LONG-TERM EXPOSURE TO AIR POLLUTION (PM$_{2.5}$ AND NO$_2$) AND MORTALITY: RESULTS OF THE ROME LONGITUDINAL STUDY (ROLS)

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Background and aims: There are few longitudinal studies evaluating the role of chronic exposure to air pollutants within the same urban setting. We analyzed the association of long-term exposure to PM$_{2.5}$ and NO$_2$ with mortality in a large cohort.

Methods: The Rome Longitudinal Study is a fixed cohort enrolled at the 2001 census. We selected subjects aged 45-80 years at the baseline who had not changed their address in the previous five years (n=684,204). Exposure at residence to PM$_{2.5}$ was predicted by means of a chemical transport model (FARM) (1 km$^2$ grid) using 2005 emissions data. Spatial levels of NO$_2$ were derived from a specific land use regression model ($R^2=0.66$). We had information on age, gender, education, occupation, place of birth, and area-based socioeconomic position at baseline. All subjects were followed till December 31, 2006. Cox regression models were used to study the association between the exposure and cause-specific mortality, taking several confounders into account.

Results: During the study period, 45,006 natural deaths occurred (33% cardiovascular, 5% respiratory disorders, 3.3% diabetes, and 12% lung cancer). The average exposure was 23 (sd 4) µg/m$^3$ for PM$_{2.5}$ and 44 (8) µg/m$^3$ for NO$_2$. The correlation of the two exposure indicators was 0.75. With increased exposure of PM$_{2.5}$ and NO$_2$ there was an increased risk of dying for natural causes: 7% (95%CI:4%-9%) for 10 µg/m$^3$ increase of PM$_{2.5}$, and 9% (95%CI:6%-13%) for 10µg/m$^3$ increase of NO$_2$. The relationships were linear with no evidence of a threshold. The strongest associations were found for cardiovascular diseases and diabetes.

Conclusions: This is one of the largest European urban cohort study on PM$_{2.5}$. The results indicate that long-term exposures to PM$_{2.5}$ and NO$_2$ at residence are associated with mortality in Rome and the effect estimates are very similar to what has been suggested in studies from the USA.