Reduction potential of urban PM2.5 mortality risk using modern ventilation systems in buildings.

https://arctichealth.org/en/permalink/ahliterature174156

Author: O O Hänninen
J. Palonen
J T Tuomisto
T. Yli-Tuomi
O. Seppänen
M J Jantunen

Author Affiliation: KTL, Centre for Environmental Health Risk Analysis, Kuopio, Finland. otto.hanninen@ktl.fi


Date: Aug-2005

Language: English

Publication Type: Article

Keywords: Adult
Aged
Air Pollution, Indoor - prevention & control
Facility Design and Construction
Female
Finland - epidemiology
Humans
Male
Middle Aged
Mortality - trends
Particle Size
Risk factors
Urban Population
Vehicle Emissions
Ventilation
Abstract: Urban PM2.5 (particulate matter with aerodynamic diameter smaller than 2.5 microm) is associated with excess mortality and other health effects. Stationary sources are regulated and considerable effort is being put into developing low-pollution vehicles and environment-friendly transportation systems. While waiting for technological breakthroughs in emission controls, the current work assesses the exposure reductions achievable by a complementary means: efficient filtration of supply air in buildings. For this purpose infiltration factors for buildings of different ages are quantified using Exposures of Adult Urban Populations in Europe Study (EXPOLIS) measurements of indoor and outdoor concentrations in a population-based probability sample of residential and occupational buildings in Helsinki, Finland. These are entered as inputs into an evaluated simulation model to compare exposures in the current scenario with an alternative scenario, where the distribution of ambient PM2.5 infiltration factors in all residential and occupational buildings are assumed to be similar to the subset of existing occupational buildings using supply air filters. In the alternative scenario exposures to ambient PM2.5 were reduced by 27%. Compared with source controls, a significant additional benefit is that infiltration affects particles from all outdoor sources. The large fraction of time spent indoors makes the reduction larger than what probably can be achieved by local transport policies or other emission controls in the near future.

It has been suggested that indoor concentrations of ambient particles and the associated health risks can be reduced by using mechanical ventilation systems with supply air filtering in buildings. The current work quantifies the effects of these concentration reductions on population exposures using population-based data from Helsinki and an exposure model. The estimated exposure reductions suggest that correctly defined building codes may reduce annual premature mortality by hundreds in Finland and by tens of thousands in the developed world altogether.

PubMed ID: 15982271 View in PubMed ❯