

# The Temperature-Related Mortality Case Study in Blue-Action

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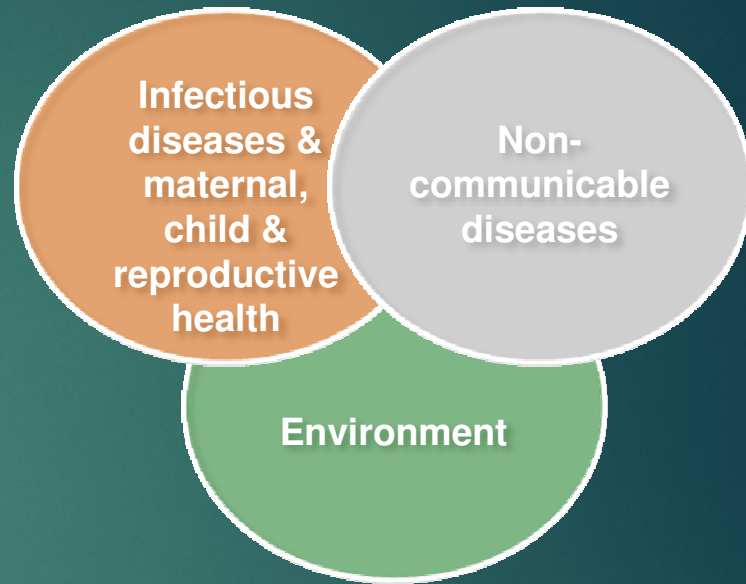
Blue-Action Kick-Off Meeting  
Berlin, Germany, January 19<sup>th</sup>, 2017

**ISGlobal** **Barcelona**  
Institute for  
Global Health



# Initiatives and Programs at ISGlobal

([www.isglobal.org/en/](http://www.isglobal.org/en/))



Urban Planning,  
Environment and  
Health Initiative



Chagas  
Initiative



Antibiotic  
Resistance  
Initiative



Malaria  
Elimination  
Initiative



Maternal, Child  
and Reproductive  
Health Initiative

# ISGlobal's Climate and Health Program

(former IC3's Climate Dynamics and Impacts Unit)

## Temperature-Related Mortality (TRM):

- Ballester et al. *Nature Communications* **2**, 358 (2011) –
- Ballester et al. *Nature Climate Change* **6**, 927-930 (2016) –

## Dengue:

- Lowe et al. *The Lancet Infectious Diseases* **14**, 619-626 (2014) –

## Cholera:

- Pascual et al. *Science* **289**, 1766-1769 (2000) –
- Rodó et al. *PNAS* **99**, 12901-12906 (2002) –
- Koelle et al. *Nature* **436**, 696-700 (2005) –

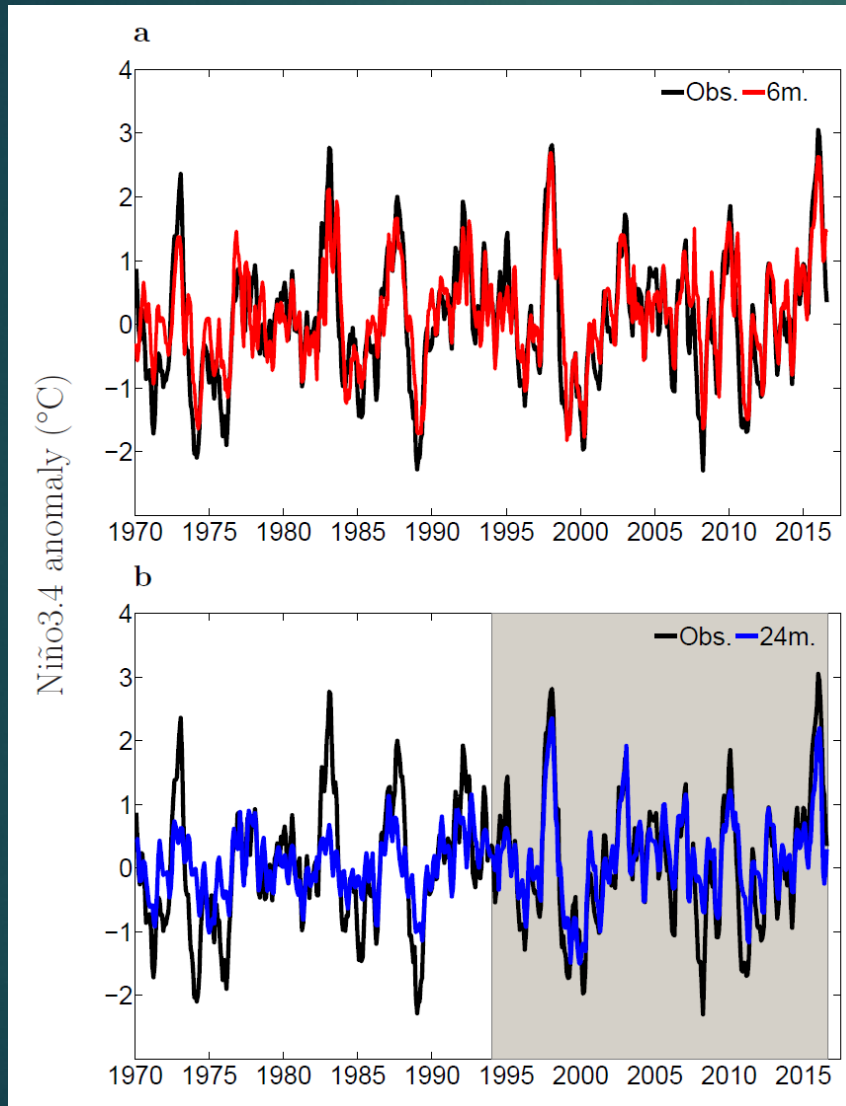
## Malaria:

- Cash et al. *Nature Climate Change* **3**, 502-507 (2013) –

## Kawasaki Disease:

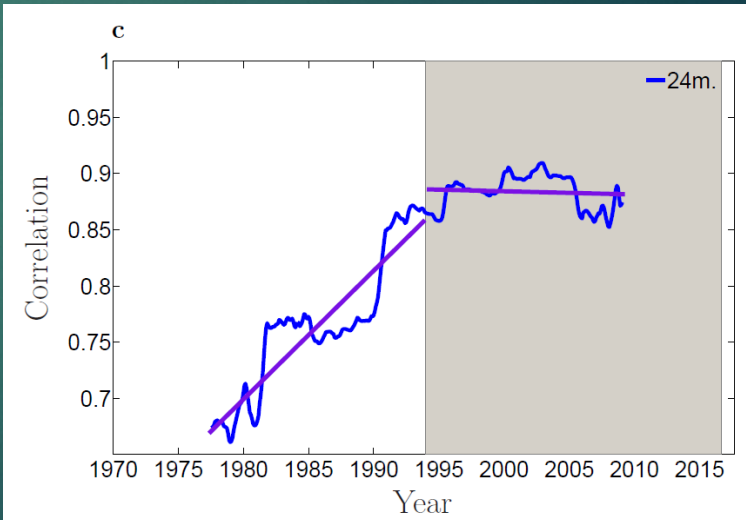
- Rodó et al. *Scientific Reports* **1**, 152 (2011) –
- Rodó et al. *PNAS* **111**, 7952-7957 (2014) –

# Climate predictability and health



Long-range retrospective  
statistical forecast  
of the Niño3.4 Index  
(not operational!).

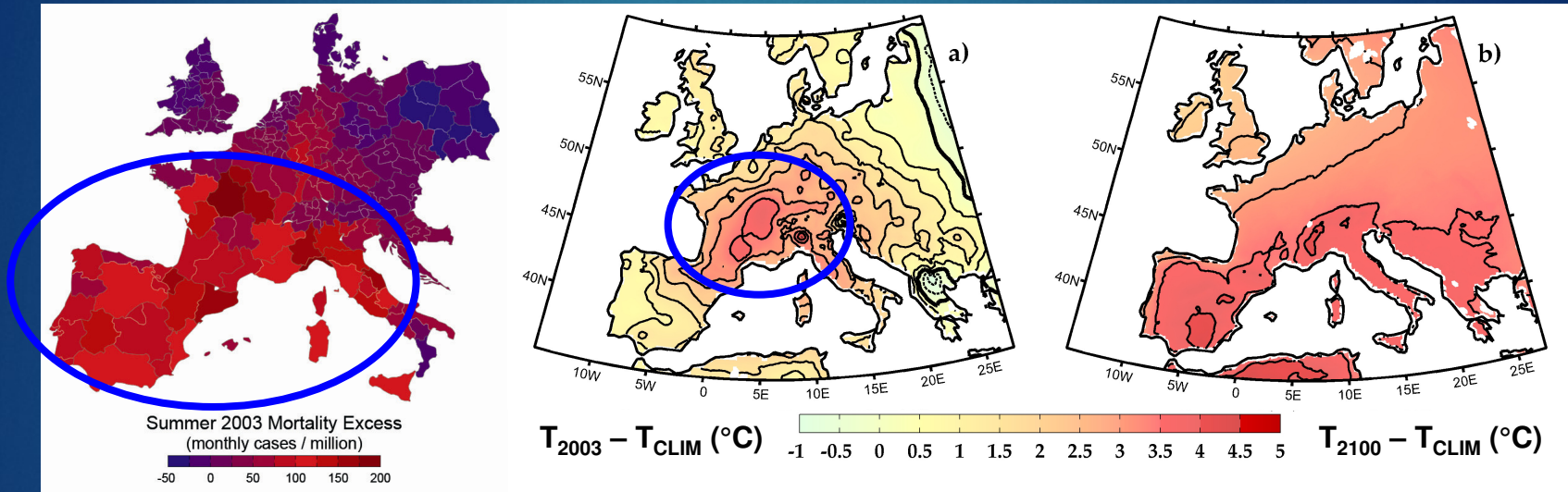
Petrova et al. (2016) J of Climate  
Petrova et al. (2017) Submitted





# The Summer 2003 Heat Wave

Ballester et al. (2011) Nature Communications



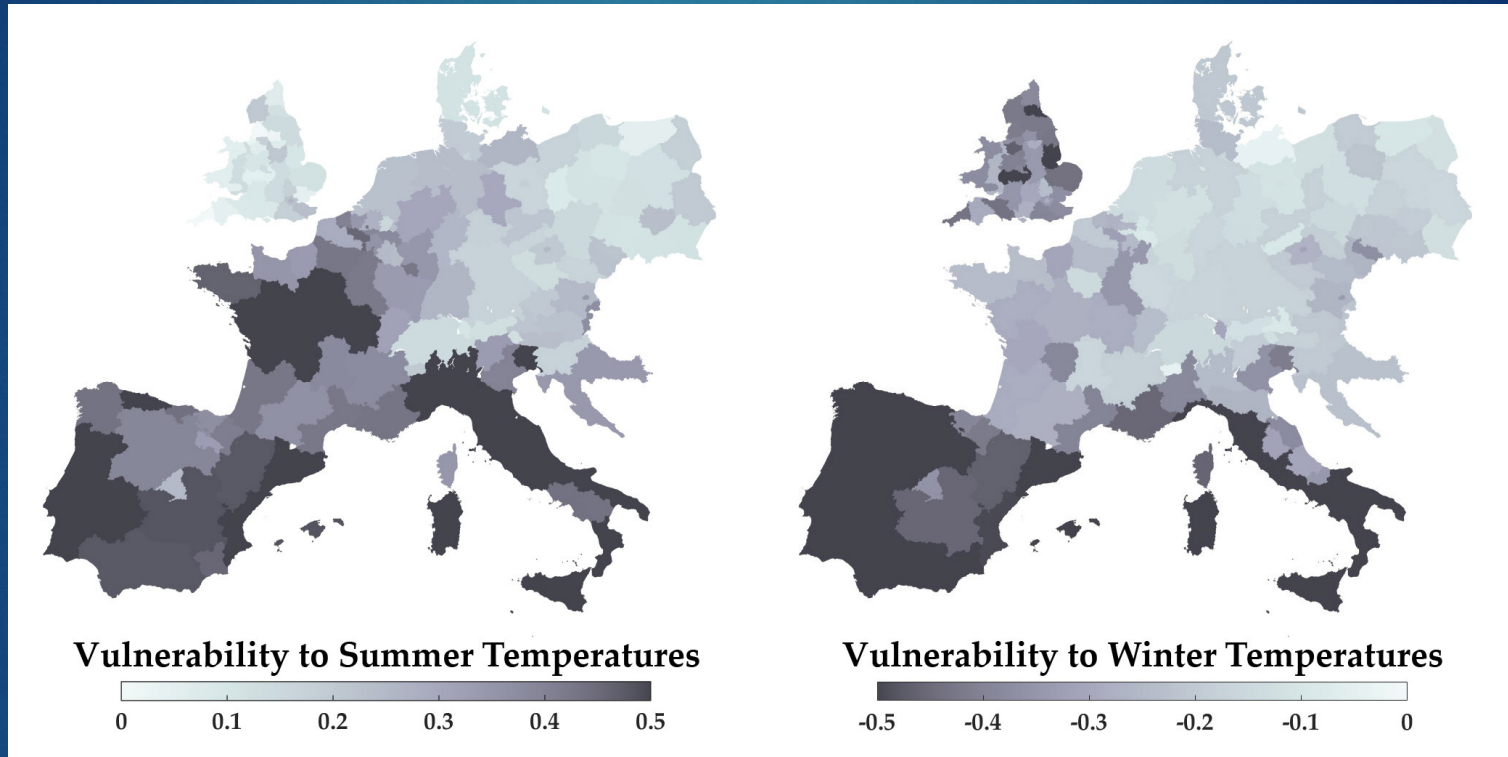
↑↑  
The record-breaking 2003 summer heat wave caused more than 70,000 additional deaths in western Europe.

↑↑  
The centre of the heat wave was in France and Switzerland, but most of the excess mortality occurred in Spain (13.7%), France (11.8%) and Italy (11.6%).

↑  
The temperature anomaly was weaker than the projected for the end of the century.

# The Importance of Preventive Plans

Ballester et al. (2016) Nature Climate Change



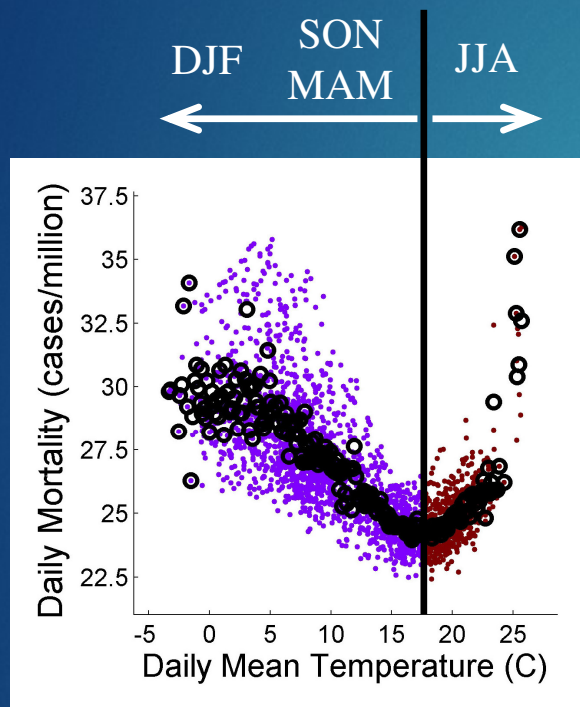
Global warming and changes in extreme events challenge public health services.

**Preventive plans do save lives:** up to 4400 deaths in France during the 11-26 July 2006 heat wave (Fouillet et al. 2008).

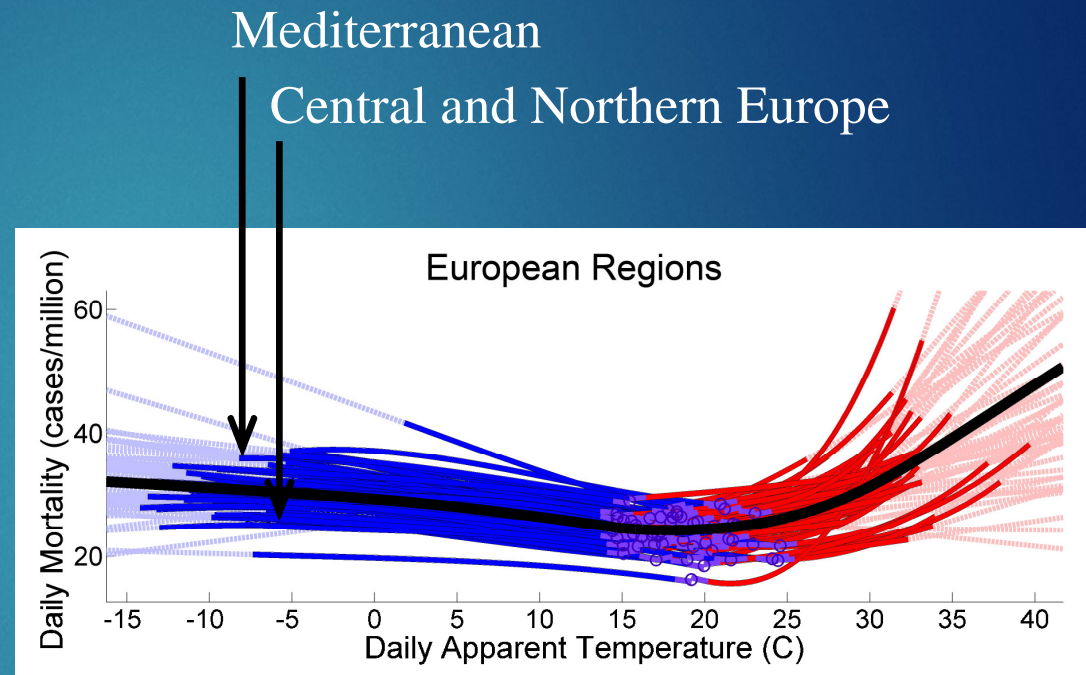
Seasonal climate forecasting provides an opportunity to anticipate TRM.



# Temperature-Mortality Relationship

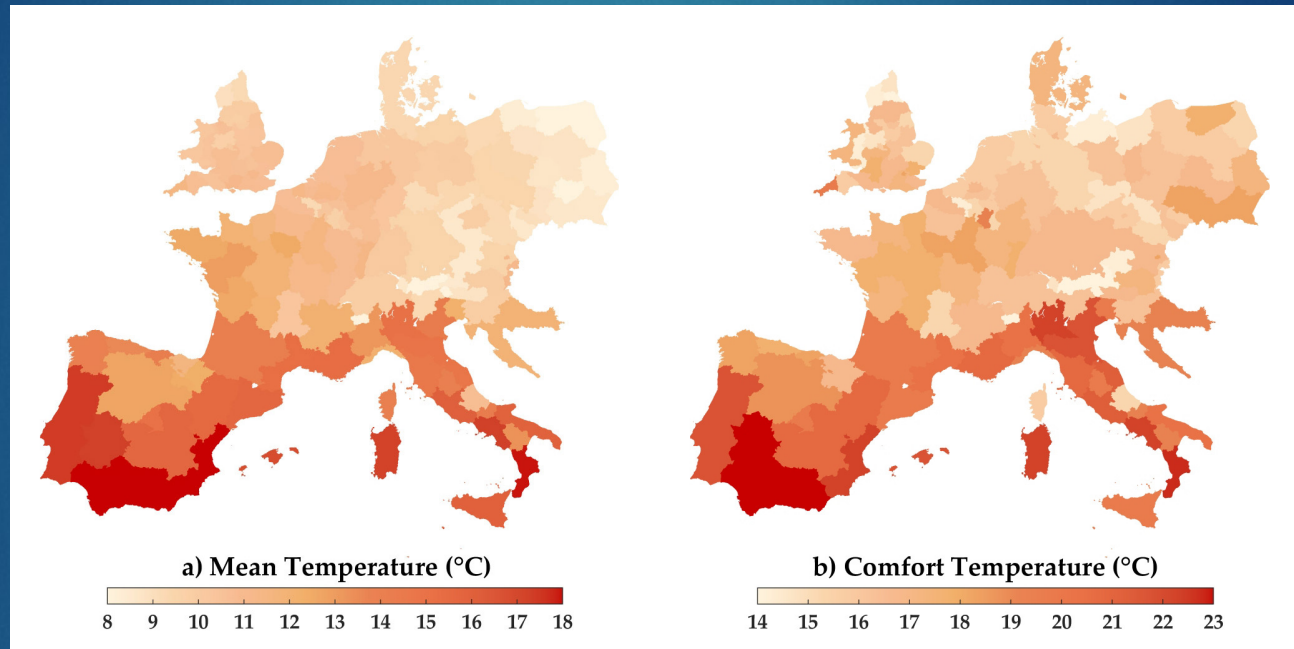


Mortality increases for temperatures colder and warmer than the comfort temperature



The characterization of the T/M relation in 166 regions allow the generation of a pan-European early warning system of heat stress risk

# The Mortality Dataset in Europe



Daily numbers of deaths are available for 166 NUTS2 regions in 16 countries.

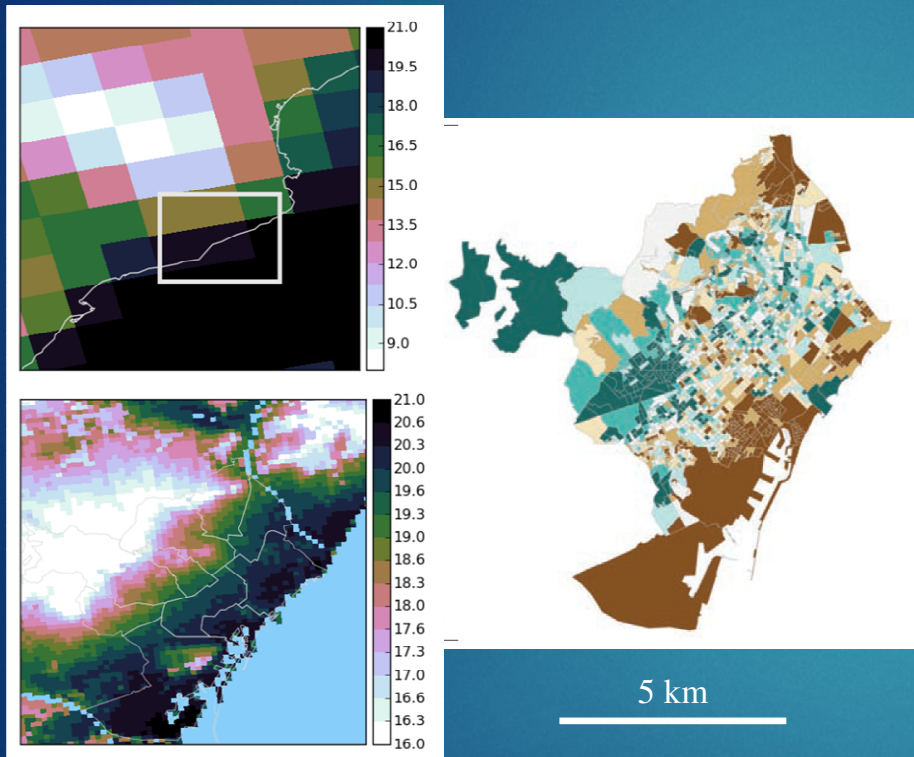
The dataset initially covered the 1998–2005 period,  
it has been recently updated to 1998–2010.

The updated database contains 51,058,802 deaths.



# H2020 PUCS: Towards Local Scales

(SC5-01-2016-2017: Exploiting the added value of climate services, Demonstration of climate services, mid 2017 – end 2019)



**En période de canicule, il y a des risques pour ma santé, quels sont les signaux d'alerte?**

Crampes

Fatigue inhabituelle

Fièvre > 38°C

Vertiges / Nausées

Si vous voyez quelqu'un v d'un malaise, **appelez le**

**À partir de 60 ans ou en je peux bénéficier personnalisé. Il me suffit de mon Centre Communal**

**En période de canicule, quels sont les bons gestes?**

JE BOIS RÉGULIÈREMENT DE L'EAU

Je mouille mon corps et je me ventile

Je mange en quantité suffisante

J'évite les efforts physiques

Je ne bois pas d'alcool

Je maintiens ma maison au frais : je ferme les volets le jour

Je donne et je prends des nouvelles de mes proches

**ATTENTION**  
 Je suis particulièrement concerné si je suis enceinte, j'ai un bébé ou je suis une personne âgée. Si je prends des médicaments : je demande conseil à mon médecin ou à mon pharmacien.

Urban Climate Model  
 (VITO's UrbClim)  
 +  
 Mortality in Barcelona

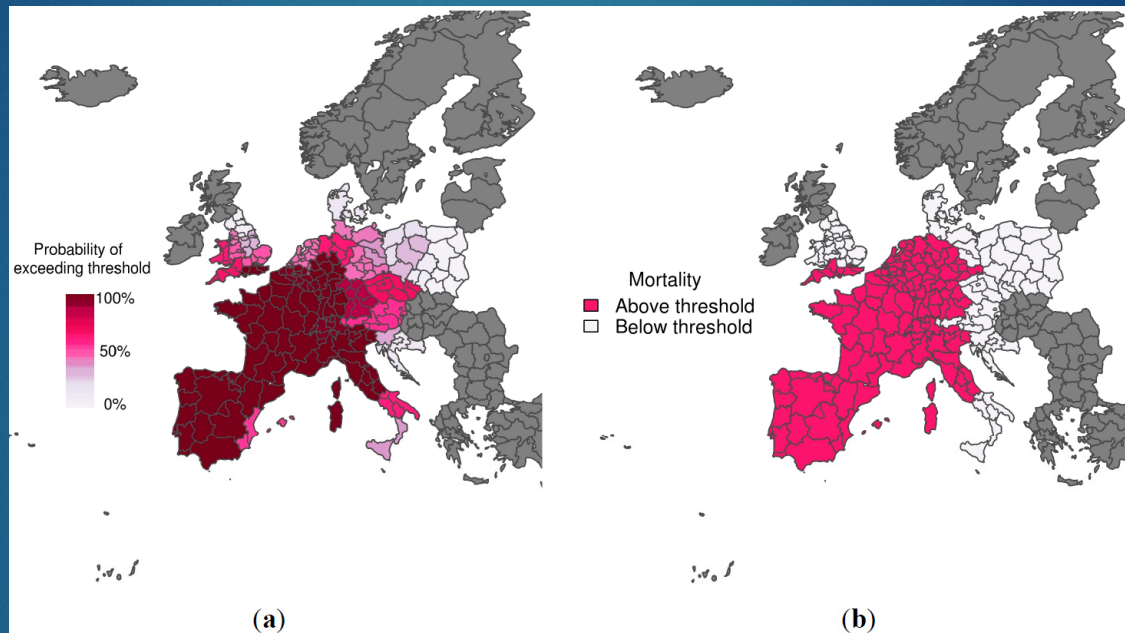


Early Warning System  
 of Local Heat Stress

# Early Warning System in EUPORIAS

([cmtool.euporias.eu/en/](http://cmtool.euporias.eu/en/))

Example:  
August 1-15, 2003



**Figure 2.** (a) Probabilistic map of exceeding emergency daily mortality thresholds (75th percentile of daily mortality distribution in the warm tail); (b) Corresponding observations during a heat wave scenario (1–15 August 2003). The graduated colour bar represents the probability of exceeding the mortality threshold (ranging from 0%, pale colours, to 100%, deep colours).



Lowe et al. (2015)  
IJERPH

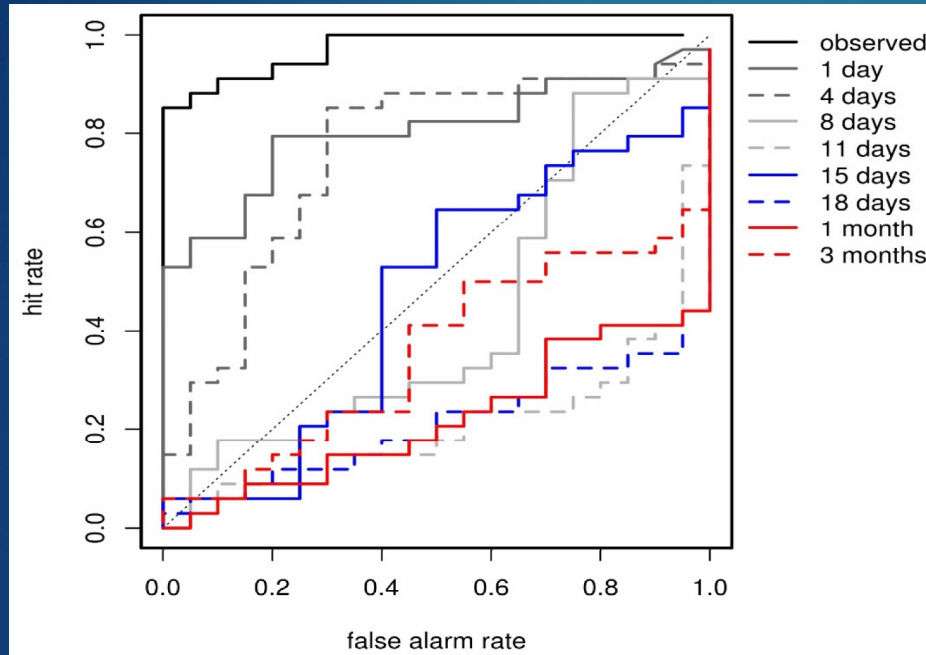
First step: retrospective probabilistic predictions using climate observations.

The predicted probability of exceeding the emergency threshold mimics the observed pattern.

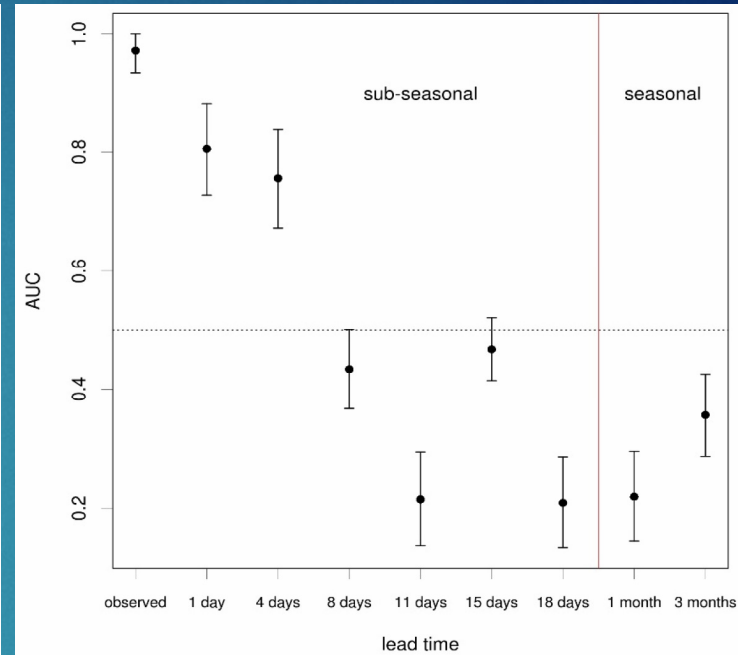


# Early Warning System in EUPORIAS

([cmtool.euporias.eu/en/](http://cmtool.euporias.eu/en/))



Example: August 1-15, 2003



Lowe et al. (2016) IJERPH

Second Step: retrospective probabilistic predictions using S2S climate forecasts.

Decreasing transition in skill between

- i) excellent predictions when using observed temperature
- ii) to predictions with no skill when using forecast temperature beyond one week.

Climate predictability is the major limiting factor.

# Climate Data Needs

Temporal resolution: Daily.

Spatial resolution:

0.50° is fine, 0.25° would be perfect.

Variables: Daily Mean 2m Temperature and Relative Humidity (or Dew Point Temperature).

Optional variables: Surface Winds and Daily Maximum/Minimum 2m Temperature.

Forecast lead time: From 1 day to 3 months.

It would be great if multiple lead times are available.

Target seasons: All, but preferentially JJA.

Hindcasts: Yes, please!

Domain: Europe (15°W-25°E, 35°N-60°N).

Please avoid huge global files.



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Thanks!

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