Climate Change and Infectious Diseases: Linkages and Gaps

A CCGHR Briefing Note [1]

Climate change refers to the consequences of changing energy inputs to the earth-atmosphere system. The movement of air and moisture around the globe are driven by these energy inputs. As a result, temperature and rain/snow patterns will continue to change in intensity over space and time beyond regular seasonal and inter-annual changes. Infectious diseases are sensitive to environmental conditions including temperature and moisture. These conditions can affect replication, virulence, and infectivity of pathogens, the breeding and survival of vectors, and disease transmission.

Specific linkages between climate change and infectious diseases include:

- Changes in evolution, virulence, and infectivity
- Range expansion of vectors and pathogens into higher elevations with increasing air temperatures (e.g. malaria in Nairobi)
- Overlaps in pathogen and vector ranges
- Interactions between chemical pollutants and pathogens, especially in warmer temperatures
- Range contraction of vectors and pathogens with increasing temperatures (e.g. expansion of desert areas)
- Movement of human reservoirs (environmental and political refugees)
- Natural and human disasters, evacuation centres and camps, and spread of infections (especially respiratory)
- Natural and human disasters and compromised public health infrastructure (e.g., water and wastewater treatment; sanitation; health care systems)

Topics of concern/Gaps in knowledge:

- Leptospirosis
- Vulnerable life stages (e.g. child, pregnancy)
- Confounding pathogen species (e.g. dengue)
- Role of human perceptions and behaviours (e.g. food practices and foodborne diseases; vector breeding habitats)
- … [Please provide inputs]

<u>A Perspective from the Caribbean</u>:

- The Caribbean region has recently seen the emergence of vector-borne disease such the Chikungunya outbreak in 2014 (with some persistent arthralgia symptoms), and the Zika virus in late 2015-2016 and its associated complications such as microcephaly. Climate change presents optimal conditions for breeding of vectors (such as *Aedes aegypti* and *Aedes albopictus*).
- Following the recent floods, there has been an increase in Leptospirosis—another vector-borne disease.
- Again following the recent hurricanes, people are displaced and live in shelters and camps, thus creating an environment for the spread of respiratory diseases.

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[1] This note was prepared by members of the CCGHR working group on the health impacts of climate change: Corinne Schuster-Wallace (Dundas, Ontario) and Rosmond Adams (Caribbean Public Health Agency)

- With hurricanes and flooding, water systems, waste disposal, the management of debris and the preparation and storage of food—all are compromised including more flies and roaches.

Climate Change and Chronic Conditions: Linkages and Gaps

A CCGHR Briefing Note [1]

Climate change refers to the consequences of changing energy inputs to the earth-atmosphere system, increasing shortwave radiation. The movement of air and moisture around the globe are driven by these energy inputs. As a result, temperature and rain/snow patterns will continue to change in intensity over space and time beyond regular seasonal and inter-annual changes. While direct impacts of climate change on chronic conditions are few, climate change is extremely likely to have an impact, especially through exposure to solar radiation, air quality, and heat/cold waves.

Specific linkages between climate change and chronic diseases include:

- Some chronic diseases emerge out of infectious diseases (e.g. sequalae and cancers) that are extremely sensitive to changing environmental conditions that can affect replication, virulence, and infectivity[2]
- Some chronic diseases are exacerbated in the patient by environmental conditions including temperature and moisture (e.g. heart disease and heat waves; respiratory disease and air pollution)
- Immunocompromising chronic diseases make sufferers more susceptible to infectious diseases[2]
- Sufferers of some chronic conditions require regular access to medicines and health care services that can be disrupted by natural disasters; this is exacerbated in the case of refugee migration
- Some medications require food and water, which can be disrupted through flood, drought, and fire events
- Some sufferers of chronic disease are more vulnerable (physically and psychologically) to natural disasters as a result of their inability to mitigate impacts e.g. through evacuation of themselves and their belongings.

Topics of concern/Gaps in knowledge:

- More research is needed on the impacts of climate change (including disasters) on mental health—anxiety, depression, despair, post-traumatic stress
- Severe weather conditions can increase injuries, leading to disabilities and death.
- Climate change causes natural disasters that affect the environment. This impacts on the agriculture sector and what is planted, grown and harvested. This may impact on the availability of fresh fruits and vegetables. People then may consume more processed foods that are risk factors for NCDs.
- Climate change and disasters disrupt life and so people may lose access to available resources that facilitate exercise, thus leading to more sedentary lifestyles—a risk factor for NCDs.

[1] This note was prepared by members of the CCGHR working group on the health impacts of climate change: Corinne Schuster-Wallace (Dundas, Ontario), Rosmond Adams (Caribbean Public Health Agency) and Vic Neufeld (CCGHR Special Advisor)

[2] See the CCGHR Briefing Note on Climate Change and Infectious Disease

Climate Change and Health Systems: Linkages and Gaps

A CCGHR Briefing Note [1]

Climate change refers to the consequences of changing energy inputs to the earth-atmosphere system, increasing shortwave radiation. The movement of air and moisture around the globe are driven by these energy inputs. As a result, temperature and rain/snow patterns will continue to change in intensity over space and time beyond regular seasonal and inter-annual changes. Health systems are vulnerable to climate change impacts directly through natural disasters (infrastructure and supply chains) and indirectly through patient loads, staffing, and changes in local patterns of disease.

Specific linkages between climate change and health systems include:

- Damage to infrastructure as a result of floods, winds (hurricanes)or fire
- Increased trauma patient loads associated with natural disasters as a result of injuries
- Increase demand for health service in some areas due to disruption in others and migration
- Decreased access to medicines and supplies as a result of natural disasters
- Reduced staff (injury, illness, or personal loss of family/property)
- (Rapidly) changing patient loads
    - Epidemic versus endemic disease patterns
    - Disasters
- Changing balance between chronic and infectious diseases (exacerbated by changes in demographics)
- Changing face of diseases presented and impact on knowledge of healthcare providers and accuracy of diagnoses for the patient (e.g. introduction and expansion of West Nile virus in North America; Chikungunya and Zika in Latin America and the Caribbean)

Topics of concern/Gaps in knowledge:

- Linking CC, socioeconomic status and access to health care
- The extent to which weak health systems contribute to the spread and management of climate change related conditions – example: the spread of Ebola in West African countries.
- There is a need to think beyond health systems, to ecohealth systems *[See the CPHA publication on "Global Change and Public Health: Addressing the Eco**logical Determinants of Health"*** (May, 2015)

<u>A Perspective from the Caribbean</u>:

> The hurricanes of 2018--Hurricane Maria and Irma have impacted numerous Caribbean countries. Stronger vector control and environmental health services are needed, at the same time as the demand on essential services for access to clean water and safe foods will increase as a result of the hurricanes.
>
> Health services need to focus on preparedness and resilience in their design and operations so they can be critical players in responding to extreme weather events…PAHO is working in the Caribbean Region on a smart hospital initiative. These initiatives make these health facilities more resilient.

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