

Title: Long-term exposure to air pollution and mortality: a nationwide small area study in Spain (LIFE MED-HISS project)

Authors: Basagaña, Xavier (1,2,3); Agis, David (1,2,3); Arévalo, Gustavo (4); Ghigo, Stefania (5); Bande, Stefano (5); Martínez-Solanas, Èrica (1,2,3); Benach, Joan (2); Baldasano, Jose Maria (4); Cadum, Ennio (5)

Affiliations: (1) Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Spain; (2) Universitat Pompeu Fabra (UPF), Barcelona, Spain; (3) CIBER Epidemiología y Salud Pública (CIBERESP), Barcelona, Spain; (4) Barcelona Supercomputing Center and Centro Nacional de Supercomputación (BSC-CNS), Barcelona, Spain; (5) Arpa Piemonte, Torino, Italy.

Background and aims: Studies on the health effects of long-term exposure to air pollution are usually based on cohorts of participants living in big cities and are not representative of the entire population. We assessed the relationship between air pollution and mortality using data from the entire population of Spain.

Methods: Mortality counts from 2,218 small areas (areas with at least 3,500 inhabitants) covering the entire Spain for years 2005-2010 were used in the analysis. Average annual levels of NO₂, O₃, PM₁₀, PM_{2.5} for the period 2009-2013 were obtained from the CALIOPE air quality forecasting system in a 4x4 km grid and were up-scaled at the small area level. We used Poisson regression models of observed deaths with expected deaths (based on age and sex distributions) included as an offset. Separate models were fitted for each pollutant and for natural, cardiovascular and respiratory causes. Models were adjusted for the following area-level variables: population, unemployment, lung cancer mortality rates (as a surrogate of smoking prevalence), and an index of economical activity. Unstructured and spatial random effects were included in the model.

Results: In models without spatial random effects, all-cause mortality was positively associated with O₃, PM₁₀ and PM_{2.5} (Relative risks (RR) and 95% credibility intervals (CI) comparing bottom to top quartile of exposure were 1.06 (1.04, 1.08), 1.10 (1.08, 1.12), and 1.09 (1.07, 1.11), respectively) and negatively associated with NO₂ (RR=0.98, 95% CI: 0.96, 0.99). After inclusion of spatial random effects, all associations became non-significant, except for PM₁₀, which became protective (RR=0.95, 95% CI: 0.92, 0.98). Similar results were obtained for cardiovascular and respiratory mortality.

Conclusions: Results indicate the presence of strong unmeasured confounders with a spatial structure. Analyses will be updated by including mortality in years 2011-2013 and by using better markers for socioeconomic status and other known confounders.

Presentation: Indicate your preference for a presentation:

- Oral
- Poster

Topics: Select 2-3 topic areas per abstract.

- Air pollution, noise
- Spatial epidemiology and GIS