

**TITLE:** Spatio-temporal exposure to fine particles and polycyclic aromatic hydrocarbons, short term effects on mortality in Rome, 2011-2012 - the EXPAH project

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**Primary category:** ambient air pollution

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**Abstract** (max 2000 characters, including spaces)

**Background:** short-term association between fine particles (PM<sub>2.5</sub>) and mortality is well established, while evidence on the effects of PM components, e.g. polycyclic aromatic hydrocarbons (PAHs) is less clear. The project EXPAH aimed at estimating population exposure to PM<sub>2.5</sub> and PAHs using spatio-temporal modelling, and investigating their short-term association with mortality in Rome, Italy.

**Methods:** PM<sub>2.5</sub>, PAHs and benzo[a]pyrene (b[a]p) were measured in 18 locations in Rome during two field campaigns from December 2011 to May 2012 to complement Rome air quality network. In addition, PM<sub>2.5</sub> and PAHs were modeled by means of the chemical transport model FARM using measurements for model validation and improvement. Data assimilation of daily concentrations has been employed to estimate PM<sub>2.5</sub> surface values. Daily mean exposures were estimated for each km<sup>2</sup> of Rome from June 2011 to May 2012. All natural deaths were collected and geo-referenced. A case-crossover analysis was applied to estimate the percent increases of mortality per interquartile ranges (IQR) of the pollutants.

**Results:** there were 22,172 natural deaths. Lagged 2-5 IQRs increases of 0.65 ng/m<sup>3</sup> in PAHs, 0.17 ng/m<sup>3</sup> in b[a]p and 14.78 µg/m<sup>3</sup> in PM<sub>2.5</sub> were associated with 2.03% (95% confidence interval=0.47, 3.60), 1.91% (0.36, 3.48) and 1.45% (-2.39, 5.44) increases in natural mortality. Effects were higher on respiratory mortality, in elderly, women and in winter, with a linear concentration-response. As sensitivity analysis, we computed daily averages of the three exposures over Rome and applied conventional time-series methods. Effects on mortality did not change for PAHs and b[a]p, while they were considerably lower for PM<sub>2.5</sub>.

**Conclusions:** a novel spatio-temporal model was applied to estimate population exposure to PAHs and PM<sub>2.5</sub> in Rome, and to investigate short-term health effects of PAHs. We found evidence of an association of all the exposures with mortality, especially for respiratory causes.