

NEONATAL MORTALITY, OUTDOOR AIR POLLUTION AND SOCIAL INEQUALITIES – A
SPATIAL ANALYSIS CONDUCTED AT A SMALL GEOGRAPHICAL LEVEL IN THREE
FRENCH METROPOLITAN AREAS.

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Background. Progress towards reducing neonatal deaths (before 28 days of life), has been slow and early deaths now account for a high proportion of infant deaths. Mapping spatial distributions of disease occurrence can serve as a useful tool for identifying exposures of public health concern.

Aims. To investigate the influence of socioeconomic characteristics and outdoor air pollution on the spatial distribution of neonatal mortality.

Methods. We conducted an ecological study using the French census block as the geographical unit, in the metropolitan areas of Lille (North of France), Lyon (center) and Paris. The outcome variable was neonatal mortality; all cases that occurred between 2002 and 2009, except for Paris 2004-2009, were geocoded using address of residence. A neighborhood deprivation index was created, using data from the 2006 census. Average nitrogen dioxide concentrations were modeled by the air quality monitoring networks. Generalized additive models allowed to take into account spatial autocorrelation and generate maps using smoothing on longitude and latitude while adjusting for covariates. We used permutation tests to examine the overall importance of location in the model and identify areas of increased risk.

Results. The strength and direction of the associations varied between cities. We found areas of elevated risk within the Lille (365 cases; 2.97‰ of live births) and Lyon (410; 2.78‰) metropolitan areas but not in Paris (462; 2.46‰). While in Lyon, the socioeconomic status has an important impact, in Lille, both deprivation and NO₂ estimates have their own role as determinants of the spatial distribution of neonatal mortality.

Conclusions. There is evidence of a variety of spatial patterns of neonatal mortality in French metropolitan areas in relation with socioeconomic deprivation and ambient air quality. This illustrates the relevance of spatial statistical techniques to model exposure and identifies priority areas for public health action.