Human Health Effects Of Global Climate Change

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Impact of Climate Change on Human Health

- Injuries, fatalities, mental health impacts
- Asthma, cardiovascular disease
- Heat-related illness and death, cardiovascular failure
- Malaria, dengue, encephalitis, hantavirus, Rift Valley fever, Lyme disease, chikungunya, West Nile virus
- Forced migration, civil conflict, mental health impacts
- Respiratory allergies, asthma
- Extreme heat
- More extreme weather
- Changes in vector ecology
- Increasing allergens
- Raising CO2 levels
- Rising sea levels
- Water and food supply impacts
- Water quality impacts
- Malnutrition, diarrheal disease
- Cholera, cryptosporidiosis, campylobacter, leptospirosis, harmful algal blooms

http://www.cdc.gov/climateandhealth/effects/default.htm
Air Pollution = increased smog, ozone and allergens

Asthma

Allergies

Sneezing, Runny Nose, Cough, Nasal Congestion, Sore Throat, and Headaches
http://asthma-free-forever.blogspot.com/
Air Pollution = cardiac and pulmonary disease (acute and exacerbated chronic)

- Climate change can increase ground-level ozone and/or particulate matter in some locations.

- Ground-level ozone (a key component of smog) is associated with:
  - diminished lung function,
  - increased hospital admissions
  - emergency room visits for asthma, COPD, and cardiac conditions
  - increases in premature deaths
Extreme Weather Events: Health Effects of Heat Waves

- Dehydration, heat exhaustion, heat stroke
- Increased mortality rate
- Can cause or exacerbate heart conditions
- Increased risk for urban dwellers, especially the elderly
- Young children are also especially vulnerable to excessive heat
- Pre-existing chronic diseases (renal, diabetes, obesity) are also associated with increased vulnerability
- If there is a power outage, we ALL have increased vulnerability
Most vulnerable populations in heat waves

Elderly, poor, no air conditioner

Very young children
Some Recent Heat Waves

Chicago: July, 1995: 700 deaths

Europe: August, 2003: 30,000 – 50,000 deaths

India: May – June 2015: >2,500 deaths (by June 5, 2015)

Pakistan: June 2015: >260 deaths (by June 22, 2015)
Extreme Climate Events: Drought

Dry, parched land: crops die

Livestock cannot survive
Adverse Effects of Drought Upon Agriculture and Human Health

Agriculture:
- Crop failure (vegetables, grains, fruits)
- Livestock & poultry: dehydration, starvation and death
- Decreased food supply

Human Health:
- Malnutrition and dehydration
- Starvation
- Poor general health, compromised immune system
- Increased vulnerability to diseases
- Increased illness and disability and loss of work
- Increased poverty
- Shortened life expectancy
- Poorer quality of life
Drought = dehydration + malnutrition

Young children are among the most vulnerable groups.

Elderly are also among the most vulnerable groups.
Extreme Climate Events: Wildfires: damage to ecosystem and to human health

2015: Fighting a wildfire in Idaho
Wildfires = release particulate matter into atmosphere: contributes to poor air quality and ozone and triggers pulmonary and cardiac disease

Wildfires in California
Extreme Weather Events: Health Effects of Hurricanes and Floods

- Injuries, Deaths, Acute illnesses
- Psychological Illness (ASD, PTSD, Depression)
- Subsequent illnesses: diarrhea, infectious diseases due to increased arthropods (mosquitoes) and increased parasitic organisms in contaminated drinking water, food poisoning
- Homelessness, Displacement, Increased level of poverty
- High risk groups: the poor, the elderly and children
- Hurricane Katrina and associated flood: (August, 2005): more than 1500 confirmed mortalities
- Hurricane Sandy and associated flooding (October 2012): $68 Billion damage; 233 fatalities in 8 countries from Cuba to NE USA
DISABLED TRUCK HANGING FROM TREE AFTER HURRICANE KATRINA

www.usatoday.com/weather/graphics/hurricane/hurricane2005/flash.htm
Climate Change Associated with Emerging Infectious Diseases: Effects Habitat Conditions of Vector and Reservoir

- Lyme disease: tick-borne spirochete
- West Nile Virus: mosquito-borne virus
- Dengue: mosquito-borne virus
- Malaria: mosquito-borne virus
- Chikungunya: mosquito-borne virus
CLIMATE CHANGE AND VECTOR-BORNE DISEASE

Affects the **vector** (arthropod; mosquito, tick):
- distribution of vector species
- population size of vectors
- reproductive cycle of vectors
- survival of vectors
- habitat characteristics

Affects the **pathogen** (virus, parasite, bacteria):
- replication/multiplication
- maturation rate
- potential transmissibility

Affects the **reservoir**:
- increased disease maintained in animal reservoirs
Lyme Disease: *Borrelia burgdorferi* (Bacteria)  
Deer Ticks (Vector)
LYME DISEASE

Lyme Disease – Endemic Regions

http://www.aldf.com/usmap.shtml
Malaria: Vector Borne Parasite

- **Malaria:**
  - **vector:** Anopheles mosquito
  - **pathogen:** Plasmodium falsiparum
    Plasmodium vivax
    Plasmodium ovale
  - **habitat:** Africa, East Africa, India
    - hot, humid conditions most attractive to mosquitoes
Malaria Vector – Anopheles Mosquito With Abdomen Full of Blood

http://science.nationalgeographic.com/science/photos/malaria.html
Malaria - widespread in Africa especially among children

http://science.nationalgeographic/science/photo/malaria.html
Dengue: Vector Borne Virus

Dengue hemorrhagic fever:

- **vector**: Aedes aegypti mosquito

- **pathogen**: 4 serotypes of Flavivirus

- **habitat**: tropical, urban regions
  
  Mexico, Brazil, Venezuela, Puerto Rico, Singapore, Taiwan, Trinidad, Tobago

  currently moving north into southern United States
DENGUE HEMORRHAGIC FEVER
Mosquito Vector – Clinical Presentation

Dengue fever is characterized by:
Fever
Rash
Muscle and joint pains

Aedes aegypti mosquito

http://www.bc.edu/schools/cas/biology/meta-elements/gif/dengue.gif
Climate Change Outcomes May Affect Global Food Security

- **AVAILABILITY** (food production)
- **ACCESS** (“purchasing power”)
- **STABILITY** (worker’s resources)
- **UTILIZATION** (food safety and quality)
Effects of Climate Change on Marine Ecosystems: Decreased Human Food Supply

- Climate change alters marine ecosystems:
  - warmer water temperatures
  - pH changes
  - decreased oxygen levels
  - decreased salinity

- Decreased biodiversity of marine species

- Result in decreased fish availability for consumers

- Increased cost to consumers

- Decreased access to lower socioeconomic groups
SURVIVAL OF THE ATLANTIC COD IS THREATENED BECAUSE OF EFFECTS OF WARMING ON THE NORTH ATLANTIC MARINE ECOSYSTEM

Photo by Jean-Denis Dutil
Results of Altered Marine Ecosystem

Summer, 2004: Record high temperatures in “Hell’s Gate”, Fraser River, Canada, persisted for several weeks.

The river was uncharacteristically low, due to the temperature.

This prevented the sockeye salmon that normally swim through there annually, from getting through successfully.

Resulted in devastating mortality of salmon with marked affect on food industry and cost to consumers.
REFERENCES

3. Semenza, JC, Rubin, CH; Falter, K; Selanikio, JD; Flanders, D; Howe, HL; Wilhelm, JL; Heat-Related Deaths During The July 1995 Heat Wave In Chicago; N Engl J Med; 335:2; pp84-90, 7/11/96
4. Vandentorren, S, Suzan, F; Medine, S; Pascal, M; Maulpoix A; Cohen, JC; Ledrans, M; Mortality in 13 French Cities During the August 2003 Heat Wave; Am J Pub Health Vol94:2, pp1518-1520 ; Sept 2004
6. Greer, A; Ng, V; Fisman, D, Climate Change and Infectious diseases in North America:the road ahead, CMAJ, 2008, Mar 11; 178(6): 715-22
7. Brunkard, JM; Cifuentes, E; Rothenberg, SJ, Assessing the Roles of Temperature, precipitation, and ENSO in dengue re-emergence on the Texas-Mexico Border region; Salud Publica Mex. 2008, May-June; 50(3):227-34
REFERENCES


9. Schmidhuber, J; Tubiello, F; Global Food Security under climate change; Proc Natl Acad Sci USA; 2007, Dec 11; 104(50): 19703-8

10. Tubiello, F; Soussana, JF, Howden, SM; Crop and Pasture response to climate change; Proc Natl Acad Sci USA; 2007 Dec 11:105(50): 19686

11. Brander, KM, Global Fish Production and Climate Change, Proc Natl Acad Sci USA 2007 Dec 11, 104(50) 19709-14

