IMPACT OF CLIMATE CHANGE ON HEATSTRESS RELATED MORTALITY IN LISBON, PORTUGAL: A 2FUN CASE STUDY

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INTRODUCTION

The observation that major causes of ill health exhibit distinct seasonal patterns suggests a priori that weather and/or climate influence their distribution and incidence. Preventing additional morbidity and mortality from climate variability requires developing and deploying adaptations that include specific consideration of climate change risks. The increasing extent and rate of climate change means it is expected to be a major health issue for decades to come.

In this study we investigated the potential impact of climate change on heat stress related mortality in Lisbon.

METHODS

We used a generalized estimating equations(GEE) approach to model the relationship between maximum temperature and daily mortality in the warm season. For the models, we had an outcome variable and several covariates, observed day by day for each summer. The relationship between maximum temperature and mortality was defined by two parameters: the threshold and the slope above the threshold. The threshold indicates the value of temperature above which the heatstress is observed. The percent increase in mortality above the threshold, the slope, was the measure of effect estimate.

To evaluate the impact of heatstress in future, downscaled future climate scenarios were developed specifically for the study region. For assessment of the attributable deaths to heat exposure, we used the method developed by Campbell-Lendrum et al. (2007). We estimated the fraction of annual deaths that could be attributed to maximum temperatures in Lisbon at the baseline period (1961-1990), and at 2040-70 under alternative emission IPCC SRES scenarios.

RESULTS

The relationship between maximum temperature (lag0-3) and log mortality rates were J shaped, this indicated an excess of risk for exposures to temperature above the city heat threshold (Figure 1). For Lisbon the estimated threshold was 29.3˚C (28.9, 29.7). The percent change in all-cause mortality per degree of above-threshold were 5.6% (95% CI: 4.6; 6.6) in Lisbon for the all-ages group and stronger associations were observed for respiratory diseases (Table 1). In the future climate scenarios evaluated the number of attributable deaths due to elevated temperatures is expected to increase in relation to the baseline number (Figure 2).

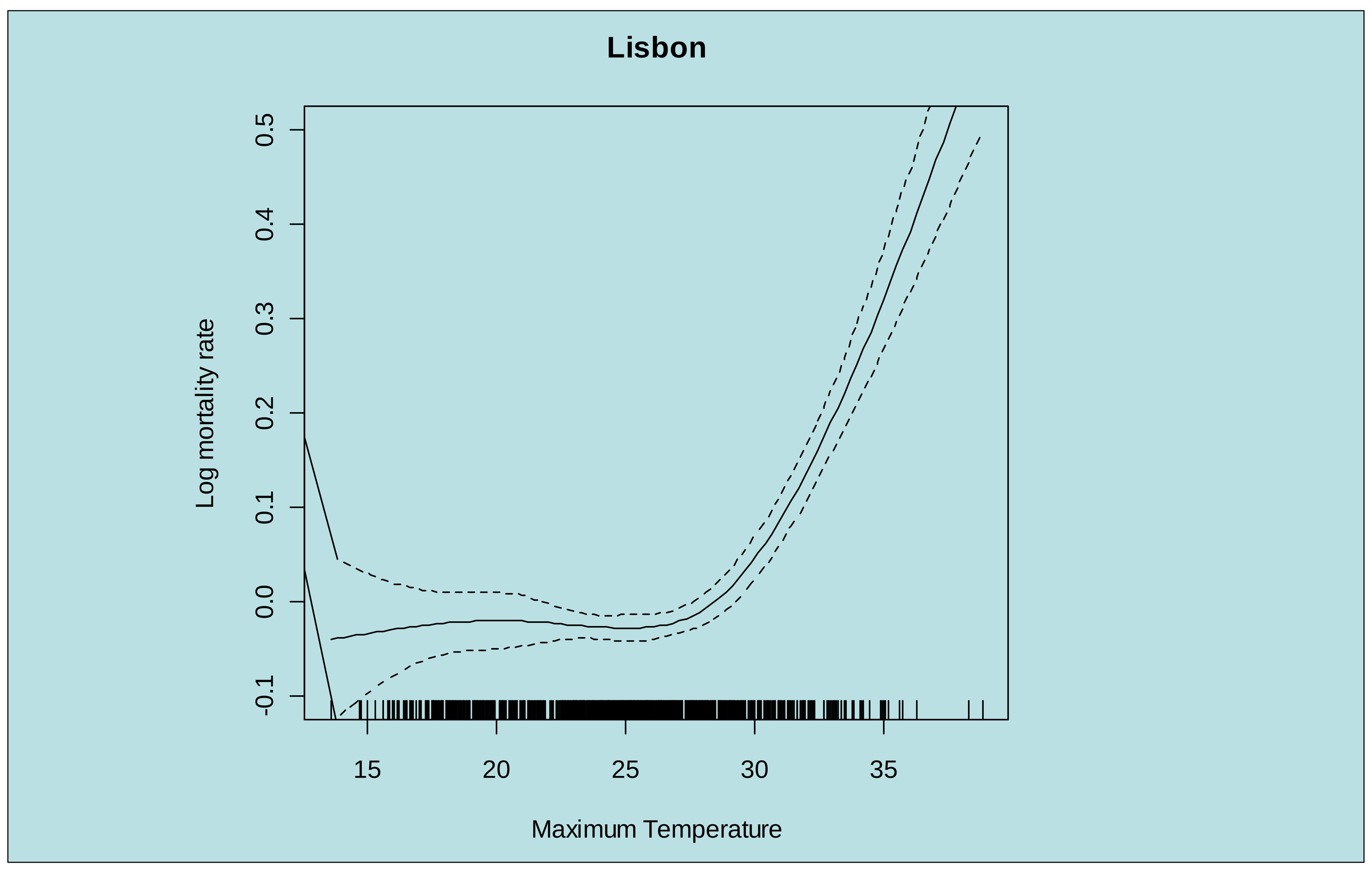

Figure 1 - Exposure-response curve (dashed lines: 95% confidence bands) of maximum temperature (lag 0-3) and daily all-causes mortality, all ages, during the warm season (April-September).

Table 1 – City-specific thresholds of maximum temperature in the warm season (April to September) and percent increase above the heat threshold in Lisbon.

	Lisbon	95% CI
Threshold	29.3	28.9, 29.7
All-ages	5.6	4.6, 6.6
15 - 64	2.1	0.1, 4.2
> 65	6.6	5.5, 7.7
Cardiovascular		
All-ages	8.5	6.59, 10.47
15 - 64	2.5	-2.82, 8.05
> 65	9.2	7.18, 11.23
Respiratory		
All-ages	8.9	5.28, 12.83
15 - 64	4.9	6.07, 17.30
> 65	9.5	5.66, 13.45

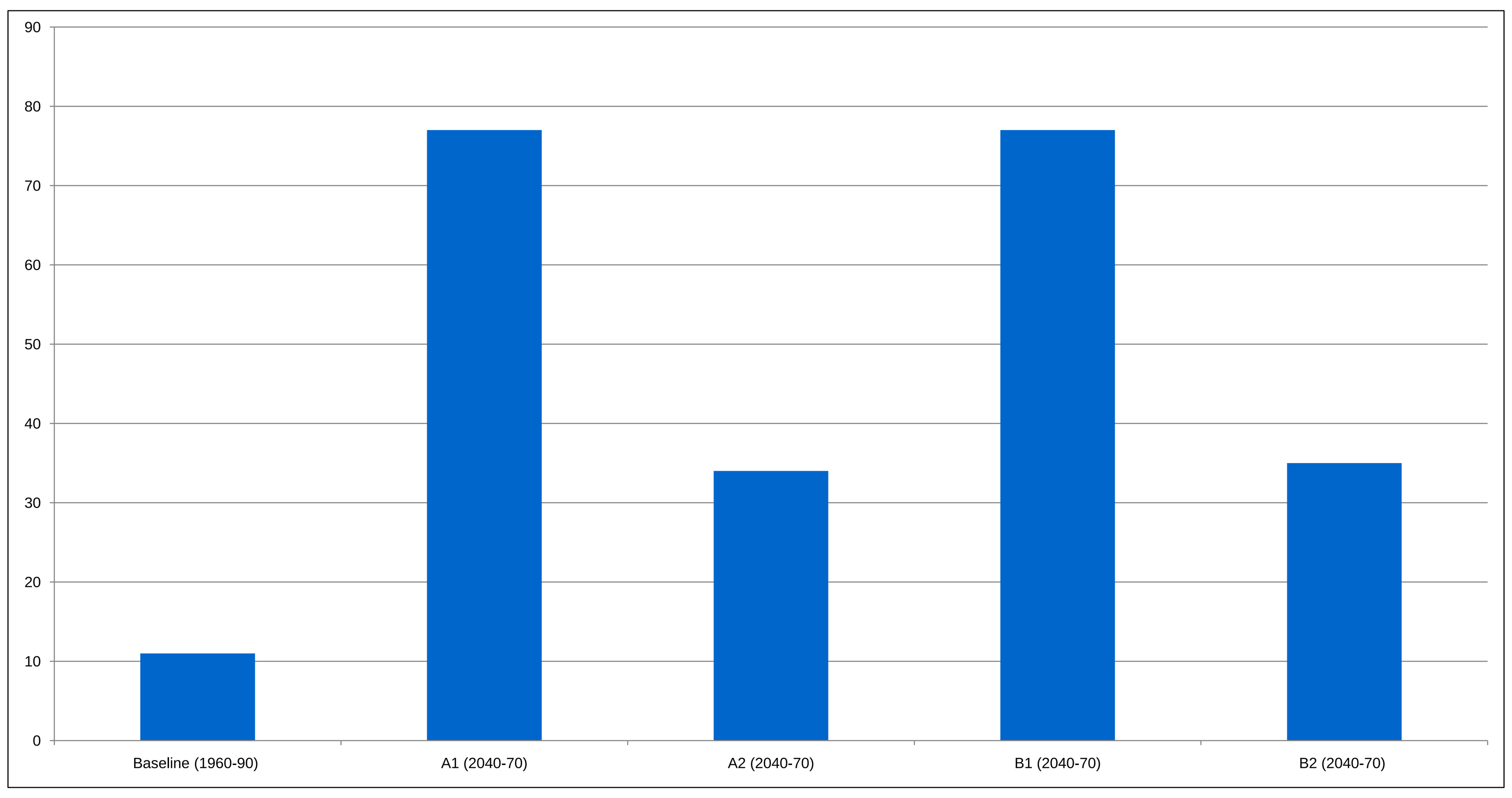

Figure 2 - Estimated annual number of deaths due to high temperatures in all-ages group at the baseline period and in different climate scenarios.

DISCUSSION AND CONCLUSION

Heatstress exposure health effects are and will remain important determinants of health in Portugal under climate change. Research needs include estimating exposure to temperature extremes, evaluation of efficacy of adaptation measures and improving effectiveness of plans to reduce exposure of population to climate risks.

REFERENCES