

EPA Tools & Resources Webinar: Air Pollution and Heart Disease

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Director, Center for Public Health and Environmental Assessment

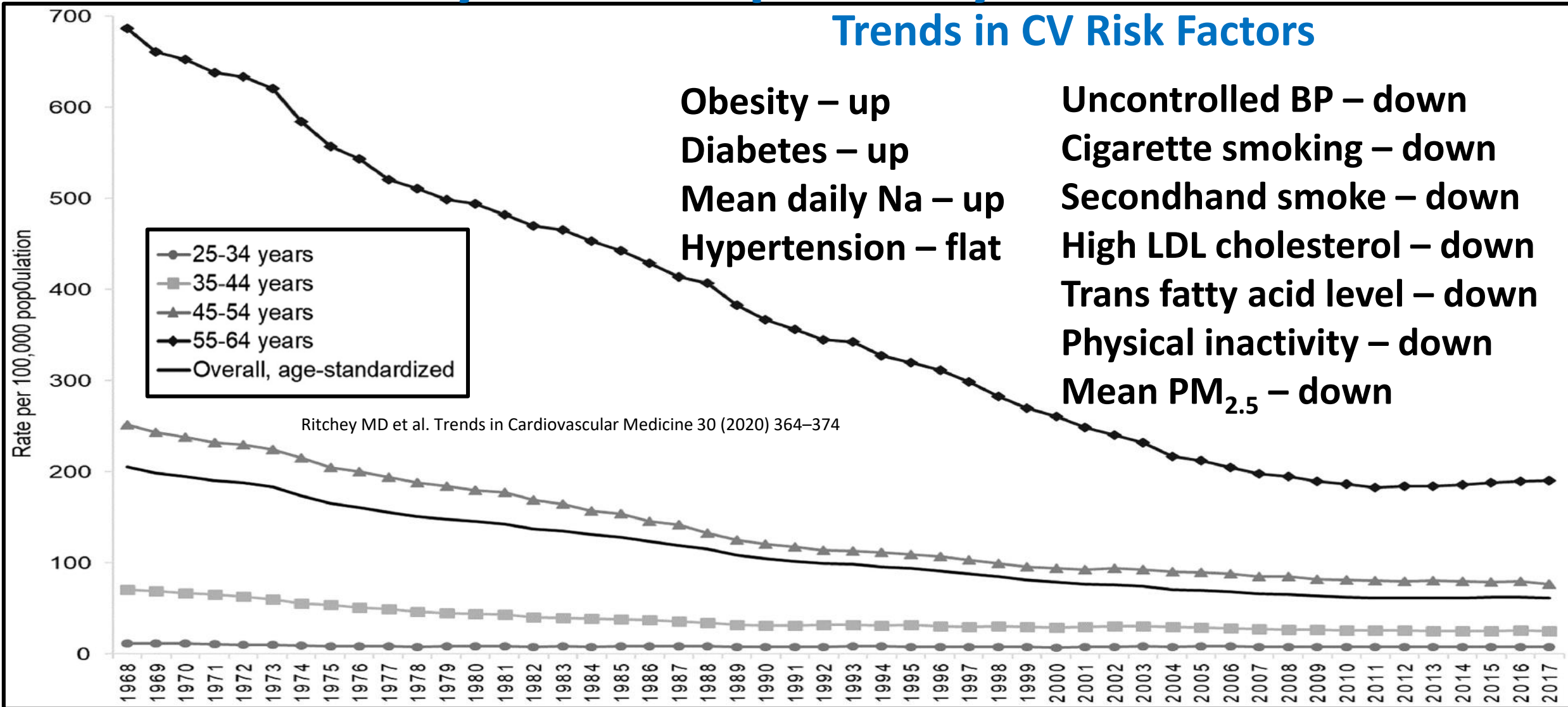
US EPA Office of Research and Development

August 19, 2020

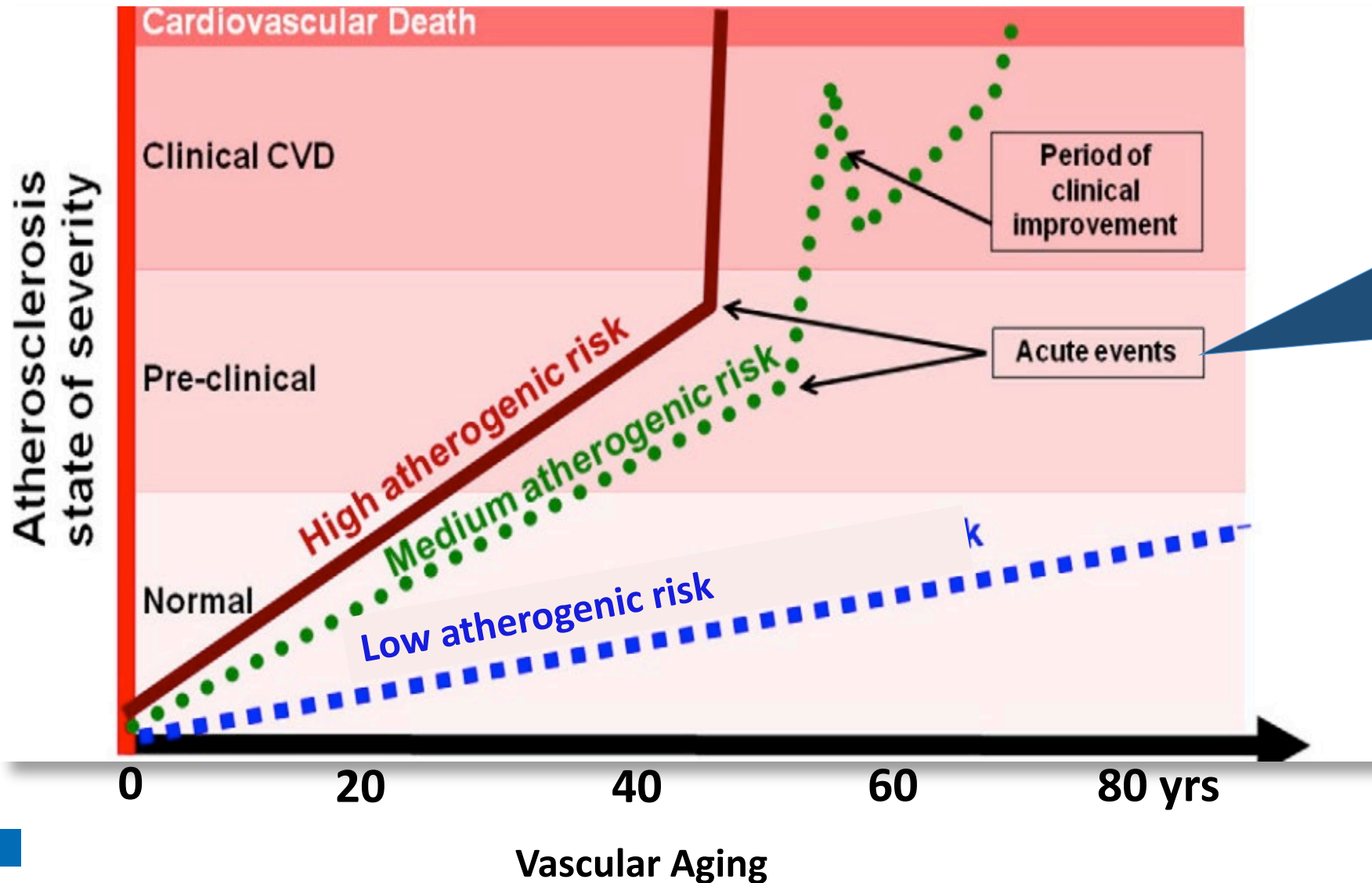


US Trends in Premature Heart Disease: Mortality over the past 50 years

Trends in CV Risk Factors



Ambient Air Particle Pollution Exposures Can Trigger Acute Cardiovascular Events

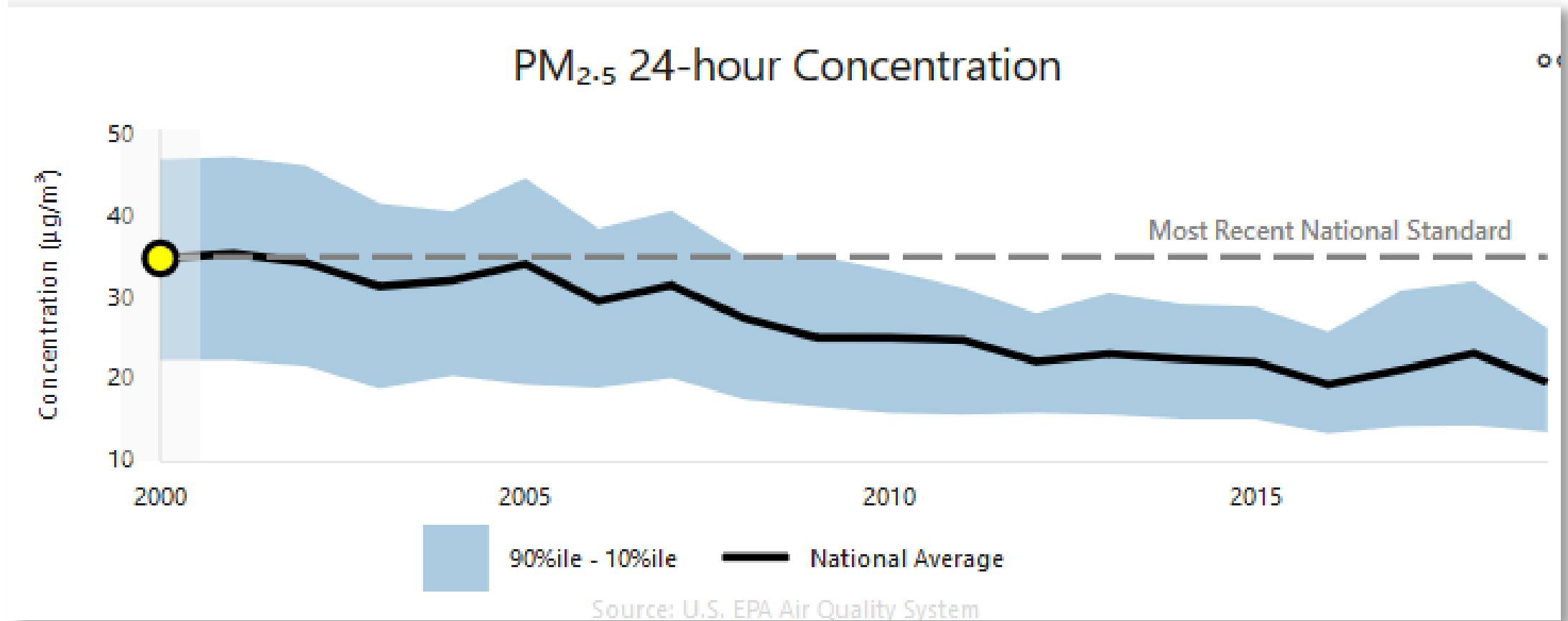


Short-term Health Effects

- Triggering of clinical events
- Precipitate organ dysfunction

N. Künzli et al.
*Progress in
Cardiovascular
Diseases* 53 (2011)
334–343

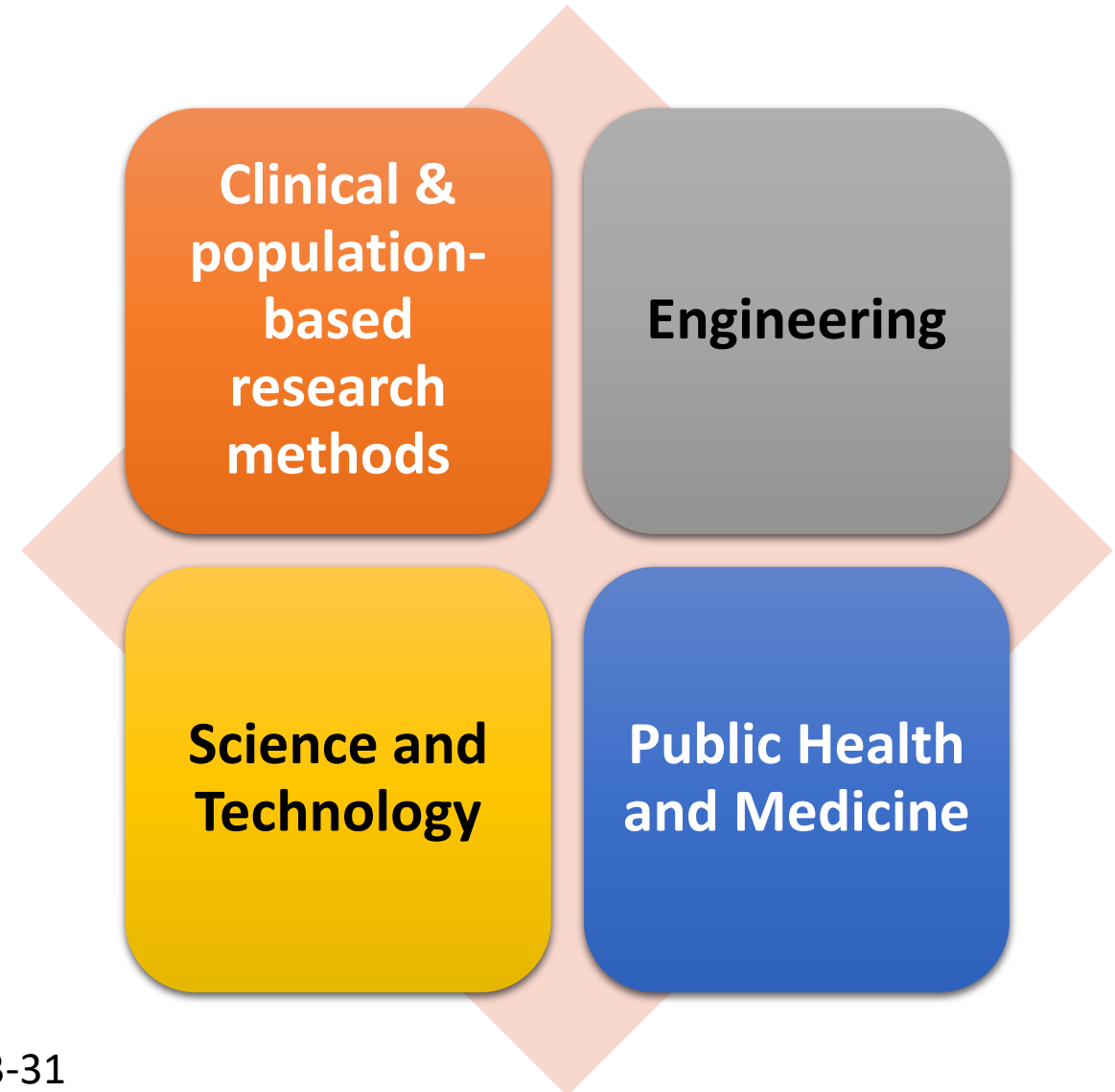
Criteria Pollutant Trends Show Clean Air Progress



Improved Life Expectancy with Declining PM_{2.5} Concentrations

Recent epidemiologic studies examining long-term PM_{2.5} exposure and mortality provide evidence of increased life expectancy as PM_{2.5} concentrations decline

- Pope et al. (2009) Decreased PM_{2.5} from 1980-2000 associated with increased in expectancy life of ~0.61 year
- Correia et al. (2013) Decreased PM_{2.5} from 2000-2007 associated with increased in life expectancy of ~0.35 year



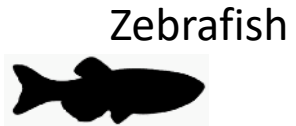
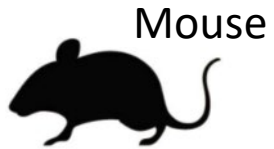
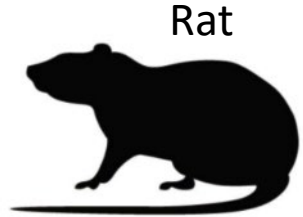
Correia et al. (2013), *Epidemiology* 24(1): 23-31
Pope et al. (2009), *NEJM* 360:376-86

Air Pollution and Cardiovascular Health-Nexus over 50 Years

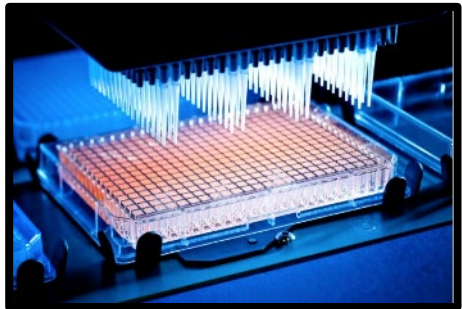
Final Rule	Primary	Indicator	Averaging Time	Level mg/m ³	PM ISA	PM-induced Cardiovascular Health Effects
1971	Primary	TSP	24-hour	260		
			Annual	75	1986 AQCD	Not mentioned
1987	Primary	PM ₁₀	24-hour	150		
			Annual	50	1996 AQCD	Descriptive
1997	Primary	PM _{2.5}	24-hour	65		
			Annual	15		
		PM ₁₀	24-hour	150		
			Annual	50	2004 AQCD	Descriptive
2006	Primary	PM _{2.5}	24-hour	35		
			Annual	15		
		PM ₁₀	24-hour	150	2009 ISA	Causative
			Annual	12		
2012	Primary	PM _{2.5}	24-hour	35		
			Annual	12		
		PM ₁₀	24-hour	150	2019 ISA	Causative

Scientific, Technical and Clinical Progress Strengthens the Link between Air Pollution and Heart Disease

Animal Models



Cellular studies



Science Disciplines

Anatomical
Histological
Biochemical

Toxicological

Physiological

Genetics
Epigenetics

“omics”

Human Studies

Occupational
Cohorts

Clinical
Cohorts

Panel Studies

Challenge
Studies

Federal
Administrative
Health Databases
(CMS)

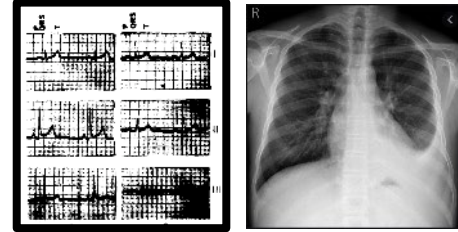
Electronic
Health Records

1970

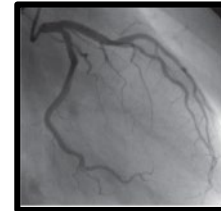


2020

Clinical Methods



BP, ECG, m-mode echo &
Chest Radiograph



Coronary Angiogram
Heart Rate Variability
Flow Mediated Dilation



Cardiac CT Angiography
MRI, & Ca Scoring

Biomarkers

WBCs
SED rate
LDH/SGOT
Glucose
CPK

Catecholamines
CRP - IL-1beta, IL-6
Fibrinogen, D-dimer,
PAI-1, prothrombin

Lipids (LDL, HDL,
Triglycerides)

BNP, NT-proBNP

Troponin
hs-Troponin T

Epidemiological Methods

GLM with
parametric
splines

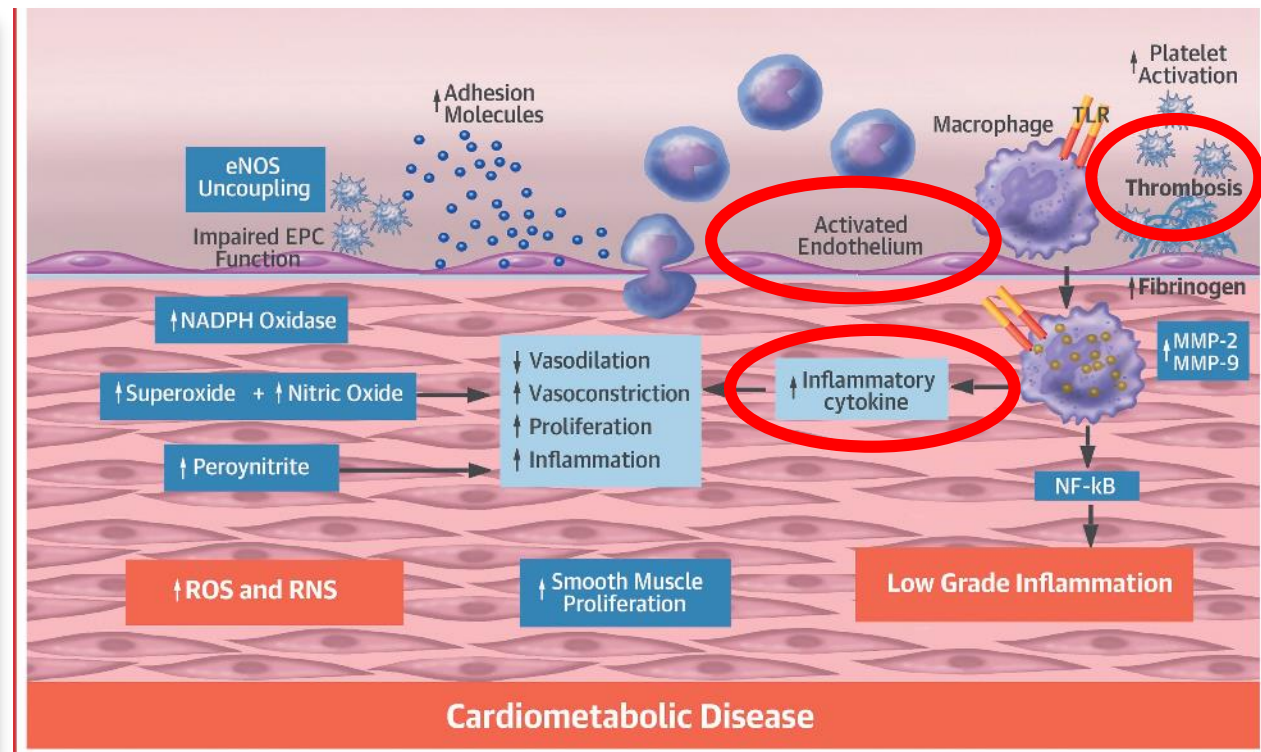
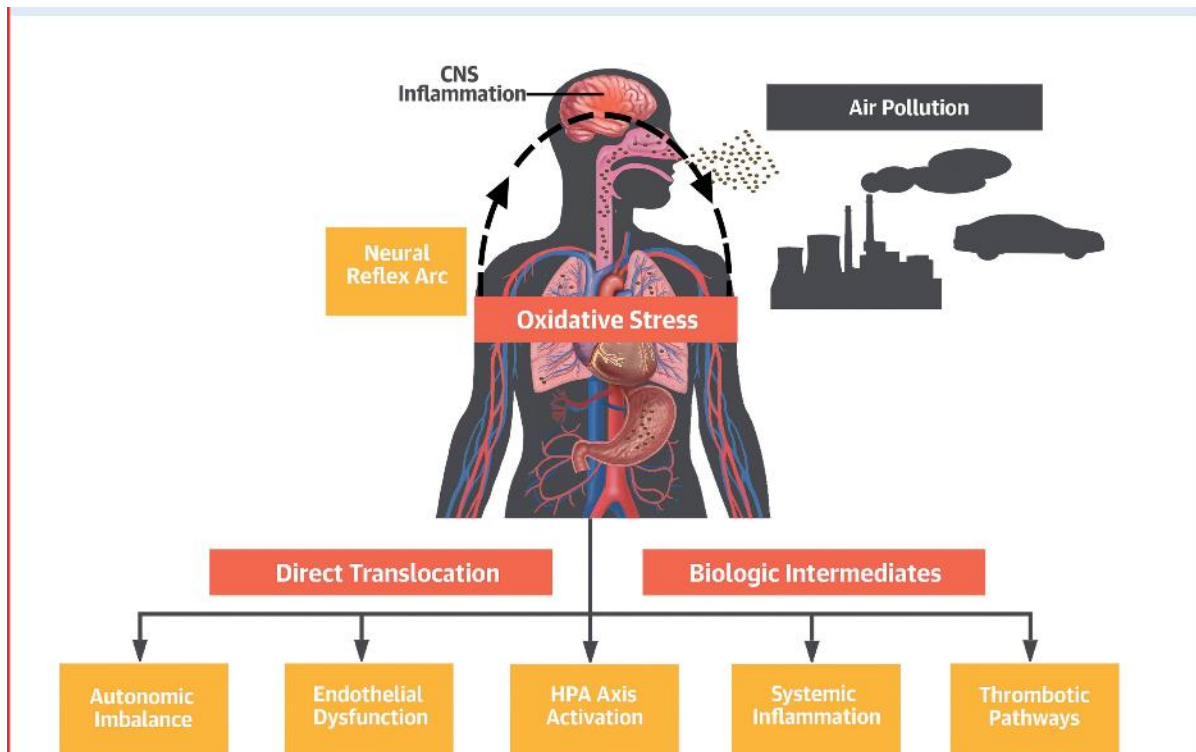
GAM with non-
parametric
smoothers

Case-Crossover

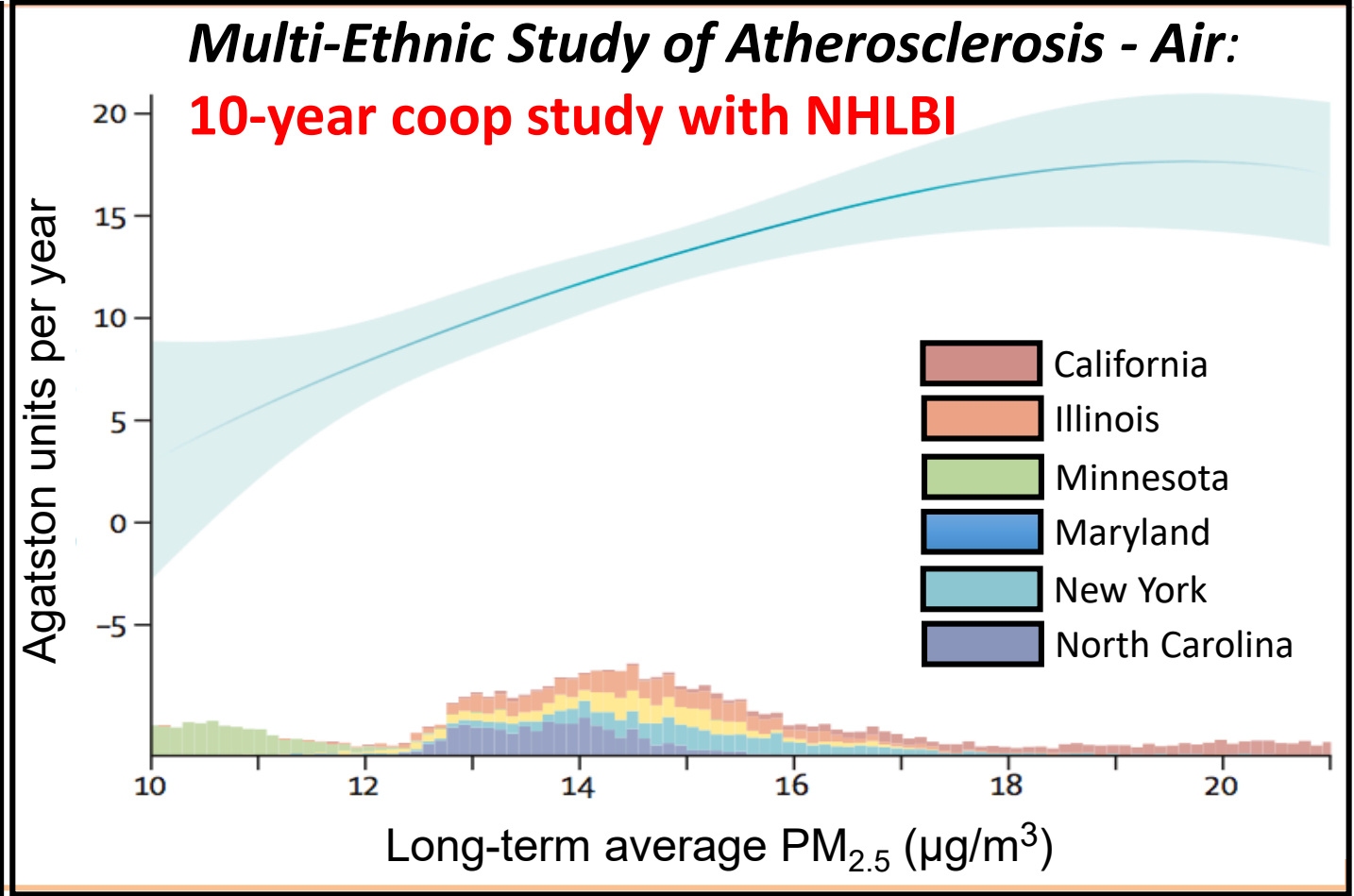
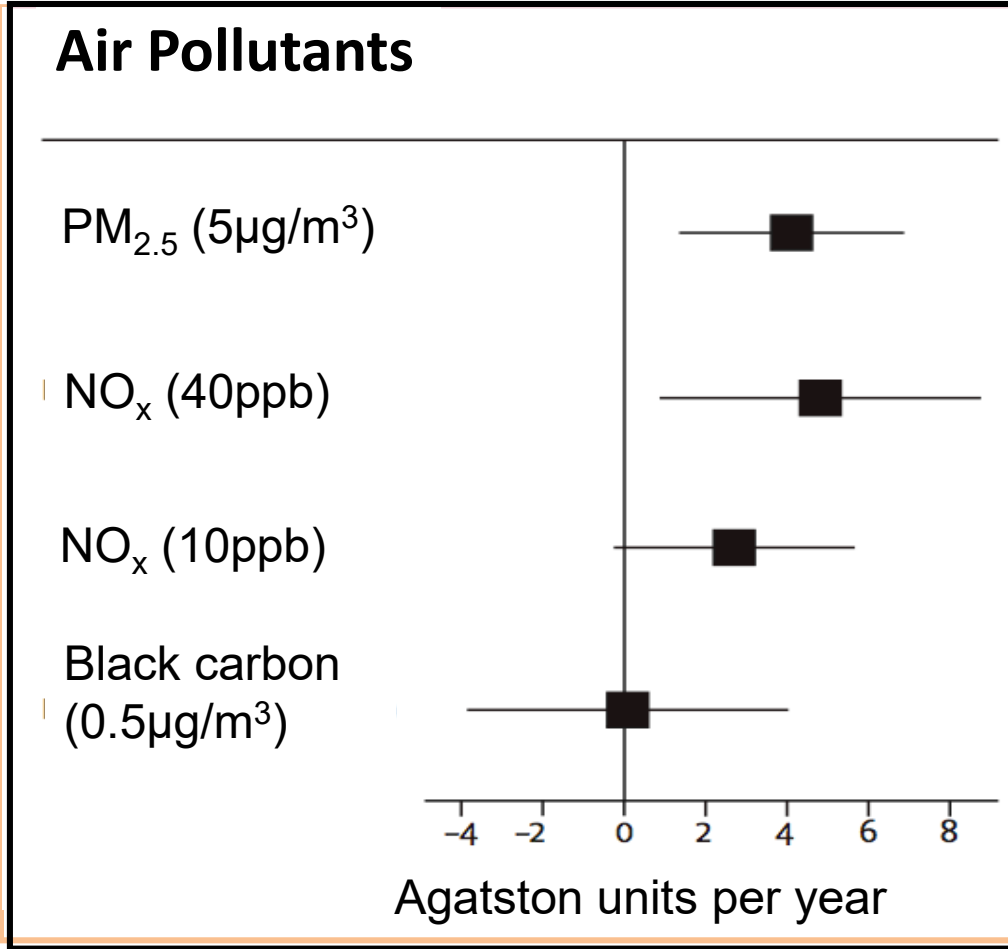
Meta-
Analysis
Systematic
Review

Biological Plausibility for PM_{2.5} Causing Cardiovascular Disease and Clinical Events

Biological pathways through which PM_{2.5} promotes cardiovascular events



Long-Term PM_{2.5} & NO₂ Exposure Increases Coronary Artery Calcium

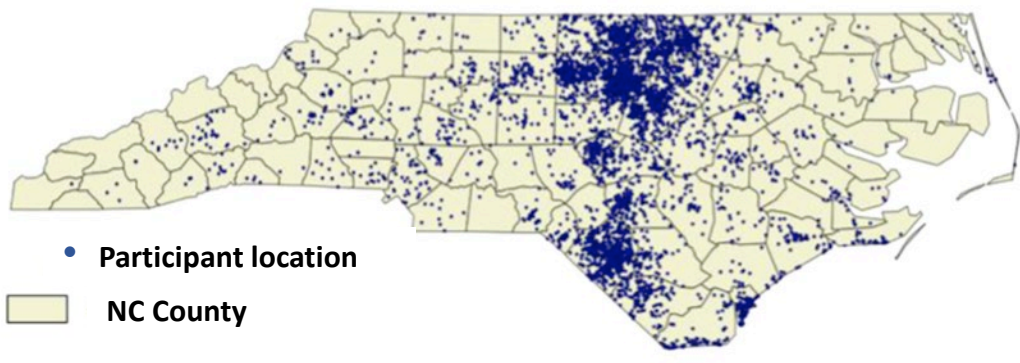
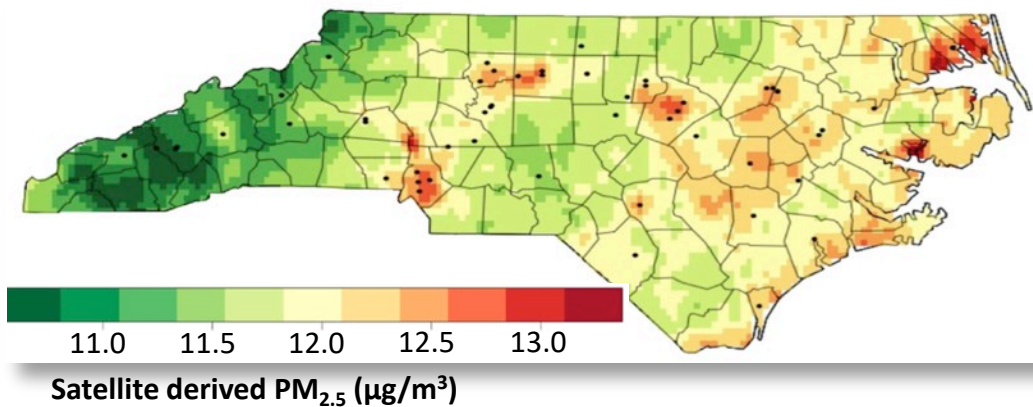


Long-term PM_{2.5} and NO₂ increased coronary calcium, an indicator of atherosclerosis

Health & Long-Term Air Pollution Exposure

Association between PM and Coronary Artery Disease

*5,679 patients who underwent coronary angiography at Duke University between 2002–2009 and resided in North Carolina**



1 µg/m³ increase in annual average PM_{2.5} was associated with an:

- **11.1% relative increase in odds of significant Coronary Artery Disease**
- **14.2% increase in the odds of having had a heart attack during the previous year**

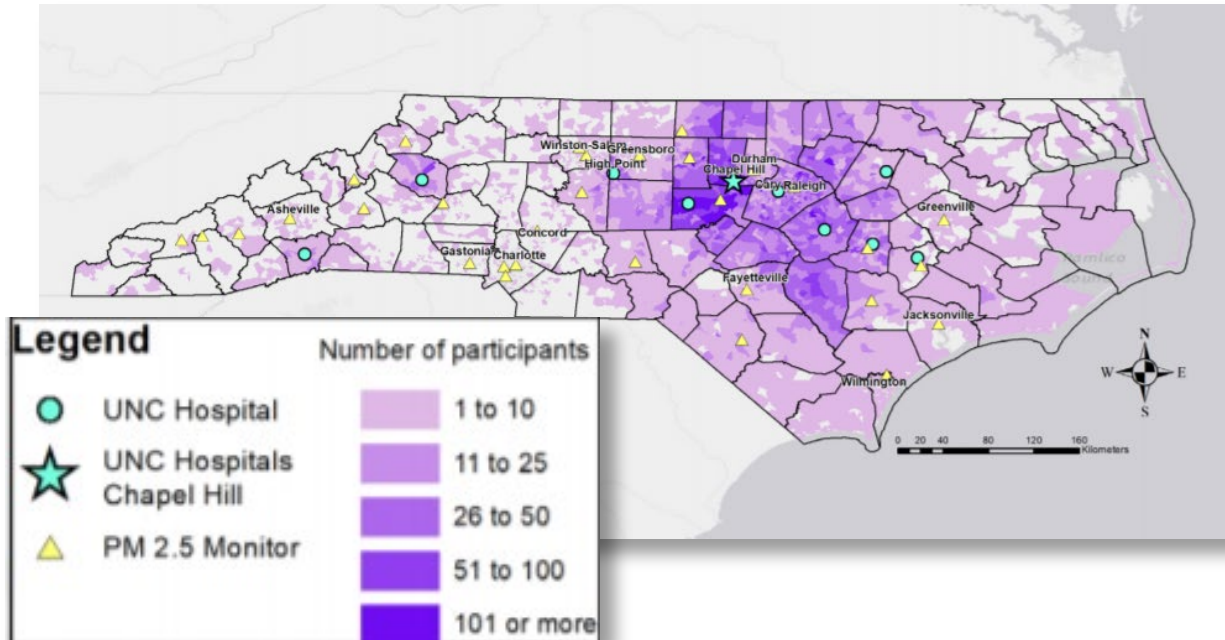
*6,575 Ohio residents undergoing elective diagnostic coronary angiography found the same relationship***

*McGuinn LA, et al. *Environ Res* 2016

**Hartiala J, et al. *J Am Heart Assoc* 2016

Air Pollution and Heart Failure Mortality Association with Age and Annual PM_{2.5} Concentration

Map of Heart Failure Patients in CARES (purple)



UNC-affiliated hospitals (blue circles) with the flagship hospital, located in Chapel Hill, NC, given as a blue star. EPA PM_{2.5} monitors are represented as yellow triangles.

Risk per 1 μg/m³ increase in PM_{2.5}

All Individuals	
HR (95% CI)	N (Deaths)
1.13 (1.10-1.15)	23,012 (4,444)
Diastolic HF	
HR (95% CI)	N (Deaths)
1.09 (1.05-1.13)	6,315 (1,449)
Systolic HF	
HR (95% CI)	N (Deaths)
1.07 (1.03-1.11)	7,041 (1,055)

Air Pollution Worsens Vascular Risk Factors

Risk Factors for Atherosclerosis and Air Quality

Poor Air Quality:

Age – might accelerate aging

Total Cholesterol – increases cholesterol

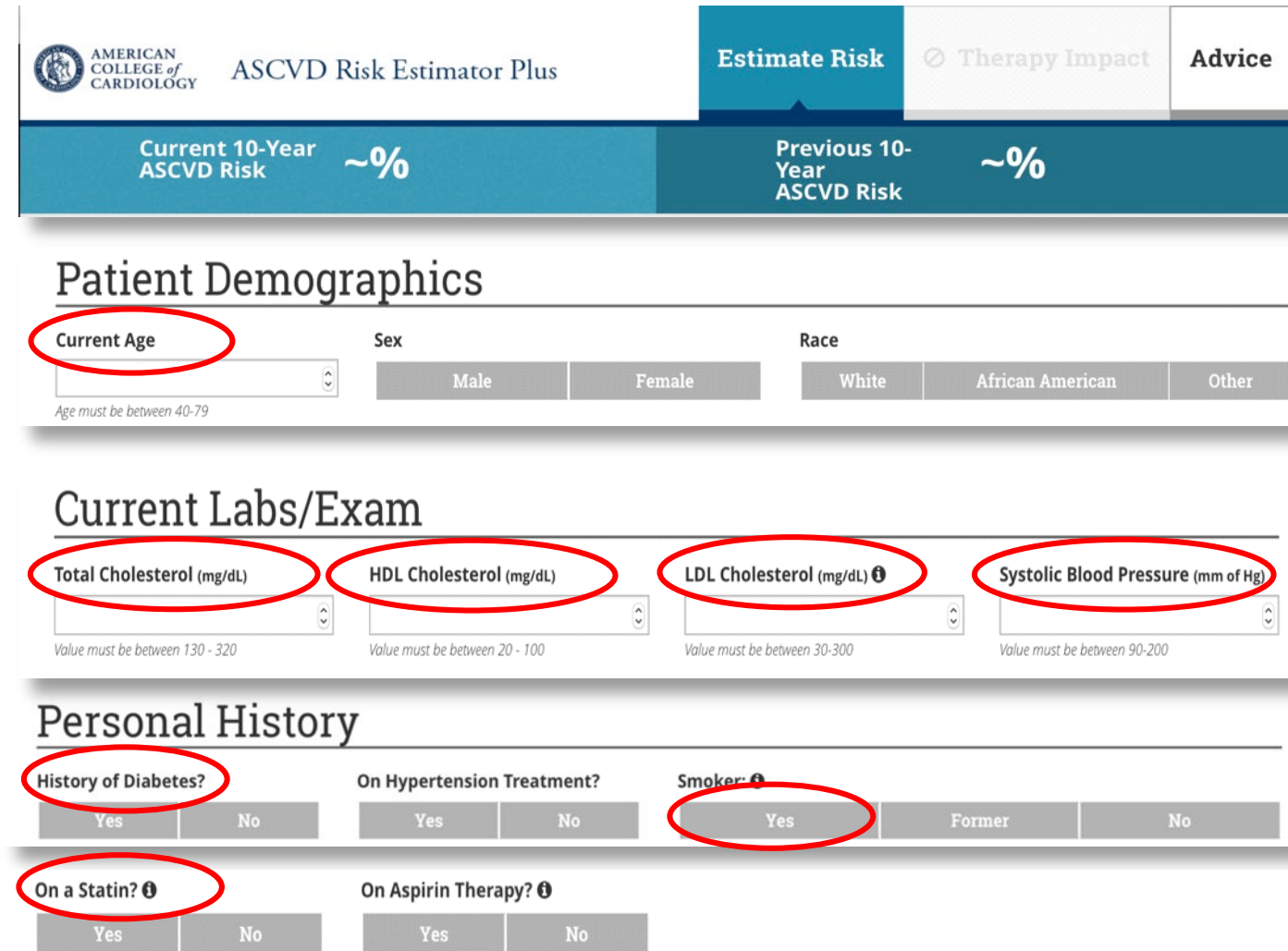
HDL – decreases HDL particle number

LDL – oxidizes LDL and ox-LDL receptor

Systolic BP – increases blood pressure

Diabetes – associated with Type II diabetes

Statin Therapy – might protective



AMERICAN COLLEGE of CARDIOLOGY ASCVD Risk Estimator Plus

Estimate Risk | Therapy Impact | Advice

Current 10-Year ASCVD Risk ~% | Previous 10-Year ASCVD Risk ~%

Patient Demographics

Current Age (circled) | Sex: Male | Female | Race: White | African American | Other

Age must be between 40-79

Current Labs/Exam

Total Cholesterol (mg/dL) (circled) | **HDL Cholesterol (mg/dL)** (circled) | **LDL Cholesterol (mg/dL)** (circled) | **Systolic Blood Pressure (mm of Hg)** (circled)

Value must be between 130 - 320 | Value must be between 20 - 100 | Value must be between 30-300 | Value must be between 90-200

Personal History

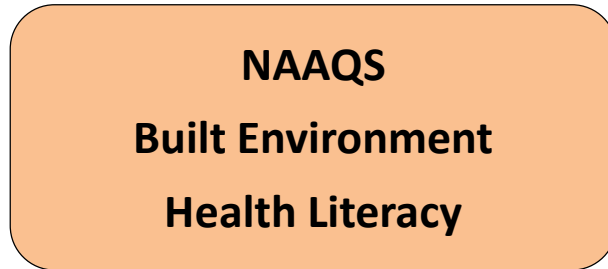
History of Diabetes? (circled) | **On Hypertension Treatment?** | **Smoker?** (circled) | Former | No

On a Statin? (circled) | **On Aspirin Therapy?**

Yes | No | Yes | No | Yes | No | Yes | No

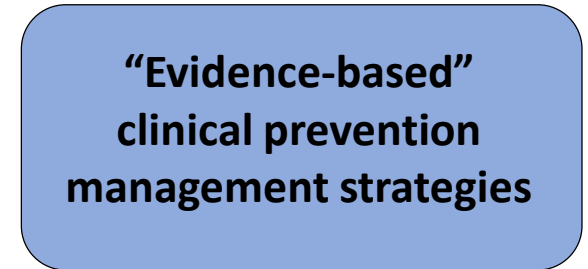
The Environmental “Buckets” of Prevention Framework

Total Population Community-Wide Prevention



- Attain & maintain NAAQS standards
- Improve built environment:
 - Places for physical activity
 - Create healthier near-road environments
- Improve overall CV health status

Traditional Clinical Prevention



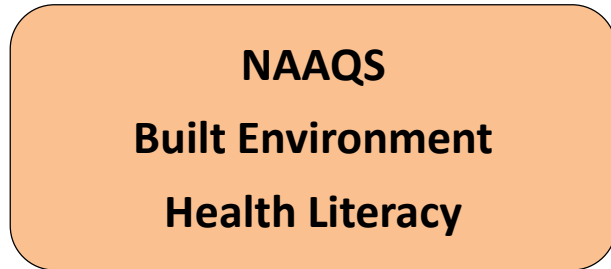
- Long-term indoor air filtration lowered markers of oxidative stress and inflammation
(Chuang H-C, et al. Environ International 2017)

Public Health

Health Care

The Environmental “Buckets” of Prevention Framework

Total Population Community-Wide Prevention



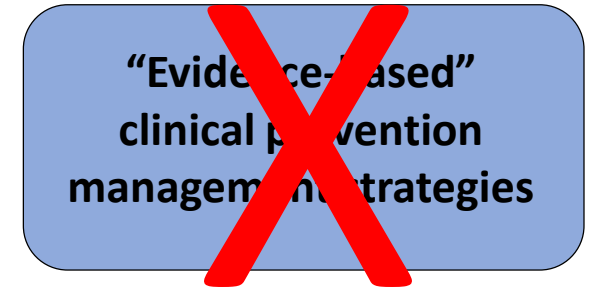
- Attain & maintain NAAQS standards
- Improve built environment:
 - Places for physical activity
 - Create healthier near-road environments
- Improve overall CV health status

Innovative Clinical Prevention



- Optimize clinical care of the at-risk priority population
- Increase awareness of health effects of PM among physicians, health care professionals and the at-risk population
- Provide guidance to lower exposure & associated risk

Traditional Clinical Prevention



- Long-term indoor air filtration lowered markers of oxidative stress and inflammation
(Chuang H-C, et al. Environ International 2017)

Public Health

Health Care

EPA's **Healthy Heart** Program Increasing Environmental Health Literacy



*EPA's **Healthy Heart** program aims to prevent heart attacks and strokes by:*

- Raising public awareness about the role outdoor air pollution plays in cardiovascular health, and
- Steps individuals can take to reduce their pollution exposure

Particle Pollution and Your Patients' Health

Web Course for Healthcare Professionals and Educators



The screenshot shows the EPA website interface for the course. At the top, there is a navigation bar with links for 'Environmental Topics', 'Laws & Regulations', and 'About EPA', along with a search bar for 'Search EPA.gov'. The main heading is 'Particle Pollution and Your Patients' Health'. Below this, there is a 'SHARE' section with icons for Facebook, Twitter, Pinterest, and Email, and a 'CONTACT US' link. The course description is presented in a light blue box, stating it is designed for various medical professionals. To the left, a dark grey box highlights 'Evidence-based Training for Healthcare Professionals' with two bullet points. At the bottom, there are links for 'Start the Course', 'Course Developers', and 'Continuing Education'. A central image shows a female doctor in a white coat and a male patient looking at a tablet together.

Environmental Topics Laws & Regulations About EPA Search EPA.gov

Particle Pollution and Your Patients' Health

CONTACT US

SHARE    

Evidence-based Training for Healthcare Professionals

- Describes the biological mechanisms responsible for the cardiovascular and respiratory health effects associated with particle pollution exposure.
- Provides educational tools to help patients understand how particle pollution exposure can affect their health and how they can use the Air Quality Index to protect their health.

This course is designed for family medicine physicians, internists, pediatricians, occupational and rehabilitation physicians, nurse practitioners, nurses, asthma educators, pulmonary specialists, cardiologists, and other medical professionals.

[Start the Course](#) [Course Developers](#) [Continuing Education](#)

Evidence-based training for healthcare professionals that provides knowledge they can share with patients to help reduce their overall risk of particle pollution health effects. Free CME, CNE, and CEU upon completion.

Wildfire Smoke Guide for Public Health Officials

Revised 2019



IV. COMMUNICATING AIR QUALITY CONDITIONS DURING SMOKE EVENTS



- Interagency collaboration
- Smoke vs. urban particles
- Addition of ozone
- Added sections

- PM web course
- Ash cleanup
- Sensors
- Stand alone fact sheets
 - Children
 - Older adults
 - Older adults
 - Respirator use
 - Pets/livestock
 - Ash cleanup
 - Preseason preparedness
 - Exposure reduction
 - Know when to evacuate



Wildfire Smoke and Your Patients' Health

Web Course for Healthcare Professionals and Educators

Environmental Topics

Laws & Regulations

About EPA

Search EPA.gov



Wildfire Smoke and Your Patients' Health

CONTACT US

SHARE



Learn about the health effects associated with wildfire smoke and actions for patients to take before and during a wildfire to reduce exposure.



This course is intended for physicians, registered nurses, asthma educators and others involved in clinical or health education.

- [Start the Course](#)
- [Obtain Continuing Education Credits](#)

[Meet the developers of this course.](#)

Developed for healthcare practitioners, the **Wildfire Smoke and Your Patients' Health course** is a trimmed down, tailored version of the **Wildfire Guide**, focusing on health effects, populations at greater risk of health effects, air quality, and actions to reduce exposure.

EPA's **Healthy Heart** Program Increasing Environmental Health Literacy



A health literacy program that provides a collection of web-based resources about the health effects of air pollution.



A national initiative, co-led by CDC and CMS, that aims to prevent 1 million heart attacks by 2022.

Healthy Heart & Million Hearts

Total Population Community-Wide Prevention

PM NAAQS

24-hour
Standard:
35 $\mu\text{g}/\text{m}^3$

Annual Standard
12 $\mu\text{g}/\text{m}^3$

Innovative Clinical Prevention



Traditional Clinical Prevention

Currently no
traditional
“evidence-based”
clinical prevention
management
strategies

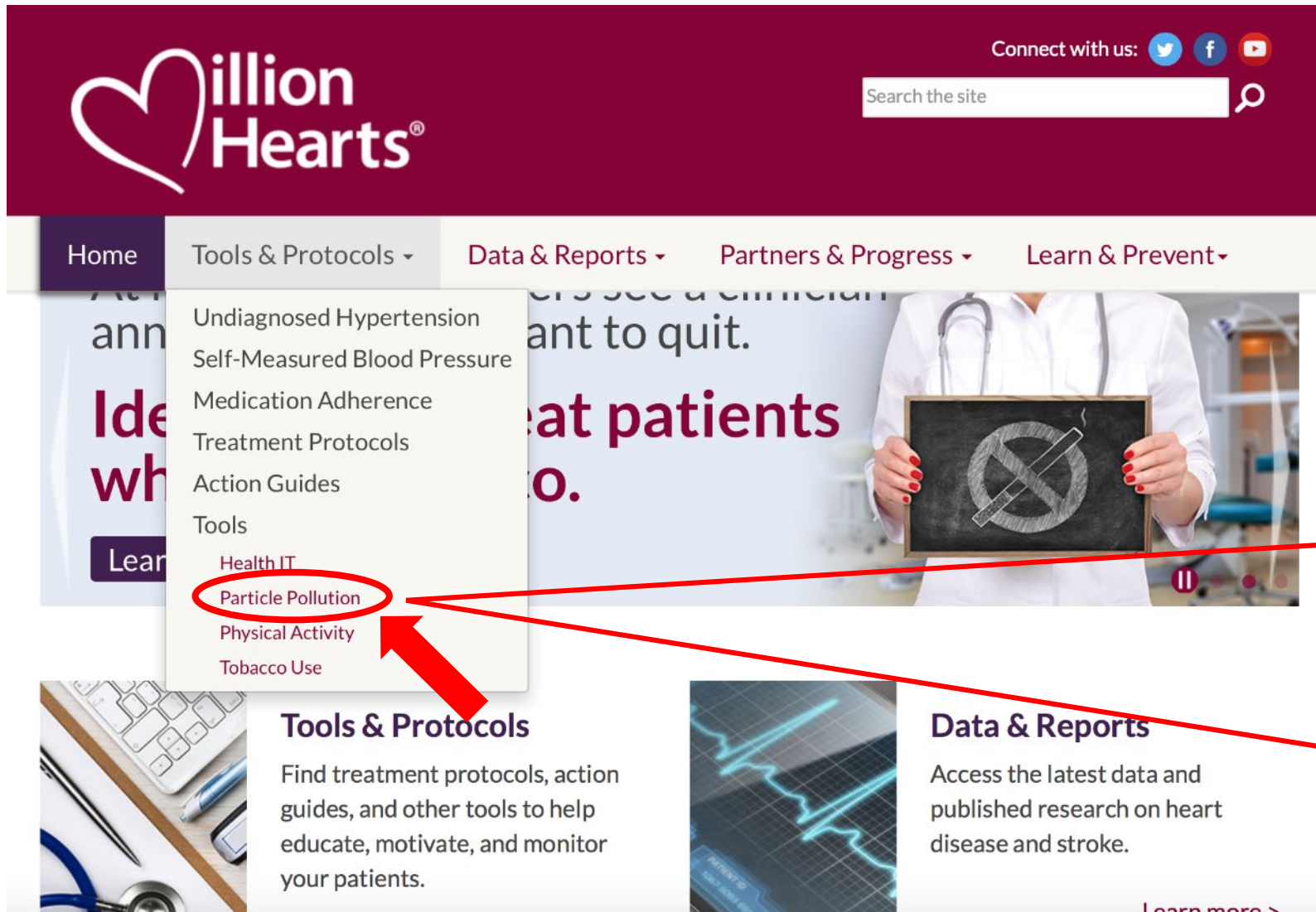
Public Health

Health Care




Million Hearts[®] 2022 Aim: Prevent a Million Heart Attacks and Strokes in 5 Years




Million Hearts® Provides Educational Tools on Particle Pollution



Million Hearts®

Connect with us:   

Search the site 

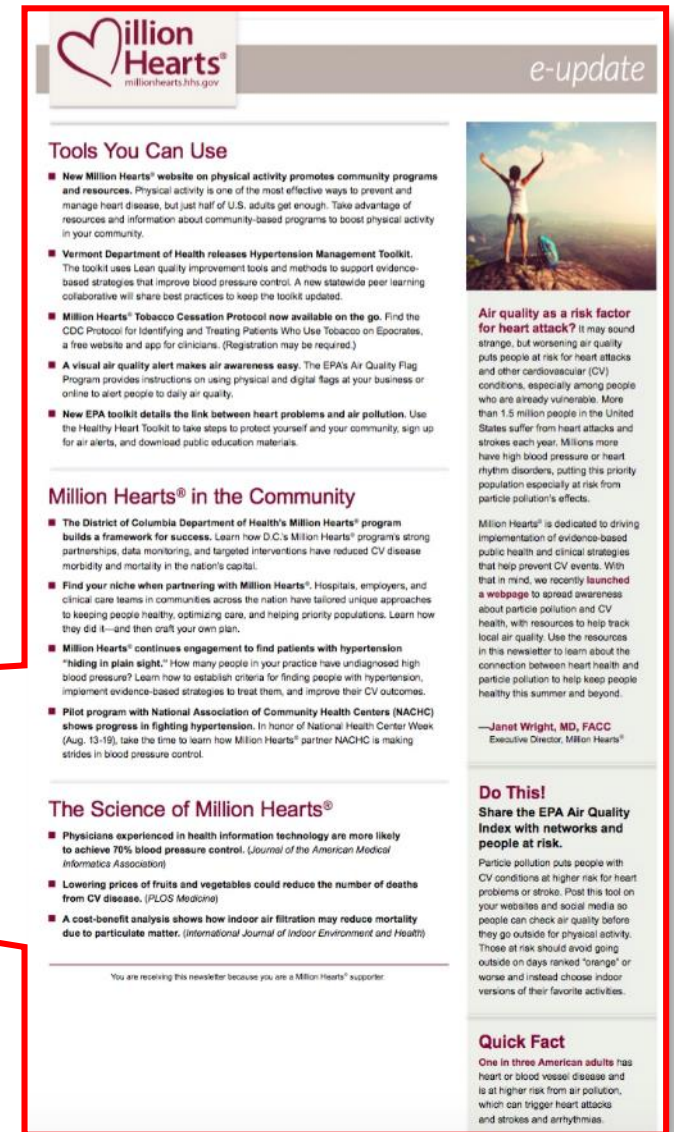
Home Tools & Protocols ▾ Data & Reports ▾ Partners & Progress ▾ Learn & Prevent ▾

Undiagnosed Hypertension
Self-Measured Blood Pressure
Medication Adherence
Treatment Protocols
Action Guides
Tools

Health IT
Particle Pollution
Physical Activity
Tobacco Use

Tools & Protocols
Find treatment protocols, action guides, and other tools to help educate, motivate, and monitor your patients.

Data & Reports
Access the latest data and published research on heart disease and stroke.




Million Hearts®
millionhearts.hhs.gov

e-update

Tools You Can Use

- **New Million Hearts® website on physical activity promotes community programs and resources.** Physical activity is one of the most effective ways to prevent and manage heart disease, but just half of U.S. adults get enough. Take advantage of resources and information about community-based programs to boost physical activity in your community.
- **Vermont Department of Health releases Hypertension Management Toolkit.** The toolkit uses Lean quality improvement tools and methods to support evidence-based strategies that improve blood pressure control. A new statewide peer learning collaborative will share best practices to keep the toolkit updated.
- **Million Hearts® Tobacco Cessation Protocol now available on the go.** Find the CDC Protocol for Identifying and Treating Patients Who Use Tobacco on Epocrates, a free website and app for clinicians. (Registration may be required.)
- **A visual air quality alert makes air awareness easy.** The EPA's Air Quality Flag Program provides instructions on using physical and digital flags at your business or online to alert people to daily air quality.
- **New EPA toolkit details the link between heart problems and air pollution.** Use the Healthy Heart Toolkit to take steps to protect yourself and your community, sign up for air alerts, and download public education materials.



Air quality as a risk factor for heart attack? It may sound strange, but worsening air quality puts people at risk for heart attacks and other cardiovascular (CV) conditions, especially among people who are already vulnerable. More than 1.5 million people in the United States suffer from heart attacks and strokes each year. Millions more have high blood pressure or heart rhythm disorders, putting this priority population especially at risk from particle pollution's effects.

Million Hearts® in the Community

- **The District of Columbia Department of Health's Million Hearts® program builds a framework for success.** Learn how D.C.'s Million Hearts® program's strong partnerships, data monitoring, and targeted interventions have reduced CV disease morbidity and mortality in the nation's capital.
- **Find your niche when partnering with Million Hearts®.** Hospitals, employers, and clinical care teams in communities across the nation have tailored unique approaches to keeping people healthy, optimizing care, and helping priority populations. Learn how they did it—and then craft your own plan.
- **Million Hearts® continues engagement to find patients with hypertension "hiding in plain sight."** How many people in your practice have undiagnosed high blood pressure? Learn how to establish criteria for finding people with hypertension, implement evidence-based strategies to treat them, and improve their CV outcomes.
- **Pilot program with National Association of Community Health Centers (NACHC) shows progress in fighting hypertension.** In honor of National Heart Center Week (Aug. 13-19), take the time to learn how Million Hearts® partner NACHC is making strides in blood pressure control.

—Janet Wright, MD, FACC
Executive Director, Million Hearts®

The Science of Million Hearts®

- **Physicians experienced in health information technology are more likely to achieve 70% blood pressure control.** (*Journal of the American Medical Informatics Association*)
- **Lowering prices of fruits and vegetables could reduce the number of deaths from CV disease.** (*PLOS Medicine*)
- **A cost-benefit analysis shows how indoor air filtration may reduce mortality due to particulate matter.** (*International Journal of Indoor Environment and Health*)

You are receiving this newsletter because you are a Million Hearts® supporter.

Do This!

Share the EPA Air Quality Index with networks and people at risk.

Particle pollution puts people with CV conditions at higher risk for heart problems or stroke. Post this tool on your websites and social media so people can check air quality before they go outside for physical activity. Those at risk should avoid going outside on days ranked "orange" or worse and instead choose indoor versions of their favorite activities.

Quick Fact

One in three American adults has heart or blood vessel disease and is at higher risk from air pollution, which can trigger heart attacks and strokes and arrhythmias.

Optimizing Care

Support includes: Counseling on risks of particulate matter

Goals	Effective Health Care Strategies
<p>Improve ABCS* Targets: 80%</p>	<p><i>High Performers Excel in the Use of...</i></p> <ul style="list-style-type: none"> • Teams—including pharmacists, nurses, community health workers, and cardiac rehab professionals • Technology—decision support, patient portals, e- and default referrals, registries, and algorithms to find gaps in care • Processes—treatment protocols; daily huddles; ABCS scorecards; proactive outreach; finding patients with undiagnosed high BP, high cholesterol, or tobacco use • Patient and Family Supports—training in home blood pressure monitoring; problem-solving in medication adherence; counseling on nutrition, physical activity, tobacco use, risks of particulate matter; referral to community-based physical activity programs and cardiac rehab
<p>Increase Use of Cardiac Rehab Target: 70%</p>	
<p>Engage Patients in Heart-Healthy Behaviors Targets: TBD</p>	

Improving Outcomes for Priority Populations

Priority Populations	Major Strategies
Blacks/African Americans	Improving hypertension control
35- to 64-year-olds, because event rates are rising	<ul style="list-style-type: none"> • Improving hypertension control and statin use • Increasing physical activity
People who have had a heart attack or stroke	<ul style="list-style-type: none"> • Increasing cardiac rehab referral and participation • Avoiding exposure to particulate matter
People with mental illness or substance use disorders	Reducing tobacco use

Informing the Public www.airnow.gov via the Internet

- *AirNow.gov Redesign Now Active*
- Updated look: Focus on local conditions
- Mobile-friendly website
- Same great information
 - Health Care Provider page
 - Fires: Current Conditions page
- Better display of temporal changes in air quality



EPA ORD Air Quality Tools: Engaging Individuals and Communities



Smoke Sense

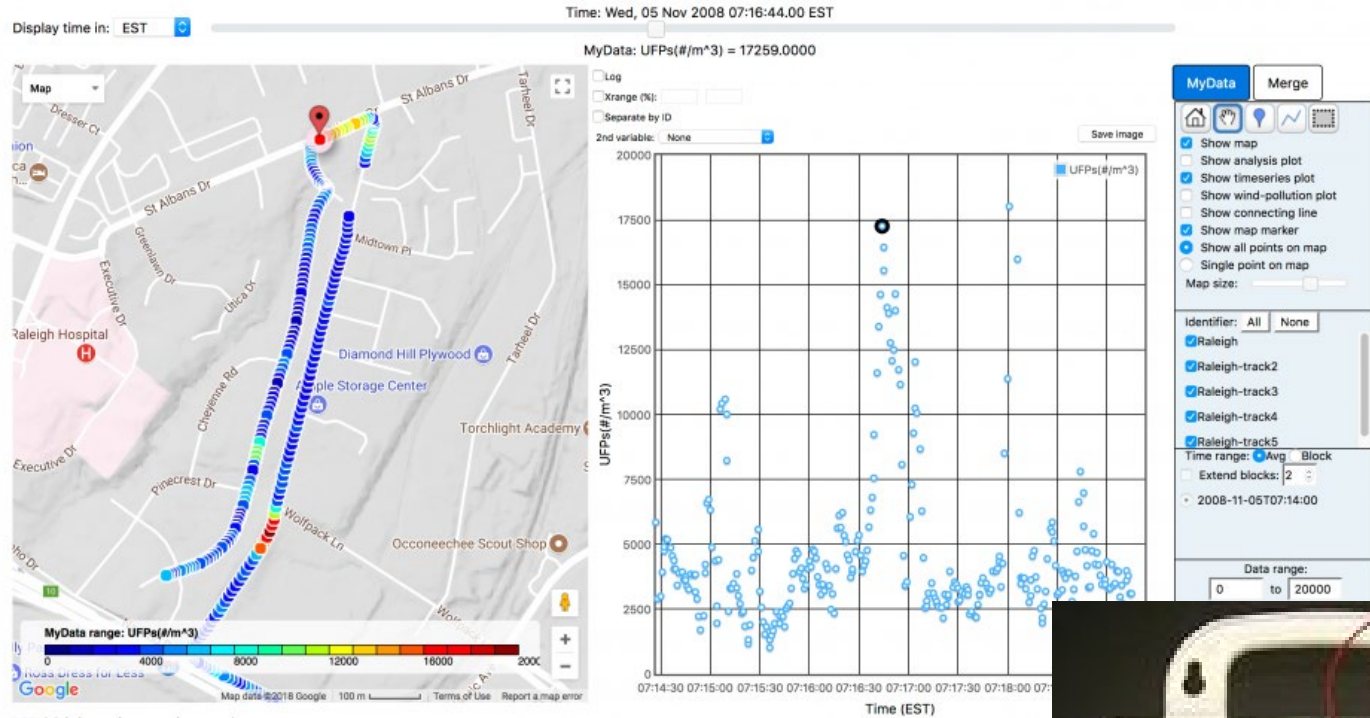
**TracMyAir
App**

Air Sensor Toolbox: Goals

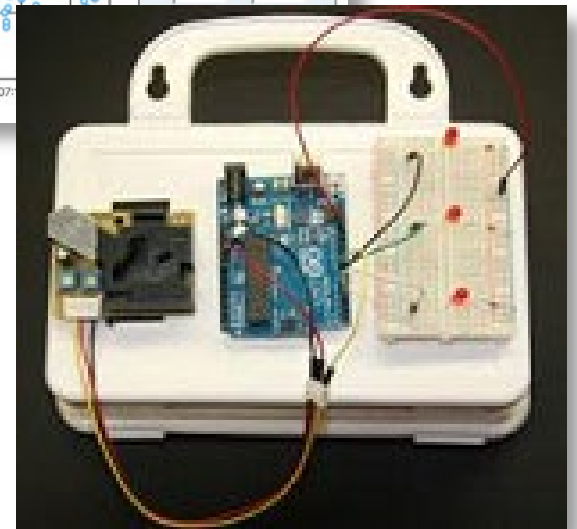


EPA's Air Sensor Toolbox provides the latest science on the performance, operation and use of air sensor monitoring systems for technology developers, air quality managers, citizen scientists and the public.

Air Sensor Toolbox: Approaches



REal Time Geospatial Data Viewer (RETIGO)



Build your own particle sensor kit

Air Sensor Toolbox: Impact



EPA and partners from the Eastern Band of Cherokee Indians review the assembly of a weather shelter for low-cost sensors.

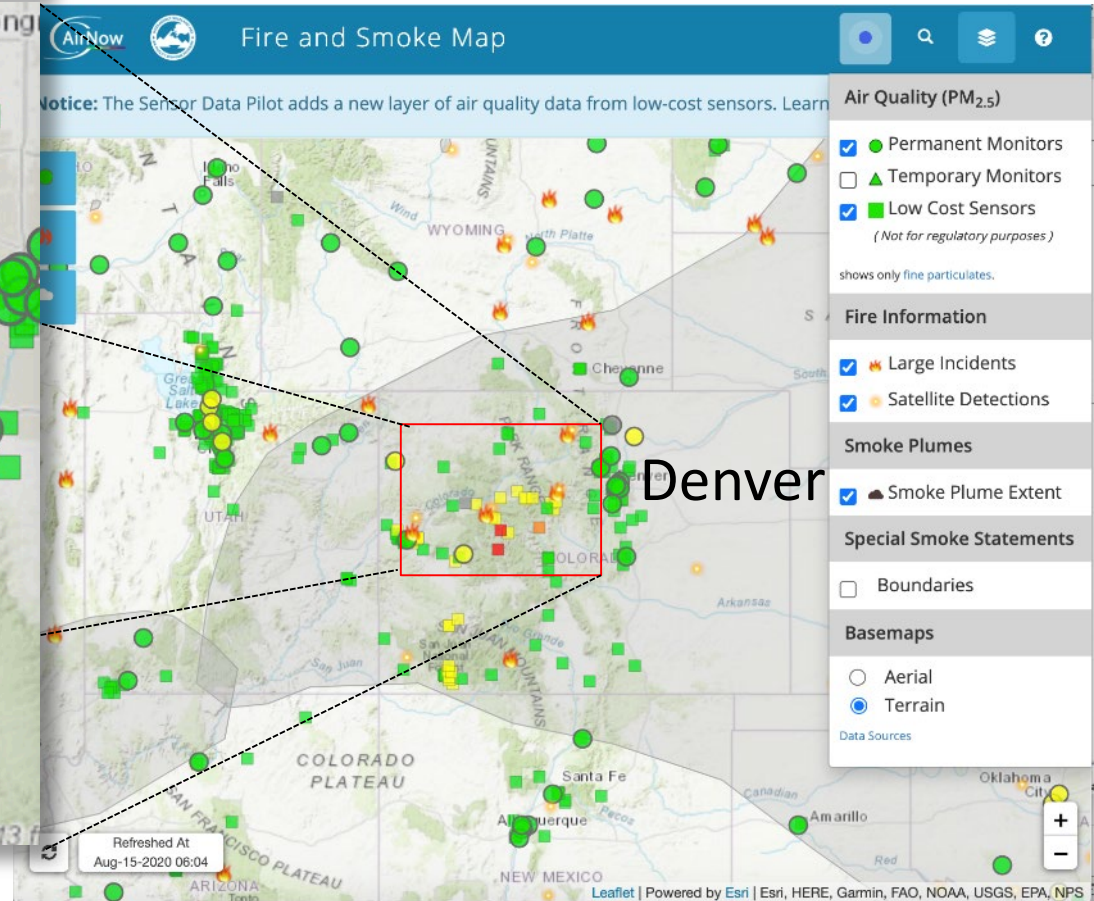
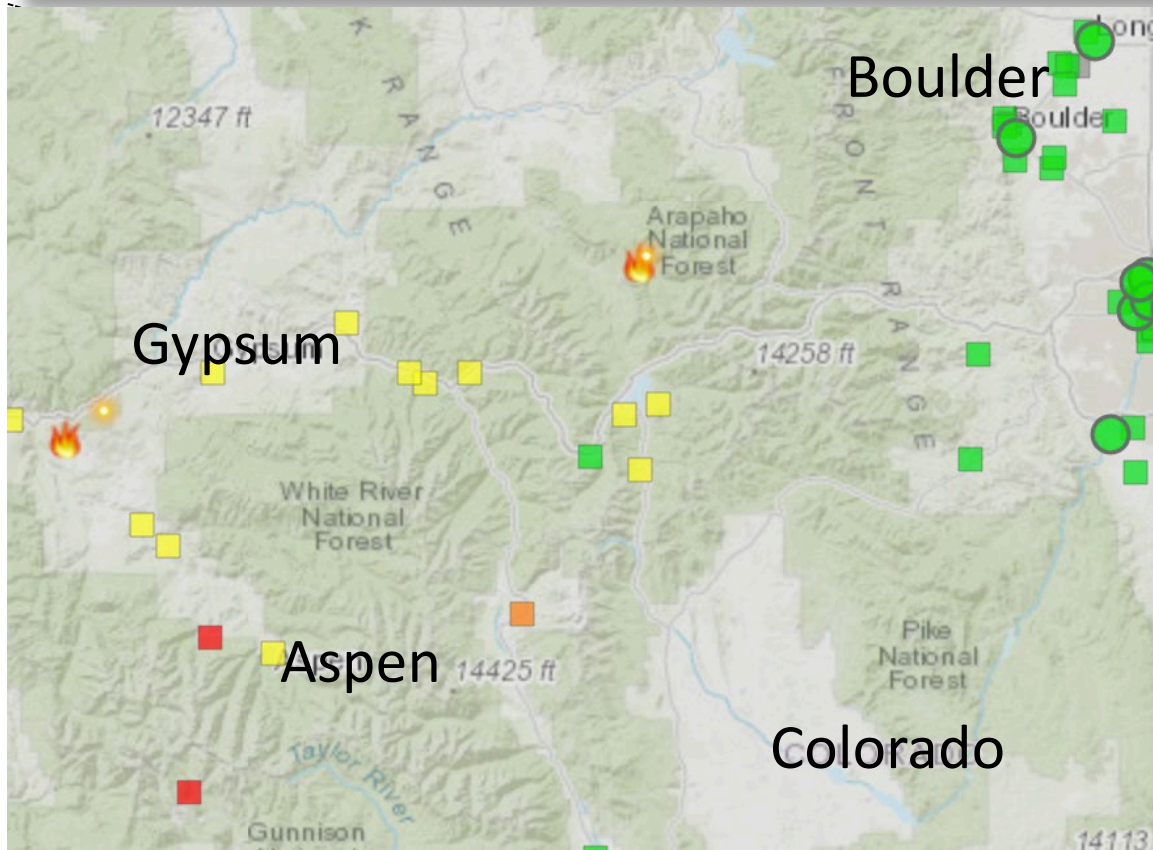
Over 50K visits to Toolbox webpage this past year



Enhanced Ambient Air Quality (PM_{2.5}) Data PurpleAir now displayed on AirNow

Air Quality (PM_{2.5}) Layers: Monitors and sensors reporting PM_{2.5} data

- Permanent Monitors: Federal, State, Tribal
- Temporary Monitors: Typically government agencies
- Low Cost Sensors: Currently from Purple Air

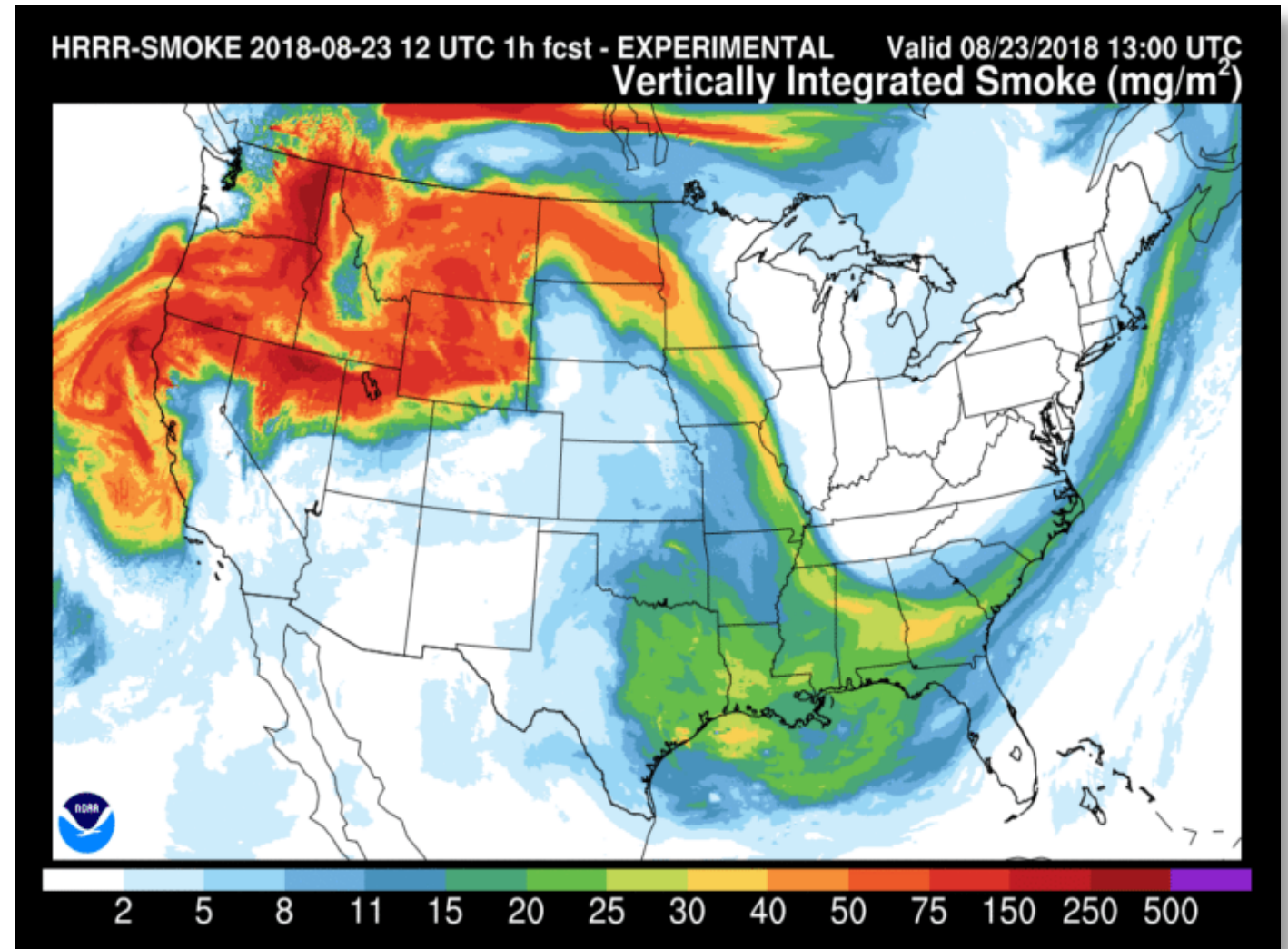


Smoke Sense: Goals



Smoke Sense

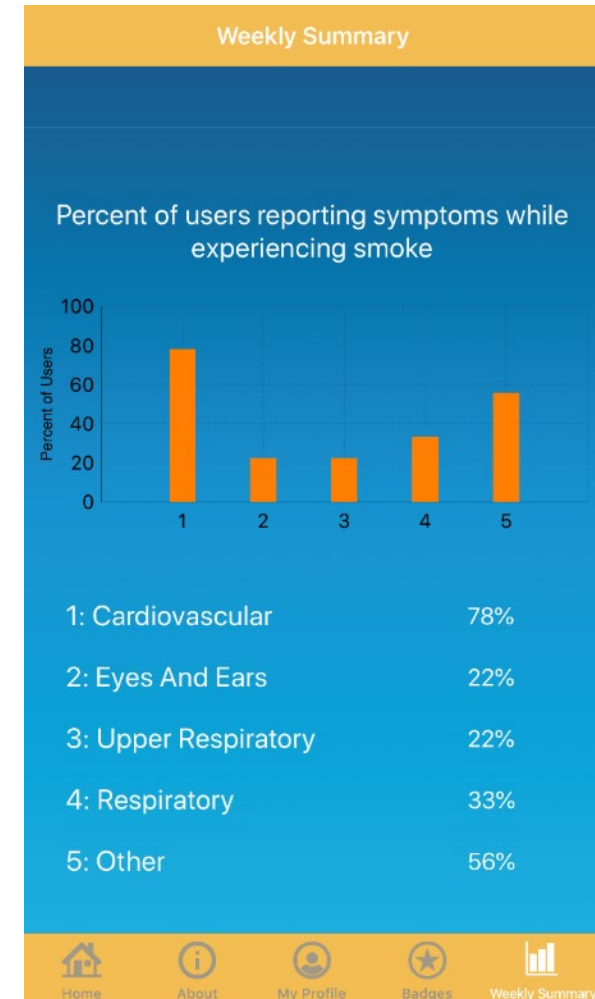
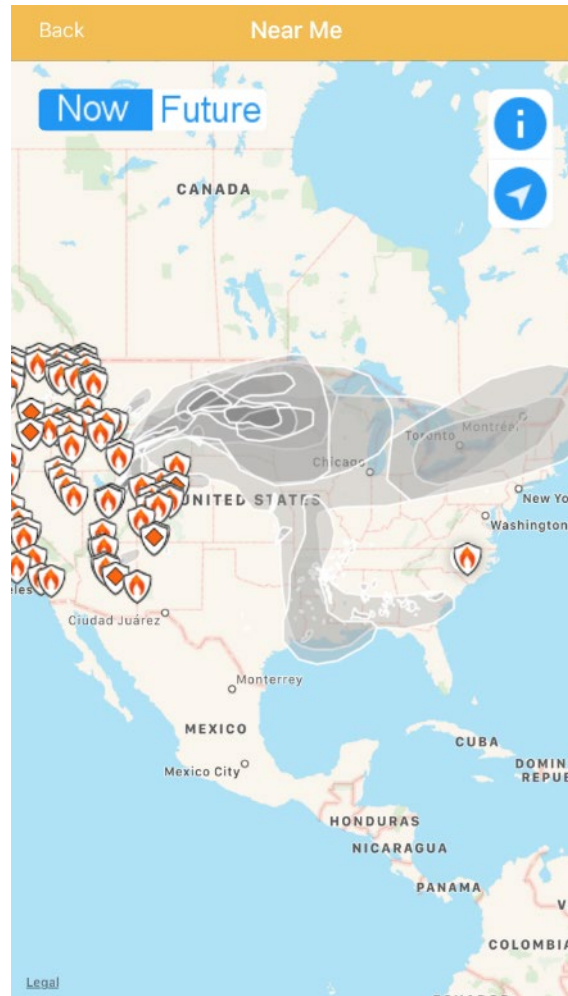
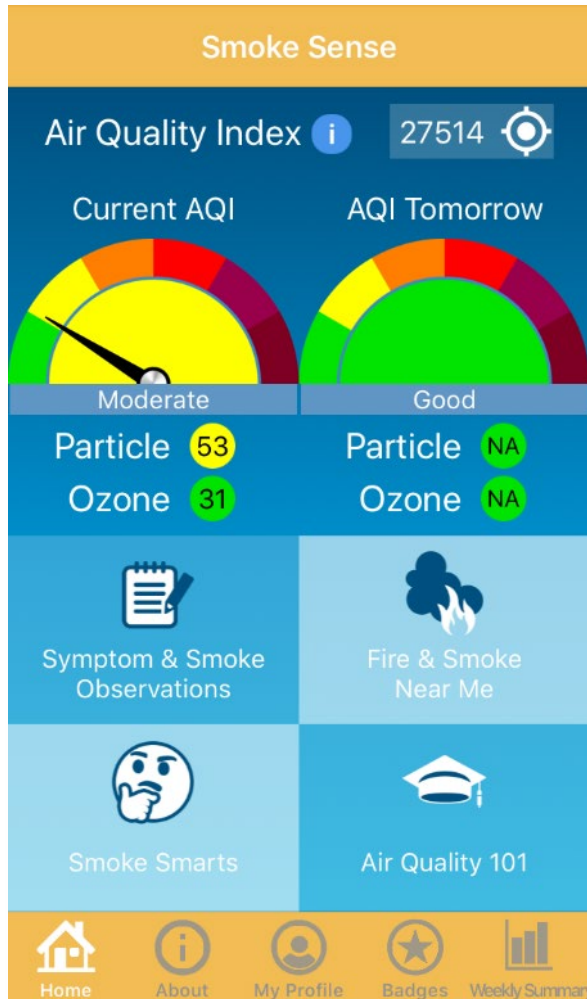
- Understand the gap between what we know about risk and ways to protect our health and the observed public health outcomes
- Increase issue engagement so people can take action to protect health
- Inform ways to improve effectiveness of health risk messaging and communication strategies



Smoke Sense: Approaches



Smoke Sense



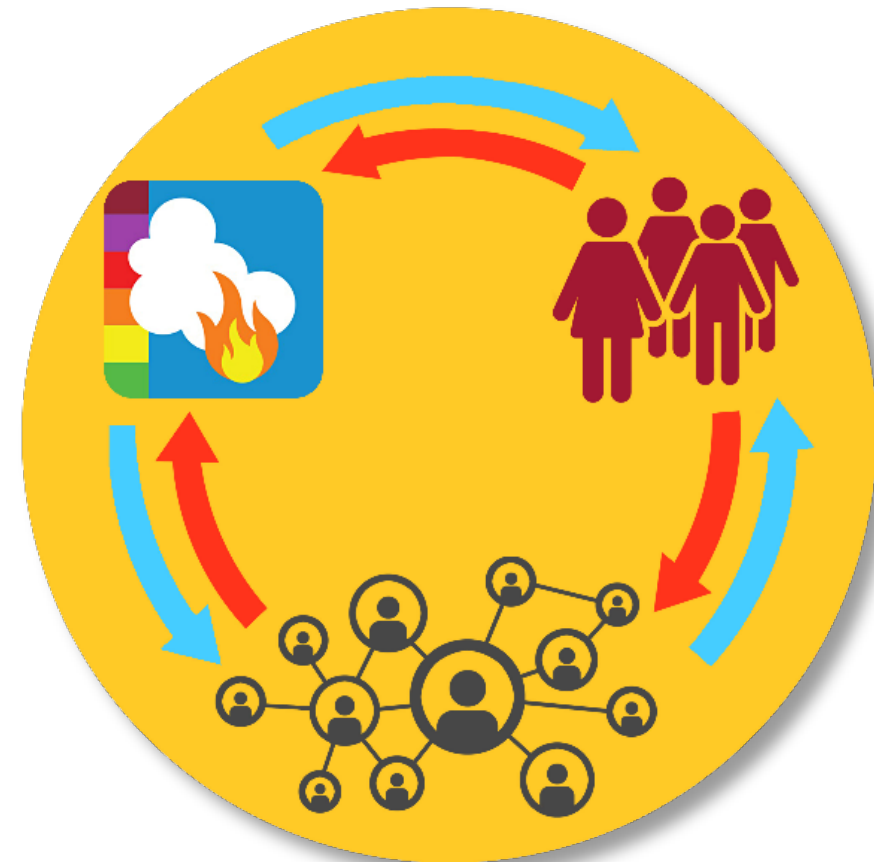
Smoke Sense: Impact



Smoke Sense

- Develops entry points for members of the public to contribute to **research, engage and access** data
- **Mutually beneficial** – it helps EPA answer questions, and it also serves as an educational/data resource that communities can leverage to address issues related to air quality and health in their communities
- Allows for **two-way communication** framework in problem formulation and dissemination of knowledge
- **Data sharing and fostering change**

Over 31K users
in all 50 states



- Develop smartphone exposure model to estimate real-time individual-level exposures and inhaled doses to PM_{2.5} and ozone
- Facilitate and expand use of exposure metrics for epidemiological studies and public health applications
- Inform ways to reduce exposures so people can take action to protect health



 EPA
www.epa.gov/research

science in ACTION

INNOVATIVE RESEARCH FOR A SUSTAINABLE FUTURE

EPA's TracMyAir App: Using smart phones to predict near real-time air pollution exposures

Background

To better understand people's contact with air pollutants and their potential for adverse health effects, it's important to estimate how much time they spend in different locations and what the air pollutant concentrations are in those locations. Using currently available personal air monitors to collect this information has several limitations, including burden on participants, cost, and need for substantial technical expertise.



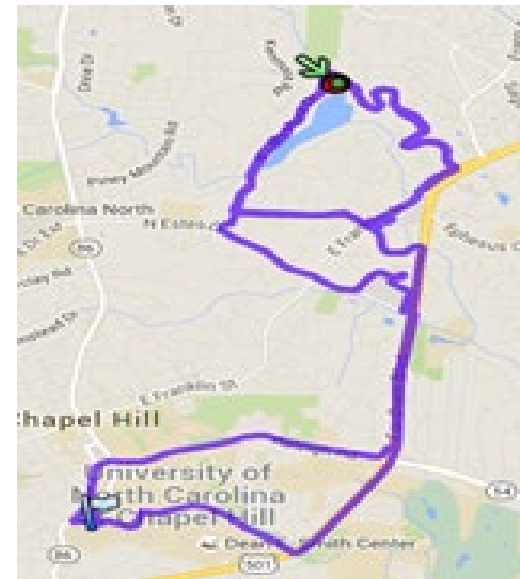
TracMyAir: Approaches

TracMyAir
App

- Tracks user's nearest PM_{2.5} and ozone monitors to determine outdoor levels
- Estimates building-specific infiltration of PM_{2.5} and ozone to determine indoor levels (accounts for open windows, window fans, home air cleaners)
- Tracks user's location and corresponding microenvironment (e.g., outdoors, in-vehicle, indoors at home, work) to determine exposure
- Tracks user's physical activity level (e.g., step counts) to determine inhaled dose



AirNow
PM_{2.5},
ozone
monitors



User's location tracks

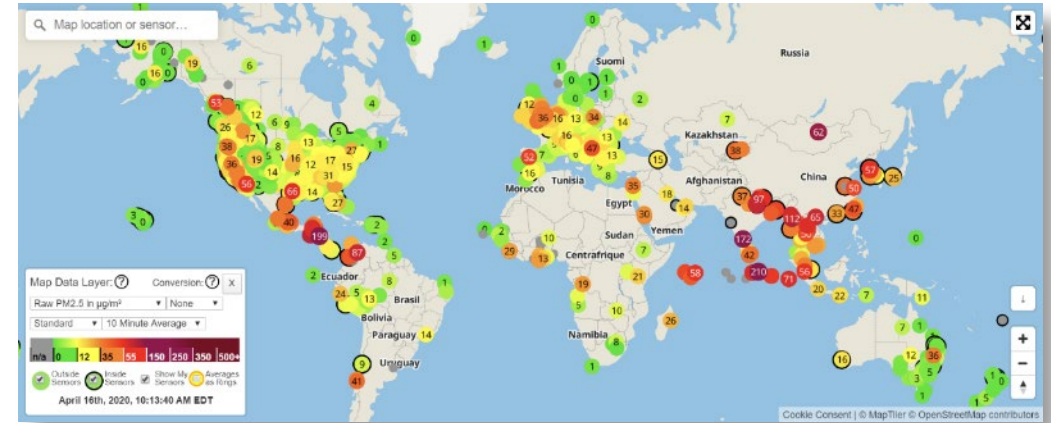


User's step counts

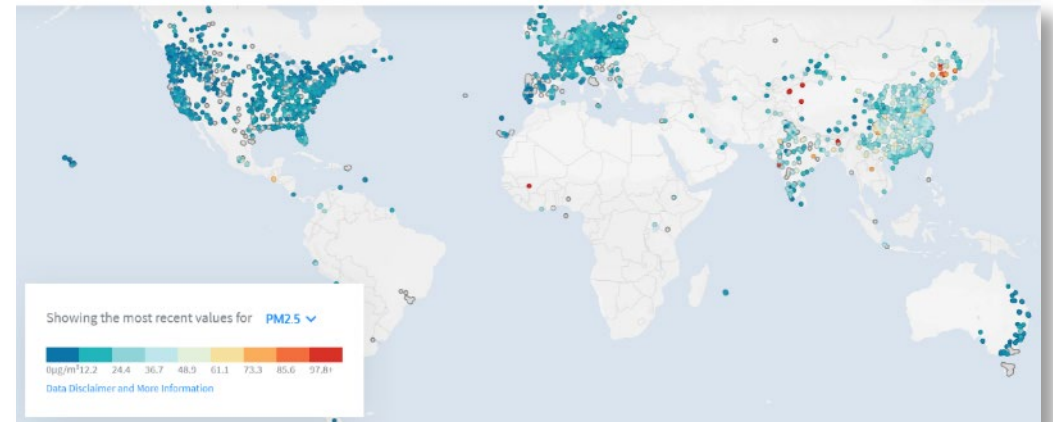
TracMyAir: Impact

TracMyAir
App

- Integrates with network of low-cost PM_{2.5} monitors (PurpleAir) for community applications
- Integrates with global network of ambient monitors (OpenAQ) for international applications
- Integrates with real-time air quality models for exposures to additional air pollutants (e.g., NO₂)
- Determines microenvironment-specific exposures and dose to help identify strategies to reduce levels (e.g., scheduling time spent outdoors and at higher physical activity levels, closing home windows, operating home air cleaners)



PurpleAir – network of low-cost PM_{2.5} monitors



OpenAQ – global network of PM_{2.5}, O₃ monitors

Solutions-Driven Research Pilot: Creating Cleaner Air Spaces

Focus: Measuring the effectiveness of air cleaning filtration systems in wildfire smoke conditions

- **Stakeholders identified research priorities including:**
 - How effective are portable air cleaners (PACs) or central air filtration systems during smoke events?
 - Under what operating and maintenance conditions and in what building types?
- **Laboratory and field studies**
- **Partnering with:**
 - Missoula City-County Health Department, Climate Smart Missoula, University of Montana
 - Hoopa Valley Tribe



Collocation of PurpleAir sensors with reference monitors at the USFS Fire Science Lab

High Resolution Air Pollution Mapping Small Scale Variability due to Local Sources

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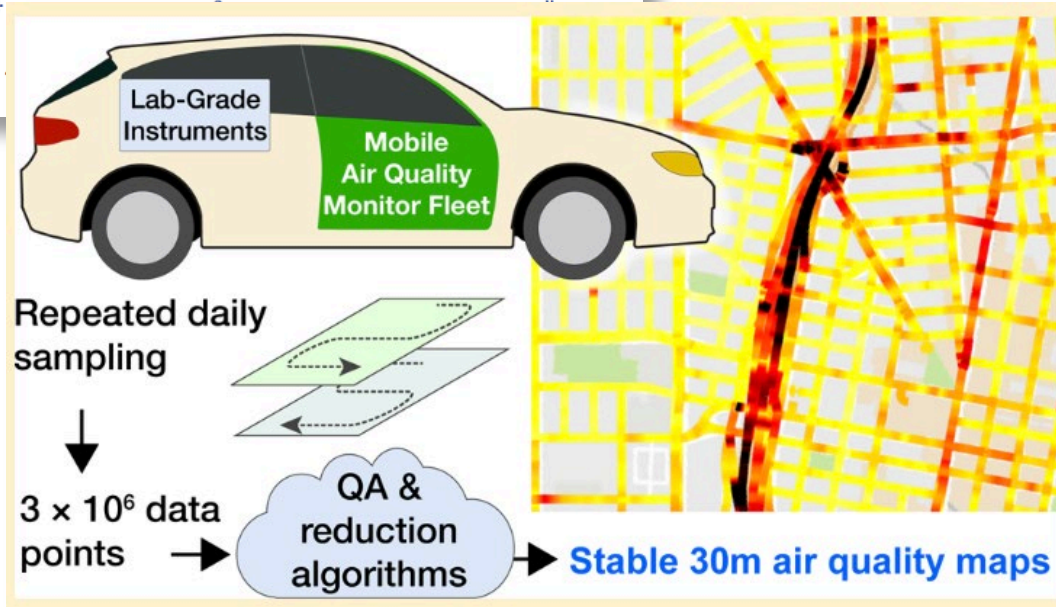
ENVIRONMENTAL
Science & Technology

High-Resolution Air Pollution Mapping with Google Street View Cars: Exploiting Big Data

Joshua S. Apte,^{*,†} Kyle P. Messier,^{†,‡} Shahzad Gani,[†]
Melissa M. Lunden,[‡] Julian D. Marshall,[#] Christopher
and Steven P. Hamburg[‡]

Apte JS et al.
Environ Sci Technol 2017

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Exposure to Particulate Air Pollution
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Low-Exposure, Health-Promoting
Cities. *Environmental Health
Perspectives* 125:527–534, 2017



Oakland, CA *Spatial distribution of Black Carbon (BC)*



COVID-19, Air Pollution and Heart Disease

Highly infectious through an aerosol route

- Uses the ACE2 receptor to attach and infect cells
- ACE2 receptors are present on cells of the respiratory and cardiovascular systems

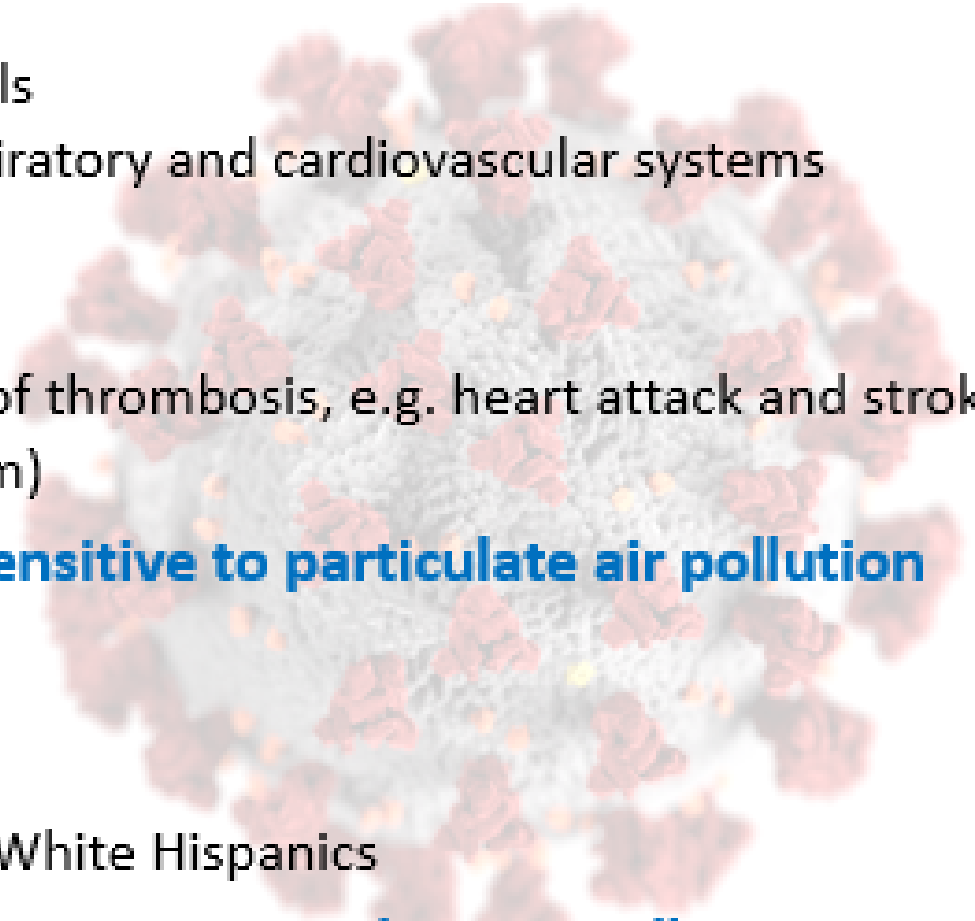
Wide spectrum of disease severity

- Pulmonary effects - pneumonia
- Cardiovascular effects including increased risk of thrombosis, e.g. heart attack and stroke
- Massive inflammatory response (cytokine storm)

Vulnerable populations include many who are sensitive to particulate air pollution

- Chronic lung, heart and kidney disease
- Obesity and Type II diabetes
- Older adults and lower socioeconomic status
- African-Americans, Native Americans and non-White Hispanics

Early epidemiology research suggests that exposure to particulate air pollution increases the severity and mortality of COVID-19



EPA COVID-19 Research to Benefit Public Health

Detecting and Monitoring SARS-CoV-2 in Wastewater

- Standardize methods to assess virus in sewage
- Monitor virus levels in sewage to assess community infection rate

Evaluating SARS-CoV-2 Cleanup and Disinfection Practices

- Surface sampling efficiency
- Alternative disinfection devices
- Longer-term SARS-CoV-2 disinfection evaluation
- Real-world surface disinfection
- Rapid viability
- PPE disinfection

Develop a Salivary Antibody Assay

- Salivary antibody assay to assess community exposure

Early epidemiology research suggests that exposure to particulate air pollution increases the severity and mortality of COVID-19

Looking to the Future

Mid-term Goals for Decreasing Cardiovascular Disease

- **Continue to apply state-of-the-art methods to conduct research to inform EPA regulatory and policy decisions**
- **Continue to develop research to better define those at higher risk from environmental exposures and find ways to mitigate risks in the most vulnerable**
- **Support HHS' goals for Million Hearts, and Healthy People 2020 and 2030**
 - Aims to decrease the prevalence of cardiovascular risk factors in the population
 - Educate clinicians, patients and family members that patients with heart disease should avoid exposure to air pollution
- **Increase cooperation between public health, healthcare systems, insurers and healthcare professionals to protect population and individual health**
 - Look at novel ways to coordinate education and healthcare to limit exposure
 - Especially among those most vulnerable

Looking to the Future

Mid-term Goals for Decreasing Cardiovascular Disease

- **Continue to work with our federal partners to provide consistent and useful guidance on environmental health issues**
 - Increase environmental health literacy through improved communication of environmental health topics, risk and decision-making
- **Increase quality and access to health data for research and public health decision-making**
 - Increase access to and integration of electronic health records data
- **Encourage the incorporation of advances in science and technology to:**
 - Improved exposure assessment to air pollutants
 - Satellite, Ground-based measurement and monitoring
 - Ongoing improvements in air pollution modeling
 - Improve personal exposure measurement and monitoring as well as health effects
 - e.g. TracMyAir app, Smoke Sense app

Contact

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Assessment

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For More Information

- Science Matters Newsletter: <https://www.epa.gov/sciencematters>
- Follow us on Twitter at @EPARESEARCH and Facebook at U.S. EPA Research
- EPA's Air Research: www.epa.gov/air-research
- EPA's Healthy Heart Toolkit: www.epa.gov/air-research/healthy-heart-toolkit-and-research
- Smoke Sense Project: www.epa.gov/air-research/smoke-sense
- Village Green Project: www.epa.gov/air-research/village-green-project

Thank You!

Special thanks to:



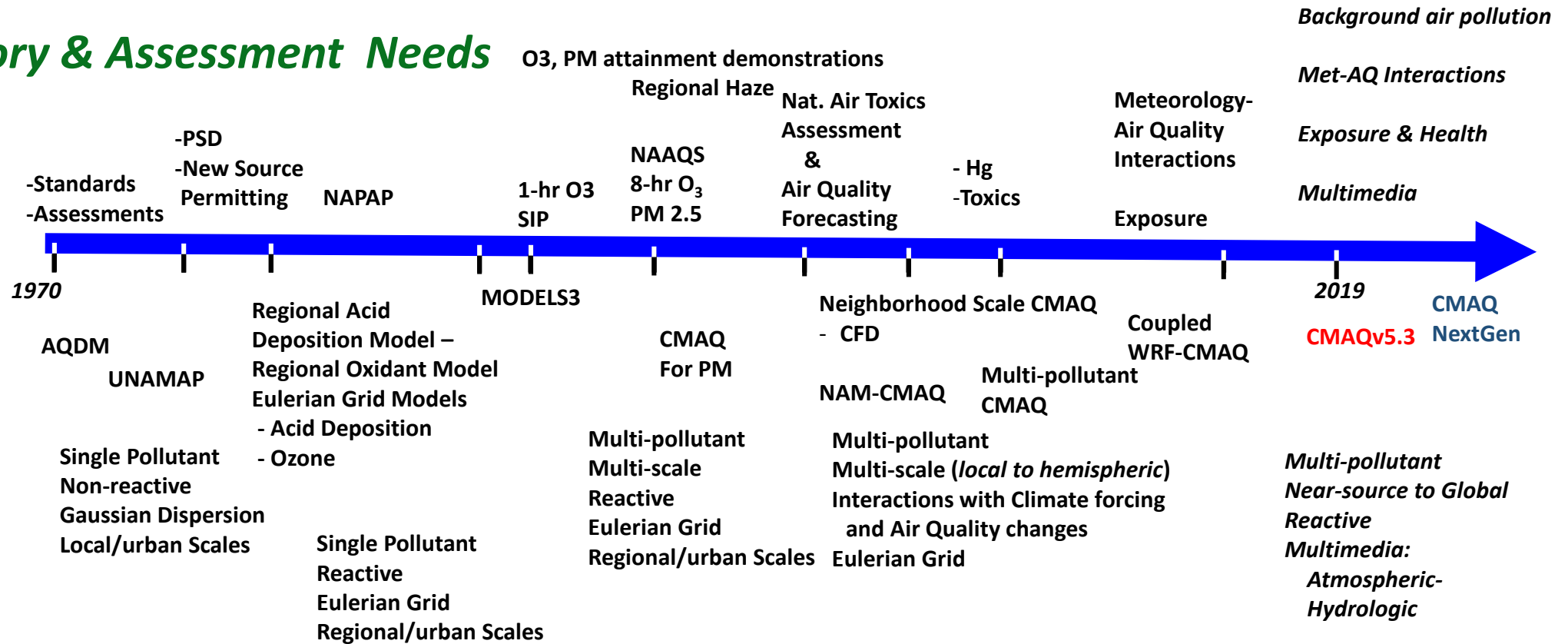
Christina Baghdikian
EPA ORD/CPHEA
Solutions-Driven
Research and
Communications

EPA's Air Quality Models

Vital for implementing the Clean Air Act

Evolution of models guided by increasingly complex application and assessment needs

Regulatory & Assessment Needs



Model Development & Applications