Impact of Climate Change on Public Health

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Thanks to Physicians for Social Responsibility; David Grass, VT Environmental Health Surveillance Chief; Matt Callihane, NH DHHS
Direct and Indirect Human Health Effects

Climate Change

Regional weather changes
- Heatwaves
- Extreme weather
- Temperature
- Precipitation

Modulating influences

Microbial contamination pathways
- Transmission dynamics

Agro-ecosystems, hydrology

Socioeconomics, demographics

Health effects
- Temperature-related illness and death
- Extreme weather-related health effects
- Air pollution-related health effects
- Water and food-borne diseases
- Vector-borne and rodent-borne diseases
- Effects of food and water shortages
- Mental, nutritional, infectious and other health effects

Vulnerable Populations

- Adds to existing health stressors for
  - Elderly
  - Very young
  - Chronically ill
    - Cardiovascular disease
    - Respiratory disease
  - Economically disadvantaged
  - Mentally ill
Severe Weather Events in NH

storms, floods, wind…

Lebanon NH July 2, 2013

Keene NH October 10, 2005
Physical injury, Social Dislocation; homelessness; agricultural disruption; exacerbation of behavioral health disorders

Streams and rivers rise which contributes to flooding of homes, businesses, and critical infrastructure like sewer and storm water systems.

Floodwaters can become contaminated with agricultural waste, chemicals, raw sewage, and other pollutants.

Floodwaters can contain disease-causing bacteria, viruses, and parasites.

Sewage overflow from treatment plants, septic fields, and municipal lines can back up into people's homes.

Flooded materials in homes, schools, and businesses can cause molds to grow and be inhaled.

Climate change increases heavy downpours.
Thermal Stress

- Heat Illnesses
  - Cramps
  - Exhaustion
  - Stroke
- Elderly and chronically ill susceptible
- Chicago 1995 week-long heat wave – 700 deaths
- Europe 2003 heat wave – 70,000 deaths
Days per year over 90 or 100,
Concord & Manchester, NH

Days over 100°F

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<td>Days over 100°F</td>
<td>1</td>
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Extreme Heat Drives ER Visits

Note: Rates are calculated based on 2000 census. The census estimate for Chittenden County in 2000 was 146,541 residents.

Confronting Infectious Diseases Emerging in the Upper Valley

- Expanding range and Seasonal persistence of vectors
  - Lyme, EEE, West Nile
- Possibly more waterborne and food borne illness
- At risk pops are widespread.

Source: Confronting Climate Change in the U.S. Northeast: Science, Impacts, and Solutions (NECIA, 2007)
Lyme Disease

Cases per 100,000 population

- 0
- 1 - 10
- 11 - 50
- 51 - 100
- 101 - 200
- > 200

Increasing Cases of Lyme Disease in NH
Degradation of Air Quality Increases Resp and Heart Disease

At risk: the young, the old and those with chronic conditions like asthma, allergy, chronic lung and heart disease
Allergens

- Warmer winters
  - Earlier start of pollen seasons
- Increase CO2
  - Increases release of biological allergens
Heat Worsens Ozone Air Pollution Exacerbating Respiratory Diseases

- Ozone - 1° component of smog
- Formed when NOx and VOC's (vehicles, powerplants) interact in presence of heat & light
- Warmer temps increase ozone formation
- Temp. increase of 4°F could increase ozone conc. by 5%
Heat Worsens Ozone Air Pollution Exacerbating Respiratory Disease

- Impaired lung function
- Severe coughing, SOB, pain when breathing
- Lung, eye irritation
- Susceptibility to respiratory infection
- Increased hospital admissions & ER visits for asthma
- Increased risk of cardiovascular complications in at-risk populations

Climate Change Increases Human Conflict

Fig. 1 Analytical framework of linkages between the climate system, natural resources, human security, and societal stability [based on (28)].

J Scheffran et al. Science 2012;336:869-871
Authoritative Assessments

- Intergovernmental Panel on Climate Change
- US Global Change Research Program
  - National Climate Change Assessment
- Vermont/New Hampshire Climate and Health Programs