Welcome!

Lisa Patel, MD, MESc, FAAP
Executive Director
Medical Society Consortium on Climate and Health
Housekeeping

- Program Guide with the agenda and all the bios are available under the Resources tab on the 2023 annual meeting page found on our website (www.docsforclimate.org)

- The hashtag for this meeting is #ClimateHealth2023. If you have questions during a session, please place those in the chat. Several sessions will have time for questions.

- If you are having difficulties with any aspect of the meeting, you can send a question to info@climateconsortium.org. There will be someone there who can answer your question promptly.
Please Amplify!

Please use #ClimateHealth2023 to share your learning & comments on social media

(bonus points if you take a selfie of yourself attending the meeting!)
Tag @docsforclimate

Questions: Please enter questions into the chat box in the bottom-right. If chat box doesn’t appear, click chat bubble at bottom of screen.
Are you interested in learning how to communicate about the intersection of climate change and health most effectively? This 5-part training series will build your confidence and skills as a public voice to change hearts and minds.

Join us and our communications partner, Burness, for the following workshops:

- Communications 101: How to Make the Case About Climate Change, Health & Equity
- Best Practices for Working with the Media
- Weighing in on Policy: How to Testify and Provide Public Comment
- Weighing in on the News: Writing Op-eds and Letters to the Editor
- Social Media: Getting Started and Being Strategic
- Rules of the Road for Engaging with Policymakers

Dates and registration details to come. Scan the QR code to sign up for more information about the trainings. Questions? Email ConsortiumMedia@burness.com
# The Day Ahead

## Education Track

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:10-10:00 am</td>
<td>Climate Clinicians on Call</td>
</tr>
<tr>
<td>10:10-11:00 am</td>
<td>Advances by Medical Societies in Climate Education</td>
</tr>
<tr>
<td>11:10-12:00 pm</td>
<td>Opportunities for Advocacy with the EPA and Federal Agencies</td>
</tr>
<tr>
<td>12:00-1:15 pm</td>
<td>Keynotes: Transitioning Off Fossil Fuels Rapidly and Justly: The Path Ahead</td>
</tr>
<tr>
<td>1:15-2:00 pm</td>
<td>Break and Networking Fair</td>
</tr>
<tr>
<td>2:00-3:00 pm</td>
<td>State-Level Implementation of IIJA and IRA: Centering on Justice40</td>
</tr>
</tbody>
</table>

## Advocacy Track

<table>
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<th>Time</th>
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</thead>
<tbody>
<tr>
<td>9:10-10:00 am</td>
<td>Climate Coaching: Tools to Build the Movement</td>
</tr>
<tr>
<td>10:10-11:00 am</td>
<td>Empowering Health Professionals to Confront Disinformation</td>
</tr>
<tr>
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</tr>
</tbody>
</table>
The Day Ahead (continued)

Education Track

3:10-4:00 pm: Innovations in Climate and Health Medical Education

4:10-5:00 pm: Climate Change and Maternal-Child Health: Impacts and Counseling for the Reproductive Landscape

Advocacy Track

Legislative Visits Training (REQUIRED if participating in Capitol Hill visits on Tuesday)

Soapbox Hill Briefing (REQUIRED if participating in Capitol Hill visits on Tuesday)

End of Monday Sessions
Climate Clinicians on Call

9:10-10 am ET

**Moderator**

Cecilia Sorenson, MD
Director, Global Consortium on Climate & Health Education, Columbia University

Stefan Wheat, MD
Department of Emergency Medicine at the University of Washington

Caitlin Rublee, MD, MPH
Assistant Professor, Department of Emergency Medicine, University of Colorado School of Medicine and Colorado School of Public Health
Climate Clinicians on Call

Medical Society Consortium on Climate and Health
Annual meeting 2023
What is a Climate Clinician?

- Health professionals who apply knowledge of climate and health impacts to clinical care in order to reduce health inequities and improve health outcomes
Sumner Lawson, MS3
University of Washington SOM

Gayle Kouklis, MD, PGY4
University of California San Francisco-Fresno
ClimateClinicians In Action…. 

2 cases

- History taking
- Diagnosis and treatment
- Counseling and after-care planning
Case 1: HPI and History taking
Case 1: Clinical Vignette

Josefine is a 31 year old migrant worker from Mexico who works in Washington State who presents to the clinic today with a cough and shortness of breath. Javier has a history of intermittent asthma, does not use any medications and has no other significant past medical, past family, past surgical, or relevant allergy history. Javier reports a chronic cough that started in September.
Play pre-recorded video
Clinical pearls

- Environmental history taking is essential
- Wildfire smoke contributes to up to 25,000 thousand deaths per year and tens of billions of dollars in cost.
<table>
<thead>
<tr>
<th>Air Quality Guide for Particle Pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Good</strong></td>
</tr>
<tr>
<td><strong>Moderate</strong></td>
</tr>
<tr>
<td><strong>Unhealthy for Sensitive Groups</strong></td>
</tr>
<tr>
<td><strong>Unhealthy</strong></td>
</tr>
<tr>
<td><strong>Very Unhealthy Alert</strong></td>
</tr>
</tbody>
</table>
Case 2: decision making, treatment and management
Case 2: Clinical Vignette

Jessica is G2P1 at 23 weeks presenting with dizziness. She states she almost passed out before coworkers made her sit down and come to the emergency department. She has had an otherwise unremarkable pregnancy and has received prenatal care. She has a history of seasonal allergies and depression and takes sertraline.
Counseling and Aftercare Planning
Institutional Protocols

**TREATMENT GOALS**

- **5 minutes**
  - Recognition
  - Initiate algorithm

- **10 minutes**
  - Initiate rapid cooling

- **30 minutes**
  - Cool to 39°C
  - Avoid re-exposure

**RECOGNITION**

- Assess airway, breathing, and circulation
- Document core temperature
- Consider alternative/concomitant diagnoses and need for neuroimaging
  - Neuroleptic Malignant Syndrome, Malignant Hyperthermia, Serotonin Syndrome, Hyperpyrexia, Sepsis

**RAPID COOLING**

- Begin external cooling and consider internal cooling
- Consider deep sedation followed by neuromuscular blockade to reduce metabolic heat production
- Use benzodiazepines to prevent shivering

**SUPPORTIVE CARE**

- Continuous temperature monitoring
- Correct electrolyte abnormalities
- Arrange for disposition (likely ICU)
- Consider transfer to transplant center if in acute liver failure

**Clinical Provider Key Steps**

- **Tasks**
  - Obtain core temperature
  - Place patient on the monitor
  - Establish large bore IVs
  - Obtain labs, EKG, and chest x-ray
    - CBC, CMP, CK, PT/INR, Magnesium, Phosphorus, Lactate, Blood Alcohol Level, Uric Acid, Urinalysis, Urine Drug Screen

- **Rapid Cooling**
  - Obtain supplies: ice, ice packs, mist bottle, fan, cooling blanket, Foley catheter, IV fluids, cooling device
  - Begin external cooling
    - Perform cold water immersion
    - Place ice packs to axilla, groin, and neck
    - Mist patient with water and direct fan
    - Apply cooling blanket (if available)
  - Consider internal cooling
    - Hang chilled fluids
    - Place 3-way Foley catheter for bladder irrigation
    - Sedate and paralyze
    - Place intravascular cooling device
    - Perform body cavity lavage (rare)
    - ECMO transfer to liver transplant center for patients with higher severity illness (rare)

Rublee et al, 2021, Evidence-Based Management of Heatstroke in the Emergency Department, West JEM
Summary:

● All health professionals occupy a critical position in the response to climate change
● We are all well placed to play a key role in educating patients, communities, colleagues, etc.
● We can use our knowledge NOW to improve patient outcomes and reduce health disparities
PAN AMERICAN CLIMATE RESILIENT HEALTH SYSTEMS COURSE

Participants will learn to:

✔ Articulate health system challenges
✔ Assess system vulnerability and adaptation
✔ Develop climate change preparation plans

English, Spanish, French Interpretation Available
Free Certificate Based Program

Tuesday & Thursday
April 4 - May 2, 2023
10:00-11:30 AM EST
12:00-1:30 PM UYT

https://bit.ly/PanAmResilience  Contact - mendezanw@paho.org & hec2141@cumc.columbia.edu
Registration is open! Join us for the next virtual Climate Change and Health Boot Camp on June 28-30, 2023.

The Climate Change and Health Boot Camp is a three-day intensive course that will prepare clinicians, scientists, and other members of the research, health, and public health communities for informed, effective engagement with climate change issues in their professional lives. Register here.
PODCAST

Climate Clinic
The Global Consortium on Climate and Health Education

About
GCCHE is proud to present Climate Clinic, a brand new podcast that will bring the latest climate and health headlines to you each week. Through four unique...

... see more

Climate Clinic - Launch
GCCHE is proud to present Climate Clinic, a brand new podcast that will bring the latest climate and health headlines to you each week. Through four unique...

Sep 7 - Played ✔️
The meeting will resume at 10:10AM ET

Next up... Advances by Medical Societies
Advances by Medical Societies in Climate Education
10:10-11 am ET

Moderator
Ann-Christine Duhaime, MD
Senior Pediatric Neurosurgeon
Massachusetts General Hospital
Nicholas T. Zervas Distinguished Professor of Neurosurgery at Harvard Medical School

Barbara Erny, MD
Faculty Fellow at the Stanford Center for Innovation on Global Health
Advisory board of EyeSustain

Shalini Shah, DO
Instructor of Pediatrics
Harvard Medical School and Pediatric & Reproductive Environmental Health Fellow at Boston Children’s Hospital

Ashley McClure, MD, FACP
Co-Founder
Climate Health Now

Jerry Abraham, MD, MPH, CMQ
Director & Chief Vaccinologist
CDU-Kedren Mobile Street Medicine Program at Kedren
Why and How to Get Your Specialty Involved in Sustainable Healthcare: A Vision from the Ophthalmologists

Barbara C. Erny, MD
Medical Liaison for International Programs
American Society of Cataract and Refractive Surgery

No Financial Disclosures
Aravind Opened my Eyes

2017
Carbon footprint of phaco
US & UK is 20x higher than Aravind

2019
Endophthalmitis rate
(335,000 phaco + IC moxi)
Aravind 0.01%
(AAO IRIS 0.04%)
International Agency for the Prevention of Blindness

• A Call to Action
• A comprehensive practical guide developed by the Climate Action Working Group (CAWG)
• Detailed guidance to the global eye care sector, NGOs
• To reduce their environmental impact and support climate resilience
10 Key Areas of Action

Lead
Advocate
Procure sustainably
Reduce the use of fossil fuels
Conserve water

Reduce and safely dispose of waste
Reduce and green the travel
Follow the 4 Principles of sustainable clinical practice
Embed environmental sustainability in education
Focus your research
Do my Society Colleagues Care?

90% concerned about climate change
59% very concerned; 10% not concerned

93% OR trash = excessive
68% “far too much”; 5% “appropriate”

93% we should seek approaches to reduce waste

78% we should seek ways to reuse supplies & instruments

5% - no changes needed
# Regulations, Policies and Mandates

**Rate the impact of the following as Drivers of waste/trash generation in ophthalmic ORs?**

<table>
<thead>
<tr>
<th>Surgeons (n=1101)</th>
<th>High impact</th>
<th>Moderate impact</th>
<th>Little / no impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single use items packaged in ways creating unnecessary waste</td>
<td>71%</td>
<td>24%</td>
<td>5%</td>
</tr>
<tr>
<td>Hospital/facility policies limit surgeon discretion for reusing supplies</td>
<td>74%</td>
<td>21%</td>
<td>5%</td>
</tr>
<tr>
<td>Regulatory agencies limit surgeon discretion for reusing supplies</td>
<td>82%</td>
<td>15%</td>
<td>3%</td>
</tr>
<tr>
<td>Manufacturers mandate single use IFU to limit liability</td>
<td>70%</td>
<td>26%</td>
<td>4%</td>
</tr>
<tr>
<td>Manufacturers drive market towards more profitable single use products</td>
<td>77%</td>
<td>20%</td>
<td>3%</td>
</tr>
<tr>
<td>Lack of environmental/carbon footprint considerations</td>
<td>65%</td>
<td>26%</td>
<td>10%</td>
</tr>
</tbody>
</table>
## Should my Society do Something?

<table>
<thead>
<tr>
<th>Topic</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory bodies should allow surgeons more discretion in reusing supplies, drugs, and devices.</td>
<td>81%</td>
<td>14%</td>
<td>3%</td>
<td>1%</td>
</tr>
<tr>
<td>Healthcare systems should adopt practices and policies that reduce carbon footprint in operating rooms.</td>
<td>78%</td>
<td>14%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>The medical societies to which I belong should advocate for the reduction of carbon footprint in operating rooms.</td>
<td>71%</td>
<td>16%</td>
<td>7%</td>
<td>3%</td>
</tr>
<tr>
<td>We need more studies to assess the safety of reuse of supplies, drugs, and devices.</td>
<td>68%</td>
<td>19%</td>
<td>7%</td>
<td>3%</td>
</tr>
</tbody>
</table>
4 Million Cataract Operations per Year in the US

While producing the least amount of waste per case, ophthalmology was still the greatest contributor of waste overall due to relatively high case volume.
Contributors to the Carbon Footprint of Cataract Surgery on One Eye

Figure 2 The carbon footprint of a patient undergoing first eye cataract surgery divided into primary sectors of GHG emissions.

The EyeSustain Mission

+ Engage, network and educate our global ophthalmic community about more sustainable practices
+ Collaborate with Industry to reduce our carbon footprint and surgical waste
+ Support research and innovative solutions that reduce ophthalmology’s environmental impact
+ Collaborate with other medical specialties to reduce the carbon footprint of our healthcare system
+ Support advocacy and education about the public health impact of climate change
Key Sustainability Topics in Ophthalmology

Sustainability in the Clinic
Turn your clinic into part of the solution.
View Sustainability in the Clinic

Sustainability in the OR
Learn why addressing operating room waste is key to sustainability efforts.
View Sustainability in the OR

Drug Waste
Reduce drug waste to save money and mitigate pollutants.
View Drug Waste

Global Green Practices
Explore best practices to shrink your carbon footprint.
View Global Green Practices
Educate Ourselves and Others

The Public Health Impact of Climate Change

Victor Dzau, MD, President of the National Academy of Medicine, provides an overview of the public health impact of climate change (speaking to the 2022 Medical Society Consortium on Climate and Health Annual Meeting).
Sustainability in the OR and Clinic

**OVERVIEW OF OPERATING ROOM WASTE**

Waste from operating rooms and labor and delivery units is responsible for 70% of waste from the healthcare sector.

---

**Create a Medical Waste Disposal Program in 5 Steps**

Learn 5 steps to creating a medical waste disposal program that will save you money. Try the online savings calculator to see how much your practice can save!

[VISIT MEDPRO DISPOSAL SITE]
Tools to Take Action

Take the Pledge
7 goals for facilities to reduce waste

Links to references
- Toolkit, flowsheets
- MyGreenDoctor.org
- Calculate your Carbon Footprint
  - Zasti, Zabbage
- Work with your staff

Recognition
Learn From Other Specialties

Unused surgical supplies cost UCSF neurosurgery an estimated $2.9M annually.

Researchers doing the “2 week challenge” found no correlation between a surgeon’s experience and the amount of wasted supplies.

Sponges, blue towels and gloves ranked as the most unused and discarded supplies.

Tell your suppliers what you want in your packs.
INDUSTRY INITIATIVES

We will continually update this section to offer practical examples to increase sustainability from the industry perspective, and to showcase the companies that have successfully done so.
GET INVOLVED

Climate solutions could rapidly improve public health and equity. As a physician, you have a trusted voice. Learn how you and your hospital or office can play a role in supporting the health of people and planet.

DONATE
Steps for Success

- High powered champion with connections
- Enthusiastic multi-talented team
- Emphasize cost savings for universal acceptance
- Website, App with notifications
- Social media
- Editorials, journal articles
- Produce and promote courses
- Work with industry
- Partner with other societies
- Nurses, administrators
- Young doctors and students
- Actionable items and tools
Thank You!
Maintenance of Certification & Climate Education

Shalini H. Shah, DO

Medical Society Consortium on Climate & Health (MSCCH) Annual Meeting

March 20th, 2023
Acknowledgements

- AAP Climate Advocates Network
  - Becca Philipsborn, MD, MPH
  - Andrew Lewandowski, DO
  - Karina Maher, MD
  - Lori Byron, MD

- This presentation was supported by the American Academy of Pediatrics (AAP) and funded (in part) by a cooperative agreement with the Centers for Disease Control and Prevention/Agency for Toxic Substances and Disease Registry (CDC/ATSDR). The U.S. Environmental Protection Agency (EPA) supports the PEHSUs by providing partial funding to CDC/ATSDR through an Inter-Agency Agreement. The findings and conclusions in this presentation have not been formally disseminated by CDC/ATSDR or EPA and should not be construed to represent any agency determination or policy. Use of trade names that may be mentioned is for identification only and does not imply endorsement by the CDC/ATSDR or EPA.
How do we engage pediatric providers?
Maintenance of Certification

Part I – Professionalism and Professional Standing
Part II – Lifelong Learning and Self-Assessment
Part III – Assessment of Knowledge, Judgement and Skills
Part IV – Improvement in Medical Practice
Practice Improvement Project Design

- **Start baseline data collection**
  - Baseline data collection
    - Data point 1: Percentage of patients who received counseling about any climate change and health topics.
    - Data point 2: Reflection on counseling

- **Complete 1st training module & start data collection for period 2**
  - Period 2 data collection
    - Data point 1: Percentage of patients who received counseling about any climate change and health topics.
    - Data point 2: Reflection on counseling

- **Complete 2nd training module & start data collection for period 3**
  - Period 3 data collection
    - Data point 1: Percentage of patients who received counseling about any climate change and health topics.
    - Data point 2: Reflection on counseling

- **Submit data & complete attestation**
Health Effects of Climate Change on Children
Self-paced

This climate and health module was designed to give pediatric providers the tools they need in order to incorporate climate change counseling into the framework of an outpatient well child visit.
Part I - Education Module
Part II - Communication Module
Current Status & Next Steps

MODULE FINALIZED AND CURRENTLY AVAILABLE ON EMORY NURSING LEARNING MANAGEMENT PLATFORM

EXPLORING OPTIONS TO FACILITATE MOC IV CREDIT

LEARNING FROM PARTICIPANT DATA AND REFLECTIONS
Medical Societies
Advancing Climate Health

presented by:

Ashley E. McClure, MD FACP
Co-Founder & Co-Director, Climate Health Now (CHN)
Primary Care Internist

Jerry P. Abraham, MD MPH CMQ
Director & Chief Vaccinologist, Kedren FQHC
President, Los Angeles County Medical Association
Trustee, California Medical Association
Councilor, American Medical Association

Medical Society Consortium on Climate & Health
Building the Climate & Health Movement
Annual Meeting - March 2023
Washington, DC
CONFLICTS OF INTEREST STATEMENT

- We have no conflicts of interest to disclose
- We are not receiving any outside funding

LEARNING OBJECTIVES

- Our journey and how we have kick-started our mission
- Why we decided to bring the AMA into climate leadership for health equity
- Our process, the challenges we faced, and the lessons we learned
- What we have achieved and what opportunities are ahead
FINDING YOUR CLIMATE ACTION

What brings you joy?
Sources of satisfaction and delight

What are you good at?
Your skills, resources, and networks

What work needs doing?
Climate and justice solutions

Source: Climate Action Venn Diagram Dr Ayana Elizabeth Johnson - Urban Ocean Lab
HOW MANY LOBBYISTS DO YOU THINK THE AMA HAS IN DC?

52!

Source: Open Secrets
<table>
<thead>
<tr>
<th>LOBBYING CLIENT</th>
<th>TOTAL SPENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Chamber of Commerce</td>
<td>$66,410,000</td>
</tr>
<tr>
<td>National Assn of Realtors</td>
<td>$44,004,025</td>
</tr>
<tr>
<td>Pharmaceutical Research &amp; Manufacturers of America</td>
<td>$30,406,000</td>
</tr>
<tr>
<td>Business Roundtable</td>
<td>$29,120,000</td>
</tr>
<tr>
<td>American Hospital Assn</td>
<td>$25,215,934</td>
</tr>
<tr>
<td>Blue Cross/Blue Shield</td>
<td>$25,176,385</td>
</tr>
<tr>
<td>Meta</td>
<td>$20,070,000</td>
</tr>
<tr>
<td>American Medical Assn</td>
<td><strong>$19,490,000</strong></td>
</tr>
</tbody>
</table>

*Source: 2021 highest spending federal lobbies per Open Secrets data*
HOW WE BECAME A TEAM

JOINING THE AMA DELEGATION

FORMING A TEAM

ATTENDED CMA HOD

AUTHORING RESOLUTIONS

CMA CLIMATE SYMPOSIUM

OUR WHY
AMA POLICY:
THE IMPORTANCE OF ORGANIZING ORGANIZED MEDICINE

Other public health issues such as gun violence, police brutality, opioid epidemics, and the AMA’s Center for Health Equity work has gotten AMA advocacy engagement by being declared as a crisis.

So, we wrote a AMA resolution declaring climate change a public health emergency in order to start giving it the attention it needs by Organized Medicine.
OUR PROCESS

- Build relationships to educate and engage colleagues, patients, legislators and leaders in the work

- Drafting and advocating for the resolution 3 times

- Coordinating with sister organizations, and value-based allies: MSCCH, CHN, CHEEA, CHO Fellowship, HHS OCHE, NAM

- Forge Coalitions

- Promote Education and Policy Leadership through Relationships

- Roll with the Punches

- Build Local Support

  Drafting resolution for state medical society, getting a seat at the table
Limiting EPA ability to regulate greenhouse gases harms public health

JUN 30, 2022

Statement attributed to:
Jack Resneck Jr, MD
President, American Medical Association
OVERCOMING CHALLENGES

We were told that:

- Climate change is not in our lane - outside typical scope of medicine
- Public health not a priority
- More pressing issues have to be prioritized such as reimbursement
- It is impossible for us to address the climate crisis in a meaningful / impactful way
AN EYE ON THE FUTURE

CREATING A CLIMATE HEALTH RESOLUTION DATABASE INCLUDING MODEL RESOLUTIONS

CREATING AN AMA CLIMATE CAUCUS

CMA ADVOCATING AND SPONSORING CLIMATE LEGISLATION

UPCOMING AMA REPORT AND RECOMMENDATIONS
HOW TO GET INVOLVED

JOIN YOUR STATE’S CLINICIAN CLIMATE GROUP

JOIN YOUR STATE OR SPECIALTY MEDICAL SOCIETY AND TALK ABOUT CLIMATE

INTRODUCE CLIMATE RESOLUTIONS IN YOUR MEDICAL SOCIETY
THANK YOU!  
ANY QUESTIONS?

- Jerry P Abraham, MD MPH CMQ  
  abraham.jerry@gmail.com
- Ashley E McClure, MD, FACP  
  ashennessy@gmail.com

CREDITS: This presentation template was created by Slidesgo, including icons by Flaticon and infographics & images by Freepik and illustrations by Storyset

slides curated by:
Mr. Wesley Acastre, MLA, Health Communications  
wesleyfacastre@gmail.com
Return to General Session
11:00 am-3:00 pm

In Person: Return to Auditorium

Virtual: Please refer to either the Zoom chat or your program guide for the zoom link

SCAN ME
Innovations in Medical Education
3:10-4:00 pm ET

**Moderator**
Ruth McDermott-Levy, PhD, MPH, RN, FAAN
Professor and Co-Director, the Mid-Atlantic Center for Children’s Health and the Environment
Villanova University’s Fitzpatrick College of Nursing

**Japhia Jayasingh-Ramkumar MD, FACP**
Clinical Associate Professor
University of Illinois Champaign-Urbana College of Medicine, Carle Illinois College of Medicine and American University of Antigua

**Natasha Sood, MPH**
Fourth-Year Medical Student
Penn State College of Medicine

**Mark McShane, MD**
Chief Resident of Pediatrics
Baylor College of Medicine / Texas Children’s Hospital
Incorporating Climate Change Education into a Pediatric Residency Curriculum

Mark A. McShane, M.D.
Department of Pediatrics
Baylor College of Medicine
Texas Children’s Hospital
Climate change: why should it be part of graduate medical education?

"I received education in medical school about climate change and how it impacts health."

- Strongly Agree (6%)
- Agree (14%)
- Neutral (16%)
- Disagree (41%)
- Strongly Disagree (23%)

"Residents would benefit from education on how to address climate change within their future scopes of practice."

- Disagree (2%)
- Neutral (6%)
- Strongly Disagree (33%)
- Agree (57%)

McShane M, Kumar S, Zuniga L. Assessing Pediatric Residents’ Knowledge and Attitudes Toward Climate Change and its Impact on Health. Pediatric Academic Societies (PAS). Apr 2022; Denver, CO.
So... how can we teach medical residents about climate change?

- Standalone lectures, interactive sessions, and grand rounds
- Incorporate small doses of information into pre-existing lectures, cases, etc. (ex: Climate Resources for Health Education)
- Weave climate-related concepts & phenomena into simulation
- *Most importantly*: start wherever you (and your institution) are right now

Twitter & LinkedIn: @MarkMcShaneMD
Incorporating climate into our curriculum

• Identify the curricular element(s) and location – standalone session in our PGY-1 didactic rotation, which reaches 3-6 residents per month (~60-65 per year)

• Pitch the idea to course director(s) and program leadership

• Build the session – virtual, ~90 minutes, case-based and interactive, with a small amount of pre-reading

• Recruit & train faculty (and/or experienced trainees) to facilitate the sessions

Twitter & LinkedIn: @MarkMcShaneMD
Comparing Pre- and Post-Session Knowledge & Attitudes

McShane M, Kumar S, Zuniga L. Assessing Pediatric Residents’ Knowledge and Attitudes Toward Climate Change and its Impact on Health. Pediatric Academic Societies (PAS). Apr 2022; Denver, CO.

"I am aware of the ways in which physicians can be climate advocates."
"Physicians and healthcare providers should be leaders in the movement to combat climate change."
"I understand how human activities contribute to climate change."
"I understand how climate change directly impacts human health."

Strongly Agree

Strongly Disagree

Neutral

$p = .002$
$p = .001$
$p = .002$
$p = .002$
The long-term climate curriculum vision (GME)

- Intro session (PGY-1): climate change effects on health (specialty specific)
- Session/lecture on the interfaces between climate change, SDoH, and health disparities
- Flipped classroom session on healthcare sustainability (PGY-3/4)
- 1-2 Grand Rounds lectures per year

Twitter & LinkedIn: @MarkMcShaneMD
Map out your Immediate, Short, and Long-term Goals

• *Immediate*: what step could you take *this week* toward advancing the climate curriculum at your institution?

• *Short-term*: what curricular element(s) do you plan to incorporate *by the end of next academic year*?

• *Long term*: what type/extent of climate curriculum will your incoming PGY-1 class experience *before they graduate in ~3-5 years*?

Twitter & LinkedIn: @MarkMcShaneMD
Innovations in Climate and Health Medical Education

Using Simulation to Incorporate Climate Change Education into Medical Curriculum

Japhia Ramkumar MD (jayasing@illinois.edu)
Objectives

Outline four examples of a variety simulation exercises used in teaching trainees about climate change and health impacts
ADD CONTENT TO CURRICULUM THROUGH ACTIVE LEARNING
Simulation Based Education

“One of the most important steps in curriculum development is the introduction of simulation-based medical teaching and learning.” (Al-Elq AH, 2010)
Create a case scenario for portrayal by a standardized patient. Include:

- Patient’s age, gender, geographic location & time of year
- Patient’s description of chief complaint & symptoms
- History including: Exposure to climate related conditions, Vulnerability to climate related conditions including patient’s medical & socio-economic condition & community characteristics

Faculty Delivered Didactic

Student Exercise

Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Malnutrition, diarrheal disease
- Water and food source impacts
- Malaria, dengue, encephalitis, bartonellosis, filariasis, leishmaniasis, Lyme disease, Chagas disease, West Nile virus
- Respiratory allergies, asthma
- Cholera, cryptosporidiosis, amoebic dysentery, Naegleria fowleri blooms

Idea for Mitigation
M1-M2 Workshop With More Structure

Group 1 Excess Heat
Group 2 Poor Air Quality
Group 3 Vector Borne Disease
Group 4 Water Borne Disease
Group 5 Extreme Weather Events

1. Work in small groups
2. Use worksheet as a mini-template to develop your case
3. Reconvene in 20 minutes
4. Share and present your case with large group
...Connecting the Dots...

Common Chief Complaints
- Allergy
- Anxiety
- Cough
- Chest pain
- Depression
- Diarrhea
- Dizziness
- Shortness of breath
- Skin rash

Climate Exposure Risks

Heat
- Outdoor workers
- Urban heat island

Poor Air Quality
- Particulates
- Pollen & Mold
- Wildfire

Vector Borne Diseases
- Lyme & others

Water Borne Illness
- Algal Blooms
- Sewage contaminated water
- Flooding

Mental Health Risks
- Property damage & loss
- Displacement
Outcomes-Cases Developed by Students from Workshop:

**Adult Case**
65-year-old in Illinois experiencing worsening **cough and shortness of breath**; history of smoking and COPD controlled by medication; Recent travel to a music festival in California - **exposed to dust, wildfire smoke, and smog**.

**Pediatric Case**
5-year-old in Michigan experiencing **sneezing, runny nose, coughing, wheezing, watery eyes, skin irritation**; family lives in a **basement apartment** that was **flooded** by a heavy storm and developed **mold**.

**Mental Health Case**
43-year-old single mother living in Houston area suffering from **anxiety and insomnia**; living in disaster relief structure months after **home destroyed by Hurricane Harvey**; had **no flood insurance** because her house was outside of the area designated as floodplain.
Example 2

Objective Structured Clinical Examination (OSCE) for M3
Deployment of Standardized Patient (SP) Case Scenario Encounter

- Group Setting
- One on One
Asthma Exacerbation Triggered by Wildfire: A Standardized Patient Case to Integrate Climate Change Into Medical Curricula

Japhia Ramkumar, MD, Holly Rosencranz, MD, MPP, and Leslie Herzog, MBA, MEd
Using Your Voice: Advocacy 101
Through the Lens of Climate Change
Example 4
An Interprofessional Discussion on Diarrhea

BEYOND THE IMODIUM
March 28 or March 31 | 6:30 p.m. to 8 p.m.

A One Health Pilot focused on the Impact of Climate Change

Gain a better understanding of human–animal–ecosystem dynamics involved in a common clinical sign

If interested, please contact:
Grace Lee Park (gleepark@illinois.edu)
Will Sander (wsander@illinois.edu)
Laura Rice (ricela@illinois.edu)

A collaboration of:
- Carle Illinois College of Medicine
- College of Veterinary Medicine
- College of Applied Health Sciences
- Champaign-Urbana Public Health District

UNIVERSITY OF ILLINOIS
URBANA-CHAMPAIGN
Take Home Lessons

1. Core curriculum clinical simulation exercises can be enhanced by incorporating a backstory that includes climate change related risks and vulnerabilities.

2. Such exercises can be modified to address emerging threats and risks and to highlight hot-button issues such as climate justice, the pandemic, and shared drivers that impact public health.

3. Exercises can be used as a springboard for discussions of policy and advocacy strategies to improve community health.

4. Students will continue to inspire your journey as educators.

5. Find your allies.
Questions and Comments
References

5. Image attestations: https://creativecommons.org
Global Perspectives for Climate and Health: An asynchronous on-line course taught across four continents

Ruth McDermott-Levy, PhD, MPH, RN, FAAN (USA)
Enembe Okokon, MBBCH, MSc, MWACP, FMCPH, PhD (Nigeria)
Poornima Prabhakaran, MBBS, MSc, PhD (India)
Richa Sharma, PhD (India)
Lauri Kuosmanen, RN, PhD (Finland)
Objective

Describe the use of COIL framework to educate health professionals about climate & health.
Five Attributes of COIL

1. Faculty from different institutions co-creating, co-teaching, co-managing course.
2. Students from different countries participating in the course but enrolled in own institution.
3. Students evaluated by their own faculty.
5. Course content, communication, & assignments use internet connection, technology that is already available at low cost.
Used an on-line platform that was accessible to all

- Worked with University IT
- Allow all to access without registering through a single academic institution
- Able to post documents, weblinks, and videos
Things to consider

- Committed Faculty
- Planning meetings
- Memorandum of Understanding
- Intellectual Property
- Faculty leader
- IT Support
Value of this course:
Learn about climate change and health impacts
Work in interdisciplinary teams
Engage with students across the global to learn
  • Regional variations of climate change
  • Impact of history, politics, economics, and cultural on climate response
Student Responses

• Sincerely appreciate who those that participated in one way, or the other to ensure that this course was a massive success, from the faculty. And a big thank you to my wonderful team members, you guys are the best. Today was massive. ~ Samuel, Nigeria

• I can't believe the semester is almost to a close and we have learned so much on the impacts of climate change and health! ~ Megan, US

• Taking this opportunity to let you know that we are really enjoying this enlightening course. ~ Rehna, India
Climate Resources for Health Education (CRHE)

A global health professional-led initiative that aims to provide free, evidence-based resources to accelerate the incorporation of climate change and planetary health concepts into health educational curricula.
The Challenges

1. Gap in understanding & managing impacts of climate on health
2. Lack of faculty expertise, protected faculty time & funding
3. Requires training at numerous levels
4. Lack of formal curricular framework & “competing priorities”

**Program Goals**

**Modular Repository**
Expert reviewed climate & health materials for health curricula

**Open Access Website**
Ensure free, easily accessible website

**Collaboration**
Utilize an inter-institutional perspective

**Diversity & Inclusion**
Recruit a diverse team and develop region specific content

**Interdisciplinary**
Develop materials for all health specialties

**Resource Renewal**
Annual renewal to keep pace with the evolving field
The Solution: CRHE Curricular Domains

- **Medicine & Advanced Practice Providers**
  - Organ Systems Science

- **Nursing**
  - Population Groups

- **Pharmacy**
  - Clinical correlates

- **Health Equity**
  - Health justice, diversity

- **Health Systems Science**
  - Determinants of Health, Sustainability, Advocacy

- **Quality Improvement**
  - Templates for QI projects

- **One Health**
  - Animal, Human, & Environmental Health

- **Humanities**
  - Eco-Anxiety, Burnout, Advocacy
CRHE Curricular Components

Learning Objectives

Oversight by Core Team
CRHE Curricular Components

Problem Based Learning Case
PBL cases developed by our contributors by curricular domain to provide context for concepts

Learning Objectives
Oversight by Core Team

Slide Decks
Short slide decks developed by our contributors based on curricular domain
Assemble teams of up to three trainees and a faculty advisor

Teams develop materials per our Instructions for Authors and Learning Objectives

Materials peer reviewed by Operations Team for standardization & revisions

Materials sent to expert reviewers for evidence-based review of content

Revised materials published on free, open-access website
Our Standards and Rubrics

### Learning Objectives
- Evidence base
- Language, Bloom’s Taxonomy
- Level appropriateness
- Alignment with CRHE mission
- Qualitative

### Peer Review
- Formatting
- Evidence base
- Professional
- Climate integration
- Health equity
- Action items
- Qualitative

### Expert Review
- Learning objectives
- Presentation
- Evidence base
- Climate integration
- Health equity
- Action items
- Qualitative
Find Climate Resources For Health Education

An expert-reviewed repository of learning objectives, slides, and cases for climate change and health curricula.

All Curricular Domains
All Topics

SEARCH RESOURCES
Expert Reviewed Repository

- Learning Objectives
- Slide Decks
- Problem Based Learning Cases
- Organ Systems & Specialties
- Health System Science (Coming Soon)
- Humanities (Coming Soon)
- Cardiovascular
- Respiratory
- Biochemistry
- Gastrointestinal
- Rheumatology
- Trauma
- Radiology
- Dermatology
- Neurology
- Psychiatry
- Reproductive
- Pediatrics
- Hematology
- Renal
- Microbiology
- Occupational
- Interprofessional
- View All
Our Content

- Learning Objectives
- Clinical Vignette
- Patient Review of Symptoms
- Medical History
- Social & Environmental History
- Family History
- Physical Exam
- Facilitator prompts & guide

Unit: Cardiovascular

OSS1.4, Heat Stress and Heart Failure

Heat Stress and Heart Failure

Authors:
Joshua M. Perez-Cruet, Medical Student, Washington University in St. Louis
Joy Song, Medical Student, Albert Einstein College of Medicine
Sophia Souris, MPH, MD, Medical University of South Carolina

Faculty Advisor:
J.G. Reves, MD, Dean Emeritus College of Medicine, Medical University of South Carolina

Reviewer:
Christian Mewaldt, MD, University of California San Francisco

FACILITATOR GUIDE

Goal:
Understand the danger of an extreme heat wave to patients with chronic heart failure and explain preventive measures.

Climate related learning objectives
1. Describe the mechanism by which extreme heat exacerbates heart failure.
2. Describe the association and probable mechanism linking heat and myocardial infarction.
3. Evaluate interventions to protect patients from forecasted heat waves.
4. Understand the risks associated with taking diuretics during heat waves and counsel patients how to use them safely.
5. Recognize the impact of global warming on vulnerable patient populations with cardiovascular disease and the role of social determinants of health in management of chronic disease.
6. Understand how geographic location affects an individual's cardiovascular response to heat.
Key Features

- Facilitator guides and speaker notes for all materials
- Implementation & “how to guide” for curriculum reform
- CRHE materials mapped to Planetary Health Report Card metrics
Our Community

- 400 Contributors
- 11 Countries
- 70+ Teams
- 650 subscribes

- 23 PBL cases
- 12 Slide decks
Our Partners

COLUMBIA | Mailman School of Public Health

GLOBAL CONSORTIUM ON CLIMATE AND HEALTH EDUCATION

Massachusetts General Hospital
Founding Member, Mass General Brigham
Center for the Environment and Health

Brigham and Women’s Hospital
Founding Member, Mass General Brigham

UCSF
University of California
San Francisco

EMORY UNIVERSITY
Improvements

- Develop region specific content
- Translate our resources
- Website searchable by tags and key words
- Renew & revise content annually
- Continue to amplify the work that is already underway
Acknowledgements & Thank you

- Dr. Cecilia Sorensen and the Global Consortium on Climate and Health Education
- CRHE partnering institutions
- Student led leadership & operations team
- CRHE Contributors
- Medical Society Consortium on Climate and Health
Join us!

Email: climateresourceshealthed@gmail.com

Visit our websites here!
References


Image formats courtesy of SlidesGo
Take a break

The meeting will resume at 4:10 pm ET

Next up... Climate change and maternal-child health
Climate Change and Maternal-Child Health: Impacts and Counseling for the Reproductive Landscape

4:10-5:00 pm ET

Moderator
Rob Byron, MD
Internist
Crow Indian Reservation, Montana

Heather Brumberg, MD, MPH
Professor of Pediatrics and Clinical Public Health
Division of Neonatology, Maria Fareri Children’s Hospital at Westchester Medical Center

Blair Wylie, MD, MPH
Founding Director of The Collaborative for Women’s Environmental Health and Professor of Obstetrics and Gynecology
Columbia University

Katie Huffling
Certified Nurse-Midwife
Executive Director of the Alliance of Nurses for Healthy Environments (ANHE)
Every Breath You Take: Why Ambient Air Pollution and Climate Change Matter to Birthing People and Infants

Heather L. Brumberg, MD, MPH, FAAP
President, Eastern Society for Pediatric Research
Professor of Pediatrics and Clinical Public Health, New York Medical College
Neonatology Attending and Associate Director of the Regional Perinatal Center, Maria Fareri Children’s Hospital at Westchester Medical Center, Valhalla, NY

The Police released this single in 1983. Definitely ahead of their time!
Developing Fetus and Windows of Vulnerability

Keith L. Moore BA, MSc, PhD, DSc (OSU), DSc (WU), FIAC, FRSM, FAAAA, T.V.N. (Vid) Persaud MD, PhD, DSc, FRCPath (Lond.), FAAAA and Mark G. Torchia MSc, PhD. The Developing Human, 20, 433-461.e1
Children Are Not Little Adults

https://www.huffpost.com/entry/just-20-photos-of-kids-dressed-as-old-people-cause-its-ridiculously-cute_n_57e98a9be4b024a52d29b3d6
Postnatal Development

- Inadequate temperature regulation (susceptibility to heat stress)
- Immature immune and DNA repair systems
- Higher minute ventilation
  - 400 ml/kg/min newborn vs 150 ml/kg/min adult exposure per mass
- More water intake relative to body weight
- Organ development ongoing (brain, lungs, reproductive)
  - Rapidly dividing cells
- Developmentally may not be able to remove self from toxic environment
  - For example: not walking or mouthing behavior

Frederica Perera, Dr.P.H., Ph.D., and Kari Nadeau, M.D., Ph.D. NEJM 2022
Sources of exposures: Earth, Wind, and Fire
Air Pollution and Climate Change Are Linked

• Combustion processes produce both air pollutants and greenhouse gases.

• Also climate change increases temperature, more forest fires and secondary production of the air pollutants (ozone, PM)

https://cleanair.org/outdoorairpollution
What Happens in the Air Does Not Stay in The Air

"Dry and Wet Deposition of Air Pollutants" from Environmental Health. Available at: http://ocw.jhsphs.edu. Copyright © Johns Hopkins Bloomberg School of Public Health. Creative Commons BY-NC-SA. Adapted by CTLT from Kemp, D. D.
Key Outdoor Air Pollutants of Concern

- **Criteria Pollutants (6)**
  - Carbon monoxide
  - Lead
  - Nitrogen Dioxide (NO$_2$)
  - Particulate Matter (PM):
    - Including PM with a median diameter less than 10 μm (PM$_{10}$) and less than 2.5 μm (PM$_{2.5}$)
  - Sulfur Dioxide (SO$_2$)
  - Ozone (O$_3$)

- **Hazardous Air Pollutants Examples**
  - Polycyclic aromatic hydrocarbons (PAHs)
  - Metals (Mercury, Chromium)
  - Solvents (benzene)
  - Formaldehyde

- **Greenhouse Gases Examples**
  - Carbon dioxide
  - Methane
  - Perfluorocarbons
Contextualizing Air Pollution: Components of Tobacco Products and Smoke in Common with Air Pollution

- Carbon monoxide
- Nitrogen Dioxide
- Polycyclic aromatic hydrocarbons (PAHs)
- Particulate matter
- Volatile organic chemicals (VOCs: ie Benzene, Formaldehyde)
- Heavy metals (ie Lead, Mercury, Chromium)

Transgenerational Effects

Asthma Risk Increased if Grandmother Used Tobacco

Table 4—Multivariable Analysis of the Joint Associations of Maternal and Child’s In Utero Exposure to Maternal Smoking With Child’s Asthma Risk, OR, and 95% CI*

<table>
<thead>
<tr>
<th>In Utero Exposure to Maternal Smoking</th>
<th>Mother</th>
<th>Child</th>
<th>No.†</th>
<th>OR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unexposed</td>
<td>Unexposed</td>
<td>118/151</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exposed</td>
<td>Exposed</td>
<td>27/58</td>
<td>1.3</td>
<td>0.8–2.1</td>
<td></td>
</tr>
<tr>
<td>Exposed</td>
<td>Unexposed</td>
<td>165/34</td>
<td>1.8</td>
<td>1.0–3.3</td>
<td></td>
</tr>
<tr>
<td>Exposed</td>
<td>Exposed</td>
<td>102/36</td>
<td>2.6</td>
<td>1.6–4.5</td>
<td></td>
</tr>
</tbody>
</table>

*Models are adjusted for race/ethnicity, gestational age, and SHS exposure.
†Number of countermatched control subjects/case patients.

(Li et al. Chest 2005; Rumrich et al. 2021)
Health impacts

Ambient Air Pollution: Health Hazards to Children

Heather L. Brummel, MD, MPH, FAMP, Catherine J. Kari, MD, PhD, FAMP. COECE ON ENVIRONMENTAL HEALTH

Extrinsic environmental factors

Intrinsic biologic factors

FIGURE 2

Health outcomes

Exposure to Toxic Environmental Agents

The American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women

American Society for Reproductive Medicine Practice Committee

The University of California, San Francisco Program on Reproductive Health and the Environment

This document was funded by the American College of Obstetricians and Gynecologists Committee on Health Care for Underserved Women and the American Society for Reproductive Medicine Practice Committee with the assistance of the University of California, San Francisco (UCSF) Program on Reproductive Health and the Environment.

Fig. 1. Environmental Influences on Reproductive and Developmental Health. (University of California, San Francisco Program on Reproductive Health and the Environment.)

https://prhe.ucsf.edu/acog-asrm-opinion
Preconception

• Recent systematic review including animal and human data
  • Decreased fertility among couples living near major highways
  • Although mostly retrospective – decreased sperm counts (ozone in prospective study), less evidence for female menstrual cycles

Pregnancy Effects

- Traffic Related Air Pollution is a risk for developing hypertensive disorders of pregnancy
- Associated with stillbirth/spont abortions and gestational diabetes (more studies needed)
- Air pollution and congenital anomalies data suggestive of cardiovascular anomalies, but more studies needed

Low Birth Weight

- Prenatal exposure to air pollution increases LBW risk, but windows of vulnerability (ie trimester) unclear
- Mother passively smoking and LBW risk:
  - 1.3+-/0.7 cigarettes = increase 10 µg/m³ exposure to NO₂
  - 3.8+-/ 2.3 cigarettes = increase 10 µg/m³ exposure to PM₂.₅

Prematurity

- Nationally, 3.32% of all preterm births (PTB) were attributable to PM$_{2.5}$
  - =15,808 PTB
  - =$5.09 billion ($760 million were spent for medical care)

- Differences by location
**Not Just Exacerbations of Asthma**

Worse lung function at 44wk CGA if mod-late preterm (vs term) with 2nd trimester PM$_{10}$

---

**Figure 1.** Associations between perinatal PM$_{2.5}$ exposure during phases of fetal lung development and child asthma at age 4. Risk ratios (95% confidence intervals) per 2 μg/m$^3$ higher PM$_{2.5}$ exposure during each window. Fully adjusted models included child age, sex, birth in warm vs. cold season, cultural/spine for details of birth (1 degree of freedom/year), study site, marital age, marital race, marital income, prepregnancy BMI, parental smoking, party, postnatal secondhand smoke, pets in the home, and Childhood Opportunity Index.

Neurodevelopment

• Associated with global psychomotor development, autism, decreased neurocognitive function, poorer academic success, ADHD

• Folate may mitigate impact of PM$_{10}$ on childhood IQ

Health Impacts and Mechanisms

Poorer nutrition, heat stress, infectious diseases, and toxic stress (e.g., racism) can only compound outcomes such as infant mortality, low birth weight, and prematurity.

Leong et al. J. Perinatology 2022

Diagram:
- Social determinants of health
  - Air Pollution
  - Climate Change
  - Endothelial dysfunction
  - Vascular remodeling
    - Impaired transport of oxygen and nutrients
      - Pre-eclampsia/hypertensive diseases of pregnancy
      - Small placenta
    - Intrauterine growth restriction
  - Epigenetic changes
    - Inflammation
    - Oxidative stress
    - Endocrine disruption
  - Increased Childhood/Lifetime Risk of:
    - Neurodevelopmental abnormalities
    - Age-related diseases (e.g., ischemic heart disease, lower respiratory tract infections, cerebrovascular disease)
    - Asthma
    - Bronchitis
    - Allergies
    - Autism
    - Otitis media
    - Cancer
    - Obesity
The Natural Experiment: Before and After
The silver lining to coronavirus lockdowns: Air quality is improving

The pandemic response has cleared the air from Los Angeles to Wuhan, China

Clear water is seen in Venice’s canals due to less tourists, motorboats and pollution, as the spread of the coronavirus disease (COVID-19) continues, in Venice, Italy, March 18, 2020. Manuel Silvestri | Reuters


Source: Sentinel-5P satellite data provided by Descartes Labs
LAUREN TIERNEY/THE WASHINGTON POST
Reduction in pollution resulted in 23 gm higher birth weight
What can we do?

Outdoor Air Quality

Resources

To learn more about outdoor air quality, visit cdph.ca.gov.

Visit airnow.gov (for download the AirNow app) to find the Air Quality Index, a color-coded scale that shows how clean or polluted the air is:

Green: Good — Moderate — Unhealthy — Very Unhealthy — Hazardous

For any AQI other than “Good”, AirNow will provide guidance on how to take action to protect your health: especially for sensitive groups like children with asthma.

UG or Unhealthy for Sensitive Groups

Ask your child’s school to use the “Air Quality Flag Program.” For more information, visit airnow.gov and scroll down to select “Flag Program.”

For more information, visit nyscheck.org/ssa.

Impact of Climate Change on Pediatric Health Care

Sponsor:
The American Board of Pediatrics

Description:
We as pediatricians are caring for children today who have been adversely impacted by our rapidly warming planet. As a result of more frequent and intense heat waves, superstorms, floods, and wildfires, we have seen an increase in asthma rates, heat-related illnesses, water- and vector-borne diseases, the prolonging of allergy seasons, and mental and emotional trauma related to intense natural disasters linked to climate change. Additionally, the impact climate change has on Earth’s food supply threatens the basic nutritional needs of children and families around the globe.

https://nyscheck.org/; Novack et al. 2006
Resources

Ambient Air Pollution: Health Hazards to Children

Heather L. Brumberg, MD, MPH, FAAP® Catherine J. Karr, MD, PhD, FAAP® COUNCIL ON ENVIRONMENTAL HEALTH
Thank You!

Email: heather_brumberg@nymc.edu

Acknowledgement: Melanie Leong, MD
Impact of extreme heat on pregnant people and neonates

KATIE HUFFLING, DNP, RN, CNM, FAAN
EXECUTIVE DIRECTOR
ALLIANCE OF NURSES FOR HEALTHY ENVIRONMENTS
Acknowledgments:

· Yuval Baharav
· Lilly Nichols
· Anya Wahal
· Owen Gow
· Kurt Shickman
· Maya Edwards
· Adrienne Arsht-Rockefeller Foundation Resilience Center
The scope of the problem

By 2070, without migration, 1 in 3 people around the world will be living with mean average temperatures of ≥ 29.0 °C (84.2 °F)

Xu C et al. Future of the human climate niche. PNAS.
Killer Heat in the United States

FIGURE 2. More People Are at Risk as the Heat Index Rises

- **Heat Index Above 90°F**
  - Outdoor workers become more susceptible to heat-related illness.

- **Heat Index Above 100°F**
  - Children, elderly adults, pregnant women, and people with underlying conditions are at heightened risk of heat-related illness.

- **Heat Index Above 105°F**
  - Anyone could be at risk of heat-related illness or even death as a result of prolonged exposure.

- **Heat Index Off the Charts**
  - Undetermined: any level of exposure is presumed extremely dangerous for all people and likely to result in heat-related illness or even death.

https://www.ucsusa.org/resources/killer-heat-united-states-0
Pregnancy is a time of increased susceptibility to heat
Heat is an environmental justice issue
<table>
<thead>
<tr>
<th>Obstetric complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gestational hypertension, preeclampsia, &amp; eclampsia</td>
</tr>
<tr>
<td>Cardiovascular events</td>
</tr>
<tr>
<td>Placental abruption</td>
</tr>
<tr>
<td>Preterm birth</td>
</tr>
<tr>
<td>Early pregnancy loss</td>
</tr>
</tbody>
</table>
Neonatal complications

- Fetal distress
- Meconium aspiration
- Neonatal ventilator use
- Fetal growth restriction and low birth weight
- Congenital heart disease
- Sudden infant death syndrome
Recommendations for patients

- Heat wave alerts
- Drink extra water
- Signs and symptoms of preterm labor
- Over 42 °C (107.6 °F), avoid using a fan.
- Provide guidance for patients that work outdoors
- Cooling centers
- Avoid heavy exercise during peak hours
- Guidance for cooling home if no A/C
Resources for providers


- Global Heat Health Information Network [https://ghhin.org/](https://ghhin.org/)


- Local health department guidance
Thank you!
Katie Huffling
240.753.3729
katie@enviRN.org
www.enviRN.org
Climate change, vector-borne disease, and reproductive health

*Blair Wylie, MD MPH*

Virgil G. Damon Professor of Obstetrics and Gynecology, Columbia University Vagelos College of Physicians and Surgeons

Founding Director, The Collaborative for Women’s Environmental Health at Columbia
Disclosures

SUPPORT:
BJW is/has been supported by the National Institute of Environmental Health Sciences (NIH R01 ES028688, K23 ES021471), National Institute of Allergy and Infectious Diseases, The Gates Foundation, Harvard Center for the Environment (HUCE), Harvard Catalyst | The Harvard Clinical and Translational Science Center (NIH Award #UL1 RR 025758).

OTHER:
BJW serves as the obstetric consultant to the Region 1 Pediatric Environmental Health and Specialty Units Network (PEHSU)*.

*The PEHSU is funded by a cooperative agreement award number 5 NU61TS000237-04 from the Agency for Toxic Substances and Disease Registry (ATSDR). U.S. Environmental Protection Agency (EPA) supports the PEHSU by providing partial funding to ATSDR under Inter-Agency Agreement number DW-75-95877701-4. Neither EPA nor ATSDR endorse the purchase of any commercial products or services mentioned in PEHSU publications. The views by speakers and moderators do not necessarily reflect the official policies of the Department of Health and Human Services.
Vector-borne diseases (VBDs)

A vector is an organism (typically arthropod) that transmits pathogen from animal host or infected human to an uninfected human.

- Malaria
- Dengue
- Chikungunya
- Yellow Fever
- Zika
- Lymphatic filariasis
- Schistosomiasis
- Onchocerciasis
- Chagas
- Leishmaniasis
- Japanese encephalitis
- African trypanosomiasis
- Lyme
- West Nile virus
Global estimates of VBD mortality

1/6th of disability (DALYs) worldwide attributed to VBD

Deaths from vector-borne disease

VBD Deaths/million
- 0 - 1
- 1 - 20
- 20 - 50
- 50 - 200
- 200 - 500
- 500 - 1900
- No Data

 Estimates by WHO sub-region for 2002 (WHO World Health Report, 2004). The boundaries shown on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement. © WHO 2009. All rights reserved.

Climate change linked with global rise in infectious disease outbreaks

US Vector-borne disease tripled in just > 10 yrs
Links between climate change and VBD

• Fewer cold days and cold nights
• More warm days and warm nights
• Increased days of extreme heat
• Decreased snow cover
• Increased sea level rise
• Increased evaporation from warming--> increased precipitation
• More extreme precipitation events
• Drought leading to increased water stagnation, pooling
• Drought impacting human behavior (containers for water collection)
• Climate migration: displaced human populations bring pathogen/vector to new locations
Thermal biology of mosquito-borne disease

Thermal biology of mosquito-borne disease

Biting Rate

Fecundity

Mosquito Development Rate

Immature survival

Mosquito lifespan

Zika virus
Zika Virus - Vectors

- **Aedes aegypti** – most efficient vector
  - Feeds primarily on humans; often bites multiple humans in single blood meal, hard to appreciate the bite, close contact with humans
  - Daytime feeder
  - Also transmits dengue, chikungunya, yellow fever

- **Aedes albopictus**
  - Also transmits dengue, chikungunya, yellow fever, WNV, JE, EEE
  - Can survive in more temperate climes, extending potential area for outbreaks
Microcephaly

• Small head compared to infants of same sex and age
• Implications for cognitive and neurologic function

Zika Virus and Birth Defects — Reviewing the Evidence for Causality

Sonja A. Rasmussen, M.D., Denise J. Jamieson, M.D., M.P.H.,
Margaret A. Honein, Ph.D., M.P.H., and Lyle R. Petersen, M.D., M.P.H.


Zika Virus - Brazil

- May 2015: 1st Zika cases in Brazil reported

- Sept 2015: Marked increase in infant microcephaly
  - Historical incidence 0.5/100,000 live births
  - Under-reported in past (HC not routinely measured)
  - Europe 1-2/100,000

- 2015: 20/100,000 live births (>3,000 cases)

Historic number of cases of Microcephaly in Brasil 2010 - 2015

Source: Brasil Health Ministry

Campos GS, Bandeira AC, Sardi SI. Zika virus outbreak, Bahia, Brazil. Emerg Infect Dis 2015;21:1885–6; http://www.cdc.gov/mmwr/volumes/65/wr/mm6503e2er.htm?s_cid=mm6503e2er.htm_w
Climate change expected to expand geographic reach of *Aedes* vector

Changes in life cycle completion over 100 years, *Aedes aegypti*

*Iwamura et al, Nature Communications*
Projected change in population at risk of Aedes transmission, in billions
Malaria
Malaria

• 200-300 million cases per year
• 1/2 million deaths per year
• Most vulnerable: infants, young children and PREGNANT women

Malaria in Pregnancy

Each year . . .
• 50 million exposed pregnancies
• 10,000 maternal deaths
• 200,000 malaria-attributable LBW infant deaths
• 200,000 cases of severe anemia

Desai. Lancet Infect Dis. 2007
Shifting endemicity and seasonality of malaria in Africa
Climate Change and Malaria

2050 projections

Yellow= current geographic distribution of malaria
Red= areas predicted to be suitable for malaria in 2050
The Mosquito Gap
What is environmental justice?

The belief that no community should be forced to deal with more pollution (exposures) based on their race, ethnicity, or socioeconomic status.
Heat is not equitably distributed

Philadelphia

Map 1: Density of those livingBelow poverty line
Map 2: Urban Heat Islands
Standing water not equally distributed

Study from Baltimore more mosquitos (larvae, pupae) in low SES neighborhoods

Little E, et al, Mailman School of Public Health
The hidden inequality of mosquito bites

Abandoned buildings contain lots of nooks and crannies for water to accumulate and for mosquitoes to lay their eggs.
Risk-benefits of Pesticides for Vector Control in Pregnancy

Benefits

Unknowns/Risks
Thank you!

Questions– Email ebj2107@cumc.Columbia.edu
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