

Heat-related health impacts associated with the urban heat island and climate change in the West Midlands, UK.

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Heatwaves are associated with a range of adverse health effects, which can lead to emergency hospitalisations and mortality. In towns and cities, the Urban Heat Island (UHI) effect i.e. higher ambient temperatures in the city centre compared with surrounding suburban and rural areas, particularly at night, can exacerbate these health effects. The effects of UHIs are often amplified during anticyclonic summer weather conditions, which can cause or exacerbate heatwaves. Climate change projections often do not include the effects of the UHI, due to difficulties in resolving urban scale features. This means that assessments of health effects using these projections may underestimate the actual magnitude of future heat-related health impacts.

Birmingham is the second most populous city in the United Kingdom, and observations indicate that it has a pronounced UHI. Recent modelling showed that replacing urban land categories in the West Midlands with rural ones led to a reduction in 2 metre temperature of around 3 degrees Celsius on average and up to 7 degrees Celsius during the heatwave of August 2003, compared with the baseline urban simulation. In addition, examination of the extent of horizontal advection of warm air away from the city centre indicated that temperatures downwind of Birmingham centre were up to 2.5 degrees Celsius warmer than those upwind.

We present results of a health impact assessment during heatwave periods, based on numerical simulations of the UHI in Birmingham and the West Midlands Metropolitan region using the regional meteorological Weather Research and Forecasting (WRF) model, with an urban canopy scheme. We find that heat-related health impacts associated with the UHI effect are significant and that the heat-health burden will increase in future, based on published temperature projections for the UK. These findings can be used to better quantify the current heat related health impacts relating to the UHI as well as future impacts under climate change scenarios. It may also be used to inform future adaptation measures to protect populations from heat in urban environments