



## THE ENVIRONMENTAL HEALTH DISPARITIES (EHD) MAP / EPA'S BENMAP

EMBEDDING ENVIRONMENTAL JUSTICE INTO WASHINGTON STATE GOVERNMENT

# Speakers



**Jeffery Bryant, PhD**  
**(he/they)**

*Supervising Spatial Epidemiologist  
Washington State  
Department of Health  
Jeffery.Bryant@doh.wa.gov*



**Rad Cunningham, MPH, MPA**  
**(he/him)**

*Epidemiologist/Section manager  
Washington State  
Department of Health  
Rad.Cunningham@doh.wa.gov*

# Partners



# The Indicators

---

## Environmental exposures

Diesel emissions

Ozone

Particulate matter 2.5 (PM2.5)

Toxic releases from facilities

Proximity to Heavy Traffic Roadways

## Environmental effects

Lead risk and exposure

Proximity to hazardous waste generators and facilities

Proximity to Superfund sites

Proximity to facilities with highly toxic substances

Wastewater discharge

## Sensitive populations

Cardiovascular disease

Low birth weight

## Socioeconomic factors

Low educational attainment

Housing burden

Transportation expense

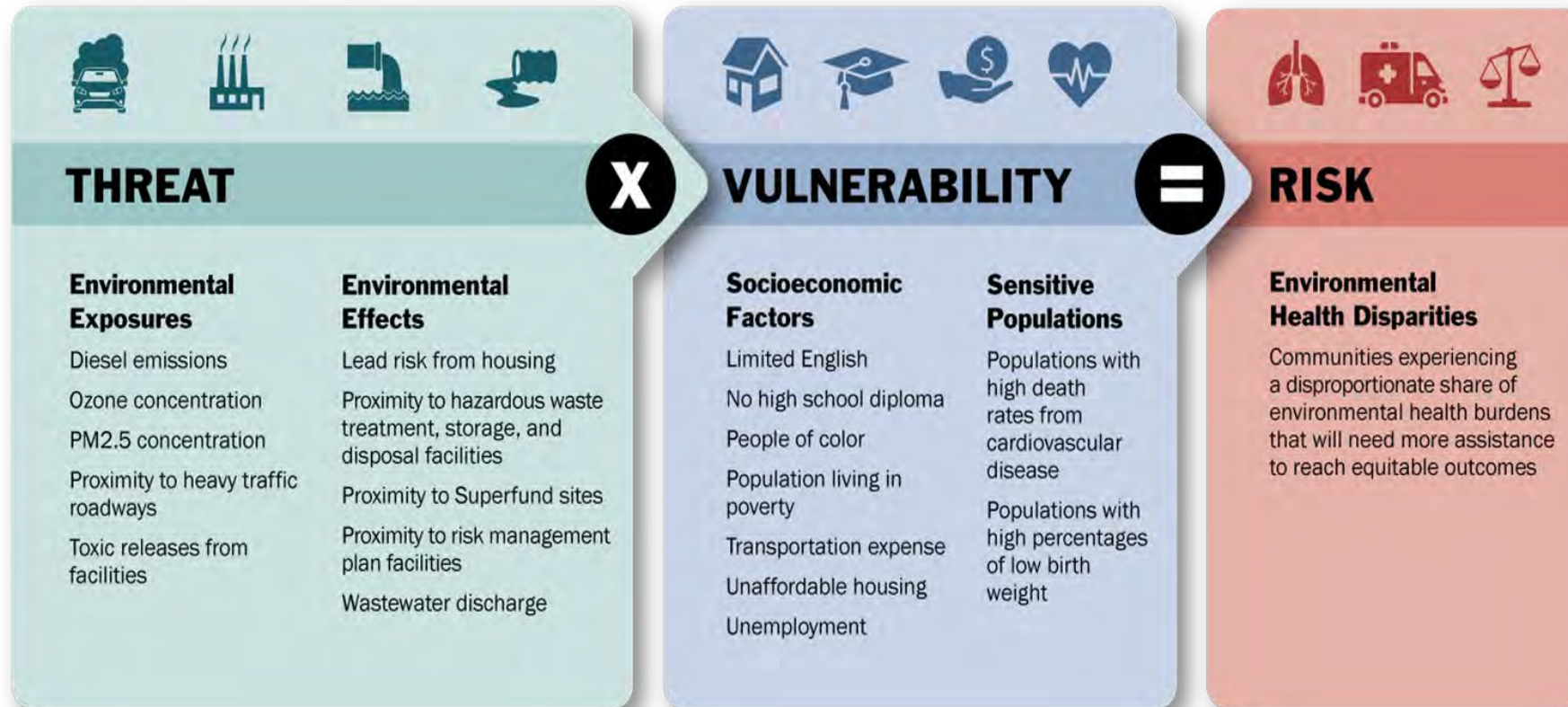
Poverty

Race (people of color)

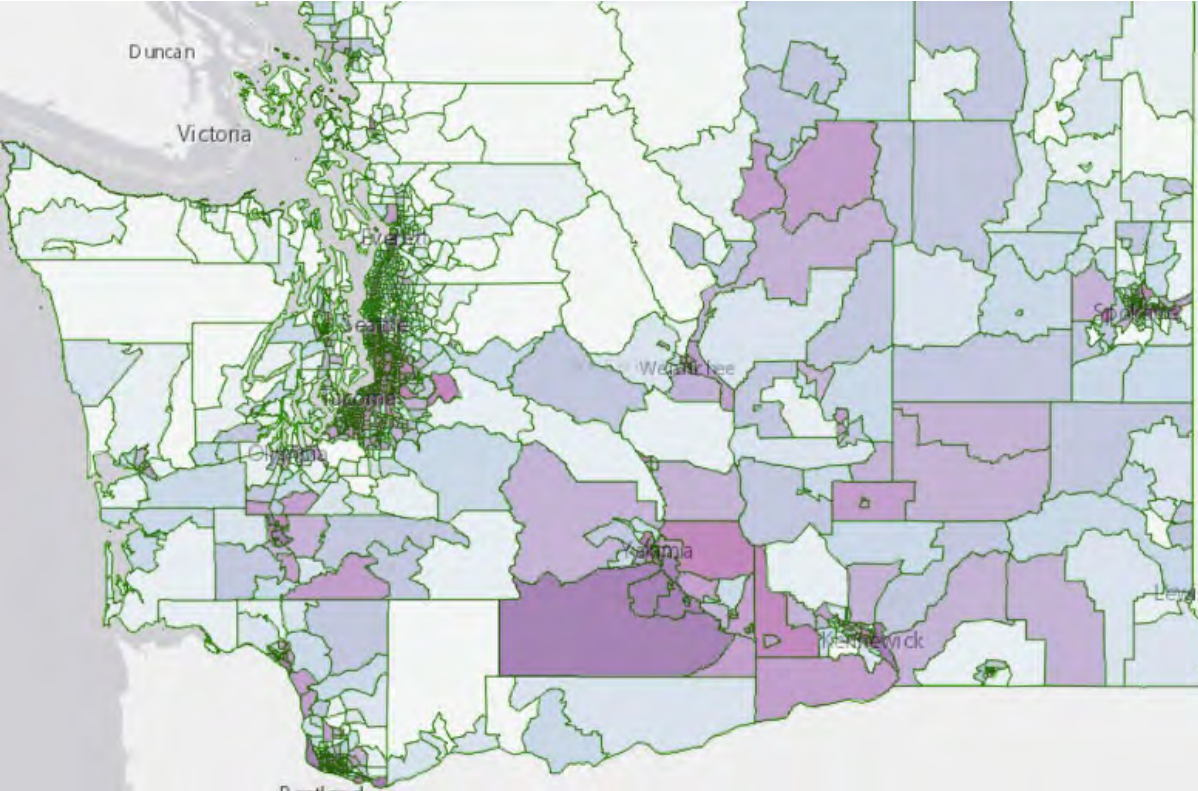
Unemployment

# Model for EHD Map

## Threat x Vulnerability = Risk



# EHD Map Ranking



Least impacted							Most impacted		
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>
10% of communities	10% of communities	10% of communities	10% of communities	10% of communities	10% of communities	10% of communities	10% of communities	10% of communities	10% of communities
70% of communities are less impacted							10% of communities are similarly impacted	20% of communities are more impacted	

# Healthy Environment for All (HEAL) Act: EHD Map

---

- Further develop the EHD map, engaging with communities, tribes, researchers, and the Environmental Justice Council
- Track changes in disparities over time
- Perform a comprehensive evaluation every three years
- Expand online video trainings and guidance on how to use the EHD map
- Provide support and consultation to state agencies on how to use the EHD map

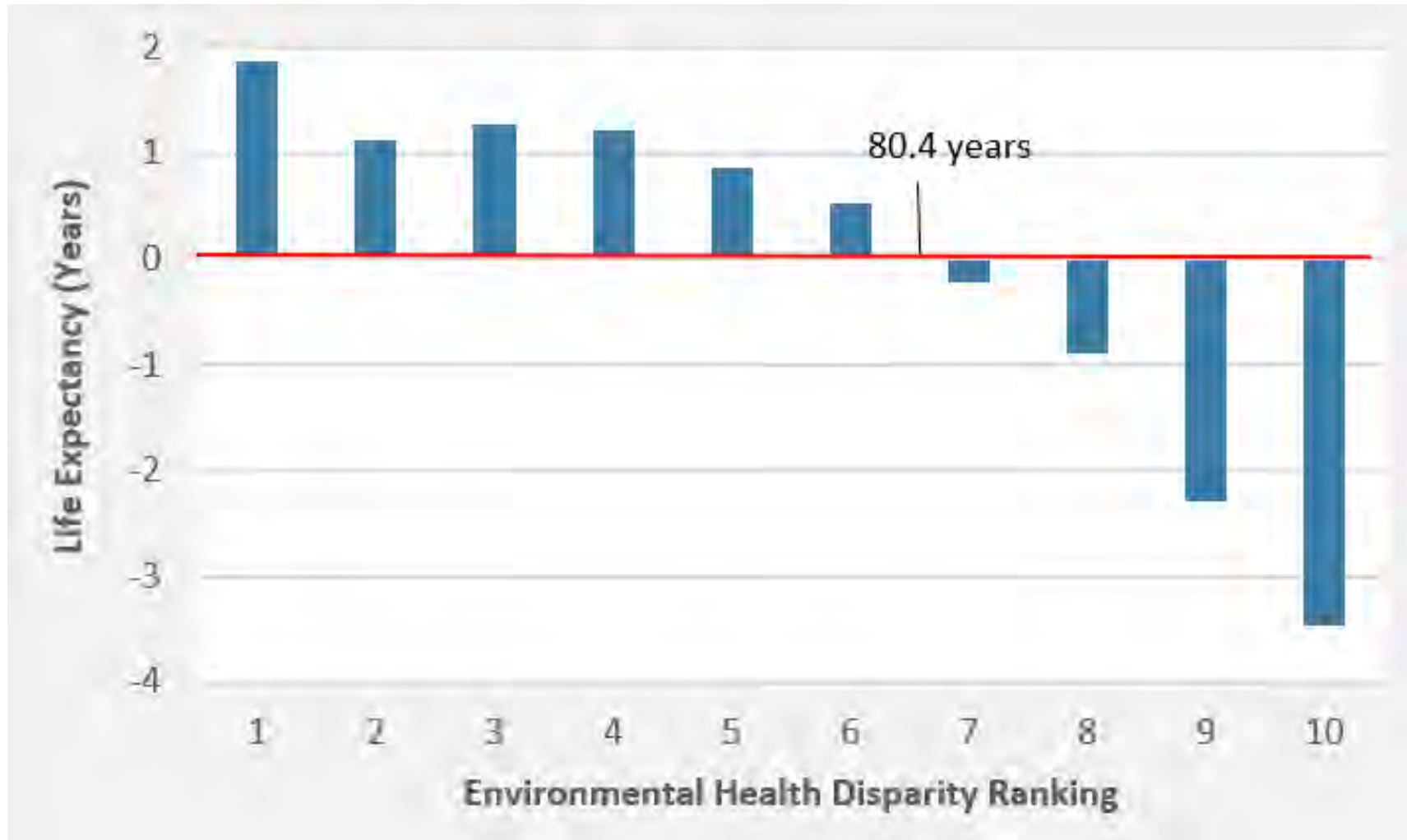
## Climate Commitment Act / Clean Energy Transformation Act

---

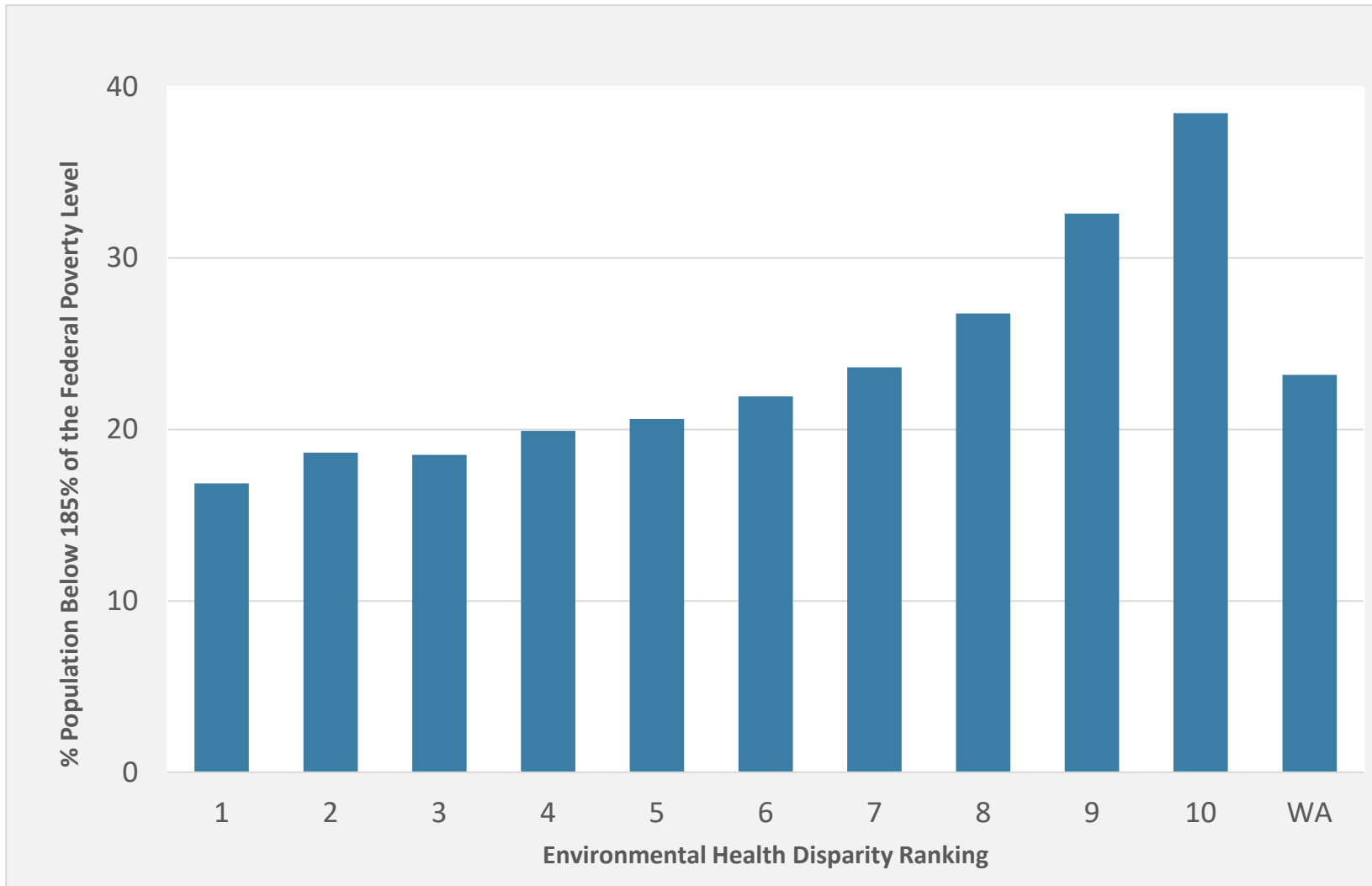
- CETA Assigned UW and DOH a Cumulative Impact Analysis (CIA) to define highly impacted communities. The definition is communities that rank a 9 or 10 on the EHD or any census tract with tribal lands.
- The CCA has a target of investing no less than 35% with a goal of investing 40% of revenues in overburdened communities with no less than 10% going to investments supported by a Tribal resolution.
- CCA uses CETA's CIA as one of the guidelines for the definition of overburdened communities.



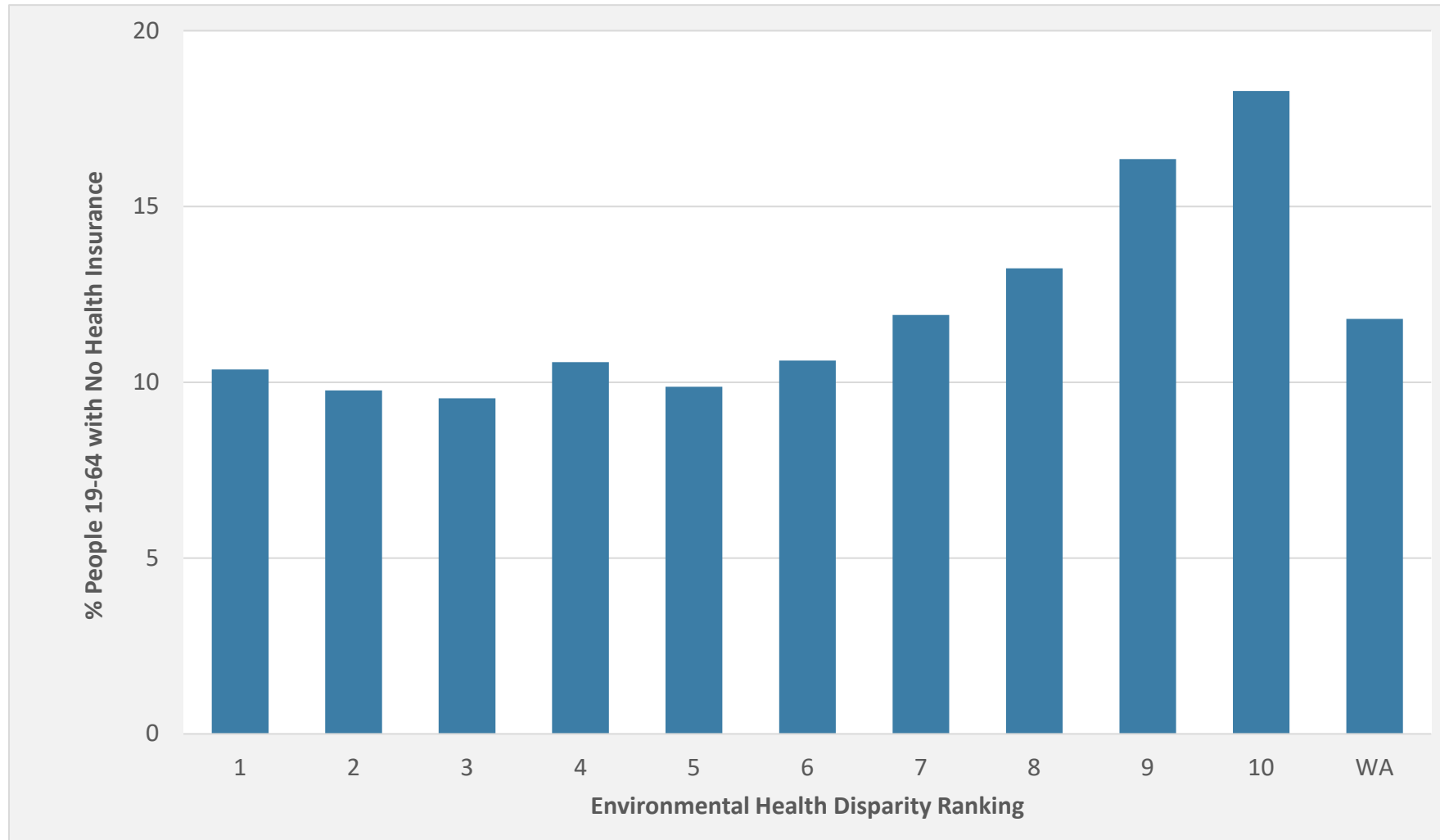
## Difference in Life Expectancy by EHD Rank



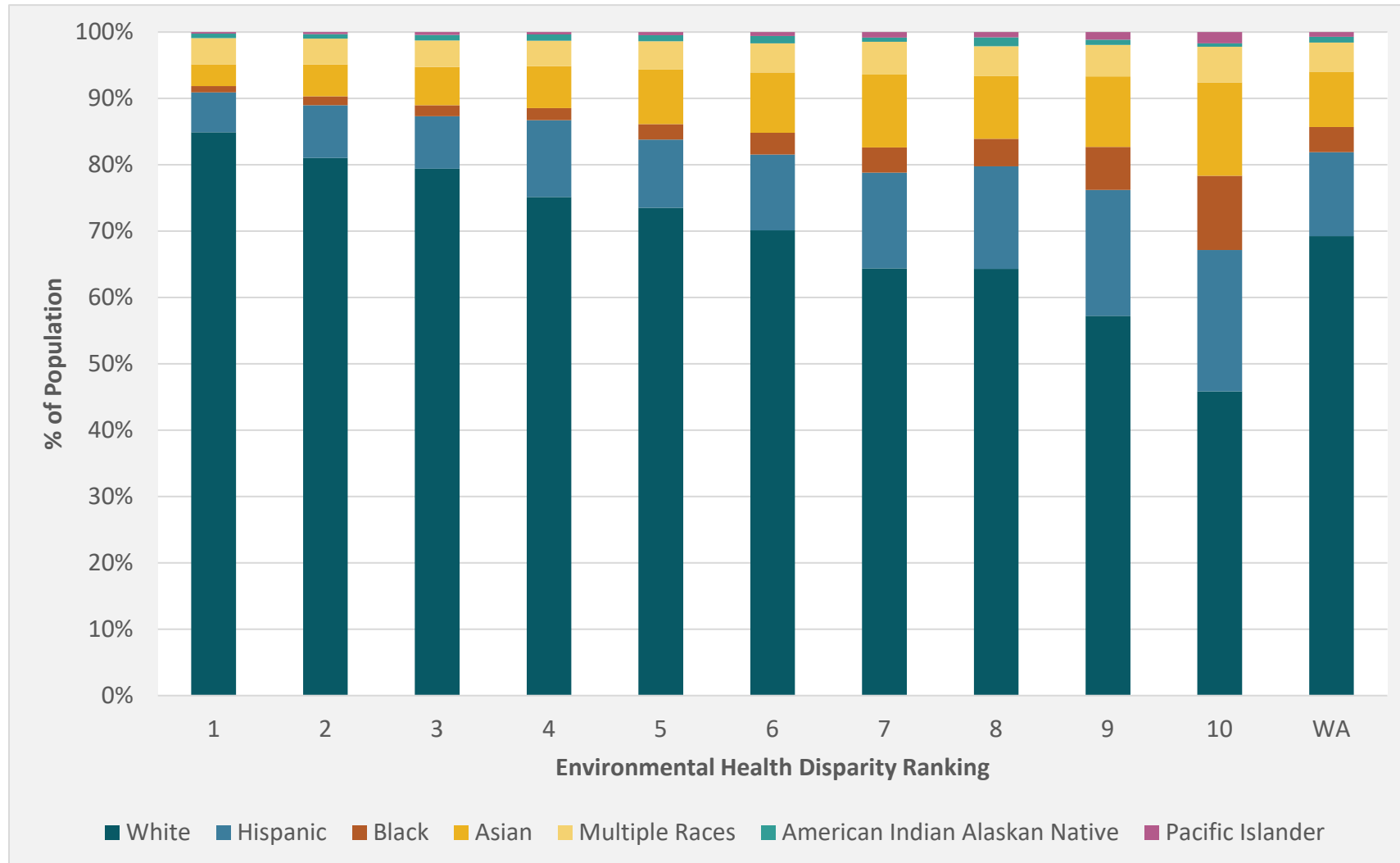
# Poverty by EHD Rank



# Health Insurance by EHD Rank



# Race and Ethnicity by EHD Rank



# Indicator Ideas

---

- Expand Proximity to Hazardous Waste Treatment Storage and Disposal Facilities Indicator (Legacy DOD sites, underground storage tanks)
- Wood stove use
- **Wildfire smoke exposure**
- Wildfire risk
- Slide risk
- **Water quality**
- Marine traffic air quality pollution
- Fish and natural resource consumption rates
- Ocean acidification
- **Harmful algal blooms**
- Stream temperature pollution
- Access to traditional foods
- Intergenerational knowledge transfer
- Natural resource dependent livelihoods
- Food deserts
- Healthcare access
- Cell and internet service access
- **Pesticides**
- **Asthma**
- **Mortgage Discrimination (modern redlining)**
- **Climate change**

Bold indicates indicator/overlay/theme under development

# Environmental Benefits Mapping and Analysis Program Community Edition (**BenMAP-CE, an EPA tool**)

- Open-source program that models the number and economic value of air pollution-related deaths and illnesses.
- It can compare pre and post scenarios or hypothetical/modeled scenarios
- Users can load their data or use pre-loaded datasets for the U.S. and China
- Pre-loaded datasets include:
  - Air quality
  - Demographics
  - Economic values
  - Concentration-response relationships

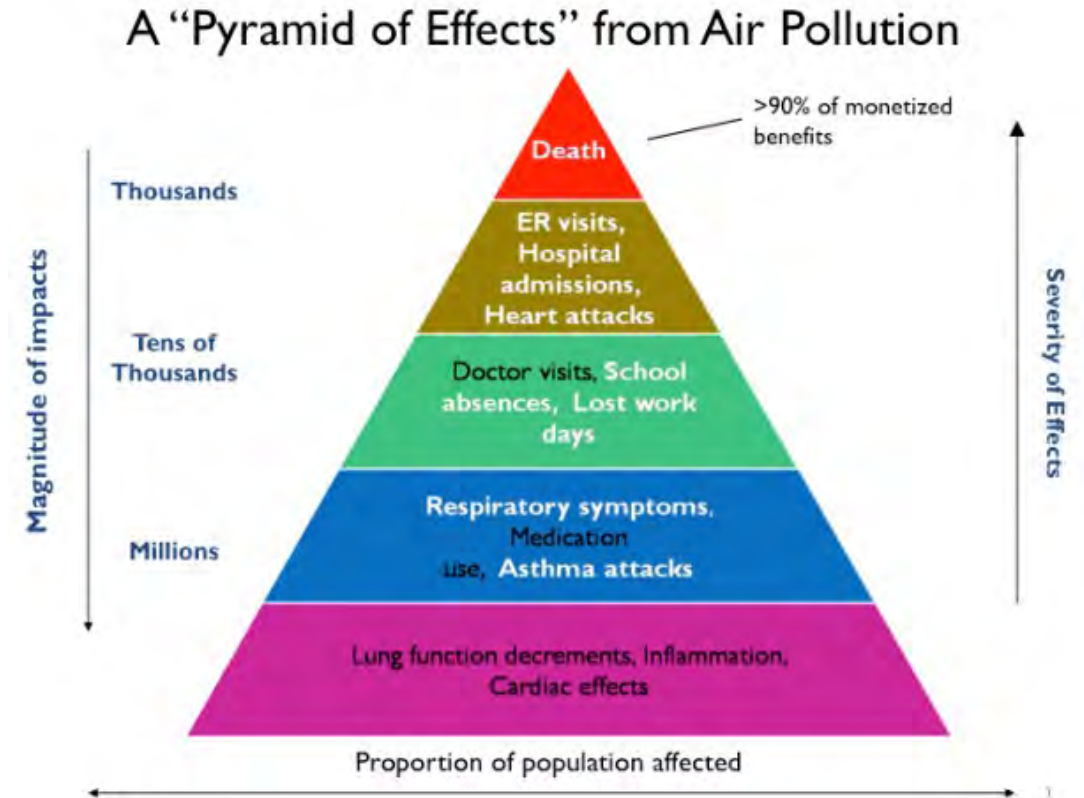
# Health and Economic Impacts

Health impact functions used in BenMAP-CE:

1. Modeled or monitored air quality changes
2. Population data
3. Baseline incidence rates
4. An effect estimate

Economic values calculation:

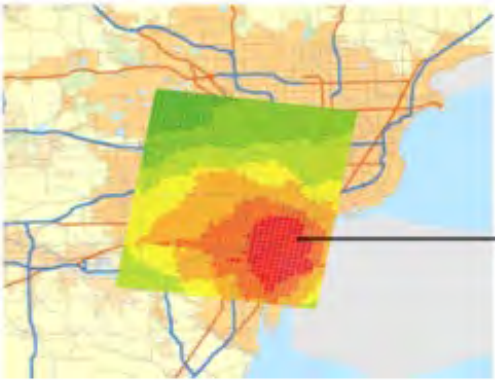
1. Cost of illness
2. Willingness to pay



Source: <https://www.epa.gov/benmap/how-benmap-ce-estimates-health-and-economic-effects-air-pollution>

# Overview of the Model

Pollutant change



Population



Baseline incidence



Effect  
estimate

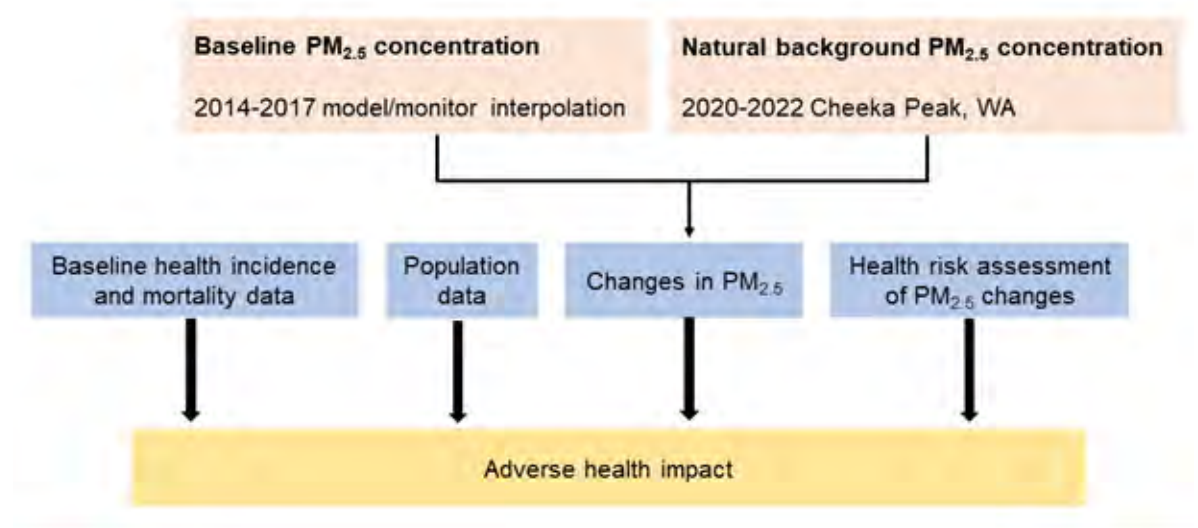
Health  
impact





# BenMAP-CE for Environmental Justice Review

- Under the Climate Commitment Act, Ecology is working on an initiative to reduce criteria air pollution in overburdened and highly impacted communities
- Ecology used BenMAP-CE to conduct the initial EJ review, with support from DOH Climate and Health epidemiologists
- The first EJ review will be completed by the end of 2023.



# BenMAP-CE Example Results

- The annual average number of estimated deaths associated with PM2.5 pollution in overburdened communities highly impacted by air pollution was about xyz

Study	Age group	Ethnicity	Race group	Cause of death	Annual number of deaths [uncertainty]	Crude annual death rate per 1,000 people [uncertainty]
Di et al.	65 to 99	Hispanic	All	All-causes	19 [16 to 21]	1.41 [1.22 to 1.60]
Di et al.	65 to 99	Non-Hispanic	AIAN	All-causes	2 [1 to 2]	0.93 [0.57 to 1.26]
Di et al.	65 to 99	Non-Hispanic	Asian	All-causes	18 [14 to 22]	0.88 [0.69 to 1.05]
Di et al.	65 to 99	Non-Hispanic	Black	All-causes	14 [13 to 14]	1.74 [1.68 to 1.81]

# CONTACT

---

**Washington Tracking Network (WTN) Team**

*[EHDMap@doh.wa.gov](mailto:EHDMap@doh.wa.gov)*



To request this document in another format, call 1-800-525-0127. Deaf or hard of hearing customers, please call 711 (Washington Relay) or email [civil.rights@doh.wa.gov](mailto:civil.rights@doh.wa.gov).