

Supplementary Information

Impact of population aging on future temperature-related mortality at different global warming levels

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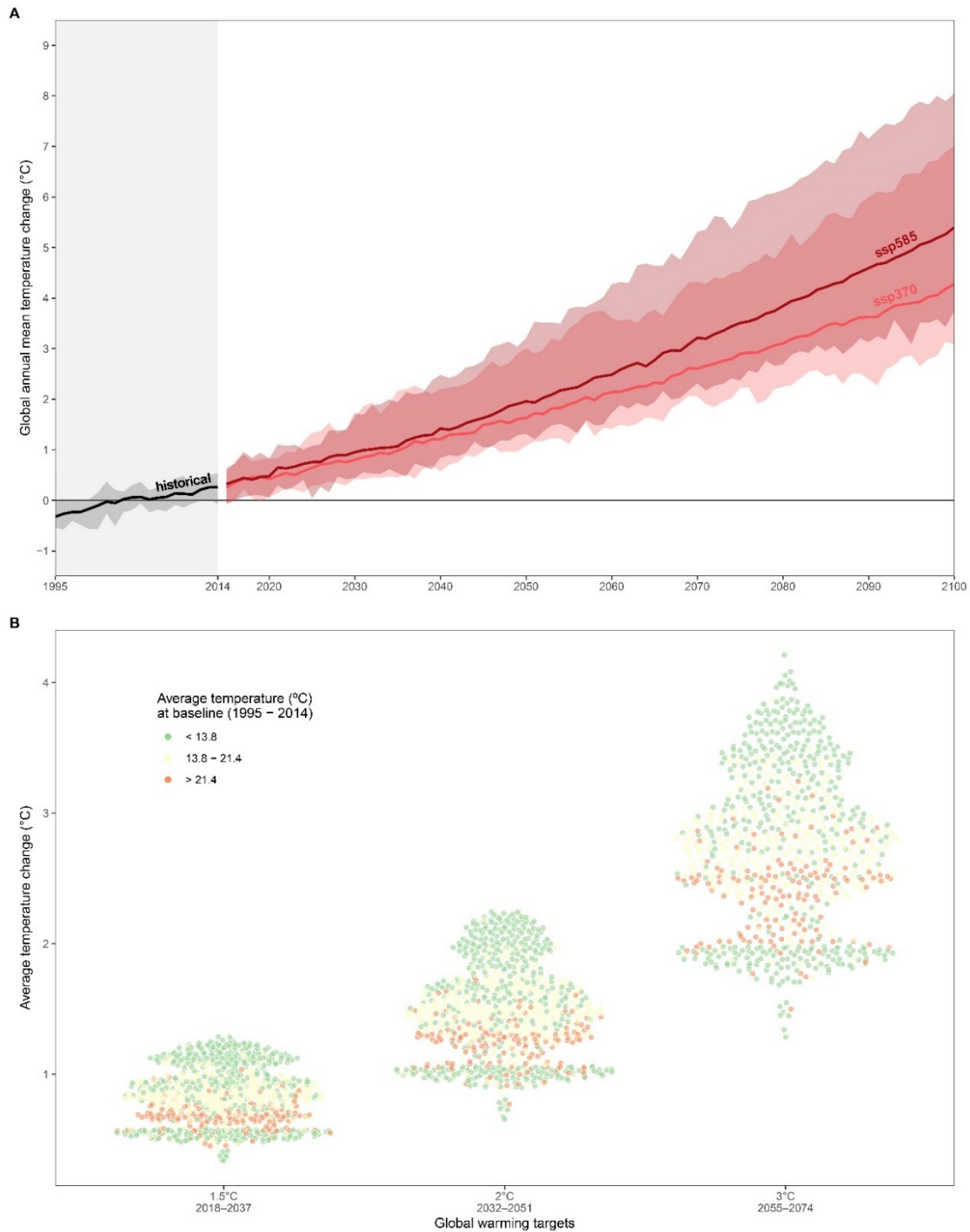
Supplementary Methods
Supplementary Figures
Supplementary Tables

Supplementary Methods

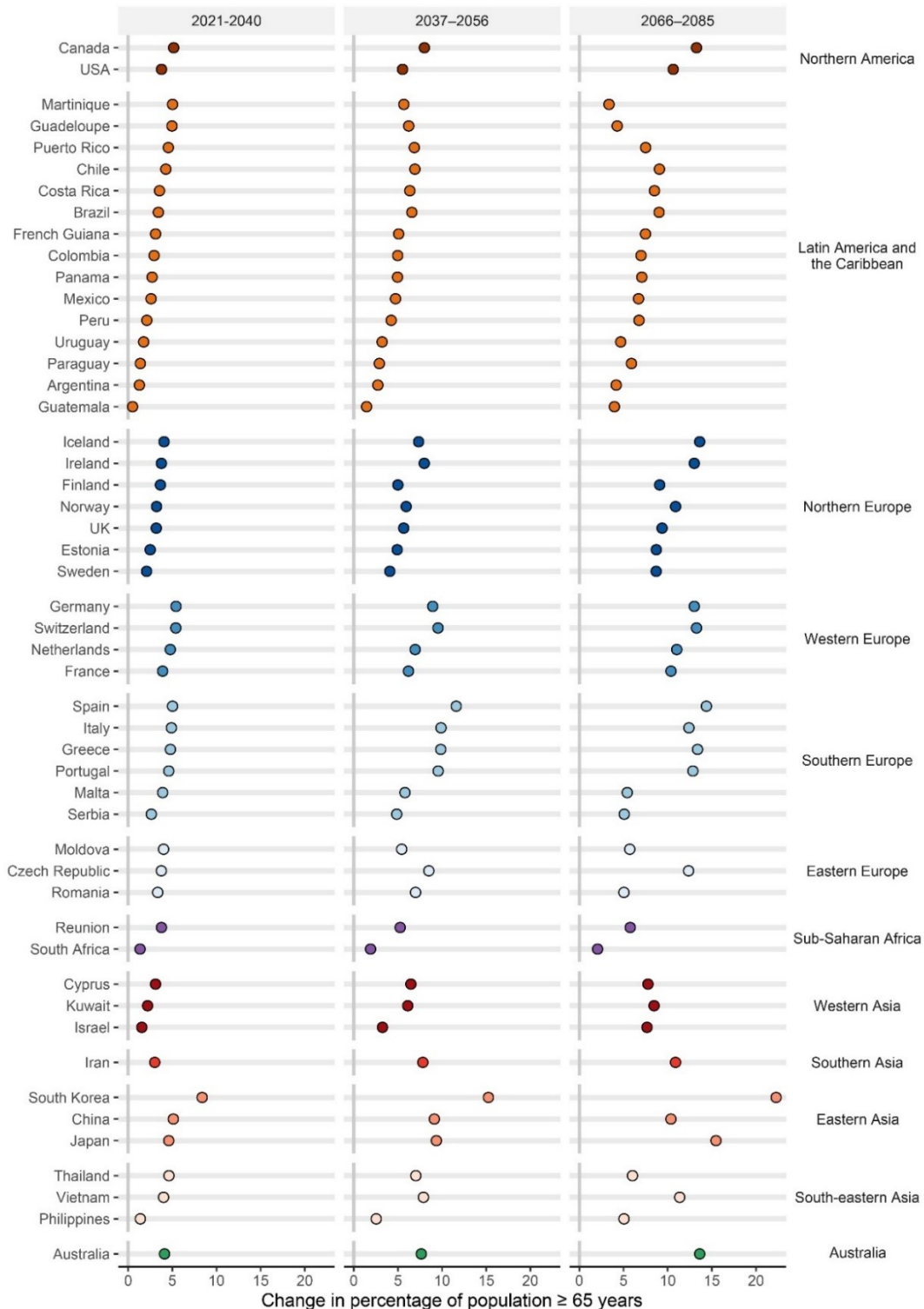
Age group-specific temperature-mortality relationships

To obtain the age group-specific relationships, we first quantified the location-specific relationship between daily mean temperature and mortality using observed data and a state-of-the-art two-stage approach coupled with distributed lag nonlinear models ¹ and multivariate dose-response meta-regression ^{2,3}. We then applied age-specific exposure-response function (ERF) predicted from a meta-analytical model derived by Dr. Noah Scovronick. In detail, it was not possible to derive pooled ERF for specific age categories from the time series analysis (1st stage) as MCC mortality data by age are not available for all locations for the same age bands. Thus, Scovronick et al. applied a novel methodology consistent with a multivariate dose-response meta-analysis that allows for continuously modelling age as an effect modifier of the temperature-mortality association. Using the derived meta-regression model, we predicted the ERF at 50, 70, and 83.5 years old, corresponding to the average age at death for each interval, which represented the temperature-mortality association at the 0-64, 65-74, and ≥ 75 years age groups, respectively. Using the youngest age group (0-64 years) as the reference, we then calculated a set of ERF conversion factors for two older groups through dividing the ERFs at age 70 and 83.5 years by the ERF at age 50 years, respectively. To keep the non-linear shape of the overall ERF and to take into account the larger temperature range for cold than for heat (Figure S3), here we used the 10th percentile of temperature for cold and the 99th percentile of temperature for heat when calculating the ERF conversion factors for cold and heat, respectively. These age group-specific ERF conversion factors were then applied to estimate the location-specific age-specific temperature-mortality associations based on the overall ERF derived from the two-stage analysis. Although this approach allows for the use of continuous risk estimates across the full temperature range, it relies on the strong assumption that difference in mortality risk between age categories remains the same across locations.

Compared with the 0-64 age group, the 65-74 and ≥ 75 years age groups have 1.2 and 1.8 times of heat-related mortality risks and 1.9 and 2.4 times of cold-related mortality risks. Applying these conversion factors to the location-specific total ERF, we obtained the age group-specific ERFs in each MCC location. Figure S3 reports the total and age group-specific exposure-response curves in 800 studied locations.

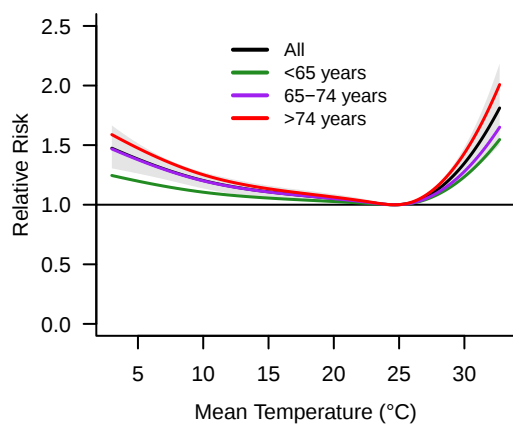


Supplementary Figure 1. Projections of average daily mean temperature changes under global warming levels. (A) Global annual average temperature changes relative to 1995–2014 (historical period, gray shaded area) under SSP5–8.5 and SSP3–7.0. Solid colored lines represent the multi-model ensemble average, and colored shades show the range of simulations from 18 global circulation models (GCMs). **(B) Location-specific average temperature changes** at different levels of global warming stratified by local average temperature at historical period (1995–2014).

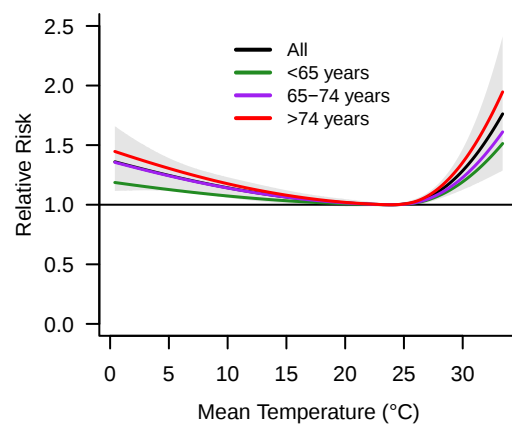


Supplementary Figure 2. Population aging at periods corresponding to different levels (1.5 °C, 2 °C, and 3 °C – SSP3-7.5) of global warming by country/area. Country-specific age-group population projections are derived from the SSP3 scenario in the first 20-year periods reaching 1.5 °C (2021–2040), 2 °C (2037–2056), and 3 °C (2066–2085) of warming, respectively.

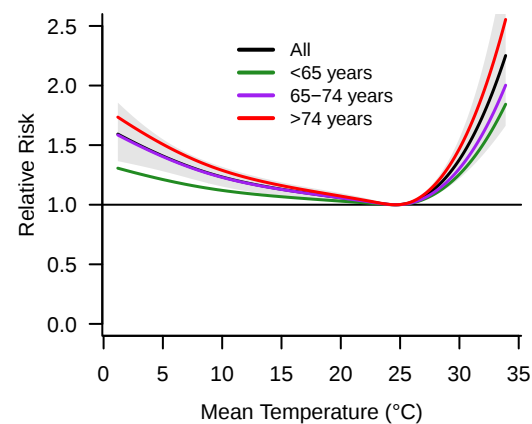
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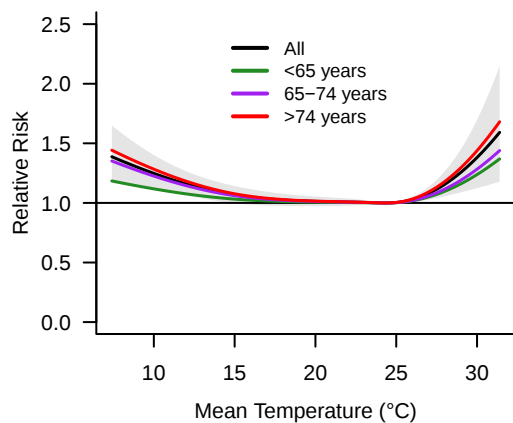
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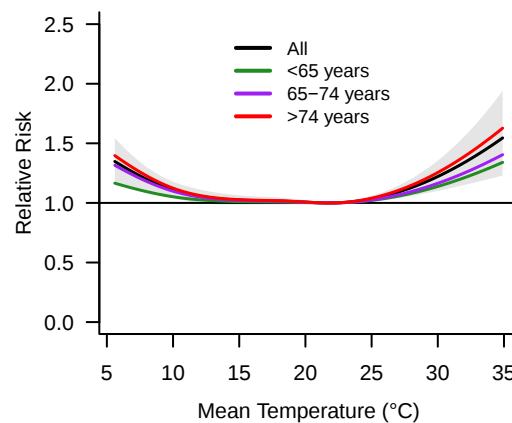
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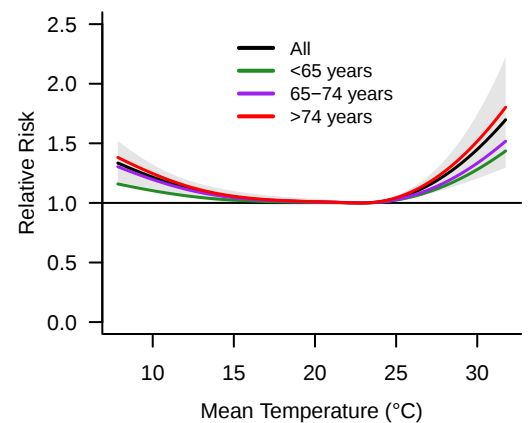
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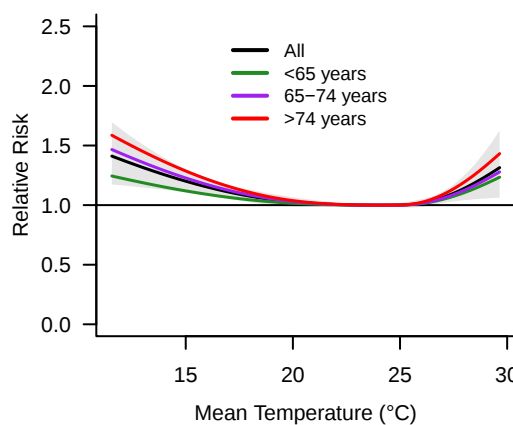
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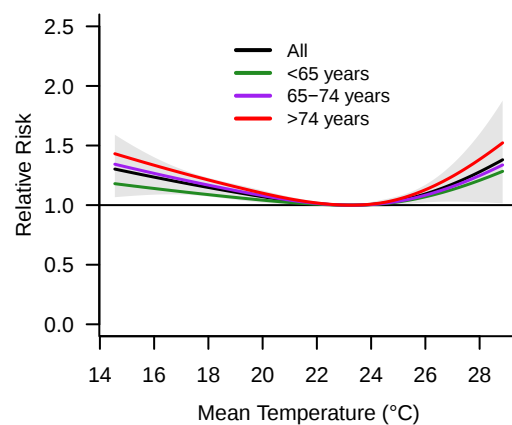
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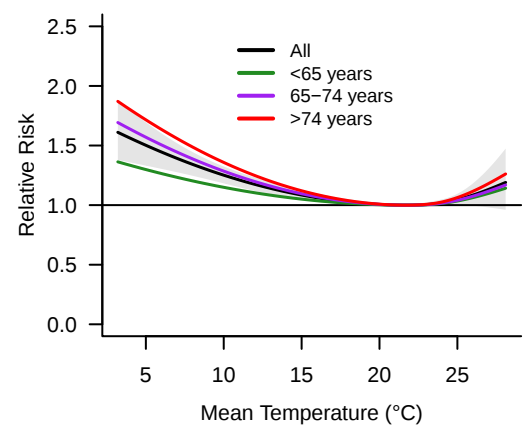
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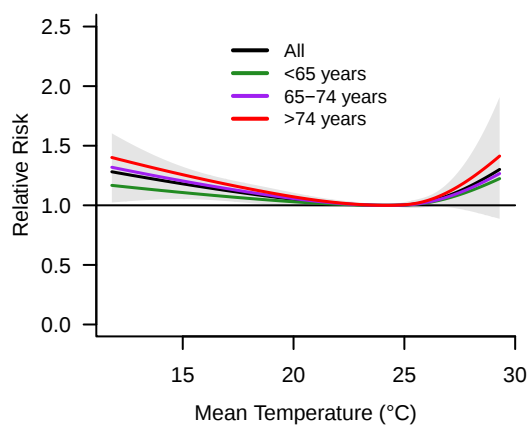
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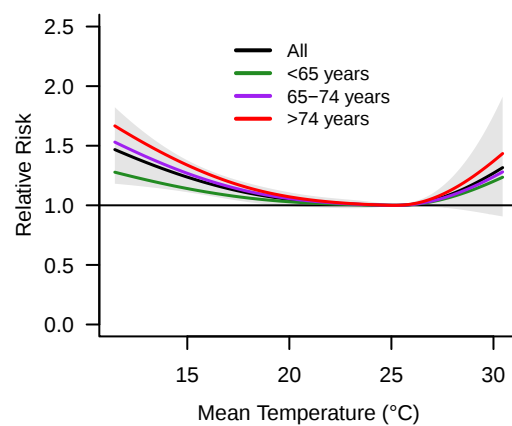
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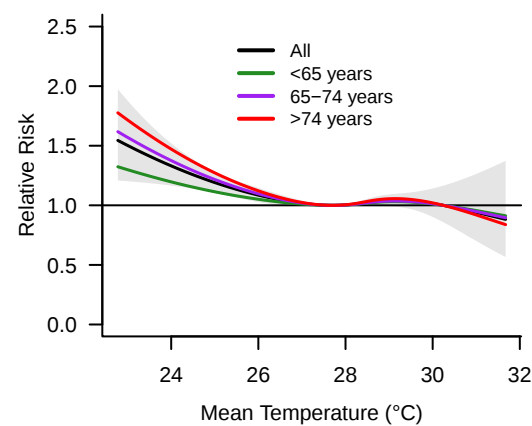
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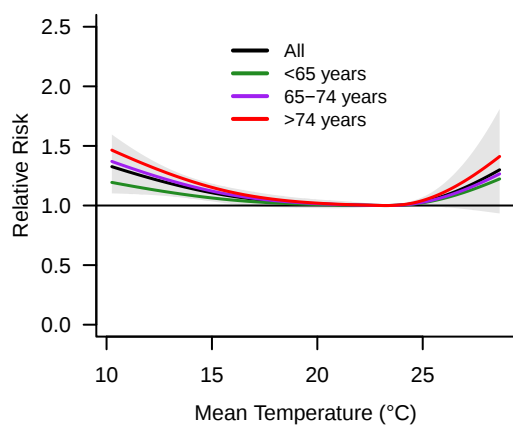
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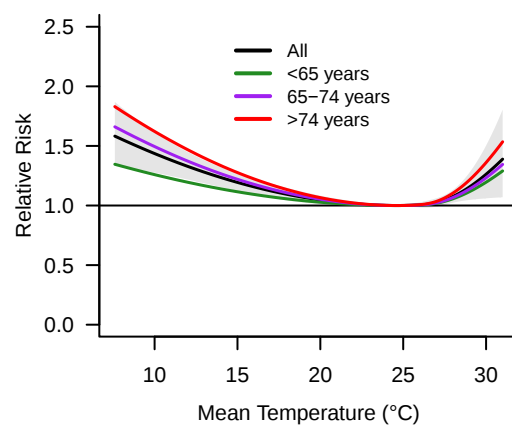
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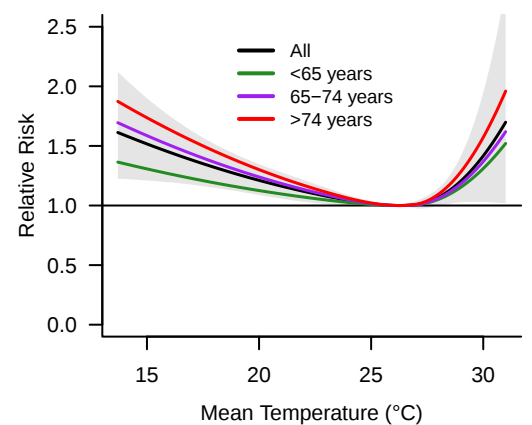
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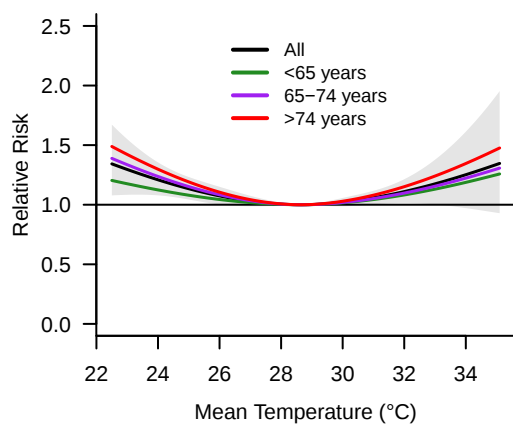
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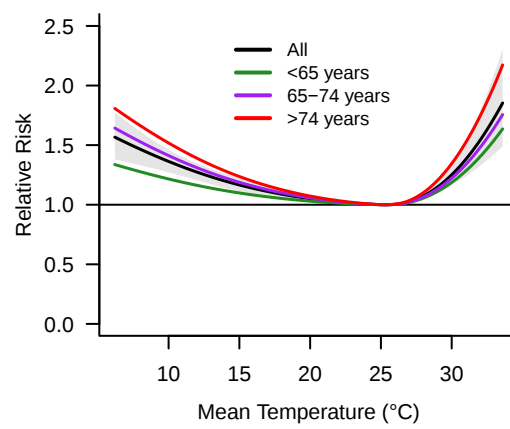
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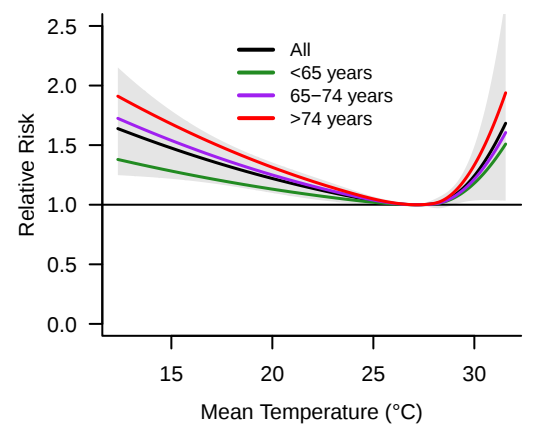
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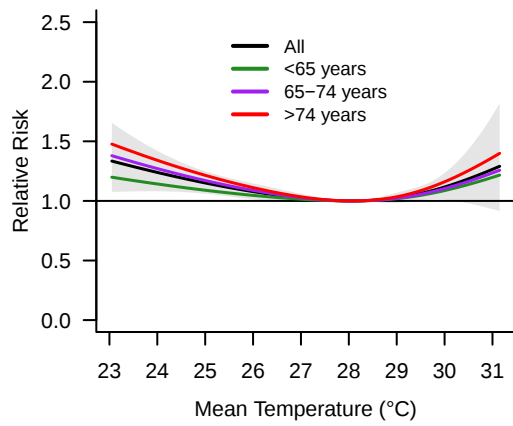
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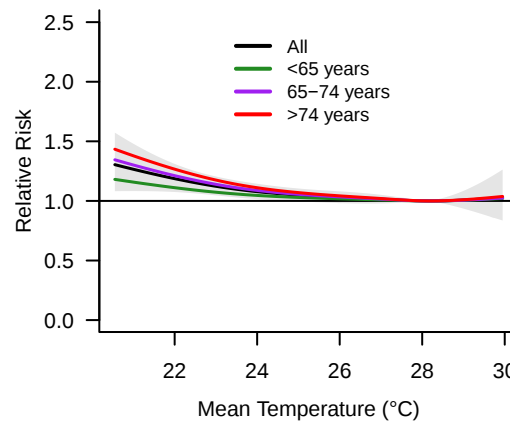
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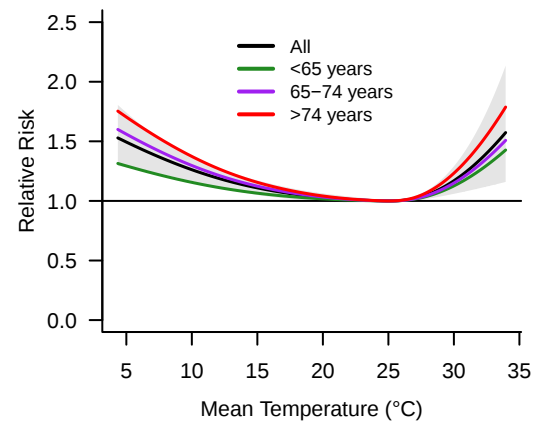
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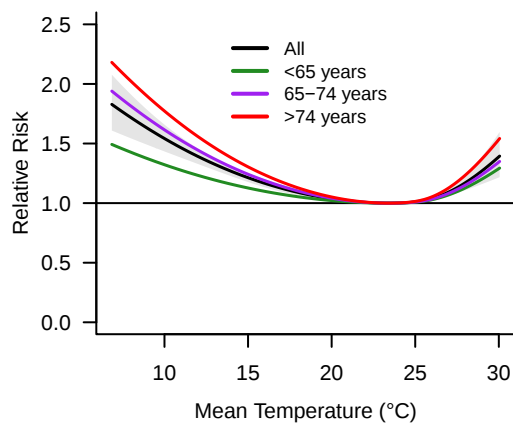
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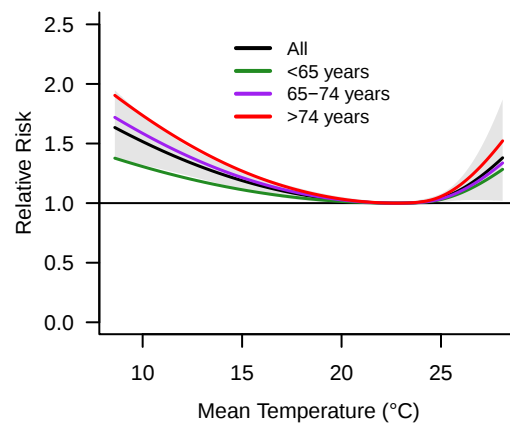
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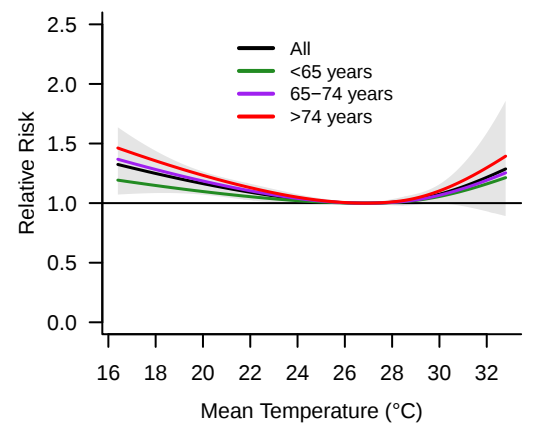
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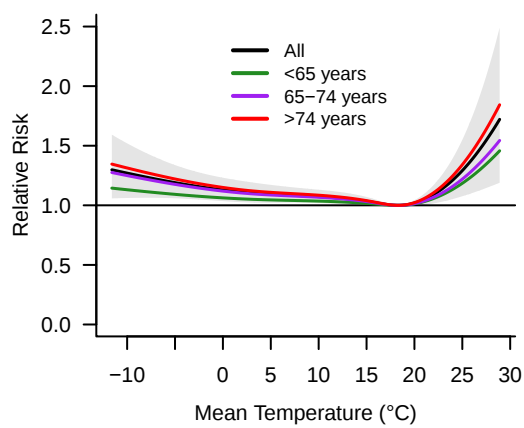
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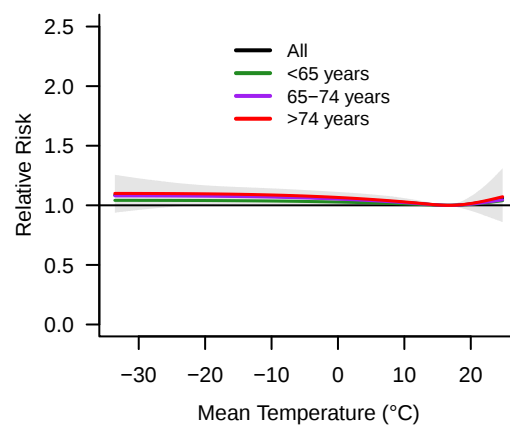
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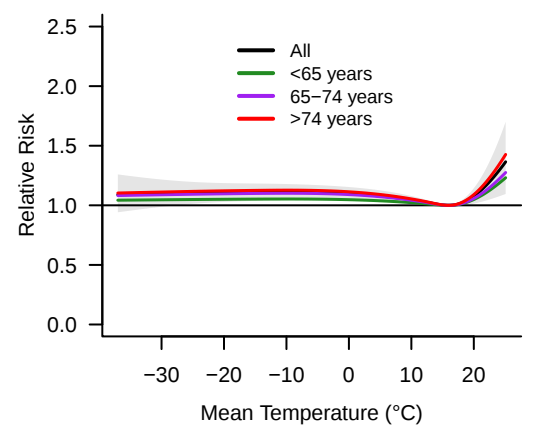
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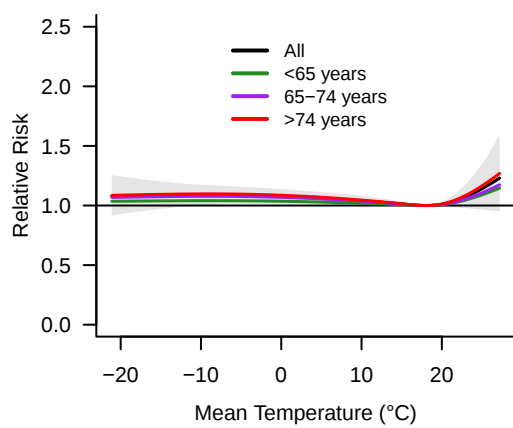
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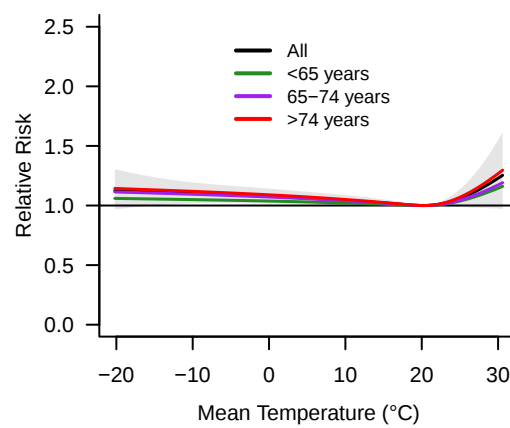
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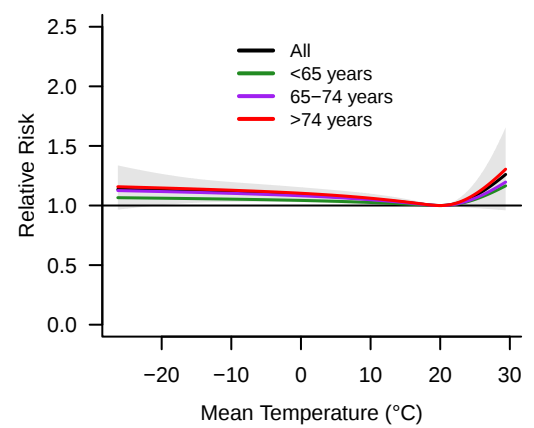
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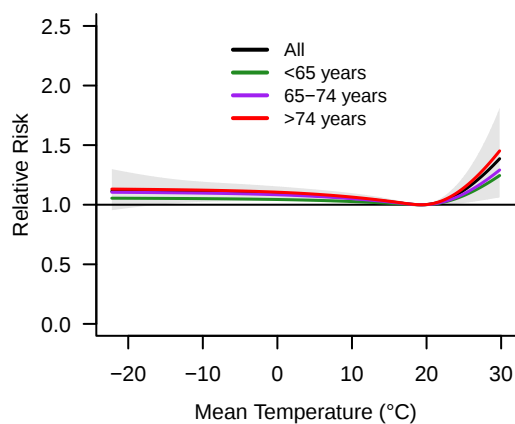
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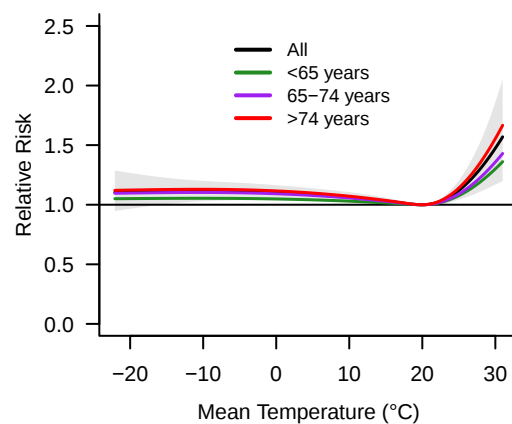
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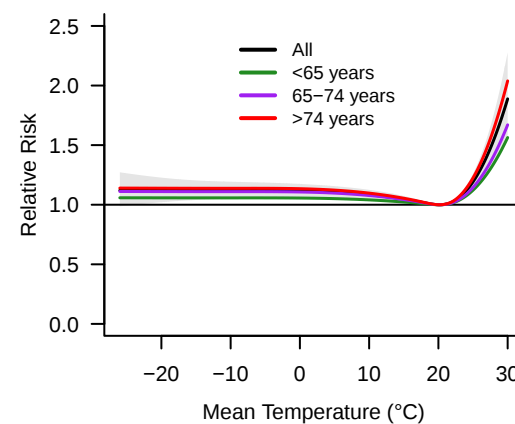
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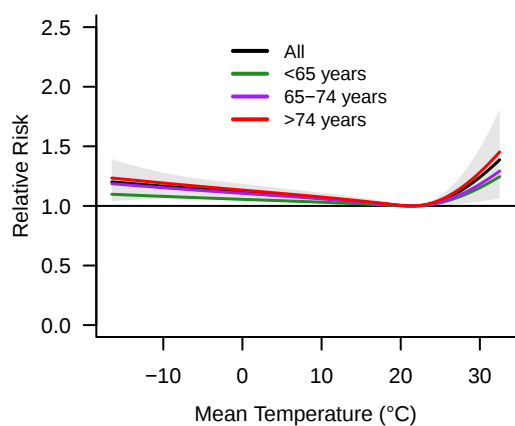
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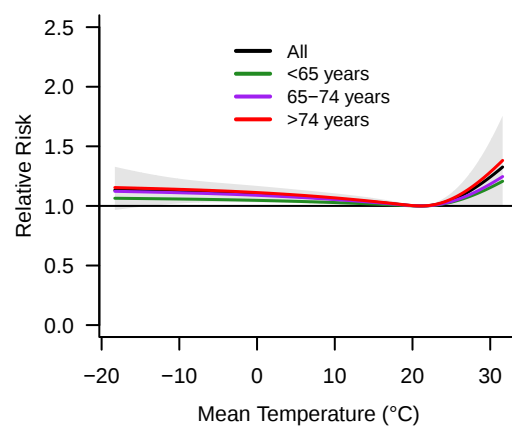
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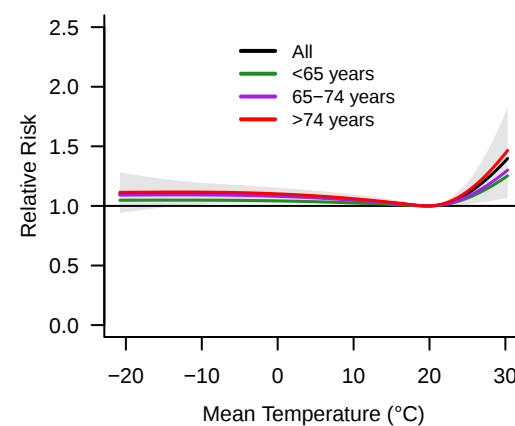
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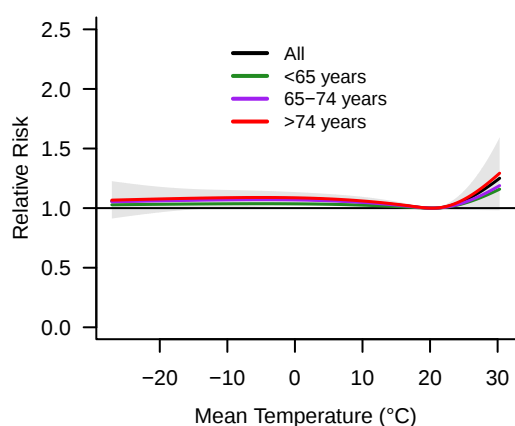
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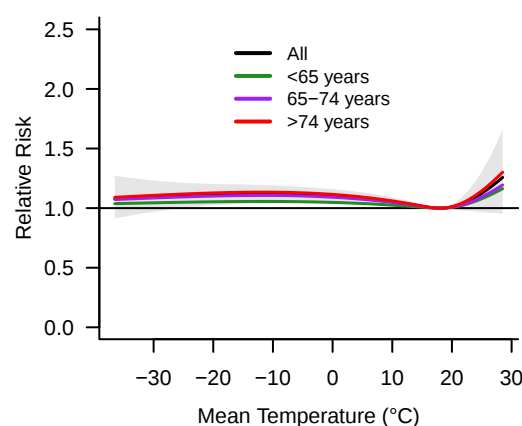
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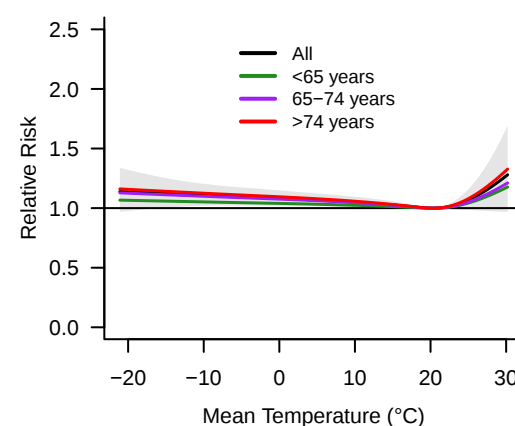
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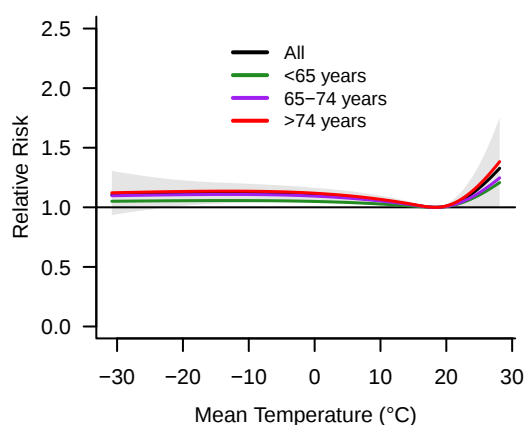
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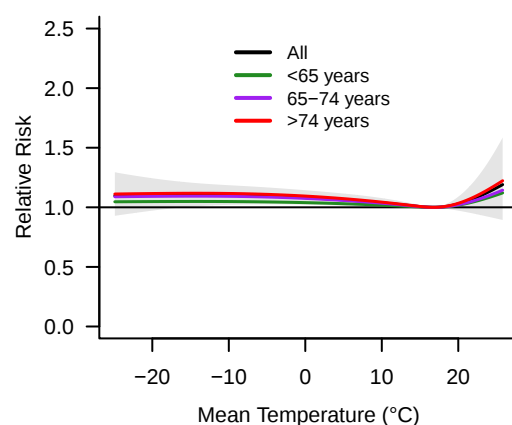
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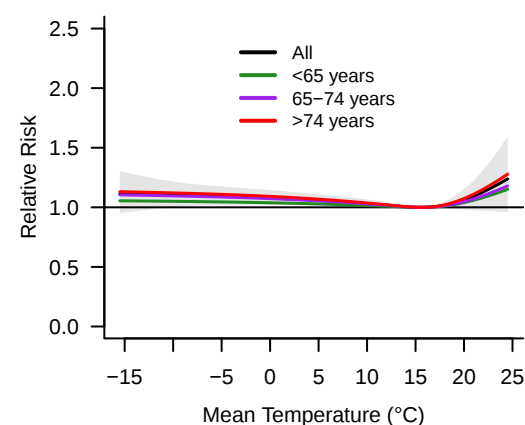
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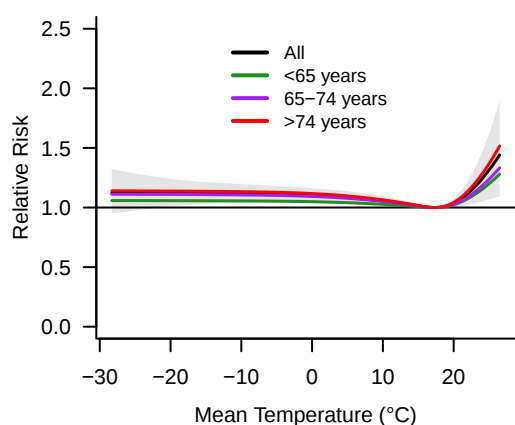
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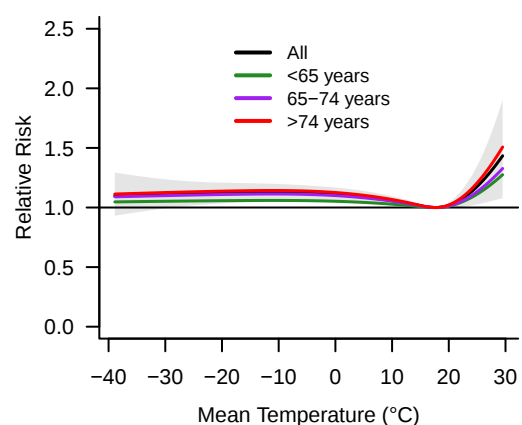
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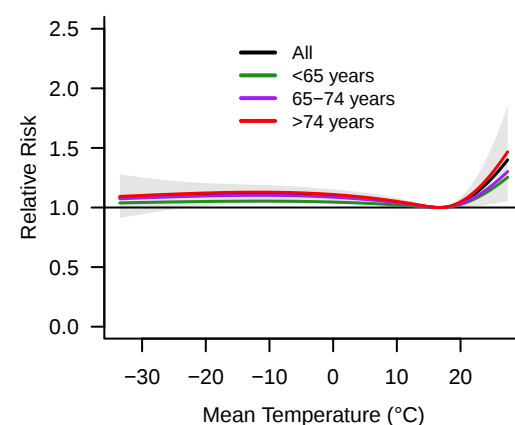
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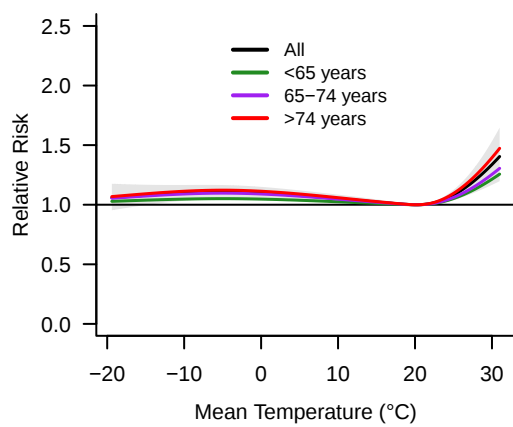
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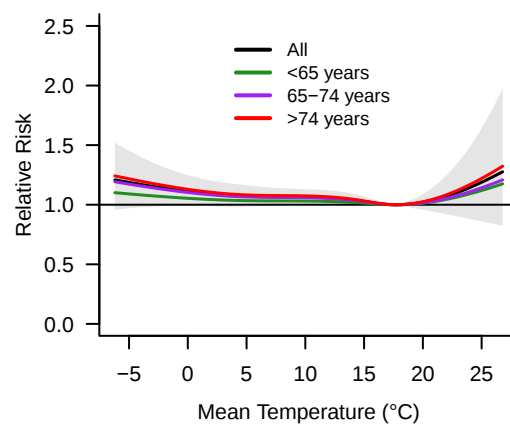
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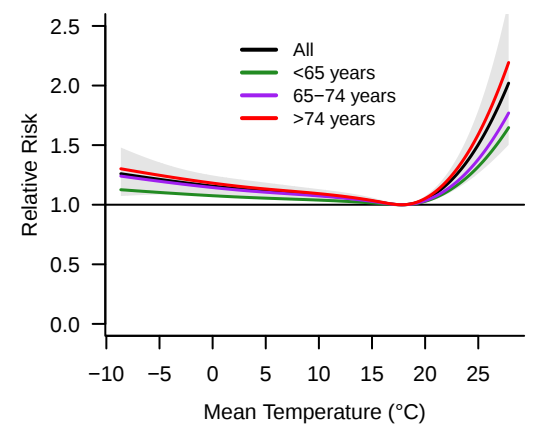
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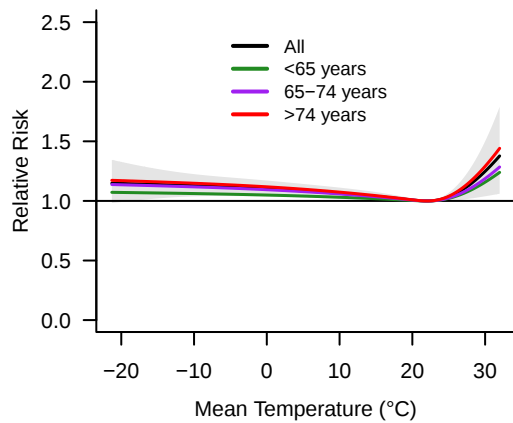
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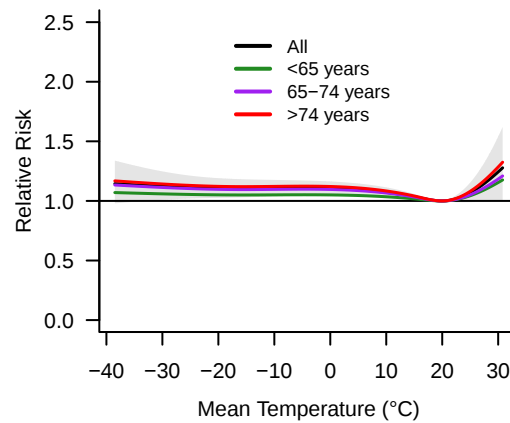
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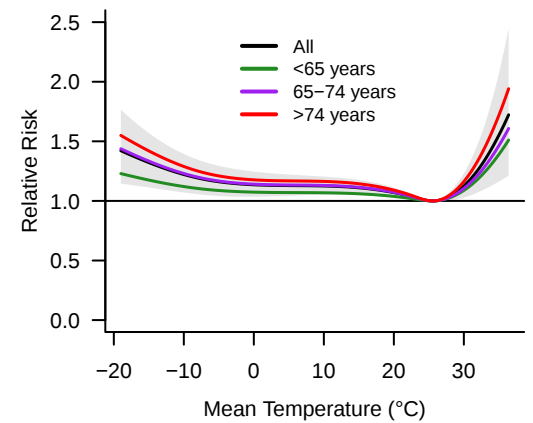
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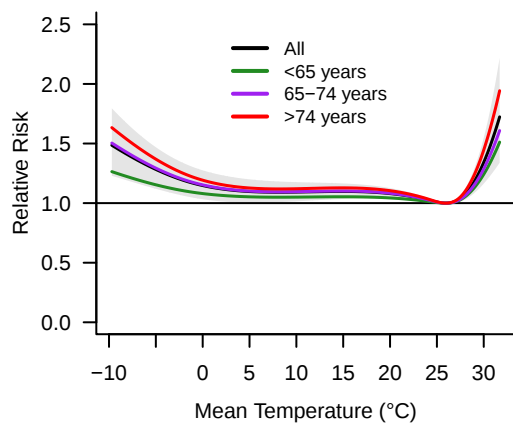
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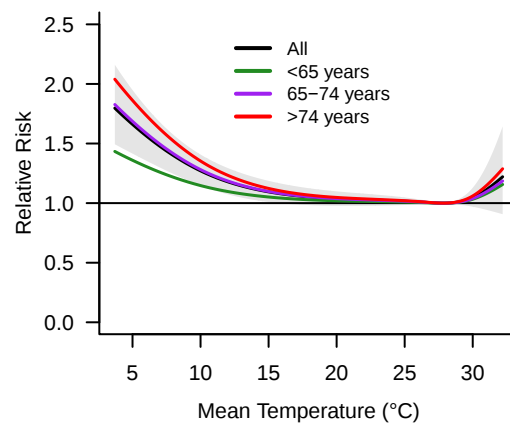
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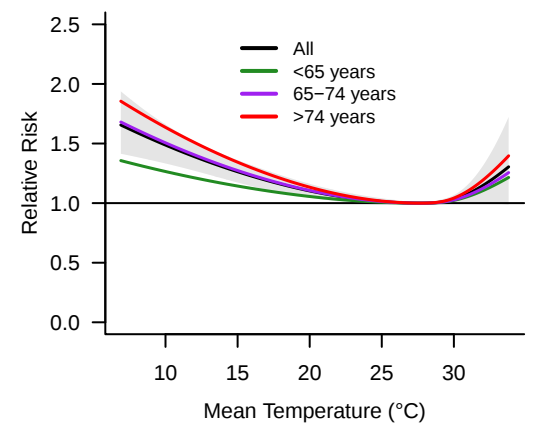
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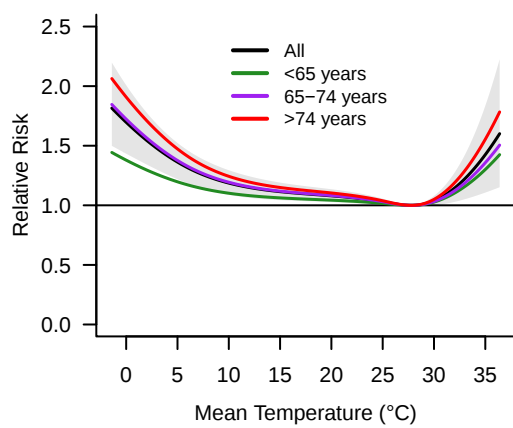
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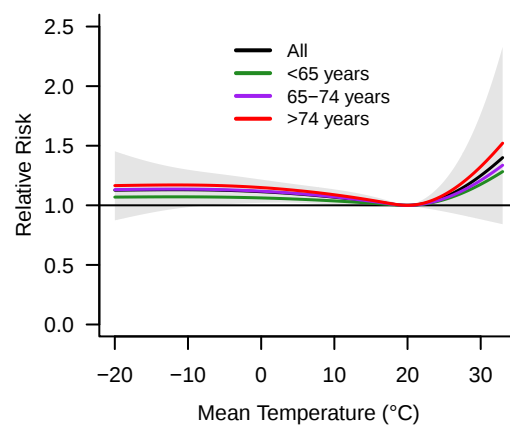
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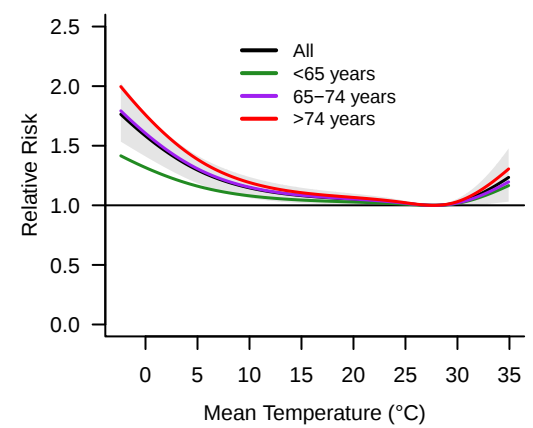
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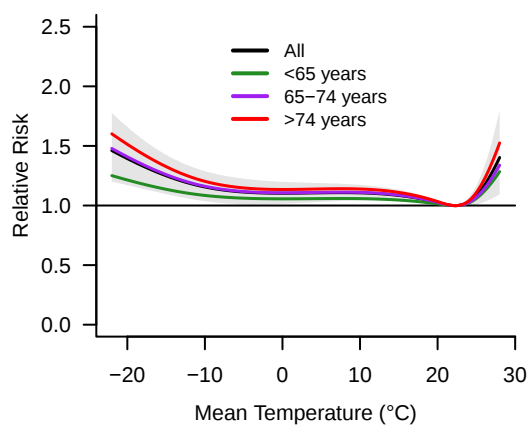
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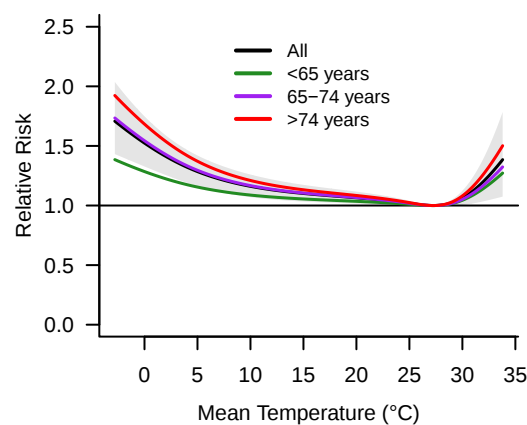
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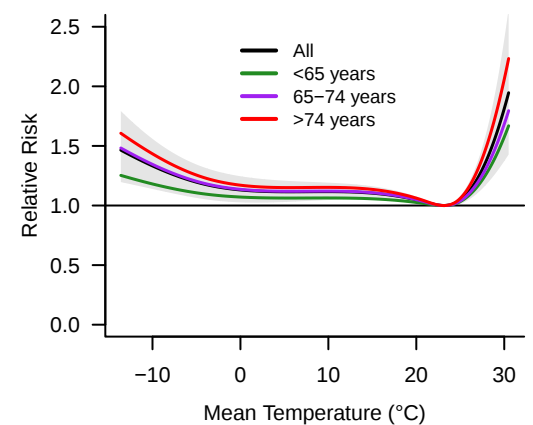
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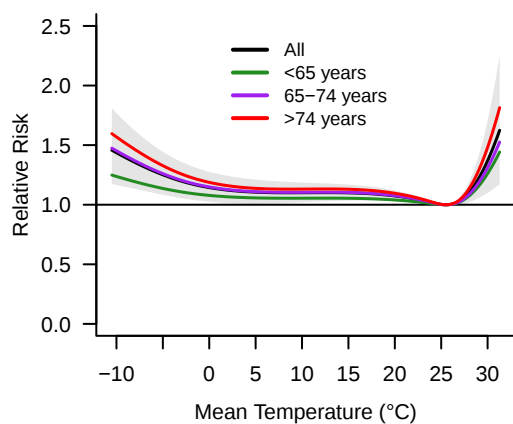
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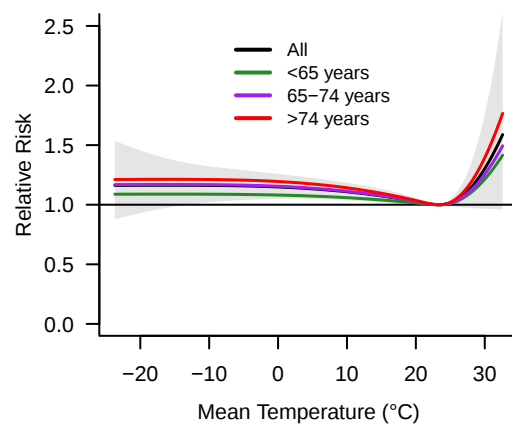
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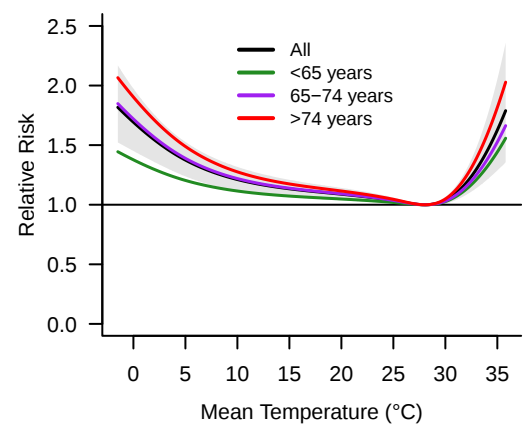
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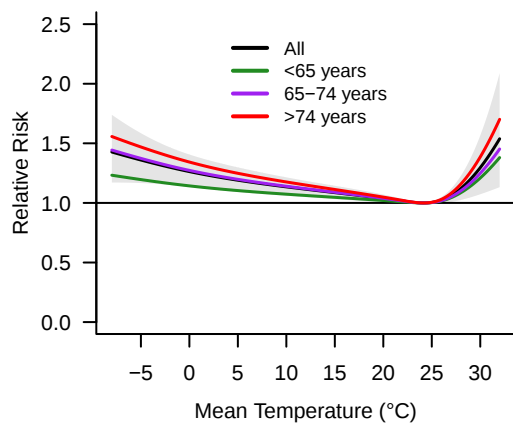
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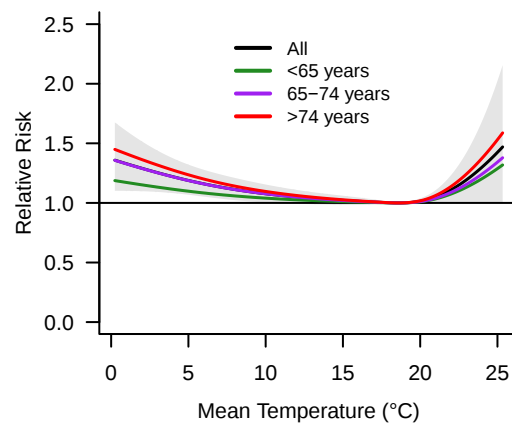
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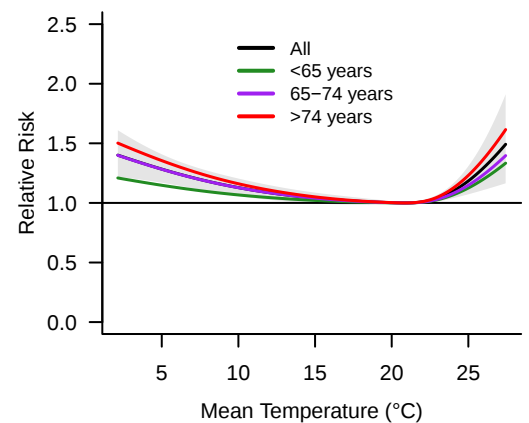
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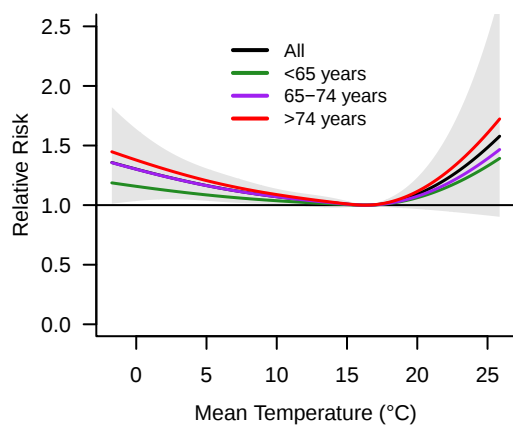
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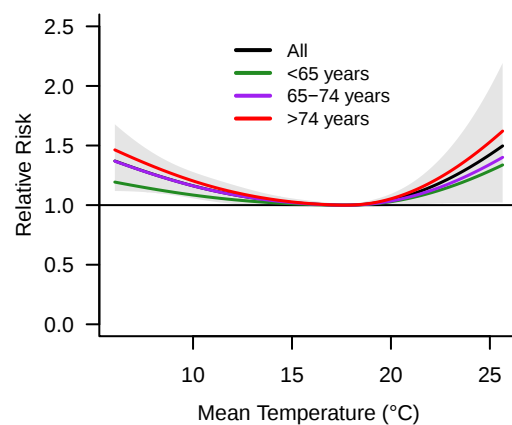
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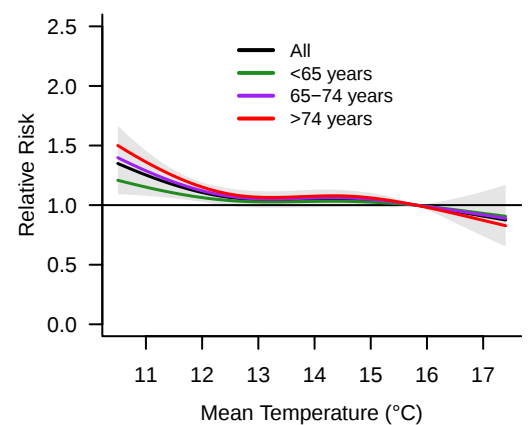
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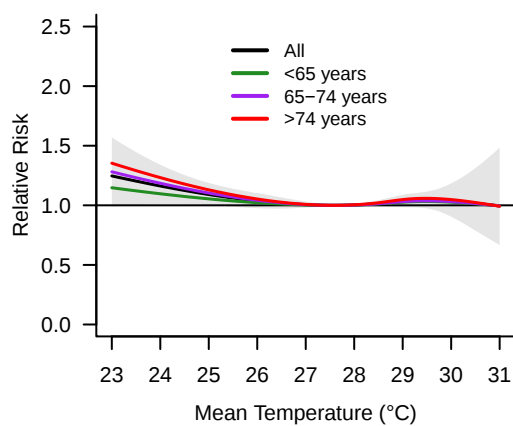
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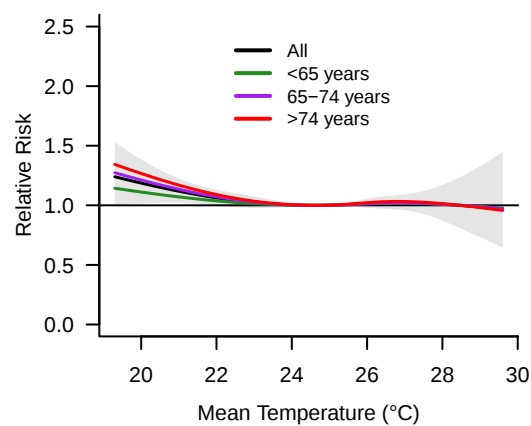
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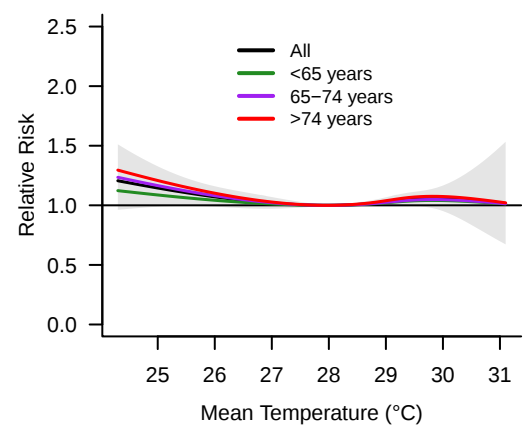
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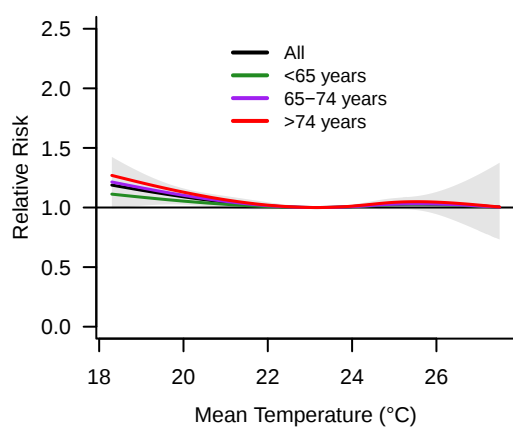
Cali – Colombia



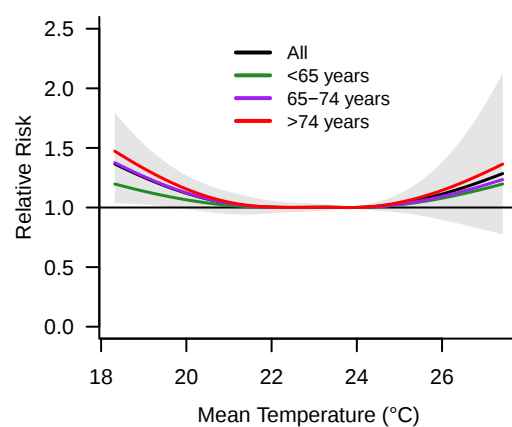
Cartagena – Colombia



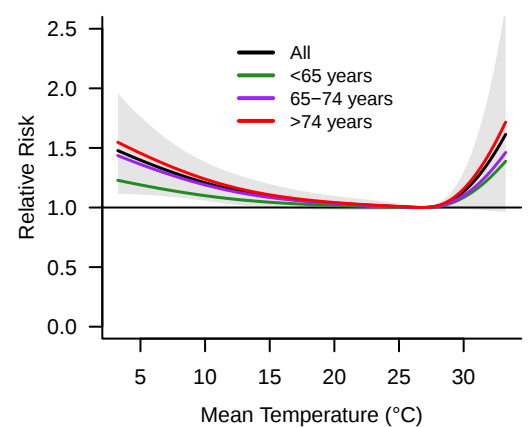
Medellin – Colombia



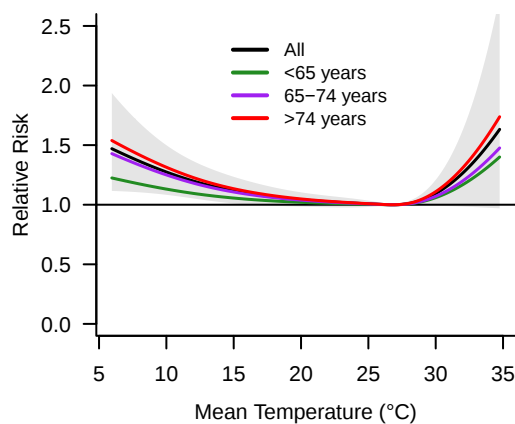
San José (CR) – Costa Rica



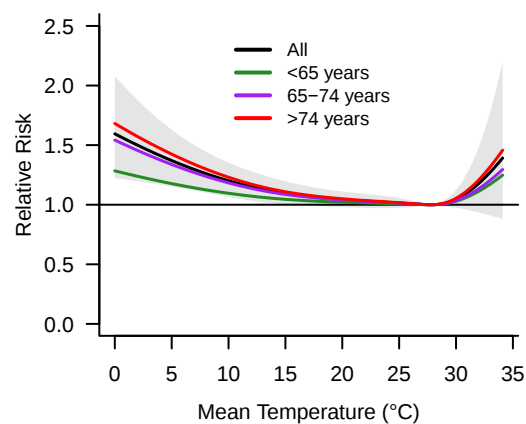
Famagusta – Cyprus



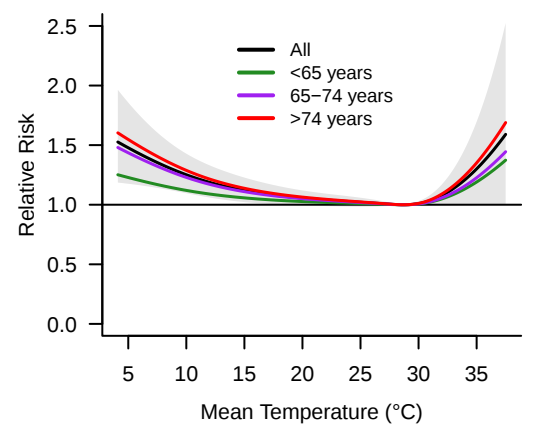
Larnaka – Cyprus



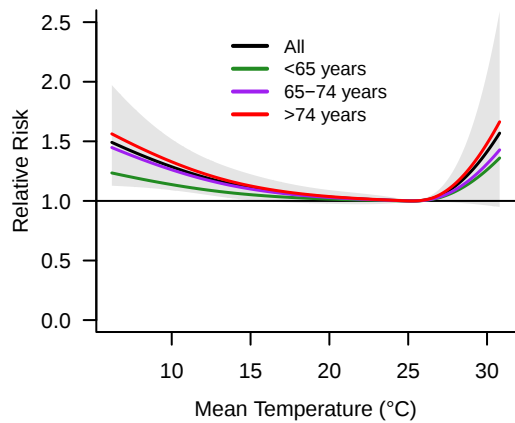
Limassol – Cyprus



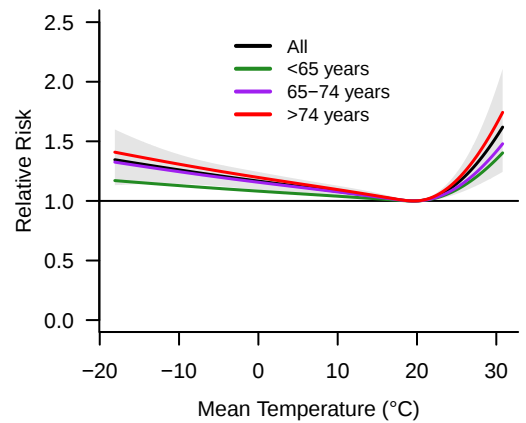
Nicosia – Cyprus



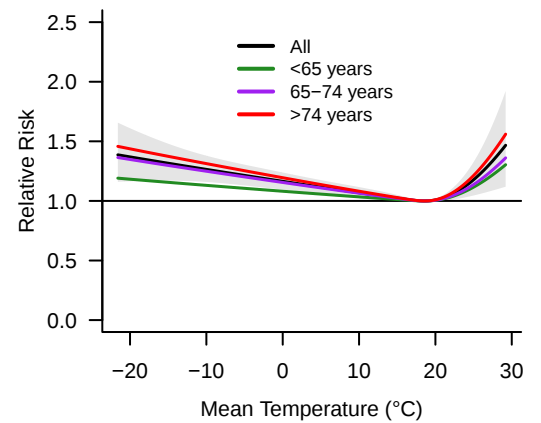
pafos – Cyprus



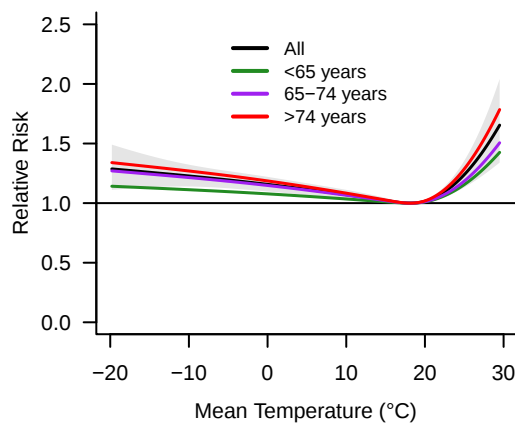
Brno – Czech Republic



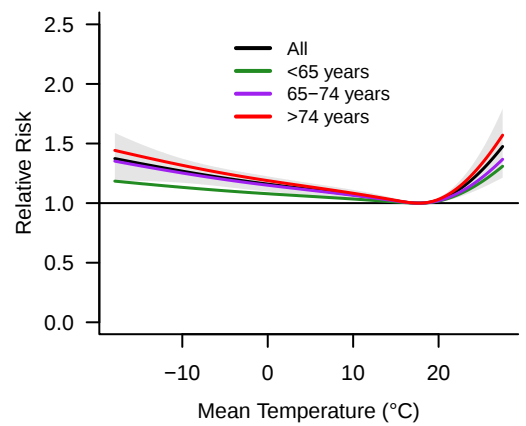
Ostrava – Czech Republic



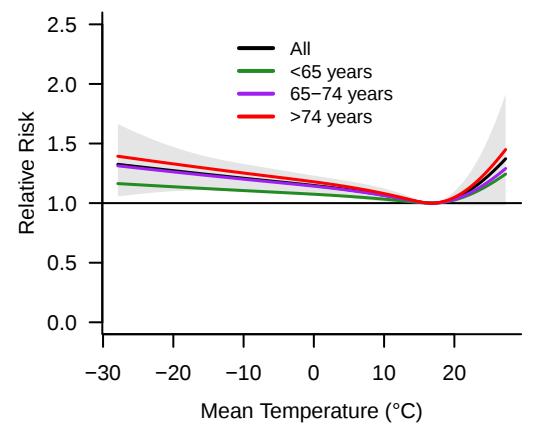
Prague – Czech Republic



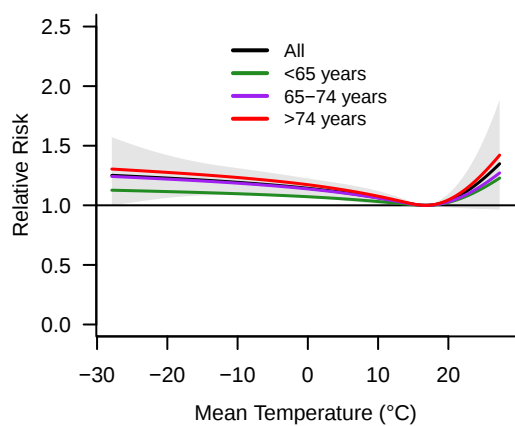
South Bohemia – Czech Republic



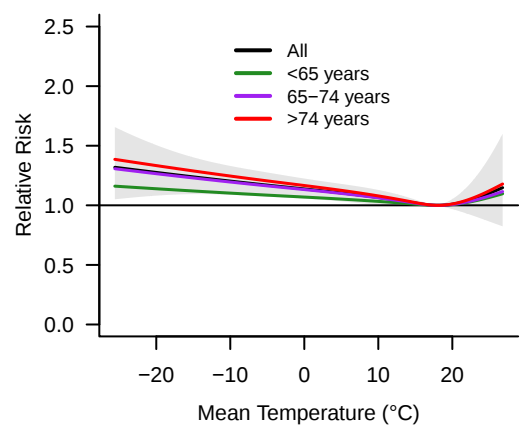
Kohtla-Järve linn – Estonia



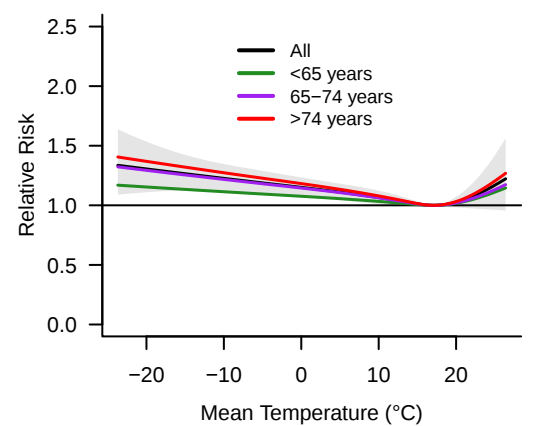
Narva linn – Estonia



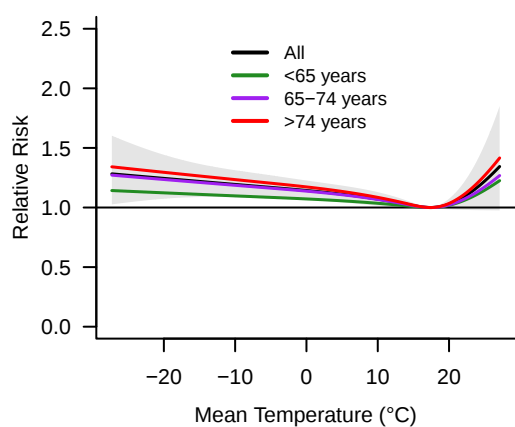
Parnu linn – Estonia



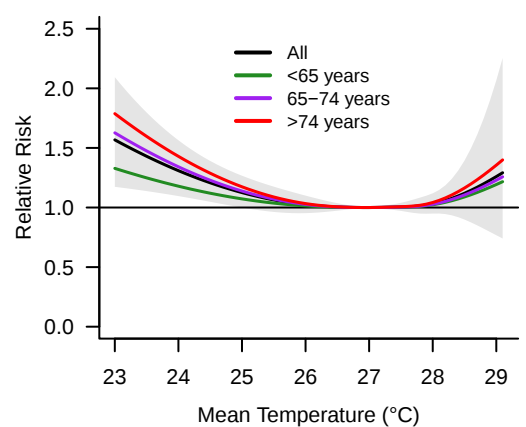
Tallinn – Estonia



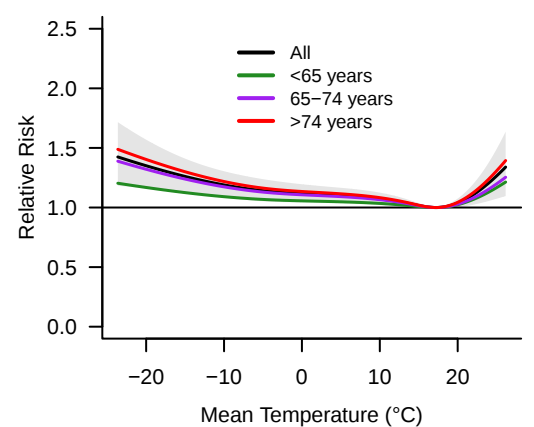
Tartu linn – Estonia



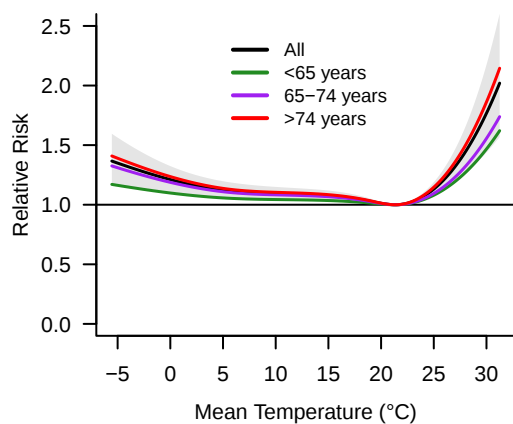
Cayenne – French Guiana



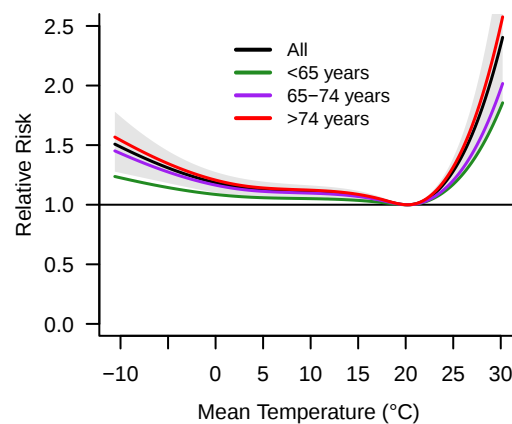
Helsinki – Finland



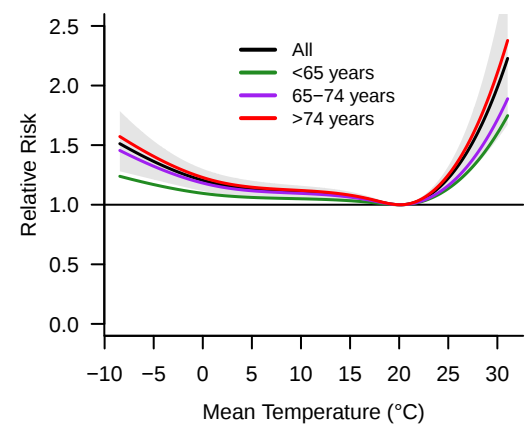
Bordeaux – France



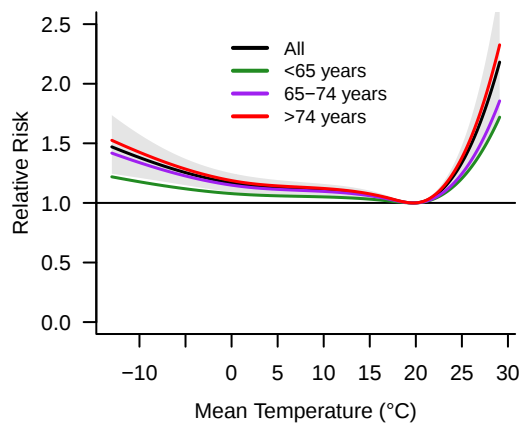
Clermont-Ferrand – France



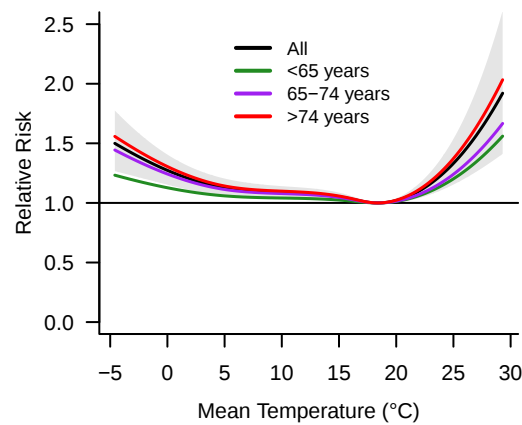
Dijon – France



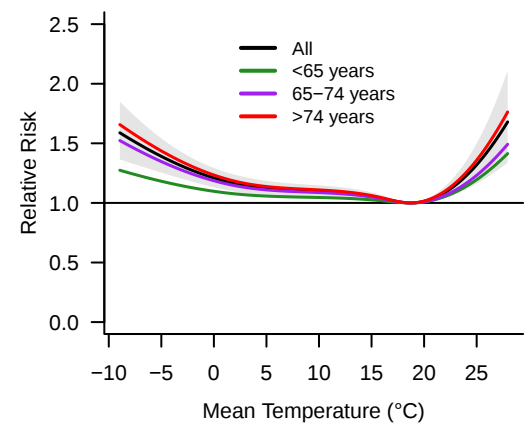
Grenoble – France



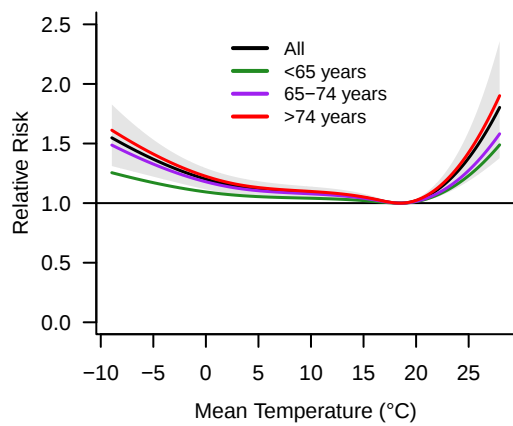
Le Havre – France



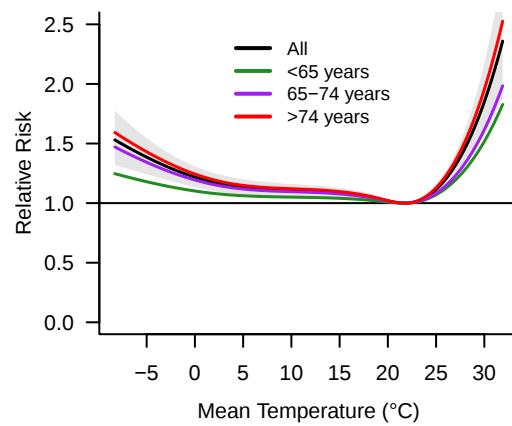
Lille – France



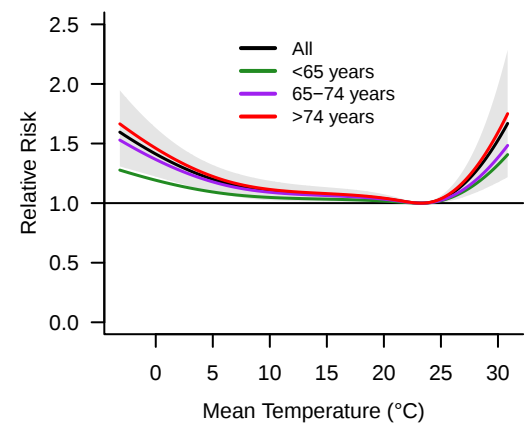
Lens-Douai – France



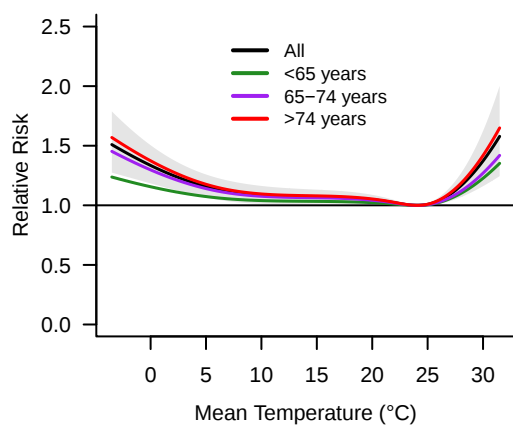
Lyon – France



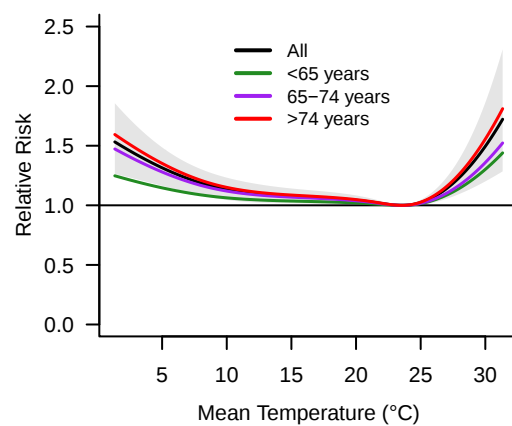
Montpellier – France



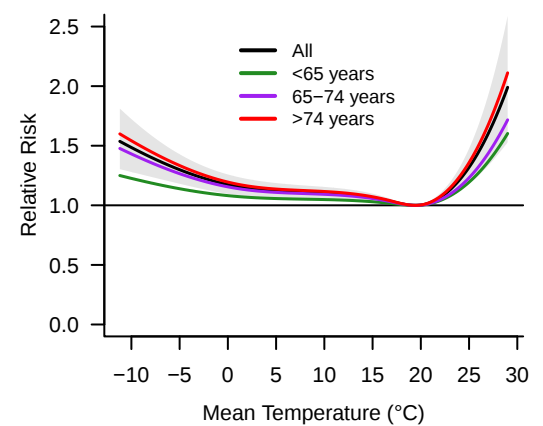
Marseille – France



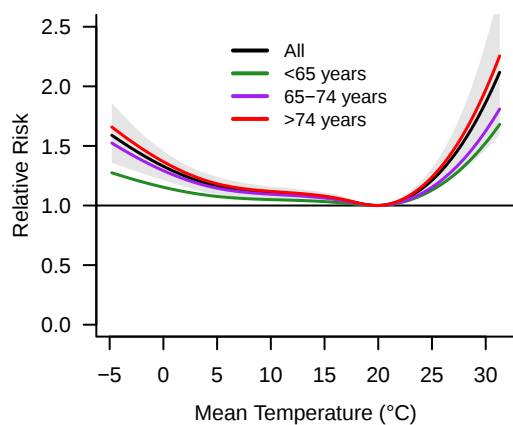
Nice – France



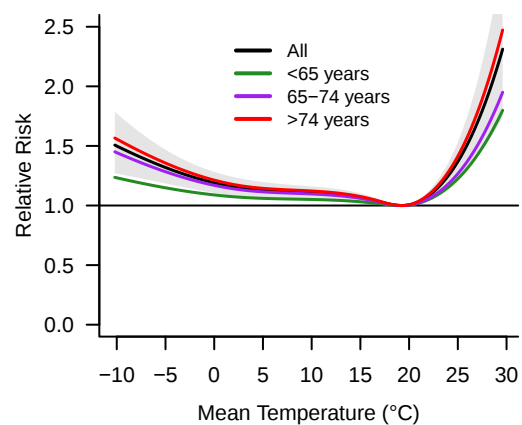
Nancy – France



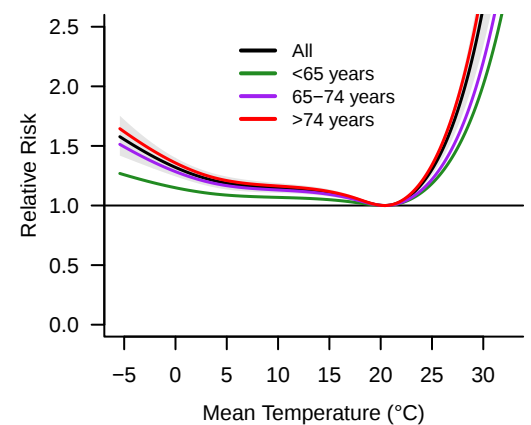
Nantes – France



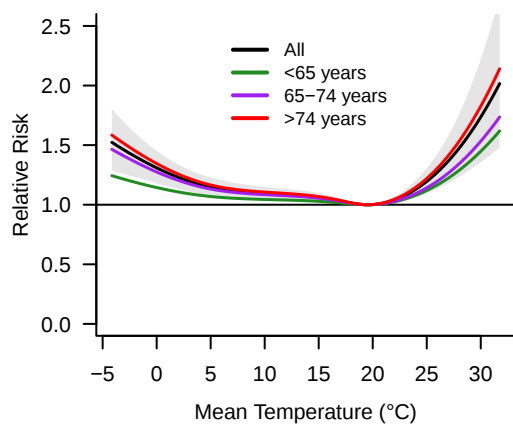
Orleans – France



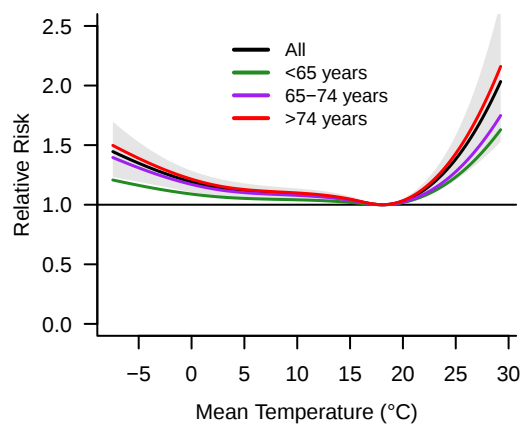
Paris – France



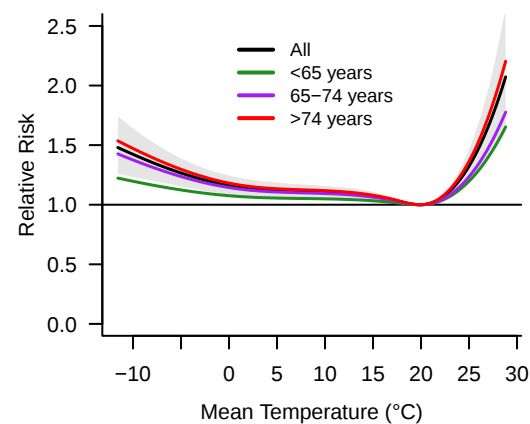
Rennes – France



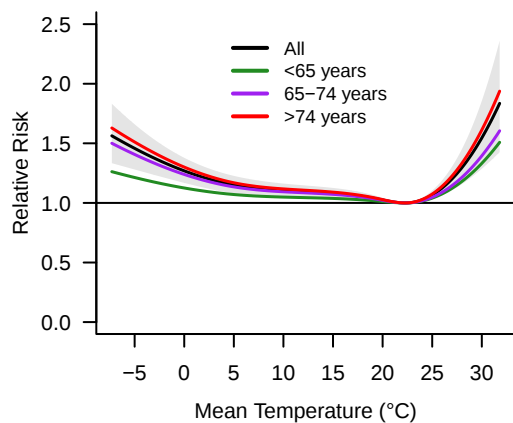
Rouen – France



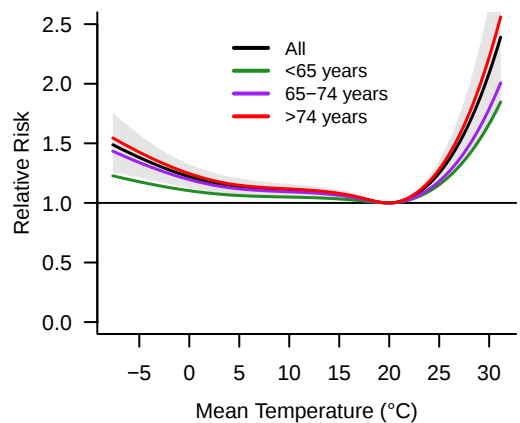
Strasbourg – France



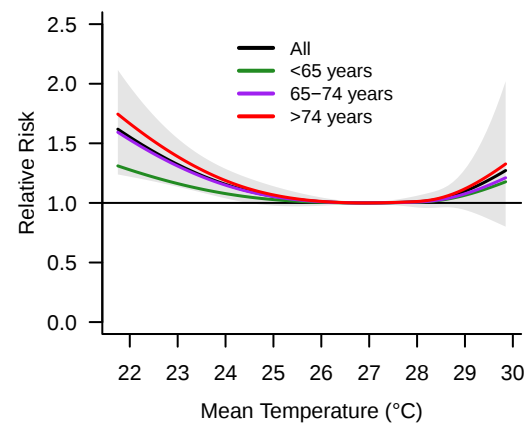
Toulouse – France



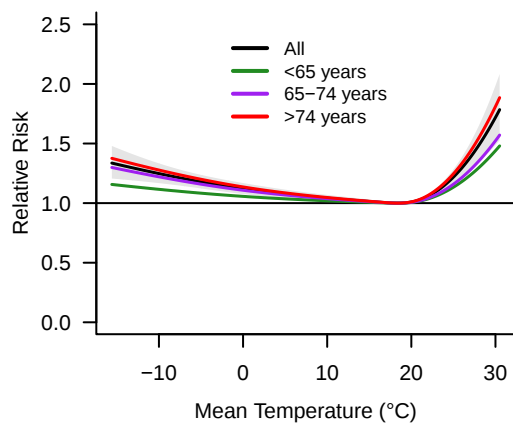
Tours – France



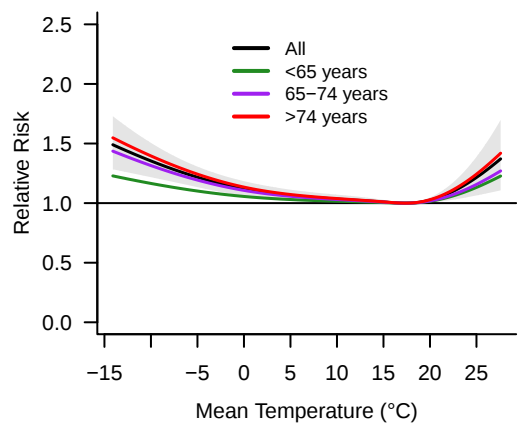
Pointe-a-Pitre – Guadeloupe



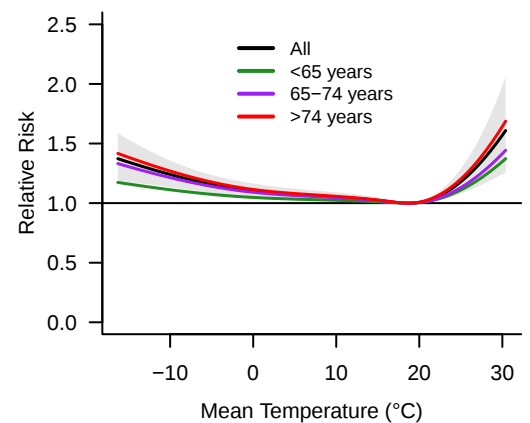
Berlin – Germany



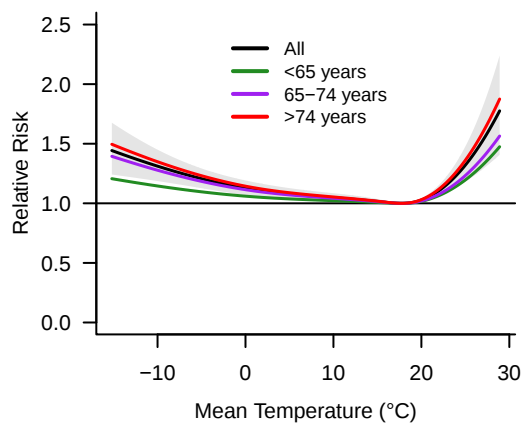
Bremen – Germany



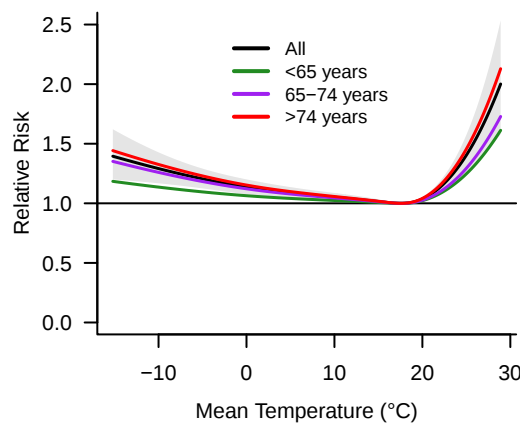
Dresden – Germany



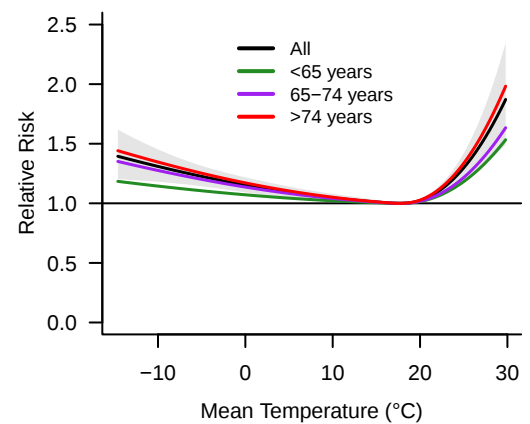
Dortmund – Germany



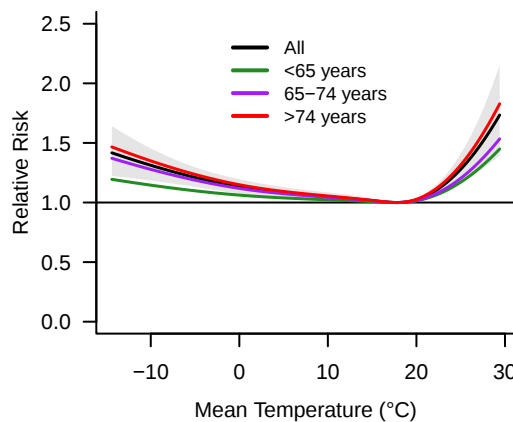
Duisburg – Germany



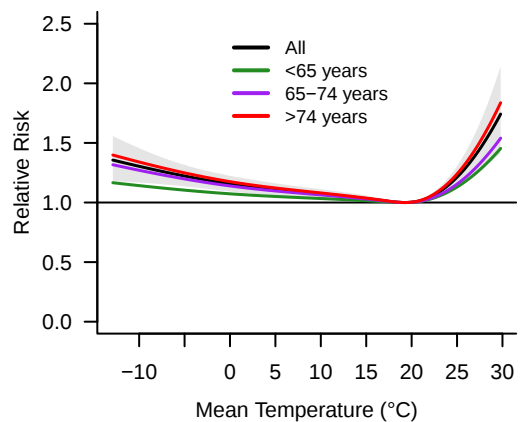
Dusseldorf – Germany



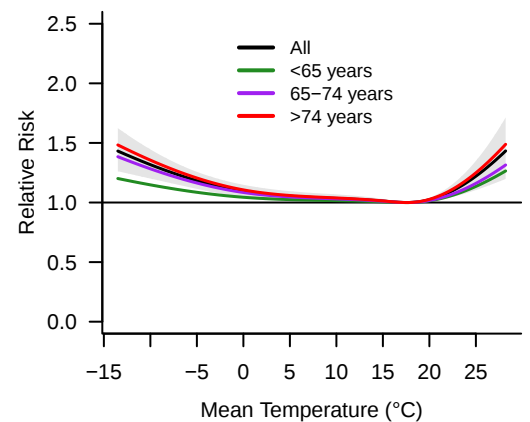
Essen – Germany



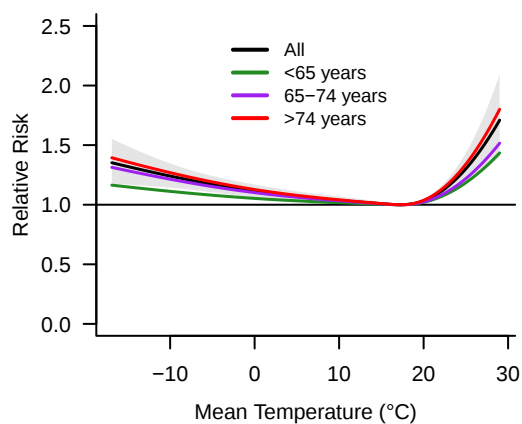
Frankfurt – Germany



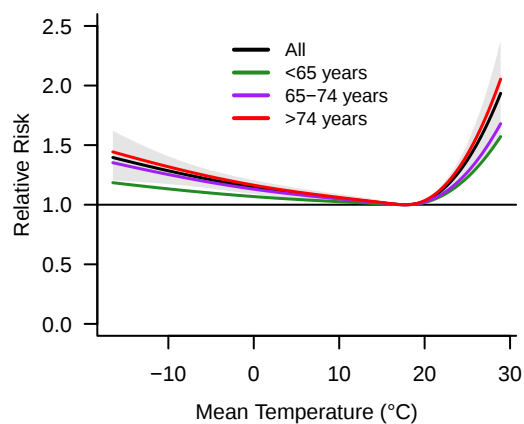
Hamburg – Germany



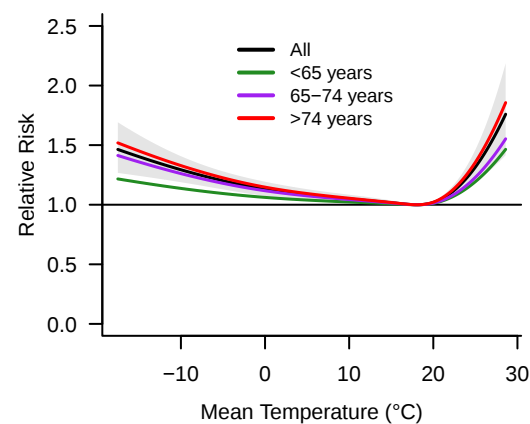
Hannover – Germany



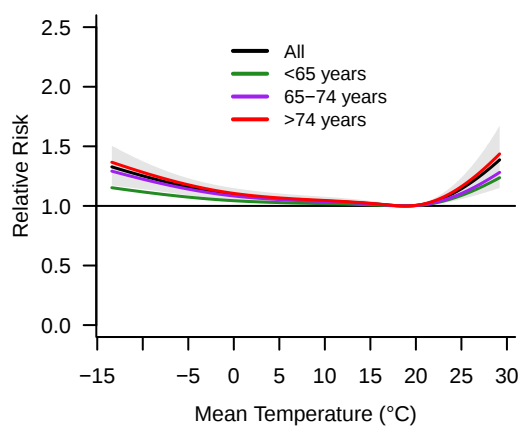
Koeln – Germany



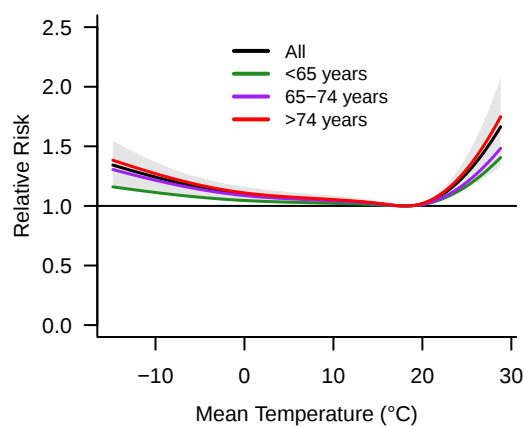
Leipzig – Germany



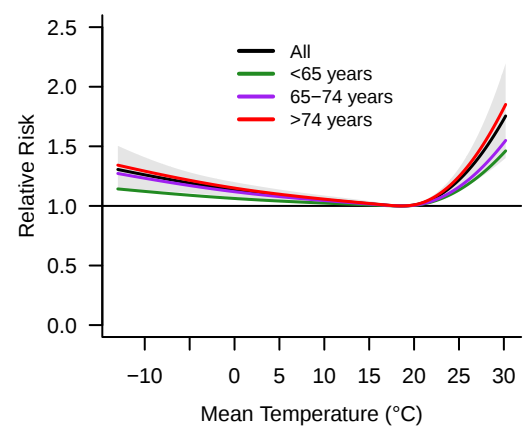
Munich – Germany



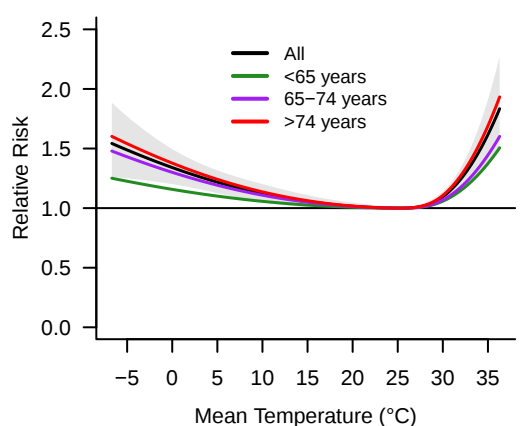
Nuremberg – Germany



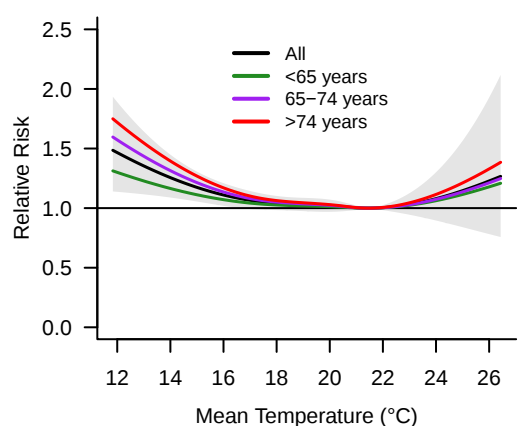
Stuttgart – Germany



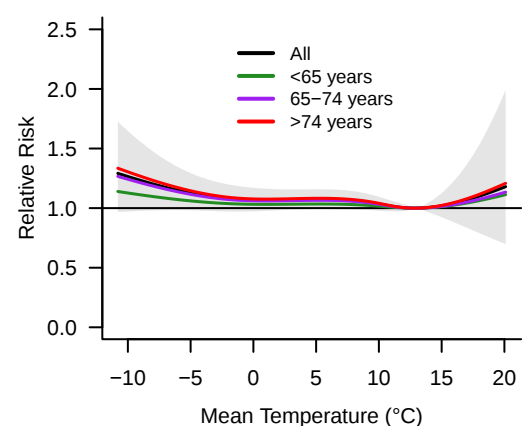
Athens – Greece



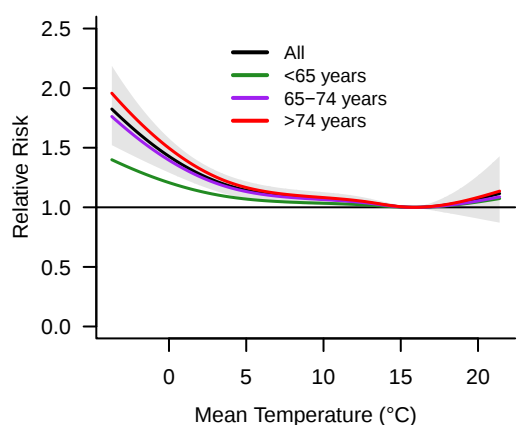
Guatemala – Guatemala



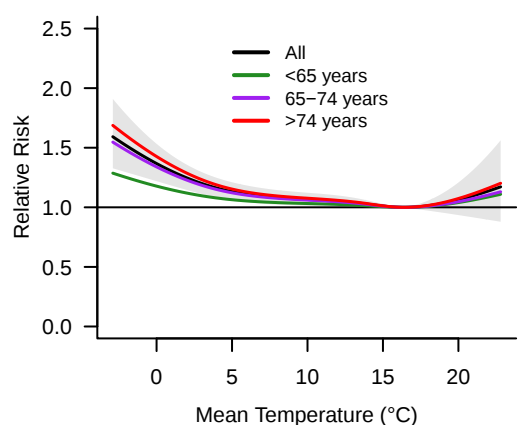
Reykjavik – Iceland



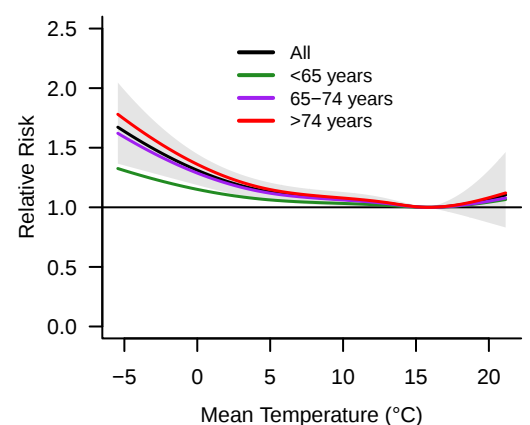
East of Northern Ireland – Ireland



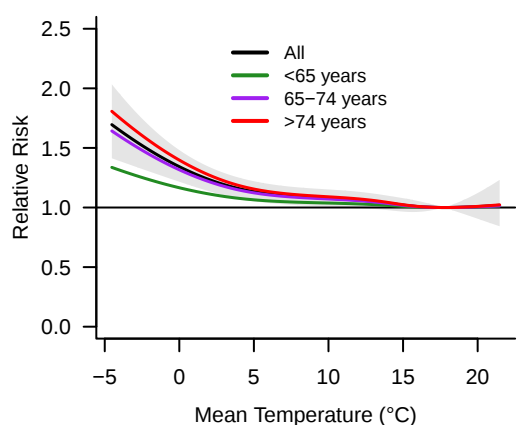
NorthEast of the Republic of Ireland – Ireland



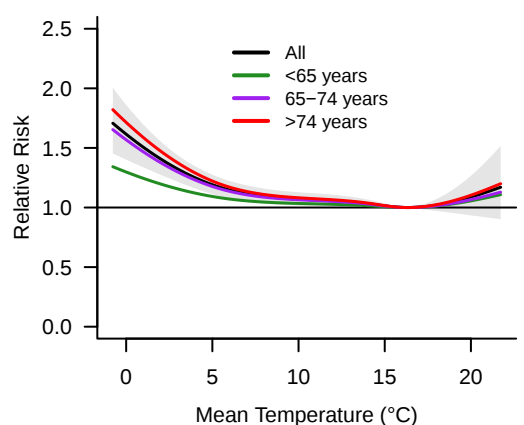
NorthWest of the Republic of Ireland – Ireland



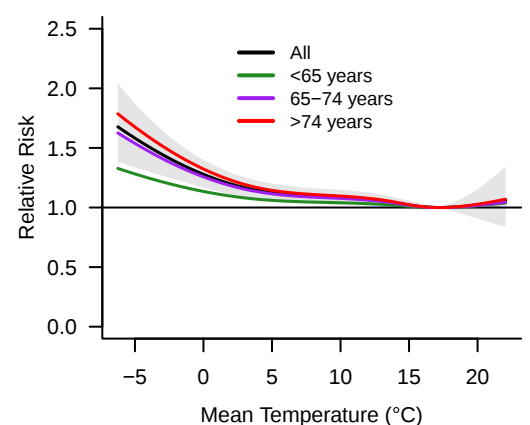
SouthEast of Republic of Ireland – Ireland



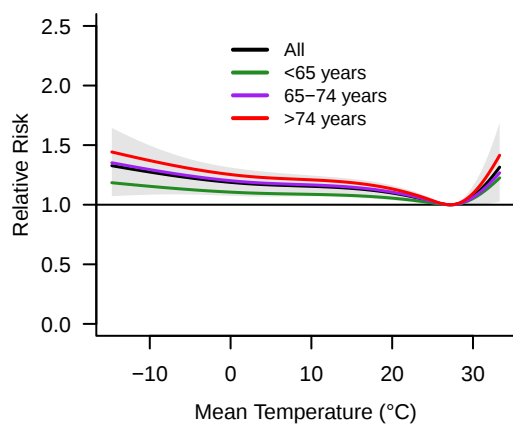
SouthWest of the Republic of Ireland – Ireland



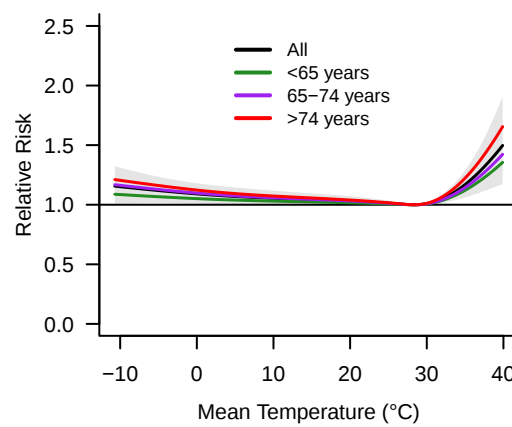
West of Northern Ireland – Ireland



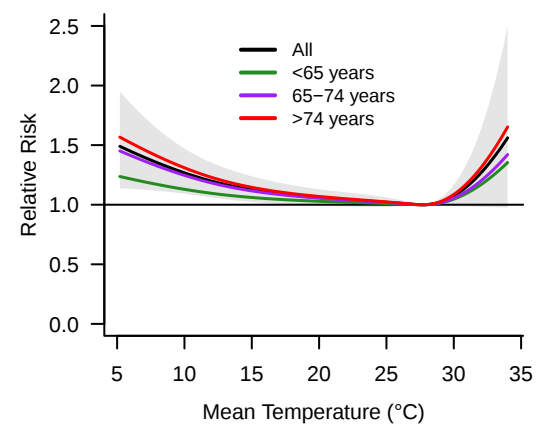
Mashhad – Iran



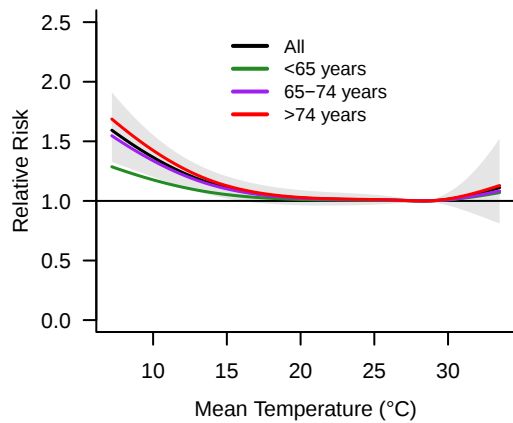
Tehran – Iran



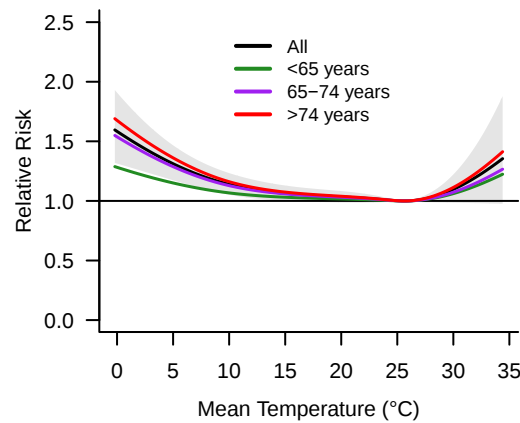
Beer Sheva – Israel



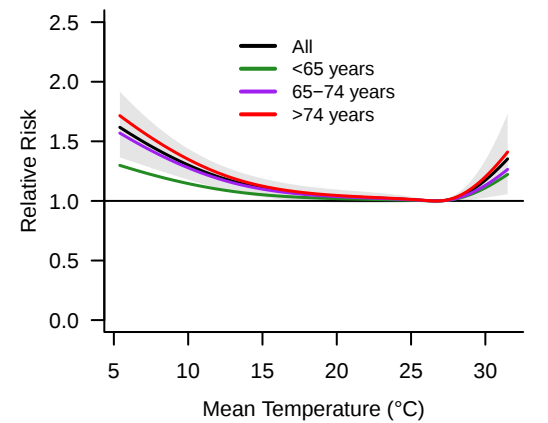
Haifa – Israel



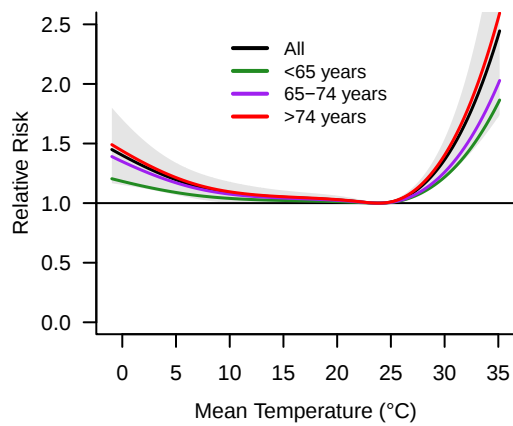
Jerusalem – Israel



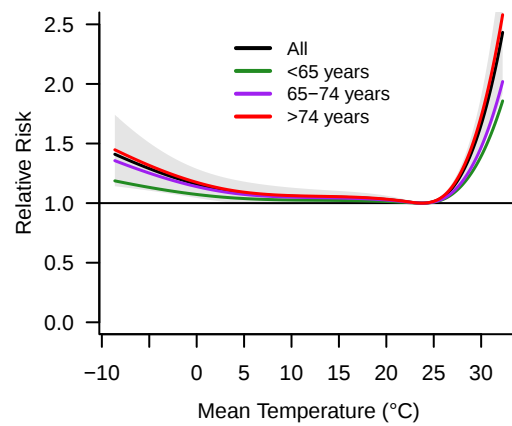
Tel Aviv – Israel



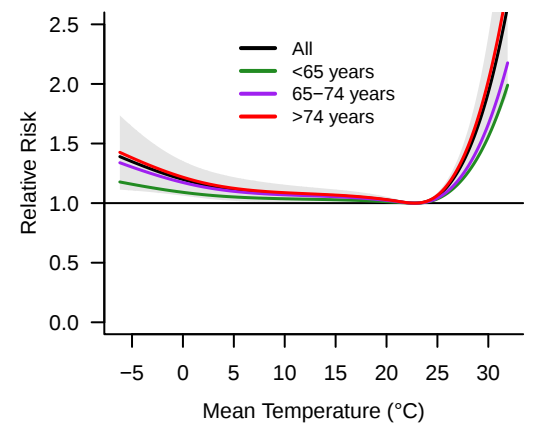
Bari – Italy



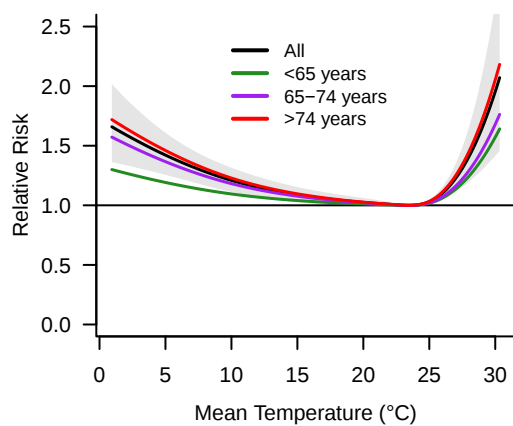
Bologna – Italy



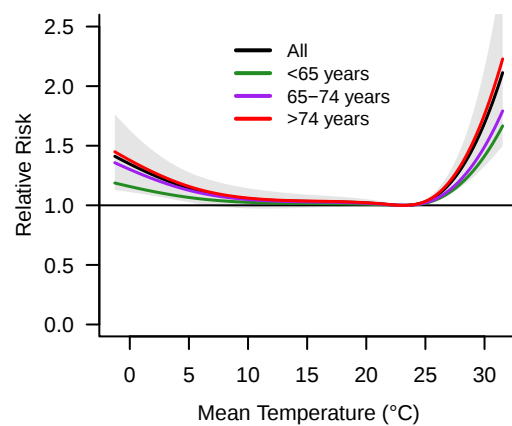
Brescia – Italy



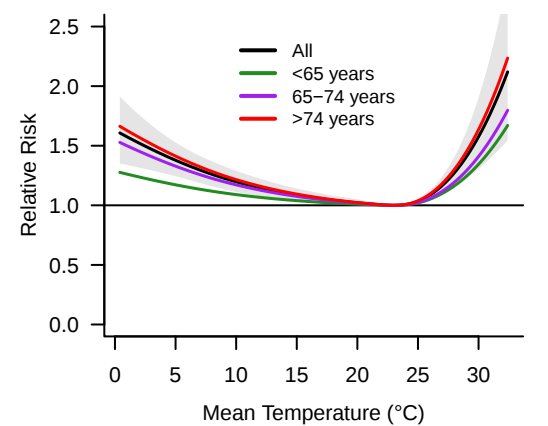
Civitavecchia – Italy



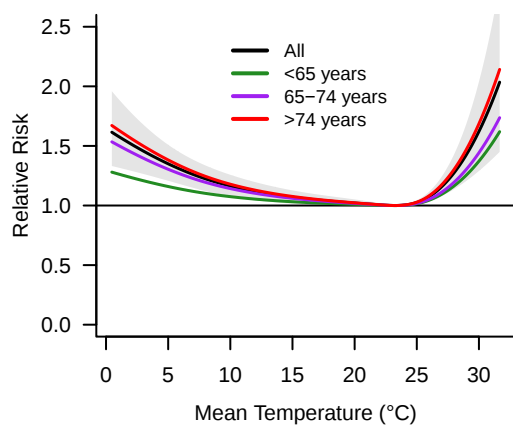
Frosinone – Italy



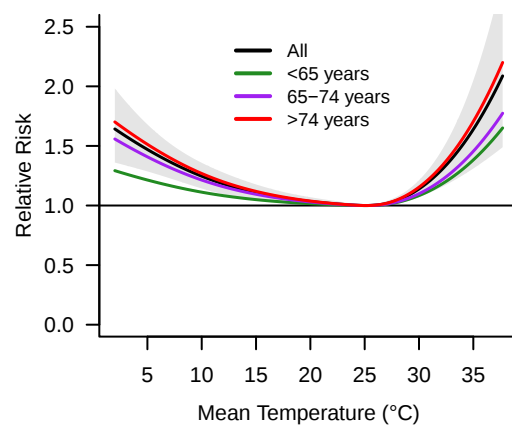
Genoa – Italy



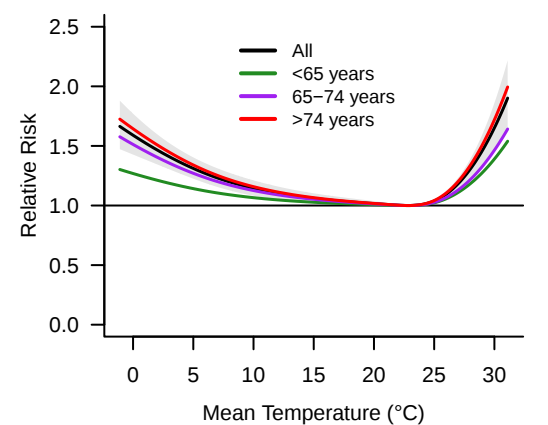
Latina – Italy



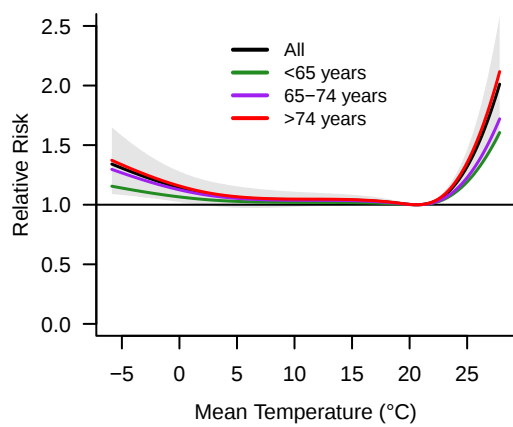
Palermo – Italy



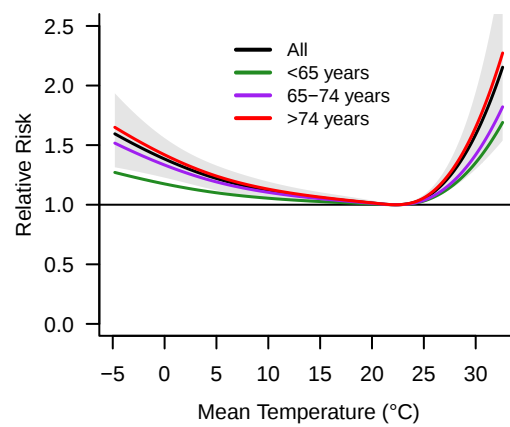
Rome – Italy



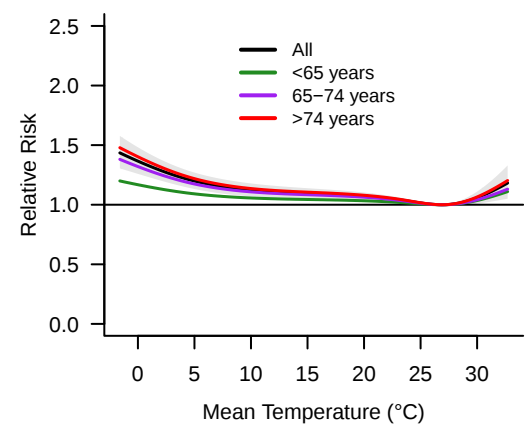
Turin – Italy



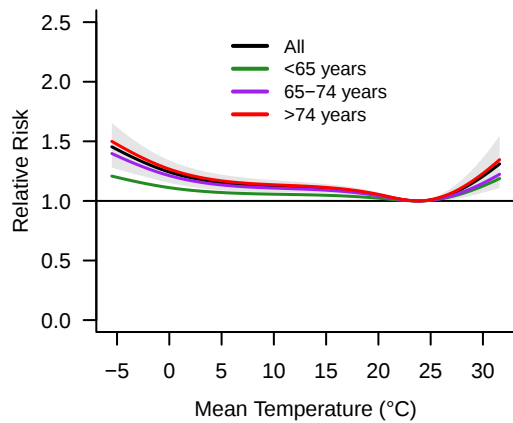
Viterbo – Italy



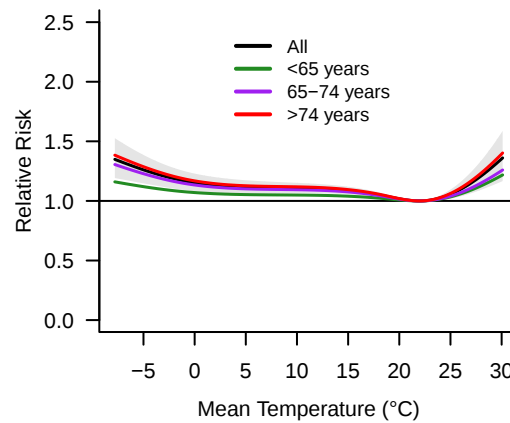
Aichi – Japan



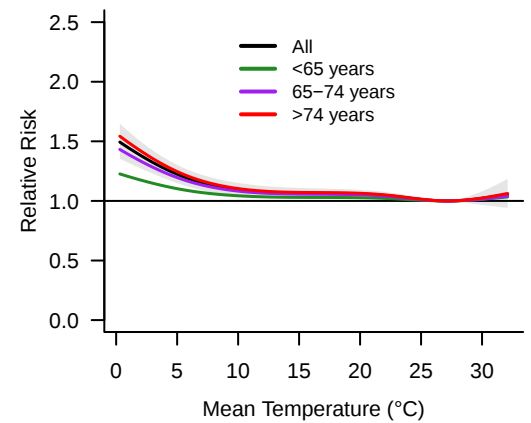
Akita – Japan



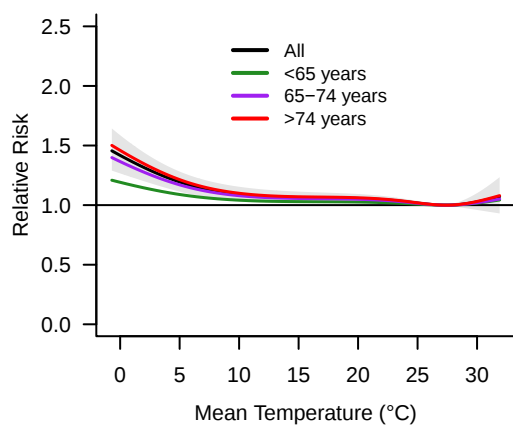
Aomori – Japan



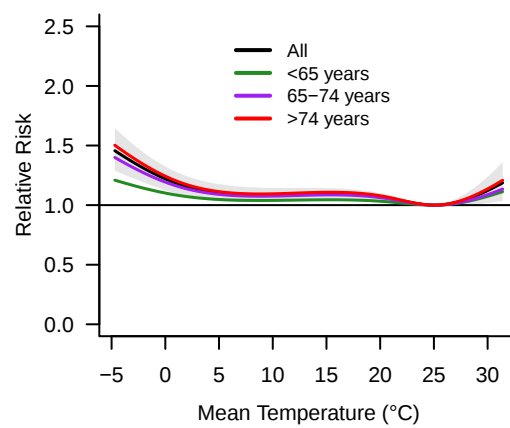
Chiba – Japan



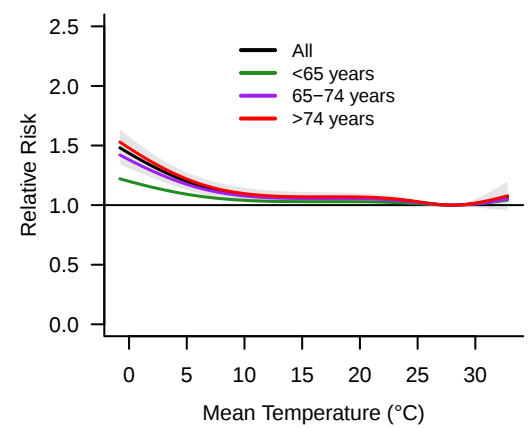
Ehime – Japan



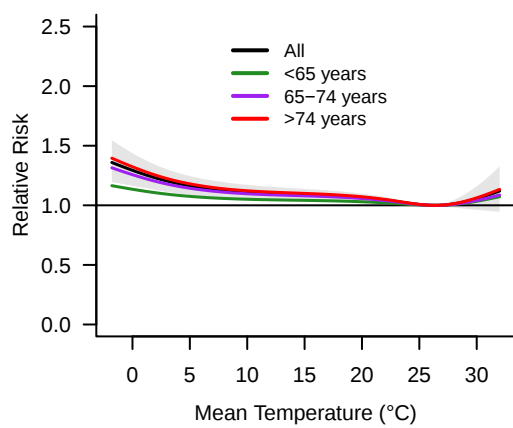
Fukushima – Japan



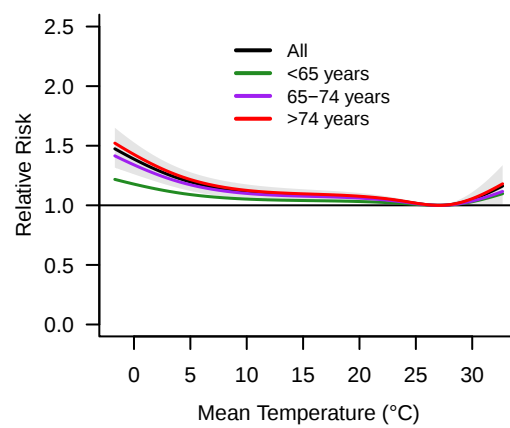
Fukuoka – Japan



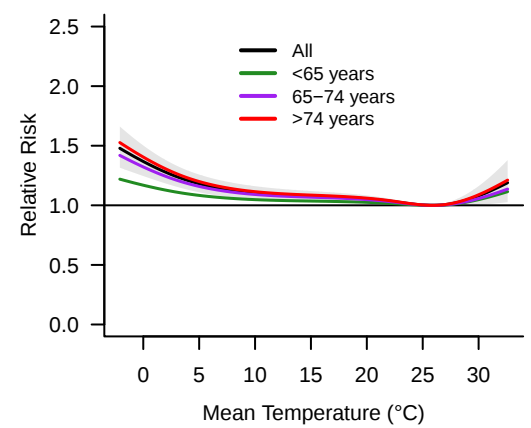
Fukui – Japan



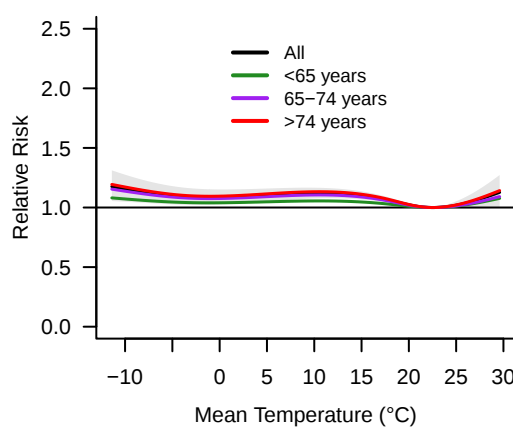
Gifu – Japan



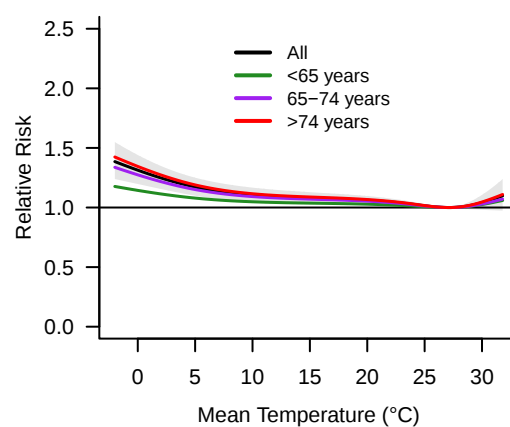
Gunma – Japan



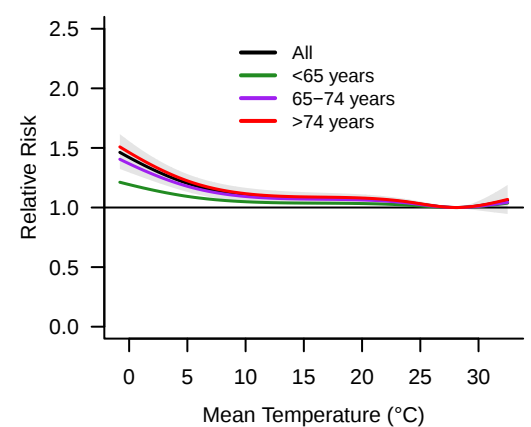
Hokkaido – Japan



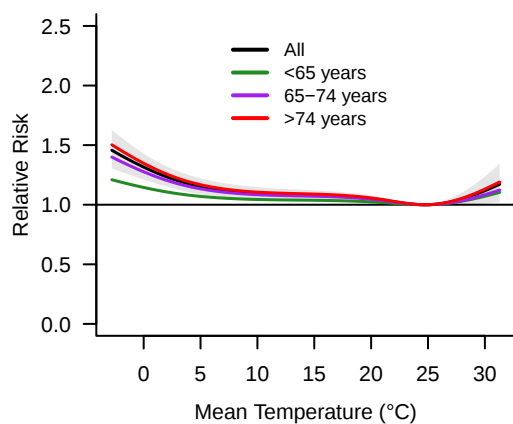
Hiroshima – Japan



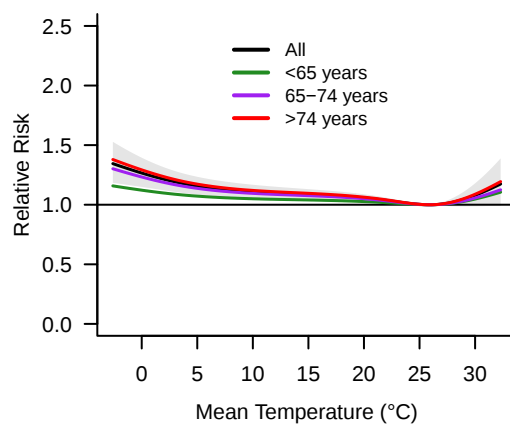
Hyogo – Japan



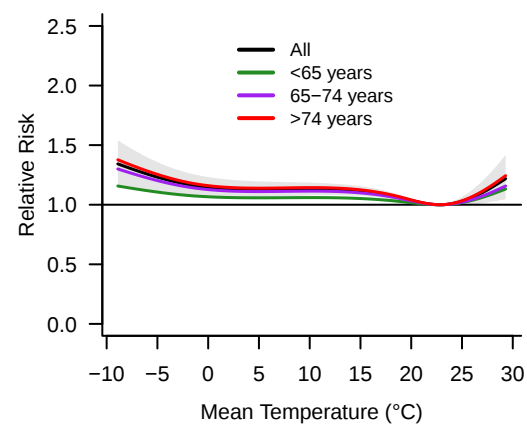
Ibaraki – Japan



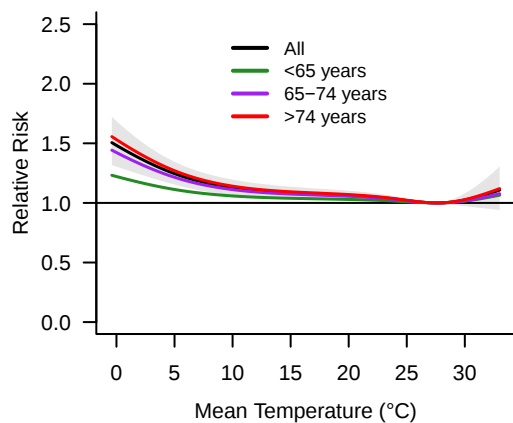
Ishikawa – Japan



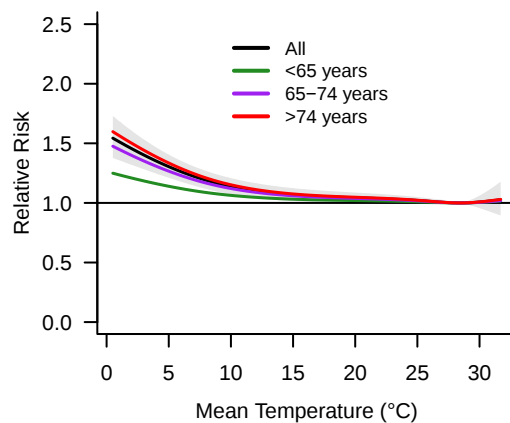
Iwate – Japan



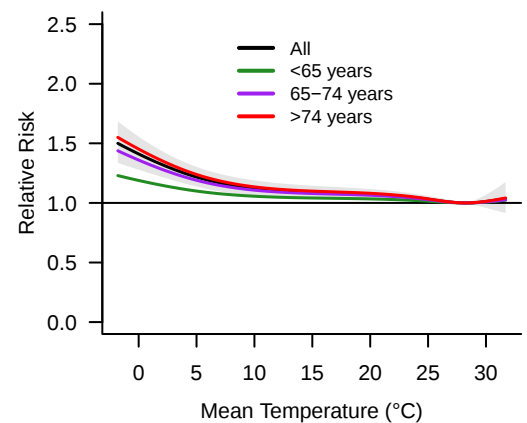
Kagawa – Japan



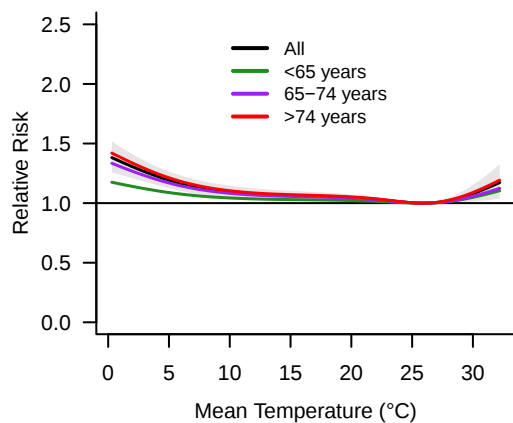
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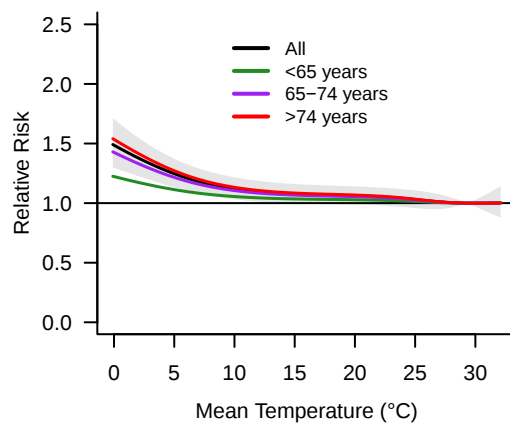
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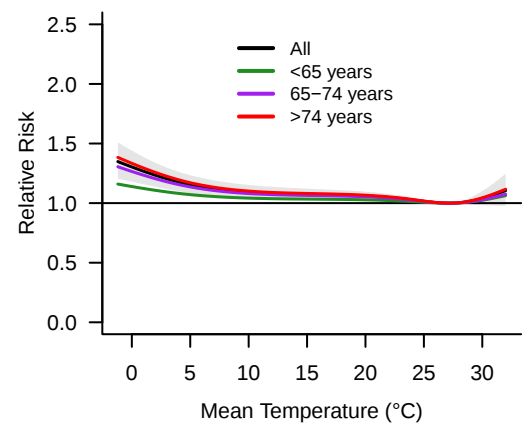
Kanagawa – Japan



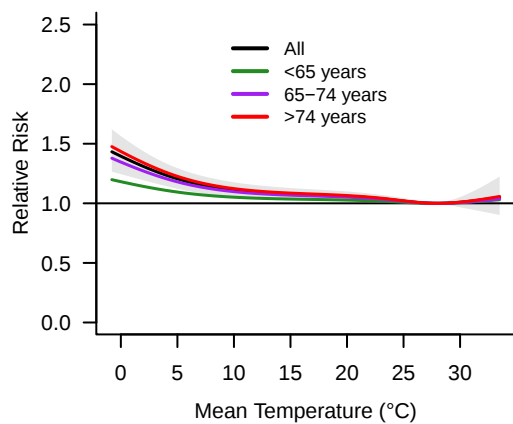
Kochi – Japan



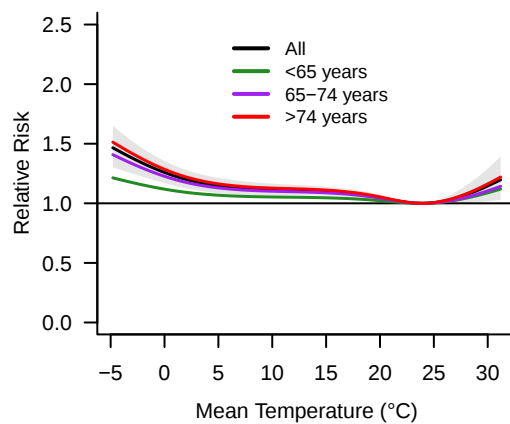
Kyoto – Japan



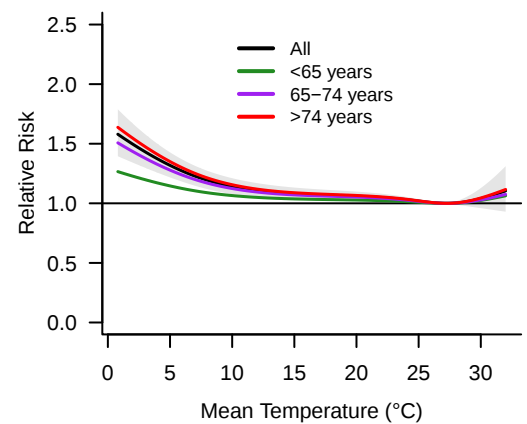
Mie – Japan



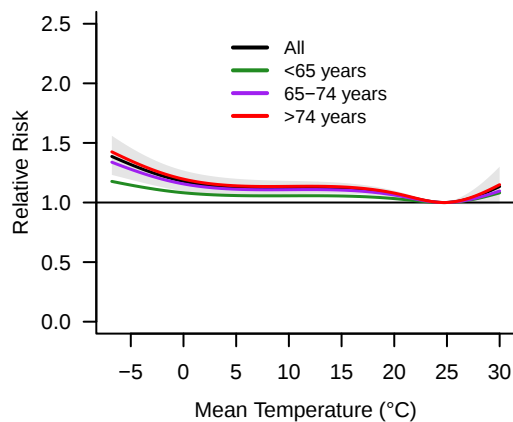
Miyagi – Japan



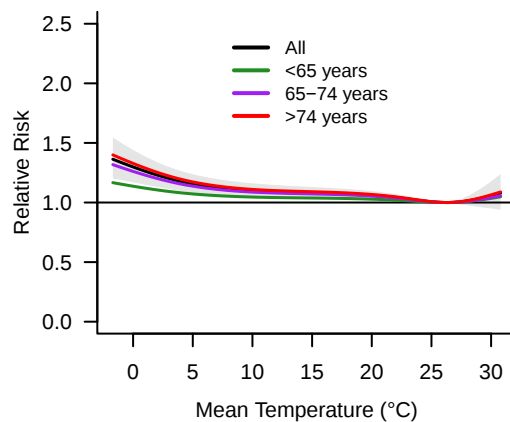
Miyazaki – Japan



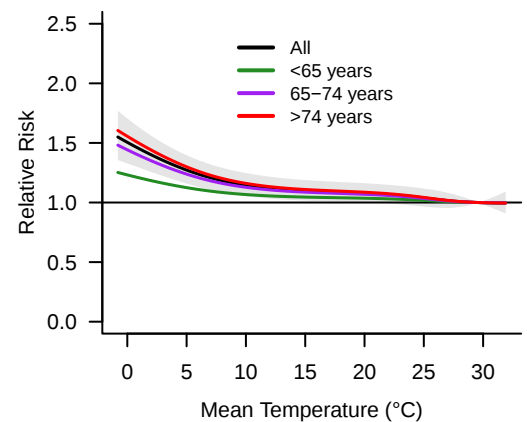
Nagano – Japan



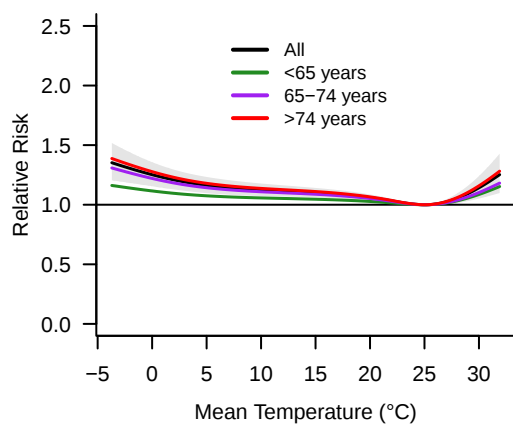
Nara – Japan



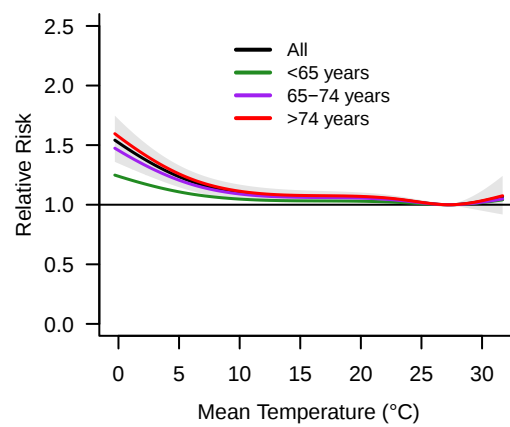
Nagasaki – Japan



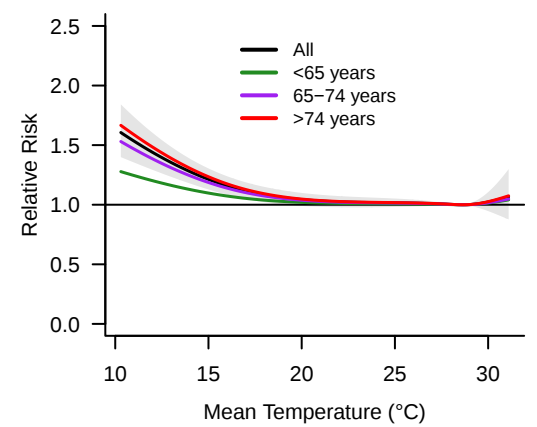
Niigata – Japan



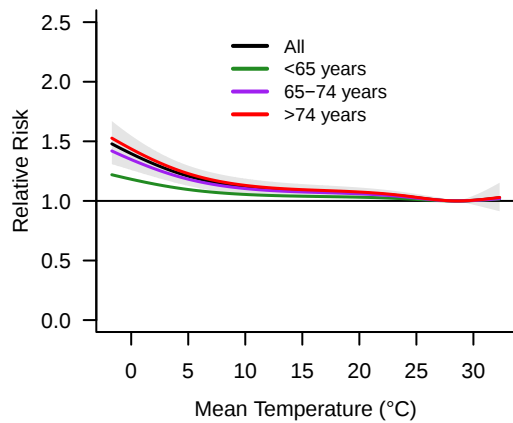
Oita – Japan



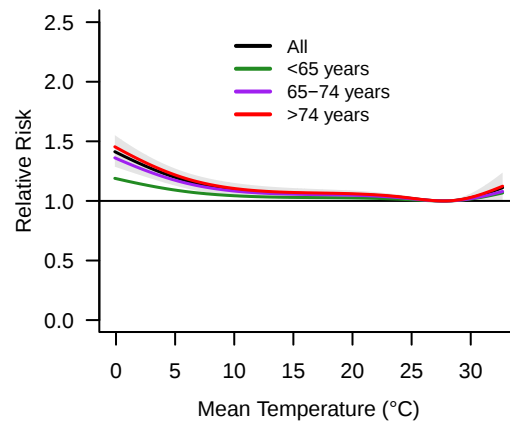
Okinawa – Japan



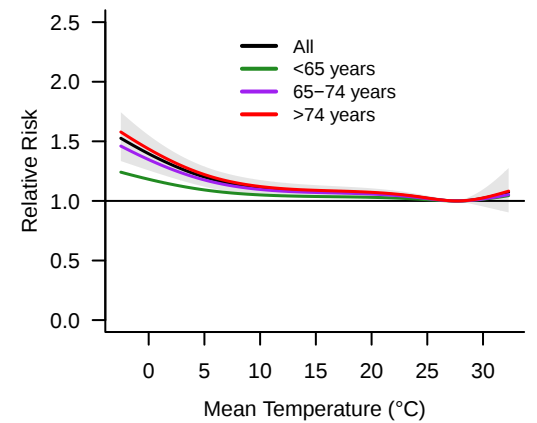
Okayama – Japan



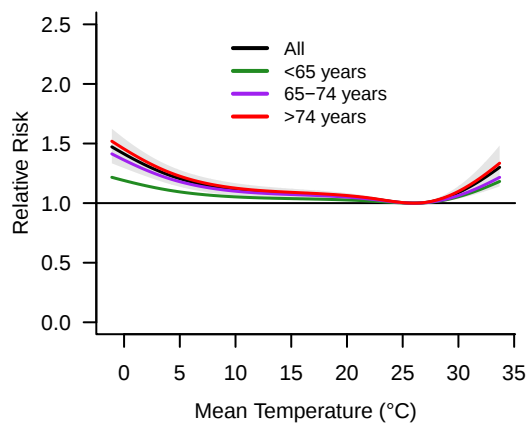
Osaka – Japan



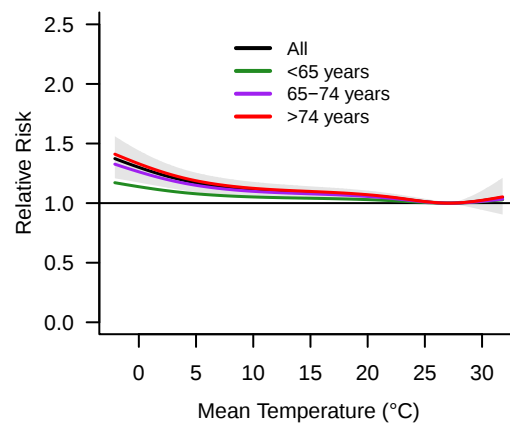
Saga – Japan



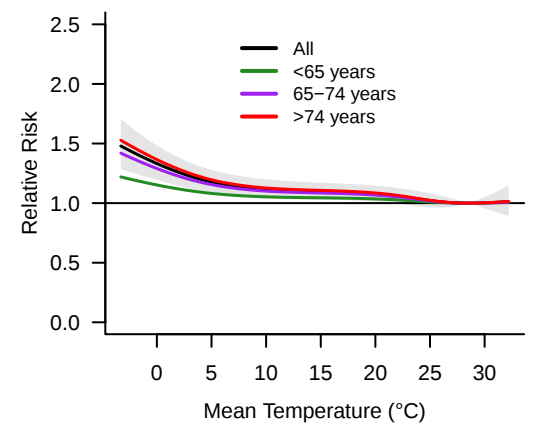
Saitama – Japan



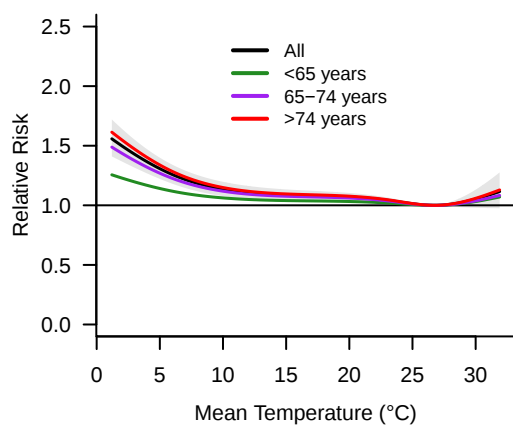
Shiga – Japan



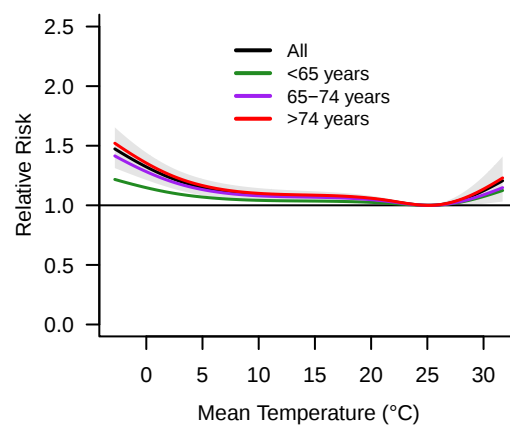
Shimane – Japan



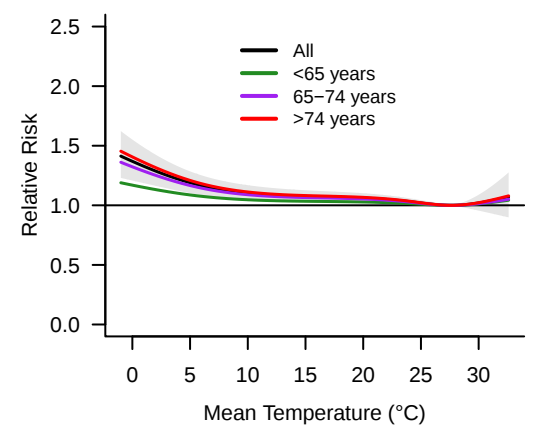
Shizuoka – Japan



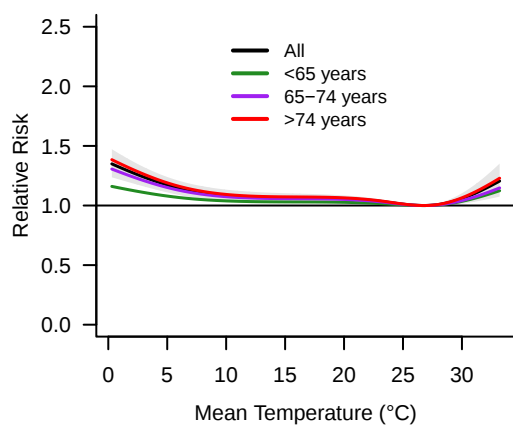
Tochigi – Japan



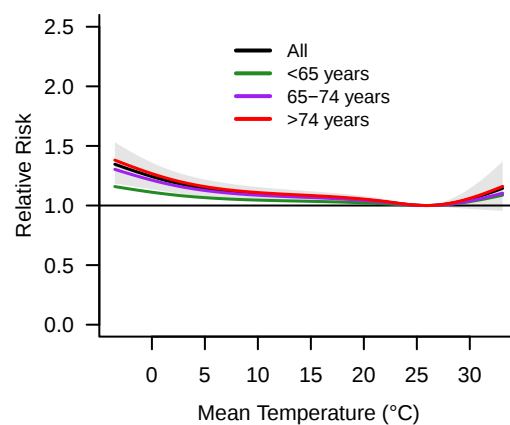
Tokushima – Japan



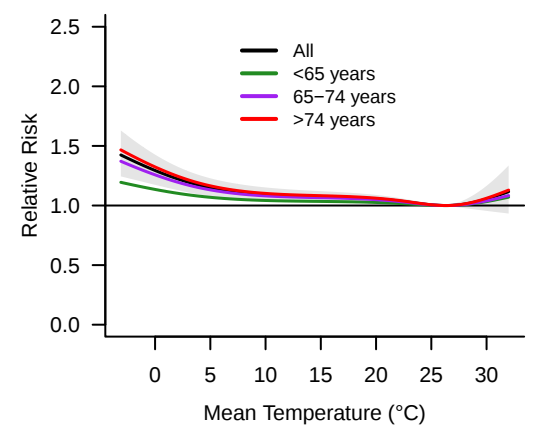
Tokyo – Japan



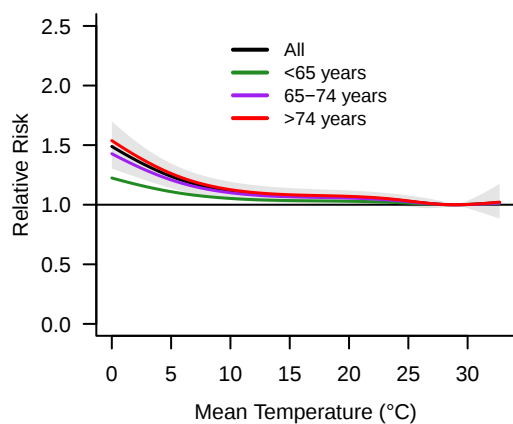
Toyama – Japan



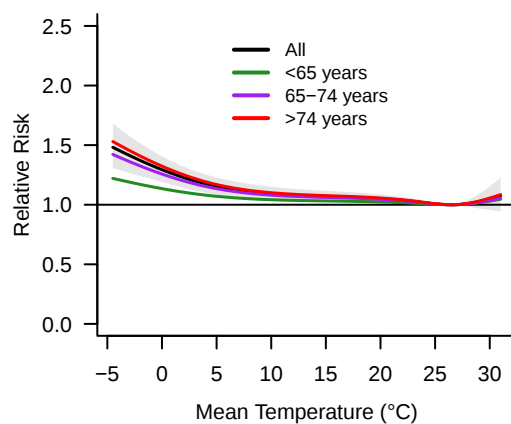
Tottori – Japan



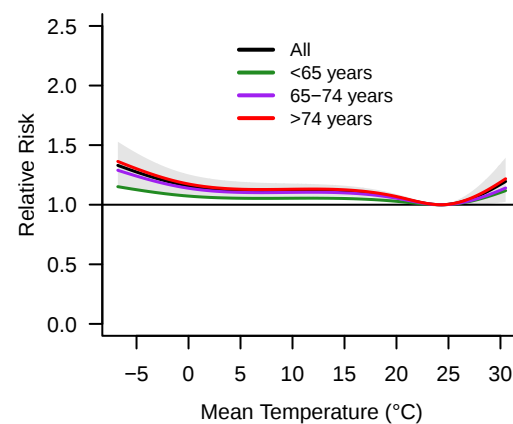
Wakayama – Japan



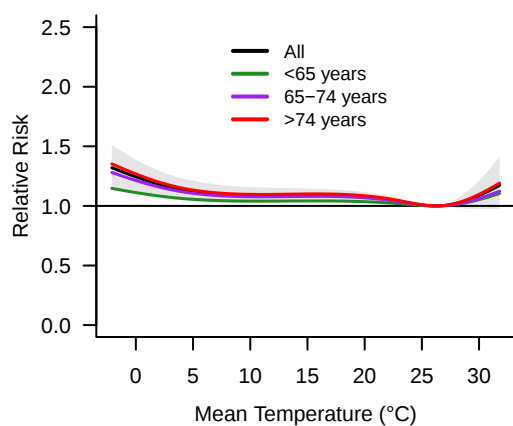
Yamaguchi – Japan



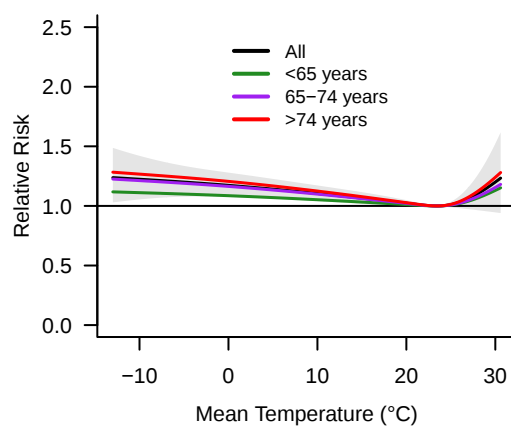
Yamagata – Japan



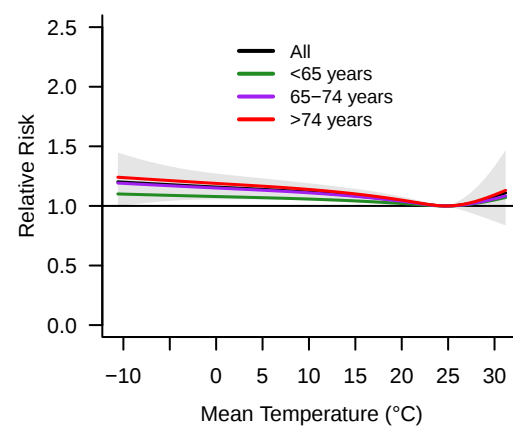
Yamanashi – Japan



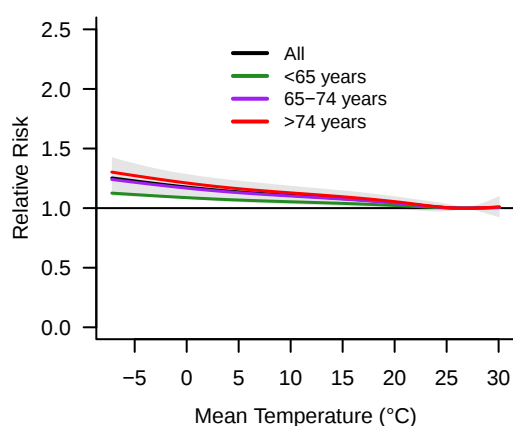
Andong – South Korea



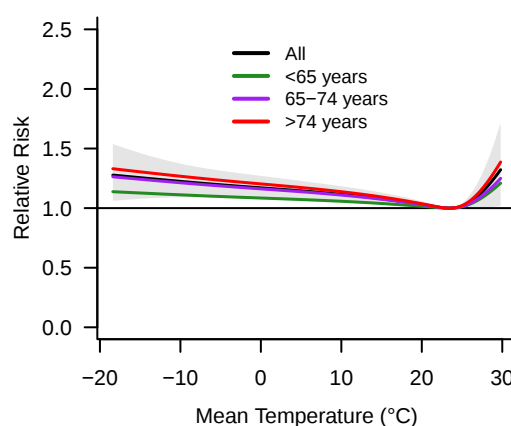
Boryeong – South Korea



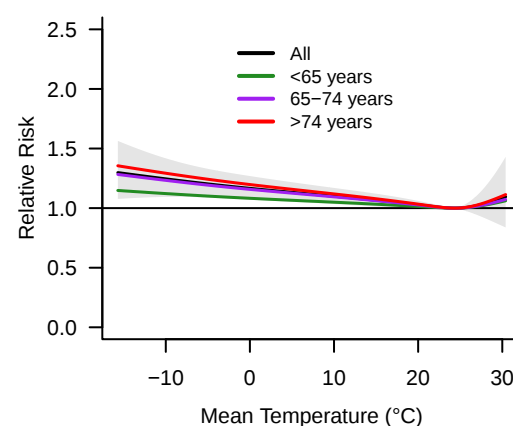
Busan – South Korea



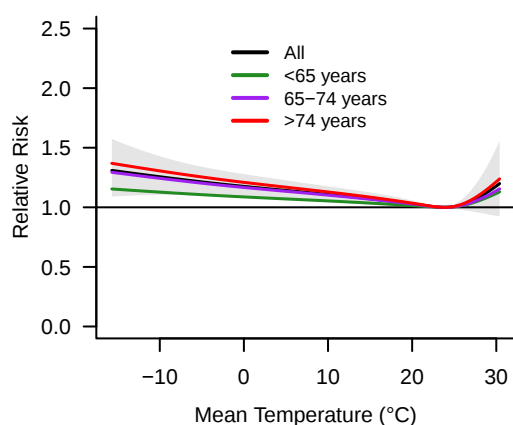
Chuncheon – South Korea



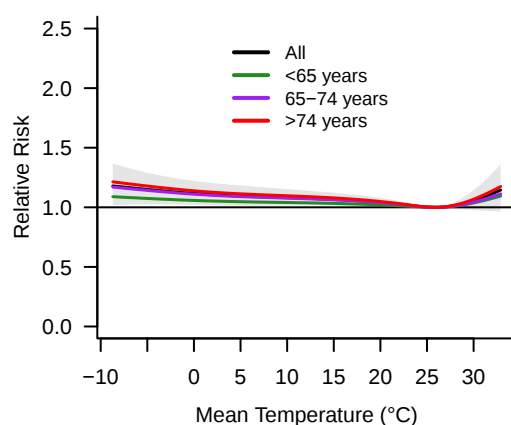
Chungju – South Korea



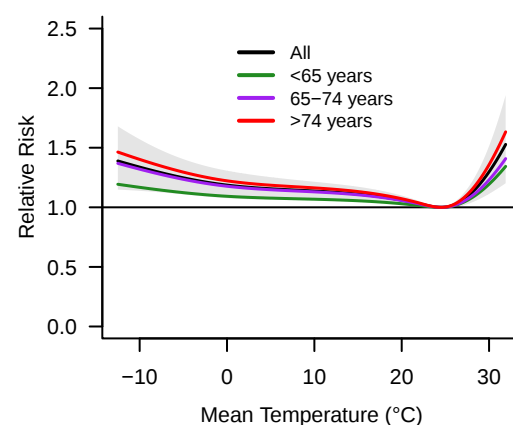
Cheonan – South Korea



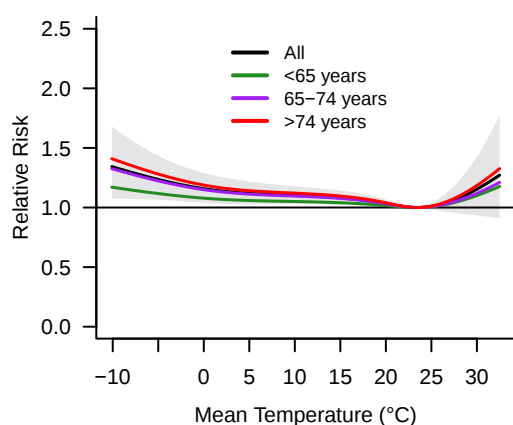
Daegu – South Korea



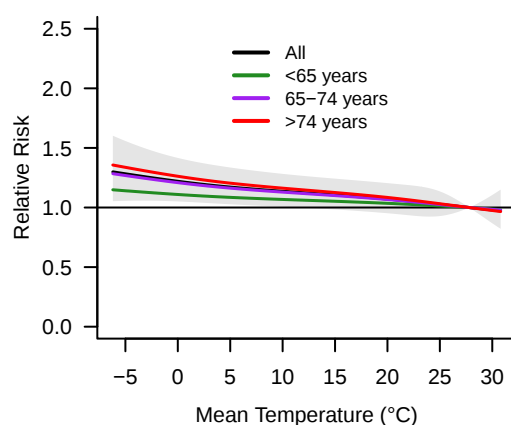
Daejeon – South Korea



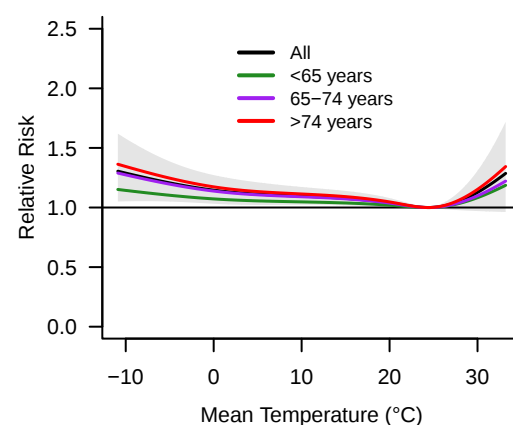
Donghae – South Korea



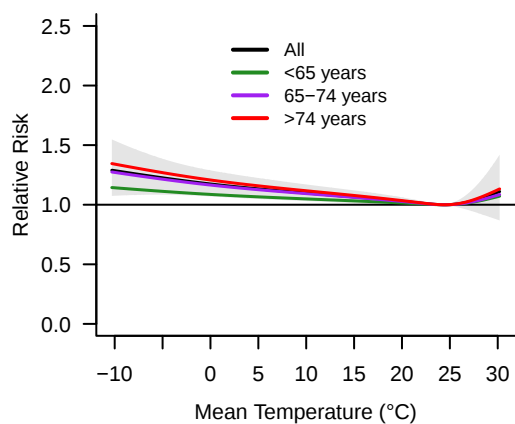
Geojae – South Korea



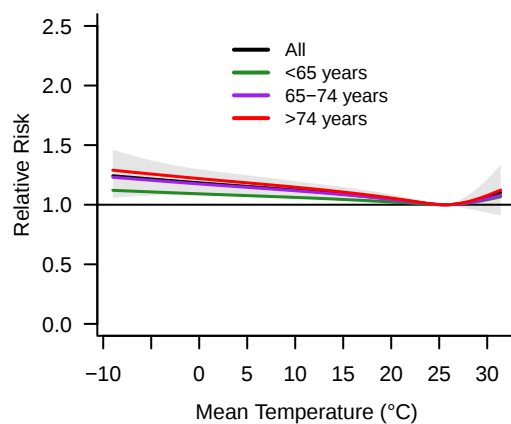
Gangneung – South Korea



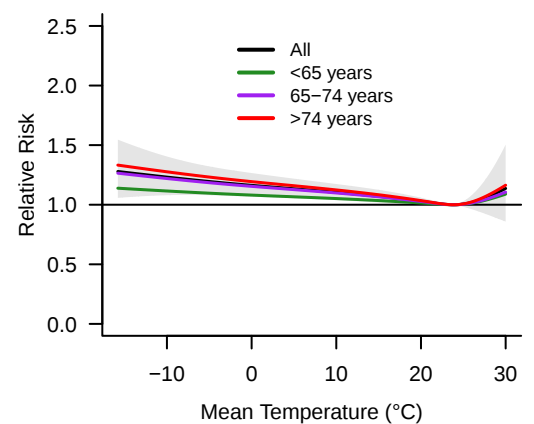
Gumi – South Korea



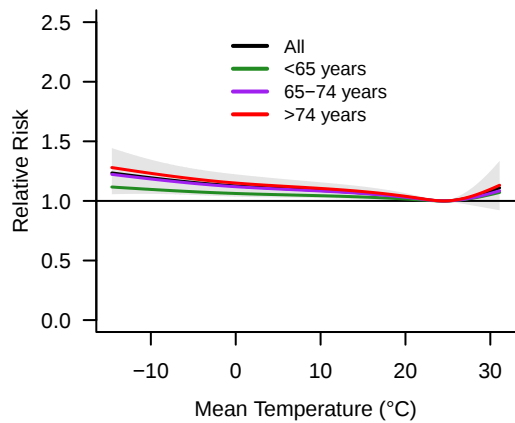
Gwangju – South Korea



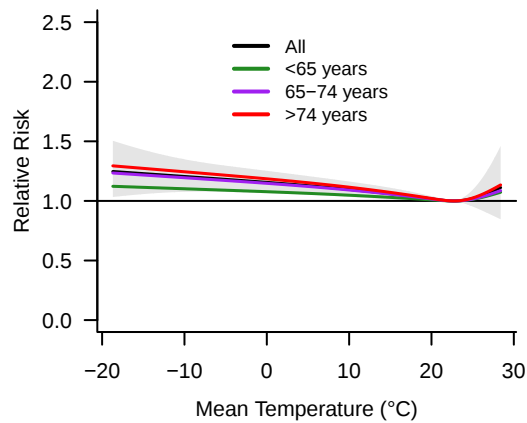
Icheon – South Korea



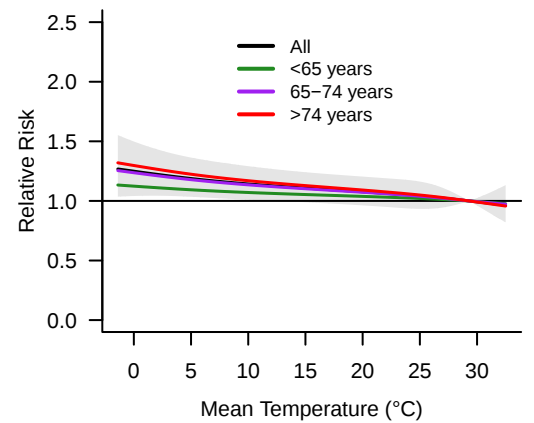
Incheon – South Korea



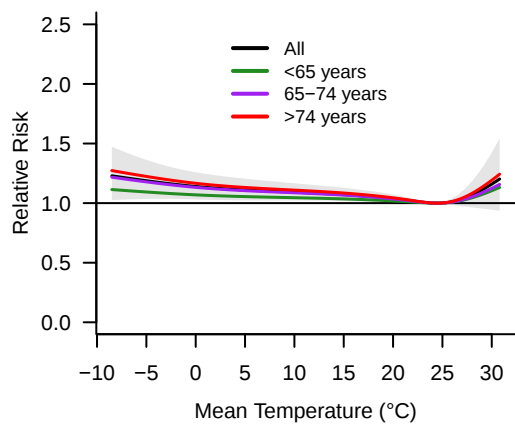
Jecheon – South Korea



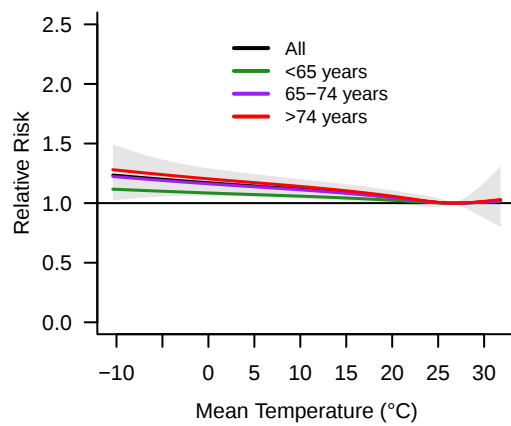
Jeju – South Korea



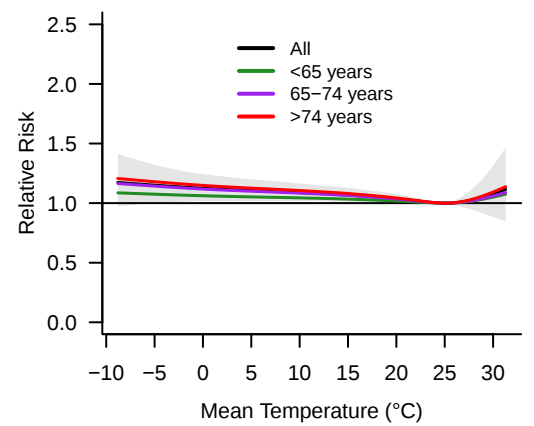
Jinju – South Korea



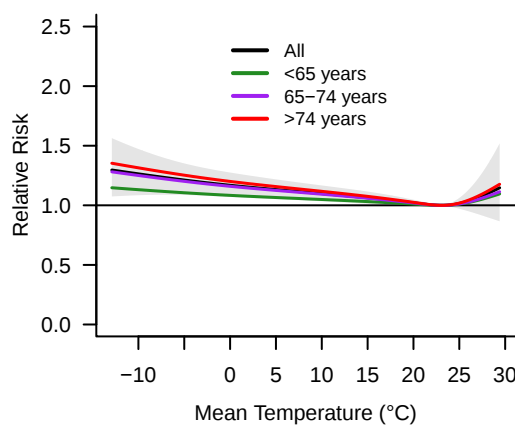
Jeongeup – South Korea



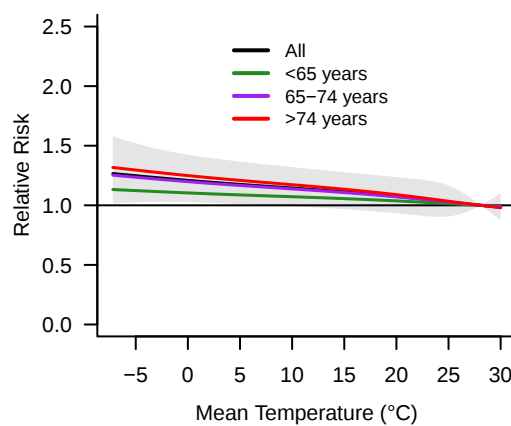
Milyang – South Korea



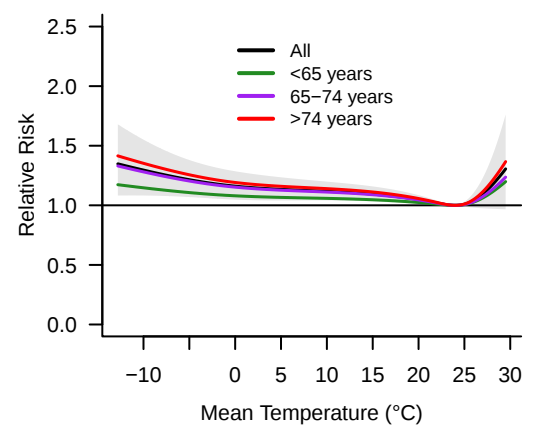
Mungyeong – South Korea



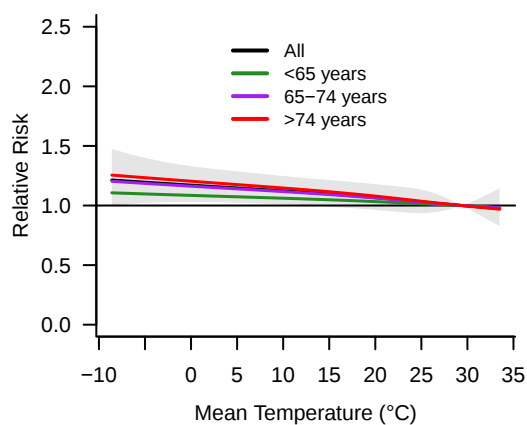
Mokpo – South Korea



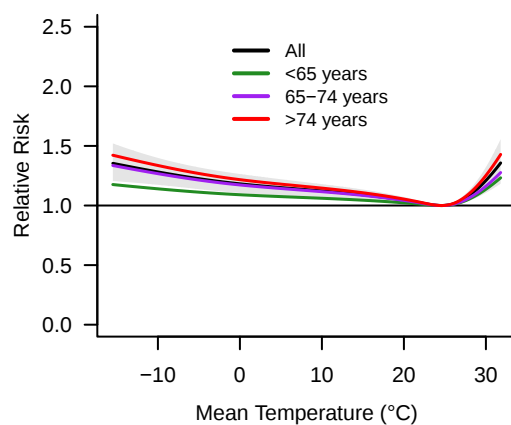
Namwon – South Korea



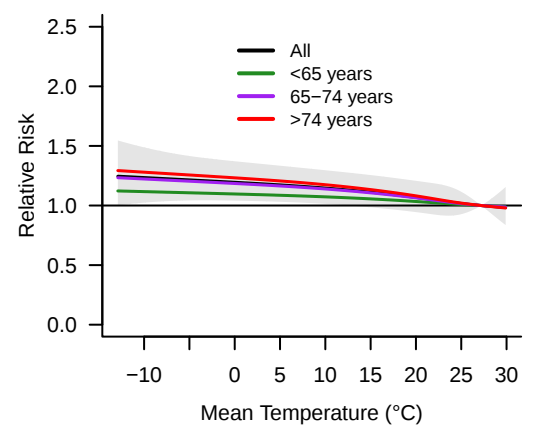
Pohang – South Korea



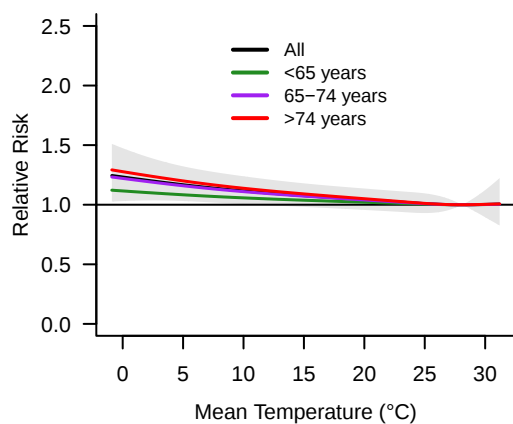
Seoul – South Korea



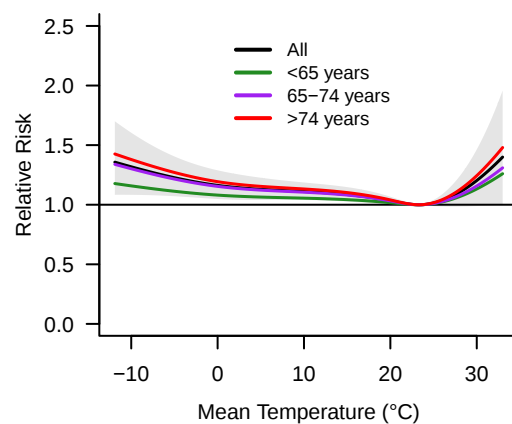
Seosan – South Korea



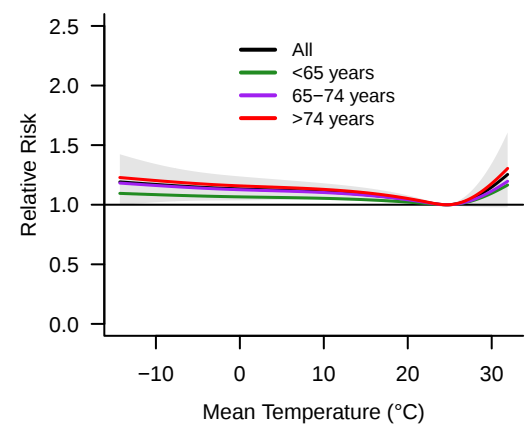
Seogyupo – South Korea



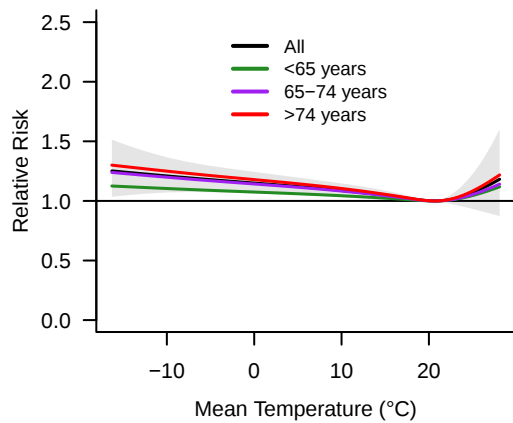
Sokcho – South Korea



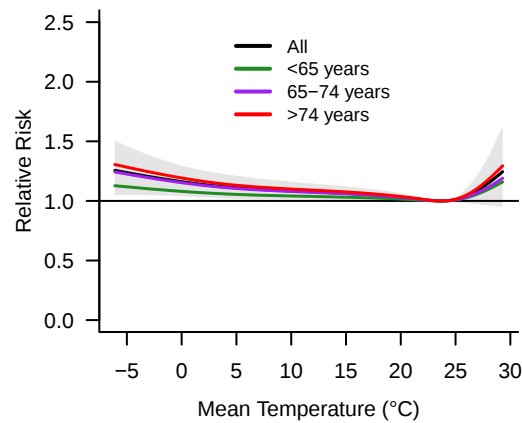
Suwon – South Korea



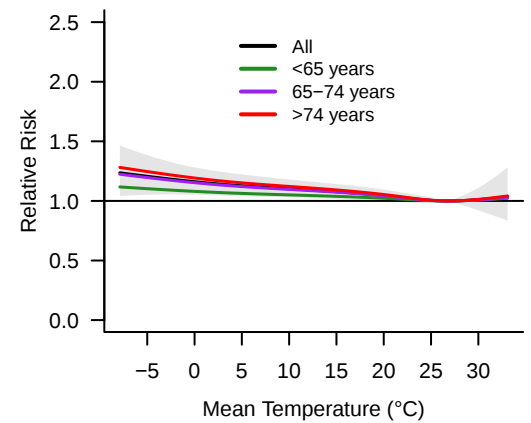
Taebaek – South Korea



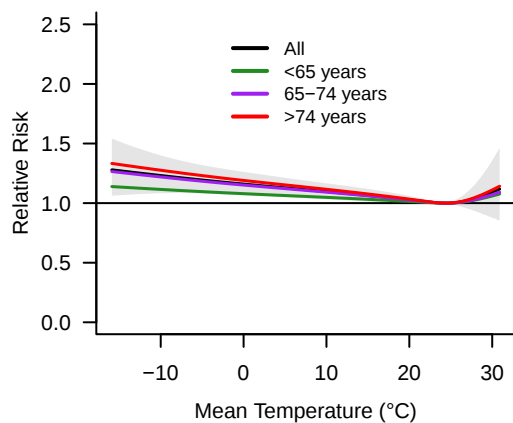
Tongyeong – South Korea



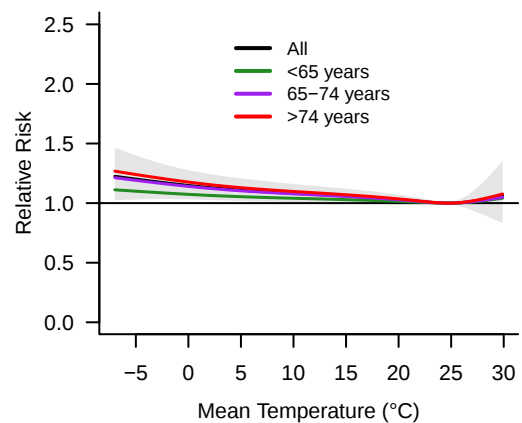
Ulsan – South Korea



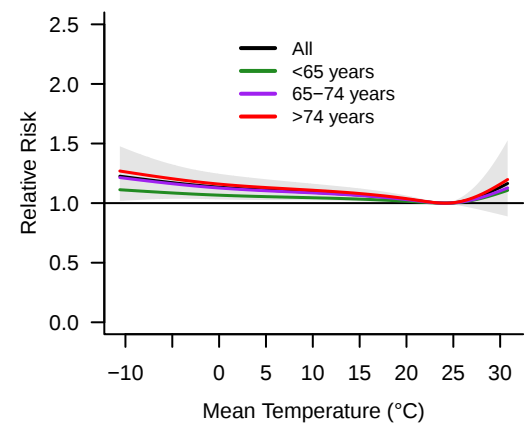
Wonju – South Korea



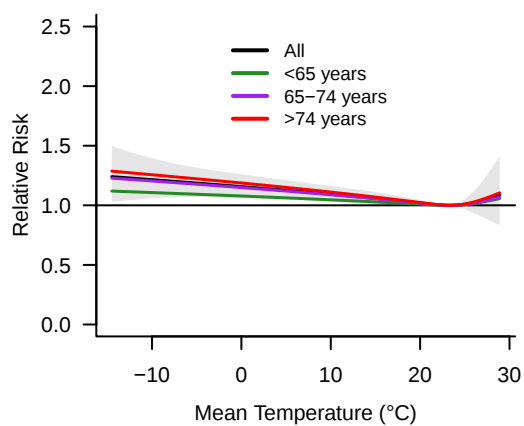
Yeosu – South Korea



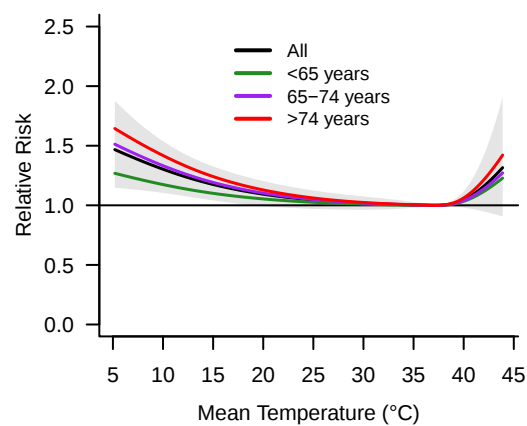
Yoengcheon – South Korea



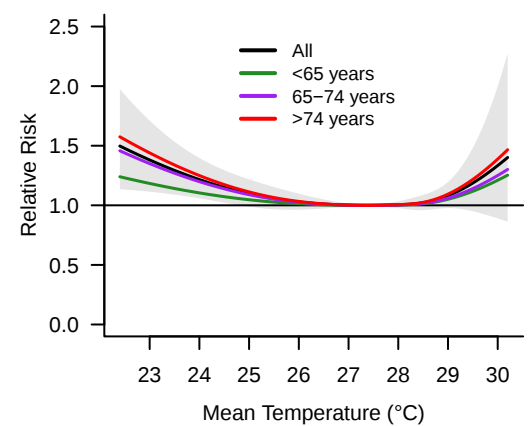
Yeongju – South Korea



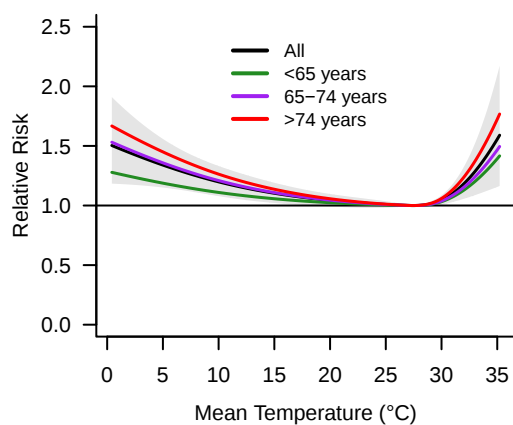
Kuwait – Kuwait



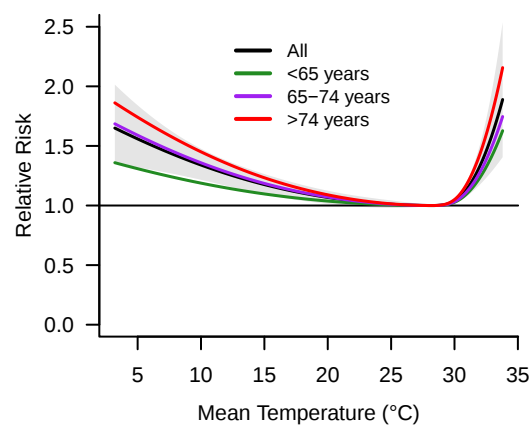
Fort-de-France – Martinique



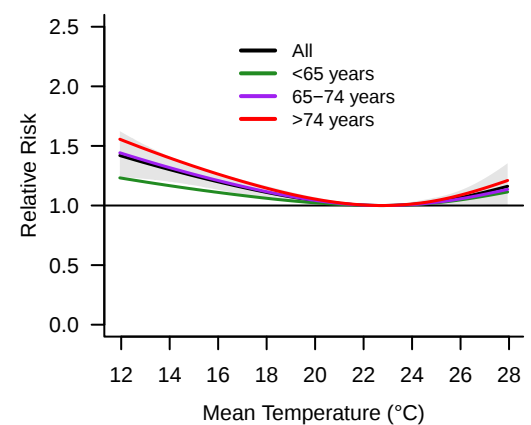
Ciudad Juarez – Mexico



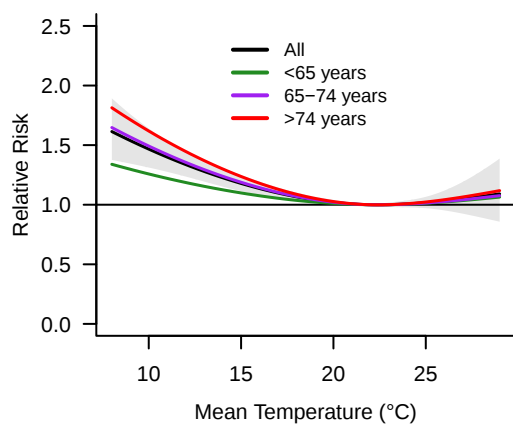
Comarca Lagunera – Mexico



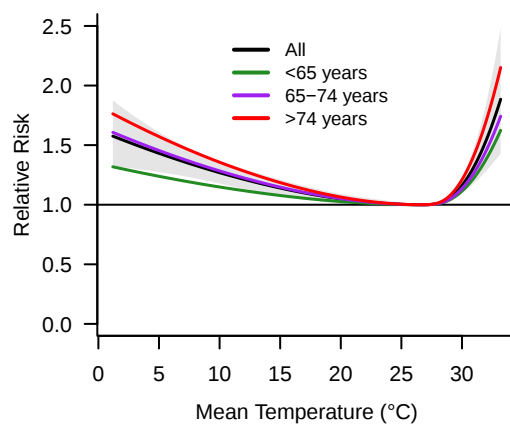
Guadalajara – Mexico



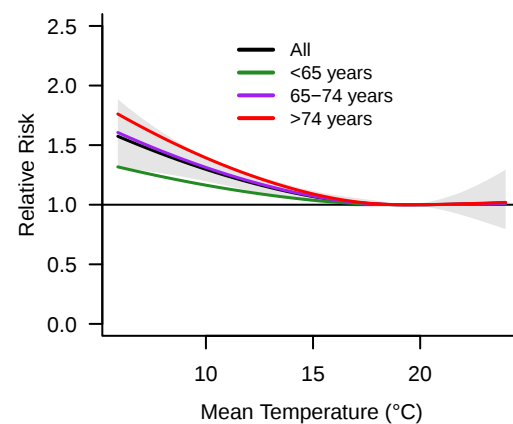
Leon – Mexico



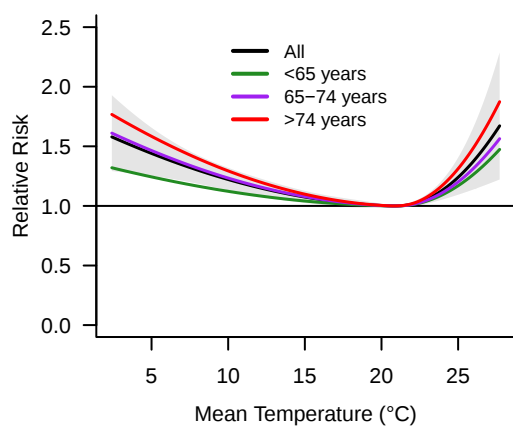
Monterrey – Mexico



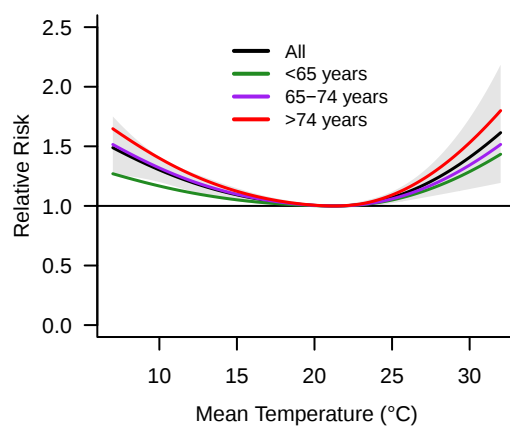
Puebla-Tlaxcala – Mexico



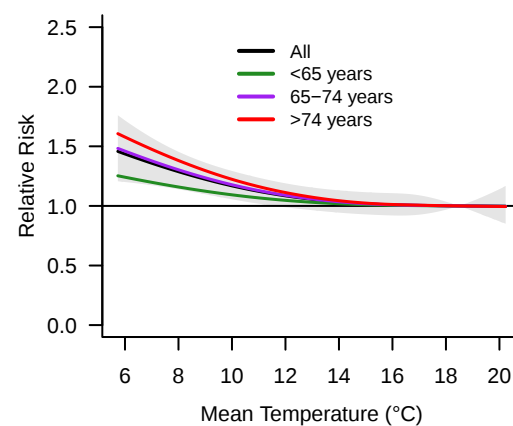
San Luis Potosi – Mexico



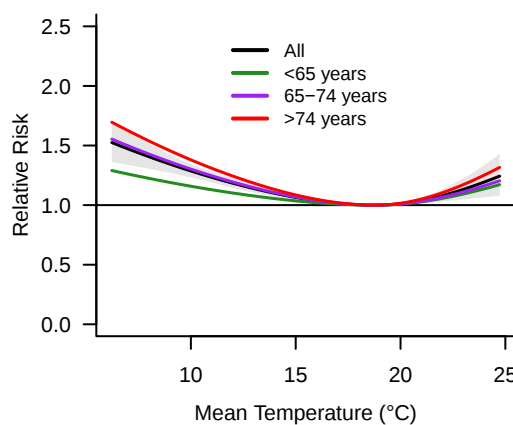
Tijuana – Mexico



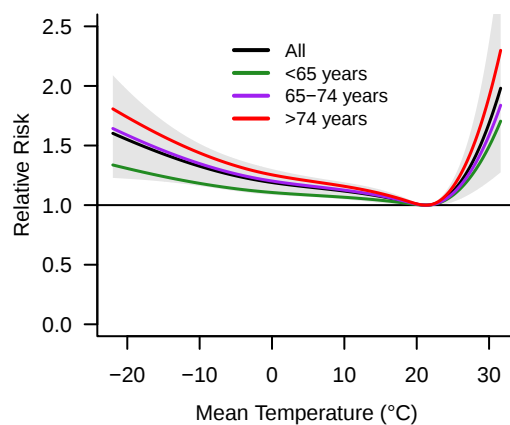
Toluca de Lerdo – Mexico



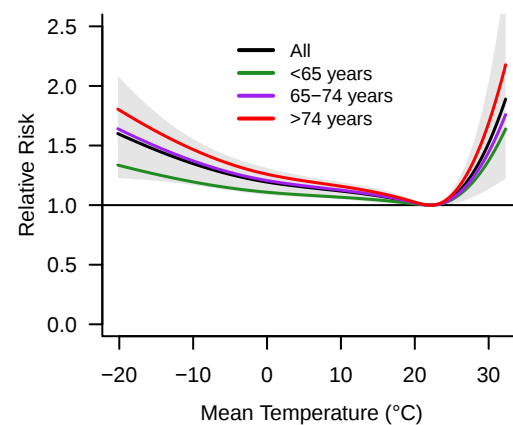
Valley of Mexico – Mexico



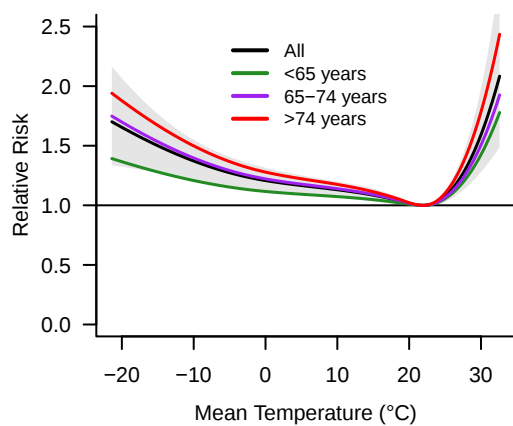
Anenii Noi – Moldova



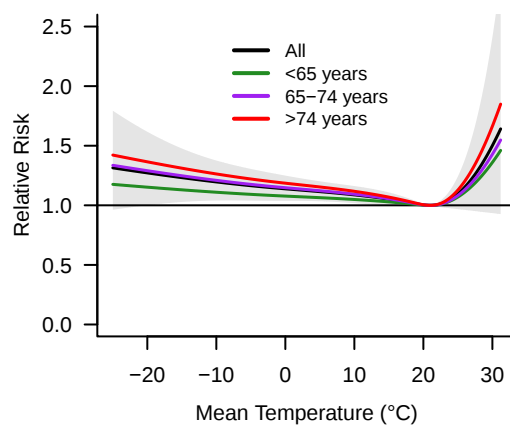
Cahul – Moldova



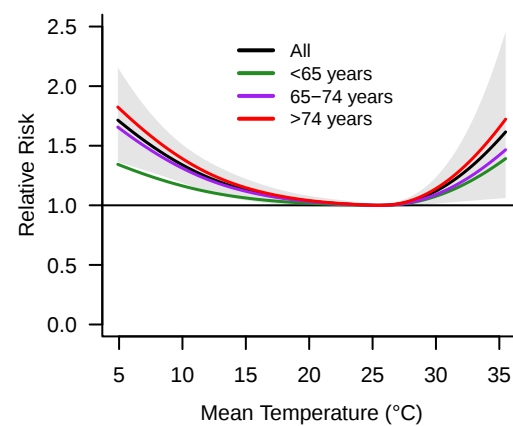
Chisinau – Moldova



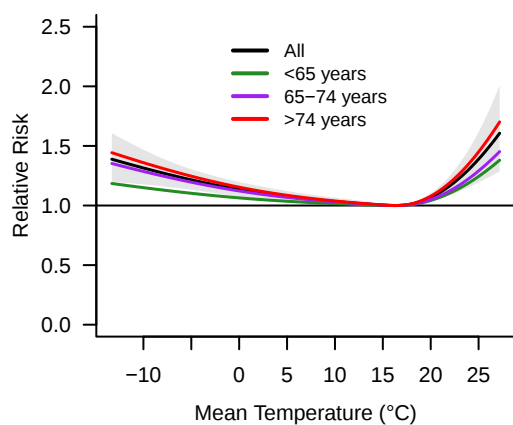
Falesti – Moldova



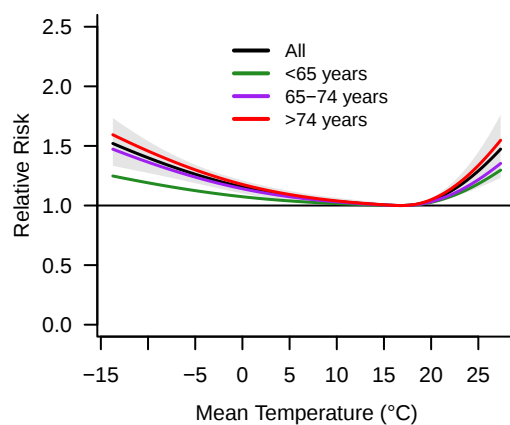
Malta – Malta



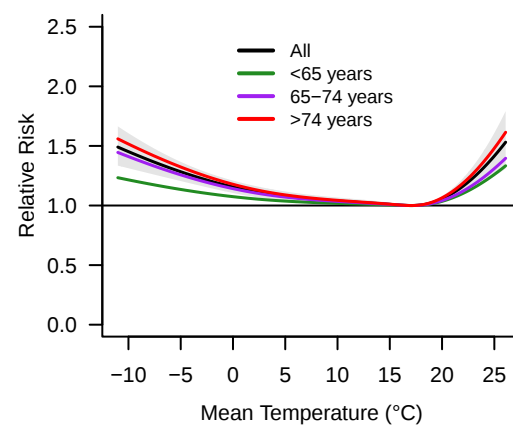
Noord-Nederland – Netherland



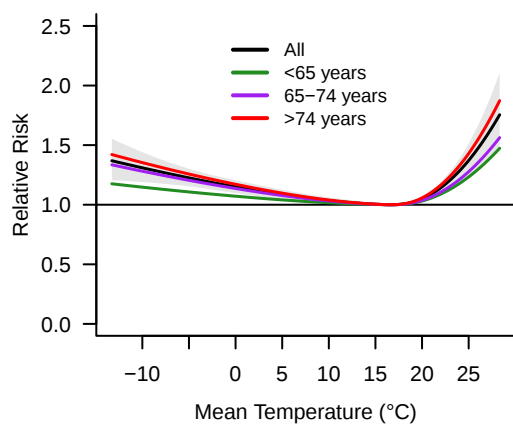
Oost-Nederland – Netherland



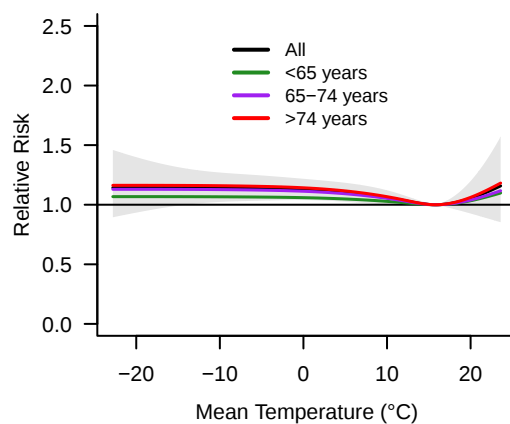
West-Nederland – Netherland



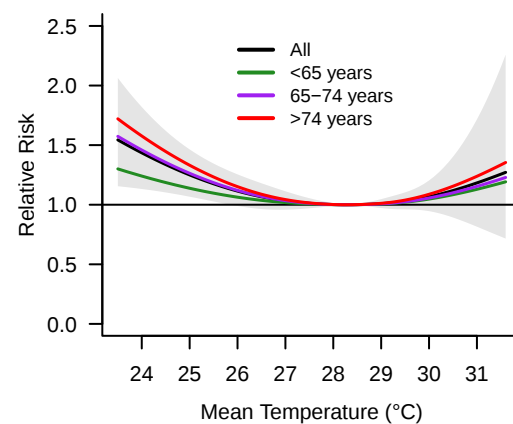
Zuid-Nederland – Netherland



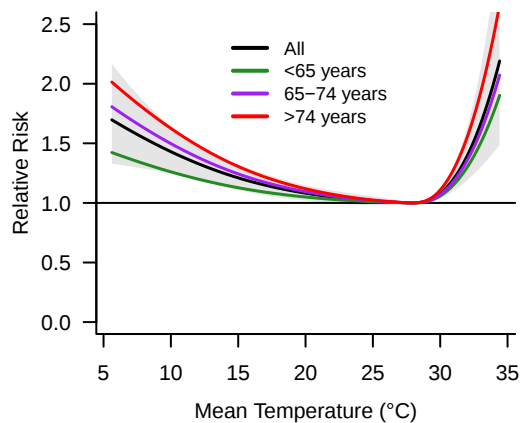
Oslo – Norway



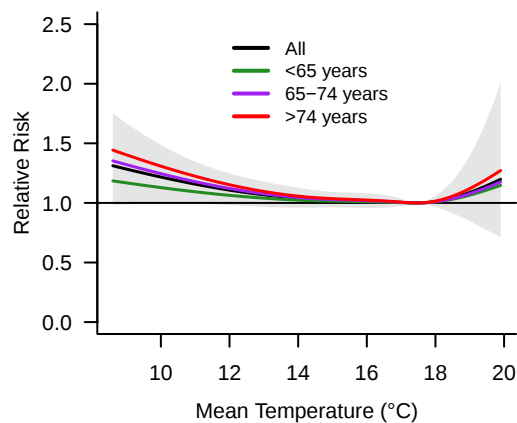
Panama – Panama



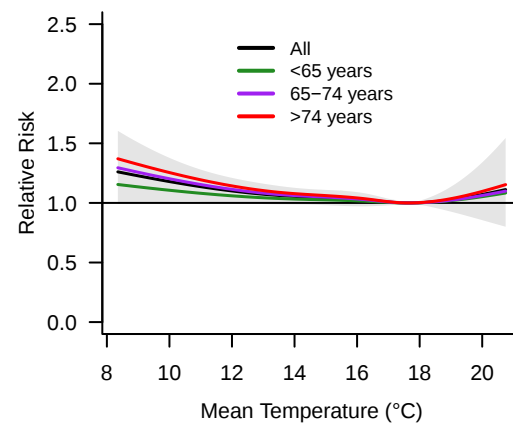
Asuncion – Paraguay



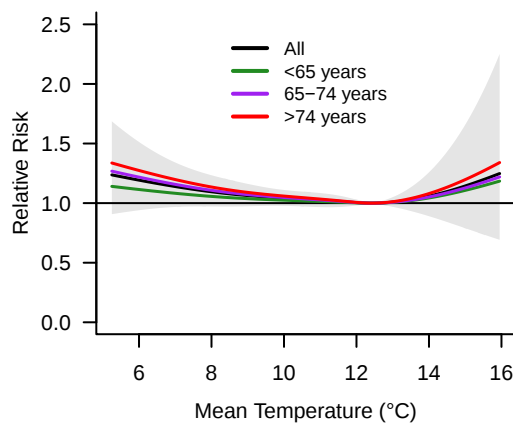
Apurimac – Peru



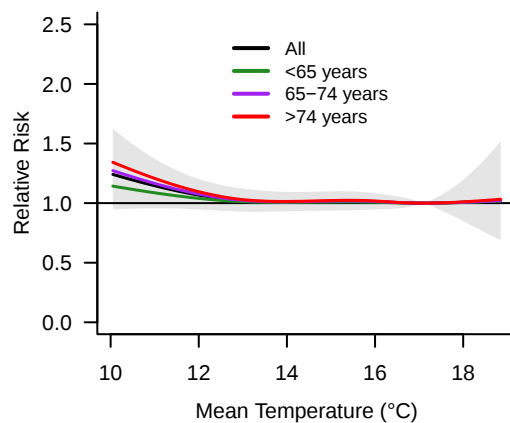
Arequipa – Peru



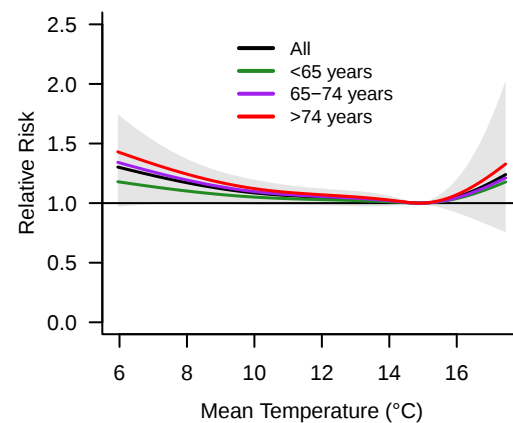
Ayacucho – Peru



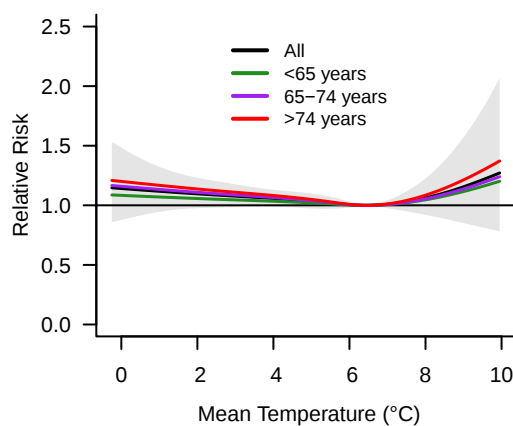
Cajamarca – Peru



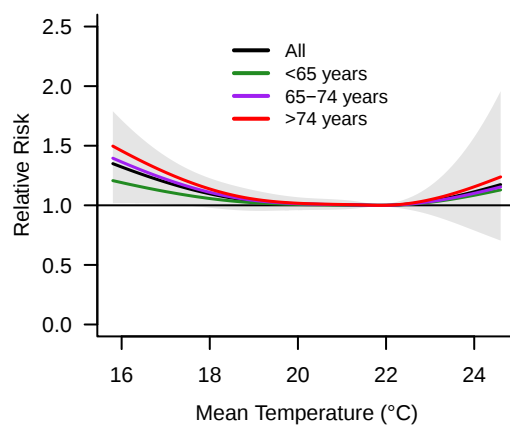
Cusco – Peru



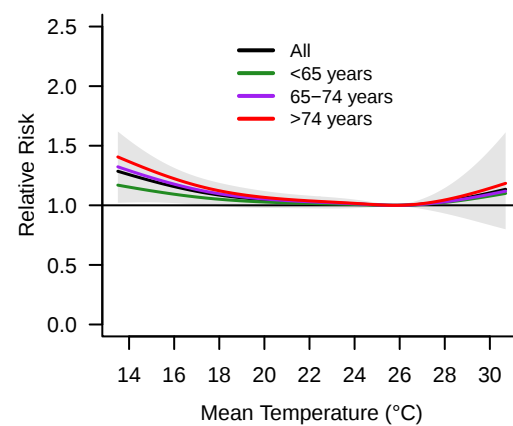
Huancavelica – Peru



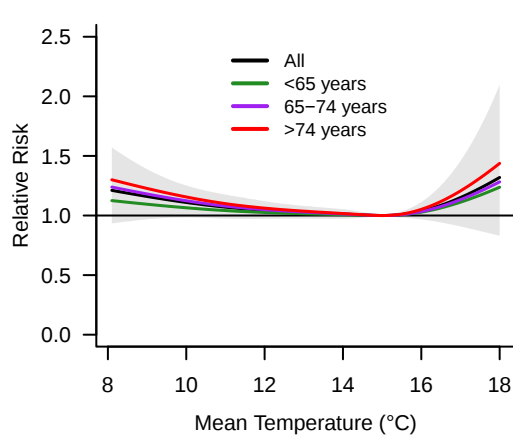
Huanuco – Peru



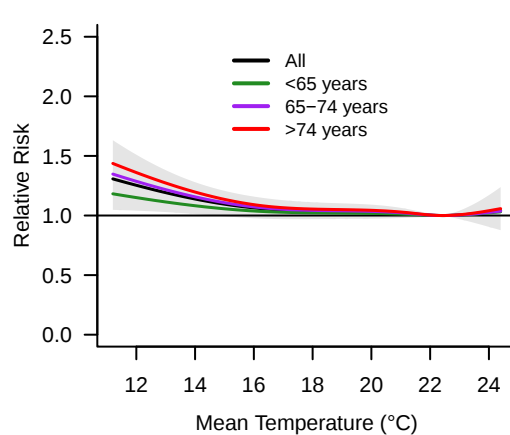
Ica – Peru



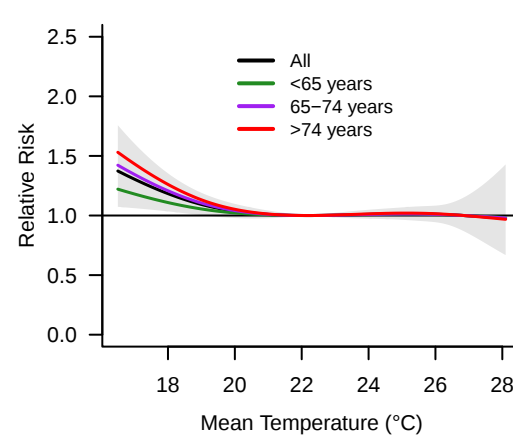
Junin – Peru



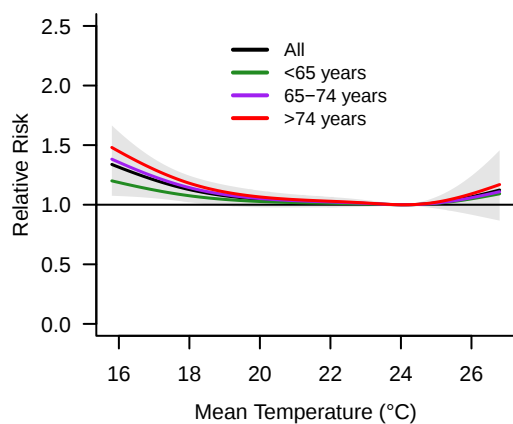
Lima – Peru



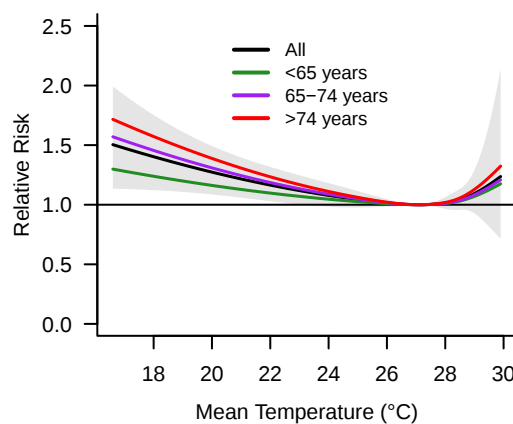
La libertad – Peru



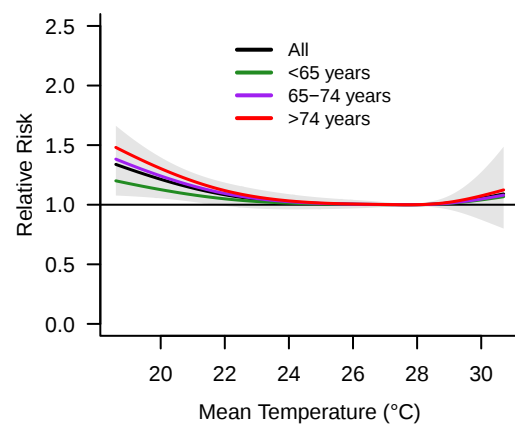
Lambayeque – Peru



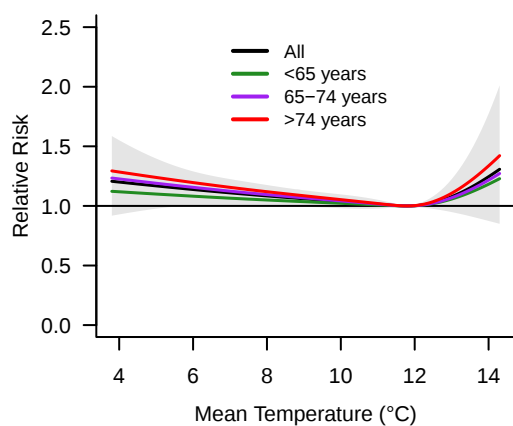
Loreto – Peru



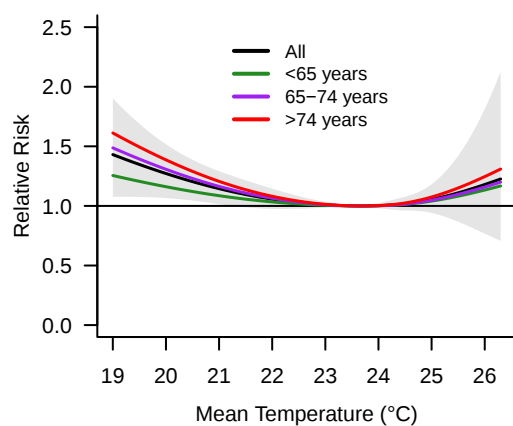
Piura – Peru



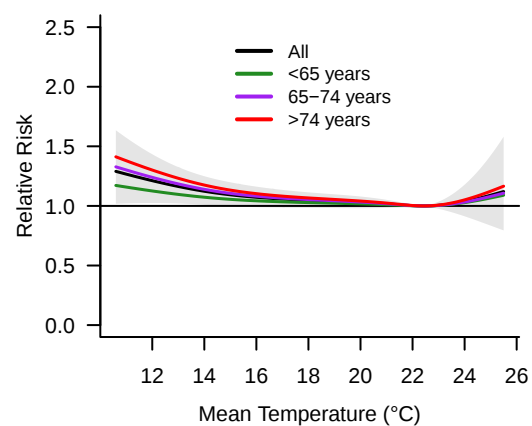
Puno – Peru



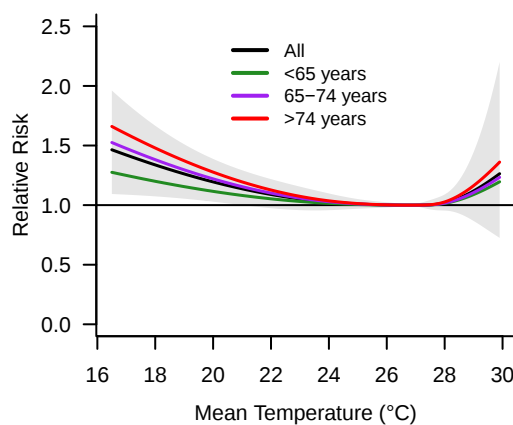
San martin- Peru



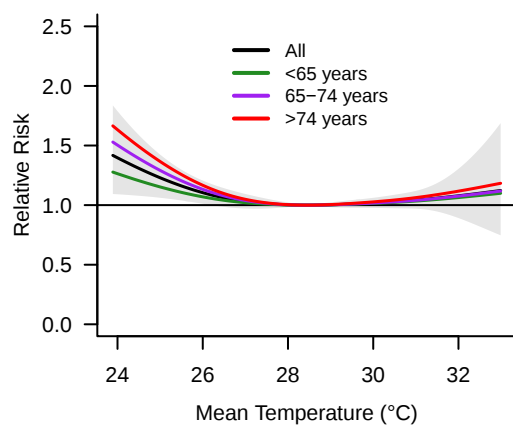
Tacna – Peru



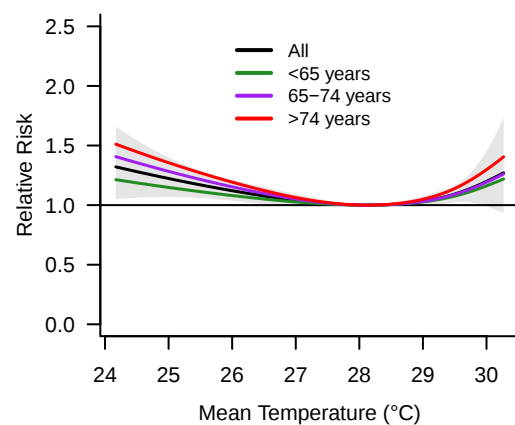
Ucayali – Peru



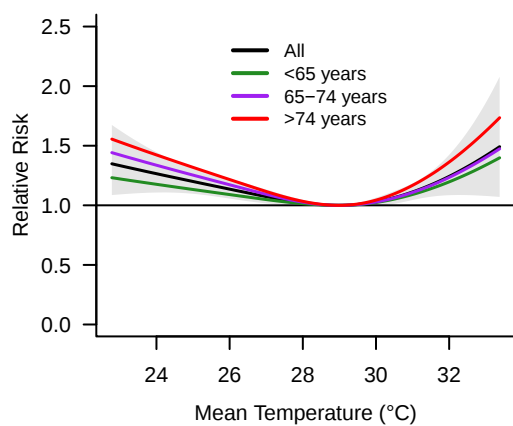
Bacoor – Philippines



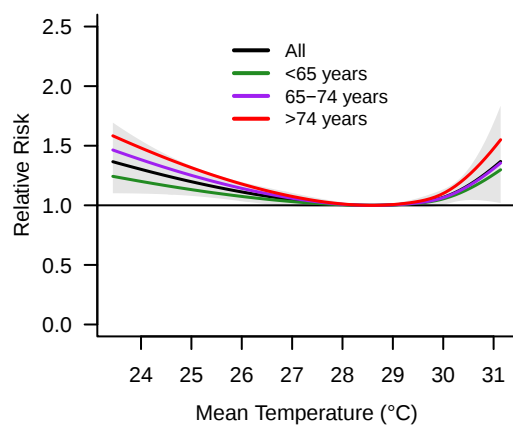
Cebu – Philippines



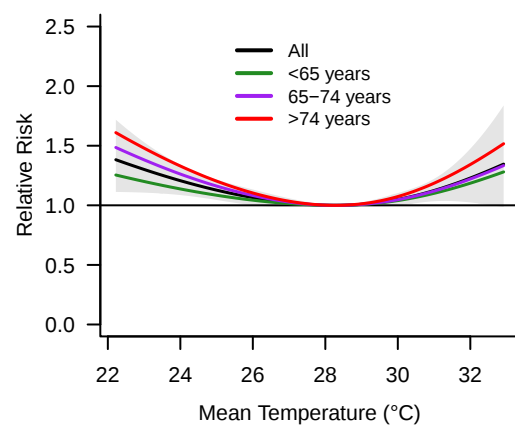
Callocan – Philippines



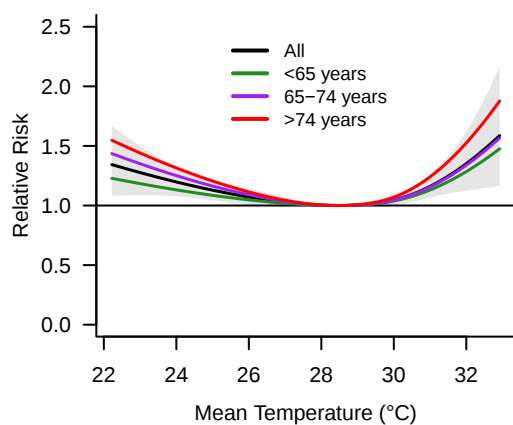
Davao – Philippines



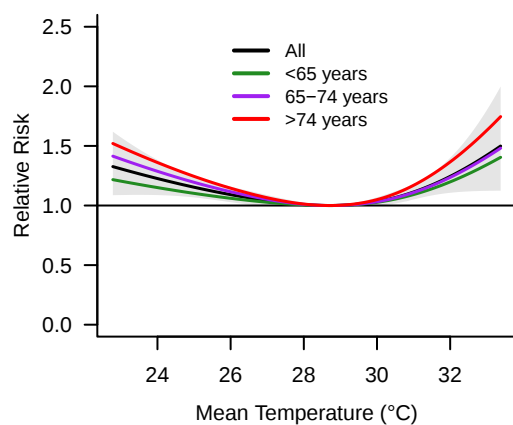
Las Pinas – Philippines



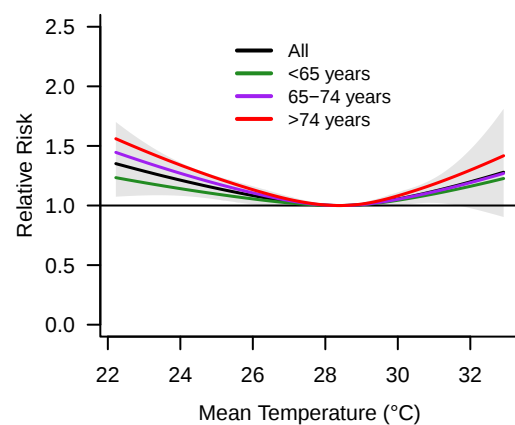
Makati – Philippines



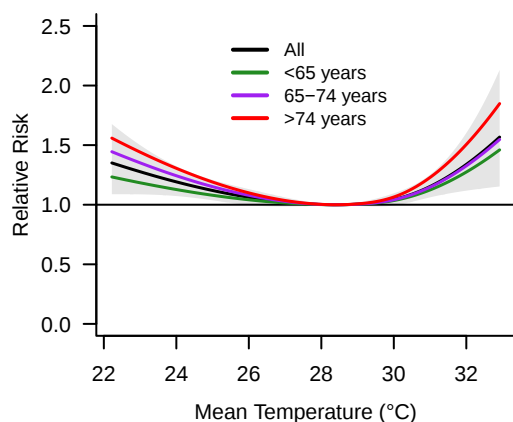
Manila – Philippines



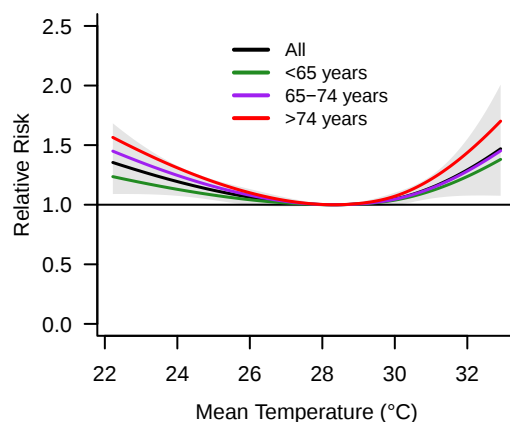
Muntinlupa – Philippines



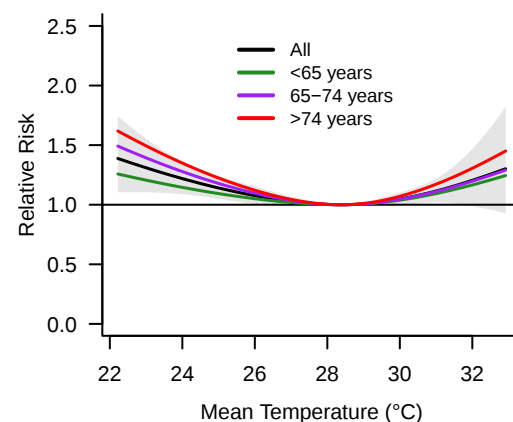
Pasig – Philippines



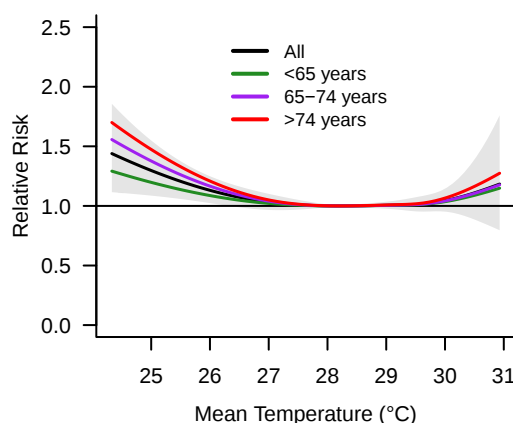
Taguig – Philippines



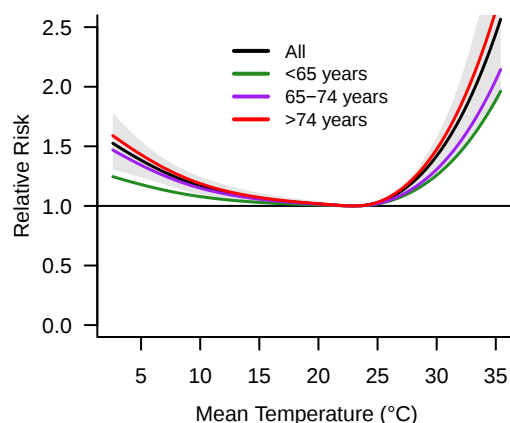
Valenzuela – Philippines



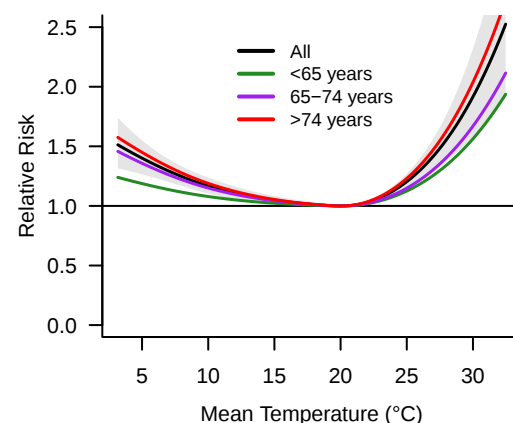
Zamboanga – Philippines



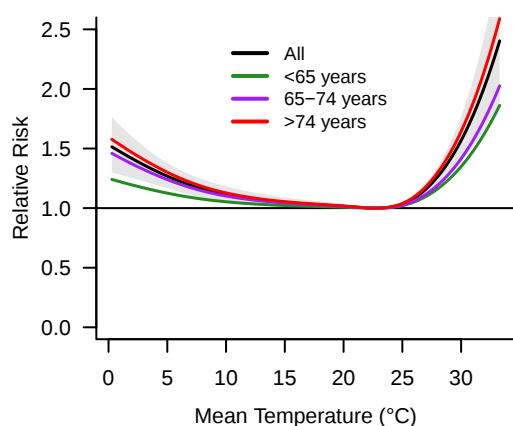
Beja – Portugal



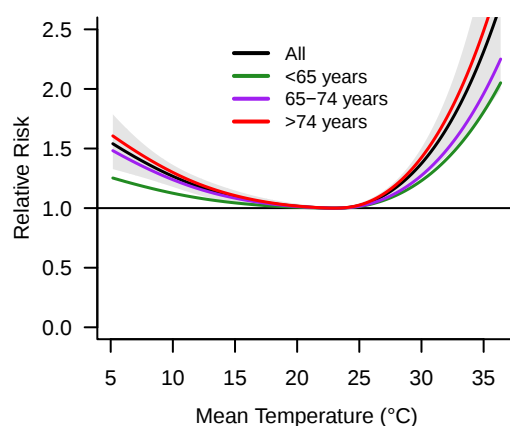
Coimbra – Portugal



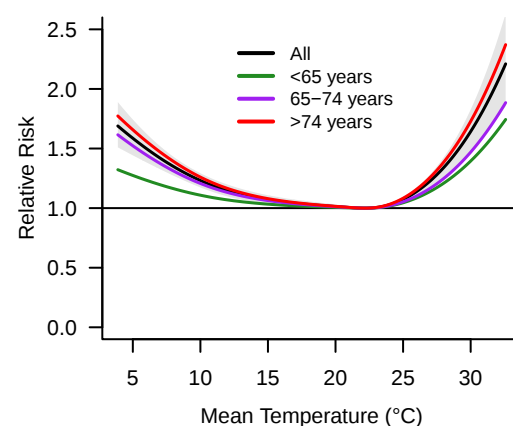
Castelobranco – Portugal



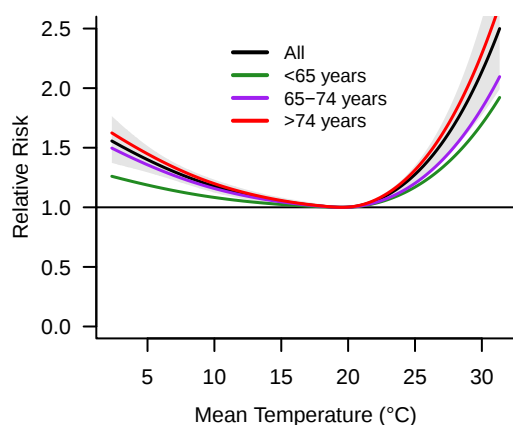
Faro – Portugal



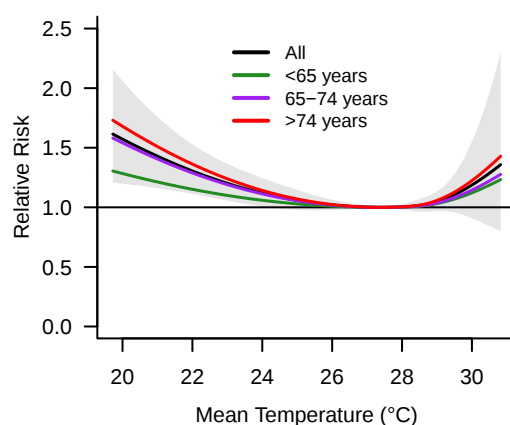
Lisboa – Portugal



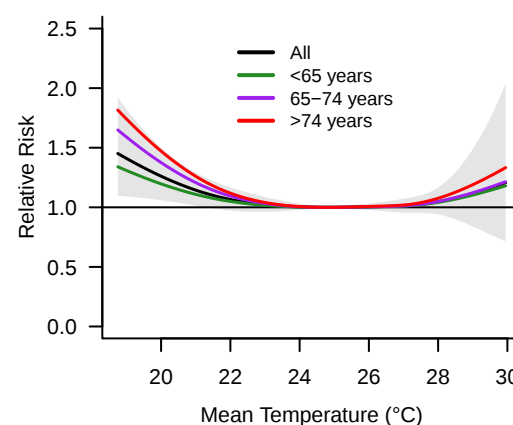
Porto – Portugal



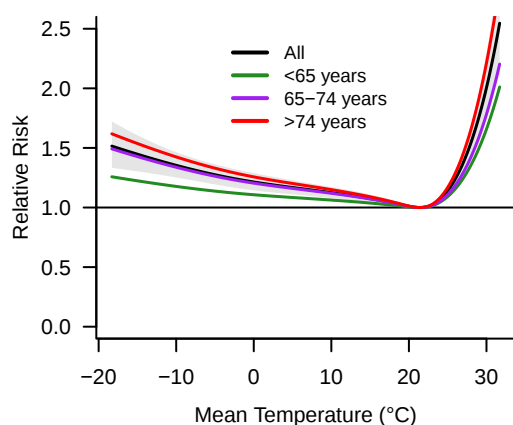
San Juan – Puerторico



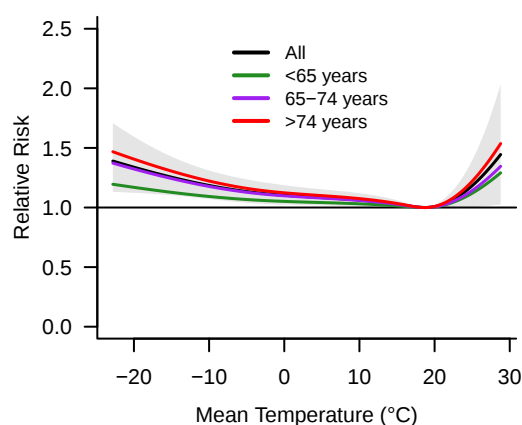
Saint-Denis – Reunion



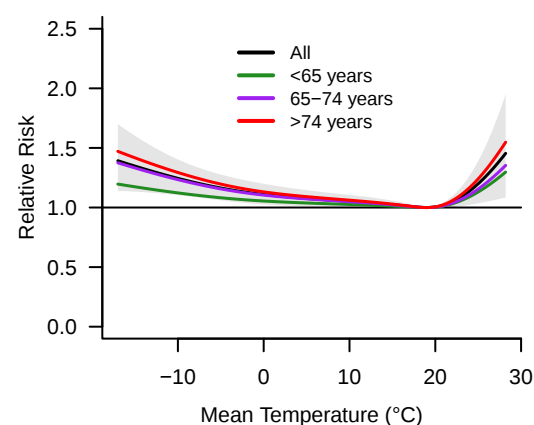
Bucharest – Romania



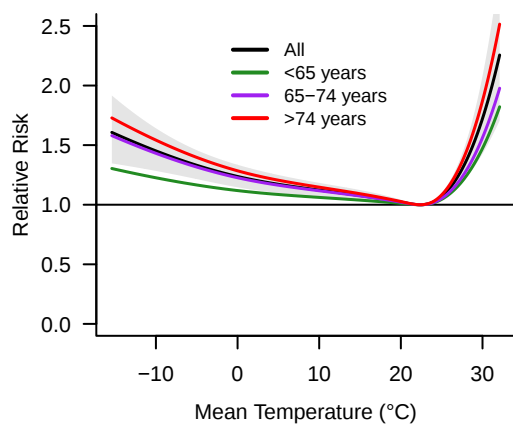
Brasov – Romania



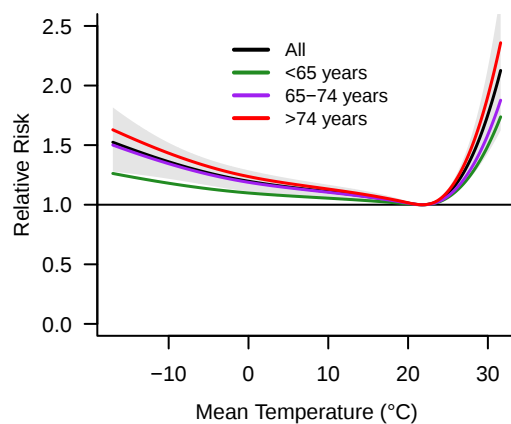
Cluj-Napoca – Romania



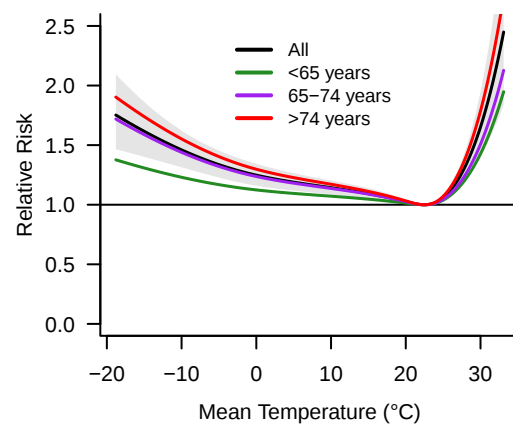
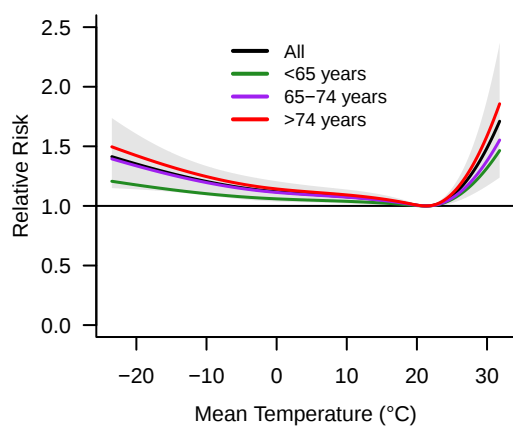
Constanta – Romania



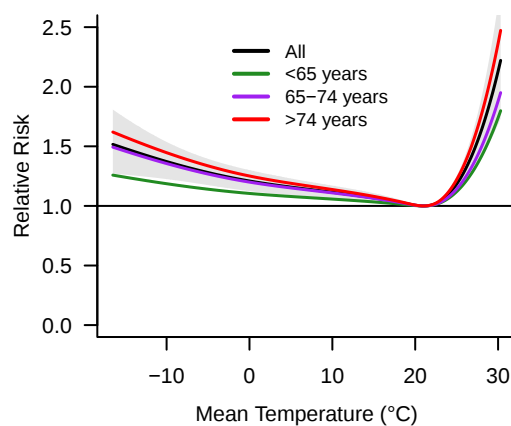
Craiova – Romania



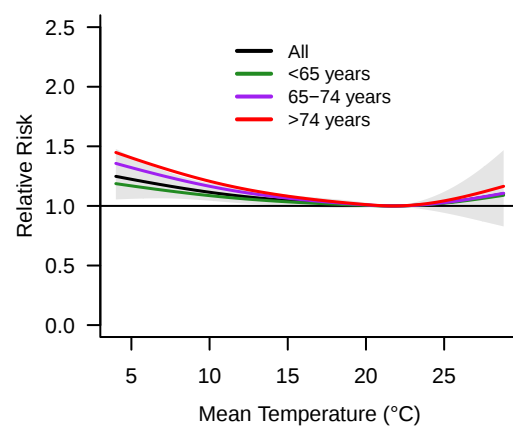
Galati – Romania

**Iasi – Romania**

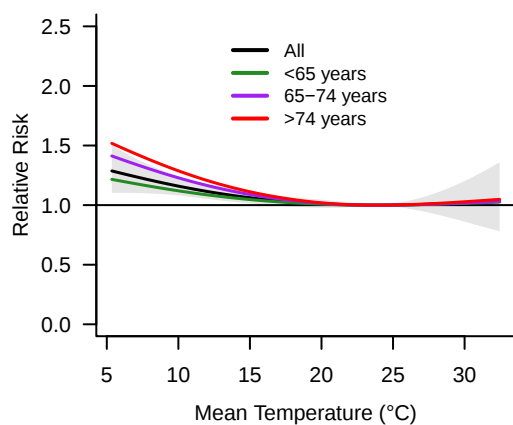
Timisoara – Romania



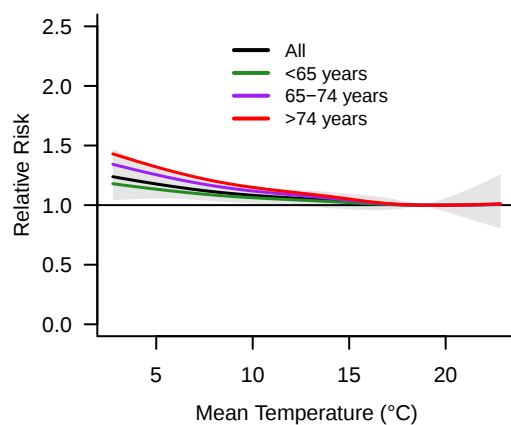
Alfred Nzo – South Africa



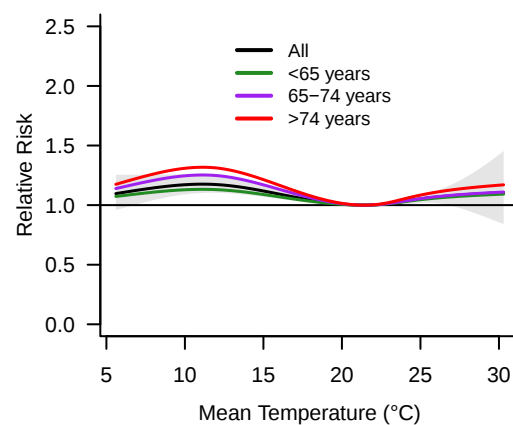
Amathole – South Africa



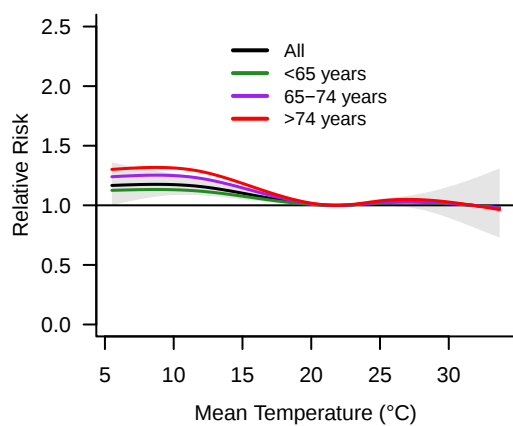
Buffalo City – South Africa



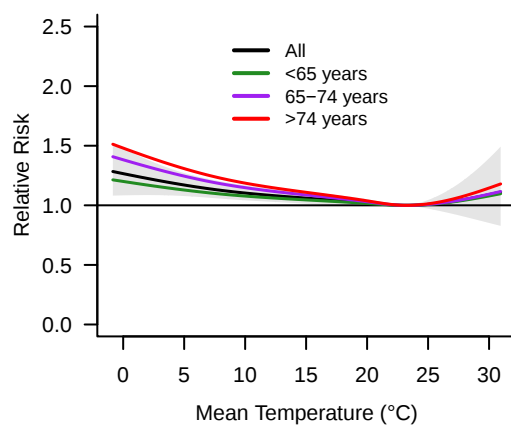
Bojanala – South Africa



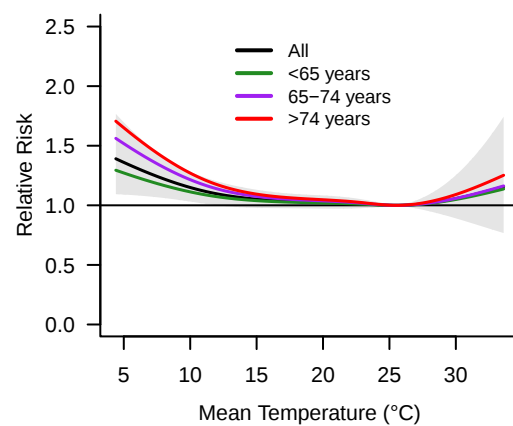
Cacadu – South Africa



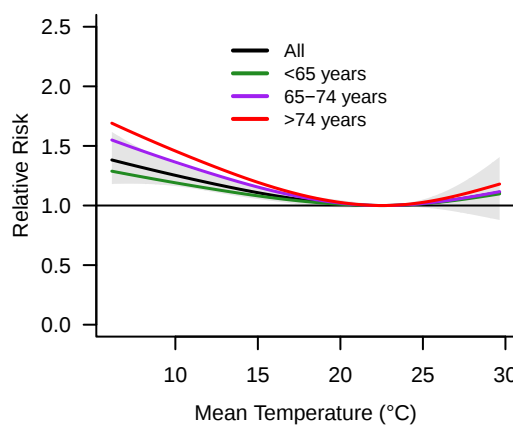
Chris Hani – South Africa



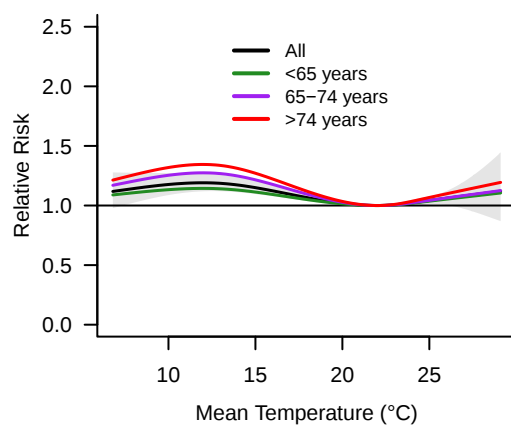
Central Karoo – South Africa



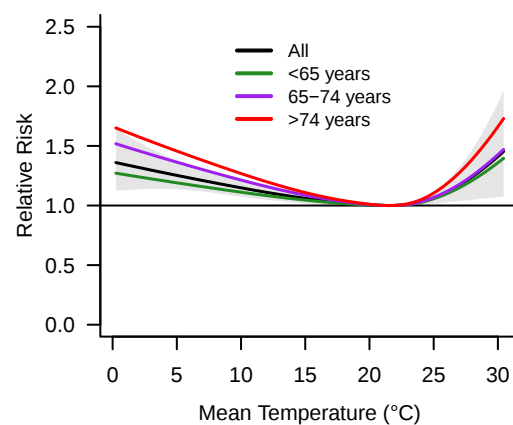
City of Cape Town – South Africa



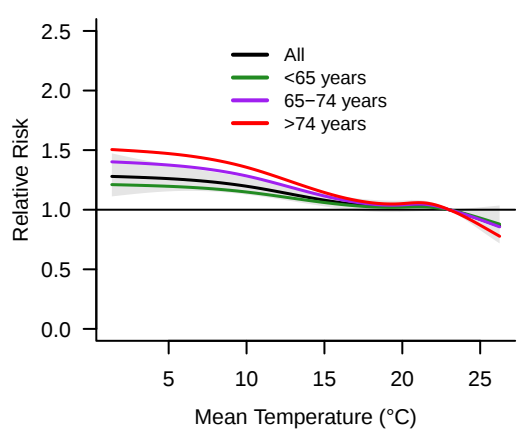
Capricorn – South Africa



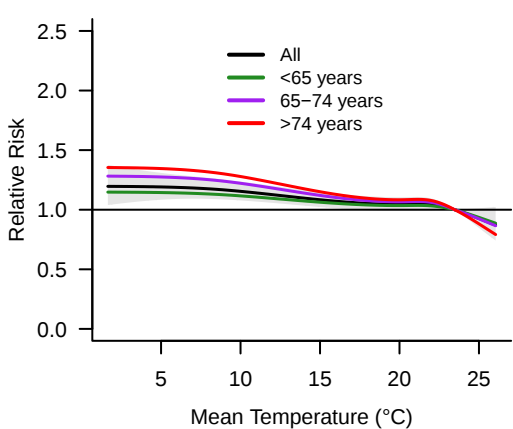
Cape Winelands – South Africa



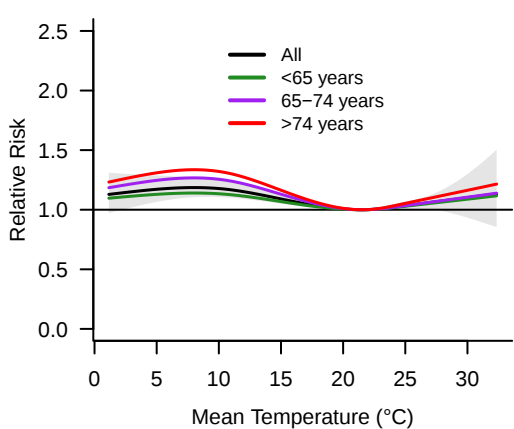
City of Johannesburg – South Africa



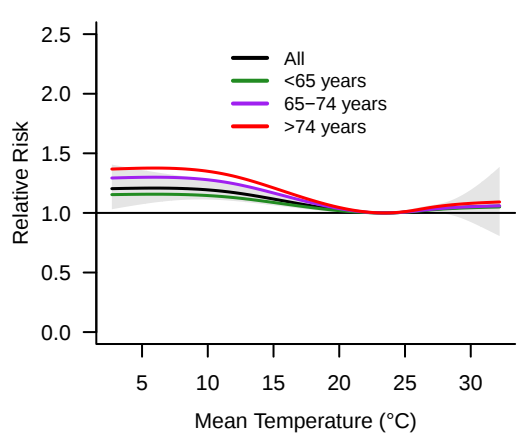
City of Tshwane – South Africa



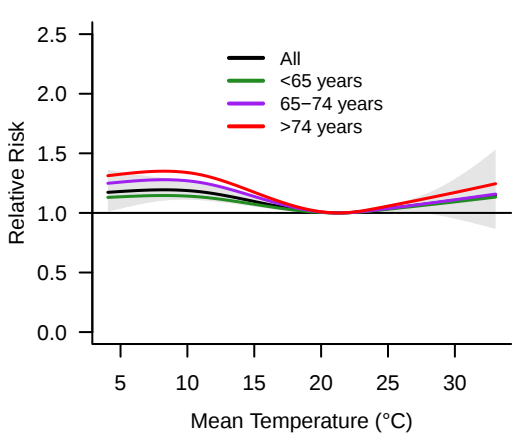
Dr Kenneth Kaunda – South Africa



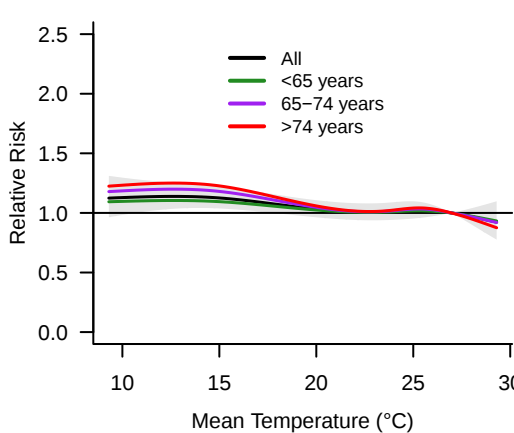
Dr Ruth Segomotsi Mompoti – South Africa



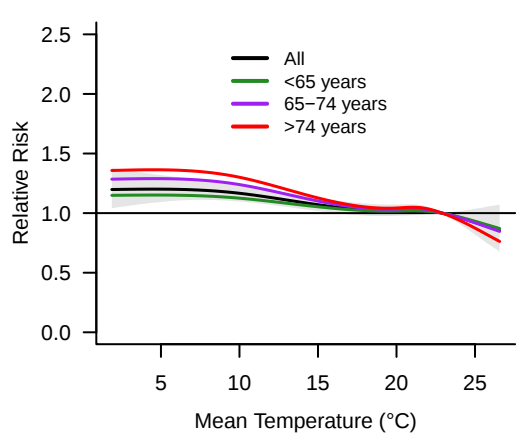
Eden – South Africa



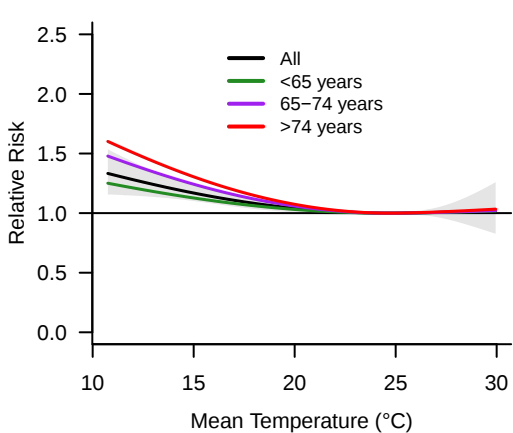
Ehlanzeni – South Africa



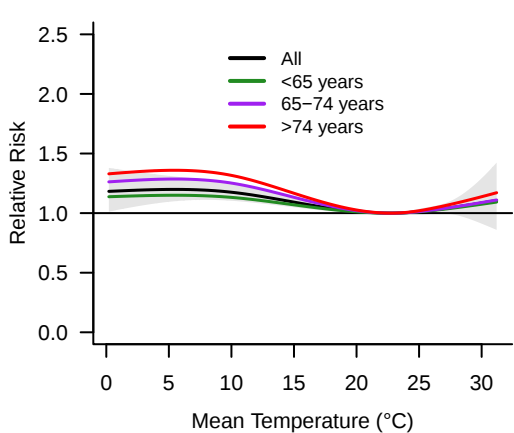
Ekurhuleni – South Africa



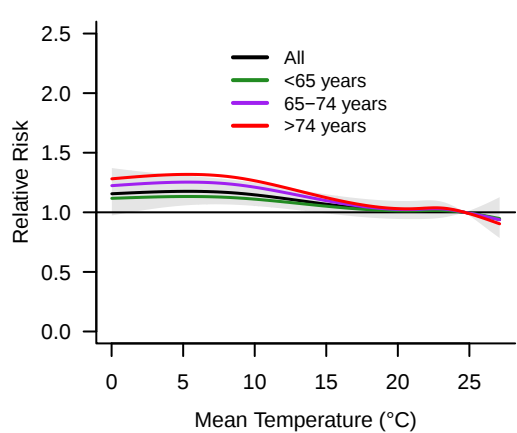
eThekweni – South Africa



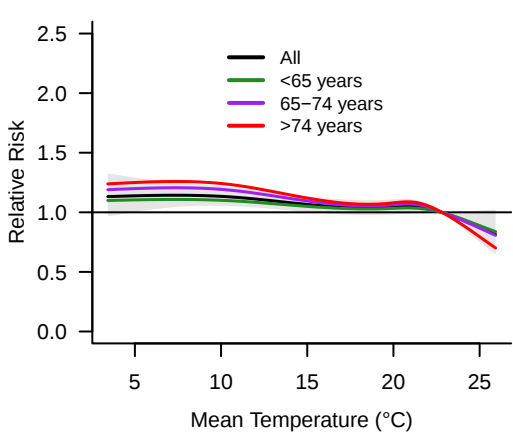
Frances Baard – South Africa



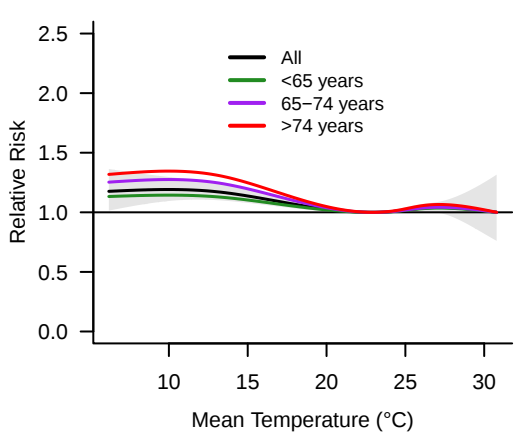
Fezile Dabi – South Africa



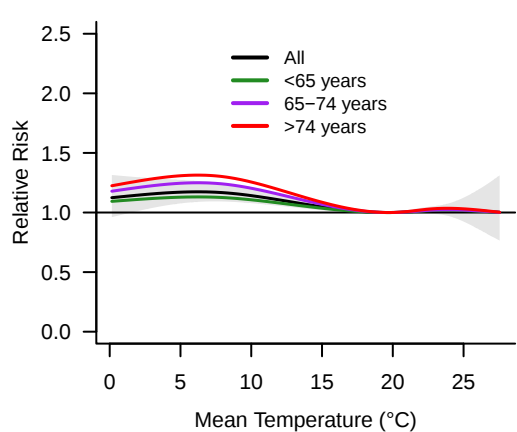
Gert Sibande – South Africa



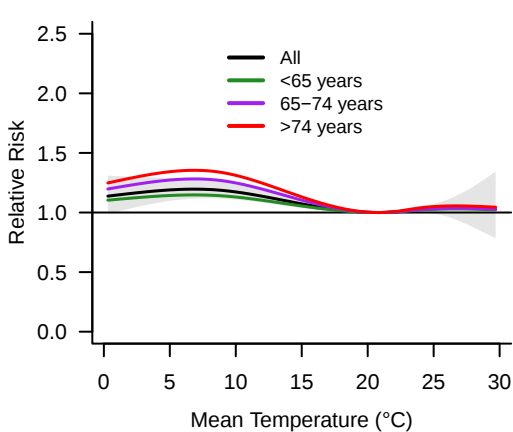
Greater Sekhukhune – South Africa



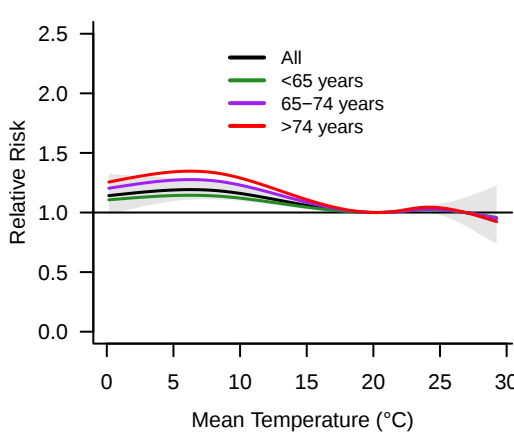
Joe Gqabi – South Africa



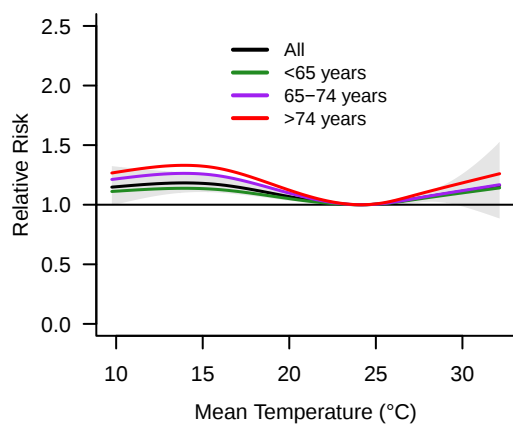
Lejweleputswa – South Africa



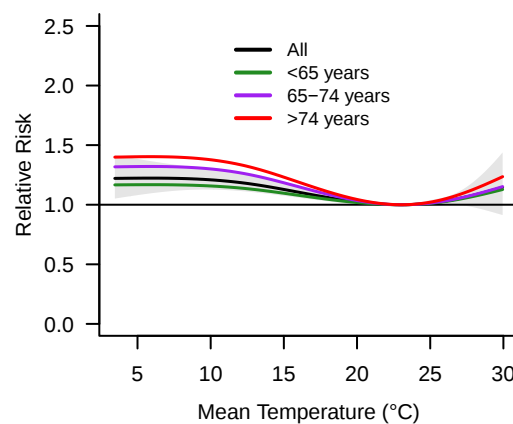
Mangaung – South Africa



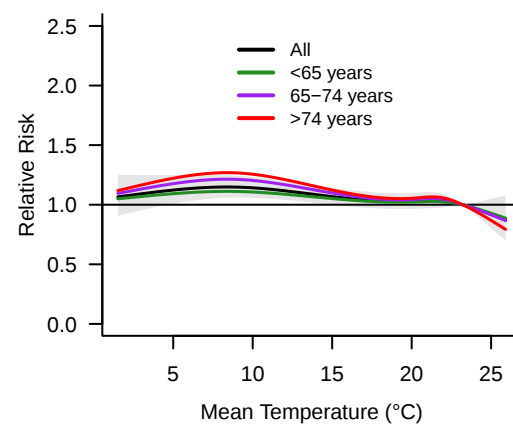
Mopani – South Africa



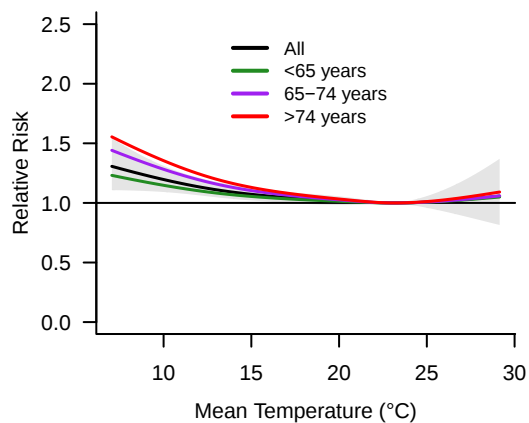
Ngaka Modiri Molema – South Africa



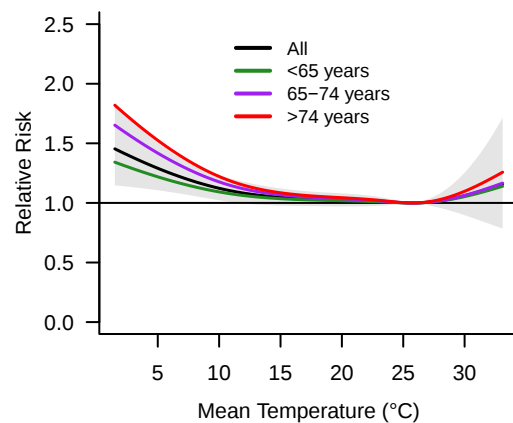
Nkangala – South Africa



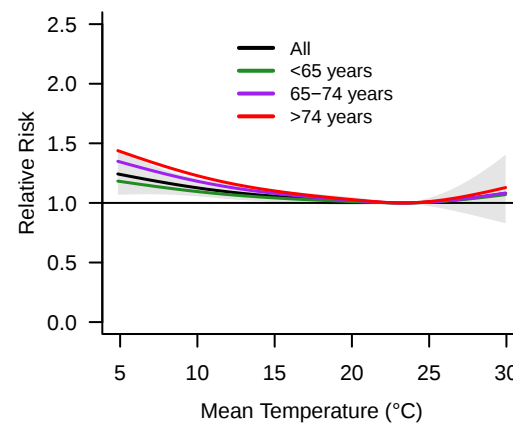
Nelson Mandela Bay – South Africa



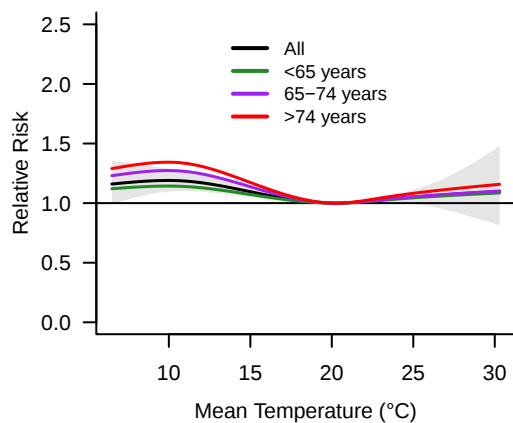
Namakwa – South Africa



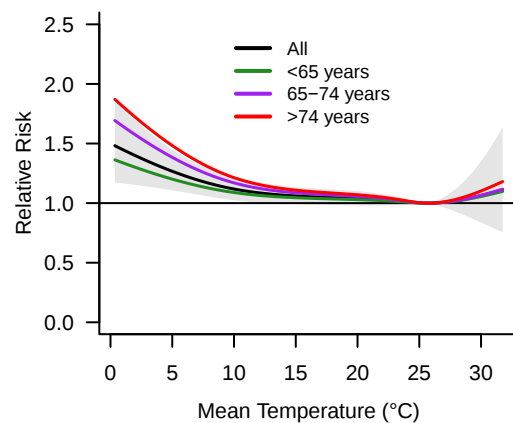
O.R.Tambo – South Africa



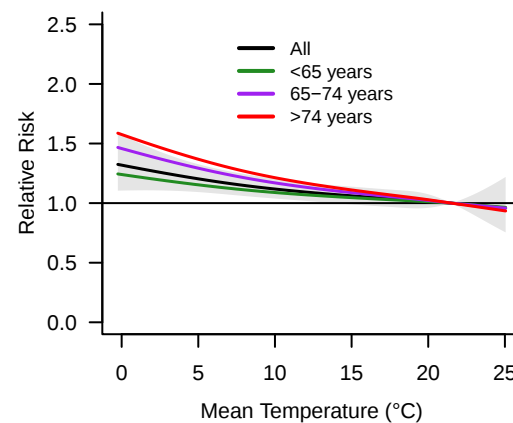
Overberg – South Africa



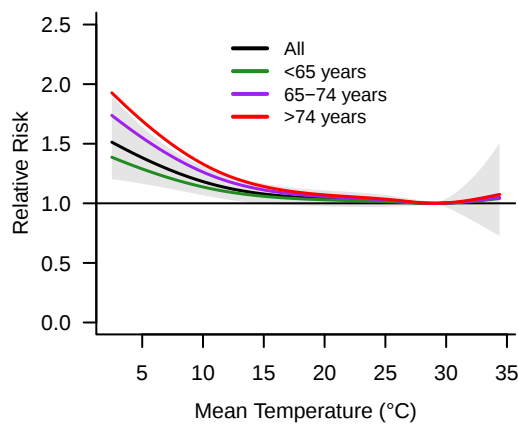
Pixley ka Seme – South Africa



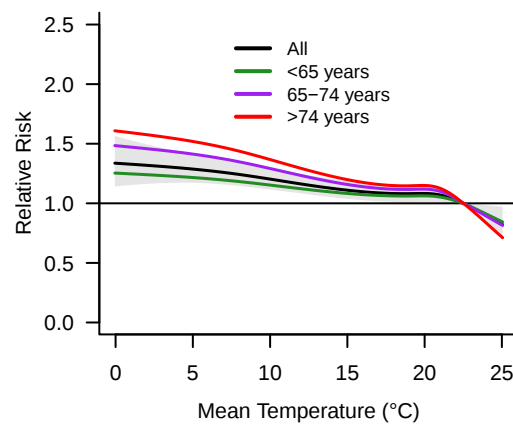
Sisonke – South Africa



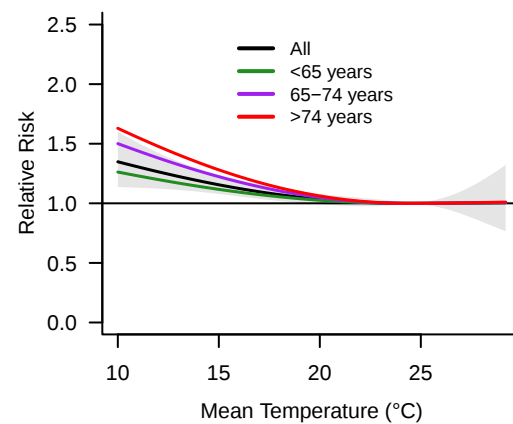
Siyanda – South Africa



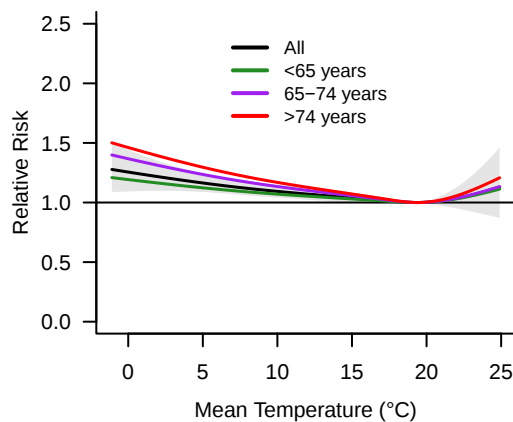
Thabo Mofutsanyane – South Africa



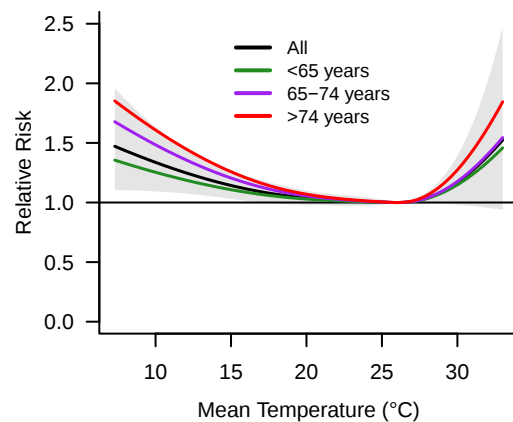
Ugu – South Africa



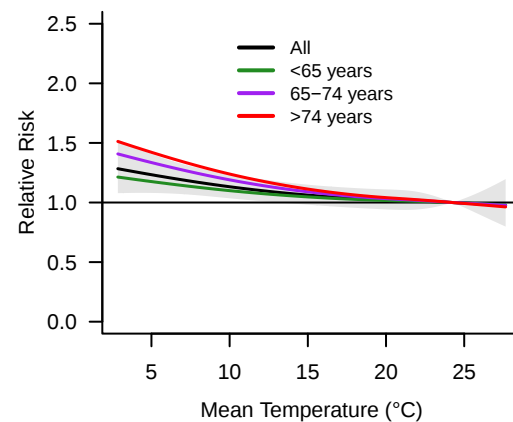
uMgungundlovu – South Africa



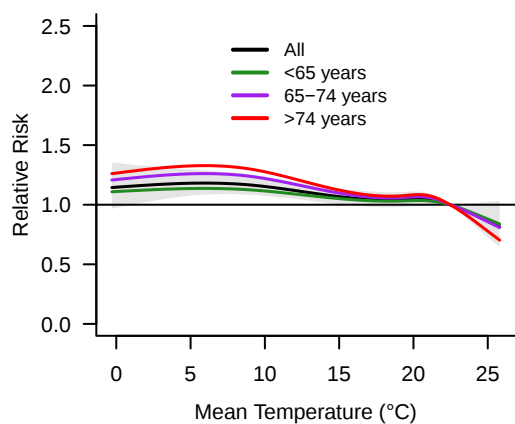
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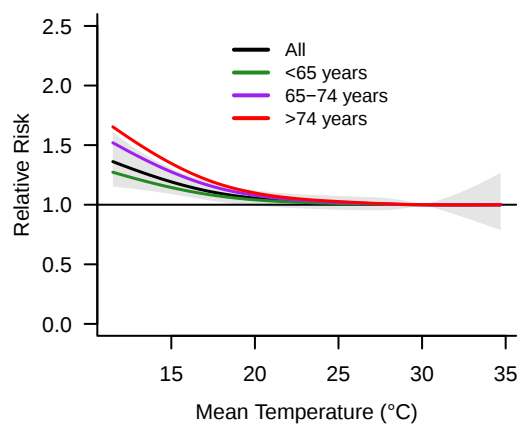
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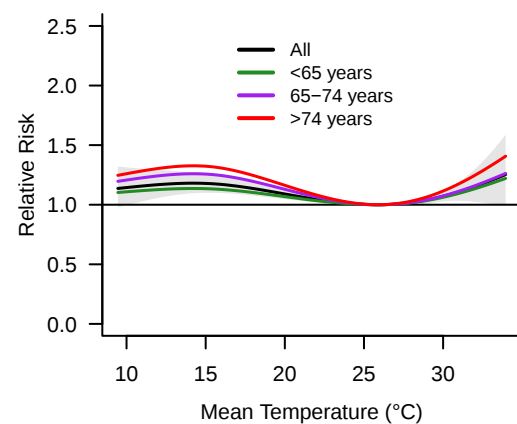
uThukela – South Africa



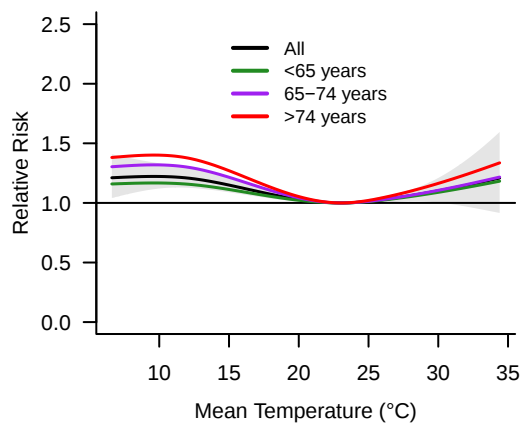
uThungulu – South Africa



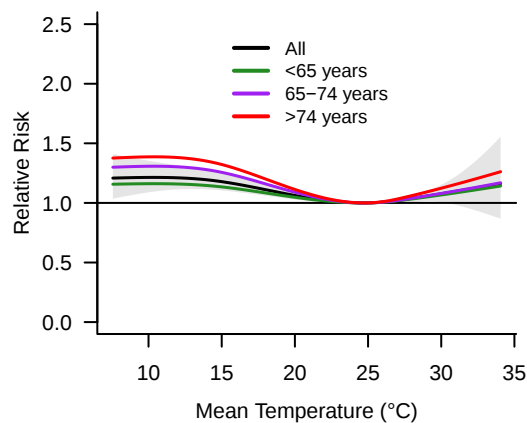
Vhembe – South Africa



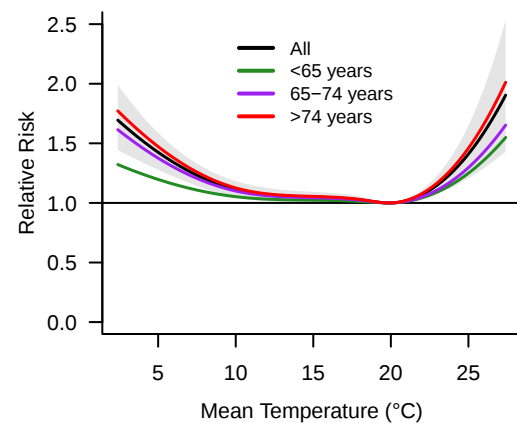
West Coast – South Africa



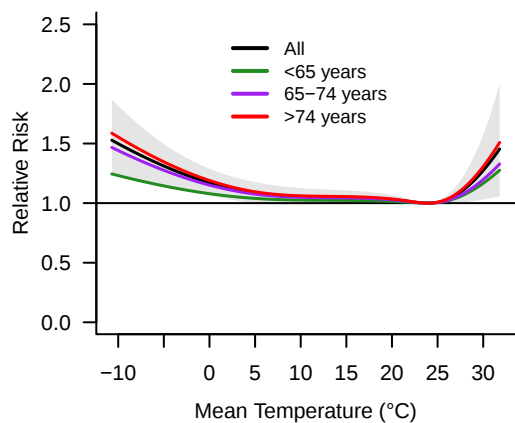
Waterberg – South Africa



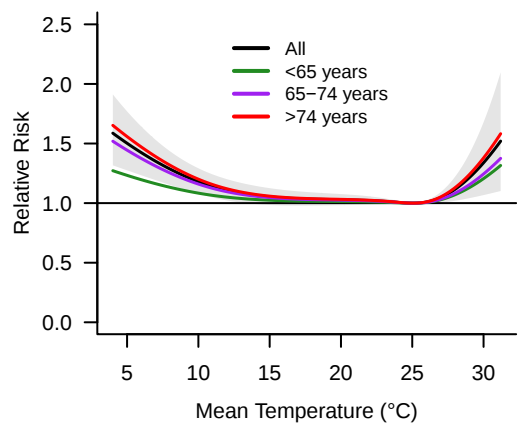
A Coruna – Spain



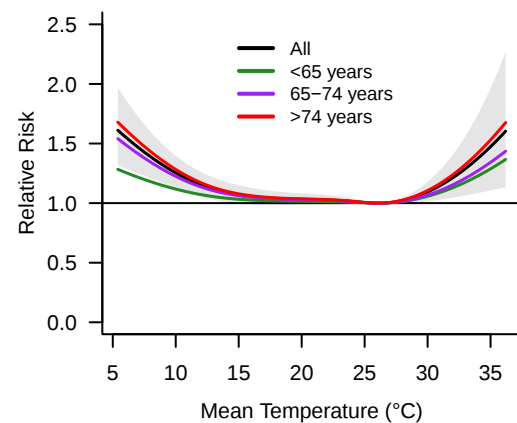
Albacete – Spain



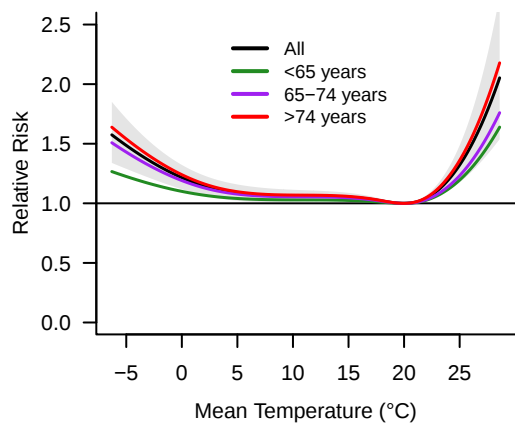
Alicante – Spain



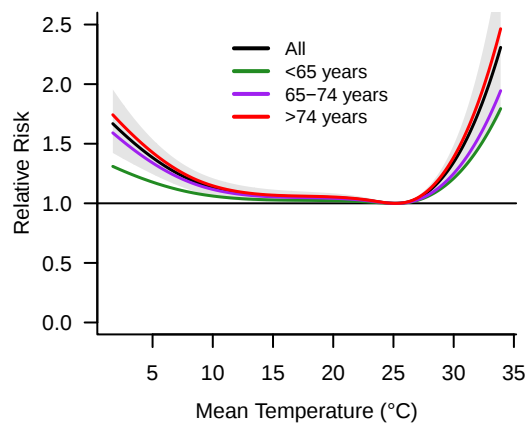
Almeria – Spain



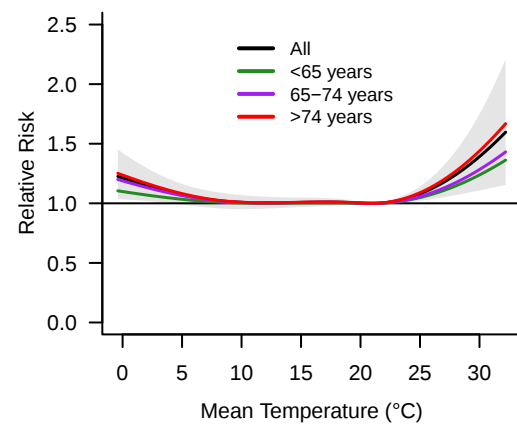
Avila – Spain



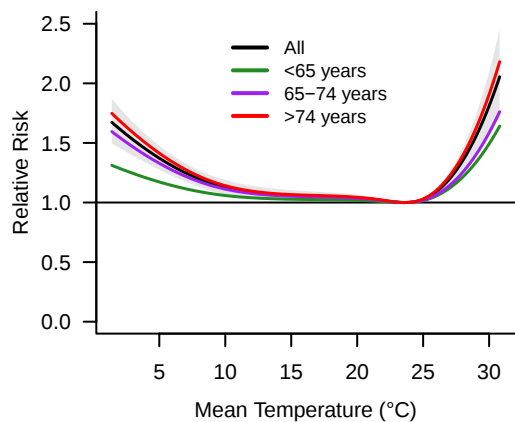
Badajoz – Spain



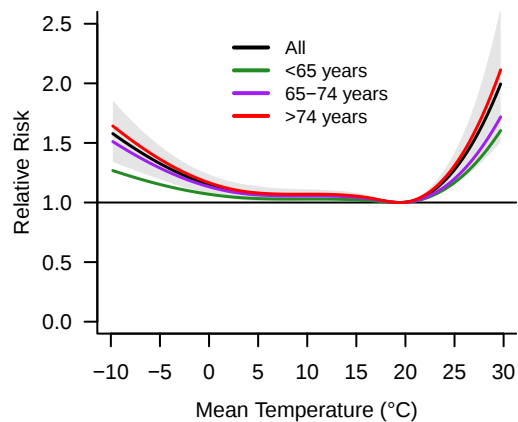
Bilbao – Spain



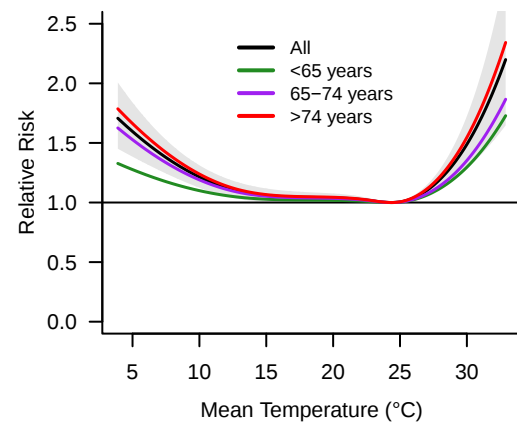
Barcelona – Spain



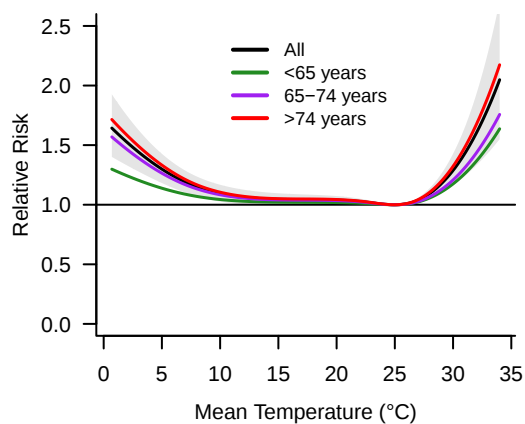
Burgos – Spain



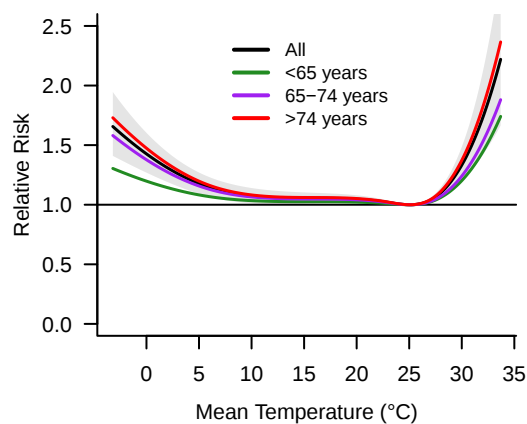
Cadiz – Spain



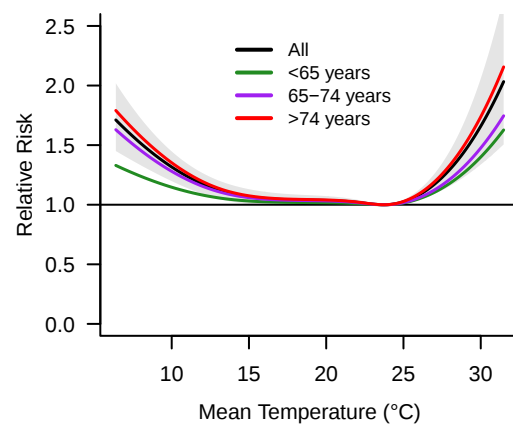
Caceres – Spain



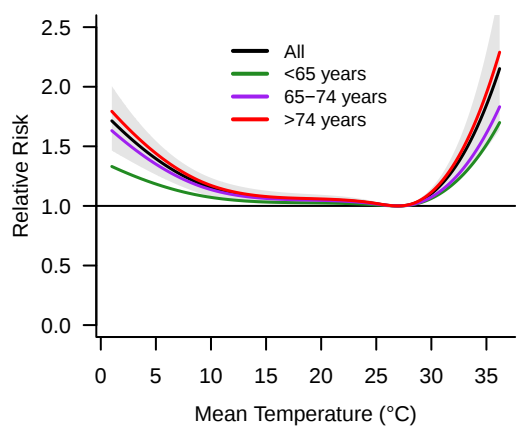
Ciudad Real – Spain



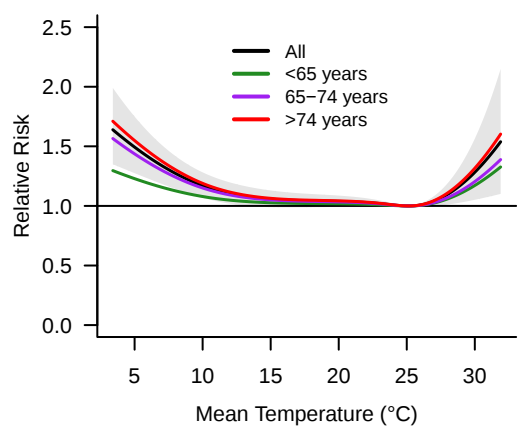
Ceuta – Spain



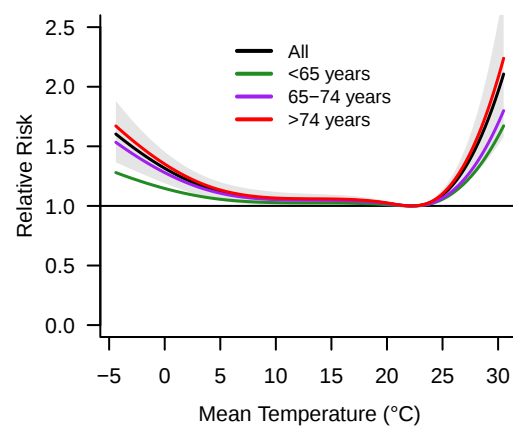
Cordoba – Spain



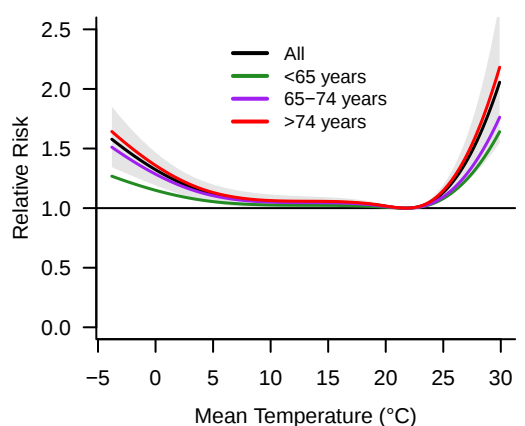
Castellon – Spain



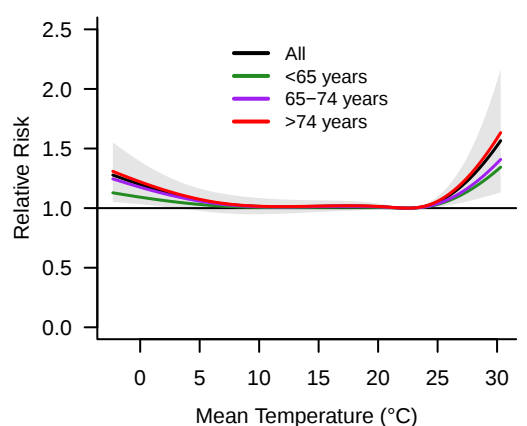
Cuenca – Spain



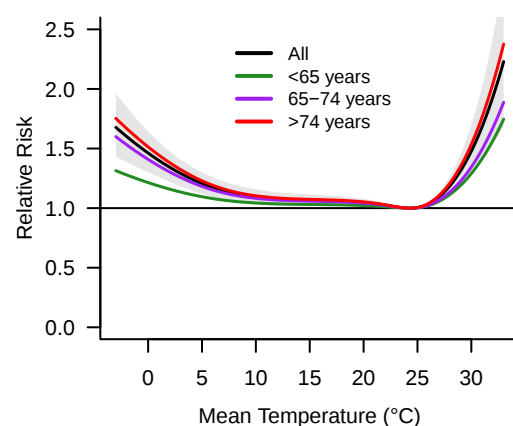
Guadalajara – Spain



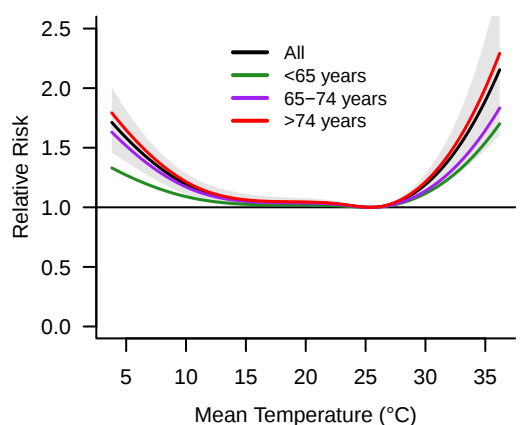
Girona – Spain



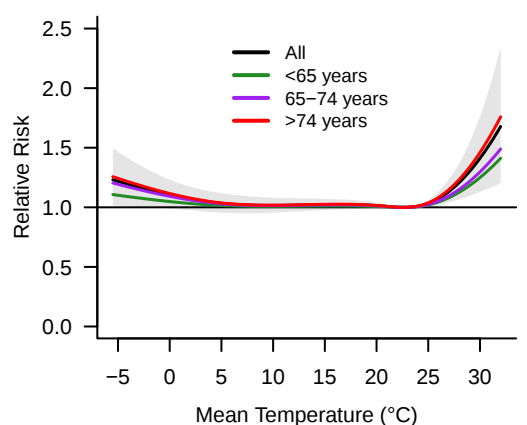
Granada – Spain



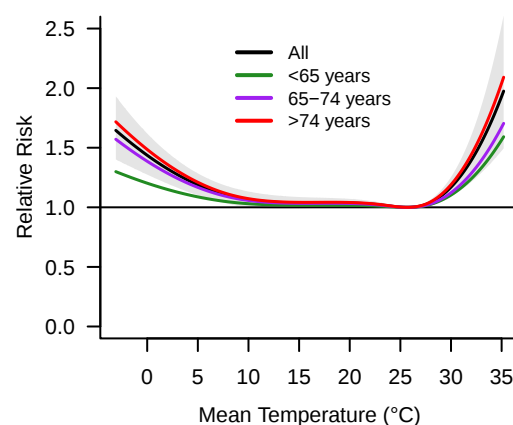
Huelva – Spain



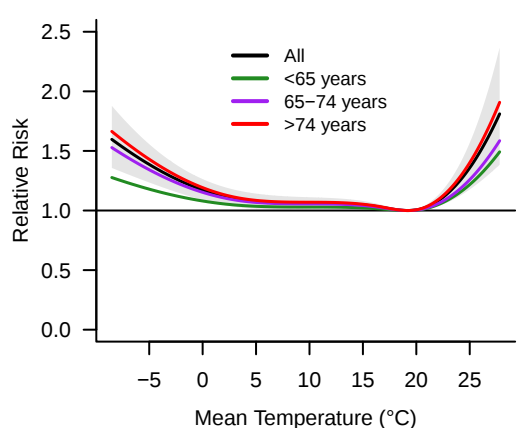
Huesca – Spain



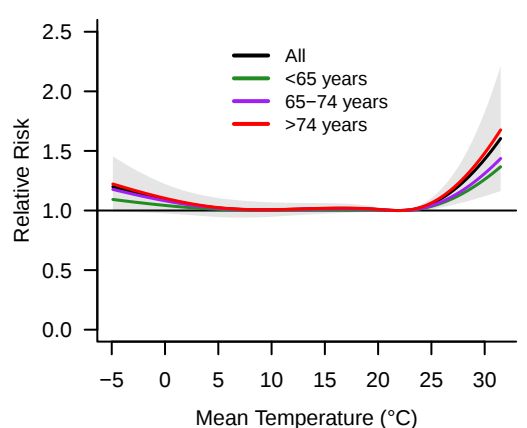
Jaen – Spain



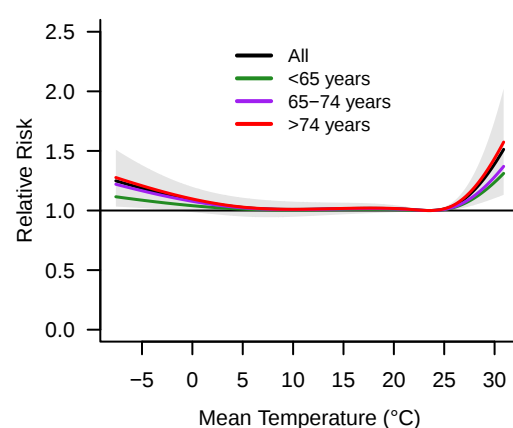
Leon – Spain



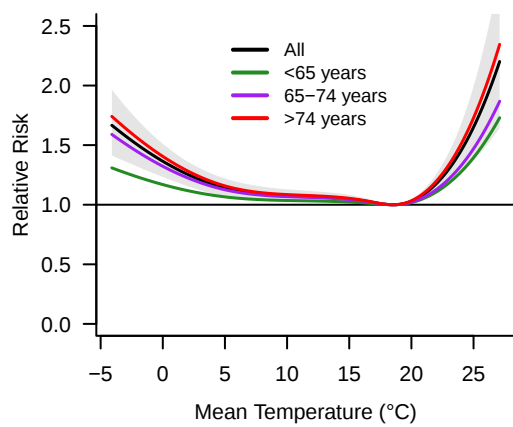
Logrono – Spain



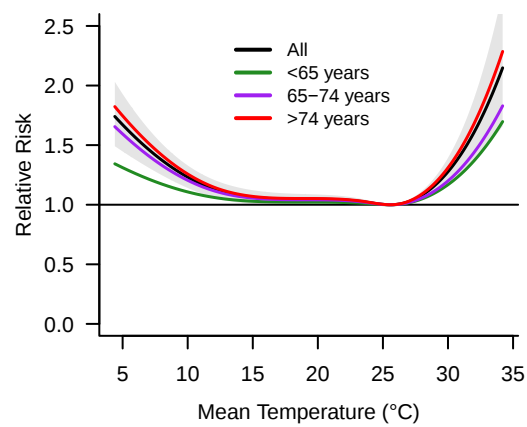
Lleida – Spain



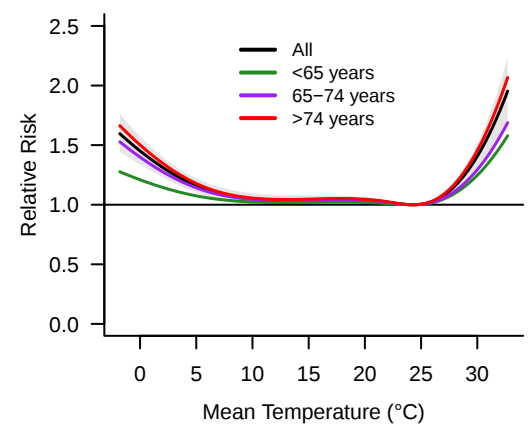
Lugo – Spain



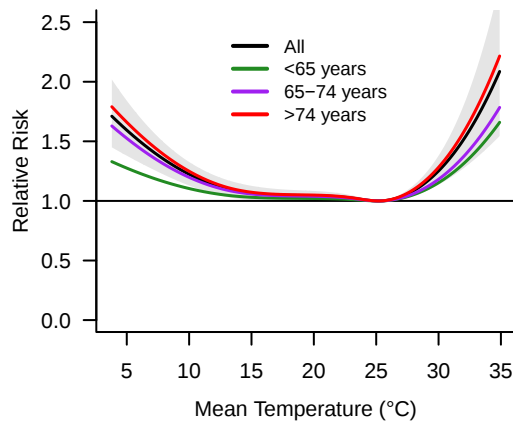
Malaga – Spain



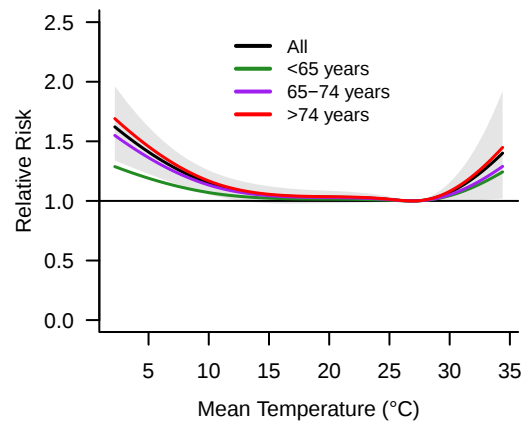
Madrid – Spain



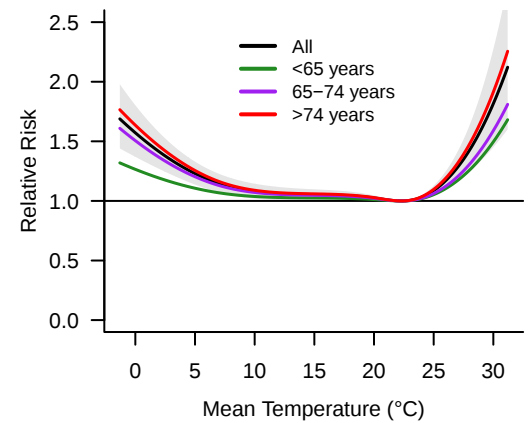
Melilla – Spain



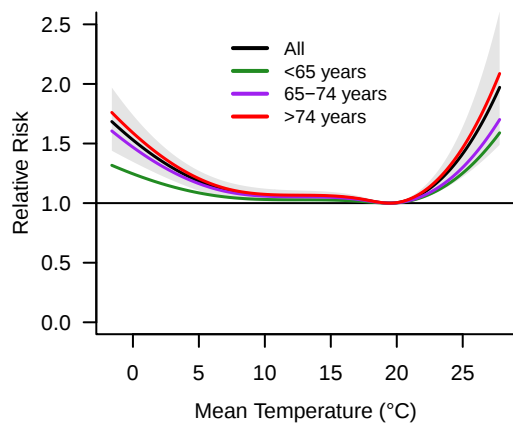
Murcia – Spain



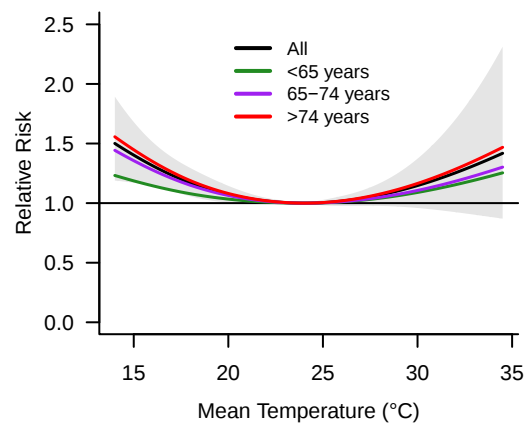
Ourense – Spain



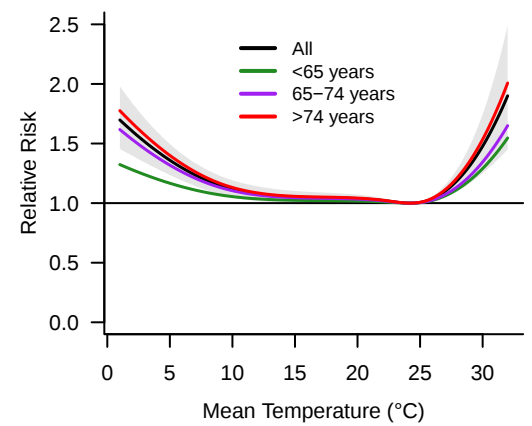
Oviedo – Spain



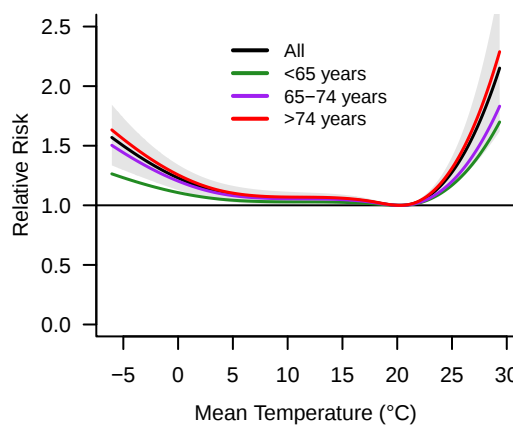
Palmas G. Canaria – Spain



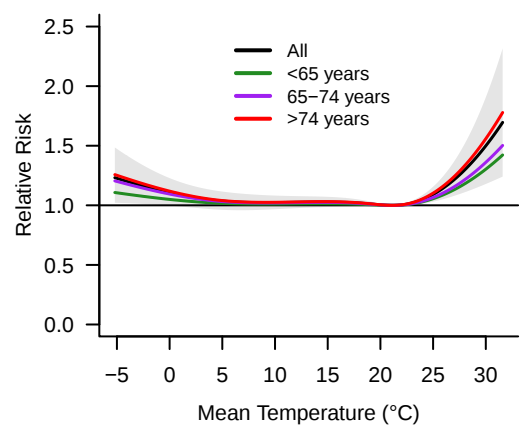
Palma Mallorca – Spain



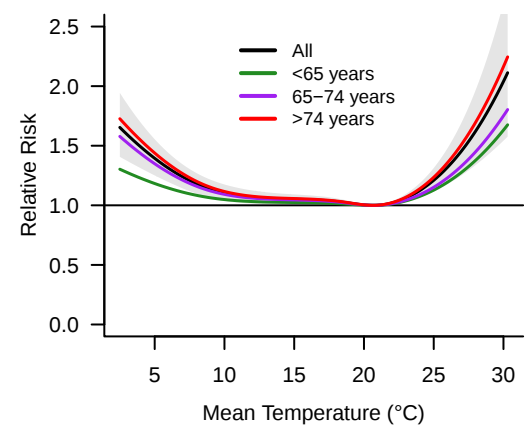
Palencia – Spain



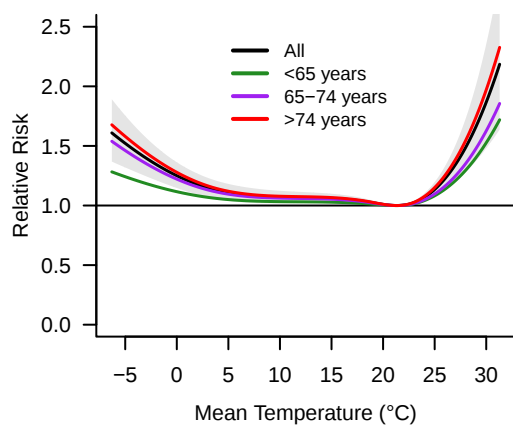
Pamplona – Spain



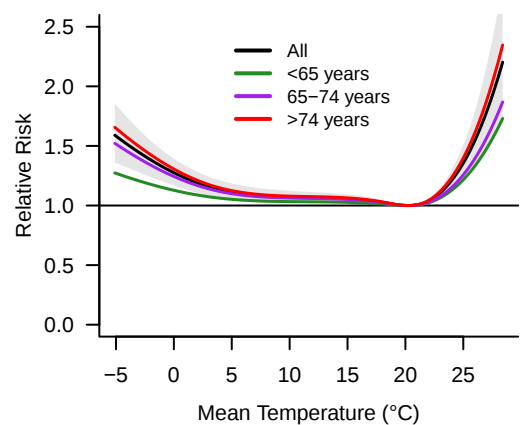
Pontevedra – Spain



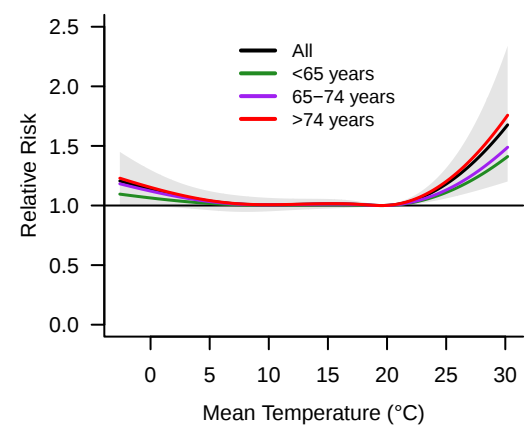
Segovia – Spain



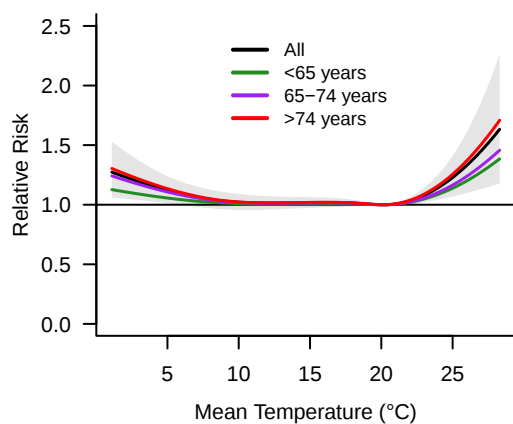
Salamanca – Spain



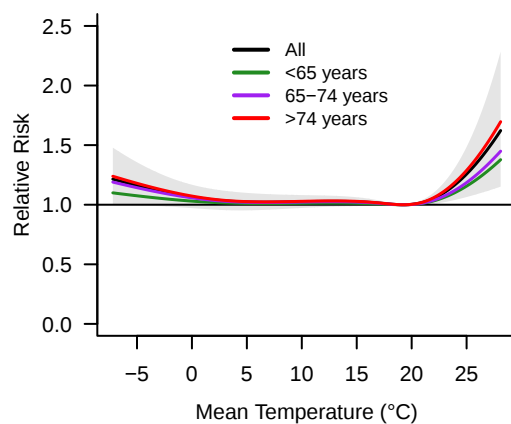
San Sebastian – Spain



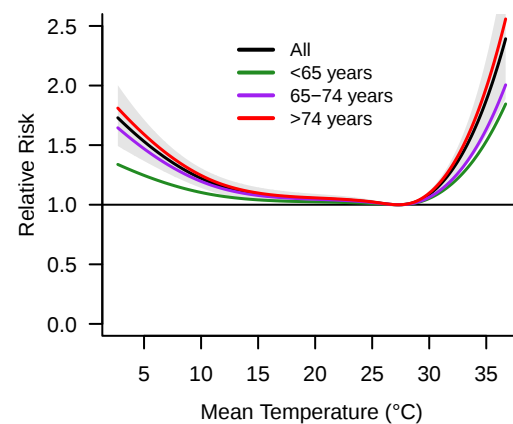
Santander – Spain



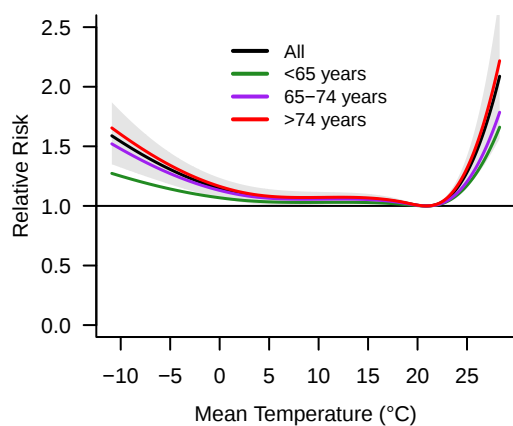
Soria – Spain



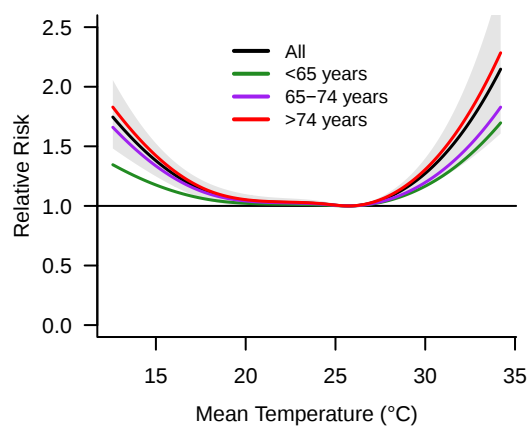
Sevilla – Spain



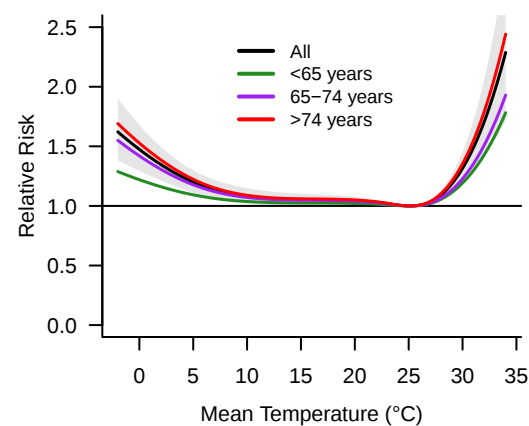
Teruel – Spain



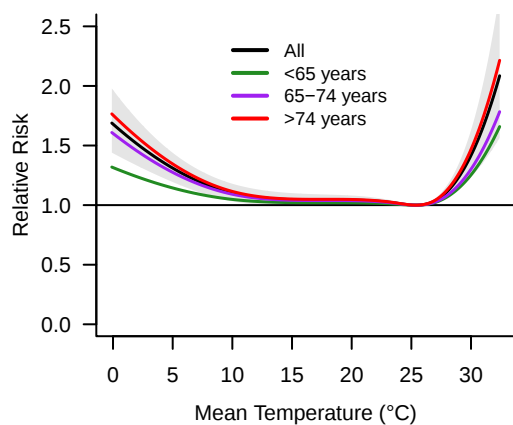
Tenerife – Spain



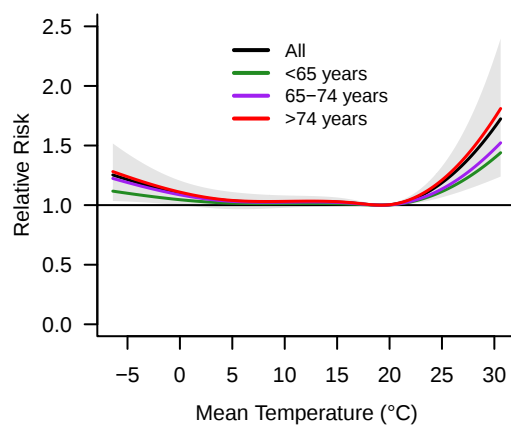
Toledo – Spain



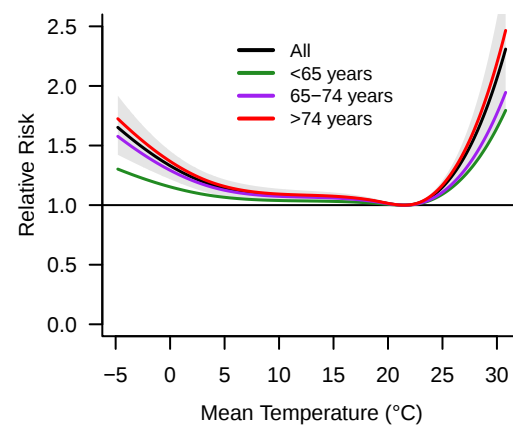
Tarragona – Spain



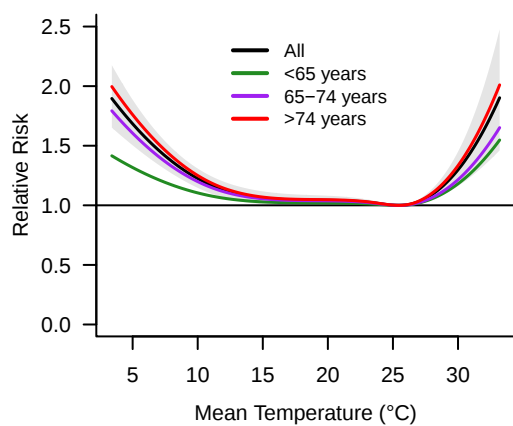
Vitoria – Spain



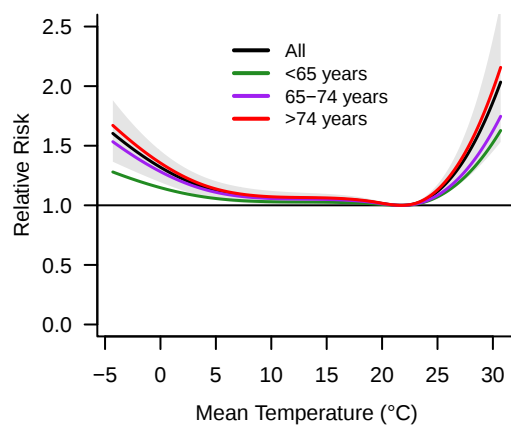
Valladolid – Spain



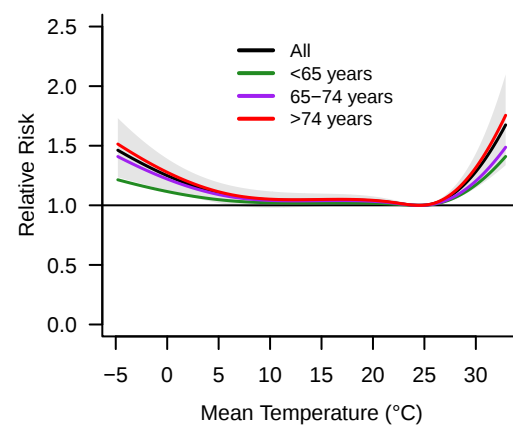
Valencia – Spain



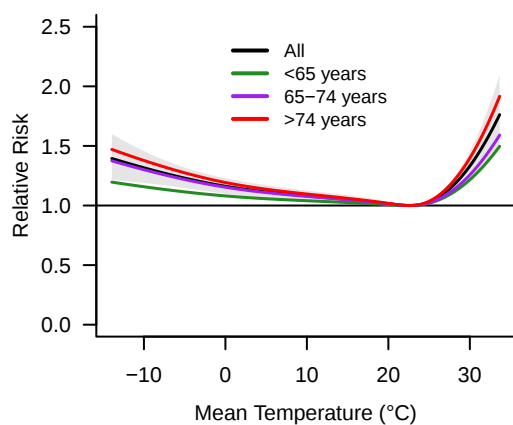
Zamora – Spain



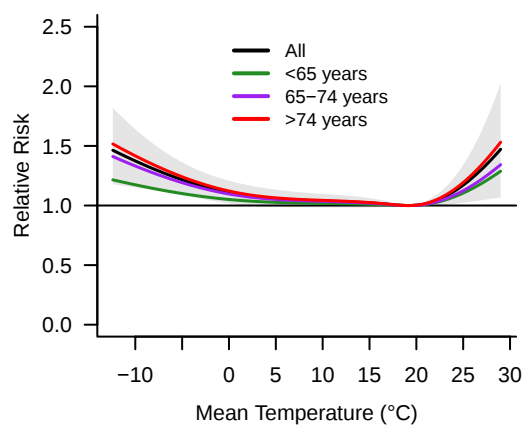
Zaragoza – Spain



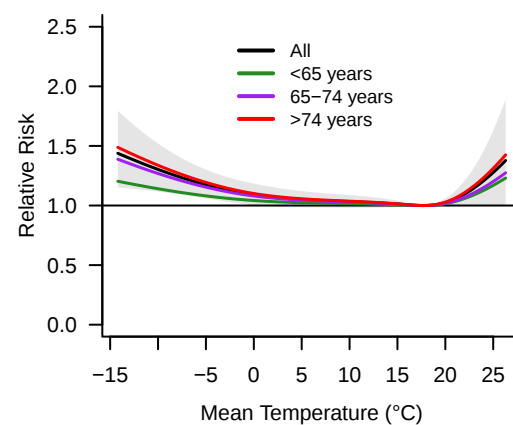
Belgrade – Serbia



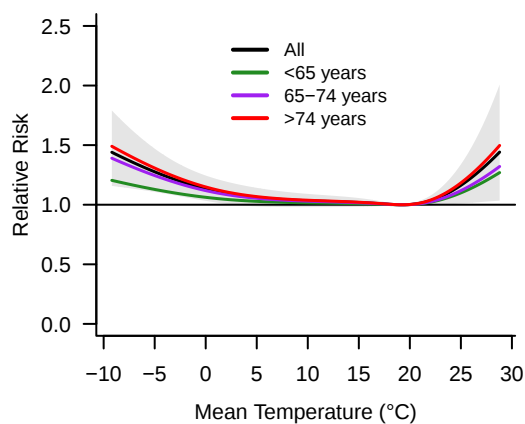
Basel – Switzerland



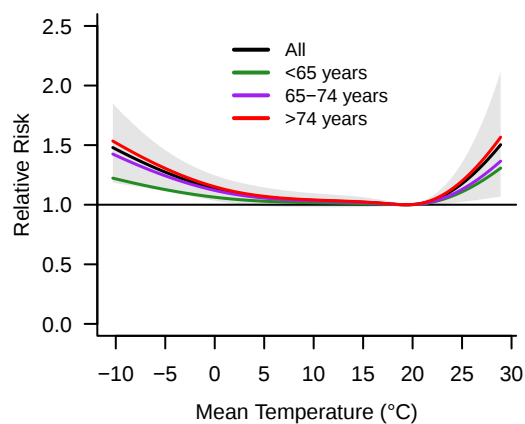
Bern – Switzerland



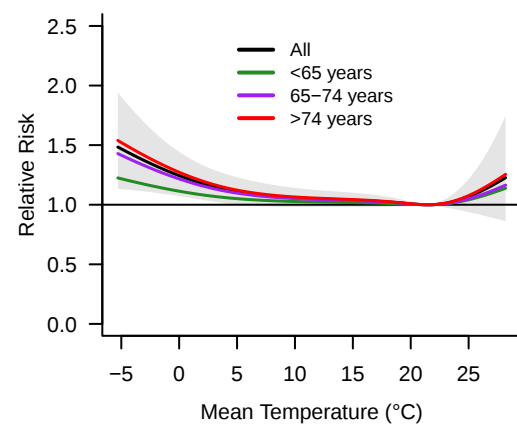
Geneve – Switzerland



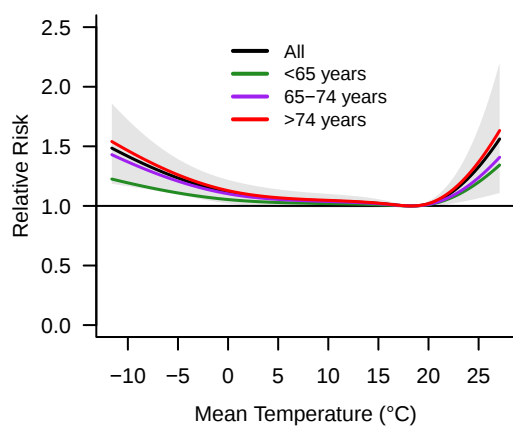
Lausanne – Switzerland



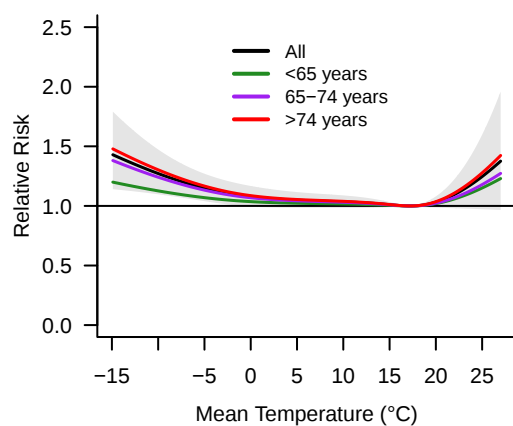
Lugano – Switzerland



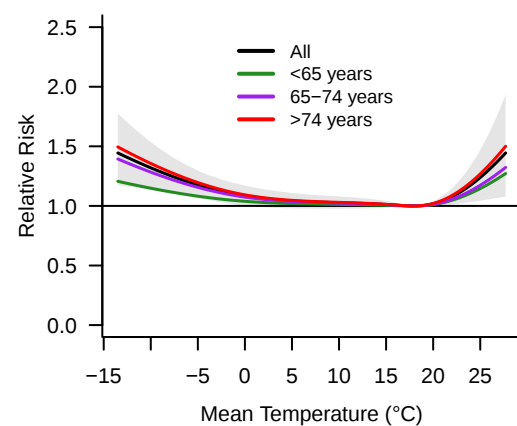
Luzern – Switzerland



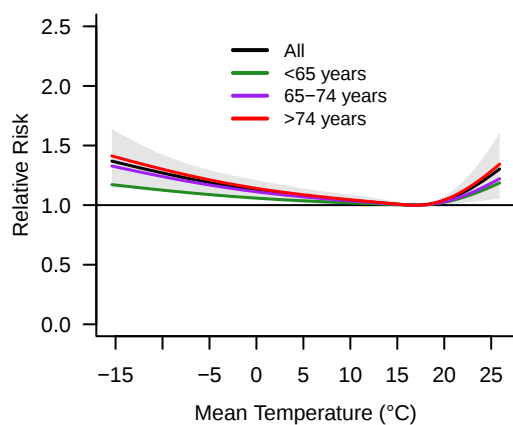
St. Gallen – Switzerland



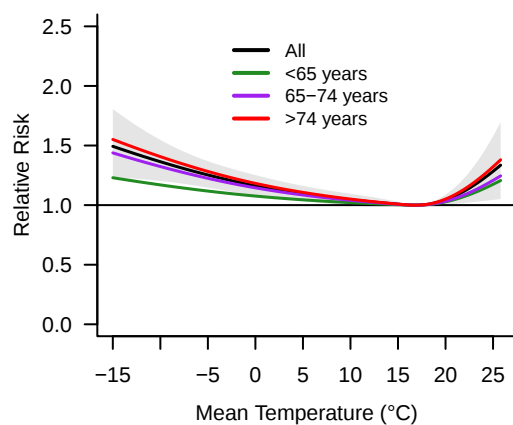
Zürich – Switzerland



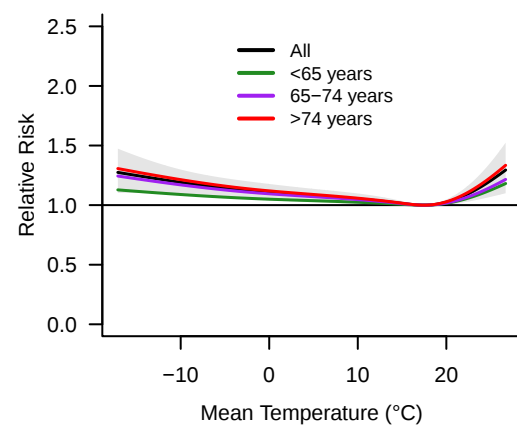
Gothenburg – Sweden



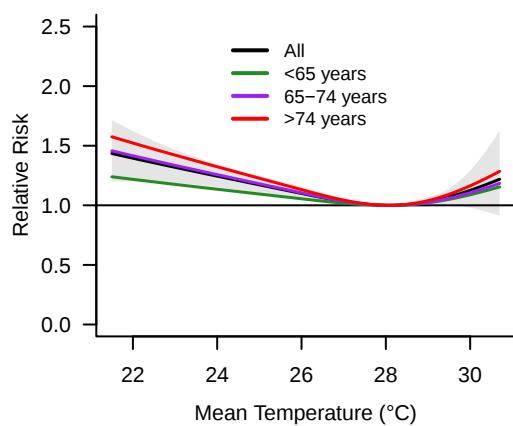
Malmö – Sweden



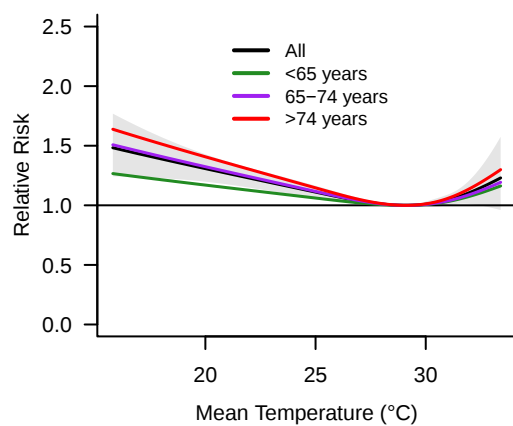
Stockholm – Sweden



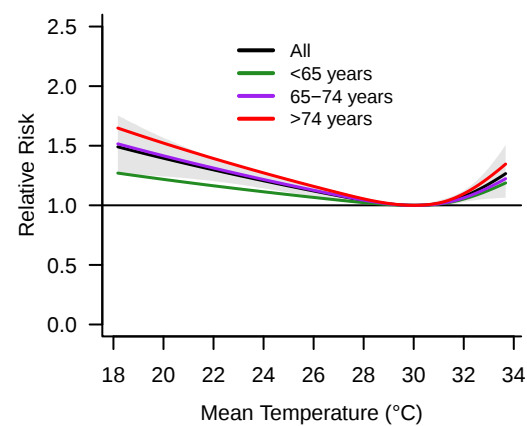
Amnat Charoen – Thailand



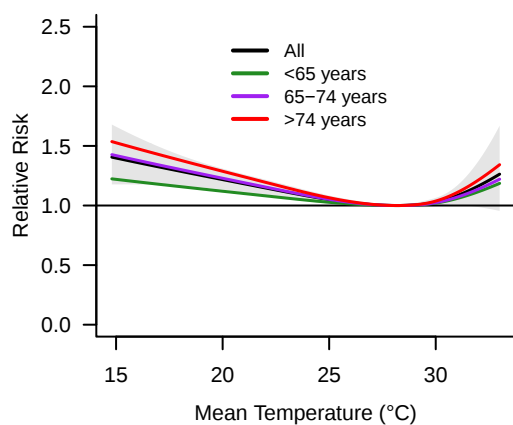
Ayutthaya – Thailand



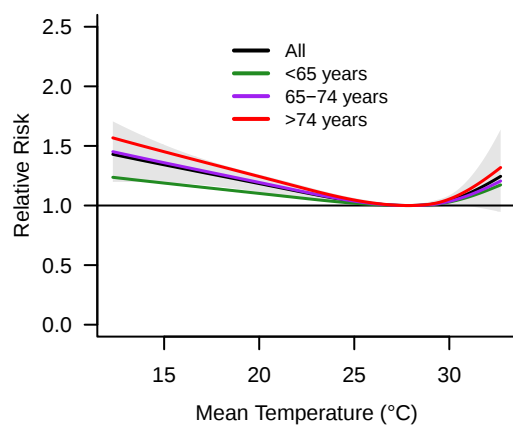
Bangkok – Thailand



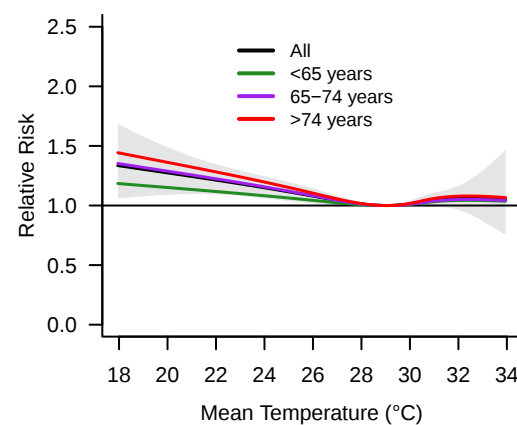
Buri Ram – Thailand



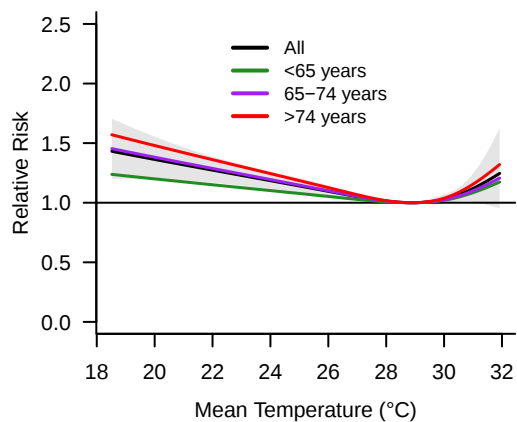
Chachoengsao – Thailand



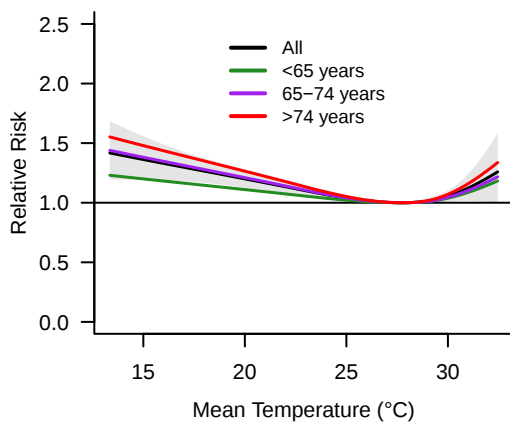
Chumphon – Thailand



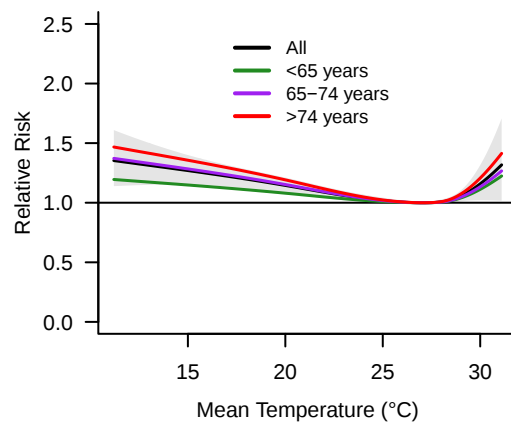
Chon Buri – Thailand



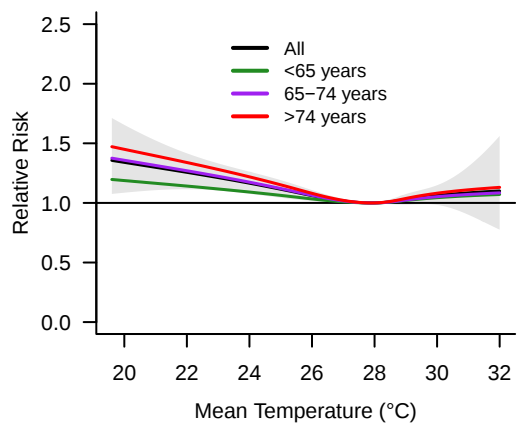
Chiang Mai – Thailand



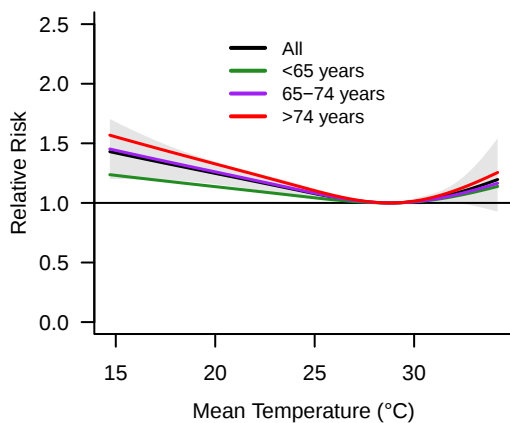
Chiang Rai – Thailand



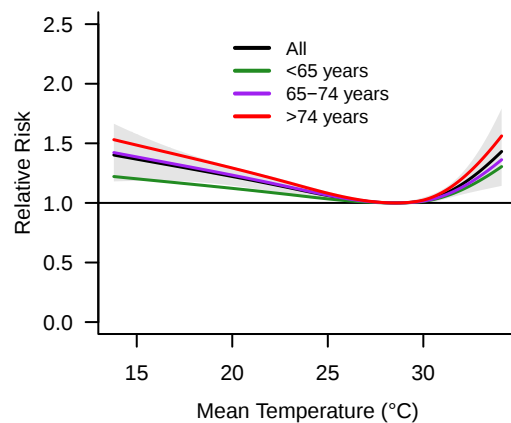
Chanthaburi – Thailand



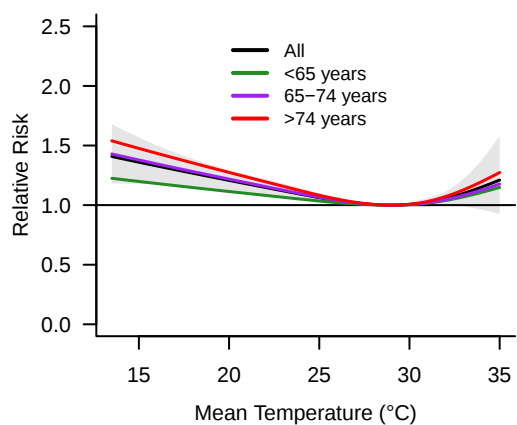
Chaiyaphum – Thailand



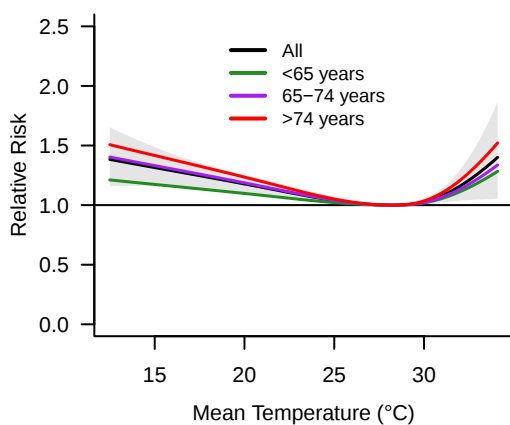
Khon Kaen – Thailand



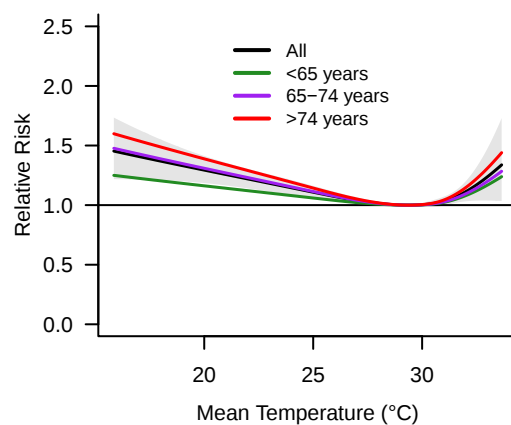
Kalasin – Thailand



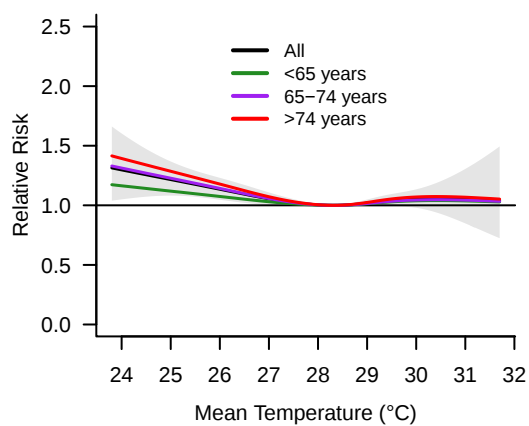
Kamphaeng Phet – Thailand



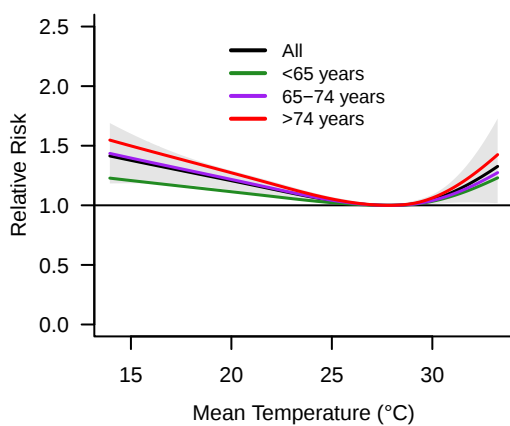
Kanchanaburi – Thailand



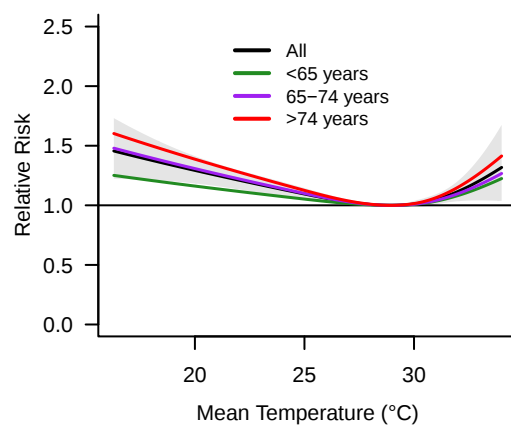
Krabi – Thailand



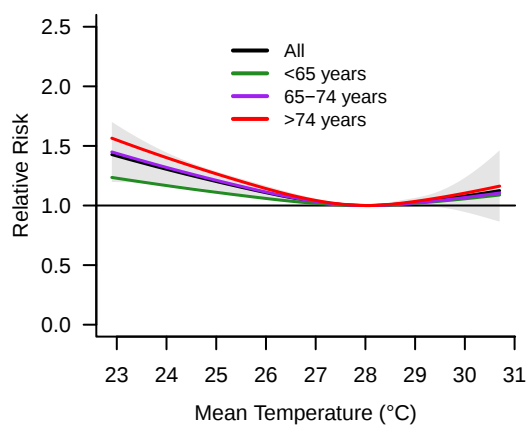
Lamphun – Thailand



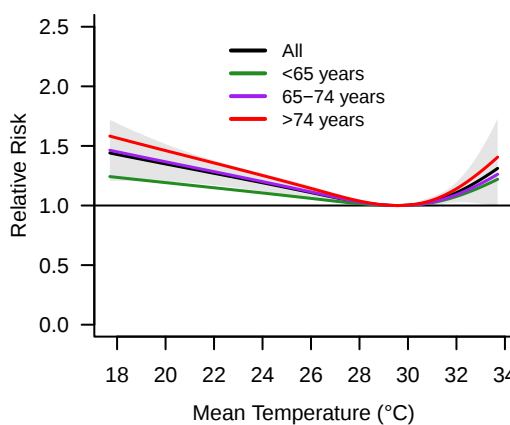
Lampang – Thailand



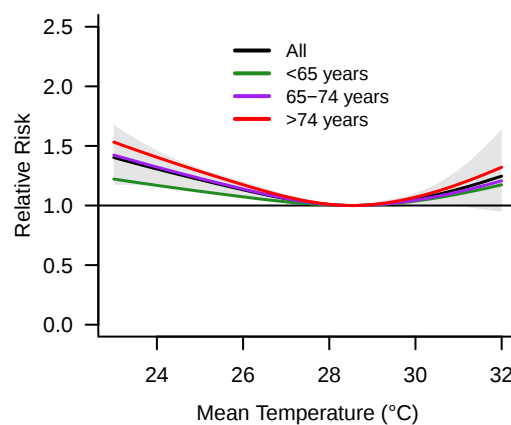
Lop Buri – Thailand



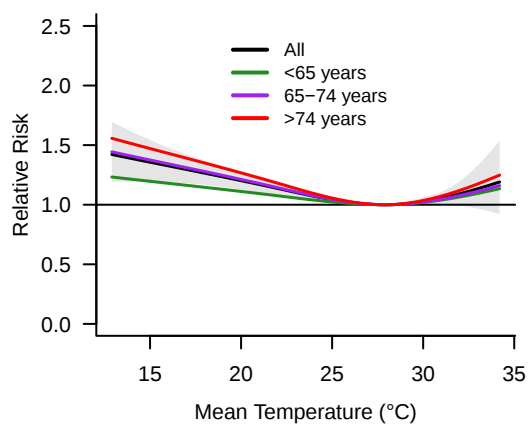
Maha Sarakham – Thailand



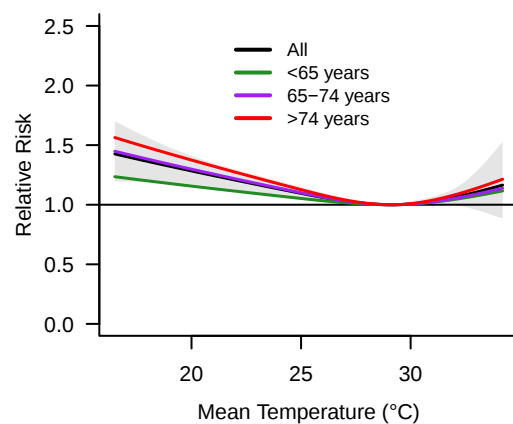
Mukdahan – Thailand



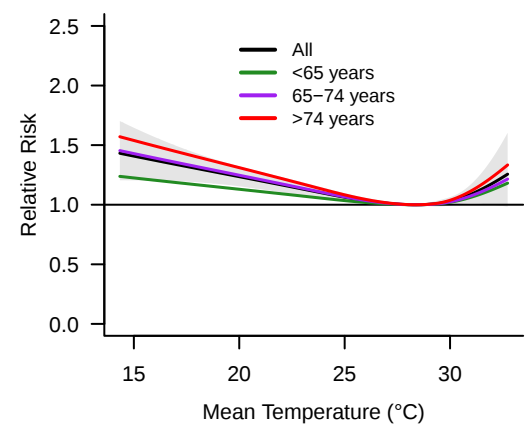
Nan – Thailand



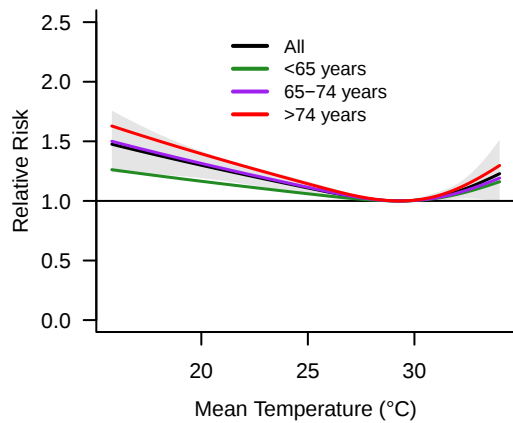
Nong Bua Lam Phu – Thailand



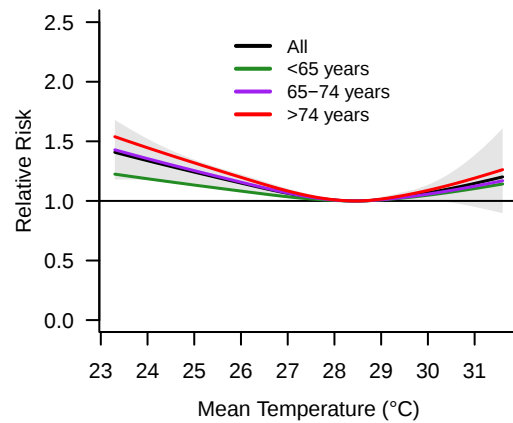
Nakhon Ratchasima – Thailand



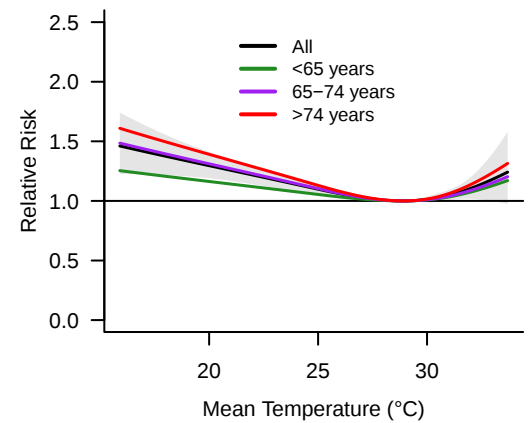
Nakhon Sawan – Thailand



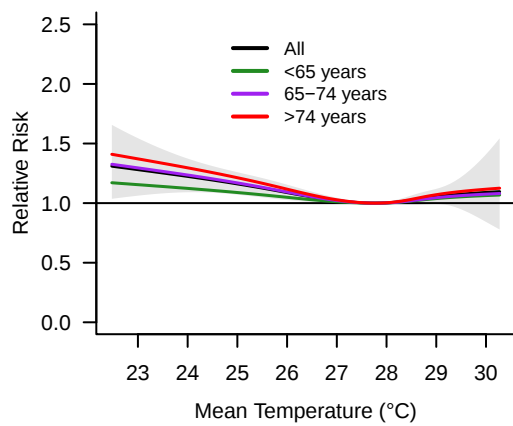
Nakhon Phanom – Thailand



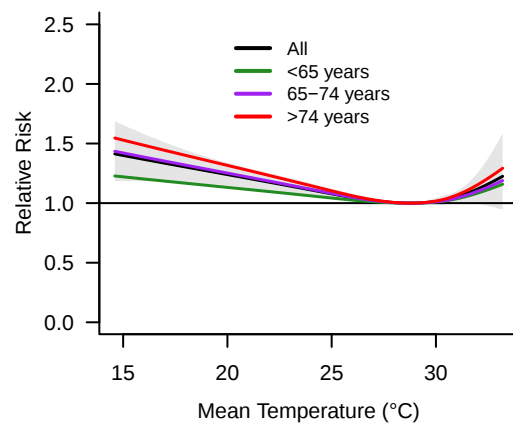
Nakhon Pathom – Thailand



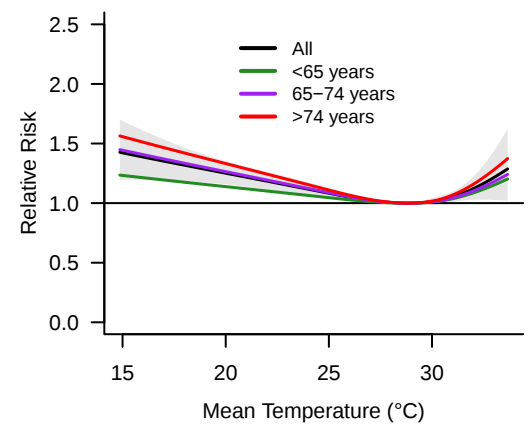
Nakhon Si Thammarat – Thailand



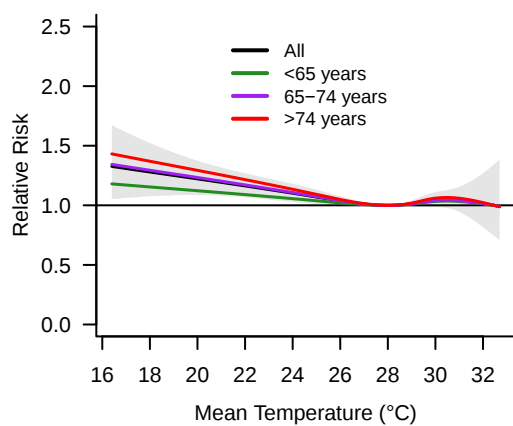
Nong Khai – Thailand



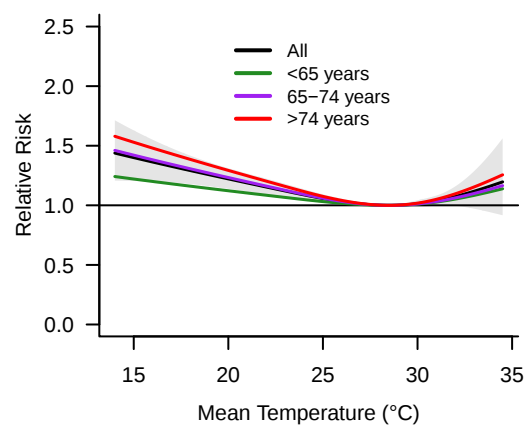
Nonthaburi – Thailand



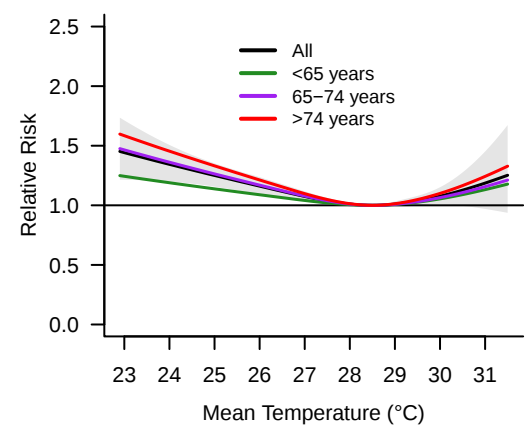
Narathiwat – Thailand



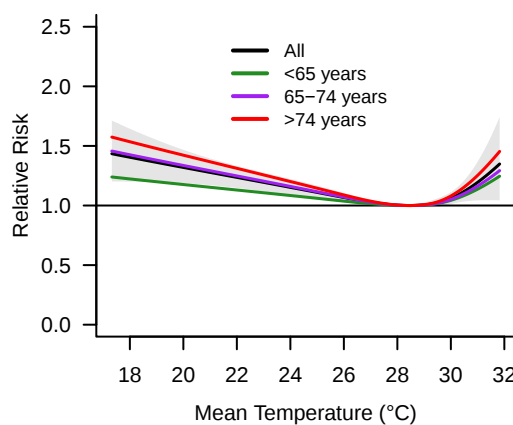
Phayao – Thailand



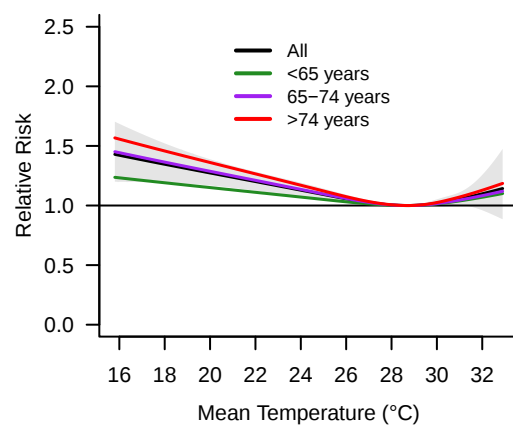
Phetchaburi – Thailand



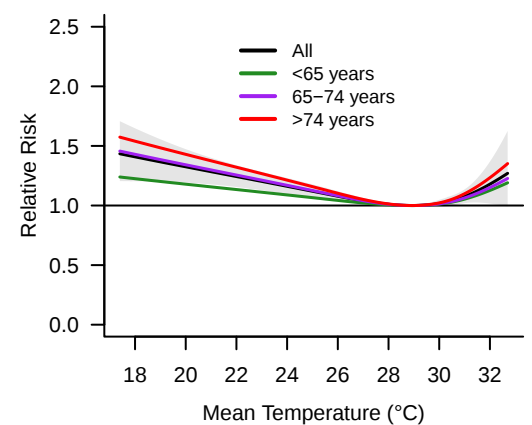
Phichit – Thailand



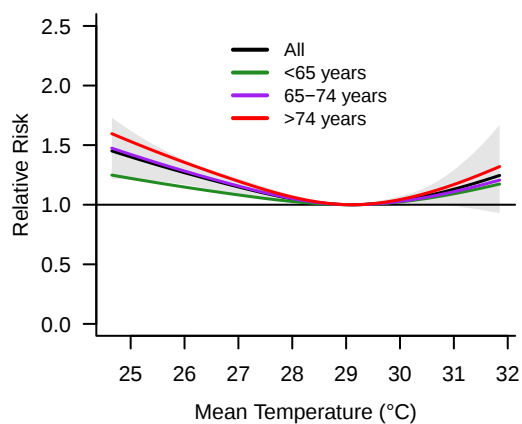
Phrae – Thailand



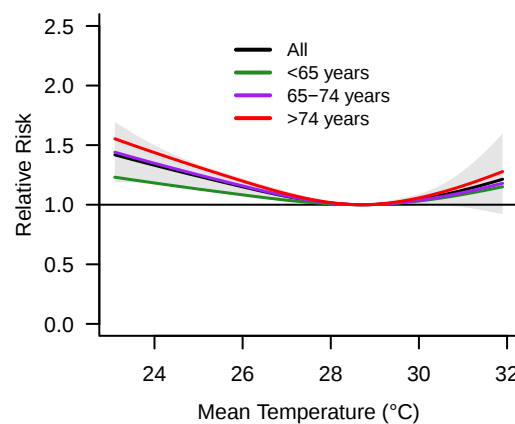
Phitsanulok – Thailand



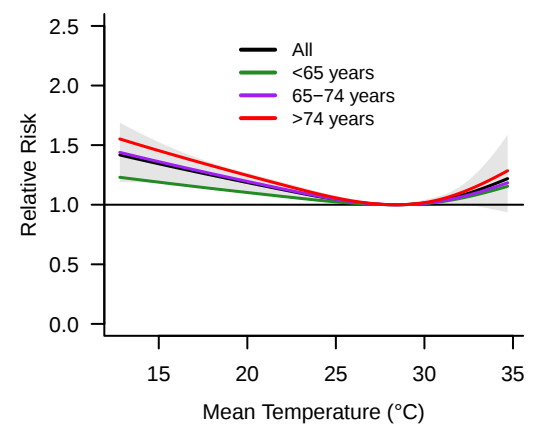
Prachin Buri – Thailand



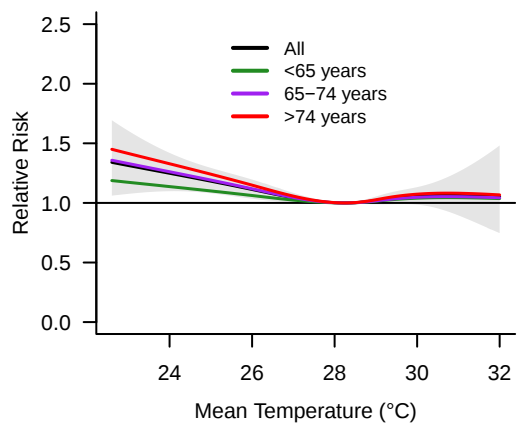
Prachuap Khiri Khan – Thailand



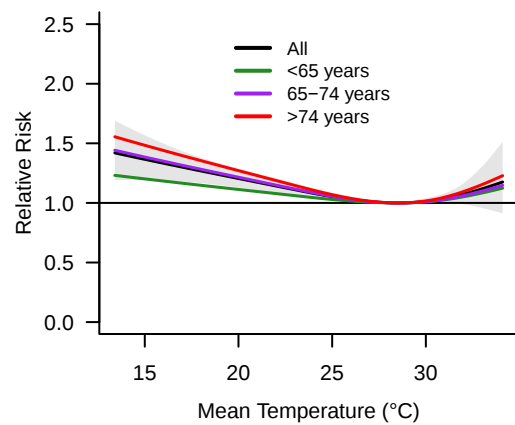
Pathum Thani – Thailand



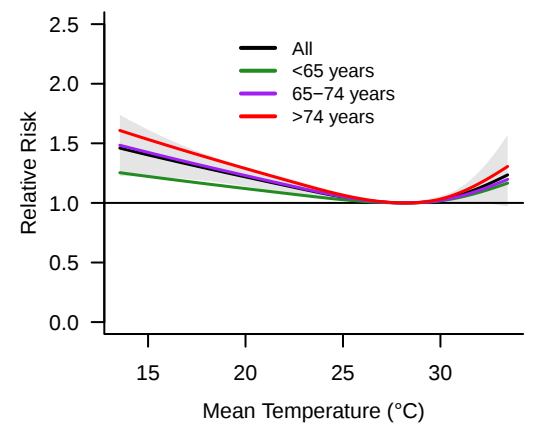
Pattani – Thailand



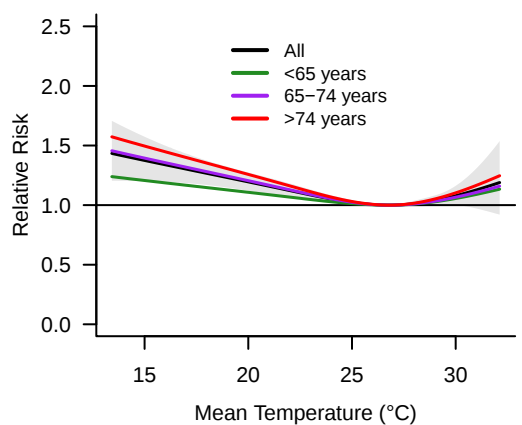
Roi Et – Thailand



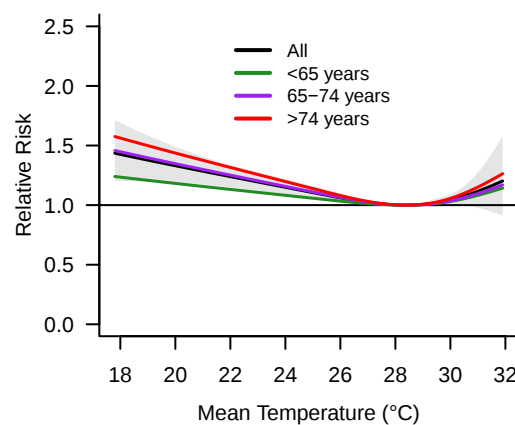
Ratchaburi – Thailand



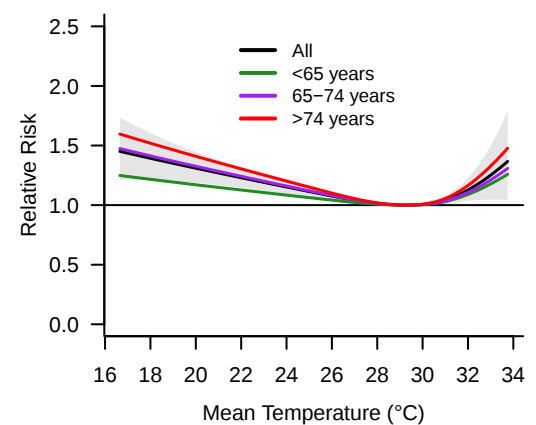
Rayong – Thailand



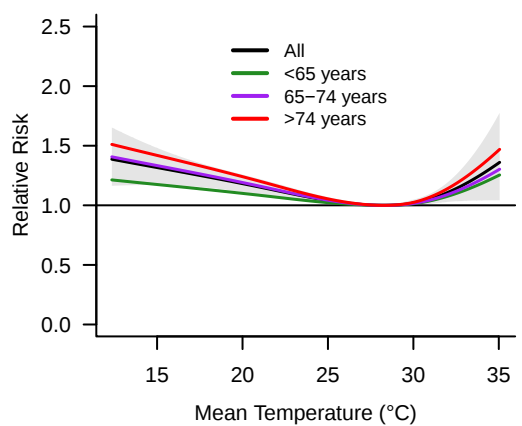
Sa Kaeo – Thailand



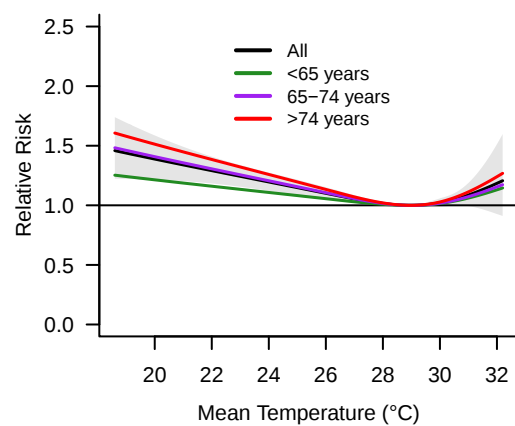
Sukhothai – Thailand



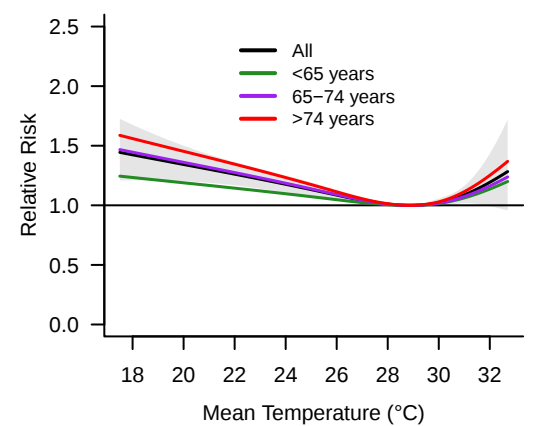
Sakon Nakhon – Thailand



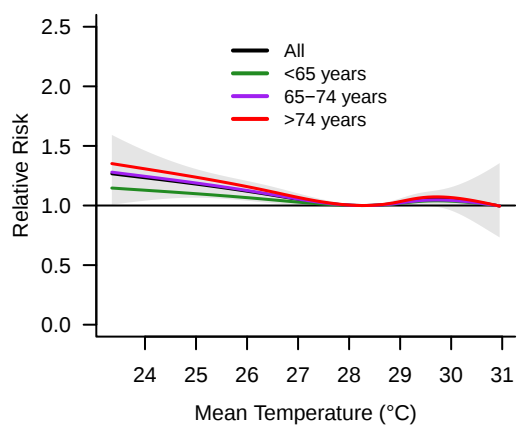
Samutprakan – Thailand



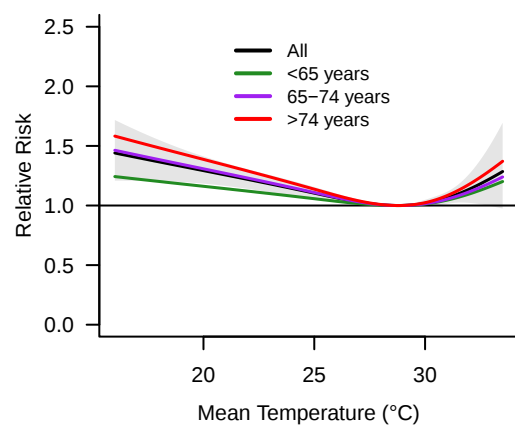
Samut Sakhon – Thailand



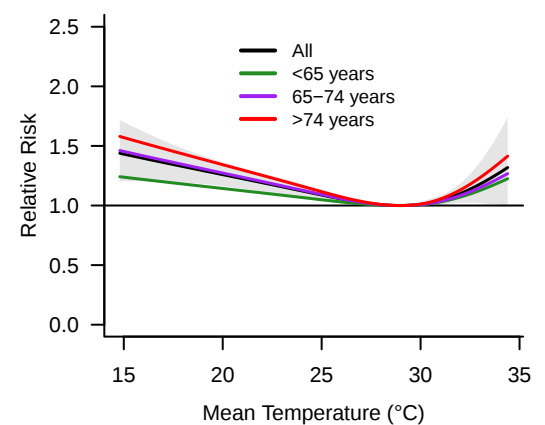
Songkhla – Thailand



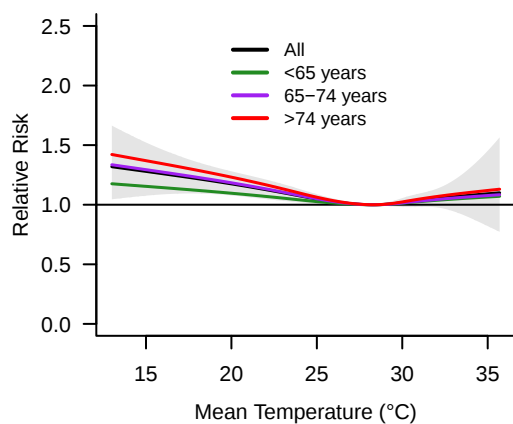
Suphanburi – Thailand



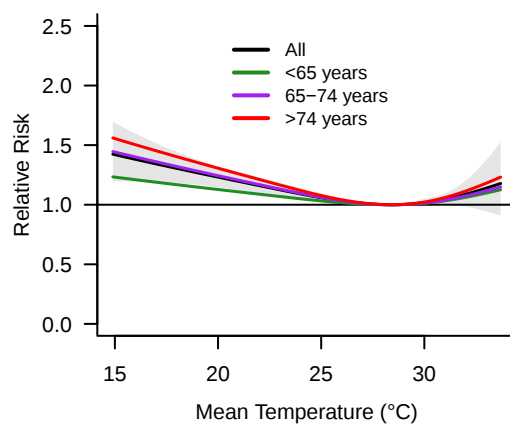
Saraburi – Thailand



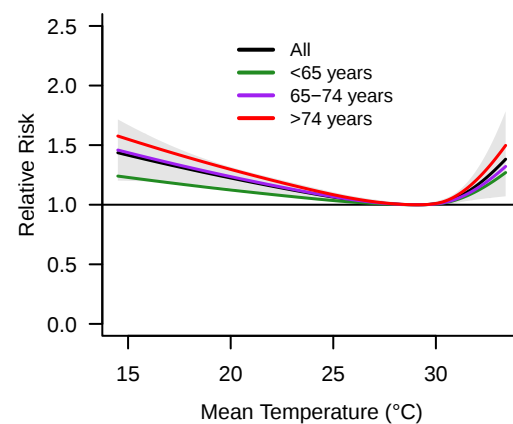
Surat Thani – Thailand



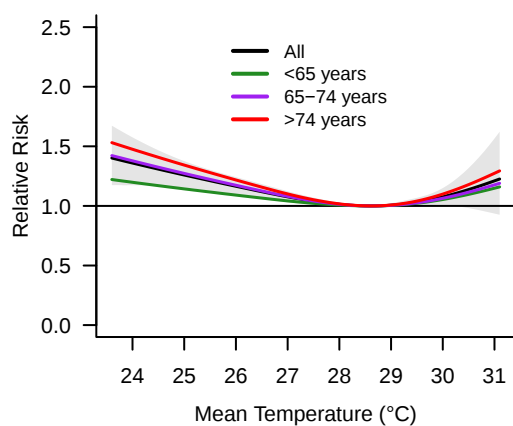
Si Sa Ket – Thailand



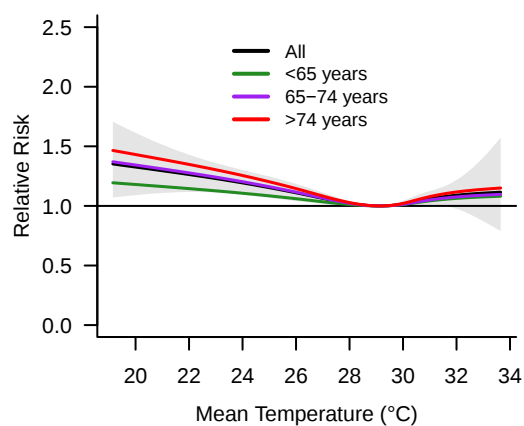
Surin – Thailand



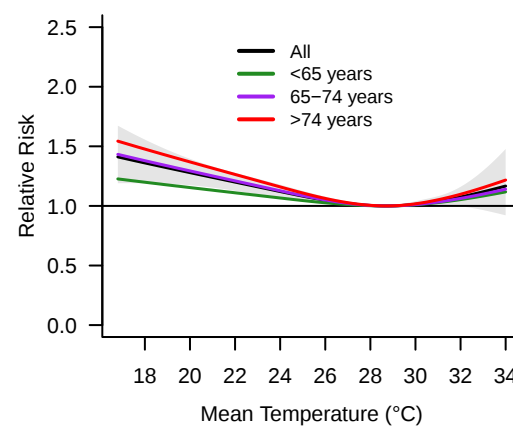
Tak – Thailand



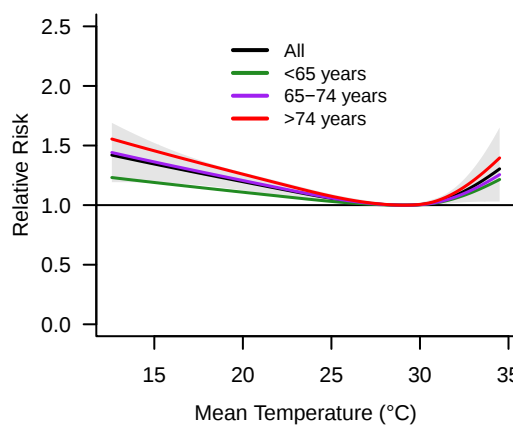
Trang – Thailand



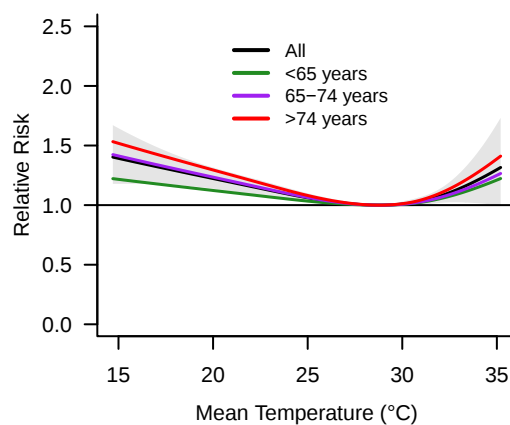
Ubon Ratchathani – Thailand



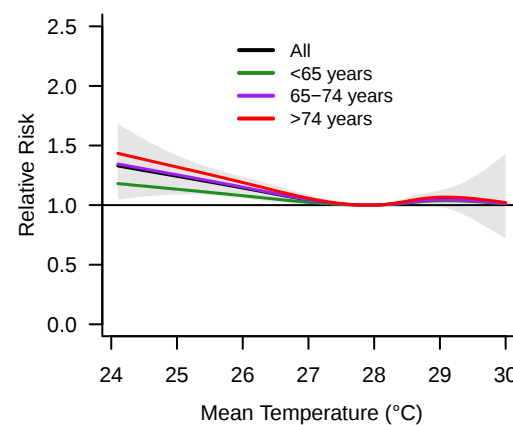
Udon Thani – Thailand



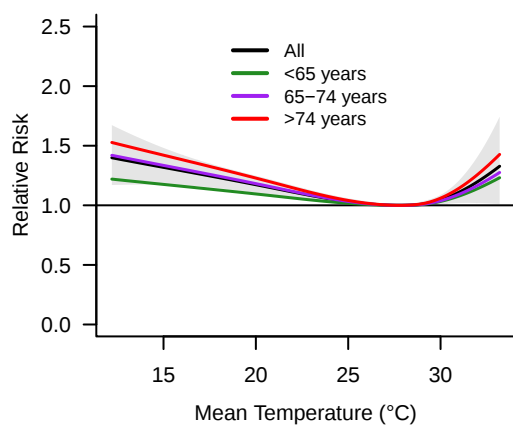
Uttaradit – Thailand



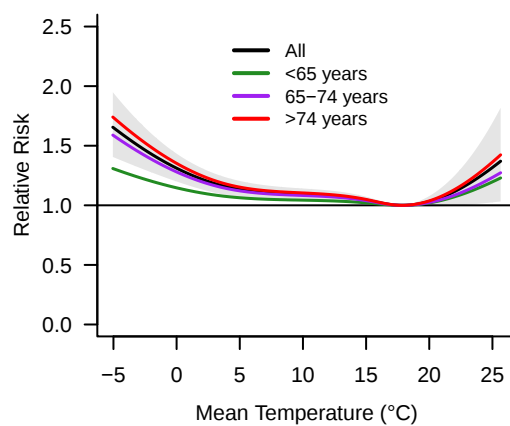
Yala – Thailand



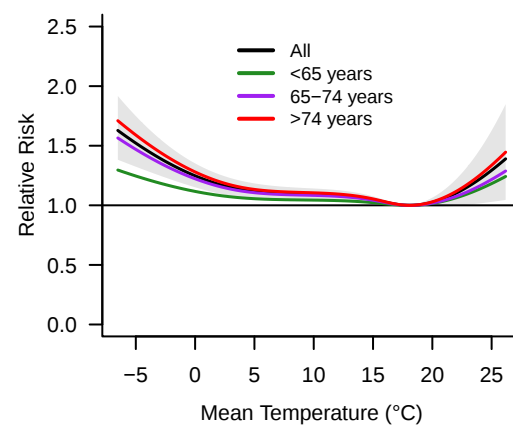
Yasothon – Thailand



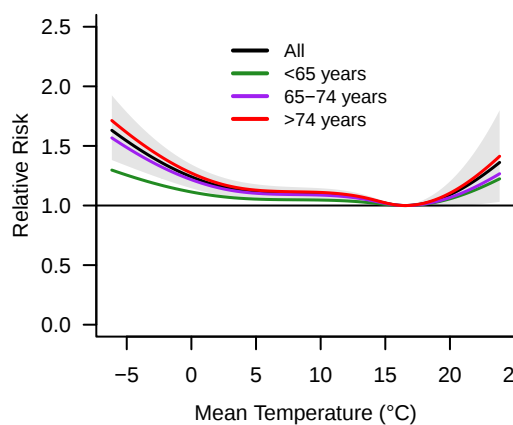
Bath – UK



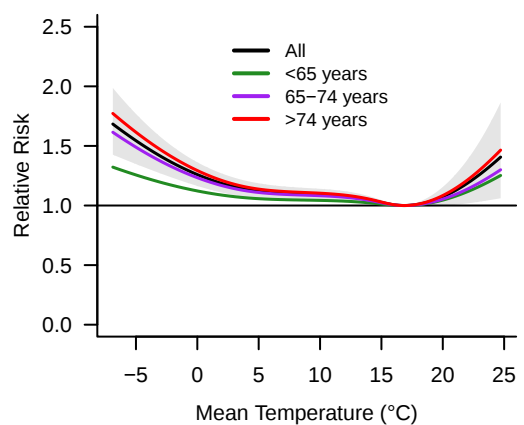
Bedford – UK



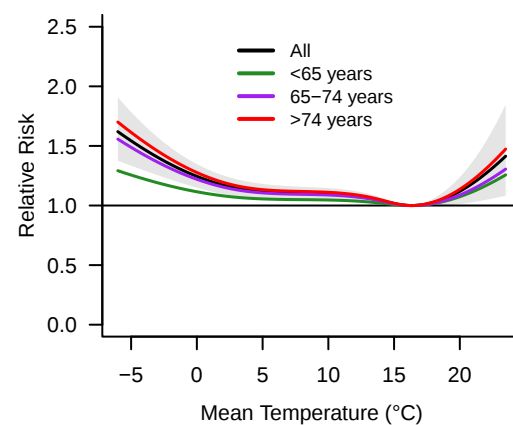
Blackburn – UK



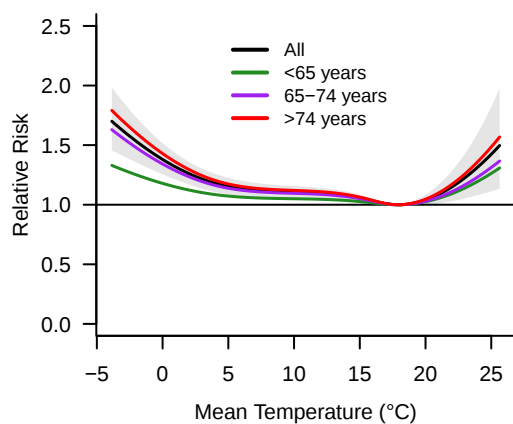
Blackpool – UK



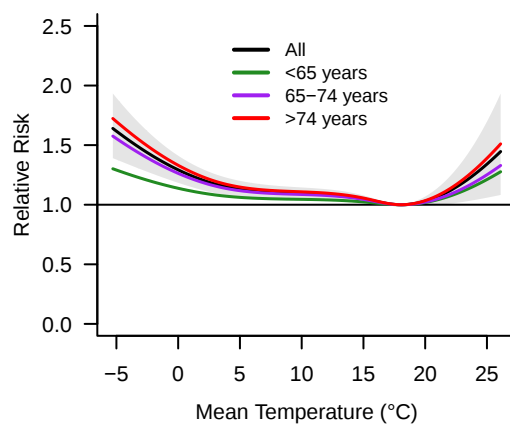
Bolton – UK



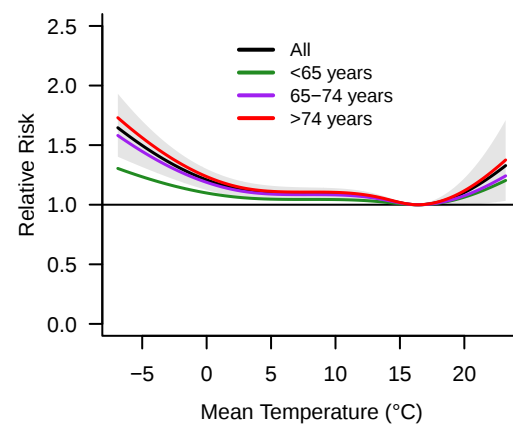
Brighton and Hove – UK



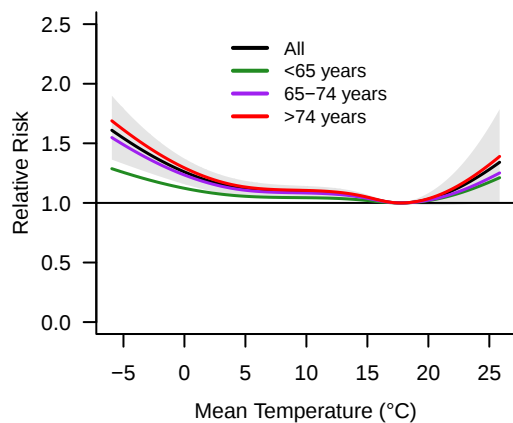
Bracknell – UK



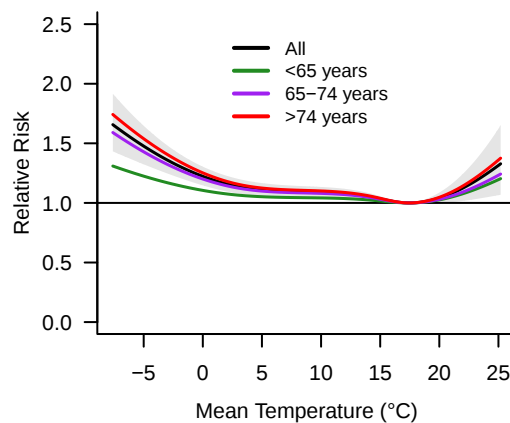
Bradford – UK



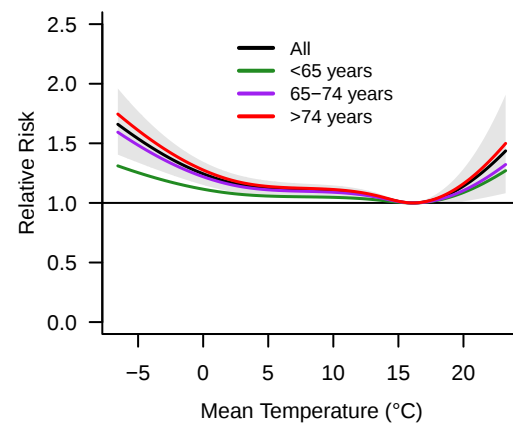
Birkenhead – UK



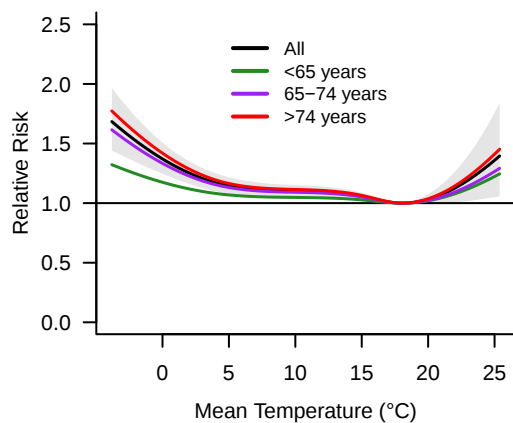
Birmingham – UK



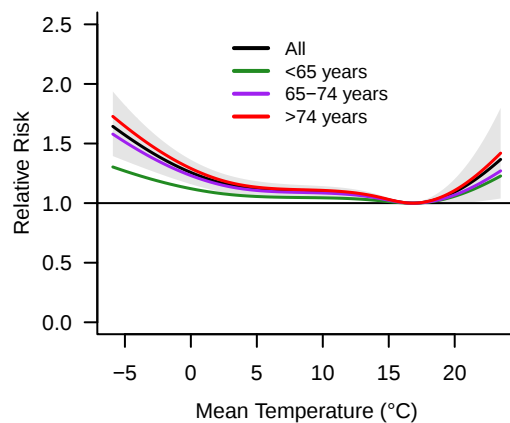
Burnley – UK



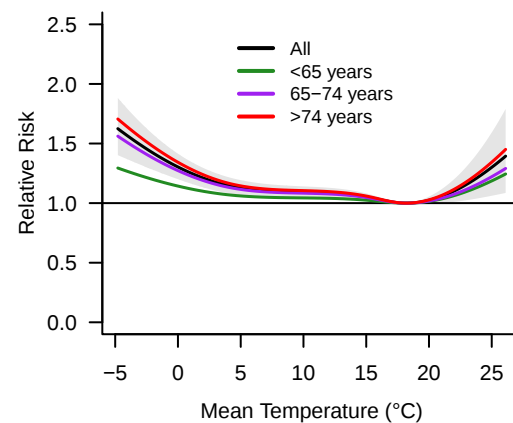
Bournemouth – UK



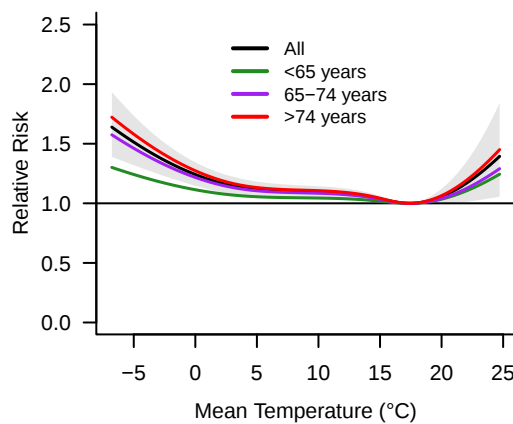
Barnsley – UK



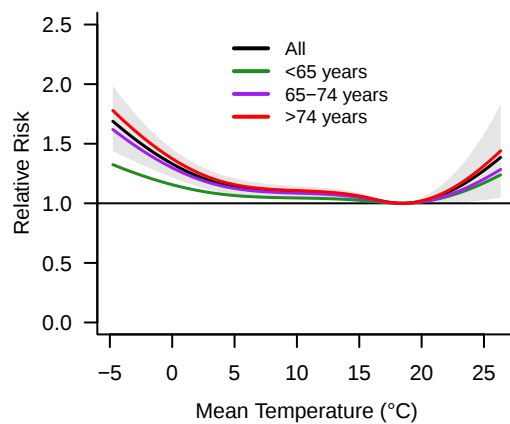
Bristol – UK



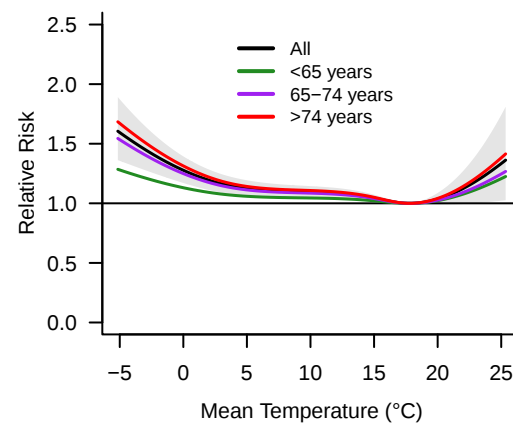
Burton upon Trent – UK



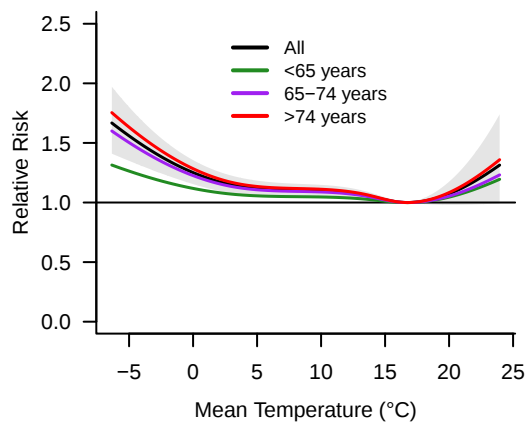
Basildon – UK



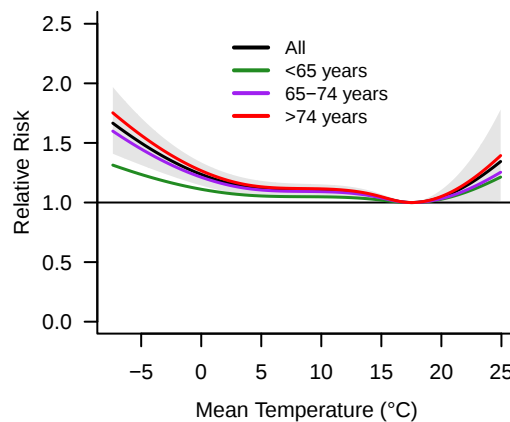
Basingstoke – UK



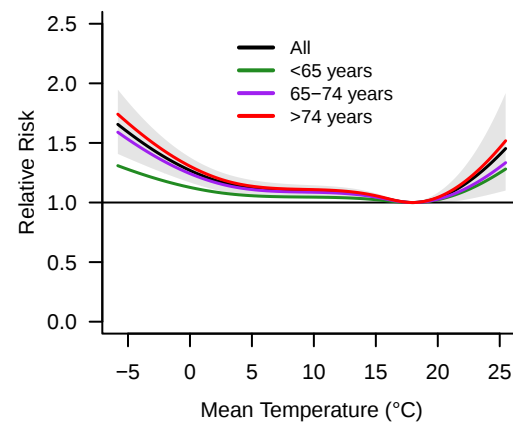
Bury – UK



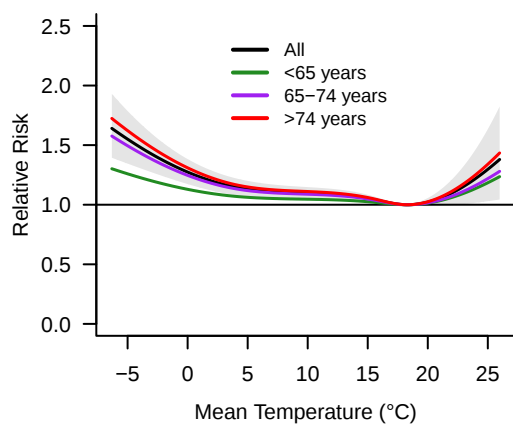
Chester – UK



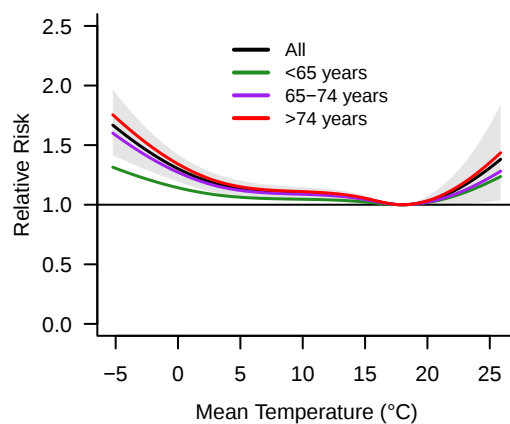
Chelmsford – UK



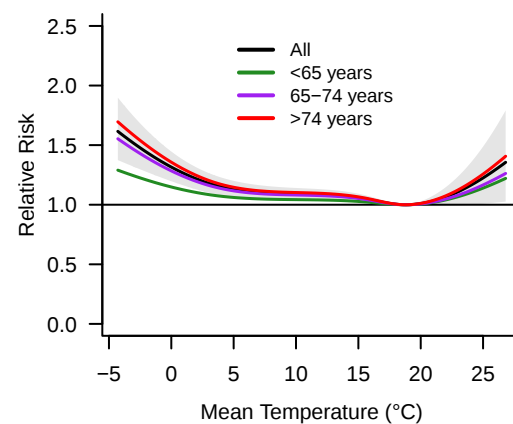
Gloucester – UK



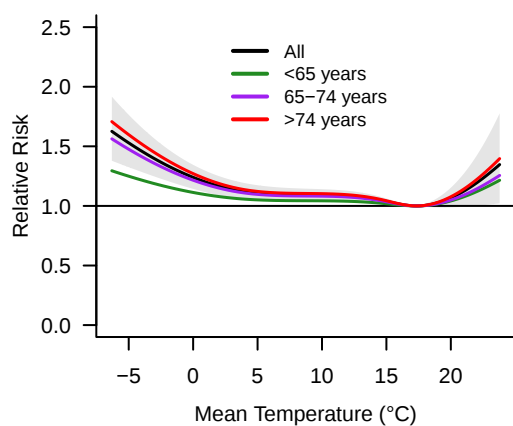
Guildford – UK



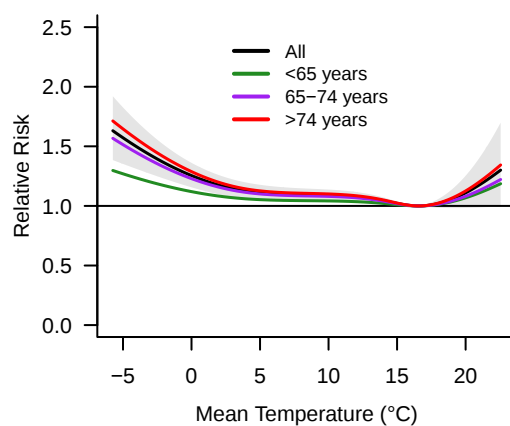
Gillingham – UK



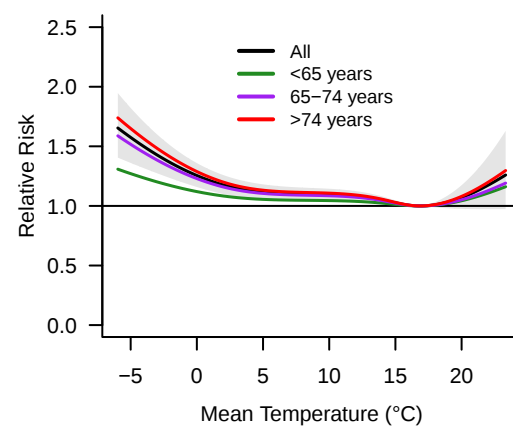
Grimsby – UK



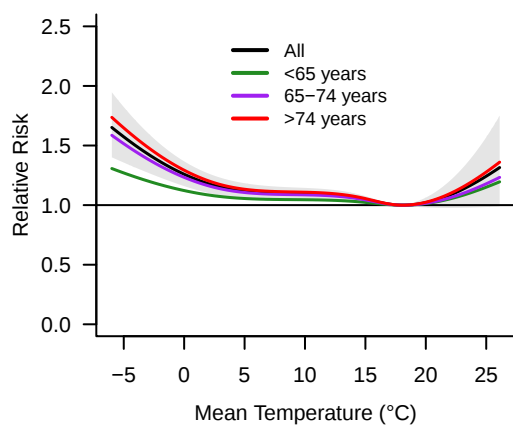
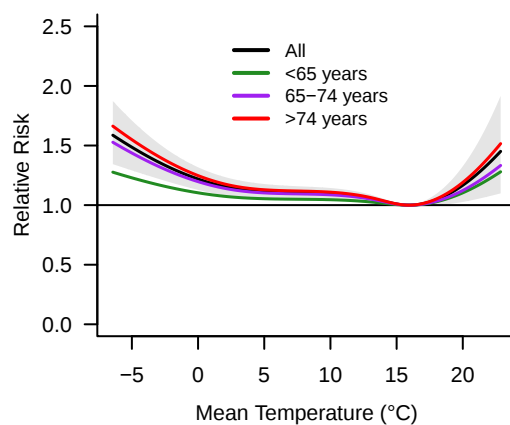
Gateshead – UK



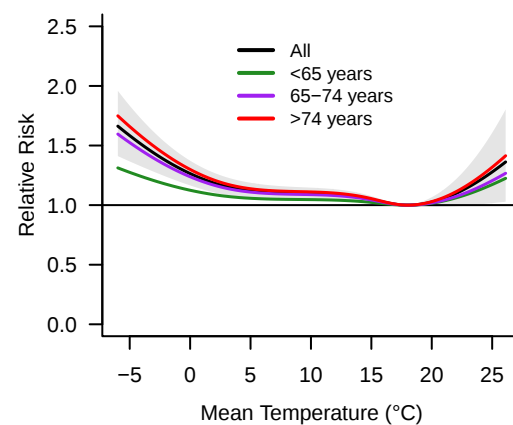
Huddersfield – UK



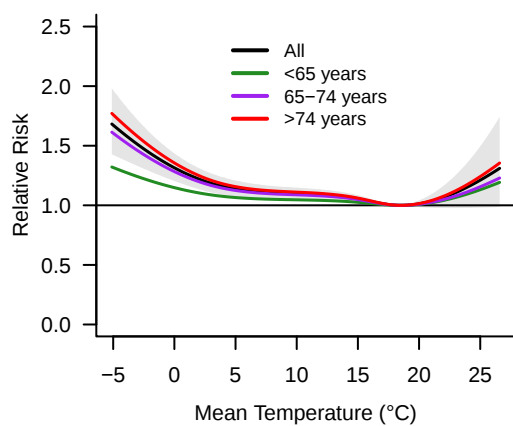
High Wycombe – UK

**Halifax – UK**

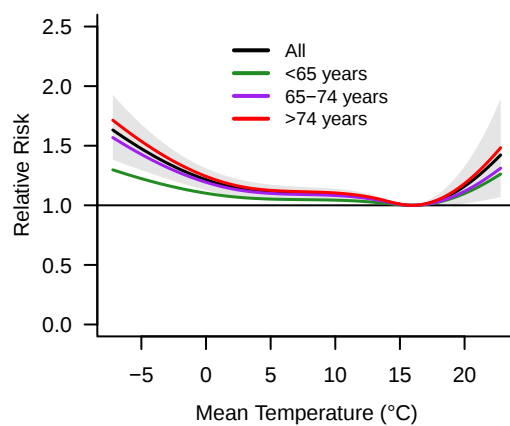
Hemel Hempstead – UK



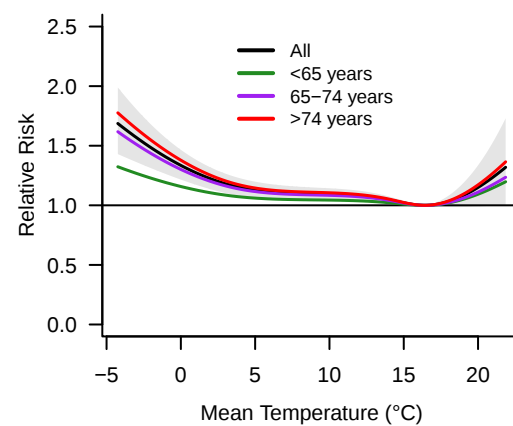
Harlow – UK



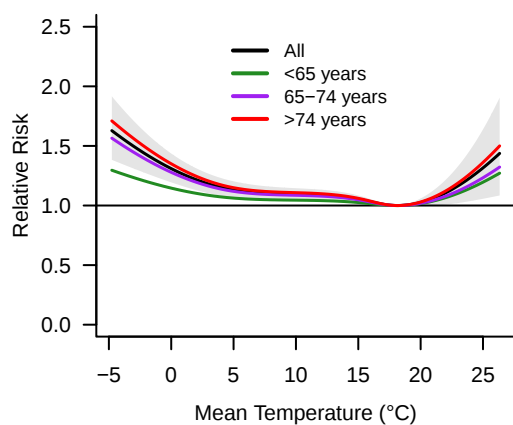
Harrogate – UK



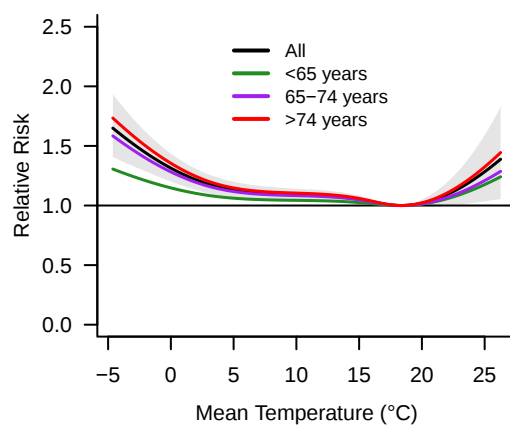
Hartlepool – UK



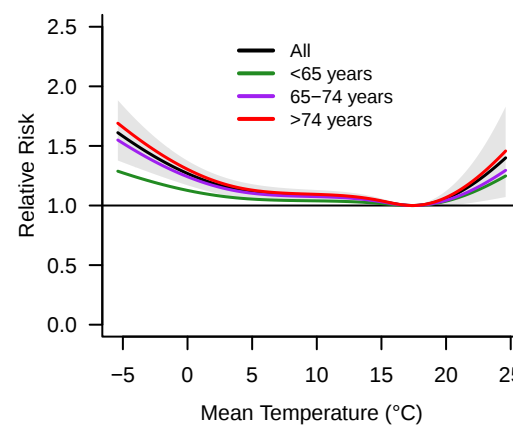
Hastings – UK



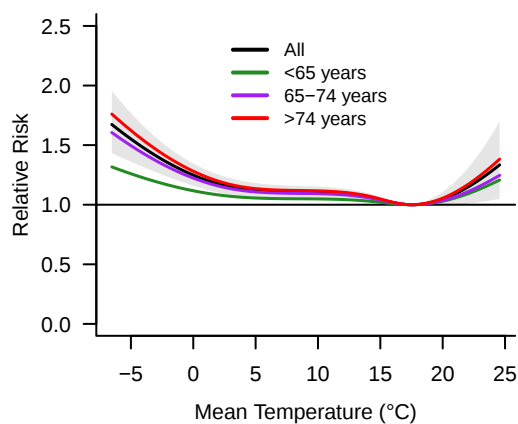
Ipswich – UK



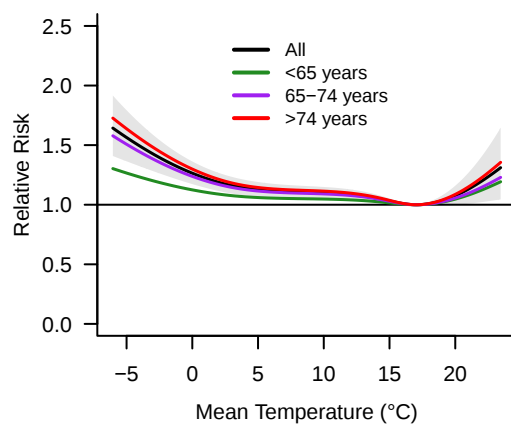
Kingston upon Hull – UK



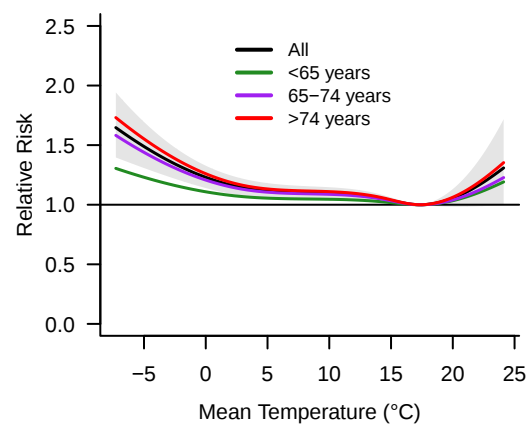
Leicester – UK



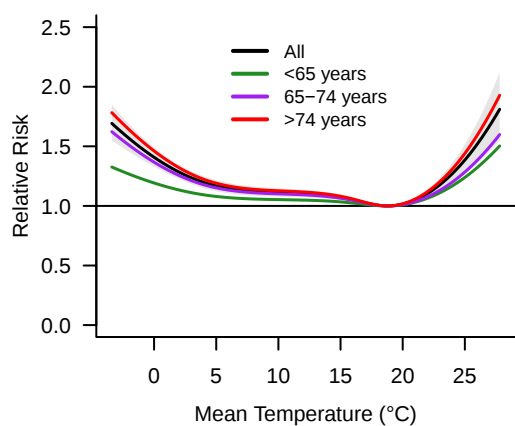
Leeds – UK



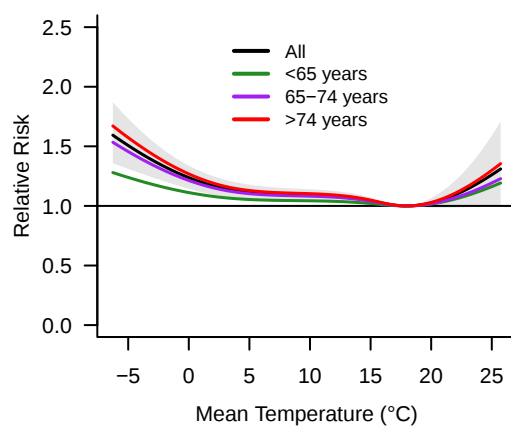
Lincoln – UK



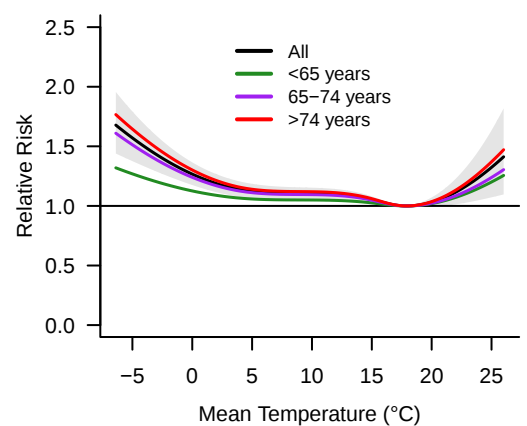
London – UK



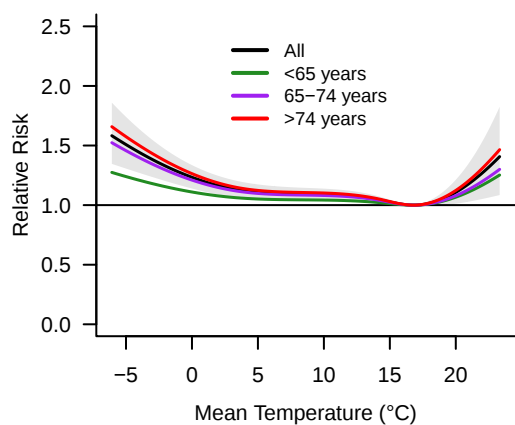
Luton – UK



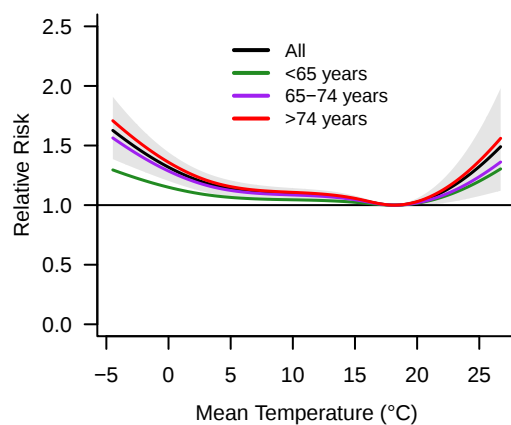
Liverpool – UK



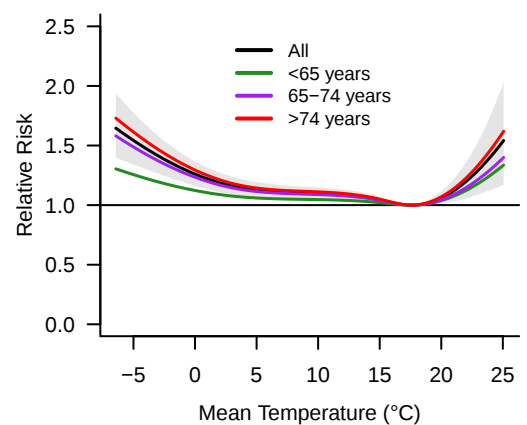
Middlesbrough – UK



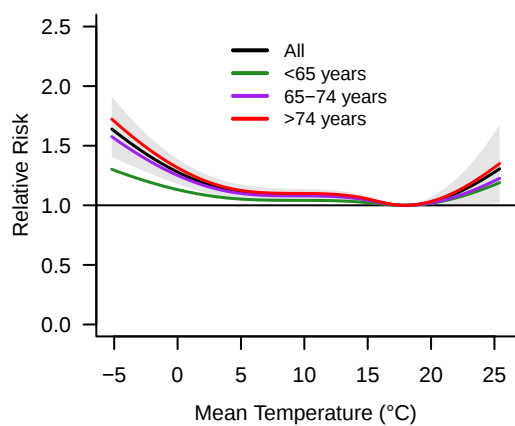
Maidstone – UK



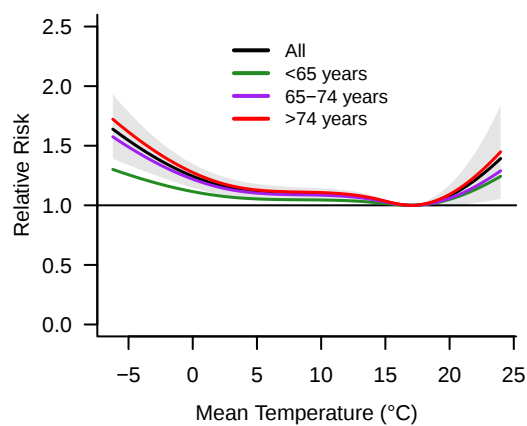
Milton Keynes – UK



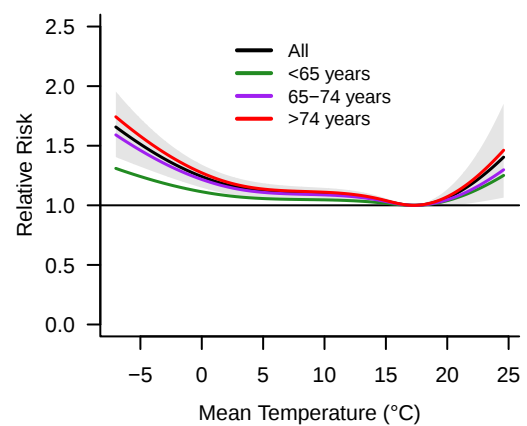
Manchester – UK



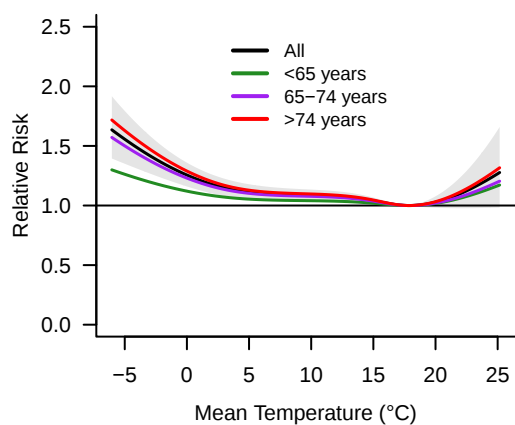
Mansfield – UK



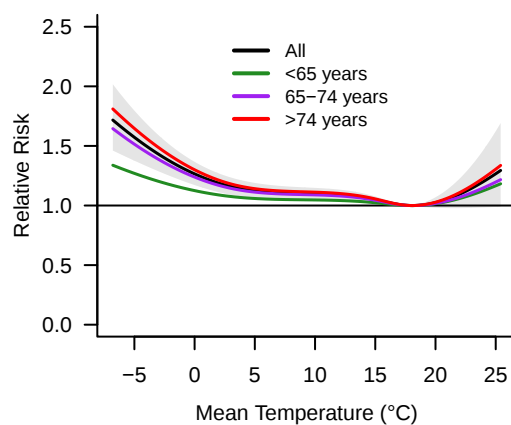
Nuneaton – UK



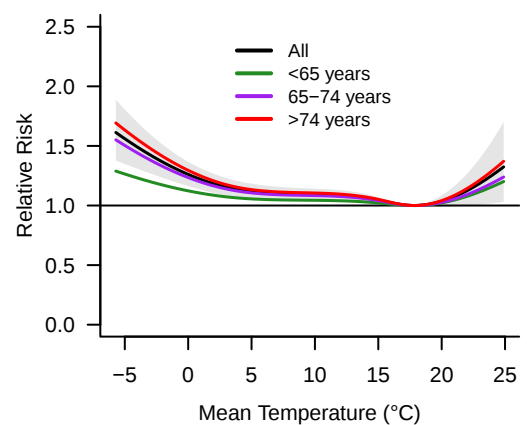
Northampton – UK



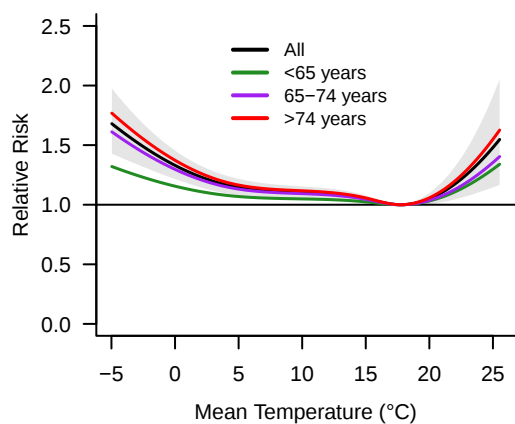
Norwich – UK



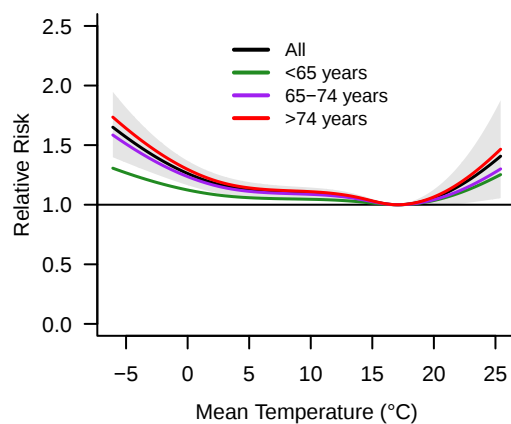
Nottingham – UK



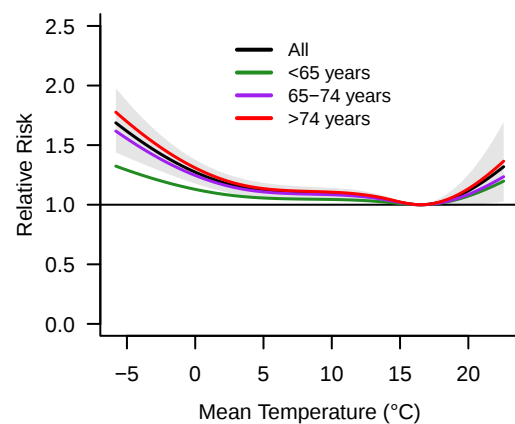
Newport – UK



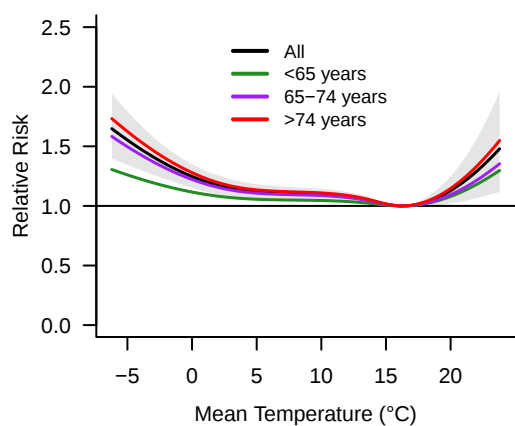
Newcastle-under-Lyme – UK



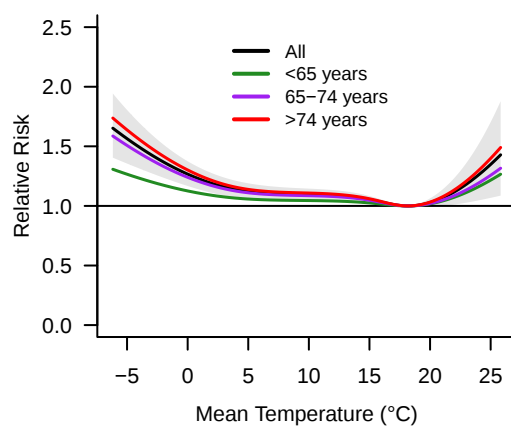
Newcastle upon Tyne – UK



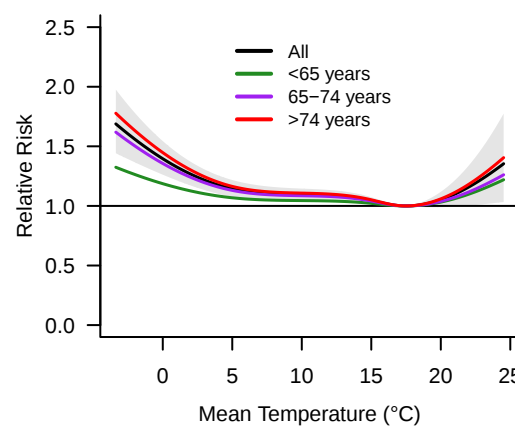
Oldham – UK



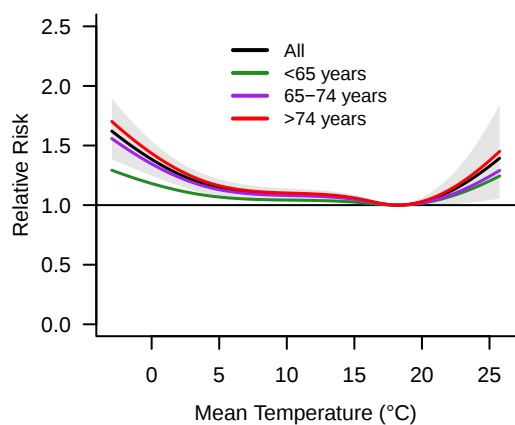
Oxford – UK



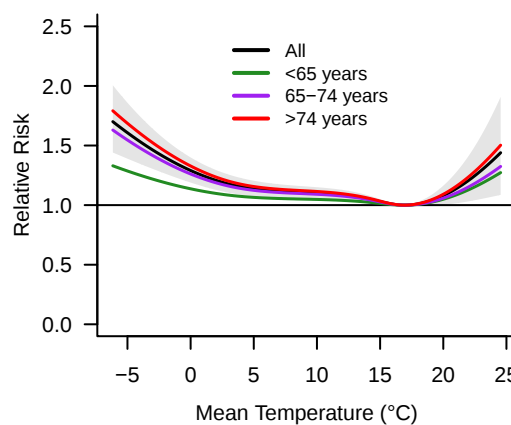
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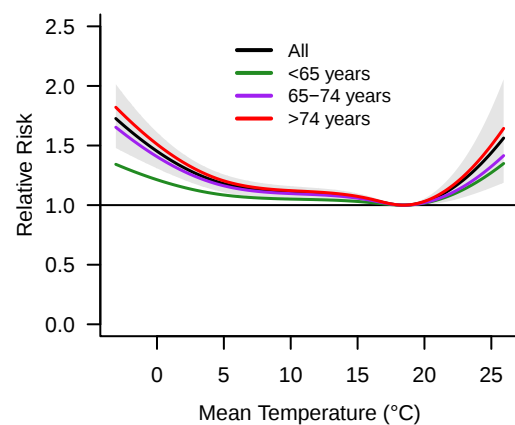
Poole – UK



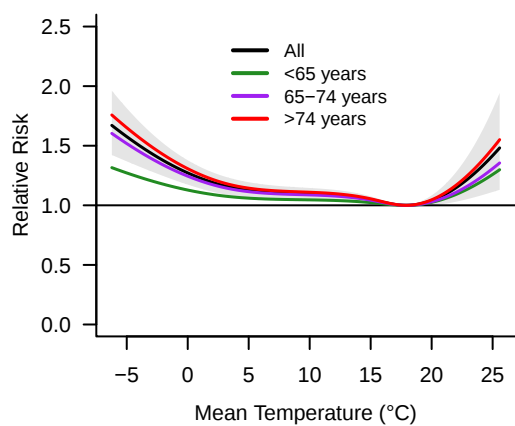
Preston – UK



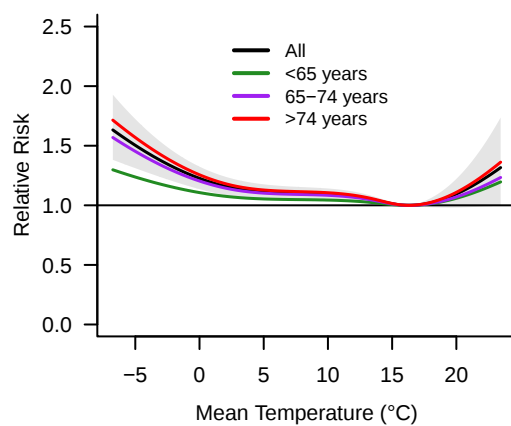
Portsmouth – UK



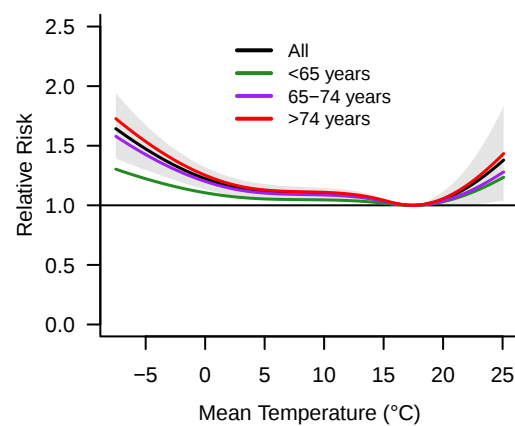
Peterborough – UK



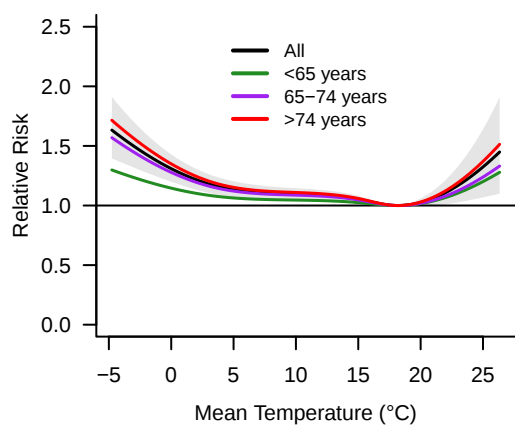
Rochdale – UK



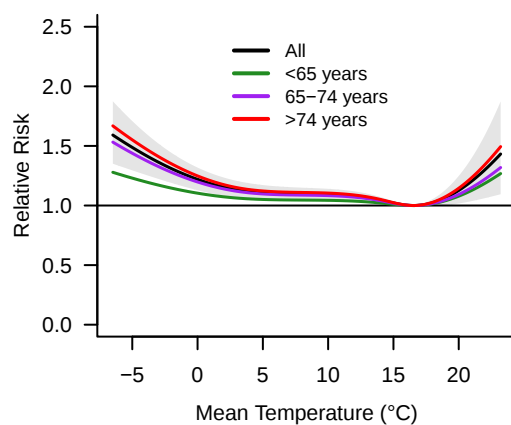
Redditch – UK



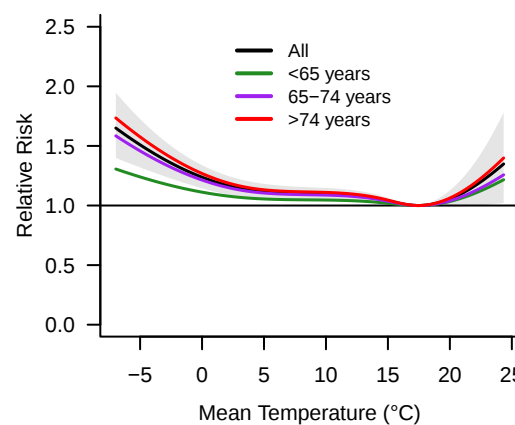
Reading – UK



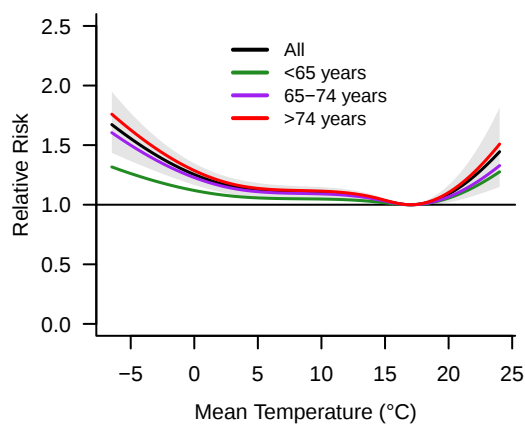
Rotherham – UK



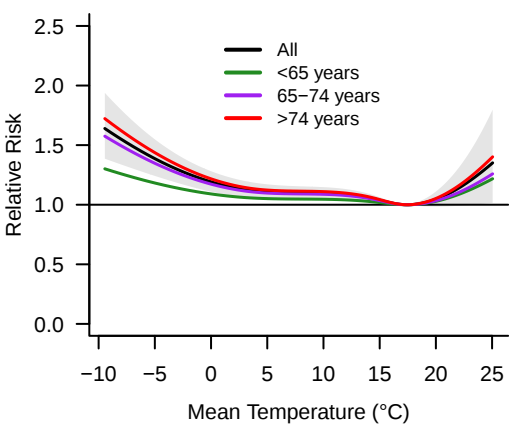
Scunthorpe – UK



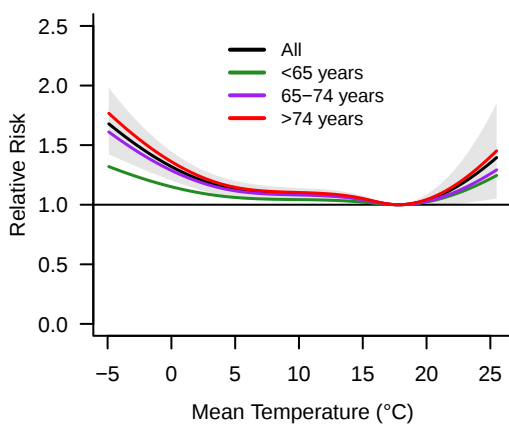
Sheffield – UK



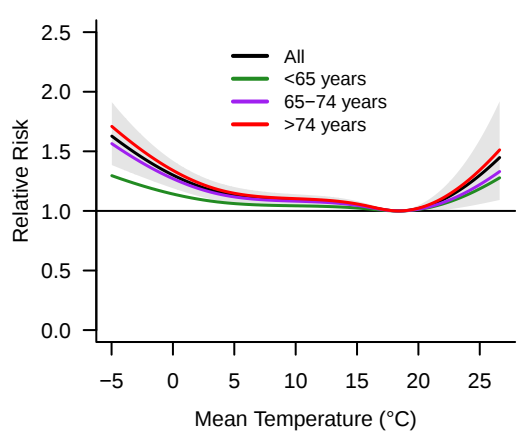
Shrewsbury – UK



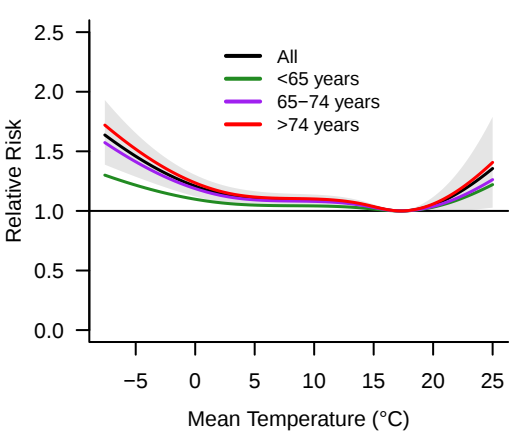
Salford – UK



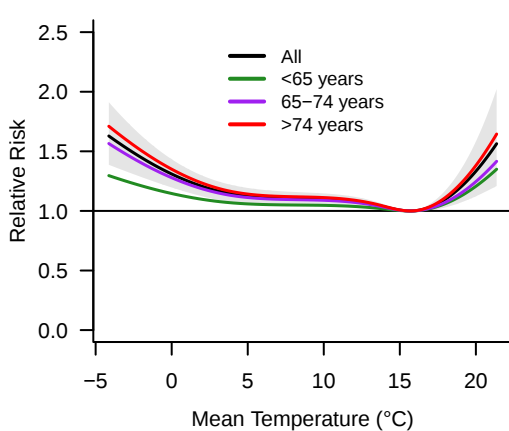
Slough – UK



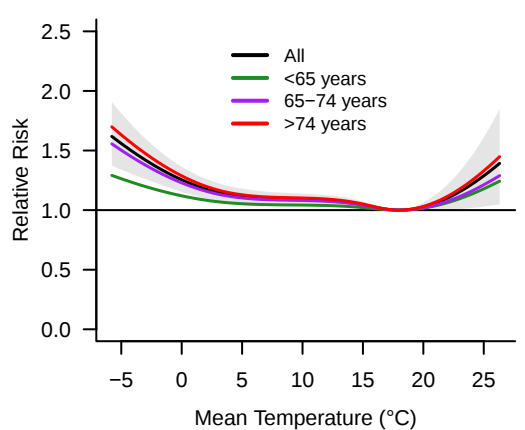
Solihull – UK



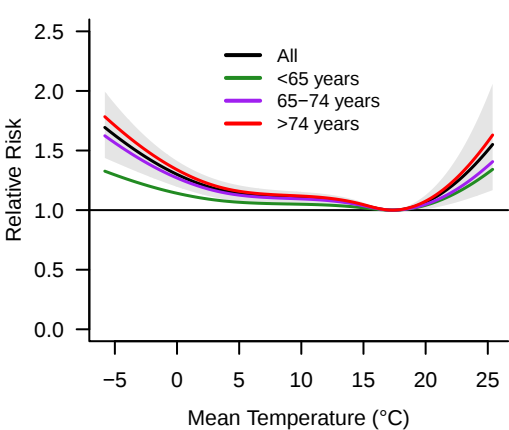
Sunderland – UK



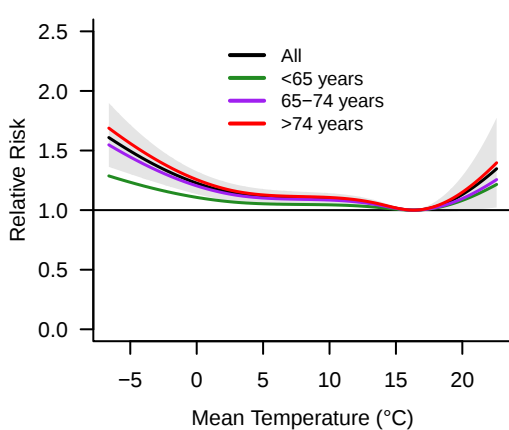
St Albans – UK



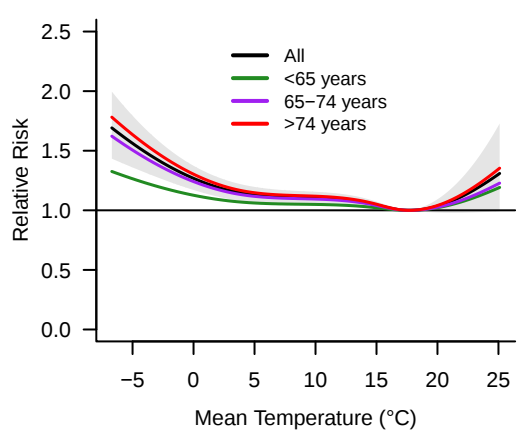
Stockport – UK



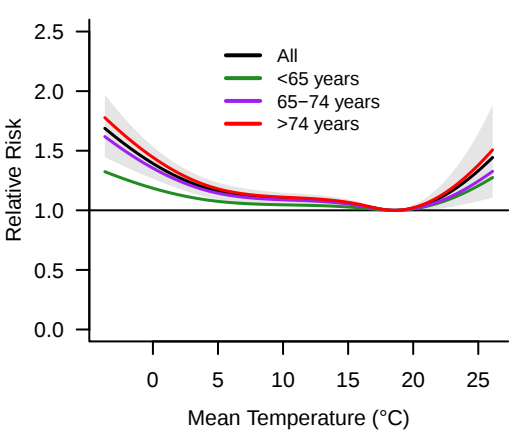
Stockton-on-Tees – UK



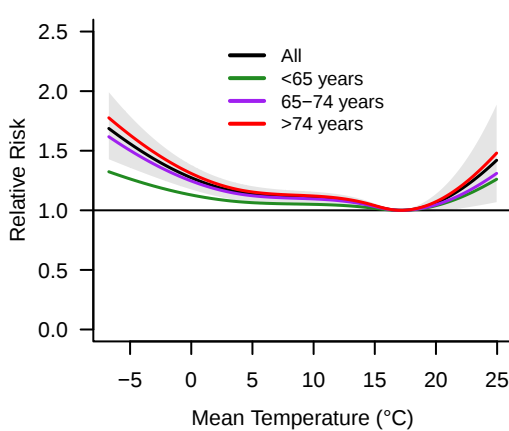
St Helens – UK



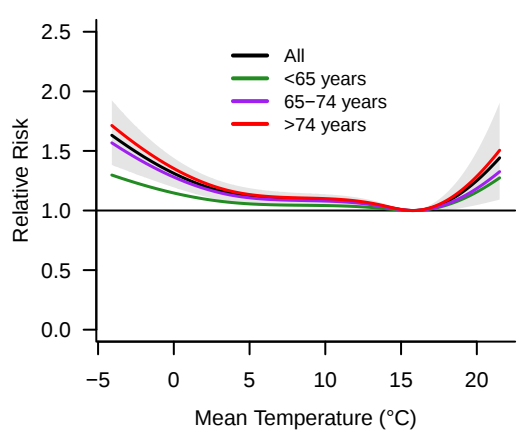
Southampton – UK



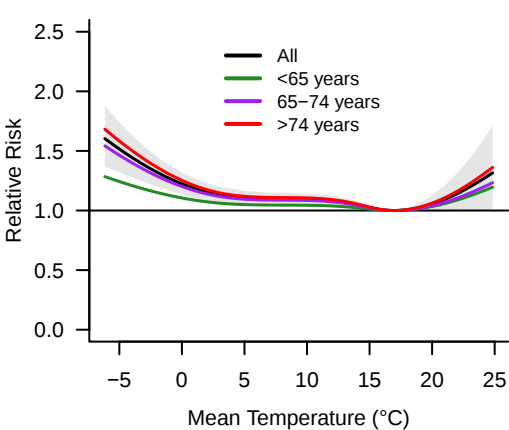
Southport – UK



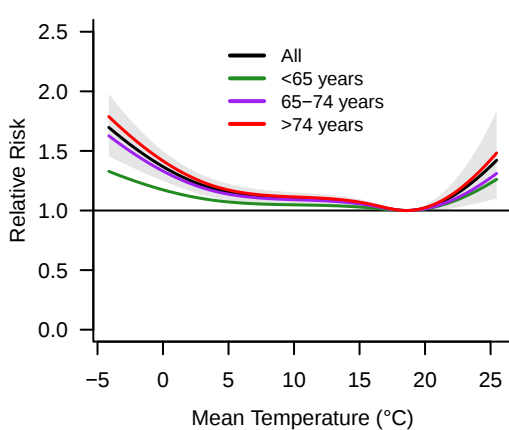
South Shields – UK



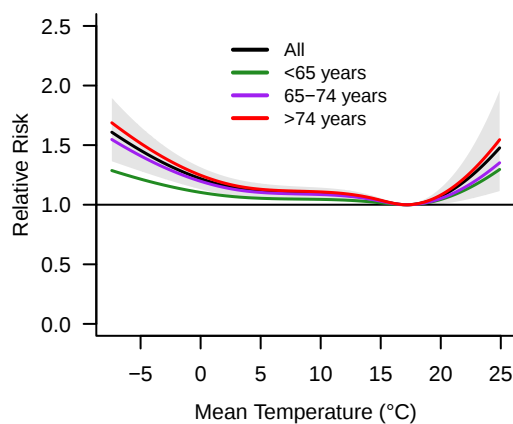
Stoke-on-Trent – UK



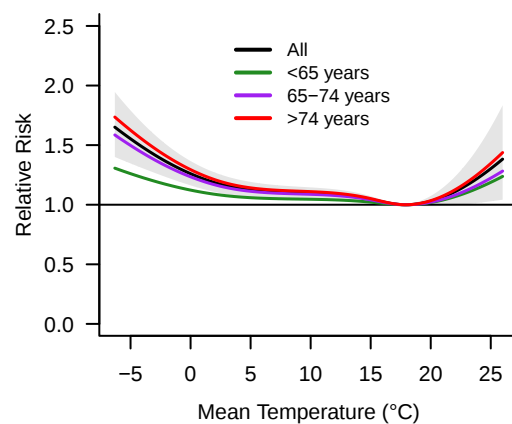
Southend-on-Sea – UK



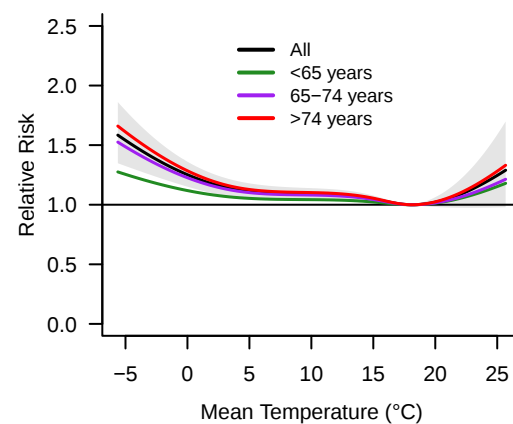
Sutton Coldfield – UK



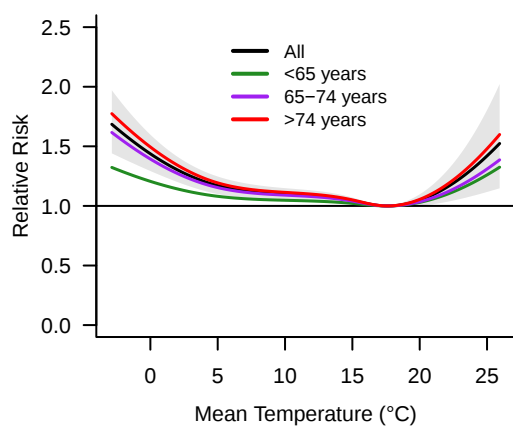
Stevenage – UK



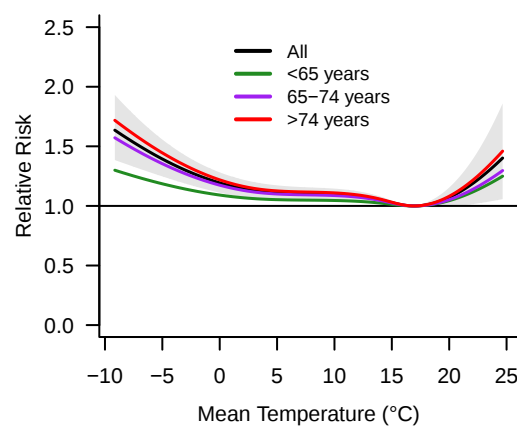
Swindon – UK



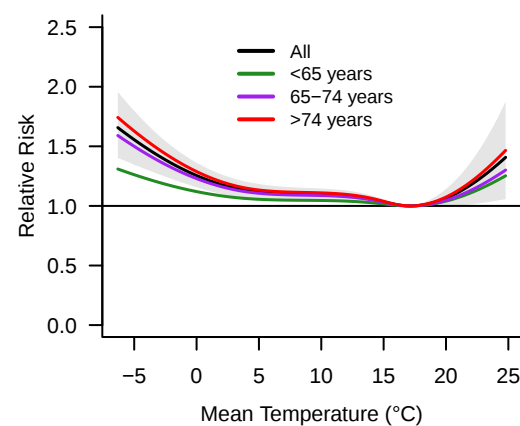
Swansea – UK



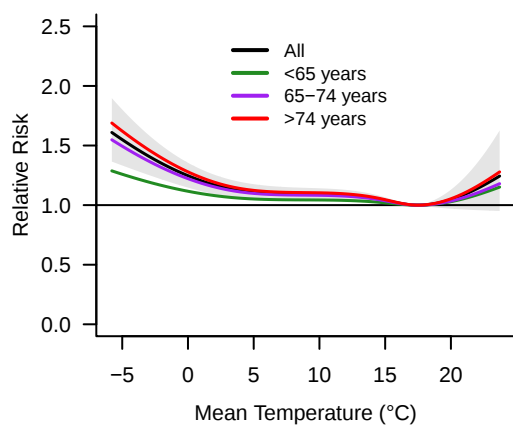
Telford – UK



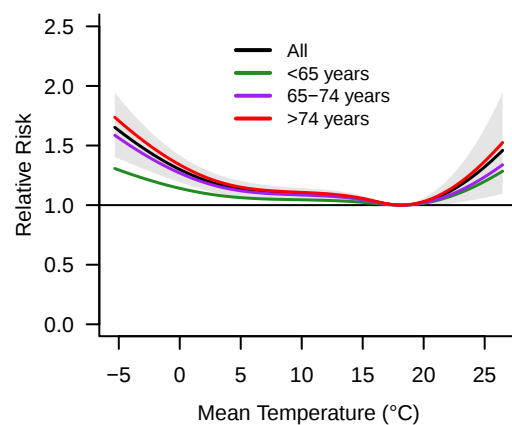
Wigan – UK



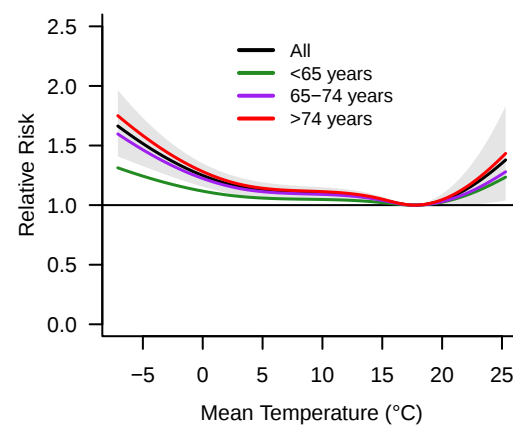
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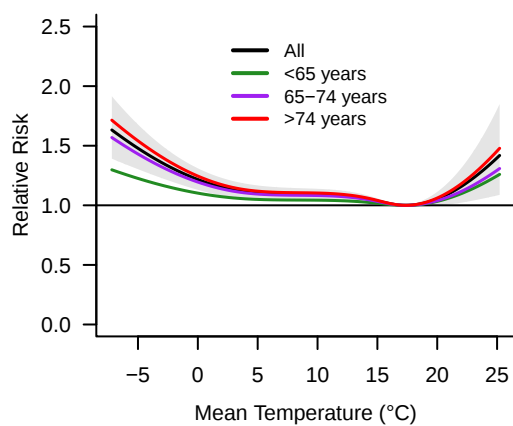
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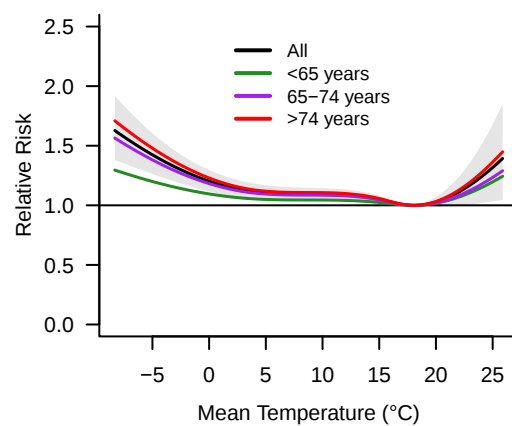
Walsall – UK



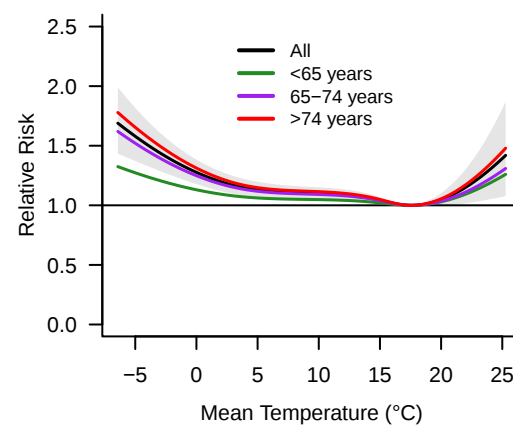
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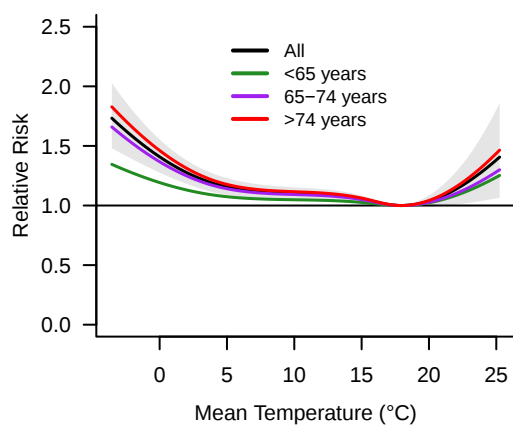
Worcester – UK



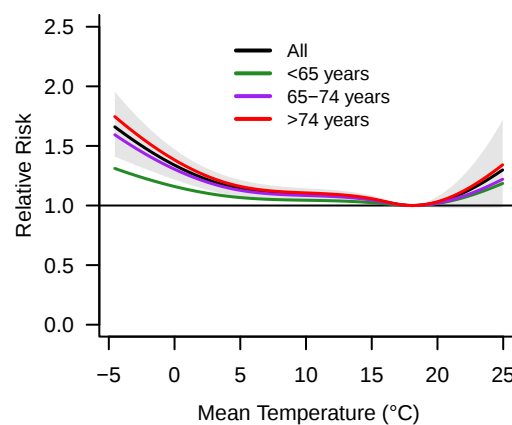
Warrington – UK



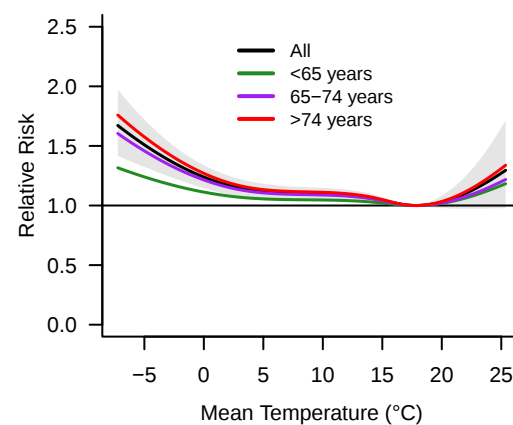
Worthing – UK



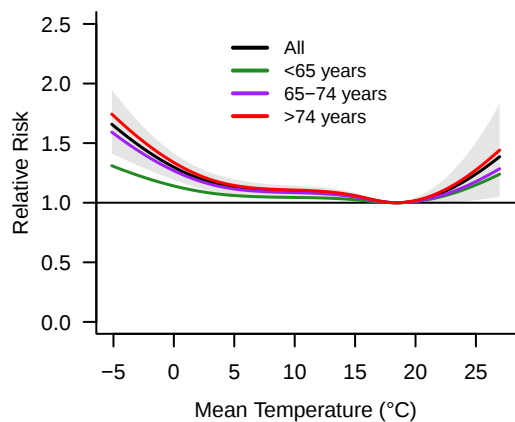
Weston-Super-Mare – UK



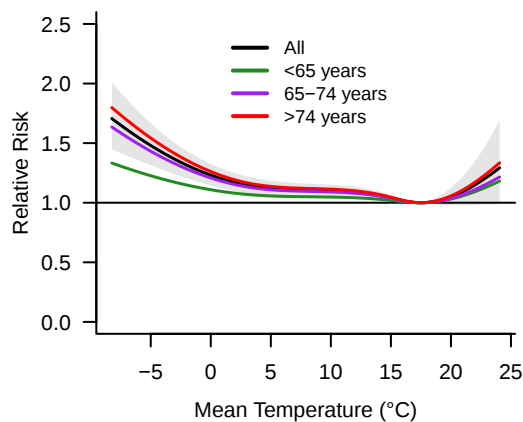
West Bromwich – UK



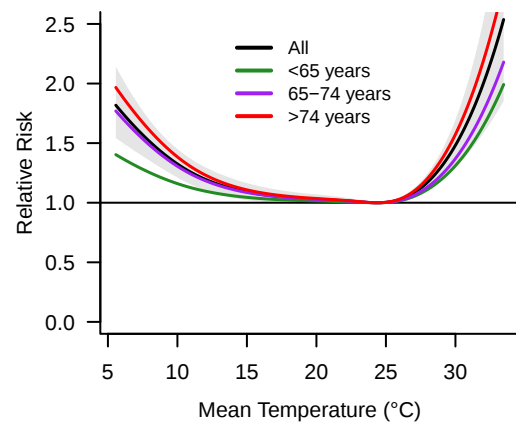
Watford – UK



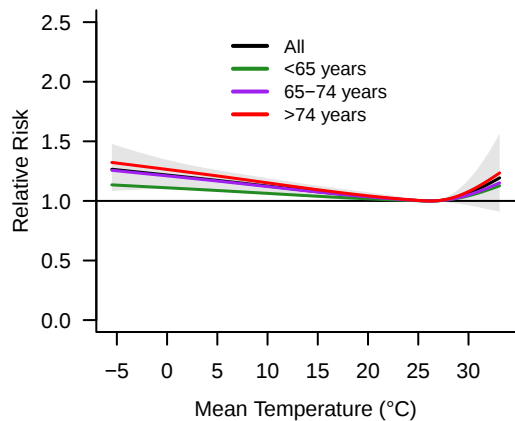
York – UK



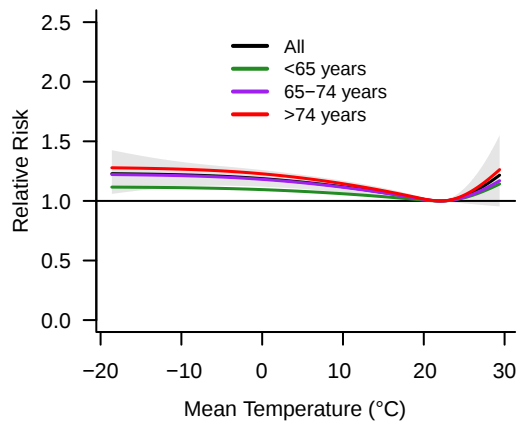
Montevideo – Uruguay



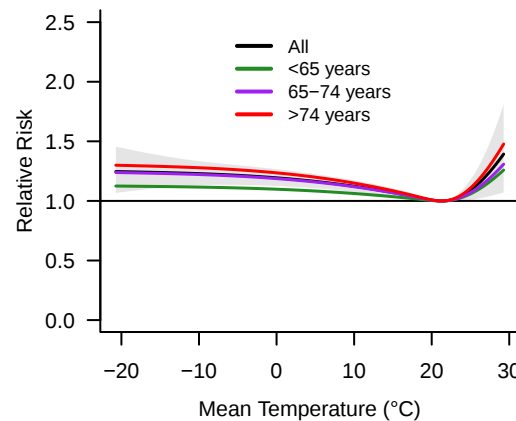
Augusta (GA) – USA



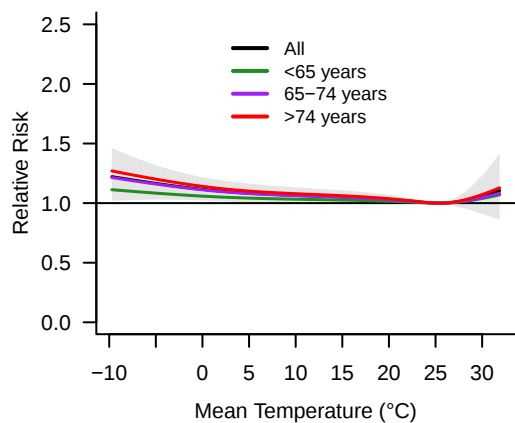
Akron (OH)– USA



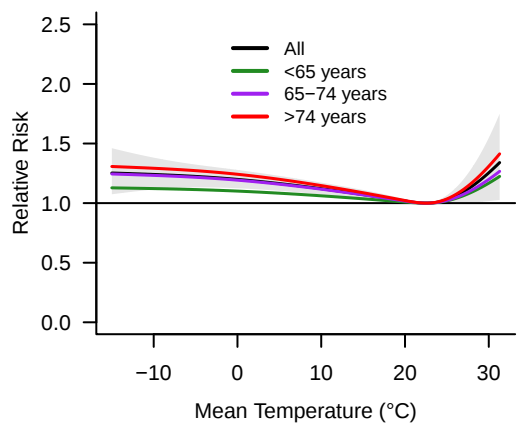
Albany (NY)– USA



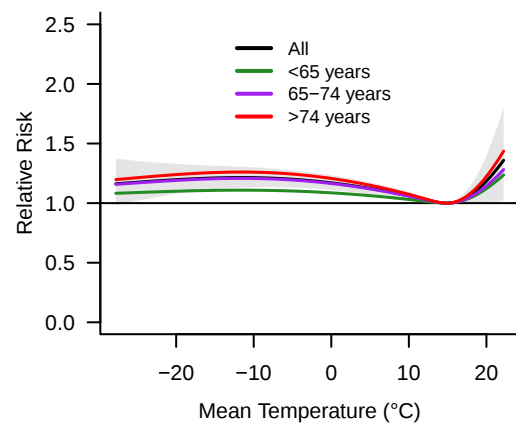
Albuquerque (NM) – USA



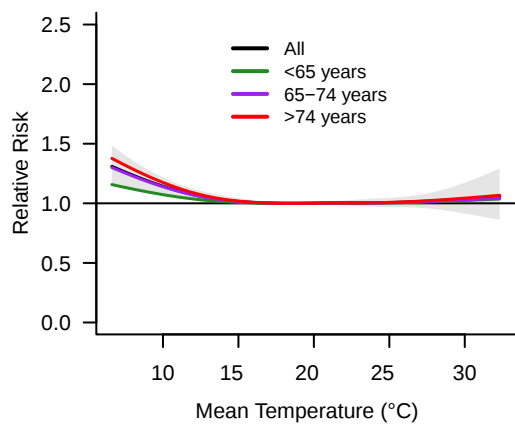
Allentown (PA)– USA



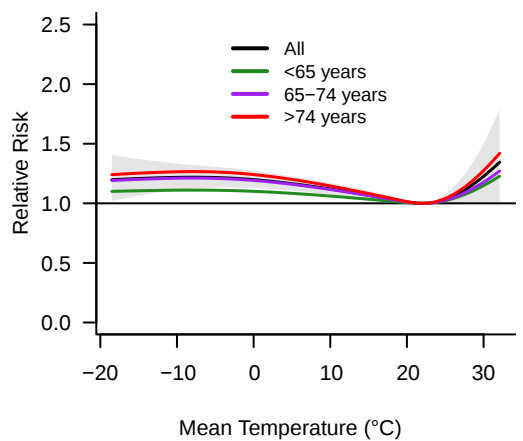
Anchorage (AK) – USA



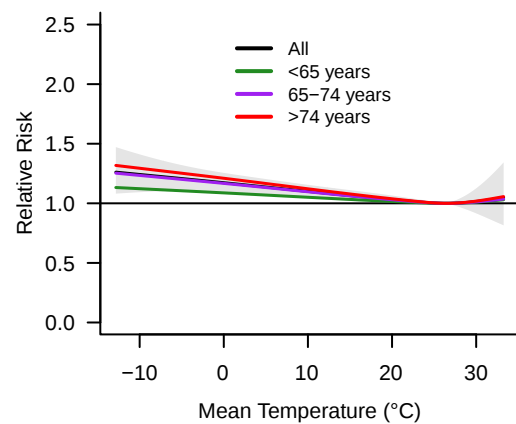
Anaheim (CA) – USA



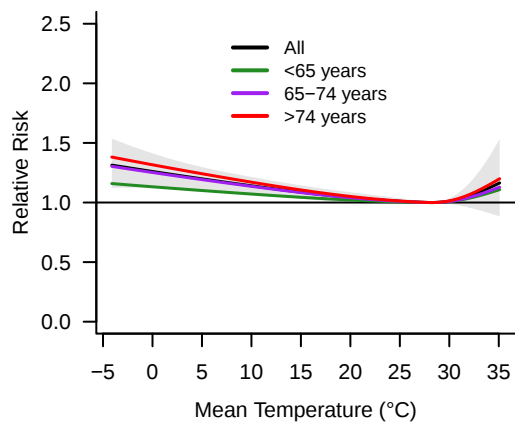
Ann arbor (MI) – USA



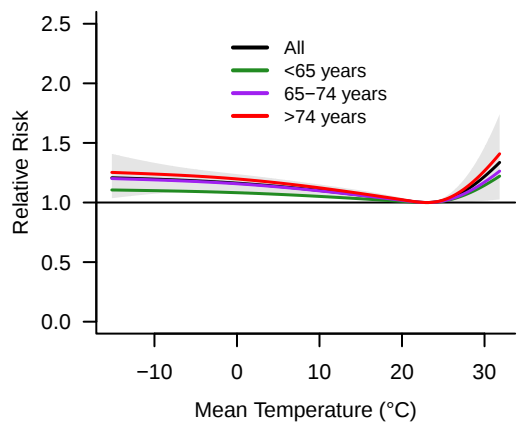
Annandale (VA) – USA



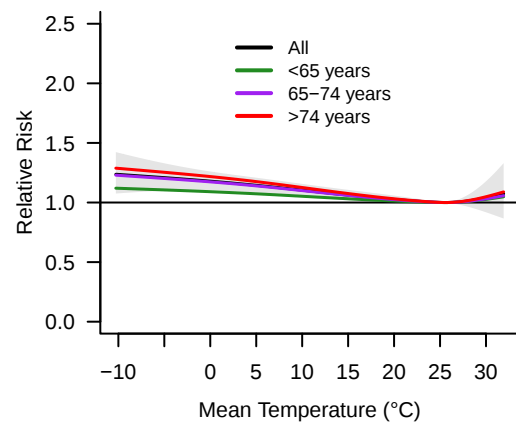
Austin (TX) – USA



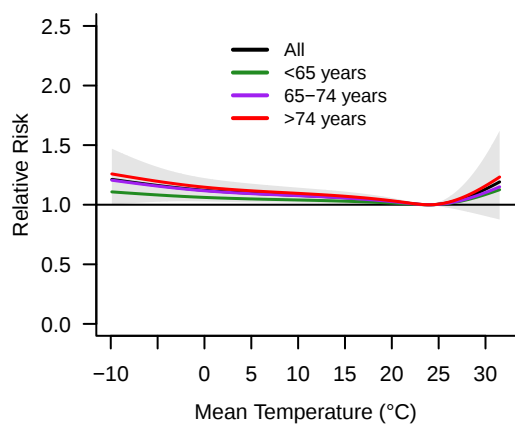
Atlantic city (NJ) – USA



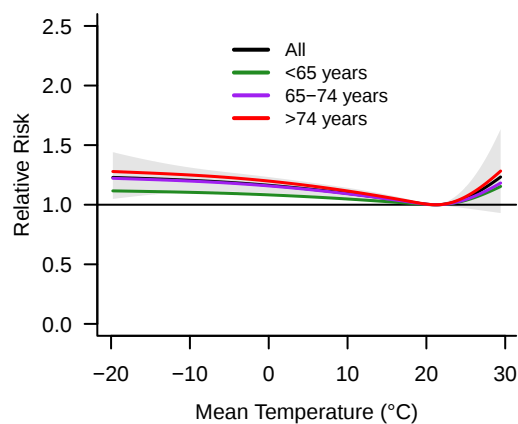
Atlanta (GA) – USA



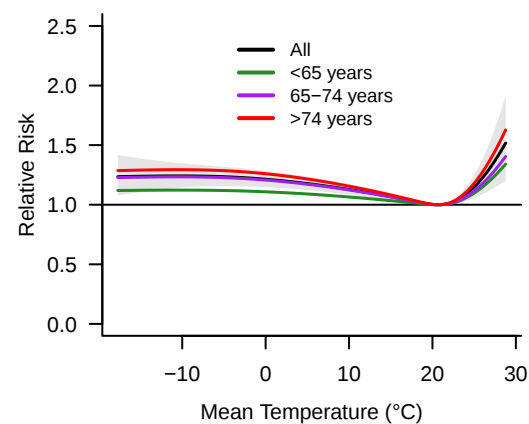
Aztec (NM) – USA



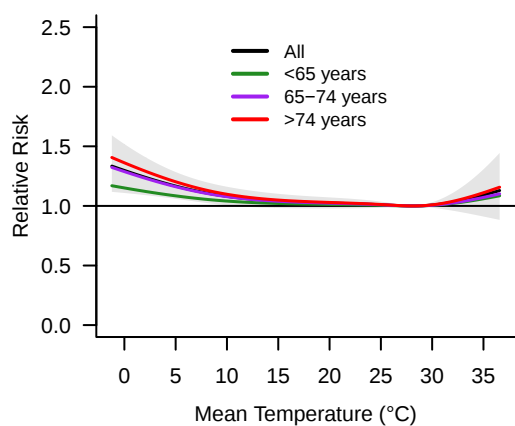
Bath (NY) – USA



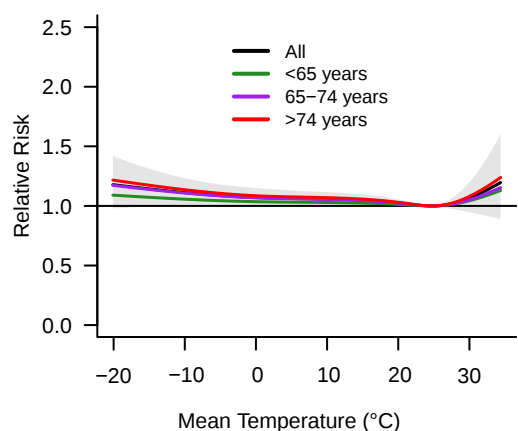
Buffalo (NY) – USA



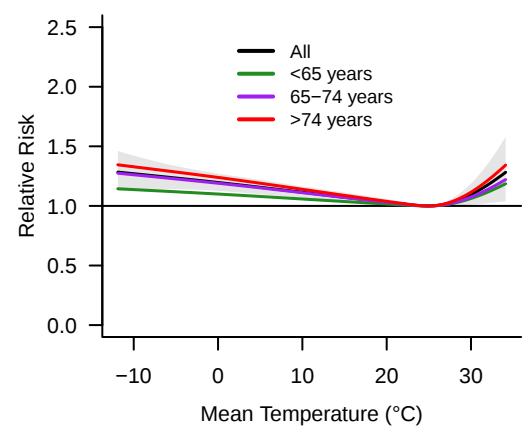
Bakersfield (CA) – USA



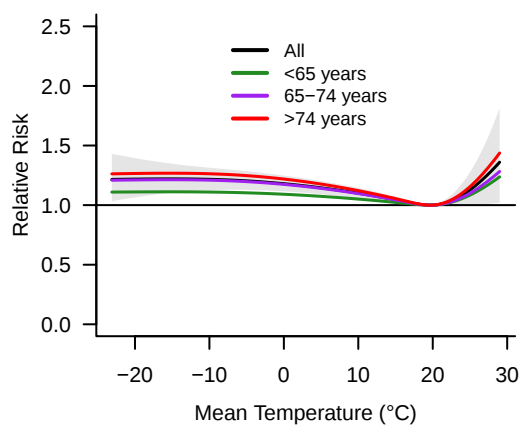
Boulder (CO)– USA



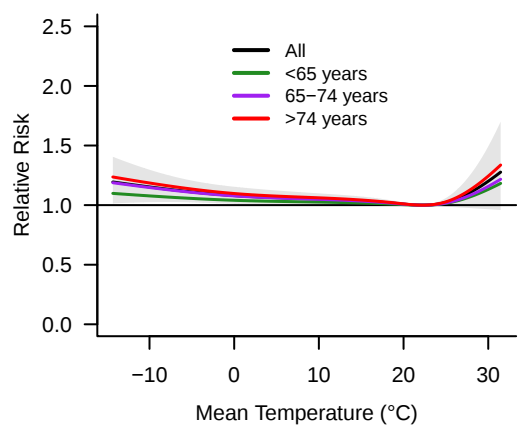
Baltimore (MD) – USA



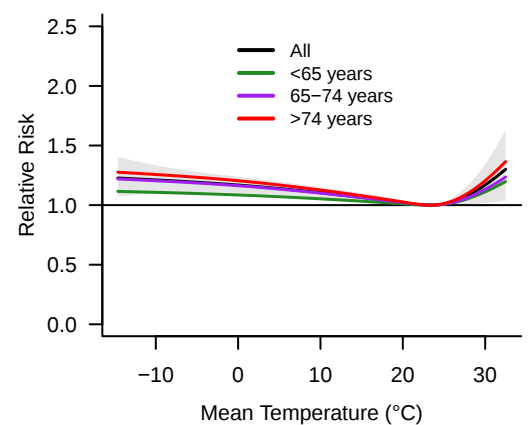
Bangor (ME) – USA



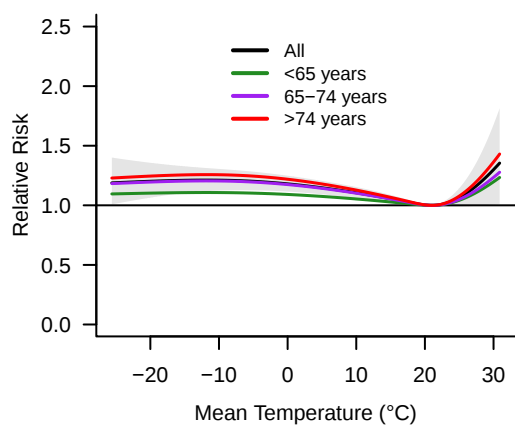
Boise city (ID) – USA



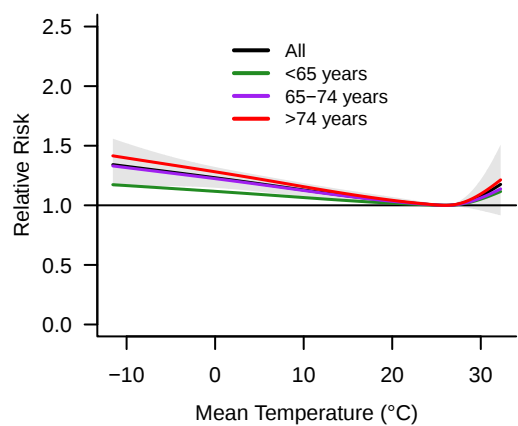
Paterson (NJ) – USA



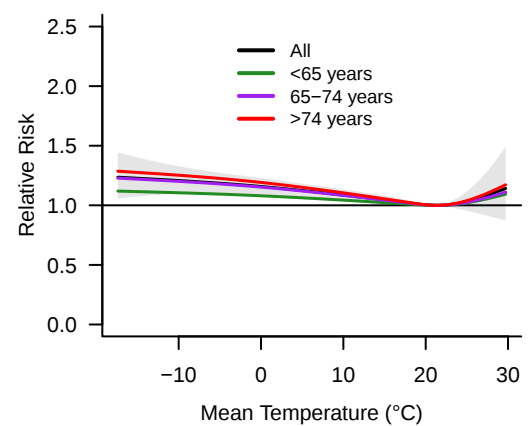
Burlington (VT) – USA



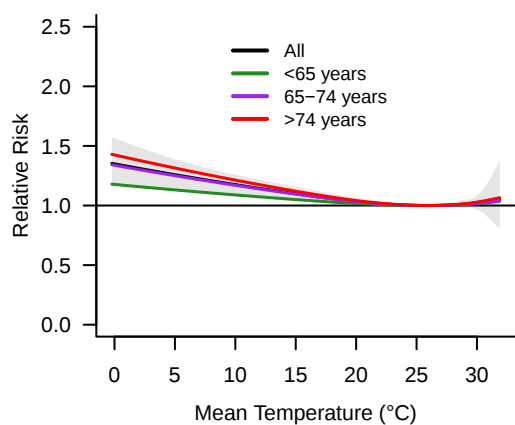
Birmingham (AL) – USA



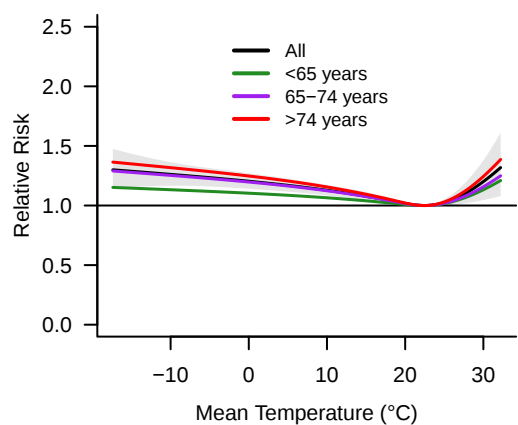
Barnstable (MA) – USA



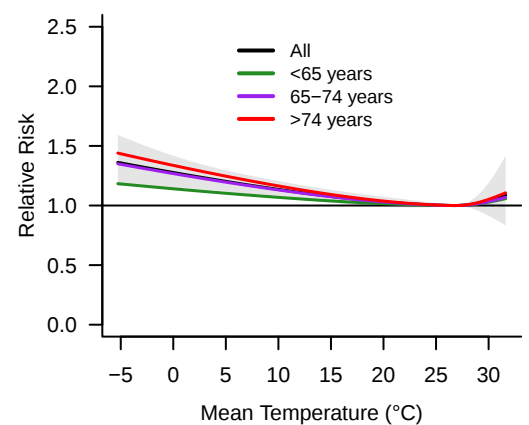
Brownsville (TX) – USA



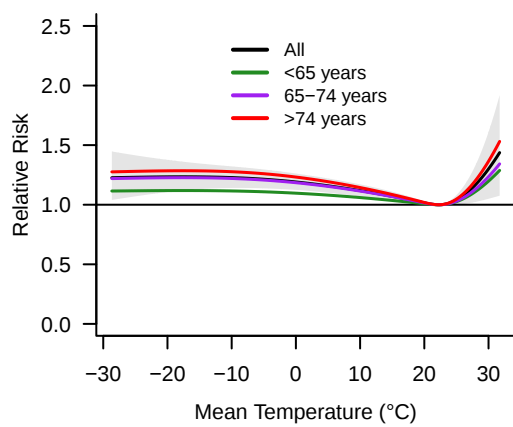
Boston (MA)– USA



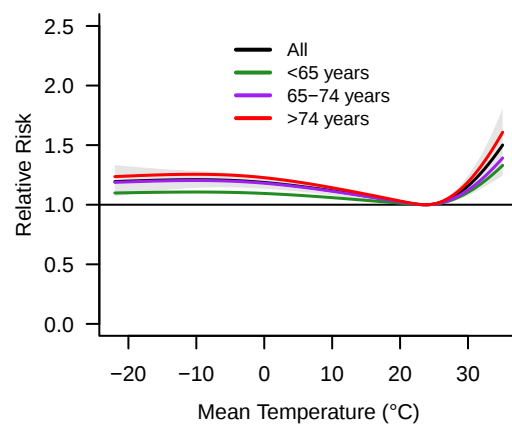
Baton rouge (LA) – USA



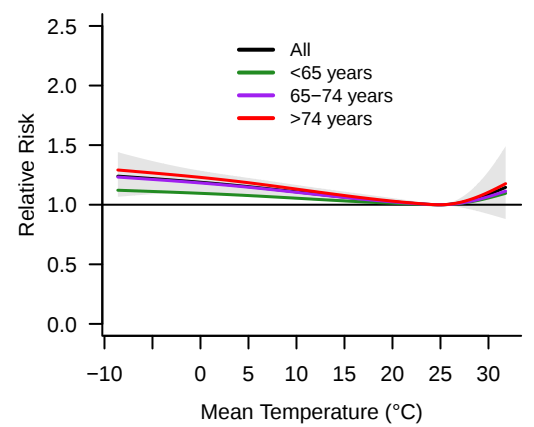
Cedar rapids (IA) – USA



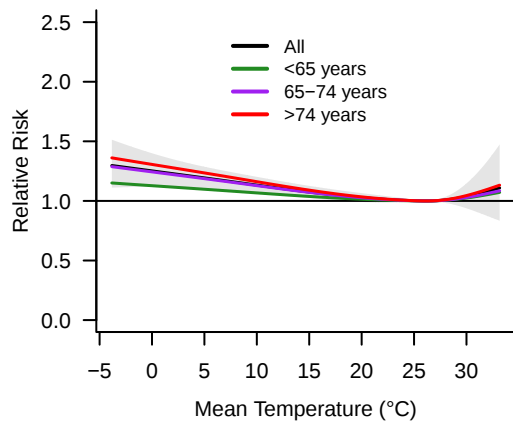
Chicago (IL) – USA



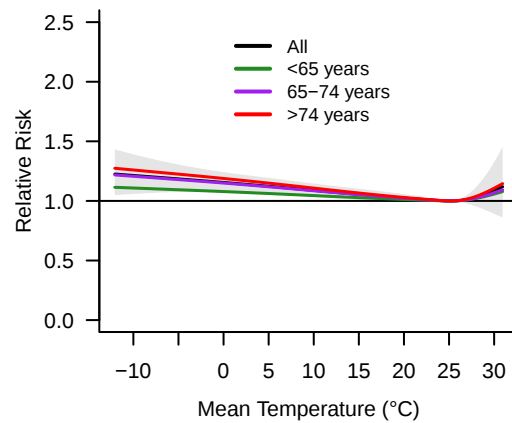
Charlotte (NC) – USA



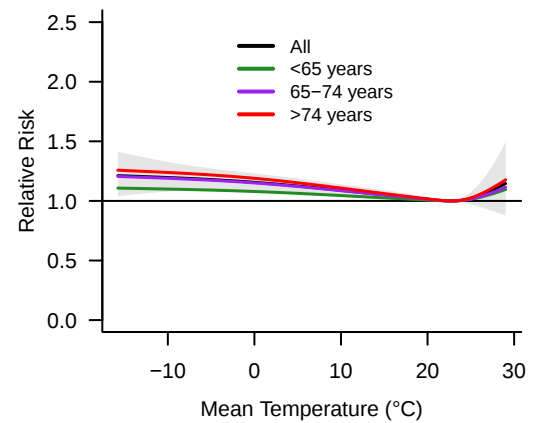
Charleston (SC) – USA



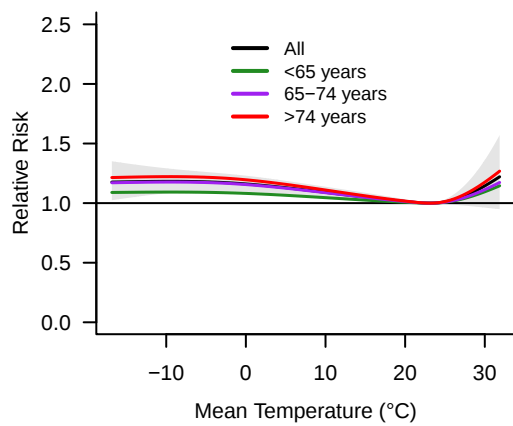
Chattanooga (TN) – USA



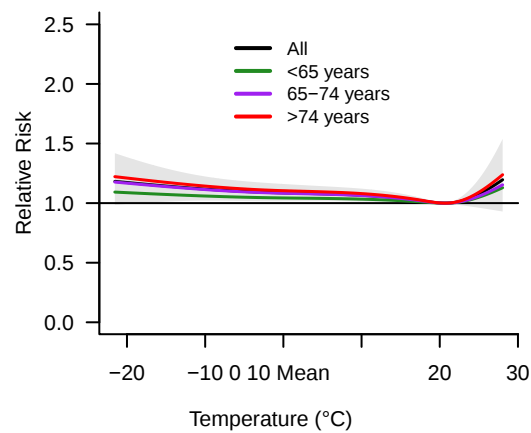
Charleston (WV) – USA



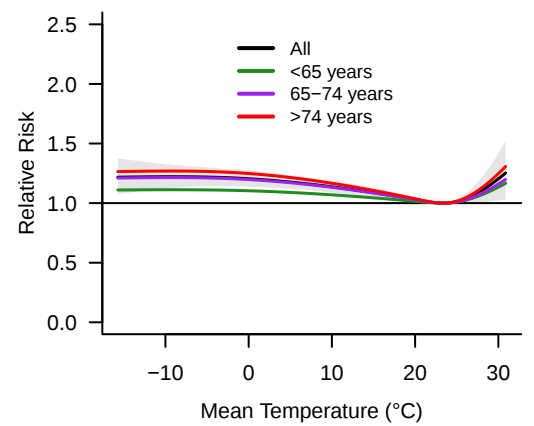
Columbus (OH) – USA



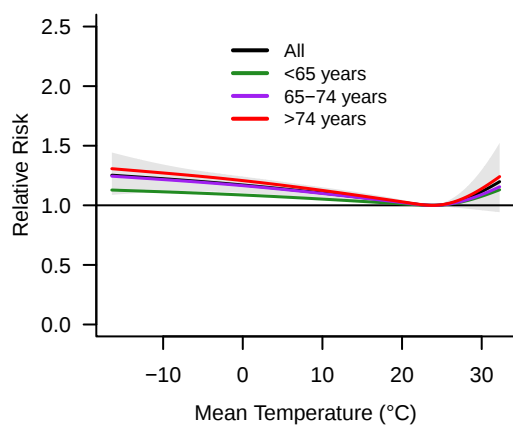
Colorado springs (CO) – USA



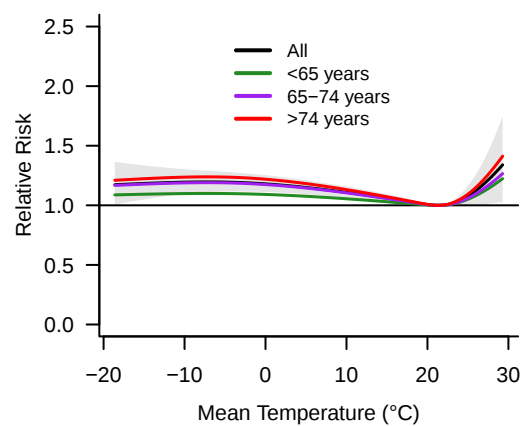
Cleveland (OH) – USA



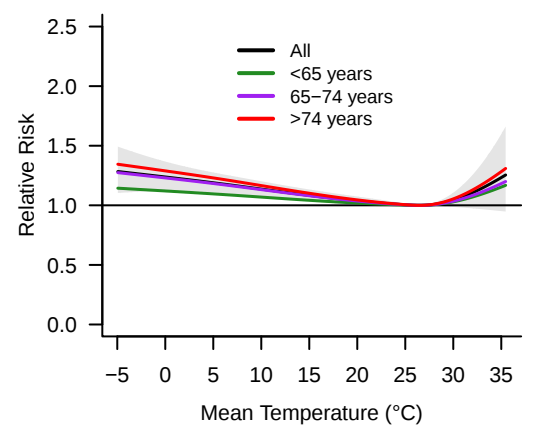
Cincinnati (OH) – USA



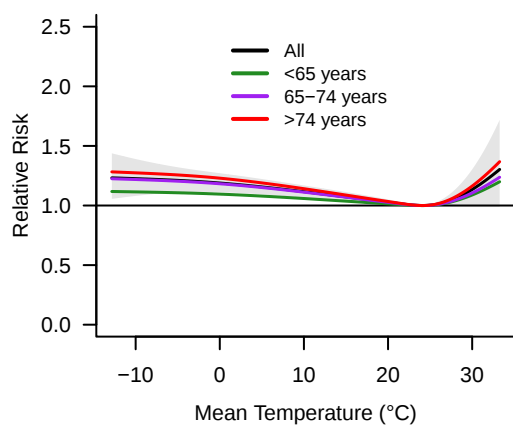
Canton (OH)– USA



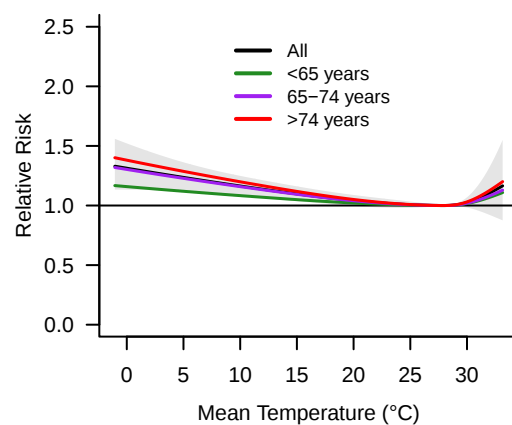
Columbia (SC) – USA



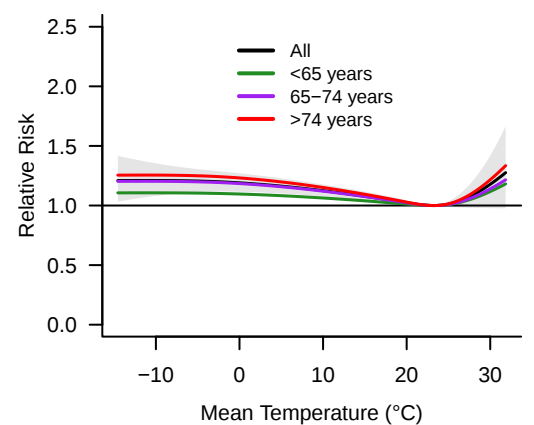
Carlisle (PA) – USA



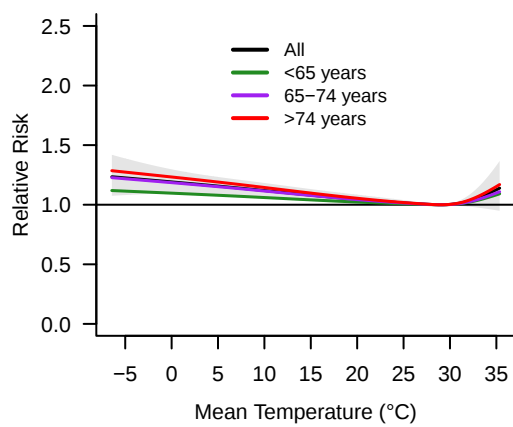
Corpus christi (TX) – USA



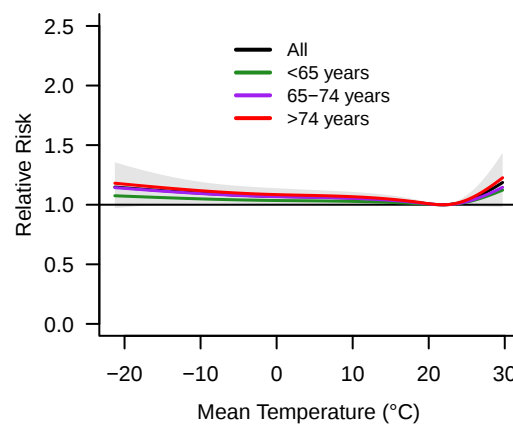
Layton (UT) – USA



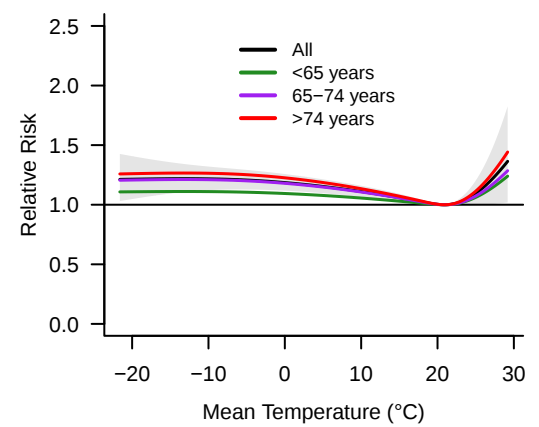
Dallas (TX) – USA



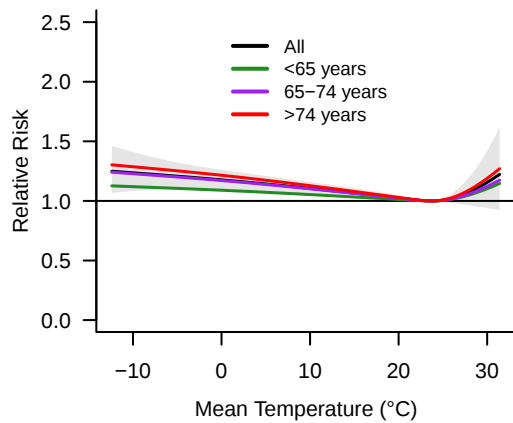
Denver (CO) – USA



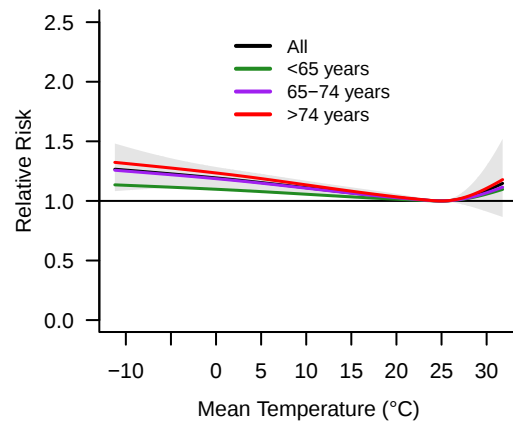
Beaver dam (WI) – USA



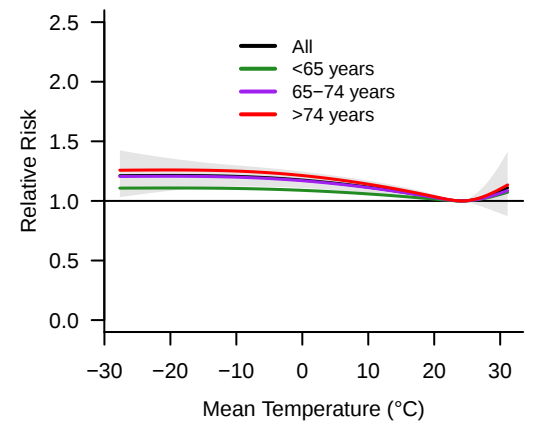
Dover (DE) – USA



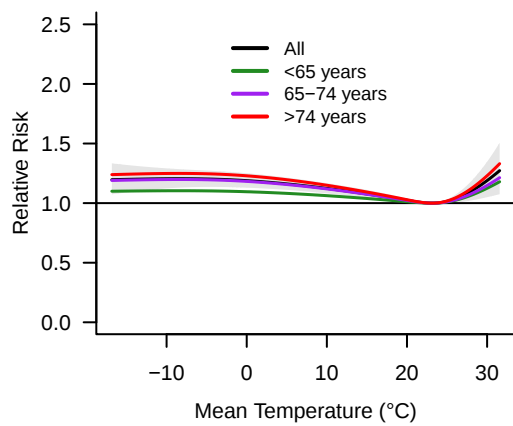
Durham (NC)– USA



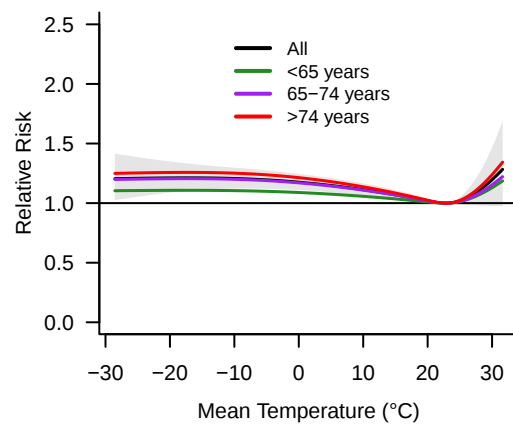
Des moines (IA) – USA



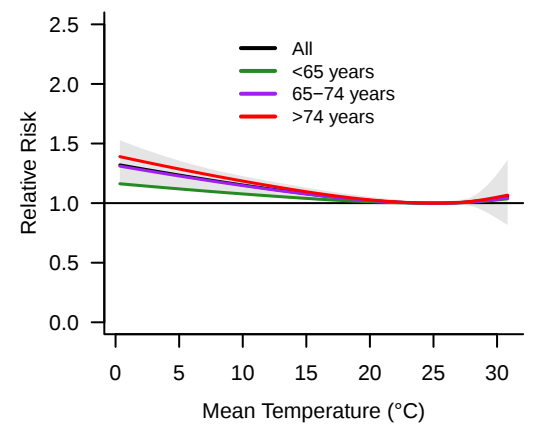
Detroit (MI)– USA



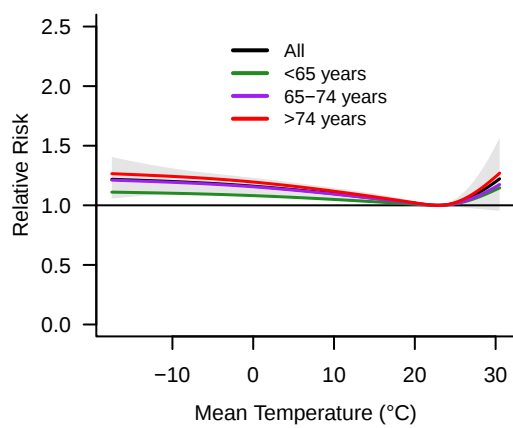
Davenport (IA) – USA



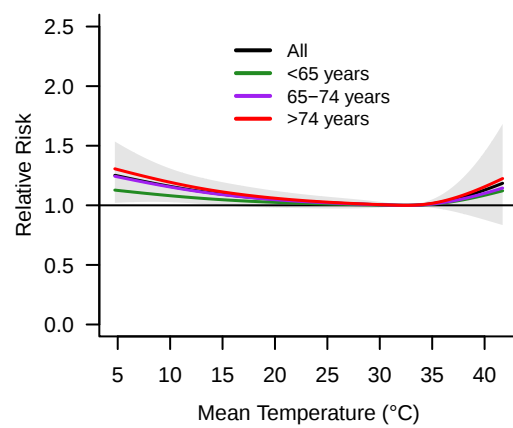
Daytona beach (FL) – USA



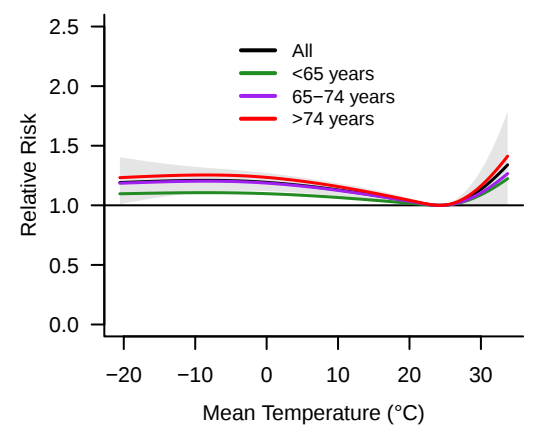
Dayton (OH) – USA



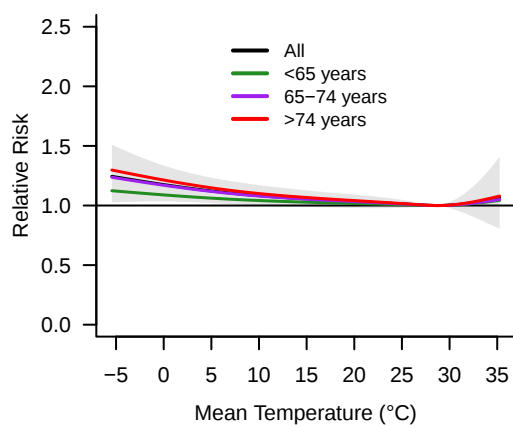
El centro (CA) – USA



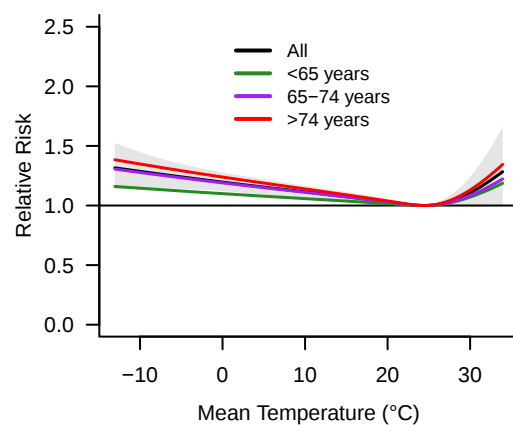
Elkhart (IN)– USA



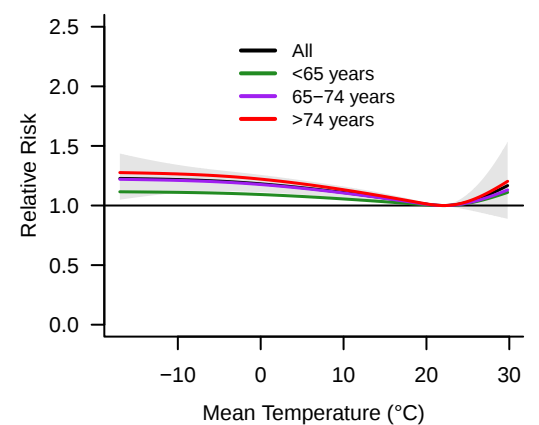
El paso (TX) – USA



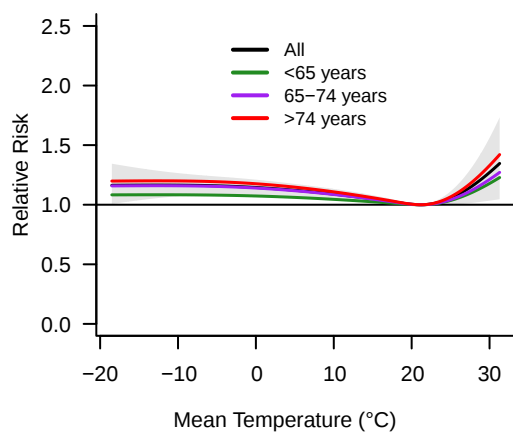
Elizabeth (NJ) – USA



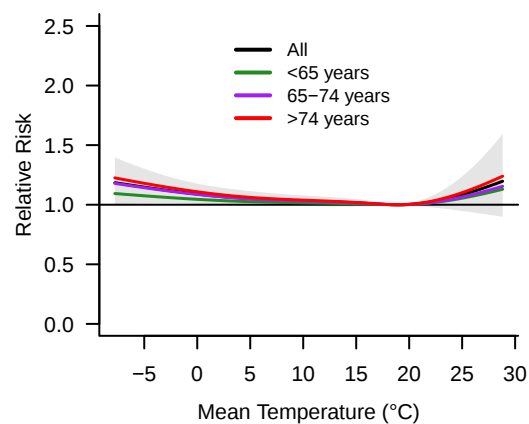
Erie (PA) – USA



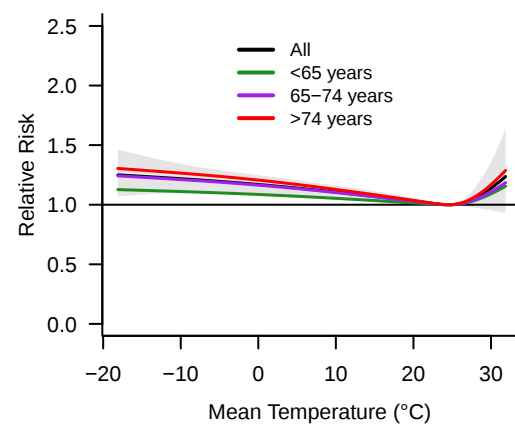
Essex (MA) – USA



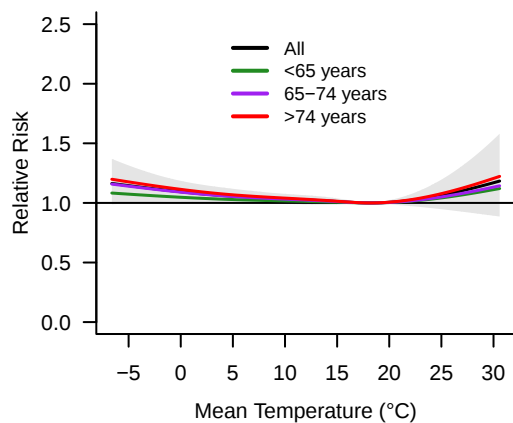
Eugene (OR) – USA



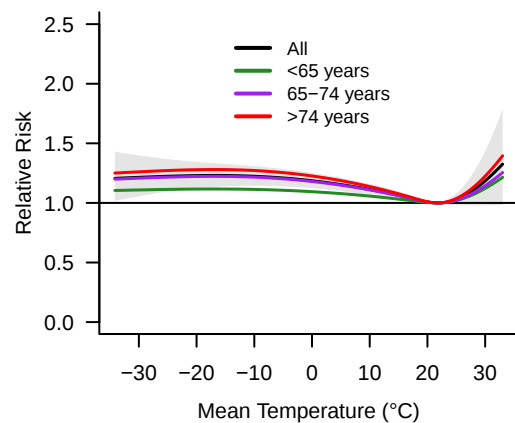
Evansville (IN) – USA



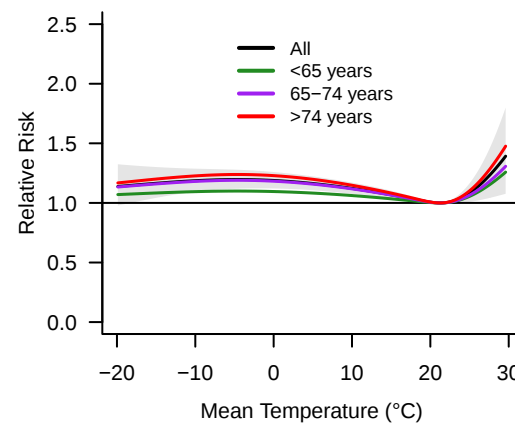
Everett (WA) – USA



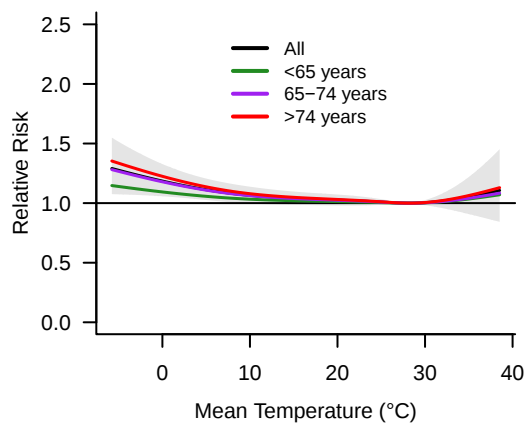
Fargo (ND) – USA



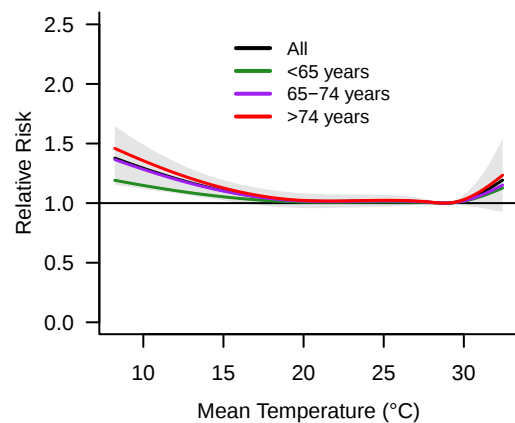
Flint (MI) – USA



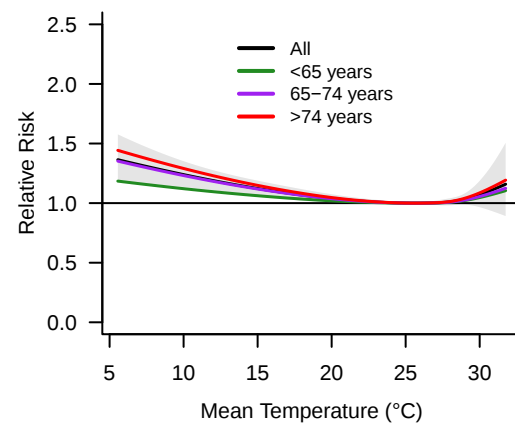
Fresno (CA) – USA



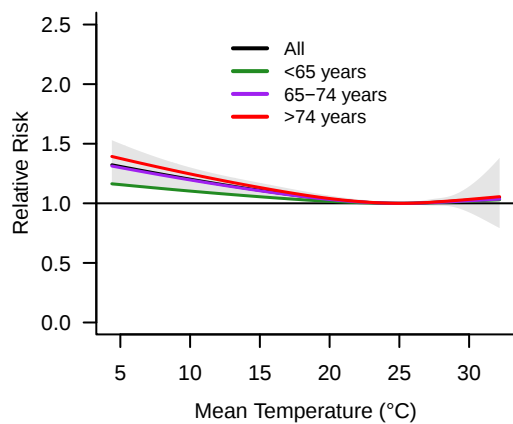
Fort lauderdale (FL) – USA



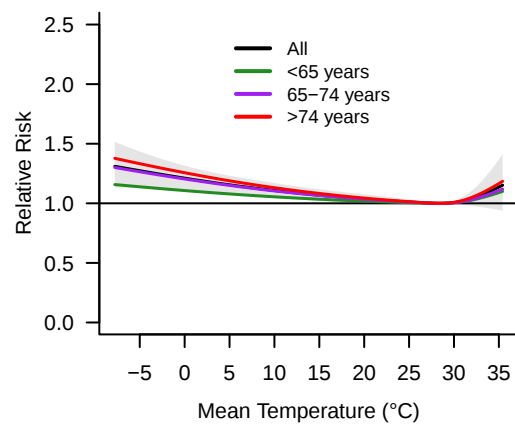
Fort myers (FL) – USA



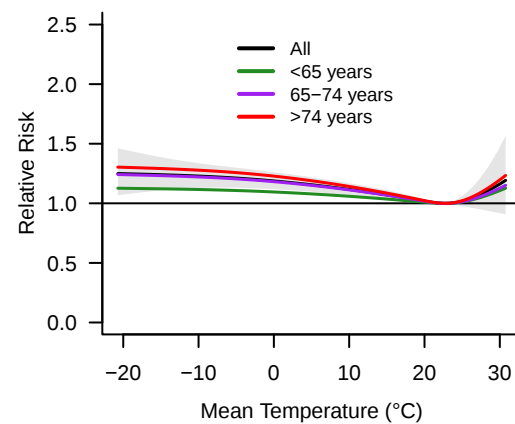
Fort pierce (FL) – USA



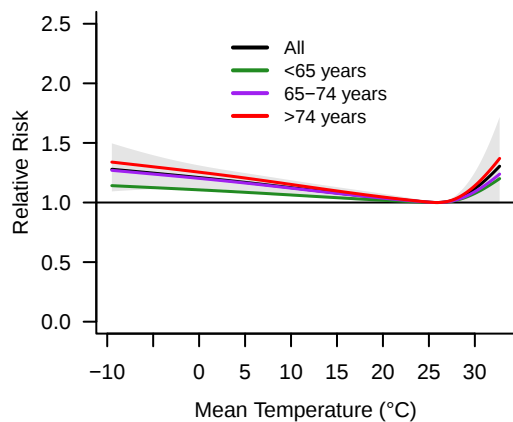
Fort worth (TX)- USA



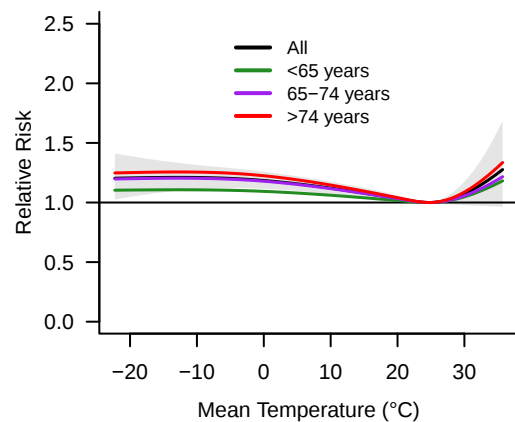
Fort wayne (IN) – USA



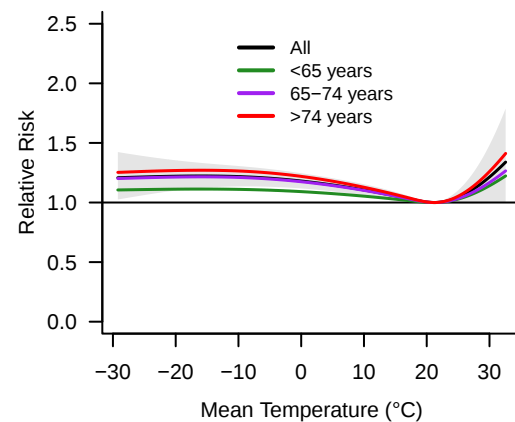
Fayetteville (NC) – USA



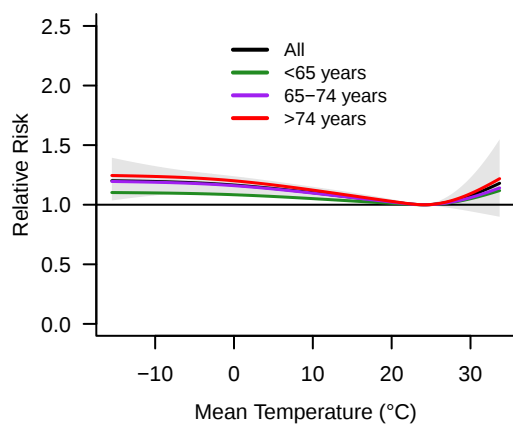
Gary (IN) – USA



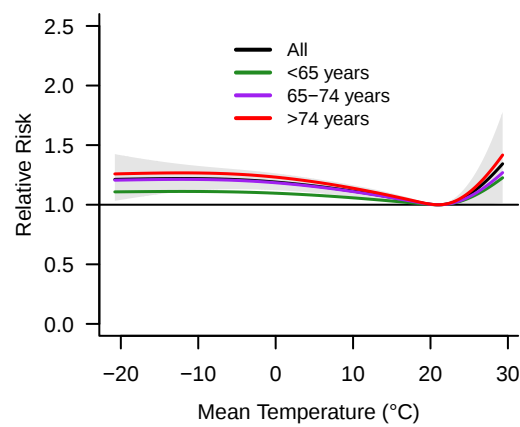
Green bay (WI) – USA



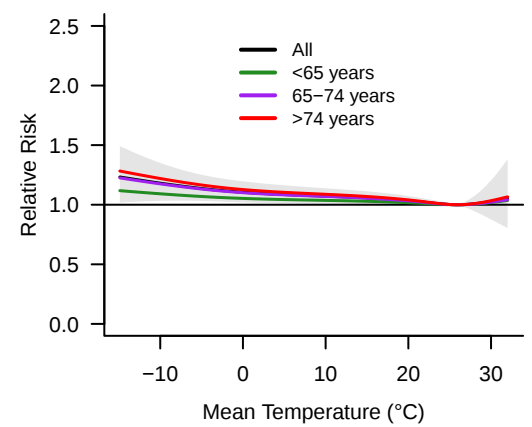
Greensburg (PA) – USA



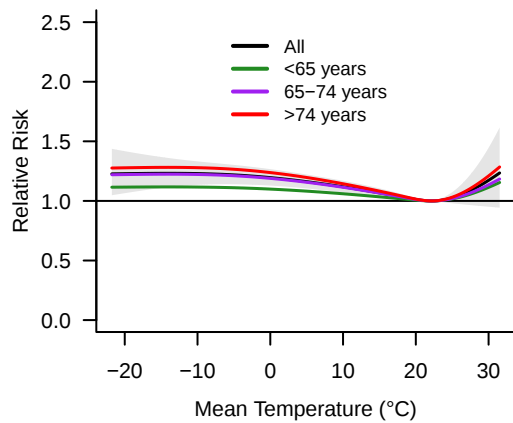
Grand haven (MI) – USA



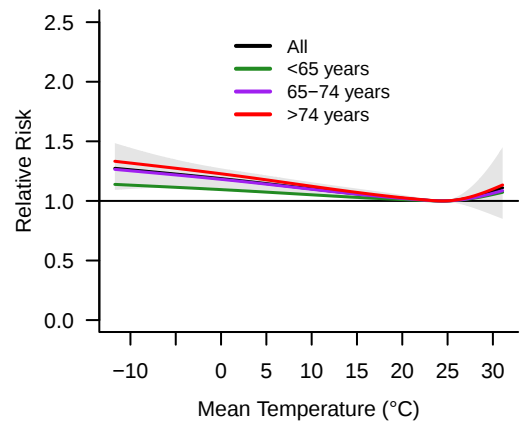
Grand junction (CO) – USA



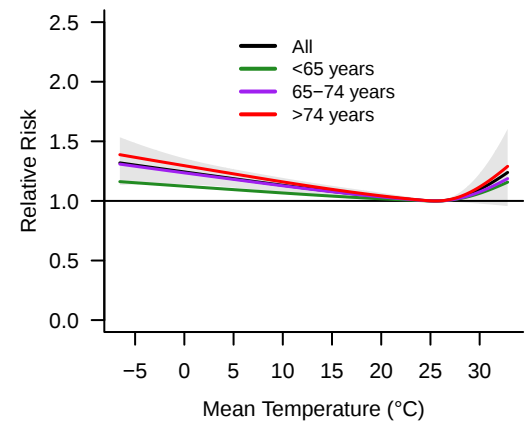
Grand rapids (MI) – USA



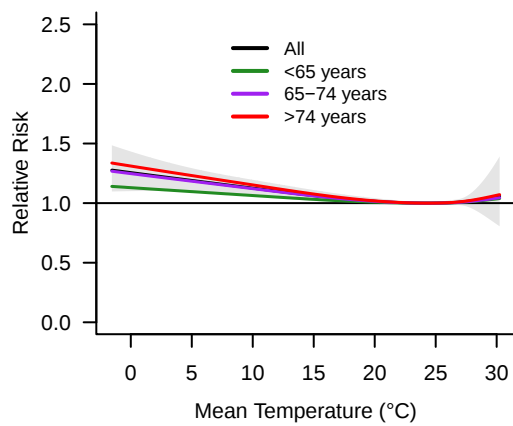
Greensboro (NC) – USA



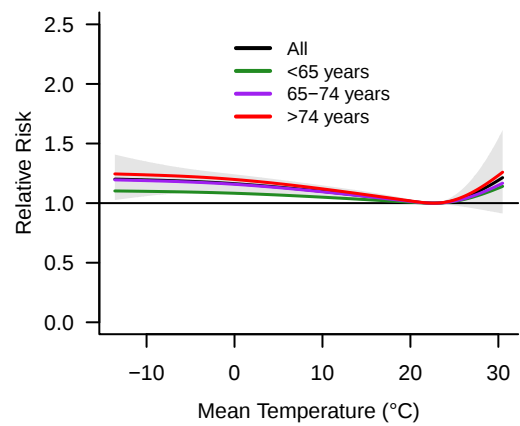
Greenville (SC) – USA



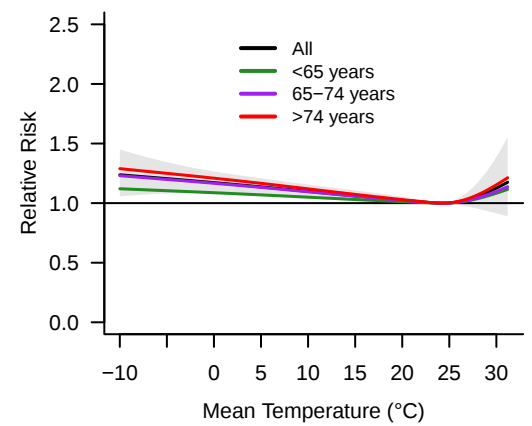
Gainesville (FL) – USA



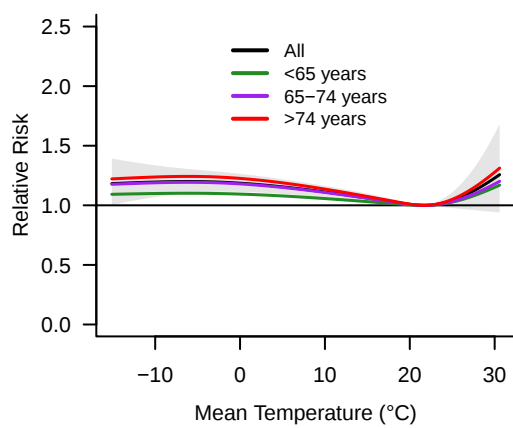
Gettysburg (PA) – USA



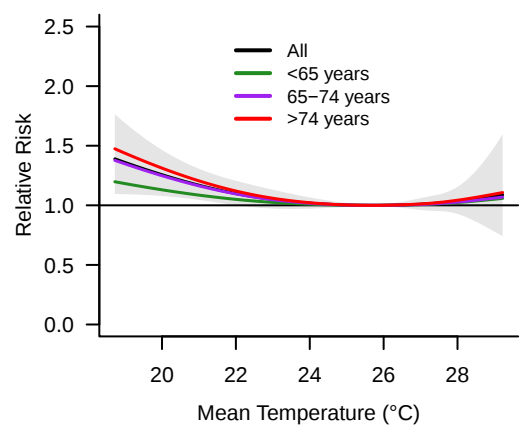
Hickory (NC) – USA



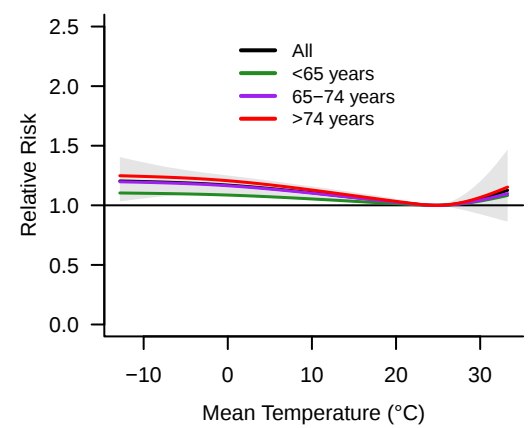
Holland (MI) – USA



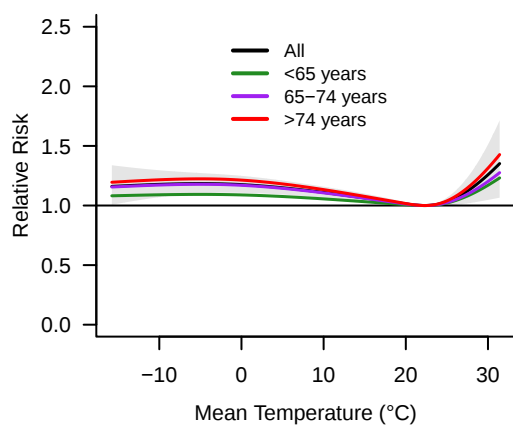
Honolulu (HI) – USA



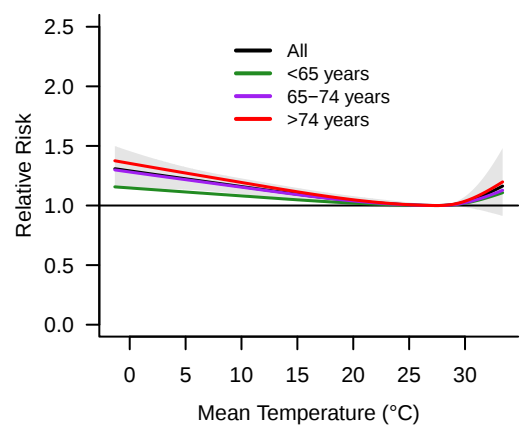
Harrisburg (PA) – USA



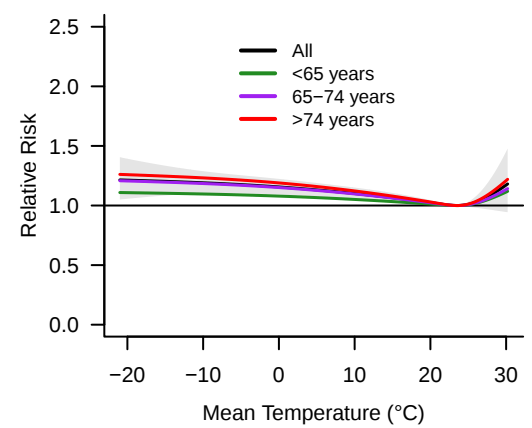
Hartford (CT) – USA



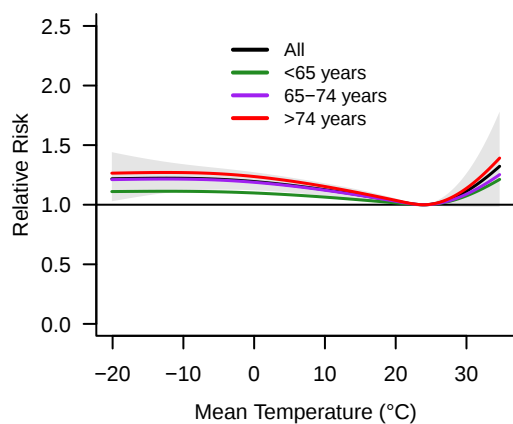
Houston (TX)– USA



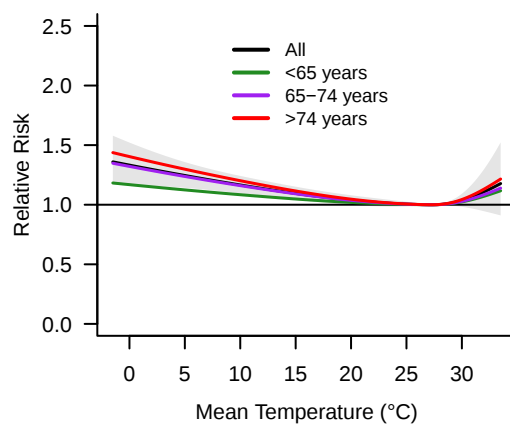
Indianapolis (IN) – USA



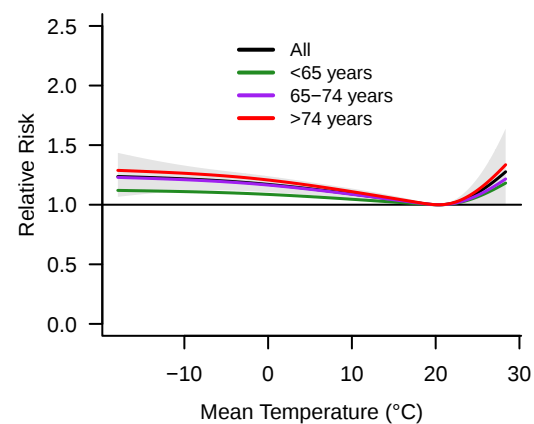
Iowa city (IA) – USA



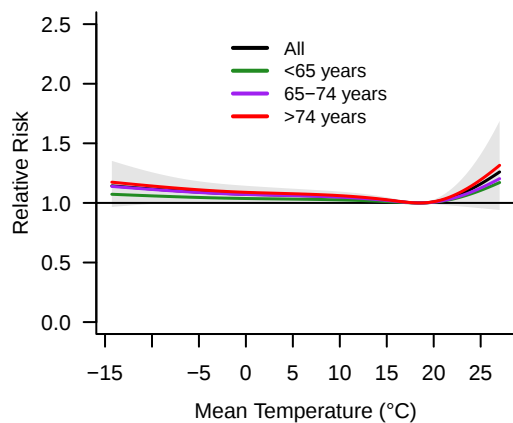
Jacksonville (FL) – USA



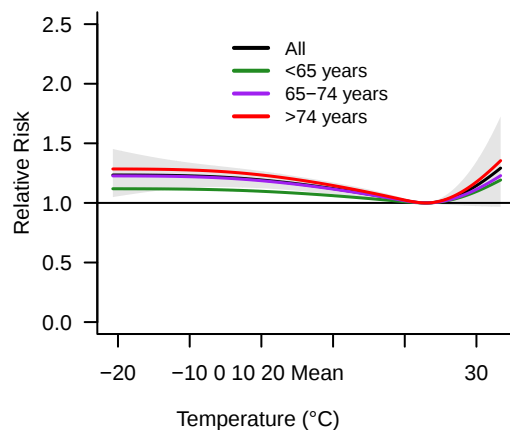
Jersey city (NJ) – USA



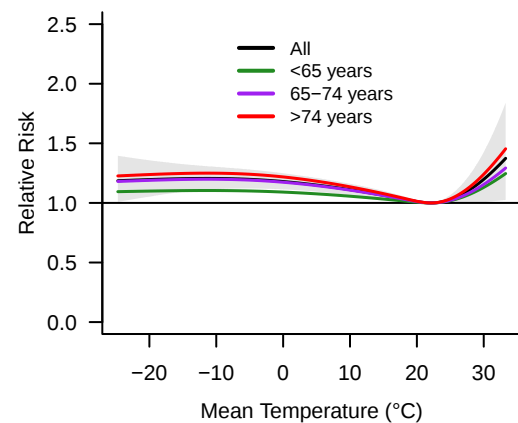
Klamath falls (OR) – USA



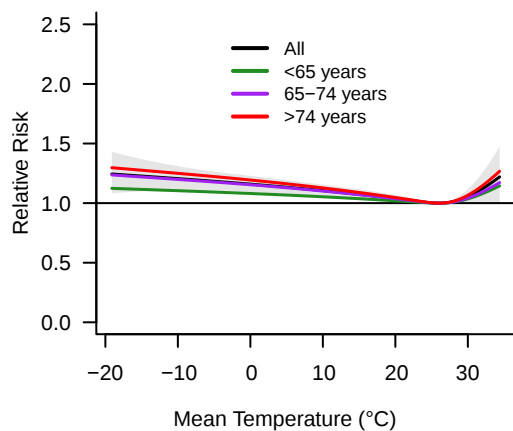
Kalamazoo (MI) – USA



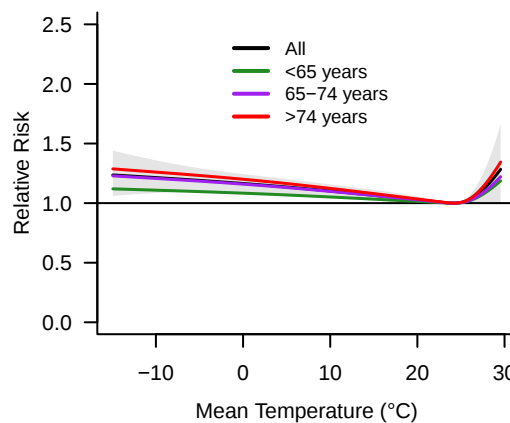
Kenosha (WI)– USA



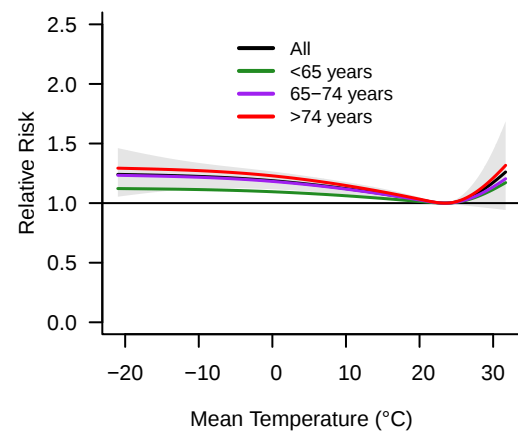
Kansas city (KS) – USA



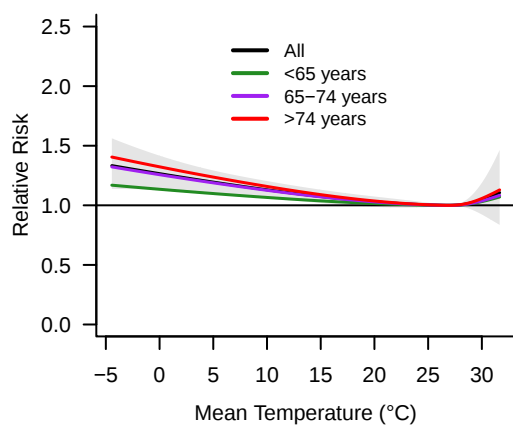
Knoxville (TN)– USA



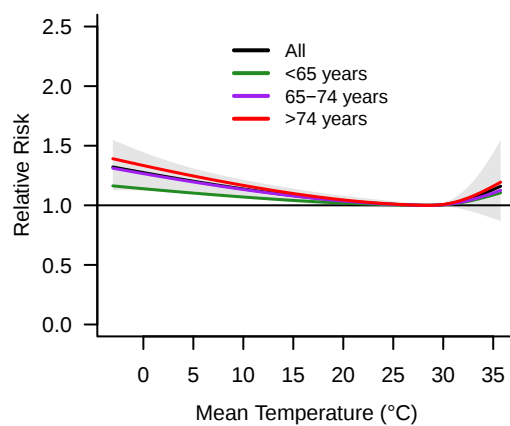
Lafayette (IN) – USA



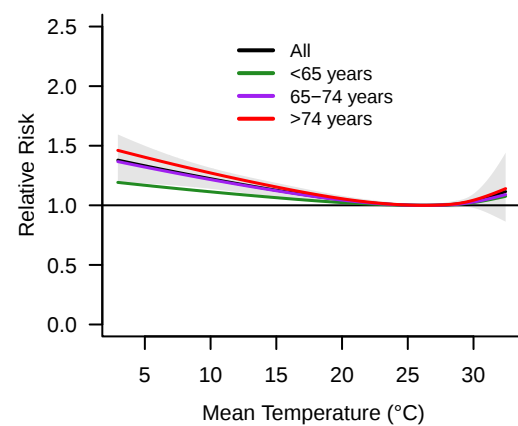
Lafayette (LA) – USA



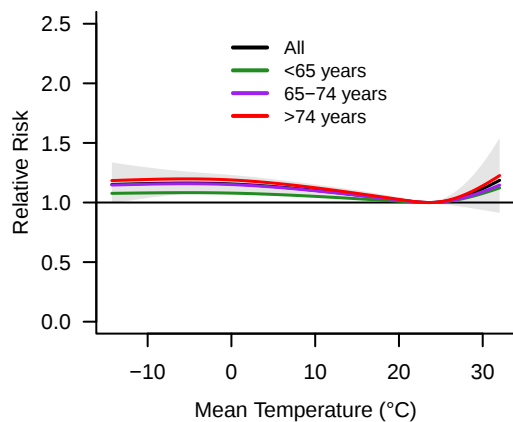
Lake charles (LA) – USA



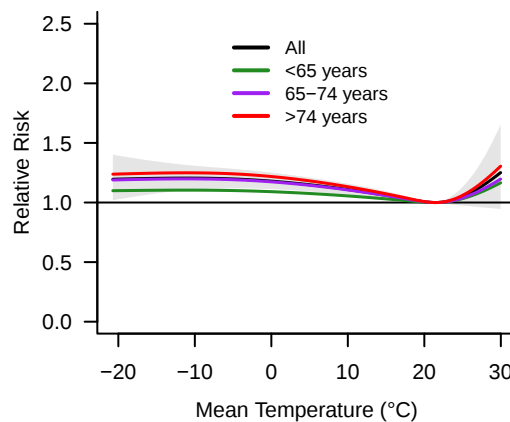
Lakeland (FL) – USA



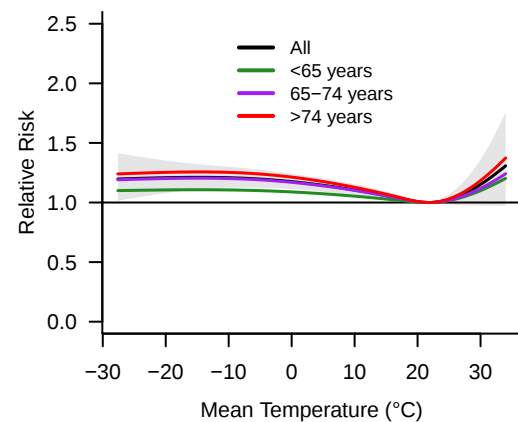
Lancaster (PA) – USA



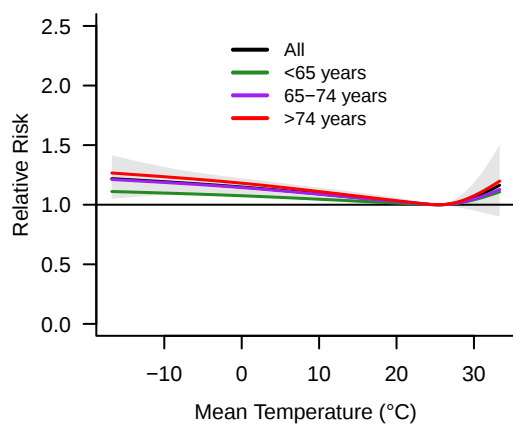
Lansing (MI) – USA



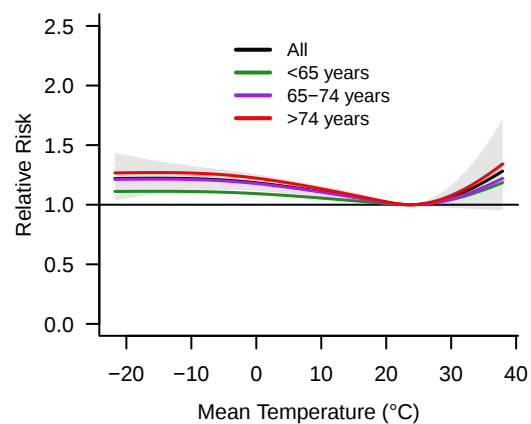
Logan (UT) – USA



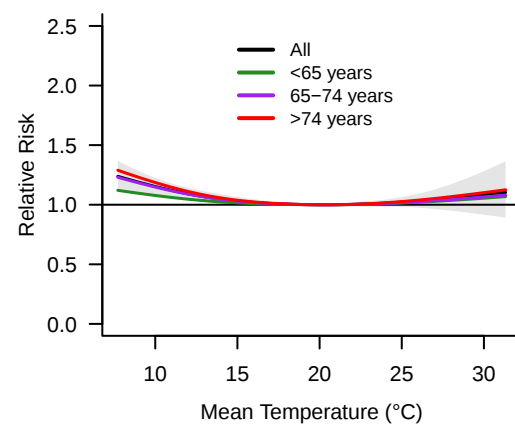
Louisville (KY) – USA



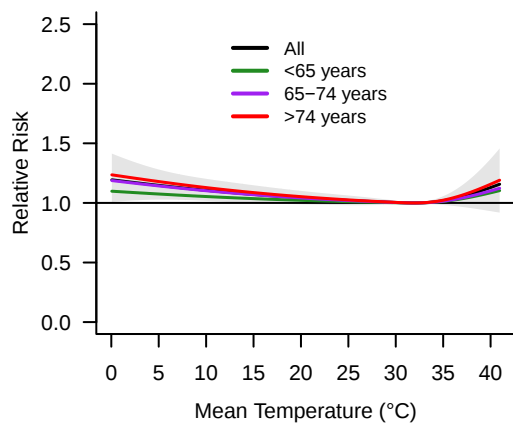
La porte (IN) – USA



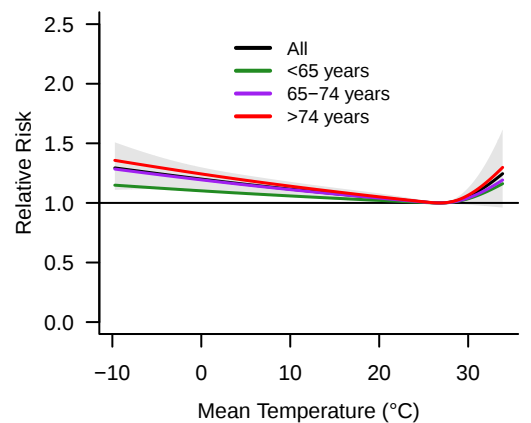
Los angeles (CA) – USA



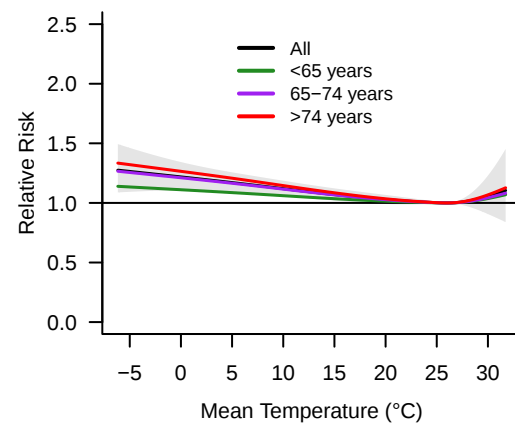
Las vegas (NV) – USA



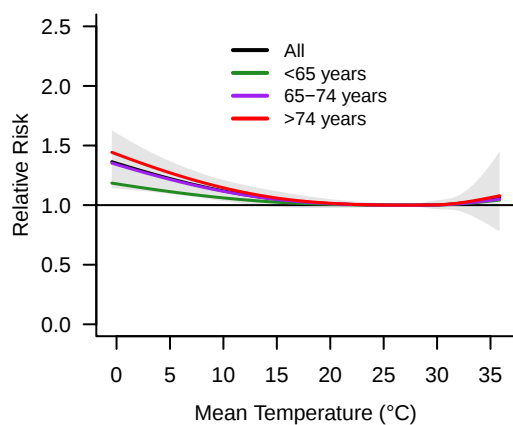
Little rock (AR) – USA



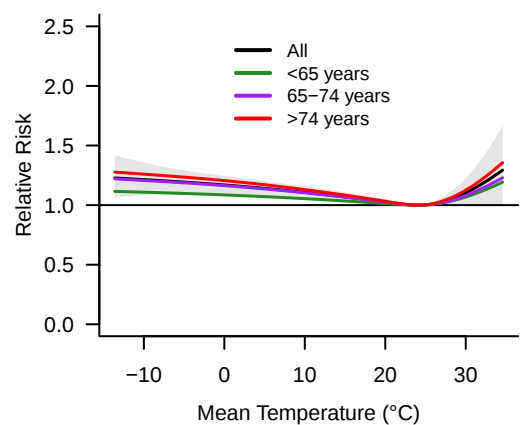
Macon (GA) – USA



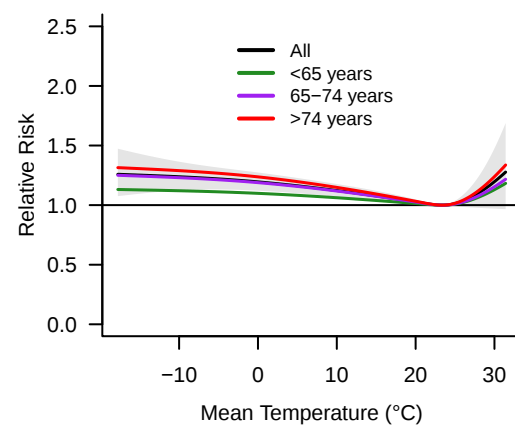
Mcallen (TX) – USA



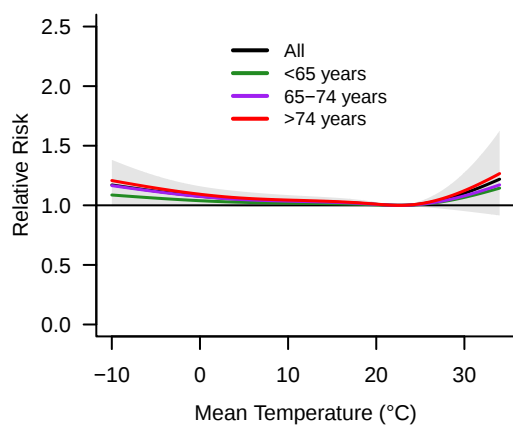
Middlesex (NJ) – USA



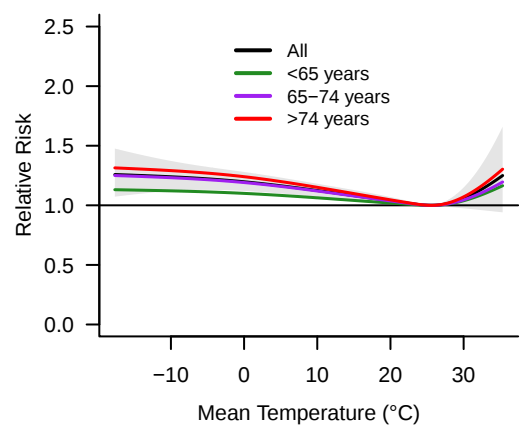
Middletown (OH) – USA



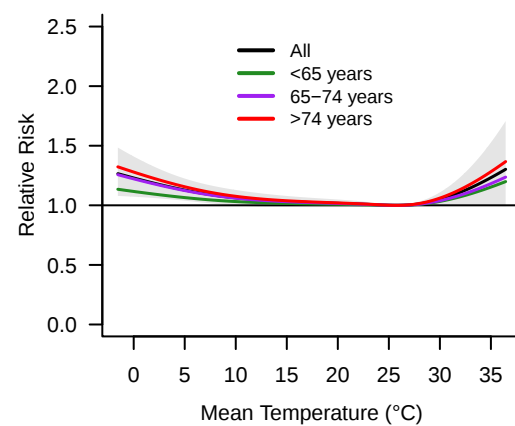
Medford (OR) – USA



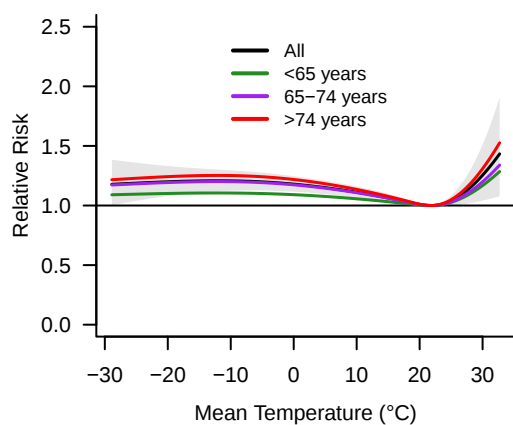
Madison (IL) – USA



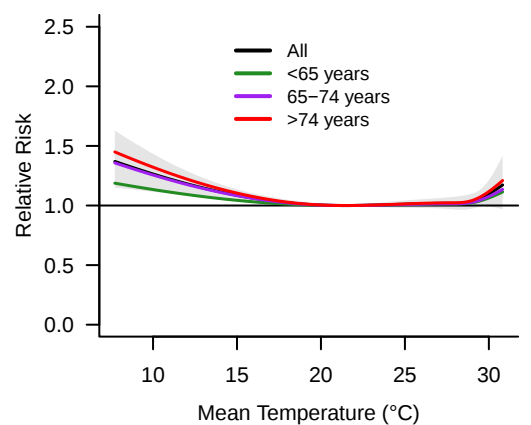
Modesto (CA) – USA



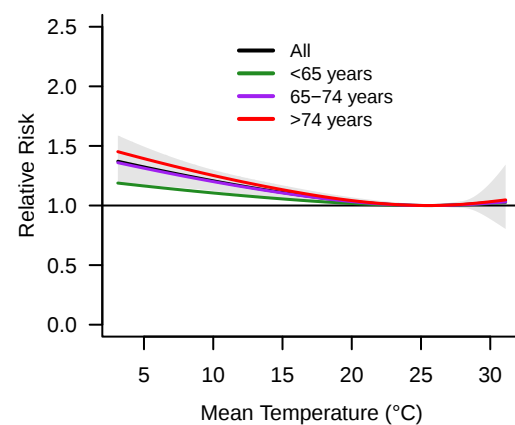
Madison (WI) – USA



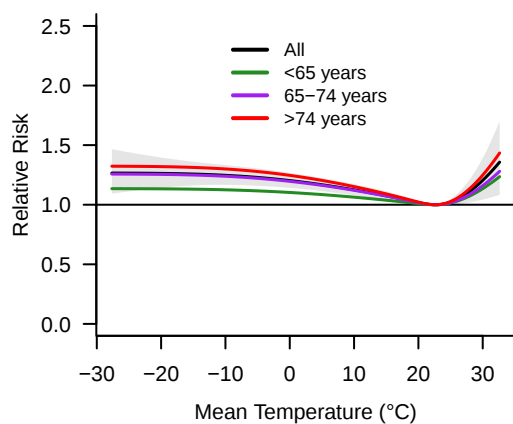
Miami (FL) – USA



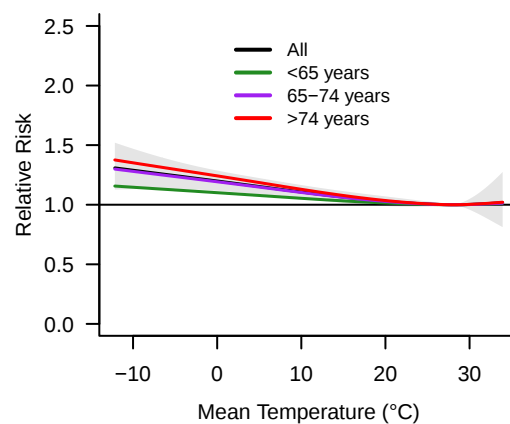
Melbourne (FL) – USA



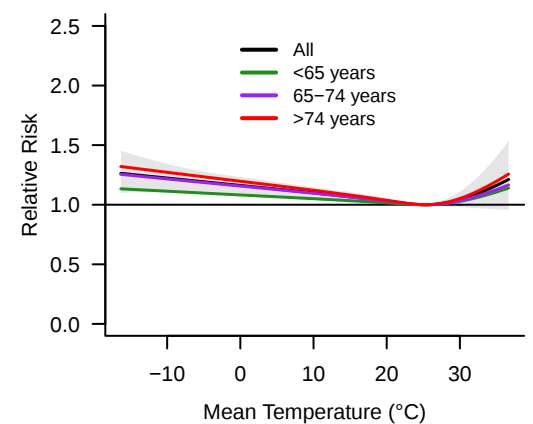
Milwaukee (WI) – USA



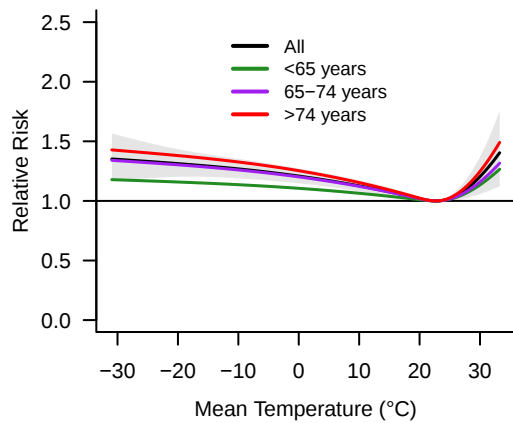
Memphis (TN) – USA



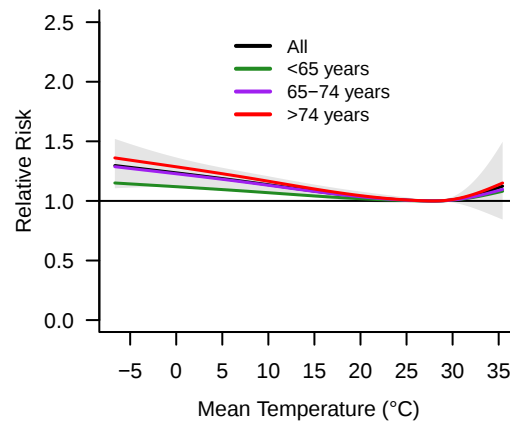
Toms river (NJ) – USA



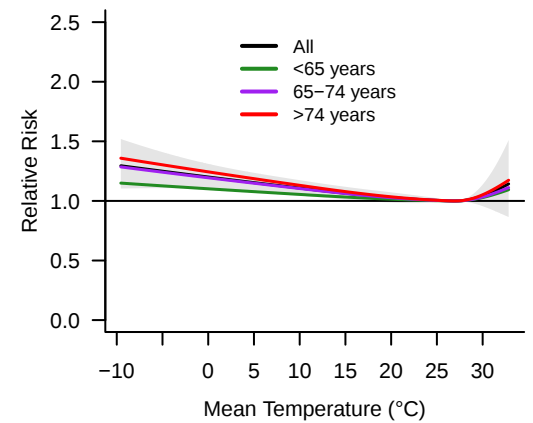
Minneapolis (MN) – USA



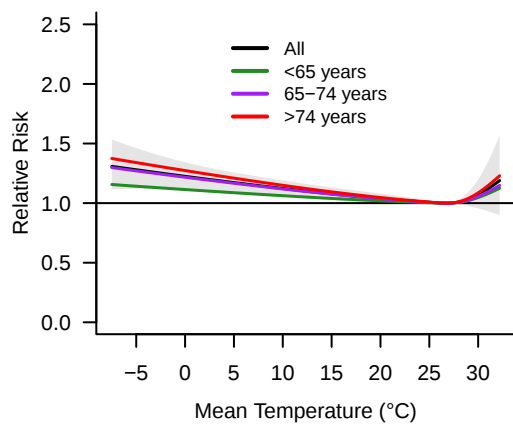
Montgomery (AL) – USA



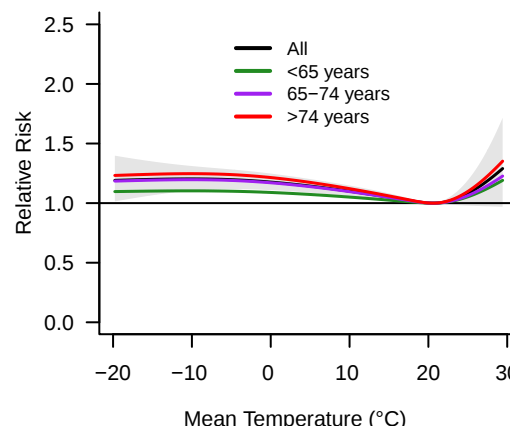
Mobile (AL) – USA



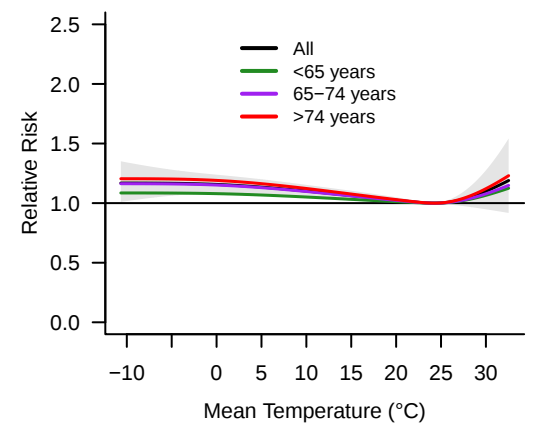
Monroe (LA) – USA



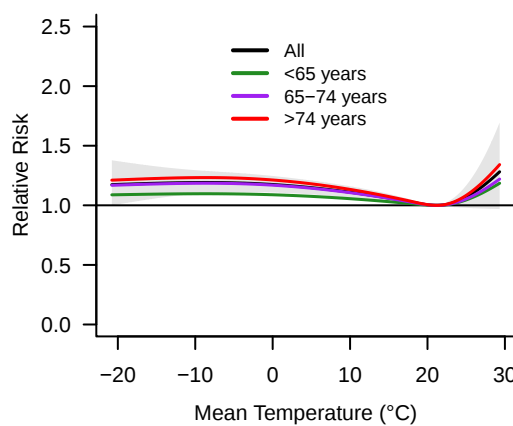
Mercer (PA) – USA



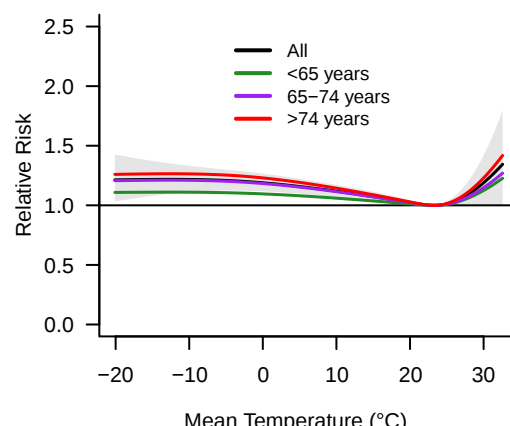
Upper marlboro (MD) – USA



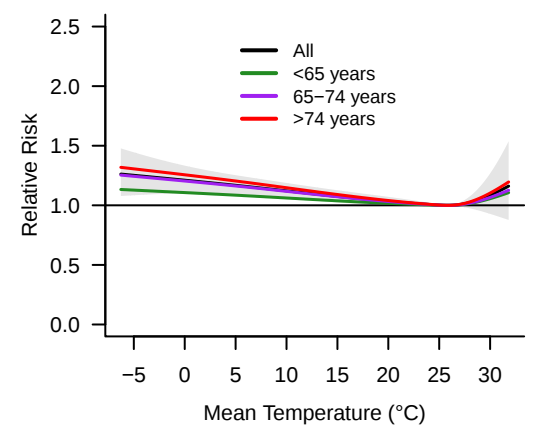
Muskegon (MI) – USA



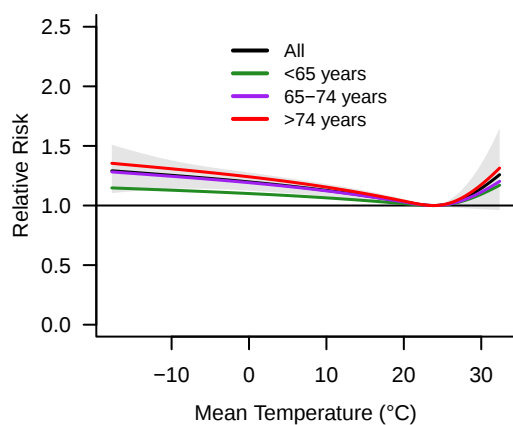
Muncie (IN) – USA



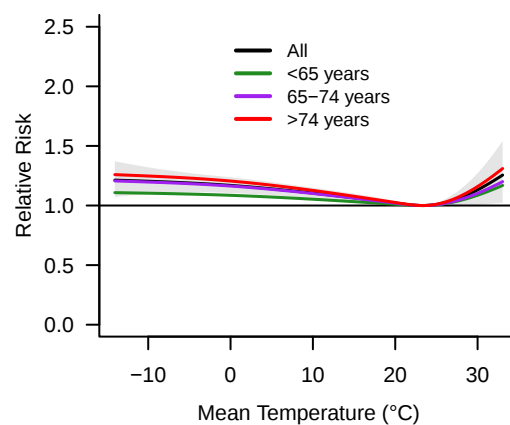
Myrtle beach (SC) – USA



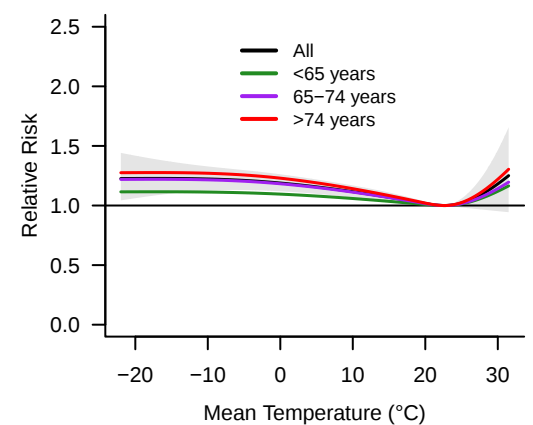
Nashua (NH)– USA



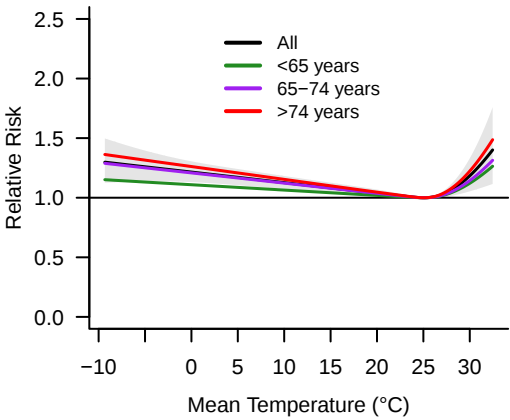
Melville (NY) – USA



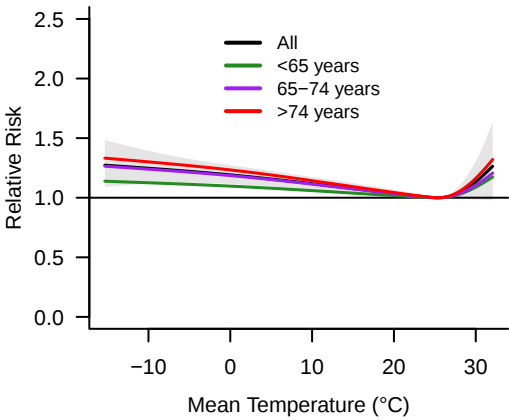
Niles (MI) – USA



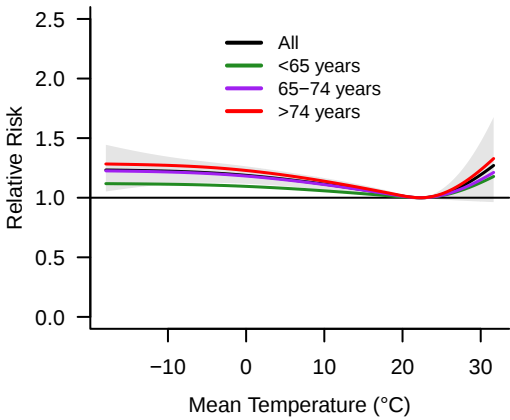
Norfolk (VA) – USA



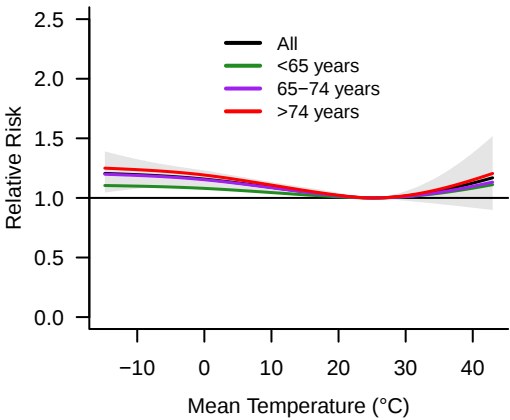
Nashville (TN) – USA



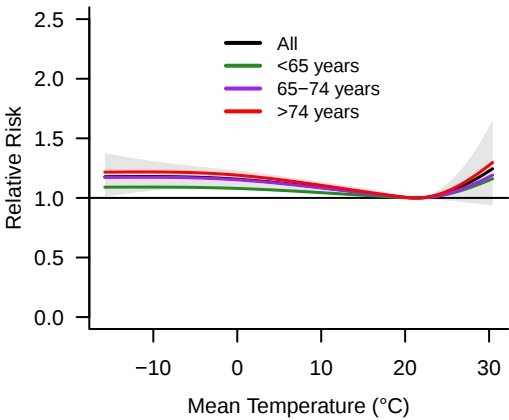
Newburgh (NY) – USA



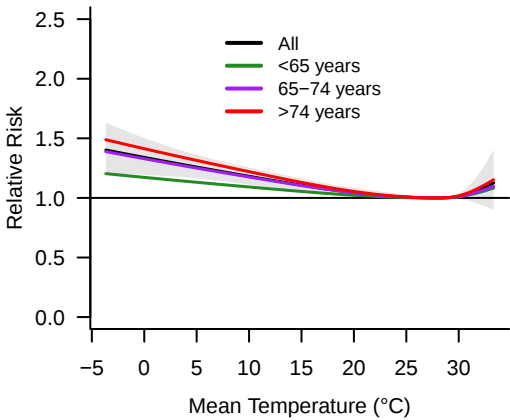
New haven (CT) – USA



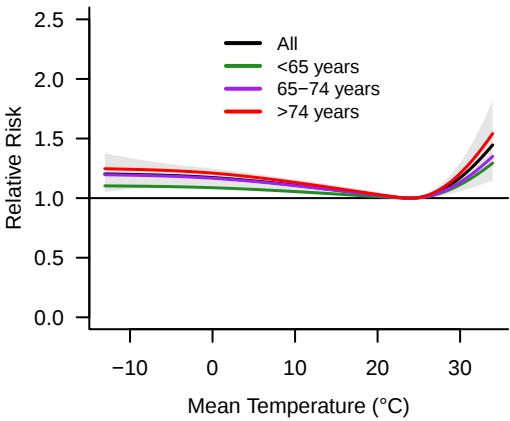
New london (CT) – USA



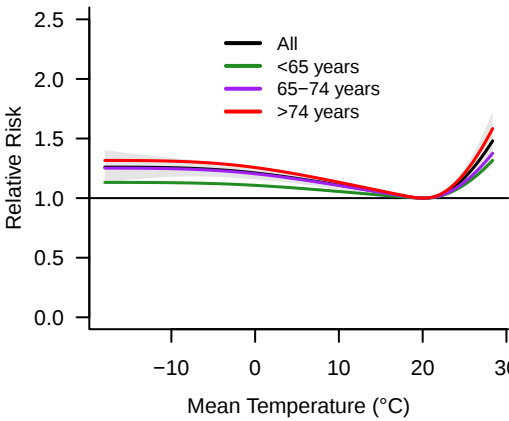
New orleans (LA) – USA



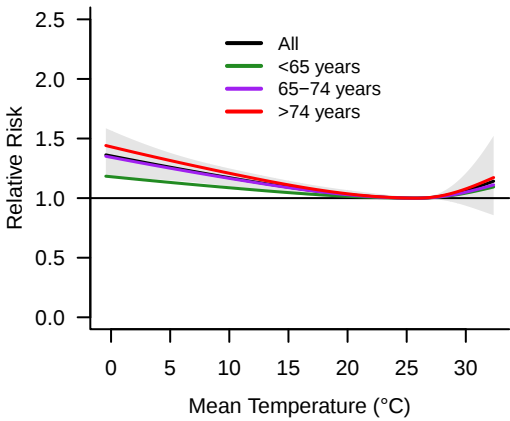
Newark (NJ) – USA



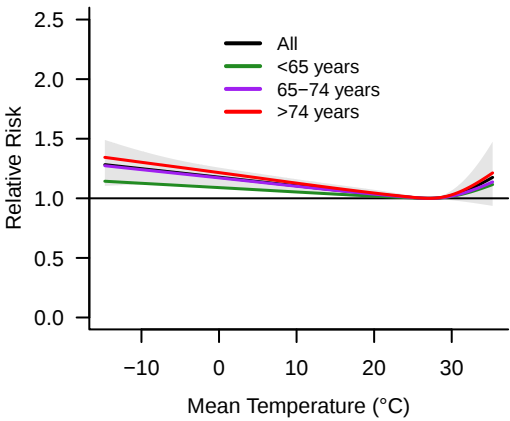
New york (NY) – USA



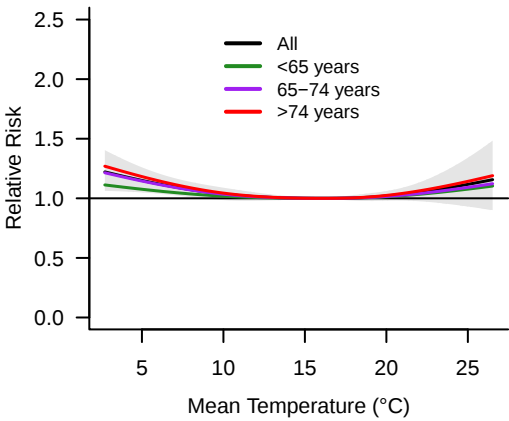
Ocala (FL) – USA



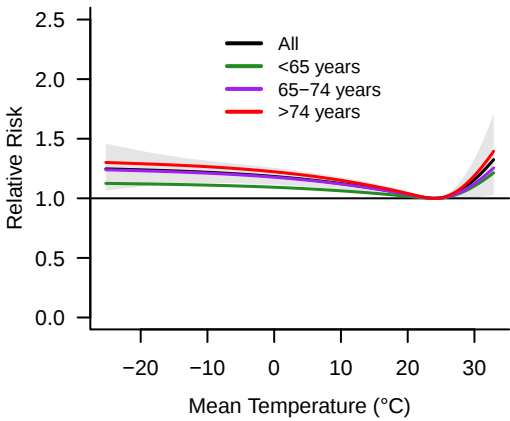
Oklahoma city (OK) – USA



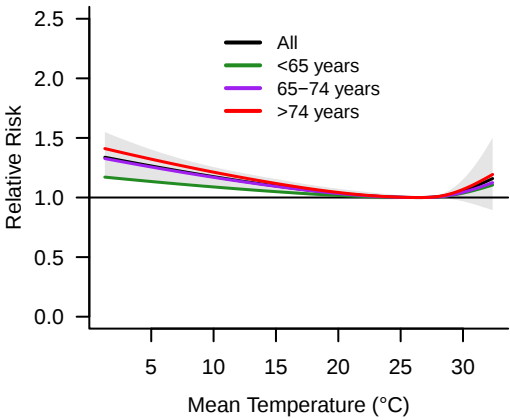
Oakland (CA)– USA



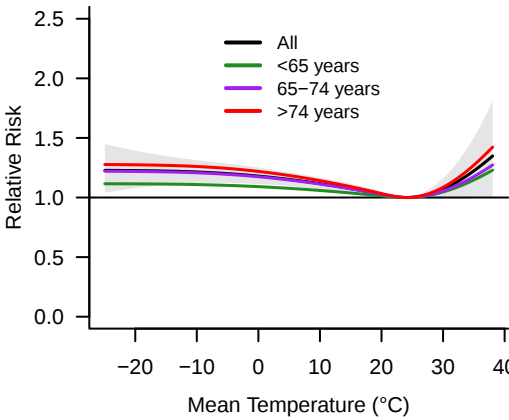
Omaha (NE) – USA



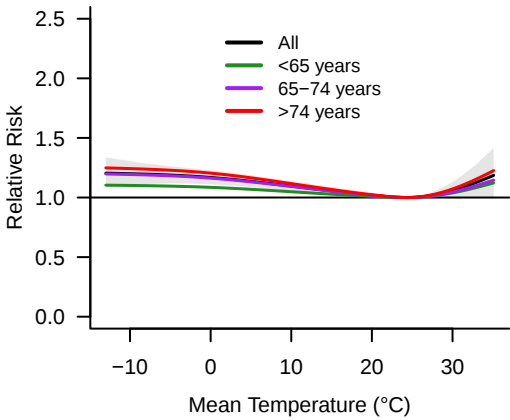
Orlando (FL)– USA



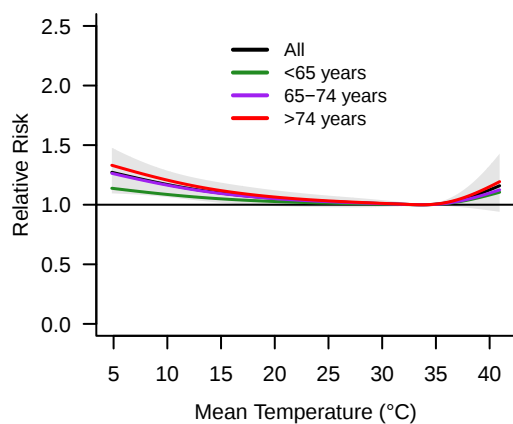
Ottawa (IL)– USA



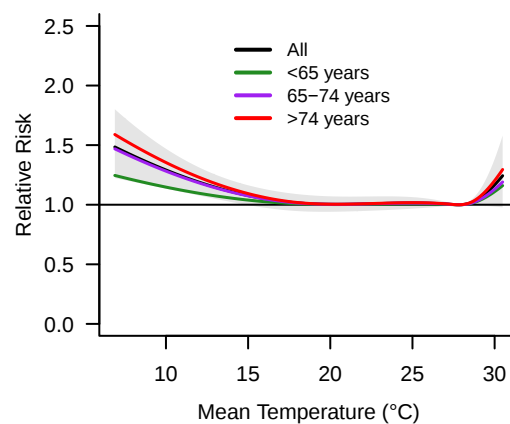
Philadelphia (PA) – USA



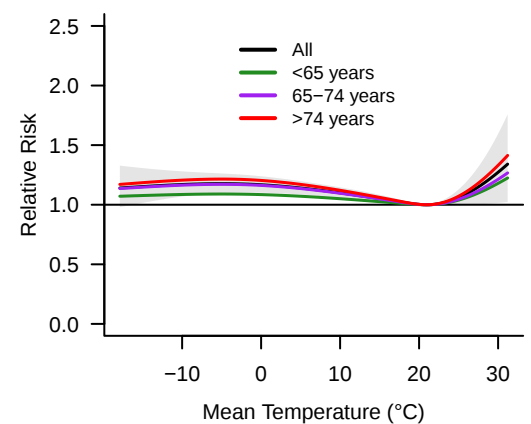
Phoenix (AZ) – USA



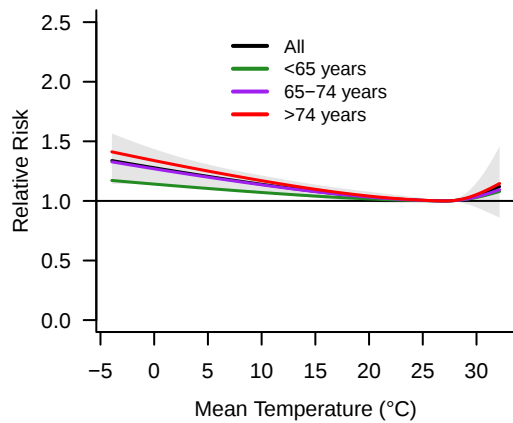
Palm beach (FL) – USA



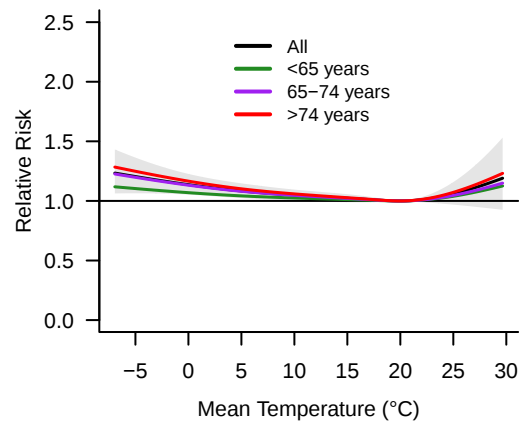
Plymouth (MA) – USA



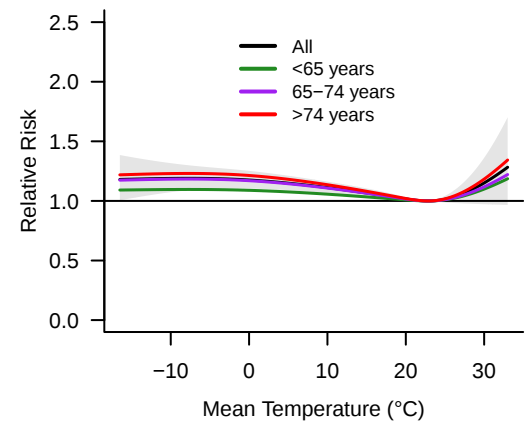
Pensacola (FL) – USA



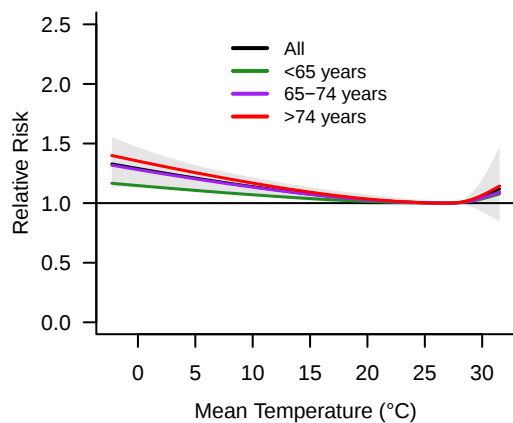
Portland (OR) – USA



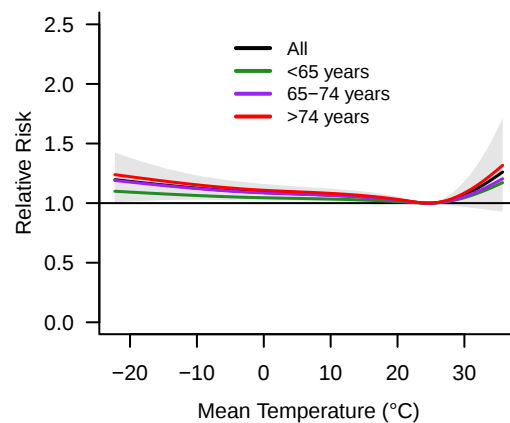
Provo (UT) – USA



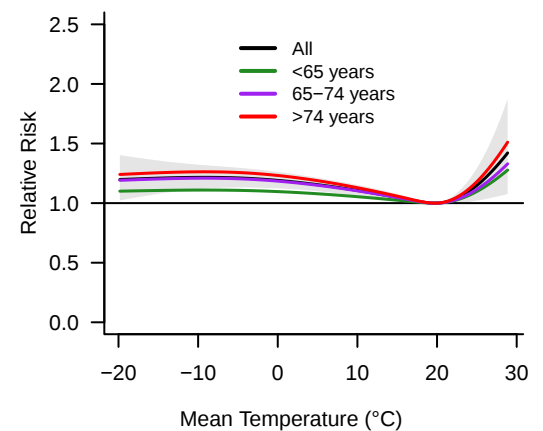
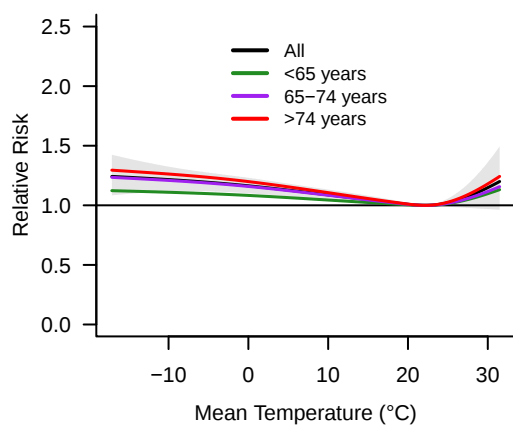
Port arthur (TX) – USA



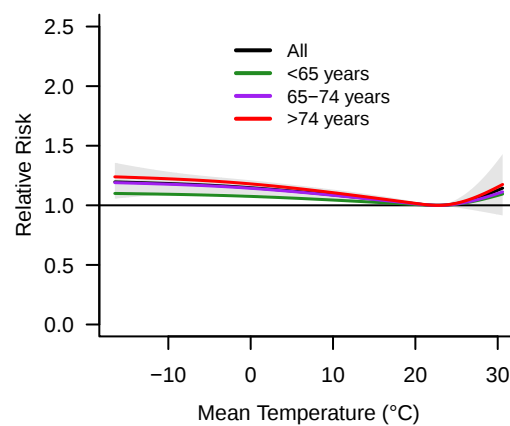
Portage (IN) – USA



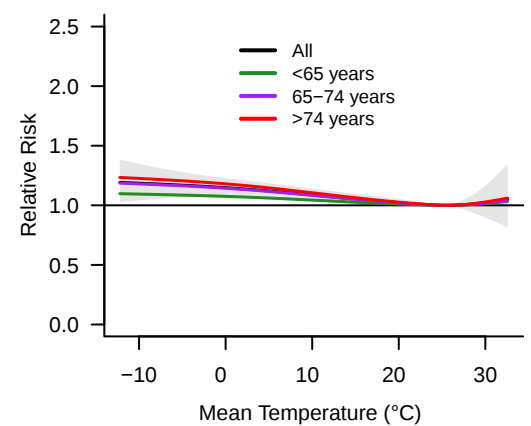
Portland (ME) – USA

**Providence (RI) – USA**

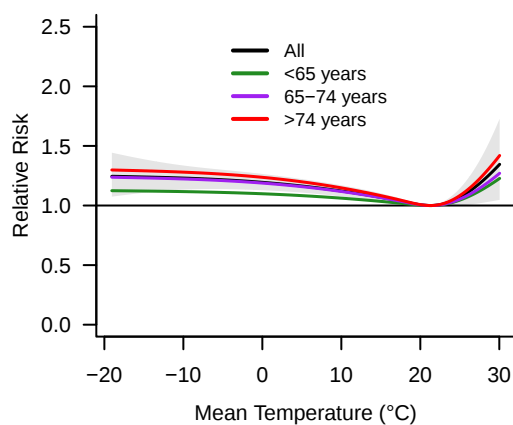
Pittsburgh (PA) – USA



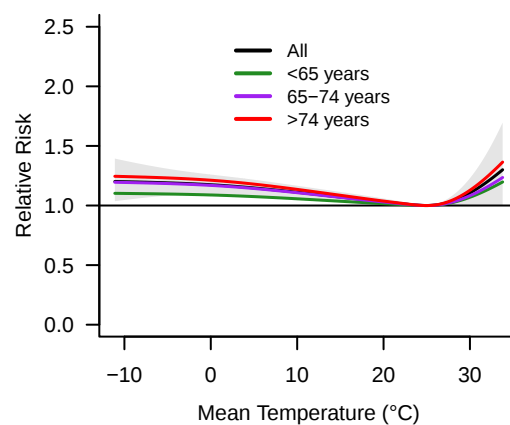
Richmond (VA) – USA



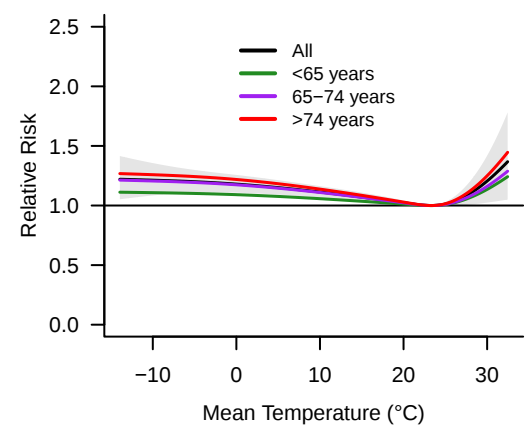
Rochester (NY) – USA



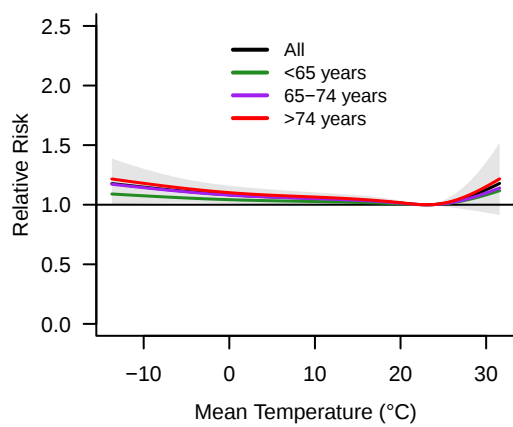
Rockville (MD) – USA



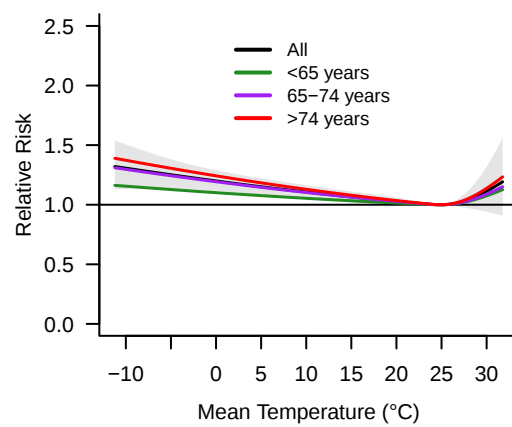
Reading (PA)– USA



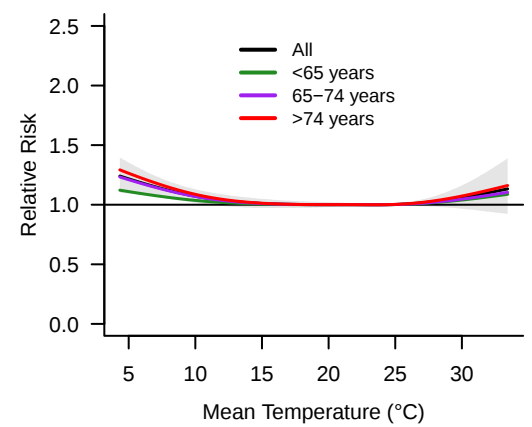
Reno (NV) – USA



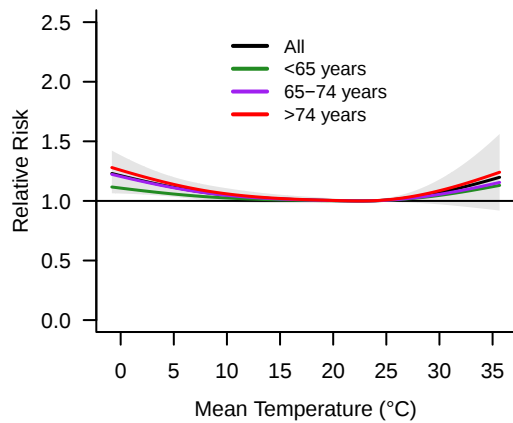
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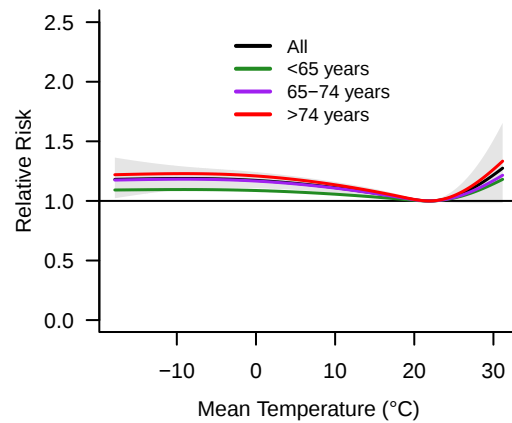
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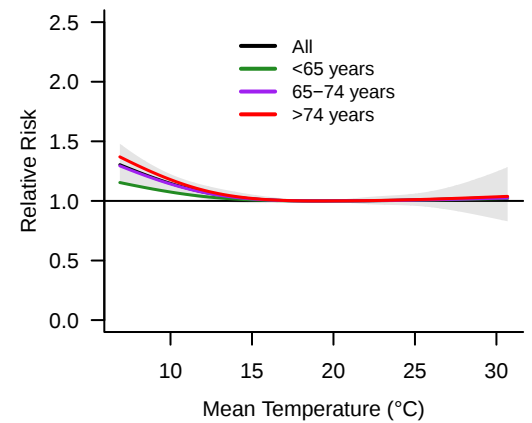
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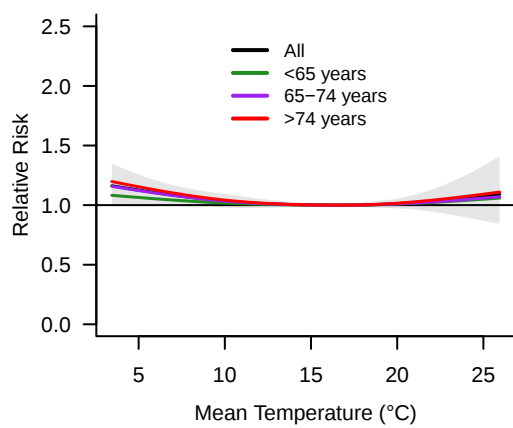
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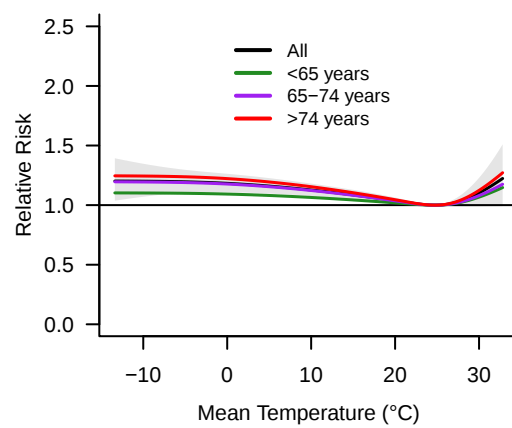
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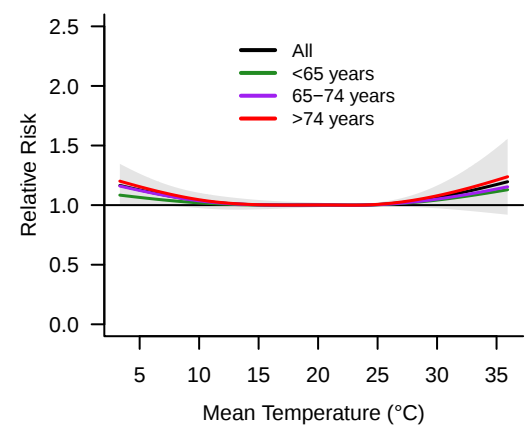
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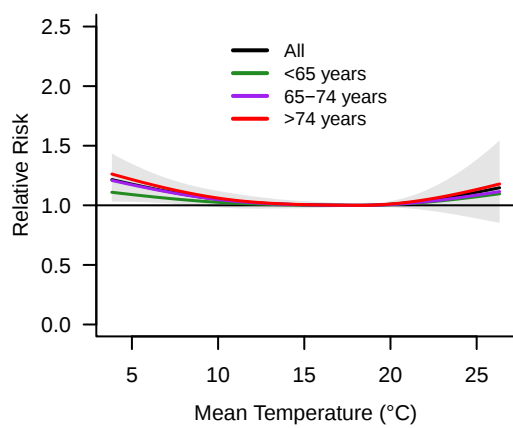
Salt Lake City (UT) – USA



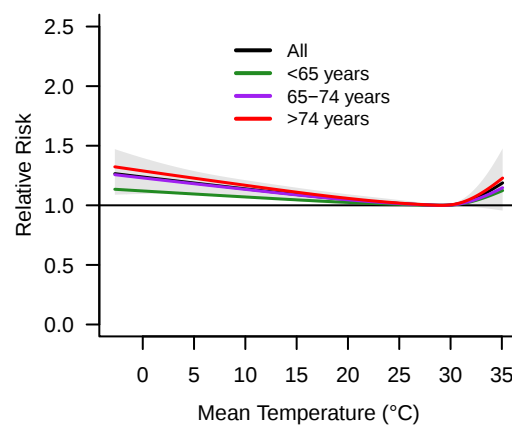
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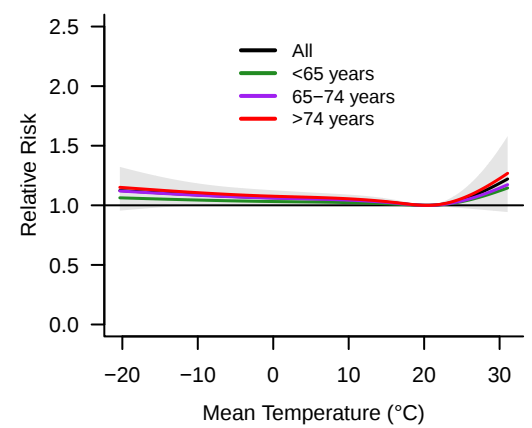
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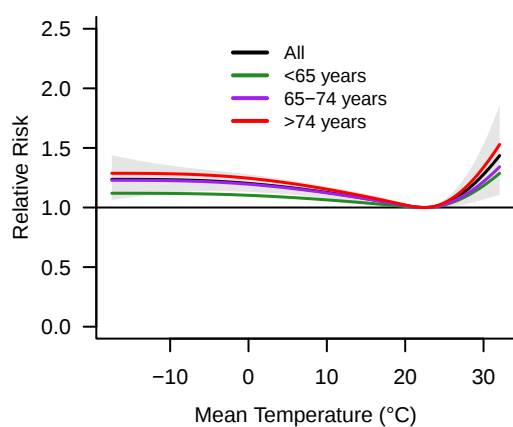
San Antonio (TX) – USA



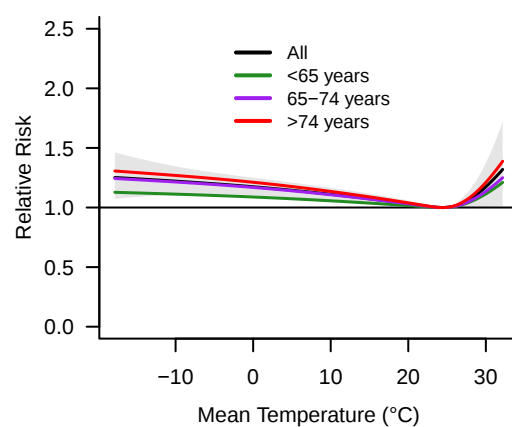
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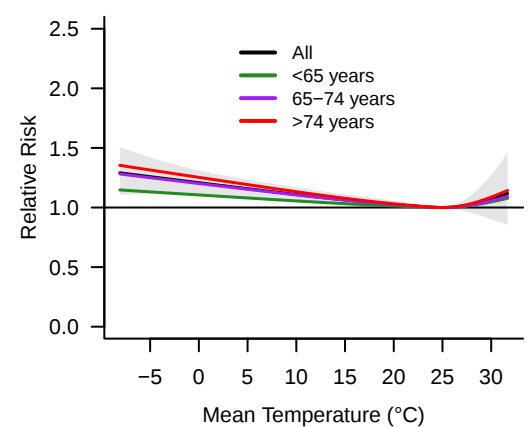
Springfield (MA)– USA



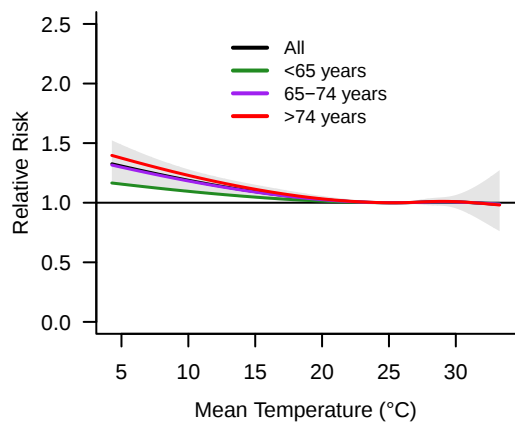
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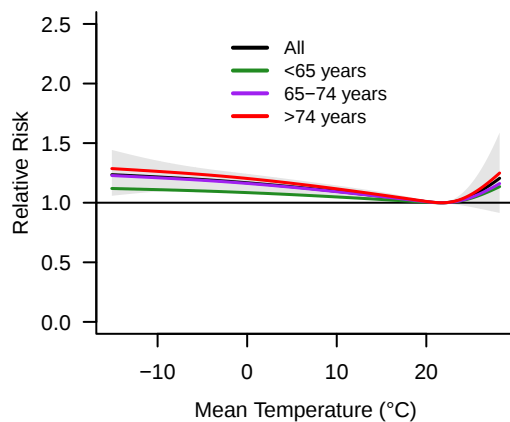
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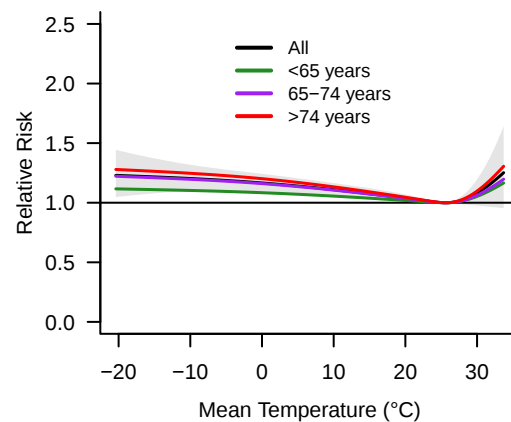
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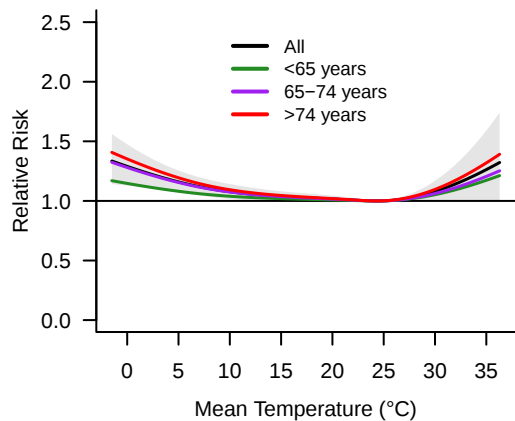
Steubenville (OH) – USA



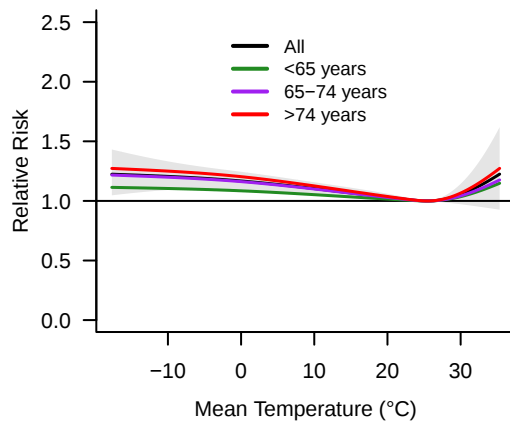
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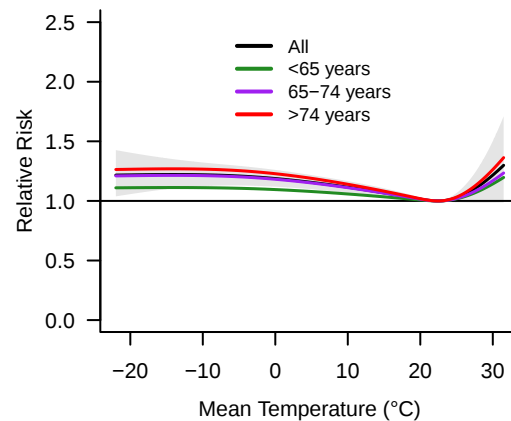
Stockton (CA) – USA



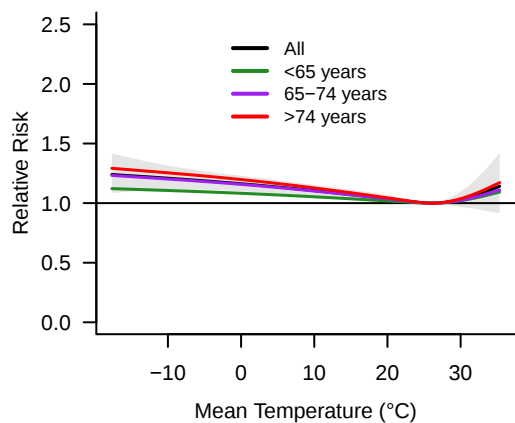
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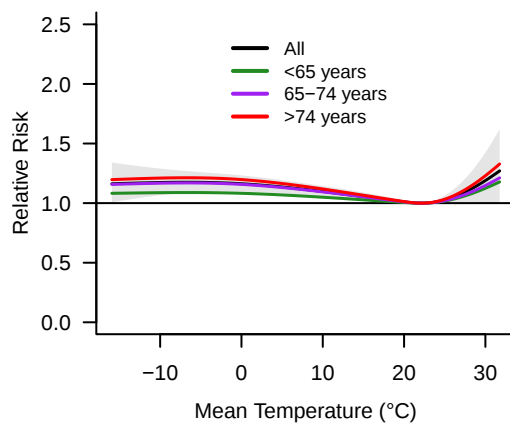
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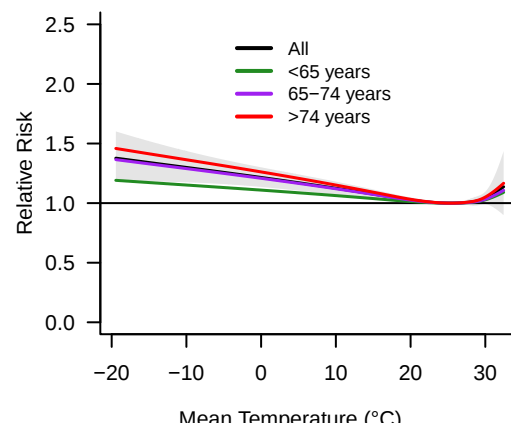
St. Louis (MO) – USA



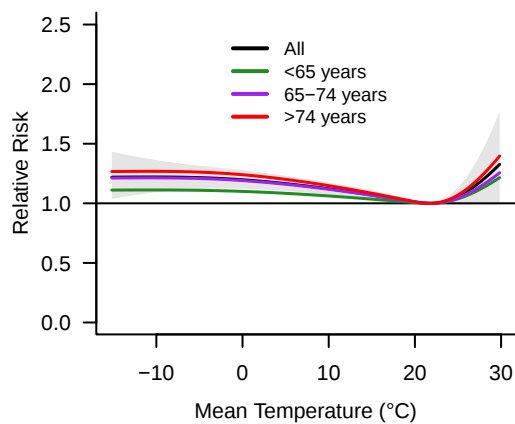
Stamford (CT) – USA



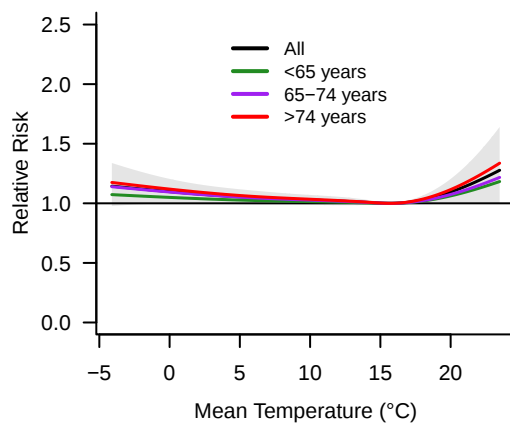
St. Petersburg (FL) – USA



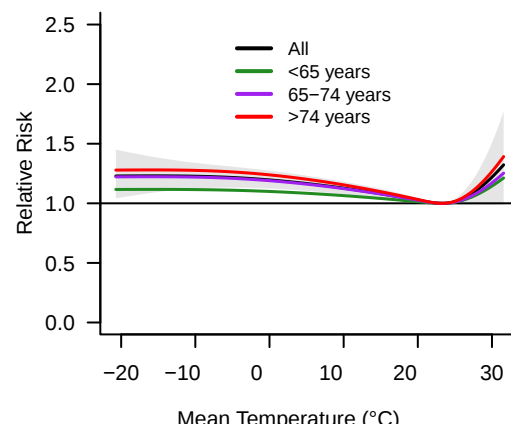
State College (PA) – USA



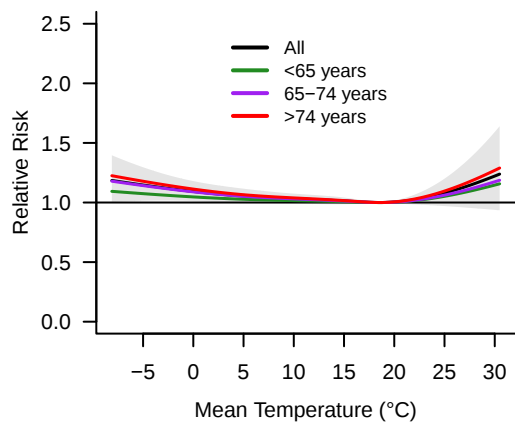
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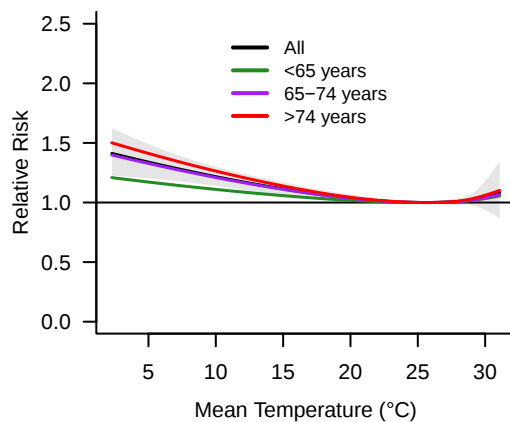
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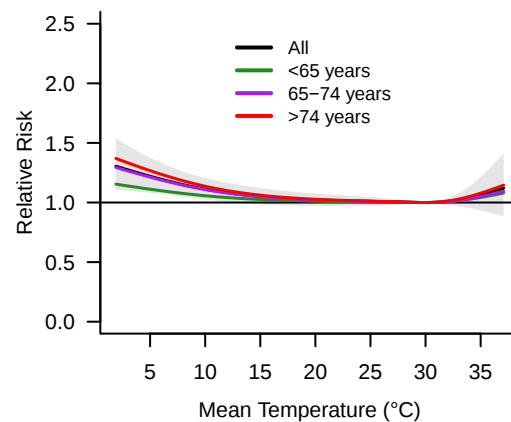
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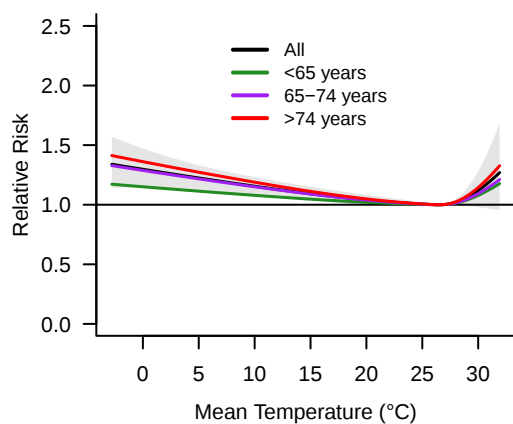
Tampa (FL)– USA



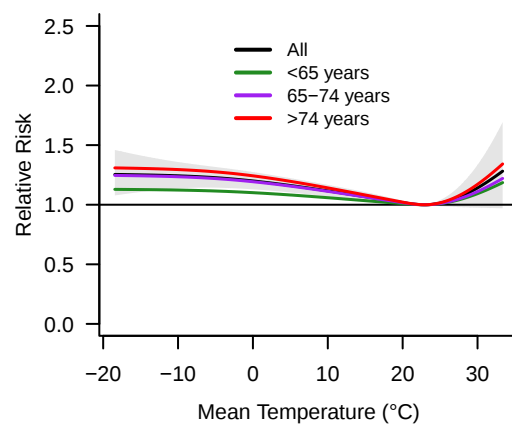
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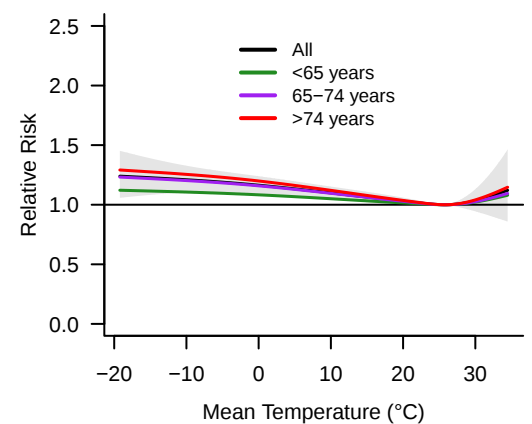
Tallahassee (FL) – USA



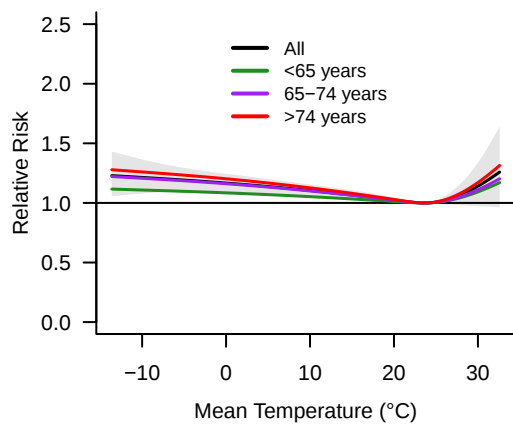
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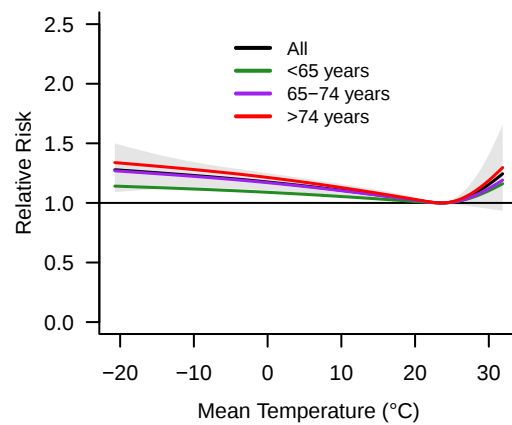
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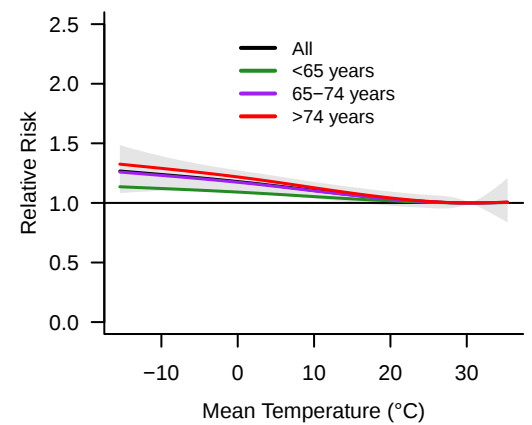
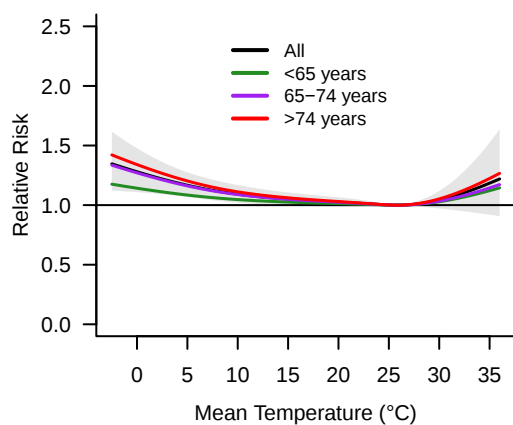
Trenton (NJ) – USA



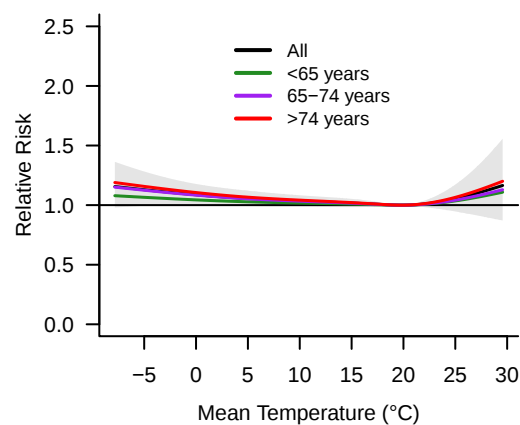
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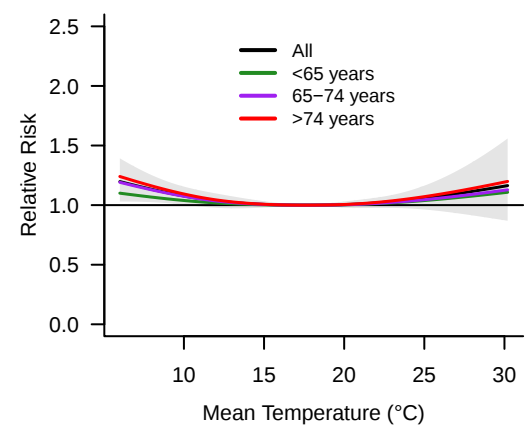
Tulsa (OK) – USA

**Visalia (CA)– USA**

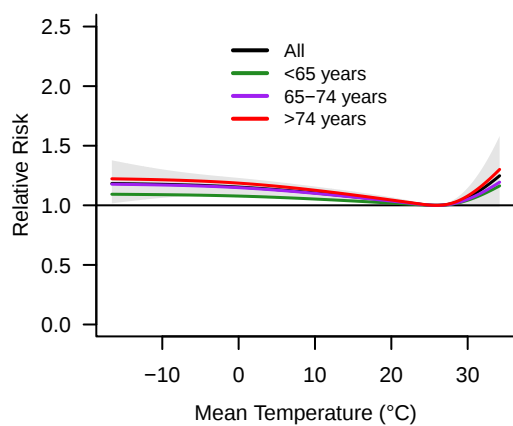
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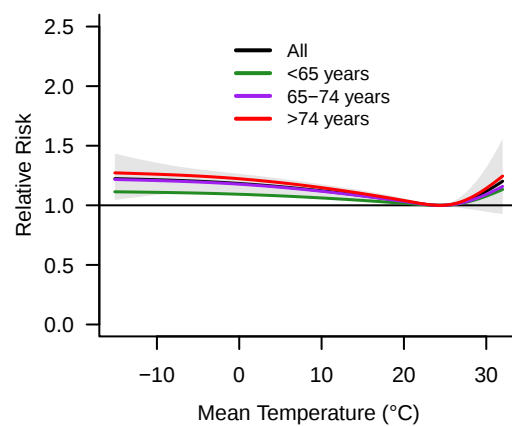
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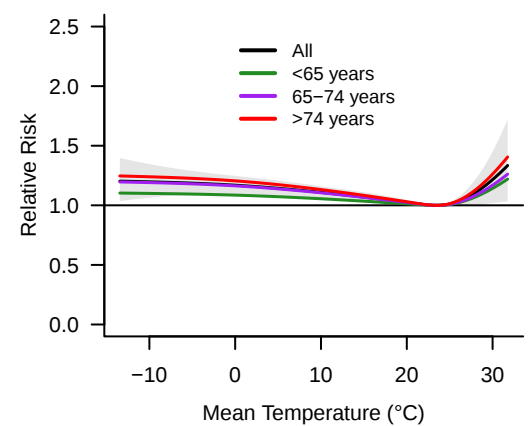
Wichita (KS) – USA



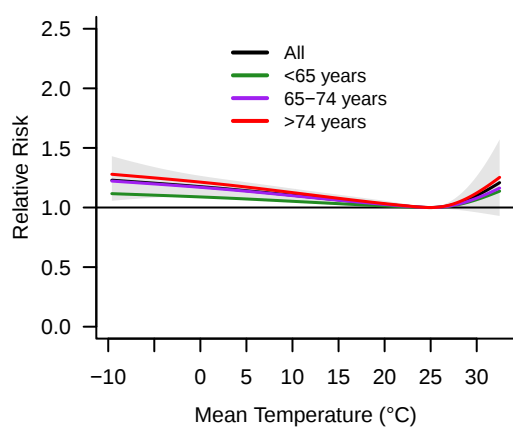
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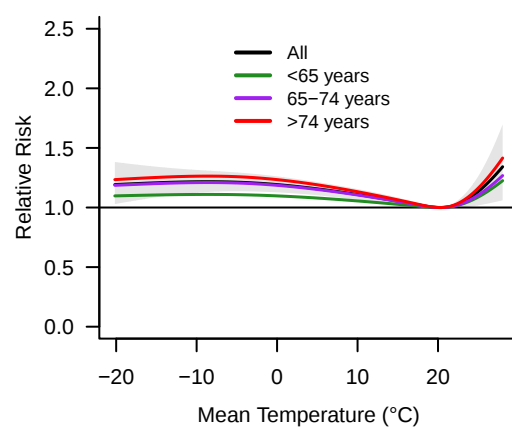
Wilmington (DE) – USA



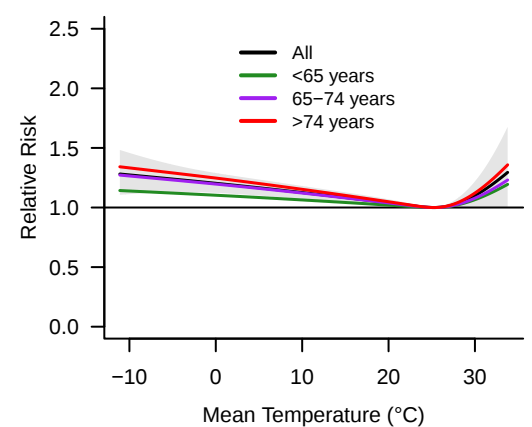
Winston-salem (NC) – USA

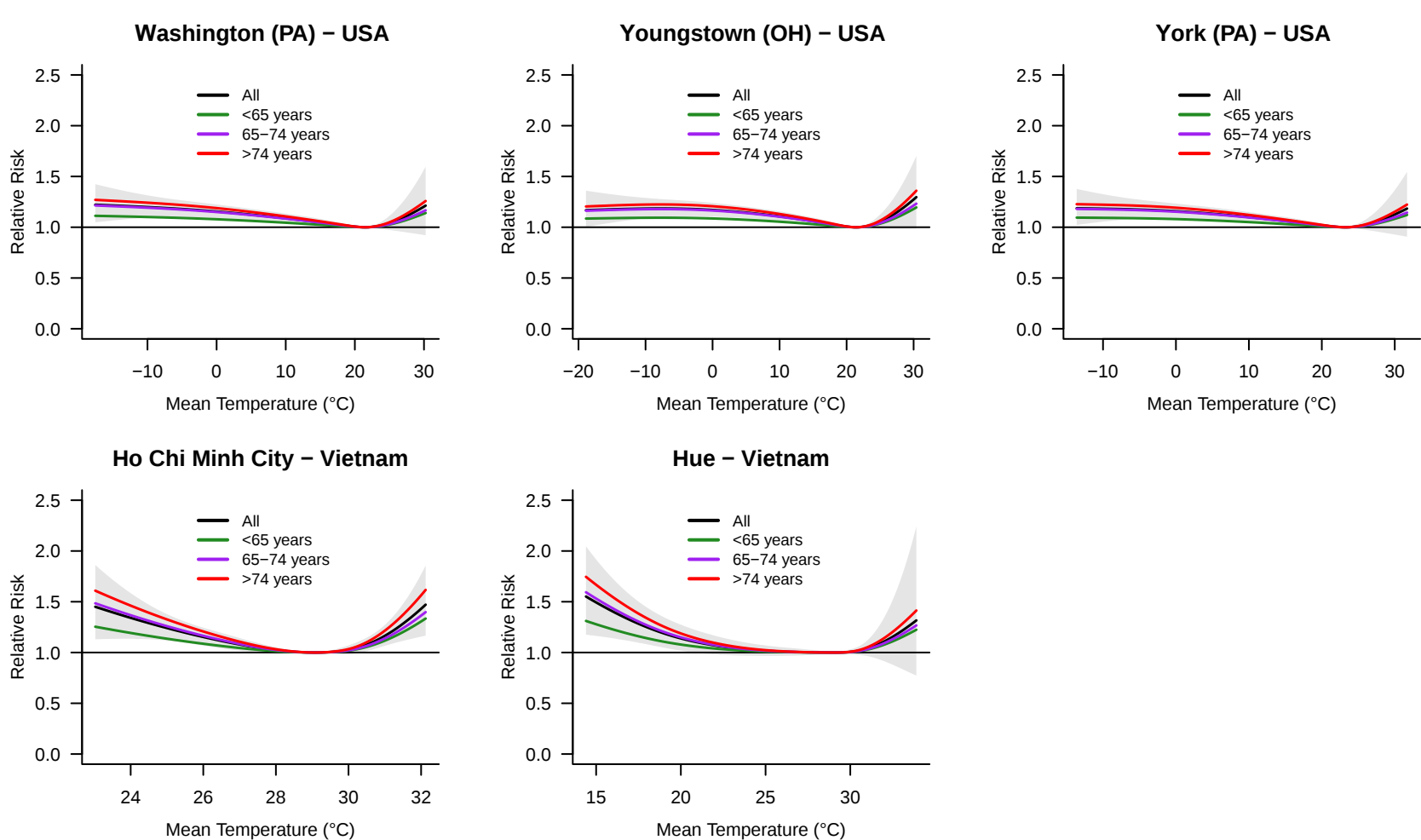


Worcester (MA) – USA

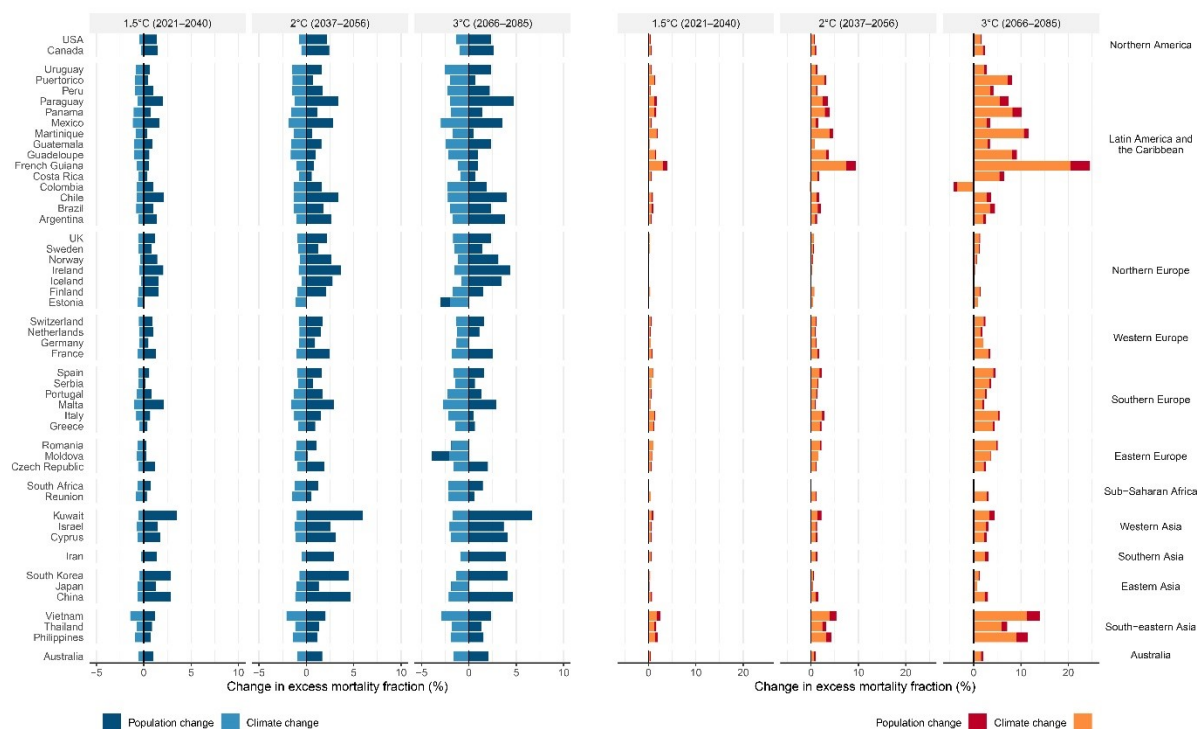


Washington (DC) – USA





Supplementary Figure 3. Temperature-mortality associations by age groups in 800 studied locations. Exposure-response associations are estimated as best linear unbiased predictions (BLUPs) and reported as relative risk (RR) for a cumulative 21-day lag of daily temperature, versus the minimum mortality temperature. Black, solid line represents the association for all age groups (with 95% CI, shaded grey); whereas blue, orange, and red dashed lines represent the association for 0-64, 65-74, and ≥ 75 years age groups, respectively.



Supplementary Figure 4. Contributions of climate change and population change to the changes cold- (A) and heat-related (B) mortality at different levels of global warming under SSP3-7.0. Country/area-level changes by climate change and population aging are shown at 1.5°C, 2°C, and 3°C of global warming using 20-year window compared with the historical period 1995–2014. The future periods in which the 20-year running mean of global mean temperature first reaches the 1.5 °C, 2 °C, and 3 °C of warming above pre-industrial level (1850–1900) are 2021–2040, 2037–2056, 2066–2085, respectively under SSP3-7.0.

Supplementary Table 1. Description of the observed temperature and mortality data in the MCC locations.

Country/ area	N locations	Period	Mortality data	Temperature data	Notes
<i>Argentina</i>	3 cities	2005-2014	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) from National Ministry of Health.	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements from one meteorological station in each city provided by the National Weather Service.	Missing data amount for 0.91% and 0.00% of the mortality and temperature series, respectively.
<i>Australia</i>	3 cities	1995-2009	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) from Australian Bureau of Statistics.	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements from meteorological stations located within ≤30 km of each city provided by Australian Bureau of Meteorology.	Missing data amount for 0.18% and 0.00% of the mortality and temperature series, respectively.
<i>Brazil</i>	18 cities	1997-2014	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) from the Ministry of Health.	Mean daily temperature (in °C), computed from the 24-h average of hourly measurements, from weather stations located within the urban area provided by National Institute of Meteorology of Brazil	Missing data amount for 1.85% and 3.21% of the mortality and temperature series, respectively.
<i>Canada</i>	25 census metropolitan areas (CMA) and 1 city (Hamilton)	1995-2014	All causes collected from Canadian Mortality Database.	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements, were obtained from Environment Canada collected from monitoring stations located closest to the CMA centre.	Missing data amount for 0.82% and 2.79% of the mortality and temperature series, respectively.
<i>Chile</i>	4 cities	2004-2014	All causes provided by the Departamento de Estadísticas e Información de Salud (Ministerio de Salud))	Mean daily temperature (in °C), computed as 24-hour average based on hourly measurements, were obtained from Sistema de Información Nacional de Calidad del Aire (SINCA), Ministerio del Medio Ambiente.	Missing data amount for 0.15% and 9.7% of the mortality and temperature series, respectively.
<i>China</i>	14 cities	1996-2014	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) from Municipal Center for	Mean daily temperature (in °C), computed as averaged hourly temperatures, were obtained from China Meteorological Data Sharing Service System (http://data.cma.cn/).	Missing data amount for 6.98% and 7.35% of the mortality and temperature series, respectively.

			Disease Control and Prevention in each city.		Data on 17 cities were originally collected, but we excluded 3 cities (Tangshan, Nanjing, Guangzhou) because of no data on non-external or suspected errors in data collection.
<i>Colombia</i>	5 cities	1998-2013	All causes provided by the National Administrative Department of Statistics DANE	Mean daily temperature (in °C), computed as 24-hour average based on hourly measurements, were obtained from Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia (IDEAM)	Missing data amount for 0.00% and 3.98% of the mortality and temperature series, respectively.
<i>Costa Rica</i>	1 city	2000-2014	All causes provided by the Instituto Nacional de Estadística y Censo. Open Access.	Meteorological data were obtained from WMO-NOAA (Surface Data Hourly Global, DS3505)	Missing data amount for 0.00% and 0.97% of the mortality and temperature series, respectively.
<i>Cyprus</i>	5 cities	2004-2014	All causes provided by the Health Monitoring Unit of the Ministry of Health of Cyprus	Meteorological data were obtained from the Department of Meteorology, Ministry of Agriculture, Rural Development, and the Environment.	Missing data amount for 0.0% and 0.0% of the mortality and temperature series, respectively.
<i>Czech Republic</i>	3 cities and 1 rural region	1995-2014	All causes provided by the Czech Statistical Office and the Institute of Health Information and Statistics	Meteorological data (temperature) were obtained from stations operated by the Czech Hydrometeorological Institute (measurements in standard climatic terms 7:00, 14:00 and 21:00 local time, and daily means)	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively.
<i>Estonia</i>	4 cities and 1 region	1997-2014	All causes provided by <i>Estonian Causes of Death Registry</i>	Mean daily temperature (in °C) were computed as the 24-h average of hourly measurements collected from <i>Estonian Environment Agency</i> .	Missing data amount for 0.0% and 0.0% of the mortality and temperature series, respectively.
<i>Finland</i>	1 metropolitan area	1995-2014	All causes provided by Statistics Finland	Mean daily temperature (in °C), Finnish Meteorological Institute. The weather stations around the country were interpolated onto a 10×10 km grid covering the whole of Finland, using a Kriging model.	Missing data amount for 0.00% and 4.88% of the mortality and temperature series, respectively.
<i>France</i>	20 cities	2000-2014	All causes provided by French National Institute of	Mean daily temperature (in °C), computed as the mean of the minimal and maximal	Missing data amount for 0.25% and 0.04% of the mortality and

			Health and Medical Research (CepiDC),	temperature, were obtained from the Meteo France. A single weather station was selected for each city.	temperature series, respectively.
<i>French Guiana</i>	1 city	2000-2014	All causes provided by French National Institute of Health and Medical Research	Mean, Max, Min daily temperature (in °C) were obtained from the Météo-France for a reference station.	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively.
<i>Germany</i>	15 cities	1995-2014	All causes provided by Research Data Centres of the Federation and the Federal States of Germany (Forschungsdatenzentrum der Statistischen Ämter des Bundes und der Länder),	Mean daily temperature (in °C), computed as the 24-h average based on hourly measurements, was obtained from the Climate Data Centre of the German National Meteorological Service (Deutscher Wetterdienst).	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively.
<i>Greece</i>	1 city	2001-2010	All causes provided by Hellenic Statistical Authority	Mean daily temperature (in °C) and relative humidity (%) were computed as the 24-h average based on hourly measurements collected from the National observatory of Athens (http://www.noa.gr/) from site “Thisio” located in the city of Athens.	Missing data amount for 0.00% and 7.05% of the mortality and temperature series, respectively.
<i>Guadeloupe</i>	1 city	2000-2014	All causes provided by French National Institute of Health and Medical Research	Mean, Max, Min daily temperature (in °C) were obtained from the Météo-France for a reference station.	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Guatemala</i>	1 city	2009-2014	All causes provided by the Instituto Nacional de Estadística, Unidad de Estadística de Salud.	Temperature data are provided by the Instituto Nacional de Sismología, Vulcanología, Meteorología y Hidrología.	Missing data amount for 0.00% and 2.15% of the mortality and temperature series, respectively.
<i>Iceland</i>	1 city	2000-2014	All causes in individuals 18 years or older provided by the Directorate of Health in Iceland, Causes of Death Register.	Mean, Max, Min daily temperature (in °C) were obtained from the databank of the Icelandic meteorological institute 2021.	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Iran</i>	2 cities	2002-2014	All causes provided by the Ferdows organization of Mashhad Municipality	Mean, Max, Min daily temperature (in °C), computed as the 24-hour average based on hourly measurements collected from IRAN Meteorological Organization (IRIMO) (http://www.irimo.ir)	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively

<i>Island of Ireland</i>	4 regions covering all Island population (ROI) and 2 in the Northern Ireland (NI))	1995-2007	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) provided by Irish Central Statistics Office Northern and Ireland Social Research Agency.	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements, were obtained from two weather stations for each ROI regions and NI regions from Met Eireann, and the United Kingdom Meteorological Office.	Missing data amount for 0.01% and 0.00% of the mortality and temperature series, respectively
<i>Israel</i>	2 cities and 2 districts	1995-2014	All causes provided by the Israeli Central Bureau of Statistics.	Mean daily temperature (in °C) were obtained from 7 weather stations in Israel.	Missing data amount for 0.00% and 0.38% of the mortality and temperature series, respectively
<i>Italy</i>	11 cities	1987-2010	All causes provided by the obtained from local mortality registries and from the rapid mortality surveillance system	Mean daily temperature (in °C) was computed as the 24-h average based on 6-h measurements obtained from the Meteorological Service of the Italian Air Force. A single weather station was selected for each city, using the airport monitoring station located closest to the city center.	Missing data amount for 1.26% and 2.34% of the mortality and temperature series, respectively. Data on 12 cities were initially collected, but 1 (Rieti) was excluded because of potential problems in data collection (strange temporal patterns).
<i>Japan</i>	47 prefectures	1995-2014	All causes provided by Ministry of Health, Labour and Welfare.	Weather station located within the urban area of the capital city (Japan Meteorology Agency)	Missing data amount for 0.00% and 0.04% of the mortality and temperature series, respectively
<i>Kuwait</i>	1 city	2000-2014	Non-external causes only (ICD-9: 0-799; ICD-10: A00-R99) provided by the National Center for Health Information, Ministry of Health, Kuwait	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements from two sources: the Directorate General of Civil Aviation (Kuwait Airport) and Kuwait's Environmental Public Authority.	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Malta</i>	1 city	1995-2014	All causes provided by the Ministry for Health in Malta	Mean daily temperature (in °C) was obtained from Malta's airport station.	Missing data amount for 0.04% and 0.00% of the mortality and temperature series, respectively
<i>Martinique</i>	1 city	2000-2014	All causes provided by French National Institute of Health and Medical Research	Mean, Max, Min daily temperature (in °C) were obtained from the Météo-France for a reference station.	Missing data amount for 0.00% and 0.02% of the mortality and temperature series, respectively
<i>Mexico</i>	10 metropolitan areas	1998-2014	All causes provided by National Institute of Statistics, Geography and Informatics	Mean daily temperature (in °C) was computed as the 24-hour average based on hourly measurements collected through the Servicio Meteorológico Nacional	Missing data amount for 0.00% and 27.03% of the mortality and temperature series, respectively

				(SMN) and the Instituto Nacional de Ecología y Cambio Climático (INECC).	
<i>Moldova</i>	4 cities	2001-2010	All causes provided by National Centre for Health Management	Mean daily temperature (in °C) computed as the average between daily minimum and maximum, were obtained from State Hydrometeorological Service, Moldova. A single weather station was selected for each city	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>The Netherlands</i>	4 regions	1995-2014	All causes provided by Statistics Netherlands	Mean daily temperature (in °C) was obtained from the Royal Dutch Meteorological Institute (KNMI) as 24-hour average based on hourly measurements	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Norway</i>	1 city	1995-2014	All causes provided by Norwegian Cause of Death registry	Mean daily temperature (in °C) based on an observational modeled dataset from the Norwegian Meteorological Institute.	Missing data amount for 2.02% and 3.85% of the mortality and temperature series, respectively
<i>Panama</i>	1 city	2013-2014	All causes provided by Instituto Nacional de Estadística y Censo, Centro de Información Estadística.	Temperature data are provided by the Empresa de Transmisión Eléctrica, S.A. (ETESA). Open Access.	Missing data amount for 0.00% and 10.66% of the mortality and temperature series, respectively
<i>Paraguay</i>	1 city	2004-2014	All causes provided by Ministerio de Salud Pública y Bienestar Social, Dirección General de Información Estratégica en Salud, Subsistema de Información de Estadísticas Vitales	Temperature data are obtained from the Global Historical Climatology Network (NOAA/WMO)	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Peru</i>	18 regions	2008-2014	All causes provided by the Peruvian Ministry of Health (MINSA in Spanish)	Mean daily temperature (in °C) was obtained from the National Meteorology and Hydrology Service of Peru (SENAMHI in Spanish). A total of 18 weather stations (one station per Region) contributed data to each department series.	Missing data amount for 2.73% and 12.12% of the mortality and temperature series, respectively
<i>Philippines</i>	12 cities	2006-2014	All causes provided by Philippine Statistics Agency	Mean daily temperature (in °C), computed as 24-hour average based on hourly measurements, were obtained from National Oceanic and Atmospheric Administration (NOAA).	Missing data amount for 0.04% and 0.00% of the mortality and temperature series, respectively

<i>Portugal</i>	6 districts	1995-2014	All causes provided by Statistics Portugal.	Mean daily temperature (in °C) was computed as the 24-hour average based on hourly measurements collected from the National Oceanic and Atmospheric Administration (NOAA)	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Puerto Rico</i>	1 city	2009-2014	All causes provided by Instituto de Estadísticas Vitales de Puerto Rico, Área de Estadísticas Vitales del Departamento de Salud	Temperature data are obtained from the Global Historical Climatology Network (NOAA/WMO)	Missing data amount for 0.00% and 5.02% of the mortality and temperature series, respectively
<i>Reunion</i>	1 city	2000-2014	All causes provided by French National Institute of Health and Medical Research	Mean, Max, Min daily temperature (in °C) were obtained from the Météo-France for a reference station.	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively.
<i>Romania</i>	8 cities	1995-2014	All causes provided by Romanian National Institute of Statistics	Meteorological data (temperature) were obtained from stations operated by the National Meteorological Administration of Romania (NMA RO) (measurements in standard climatic terms, mean daily) by https://www.ecad.eu/	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Serbia</i>	1 city	1995-2014	All causes, provided by the Statistical office of the Republic of Serbia	Mean daily temperature (in °C), computed as the 24-hour average based on 3-hourly measurements, were obtained from the Integrated Surface Dataset (ISD), National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA).	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>South Africa</i>	45 district municipalities	1997-2013	All causes provided by Statistics South Africa, which had no role in the design, analysis or interpretation of the study.	Mean daily temperature (in °C) was computed as the average between daily minimum and maximum collected from the Agricultural Research Council of South Africa and the National Oceanic and Atmospheric Administration (NOAA).	Missing data amount for 0.00% and 12.27% of the mortality and temperature series, respectively 7 locations were excluded because of a high % of missing data or unstable temporal patterns in the mortality data, possibly due to problems with data collection.

<i>South Korea</i>	36 cities	1997-2018	All causes provided by Korea Bureau of Statistics	Mean daily temperature (in °C, computed as the 24-hour average based on hourly measurements, were obtained from weather stations located within the urban area managed by Korea Meteorological Administration.	Missing data amount for 0.00% and 0.01% of the mortality and temperature series, respectively
<i>Spain</i>	52 cities	1995-2014	Non-external causes (ICD-9: 0-799; ICD-10: A00-R99) from the Spain National Institute of Statistics.	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements, and was obtained from weather stations of the Spain National Meteorology Agency. A single weather station, located within the urban area or at the near airport, was selected for each city	Missing data amount for 0.00% and 0.84% of the mortality and temperature series, respectively
<i>Sweden</i>	3 cities	1995-2014	All causes provided by the Swedish Cause of Death Register at the Swedish National Board of Health and Welfare	Mean daily temperature (in °C, computed as the 24-hour average based on hourly measurements, were obtained from the Environment and Health Administration.	Missing data amount for 0.00% and 2.06% of the mortality and temperature series, respectively
<i>Switzerland</i>	7 cities and 1 metropolitan area (Lugano)	1995-2013	Non-external causes only other than accidents (ICD-10codes A00-R99, V01-V99, W00-X59) provided from Federal Office of Statistics (Switzerland)	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements, were obtained from the IDAWEB database (a service provided by MeteoSwiss, the Swiss Federal Office of Meteorology and Climatology). A single weather station located within or near the urban area was selected for each city.	Missing data amount for 0.0% and 0.0% of the mortality and temperature series, respectively.
<i>Thailand</i>	61 regions	1999-2008	Non-external (ICD-9: 0-799; ICD-10: A00-R99) mortality, provided the Ministry of Public Health, Thailand.	Mean daily temperature (in °C), computed as the average between daily minimum and maximum, were obtained from the Meteorological Department, Ministry of Information and Communication Technology, Thailand.	Missing data amount for 0.00% and 4.99% of the mortality and temperature series, respectively. The region of Phetchabun was excluded because of high percentage of missing data.
<i>UK</i>	112 built-up areas	1995-2014	All causes provided by the Office of National Statistics.	Mean daily temperature (in °C) was computed as the 24-hour average based on hourly measurements from UKCP09 5kmx5km product	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively
<i>Uruguay</i>	1 city	2012-2014	Non-external causes are provided by the Ministerio de Salud Publica (MSP).	Temperature data are provided by the Instituto Uruguayo de Meteorología (INUMET)	Missing data amount for 0.00% and 0.00% of the mortality and temperature series, respectively

<i>USA</i>	210 cities	1995-2006	All causes provided by the National Center for Health Statistics (NCHS).	Mean daily temperature (in °C), computed as the 24-hour average based on hourly measurements, were obtained from the National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA).	Missing data amount for 2.65% and 2.70% of the mortality and temperature series, respectively. 1 city was excluded (Nampa) because of high percentage of missing.
<i>Vietnam</i>	2 cities	2009-2013	All causes provided by Provincial Department of Health.	Mean daily temperature (in °C), computed as computed from the 24-h average of hourly measurements, were obtained from National Oceanic and Atmospheric Administration's (NOAA) National Climate Data Center (NCDC). A single weather station was selected for each city.	Missing data amount for 0.00% and 0.57% of the mortality and temperature series, respectively

Supplementary Table 2. Descriptive statistics of observation data by region and country/area.

Country	N of cities	Period	Total deaths	Daily mean temperature (°C) [mean (min-max)]
Northern America				
USA	210	1995 - 2006	14,582,845	14.1 (3.4-25.0)
Canada	26	1995 - 2014	2,590,214	7.0 (2.5-10.9)
Latin America and the Caribbean				
Guadeloupe	1	2000 - 2014	24,492	26.6
Martinique	1	2000 - 2014	18,641	27.0
Puerto Rico	1	2009 - 2014	20,192	26.7
Costa Rica	1	2000 - 2014	25,337	22.6
Guatemala	1	2009 - 2014	47,939	19.3
Mexico	10	1998 - 2014	2,980,086	18.8 (13.9-23.3)
Panama	1	2013 - 2014	5,779	28.0
Argentina	3	2005 - 2014	623,834	18.1 (17.8-18.5)
Brazil	18	1997 - 2014	3,079,875	23.3 (18.8-27.8)
Chile	4	2004 - 2014	325,462	13.7 (11.5-15.4)
Colombia	5	1998 - 2013	956,539	23.4 (13.9-28.0)
French Guiana	1	2000 - 2014	6,592	27.0
Paraguay	1	2004 - 2014	33,303	23.2
Peru	18	2008 - 2014	633,137	17.9 (4.6-27.0)
Uruguay	1	2012 - 2014	91,041	18.7
Northern Europe				
Estonia	5	1997 - 2014	137,946	6.1 (5.5-6.7)
Finland	1	1995 - 2014	146,417	6.3
Iceland	1	2000 - 2014	19,182	5.4
Ireland	6	1995 - 2007	557,877	10.0 (9.5-10.9)
Norway	1	1995 - 2014	96,765	5.1
Sweden	3	1995 - 2014	533,181	8.5 (7.8-8.9)
UK	112	1995 - 2014	4,448,105	10.5 (9.3-11.7)
Western Europe				
France	20	2000 - 2014	1,693,354	12.6 (10.8-16.3)
Germany	15	1995 - 2014	3,079,580	10.2 (9.5-11.0)
Netherlands	4	1995 - 2014	2,754,019	10.3 (9.8-10.7)
Switzerland	8	1995 - 2013	243,638	10.4 (8.6-12.9)
Southern Europe				
Cyprus	5	2004 - 2014	51,927	20.4 (19.9-21.3)
Greece	1	2001 - 2010	287,969	18.7
Italy	11	1995 - 2010	613,479	15.5 (12.5-18.4)
Malta	1	1995 - 2014	61,757	19.3
Portugal	6	1995 - 2014	1,010,888	16.3 (15.1-18.2)
Spain	52	1995 - 2014	2,452,909	15.6 (11.1-21.9)
Eastern Europe				
Czech Republic	4	1995 - 2014	643,810	9.0 (8.2-9.8)
Moldova	4	2001 - 2010	59,906	10.7 (10.2-11.3)
Romania	8	1995 - 2014	824,327	10.7 (8.2-12.6)
Serbia	1	1995 - 2014	393,574	13.0
Sub-Saharan Africa				
South Africa	45	1997 - 2013	7,775,888	18.0 (12.4-22.8)

Country	N of cities	Period	Total deaths	Daily mean temperature (°C) [mean (min-max)]
Reunion	1	2000 - 2014	12,946	24.5
Western Asia				
Israel	4	1995 - 2014	356,920	20.4 (18.4-21.5)
Kuwait	1	2000 - 2014	63,184	27.0
Southern Asia				
Iran	2	2002 - 2014	763,675	16.7 (16-17.3)
Eastern Asia				
China	14	1996 - 2014	1,026,772	14.5 (7.4-23.7)
Japan	47	1995 - 2014	21,353,321	15.5 (9.2-23.3)
South Korea	36	1997 - 2014	2,445,155	13.1 (9.1-17.1)
South-Eastern Asia				
Philippines	12	2006 - 2014	408,430	28.2 (27.9-28.6)
Thailand	61	1999 - 2008	1,801,653	27.6 (25.1-29.3)
Vietnam	2	2009 - 2013	108,173	27.1 (25.7-28.5)
Australia				
Australia	3	1995 - 2009	789,037	18.2 (15.9-20.3)

Supplementary Table 3. CMIP6 GCMs used in this study.

Model Name	Modeling Center	Institution Id	Nominal Resolution
ACCES-CM2	Commonwealth Scientific and Industrial Research Organisation and Australian Research Council Centre of Excellence for Climate System Science, Australia	CSIRO-ARCCSS	250 km
AWI-CM-1-1-MR	Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research, Germany	AWI	100 km
BCC-CSM2-MR	Beijing Climate Center, China	BCC	100 km
CESM2	National Center for Atmospheric Research, USA	NCAR	100 km
CNRM-CM6-1	Centre National de Recherches Meteorologiques and Centre Europeen de Recherche et de Formation Avancee en Calcul Scientifique, France	CNRM-CERFACS	250 km
CNRM-CM6-1-HR		CNRM-CERFACS	50 km
CNRM-ESM-2-1		CNRM-CERFACS	250 km
GFDL-ESM4	National Oceanic and Atmospheric Administration, Geophysical Fluid Dynamics Laboratory, USA	NOAA-GFDL	100 km
IITEM-ESM	Centre for Climate Change Research, Indian Institute of Tropical Meteorology Pune, India	CCCR-IITM	250 km
INM-CM4-8	Institute for Numerical Mathematics, Russian Academy of Science, Russia	INM	100 km
INM-CM5-0		INM	100 km
IPSL-CM6A-LR	Institut Pierre Simon Laplace, France	IPSL	250 km
MIROC6	Japan Agency for Marine-Earth Science and Technology; Atmosphere and Ocean Research Institute, The University of Tokyo; National Institute for Environmental Studies; and RIKEN Center for Computational Science; Japan	MIROC	250 km
MIROC-ES2L		MIROC	500 km
MPI-ESM1-2-LR	Max Planck Institute for Meteorology, Germany	MPI-M	250 km
MRI-ESM2-0	Meteorological Research Institute, Japan	MRI	100 km
NORES2-MM	NorESM Climate modeling Consortium consisting of CICERO (Center for International Climate and Environmental Research), MET-Norway (Norwegian Meteorological Institute), NERSC (Nansen Environmental and Remote Sensing Center), NILU (Norwegian Institute for Air Research), UiB (University of Bergen), UiO (University of Oslo) and UNI (Uni Research), Norway.	NCC	100 km
UKESM1-0-LL	Met Office Hadley Centre, UK	MOHC	250 km

Supplementary Table 4. Projected changes (95% eCIs) in cold- and heat-related excess mortality (%) at different levels of global warming under SSP5-8.5 by country/area under the “climate only” scenario.

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Overall	-0.6 (-1.0, -0.3)	-1.1 (-1.6, -0.6)	-1.7 (-2.6, -1.0)	0.4 (0.0, 0.8)	0.8 (0.0, 1.7)	1.8 (-0.5, 4.5)
Australia						
Australia	-0.5 (-1.0, -0.1)	-0.9 (-1.6, -0.4)	-1.6 (-2.8, -0.6)	0.3 (0.1, 0.7)	0.6 (0.2, 1.3)	1.5 (0.6, 3.3)
Eastern Asia						
China	-0.8 (-1.3, -0.4)	-1.3 (-2.0, -0.7)	-2.3 (-3.3, -1.3)	0.5 (0.1, 1.2)	1.1 (0.3, 2.2)	2.6 (0.6, 5.5)
Japan	-0.6 (-1.2, -0.2)	-1.1 (-1.7, -0.6)	-1.9 (-2.8, -1.1)	0.2 (0.0, 0.5)	0.3 (-0.1, 0.9)	0.7 (-0.2, 1.9)
South Korea	-0.5 (-0.9, -0.2)	-0.8 (-1.3, -0.4)	-1.4 (-2.2, -0.6)	0.2 (0.0, 0.7)	0.5 (0.0, 1.1)	1.1 (0.0, 2.7)
Eastern Europe						
Czech Republic	-0.6 (-1.0, -0.2)	-0.9 (-1.6, -0.5)	-1.6 (-2.7, -0.9)	0.5 (0.1, 0.9)	1.0 (0.3, 1.9)	2.2 (0.9, 4.8)
Moldova	-0.7 (-1.2, -0.2)	-1.2 (-1.8, -0.6)	-2.0 (-3.3, -1.1)	0.8 (0.2, 1.7)	1.6 (0.5, 3.0)	3.6 (1.6, 6.8)
Romania	-0.6 (-1.0, -0.2)	-1.0 (-1.6, -0.6)	-1.8 (-3.1, -1.0)	1.1 (0.4, 1.8)	2.2 (0.8, 3.4)	4.8 (2.4, 7.9)
Serbia	-0.6 (-0.9, -0.1)	-0.8 (-1.3, -0.4)	-1.4 (-2.6, -0.7)	0.8 (0.1, 1.5)	1.5 (0.3, 2.3)	3.3 (1.3, 5.8)
South America						
Costa Rica	-0.6 (-2.2, 1.1)	-0.7 (-3.1, 1.7)	-0.9 (-4.0, 2.5)	0.5 (-0.7, 2.0)	1.4 (-1.8, 5.0)	5.2 (-6.9, 18.7)
Guatemala	-0.9 (-2.2, 0.1)	-1.5 (-3.6, 0.1)	-2.4 (-5.6, 0.4)	0.2 (-0.4, 0.9)	0.6 (-1.2, 2.7)	2.5 (-4.4, 10.3)
Mexico	-1.1 (-1.9, -0.6)	-1.9 (-2.6, -1.3)	-3.0 (-4.1, -2.1)	0.5 (0.1, 0.9)	1.0 (0.3, 1.8)	2.7 (0.6, 5.0)
Panama	-1.1 (-3.0, 0.4)	-1.5 (-4.4, 0.6)	-2.0 (-5.5, 0.9)	1.1 (-1.3, 3.4)	2.7 (-3.7, 7.7)	7.9 (-15.1, 25.0)
Argentina	-0.6 (-1.0, 0.0)	-0.9 (-1.6, -0.4)	-1.8 (-2.8, -1.0)	0.4 (0.0, 0.9)	0.8 (0.3, 1.5)	1.9 (0.7, 3.8)
Brazil	-0.7 (-1.4, 0.0)	-1.2 (-2.2, -0.5)	-2.0 (-3.1, -1.0)	0.7 (-0.1, 1.4)	1.5 (0.2, 3.3)	3.5 (-0.2, 8.6)
Chile	-0.7 (-1.4, -0.2)	-1.2 (-2.3, -0.6)	-2.2 (-3.8, -1.1)	0.5 (0.2, 1.0)	1.1 (0.4, 2.1)	2.8 (0.9, 5.2)
Colombia	-0.7 (-1.6, 0.0)	-1.3 (-2.8, -0.1)	-2.2 (-4.4, -0.2)	0.0 (-1.7, 1.1)	-0.3 (-6.4, 2.8)	-3.4 (-38.6, 10.5)
French Guiana	-0.8 (-2.2, 0.6)	-1.0 (-2.9, 0.9)	-1.2 (-3.4, 1.1)	2.8 (-4.0, 9.7)	6.9 (-11.8, 20.5)	19.3 (-45.4, 53.9)
Paraguay	-0.7 (-1.6, -0.2)	-1.2 (-2.7, -0.4)	-2.1 (-3.7, -0.8)	1.2 (0.0, 4.0)	2.4 (0.3, 7.6)	5.6 (1.1, 11.9)
Peru	-0.9 (-2.0, 0.0)	-1.5 (-3.1, 0.0)	-2.3 (-4.8, 0.1)	0.3 (-0.9, 1.5)	1.0 (-2.6, 4.1)	3.3 (-9.8, 13.4)
Uruguay	-0.8 (-1.7, -0.1)	-1.3 (-2.8, -0.5)	-2.5 (-4.2, -1.5)	0.4 (0.1, 1.2)	0.9 (0.4, 1.7)	2.2 (0.8, 4.6)
Guadeloupe	-1.1 (-2.2, -0.2)	-1.6 (-3.1, -0.3)	-2.2 (-4.3, -0.2)	1.3 (-1.0, 3.9)	2.9 (-2.9, 8.1)	8.1 (-10.5, 22.5)

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Martinique	-0.9 (-2.1, 0.1)	-1.2 (-2.9, 0.2)	-1.7 (-3.9, 0.6)	1.6 (-0.5, 4.3)	3.8 (-1.4, 8.9)	10.5 (-5.6, 25.7)
Puerto Rico	-0.9 (-2.1, 0.0)	-1.4 (-3.2, 0.1)	-2.0 (-4.6, 0.3)	1.2 (-0.6, 3.2)	2.6 (-1.6, 6.8)	7.1 (-6.2, 18.5)
Northern America						
Canada	-0.3 (-0.6, -0.1)	-0.6 (-1.0, -0.2)	-1.0 (-1.8, -0.4)	0.4 (0.1, 0.9)	0.8 (0.2, 1.9)	2.0 (0.5, 4.8)
USA	-0.5 (-0.8, -0.2)	-0.8 (-1.3, -0.4)	-1.4 (-2.1, -0.8)	0.3 (-0.1, 0.8)	0.6 (-0.2, 1.5)	1.4 (-0.4, 3.6)
Northern Europe						
Estonia	-0.7 (-1.3, -0.2)	-1.1 (-2.2, -0.5)	-1.9 (-3.5, -0.9)	0.2 (-0.1, 0.7)	0.4 (-0.1, 1.3)	0.8 (-0.3, 2.8)
Finland	-0.6 (-1.2, -0.1)	-0.9 (-1.9, -0.4)	-1.6 (-3.1, -0.6)	0.3 (-0.2, 0.9)	0.6 (0.0, 1.6)	1.3 (0.2, 3.8)
Iceland	-0.3 (-1.2, 0.5)	-0.5 (-1.6, 0.3)	-0.8 (-2.5, 0.4)	0.0 (-0.1, 0.2)	0.0 (-0.3, 0.4)	0.1 (-0.7, 1.2)
Ireland	-0.4 (-1.2, 0.3)	-0.8 (-1.8, -0.1)	-1.5 (-2.9, -0.1)	0.1 (-0.2, 0.3)	0.1 (-0.3, 0.6)	0.3 (-0.8, 1.8)
Norway	-0.4 (-0.9, 0.0)	-0.6 (-1.5, -0.1)	-1.1 (-2.5, -0.2)	0.1 (-0.2, 0.5)	0.3 (-0.4, 1.0)	0.6 (-1.0, 2.5)
Sweden	-0.5 (-1.1, -0.1)	-0.9 (-1.7, -0.4)	-1.5 (-2.6, -0.6)	0.3 (-0.1, 0.6)	0.5 (0.1, 1.2)	1.1 (0.2, 2.9)
UK	-0.5 (-1.1, 0.0)	-1.0 (-1.7, -0.4)	-1.6 (-2.9, -0.8)	0.2 (-0.2, 0.7)	0.5 (-0.1, 1.2)	1.2 (0.2, 3.4)
South-eastern Asia						
Philippines	-0.9 (-1.9, -0.2)	-1.4 (-2.7, -0.2)	-1.9 (-3.6, -0.3)	1.3 (0.3, 2.7)	3.1 (0.4, 6.3)	8.9 (-0.7, 20.5)
Thailand	-0.7 (-1.4, -0.1)	-1.2 (-2.1, -0.5)	-1.9 (-3.0, -0.9)	1 (-0.2, 2.9)	2.3 (-0.2, 5.8)	6 (-1.8, 17.4)
Vietnam	-1.4 (-2.6, -0.5)	-2.1 (-3.8, -0.8)	-2.9 (-5.0, -1.0)	1.7 (0.4, 3.4)	3.9 (0.9, 8.0)	11 (1.3, 26.8)
Sub-Saharan Africa						
South Africa	-0.6 (-1.1, -0.3)	-1.1 (-1.8, -0.6)	-2.1 (-3.4, -1.2)	0 (-0.4, 0.4)	0 (-0.9, 0.8)	-0.2 (-3.9, 2)
Reunion	-0.8 (-1.9, -0.1)	-1.4 (-2.8, -0.1)	-2.1 (-4.2, 0.0)	0.4 (-0.6, 1.4)	0.9 (-1.7, 3.3)	2.7 (-5.9, 9.9)
Southern Asia						
Iran	-0.3 (-0.5, -0.1)	-0.5 (-0.9, -0.2)	-0.9 (-1.5, -0.3)	0.5 (0.0, 1.0)	1.0 (0.2, 2.0)	2.5 (0.6, 4.7)
Southern Europe						
Cyprus	-0.7 (-1.4, -0.1)	-1.1 (-1.9, -0.4)	-1.9 (-3.3, -0.8)	0.5 (-0.1, 1.2)	1.0 (-0.2, 2.4)	2.4 (-0.4, 5.4)
Greece	-0.5 (-1.0, -0.2)	-0.8 (-1.4, -0.4)	-1.4 (-2.4, -0.6)	1.0 (0.3, 2.4)	1.9 (0.7, 3.8)	4.1 (1.8, 7.2)
Italy	-0.8 (-1.3, -0.2)	-1.3 (-1.9, -0.6)	-2.1 (-3.3, -1.2)	1.3 (0.6, 2.7)	2.6 (1.0, 3.9)	5.3 (2.8, 9.1)
Malta	-1.0 (-1.8, -0.3)	-1.6 (-2.5, -0.7)	-2.7 (-4.3, -1.3)	0.4 (0.0, 0.9)	0.8 (0.1, 1.7)	1.9 (0.2, 3.9)
Portugal	-0.7 (-1.3, -0.3)	-1.3 (-2.0, -0.6)	-2.2 (-3.5, -1.3)	0.5 (-0.1, 1.2)	1.0 (0.0, 1.7)	2.4 (1.0, 3.8)

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Spain	-0.6 (-1.0, -0.2)	-0.9 (-1.5, -0.4)	-1.6 (-2.5, -0.9)	0.9 (0.4, 1.7)	1.8 (1.0, 2.8)	4.2 (2.4, 6.3)
Western Asia						
Israel	-0.7 (-1.4, 0.1)	-1.2 (-1.9, -0.5)	-2.1 (-3.2, -1.1)	0.5 (-0.1, 1.2)	1.2 (-0.2, 2.5)	2.8 (-0.3, 6.0)
Kuwait	-0.6 (-1.1, -0.1)	-1.0 (-1.7, -0.3)	-1.8 (-3.0, -0.7)	0.7 (-0.3, 1.8)	1.5 (-0.7, 3.6)	3.4 (-1.6, 7.7)
Western Europe						
France	-0.6 (-1.1, -0.1)	-1.0 (-1.7, -0.5)	-1.8 (-2.9, -1.0)	0.7 (0.2, 1.2)	1.4 (0.6, 2.3)	3.2 (1.5, 6.2)
Germany	-0.5 (-0.9, -0.1)	-0.7 (-1.3, -0.4)	-1.2 (-2.1, -0.6)	0.4 (0.0, 0.9)	0.9 (0.3, 1.8)	2.1 (0.8, 4.7)
Netherlands	-0.4 (-0.9, 0.0)	-0.7 (-1.3, -0.4)	-1.2 (-2.1, -0.5)	0.4 (0.0, 0.8)	0.7 (0.1, 1.4)	1.6 (0.6, 3.5)
Switzerland	-0.5 (-0.9, -0.1)	-0.8 (-1.4, -0.3)	-1.3 (-2.4, -0.5)	0.5 (0.0, 1.1)	1.0 (0.0, 2.2)	2.2 (0.0, 5.3)

Supplementary Table 5. Projected changes (95% eCIs) in cold- and heat-related excess mortality (%) at different levels of global warming under SSP5-8.5 by country/area under the “climate-population” scenario.

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Overall	0.1 (-0.2, 0.4)	0.4 (0.0, 0.8)	0.2 (-0.7, 0.8)	0.5 (0.0, 1.0)	1.0 (0.0, 2.2)	2.5 (-1.3, 5.9)
Australia						
Australia	0.1 (-0.4, 0.6)	0.4 (-0.4, 1.3)	0.3 (-0.8, 1.6)	0.4 (0.1, 0.9)	0.9 (0.3, 1.7)	2.0 (0.8, 4.1)
Eastern Asia						
China	1.0 (0.5, 1.6)	2.3 (1.4, 3.3)	2.3 (1.2, 3.5)	0.7 (0.1, 1.5)	1.6 (0.4, 3.0)	3.5 (0.9, 6.9)
Japan	0.1 (-0.5, 0.5)	-0.2 (-0.8, 0.2)	-1.7 (-2.6, -0.9)	0.2 (0.0, 0.6)	0.4 (-0.1, 1.0)	0.8 (-0.2, 2.1)
South Korea	1.5 (0.9, 2.0)	2.7 (1.7, 3.7)	3.1 (2.0, 4.2)	0.3 (0.0, 0.8)	0.7 (0.0, 1.5)	1.4 (0.0, 3.4)
Eastern Europe						
Czech Republic	-0.2 (-0.6, 0.2)	0.3 (-0.3, 0.7)	0.7 (-0.5, 1.6)	0.5 (0.1, 1.0)	1.2 (0.5, 2.2)	2.7 (1.2, 5.7)
Moldova	-1.4 (-2.0, -0.7)	-2.1 (-3.1, -1.3)	-6.9 (-9.5, -4.4)	0.8 (0.1, 1.6)	1.7 (0.5, 3.1)	3.7 (1.6, 7.1)
Romania	-1.2 (-1.7, -0.7)	-1.4 (-2.0, -0.8)	-1.4 (-2.9, -0.6)	1.0 (0.3, 1.8)	2.3 (0.8, 3.5)	5.3 (2.8, 8.7)
Serbia	-0.9 (-1.4, -0.4)	-0.7 (-1.2, -0.2)	-0.6 (-1.8, 0.2)	0.7 (0.0, 1.5)	1.6 (0.3, 2.4)	3.9 (1.6, 6.6)
Latin America and the Caribbean						
Costa Rica	-0.3 (-1.3, 0.5)	-0.3 (-1.3, 0.6)	-0.3 (-1.4, 0.8)	0.6 (-0.9, 2.6)	1.8 (-2.5, 6.3)	6.5 (-9.2, 22.3)
Guatemala	-0.5 (-1.6, 0.4)	-0.8 (-2.2, 0.4)	-1.2 (-3.1, 0.4)	0.2 (-0.4, 1.1)	0.7 (-1.5, 3.2)	3.3 (-6.2, 12.9)
Mexico	-0.2 (-0.9, 0.3)	0 (-0.7, 0.6)	-0.5 (-1.6, 0.3)	0.6 (0.2, 1.1)	1.4 (0.4, 2.4)	3.6 (0.8, 6.4)
Panama	-0.7 (-2.0, 0.4)	-0.7 (-2.3, 0.3)	-0.8 (-2.4, 0.4)	1.4 (-1.7, 4.1)	3.6 (-5.2, 9.8)	10.2 (-21.6, 29.9)
Argentina	0.0 (-0.3, 0.6)	0.5 (-0.2, 1.1)	0.6 (-0.3, 1.5)	0.5 (0.0, 1.0)	1.1 (0.5, 1.8)	2.5 (1.1, 4.6)
Brazil	-0.1 (-0.8, 0.7)	0.0 (-1.0, 0.8)	-0.2 (-1.1, 0.8)	0.9 (0.0, 1.7)	2.0 (0.4, 4.2)	4.8 (-0.2, 10.9)
Chile	0.6 (-0.1, 1.3)	1.4 (0.1, 2.6)	1.3 (-0.4, 3.0)	0.7 (0.2, 1.3)	1.6 (0.6, 2.9)	3.8 (1.3, 6.7)
Colombia	-0.1 (-0.9, 0.6)	-0.1 (-1.3, 1.0)	-0.8 (-2.1, 0.4)	0.1 (-2.1, 1.4)	-0.3 (-9.4, 3.7)	-4.7 (-66.5, 13.9)
French Guiana	-0.4 (-1.4, 0.3)	-0.4 (-1.2, 0.3)	-0.4 (-1.1, 0.3)	3.7 (-5.3, 11.5)	9.3 (-17.8, 25)	24.5 (-73.6, 61.1)
Paraguay	0.5 (-0.4, 1.3)	1.2 (-0.3, 2.5)	1.5 (0.1, 3.6)	1.6 (0.3, 4.6)	3.3 (1.0, 8.7)	7.6 (2.3, 14.6)
Peru	-0.4 (-1.2, 0.2)	-0.4 (-1.5, 0.4)	-0.9 (-2.6, 0.3)	0.4 (-1.1, 1.7)	1.2 (-3.5, 4.9)	4.2 (-14.7, 16.2)
Uruguay	-1.0 (-1.9, -0.3)	-1.1 (-2.7, -0.4)	-2.2 (-4.0, -1.2)	0.4 (0.1, 1.1)	1.0 (0.5, 1.8)	2.5 (1.0, 5.1)
Guadeloupe	-0.8 (-1.8, -0.2)	-1.0 (-2.1, -0.2)	-1.4 (-2.8, -0.2)	1.5 (-1.2, 4.3)	3.6 (-3.5, 9.4)	9.5 (-12.8, 24.9)
Martinique	-0.7 (-1.8, 0.0)	-0.9 (-2.2, 0.1)	-1.2 (-2.9, 0.3)	1.8 (-0.5, 4.6)	4.4 (-1.5, 10.0)	11.9 (-6.3, 27.7)

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Puertorico	-0.8 (-1.8, -0.1)	-1.1 (-2.5, 0.0)	-1.9 (-4.4, 0.3)	1.3 (-0.7, 3.6)	3.1 (-1.9, 7.7)	8.1 (-7.3, 20.3)
Northern America						
Canada	0.5 (0.3, 0.7)	1.3 (0.8, 1.7)	1.5 (0.7, 2.0)	0.5 (0.1, 1.0)	1.1 (0.3, 2.3)	2.4 (0.7, 5.6)
USA	0.3 (0.0, 0.6)	0.9 (0.5, 1.4)	0.7 (-0.1, 1.2)	0.4 (-0.1, 0.9)	0.8 (-0.2, 1.9)	1.7 (-0.5, 4.3)
Northern Europe						
Estonia	-1.3 (-2, -0.7)	-2.1 (-3.4, -1.2)	-3.4 (-5.3, -1.9)	0.2 (-0.1, 0.7)	0.4 (-0.1, 1.3)	0.9 (-0.3, 3.1)
Finland	0.2 (-0.4, 0.8)	0.7 (-0.3, 1.5)	-0.2 (-1.6, 0.7)	0.4 (-0.1, 1.0)	0.7 (0.1, 1.9)	1.5 (0.3, 4.3)
Iceland	0.5 (-0.5, 1.6)	1.6 (-0.4, 3.8)	2.3 (-0.7, 5.5)	0.0 (-0.2, 0.2)	0.1 (-0.3, 0.5)	0.2 (-0.9, 1.4)
Ireland	0.7 (0.0, 1.6)	1.7 (0.7, 2.9)	2.6 (1.1, 4.6)	0.1 (-0.2, 0.4)	0.2 (-0.4, 0.8)	0.4 (-1.0, 2.2)
Norway	0.2 (-0.2, 0.6)	1.2 (0.2, 2.2)	1.9 (0.2, 3.6)	0.2 (-0.3, 0.6)	0.3 (-0.6, 1.3)	0.8 (-1.3, 3)
Sweden	-0.3 (-0.8, 0.1)	-0.1 (-0.8, 0.4)	-0.2 (-1.3, 0.5)	0.3 (0.0, 0.6)	0.6 (0.1, 1.3)	1.3 (0.3, 3.3)
UK	-0.2 (-0.8, 0.4)	0.2 (-0.5, 0.8)	0.2 (-0.9, 1.2)	0.3 (-0.2, 0.7)	0.6 (0.0, 1.3)	1.4 (0.3, 3.8)
South-eastern Asia						
Philippines	-0.5 (-1.2, -0.1)	-0.6 (-1.5, -0.1)	-0.8 (-1.7, -0.2)	1.8 (0.5, 3.3)	4.3 (0.7, 7.9)	12.1 (-1.1, 25.3)
Thailand	-0.2 (-0.8, 0.7)	-0.2 (-0.8, 0.7)	-0.6 (-1.5, 0.2)	1.4 (0.0, 3.5)	3.2 (-0.1, 7.4)	7.8 (-2.6, 20.8)
Vietnam	-0.8 (-1.8, -0.2)	-0.7 (-1.8, 0.0)	-1.0 (-2.2, 0.5)	2.1 (0.6, 4.1)	5.3 (1.4, 10.2)	14.2 (2.2, 32.0)
Sub-Saharan Africa						
South Africa	0.0 (-0.5, 0.3)	0.1 (-0.7, 0.7)	0.4 (-1.1, 1.5)	0.0 (-0.5, 0.5)	0.1 (-1.2, 0.9)	-0.3 (-6.6, 2.7)
Reunion	-0.6 (-1.6, -0.1)	-0.9 (-2.2, -0.2)	-1.3 (-3.0, -0.2)	0.5 (-0.8, 1.6)	1.2 (-2.1, 3.9)	3.7 (-9.0, 12.3)
Southern Asia						
Iran	0.3 (0.1, 0.5)	1.4 (0.6, 2.1)	2.6 (1.1, 3.9)	0.6 (0.1, 1.2)	1.4 (0.3, 2.6)	3.4 (0.9, 6.4)
Southern Europe						
Cyprus	0.2 (-0.4, 0.8)	1.2 (0.3, 2.1)	1.8 (0.5, 3.2)	0.6 (-0.1, 1.4)	1.3 (-0.2, 3.0)	3.0 (-0.5, 6.6)
Greece	-0.5 (-0.9, -0.1)	-0.5 (-1.0, -0.1)	-0.7 (-1.5, 0.0)	1.1 (0.3, 2.4)	2.1 (0.9, 4.1)	4.6 (2.2, 8.0)
Italy	-0.8 (-1.3, -0.2)	-0.8 (-1.4, -0.2)	-0.8 (-2.0, 0.1)	1.4 (0.6, 2.8)	2.8 (1.2, 4.3)	5.9 (3.3, 9.9)
Malta	0.2 (-0.6, 1.0)	0.8 (-0.3, 1.9)	-0.1 (-1.5, 1.5)	0.5 (0.0, 1.1)	1.1 (0.1, 2.1)	2.3 (0.3, 4.6)
Portugal	-0.6 (-1.2, -0.2)	-0.6 (-1.2, 0.1)	-0.7 (-1.9, 0.1)	0.6 (-0.1, 1.3)	1.2 (0.1, 2.0)	2.8 (1.4, 4.4)

Country/area	Changes in cold-related mortality (%)			Changes in heat-related mortality (%)		
	1.5 °C	2 °C	3 °C	1.5 °C	2 °C	3 °C
Spain	-0.6 (-1.0, -0.2)	-0.3 (-0.7, 0.2)	0.3 (-0.5, 1.0)	1.0 (0.4, 1.8)	2.1 (1.2, 3.2)	4.8 (2.9, 7.2)
Western Asia						
Israel	0.0 (-0.6, 0.8)	0.5 (-0.4, 1.4)	0.5 (-0.8, 1.7)	0.6 (-0.1, 1.4)	1.4 (-0.2, 2.9)	3.4 (-0.4, 6.9)
Kuwait	1.9 (0.0, 3.5)	4.2 (0.2, 7.5)	5.1 (-0.1, 9.4)	1.1 (-0.5, 2.5)	2.3 (-1, 5.1)	4.9 (-2.4, 10.5)
Western Europe						
France	-0.3 (-0.8, 0.2)	0.2 (-0.4, 0.8)	0.1 (-1.0, 0.8)	0.7 (0.2, 1.3)	1.6 (0.7, 2.7)	3.6 (1.8, 6.8)
Germany	-0.3 (-0.8, 0.1)	-0.4 (-0.9, -0.1)	-0.7 (-1.6, -0.1)	0.5 (0.1, 0.9)	1.1 (0.4, 2.0)	2.3 (0.9, 5.1)
Netherland	0.1 (-0.4, 0.5)	0.3 (-0.3, 0.8)	-0.1 (-0.9, 0.7)	0.5 (0.1, 0.9)	0.9 (0.3, 1.7)	1.9 (0.9, 4.1)
Switzerland	-0.1 (-0.4, 0.3)	0.3 (-0.2, 0.7)	0.3 (-0.6, 1.0)	0.6 (0.0, 1.3)	1.2 (0.0, 2.6)	2.7 (0.0, 6.1)

Supplementary Table 6. Projected changes (95% eCIs) in non-optimal temperature-related excess mortality (%) at different levels of global warming under SSP5-8.5 by country/area under the “climate-population” scenario.

Country/area	1.5 °C	2 °C	3 °C
Overall	0.5 (0.1 to 0.9)	1.5 (0.3 to 2.4)	2.7 (-1.3 to 5.6)
Australia			
Australia	0.5 (0.0, 1.0)	1.3 (0.3, 2.3)	2.3 (0.7, 4.1)
Eastern Asia			
China	1.8 (1.0, 2.6)	3.9 (2.4, 5.3)	5.7 (3.1, 8.5)
Japan	0.3 (-0.3, 0.7)	0.1 (-0.5, 0.7)	-0.9 (-2.2, 0.1)
South Korea	1.8 (1.2, 2.4)	3.4 (2.3, 4.4)	4.5 (2.9, 6.1)
Eastern Europe			
Czech Republic	0.4 (-0.1, 0.8)	1.5 (0.7, 2.4)	3.4 (1.7, 5.5)
Moldova	-0.6 (-1.4, 0.1)	-0.5 (-1.7, 0.9)	-3.2 (-5.9, -0.3)
Romania	-0.2 (-0.8, 0.5)	0.9 (-0.2, 2.0)	3.9 (1.8, 6.1)
Serbia	-0.2 (-0.9, 0.5)	0.9 (-0.1, 1.7)	3.3 (1.2, 5.2)
Latin America and the Caribbean			
Costa Rica	0.3 (-1.2, 2.0)	1.6 (-2.6, 5.8)	6.2 (-9.2, 21.7)
Guatemala	-0.3 (-1.5, 0.7)	-0.1 (-2.5, 2.4)	2.1 (-7.5, 11.2)
Mexico	0.4 (-0.3, 1.1)	1.4 (0.3, 2.3)	3.1 (0.4, 5.4)
Panama	0.7 (-2.3, 3.3)	2.9 (-5.6, 8.9)	9.4 (-22.2, 28.6)
Argentina	0.5 (-0.1, 1.0)	1.6 (0.6, 2.5)	3.1 (1.6, 4.7)
Brazil	0.7 (0.1, 1.4)	2.0 (0.5, 3.5)	4.7 (-0.4, 10.1)
Chile	1.3 (0.4, 2.3)	3.0 (1.3, 4.6)	5.0 (2.1, 7.9)
Colombia	0.0 (-2.3, 1.2)	-0.4 (-9.8, 3.2)	-5.4 (-67.9, 13.3)
French Guiana	3.2 (-5.7, 10.8)	8.9 (-17.9, 24.3)	24.1 (-74, 60.7)
Paraguay	2.1 (0.9, 4.2)	4.5 (2.2, 8.4)	9.1 (4.5, 15.2)
Peru	0.0 (-1.6, 1.1)	0.8 (-4.0, 4.0)	3.3 (-15.8, 14.8)
Uruguay	-0.6 (-1.3, 0.2)	-0.1 (-1.1, 0.7)	0.3 (-1.2, 2.3)
Guadeloupe	0.7 (-2.1, 3.1)	2.7 (-4.5, 8.1)	8.1 (-14.1, 23.1)
Martinique	1.1 (-1.2, 3.6)	3.5 (-2.3, 8.9)	10.6 (-7.3, 26.2)
Puertorico	0.6 (-1.4, 2.5)	2.0 (-2.8, 6.2)	6.2 (-8.7, 17.8)
Northern America			
Canada	1.0 (0.5, 1.4)	2.3 (1.4, 3.4)	3.9 (2.0, 6.6)
USA	0.6 (0.1, 1.1)	1.7 (0.6, 2.7)	2.4 (0.1, 4.6)
Northern Europe			
Estonia	-1.1 (-1.8, -0.5)	-1.7 (-2.9, -0.8)	-2.5 (-4.4, -0.8)
Finland	0.6 (0.0, 1.1)	1.4 (0.4, 2.5)	1.3 (-0.1, 3.1)
Iceland	0.6 (-0.4, 1.6)	1.7 (-0.3, 3.8)	2.5 (-0.4, 5.5)
Ireland	0.8 (0.0, 1.7)	1.9 (0.8, 3.0)	3.1 (0.9, 4.8)
Norway	0.3 (-0.3, 0.8)	1.6 (0.3, 2.8)	2.7 (0.1, 4.9)
Sweden	0 (-0.4, 0.4)	0.5 (-0.2, 1.2)	1.1 (-0.1, 2.4)
UK	0.1 (-0.5, 0.5)	0.7 (0.0, 1.3)	1.6 (0.4, 3.1)

Country/area	1.5 °C	2 °C	3 °C
Overall	0.5 (0.1 to 0.9)	1.5 (0.3 to 2.4)	2.7 (-1.3 to 5.6)
South-eastern Asia			
Philippines	1.3 (-0.1, 2.6)	3.7 (0.1, 7.0)	11.3 (-1.8, 24.3)
Thailand	1.2 (-0.1, 3.0)	3.1 (-0.3, 6.9)	7.2 (-3.2, 19.5)
Vietnam	1.4 (-0.1, 3.3)	4.6 (1.0, 9.0)	13.2 (2.4, 30.4)
Sub-Saharan Africa			
South Africa	0.0 (-0.7, 0.3)	0.2 (-1.3, 0.8)	0.1 (-6.9, 2.3)
Reunion	-0.1 (-1.5, 1.0)	0.2 (-3.0, 2.7)	2.3 (-10.3, 10.4)
Southern Asia			
Iran	0.8 (0.3, 1.4)	2.8 (1.4, 4.1)	6.0 (3.0, 9.0)
Southern Europe			
Cyprus	0.9 (-0.1, 1.8)	2.5 (0.4, 4.5)	4.8 (0.6, 8.6)
Greece	0.6 (-0.1, 1.7)	1.6 (0.5, 3.3)	3.9 (1.8, 6.8)
Italy	0.6 (-0.1, 1.8)	2.0 (0.8, 3.2)	5.1 (2.9, 8.0)
Malta	0.7 (-0.2, 1.6)	1.8 (0.4, 3.2)	2.2 (-0.1, 4.3)
Portugal	0.0 (-0.3, 0.3)	0.6 (0.1, 1.3)	2.1 (1.2, 3.0)
Spain	0.4 (-0.1, 1.2)	1.8 (1.0, 2.9)	5.1 (3.2, 7.3)
Western Asia			
Israel	0.6 (-0.4, 1.5)	1.9 (-0.1, 3.7)	3.8 (-0.3, 7.5)
Kuwait	2.9 (0.4, 5.2)	6.4 (0.9, 11.3)	10.0 (0.1, 17.7)
Western Europe			
France	0.4 (-0.1, 0.9)	1.8 (1.1, 2.6)	3.7 (2.3, 5.9)
Germany	0.1 (-0.4, 0.6)	0.7 (0.1, 1.4)	1.6 (0.4, 3.6)
Netherlands	0.5 (0.1, 1.0)	1.3 (0.6, 2.0)	1.8 (0.9, 3.2)
Switzerland	0.5 (-0.2, 1.2)	1.5 (0.1, 2.8)	3.0 (0.1, 6.0)

Supplementary Table 7. Changes (95% eCIs) in non-optimal temperature-related excess mortality (%) due to population aging at different levels of global warming under SSP5-8.5 by country/area under the “climate-population” scenario compared with the “climate-only” scenario.

Country/area	1.5 °C	2 °C	3 °C
Overall	0.8 (0.6 to 0.9)	1.7 (1.2 to 2.1)	2.6 (0.9, 3.5)
Australia			
Australia	0.7 (0.2, 1.2)	1.5 (0.4, 2.7)	2.4 (0.6, 4.0)
Eastern Asia			
China	2.0 (1.4, 2.5)	4.1 (3.0, 5.2)	5.4 (3.9, 6.7)
Japan	0.7 (0.5, 0.9)	0.9 (0.7, 1.1)	0.2 (0.1, 0.3)
South Korea	2.0 (1.4, 2.6)	3.7 (2.5, 4.7)	4.8 (3.3, 6.1)
Eastern Europe			
Czech Republic	0.5 (0.3, 0.6)	1.4 (1.0, 1.8)	2.8 (2.0, 3.6)
Moldova	-0.7 (-1.0, -0.5)	-0.9 (-1.3, -0.5)	-4.8 (-6.5, -3.1)
Romania	-0.6 (-0.8, -0.4)	-0.2 (-0.4, -0.1)	0.9 (0.7, 1.1)
Serbia	-0.4 (-0.5, -0.3)	0.3 (0.2, 0.3)	1.4 (1.0, 1.8)
Latin America and the Caribbean			
Costa Rica	0.4 (-0.8, 1.5)	0.9 (-1.5, 3.0)	1.9 (-3, 5.3)
Guatemala	0.4 (-0.1, 1.0)	0.9 (-0.3, 2.0)	2.0 (-1.2, 4.3)
Mexico	1.0 (0.8, 1.3)	2.2 (1.7, 2.8)	3.4 (2.4, 4.2)
Panama	0.7 (-0.4, 1.6)	1.7 (-1.2, 3.8)	3.5 (-5.8, 7.0)
Argentina	0.7 (0.5, 0.8)	1.7 (1.3, 2.1)	3.0 (2.2, 3.7)
Brazil	0.8 (0.5, 1.0)	1.7 (1.1, 2.2)	3.1 (1.4, 4.3)
Chile	1.5 (0.7, 2.2)	3.1 (1.5, 4.5)	4.4 (2.2, 6.4)
Colombia	0.7 (0.2, 1.0)	1.2 (-1.3, 1.9)	0.2 (-25.9, 3.7)
French Guiana	1.2 (-1.2, 2.7)	3.0 (-5.5, 6.1)	6.0 (-28.6, 9.5)
Paraguay	1.6 (0.9, 2.3)	3.3 (1.8, 4.6)	5.6 (3.2, 7.7)
Peru	0.6 (0.0, 1.1)	1.3 (-0.2, 2.3)	2.2 (-3.7, 4.2)
Uruguay	-0.2 (-0.3, -0.1)	0.2 (0.1, 0.3)	0.6 (0.4, 0.8)
Guadeloupe	0.5 (0.0, 0.9)	1.3 (-0.3, 2.3)	2.2 (-1.7, 3.8)
Martinique	0.3 (0.0, 0.6)	1.0 (-0.1, 1.9)	1.8 (-0.6, 3.0)
Puertorico	0.3 (-0.1, 0.7)	0.8 (-0.2, 1.6)	1.2 (-1.1, 2.0)
Northern America			
Canada	0.9 (0.6, 1.2)	2.1 (1.4, 2.7)	2.9 (1.9, 3.9)
USA	0.8 (0.6, 1.0)	1.9 (1.3, 2.4)	2.4 (1.6, 3.0)
Northern Europe			
Estonia	-0.6 (-0.7, -0.4)	-1.0 (-1.3, -0.7)	-1.4 (-1.8, -0.9)
Finland	0.9 (0.4, 1.3)	1.8 (0.9, 2.6)	1.7 (0.8, 2.4)
Iceland	0.8 (0.0, 1.6)	2.1 (-0.1, 4.1)	3.1 (-0.2, 6.2)
Ireland	1.2 (0.8, 1.4)	2.6 (1.9, 3.3)	4.2 (3.0, 5.2)
Norway	0.6 (0.2, 0.9)	1.9 (0.7, 3.1)	3.2 (1.1, 5.1)
Sweden	0.3 (0.2, 0.4)	0.9 (0.5, 1.2)	1.4 (0.9, 1.9)
UK	0.4 (0.3, 0.4)	1.2 (1.0, 1.4)	2.1 (1.6, 2.5)

Country/area	1.5 °C	2 °C	3 °C
Overall	0.8 (0.6 to 0.9)	1.7 (1.2 to 2.1)	2.6 (0.9, 3.5)
South-eastern Asia			
Philippines	0.8 (0.3, 1.4)	1.9 (0.7, 3.1)	4.3 (0.3, 6.3)
Thailand	0.9 (0.5, 1.4)	2.0 (0.9, 2.9)	3.1 (0.3, 4.7)
Vietnam	1.0 (0.5, 1.8)	2.8 (1.3, 5.1)	5.1 (2.5, 7.8)
Sub-Saharan Africa			
South Africa	0.5 (0.4, 0.7)	1.3 (0.9, 1.5)	2.4 (-0.1, 3.2)
Reunion	0.3 (-0.1, 0.5)	0.6 (-0.4, 1.3)	1.7 (-2.8, 3.5)
Southern Asia			
Iran	0.6 (0.3, 0.9)	2.2 (1.1, 3.2)	4.4 (2.3, 6.2)
Southern Europe			
Cyprus	1.0 (0.4, 1.6)	2.6 (1.0, 3.8)	4.4 (1.7, 6.6)
Greece	0.1 (0.0, 0.1)	0.5 (0.3, 0.7)	1.2 (0.7, 1.7)
Italy	0.1 (0.1, 0.1)	0.7 (0.5, 0.9)	1.9 (1.3, 2.4)
Malta	1.3 (0.6, 1.9)	2.6 (1.2, 3.7)	3.0 (1.4, 4.4)
Portugal	0.2 (0.1, 0.2)	0.9 (0.6, 1.1)	1.9 (1.4, 2.4)
Spain	0.0 (0.0, 0.0)	0.9 (0.6, 1.3)	2.5 (1.5, 3.4)
Western Asia			
Israel	0.8 (0.3, 1.3)	1.9 (0.6, 3.1)	3.1 (1.0, 5.0)
Kuwait	2.7 (0.6, 4.6)	5.9 (1.2, 10.0)	8.4 (1.6, 13.9)
Western Europe			
France	0.3 (0.3, 0.4)	1.5 (1.1, 1.8)	2.3 (1.8, 2.8)
Germany	0.2 (0.1, 0.2)	0.5 (0.3, 0.6)	0.8 (0.5, 1.0)
Netherland	0.6 (0.4, 0.8)	1.3 (0.8, 1.7)	1.4 (1.0, 1.9)
Switzerland	0.5 (0.2, 0.7)	1.3 (0.5, 1.9)	2.0 (0.9, 3.0)

Supplementary References

- 1 Gasparrini, A., Armstrong, B. & Kenward, M. G. Distributed lag non-linear models. *Stat Med* **29**, 2224-2234 (2010).
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- 3 Sera, F., Armstrong, B., Blangiardo, M. & Gasparrini, A. An extended mixed-effects framework for meta-analysis. *Stat Med* **38**, 5429-5444, doi:10.1002/sim.8362 (2019).