

H2: Modeling the temperature-mortality relationship under changing climate and society.



Hosts: Luís Costa, Linda Krümmenauer & Veronika Huber

Contributions:



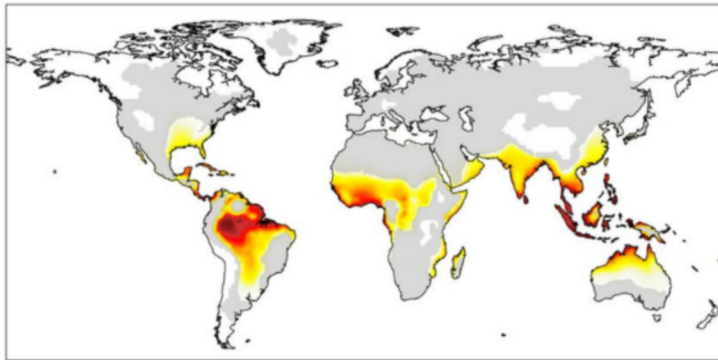
POTSAM-INSTITUT FÜR
KLIMAFOLGENFORSCHUNG



Why are we here?

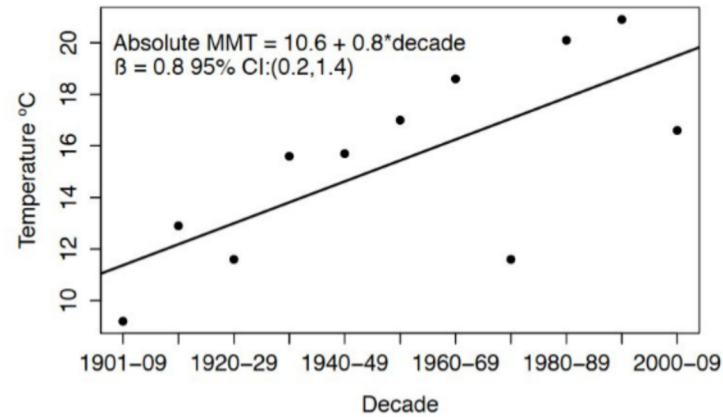
Future distribution of deadly climatic conditions

RCP 4.5



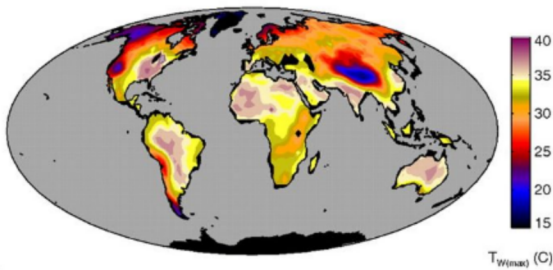
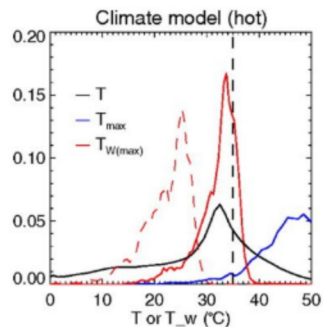
Mora et al, 2017 Nature Climate Change

Observed acclimatization (Stockholm and France).

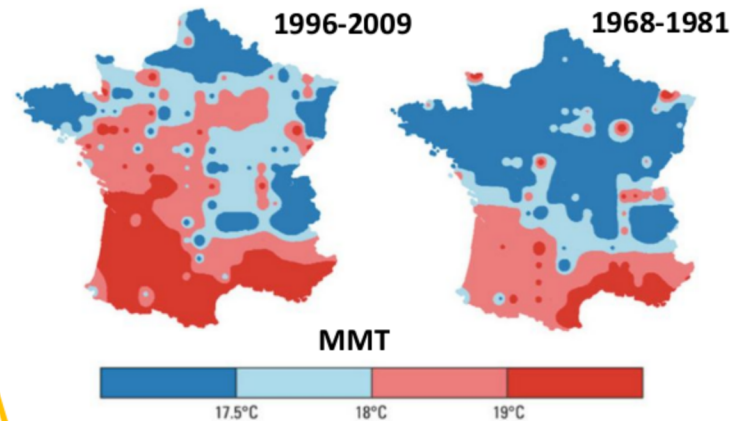


Åström et al, 2016 Environ. Health Perspect.

Adaptability limit to heat stress

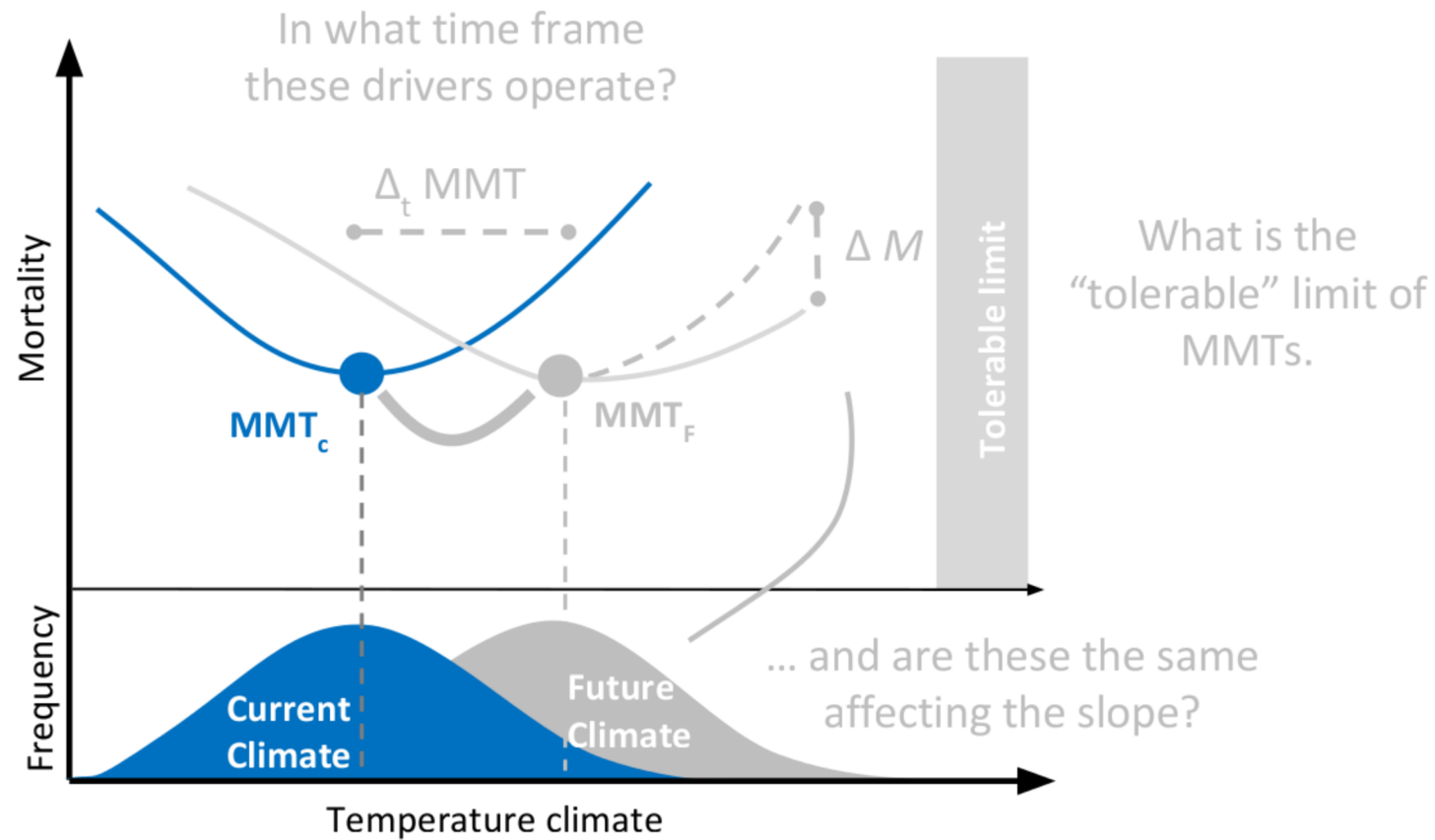


Sherwood and Huber, 2010 PNAS.



Barrett, 2015 Environ. Health Perspect.

Because advances are still needed...



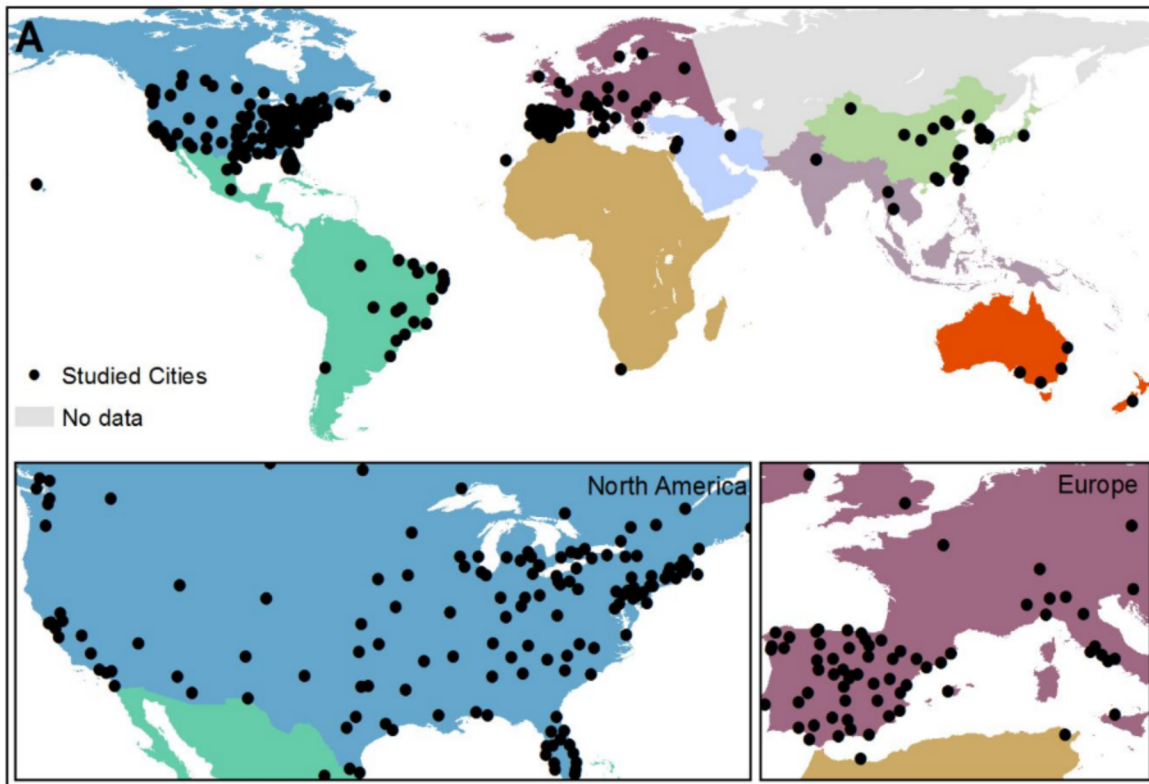
What is the "tolerable" limit of MMTs.

What drives regional changes in MMTs beyond climate?

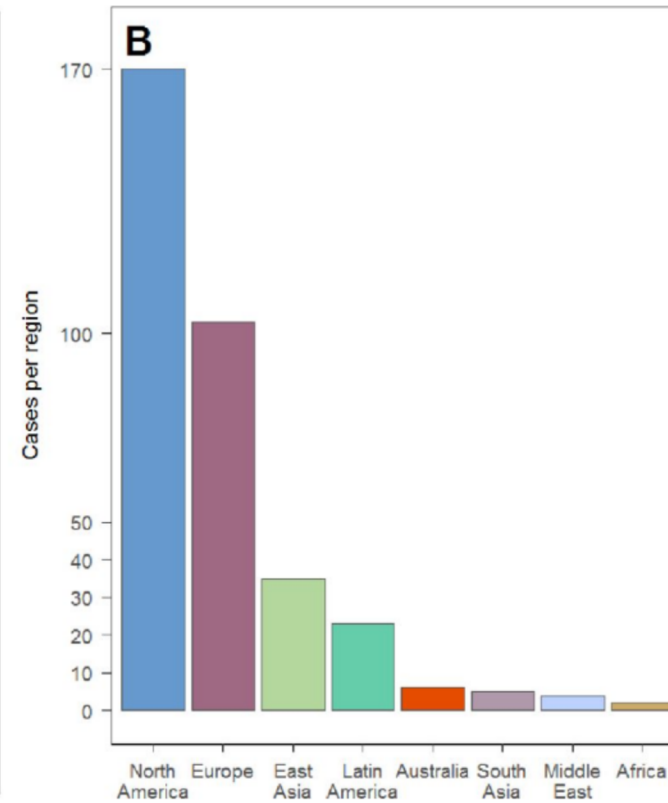
$$MMT = f(\text{climate}, ?, ?, ?)$$

Investigating present MMTs

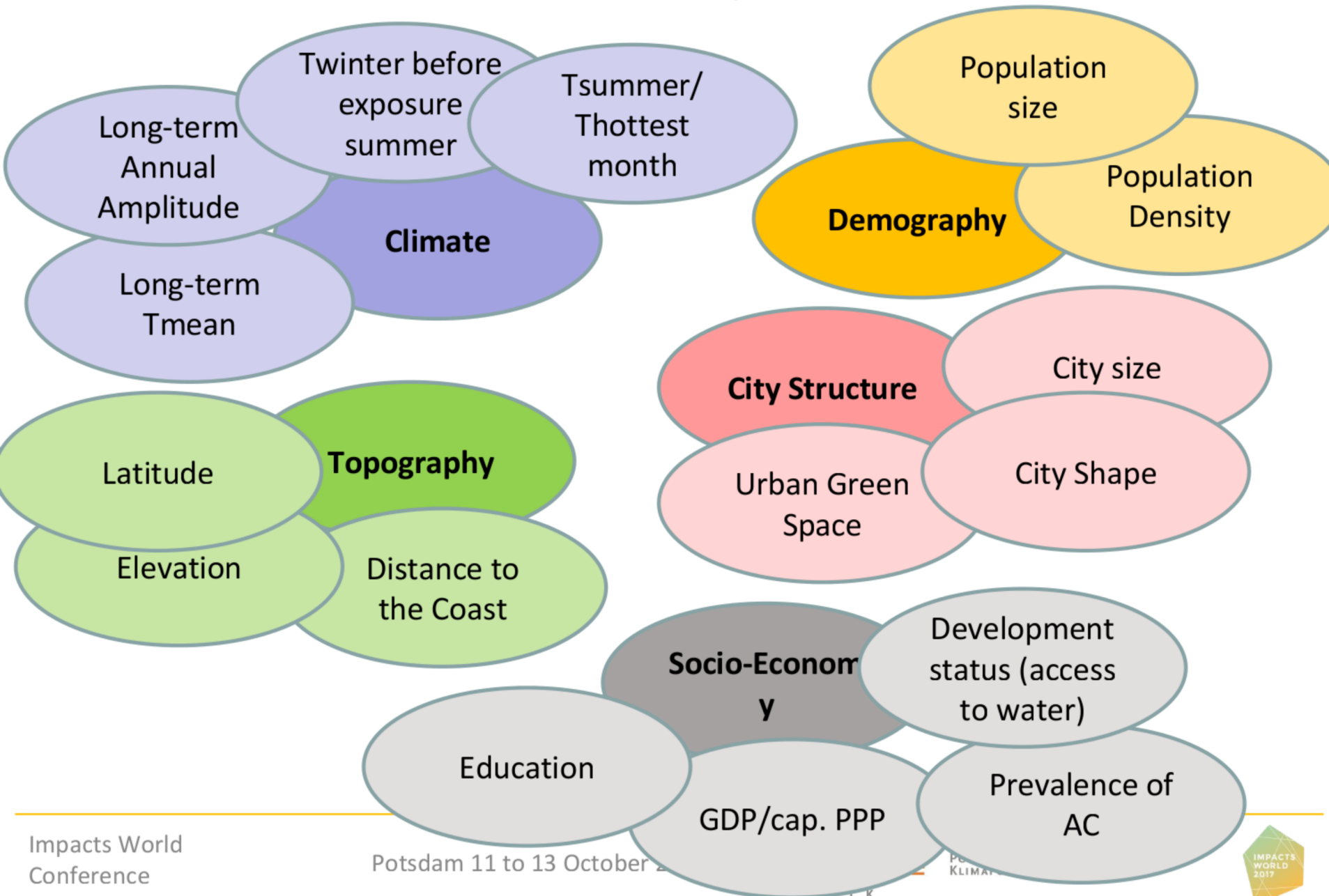
279 case study cities from literature (348 MMTs)



Regional distribution of case study cities.



Which factors drive present MMTs?



Experiments with models & variables showed...

- Multivariate non-linear regression and logistic curve fit (Eq. 1)

Eq. 1
$$MMTs = \frac{c - d}{1 + \exp(-z)} + d + \varepsilon$$

MMTs apparent (AT) Minimum Mortality Temperatures in °C

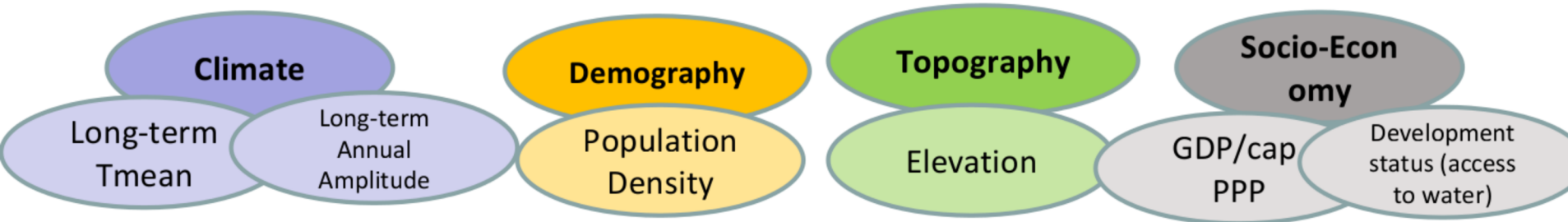
z

X_i, β_i independent variables and parameters

c upper asymptote

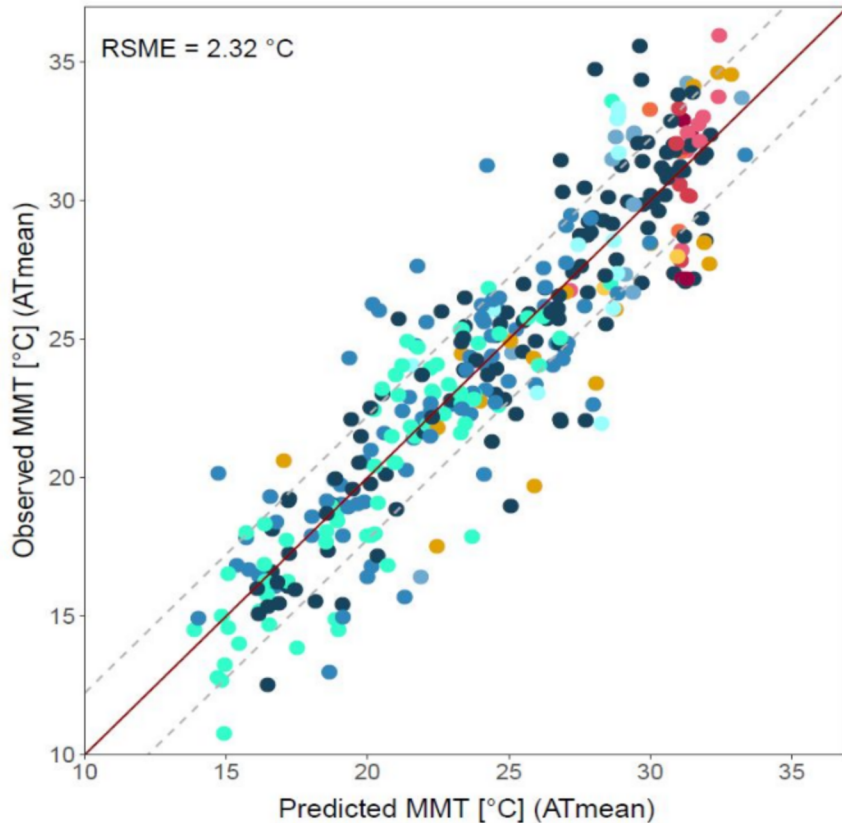
d lower asymptote

ε error term



Evaluation of suggested model

Observed versus predicted MMTs



Aggregated Climate Zones (based on Köppen Geiger)



MMTs from tropical cities

- Among highest MMTs
- Lowest Amplitude values paired with highest Tmean values

MMTs from subtropics/oceanic climates

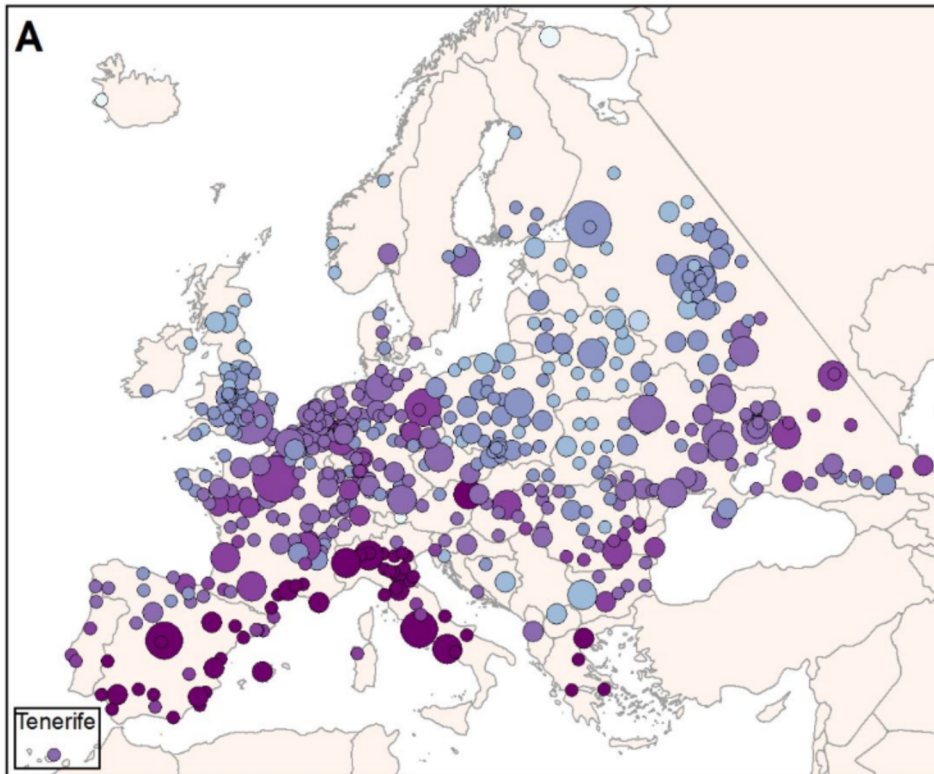
- All over the plot
- Mostly medium Amplitude and Tmean values

MMTs from continental cities

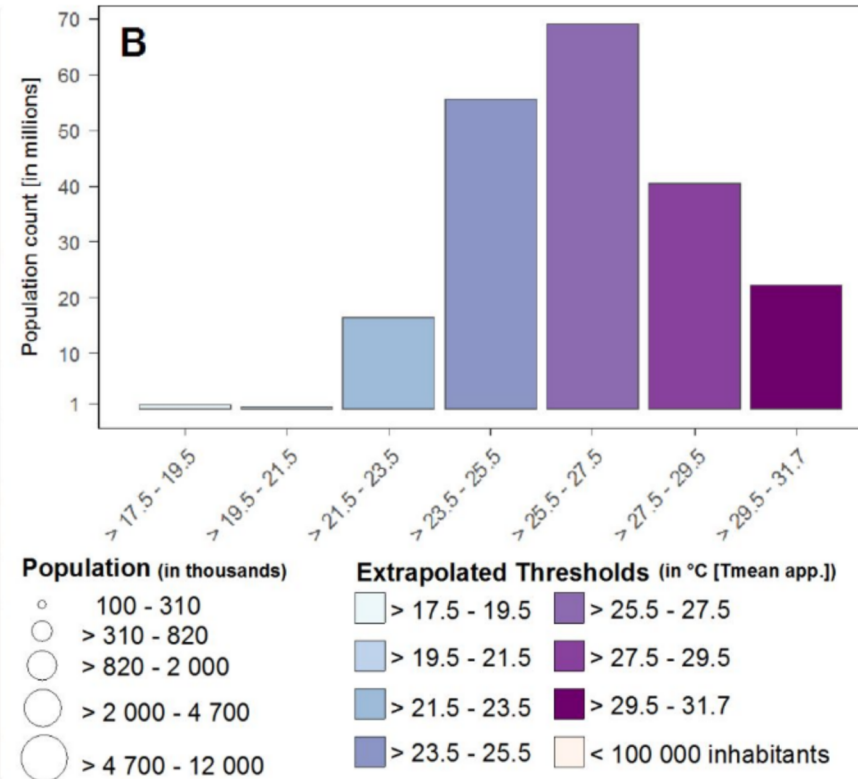
- Lowest MMTs but also in medium and few in the highest MMT range
- Highest Amplitude values
- Low or medium Tmean values

Estimation of present MMTs for European cities

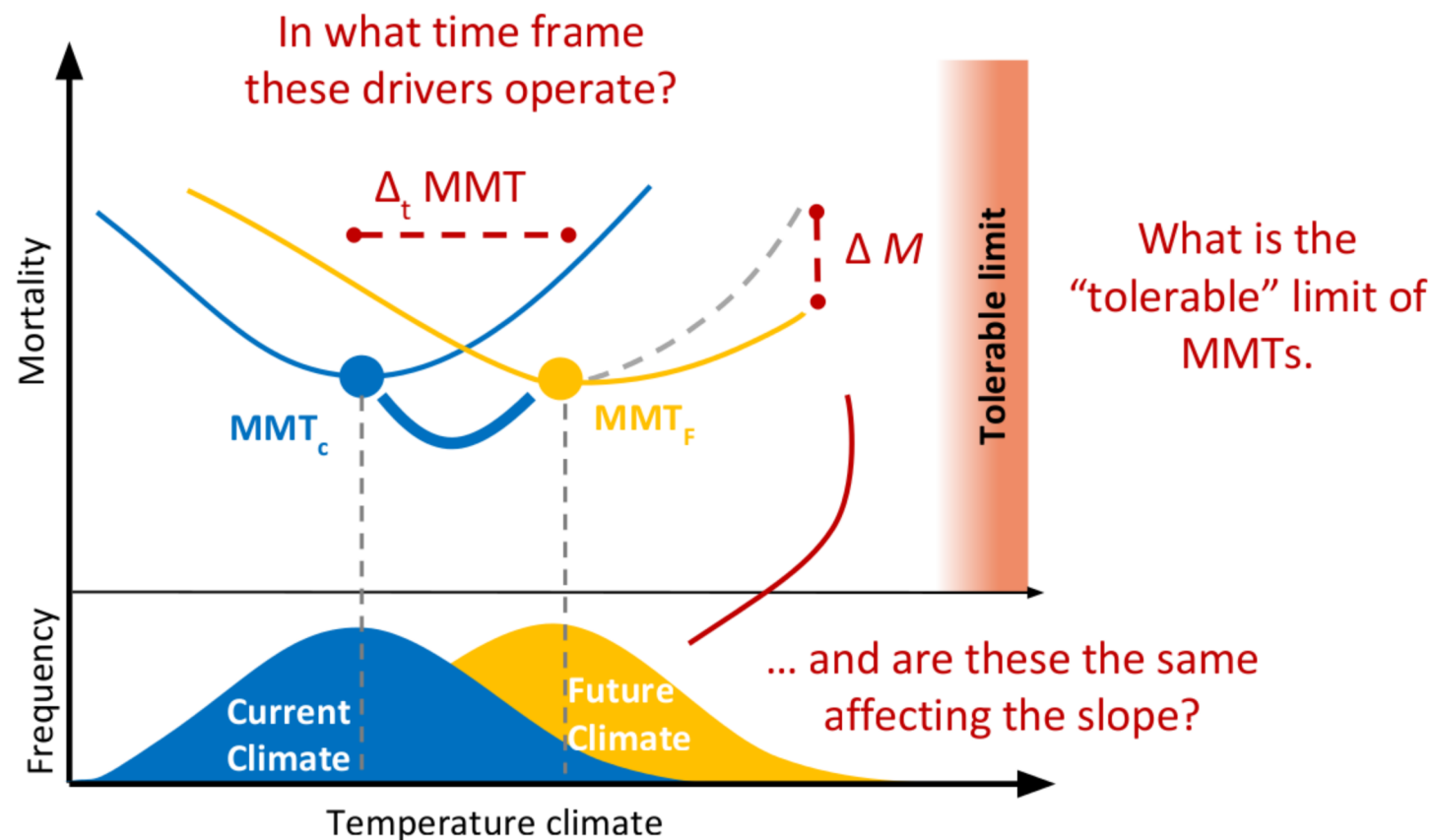
MMT estimates for ~600 major European settlements with population > 100 000)



Cumulative population per MMT class



Because advances are still needed...



What drives regional changes in MMTs beyond climate?

$$\text{MMT} = f(\text{climate, demography, topography, socio-economy})$$

112. Modelling the temperature-mortality relationship under changing climate and society.



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

Quantitative comparison of temperature-related mortality adaptation modelling methods – Simon Gosling

Future impact of heat on mortality in the Philippines, under a no-adaptation assumption – Xerxes Seposo

Evaluation of adaptation measures to heat in Switzerland: Changes in the temperature-mortality relationship between 1995 and 2013 and excess mortality during the warm summer of 2015 – Martina Ragetti

Workshop discussion : Driving forward the modelling of heat-mortality.