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BG1.2
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Future fire impact on PM2.5 pollution and attributable mortality

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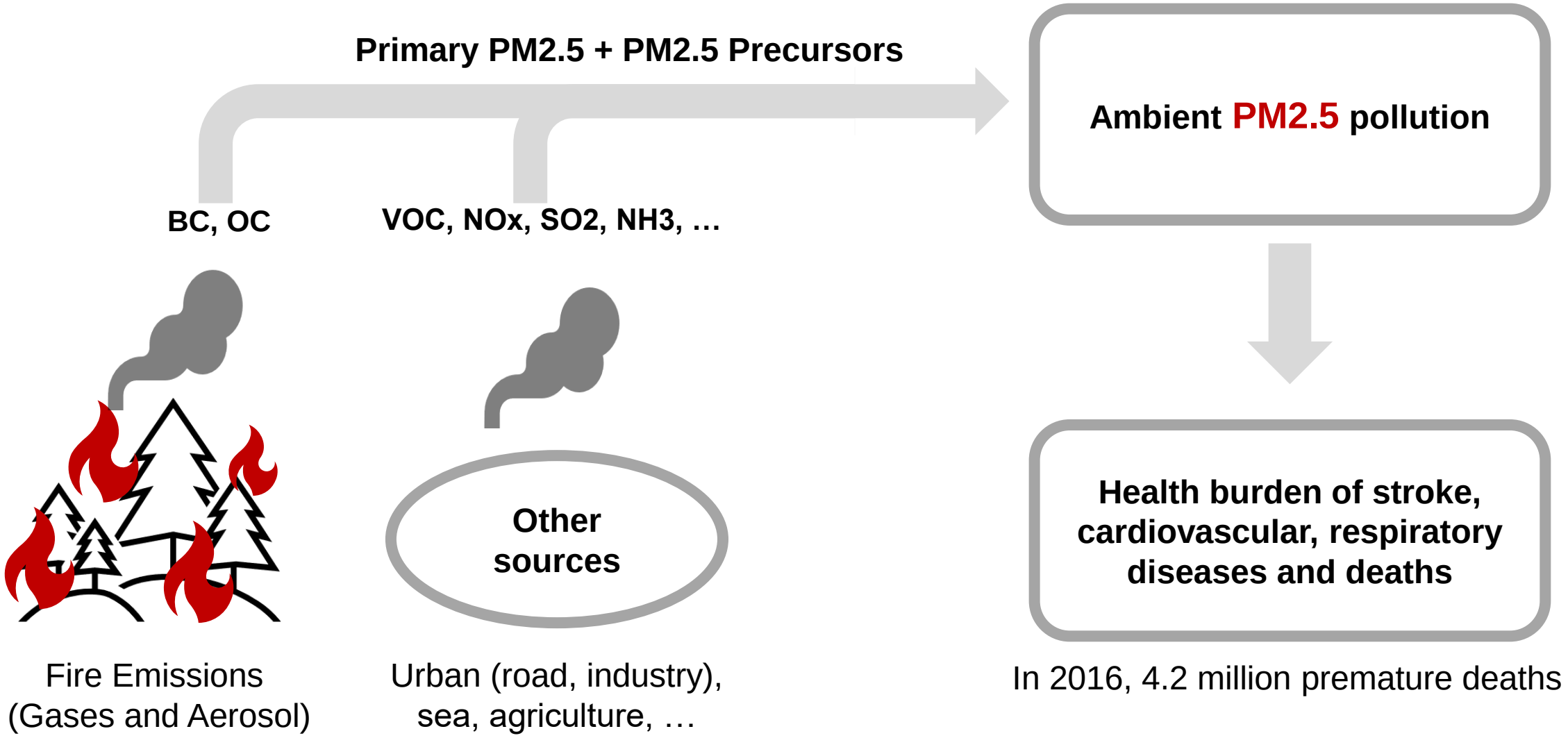
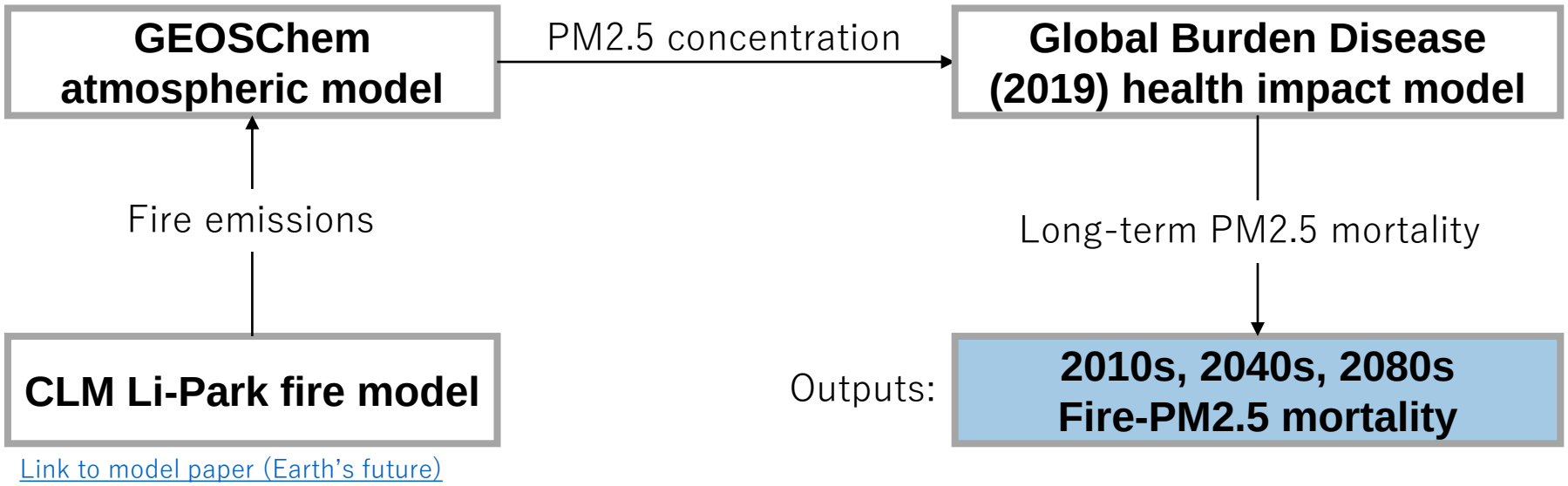
Background


Primary PM2.5 + PM2.5 Precursors
Ambient PM2.5 pollution
BC, OC
VOC, NOx, SO2, NH3, …
Other sources
Health burden of stroke, cardiovascular, respiratory diseases and deaths
Fire Emissions (Gases and Aerosol)
Urban (road, industry), sea, agriculture, …
In 2016, 4.2 million premature deaths

Research question & Methods

Q. How many PM2.5 mortality is attributed to Fire?
Q. How does it differ spatially (by country)?
Q. How will it change in the future (under diverse SSP-RCP scenarios)?

- Use three global scale models:

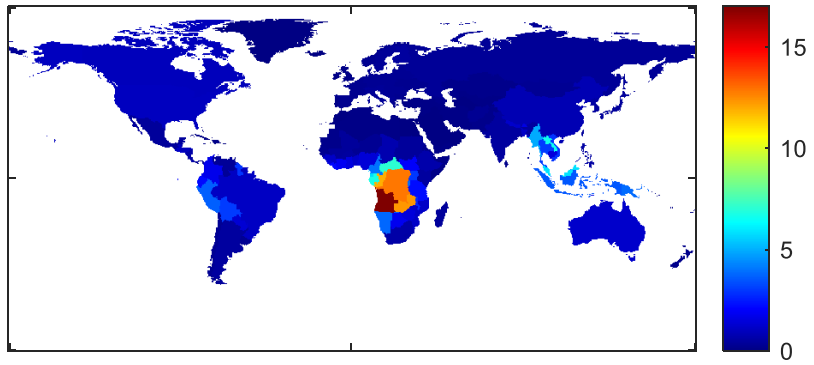


Link to model paper (Earth's future)

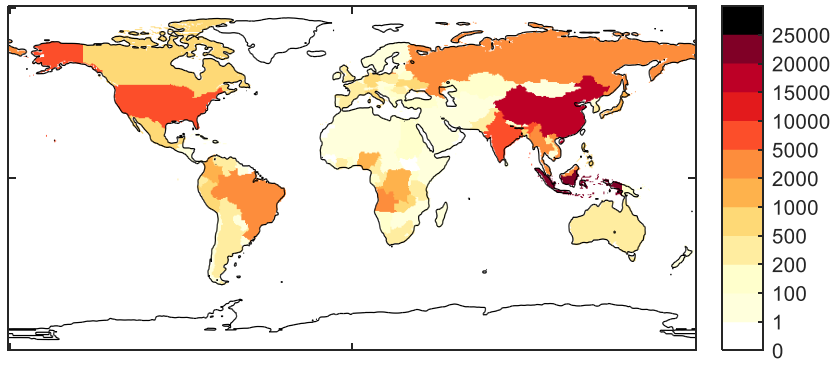
- Future scenarios: *SSP 1, 2, 3, 4, 5 X *RCP 2.6, 6.0 (with two Global Climate Models)
  Fix other emissions and atmospheric variables to year 2016
  - SSP: shared socioeconomic pathway (ssp1: equal and sustainable develop, ssp3: high pop growth, ssp5: fossil-fuel intensive consumption)
  - RCP: representative concentration pathway (RCP 2.6: below 2 ℃ warming, RCP 6.0: above 2 ℃ warming with high possibility)

Results 1. Fire-PM2.5 mortality in 2010s

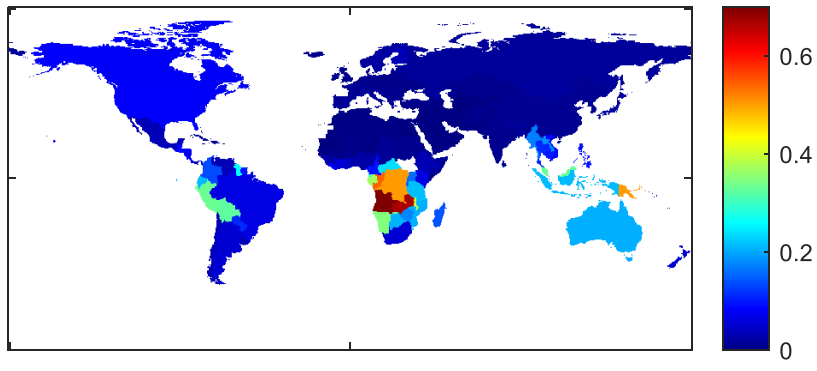
Population weighted Fire-PM2.5 mass $(\mu g/m^3)$

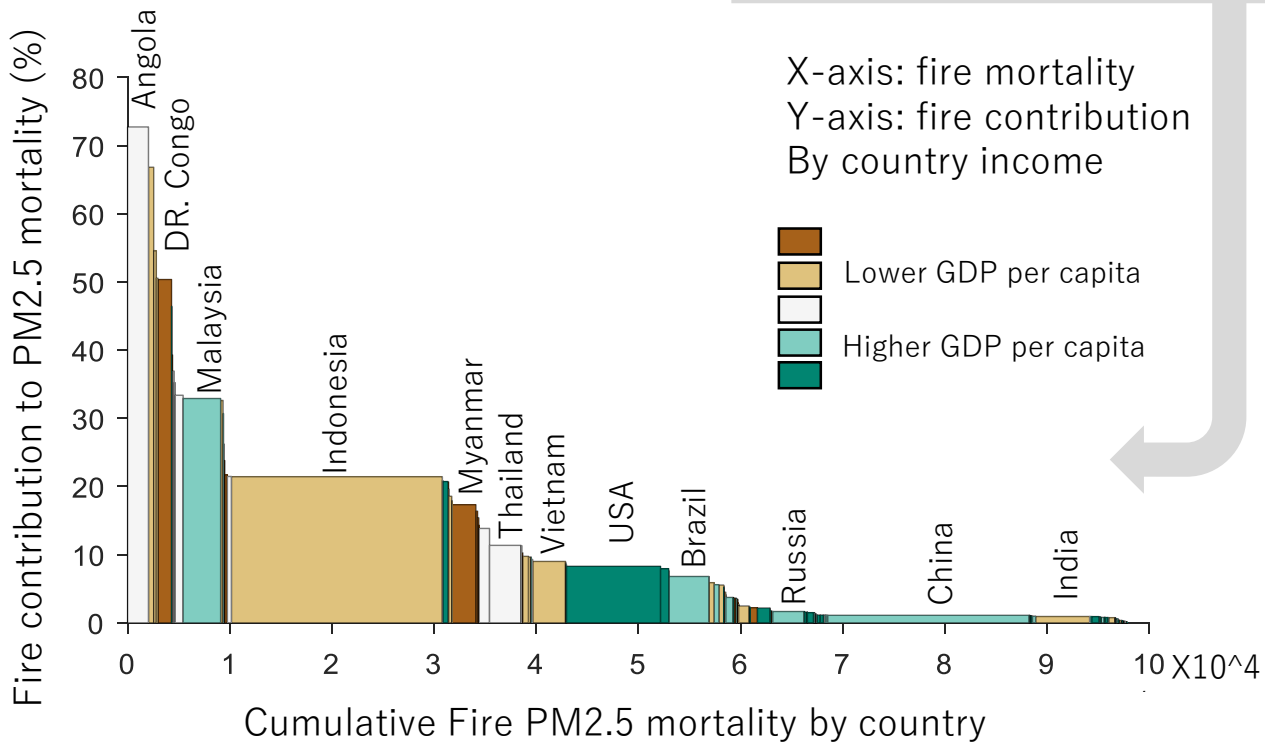


Fire-PM2.5 attributable mortality



Fire contribution to PM2.5 mortality





X-axis: fire mortality
Y-axis: fire contribution
By country income

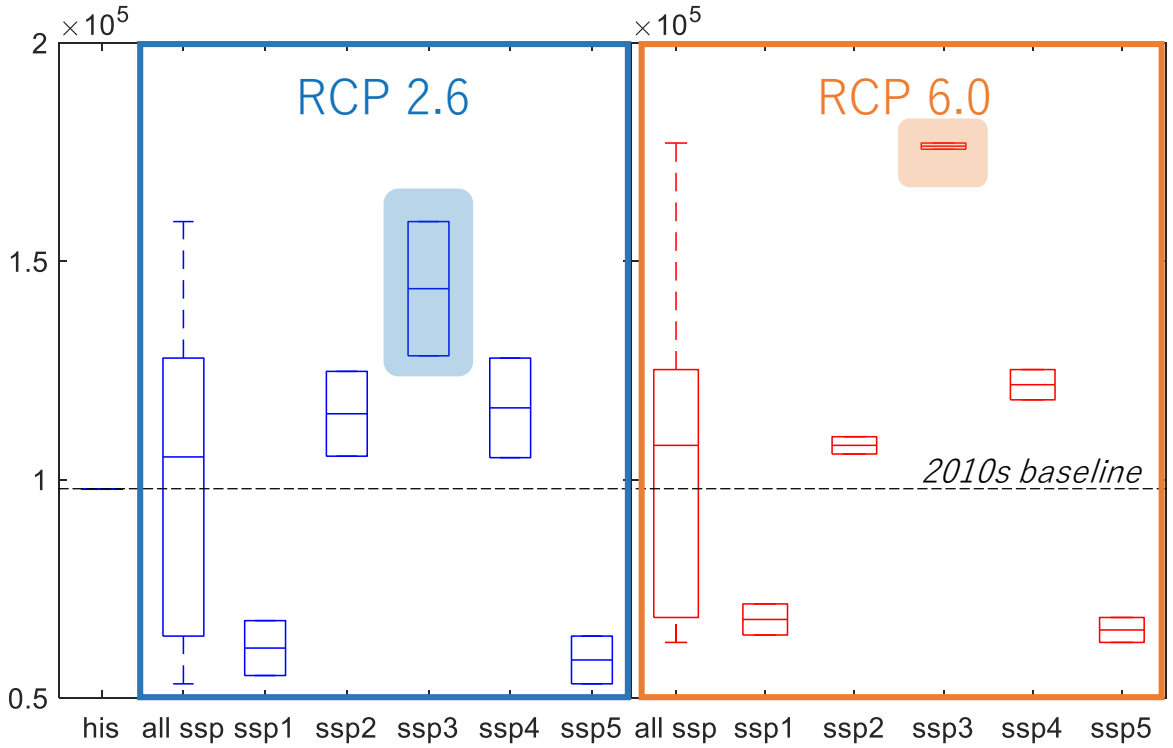
Lower GDP per capita

Higher GDP per capita

- **Fire PM2.5 attributes 97,834 deaths** (2.4% of all-source PM2.5 mortality).
- Some African countries has more than 50% contribution of fire.
- Except for USA and Malaysia, fire mortality is more focused on lower income countries (**higher in tropical region**)

Results 2. Future changes

Total Fire PM2.5 mortality in 2090s



By SSPs (range: two GCMs)

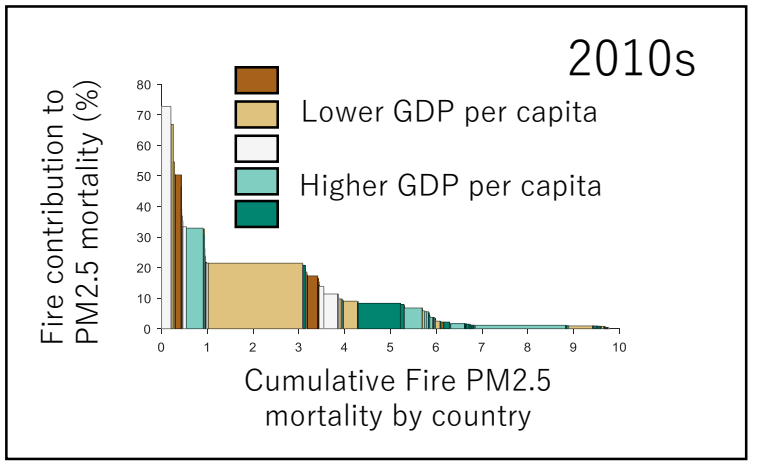
- **Future mortality** differs depending on by **climate change**, **socioeconomic change**

- SSP3: high population increase
- RCP6.0 > RCP2.6: → increase fires in boreal forest, tropical peat fires.
  SSP3-6.0 has **32,640 more mortality** than SSP3-2.6.

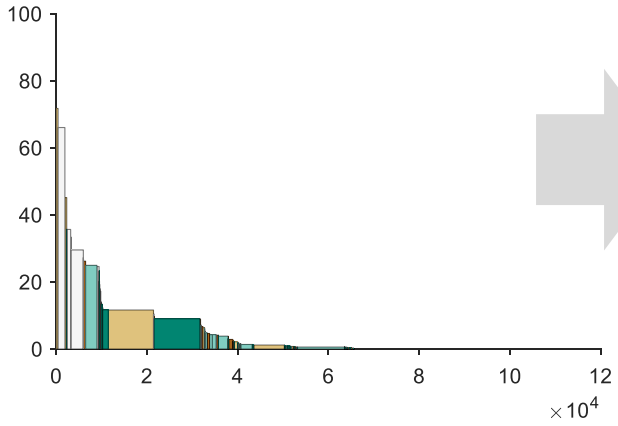
Results 2. Future changes

Fire contribution changes by country in 2090s

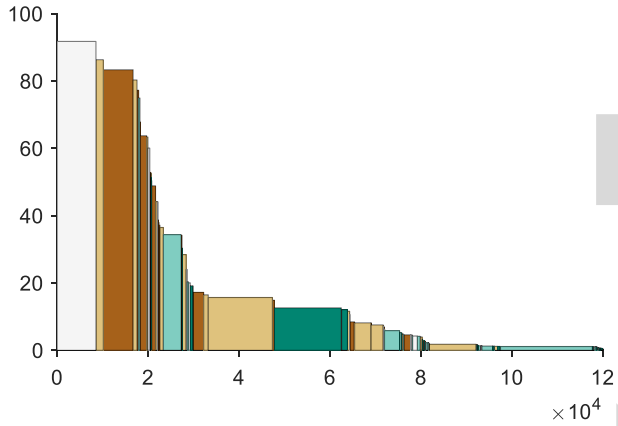
- The fire attributed mortality on low-income countries will increase Under **SSP4 (unequal development), RCP 2.6 (less increase in USA)**



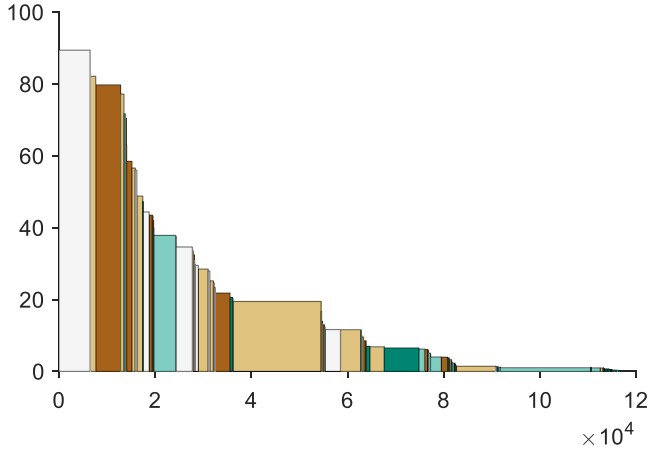
SSP5-6.0



SSP4-6.0



SSP4-**2.6**



The area of brown color increases

Summary of findings

Key finding

- 97,834 fire PM2.5 mortality was calculated for 2010s based on GBD 2019 method.
- Fire contribution in PM2.5 mortality is higher in tropical region.
- Future fire PM2.5 mortality may be largest under SSP3-6.0.
- Lower income countries will have higher fire contribution under SSP4 and RCP2.6.

Plan

- Quantifying the effects of climate change on fire-mortality focusing on the historical period (1900s-2010s) based on ISIMIP3a (welcome your contribution! Please contact me)

Thank you for listening !

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