Peer Review File

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Reviewer A

I thank the authors for working on this manuscript. It addresses a highly relevant and critical public health issue, the burden of lung cancer attributable to household air pollution. The use of Global Burden of Disease data and advanced modeling techniques like the Bayesian Age-Period-Cohort model for future projections is commendable.

Major comments:

The manuscript has a significant overlap with existing, recent publication by Zhou et al. (2024) which also studied the global burden of lung cancer from household fine particulate matter pollution. It would be particularly relevant for the authors to have a reasonable justification, and state the main purpose of working on the manuscript. It would be important as well to add how the knowledge from this work would add to the current existing information, and that it would warrant a separate publication.

Reply: We greatly appreciate this important observation. The study by Zhou et al. (2024), *"Global burden of lung cancer attributable to household fine particulate matter pollution in 204 countries and territories, 1990–2019"*, is indeed a highly relevant contribution to this field. We fully understand the reviewer's concern regarding potential overlap and would like to clarify the distinct scope and contribution of our work.

First, our study uses the most updated dataset from the Global Burden of Disease (GBD) 2021, covering the period 1990 to 2021, which extends the time frame beyond Zhou et al. (2024) and incorporates the effects of recent demographic and environmental shifts. Second, in addition to reporting global, regional, and national trends, we conducted age-period-cohort (APC) analyses and applied a Bayesian age-period-cohort (BAPC) model to project the burden of tracheal, bronchus, and lung (TBL) cancers attributable to household air pollution (HAP) over the next 30 years. These advanced modeling approaches provide deeper insights into the independent effects of age, period, and cohort, as well as robust forecasts of future trends, analyses that were not presented in Zhou et al. (2024). Third, while Zhou et al. primarily focused on fine particulate matter, our study evaluates the broader spectrum of HAP exposure, thereby offering a more comprehensive perspective on risk attribution.

Taken together, our manuscript differs from Zhou et al. (2024) in time span, updated data sources, methodological framework, depth of stratified analyses, and provision of practical policy implications. We therefore believe our findings make a novel and timely contribution, warranting independent publication.

Minor comments:

Under Methods Section:

1. The sentences seem to inappropriately cite references 8, 9, 10 and 11.

Reply: Thank you for pointing this out. We have carefully reviewed and corrected the citations. References 8 and 9 appropriately describe the Global Burden of Disease (GBD) framework and the derivation of disability-adjusted life years (DALYs). To further strengthen clarity, we have added a new reference (PMID: 39290907), which provides a detailed methodological description of DALY estimation, including the modeling of incidence, survival, and disability weights across different disease phases.

Regarding references 10 and 11, they indeed define the socio-demographic index (SDI). To ensure methodological accuracy, we also added a recent reference (PMID: 38642570), which elaborates on the SDI's construction as the geometric mean of per capita income, educational attainment, and fertility rates among women under 25, rescaled between 0 (lowest development) and 1 (highest development).

2. Line 97 sentence mentioning NCI network tool cites reference 13 which seems to be inappropriate.

Reply: Thanks. We appreciate the reviewer's careful attention. We agree that the original citation was not appropriate for describing the Bayesian age-period-cohort (BAPC) model. We have replaced it with a more relevant source (PMID: 39416384), which provides a comprehensive account of the BAPC framework. Specifically, it describes how the model integrates dynamic age, period, and cohort effects using second-order random walks for smoothing, and how it employs integrated nested Laplace approximation (INLA) to efficiently estimate posterior distributions. This substitution ensures methodological accuracy and improves the transparency of our analysis.

Reviewer B

It has been an honour for me to review your manuscript on the trend of household air pollution and its burden on lung cancer. This study addresses a critical public health issue that is often overlooked in developing countries. The manuscript is well-written; however, I have a few comments:

1. Line 31: Please remove "and" before "cancers,"

   Reply: We appreciate this observation. After careful consideration, we have decided to retain "and cancers," because it is part of the established terminology "tracheal, bronchial, and lung cancer", which is widely used in medical literature (e.g., PMID: 40763413; PMID: 39979494). In the GBD 2021 framework, this term corresponds to malignant neoplasms of the trachea, bronchus, and lungs (ICD-10 codes C33–C34). Thus, we believe that keeping "and" maintains terminological accuracy and consistency with authoritative sources.

2. Line 55: Use the past tense: "this study used."

   Reply: Thanks. We have revised the sentence to the past tense:

   "This study used data from the Global Burden of Disease (GBD) 2021 to assess the global burden of TBL cancer from HAP between 1990 and 2021." (**Line: 64**)

3. The introduction covers key elements, but it would be beneficial to add a few sentences acknowledging the interventions by international agencies aimed at curbing cancer, as well as the relevance of this study to the Sustainable Development Goals 2030.

   Reply: Thanks. We agree with this important suggestion. We have added sentences in the Introduction to acknowledge international interventions and emphasize the relevance of our work to the Sustainable Development Goals (SDGs):

   International efforts spearheaded by agencies such as the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have been implemented to reduce HAP exposure and improve household air quality. These initiatives include worldwide programs promoting the adoption of clean energy and advanced cookstove technologies, which are designed to curb the use of solid fuels and mitigate associated health risks. Such interventions are vital for attaining the health-oriented objectives of the 2030 Sustainable Development Goals (SDGs), especially SDG 3 (to ensure healthy lives and promote well-being for all at all ages) and SDG 7 (to ensure access to affordable, reliable, sustainable, and modern energy). Achieving progress in these areas is crucial for alleviating the global disease burden related to HAP and enhancing overall quality of life. (**Line: 53-63**)

4. Lines 216-220: It is important to acknowledge that there are numerous pollutants (e.g., smoking) and to discuss the role of ventilation in reducing the concentration of various indoor pollutants.

Reply: Thanks. We appreciate this valuable suggestion. The Discussion section has been revised to acknowledge the multi-factorial nature of indoor air pollution and to highlight the importance of ventilation:

"Importantly, indoor air quality in these regions is shaped not only by fuel combustion but also by additional sources of pollution, such as tobacco smoking, which further compound overall exposure and health risks. Moreover, inadequate household ventilation exacerbates the accumulation of multiple pollutants, intensifying harmful emissions and worsening respiratory health outcomes. Effective interventions must therefore adopt an integrated approach that simultaneously addresses cleaner fuel adoption, ventilation improvements, and broader household air quality management." **(Line: 231-237)**

5. Given the threat posed by indoor pollutants, it would be advantageous to include practical recommendations that the general public could implement to minimize the risk of cancer associated with poor air quality.

Reply: Thanks. We agree that providing practical recommendations enhances the applicability of our findings. In the revised Discussion, we have added a new paragraph highlighting feasible measures that households can adopt:

"In addition to policy-level interventions, household-level actions are critical in reducing HAP-related cancer risks. Transitioning from solid fuels to cleaner energy sources such as liquefied petroleum gas, electricity, or biogas is the most effective measure. Improving ventilation through chimneys, exhaust fans, or semi-open cooking arrangements can substantially reduce indoor pollutant accumulation. Avoiding additional sources of combustion, such as indoor smoking and incense burning, further decreases overall exposure. Regular maintenance of cooking and ventilation equipment is also important, and raising awareness of the health risks of HAP, particularly among women and children, who bear the greatest exposure, can promote sustainable behavioral changes. Collectively, these strategies are relatively low-cost, feasible, and aligned with WHO guidelines, thereby complementing structural clean energy policies and accelerating reductions in HAP-related cancer burden." (Line:306-322)

This manuscript is worthy of consideration for publication, provided that the above comments are addressed.