Reviewer's report

Title: Directly measured secondhand smoke exposure and COPD health outcomes

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Reviewer: Gabriel Leung

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General
This is an important paper that addresses an urgent question vis-à-vis the impact of SHS on COPD, which is a major cause of morbidity and mortality worldwide and particularly in the rapidly developing East Asian region with over 1/5 of the global population and some of the highest smoking rates.

Outstanding strengths of the study are the detailed and specific measurement of both exposure and outcome variables a priori. Nevertheless, Table 2 begs questions regarding the validity of the different exposure measures with low kappa and correlation coefficients. Moreover, the potential strengths do not compensate for the Achilles’ heel of likely selection bias and inadequate sample size in the recruitment and follow-up, which poses a serious (probably fatal) threat to validity.

In sum, this paper could have been a worthwhile addition to the literature if it had been among the first to empirically generate the hypothesis of the detrimental prognostic effect of SHS on COPD. However, the very limited data (regardless of whatever further statistical manipulation subsequently) restrict its usefulness to confirm or refute this hypothesis that has already been posited for quite some time.

Discretionary Revisions (which are recommendations for improvement but which the author can choose to ignore)
None.

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)
1. p.4, last para “Surely the sentence “Respondents who reported asthma alone were not considered to have COPD for the purposes of this study” is a statement of the obvious that can (should?) be omitted.
2. Next sentence “what is the denominator for the “subgroup of 47 participants”?

Major Compulsory Revisions (which the author must respond to before a decision on publication can be reached)
1. Study recruitment “why were waves 3 and 4 used but not the previous 2 waves?
2. Figure “were the “new” COPD cases in successive waves mislabelled or unidentified previously or do the authors believe there were truly medically incident cases (which seems less likely to me)?
3. Notwithstanding Table 1 and p values >0.15 for the measured confounders, I am concerned about the potential selection bias where only half the non-smoking COPD cases had SHS monitoring. This needs to be more fully explained justified.
4. In addition, the final n=77 is very small and likely accounts for the inadequate power in detecting true associations where they may exist. A formal power calculation should be carried out.
5. Footnote of Table 2 “please explain why the reliability of the 3 exposure measures fare so poorly on formal statistical testing by correlation and kappa analysis? This goes to the validity of exposure measurement.
6. Table 3 “the footnote indicates n=105 whereas the title and the rest of the paper suggests n=77. Please reconcile.
7. Table 3 and associated main text “the lack of a dose response relationship (ie the middle exposure group of 1-3 hours of SHS being associated with the worst outcomes cross sectionally and prospectively) is troubling, and may have been an artefact of an inadequate sample size coupled with the distribution of misclassified self-reported exposure across tertiles, or maybe not. It is impossible to tell with the data unfortunately.

Tables 4 and 5 show that urine continine was probably the only reliable exposure measure, of the 3 that were deployed. This almost amounts to trawling the data for probabilistic associations. Moreover, the small n precluded precise estimation of any of the outcomes consistently and reliably so that the reader is left with having to take the leap of faith in terms of a priori belief and biological plausibility.
What next?: Reject because scientifically unsound

Level of interest: An article of limited interest

Quality of written English: Acceptable

Statistical review: No

Declaration of competing interests:

I declare that I have no competing interests.