

Asthma hospitalisations and heat exposure in England

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Outline

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Introduction

Asthma burden

- ▶ 3rd cause of death, 3.17 million deaths in 2019 globally.
- ▶ 12% of UK the population is living with asthma.
- ▶ Asthma exacerbations: cold air, air pollutants and allergens.
- ▶ The role of temperature is unclear.

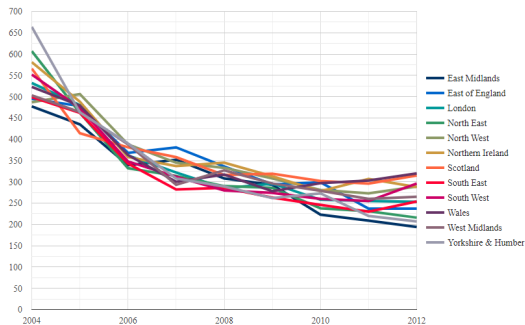
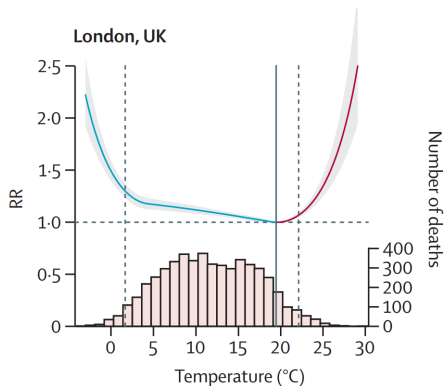


Figure 1: Incidence per 100,000 people

Temperature

- ▶ Typically U-shaped relationship between temperature and health.
- ▶ Cold, dry air or hot air can trigger a flare-up.
- ▶ Different confounding, different lags across different temperatures.
- ▶ This study focuses on warm temperatures.



Previous studies

Authors	Aggregation	Country	Confounders	Effect
Zhang et al 2014	city & daily	Shanghai	weather, air pollution	0.90 (0.80, 1.01) at 75th vs 50th
Lam 2016 et al	city & daily	Hong Kong	weather, air pollution	1.19 (1.06, 1.36) at 30°C vs 27°C
Wu 2021 et al	individual	Brazil	no adjustment	1.0% (0.7%, 1.4%) per 1°C

- ▶ Spatial & temporal aggregation
 - ▶ Exposure varies on high resolution.
 - ▶ Insufficient adjustment for confounding (for instance physical activity).
 - ▶ Ecological bias
- ▶ One study individual data, but did not account for confounders

Methods

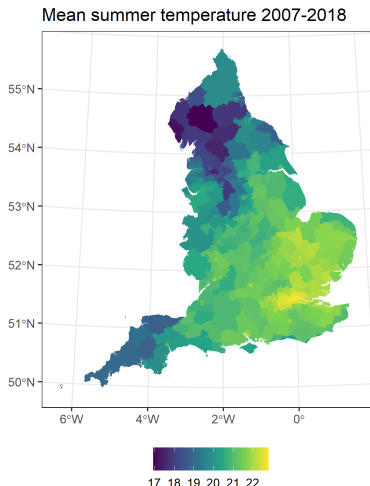
Outcome and Exposure

Outcome

- ▶ NHS digital & SAHSU.
- ▶ Asthma hospitalization (ICD10 J45-46) 2002-2019.
- ▶ Individual data/ 100m grid spatial resolution.
- ▶ Summer months.

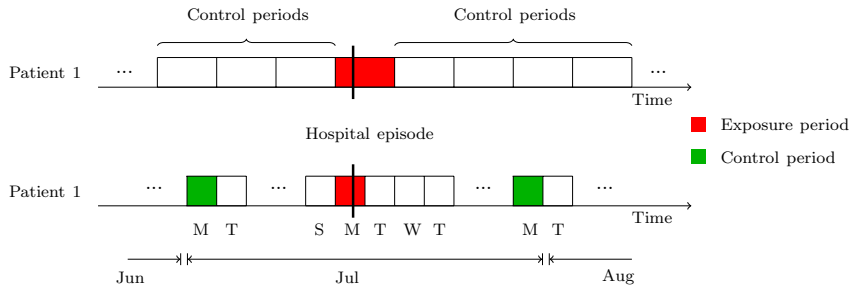
Exposure

- ▶ Daily mean temperature 2002-2018 at 1km grid from MetOffice.
- ▶ lag0-3.

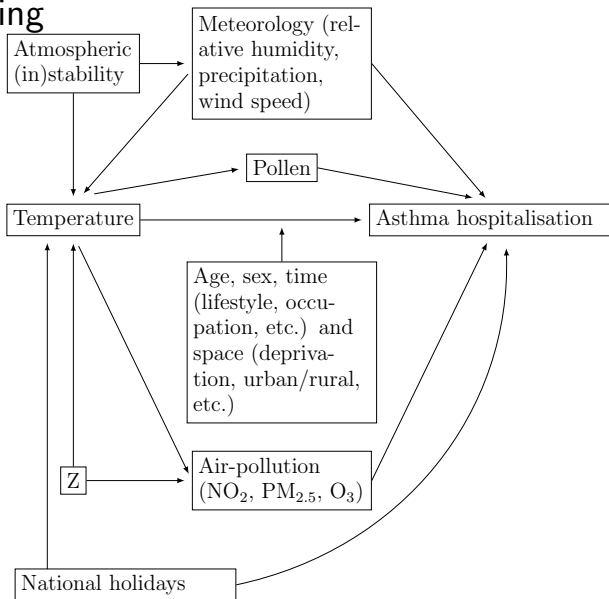


Case cross-over design

- ▶ Epidemiological study design for transient environmental exposures
- ▶ Sample from same month and days
- ▶ Exposure period 0-2 days before the hospital episode (mean temperature)



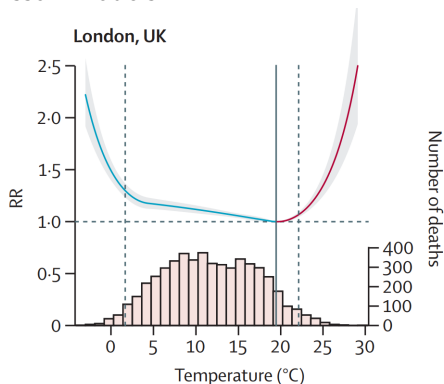
Confounding



Statistical analysis

Bayesian hierarchical conditional Poisson models:

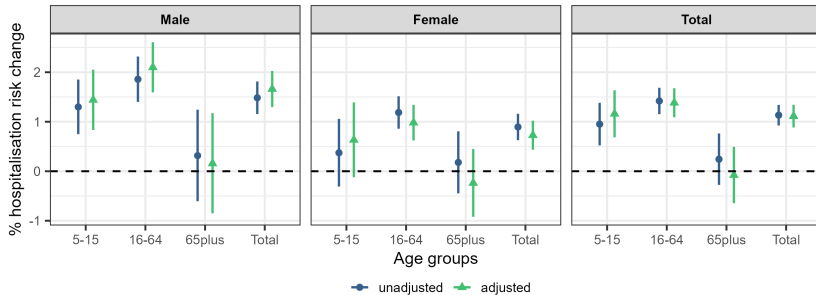
- ▶ Step 1. Check if effect linear (random walk of order 2)
- ▶ Step 2. Examine how the effect varies by age and sex (stratified analysis)
- ▶ Step 3. Examine how the effect varies by space and period (stratified analysis)



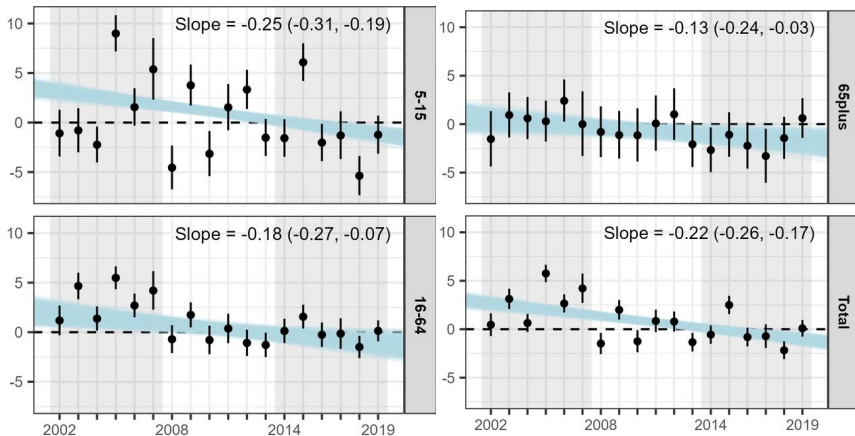
Results

Overall effect

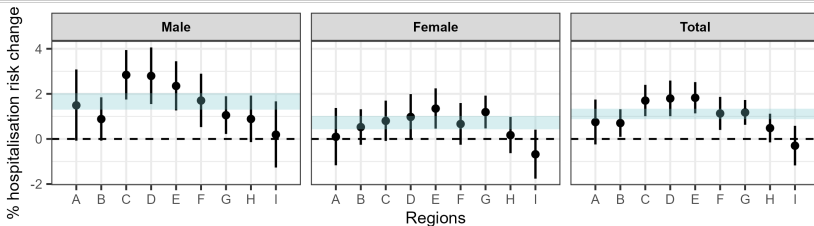
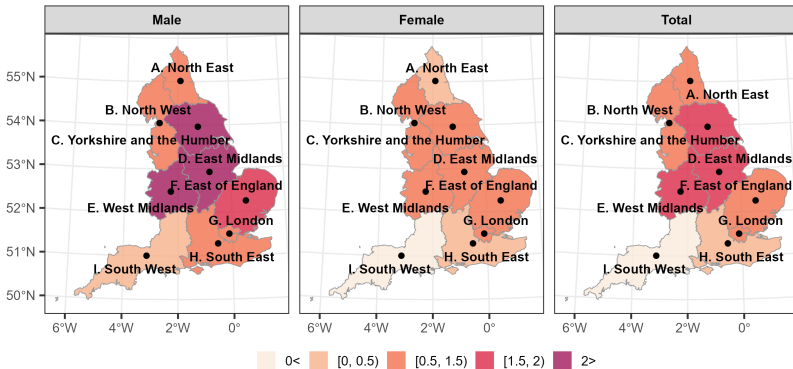
- ▶ The effect was found to be linear.



Asthma: Temporal effect modification



Spa



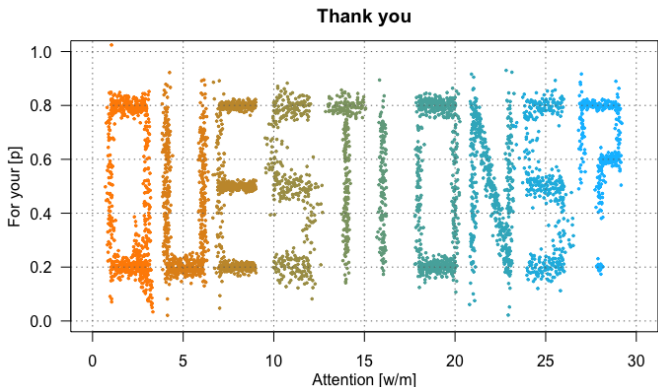
Discussion

Summary of the results – Take home message

- ▶ 1.11% (0.88% to 1.34%) for every 1°C increase in warm temperatures.
- ▶ The effect was highest for males aged 16-64 and during 2002-2006.

Take home message

The effect of warm temperatures on asthma hospitalisation has attenuated over time suggesting potential adaptive mechanisms to heat exposure or differences in behaviours, lifestyle, comorbid conditions, other environmental exposures and occupation over time.



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