# L'apport des études épidémiologiques multicentriques pour caractériser les risques liés au climat

*Aurelio Tobías on behalf of the MCC Collaborative Research Network*

*Les Rencontres de Santé publique France 2018*
Paris, 30th May 2018

Santé publique France

idaea · EGAR · CSIC Consejo Superior de Investigaciones Científicas · LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

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# The role of the *MCC Collaborative Research Network* to characterize climate and health related risks

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# Conflict of interest

- *Cette intervention est faite en toute indépendance vis-à-vis de l'organisateur de la manifestation. Je n'ai pas de lien d'intérêts avec le sujet traité*
- This presentation is done in total independence from the event organizer. I have no link of  interest to declare with the topic presented

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# Outline

- Introduction
- The MCC Network
- Main results
- Future impacts
- Discussion

# Introduction

- **After the 2003 heat wave**, the num. of studies on temperature on health increased substantially

- However, **comparison across studies and areas is not straight forward** because of different methods used

- **Modelling complexities**
    - Non-linear exposure-response
    - Differential lag patterns
    - Reporting and comparing the impact

# Introduction
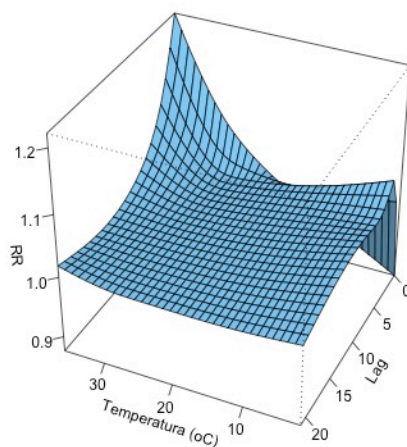


- **Distributed Lag Non-linear Models** *(Gasparrini et al. 2010, Gasparrini 2011, Gasparrini 2014)*

- **Flexible modelling framework** allowing non-linear/lagged associations between temperature and health outcome

- **Separation of effects** due to cold and heat

## The MCC Network

- The **Multi-City Multi-Country (MCC) Research Network** is an international collaboration aiming at producing epidemiological evidence on associations between weather and health
  - Framework for epidemiological analyses at **global level** collecting data from multiple locations within several countries
  - Emphasis on a **collaborative approach**
  - Requirements of **data/code sharing** and authorship
  - **Sub-project** proposals and leaders

## The MCC Network

- **Largest dataset** ever collected: data from **571 locations in 29 countries** within the period 1972–2017, including **110 million deaths**
- **Countries:** Argentina, Australia, Brazil, Canada, Chile, China, Colombia, Czech Republic, Estonia, Finland, France, Iran, Ireland, Italy, Japan, Mexico, Moldova, Philippines, Portugal, South Africa, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, UK, USA, Vietnam
- **Daily time series** of daily mortality counts and temperature
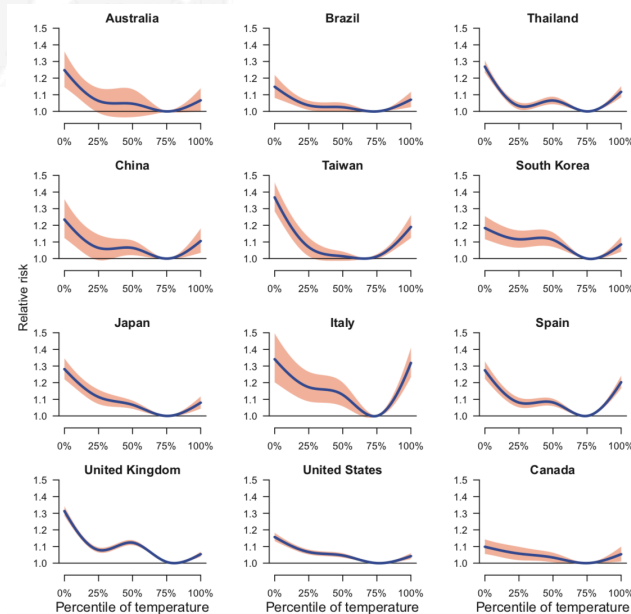
# The MCC Network

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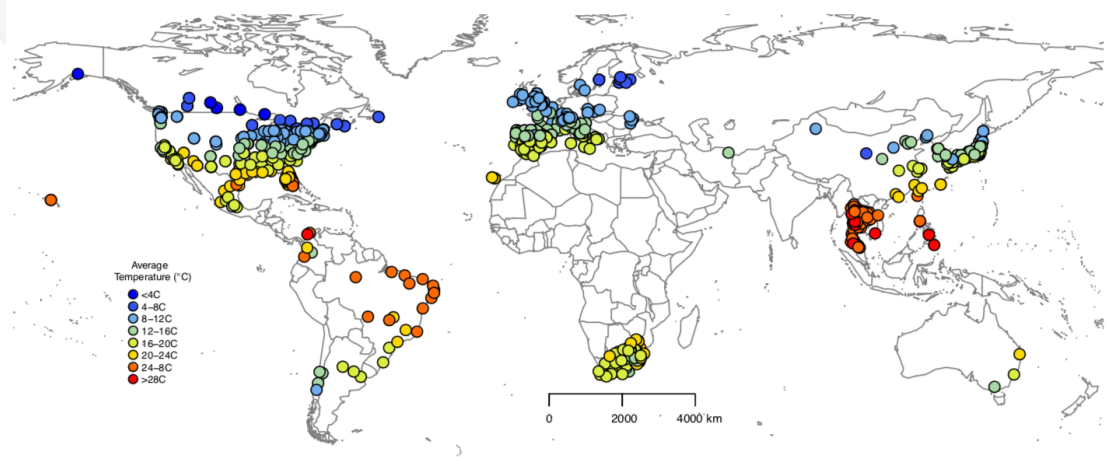
# Summary of main results

- Geographical variation *(Guo et al. 2014)*

- Attributable mortality *(Gasparrini et al. 2015)*

- Temporal variation *(Gasparrini et al. 2015)*

- Changes in susceptibility *(Gasparrini et al. 2016)*

- Heat wave and mortality *(Guo et al. 2017)*


- All published papers are open access and available at *http://mccstudy.lshtm.ac.uk/*
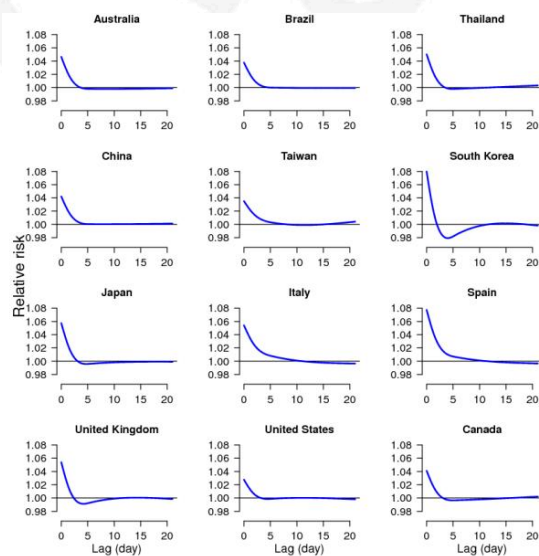
# Geographical variation
*(Guo et al. Epidemiology 2014)*

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*(Guo et al. Epidemiology 2014)*

- Short-term effects for heat
- Long term effects for cold
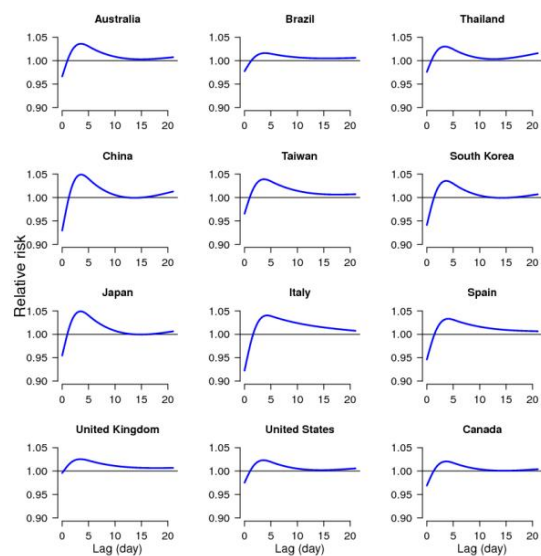
# Attributable mortality
*(Gasparrini et al. The Lancet 2015)*
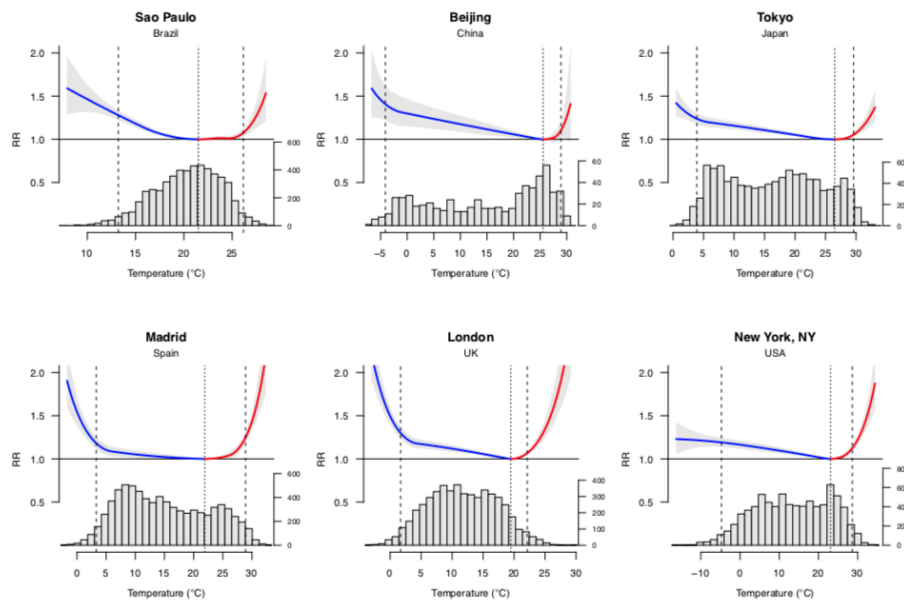
# Attributable mortality
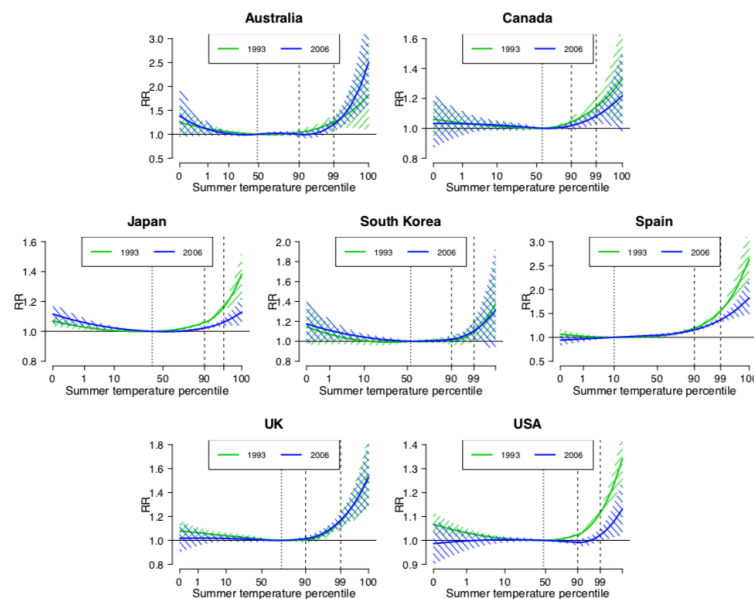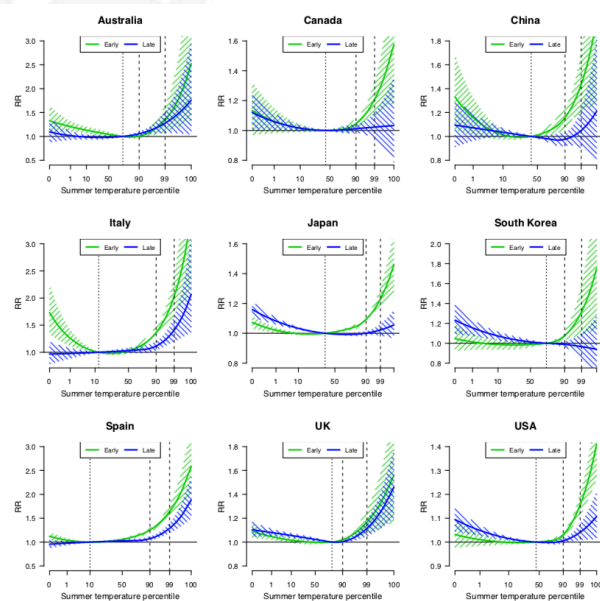*(Gasparrini et al. The Lancet 2015)*
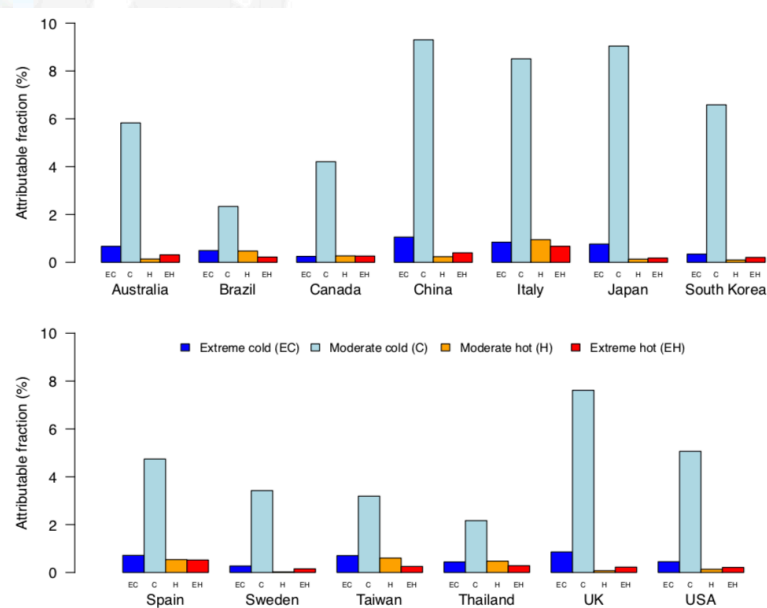
# Temporal variation
*(Gasparrini et al. Environmental Health Perspectives 2015)*

# Changes in susceptibility
*(Gasparrini et al. American Journal of Epidemiology 2016)*

# Heat waves and mortality
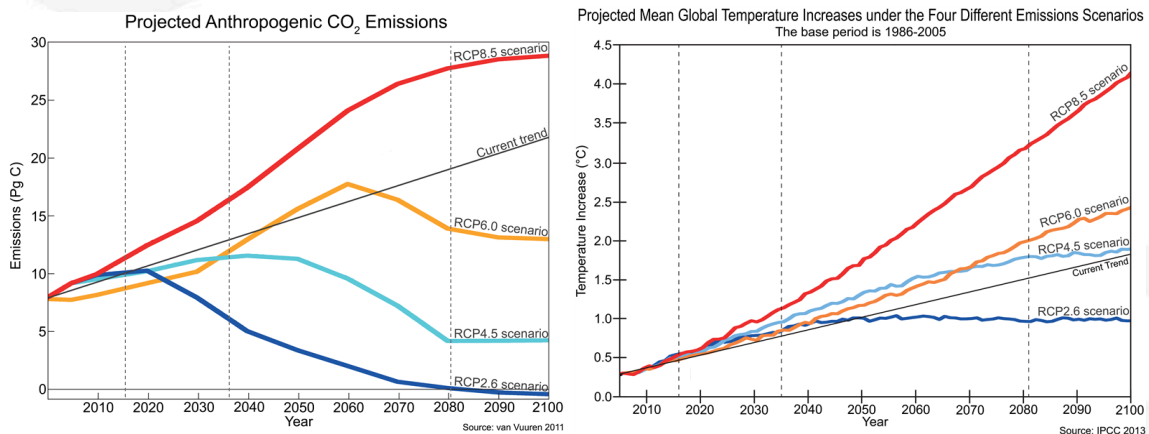*(Guo et al. Environmental Health Perspectives 2017)*

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# Future impacts

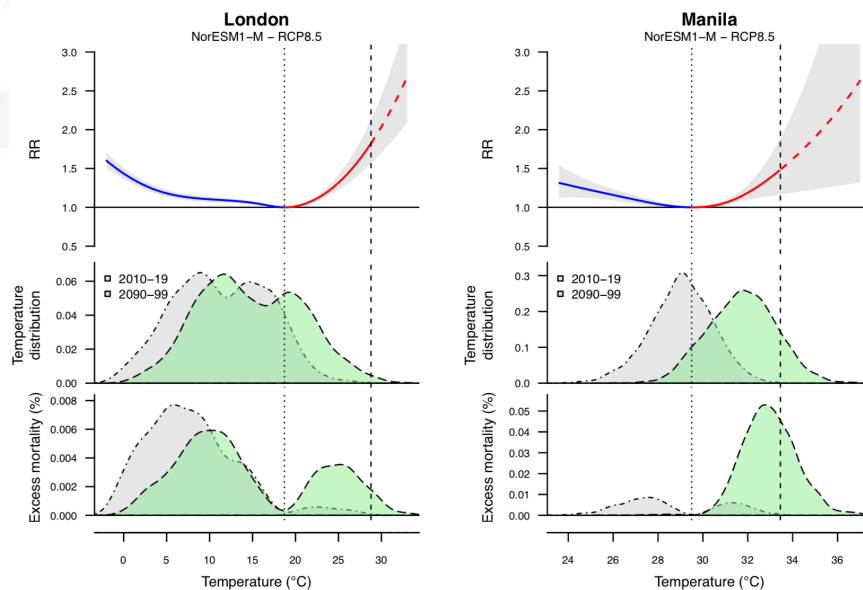- Anthropogenic emissions of greenhouse gases are the main cause for global warming *(IPCC 2014)*



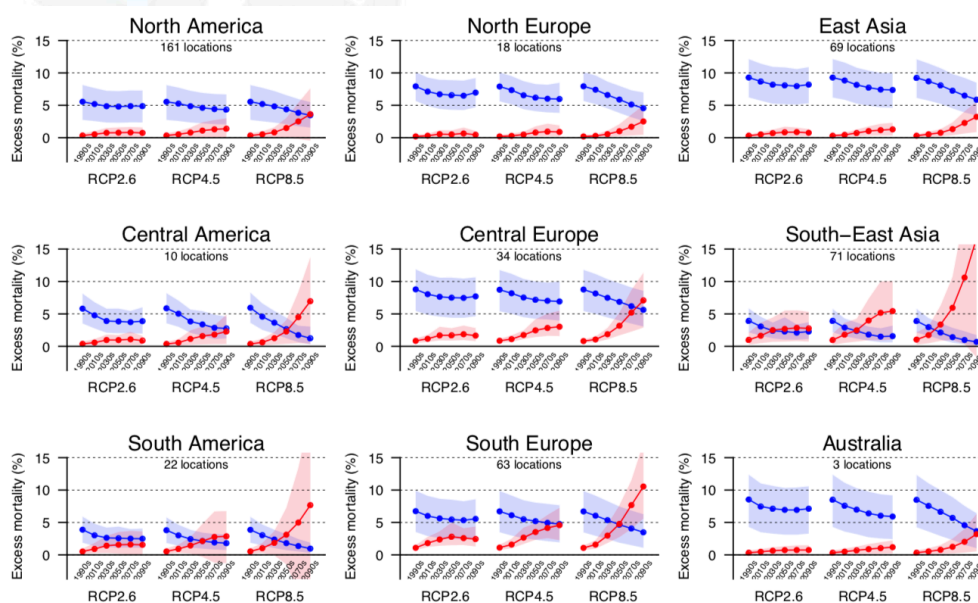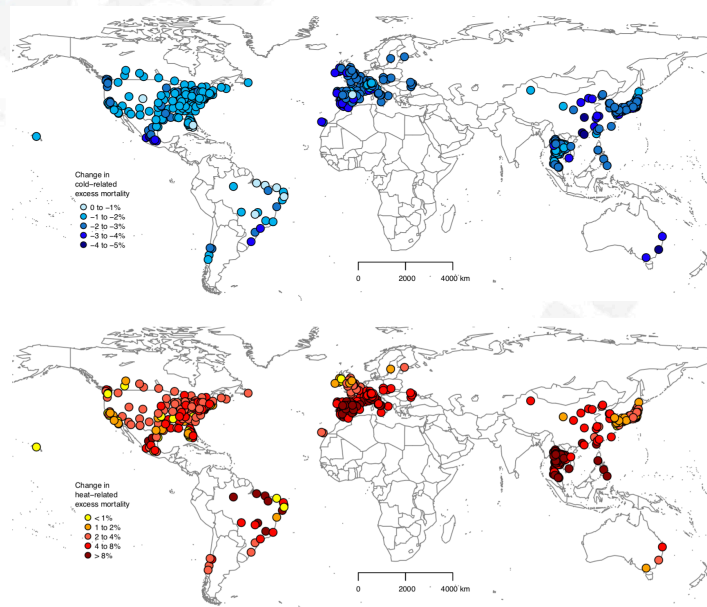*[from http://sites.gsu.edu/geog1112/]*

# Scenarios of global warming
*(Gasparrini et al. The Lancet Planetary Health 2017)*

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# Forthcoming research

- **Extension** of the MCC network and database
- Analysis of **geographical heterogeneity** with location-specific meta-variables on climatological, geographical, demographic and socio-economic characteristics
- **Cause-specific analyses** (cardiovascular, respiratory, SIDS, suicides)
- Replicating the approach to assess **heath effects of air pollution** ($PM_{10}$, $PM_{2.5}$, $O_3$, $NO_2$, $SO_2$, CO)
- Further health **impact projection analyses**

## Discussion

- The MCC collaboration is the **largest epidemiological study** on temperature, climate and health

- A number of analyses have investigated **various aspects of associations of weather and health** and assessed **health impact projections** under climate change scenarios

- Results show a **general pattern of increase in temperature-related excess mortality**, especially under more extreme scenarios, but with important **geographical differences**

- Impacts are much **reduced under milder global warming scenarios**, confirming the benefits of the implementation of mitigation policies to reduce GHG emissions
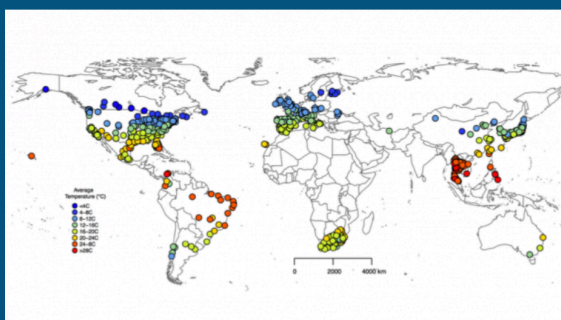
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# Merci pour votre attention!



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### http://mccstudy.lshtm.ac.uk/