RESIDENT IN PROXIMITY OF A COAL-OIL-FIRED THERMAL POWER PLANT AND RISK OF LUNG AND BLADDER CANCER IN NORTH-EASTERN ITALY. A POPULATION BASED STUDY: 1995-2009

Paolo Collarile[1], Ettore Bidoli[1], Fabio Barbone[2,3], Loris Zanier[4], Stefania Del Zotto[4], Simonetta Fuser[5], Fulvio Stel[5], Chiara Panato[1], Irene Gallai[5] and Diego Serraino[1,6]

[1]Cancer Epidemiology Unit, IRCCS Centro di Riferimento Oncologico, Aviano – Italy;
[2]Institute for Maternal and Child Health, IRCCS Burlo Garofolo,Trieste - Italy;
[3]Department of Medical and Biological Sciences, University of Udine, Udine - Italy;
[4]Epidemiologic Service, Regional Health Directorate of Friuli Venezia Giulia, Udine - Italy;
[5]Regional Environmental Protection Agency of Friuli Venezia Giulia, Palmanova - Italy
[6]Friuli Venezia Giulia Cancer Registry, IRCCS Centro di Riferimento Oncologico, Aviano – Italy.

Background

This study investigated the risk of lung and bladder cancers risk in people living residing near in proximity of a coal-oil-fired thermal power plant in an area of north-eastern Italy, covered by a population-based cancer registry. The city of Monfalcone is located in the Friuli Venezia Giulia region, northeastern Italy, and shares with 13 surrounding municipalities a concentration of industries (a power plant, a large shipyard, a paper mill, and other manufacturing industries) and several transport infrastructure such as port, airport, and highway. The coal-fired and oil thermal power plant is located near the city center of Monfalcone since 1965.

Methods

The study area was defined according to a deposition model of the specific emissions of NO_2 of the coal-fired thermal power plant.

The residential exposure was defined a priori by ARPA-FVG that recovers the point emission data of C6H6, NO2, PM10, SO2 reported by individual industries and data on road traffic, port, airport, home heating, and local environmental monitoring system. Then, the residential exposure to air pollution was modelized for the overall area on a 400x400 meter grid. Incidence rate ratios (IRR) by sex, age, and histology were computed according to tertiles of residential exposure to benzene (C_6H_6), nitrogen dioxide (NO_2), particular matter, and sulfur dioxide (SO_2) among 1076 incident cases of lung and 650 cases of bladder cancers.

Figure 1: Mathematical modeling of residential exposure to air pollutant in study area, stratified to tertile of exposure: (**a**) Nitrogen dioxide exposure; (**b**) Benzene exposure; (**c**) Particular matter exposure; (**d**) Sulfur dioxide exposure. 400x400 meter cells correspond to populated area from one or more people in 1995-2009 period. The blue line corresponds to the boundaries of individual municipalities. The black point corresponds to the position of the thermal power plant.

Results

In men of all ages and in women under 75 years of age, no significant associations were observed.

In men of all ages and in women under 75 years of age, no significant associations were observed. Conversely, in women aged >75 years significantly increased risks of lung and bladder cancers were related to high exposure to benzene: 2.00 (IC95% 1.23-3.25) for lung cancer and 1.94 (IC95% 1.01-3.74) for bladder cancer (IRR for highest vs. lowest tertile). In these women risks of lung and bladder cancer were also related to exposure to NO_2:1.72 (IC95% 1.07-2.77) for lung cancer and 1.94 (IC95% 1.03-3.65) for bladder cancer (IRR for highest vs. lowest tertile). In these women, a 1.71 (IC95% 1.07-2.73) fold higher risk of lung cancer was also related to a high exposure to SO_2.

Conclusion

The findings of this descriptive study indicated that air pollution may have a role with regard to the risk of lung and bladder cancers, limited to women aged ≥ 75 years. Such increased risk warrants further analytical investigations. These subjects persons represented approximately 11% of all the cases of lung and bladder cancers in this population. Further analytical investigations are necessary to shed light on the possible determinants of these increased risks, in particular, air pollutants from multiple industrial sources, road, port and airport traffic, home heating, as well as on the role of occupation, smoking habits, and other lifestyles.
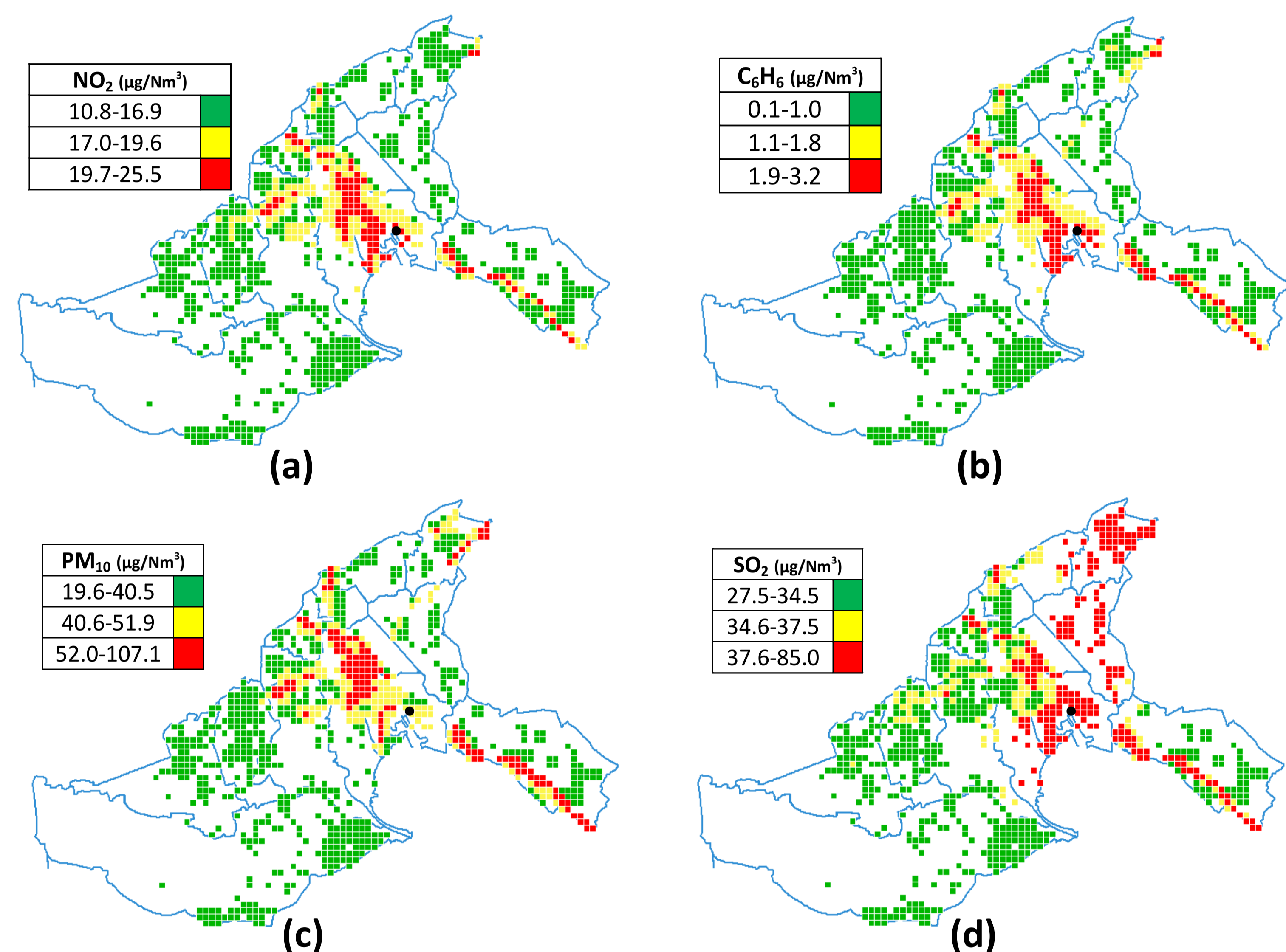
Correspondence to:paolo.collarile@cro.it; epidemiology@cro.it