Public Health Addresses
Climate Change

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Director, Environmental & Occupational Health Division
Boston Public Health Commission
Agenda

• BPHC Overview
• Climate Change Impacts of Public Health Concern
• Boston’s Climate Adaptation Efforts
• CleanAir Cabs – a win/win/win example
• Extreme Temperature Planning – looking to the future and building systems
BPHC Overview

• Board of Health for the City of Boston
• Mission: To protect, preserve, and promote the health and well being of Boston’s residents, particularly the most vulnerable
Environmental & Occupational Health Division Mission

To respond to the full range of environmental and occupational public health issues in residences, public buildings, businesses, industry, and the environment, which pose a health threat to the citizens of Boston, particularly those most vulnerable.
Social Determinants of Health

• Residents can fall into many categories.

• Though the experience of climate change is often shared among an entire population, not everyone is equally at risk of having a related poor health outcome. Age, economic resources, location, and other factors all contribute to differential impact that climate change may have on health (Health of Boston Report)

• Nothing about someone's race, national origin, age, etc., makes them inherently vulnerable: we see acknowledging vulnerability as an assessment of the system's deficiencies, rather than a judgment of Boston residents. (Resilient Boston)
Climate Change Impacts of Public Health Concern

- Acute Impacts
- Chronic Impacts
Climate Change and Health

## Acute Public Health Concerns for Climate Change

<table>
<thead>
<tr>
<th>Extreme temperature events</th>
<th>Sea level rise &amp; flooding</th>
<th>Storm events/extreme weather</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypo/hyperthermia</td>
<td>Flood displacement &amp; homelessness</td>
<td>Direct injuries &amp; property damage</td>
</tr>
<tr>
<td>Frostbite</td>
<td>Mold growth &amp; respiratory impacts</td>
<td>Mold growth &amp; respiratory impacts</td>
</tr>
<tr>
<td>Dehydration</td>
<td>Chemical exposures</td>
<td>Chemical exposures</td>
</tr>
<tr>
<td>Cardiovascular disease</td>
<td>Prevention of service delivery</td>
<td>Cardiovascular disease</td>
</tr>
<tr>
<td>Injuries</td>
<td>Impacts of systems disruption</td>
<td>Prevention of service delivery</td>
</tr>
<tr>
<td>Crime</td>
<td></td>
<td>Impacts of systems disruption</td>
</tr>
</tbody>
</table>
# Chronic Public Health Concerns for Climate Change

<table>
<thead>
<tr>
<th>Vector-borne illnesses</th>
<th>Chronic diseases</th>
<th>Drought</th>
<th>Economic impacts</th>
<th>Disparate impacts &amp; displacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Longer seasons/wider areas for existing diseases – Lyme, WNV, etc.</td>
<td>Asthma worsened by longer, more intense pollen seasons; worsening air quality; etc.</td>
<td>Food insecurity</td>
<td>Rising prices for food and other necessities</td>
<td>Green gentrification</td>
</tr>
<tr>
<td>Disease migration due to vector range extension</td>
<td>Cardiovascular disease</td>
<td></td>
<td>Flood insurance &amp; flood map impacts on property values</td>
<td></td>
</tr>
<tr>
<td>Emerging illnesses</td>
<td>Effective management of others</td>
<td></td>
<td>Equipment and operating costs of adaptation</td>
<td></td>
</tr>
</tbody>
</table>
Boston’s Guiding Documents
Boston’s Climate Adaptation Efforts

- Boston Climate Action Plan
- Zero Waste Boston
- Carbon Free Boston
- Extreme Temperature Planning

- Resilient Boston Harbor, etc.
- City of Boston Hazard Mitigation Plan
- Municipal Aggregate Power Purchasing
- Greenovate Boston
BPHC’s Role

- Emergency Medical Services and Medical Intelligence Center
- Integrate climate change into programming
- Office of Public Health Preparedness
- Extreme Temperature Planning
- Participate in city planning processes
Boston CleanAir Cabs

Addresses:
• Health
• Environmental quality
• Climate change
• Economics
The Issues

- 1,825 licensed taxi cabs in Boston
- Majority Crown Victoria (10mpg)
- 60,000 – 100,000 miles/year/car

- Tailpipe emissions – asthma and other illness
- Greenhouse gas emissions
- Economic considerations
Boston’s Taxi Industry in 2005

- Limited number (1,825) of medallions controlled by a small pool of owners
- Most medallion owners also own the cars
- Owner leases the car/medallion to a driver
  - $700/week (14 consecutive 12-hour shifts)
  - $170/week premium for a hybrid
  - 12-hour shift rates are $77/$18
- Driver pays for all fuel costs and tolls/fees
- Driver’s income = fares - costs
History of CleanAir Cabs

- **Apr. 2005**: BPHC approached by concerned citizen, John Moore, with the idea of hybrid cabs
- **Late 2005**: Shopped the idea to BPD, MASSPort, City Hall, and ICLEI Local Government for Sustainability
- **Early 2006**: Approval by BPD for use of Ford Escape and Toyota Camry hybrids as cabs
- **Apr.–May 2006**: Logan Airport offers “front of line” privilege to hybrid cabs
- **June 2006**: Receive grant from the Oak Foundation for incentives
- **Sep. 2006**: First hybrid cab displayed at AltWheels festival on City Hall Plaza
- **Apr. 2007**: Formal program launch
The taxicab goes green

TONY LEE
tony.lee@metro.us

BOSTON That’s not a racing stripe seen running down the side of a Boston taxicab. More accurately, it’s a sign of hope for a cleaner city.

Adorned with a unique green stripe that sets it apart from the rest of the fleet, the city’s first hybrid taxi was introduced to the streets this weekend as part of the Art Wheels Festival.

“Although it’s not the first example of how we can partner with an important industry serving Boston’s residents and visitors to reduce impacts on public health and environment,” Mayor Thomas Menino said.

A hybrid cab in Boston was the dream of John Moore, a local architect who first pitched the idea to the city but was told he needed some numbers to back up his proposal. So Moore went to work, following a cab for 10 hours in a hybrid to see how much of a difference it would make.

While the cab burned 12 gallons of gas, the hybrid spent just over three.

“That was all they needed to see,” said Moore, who launched Boston CleanAir Cabs soon thereafter.

Moore thought he would surrender the idea if and when he met objections, but he never did. “It’s just a great idea,” he said. “It helps everyone – the driver, the passenger, the citizens of Boston.”

Mayor Thomas Menino steps into the city’s first hybrid taxi, a Toyota Camry introduced to Boston’s streets this past weekend.

MAYOR THOMAS MENINO

Choosing the Boston Cab Association to be the first to drive the Toyota Camry, Fes-tus Igbaro, a native of Nigeria, has received nothing but positive returns.

“When people get in the car they say, ‘I wish all taxis in Boston were like this,’” Igbaro said.

Moore hopes to have 100 hybrid taxis on the road within a year. No new medallions are being offered, so the new vehicles would simply replace the old Crown Victorias currently clogging both cab stands and, in reality, the city’s air.
2005 Drive-behind fuel cost study: Crown Victoria vs. Escape Hybrid

- 9 hours
- 97 miles driven
- 17 fares

<table>
<thead>
<tr>
<th>Vehicle</th>
<th>Fuel used</th>
<th>Fuel Efficiency</th>
<th>Cost at $2.149/gal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown Victoria</td>
<td>10.25 gallons</td>
<td>9.46 MPG</td>
<td>$22.03</td>
</tr>
<tr>
<td>Escape (4WD)</td>
<td>3.77 gallons</td>
<td>25.73 MPG</td>
<td>$8.10</td>
</tr>
</tbody>
</table>
### Camry Fuel Use Data

**Boston Cab Association**

**Toyota Camry Hybrid Taxi (2007)**

**Fuel Consumption data**

<table>
<thead>
<tr>
<th>Fill-up Date</th>
<th>Gas Used (gallons)</th>
<th>Gas Used (dollars)</th>
<th>Gas Price ($/gallon)</th>
<th>Odometer Reading</th>
<th>Miles Traveled</th>
<th>Mileage (miles/gallon)</th>
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</thead>
<tbody>
<tr>
<td>10/5/06</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>5240</td>
<td>n/a</td>
<td>n/a</td>
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<tr>
<td>10/7/06</td>
<td>10.597</td>
<td>$22.88</td>
<td>$2.16</td>
<td>5603</td>
<td>363</td>
<td>34.3</td>
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<tr>
<td>10/10/06</td>
<td>8.570</td>
<td>$18.33</td>
<td>$2.14</td>
<td>5897</td>
<td>294</td>
<td>34.3</td>
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<tr>
<td>10/11/06</td>
<td>8.658</td>
<td>$18.52</td>
<td>$2.14</td>
<td>6184</td>
<td>287</td>
<td>33.1</td>
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<tr>
<td>10/13/06</td>
<td>8.357</td>
<td>$17.54</td>
<td>$2.10</td>
<td>6474</td>
<td>290</td>
<td>34.7</td>
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<tr>
<td>10/16/06</td>
<td>11.812</td>
<td>$24.79</td>
<td>$2.10</td>
<td>6862</td>
<td>388</td>
<td>32.8</td>
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<tr>
<td>10/18/06</td>
<td>9.904</td>
<td>$20.59</td>
<td>$2.08</td>
<td>7203</td>
<td>341</td>
<td>34.4</td>
</tr>
<tr>
<td>10/20/06</td>
<td>9.833</td>
<td>$20.44</td>
<td>$2.08</td>
<td>7534</td>
<td>331</td>
<td>33.7</td>
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<tr>
<td>10/21/06</td>
<td>6.943</td>
<td>$14.43</td>
<td>$2.08</td>
<td>7752</td>
<td>218</td>
<td>31.4</td>
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<tr>
<td>10/23/06</td>
<td>10.040</td>
<td>$20.87</td>
<td>$2.08</td>
<td>8072</td>
<td>320</td>
<td>31.9</td>
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<tr>
<td>10/26/06</td>
<td>10.317</td>
<td>$21.45</td>
<td>$2.08</td>
<td>8413</td>
<td>341</td>
<td>33.1</td>
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<td>10/28/06</td>
<td>11.319</td>
<td>$23.19</td>
<td>$2.05</td>
<td>8783</td>
<td>370</td>
<td>32.7</td>
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<tr>
<td>10/31/06</td>
<td>11.647</td>
<td>$24.21</td>
<td>$2.08</td>
<td>9190</td>
<td>407</td>
<td>34.9</td>
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<tr>
<td>11/2/06</td>
<td>9.415</td>
<td>$19.57</td>
<td>$2.08</td>
<td>9521</td>
<td>331</td>
<td>35.2</td>
</tr>
</tbody>
</table>

**Totals:**
- **28 days**
- **127.41 gallons**
- **$266.81**
- **$2.09 (average)**
- **4281 miles**
- **33.6 (average)**

**Source:**
Boston CleanAir CABS

[johnm@post.harvard.edu](mailto:johnm@post.harvard.edu)
Cumulative CO₂ Emissions for a Single Taxi

- Crown Victoria taxi
- Hybrid Taxi

5-year savings ~360,000 pounds of CO₂/cab replaced at 60,000 miles/year/cab
Since then...

- **August 2008**: City mandates all cabs in fleet convert by 2015
- **March 2009**: Medallion owners sued in Federal Court, blocking the order
- **2012**: City awards Boston Cab Association with Green Business Award for converting 400/500 cabs
Impact as of Summer 2018

- 1,828 taxi medallions in Boston
- 1,787 currently on the road
- 861 (48% of cabs on the road) are hybrids
<table>
<thead>
<tr>
<th>Benefits</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>~3,800 gallons of gasoline saved per cab every 60,000 mile year</td>
<td>~3,271,800 gallons of unburned gasoline/year</td>
</tr>
<tr>
<td>Over 31,000 tons of CO₂ reduced per year at the tailpipe (over 155,000 tons over 5 years)</td>
<td>Over 31,000 tons of CO₂ reduced per year at the tailpipe (over 155,000 tons over 5 years)</td>
</tr>
<tr>
<td>Asthma emergency room visits decreased despite no change in the rate (12%) of adults with asthma</td>
<td>Cab drivers report higher customer satisfaction</td>
</tr>
<tr>
<td>$4,000 increased income for drivers</td>
<td>$6,800 increased revenue for medallion owner</td>
</tr>
</tbody>
</table>
Lessons Learned

• Coalition building - engaging gatekeepers and peers

• “Speak the language of the audience”: Health, Finance, Safety, Climate, Prestige

• Limited time incentives to get from early adopters to critical mass

• Leading by example
Remaining & Emerging Challenges

- Getting the rest of the cabs
- Reducing personal vehicle traffic
- Rideshare services like Uber and Lyft
  - Nearly 100,000 rides/day
  - Pulling passengers from public transit as well as cabs
  - No clear incentive mechanism for hybrids/EV but there are central decision-makers
FEELIN' HOT HOT HOT
• Who has the authority to decide heat/cold unsafe for residents’ health?

• What services and resources are available in the event of an announcement?

Extreme Temperatures
Office of Public Health Preparedness

Our Vision:

A resilient Boston through healthy, informed, and connected communities that are supported every day and during emergencies by strong, integrated public health and healthcare systems.

- Community fares better after an emergency
- Equitable access to health and human services during and after emergencies

Course Details

- Course Description
- Course Logistics
- Target Audience & Accreditation
- Funding and Acknowledgements

You are accessing this course as a guest

You may still complete the course as a guest. However, you must enroll now if you want to record your completion of this course on the learning center.

GO TO ENROLLMENT PAGE

https://delvalle.bphc.org/course/view.php?id=251
Annual Est. Heat Event Deaths in Boston

- Currently - 18
- By 2020 - 36
- By 2080 - 63 - 115

Data source: Rossi et al. 2015
Cold Weather: Winter 2017-18

Impact on:
- Homeless Population
- Public Safety
- Hospitals
- Utilities
Goals

- Not be weather reporters
- Improve health outcomes
- Enhance monitoring and preparedness for extreme temperatures
- Provide better coordination and communication across agencies
- Make information and resources better available to public
How?: Info Gathering & Stakeholder Buy-In

- Inclusive inception phase
- Reviewed 65+ resources, policies, and reports from local, state, federal and international perspectives.
- 15+ individual stakeholder meetings with city agencies, research groups, and NWS.
- Consultative meetings with Healthcare Coalition partners.
How?: Structure

Extreme Temperature Advisory Group

Public Health Outcomes & Temperature Thresholds
Focuses on revising system and temperature thresholds using a public health approach

Communications, Messaging and Materials
Discusses messages and drafts systems for distribution via various mediums

Community Engagement
Looks at ways to best engage community in information sharing and community response

100+ participants
How?: Data Layering

Source: Harvard University, City of Boston, MassGIS, Esri Canada, Esri, HERE, Garmin, USGS, NGA, EPA, USDA, NPS
## How?: Proposed Thresholds

<table>
<thead>
<tr>
<th>Type</th>
<th>Audience</th>
<th>Source(s)</th>
<th>Threshold</th>
<th>Length</th>
<th>Spike</th>
<th>Overnight Low</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public Health Heat Advisory</td>
<td>Whole City</td>
<td>NWS Logan, BPHC Heat Island Formula</td>
<td>90 F Heat Index</td>
<td>3 Days</td>
<td>HI of 105 F</td>
<td>Not below 75</td>
</tr>
<tr>
<td>Public Health Heat Advisory</td>
<td>Targeted</td>
<td>NWS Heat Island Zips, BPHC Heat Island Formula</td>
<td>90 F Heat Index</td>
<td>3 Days</td>
<td>HI of 105 F</td>
<td>Not below 75</td>
</tr>
<tr>
<td>Public Health Heat Alert</td>
<td>Whole City</td>
<td>NWS Logan, BPHC Heat Island Formula</td>
<td>95 Heat Index in Heat Islands</td>
<td>2 Days</td>
<td>Plus 30 F from previous day</td>
<td>Not below 75 in Heat Islands</td>
</tr>
<tr>
<td>Public Health Cold Weather Advisory</td>
<td>Whole City</td>
<td>NWS Logan</td>
<td>(-15F) windchill</td>
<td>Any</td>
<td>&lt; 32 F</td>
<td></td>
</tr>
<tr>
<td>Public Health Cold Weather Alert</td>
<td>Whole City</td>
<td>NWS Logan</td>
<td>(-25F) windchill</td>
<td>Any</td>
<td>&lt; 32 F</td>
<td></td>
</tr>
</tbody>
</table>
How?: Resource Mapping

• City of Boston resources (limited)

• What are neighborhoods and community organizations already doing around this issue?

• Asset based planning
Common Themes

• Communications consistency
• Planning inclusion
• Accessible materials and content
• Integrated outreach methods
• Asset-based planning! What is community already doing?
• Year-round messaging
Community Engagement
• How do we use this to more fully engage with communities on their own resilience?

Monitoring & Evaluation
• Design research framework and project to identify ways to evaluate if this system is a robust and equitable public health system.
• Illness vs. Hospitalization vs. Death

Interdisciplinary Planning Process
• Model for citywide emergency planning

Strategic Alignment & Additional Funding – City of Boston, Foundations
Thank You

Questions?

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More Resources

• Boston Programs
  • https://www.boston.gov/departments/environment/carbon-free-boston#climate-action-plan-update
  • https://www.boston.gov/departments/environment/zero-waste-boston
  • https://www.boston.gov/departments/mayors-office/imagine-boston-2030
  • https://www.boston.gov/departments/environment/carbon-free-boston
  • https://www.boston.gov/departments/environment/climate-ready-boston

• Media
  • https://boston.curbed.com/2019/2/14/18223974/boston-climate-change-2080

• National Association of County and City Health Officials
  • https://www.naccho.org/programs/environmental-health/hazards/climate-change