Methodological considerations in projections of temperature-related health impacts under climate change scenarios

Antonio Gasparrini and Francesco Sera

London School of Hygiene & Tropical Medicine, UK

Impacts World 2017
Potsdam, Germany, 11-13 October 2017

Motivation

The health impact of **climate change** will occur through multiple pathways, both **direct** and **indirect**

An important direct pathway is represented by changes in **exposure to non-optimal temperatures**, both heat and cold

Previous projection studies are **mostly limited to heat-related impacts**, and use a **variety of modelling approaches** to quantify the health burden

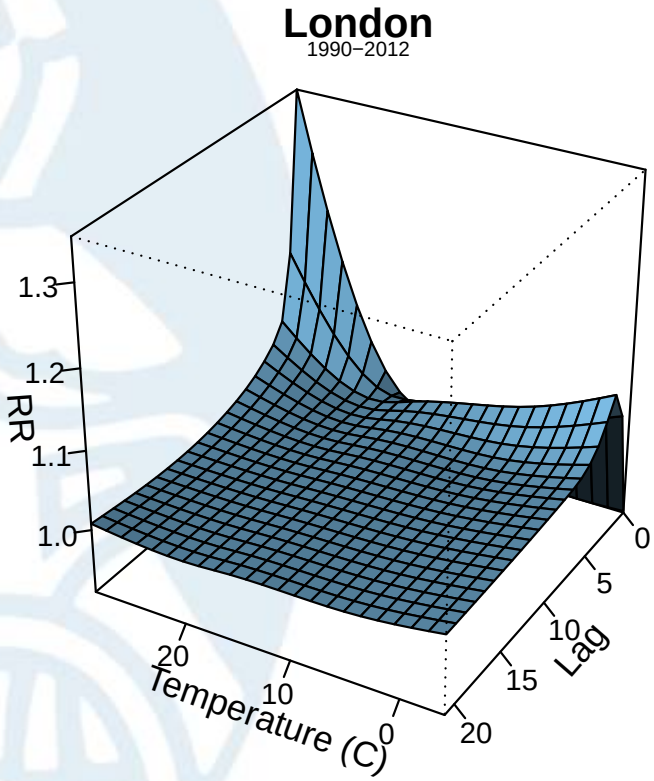
Modelling choices can critically affect the final estimates, and to date the **methodological discussion** on various approaches has been limited

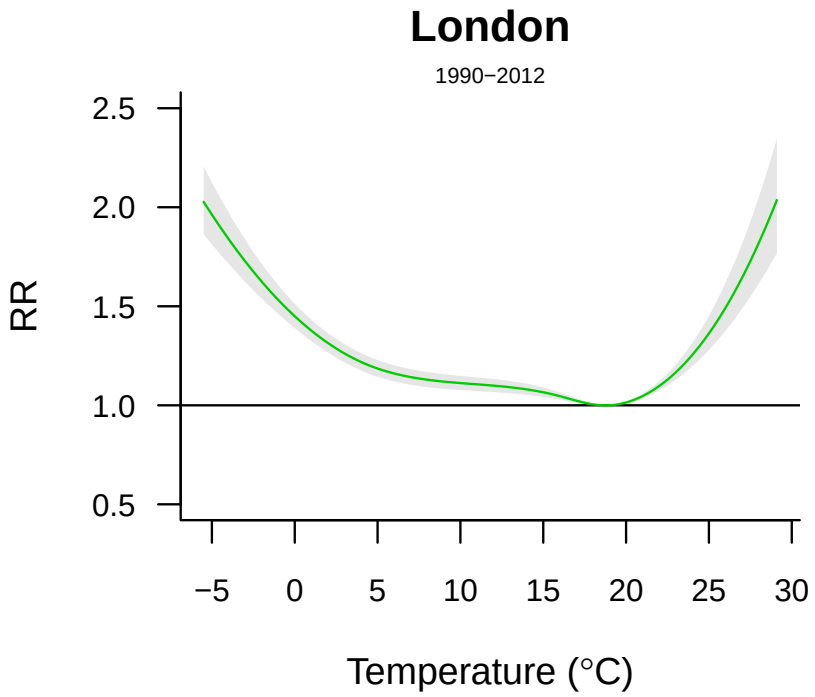
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Methodological issues

- Estimation of the exposure-response from observed data
- Projected temperature and mortality series
- Bias-correction or calibration
- Extrapolation of exposure-response curves
- Projection and quantification of the impact
- Demographic changes and adaptation
- Ensemble estimates and quantification of uncertainty

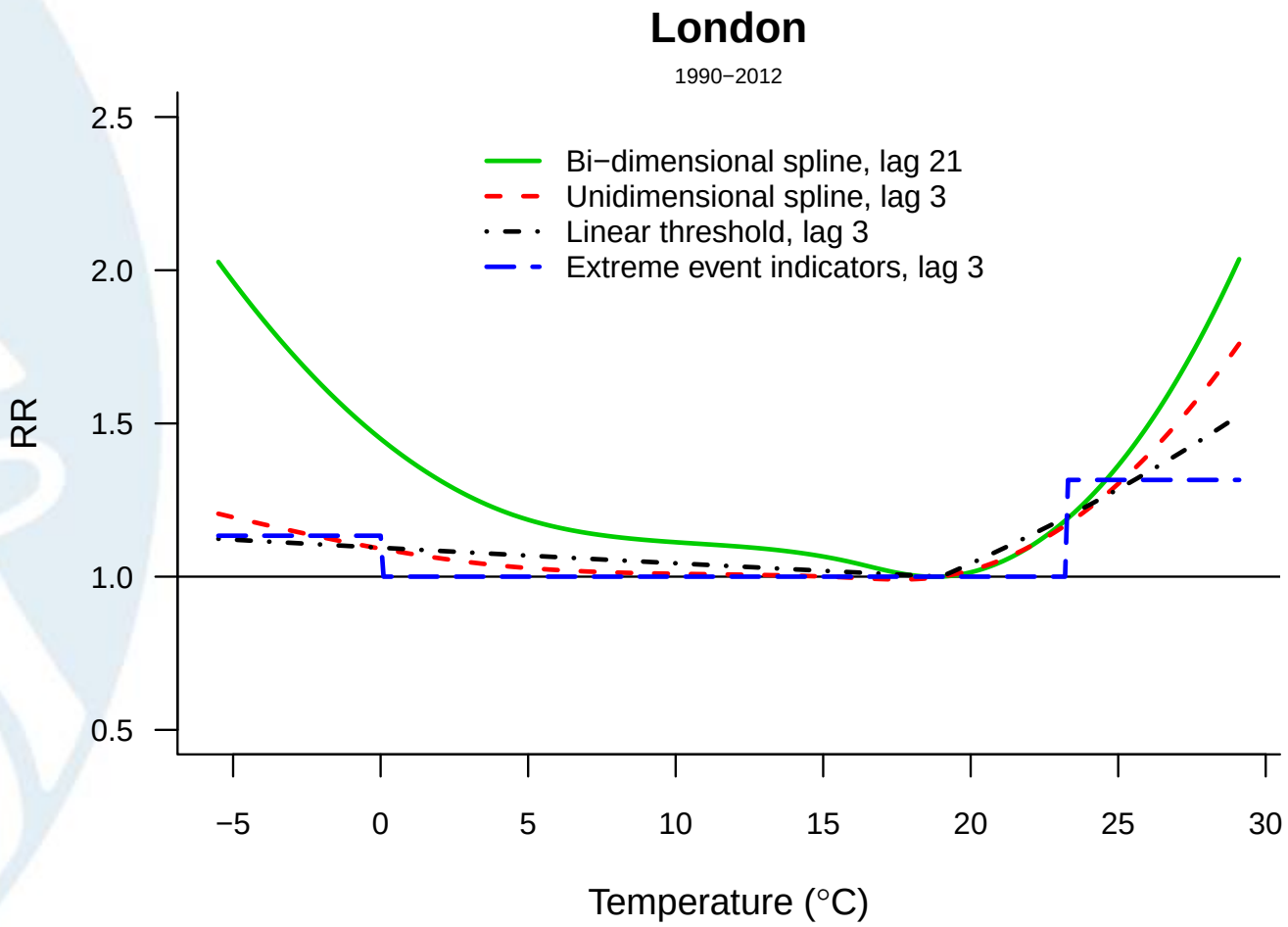
Estimation of the exposure-response





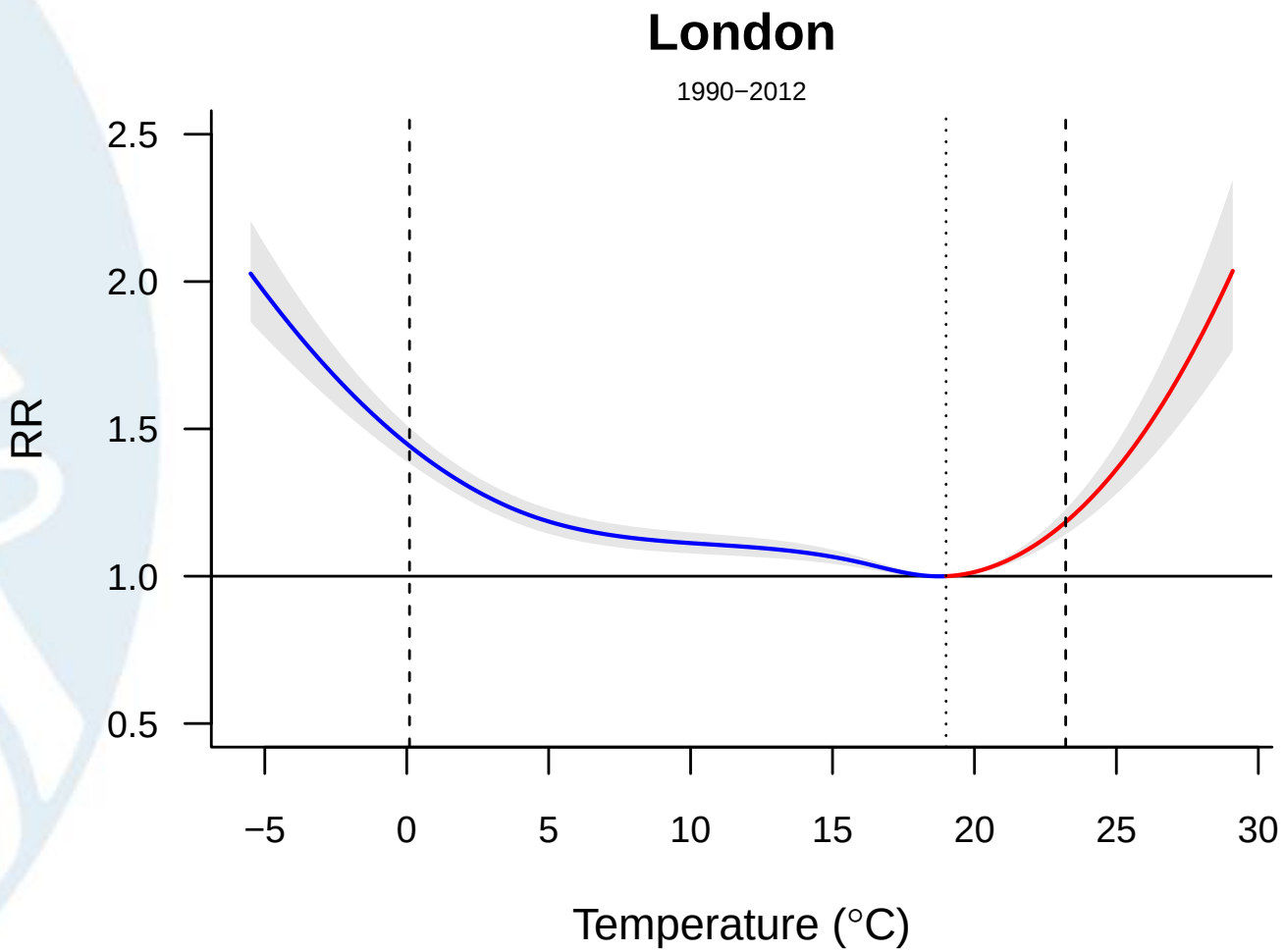
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Comparison between models

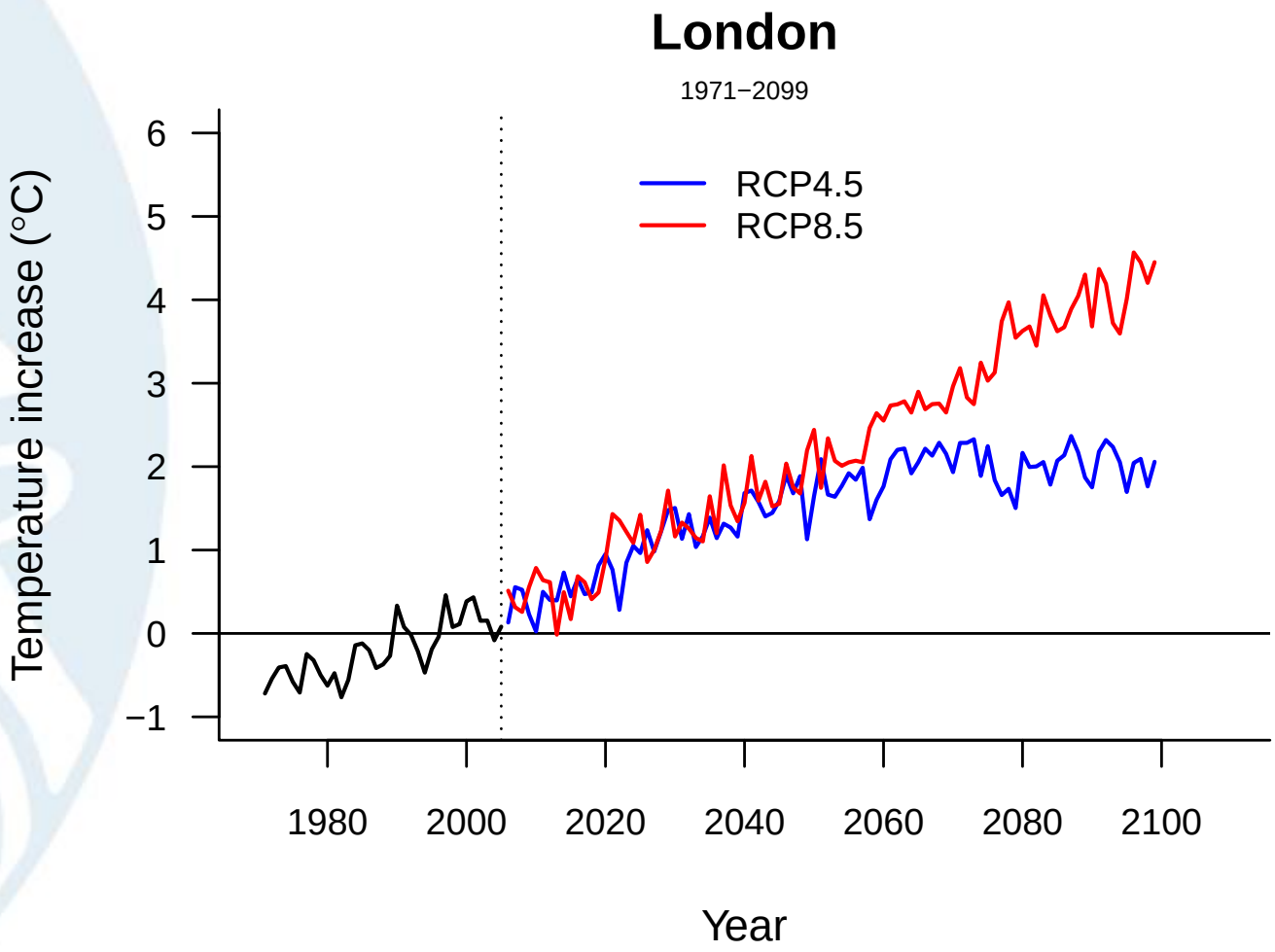


LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Centering and components

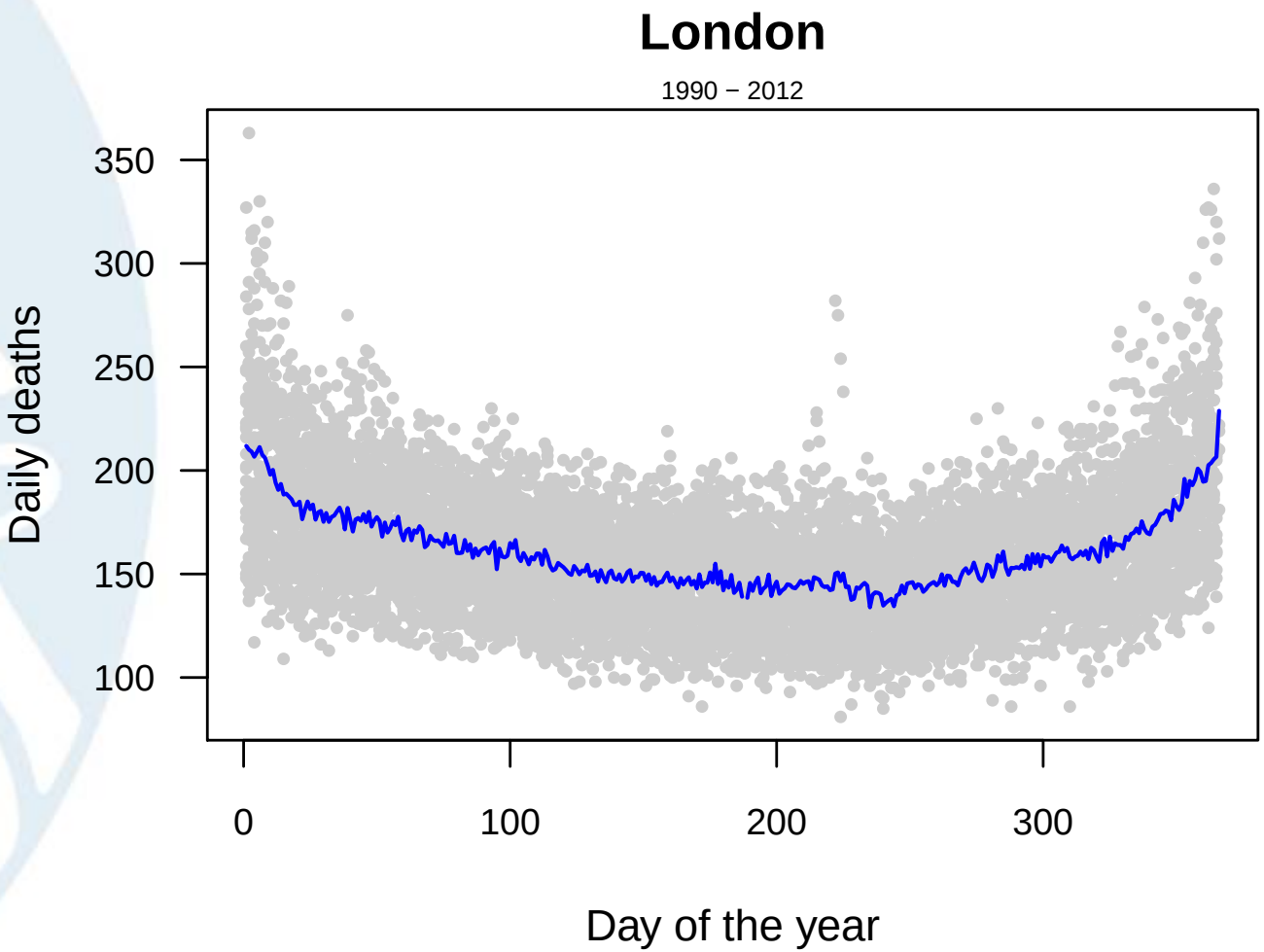


Projected temperature series (scenarios)

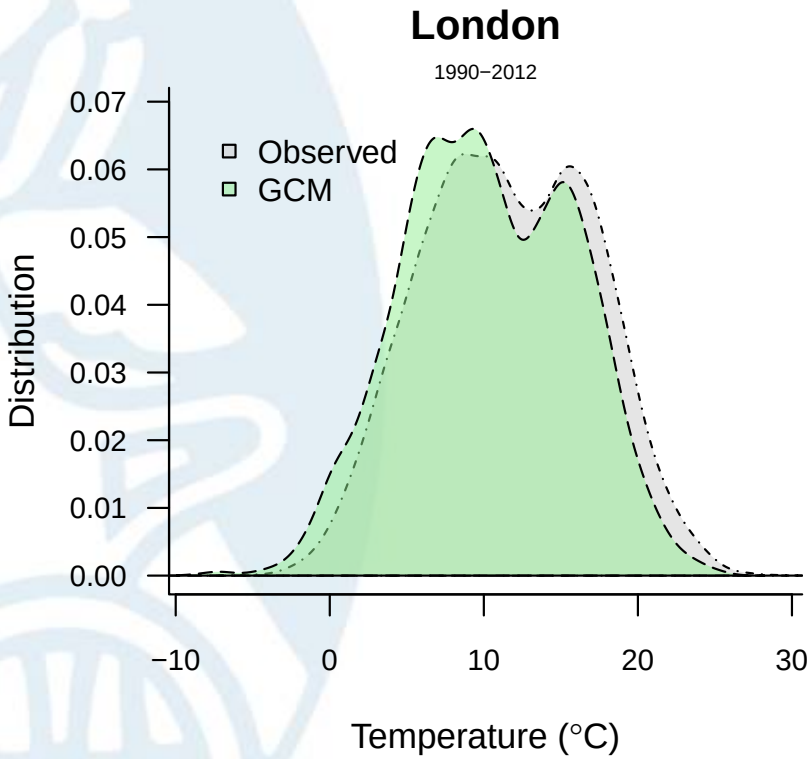


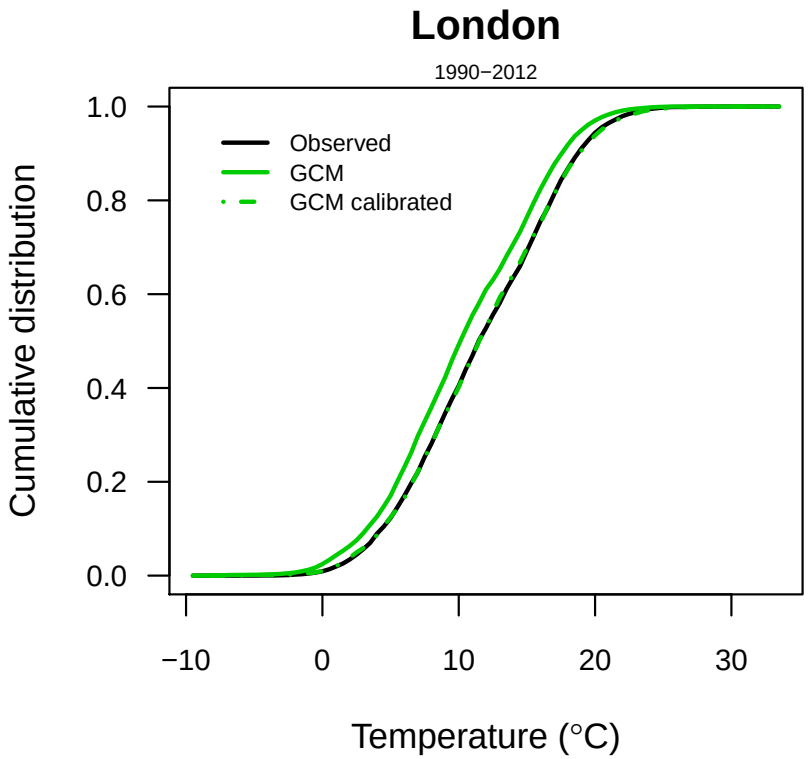
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Projected mortality series (seasonal)

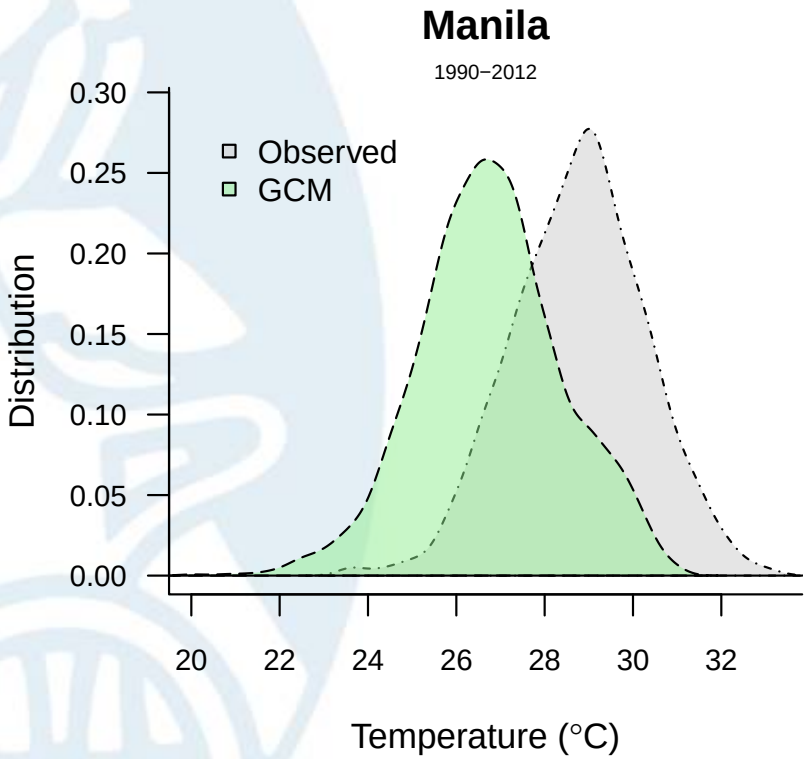


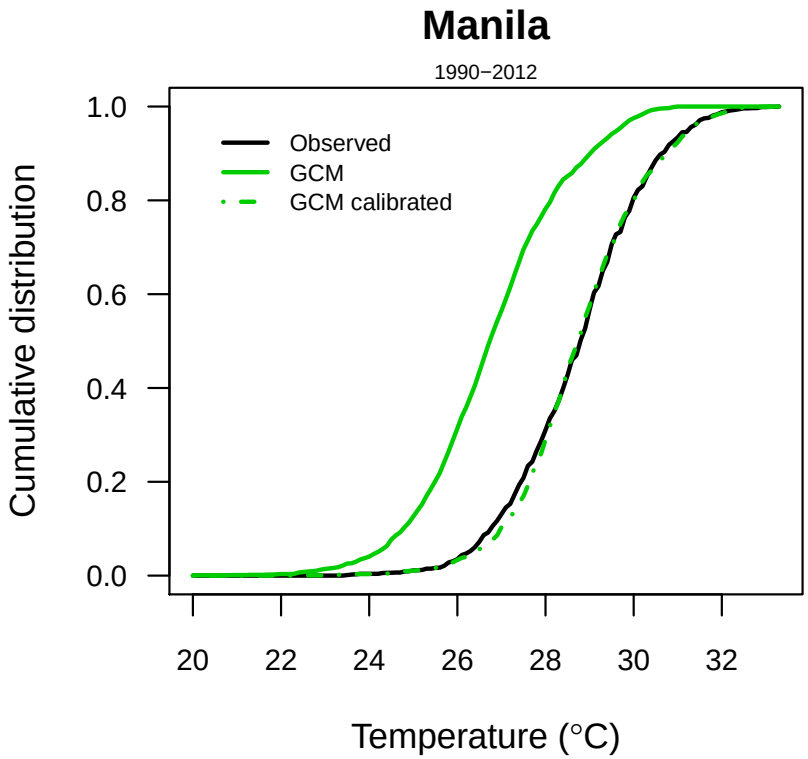
Calibration (bias-correction) – I



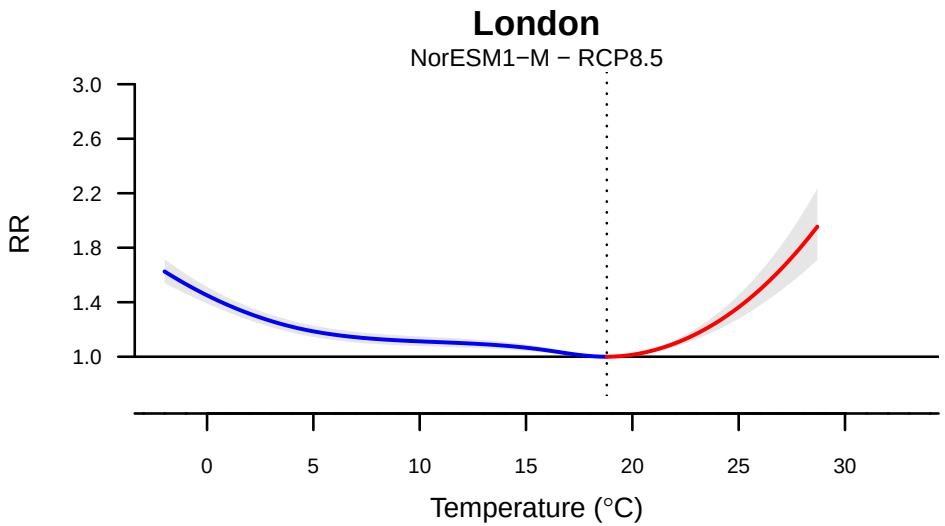


Calibration (bias-correction) – I

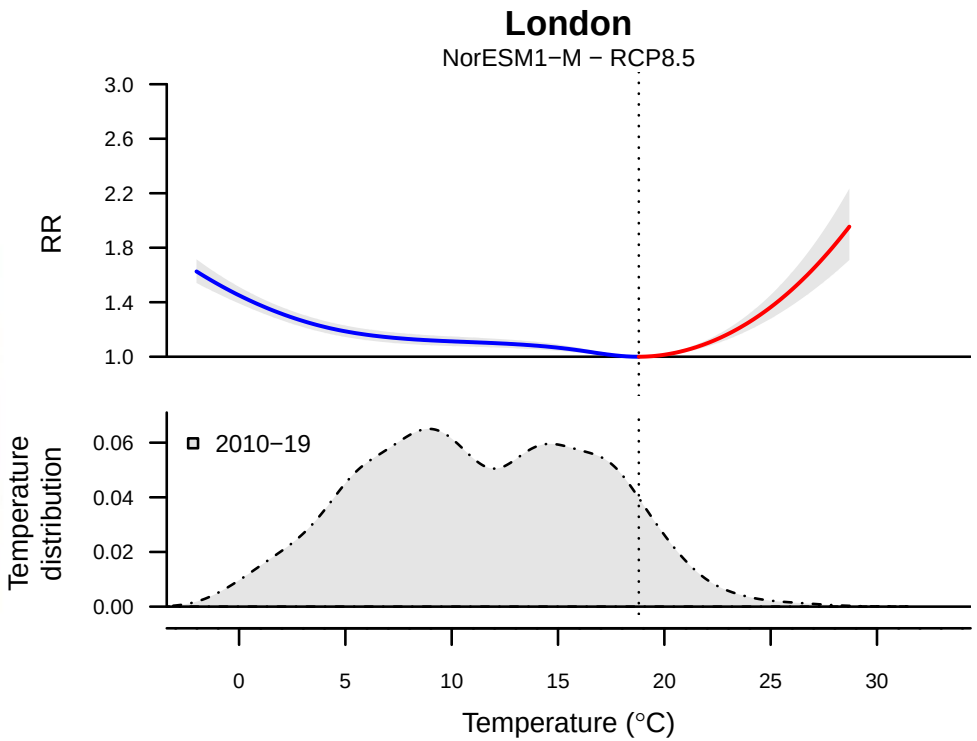




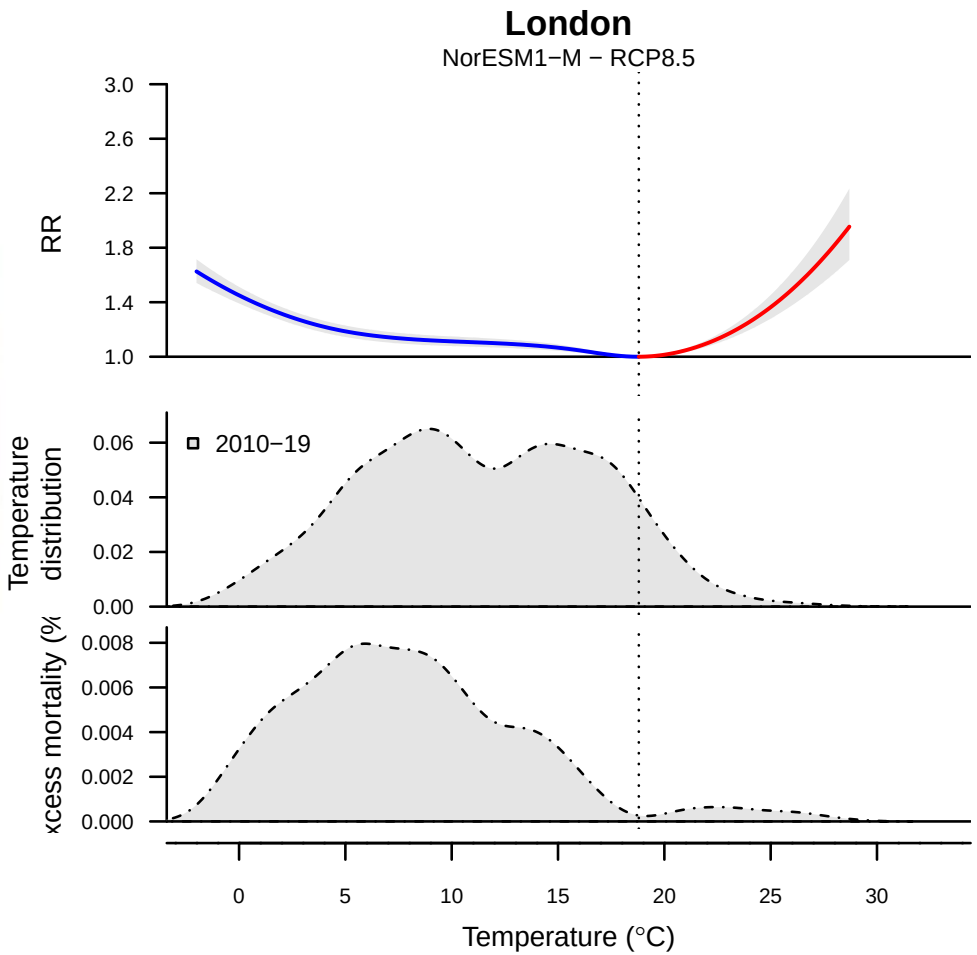
Projecting the impact



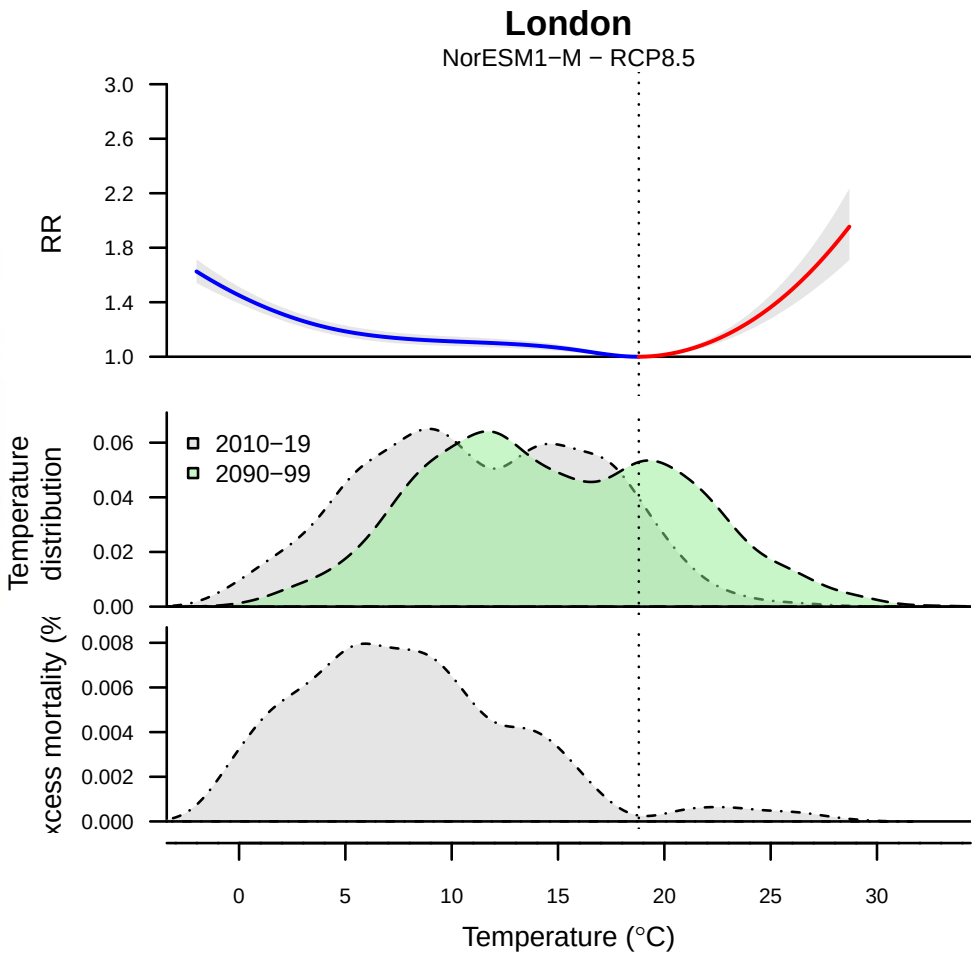
Projecting the impact



Projecting the impact

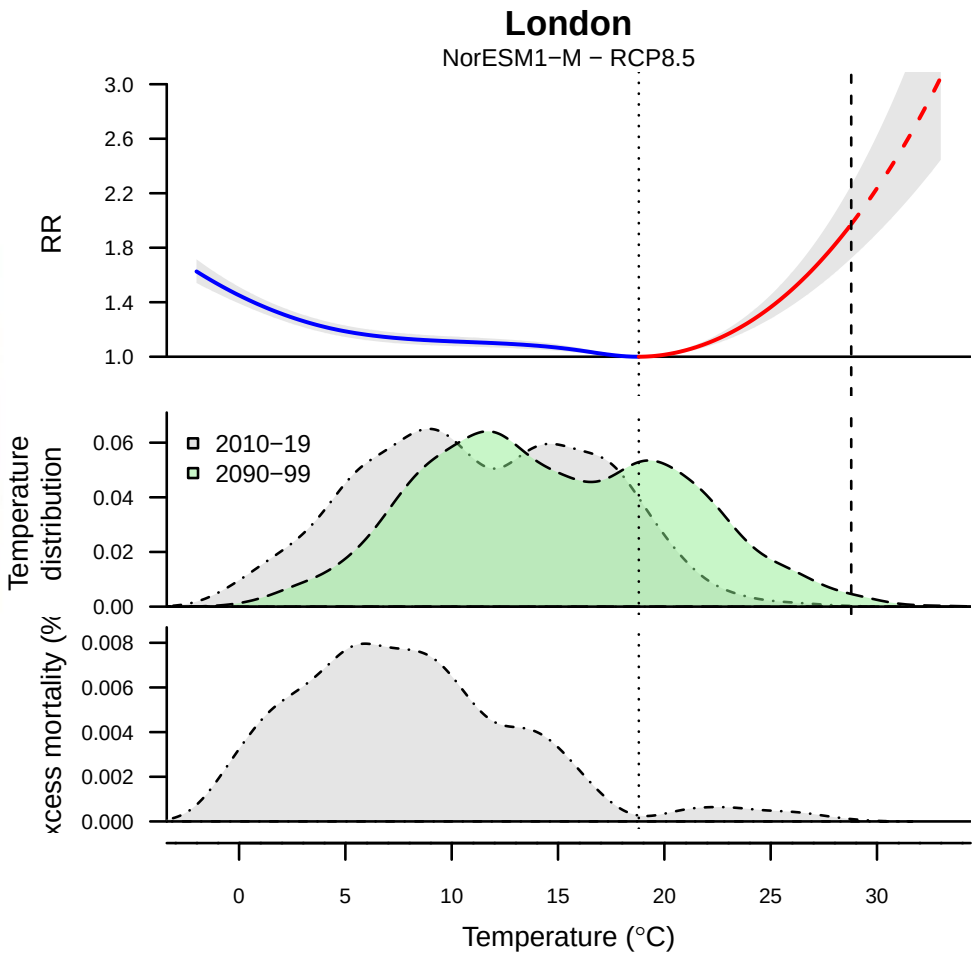


Projecting the impact



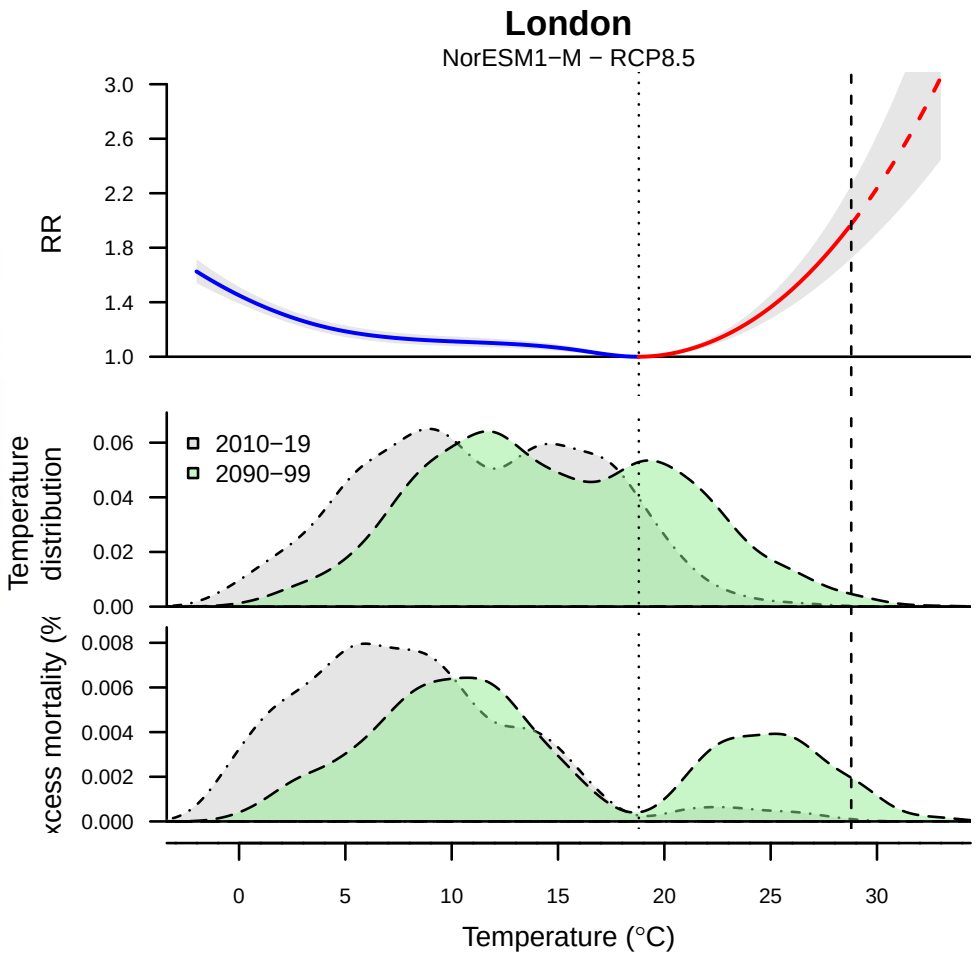
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Projecting the impact



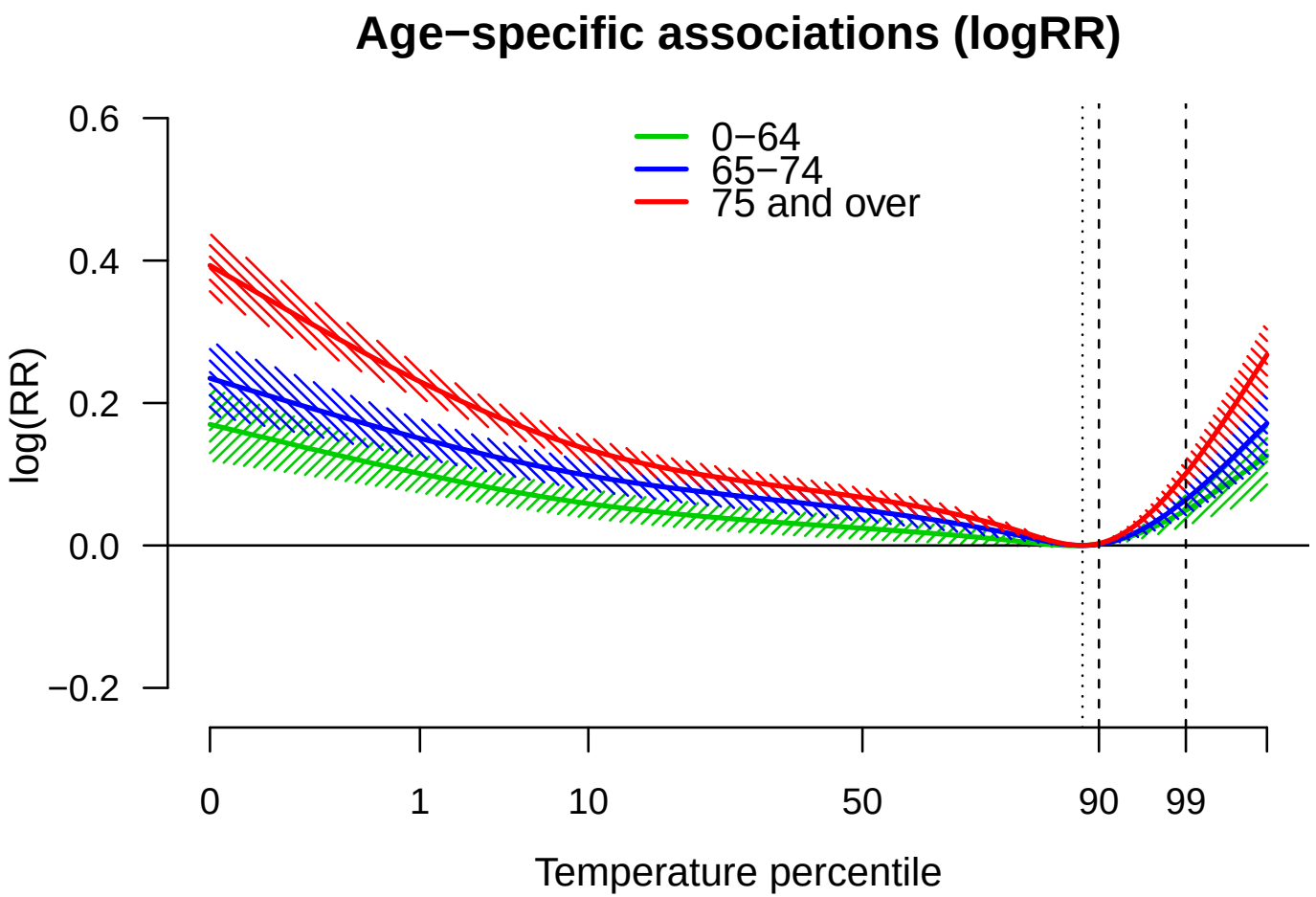
LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

Projecting the impact

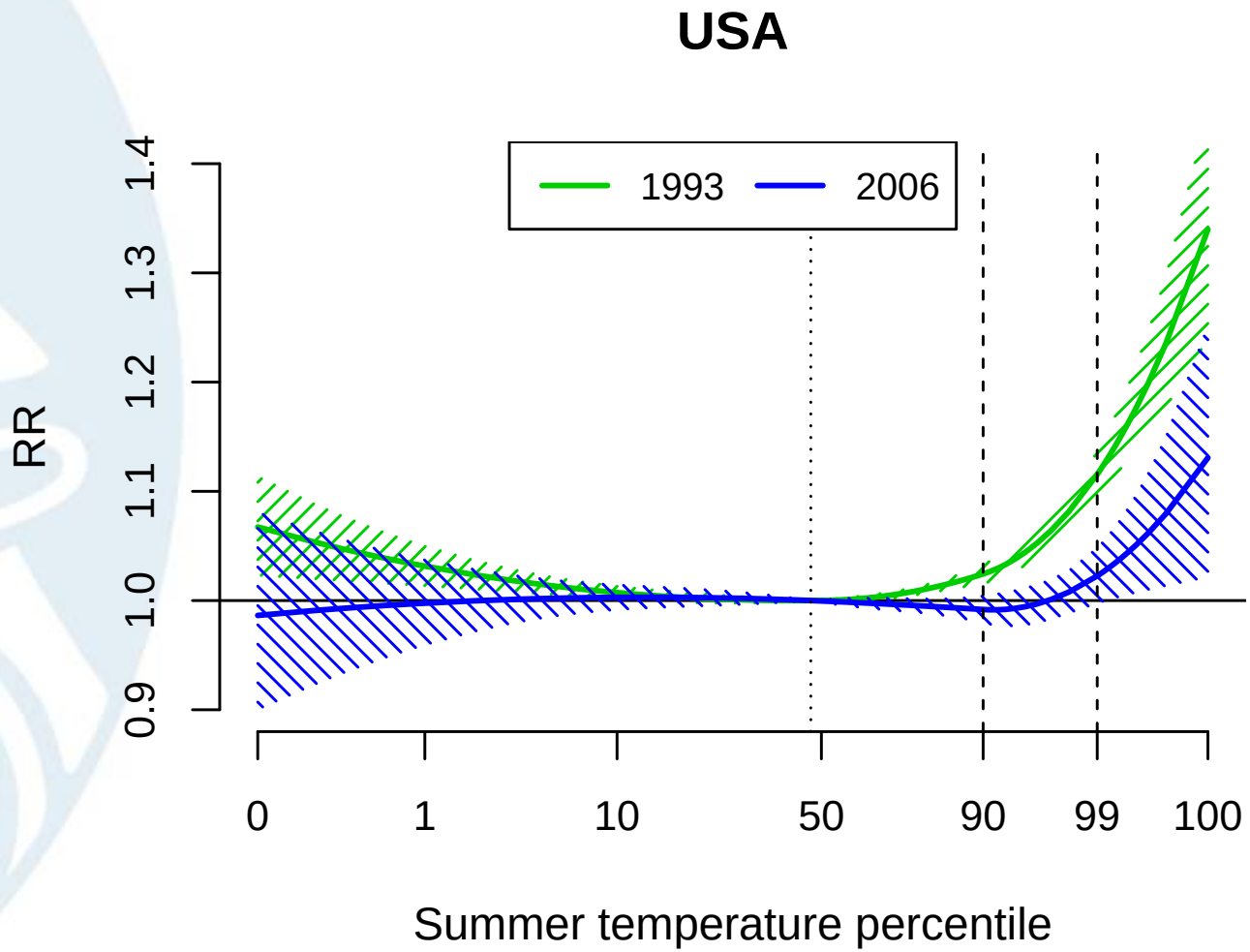


LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE

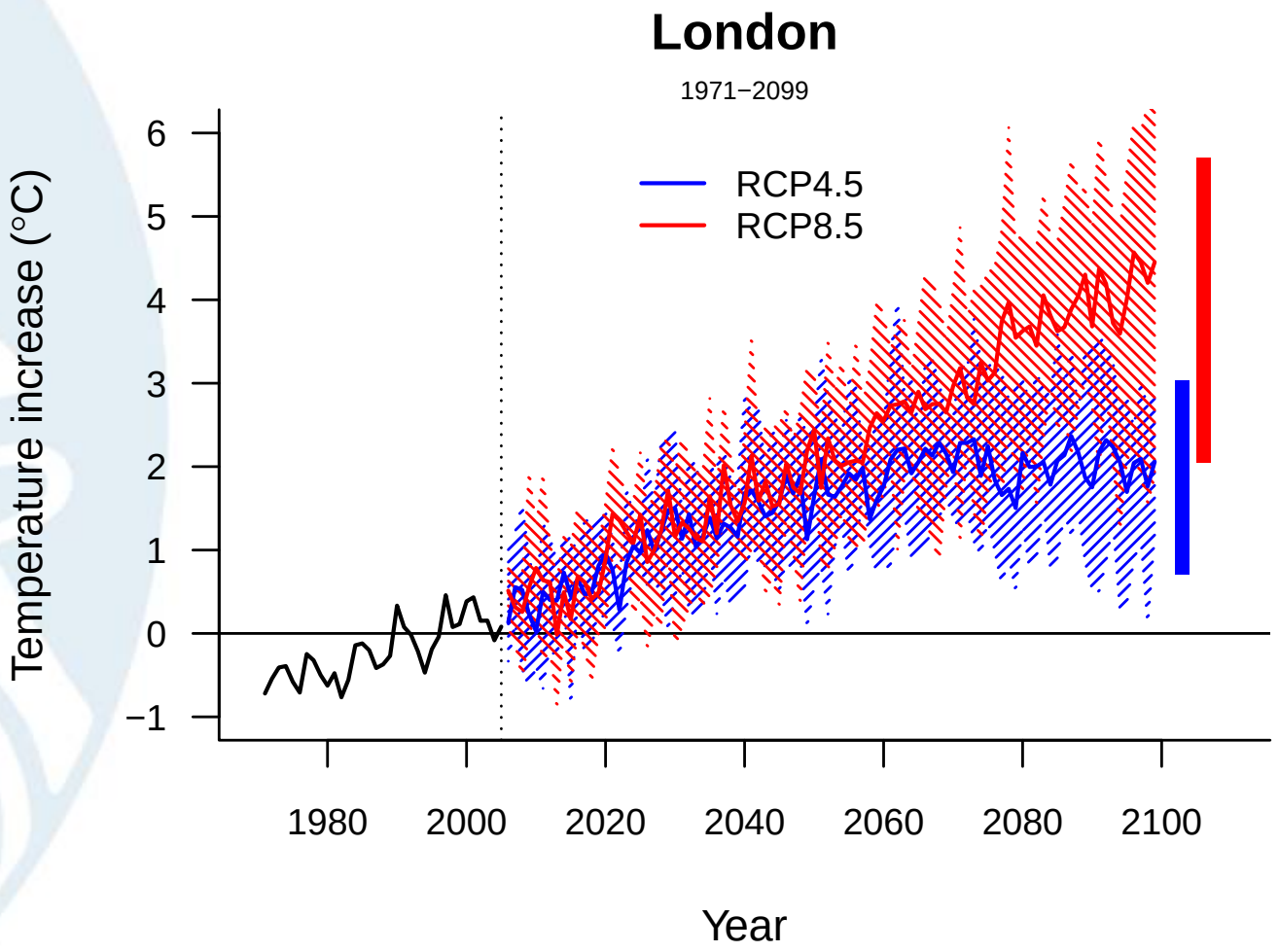
Demographic changes



Adaptation


USA
1993
2006
RR
0.9
1.0
1.1
1.2
1.3
1.4
0
1
10
50
90
99
100
Summer temperature percentile

Ensemble mean and uncertainty



Conclusions

Projecting temperature-related health impacts involves a **series of steps** that entail critical methodological issues

Each step requires key **assumptions**, and often involves important **limitations**, that are rarely acknowledged or considered

A methodological discussion on alternative modelling approaches is paramount for selecting **appropriate procedures** and for identifying **research gaps**

We are preparing a **tutorial article** to elaborate on these issues and to illustrate approaches to address each step with reproducible examples and code

LONDON SCHOOL of HYGIENE &TROPICAL MEDICINE