



Air Quality and Health Outcomes: What we Know, What to Do

Rohan Radhakrishna MD, MPH, MS
Chair – Family and Adult Medicine
Deputy Health Officer, Contra Costa County



Overview

- How are West Contra Costa County communities affected by air quality? Who's most affected?
- What are the environmental contributors?
- What more can we do?

HEALTH IMPACTS OF AIR POLLUTION

- ☁ Impaired lung growth in children
- ☁ Increased asthma, coughs and bronchitis
- ☁ Impairment of brain development in babies and small children
- ☁ Low birth weight and adverse birth outcomes
- ☁ Heart attack and stroke
- ☁ Upper respiratory track irritation and infection
- ☁ Worsening of existing health problems in people with chronic disease

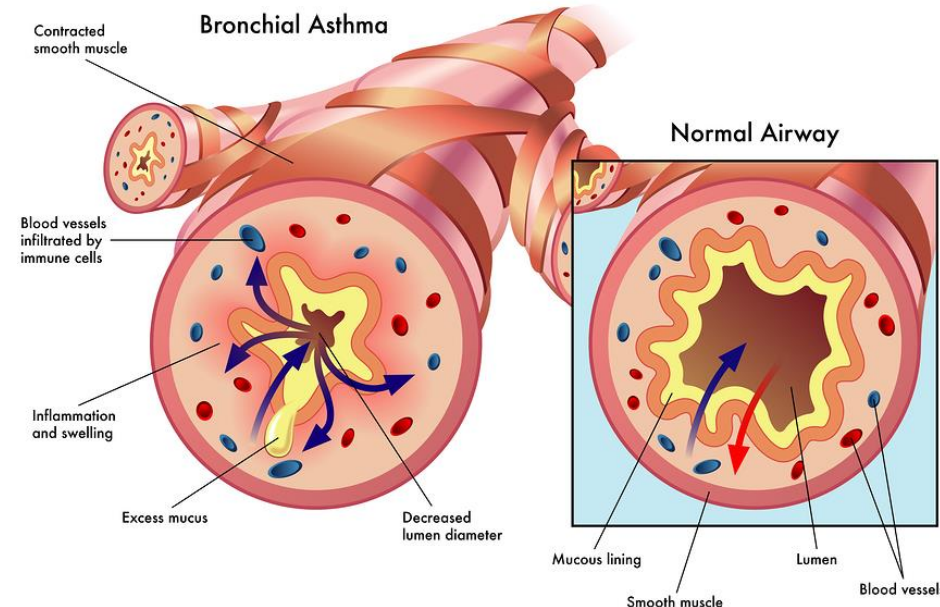
PEOPLE MOST SUSCEPTIBLE



Outdoor Air Pollution & Health

Particulate air pollution, including **smoking**, **wild fires** and **point source** or **motor vehicle exhaust**, lead to impairment of lung function, an effect that occurs in a few minutes.

1. Stressed Lung triggers the brain and heart raising blood pressure
2. Inflammation triggers vessel damage and clotting
3. Air Sac (alveoli) damage decreases lung function and increases risk of heart/lung disease and infections



Air Pollution & Adverse Birth Outcomes

1. Low Birth Weight
2. Pre-term Birth
3. Small for Gestational Age

Meta-analysis showed very mild effect size
(CO, NO₂, NO_x, O₃, PM_{2.5}, PM₁₀, or SO₂)

Still controversial

Outdoor Air Pollution and Asthma

- Proximity to roads with heavy traffic may contribute to:
 - New onset (in children and adults)
 - Exacerbation (in children and adults)
 - Increased risk of ED visits and hospitalizations due to asthma (in children)
 - Black carbon (particulates), organic compounds and heavy metals from traffic pollution all contribute to asthma risk and severity

Sources: Salam, 2008. Lin, 2002. McConnell, 2010. Guamieri, 2014. Jerrett, 2008. Nishimura, 2013. Wilhelm, 2008. Rusconi, 2010. Shamasunder, 2018, Patel, 2009.



Outdoor Air Pollution and Asthma

- Proximity to point sources of pollution may contribute to asthma severity:
 - Risk of asthma attack is associated with residing near a grain mill (odds ratio (OR) = 1.35), petroleum refinery (OR = 1.44), asphalt plant (OR = 1.23), or power plant (OR = 1.28) (all p's < 0.05).
 - Residence near major air emissions sources (>100 tons/year) increased asthma attack risk by 108% (p < 0.05).




Resources

Cal Enviro-Screen

CDPH CCB: CA Community Burden

Healthy Places Index



Welcome to the Preview Version of the CCB!

SEE CCB DATA IN ACTION, in the new 'Measuring Health Status in California'

NEWS AND UPDATES


Report 'bugs' HERE!

Share your feedback HERE!


The California Community Burden of Disease Engine (CCB) is a tool to explore data on burden of disease in multiple levels of geographic granularity.

The CCB currently displays over 15 years of California condition-specific mortality burden data, using a range of measures displayed at the statewide, county,


California Community Burden of Disease and Cost Engine (CCB):
An emerging toolset for epidemiologic analysis and scientific insight, exploring the intersection between health disparities and place




INTERACTIVE MAP




STATIC MAP




TRENDS




SOCIAL DETERMINANTS



RANK BY GEOGRAPHY



DATA TABLE



RANK BY CAUSE

< Back **Clean Air - Diesel PM** ✕

What is the connection to health?

Everyone should be able to live in neighborhoods where it is safe to breathe. Since diesel particulate matter is so small, it can reach deep into people's lungs, increasing the risk of cardiovascular and respiratory diseases, poor birth outcomes, and premature death.

Policy actions to address this indicator

Reduce Pollution

- [Low-Emission Vehicles and Freight](#)
- [Reduce Emissions from Other Sources](#)

Protect Residents from Pollution

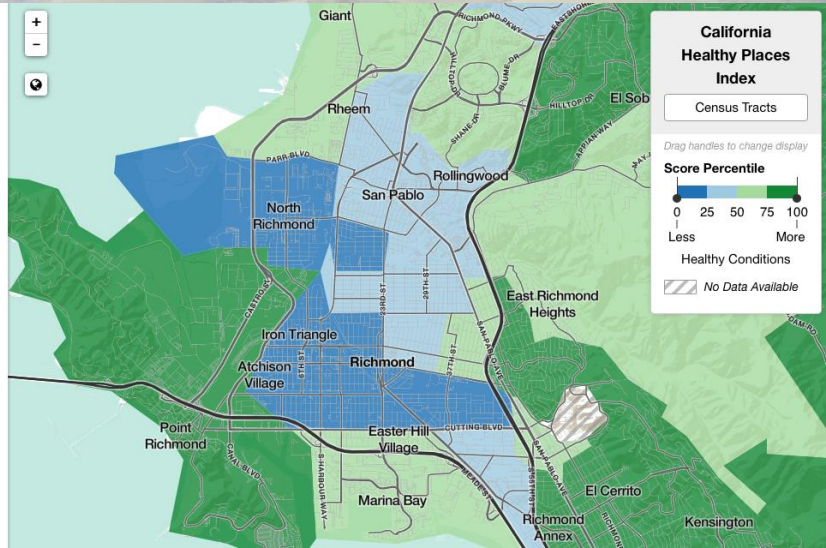
- [Separate People and Pollution](#)
- [Reduce Exposure to Pollution](#)
- [Build Community Power and Connection](#)

More information about this indicator

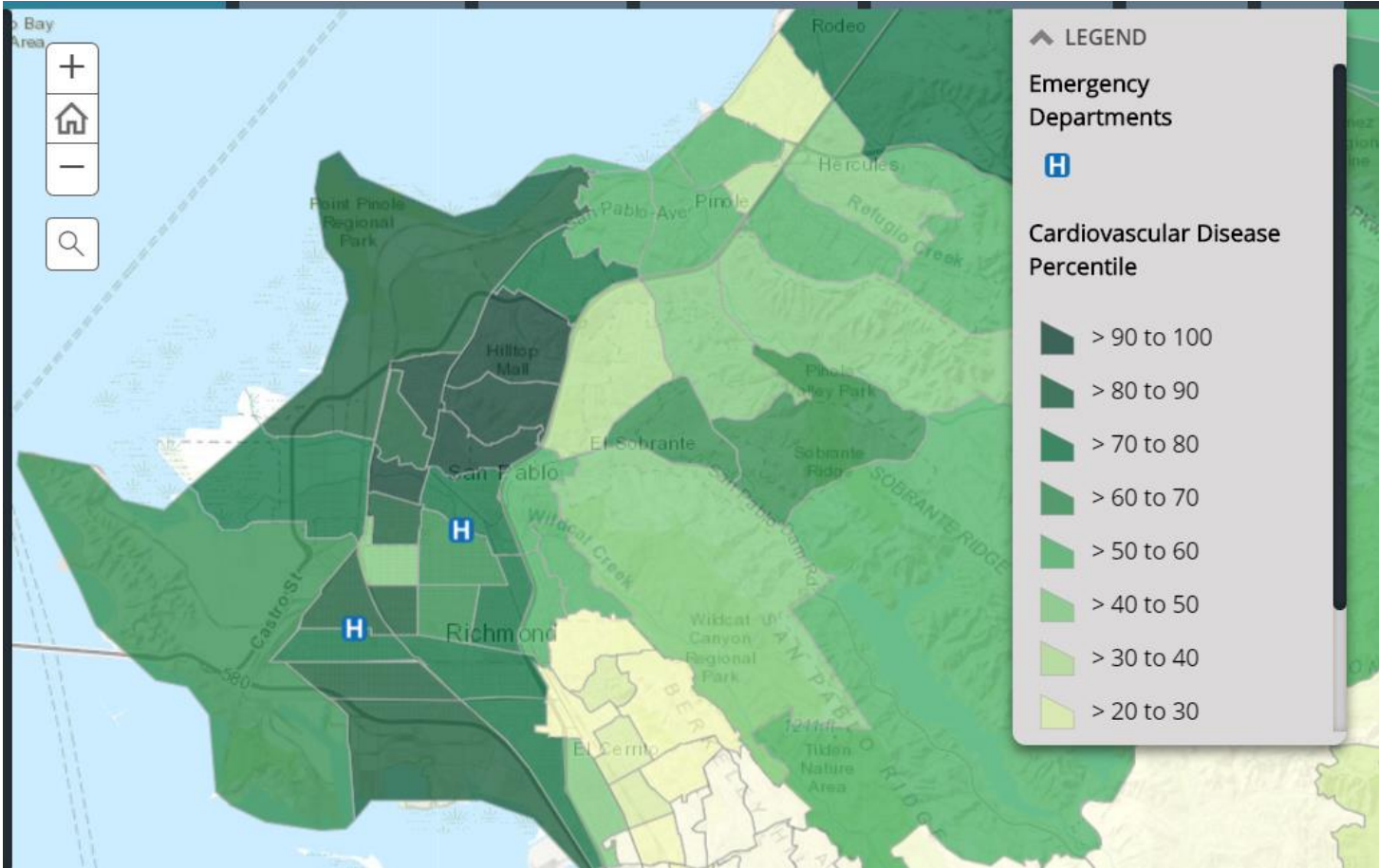
Technical definition: Spatial distribution of gridded diesel PM emissions from on-road and non-road sources for a 2012 summer day in July (kg/day)

Data source: CalEnviroScreen 3.0

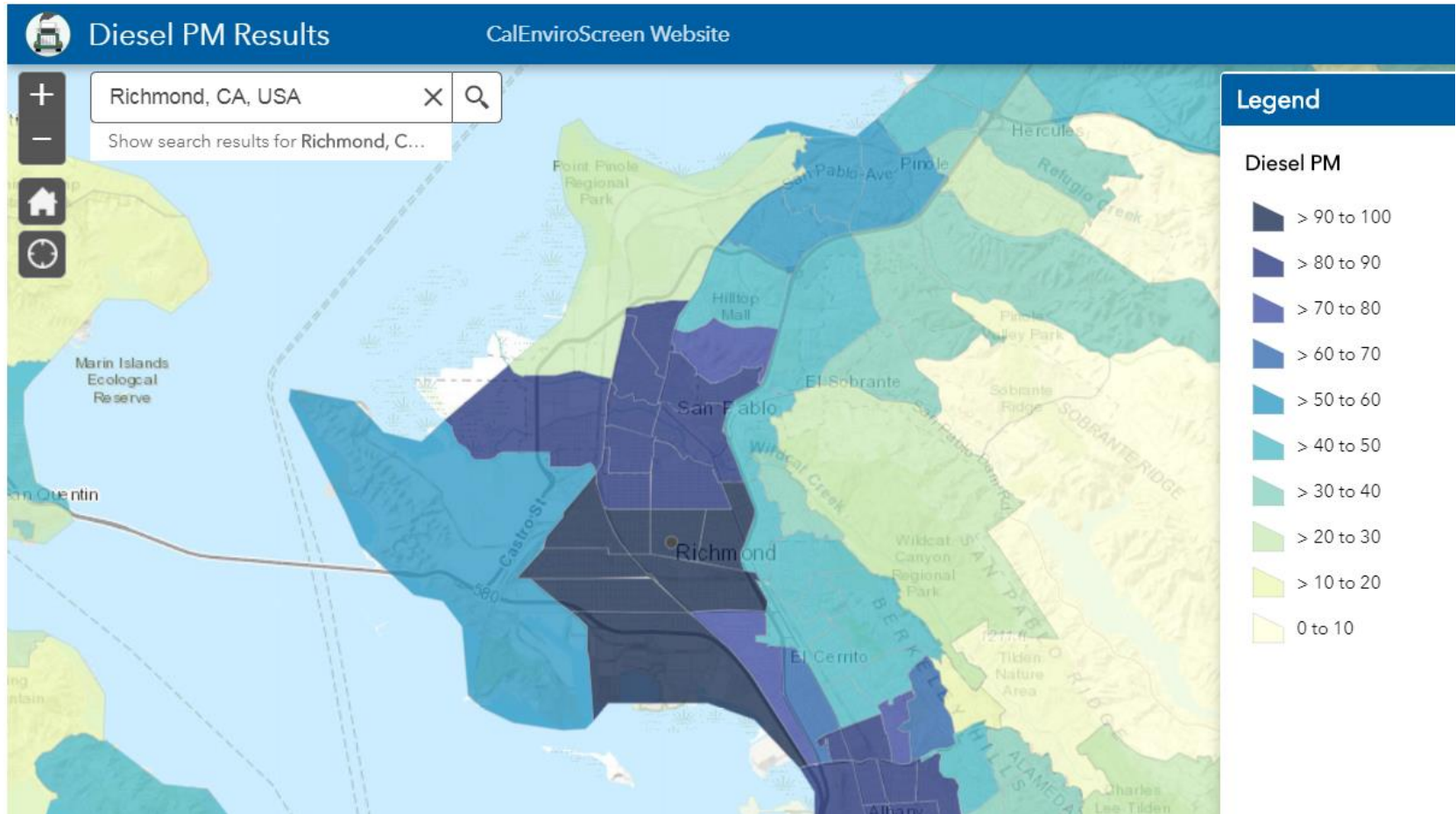
Year: 2017



Emergency Department Visit Rate Myocardial Infarction (2011-2013)

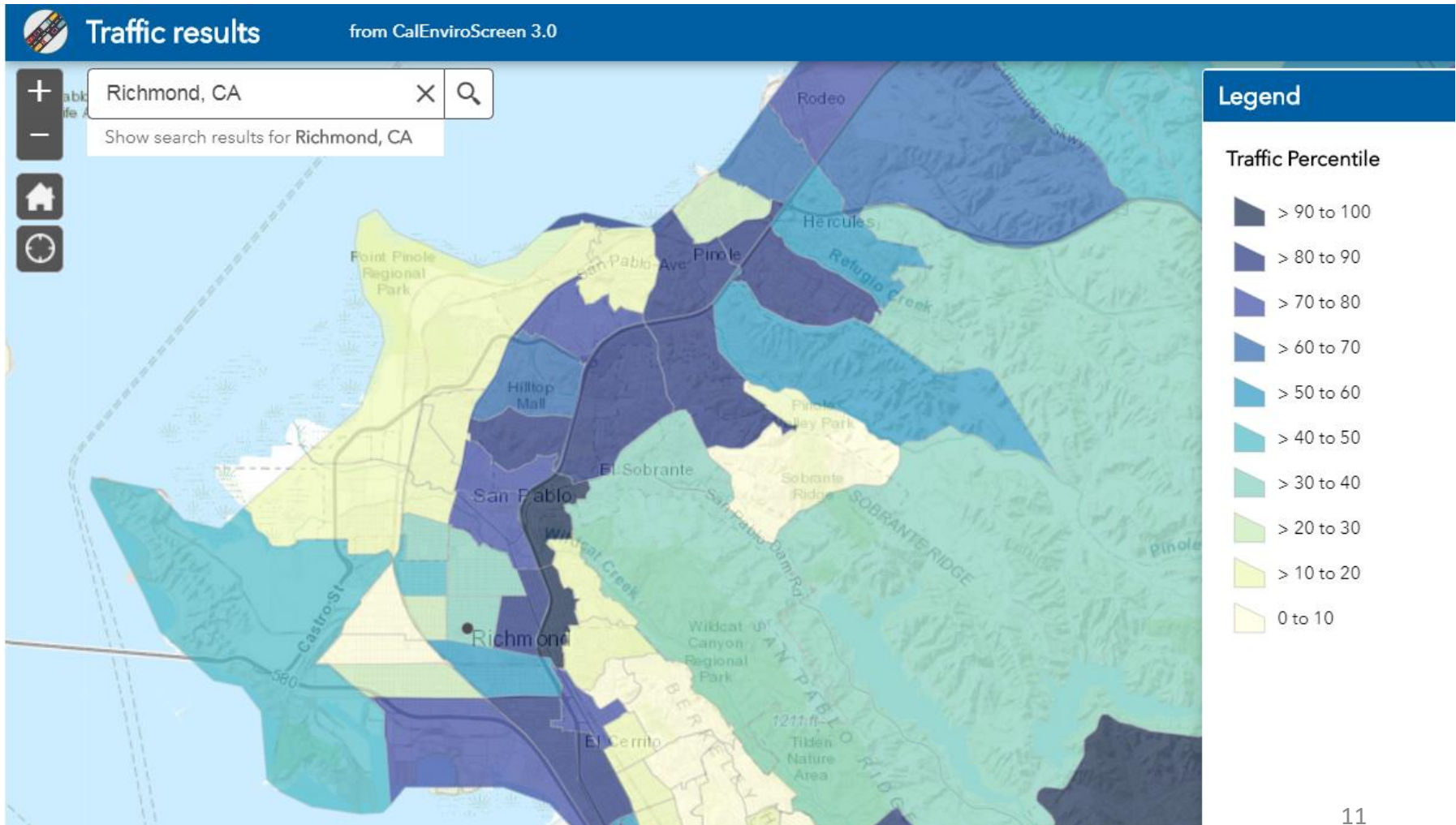


Diesel Particulate Matter Richmond Region Percentile

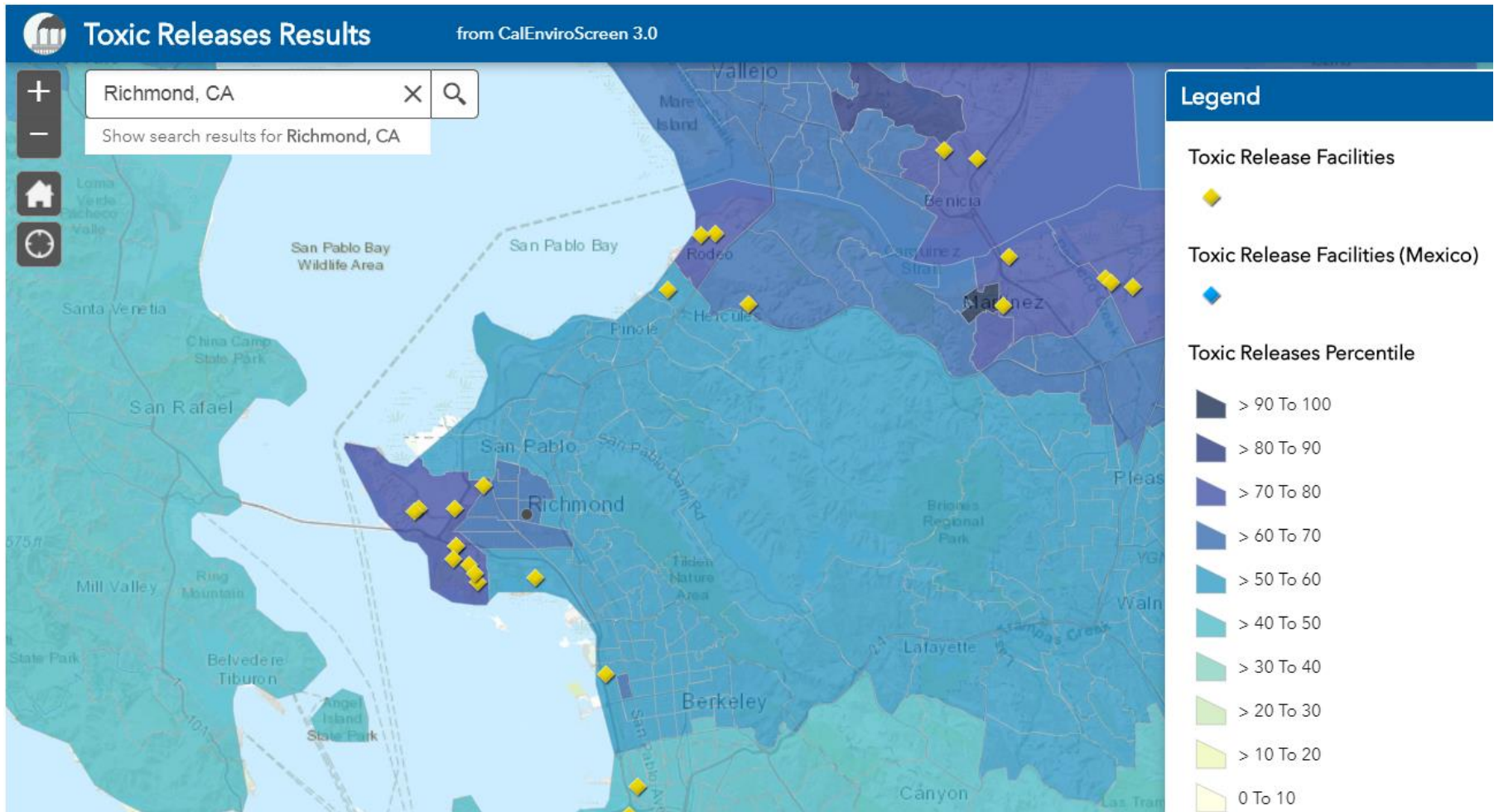


Traffic Results

Richmond Region Percentile



Toxic Releases Results Richmond Region Percentile



Ozone Pollution has worsened in recent years

High Ozone Days

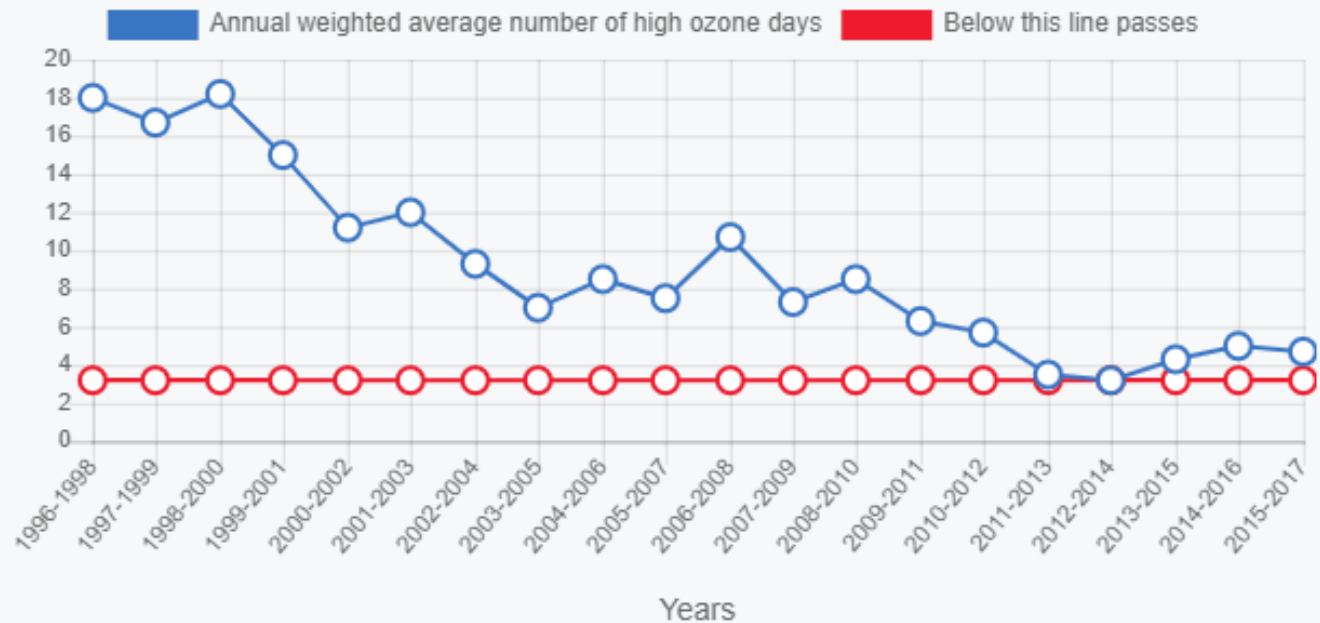
[Learn More](#)

Ozone Grade: F

[How is my grade calculated?](#)

Weighted Average 4.7

Contra Costa



Particulate Pollution has worsened in recent years

Particle Pollution - 24 Hour

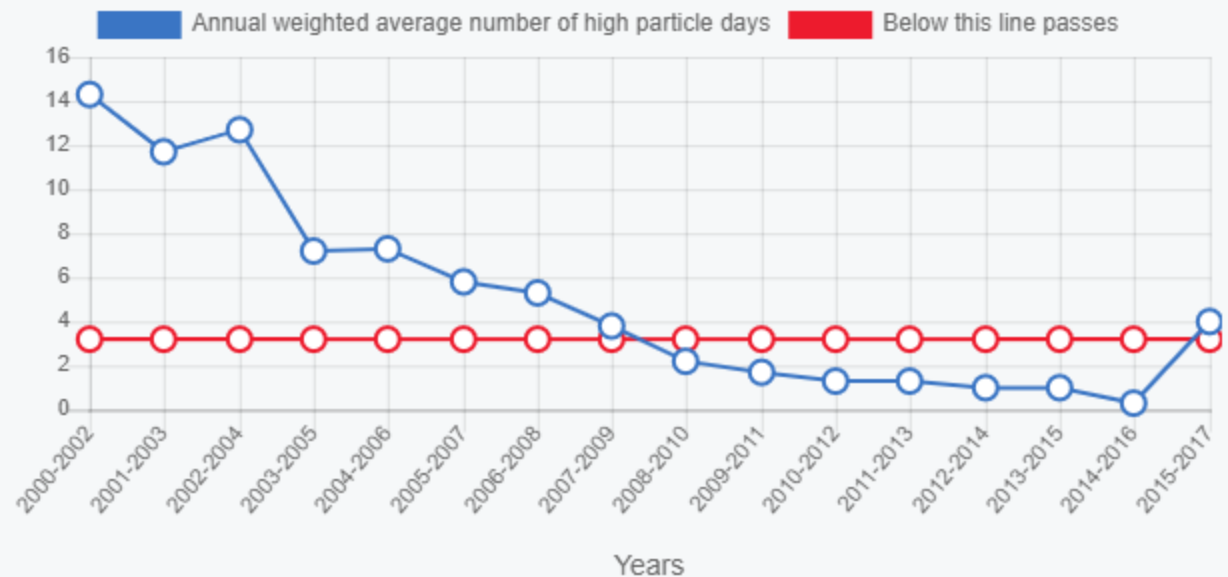
[Learn More](#)

Grade: F

[How is my grade calculated?](#)

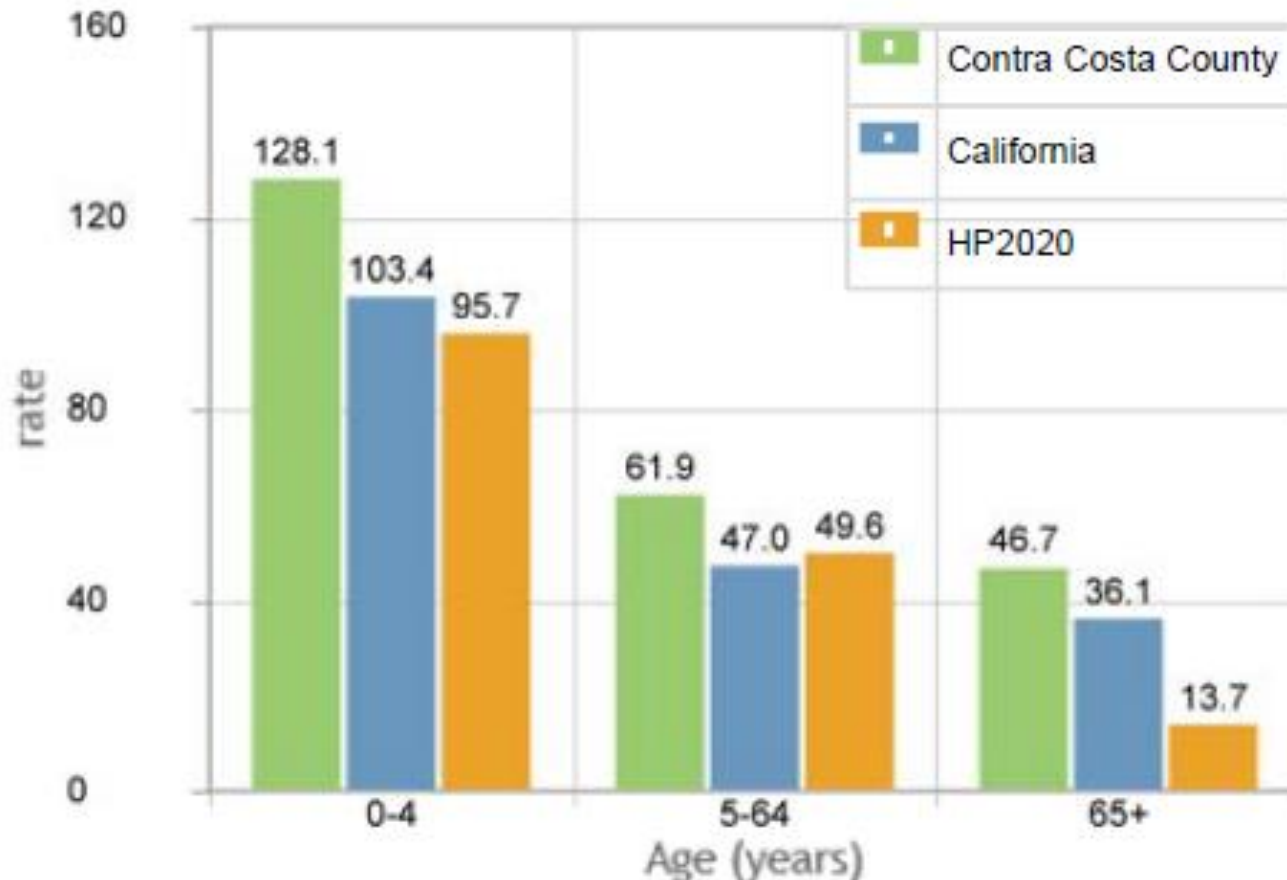
Weighted Average: 4.0

Contra Costa



Asthma Severity is above the Healthy Person 2020 target levels

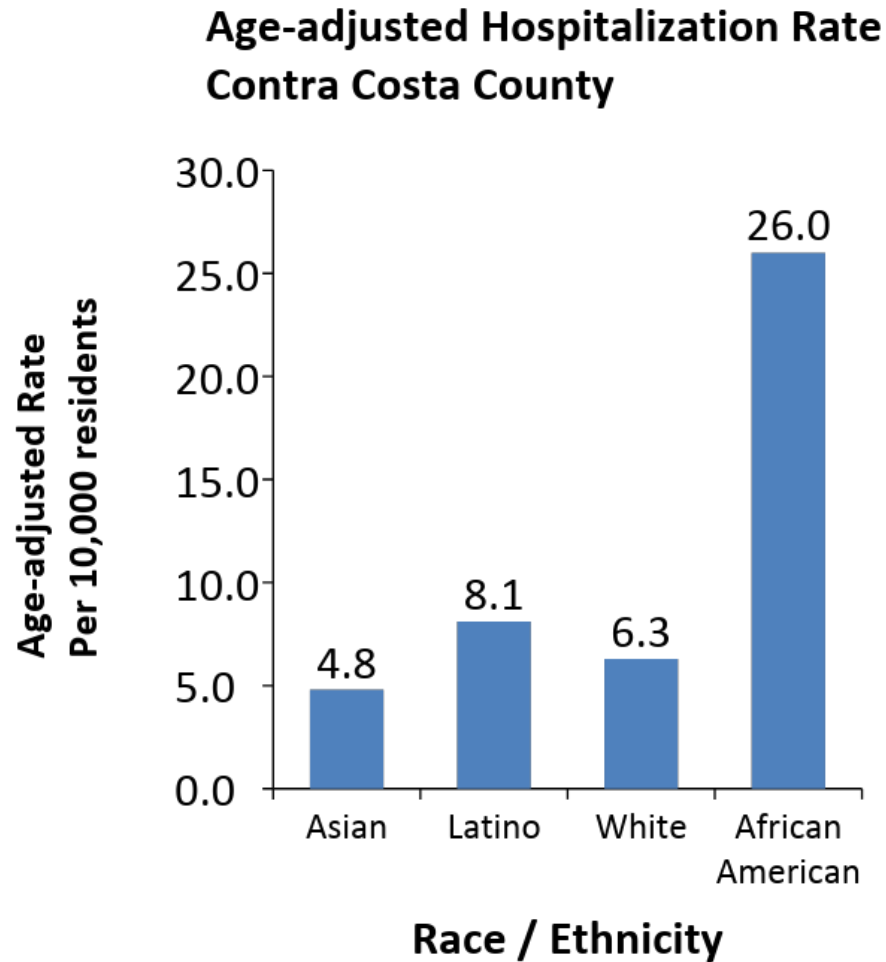
Asthma ED Visits per 10,000 Residents by Age Compared to California and HP2020 Targets, 2014



Source: California Healthy Breathing; Office of Statewide Health Planning and Development

Asthma hospitalizations are more frequent among African-Americans

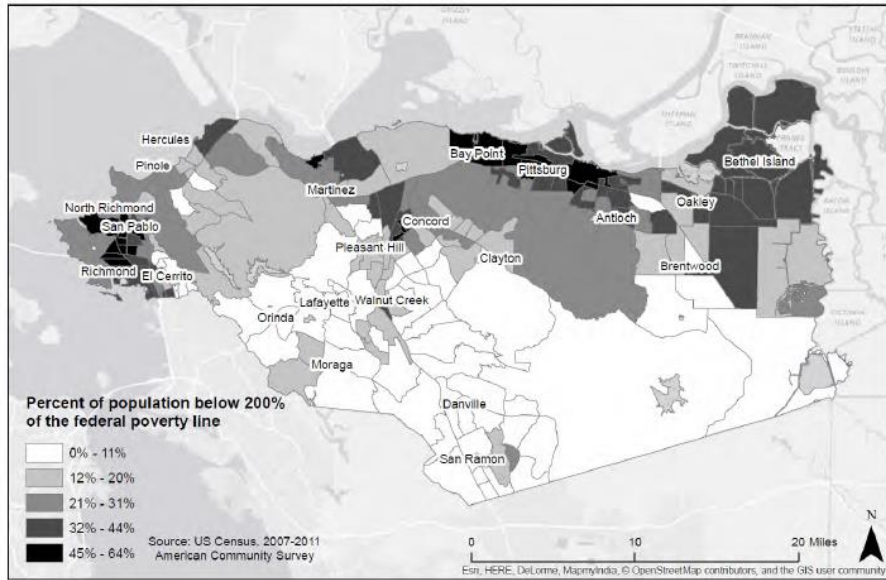
Asthma Hospitalizations by Race/Ethnicity, 2014



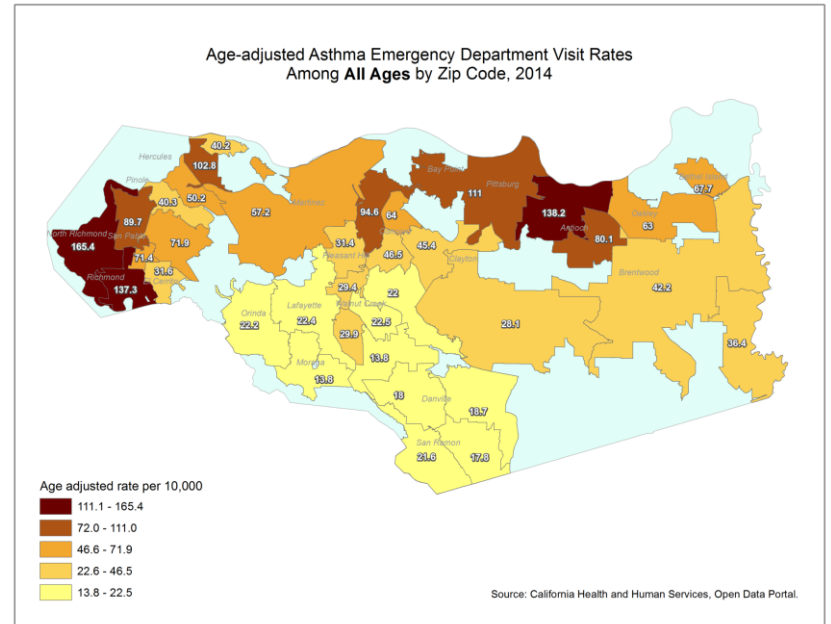
Asthma Disproportionately Affects the Poor

Percentage of Population Below 200% of the Federal Poverty Level, 2007-2011

Figure 10: Percentage Of Population Below 200% Of The Federal Poverty Level, 2007-2011



Age-adjusted Asthma Emergency Department Visit Rates Among **Children** by Zip Code, 2014



Contra Costa Public Health, EPE, October 2018

Air Quality Affects Health
Air Quality is Worsening
Health Outcomes are Worse in CCC
and even worse in West CCC

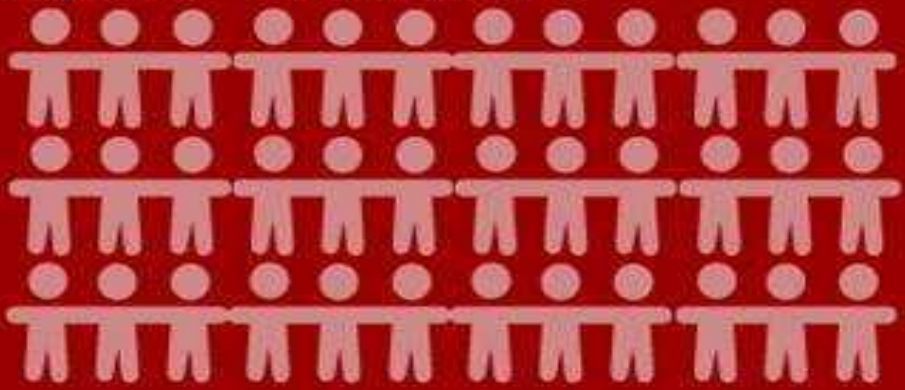
Is there hope?

Cleaner Air = Healthier Lungs

USC Researchers find less pollution in LA area is associated with better lung function in children

USC CHILDREN'S HEALTH STUDY

2,120 Children



5 SoCal Communities



WHAT WAS MEASURED ?

Lung function



3 groups of kids were tested from 11-15 years of age.
Group 1 was tested: 1994-1998
Group 2 was tested: 1997-2001
Group 3 was tested: 2007-2011

Pollution

Pollution levels across So Cal have been measured for a period spanning 20 years starting in 1994.



Particles: Coarse (PM10), Fine (PM 2.5)
Gases: Nitrogen Dioxide (NO2), Ozone (O3)

The major findings of the study were:

- Lung function deficits associated with **nitrogen dioxide, atmospheric acidity, PM 2.5 and PM10**.
- Children living in high ozone communities, who are especially active, are up to **three times** more likely to develop asthma.
- Children living near roadways with high **traffic** have an increased risk for asthma diagnosis.
- Short-Term exposures to elevated ozone levels associated with increase (up to 1.3 million per year) in **school absences** from respiratory illnesses and asthma attacks.
- Children who move to cleaner communities have improvements in lung function growth rates. This means that **even small reductions in air pollution can have immediate benefits** to the long-term respiratory health of children living in polluted communities.

POLLUTION DOWN, LUNG HEALTH UP

Air quality in the Los Angeles basin, as measured in five cities by USC researchers, improved over two decades. That provided a more healthful environment for children's growing lungs.

AIR POLLUTION

Nitrogen
dioxide

Fine
particles



33%



47%

CHILDREN'S LUNGS

In 1998, nearly eight of 100 15-year-olds had significant lung deficits.



By 2011, only about 3 1/2 of 100 15-year-olds had significant lung deficits.



Indoor Air Quality and Asthma



Inadequate ventilation, which increases exposure to indoor and outdoor air pollution and increases moisture and mold, is associated with an increased risk of respiratory symptoms, cardiovascular disease, and cancer;⁷



Improper heating and cooling combine with temperature extremes from climate change that can exacerbate illnesses or cause death;⁹



Indoor moisture and mold contribute to respiratory diseases, such as asthma;⁶



Pests, such as cockroaches and rodents, are connected to a range of communicable and respiratory diseases;⁸



Stress from unhealthy housing conditions can have mental health impacts, including depression.¹⁰



Community messaging during unhealthy air days (wildfire smoke, ozone, etc.)

AIR QUALITY IN THE BAY AREA IS UNHEALTHY FOR PEOPLE WITH RESPIRATORY CONDITIONS

- People with pre-existing respiratory illnesses like asthma should reduce outdoor activities
- Everyone, especially children, should reduce physical exertion



For current air quality in your area visit airnow.gov or sparetheair.org

Developing a robust wildfire smoke emergency response plan

Identify, support and promote “Cleaner Air Centers” as daytime respite locations for homeless and those with poor indoor air quality

Develop robust messaging aligned with messaging from state and regional agencies

Develop automated text messaging to send to asthma patients during smoke events



Additional Actions:

- CCHP Home Visiting Nurse Pilot
- Green and Healthy Homes Initiative - weatherization
- Board of Supervisors Ad Hoc Committee on Childhood Asthma
 - Bring stakeholders together to develop overall strategy
- Children's Leadership Council
 - Kickoff meeting March 27, 2019
- Support a state wellness fund for chronic disease prevention
 - Possibly funded by a sugar sweetened beverage tax
- Build healthy living into the county general plan revision
 - Bike lanes, parks, public transportation
 - Reduce point sources of pollution (i.e. industry)
 - Reduce mobile sources of pollution (diesel, gasoline vehicles)
- Address the affordable housing crisis
 - Help homeless become housed
 - Help those in substandard housing move to better, healthier housing

Causation can be hard to pinpoint
Correlation is strong enough to mitigate air
pollution for better human health

