Module 2

Climate Change Toolkit for Health Professionals

Global Health Impacts of Climate Change

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ACME CAPE

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ACME
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Preface

This toolkit consists of eight modules which have been prepared as stand-alone documents that can be read by themselves, but they have also been prepared to complement one another. It has been designed as a tool for health professionals and students in the health care and public health sectors who want to engage more directly on the issue of climate change as educators with their patients, peers and communities, and/or as advocates for the policies, programs and practices needed to mitigate climate change and/or prepare for climate change in their workplaces and communities.

Module 1 – Climate Change – Science, Drivers & Global Response provides an introduction to climate science and discusses the human activities that are contributing to climate change, the international commitments that have been made to address it, and where we are in terms of complying with those commitments.

Module 2 – Global Health Impacts of Climate Change summarizes the direct and indirect health impacts that are occurring, and are predicted to result from, climate change, on a global scale.

Module 3 – Climate Change Health Impacts across Canada summarizes the direct and indirect health impacts that are occurring, and that are predicted to occur, in the different regions of Canada.

Module 4 – Greenhouse Gas Emissions in Canada by Sector and Region discusses the volume of greenhouse gases emitted, and the trends in those emissions, from different sectors in Canada at a national, provincial and territorial scale.

Module 5 – Climate Change Solutions with Immediate Health Benefits discusses climate solutions that can produce fairly immediate health co-benefits for the jurisdictions that implement them.

Module 6 – Taking Action on Climate Change at Health Care Facilities discusses the climate mitigation and adaptation policies, programs and practices that can be adopted and implemented by health care institutions to reduce their greenhouse gas emissions and prepare for climate change.

Module 7 – Preparing for Climate Change in our Communities discusses the climate adaptation policies and programs that can be developed by public health units or municipalities to minimize the health impacts associated with climate change.

Module 8 – Engaging in Climate Change as Health Professionals discusses the different ways in which health professionals can educate and engage their patients, the public, their peers, and their communities on the health impacts of climate change, and the policies and programs needed to mitigate climate change and prepare for it.

Module 2 – Global Health Impacts of Climate Change

Introduction

In 2009, the University College London and The Lancet medical journal published the UCL-Lancet Commission on Managing the Health Effects of Climate Change, stating that, "climate change is the biggest global health threat of the 21st century" (Costello et al., 2009). In 2014, the World Health Organization (WHO) estimated climate change will result in an additional 250,000 deaths per year between 2030 and 2050 as the result of heat, undernutrition, diarrhoeal disease and malaria (Hales et al., 2014).

Direct and Indirect Health Impacts

Climate change impacts health directly via trauma, displacement and deaths associated with floods, storms, and wildfires, and via heat-related illness. Exposures mediated through natural systems include insect-borne diseases such as malaria and air pollution resulting from increased production of pollen or smoke from wildfires. Exposures heavily mediated by human systems include food insecurity, migration, displacement, and conflict.

Undernutrition. Photo by Parijatha Budidhi

Direct Impacts of Climate Change

Heat Impacts

Heat exposure can have a direct effect on population-level morbidity and mortality, due to increases in heat-related illnesses (heat exhaustion and heat stroke) and greater risk of cardiovascular, respiratory, and renal disease (Arbuthnott and Hajat, 2017). Heat exposure has further impacts on mental health (see Box 3).

Both increases in daily temperatures and periodic heat waves (i.e. extreme heat that lasts for 4 days or longer) can have complex health impacts. When they occur, heat waves have large impacts on entire populations; however, heat waves occur less commonly than days when temperatures exceed optimum levels for a location, and as such, contribute only a fraction of the overall morbidity and mortality associated with climate change heat exposure

(Hales et al., 2014; Smith et al., 2014).

Studies have found that anthropogenic (human-induced) climate change has increased the likelihood and/or intensity of many recent heat waves, including heat waves experienced across Europe in 2003, Russia in 2010, and Australia, Europe, China, Japan, and Korea in 2013 (Watts et al., 2015). Indeed, 18 million more people over 65 were exposed to a heat wave in 2017 than were exposed in 2016, which is 157 million more than the 1986-2005 average (Watts et al., 2018).

In the absence of climate change adaptation, the WHO estimates that the excess burden of annual mortality due to extreme heat will exceed 92,000 deaths by 2030 and 255,000 deaths by 2050.

With 1.5°C of global warming by the end of the century, it is estimated that some 350 million more people will face exposure to deadly heat by 2050 than would be expected at current temperatures (Hasegawa and Slade, 2018). With 2°C of global warming, cities like Kolkata, India and Karachi, Pakistan could expect heat waves similar to those experienced in 2015 on an annual basis (Hasegawa and Slade, 2018). In the absence of climate change adaptation, the WHO estimates that the excess burden of annual mortality due to extreme heat will exceed 92,000 deaths by 2030 and 255,000 deaths by 2050; these numbers, they argue, could be improved by implementing adaptation measures (Hales et al., 2014).

Impact of Heat on Labour Capacity

Heat and heat waves also affect the labour capacity of sectors of the economy such as agriculture, industry, and services. In 2017, 153 billion labour hours were lost due to heat; 62 billion more than were lost in 2000, with 80% of the hours lost by the agricultural sector (Watts et al., 2018). Countries such as China and India are particularly vulnerable, with China alone experiencing 21 billion hours of labour lost in 2017, equivalent to the total working hours of 10.5 million employees in one year or 1.4% of the total Chinese working population (Cai, Cui and Gong, 2018). Even with the limited effects of a 1.5°C global warming scenario, labour capacity losses due to heat are expected to cost China 250 billion yuan (approximately US$37 billion) per year by the 2030s (Hasegawa and Slade, 2018).

Cold exposure

Although cold-related health exposures are projected to decrease with global warming, increases in heat-related morbidity and mortality will far outweigh any benefits from these reductions at the global level (Smith et al., 2014; Hasegawa and Slade, 2018).

Floods and storms

Flooding and storms linked to climate change can adversely affect human health by damaging health services and other infrastructure; accelerating the spread of infectious diarrheal, leptospirosis, and vector-borne diseases; increasing the incidence of injuries, drowning, and hypothermia; and impacting mental health.

In many countries, flooding poses the biggest natural hazard risk for both mortality and the proportion of the population impacted and the frequency of river flooding events is increasing (Smith et al., 2014). Whether climate change influences the frequency of storms and other kinds of floods remains uncertain; however, there is some evidence that it contributed to flooding in the United Kingdom in 2011, and to seasonal precipitation in the United States and India in 2013 (Watts et al., 2015).

House destroyed by a Superstorm.
Photo by Acrylik.

More frequent and intense flooding events means economic losses are increasing, but there has not been clear evidence of an increase in the number of deaths due to weather-related disasters (Watts et al., 2018). Whereas stable mortality rates are likely due to more effective adaptation responses in the wake of more frequent disasters, there could be tipping points where increasing population exposure occurs at a faster rate than the ability to mitigate the risk, causing the global number of deaths due to floods and storms to rise (Smith et al., 2014).

More frequent and intense rainfall is expected to affect most parts of the world, and particularly impact Asia, Africa, and Central and South America - regions that are often less equipped for preparations and responses to these events. One-in-one hundred year storm-surge events are projected to impact an estimated additional 52 million people in 84 developing countries by 2100 (Smith et al., 2014).

Indirect Impacts Mediated by Natural Systems

Air pollution

Air pollution is estimated to cause seven million premature deaths per year globally (Landrigan et al., 2017). The majority of air pollution produced by human activity is due to the combustion of fuels for

Box 1: Vulnerable populations

There are several populations that are expwected to be disproportionately affected by the health effects of climate change (Smith et al., 2014; Watts et al., 2015). Factors affecting climate change vulnerability include:

● ***Geography:*** *Inhabitants of low-lying coastal settlements, socially and economically disadvantaged rural populations reliant on subsistence farming and with poorer access to services, and outdoor workers in countries with hot climates are more likely to experience health effects. Regions of Asia and Africa are projected to experience 85 to 95% of the global exposure to multi-sector risks (including risks to water, energy and land sectors, such as drought intensity and water stress, cooling demand change and heatwave exposure, habitat degradation, and crop yields) (Hasegawa and Slade, 2018).*

● ***Indigenous Identity:*** *Climate change poses greater risks of health effects to Indigenous peoples who depend heavily on local resources and live in parts of the world where the climate is changing quickly such as Inuit populations in the Canadian Arctic.*

● ***Current Health Status:*** *Populations with a high prevalence of conditions such as diabetes, ischaemic heart disease, and human immunodeficiency virus (HIV) will be at more sensitive to health effects. Populations exposed to baseline levels of pathogens and parasites such as dengue virus (dengue fever) and plasmodium (malaria) will be at greater risk of outbreaks following flooding events.*

● ***Age:*** *Children are physiologically more susceptible to undernutrition, diarrhea, malaria, and dengue fever. Households with children are likelier to have a lower than average income, rendering children more susceptible to food insecurity. Older people are often less physiologically able to respond to stressors like heat and air pollution, and tend to experience greater risks during extreme events, due to their poorer mobility and limited ability to extricate themselves from hazardous situations.*

● ***Gender:*** *Women and girls can be at greater risk for the health effects of climate change due to lower socioeconomic status and limitations imposed by gender roles. In many countries, women and girls have lower baselines of nutrition, and experience greater risk of poor nutrition during periods of food scarcity. In developed countries, males are at greater risk of fatality due to flooding. However, females face a greater risk in developing countries, where the overall risk of flooding fatality is higher. During heatwaves, working age men experience high risk of health effects due to higher numbers in manual work, although women of all ages maybe at greater risk during heatwaves overall.*

● ***Socioeconomic Status:*** *The poorest countries and regions within them are most susceptible to the health effects of climate change; the socioeconomically poorest individuals living in a population experience the greatest risks during heat waves, flooding, and tropical cyclones.*

● ***Access to Health Care and Services:*** *Populations with poorer access to health care and services have generally poorer climate resilience. Reduced health care and services capacity in the wake of natural hazard events can enable the resurgence of climate-sensitive infectious diseases.*

Unfortunately, research has shown that populations are becoming more vulnerable to the health effects of climate change over time. For example, the authors of the 2018 Report of the Lancet Countdown on Health and Climate Change found that the proportion of people over the age of 65 with underlying health conditions, such as cardiovascular disease, is increasing, which means that there is an increase in the those who are becoming more vulnerable to heat exposure (Watts et al., 2018).

electricity, cooking, heating, transportation, industrial and agricultural processes (Blanco et al., 2014). Since these activities additionally produce greenhouse gases (GHG) emissions, climate change and air pollution are inextricably linked.

Climate change affects the level of air pollution as higher temperatures increase the number of reactions giving rise to ground-level ozone in the atmosphere (Jacob and Winner, 2009). Ozone-related mortality is projected to be higher with 2°C of global warming compared to 1.5°C of global warming (Hasegawa and Slade, 2018).

Warmer conditions can increase the production and release of airborne allergens (such as fungal spores and plant pollen) and higher carbon dioxide (CO_2) levels can stimulate growth of these plants. Increases in airborne allergens could trigger asthma and other allergic respiratory diseases. (Smith et al., 2014).

Air pollution in Jodhpur India.
Photo by PauFranch.

Increasing temperatures, humidity, and air stagnation can increase the concentration of fine particulate matter (PM2.5) in the air, while increasing levels of precipitation can decrease PM2.5 concentrations (He et al., 2017). Fine particulate matter increases the risk of ischaemic heart disease (IHD), ischaemic stroke, chronic obstructive pulmonary disease (COPD) and lung cancer in adults and acute lower respiratory infections in children under five years of age (Forouzanfar et al., 2016; WHO, 2016). There is also emerging evidence of the association between PM2.5 and obesity, diabetes, attention deficit hyperactivity disorder, autism, neurodegenerative disease, premature birth and low birthweight (Landrigan et al., 2017)

Wildfires

Extreme wildfires are predicted to increase in many parts of the world as a result of climate change (Reid et al., 2016). Wildfires can lead to acute deaths due to burns and trauma (Cameron et al., 2009), the need for emergent evacuation of healthcare structures (Matear, 2017) and insomnia and post-traumatic-stress disorder symptoms in survivors of evacuations (Psarros et al., 2017). Smoke can produce extremely high levels of air pollution by releasing PM2.5 and other toxic substances that may affect populations for days to months, with these hazards more commonly occurring after heat waves and droughts. Estimates suggest that air pollution resulting from forest fires may lead to 339,000 premature deaths on a global basis per year (Smith et al., 2014). There is also emerging evidence of feelings of isolation, sadness, and anticipatory grief around wildfires as a sign of worsening climate change as a result of prolonged exposure to wildfire smoke itself (Dodd et al., 2018).

Estimates suggest that air pollution resulting from forest fires may lead to 339,000 premature deaths on a global basis per year.

Ultraviolet Radiation

The incidence and prevalence of non-melanoma skin cancers and cataract-related eye diseases are linked to levels of ultraviolet (UV) radiation and summertime maximum temperatures. It is uncertain how the rate skin cancers will be affected by climate change in the future. Levels of UV radiation are expected to return to pre-industrial conditions by the mid-century, owing to worldwide efforts to reduce emissions of ozone-depleting chlorofluorocarbons, but warmer temperatures in cooler climates may lead to people increasing their UV exposure by spending more time outdoors (Smith et al., 2014). Additionally, malignant skin melanoma mortality is rising, particularly in Europe, the Americas, and the Western Pacific (Watts et al., 2018).

Food- and water-borne infectious diseases

Diarrheal and enteric disease transmissions are affected by changes in temperature and rainfall, with studies indicating that higher temperatures and water scarcity increase diarrheal diseases of all causes (Hales et al., 2014; Smith et al., 2014).

Climate change may influence the growth, survival, persistence, transmission, and/or virulence of certain pathogens by affecting the local ecosystem capacity to act as a reservoir for species as vectors of animal-borne diseases. Risks of infection by Vibrio species of bacteria (which include cholera) are affected by temperature, precipitation, and changes in water composition. From the 1980s to the 2010s, the suitability of environments for Vibrio infections has increased by 27% and 24% in the northeastern United States, and coastal regions of the Baltic, respectively (Watts et al., 2018).

Every degree increase in average temperature increases the risk of diarrheal disease morbidity and mortality. In the absence of climate change, however, the WHO projects that global diarrheal mortality will decline over the course of the century in all socioeconomic development scenarios, so that overall risk of climate change attributable deaths due to diarrhea will be lower in 2050 than 2030, even as temperatures continue to rise (Hales et al., 2014). Despite a declining burden, excess diarrheal disease mortality will persist among children and youth up to the age of 15 years, with an estimated 48,000 additional deaths per year by 2030 and 33,000 additional deaths per year by 2050 (Hales et al., 2014).

Vector-borne Diseases

The spread of vector-borne diseases (including malaria, dengue fever, West Nile virus, and Lyme disease) is influenced by temperature, rainfall, flooding, economic development, and public health programs. For example, economic development and public health programs can decrease the risk of malaria and dengue fever, however, in most cases, climate change will increase the risk. Factoring in various developmental and climate scenarios makes quantifying future impacts for vector-borne diseases a challenging proposition.

Malaria

Even accounting for improvements in malaria control, the WHO projects that climate change will result in an estimated 60,000 additional deaths due to malaria by 2030 and 200 million more people are expected to be at risk of malaria by 2050 (Hales et al., 2014). Highland areas of Africa have increased in suitability for malaria infections by 20.9% from the 1950s to the 2010s, but similar trends

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have not been observed in other malaria-endemic regions (Watts et al., 2018).

Later this century, climate change is projected to extend the geographic range of malaria, lengthen its seasonal period of infection, and place more people at risk, with worsening effects associated with 2°C of warming compared to 1.5°C of warming (Hasegawa and Slade, 2018). Higher temperatures and shifts in rainfall pattern associated with climate change are further expected to hamper malarial disease control efforts, placing an additional 200 million people at risk by 2050 (Smith et al., 2014).

Dengue Fever, Chikunguyna, Yellow Fever & Zika

Dengue fever is caused by a flavivirus and transmitted by the Aedes aegypti and Aedes albopictus species of mosquito. These mosquitoes are further responsible for the transmission of other viruses including chikungunya, yellow fever, and Zika. Warmer temperatures increase the capacity for these mosquitoes to act as a vector by affecting their rate of survival, frequency of biting, extrinsic incubation period to become infectious, and probability of transmission from vector to human and human to vector per bite (Hales et al., 2014; Watts et al., 2018). In 2016, global vectorial capacity for the transmission of dengue virus was the highest on record, rising 9.1% above the 1950s baseline for Aedes aegypti and 11.1% above the baseline for Aedes albopictus (Watts et al., 2018).

The geographic distribution of Aedes mosquitoes is projected to increase over a greater extent at 2°C versus 1.5°C of global warming by 2100, potentially affecting rates of transmission for both the dengue and chikungunya viruses (Hasegawa and Slade, 2018). Holding socioeconomic development constant, an estimated 520 million additional people will be put at risk of dengue fever around the world by 2050; however, this number decreases if socioeconomic development improves (Hales et al., 2014).

Mosquito.
Photo by Tskstock.

Tick-Borne Diseases

Other vector-borne diseases are considered to be climate sensitive, although their global impact is anticipated to be less than is expected of malaria and dengue fever. In Europe since the 1970s, tick-borne encephalitis cases have risen, but climate change is just one of many factors driving this increase (Smith et al., 2014). West Nile virus, Lyme disease, and other tick-borne diseases will expand geographically with increasing suitability of the climate in North America, and European regions will see greater risk of Leishmaniosis and Chagas disease in endemic areas (Hasegawa and Slade, 2018).

Indirect Impacts Mediated by Human Systems

Livelihoods and Poverty

As mentioned in the earlier section on heat exposure, heat can have large effects on labour capacity, particularly in agriculture. Other risks to occupational health associated with climate change include increased risk of malaria and dengue fever in field workers, and injuries and mortality risks from extreme weather events and flooding (Smith et al., 2014).

Three to 16 million people could be forced into extreme poverty as the result of climate change. Climate change has the potential to reduce average global incomes and widen global income inequality, with more severe impacts projected in urban areas and some rural regions of sub-Saharan Africa and Southeast Asia (Hasegawa and Slade, 2018).

The authors of the 2018 Report of the Lancet Countdown tallied economic losses from all climate change-related events, including storms, floods, mudslides, heatwaves, droughts, and wildfires. In 2017, there were a total of 712 events, resulting in overall economic losses of US $326 billion; 99% of these losses occurred in low-income countries, and were uninsured (Watts et al., 2018).

Dead Cow. Photo by 1a_photography.

Migration and displacement

The social, economic, and environmental factors underlying migration decisions are complex and varied, making it difficult to observe or estimate the magnitude of climate change effects. Nevertheless, the authors of the 2017 Lancet Countdown Report found that climate change was the sole contributing factor for at least 4,400 people forced to migrate on account of sea level rise, changing ice conditions, coastal erosion, or damage to infrastructure (Watts et al., 2017).

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Populations living in the arctic, tropical regions, and on small-island developing states face the greatest threat of displacement. In the 2°C of global warming scenario, these populations may be required to move distances greater than 1000 km with evacuation from these areas to tropical margins and the subtropics increasing population density in these destinations by 300% (Hasegawa and Slade, 2018). According to the OECD International Migration Database, a 1oC increase in global warming was associated

Box 2: Climate Change and Mental Health

The impacts of climate change on mental health are difficult to track, owing to both a diverse range of mental health outcomes, and long and complex etiological pathways, which can include distal root causes such as famine, war, and poverty (Watts et al., 2017). A number of different climate-related risks can impact mental health, by placing increased stress on those with existing mental illnesses and triggering new onsets.

Both high temperatures and heatwaves are associated with more hospital admissions for mental illness, and increased risk of suicide. Flood, storm, and other natural hazard exposures increase the risk of psychological distress, including post-traumatic stress, anxiety, and depression and these mental impacts can remain for years after the event. Slow-developing events such as prolonged drought periods can result in chronic psychological distress, and increased risk of suicide. The consequences of extreme weather conditions in terms of productivity across agricultural, fishing, forestry and other economic sectors may affect personal livelihoods, placing added stress on individuals and communities.

The Medical Journal of Australia and The Lancet medical journal MJA-Lancet Countdown on Health and Climate Change examined the association between mean annual maximum temperatures and suicide rates for Australia. The authors found that higher temperatures predicted an elevated suicide rate in warmer states and territories; however, in cooler states elevated suicide rates were predicted by cooler maximum temperatures (Zhang et al., 2018).

In recent years, the term eco-anxiety has been used to describe people's experiences when faced with the ecological and existential threats posed by climate change, and other environmental issues (Castelloe, 2018). Solastalgia is another term that has been coined to describe the sense of loss people suffer when their natural environment has been destroyed; it conveys the feeling of being homesick while at home and experiencing the loss of land, amenities, and opportunity (Smith et al., 2014).

with a 1.9% increase in migration from one country to another, and each additional millimetre of average annual precipitation is associated with an increase in this same kind of bilateral migration by 0.5% (Hasegawa and Slade, 2018).

Currently, millions of people are on the move worldwide, many for multi-factorial reasons, including climate change (Medecins Sans Frontieres, 2018). Mobility is known to take place on a spectrum from forced displacement to voluntary migration, with the majority of climate-related migration likely to be in-country and towards urban areas. Final numbers will depend on an interplay between climate impacts, vulnerability, and resilience (Medecins Sans Frontieres, 2018).

Conflict

Climate change could be one of the many drivers of conflict in various regions. For example, drought has been shown to significantly increase the likelihood of sustained conflict for nations or groups dependent on agricultural livelihoods (Hasegawa and Slade, 2018). The International Panel on Climate Change (IPCC) Special Report on Global Warming of 1.5°C found that a number of studies link climate change and human conflicts across all major regions of the world. A 1°C increase in global warming, or more extreme rainfall, has been found to increase the frequency of conflict by 14%. If the world warms by 2°C

Box 3: Regional impacts

Regions in Asia and Africa are projected to experience the greatest risk of climate change impacts to multiple sectors (as described in Box 1). However, all regions of the world are facing numerous threats. In its Fifth Assessment Report, the Intergovernmental Panel on Climate Change (IPCC) outlined the most pressing current and future risks for each region (IPCC, 2014):

• Africa
o Compounded stress on water resources.
o Reduced crop productivity adversely affecting national, regional, and household livelihoods and food security.
o Changes in the geographic range and incidence of vector- and water-borne diseases.

• Asia
o Increased riverine, coastal, and urban flooding.
o Increased heat-related mortality risk.
o Increased risk of drought-related water and food shortages.

• Europe
o Flooding in river basins and along coasts driven by increased urbanisation, rising sea levels, coastal erosion, and peak river discharges.
o Increased water restrictions.
o Higher frequency of extreme heat events and associated risk of wildfires in Europe and the Russian boreal region.

• Australasia
o Degradation of coral reef systems in Australia.
o Increased frequency and intensity of flood damage to infrastructure and settlements.
o Increased risks to coastal infrastructure and low-lying ecosystems.

• Central and South America
o Decreased water availability in semi-arid and glacier-melt dependent regions.
o Decreased food production and food quality.
o Spread of vector-borne diseases in higher altitudes and latitudes spreading further from the equator.

• North America
o Wildfire-induced loss of property and ecosystem integrity, human morbidity and mortality.
o Increased heat-related mortality risk.
o Urban floods in riverine and coastal areas.

• Polar Regions
o Risks to freshwater, terrestrial, and marine ecosystems with changes in ice, snow cover, permafrost, freshwater, and ocean conditions.
o Increased food and water insecurity and damage to infrastructure.
o Unprecedented challenges for northern communities due to complex inter-linkages between climate-related hazards and subsistence land use if rates of change exceed societal adaptation.

• Small Islands
o Loss of livelihoods, coastal settlements, infrastructure, ecosystem services, and economic stability due to rising global mean sea level and high-water-level events.

Box 4: The Lancet Countdown: Tracking Progress on Health and Climate Change

The Lancet Countdown: Tracking Progress on Health and Climate Change is an international research collaboration building on the work of the 2015 Lancet Commission on Health and Climate Change. It was formed to provide a global overview of public health responses to climate change across national contexts. Aiming to help inform an accelerated response to climate change, this initiative tracks the levels of progress achieved on over 40 indicators across five key thematic areas:

- *Climate Change Impacts, Exposures and Vulnerability;*
- *Adaptation, Planning, and Resilience for Health;*
- *Mitigation Actions and Health Co-benefits;*
- *Finance and Economics; and*
- *Public and Political Engagement.*

The Lancet Countdown published its findings in The Lancet medical journal each year, immediately prior to the annual United Nation's Climate Change Conferences. As such, Lancet Countdown data provides a tool to drive national-level policy recommendations, furnishing information for tailored advocacy like the Lancet Countdown 2018 Report - Briefing for Canadian Policymakers (Howard, Rose and Rivers, 2018). The Lancet Countdown comes at a crucial time for international cooperation and national action on climate change, by helping to highlight and track the implementation of the Paris Agreement, and its resulting health benefits.

to 4°C by 2050, rates of human conflict would be expected to increase accordingly (Hasegawa and Slade, 2018).

As a result of concerns around undernutrition, vector-borne disease, migration, severe weather and conflict, humanitarian organizations are becoming increasingly concerned with climate change. In a recent policy brief produced as part of the Lancet Countdown project, Medecins Sans Frontieres/Doctors Without Borders emphasized that anticipated needs in an unmitigated scenario will far exceed the response capabilities of relief actors, and that medical mobilization must therefore address the systemic causes of climate change and emphasize the duty to accelerate mitigation (Medecins Sans Frontieres, 2018).

Conclusion

Climate change has been described as the biggest global health threat of the 21st century. These risks to health include changing exposures to heat, floods and storms, UV radiation, vector-borne diseases, diarrheal and enteric diseases, undernutrition, loss of livelihoods and poverty, migration and displacement, and conflict. Populations most vulnerable to the health impacts of climate change include those living in areas of most geographical risk, Indigenous populations, women, children, and the elderly, and people living in poverty, with pre-existing medical conditions, or with poorer access to health services. Climate change health effects will be felt in every region of the world; however, parts of Asia and Africa, small islands, and polar regions will face the greatest disparities. Unmitigated climate change will exceed the capabilities of medical humanitarian relief actors and put not only health, but global security and the continued functioning of health systems at risk.

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