Long term effects of air pollution on mortality: Results from the Italian cohort in the LIFE MED HISS project (LIFE12 ENV/IT/000834)


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Introduction

It is well known that long term exposure to air pollution increases the risk of mortality but there are relatively few studies assessing the impact of air pollution outside urban areas, representing different exposure settings methods and using exposure data at several time points during follow-up.

Methods

The study is based on a 13-year mortality follow-up (2000-2012) of the 1999-2000 National Health Interview Survey (NHIS), including 1,449 Italian Municipalities; for this analysis we selected a subcohort of 75,900 subjects aged 35 or older. A mean annual level of exposure to long term particulate matter (PM2.5) and nitrogen dioxide (NO2) of the municipality of residence was assigned to each subject, based on modeled data with spatial resolution of 4x4km2 that were first integrated with measured values and then up-scaled at municipality level. All the modelled data for the calendar years 1999, 2003, 2005, 2007 and 2010, available in the national database, were used in this work. Rural areas were defined as municipalities with ≤20,000 inhabitants.

Pearson and Spearman correlation coefficients were calculated in addition to univariate descriptive analyses. **Confounding factors** included in the models, affecting both outcome and exposure, as suggested by a review of the literature and harmonized according to other European projects using NHIS (Demetrio and Eurothine), were age, gender, educational level, activity status, living alone, body mass index, smoking, physical activity and an indicator of urban/rural municipality.

A multivariate Cox proportional hazards model with time-varying variables (age and exposure levels) was used to calculate hazard ratios (HR) and 95% confidence interval (CI), including one pollutant at time and testing the assumption of proportionality of risks and effect modification. To account for the sampling design of the Italian NHIS, the standard errors of CIs were calculated using the sandwich variance estimate, which adjust for family within each municipality (correlated observation). Results are shown according to a 10 µg/m3 increase in exposure. Sensitivity analyses were implemented in order to evaluate different health effects of exposure by modifiers, to compute health risks in the sub-cohort of older people and to evaluate the multi-collinearity in the model definition.

Results

Overall, 14,166 natural deaths occurred during the follow-up. For 10 µg/m3 increase of NO2 and PM2.5 the adjusted HRs and their 95% CIs were, respectively (Table 1): 1.03(1.01;1.05) and 1.04(1.02;1.06) for natural mortality, 1.13(1.06;1.22) and 1.12(1.04;1.21) for lung cancer mortality, 1.04(1.00;1.08) and 1.06(1.02;1.10) for neoplasms mortality.

In rural areas HRs were higher; e.g. the HR for lung cancer mortality for NO2 was 1.22(1.10;1.37), while for PM2.5 was 1.22(1.08;1.37); the sensitivity analyses revealed higher risks in older people (data not shown).

Conclusions

The pilot study LIFE MED HISS conducted in Italy showed results comparable with other cohort studies. A focus on susceptible populations has been done (results are presented in an other poster).

Significant results even for rural areas, despite lower concentrations and different PM composition, are precious to support and address national and local policies makers to implement effective measures even in these areas. Information on diet and alcohol consumptions, not available in this National Survey, is partially included in BMI measure.