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## **Risk of dying in hospital from respiratory causes is higher in the summer than in the winter**

*A study analyses the association between ambient temperature and hospital mortality from respiratory diseases in the provinces of Madrid and Barcelona*

**Barcelona, XX XX, 2023 (EMBARGOED)**-. Global warming caused by climate change could **exacerbate** the burden of inpatient **mortality** from **respiratory diseases** during the warm season. This is the main conclusion of a study led by the Barcelona Institute for Global Health (ISGlobal), a centre supported by the "la Caixa" Foundation, and published in *The Lancet Regional Health - Europe*. The results could help health facilities adapt to climate change.

The research team analysed the **association** between **ambient temperature** and **in-hospital mortality from respiratory diseases** in the provinces of **Madrid and Barcelona** between 2006 and 2019. In both locations, the number of hospital admissions (including those resulting in death) was higher in the cold season and lower in the warm season, with a peak in the month of January and a minimum in the month of August. In contrast to hospital admissions, which were higher during the cold season, the **maximum incidence of inpatient mortality occurred during the summer** and was strongly associated with high temperatures.

To calculate the association between ambient temperature and hospital mortality, the team used data on **daily hospital admissions, weather** (temperature and relative humidity) and **air pollutants** (O<sub>3</sub>, PM<sub>2.5</sub>, PM<sub>10</sub> and NO<sub>2</sub>). Although it is well established that daily exposure to heat and cold is associated with a higher risk of hospital admission from a range of respiratory diseases such as pneumonia, chronic obstructive pulmonary disease (COPD) and asthma, no study had focused on the proportion of hospital admissions that result in death, and therefore, the more severe cases.

### **The link between high temperatures and mortality**

In terms of attributable burden, summer temperatures accounted for **16% and 22.1%** of overall **fatal hospitalisations from respiratory diseases** in Madrid and Barcelona, respectively. The heat **effect was immediate**, with most of the impact occurring within the first three days of exposure to high temperatures.

“This suggests that the increase in acute respiratory outcomes during heat is more related to the aggravation of chronic and infectious respiratory diseases than to the spread of new respiratory infections, which usually take several days to cause symptoms,” says **Hicham Achebak**, first author of the study and researcher at Inserm and ISGlobal, who holds a **Marie Skłodowska-Curie Postdoctoral Fellowship** from the European Commission.

The results of the study showed an effect of heat on **acute bronchitis** and **bronchiolitis, pneumonia** and **respiratory failure**. Neither relative humidity nor air pollutants played a statistically significant role in the association of heat with mortality in patients admitted for respiratory disease. The research also showed that **women were more vulnerable to heat than men**. “This is most likely due to specific physiological differences in thermoregulation. Women have a higher

temperature threshold above which sweating mechanisms are activated, and a lower sweat output than men, which results in less evaporative heat loss, and therefore greater susceptibility to the effects of heat," explains **Joan Ballester**, ISGlobal researcher and last author of the study.

### **Adapting to climate change in hospital centres**

The study shows that high temperatures contributed to an increase in the risk of fatal hospital admissions, especially in Barcelona, whereas low temperatures were not associated with this variable. According to the research team, this might have to do with the fact that health services are increasingly prepared to deal with winter peaks in respiratory diseases.

In this sense, the findings have important **implications for health adaptation policies to climate change**, and for projections of the impact of climate change on human health. "Unless effective adaptation measures are taken in hospital facilities, climate warming could exacerbate the burden of inpatient mortality from respiratory diseases during the warm season," says **Hicham Achebak**.

### **Reference**

Achebak H, Garcia-Aymerich J, Rey G, Chen Z, Méndez-Turrubiates RF, Ballester J. Ambient temperature and seasonal variation in inpatient mortality from respiratory diseases: a retrospective observational study. *Lancet Regional Health - Europe*. Oct 2023. [doi: to complete](#)

### **About ISGlobal**

The Barcelona Institute for Global Health, ISGlobal, is the fruit of an innovative alliance between the "la Caixa" Foundation and academic and government institutions to contribute to the efforts undertaken by the international community to address the challenges in global health. ISGlobal is a consolidated hub of excellence in research that has grown out of work first started in the world of health care by the Hospital Clínic and the Parc de Salut MAR and in the academic sphere by the University of Barcelona and Pompeu Fabra University. Its working model is based on the generation of scientific knowledge through Research Programmes and Groups, and its translation through the areas of Training and Analysis and Global Development. ISGlobal has been named a Severo Ochoa Centre of Excellence and is a member of the CERCA system of the Generalitat de Catalunya.

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