Climate Health & Medical Sustainability Curriculum Integration
Mission

- Integrate climate and environmental determinants of health into our medical curriculum across preclinical and clinical years
- Approach climate change related health challenges as prospective medical professionals
- Recognize the intersectionality of climate change and environmental justice
- Amplify the importance of climate health in medicine
- Maintain evidence based information and remove any political slants from environmental and climate health
Preclinical and Clinical Curriculum Integration Goals

- Emphasize the direct health effects of climate change and environmental health
- Highlight the disparities and environmental injustices
- Incorporate environmental history taking strategies
- Consolidate existing Georgetown University opportunities
- Develop Environmental Health Longitudinal Track
Student-led Approach to Integration

**IDENTIFY**
relevant topics in climate change and environmental health that directly impacts human health

**RESEARCH**
Using evidence-based strategies and sources for the most up-to-date information on the topic

**PREPARE**
One-page research proposal and lecture material slides with references

**PRESENT**
The research and material to the appropriate module directors and faculty members explaining the importance of integration

**INTEGRATE**
Success Stories...

Module Co-Directors: Dr. Cihlar and Dr. Cole

Integrating ID and IRD in our discussion of how climate change impacts health:
Both the range and duration of risk for contracting vector-borne diseases are expanding with changes in precipitation and temperature caused by climate change. In addition, many vector-borne diseases have skin manifestations, requiring a higher index of suspicion for cutaneous and water-borne diseases in patients presenting with skin lesions and rashes in previously unaffected geographical regions. Ocean warming, rising sea levels, and the increasing intensity of extreme weather and flooding are associated with waterborne diseases with dermatologic presentations such as Vibrio and harmful algae exposures.

1. Enterics 1 and 2 lectures taught by Dr. Fonzi/

- **Hand Foot Mouth Disease** — As temperatures increase, epidemic viral diseases such as hand-foot-and-mouth disease caused by Coxsackievirus may develop transmission seasons that are longer and more intense. Hand-foot-and-mouth disease is a classic seasonal enteroviral infection in temperate climates. The incidence positively correlates with average temperature and average humidity (Coates et al. 2019).

- **Vibrio species** — Vibrio-related diseases appear to correlate with higher water temperatures and sea-level rise with changes in salinity (Deeb et al. 2018). *Vibrio parahaemolyticus* and *V. vulniﬁcus* reproduce and proliferate more rapidly in warmer waters (Deeb et al. 2018). Even small changes in peak water temperature have been correlated with local hospital admissions for *V. vulniﬁcus*-associated wound infections, cellulitis, and sepsis (Deeb et al. 2018). Higher than average temperatures in the Gulf of Mexico contribute to higher numbers of *V. vulniﬁcus* illnesses from consuming raw oysters (Deeb et al. 2018). These have numerous clinical implications, including recommending individuals to avoid areas where outbreaks have been reported, reduce oyster consumption, and avoid swimming especially if high risk (Trtanj et al. 2016).

Special thanks to Chloé Jammes and Srueeva Sathi, M2 for this slide!
Dietary Implications of Climate Change

The unprecedented rise in carbon dioxide ($CO_2$) levels has become the hallmark of the climate change crisis and is associated with increased heat-trapping, rising sea levels and extreme weather patterns. We often hear about the medical implications of climate change in the context of rising rates of infectious disease, pulmonary diseases from air pollution, or even food insecurity due to drought or changes in seasonal patterns, however, relatively recent research has shown a change in the biochemical distribution of carbohydrates and proteins in crops.

As with any change in thermodynamics, increased atmospheric carbon dioxide in plant material will increase atmospheric carbohydrates in plant material. Increased atmospheric carbohydrates in plant material will increase plant productivity, which will increase food production.

More $CO_2$ + More Heat = More Photosynthesis

- Rising $CO_2$ levels are expected to change the biochemical distribution of nutrients in rice and wheat grain
- Increased photosynthesis and carbon fixation will increase carbohydrates but leave less room for proteins and nutrients
- If atmospheric $CO_2$ continues to rise as expected (based on current trajectories) food will become less nutritious.

The New York Times

How More Carbon Dioxide Can Make Food Less Nutritious

Carbon dioxide helps plants grow. But a new study shows that rice grown in higher levels of carbon dioxide has lower amounts of several important nutrients.


Extreme Weather Temperatures and Cardiovascular Health Implications

Climate change is a global phenomenon showing an impact in nearly every facet of human life. As with most human struggles, it disproportionately impacts the most vulnerable populations—populations we as future physicians are guaranteed to interact with. It is well documented fact that the average land and sea temperatures have steadily increased globally over the last century with a compounded increase beginning in the 1980’s until now. Although changes are a reality, the most vulnerable patients are the elderly, pregnant women, and patients with pre-existing cardiovascular conditions. Extreme weather events associated with these changes such as heat waves, floods, and hurricanes can result in cardiovascular events like myocardial infarctions, stroke, and death.

Aging, Heat and the Heart

- Fastest growing age group are the elderly -- people are living longer!
- Average temperatures have been steadily increasing.
- Extreme weather patterns leading to increased severity and frequency of heat waves.

When exposed to heat for a period of 30 minutes the older age group of 64-81 years (red dots) had:

- Attenuated cardiac output
- Decreased stroke volume

Student-led Curriculum Integration Progress Report

Proposals in-progress:
- Climate change and infectious disease (4 lectures)
- Respiratory health and air pollution (2 lectures)
- Respiratory infections
- Environmental history taking
- Allergies and climate change
- Water intake: Climate change and renal diseases
- Water shortage
- Effects of high temperatures on renal health
- Climate change and mental health
Speaking Engagements

- Invite climate health thought leaders to increase awareness and motivate action among student body members
- One speaker featured every month during the academic year
- Representation ranges from environmental lobbyists to climate change communication experts
IMECCS

An international collaboration of medical students intent on making climate and sustainability education accessible at every medical institution.

Mission

- Empower healthcare students and faculty members worldwide to integrate climate and sustainability education into their curricula
- Create open source educational content and guides for implementation
Planetary Health Report Card (PHRC)

In the 2020-2021 PHRC, GUSOM scored a...

C overall,
C for curriculum,
B for support for student-led initiatives.

2. Does your medical school curriculum address the relationship between extreme temperature health risks and climate change, as well as the socioeconomic/racial disparities in extreme heat exposure?

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<tr>
<td>3</td>
<td>This topic was explored in depth by the core curriculum.</td>
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<td>This topic was briefly covered in the core curriculum.</td>
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<tr>
<td>1</td>
<td>This topic was covered in elective coursework.</td>
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<td>This topic was not covered.</td>
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Score explanation: As part of the M1 core curriculum at Georgetown “Environmental Health and Climate Change Workshop” led by Dr. C, extensive discussion on the effects of rising temperatures on heat stress specifically among young athletes.

7. Does your medical school curriculum address the relationships between health, individual patient food and water security, ecosystem health, and climate change?

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Score explanation: During the M1 Nutrition & Patient Health Intercession, there were several lectures on food security led by Dr. Yumi Jarris, Dr. Kofi Essel, and Katherine Donnelly. The lectures covered “An Approach to Food Insecurity Screening in a Clinical Setting” and “Food Insecurity Identification & Management.” However, these lectures did not discuss the relationship between climate change and food security.
Next Steps: Environmental Health Longitudinal Track

- Propose the research and development of a new longitudinal academic track
- Allow medical school students with a vested interest in climate change and environmental health to expand their scholarly repertoire
- Provide environmental health focused research opportunities
- Connect with local and national interest groups
- Provide opportunities for advocacy
- Take advantage of the proximity to the nation’s capital
- Lead a campus sustainability project