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Association between air pollution and rhinitis incidence in two European cohorts

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ABSTRACT

Background: The association between air pollution and rhinitis is not well established.
Aim: The aim of this longitudinal analysis was to study the association between modeled air pollution at the subjects' home addresses and self-reported incidence of rhinitis.
Methods: We used data from 1533 adults from two multicentre cohorts' studies (EGEA and ECRHS). Rhinitis incidence was defined as reporting rhinitis at the second follow-up (2011 to 2013) but not at the first follow-up (2000 to 2007). Annual exposure to NO_2, PM_{10} and $PM_{2.5}$ at the participants' home addresses was estimated using land-use regression models developed by the ESCAPE project for the 2009–2010 period. Incidence rate ratios (IRR) were computed using Poisson regression. Pooled analysis, analyses by city and meta-regression

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testing for heterogeneity were carried out.
Results: No association between long-term air pollution exposure and incidence of rhinitis was found (adjusted IRR (aIRR) for an increase of 10 $\mu g \cdot m^{-3}$ of NO_2: 1.00 [0.91–1.09], for an increase of 5 $\mu g \cdot m^{-3}$ of $PM_{2.5}$: 0.88 [0.73–1.04]). Similar results were found in the two-pollutant model (aIRR for an increase of 10 $\mu g \cdot m^{-3}$ of NO_2: 1.01 [0.87–1.17], for an increase of 5 $\mu g \cdot m^{-3}$ of $PM_{2.5}$: 0.87 [0.68–1.08]). Results differed depending on the city, but no regional pattern emerged for any of the pollutants.
Conclusions: This study did not find any consistent evidence of an association between long-term air pollution and incident rhinitis.

1. Introduction

The prevalence of rhinitis varies between 10 and 50% worldwide (Bousquet et al., 2008; Wang et al., 2014) and has strongly increased during the last decades, mostly in industrialized countries (de Marco et al., 2012; Zhang and Zhang, 2014). Although rhinitis is usually considered as a minor respiratory condition, it is often associated with a strong impairment in daily life and has an important economical and societal impact (Bousquet et al., 2017; Leynaert and Soussan, 2003; Linneberg et al., 2016). Although environmental determinants of rhinitis are not well-known, environmental changes are suspected to be a major driver in the rise of allergy. During the past years, the link between outdoor air pollution and allergy continues to strengthen, both in children and in adults (Carlsten and Rider, 2017).

Rhinitis is a complex disease, frequently associated with asthma, whatever the allergic sensitization status (Shaaban et al., 2008). In adults there is growing evidence associating air pollution with asthma (Guarnieri and Balmes, 2014). There are also evidences of the adverse effect of outdoor air pollution on allergic diseases (HEI, 2010; Heinrich and Wichmann, 2004), even if this association is not consistently reported (Lindgren et al., 2009). However, there are very few studies on the effect of air pollution on rhinitis (Deng et al., 2016; Jang et al., 2016; Rancière et al., 2016). It has been shown that air pollution and particularly diesel exhaust particles have the capability of enhancing immunological responses to allergens and elicit inflammatory reactions in the airways at relatively low concentrations and even with short exposure durations (Brunekreef and Sunyer, 2003). Traffic-related air pollutants modify responses to allergens in the nasal mucosa (Peden, 2001), and several studies have shown an increase in daily consultations for allergic rhinitis in general practitioners due to short-term air pollution exposure (Hajat et al., 2001; Zhang et al., 2011). Traffic-related air pollution has been consistently associated with prevalence of rhinitis among an Italian population, but only among non-smokers (Cesaroni et al., 2008). Furthermore, proximity to traffic has been associated with allergic rhinitis prevalence among Swedish adults (Lindgren et al., 2009). However, no study has ever assessed the association between exposure to long-term air pollution and the incidence of rhinitis in adults.

The aim of the present study was to assess the association between long term modeled air pollution exposure at the participant's home addresses and the incidence of self-reported rhinitis among adults from two large European studies.

2. Methods

2.1. Study design and participants

The data came from two multicentre epidemiological European studies: the French Epidemiological case-control and family-based study of the Genetics and Environment of Asthma (EGEA, (Kauffmann

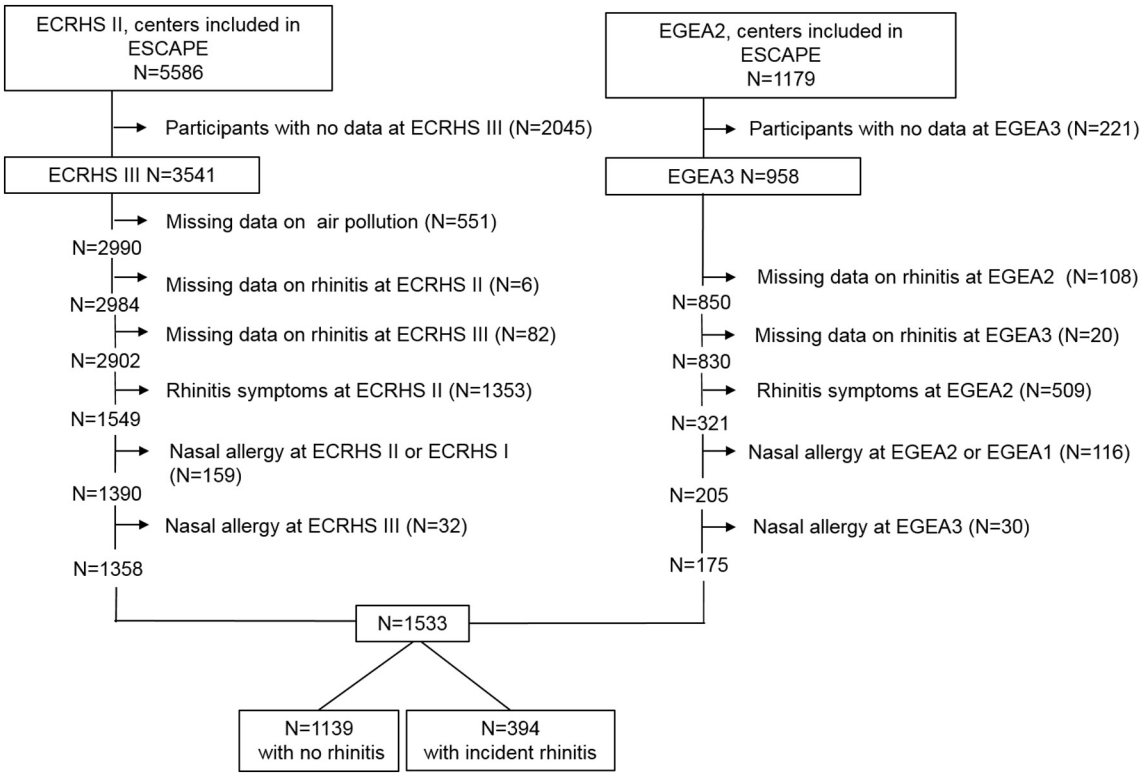

Fig. 1. Flow-chart of the participants.