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

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### 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

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