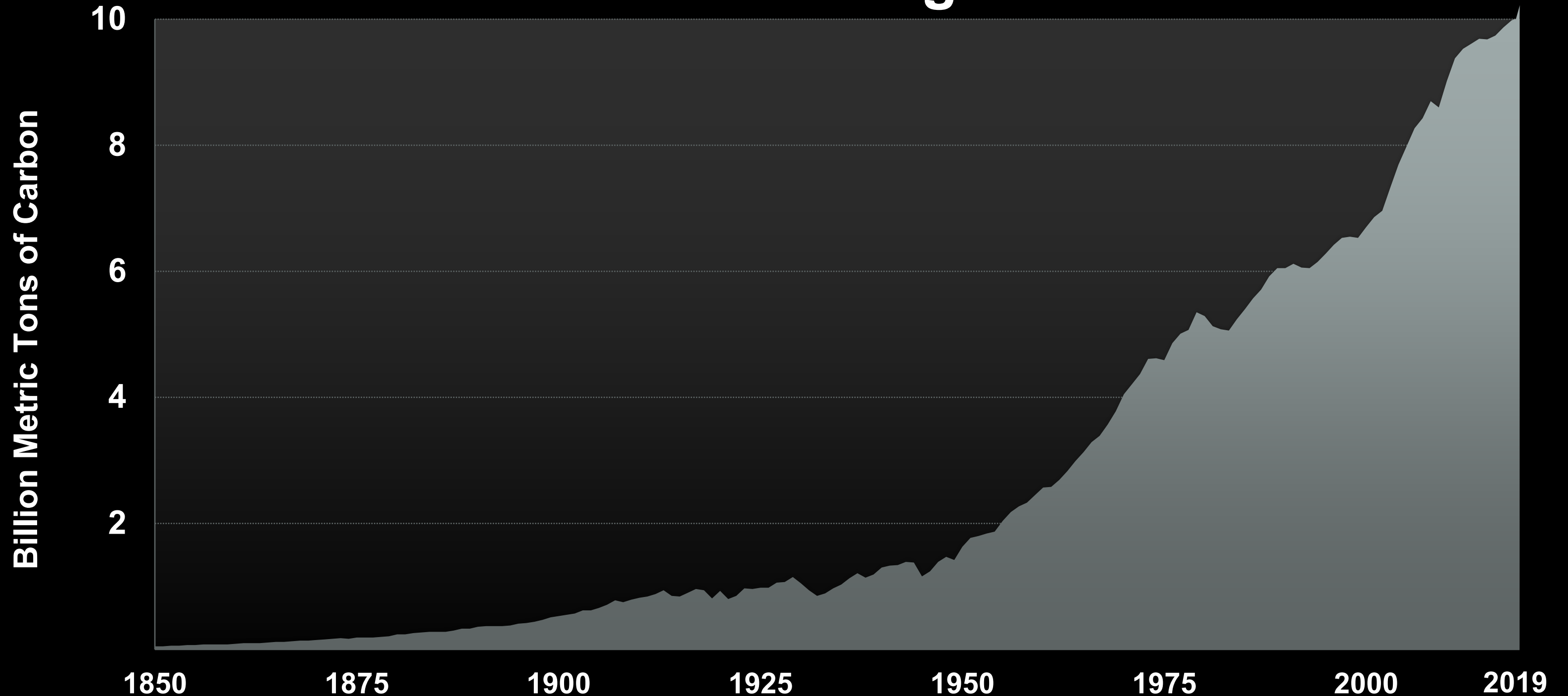




THE CLIMATE CRISIS AIR POLLUTION AND ITS SOLUTIONS

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University
Councilmember at Bay Area Air Quality
Management District

The Largest Source of Global Warming Pollution Is the Burning of Fossil Fuels



Source: U.S. Department of Energy/CDIAC

Changchun, Jilin Province, China

April 15, 2020

A study of 324 cities in China found a 15 – 22% increase in COVID-19 cases in areas with elevated levels of NO₂ and PM 2.5 particulate pollution.

PM_{2.5}: Tiny Particles, Deep Impact

Microscopic particle pollution known as PM_{2.5}, which is a prevalent component in wildfire smoke, is a growing cause for concern due its lingering health impacts at time when climate change is driving an increase in smoke from wildfires. New research is looking at possible links between wildfire smoke and Covid-19.

SIZE COMPARISON

Diameter in microns (µm)

Combustion particles,
organic compounds
2.5µm

Red blood cell
7µm

Dust, pollen, mold
10µm

Human hair
50-70µm

Fine beach
sand
90µm

90 microns (µm)

NEGATIVE HEALTH EFFECTS

Short-term effects
include eye, nose, throat
and lung irritation, runny
nose, coughing, sneezing,
shortness of breath

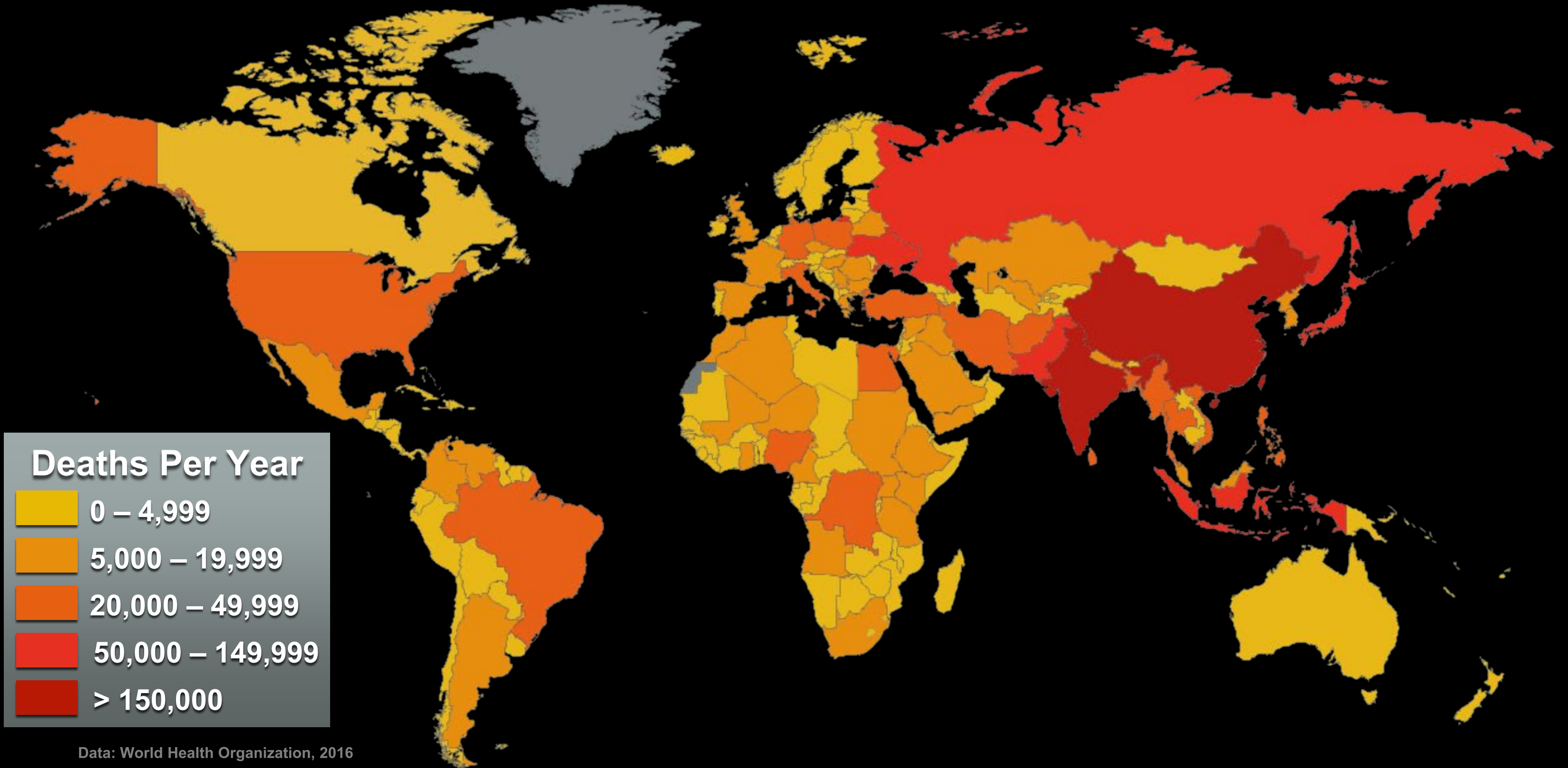
Long-term effects
include asthma, chronic
bronchitis and decreased
lung function, cardiovascular
damage, and increased
mortality in people with lung
and/or heart disease

■ *Children, the
elderly and people
with breathing and
heart problems may
be more sensitive
to PM_{2.5}.*

Health effects of air pollution



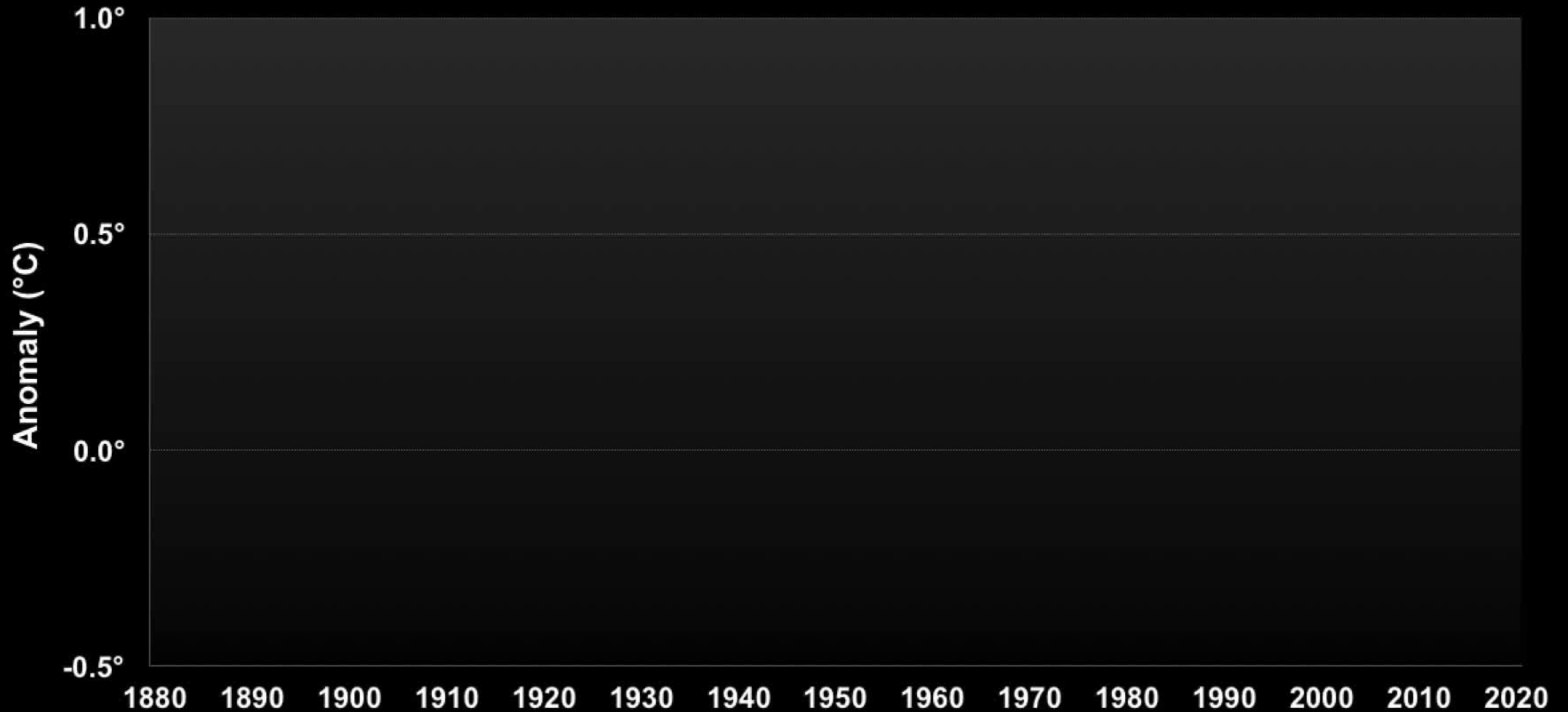
Deaths Attributable to Ambient Air Pollution



Data: World Health Organization, 2016

Global Surface Temperature – Departure from Average

1880 – 2016



Air Pollution at US – Mexico Border

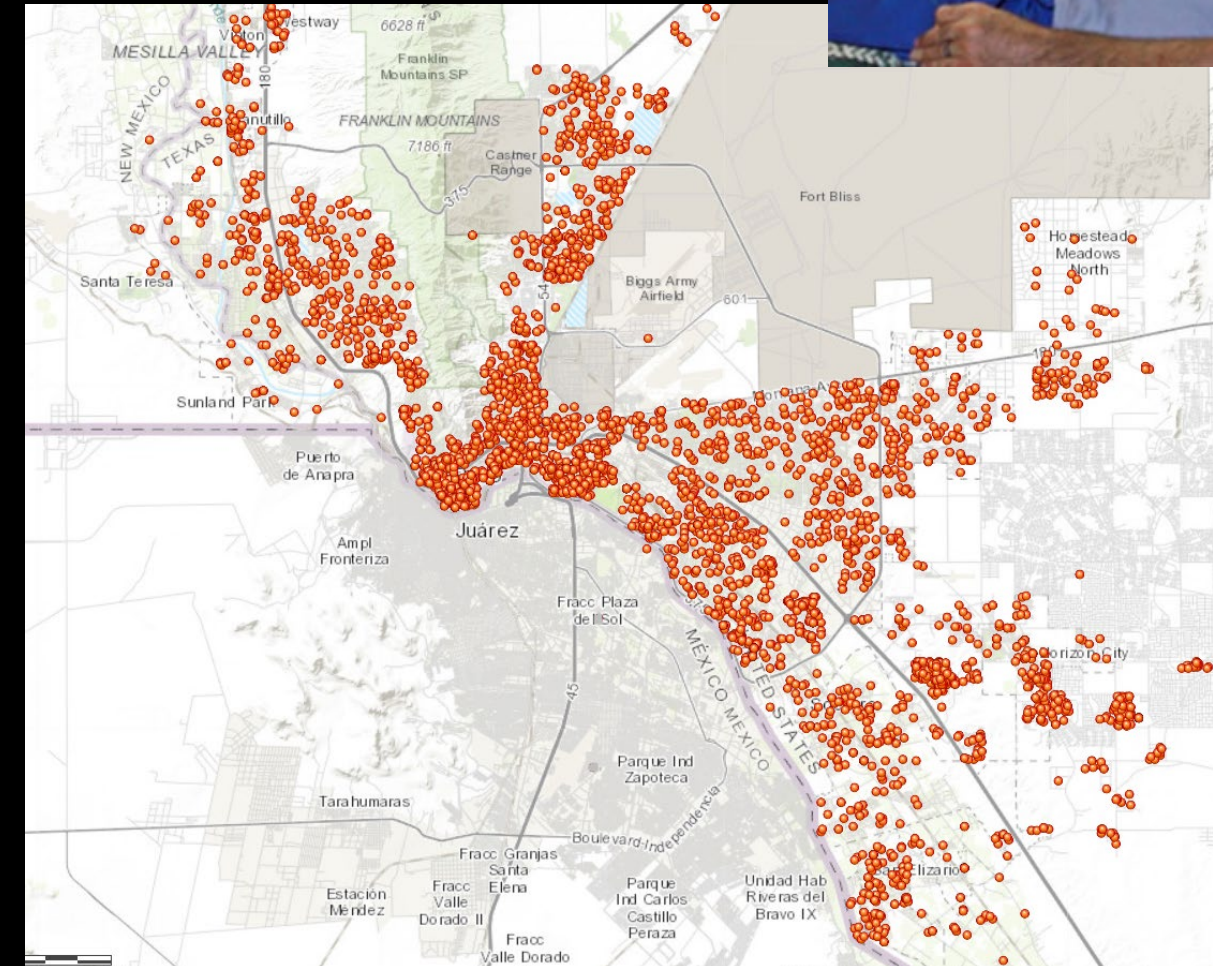


Evidence-based screenings

Study Period: 2014-2020

- About 5,000 of low-income residents in El Paso, TX region.
- Health measurements: respiratory and cardiovascular health outcomes

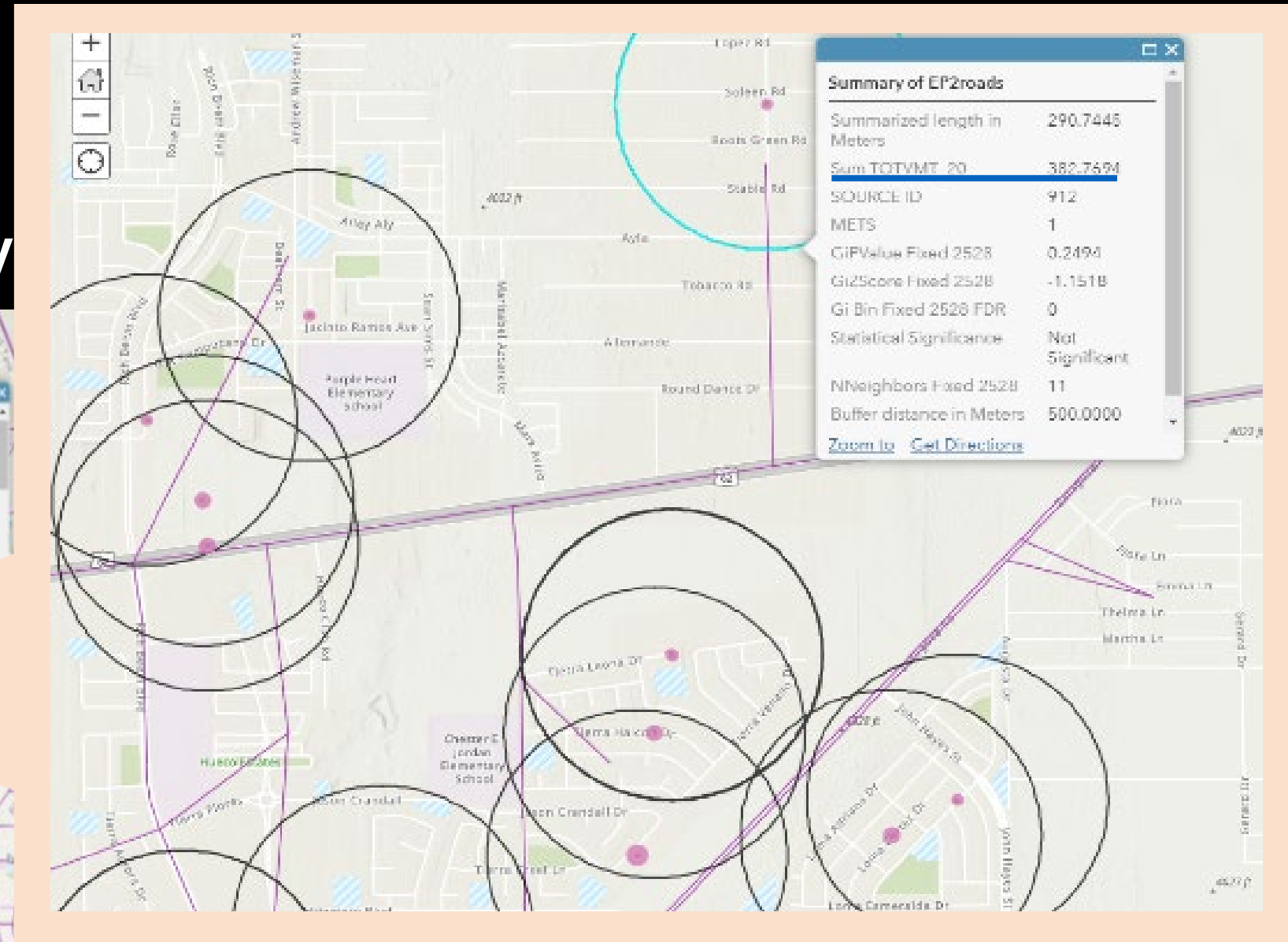
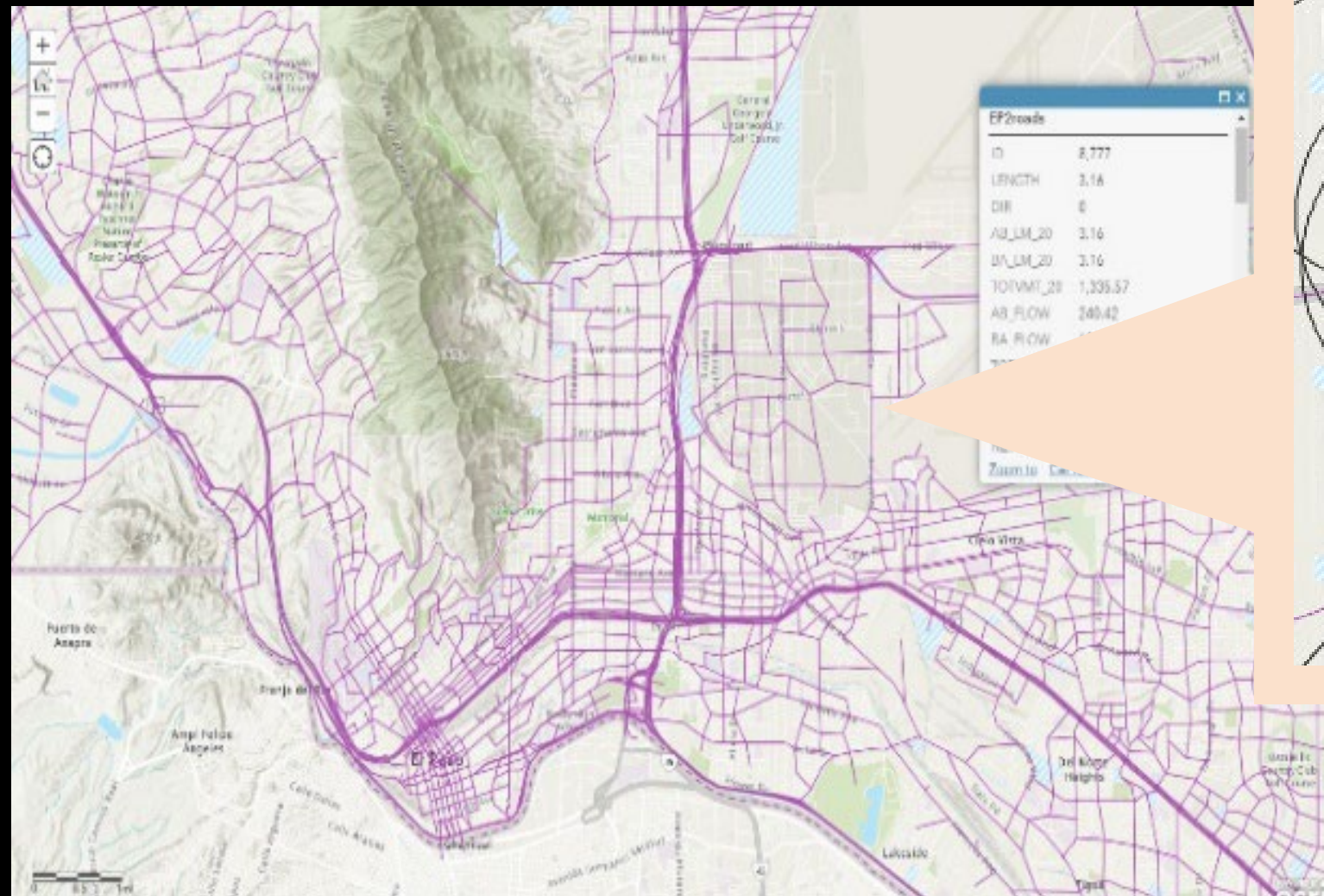
Residential addresses collected to assess long-term air pollution exposure.



Residential addresses of participants from El Paso, TX

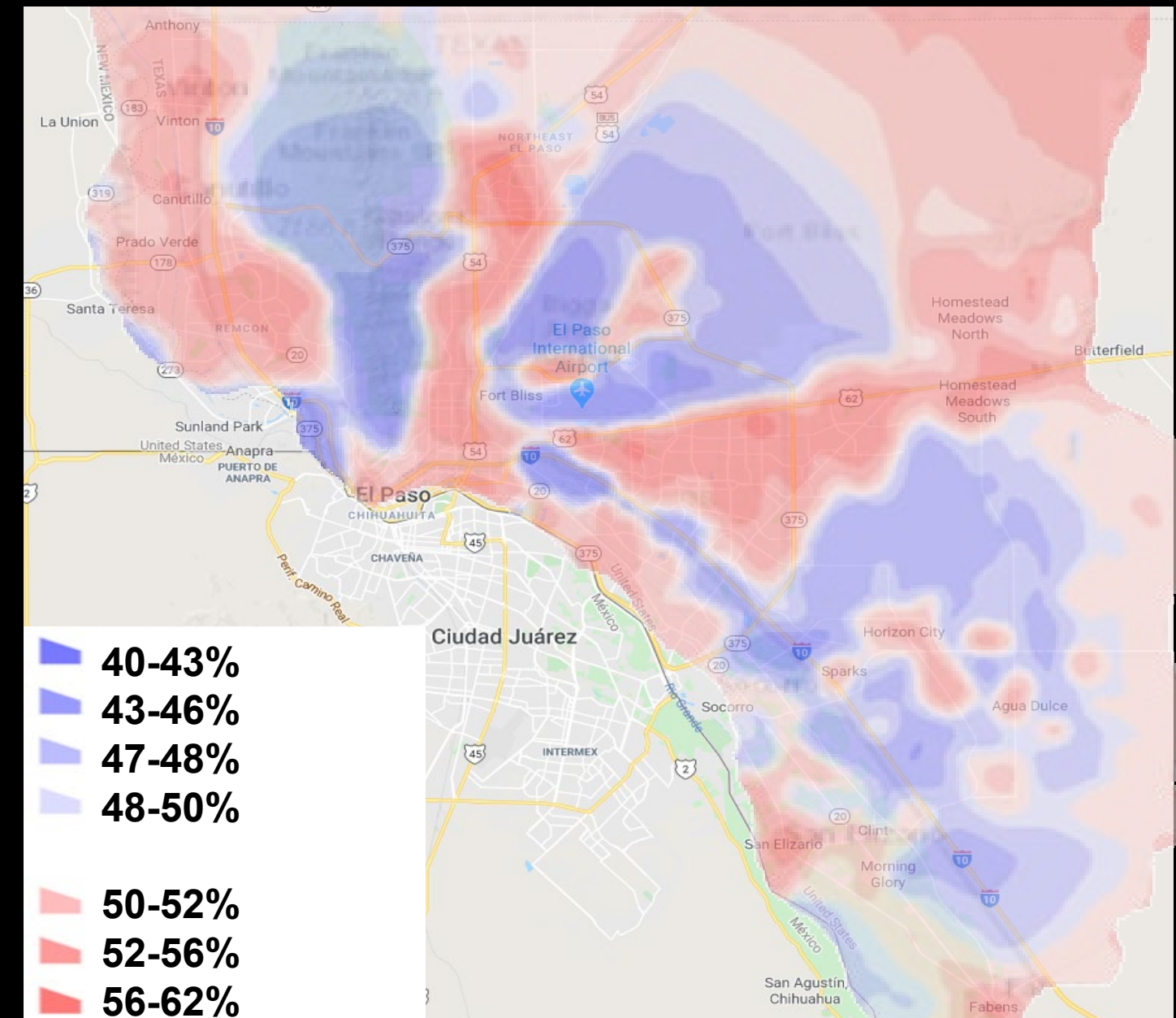
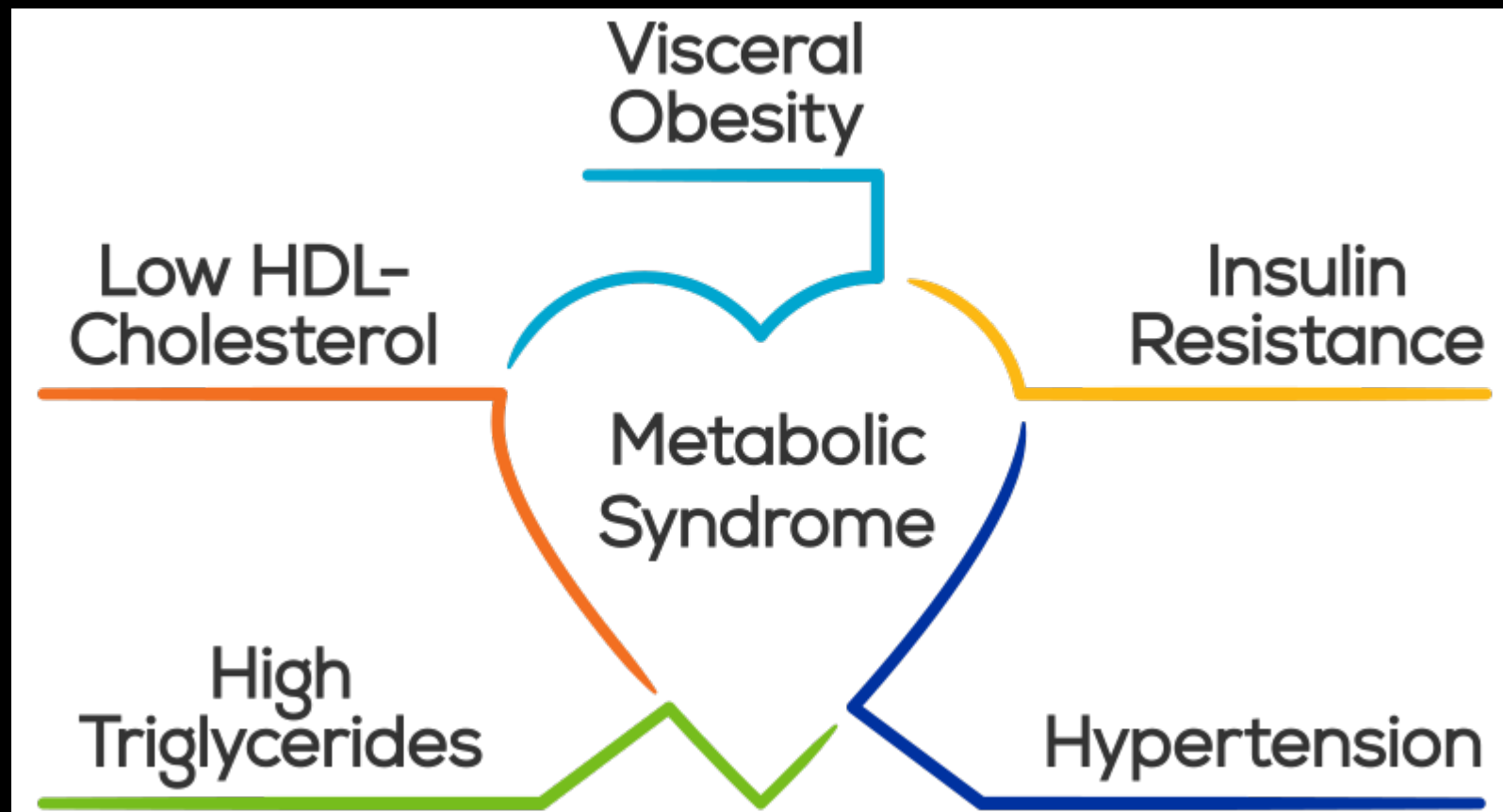
GIS Mapping: Traffic Volume

Traffic volume from MPO traffic lay



Vehicle miles traveled within 500m

Predicted Probability of Metabolic Syndrome



Map of predicted probability of metabolic syndrome based on the GIS model

Air Pollution and Physical Activity

The benefits of physical activity are essential for health

↓ Risk of cardiovascular disease

↓ Metabolic syndrome

Outdoor physical activity exposes people to air pollutants might lead to ↑ Cardiovascular or respiratory diseases

Health habits → young age

Emphasize physical activity with asthma patients

Air quality data at elementary school

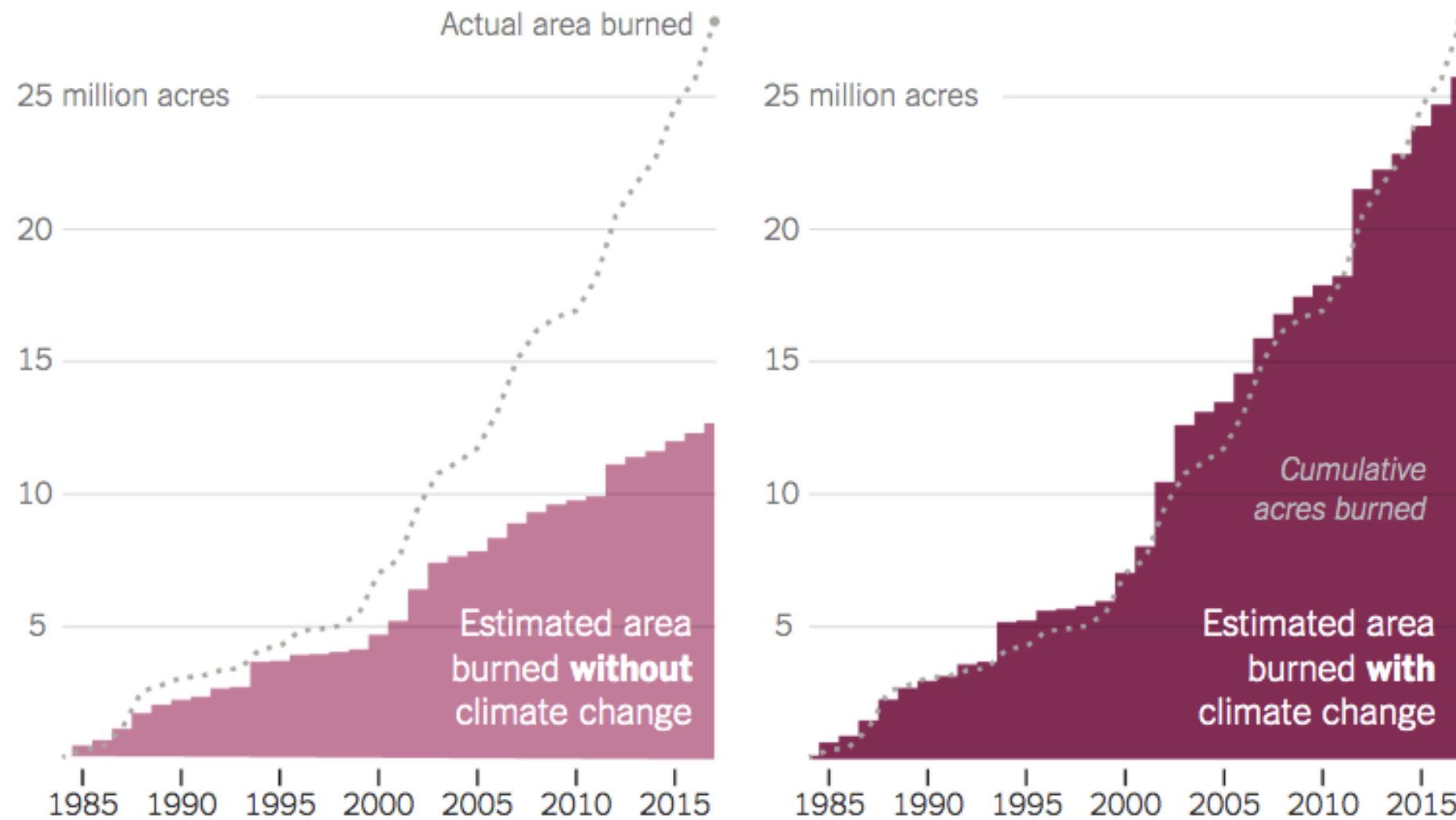
- $PM_{2.5}$, PM_{10} , NO_2 and ozone

Health measurements:

- 1 day/week, ages 6-12



Record Breaking Fires burn more acres in a world warmed by climate change



Source: Proceedings of the National Academy of Sciences; data updated through 2017 by A. Park Williams



PNAS October 18, 2016 113 (42) 11770-11775



Hotter Years Typically Have More Fires

45 Years of Western U.S. Fires and Temperatures

65.0

63.3

61.5

59.8

58.0

1970

1975

1980

1985

1990

1995

2000

2005

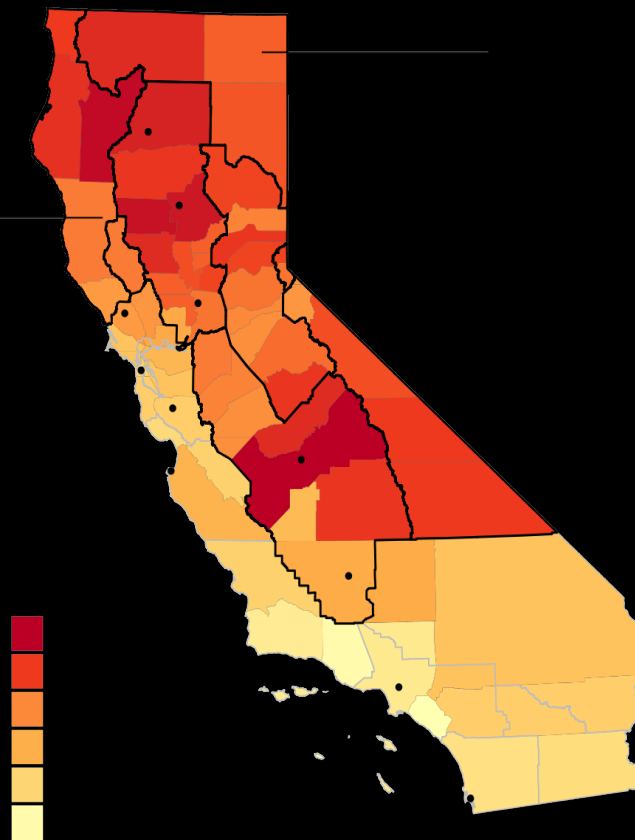
2010

2015

Typical Smoke exposure is equivalent to 15-20 cigarettes per day and now wildfire is ~50% residential/commercial



Most counties in CA have 60 days or more smoky days/yr due to WF



Even after 4-5 days of AQI 100-200, WFs are associated with
-40% increase in heart attacks
-20% increase in stroke
-50% increase in asthma
in certain ages

*there is no safe distance from WF smoke
10x more toxic than air pollution

Wildfires are spreading throughout the world and most are man-made—leads to worsening greenhouse gas emissions and climate change

Vacaville, California

August 19, 2020

More than 360 wildfires
were burning across
California.



San Francisco, California, US

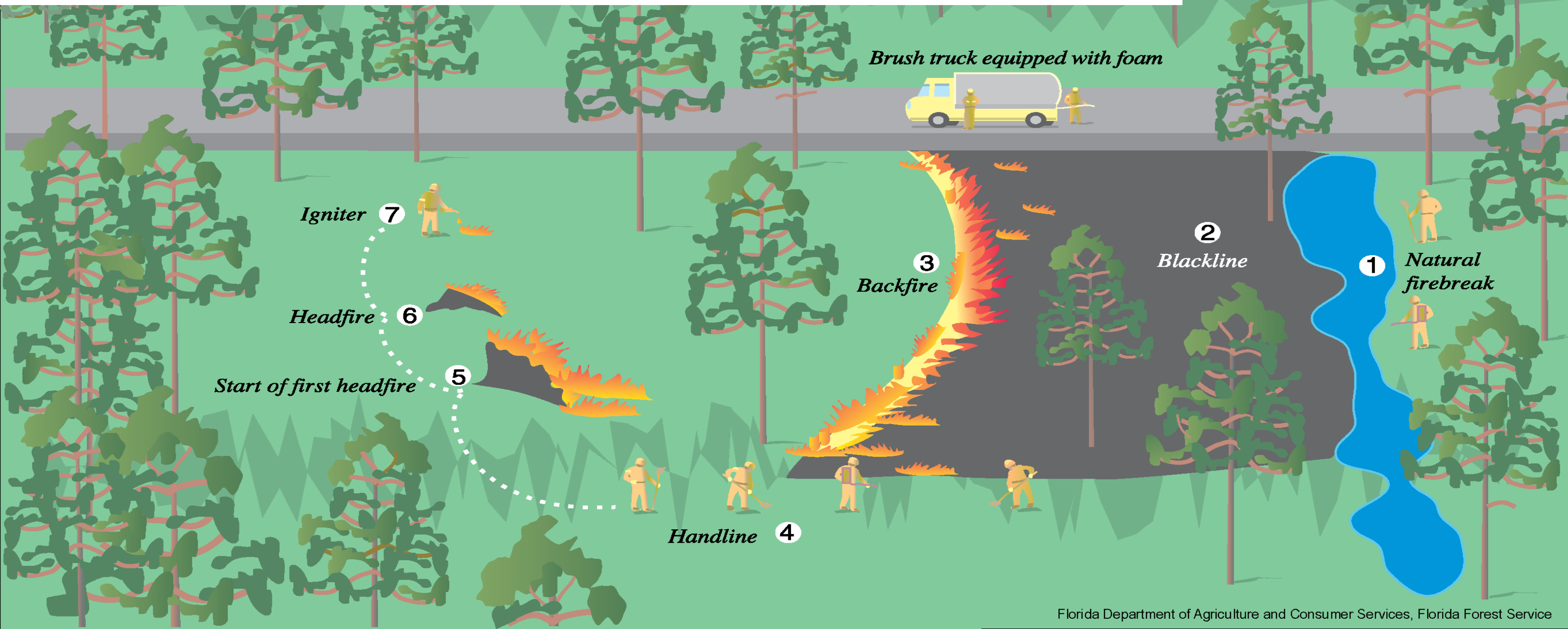
September 9, 2020



The Impact of Prescribed Fire versus Wildfire on the Immune and Cardiovascular Systems of Children

[Mary Prunicki,¹](#) [Rodd Kelsey,²](#) [Justin Lee,¹](#) [Xiaoying Zhou,¹](#) [Edward Smith,²](#) [Francois Haddad,¹](#) [Joseph Wu,¹](#) and [Kari Nadeau¹](#)

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RESEARCH

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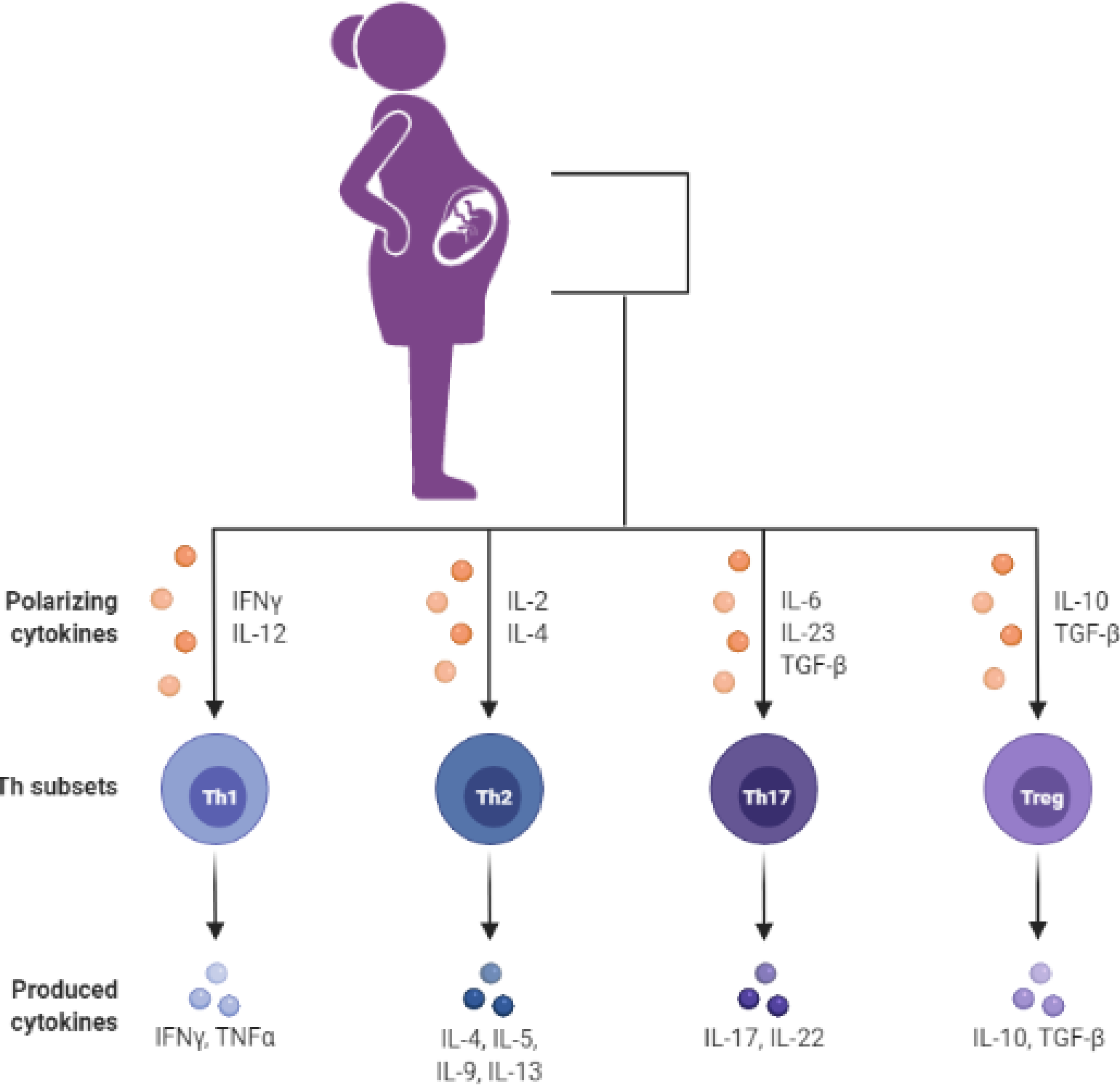
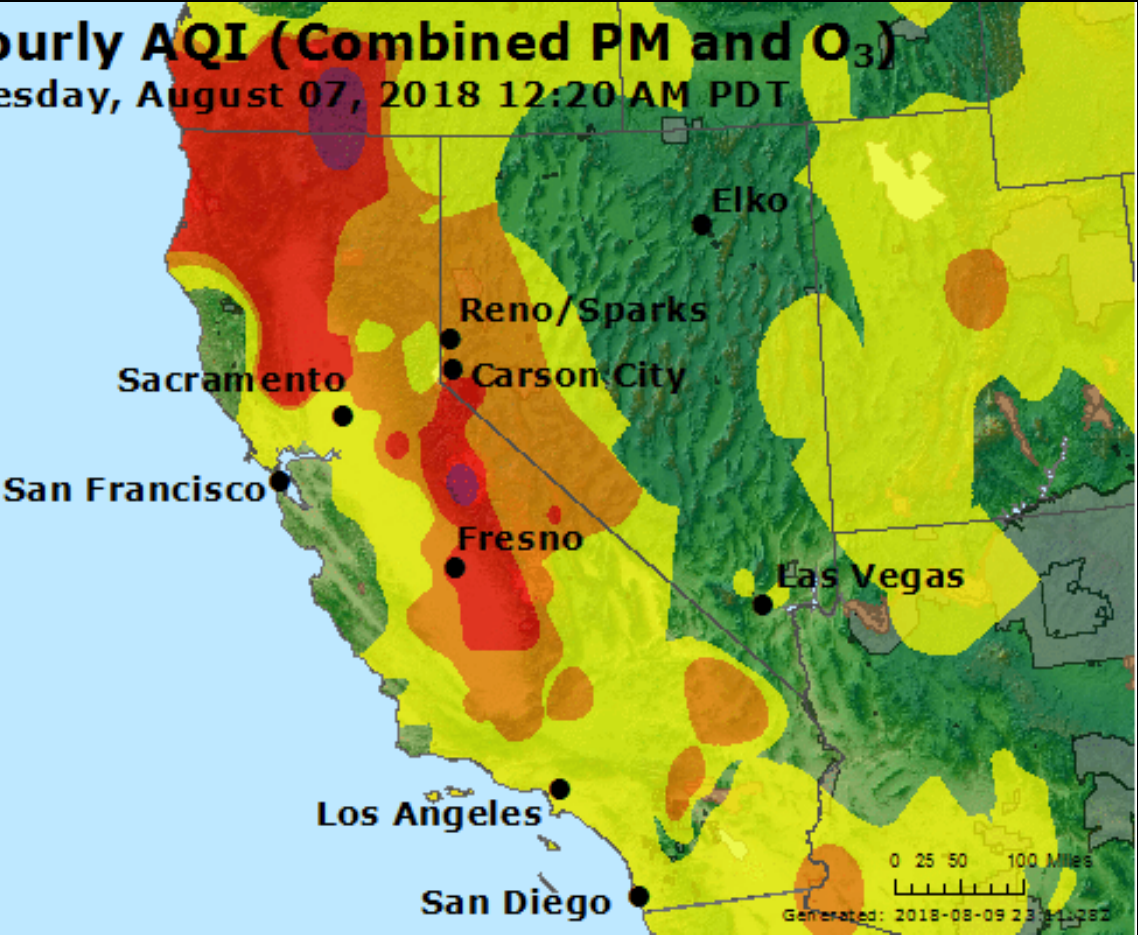


Increases in ambient air pollutants during pregnancy are linked to increases in methylation of IL4, IL10, and IFN γ

Juan Aguilera¹ , Xiaorui Han¹, Shu Cao¹, John Balmes^{2,3}, Fred Lurmann⁴, Tim Tyner^{5,6}, Liza Lutzker², Elizabeth Noth², S. Katharine Hammond², Vanitha Sampath¹, Trevor Burt⁷, P. J. Utz⁸, Purvesh Khatri⁹, Nima Aghaeepour¹⁰, Holden Maecker¹¹, Mary Prunicki¹ and Kari Nadeau^{1*}

Hourly AQI (Combined PM and O₃)

Tuesday, August 07, 2018 12:20 AM PDT



**“Climate Change
is a
Medical Emergency.”**



our world depends on it.