

ENVIRONMENTAL JUSTICE: DISPARITIES IN HAZARDS AND AMENITIES IN THE UNITED STATES OF AMERICA

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My Definition of Environmental Justice (EJ)

- EJ Framework is a Three-Legged Stool
 - **Leg 1:** Differential Burden and Exposure to Environmental Hazards and LULUs (chemical plants, TRI facilities, incinerators, brownfields, heavily-trafficked roadways, industrial zoning, goods movement activities, landfills, depots, etc)
 - **Leg 2:** High Concentration of Psychosocial Stressors (Crime, Violence, Poverty, isms, social disorder)
 - **Leg 3:** Lack of access to high quality health-promoting infrastructure (supermarkets, banks, schools, basic amenities, housing, parks/green space, economic opportunity structures)

The Role Race Plays

Inequity in consumption of goods and services adds to racial–ethnic disparities in air pollution exposure

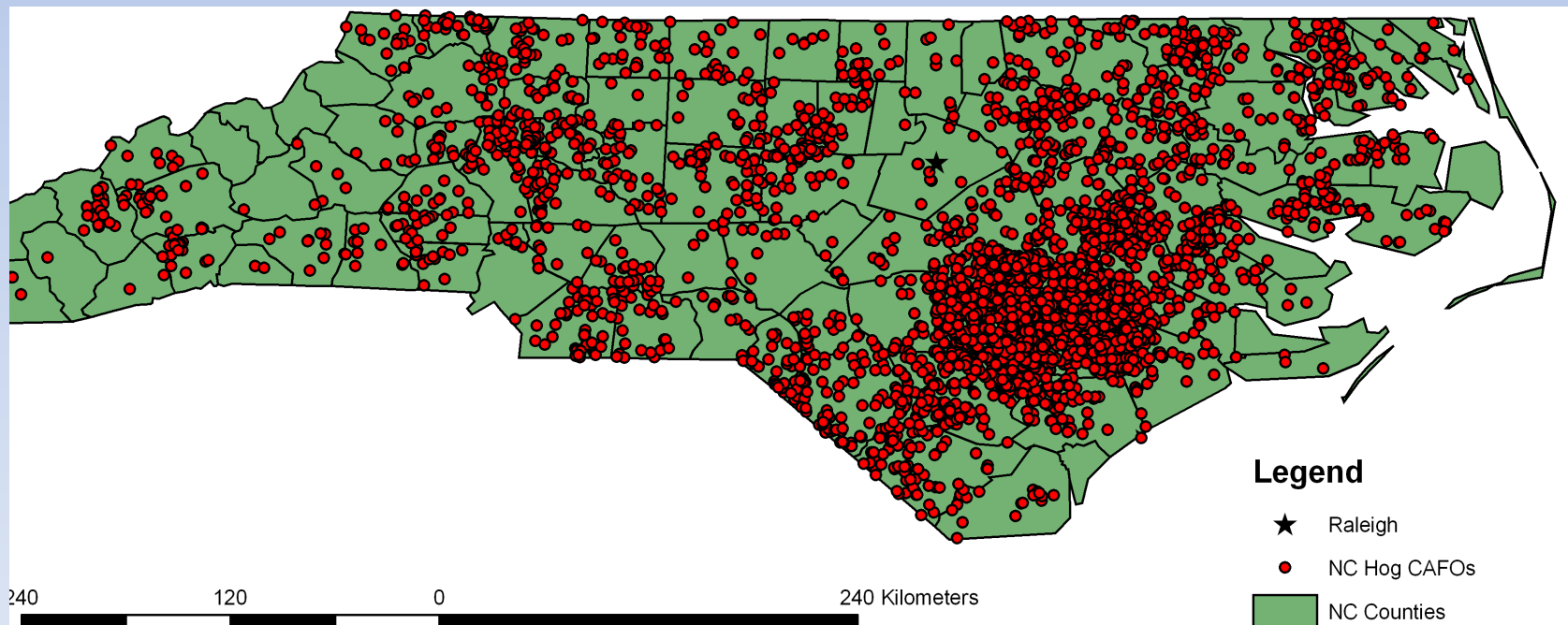
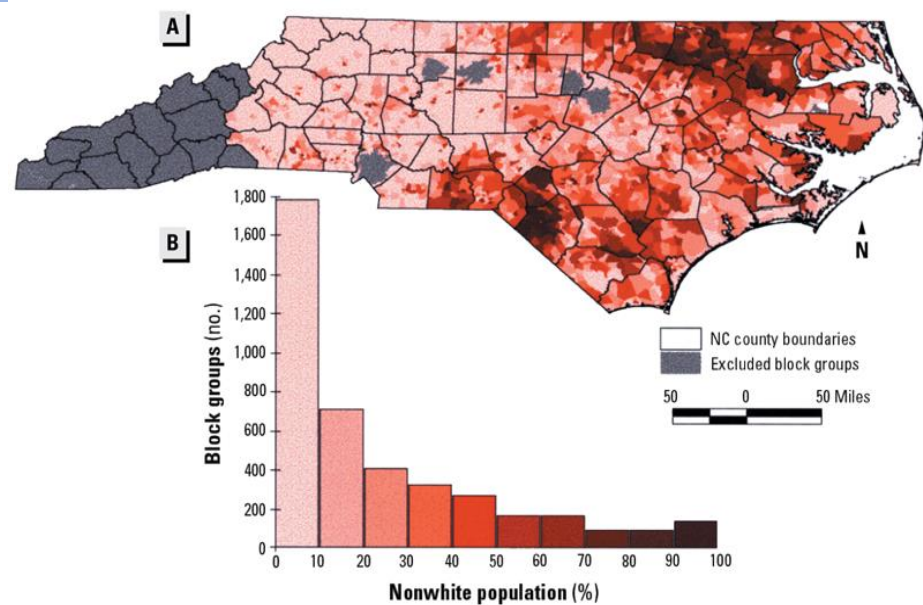
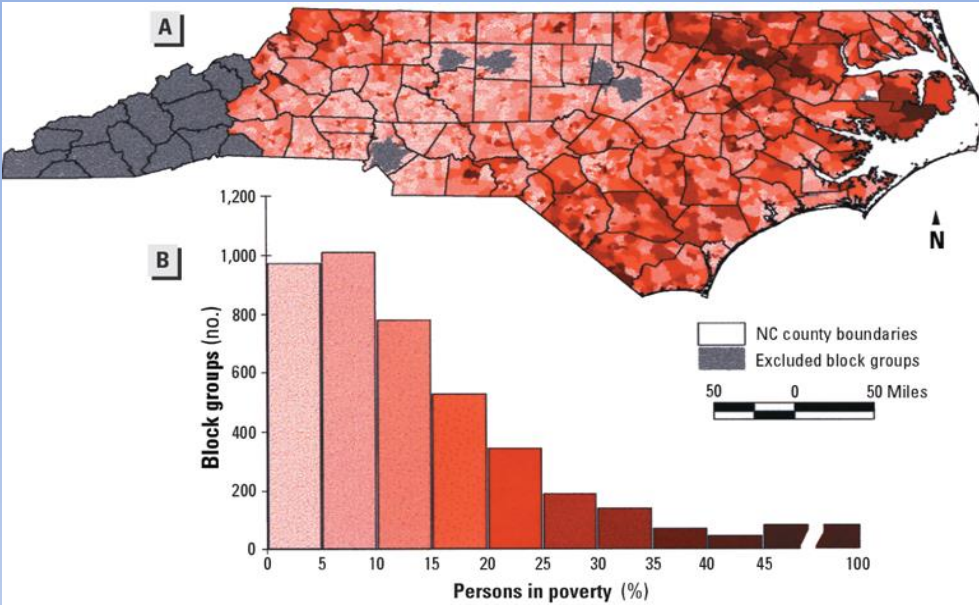


Christopher W. Tessum, Joshua S. Apte, Andrew L. Goodkind, Nicholas Z. Muller, Kimberley A. Mullins, David A. Paoella, Stephen Polasky, Nathaniel P. Springer, Sumil K. Thakrar, Julian D. Marshall, and Jason D. Hill

PNAS March 26, 2019 116 (13) 6001-6006; first published March 11, 2019 <https://doi.org/10.1073/pnas.1818859116>

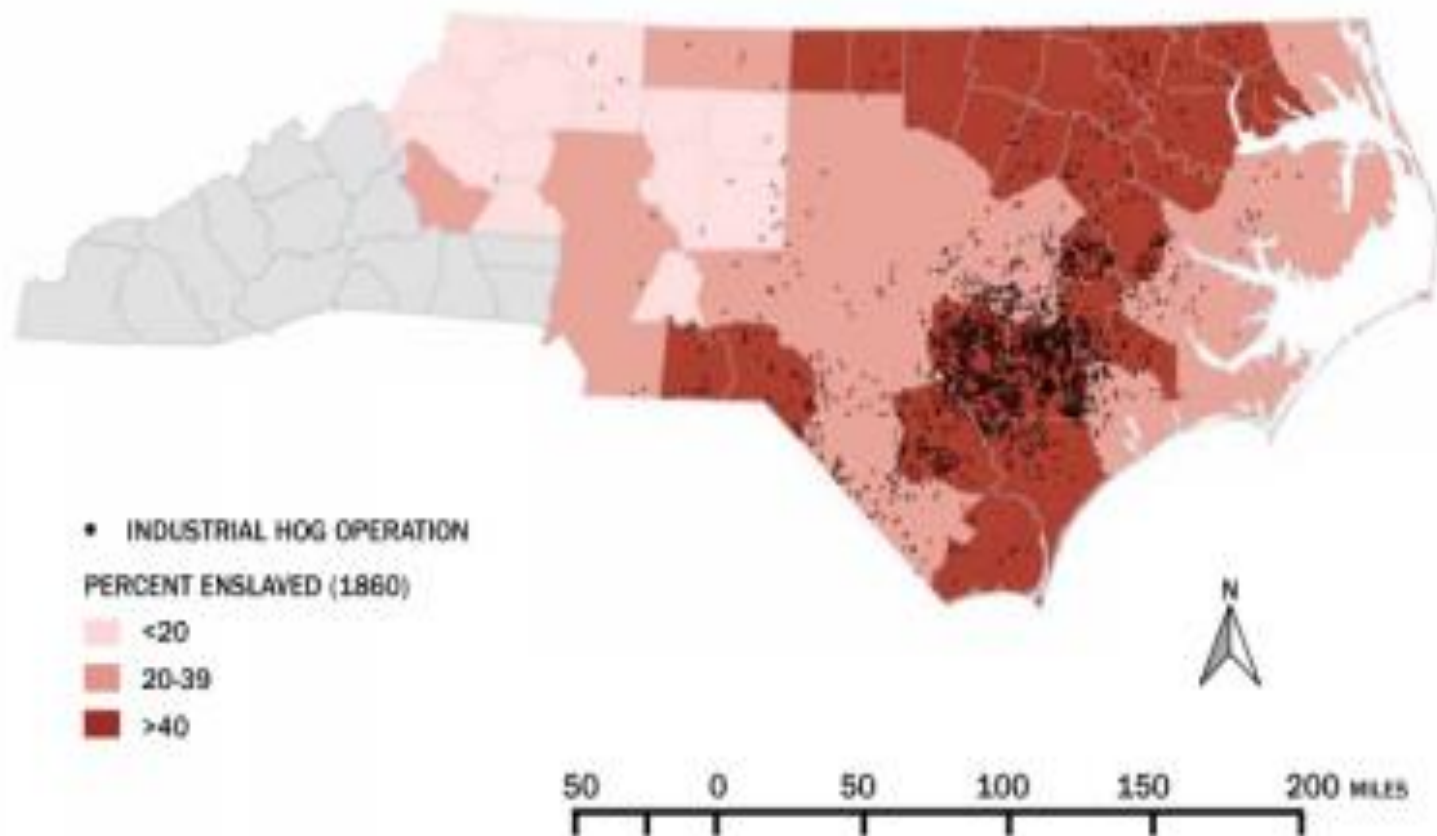
Edited by Susan Hanson, Clark University, Worcester, MA, and approved February 4, 2019 (received for review November 2, 2018)

majority, but disproportionately inhaled by black and Hispanic minorities. On average, non-Hispanic whites experience a “pollution advantage”: They experience ~17% less air pollution exposure than is caused by their consumption. Blacks and Hispanics on average bear a “pollution burden” of 56% and 63% excess exposure, respectively, relative to the exposure caused by their consumption. The total disparity is caused as much by how much people consume as by how much pollution they breathe. Differences in the types of goods and services consumed by each group are less important. PM_{2.5} exposures



Maps from a study (Wing et al. 2000) show distributions of poverty, people of color residents, and hog CAFOs in North Carolina.

NORTH CAROLINA ENSLAVED POPULATION IN 1860 AND INDUSTRIAL HOG OPERATIONS RE-PERMITTED IN 2014



Climate Change and Environmental Justice

RACE, PLACE, AND ENVIRONMENTAL JUSTICE AFTER HURRICANE KATRINA

Struggles to Reclaim, Rebuild, and
Revitalize New Orleans and the Gulf Coast



FOREWORD BY MARC H. MORIAL

***** EDITED BY *****
**ROBERT D. BULLARD
AND BEVERLY WRIGHT**

NAACP Report: Coal-Blooded

- The report states that coal is killing people of color
 - The extraction, refinement, burning, and waste produced from coal including greenhouse gases emissions like CO₂ and co-pollutants
- Nearly six million Americans live within three miles of a coal power plant which are disproportionately located in low-income communities and communities of color
- People who live within three miles of a coal power plant have an average per capita income of \$18,400, which is lower than the U.S. average of \$21,587
- Among those living within three miles of a coal power plant, 39 percent are people of color — a figure that is higher than the 36 percent proportion of people of color in the total U.S. population.
- Moreover, the coal plants that have been built within urban areas in the U.S. tend overwhelmingly to be located in communities of color.

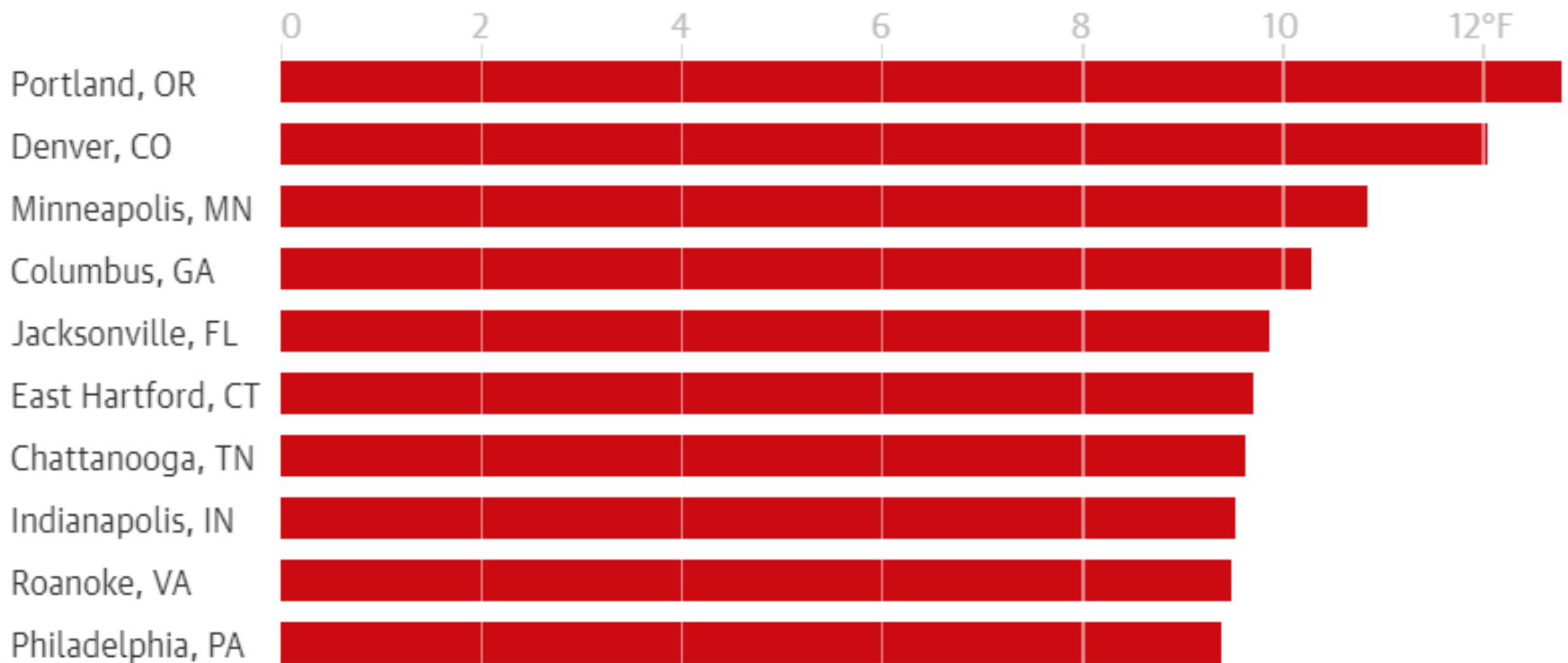
NAACP Report: Fumes Across the Fenceline

- More than 1 million African-Americans live within a half mile of existing natural gas facilities and the number is growing every year
- Face elevated risk of cancer due to toxic air emissions from natural gas developments
- Over 1 million African-Americans live in counties that face a cancer risk above EPA's level of concern due to natural gas facilities
- More than 6.7 million African-Americans live in the 91 counties with oil refineries

Redlining and Urban Heat Islands

A new study found that temperatures in formerly redlined and non-redlined neighborhoods within cities differ by up to 12.6°F

Heat differences between redline and non-redlined neighborhoods (fahrenheit)



Guardian graphic | Researchers from the Science Museum of Virginia, Portland State University and Virginia Commonwealth University

Climate Change, Heat, and Disparities

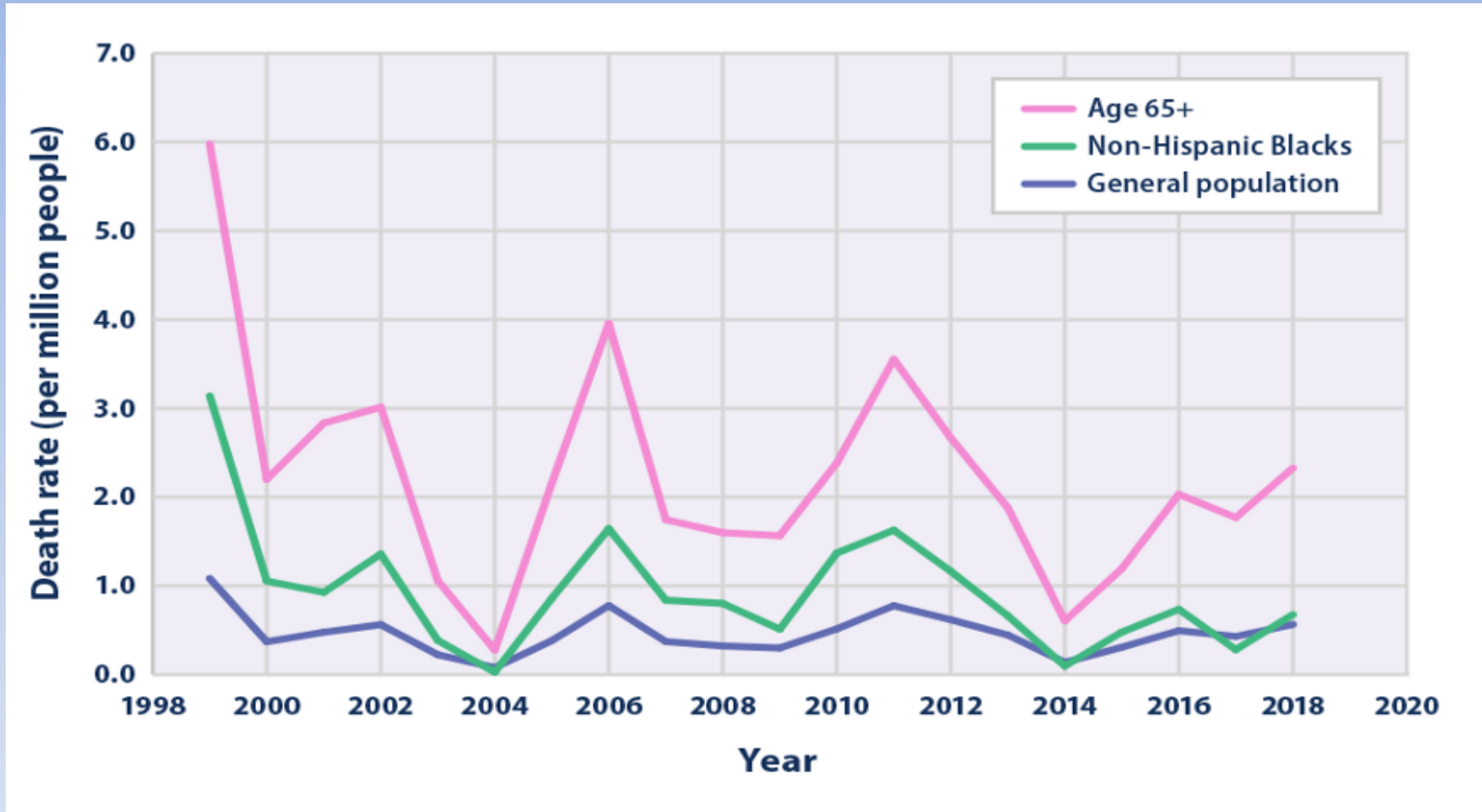
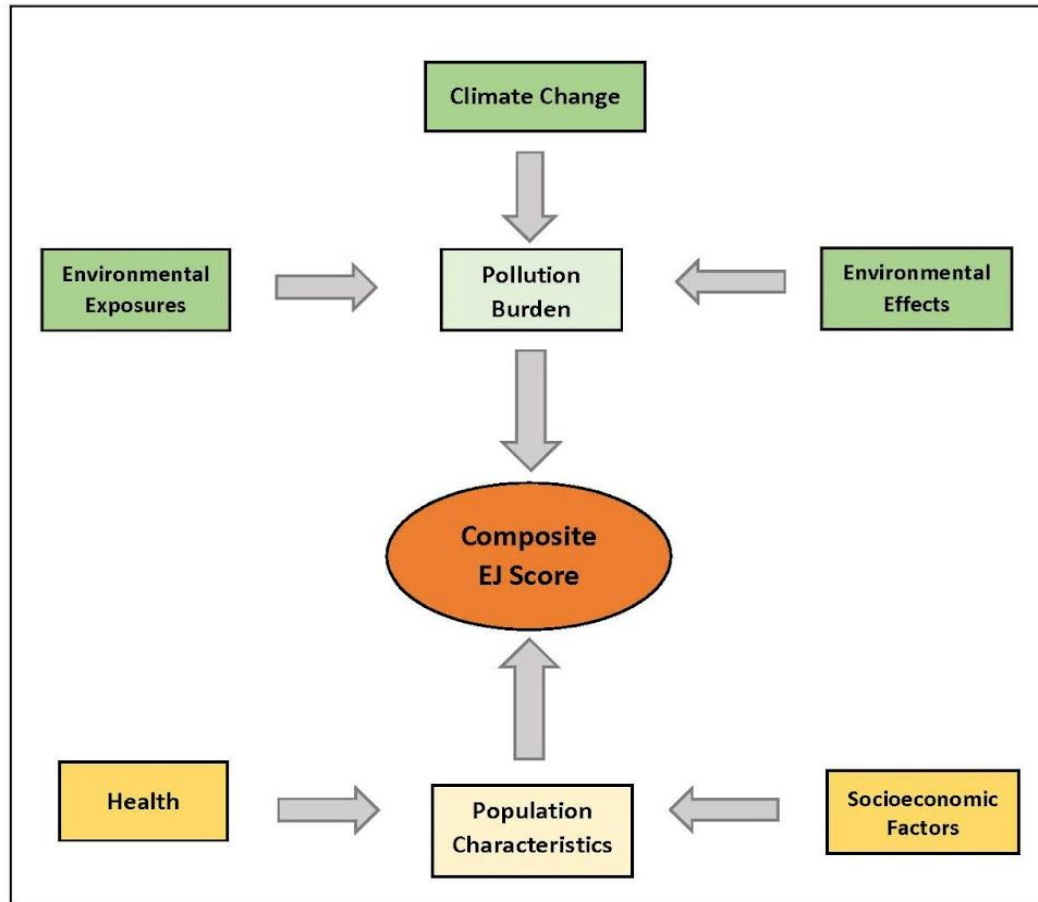


Figure: A graph showing the trend of summer deaths due to heat and cardiovascular disease in the USA, distributed across three groups. Non-Hispanic Blacks and those aged 65+ had consistently higher rates than the general population. SOURCE: *Environmental Protection Agency (EPA)*

Composite Environmental Justice Score



CEJ Score Calculation

Pollution Burden

As shown in the figure environmental exposures, environmental effects, and climate change are used to determine pollution burden.

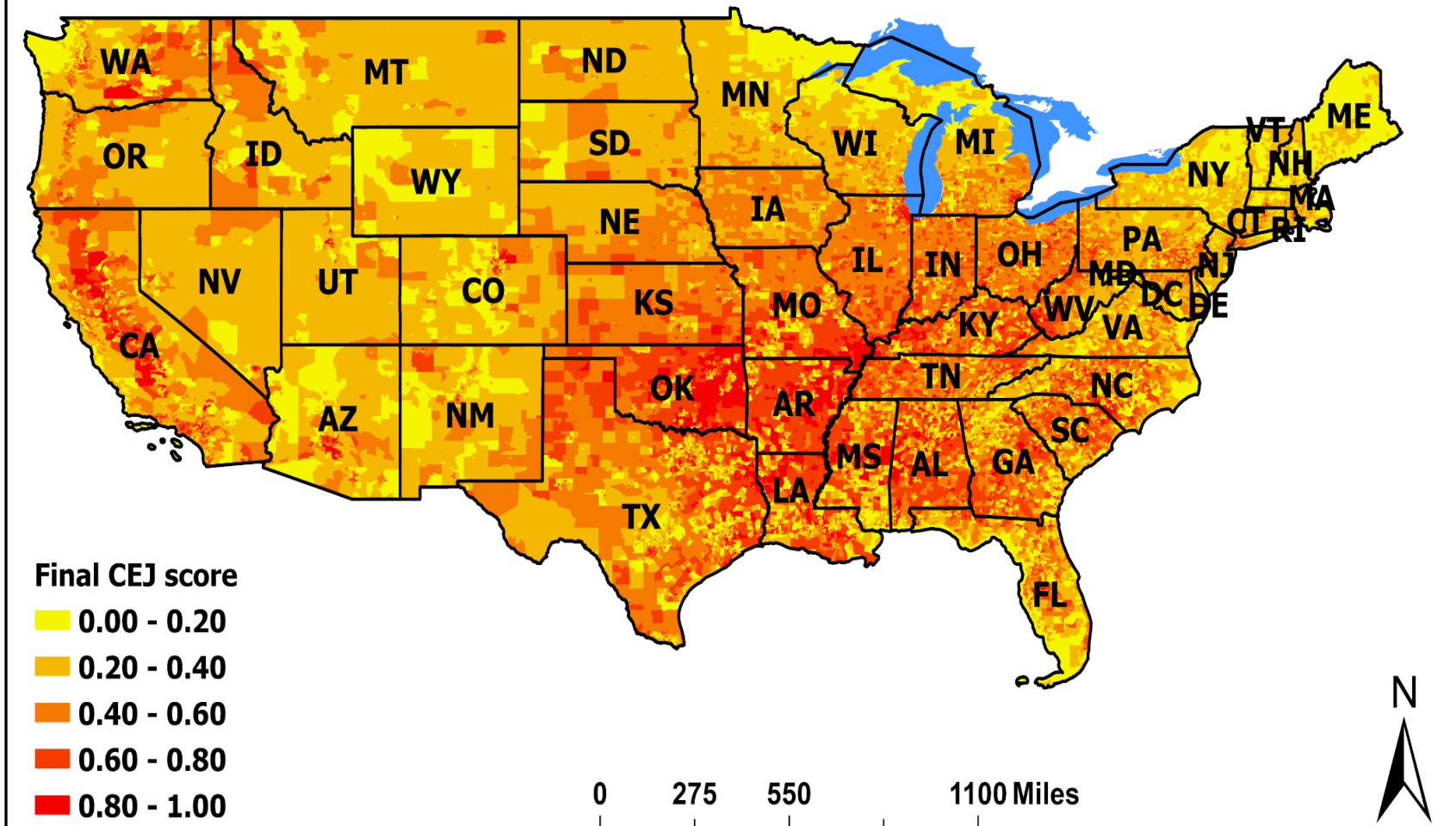
Population Characteristics

As shown in the figure , health and socioeconomic factors are used to determine population characteristics.

The CEJ Score was calculated by multiplying the pollution burden (weighted average of environmental pollution exposures, climate change, and environmental effects) by the population characteristics (average of health and socioeconomic factors).

Composite Environmental Justice Score

CONUS Census Tract level CEJ score



Environmental Justice Issues and the State of Maryland

Double Disparity: Being Overburdened and Medically Underserved

- In the State of Maryland, we found that census tracts with a higher proportion of non-White residents and people living in poverty were more likely to be closer to TRI facilities
- The highest proportion of non-White residents resided in tracts more than 0.5km and up to 1km away from a TRI facility
- Additionally, % poverty, unemployment, less than high school education, and homes built pre-1950 were higher in HPSA tracts hosting TRI facilities than in non-HPSA tracts hosting TRI facilities. In addition, both low-income groups and persons without a high school education are both overburdened and medically underserved

Mean Distribution of Sociodemographic Measures by TRI Facility Buffer Zones for 2010 Maryland HPSA tracts and non-HPSA tracts

Sociodemographic measures	Host	1 km – 5 km buffer
	HPSA/Non-HPSA	HPSA/Non-HPSA
# Census tracts	57/202	117/496
% Hispanic	8.3/6.6*	10.3/8.2*
% Non-white	55.8/33.4	79.8/41.9
% Poverty	18.8/8.8	16/6.5
% Unemployment	11.2/6.2	11.1/5.5
% Less than HS education	22.2/13.3	21/9.5
% Homeownership	53.4/68.6	47.9/73.8
% Homes built pre-1950	41.5/20.9	27.6/14.4
Diversity index	0.41/0.43*	0.37/0.45
Median HH income	47428/70202	48723/88798

*Statistically insignificant at the level of 0.05.

Wilson, SM et al. "Being overburdened and medically underserved: assessment of this double disparity for populations in the state of Maryland." *Environmental Health* 13 (2014): 1-12.

Maryland Mid-Atlantic EJScreen Map

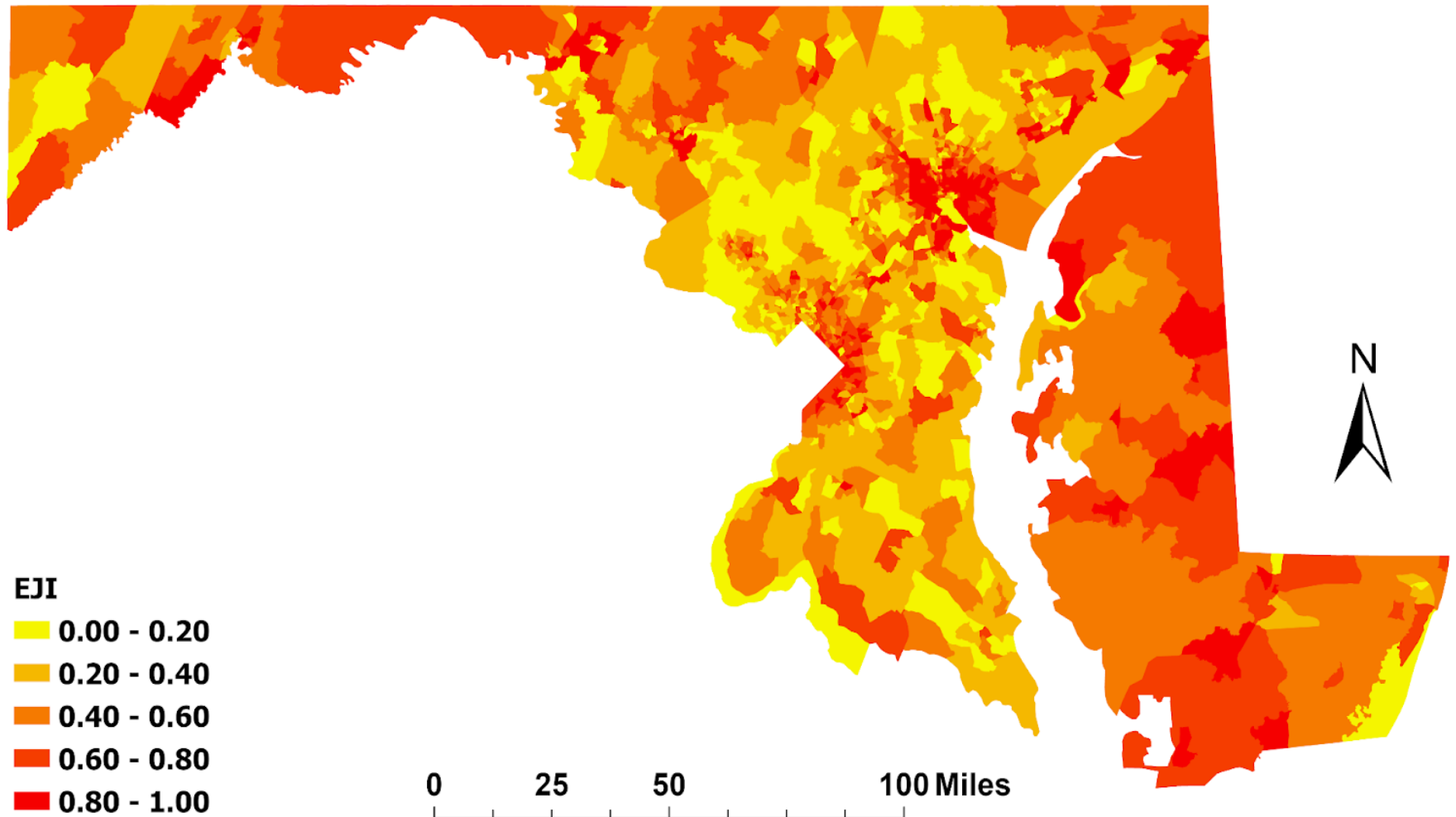


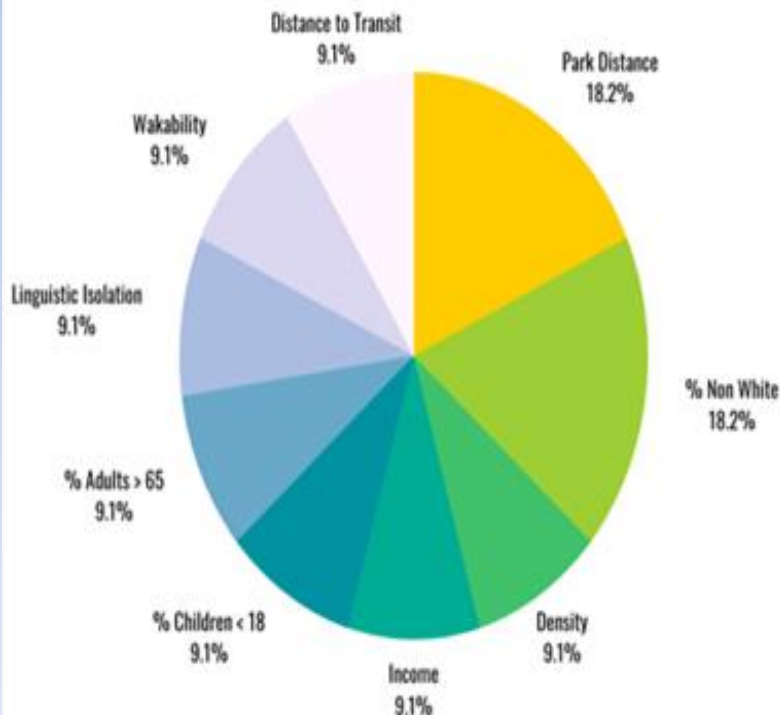
Figure. In Maryland, 682 census tracts had scores higher than the 50th percentile. The environmental justice scores for 146 census tracts are greater than the 90th percentile. The top 100 worst affected census tracts in Maryland using Mid-Atlantic EJSCREEN. 89% of the top worst affected census tracts are in Baltimore city.

MARYLAND'S PARK EQUITY TOOL

[HTTPS://DNR.MARYLAND.GOV/PAGES/PARKEQUITY.ASPX](https://dnr.maryland.gov/pages/parkequity.aspx)

PARK EQUITY DATA LAYERS

LAYERS & WEIGHTING OF MODEL



PARK DISTANCE
LOCAL AND STATE DATA



POPULATION DENSITY
US CENSUS



INCOME
US CENSUS

% NON-WHITE
US CENSUS



LINGUISTIC ISOLATION
US CENSUS

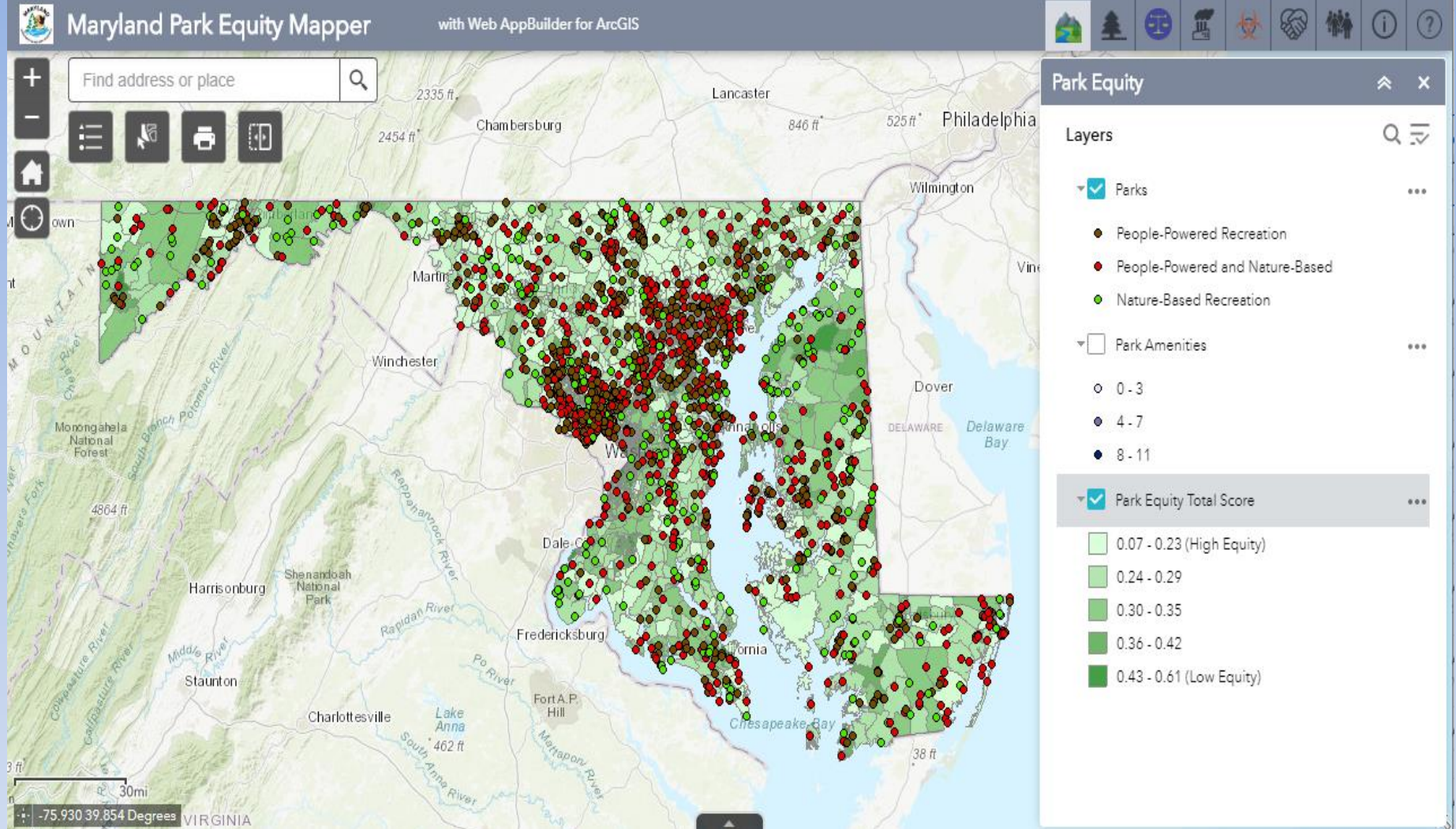
% CHILDREN < 18
US CENSUS

% ADULTS > 65
US CENSUS

WALKABILITY
EPA EJ SCREEN

ACCESS TO TRANSIT
MARYLAND DOT





- The “Park Equity Total Score layer” is a composite score of eight park equity indicators: Population Density, Low Wealth, Youth, Adult 65+, Park Distance, Public Transit Distance, Walkability, and % Non-White Population.
- Census block groups are shaded by the composite score with higher scores (i.e., low equity and high need of intervention) relating to darker shading.

**Environmental Justice Issues
and the City of Baltimore,
Maryland**

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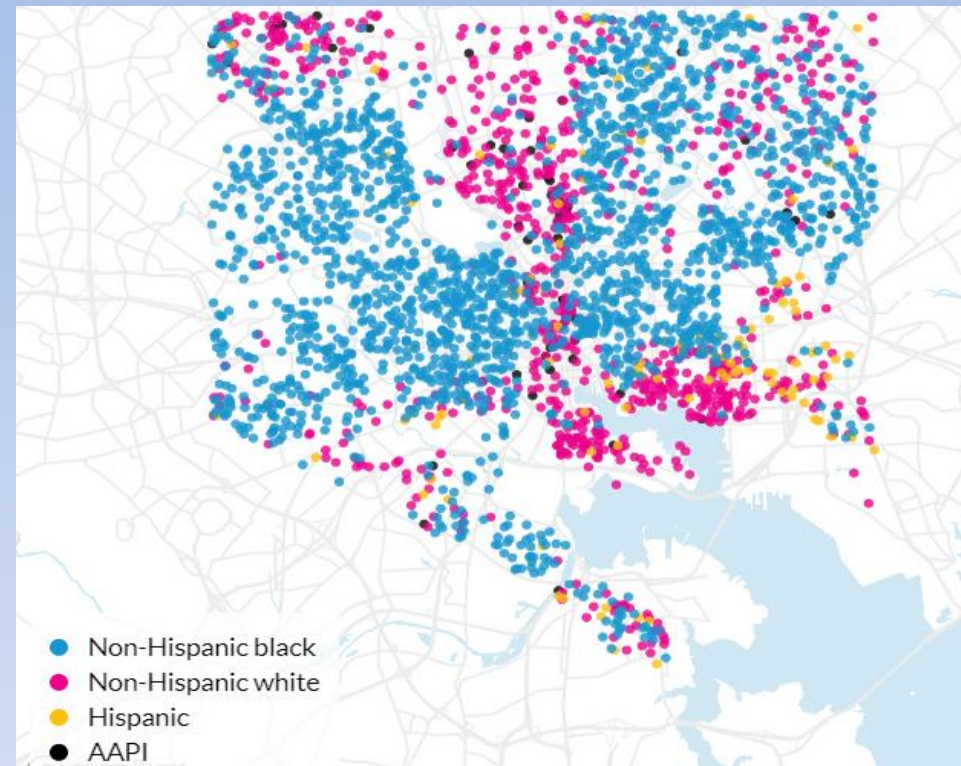
THE BLACK BUTTERFLY

THE
HARMFUL POLITICS
OF
RACE AND SPACE
IN AMERICA

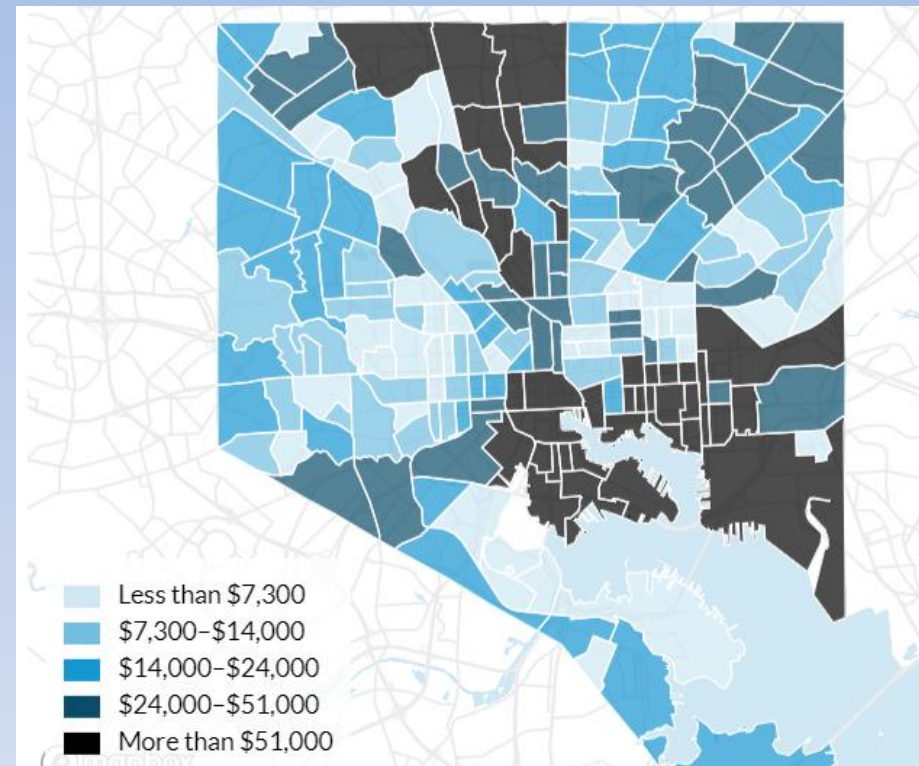
LAWRENCE T. BROWN

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The “Black Butterfly” in Baltimore City, Maryland (Dr. Lawrence Brown)

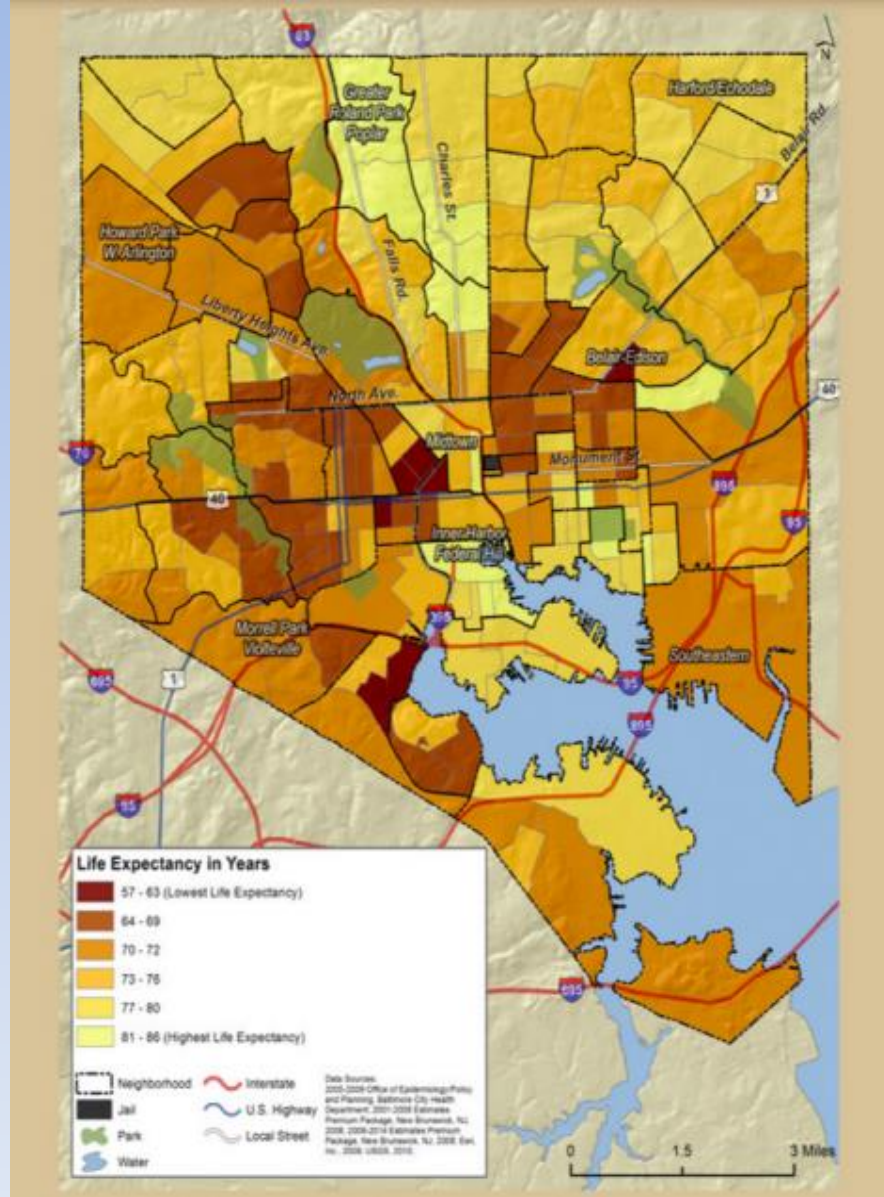
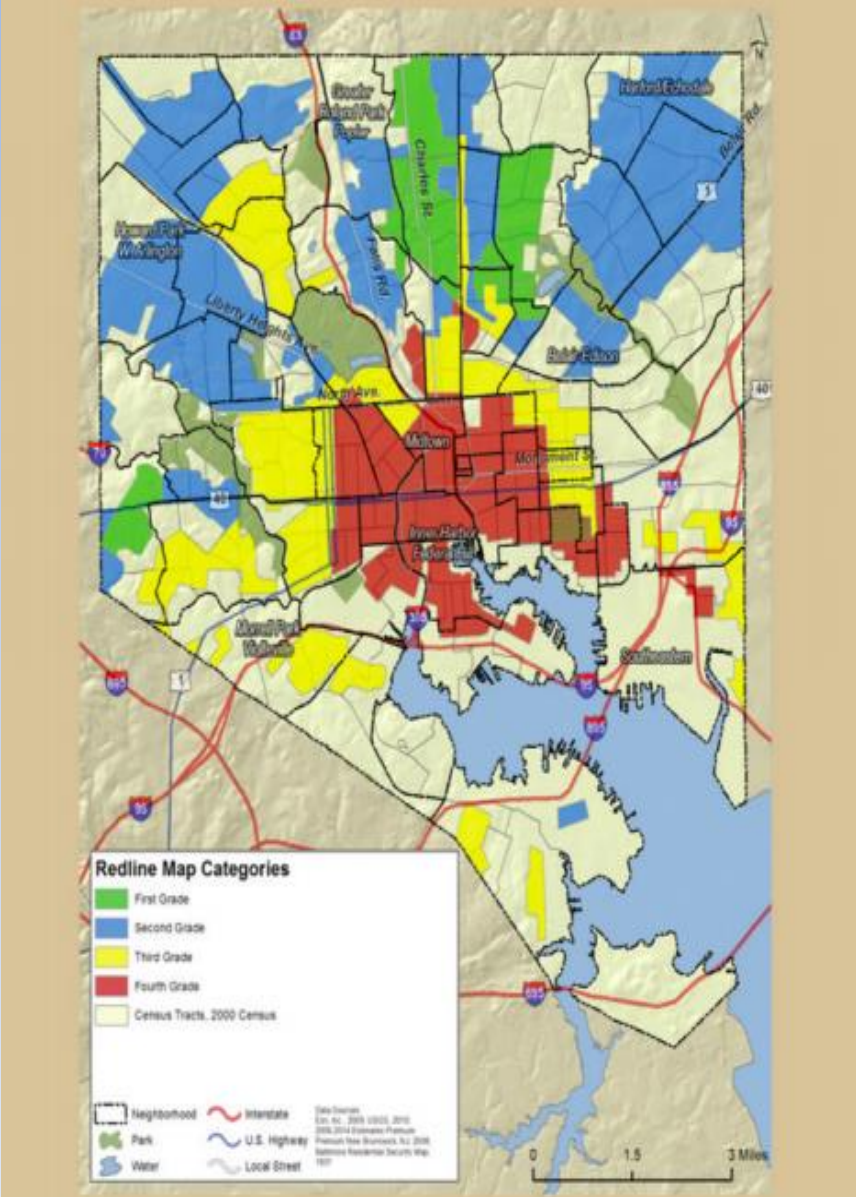


Swaths of hypersegregated Black communities in western and eastern portions of the city.



Residential, commercial, and industrial real estate sales. Per-home sale prices in predominantly white neighborhoods are higher than those in Black neighborhoods.

Redlining and Health in Baltimore

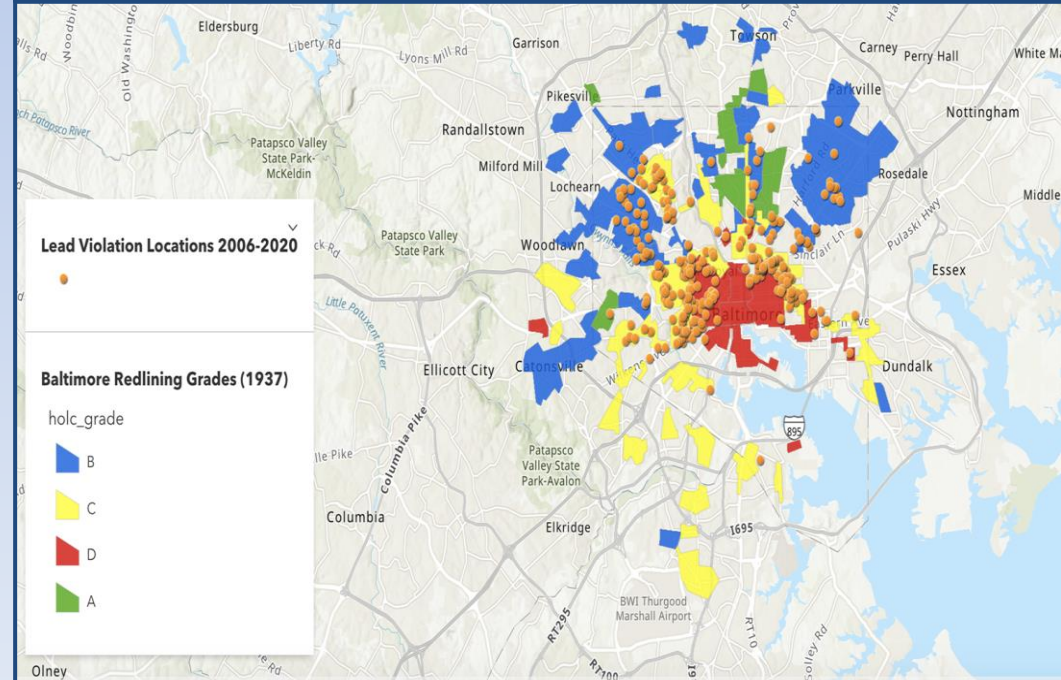
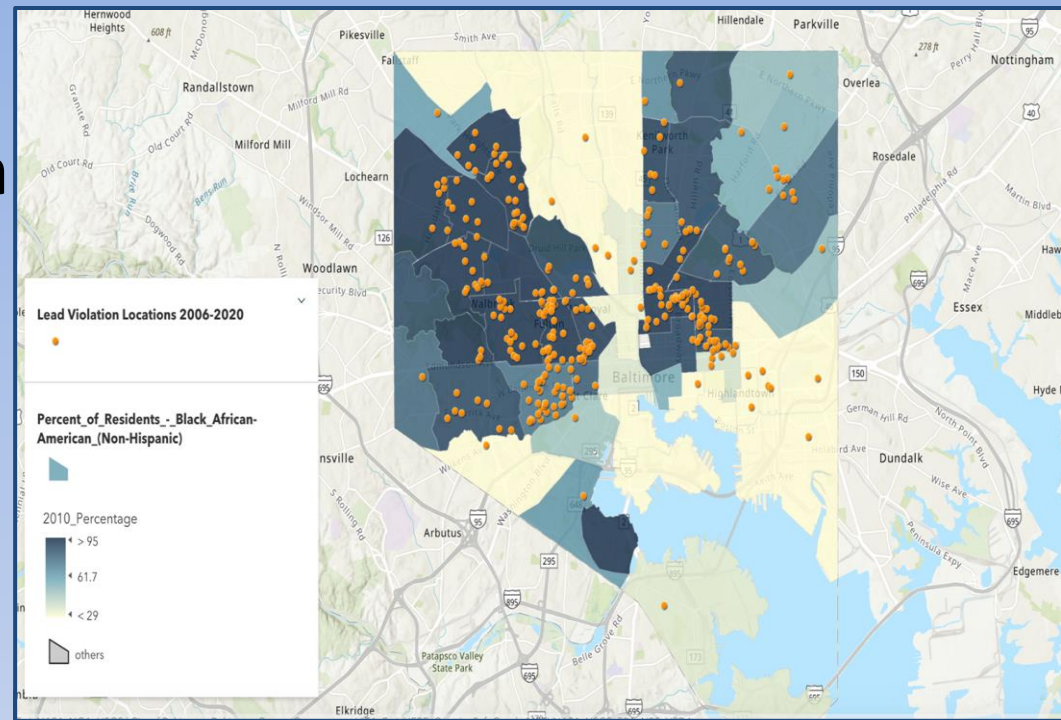


Environmental Public Health Tracking Program

Housing and Lead

Redlining, Housing Discrimination, and Environmental Health Disparities in Baltimore, Maryland

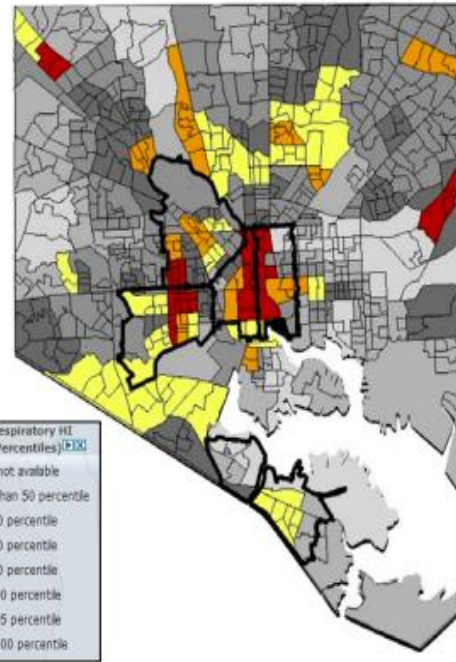
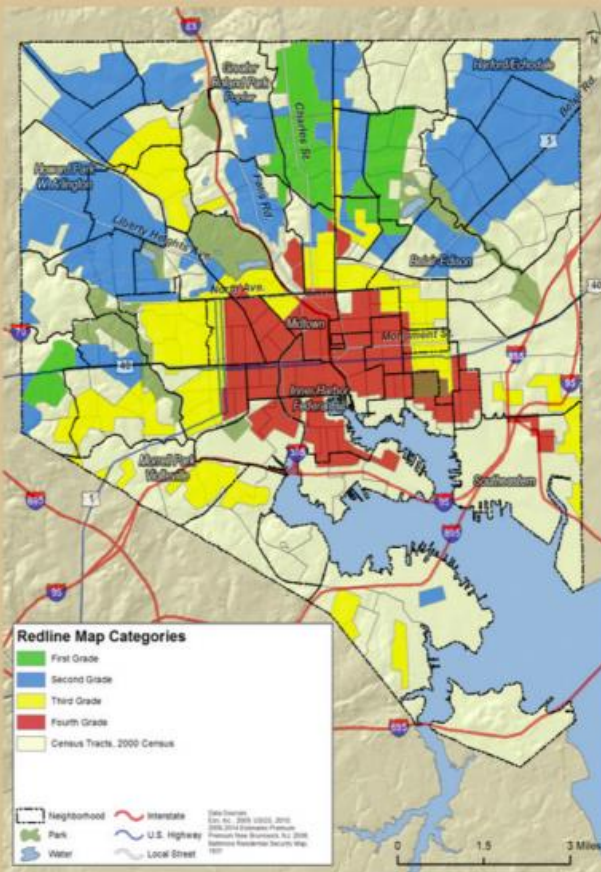
CEEJH Center
August 20, 2021



- The top map shows the **environmental racism of lead poisoning**, as most lead violations (orange dots) in Baltimore are found in census tracts home to majority Black residents.
- The other map shows the **connection between lead poisoning and redlining grades**, as most lead violations are in the yellow and red areas that were deemed least favorable for providing mortgage loans.

Asthma, Air Pollution, Environmental Justice

Figure ES-3. 2011 Comparison of Respiratory Risks from Toxic Air Pollution (left) to Asthma Hospitalization Rates (right)



Note: Bold boundaries on Respiratory Risk map highlight zip codes with the five highest asthma-related hospitalization rates in 2011.

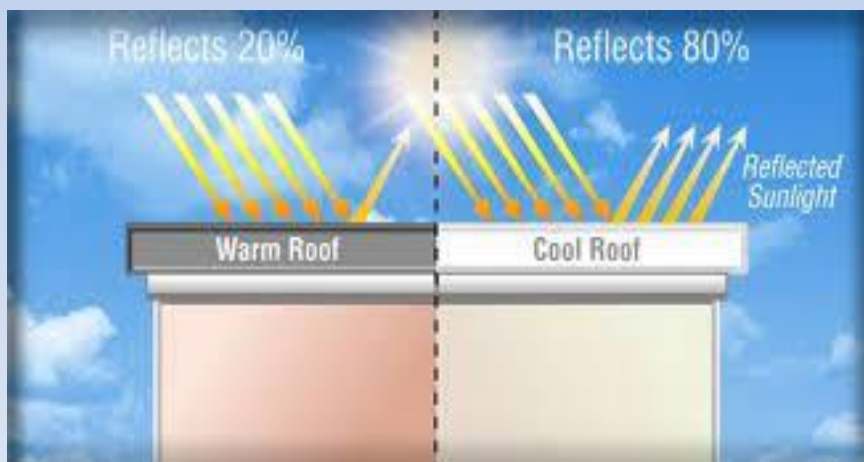
Overall, the city has an age-adjusted mortality rate 40% higher than the rest of Maryland. In 2010, the EIP found that Baltimore City's rate of asthma-related hospitalizations (40.22/10,000 residents) was ~3 times higher than the U.S. average (14.1/10,000 residents) and ~2 times higher than the state of Maryland (18.14/10,000 residents). The asthma disparity follows socioeconomic lines.

Baltimore's Urban Heat Island

Baltimore's Urban Heat Island is Ranked Among the Worst in the Nation

- Traditional building materials can increase heat in an area by 9 degrees
 - Baltimore's housing topped with Black tar, absorbs heat and exacerbates the issue
 - **East and West Baltimore can be 15 degrees hotter** than more affluent areas

The fix: Investment in low-income communities of color, installation of “cool roofs” that reflect sunlight, installation of solar panels, increasing the tree canopy



Retrieved from:

<https://newscenter.lbl.gov/2011/11/03/cool-roofs-really-can-be-cool/>

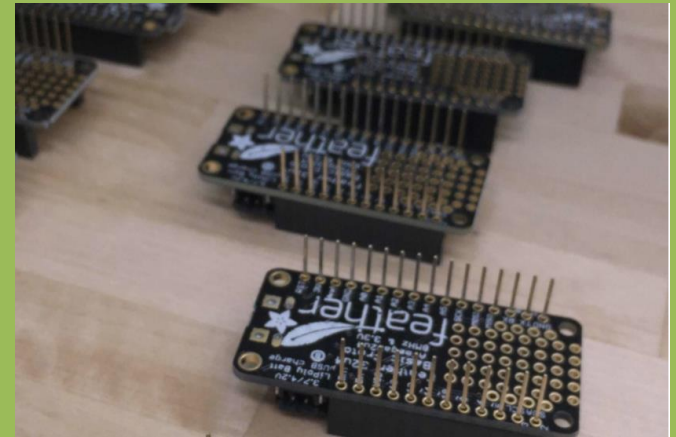


Retrieved from:

<https://www.washingtonnature.org/fieldnotes/2017-science-two-minute-takeaway-what-is-tree-canopy>

Code Red: Baltimore's Climate Divide

- University of Maryland journalists partnered with the A. James Clark School of Engineering at UMD to implement heat and humidity sensors into Baltimore homes for data collection.
- 80 sensors were built with capabilities such as measuring temperature, humidity, date, and time to be updated once a minute, and used for a period of 10 summer weeks.
- Over a dozen data sources were used in conjunction with data from these sensors to inform the study, including health and historical records.



Timothy Jacobson University of Maryland,
<https://cnsmaryland.org/interactives/summer-2019/code-red/behind-scenes.html>

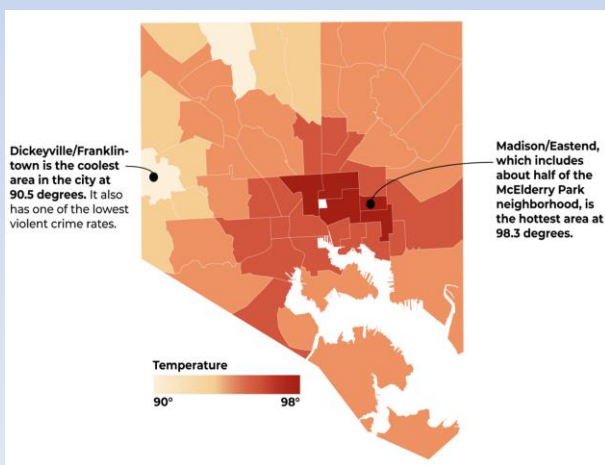
Code Red: Heat & Inequality



<https://cnsmaryland.org/interactives/summer-2019/code-red/neighborhood-heat-inequality.html>



Drastic temperature differences can be observed in city infrastructure, most often attributed to SES. Those who can afford the shadier homes experience significant comfort and security as opposed to those experiencing dangerous heat levels. President and CEO of American Forests says “The single greatest threat from climate change to people in cities is extreme heat”



With poor air quality and damaged infrastructure, the effects of climate change are exacerbated for at-risk communities, putting them even closer to harm's way. Data has shown that those living in hotter parts of the city are “more likely to be poor, to live shorter lives, and to experience higher rates of violent crime and unemployment”.

Code Red: Heat & Health

Emergency medical calls spiked in Baltimore during the summer heatwave of 2019, with increased calls for “dehydration, respiratory distress, kidney disease, diabetes complications, heart attacks, and heart failures”.

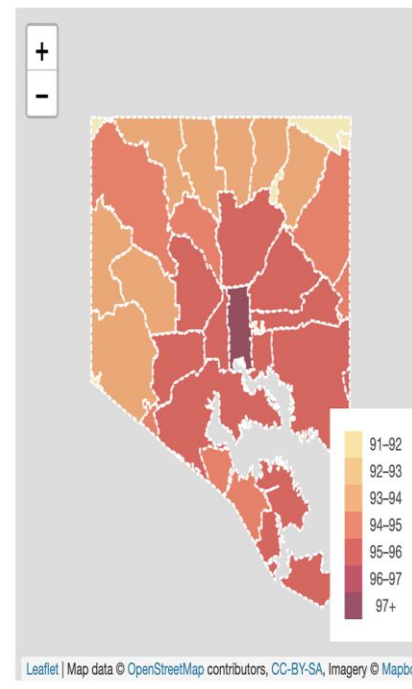
- Children and the elderly face the greatest risk for heat complications.

Despite two air conditioning units in-house, sensors recorded the indoor heat index to reach 92 degrees for one of the observed Baltimore residents. ⁷Between 2012 and 2018, there were 134 heat-related deaths in Maryland. Thirty-seven of those deaths (28%) occurred in Baltimore (62% Black), even though Baltimore accounts for 10% of the state population.

<https://cnsmaryland.org/interactives/summer-2019/code-red/heat-health.html>

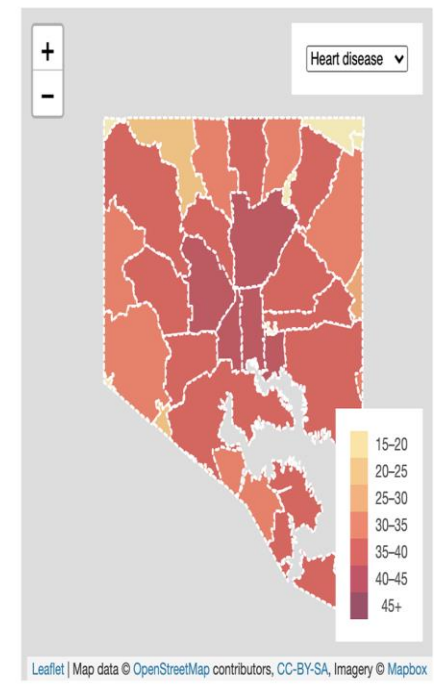
Temperature by ZIP Code

Click an area for median afternoon temperature on August 29, 2018.



Health conditions by ZIP Code

Select a health condition from dropdown to change the map



THANKS!

**COMMUNITY
ENGAGEMENT,
ENVIRONMENTAL
JUSTICE, &
HEALTH**

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Environmental Justice, & Health**

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