Climate Changes Health

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Introducing the Climate Change Curriculum Infusion Project

- Climate change...the greatest threat AND opportunity to health of the 21st century

- New disciplines like planetary health are emerging

- The CCCIP project addresses the gap in medical education linking the global environment to human health
Climate Change Curriculum Infusion Project

• Climate change concepts and specific health examples will enhance existing didactic content

• Unique footer on slides designate content that is part of the CCCIP
How will this work?

Existing content

Climate and health content added in between

Existing content
Association of American Medical Colleges (AAMC) supports a database in its Curriculum Inventory (CI) that aggregates institution reported curricular activity and allows queries through specific search terms...

...search indicated that schools do not report any explicit inclusion of climate change education in their curriculum.

Fortunately, many health topic areas already exist in medical school curricula where climate change education can be incorporated into the discussion simply by broadening the horizon within which these topics are taught. The querying of the AAMC’s database described above did reveal educational activities that touched on topics of concern to climate change education, including basic disease entities such as asthma and Lyme disease.
Our road map...

Guidelines Aim to Bridge the Education Gap on Climate Change and Health

A GLOBAL CONSORTIUM OF HEALTH EDUCATORS AGREE ON A SET OF CORE COMPETENCIES TO EQUIP DOCTORS, NURSES, AND PUBLIC HEALTH PROFESSIONALS TO RESPOND TO CLIMATE CHANGE

The Global Consortium on Climate and Health Education (GCHE), an international forum for developing curricula related to the health impacts of climate change, has announced a set of core competencies for students of public health, nursing, and medicine.
CC cross walked with med school competencies...

Competency 2: Scientific and Medical Knowledge

**Prerequisite knowledge of climate drivers, weather, climate change, and climate variability**

- Organ structure and function
  - Describe the incidence of, prevalence of, and risk factors for major diseases
  - Applies fundamental knowledge of ecology, biology, and complex systems in environmental science

- Characteristics and mechanisms of disease
  - Recognize the impact of age, culture, environment, disability, ethnicity/race, gender, sexuality, socioeconomic status, and spirituality on health, disease, treatment, and prevention
  - Applies knowledge of the health impacts of climate change relevant to adopting health services

- Healing and Therapeutics
  - Recognizes the global distribution of disease and its impact on the health care needs of communities
  - Describes emergency preparedness as related to health care needs
  - Applies knowledge of climate mitigation and adaptation, and health co-benefits of actions

- Social and cultural determinants of health and disease
  - Shares how health care professionals and facilities can respond to health risks of climate change
  - Applies knowledge of international, national, and subnational policy frameworks in addressing health risks of climate change

- Health care resources and delivery systems
  - Understanding of the role of international, national, and subnational policy frameworks in addressing health risks of climate change

- Ethical principles of medical practice and research
  - Apply the principles of autonomy, beneficence, non-maleficence, and justice to clinical scenarios and to issues of resource allocation
  - Applies knowledge of the ethical, professional, and legal obligations relevant to climate and health

Legend:
- ✅ Existing Core Competencies
- 🟢 Core Climate and Health Competencies

Orientation/InFocus
First Year Medical Courses
Second Year Medical Courses
Sampler of CCCIP slides from a selection of courses...
The Social Determinants of Health & Climate Change

What does structural racism have to do with climate change and health equity?
In 2014, researchers conducted a survey of Black physician members of the National Medication Association (NMA)\(^1\), who care for a disproportionately high number of Black patients

- 86% said that climate change was relevant to direct patient care
- 61% said that their own patients were already being harmed by climate change

Most commonly occurring climate-related health issues:

- injuries due to severe weather (88%)
- air pollution-related increases in severity of chronic disease (88%)
- increased allergic symptoms (80%)
- heat-related effects (75%)

“I had a patient who had a severe respiratory infection. His family had the same infection. They were housebound due to Hurricane Sandy. This delayed their medical care.”

“Extreme weather (heat and dry climate) causing heat strokes and brush fires, with subsequent smog (and) worsening of asthma symptoms”

“In New Orleans there are a lot of patient’s who experience severe symptoms from asthma. This was a prevalent concern since we are surrounded by two large bodies of water. However following Katrina and it’s damage now mold has become an unwelcome presence in a lot of patient’s lives.”

“Weather related increases in COPD exacerbation, cardiac failure exacerbations, Sickle crises, asthma…

“My patient experienced atrocities during hurricane Katrina. As a result, she had PTSD and severe depression that prevented her from holding a stable job. I do believe that with climate change and global warming, we should expect more hurricanes of Katrina’s severity and such resultant mental health issues.”
For reflection:
Consider these **Determinants of Vulnerability** to the health impacts of climate change.\(^2\)

Why might the patients of the physicians in the NMA survey carry a high vulnerability burden?
Climate change is not the Great Equalizer. It is the Great Multiplier.

-Mary Annaïse Heglar, Climate Journalist

Structural racism exposes Black patients to a high burden of climate and environmental risk factors which adversely affect maternal and fetal outcomes

Correlations disproportionately strong for Black patients:

- Heat exposure and risk of preterm birth
- Air pollution exposure and risk of low birth weight

Exposure is high in majority-Black zip codes

**Heat exposure:**
- intra-urban heat islands and heat injuries during summer months track with historical redlining

**Air pollution exposure:**
- air quality and respiratory illnesses track with deliberate placement of industrial plants and transportation depots

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FLOODING

Exposures and Impacts
FEMA flood maps: systemic neglect and exposure to flood-related health risks

An independent 2020 study revealed hidden flood risk across the U.S. which FEMA had failed to identify.

In ⅔ of states, the burden of hidden risk fell disproportionately on communities of color.

Example: Chicago neighborhood of Englewood

https://drrobertbullard.com/

When you start peeling the onion and uncovering layers and layers of inequity that have been subsidized by government, it makes a lot of people uncomfortable.

-Dr. Robert Bullard, “The Father of Environmental Justice”
References


We Can't Solve the Climate Crisis Unless Black Lives Matter

BY AYANA ELIZABETH JOHNSON

JULY 9, 2020 6:28 AM EDT

“The climate crisis requires that we build the biggest team possible. So wouldn’t it make sense to prioritize the people who already get it?”

Art & Science of Medicine

The Patient as a Person: Obtaining an Effective Social History
Thinking about environmental factors:

- **Heat waves/Extreme cold**
  - Do you have enough air conditioning and heat?
  - Do you work outdoors?
  - Do you have trouble paying the fuel bill in winter or electric bills in summer?
  - Do you have someone you could call if it feels too hot or too cold in your home?

- **Disasters**
  - Is your home vulnerable to flooding?
  - If you have life support equipment, are you registered with the electric utility?
Immunology

Lecture: Immunology of Allergic Responses
Ragweed is the primary allergen trigger of fall hay fever.

Ragweed grows faster, produces more pollen per plant, and has higher allergenic content under increased carbon dioxide levels. (Ziska and Caulfield, 2000)

More airborne allergens could mean more asthma attacks.
Medical Microbiology

Lecture: Bacterial biology, mechanisms
Host Factors: Climate Change, Malnutrition, and Immunocompetence

- Extreme weather can destabilize food supply and high CO2 can decrease nutritional content

- 200 million may be at risk of hunger and zinc deficiency by 2050 (IPCC 2013 and Myers et al Lancet GH 2015)...

- Both are major contributors to immunodeficiency and diarrhea and pneumonia morbidity.
Medical Microbiology

Lecture: Other bacterial GI pathogens
Urban, rural, and agricultural runoff contaminate drinking water, recreational water, and fish/shellfish, especially after more intense precipitation.

As climate changes, the risk of human exposure to water-related pathogens will increase.

For example, the *cholera vibrio* harbors in algae and copepods (a group of small crustaceans), whose proliferation is affected by sea-surface temperature and other environmental factors.

From *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment* 2016
Medical Microbiology
Lecture: Global perspective
The observed latitudinal trends in many taxa support the hypothesis of global warming-driven pest movement.

Published observations of 612 crop pests and pathogens:

Fitted values (solid line) and standard errors (dashed lines) derived from generalized additive mixed models of latitude against year of observation.
Climate change 'will create world's biggest refugee crisis'

Experts warn refugees could number tens of millions in the next decade, and call for a new legal framework to protect the most vulnerable.

Tens of millions of people will be forced from their homes by climate change in the next decade, creating the biggest refugee crisis the world has ever seen, according to a new report.
Refugee crisis: Is climate change affecting mass migration?

Beyond the fighting and fanaticism, another long-term threat menaces the world's troubled regions.

Tom Bawden | Monday 7 September 2015 | 0.5 comments

Brown areas indicate areas where few plants grow and vegetation is scarce.

Green areas indicate areas where vegetation is healthy, foliage is dense and plants are growing quickly.

Did climate change help spark the Syrian war? THE EARTH INSTITUTE AT COLUMBIA UNIVERSITY, NASA
Brain and Behavior

Lectures:
Child Development
ADHD and Autism
Nutritional and Metabolic Disorders of the CNS
Extreme weather can destabilize food supply and high CO2 can decrease nutritional content. Changes in rainfall could affect both crop quality and quantity.
Increasing evidence linking air pollution to altered brain development

Particulate air pollutants, APOE alleles and their contributions to cognitive impairment in older women and to amyloidogenesis in experimental models

M Cacciottolo, X Wong, I Driscoll, N Woodward, A Saffari, J Reyes, M L Serre, W Vizuete, C Sioutas, T E Morgan, M Gatz, H C Chui, S A Shumaker, S M Resnick, M A Espeland, C E Finch & J C Chen

US wide cohort study with 3647 older women with APOE alleles

Women who had the APOE-e4 variant were nearly three times more likely to develop dementia if they were exposed to high levels of air pollution than APOE-e4 carriers who were not.

Animal models

Transgenic mice with APOE exposed to urban nanosized particulate matter (nPM) over 15 weeks showed increased cerebral β-Amyloid deposits and selective atrophy of hippocampal neurites.

In vitro studies

In vitro nPM exposure of neuroblastoma cells increased the pro-amyloidogenic processing of the amyloid precursor protein.
Progress to date...

First Year

- Fall 2018
- ASM and LCE: Structures
- Molecular, Cellular, and Genomic Foundations

Second Year

- Fall 2018
- ASM and LCE: Brain and Behavior
- InFOCUS: Cardiovascular
- Pulmonary

- Winter Break
- Fall 2018
- ASM and LCE: Gastrointestinal
- Musculoskeletal
- Hematology

- Spring Break
- ASM and LCE: Sexual Reproductive Health
- Endocrine

Mount Sinai
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