

childhood infections and use of bleach at home.²

Dr Wise expresses disappointment with ‘design flaws’ and ‘the speculative nature of our conclusions’. We do not agree that our study was badly designed, and the limitations have been carefully considered and discussed in our original paper. We relied on questionnaires for both exposure and outcome, but this does not imply flawed results or bad study design. Obviously, future studies are needed with better exposure and outcome assessment to further address the causal nature of the associations, as we acknowledge in the discussion.

Dr Wise is particularly concerned about the reliability of self-reported illnesses. Indeed, no further description of the targeted infections was given to the parents, nor were these illnesses confirmed by medical diagnosis. The use of parental report information is a limitation of our study already acknowledged in our paper. Nevertheless, backed by previous evidence,³ we considered that parents were capable of distinguishing these common illnesses, characterised by specific symptomatology.

Another issue raised by Dr Wise concerns potential confounding factors. The term ‘confounding’ should not be used loosely. For confounding to be present, a factor must be associated with both the exposure and the outcome. In our study, confounding would occur if bleach use was more prevalent with increasing smoking in the home, ambient air pollution or pre-existing health conditions. Our models were adjusted for passive smoking and adjustment for pre-existing asthma did not modify our results. Air pollution was not considered, since there is little plausibility for bleach use to be associated with it.

Finally, Dr Wise questions our exposure assessment. As discussed in our paper, we had only basic information on the use of bleach. Consequently, children with low exposure may be classified into the same group as children with high exposure. We had no information on other cleaning products and we cannot exclude the possibility that the observed results are due to the use of other irritants or their combinations.

While pointing out limitations of our study, Dr Wise fails to recognise its merits. With the inclusion of 9102 children from three geographically spread out regions in Europe, our study is currently the largest study to evaluate the association between the use of bleach at home and infections. Our results are also biologically plausible⁴ and consistent with previous research.^{5 6}

Author response to Dr Wise’s letter

We welcome the opportunity to respond to the concerns of Dr Wise¹ from the American Chemistry Council, regarding our report on the association between

Although the health effects found are rather modest and the above described limitations need to be (and have been) acknowledged, the highly prevalent use of bleach makes our findings of public health interest.

After considering strengths and weaknesses, we stand by our prudent conclusion that passive exposure to cleaning bleach in the home may have adverse effects on school-age children by increasing the risk of respiratory and other infections. Our results suggest a plausible hypothesis that needs to be confirmed in further studies including more detailed exposure and health assessment.

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REFERENCES

- 1 Wise K. Response to 'Domestic use of bleach and infections in children: a multicentre cross-sectional study'. *Occup Environ Med* 2016;**73**:215.
- 2 Casas L, Espinosa A, Borràs-santos A, et al. Domestic use of bleach and infections in children: a multicentre cross-sectional study. *Occup Environ Med* 2015;**72**:602–4.
- 3 Strippoli M-PF, Silverman M, Michel G, et al. A parent-completed respiratory questionnaire for 1-year-old children: repeatability. *Arch Dis Child* 2007;**92**:861–5.
- 4 MacIntyre EA, Gehring U, Mölter A, et al. Air pollution and respiratory infections during early childhood: an analysis of 10 European birth cohorts within the ESCAPE Project. *Environ Health Perspect* 2014;**122**:107–13.
- 5 Nickmilder M, Carbonnelle S, Bernard A. House cleaning with chlorine bleach and the risks of allergic and respiratory diseases in children. *Pediatr Allergy Immunol* 2007;**18**:27–35.
- 6 Zock J-P, Plana E, Antó JM, et al. Domestic use of hypochlorite bleach, atopic sensitization, and respiratory symptoms in adults. *J Allergy Clin Immunol* 2009;**124**:731–8.e1.