?what health data do we need to support adaptation action?

tom kosatsky, md

CEC, Hermosillo 18 may 2017

BC Centre for Disease Control
An agency of the Provincial Health Services Authority

National Collaborating Centre for Environmental Health
Centre de collaboration nationale en santé environnementale

taking a broad approach to adaptation, including…

1. creating cooler outdoor environments
2. designing cooler buildings
3. living and working smarter in the heat
4. supporting community resilience
5. reducing vulnerability due to poor health

maximize co-benefits
reduce disparities
have no regrets

!Advocate!

challenges of health data

lack of heat-health specificity

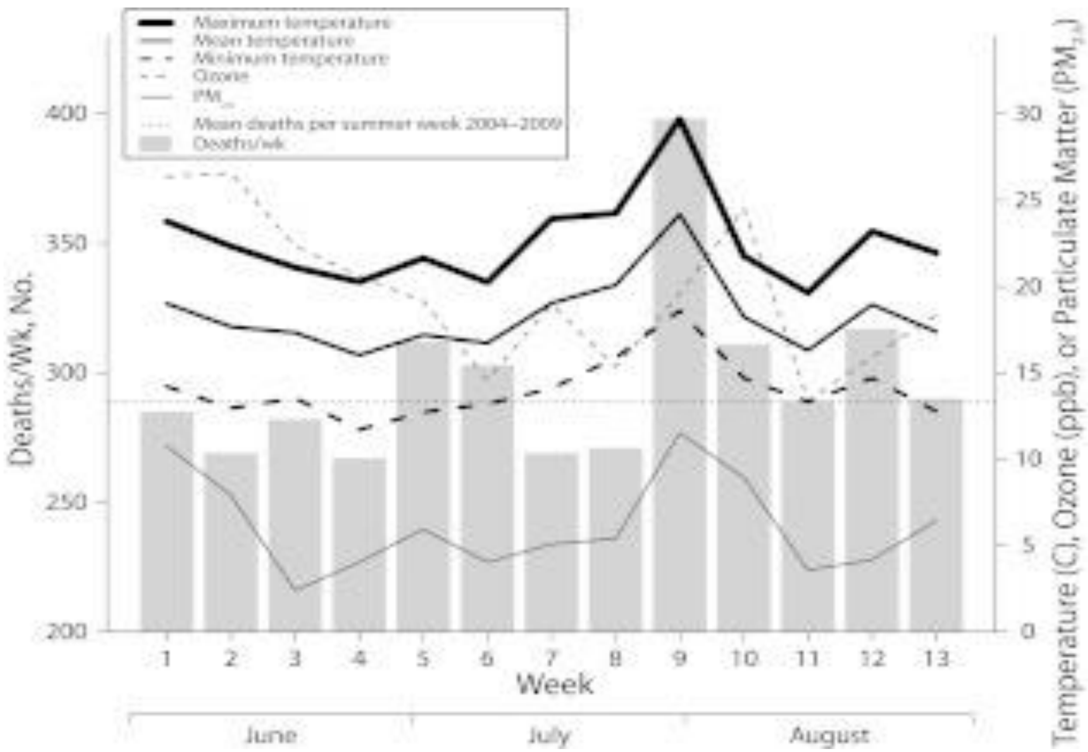
epidemiologic models demand numbers

modelling biases and difficulties in interpretation

optimal representation of vulnerabilities by eco-region, and jurisdiction

and its application

learning from extreme heat events 1



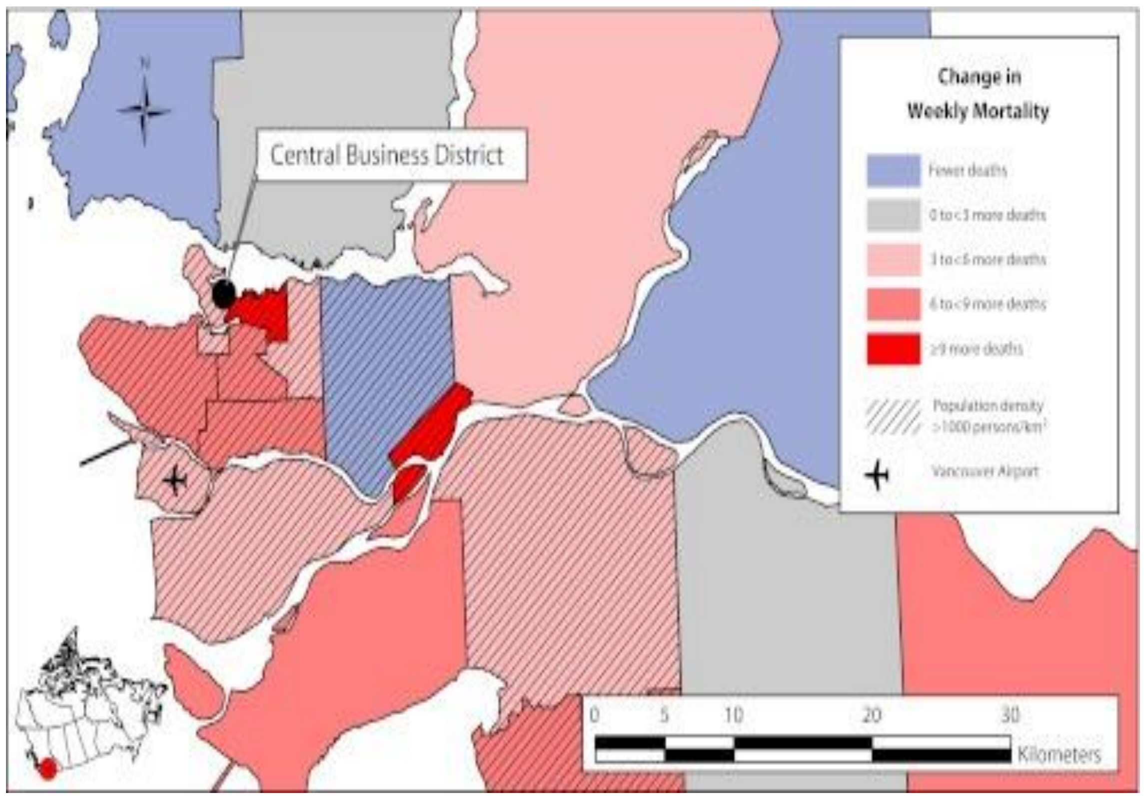
Kosatsky, 2012

learning from extreme heat events 2

Characteristic	Comparison Group	8 Previous Weeks, Summer 2009, OR (95% CI)	8 Same Weeks, Summers 2001–2008, OR (95% CI)	4 Same Weeks, Summers 2005–2008, OR (95% CI)
Age, y				
< 65	≥ 85	1.10 (0.82, 1.49)	0.95 (0.70, 1.29)	0.99 (0.71, 1.38)
65–74	≥ 85	**1.47* (1.06, 2.03)**	1.03 (0.75, 1.42)	1.35 (0.94, 1.93)
75–84	≥ 85	1.02 (0.76, 1.36)	0.88 (0.66, 1.17)	0.97 (0.71, 1.32)
Male	Female	1.12 (0.90, 1.39)	1.09 (0.88, 1.36)	1.08 (0.85, 1.37)
Died outside institution[a]	Died in institution	**1.43* (1.10, 1.86)**	1.42 (0.94, 2.14)[b]	1.42 (0.94, 2.14)[b]
> 1000 people/km^2	≤ 1000 people/km^2	**1.26* (1.02, 1.58)**	**1.32* (1.06, 1.65)**	**1.43* (1.13, 1.82)**
> 40% of people aged ≥ 65 y living alone	≤ 40% of people aged ≥ 65 y living alone	1.23 (0.88, 1.72)	1.07 (0.77, 1.49)	1.12 (0.78, 1.61)
> 20% under LICO[c]	≤ 20% under LICO	1.17 (0.94, 1.45)	**1.23* (1.00, 1.52)**	**1.34* (1.07, 1.70)**

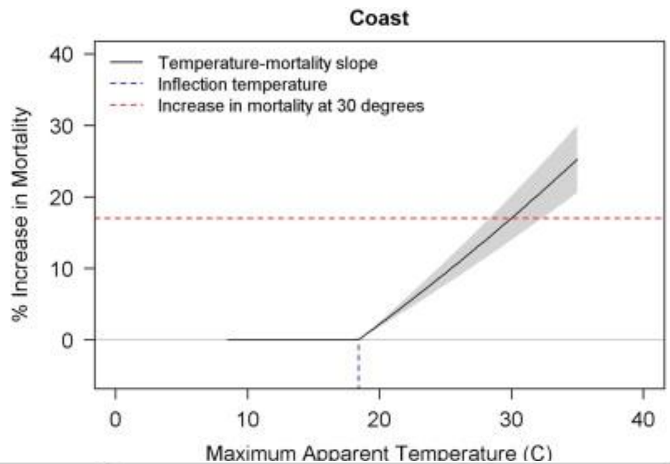
Kosatsky, 2012

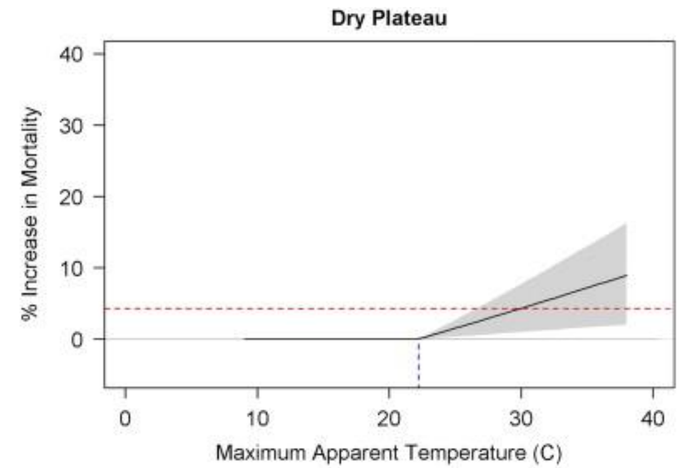
learning from extreme heat events 3

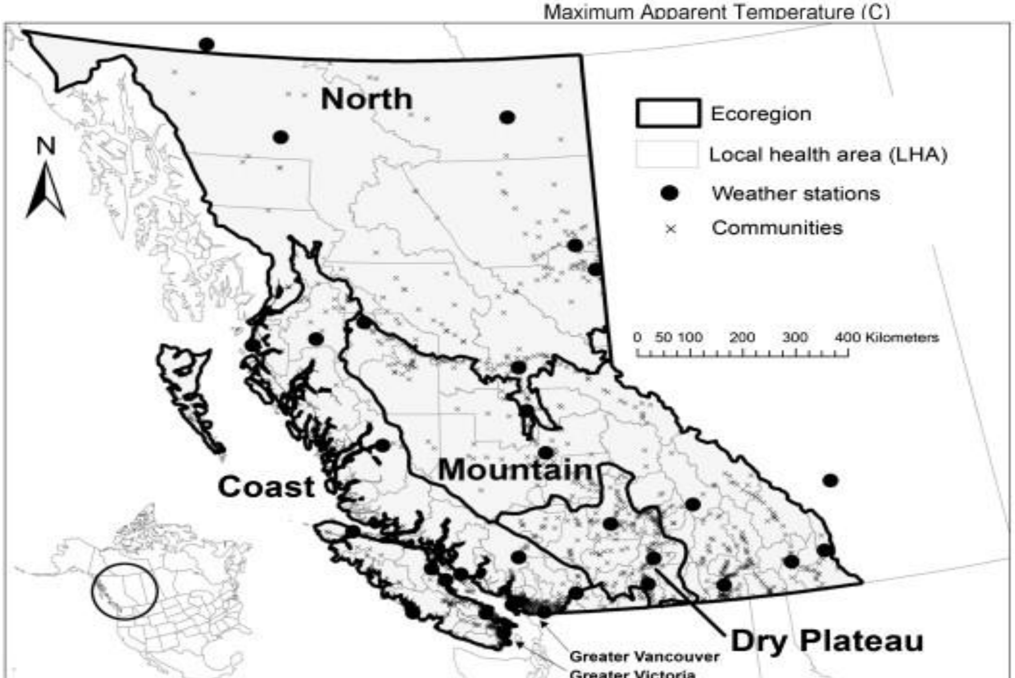


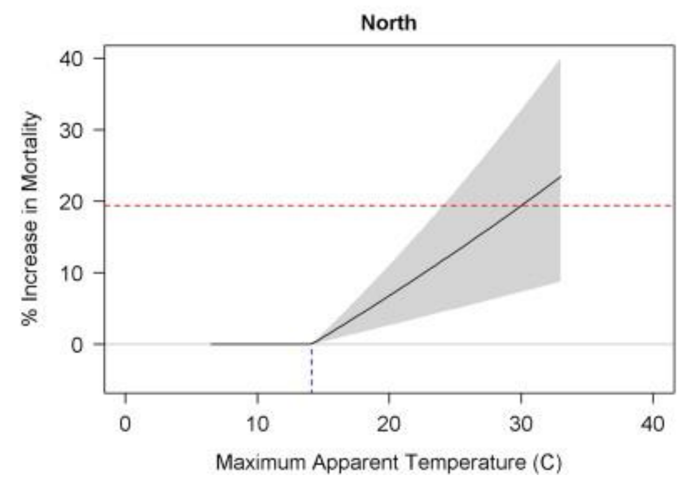
Kosatsky, 2012

modelled heat/health associations 1



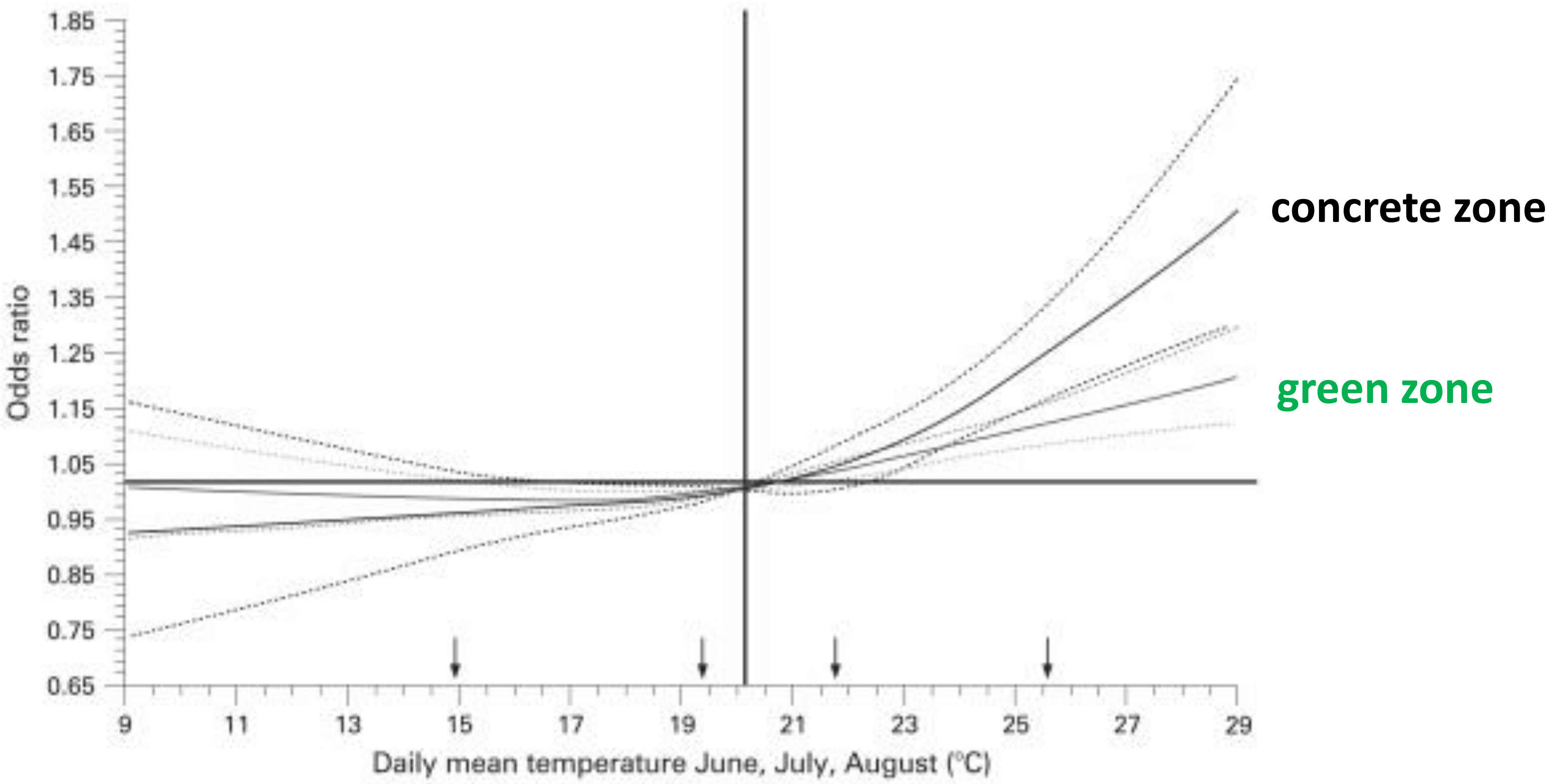






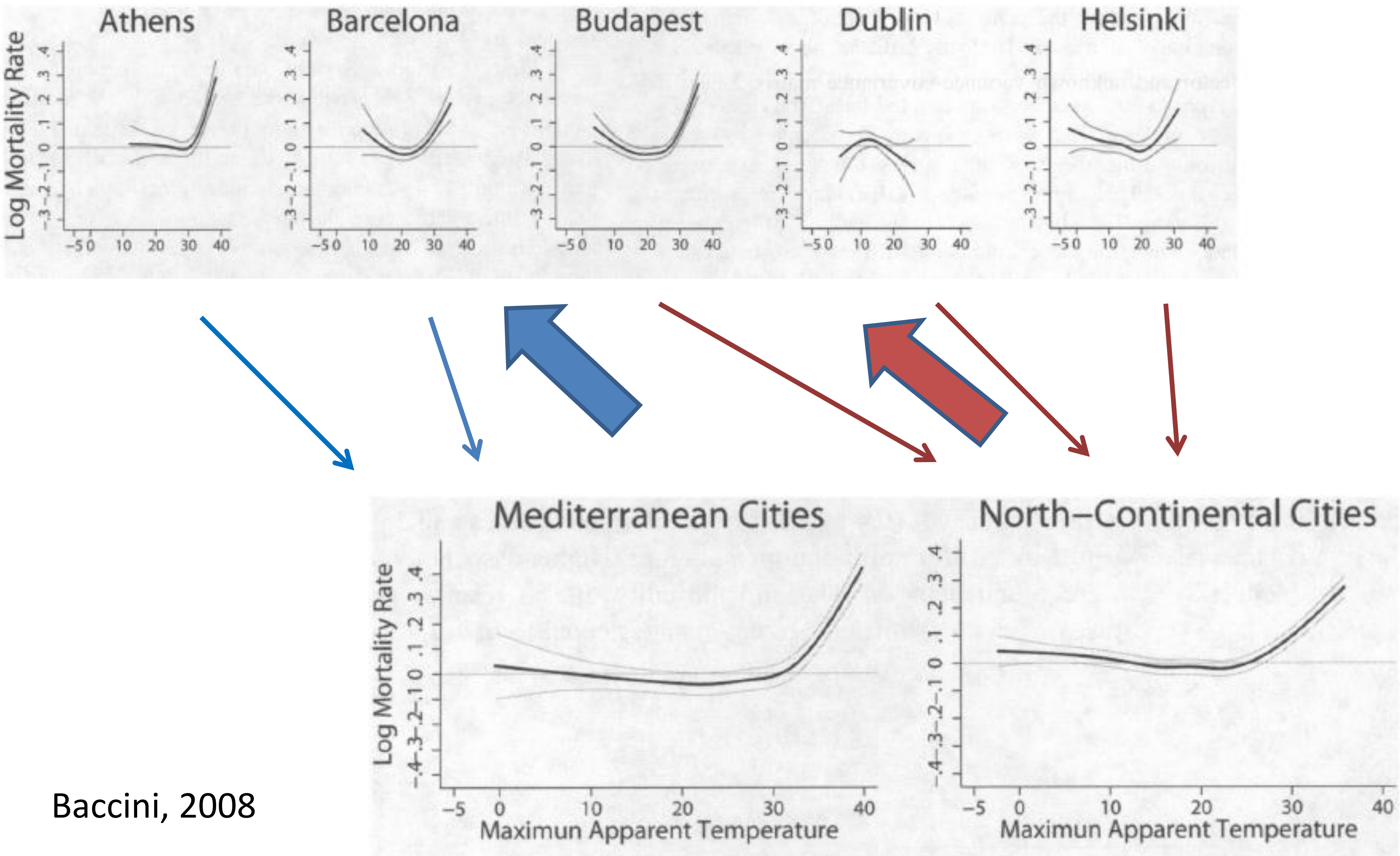
Henderson, 2013

modelled heat/health associations 2



Smargiassi, 2009

Bayesian borrowing



Baccini, 2008

Rural/ urban heat impacts

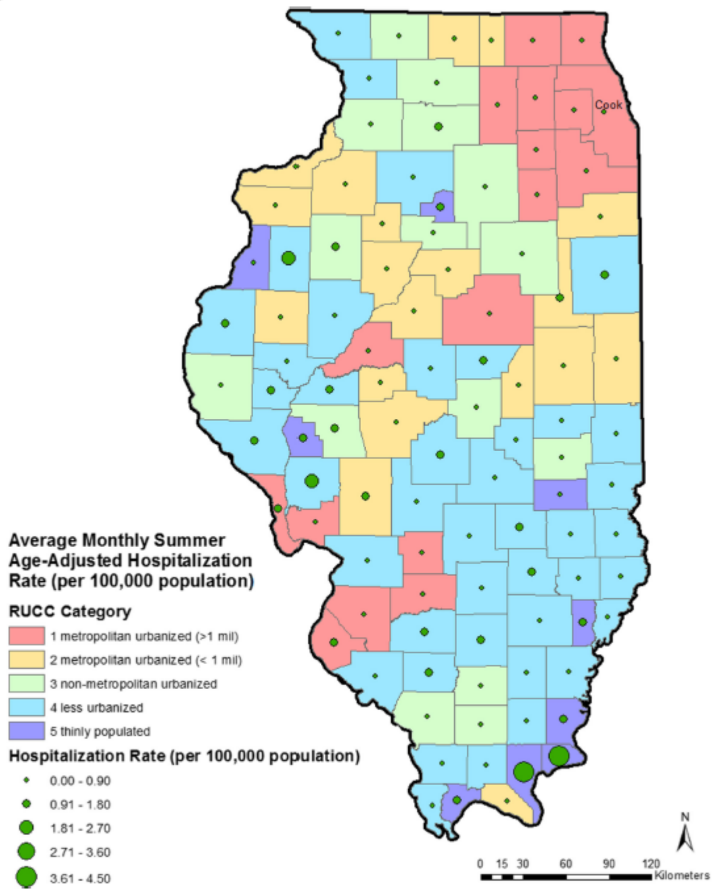


Fig. 1 Map of Illinois showing urban/rural classifications and average monthly summer age-adjusted hospitalization rate for heat-stress illness (per 100,000 population) by county for the 28-year study period. Cook: Cook County, that contains the City of Chicago

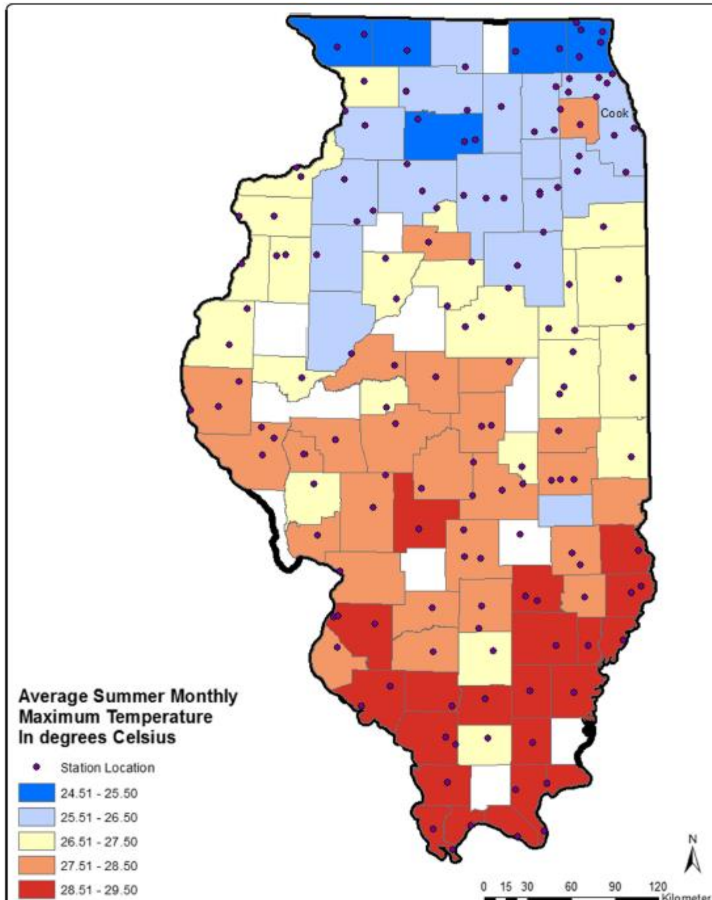


Fig. 2 Map of Illinois showing annual average summer monthly maximum temperature in degrees Celsius by county and locations of weather stations. Cook: Cook County, that contains the City of Chicago

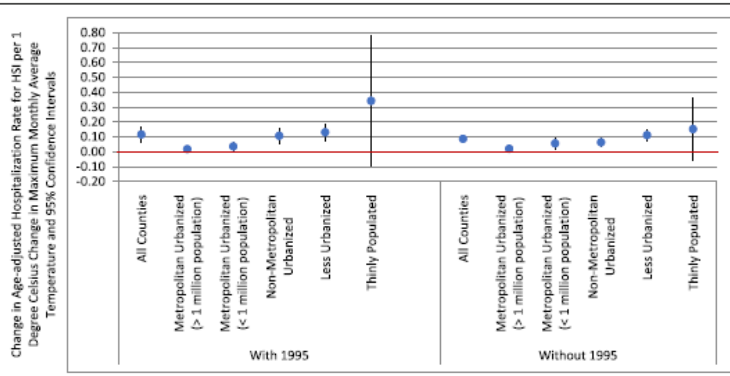
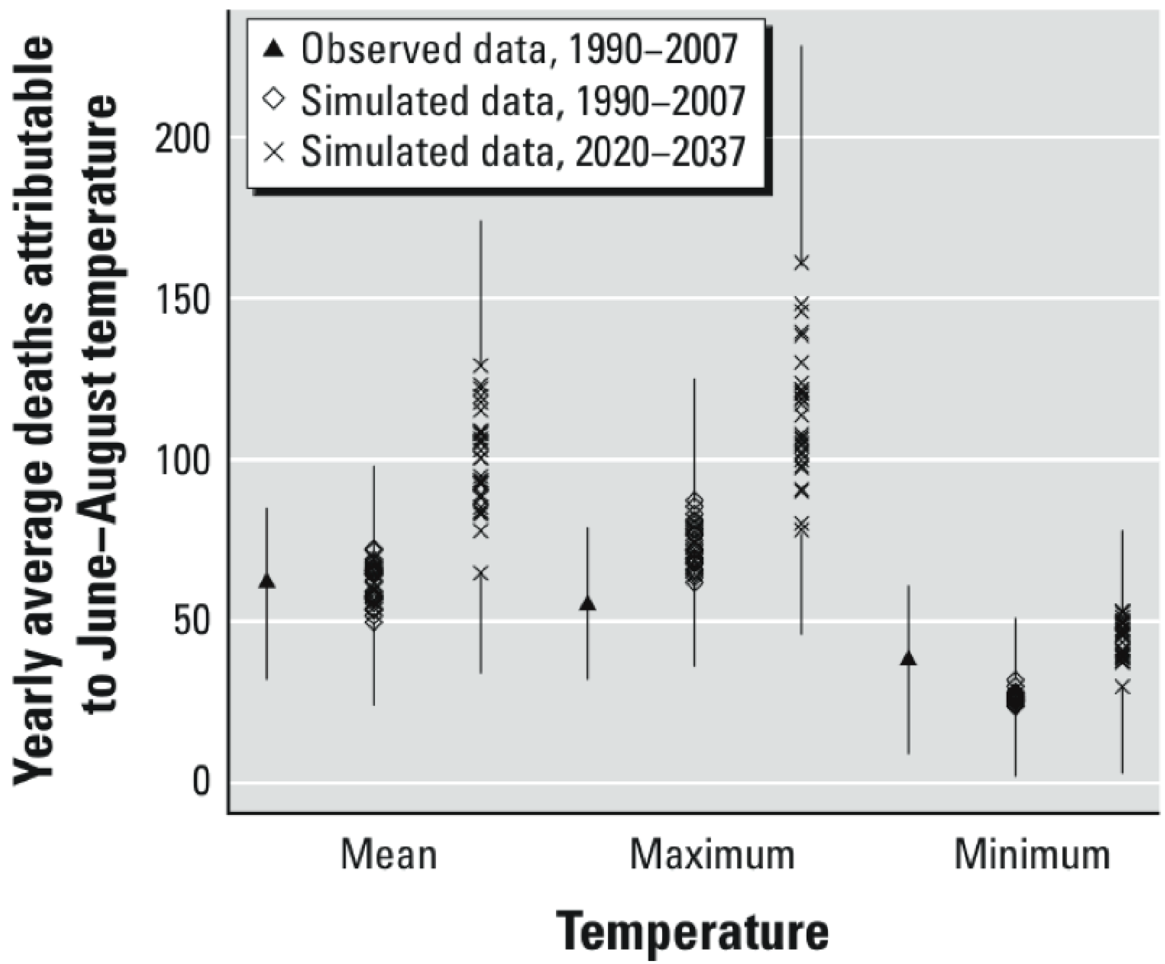


Fig. 3 Estimated change in heat-stress illness per 1 °C change in maximum monthly average temperature (after adjustment for county percent below poverty level, percent population Black, and percent population Hispanic) and 95% confidence intervals for all counties and by rural/urban stratification (RUCC1–metropolitan urbanized (> 1 million population); RUCC2–metropolitan urbanized (< 1 million population); RUCC3–non-metropolitan urbanized; RUCC 4–less urbanized; RUCC5–thinly populated) for all study years, 1987–2014, and excluding 1995, the year of the heatwave

Jagai, 2017

projecting consequences



Benmarhnia, 2014

Definition of temperature—mortality scenarios by resetting data observed

For each city, four alternative scenarios were defined by selecting specific daily series of baseline mortality and exposure.

The extreme scenarios consisted of the 6-month daily time series of maximum apparent temperature with corresponding baseline mortality obtained by selecting over all the observed years, for each month and day:

H1, the second to hottest day

C1, the second to coldest day.

For example, for the H1 scenario, we considered the hypothetical summer constituted by the second to hottest 1 April, the second to hottest 2 April....the second to hottest 30 September. We selected the second to coldest and the second to hottest days (instead of the hottest and the coldest days) to avoid scenarios that markedly over-represent extreme values.

In addition, we defined two scenarios by selecting:

H2, the summer characterised by the highest mean level of apparent temperature

C2, the summer characterised by the lowest mean level of apparent temperature.

These four scenarios were used for evaluating the impact of heat during summers hypothetically cooler and warmer than the overall (up to) 11-year mean.

scenario building

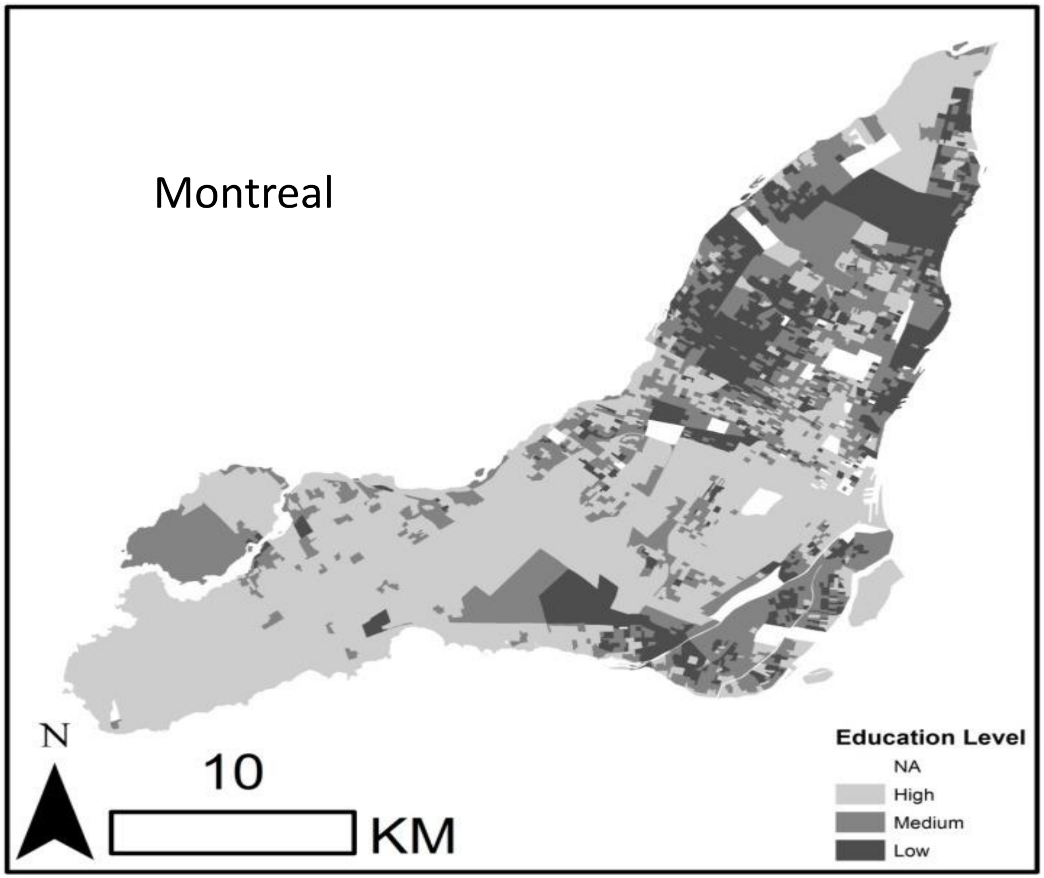
Baccini, 2008a

Table 4 Mean number of attributable deaths per year and 80% credibility intervals (see Methods for definition) calculated under the observed series and the four hypothetical low-exposure and high-exposure scenarios, by city

No of attributable deaths* (80% CrI)					
City	**Observed over study period**	**Scenario H1 (second to hottest days)**	**Scenario H2 (hottest year)**	**Scenario C1 (second to coldest days)**	**Scenario C2 (coldest year)**
Athens	230 (172 to 290)	321 (232 to 420)	359 (272 to 447)	22 (8 to 38)	168 (124 to 212)
Barcelona	290 (212 to 374)	421 (305 to 546)	429 (328 to 540)	139 (90 to 190)	216 (152 to 284)
Budapest	399 (346 to 463)	960 (848 to 1077)	632 (550 to 716)	29 (16 to 45)	282 (235 to 334)
Dublin	0 (0 to 1)	0 (0 to 1)	2 (0,5)	0 (0 to 0)	0 (0 to 0)
Helsinki	11 (6 to 17)	35 (17 to 55)	21 (11 to 32)	0 (0 to 0)	0 (0 to 0)
Ljubljana	13 (1 to 34)	21 (1 to 50)	15 (3 to 33)	1 (0 to 3)	6 (1 to 16)
London	142 (99 to 185)	377 (270 to 493)	476 (362 to 598)	0 (0 to 0)	1 (0 to 2)
Milan	95 (70 to 123)	240 (183 to 301)	79 (48 to 113)	0 (0 to 0)	1 (0 to 2)
Paris	423 (57 to 488)	969 (828 to 1107)	572 (479 to 662)	0 (0 to 0)	142 (108 to 178)
Prague	72 (53 to 92)	198 (149 to 257)	117 (90 to 149)	0 (0 to 0)	24 (16 to 33)
Rome	388 (339 to 440)	848 (751 to 950)	659 (588 to 731)	28 (16 to 41)	385 (346 to 426)
Stockholm	21 (13 to 30)	47 (24 to 72)	24 (14 to 34)	0 (0 to 0)	0 (0 to 0)
Turin	121 (80 to 168)	248 (177 to 323)	216 (150 to 283)	10 (0 to 22)	49 (24 to 78)
Valencia	72 (29 to 123)	67 (8 to 132)	58 (8 to 115)	34 (4 to 71)	43 (6 to 89)
Zurich	29 (18 to 41)	62 (38 to 88)	51 (32 to 70)	2 (0 to 3)	13 (7 to 20)

80% CrI, 80% credibility interval.
*Values rounded to an integer.

small area vulnerability assessments 1



Benmarhnia, 2015

determinants of behaviour

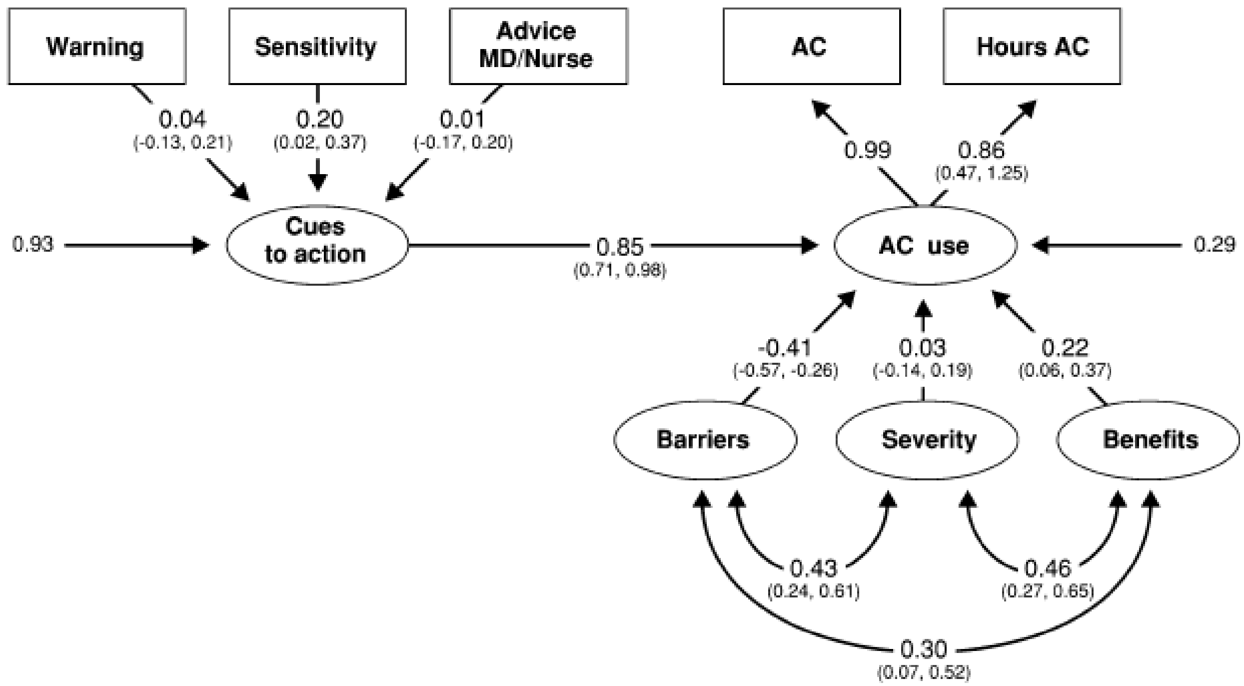


Fig. 1. Depiction of the causal model between perceived benefits, perceived barriers, perceived severity, cues to action and AC use, with standardized causal coefficients. Unstandardized residual variances for Cues to Action and AC use were constrained to 0.3. The coefficient linking AC use to AC was constrained to 1.0.

Richard, 2011

mitigation asset mapping

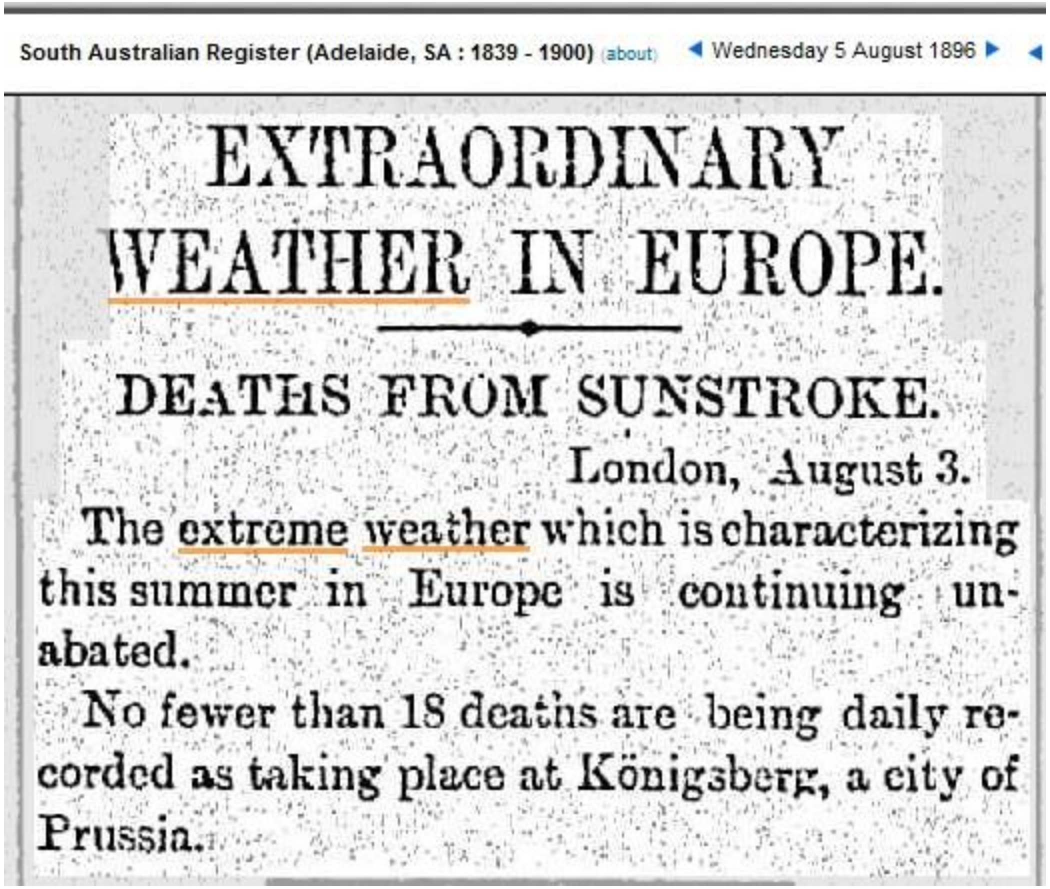
prevention effectiveness

- “Heat Watch Warning Systems Save Lives”

“the cost of running a heat wave warning system is “noise” compared to economic benefits of saving 117 lives.”

telling a tale that resonates

Dead in Minutes: Dogs and Heatstroke



South Australian Register (Adelaide, SA : 1839 - 1900) (about) Wednesday 5 August 1896

EXTRAORDINARY WEATHER IN EUROPE.

DEATHS FROM SUNSTROKE.

London, August 3.

The extreme weather which is characterizing this summer in Europe is continuing unabated.

No fewer than 18 deaths are being daily recorded as taking place at Königsberg, a city of Prussia.

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gracias

merci

thanks

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Centre de collaboration nationale en santé environnementale