



THE AUSTRALIAN NATIONAL UNIVERSITY

# **Climate Change and Risks to Health .. in Remote Indigenous Communities**

Sharing Knowledge: A Workshop on Climate Change  
Impacts and Adaptation Strategies for Northern Australian  
Indigenous Communities  
Darwin, March 30-31, 2006

**Tony McMichael**

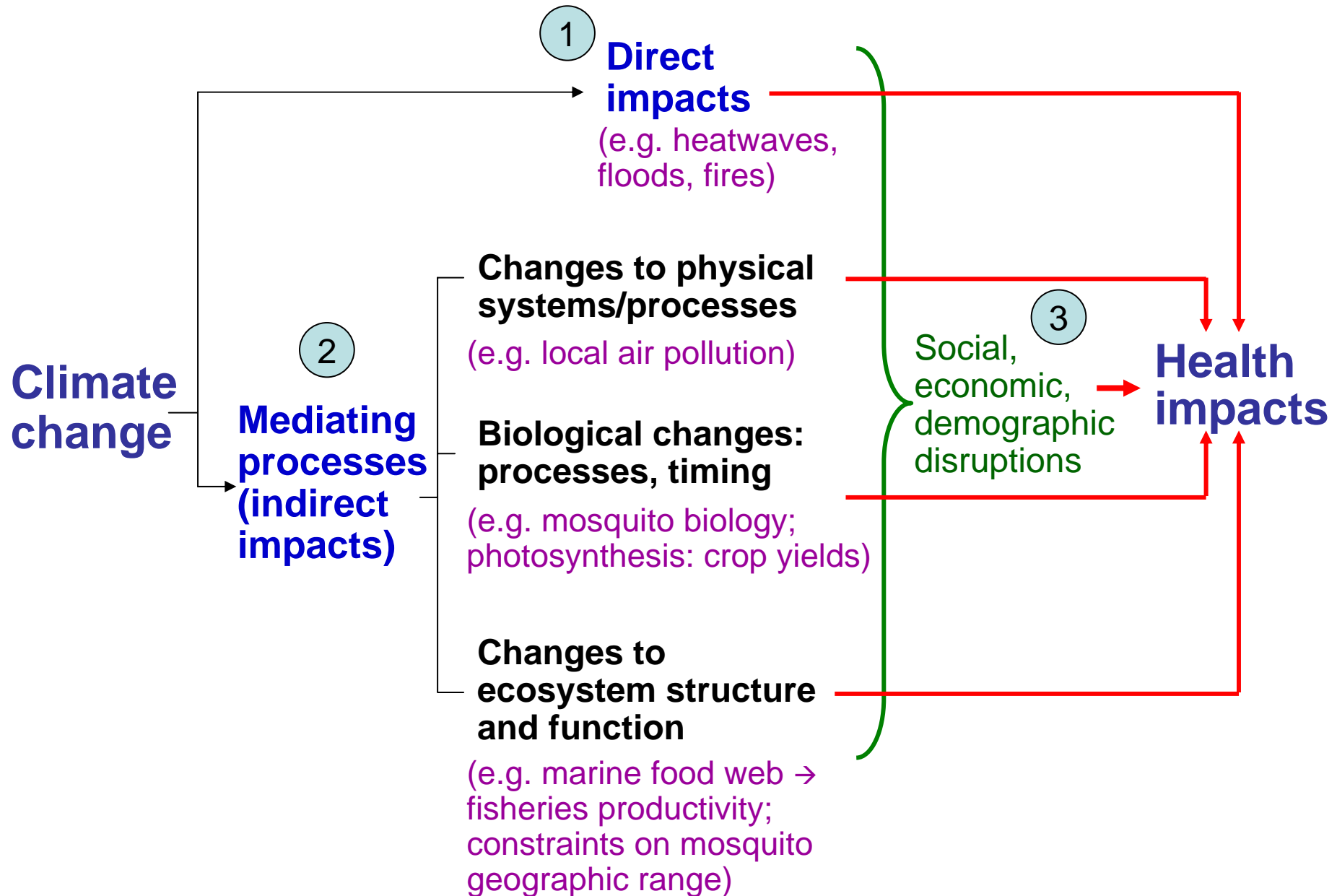
**National Centre for Epidemiology and Population Health  
The Australian National University  
Canberra**

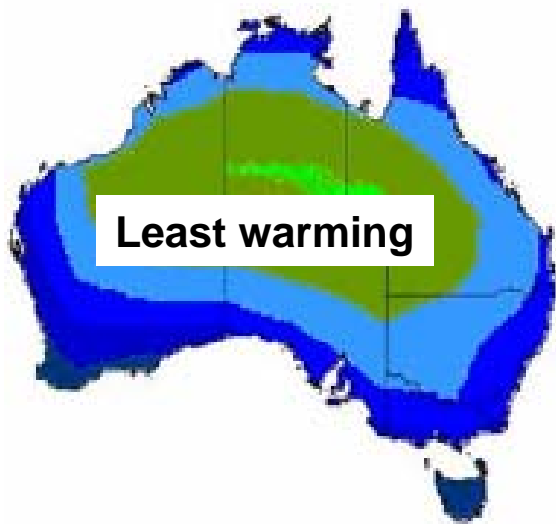
# Likely health-impact issues

- Extremes of heat – exhaustion, heart attacks, strokes; violence
- Increases in extreme weather events: cyclones, floods, droughts (geographic range of droughts?)
- Changes in bushfires – burns, smoke, game (eg D Bowman's work)
- Temperature effects on rates of gastroenteritis (diarrhoeal disease) and some other infectious diseases
- Changes in range/seasonality of some mosquito-borne infections (e.g. dengue, Japanese Encephalitis)
- Changes in biodiversity, especially food species

ALSO: mental health disorders (stress, socioeconomic disruption); and health effects of displacement (and, indirectly, due to incoming environmental refugees)

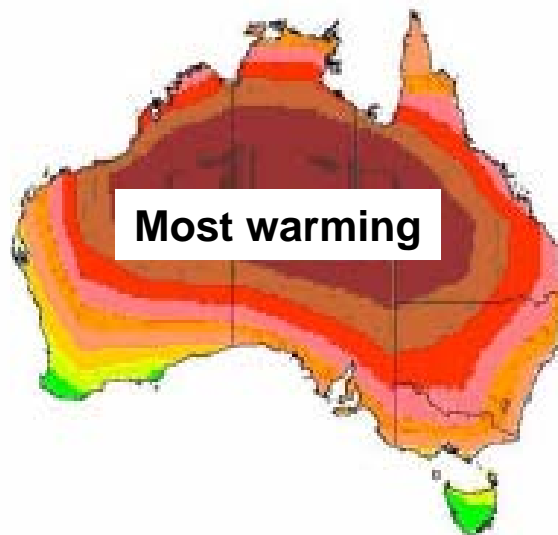
# Climate Change and Health: Direct and Indirect Pathways





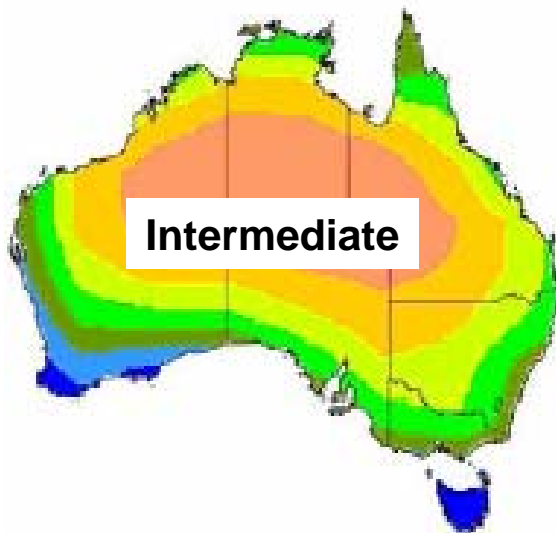
450 PPM SCENARIO

Marked emissions reduction



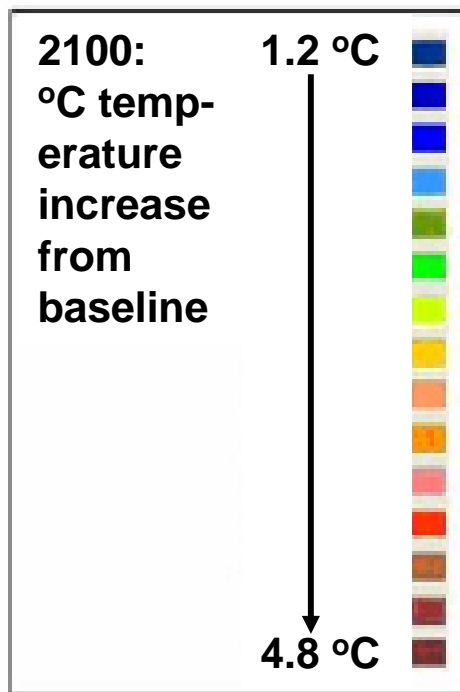
A2 SCENARIO

High emissions



Medium emissions

B2 SCENARIO

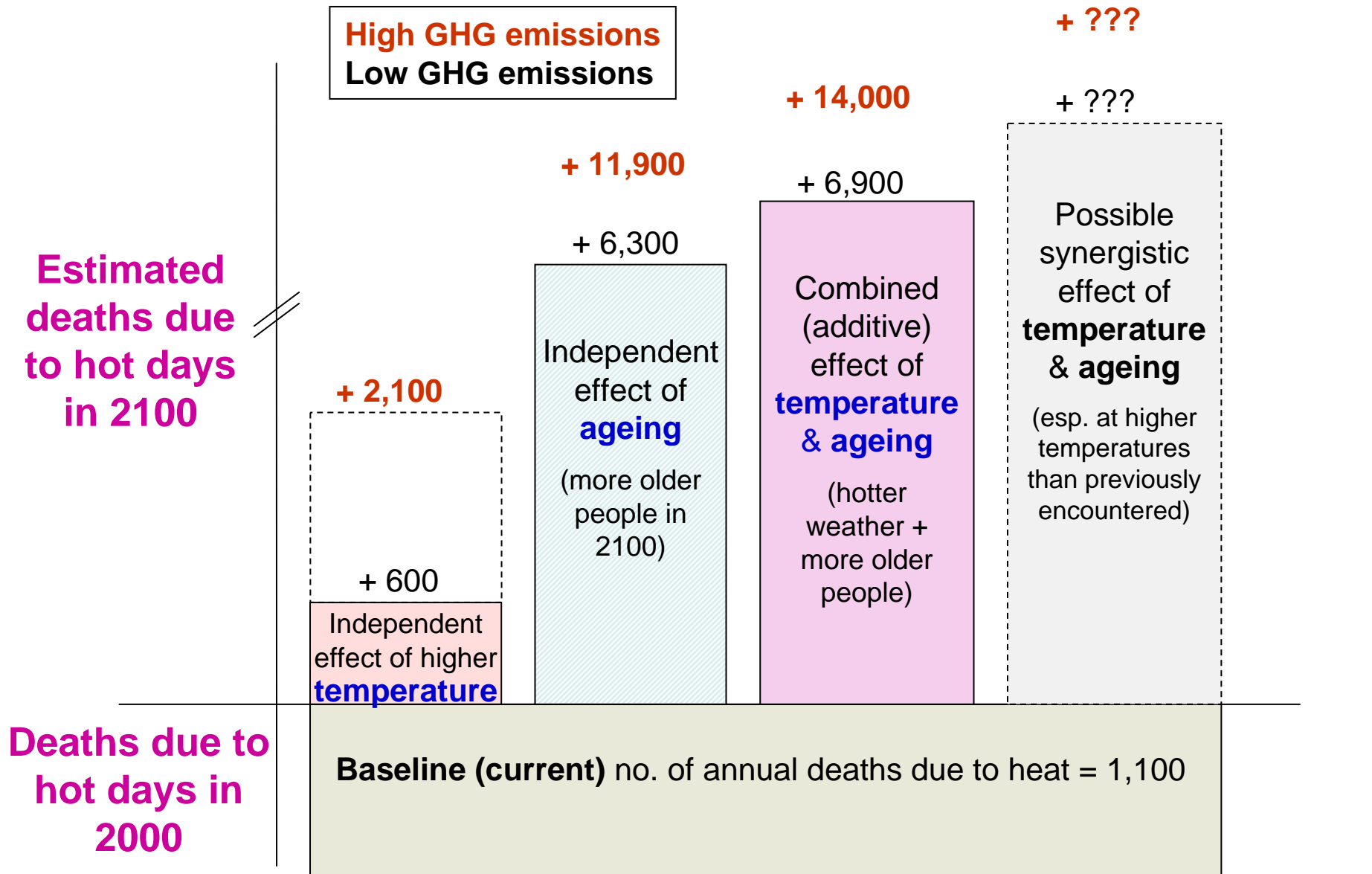


## Modelled future warming in Australia, by 2100

- CSIRO Mk2 model
- alternative global greenhouse gas emission scenarios: SRES/A2, /B2, and WRE450

Woodruff et al. (2005) *Climate Change Health Impacts by 2100*

# Forecast deaths in people >65 due to thermal stress (with higher mean annual temperatures): Australian capital cities, 2100



# Hotter temperatures

- Increased average temperatures and heat-waves have implications for [house design](#) ...
- especially if increased reliance on air-conditioning and high thermal mass buildings (i.e., [southern-style house](#)).
- Increased risk of power failures in remote communities  
→ leaving people unacclimatised in extreme heat?
- Poor cardiovascular health, low physical fitness and high alcohol intake (etc.) increase the risk (heart attack, etc.) due to heat stress during heatwaves.

## Bushfires, smoke and health

Some evidence (5 studies: inconsistent results) suggests that bushfire smoke, at high concentrations, contributes to increased hospital presentations with asthma.

# Extreme events, I

**Cyclones:** Frequency of tropical cyclones in Australian region has decreased since 1967.

However, cyclone intensity has increased (Kuleshov, 2003; Hennessy 2004).

? cyclone projections for northern Australia.

**Rainfall:** On balance, models indicate that projections for northern Australia are for more pronounced wet and dry seasons.



## Extreme events, II – Fire

**Fire danger** in Australia is likely to increase with climate change.

There may be a reduced **interval** between fires, increased **fire-line** intensity, decrease in fire **extinguishments**, and faster fire **spread**

# Bushfires, smoke and health

Some evidence suggests (5 studies: inconsistent results) that bushfire smoke, at high concentrations, plays a role in increasing hospital presentations of asthma.

# Less Cold Weather – health impacts?

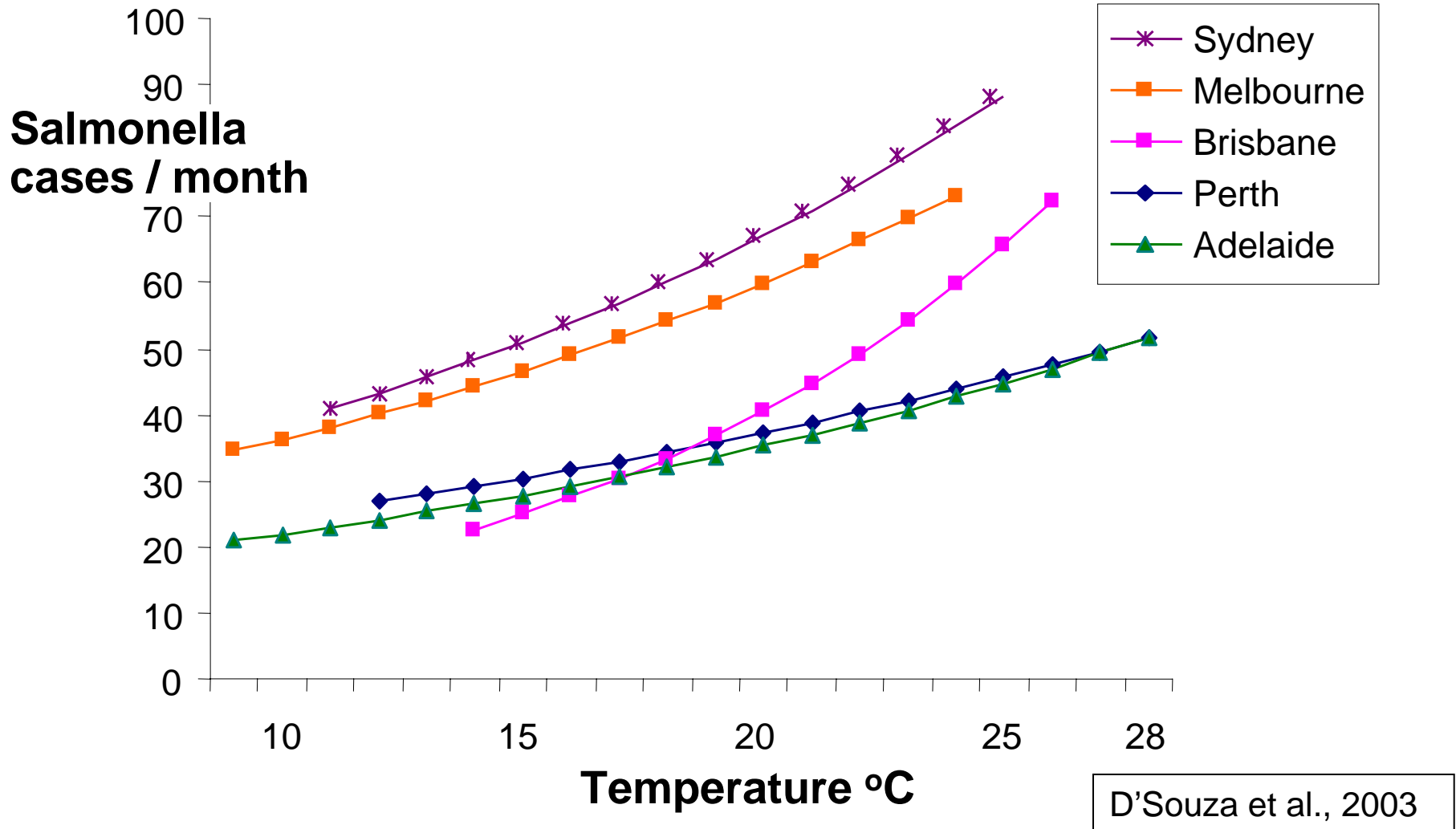
- Cold weather increases rates of **acute lower respiratory infection (incl pneumonia)**, which are very high in the Western Desert communities.
- There is more (bacterial) **meningitis** in winter.
  - Viral meningitis (enterovirus) outbreaks have been reported for summer, spring, autumn (latter in WA). Summer outbreaks predominate and would increase with incr rainfall and higher temps.
- Epidemics of **diarrhoea from rotavirus** occur in autumn-winter in desert communities (every 2-5 yrs).

.....

- Cold weather also increases fire-accident **burns**.

# Monthly cases of *Salmonella* food-poisoning in relation to monthly temperature

Australian cities, 1991-2001 (modelled best-fit graphs)



# Estimated increase in diarrhoeal disease hospital admissions: Aboriginal communities, Alice Springs

Modelled in relation to three plausible climate change scenarios (CSIRO)

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- Current annual average = 634 cases
  - 2020: + 3-5%
  - 2050: + 10-15%
-

# Wet weather

Wet weather leads to flash floods and drowning

... and floods cause cut-off communities, with worse-than-usual diets and wet blankets.

# Rainfall and diarrhoeal diseases

**Rainfall pattern is changing towards more intense precipitation events**

..... drought periods could present further challenges for safe water storage between rain events in rural communities

- implications for water-washed gastrointestinal diseases (water availability, hygiene, etc)

## **Water Supply** (IPCC Third Assessment Report, 2001)

“Increased evaporation and possible decreases of rainfall in many areas would adversely affect water supply, agriculture, and survival and reproduction of key species in parts of Australia and NZ (medium confidence)”



# But ....

- Does this apply in remote communities and Alice Springs – where bore water is the main/exclusive source of freshwater?

# CC and water availability

If water < 10 litres/person/day, expect more trachoma, conjunctivitis, pyoderma, Shigella, and gastroenteritis.

If > 50 litres/person/day, expect maximum health benefit.

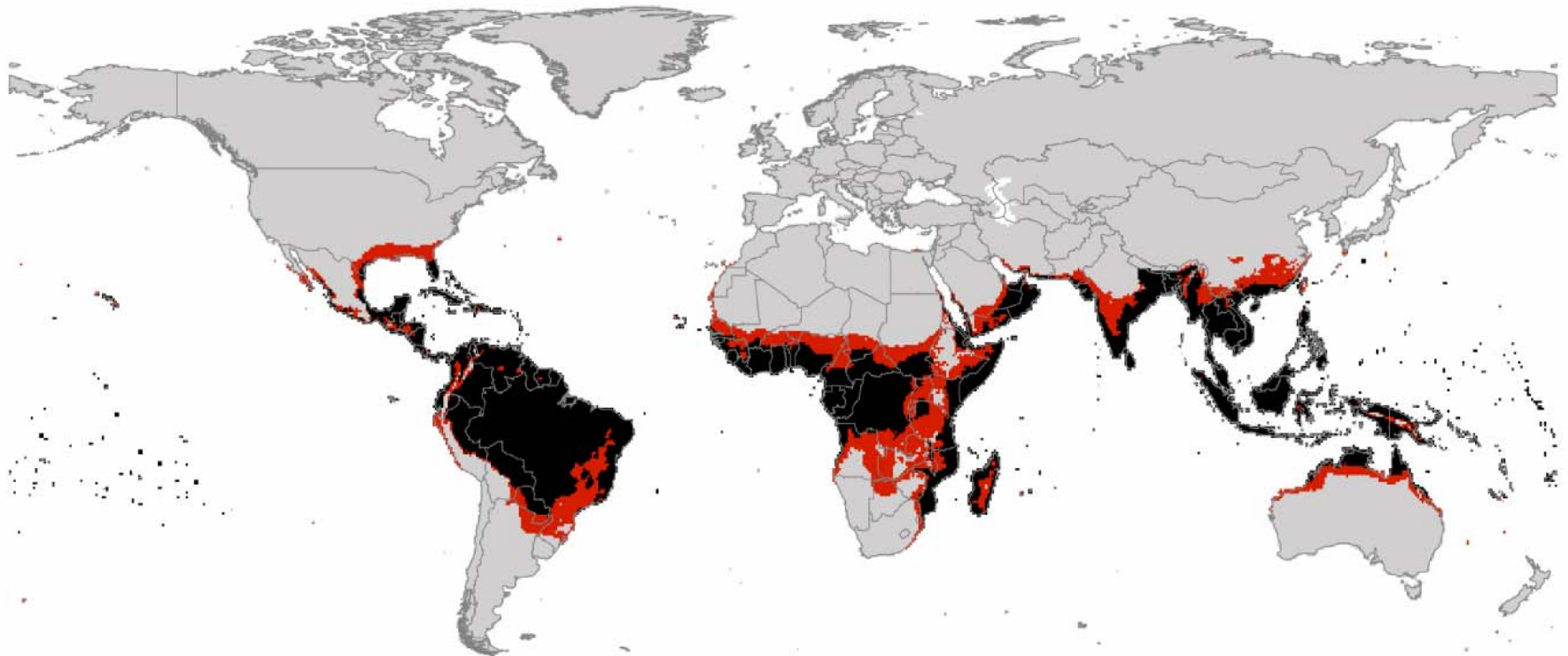
If surface water lies around camps in hot weather, expect more diarrhoea and (viral) hepatitis A.

# CC and introduced infections

Increased risk from introduced infections:

- something **new** (perhaps flown in by new birds or new tourists);
- **re-introductions** (dengue, malaria);
- **range/season expansion** (esp Ross River fever, already sporadic in Central Australia).

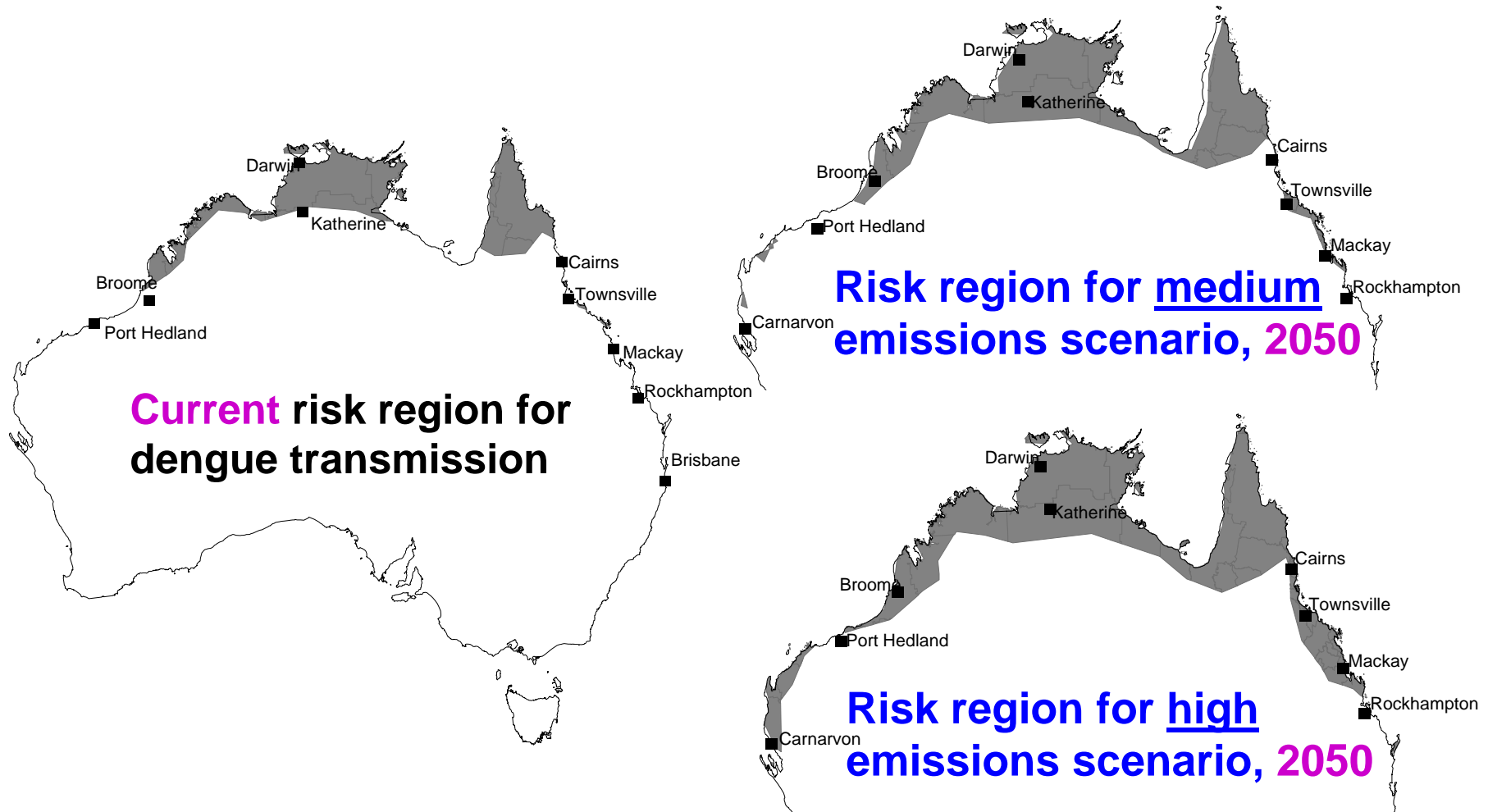
# Climate Change and Dengue Fever: Current and estimated future (2080s) range of potential transmission (Hales et al, 2002)



- Current climate “envelope”
- 2080s climate “envelope”  
(middle-range CC scenario)

Dengue is world's major mosquito-borne viral disease. Transmitted by two main vector species, esp *Aedes aegyptii*. The mosquitoes are sensitive to humidity and temperature; breed in small pools of water.

# Dengue Fever: Statistical modelling of receptive geographic region for *Ae. Aegyptii* mosquito, under alternative climate-change scenarios for 2050



# Some Information/Research Needs

- Area-specific modelled forecasts of CC
  - and by season
- Document various impacts of extremes of heat
- Analyse recent seasonal variations in infectious disease diagnoses and hospital admissions
  - Darwin, Alice Springs
  - NT aerial medical evacuations

# Recap: Likely health-impacts of CC in Nth Aust

- Extremes of heat
- Changes in patterns of extreme weather events: cyclones, floods, fires, droughts
- Temperature effects on gastroenteritis (diarrhoeal disease) and some other infectious diseases
- Changes in range/seasonality of some mosquito-borne infections (e.g. dengue, Japanese Encephalitis)
- Changes in biodiversity, especially food species

ALSO: mental health disorders (stress, socioeconomic disruption); and health effects of displacement and, indirectly, of incoming environmental refugees





The End