

SPECIAL ARTICLE

Health and equity impacts of climate change in Aotearoa-New Zealand, and health gains from climate action

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Abstract

Human-caused climate change poses an increasingly serious and urgent threat to health and health equity. Under all the climate projections reported in the recent Intergovernmental Panel on Climate Change assessment, New Zealand will experience direct impacts, biologically mediated impacts, and socially mediated impacts on health. These will disproportionately affect populations that already experience disadvantage and poorer health.

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 (land temperatures on average 4–7°C higher by 2100). This level of climate change would threaten the habitability of some parts of the world because of extreme weather, limits on working outdoors, and severely reduced food production.

However, well-planned action to reduce greenhouse gas emissions could bring about substantial benefits to health, and help New Zealand tackle its costly burden of health inequity and chronic disease.

Human-caused climate change is a serious and increasingly urgent threat to human health and wellbeing.^{1–5} Climate change will cause higher temperatures, extreme weather such as heatwaves, heavy rainfall events and/or drought, intense tropical storms and sea-level rise. It is projected that rising levels of carbon dioxide (CO₂) in the atmosphere will increase the acidity of the oceans by 150–200% by 2100. These changes result in many risks to human health that are recognised by world health and science authorities, New Zealand health bodies, and leading medical journals alike.^{2–11}

Globally and in New Zealand, leading health threats include high temperatures and extreme events (direct impacts), changing patterns of infectious diseases and water/food shortages or price changes (biologically mediated impacts), and risks related to economic change, loss of livelihoods and forced migration (socially mediated impacts).^{3,12–16}

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 (4–7°C or higher by 2100).^{1,6,17,18} At such levels of warming the Intergovernmental Panel on Climate Change (IPCC) warns that normal human activities (e.g. growing food, working outdoors) will be increasingly compromised in some parts of the world during parts of the year; there will be large risks to global and regional food security; and higher risk of crossing ‘tipping points’ (thresholds for abrupt and irreversible change) in the earth and interlinked human systems.⁶

However, if well-planned action to reduce greenhouse gas (GHG) emissions were undertaken globally and in New Zealand, there could be substantial positive impacts not only for limiting future climate change, but also for health, equity, and wellbeing.^{2–4,19}

This paper reflects the recent Fifth Assessment Report of the IPCC (AR5), and the increased urgency indicated for action to avoid worsening human health impacts from climate change. It also updates both Metcalfe et al’s Special Article on climate change and health in the *Journal* in 2009,¹² and Phipps et al’s paper on the climate change challenge for General Practice in New Zealand in the *Journal* in 2011.¹³

Global health impact of climate change

Climate change is already contributing to global disease, disability and premature death—most seriously affecting people in poor countries, and the most disadvantaged and vulnerable within all countries.^{2,6,7,20}

By the 2050s, the projected health impacts are extensive (summarised in Box 1).² Levels of risk will be influenced by population vulnerability (population health status, age, gender, health infrastructure) as well as the degree of social and economic development within populations during this timeframe.²

Box 1. Expected global health impacts with projected climate change to 2050²

Health Impact	IPCC Level of Confidence*
Higher risk of injury, disease and death from more intense heat waves and fires	Very high confidence
Higher risk of food- and water-borne diseases	Very high confidence
Higher risk of under-nutrition from lower food production in poor regions	High confidence
Health impacts related to lost work capacity/lower labour productivity in vulnerable populations	High confidence
Higher risk of vector-borne diseases in some areas	Medium confidence
Modest improvements in cold-related mortality and morbidity in some areas	Low confidence
Reduced capacity of disease-carrying vectors (from exceedance of thermal thresholds) in some areas	Medium confidence

* Confidence: IPCC qualitative assessment of evidence (type, amount, quality, consistency) and the agreement of evidence.

Box 1 includes some possible health gains from climate change (e.g. reduction in cold-related morbidity and mortality), but the IPCC has concluded that any positive effects from climate change will be outweighed globally by negative effects.^{2,3}

It is important to note that many climate-health risk assessments to date remain conservative (based on lower-range warming scenarios of around 2°C) and consider relatively near-future timeframes (e.g. by 2030 or 2050).²⁰ However it is becoming increasingly likely that higher levels of warming may occur by 2100.^{1,2,17,18} This would lead to environmental conditions (e.g. periods of extreme high temperatures; inability to raise food crops) that threaten human health and wellbeing in large parts of the world.^{2,21} Under such scenarios, resources would become scarce and populations may be forced to migrate to other regions, creating risk factors for violence and conflict.^{2,22}

Health impacts of climate change in Aotearoa-New Zealand

New Zealand is already experiencing climate change, and more change is expected.²³ According to the projections reported in the AR5, New Zealand will continue to warm over coming decades, and will be wetter in the west and drier in the east and north. Heavier and more frequent extreme rainfalls are expected (with increased flood risk), along with more drought, the duration of drought in the north and east is projected to at least double by 2040.^{16,23,24}

There is expected to be more extreme heat (up to 60 more days >25°C in the north by 2090), with increased wild-fire risk. Some of these trends (e.g. increases in heavy precipitation) have already been observed.^{16,23,24}

Table 1. Expected health impacts of climate change in New Zealand

Food security and nutrition: Increased global food prices, affecting a large number of locally produced and imported food staples in New Zealand, are likely to reduce the ability of some groups to afford a variety of nutritious foods, further compromising nutritional outcomes for those groups. ^{2,30-32}
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. ^{2,33-36}
Housing and health: Healthiness of some housing will be affected by extreme weather, for example, indoor moisture (with heavy rainfall, flooding), high indoor temperatures (during heatwaves in poorly insulated houses). ³⁷ It is also likely that people will arrive in New Zealand from climate-change affected areas. This may put further pressure on availability of low income-larger family homes, potentially impacting household overcrowding and the incidence of some infectious diseases. ^{14,38,39}
Injury and illness from extreme weather events (e.g. flooding, storms, landslides, storm surges, drought): Immediate trauma, and indirect health impacts in weeks to months after extreme events (e.g. mental health problems, exacerbation of pre-existing medical conditions). ^{2,40-42}
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 seasonal factors that are unrelated to climate. ^{2,43-50}
Vector-borne and zoonotic (animal to human) disease: Increased likelihood that mosquito vectors could establish in New Zealand, 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. ^{2,51-56}
Food- and water-borne disease: Heavy rainfall can lead to contamination of drinking and recreational water/shellfish with faecal pathogens from animals and humans. Both high and low rainfall, and higher temperatures may impact on bacterial and parasitic diseases causing gastroenteritis (e.g. giardiasis, salmonellosis). Dry conditions could affect continuity of household water supplies, impacting diseases influenced by hygiene. ^{2,56-59}
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. ^{2,60-63}
Physical activity: Warmer temperatures, and either increases or decreases in outdoor time, may impact on levels of recreational physical activity—an important determinant of health. ⁶⁴
Cardio-respiratory disease from air pollution: High temperatures can exacerbate photo-chemical air pollution with impacts on respiratory disease. Hot, dry conditions increase potential for bush/forest fires, where smoke impacts on people with cardiorespiratory disease. ^{2,65-68}
Allergic diseases, including asthma: Possible impacts on allergic conditions with changes in plant distribution, flowering, and pollen production. ^{2,69}
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). ^{37,70}

Sea-level rise is expected to continue, with an increase in the frequency of extreme high tides and their associated risks, including coastal flooding, inundation, and erosion.^{16,23,24}

These climate and related environmental changes have multiple implications for health and wellbeing in New Zealand (Table 1). The magnitude of health impacts will depend on the existing burden of climate-sensitive diseases, the extent and rate of climate change in New Zealand, the capacity of individuals and society to adapt, and the policies chosen to reduce and adapt to climate change.²⁵

New Zealand is already affected by a range of diseases that are sensitive to climatic factors,^{26–29} and climate trends may well be affecting New Zealanders' health and wellbeing, although such effects are not yet well quantified.²⁵

Furthermore, given that global greenhouse gas emissions are continuing to track near the upper end of projections, it will be important to gain a better understanding of the health impacts in New Zealand under high-end scenarios of climate change.²

Effects on the determinants of health in Aotearoa-New Zealand

In addition to the health issues listed in table 1, climate change will impact on the broader socioeconomic determinants of health in New Zealand.^{14–16}

The economy will be influenced by global climate change.¹⁵ Reduced export income due to, for example, effects on agricultural production (or overseas markets) could lead to higher unemployment, less household money to secure the basics for good health, and a reduced tax-base for health and social spending. An analysis prepared for the Ministry of Primary Industries in 2013 showed that under a high end warming scenario (4.4°C average temperature increase by 2100) there would be a significant decline in dairy pasture production, along with increased dairy cow heat stress in many dairying areas of New Zealand.⁷¹

However, some positive effects on agriculture/horticulture in New Zealand are also possible.^{16,23,71} Thus forward planning and adaptability within the sector will be required to safeguard the economic output of climate sensitive primary industries,⁷² which many New Zealanders rely on for good health and wellbeing.

Furthermore, responses to mitigate climate change also have the potential to adversely impact on health. For example, mitigation policies that raise costs for fuel and energy (and therefore increase costs of goods and services) without compensatory measures, could place extra financial burden on people, particularly for low income families, thus affecting ability to afford the basics for good health.⁷³

Risks of climate change to health equity and Māori health in Aotearoa-New Zealand

Climate change will cause different impacts for different population groups depending on geographic location, age, ethnicity, health status, and socioeconomic circumstances.^{2,25} Māori, Pacific, and low-income groups in New Zealand are at risk of greater adverse health impacts from climate change.^{10,14,74}

Māori are at risk of greater impacts (compared with NZ European people) because of a disproportionate burden of disease across many of the health conditions affected by climate change: infectious diseases (e.g. gastrointestinal infection),^{75,76} chronic conditions (e.g. cardio-respiratory disease),^{75,77,78} and mental ill-health.^{75,79,80}

The disproportionately high number of Māori living in deprived circumstances^{78,81} means that climate change effects on food security^{30,82} and vulnerable infrastructure and housing^{25,83,84} will be more difficult to prepare for and recover from—meaning that important determinants of health (such as healthy nutrition, safe drinking water, healthy homes) are undermined.

Any additional pressure on the availability of low income and/or larger family homes resulting from arrival of climate migrants in areas with existing housing pressures (e.g. Auckland region)^{14,85,86} would also disproportionately affect Māori who have higher levels of household overcrowding and crowding-related infectious diseases.^{87,88} Previous experience in New Zealand has shown that factors that affect the ability of low income families to buy or rent adequately sized houses can lead to families co-habiting, with resultant household overcrowding.⁸⁹

Additional factors which increase climate-health risks for Māori include indigenous relationships with the environment, greater exposure to food-borne disease risk through customary practices such as collection of kaimoana (seafood),⁹⁰ greater exposure to outdoor heat whilst undertaking outdoor labour (Māori are overrepresented in semi-skilled/unskilled workforces),^{91,92} and poorer access to and through health and social services.⁹³⁻¹⁰⁰

Perhaps even more significant are the implications for the economic determinants of health for Māori. The Māori economy is heavily invested in climate-sensitive primary industries;^{23,84} and policy responses that place extra financial burden on low income families (disproportionately Māori), without counter-balancing measures, would exacerbate Māori experience of poverty and poverty-related diseases.^{73,76}

It is important to note that while this section has focussed on the equity impacts for Māori, many of these issues are also relevant to Pacific peoples in New Zealand and to low income New Zealanders.^{10,14}

Health benefits of climate action

The other important link between climate change and health is the substantial opportunity to improve current population health and wellbeing through well-designed policies to reduce greenhouse gas (GHG) emissions.^{2-4,19} Knowledge in this area has increased substantially in the last five years, and the health chapter in the recent Fifth Assessment Report of the IPCC included, for the first time, a dedicated section about the health co-benefits of climate action.²

Health and health equity gains are possible for heart disease, cancer, obesity, musculoskeletal disease, Type 2 diabetes, respiratory disease, motor vehicle injuries, and mental health, with resultant cost savings for the health system.^{2-4,19.}

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

- Active transport (walking, cycling, public transport) in addition to reducing CO₂ emissions, improves physical activity and can reduce air pollution and road traffic injuries.^{2,101-107} Walking and cycling are inexpensive, and public transport is used proportionately more by people with lower incomes. Thus improved active and public transport infrastructure has the potential to benefit health, climate and equity.¹⁰¹
- In New Zealand healthy eating, including increased plant and less red meat and animal fat consumption, would reduce agricultural GHG emissions, and likely lead to reduced rates of bowel cancer and heart disease.^{2,108-111}
- 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).¹¹²⁻¹¹⁴
- 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 health gains.²

Thus well planned climate action could contribute to significant reductions in the large burden of chronic disease and health inequity in New Zealand, leading to large cost savings for the health sector and society as a whole. This could offset a great deal of the early costs associated with climate change mitigation measures.^{2,3}

The New Zealand research community continues to make a strong contribution to the body of knowledge on the health co-benefits of climate action. The housing and health programme (University

of Otago, Wellington) has led the way in quantifying the costs and benefits (including health) of insulation and clean heating.^{112,113}

Research at the University of Auckland, using novel modelling techniques, has indicated that transport policy that enables safe commuter bicycling in Auckland has the potential to yield benefits (with respect to injury, physical activity, fuel costs, air pollution, and carbon emissions) that are 10–25 times greater than costs.¹⁰⁷

The way forward

Rapid and sustained global action to reduce GHG emissions is required to avoid the worst health effects of climate change.^{2,115} 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.^{4,115}

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 to reduce climate risks in ways that improve health and equity.⁴

Some New Zealand health organisations are beginning to take a lead in addressing their climate-health responsibilities, with action to measure and reduce organisational carbon footprint (Counties-Manukau District Health Board, Canterbury District Health Board), and employment of Sustainability Officers (Counties-Manukau, Waitemata, Auckland and Canterbury District Health Boards). A national network of health professionals interested in collaborating to improve the environmental sustainability of the New Zealand health sector was established in early 2014.¹¹⁶

There is much untapped willingness amongst health professionals to improve environmental sustainability within their workplaces (with large potential for operational cost savings),^{117,118} but as yet no national framework or mandate to support this, despite a growing international movement and ample international expertise.¹¹⁹

There is also a need for the health sector to plan for the inevitable health impacts of climate change in coming decades. Health services should plan for more climate-sensitive diseases, extreme weather events and their casualties, and climate migrants with new and challenging health issues.^{10,14,120}

Public Health Services should be strengthened to enable planning and response capability for impacts on drinking water, sewage systems, and civil defence emergencies. Public health surveillance systems need to be in place to detect new and emerging illnesses.^{10,120}

It is essential that planning prioritises those population groups most in need of health support in the face of climate change—Māori, Pacific, people on low incomes, migrants, rural people, children, and the elderly.¹⁰ Other events (e.g. Christchurch earthquakes, Hurricane Katrina) have shown that planning is required to avoid an inverse equity pattern in post-disaster responses and outcomes.^{121–123}

Outside the health sector, effective public policies are required that both lessen climate risk, and improve population health and health equity. These policies should include an effective carbon pricing system (to replace the largely ineffective Emissions Trading Scheme),¹²⁴ while ensuring that financial costs do not adversely affect those on low incomes.^{4,73}

Greater investment is required in programmes that both decrease GHG emissions and improve health, such as healthy housing modifications (insulation and clean/efficient heating), active transport infrastructure, and interventions that encourage increased plant and less red meat and animal fat consumption.

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.¹²⁵ 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.

New Zealand must also consider its role in international climate change negotiations and responses. As a high (and growing) per-capita greenhouse gas emitter,^{126–128} New Zealand has a responsibility to both increase its own ambitions with respect to greenhouse gas emission reductions, and to promote fair and equitable approaches to emissions reductions globally that take into account historical responsibility and capacity to mitigate.^{129,130}

New Zealand, as part of the Pacific, will also need to play a role in supporting the health, wellbeing and adaptation of Pacific Island and other developing nation populations who will face many of the worst health effects of climate change.^{131,132}

Conclusion

Climate change poses an urgent threat to human health, wellbeing, and health equity globally, and in Aotearoa-New Zealand.

On the other hand, well-planned action to reduce greenhouse gas emissions offers opportunities to improve population health, equity, and reduce chronic disease burden. This could result in large cost savings for the health sector and society as a whole, which would offset a great deal of the early costs associated with climate change mitigation measures.

As health professionals, we have a responsibility to raise awareness of the health implications of climate change, and to press for urgent action. If we act quickly, we have an opportunity to turn one of our greatest health threats into positive action to significantly improve the health, equity, and resilience of our patients and population.

Competing interests: Scott Metcalfe is a member of the NZMA Services Board.

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References

1. 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 University Press, Cambridge, United Kingdom and New York, NY, USA, 2013. <https://www.ipcc.ch/report/ar5/wg1/>
2. Smith KR, Woodward A, Campbell-Lendrum D, Chadee D, Honda Y, et al. Human Health: Impacts, Adaptation, and Co-benefits. In: Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Field CB, Barros VR, Mastrandrea MD, Mach KJ, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2014. http://ipcc-wg2.gov/AR5/images/uploads/WGIAR5-Chap11_FGDall.pdf

3. Woodward A, Smith KR, Campbell-Lendrum D, Chadee DD, Honda Y, et al. Climate change and health: on the latest IPCC report. *Lancet*. 2014;383(9924):1185-9. [http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(14\)60576-6/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(14)60576-6/fulltext)
4. McCoy D, Montgomery H, Sabaratnam A, Godlee F. Climate change and human survival. *BMJ*. 2014;348:g2351. <http://www.bmj.com/content/348/bmj.g2351>
5. McMichael AJ. Globalization, climate change, and human health. *N Engl J Med*. 2013;368:1335-43. doi: 10.1056/NEJMr1109341. <http://www.nejm.org/doi/full/10.1056/NEJMr1109341>
6. IPCC, 2014: Summary for Policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field CB, Barros VR, Mastrandrea MD, Mach KJ, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2014. <https://www.ipcc.ch/report/ar5/wg2/>
7. World Health Organization and World Meteorological Association. *Atlas of Health and Climate*. Geneva: WHO, 2012. <http://www.who.int/globalchange/publications/atlas/en/index.html>
8. World Medical Association. WMA Declaration of Delhi on Health and Climate Change. Adopted by the 60th WMA General Assembly. New Delhi: World Medical Association, October 2009. <http://www.wma.net/en/30publications/10policies/c5/index.html>
9. New Zealand Medical Association. NZMA Position Statement on Health and Climate Change. Wellington: NZMA, 2010. <http://www.nzma.org.nz/policies/advocacy/position-statements/climatechange>
10. New Zealand College of Public Health Medicine. Policy Statement on Climate Change. Wellington: New Zealand College of Public Health Medicine, 2013. http://www.nzcpmh.org.nz/media/74098/1_nzcpmh_climate_change_policy_final_comms_version2.pdf
11. Public Health Association of New Zealand. Position Statement: Preventing Global Climate Change. Wellington: PHA, 2001. <http://www.pha.org.nz/policies/phapolicyclimatechange.pdf>
12. Metcalfe S, Woodward A, Macmillan A, Baker M, Howden-Chapman P, et al. New Zealand Climate and Health. Why New Zealand must rapidly halve its greenhouse gas emissions. *N Z Med J*. 2009;122:72-95. http://www.nzma.org.nz/data/assets/pdf_file/0010/17785/Vol-122-No-1304-09-October-2009.pdf
13. Phipps R, Randerson R, Blashki G. The climate change challenge for general practice in New Zealand. *N Z Med J*. 2011;124:47-54. <http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2011/vol-124-no-1333/view-hipps>
14. Howden-Chapman P, Chapman R, Hales S, Britton E, Wilson N. Climate Change and Human Health: Impact and Adaptation Issues for New Zealand. In: Nottage RAC, Wratt DS, Bornman JF, Jones K (eds). *Climate Change Adaptation in New Zealand: Future Scenarios and Some Sectoral Perspectives*. Wellington: New Zealand Climate Change Centre, 2010. [http://www.nzclimatechangecentre.org/sites/nzclimatechangecentre.org/files/images/research/Climate%20Change%20Adaptation%20in%20New%20Zealand%20\(NZCCC\)%20high%208.pdf](http://www.nzclimatechangecentre.org/sites/nzclimatechangecentre.org/files/images/research/Climate%20Change%20Adaptation%20in%20New%20Zealand%20(NZCCC)%20high%208.pdf)
15. Reisinger A, Mullan B, Manning M. Global and Local Climate Change Scenarios to Support Adaption in New Zealand. In: Nottage RAC, Wratt DS, Bornman JF, Jones K (eds). *Climate Change Adaptation in New Zealand: Future Scenarios and Some Sectoral Perspectives*. Wellington: New Zealand Climate Change Centre, 2010. <http://www.nzclimatechangecentre.org/sites/nzclimatechangecentre.org/files/images/research/Climate%20Change%20Adaptation%20in%20New%20Zealand%20%28NZCCC%29%20high%202.pdf>
16. Office of the Prime Minister's Chief Science Advisor. *New Zealand's Changing Climate and Oceans: The Impacts of Human Activity and Implications for the Future*. Wellington: Office of the Prime Minister's Chief Science Advisor, July 2013. <http://www.pmcasa.org.nz/wp-content/uploads/New-Zealands-Changing-Climate-and-Oceans-report.pdf>

17. PriceWaterhouseCoopers. Too Late for 2°C? Low Carbon Economy Index 2012. November 2012. <https://www.thepmr.org/system/files/documents/Low%20Carbon%20Economy%20Index%202012.pdf>
18. The World Bank. Turn Down The Heat: Why a 4oC Warmer World Must be Avoided. A Report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics, 2012. http://climatechange.worldbank.org/sites/default/files/Turn_Down_the_heat_Why_a_4_degree_centrig_rade_warmer_world_must_be_avoided.pdf
19. 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;374:2104-14. [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)
20. McMichael AJ, Campbell-Lendrum C, Kovats S, Edwards S, Wilkinson P et al. Global Climate Change. In: Ezzati M, Lopez AD, Rodgers A, Murray CJ (eds). *Comparative quantification of health risks: global and regional burden of disease due to selected major risk factors*. Geneva: World Health Organisation, 2004. <http://www.who.int/publications/cra/chapters/volume2/1543-1650.pdf?ua=1>
21. The World Bank. Turn Down The Heat: Climate Extremes, Regional Impacts and the Case for Resilience. A report for the World Bank by the Potsdam Institute for Climate Impact Research and Climate Analytics, 2013. <http://www.worldbank.org/en/topic/climatechange/publication/turn-down-the-heat-climate-extremes-regional-impacts-resilience>
22. Hsiang S, Burke M, Miguel E. Quantifying the influence of climate on human conflict. *Science*. 2013;341. doi: 10.1126/science.1235367.
23. Hollis M. Climate Change: IPCC Fifth Assessment Report New Zealand findings. Wellington: New Zealand Climate Change Centre, 2014. <http://www.nzclimatechangecentre.org/research/ipcc-fifth-assessment-report-new-zealand-findings>
24. Reisinger A, Kitching R, Chiew F, Hughes L, Newton P, et al. Australasia. In: *Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Field CB, Barros VR, Mastrandrea MD, Mach KJ, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2014. http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap25_FGDall.pdf
25. Woodward A, Hales S, De Wet N. Climate Change Potential Effects on Human Health in New Zealand. Report prepared for the Ministry for the Environment. Wellington: Ministry for the Environment, 2001. <https://www.mfe.govt.nz/sites/default/files/Climate%20change%20potential%20effects%20on%20human%20health%20in%20New%20Zealand.pdf>
26. Crump JA, Murdoch DR, Baker MG. Emerging infectious diseases in an island ecosystem: the New Zealand perspective. *Emerg Infect Dis*. 2001;7:767-72. http://wwwnc.cdc.gov/eid/article/7/5/01-7501_article.htm
27. Baker M, Barnard L, Kvalsvig A et al. Increasing incidence of serious infectious diseases and inequalities in New Zealand: a national epidemiological study. *Lancet*. 2012;379:1112-1119.
28. O'Dea D. The Costs of Skin Cancer to New Zealand. A report to the Cancer Society of New Zealand, 2009. http://www.cancernz.org.nz/assets/files/info/SunSmart/CostsofSkinCancer_NZ_22October2009.pdf
29. Asher MI, Barry D, Clayton T, Crane J, D'Souza W, et al; International Study of Asthma and Allergies in Childhood (ISAAC) Phase One. The burden of symptoms of asthma, allergic rhinoconjunctivitis and atopic eczema in children and adolescents in six New Zealand centres: ISAAC Phase One. *N Z Med J*. 2001;114(1128):114-20. http://www.nzma.org.nz/_data/assets/pdf_file/0014/18014/Vol-114-No-1128-23-March-2001.pdf
30. Parnell WR, Reid J, Wilson NC, McKenzie J, Russell DG. Food security: is New Zealand a land of plenty? *N Z Med J*. 2001;114(1128):141-5. http://www.nzma.org.nz/_data/assets/pdf_file/0014/18014/Vol-114-No-1128-23-March-2001.pdf

31. Quiggin J. Drought, Climate Change and Food prices in Australia. University of Queensland, 2008. http://www.acfonline.org.au/sites/default/files/resources/Climate_change_and_food_prices_in_Australia.pdf
32. Husband A. Climate change and the role of food price in determining obesity risk. *Am J Public Health*. 2013;103:e2. <http://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2012.301084>
33. Nicholls N, Butler C, Hanigan I. Inter-annual rainfall variations and suicide in New South Wales, Australia. *Int J Biometereology*. 2006;50:139-43. <http://link.springer.com/article/10.1007%2Fs00484-005-0002-y>
34. Berry HL, Bowen K, Kjellstrom T. Climate change and mental health: a causal pathways framework. *Int J Public Health*. 2010;55:123-32. <http://link.springer.com/article/10.1007%2Fs00038-009-0112-0>
35. Polain J, Berry H, Hoskin J. Rapid change, climate adversity and the next 'big dry': older farmers' mental health. *Aust J Rural Health*. 2011;19:239-43.
36. Fritze J, Blashki G, Burke S, Wiseman J. Hope, despair and transformation: climate change and the promotion of mental health and wellbeing. *Int J Ment Health Syst*. 2008;2:13. <http://www.ijmhs.com/content/2/1/13>
37. Vardoulakis S, Thornes J, Ka-Man L. Health Effects of Climate Change in the Indoor Environment. In: Vardoulakis S, Heaviside C (eds). *Health Effects of Climate Change in the UK: Current Evidence, Recommendations and Research Gaps*. London: Health Protection Agency, 2012. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/371103/Health_Effects_of_Climate_Change_in_the_UK_2012_V13_with_cover_accessible.pdf
38. McMichael C, Barnett J, McMichael AJ. An ill wind? Climate change, migration, and health. *Environ Health Perspect*. 2012;120:646-54. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3346786/>
39. Britton E. *Preparing for Change*. Wellington: Regional Public Health, 2009.
40. McMichael A, Woodruff R, Whetton P, Hennessy K, Nicholls N, Hales S, Woodward A, Kjellstrom T. *Health and Climate Change in Oceania: A Risk Assessment 2002*. Canberra: Commonwealth Department of Health and Ageing, 2003. pp33-34,57 (table 17). http://webarchive.nla.gov.au/gov/20080727052932/http://health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-publicat-document-metadata-env_climate.htm
41. McKinney N, Houser C, Meyer-Arendt K. Direct and indirect mortality in Florida during the 2004 hurricane season. *Int J Biometeorol*. 2011;55:533-46. doi: 10.1007/s00484-010-0370-9
42. Kessler RC, Galea S, Gruber MJ, Sampson NA, Ursano RJ, Wessely S. Trends in mental illness and suicidality after Hurricane Katrina. *Mol Psychiatry*. 2008;13:374-84. doi: 10.1038/sj.mp.4002119.
43. Basu R. High ambient temperature and mortality: a review of epidemiologic studies from 2001 to 2008. *Environ Health*. 2009;8:40. <http://www.ehjournal.net/content/8/1/40>
44. Kjellstrom T. Climate change, direct heat exposure, health and wellbeing in low and middle income countries. *Global Health Action*. 2009. doi: 10.3402/gha.v2i1.1958 <http://www.globalhealthaction.net/index.php/gha/article/view/1958/2183>
45. Hales S, Woodward A. Potential Health Impacts and Policy Responses. In: Chapman R, Boston J, Schwass M (eds). *Confronting Climate Change: Critical Issues for New Zealand*. Wellington: Victoria University Press, 2006
46. Dunne JP, Ronald J, Stouffer J, Jasmin JG. Reductions in labour capacity from heat stress under climate change. *Nature Climate Change*. 2013;3:1827 <http://www.nature.com/nclimate/journal/v3/n6/full/nclimate1827.html>
47. Hales S, Salmond C, Town GI, Kjellstrom T, Woodward A. Daily mortality in relation to weather and air pollution in Christchurch, New Zealand. *Aust NZ J Public Health*. 2000;24:89-91.
48. Cockburn S. *Does Climate Affect Mortality in Auckland*. Thesis. Dunedin: University of Otago, 2001.
49. McMichael A, Woodruff R, Whetton P, Hennessy K, Nicholls N, Hales S, Woodward A, Kjellstrom T. *Health and Climate Change in Oceania: A Risk Assessment 2002*. Canberra: Commonwealth

- Department of Health and Ageing, 2003. pp28,33 (tables 5,6).
http://webarchive.nla.gov.au/gov/20080727052932/http://health.gov.au/internet/main/publishing.nsf/Content/health-publth-publicat-document-metadata-env_climate.htm
50. Ebi K, Mills D. Winter mortality in a warming world: a reassessment. *WIREs Climate Change*. 2013;4:203-212. <http://wires.wiley.com/WileyCDA/WiresArticle/wisId-WCC211.html>
 51. de Wet N, Slaney D, Ye W, Hales S, Warrick R. Hotspots: Exotic Mosquito Risk Profiles for New Zealand. IGCI Report. Hamilton: International Global Change Institute (IGCI), University of Waikato/Ecology and Health Research Centre, Wellington School of Medicine and Health Sciences, 2005. <http://researchcommons.waikato.ac.nz/handle/10289/916>
 52. de Wet N, Slaney D, Ye W, Hales S, Warrick R. Hotspots: Modelling Capacity for Vector-Borne Disease Risk Analysis in New Zealand: A Case Study of Ochlerotatus Campthorhynchus Incursions in New Zealand. IGCI Report. Hamilton: International Global Change Institute (IGCI), University of Waikato/Ecology and Health Research Centre, Wellington School of Medicine and Health Sciences, 2005. <http://researchcommons.waikato.ac.nz/handle/10289/917>
 53. Mills JN, Gage KL, Khan AS. Potential influence of climate change on vector-borne and zoonotic diseases: a review and proposed research plan. *Environ Health Perspect*. 2010;118:1507-14. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2974686/>
 54. Derraik JG, Slaney D, Nye ER, Weinstein P. Vector-borne disease prevention: the need for a joint South Pacific approach. *N Z Med J*. 2009;122(1299):7-12. http://www.nzma.org.nz/data/assets/pdf_file/0006/17790/Vol-122-No-1299-24-July-2009.pdf
 55. Derraik JG, Slaney D, Nye ER, Weinstein P. Chikungunya virus: a novel and potentially serious threat to New Zealand and the South Pacific islands. *Am J Trop Med Hygiene*. 2010;83:755-9. <http://www.ajtmh.org/content/83/4/755.long>
 56. Wilson N, Slaney D, Baker MG, Hales S, Britton E. Climate change and infectious disease in New Zealand: a brief review and tentative research agenda. *Rev Environ Health*. 2011;26:93-99. <http://www.degruyter.com/view/j/reveh.2011.26.issue-2/reveh.2011.013/reveh.2011.013.xml>
 57. Hambling T, Bandaranayake D. Climate change and waterborne diseases in New Zealand and the role of primary care in the early detection of common source waterborne disease outbreaks. *Public Health Surveillance Report*. 2012;10(4). http://www.surv.esr.cri.nz/PDF_surveillance/NZPHSR/2012/NZPHSR2012Dec.pdf
 58. Britton E, Hales S, Venugopal K, Baker MG. Positive association between ambient temperature and salmonellosis notifications in New Zealand, 1965-2006. *Aust NZ J Public Health*. 2010;34:126-9. doi: 10.1111/j.1753-6405.2010.00495.x.
 59. Lal A, Baker MG, Hales S, French NP. Potential effects of global environmental changes on cryptosporidiosis and giardiasis transmission. *Trends Parasitol*. 2013;29:83-90. <http://www.sciencedirect.com/science/article/pii/S1471492212001833>
 60. McMichael AJ, Campbell-Lendrum DH, Corvalan CF, Ebi KL, Githelo A, Scheraga JD, Woodward A, (eds). *Climate Change and Human Health. Risks and Responses*. Geneva: World Health Organization, 2003. <http://www.who.int/globalchange/publications/cchhbook/en/>, <http://www.who.int/globalchange/publications/climchange.pdf>
 61. Waugh DW, Oman L, Kawa SR. Impacts of climate change on stratospheric ozone recovery. *Geophysical Res Letters*. 2009;36:L03805 doi:10.1029/2008GL036223. http://acdb-ext.gsfc.nasa.gov/People/Oman/papers/Waugh_etal_2009aGRL.pdf
 62. Lucas R, McMichael T, Smith R, Armstrong B. Solar Ultraviolet Radiation: Global Burden of Disease from Solar Ultraviolet Radiation. *Environmental Burden of Disease Series, No.13*. Geneva: World Health Organization, 2006. <http://www.who.int/uv/health/solaruvrad.pdf>
 63. Thomas P, Swaminathan A, Lucas RM. Climate change and health with an emphasis on interaction with ultraviolet radiation: a review. *Global Change Biology*. 2012;18:2392-2406.
 64. Stamatakis E, Nnoaham K, Foster C, Scarborough P. The influence of global heating on discretionary physical activity: an important and overlooked consequence of climate change. *J Physical Activity*

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no-1406/6366>

- Health. 2013;10:765-768.
http://www.naspsa.org/AcuCustom/Sitename/Documents/DocumentItem/00b_Stamatakis_JPAH_20130000_ej.pdf
65. The Royal Society. Ground-Level Ozone in the 21st century: Future Trends, Impacts and Policy Implications. Science Policy Report 15/08. London: The Royal Society, 2008.
<http://royalsociety.org/policy/publications/2008/ground-level-ozone/>
 66. Ebi KL, McGregor G. Climate change, tropospheric ozone and particulate matter, and health impacts. *Environ Health Perspect*. 2008 Nov;116:1449-55.
<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2592262/>
 67. Pearce HG, Mullan AB, Salinger MJ, et al. Impact of Climate Change on Long-Term Fire Danger. New Zealand Fire Service Commission Research Report 50. Wellington: NIWA/Forest Research, for New Zealand Fire Service Commission, 2005. <http://www.fire.org.nz/Research/Published-Reports/Documents/bfcdb58e48631b9442304dc76797bad2.pdf>
 68. Finlay SE, Moffat A, Gazzard R, et al. Health impacts of wildfires. *PLoS Curr*. 2012;4:e4f959951cce2c. <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3492003/>
 69. D'Amato G, Cecchi L. Effects of climate change on environmental factors in respiratory allergic diseases. *Clin Exp Allergy*. 2008;38:1264-74. <http://onlinelibrary.wiley.com/doi/10.1111/j.1365-2222.2008.03033.x/full>
 70. Committee on the Effect of Climate Change on Indoor Air Quality and Public Health, Institute of Medicine (IOM). *Climate Change, the Indoor Environment and Health*. Washington DC: Institute of Medicine, 2011. http://www.nap.edu/catalog.php?record_id=13115
 71. Ministry for Primary Industries. *4 Degrees of Global Warming: Effects on the New Zealand Primary Sector*. Technical Information Paper No: 2013/46. Wellington: Ministry for Primary Industries, 2013. <http://www.mpi.govt.nz/news-resources/publications.aspx?title=four%20degrees%20of%20global%20warming>
 72. New Zealand Treasury. *New Zealand Economic and Financial Overview 2013*. Wellington: New Zealand Treasury, 2013. <http://www.treasury.govt.nz/economy/overview/2013/nzefo-13.pdf>
 73. 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://www.nzma.org.nz/_data/assets/pdf_file/0006/17799/Vol-122-No-1290-27-February-2009.pdf
 74. Jones R, Bennett H, Keating G, Blaiklock A. Climate change and the right to health for Māori in Aotearoa/New Zealand. *Health and Human Rights Journal*. 2014;16:54-68.
 75. Ministry of Health. *Health Loss in New Zealand: A Report from the New Zealand Burden of Diseases, Injuries and Risk Factors Study, 2006–2016*. Statistical Annex Māori/Non-Māori DALY Rate Ratio by Condition. Wellington: Ministry of Health, 2013.
<http://www.health.govt.nz/system/files/documents/publications/workbook-3-nzbd-inequalities-2006.xlsx>
 76. Baker M, Barnard L, Kvalsvig A, et al. Increasing incidence of serious infectious diseases and inequalities in New Zealand: a national epidemiological study. *Lancet*. 2012;379:1112-1119.
 77. Ministry of Health. *The Health of Māori Adults and Children*. Wellington: Ministry of Health, 2013.
<http://www.health.govt.nz/publication/health-Māori-adults-and-children>
 78. Ministry of Health. *Tatau Kahukura: Māori Health Chartbook 2010*, 2nd ed. Wellington: Ministry of Health, 2010. <http://www.health.govt.nz/publication/tatau-kahukura-Māori-health-chart-book-2010-2nd-edition>
 79. Beautrais A. Suicidal behaviour. In: MA Oakley Browne, JE Wells, KM Scott (eds). *Te Rau Hinengaro: The New Zealand Mental Health Survey*. Wellington: Ministry of Health, 2006.
<http://www.health.govt.nz/publication/te-rau-hinengaro-new-zealand-mental-health-survey>

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no-1406/6366>

80. Ministry of Health. Paper for the Ministerial Committee on Suicide Prevention. Māori Suicide Prevention. Wellington: Ministry of Health, 2010.
[http://www.moh.govt.nz/moh.nsf/Files/suicide2011/\\$file/maori-suicide-prevention-paper-may2010.pdf](http://www.moh.govt.nz/moh.nsf/Files/suicide2011/$file/maori-suicide-prevention-paper-may2010.pdf)
81. Tobias M, Bhattacharya A, White P. Cross classification of the New Zealand population by ethnicity and deprivation: trends from 1996-2006. *Aust NZ J Public Health*. 2008;32:431-6.
82. Ministry of Health. A Focus on Māori Nutrition: Findings from the 2008/09 New Zealand Adult Nutrition Survey. Wellington: Ministry of Health, 2012. <http://www.health.govt.nz/publication/focus-Māori-nutrition>
83. Waldegrave C, King P, Walker T, Fitzgerald E. Māori Housing Experiences: Emerging Trends and Issues. Wellington: The Family Centre Social Policy Research Unit /Research Centre for Māori Health and Development, Massey University, 2006. <http://www.chranz.co.nz/pdfs/maori-housing-experiences.pdf>
84. King DN, Penny G, Severne S. The Climate Change Matrix Facing Māori society. In: Nottage RAC, Wratt DS, Bornman JF, Jones K (eds). *Climate Change Adaptation in New Zealand: Future Scenarios and Some Sectoral Perspectives*. Wellington: New Zealand Climate Change Centre, 2010.
<http://www.nzclimatechangecentre.org/sites/nzclimatechangecentre.org/files/images/research/Climate%20Change%20Adaptation%20in%20New%20Zealand%20%28NZCCC%29%20high%207.pdf>
85. Baker M, Howden-Chapman P. Time to invest in better housing for New Zealand Children. *NZ Med J*. 2012;125(1367):6-10. <http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2012/vol-125-no-1367>
86. Statistics New Zealand. *Moving to New Zealand: Reasons and Patterns of Settlement*. Wellington: Statistics New Zealand, 2007.
http://www.stats.govt.nz/browse_for_stats/population/Migration/internal-migration/moving-to-nz-reasons-and-patterns-of-settlement.aspx
87. Baker M, Goodyear R, Barnard L, Howden-Chapman P. *The Distribution of Household Overcrowding in New Zealand: An Analysis Based on 1991-2006 Census Data*. Wellington: He Kainga Oranga/Housing and Health Research Programme, University of Otago, 2012.
<http://www.healthyhousing.org.nz/wp-content/uploads/2010/01/HH-Crowding-in-NZ-25-May-2013.pdf>
88. Baker M, McDonald A, Zhang J, Howden-Chapman P. *Infectious Disease Attributable to Household Crowding in New Zealand: A Systematic Review and Burden of Disease Estimate*. Wellington: He Kainga Oranga/Housing and Health Research Programme, University of Otago, 2013.
<http://www.healthyhousing.org.nz/wp-content/uploads/2010/01/HH-Crowding-ID-Burden-25-May-2013.pdf>
89. McNicholas A, Lennon D, Crampton P et al. Overcrowding and infectious disease – when will we learn the lessons of our past. *NZ Med J*. 2000;113(1121):453-454.
http://www.nzma.org.nz/data/assets/pdf_file/0014/18122/Vol-113-No-1121-10-November-2000.pdf
90. Auckland Regional Public Health Service. *Te Hau o Te Whenua, Te Hau o Te Tangata*. Auckland: Auckland Regional Public Health Service, 2005.
<http://www.arphs.govt.nz/Portals/0/About%20us/Publications%20and%20Reports/Maori%20Public%20Health%20Report/Introduction.pdf>
91. Ministry of Business, Innovation and Employment. *Māori Labour Market Factsheet March 2013*. Wellington: Ministry of Business, Innovation and Employment, 2013.
<http://www.dol.govt.nz/publications/lmr/pdfs/lmr-fs/lmr-fs-maori-mar13.pdf>
92. Department of Labour. *Māori in the Labour Market*. Wellington, Department of Labour, 2009.
<http://www.dol.govt.nz/publications/lmr/maori/in-the-labour-market-2009/full-report.pdf>
93. Reid P, Robson B (eds). *Hauora Māori Standards of Health IV*. Wellington: Te Rōpū Rangahau Hauora A Eru Pōmare, 2007. <http://www.otago.ac.nz/wellington/otago067747.pdf>
94. Crengle S, Lay-Yee R, Davis P, Pearson J. *A Comparison of Māori and non-Māori Patient Visits to Doctors: the National Primary Medical Care Survey (NatMedCa): 2001/02. Report 6*. Wellington:

- Ministry of Health, 2005.
[http://www.moh.govt.nz/notebook/nbbooks.nsf/0/D222772D6D01D0FACC25748C007D64D8/\\$file/NatMedCaReport6Dec2005.pdf](http://www.moh.govt.nz/notebook/nbbooks.nsf/0/D222772D6D01D0FACC25748C007D64D8/$file/NatMedCaReport6Dec2005.pdf)
95. Davis P, Lay-Yee R, Dyal L, Briant R, Sporle A, Brunt D, et al. Quality of hospital care for Māori patients in New Zealand: retrospective cross-sectional assessment. *Lancet*. 2006;367:1920-25.
 96. Robson B, Purdie G, Cormack D. Unequal impact: Māori and non-Māori Cancer Statistics 1996-2001. Wellington: Ministry of Health, 2006. <http://www.health.govt.nz/publication/unequal-impact-Māori-and-non-Māori-cancer-statistics-1996-2001>
 97. Tukuitonga C, Bindman A. Ethnic and gender differences in the use of coronary artery revascularisation procedures in New Zealand. *NZ Med J*. 2002;115:179-82.
<https://researchspace.auckland.ac.nz/bitstream/handle/2292/4506/12044000.pdf?sequence=1>
 98. Hill S, Sarfati D, Blakely T, et al. Ethnicity and management of colon cancer in New Zealand: do indigenous patients get a worse deal? *Cancer*. 2010;116:3205-3214.
<http://www.ncbi.nlm.nih.gov/pubmed/20564634>
 99. Crengle S, Robinson E, Grant C, Arroll B. Pharmacological management of children's asthma in general practice: findings from a community-based cross-sectional survey in Auckland, New Zealand. *NZ Med J*. 2011;124:44-56. <http://journal.nzma.org.nz/journal/124-1346/4969/content.pdf>
 100. Gillies T, Tomlin A, Dovey S, Tilyard M., Ethnic disparities in asthma treatment and outcomes in children aged under 15 years in New Zealand: analysis of national databases. *Prim Care Respir J*. 2013;22:312-318. http://www.thepcrj.org/journ/view_article.php?article_id=1051
 101. Hosking J, Mudu P, Dora C. Health Co-benefits of Climate Change Mitigation – Transport sector. Geneva: World Health Organization, 2011.
http://www.who.int/hia/examples/trspt_comms/hge_transport_lowresdurban_30_11_2011.pdf
 102. Woodcock J, Edwards P, Tonne C et al. Public health benefits of strategies to reduce greenhouse-gas emissions: urban land transport. *Lancet*. 2009;374:1930-43.
<http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2809%2961714-1/fulltext>
 103. Lindsay G, Macmillan A, Woodward A. Moving urban trips from cars to bicycles: impact on health and emissions. *Aust NZ J Public Health*, 2011;35:54-60.
<http://onlinelibrary.wiley.com/doi/10.1111/j.1753-6405.2010.00621.x/full>
 104. Smith KR, Jerrett M, Anderson HR et al. Public health benefits of strategies to reduce greenhouse-gas emissions: health implications of short-lived greenhouse pollutants. *Lancet*. 2009;374:2091-103.
[http://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(09\)61716-5/fulltext](http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(09)61716-5/fulltext)
 105. West JJ, Smith SJ, Silva RA et al. Co-benefits of mitigating global greenhouse gas emissions for future air quality and human health. *Nature Climate Change*. 2013;3:885-889.
<http://www.nature.com/nclimate/journal/v3/n10/full/nclimate2009.html>
 106. Roberts I, Arnold E. Policy at the crossroads: climate change and injury control. *Inj Prev*. 2007;13:222-3.
 107. Macmillan A, Connor J, Witten K, Kearns R, Rees D. The societal costs and benefits of commuter bicycling: simulating the effects of specific policies using system dynamics modeling. *Environ Health Perspect*. 2014;122:335-344.
 108. Friel S, Dangour AD, Garnett T et al. Public health benefits of strategies to reduce greenhouse-gas emissions: food and agriculture. *Lancet*. 2009;374:2016-25.
 109. McMichael AJ, Powles JW, Butler CD, Uauy R. Food, livestock production, energy, climate change, and health. *Lancet*. 2007;370:1253-63.
 110. Powles J. Why diets need to change to avert harm from global warming. *Int J Epidemiol*. 2000;38:1141-2. <http://ije.oxfordjournals.org/cgi/content/full/38/4/1141>
 111. Wilson N, Nghiem N, Ni Mhurchu C, Eyles H, Baker MG, Blakely T. Foods and dietary patterns that are healthy, low-cost, and environmentally sustainable: a case study of optimization modeling for New

- Zealand. PLoS ONE. 2013;8:e59648. doi:10.1371/journal.pone.0059648.
<http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0059648>
112. Howden-Chapman P, Matheson A, Viggers H et al. Retrofitting houses with insulation to reduce health inequalities: results of a clustered, randomised trial in a community setting. *BMJ*. 2007;334:460-464.
<http://www.bmj.com/content/334/7591/460>
113. Chapman R, Howden-Chapman P, Viggers H, et al. Retrofitting houses with insulation: a cost-benefit analysis of a randomised community trial. *J Epidemiol Community Health*. 2009;63:271-7.
114. Wilkinson P, Smith KR, Davies M et al. Public health benefits of strategies to reduce greenhouse-gas emissions: household energy. *Lancet*. 2009;374:1917-29.
<http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2809%2961713-X/fulltext>
115. IPCC, 2014: Summary for Policymakers. In: *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Edenhofer O, Pichs-Madruga R, Sokona Y, et al. (eds.)]. Cambridge University Press, Cambridge, UK and New York, NY, USA, 2014. <https://www.ipcc.ch/report/ar5/wg3/>
116. Draft Terms of Reference for Greening NZ Healthcare National Network, August 2014.
117. NHS Sustainable Development Unit. *Save Money by Saving Carbon: Decision Making in the NHS Using Marginal Abatement Cost Curves*. Cambridge: NHS SDU, 2010.
<http://www.sduhealth.org.uk/resources/default.aspx?q=saving+money+by+saving+carbon>
118. Kaplan S, Sadler B, Little K et al. Can Sustainable Hospitals Help Bend the Health Care Cost Curve?. Commonwealth Fund Issue Brief, Nov 2012. <http://www.commonwealthfund.org/publications/issue-briefs/2012/nov/sustainable-hospitals>
119. NHS Sustainable Development Unit. *Sustainable Development Management Plan (SDMP) Guidance for Health and Social Care Organisations*. Cambridge: NHS SDU, 2014.
http://www.sduhealth.org.uk/documents/SDMP/SDMP_Guidance_-_March_2014.pdf
120. Frumpkin H, Hess JG, Luber G, Malilay J, McGeehin M. Climate change: the public health response. *Am J Public Health*. 2008;98:435-45.
121. Tierney K. Social Inequality, Hazards and Disasters. In: Daniels RJ, Kettl DF, Kunreuther H (eds). *On Risk and Disaster: Lessons from Hurricane Katrina*. Philadelphia: University of Pennsylvania Press, 2006.
122. Is the rebuild worsening poverty in Christchurch. *The Press* 14/12/2013. <http://www.stuff.co.nz/the-press/business/the-rebuild/9517254/Is-the-rebuild-worsening-poverty-in-Christchurch>
123. Shirlaw N. Children and the Canterbury Earthquakes. Child Poverty Action Group Background Paper. Auckland: Child Poverty Action Group, 2014.
<http://www.cpag.org.nz/assets/Backgrounders/140227%20CPAG%20Children%20and%20the%20Canterbury%20Feb2014.pdf>
124. Parliamentary Commissioner for the Environment. Submission to the Finance and Expenditure Committee on the Climate Change Response (Emissions Trading and Other Matters) Amendment Bill, Sept 2012. <http://www.pce.parliament.nz/publications/submissions-and-advice/submission-on-the-climate-change-response-emissions-trading-and-other-matters-amendment-bill>
125. Public Health Advisory Committee. *A Guide to Health Impact Assessment*. Wellington: PHAC, 2005.
<http://nhc.health.govt.nz/resources/publications/guide-health-impact-assessment-2nd-edition>
126. United Nations, Department of Economic and Social Affairs, Population Division. *World Population Prospects: The 2012 Revision*. United Nations, 2013. File POP/I-1: Total population (both sexes combined) by major area, region and country, annually for 1950-2100 (thousands) Estimates, 1950-2010, POP/DB/WPP/Rev.2012/POP/F01-1.
http://un.orgEXCEL_FILES%2F1_Population%2FWPP2012_POP_F01_1_TOTAL_POPULATION_BOTH_SEXES

<http://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2014/vol-127-no-1406/6366>

127. UNFCCC, year 2011 data. All Annex I countries - Total emissions excluding LULUCF/LUCF: aggregate_GHG, Gg CO2 eq., 2011; aggregate_GHG, Gg CO2 eq., change, 1990 to 2011. <http://maps.unfccc.int/di/map/>
128. Ministry for the Environment. New Zealand's Greenhouse Gas Inventory and Net Position Report 1990-2011, Snapshot April 2013; New Zealand's Greenhouse Gas Inventory. Wellington: Ministry for the Environment, 2013.
129. Oxfam International. Hang Together or Separately? How Global Co-operation is Key to a Fair and Adequate Climate Deal at Copenhagen. Briefing Paper 128, 2009. <http://policy-practice.oxfam.org.uk/publications/hang-together-or-separately-how-global-cooperation-is-key-to-a-fair-and-adequat-114525>)
130. Baer P, Athanasiou T, Kartha S, Kemp-Benedict E. The Right to Development in a Climate Constrained World: the Greenhouse Development Rights framework (2nd edition). Heinrich Böll Foundation / Christian Aid / EcoEquity / Stockholm Environment Institute, 2008. <http://gdrights.org/wp-content/uploads/2009/01/thegdrsframework.pdf>
131. Nurse L, McLean R, Agard J, Briguglio L, Duvat V et al. Small Islands. In: Climate Change 2014: Impacts, Adaptation and Vulnerability. Contribution of Working Group II 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 University Press, Cambridge, United Kingdom and New York, NY, USA. http://ipcc-wg2.gov/AR5/images/uploads/WGIIAR5-Chap29_FGDall.pdf
132. Hosking J, Jones R, Percival T, Turner N, Ameratunga S. Climate change: the implications for child health in Australasia. *J Paediatr Child Health*. 2011;47:493-96. <http://onlinelibrary.wiley.com/doi/10.1111/j.1440-1754.2010.01699.x/full>