Title:

Noise exposure and spatial clustering of infant mortality rate – Lyon metropolitan area - France

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Abstract:

Introduction
An increasing number of studies document the link between fatal pregnancy outcome or early life mortality and environmental exposures, particularly air pollution; few investigate health effects of noise. In this context, the objective of this study is to investigate the association between traffic noise exposure and infant mortality measured at the French census block in the Lyon metropolitan area.

Data and methods
To identify areas reporting higher risks, we used the spatial scan statistic using the SaTScan software. In this approach, a circular scanning window is moved across the study area. The likelihood ratio statistic is used to test if a cluster is significant or not. Using the Lden indicator as the measure of exposure to traffic noise, spatial analyses were performed for all infant mortality cases (678 occurring between 2000 and 2008) in two stages: *(i)* unadjusted analysis, *(ii)* adjusted analysis for noise exposure. The census block estimates of Lden values were derived from measurements or modeled levels for all houses within the Lyon metropolitan area, in the framework of the EU obligation to publish detailed noise maps.

Results
We identified one statistically significant cluster of increased prevalence in north East part of the Lyon area (p-values=0.042). This cluster included 45 IRIS with a radius of about 9101 metres, and a total population size of 16137, with 113 infant mortality cases. The relative risk for this significant cluster is equal to 1.56. Results were unchanged after adjustment for exposure to noise (p-value=0.045)

Conclusion
The study revealed that *(i)* the spatial distribution of infant mortality is not randomly distributed and, that *(ii)* there is a relationship between traffic noise and infant mortality measured at the French census block level. Several hypotheses can be advanced to explain this new finding, including the stress generated by noise during pregnancy.