The intersection of public Health and climate governance; a brief data-driven investigation

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https://github.com/OmdGPersia/Climate-Governance-and-Public-Health

1. Introduction

Climate policies prioritize environmental sustainability but may also be influenced by health concerns from environmental degradation. Air pollution represents a critical public health issue, causing millions of premature deaths annually (WHO, 2023). Climate change worsens air pollution through multiple pathways: increased desert dust, more frequent wildfires, accelerated ozone formation, and altered atmospheric patterns trapping pollutants. These changes create a feedback loop where climate policy becomes increasingly relevant to public health. However, how health data shapes and affects climate governance remains underexplored.

Despite growing recognition of health co-benefits from climate change mitigation, a significant research gap exists in understanding how these benefits influence policy development. Studies in Australia and the EU reveal very limited integration of health considerations into climate policies, while comprehensive research on how air pollution health data shapes climate governance remains notably scarce.

This short data-driven study examines how public health burdens influence climate policymaking at regional and global scales, investigating whether worsening health crises catalyse stronger environmental regulations or if political and economic constraints hinder policy adjustments. Rather than evaluating policy effectiveness in reducing emissions, we analyse whether variations in health data—particularly air pollution-related mortality and damages—correlate with shifts in climate policymaking. Our model positions climate policy indices as independent variables and health outcomes as dependent variables to determine if regions with higher pollution-related health burdens exhibit stronger climate policy responses or if policy stagnation persists despite escalating health crises.

2. Material and Methods

The study integrates two primary datasets to explore the relationship between climate governance and public health. The first is the Climate Change Laws of the World (CCLW) database from the Grantham Research Institute at the London School of Economics. The second is World Bank global health indicators. The construction of policy indices was informed by the CCLW dataset, with a systematic analysis of policy documents across global jurisdictions. The study extracted multidimensional policy characteristics, including policy types, sectoral coverage, mitigation and adaptation strategies, and recent policy developments. To enhance methodological rigor, multiple AI language models were consulted to validate policy indicator distributions, with the justification documented in the justification report. Normalization through z-score transformation standardized indicators, thereby enabling meaningful cross-country comparisons.

Health impact assessment leveraged World Bank and WHO metrics focusing on air pollution and mortality. Indicators included death rates from household and ambient air pollution, mean annual pollution exposure, $PM_{2.5}$ levels, and age-standardized mortality rates. These metrics underwent comprehensive normalization to create a composite health index capturing environmental health burdens. The analytical approach employed a fixed-effects panel data model, which controls for unobserved country-specific and temporal characteristics. This

method allows examination of how health impacts correlate with climate policy responsiveness. Two-way fixed effects were incorporated to account for both region variations and temporal trends. A regional dimension was introduced to explore geographical variations in the health-policy relationship. Countries were categorized into regions, with interaction models developed to investigate how regional contexts might modulate environmental health governance responses. Visualization techniques, including region-specific scatter plots, provided intuitive representations of these complex interactions.

3. Results and Discussions

The analysis revealed a nuanced and complex relationship between health impacts and climate policy responses across different global regions. The fixed-effects panel data model indicated a statistically significant (p-value < 0.05) negative correlation between health and policy indices when accounting the factors geography and regions. However, this relationship was not significant at the global level, suggesting that increased health burdens do not necessarily lead to more robust climate policies.

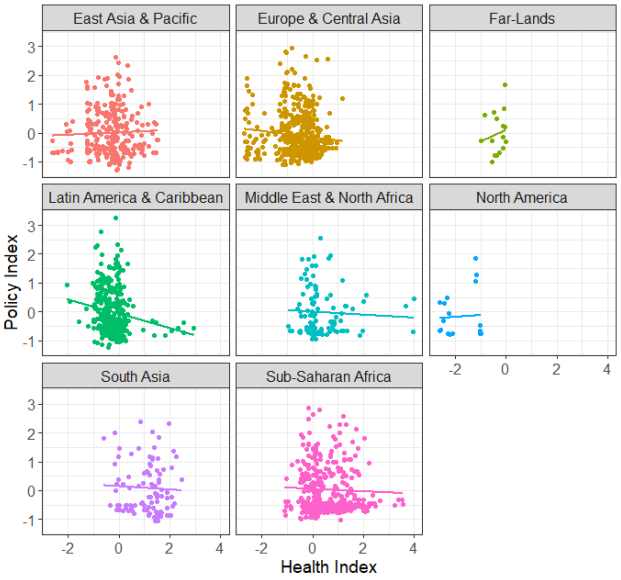

Figure 1. Relationship between the policy and health indices by region.

The regional visualization (Figure 1) uncovered distinct patterns of interaction. Regions like East Asia & Pacific and Europe & Central Asia displayed more consistent policy approaches, while Latin America & Caribbean and Sub-Saharan Africa showed greater variability in policy responses. This non-uniform relationship indicates that contextual factors such as economic development, political systems, and institutional capacity significantly influence climate policy formation, beyond direct health impact considerations. The unexpected inverse correlation challenges simplistic assumptions about how environmental health challenges drive policy development, highlighting the need for more sophisticated understanding of global climate governance mechanisms.

4. Implications for Public and Political Engagement with Climate and Health

This brief study highlights the complexity of integrating public health considerations into climate policy. The findings suggest that regional political, economic, and institutional contexts significantly shape policy responses, challenging the assumption that worsening health crises automatically drive stronger climate governance. While some regions demonstrate a clearer link between public health burdens and policy actions, others exhibit policy stagnation despite escalating health risks.

These insights underscore the need for region-specific policy strategies rather than uniform global approaches. Future research should incorporate additional factors such as per capita greenhouse gas emissions, renewable energy adoption, and socioeconomic variables to develop a more comprehensive framework for analysing climate-health governance. Enhanced metrics and interdisciplinary methodologies could provide deeper insights into how public and political engagement with climate change and health can drive more effective, responsive policymaking.