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Inequality in the exposure to air pollution and temperature through the century

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Air quality and surface temperature exert significant influences on human health. However, the impact of air pollution and non-optimal temperature is not uniformly experienced across the population. In this study, we employ the "Gini" coefficient, a commonly used concept in economics. While traditionally applied to represent wealth inequality, we adapt this coefficient to gauge spatial inequality in population exposure to air pollutants and temperature, irrespective of the economic income of the population. As pollution and temperature are dynamic and subject to change in the future due to varying climate change and socioeconomic scenarios, our analysis extends to potential scenarios projected by the Coupled Model Intercomparison Project (CMIP6). We show changes of the Gini coefficient both at global, regional and country scale for the present century (2000-2100) covered by the model simulations. Our findings indicate that at global level, air quality inequality has peaked around the present time, with a trend towards decreasing inequality in most projections, reaching a minimum by the end of the century. Conversely, temperature exposure inequality will fluctuate based on the scenario, primarily showing an increasing inequality trend over time in alignment with anticipated climate change impacts. Importantly, the Gini coefficient estimation provides a complementary view to air quality and climate change assessment, indicating exposure disparities among the population in a specific region. Our study shows the unequal distribution of air quality and temperature exposure among populations, emphasizing the need for targeted interventions and policies to address these disparities, especially considering the projected changes in climate and socioeconomic factors.