



## The effect of cold waves on mortality in urban and rural areas of Madrid

López-Bueno, José Antonio; Navas-Martín, Miguel Ángel; Diaz, Julio; Mirón, Isidro Juan; Rico, María Yolanda Luna; Sanchez Martinez, Gerardo; Culqui, Dante; Linares, Cristina

*Link to article, DOI:*  
[10.1289/isee.2021.P-039](https://doi.org/10.1289/isee.2021.P-039)

*Publication date:*  
2021

*Document Version*  
Publisher's PDF, also known as Version of record

[Link back to DTU Orbit](#)

*Citation (APA):*  
López-Bueno, J. A., Navas-Martín, M. Á., Diaz, J., Mirón, I. J., Rico, M. Y. L., Sanchez Martinez, G., Culqui, D., & Linares, C. (2021). *The effect of cold waves on mortality in urban and rural areas of Madrid*. Abstract from 33rd Annual Conference of the International Society for Environmental Epidemiology, New York City, New York, United States. <https://doi.org/10.1289/isee.2021.P-039>

---

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

## The Effect of Cold Waves on Mortality in Urban and Rural Areas of Madrid

José Antonio López Bueno, Miguel Ángel Navas Martín, Julio Díaz, Isidro Juan Mirón, María Yolanda Luna, Gerardo Sánchez Martínez, Culqui Dante, and Linares Cristina

### Abstract

**BACKGROUND AND AIM:** While many studies analyze the effect of extreme thermal events on health, little has been written about the effects of extreme cold on mortality of rural population. Therefore, we tried to analyze these effects on urban areas and rural areas from Madrid and to test whether differentiated extreme cold effects exist between both population classes. **METHODS:** We analyzed data from the municipalities with over 10,000 inhabitants for the period from January 1, 2000 through December 31, 2013. Municipalities were classified as urban or rural (Eurostat), and they were grouped into similar climatological zones. The dependent variable was the daily mortality rate due to natural causes per million inhabitants (CIE-X: A00-R99) that occurred between the months of November and March for the period. The independent variable was minimum daily temperature (°C). Social and demographic contextual variables were used, including: population age 64 (%), deprivation index and housing indicators. The analysis was carried out in three phases: 1. determination of the threshold temperature which defines the cold waves; 2. Determination of the relative risk (RR) for cold waves using Poisson linear regression (GLM); 3. Using GLM of the binomial family, Odds Ratios (OR) were calculated to analyze the relationship between the frequency of the appearance of cold waves and the socioeconomic variables. **RESULTS:** The urban zone experienced 585 extreme cold events related to attributable increases in the mortality rate. The average number of cold waves in the rural zones was 319. The primary risk factor was the percentage of population over age 64, and the primary protective factor was housing rehabilitation. Globally, the period experienced more cold waves (1,542) than heat waves (1,130). **CONCLUSIONS:** The urban zone was more vulnerable than the rural areas. Due to cold spells were more frequent than heat waves, the results support the development of specific prevention plans. **KEYWORDS:** Cold-spells, mortality, urban-rural, deprivation, building quality, ageing

Bueno, J. A. L., Martín, M. Á. N., Díaz, J., Mirón, I. J., Luna, M. Y., Martínez, G. S., Dante, C., & Cristina, L. (2021). The Effect of Cold Waves on Mortality in Urban and Rural Areas of Madrid. ISEE Conference Abstracts. <https://doi.org/10.1289/isee.2021.P-039>