

8 Climate Change and Human Health

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Background

Human-caused climate change is a serious and urgent threat to human health. Climate change and its environmental manifestations (e.g. warmer temperatures, more heat waves, altered rainfall patterns, more extreme weather such as heavy rainfall events and/or drought, tropical storms, sea-level rise) result in many risks to human health, both direct and indirect, that are recognised by world health authorities and leading medical journals alike.

Globally, leading health threats include water and food shortages, extreme weather events, and changing patterns of infectious disease. In New Zealand there will also be new health and social pressures relating to climate migrant and refugee populations arriving in New Zealand and flow-on health impacts from changes in the global economy.

Without rapid global action to reduce greenhouse gas emissions (particularly from fossil fuels), the world will breach its carbon budget and may experience high levels of warming (4-6°C by 2100) that render many populated areas of the world unable to support human health. However, if well-planned action to reduce greenhouse gas (GHG) emissions were undertaken globally and in New Zealand, there could be positive impacts not only for limiting climate change, but also for health.

The Issue

Climate change is almost certainly already contributing to global disease, disability and premature death, with larger health impacts expected over coming decades. It has been estimated that climate change already causes 400,000 deaths per year through malnutrition, heat illnesses, diarrhoeal infections, vector (e.g. mosquito) borne disease, meningitis and environmental disasters; and that this number will increase substantially by 2030 if current emission patterns continue. These health impacts most seriously affect people in developing countries, and the most disadvantaged and vulnerable within all countries.

Most of the climate-health risk assessments to date are quite conservative (based on lower-range warming scenarios of around 2°C) and consider relatively near-future timeframes (e.g. by 2030 or 2050). However it is becoming increasingly possible that higher levels of warming may occur by 2100, which could lead to environmental and social conditions that are simply unable to support human health and wellbeing in large parts of the world.

New Zealand already has a relatively high burden of several diseases that are sensitive to climatic conditions, and climate trends may already be affecting the health of New Zealanders. The impacts over coming decades are likely to be multiple (Table 1). Health impacts will depend on the extent and rate of climate change (and associated environmental changes) in New Zealand, the capacity of individuals and society to adapt, and the policies chosen to reduce and adapt to climate change.



Table 1. Health impacts of climate change in New Zealand

<p>Food security and nutrition: Increased global food prices may exacerbate food insecurity (inability to afford nutritious food) and therefore compromise nutrition for some groups.</p>
<p>Mental health and suicide: Increased stress and mental health issues (e.g. farmers with drought, victims of extreme weather). Young people may suffer anxieties about catastrophic climate change, not unlike those experienced by children growing up with the fear of nuclear war.</p>
<p>Migrant health issues: It is likely that migrants and refugees will arrive in NZ from climate-change affected areas. This may impact on household overcrowding and the incidence of some infectious diseases.</p>
<p>Injury and illness from extreme weather events (e.g. flooding, landslides, storm surges, drought): Immediate trauma, and indirect health impacts in weeks to months after extreme events (e.g. infectious diseases, mental health problems and exacerbation of pre-existing medical conditions).</p>
<p>Heat-related deaths and illness: Increases in heat-related deaths and illness, particularly for those with chronic illness and those aged over 65 years. Heat stress for outdoor workers. Winter deaths may decline, but this is uncertain as winter deaths may be influenced by seasonality (e.g. cycles of infectious disease) rather than temperature per se.</p>
<p>Vector-borne and zoonotic (animal to human) disease: Increased likelihood that mosquito vectors could establish in NZ, which could lead to local transmission of mosquito-borne diseases (e.g. dengue, Ross River virus). Also possible impacts on other vector-borne diseases (e.g. tick-borne) and zoonotic diseases.</p>
<p>Food- and water-borne disease: Heavy rainfall can lead to contamination of drinking and recreational water/shellfish with faecal (poo) pathogens from animals and humans. Both high and low rainfall, and higher temperatures may impact on viral, bacterial and parasitic diseases causing gastroenteritis (e.g. giardia). Studies correlate temperature increases with food-borne disease (e.g. salmonella), and dry conditions could affect continuity of household water supplies, impacting diseases influenced by hygiene (e.g. gastrointestinal infection).</p>
<p>Ultraviolet (UV) radiation: Climate change may delay recovery of stratospheric ozone. Warmer temperatures could promote increased or decreased outdoor time, affecting exposure to solar ultraviolet (UV) radiation – with possible impacts on rates of skin cancer, eye disease, and vitamin D levels.</p>
<p>Physical activity: Warmer temperatures and either increases or decreases in outdoor time may impact on levels of physical activity – an important determinant of health.</p>
<p>Cardio-respiratory (heart and lung) disease from air pollution: High temperatures can exacerbate photochemical air pollution with impacts on respiratory disease. Hot, dry conditions increase potential for bush/forest fires, where smoke impacts on people with cardiorespiratory disease.</p>
<p>Allergic diseases, including asthma: Possible impacts on allergic conditions with changes in plant distribution, flowering, and pollen production.</p>
<p>Indoor environment: Climate change may affect the healthiness of indoor environments (e.g. overheating of buildings, changes in indoor air pollutants, flood damage and indoor moisture).</p>

In New Zealand there will be different impacts for different population groups depending on age, ethnicity, and health and socioeconomic circumstances. Māori, Pacific, vulnerable, and low income groups are at risk of greater health impacts from climate change; thus climate change also has serious implications for health 'equity' (the fair distribution of good health across different population groups) in New Zealand.

Māori are at risk of greater impacts compared with non-Māori, not only because of differences in health and socioeconomic status, but also because of indigenous relationships with the environment, customary practices such as collection of kaimoana (seafood) with exposure to food-borne disease risk, and lower access to and through health and social services.

Furthermore the New Zealand economy will be influenced by global climate and socioeconomic changes/responses to climate change. Reduced export income due to, for example, climate change effects on agriculture, could impact on the socioeconomic factors (social determinants) that underpin good health. There could be higher unemployment, less household money to secure the

basics for good health, and a reduced tax-base for health sector spending. These indirect impacts on the determinants of health may equal, or even outweigh, the direct health impacts of climate change in New Zealand.

Extra health and social challenges will also arise with the arrival of climate migrants and refugees from the Pacific affected by sea-level rise and from elsewhere.

Poorly planned responses to climate change could also impact on health and health equity. Climate change policies that raise costs for fuel and energy (and therefore increase costs of goods and services) without counter-balancing measures, could place extra financial burden on people – particularly low income families – thus affecting ability to afford the basics for good health. However with deliberate policies that align health, health equity and climate goals it is possible to avoid such negative consequences, and instead to gain all-round benefits for health, equity and climate change.

Health Benefits of Climate Action

Well-designed policies to reduce GHG emissions can bring about health and health equity gains including reductions in heart disease, cancer, obesity, musculoskeletal disease, Type 2 diabetes, respiratory disease, motor vehicle injuries, and improvements in mental health – with resultant cost savings for the health care system.

These co-benefits arise because some emission reductions measures impact on important determinants of health, especially energy intake (nutrition) and expenditure (physical movement). For example:

- Active transport (walking, cycling, public transport) improves physical activity, reduces emissions, and can reduce air pollution and road traffic injuries. Walking and cycling are inexpensive, and public transport is used proportionately more by people with lower incomes – with benefits to health, climate and equity.
- Healthy eating, including increased plant and less red meat and animal fat consumption, would reduce the emissions associated with food production and likely lead to reduced rates of bowel cancer and heart disease.
- Improving indoor environments (e.g. energy efficiency measures such as home insulation) can reduce illnesses associated with cold, damp housing (e.g. childhood asthma and chest infections which are leading causes of hospital admissions, particularly for Māori and Pacific children).
- Increasing energy efficiency and/or moving away from fossil fuels would reduce health-damaging air pollution (e.g. particulates) from fuel combustion, in both indoor and outdoor environments, with large health gains.

Solutions

Rapid and sustained global action to reduce GHG emissions is required to avoid the worst health effects of climate change. It is possible to limit the degree of future climate change - and to improve health - if the world rapidly upscales carbon-neutral energy production to replace energy production from fossil fuels, along with reducing energy usage, increasing carbon dioxide sinks (e.g. forests) and curbing rising levels of methane and nitrous oxide by modifying our waste management and agricultural/food systems.

All individuals, groups, businesses and organisations have a role in reducing emissions, reducing investment in fossil fuels, and demanding that local and central governments act in our best interests to reduce climate risks in ways that improve health.

Effective public policies are required that both lessen climate risk, and improve population health and the fair distribution of good health across population groups. These policies include an effective carbon pricing system, and reinvestment of the carbon revenue to reduce living costs for those who can least afford it. Greater investment is required in programmes that both decrease GHG emissions and improve health – such as healthy housing modifications (insulation and clean/efficient heating) and active transport infrastructure.

One way to encourage this is to ensure that public policy decisions include a health impact analysis, so that potential adverse health impacts can be avoided and positive effects maximised. It is also critical that any such decisions incorporate an equity analysis, to ensure that the resulting interventions contribute to reducing social and health inequities.

Health organisations are beginning to take a lead in addressing their climate-health responsibilities with action to measure and reduce organisational carbon footprint using certified programmes.

There is also a need for the health sector to plan for the inevitable health impacts of climate change. There needs to be health service planning to prepare for the likely stresses from more climate-sensitive diseases, extreme weather events and their casualties, and climate migrants with new and challenging health issues.

Public health infrastructure (drinking water, sewage systems, building health and safety) should be future-proofed to withstand the effects of climate change, and public health surveillance systems need to be in place to detect new and emerging illnesses related to climate change. Planning needs to prioritise those population groups most at need of health support in the face of climate change – Māori, Pacific, people on low incomes, refugees, rural people, children, and the elderly.

We all have a role in highlighting the health and wellbeing impacts of climate change. We should be insisting that health be at the centre of climate change decisions, and that climate policy be designed in a way that improves health and creates a more equitable, just and resilient society.

References

Costello A, Abbas M, Allen A, Ball S, Bell S, et al. Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission. *Lancet*.2009;373:1693-1733.

([http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(09\)60935-1/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)60935-1/fulltext))

McMichael AJ. Globalization, climate change, and human health. *N Engl J Med*. 2013;368(14):1335-43. doi: 10.1056/NEJMra1109341.

(<http://www.nejm.org/doi/full/10.1056/NEJMra1109341>)

NZCPHM. Climate Change: New Zealand College of Public Health Medicine Policy Statement. Wellington, 2013.

(http://www.nzcphm.org.nz/media/74098/1_nzcphm_climate_change_policy_final_comms_version.pdf)

supplements at (<http://www.nzcphm.org.nz/policy-publications>)

Confalonieri U, Menne B, Akhtar R, Ebi KL, Hauengue M, Kovats RS, Revich B, Woodward A. Human health. In: *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press, 2007. pp391-431.

(http://www.ipcc.ch/publications_and_data/ar4/wg2/en/ch8.html)

Climate Vulnerability Monitor 2nd Edition: a guide to the cold calculus of a hot planet. DARA International and the Climate Vulnerable Forum, 2012. (<http://daraint.org/climate-vulnerability-monitor/climate-vulnerability-monitor-2012/report/>)

IPCC, 2013. Summary for Policymakers. In: *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Stocker TF, Qin D, Plattner G-K, Tignor M, Allen SK, et al (eds.)]. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press, 2013.

(http://www.climatechange2013.org/images/report/WG1AR5_SPM_FINAL.pdf)

Haines A, McMichael AJ, Smith KR et al. Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. *Lancet*. 2009;374(9707):2104-14.

([http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(09\)61759-1/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)61759-1/fulltext))

Dhar D, Macmillan A, Lindsay G, Woodward A. Carbon pricing in New Zealand: implications for public health. *N Z Med J*. 2009;122(1290):105-15. (<http://journal.nzma.org.nz/journal/122-1290/3483/>)

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