

Climate-Health Challenges and Cerebrospinal Meningitis (CSM) Resilience in Ghana

Summary

Cerebrospinal meningitis (CSM) remains one of the most climate-sensitive and epidemic-prone diseases affecting northern Ghana, particularly the Upper West Region. Climate variability, including rising temperatures, prolonged dry seasons, low humidity, and dust-laden Harmattan winds, continues to increase outbreak risk and threatens public health security. Recent trends suggest that climate change is expanding meningitis risk zones and increasing outbreak frequency. Although Ghana has made progress in outbreak response and vaccination campaigns, current interventions remain largely reactive rather than predictive. Strengthening climate-informed surveillance, resilient health systems, preventive vaccination, and community preparedness is therefore critical. This policy brief outlines the key climate-health risks associated with CSM and provides strategic policy recommendations aimed at prevention, rapid response, and long-term resilience building.

Introduction

Cerebrospinal meningitis is an inflammation of the membranes surrounding the brain and spinal cord, caused mainly by bacterial infections such as *Neisseria meningitidis*, *Haemophilus influenzae type b*, and *Streptococcus pneumoniae*. Northern Ghana lies within Africa’s “meningitis belt,” making regions such as the Upper West Region particularly vulnerable to recurrent outbreaks. Environmental and climatic conditions during the Harmattan season significantly contribute to disease transmission. Key risk factors identified include:

- Rising temperatures and extreme heat;
 - Dry and dusty Harmattan winds;
 - Low humidity;
 - Poor ventilation and overcrowded housing;
- Dust exposure in markets and roads;
 - Population movement and cross-border migration;
 - Low vaccination coverage.

Historical trends presented during the dialogue indicate recurring outbreaks with varying mortality rates in both Ghana and the Upper West Region between 2010 and 2025.

Dialogue Key Policy Issues

1. **Climate Change and Increasing CSM Vulnerability:** Climate change is intensifying environmental conditions that favour the transmission of meningitis. Longer dry seasons, increasing temperatures, and changing weather patterns are contributing to the persistence and expansion of outbreaks. Without climate-responsive interventions, vulnerable communities may continue to experience repeated outbreaks and avoidable deaths.

2. **Weak Climate-Informed Surveillance Systems:** Although disease surveillance systems exist, there is limited integration of meteorological data into routine outbreak monitoring and preparedness planning. Early warning systems that can predict outbreaks before thresholds are reached remain underdeveloped.
3. **Inadequate Preparedness and Health System Capacity:** Many high-risk districts continue to face shortages of essential logistics, laboratory capacity, trained personnel, and emergency preparedness systems during outbreak periods. Delays in case detection and response increase mortality risks.

4. **Limited Community Awareness and Preventive Behaviour:** Public understanding of climate-sensitive health risks remains limited in some communities. Poor ventilation, overcrowding, delayed healthcare seeking, and exposure to dust continue to contribute to transmission.

5. **Weak Cross-Sector Coordination:** Climate-health challenges require coordinated action between the health, meteorological, environmental, housing, and local government sectors. Existing collaboration mechanisms remain insufficient for sustained climate-health resilience planning.



Policy Recommendations***Strengthen Climate-Informed Surveillance and Early Warning Systems***

- Integrate climate and meteorological data into disease surveillance platforms such as SORMAS.
- Develop predictive early warning systems to identify outbreak risks before peak transmission periods.
- Improve geospatial mapping and hotspot identification in vulnerable districts.

Improve Vaccination and Preventive Health Measures

- Strengthen routine immunization and preventive vaccination campaigns in high-risk districts.
- Ensure adequate stockpiling and equitable distribution of multivalent meningitis vaccines.
- Conduct seasonal vaccination drives ahead of the Harmattan period.

Enhance Outbreak Preparedness and Emergency Response

- Preposition essential supplies, antibiotics, and lumbar puncture kits in vulnerable districts before the dry season.
- Strengthen laboratory systems for rapid confirmation and serogroup identification.
- Activate district and regional Public Health Emergency Operations Centres (PHEOCs) during high-risk periods.
- Improve cross-border disease surveillance and emergency coordination.

Promote Community Awareness and Climate-Sensitive Risk Communication

- Intensify public education on overcrowding, ventilation, dust exposure, and early healthcare seeking.
- Use local radio stations, traditional leaders, and community health volunteers to disseminate climate-health messages.
- Encourage behavioural adaptations that reduce exposure to heat and dust.

Build Climate-Resilient Health Systems

- Integrate climate risks into national and regional health planning frameworks.
- Upgrade health facilities with improved ventilation and climate-resilient infrastructure.
- Train health workers in climate-sensitive disease surveillance and response.
- Strengthen partnerships between the health, meteorological, housing, and environmental sectors.

Support Research and Sustainable Financing

- Invest in operational research on climate-CSM dynamics in northern Ghana.
- Support data-driven decision-making through predictive modelling and climate-health analytics.
- Mobilize sustainable financing through partnerships with climate and global health agencies.

Call-to-Action Matrix

Priority Area	Recommended Action	Lead Institutions	Timeline	Expected Outcome
Climate Surveillance	Integrate meteorological data into disease surveillance systems	Ghana Health Service, Ghana Meteorological Agency	Immediate-Medium Term	Early outbreak detection
Vaccination	Expand preventive vaccination campaigns in high-risk districts	Ghana Health Service, Ministry of Health	Immediate-Continuous	Reduced infection and mortality
Emergency Preparedness	Preposition medical supplies; strengthen lab systems	Regional Health Directorates, District Assemblies	Short Term	Faster outbreak response

Call-to-Action Matrix

Priority Area	Recommended Action	Lead Institutions	Timeline	Expected Outcome
Community Engagement	Scale up public education and climate-health communication	Information Services Dept., Community Leaders	Continuous	Increased preventive behaviour
Health System Resilience	Upgrade health infrastructure and workforce capacity	Ministry of Health, Development Partners	Medium–Long Term	Stronger climate-resilient systems
Research & Innovation	Support climate-health research and predictive modelling	Universities, Research Institutions	Continuous	Evidence-based policy planning
Cross-Sector Collaboration	Establish coordinated climate-health response frameworks	NDPC, Ministries, Local Governments	Continuous	Integrated climate-health governance

Conclusions

- Climate change is increasingly shaping the epidemiology of cerebrospinal meningitis in Ghana, particularly in the northern ecological zones.
- The recurring outbreaks in the Upper West Region demonstrate the urgent need to transition from reactive outbreak management to preventive, climate-informed, and resilience-based approaches.
- Strengthening surveillance systems, improving vaccination coverage, investing in resilient health infrastructure, and enhancing community preparedness are essential to reducing the burden of CSM and protecting vulnerable populations.
- A coordinated national response that integrates climate action with public health planning is no longer optional; it is essential for safeguarding lives, strengthening resilience, and ensuring sustainable development.

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