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Short Communication

Have health inequities, the COVID-19 pandemic and climate change led to the deadliest heatwave in France since 2003?

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ABSTRACT

Objectives: Between 2015 and 2019, 5700 excess deaths were observed during heatwaves in France. The summer of 2020 combined exceptionally high temperatures with the COVID-19 pandemic. The associated health impacts of this unique situation are described in this study.

Study design: This is an observational study based on indicators of the French heat prevention plan.

Methods: Mortality and morbidity data during heatwaves were compared between 2020 and previous years, alongside COVID-19 in-hospital mortality.

Results: In total, 1921 additional deaths (+18.2%) were observed during the 2020 heatwaves, which is the largest number of deaths observed since 2003. Less than 100 deaths were attributed to COVID-19 during the heatwaves of 2020.

Conclusions: Exceptionally high temperatures driven by climate change, combined with health inequities exacerbated by the COVID-19 outbreak, may have increased vulnerability to heat in 2020.

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Introduction

Heatwaves are the most notable health risk associated with climate change.¹ They present rapidly evolving characteristics, and the increase in frequency, intensity and temporal and geographical spread seems to have undertaken a new rhythm in France since 2015. Heat warnings are based on departmental thresholds that are graded on a four-colour scale; green (no risk), yellow (moderate risk, e.g., forecasts slightly below thresholds), orange (high risk, forecasts above thresholds) and red (extreme risk).^{2,3} In 2019, record-breaking temperatures (up to 46 °C in the South of France and 43 °C in the Paris region) led to the activation of the red level for the first time since the creation of the heat warning system in 2004. There were 5700 excess deaths recorded during heatwaves between 2015 and 2019.⁴

The summer of 2020 was characterised by extreme summer temperatures, leading to activation of the red-level warning for the second time since 2004. The COVID-19 pandemic interfered with the preparation and operation of the heat prevention plan. Qualitative rules were defined to upgrade the heat warning level in areas with critical COVID-19 situations. Heat prevention messages were

modified to emphasise the need to maintain protective measures against COVID-19 despite the heat. The French High Council of Public Health developed specific recommendations to improve diagnosis, treatment and prevention of COVID-19 during heatwaves.⁵

Summer 2020 was exceptional from the meteorological, social and medical point of view. In this study, the health impacts observed during the 2020 heatwaves in France are described.

Methods

In France, the surveillance of heatwaves and their associated mortality and morbidity are monitored by the heat prevention plan and warning system. This is in place for each of the 96 French metropolitan departments between the 1st of June and the 15th of September. In brief, heatwaves are characterised by 3-day averaged minimal and maximal temperatures exceeding thresholds.²

Data on emergency room visits and general practitioner consultations were collected through a nationwide surveillance system.⁷ In 2020, data on in-hospital daily COVID-19 deaths⁸ during heatwaves were also collected. Excess mortality was estimated through a comparison with historical data.⁶

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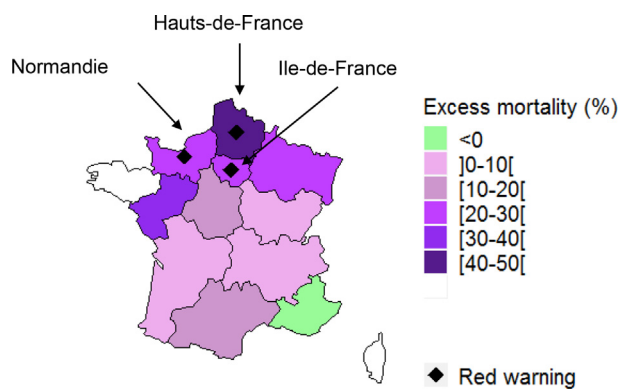


Fig. 1. Regional excess mortality during the 2020 heat waves – regions in white did not experienced heat wave in 2020.

Results

In France, several heatwaves were observed in 2020, the most severe between the 5th and the 13th of August. During this period, 50 million individuals (77% of the population) were exposed to at least an orange warning. In total, 30.9% of the population experienced at least one day of red warning, in three regions (Hauts-de-France, Ile-de-France and Normandie) [regions are an administrative subdivision comprising several departments. France is divided into 13 regions and 96 departments] (see Fig. 1).

A moderate increase in healthcare consumption for heat-related causes was observed during the heatwaves in 2020; however, this was approximately 30% lower than during previous years.

There were 1921 excess deaths [1481 : 2384] observed during the 2020 heatwaves (+18.2% increase in all-cause mortality). The largest proportion of excess deaths was observed in the elderly population (+19.7% for people aged ≥75 years; +20.5% for those aged 65–74 years), but an unusually high mortality rate was also observed in the 45- to 64-year-old age group (+12.0%).

Strong geographical disparities were observed. For the first time, since the implementation of the heat warning system in 2004, an excess mortality of more than 20% was observed in five regions (see Fig. 1). The three regions that experienced red warnings totalled 50% of the total mortality burden.

The mortality burden was exceptionally high in the Hauts-de-France region (5.9 million inhabitants), which recorded 561 excess deaths (+45.6% increase in all-cause mortality). All age groups were severely impacted in this region: +40% mortality in the 45- to 64-year-old age group, +46% in the 65- to 74-year-old age group and +50% in the ≥75-year-old age group.

Fig. 2 illustrates the distribution of excess mortality by intensity of heatwave (intensity = maximum daily temperature differences to thresholds) for different time periods. For comparable intensities, a somewhat lower excess mortality was observed after 2004 than after 2003, suggesting population adaptation (e.g., owing to the heat prevention plans); however, increased excess mortality was observed in 2020, especially for moderate heatwave intensities.

There were 100 deaths attributed to COVID-19 during the 2020 heatwaves. This number is not directly comparable with the overall excess mortality during heatwaves as heat may have contributed to some COVID-19–related deaths and vice versa. However, the difference in the order of magnitude confirmed that most of the excess mortality observed during the heatwaves in 2020 was not driven by COVID-19. On average, 11 COVID-19 deaths were recorded daily during non-heatwave days during summer 2020 compared with 9 COVID-19 deaths per day during heatwave days.

Discussion

In 2020, heatwaves resulted in high excess mortality, especially in Northern France. Studies attributing the 2020 heatwaves to climate change are not yet available, but a climate change contribution to the heatwaves observed in 2015, 2016, 2018 and 2019 has been identified.⁹ It is likely that climate change has also contributed

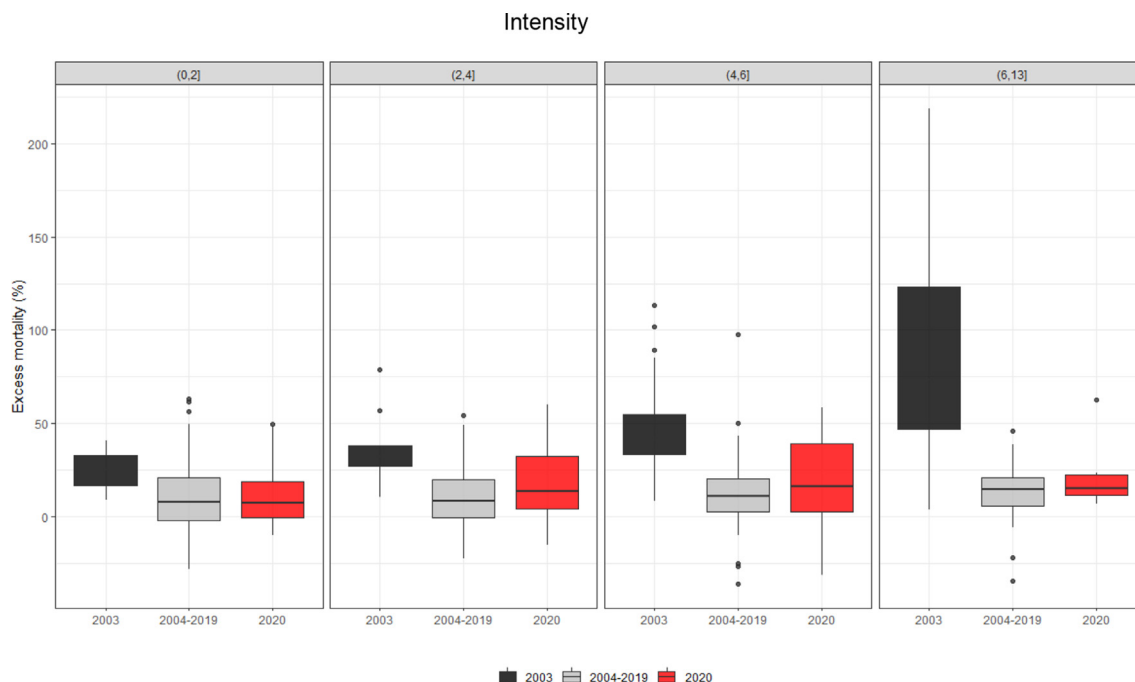


Fig. 2. Distribution of departmental excess mortality depending on the heat wave departmental intensity, distinguishing 2003, 2020, and 2004-2019.

to the 2020 heatwaves and therefore to the associated excess mortality.

The 2020 heatwaves were particularly severe in the Hauts-de-France region, which is also an area that experiences many health inequities (e.g., high prevalence of chronic diseases and large number of elderly people living alone). A decrease in healthcare consumption and prevention has been described in this region in the recent years.¹⁰ These socio-economic factors are known to dramatically increase heat-related risks and may have contributed to the high excess mortality observed in 2020 in this region.

Finally, in 2020, the focus on COVID-19 may have reduced the risk perception of heatwaves, discouraging the adoption of preventive behaviours, and led to delays in healthcare consumption, resulting in an aggravation of heat-related symptoms.

Additional analyses are required to better understand the determinants of mortality during the 2020 heatwaves. However, this study acts as a reminder that prevention of the impacts of heat remains a difficult challenge, despite tremendous efforts, especially when facing exceptional climatic and socio-economic situations.

Author statements

Ethical approval

Not required.

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Competing interests

None declared.

Author contributions

M.P., writing the original draft; R.L., analysis, review and editing; K.L., review and editing; G.B., review and editing; S.D., review and editing.

Access to data

Data before 2020 can be downloaded from the website <https://geodes.santepubliquefrance.fr>. The 2020 data will be available in the same website soon. As the website is in French, researchers may contact the corresponding author to help them in the process of accessing the data.

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