

Heat ascribed mortality in south-east England



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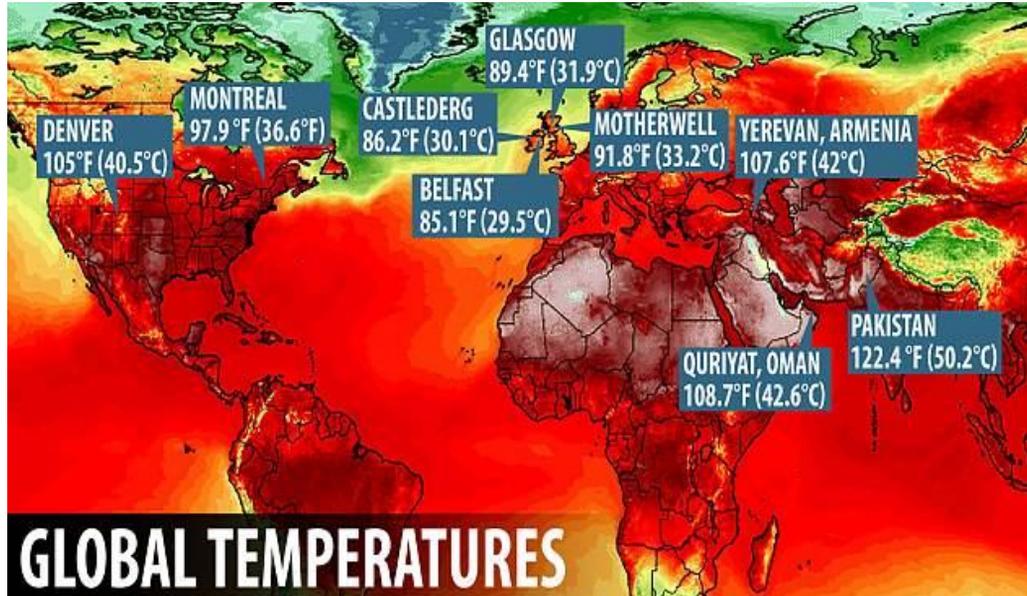
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Heatwave: A global problem



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Source: <https://www.dailymail.co.uk/sciencetech/article-5916967>

Future heatwave risk showed a progressive and strong increase in frequency all over Europe (Forzieri et al., 2016; Guerreiro et al., 2018).



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Review

Hydro-meteorological risk assessment methods and management by nature-based solutions



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What is



Hazard? – A potential source of damage or harm to people and environment, can be natural (forest fire) or anthropogenic (bomb blast).

Disaster? – Outcome of hazard on various scales, so can be inter-changeable

Vulnerability? – Susceptibility towards hazard

Exposure? – confrontation with hazard

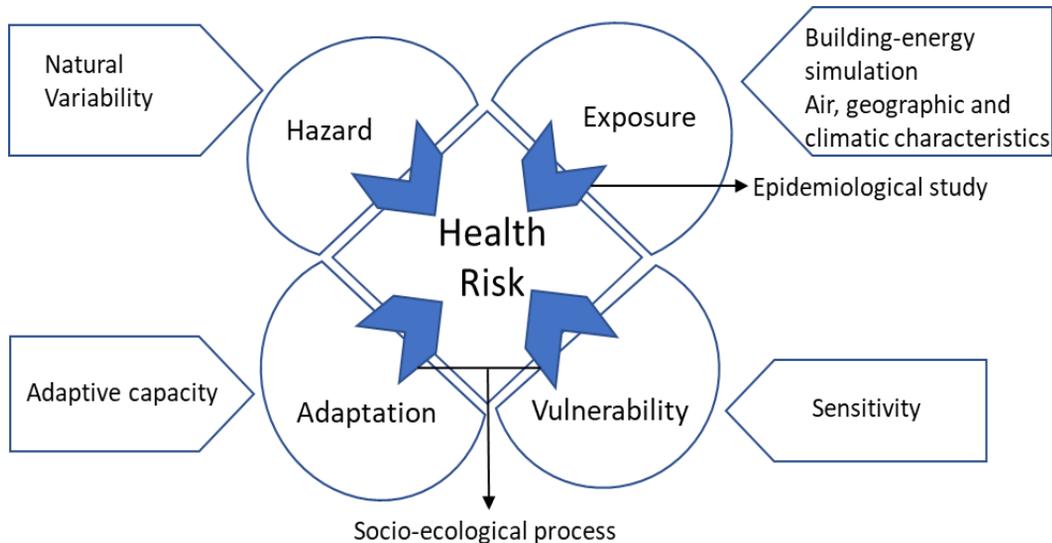
Adaptability? – Strength to cope up with hazard

Risk? - Threat posed by interplay of above elements

Hydrometeorological Hazard or Risk (HMH or HMR)? – Hazard or risk of climatic origin

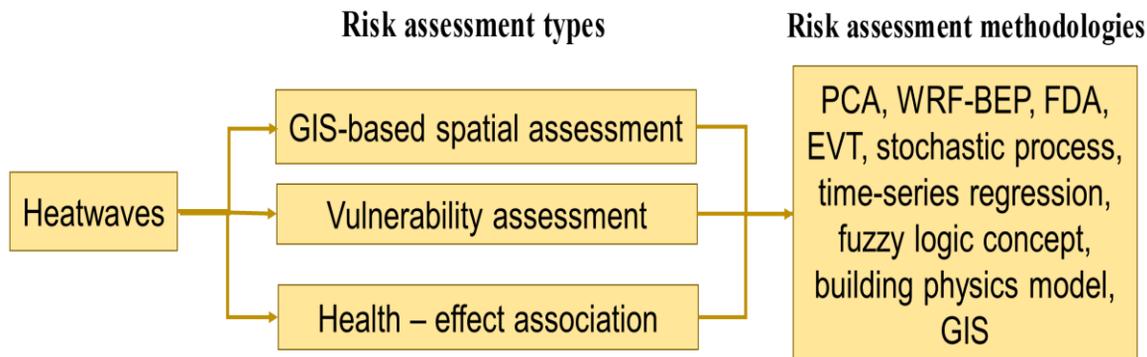


Heat-health risk assessment



Interaction of hazard, its exposure, and vulnerability and adaptation capacities of people at health risk.

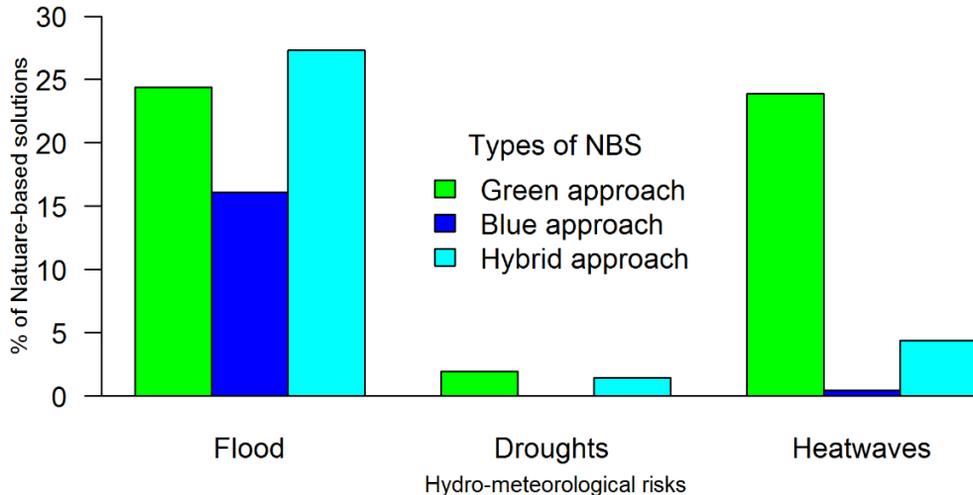
Risk assessment methods for extreme heat events



Types of risk assessment and its methodologies employed in published literature for heatwave HMR



Nature-based solution (NBS) - solutions inspired by and copying from nature and its fundamentals, e.g. green roof, green wall for heat management.



NBS used to manage HMHs in Europe. The data used in this figure obtained from Natural Hazards – Nature-based Solutions platform (<https://naturebasedsolutions.org/map>). (Sahani et al., 2019)



Goal: Health-impact assessment of heatwaves or extreme temperatures by associating them with mortality to find relative risk/attributable risk.

Study site:

South-east of England



(Source: Google images)



Methodology:

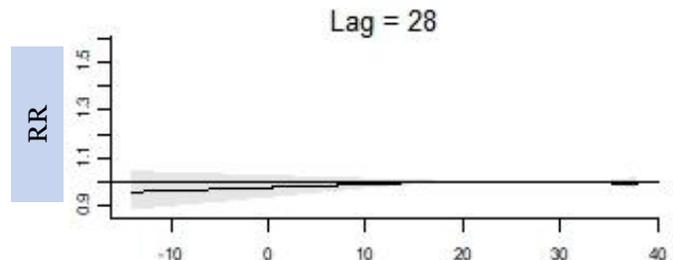
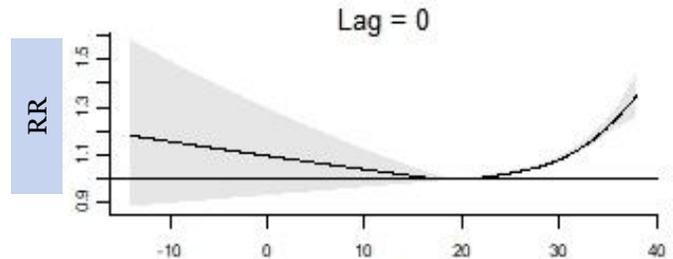
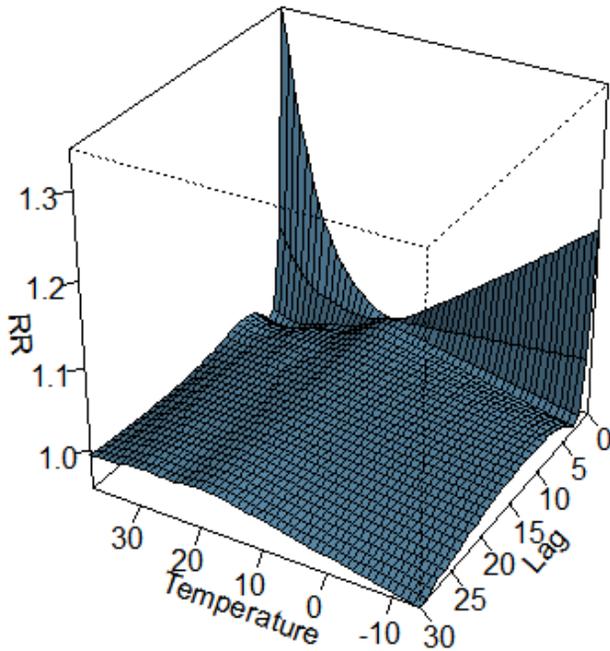
Data: Daily temperature and all-cause mortality

Statistical Analysis: Quasi-poisson Distributed lag non-linear model (DLNM)

- Cross-basis function formulation
- Control for covariates: Time, $df=3$; Date, $df=28$
- R package 'dlnm' 2.2.0 and 'splines' used for plotting the Relative risk (RR)



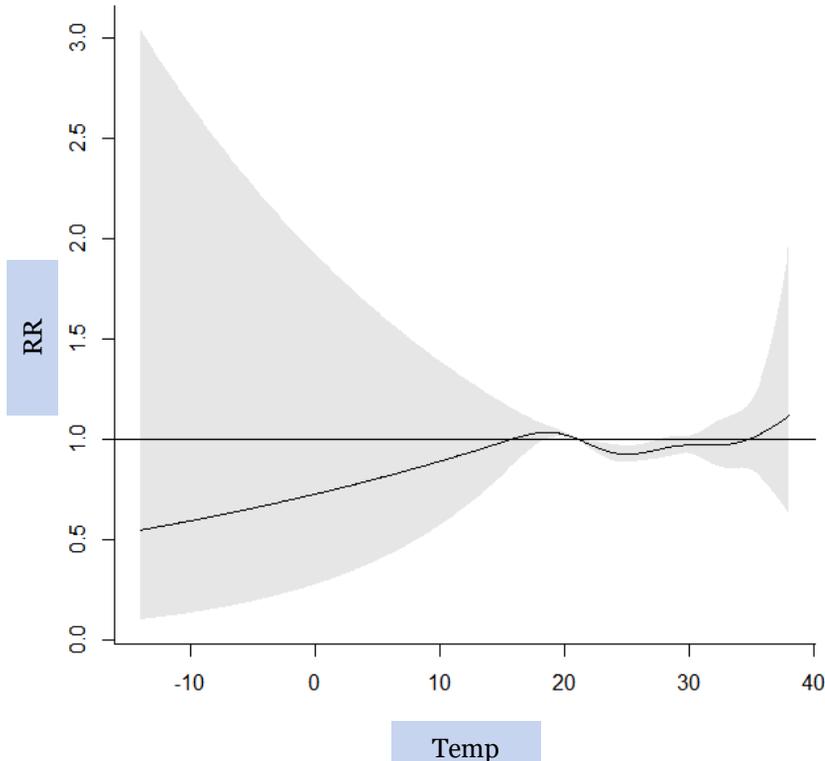
Results



3-D Plot of RR along temperature and lags



Overall effect of temperature on mortality S-E England 1981-2014



% ile	Temp (°C)	RR	CI (95%)
90	28.7	0.963	0.917-1.011
95	30.2	0.970	0.925-1.018
99	32.4	0.970	0.862-1.092
99.9	36.2	1.043	0.779-1.398



- Overall RR of mortality due to extreme heat, 36.2 °C (i.e. 99.9 %ile of temperature) for SE England is 1.043, i.e. 4.3 % more deaths attributable to extreme heat.
- This risk evaluation can be taken to next step for proper and site-focused mitigation strategies by heat vulnerability identification.
- Nature based solution is being promoted by many researchers (Frantzeskaki, 2019; Vieira et al.,2018) but more evidence building is need for its wider significance for heat management.



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Thank you



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