Estimating human health impacts in a +4°C world

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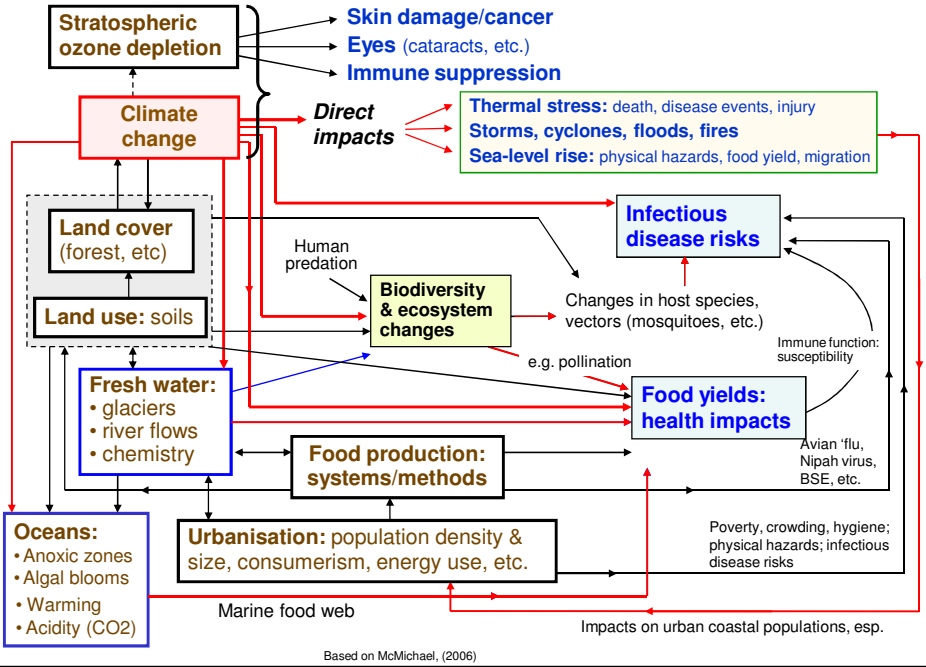
Outline

1. Pathways of health impact
2. Examples of health impact estimates
3. Vulnerability
4. Adaptation
5. Conclusions

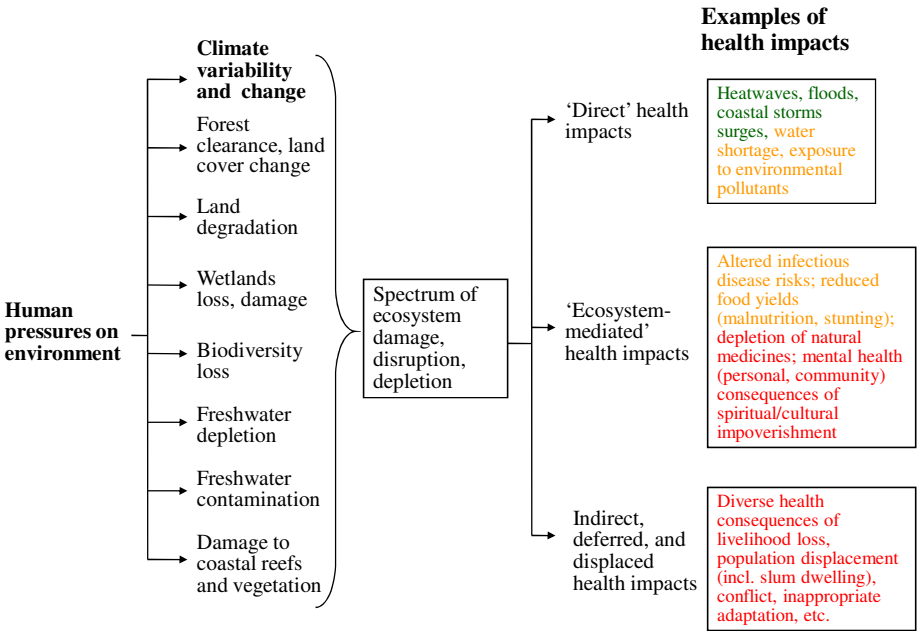
Climate change: impact pathways

- Water availability
- Extreme events
- Loss of ecosystem services (especially food security)
- Communicable disease transmission
- Social disruption, migration, conflict

Global Environmental Changes: health risks



Based on McMichael, (2006)



Health and climate variability: relative importance

1. Direct, often local, short term impacts of flooding, heatwaves: (+)
2. Ecosystem mediated: communicable disease, malnutrition (++)
3. Complex deferred/displaced hazards: assessment of health impacts not yet attempted, but (+++)?

Quantitative estimates of population at risk

- Feasible for direct acting climate hazards, and some ecologically mediated pathways where the climate influence is dominant (eg. many communicable diseases)
- More difficult where social adaptation is a major factor, or where impacts on social systems dominate (eg, health impacts of food insecurity, population displacement)

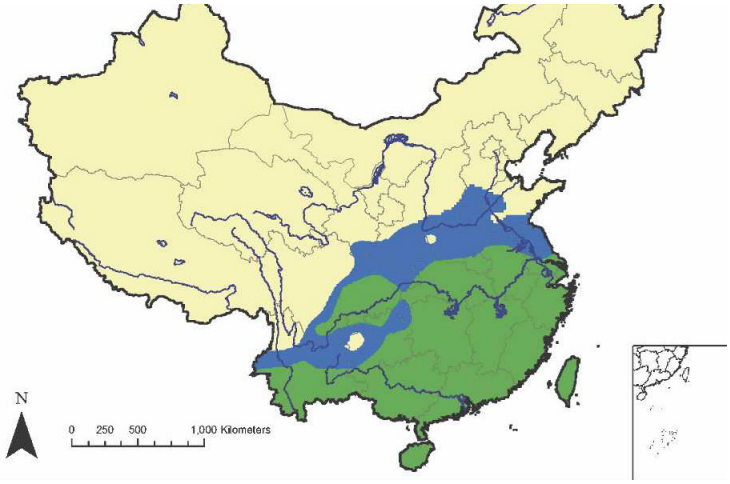
Biological thresholds

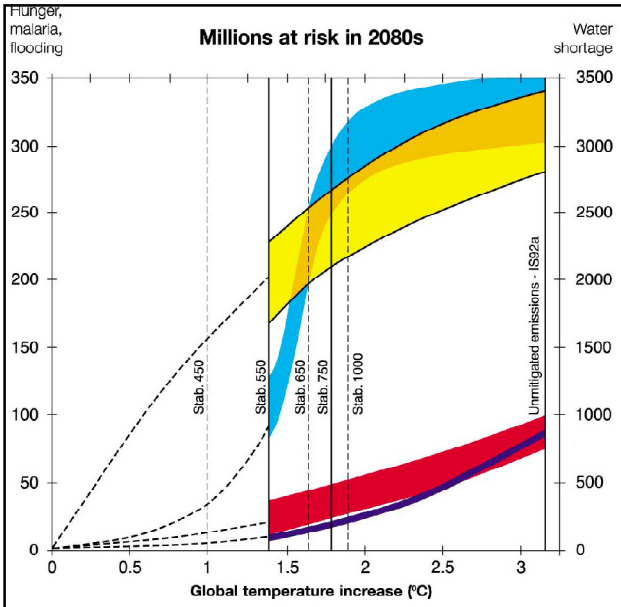
- Communicable diseases sensitive to climate variability, often with clear temperature thresholds. (eg, salmonella, diarrhoeal illness, ciguatera).
- Effects on non communicable diseases (eg heatwaves) may have physiological thresholds, but social adaptations mean that observed relationships in populations vary.
- This complicates projections of future impact

Future impacts

- Possible to make sensible projections about *exposure* to heatwaves, flooding, communicable disease risks, food insecurity
- But: difficult to extrapolate these estimates to actual disease burdens (due to effect of local social responses on current and future risks)

Schistosomiasis in China





Parry et al, (2001)

Vulnerability: who and where

- Exposed to physical hazards
- Communities already at the ecological or social limits of adaptation to current climate
- Especially in poor countries
- Lack of basic infrastructure
- Water stressed
- Food insecure, dependent on local resources
- On fringes of existing areas of vector borne disease transmission

Adaptation

- Ability to adapt is context dependent – difficult to assess on global scale.
- Danger of "mal-adaptive" responses (eg. fossil fuel powered air conditioning, desalination)
- Likely to be tipping points in social as well as natural systems... increasing danger of loss of global adaptive capacity with increasing temperature rise
- Need to consider global adaptation policies, eg population migration rights, optimal (geographic and social) distribution of ecosystem services (food, water and carbon sinks)

Conclusions

- Climate change *will increasingly* make major public health risks more difficult to control, especially in poor countries
- Quantitative projections of changes in health-related exposures -- less confidence in resulting disease burden (can estimate impact of mitigation options, however)
- Hunger, starvation, conflict and population movement may be widespread in a +4C world
- These processes and their consequences, rather than more direct impacts of climate change, would become dominant influences on health

Policy implications

- From a public health perspective, it is clear that we need to avoid +4C
- Nevertheless, we need to plan adaptation responses for +4C
- Public health is one of the prerequisites for sustainable development, (in turn a requirement for successful climate mitigation)
- Protection of public health requires substantial redistribution of global resources (even without climate change)

The End

Exposure	Vulnerability factors	Adaptation
Storms and floods	Location, infrastructure, lack of warning, poverty (restricted choices)	Location, exposure forecasts, building standards
Heatwaves	Age, health status (esp CVD), housing quality, location (heat-island), knowledge	Physiological; behavioural (clothing, etc.-- public education), forecasts, air conditioning, housing and urban design, security of electricity supplies
Air pollution/ cold events	age, health status (esp. smoking) status, poor access to health-care	Stricter (urban) air standards, new technologies, forecasting, building standards, ventilation in relation to indoor temperature and humidity/condensation security of electricity supplies
Vector-borne diseases	Location, poverty (poor housing), inadequate vector/pest control programs	Vector/pest control, public education, disease surveillance, treatment
Water- and food-borne diseases	Location, poverty (poor housing), ignorance of transmission sources,	Public health infrastructure/policies, public education, quality control (food and water), surveillance
Health effects of food and water shortages	Poverty, prior malnutrition, region (food insecurity, water stress), isolation (low access to markets, trade)	Adapted farming (new crops, ? GM crops/livestock), subsidies for changes/shifts, water conservation
Displacement, dislocation: mental health, infectious diseases	Poverty, marginality, minority status; subsistence agriculture, coastal dwelling; women and children, the elderly	Government support for displaced or disadvantaged communities, progressive immigration policies, public health facilities, health care (adapted from McMichael, 2007)