Appendix

Table 1A. Summary of the 46 publications included in this study

#	Publication	City / Country	Study period	Modelling technique	Data source	Sample size	Variables
1	Bassil et al. (2009)	Toronto, Canada	2002-2005	Geospatial modelling	Calls responded by ambulance	200,000 calls	Temperature and socio-economic factor
2	Bayentin et al. (2010)	Quebec, Canada	1989-2006	Generalised additive model	Daily cases of IHD	n.a	Meteorological, Demographic and Social
3	Benmarhnia et al. (2014)	Paris, France	2004-2009	Stratified Poisson regression	Deaths aged 35	46,056 deaths	Temperature, air pollution and social deprivation
4	Benmarhnia et al. (2017)	Paris, France	2004-2009	Bernoulli cluster analysis,	Deaths for residents 65+	n.a.	Temperature, Socio-economic & demographic
5	Bishop-Williams et al. (2015)	Ontario, Canada	2010-2012	Poisson regression model	No of emergency Room visits	n.a	Temperature
6	Borden and Cutter (2008)	USA	1970-2004	Geospatial modelling	Mortality data from Sheldus	n.a	Natural hazards
7	Burkart et al. (2016)	Lisbon, Portugal	1998-2008	Distribution lag non-linear models	Daily aged 65+ deaths	218,764 deaths	Vegetation, water bodies and meteorological data
8	Burke et al. (2016)	Sub-Saharan Africa	1980-2010	Multivariate analysis	Children aged under 5 mortality	393,685 death.	Temperature, malaria burden and conflicts
9	Carmona et al, (2016)	Spain	2000-2009	Generalised linear models,	Daily deaths due to natural causes	n.a.	Temperature
10	Chen et al. (2015)	Nanjing, China	2009-2011	Generalised additive model	Stoke mortality risk	1,047 deaths	High heat exposure and high vulnerability
11	Chen et al. (2016)	Jiangsu, China	2009-2013	Distributed lag non-linear model	Heat-related mortality risk	73.9 m people	Urbanicity
12	Chien et al. (2016)	Texas, USA	2006-2011	Quasi-Poisson regression model	All-cause mortality data	n.a.	Temperature, humidity and socio-economic data
13	Guo et al. (2017)	31 Provinces, China	2005-2013	Generalised linear mixed model	Tuberculosis incidences	9.5 m cases	Socio-economic and meteorological data
14	Harlan et al. (2013)	Maricopa, Arizona, USA	2000-2008	Binary logistic regression	Deaths from heat exposure	455 deaths	Vegetation, socio-economy, and population
15	Hattis et al. (2012)	Massachusetts, USA	1990-2008	Correlation and linear regression	Heat related mortality	n.a.	Temperature, humidity and socio-demographic data
16	Heo et al. (2016)	South Korea	1996-2012	Generalised additive model	Daily all-cause mortality	n.a.	Temperature and socio-economic status
17	Ho et al. (2017)	Vancouver, Canada	1998-2014	Conditional logistic regression	Deaths except traffic accidents	997 deaths	Temperature and social vulnerability
18	Hondula et al. (2012)	Philadelphia, USA	1983-2008	PC regression	All-cause mortality	409,554 deaths	Climate, population and socio-economy
19	Hondula et al. (2013)	Philadelphia, USA	1983-2005	Generalised additive models	Daily all-cause mortality	n.a.	Temperature
20	Hondula and barnett. (2014)	Brisbane, Australia	2007-2011	Bayesian Poisson regression model	Daily non-accidental	353,231 cases	Weather and demographic data
21	Hondula et al. (2015)	USA	1983-2008	Poisson regression model	Daily mortality records	2.2 m deaths	Temperature, socio-economy and population
22	Jenerette et al. (2016)	Phoenix, USA	2011	Generalised Linear models	Symptoms, heat related illness	695	Vegetation, Land Surface Temperature (LST), and urbanization
23	Johnson and Wilson (2009)	Philadelphia, USA	1993	Standard deviation eclipse	Heat related fatality	118 deaths	Urban poor

24	Johnson et al. (2009)	Philadelphia, USA	1993	Logistic regression	Death due to heat	118 deaths	Surface temperature, socio-demographics
25	Laaidi et al. (2012)	Paris, France	2003	Conditional logistic regression	Aged ≥ 65 at home	241 deaths	Surface temperature
26	Lee et al. (2016)	Georgia, North Carolina, and South Carolina, USA	2007-2011	Conditional logistic regression	Non-accidental mortality	848,270 deaths	Temperature and socio-economic factor
27	Onozuka and Hagihara (2016)	Japan	2007-2010	Poisson & Lag nonlinear analysis	Daily emergency	5.3 m cases	Weather variables
28	Onozuka and Hagihara (2017b)	Japan	2005-2014	Multivariate random-effect	Patient aged 18+ with OHCA	166,496 cases	Temperature
29	Onozuka and hagihara (2017a)	Japan	2007-2010	Poisson regression and	Emergency ambulance	15.8 m cases	Temperature
30	Pascal et al. (2014)	France	2000-2006	Additive regression	Daily mortality	548,478 deaths	Particulate matter
31	Qi et al. (2014)	Australia	1986-2005	Bayesian conditional model	Suicide data	45,293 suicides	Meteorological and scio-demographic data
32	Rey et al. (2009)	France	2003	Bayesian spatial smoothing	Deaths aged 55+	14000 deaths	Temperature and ozone concentration
33	Rosenthal et al. (2014)	New York, USA	1997-2006	Least squares linear regression	Natural cause death, Aged 65+	n.a.	Socio economic, health and demography
34	Saha et al. (2015)	USA	2000-2010	Conditional logistic regression	Hyperthermia related	11031 cases	Temperature and air quality
35	Schuster et al. (2014)	Berlin, Germany	2001-2010	Aggregation and cluster analysis	Daily death counts	n.a.	Meteorological and demography
36	Son et al. (2016)	Seoul, Korea	2000-2009	Over-dispersed Poisson / Generalised linear mixed model	Daily counts of death	n.a.	Temperature, age, gender and vegetation
37	Taylor et al. (2015)	London, UK	2006	Statistical analysis	Mortality statistics	n.a.	Dwelling type, urban heat island and weather
38	Thach et al. (2015)	Hong Kong	2006	Additive mixed model	Mortality rates & monthly deaths	Aggregated to 145 tertiary planning units	Physiological equivalent temperature (PET)
39	Uejio et al. (2011)	Philadelphia, USA	1999	Spatial generalised linear mixed models	Heat mortality	63 deaths	Exposure, neighbourhood stability and environment
40	Urban and Kyselý (2018)	Prague, Czech Republic	1994-2009	Linear regression model	Cardiovascular Mortality	n.a	Meteorological data
41	Urban et al. (2016)	Czech Republic	1994-2009	Spearman's correlation	Cardiovascular Mortality	930,659 deaths	Climate, altitude, and urbanization
42	Vaneckova et al. (2010)	Sydney, Australia	1993-2004	Generalised linear model	Daily mortality, aged 65+	n.a	Temperature, Ozone and particulate matter
43	Vargo et al. (2016)	USA	1987-2005	Comparative risk assessment	Estimates of mortality in 2050	n.a	Temperature, Age, Income and race
44	Wang et al. (2017)	China	2007-2012	Distributed lag nonlinear model,	Mortality dataset	70m people	Temperature and meteorological variables
45	Willers et al. (2016)	Rottendam, Netherlands	1995-2009	Exposure modelling	Natural Mortality	n.a.	Heat and a ir pollution
46	Wu et al. (2011)	Taiwan	1994-2003	Spatial regression model	Cardiovascular mortality	n.a.	Temperature

Table 2A. Summary of risk attributable to socio-demographic and environmental factors

Region	Case	Sample size	% Risk (95%CI)
Rural/urban			
Jiangsu, China	Heat related mortality	n.a.	less urban:1.43 (1.36-1.50) urban:1.26(1.23-1.30)
Nanjiang, China	Stroke mortality	418 cases	urban: 0.94 (0.96-1.12) rural:1.89 (1.63-2.17)
Seoul, Korea	Daily counts of deaths	n.a.	Low NDVI: 4.1% (2.3-5.9%) Medium NDVI: 3.0% (0.2-5.9%) High NDVI: 2.2% (-0.5-5.0%)
Lisbon, Portugal	Daily aged stratified deaths	218,764 deaths aged ≥65	Low NDVI: 14.7% (1.9-17.5%) High NDVI: 3.0% (2.0-4.0%)
Phoenix, USA	Heat distress calls	637 calls	urban heat island:1.01(1.01-1.02)
Paris, France	Daily mortality age ≥65	1,238 deaths	0.0041 (0.001-0.008)
Age			
Rotterdam, Netherlands	Natural cause mortality	n.a.	<45 year: 7% (6-9%) 45-64 years: 8% (7-9%) 65-84 years: 6% (5-6%) >=85 years 10% :(9-11%)
Phoenix, USA	Heat distress calls	637 calls	age 65 and+: 0.86 (0.78-0.95)
South Korea	Daily all cause, respiratory and cardiovascular mortality	n.a.	age <20:1.08 (0.92-1.27) age 20-74: 1.03 (0.99-1.07) age 75+: 1.04 (1.02-1.06)
Japan	Patients aged 18+ experienced an OHCA	166,496 cases	age 18-64:1.12 (0.92-1.36) age 65-74:0.95(0.78-1.16) age 75-1101.24(1.11-1.38)
Jiangsu, China	Heat related mortality	n.a.	age >=65: 4.6% (1.6-7.7)
Race			
Georgia, N S Carolina	Deaths from natural cause	848,270 deaths	Black: 4.35% (2.22-6.53) White: 0.6% (-0.84-2.07)
Philadelphia, USA	Extreme heat mortality	63 deaths	Black neighbourhood:1.01 (1.00-1.02)
Phoenix, USA	Heat distress calls	637 calls	Black: 1.03 (1.01-1.04)
Australia	Suicide deaths	45,293 deaths	Aboriginal: 1.0107 (1.0062-1.0151), 1996-2000 1.0126 (1.0076-1.0176), 2001-2005
Paris, France	Daily mortality age 65+	1,238 deaths	foreigners: 0.614 (0.01-1.22)
Rotterdam, Netherlands	Natural cause mortality	n.a.	Non-western origin: 8% (7-10%)
Socio-economy			
Paris, France	Daily mortality age ≥65	1238 deaths	blue collar: 1.28 (0.211-2.348)
South Korea	Daily all cause, respiratory And cardiovascular mortality	n.a.	white collar: 1.01 (0.99-1.03) blue collar: 1.06 (1.04-1.07)
Australia	Suicide deaths	45,293 deaths	unemployment:1.0187 (1.0060-1.0375), 1996-2000 unemployment:1.0198 (1.0041-1.0354), 2001-2005

Pollutants			
France	Deaths age ≥65	14,000 deaths	$PM_{2.5}$: 5.1% (1.8-8.4) $PM_{10-2.5}$: 7.2% (2.8-11.7)
Paris, France	Daily mortality age ≥65	1,238 deaths	PM_{10}: 0.02 (0.001-0.045) $PM_{2.5}$: 0.032 (-0.001-0.064)
9 French cities	Daily mortality	548,478 deaths	PM_{10}: 0.8% (0.2-1.5) $PM_{2.5}$: 0.7% (0.1-1.6)

NDVI: Normalized Difference Vegetation Index; OHCA: Out-of-hospital cardiac arrest;
$PM_{2.5}$: Fine inhalable particles, with diameters that are generally 2.5 micrometers and smaller;
$PM_{10-2.5}$: Coarse inhalable particles, with diameters that are generally between 2.5. and 10 micrometers;
PM_{10}: Inhalable particles, with diameters that are generally 10 micrometers and smaller.

Tables' References

Bassil KL, Cole DC, Moineddin R, Craig AM, Lou WW, Schwartz B, Rea E, 2009. Temporal and spatial variation of heat-related illness using 911 medical dispatch data. Environ Res 109:600-6.

Bayentin L, El Adlouni S, Ouarda TB, Gosselin P, Doyon B, Chebana F, 2010. Spatial variability of climate effects on ischemic heart disease hospitalization rates for the period 1989-2006 in Quebec, Canada. Int J Health Geographics 9:5

Benmarhnia T, Oulhote Y, Petit C, Lapostolle A, Chauvin P, Zmirou-Navier D, Deguen S, 2014. Chronic air pollution and social deprivation as modifiers of the association between high temperature and daily mortality. Environ Health 13:53.

Benmarhnia T, Kihal-Talantikite W, Ragettli MS, Deguen S, 2017. Small-area spatiotemporal analysis of heatwave impacts on elderly mortality in Paris: A cluster analysis approach. Science of the Total Environ 592:288-94.

Bishop-Williams KE, Berke O, Pearl DL, Kelton DF, 2015. A spatial analysis of heat stress related emergency room visits in rural Southern Ontario during heat waves. BMC emergency medicine 15:17.

Borden KA, Cutter SL, 2008. Spatial patterns of natural hazards mortality in the United States. Int J Health Geographics 7:64.

Burkart K, Meier F, Schneider A, Breitner S, Canário P, Alcoforado MJ, Endlicher W, 2016. Modification of heat-related mortality in an elderly urban population by vegetation (urban green) and proximity to water (urban blue): evidence from Lisbon, Portugal. Environ Health Perspect 124:927-34.

Burke M, Heft-Neal S, Bendavid E, 2016. Sources of variation in under-5 mortality across sub-Saharan Africa: a spatial analysis. The Lancet Global Health 4:e936-45.

Carmona R, Díaz J, Mirón IJ, Ortiz C, León I, Linares C, 2016. Geographical variation in relative risks associated with cold waves in Spain: the need for a cold wave prevention plan. Environ Int 88:103-11.

Chan EYY, Goggins WB, Kim JJ, Griffiths SM, 2012. A study of intracity variation of temperature-related mortality and socioeconomic status among the Chinese population in Hong Kong. J Epidemiol Community Health 66:322-7.

Chen K, Huang L, Zhou L, Ma Z Bi J, Li T, 2015. Spatial analysis of the effect of the 2010 heat wave on stroke mortality in Nanjing, China. Scientific Rep 5:10816.

Chen K, Zhou L, Chen X, Ma Z, Liu Y, Huang L, Kinney PL, 2016. Urbanization level and vulnerability to heat-related mortality in Jiangsu Province, China. Environ Health Perspect 124:1863.

Chien LC, Guo Y, Zhang K, 2016. Spatiotemporal analysis of heat and heat wave effects on elderly mortality in Texas, 2006–2011. Sci Total Environment 562:845-51.

Guo C, Du Y, Shen SQ, Lao XQ, Qian J, Ou CQ, 2017. Spatiotemporal analysis of tuberculosis incidence and its associated factors in mainland China. Epidemiol & Infection 145:2510-9.

Harlan SL, Declet-Barreto JH, Stefanov WL, Petitti DB, 2013. Neighborhood effects on heat deaths: social and environmental predictors of vulnerability in Maricopa County, Arizona. Environ Health Perspect 121:197-204.

Hattis D, Ogneva-Himmelberger Y, Ratick S, 2012. The spatial variability of heat-related mortality in Massachusetts. Applied Geography 33:45-52.

Heo S, Lee E, Kwon BY, Lee S, Jo KH, Kim J, 2016. Long-term changes in the heat–mortality relationship according to heterogeneous regional climate: a time-series study in South Korea. BMJ Open 6:e011786.

Ho HC, Knudby A, Walker BB, Henderson SB, (2017). Delineation of spatial variability in the temperature–mortality relationship on extremely hot days in greater Vancouver, Canada. Environ Health Perspect 125:66-75.

Hondula DM, Barnett AG, 2014. Heat-related morbidity in Brisbane, Australia: spatial variation and area-level predictors. Environ Health Perspect 122:831.

Hondula DM, Davis RE, Leisten MJ, Saha MV, Veazey LM, Wegner CR, 2012. Fine-scale spatial variability of heat-related mortality in Philadelphia County, USA, from 1983-2008: a case-series analysis. Environ Health 11:16.

Hondula DM, Davis RE, Rocklöv J, Saha MV, 2013. A time series approach for evaluating intra-city heat-related mortality. J Epidemiol Community Health 67:707-12.
Hondula DM, Davis RE, Saha MV, Wegner CR, Veazey LM, 2015. Geographic dimensions of heat-related mortality in seven US cities. Environ Res 138:439-52.
Jenerette GD, Harlan SL, Buyantuev A, Stefanov WL, Declet-Barreto J, Ruddell BL et al., 2016. Micro-scale urban surface temperatures are related to land-cover features and residential heat related health impacts in Phoenix, AZ USA. Landscape Ecology 31:745-60.
Johnson DP, Wilson JS, Luber GC, 2009. Socioeconomic indicators of heat-related health risk supplemented with remotely sensed data. Int J Health Geographics 8:57.
Johnson DP, Wilson JS, 2009. The socio-spatial dynamics of extreme urban heat events: The case of heat-related deaths in Philadelphia. Applied Geography 29:419-34.
Laaidi K, Zeghnoun A, Dousset B, Bretin P, Vandentorren S, Giraudet E, Beaudeau P, 2012. The impact of heat islands on mortality in Paris during the August 2003 heat wave. Environ Health Perspect 120:254-9.
Lee M, Shi L, Zanobetti A, Schwartz JD, 2016. Study on the association between ambient temperature and mortality using spatially resolved exposure data. Environ Res 151:610-17.
Onozuka D, Hagihara A, 2016. Spatial and temporal variation in emergency transport during periods of extreme heat in Japan: a nationwide study. Sci Total Environ 544:220-9.
Onozuka D, Hagihara A, 2017a. Spatiotemporal variations of extreme low temperature for emergency transport: a nationwide observational study. Int J Biometeorol 61:1081-94.
Onozuka D, Hagihara A, 2017b. Spatiotemporal variation in heat-related out-of-hospital cardiac arrest during the summer in Japan. Sci Total Environ 583:401-7.
Pascal M, Falq G, Wagner V, Chatignoux E, Corso M, Blanchard M, Larrieu S, 2014. Short-term impacts of particulate matter (PM10, PM10–2.5, PM2. 5) on mortality in nine French cities. Atmospheric Environ 95:175-84.
Qi X, Hu W, Mengersen K, Tong S, 2014. Socio-environmental drivers and suicide in Australia: Bayesian spatial analysis. BMC Public Health 14:681.
Rey G, Fouillet A, Bessemoulin P, Frayssinet P, Dufour A, Jougla E, Hémon D, 2009. Heat exposure and socio-economic vulnerability as synergistic factors in heat-wave-related mortality. European J Epidemiol 24:495-502.
Rosenthal JK, Kinney PL, Metzger KB, 2014. Intra-urban vulnerability to heat-related mortality in New York City, 1997–2006. Health & Place 30:45-60.
Saha S, Brock JW, Vaidyanathan A, Easterling DR, Luber G, 2015. Spatial variation in hyperthermia emergency department visits among those with employer-based insurance in the United States–a case-crossover analysis. Environ Health 14:20.
Schuster C, Burkart K, Lakes T, 2014. Heat mortality in Berlin–Spatial variability at the neighborhood scale. Urban Climate 10:134-47
Son JY, Lane KJ, Lee JT, Bell ML, 2016. Urban vegetation and heat-related mortality in Seoul, Korea. Environ Res 151:728-33.
Taylor J, Wilkinson P, Davies M, Armstrong B, Chalabi Z, Mavrogianni A, Bohnenstengel SI, 2015. Mapping the effects of urban heat island, housing, and age on excess heat-related mortality in London. Urban Climate 14:517-28.
Thach TQ, Zheng Q, Lai PC, Wong PPY, Chau PYK, Jahn HJ, et al., 2015. Assessing spatial associations between thermal stress and mortality in Hong Kong: A small-area ecological study. Sci Total Environ 502:666-72.
Uejio CK, Wilhelmi OV, Golden JS, Mills DM, Gulino SP, Samenow JP, 2011. Intra-urban societal vulnerability to extreme heat: the role of heat exposure and the built environment, socioeconomics, and neighborhood stability. Health & Place 17:498-507.
Urban A, Burkart K, Kyselý J, Schuster C, Plavcová E, Hanzlíková H, Lakes T, 2016. Spatial patterns of heat-related cardiovascular mortality in the Czech Republic. Int J Environ Res Public Health 13:284.
Urban A, Kyselý J, 2018. Application of spatial synoptic classification in evaluating links between heat stress and cardiovascular mortality and morbidity in Prague, Czech Republic. Int J Biometeorol 62:85-96.

Vaneckova P, Beggs PJ, Jacobson CR, 2010. Spatial analysis of heat-related mortality among the elderly between 1993 and 2004 in Sydney, Australia. Social Sci Med 70:293-304.
Vargo J, Stone B, Habeeb D, Liu P, Russell A, 2016. The social and spatial distribution of temperature-related health impacts from urban heat island reduction policies. Environ Sci Policy 66:366-74.
Wang C, Zhang Z, Zhou M, Zhang L, Yin P, Ye W, Chen Y, 2017. Nonlinear relationship between extreme temperature and mortality in different temperature zones: A systematic study of 122 communities across the mainland of China. Sci Total Environ 586:96-106.
Willers SM, Jonker MF, Klok L, Keuken MP, Odink J, van den Elshout S, et al., 2016. High resolution exposure modelling of heat and air pollution and the impact on mortality. Environ Int 89:102-9.
Wu PC, Lin CY, Lung SC, Guo HR, Chou CH, Su HJ, 2011. Cardiovascular mortality during heat and cold events: determinants of regional vulnerability in Taiwan. Occupational Environ Med 68:525-30.