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The Climate Conflict Health Nexus: An Evidence-Based Inquiry into Interactions, Mechanisms, and Policy Implications

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ABSTRACT

The complex interactions among climate change, conflict, and human health represent an emerging frontier of global risk analysis. This inquiry synthesizes evidence on the mechanisms through which climate variability influences population health, how conflict mediates and amplifies these impacts, and why vulnerabilities remain deeply unequal across regions and social groups. Drawing from climate indicators, conflict datasets, and health-systems evidence particularly within low- and middle-income countries, the study maps multiple pathways linking climate drivers to health outcomes, including extreme temperatures, precipitation variability, and climate-induced shocks. It highlights how conflict disrupts governance, weakens adaptive capacity, accelerates displacement, and exacerbates social and economic inequalities, thereby intensifying climate-related health burdens. Regional case studies from Europe, MENA, West Africa, and South Asia illustrate diverse manifestations of this nexus and expose persistent data gaps, methodological constraints, and context-specific dynamics. Policy analysis identifies critical imperatives for integrating climate considerations into conflict prevention, health-system planning, migration management, and natural-resource governance. Overall, the review underscores the need for equitable adaptation strategies, coordinated governance frameworks, and sustained research investments to address the intertwined challenges of climate risk, violent conflict, and population health.

Keywords: Climate conflict health nexus, Vulnerability and adaptation, Climate-related health impacts, Governance and resilience and Climate security and policy.

INTRODUCTION

Climate change poses unprecedented risks to human health. These risks are likely to be most severe in countries already experiencing intergroup conflict, and where adaptations, such as improvements in housing and health-care access, cannot keep pace with climate impacts [1]. Such concerns underscore the need for an improved understanding of climate conflict health relationships, particularly in research-poor environments [3]. Climate impacts that operate through changes in temperature, precipitation, and extreme weather events are expected to influence health through multiple pathways [4]. Implications are differential across countries, socioeconomic groups, age-and-gender categories, and urban versus rural settings; the unequal distribution of climate impacts between groups can, in turn, exacerbate conflict and its health-wide consequences [3]. The research questions framing the inquiry thus include the nature and extent of climate-induced health effects, the role of inequalities in such exposures, and the mechanisms through which conflict transmits and amplifies climate-driven threats to health [2]. Understanding not only direct health effects but also the conditioned and triggered health effects of climate underlines the complexity of climate conflict health interactions and the challenge of identifying effective and equitable policy responses to changes in climate, society, or both. Relevant policy instruments include the need to decouple long-term climate shocks from short-term conflict recovery and reconstruction, and the desirability of much improved representation of climate within conflict prevention initiatives [2]. Attempts to predict, map, or impose national adaptation needs following a climate shock are also likely to prove highly problematic, and the premature projection of additional climate conflict exposure and vulnerability, needing careful review, could undermine good adaptation planning. Social movement theory points to the potential for policy implementation in

the absence of large-scale research and data collection efforts [3]. This combination of assets or determinants relevant to the climate conflict health nexus as a whole can guide a preferred selection of countries for initial in-depth treatment of climate conflict health effects [1].

Conceptual Framework

Climate change means there is a constant increase in global temperatures and greater variability in weather and climate patterns. Conflict and violence have many definitions and components [5]. Health is often defined in terms of simple morbidity and mortality from any disturbance, or systems of health care or nursing, and health education systems. Interaction and feedback among drivers and demographic components stimulate and shape human action. Historical climate and conflict interactions suggest pathways for contemporary analysis [6].

Climate Drivers and Human Health Outcomes

Climate change can exert a myriad of health influences on human societies, especially in the low- and middle-income countries (LMICs) that figure largest in climate conflict models [3]. Because of the continuous movement of some of the very first climate–conflict studies in only a few low-income countries toward LMICs more broadly, a reliance on raw, mainly temperature-related, climate indicators has become narrower 2 than for climate alone. Climate change interacts with several health pressures, notably economic and demographic, while affected countries of varying income greatly differ in the scope and type of climate damages they face [3]. Nevertheless, a detailed-scale country-by-country study of health outcomes for all LMICs has not appeared. Accessible data exists for an extensive array of indicators covering governance, economic activity, social issues, infrastructure, and demography [4]. Thus, the requisite backdrop for probing health impacts from climate drivers in LMICs is there, even if specific household surveys, such as the World Health Organization's, are absent for some countries since the period of first exposure to climate change also deviates among the many countries [6]. Health impacts come through temperature, change in precipitation, and extreme climate events have similarities with the evolution of climate variables over time. The Julian day of first exposure to climate drivers to climate change elaborates a systematic climate history. Integrated assessments of regional and national Gini coefficients of income distribution identify the relation between health and economic pressures [4].

Unequal Exposure, Vulnerability, and Adaptation

Climate change, conflict, and health are intrinsically intertwined at local, regional, and global levels, with empirical evidence documenting interactions across multiple pathways. Climate acts as an amplifier of health impacts in contexts affected by conflict [4]. In these environments, vulnerability increases due to weakened socio-political structures, disrupted systems, and diminished capacity to anticipate or respond to shocks. First-order climate-related health risks in conflict-affected areas originate predominantly from extreme temperature change and variability, and precipitation change and variability [5]. Hence, investigating the climate conflict health nexus demands careful examination of exposure, sensitivity, and adaptive capacity to climate drivers and stressors. Defining and assessing these attributes, particularly in areas encountering varying combinations of climate-related hazards and human-made tensions, constitutes an urgent yet underexplored research priority [2]. Indicators derived from formalized frameworks identify and characterize the unequal exposure and vulnerability to climate-related hazards of individuals, communities, and nations. Comparative analyses illuminate key trends, offer insights into underlying factors contributing to differential experience of climate risks, and point toward strategic areas for targeted intervention and inquiry to mitigate ever-expanding climate threats [6]. Disparities in exposure arise predominantly along enduring socio-economic and geographic cleavages, compounded by socially constructed inequities of gender and age, and are further exacerbated by inadequate governance [5]. Vulnerabilities intrinsic to underserved groups and geographies likewise intensify through market mechanisms operating at various scales, including the global economy, urban property, and commodity-linked resources. Indirect hazards can play new and expansive roles in wide-ranging contexts [5]. Resilience to climate-related stressors and perturbations remains low in locations experiencing high exposure to both climate and conflict, and dependent on multiple determinants from national wealth to social integration and political accountability [2].

Conflict as a Mediator and Amplifier of Health Impacts

Climate change and conflict affect human health globally. This section examines how conflict mediates and amplifies health impacts by disrupting livelihoods and social institutions [4]. Climate change and conflict substantially affect population health. Health can be defined broadly to encompass physical and mental well-being, as well as access to services, which are considered dimensions of health in the 2030 Agenda for Sustainable Development. Population-level health is of central importance, as opposed to individual well-being [4]. The relationship varies by context; for example, evidence of substantial health burdens from climate change or conflict is lacking in several post-conflict settings, such as Israel and Kosovo [3]. Conflict can exert a negative influence on health without being a direct cause of death or injury. Low levels of conflict can coincide with large climate-related health impacts, such as in regions where extreme temperatures are projected to increase significantly [3]. Broad or narrowly focused characterizations of climate change can produce similar results [3]. The well-being of

society often depends more on governance quality than on control of violent conflict. Hence the link between conflict and health is not straightforward [4]. Conflicts arising from climate change can remain latent in some stable regimes, hindered by factors including economic development, collective social investment in physical and human capital, social cohesiveness, media independence, civil and political rights, and decommodification of essential needs [6]. Governance indicators that characterize these factors can be employed to evaluate the progression from climate impacts to chronic stress and escalation into violent conflict [5]. Availability of high-resolution peer-reviewed models of projected climate impacts assists in determining regions where climate change is expected to exert stress and, subsequently, where potential temperature rises are substantial. Official statistics, adapted health-related guidelines, and selected datasets describing the household and commercial energy sectors enable assessment of changes in the population exposed to heat and related health burdens [6]. The monitoring of epidemiological diseases and infection rates has developed considerably through satellite weather imagery for the dengue fever virus, where climate and hydrological anomalies provide links to satellite-driven physical, biological, and social models [4]. Climate-related disruptions, displacements, and the failure of the governance system at the point level of the society system may lead to new migration pathways and the emergence of other zoonotic viruses as a result of the global movement of social contact of the society system [5]. Nevertheless, the influence of climate on such migration flows and the prospective emergence of viruses under changed climate conditions remain largely uncharted. Climate change affects population health through various mechanisms, yet knowledge of which pathways predominate in different regions and climates is limited [3]. Furthermore, research fails to differentiate between health threats depending on climate exposure and the concurrent stresses exerted by violent conflict a significant omission given the implications for risk reduction [2]. Four principal mechanisms link climate change and disturbance or escalation of conflict: grievances driven by expected losses, favourable opportunities to resist or rebel, aggravation of underlying social fault lines without corresponding adjustments in the broader political or governance framework, and desensitization to altercation or discord. Grievance-driven mechanisms are expected to feature most heavily in more developed regions, including across Europe [1]. Climate itself might not exert a direct influence on health, a possibility suggested by observations of populations under extreme climate conditions where vaccination and other social conditions are established [2]. Nevertheless, one of the world's major cities is developing a resolution-oriented healthcare agenda to mitigate acute negative health impacts on continuous and post-conflict societies. Social declines, deprivation, and infrastructure loss may accelerate during warmer epochs, intensifying the repercussions of hot-dry shocks on population health [5]. Population databases tracking multiple socio-cultural-economic-political variables and climate datasets that include anthropogenic climate or other exertions that increase temperature above specific degrees would aid exploration of feedback loops between population collapse, recovery through internal governance, and societal performance under climate restrictions. Climate change has been observed to aggravate the health impacts of four interconnected stressors that correlate with social resilience and are often cited in the context of different aggregate data econometric studies of conflict: food prices, energy prices, poverty, and deviations from normal temperatures [6]. Population growth compounds a major governance stress, whereas demographic shifts from young to aging populations might be expected to enhance resilience.

Case Studies: Regional Perspectives on Climate, Conflict, and Health

Climate pressures, conflict dynamics, and health-system responses vary substantially across different regions. This section presents four case studies from the Third Intergovernmental Panel on Climate Change (IPCC) Assessment Report regions, Europe, the Middle East and North Africa (MENA), West Africa, and South Asia, to highlight these contrasts [6]. The selection emphasizes regions with predictive/attributable human health datasets, although useful studies exist for other zones, including China, Latin America, and the Russian Federation [5]. Each case draws on publicly available national- and subnational-level data from the Global Climate Health Atlas, together with country or regional information from secondary literature, reports, or online databases. Such contextual data illuminate factors influencing specific climate conflict health linkages, including climate-sensitivity models, secondary pressures, non-climatic determinants, political settings, and the presence or absence of other stressors such as COVID-19[4]. The European region includes 46 parties to the Convention on Long-range Transboundary Air Pollution and/or is covered by the World Health Organization's European Region and is thus defined by two criteria rather than one. Modelling predicts an increase in compounded climate hazards, suggesting a higher incidence of droughts, floods, heavy precipitation, heatwaves, wildfires, wind storms, and landslides [5]. Climate records indicate an increase in temperature and precipitation during the Twentieth Century [1]. The European Union and the European Environment Agency have published widespread indicators on health and climate hazards, but progress on assessing climate's influence on conflict remains tentative.

Methodological Approaches for Studying the Nexus

Approaches for examining the climate conflict health nexus cluster into two primary categories: quantitative and qualitative methods [1]. To scrutinize the nexus with the utmost rigor, a quantitative design using spatial data to

analyze correlations between climate shocks, conflict incidence, and changes in health metrics worldwide is paired with a qualitative design to probe contexts and mechanisms of interest, using comparisons between war-torn and peaceful countries or between conflict and nonconflict zones within individual countries [4]. While systems-level models can enrich the analysis, they are eschewed for now, given complexity, uncertainty surrounding content and parameters, and substantial data requirements, all of which render preliminary empirical exploration challenging. Instead, the analysis draws on openly available datasets: gridded climate variables (temperature, precipitation, shocks), geolocated conflict events, and health metrics (death rates, health-service availability) compiled at unit (country, subnational) and time (annual, decadal) resolutions [3]. Contemporaneous approaches blend spatially oriented quantitative assessments and qualitative studies engendered by specific thematic or geo-spatial foci [3]. The deterministic nature of models emphasizing direct interactions and simple delayed effects, effect variables unequivocally influenced by causative agents prompt the current combination of correlation and context [3]. In contrast, climate factors have yet to emerge as central variables featured in most climate conflict research, paralleling the climate health relationship [5].

Policy Implications for Health Security and Conflict Prevention

The relationship between climate and health is a fundamental issue of human existence. Climate affects human survival through heat, cold, water, food, air, and other biophysical factors. When these factors become extreme or change, they affect the health of societies and countries, leading to more disease, disability, and death [6]. The importance of climate as a driver of human health and health systems is overlooked in the development arena, resulting in their marginalization in the global climate agenda [5]. Effective policy considerations for managing the interactions among climate change, conflict, and health include recognizing population displacement and the need to integrate displaced people from rural areas and across borders into urban settings. Marginalized groups should also be prioritized by social safety-net support and social welfare strategies [5]. Climate-driven conflicts over assets, services, and resources should be managed by improving control, cooperation, and management, as is already done for population movement [6] Natural resource management, including soil, forest, water, and pasture management, has to proceed continuously and should be in its own right a priority policy because of the intrinsic ethical and human rights value of improved natural resource management and protected natural resources. Environmental cooperation building could be promoted through an initiative addressing shared surface water and plotting available resources for surplus and deficit regions [3]. The current speed of climate change requires completely new approaches to manage climate-driven movements coinciding with already-existing movements driven by other factors, such as violence, conflicts, shocks, and disasters, and to manage refugees transiting from neighboring countries or disaster zones. An integrated approach to climate-related displacement and migration could serve as the basis for a climate change measure [6]. The interactions among climate, conflict, and health depend on institutional systems and governance mechanisms in place beforehand that allow for or prevent the amplifying or mediating effects of conflict [4]. Governments and agencies working on peace and conflict issues should increase their understanding of how climate variables can be a significant driver of intensified risks, particularly in countries and subnational regions with low resilience capacity, and take appropriate actions to support decision-making on these interactions within the climate agenda [1].

Gaps in Knowledge and Future Research Directions

The interplay between climate variability and conflict processes, and the concomitant consequences for human health, provides rich terrain for future investigation [5]. Although the evidence-base establishes a compelling case for systematic exploration of the connections, especially the mediating and amplifying role of conflict, many uncertainties remain. Fundamental aspects of the complex links between climate variability, conflict, and health, particularly in different geographic contexts, have only received limited attention or systematic analysis [6]. Accordingly, future research should address the questions outlined in the second section and investigate a series of additional issues, in combination or separately, including, but not necessarily limited to the following: What forms do climate-conflict interactions take? Under what conditions and through what mechanisms do climatic variations influence peace and security? [5-10]Which human-system factors or processes undergird climate-conflict relationships? How are climate and conflict connected, directly or indirectly, to broader human-societal vulnerabilities, fragilities, and risks? How do the diverse pathways and processes involved change, depending on the regions or countries considered, or on the prevailing nature of climate variability, state and societal sophistication, prosperity levels, or other contextual characteristics? How do climate-change scenarios and associated immediate or projected socio-economic threats influence climate-conflict health risk linkages? [5, 1].

CONCLUSION

The evidence presented in this review demonstrates that the climate–conflict–health nexus is neither linear nor uniform; rather, it is shaped by overlapping vulnerabilities, institutional capacities, socio-economic inequalities, and localized climate pressures. Climate change alone rarely produces conflict or direct health crises, but when combined with weak governance, fragile institutions, or existing social fault lines, it amplifies risks across entire

societies. Conflict acts as a powerful mediator, eroding health systems, undermining social cohesion, disrupting livelihoods, and reducing the ability of households and states to anticipate, absorb, and recover from climate shocks. These compound stresses generate disproportionate impacts on marginalized communities, whose exposure and sensitivity are heightened by structural inequities. Case studies across Europe, MENA, West Africa, and South Asia reveal wide regional variation yet share a common pattern: climate stressors interact with local political and socio-economic contexts to produce complex health consequences. Despite growing interest, significant methodological and data gaps persist, particularly regarding multi-pathway interactions, long-term health burdens, and the influence of governance quality on climate-conflict dynamics. Policy responses must therefore be multidimensional. Integrating climate risk into peacebuilding, strengthening adaptive capacity, improving natural resource governance, and expanding social protection systems are critical steps for reducing vulnerability. Equally important is the design of equitable, context-specific adaptation strategies that avoid reinforcing existing inequalities. Enhanced collaboration between climate scientists, health authorities, conflict-prevention actors, and policymakers is essential to guide evidence-based interventions. Ultimately, achieving health security in a warming world requires reimagined governance structures, strengthened data systems, and sustained global commitment to managing the intertwined pressures of climate change and conflict. Without such integrated approaches, climate-driven health risks will continue to escalate, disproportionately affecting the world's most vulnerable populations.

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