Introduction

An excess of risk of cancer in the populations living near municipal solid waste incinerators (MSWI) has been highlighted in some scientific publications [1, 2, 3] and caused a concern to the French population exposed to these facilities.

In addition, several occupational studies suggest that dioxin is a human carcinogen in workers [4], however no consistent pattern has emerged on its carcinogenicity in the general population.

Objective

The objective of this study is to evaluate the excess of risk of cancer, in France, related to the past exposure to the atmospheric emissions of MSWI.

Methods

General design

Retrospective ecological study

- Statistical unit: IRIS (lots regroupés pour l’information statistique) - Demographic unit defined by the French National Institute for Statistics and Economic Studies (Insee)
- Study period: 1990-1999
- Population: adults of either sex above 14
- Study area: 4 French metropolitan administrative areas (départements) - Bas-Rhin, Haut-Rhin, Isère, Tarn - representing 2,272 IRIS and, over the period study, 25,000,000 person-years and 135,567 cases of cancer

Exposure to the risk factor and co-factors

Estimation of exposure to MSWI

- 16 municipal solid waste incinerators (MSWI) have been running during the study period
- Dioxin (2,3,7,8 TCDD) was considered as a surrogate marker of emitted pollutants
- Atmospheric dispersion was modeled by a second generation Gaussian model (ADMS3)
- Variable of exposure: mean of annual cumulated deposition of dioxin (over the study period)
- Duration of exposure: from the start of incineration operations (earlier:1972) to the beginning of the latency period (5 years for leukaemia, 10 years for other localizations)

Confounding factors

- Urban/ Rural status (data from Insee, 1999)
- Socio-economic deprivation (index defined by a principal component analysis of Insee’s data, 1990 census)
- Population density (data from Insee, 1990 census)
- Air pollution from traffic: NO2 air concentrations (WHO II project, 2000)
- Pollution to other industries: number of industry-years (data from Insee, 1972-1984 period)

Development of a Geographic Information System (GIS) to localize cases of cancer and define exposures at the IRIS level

Statistical analysis

- Poisson regression
- Generalized additive models with a function of the coordinates of the centroid of the IRIS
- Bayesian hierarchical analysis accounting for over dispersion

Preliminary results on 2 cancer localizations

- The table on the right presents the relative risks and their 95% confidence interval for an increase of the exposure index from the 5th to the 95th percentiles.
- We can observe a positive association for the 2 first localizations studied. In women, it is a positive significant association for all cancers, whatever the type.
- Note that this work is still in progress.

Discussion

Strengths

- Large size of population sample
- High rate of success in geocoding home addresses
- Description of exposure to MSW emission using a reliable dispersion model and a GIS
- Several confounding factors taken into account

In favor of a potential carcinogenic risk associated with residential exposure to carcinogens emitted by MSWI, these epidemiological elements need to be supported by further investigations.

References


