From the Pump Handle to Hazardous Waste: Mapping Environmental Health and Justice

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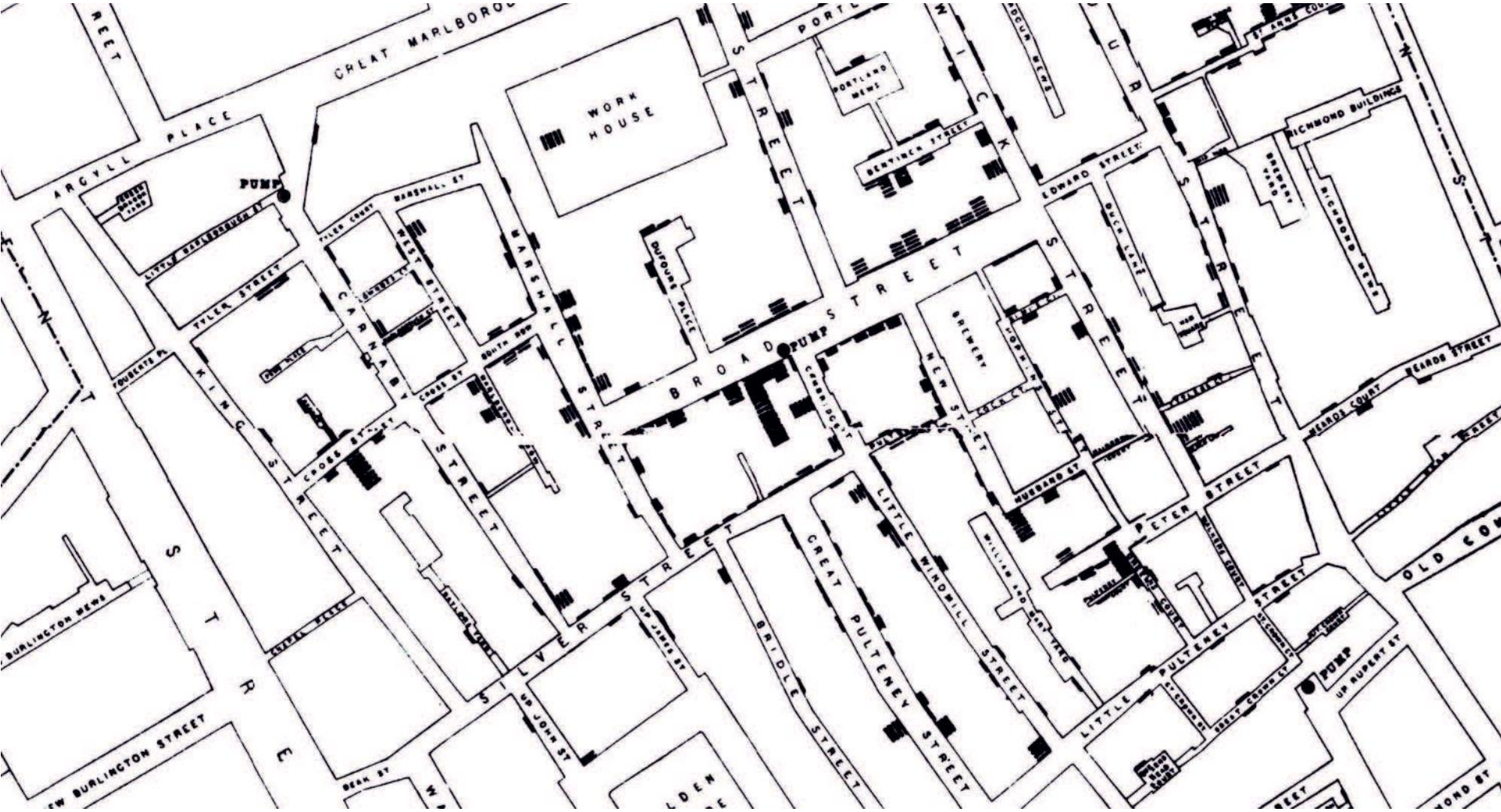
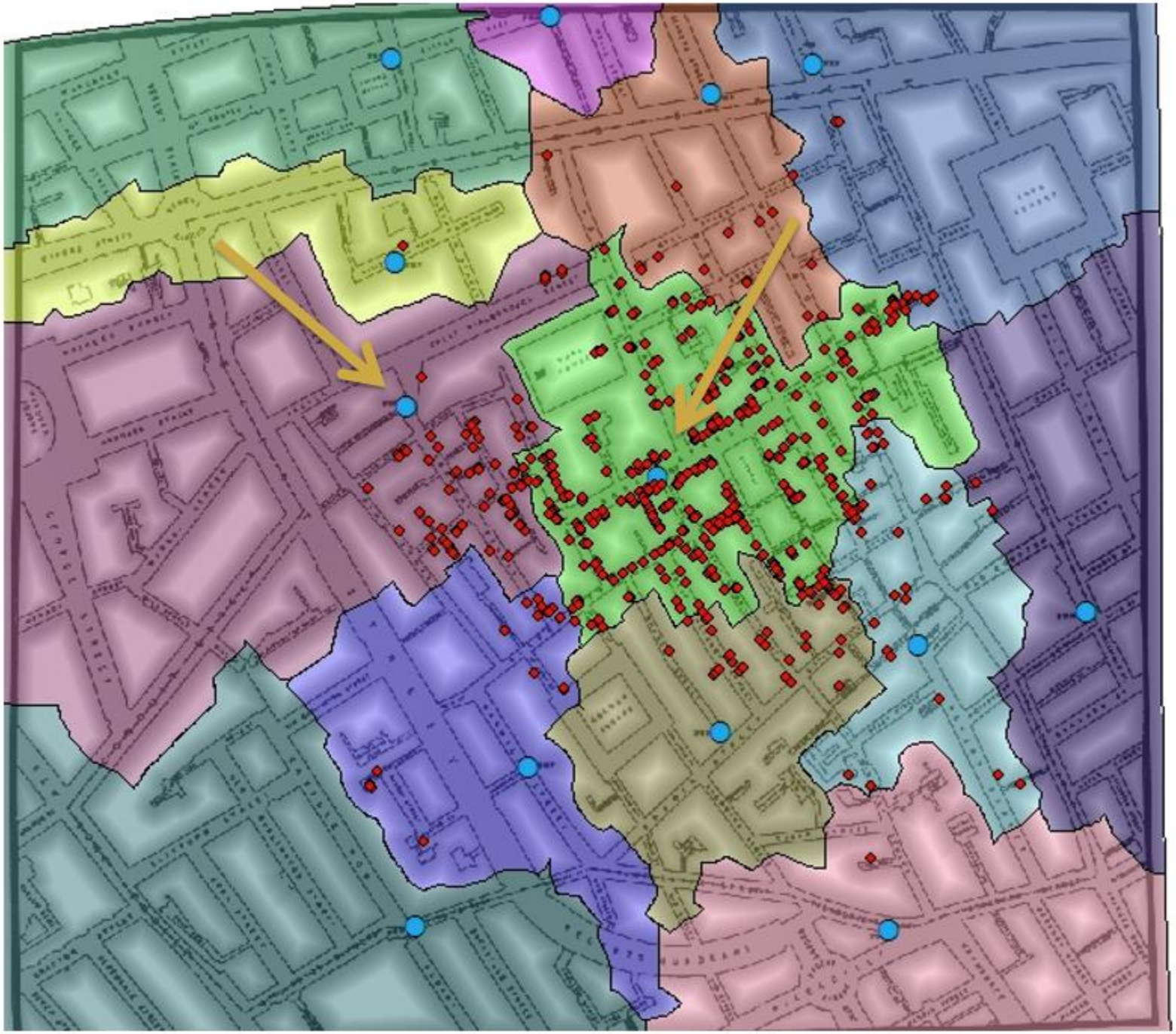
Overview

- Mapping exposures: John Snow and the ArcGIS of time
- Environmental Justice: a movement based on unjust spatial distribution of exposures and health impacts
- Community mapping for environmental health: examples
- Climate Justice: an opportunity to engage communities on health promotion as well as risk mitigation

John Snow's Map of Cholera, Soho, 1854

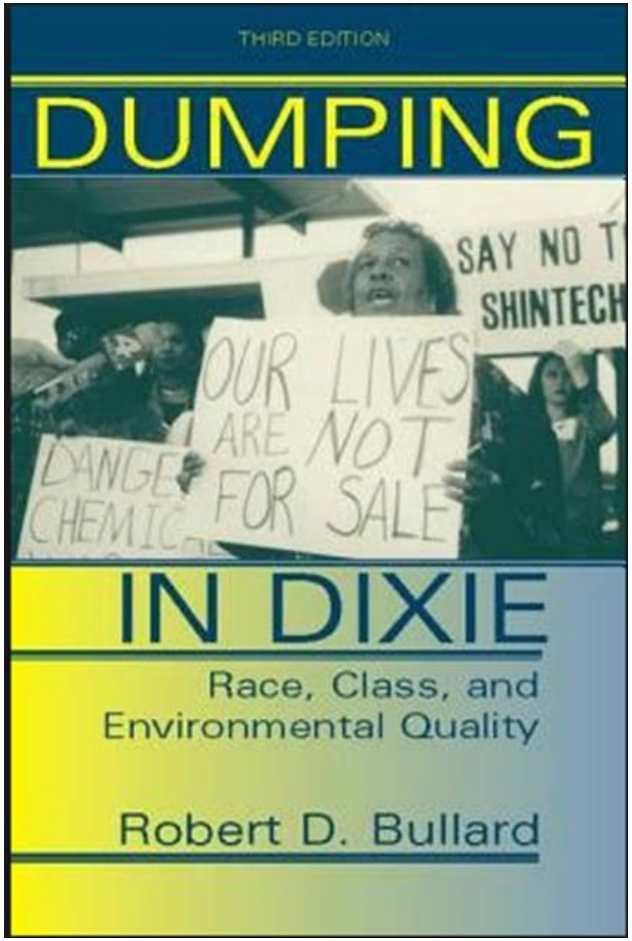




Source: GIS Analyses of Snow's Map

Early Environmental Justice (EJ) Research

- Dr. Robert Bullard studied spatial locations of municipal solid waste facilities in the 1970's
- Found communities co-located with hazardous waste sites in:
  - Houston, Texas
  - West Dallas, Texas
  - Institute, West Virginia
  - Alsen, Louisiana
  - Emelle-Sumter County, Alabama



Warren County, North Carolina (1982)

The first EJ movement

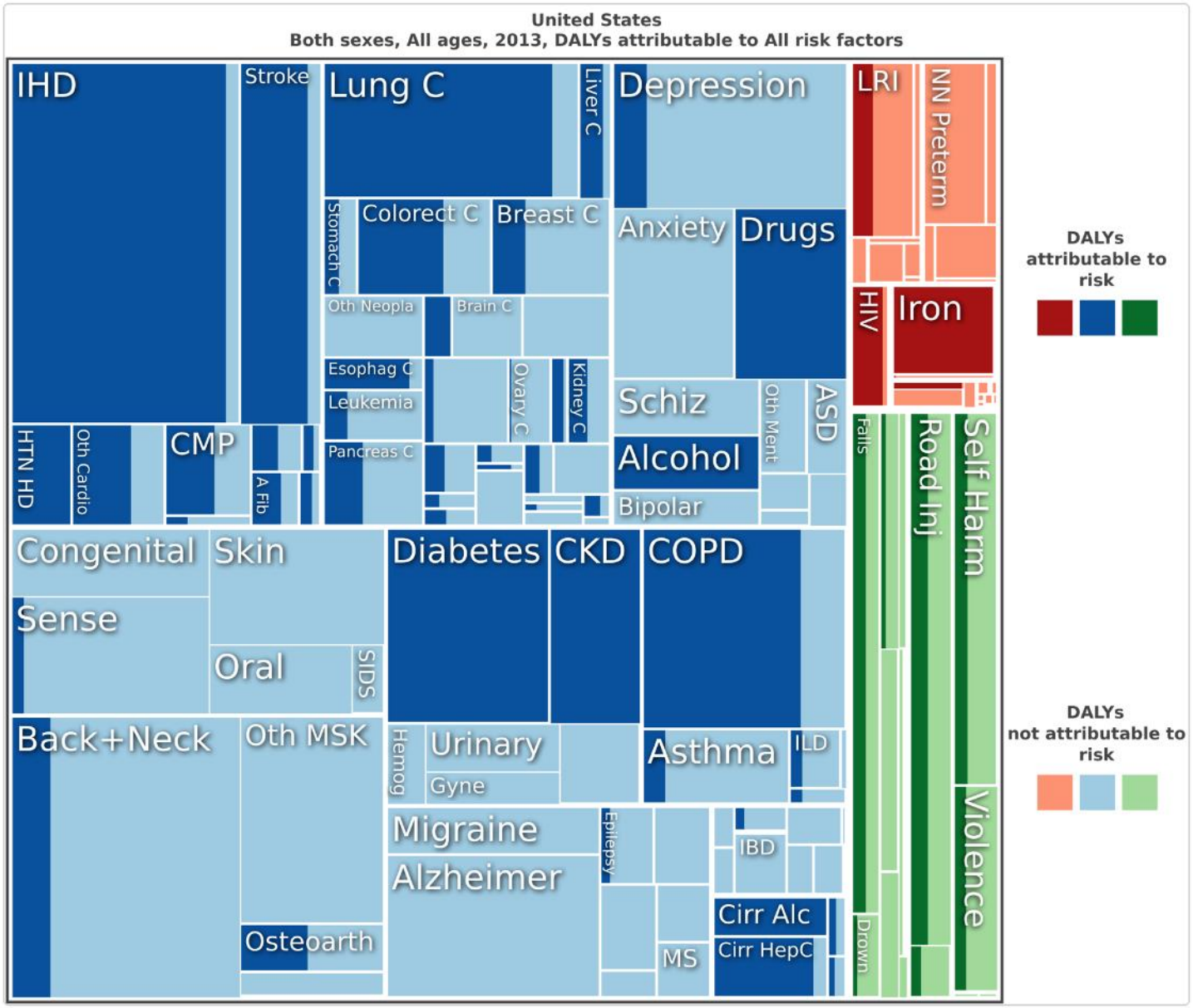
- Residents of Warren County, North Carolina organized against the siting of a hazardous waste landfill.
- A followup 1983 GAO report found that landfills were disproportionately sited in communities with greater percentages of minority and low-income populations

EJ and Health Disparities Today

Unequal life expectancy based on neighborhood

Courtesy of Robert Wood Johnson Foundation: Metro Map: Washington, D.C.

Snapshot of US Burden of Disease and Risks, IHME



Source: Institute for Health Metrics and Evaluation, Snapshot of U.S. Burden of Disease and Risks

Dr. Karen DeSalvo, “Public Health 3.0”

“Your ZIP code is more important to your health than your genetic code”

Using community-based mapping and monitoring to reduce air pollution

CALIFORNIA ENVIRONMENTAL HEALTH TRACKING PROGRAM

COMITE CIVICO DEL VALLE, INC

This project funded by **National Institute of Environmental Health Sciences** grant R01ES022722

SCHOOL OF PUBLIC HEALTH
UNIVERSITY of WASHINGTON

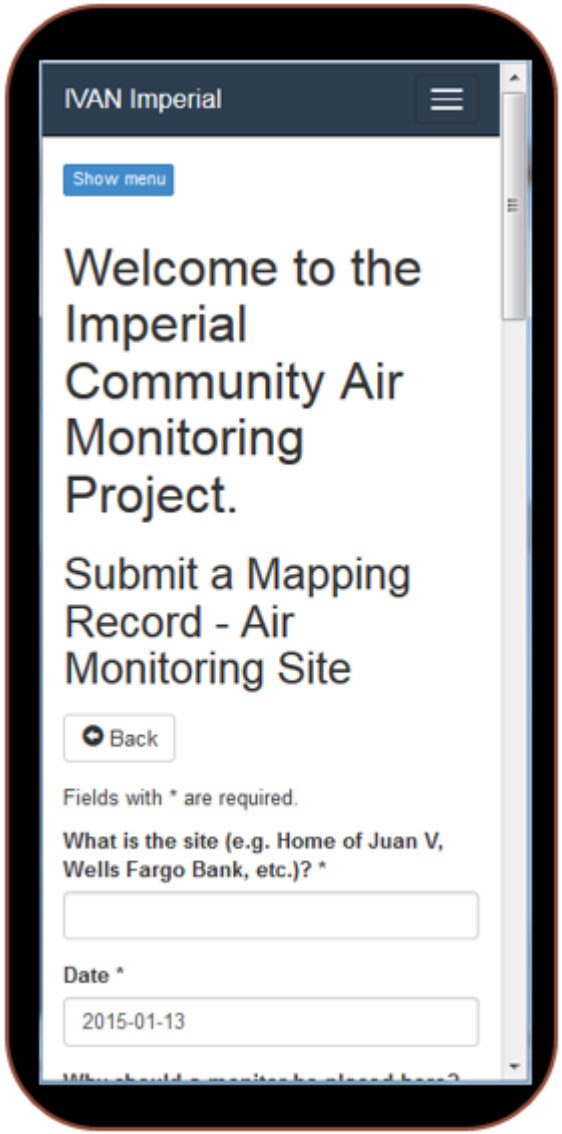
Next generation air sensor technology

- Low cost portable air monitors provide new opportunities for community monitoring
  - Modified Dylos particle counter with 4 size bins
  - PM2.5 and PM10
  - Wireless connectivity for real-time reporting
  - Custom shelters to protect from extreme weather

- Community priorities
  - Produce data that is useful for personal and community actions
  - Use data to reduce air pollution levels and exposures

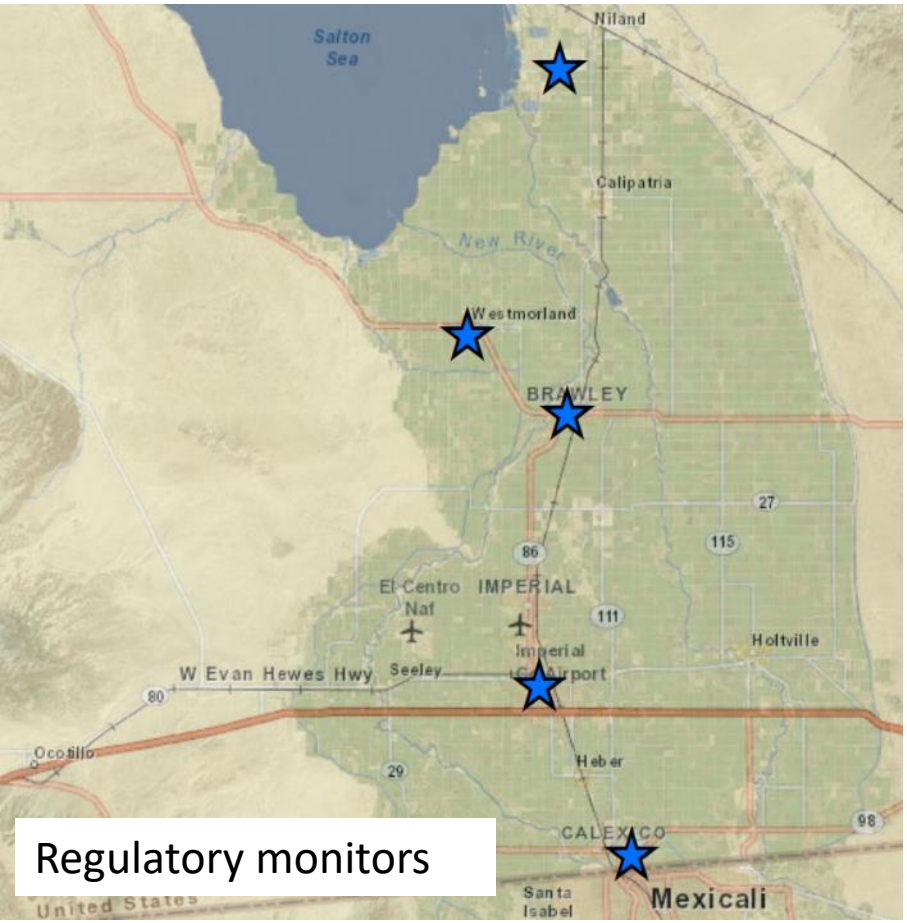
- Scientific/technical priorities
  - Produce scientifically accurate data
  - Assess ability of monitors/network to provide data that better identifies local air pollution trends and hotspots

Data collection with community mapping tool

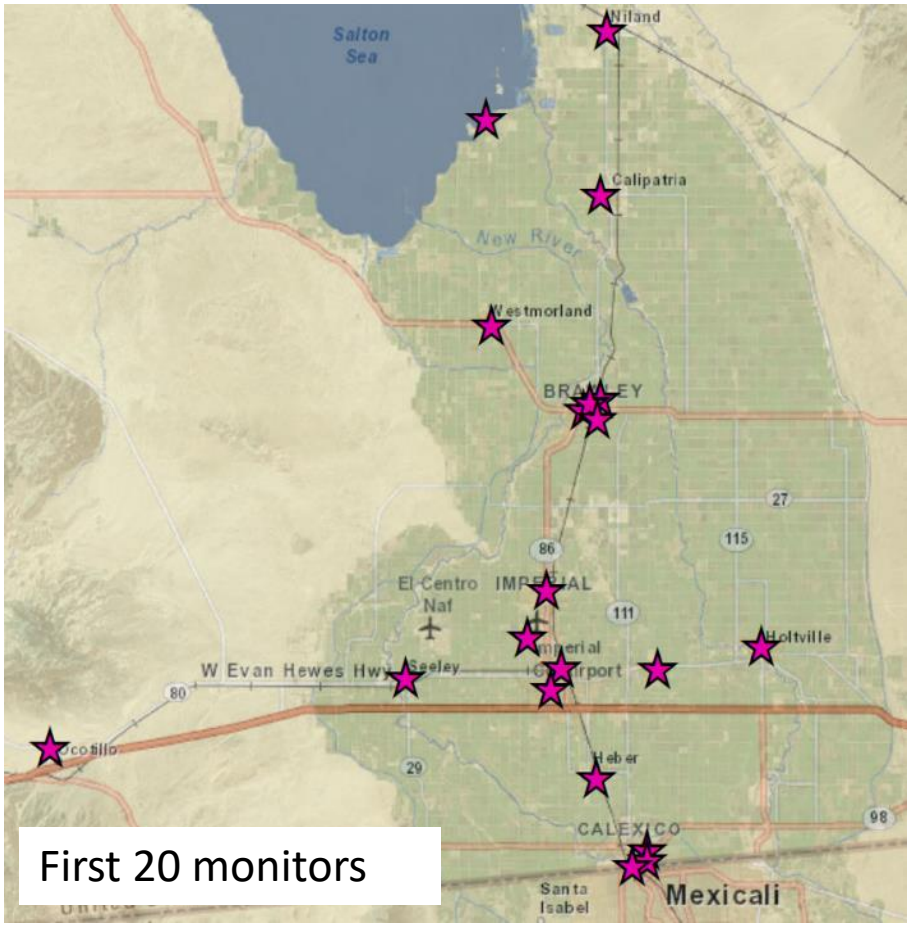


Identifying Violations Affecting Neighborhoods (IVAN)

- Innovative crowd-sourcing mapping tool
- Designed by/for residents to report EH violations
- Modified to enable data collection for project



Regulatory monitors



First 20 monitors

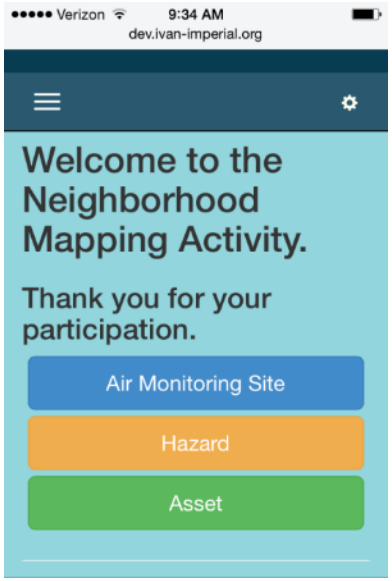
The sites selected for the first 20 monitors

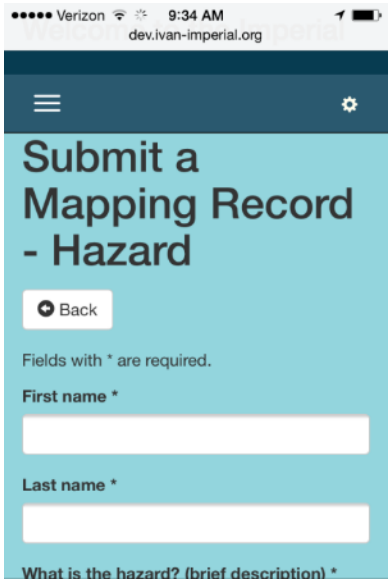
- **14** public schools (including a colocation with a regulatory monitor)
- **2** government buildings
- **2** private residences
- **1** business
- **1** national wildlife refuge (colocation with irrigation district monitor)

Neighborhood hazard and asset mapping

Purpose and process

- Separate but complementary activity from air monitoring
  - Allow participants to identify, learn about, and take action on other environmental health concerns
  - Learn about and gain experience in community action planning prior to developing strategies in response to air monitoring results
  - Keep participants engaged during “inactive” monitor deployment and testing period
  - Data generated may inform placement of remaining monitors
- Initial review of existing hazard and asset data informed CSC’s selection of project’s priority communities
- 45 participants collected data
  - Environmental hazards and community assets
  - As encountered over a week-long period
  - Using IVAN mobile web tool (more later)





Mapping results: hazards

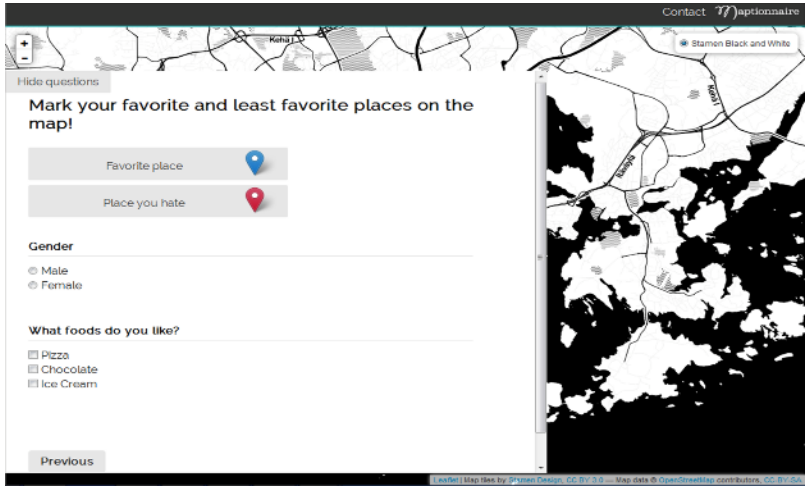
Hazard Topics	Examples
Pesticides	• smell of pesticides
Air pollution source	• farming agricultural dust • burning field
Trash/solid waste	• burned out home • abandoned home
Toxic substance	• auto body repair shop next to daycare center
Polluted water	• street drainage • contaminated canals
Noise	• off-road vehicle activity • wind turbines
Other	• traffic safety issues • loose dogs

Mapping results: assets

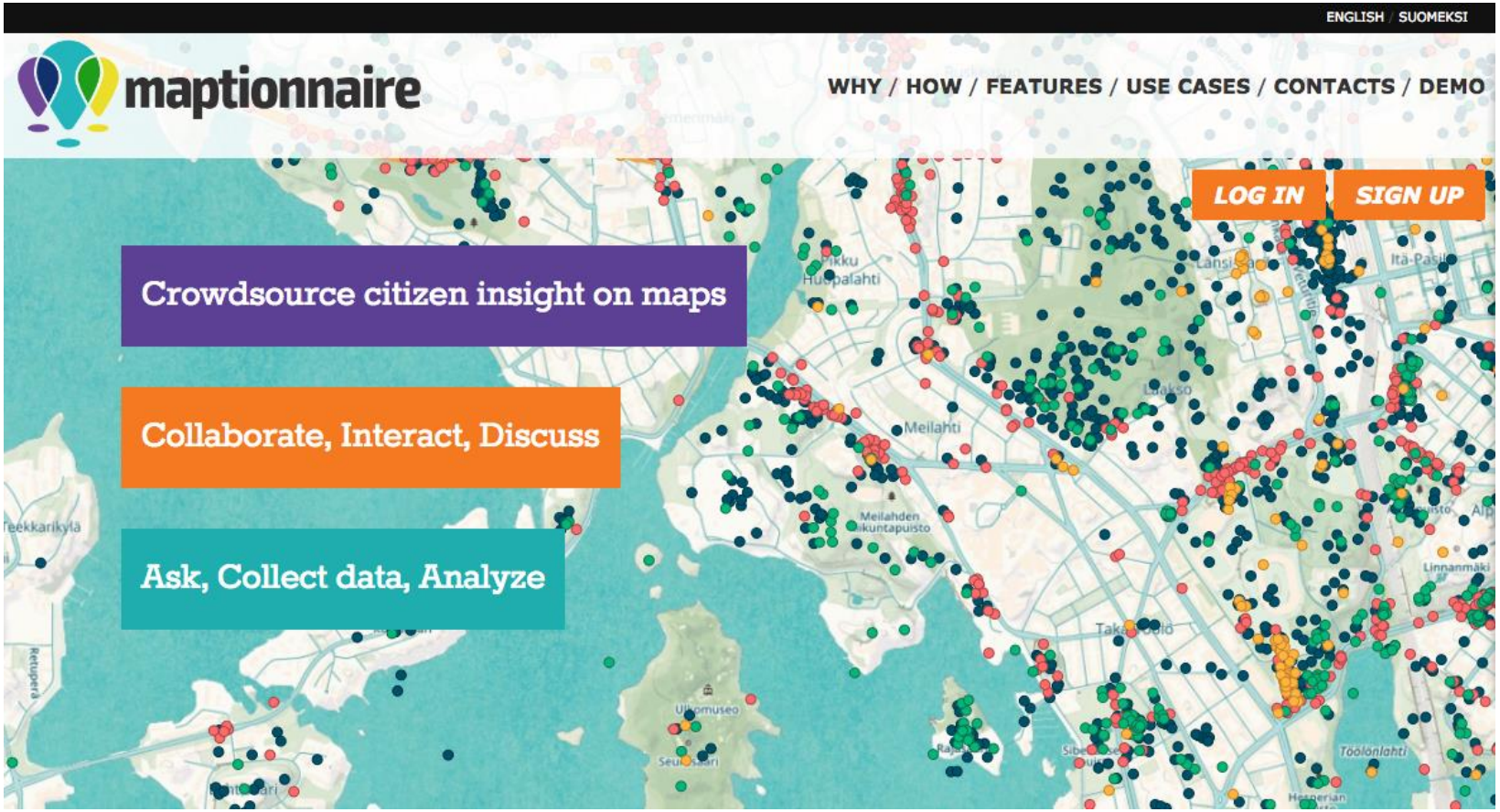
Asset Topics	Examples
Provides services	• public transportation • hospital, clinic
Has expertise to offer	• fire department • Lions center
Serves vulnerable population	• groundwater basin • community center
Has political influence	• library (parents meet weekly) • city hall
Provides economic opportunities	• employment services center • chamber of commerce
Other	• parks • church bulletin • good schools

Soft-GIS: an innovative tool for community input

- Pioneered in Finland by Aalto University and Mapita
- Adds layer of geospatial qualitative data
- Currently Esri-based
- “4P” Approach: Public, Private, People, Partnership



"Crowdsource citizen insight"….



Source: Maptionnaire.com

"Crowdsource citizen insight"…., Continued

ENGLISH / SUOMEKSI

maptionnaire

WHY / HOW / FEATURES / USE CASES / CONTACTS / DEMO

to get from ideas to insight in 4 easy steps?

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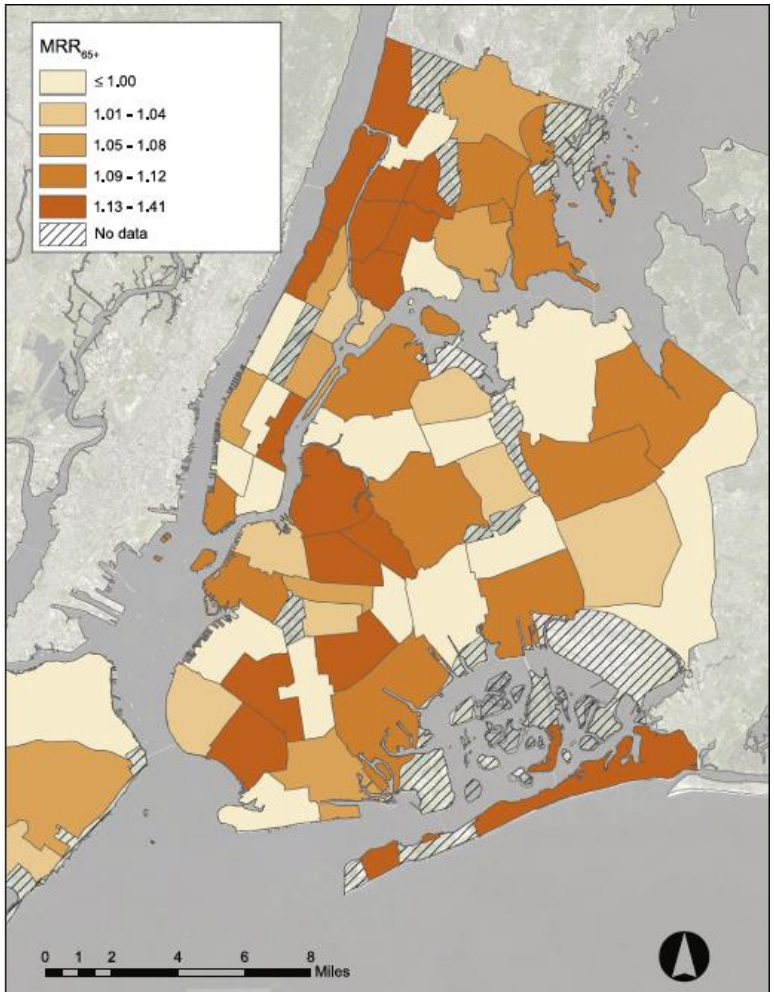
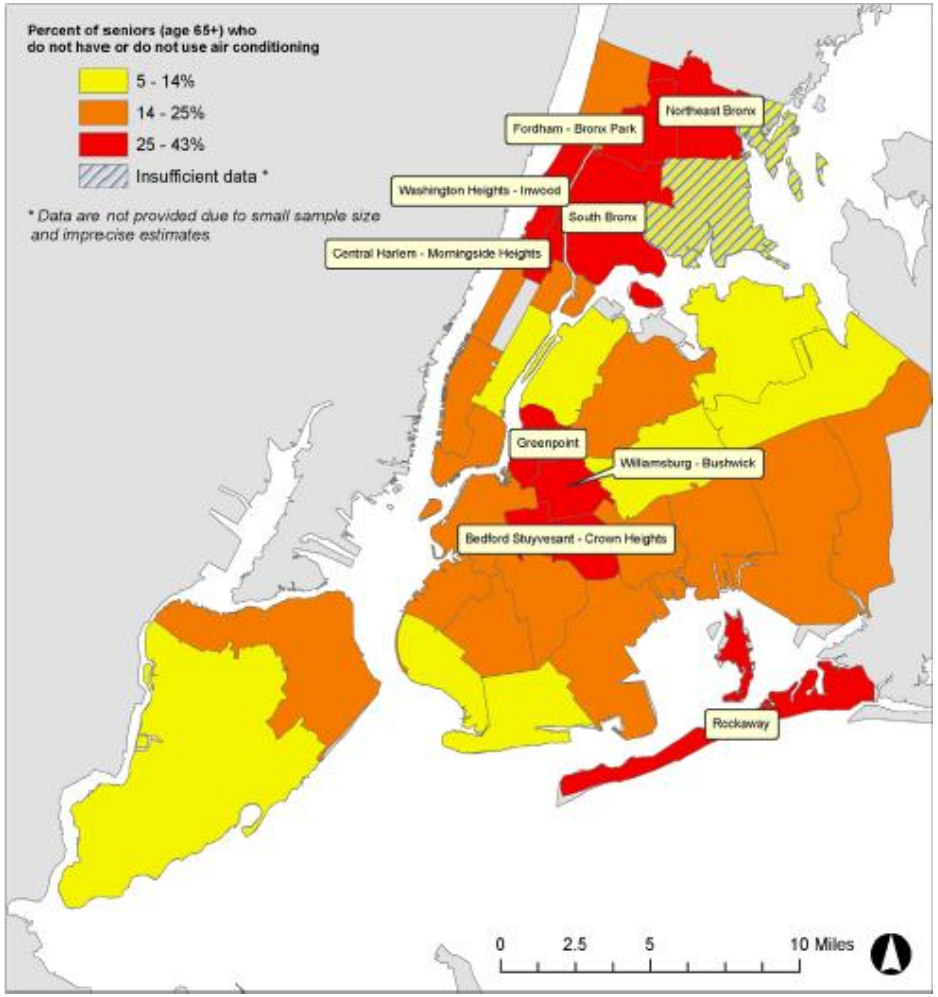
Heat: mortality in NYC linked to lack of air conditioning



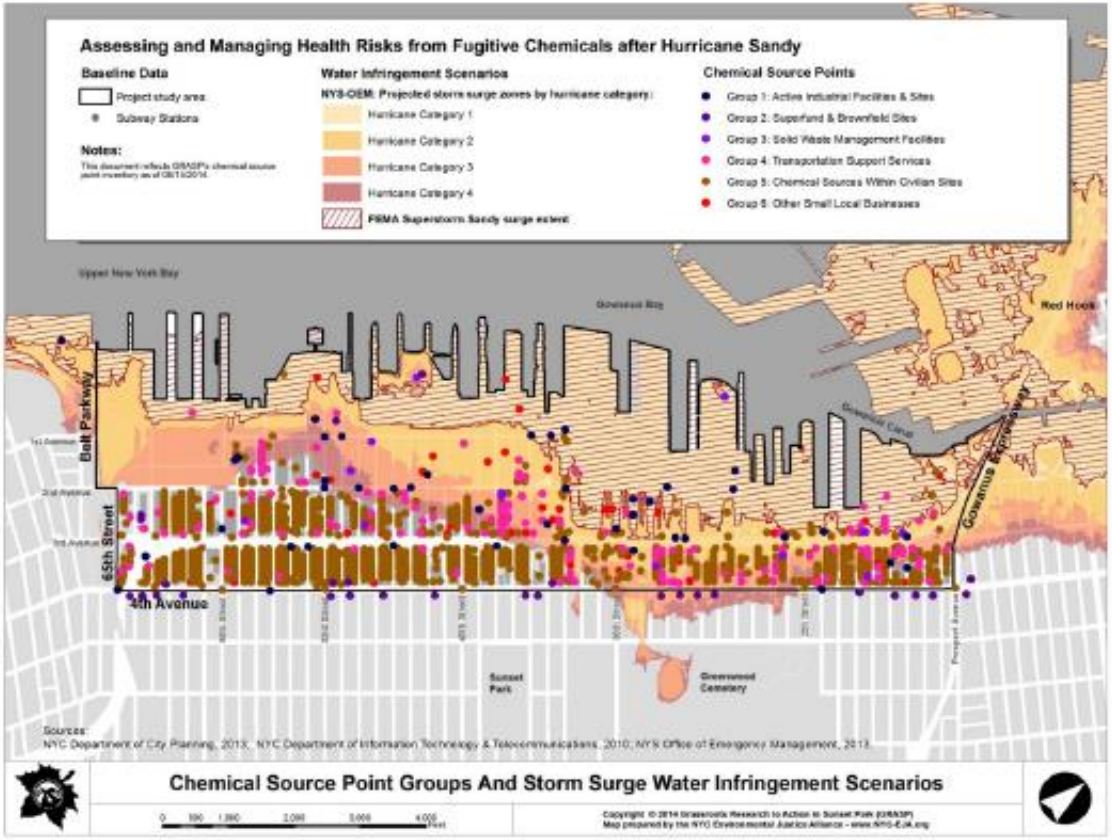


Klein Rosenthal et al., 2014. Intra-urban vulnerability to heat-related mortality in New York City, 1997–2006

Climate Justice and Community Resiliency Center

- Organize block by block
- Facilitate community-based resiliency planning
- Help business become climate adaptable
- Develop renewable energy facilities
- Promote storm water management infrastructure

Community-based research



- Over 2,200 chemical source points mapped within study area
- Chemical source points maps overlaid to 9 different water infringement scenarios:
  - 5 storm surge scenarios
  - 4 flooding scenarios

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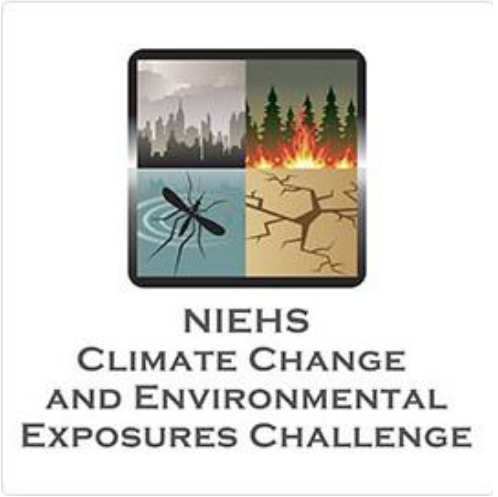
RAND CORPORATION
GRASSROOTS RESEARCH TO ACTION IN SUNSET PARK

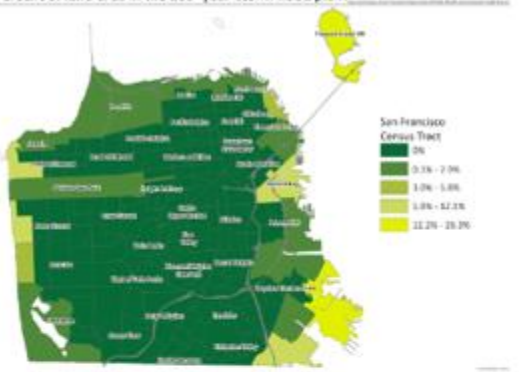
The NIEHS Climate Change and Environmental Exposures Challenge

- Goal: To help decision makers around the country understand and address climate change's effects on environmental health by:
  - **Creating data visualization tools and maps that connect current science on climate change to the exposure pathways for environmental hazards and risks.**
- Five winners selected in 2016
- Tools available at U.S. Climate Resilience toolkit

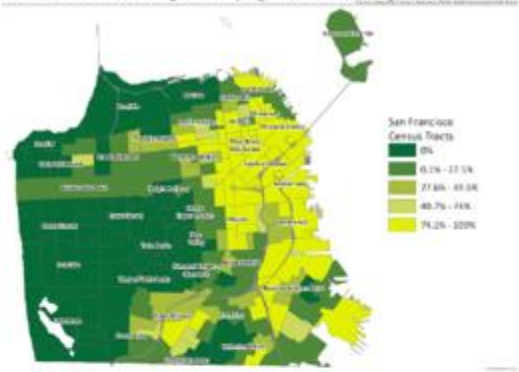


The San Francisco Climate and Health Profile

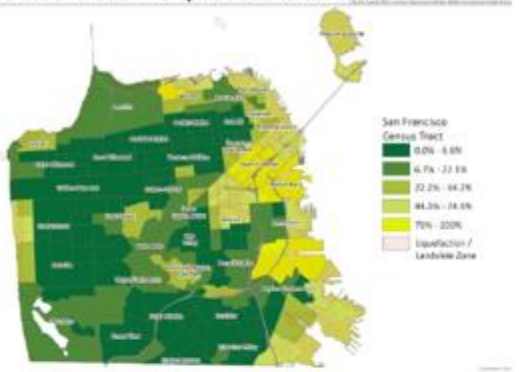
Percent of land area in the 100- year-storm flood plain



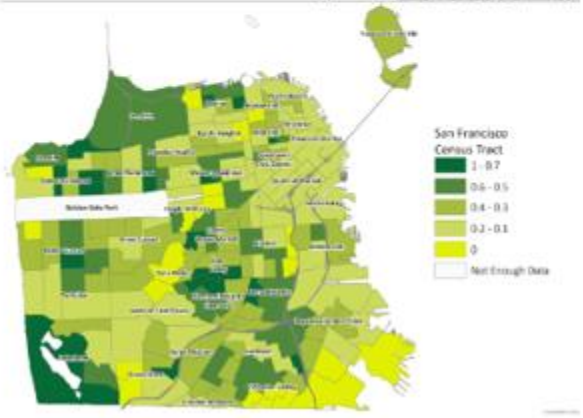
Percent of land-area in 'high' or 'very high' heat vulnerability zones



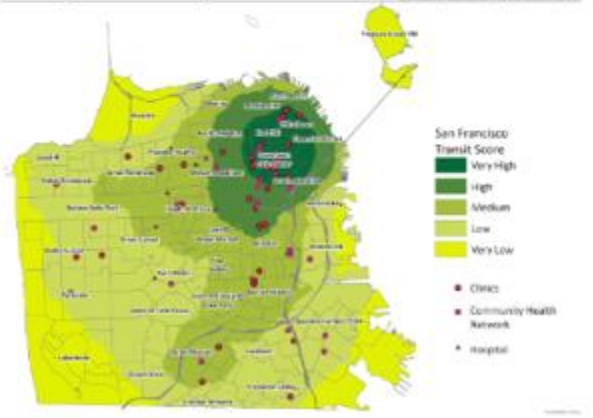
Percent of land-area in a liquefaction or landslide zone



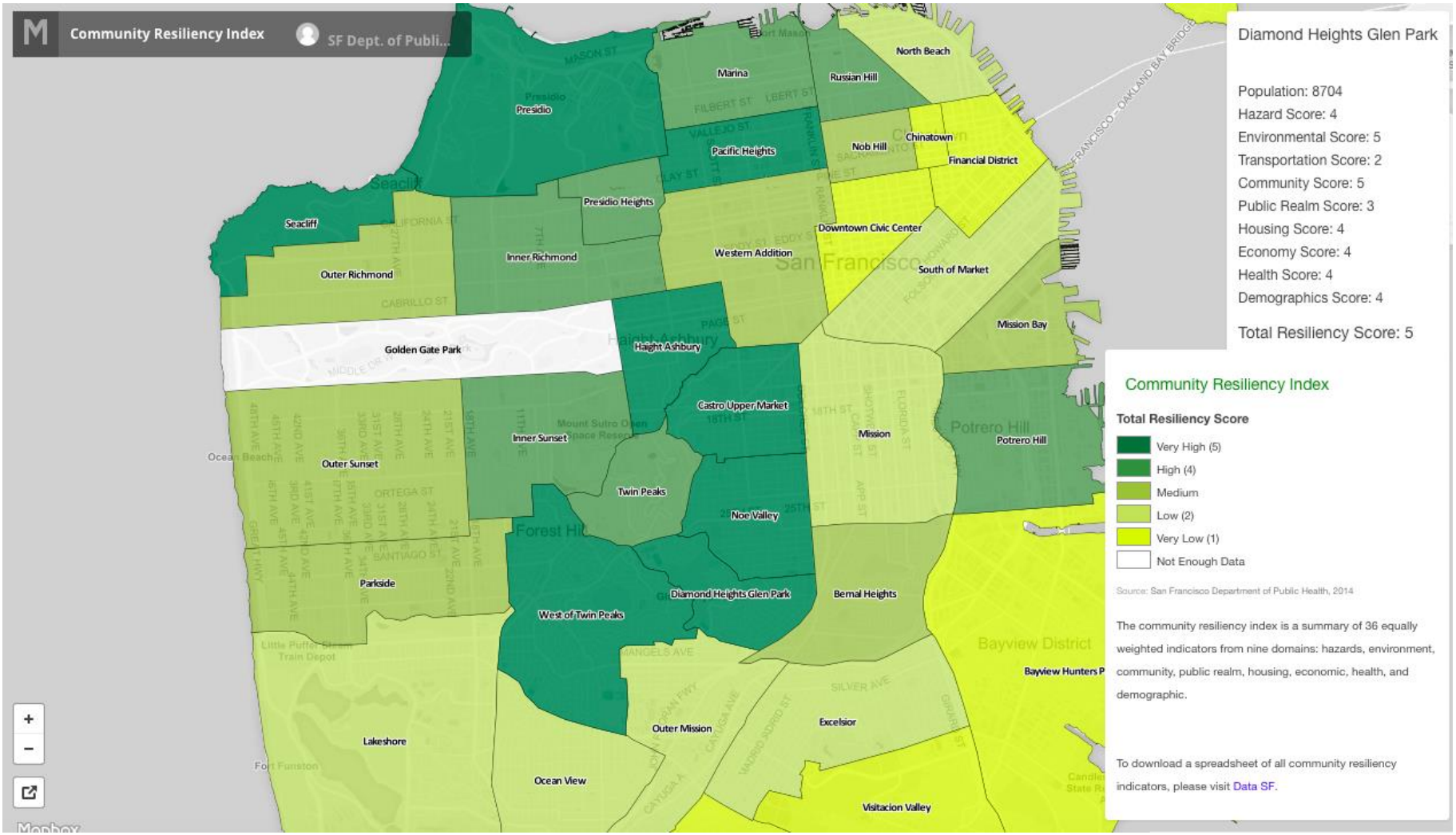
Shelters and cooler centers within .25 miles, per 1000 people (day population)



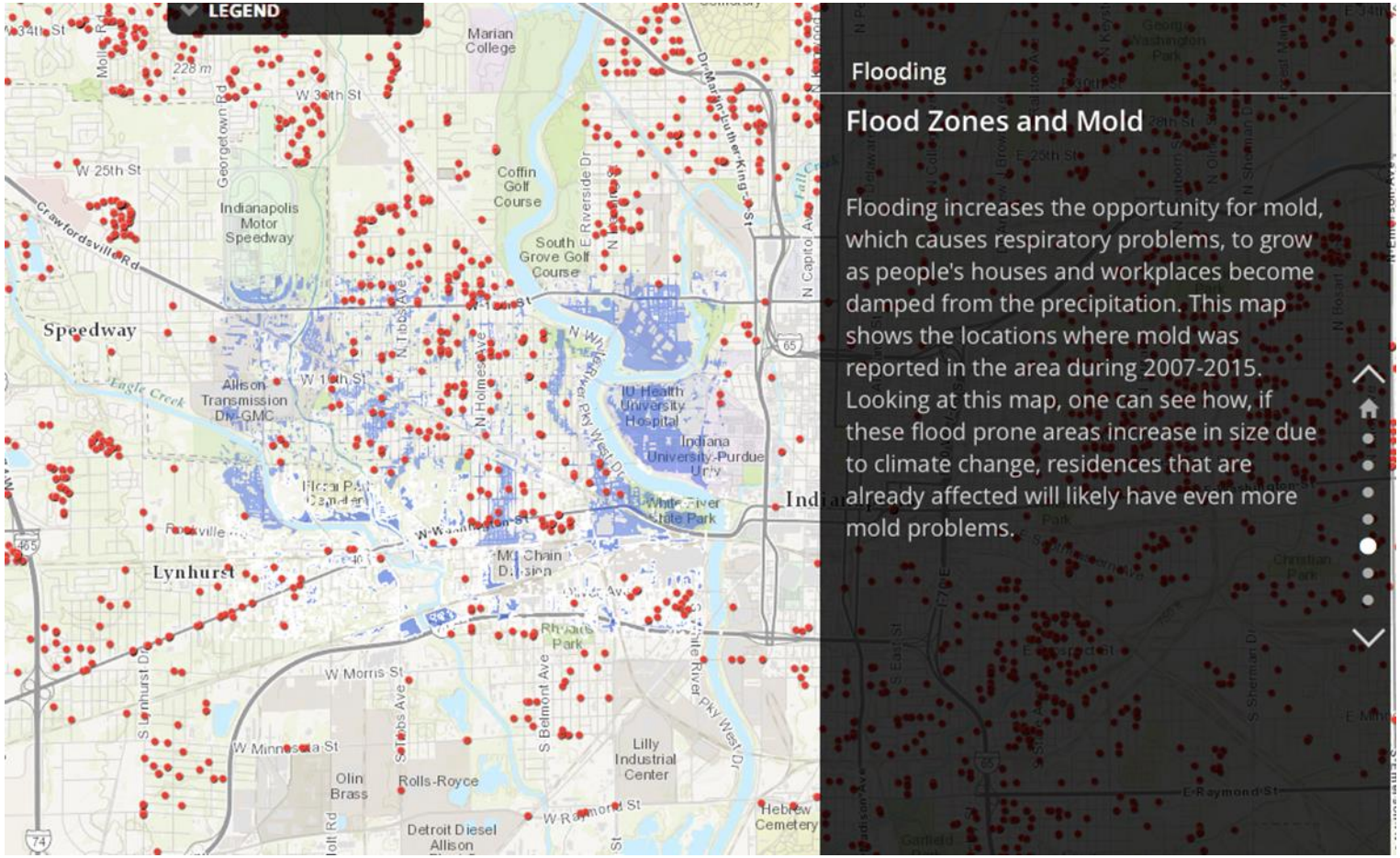
Proximity and Access to Hospitals and Clinics



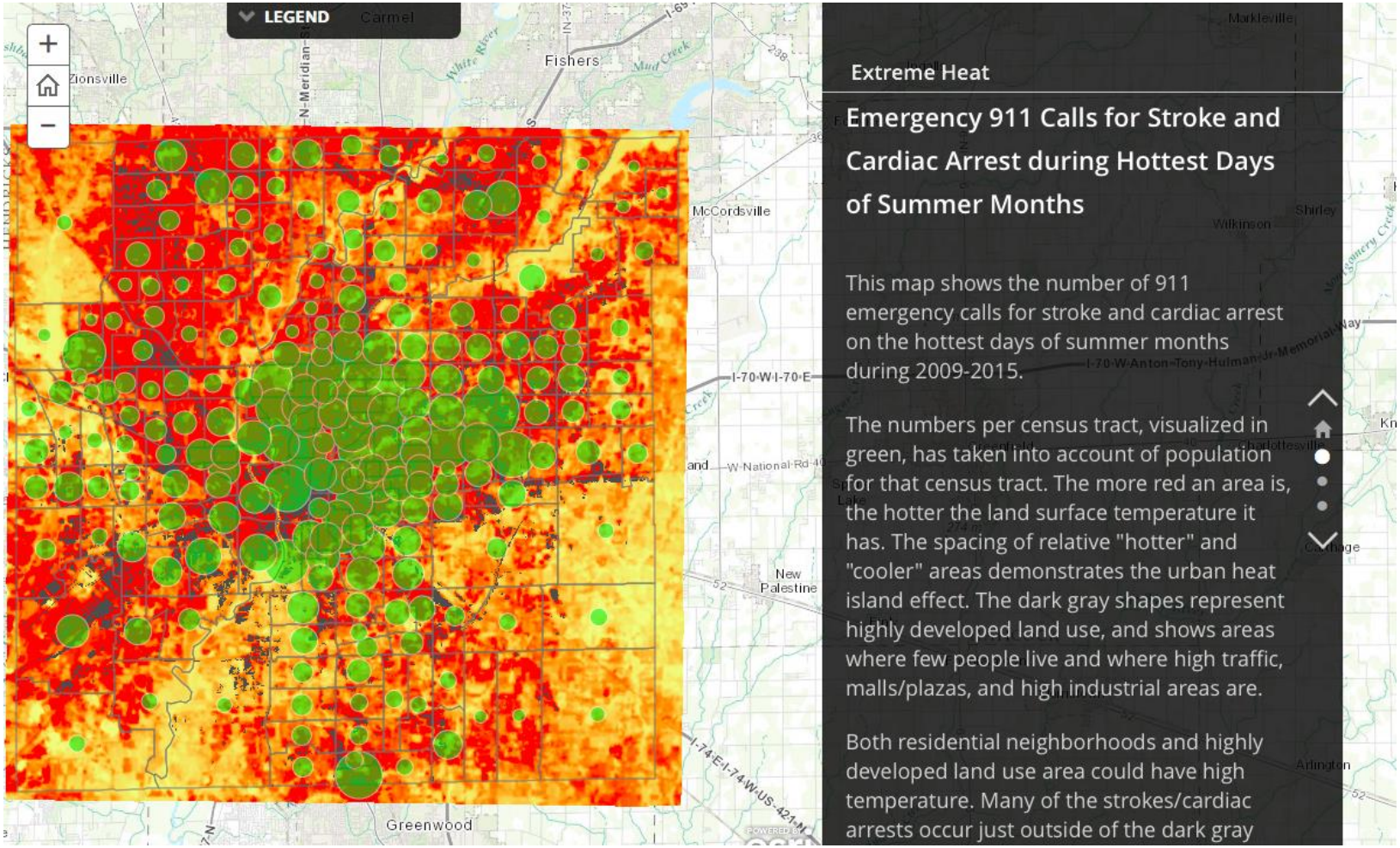
San Francisco Climate and Health Profile, Continued



Effects of Climate Change on the Future of Local Communities in Indianapolis



Effects of Climate Change on the Future of Local Communities in Indianapolis, Continued



Mapping tools for health benefits…

U.S. Climate Resilience Toolkit

Get Started | Taking Action | Tools | Topics | Expertise

About | Contact | Funding Opportunities | FAQ

Search

Tools › Urban Tree Canopy Assessment ›

Improving a city's tree canopy (i.e., tree cover) can have numerous benefits, from reducing summer peak temperatures to improving air quality to strengthening social ties among neighbors. These factors can improve climate resilience while also helping a community attract businesses and residents.

The U.S. Forest Service's Urban Tree Canopy (UTC) Assessment helps decision makers understand their urban forest resources, particularly the amount of tree canopy that currently exists and the amount that could exist. The tool assists users in identifying vulnerable populations that lack equal opportunities to

Webpage:

Urban Tree Canopy Assessment ›

Topic:

Human Health › Extreme Heat–NIHHIS ›

Human Health ›
Increased Levels of Air Pollutants ›

Can new tools help achieve sustainable, healthy communities?

For more information

- NIEHS Climate Change and Human Health
- NIEHS Partnerships in Environmental Public Health
- US Climate Resilience Toolkit
- US Climate Data Initiative

Thank you!

National Institute of Environmental Health Sciences
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National Toxicology Program
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Srp Superfund Research Program

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NIEHS Climate Change and Human Health