

Life and Breath:

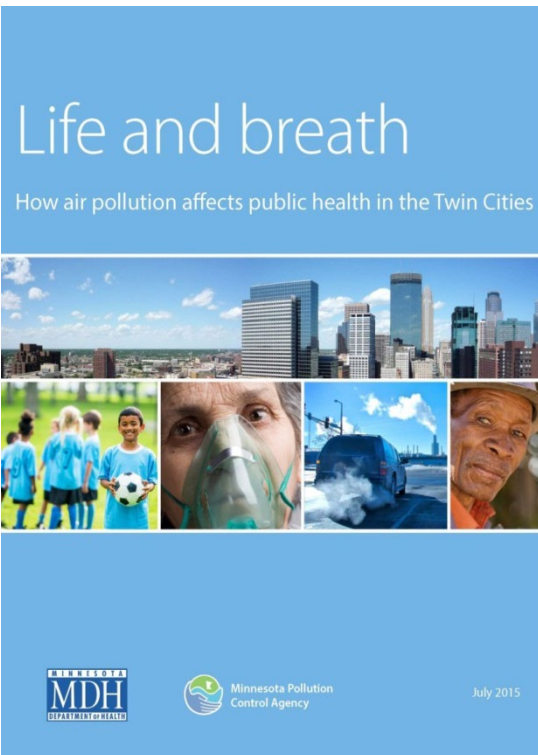
How air quality impacts health in Minnesota population centers

September 6, 2023
Met Council TAB Technical Advisory
Committee

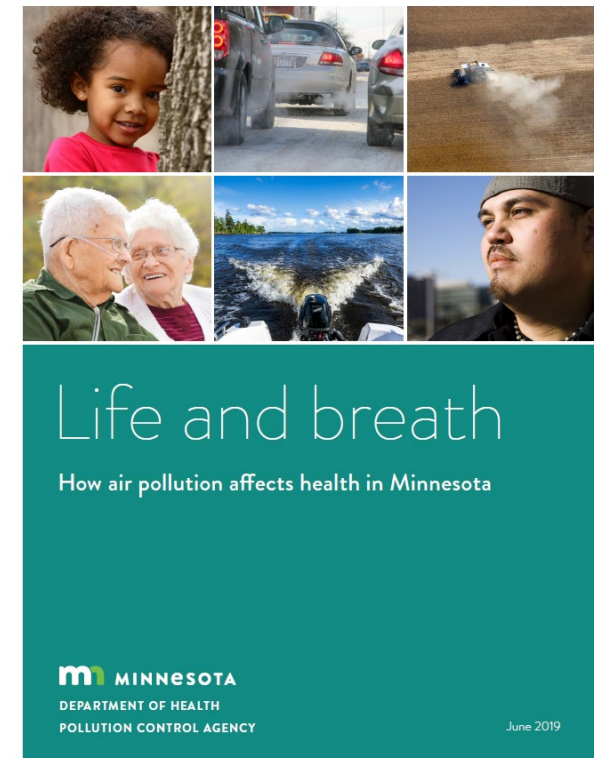
David Bael, MPCA Economic Policy Analyst
Kathy Raleigh, MDH Principal Epidemiologist

Minnesota Air and Health Joint Initiative

MPCA/MDH collaboration to understand and address role of air quality and health



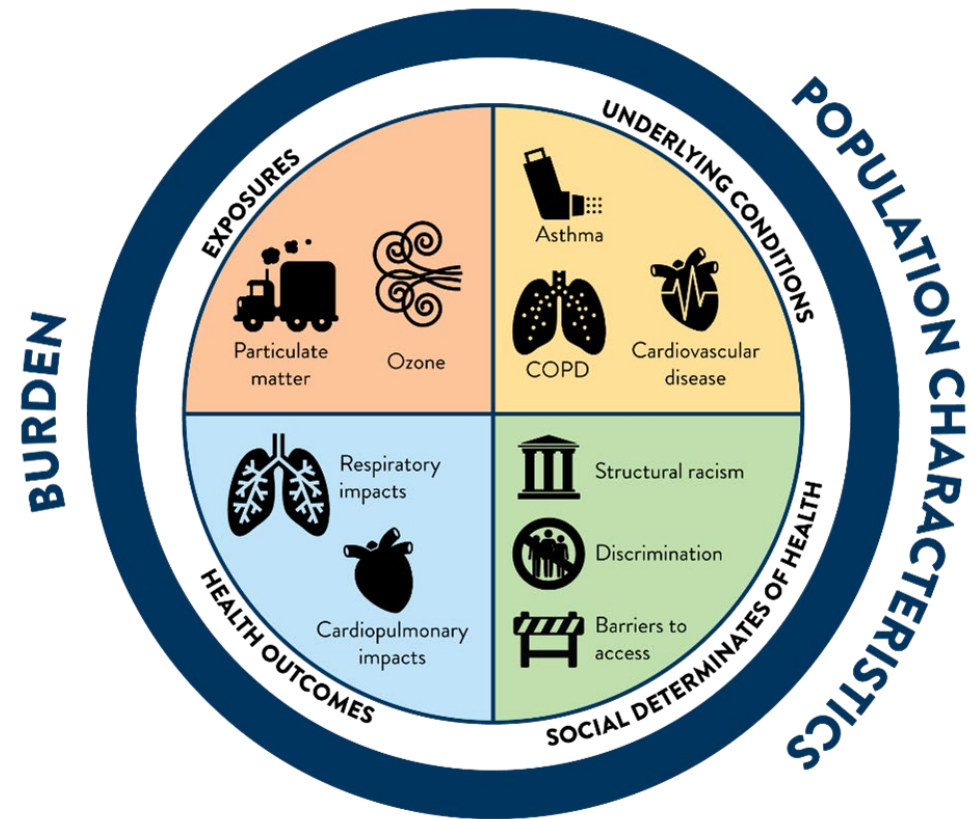
- Air Quality and Respiratory Health Initiative:
Goals to use data to inform communities about air quality and health
- MPCA generates air quality monitoring and modeling data, estimates risks to inform actions
- MDH: conducts disease surveillance to inform disease prevention actions, including data on social, behavioral and environmental risks



Air & health in Minnesota

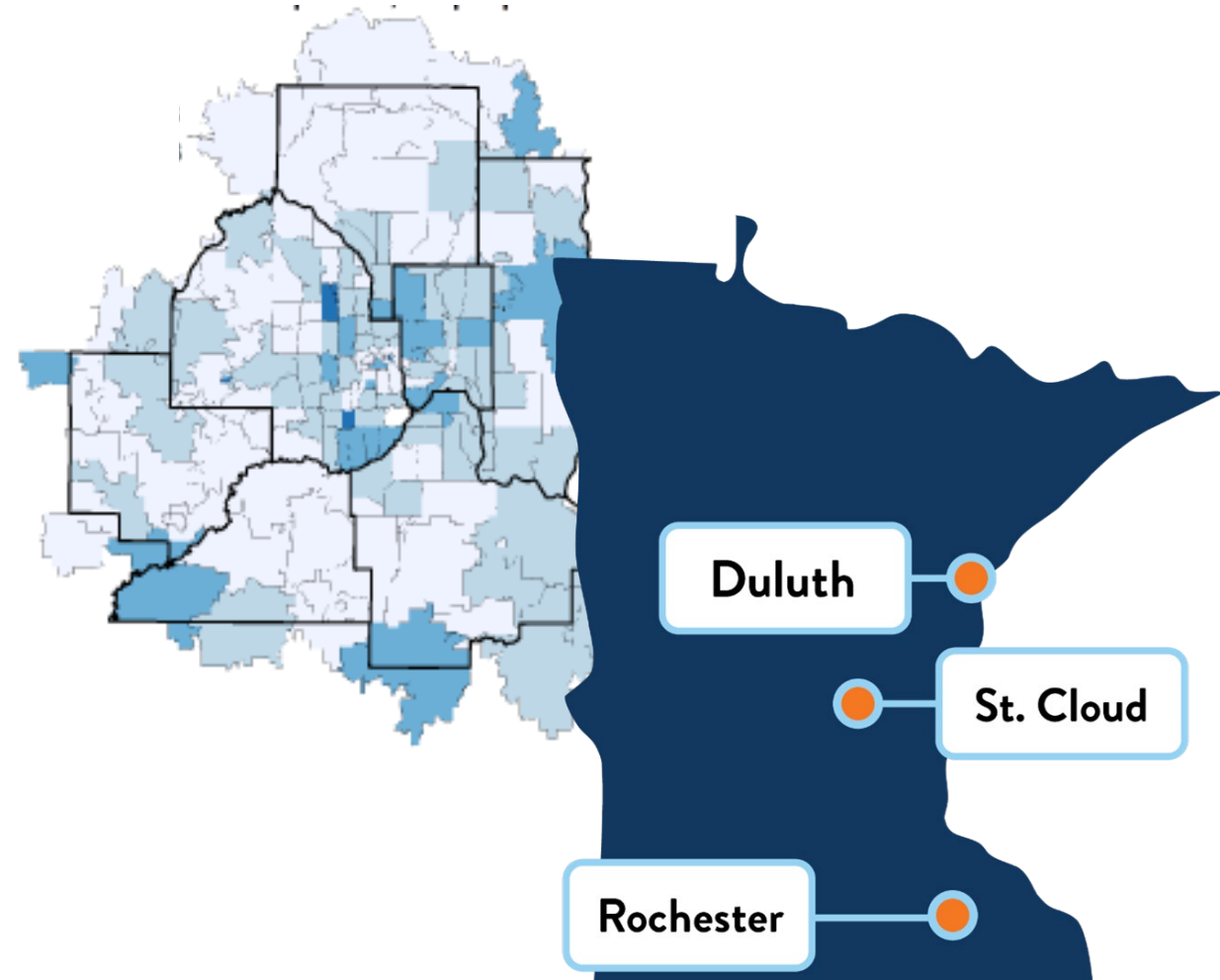
Health impacts of air pollution are not evenly distributed

- MN has generally good air quality and meets federal standards, but even low and moderate levels of air pollution can contribute to serious illness and death
- Health effects are especially felt in communities already impacted by health inequities and over-burdened with other social and environmental stressors

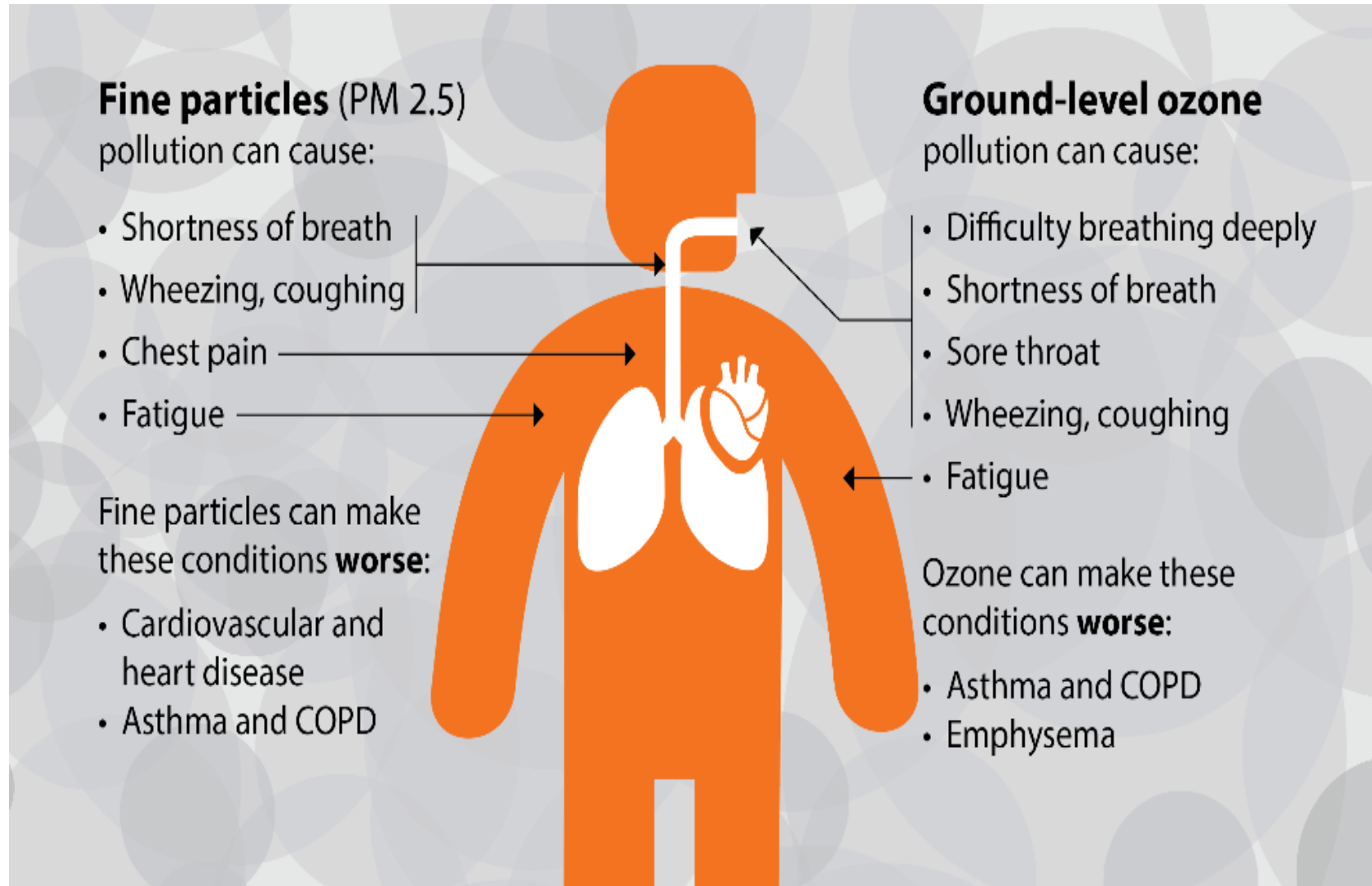


Project goals

- Demonstrate magnitude of air pollution's contribution to serious cardio-pulmonary hospitalizations and premature deaths
 - Twin Cities Metro 7-county region zip codes
 - Greater MN largest cities
- Describe disparate impacts across zip codes and regional patterns in over-burdened and disadvantaged communities
- Quantify health benefits of reducing pollution by 10%



PM_{2.5} and ozone health impacts

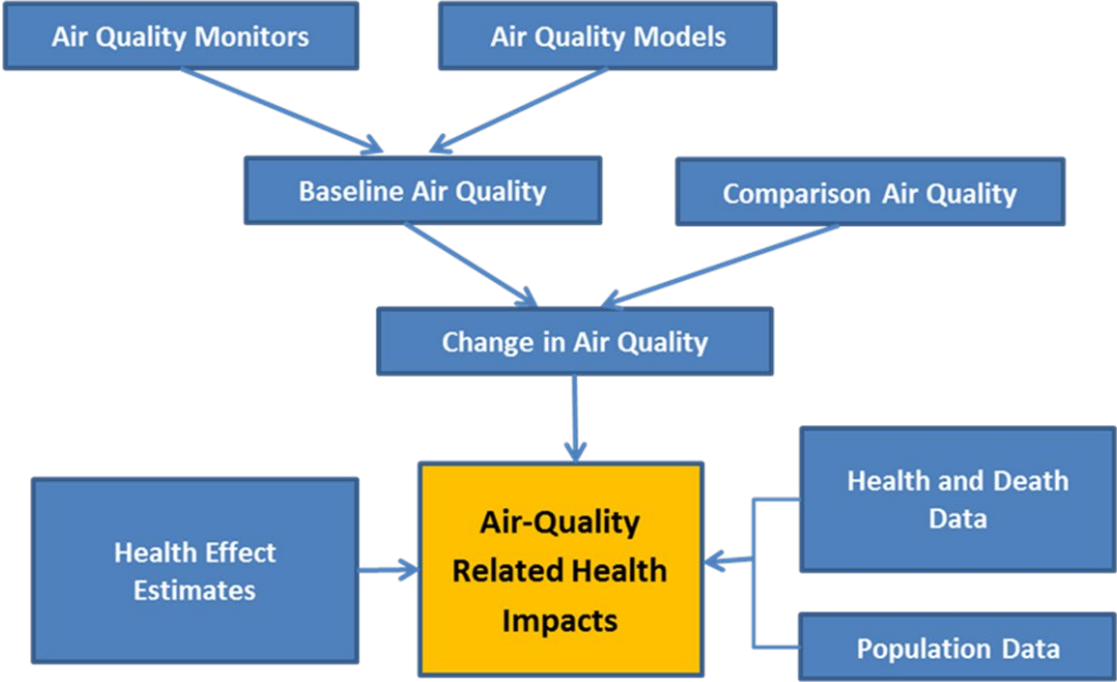


Social determinants of health

- 4 Social indicators evaluated and key to the work we do
 - BIPOC populations
 - Poverty level
 - Un-insurance status
 - Disability status



How can health impacts of air pollution be counted?



Project methods and data

Method:

- EPA impact assessment model (BenMAP)

Data inputs:

- Air pollution modelled data: fused air quality surface using downscaling (US EPA, 2015)
 - *Annual average $PM_{2.5}$ (daily 24-hour average)*
 - *Seasonal average ozone (8-hour maximum)*
- Hospitalization, ED visit data (MN Hospital Association, 2013-2017); Death data (MDH Office of Vital Records (2013-2017))
- Equity factors: poverty rate, residential BIPOC population, uninsured, disability status (US Census 2013-2017)



Overall findings

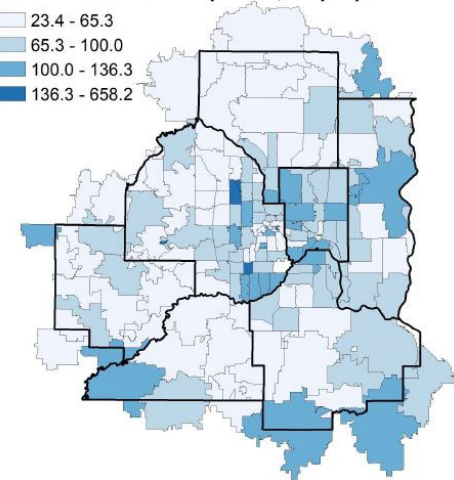
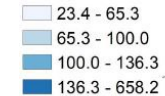
Air pollution contribution to premature mortality:

- **10%** of deaths in the Twin Cities metro area (about 1,600 deaths)
- **9%** of deaths in three Greater MN cities (about 280 deaths)

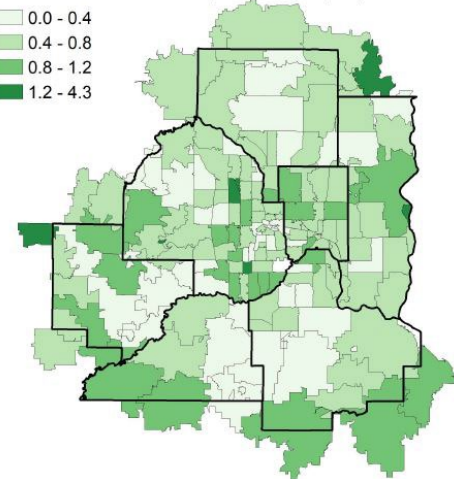
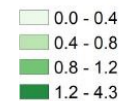
Disproportionate impacts across marginalized communities

- Persistent and consistent with prior work
- Underlying chronic health inequities are key driver
- Inequities faced by communities with more BIPOC residents, more people living in poverty, with a disability, or without health insurance are critical area for action

All cause deaths deaths
PM2.5-attributable rate per 100,000 people



Cardiopulmonary deaths
Ozone-attributable rate per 100,000 people



Findings: Air pollution and early deaths

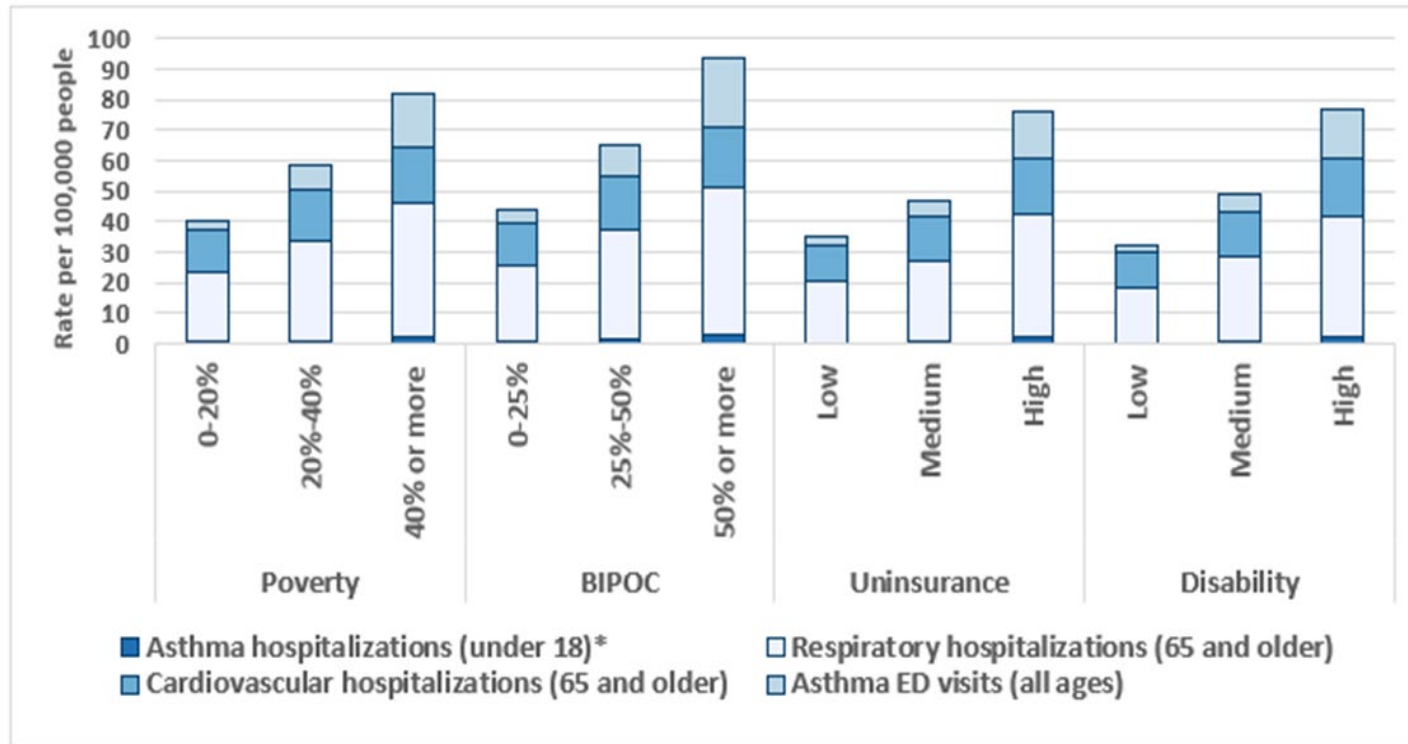
Table 1: Estimated deaths attributable to air pollution in the seven-county Twin Cities metro area.

Health outcome	Pollutant	Year	Deaths*	Percent of deaths*	Attributable rate**	Deaths preventable with air quality improvements***
All cause deaths (25 and older)	PM _{2.5}	2008	2,152	12.6%	110.5	247
		2015	1,588	8.6%	74.9	185
Cardiopulmonary deaths (all ages)	Ozone	2008	23	1.1%	0.8	7
		2015	19	0.8%	0.6	7

*Attributable to PM2.5 and ozone **per 100,000 people ***reduction of 10% for PM2.5 and ozone

Metro findings

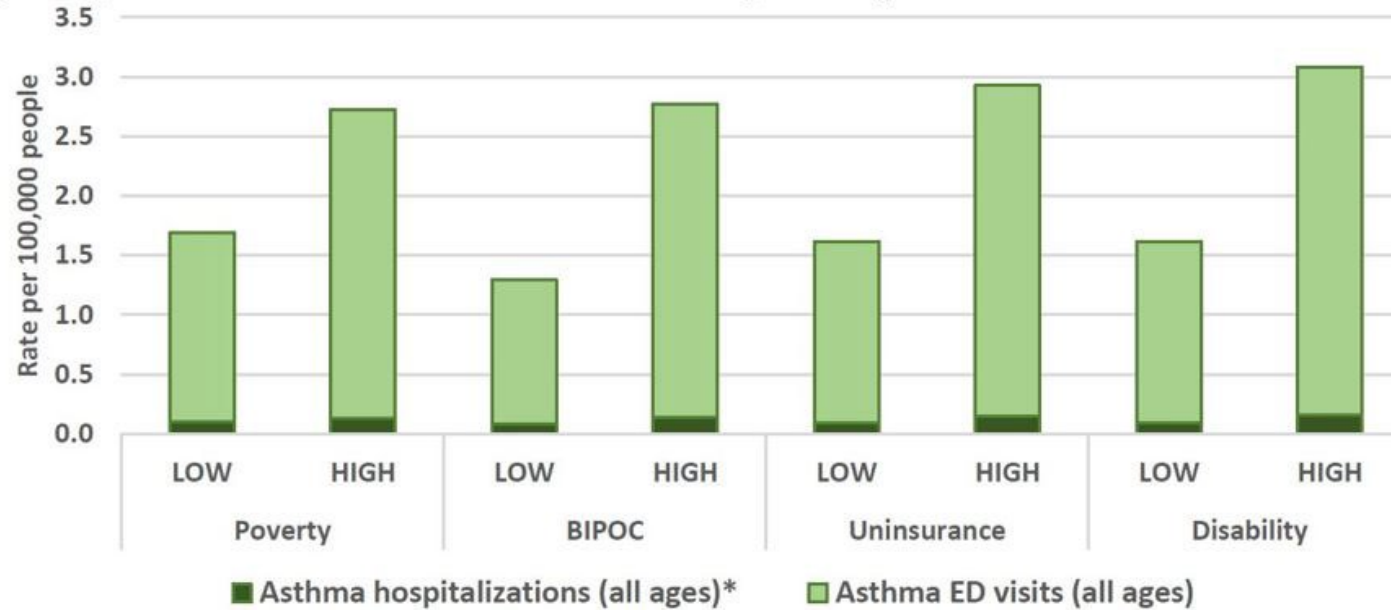
Demographic indicators of Twin Cities zip codes 2015: non-fatal impacts from PM_{2.5} by poverty, BIPOC residents, un-insurance status, and any disability



- Overall, air pollution contributed to nearly 500 cardio-pulmonary hospitalizations during the project period.
- Disparities in non-fatal outcomes follow similar pattern across communities with more BIPOC residents, more people living in poverty, with a disability, or without health insurance.
- Areas with the highest proportion of BIPOC residents had more than *five times* the rate of asthma emergency room visits.

Greater Minnesota city findings

Demographic indicators of Greater Minnesota cities zip codes 2015: non-fatal impacts from ozone by poverty, BIPOC residents, un-insurance status, and any disability



- Despite relatively good air quality in Duluth, Rochester, and St. Cloud, we find health impacts from fine particles and ozone pollution.
- Overall, air pollution contributed to around 50 hospitalizations and emergency department visits during the project period.
- Similar pattern in disparities for asthma hospitalization and ED visits, compared to Metro.

Key messages

Air quality in MN meets current national standards. However, the **data show there are still observable health impacts below standards.**

Over time there have been reductions in air pollution levels and morbidity/mortality outcomes, but **disparities persist related to social determinants of health.**

Importance of **reducing air pollution alongside addressing chronic health inequities** for reducing impacts of environmental pollution and injustices.

Implications remain for other environmental justice and environmental hazards, like climate change, wildfire smoke, and traffic patterns more prevalent near low-income residents

MPCA is working with partners to:

- Reduce pollution in population centers focusing on areas of concern for environmental justice
- Reduce vehicle emissions
- Improve understanding of air quality at the community scale
- Increase awareness about air quality forecasts, alerts, and tools for communities and health care providers

MDH actions:

- Systems: New Health Equity Bureau
- Track connections between environmental exposures, inequities, and health outcomes
- Identify vulnerable populations and determine sub-groups for future risks
- Asthma program uses childhood ED rates in the metro to select zip codes for community-based projects and working with LPH director for asthma home assessments and allergen reducing projects.
- Advance health-based guidance for key air pollutants and expand linkages between communities and clinical care and prevention services

Summary and action steps

Achieving health equity and environmental justice are linked

- Wide and consistent health disparities across urban areas of the state
- Underlying chronic health inequities may increase vulnerability to environmental pollution

Action is needed to improve outcomes together with communities

- Reducing local air pollution further could avoid impacts
- Continue inter-agency efforts and support of local agencies, partners, and communities to protect health of all Minnesotans

Thank you!

MPCA – David Bael, david.bael@state.mn.us
MDH – Kathy Raleigh, Kathy.Raleigh@state.mn.us

