Effects of Chronic PM Exposure From Local Heating on Self-reported Respiratory and Cardiovascular Health in the RHINE Tartu Cohort

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Background/Aims:

Residential wood combustion is widely used for local heating in Northern Europe, and it has been found to be a significant source of particulate pollutants in Estonia. Because of poor combustion, the emissions, and due to bad dispersion conditions, the concentrations can be relatively high. The relationship between particulate matter (PM) and health effects has been shown in numerous studies; however, it has been difficult to separate the source-specific effects from the effects of all types of PM. This paper aims to study the effects of local heating-induced PM on respiratory and cardiovascular health.

Methods:

The relationship between particles and self-reported symptoms was studied in the Respiratory Health in Northern Europe Tartu cohort. A postal questionnaire with questions regarding respiratory complains, cardiac disease, lifestyle as smoking habits, indoor environment, occupation, early life exposure, and sleep disorders was sent to 2460 adults. The annual concentrations of particles induced by local heating were modeled with an atmospheric dispersion model AirViro and obtained PM$_{2.5}$ concentrations in 200 $\times$ 200 m grid cells were linked with home addresses, using geographic information system. The relationship between the level of fine particles outside home and self-reported health problems was analyzed with logistic regression model.

Results:

The annual average exposure to PM induced by local heating was 4.1 $\mu$g$^{-3}$ (max, 7.4 $\mu$g$^{-3}$). We found a significant relation with wheezing, OR = 1.10 (95% CI: 1.00–1.21); and cough, OR = 1.07 (95% CI: 1.00–1.14) per 1 $\mu$g$^{-3}$ increase in PM$_{2.5}$ exposure. The associations were slightly positive but nonsignificant for chronic bronchitis, rhinitis, shortness of breath, hypertension, and cardiac diseases.
Conclusion:

The local heating pollution seems to induce slight respiratory symptoms such as wheezing and cough. These particles appear to be different from others, as our previous results with traffic-induced PM had shown relationship only with cardiac diseases.

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