

Second-hand smoke in the home more harmful than air pollution

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POLLUTION CAUSED BY FINE PARTICULATE MATTER IS AROUND TEN TIMES HIGHER IN HOMES WHERE people smoke indoors compared with non-smoking homes, a study from Scotland has found.¹

Furthermore, home air pollution from smoking appears to dwarf that from outdoor sources.

Data were analysed from four studies, where fine particulate matter $< 2.5 \mu\text{m}$ ($\text{PM}_{2.5}$) was measured in a range of Scottish homes between 2009 and 2013. Data from non-smoking homes, i.e. where all residents were non-smokers, was used for comparison.

There was significant variation in $\text{PM}_{2.5}$ levels found in smoking homes in the four studies, and the authors hypothesise that this is due to differences in the population samples in each of the studies.

However, overall median $\text{PM}_{2.5}$ concentrations in smoking homes across all studies was $31 \mu\text{g}/\text{m}^3$ compared with $3 \mu\text{g}/\text{m}^3$ in the smoke-free homes. Non-smokers living with smokers had average $\text{PM}_{2.5}$ exposure levels more than three times higher than the WHO guidance for annual exposure ($10 \mu\text{g}/\text{m}^3$).

Around 25% of the smoking households demonstrated 24-hour average $\text{PM}_{2.5}$ concentrations greater than $111 \mu\text{g}/\text{m}^3$, more than 11 times the annual limit recommended by the WHO.

The authors used the data to estimate $\text{PM}_{2.5}$ inhalation for a range of ages. In each case in smoking homes the median percentage of total daily inhaled $\text{PM}_{2.5}$ from within the home was between 84% and 100%, with preschool children and non-smoking housebound elderly people receiving the highest proportion of exposure at home compared with outdoor sources.

In all smoke-free homes the median 24-hour average value for $\text{PM}_{2.5}$ exposure was below the WHO limit of $10 \mu\text{g}/\text{m}^3$. This limit was exceeded in all situations for those dwelling in smoking homes. A two year old living in a smoking home would experience a 24-hour $\text{PM}_{2.5}$ exposure of $38 \mu\text{g}/\text{m}^3$, nearly four times the WHO limit.

The authors went on to estimate the amount of $\text{PM}_{2.5}$ inhaled over a typical lifetime of 80 years. Those living in a smoke-free household would inhale an estimated

average 0.76 g, compared with 5.82 g for a non-smoker living in a smoking household. The seven-fold (5 g) difference is likely to be associated with significant health risk, and is the equivalent of smoking one cigarette per day for a year. In contrast a smoker with a 20 a day habit for 62 years is likely to inhale 6.3 kg of $\text{PM}_{2.5}$.

It is well established that exposure to second-hand smoke is associated with respiratory and cardiovascular disease. Measurement of $\text{PM}_{2.5}$ has widely been used as a marker for second-hand smoke exposure, though sources of these particles are heterogeneous and include motor exhausts and industrial emissions, with the latter two being the predominant sources of outdoor exposure.

Considering that we spend the majority of our time indoors, and that smoke-free legislation has resulted in less exposure to second-hand smoke in leisure and workplace settings, the authors of this paper argue that we need better understanding of $\text{PM}_{2.5}$ exposure in the home and the contribution made by second-hand smoke.

'There has tended to be a disconnect between public perception of second-hand smoke-derived $\text{PM}_{2.5}$ and the hazard of outdoor air pollution,' the researchers say.

They add that their findings demonstrated that 'approximately 20% of those living in smoking homes in Scotland will inhale a lifetime mass of $\text{PM}_{2.5}$ greater than the median value predicted for a non-smoker living in a heavily polluted urban setting.'

They conclude that for the substantial proportion of Scots exposed to second-hand smoke at home indoor air pollution from smoking dwarfs that from outdoor sources, and that efforts to reduce exposure to second-hand smoke within the home are needed.

'The seven-fold (5g) difference is likely to be associated with significant health risk, and is the equivalent of smoking one cigarette per day for a year'

REFERENCE

¹ Semple S, Apsley A, Azmina Ibrahim T et al. Fine particulate matter concentrations in smoking households: just how much secondhand smoke do you breathe in if you live with a smoker who smokes indoors? *Tob Control* 2014;0:1-7. doi:10.1136/tobaccocontrol-2014-051635

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