



Contents lists available at ScienceDirect

Science of the Total Environment

journal homepage: www.elsevier.com/locate/scitotenv

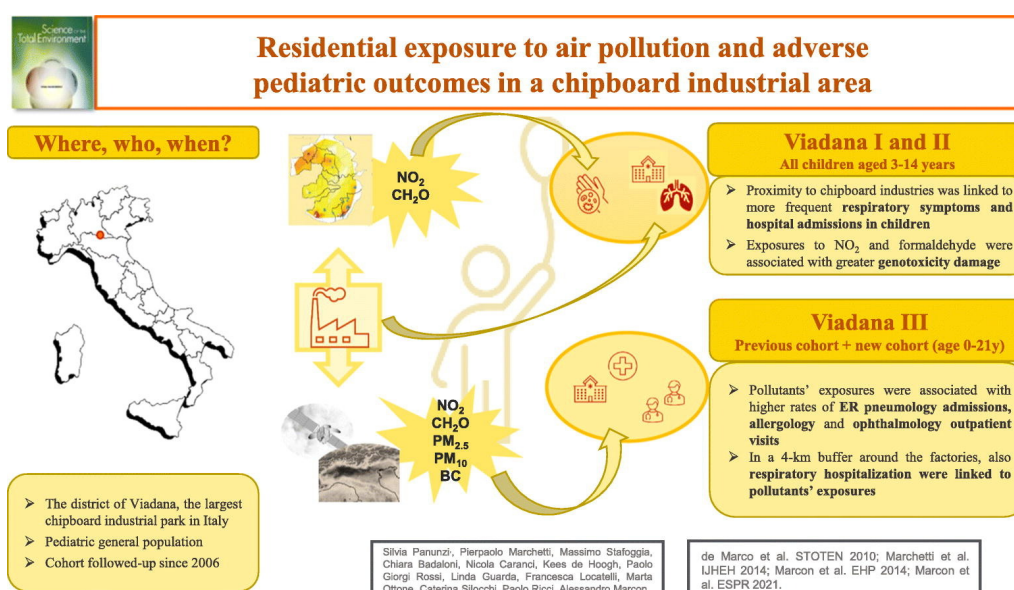


Residential exposure to air pollution and adverse respiratory and allergic outcomes in children and adolescents living in a chipboard industrial area of Northern Italy

Silvia Panunzi ^a, Pierpaolo Marchetti ^a, Massimo Stafoggia ^b, Chiara Badaloni ^b, Nicola Caranci ^c, Kees de Hoogh ^{d e}, Paolo Giorgi Rossi ^f, Linda Guarda ^g, Francesca Locatelli ^a, Marta Ottone ^f, Caterina Silocchi ^h, Paolo Ricci ^g, Alessandro Marcon ^a

- a Unit of Epidemiology and Medical Statistics, Department of Diagnostics and Public Health, University of Verona, Italy
- b Department of Epidemiology, Lazio Regional Health Service ASL Roma 1, Rome, Italy
- c Regional Health and Social Care Agency, Emilia-Romagna Region, Bologna, Italy
- d Swiss Tropical and Public Health Institute, Allschwil, Switzerland
- e University of Basel, Basel, Switzerland
- f Epidemiology Unit, AUSL - IRCCS Reggio Emilia, Reggio Emilia, Italy
- g UOC Osservatorio Epidemiologico, Agenzia di Tutela della Salute della Val Padana, Mantova, Italy
- h UOS Salute e Ambiente, Agenzia di Tutela della Salute della Val Padana, Mantova, Italy

GRAPHICAL ABSTRACT



ABSTRACT

Background

Chipboard production is a source of wood dust, formaldehyde, and combustion-related pollutants such as nitrogen dioxide (NO₂) and particulate matter (PM). In this cohort study, we assessed whether exposures to NO₂, formaldehyde, PM₁₀, PM_{2.5}, and black carbon were associated with adverse respiratory and allergic outcomes among all 7525 people aged 0–21 years residing in the Viadana district, an area in Northern Italy including the largest chipboard industrial park in the country.

Methods

Data on hospitalizations, emergency room (ER) admissions, and specialist visits in pneumology, allergology, ophthalmology, and otorhinolaryngology were obtained from the Local Health Unit. Residential air pollution concentrations in 2013 (baseline) were derived using local (Viadana II), national (EPISAT), and continental (ELAPSE) exposure models. Associations were estimated using negative binomial regression models for counts of events occurred during 2013–2017, with follow-up time as an offset term and adjustment for sex, age, nationality, and a census-block socio-economic indicator.

Results

Median annual exposures to NO₂, PM₁₀, and PM_{2.5} were below the European Union annual air quality standards (40, 40, and 25 µg/m³) but above the World Health Organization 2021 air quality guideline levels (10, 15, and 5 µg/m³). Exposures to NO₂ and PM_{2.5} were significantly associated with higher rates of ER pneumology admissions (13 to 30 % higher rates per interquartile range exposure differences, all $p < 0.01$). Higher rates of allergology and ophthalmology visits were found for participants exposed to higher pollutants' concentrations. When considering the 4-km buffer around the industries, associations with respiratory hospitalizations became significant, and associations with ER pneumology admissions, allergology and ophthalmology visits became stronger. Formaldehyde was not associated with the outcomes considered.

Conclusion

Using administrative indicators of health effects a priori attributable to air pollution, we documented the adverse impact of long-term air pollution exposure in residential areas close to the largest chipboard industries in Italy. These findings, combined with evidence from previous studies, call for an action to improve air quality through preventive measures especially targeting emissions related to the industrial activities.