Air pollution exposure on home-to-school walking routes reduces the development of working memory in children

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Credit: Barcelona Institute for Global Health

A study led by the Barcelona Institute for Global Health (ISGlobal) has demonstrated that exposure to air pollution on the way to school can have damaging effects on children's cognitive development. The study, published recently in *Environmental Pollution*, found an association between a reduction in working memory and exposure to fine particulate matter (PM2.5) and black carbon during the walking commute to and

from school. However, the researchers emphasize that the benefits of daily walking or cycling outweigh the risks of exposure.

Previous research found that exposure to traffic-related pollutants in schools was associated with slower cognitive development. The aim of the new study was to assess the impact of air pollution exposure during the walking commute to school. The findings of an earlier study had shown that 20 percent of a child's daily dose of black carbon, a pollutant directly related to traffic, is inhaled during urban commutes.

"The results of earlier toxicological and experimental studies have shown that these short exposures to very high concentrations of pollutants can have a disproportionately high impact on health," explains Mar Álvarez-Pedrerol, ISGlobal researcher and first author of the study. "The detrimental effects may be particularly marked in children because of their smaller lung capacity and higher respiratory rate," she adds.

The study was carried out in Barcelona and enrolled over 1,200 children aged from seven to 10 from 39 schools, all of whom walked to school on a daily basis. The children's working memory and attention capacity was assessed several times during the 12-month study. Their exposure to air pollution over the same period was calculated on the basis of estimated levels on the shortest walking route to their school.

Statistical analysis of the findings revealed that exposure to PM2.5 and black carbon was associated with a reduction in the growth of working memory; an interquartile range increase in PM 2.5 and black carbon levels was associated with a decline of 4.6 percent and 3.9 percent, respectively, in expected annual development of working memory. No significant associations were found with exposure to NO2 and none of the pollutants studied were observed to have any effect on attention capacity. In this study, boys were much more sensitive than girls to the effects of both PM2.5 and black carbon.

"Above all, we do not want to create the impression that walking to school is bad for children's health because the opposite is true—walking or cycling to school, which builds physical activity into the child's daily routine, has health benefits that far outweigh any negative impact of air pollution," explains Jordi Sunyer, head of ISGlobal's Child Health Programme and co-author of the study.

"The fact that children who walk to school may be more exposed to pollution does not mean that children who commute by car or on public transport are not also exposed to high levels. His colleague Mar Álvarez-Pedrerol goes on to explain "The solution is the same for everyone: reduce the use of private vehicles for the school run and create less polluted and safer home-to-school routes."

This is the first time that a team of scientists has studied the potential impact on cognitive development of exposure to air pollution in children who walk to school.

More information: Mar Alvarez-Pedrerol et al, Impact of commuting exposure to traffic-related air pollution on cognitive development in children walking to school, *Environmental Pollution* (2017). DOI: 10.1016/j.envpol.2017.08.075

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