



OLD AND WEAK
THE MOST VULNERABLE TO HEATWAVES

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MESSAGE

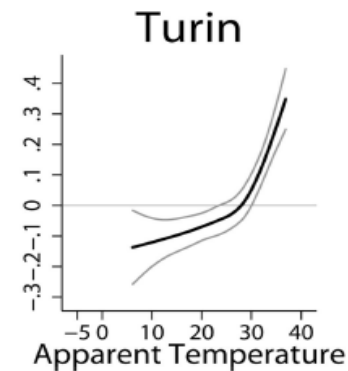
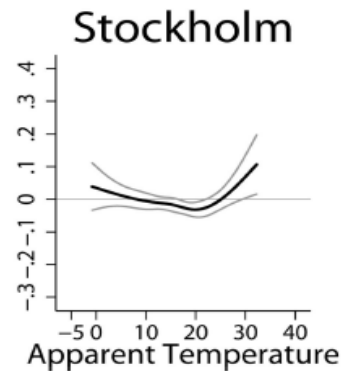
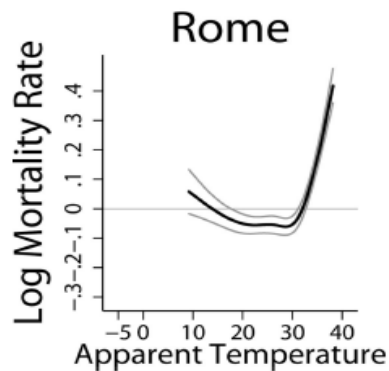
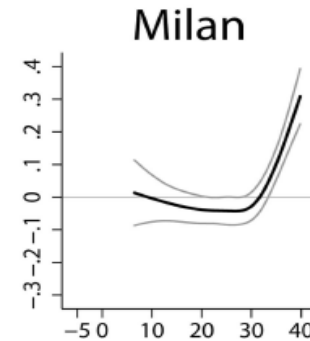
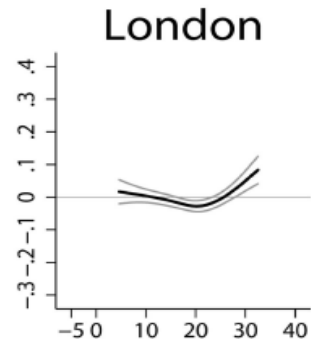
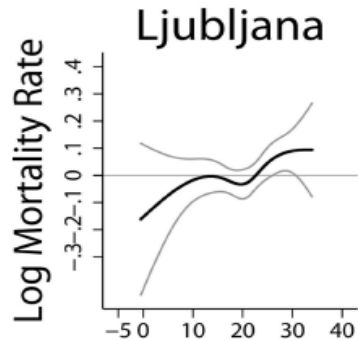
- Heat increases mortality also in a cold climate
- Heat mortality effect largest in elderly
- Harvesting indicates deaths in vulnerable
- Intensity more important than duration for elderly
- Minor heatwave effect in persons without a diagnose
- Adaptation better in countries hit by fatal heatwave
- HEWS with action plan not established everywhere



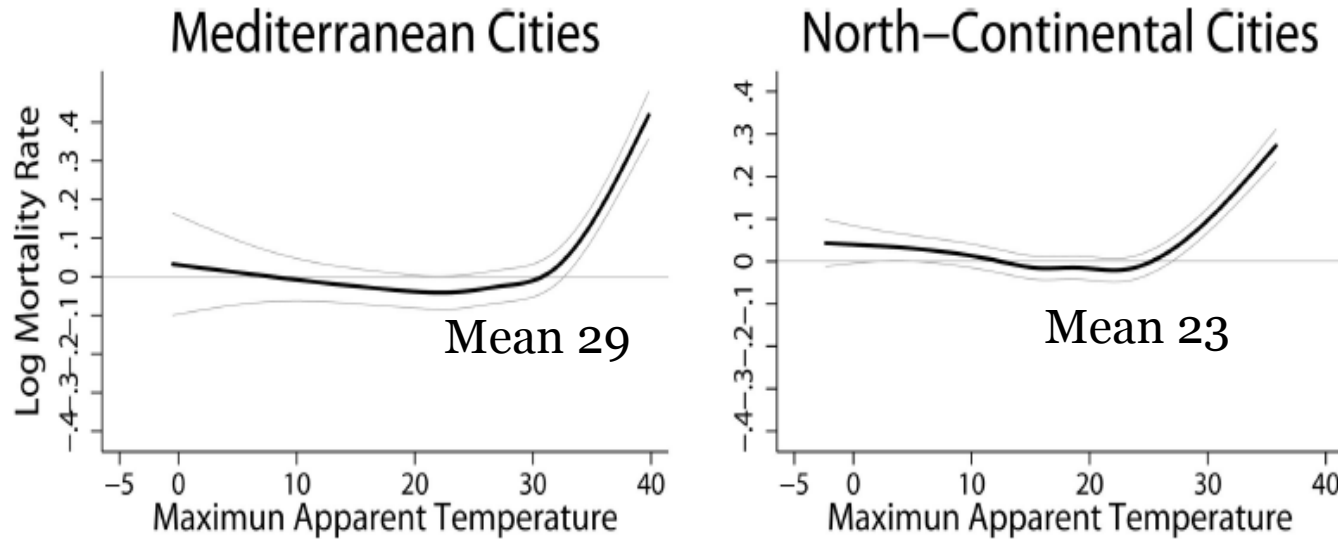
15 EUROPEAN CITIES IN PHEWE

BACCINI ET AL, 2008

EFFECT OF TEMP IN 4 DAYS



INCREASE IN MORTALITY PER 1C ABOVE CITY THRESHOLD



EFFECTS OF HEAT ON MORTALITY ARE LARGER IN ELDERLY

Age; yrs	Mediterranean Cities		North-Continental Cities	
	% Change	(95% CrI)	% Change	(95% CrI)
Natural mortality				
All	3.12	(0.60 to 5.73)	1.84	(0.06 to 3.64)
15–64	0.92	(–1.29 to 3.13)	1.31	(–0.94 to 3.72)
65–74	2.13	(–0.42 to 4.74)	1.65	(–0.51 to 3.87)
75+	4.22	(1.33 to 7.20)	2.07	(0.24 to 3.89)
Cardiovascular mortality				
All	3.70	(0.36 to 7.04)	2.44	(–0.09 to 5.32)
15–64	0.57	(–2.47 to 3.83)	1.04	(–2.20 to 4.92)
65–74	1.92	(–1.49 to 5.35)	1.50	(–1.12 to 4.62)
75+	4.66	(1.13 to 8.18)	2.55	(–0.24 to 5.51)
Respiratory mortality				
All	6.71	(2.43 to 11.26)	6.10	(2.46 to 11.08)
15–64	1.54	(–3.68 to 7.22)	3.02	(–1.55 to 7.42)
65–74	3.37	(–1.46 to 8.22)	3.90	(–0.16 to 8.92)
75+	8.10	(3.24 to 13.37)	6.62	(3.04 to 11.42)



HARVESTING SUGGESTS DEATHS IN VULNERABLE GROUPS

TABLE 4. Meta-Analytic Cumulative Percent Changes (95% Credibility Intervals) in Natural Mortality Associated With a 1°C Increase in Maximum Apparent Temperature Above the City-Specific Threshold

Lag Days	Mediterranean Cities		North-Continental Cities	
	% Change	(95% CrI)	% Change	(95% CrI)
0	2.25	(0.07 to 4.49)	1.25	(−0.50 to 2.98)
3	3.12	(0.60 to 5.72)	1.84	(0.06 to 3.64)
5	3.00	(0.35 to 5.75)	1.28	(−0.71 to 3.17)
10	2.57	(0.12 to 5.10)	0.94	(−0.94 to 2.75)
15	1.88	(−0.36 to 4.16)	0.79	(−1.14 to 2.64)
20	1.38	(−0.72 to 3.51)	0.71	(−1.21 to 2.58)
25	1.01	(−1.06 to 3.09)	0.65	(−1.22 to 2.51)
30	1.26	(−0.78 to 3.36)	0.51	(−1.36 to 2.36)



EFFECT OF BOTH INTENSITY (TEMP) AND DURATION?

Some studies suggests there are no added effects of heat duration

Other studies (e.g. from Stockholm, Moscow) indicate a separate effect of the number of hot days

Mortality related to temperature and persistent extreme temperatures: a study of cause-specific and age-stratified mortality

Joacim Rocklöv,¹ Kristie Ebi,² Bertil Forsberg¹ (OEM, 2010)



HEAT DURATION SEEMS LESS IMPORTANT FOR MORE VULNERABLE

Table 3 Relative risks (RR) associated with temperature and persistent extreme temperatures potential confounding, calendar patterns, seasonality and long-term time trends.

	Estimated simultaneously in summer model	
	RR associated with a 1°C increase in minimum apparent temperature (lag 0–1)	RR associated with day number in sequence of persistent extreme hot temperature
All causes (excluding external)	1.006 (1.001 to 1.010)	1.024 (1.010 to 1.038)
Cardiovascular causes	1.004 (0.998 to 1.009)	1.020 (1.000 to 1.041)
Respiratory causes	1.014 (0.997 to 1.030)	1.039 (0.987 to 1.094)
Other causes	1.007 (1.001 to 1.013)	1.023 (1.003 to 1.042)
All causes (excluding external) ages 0–44	0.994 (0.972 to 1.018)	0.977 (0.892 to 1.071)
All causes (excluding external) ages 45–64	0.992 (0.980 to 1.004)	1.036 (0.996 to 1.079)
All causes (excluding external) ages 65–79	1.004 (0.996 to 1.010)	1.028 (1.004 to 1.052)
All causes (excluding external) ages 80+	1.011 (1.005 to 1.017)	1.021 (1.002 to 1.040)



LARGE EFFECTS OF INTENSITY BUT LESS OF DURATION IN ELDERLY

ORIGINAL ARTICLE

Susceptibility to mortality related to temperature and heat and cold wave duration in the population of Stockholm County, Sweden

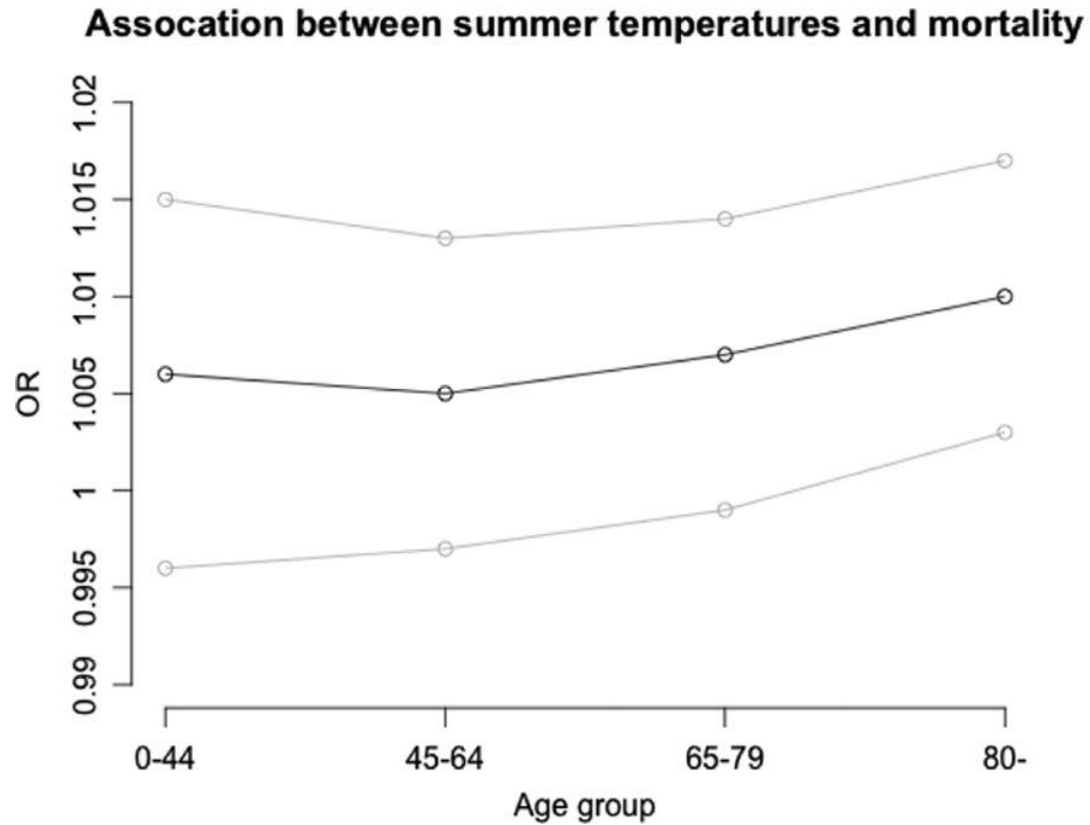
Joacim Rocklöv^{1*}, Bertil Forsberg², Kristie Ebi^{1,2} and Tom Bellander^{3,4}

GHA, 2014



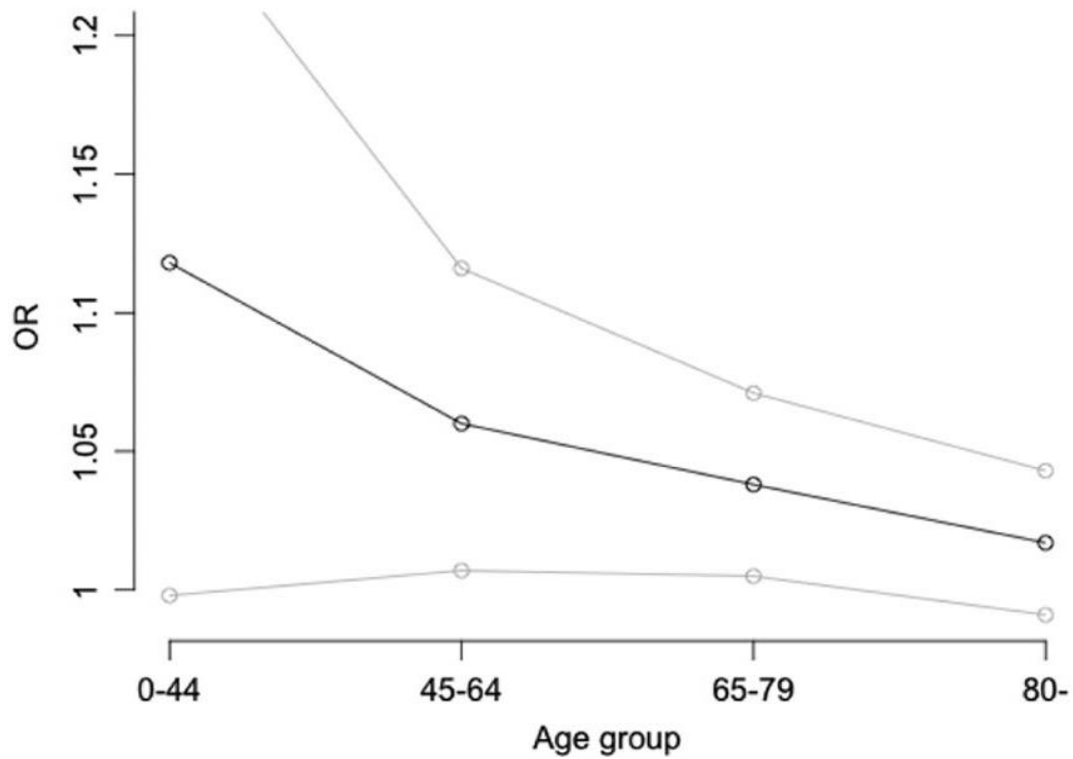
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OR PER 1°C ABOVE DMAX 22



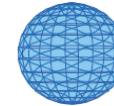
OR PER 1 DAY LONGER HEATWAVE

Association between heat wave duration and mortality



HEATWAVE EFFECT IN PEOPLE WITH CHRONIC DISEASES

Oudin Åström *et al. Environmental Health* (2015) 14:30
DOI 10.1186/s12940-015-0012-0



ENVIRONMENTAL HEALTH

RESEARCH

Open Access

The effect of heat waves on mortality in susceptible groups: a cohort study of a mediterranean and a northern European City

Daniel Oudin Åström^{1*}, Patrizia Schifano², Federica Asta², Adele Lallo², Paola Michelozzi², Joacim Rocklöv³ and Bertil Forsberg¹



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HIGH HEATWAVE MORTALITY IN PEOPLE 50+ WITH PSYCHIATRIC DISEASES (STHLM)

CHF	RR (95% CI)	1.10 (1.02–1.19)
	RRR (95% CI)	
COPD	RR (95% CI)	1.12 (0.94–1.33)
	RRR (95% CI)	
DIABETES	RR (95% CI)	1.12 (1.00–1.25)
	RRR (95% CI)	
PSYCHIATRIC	RR (95% CI)	1.33 (1.10–1.61)
	RRR (95% CI)	
MI	RR (95% CI)	1.23 (1.02–1.50)
	RRR (95% CI)	
LR	RR (95% CI)	1.01 (0.96–1.07)
	RRR (95% CI)	
GENERAL	RR (95% CI)	1.08 (1.03–1.12)
	RRR (95% CI)	



EFFECTS OF ADAPTATION



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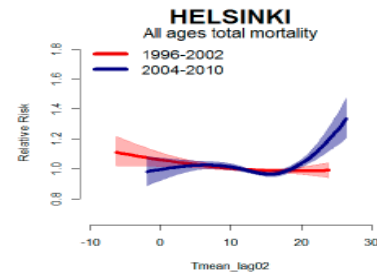
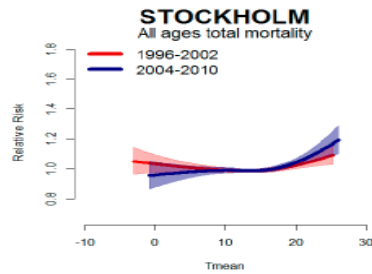
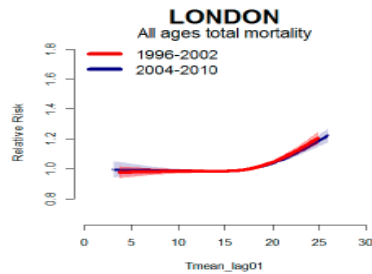
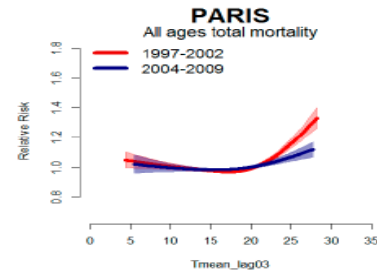
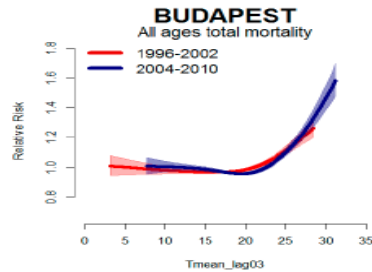
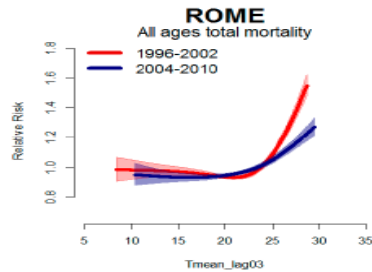
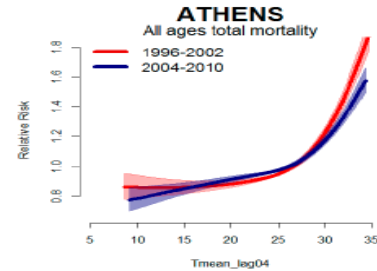
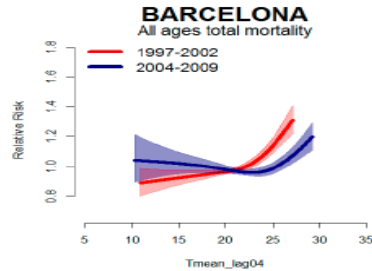
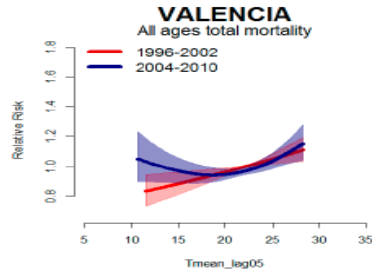
Article

Changes in the Effect of Heat on Mortality in the Last 20 Years in Nine European Cities. Results from the PHASE Project



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THE 2003 HEATWAVE INITIATED HEATWAVE PLANS AND HEWS



Int. J. Environ. Res. Public Health **2011**, *8*, 4623-4648; doi:10.3390/ijerph8124623

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Review

Heatwave Early Warning Systems and Adaptation Advice to Reduce Human Health Consequences of Heatwaves

Dianne Lowe^{1,2,*}, Kristie L. Ebi³ and Bertil Forsberg¹



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12 HEATWAVE EARLY WARNING SYSTEMS

- Many HEWS started 2004
- Most HEWS are run by Public Health Agencies
- Threshold temperatures vary also within countries
- Real time health data used in several countries
- Some include air pollution
- A heatwave plan is linked to the system (WHO)
- Vulnerable groups and advice included in plan
- Varying degree of action



Identifies at risk populations	11/12
Elderly	11/12
Chronically ill	11/12
Medication groups	11/12
Homeless	3/12
Obese/unfit	8/12
Cognitive	8/12
Outdoor workers	7/12
Physically active	6/12
Children	11/12
Disabled	8/12
Socio economic status	3/12
Ethnic minorities	0/12
Tourists	1/12
Isolated	3/12
Gender	1/12
Drug/alcohol dependency	4/12



Action	Proportion of action plans addressing action
Individual adaptation advice	11/12
Heat avoidance	11/12
Limit physical/outdoor activity	11/12
Wear loose light colour clothes	9/12
Hydration	11/12
Cool homes	11/12
Cool body	11/12
Spend time in aircon env	4/12
Help vulnerable individuals	9/12
Seek advice for health problems	6/12
Seek advice changing medications use	5/12
Medication storage	2/12
Food handling/preparation	7/12
Replenish electrolyte intake	4/12
Protect against sunburn	4/12
Know forecasted temp	4/12
Monitor room temp	3/12
Travel by night/cooler hours	2/12
Rational working hours	2/12



Action	Proportion of action plans addressing action
Considers broader support measures	11/12
Suggests attend public cooling area	8/12
Provides list of cooling areas	6/12
Monitors/supports public cooling area	4/12
Maintains list of vulnerable individuals	2/12
Monitors vulnerable individuals	8/12
Provides outreach to identified vulnerable	5/12
Addresses shelter/water needs of homeless	3/12
Seeks to identify transport needy	2/12
Provides support for transport needy	0/12
Provides heat health phone line	8/12



MESSAGE

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THANK YOU!



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