Probabilistic projections of the impact of climate change on heat-related mortality in three European cities

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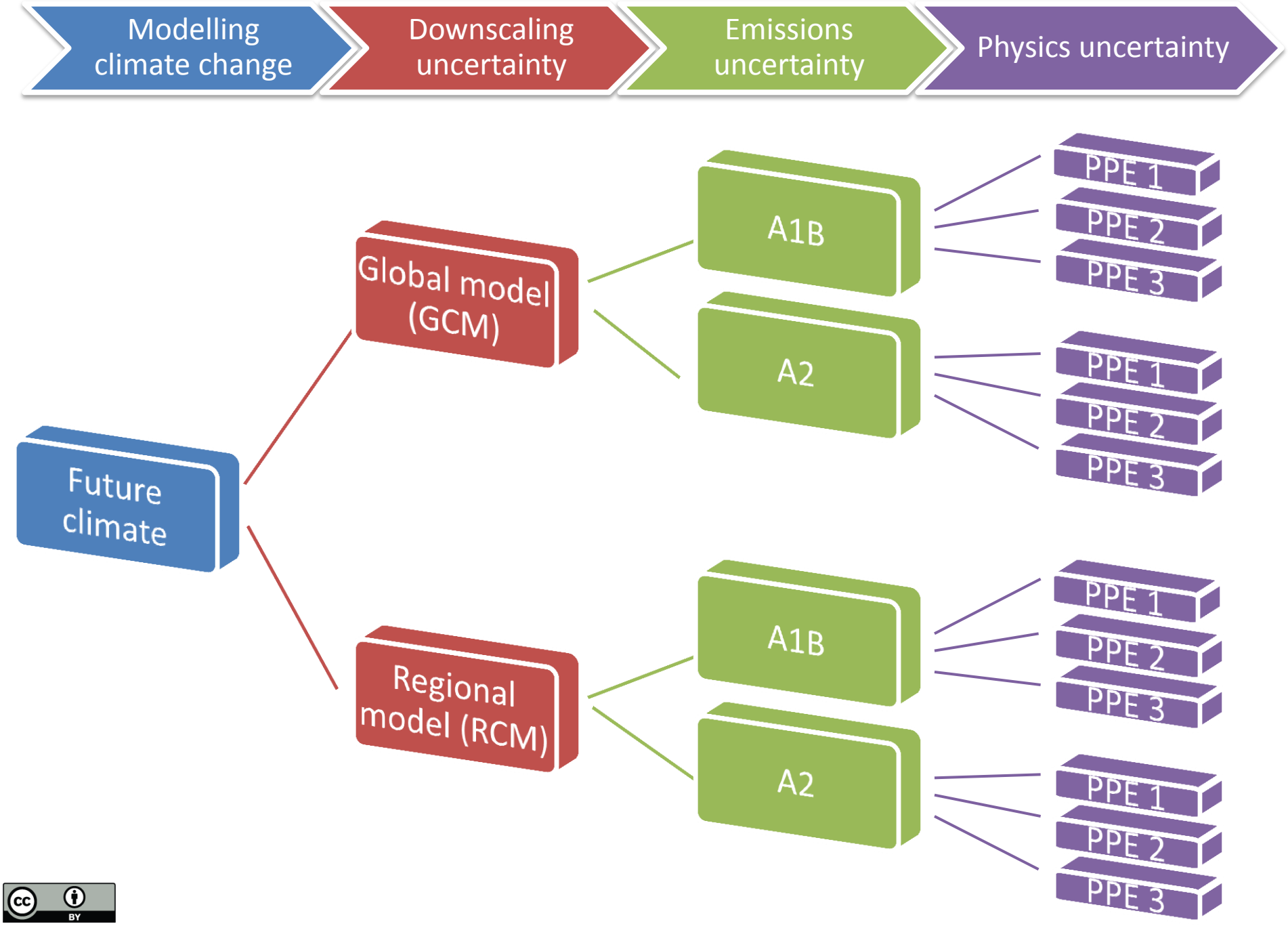
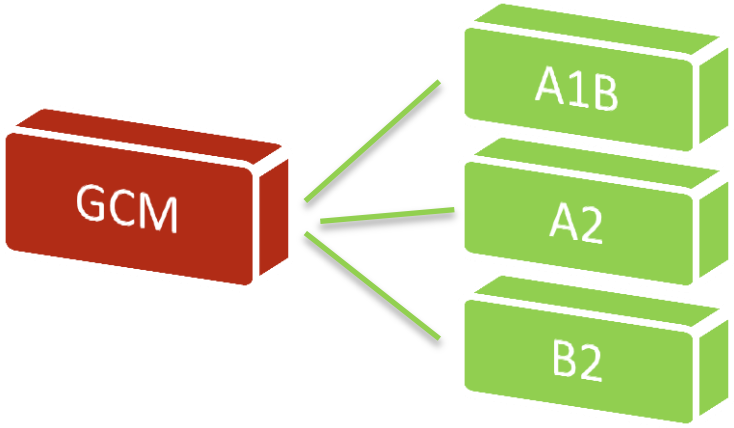
Climate modelling uncertainty

Representing inherrent uncertainties

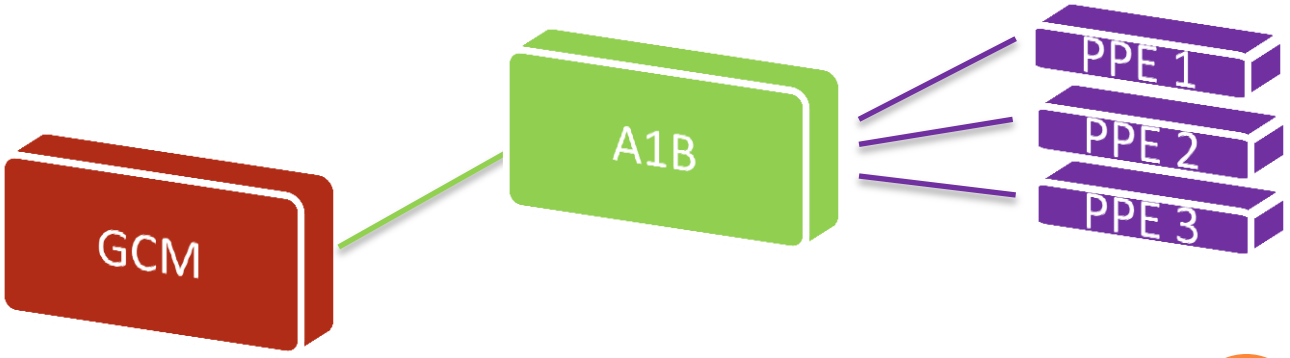

Modelling climate change
Downscaling uncertainty
Emissions uncertainty
Physics uncertainty
Future climate
Global model (GCM)
Regional model (RCM)
A1B
A2
A1B
A2
PPE 1
PPE 2
PPE 3
PPE 1
PPE 2
PPE 3
PPE 1
PPE 2
PPE 3
PPE 1
PPE 2
PPE 3

Methods

- Climate projections from:
  - 'Standard' HadCM3 climate model (**1 sim** for each emissions scenario)
    - SRES **A1B**, **A2** and **B2**



  - HadCM3 QUMP ensemble (**17 sims** for each emissions scenario)
    - SRES **A1B**

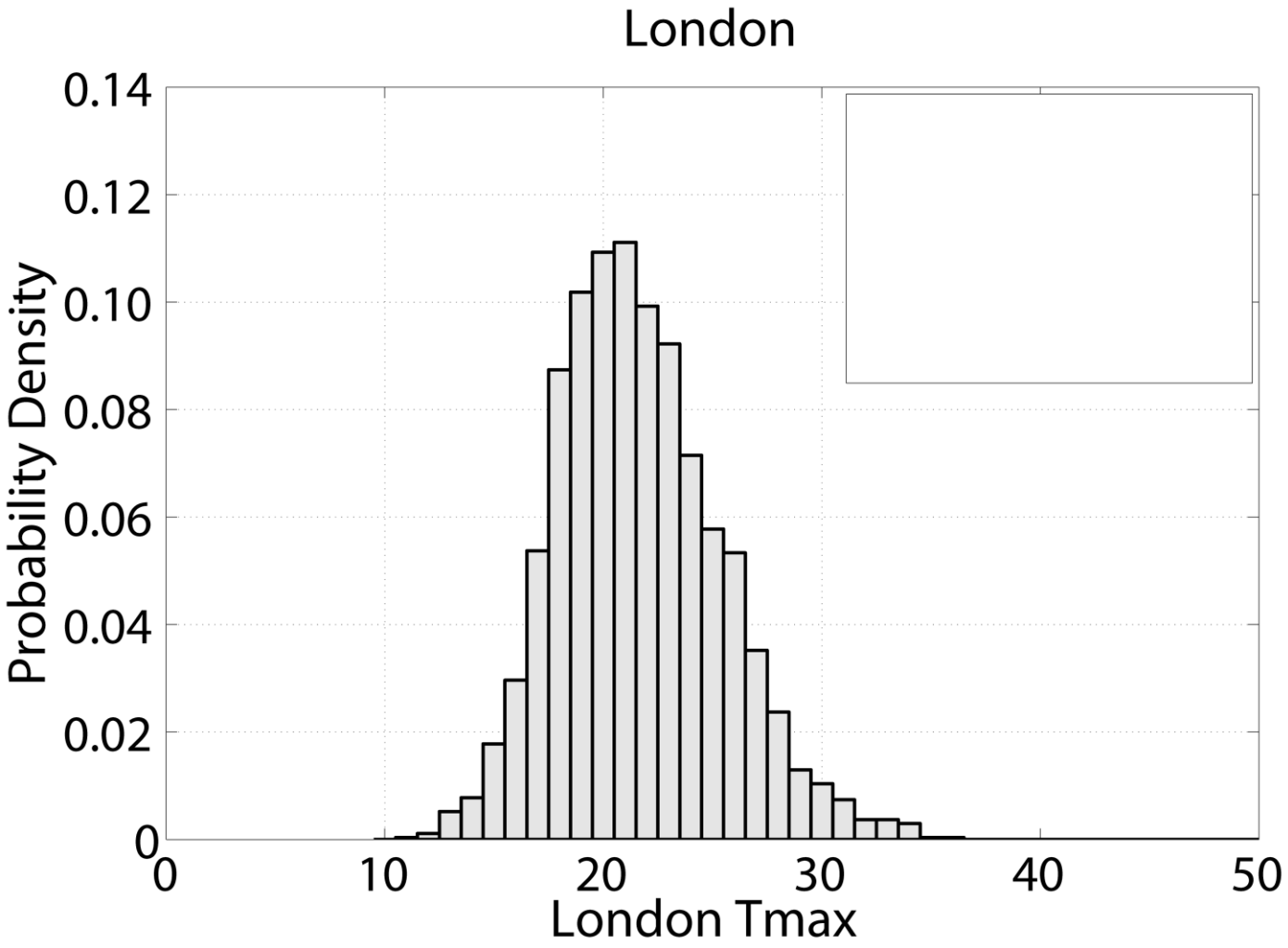


- Empirical statistical temperature mortality models
  - London, Lisbon, Budapest

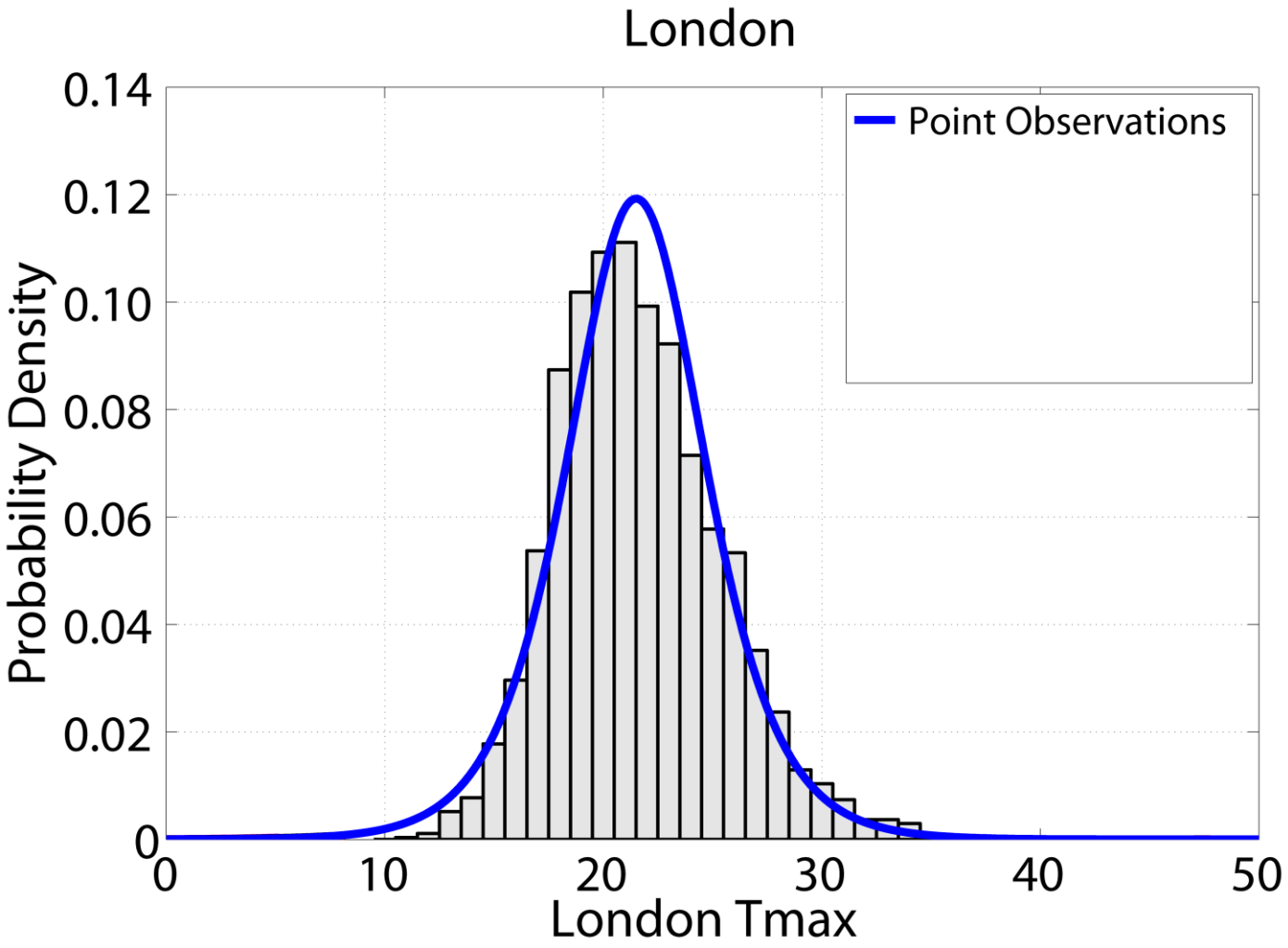
Results

Projections of summer daily maximum temperature

Distribution of daily Tmax



Distribution of daily Tmax



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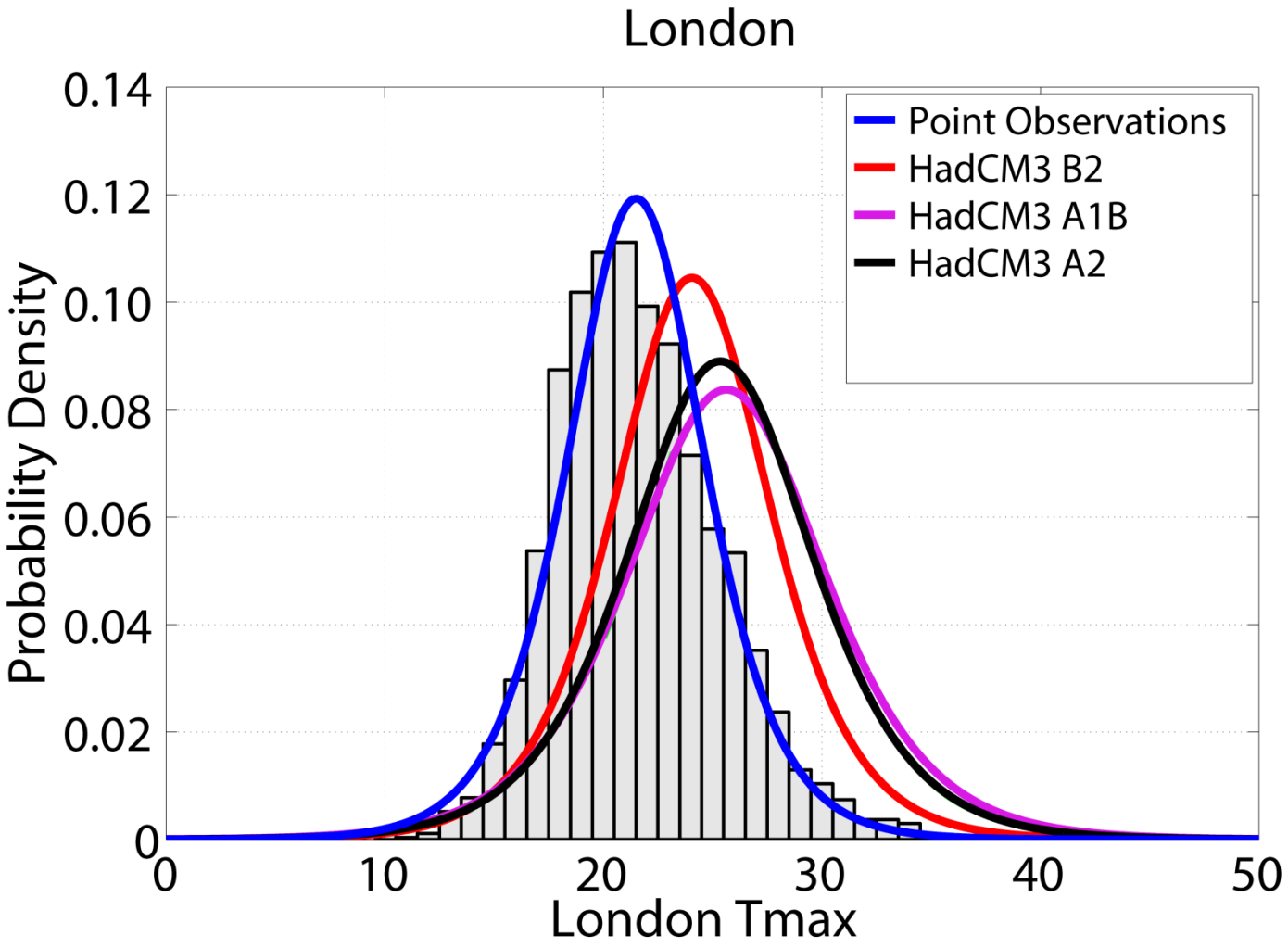

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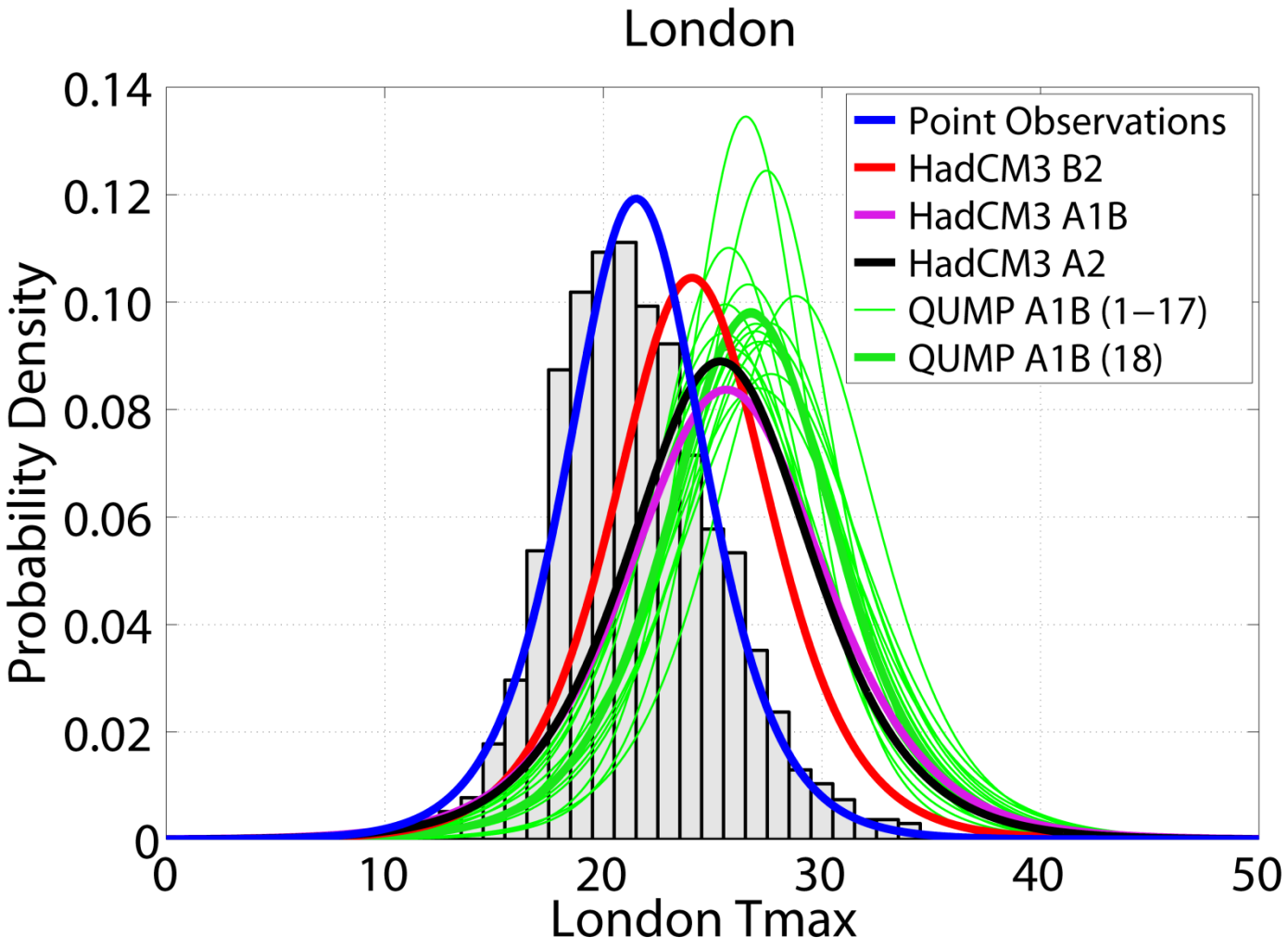

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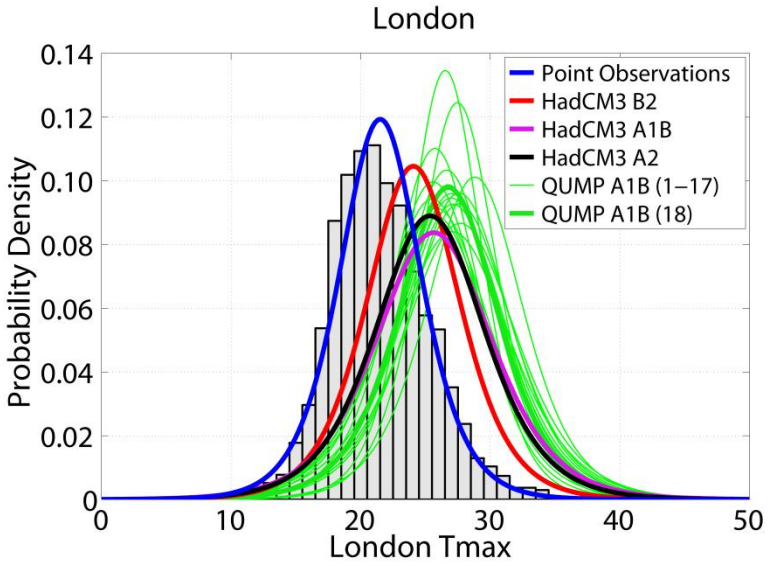
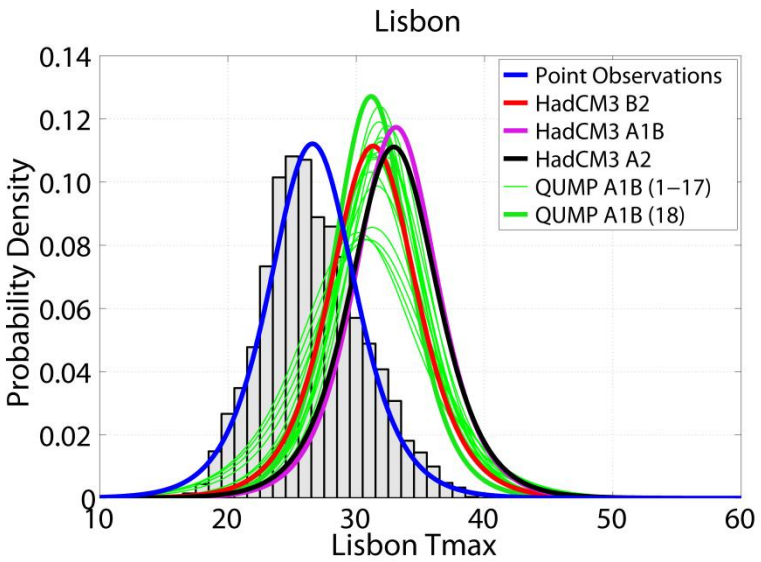
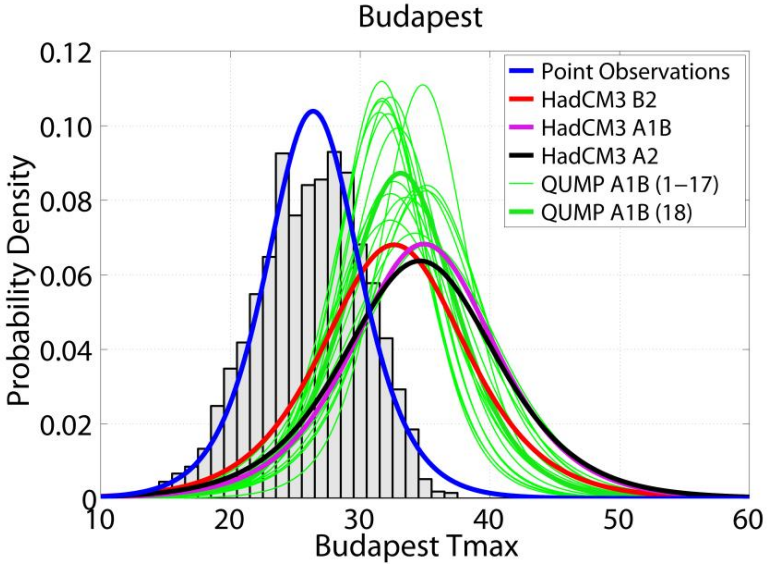




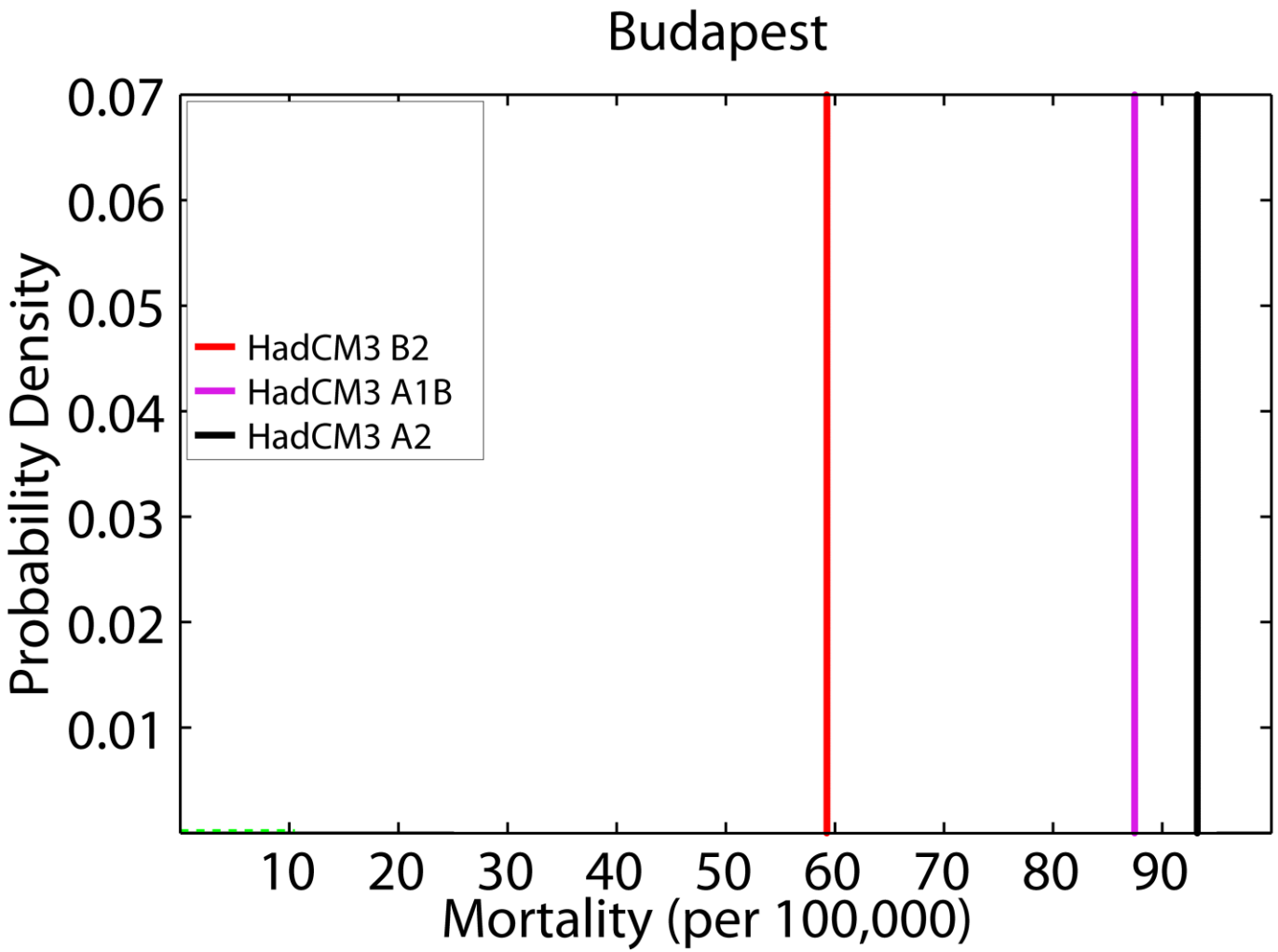


Results

Probabilistic vs. deterministic projections of summer heat-related mortality

Mortality attributable to climate change in the 2080s

(present day heat-related mortality rate in Budapest is 5.4 per 100,000)



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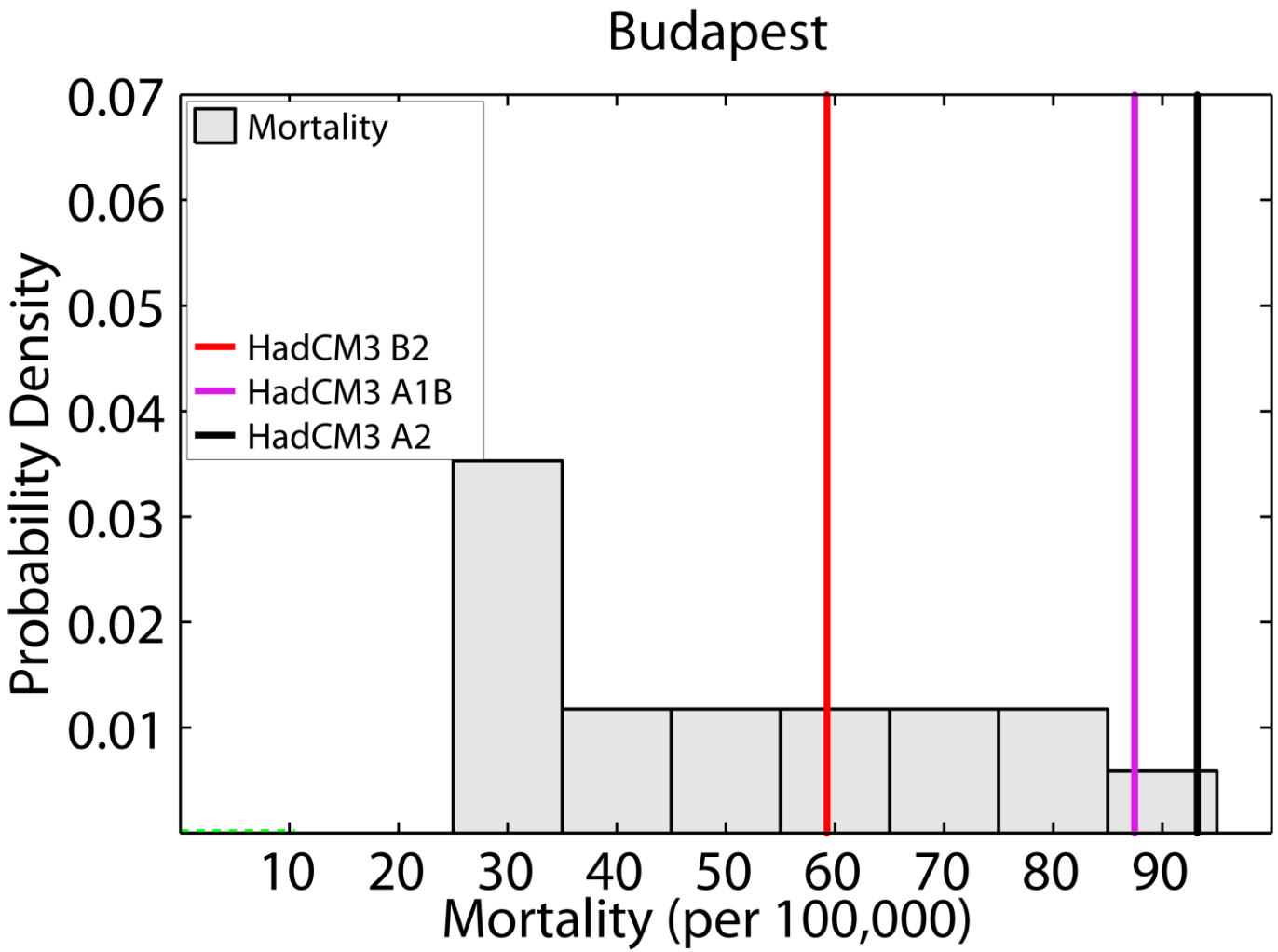

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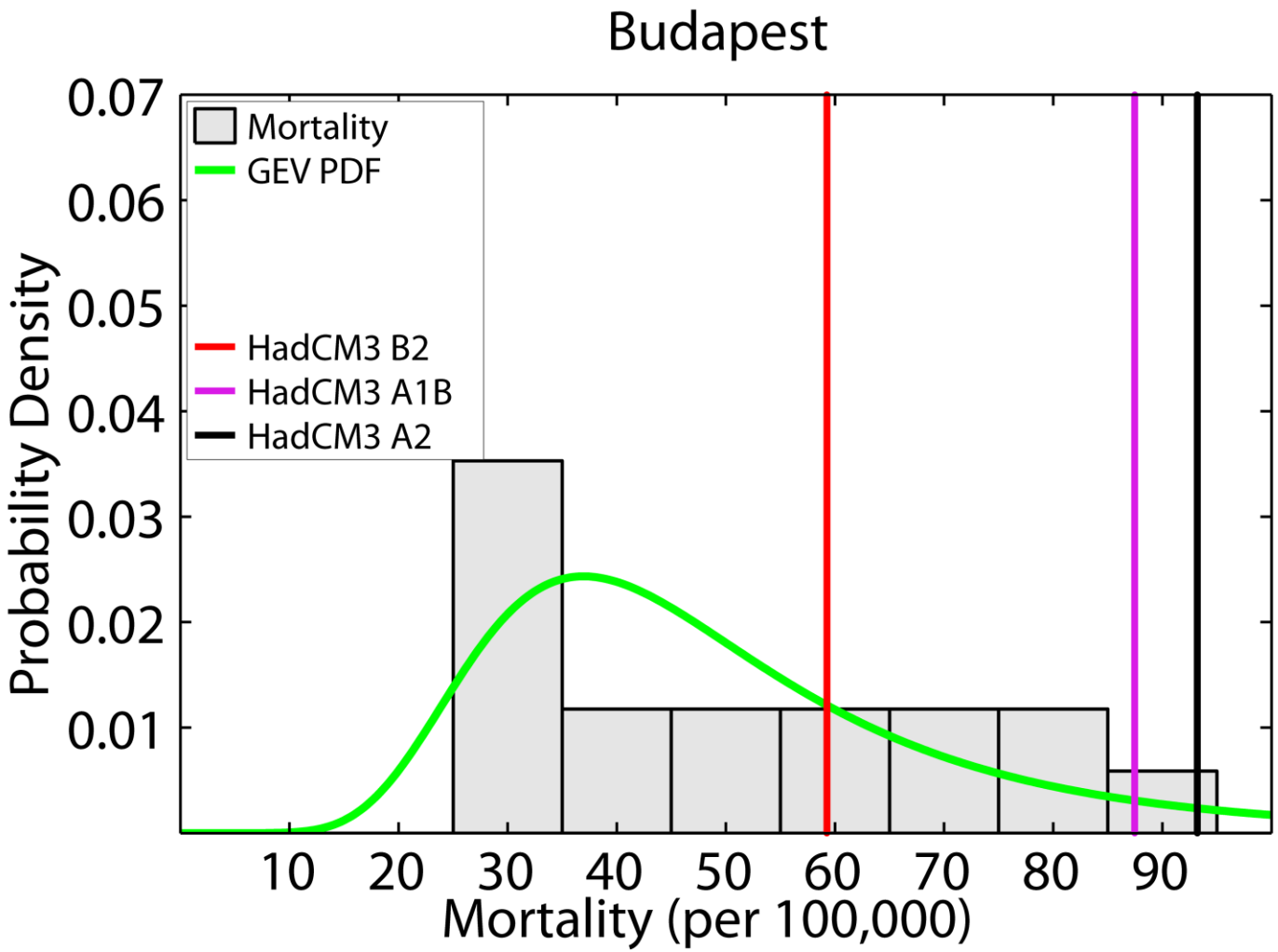
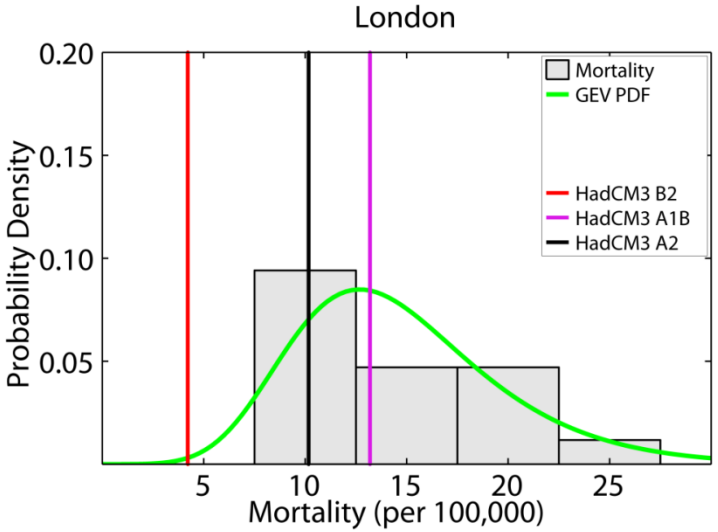
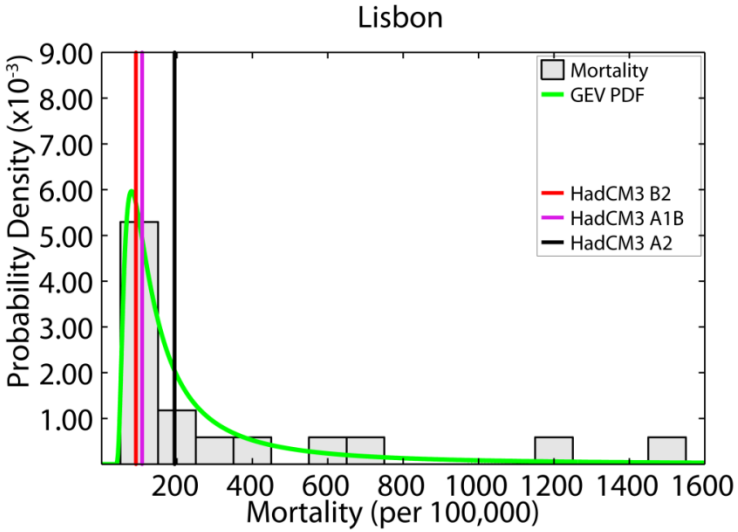
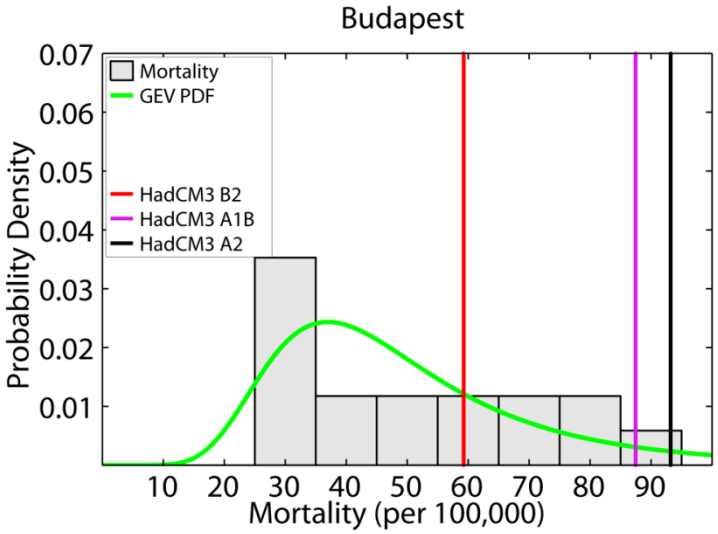


Mortality attributable to climate change in the 2080s

(present day heat-related mortality rate in London is 1.8 per 100,000)
(present day heat-related mortality rate in Lisbon is 4.6 per 100,000)
(present day heat-related mortality rate in Budapest is 5.4 per 100,000)





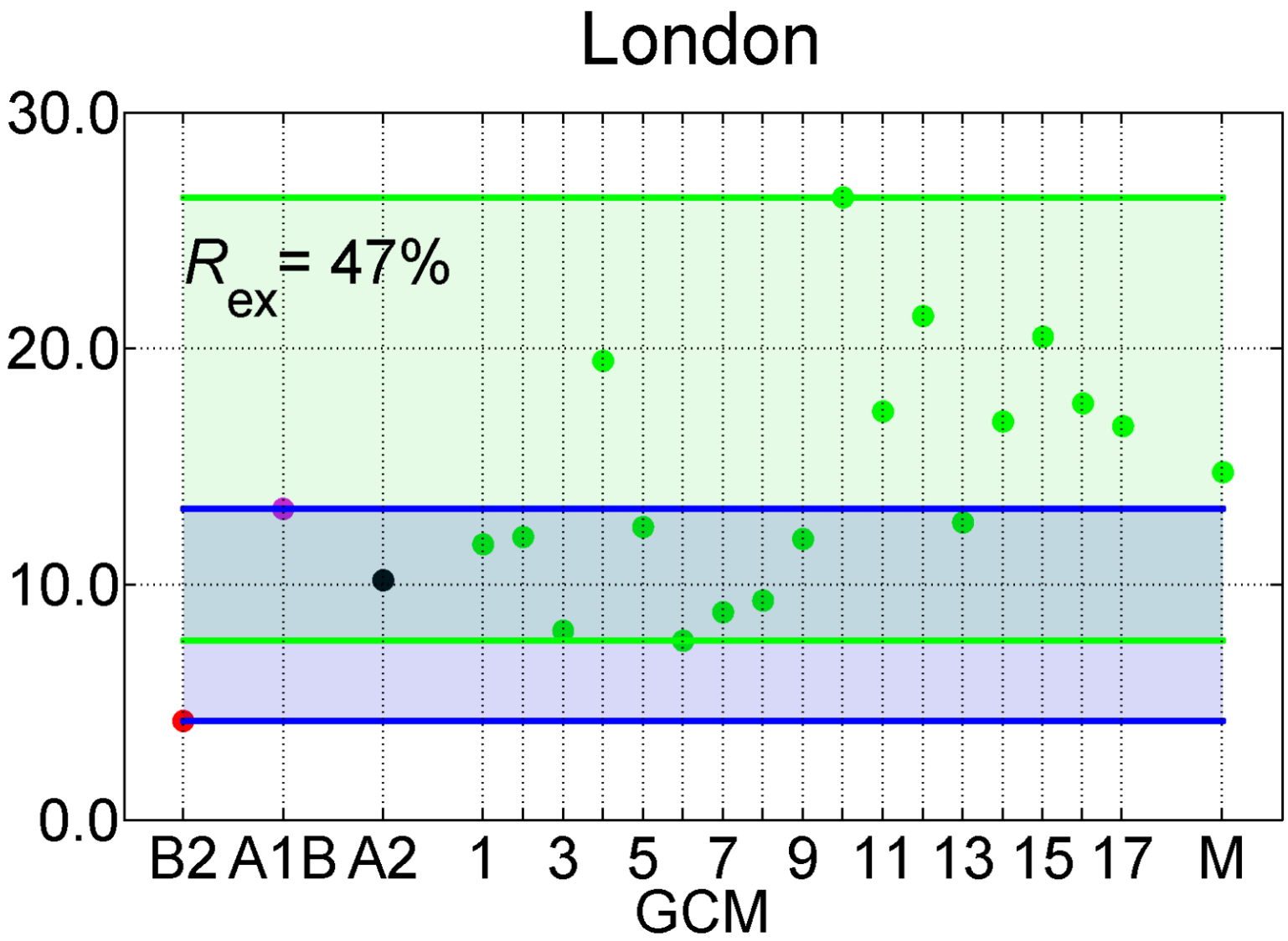


Results

Comparing emissions uncertainty with climate model physics uncertainty

Mortality attributable to climate change in the 2080s

(present day heat-related mortality rate in London is 1.8 per 100,000)



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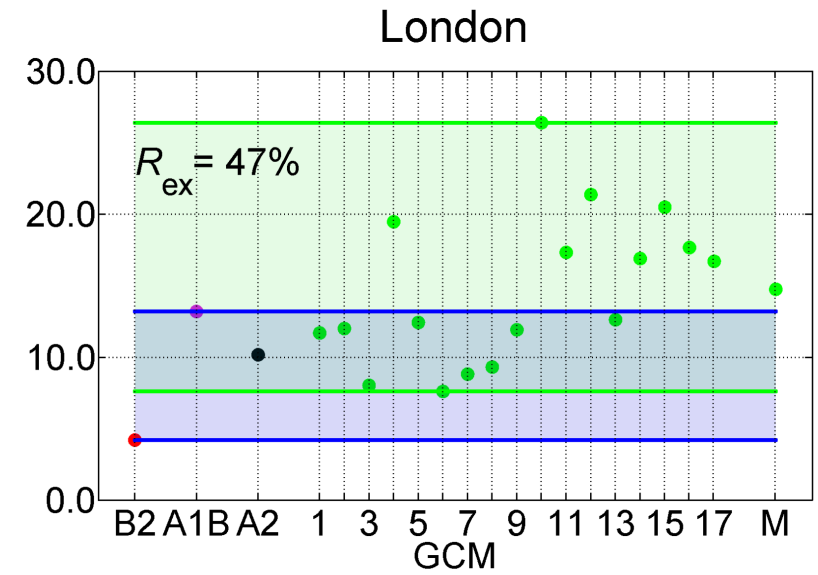
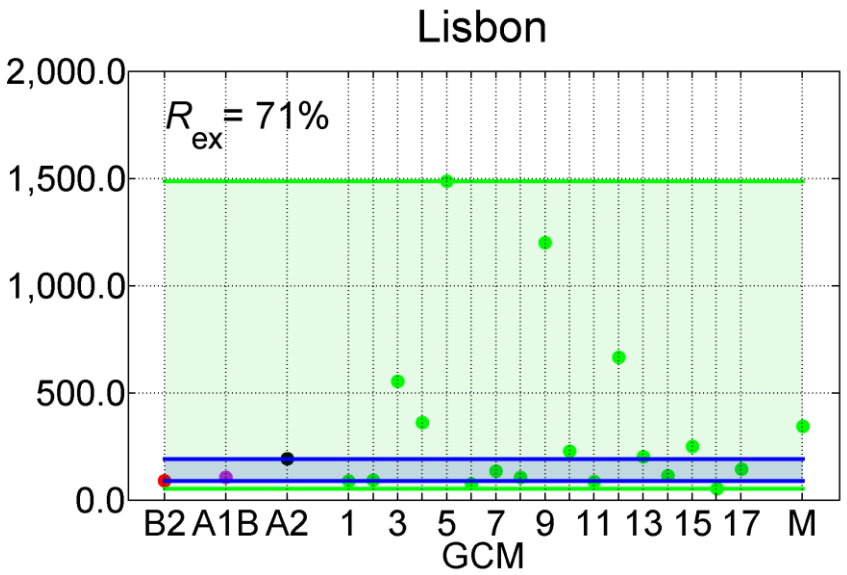
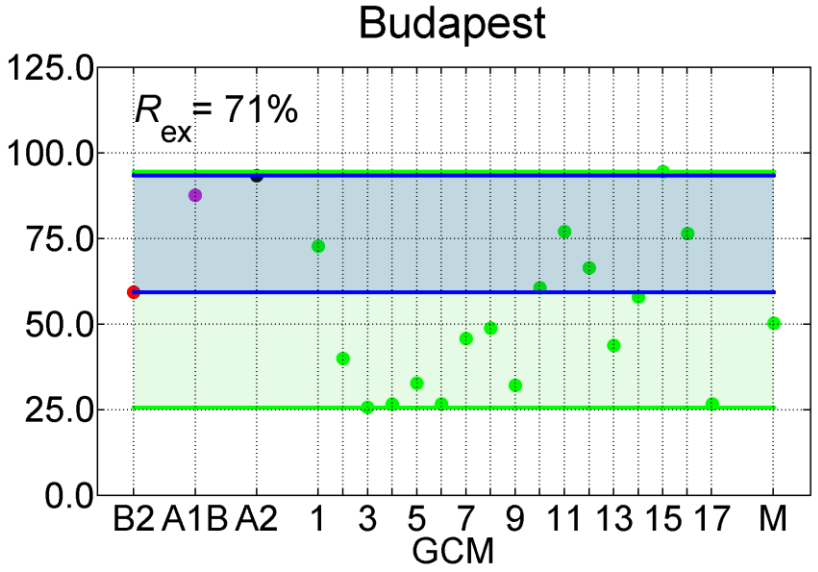




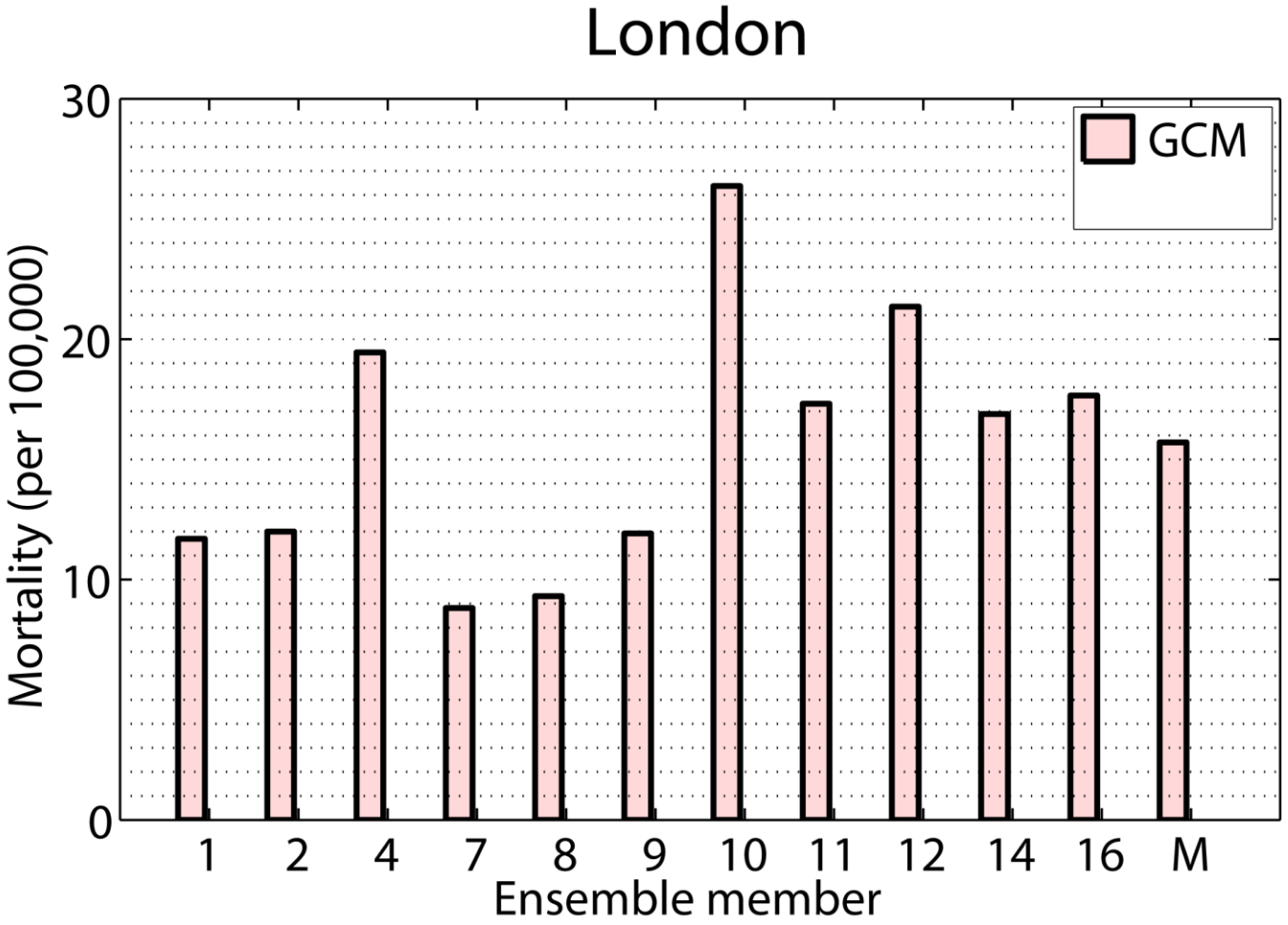


Results

GCM vs. RCM projections

Mortality attributable to climate change in the 2080s in London under SRES A1B (QUMP)

(present day heat-related mortality rate in London is 1.8 per 100,000)



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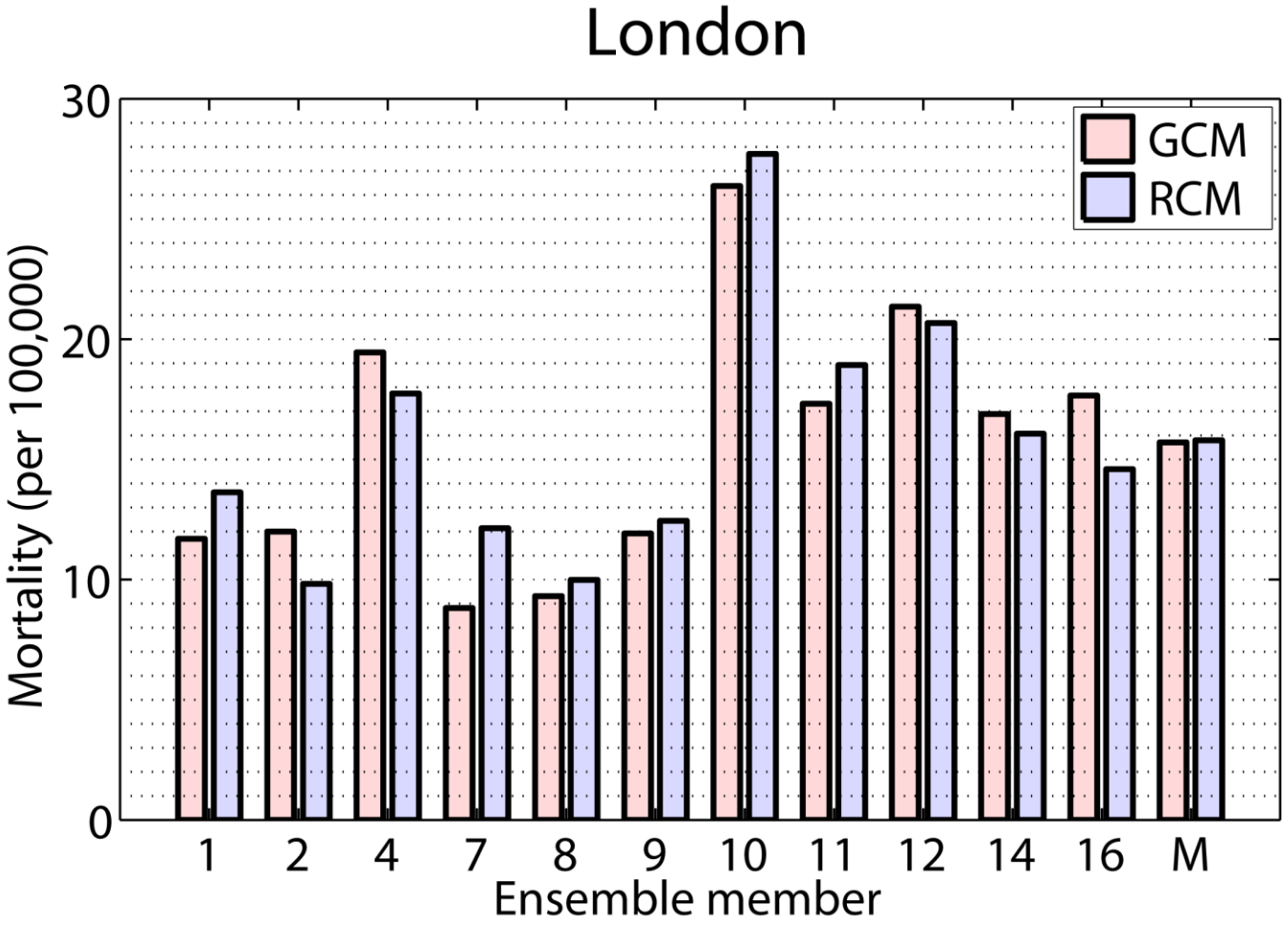

Conclusions

1. Impacts are more sensitive to **climate model physics** uncertainty than they are to **emissions scenario** uncertainty

2. Whether climate projections are from a **GCM** or **RCM** makes relatively little difference to **impacts**

3. **Larger ensembles** needed to improve robustness of probabilistic impacts estimates

4. Decision & policy-makers need to be **comfortable** with risk-based projections of impacts

Thank You

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