**Supplementary data**

Supplement to: Onozuka D, Gasparrini A, Sera F, Hashizume M, Honda Y. Future projections of temperature-related excess out-of-hospital cardiac arrest under climate change scenarios in Japan.

**Table S4.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP6.0 scenario.

**Table S5.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP8.5 scenario.

**Table S6.** Sensitivity analysis, by varying modelling choices. Results were the net difference in excess morbidity in 2090–2099 compared with 2010–2019.

**Figure S1.** Temperature and excess morbidity in different climates.

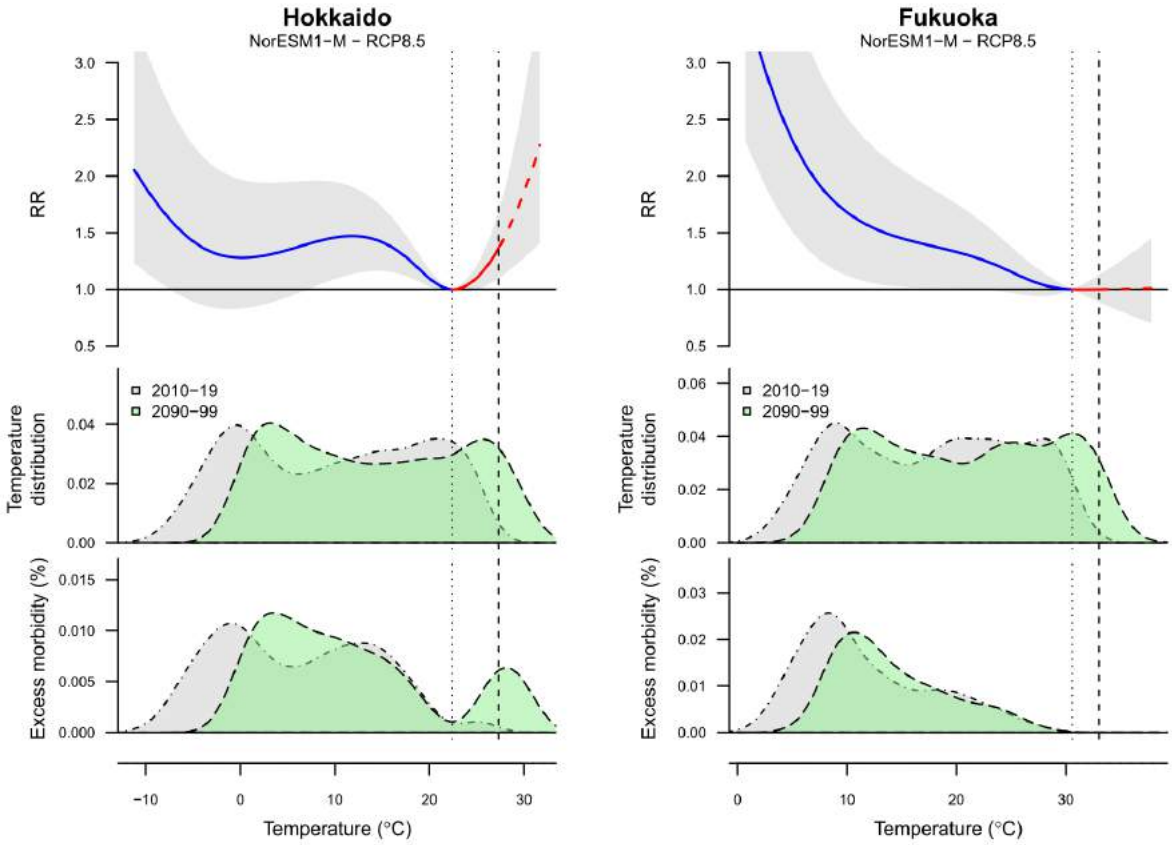
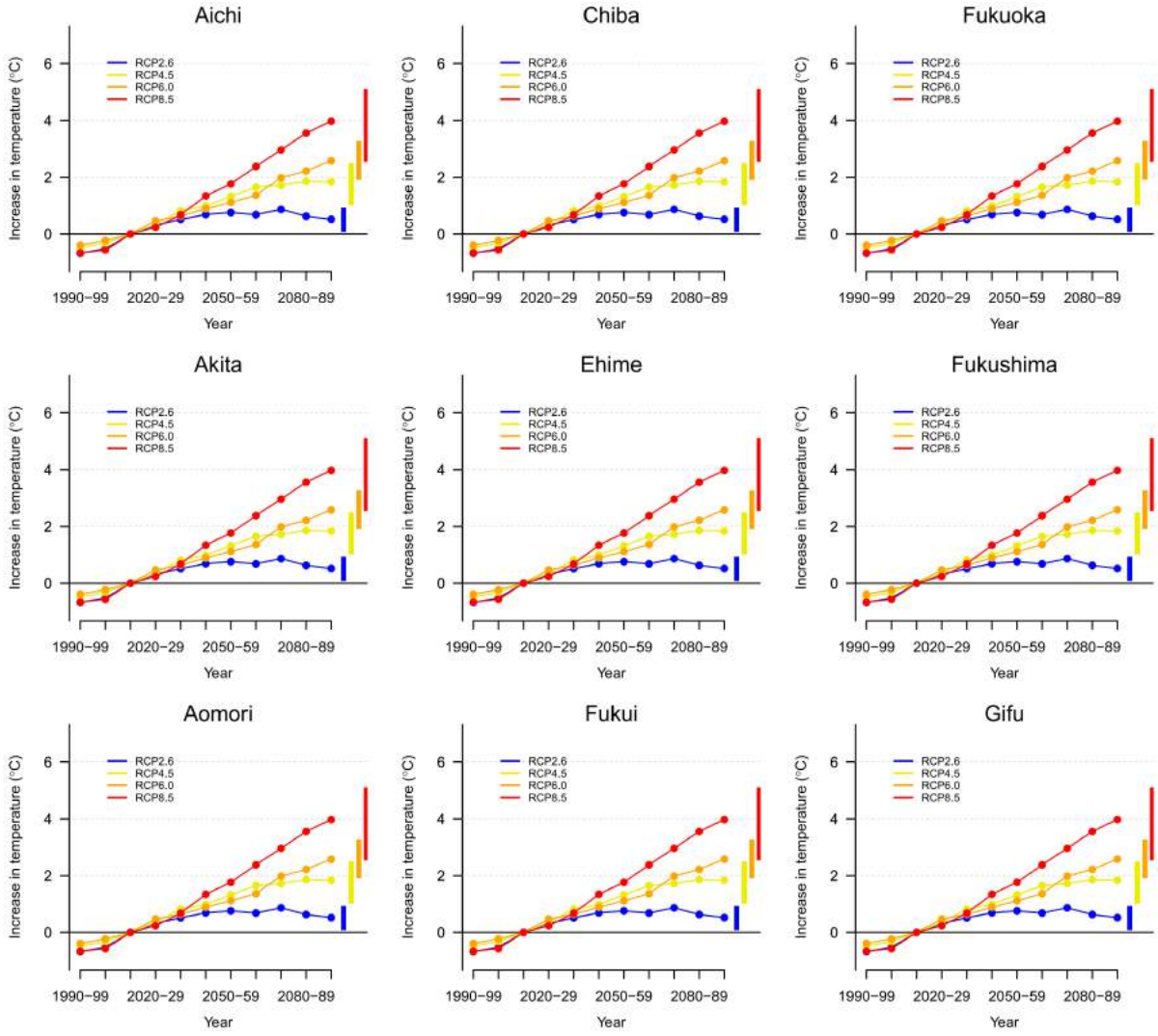
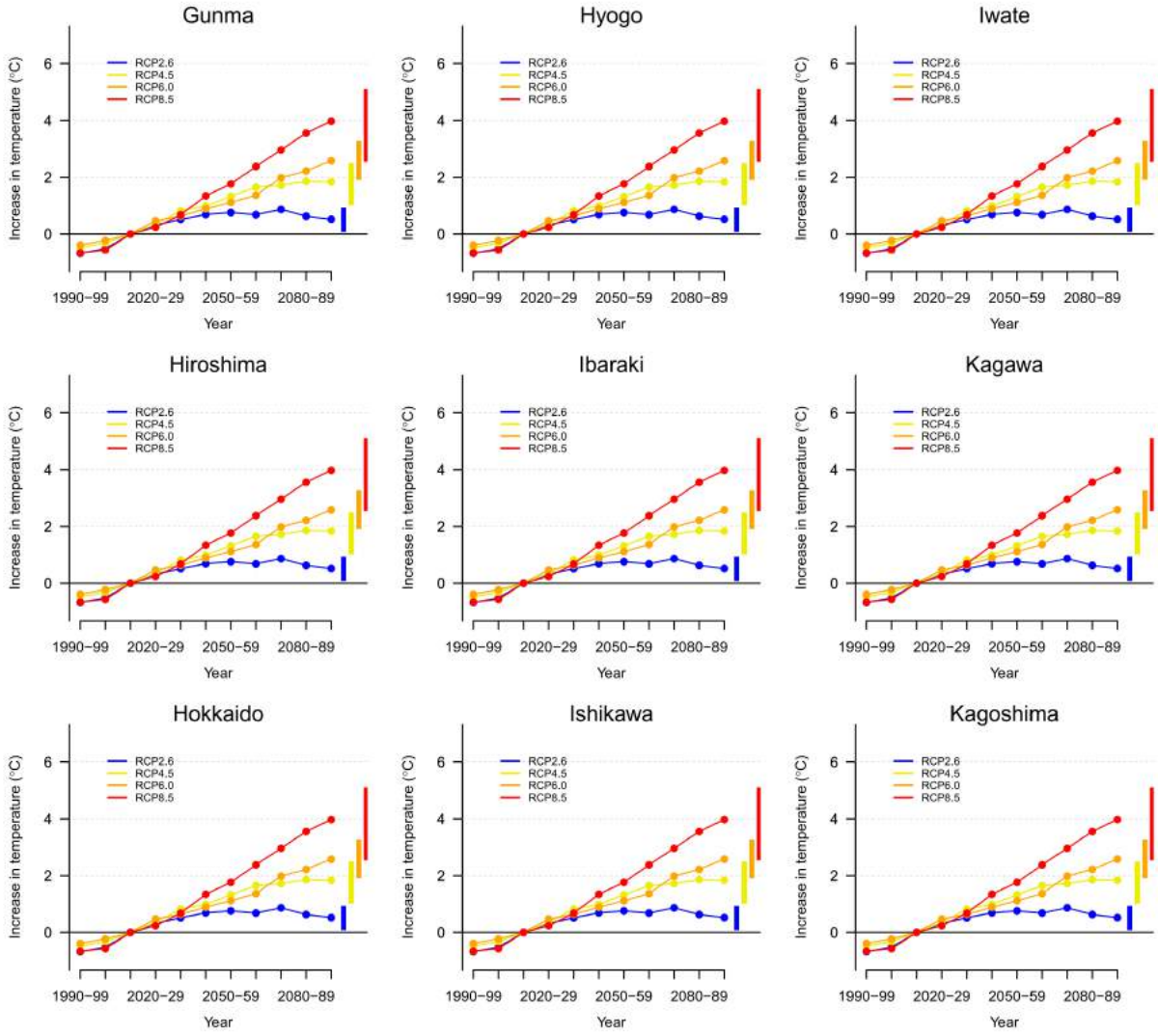
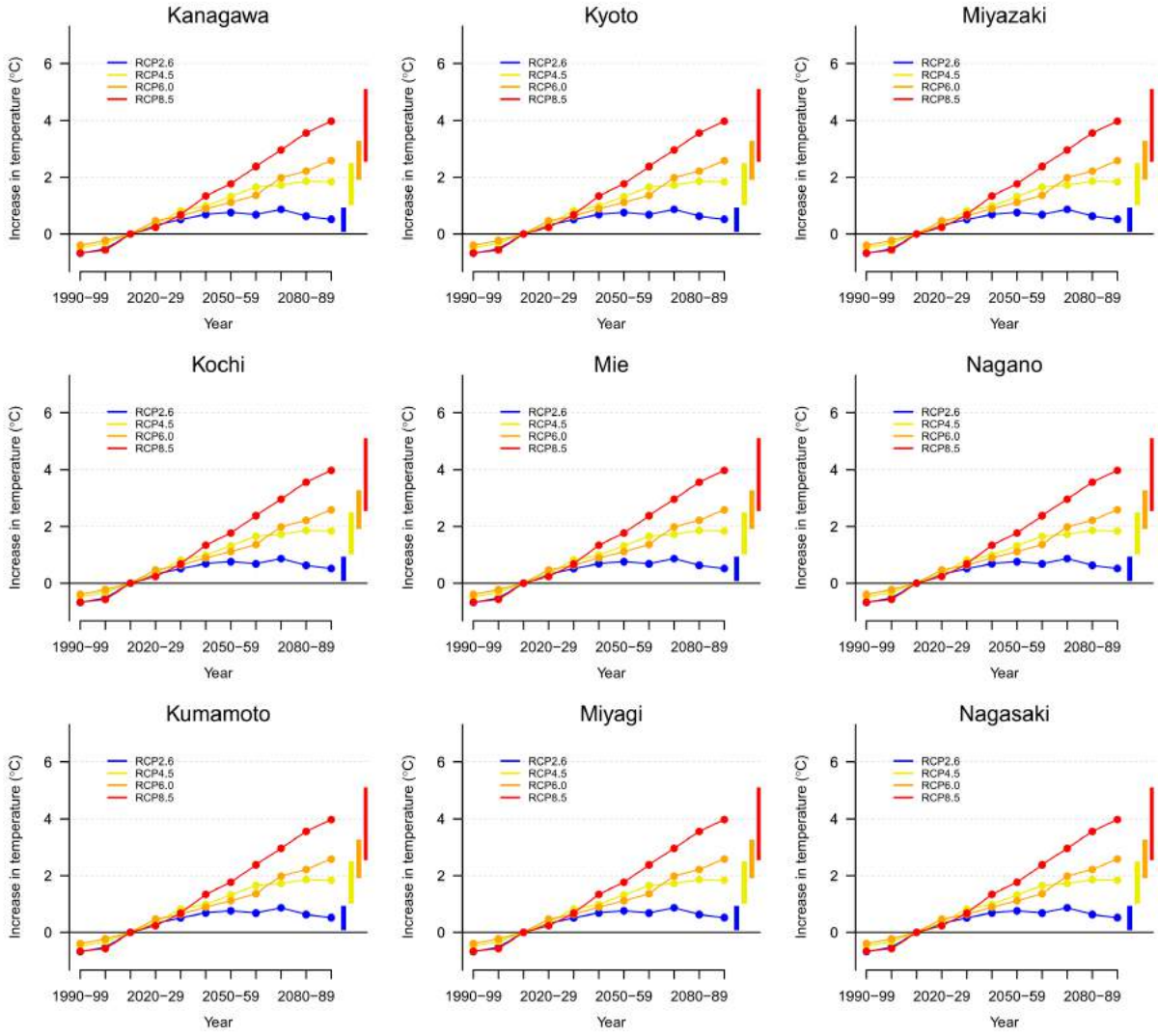
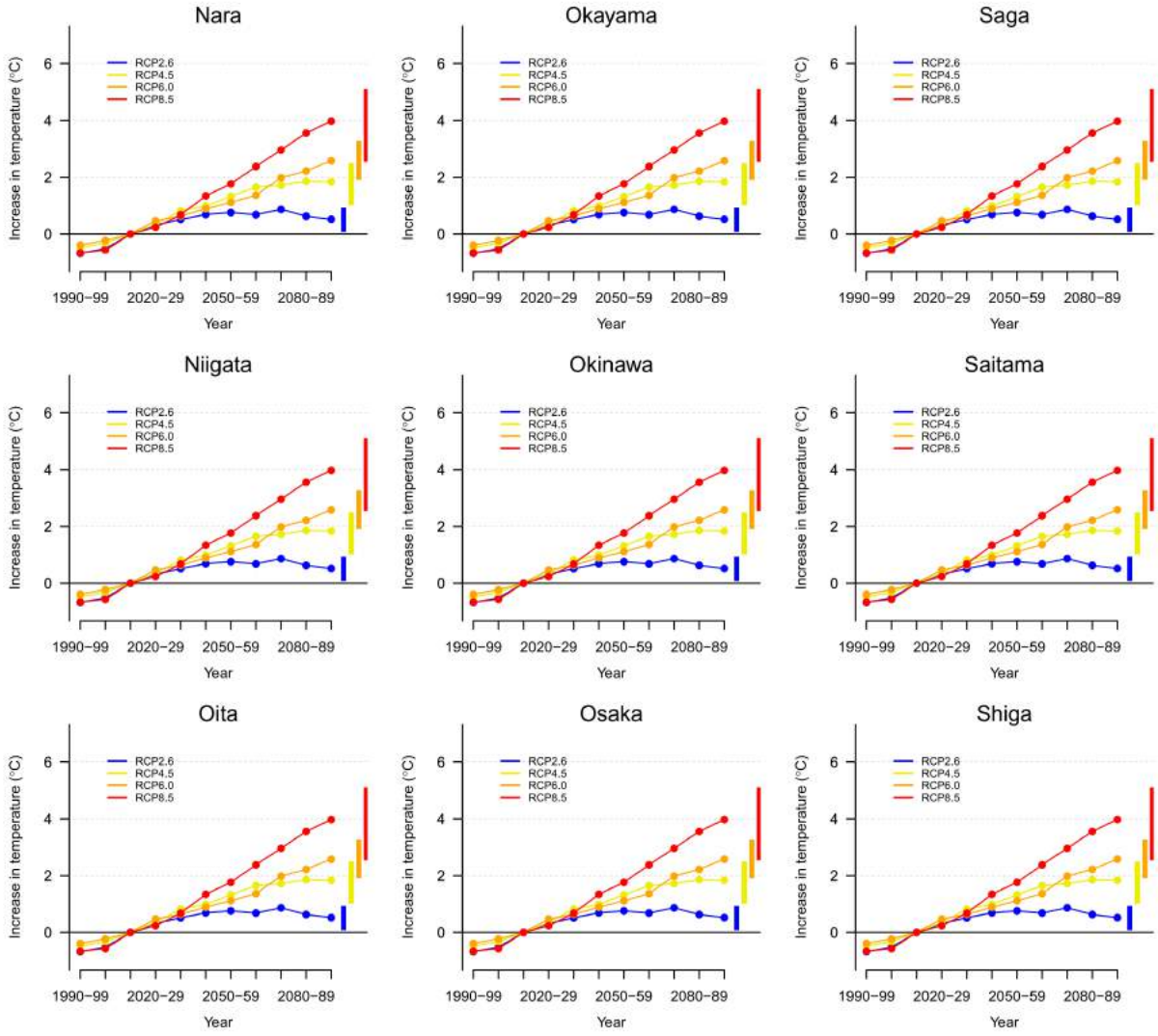


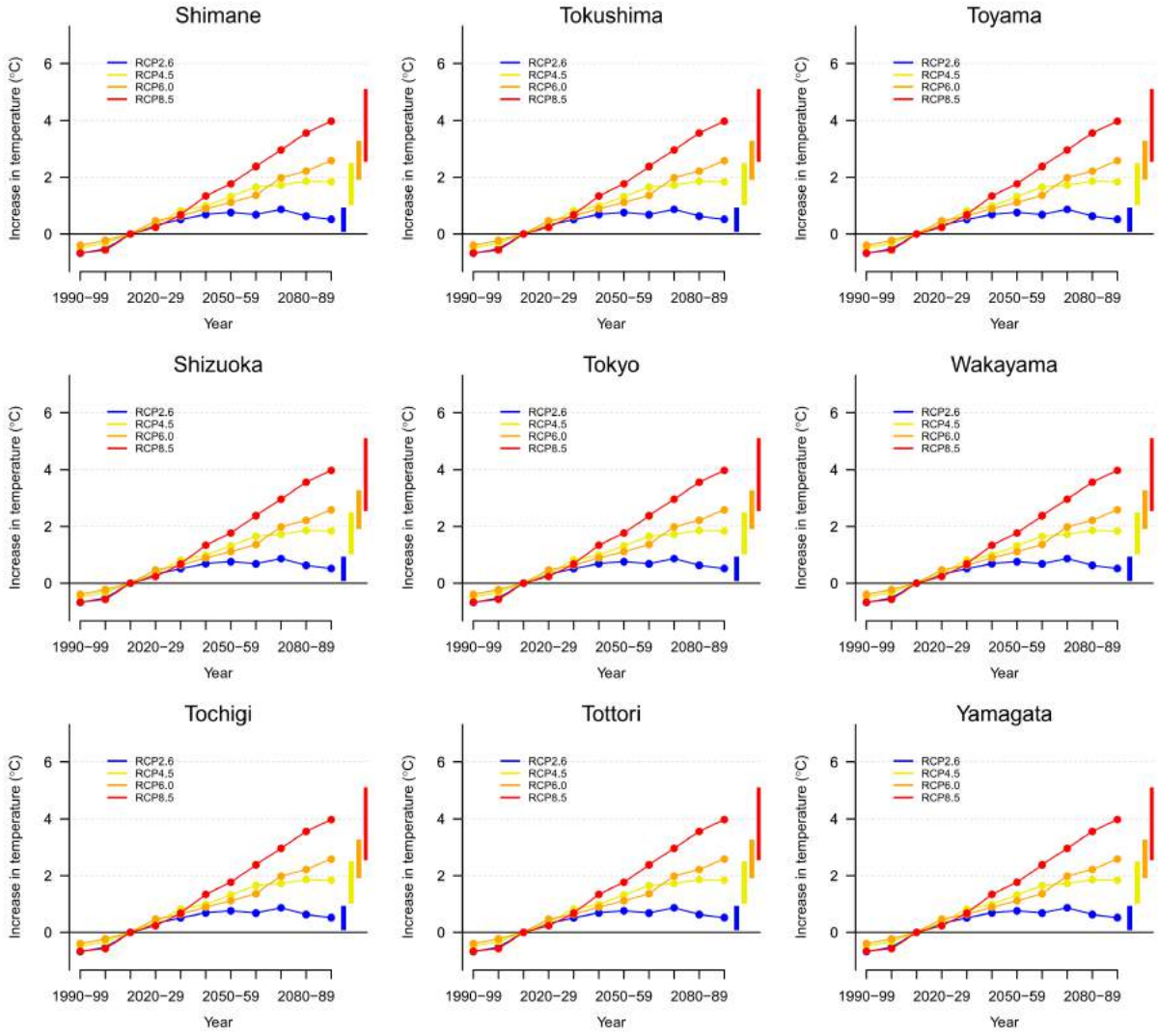
**Figure S2.** Decadal temperature trends by prefecture and scenario.

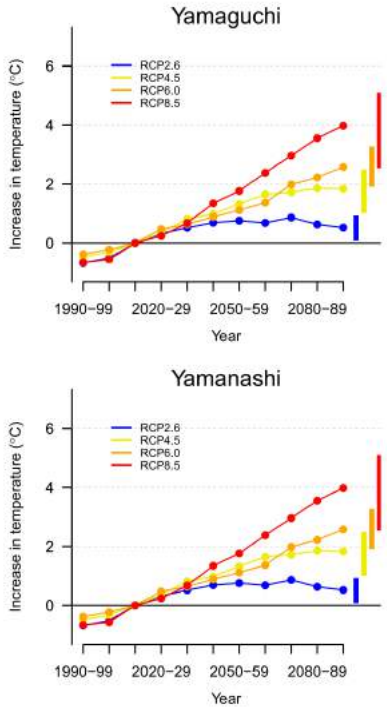



Gunma
Hyogo
Iwate
Hiroshima
Ibaraki
Kagawa
Hokkaido
Ishikawa
Kagoshima
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year


Kanagawa
Kyoto
Miyazaki
Kochi
Mie
Nagano
Kumamoto
Miyagi
Nagasaki
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year


Nara
Okayama
Saga
Niigata
Okinawa
Saitama
Oita
Osaka
Shiga
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year


Shimane
Tokushima
Toyama
Shizuoka
Tokyo
Wakayama
Tochigi
Tottori
Yamagata
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year


Yamaguchi
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year


Yamanashi
RCP2.6
RCP4.5
RCP6.0
RCP8.5
Increase in temperature (°C)
0
2
4
6
1990–99
2020–29
2050–59
2080–89
Year

**Figure S3.** Map of prefecture-specific changes in temperature.

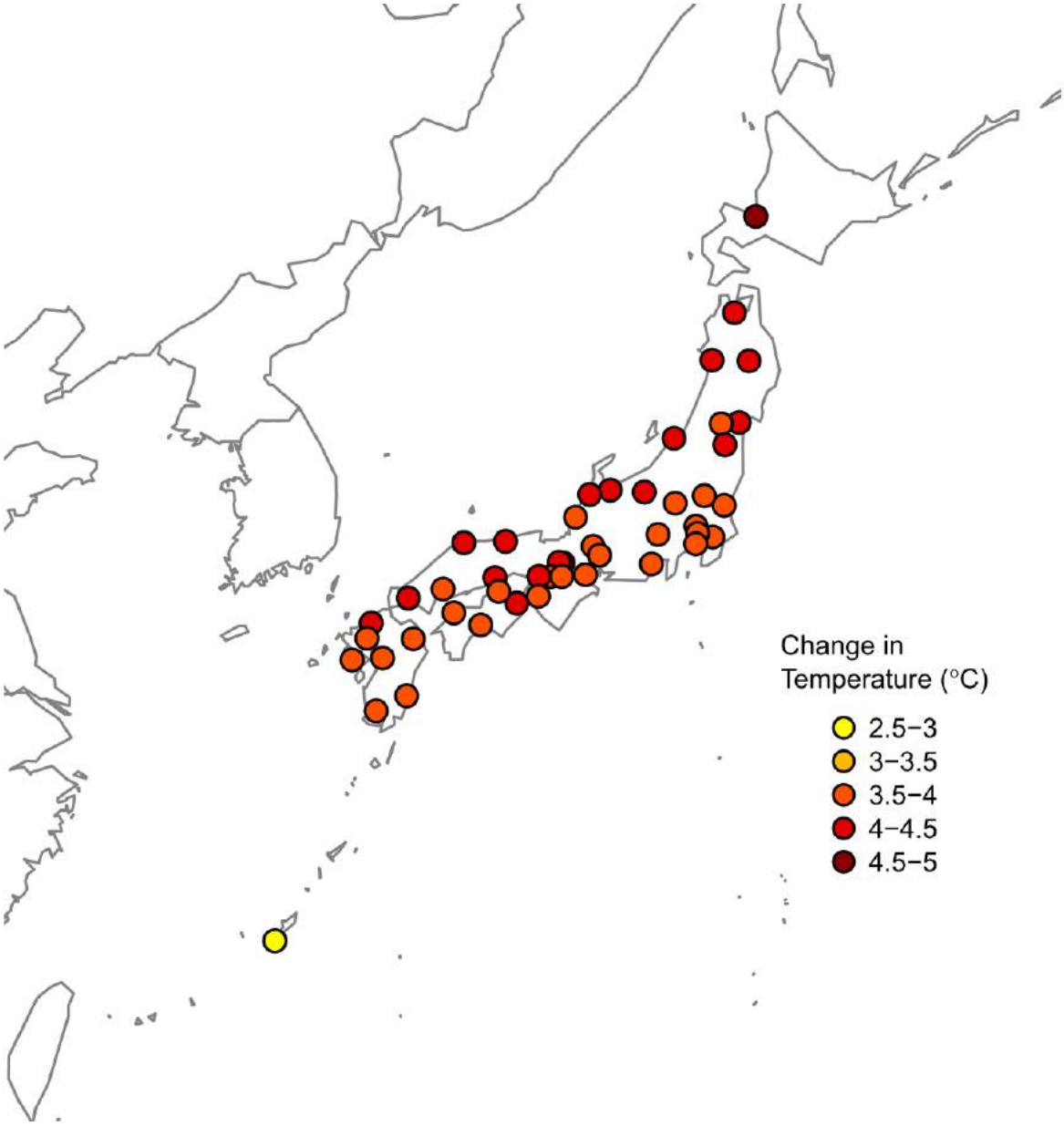
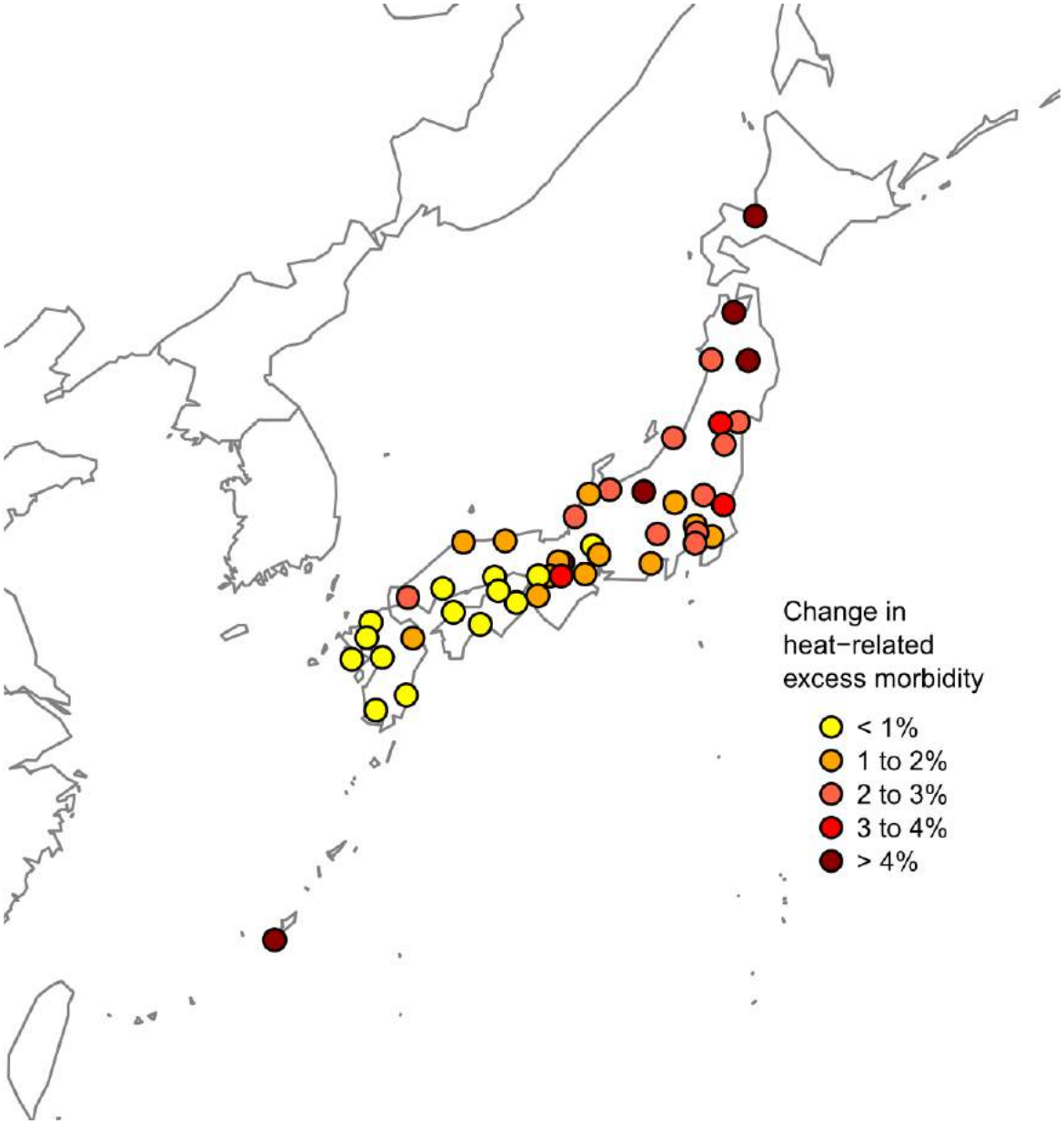
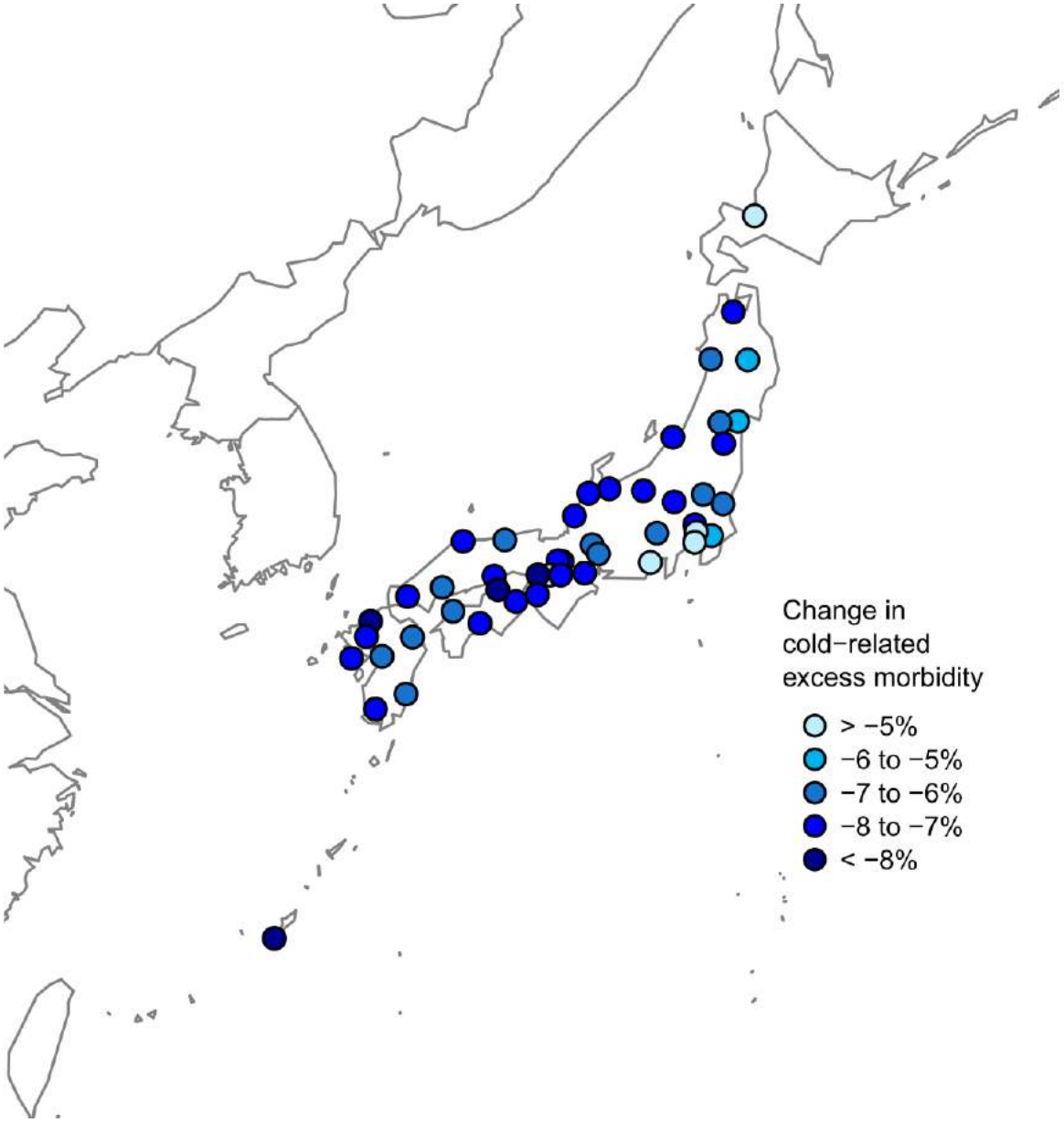


**Figure S4.** Map of prefecture-specific changes in temperature-related excess morbidity.




Change in
cold−related
excess morbidity
> −5%
−6 to −5%
−7 to −6%
−8 to −7%
< −8%

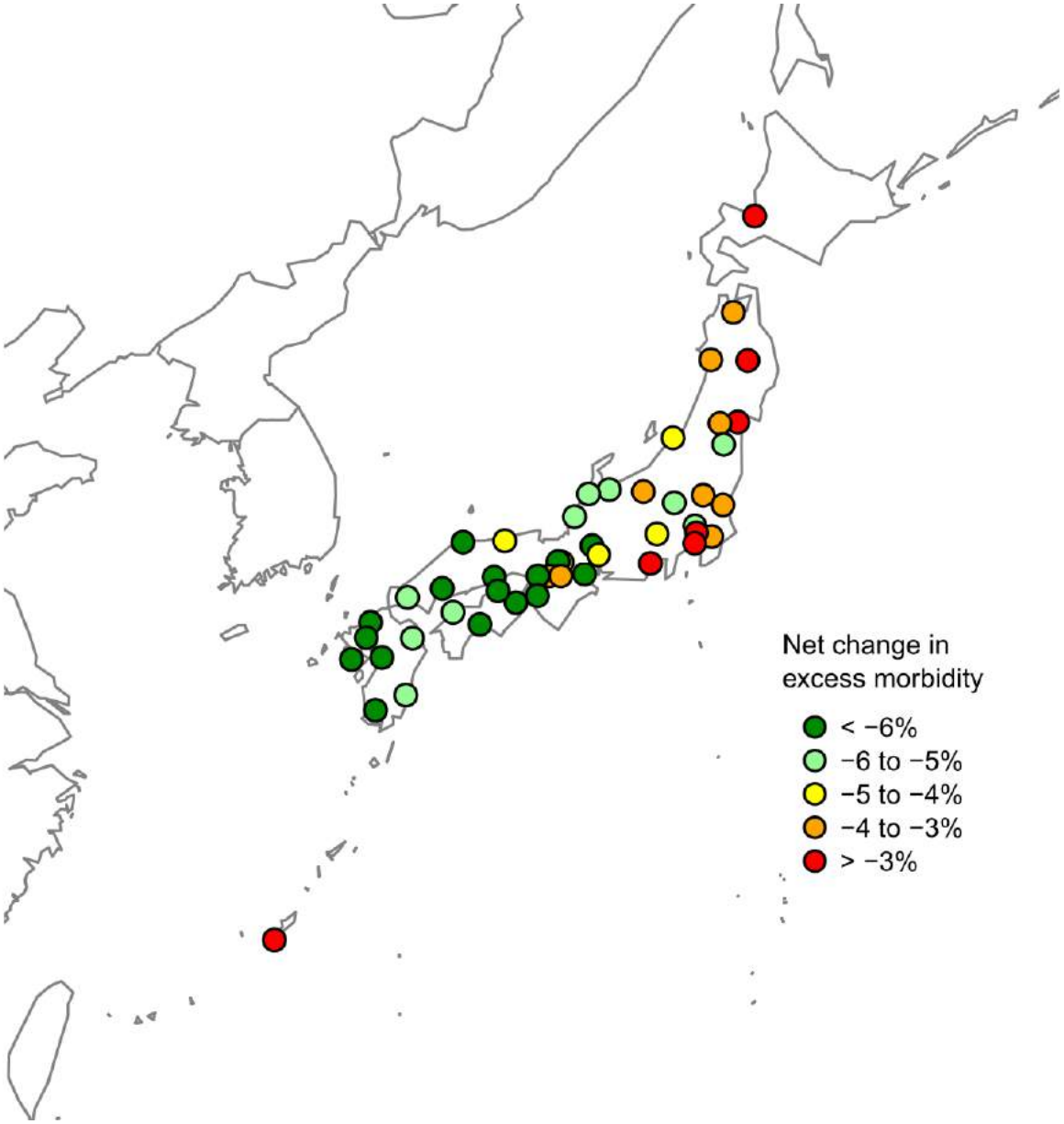
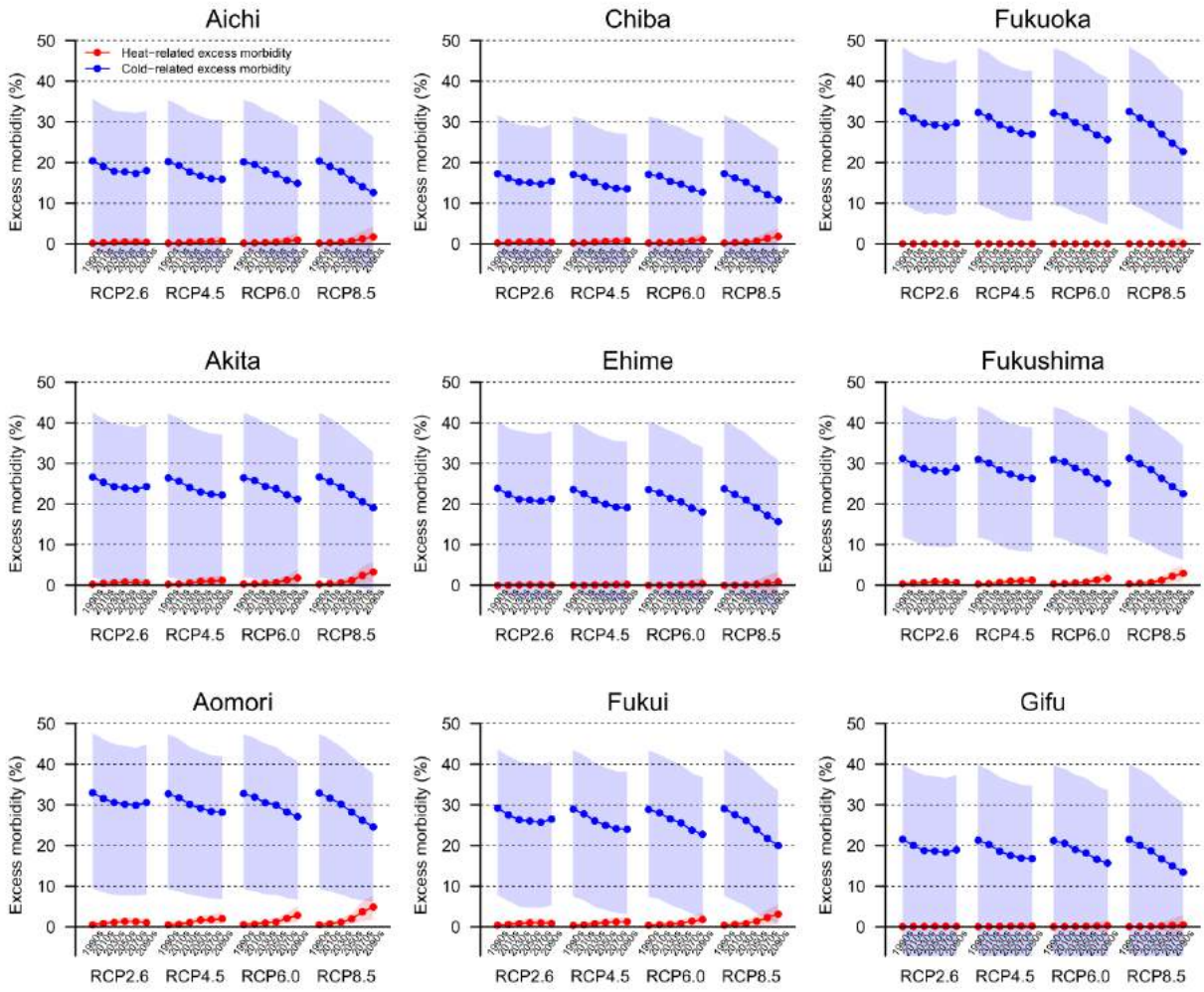
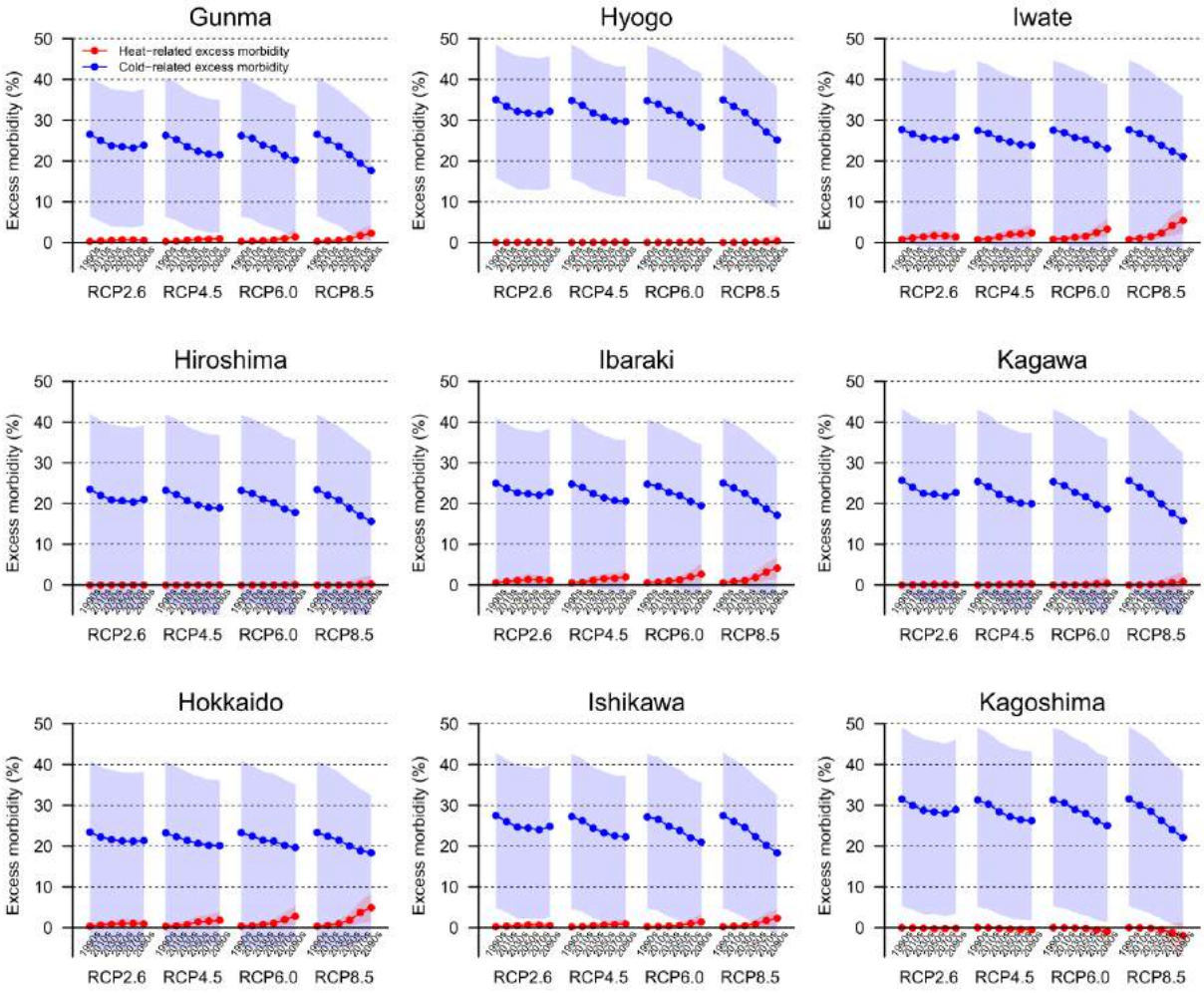
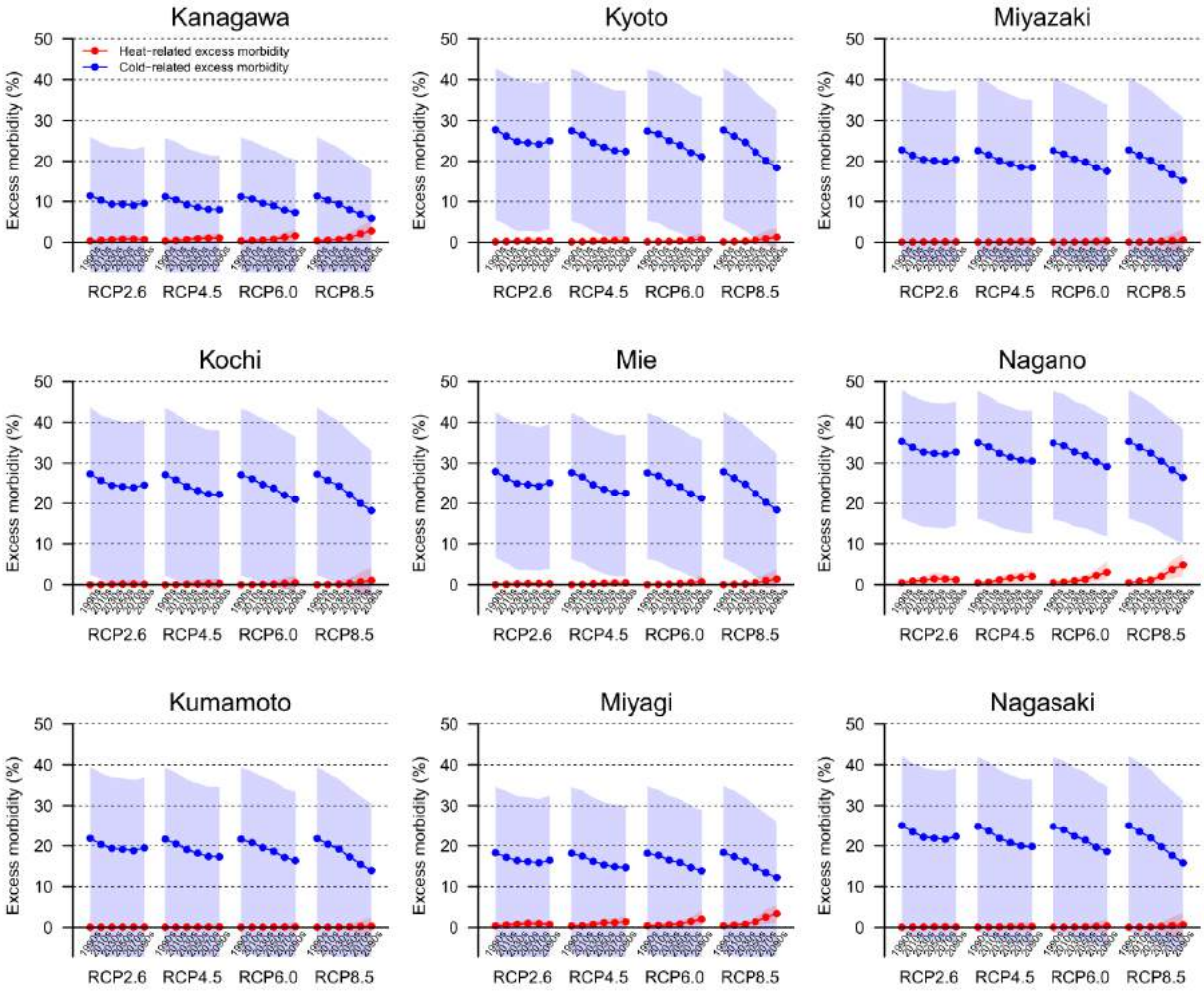
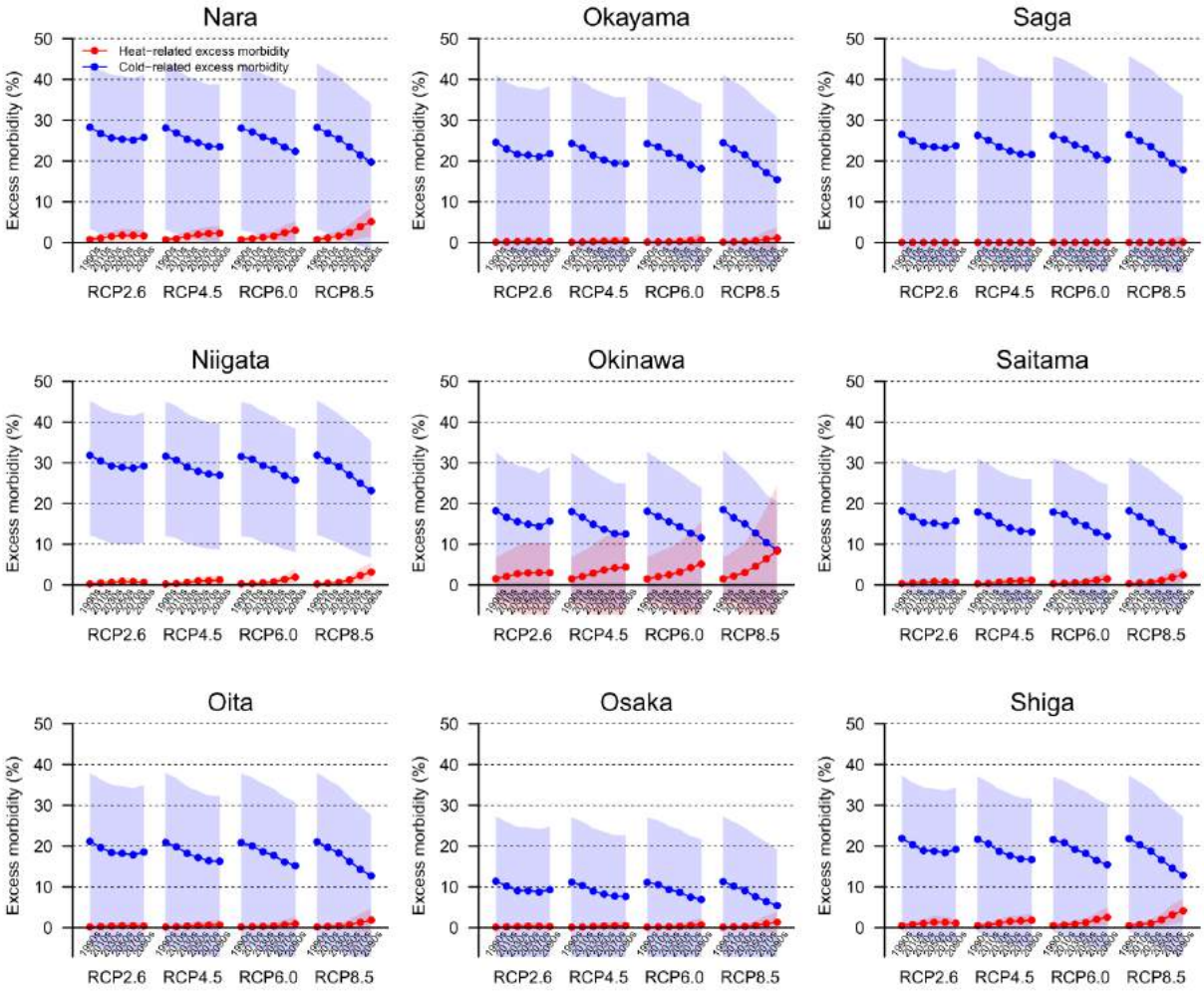

Net change in
excess morbidity
< −6%
−6 to −5%
−5 to −4%
−4 to −3%
> −3%

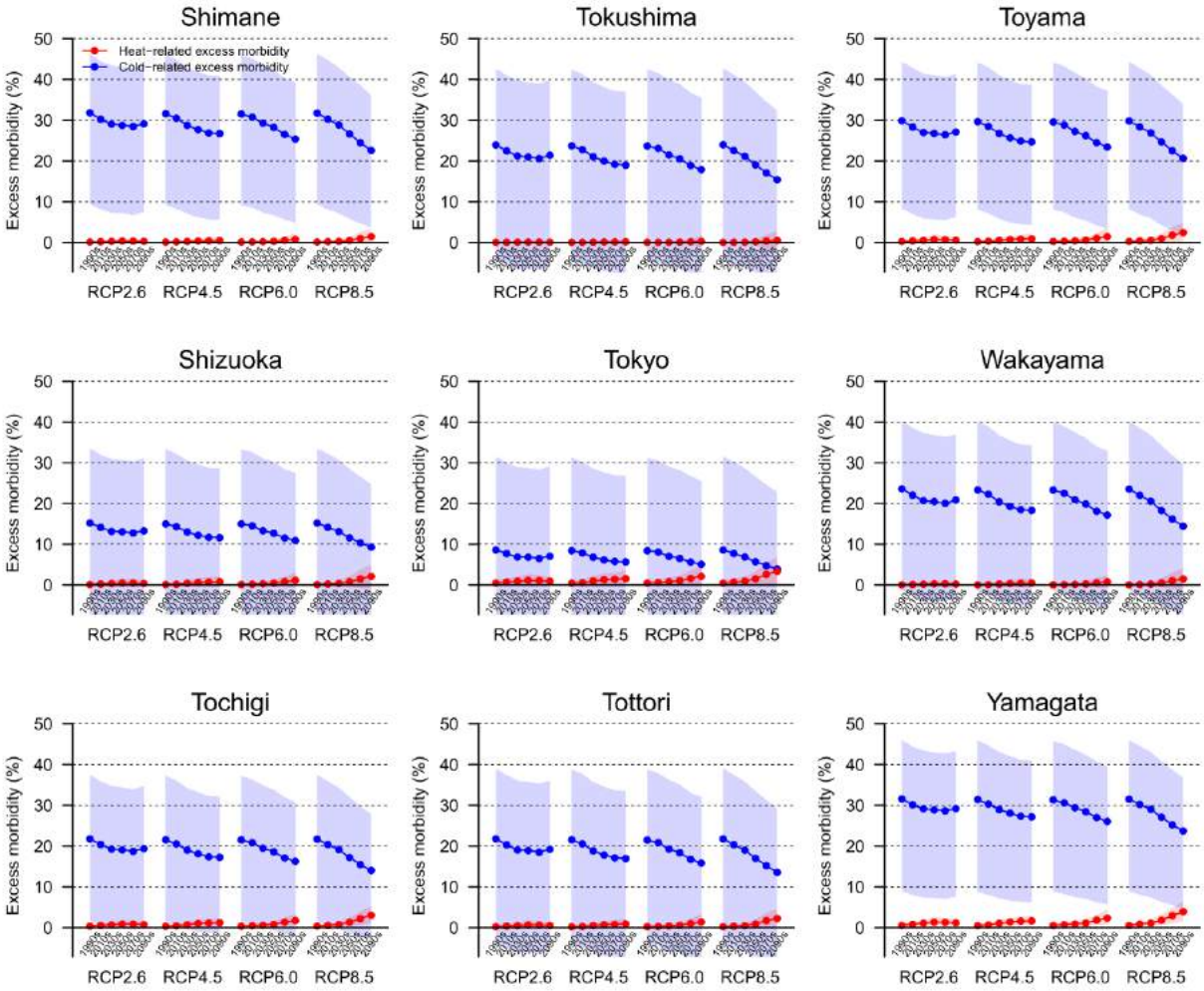
**Figure S5.** Trends in heat-related and cold-related excess morbidity by prefecture.

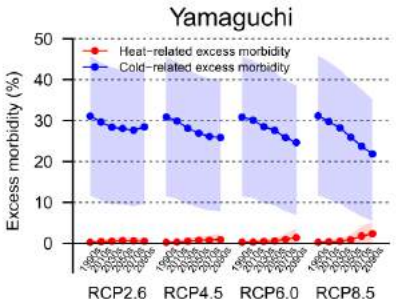



Gunma
Hyogo
Iwate
Hiroshima
Ibaraki
Kagawa
Hokkaido
Ishikawa
Kagoshima
Heat−related excess morbidity
Cold−related excess morbidity
Excess morbidity (%)
0
10
20
30
40
50
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Kanagawa
Kyoto
Miyazaki
Kochi
Mie
Nagano
Kumamoto
Miyagi
Nagasaki
Heat−related excess morbidity
Cold−related excess morbidity
Excess morbidity (%)
0
10
20
30
40
50
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Nara
Okayama
Saga
Niigata
Okinawa
Saitama
Oita
Osaka
Shiga
Heat−related excess morbidity
Cold−related excess morbidity
Excess morbidity (%)
0
10
20
30
40
50
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Shimane
Tokushima
Toyama
Shizuoka
Tokyo
Wakayama
Tochigi
Tottori
Yamagata
Heat−related excess morbidity
Cold−related excess morbidity
Excess morbidity (%)
0
10
20
30
40
50
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Yamaguchi
Heat−related excess morbidity
Cold−related excess morbidity
Excess morbidity (%)
50
40
30
20
10
0
RCP2.6
RCP4.5
RCP6.0
RCP8.5

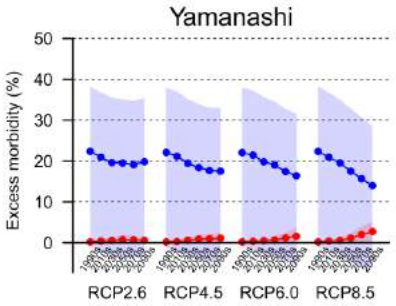
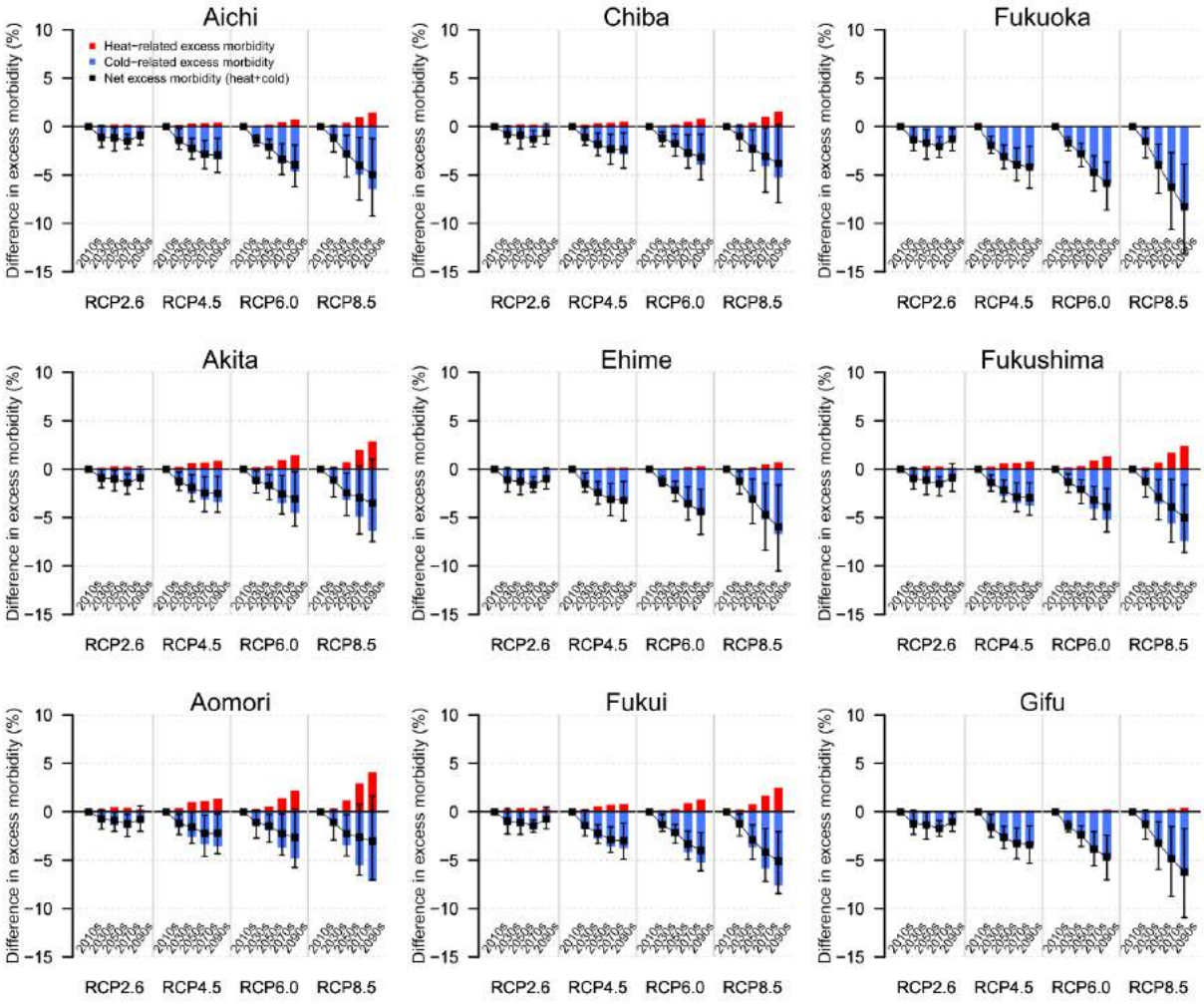
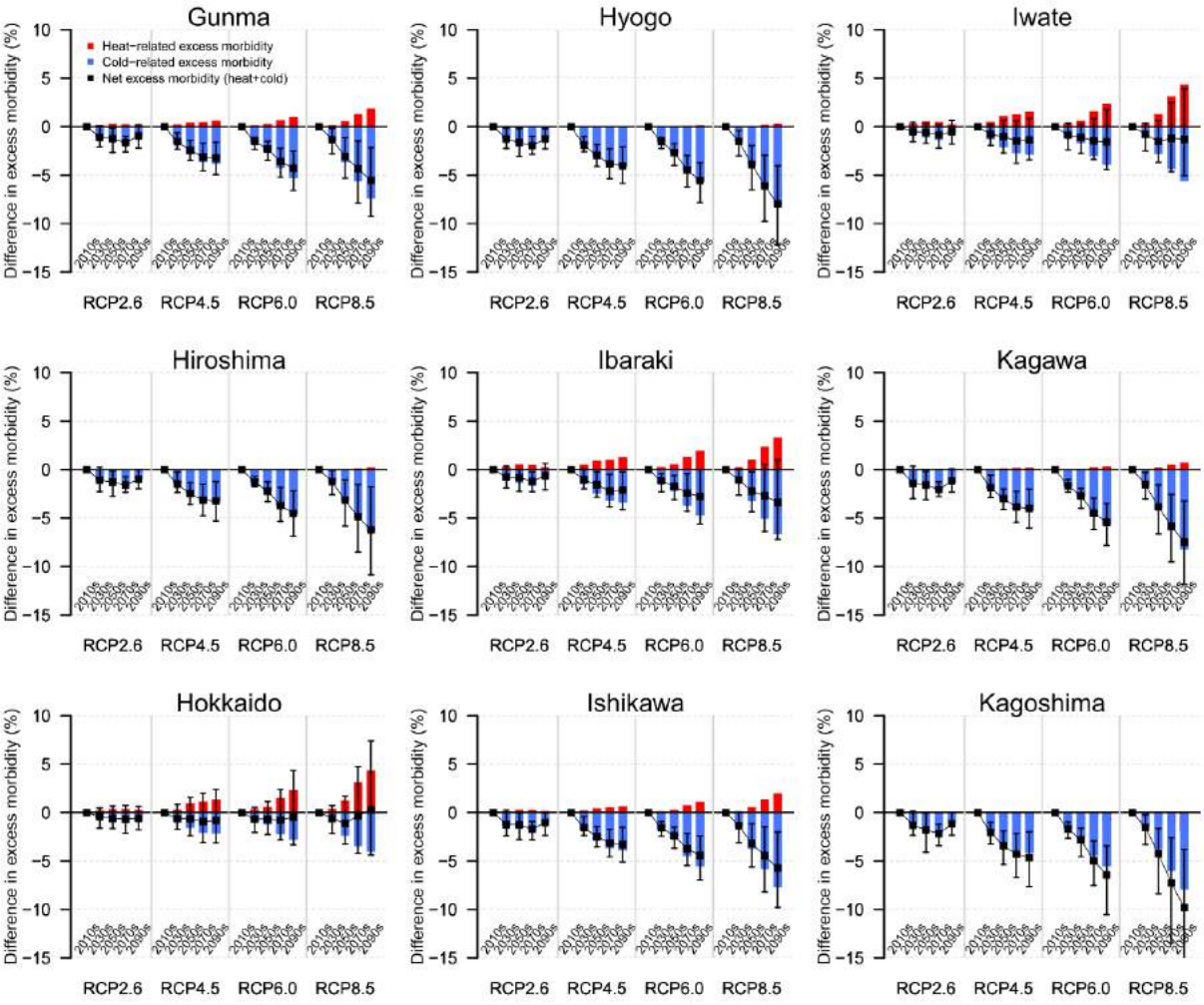
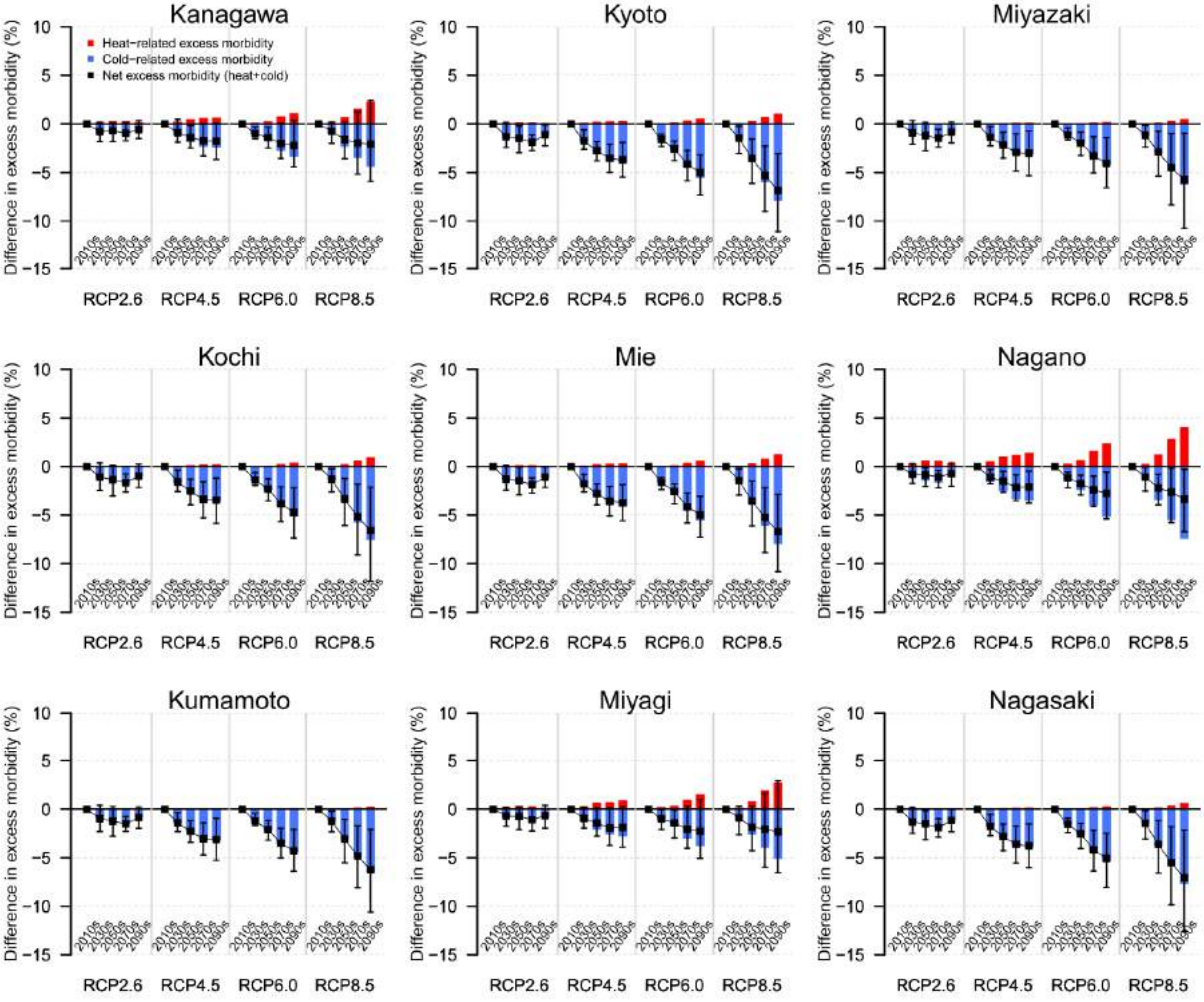
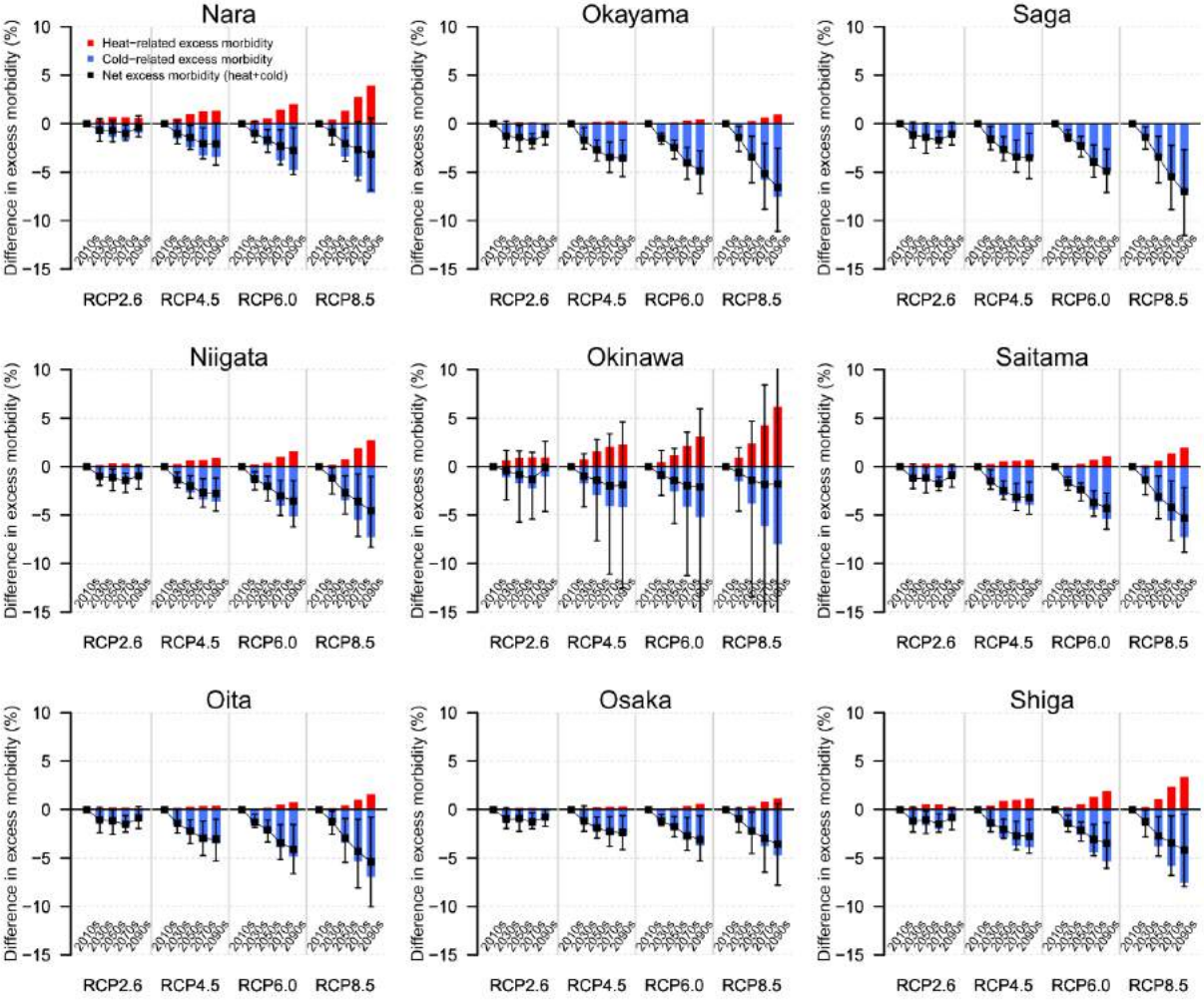

Yamanashi
Excess morbidity (%)
50
40
30
20
10
0
RCP2.6
RCP4.5
RCP6.0
RCP8.5

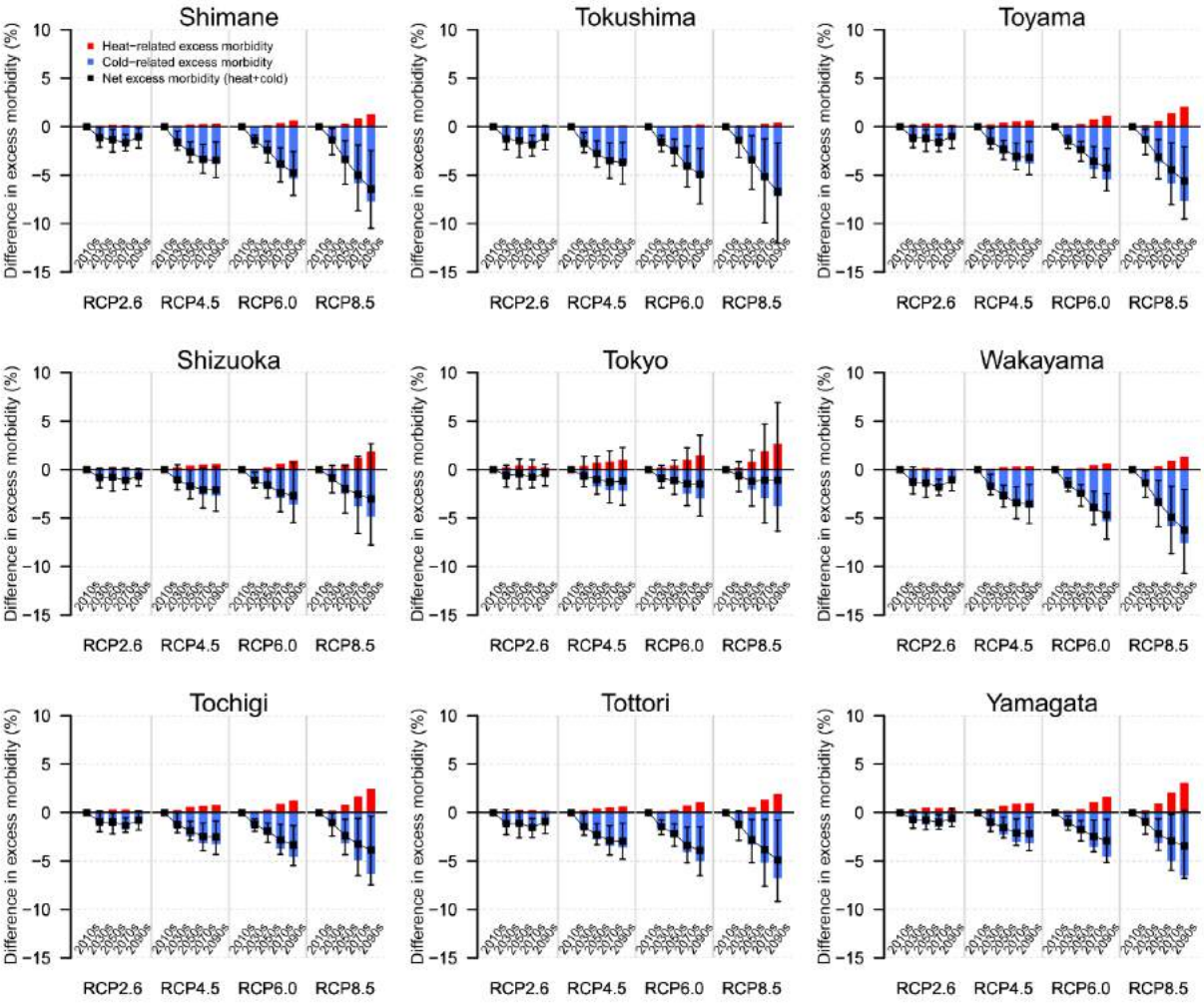
**Figure S6.** Temporal change in excess morbidity by prefecture.

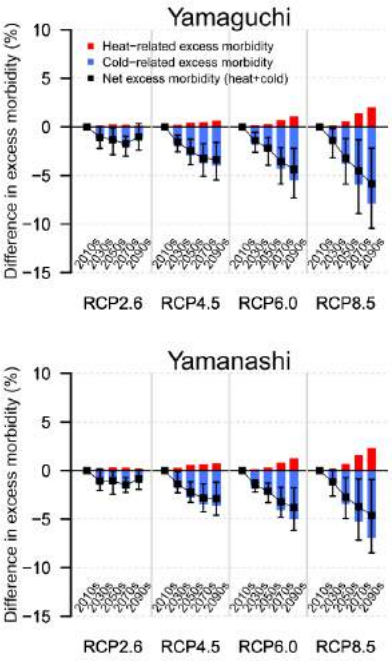



Gunma
Hyogo
Iwate
Hiroshima
Ibaraki
Kagawa
Hokkaido
Ishikawa
Kagoshima
Heat−related excess morbidity
Cold−related excess morbidity
Net excess morbidity (heat+cold)
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
2010s
2030s
2050s
2070s
2090s
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Kanagawa
Kyoto
Miyazaki
Kochi
Mie
Nagano
Kumamoto
Miyagi
Nagasaki
Heat−related excess morbidity
Cold−related excess morbidity
Net excess morbidity (heat+cold)
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
2010s
2030s
2050s
2070s
2090s
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Nara
Okayama
Saga
Niigata
Okinawa
Saitama
Oita
Osaka
Shiga
Heat−related excess morbidity
Cold−related excess morbidity
Net excess morbidity (heat+cold)
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
2010s
2030s
2050s
2070s
2090s
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Shimane
Tokushima
Toyama
Shizuoka
Tokyo
Wakayama
Tochigi
Tottori
Yamagata
Heat−related excess morbidity
Cold−related excess morbidity
Net excess morbidity (heat+cold)
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
RCP2.6
RCP4.5
RCP6.0
RCP8.5
2010s
2030s
2050s
2070s
2090s


Yamaguchi
Heat−related excess morbidity
Cold−related excess morbidity
Net excess morbidity (heat+cold)
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
2010s
2030s
2050s
2070s
2090s
RCP2.6
RCP4.5
RCP6.0
RCP8.5


Yamanashi
Difference in excess morbidity (%)
10
5
0
−5
−10
−15
2010s
2030s
2050s
2070s
2090s
RCP2.6
RCP4.5
RCP6.0
RCP8.5

**Table S1.** Descriptive statistics by prefecture in 2005–2015.

| Prefecture | Total OHCAs | Temperature, °C |
|---|---|---|
| Aichi | 43,211 | 16.3 (-1.5, 32.7) |
| Akita | 8,707 | 12.1 (-5.5, 31.6) |
| Aomori | 10,435 | 10.7 (-7.4, 30.1) |
| Chiba | 33,572 | 16.3 (0.3, 32.1) |
| Ehime | 10,121 | 16.8 (-0.4, 31.7) |
| Fukui | 3,723 | 14.8 (-1.8, 31.9) |
| Fukuoka | 17,710 | 17.4 (-0.1, 32.8) |
| Fukushima | 16,440 | 13.5 (-4.2, 31.4) |
| Gifu | 15,555 | 16.2 (-1.7, 32.7) |
| Gunma | 12,836 | 15.1 (-1.4, 32.6) |
| Hiroshima | 12,298 | 16.5 (-2.0, 31.8) |
| Hokkaido | 31,100 | 9.4 (-10.7, 29.3) |
| Hyogo | 28,563 | 17.0 (-0.3, 32.5) |
| Ibaraki | 18,436 | 14.2 (-1.7, 31.0) |
| Ishikawa | 5,190 | 15.0 (-1.8, 32.4) |
| Iwate | 10,558 | 10.7 (-7.7, 29.3) |
| Kagawa | 5,423 | 16.8 (-0.1, 33.0) |
| Kagoshima | 9,525 | 18.8 (0.7, 31.7) |
| Kanagawa | 52,008 | 16.3 (0.3, 32.2) |
| Kochi | 3,990 | 17.4 (-0.1, 31.3) |
| Kumamoto | 10,108 | 17.3 (-0.7, 31.7) |
| Kyoto | 15,552 | 16.2 (-1.2, 32.6) |
| Mie | 12,875 | 16.3 (-0.3, 33.1) |
| Miyagi | 15,139 | 12.9 (-4.5, 31.2) |
| Miyazaki | 5,585 | 17.7 (0.8, 31.6) |
| Nagano | 12,482 | 12.3 (-6.0, 30.0) |
| Nagasaki | 6,873 | 17.4 (-0.3, 31.9) |
| Nara | 8,795 | 15.1 (-1.1, 30.5) |
| Niigata | 14,643 | 14.1 (-2.8, 31.5) |
| Oita | 5,773 | 16.8 (-0.3, 31.7) |
| Okayama | 10,035 | 16.5 (-0.9, 32.3) |
| Okinawa | 6,458 | 23.3 (10.3, 31.1) |
| Osaka | 51,337 | 17.1 (0.5, 32.7) |
| Saga | 3,784 | 16.9 (-0.8, 32.3) |
| Saitama | 41,183 | 15.5 (-0.8, 33.7) |
| Shiga | 7,029 | 15.1 (-1.6, 31.8) |
| Shimane | 5,459 | 15.2 (-1.6, 32.2) |
| Shizuoka | 21,680 | 16.9 (1.7, 31.9) |
| Tochigi | 14,023 | 14.4 (-2.5, 31.7) |

| | | |
|---|---|---|
| Tokushima | 3,569 | 16.8 (-0.4, 32.6) |
| Tokyo | 79,006 | 16.6 (0.3, 33.2) |
| Tottori | 4,309 | 15.2 (-2.0, 32.0) |
| Toyama | 5,428 | 14.5 (-2.8, 32.2) |
| Wakayama | 5,861 | 16.9 (0.9, 32.7) |
| Yamagata | 8,929 | 12.1 (-5.8, 30.4) |
| Yamaguchi | 8,156 | 15.8 (-2.1, 31.0) |
| Yamanashi | 6,245 | 15.1 (-2.1, 31.8) |

**Table S2.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP2.6 scenario.

| | | RCP2.6 | | |
|---|---|---|---|---|
| | | 2010–2019 | 2050–2059 | 2090–2099 |
| Aichi | Heat | 0.2 (-0.2, 0.6) | 0.4 (-0.4, 1.3) | 0.3 (-0.3, 0.9) |
| | Cold | 19.0 (-2.3, 34.1) | 17.7 (-3.3, 32.4) | 18.0 (-3.2, 32.7) |
| | Net | - | -1.2 (-2.5, -0.1) | -0.9 (-1.9, -0.0) |
| Akita | Heat | 0.5 (-0.0, 1.1) | 0.8 (0.0, 1.7) | 0.6 (0.0, 1.4) |
| | Cold | 25.3 (1.2, 40.9) | 24.0 (0.6, 39.3) | 24.3 (0.6, 39.8) |
| | Net | - | -1.0 (-2.3, -0.1) | -0.9 (-2.0, 0.3) |
| Aomori | Heat | 0.8 (0.2, 1.5) | 1.3 (0.4, 2.4) | 1.0 (0.2, 2.0) |
| | Cold | 31.6 (8.5, 46.1) | 30.2 (7.7, 44.5) | 30.6 (7.9, 44.9) |
| | Net | - | -0.9 (-2.0, -0.0) | -0.8 (-2.0, 0.6) |
| Chiba | Heat | 0.2 (-0.2, 0.6) | 0.5 (-0.2, 1.3) | 0.3 (-0.2, 0.9) |
| | Cold | 16.2 (-3.5, 30.2) | 15.0 (-4.2, 29.0) | 15.4 (-4.1, 29.4) |
| | Net | - | -0.9 (-2.3, -0.0) | -0.7 (-1.8, 0.3) |
| Ehime | Heat | 0.1 (-0.3, 0.4) | 0.1 (-0.5, 0.8) | 0.1 (-0.4, 0.6) |
| | Cold | 22.3 (-2.2, 38.7) | 21.0 (-3.2, 37.4) | 21.3 (-3.0, 37.8) |
| | Net | - | -1.3 (-2.6, -0.2) | -1.0 (-2.0, 0.1) |
| Fukui | Heat | 0.6 (-0.0, 1.2) | 1.0 (0.0, 2.1) | 0.9 (0.0, 1.7) |
| | Cold | 27.6 (6.4, 42.0) | 26.0 (4.8, 40.3) | 26.5 (5.2, 40.7) |
| | Net | - | -1.1 (-2.3, 0.0) | -0.7 (-1.8, 0.5) |
| Fukuoka | Heat | -0.0 (-0.1, 0.1) | -0.0 (-0.5, 0.4) | -0.0 (-0.2, 0.2) |
| | Cold | 30.9 (8.4, 46.7) | 29.2 (7.5, 44.9) | 29.7 (7.5, 45.3) |
| | Net | - | -1.7 (-3.4, -0.3) | -1.3 (-2.5, -0.2) |
| Fukushima | Heat | 0.5 (0.1, 1.0) | 0.9 (0.2, 1.8) | 0.7 (0.2, 1.3) |
| | Cold | 29.8 (10.9, 42.6) | 28.3 (9.6, 41.0) | 28.8 (9.8, 41.6) |
| | Net | - | -1.2 (-2.6, -0.2) | -0.9 (-2.3, 0.6) |
| Gifu | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.5, 0.7) | 0.1 (-0.4, 0.5) |
| | Cold | 20.0 (-7.9, 38.4) | 18.6 (-8.7, 37.0) | 19.0 (-8.8, 37.4) |
| | Net | - | -1.3 (-2.8, -0.1) | -1.0 (-2.0, -0.1) |
| Gunma | Heat | 0.4 (-0.0, 0.8) | 0.6 (-0.0, 1.5) | 0.5 (-0.0, 1.1) |
| | Cold | 25.0 (5.2, 39.0) | 23.5 (3.8, 37.3) | 23.9 (4.2, 37.8) |
| | Net | - | -1.2 (-2.7, -0.1) | -1.0 (-2.2, 0.2) |
| Hiroshima | Heat | 0.0 (-0.2, 0.2) | 0.0 (-0.5, 0.6) | 0.0 (-0.4, 0.4) |
| | Cold | 22.0 (-4.9, 40.4) | 20.7 (-6.0, 38.9) | 21.0 (-5.9, 39.2) |
| | Net | - | -1.3 (-2.8, -0.2) | -1.0 (-2.0, -0.0) |
| Hokkaido | Heat | 0.6 (0.0, 1.4) | 1.0 (0.1, 2.3) | 0.9 (0.1, 1.9) |
| | Cold | 22.2 (-5.2, 39.4) | 21.2 (-5.2, 38.1) | 21.3 (-5.1, 38.3) |
| | Net | - | -0.6 (-1.6, 0.7) | -0.6 (-1.8, 0.6) |

| | | | | |
|---|---|---|---|---|
| Hyogo | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.2, 0.3) | 0.0 (-0.1, 0.2) |
| | Cold | 33.4 (14.5, 46.9) | 31.8 (13.0, 45.5) | 32.2 (13.3, 45.7) |
| | Net | - | -1.6 (-3.1, -0.2) | -1.2 (-2.3, -0.2) |
| Ibaraki | Heat | 0.8 (0.2, 1.5) | 1.4 (0.3, 2.8) | 1.1 (0.3, 2.0) |
| | Cold | 23.7 (0.2, 39.5) | 22.4 (-0.6, 37.8) | 22.8 (-0.6, 38.5) |
| | Net | - | -0.8 (-2.3, 0.0) | -0.6 (-2.1, 0.6) |
| Ishikawa | Heat | 0.3 (-0.1, 0.8) | 0.6 (-0.1, 1.8) | 0.5 (-0.1, 1.1) |
| | Cold | 26.0 (3.7, 41.2) | 24.4 (2.2, 39.5) | 24.8 (2.6, 39.9) |
| | Net | - | -1.3 (-2.8, -0.0) | -1.0 (-2.4, -0.1) |
| Iwate | Heat | 1.1 (0.4, 1.9) | 1.6 (0.6, 3.0) | 1.3 (0.3, 2.5) |
| | Cold | 26.6 (-0.6, 43.4) | 25.5 (-1.1, 42.1) | 25.8 (-1.2, 42.6) |
| | Net | - | -0.6 (-1.7, 0.4) | -0.5 (-1.8, 0.7) |
| Kagawa | Heat | 0.1 (-0.3, 0.4) | 0.2 (-0.5, 0.9) | 0.1 (-0.4, 0.7) |
| | Cold | 24.0 (-2.7, 41.6) | 22.3 (-4.1, 39.8) | 22.7 (-3.8, 40.1) |
| | Net | - | -1.6 (-3.1, -0.2) | -1.2 (-2.3, 0.1) |
| Kagoshima | Heat | -0.1 (-0.3, 0.1) | -0.3 (-1.2, 0.2) | -0.2 (-0.5, 0.1) |
| | Cold | 30.0 (4.3, 47.5) | 28.4 (3.4, 45.8) | 28.9 (3.5, 46.2) |
| | Net | - | -1.8 (-4.1, -0.0) | -1.2 (-2.3, -0.0) |
| Kanagawa | Heat | 0.4 (-0.0, 0.9) | 0.7 (-0.0, 1.6) | 0.6 (-0.0, 1.2) |
| | Cold | 10.3 (-9.4, 24.6) | 9.3 (-9.9, 23.3) | 9.5 (-9.7, 23.6) |
| | Net | - | -0.7 (-1.8, 0.1) | -0.6 (-1.5, 0.4) |
| Kochi | Heat | 0.1 (-0.4, 0.5) | 0.2 (-0.7, 1.1) | 0.2 (-0.6, 0.9) |
| | Cold | 25.7 (1.4, 41.7) | 24.2 (0.2, 40.2) | 24.6 (0.6, 40.7) |
| | Net | - | -1.4 (-3.0, 0.1) | -1.0 (-2.2, 0.2) |
| Kumamoto | Heat | 0.0 (-0.2, 0.2) | 0.0 (-0.4, 0.5) | 0.0 (-0.4, 0.5) |
| | Cold | 20.4 (-6.7, 38.0) | 19.1 (-7.6, 36.7) | 19.5 (-7.3, 36.9) |
| | Net | - | -1.2 (-2.8, 0.3) | -0.9 (-2.0, 0.2) |
| Kyoto | Heat | 0.1 (-0.2, 0.5) | 0.3 (-0.4, 1.1) | 0.2 (-0.3, 0.7) |
| | Cold | 26.2 (4.2, 41.3) | 24.5 (2.7, 39.6) | 25.0 (3.1, 39.9) |
| | Net | - | -1.5 (-3.0, -0.2) | -1.1 (-2.3, -0.1) |
| Mie | Heat | 0.1 (-0.2, 0.5) | 0.3 (-0.3, 1.0) | 0.2 (-0.3, 0.7) |
| | Cold | 26.3 (5.3, 40.9) | 24.7 (3.6, 39.4) | 25.2 (4.0, 39.6) |
| | Net | - | -1.5 (-2.9, -0.1) | -1.1 (-2.1, -0.0) |
| Miyagi | Heat | 0.6 (0.1, 1.1) | 1.0 (0.2, 2.0) | 0.7 (0.1, 1.5) |
| | Cold | 17.2 (-7.2, 33.6) | 16.1 (-7.4, 32.0) | 16.4 (-7.5, 32.5) |
| | Net | - | -0.7 (-2.1, 0.2) | -0.7 (-2.0, 0.4) |
| Miyazaki | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.5, 0.6) | 0.1 (-0.4, 0.5) |
| | Cold | 21.4 (-4.2, 39.0) | 20.1 (-4.9, 37.4) | 20.5 (-4.7, 37.6) |
| | Net | - | -1.2 (-2.8, 0.2) | -0.9 (-2.0, 0.2) |
| Nagano | Heat | 0.8 (0.3, 1.5) | 1.5 (0.5, 3.1) | 1.2 (0.4, 2.0) |
| | Cold | 33.9 (15.2, 46.4) | 32.4 (14.0, 44.7) | 32.8 (14.5, 45.1) |
| | Net | - | -0.8 (-2.1, -0.2) | -0.7 (-2.0, 0.3) |

| | | | | |
|---|---|---|---|---|
| Nagasaki | Heat | 0.0 (-0.3, 0.3) | 0.1 (-0.6, 0.8) | 0.1 (-0.5, 0.6) |
| | Cold | 23.5 (-2.0, 40.4) | 21.9 (-3.0, 38.8) | 22.3 (-3.1, 39.3) |
| | Net | - | -1.5 (-3.1, -0.1) | -1.2 (-2.3, -0.0) |
| Nara | Heat | 1.1 (0.1, 2.1) | 1.7 (0.2, 3.4) | 1.6 (0.2, 3.0) |
| | Cold | 26.7 (2.1, 42.2) | 25.4 (1.5, 40.9) | 25.8 (1.8, 41.2) |
| | Net | - | -0.7 (-1.9, 0.3) | -0.4 (-1.4, 0.8) |
| Niigata | Heat | 0.5 (0.1, 1.0) | 0.9 (0.2, 1.9) | 0.7 (0.1, 1.3) |
| | Cold | 30.4 (11.2, 43.7) | 28.9 (10.0, 41.9) | 29.3 (10.3, 42.4) |
| | Net | - | -1.2 (-2.5, -0.3) | -0.9 (-2.3, 0.2) |
| Oita | Heat | 0.2 (-0.3, 0.8) | 0.5 (-0.5, 1.4) | 0.4 (-0.4, 1.1) |
| | Cold | 19.6 (-5.1, 36.3) | 18.2 (-6.0, 34.7) | 18.6 (-5.6, 34.9) |
| | Net | - | -1.2 (-2.6, -0.1) | -0.9 (-2.0, 0.3) |
| Okayama | Heat | 0.1 (-0.3, 0.5) | 0.2 (-0.5, 1.1) | 0.2 (-0.4, 0.8) |
| | Cold | 23.0 (-1.8, 39.4) | 21.4 (-3.0, 37.9) | 21.8 (-2.6, 38.3) |
| | Net | - | -1.4 (-2.9, -0.2) | -1.1 (-2.2, -0.1) |
| Okinawa | Heat | 2.1 (-5.7, 8.2) | 3.0 (-7.4, 10.3) | 3.0 (-7.4, 10.2) |
| | Cold | 16.6 (-4.1, 30.5) | 14.9 (-4.6, 28.7) | 15.6 (-4.3, 29.0) |
| | Net | - | -0.8 (-5.7, 1.6) | -0.1 (-4.6, 2.6) |
| Osaka | Heat | 0.2 (-0.3, 0.6) | 0.3 (-0.5, 1.2) | 0.2 (-0.4, 0.8) |
| | Cold | 10.2 (-11.7, 25.9) | 9.1 (-12.4, 24.6) | 9.3 (-12.3, 24.8) |
| | Net | - | -0.9 (-2.2, -0.1) | -0.8 (-1.7, 0.0) |
| Saga | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.3, 0.3) | 0.0 (-0.3, 0.3) |
| | Cold | 24.9 (-4.4, 44.2) | 23.4 (-4.9, 42.6) | 23.8 (-4.9, 42.7) |
| | Net | - | -1.4 (-3.0, 0.0) | -1.1 (-2.2, 0.1) |
| Saitama | Heat | 0.5 (-0.0, 1.0) | 0.8 (0.0, 1.7) | 0.7 (0.0, 1.3) |
| | Cold | 16.7 (-1.6, 29.5) | 15.2 (-2.4, 28.4) | 15.7 (-2.2, 28.6) |
| | Net | - | -1.2 (-2.7, -0.1) | -0.9 (-2.1, 0.2) |
| Shiga | Heat | 0.8 (-0.1, 1.5) | 1.3 (0.1, 2.9) | 1.1 (0.1, 2.1) |
| | Cold | 20.4 (-1.9, 35.6) | 18.8 (-3.4, 34.2) | 19.2 (-3.2, 34.5) |
| | Net | - | -1.1 (-2.5, -0.1) | -0.8 (-2.1, 0.2) |
| Shimane | Heat | 0.2 (-0.1, 0.5) | 0.3 (-0.2, 1.2) | 0.2 (-0.2, 0.7) |
| | Cold | 30.3 (8.2, 44.5) | 28.7 (7.2, 43.1) | 29.1 (7.5, 43.4) |
| | Net | - | -1.3 (-2.6, -0.3) | -1.1 (-2.2, -0.1) |
| Shizuoka | Heat | 0.3 (-0.2, 0.8) | 0.5 (-0.4, 1.5) | 0.4 (-0.3, 1.1) |
| | Cold | 14.1 (-13.2, 32.0) | 13.1 (-13.2, 30.7) | 13.3 (-13.4, 31.0) |
| | Net | - | -0.8 (-2.2, 0.2) | -0.7 (-1.7, 0.1) |
| Tochigi | Heat | 0.5 (0.0, 1.0) | 0.9 (0.1, 1.8) | 0.7 (0.1, 1.3) |
| | Cold | 20.4 (0.5, 35.9) | 19.1 (-0.2, 34.4) | 19.4 (-0.1, 34.8) |
| | Net | - | -1.0 (-2.2, -0.1) | -0.8 (-1.8, 0.2) |
| Tokushima | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.4, 0.6) | 0.0 (-0.3, 0.4) |
| | Cold | 22.5 (-5.5, 41.0) | 21.0 (-6.5, 39.3) | 21.4 (-6.2, 39.9) |
| | Net | - | -1.4 (-3.2, -0.1) | -1.1 (-2.3, 0.1) |

| | | | | |
|---|---|---|---|---|
| Tokyo | Heat | 0.7 (-0.2, 1.6) | 1.1 (-0.3, 2.7) | 0.9 (-0.2, 2.0) |
| | Cold | 7.7 (-28.7, 30.0) | 6.8 (-28.4, 28.8) | 7.1 (-28.7, 29.2) |
| | Net | - | -0.4 (-2.0, 1.1) | -0.4 (-1.7, 0.5) |
| Tottori | Heat | 0.4 (-0.2, 0.9) | 0.6 (-0.2, 1.8) | 0.5 (-0.2, 1.2) |
| | Cold | 20.3 (-5.0, 37.4) | 18.9 (-6.1, 35.8) | 19.2 (-5.9, 36.1) |
| | Net | - | -1.1 (-2.6, 0.1) | -0.9 (-2.2, 0.0) |
| Toyama | Heat | 0.4 (-0.1, 0.9) | 0.7 (-0.1, 2.1) | 0.5 (-0.1, 1.2) |
| | Cold | 28.3 (7.0, 42.9) | 26.8 (5.7, 41.0) | 27.1 (6.2, 41.4) |
| | Net | - | -1.2 (-2.6, -0.3) | -1.0 (-2.2, 0.0) |
| Wakayama | Heat | 0.1 (-0.3, 0.5) | 0.3 (-0.4, 1.2) | 0.2 (-0.4, 0.8) |
| | Cold | 22.0 (-2.5, 38.6) | 20.5 (-3.9, 36.9) | 20.9 (-3.4, 37.0) |
| | Net | - | -1.4 (-2.9, -0.0) | -1.1 (-2.2, 0.0) |
| Yamagata | Heat | 0.8 (0.2, 1.5) | 1.3 (0.3, 2.6) | 1.2 (0.3, 2.0) |
| | Cold | 30.2 (8.0, 44.4) | 28.9 (7.2, 42.9) | 29.2 (7.5, 43.3) |
| | Net | - | -0.8 (-1.8, -0.0) | -0.6 (-1.4, 0.4) |
| Yamaguchi | Heat | 0.3 (-0.2, 0.9) | 0.6 (-0.3, 1.7) | 0.4 (-0.3, 1.3) |
| | Cold | 29.6 (10.4, 44.1) | 28.0 (9.5, 42.4) | 28.5 (9.6, 43.1) |
| | Net | - | -1.3 (-2.9, -0.1) | -1.0 (-2.4, 0.4) |
| Yamanashi | Heat | 0.4 (-0.2, 0.9) | 0.8 (-0.1, 1.9) | 0.6 (-0.1, 1.3) |
| | Cold | 20.9 (-2.0, 36.8) | 19.5 (-3.4, 35.2) | 19.9 (-3.1, 35.5) |
| | Net | - | -1.0 (-2.4, -0.0) | -0.9 (-1.9, 0.1) |

**Table S3.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP4.5 scenario.

| | | RCP4.5 | | |
|---|---|---|---|---|
| | | 2010–2019 | 2050–2059 | 2090–2099 |
| Aichi | Heat | 0.2 (-0.2, 0.5) | 0.5 (-0.4, 1.4) | 0.6 (-0.5, 1.7) |
| | Cold | 19.3 (-2.1, 34.2) | 16.7 (-4.3, 31.4) | 15.9 (-4.5, 30.4) |
| | Net | - | -2.3 (-3.4, -1.2) | -3.0 (-4.7, -1.2) |
| Akita | Heat | 0.3 (-0.0, 0.8) | 1.0 (0.1, 1.9) | 1.2 (0.2, 2.5) |
| | Cold | 25.6 (1.5, 41.1) | 23.0 (-0.1, 38.1) | 22.2 (-0.3, 37.1) |
| | Net | - | -1.9 (-3.3, -0.6) | -2.5 (-4.5, -0.7) |
| Aomori | Heat | 0.6 (0.1, 1.2) | 1.6 (0.6, 2.7) | 2.0 (0.7, 3.7) |
| | Cold | 31.8 (8.7, 46.3) | 29.1 (7.4, 43.2) | 28.2 (6.8, 42.0) |
| | Net | - | -1.6 (-3.3, -0.0) | -2.2 (-4.3, -0.2) |
| Chiba | Heat | 0.2 (-0.1, 0.5) | 0.6 (-0.3, 1.3) | 0.7 (-0.3, 1.8) |
| | Cold | 16.4 (-3.3, 30.5) | 14.2 (-4.7, 27.9) | 13.5 (-4.8, 27.0) |
| | Net | - | -1.8 (-3.0, -0.7) | -2.4 (-4.3, -0.7) |
| Ehime | Heat | 0.0 (-0.2, 0.3) | 0.2 (-0.6, 0.9) | 0.2 (-0.8, 1.1) |
| | Cold | 22.5 (-2.1, 38.9) | 20.0 (-3.8, 36.3) | 19.1 (-4.2, 35.4) |
| | Net | - | -2.4 (-3.6, -1.3) | -3.2 (-5.3, -1.3) |
| Fukui | Heat | 0.5 (-0.1, 1.0) | 1.0 (0.0, 2.0) | 1.2 (0.1, 2.4) |
| | Cold | 27.8 (6.6, 42.3) | 25.0 (4.1, 39.2) | 24.0 (3.2, 38.2) |
| | Net | - | -2.2 (-3.3, -1.3) | -3.0 (-4.9, -1.2) |
| Fukuoka | Heat | -0.0 (-0.1, 0.1) | -0.0 (-0.3, 0.3) | -0.0 (-0.6, 0.5) |
| | Cold | 31.2 (8.7, 47.0) | 28.1 (6.2, 43.6) | 27.0 (5.7, 42.7) |
| | Net | - | -3.1 (-4.3, -1.9) | -4.2 (-6.4, -2.0) |
| Fukushima | Heat | 0.4 (0.1, 0.8) | 1.0 (0.3, 1.8) | 1.2 (0.3, 2.4) |
| | Cold | 30.1 (11.2, 42.9) | 27.3 (8.8, 39.9) | 26.3 (8.2, 38.8) |
| | Net | - | -2.2 (-3.3, -1.1) | -2.9 (-4.7, -1.4) |
| Gifu | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.6, 0.8) | 0.1 (-0.8, 1.0) |
| | Cold | 20.3 (-7.6, 38.6) | 17.6 (-9.5, 35.8) | 16.8 (-9.9, 34.8) |
| | Net | - | -2.6 (-3.8, -1.5) | -3.4 (-5.3, -1.4) |
| Gunma | Heat | 0.3 (-0.1, 0.6) | 0.7 (-0.0, 1.5) | 0.9 (0.0, 2.0) |
| | Cold | 25.3 (5.5, 39.3) | 22.4 (3.0, 36.1) | 21.4 (2.4, 35.0) |
| | Net | - | -2.4 (-3.5, -1.4) | -3.2 (-4.9, -1.6) |
| Hiroshima | Heat | 0.0 (-0.2, 0.2) | 0.0 (-0.5, 0.5) | 0.1 (-0.7, 0.7) |
| | Cold | 22.2 (-4.9, 40.7) | 19.7 (-7.0, 37.8) | 18.9 (-7.3, 36.9) |
| | Net | - | -2.5 (-3.6, -1.3) | -3.3 (-5.3, -1.2) |
| Hokkaido | Heat | 0.4 (-0.0, 1.0) | 1.4 (0.2, 2.8) | 1.8 (0.3, 3.8) |
| | Cold | 22.3 (-5.1, 39.6) | 20.7 (-4.7, 37.1) | 20.1 (-4.2, 36.2) |
| | Net | - | -0.6 (-2.4, 1.6) | -0.8 (-3.1, 2.4) |

| | | | | |
|---|---|---|---|---|
| Hyogo | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.3, 0.4) | 0.1 (-0.4, 0.5) |
| | Cold | 33.7 (14.7, 47.3) | 30.7 (12.2, 44.1) | 29.6 (11.2, 43.2) |
| | Net | - | -3.0 (-4.1, -1.9) | -4.0 (-5.8, -2.1) |
| Ibaraki | Heat | 0.7 (0.1, 1.2) | 1.6 (0.4, 2.8) | 1.9 (0.5, 3.6) |
| | Cold | 23.9 (0.4, 39.7) | 21.4 (-1.0, 36.8) | 20.5 (-1.6, 35.6) |
| | Net | - | -1.6 (-2.8, -0.2) | -2.1 (-4.1, -0.2) |
| Ishikawa | Heat | 0.2 (-0.1, 0.6) | 0.7 (-0.1, 1.5) | 0.9 (-0.0, 2.1) |
| | Cold | 26.2 (3.9, 41.5) | 23.3 (1.4, 38.3) | 22.3 (0.7, 37.2) |
| | Net | - | -2.5 (-3.5, -1.4) | -3.3 (-5.1, -1.5) |
| Iwate | Heat | 0.8 (0.2, 1.5) | 2.0 (0.8, 3.2) | 2.4 (0.9, 4.2) |
| | Cold | 26.8 (-0.5, 43.6) | 24.6 (-1.4, 40.9) | 23.9 (-1.4, 40.0) |
| | Net | - | -1.0 (-2.7, 0.7) | -1.4 (-3.4, 0.9) |
| Kagawa | Heat | 0.1 (-0.2, 0.4) | 0.2 (-0.6, 1.0) | 0.3 (-0.7, 1.2) |
| | Cold | 24.1 (-2.7, 41.9) | 21.0 (-5.4, 38.4) | 19.9 (-6.2, 37.3) |
| | Net | - | -3.0 (-4.1, -2.0) | -4.0 (-6.0, -2.0) |
| Kagoshima | Heat | -0.1 (-0.2, 0.0) | -0.4 (-1.4, 0.3) | -0.6 (-2.2, 0.4) |
| | Cold | 30.3 (4.5, 47.8) | 27.2 (2.4, 44.3) | 26.2 (1.8, 43.2) |
| | Net | - | -3.4 (-5.4, -1.9) | -4.6 (-7.7, -2.0) |
| Kanagawa | Heat | 0.4 (-0.1, 0.8) | 0.9 (0.0, 1.7) | 1.0 (0.0, 2.1) |
| | Cold | 10.4 (-9.5, 24.8) | 8.5 (-10.3, 22.3) | 7.9 (-10.3, 21.4) |
| | Net | - | -1.4 (-2.5, -0.1) | -1.8 (-3.7, 0.0) |
| Kochi | Heat | 0.1 (-0.3, 0.4) | 0.2 (-0.8, 1.2) | 0.3 (-1.0, 1.5) |
| | Cold | 25.9 (1.2, 42.1) | 23.2 (-0.5, 39.1) | 22.2 (-1.0, 38.0) |
| | Net | - | -2.5 (-3.9, -1.3) | -3.4 (-5.9, -1.2) |
| Kumamoto | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.5, 0.6) | 0.1 (-0.7, 0.8) |
| | Cold | 20.5 (-6.9, 38.1) | 18.2 (-8.5, 35.5) | 17.3 (-8.7, 34.6) |
| | Net | - | -2.3 (-3.4, -1.2) | -3.1 (-5.3, -0.9) |
| Kyoto | Heat | 0.1 (-0.2, 0.4) | 0.3 (-0.5, 1.2) | 0.4 (-0.6, 1.4) |
| | Cold | 26.4 (4.3, 41.6) | 23.4 (1.6, 38.4) | 22.4 (0.9, 37.3) |
| | Net | - | -2.7 (-3.8, -1.8) | -3.7 (-5.5, -1.9) |
| Mie | Heat | 0.1 (-0.2, 0.4) | 0.4 (-0.4, 1.1) | 0.5 (-0.5, 1.4) |
| | Cold | 26.6 (5.4, 41.1) | 23.5 (2.7, 37.8) | 22.5 (2.0, 36.9) |
| | Net | - | -2.8 (-3.9, -1.8) | -3.7 (-5.6, -1.9) |
| Miyagi | Heat | 0.4 (0.0, 0.9) | 1.1 (0.3, 2.0) | 1.4 (0.3, 2.7) |
| | Cold | 17.4 (-6.9, 33.7) | 15.3 (-7.7, 30.9) | 14.6 (-7.6, 30.0) |
| | Net | - | -1.4 (-2.8, 0.1) | -1.9 (-3.9, 0.3) |
| Miyazaki | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.6, 0.7) | 0.1 (-0.7, 1.0) |
| | Cold | 21.5 (-4.1, 39.3) | 19.2 (-5.4, 36.4) | 18.4 (-5.8, 35.1) |
| | Net | - | -2.2 (-3.5, -0.8) | -3.0 (-5.3, -0.7) |
| Nagano | Heat | 0.6 (0.2, 1.1) | 1.7 (0.6, 2.8) | 2.1 (0.7, 3.7) |
| | Cold | 34.0 (15.4, 46.5) | 31.5 (13.3, 43.7) | 30.5 (12.5, 42.8) |
| | Net | - | -1.5 (-2.7, -0.5) | -2.1 (-3.8, -0.5) |

| | | | | |
|---|---|---|---|---|
| Nagasaki | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.7, 0.9) | 0.2 (-0.9, 1.2) |
| | Cold | 23.7 (-2.1, 40.7) | 20.8 (-3.9, 37.5) | 19.8 (-4.4, 36.5) |
| | Net | - | -2.8 (-4.3, -1.5) | -3.8 (-6.0, -1.5) |
| Nara | Heat | 0.9 (0.1, 1.8) | 1.9 (0.3, 3.4) | 2.3 (0.4, 4.0) |
| | Cold | 26.9 (2.1, 42.6) | 24.5 (0.7, 39.8) | 23.5 (0.2, 38.8) |
| | Net | - | -1.4 (-2.7, -0.2) | -2.1 (-4.3, 0.0) |
| Niigata | Heat | 0.4 (0.0, 0.7) | 1.0 (0.2, 1.8) | 1.2 (0.3, 2.5) |
| | Cold | 30.6 (11.4, 43.9) | 27.9 (9.4, 40.9) | 26.9 (8.8, 39.8) |
| | Net | - | -2.0 (-3.2, -1.0) | -2.8 (-4.6, -1.2) |
| Oita | Heat | 0.2 (-0.3, 0.6) | 0.5 (-0.5, 1.5) | 0.6 (-0.6, 1.8) |
| | Cold | 19.8 (-5.0, 36.7) | 17.2 (-6.6, 33.5) | 16.3 (-7.1, 32.3) |
| | Net | - | -2.2 (-3.5, -1.0) | -3.1 (-5.3, -1.0) |
| Okayama | Heat | 0.1 (-0.2, 0.4) | 0.3 (-0.6, 1.1) | 0.3 (-0.7, 1.4) |
| | Cold | 23.1 (-1.7, 39.7) | 20.3 (-4.1, 36.7) | 19.3 (-4.6, 35.6) |
| | Net | - | -2.7 (-3.8, -1.7) | -3.6 (-5.5, -1.7) |
| Okinawa | Heat | 2.1 (-5.8, 8.2) | 3.7 (-8.2, 11.7) | 4.4 (-10.5, 13.4) |
| | Cold | 16.7 (-4.2, 30.7) | 13.7 (-5.5, 26.6) | 12.5 (-5.3, 24.9) |
| | Net | - | -1.4 (-7.7, 2.8) | -1.9 (-12.5, 4.6) |
| Osaka | Heat | 0.1 (-0.2, 0.5) | 0.4 (-0.5, 1.3) | 0.5 (-0.6, 1.6) |
| | Cold | 10.3 (-11.6, 26.1) | 8.2 (-13.1, 23.5) | 7.6 (-13.3, 22.7) |
| | Net | - | -1.9 (-2.9, -0.8) | -2.4 (-4.2, -0.6) |
| Saga | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.3, 0.3) | 0.0 (-0.5, 0.4) |
| | Cold | 25.1 (-4.3, 44.6) | 22.4 (-6.1, 41.5) | 21.5 (-6.4, 40.5) |
| | Net | - | -2.6 (-3.8, -1.3) | -3.5 (-5.7, -1.0) |
| Saitama | Heat | 0.4 (-0.1, 0.8) | 0.9 (0.1, 1.8) | 1.1 (0.1, 2.2) |
| | Cold | 17.0 (-1.2, 29.8) | 14.0 (-3.9, 26.8) | 13.0 (-4.3, 26.0) |
| | Net | - | -2.5 (-3.4, -1.5) | -3.2 (-4.9, -1.6) |
| Shiga | Heat | 0.6 (-0.1, 1.3) | 1.5 (0.2, 2.8) | 1.8 (0.3, 3.5) |
| | Cold | 20.6 (-1.8, 35.7) | 17.7 (-4.2, 32.8) | 16.7 (-5.1, 31.7) |
| | Net | - | -2.0 (-3.0, -1.0) | -2.8 (-4.5, -1.0) |
| Shimane | Heat | 0.1 (-0.1, 0.4) | 0.3 (-0.2, 0.9) | 0.4 (-0.2, 1.3) |
| | Cold | 30.5 (8.2, 44.8) | 27.7 (6.2, 41.9) | 26.7 (5.6, 40.9) |
| | Net | - | -2.6 (-3.7, -1.6) | -3.5 (-5.3, -1.6) |
| Shizuoka | Heat | 0.2 (-0.2, 0.6) | 0.6 (-0.4, 1.7) | 0.8 (-0.5, 2.2) |
| | Cold | 14.3 (-13.1, 32.2) | 12.2 (-13.6, 29.6) | 11.6 (-13.5, 28.7) |
| | Net | - | -1.7 (-3.0, -0.0) | -2.1 (-4.3, 0.3) |
| Tochigi | Heat | 0.4 (0.0, 0.8) | 1.0 (0.1, 1.9) | 1.2 (0.2, 2.2) |
| | Cold | 20.5 (0.4, 36.1) | 18.1 (-1.1, 33.2) | 17.3 (-1.4, 32.2) |
| | Net | - | -1.9 (-2.9, -0.9) | -2.5 (-4.3, -0.9) |
| Tokushima | Heat | 0.0 (-0.1, 0.1) | 0.1 (-0.5, 0.6) | 0.1 (-0.7, 0.9) |
| | Cold | 22.8 (-5.2, 41.4) | 19.9 (-7.1, 38.1) | 19.0 (-7.6, 36.9) |
| | Net | - | -2.8 (-4.2, -1.5) | -3.7 (-5.9, -1.6) |

| | | | | |
|---|---|---|---|---|
| Tokyo | Heat | 0.6 (-0.2, 1.3) | 1.3 (-0.3, 2.9) | 1.6 (-0.3, 3.5) |
| | Cold | 7.9 (-28.5, 30.2) | 6.1 (-28.8, 27.6) | 5.7 (-28.1, 26.9) |
| | Net | - | -1.0 (-2.5, 1.4) | -1.2 (-3.7, 2.3) |
| Tottori | Heat | 0.3 (-0.1, 0.7) | 0.7 (-0.2, 1.6) | 0.9 (-0.2, 2.2) |
| | Cold | 20.6 (-4.8, 37.7) | 17.8 (-7.0, 34.6) | 16.9 (-7.3, 33.5) |
| | Net | - | -2.3 (-3.3, -1.1) | -3.0 (-4.8, -1.1) |
| Toyama | Heat | 0.3 (-0.1, 0.6) | 0.7 (-0.1, 1.6) | 0.9 (-0.1, 2.2) |
| | Cold | 28.5 (7.1, 43.0) | 25.7 (4.9, 39.9) | 24.7 (4.3, 38.7) |
| | Net | - | -2.3 (-3.4, -1.4) | -3.2 (-4.9, -1.5) |
| Wakayama | Heat | 0.1 (-0.2, 0.4) | 0.4 (-0.5, 1.3) | 0.5 (-0.6, 1.6) |
| | Cold | 22.2 (-2.3, 38.9) | 19.3 (-4.7, 35.5) | 18.3 (-5.3, 34.3) |
| | Net | - | -2.7 (-3.9, -1.6) | -3.6 (-5.6, -1.6) |
| Yamagata | Heat | 0.7 (0.1, 1.2) | 1.4 (0.4, 2.3) | 1.6 (0.5, 2.8) |
| | Cold | 30.3 (8.0, 44.7) | 28.1 (6.6, 42.1) | 27.2 (6.2, 41.0) |
| | Net | - | -1.6 (-2.6, -0.5) | -2.2 (-3.9, -0.5) |
| Yamaguchi | Heat | 0.2 (-0.2, 0.7) | 0.7 (-0.3, 1.8) | 0.9 (-0.4, 2.3) |
| | Cold | 29.9 (10.7, 44.4) | 26.9 (8.7, 41.2) | 25.9 (7.7, 40.1) |
| | Net | - | -2.5 (-3.9, -1.3) | -3.3 (-5.5, -1.6) |
| Yamanashi | Heat | 0.3 (-0.2, 0.8) | 0.9 (-0.1, 1.9) | 1.1 (-0.1, 2.4) |
| | Cold | 21.2 (-1.9, 37.0) | 18.4 (-4.2, 33.9) | 17.5 (-4.8, 33.0) |
| | Net | - | -2.2 (-3.3, -1.2) | -2.9 (-4.6, -1.2) |

**Table S4.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP6.0 scenario.

| | | RCP6.0 | | |
|---|---|---|---|---|
| | | 2010–2019 | 2050–2059 | 2090–2099 |
| Aichi | Heat | 0.2 (-0.2, 0.5) | 0.4 (-0.4, 1.1) | 0.9 (-0.6, 2.6) |
| | Cold | 19.5 (-1.9, 34.6) | 17.2 (-3.7, 31.8) | 14.8 (-5.2, 29.1) |
| | Net | - | -2.1 (-3.3, -1.3) | -3.9 (-6.2, -1.9) |
| Akita | Heat | 0.3 (-0.0, 0.7) | 0.7 (0.0, 1.3) | 1.8 (0.4, 3.8) |
| | Cold | 25.7 (1.6, 41.4) | 23.7 (0.6, 39.0) | 21.2 (-0.7, 35.9) |
| | Net | - | -1.7 (-3.2, -0.6) | -3.0 (-5.9, -0.3) |
| Aomori | Heat | 0.7 (0.2, 1.2) | 1.2 (0.4, 2.0) | 2.8 (1.1, 5.1) |
| | Cold | 31.9 (8.7, 46.5) | 30.0 (7.9, 44.2) | 27.1 (6.7, 40.9) |
| | Net | - | -1.5 (-3.1, -0.3) | -2.6 (-5.8, 0.3) |
| Chiba | Heat | 0.2 (-0.2, 0.6) | 0.4 (-0.2, 1.1) | 1.0 (-0.3, 2.6) |
| | Cold | 16.6 (-3.1, 30.7) | 14.7 (-4.3, 28.6) | 12.7 (-5.2, 26.1) |
| | Net | - | -1.8 (-3.0, -0.7) | -3.2 (-5.5, -0.8) |
| Ehime | Heat | 0.1 (-0.2, 0.3) | 0.1 (-0.4, 0.6) | 0.4 (-1.1, 1.8) |
| | Cold | 22.7 (-2.0, 39.2) | 20.5 (-3.4, 36.9) | 18.0 (-4.4, 33.9) |
| | Net | - | -2.2 (-3.3, -1.2) | -4.4 (-6.7, -2.1) |
| Fukui | Heat | 0.5 (-0.1, 1.0) | 0.8 (-0.0, 1.7) | 1.8 (0.3, 3.5) |
| | Cold | 28.0 (6.8, 42.4) | 25.5 (4.5, 39.8) | 22.8 (2.5, 36.7) |
| | Net | - | -2.2 (-3.2, -1.3) | -4.0 (-6.1, -2.1) |
| Fukuoka | Heat | -0.0 (-0.1, 0.1) | -0.0 (-0.2, 0.2) | -0.0 (-1.1, 0.9) |
| | Cold | 31.5 (9.0, 47.3) | 28.7 (6.9, 44.3) | 25.6 (4.7, 40.9) |
| | Net | - | -2.8 (-4.1, -1.7) | -5.9 (-8.6, -3.7) |
| Fukushima | Heat | 0.4 (0.1, 0.8) | 0.8 (0.2, 1.4) | 1.7 (0.5, 3.7) |
| | Cold | 30.3 (11.3, 43.2) | 27.9 (9.4, 40.6) | 25.1 (7.5, 37.5) |
| | Net | - | -2.1 (-3.6, -1.1) | -3.9 (-6.5, -2.0) |
| Gifu | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.5, 0.6) | 0.2 (-1.2, 1.6) |
| | Cold | 20.6 (-7.3, 38.9) | 18.1 (-9.0, 36.6) | 15.7 (-10.1, 33.6) |
| | Net | - | -2.4 (-3.6, -1.5) | -4.7 (-7.0, -2.4) |
| Gunma | Heat | 0.3 (-0.1, 0.6) | 0.6 (-0.0, 1.2) | 1.3 (0.1, 3.1) |
| | Cold | 25.6 (5.8, 39.5) | 23.0 (3.5, 36.7) | 20.2 (1.6, 33.6) |
| | Net | - | -2.3 (-3.5, -1.5) | -4.3 (-6.6, -2.5) |
| Hiroshima | Heat | 0.0 (-0.2, 0.2) | 0.0 (-0.3, 0.4) | 0.1 (-1.2, 1.3) |
| | Cold | 22.4 (-4.7, 40.8) | 20.2 (-6.3, 38.3) | 17.8 (-7.8, 35.6) |
| | Net | - | -2.2 (-3.3, -1.3) | -4.5 (-6.9, -2.2) |
| Hokkaido | Heat | 0.4 (-0.0, 0.9) | 1.0 (0.1, 2.0) | 2.8 (0.6, 5.3) |
| | Cold | 22.4 (-5.1, 39.7) | 21.2 (-4.6, 37.8) | 19.6 (-3.6, 35.1) |
| | Net | - | -0.7 (-2.3, 1.1) | -0.5 (-3.3, 4.3) |

| | | | | |
|---|---|---|---|---|
| Hyogo | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.2, 0.2) | 0.1 (-0.7, 1.0) |
| | Cold | 33.9 (14.9, 47.5) | 31.3 (12.6, 44.8) | 28.3 (10.4, 41.6) |
| | Net | - | -2.7 (-4.0, -1.7) | -5.6 (-7.8, -3.7) |
| Ibaraki | Heat | 0.7 (0.1, 1.3) | 1.2 (0.3, 2.2) | 2.6 (0.8, 5.3) |
| | Cold | 24.2 (0.4, 39.9) | 22.0 (-1.0, 37.3) | 19.5 (-2.0, 34.5) |
| | Net | - | -1.7 (-3.1, -0.6) | -2.8 (-5.6, 0.0) |
| Ishikawa | Heat | 0.2 (-0.1, 0.5) | 0.6 (-0.1, 1.2) | 1.4 (0.1, 3.3) |
| | Cold | 26.5 (4.1, 41.8) | 23.8 (1.8, 38.8) | 21.0 (0.0, 35.6) |
| | Net | - | -2.4 (-3.7, -1.5) | -4.4 (-7.0, -2.4) |
| Iwate | Heat | 0.9 (0.3, 1.5) | 1.5 (0.6, 2.4) | 3.3 (1.4, 5.8) |
| | Cold | 27.0 (-0.4, 43.8) | 25.3 (-1.0, 41.6) | 23.0 (-1.4, 38.7) |
| | Net | - | -1.1 (-2.8, 0.3) | -1.6 (-4.4, 1.8) |
| Kagawa | Heat | 0.1 (-0.3, 0.4) | 0.1 (-0.5, 0.7) | 0.4 (-1.0, 1.8) |
| | Cold | 24.5 (-2.2, 42.0) | 21.7 (-4.7, 39.0) | 18.7 (-7.1, 35.8) |
| | Net | - | -2.7 (-4.0, -1.9) | -5.4 (-7.8, -3.5) |
| Kagoshima | Heat | -0.1 (-0.2, 0.0) | -0.2 (-0.9, 0.2) | -0.9 (-3.8, 0.7) |
| | Cold | 30.6 (4.8, 48.2) | 28.0 (3.0, 45.3) | 25.0 (1.3, 41.8) |
| | Net | - | -2.8 (-4.6, -1.6) | -6.4 (-10.5, -3.5) |
| Kanagawa | Heat | 0.4 (-0.1, 0.8) | 0.7 (-0.0, 1.3) | 1.5 (0.2, 3.2) |
| | Cold | 10.6 (-9.2, 25.0) | 8.9 (-9.9, 22.7) | 7.3 (-10.3, 20.3) |
| | Net | - | -1.4 (-2.5, -0.3) | -2.2 (-4.4, 0.4) |
| Kochi | Heat | 0.1 (-0.3, 0.4) | 0.2 (-0.6, 0.8) | 0.5 (-1.4, 2.2) |
| | Cold | 26.2 (1.5, 42.3) | 23.8 (-0.2, 39.8) | 21.0 (-1.6, 36.5) |
| | Net | - | -2.3 (-3.5, -1.3) | -4.7 (-7.3, -2.2) |
| Kumamoto | Heat | 0.0 (-0.2, 0.2) | 0.0 (-0.3, 0.4) | 0.1 (-1.0, 1.1) |
| | Cold | 20.7 (-6.6, 38.4) | 18.6 (-7.9, 36.1) | 16.3 (-9.4, 33.3) |
| | Net | - | -2.1 (-3.2, -1.2) | -4.3 (-6.4, -2.1) |
| Kyoto | Heat | 0.1 (-0.2, 0.4) | 0.2 (-0.4, 0.9) | 0.7 (-0.8, 2.2) |
| | Cold | 26.7 (4.8, 41.8) | 24.0 (2.2, 38.8) | 21.1 (0.1, 35.8) |
| | Net | - | -2.6 (-3.8, -1.8) | -5.0 (-7.3, -3.2) |
| Mie | Heat | 0.1 (-0.2, 0.4) | 0.3 (-0.3, 0.9) | 0.7 (-0.6, 2.2) |
| | Cold | 26.9 (5.8, 41.4) | 24.1 (3.3, 38.6) | 21.3 (1.3, 35.7) |
| | Net | - | -2.6 (-3.8, -1.8) | -5.0 (-7.3, -3.1) |
| Miyagi | Heat | 0.5 (0.1, 0.9) | 0.9 (0.2, 1.5) | 2.0 (0.6, 4.1) |
| | Cold | 17.7 (-6.8, 33.9) | 15.9 (-7.5, 31.6) | 13.9 (-7.5, 28.8) |
| | Net | - | -1.4 (-3.0, -0.1) | -2.3 (-5.1, 1.0) |
| Miyazaki | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.4, 0.5) | 0.2 (-1.1, 1.4) |
| | Cold | 21.7 (-3.9, 39.4) | 19.7 (-5.1, 36.9) | 17.5 (-6.2, 33.9) |
| | Net | - | -2.0 (-3.3, -0.8) | -4.1 (-6.6, -1.4) |
| Nagano | Heat | 0.7 (0.2, 1.1) | 1.3 (0.5, 2.2) | 3.1 (1.3, 5.8) |
| | Cold | 34.3 (15.6, 46.9) | 31.9 (13.9, 44.2) | 29.2 (11.8, 41.2) |
| | Net | - | -1.8 (-2.9, -0.9) | -2.8 (-5.4, -0.6) |

| | | | | |
|---|---|---|---|---|
| Nagasaki | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.5, 0.7) | 0.3 (-1.4, 2.0) |
| | Cold | 24.0 (-1.6, 41.0) | 21.4 (-3.5, 38.2) | 18.6 (-4.8, 34.8) |
| | Net | - | -2.5 (-4.1, -1.5) | -5.1 (-8.1, -2.5) |
| Nara | Heat | 1.0 (0.1, 1.8) | 1.5 (0.2, 2.8) | 3.0 (0.6, 5.2) |
| | Cold | 27.1 (2.4, 42.7) | 24.9 (0.9, 40.3) | 22.4 (-0.6, 37.4) |
| | Net | - | -1.7 (-2.9, -0.6) | -2.8 (-5.3, -0.4) |
| Niigata | Heat | 0.4 (0.0, 0.7) | 0.8 (0.1, 1.4) | 1.9 (0.5, 4.1) |
| | Cold | 30.9 (11.6, 44.2) | 28.4 (9.8, 41.4) | 25.7 (8.0, 38.4) |
| | Net | - | -2.0 (-3.5, -1.0) | -3.6 (-6.2, -1.4) |
| Oita | Heat | 0.2 (-0.3, 0.7) | 0.4 (-0.5, 1.2) | 1.0 (-0.8, 2.7) |
| | Cold | 20.0 (-4.7, 36.8) | 17.7 (-6.1, 34.1) | 15.2 (-7.6, 30.9) |
| | Net | - | -2.1 (-3.4, -1.1) | -4.1 (-6.6, -1.5) |
| Okayama | Heat | 0.1 (-0.2, 0.4) | 0.2 (-0.5, 0.8) | 0.6 (-1.0, 2.2) |
| | Cold | 23.4 (-1.3, 39.9) | 20.8 (-3.5, 37.1) | 18.1 (-5.3, 34.0) |
| | Net | - | -2.5 (-3.6, -1.7) | -4.8 (-7.2, -2.8) |
| Okinawa | Heat | 2.1 (-5.7, 8.0) | 3.2 (-7.7, 10.5) | 5.2 (-13.8, 15.5) |
| | Cold | 16.8 (-4.1, 30.9) | 14.3 (-5.1, 27.6) | 11.6 (-5.8, 23.9) |
| | Net | - | -1.4 (-5.9, 1.9) | -2.1 (-16.6, 6.0) |
| Osaka | Heat | 0.1 (-0.3, 0.5) | 0.3 (-0.4, 1.0) | 0.7 (-0.8, 2.3) |
| | Cold | 10.6 (-11.2, 26.3) | 8.7 (-12.6, 24.1) | 6.9 (-13.2, 21.7) |
| | Net | - | -1.8 (-2.8, -0.7) | -3.1 (-5.3, -0.7) |
| Saga | Heat | 0.0 (-0.1, 0.1) | 0.0 (-0.2, 0.2) | 0.0 (-0.8, 0.7) |
| | Cold | 25.3 (-4.0, 44.8) | 23.0 (-5.6, 42.0) | 20.4 (-7.3, 39.1) |
| | Net | - | -2.3 (-3.4, -1.3) | -4.9 (-7.1, -2.6) |
| Saitama | Heat | 0.4 (-0.0, 0.9) | 0.7 (0.0, 1.5) | 1.5 (0.3, 3.2) |
| | Cold | 17.3 (-0.7, 30.3) | 14.7 (-3.1, 27.5) | 12.0 (-5.1, 24.7) |
| | Net | - | -2.4 (-3.6, -1.7) | -4.3 (-6.5, -2.7) |
| Shiga | Heat | 0.7 (-0.1, 1.3) | 1.2 (0.1, 2.3) | 2.5 (0.6, 5.1) |
| | Cold | 20.8 (-1.6, 36.1) | 18.2 (-3.9, 33.4) | 15.5 (-5.6, 30.4) |
| | Net | - | -2.1 (-3.3, -1.3) | -3.5 (-6.1, -1.3) |
| Shimane | Heat | 0.1 (-0.1, 0.4) | 0.2 (-0.2, 0.7) | 0.8 (-0.3, 2.3) |
| | Cold | 30.8 (8.6, 45.2) | 28.2 (6.7, 42.4) | 25.4 (4.9, 39.4) |
| | Net | - | -2.4 (-3.7, -1.5) | -4.7 (-7.1, -2.6) |
| Shizuoka | Heat | 0.2 (-0.2, 0.7) | 0.5 (-0.4, 1.3) | 1.1 (-0.6, 3.1) |
| | Cold | 14.5 (-12.9, 32.6) | 12.7 (-13.5, 30.2) | 10.9 (-13.5, 27.5) |
| | Net | - | -1.6 (-2.9, -0.2) | -2.7 (-5.4, 0.7) |
| Tochigi | Heat | 0.5 (0.0, 0.9) | 0.8 (0.1, 1.5) | 1.7 (0.4, 3.3) |
| | Cold | 20.8 (0.8, 36.3) | 18.6 (-0.7, 33.9) | 16.2 (-2.1, 30.8) |
| | Net | - | -1.9 (-3.1, -1.1) | -3.3 (-5.5, -1.4) |
| Tokushima | Heat | 0.0 (-0.1, 0.1) | 0.1 (-0.3, 0.4) | 0.2 (-1.1, 1.7) |
| | Cold | 23.1 (-5.0, 41.6) | 20.6 (-6.4, 38.9) | 17.9 (-7.8, 35.6) |
| | Net | - | -2.5 (-4.0, -1.3) | -5.0 (-8.0, -2.2) |

| | | | | |
|---|---|---|---|---|
| Tokyo | Heat | 0.6 (-0.2, 1.4) | 1.0 (-0.3, 2.4) | 2.1 (-0.3, 4.9) |
| | Cold | 8.1 (-28.3, 30.5) | 6.6 (-28.5, 28.2) | 5.1 (-27.3, 25.5) |
| | Net | - | -1.1 (-2.5, 1.0) | -1.5 (-4.8, 3.6) |
| Tottori | Heat | 0.3 (-0.2, 0.6) | 0.6 (-0.2, 1.3) | 1.4 (-0.2, 3.3) |
| | Cold | 20.9 (-4.5, 37.9) | 18.4 (-6.2, 35.1) | 15.8 (-7.6, 32.1) |
| | Net | - | -2.2 (-3.5, -1.2) | -3.9 (-6.5, -1.5) |
| Toyama | Heat | 0.3 (-0.1, 0.6) | 0.6 (-0.1, 1.3) | 1.4 (-0.0, 3.5) |
| | Cold | 28.8 (7.4, 43.2) | 26.2 (5.4, 40.3) | 23.4 (3.4, 37.3) |
| | Net | - | -2.4 (-3.6, -1.5) | -4.3 (-6.6, -2.2) |
| Wakayama | Heat | 0.1 (-0.2, 0.4) | 0.3 (-0.4, 0.9) | 0.8 (-0.7, 2.4) |
| | Cold | 22.5 (-2.1, 39.0) | 19.9 (-4.2, 36.1) | 17.2 (-6.0, 33.0) |
| | Net | - | -2.4 (-3.8, -1.6) | -4.7 (-7.2, -2.5) |
| Yamagata | Heat | 0.7 (0.1, 1.2) | 1.1 (0.2, 2.0) | 2.3 (0.8, 4.4) |
| | Cold | 30.6 (8.3, 44.9) | 28.5 (7.1, 42.4) | 26.0 (5.7, 39.5) |
| | Net | - | -1.8 (-2.9, -0.8) | -2.9 (-5.1, -0.7) |
| Yamaguchi | Heat | 0.2 (-0.2, 0.6) | 0.5 (-0.3, 1.3) | 1.4 (-0.4, 3.6) |
| | Cold | 30.1 (11.1, 44.7) | 27.6 (9.2, 41.9) | 24.6 (6.9, 38.6) |
| | Net | - | -2.2 (-4.0, -1.1) | -4.4 (-7.3, -2.2) |
| Yamanashi | Heat | 0.4 (-0.2, 0.8) | 0.7 (-0.2, 1.5) | 1.6 (0.0, 3.7) |
| | Cold | 21.5 (-1.6, 37.2) | 19.0 (-3.6, 34.5) | 16.4 (-5.4, 31.6) |
| | Net | - | -2.1 (-3.3, -1.3) | -3.8 (-6.1, -1.8) |

**Table S5.** Heat-related, cold-related, and net change in excess morbidity (%) with 95% eCI by prefecture and period under the RCP8.5 scenario.

| | | RCP8.5 | | |
|---|---|---|---|---|
| | | 2010–2019 | 2050–2059 | 2090–2099 |
| Aichi | Heat | 0.2 (-0.2, 0.6) | 0.6 (-0.5, 1.8) | 1.7 (-0.9, 4.2) |
| | Cold | 19.1 (-2.3, 34.1) | 15.8 (-4.7, 30.3) | 12.6 (-6.0, 26.3) |
| | Net | - | -2.8 (-5.2, -0.9) | -5.0 (-9.2, -1.2) |
| Akita | Heat | 0.4 (-0.0, 0.9) | 1.2 (0.2, 2.2) | 3.3 (0.9, 5.8) |
| | Cold | 25.5 (1.4, 41.1) | 22.3 (-0.1, 37.2) | 19.0 (-1.2, 32.8) |
| | Net | - | -2.5 (-4.8, -0.4) | -3.5 (-7.5, 1.0) |
| Aomori | Heat | 0.8 (0.2, 1.3) | 1.9 (0.7, 3.2) | 4.8 (1.9, 7.6) |
| | Cold | 31.7 (8.7, 46.1) | 28.2 (7.0, 42.0) | 24.5 (6.2, 37.6) |
| | Net | - | -2.3 (-4.6, -0.3) | -3.1 (-7.0, 1.6) |
| Chiba | Heat | 0.2 (-0.2, 0.6) | 0.7 (-0.3, 1.7) | 1.8 (-0.3, 3.9) |
| | Cold | 16.2 (-3.6, 30.3) | 13.5 (-4.9, 27.0) | 10.9 (-5.3, 23.4) |
| | Net | - | -2.3 (-4.6, -0.3) | -3.8 (-7.8, 0.2) |
| Ehime | Heat | 0.1 (-0.3, 0.4) | 0.3 (-0.8, 1.3) | 0.8 (-2.1, 3.3) |
| | Cold | 22.3 (-2.3, 39.0) | 19.1 (-4.0, 35.1) | 15.6 (-5.5, 30.8) |
| | Net | - | -3.1 (-5.7, -1.0) | -6.0 (-10.5, -1.6) |
| Fukui | Heat | 0.6 (-0.0, 1.3) | 1.4 (0.1, 2.6) | 3.1 (0.7, 5.6) |
| | Cold | 27.6 (6.4, 42.0) | 23.9 (3.3, 38.0) | 20.0 (0.8, 33.6) |
| | Net | - | -2.9 (-4.9, -1.4) | -5.1 (-8.4, -2.1) |
| Fukuoka | Heat | -0.0 (-0.1, 0.1) | -0.0 (-0.5, 0.4) | 0.0 (-2.0, 1.7) |
| | Cold | 31.0 (8.7, 46.8) | 27.0 (5.8, 42.2) | 22.7 (3.2, 37.7) |
| | Net | - | -4.0 (-6.9, -1.8) | -8.3 (-13.1, -3.9) |
| Fukushima | Heat | 0.5 (0.1, 1.0) | 1.2 (0.4, 2.2) | 2.9 (1.0, 4.9) |
| | Cold | 29.9 (10.8, 42.8) | 26.3 (8.2, 38.7) | 22.5 (6.2, 34.4) |
| | Net | - | -2.9 (-5.2, -1.1) | -5.0 (-8.6, -1.6) |
| Gifu | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.8, 1.0) | 0.5 (-2.2, 2.8) |
| | Cold | 20.1 (-7.8, 38.7) | 16.7 (-9.8, 34.6) | 13.4 (-11.0, 30.5) |
| | Net | - | -3.3 (-6.0, -1.0) | -6.2 (-10.9, -1.7) |
| Gunma | Heat | 0.4 (-0.0, 0.8) | 0.9 (0.1, 1.9) | 2.3 (0.4, 4.2) |
| | Cold | 25.1 (5.2, 39.0) | 21.4 (2.4, 34.9) | 17.6 (0.2, 30.4) |
| | Net | - | -3.1 (-5.3, -1.1) | -5.5 (-9.2, -2.1) |
| Hiroshima | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.8, 0.8) | 0.2 (-2.4, 2.4) |
| | Cold | 22.0 (-4.8, 40.4) | 18.8 (-7.1, 36.8) | 15.6 (-8.4, 32.7) |
| | Net | - | -3.2 (-5.8, -1.1) | -6.2 (-10.8, -1.8) |
| Hokkaido | Heat | 0.5 (0.0, 1.0) | 1.8 (0.4, 3.5) | 4.9 (1.5, 8.4) |
| | Cold | 22.4 (-5.0, 39.7) | 20.0 (-4.4, 35.9) | 18.3 (-2.4, 32.5) |
| | Net | - | -1.1 (-3.3, 1.7) | 0.3 (-4.4, 7.4) |

| | | | | |
|---|---|---|---|---|
| Hyogo | Heat | 0.0 (-0.1, 0.1) | 0.1 (-0.4, 0.6) | 0.3 (-1.5, 2.1) |
| | Cold | 33.4 (14.4, 47.0) | 29.5 (11.4, 42.7) | 25.2 (8.3, 38.2) |
| | Net | - | -3.9 (-6.5, -2.0) | -8.0 (-12.2, -4.0) |
| Ibaraki | Heat | 0.8 (0.2, 1.5) | 1.9 (0.6, 3.3) | 4.1 (1.5, 6.8) |
| | Cold | 23.8 (0.2, 39.5) | 20.5 (-1.7, 35.6) | 17.1 (-2.4, 31.2) |
| | Net | - | -2.2 (-4.3, -0.2) | -3.4 (-7.2, 1.0) |
| Ishikawa | Heat | 0.3 (-0.1, 0.7) | 0.9 (-0.0, 1.9) | 2.3 (0.3, 4.4) |
| | Cold | 26.0 (3.6, 41.3) | 22.3 (0.9, 37.0) | 18.3 (-1.4, 32.5) |
| | Net | - | -3.2 (-5.6, -1.2) | -5.7 (-9.8, -2.0) |
| Iwate | Heat | 1.0 (0.4, 1.8) | 2.3 (1.0, 3.7) | 5.4 (2.3, 8.2) |
| | Cold | 26.7 (-0.7, 43.6) | 23.9 (-1.3, 39.8) | 21.1 (-1.3, 35.8) |
| | Net | - | -1.5 (-3.7, 0.6) | -1.3 (-5.0, 3.9) |
| Kagawa | Heat | 0.1 (-0.3, 0.5) | 0.3 (-0.8, 1.3) | 0.8 (-1.8, 3.2) |
| | Cold | 23.9 (-2.7, 41.4) | 19.9 (-6.3, 37.1) | 15.7 (-8.6, 32.3) |
| | Net | - | -3.8 (-6.6, -1.6) | -7.5 (-11.9, -3.2) |
| Kagoshima | Heat | -0.1 (-0.3, 0.1) | -0.5 (-2.2, 0.4) | -2.0 (-7.7, 1.4) |
| | Cold | 30.1 (4.3, 47.7) | 26.2 (2.0, 43.1) | 22.1 (-0.1, 38.5) |
| | Net | - | -4.3 (-8.4, -1.6) | -9.8 (-18.3, -3.8) |
| Kanagawa | Heat | 0.5 (-0.0, 1.0) | 1.2 (0.1, 2.3) | 2.8 (0.6, 5.2) |
| | Cold | 10.3 (-9.5, 24.6) | 7.9 (-10.2, 21.4) | 5.9 (-9.8, 17.9) |
| | Net | - | -1.6 (-3.6, 0.2) | -2.1 (-5.9, 2.5) |
| Kochi | Heat | 0.1 (-0.4, 0.6) | 0.3 (-1.1, 1.6) | 1.1 (-2.8, 4.2) |
| | Cold | 25.7 (1.4, 41.8) | 22.1 (-0.8, 37.7) | 18.2 (-2.8, 33.1) |
| | Net | - | -3.3 (-6.1, -1.2) | -6.6 (-11.8, -2.1) |
| Kumamoto | Heat | 0.0 (-0.2, 0.3) | 0.1 (-0.8, 0.8) | 0.3 (-2.3, 2.5) |
| | Cold | 20.4 (-6.7, 37.9) | 17.3 (-8.7, 34.3) | 13.9 (-10.4, 30.5) |
| | Net | - | -3.1 (-5.5, -1.1) | -6.2 (-10.6, -2.1) |
| Kyoto | Heat | 0.1 (-0.3, 0.5) | 0.4 (-0.6, 1.5) | 1.2 (-1.2, 3.6) |
| | Cold | 26.2 (4.3, 41.2) | 22.3 (0.9, 36.9) | 18.3 (-1.5, 32.5) |
| | Net | - | -3.6 (-6.1, -1.5) | -6.8 (-11.1, -3.0) |
| Mie | Heat | 0.1 (-0.2, 0.5) | 0.5 (-0.5, 1.5) | 1.4 (-0.8, 3.6) |
| | Cold | 26.4 (5.3, 40.9) | 22.4 (2.1, 36.8) | 18.4 (-0.6, 32.3) |
| | Net | - | -3.6 (-6.1, -1.5) | -6.7 (-10.8, -2.9) |
| Miyagi | Heat | 0.6 (0.1, 1.1) | 1.4 (0.4, 2.4) | 3.4 (1.1, 5.5) |
| | Cold | 17.3 (-7.1, 33.6) | 14.7 (-7.6, 29.9) | 12.2 (-7.1, 26.0) |
| | Net | - | -1.9 (-4.3, 0.3) | -2.3 (-6.5, 2.9) |
| Miyazaki | Heat | 0.0 (-0.3, 0.3) | 0.2 (-0.8, 1.1) | 0.6 (-2.4, 3.1) |
| | Cold | 21.4 (-4.2, 39.0) | 18.4 (-5.8, 35.2) | 15.1 (-7.0, 30.8) |
| | Net | - | -2.9 (-5.4, -0.7) | -5.7 (-10.7, -0.9) |
| Nagano | Heat | 0.8 (0.3, 1.4) | 2.1 (0.9, 3.3) | 4.9 (2.1, 7.5) |
| | Cold | 33.9 (15.3, 46.4) | 30.4 (12.7, 42.5) | 26.5 (10.1, 38.3) |
| | Net | - | -2.2 (-3.9, -0.8) | -3.3 (-6.7, -0.3) |

| | | | | |
|---|---|---|---|---|
| Nagasaki | Heat | 0.0 (-0.3, 0.3) | 0.2 (-1.0, 1.3) | 0.7 (-2.6, 3.6) |
| | Cold | 23.5 (-2.0, 40.5) | 19.7 (-4.3, 36.1) | 15.8 (-6.0, 31.4) |
| | Net | - | -3.6 (-6.6, -1.2) | -7.1 (-12.6, -2.1) |
| Nara | Heat | 1.1 (0.1, 2.2) | 2.5 (0.5, 4.4) | 5.1 (1.3, 8.4) |
| | Cold | 26.8 (2.1, 42.3) | 23.4 (0.1, 38.4) | 19.7 (-1.6, 34.1) |
| | Net | - | -2.0 (-3.9, -0.4) | -3.2 (-6.9, 0.6) |
| Niigata | Heat | 0.4 (0.1, 0.9) | 1.2 (0.3, 2.2) | 3.2 (1.0, 5.4) |
| | Cold | 30.5 (11.3, 43.7) | 27.0 (8.8, 39.7) | 23.2 (6.7, 35.2) |
| | Net | - | -2.7 (-4.9, -1.0) | -4.6 (-8.3, -1.0) |
| Oita | Heat | 0.3 (-0.3, 0.9) | 0.7 (-0.7, 2.0) | 1.8 (-1.2, 4.6) |
| | Cold | 19.6 (-5.0, 36.3) | 16.2 (-7.1, 32.2) | 12.7 (-8.2, 27.6) |
| | Net | - | -3.0 (-5.5, -0.9) | -5.4 (-10.0, -0.8) |
| Okayama | Heat | 0.1 (-0.3, 0.6) | 0.4 (-0.8, 1.5) | 1.1 (-1.8, 3.7) |
| | Cold | 23.0 (-1.8, 39.5) | 19.3 (-4.5, 35.2) | 15.4 (-6.3, 30.8) |
| | Net | - | -3.4 (-6.1, -1.3) | -6.6 (-11.1, -2.5) |
| Okinawa | Heat | 2.2 (-5.9, 8.3) | 4.6 (-11.6, 14.1) | 8.4 (-38.7, 24.5) |
| | Cold | 16.6 (-4.2, 30.6) | 12.7 (-5.7, 25.5) | 8.5 (-5.8, 20.5) |
| | Net | - | -1.4 (-13.5, 4.7) | -1.8 (-47.6, 12.5) |
| Osaka | Heat | 0.2 (-0.3, 0.6) | 0.5 (-0.6, 1.6) | 1.3 (-1.3, 3.9) |
| | Cold | 10.2 (-11.7, 25.9) | 7.6 (-13.1, 22.6) | 5.4 (-13.1, 19.2) |
| | Net | - | -2.2 (-4.5, -0.3) | -3.6 (-7.8, 0.6) |
| Saga | Heat | 0.0 (-0.2, 0.1) | 0.0 (-0.5, 0.5) | 0.1 (-1.9, 1.7) |
| | Cold | 24.9 (-4.3, 44.2) | 21.5 (-6.4, 40.3) | 17.8 (-8.0, 36.0) |
| | Net | - | -3.4 (-6.1, -1.3) | -7.0 (-11.5, -2.7) |
| Saitama | Heat | 0.5 (-0.0, 1.0) | 1.1 (0.1, 2.2) | 2.5 (0.6, 4.4) |
| | Cold | 16.8 (-1.4, 29.8) | 13.1 (-4.2, 25.8) | 9.5 (-6.3, 21.7) |
| | Net | - | -3.1 (-5.4, -1.0) | -5.3 (-8.8, -2.2) |
| Shiga | Heat | 0.8 (-0.0, 1.5) | 1.9 (0.3, 3.4) | 4.1 (1.2, 7.1) |
| | Cold | 20.4 (-2.1, 35.6) | 16.6 (-4.9, 31.4) | 12.8 (-7.1, 27.2) |
| | Net | - | -2.7 (-4.8, -0.7) | -4.2 (-8.0, -0.5) |
| Shimane | Heat | 0.2 (-0.1, 0.5) | 0.5 (-0.2, 1.3) | 1.4 (-0.3, 3.4) |
| | Cold | 30.3 (8.1, 44.8) | 26.6 (5.7, 40.7) | 22.6 (3.6, 36.1) |
| | Net | - | -3.4 (-5.9, -1.4) | -6.4 (-10.5, -2.4) |
| Shizuoka | Heat | 0.3 (-0.3, 0.8) | 0.8 (-0.5, 2.2) | 2.1 (-0.9, 5.0) |
| | Cold | 14.1 (-13.1, 32.2) | 11.6 (-13.4, 28.5) | 9.3 (-12.6, 24.7) |
| | Net | - | -2.0 (-4.5, 0.4) | -3.0 (-7.8, 2.7) |
| Tochigi | Heat | 0.5 (0.0, 1.0) | 1.3 (0.3, 2.5) | 3.0 (1.0, 5.2) |
| | Cold | 20.4 (0.6, 35.9) | 17.2 (-1.4, 32.0) | 14.0 (-2.9, 27.9) |
| | Net | - | -2.4 (-4.3, -0.7) | -3.9 (-7.5, -0.4) |
| Tokushima | Heat | 0.0 (-0.2, 0.2) | 0.1 (-0.6, 0.8) | 0.5 (-2.0, 2.7) |
| | Cold | 22.6 (-5.4, 41.2) | 19.0 (-7.4, 37.0) | 15.4 (-8.8, 32.4) |
| | Net | - | -3.4 (-6.5, -0.9) | -6.7 (-12.0, -1.7) |

| | | | | |
|---|---|---|---|---|
| Tokyo | Heat | 0.7 (-0.2, 1.6) | 1.5 (-0.3, 3.4) | 3.4 (-0.4, 6.8) |
| | Cold | 7.7 (-28.5, 30.2) | 5.7 (-28.1, 26.7) | 4.0 (-24.8, 22.9) |
| | Net | - | -1.2 (-3.8, 2.0) | -1.1 (-6.4, 6.9) |
| Tottori | Heat | 0.3 (-0.2, 0.8) | 0.9 (-0.2, 2.0) | 2.2 (-0.0, 4.5) |
| | Cold | 20.4 (-5.0, 37.4) | 17.0 (-7.2, 33.5) | 13.6 (-8.4, 29.1) |
| | Net | - | -2.8 (-5.2, -0.7) | -4.9 (-9.2, -0.8) |
| Toyama | Heat | 0.4 (-0.1, 0.9) | 1.0 (-0.1, 2.2) | 2.4 (0.2, 4.7) |
| | Cold | 28.3 (6.9, 42.8) | 24.6 (4.2, 38.5) | 20.7 (1.9, 34.0) |
| | Net | - | -3.1 (-5.4, -1.3) | -5.6 (-9.5, -2.1) |
| Wakayama | Heat | 0.1 (-0.3, 0.5) | 0.5 (-0.6, 1.7) | 1.5 (-1.1, 4.1) |
| | Cold | 22.0 (-2.5, 38.5) | 18.3 (-5.3, 34.3) | 14.4 (-7.2, 29.6) |
| | Net | - | -3.3 (-5.9, -1.1) | -6.2 (-10.7, -2.0) |
| Yamagata | Heat | 0.9 (0.2, 1.6) | 1.8 (0.5, 3.2) | 3.9 (1.6, 6.3) |
| | Cold | 30.2 (8.1, 44.6) | 27.1 (6.3, 40.8) | 23.7 (4.7, 36.7) |
| | Net | - | -2.2 (-3.9, -0.7) | -3.4 (-6.8, 0.2) |
| Yamaguchi | Heat | 0.3 (-0.2, 0.8) | 0.9 (-0.4, 2.1) | 2.3 (-0.6, 5.2) |
| | Cold | 29.7 (10.7, 44.3) | 25.9 (8.0, 39.9) | 21.8 (5.4, 35.2) |
| | Net | - | -3.2 (-5.9, -1.2) | -5.9 (-10.4, -2.2) |
| Yamanashi | Heat | 0.4 (-0.2, 1.0) | 1.1 (-0.1, 2.4) | 2.7 (0.3, 5.2) |
| | Cold | 20.9 (-2.1, 36.7) | 17.5 (-4.8, 32.8) | 14.0 (-6.4, 28.5) |
| | Net | - | -2.7 (-5.0, -0.7) | -4.6 (-8.5, -0.9) |

**Table S6.** Sensitivity analysis, by varying modelling choices. Results were the net difference in excess morbidity in 2090–2099 compared with 2010–2019.

| | RCP2.6 | RCP4.5 | RCP6.0 | RCP8.5 |
|---|---|---|---|---|
| | Net excess morbidity (95% eCI) | Net excess morbidity (95% eCI) | Net excess morbidity (95% eCI) | Net excess morbidity (95% eCI) |
| ***Modelling choices*** | | | | |
| 6 df/year for seasonal control | -0.8 (-1.9, 0.3) | -2.7 (-4.1, -1.2) | -3.5 (-5.6, -2.0) | -4.7 (-7.1, -2.4) |
| 10 df/year for seasonal control | -0.8 (-1.8, 0.1) | -2.6 (-4.1, -1.3) | -3.5 (-5.5, -2.0) | -4.6 (-7.8, -2.1) |
| ***Lag choices*** | | | | |
| 14 days | -0.7 (-1.8, 0.3) | -2.4 (-4.1, -1.0) | -3.2 (-5.4, -1.5) | -3.9 (-7.4, -1.2) |
| 28 days | -0.9 (-1.7, 0.0) | -2.7 (-4.0, -1.4) | -3.6 (-5.0, -2.3) | -4.4 (-8.1, -1.9) |
| ***Control for confounding factors*** | | | | |
| With relative humidity | -0.8 (-1.9, 0.1) | -2.6 (-4.2, -0.9) | -3.4 (-5.5, -1.4) | -4.3 (-7.6, -0.7) |
| With pubic holiday | -0.8 (-1.8, 0.2) | -2.6 (-4.2, -1.0) | -3.4 (-5.5, -1.4) | -4.2 (-7.6, -0.8) |
| Without day of the week | -0.8 (-1.9, 0.1) | -2.6 (-4.4, -0.8) | -3.4 (-5.7, -1.0) | -4.2 (-8.1, -0.3) |