ZEV Commission Meeting

June 25, 3 pm
Online webinar
Agenda

- Welcome and introductions
- Presentation by Dr. Gaurab Basu, co-director of the Center for Health Equity Education & Advocacy at Cambridge Health Alliance
  - Discussion / Q&A
- Updates on ongoing initiatives:
  - MOR-EV
  - Accelerate Clean Transportation Now (ACTNow)
  - VW Settlement funds and MassEVIP
  - Transportation and Climate Initiative
  - Discussion / Q&A
- Suggestions for new programs to address transportation pollution
  - Discussion / Q&A
A clean transportation system for my patients

Gaurab Basu, MD, MPH
Co-Director Center for Health Equity Education & Advocacy (CHEEA)
Cambridge Health Alliance
Instructor, Harvard Medical School
A clean transportation system is the prescription my patients need

Transforming our dirty transportation system has long been an urgent public health issue.

By Gaurab Basu Updated May 25, 2020, 11:00 a.m.
Confirmed COVID-19 Cumulative Cases per 10,000 Inhabitants*

Percent Minority
- < 25%
- 25% - 50%
- 50% - 75%
- > 75%

- Chelsea
- Brockton
- Lawrence
- Everett
- Revere
- Lynn
- Lowell
- Boston
- Framingham
- Peabody
- Taunton
- Cambridge
- Plymouth
- Massachusetts

Cumulative Cases per 10,000 inhabitants

Updated data: May 4

* Graph shows 7-day moving average of rate

Figure by: Koen F. Tieskens, PhD, Raquel Jimenez Celsi, MSc., Boston University School of Public Health
Information provided by the Massachusetts Major City Chiefs of Police and compiled by the Massachusetts Attorney General’s Office, US Census, 2010
Air Pollution

COVID-19 PM2.5
A national study on long-term exposure to air pollution and COVID-19 mortality in the United States

Results: We found that an increase of only 1 μg/m³ in PM$_{2.5}$ is associated with an 8% increase in the COVID-19 death rate (95% confidence interval [CI]: 2%, 15%). The results were statistically significant and robust to secondary and sensitivity analyses.

Conclusions: A small increase in long-term exposure to PM$_{2.5}$ leads to a large increase in the COVID-19 death rate. Despite inherent limitations of the ecological study design, our results underscore the importance of continuing to enforce existing air pollution regulations to protect human health both during and after the COVID-19 crisis. The data and code are publicly available so our analyses can be updated routinely.
Air pollution

- Increase in heart attacks
- Childhood asthma exacerbations
- Strokes
- Premature deaths
- Premature birth, low birth weight, stillbirths
FIGURE 1. High Variation in Exposure to PM$_{2.5}$ Pollution from On-Road Vehicles in Massachusetts

PM$_{2.5}$ from On-Road Vehicles, Average Annual Concentration (µg/m$^3$)

Three Massachusetts counties have average PM$_{2.5}$ exposures higher than the state average. In Suffolk County, the most polluted, average concentration is 88 percent above the state average. Middlesex and Norfolk are the next most polluted, with concentrations 17 percent and 3 percent above the state average, respectively. High levels of PM$_{2.5}$ are found in pockets in Springfield, bordering I-91, as well as in areas of Massachusetts east of Providence, Rhode Island, bordering I-195.

Intergovernmental Panel on Climate Change 2018

- We have warming to 1 deg above pre-industrial levels
- Warming to 1.5 C is likely to happen between 2030-2052 at current rate
- To limit climate change to 1.5 deg C, we must decrease greenhouse emissions 45% from 2010 levels by 2030 and reach net zero by 2050

- 2019 UN Environmental Program - decrease emissions by 7.6% a year from 2020-2030
Climate change’s heavy toll

As global temperatures rise, they put billions of people at risk of heatwaves, water shortages and a range of other problems. And these impacts fall hardest on the poorest and most vulnerable people. The map below shows the cumulative risks from major climate impacts with 2 °C of warming; the chart estimates how many people would be affected by a selection of those risks.

Cumulative risks of 1.5 °C warming

<table>
<thead>
<tr>
<th>Risk</th>
<th>Population affected by various risks (millions of people)</th>
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<tbody>
<tr>
<td>Heatwave exposure</td>
<td>3,960</td>
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<tr>
<td>Water stress</td>
<td>3,340</td>
</tr>
<tr>
<td>Risk to power production</td>
<td>334</td>
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<tr>
<td>Crop yield change</td>
<td>35</td>
</tr>
<tr>
<td>Habitat degradation</td>
<td>91</td>
</tr>
</tbody>
</table>

Climate change’s heavy toll

As global temperatures rise, they put billions of people at risk of heatwaves, water shortages and a range of other problems. And these impacts fall hardest on the poorest and most vulnerable people. The map below shows the cumulative risks from major climate impacts with 2 °C of warming; the chart estimates how many people would be affected by a selection of those risks.

Cumulative risks of 2°C warming

<table>
<thead>
<tr>
<th>Risk category</th>
<th>Population affected by various risks (millions of people)</th>
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<tr>
<td>Heatwave exposure</td>
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<tr>
<td>Water stress</td>
<td>3,658</td>
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<td>Risk to power production</td>
<td>385</td>
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<td>Crop yield change</td>
<td>362</td>
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<td>Habitat degradation</td>
<td>680</td>
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</table>

Climate change’s heavy toll

As global temperatures rise, they put billions of people at risk of heatwaves, water shortages and a range of other problems. And these impacts fall hardest on the poorest and most vulnerable people. The map below shows the cumulative risks from major climate impacts with 2 °C of warming; the chart estimates how many people would be affected by a selection of those risks.

Cumulative risks of 3°C warming

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Risk score</th>
<th>Population affected by various risks (millions of people)</th>
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<tbody>
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<td>Heatwave exposure</td>
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<td>7,909</td>
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<tr>
<td>Water stress</td>
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<td>3,920</td>
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<td>Risk to power production</td>
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<td>742</td>
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<tr>
<td>Crop yield change</td>
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<td>1,817</td>
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<tr>
<td>Habitat degradation</td>
<td></td>
<td>1,357</td>
</tr>
</tbody>
</table>

Major Health Risks Associated with Climate Change

- Injuries
- Fatalities
- Mental health effects
- Heat-related illness and death
- Exacerbations of asthma and other respiratory diseases
- Respiratory allergies
- Cardiovascular disease
- Campylobacter infection
- Cholera
- Cryptosporidiosis
- Harmful algal blooms
- Leptospirosis
- Undernutrition
- Salmonella food poisoning and other foodborne diseases
- Mycotoxin effects
- Chikungunya
- Dengue
- Encephalitis (various forms)
- Hantavirus infection
- Lyme disease
- Malaria
- Rift Valley fever
- West Nile virus infection
- Zika virus infection

Physical and mental health effects of violent conflict and forced migration (complex and context-specific risks)
FIGURE 2
Net US GHG emissions by sector
Million metric tons CO2e, IPCC definitions, excludes international bunkers

Source: Rhodium Climate Service
ALLOW ME TO HAVE A FUTURE
Suggestions for new programs to address transportation pollution

- Incentives for urban delivery truck electrification
- Electrification of ride-hailing fleets
- EV Affordability programs for low and moderate income consumers
- Pilot projects and community grants for environmental justice communities.
Urban delivery trucks
Commercial vehicles represent a small share of the global on-road fleet but contribute a disproportionate share of fuel consumption and emissions.

G20 nations:

- **11%** of global on-road fleet are HDVs
- **46%** of on-road fuel consumption by HDVs
- **71%** of on-road particulates by HDVs

Data: **ICCT (2015)**

NYC exposures and impacts:

Graphic: **NYC’s Roadmap to 80x50 at 80**
Model availability to double by 2023

Total cumulative vehicle models, U.S. & Canada

- **2019**: 95 models
- **2020**: 169 models
- **2021**: 185 models
- **2022**: 188 models
- **2023**: 195 models
M/HD ZEV model availability growing

Total cumulative vehicle models by vehicle type and year, U.S. & Canada
Zero-emission vehicles will come in waves, and our “beachhead” strategy targets applications where zero-emission technology is likely to succeed first.

**Wave 1**
- **Transit**
  - ZE transit buses
  - Available now
  - Chanje Class 5 Delivery Van
  - Available now
  - Orange EV yard tractor
  - Available now

**Wave 2**
- **Urban Delivery**
  - Similar drivetrain and component sizing can scale to early near applications

**Wave 3**
- **Medium Freight**
  - Expanded supply chain capabilities and price reductions enable additional applications
  - International eMV
  - Announced 2021
  - Freightliner eM2
  - Demo now; announced 2021

**Wave 4**
- **Heavy Regional Freight**
  - Steadily increasing volumes and infrastructure strengthen business case and performance confidence
  - Freightliner eCascadia
  - Demo now; announced 2021
  - Nikola BEV/FC tractor
  - Coming 2022-2023
  - Volvo VNR Electric
  - Demo now; announced 2020 in NA
  - Mack e-Refuse
  - Demo 2020; Coming 2022
  - Tesla demo
  - Coming 2021

**Corridor Longhaul**
- **Corridor Longhaul**
  - 2019 2020 2021 2022 2023

- Freightliner eM2 Demo now; announced 2021
  - Freightliner eCascadia Demo now; announced 2021
  - Nikola BEV/FC tractor Coming 2022-2023
  - Volvo VNR Electric Demo now; announced 2020 in NA
  - Mack e-Refuse Demo 2020; Coming 2022
  - Tesla demo Coming 2021
Chicago had $11.3M electric/hybrid truck voucher program; $1.425M NG/Elec infrastructure; $1.275M Green Taxi (NG) since 2014, $14.5M disbursed to date; new round launched late 2019, $35M now available.

California has invested over $500M for hybrid and electric trucks and low-NOx engines. CALSTART helped design, and has managed for >10 years.
Thank you!

Benjamin Mandel
Northeast Regional Director
CALSTART
bmandel@calstart.org

For more information visit: www.globaldrivetozero.org
Ride Hailing fleets
Making EVs affordable for low and moderate income residents

- Used EV rebate program
- Subsidized financing assistance modelled after Mass Solar Loan program
- Increased incentives for means-targeted households
- Targeted incentives towards high mileage, low-income workers (such as home health care workers)
- Considering point of sale rebate
Pilot projects targeting low income and/or environmental justice communities

- Electrification of port vehicles, such as drayage trucks or port equipment.
- An incentive or community project on ebikes.
- Carsharing electric vehicle projects.
- Electrification of school buses.
- Increased incentives and outreach to rural drivers.
- Targeted incentives based on zip code.
- A pilot project on long haul tractor-trailers.
- Electrification of vehicles around Logan Airport.
Thank you!

For more information, to view this webinar, and to submit questions or comments, follow our work at [https://www.mass.gov/service-details/zero-emission-vehicle-zev-commission](https://www.mass.gov/service-details/zero-emission-vehicle-zev-commission)

You can contact us at:

- Daniel Gatti, Director of Clean Transportation Policy, daniel.gatti@mass.gov
- Rishi Reddi, Director of Environmental Justice, rishi.p.reddi@mass.gov
- Judy Chang, Undersecretary for Energy and co-chair, judy.chang@mass.gov
- Dan Sieger, Undersecretary for Environment and co-chair, dan.sieger@mass.gov
Many duty cycles show extensive coverage—extreme ranges coming

Truck range by vehicle type and availability year, U.S. & Canada

<table>
<thead>
<tr>
<th>Vehicle Type</th>
<th>2023</th>
<th>2022</th>
<th>2021</th>
<th>2020</th>
<th>Currently Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>HD Truck</td>
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<td></td>
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<tr>
<td>MD truck</td>
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<td></td>
<td></td>
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<tr>
<td>Other</td>
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<td></td>
<td></td>
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<tr>
<td>MD step van</td>
<td></td>
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<tr>
<td>Cargo van</td>
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<tr>
<td>Yard tractor</td>
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</table>

Availability Year:
- Currently Available
- 2020
- 2021
- 2022
- 2023

Legend:
- Nikola Two and Tre Fuel Cell
- Tesla Semi Electric
- Hyundai HDC-6 NEPTUNE (U.S.) Fuel Cell

Range (mi)
Ecosystems of change can enable and accelerate the transition towards zero-emission commercial vehicles

**POLICIES**
- Exclusion zones
- Access restrictions
- Procurement requirements
- Sales requirements
- Fuel efficiency/GHG regulations
- Low-carbon fuel standards

**INFRASTRUCTURE INVESTMENTS**
- Depot charging
- Public infrastructure
- Corridor charging

**FINANCIAL INCENTIVES**
- Voucher purchase incentives
- Tax purchase incentives
- Congestion pricing
- Favorable electricity rates
- Battery production/purchase

**PILOT PROJECTS**
- Vehicle
- Infrastructure
- Business models