



ELSEVIER

Contents lists available at ScienceDirect

## Preventive Medicine

journal homepage: [www.elsevier.com/locate/ypmed](http://www.elsevier.com/locate/ypmed)

## Correspondence

## Issues estimating burden of respiratory disease attributable to second-hand smoke exposure at home in children in Spain

## To the Editor

In their study, [Continente et al. \(2019\)](#) titled: “Burden of respiratory disease attributable to secondhand smoke exposure at home in children in Spain (2015)” estimated the burden of respiratory disease (asthma, otitis media (OM), and lower respiratory infections (LRI)) caused by secondhand smoke (SHS) exposure using the population attributable fraction (PAF). Prevalence of exposure was obtained from a telephone survey of 2411 Spanish households with children ranged 0 to 11 years old. The outcomes were incident and hospitalization cases of asthma, OM and LRI. The authors did not have access to raw data to estimate the risk ratio (RR) for SHS exposure. They calculated the PAF for SHS exposure based on the pooled odds ratios (ORs) reported in external meta-analyses.

In the estimation of the burden of disease section, it was indicated that population attributable fraction (PAF) of SHS exposure for incident cases and hospitalization cases were estimated using Levin's formula. In Levin's formula,  $p_e$  is the proportion of the population exposed to SHS and RR is causal risk ratio for the SHS (or odds ratio (OR) in case of uncommon outcome).

$$PAF_{Levin} = \frac{p_e(RR - 1)}{p_e(RR - 1) + 1} \quad (1)$$

However, there are several concerns in the analysis.

First, the main problem with this analysis is the inappropriate use of Levin's formula. Levin's formula is unbiased only in the absence of confounding and effect modification ([Darrow and Steenland, 2011](#); [Mansournia and Altman, 2018](#)). In observational studies that are liable to confounding, the Miettinen formula ( $PAF = p_c(RR_{adj} - 1) / RR_{adj}$ ) is appropriate for use in practice ([Mansournia and Altman, 2018](#)) where  $p_c$  is the prevalence of exposure among the cases.

Second, they incorrectly used a pooled adjusted odds ratio (OR) in place of adjusted risk ratio ( $RR_{adj}$ ) which can introduce further bias depending on the rarity of the outcomes.

Third, the pooled adjusted OR estimates derived from the meta-analyses which included cross-sectional and case-control studies are subject to several biases including reverse causality, recall bias, and residual confounding. These are other sources of biases in the reported PAF estimates.

Fourth, calculation of the burden of incident cases and hospitalization cases attributable to SHS by sex and age group using one pooled adjusted OR is improper. Exposure and outcomes must be defined si-

ilarly for PAF and odds ratio (OR) ([Flegal, 2014](#)).

In sum, we recommend using the Miettinen PAF formula for SHS exposure with acknowledgment of the biases in the estimation of the adjusted RR.

## Declarations

*Ethics approval and consent to participate*

Not applicable.

*Consent for publication*

Not applicable.

*Availability of data and material*

Not applicable.

*Competing interests*

The authors declare that they have no competing interests or financial disclosure about this publication.

*Funding*

Not applicable.

*Authors' contributions*

AKh wrote the paper and MMM revised the paper. All authors approved the final version of the paper.

*Acknowledgements*

Not applicable.

## References

- Continente, X., Arechavala, T., Fernandez, E., Perez-Rios, M., Schiaffino, A., Soriano, J.B., Lopez, M.J., 2019. Burden of respiratory disease attributable to secondhand smoke exposure at home in children in Spain (2015). *Prev. Med.* 123, 34–40. <https://doi.org/10.1016/j.ypmed.2019.02.028>.

<https://doi.org/10.1016/j.ypmed.2019.04.012>

Received 24 March 2019; Received in revised form 2 April 2019; Accepted 14 April 2019

Available online 25 April 2019

0091-7435/ © 2019 Elsevier Inc. All rights reserved.

- Darrow, L.A., Steenland, N.K., 2011. Confounding and bias in the attributable fraction. *Epidemiology* 22 (1), 53–58. <https://doi.org/10.1097/EDE.0b013e3181fce49b>.
- Flegal, K.M., 2014. Bias in calculation of attributable fractions using relative risks from nonsmokers only. *Epidemiology* 25 (6), 913–916. <https://doi.org/10.1097/ede.000000000000181>.
- Mansournia, M.A., Altman, D.G., 2018. Population attributable fraction. *BMJ* 360, k757. <https://doi.org/10.1136/bmj.k757>.

Ahmad Khosravi<sup>a</sup>, Mohammad Ali Mansournia<sup>b,\*</sup>

<sup>a</sup> *Department of Epidemiology, School of Public Health, Shahroud University of Medical Sciences, Shahroud, Iran*

<sup>b</sup> *Department of Epidemiology and Biostatistics, Tehran University of Medical Sciences, Tehran, Iran*

*E-mail address: mansournia\_ma@yahoo.com (M.A. Mansournia).*

---

\* Corresponding author.