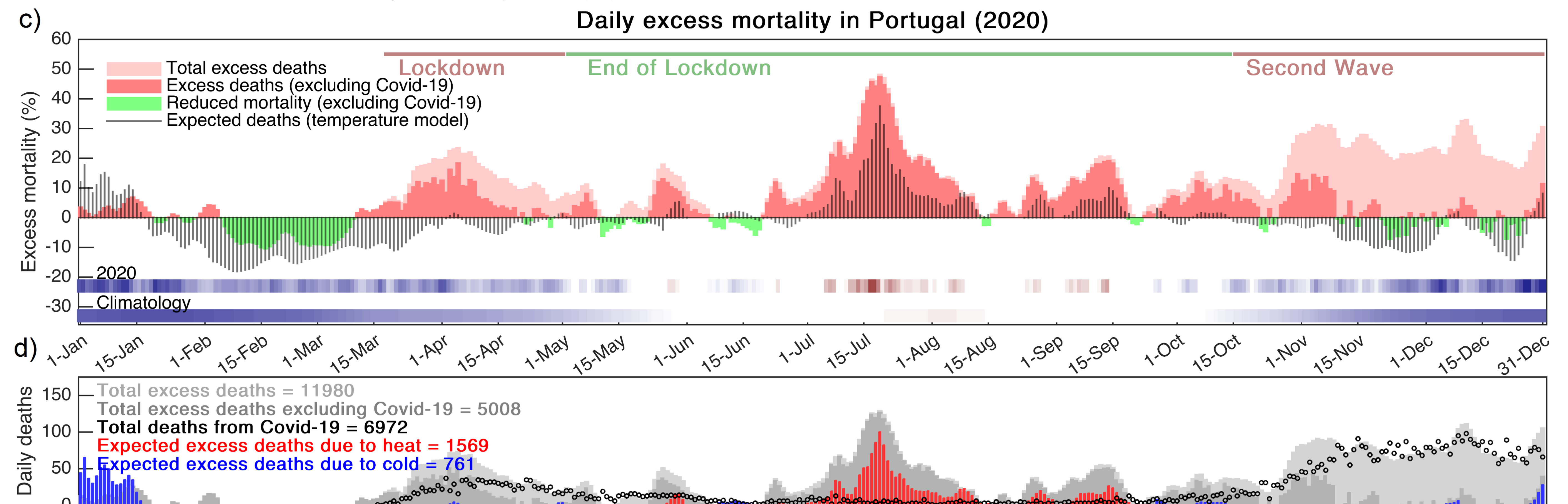
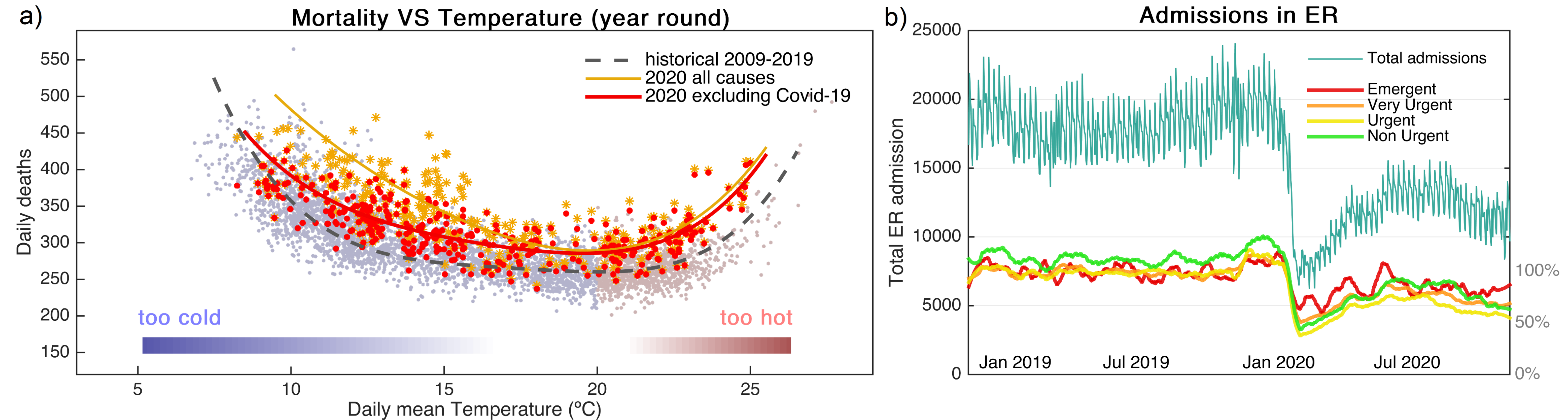
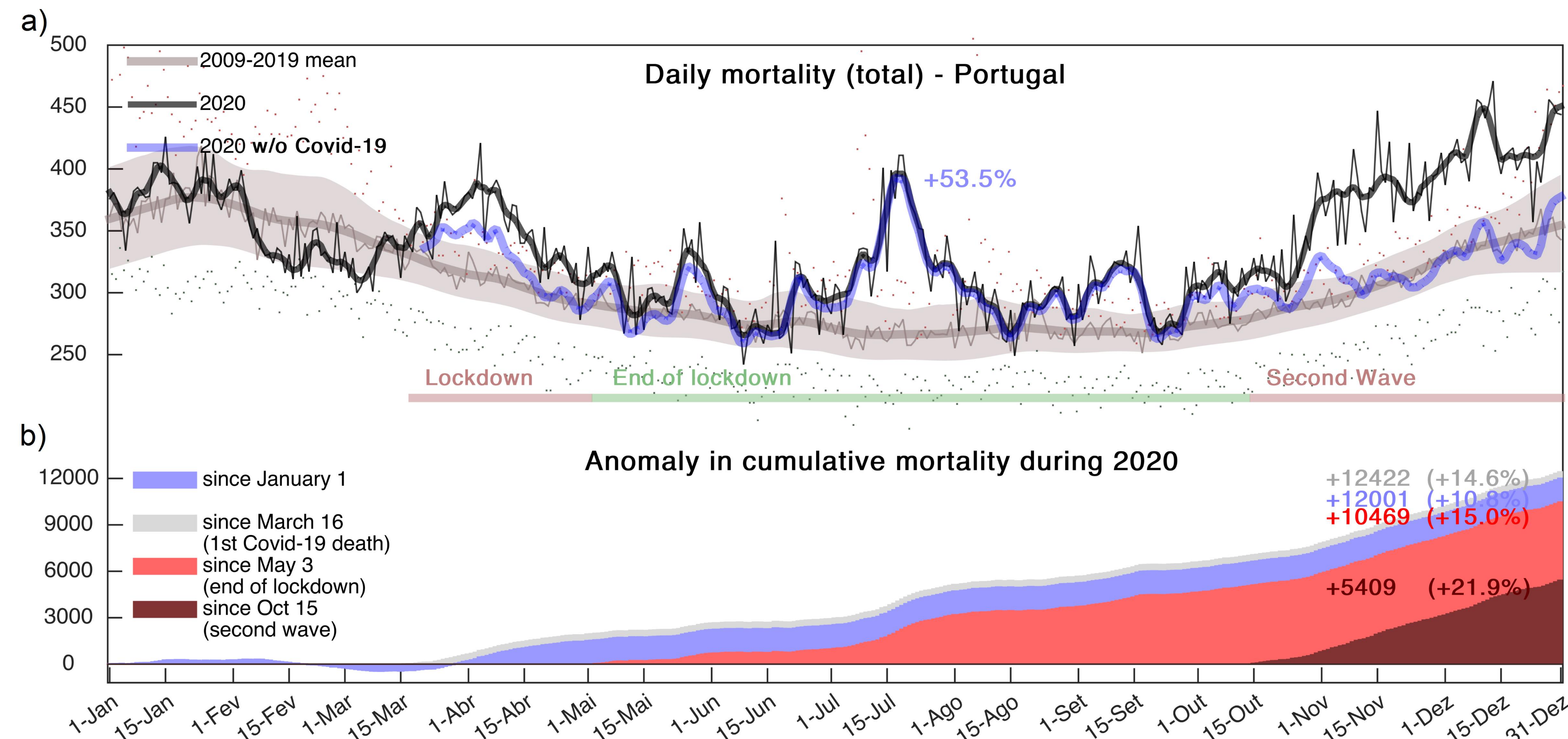


Heat-related mortality in Portugal amplified during the COVID-19 pandemic

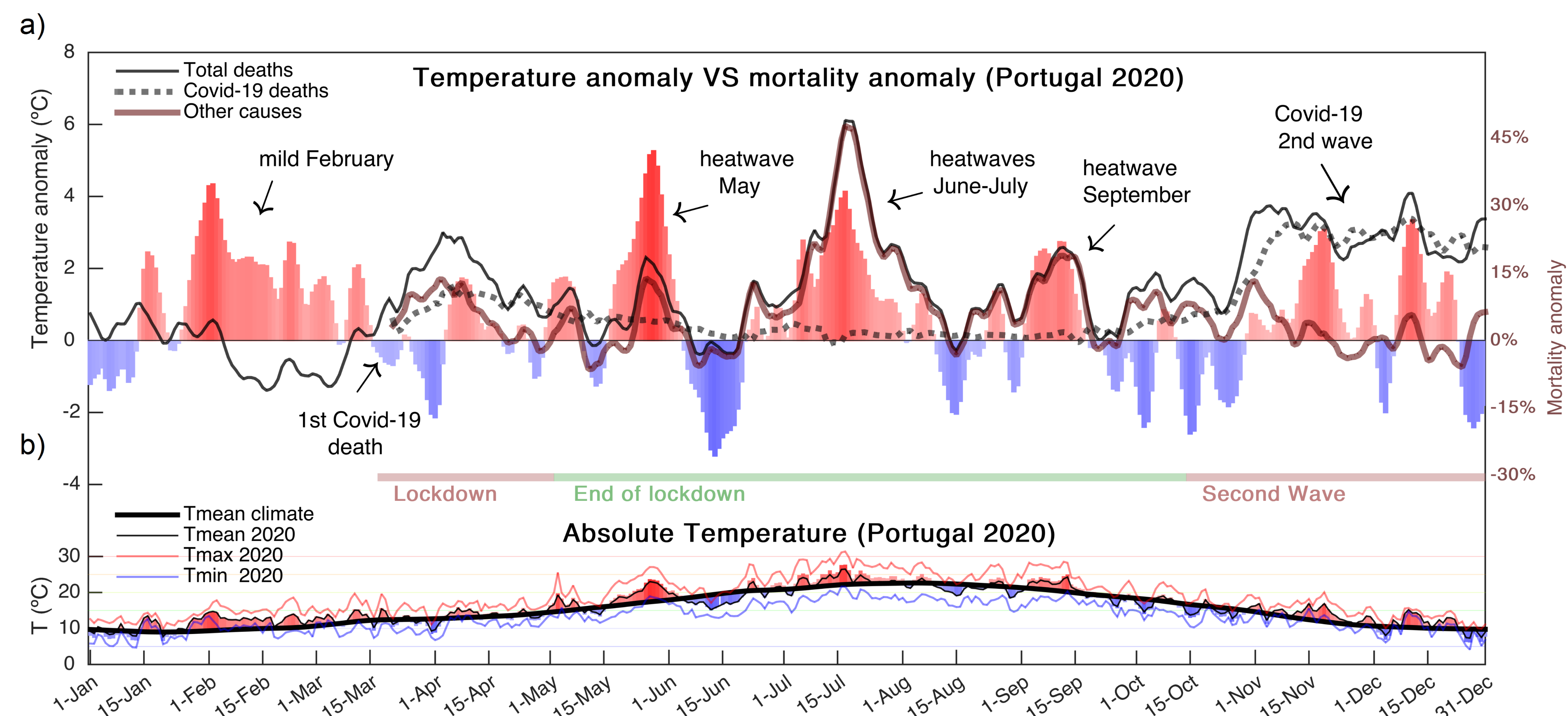
Pedro M Sousa^(1,2), Ricardo M Trigo⁽¹⁾, Ana Russo⁽¹⁾, João L Geirinhas⁽¹⁾, Ana Rodrigues⁽³⁾, Susana Silva⁽³⁾, Ana Torres⁽³⁾

(1) Instituto Dom Luiz (IDL), Faculdade de Ciências, Universidade de Lisboa, 1749-016 Lisboa, Portugal; (2) Instituto Português do Mar e da Atmosfera (IPMA), 1749-077 Lisboa, Portugal;

(3) Instituto Nacional de Saúde Doutor Ricardo Jorge (INSA), Avenida Padre Cruz, 1649-016, Lisboa, Portugal



- 2020 presented the highest mortality burden in recent history in Portugal (11% above the baseline)
- While COVID-19 dominated excess mortality during spring (1st wave) and from October onwards (2nd wave), excess mortality during summer months was essentially linked to heatwave occurrence
- July 2020 was the warmest since 1931 over continental Portugal (+2.6°C)
- However, the lethality ratio of these heatwaves was much higher than in recent events (e.g. 2013)



- The temperature-mortality relation was established using data for 2009-2019, showing that:
 - the Minimum Mortality Temperature (MMT) is around 20°C
 - the curve has been shifted upwards during the pandemic year (2020), even when excluding COVID-19 direct mortality
- The widespread health-care system disruptions combined with possible fear of the population from getting adequate (and on time) medical help might have had some amplification effect, particularly relevant in summer
- This suggests an amplification factor due to widespread health-care system disruptions compounded with fear of the population from getting adequate (and on time) medical help, being this effect particularly relevant during summer

In summary, without the disruptions due to the pandemic, excess mortality would still have occurred with such heat-waves, but results suggest the burden has been amplified by at least 50%.