Mat Heal, School of Chemistry, University of Edinburgh

Surface ozone distributions (focus on human health)

- All in collaboration: UoE GeoSciences, CEH, LSHTM, St. Georges, Strathclyde, Public Health England,…

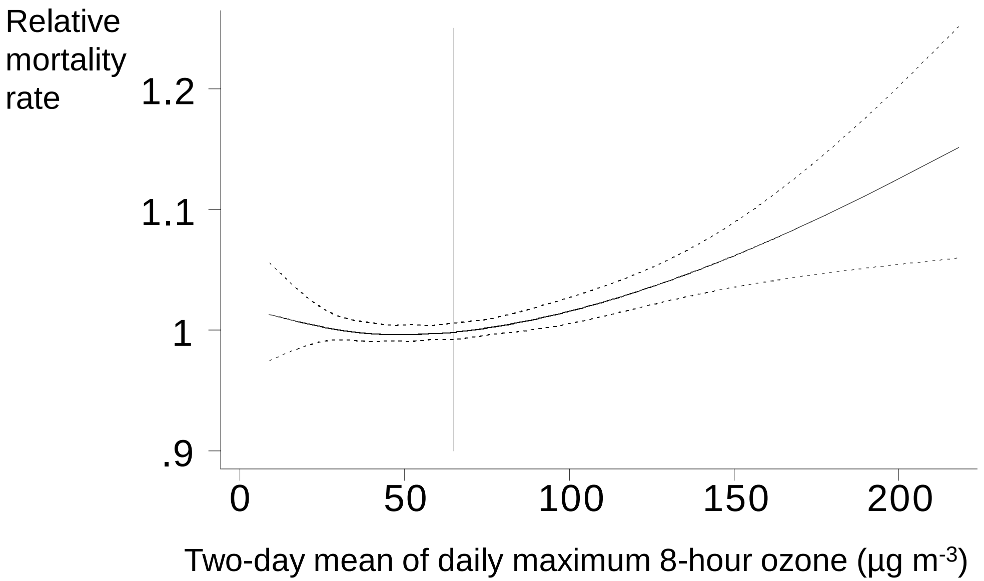
- From small spatial scale (intra-urban) to UK and regional

- For health epidemiology and for health impacts assessment

- Via monitor, model and (in the future) fine spatial scale measurement

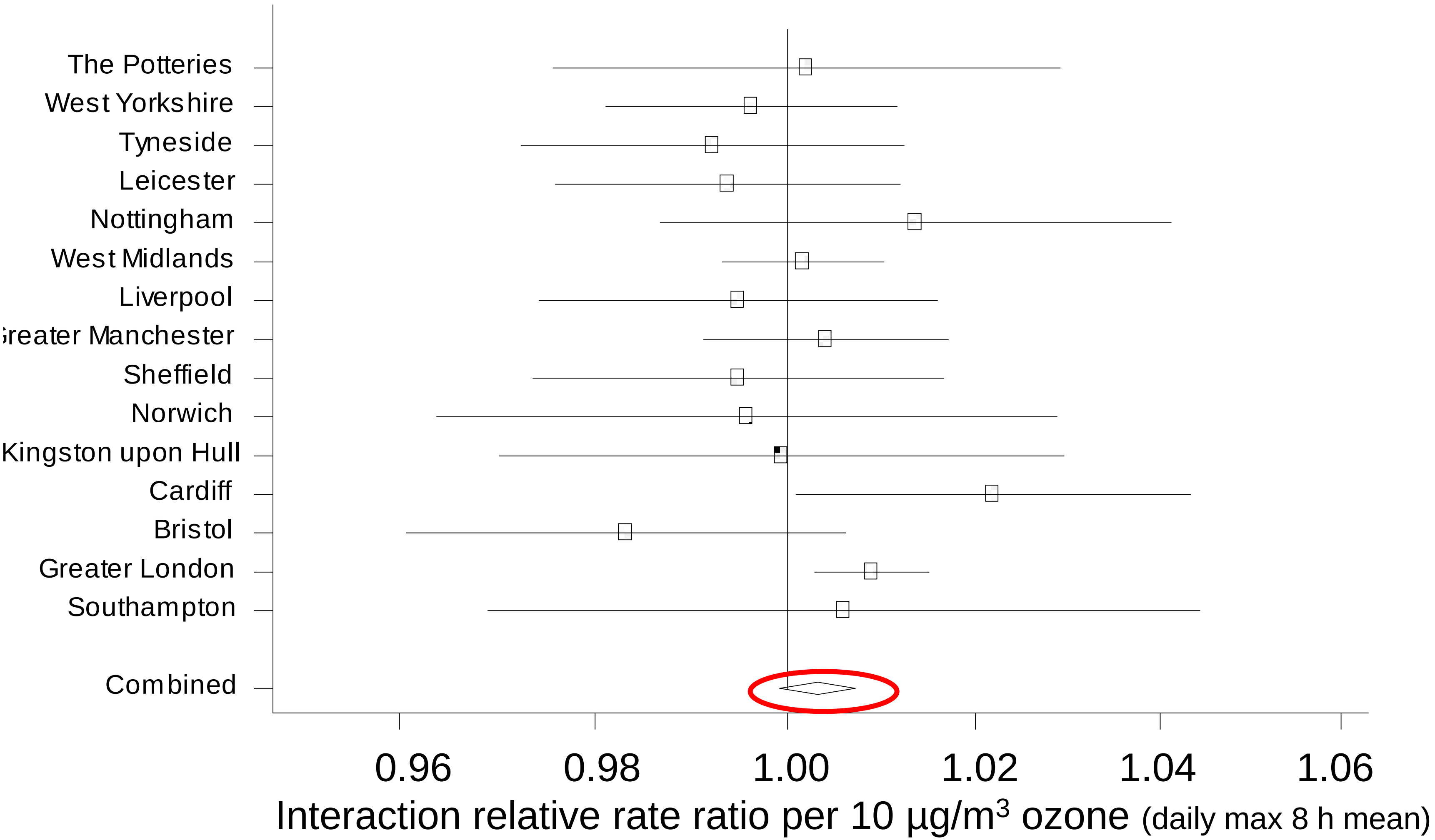
Ozone and mortality time series: UK results

- 0.3% ($p < 0.01$) mortality increase per 10 μg m^{-3} daily max 8-h ozone
- Spline curve of response suggests threshold at ~65 μg m^{-3}



Pattenden et al. (2010) Ozone, heat and mortality: acute effects in 15 British conurbations, Occup. Env. Med. 67, 699-707

Extra ozone effect on hot days?



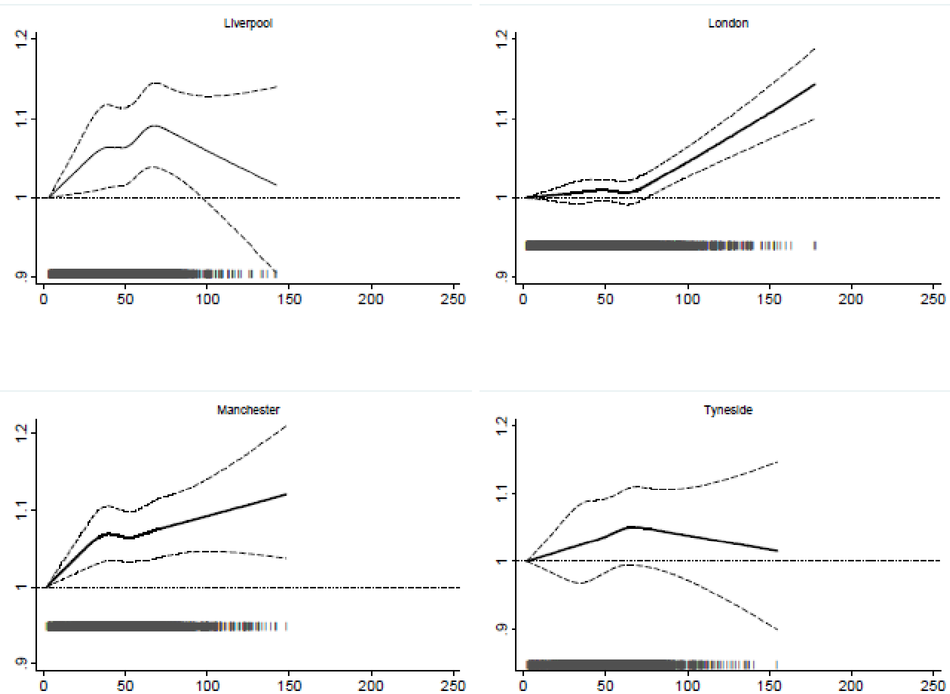
0.3% extra multiplicative (interaction) effect of ozone on hot days (p = 0.12)

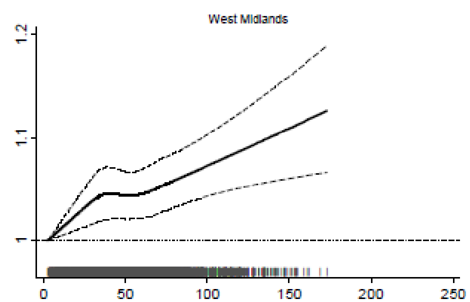
95% CI: 0.999-1.007

Atkinson et al. (2012) Concentration–response function for ozone and daily mortality: results from five urban and five rural UK populations, Env. Health Persp. 120, 1411-7

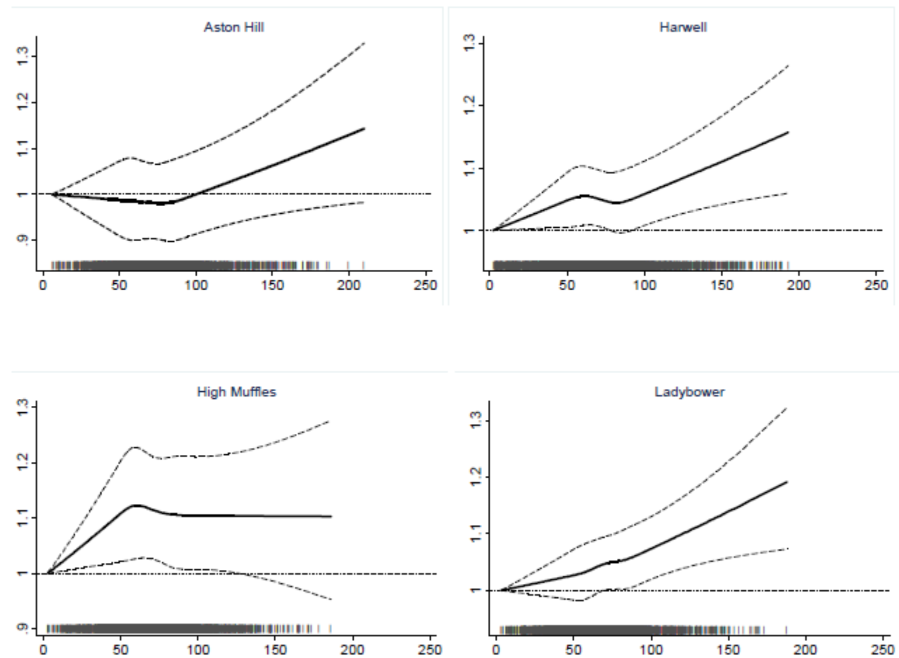
Evidence for threshold in London, not elsewhere

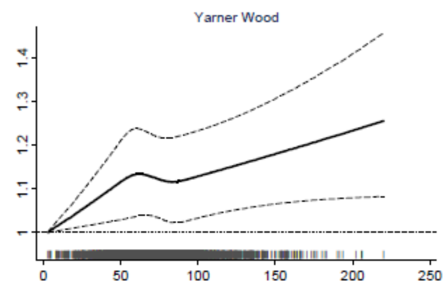
Differences in health coefficient with season in different areas needs investigating





URBAN





RURAL

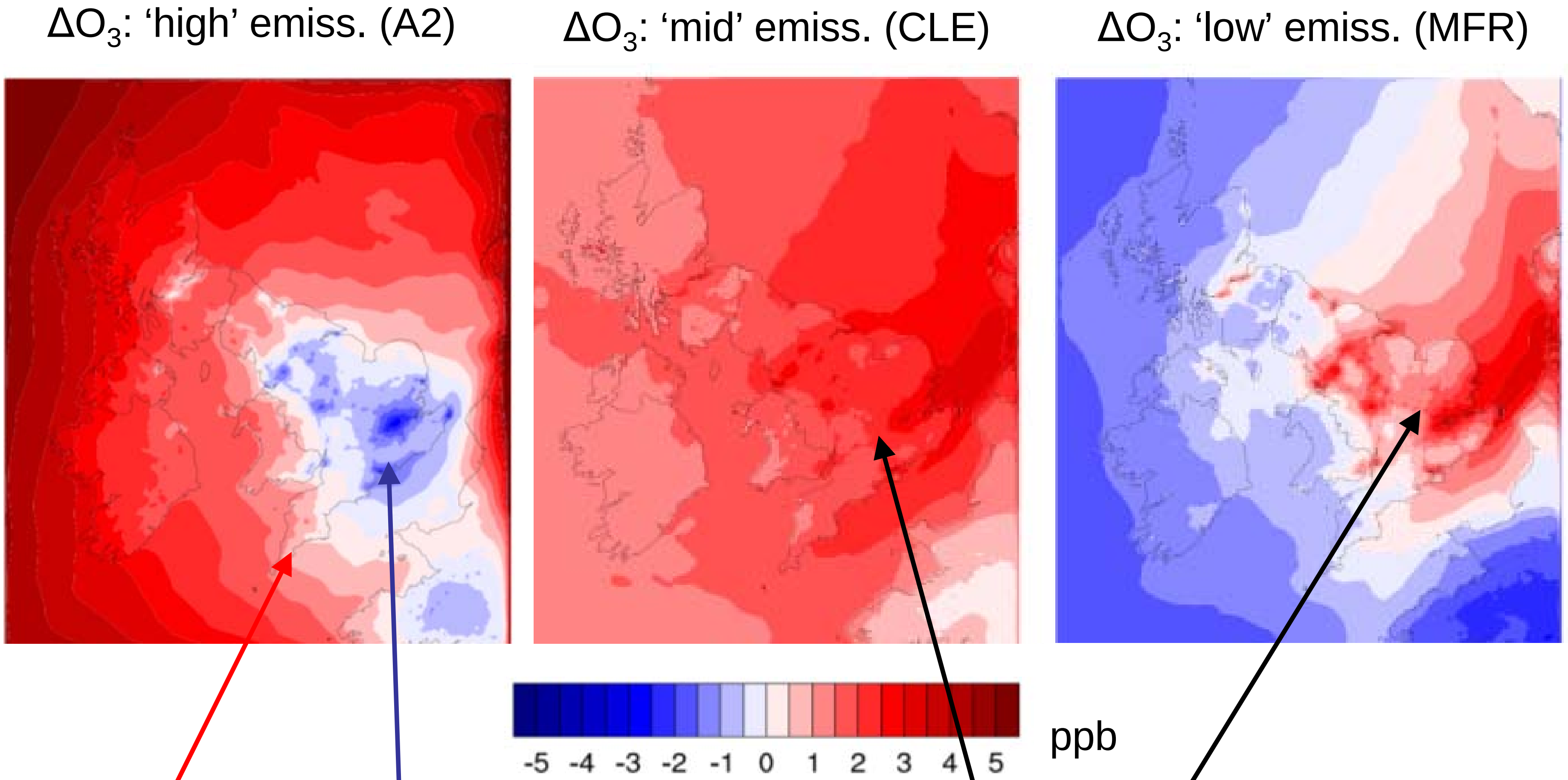
NERC consortium project

Air pollution and weather-related health impacts: methodological study based on spatio-temporally disaggregated multi-pollutant models for present-day and future: "AWESOME"

London School of Hygiene and Tropical Medicine
St. Georges Hospital University of London
University of Edinburgh & CEH
University of Strathclyde
University College London

(1) Model (WRF-EMEP) UK distributions of surface air pollutants for 2000-2010
(2) Model evaluation – statistical & measurement
(3) Via building models, estimate indoor exposure and the indoor environment
(4) Gridded time-series epidemiology investigating inter alia multi-pollutant effects, pollutant threshold effects, weather modifications, geographical variation, modification by housing, etc.
(5) Impact of selected air quality and climate policies on changes in the distributions of (multi-)pollutant concentrations and related health burdens
(6) Examination of socio-economic differentials in current and potential future AQ health impacts
(7) Development of decision-analysis framework

Change in annual average surface O_3 (future emissions)



Red: **increase** in future O_3

Blue: **decrease** in future O_3

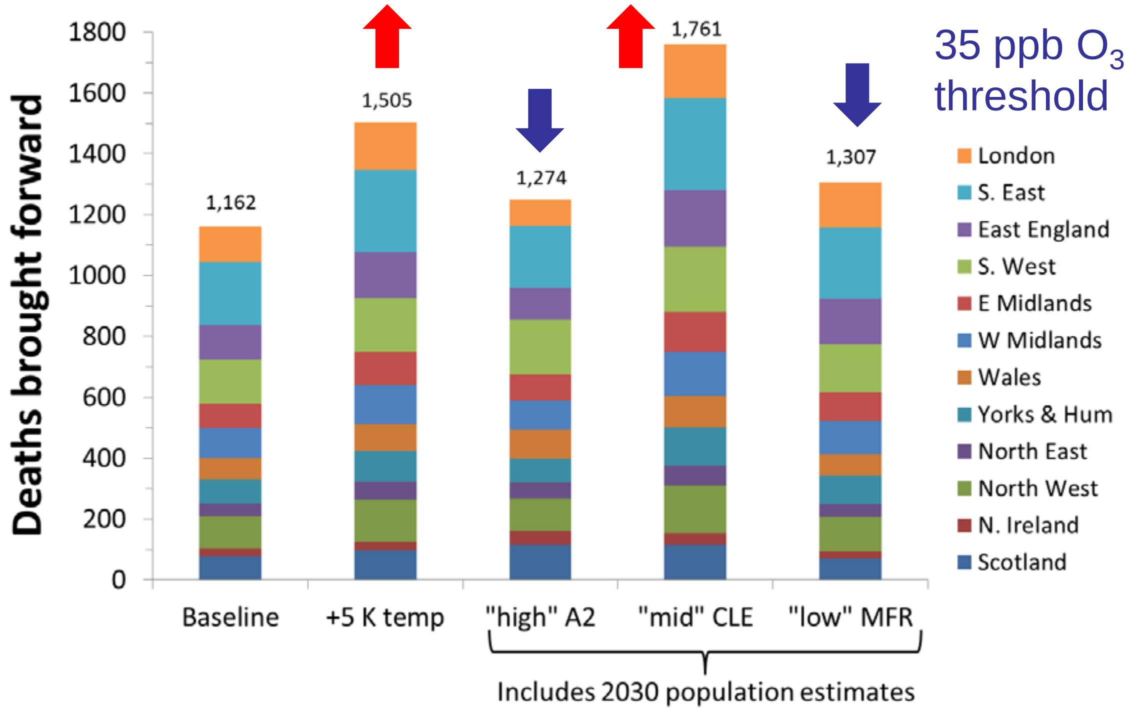
Reducing emissions results in higher O_3 in S & E UK due to reduced O_3 loss via NO_x

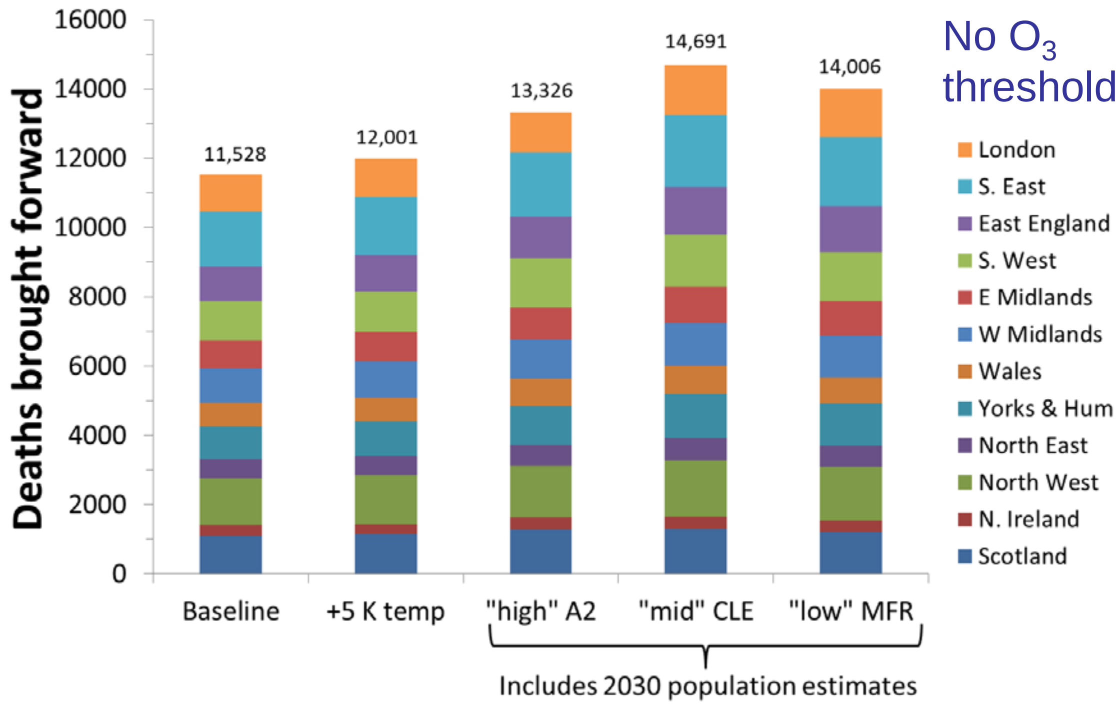
Mortality burdens

With 35 ppb O_3 threshold assumption:
~ order of magnitude lower O_3-attributable mortality

but greater sensitivity to +5 °C & CLE emission scenarios and lower sensitivity to “high” and “low” emission scenarios

Heal et al. (in prep) Health burdens in the UK from ozone under different future scenarios





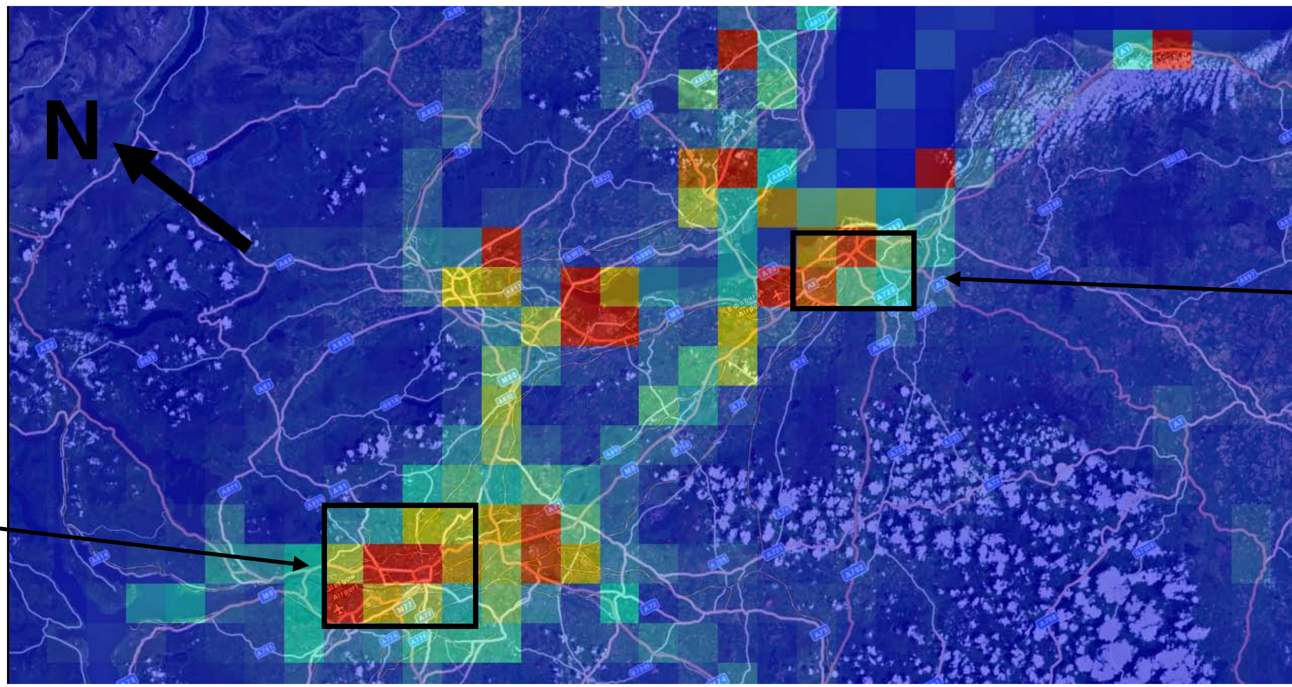
Additional measurements & modelling to enhance evaluation

Exploration of:

(1) Extent of intra-grid variability

(2) The relationship between increased # measurement points within a grid and the closeness of modelled and measured grid averages

- – within a grid at different times
- – between grids at same time



(a) Deployment of passive diffusion samplers for NO_2 & O_3

(b) ‘Mobile’ deployment of real-time sensors for NO_2, O_3, PM & BC

(c) Rotated deployment of real-time sensors for NO_2, O_3, PM & BC c.f. fixed location