry. The study assumed a 30% transition from ICE VMT to eVMT. This transition would result in "domain average decreases in all criteria pollutants: that is, NO_2 decreases −0.29 ppb (−10.3%) […] and $PM_{2.5}$ decreases −0.09 μg m^{-3} (−1.6%)."[11] The study showed a transition of 30% of VMT to eVMT would result in significantly fewer premature deaths in the Chicagoland area each year. Reductions in NO_2 emissions would result in a decrease of approximately 1120 premature deaths annually. Moreover, decreases in $PM_{2.5}$ would result in an estimated 170 fewer premature deaths. additional premature deaths.[12] This reduction in NO_2 and $PM_{2.5}$ levels would significantly benefit people of color communities and would result in large benefits for Black populations.

A 30% shift from VMT to eVMT also results in significant economic benefits. Reduced NO_2 emissions are estimated to result in savings of $10.75 billion per year due to fewer deaths, while reduced $PM_{2.5}$ is estimated to result in savings of $1.63 billion per year due to fewer deaths.[13] Overall, these findings show significant benefits to transitioning both HDVs and LDVs from ICE VMT to eVMT, particularly accruing in people of color communities.

IV. CONCLUSION

For the reasons given above and in the Statement of Reasons, I strongly support adoption of the Rules in Illinois. The passage of the Advanced Clean Cars II (ACC II) regulation, the Advanced Clean Trucks (ACT) regulation, and the Heavy-Duty Low NOx Omnibus (Low-NOx)

[10] M.A. Visa, et al., (2023). *Neighborhood-scale air quality, public health, and equity implications of multi-modal vehicle electrificatio*n, Environmental Research: Infrastructure & Sustainability, https://doi.org/10.1088/2634-4505/acf60d.
[11] *Id.*
[12] Models predicted an increase of 80 premature deaths due to increased levels of $MDA8O_3$, which is maximum daily average 8-hour ozone.
[13] Increased $MDA8O_3$ surface-levels are estimated to result in increased expenditures of $768 million per year.

regulations in Illinois stand to improve air quality, public health, and to concentrate those improvements in the very communities in Illinois that have historically suffered the most from poor air quality and its attendant health harms.

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- **SELECT PUBLICATIONS**

P.M. Graffy, A. Sunderraj, M.A. Visa, C. Miller, B.W. Barrett, S. Rao, S.F. Camilleri*, R.D. Harp, C. Li**, A. Brenneman, J. Chan, A. Kho, N. Allen & D.E. Horton (accepted) Methodological approaches for measuring the association between heat exposure and health outcomes: a comprehensive global scoping review, ***GeoHealth***.

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BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF JULIANA PINO
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Juliana Pino in support of Rule Proponents' regulatory proposal for presentation at the December 2 and 3, 2024 hearing in the above-captioned matter.

TESTIMONY OF JULIANA PINO

I. INTRODUCTION

My name is Juliana Pino and I am Deputy Director of the Little Village Environmental Justice Organization (LVEJO), where I have worked since 2015. LVEJO is a Chicago-based public interest group whose mission is to advance environmental justice in the Little Village neighborhood of Chicago by organizing and advancing the interests of immigrant, low-income, and working-class families. I have 10 years of professional experience in environmental justice policy work.

My current work and responsibilities include collaborating with LVEJO's directorial team to manage organizational strategy, development, policies, and programs underscored by a focus on the well-being of our team, growing a just culture, and continually aligning our

practices with our mission and values. I am also responsible for creating and directing LVEJO's policy program. This involves analyzing and advocating for environmental justice in local, state, and federal environmental policy. Additionally, I currently serve on multiple government bodies on behalf of LVEJO, including the Illinois Electric Vehicle Permitting Task Force and the City of Chicago Environmental Equity Working Group. Some of the various legislation I helped negotiate in my role at LVEJO include the 2021 Climate and Equitable Jobs Act (CEJA), the 2021 Lead Service Line (LSL) Replacement and Notification Act, the 2017 Preventing Lead in Drinking Water Act, the 2016 Future Energy Jobs Act (FEJA), and the 2016 law that reformed the Illinois Commission on Environmental Justice.

My curriculum vitae/resume is attached hereto.

II. QUALIFICATIONS

I have a Bachelor of Arts, with honors, in East Asian Languages and Civilizations from the University of Chicago, a Master of Public Policy with a specialization in Public Policy Analysis and a Master of Science in Natural Resources and Environment with specializations in Environmental Justice, Environmental Policy & Planning, both from the University of Michigan.

From 2013-2014, I worked in research roles on a multi-year research study carried out by the University of Michigan for the U.S. Department of Agriculture while attending the University of Michigan. In 2014, I also served as a Water Policy and Collaborative Governance Intern for the National Oceanic and Atmospheric Administration. From 2014-2015, I worked for the Great Lakes Commission, first as a Water Policy and Collaborative Governance Intern, then later as a Policy and Governance Associate. In 2015, I also served as a Graduate Instructor in Values & Ethics in Public Policy at the University of Michigan.

I first began working for LVEJO in March 2015, as a Policy and Research Associate, before becoming Policy Director later that same year. I became Deputy Director of LVEJO in 2024.

III. PURPOSE OF TESTIMONY

I am submitting this pre-filed testimony in support of Rule Proponents' regulatory proposal, which requests that the Illinois Pollution Control Board adopt the Advanced Clean Cars II (ACC II), Advanced Clean Truck (ACT), and Heavy-Medium Duty Low NOx Omnibus (Low-NOx) regulations (collectively referred to as the "Clean Car and Truck Standards" or simply the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code.

Specifically, I am testifying to the disparate impacts of air pollution on environmental justice[1] (EJ) communities throughout the state as described in section III of Rule Proponents' Statement of Reasons. I will speak to the disproportionate share of vehicle emissions concentrated in EJ communities in Chicago and how those vehicle emissions affect the health and quality of life of residents of those communities. I will also testify to the need for the Board to promptly consider and adopt the Rules, as described in section II.c of the Statement of Reasons.

[1] EJ communities include low-income communities and communities of color that "bear disproportionately high or adverse effects of environmental pollution," and experience the greatest combined environmental, health, and social stressors. *See* Statement of Reasons at 10, (citing 415 ILCS 155/5). The concept and use of the phrase "environmental justice communities" is rooted in decades of community advocacy that identified both discriminatory racial motives in the implementation of environmental laws and racially disparate impacts of environmental law and policy decisions, which produce and perpetuate the disproportionate distribution of environmental harms and benefits and which can constitute violations of federal civil rights laws.

My pre-filed testimony addresses the topics indicated in the Statement of Reasons as being addressed in the testimony of José Acosta and is offered on behalf of LVEJO in lieu of testimony from Mr. Acosta.[2]

IV. DISPARATE IMPACTS OF AIR POLLUTION

Air pollution from vehicles significantly and disproportionately harms the health of EJ communities, including the communities that LVEJO works to support. As discussed in section III.d of the Statement of Reasons, Illinois vehicles significantly contribute to elevated pollution levels in environmental justice zip codes in Chicago.[3] Other witnesses detail this pollution and its health harms, which include premature deaths, heart attacks, asthma attacks, and other effects.[4]

This comes as no surprise to residents of EJ communities in Illinois who experience high volumes of polluting heavy-duty vehicle traffic day in and day out. A 2023 study, which LVEJO helped lead, showed that over 400 trucks per hour move through intersections in some EJ communities like McKinley Park and Archer Heights.[5] The study design was sure to select sites with especially sensitive populations as well as reference sites to gain a fuller understanding regarding the impact of truck emissions in Chicago. Historically racist policies and practices[6] have systemically funneled industrial facilities, rail yards, and highways—and the diesel truck

[2] Statement of Reasons at 68.
[3] *Id.* at 31 (citing Exhibit 8: Sierra Club, et al., Letter to Gov. JB Pritzker Re: Vehicles' Contribution to Illinois Ozone Pollution: Implications for Public Health and Environmental Justice in Illinois, (Nov. 1, 2023), https://www.sierraclub.org/sites/default/files/2023-11/IL%20Sonoma%20Report_Letter.pdf at 14-16).
[4] *See, e.g.*, *id.* at §§ III.b-c.
[5] *Id.* at 31 (citing Carolina Macias, et al., *Chicago Truck Data Portal*, (2023), https://apps.cnt.org/truck-count-tracker/ ("Chicago Truck Data Portal")).
[6] U.S. Dept. of Hous. and Urban Dev., Letter of Findings of Noncompliance with Title VI and Section 109, *Se. Envtl. Task Force, et al. v. City of Chi.*, Case No. 05-20-0419-6/8/9, (July 19, 2022), https://www hud.gov/sites/dfiles/Main/documents/Letter_of_Finding_05-20-0419_City_of_Chicago.pdf, at 13-16 (describing City of Chicago land use laws and policies, specifically the "Industrial Corridor" system, that concentrate industry in people of color communities).

traffic that come with them—into these communities, some of which are just across Interstate 55 and the Sanitary and Ship Canal from Little Village, where LVEJO operates.[7] Little Village/South Lawndale experiences similarly concerning levels of truck traffic, with one intersection averaging over 160 trucks per hour.[8] This study was inspired by students at a high school in Little Village, who documented that, just outside of their school, a truck passed once every minute.[9] The impact of truck emissions on EJ communities is significant and unescapable, especially for the most vulnerable groups, the elderly and children. A few examples help illustrate how this can play out. Within one third of a mile of the Brighton Park Community Campus there is an elementary school, a middle school, a high school, and a retirement center for the elderly. Between the 8:00 AM and 5:00 PM hours, when these places are at their busiest with those students and senior citizens coming and going, over 850 trucks pass through the adjoining S. Western Blvd. & W. 47th St. intersection.[10] Less than one third of a mile from the Nathan S. Davis elementary school at least 60 trucks pass per hour between 11:00 AM and 3:00 PM, including 90 per hour during the noon hour that can coincide with student's outdoor recess times. This census tract contains a significant number of Hispanic people; Hispanic middle school students in Chicago experience asthma at rate of about double of white students.[11]

Not only are EJ communities disproportionately exposed to vehicle pollution, but they are also more likely to be seriously harmed by that pollution, due to the interaction of

[7] Statement of Reasons at 10 (citing Chicago Truck Data Portal).
[8] Chicago Truck Data Portal. Average 24-hour truck traffic data reported for intersection of South Pulaski Road and West 36th Street. Peak hourly truck traffic at this intersection was 335 trucks per hour.
[9] *Id.*; Voluntary Compliance Agreement/Conciliation Agreement Between U.S. Dept. of Hous. and Urban Dev., Office of Fair Hous. and Equal Opportunity and the City of Chi.; *HUD Case No. 05-20-0419-6/8/9*, https://www.hud.gov/sites/dfiles/Main/documents/Signed_VCA_Chicago.pdf.
[10] Chicago Truck Data Portal. Data can be filtered in the online tool for S Kedzie Ave & Corwith Intermodal Facility b/w W 40th Pl & W 41st St.
[11] Exhibit 6: *Respiratory Health Association, Racial Disparities in Childhood Asthma: Chicago, 2016-2021*, (May 2022), https://resphealth.org/wp-content/uploads/2022/05/Updated-Asthma-Disparities-Report.pdf.

disproportionate air pollution burdens with other structural inequities that are concentrated in these same communities.[12] People in EJ communities suffer higher rates of pre-existing health conditions like asthma that can be aggravated by air pollution.[13] And they often lack adequate access to health care, which makes it more difficult to address these health problems.[14] Many EJ communities are also in "heat islands" with dense heat-absorbing urban development and relatively little tree cover or green space, which makes them more susceptible to extreme heat and other impacts of climate change that is being driven in part by transportation emissions.[15]

V. THE NEED FOR PROMPT CONSIDERATION OF THE RULES

Adopting the proposed Rules will significantly reduce pollution from vehicles in Illinois, as described further by other witnesses.[16] This will reduce the harms from vehicle pollution—especially pollution from heavy-duty vehicles—that are disproportionately felt by EJ communities.[17] The Rules will also reduce the cumulative burdens on EJ communities from interactions between air pollution and other environmental, health, and social stressors. The ACC II Rule's provision for environmental justice vehicle credits will also help ensure that EJ communities can access and benefit from zero-emission vehicles through, for example, community-based clean mobility programs.[18]

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[12] Statement of Reasons at 32-33.
[13] For example, Black Illinois residents had six times higher rates of Asthma-related ER visits white Illinois residents. *Id.* (citing Ill. Dept. of Public Health, *Asthma Trends: Hospital Discharge Data, 2016-2019*, (Sept. 2, 2020), https://dph.illinois.gov/content/dam/soi/en/web/idph/files/publications/asthma-trends-hospital-discharge-data-2016-2019.pdf).
[14] *Id.* at 32 (citing Rockville (MD): Agency for Healthcare Research and Quality (US), *2021 National Healthcare Quality and Disparities Report: Access to Healthcare and Disparities in Access*, (Dec. 2021), https://www ncbi.nlm.nih.gov/books/NBK578537/).
[15] *Id.* at 24-25 (citing Metropolitan Mayors Caucus, *Climate Action Plan for the Chicago Region*, (2021), https://mayorscaucus.org/wp-content/uploads/2021/06/RegionalCAP_primary_and_appendices_062321-02.pdf at 6).
[16] *See, e.g.*, *id.* at §§ IV.a.ii, IV.b.ii, IV.c.ii.
[17] *See id.* at 21 ("The negative health impacts of $PM_{2.5}$ are felt most in underserved low-income communities and communities of color, so the rules' $PM_{2.5}$ reductions will be delivered in the places where they will make the biggest impacts in real health outcomes for real people.").
[18] *See id.* at 44.

More generally, the proposed Rules will help ensure that Illinois meets CEJA's statutory target of putting one million electric vehicles on Illinois roads by 2030, achieves the state's commitment to reach net-zero emissions economy-wide no later than 2050, and expeditiously reaches attainment of the federal Clean Air Act's National Ambient Air Quality Standards.[19] Decisive action in the next few years will be critical for meeting CEJA's fast-approaching 2030 target, and for meeting longer-term goals due to the long lifetimes of newly-sold vehicles.

Because the federal Clean Air Act requires a two-year lead time between when the proposed Rules are adopted and when they can take effect, the Pollution Control Board should proceed promptly to adopt the Rules as soon as possible.[20] This will allow the Rules to begin improving air quality in EJ communities and throughout Illinois as quickly as possible, avoid the additional health harms and environmental injustices from an additional model year of higher-polluting vehicle sales, and help ensure that Illinois meets short- and long-term goals under CEJA and the Clean Air Act.

VI. CONCLUSION

For the reasons given above and in the Statement of Reasons, I urge the Illinois Pollution Control Board to adopt the proposed Clean Car and Truck Standards to reduce health-harming pollution and its disproportionate impact on environmental justice communities in Illinois.

Thank you for the opportunity to testify. I am prepared to answer any questions from hearing participants regarding my testimony above as well as the sections of the Rule Proponents' Statement of Reasons identified above.

[19] *See id.* at 20-21.
[20] *See id.* at 21-22.

Dated: September 16, 2024

Juliana Pino
Deputy Director
Little Village Environmental Justice Organization (LVEJO)
325 W Greenleaf Ave., Apt. 1E,
Chicago, IL 60626

jpino@lvejo.org
LinkedIn

JULIANA PINO

PROFESSIONAL EXPERIENCE – CURRENT AND RECENT

LITTLE VILLAGE ENVIRONMENTAL JUSTICE ORGANIZATION (Chicago, IL)

Deputy Director July 2024 – Present
Policy Director December 2015 – June 2024
Policy and Research Associate March 2015 – December 2015

- Create and direct policy program: analyze and advocate for environmental justice and economic justice in local, state, and federal environmental policy via executing complex, multi-jurisdictional campaign strategies including legislative, regulatory, administrative, and legal interventions
- Collaborate to build and lead local, statewide, regional, and national coalitions with strong cross-sector alignment, co-creating robust decision-making frameworks that center the perspectives of those most affected by both broader structural oppression and the specific policies being deliberated
- Negotiate and mediate in multi-party statutory development in environmental and economic policy, including energy systems, food systems, water quality, air quality, brownfields, toxics, land use, transportation, workforce development, and other key areas
- Advance energy democracy and community self-determination in regulatory and legislative arenas and meaningful participatory management of shared resources; center frontline leaders as generators of transformative policy governance and models
- Provide technical assistance to directly impacted community groups in Chicago, Midwest, and nationally
- Serve on three-person Directorial team to run community-based organization with 2880% budget tenure increase
- Manage organizational strategy, development, policies, and programs underscored by a focus on the well-being of our team, growing a just culture, and continually aligning our practices with our mission and values
- **Leader/Negotiator in Select Legislation**: 2021 Climate and Equitable Jobs Act (CEJA) most equity-focused climate and energy law in the nation with path to 100% clean energy by 2050 and suite of policies, programs, and thousands of jobs for Black and Brown Illinoisans and frontline communities impacted by energy and transportation industries; 2021 Lead Service Line (LSL) Replacement and Notification Act making Illinois 3rd state in nation to require eradication of toxic LSLs; 2017 law mandates lead in water testing at schools and daycares in IL; 2016 Future Energy Jobs Act previously the broadest energy system reform in Illinois state history: first lead negotiator for low-income households and environmental justice communities; 2016 law reformed Illinois Commission on Environmental Justice, ensuring direct frontline community representation
- **Service in Select Government Advisory Bodies**: [Current] Illinois Electric Vehicle Permitting Task Force (member), City of Chicago Environmental Equity Working Group (member), Illinois Commission on Environmental Justice (Staff to Chair Kim Wasserman) [Past: Administrative Transition] City of Chicago Mayor Brandon Johnson's Chicago for the People, Environmental Justice Subcommittee (Co-Chair over all issues related to environment); Governor J.B. Pritzker Powering Illinois' Future Committee (LVEJO proxy); Former City of Chicago Mayor Lori Lightfoot's Better Together Chicago, Environment Committee (LVEJO proxy)

ILLINOIS CLEAN ENERGY COMMUNITY FOUNDATION (Chicago, IL)

Chairman and Trustee, Board of Directors December 2023 – Present

- Appointed by Governor J.B. Pritzker to term leading 6-member Trustee Board of foundation that has awarded $351 million in grants to Illinois schools, municipalities, local governments, and nonprofits since founding
- Ensure fiduciary duties of Trustees on the Board are fulfilled and grantmaking is managed effectively, furthering the mission to support projects that improve energy efficiency, advance the development and use of renewable energy resources, and protect natural areas and wildlife habitat in communities across Illinois

GRID ALTERNATIVES (Oakland, CA; Remote)

Member, National Board of Directors May 2024 – Present

- Member of 6-person Board for the nation's largest nonprofit solar installer and leader in low-income solar policy with $100 million+ budget, providing oversight to ensure sound fiscal, operational, and strategic decision-making

ILLINOIS ENVIRONMENTAL COUNCIL (Chicago, IL)
Elected Member, Board of Directors October 2016 – Present

- Serve on Board of Directors of statewide organization representing 100+ member organizations comprising the environmental community, working to promote sound environmental laws and policies in Illinois through education and legislative advocacy at municipal, county, state, and national jurisdictions

ASYLUM SEEKER ADVOCACY PROJECT (Chicago, IL)
Member, Board of Directors January 2021 – December 2023

- Serve on Board of Directors of national organization making transformative change with 500,000+ asylum seeker members driving immigration advocacy and receiving legal assistance and community support

JULIANA PINO CONSULTING (Chicago, IL)
Strategy Consultant (Sole Proprietor) January 2004 – Present

- Provide equity strategy, cross-sector alignment strategy, information dissemination strategy, organizational development strategy, corporate identity branding, front-end development, and web management consulting services to individuals, non-profits, and small to mid-size businesses serving their communities to create change

SELECT AWARDS

Elevate Energy Climate Changemakers Award – 2020 – Illinois | "Elevate Energy focuses on building equity through climate action. As part of our 20th anniversary, we're highlighting leaders in equity work and climate action across Illinois."

Rachel's Network Catalyst Award – 2019 – National | "Rachel's Network Catalyst Award provided (6) women leaders of color who are building a healthier, safer, and more just world with: a $10,000 prize; networking opportunities; and national recognition within the environmental, philanthropic, and women's leadership communities."

Illinois Legislative Green Caucus Karen May Environmental Leadership Award – 2019 – Illinois | "The Karen May Environmental Leadership Award is presented by leaders of the Illinois Legislative Green Caucus to one exemplary environmental advocate each year." Awarded for critical role in creation of CEJA and advancing climate and energy legislation.

Grist 50 Fixer – 2018 – International/National | "Each year, Grist searches high and low for the most inspiring innovators and do-ers working on fresh solutions to the planet's biggest problems. […] collection of 50 Fixers who are building a sustainable world that works for everyone. The Grist 50 shows what a vibrant, diverse sustainability movement looks like. Last year's list reached and inspired 12 million readers."

People for Community Recovery President William Clinton Award – 2018 – Illinois | "For commitment to ensuring communities of color surviving environmental racism understand their conditions and lead policy change."

Midwest Energy News – 40 Under 40 – 2017 – Midwest | "Midwest Energy News' 40 Under 40 award program highlights emerging leaders throughout the region and their work in America's transition to a clean energy economy."

EDUCATION

University of Michigan (Ann Arbor, MI)
Master of Public Policy, GERALD R. FORD SCHOOL OF PUBLIC POLICY May 2015
Master of Science, **Natural Resources and Environment: Environmental Justice**, **Environmental Policy & Planning**, SCHOOL FOR ENVIRONMENT AND SUSTAINABILITY

University of Chicago (Chicago, IL)
Bachelor of Arts, **East Asian Languages and Civilizations, with Honors** June 2008

- ***Focus:*** Post-imperial Chinese social history, collective memory, and their relationship to domestic and foreign policy

Princeton University (Beijing, P.R.C.) Full-time Mandarin Chinese study in top immersion program. Summer 2006

SELECT PROFESSIONAL EXPERIENCE – PAST ROLES

GREAT LAKES COMMISSION | Policy and Governance Associate	09/2014 – 05/2015
Water Policy and Collaborative Governance Intern	05/2014 – 08/2014
UNIVERSITY OF MICHIGAN | Graduate Instructor, Values & Ethics in Public Policy	01/2015 – 05/2015
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION	
Water Policy and Collaborative Governance Intern	05/2014 – 09/2014
SCHOOL FOR ENVIRONMENT AND SUSTAINABILITY, UNIVERSITY OF MICHIGAN	
Graduate Student Research Assistant to Professor Dorceta E. Taylor	11/2013 – 09/2014
Graduate Student Research Assistant to Professor Maria Carmen Lemos	01/2013 – 05/2013
U.S. DEPARTMENT OF AGRICULTURE | Master's Student Consultant	04/ 2013 – 04/2014
U.S.-CHINA CHAMBER OF COMMERCE | Associate Director (of the Chamber)	06/2008 – 03/2010

LANGUAGES AND COMPUTER SKILLS

LANGUAGES (Writing/Speaking): **Spanish** (Native), **Mandarin Chinese** (Professional), **German** (Basic)

COMPUTING: Statistics (Stata, SPSS, Excel, RStudio); Microsoft Office (Word, Excel, PowerPoint, Outlook); Online Collaboration (Google Workspace, Microsoft Teams/SharePoint, Zoom, WebEx, Jitsi Meet, Asana, Slack, Basecamp, Trello, Miro, Lucidchart, Airtable, Monday); Design (Canva, Photoshop, Illustrator, InDesign); Web Dev. (HTML/CSS, Python, JavaScript, jQuery, PHP, Ruby); Social Media and Email Marketing (LinkedIn, Twitter, Facebook, Instagram, TikTok, Mailchimp, Constant Contact); Citation Managers (Zotero, EndNote, Mendeley)

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

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IN THE MATTER OF:	)	
	)	R2024-017
PROPOSED CLEAN CAR AND	)	
TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF BRIAN URBASZEWSKI
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Brian Urbaszewski in support of Rule Proponents' regulatory proposal for presentation at the December 2 and 3, 2024, hearing in the above-captioned matter.

TESTIMONY OF BRIAN URBASZEWSKI

I. INTRODUCTION

My name is Brian Urbaszewski, and I am the Director of Environmental Health Programs at Respiratory Health Association (RHA). RHA is an Illinois-based, public health advocacy group whose mission is to prevent lung disease, promote clean air, and help people live better through education, research, and policy change.

II. QUALIFICATIONS

I hold a Bachelor's degree in Geographic Studies from the University of Chicago and a Master's of Urban Planning and Policy from the University of Illinois – Chicago. I have also done post-graduate work at the University of California – Los Angeles. I have 31 years of professional experience in environmental policy. I have served as Director of Environmental

Health Programs at RHA for over 25 years, where I have worked with community and environmental justice groups throughout Illinois in efforts to address local environmental health threats from coal-fired power plants, to refineries and industrial facilities, as well as mobile source emissions from cars, buses, trucks, and locomotives. I manage RHA's advocacy and programs related to clean air issues including climate change, clean energy, and electric vehicles. I have also worked to educate the press and policy makers on clean air issues of concern, as well as policy solutions to those problems. I have been the main contact for RHA in legal actions against large polluters as well as RHA's representative in legislative and administrative hearings dealing with air pollution policy. Previously, I worked for the Illinois Environmental Protection Agency and within the office of Illinois Governor Jim Edgar. My curriculum vitae/resume is attached hereto.

III. PURPOSE OF TESTIMONY

I am submitting this pre-filed testimony in support of Rule Proponents' regulatory proposal, which requests that the Illinois Pollution Control Board adopt the Advanced Clean Cars II (ACC II), Advanced Clean Truck (ACT), and Heavy-Medium Duty Low NOx Omnibus (Low NOx) regulations (collectively referred to as the "Clean Car and Truck Standards" or simply the "Rules") by adding a new code section, 35 Ill. Admin. Code 242, to the Illinois Administrative Code.

Specifically, I am testifying to the public health benefits of reducing air pollution from the transportation sector; to various state, federal, and utility policies and resources that promote and support vehicle electrification; and to the research and publications cited throughout the Statement of Reasons that RHA authored or participated in producing. In particular, I will testify

in support of material described in Sections II.b., III.b.-d., IV.a.iv., and IV.b.iv of the Statement of Reasons.

IV. THE RULES' ALIGNMENT WITH STATE TARGETS AND GOALS

With my experience as the Director of Environmental Health Programs and the lead regulatory and legislative negotiator for RHA, I am able to testify as to how the Rules closely align with Illinois' electric vehicle adoption targets set out in the Climate and Equitable Jobs Act (CEJA) and the longer-term climate goals established by Governor Pritzker's Executive Order 2019-06.

I was involved in the passage of CEJA through my work as RHA's representative on the Illinois Clean Jobs Coalition, which was a key player in the negotiation of the bill. I was also involved in the development and passage of numerous pieces of Illinois state legislation regarding air pollution and climate change prior to CEJA, including an older bill that RHA had championed, House Bill 2899, which directed funds towards an EV rebate program and was ultimately incorporated into CEJA.[1] As discussed in Section II.b of the Statement of Reasons, CEJA, passed by the Illinois legislature in 2021, codifies the state's goal of putting one million electric vehicles on the roads of Illinois by 2030.[2] I can testify that this legislative goal established in CEJA would be met by requiring manufacturers to increase light-duty ZEV sales in Illinois year-over-year, as under the ACC II rule, which, if adopted in Illinois, would result in well-over the goal of one million ZEVs on Illinois roads by 2030.[3] Adopting the ACC II rule would drastically ramp up light-duty vehicle adoption and lead to meeting or exceeding CEJA's light-duty ZEV adoption target of one million electric vehicles by 2030 with a single policy lever.

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[1] HB 2899, 101st Gen. Assemb., Reg. Sess. (Ill. 2019), https://www.ilga.gov/legislation/BillStatus.asp?DocNum=2899&GAID=15&DocTypeID=HB&LegId=119208&SessionID=108&GA=101.

[2] 20 ILCS § 627/45. Climate and Equitable Jobs Act, 2021 Ill. Legis. Serv. P.A. 102-662 (West). CEJA also aims to decarbonize the state's energy sector by 2045. 20 ILCS § 3855/1–5.

[3] Statement of Reasons at 18, 21 (citing Exhibit 4: ERM, *Analysis Update: Illinois Advanced Clean Cars II Program* ("ERM analysis")).

CEJA is also a landmark statute for its commitment to principles of equity and environmental justice. As a general matter in Illinois, low-income communities and communities of color live in places where they experience a disproportionate share of vehicular air pollution sources and bear disproportionately high health burdens as a result; CEJA includes several provisions aimed at addressing these inequities. I can testify to how adopting the Rules furthers that objective. The General Assembly justified its decision to invest in the clean energy sector because of its potential to be "a vehicle for expanding equitable access to public health, safety, a cleaner environment, quality jobs, and economic opportunity."[4] The General Assembly found specifically that expanding EV adoption equitably required increasing vehicle charging infrastructure throughout the state, "especially in low-income and EJ communities, where levels of air pollution burden tend to be higher."[5] Thus, the General Assembly earmarked significant investments in workforce development for communities impacted by the energy transition, and imposed equity considerations in its design of a statewide EV purchase rebate, including directly prioritizing rebates to "low income" EV purchasers.[6] The proposed ACC II, ACT, and Low NOx rules in particular will help the state meet these policy goals and advance the state's commitment to environmental justice by decreasing mobile source air pollution in disadvantaged communities, who currently endure some of the worst air quality within the state.[7] In particular, the proposed Rules will significantly reduce emissions of the ozone-precursor nitrogen oxides, including NO_2,

[4] 20 ILCS § 730/5–10.
[5] 20 ILCS § 627/45(a)(7).
[6] State of Illinois, "Illinois Drives Electric: CEJA and Climate Action," (2024), https://ev.illinois.gov/illinois-commitment/ceja-and-climate-action html ("Equity is a driving factor throughout CEJA's programs and is a top priority of Governor Pritzker's"); 20 ILCS § 605/605–1075 (creating an "Energy Transition Assistance Fund"); 415 ILCS §§ 120/10, 120/27 (creating an electric vehicle rebate and definitions of "[e]nvironmental justice communit[ies]" and "[l]ow income" for purposes of focusing benefits and specifically directing that administrators "prioritize" rebate applications from low-income purchasers).
[7] U.S. EPA, *Illinois Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants*, (May 31, 2024), https://www3.epa.gov/airquality/greenbook/anayo_il html.

an ozone pre-cursor that recent studies identify as having serious health impacts at levels lower than current regulatory thresholds.[8] I can testify that the Rules will help the state meet CEJA's policy goals regarding equity on air pollution issues and will advance the state's more general commitments to environmental justice.

Section II.b of the Statement of Reasons outlines the Rules' importance in attaining Illinois' long-term climate goals. Governor Pritzker has, by Executive Order, set a long-term decarbonization target, recognizing that "the State of Illinois . . . must take action immediately in order to prevent further impacts of climate change" and "commit[ting] to the principles of the Paris Climate Agreement."[9] To meet the Paris Climate Agreement goal of keeping global warming to no more than 1.5°C, emissions must reach net zero by 2050.[10] I can testify as to how the mechanics of the Rules can help Illinois achieve that long-term target of net zero transportation sector emissions by 2050. Vehicles often remain on the road for fifteen years or more, and thus policies aimed at reaching net-zero transportation sector emissions by 2050 must lead to the end of new sales of internal combustion engine vehicles—across light-, medium-, and heavy-duty vehicle classes—by approximately 2035, which is the target set for passenger vehicles by the ACC II rule. The ACT rule will not require 100% zero emission medium- and heavy-duty vehicle sales by 2035 but will significantly accelerate progress toward that benchmark as compared with likely market trends in the absence of the proposed Rules.

[8] Sara F. Camilleri, et al., "Air quality, health and equity implications of electrifying heavy-duty vehicles," *Nat. Sustain.*, 6, 1643-1653, (Sept. 5, 2023), https://doi.org/10.1038/s41893-023-01219-0, ("Camilleri HDV Report").
[9] Exec. Dep't of State of Ill., No. 2019-06, Executive Order Joining the US Climate Alliance and Committing to the Principles of the Paris Climate Agreement (2019), https://www2.illinois.gov/IISNews/19626-Executive_Order_2019-06.pdf ("Exec. Order 2019-06").
[10] United Nations, "For a livable climate: Net-zero commitments must be backed by credible action," (2023), https://www.un.org/en/climatechange/net-zero-coalition ("U.N. Net-Zero Coalition").

V. PUBLIC AND PRIVATE INVESTMENTS IN ELECTRIC VEHICLES IN-STATE MAKE ILLINOIS READY FOR THE RULES.

I can testify to the significant investments in recent years in light-, medium-, and heavy-duty charging infrastructure by the federal government, state of Illinois, and regulated utilities. When the investments in EV charging infrastructure are paired with the ACC II and ACT rules, which spur zero-emission EV sales, Illinois' long-term goal of reaching net-zero transportation sector emissions by 2050 becomes within reach. I can testify as to the descriptions of these investments as laid out in Section II.b of the Statement of Reasons.

The state of Illinois itself has committed hundreds of millions of dollars towards electric vehicles infrastructure through various programs.[11] Even since the Statement of Reasons was filed, the Illinois EPA announced the opening of the first four EV charging sites under the Illinois EPA's Driving a Cleaner Illinois program under CEJA,[12] with many more to open in the coming months. Additionally, Illinois just recently received $430 million in funding from the EPA's Climate

[11] *See* Fed. Highway Admin., 5-year National Electric Vehicle Infrastructure Funding by State, U.S. Dep't of Transportation, (Sept. 13, 2022), https://www fhwa.dot.gov/bipartisan-infrastructure-law/evs_5year_nevi_funding_by_state.cfm (Illinois receives $148.6 million in federal National Electric Vehicle Infrastructure (NEVI) funding); Ill. Dep't of Transp., Notice of Funding Opportunity, (Mar. 2024), https://idot.illinois.gov/content/dam/soi/en/web/idot/documents/transportation-system/planning/drive-electric/IDOT_NEVI_NOFO_FINAL.pdf (Illinois began rolling out first $50 million of NEVI funding in March 2024); State of Ill., "Gov. Pritzker Announces $14.9M in Federal Funding for Illinois' Community Charging Program," (Jan. 11, 2024), https://www.illinois.gov/news/press-release.29498.html (The Illinois Finance Authority was awarded $14.9 million in competitive federal Charging and Fueling Infrastructure (CFI) funds in January 2024); Pub. Act 101-0029, 101st Gen. Assemb., (Ill. 2019) (Illinois has dedicated $70 million in state capital funds to EV charging grants); State of Ill., "Illinois EPA Announces $25.1 Million in Grant Awards for Public Electric Vehicle Charging Infrastructure," (Apr. 10, 2024), https://www.illinois.gov/news/press-release.29878.html ($25.1 million of the state capital funds were awarded for public EV charging infrastructure projects in April 2024); State of Ill., "Illinois EPA Announces $44 Million Notice of Funding Opportunity for Public Electric Vehicle Charging Infrastructure," (Mar. 22, 2024), https://www.illinois.gov/news/press-release.29789 html (additional $44 million in funding for public EV charging infrastructure was made available in March 2024); John Pletz, "Illinois EPA awards $12.6M to build initial wave of EV chargers," (June 5, 2023), https://www.chicagobusiness.com/technology/illinois-epa-awards-126m-build-ev-chargers (Illinois allotting $12.6 million from settlement of multi-state Volkswagen Clean Air Act settlement to EV charging infrastructure).

[12] State of Ill., "Illinois EPA Announces Opening of First State-Funded Public Electric Vehicle Chargers," (July 31, 2024), https://epa.illinois.gov/content/dam/soi/en/web/epa/about-us/documents/news-releases/2024/07.31.2024-IEPA-First-State-Funded-EV-Chargers-Final.pdf.

Pollution Reduction Grants (CPRG).[13] Illinois applied for the funding through the Illinois Climate Action Plan submitted in March 2024.[14] Roughly $115 million of that funding addresses clean transportation and freight, ranging from programs that address heavy-duty charging infrastructure to programs that support deployment of on and off-road electric freight vehicles.[15] In 2022, the State committed the remaining $88 million of the original $108.7 million allocated to it under the 2016 multistate Clean Air Act settlement with Volkswagen settlement to electric vehicles and EV infrastructure exclusively (except for a small amount to cover IEPA administration of the entire program).[16] Moreover, Illinois' 2023 fiscal year state budget included $30 million for state vehicle fleet electrification,[17] and IDOT applied for and was also awarded $7.1 million in federal funds in January 2024 to fix and replace aging electric vehicle chargers across state from the Federal Highway Administration's Electric Vehicle Charger Reliability and Accessibility Program.[18]

Regulated electric utilities, such as ComEd and Ameren, are making significant investments in EV charging infrastructure and supporting vehicle electrification through both consulting with fleet owners and implementing favorable interconnection policies as part of the CEJA Beneficial Electrification Plan process. The utilities' Beneficial Electrification plans provide consumer rebates for homeowners, businesses, and government entities that install EV

[13] Ill. EPA, "State of Illinois: Climate Pollution Reduction Grant Implementation Grant," (April 1, 2024), https://epa.illinois.gov/content/dam/soi/en/web/epa/topics/climate/documents/soi-cprg-implementation-grant.pdf ("Ill. EPA CPRG").
[14] Ill. EPA, "Priority Climate Action Plan," (Mar. 1, 2024), https://epa.illinois.gov/content/dam/soi/en/web/epa/topics/climate/documents/Illinois%20Priority%20Climate%20Action%20Plan.pdf.
[15] Ill. EPA CPRG, *supra* note 13.
[16] The categories where Volkswagen funds could be spent per the 2021 plan revision: 1) Up to 15% for light-duty ZEV supply equipment projects; 2) up to 32% for all-electric public transit projects; 3) up to 32% for all-electric school bus projects; and 4) up to 19% for class 4-8 local freight trucks (which will be replaced with new all-electric class 4-8 trucks). Ill. EPA, "VW Settlement," (2024), https://epa.illinois.gov/topics/air-quality/driving-a-cleaner-illinois/vw-settlement.html.
[17] State of Ill., "Illinois State Budget Fiscal Year 2023," (Feb. 2, 2023), https://budget.illinois.gov/content/dam/soi/en/web/budget/documents/budget-book/fy2023-budget-book/fiscal-year-2023-operating-budget.pdf.
[18] Ill. Dep't of Transp., "IDOT awarded $7.1 million in federal funds to fix, replace electric vehicle chargers across state," (Jan. 19, 2024), https://idot.illinois.gov/news/press-release.29534.html.

chargers.[19] RHA has intervened in Beneficial Electrification Plan proceedings before the Illinois Commerce Commission; as RHA's representative in those proceedings, I can testify to how the utilities' plans support the feasibility of Illinois' implementing the proposed Rules.

There has also been significant independent investment by the private sector, where, for example, Amazon has spent between $50-90 million on charging hardware for its fleet of electric delivery vehicles built by Rivian, which has its primary manufacturing plant in Illinois.[20] Similarly, state agencies,[21] school districts, and transit agencies[22] have been investing directly to build out electric fleets and associated infrastructure for years. Further, the state of Illinois has adopted various legislative policies geared towards requiring public entities to use EVs and facilitating EV usage among private citizens,[23] which enhances the existing demand for EVs referenced above.

[19] Through the CEJA Beneficial Electrification Plan process, ComEd made $5 million available in February 2024 for consumer rebates for homeowners installing EV chargers at residences. An additional approved $5 million is approved for spending in 2025. And while not able to cover the costs of the EV charging units themselves, ComEd's ICC-approved plan also allowed the utility to move forward in offering $30 million in 2024 "make-ready" rebates to businesses and governments installing EV charging units that aim to cover the preparatory and ancillary work needed to electrically connect and power EV charging equipment that is installed. The Utility has made that rebate funding available to its customers and has approval to offer another $30 million for this purpose in 2025. Final Order, *Commonwealth Edison Company Petition for Approval of Beneficial Electrification Plan*, Ill. Commerce Comm'n 22-0432 & 22-0442 (cons.) (Mar. 23, 2023), at 68–69. *See also* ComEd, BE Plan, (compliance filing May 2023), https://icc.illinois.gov/downloads/public/edocket/589765.PDF.

[20] Matt Day, "How Amazon Became the Largest Private EV Charging Operator in the US," (Apr. 15, 2024), https://www.bloomberg.com/news/articles/2024-04-15/amazon-electric-vans-powered-by-17-000-ev-chargers.

[21] Illinois Department of Transportation purchased 50 battery-electric paratransit vans for agencies around the state this year. Ill. Dep't of Transp., "Illinois transit providers getting $57.1 million in new vehicles through IDOT's Consolidated Vehicle Procurement Program," (Feb. 15, 2024), https://idot.illinois.gov/news/press-release.29640.html.

[22] CTA and Pace have invested in electric transit buses and equipment. *See* Chi. Transit Auth., "Electric buses," (2024), https://www.transitchicago.com/electricbus/; Pace, "Pace's Inaugural Electric Bus Enters Service," (Jan. 19, 2024), https://www.pacebus.com/news/paces-inaugural-electric-bus-enters-service.

[23] *See* Pub. Act 103-0581, 103rd Gen. Assemb., (Ill. 2024) (state agencies, with some exceptions, must begin buying only zero-emission passenger vehicles by 2030); Pub. Act 103-0281, 103rd Gen. Assemb., (Ill. 2024) (prohibits, with some exceptions, northeastern Illinois transit agencies from buying non-zero emission buses after July 1, 2026); Pub. Act 103-0053, 103rd Gen. Assemb., (Ill. 2024) (requiring all new homes in Illinois to be EV charging capable and giving tenants' rights to install and use EV charging equipment).

I can testify that the overall effect of these investments is that significant resources are already being committed to purchase EVs and develop necessary charging infrastructure. Thus, there is already existing demand and policy and financial support for the expanded EV fleet, which the Rules will create by requiring manufacturers sell a steadily increasing percentage of new zero-emitting vehicles.

VI. THE RULES WOULD BENEFIT ILLINOIS BY CREATING DEMAND FOR EVS THAT ILLINOIS MANUFACTURERS PRODUCE.

Alongside the favorable state policy environment, variety of funding available to support vehicle electrification, and growing demand for EVs, I can testify that adoption of the Rules will support the EV manufacturing industry in Illinois. For example, the Rivian facility "boasts a production capacity of 150,000 vehicles annually."[24] Rivian anticipates increasing its total annual capacity of 215,000 vehicles because the facility received an $827 million incentive package from Illinois and recently unveiled a midsize SUV R2 model, which is scheduled to launch in 2026 and be produced in Illinois.[25] The company has hired approximately 8,000 people in Illinois,[26] and it produced 57,232 vehicles in 2023 at the Illinois facility.[27] Another example is the 900,000-square-foot Lion Electric facility in Joliet, IL, which, when announced, was described as "the largest all-electric U.S. plant dedicated to medium and heavy-duty commercial vehicle production."[28] In 2023, the plant had an expected manufacturing capacity of 2,500 all-electric school buses, and at

[24] Colin Velez, "Rivian gets millions in state incentives for Illinois factory expansion," (May 3, 2024), https://www.cbtnews.com/rivian-gets-millions-in-state-incentives-for-illinois-factory-expansion/.
[25] Ed Ludlow and Isis Almedia, "Rivian Secures $827 Million in Funding to Expand in Illinois," (May 2, 2024), https://www.ttnews.com/articles/rivian-827-million-illinois.
[26] *Id.*
[27] Mark Kane, "Rivian EV Production Hit A New Record In Q4 2023 Beating Annual Guidance," (Jan. 2, 2024), https://insideevs.com/news/702939/rivian-ev-production-deliveries-2023q4/.
[28] Lion Electric, "Lion Electric Celebrates Official Opening of Largest All-Electric U.S. Manufacturing Facility Dedicated to Medium and Heavy-Duty Commercial Vehicle Production," (July 21, 2023), https://thelionelectric.com/documents/en/PressRelease_JolietGrandOpening_July212023.pdf.

full scale, the facility could produce around 20,000 vehicles (which include buses and trucks) per year.[29] The plant lately has been struggling due to the slow rollout of government incentive programs that will function to increase demand for the electric school buses.[30] Just recently, the facility "laid off 300 more people or about a third of its workforce" amid dropping revenue.[31] This was the fourth round of layoffs since late 2023.[32]

Similarly, Stellantis has plans to invest in, expand, and reopen the shuttered Belvidere, Illinois, plant to build electric vehicles. Approximately $4.8 billion in new investment was slated for that plant in retooling and expansion.[33] However, by summer 2024 the company announced a delay in investing in the plant, though its 2023 union contract commits it to follow through on the plans.[34] The plant had over 1,350 employees when it closed in 2023, and the retooling and expansion of the facilities are expected to employ 4,000 to 5,000 union workers.[35] I can testify that the Rules would require that the EV supply has a place to be sold, thus providing a solid, long term source of demand that increases over time and addressing the lack of demand that currently hinders EV manufacturers like Lion.

[29] *Id.*
[30] John Lippert, "Lion Electric's Joliet plant operating significantly below capacity as US and Canadian subsidies lag," (July 31, 2024), https://www.chicagotribune.com/2024/07/31/lion-electric-layoffs-joliet/.
[31] *Id.*
[32] *Id.*
[33] David Shepardson and Abhijith Ganapavaram, "Stellantis delays investment plans for Illinois," (Aug. 20, 2024), https://www.reuters.com/business/autos-transportation/stellantis-confirms-belvidere-investment-plans-are-delayed-2024-08-20/.
[34] Detroit News, "UAW-Stellantis faceoff over Belvidere plant's future centers on a single contract sentence," (Sept. 3, 2024), https://www.chicagotribune.com/2024/09/03/uaw-stellantis-faceoff-over-belvidere-plants-future-centers-on-a-single-contract-sentence/.
[35] Todd Feurer, "Stellantis plant in Belvidere, Illinois, gets $334M from feds for reopening, manufacturing of EVs," (July 11, 2024), https://www.cbsnews.com/chicago/news/stellantis-assembly-plant-belvidere-federal-funding-electric-vehicles/.

VII. VEHICLE EMISSIONS' AIR QUALITY AND CLIMATE IMPACTS

a. Most Illinois residents live in areas plagued by unhealthy air.

As the Director of Environmental Health Programs and the lead regulatory and legislative negotiator with RHA for environmental policy, I can testify to the status of air quality and air pollution issues affecting Illinois residents. As explained in Section III.b of the Statement of Reasons, roughly nine million Illinois residents, comprising 71% of the state's population, live in areas that are designated as failing to meet EPA's health-based standards for ozone pollution.[36] The Chicago area is currently designated as in Moderate Nonattainment under EPA's 2015 health-based 8-hour ozone NAAQS, as is the Illinois portion of the St. Louis area.[37]

i. Ozone

The American Lung Association named Chicago "one of the most polluted cities" and in its 2023 "State of the Air" report gave Cook, DuPage, Kane, Lake, Madison, and McHenry counties the grade of "F" based on the number of high ozone days they experienced.[38] The health harms from ozone, the main component of smog, are well-established.[39] The Chicago nonattainment area has continued to log high 8-hour daily ozone values, reaching as high as 104 ppb in 2020—which is 48% higher than the NAAQS of 70 ppb—as well as highs of 96 ppb in both 2017 and 2018 and 95 ppb in 2019.[40] I can testify that the numbers above demonstrate that the

[36] U.S. EPA, *8-Hour Ozone (2015) Designated Area/State Information*, (Aug. 31, 2024), https://www3.epa.gov/airquality/greenbook/jbtc.html.
[37] *Id.*
[38] Am. Lung Ass'n, *2023 State of the Air Report Card: Illinois*, https://www.lung.org/research/sota/city-rankings/msas/chicago-naperville-il-in-wi#ozone.
[39] *See* U.S. EPA, *Policy Assessment for the Review of the Ozone National Ambient Air Quality Standards*, (EPA-HQ-OAR-2008-0699-0404), (Aug. 2014), https://www3.epa.gov/ttn/naaqs/standards/ozone/data/20140829pa.pdf; *see also* Exhibit 7 to Statement of Reasons: RHA Dirty Dozen; Clean Air Task Force, *Deaths by Dirty Diesel: Mapping the health impacts of diesel nationwide*, https://www.catf.us/deathsbydiesel/.
[40] U.S. EPA, *Outdoor Air Quality Data: Monitor Values Report*, (Jan. 29, 2024), https://www.epa.gov/outdoor-air-quality-data/monitor-values-report. This data excludes exceptional events.

Chicago nonattainment area is failing to make meaningful and lasting progress toward meeting the ozone NAAQS, and communities in and surrounding urban areas are routinely exposed to extremely high ozone concentrations.

The Chicago metropolitan area missed the August 3, 2021, deadline for meeting the 2015 health-based 70ppb ozone NAAQS, and U.S. EPA therefore moved it from the "marginal" category of nonattainment to the more serious "moderate" nonattainment classification.[41] This action imposes more protective and stringent policy requirements aimed at meeting the NAAQS by August 2024. It also imposed additional requirements on the state to reduce ozone precursor admissions. Illinois was subsequently expected to meet the ozone standard by August 3, 2024, and it would be required to prove that it meets the ozone NAAQS by using data from the previous three full ozone seasons in 2021-23. Current public IEPA data I have reviewed indicates that the region has not attained the ozone standard and will again be moved up to an even more stringent category of nonattainment, which will require it to implement additional steps to reduce emissions further.[42] That decision will be made by USEPA in the coming months.

Even where ozone levels are below USEPA's NAAQS threshold, ozone can still cause harmful health effects, particularly for young children, the elderly, and those with existing respiratory conditions. At its March 2023 meeting, USEPA's Clean Air Scientific Advisory Committee—composed of preeminent national experts on ozone air pollution—recommended tightening the primary health-based ozone standard from its current 70 part per billion (ppb) level

[41] U.S. EPA, "Proposed Determinations of Attainment by the Attainment Date, Extension of the Attainment Date, and Reclassification of Several Areas Classified as Marginal for the 2015 Ozone National Ambient Air Quality Standards," (Apr. 2024), https://www.epa.gov/system/files/documents/2022-04/fact-sheet-proposed-2015-ozone-determinations-revisedv2.pdf; *see also* 87 Fed. Reg. 60897 (Oct. 7, 2022).
[42] *See* U.S. EPA, *Air Quality Design Values for Criteria Pollutants*, (last visited Sept. 12, 2024), https://epa maps.arcgis.com/apps/MapSeries/index.html?appid=bc6f3a961ea14013afb2e0d0e450b0d1 ("EPA Air Quality Design Criteria").

to a range of 55-60 ppb.[43] The health effects of ozone exposure are cumulative, increasing with higher ozone concentrations and increased exposure time.[44] Widely-accepted scientific research has established that ozone concentrations as low as 60 ppb—below the 70 ppb NAAQS—can cause inflammation and decreased lung function in healthy, exercising adults after 6.6 hours of exposure.[45] Furthermore, studies have observed an association between short-term ozone exposure and hospital admission or emergency department visits at concentrations as low as 31 ppb.[46]

ii. NO_2

Nitrogen Dioxide (NO_2) is a regulated pollutant emitted by internal combustion engines of motor vehicles, and a component in the formation of ozone.[47] NO_2 is extremely harmful to health, and reducing vehicle emissions will help reduce its presence in the air. NO_2 is particularly dangerous to the young, elderly, or asthmatic, and "exposures over short periods can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital admissions and visits to emergency rooms."[48] Recently, NASA data about NO_2 became available through the USEPA's EJScreen mapping tool. As NASA described the importance of assessing NO_2 exposures at local levels: "Communities of color and lower-income populations often live closer to highways, factories, transportation hubs, and other

[43] Darya Minovi, "In a Blow to Public Health, EPA Delays Strengthening Ozone Standards," (Oct. 12, 2023), https://blog.ucsusa.org/dminovi/in-a-blow-to-public-health-epa-delays-strengthening-ozone-standards/ ("Minovi article"); *see also* EPA Air Quality Design Criteria, *supra* note 42.
[44] *See* Minovi article, *supra* note 43.
[45] U.S. EPA, *Integrated Science Assessment for Ozone and Related Photochemical Oxidants*, (Apr. 2020), https://www.epa.gov/isa/integrated-science-assessment-isa-ozone-and-related-photochemical-oxidants/, at IS-1.
[46] *Id*. at IS-27.
[47] U.S. EPA, *Nitrogen Dioxide (NO_2) Pollution*, (last visited May 30, 2024), https://www.epa.gov/no2-pollution/basic-information-about-no2#What%20is%20NO2.
[48] *Id.*

NO_2 sources than their wealthier counterparts. As a result, residents are exposed to higher levels of this air pollutant and others, exacerbating health inequalities."[49]

iii. Fine particulate matter

In addition to ozone and NO_2, fine particulate matter ($PM_{2.5}$)—air pollution particles less than 2.5 millionths of a meter in size—can cause significant health effects. Combustion vehicles, and especially medium- and heavy-duty diesel trucks, emit significant amounts of $PM_{2.5}$. These emissions can become concentrated enough to be seen as smoke or soot and can exacerbate health conditions like asthma and contribute to premature deaths, particularly among those with lung and heart disease. Data from the USEPA indicate that, nationally, heavy-duty diesel vehicles account for 25% of fine particulate matter emissions from all vehicles, despite making up only 4% of the vehicles on the road.[50] The diesel engine RHA study referenced in the following subsection expands on these health effects using data specific to Illinois. On February 7, 2024, U.S. EPA strengthened the National Ambient Air Quality Standards for Fine Particulate Matter ($PM_{2.5}$ NAAQS). U.S. EPA set the level of the primary (health-based) annual $PM_{2.5}$ standard at 9.0 micrograms per cubic meter to provide increased public health protection as compared to the prior standard, consistent with the available health science.[51] The "design value" used to evaluate compliance with this NAAQS is the annual arithmetic mean of $PM_{2.5}$ concentrations, averaged over three years. Data available on U.S. EPA's website shows the 2024 design values for several Chicago area air monitors as exceeding the newly adopted health standards limits, putting the

[49] Emily DeMarco, "NASA, EPA Tackle NO_2 Air Pollution in Overburdened Communities," (Aug. 5, 2024) https://science.nasa.gov/earth/nasa-epa-tackle-no2-air-pollution-in-overburdened-communities/.
[50] Exhibit 7 to Statement of Reasons: RHA Dirty Dozen.
[51] U.S. EPA, "Reconsideration of the National Ambient Air Quality Standards for Particulate Matter," (Mar. 6, 2024), https://www federalregister.gov/documents/2024/03/06/2024-02637/reconsideration-of-the-national-ambient-air-quality-standards-for-particulate-matter; 89 Fed. Reg. 16202 (Mar. 6, 2024).

region at risk of being labeled as in nonattainment with that health standard in addition to its nonattainment with the ozone standard discussed above.[52]

In September 2024, a study sponsored by the industry-funded Health Effects Institute found that both pre-natal and post-natal $PM_{2.5}$ and NO_2 air pollution exposures were related to asthma development. Per the Health Effects Institute summary, the findings were observed at $PM_{2.5}$ and NO_2 levels below current (25 & 40 µg/m3) and even proposed (10 & 20 µg/m3) annual EU air quality standards.[53]

b. Vehicle emissions contribute significantly to health-harming pollution and climate-altering greenhouse gases.

Through my role at RHA, I can speak to how vehicle emissions contribute to harmful pollution and climate-altering greenhouse gases. Vehicles are one of the main contributors to both health-harming pollution and GHG emissions in Illinois. Chicago is the nation's largest freight hub, where shipments via rail move onto and off of medium- and heavy-duty trucks at some of the nation's largest intermodal freight yards.[54] Transportation is the state's largest source of climate pollution, representing over 26% of statewide emissions, or roughly 60 million metric tons of annual climate pollution.[55] Transportation is also a major contributor to harmful air pollution in Illinois, including nitrogen oxides, ground-level ozone, and $PM_{2.5}$. On-road vehicles emit over 71,000 tons of NOx per year (over 46,000 tons from heavy-duty vehicles and nearly 25,000 tons

[52] EPA Air Quality Design Criteria, *supra* note 42.
[53] Health Effects Institute, *Air Pollution and Children's Asthma: Prenatal and Postnatal Assessment of an Array of Air Pollutants*, (Sept. 2024), https://www.healtheffects.org/sites/default/files/pedersen-rr-219-statement.pdf.
[54] Camilleri HDV Report, *supra* note 8.
[55] U.S. EPA, *Greenhouse Gas Inventory Data Explorer*, (Aug. 18, 2023), https://cfpub.epa.gov/ghgdata/inventoryexplorer/#allsectors/allsectors/allgas/econsect/current; *see also* U.S. EIA, Table 3: State Energy-Related Carbon Dioxide Emissions by Sector, (July 12, 2023), https://www.eia.gov/environment/emissions/state/, (reporting that the transportation sector accounted for 32.6% of Illinois' energy-related CO_2 emissions in 2021).

from light-duty), representing 25% of total statewide emissions, and over 2,500 tons of $PM_{2.5}$ per year (over 1,400 tons from heavy-duty vehicles and over 1,000 from light-duty).[56]

A May 2022 RHA study explored the negative health effects of diesel engine $PM_{2.5}$ emissions in Illinois. As detailed in the Statement of Reasons, RHA examined Illinois county-level diesel emissions data from the Clean Air Task Force data on public health effects and economic risks associated with diesel engine pollution nationwide. We found that:

> People who live, work, or go to school closer to highways, warehouses, intermodal rail, and truck freight facilities, loading docks, fleet garages, etc. (as well as those who work at these facilities) are more likely to be affected by diesel engine $PM_{2.5}$ and other forms of air pollution from diesel engines.[57]

Recent scientific studies have made similar findings. Specifically, a study published just this summer found that warehouses increase NO_2 exposure by "worsen[ing] local traffic-related air pollution with an average near-warehouse NO_2 enhancement of nearly 20%."[58] As the authors note, warehouses "are disproportionately located in marginalized and minoritized communities."[59]

RHA's 2022 study projected 416 deaths in Illinois in 2023 as a result of diesel engine $PM_{2.5}$ pollution, in addition to 199 non-fatal heart attacks and 5,000 asthma attacks.[60] Using national mapping data provided by Clean Air Task Force, RHA found that twelve of Illinois' 102 counties—representing more than 64% of the state's population[61]—ranked in the top 9% of all U.S. counties in terms of the health, societal, and economic harms caused by $PM_{2.5}$ from diesel air

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[56] U.S. EPA, *2020 National Emissions Inventory Supporting Data and Summaries*, (Mar. 30, 2023), https://www.epa.gov/air-emissions-inventories/2020-nei-supporting-data-and-summaries; *see also* Exhibit 8 to Statement of Reasons: Sierra Club, et al., Letter to Gov. JB Pritzker Re: Vehicles' Contribution to Illinois Ozone Pollution: Implications for Public Health and Environmental Justice in Illinois, (Nov. 1, 2023), https://resphealth.org/wp-content/uploads/2023/11/IL-Sonoma-ReportLetter.pdf.
[57] Exhibit 7 to Statement of Reasons: RHA Dirty Dozen at 2.
[58] G. H. Kerr, et al., "Air pollution impacts from warehousing in the United States uncovered with satellite data," *Nat. Commun.* 15, 6006 (2024), https://doi.org/10.1038/s41467-024-50000-0.
[59] *Id.*
[60] *Id.* at 3.
[61] *Id.*

pollution.[62] While this study looked at all diesel pollution (i.e. including off-road sources) and looked at health impacts of diesel pollution in Illinois regardless of from where the pollution was emitted, it nonetheless demonstrates the urgency of adopting the Rules to reduce widespread and harmful health effects of diesel pollution from motor vehicles.

I can testify that vehicle emissions also heavily contribute to ozone nonattainment. According to analysis by Sonoma Technology, emissions from Illinois vehicles contributed significantly to ozone concentrations in the Chicago nonattainment area on every day that the area exceeded the 70 ppb 8-hour National Ambient Air Quality Standard (NAAQS) in 2016, with similar modeled results for days exceeding the standard in 2023.[63]

A 2022 study by the automobile industry-funded Health Effects Institute demonstrates how the sum of traffic-related air pollution leads to a wide range of negative health outcomes. The study, the largest ever review of existing research on long-term exposure to traffic-related air pollution and health outcomes, found:

> [A] high or moderate-to-high level of confidence in an association between long-term exposure to [traffic-related air pollution] and the adverse health outcomes all-cause, circulatory, ischemic heart disease (IHD), and lung cancer mortality; asthma onset in both children and adults; and acute lower respiratory infections (ALRI) in children.[64]

Drawing on reports such as that, I can testify that by reducing such emissions the Rules will improve health outcomes for Illinois residents.

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[62] *Id*. at 2.

[63] Exhibit 8 to Statement of Reasons, *supra* note 56, at 13–17. Illinois vehicles contributed at least 1% of the maximum permissible ozone concentration on every day the Chicago area exceeded the standard in 2016, and on all but one of those days in 2023 (April 16, when vehicles contributed 0.8%).

[64] Health Effects Institute, *HEI Special Report 23 (Updated 4-5-2023): Systematic Review and Meta-analysis of Selected Health Effects of Long-Term Exposure to Traffic-Related Air Pollution*, (Apr. 5, 2023), https://www.healtheffects.org/publication/systematic-review-and-meta-analysis-selected-health-effects-long-term-exposure-traffic/, at xii.

c. Vehicle emissions disproportionately impact lower-income communities and communities of color.

From the perspective of RHA, I can complement the testimony of Juliana Pino, Professor Dan Horton, and Dr. Peter Orris to further explain how the negative health impacts of vehicle pollution fall disproportionately on low-income communities and communities of color. RHA published a report in 2022 examining the disparities related to asthma burdens in Chicago, with a particular focus on emergency department (ED) visits. The report found that:

> While disparities in asthma-related ED visits exist across all races, the greatest gaps are between Black and white children – and that gap increased during the latest reporting period. As of 2021, Black children ages 5 to 19 years old were 4.3 times more likely to have an asthma-related ED visit than white children. This is a 9% increase from the gap previously reported in 2016.[65]

Underlying asthma prevalence is harder to ascertain because it is not consistently monitored by government sources, but available survey data showing prevalence variations between ethnic categories does not show anywhere near that stark of differences shown by the disparity in emergency department visits. In short, severe asthma health events are occurring with greater frequency than would be suggested by the number of people who have asthma.

Furthermore, the concentration of vehicle emissions in such communities is particularly pernicious because of the ways in which the health harms of vehicle emissions interact with other structural inequities concentrated in these same communities. For example, people in low-income communities and communities of color suffer higher rates of pre-existing health conditions that can be aggravated by air pollution. These same communities often lack sufficient financial resources or access to healthcare, meaning it is more difficult for people there to

[65] Sarah M. Hughes, "New Study Reveals Widening Racial Gaps Among Chicago Children with Asthma," (May 17, 2022), https://resphealth.org/new-study-reveals-widening-racial-gaps-among-chicago-children-with-asthma/#:~:text=While%20disparities%20in%20asthma%2Drelated,ED%20visit%20than%20white%20children.

address these respiratory and other health problems caused or exacerbated by air pollution from vehicles.[66]

VIII. FEASIBILITY OF THE ACC II AND ACT RULES

a. The ACC II rule is feasible and will lead to equitable outcomes.

As detailed in the Statement of Reasons Section IV.A.iv., I can testify to several reasons that meeting the requirements of the ACC II rule is feasible in Illinois.

First, the ACC II rule will accelerate an already-strong ZEV market, and the state-specific policies and trends, as I described above, show that Illinois has worked aggressively to support EV charging infrastructure and EV adoption. Illinois has long provided rebates on EV purchases by individual customers. The EV rebate language in CEJA modified and replaced provisions in a prior program created in 1998, which had allowed for $4,000 rebates for a variety of alternative fuel vehicles, [67] including electric vehicles.[68] CEJA narrowed this financial support to focus exclusively on supporting electric vehicles by eliminating incentives for fuels other than electricity. Moreover, Illinois itself, through CEJA, has provided roughly $70 million in state funding towards charging infrastructure. Illinois has secured federal funding to support the transition to electric vehicles and is exploring every funding source to which it has access. My testimony above at pages 5–8 supports the Statement of Reason's detailed explanations of the existing incentives supporting the EV transition. The conclusion that the ACC II rule's ZEV requirements are achievable based on ZEV market analyses is further buttressed by the Illinois policies and government financial support to which I have testified above.

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[66] Rockville (MD): Agency for Healthcare Research and Quality (US), *2021 National Healthcare Quality and Disparities Report: Access to Healthcare and Disparities in Access*, (Dec. 2021), https://www ncbi.nlm.nih.gov/books/NBK578537/.

[67] U.S. Dep't of Energy, "Guide to Alternative Fuel Vehicle Incentives and Laws," (Sept. 1998), https://www.nrel.gov/docs/fy99osti/24758.pdf, at 54.

[68] *See* 415 ILCS § 120/10.

Second, the ACC II rule will make affordable ZEVs more widely available and facilitate more equitable adoption of ZEVs in lower-income communities and those disproportionately impacted by transportation sector air pollution. As a general matter, selling more new EVs will logically result in more used EVs being available for resale over time, which will be available for car purchasers in the used vehicle market. Specifically, the ACC II rule supports EV affordability by allowing manufacturers to earn additional compliance credits from ZEV sales in such communities through "Environmental Justice Vehicle Values" under Section 242.123 of the proposed Rules. These provisions will help ensure that all Illinois residents share equitably in the rule's benefits while providing additional compliance flexibility. Under these provisions, automakers may earn more than one credit per ZEV sale (i.e., a higher "vehicle value") where the vehicle sale is deemed to promote equity objectives as defined by the rule. The Rules replace the California definition of environmental justice community with a pre-existing definition from Illinois law, namely the "equity investment eligible community" definition in CEJA, 20 ILCS § 627/45(b). Because the Illinois legislature recently created this term of art for the State, using that Illinois-defined term to effectuate the Rules' equity provisions creates a unified vision in Illinois for how to promote vehicle electrification in disproportionately impacted communities.

Third, as mentioned earlier in this testimony, CEJA provides additional incentives for consumers to purchase EVs by offering rebate programs. Moreover, as also discussed above and in the Statement of Reasons, electric utilities in Illinois are required to develop and implement Beneficial Electrification plans, which currently and as proposed offer rebates and include investments for charging stations that will further facilitate adoption of EVs in Illinois.

Fourth, the Rules will spur opportunities for Illinois workers and businesses. In addition to the above description of the Lion facility in Joliet, Rivian plant in Normal, and Stellantis plant

in Belvidere, I can testify to the information presented in Section IV.a.iv.6 of the Statement of Reasons as to how the Rules help Illinois businesses.[69]

Fifth, and finally, electricity market experts predict that the widespread adoption of EVs under the Rules will put downward pressure on electricity rates by spreading system costs across more units of electricity purchased, which should benefit all Illinois utility customers in terms of per-unit rates. I can testify on how this point indicates economic and equity benefits of the Rules based on my knowledge of Illinois policies and studies, such as a study put together by the Illinois Citizens Utility Board (CUB) that evaluated the added value from EV adoption for electricity customers in Illinois as a whole. The study researched the impact of EV ownership on electricity prices under a scenario where EV owners practiced optimized charging, which assumes all EV charging occurs between 12AM and 6AM.[70] Based on vehicle electrification projections that included more EVs than would be required under the Rules, the study found that "the combined projected value to Illinois electricity customers of optimized EV charging patterns is up to $2.6 billion."[71] Though that precise projection was not based on vehicle electrification rates as required under the Rules, it still provides reason to believe that vehicle electrification can deliver benefits to electricity rate-payers. EV adoption with optimized charging patterns reduces energy prices for all ratepayers because:

> Higher demand in off-peak periods of ample capacity results in greater utilization of generators that have already been dispatched or are almost always operating, such as wind turbines and nuclear plants. Increased production from a generator will produce a lower average total cost per megawatt-hour (MWh) because its fixed costs can be spread over more output.[72]

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[69] Statement of Reasons at 46–48.
[70] Citizens Utility Board (CUB), *Charging Ahead: Deriving Value from Electric Vehicles for All Electricity Customers*, (Mar. 26, 2019), https://www.citizensutilityboard.org/wp-content/uploads/2019/03/Charging-Ahead-Deriving-Value-from-Electric-Vehicles-for-All-Electricity-Customers-v6-031419.pdf, at 12.
[71] *Id.* at 16 (note that $2.6 billion is the benefits derived from the most aggressive EV expansion scenario studied, assuming 2.2 million EVs by 2030).
[72] *Id.* at 12.

I can testify that this CUB study supports the Statement of Reason's analysis regarding EV adoption's impact on electricity rates across Illinois. This CUB study is consistent with a study by Synapse Energy Economics finding that EVs are already contributing to reductions in rates for all electric customers, as well as ERM's analysis showing that adopting the ACC II rule in Illinois would reduce the average household's annual energy bill by $24 in 2050.[73]

b. The ACT rule is feasible.

As described in the Statement of Reasons Section IV. a.iv-b.iv, the ACT rule is also feasible. Specifically, as discussed in my testimony above, on pages 5-8, ZEV adoption is supported not only by IRA incentives but by substantial federal, state and utility incentives and policies, such as CEJA funds, funds from the Volkswagen settlement with Illinois, and the utility Beneficial Electrification Plans. I can testify that these incentives lower the costs associated with purchasing and using clean vehicles and chargers, ensuring that businesses can fully reap the benefits of the transition to ZEVs.

[73] Statement of Reasons at 48–49 (citing Synapse Energy Economics, *Electric Vehicles Are Driving Rates Down: National Update*, (June 2023), https://www.synapse-energy.com/sites/default/files/Electric%20Vehicles%20Are%20Driving%20Rates%20Down%20Factsheet.pdf, at 1; Exhibit 4: ERM, *Analysis Update: Illinois Advanced Clean Cars II Program* at UtilityImpacts page).

IX. CONCLUSION

For the reasons given above and in the Statement of Reasons, I strongly support adoption of the Rules in Illinois. The passage of the Rules in Illinois will improve air quality and public health and serve environmental justice zip codes that have disproportionately been impacted by air pollutants and their health hazards. The passage of the rules will also decrease greenhouse gases, support Illinois's fight against climate change, and enable the state to keep its stated commitment of compliance[74] with the Paris Climate Agreement.[75]

Thank you for the opportunity to testify. I am prepared to answer any questions from hearing participants regarding my testimony above as well as the sections of the Rule Proponents' Statement of Reasons identified above.

Dated: September 16, 2024.

Brian Urbaszewski
Respiratory Health Association
1440 W. Washington Blvd.
Chicago, IL 60607

[74] Governor Pritzker's EO 2019-06 confirmed that in joining the U.S. Climate Alliance, "the state shall commit to the principles of the Paris Climate Agreement." Exec. Order 2019-06, *supra* note 9.
[75] "To keep global warming to no more than 1.5°C – as called for in the Paris Agreement – emissions need to be reduced by 45% by 2030 and reach net zero by 2050." U.N. Net-Zero Coalition, *supra* note 10.

Brian Peter Urbaszewski
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1998-present **Director of Environmental Health Programs**
Respiratory Health Association

Serve as chief advocate, project manager and media spokesperson on outdoor and indoor air pollution issues, including health science and standards, Clean Air Act implementation and compliance, stationary and mobile source emissions, energy, climate change, and radon. Lobby federal, state and local officials; co-lead volunteer federal and state lobbing efforts.

Expanded program: Supervised Environmental Associate, interns, volunteers; Responsible for department budget; raised over $1,000,000 from government and foundation sources. Media experience at national and local level in TV, radio and print.

Co-lead group implementing Climate and Equitable Job Act transportation components, including EV and EV charger rebates and utility-derived Beneficial Electrification plans (>$100m spending/year)

Wrote and secured passage of Illinois laws to limit diesel pollution. Wrote reports supporting these efforts. Ran multi-year campaign to reduce emissions of the CTA bus fleet; resulted in cleaner fuel use, pollution control retrofits with over $20m in capital investment, 2040 decarbonization committment.

Oversaw appeals of state power plant Title V air permits and other legal and administrative actions. Helped resolve successful air pollution citizen suit. $9m settlement put back into nearby communities.

Engaged in extensive work on federal and state multi-pollutant power plant strategies to block and promote legislation and improve regulatory actions through media outreach, candidate education, and grassroots mobilization. Educated volunteers to submit extensive comments on federal regulation and air quality standard proposals. Challenged permits for construction of potential major new air emission sources. Actively participated in implementation of federal air rules in Illinois and in development and adoption of innovative state air pollution rules for power plants.

Drove adoption of state and local diesel vehicle idling limits, pollution retrofits and clean fuel use on Illinois DOT urban construction projects through Gubernatorial Order. Enacted similar clean diesel construction requirements within Cook County and Chicago.

Co-founded the Chicago Campaign for Clean Power coalition to persuade mayor and city council to require modern pollution controls on Fisk and Crawford coal power plants. Drafted power plant emission ordinance for Chicago. Helped direct subsequent coalition actions that ultimately led to closure of the plants. Co-wrote innovative sulfur dioxide emission tax proposal passed by Cook County Board.

Prior Employment

1993-98 **Environmental Protection Specialist, Illinois Environmental Protection Agency**
1992-93 **Dunn Fellow, Office of the Illinois Governor Jim Edgar**

Education

2002 Masters in Urban Planning and Policy - University of Illinois.
1989-92 Graduate Program, Geography - University of California, Los Angeles.
1989 AB Geography, University of Chicago. Dean's List 1987-89.

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

	)	
	)	
IN THE MATTER OF:	)	
	)	R2024-017
PROPOSED CLEAN CAR AND	)	
TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF MYRNA SALGADO-ROMO
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Myrna V. Salgado-Romo in support of Rule Proponents' regulatory proposal for presentation at the December 2-3 hearing in the above-captioned matter.

TESTIMONY OF MYRNA V. SALGADO-ROMO

My name is Myrna V. Salgado-Romo. I live and work in the McKinley Park neighborhood of Chicago, Illinois. I have lived here for over sixteen years and have worked in the neighborhood for twelve years. I have lived on the South Side of Chicago my entire life.

I work as a Network Manager for the Chicago Environmental Justice Network (CEJN). CEJN is a network of allied environmental justice organizations working in frontline communities throughout the Chicago metropolitan area to change systems and build power through transformative campaigns, policy advocacy, and community-based education. It is also a collaborative hub for environmental justice organizations to develop and share movement strategies, resources, and experiences. CEJN's member organizations include the Little Village

Environmental Justice Organization, People for Community Recovery, Southeast Environmental Task Force, and Neighbors for Environmental Justice (N4EJ).

In addition to my role at CEJN, I have been a member of N4EJ since it was formed in 2018. N4EJ was formed to protect the health and environment of residents on the Southwest Side of Chicago. Our members live in areas including but not limited to McKinley Park, Brighton Park, Bridgeport, Back of the Yards, and Little Village. The organization was formed in response to polluting industrial development in our community without the community's notification or input.

I support and believe in CEJN's mission to change systems and build power through transformative campaigns, policy advocacy, and community-based education. To me and CEJN, environmental justice means just treatment and meaningful involvement of all people, regardless of income, race, gender base, color, national origin, Tribal affiliation, disability, documentation status, or occupation, in agency decision-making and other activities that affect human health and the environment. Our goal is to fully protect people from disproportionate and adverse human health and environmental effects (including risks) and hazards, including those related to climate change, the cumulative impacts of environmental and other burdens, and the legacy of racism or other structural or systemic barriers; and have equitable access to a healthy, sustainable, and resilient environment to live, play, work, learn, grow, worship, and engage in cultural and subsistence practices.

My testimony is based on my personal experience with vehicle air pollution and my experience at CEJN and N4EJ working with and advocating for communities that are exposed to this air pollution on the South and West sides of Chicago.

I. PURPOSE OF TESTIMONY

The purpose of my testimony is to provide support for the Rule Proponents' proposal to adopt Clean Car and Truck Standards in Illinois by offering my perspective on how vehicle pollution harms me and the communities I serve, and how the proposed Standards will benefit these communities by reducing vehicle pollution. I am submitting pre-filed testimony and making myself available for cross-examination at the rulemaking hearing so that the Illinois Pollution Control Board can fully consider testimony from someone who is directly affected by vehicle pollution. The Board will likely hear from public commenters who also have direct experience with vehicle pollution, and I encourage the Board to consider these comments carefully.

II. THE IMPACT OF VEHICLE POLLUTION ON ME AND MY COMMUNITY

I live in an area with very high levels of traffic—especially heavy truck traffic—which is a significant source of health-harming air pollution. I live near several heavily-trafficked highways, including Interstate 55, Archer Avenue, Ashland Avenue, Damen Avenue, and South Western Avenue. Much of the area near my home is designated as an Industrial Corridor, and there are many facilities in the area that generate a lot of heavy-duty vehicle traffic. For example, about 200 trucks per day enter and exit the MAT asphalt plant on Pershing Road. There is also a lot of truck traffic around the railyards, warehouses, and transit depots in the area. I have noticed that the most heavy truck traffic is usually in the morning and afternoon, but even outside of these hours there is often significant truck traffic throughout the day.

I am very concerned about the air pollution levels in my community, and specifically air pollution from vehicles. I am concerned that vehicle pollution exposes my family and my community to serious health and safety risks. I am aware that vehicle exhaust contributes to fine

particulate matter, ozone formation, and other pollutants. I am aware that exposure to these pollutants can increase the risk of asthma and other respiratory conditions, premature death, and other health harms. I am deeply concerned about the effect of vehicle pollution on my family members, especially my sister and her three children, who live in the same apartment building as me.

I previously worked in a public school that focuses on health and wellness to educate the whole child. This school serves children across the Southwest Side, many of whom reside in McKinley Park, Back of the Yards, and surrounding areas. One of my responsibilities at the school was to support first aid and medication administration. Many of my students already suffered from asthma, and I am concerned about the continued health and safety of these students. The school would conduct long walks outside as part of its focus on health and wellness. I noticed that many of our students experienced difficulty breathing and chest pain after participating in these outdoor walks. I am concerned that these symptoms were connected to the levels of air pollution in the area.

I am similarly concerned about the health of my nieces and nephews, who spend a lot of time outdoors and who recently attended an outdoor summer camp at McKinley Park, at the intersection of Archer Avenue, South Western Boulevard, and Pershing Road—three heavily trafficked roads with a lot of trucks. I thought that their time at camp would be good for their health by giving them some exercise and time outdoors, but all of the nearby truck traffic and industrial pollution make me question this. I am worried about the long-term health ramifications these children may face from exposure to pollution from vehicles and other sources.

Last year, I lost my mother to ALS. One of the things I tried to do with her was take her outside to enjoy the fresh air, but this was difficult because exposure to air pollution exacerbated her illness. It was really hard to give my mother a good life under these circumstances.

I myself have a history of reactive airway disease, which I believe is a consequence of breathing contaminated air. In order to protect my health, I limit the time I spend outdoors. My family and I try to enjoy outdoor time daily but have resorted to late night walks due to the truck traffic and surrounding industry operating during the day. I run an air purifier in my apartment and mostly keep my windows closed, even though I would like to be able to open them for fresh air. I cannot drive in traffic with my car windows down without experiencing shortness of breath and difficulty breathing. Sometimes I wear a mask when I go outside if the air quality is bad.

I also check the air quality every day so that I can make informed decisions to protect my health. CEJN has established a network of air quality monitors for the community, which I often use to check the daily air quality. This is a helpful resource, but the responsibility for monitoring air quality should not fall to the community. The government should take responsibility because government agencies are the ones with the ability to address air pollution. Similarly, I believe the government should be responsible for reducing vehicle pollution, rather than individual consumers.

I understand that adopting the proposed Clean Car and Truck standards would increase adoption of clean vehicles in Illinois. This could significantly improve the air quality in Chicago and throughout Illinois. If the risks related to vehicle pollution are reduced by the Board adopting the proposed Clean Car and Clean Truck standards, I would not be as concerned about going outside. I would be more comfortable participating in more vigorous activities such as tennis, soccer, softball, basketball, or running. I believe that by adopting the proposed standards to

reduce vehicle emissions, the Board can help make a more healthy and productive life for me, my family, my neighbors, and the state of Illinois.

III. CONCLUSION

I urge the Illinois Pollution Control Board to adopt the proposed Clean Car and Truck Standards to reduce air pollution and its significant harm to my health, my quality of life, and my community.

Thank you for the opportunity to testify. I am prepared to answer any questions from hearing participants regarding my testimony.

Dated: 9/4/24

Myrna V. Salgado-Romo

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

PRE-FILED TESTIMONY OF JUSTIN FLORES
IN SUPPORT OF RULE PROPONENTS' REGULATORY PROPOSAL

Sierra Club, Natural Resources Defense Council, Environmental Defense Fund, Respiratory Health Association, Chicago Environmental Justice Network, and Center for Neighborhood Technology (collectively, "Rule Proponents"), by and through counsel, hereby submit the following Pre-Filed Testimony of Justin Flores in support of Rule Proponents' regulatory proposal for presentation at the December 2-3 hearing in the above-captioned matter.

TESTIMONY OF JUSTIN FLORES

My name is Justin Flores. I am a resident of the Pilsen neighborhood in Chicago, Illinois, where I have lived for six years with my partner and two dogs. I grew up in the city of East Chicago in Northwest Indiana. My testimony is based on my personal experience with air pollution from fossil fuel vehicles in Chicago.

I. PURPOSE OF TESTIMONY

The purpose of my testimony is to provide support for the Rule Proponents' proposal to adopt Clean Car and Truck Standards in Illinois, and to share my perspective on how these Proposed Rules will benefit Illinois communities that suffer from unhealthy air pollution. I know that many Illinois residents have stories like mine, and I expect that some of them will share their stories through public comments in this rulemaking proceeding. I am offering my story and perspective as pre-filed testimony and making myself available for cross-examination at the

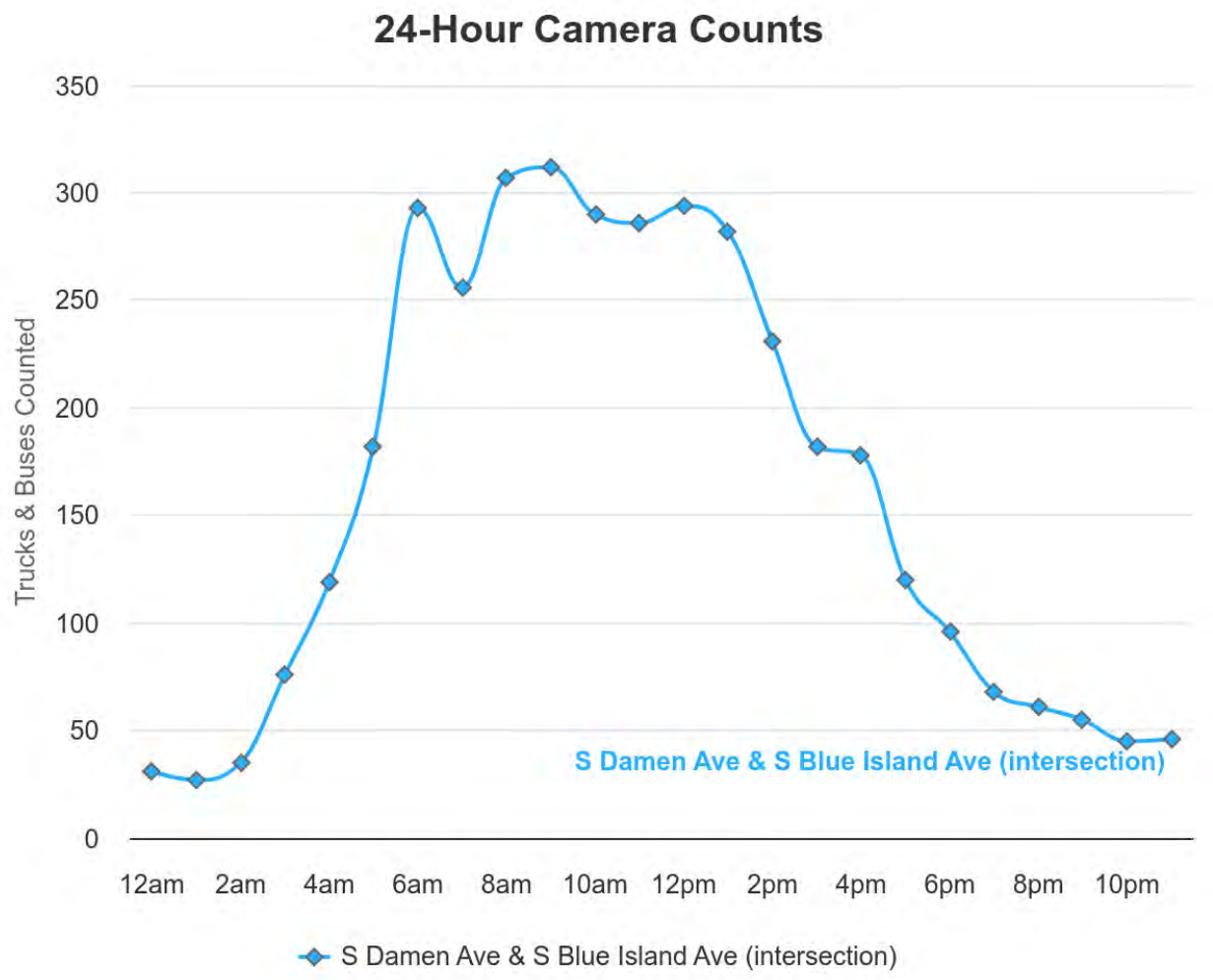
rulemaking hearing to help enable the Illinois Pollution Control Board to fully consider the perspectives of people impacted by Illinois' transportation-sector pollution.

II. VEHICLE POLLUTION IN CHICAGO'S LOWER WEST SIDE

My neighborhood is affected by multiple significant sources of air pollution, including pollution from vehicles. I live in the Pilsen neighborhood, which is situated in the Lower West Side, between Interstate 94, Interstate 55, and Interstate 290. Several of the roads near my home are major throughways with lots of heavy truck traffic. These include Ashland Avenue, Blue Island Avenue, Cermak Road, Damen Avenue, South Western Avenue, South Halsted Street, and others. The truck traffic is so pervasive that I have come to know when it will be heaviest, usually in the morning and afternoon just before the typical passenger vehicle rush hour.

I live about one half mile from the intersection of Blue Island Avenue and Damen Avenue, which was one of the intersections that was examined by the Little Village Environmental Justice Organization (LVEJO) and its partners in a study about truck traffic in Chicago.[1] The study found that 3,872 trucks and buses pass through this intersection per day, with peak traffic of 312 trucks per hour. This is some of the heaviest truck traffic of any intersection examined in the study. The chart below shows the hourly truck and bus counts reported in the study for the intersection of Damen and Blue Island. This study's findings reflect my experience that this intersection and the surrounding area have extremely high levels of truck traffic. In the next section, I describe how I am affected every day by this traffic and the pollution that it causes.

[1] Carolina Macias, et al., *Chicago Truck Data Portal*, (2023), https://apps.cnt.org/truck-count-tracker/.



III. MY EXPERIENCE WITH CHICAGO'S TRANSPORTATION POLLUTION

Air pollution from vehicles significantly harms my health, my community, and my ability to enjoy the outdoor activities that I love. I am aware that scientific research has documented the health harms caused by air pollution from vehicles, but I am most familiar with the way this pollution has affected me personally.

I am an avid daily runner, and I especially enjoy training for marathons and other long-distance races. I also enjoy playing basketball and tennis and walking with my two dogs. However, I have asthma, and exercising in polluted air can contribute to severe asthma attacks. I

have to go to the emergency room at least once per year for breathing treatments when my preventative inhaler and rescue inhaler fail to stop an asthma attack.

To help manage my asthma, I have to take precautions to avoid being exposed to air pollution. I check the local air quality index multiple times per day, and I have to make decisions about whether to go outside based on the air quality. I am frequently forced to exercise indoors, and I have had to cancel plans to play basketball with my friends when the air quality was bad. When I am able to exercise outdoors, I typically go out of my neighborhood to run where there is less traffic and the air quality is better. I also use an air purifier in my apartment and don't open the windows as often as I would like to, because I am concerned about letting polluted air into my home.

Heavy-duty vehicles are also a major source of noise pollution. The sound of trucks accelerating can trigger noise-related post-traumatic stress for me. One of the reasons I generally keep my windows closed is to reduce the level of traffic noise in my apartment.

Beyond my own health, I am concerned about how air pollution affects my family and my community. My grandmother lives nearby, and on days when air quality is bad I tell her not to go outside. Some other elderly members of my family want to visit me in Chicago, but I don't think it's safe for them to do that. For example, my mother has lupus, and I am concerned about how the pollution in my neighborhood could affect her. I also see a lot of my elderly neighbors who are unable to go outside and enjoy the neighborhood when the air is hazy. I worry about how air pollution affects the children in my neighborhood, like the students who attend a high school right next to the busy intersection of Ashland Avenue and Cermak Road. I especially worry for my nieces and nephews who live nearby. I hope they will be able to live in a healthier, cleaner community with better air quality than I have experienced.

I moved to the Pilsen neighborhood to be close to family and to live in a community that shares my Mexican-American heritage. But I often feel like I can't enjoy the things that brought me to this area because of all the pollution from vehicles and other sources. Sometimes I talk with my partner about whether we should try to move somewhere different to escape the air pollution, even though we want to be able to stay in our community.

I understand that adopting the proposed Clean Car and Truck Standards would increase adoption of clean vehicles in Illinois, including zero-emitting vehicles that do not have noisy diesel engines. This would significantly improve the air quality in my neighborhood, helping protect my health and allowing me to better enjoy the outdoor activities that I love. It would also allow me, my family, and my community to spend more time together in our neighborhood.

IV. CONCLUSION

I urge the Illinois Pollution Control Board to adopt the proposed Clean Car and Truck Standards to reduce air pollution and its significant harms to my health, my quality of life, and my community.

Thank you for the opportunity to testify. I am prepared to answer any questions from hearing participants regarding my testimony.

Dated: September 4, 2024

Justin Flores

BEFORE THE ILLINOIS POLLUTION CONTROL BOARD

IN THE MATTER OF:	)	
	)	R2024-017
PROPOSED CLEAN CAR AND TRUCK STANDARDS	)	(Rulemaking – Air)

CERTIFICATE OF SERVICE

I, the undersigned, on affirmation state the following:

That I have served the attached Notice of Filing; Rule Proponents' Pre-Filed Testimony List; Joint Supplemental Testimony of Kathy Harris and Muhammed Patel, Pre-Filed Testimony of Tom Cackette; Pre-Filed Testimony of Dr. Peter Orris; Pre-Filed Testimony of Dr. Daniel E. Horton; Pre-Filed Testimony of Juliana Pino; Pre-Filed Testimony of Brian Urbaszewski; Pre-Filed Testimony of Myrna Salgado; Pre-Filed Testimony of Justin Flores; and Certificate of Service, by e-mail upon the following individuals listed at the e-mail addresses indicated:

Don Brown Clerk of the Board Illinois Pollution Control Board don.brown@illinois.gov	Vanessa Horton & Carlie Leoni Hearing Officers Illinois Pollution Control Board Vanessa.Horton@Illinois.gov Carlie.Leoni@Illinois.Gov
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That my e-mail address is robert.weinstock@law.northwestern.edu.

That the number of pages in the e-mail transmission is 166.

That the e-mail transmission took place before 5:00 p.m. on the date of September 16, 2024.

Date: September 16, 2024

/s/ *Robert Weinstock*

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