

Association of Proximity to Polluting Industries, Deprivation and Infant Mortality - A spatial analysis using census data – Lille metropolitan Area – France

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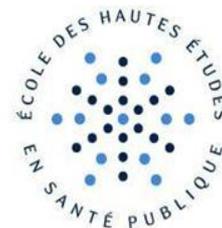
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ADEME



Agence de l'Environnement
et de la Maîtrise de l'Énergie



EHESP

Founding : ANR, DGS, EHESP, ADEME, Region Nord Pas de Calais

Plan of the presentation

- 1. Scientific Context**
- 2. Equit'Area Objectives**
- 3. Materials & methods**
- 4. Preliminary results**
- 5. Discussion-Conclusion**



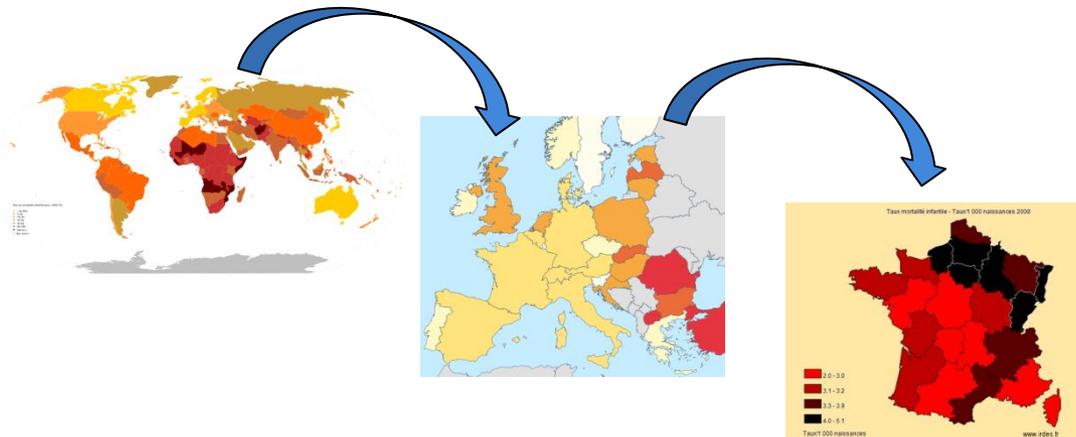
Scientific context (1/2)

- Infant Mortality rate (babies dying before age one, per 1000 live births)
- => Infant mortality: an appropriate **indicator of the health status** of a population.
- Association birth outcome and environmental exposure are well-known



Scientific context (2/2)

- Many individual risk factors are documented
=> age, sex, alcohol, tobacco, stress ...
- Evidence of social health inequalities is well established
=> socioeconomically disadvantaged populations are more strongly affected by health problems
- Spatial disparities in infant mortality rate



Environnemental exposure are suspected

Equit'Area Objectives

- EQUIT 'AREA program

Contribution of cumulative environmental exposures to social inequalities in health

Lille, Paris, Lyon & Marseille



- Objective of the present study

Association of Proximity to Polluting Industries, Deprivation and Infant Mortality in Lille metropolitan Area?

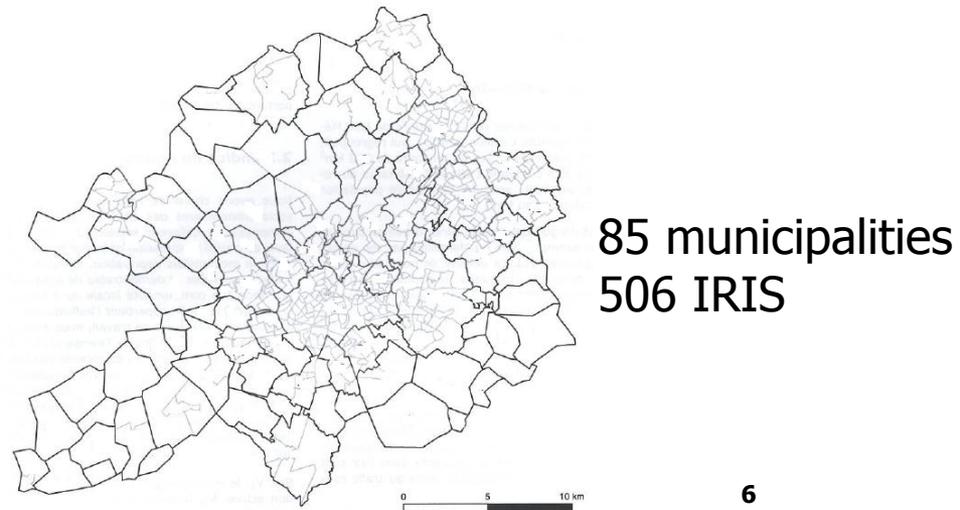
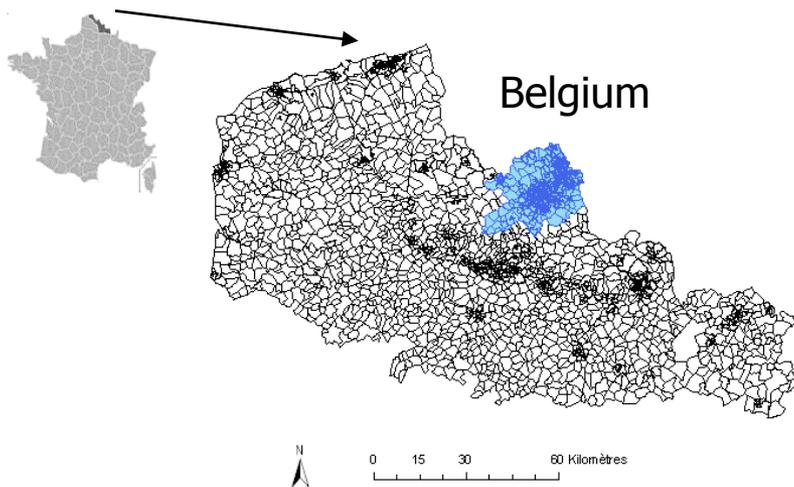


Materials & Methods (1/5)

- Study Setting and Small-Area Level

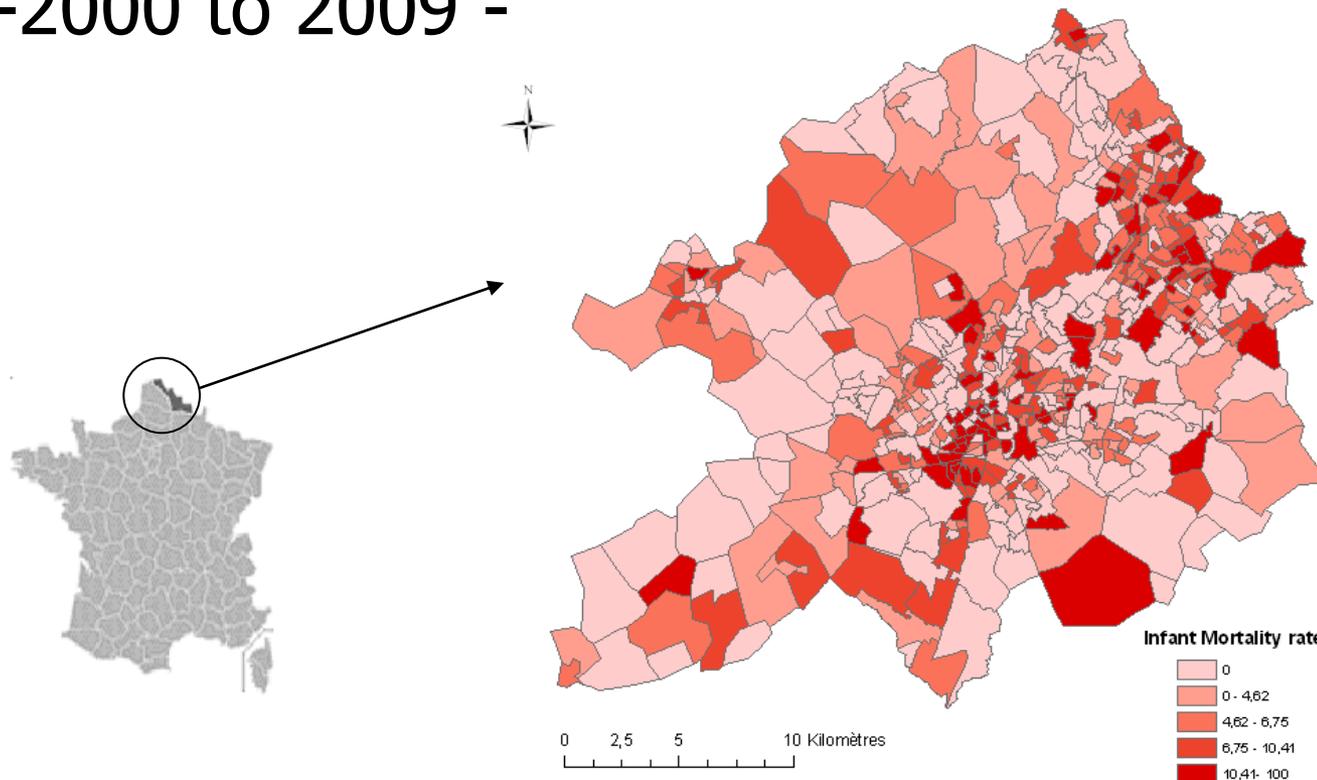
• The **Ecological study** setting is Lille metropole area in northern France

The small-area level used was the **French census block**: IRIS (a residential neighborhood with an average of 2000 inhabitants)



Materials & Methods (2/5)

- Spatial distribution of the **infant mortality rates** in the Lille metropolitan area at the census block -2000 to 2009 -

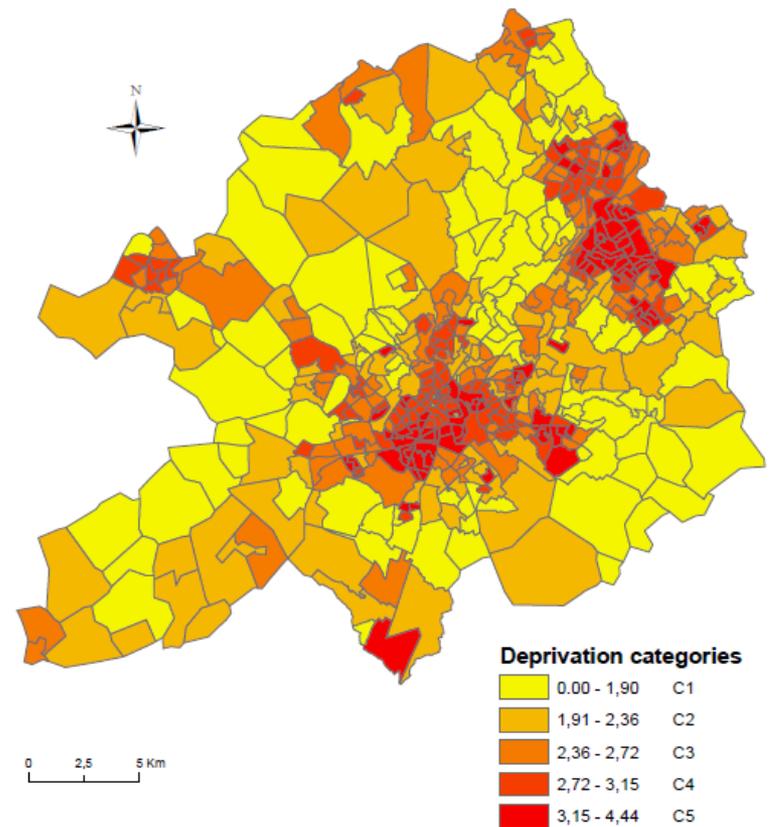


Materials & Methods (3/5)

- Map of the **deprivation index** in the Lille metropolitan area at the census block

- Available data : 1999 national census

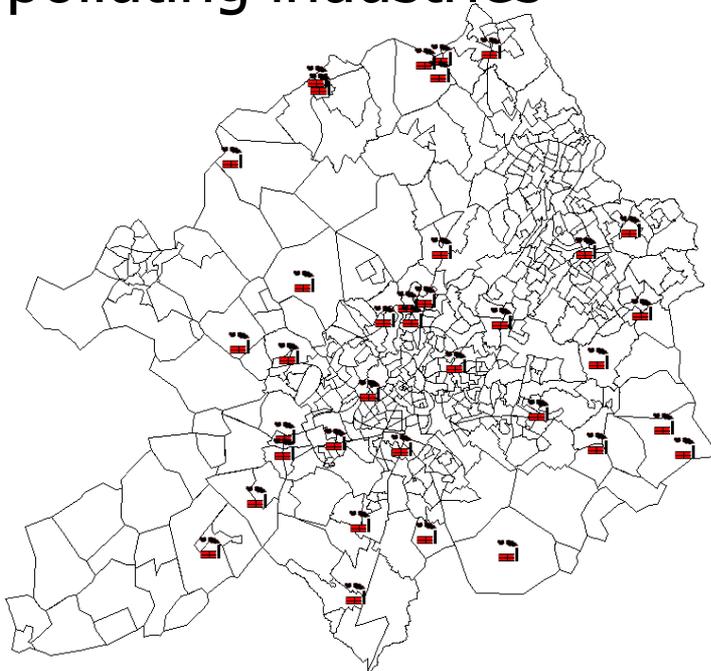
- Multiple dimension: income, education, job, family, immigration ...



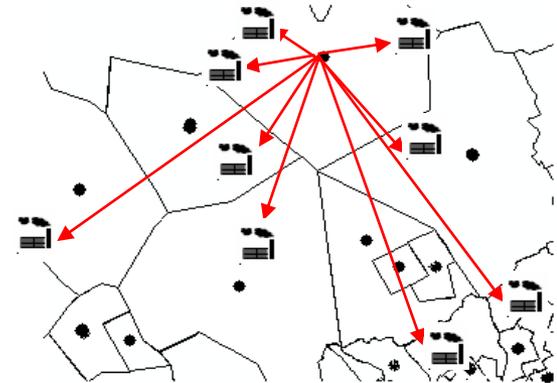
Materials & Methods (4/5)

- Proximity to pollutant industries

EPER data base: =>
European register of
polluting industries



Method: sum of distances
from the centroid of
various industrial facilities
in residence life





Materials & Methods(5/5)

- Statistical Analysis

Bayesian model

- => Able to capture the variability of rare health events
- => Can take into account the spatial autocorrelation

Results (1/3):

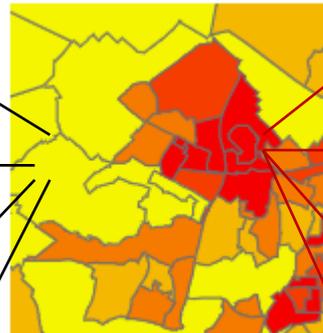
• Social inequalities in LMA

9% single parent family

7.9% unemployment

9.5% lower education level

9.2% multiple dwellings

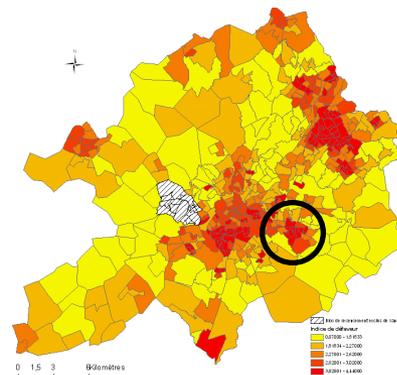


24.8% single parent family

30.7% unemployment

29.2% lower education level

62.5% multiple dwellings



Results (2/3):

- Infant mortality and Deprivation : existence of social inequalities in infant mortality risk

TABLE 2. Rate ratio (RR) and 95% Credible Interval (CI) of Infant Mortality According to Census Block Deprivation Level, for Several Models

Models	Deprivation Category*	RR (95% CI)	RR (95% CI)
		With spatial auto correlation	Without spatial autocorrelation
Model 1: quantitative deprivation level	SES	1.55 (1.34-1.78)	1.53 (1.37-1.70)
Model 2 : deprivation in five categories	C1†	1.00	1.00
	C2	1.41 (0.99-2.00)	1.58 (1.13-2.24)
	C3	1.82 (1.31-2.57)	1.98 (1.43-2.76)
	C4	2.39 (1.70-3.37)	2.63 (1.92-3.65)
	C5	2.59 (1.88-3.61)	2.91 (2.17-3.96)

*C1 is the least deprived category, C5 the most

†Reference Category

The risk of infant mortality depends on the socioeconomic gradient

Padilla C; Lalloué B; Lucas E; Zmirou D; Deguen S. Spatial analysis of social inequalities in infant mortality in the Lille Metropolitan Area – in preparation International journal of epidemiology

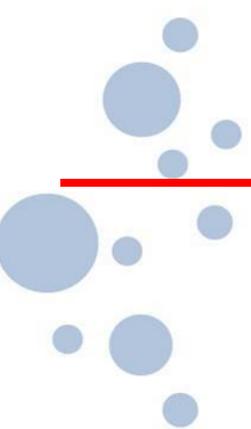
Results (3/3)

- No significant association with the proximity to polluting industries, deprivation and infant mortality

TABLE 2. Rate ratio (RR) and 95% Credible Interval (CI) of Infant Mortality According to Census Block Deprivation Level, for Several Models

Models	Variables	RR (95% CI)
Model : quantitative	SES	1.53 (1.33-1.76)
	Proximity to pollutant industries	0.91 (1.55-1.47)
	Interaction : SES & proximity of industries	1.01 (0.83-1.23)

=> Not enough pollutant industries to have possible significant association.



Conclusion

- Evidence of social and environmental inequalities on infant mortality in LMA
- Vulnerability phenomenon: residents might be more sensitive to the effect of exposure
- Advantages
 - The smallest of the spatial unit available in France
 - A statistical method adapted to the design of the study
- Disadvantages
 - EPER-data: few industries were registered in the data base in the study-area
 - Not best method to analyse proximity of polluting industries