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Ohio Cardiovascular and Diabetes Health Collaborative

CASE WESTERN RESERVE UNIVERSITY
School of Medicine

In partnership with:

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Ohio University Heritage College of Osteopathic Medicine

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Ohio Colleges of Medicine Government Resource Center

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Project ECHO®

Cardi-OH ECHO

Health Equity and Cardiovascular Risk

September 28, 2023

Cardi-OH ECHO Team

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Case Western Reserve University

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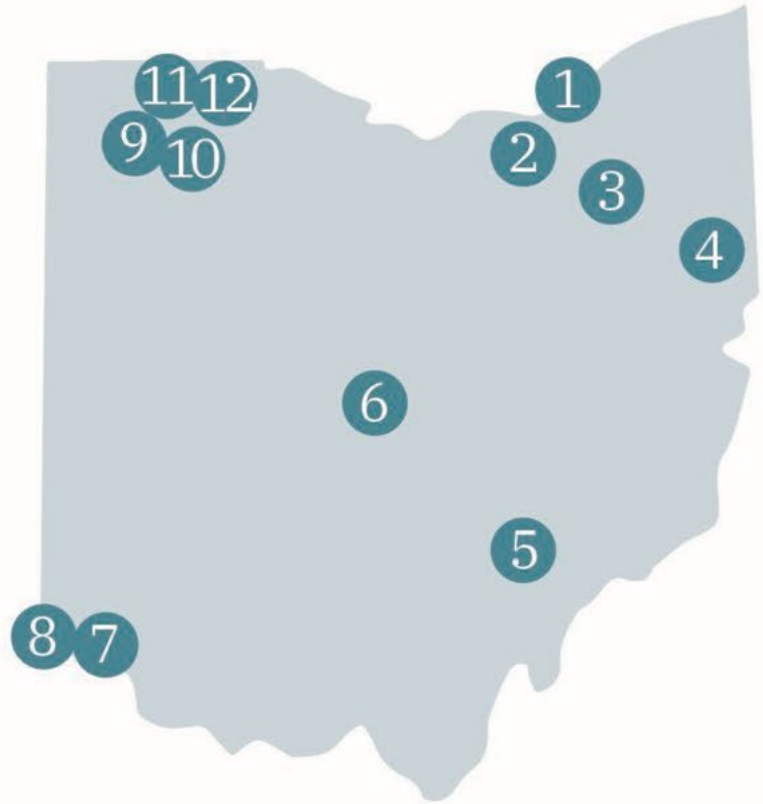
Fall 2023 Cardi-OH ECHO Participant Sites



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9 **UTMC Comprehensive Care Center, Internal Medicine**
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Toledo

11 **UTMC Family Medicine**
Toledo

12 **Paramount Health Care Inc**
Toledo

Today's Presenters

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Case Western Reserve University

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Goutham Rao, MD, FAHA
Case Western Reserve University

LEAD DISCUSSANTS

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Ohio University Diabetes Institute

Disclosure Statements

- The following speakers and subject matter experts have a relevant financial interest or affiliation with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of their presentation*:
  - Danette Conklin, PhD; Kathleen Dungan, MD, MPH; Adam T. Perzynski, PhD; Christopher A. Taylor, PhD, RDN, LD, FAND; Jackson Wright, MD, PhD
- The remaining speakers and subject matter experts have no financial relationships with any commercial interest related to the content of this activity:
  - Karen Bailey, MS, RDN, LD, CDCES; Kristen Berg, PhD; Elizabeth Beverly, PhD; Merilee Clemons, PharmD; Revital Gordodeski Baskin, MD; George Matar, MD; Kelsey Ufholz, PhD; Goutham Rao, MD; James Werner, PhD, MSSA
- The following members of the planning committee DO NOT have any disclosures/financial relationships from any ineligible companies:
  - Shari Bolen, MD; Anderson Christopher; Richard Cornachione; Carolyn Henceroth; Gillian Irwin; Michael Konstan, MD; Elizabeth Littman; Devin O'Neill; Steven Ostrolencki; Ann Nevar; Claire Rollins; Catherine Sullivan

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Environmental Pollution and Cardiovascular Risk

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Chief Clinician Experience and Well-Being Officer, University Hospitals Health System

Jack H. Medalie Endowed Professor and Chairman

Department of Family Medicine and Community Health

Division Chief, Family Medicine, Rainbow Babies and Children's Hospital

Case Western Reserve University School of Medicine & University Hospitals Cleveland Medical Center

Learning Objectives

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1. List a minimum of three environmental pollutants responsible for increased cardiovascular risk.
2. Describe disparities in exposure to environmental pollutants among different racial and ethnic groups in the United States.
3. List a minimum of two resources to identify communities prone to increased cardiovascular risk due to environmental pollutants.

Air pollution is the primary type of pollutant to be considered.

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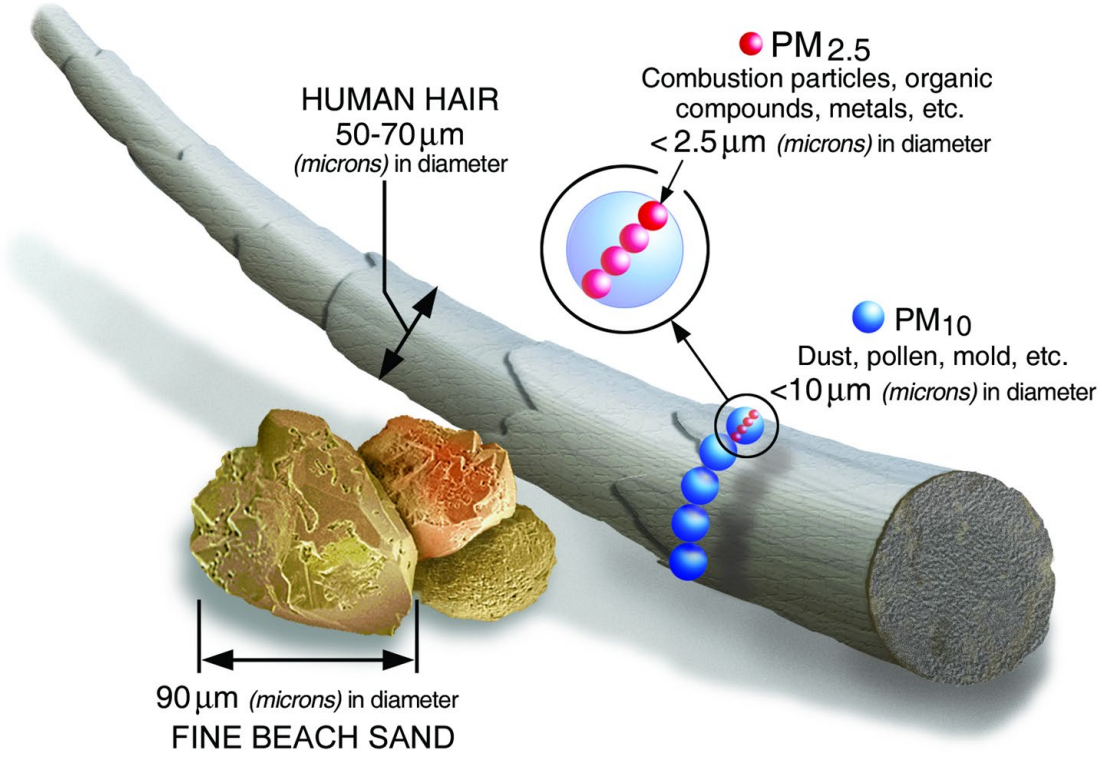
- $PM_{2.5}$
  - Refers to particulate matter 2.5um (micrometers) in diameter
  - Sulfates and organic carbon
- Ozone gas



Air pollution convincingly linked to cardiovascular morbidity and mortality.

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- Integrated Exposure-Response (IER) Model:
  - $PM_{2.5}$ resulted in 4.2 million deaths and 103.1 million disability-adjusted life years lost in 2015 representing 7.6% of global mortality and 4.2% of global DALYS lost.
  - The number of deaths attributed to ambient air pollution alone was more than the sum of deaths attributed to ischemic heart disease, stroke, COPD, lung cancer, and lower respiratory tract infections.

Dose Dependency

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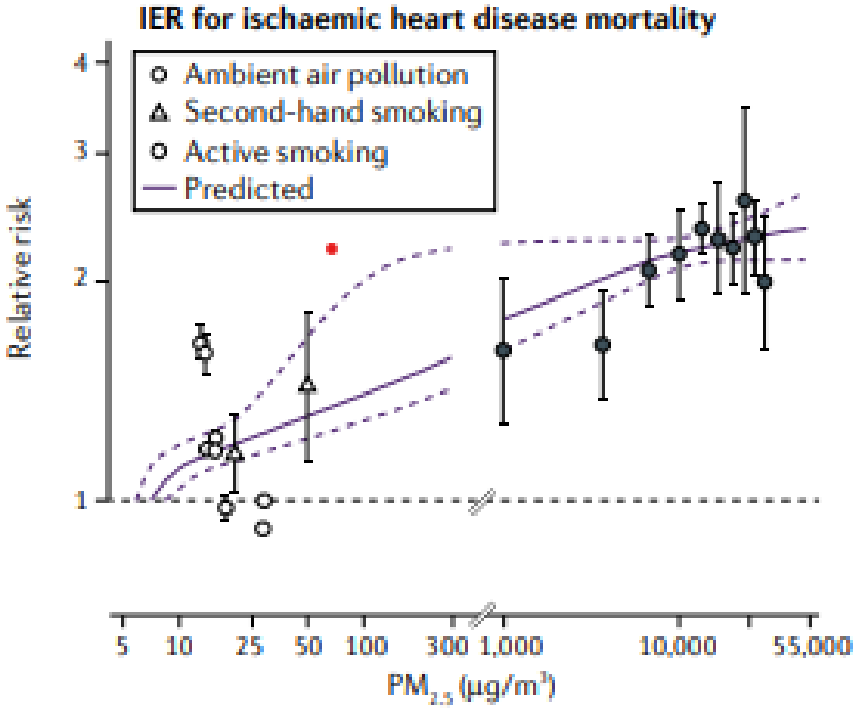

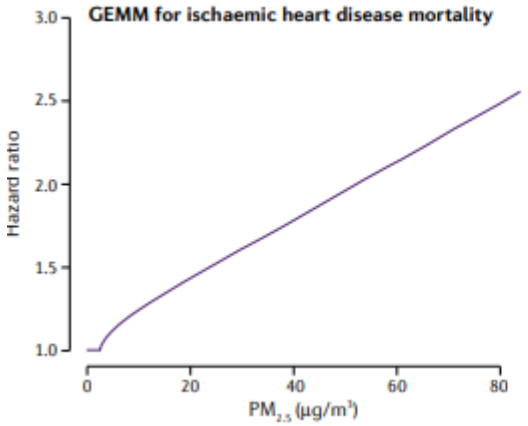

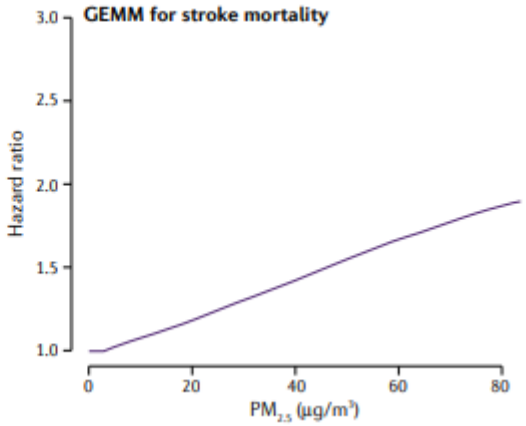

Mechanisms and Harvesting Effect

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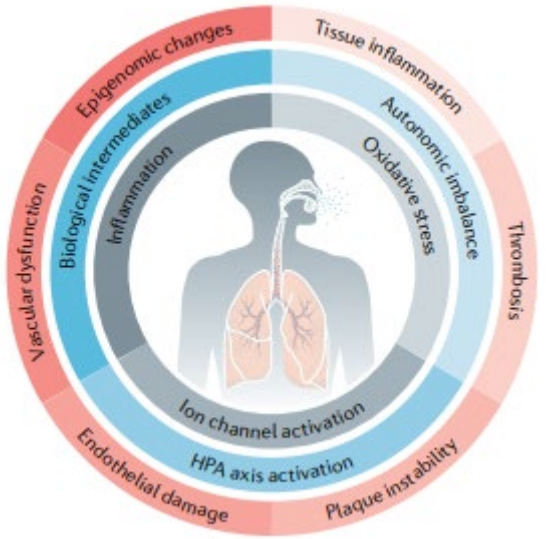
- Harvesting Effect: Mortality displacement.



Consequences

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- Atherosclerosis: Each 5ug/m^3 increase in $PM_{2.5}$ is associated with progression of coronary calcium of 4.5 Agatson units per year.
- Hypertension: Short-term increases upon exposure; Air filtration systems reduce SBP by 3.2mmHg.
- Acute/Coronary Syndrome/MI: Each 10ug/m^3 increase in $PM_{2.5}$ associated with a 2.5% relative increase in risk of MI.
- Arrhythmias/heart failure/peripheral arterial disease/venous thromboembolism/diabetes/stroke.

What can we do?

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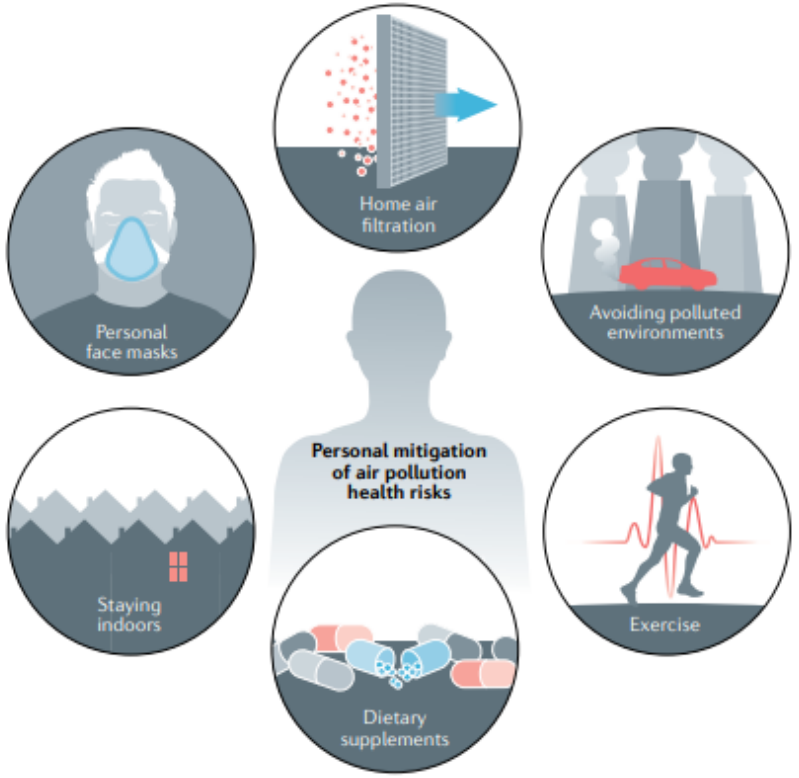
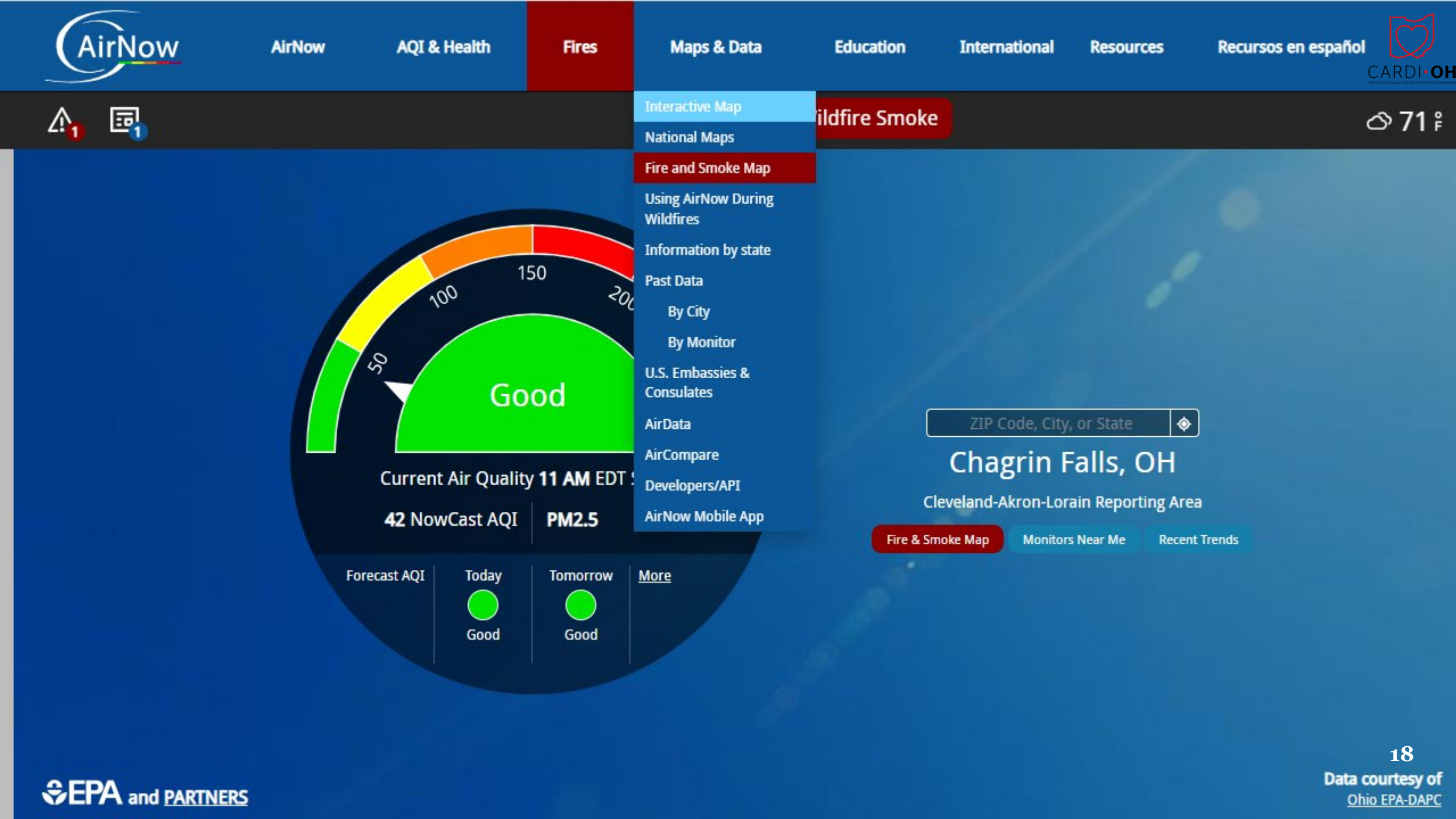
- Public Health Measures/Societal/ Governmental Reform
  - Vehicle emissions
  - Reforestation
  - Decarbonization as a health strategy to complement climate change mitigation.

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Good
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42 NowCast AQI
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Good
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Table 3. Current Cigarette Smoking Among US Adults Aged 18 or Older, By Sociodemographic Characteristics and Poverty Status[a], National Survey on Drug Use and Health, 2011–2014

Characteristic	Men		Women		Total	
	Below, % (95% CI)	At or Above, % (95% CI) [*P* Value]	Below, % (95% CI)	At or Above, % (95% CI) [*P* Value]	Below, % (95% CI)	At or Above, % (95% CI) [*P* Value]
Overall[c]	41.1 (39.8–42.5)	23.7 (23.2–24.2) [<.001]	32.5 (31.4–33.6)	18.3 (17.8–18.7) [<.001]	36.0 (35.1–36.9)	20.9 (20.6–21.3) [<.001]
Age, y						
18–24	38.9 (37.5–40.3)	35.4 (34.6–36.2) [<.001]	28.6 (27.6–29.7)	24.7 (24.0–25.4) [<.001]	33.2 (32.3–34.2)	30.3 (29.8–30.9) [<.001]
25–44	45.3 (43.2–47.5)	30.0 (29.3–30.8) [<.001]	35.9 (34.3–37.5)	22.2 (21.5–22.8) [<.001]	39.6 (38.3–41.0)	26.2 (25.6–26.7) [<.001]
45–64	43.4 (40.5–46.4)	20.7 (19.8–21.6) [<.001]	39.2 (36.6–41.9)	18.6 (17.8–19.4) [<.001]	41.0 (39.0–43.1)	19.6 (19.0–20.3) [<.001]
≥65	20.4 (14.8–27.4)	10.1 (9.1–11.2) [.002]	13.5 (10.8–16.8)	8.7 (7.9–9.5) [.002]	15.7 (13.1–18.8)	9.3 (8.6–10.0) [<.001]
Race/ethnicity						
Non-Hispanic white	50.9 (48.9–52.9)	23.7 (23.2–24.3) [<.001]	44.8 (43.1–46.5)	20.2 (19.7–20.8) [<.001]	47.4 (46.1–48.7)	22.0 (21.5–22.4) [<.001]
Non-Hispanic black	44.1 (41.2–47.1)	25.9 (24.3–27.5) [<.001]	30.9 (28.6–33.3)	15.8 (14.6–17.1) [<.001]	35.9 (34.1–37.8)	20.6 (19.6–21.7) [<.001]
American Indian/Alaska Native	53.7 (43.7–63.4)	35.7 (29.1–42.9) [.004]	49.0 (40.2–57.8)	31.7 (26.1–37.9) [<.001]	50.8 (43.6–58.0)	33.7 (29.3–38.5) [<.001]
Non-Hispanic Asian	24.2 (18.4–31.0)	14.5 (12.7–16.6) [.004]	7.6 (5.3–10.7)	5.7 (4.7–7.0) [.22]	15.0 (12.0–18.7)	9.8 (8.7–10.9) [.004]
Hispanic	25.5 (23.3–27.8)	23.5 (22.3–24.8) [.14]	16.8 (15.2–18.6)	13.1 (12.0–14.2) [<.001]	20.4 (19.1–21.8)	18.6 (17.8–19.5) [.02]
US Census region[d]						
Northeast	39.6 (36.4–42.9)	31.5 (29.8–33.2) [<.001]	31.2 (28.6–34.0)	18.4 (17.4–19.4) [<.001]	34.4 (32.5–36.5)	20.4 (19.6–21.2) [<.001]
Midwest	49.1 (46.3–51.8)	25.5 (24.6–26.4) [<.001]	41.3 (39.0–43.7)	21.1 (20.4–21.9) [<.001]	44.6 (42.8–46.4)	23.3 (22.6–23.9) [<.001]
South	43.2 (41.0–45.4)	25.0 (24.2–25.8) [<.001]	32.9 (31.2–34.6)	19.1 (18.3–19.9) [<.001]	37.1 (35.7–38.5)	22.0 (21.4–22.6) [<.001]
West	32.3 (29.7–35.0)	21.0 (19.9–22.1) [<.001]	25.4 (23.4–27.6)	14.1 (13.2–15.0) [<.001]	28.4 (26.7–30.1)	17.5 (16.8–18.3) [<.001]

[a] Household income in relationship to the federal poverty level.

Cost of 1ppd in Ohio: $2416 annually.

The poor suffer disproportionately

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Variable	Proportion of Population, %	$PM_{2.5}$ Burden, Absolute (Proportional)	PM_{10} Burden, Absolute (Proportional)	Facility Burden, Absolute (Proportional)
Overall population	1.00	22.4 (. . .)	29.2 (. . .)	5.7 (. . .)
Race/ethnicity[a]				
White	0.63	18.8 (0.84)	24.7 (0.85)	4.1 (0.72)
Non-White	0.37	28.6 (1.28)	37.0 (1.27)	8.5 (1.49)
Black	0.12	34.5 (1.54)	43.6 (1.49)	6.2 (1.09)
Hispanic	0.17	26.9 (1.20)	35.9 (1.23)	9.8 (1.70)
Poverty level				
Above poverty	0.85	20.9 (0.93)	27.2 (0.93)	5.5 (0.95)
Below poverty	0.15	30.3 (1.35)	39.3 (1.35)	7.2 (1.26)

Key Lessons

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- $PM_{2.5}$ are a major cause of cardiovascular morbidity and mortality.
- Carbon and sulfates are principal culprits among $PM_{2.5}$. Ozone is a major gaseous pollutant which adversely affects cardiovascular health.
- Avoiding polluting environments and circumstances is especially important for patients with cardiovascular risk factors or cardiovascular disease.
- Older patients with cardiovascular and respiratory illness should use masks, monitor air quality, and exercise indoors when outdoor air quality is poor.

Thank you!

Questions/Discussion