



PM_{2.5}-Attributable Mortality Burden Variability by Exposure Model and Hazard Ratio



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Background

Epidemiologic studies of mortality attributable to long-term PM_{2.5} mortality using a variety of exposure estimation approaches consistently show positive, but variable, hazard ratios (HRs). This analysis explores how the estimated number of PM_{2.5}-related deaths calculated in a risk assessment can vary according to both the exposure model and HR.

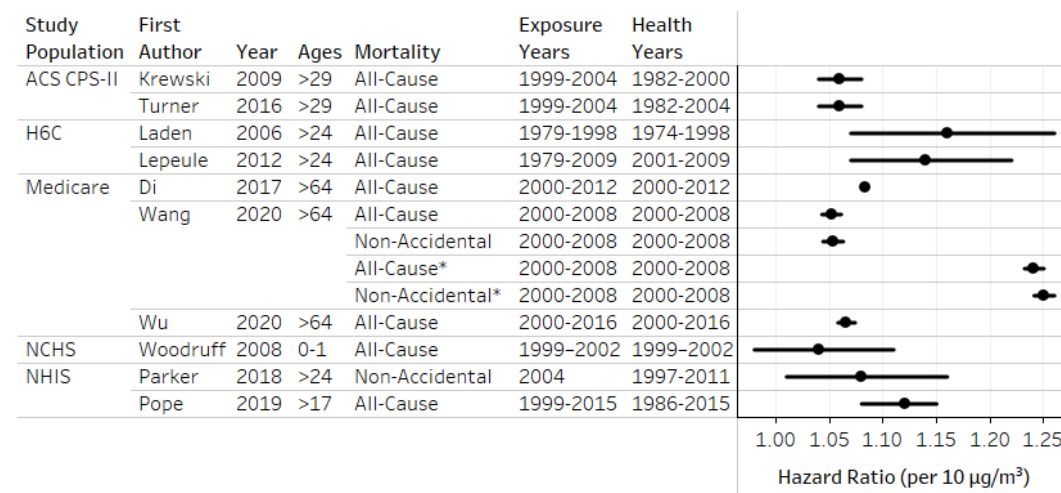
Methods

Exposure Models

- Di 2016
- Di 2019
- Downscaler
- eVNA
- Hu 2017
- VD 2019
- VNA
- CAMx*
- CMAQ*

*CAMx and CMAQ results are shown for context only as they are photochemical air quality models that were not calibrated with observations and are used as inputs to other exposure model

Epidemiologic HRs



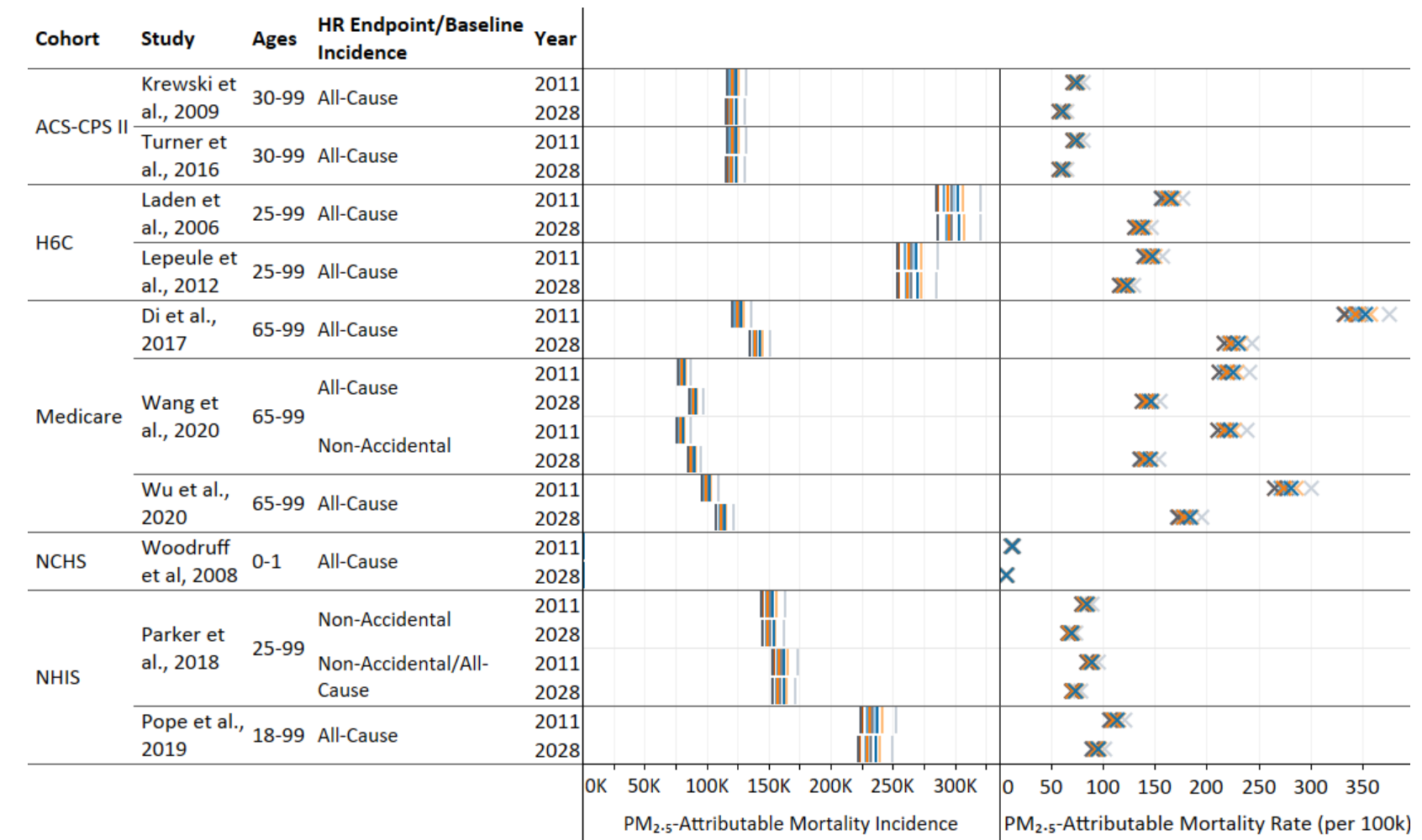
*No adjustment for socioeconomic status (SES), included as a comparison with exposure-stratified HRs that do not include SES adjustment.

Conclusions

- Unstratified PM_{2.5}-attributable mortality burden incidence estimates vary by up to 4-fold and rate estimates by over 6-fold, with HRs contributing more variability than exposure models.
- Race- and/or ethnicity-stratified mortality burden estimates fall within the range of the reference HRs, although interestingly, incidence estimates in the future year were larger than the respective unstratified mortality burden incidence estimates, likely due to increasing proportions of people/communities of color. In contrast, racial/ethnic-stratified rate estimates were more similar to reference rates in both the past and future years and more clearly reflect the predicted decrease in future PM_{2.5} levels.
- Exposure-stratified HRs led to both the largest and smallest mortality burden estimates, with HRs split by thresholds mostly leading to higher estimates and sublinear curve HRs leading to smaller estimates.

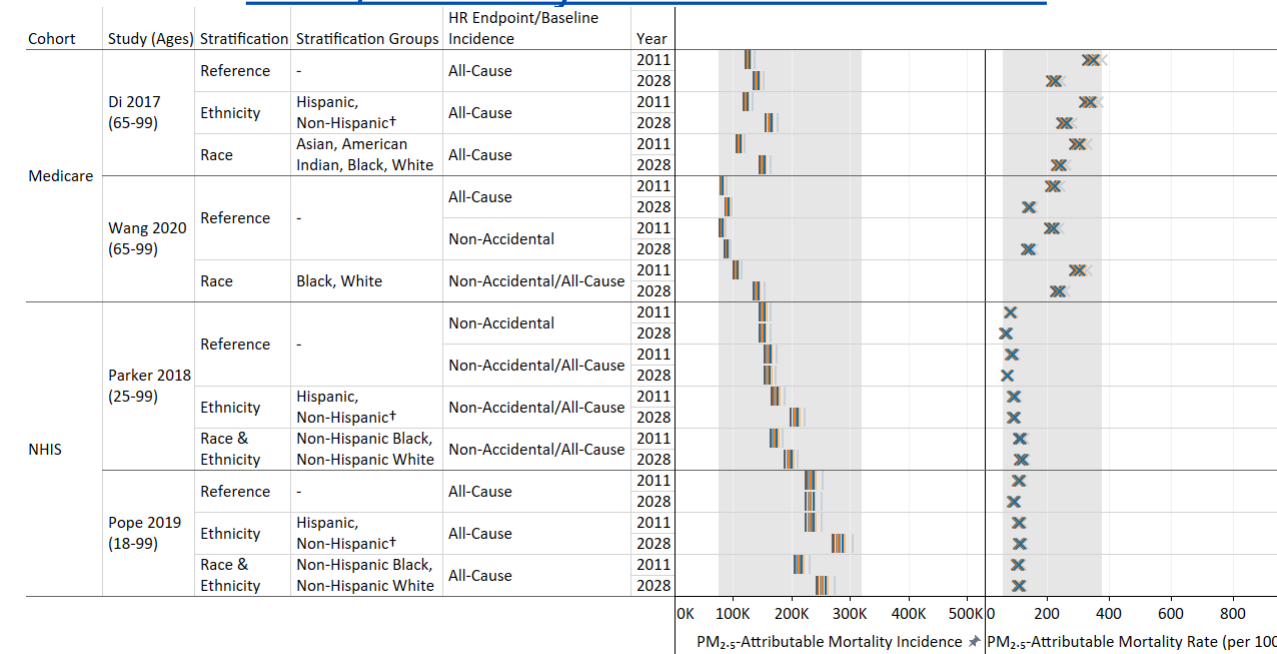
Results

Unstratified Mortality Burden Incidence and Rate Estimates

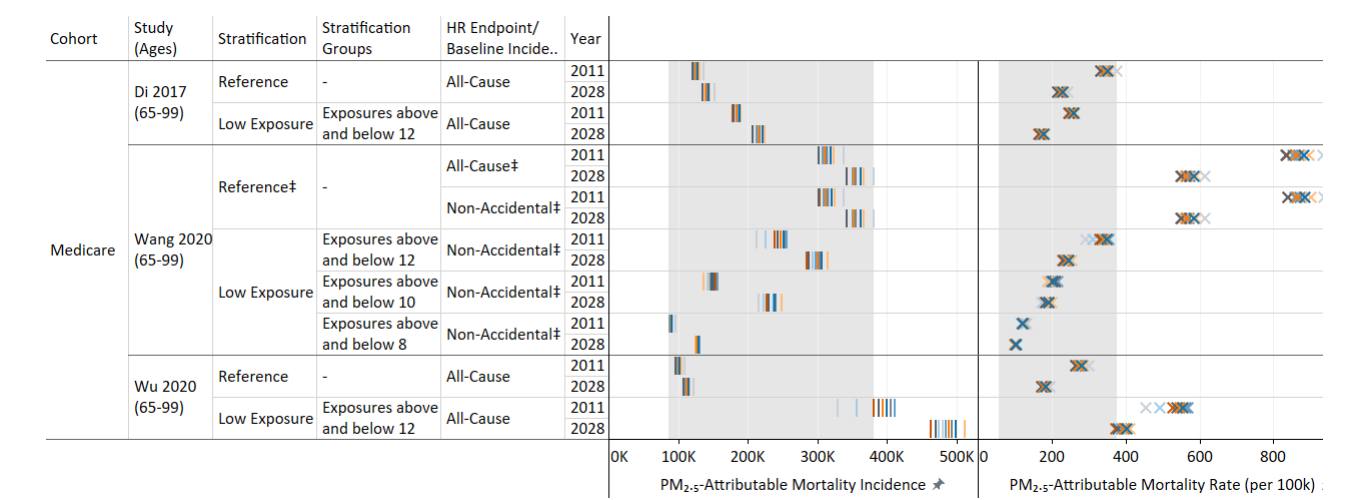


ACS CPS-II: American Cancer Society Cancer Prevention Study II, H6C: Harvard Six Cities study, NHIS: National Health Interview Survey, NCHS: National Center for Health Statistics

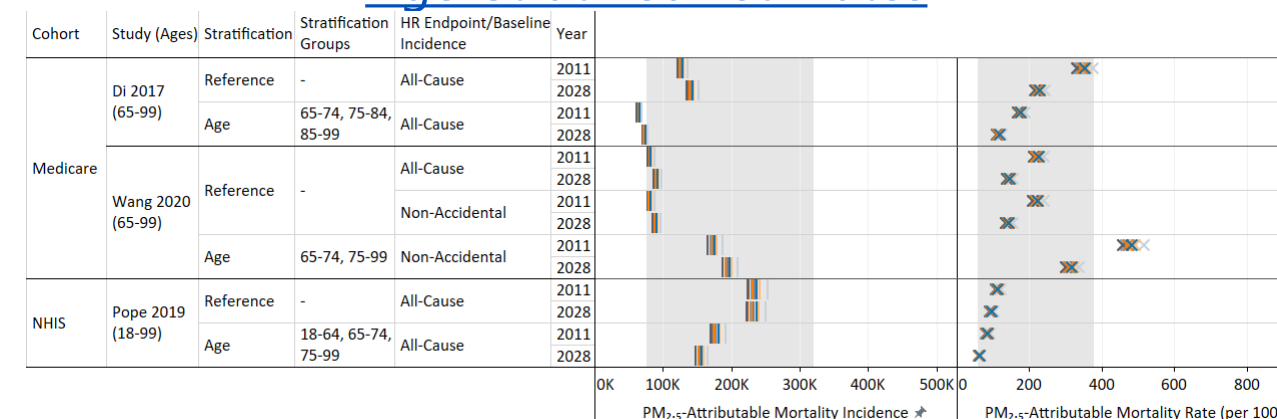
Race/Ethnicity-Stratified Estimates



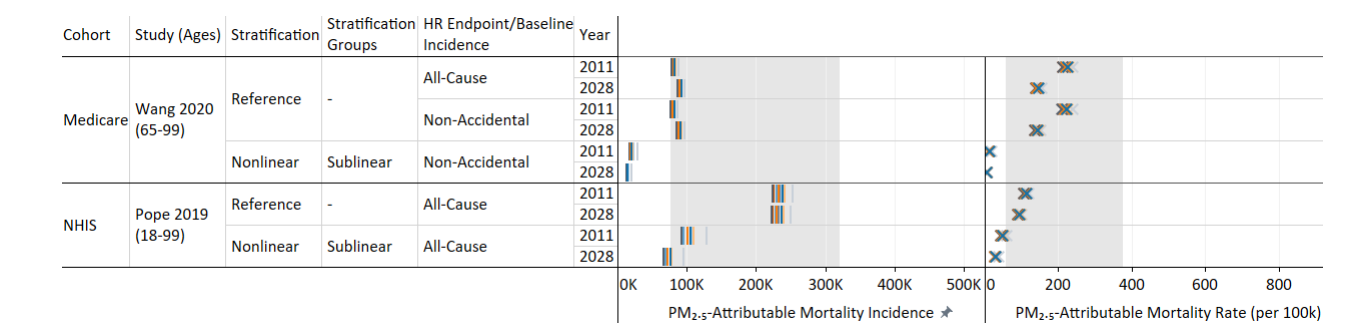
Exposure-Stratified Estimates



Age-Stratified Estimates



Nonlinear Estimates



Shaded bands show the range of unstratified mortality estimates from the top figure.
 † Non-Hispanic-specific HR not provided by study, so the overall HR was applied to the non-Hispanic population.
 ‡ No SES adjustment.

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