

## Urban Heat Vulnerability Study - JFK neighborhood

### Organizer

Sustainability | City of OKC  
The University of Oklahoma  
The University of Oklahoma Health Sciences Center  
Texas A&M University  
John F. Kennedy Neighborhood  
The EnviHealth Explorer

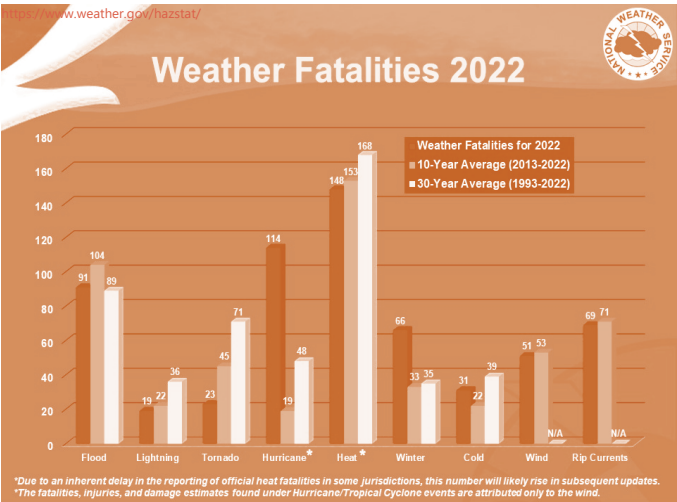
### Acknowledgement

NASA Earth Science  
NASA Applied Science  
NOAA National Integrated Heat Health Information System

Urban Heat Vulnerability Study - JFK neighborhood

About our study

How Does Heat Affect Our Health?



The U.S. Natural Hazard Statistics provide statistical information on fatalities, injuries, and damages caused by weather related hazards (<https://www.weather.gov/hazstat/>). According to Figure 1, heat is responsible to the most hazard related deaths.

Figure 1. Hazard-related fatalities in the U.S. 2022 (By National Weather Service)

Figure 2 shows rates for deaths that medical professionals have classified as being caused by a combination of cardiovascular disease (diseases of the circulatory system) and heat exposure. This graph presents summer (May to September) death rates from 1999 to 2018 for three population groups in the 50 states and the District of Columbia. The blue line shows rates for the entire population, the green line shows rates for non-Hispanic Black people, and the pink line shows rates for people aged 65 and older (<https://www.epa.gov/climate-indicators/climate-change-indicators-heat-related-deaths>).

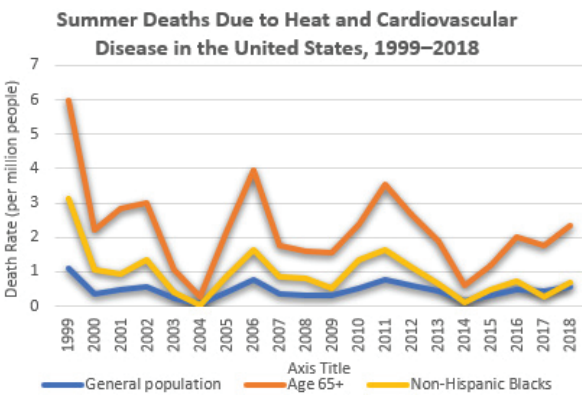


Figure 2. Summer Deaths Due to Heat and Cardiovascular Disease in the United States, 1999-2018 (By EPA)

Urban Heat Vulnerability Study - JFK neighborhood

What’s happening in OKC?

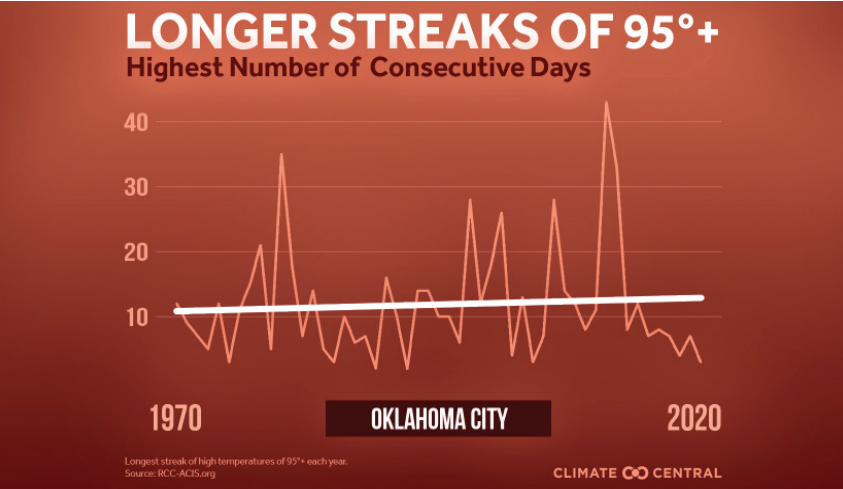


Figure 3. Highest number of consecutive days (above 95 F) of OKC (By Climate Central)

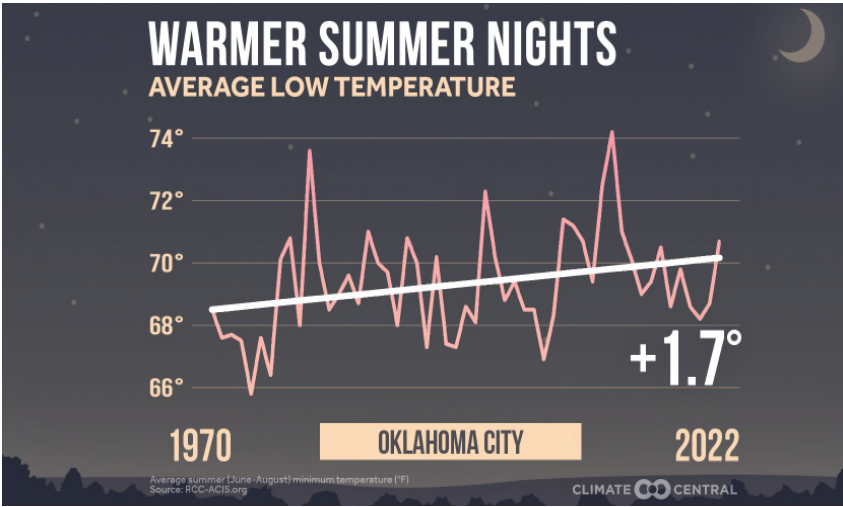
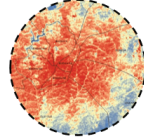
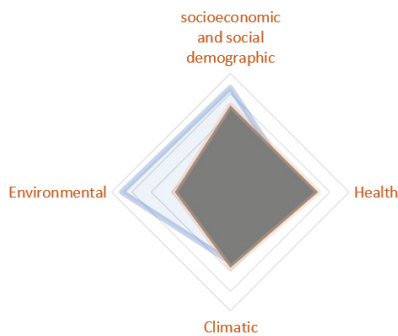


Figure 4. Summer average low temperature of OKC (By Climate Central)

# Urban Heat Vulnerability Study - JFK neighborhood

## About our study

### OKC Heat Vulnerability Index



#### Sensitivity

- Socioeconomic factors
- Demographic factors
- Health conditions

#### Adaptive Capacity

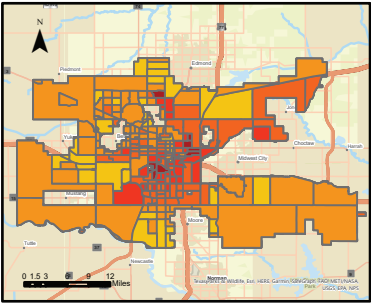
- Urban morphology
- Living conditions

#### Exposure (measured)

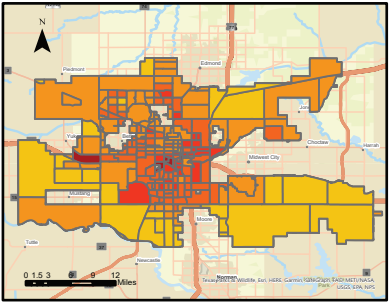
- Meteorological data
- Land surface temperature
- Human physiological and physical factors

*Vulnerability = Sensitivity + Exposure + Adaptive Capacity*

Oklahoma City Heat Vulnerability Index (HVI) 2015



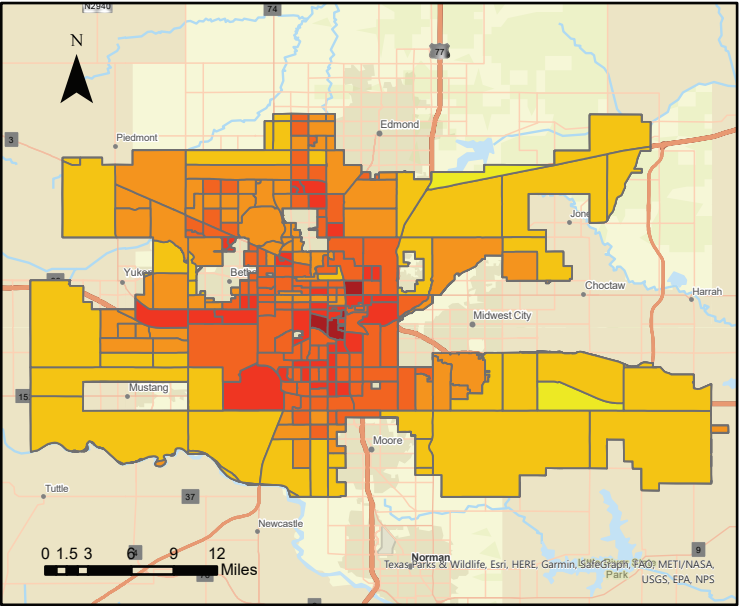
Oklahoma City Heat Vulnerability Index (HVI) 2016



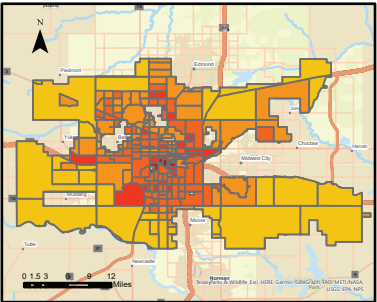


Urban Heat Vulnerability Study - JFK neighborhood

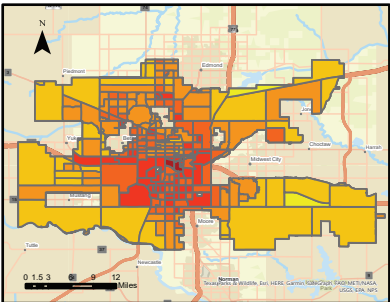
Oklahoma City Heat Vulnerability Index (HVI) 2020



Oklahoma City Heat Vulnerability Index (HVI) 2017



Oklahoma City Heat Vulnerability Index (HVI) 2019



## Urban Heat Vulnerability Study - JFK neighborhood

### About our study

#### Sensitivity

*Young kids and elders, female, low-income, low education level, living alone, minority, unemployment, rent house, no vehicle, language barrier, no insurance, disability, specific illness\**



##### Children

- Smaller body mass to surface area ratio than adults
- Lose more fluid quickly
- Limited ability to communicate discomfort



##### Elders

- Limited ability to regulate temperature effectively
- Limited ability to respond to changes in temperature
- Chronic health conditions
- Reduced mobility



##### Female

- Higher rates of certain chronic health conditions
- Hormonal differences
- Higher body fat rate



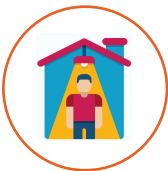
##### Low-income

- Inadequate housing conditions
- Limited mobility and transportation
- Residence in urban heat islands



##### Low-education level

- Limited awareness of heat-related risks
- Lack of access to information
- Limited problem-solving and decision making skills



##### Living alone

- Limited social support and monitoring
- Lack of awareness or education
- Psychological factors: feelings of isolation may impact mental well-being and cognitive functioning



## Urban Heat Vulnerability Study - JFK neighborhood

### Sensitivity



#### Minority

- Cultural and linguistic barriers
- Disproportionate exposure to urban heat islands
- Higher levels of poverty and limited access to resources



#### Unemployment

- Inadequate housing conditions
- Limited access to cooling centers
- Social isolation, increased stress, anxiety, and depression



#### Language Barrier

- Limited access to information and resources
- Limited communication with healthcare providers
- Limited social support



#### No insurance

- Limited access to health care and medication
- Inability to afford preventive measures



#### Rent house

- Limited financial resources
- Restrictions on modifying the rental property
- Inadequate housing conditions



#### No vehicle

- Limited mobility to cooling options
- Longer exposure to heat



Urban Heat Vulnerability Study - JFK neighborhood

About our study

Sensitivity



- Disability
- Impaired thermoregulation
  - Limited mobility and access to cooling resources
  - Medications and underlying health conditions
  - Communication and cognitive challenges



- Chronic diseases
- Diabetes, asthma, high blood pressure, obesity, COPD (Chronic obstructive pulmonary disease), CHD (Congenital heart disease), mental health



Physical characteristics



Physiological characteristics



Communication



Mobility



Living Condition



Well-being



Information



Problem solving



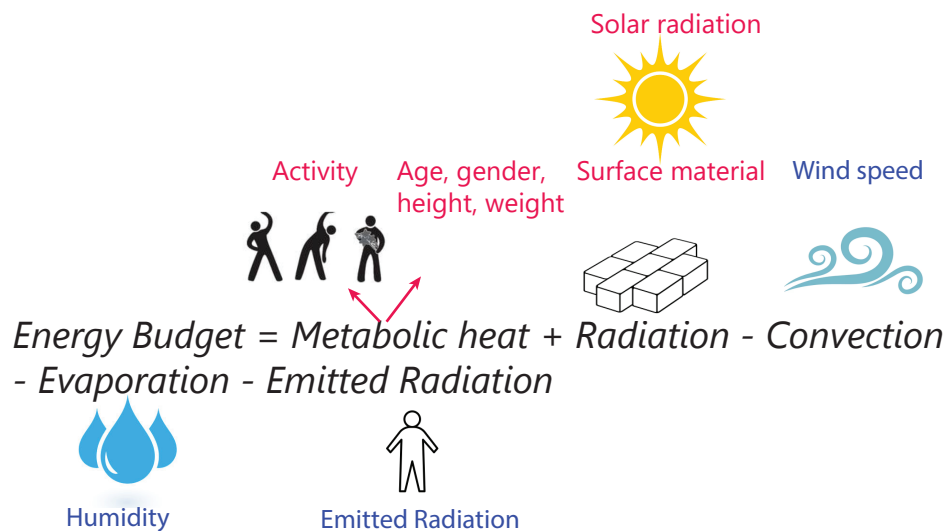
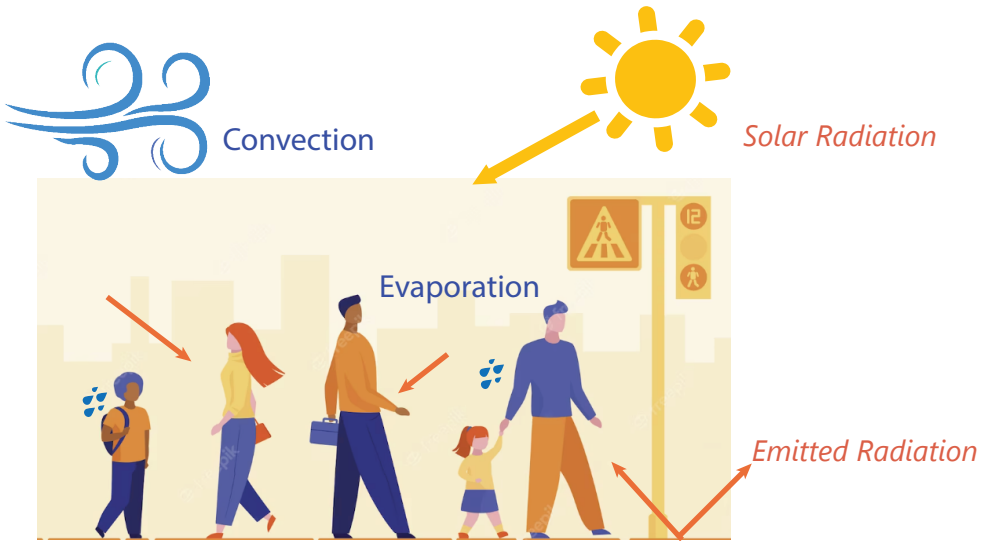
Social resources

Urban Heat Vulnerability Study - JFK neighborhood

About our study

Exposure

Air temperature, humidity, wind speed, solar radiation, land surface temperature, surface material and albedo



# Urban Heat Vulnerability Study - JFK neighborhood

## About our study

*Adaptive Capacity* Green and water space area, distance to cooling facilities, density and healthy of vegetation, urban density, electricity supply, communication technologies



- Small green and water area
- Urban heat island effects
  - Lack of shade, reduced evaporative cooling, increased heat absorption



- Long distance to cooling facilities (shopping mall, public library, school,
- Health risks for vulnerable populations
  - Heat exposure during travel
  - Limited respite from heat



- High density and healthy of vegetation
- Shades, transpires moisture, and releases oxygen



- High paved road density
- Increased heat absorption of heat
  - Reduced natural cooling
  - Limited space for green infrastructure



- High building density
- Reduced airflow and ventilation
  - Heat trapping
  - Increased energy consumption



- No access to internet
- Limited access to online resources for heat mitigation
  - Reduced access to social support networks
  - Impaired communication during emergencies



Adaptive Capacity



- No computer
- Limited access to heat-related information
  - Impaired communication during emergencies




- No phone
- Limited access to heat-related information
  - Impaired communication during emergencies



 Information

 Help

 Social resources



Natural environment



Built environment



Transportation



Living Condition



Energy consumption



Communication

# How to protect yourself under heat?

## Prepare for heat

Identify **cool places in your community** where you can go to get cool such as libraries and shopping malls



Prepare enough **water**



Check your **car!**



## Be SAFE during HEAT

Use **water!**



Drink water, cool your wrist, chest, neck and temple

**Bright colors!**



Wear white or bright color clothes!

**Cool** your room!

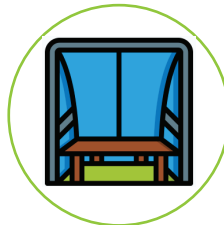


Cover windows with drapes or shades. Shut windows and curtains.

Less **activities and eat**



Find a **shelter!**





## Urban Heat Vulnerability Study - JFK neighborhood

### About our team



We are a group of researchers focusing on environmental health study. Our research area include thermal comfort, indoor/outdoor air quality, urban climatology, community engagement, community and urban design, health and medical geography.

Please contact us at [Envi-health@ouhsc.edu](mailto:Envi-health@ouhsc.edu)

**WE CARE ABOUT OUR CITY AND COMMUNITIES!**

