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# Supplemental Material

## Evaluation of the Impact of Ambient Temperatures on Occupational Injuries in Spain

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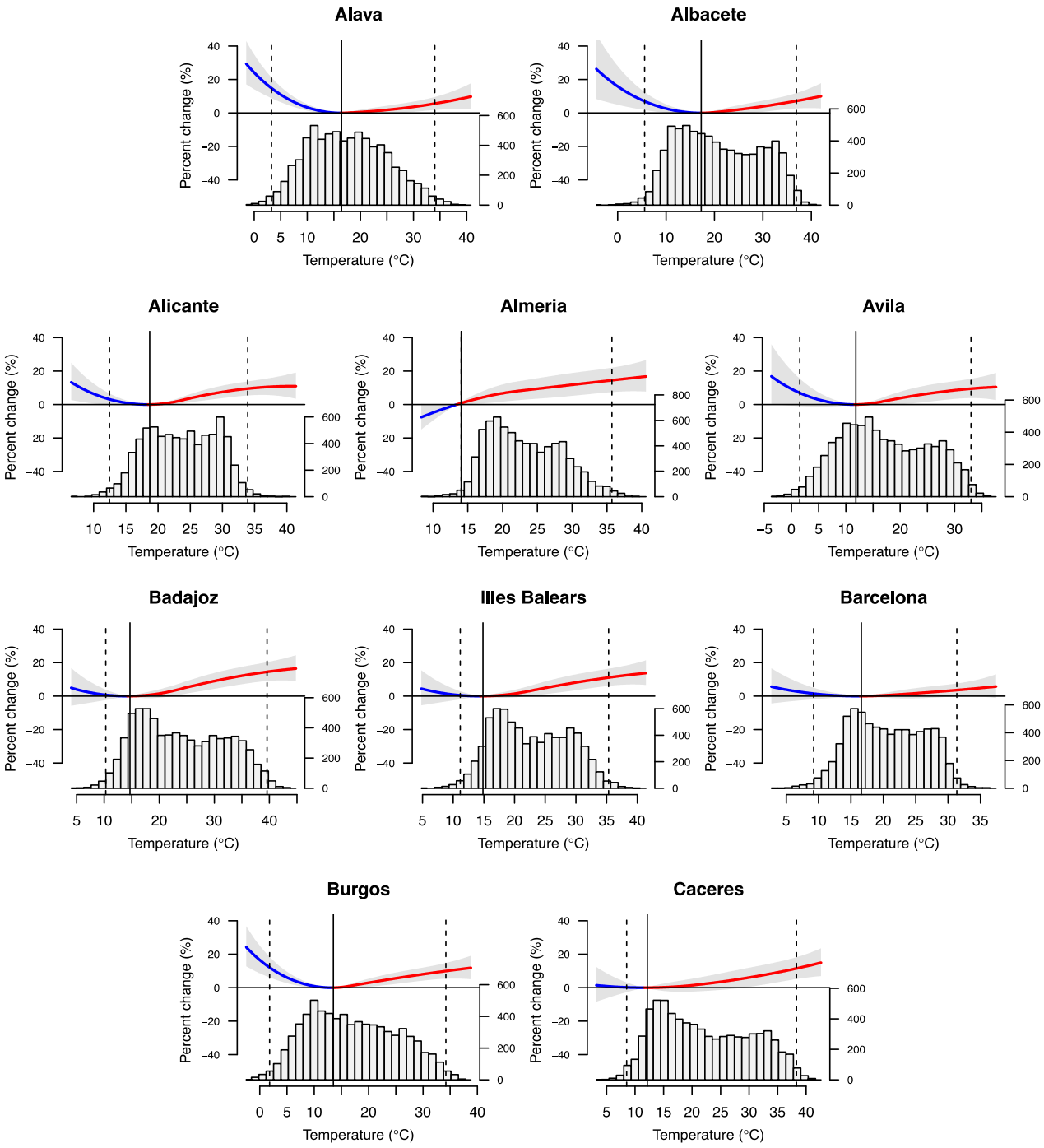


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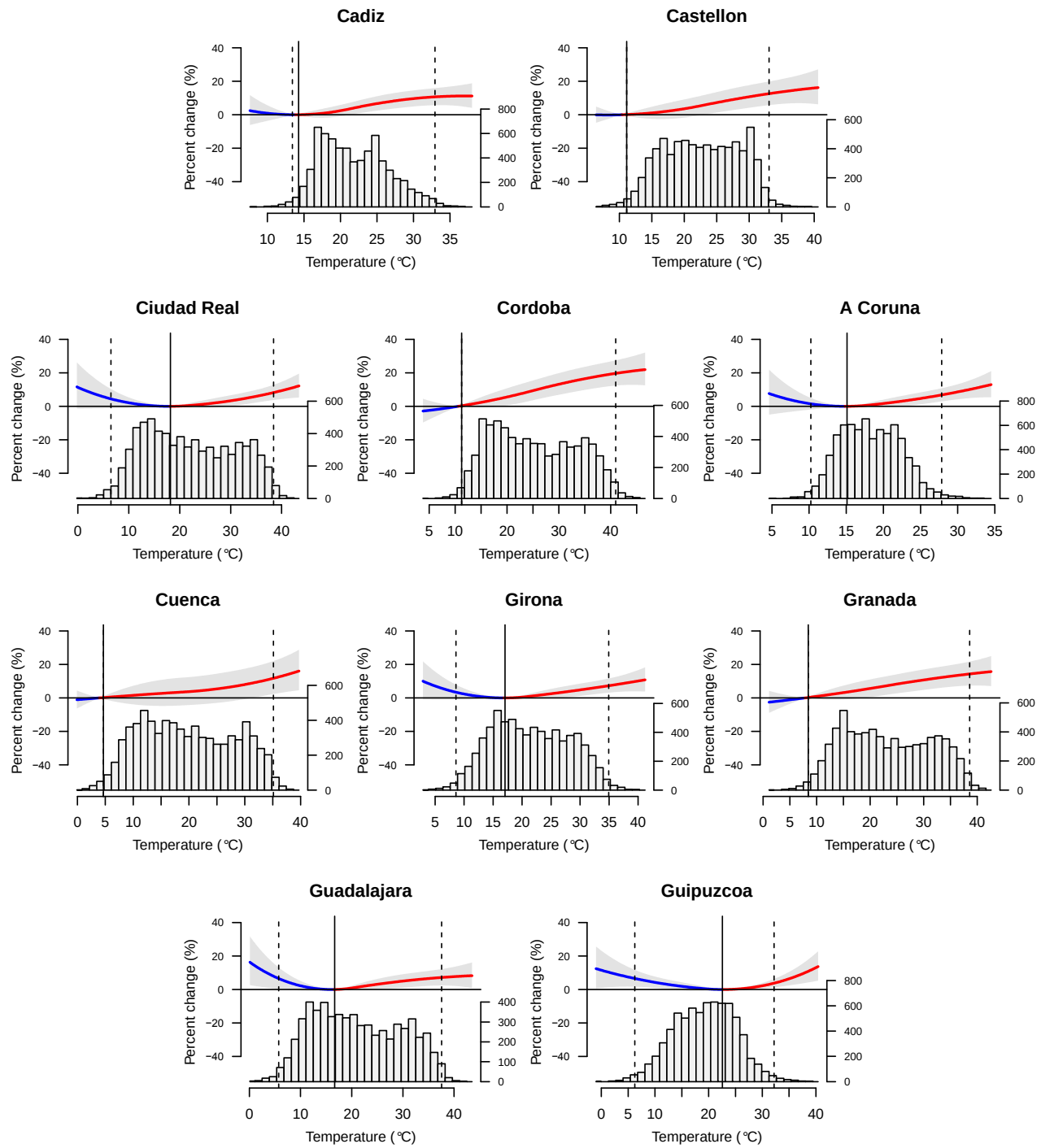


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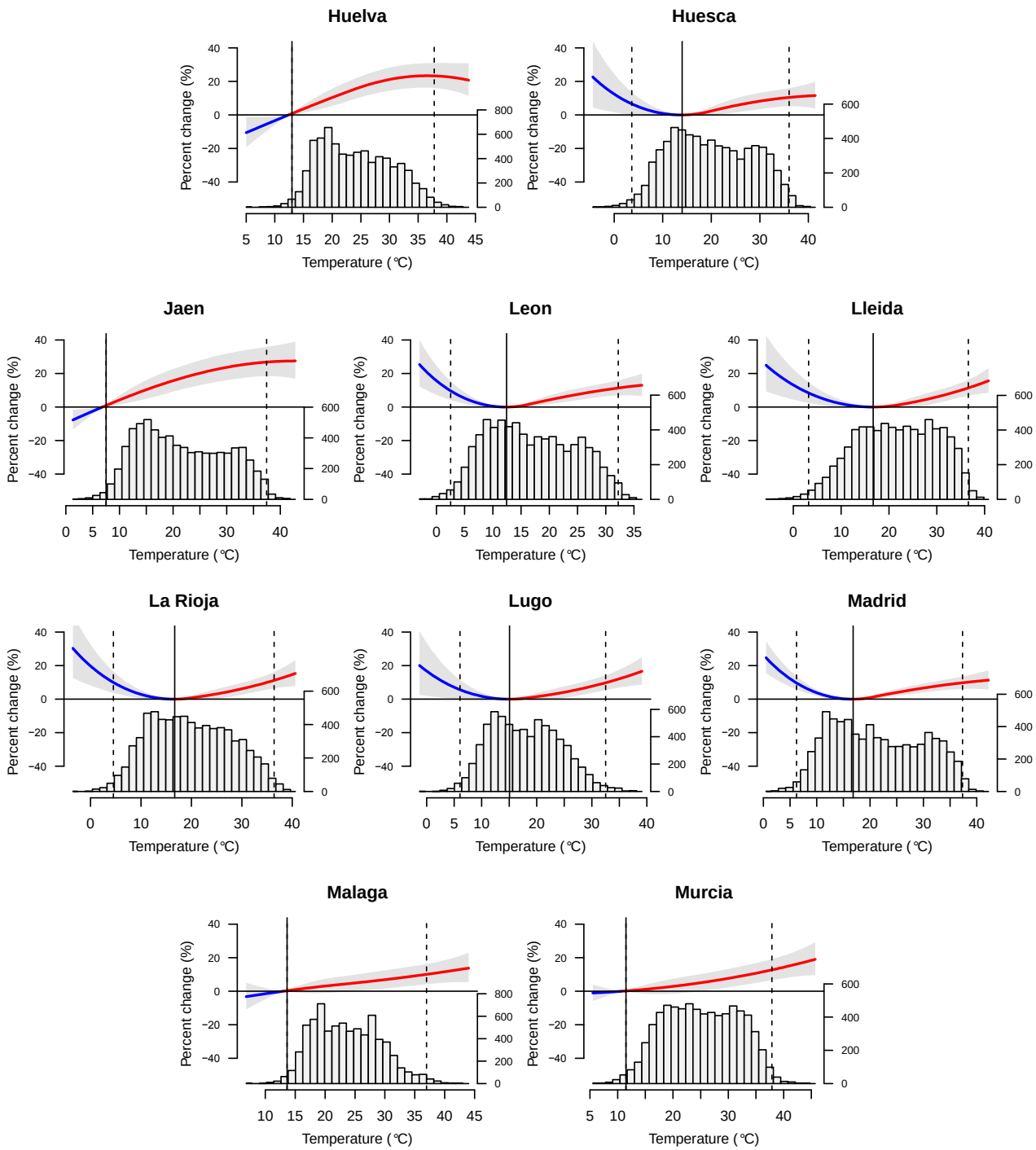


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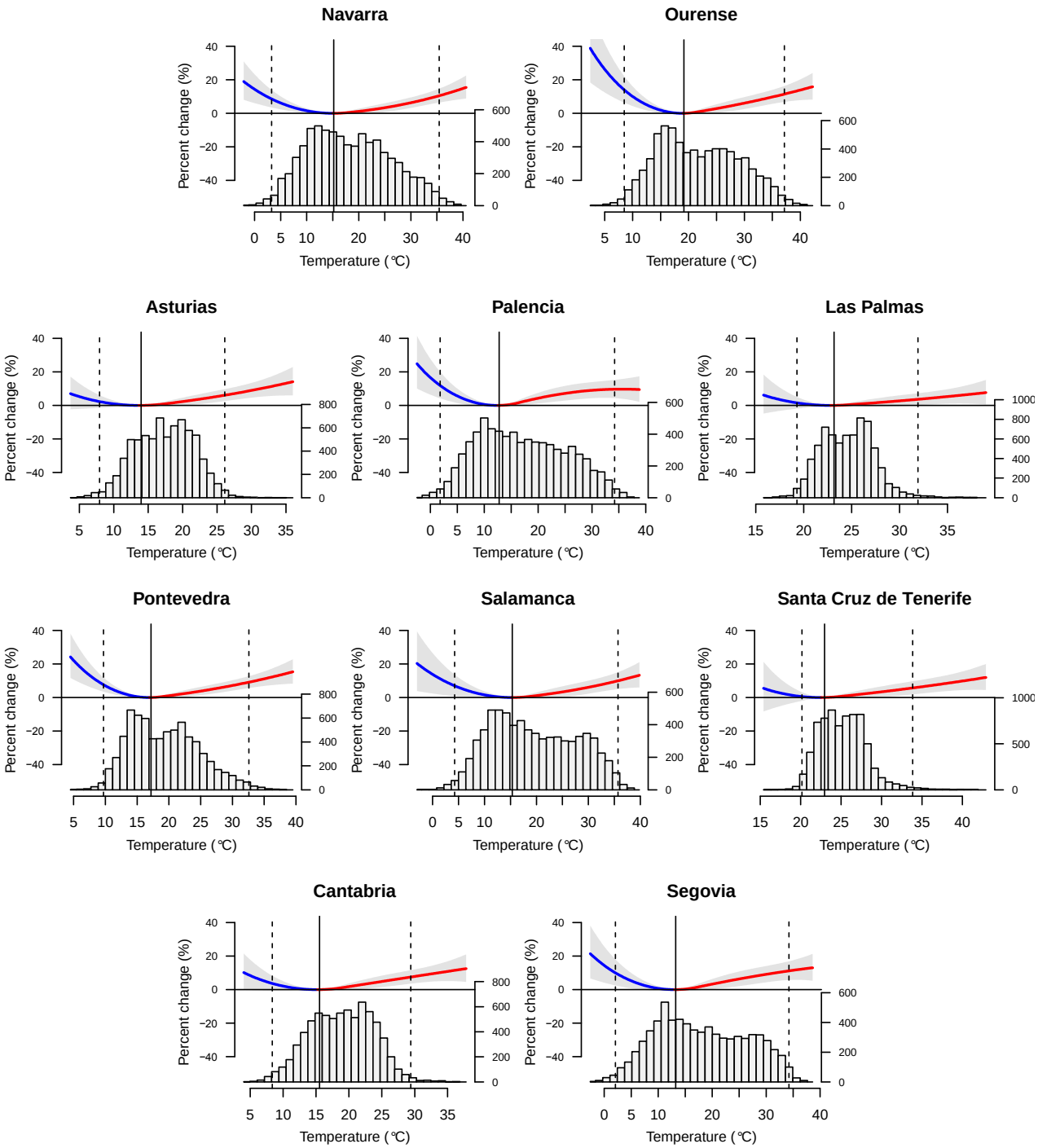


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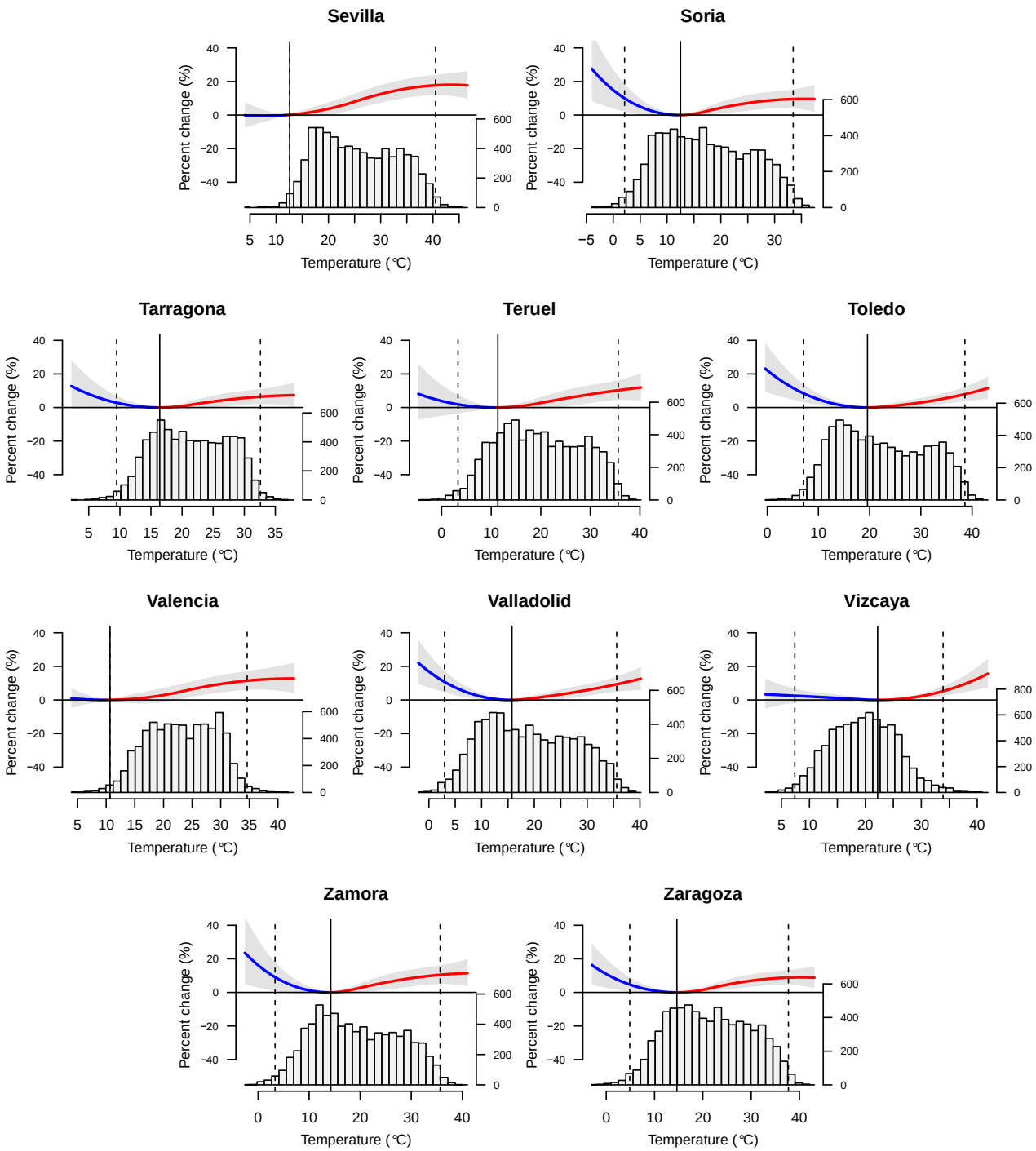


**Figure S1. Overall cumulative exposure-response relationships in 50 Spanish provinces**
These relationships were derived from the best linear unbiased prediction (BLUP) with 95%CI of the overall cumulative exposure-response association. The BLUP is a compromise between the location-specific association (1st stage) and the pooled association (2nd stage). It is used to compensate areas reporting a small daily number of occupational injuries (with imprecise estimations) with areas reporting larger numbers and similar characteristics (Post et al. 2001; Gasparrini et al. 2012).
The minimum injury temperature and the 1st and 99th percentiles are represented by solid and dashed lines, respectively.

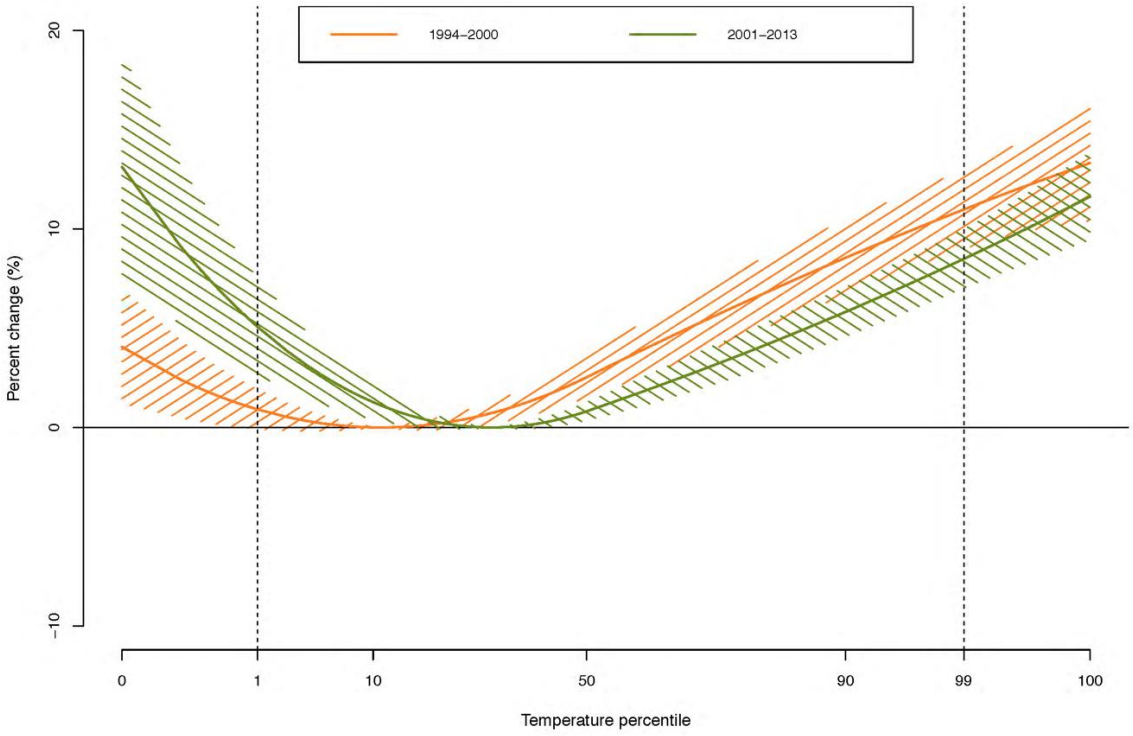


**Figure S2. Overall cumulative exposure-response relationships in Spain in two periods: 1994-2000 and 2001-2013**

Exposure-response association in percent difference (with 95% confidence interval – shaded) between ambient temperature and occupational injuries in Spain, in two periods: 1994-2000 (orange) and 2001-2013 (green). These two periods correspond to cutoff point of the implementation of occupational injury prevention programs. The relationship considers 4 days of lag. Dashed lines are temperature in the 1st and 99th percentiles.

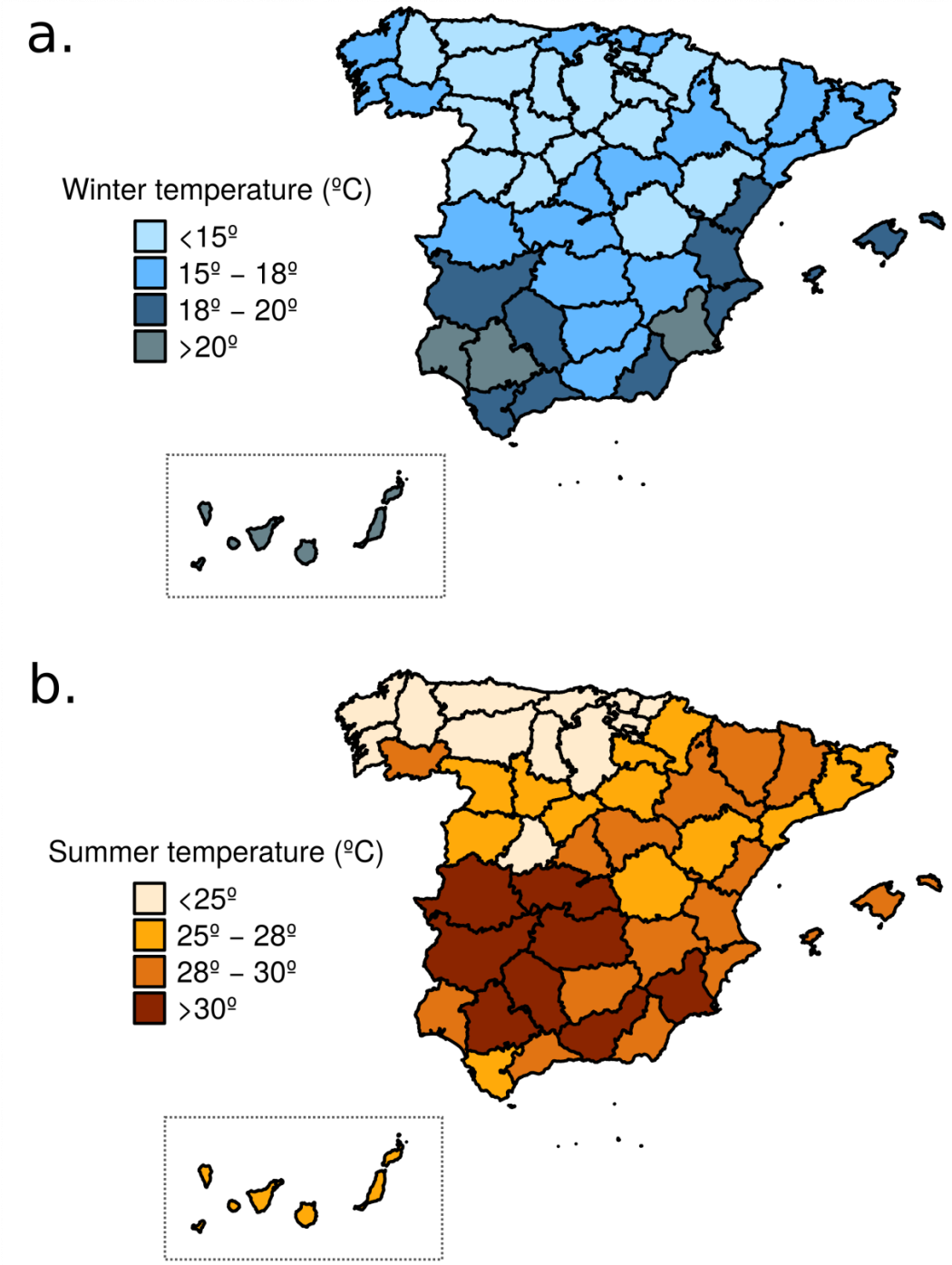


**Figure S3. Distribution of average of maximum temperatures in winter (a) and summer (b) by Spanish provinces, 1994-2013**

The winter period corresponds from the 1st of October until the 30th of April, while the summer period goes from the 1st of May until the 30th of September.

**Table S1. Descriptive statistics on daily number of occupational injuries and maximum temperature. Spanish Provinces (1994-2013)**

| Province | Population (2001 census) | Total number of injuries | % of all injuries | Number of occupational injuries per day | | | Daily maximum temperature | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean | Min | Max | Mean | Min | Max |
| Alava | 286,387 | 161,933 | 1.0 | 22.2 | 0 | 89 | 17.5 | -1.5 | 40.8 |
| Albacete | 364,835 | 135,482 | 0.8 | 18.5 | 0 | 135 | 21.1 | -4.4 | 42.0 |
| Alicante | 1,461,925 | 515,148 | 3.2 | 70.5 | 0 | 286 | 23.5 | 6.5 | 41.4 |
| Almeria | 536,731 | 223,062 | 1.4 | 30.5 | 0 | 129 | 23.2 | 8.3 | 40.6 |
| Avila | 163,442 | 30,954 | 0.2 | 4.2 | 0 | 20 | 17.2 | -3.7 | 37.6 |
| Badajoz | 654,882 | 171,110 | 1.1 | 23.4 | 0 | 98 | 24.0 | 4.0 | 44.8 |
| Illes Balears | 841,669 | 480,101 | 3.0 | 65.7 | 0 | 199 | 22.7 | 4.8 | 41.4 |
| Barcelona | 4,805,927 | 2,301,523 | 14.4 | 315.1 | 2 | 1,262 | 20.7 | 2.7 | 37.4 |
| Burgos | 348,934 | 137,648 | 0.9 | 18.8 | 0 | 72 | 17.0 | -2.5 | 38.8 |
| Caceres | 403,621 | 94,340 | 0.6 | 12.9 | 0 | 64 | 22.2 | 3.2 | 42.6 |
| Cadiz | 1,116,491 | 376,959 | 2.4 | 51.6 | 0 | 157 | 21.9 | 7.6 | 38.0 |
| Castellon | 484,566 | 208,478 | 1.3 | 28.5 | 0 | 136 | 22.7 | 6.4 | 40.6 |
| Ciudad Real | 478,957 | 158,359 | 1.0 | 21.7 | 0 | 95 | 22.1 | -0.2 | 43.4 |
| Cordoba | 761,657 | 241,416 | 1.5 | 33.0 | 0 | 113 | 25.3 | 3.8 | 46.6 |
| A Coruna | 1,096,027 | 338,916 | 2.1 | 46.4 | 0 | 207 | 18.2 | 4.6 | 34.5 |
| Cuenca | 200,346 | 54,289 | 0.3 | 7.4 | 0 | 50 | 19.8 | -0.1 | 39.7 |
| Girona | 565,304 | 280,846 | 1.8 | 38.4 | 0 | 150 | 21.5 | 2.9 | 41.2 |
| Granada | 821,660 | 218,203 | 1.4 | 29.9 | 0 | 127 | 23.3 | 1.1 | 42.6 |
| Guadalajara | 174,999 | 80,503 | 0.5 | 11.0 | 0 | 50 | 21.2 | 0.1 | 43.5 |
| Guipuzcoa | 673,563 | 264,108 | 1.7 | 36.2 | 0 | 149 | 19.3 | -1.0 | 40.4 |
| Huelva | 462,579 | 186,828 | 1.2 | 25.6 | 0 | 90 | 24.2 | 5.0 | 43.8 |
| Huesca | 206,502 | 62,694 | 0.4 | 8.6 | 0 | 31 | 20.1 | -4.4 | 41.4 |
| Jaen | 643,820 | 175,833 | 1.1 | 24.1 | 0 | 80 | 21.7 | 1.3 | 42.8 |
| Leon | 488,751 | 177,392 | 1.1 | 24.3 | 0 | 92 | 16.9 | -3.0 | 36.4 |
| Lleida | 362,206 | 158,327 | 1.0 | 21.7 | 0 | 77 | 21.8 | -5.8 | 40.8 |
| La Rioja | 276,702 | 103,747 | 0.6 | 14.2 | 0 | 59 | 19.9 | -3.5 | 40.6 |
| Lugo | 357,648 | 82,339 | 0.5 | 11.3 | 0 | 40 | 17.8 | -1.4 | 39.1 |
| Madrid | 5,423,384 | 2,265,782 | 14.2 | 310.2 | 3 | 1,196 | 21.3 | 0.5 | 42.2 |
| Malaga | 1,287,017 | 491,705 | 3.1 | 67.3 | 0 | 230 | 23.5 | 6.8 | 44.0 |
| Murcia | 1,197,646 | 504,135 | 3.2 | 69.0 | 0 | 310 | 25.1 | 5.5 | 45.7 |
| Navarra | 555,829 | 239,352 | 1.5 | 32.8 | 0 | 142 | 18.2 | -2.1 | 40.6 |
| Ourense | 338,446 | 75,517 | 0.5 | 10.3 | 0 | 50 | 21.8 | 2.4 | 42.2 |
| Asturias | 1,062,998 | 404,968 | 2.5 | 55.4 | 0 | 305 | 17.2 | 3.7 | 36.0 |
| Palencia | 174,143 | 52,722 | 0.3 | 7.2 | 0 | 34 | 17.0 | -2.5 | 38.8 |
| Las Palmas | 887,676 | 416,609 | 2.6 | 57.0 | 1 | 215 | 24.4 | 15.8 | 39.0 |
| Pontevedra | 903,759 | 341,550 | 2.1 | 46.8 | 0 | 170 | 19.2 | 4.5 | 39.5 |
| Salamanca | 345,609 | 81,057 | 0.5 | 11.1 | 0 | 43 | 19.5 | -3.0 | 39.8 |

| Province | Population (2001 census) | Total number of injuries | % of all injuries | Number of occupational injuries per day | | | Daily maximum temperature | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Mean | Min | Max | Mean | Min | Max |
| Santa Cruz de Tenerife | 806,801 | 328,268 | 2.1 | 44.9 | 0 | 179 | 24.9 | 15.4 | 42.9 |
| Cantabria | 535,131 | 176,444 | 1.1 | 24.2 | 0 | 83 | 18.8 | 4.0 | 37.8 |
| Segovia | 147,694 | 43,966 | 0.3 | 6.0 | 0 | 37 | 18.1 | -2.6 | 38.6 |
| Sevilla | 1,727,603 | 614,930 | 3.8 | 84.2 | 0 | 269 | 25.7 | 4.0 | 46.6 |
| Soria | 90,717 | 30,397 | 0.2 | 4.2 | 0 | 34 | 17.5 | -4.0 | 37.4 |
| Tarragona | 609,673 | 266,332 | 1.7 | 36.5 | 0 | 163 | 21.5 | 2.2 | 38.0 |
| Teruel | 135,858 | 40,725 | 0.3 | 5.6 | 0 | 27 | 19.8 | -4.8 | 40.2 |
| Toledo | 541,379 | 233,472 | 1.5 | 32.0 | 0 | 126 | 22.5 | -0.4 | 43.1 |
| Valencia | 2,216,285 | 1,017,410 | 6.4 | 139.3 | 1 | 657 | 23.2 | 3.9 | 42.8 |
| Valladolid | 498,094 | 152,836 | 1.0 | 20.9 | 0 | 75 | 18.9 | -2.0 | 40.2 |
| Vizcaya | 1,122,637 | 450,183 | 2.8 | 61.6 | 0 | 235 | 19.5 | 2.1 | 41.9 |
| Zamora | 199,090 | 39,552 | 0.2 | 5.4 | 0 | 24 | 19.3 | -2.6 | 41.0 |
| Zaragoza | 861,855 | 303,860 | 1.9 | 41.6 | 0 | 169 | 21.5 | -3.0 | 43.1 |
| **TOTAL** | **40,709,455** | **15,992,310** | - | **2,189** | **17** | **8,018** | **20.9** | **4.4** | **37.0** |

**Table S2. Daily variation in maximum temperature within four Spanish provinces**

Data from January 1983 to December 2006 in four Spanish provinces. The capital of each province was also included in the list of stations.

| Province | Number of stations | Maximum temperature correlation | | Minimum temperature correlation | |
|---|---|---|---|---|---|
| | | Range | Mean | Range | Mean |
| Barcelona | 21 | [0.89 - 1.00] | 0.95 | [0.86 - 1.00] | 0.95 |
| Girona | 16 | [0.87 - 1.00] | 0.95 | [0.82 - 1.00] | 0.93 |
| Lleida | 15 | [0.86 - 1.00] | 0.94 | [0.83 - 1.00] | 0.94 |
| Tarragona | 14 | [0.89 - 1.00] | 0.95 | [0.87 - 1.00] | 0.95 |

**Table S3. Sensitivity analyses**

Computed on the percent difference (%), the percentile of minimum occupational injuries, and the fraction (%) attributable to temperature (total, cold, and heat components), by varying modelling choices, fitting the models to all occupational injuries.

| Modelling choices | COLD EFFECTS | PMOI | HOT EFFECTS | ATTRIBUTABLE FRACTION | | |
|---|---|---|---|---|---|---|
| | 1st vs PMOI (%) | | 99th vs PMOI (%) | Total (%) | Cold (%) | Heat (%) |
| Main model | 4 (2-6) | 27 | 9 (8-11) | 2.72 (2.44-2.97) | 0.32 (0.24-0.38) | 2.40 (2.09-2.68) |
| Knots for exposure-response: 33rd and 66th percentiles | 4 (2-6) | 25 | 9 (7-11) | 2.93 (2.62-3.22) | 0.36 (0.27-0.44) | 2.57 (2.23-2.89) |
| Knots for exposure-response: 25th and 75th percentiles | 4 (2-6) | 20 | 9 (7-11) | 2.91 (2.54-3.23) | 0.32 (0.24-0.39) | 2.59 (2.20-2.94) |
| Knots for exposure-response: 25th, 50th and 75th percentiles | 4 (2-6) | 22 | 9 (7-11) | 3.18 (2.85-3.47) | 0.43 (0.34-0.51) | 2.75 (2.40-3.07) |
| Lag period: 5 | 4 (2-6) | 29 | 9 (8-11) | 2.94 (2.60-3.26) | 0.33 (0.24-0.42) | 2.61 (2.24-2.95) |
| Lag period: 7 | 4 (2-7) | 32 | 8 (7-10) | 3.01 (2.36-3.54) | 0.56 (0.38-0.72) | 2.44 (1.84-2.97) |
| Df/year for seasonal control: 6 | 4 (2-6) | 28 | 8 (6-9) | 2.69 (2.40-2.95) | 0.42 (0.33-0.50) | 2.28 (1.98-2.54) |
| Df/year for seasonal control: 10 | 5 (3-7) | 29 | 8 (7-9) | 2.66 (2.44-2.86) | 0.37 (0.29-0.43) | 2.29 (2.04-2.53) |
| **Exposure** | | | | | | |
| Mean temperature | 6 (4-8) | 35 | 9 (8-10) | 2.31 (2.18-2.42) | 0.52 (0.46-0.59) | 1.78 (1.63-1.91) |
| Minimum temperature | 8 (6-10) | 50 | 5 (4-6) | 1.86 (1.72-1.98) | 0.78 (0.71-0.83) | 1.08 (0.97-1.18) |

PMOI: percentile of minimum occupational injuries

**Table S4. Percent difference (95% Confidence Intervals) for the relationship between extreme cold - hot ambient temperatures and occupational injuries in Spain (1994-2013)**

| Workers' characteristics | | Total number of injuries | % of all injuries | COLD EFFECTS 1st vs PMOI (%) | PMOI | HOT EFFECTS 99th vs PMOI (%) | p-value[b] |
|---|---|---|---|---|---|---|---|
| **Overall** | | **15,992,310** | - | 4 (2-6)* | 27 | 9 (8-11)* | - |
| **Sex** | | | | | | | |
| | Women | 3,568,753 | 22.32 | 11 (8-5)* | 42 | 5 (2-7)* | <0.000 |
| | Men | 12,423,557 | 77.68 | 3 (1-5)* | 23 | 9 (7-12)* | |
| **Age group** | | | | | | | |
| | ≤24 | 2,894,904 | 18.10 | 0 (-1-2) | 10 | 11 (8-14)* | <0.000 |
| | 25-34 | 5,092,208 | 31.84 | 3 (1-5)* | 26 | 7 (5-10)* | |
| | 35-54 | 6,773,912 | 42.36 | 6 (4-8)* | 30 | 8 (5-10)* | |
| | ≥55 | 1,231,286 | 7.70 | 2 (9-15)* | 36 | 6 (3-10)* | |
| **Nationality[a]** | | | | | | | |
| | Spanish | 7,593,356 | 88.01 | 7 (4-10)* | 34 | 7 (4-10)* | 0.144 |
| | Other | 869,802 | 10.08 | 2 (-1-5) | 17 | 9 (4-14)* | |
| | Unknown | 164,503 | 1.91 | | | | |
| **Type of contract** | | | | | | | |
| | Permanent | 7,640,135 | 47.77 | 7 (5-9)* | 34 | 7 (5-9)* | 0.022 |
| | Temporary | 7,890,694 | 49.34 | 3 (1-5)* | 22 | 9 (7-12)* | |
| | Other [(1)] | 296,106 | 1.85 | 3 (1-5)* | 27 | 6 (3-8)* | |
| **Selected economic sectors** | | | | | | | |
| | Agriculture, forestry and fishing | 741,292 | 4.64 | -5 (-8- -2) | 10 | 29 (23-36)* | <0.000 |
| | Construction | 3,546,754 | 22.18 | 2 (0-4) | 20 | 9 (6-12)* | |

| Workers' characteristics | Total number of injuries | % of all injuries | COLD EFFECTS 1st vs PMOI (%) | PMOI | HOT EFFECTS 99th vs PMOI (%) | p-value[b] |
|---|---|---|---|---|---|---|
| Electricity, gas, steam and air conditioning supply [(2)] | 37,012 | 0.23 | 10 (-4-25) | 88 | 1 (-6-10)* | |
| Extractive industries [(3)] | 218,184 | 1.36 | 1 (-4-5) | 10 | 13 (5-21)* | |
| Waste collection, treatment and removal [(4)] | 151,374 | 0.95 | 1 (-3-6) | 17 | 12 (4-20)* | |
| Transport and storage | 941,369 | 5.89 | 11 (8-14)* | 38 | 8 (4-11)* | |
| Hotel industry | 976,342 | 6.11 | 5 (2-7)* | 35 | 10 (7-13)* | |
| Manufacturing | 4,023,643 | 25.16 | 5 (3-8)* | 36 | 4 (2-7)* | |
| **Type on injury** | | | | | | |
| Superficial injuries | 4,473,748 | 27.97 | 4 (2-5)* | 22 | 12 (10-15)* | |
| Bone fractures, strains and sprains | 10,062,448 | 62.92 | 4 (2-7)* | 31 | 5 (3-7)* | |
| Internal injuries and contusions | 529,667 | 3.31 | 5 (1-9)* | 32 | 3 (-2-7) | |
| Burns and frostbite | 256,052 | 1.60 | 6 (2-10)* | 17 | 61 (51-71)* | |
| Choking and asphyxia [(5)] | 12,186 | 0.08 | -3 (-19-16) | 10 | 21 (-24-92) | |
| Effects of extreme temperatures [(6)] | 15,580 | 0.10 | -5 (-22-16) | 10 | 81 (22-169)* | <0.000 |
| Psychological damages and traumatic events [(7)] | 18,997 | 0.12 | -1 (-21-23) | 90 | -11 (-23-5) | |
| Multiple injuries | 235,835 | 1.47 | 17 (12-23)* | 38 | 16 (8-24)* | |
| Heart attack, stroke and non traumatic pathologies [(8)] | 27,655 | 0.17 | 1 (-8-10) | 10 | 11 (-7-33) | |
| Other injuries [(9)] | 360,142 | 2.25 | -3 (-21-18) | 10 | 23 (-26-3) | |
| **Duration of leave (days)** | | | | | | |
| <4 | 1,766,077 | 11.04 | 8 (5-11)* | 46 | 3 (0-6) | <0.000 |

| Workers' characteristics | | Total number of injuries | % of all injuries | COLD EFFECTS | PMOI | HOT EFFECTS | p-value[b] |
|---|---|---|---|---|---|---|---|
| | | | | 1st vs PMOI (%) | | 99th vs PMOI (%) | |
| | 4-15 | 7,388,886 | 46.20 | 4 (2-6)* | 29 | 8 (5-10)* | |
| | 16-60 | 5,706,709 | 35.68 | 4 (1-6)* | 22 | 10 (8-13)* | |
| | >60 | 1,130,638 | 7.07 | 9 (6-13)* | 33 | 9 (6-12)* | |
| **Workers' occupational class** | | | | | | | |
| | Non-manual workers | 1,506,913 | 9.42 | 18 (13-22)* | 39 | 9 (5-12)* | <0.000 |
| | Manual workers | 13,072,003 | 81.74 | 3 (1-5)* | 27 | 6 (3-8)* | |

PMOI: percentile of minimum occupational injuries

[a] Data available since 2003

[b] Results from a multivariate Wald-test

Some provinces were excluded from the model due to convergence problems. [(1)] 22 provinces; [(2)] 7 provinces; [(3)] 3 provinces; [(4)] 5 provinces; [(5)] 36 provinces; [(6)] 26 provinces; [(7)] 8 provinces; [(8)] 11 provinces; [(9)] 8 provinces

* p-value<0.05

**Table S5. Percent difference (95% Confidence Intervals) for the relationship between extreme cold - hot ambient temperatures and occupational injuries in Spain (1994-2013). Economic sectors and sex / age**

| Workers' characteristics | | Total number of work-injuries | % of all injuries | % of injuries in the economic sector | COLD EFFECTS | PMOI | HOT EFFECTS |
|---|---|---|---|---|---|---|---|
| | | | | | 1st vs PMOI (%) | | 99th vs PMOI (%) |
| **Selected economic sectors and sex** | | | | | | | |
| Agriculture, forestry and fishing | | | | | | | |
| | Women | 143,589 | 0.9 | 19.37 | 0 (-6 - 7) | 10 | 30 (20 - 42) |
| | Men | 597,703 | 3.74 | 80.63 | -7 (-10--4) | 10 | 30 (25 - 36) |
| Construction | | | | | | | |
| | Women | 66,062 | 0.41 | 1.86 | - | - | - |
| | Men | 3,480,692 | 21.76 | 98.14 | - | - | - |
| Electricity, gas, steam and air conditioning supply | | | | | | | |
| | Women | 2,254 | 0.01 | 6.09 | - | - | - |
| | Men | 34,758 | 0.22 | 93.91 | - | - | - |
| Extractive industries | | | | | | | |
| | Women | 5,679 | 0.04 | 2.60 | - | - | - |
| | Men | 212,505 | 1.33 | 97.40 | - | - | - |
| Waste collection, treatment and removal | | | | | | | |
| | Women | 22,723 | 0.14 | 15.01 | - | - | - |
| | Men | 128,651 | 0.8 | 84.99 | - | - | - |
| Transport and storage | | | | | | | |
| | Women | 125,580 | 0.79 | 13.34 | - | - | - |
| | Men | 815,789 | 5.1 | 86.66 | - | - | - |
| Hotel industry | | | | | | | |
| | Women | 479,811 | 3 | 49.14 | 5 (1 - 9) | 52 | 8 (4 - 11) |
| | Men | 496,531 | 3.1 | 50.86 | 4 (1 - 8) | 58 | 12 (8 - 16) |
| Manufacturing | | | | | | | |
| | Women | 538,167 | 3.37 | 13.38 | - | - | - |

| Workers' characteristics | | Total number of work-injuries | % of all injuries | % of injuries in the economic sector | COLD EFFECTS | PMOI | HOT EFFECTS |
|---|---|---|---|---|---|---|---|
| | | | | | 1st vs PMOI (%) | | 99th vs PMOI (%) |
| | Men | 3,485,476 | 21.79 | 86.62 | - | - | - |
| **Selected economic sectors and age group** | | | | | | | |
| Agriculture, forestry and fishing | ≤24 [(1)] | 125,439 | 0.78 | 16.92 | -9 (-16 - -3) | 10 | 34 (21 - 47) |
| | 25-34 | 204,839 | 1.28 | 27.63 | -7 (-11 - -3) | 10 | 29 (20 - 38) |
| | 35-54 | 333,222 | 2.08 | 44.95 | -6 (-9 - -3) | 10 | 31 (24 - 38) |
| | ≥55 | 77,792 | 0.49 | 10.49 | -3 (-9 - 3) | 10 | 35 (23 - 48) |
| Construction | ≤24 | 703,393 | 4.4 | 19.83 | -1 (-3 - 1) | 10 | 14 (10 - 18) |
| | 25-34 | 1,191,964 | 7.45 | 33.61 | 0 (-1 - 2) | 10 | 10 (7 - 13) |
| | 35-54 | 1,416,791 | 8.86 | 39.95 | 2 (0 - 4) | 19 | 9 (7 - 12) |
| | ≥55 | 234,606 | 1.47 | 6.61 | 7 (2 - 12) | 35 | 7 (2 - 12) |
| Electricity, gas, steam and air conditioning supply | ≤24 | 4,469 | 0.03 | 12.07 | - | - | - |
| | 25-34 | 10,021 | 0.06 | 27.08 | - | - | - |
| | 35-54 | 18,879 | 0.12 | 51.01 | - | - | - |
| | ≥55 | 3,643 | 0.02 | 9.84 | - | - | - |
| Extractive industries | ≤24 | 15,348 | 0.1 | 7.03 | - | - | - |
| | 25-34 | 64,549 | 0.4 | 29.58 | - | - | - |
| | 35-54 | 131,600 | 0.82 | 60.32 | - | - | - |
| | ≥55 | 6,687 | 0.04 | 3.06 | - | - | - |
| Waste collection, treatment and removal | ≤24 | 13,190 | 0.08 | 8.71 | - | - | - |
| | 25-34 | 41,986 | 0.26 | 27.74 | - | - | - |

| Workers' characteristics | | Total number of work-injuries | % of all injuries | % of injuries in the economic sector | COLD EFFECTS | PMOI | HOT EFFECTS |
|---|---|---|---|---|---|---|---|
| | | | | | 1st vs PMOI (%) | | 99th vs PMOI (%) |
| | 35-54 | 81,416 | 0.51 | 53.78 | - | - | - |
| | ≥55 | 14,782 | 0.09 | 9.77 | - | - | - |
| Transport and storage | | | | | | | |
| | ≤24 [(2)] | 104,483 | 0.65 | 11.10 | 3 (-2 - 9) | 18 | 22 (13 - 32) |
| | 25-34 | 305,261 | 1.91 | 32.43 | 5 (2 - 9) | 43 | 5 (0 -11) |
| | 35-54 | 459,276 | 2.87 | 48.79 | 12 (9 - 16) | 40 | 8 (5 -12) |
| | ≥55 [(3)] | 72,349 | 0.45 | 7.69 | 16 (8 - 25) | 37 | 8 (-5 - 23) |
| Hotel industry | | | | | | | |
| | ≤24 | 228,012 | 1.43 | 23.35 | 2 (-3 - 6) | 26 | 15 (10 - 21) |
| | 25-34 | 307,995 | 1.93 | 31.55 | 7 (3 - 10) | 29 | 10 (5 - 15) |
| | 35-54 | 380,377 | 2.38 | 38.96 | 2 (-1 - 6) | 54 | 8 (4 -12) |
| | ≥55 [(4)] | 59,958 | 0.37 | 6.14 | 11 (3 - 21) | 49 | 2 (-8 - 13) |
| Manufacturing | | | | | | | |
| | ≤24 | 768,375 | 4.8 | 19.10 | 1 (-2 - 3) | 18 | 8 (4 - 12) |
| | 25-34 | 1,282,353 | 8.02 | 31.87 | 4 (1 - 6) | 37 | 5 (2 - 8) |
| | 35-54 | 1,658,602 | 10.37 | 41.22 | 6 (4 - 8) | 36 | 6 (3 - 8) |
| | ≥55 | 314,313 | 1.97 | 7.81 | 11 (8 - 15) | 40 | 6 (1 -12) |

PMOI: percentile of minimum occupational injuries

Those economic sectors with more than 85% of injuries registered among male workers have been excluded from the analyses due to the failure to check sex differences.

Some provinces were excluded from the model due to convergence problems. [(1)] 1 province; [(2)] 6 provinces; [(3)] 2 provinces; [(4)] 8 provinces

**Table S6. Percent difference (95% Confidence Intervals) for the relationship between extreme cold - hot ambient temperatures and occupational injuries in Spain in two periods: 1994-2000 and 2001-2013.**

| Period | COLD EFFECTS 1st vs PMOI (%) | PMOI | HOT EFFECTS 99th vs PMOI (%) |
|---|---|---|---|
| Total period (1994-2013) | 4 (2-6) | 27 | 9 (8-11) |
| Period 1994-2000 | 1 (0-2) | 11 | 11 (9-13) |
| Period 2001-2013 | 5 (3-8) | 33 | 8 (7-10) |

These two periods correspond to cutoff point of the implementation of occupational injury prevention programs.

**References**

Gasparrini A, Armstrong B, Kenward MG. 2012. Multivariate Meta-Analysis for Non-Linear and Other Multi-Parameter Associations. *Stat Med* 31 (29): 3821. doi:10.1002/sim.5471.

Post E, Hoaglin D, Deck L, Larntz K. 2001. An Empirical Bayes Approach to Estimating the Relation of Mortality to Exposure to Particulate Matter. *Risk Anal Off Publ Soc Risk Anal* 21 (5): 837–42.