Research Findings

Although the point estimates of the meta-coefficients in the subgroups of primary, secondary, and tertiary education showed increased risk, the meta-analysis results did not indicate any statistically significant difference in the size of the relative risk (RR) for all-cause mortality in relation to $PM_{2.5}$ by individual-level education (Figure 3). The risk estimates were alsoare similar not statistically significantly different when comparing income in quintiles 2, 3, 4, and 5 with quintile 1. The RRs adjusted for both individual lifestyle factors (such as smoking, alcohol intake, physical activity, diet, and body mass index) and SES were not significantly different when compared to those adjusted for SES factors only. Even if we observed generally higher air pollution concentrations among lower SES groups, there was no difference of long-term $PM_{2.5}$ exposure on mortality across the strata of SES indicators (income and education).

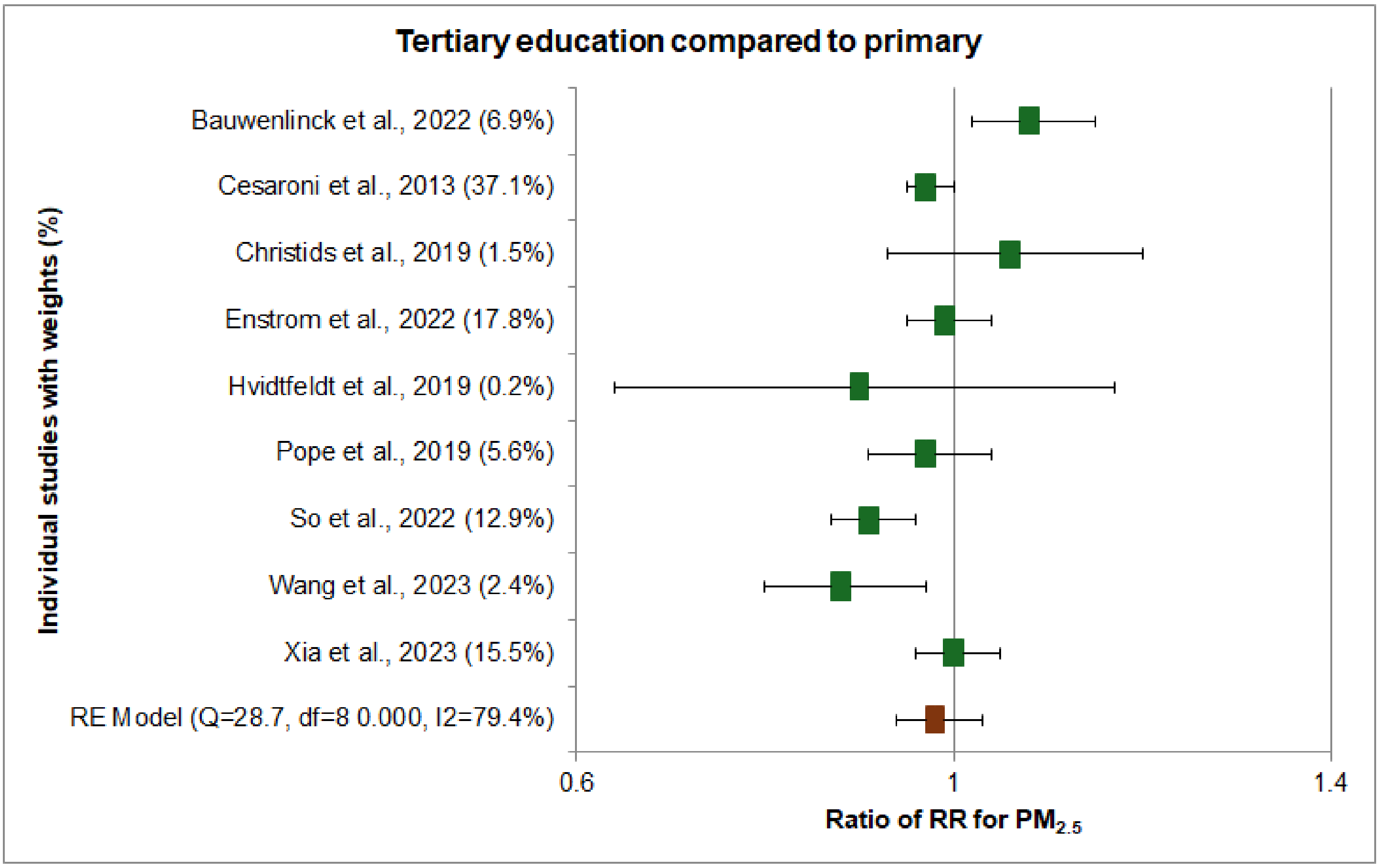

Figure 3. Modification of the association between fine particles ($PM_{2.5}$) and total mortality by level of education.The forest plot indicates the ratio of the RR for mortality in relation to $PM_{2.5}$ in groups with higher versus primary education.

Results in the HIA context

An important question in the context of air pollution exposure, SES, and their impact on health is to what extent differential exposure and differential susceptibility to air pollution among lower SES groups are relevant for conducting health impact assessments (HIAs). HIA itself is a decision-making tool that studies how factors, policies, decisions etc may impact health and well-being. As RRs for all-cause mortality associated with $PM_{2.5}$ did not depend on education or individual income, the same RRs can be applied in health impact assessment despite the SES status. The variations in health impacts among different SES groups will be driven by differences in exposure and by differences in mortality rates.

Policy Implications

Healthcare Access and Social Support: Improve healthcare and social services in underserved areas to combat air pollution's health effects. Expand coverage, enhance preventative care, and tackle social factors like poverty and housing instability. Invest in community health programs for better outcomes.

Equity-Centric Policy Formulation: Prioritize fairness and community involvement in air quality policy. Create regulations that address vulnerable populations' needs and distribute environmental benefits fairly.

Community-Centered Approaches: Support communities advocating for clean air by partnering with government, organizations, and academia. Offer education, monitoring tools, and engagement platforms for active participation in decision-making.

Targeted Pollution Reduction Strategies: Implement tailored measures to reduce pollution in heavily affected areas. Regulate emissions from industries and traffic, while investing in clean energy and sustainable transportation. Prioritize environmental justice for effective interventions.

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