“Silent Killers”

Madeleine K. Scammell, DSc.

Associate Professor of Environmental Health

Chelsea East Boston Heat Study (C-HEAT)

Boston University School of Public Health
Department of Environmental Health

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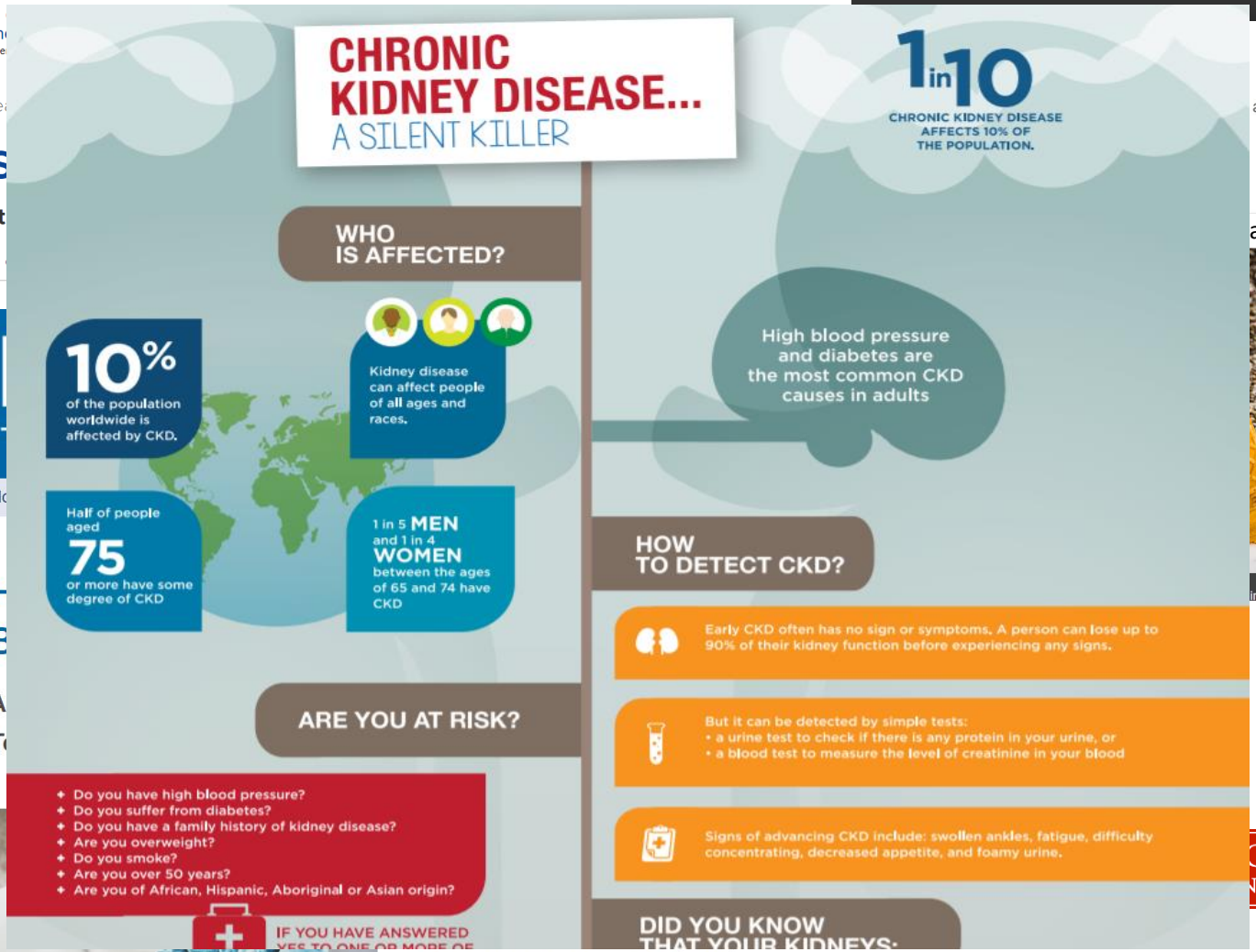

National Atmosph
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Home / News & Fea

Excess

Heat exhaust

Weather | sun safety

and climate change is

arth/silent-killer

information about your use of our site

https://www.paho.org

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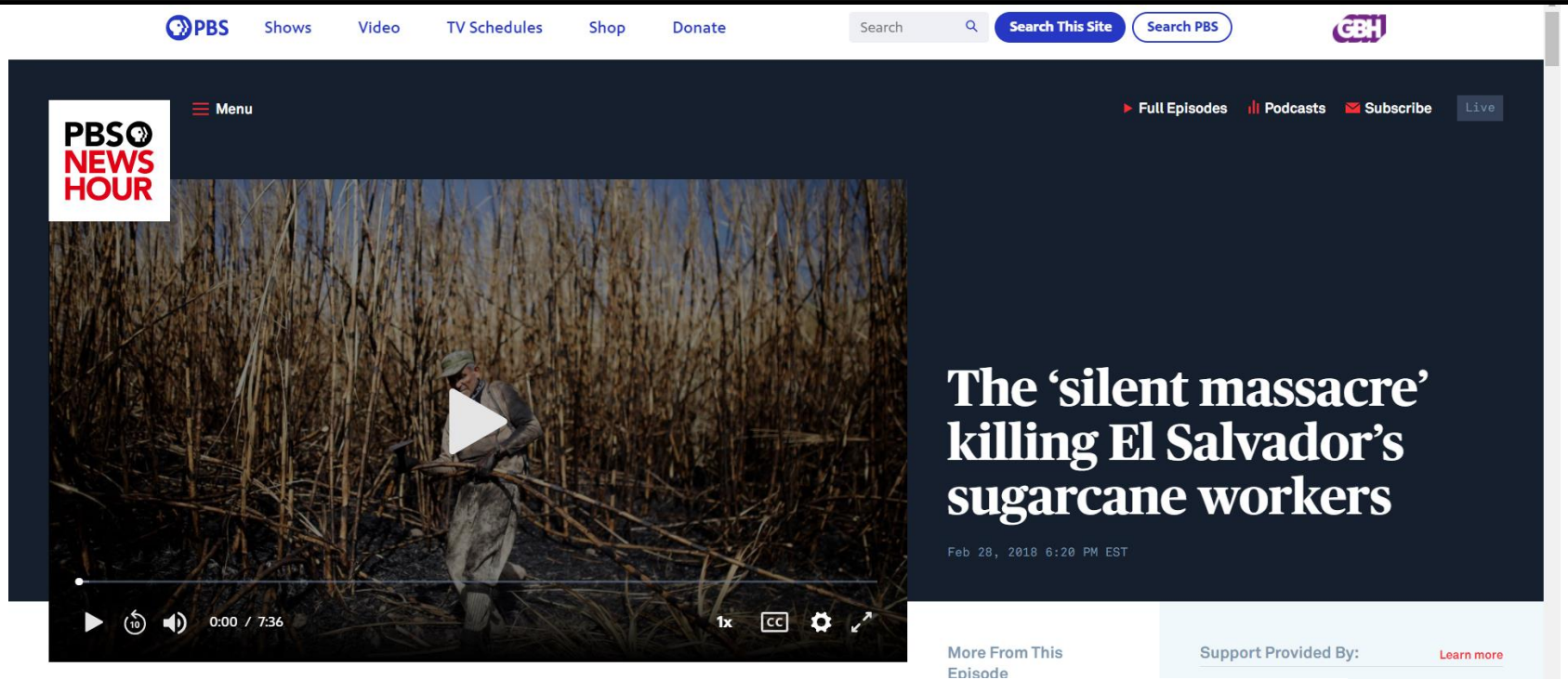
Control and Prevention (CDC).



https://www.pbs.org/newshour/show/the-silent-massacre-killing-el-salvadors-sugarcane-workers

Fred de Sam Lazaro
Feb 2018

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HEAT STRESS HYPOTHESIS

Lucas et al. Extreme Physiology & Medicine 2015, 4(Suppl 1):A23
http://www.extremephysiolmed.com/content/4/S1/A23

Extreme Physiology & Medicine

MEETING ABSTRACT Open Access

Heat stress and workload associated with sugarcane cutting - an excessively strenuous occupation!

Rebekah Al Lucas[1*], Theo Bodin[2], Ramon García-Trabanino[3], Catharina Wesseling[2], Jason Glaser[4], Ilana Weiss[4], Emmanuel Jarquin[5], Kristina Jakobsson[6], David H Wegman[7]

Annals of Nutrition and Metabolism

Proceedings

OPEN ACC

Mechanisms by Which Dehydration May Lead to Chronic Kidney Disease

Roncal-Jimenez C.[a] · Lanaspa M.A.[a] · Jensen T.[a] · Sanchez-Lozada L.G.[b] · Johnson R.J.[a]

International Journal of Environmental Research and Public Health

MDPI

ELSEVIER

Environmental Research
Volume 142, October 2015, Pages 746-755

Article

Climate Trends at a Hotspot of Chronic Kidney Disease of Unknown Causes in Nicaragua, 1973–2014

Zoe E. Petropoulos [1,*,†], Oriana Ramirez-Rubio [2,3,†], Madeleine K. Scammell [1], Rebecca L. Laws [1], Damaris Lopez-Pilarte [3], Juan José Amador [3], Joan Ballester [2], Cristina O'Callaghan-Gordo [2,4,5,6] and Daniel R. Brooks [3]

Heat stress, dehydration, and kidney function in sugarcane cutters in El Salvador – A cross-shift study of workers at risk of Mesoamerican nephropathy

Ramón García-Trabanino [a], Emmanuel Jarquín [b], Catharina Wesseling [c], Richard J Johnson [d], Marvin González-Quiroz [e, f], Ilana Weiss [g], Jason Glaser [g], Juan José Vindell [h], Leo Stockfelt [i], Carlos Roncal [d], Tamara Harra [d], Lars Barregard [i]

JPS since1951

Journal of Pharmacological Sciences
Volume 141, Issue 1, September 2019, Pages 49-55

Full Paper

A novel rat model of contrast-induced nephropathy based on dehydration

Kun Liu [a], Ling-yun Zhou [a], Dai-yang Li [a], Wen-jing Cheng [b], Wen-jun Yin [a], Can Hu [a], Yue-liang Xie [a], Jiang-lin Wang [a], Shan-ru Zuo [a], Lin-hua Chen [a], Ge Zhou [a], Xiao-cong Zuo [a, c]

Prevalence and Risk Factors for CKD Among Brickmaking Workers in La Paz Centro, Nicaragua

Lyanne Gallo-Ruiz, Caryn M. Sennett,* Mauricio Sánchez-Delgado, Ana García-Urbina, Tania Gámez-Altamirano, Komal Basra, Rebecca L. Laws, Juan José Amador, Damaris Lopez-Pilarte, Yorghos Tripodis, Daniel R. Brooks, Michael D. McClean, Joseph Kupferman, David Friedman, Aurora Aragón, Marvin González-Quiroz, and Madeleine K. Scammell*

Rationale & Objective: In Central America, there is a high prevalence of chronic kidney disease (CKD) of nontraditional etiology often observed among agricultural workers. Few studies have assessed CKD prevalence among workers in nonagricultural occupations, which was the objective of this investigation.

Study Design: Prospective cohort study.

Setting & Participants: Male and female workers (n = 224) employed by artisanal brickmaking facilities in La Paz Centro, Nicaragua.

Predictors: Age, sex, education, smoking status, body mass index, alcohol consumption, water consumption, first-degree relative(s) with CKD, years worked, hours worked per week, job category, study visit (baseline and follow-up), and self-reporte

Outcomes: CK ular filtration rat 2 time points 4

Analytical Ap model with an was used to e demographics, eGFR at basel

factors and time with change in eGFR was also evaluated. Multivariable logistic regression models were used to evaluate predictors of CKD.

Results: The CKD prevalence was 12.1% (n = 27), 100% of cases were male, 30% had stage 5 CKD (eGFR < 15 mL/min/1.73 m^2), and 22% were younger than 35 years. Proportions of participants with eGFRs < 60 mL/min/1.73 m^2 at baseline and follow-up were 13.8% and 15.2%, respectively. Linear regression analysis demonstrated significant predictors of lower kidney function at baseline including oven work, older age, lack of education, and having an immediate family member with CKD. Predictors of CKD identified using logistic regression analysis included oven work and lack of education.

Complete author and article information provided before references.

Correspondence to M. González-Quiroz (marvin99_00@yahoo.es)

**L.G.R and C.M.S. contributed equally to this work.*

Am J Kidney Dis. XX(XX): 1-9. Published online Month X, XXXX.

doi: 10.1053/j.ajkd.2019.01.017

Table 3. Linear Regression Models of eGFR

	eGFR, mL/min/1.73 m^2			
Variable	Mean Difference (95% CI)	*P*	Coefficient From Time Interaction (95% CI)	*P*
Age, per 1 y older	−0.95 (−1.42 to −0.47)[a]	<0.001[a]	0.07 (−0.27 to 0.41)	0.7
Male sex	−5.24 (−17.02 to 6.54)	0.4	−2.22 (−10.88 to 6.45)	0.6
BMI ≥ 30 vs <30 kg/m^2	−2.28 (−12.85 to 8.29)	0.7	−0.77 (−9.38 to 7.85)	0.9
Education				
No formal education	−14.17 (−24.30 to −4.05)[a]	0.006[a]	−1.98 (−9.29 to 5.32)	0.6
Primary	−3.9 (−12.50 to 4.69)	0.2	−5.70 (−11.88 to 0.47)	0.07
Secondary/university	1.00 (reference)	—	1.00 (reference)	—
Immediate family member with CKD (Y vs N)	−7.66 (−15.17 to −0.32)[a]	0.05[a]	−1.64 (−7.14 to 3.86)	0.6
F/U study visit (vs BL)	3.91 (−11.07 to 18.88)	0.6		
Job				
Oven work at both visits	−15.52 (−26.02 to −5.01)[a]	0.004[a]	7.10 (−0.59 to 14.79)	0.07

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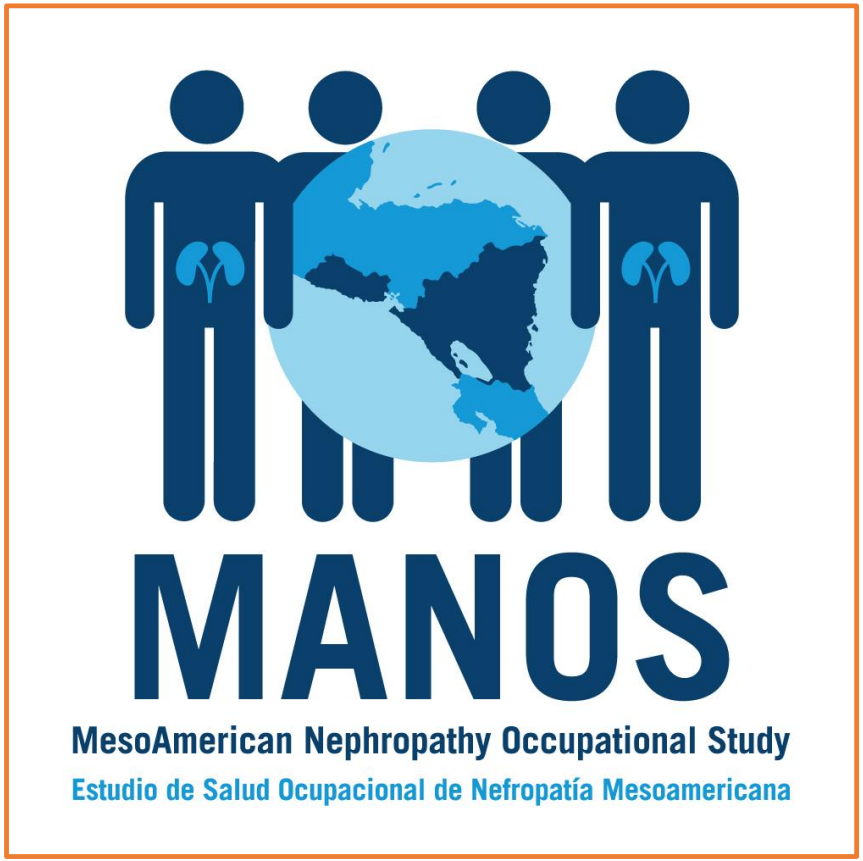
El Salvador:
Dr. Emmanuel Jarquin
Dr. Ramon Trabanino

Nicaragua:
Dr. Juan Jose Amador
Lic. Damaris Lopez



NIH
NIEHS
R01ES027584

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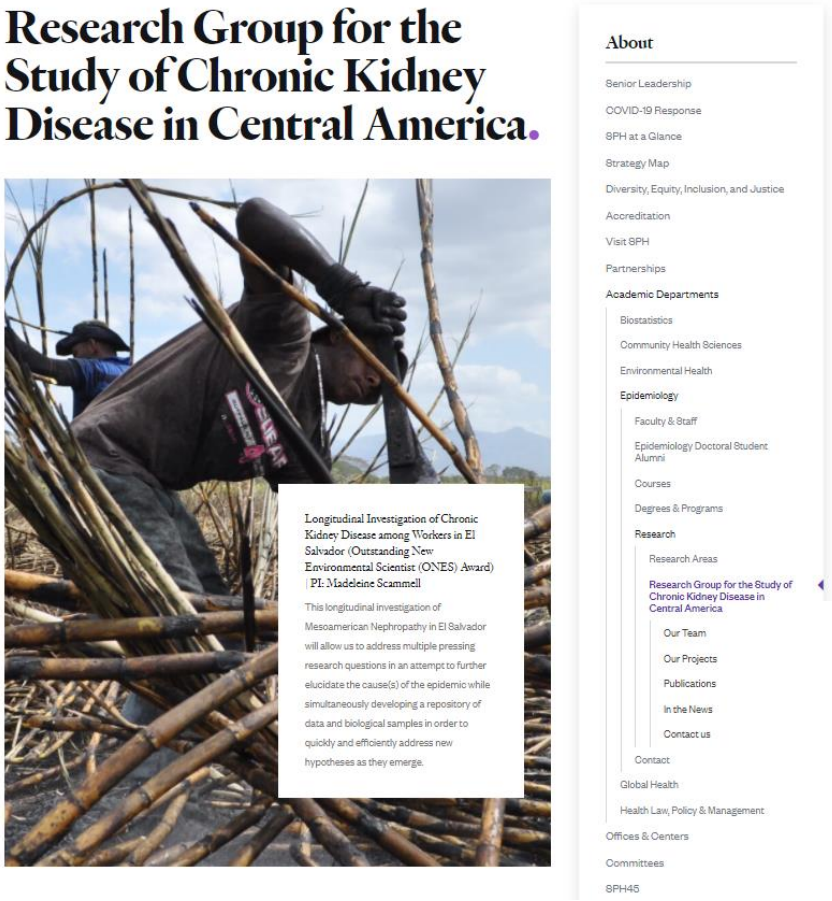
https://sites.bu.edu/buckdntresearch/



MANOS BU Team

- Dan Brooks
- Jessica Leibler
- Sinead Keogh
- Zoe Petropolous
- Iris Delgado
- Erin Polka
- David Friedman (Harvard/BIDMC)
- Yorghos Tripodis
- Mike McClean

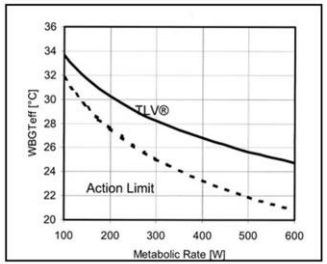
Collaborators:

- Linda McCauley, Emory University
- Ana Navas-Acien, Columbia University
- Patrick Parsons, State University of New York
- Kannan Kurunthachalam, New York University
- Chirag Parikh, Johns Hopkins University

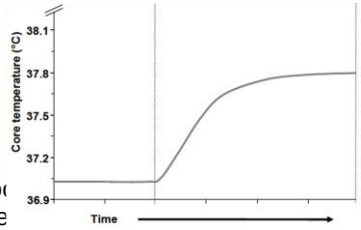
Characterizing Heat Exposure & Heat Stress

Zoe Petropoulos, **PhD**
NIEHS F31 ES030974

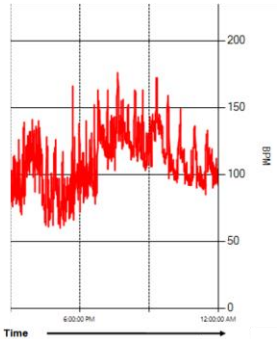
Wet Bulb Globe Temperature



Core Body Temperature



Heart Rate and Accelerometry



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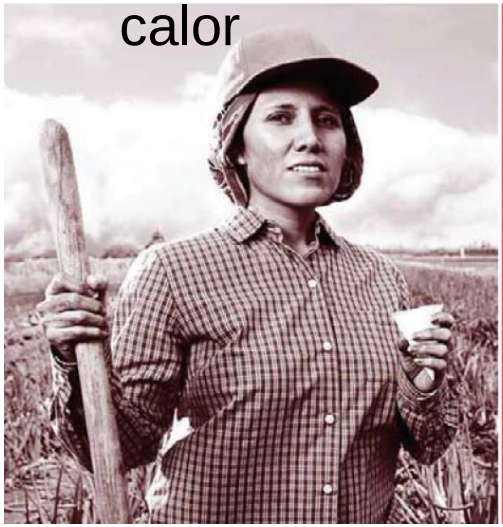
HEAT STRESS HYPOTHESIS

- Prevención de enfermedades a caus
calor



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HEAT STRESS HYPOTHESIS

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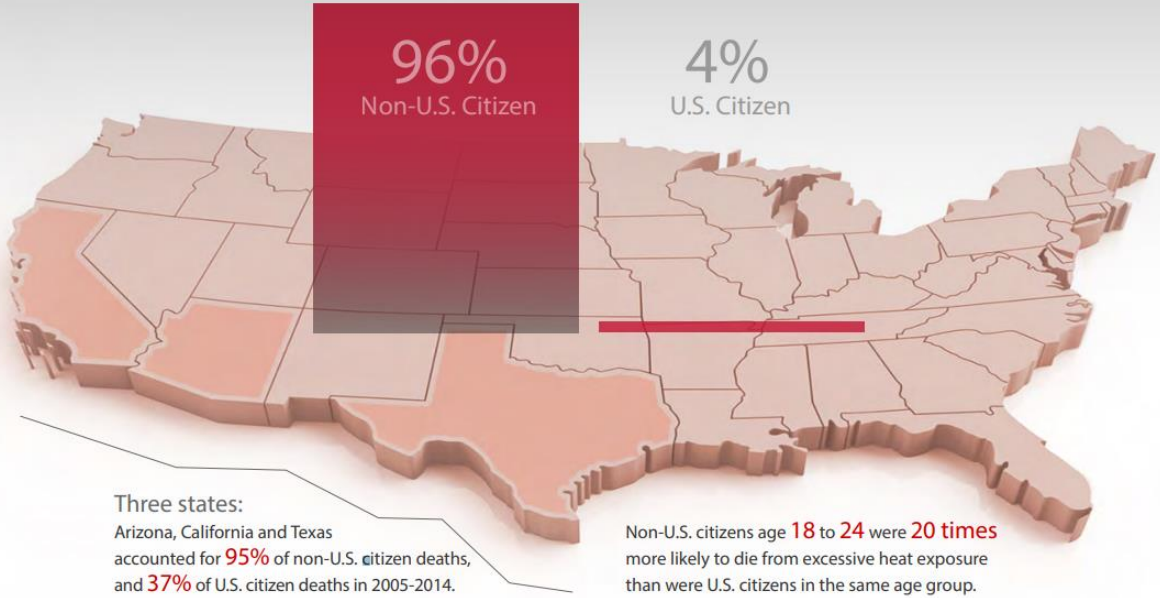
Differences in Heat-related Mortality by Citizenship Status: United States 2005-2014

Estimated Percentage of Heat-related Deaths by Citizenship (2005-2014)



Heat-related deaths accounted for 999 (2.23%) deaths among non-U.S. citizens compared with 4,196 (0.02%) deaths among U.S. citizens.

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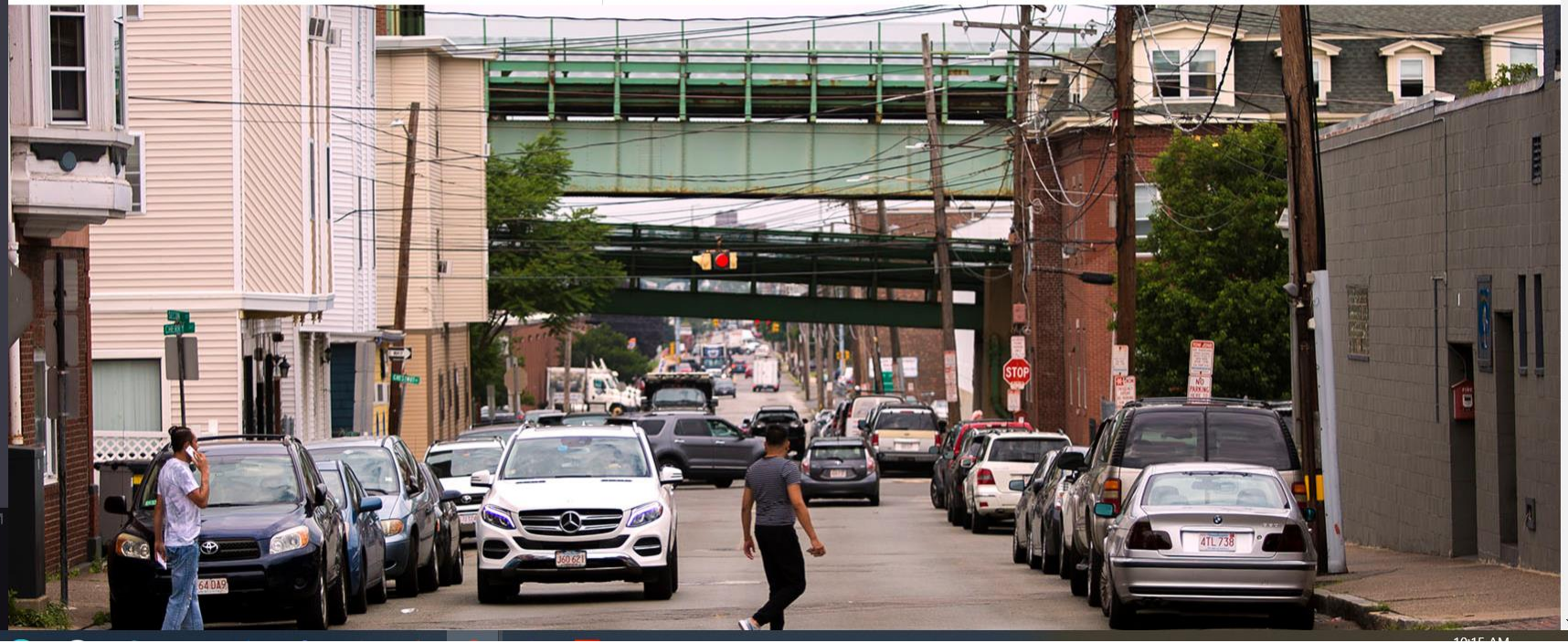
https://www.apha.org/

06:41

No Tropical Paradise: Urban 'Heat Islands' Are Hotbeds For Health Problems

Updated July 07, 2017 | By Martha Bebinger



Funded: Barr Foundation

Thank you to C-HEAT Study participants

GreenRoots

- Roseann Bongiovanni
- Bianca Bowman
- Ibrahim Lopez-Hernandez

Boston University

- Patricia Fabian
- Flannery Black-Ingersoll
- Pilar Botana
- Leila Heidari
- Patrick Kinney
- Julie de Lange
- Hannah Levine
- Jonathan Levy
- Alina McIntyre
- Chad Milando
- Abgel Negassa
- Ameera & Alex Saba

City of Chelsea

- Victor Tiernan and Ben Cares

Advisory team

- Zoe Davis City of Boston, Climate Resilience Program
- Matt Frank Chelsea Housing Authority
- Melanie Gárate Mystic River Watershed Association/Mystic Resilience Collaborative
- Indrani Ghosh Weston & Sampson
- Rafael Mares The Neighborhood Developers
- Fidel Maltez City of Chelsea, Department of Public Works

Barr Foundation

- Kalila Barnett

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Goal and Objectives

- **Build capacity to respond to extreme heat events:**
  - **Map.** Characterize high-risk locations and populations AND mitigating community assets via participatory mapping and monitoring.
  - **Measure.** Analyze personal and home temperature exposure patterns via field measurements
  - **Listen.** Learn about barriers and opportunities to maintain temperature control among vulnerable residents via Photovoice, surveys, and questionnaires
  - **Translate.** Key findings from our studies into intervention strategies at individual, community and city level

C-HEAT

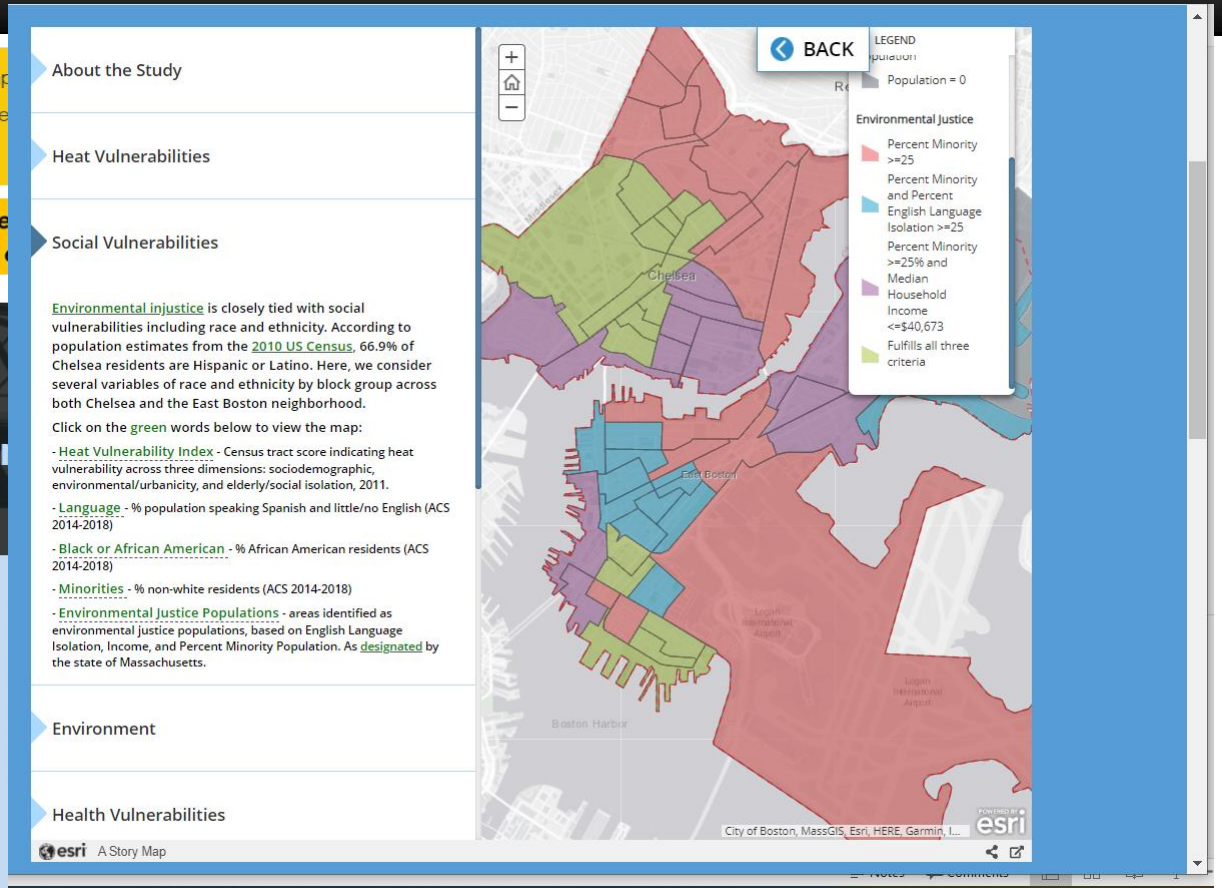
Data Dashboard | City Heat Plans | Temp
Photovoice | Community Resources | Pre
Data Applications | About Us

Do you worry about extre
Are you concerned about your

C-HEAT:

A study of heat exposu
Boston, Massachusetts

A collaborative research project between GreenRoots and the Boston University School of Public Health.



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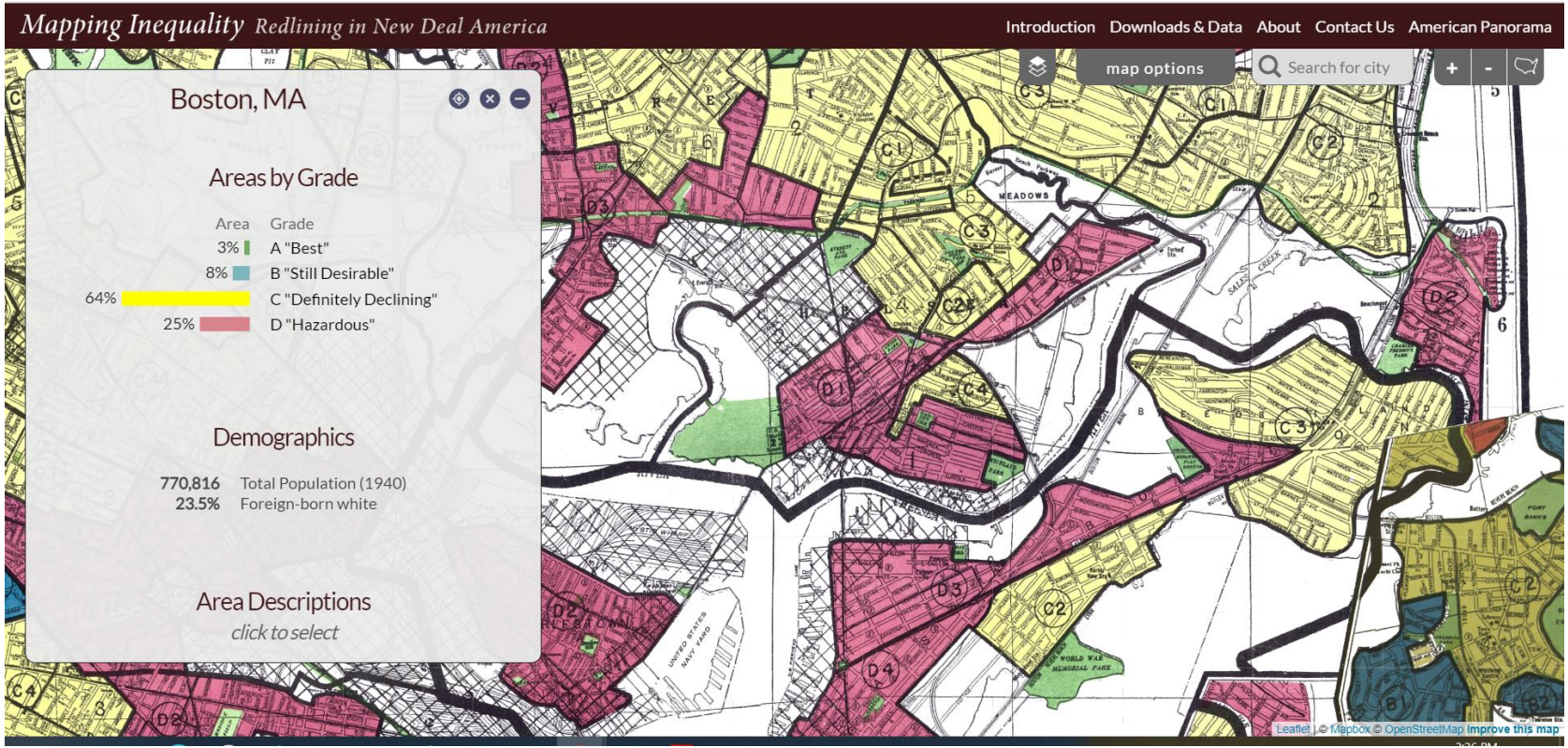
https://dsl.richmond.edu/panorama/redlining/#loc=14/42.392/-71.044&city=boston-ma



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Chelsea and East Boston Redlining Map

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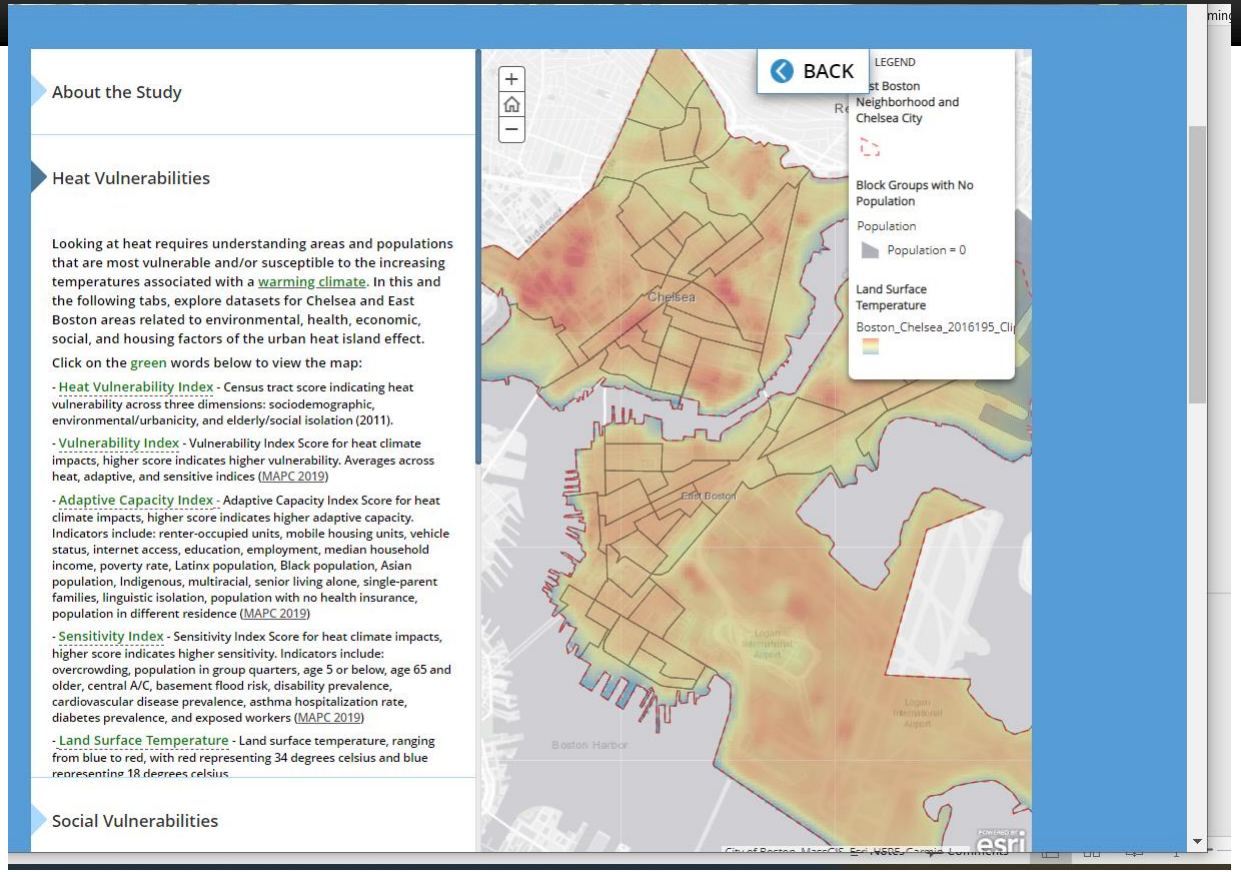

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34 degrees C
93.2 degrees F

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C-HEAT: Translate

City Heat Plans: Urban Heat Island Mitigation and Adaptation in the United States

Last Updated 8/12/2020

START HERE

City Heat Plans: About this Story Map


Boston: Update City Heat Emergency Action Plan...


Boston: Developing a heat plan (2010)


Chicago: Climate Action Plan Impacts Report (2010)


Dallas: Adopt-a-Tree-Median (2009-present)


Dallas: Dallas Comprehensive...


Los Angeles: Increased Vegetation and Albedo...

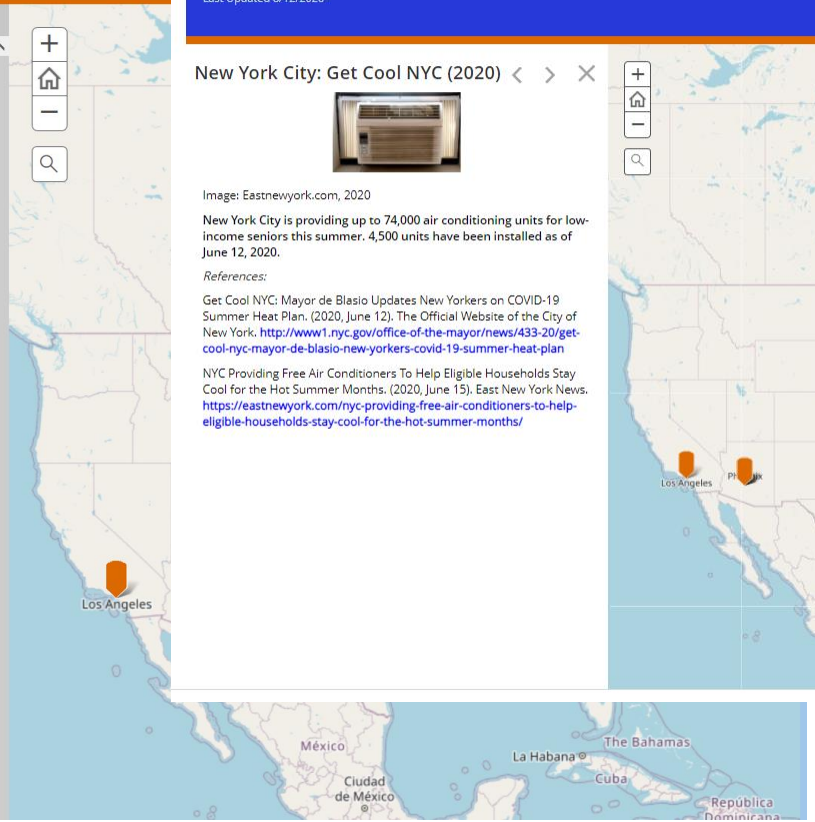

New York City: Public Cooling Areas (2020)


New York City: Get Cool NYC (2020)


Philadelphia: Low Income Home Energy Assistance...


Philadelphia: Beat the Heat Hunting Park - Heat...


Phoenix: Reinvent Phoenix Project (2012-present)



City Heat Plans: Urban Heat Island Mitigation and Adaptation in the United States

Last Updated 8/12/2020

New York City: Get Cool NYC (2020)

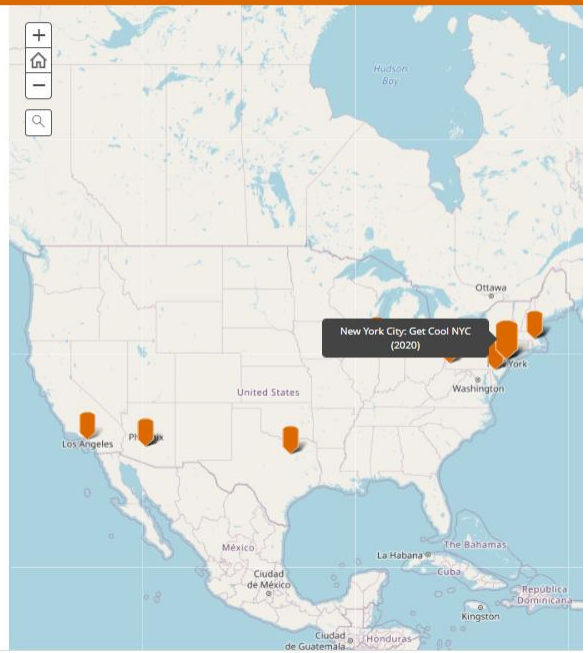
Image: Eastnewyork.com, 2020

New York City is providing up to 74,000 air conditioning units for low-income seniors this summer. 4,500 units have been installed as of June 12, 2020.

References:

Get Cool NYC: Mayor de Blasio Updates New Yorkers on COVID-19 Summer Heat Plan. (2020, June 12). The Official Website of the City of New York. http://www1.nyc.gov/office-of-the-mayor/news/433-20/get-cool-nyc-mayor-de-blasio-new-yorkers-covid-19-summer-heat-plan

NYC Providing Free Air Conditioners To Help Eligible Households Stay Cool for the Hot Summer Months. (2020, June 15). East New York News. https://eastnewyork.com/nyc-providing-free-air-conditioners-to-help-eligible-households-stay-cool-for-the-hot-summer-months/



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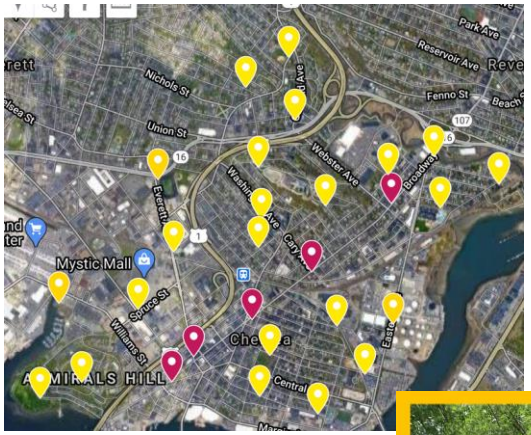
Outdoor temperature



- Partnered with City of Chelsea
- Municipal Vulnerabilities Planning grant

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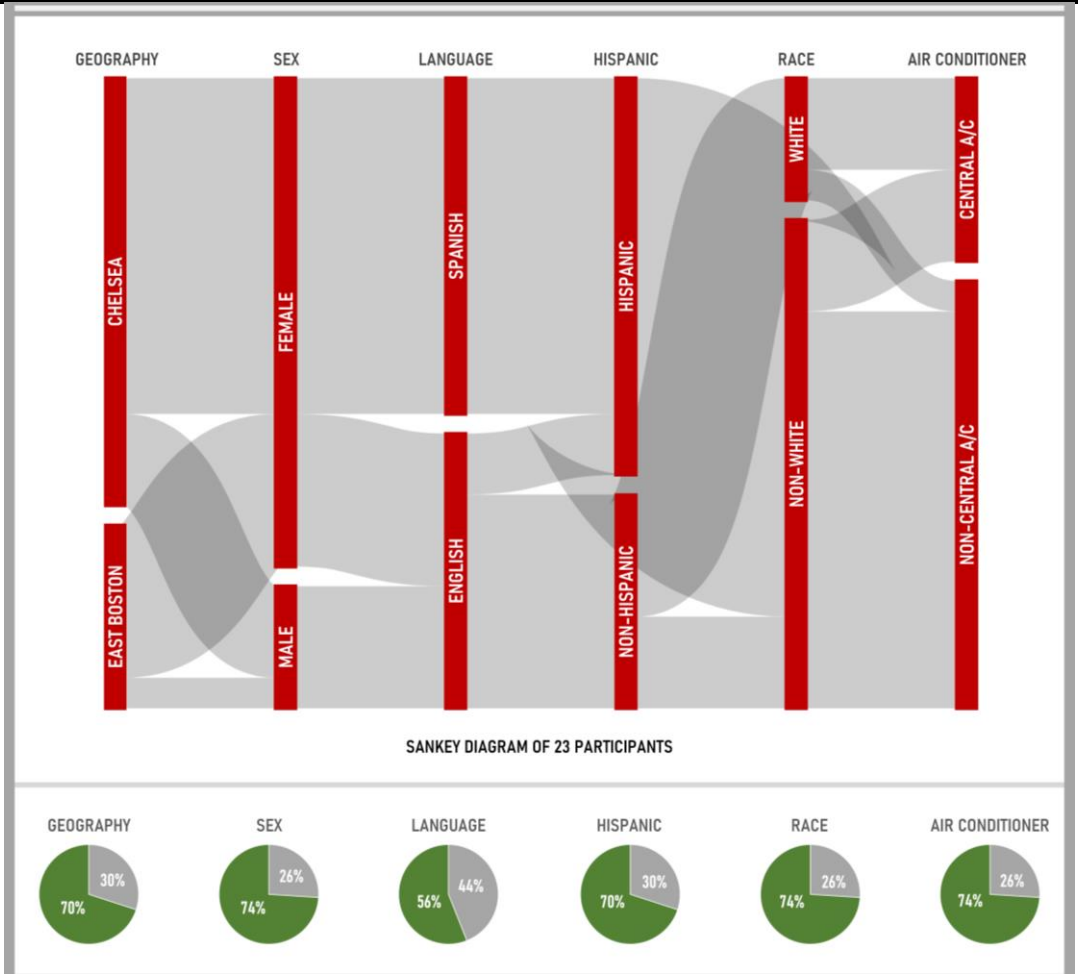

- 24 households
- Recruited via email list serv, member mtgs, word of mouth

Celebrating 25 Years of Fighting for Social and Environmental Justice!
GreenRoots

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Indoor and personal data collection

Phone data connects to a cloud database

Azure function (Microsoft service available at BU) requests (1) and receives (2) data, and uploads (3) to the HIPAA Sharepoint database **every 10 minutes**

Biometric data:
(heart rate, step count, sleep)

Location data:
(Latitude, Longitude) *

1 inch

Temp / Relative Humidity:

1.5 inch

Data in the cloud

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FitBit, Tile, HOBO images taken from manufacturer
https://www.androidcentral.com/sites/androidcentral.com/files/styles/mediumplus/public/article_images/2019/08/oneplus-7-pro-iphone-xs-1.jpg?itok=MuPTcBjU

Where is it hot?

- **20 ambient sensors** on trees in Chelsea and East Boston
- **Installed** between May 21 and June 17
- As of August 31, we collected on average **~69 days of data** per sensor

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Where is it hot?

Hourly outdoor temperatures…

Ranged: 55°F to 101°F

Hottest sensor on average: 7 °F higher than coolest sensor

Mary C. Burke Elementary Complex

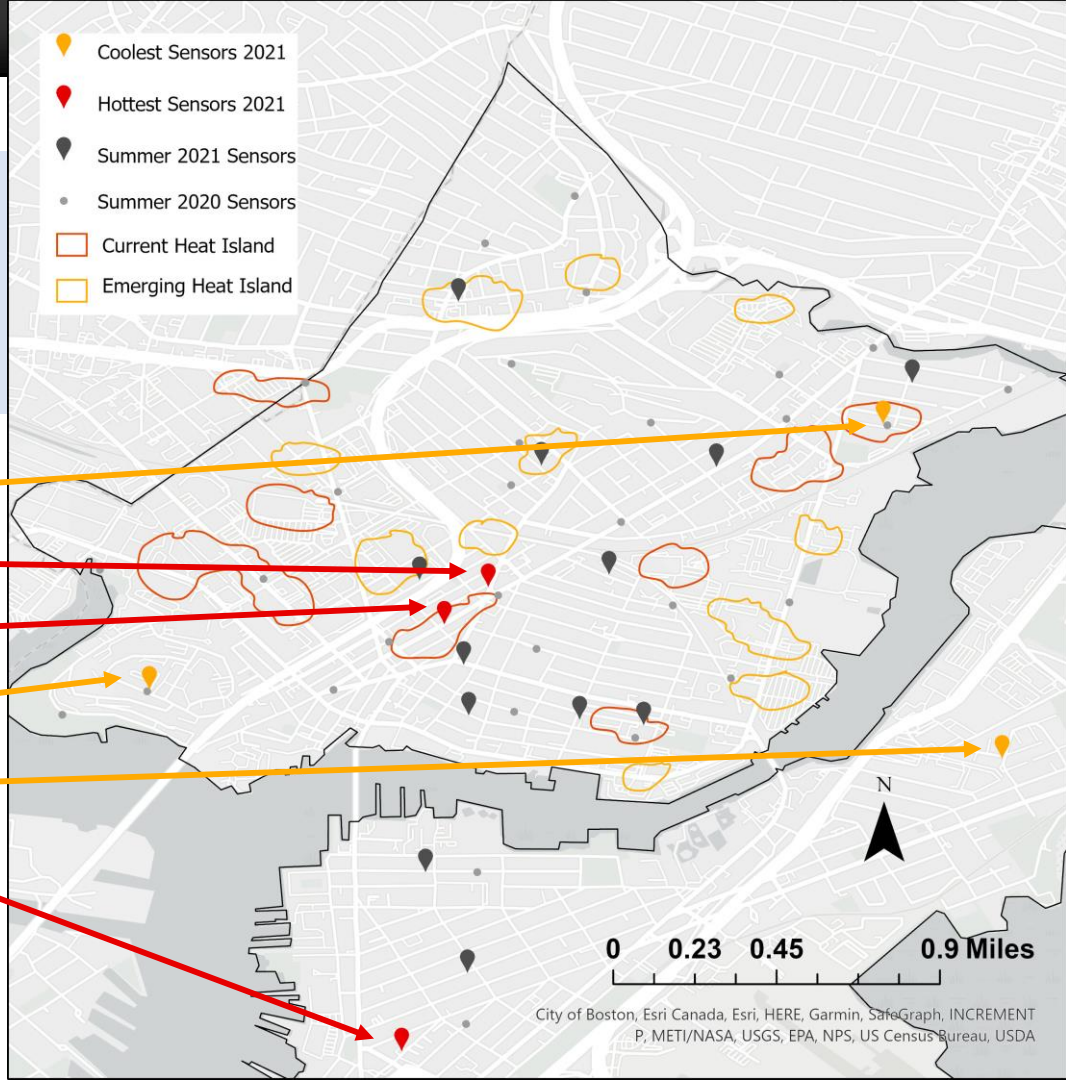
Washington & Cherry

Broadway & Fourth

Boatswains Way

Trustman & Brandywyne

London & Porter



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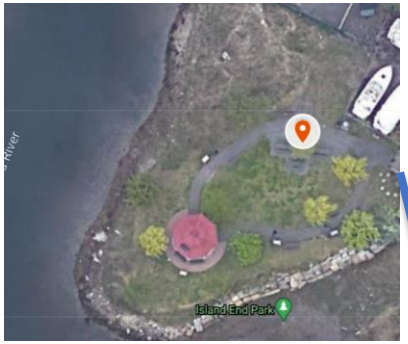
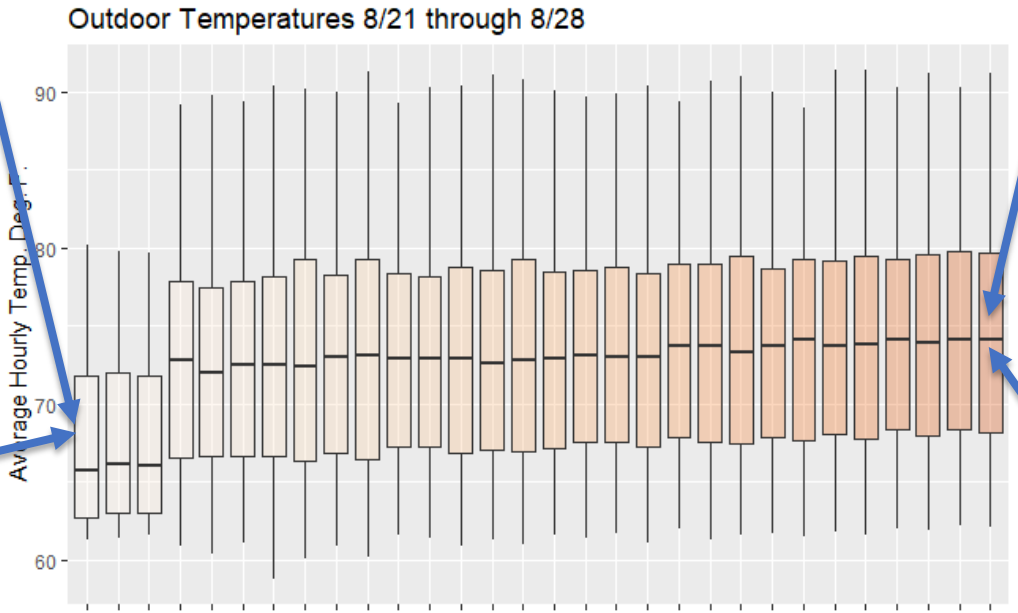
On a hot week: ***Outdoor*** **Temperatures**





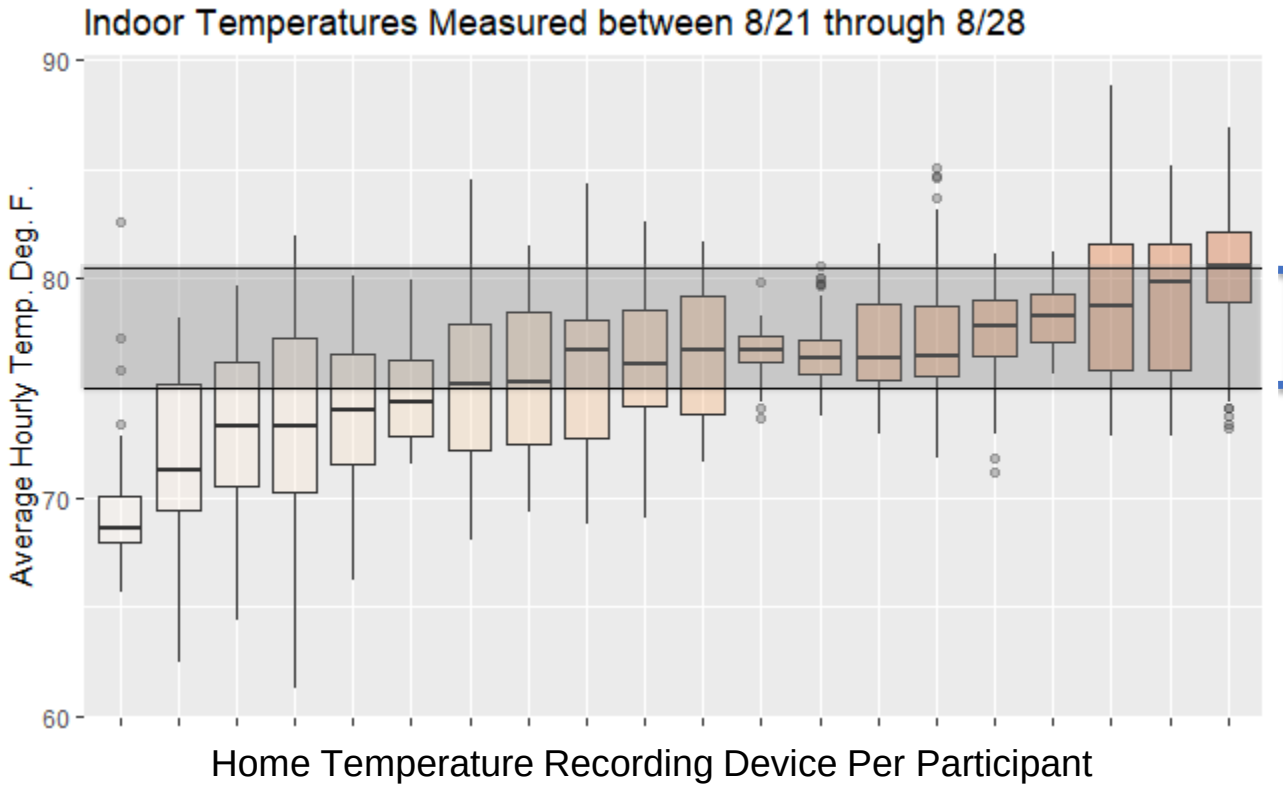
Outdoor Temperature Recording Devices

What makes homes hot?

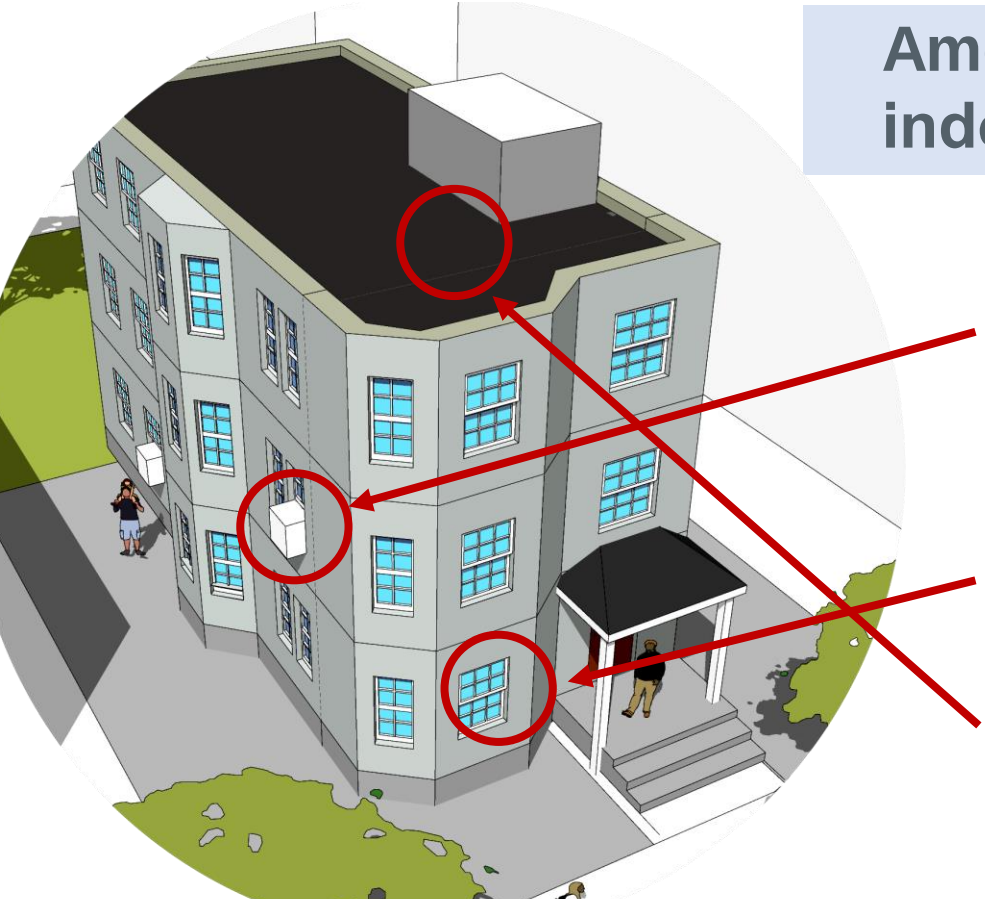
Variables Considered:

- **Roof tone**
- Façade tone
- Façade type
- Window-wall ratio
- **AC type**
- Shade tree
- **Floor**
- Roof shape
- % Impervious
- % Pavement
- Direction
- % Trees
- Year Built
- Stories
- Style
- Value

On a hot week: *Indoor* Temperatures



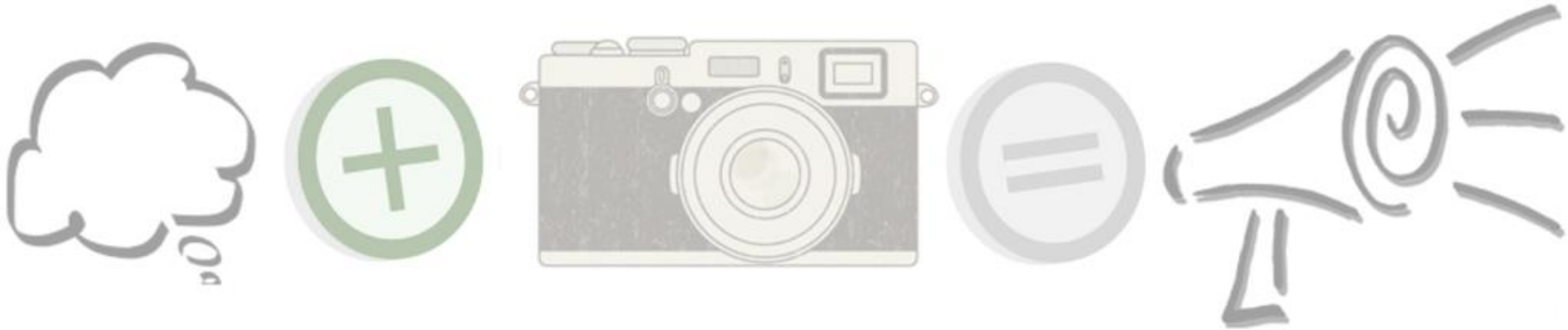
What makes homes hotter or cooler?



Among our participants, cooler indoor temperatures for those…

- **Using AC** in a given week (as indicated by weekly check-ins)
- With **Central AC** (compared to other AC)
- Living **below floor 2** (compared to on/above floor 2)
- With **lighter-colored roofs** (at midday, compared to darker roof tones)

Photovoice



A **participatory action research** method that engages participants in the use of **photography** to represent their **experience and perspectives** on a certain topic.

Budig K, Diez J, Conde P, Sastre M, Hernán M, Franco M. Photovoice and empowerment: evaluating the transformative potential of a participatory action research project. BMC Public Health 2018 vol: 18 (1)

Goals of Photovoice

- 1) to enable people to record and reflect their community's strengths and concerns
- 2) to promote critical dialogue and knowledge about important issue through small group discussions of photographs
- 3) to reach policy makers

Wang C, Burris MA. Photovoice: concept, methodology, and use for participatory needs assessment. Heal Educ Behav. 1997; 24:369–87.

Results

- Where are the trees? / Here are the trees!
  - Tree (in)equity: there is unequal distribution and access to green space and parks. The quality, utility, and accessibility of green spaces matters.
  - When we feel the heat: in transit! Feeling the lack of shade and the heat from the pavement while walking, at bus stops, and MBTA stations.
  - Compounded problems: Where there is a lack of trees, there are also other exposures: noise, air pollution from cars and buses.
- Populations vulnerable to heat
- Water: the good, the bad and the ugly
- Keeping it cool, creatively

Where are the trees?

This is the industrial side of Chelsea which impacts the microclimate. Both factory and truck exhaust surrounding concrete adds to the heat island effect.

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Here are the trees!

This street, and the rest of Admiral's Hill, has an abundance of trees and vegetation that offer protection from the heat as well as the air and noise pollution of the Tobin Bridge. I am hopeful that when city officials see these photos, they'll see how much inequity is present.

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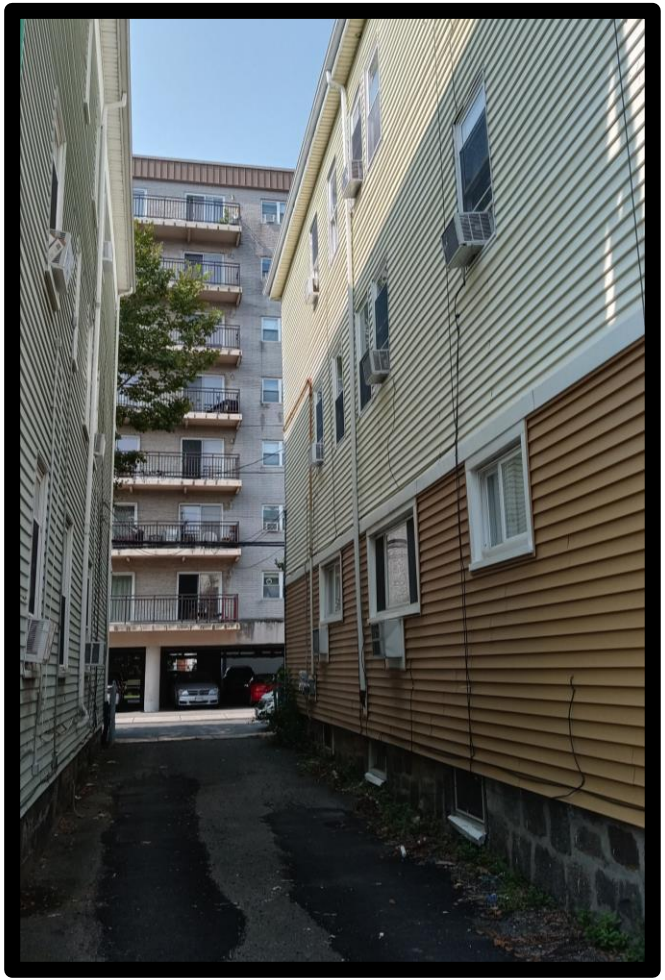
Keeping it cool

Cuando sales y miras a tu alrededor, ves muchos aires acondicionados en las ventanas. La mayoría de ellos son viejos, poco eficientes, y ruidosos. En nuestra comunidad, hay mucha gente que no se puede permitir comprar un aparato de aire nuevo. Muchos de ellos, tampoco tienen donde almacenarlo, así que los deben dejar en las ventanas todo el invierno.



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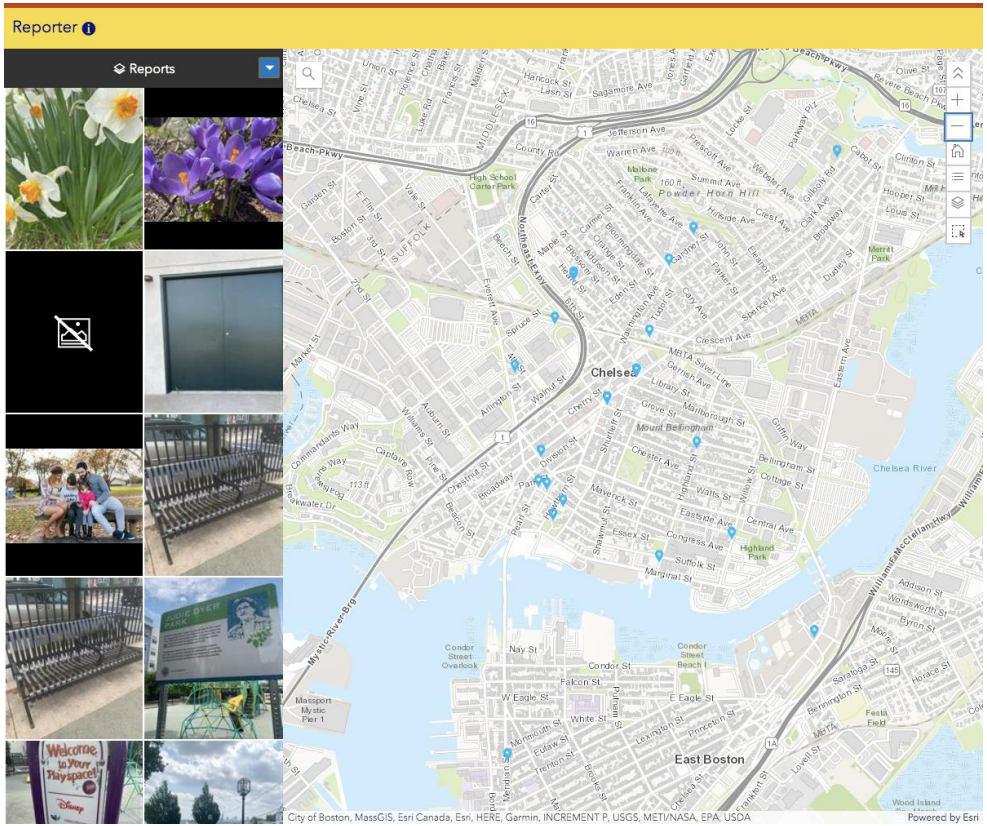
Youth Engagement and Social Media



https://storymaps.arcgis.com/stories/b2678cc9407c446e8bcfe7be184dccac

TikTok

Opportunity: Evaluate use of **Drinking Water & Misting** Stations

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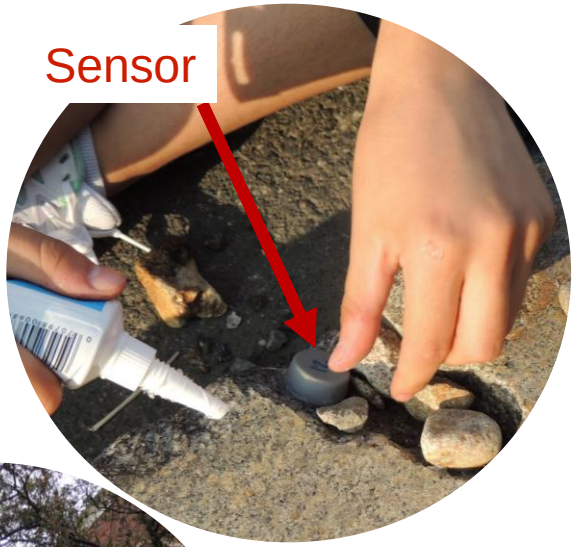
2021-2022 Interventions & Future Analyses

White roofs

Williams Jr. High School

Playgrounds & parks



Sensor

Burke Elementary Complex

Bus stops

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Analyze data from “Cool block interventions“

Other City MVP interventions

- Street reflective murals
- Sidewalk pavers
- Greenspace

Public Health Post

FOLLOW PHPOD THE TURNING POINT MENU SEARCH

Climate Disease and Kidney Injustice

By Madeleine K. Scammell
November 6, 2017

RESEARCH

https://**www.publichealthpost.org**/research/climate-chronic-kidney-disease/

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