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Is educational attainment associated with acute exposure to air pollution and pollen, and is it worse for pupils with asthma and seasonal allergic rhinitis?

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Introduction

There is a lack of evidence of the adverse effects of air pollution and pollen on cognition for people with air quality related health conditions. This study explored the effects of air quality and respiratory health conditions on educational attainment for 18,241 pupils across the city of Cardiff, United Kingdom.

Objectives and Approach

Anonymised, routinely collected health and education data were linked at the household and school level with modelled high spatial resolution pollution data, and daily pollen measurements using the Secure Anonymised Information Linkage (SAIL) databank. This created 7 repeated cross-sectional cohorts (2009-2015). Multilevel linear regression analysis examined whether exam performance was associated with health status and/or air quality levels averaged at school and home locations during revision and examination periods. We also investigated the combined effects of air quality and associations with educational attainment for pupils who were treated for asthma and/or Severe Allergic Rhinitis (SAR), and those who were not.

Results

The cohort contained 9337 males and 8904 female pupils. There were 871 treated for asthma, 2091 for SAR, and 634 treated for both. Asthma was not associated with exam performance (p=0.700). However, SAR was positively associated with exam performance (p 2) was negatively associated with educational attainment (p = 0.002). Other indicators of air quality (pollutants: Ozone, Particulate Matter - PM2.5, and pollen) were not associated with educational attainment (p> 0.05). Exposure to NO2 was negatively associated with educational attainment irrespective of treatment for asthma or SAR. There was no combined effect of air quality on the variation in educational attainment between those who are treated for asthma and/or SAR and those who were not.

Conclusion/Implications

Irrespective of health status, exposure to NO2 was negatively associated with educational attainment. Treatment seeking behaviour may be a possible explanation for the positive association between SAR and educational attainment. For a more accurate reflection of health status, health outcomes not subject to treatment seeking behaviour should be investigated.

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