Green Residents of Westchester Ecological Commission

Air Pollution And Your Health

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February 24th, 2024

No Financial Interest to Disclose.

GR OW

Green Residents of Westchester Ecological Commission

Presentation Overview

- Air Pollution Background
- Air Pollutants
- Health Implications of Air Pollution
- Air Quality in Your Community
- What You Can do About Air Pollution
- Conclusion

https://www.ucl.ac.uk/news/2021/feb/fossil-fuel-air-pollution-responsible-1-5-deaths-worldwide

Air Pollution Background

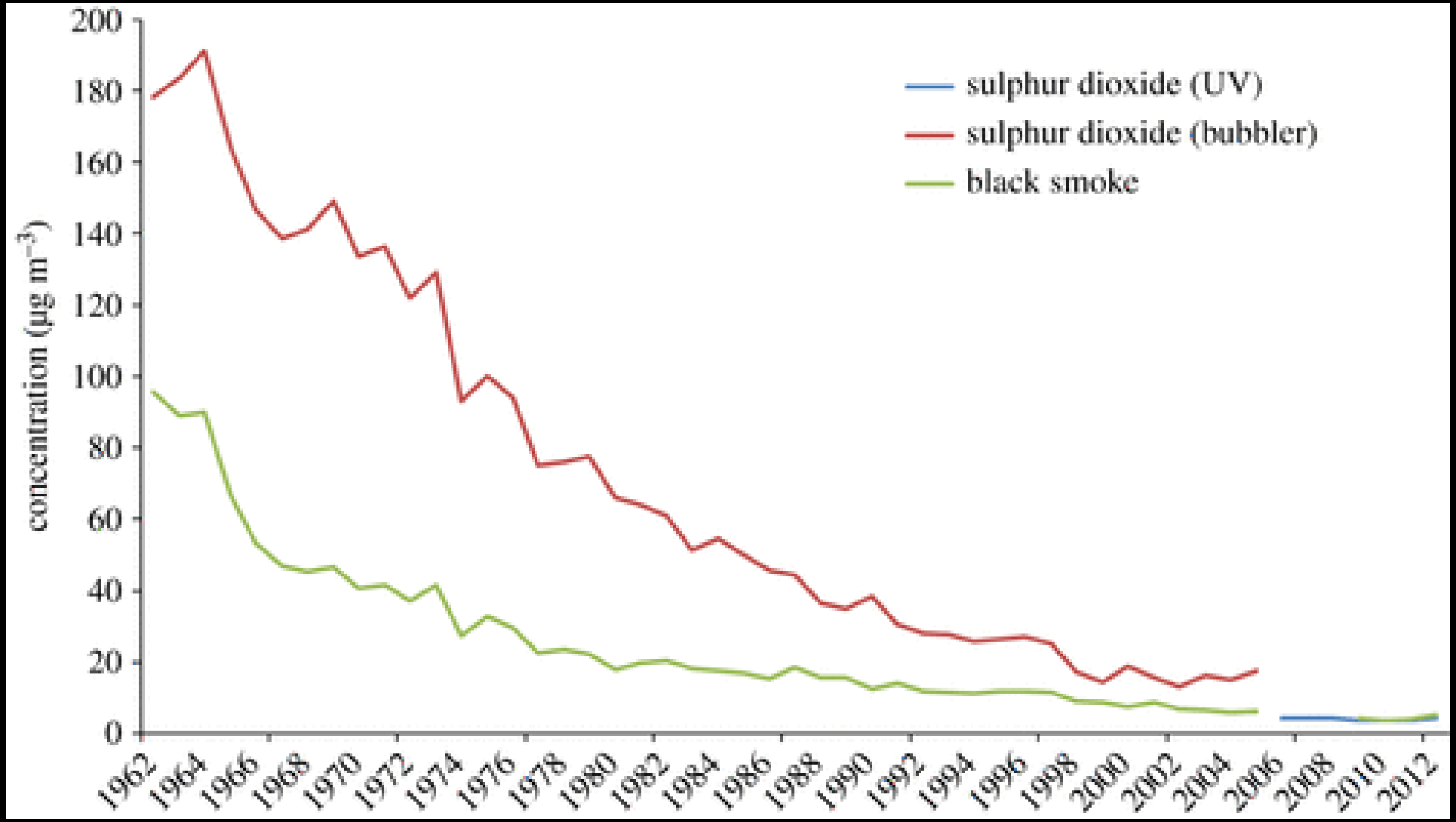
https://earth.org/10-facts-about-air-pollution/

A Chronology of Global Air Quality

Fowler D et al. 2020 A royalsocietypublishing.org/journal/rsta

- Air pollution has been recognized as a threat health threat since the time of Hippocrates, *ca* 400 BC.
- The industrial revolution accelerated the emissions of pollutants, culminating with the great smog of London in 1952.
- The 1952 London smog resulted in the premature mortality of approximately 12 000 people.
- The public and political reaction led to the introduction of the Clean Air Act in 1956.

https://royalsocietypublishing.org/doi/10.1098/rsta.2019.0314



The decline in Sulfur dioxide (SO_2) and smoke in London following the Clean Air Act (1956)

Data from the 'bubbler method' sampling air through a peroxide solution in water and ultraviolet (UV) spectroscopy.

A chronology of global air quality, Volume: 378, Issue: 2183, DOI: (10.1098/rsta.2019.0314)

The Donora Smog Revisited: 70 Years After the Event That Inspired the Clean Air Act.

Elizabeth T. Jacobs, PhD, AJPH Supplement 2, 2018, Vol 108, No. S2

- In October 1948, the communities of Donora and Webster in Pennsylvania were visited by a smog that changed the face of environmental protection in the United States.
- 20 individuals died, and about 5900, 43% of the population of Donora, were affected by the smog.
- The enactment of the Clean Air Act of 1970 (1970 CAA) resulted in a major shift in the federal government's role in air pollution control.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5922205/#:~:text=At%20the%20end%20of%20October,were%20affected%20by%20the%20smog.

NYC south view from the Empire State Building in 1966, one of the worst smog days.

"The dawning of environmental consciousness in the USA during the 1960s led to a national commitment to clean air and water with the creation, in 1970, of the Environmental Protection Agency."

Credit...Neal Boenzi/The New York Times

https://www.nytimes.com/2017/02/28/nyregion/new-york-city-smog.html

Chicago has the worst air quality in the world due to Canadian wildfire smoke

By Caitlin O'Kane, June 27, 2023, CBS News

Chicago, had some of the worst air quality in the world as wildfire smoke from Quebec, Canada, seeps into the Midwest.

The fires impacted Chicago, Milwaukee and Detroit, and all three cities hit the purple zone of the AQI, or air quality index

https://www.cbsnews.com/news/chicago-worst-air-quality-canadian-wildfire-smoke-june-27-2023/

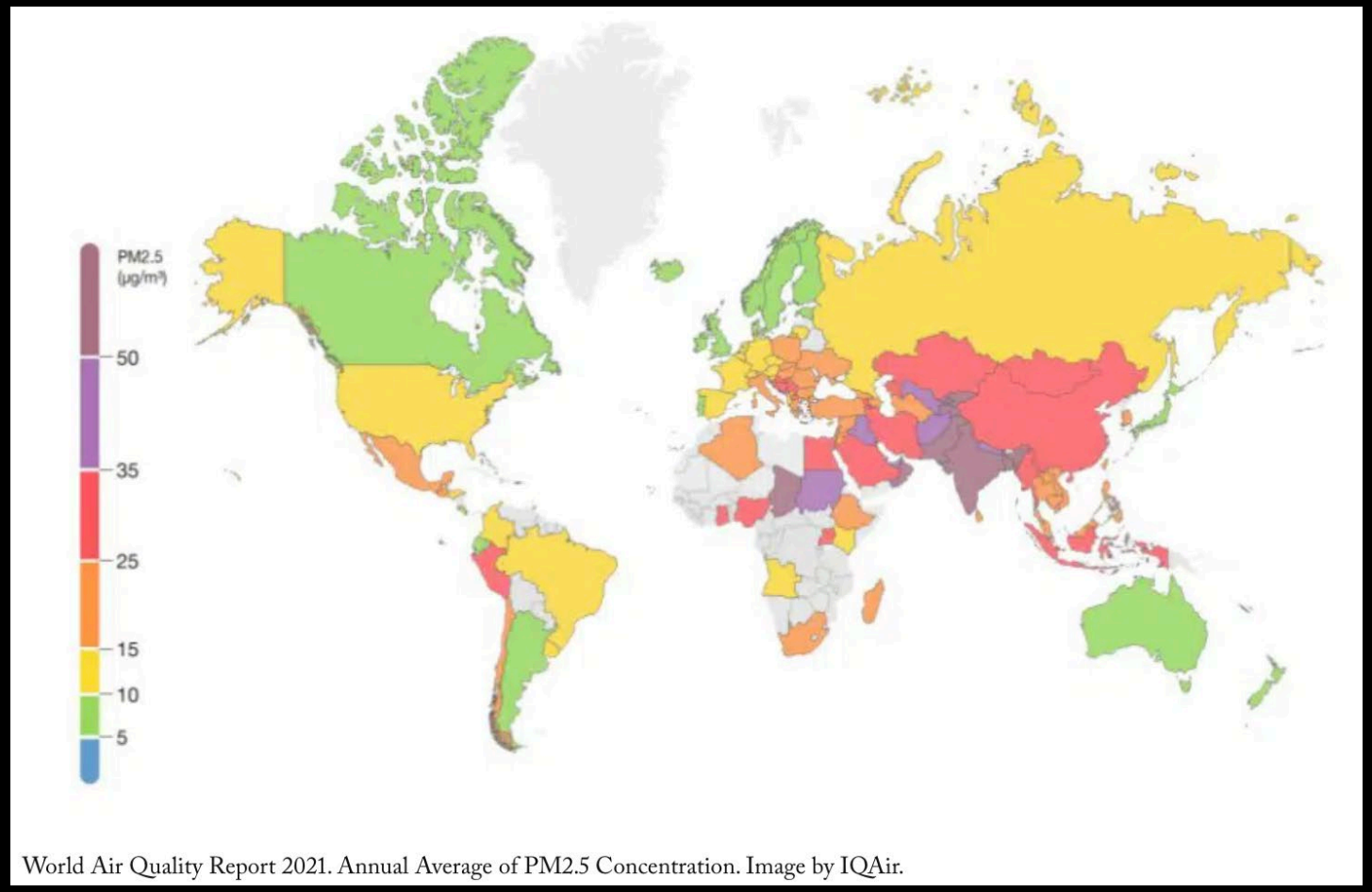
Air Quality Index (AQI).

AQI LEVEL	Health Descriptor	Meaning
0 - 50	GOOD	Quality is considered satisfactory and poses little or no risk to health
51 - 100	MODERATE	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution
101 - 150	UNHEALTHY FOR SENSITIVE GROUPS	Although the general public is not likely to be affected at this AQI range, people with lung disease, older adults and children are at a greater risk from exposure to ozone, whereas persons with heart and lung disease, older adults and children are at greater risk from the presence of particles in the air
151 - 200	UNHEALTHY	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects
201 - 300	VERY UNHEALTHY	Health alert: everyone may experience more serious health effects
301 - 500	HAZARDOUS	Health warnings of emergency conditions; the entire population is more likely to be affected

Different countries have their own air quality indices, corresponding to different national air quality standards.

https://earth.org/history-of-air-pollution/

Air Pollution Today



World Air Quality Report 2021. Annual Average of PM2.5 Concentration. Image by IQAir.

The 10 most world's polluted cities were in India, with a PM2.5 of 106.2

WHO: 91% of the world's population is living in places where air pollution levels exceed the WHO guideline limits.

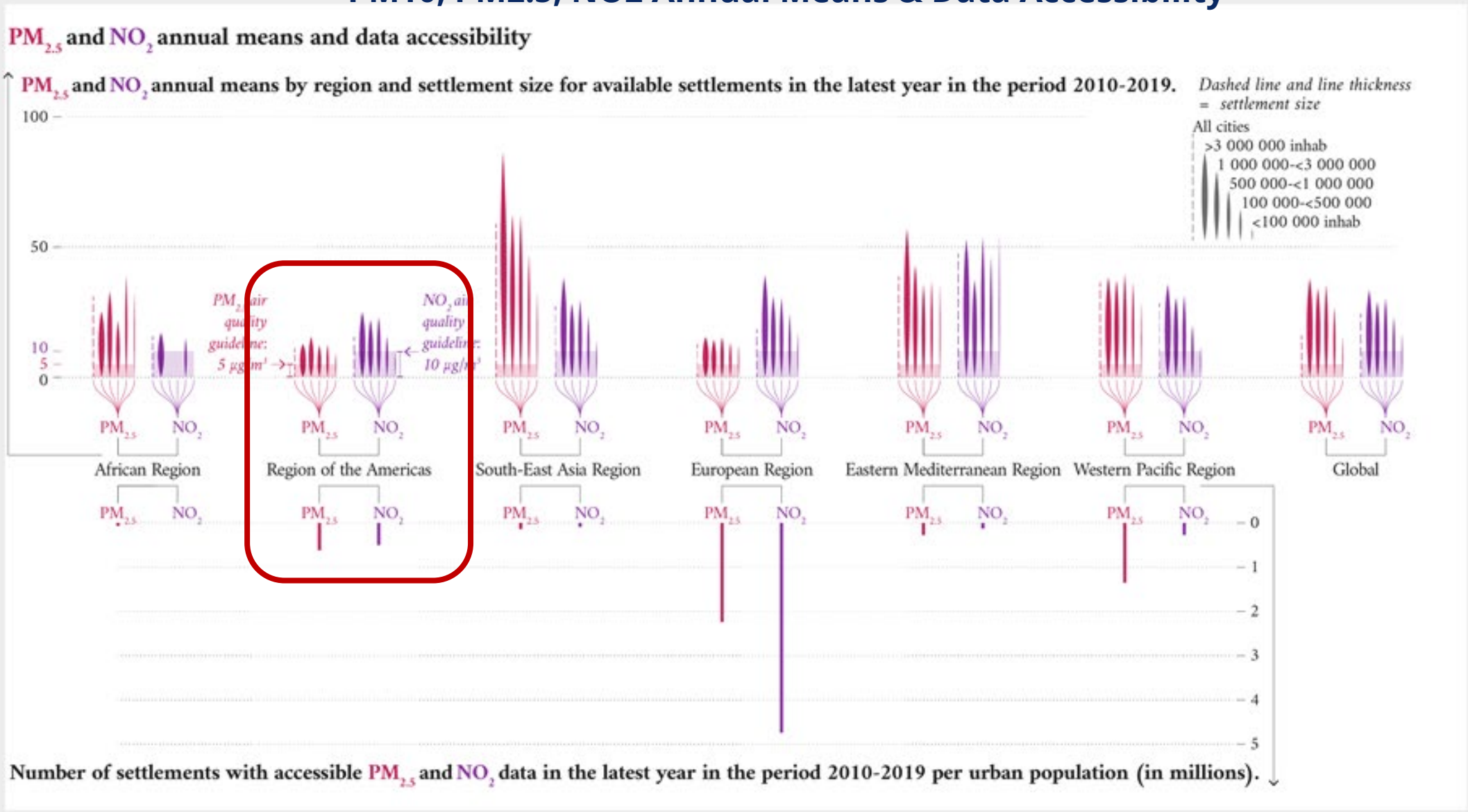
The worst air quality in the world is in the Global South, especially in Africa, South America, and Southeast Asia.

Developing nations are rich in fossil fuels, and coal power plants are prevalent in these regions.

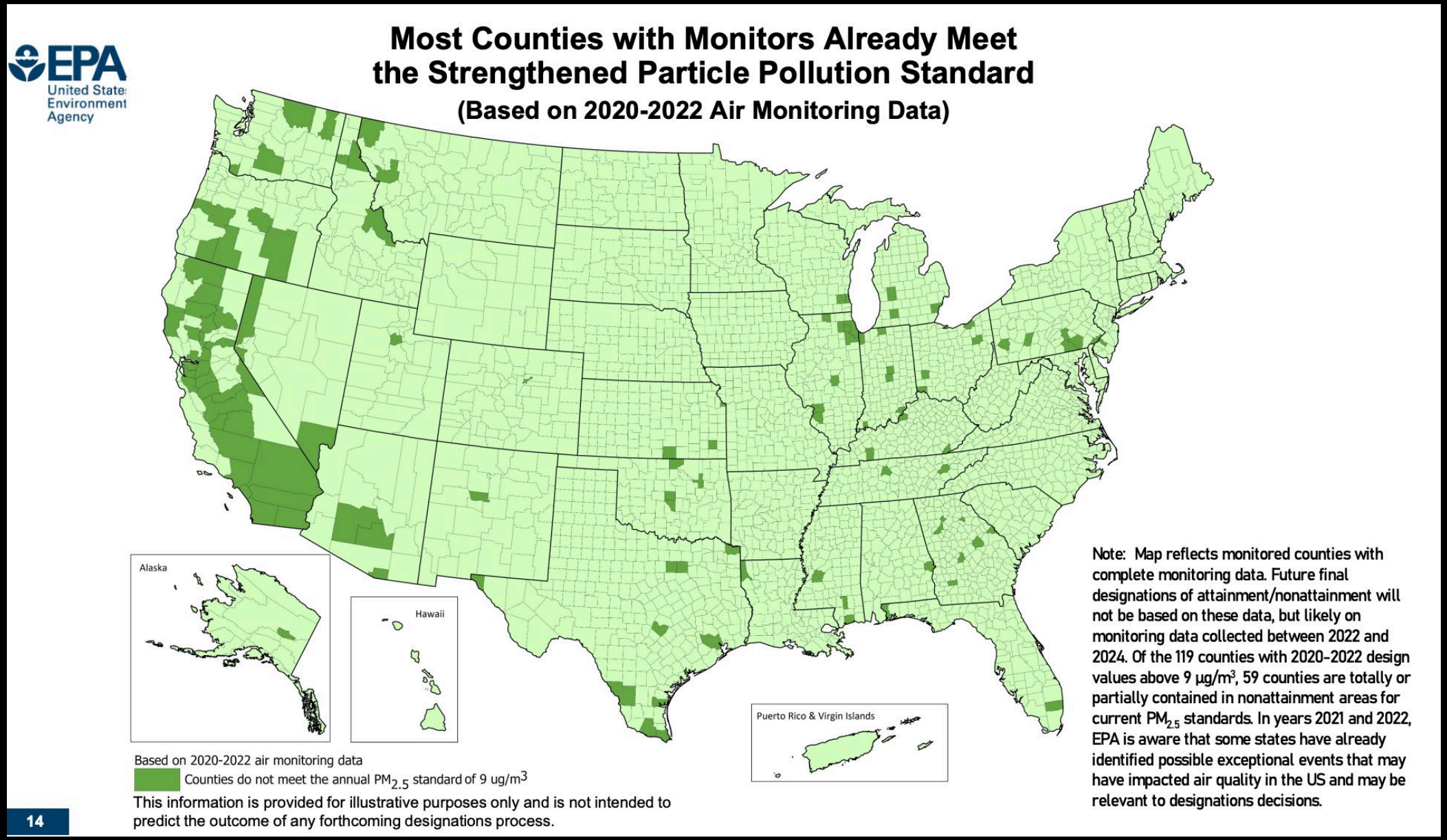
They rely on wood, crop wastes, charcoal, coal and kerosene for cooking, heating, and lighting.

https://earth.org/history-of-air-pollution/

PM10, PM2.5, NO2 Annual Means & Data Accessibility



https://www.who.int/data/gho/data/themes/air-pollution/who-air-quality-database/2022



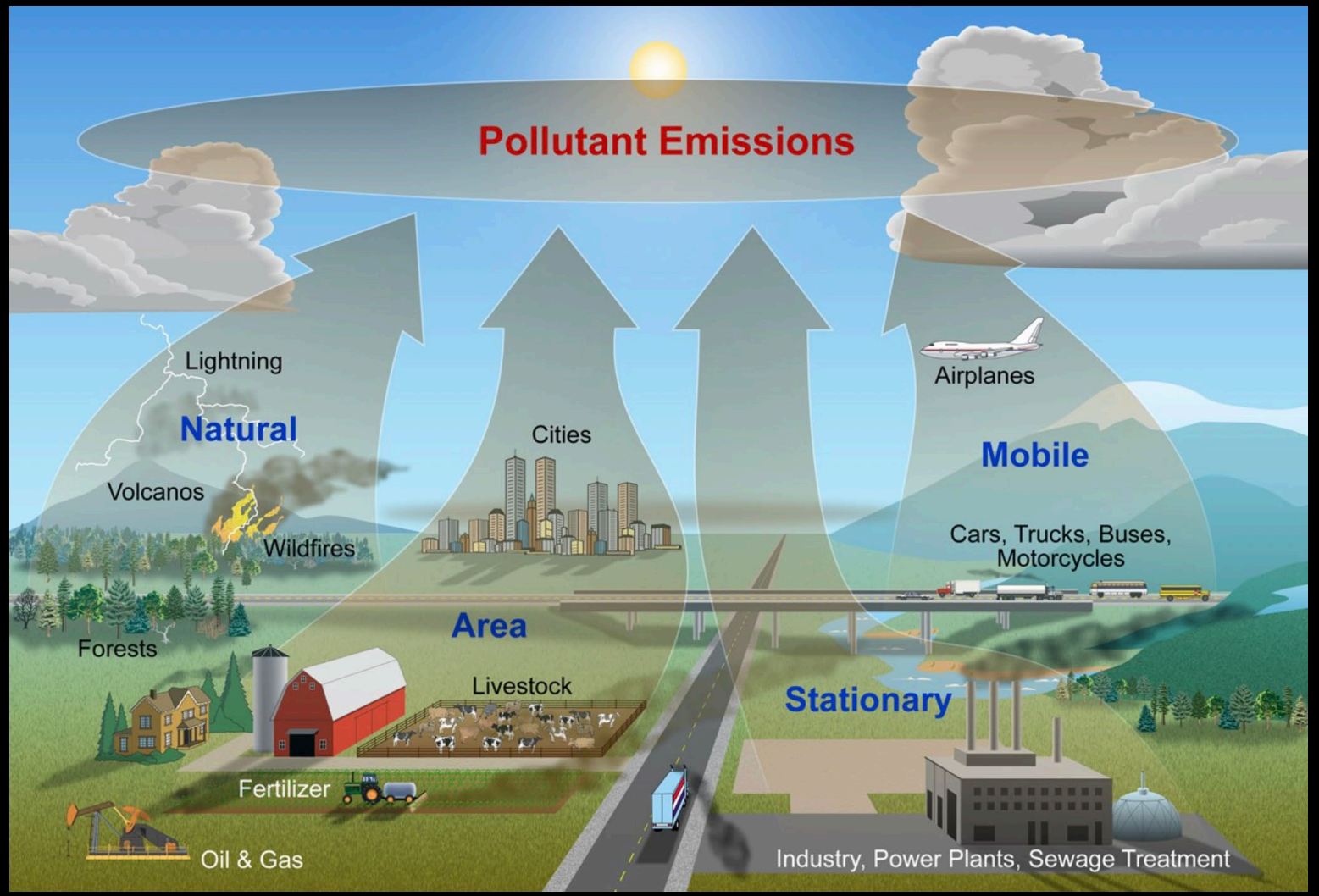
EPA is strengthening the level of the annual standard for fine particles (PM2.5) to 9.0 µg/m^3

https://www.epa.gov/system/files/documents/2024-02/2024-pm-naaqs-final-overview-presentation.pdf

Air Pollutants

Most Dangerous and Widespread Outdoor Air Pollutants in the US

Air pollutant classification

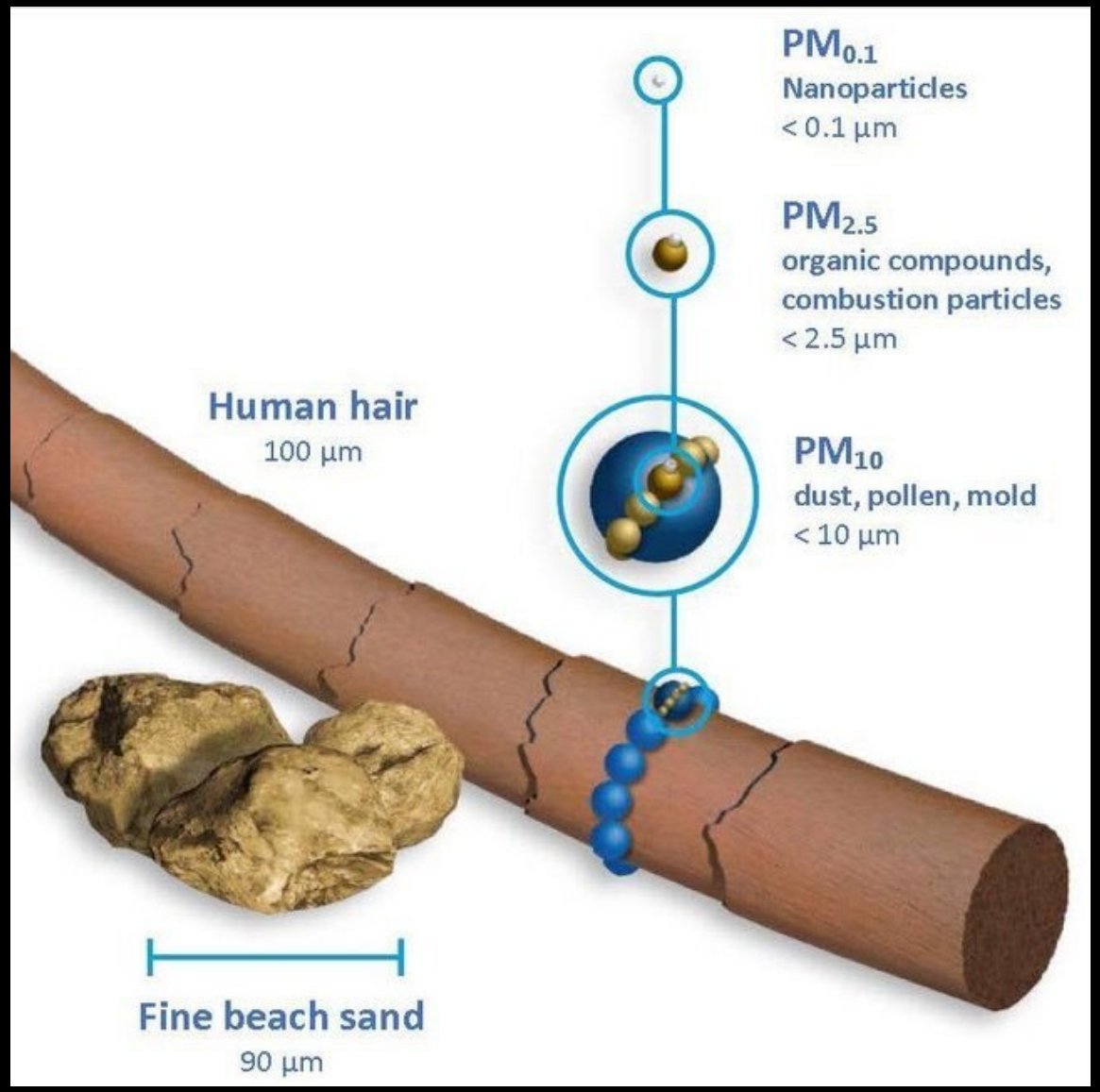


- Air pollutants can be composed of solid matter or gaseous particles.
- The solid particles form particulate matter (PM) vary in size, ranging from ultrafine to coarse particles.
- PM also varies in composition, making it important to measure, especially toxic PM such as black carbon.
- A variety of air pollutants include: ground-level ozone, nitrogen dioxide, volatile organic compounds (VOCs).

https://www.nps.gov/subjects/air/sources.htm

https://www.clarity.io/blog/how-measuring-different-types-of-air-pollutants-creates-a-more-holistic-picture-of-air-pollution

Particulate Matter – PM10, PM2.5, PM0.1



- **Coarse particles**, called **PM_{10},** can include wind-blown dust, ash, pollen and smoke.
- **Fine particles**, **$PM_{2.5}$**, are most often a by-product of burning wood or fossil fuels.
- The tiniest are called **ultrafine particles**, or **$PM_{0.1}$**, which are also produced by combustion.

Source: https://www.epa.gov/pm-pollution

Hilco to pay $12.25 million in class-action lawsuit over dust cloud debacle in Little Village

Particle Matter Pollution (PM) occurs when tiny particles from dirty power plants, construction and demolition activities, wood and fuel burning, wildfires, road dust, and vehicle emissions enter the air.

The 2020 demolition of a smokestack at the Crawford power plant sent dust billowing through Little Village.
Tyler Pasciak LaRiviere/Sun-Times file

https://chicago.suntimes.com/2024/1/17/24041324/hilco-smokestack-demolition-2020-settlement-little-village-12-million

http://www.stateoftheair.org/

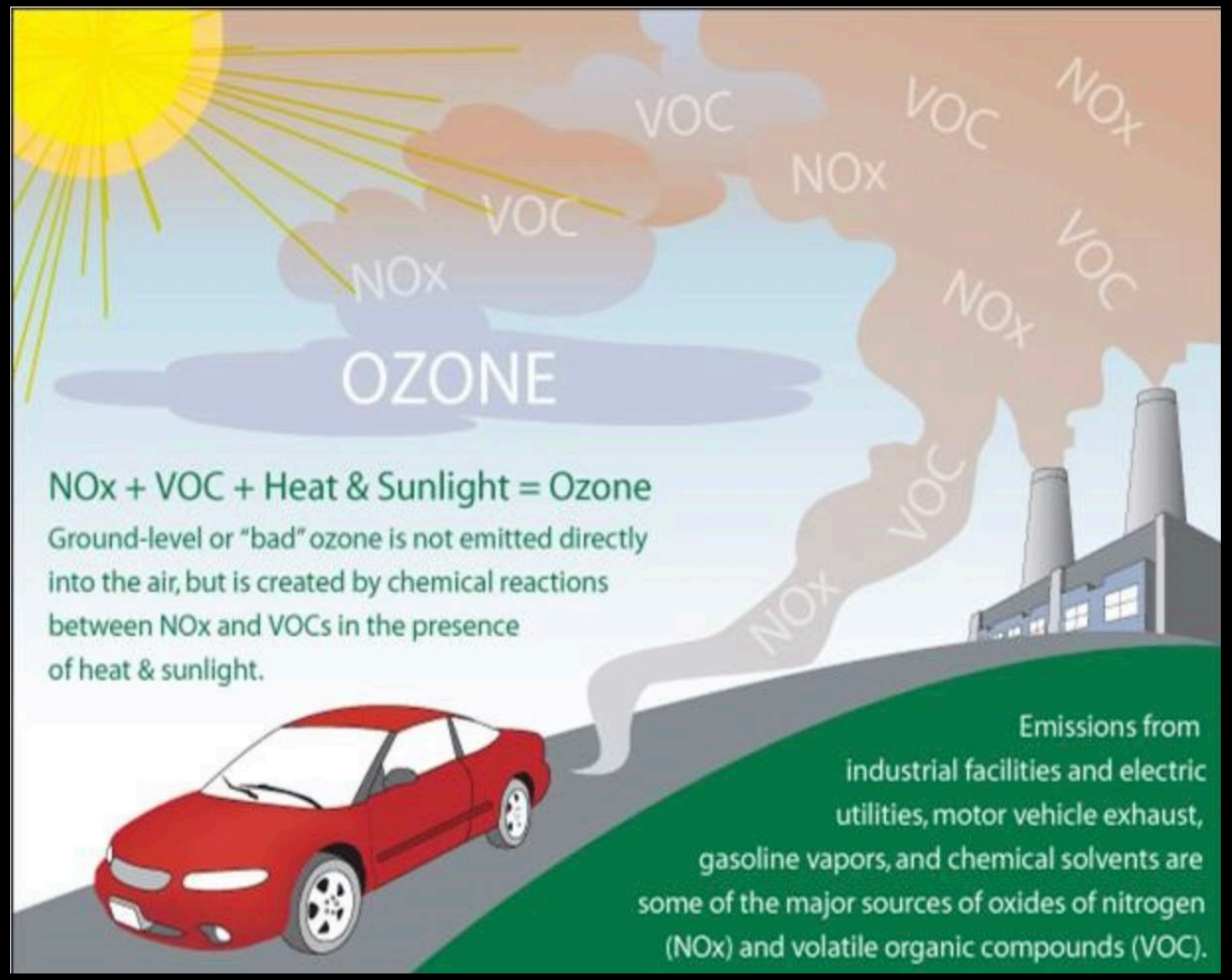
PM2.5 Explained

- **Particulate Matter (PM)** is a mixture of solid and liquid particles suspended in the air.
- **PM2.5 are fine particles** with a diameter less than 2.5 µ remain suspended in the air for longer durations.
- **Health risk with PM2.5:** Can travel into **the lungs and the blood stream.**
- **PM2.5 is used to describe pollutant levels**, from exposure of PM2.5 over a 24-hour period.
- **PM2.5 at or below 12 µg/m³ is considered healthy** with little to no risk from exposure.
- **Levels at or above 35 µg/m³ during a 24-hour** period, the air is considered **unhealthy** for people with breathing issues.
- **Prolonged** exposure to **levels above 50 µg/m³** can lead to sever health issues and **premature mortality**.

https://www.indoorairhygiene.org/pm2-5-explained/#:~:text=If%20the%20level%20goes%20to,health%20issues%20and%20premature%20mortality.

http://www.stateoftheair.org/

Ground-level Ozone Pollution



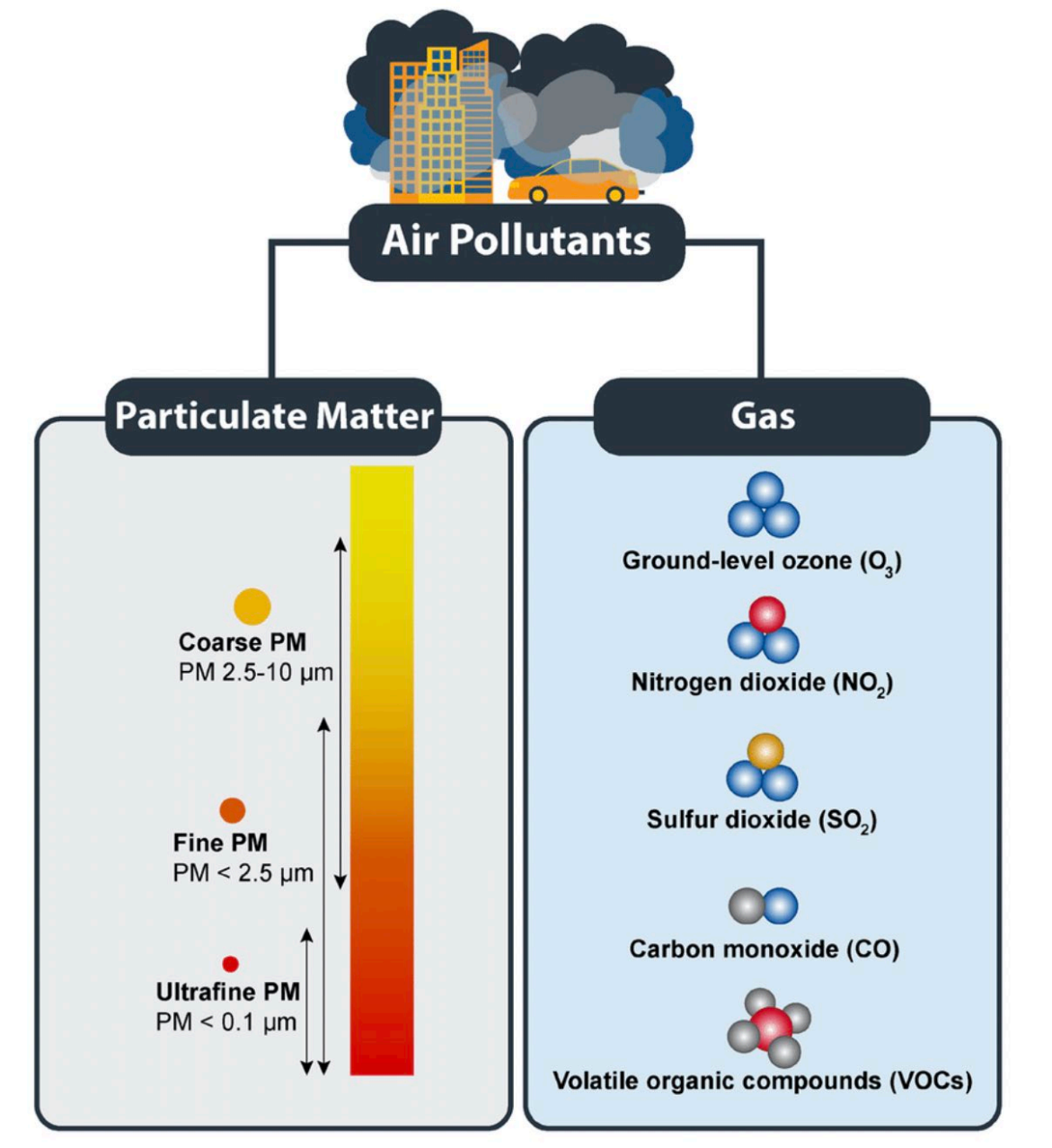
Ozone is a gas composed of three atoms of oxygen. Ozone occurs both in the Earth's upper atmosphere and at ground level. Ozone can be good or bad, depending on where it is found.

Stratospheric ozone is "good" because it protects living things from ultraviolet radiation from the sun.

Ground-level ozone is "bad" because it can trigger health problems, particularly for children, the elderly, and people with lung diseases.

Ground-level Ozone (or Smog, O3) forms when emissions from vehicles, refineries, chemical plants, paint and solvents react with heat and sunlight.

https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics



(Image source: Sompornrattanaphan et al.)

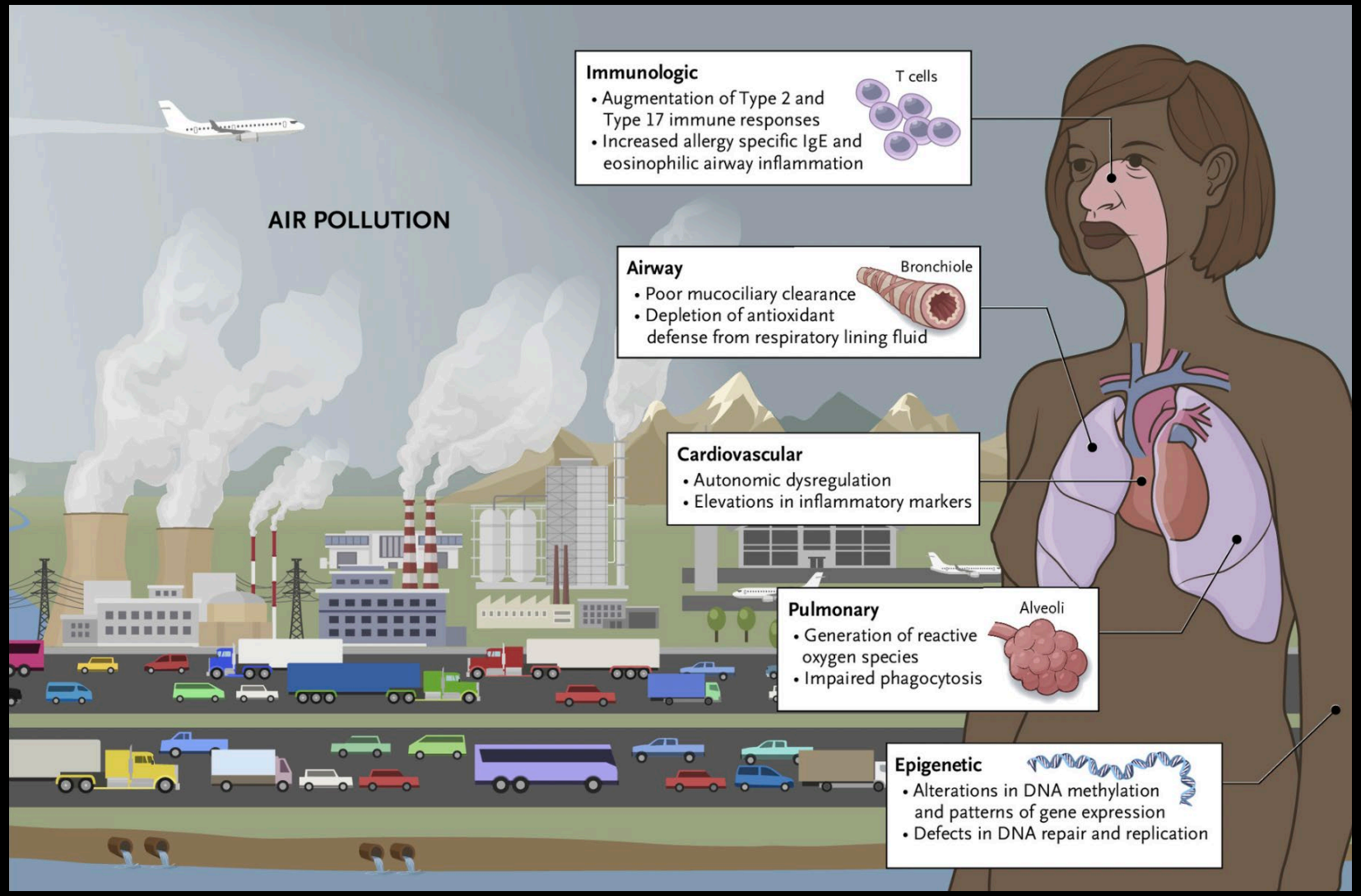
Other Outdoor Air Pollutants

- **Nitrogen Oxides** (NO2/NOx) from burning fuels, It contributes to ozone pollution.
- **Carbon Monoxide** (CO) a by-product of combustion.
- **Sulfur Dioxide** (SO2) from power plants and refineries
- **Air Toxics** from power plants.
- **Lead** (Pb) from incinerators and contaminated materials

Indoor Air Pollutants

- **Asbestos:** microscopic mineral fibers that can be inhaled into the lungs.
- **Biological Pollutants:** Viruses, Bacteria, Fungi, Mold, Dust Mites, Cockroaches.
- **Carbon Monoxide** (CO) and **Nitrogen Dioxide** (NO2), odorless, colorless gases
- **Lead**: toxic metal once common in household products and paint
- **Radon**: naturally occurring radioactive gas that is colorless and odorless.
- **Secondhand Smoke**: tobacco smoke; includes benzene, formaldehyde and CO.
- **Volatile Organic Compounds** (VOCs): chemicals in household products, formaldehyde, and benzene from gas stoves.

Health Implications of Air Pollution



https://evidence.nejm.org/doi/full/10.1056/EVIDra2200068

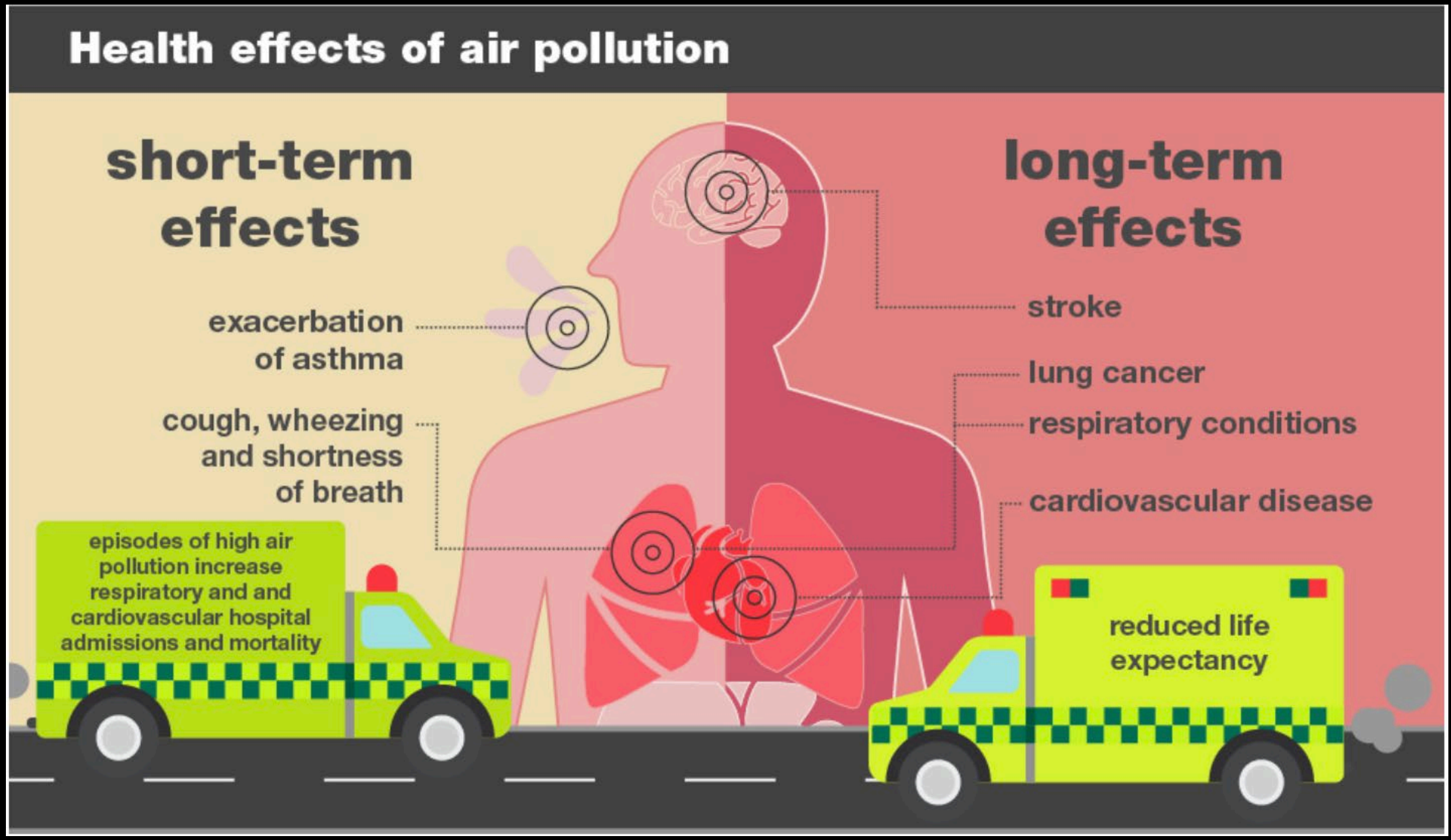
Fossil fuel air pollution responsible for deaths worldwide (University College London, 9 February 2021)

- An estimated 1 in 5 deaths (18 to 21.5%) every year can be attributed to fossil fuel pollution.

- More than 8 million people around the globe die each year as a result of air containing particles from burning fuels like coal, petrol and diesel.

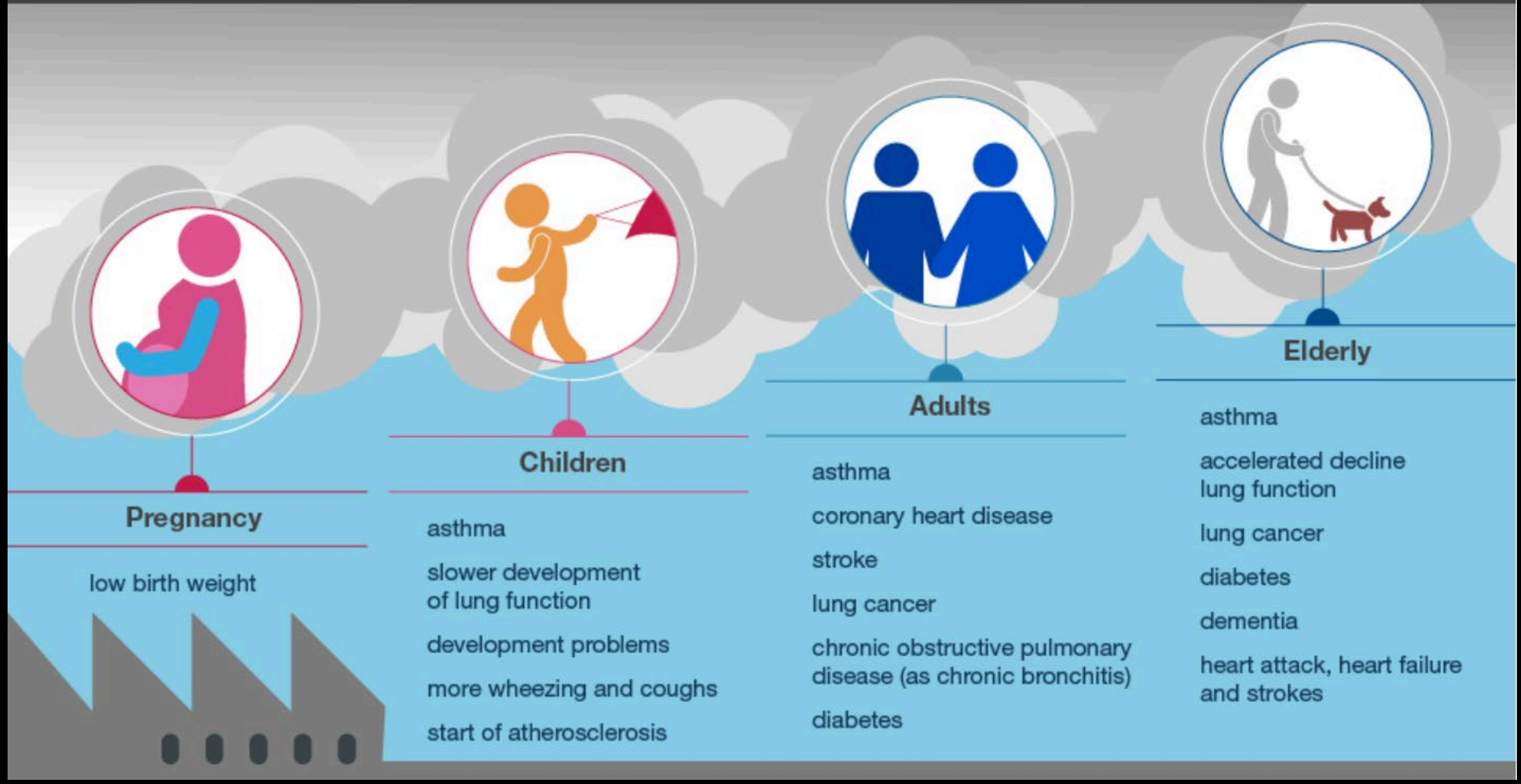
- Aggravating respiratory conditions, and can lead to lung cancer, coronary heart disease, strokes and early death.

https://www.ucl.ac.uk/news/2021/feb/fossil-fuel-air-pollution-responsible-1-5-deaths-worldwide

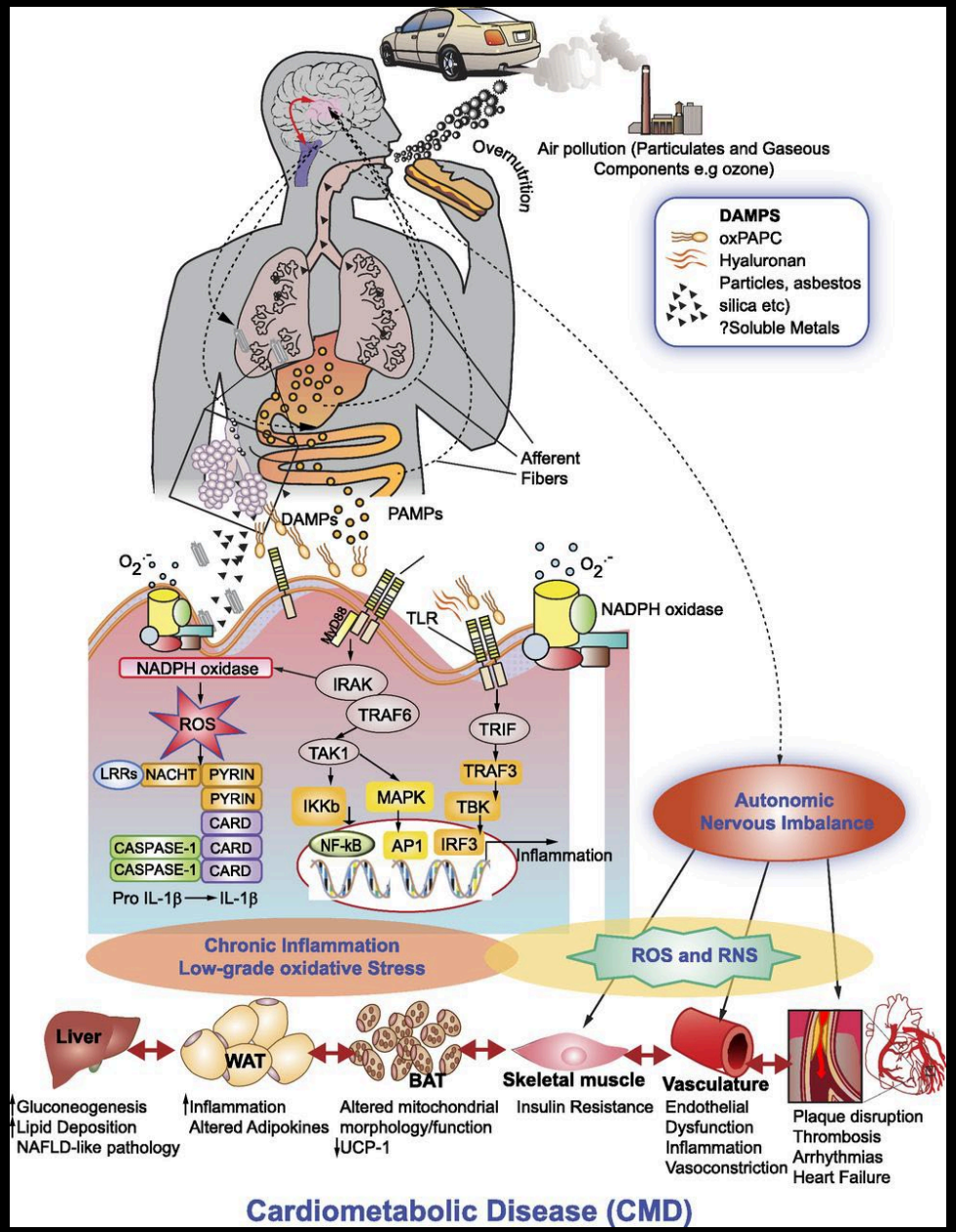


https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

Air pollution affects people throughout their lifetime



https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution



American Diabetes Association.

From: **Air Pollution and Type 2 DiabetesMechanistic Insights**

Diabetes. 2012;61(12):3037-3045. doi:10.2337/db12-0190

Air Pollution, including PM2.5, Ozone (O3), and nitrogen dioxide (NO2), can enter the bloodstream, impacting organs, including the ones involved in glucose metabolism.

- Exposure to air pollution for long time, may lead to systemic inflammation, disruption of insulin production and insulin resistance and, raising the risk for Type 2 Diabetes.

- The pollutants generate oxidative stress, damaging pancreatic cells, which are responsible for insulin production and secretion.

- The Gut Microbiome is vital to regulating glucose metabolism, and air pollution can leading to an increased risk of Diabetes.

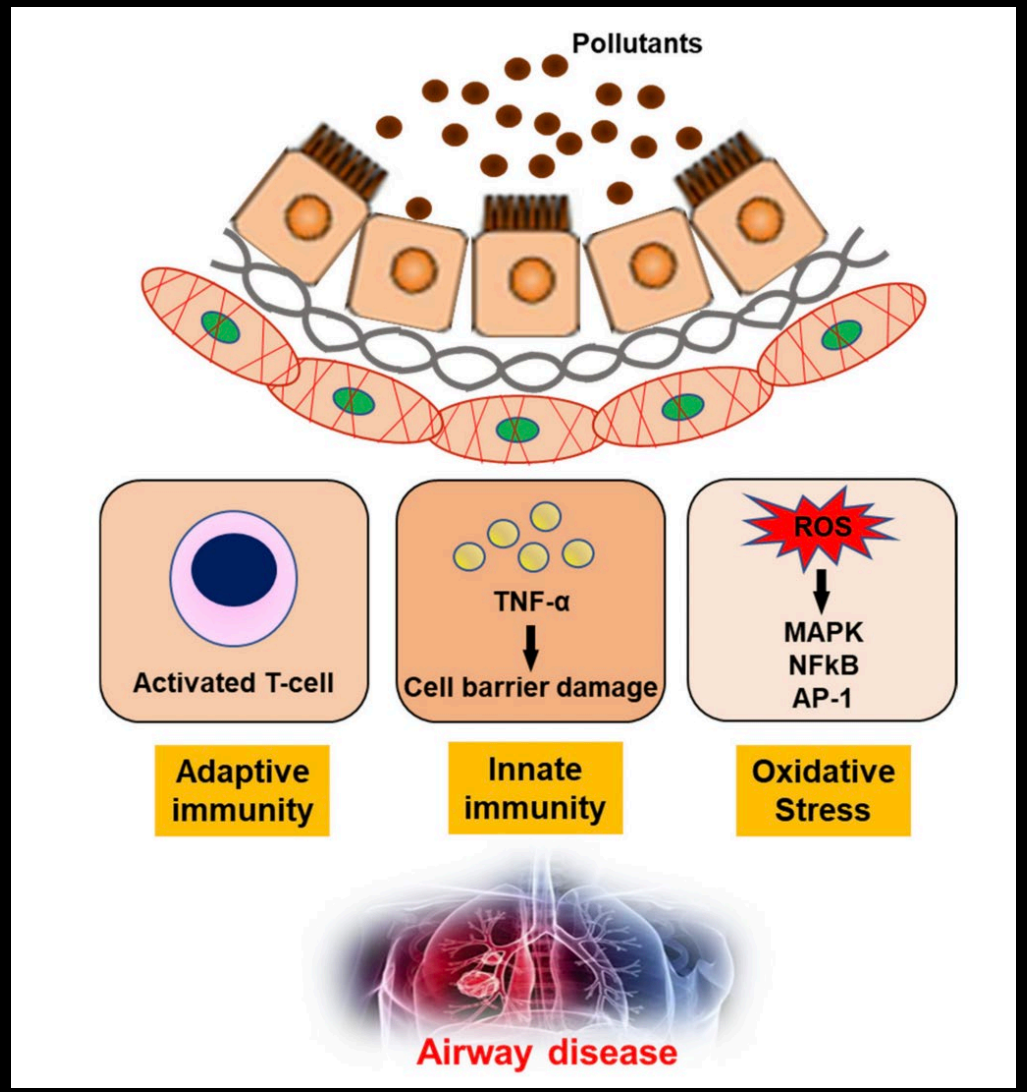
https://diabetesjournals.org/diabetes/article/61/12/3037/33738/Air-Pollution-and-Type-2-DiabetesMechanistic

Health Effects of Ozone Pollution

- **Ozone can be harmful**, especially on hot sunny days when ozone can reach unhealthy levels.
- People most at **risk** include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers.
- Depending on the level of exposure, ozone can:
  - Cause coughing and sore throat, difficult to breathe, pain with deep breath and damage the airways. Make the lungs more susceptible to infection and worsening asthma, emphysema, and chronic bronchitis.
- Some of these effects have been found **even in healthy people**.
- Long-term exposure to **ozone is associated with increase deaths from respiratory causes**.

https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution

The Mechanism of Air Pollutants for Airway Disease.



- Ozone is highly reactive, and oxidizes proteins and lipids in the lung. This increases lung permeability, via pro-inflammatory cytokines.
- Allergic airway diseases are linked to exposure to atmospheric pollutants. This may be a factor in the increasing prevalence of asthma.
- The combined effect of ozone and diesel exhaust particles (DEPs) may develop and exacerbate asthma

https://www.mdpi.com/1660-4601/18/18/9905

Particulate Matter – PM2.5, PM0.1

Air Pollution and the Brain

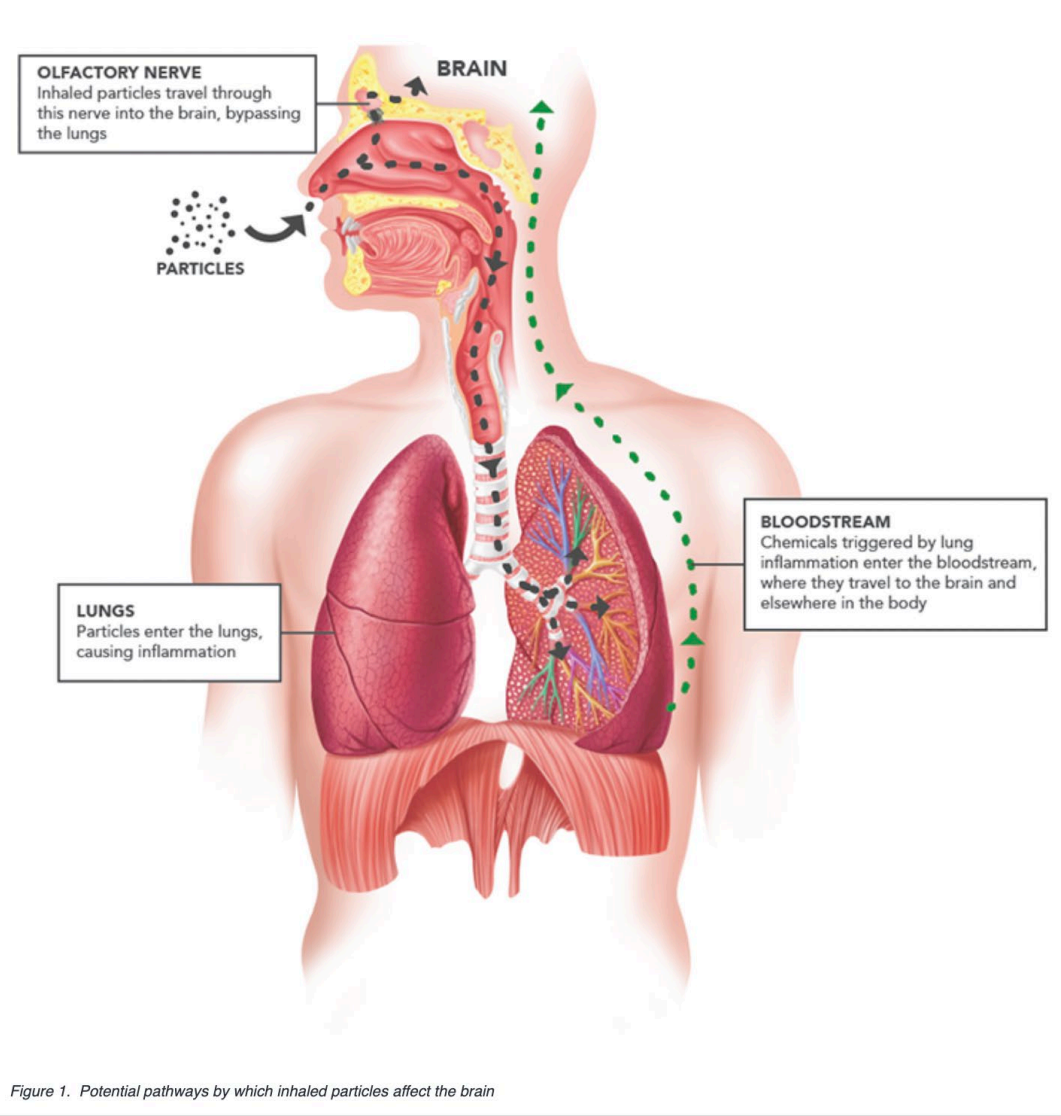


Figure 1. Potential pathways by which inhaled particles affect the brain

Exposed animals to **UFPM < 0.1 μ** showed:

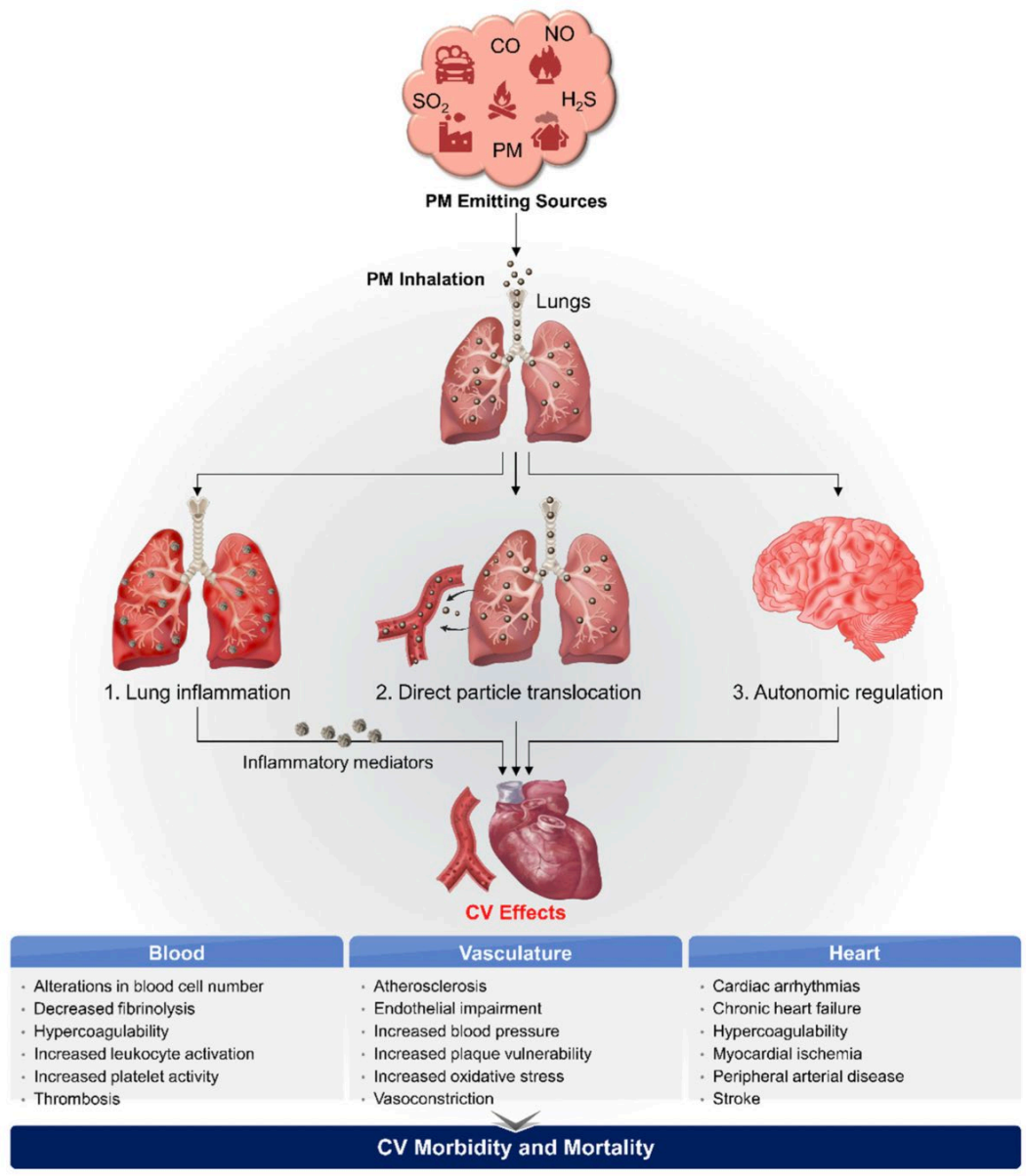
- Inhaled particles **can travel through the nasal nerve from the nasal cavity into the brain.**
- **UFPM carried in the bloodstream** can **pass** through the **barrier that normally protects** the brain
- Chemical markers of **brain inflammation can increase.**

A **Canadian study** found that risk of **dementia increased** the closer people lived to major roadways.

A **U.S. study** showed higher risk of **cognitive decline and dementia** when exposed to levels of **PM2.5, and < 2.5 μ** above the national standard.

https://ww2.arb.ca.gov/resources/fact-sheets/air-pollution-and-brain/printable/print

Air Pollution and Heart Disease

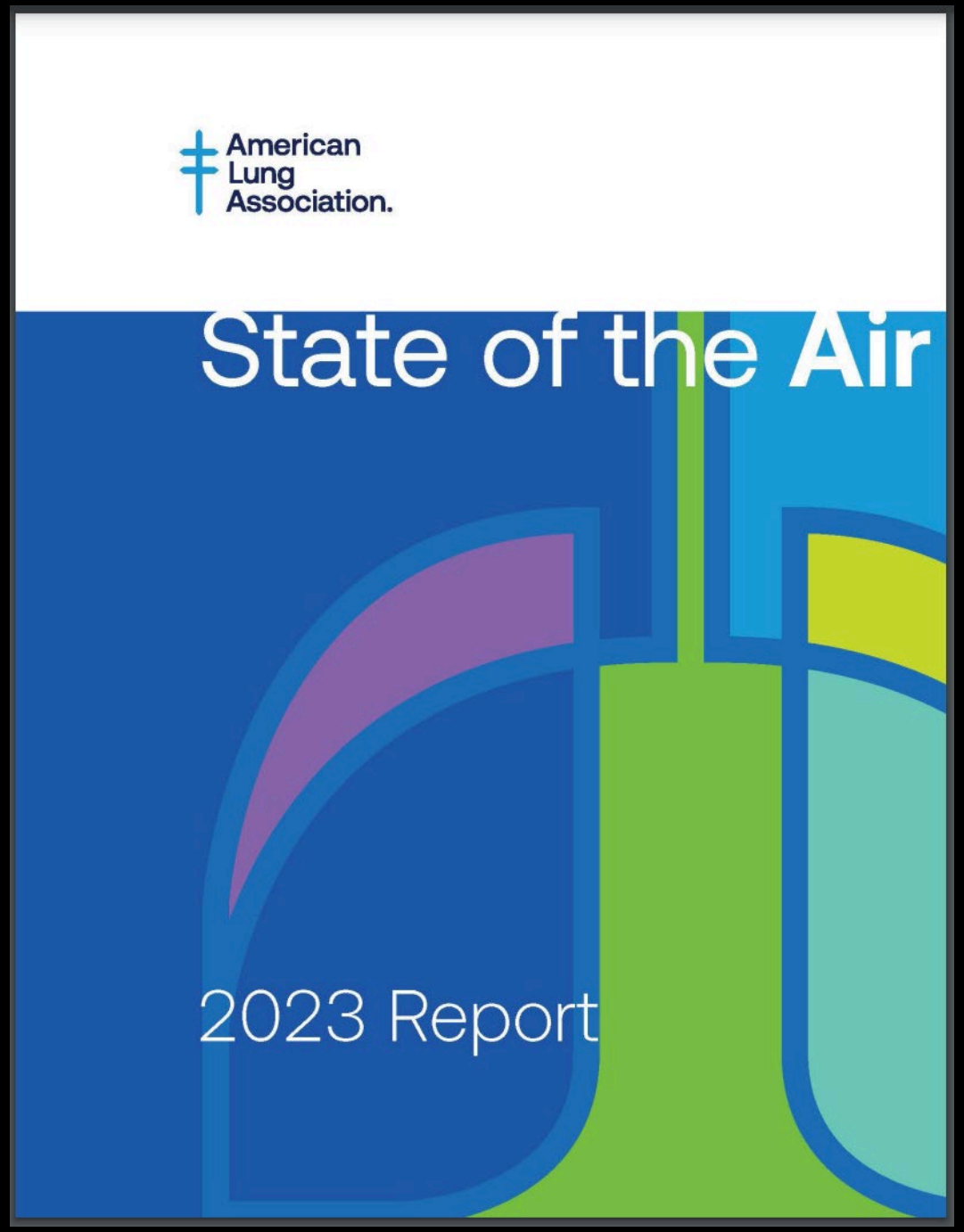


- Studies showed **high risk of cardiovascular events** with long-and short-term **exposure to air pollutants.**
- The MESA study determined **that long-term exposure to $PM_{2.5}$, NO_x, and ozone** was associated with the progression of coronary artery calcification and **atherosclerosis**.
- Higher levels of **air pollutants** are associated with **hypertension** and higher **risk of mortality** from ischemic heart disease, arrhythmias, and heart failure.
- **Numerous studies** worldwide have **corroborated these findings** since that time

https://www.mdpi.com/2079-4991/12/15/2656

https://evidence.nejm.org/doi/full/10.1056/EVIDra2200068

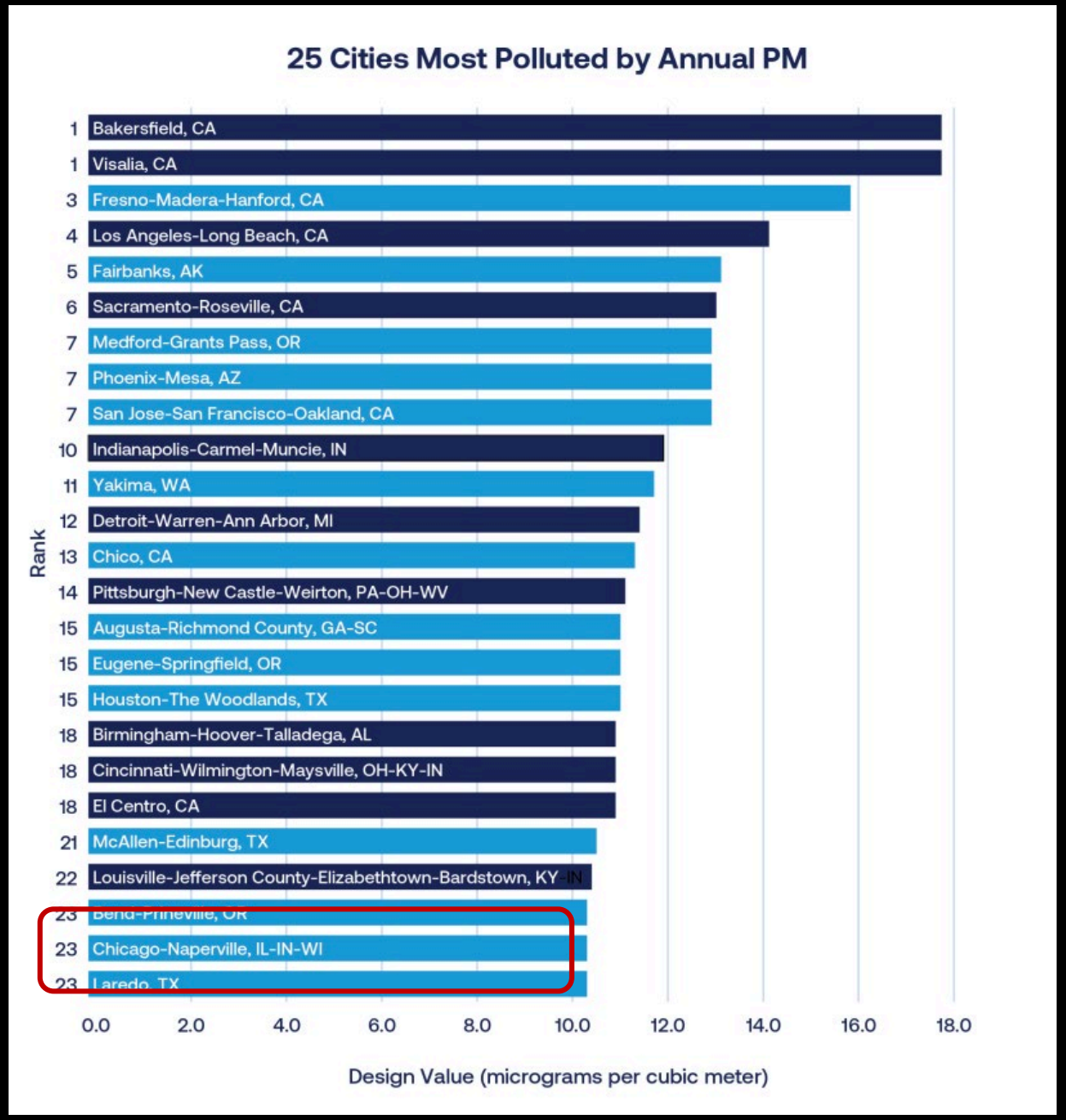
Air Quality in Your Community



The State of the Air

- State of the Air is a website published by the American Lung Association.
- The State of the Air looks at two of the most widespread and dangerous pollutants ozone and particulate pollution based on EPA measurements

http://www.stateoftheair.org/



25 Cities Most Polluted by Annual PM

- Cities with high power plant emissions and industrial infrastructures, with sources of year-round PM pollution.
- These included Indianapolis, Detroit, Pittsburgh, Cincinnati and Chicago-Naperville.

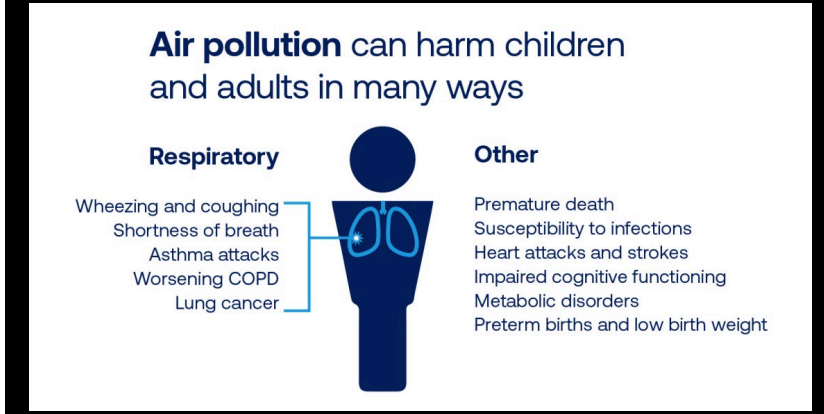
https://www.lung.org/research/sota

Data Tables

Table 2b People at Risk in 25 U.S. Cities Most Polluted by Year-Round Particle Pollution (Annual $PM_{2.5}$)

2023 Rank	Metropolitan Statistical Areas	Total Population	Under 18	65 and Over	Pediatric Asthma	Adult Asthma	COPD	Lung Cancer	CV Disease	Pregnancies	People of Color	Poverty
1	Bakersfield, CA	917,673	263,402	104,638	13,139	57,795	27,903	346	37,178	9,412	632,525	164,169
1	Visalia, CA	477,054	144,196	55,572	7,193	29,409	14,362	179	19,237	4,989	351,235	88,367
3	Fresno-Madera-Hanford, CA	1,326,434	370,656	166,947	18,488	84,458	41,730	499	56,129	13,906	954,184	248,788
4	Los Angeles-Long Beach, CA	18,490,242	4,112,015	2,705,866	205,110	1,272,354	648,442	6,949	895,585	200,022	13,071,213	2,316,720
5	Fairbanks, AK	95,593	22,506	11,366	1,485	6,595	3,866	49	4,450	1,261	29,724	7,247
6	Sacramento-Roseville, CA	2,697,399	608,540	445,410	30,355	184,931	97,656	1,013	136,361	28,177	1,325,731	317,925
7	San Jose-San Francisco-Oakland, CA	9,545,921	2,028,372	1,520,400	101,177	665,484	346,398	3,589	482,268	101,021	6,071,450	909,294
7	Phoenix-Mesa, AZ	4,999,734	1,145,926	819,746	92,379	366,150	211,696	1,970	305,529	54,708	2,317,167	556,754
7	Medford-Grants Pass, OR	312,080	63,156	74,256	4,389	27,924	16,607	146	22,984	2,601	59,577	44,396
10	Indianapolis-Carmel-Muncie, IN	2,507,944	600,785	371,608	42,254	197,689	157,460	1,556	163,232	30,309	680,691	272,410
11	Yakima, WA	256,035	75,344	36,193	5,508	19,003	9,052	124	12,015	2,605	151,594	37,078
12	Detroit-Warren-Ann Arbor, MI	5,393,033	1,164,730	935,955	81,511	493,567	329,752	3,195	400,142	56,884	1,764,417	713,268
13	Chico, CA	208,309	42,437	37,992	2,117	14,671	7,834	78	10,807	2,243	64,260	33,874
14	Pittsburgh-New Castle-Weirton, PA-OH-WV	2,637,506	499,377	554,715	32,720	221,020	153,253	1,559	216,368	26,029	386,787	293,775
15	Eugene-Springfield, OR	383,189	68,642	78,561	4,771	35,390	19,103	180	25,578	3,785	74,138	53,989
15	Augusta-Richmond County, GA-SC	615,933	140,717	104,050	12,390	44,319	33,368	351	43,817	6,694	289,250	93,326
15	Houston-The Woodlands, TX	7,398,774	1,927,208	894,440	122,452	460,317	325,709	3,366	385,518	93,373	4,839,676	1,036,292
18	El Centro, CA	179,851	51,197	24,033	2,554	11,371	5,719	68	7,739	1,715	163,246	29,738
18	Cincinnati-Wilmington-Maysville, OH-KY-IN	2,318,870	538,113	373,954	30,908	192,950	158,476	1,591	182,639	26,076	496,399	273,458
18	Birmingham-Hoover-Talladega, AL	1,350,100	306,036	232,702	29,496	105,400	98,489	819	121,624	15,467	479,199	196,969
21	McAllen-Edinburg, TX	946,405	299,852	107,413	19,052	53,940	37,526	430	44,585	11,595	894,220	271,830
22	Louisville-Jefferson County--Elizabethtown--Bardstown, KY-IN	1,512,785	339,875	251,417	18,500	134,917	122,682	1,209	131,898	17,569	371,818	184,842
23	Bend-Prineville, OR	230,540	44,762	48,596	3,111	20,980	11,841	108	15,935	2,053	31,515	20,737
~~23~~	~~Laredo, TX~~	~~267,945~~	~~85,427~~	~~26,695~~	~~5,428~~	~~15,224~~	~~10,370~~	~~122~~	~~12,044~~	~~3,287~~	~~258,388~~	~~59,771~~
23	Chicago-Naperville, IL-IN-WI	9,876,339	2,202,143	1,552,155	154,670	680,535	440,098	5,694	620,403	105,565	4,679,774	1,117,401

People at Risk in Cities Most Polluted by Year-Round Particle Pollution (Annual PM2.5)



https://www.lung.org/research/sota

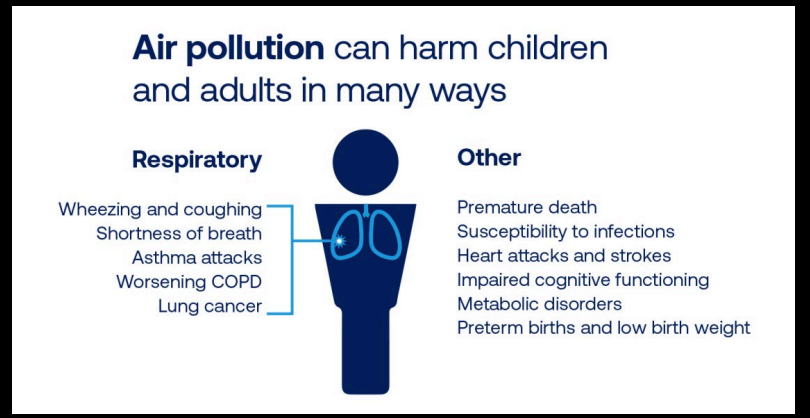
The State of the Air In Illinois

State Tables

ILLINOIS

American Lung Association in Illinois

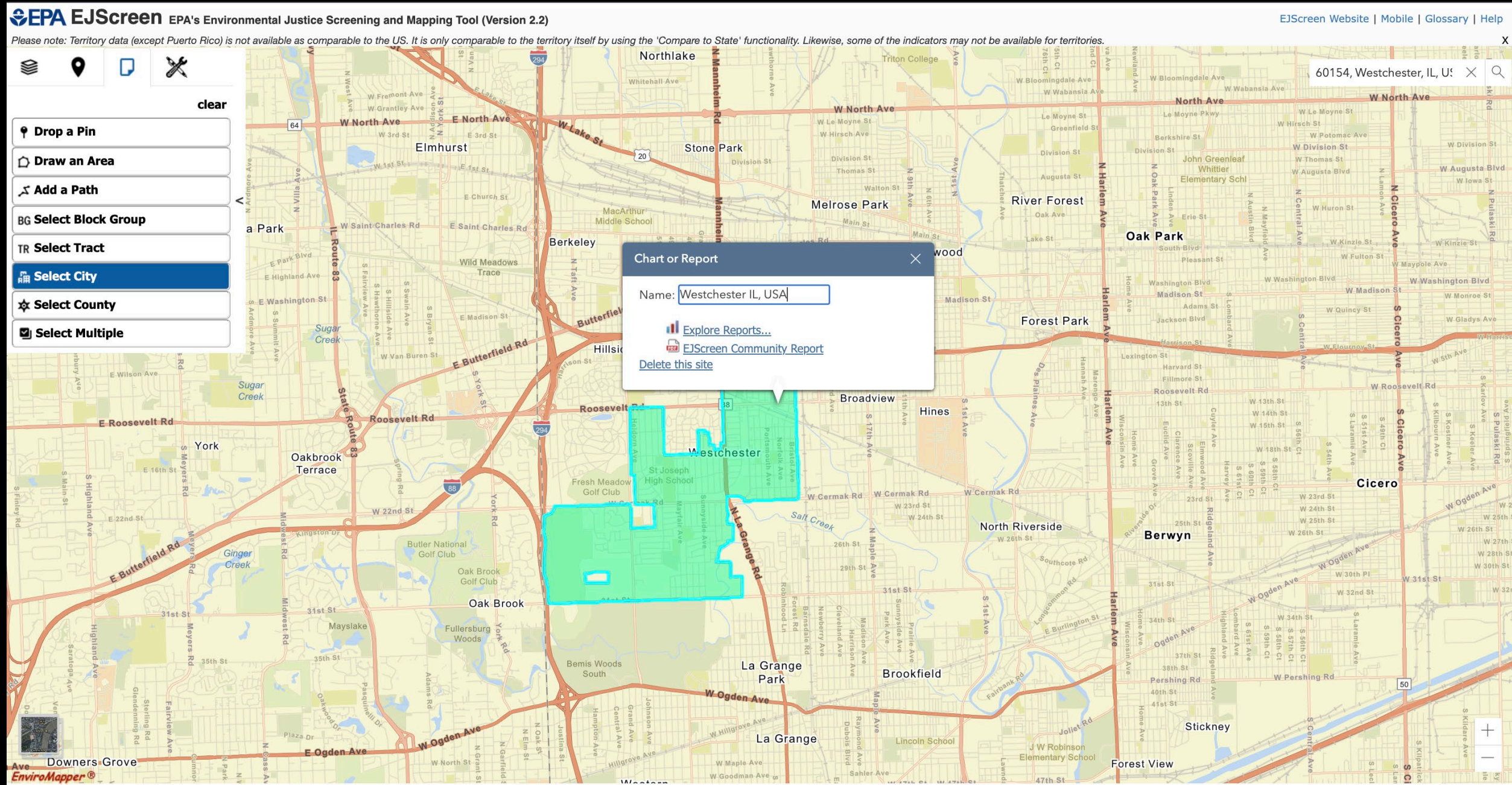
				AT-RISK GROUPS							
				Lung Diseases							
County	Total Population	Under 18	65 & Over	Pediatric Asthma	Adult Asthma	COPD	Lung Cancer	CV Disease	Pregnancies	Poverty	People of Color
Adams	64,954	14,712	13,463	1,035	4,316	3,137	37	4,711	590	7,424	5,877
Champaign	205,943	39,315	28,273	2,767	14,910	7,918	118	11,011	2,641	28,582	70,591
Clark	15,899	3,475	3,077	245	1,019	749	9	1,115	135	1,583	599
Cook	5,173,146	1,111,446	807,186	78,216	354,509	218,829	2,959	318,460	57,451	703,874	3,027,779
DuPage	924,885	206,835	155,352	14,556	61,984	40,994	530	60,688	9,197	62,952	323,625
Effingham	34,430	8,253	6,396	581	2,253	1,571	20	2,544	307	3,158	1,666
Hamilton	7,911	1,743	1,753	123	527	400	5	605	69	1,032	394
Jersey	21,333	4,319	4,280	304	1,456	1,046	12	1,572	197	1,914	1,005
Jo Daviess	21,939	4,020	6,417	283	1,508	1,317	13	2,034	159	1,877	1,289
Kane	515,588	125,987	76,629	8,866	33,686	21,462	295	31,585	5,141	43,982	226,500
Lake	711,239	167,217	109,313	11,768	46,972	30,287	408	44,687	6,926	58,626	289,459
McHenry	311,122	71,178	49,322	5,009	20,607	13,645	178	20,274	2,963	18,456	65,299
McLean	170,889	36,154	24,260	2,544	11,903	6,790	98	9,669	2,070	21,514	36,526
Macon	102,432	23,011	21,285	1,619	6,833	4,940	59	7,406	1,003	16,893	25,821
Macoupin	44,406	9,252	9,422	651	3,001	2,227	25	3,363	403	6,702	1,889
Madison	264,490	57,401	47,890	4,040	17,853	12,139	151	18,048	2,639	29,596	42,541
Peoria	179,432	42,902	32,182	3,019	11,838	7,942	103	11,743	1,813	28,357	56,304
Randolph	30,142	5,779	5,816	407	2,103	1,441	17	2,142	227	3,909	5,065
Rock Island	142,909	32,070	28,843	2,257	9,559	6,778	82	10,124	1,341	22,803	43,467
St. Clair	254,796	59,630	43,039	4,196	16,858	11,197	146	16,578	2,572	33,300	99,924
Sangamon	194,734	42,966	36,600	3,024	13,067	9,061	111	13,514	1,931	27,610	40,620
Will	697,252	167,087	97,936	11,759	45,832	28,649	399	42,060	7,120	54,149	271,606
Winnebago	283,119	66,417	51,801	4,674	18,675	12,867	162	19,164	2,749	39,659	95,369



https://www.lung.org/research/sota

https://www.epa.gov/ejscre

https://ejscreen.epa.gov/mapper/



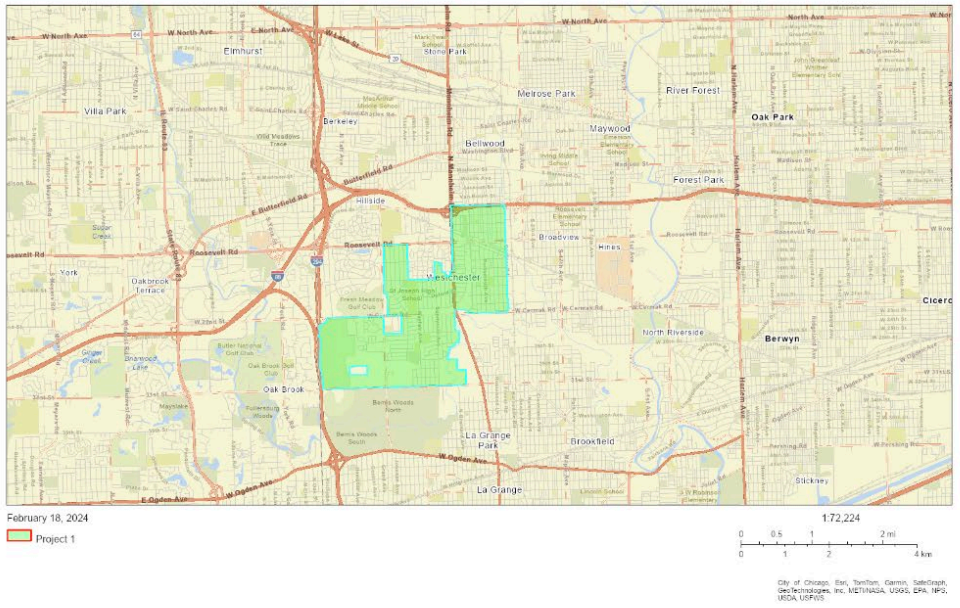
EJScreen Community Report

This report provides environmental and socioeconomic information for user-defined areas, and combines that data into environmental justice and supplemental indexes.

Westchester, IL

City: Westchester
Population: 16,644
Area in square miles: 3.69

A3 Landscape



COMMUNITY INFORMATION

Low income: 13 percent	People of color: 46 percent	Less than high school education: 6 percent	Limited English households: 3 percent
Unemployment: 5 percent	Persons with disabilities: 13 percent	Male: 46 percent	Female: 54 percent
79 years Average life expectancy	$46,491 Per capita income	Number of households: 6,833	Owner occupied: 88 percent

BREAKDOWN BY RACE

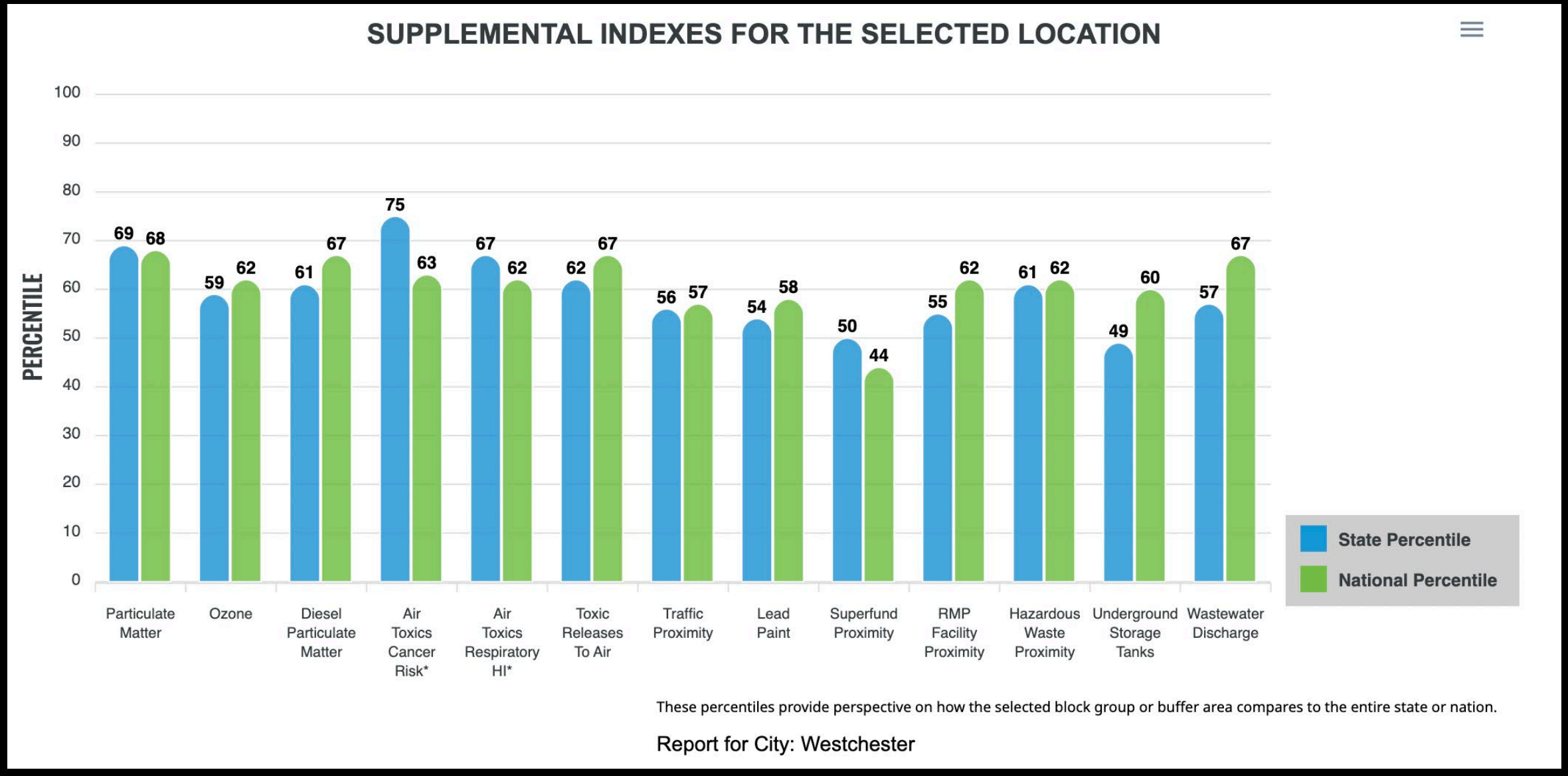
https://ejscreen.epa.gov/mapper/

EJScreen Community Report

This report provides environmental and socioeconomic information

https://ejscreen.epa.gov/mapper/

Report for the City of Westchester



https://ejscreen.epa.gov/mapper/ejscreen_SOE.aspx

US EPA EJScreen for Westchester

Variables	Value	IL Avg	IL %ile	US Avg	US %ile
PM (µg/m³) recommended < 8 (WHO 5)	**10.3**	**9.44**	**93**	**8.08**	**95**
Ozone (ppb) recommended < 60	**65.6**	**63.6**	69	**61.6**	78
Diesel PM (µg/m³)	**0.476**	0.358	75	0.261	**89**
Toxic Releases to Air	**7,800**	6,000	78	4,600	**91**
Traffic Proximity (daily traffic count/distance to road)	**440**	200	**92**	210	**89**
RMP Facility Proximity (facility count/km distance)	**0.92**	0.72	76	0.43	**87**
Hazardous Waste Proximity (facility count/km distance)	**3.3**	1.7	**84**	1.9	**82**
Underground Storage Tanks (count/km2)	**9.5**	8.6	67	3.9	**88**

https://www.epa.gov/ejscreen

What's the State of Your Air? Report Card: Illinois

American Lung Association. State of the Air | 2023

Back to Lung.org | TRANSLATE

Report Cards | Key Findings | Health Impact | Recommendations | For The Media

Sorted by County

County	Grade	Wgt. Avg.	Orange Days	Red Days	Purple Days
Adams	A	0.0	0	0	0
Champaign	B	0.7	2	0	0
Clark	A	0.0	0	0	0
Cook	F	15.5	39	5	0
DuPage	F	3.3	7	2	0
Effingham	A	0.0	0	0	0
Hamilton	B	0.7	2	0	0
Jersey	C	1.7	5	0	0
Jo Daviess	A	0.0	0	0	0
Kane	F	3.8	10	1	0
Lake	F	7.5	21	1	0

https://www.lung.org/research/sota/city-rankings/states/illinois

What You Can do About Air Pollution

Call to action: reducing air pollution. Local government

https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

Air pollution is a concern for all of us

PERC (perchloroethylene)

- There are many activities that can have adverse effects on the air we breathe.
- Driving cars, trucks and buses; burning coal, oil, and wood; and manufacturing chemicals.
- Air pollution can even come from smaller, everyday activities such as filling your car with gas, painting operations and dry cleaning.

https://portal.ct.gov/DPH/Environmental-Health/Environmental-and-Occupational-Health-Assessment/Air-Pollution#:~:text=These%20activities%20include%20driving%20cars,and%20degreasing%20and%20painting%20operations.

https://environmentaldefence.ca/wp-content/uploads/2016/01/Environmental-Defence-Dry-Cleaning-Report.pdf

PERC (perchloroethylene)

PERC threatens the environment through direct release into the air during the dry cleaning process, but also from hazardous waste and spills that can contaminate soil and drinking water.

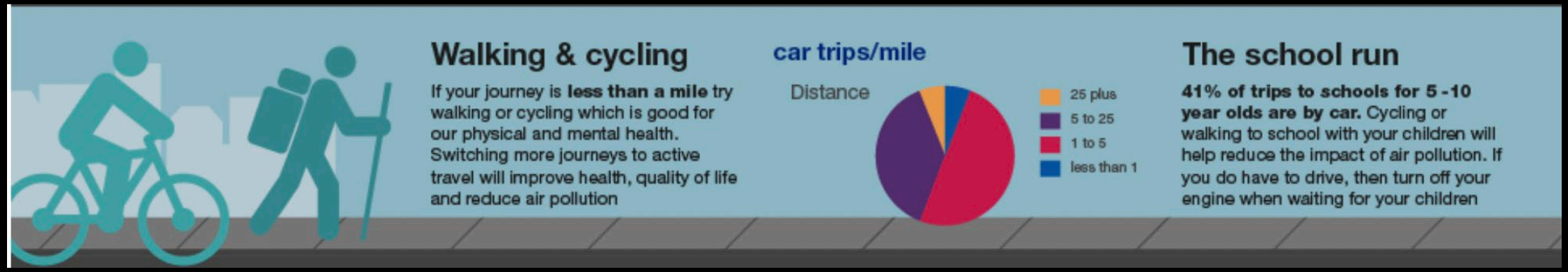
COMPARISON OF U.S. GRANT PROGRAMS

	PERC MACHINE REMOVAL	SWITCH PERC TO WET CLEANING	SWITCH PERC TO HYDROCARBON CLEANING
California	-	$10,000	$5,000
New Jersey	$10,000	$15,000	-
Philadelphia (City)	-	$1,000	$1,000
Boston (TURI)	-	$15,000	-

- OSHA has set up a limit concentration of PERC's at 0.1 mg/m3
- In addition to phasing out PERC, all dry cleaning using PERC must meet stricter equipment standards.
- All dry cleaners are required to have vapor barriers and carbon absorbers to address potential leaks.
- EPA offered a Dry Cleaner Removal Reimbursement Program, to remove PERC dry cleaning machines, it is a financial incentive for replacing a PERC system with a wet cleaning system

https://environmentaldefence.ca/wp-content/uploads/2016/01/Environmental-Defence-Dry-Cleaning-Report.pdf

Call to action: AIR POLLUTION IS A CONCERN FOR ALL OF US



If the journey is less than a mile, walking or cycling are preferable, these activities have additional benefits of improving physical and mental health and quality of life.

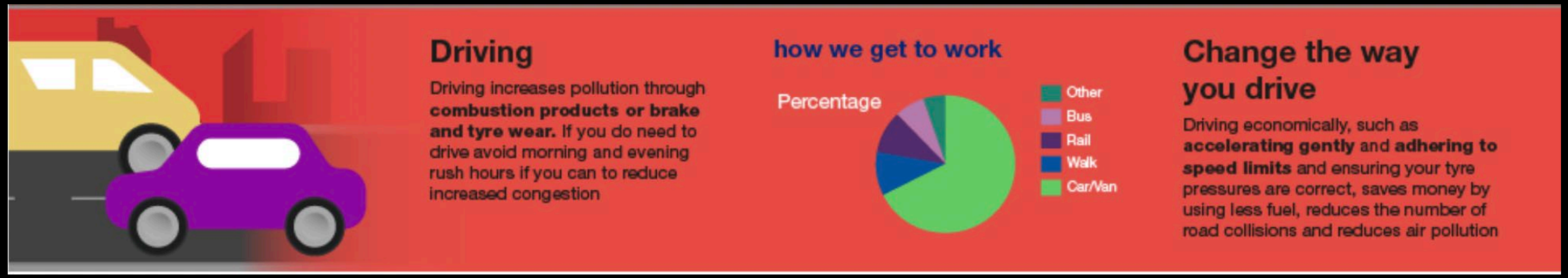
https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

AIR POLLUTION IS A CONCERN FOR ALL OF US

Using public transportation reduces the number of cars on the road. Public transport reduces polluted routes, such as main roads, improving health and reducing exposure.

https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

AIR POLLUTION IS A CONCERN FOR ALL OF US



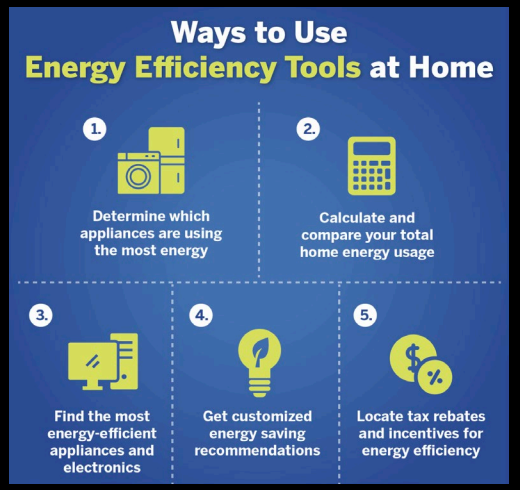
If driving: try carpooling and avoid rush hours.
Driving economically: accelerating gently, adhering to speed limits,
Correct tire pressures: saves money by using less fuel, reduces road collisions and air pollution. Turning off engines when waiting.

https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution

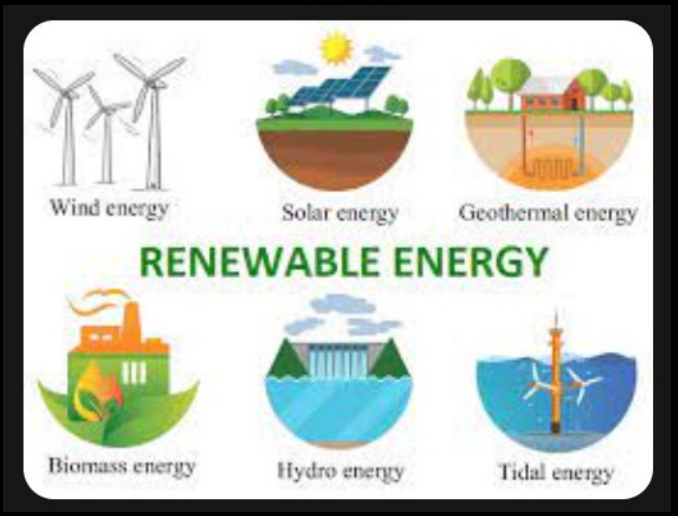
AIR POLLUTION IS A CONCERN FOR ALL OF US

Don't burn your trash.

Switch to electric or hand-powered lawn equipment



Efficient appliances and heating systems



Renewable energy to power your home

Plant and care for trees.

Fuel efficient vehicles

https://dnr.mo.gov/air/get-involved/help-improve-air-quality

Conclusion

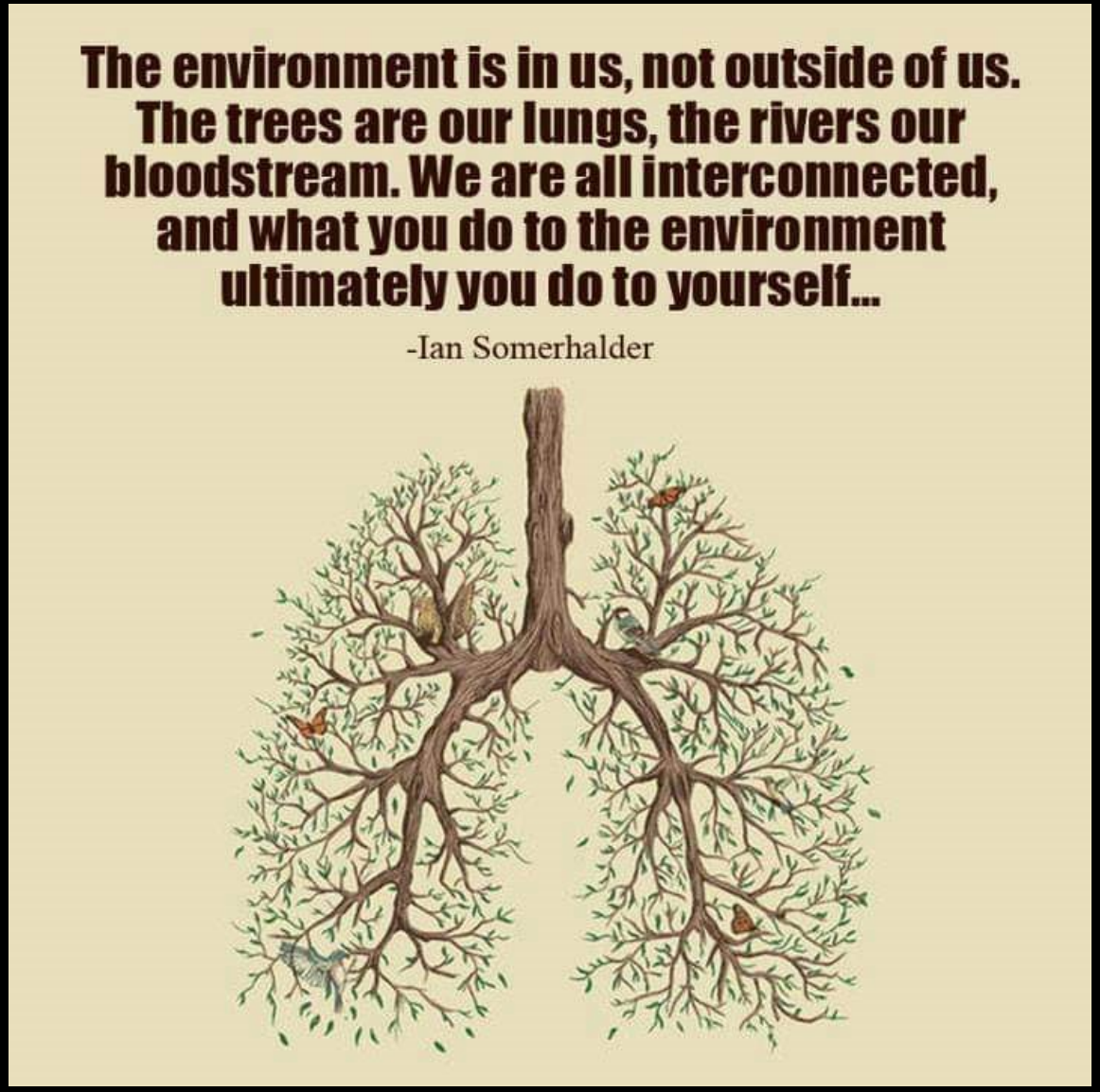
The American Lung Association slogan is: **“When you can’t breathe, nothing else matters.”**

Together, through collective action, we can all help improve air quality and address climate change.

Everyone has a role to play, and simple individual steps can make a collective difference.

The more people stand up, the bigger our impact will be.

Questions



Adapted from: E. Wiseman

Reference:

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- http://www.stateoftheair.org/
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- https://ww2.arb.ca.gov/resources/fact-sheets/air-pollution-and-brain/printable/print
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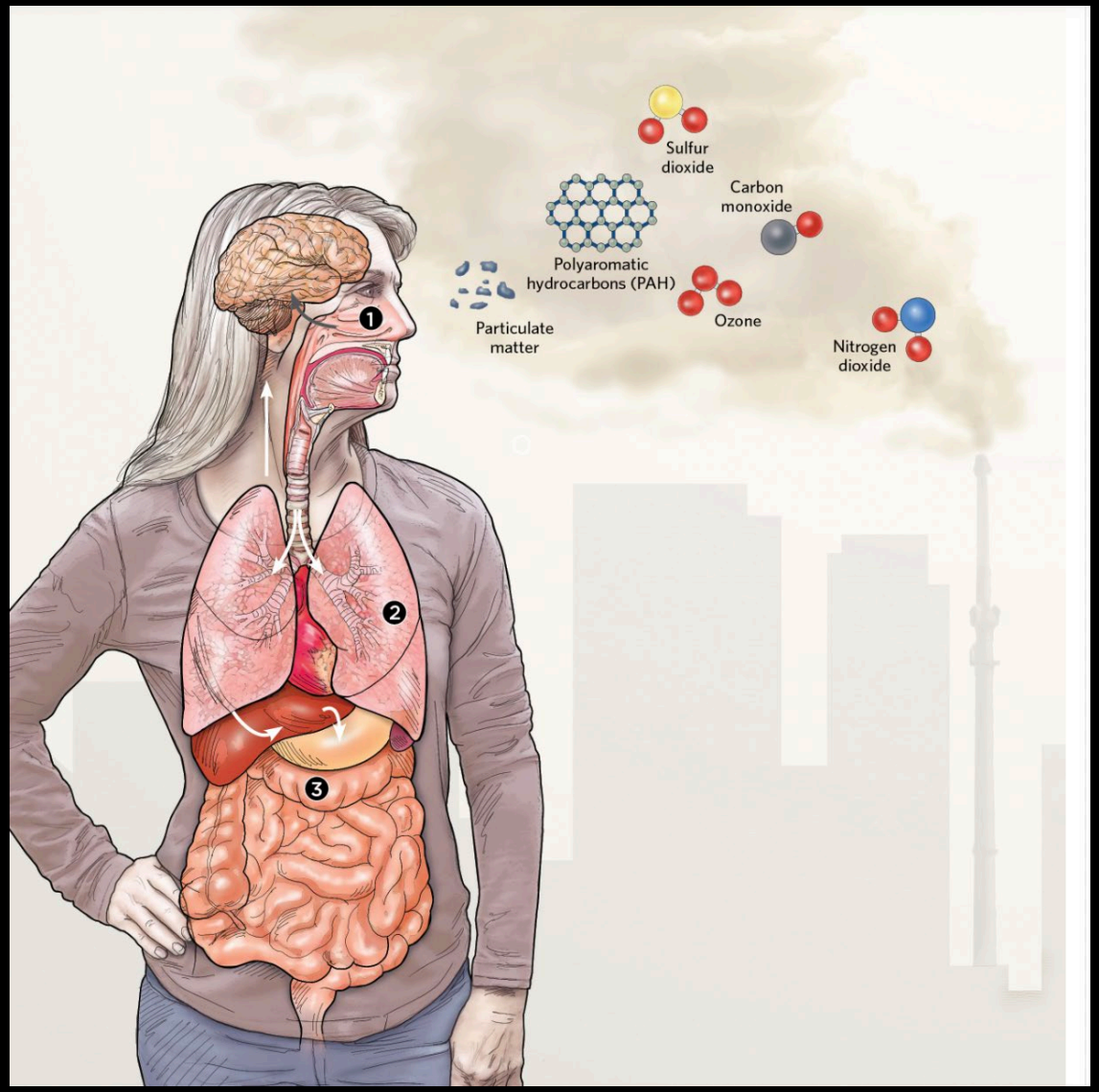
- https://www.pca.state.mn.us/news-and-stories/what-you-can-do-about-air-pollution
- http://www.stateoftheair.org

Pollutants Penetration to the Body



1) In through the nose
Breathed through the nose, they have **direct contact with the olfactory bulb forebrain**. PM < 2.5 μ can reach the brain regions via this route.

2) Inhaled into the lungs
Most gases can **traverse the lungs into the bloodstream**, and **PM can do the same**. Circulating contaminants may **cross the blood/brain barrier** to interact with the **brain**.

3) Via the gut
Pollutants entering the gut **in swallowed air,** absorbed into the **bloodstream**, where they **travel to the brain.**

Pollution is associated with **altered gut microbiomes** in humans. **Microbiome changes are linked to cognitive function**, suggesting air pollution act on the brain via this indirect pathway.

https://www.the-scientist.com/infographics/infographic--how-air-pollution-could-affect-the-brain-66478

"Earlier this summer, **Chicago** was clocking in the **worst air quality in the world** as a result of wildfire smoke drifting down from Canada"
According to the EPA, air quality that **exceeds 35 µg/m3 (measurement of PM 2.5)** is considered unhealthy, **The air quality index that day was 175 µg/m3**

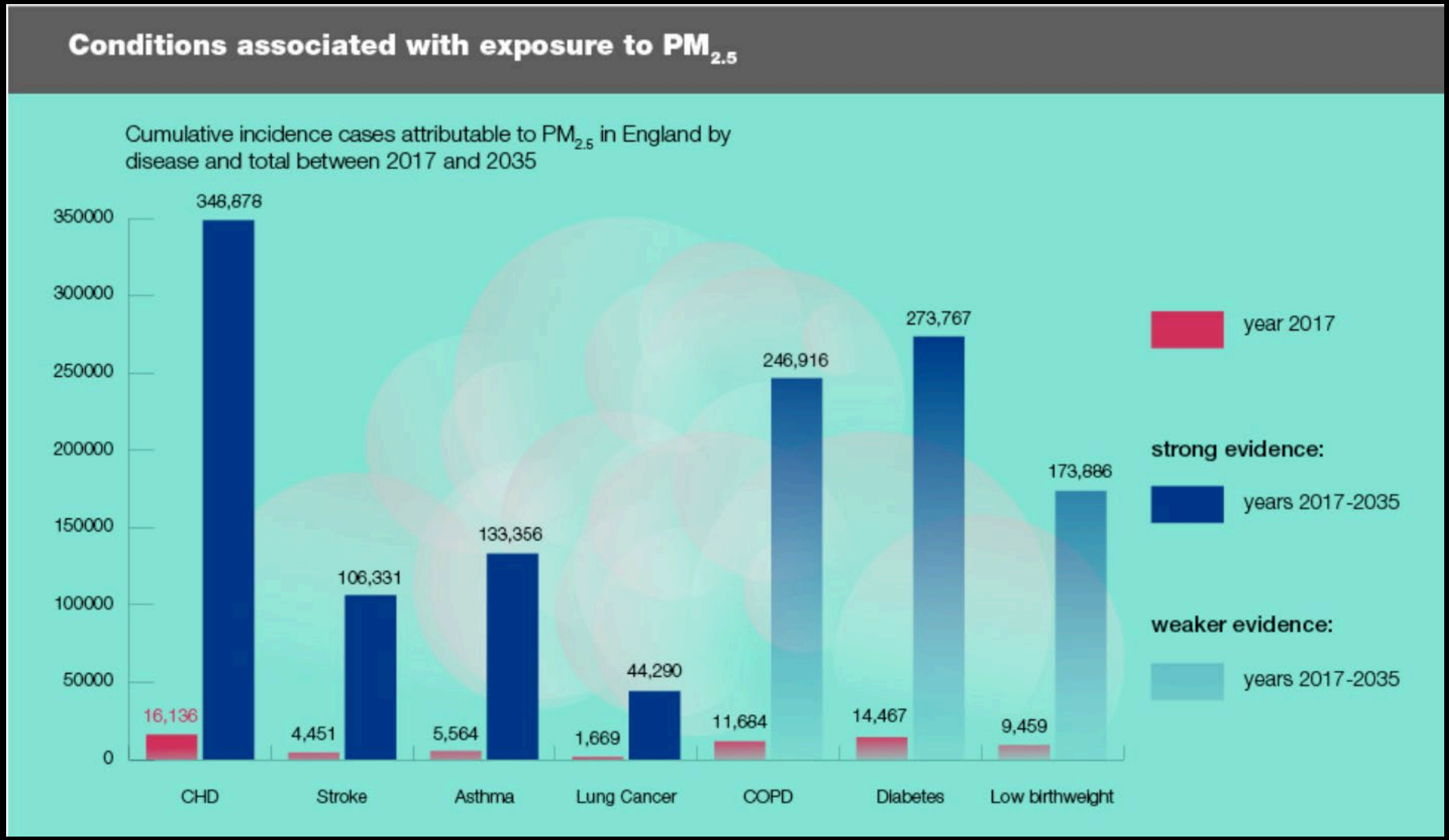
The Washington Post
Democracy Dies in Darkness

Updated June 27, 2023 at 6:44 p.m. EDT | Published June 27, 2023 at 10:55 a.m. EDT

Chicago's skyline is draped in heavy smoke from the Canadian wildfires on Tuesday. (Kamil Krzaczynski/AFP/Getty Images)

(Francesca Mathewes July 27, 2023, Block Club Chicago) https://blockclubchicago.org/2023/07/27/chicagos-bad-air-quality-might-be-around-for-awhile-heres-what-you-should-know/

Conditions associated with exposure to $PM_{2.5}$



https://www.gov.uk/government/publications/health-matters-air-pollution/health-matters-air-pollution