

THE INTERACTION OF OZONE AND HIGH SUMMER TEMPERATURES ON DAILY MORTALITY AND THE URBAN HEAT ISLAND EFFECT

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Background and Aims: health effects of ozone and high temperatures on mortality are well-established in the epidemiological literature. However, the extent to which the two exposures act independently or interact synergistically on mortality remains unclear. Furthermore, the spatial distribution of the ozone effects inside urban areas is still unexplored. We aimed at investigating: 1) the effect modification of summer temperatures on the ozone-mortality relationship; 2) the heterogeneity of the ozone-mortality association between nighttime warmer and cooler areas (urban heat island, UHI) of Rome, Italy.

Methods: all subjects aged 65+ years, resident of Rome and deceased in the city during 2001-2009, April-September, were considered. Information on maximum 8-hr daily ozone concentrations was provided by two Regional Environmental Protection Agency monitoring stations. Daily mean apparent temperature (AT) was derived by combining air and dew point temperature from an airport monitoring station. Finally, a two-level indicator of the UHI was obtained at the census-block level from AATSR satellite data. We performed a case-crossover analysis to estimate the effect of ozone on mortality in the whole population, according to daily AT percentiles, and according to the UHI indicator.

Results: 76,056 deaths occurred in the study period: 48% in warmer areas and 37% in cooler ones (15% missing). The overall ozone effect was high (lag 0-5, 1.36% increase of risk, 95%CI=0.63-2.10). It displayed a strong gradient according to daily mean AT levels (0.18%, 0.05%, 1.75% and 3.63% increases of risk in strata of AT below 50th percentile, 50th-75th, 75th-90th and above 90th percentile, respectively). The overall ozone effect was double in warmer areas (2.05%, CI=0.84-3.28) as compared to cooler ones (1.12%, CI=0.06-2.19).

Conclusions: ambient ozone and high temperatures interact on mortality, representing a relevant public health challenge. Ozone prevention measures should be targeted on elderly people residing in the warmest part of urban areas.