Healthy People, Healthy Planet

Climate Change and Chronic Disease: Common Drivers, Common Solutions

Module 1: Climate Change
Module 2: Chronic Disease
Module 3: Common Drivers, Common Solutions

Presented by:
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Greater Boston Physicians for Social Responsibility

With Support from:
The Boston University Superfund Research Project
Healthy People, Healthy Planet: Objectives

- To inform & empower health providers to understand, mitigate & help prevent climate change & chronic disease.

- Review key science behind climate change and chronic disease.

- Clarify the major drivers of these crises – and how we can fix them.
Healthy People, Healthy Planet
Climate Change and Chronic Disease: Common Drivers, Common Solutions

Climate Change
Module 1 of 3

Jill Stein, MD
Greater Boston Physicians for Social Responsibility
Module 1: What We Will Cover

- The devastating human impacts, and acceleration of climate change.
- The science of climate change.
- The impacts of climate change on human health.
- The need to urgently bring atmospheric CO2 down to a safe level – below 350 ppm – to reverse these impacts and prevent far worse ones in the pipeline.
Environment Drives Chronic Disease and the Climate Crisis

- Environmental Factors
  - Food system/Diet
  - Fossil Fuels
  - Socioeconomic Stress
  - Chemicals
  - Built Environment/Transportation

- Altered Biological Pathways

- Greenhouse Gases

- Climate Crisis
  - Heat, drought, storms, fires, ice sheet instability, sea level rise, loss of glacial irrigation, food insecurity/starvation, tropical diseases

- Chronic Disease
Key Solutions Are At Hand

- **Green Energy**
  - Wind $\rightarrow$ 2.6X total US electricity (1)
  - Parking lot solar cells $\rightarrow$ ~1.5X US electricity need (2)
  - Conservation/efficiency $\rightarrow$ ↓ electricity 75% (3)

- **Local/Regional sustainable food production**

- **Relocalized, green economies**

- **Healthy food/transportation $\rightarrow$ ↓ chronic disease**
  - local/whole food, public/active transportation, safer chemicals

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3. Amory Lovins. PSR fact sheet, Climate Change and Human Health
Climate Crisis

"the biggest global health threat of the 21st century"

"the greatest ongoing silent crisis of human history ... causing widespread devastation and suffering around the planet today."
- Kofi Annan & the Global Humanitarian Forum, 2009
...every year climate change leaves over:
- 300,000 people dead,
- 325 million people seriously affected,
- economic losses of $125 B,
- 4 billion people vulnerable,
- 500 million people are at extreme risk.

‘...climate change is already highly dangerous at well below 1 degree [C] of warming. Two degrees would be catastrophic.’

At the current rate of high emissions, some scientists predict two degrees of warming will be reached as soon as 2030.*

* [http://www.eci.ox.ac.uk/4degrees/ppt/1-2betts.pdf](http://www.eci.ox.ac.uk/4degrees/ppt/1-2betts.pdf)  
[http://www.eci.ox.ac.uk/4degrees/audio/1-2betts.mp3](http://www.eci.ox.ac.uk/4degrees/audio/1-2betts.mp3)
Warming is unequivocal; most of the warming of the past 50 years is very likely (90%) due to increases in greenhouse gases.

- Intergovernmental Panel on Climate Change, 2007
Rising Temperatures

AVERAGE GLOBAL TEMPERATURES SINCE 1850
GLOBAL AVERAGE NEAR-SURFACE TEMPERATURES

Temp difference (degrees C) from long-term average

- Difference from long-term average
- Provisional 2006 figure
- Predicted 2007 figure
- 10-year running mean

SOURCE: Met Office/Univ of East Anglia/Hadley Centre
Rising CO2

Mauna Loa Observatory, Hawaii
Monthly Average Carbon Dioxide Concentration

Data from Scripps CO₂ Program  Last updated February 2006
The Greenhouse Effect:
Why Rising CO2 Causes Rising Temperature

Solar energy passes through Greenhouse gases in atmosphere

Radiant heat is trapped
CO2 and Temperature Closely Linked Over the Ages

Source: http://www.realclimate.org/epica.jpg
Rising CO2/Temperature Also Linked To Melting Ice/Rising Sea Level

The safe upper limit of CO2 is somewhere below 350ppm.

Figure from: Hansen et al, 2008 Target atmospheric CO2: Where should humanity aim? Open Atmos. Sci. J., 2, 217-231
The Melting Arctic: September 1979

Source: NASA/Goddard Space Flight Center, Scientific Visualization Studio, 2009
The Melting Arctic: September 2007

Source: NASA/Goddard Space Flight Center, Scientific Visualization Studio, 2009
The Arctic - Gone: September 2013-2030?

Original Image: NASA/Goddard Space Flight Center, Scientific Visualization Studio, 2009
Potential Sea Level Rise
Possible Melting of Other Ice Sheets

A 10-meter rise in sea level would displace 23 million Americans.

This is equivalent to 23 Hurricane Katrinas.

Sea level rise in Boston Area
Since the Industrial Era, CO2 Has Soared

Through at least 800,000 years, CO2 never exceeded 300ppm.

Since the start of the industrial era CO2 climbed from 275 to 387ppm.

CO2 is increasing now at 2.2ppm/year and accelerating.

At 387 ppm, Earth Is In Energy Imbalance

Heat absorption exceeds radiation → net warming

- polar ice melting, glaciers retreating
- tundra thawing, methane pluming
- climate zones shifting pole-ward
- forest fires, extreme weather events increasing
- sea level rise – if complete melting → 200 feet
Effects Of A Warming Climate on Health
# Extreme Weather Events and Disasters

- Droughts and associated famine are the most deadly.
- Globally, 65.5 million children annually were affected by disasters between 1990-2000.
  - Infectious diseases from sewage, poor sanitation, lack of clean water, refrigeration, crowding, insects
  - Posttraumatic stress disorder, high rates of sleep disturbance, aggressive behavior, sadness and substance use/abuse
Drought
Globally, infectious diarrhea is the second-leading cause of death in young children.

WHO estimates 1.62 million children younger than 5 years die of diarrhea annually, most from contaminated water.

In developed countries diarrhea death is rare, but illnesses due to temperature increases are likely

Vector-borne infections are affected by climate change, both the hosts and pathogens.
Spreading Infectious Disease: Malaria

Climate Change and Malaria

Distribution of the primary Malaria agent
- Current distribution
- Possible extended distribution by 2050 (suitable climate)

Current distribution represents the maximum extent of the distribution of the Plasmodium falciparum parasite. For 2050, areas within the current maximum extent have been excluded from the map. The scenario is based on the high scenario from the HadCM2 experiment.

Spreading Infectious Disease: Dengue

1990

2085

[Color-coded world maps showing disease spread]

[Image of a mosquito and a person with a child]

[Legend: 0.0-0.1, 0.1-0.2, 0.2-0.3, 0.3-0.4, 0.4-0.5, 0.5-0.6, 0.6-0.7, 0.7-0.8, 0.8-0.9, 0.9-1.0]
Spreading Infectious Disease: West Nile Virus

* Year of extreme drought may have increased West Nile virus cases in the U.S. and Canada.

** Preliminary count.

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of cases</th>
<th>Deaths</th>
</tr>
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<tbody>
<tr>
<td>1999</td>
<td>62</td>
<td>7</td>
</tr>
<tr>
<td>2000</td>
<td>21</td>
<td>2</td>
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<tr>
<td>2001</td>
<td>66</td>
<td>9</td>
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<tr>
<td>2002</td>
<td>4,156</td>
<td>284</td>
</tr>
<tr>
<td>2003*</td>
<td>9,862</td>
<td>264</td>
</tr>
<tr>
<td>2004</td>
<td>2,539</td>
<td>100</td>
</tr>
<tr>
<td>2005</td>
<td>2,949**</td>
<td>116</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19,655</td>
<td>782</td>
</tr>
</tbody>
</table>

2006: One case in Mississippi so far
Deteriorating Air Quality: Ozone Pollution

NOx + VOC + Heat & Sunlight = Ozone

Ground-level or "bad" ozone is not emitted directly into the air, but is created by chemical reactions between NOx and VOCs in the presence of heat & sunlight.

Emissions from industrial facilities and electric utilities, motor vehicle exhaust, gasoline vapors, and chemical solvents are some of the major sources of oxides of nitrogen (NOx) and volatile organic compounds (VOC).
Health Effects of Ground Level Ozone

Healthy Airway

Inflamed Airway

Asthma Inhaler
Natural Air Pollutants
Climate change is already causing devastating human impacts, and it is accelerating.

CO2, temperature, ice, and sea levels are linked. High CO2 is melting ice sheets worldwide, posing risks of catastrophic sea level rise if allowed to persist.

Over 300,000 lives per year are lost from extreme weather, famine, floods, declining air quality, and spreading tropical diseases. Greatest impacts are in poor countries.

To reverse these impacts and prevent far worse ones already in the pipeline, CO2 must be brought to a safe level – below 350 ppm – urgently.
Module 2: Environmental Drivers of Chronic Disease

- How environmental factors are key drivers of many common chronic diseases
- How environmental factors alter key biological pathways leading to chronic disease
For more information contact:
Greater Boston
Physicians for Social Responsibility
www.psr.org/boston

For additional resources on environmental health and nursing contact:
The Environmental Health Nursing Education Collaborative
www.ehnursing.org