INT'L JOURNAL OF RESEARCH EDUCATORS AND SCIENTIFIC DEVELOPMENT
(ISSN) Print: 2992-5665 and Online: 2992-5673
Impact Factor: 5.5 || https://www.ijresd.net
Vol 7 Issue 2. Jan, 2025

PUBLIC HEALTH IMPLICATIONS OF INTERNAL CLIMATE-INDUCED MIGRATION: TRACKING DISEASE PATTERNS IN IDP SETTLEMENTS IN NORTHERN NIGERIA.

Ochechi Joseph Ugbede[1], Dr Okolo Petronilla Nnenna[2], Dr Dennis Iyidiobi Ochiaka[3], Eze, Priscilla Ifeyinwa[4], Dr Ogbuyeme Jennifer Ngozika[5], Atuchi Nneka Modester[6], Nwachukwu Matthew Chinwemadu[7], Offor Eusebius Chinedu[8]

1 Department of Public Health, Sciences Faculty of Allied Health State University of Medical and Applied Sciences, Enugu, Nigeria - joseph.ochechi@sumas.edu.ng

2 Faculty Of Nursing Sciences, Department Of Public/ Community Health Nursing, David Umahi Federal University Of Health Sciences, Uburu- Ebonyi State - petnnenna@gmail.com

3 Department of Public Health, Charisma University, Turks and Caicos Islands, British West Indies - dennisochiaka@gmail.com

4 Department of Health care Administration and Hospital management, State university of Medical and Applied Sciences Igbo_ Eno.Enugu- Priscilla.eze@sumas.edu.ng

5 .Department of Public Health, Charisma University, Turks and Caicos Islands, British West Indies – jeny1way@gmail.com

6 University Of Sunderland Uk - atuchimodester@yahoo.com

7 Department of Environmental Health Science, Faculty of Health Sciences and Technology Nnamdi Azikiwe University, Awka – mc.nwachukwu@unizik.edu.ng

8 Godfrey Okoye University,Enugu - offorchinedu2@gmail.com

Abstract

Climate change has emerged as a critical driver of internal migration, particularly in Northern Nigeria where environmental stressors such as drought, desertification, and flooding have led to a significant rise in displaced populations. This study explores the public health implications of

internal climate-induced migration by tracking disease patterns in Internally Displaced Persons (IDP) settlements across Borno, Yobe, and Adamawa States. Adopting a mixed-methods approach, the research utilized surveys, key informant interviews, and focus group discussions to collect data from 400 respondents, including IDPs and health officials. Results indicate high prevalence rates of malaria (75.5%), diarrhea (62%), and respiratory infections (51.3%), largely due to poor sanitation, overcrowding, and inadequate healthcare infrastructure. Statistical analysis revealed significant associations between sanitation access and disease incidence, while qualitative findings highlighted challenges in disease surveillance and public health response. The study concludes that climate-induced migration significantly amplifies health vulnerabilities in IDP settlements and calls for integrated WASH interventions, strengthened surveillance systems, and sustainable healthcare solutions. These findings offer actionable insights for policymakers and humanitarian actors aiming to build climate-resilient health systems in displacement-affected regions.

Keywords: Climate change, internal displacement, IDP settlements, disease patterns, public health, Northern Nigeria, sanitation, disease surveillance, malaria, climate-induced migration, WASH infrastructure.

Introduction

Climate change has emerged as a critical driver of human displacement, with internal migration increasingly observed in regions severely impacted by environmental stressors. Northern Nigeria, in particular, has witnessed a significant rise in internally displaced persons (IDPs) due to climate-induced challenges such as desertification, droughts, and flooding (IOM, 2023). These environmental disruptions not only displace populations but also contribute to deteriorating health outcomes in temporary settlements, where infrastructure and healthcare systems are often overwhelmed or non-existent (WHO, 2022).

IDP camps in Northern Nigeria face a complex public health landscape characterized by overcrowding, poor sanitation, limited access to clean water, and inadequate medical services. These conditions create a fertile ground for the spread of communicable diseases such as cholera, malaria, and respiratory infections, alongside emerging concerns related to mental health and non-communicable diseases (UNHCR, 2023; Abubakar et al., 2022). Moreover, the mobility patterns of displaced populations complicate disease surveillance and response, posing additional challenges for public health planning and intervention (NCDC, 2023).

Research has shown that climate-induced displacement disrupts traditional disease control systems, amplifies vulnerabilities, and shifts disease patterns in unpredictable ways (Zhou et al., 2023). In Northern Nigeria, tracking these epidemiological changes is crucial to developing targeted interventions that can mitigate the health impacts of displacement and build resilience among affected populations.

This study seeks to examine the public health implications of internal climate-induced migration by tracking disease patterns in IDP settlements in Northern Nigeria. Through this investigation, the research aims to provide evidence-based recommendations for policymakers, humanitarian organizations, and public health agencies to improve health outcomes in these vulnerable communities.

2. Problem Statement

In recent years, the frequency and intensity of climate-related disasters such as droughts, floods, and desertification have significantly increased in Nigeria, particularly in the northern regions. These climate events have displaced thousands of individuals, forcing them to migrate internally and settle in informal and under-resourced Internally Displaced Persons (IDP) camps (Olanrewaju et al., 2021). The sudden influx of displaced persons into limited facilities places immense pressure on basic amenities, including healthcare, water, and sanitation infrastructure, thereby heightening the risk of disease outbreaks (Adewale et al., 2022).

Despite the growing population of IDPs in Northern Nigeria, there remains a glaring gap in public health surveillance and intervention strategies tailored to these vulnerable communities. Studies have documented increased cases of communicable diseases such as cholera, malaria, typhoid, and respiratory infections in IDP settlements (Bello & Yusuf, 2023). However, these reports often lack a climate-oriented epidemiological lens necessary to track and understand disease patterns in relation to the underlying environmental drivers.

Moreover, national health and migration policies have been slow to respond to the dynamic public health needs of IDPs, often treating climate-induced migration as a humanitarian crisis rather than a long-term public health challenge (Nwankwo et al., 2023). This oversight limits the effectiveness of intervention efforts and exacerbates the health vulnerabilities of displaced populations, especially women, children, and the elderly, who are disproportionately affected.

This study, therefore, seeks to fill the existing research gap by investigating the public health implications of climate-induced internal migration in Northern Nigeria, with a focus on identifying and tracking disease patterns in IDP settlements. Addressing this problem is crucial for developing sustainable, climate-resilient health systems and policies that can effectively respond to the evolving needs of displaced communities.

Literature Review

a. Conceptual Clarifications

Climate-Induced Migration

Climate-induced migration refers to population movement that is primarily triggered by environmental factors resulting from climate change, such as droughts, floods, desertification, and rising temperatures. These climatic stressors compromise livelihoods, especially in

agrarian economies, prompting internal or cross-border displacement (IOM, 2022). In sub-Saharan Africa, prolonged droughts and erratic rainfall have led to decreased agricultural productivity, contributing significantly to forced migration (UNHCR, 2023).

In Nigeria, regions like the North-East and North-West are increasingly affected by desert encroachment and water scarcity, exacerbating conflict over resources and triggering mass internal displacements (IDMC, 2023). These displacements are often compounded by insecurity from armed conflicts, creating a complex interplay between environmental stressors and human vulnerability (Ajibade & Daramola, 2022).

Internal Displacement and Internally Displaced Persons (IDPs)

Internally displaced persons (IDPs) are individuals or groups who are forced to flee their homes due to conflict, violence, disasters, or climate-related events but remain within their country's borders. In Nigeria, as of 2023, over 3.5 million people are estimated to be internally displaced, with a significant proportion located in Northern Nigeria due to a combination of Boko Haram insurgency and climate-induced events such as flooding and drought (UNHCR, 2023; IDMC, 2023).

IDPs in Northern Nigeria typically reside in overcrowded camps or informal settlements with inadequate access to food, water, sanitation, and healthcare services. These environments foster conditions ripe for disease transmission and contribute to the long-term physical and psychological deterioration of displaced populations (Olayemi et al., 2023).

Public Health and Disease Patterns

Public health implications of internal displacement encompass a broad spectrum of issues, including the spread of infectious diseases (e.g., cholera, malaria, measles), increased rates of malnutrition, maternal and child health crises, and a rise in mental health disorders such as anxiety, PTSD, and depression (WHO, 2023). IDP camps often lack basic infrastructure and health services, making disease surveillance and management difficult.

Children and pregnant women are disproportionately affected, with outbreaks of vaccine-preventable diseases occurring due to disruptions in routine immunization programs (Amadi et al., 2023). Mental health, often under-prioritized in humanitarian responses, is another critical dimension, with many IDPs showing signs of trauma due to displacement, violence, and loss (Adewuyi & Omole, 2023).

The convergence of environmental degradation, displacement, and limited healthcare access in Northern Nigeria underscores a growing public health emergency requiring targeted policy and research interventions.

b. Climate Change and Internal Migration

Global Context

Climate change has increasingly been recognized as a major driver of internal displacement around the world. Rising temperatures, extreme weather events, and ecosystem disruptions contribute to the loss of livelihoods, especially in rural and agrarian communities, compelling people to migrate in search of safety and resources (IOM, 2023). Droughts, floods, and tropical storms have displaced millions internally, particularly in vulnerable regions such as South and Southeast Asia, Latin America, and Sub-Saharan Africa (IDMC, 2023).

For example, in Bangladesh, rising sea levels and frequent flooding have pushed large populations from coastal regions to urban slums (Rigaud et al., 2018). In Central America's Dry Corridor, prolonged drought has triggered internal migration as farming becomes unsustainable (Cordero et al., 2022). These instances exemplify the growing phenomenon of climate-induced internal migration, which is projected to worsen under current emission trajectories (IPCC, 2023).

African and Nigerian Contexts

Africa is one of the most climate-vulnerable continents due to high dependency on agriculture, limited adaptive capacity, and weak infrastructure (UNEP, 2022). In the Sahel region, recurrent droughts, desertification, and resource scarcity have forced many to abandon traditional pastoral livelihoods and migrate to urban or peri-urban areas (IOM, 2022).

In Nigeria, particularly in the northern states, climate variability—manifested through desert encroachment, drying water bodies like Lake Chad, and erratic rainfall—has led to significant internal displacement (Adewale et al., 2023). These environmental stressors have compounded existing socio-political challenges such as herder-farmer conflicts, contributing to forced movements across the Middle Belt and Northern Nigeria (Akinyemi & Olaniyi, 2022).

A report by the Nigerian Meteorological Agency (NiMet) and the Internal Displacement Monitoring Centre (IDMC) revealed that over 300,000 people were internally displaced due to flooding and land degradation between 2020 and 2022 alone (IDMC, 2023). These migrants, often relocated to informal settlements or IDP camps, face heightened risks of disease outbreaks, food insecurity, and limited access to health care (UNHCR, 2023).

c. Health Impacts of Climate-Induced Migration

Climate-induced internal migration often leads to the creation of informal or overcrowded settlements with inadequate infrastructure and resources. These conditions significantly impact the health of displaced populations, particularly in regions like Northern Nigeria where resources are already strained.

Infectious Disease Outbreaks

Internal displacement due to climate stressors—such as droughts or floods—creates conditions conducive to the spread of infectious diseases. Overcrowded IDP camps often lack proper sanitation, clean water, and adequate waste disposal systems. These conditions foster the rapid transmission of waterborne and vector-borne diseases like cholera and malaria. A recent study by Okaka and Odhiambo (2023) in IDP camps in Sub-Saharan Africa reported a 47% rise in cholera cases following flood-related displacements, attributing the spike to contaminated water sources and poor hygiene infrastructure.

Similarly, malaria remains prevalent in IDP settlements due to stagnant water and limited access to mosquito nets. Ibrahim et al. (2022) found malaria incidence among displaced populations in Northern Nigeria to be twice as high as in neighboring non-displaced communities. Respiratory infections such as pneumonia also thrive in overcrowded shelters, especially among children and the elderly (WHO, 2023).

Nutrition and Food Security

Food insecurity is a consistent challenge in IDP settlements, exacerbated by the disruption of agricultural livelihoods caused by climate events. Displaced populations often lose access to farmland and markets, leading to nutritional deficits and reliance on humanitarian aid, which may be inconsistent or inadequate. According to Adebayo et al. (2023), over 60% of IDPs in Northeast Nigeria experience moderate to severe food insecurity, with children under five being most vulnerable to acute malnutrition.

The same study highlighted how climate-induced crop failure and livestock loss directly contribute to both displacement and subsequent food scarcity in camps. Nutritional deficiencies among women and children were particularly severe, increasing the risk of stunted growth and maternal complications.

Mental Health and Psychological Stress

Displacement, especially when induced by climate disasters, is associated with significant mental health challenges. The trauma of losing homes, livelihoods, and community ties, combined with the uncertainty of displacement, often leads to elevated rates of anxiety, depression, and post-traumatic stress disorder (PTSD).

A qualitative study conducted in 2022 by Musa and Eze in IDP settlements in Borno State found that 38% of adult respondents reported symptoms consistent with depression, and nearly 25% exhibited signs of PTSD. The authors noted that the absence of psychosocial support systems and the stigma surrounding mental health further worsened the situation.

Moreover, women and girls in IDP camps face heightened risks of gender-based violence, which contributes to both physical and psychological trauma (UNHCR, 2023).

Healthcare Access and Services

Access to healthcare services in IDP settlements is often constrained by a combination of infrastructural, logistical, and systemic barriers. Clinics, if available, are frequently understaffed, lack essential medicines, and operate under poor sanitary conditions. Financial constraints, insecurity, and long distances to facilities further hinder access to healthcare for many displaced persons.

Research by Olorunfemi et al. (2023) reported that only 34% of surveyed IDPs in Northern Nigeria had access to formal healthcare services. Many relied on traditional remedies or makeshift medical tents with limited capacity. Additionally, maternal health services, immunizations, and chronic disease management are significantly lacking in these camps, leading to preventable complications and fatalities.

d. Tracking and Surveillance of Disease Patterns in IDP Settlements

Data Collection Methods

Effective surveillance and tracking of disease patterns in internally displaced persons (IDP) settlements are crucial for timely responses to public health emergencies. Modern data collection methods combine **epidemiological surveys, mobile health (mHealth) technologies, and Geographic Information Systems (GIS)** to monitor disease trends and outbreak dynamics. For instance, **digital disease surveillance systems** such as the Early Warning Alert and Response Network (EWARN), developed by the World Health Organization (WHO), are employed in humanitarian settings to detect potential outbreaks early (WHO, 2023).

Moreover, **community-based surveillance (CBS)** has been instrumental in settings where formal healthcare infrastructure is lacking. CBS empowers trained community health workers or volunteers to report health-related data using simple digital tools like smartphones and SMS-based reporting systems (Obasola & Mabawonku, 2022). These tools ensure real-time data sharing and quicker response times to emerging health issues.

Case Studies and Examples

Several studies illustrate the effectiveness and challenges of disease surveillance in IDP settings:

In **Borno State, Nigeria**, where millions have been displaced due to insurgency and climate-related stress, the Nigerian Centre for Disease Control (NCDC) implemented EWARN to track diseases like cholera and measles. The system was credited with reducing outbreak response time by over 40% (NCDC, 2022).

Similarly, in **South Sudan**, a CBS system helped detect and respond to a hepatitis E outbreak in the Bentiu IDP camp. The integration of mobile technology and on-the-ground reporting allowed health officials to contain the outbreak within weeks (Fekadu et al., 2023).

In **Bangladesh's Rohingya refugee camps**, real-time data dashboards developed by WHO and partners helped monitor cases of diphtheria, leading to mass immunization campaigns that curtailed further spread (Ahmed et al., 2022).

Challenges in Disease Surveillance

Despite the availability of innovative tools, several limitations hinder effective disease surveillance in IDP settlements. A major challenge is the **lack of standardized data collection protocols** across different humanitarian agencies, which leads to fragmented data (Oladipo et al., 2023). Moreover, **poor infrastructure**, such as limited internet access, unreliable electricity, and inadequate health facilities, hampers real-time data transmission and diagnostics (Adamu & Mohammed, 2022).

Another significant challenge is the **underreporting of diseases due to stigma**, cultural beliefs, or fear of authorities, especially among vulnerable populations such as women and children (UNHCR, 2023). Additionally, **human resource constraints**—particularly the shortage of trained personnel to manage surveillance systems—remain a persistent barrier.

Lastly, **policy and governance issues**, including limited funding and weak coordination between national health bodies and international NGOs, often delay critical health interventions and outbreak responses (Ibrahim et al., 2023).

Methods

4. **Research Design**

This study adopted a **mixed-methods research design**, combining both quantitative and qualitative approaches. The quantitative component involved epidemiological surveys and data analysis of reported disease cases, while the qualitative aspect consisted of in-depth interviews with key informants and focus group discussions (FGDs) to capture lived experiences and contextual factors influencing public health in IDP settlements.

5. **Study Area**

The research was conducted across selected IDP settlements in **Borno, Yobe, and Adamawa States** in Northern Nigeria. These states were chosen due to their high prevalence of climate-induced displacement resulting from droughts, desertification, and conflict exacerbated by environmental stressors. IDP camps such as **Muna Garage (Borno), Damaturu Camp (Yobe), and Fufore Camp (Adamawa)** served as the primary sites for data collection.

6. Population and Sample Size

The target population comprised **internally displaced persons (IDPs), healthcare workers, camp administrators**, and representatives from public health agencies. Using **Yamane's formula** for determining sample size from a finite population and assuming a 95% confidence level, a total

sample of **400 respondents** was selected across the three states.

7. **Sampling Technique**

A **multi-stage sampling technique** was employed. First, three states with high IDP concentrations were purposively selected. Second, within each state, one major IDP camp was randomly selected. Finally, **systematic random sampling** was used to select IDPs for the survey, while **purposive sampling** identified health workers and administrators for interviews.

8. **Instruments for Data Collection**

Three main instruments were used:

1. **Structured Questionnaire** – Designed to capture data on health status, access to healthcare, water and sanitation, and disease prevalence among IDPs. The questionnaire included both closed and open-ended questions.
2. **Key Informant Interview (KII) Guide** – Used to obtain insights from camp health officers, NGO representatives, and government health officials on disease surveillance and public health interventions.
3. **Focus Group Discussion Guide** – Facilitated discussions among IDPs (segmented by age and gender) to understand their perceptions of disease outbreaks, coping strategies, and healthcare experiences.

9. **Data Collection Procedure**

Data collection took place over a period of **eight weeks**. Trained field assistants administered questionnaires using **tablet-based survey tools (ODK Collect)** for efficiency and data accuracy. Interviews and FGDs were conducted in **Hausa and Kanuri**, then translated and transcribed into English. All participants gave **informed consent**, and ethical clearance was obtained from the **National Health Research Ethics Committee (NHREC)**.

10. **Data Analysis**

- **Quantitative data** from the questionnaires were analyzed using **SPSS version 27**. Descriptive statistics such as frequencies, means, and standard deviations were computed. Chi-square tests and logistic regression were used to determine associations between disease patterns and factors like sanitation access, crowding, and duration of displacement.
- **Qualitative data** were analyzed using **thematic content analysis**. Interview and FGD transcripts were coded using **NVivo 12**, and recurring themes related to public health risks, surveillance challenges, and access to care were identified and synthesized.

11. **Validity and Reliability**

The questionnaire was pre-tested in a non-study IDP camp in Gombe State. Reliability was assessed using **Cronbach's alpha**, which yielded a value of **0.82**, indicating high internal consistency. Expert review by public health researchers ensured the **face and content validity** of the instruments.

12. **Ethical Considerations**

The study adhered to all ethical guidelines for research involving vulnerable populations. Participants were informed of the purpose of the study, their right to withdraw at any time, and assurances of confidentiality. Ethical approval was obtained from NHREC (Approval No: NHREC/01/10/2024).

Results

- Demographic Characteristics of Respondents

A total of 400 respondents participated in the study. Table 1 presents the demographic distribution:

Table 1: Demographic Characteristics of Respondents (N = 400)

Variable	Category	Frequency	Percentage (%)
Gender	Male	172	43.0
	Female	228	57.0
Age Group	18–30	124	31.0
	31–45	189	47.3
	46 and above	87	21.8
Education Level	No Formal Education	136	34.0
	Primary	112	28.0
	Secondary	96	24.0
	Tertiary	56	14.0
Duration in Camp	< 1 year	104	26.0
	1–3 years	211	52.8
	> 3 years	85	21.2

- **Disease Prevalence in IDP Settlements**

Respondents were asked about diseases commonly experienced in the camps. Malaria, diarrhea, and respiratory infections were most frequently reported.

Table 2: Prevalence of Common Diseases

Disease Type	Frequency	Percentage (%)
Malaria	302	75.5
Diarrhea	248	62.0
Respiratory Infections	205	51.3
Skin Infections	143	35.8
Measles	77	19.3

- **Sanitation and Water Access**

More than half of respondents reported inadequate access to clean water and proper sanitation facilities.

Table 3: Access to Water and Sanitation Facilities

Access Type	Adequate	Inadequate	Percentage Inadequate (%)
Safe Drinking Water	147	253	63.3
Functional Toilets	189	211	52.8
Handwashing Facilities	134	266	66.5

- **Relationship between Sanitation Access and Disease Incidence**

A Chi-square test revealed a significant association between poor sanitation access and incidence of diarrhea ($\chi 2=18.76$, df = 1, $p < 0.001$).

- **Logistic Regression: Predictors of Disease Outbreaks**

A logistic regression was performed to predict the likelihood of contracting waterborne diseases based on sanitation access, overcrowding, and camp duration.

Table 4: Logistic Regression Results

Predictor	B	SE	Wald	OR (Exp(B))	p-value
Poor Sanitation	1.47	0.35	17.60	4.35	0.000
Overcrowding	1.12	0.29	14.93	3.06	0.000
Duration (>3 years)	0.76	0.28	7.33	2.13	0.007

- **Qualitative Findings from KIIs and FGDs**

Theme 1: Challenges in Disease Surveillance

a. Health workers reported **limited diagnostic tools and delayed laboratory confirmation** of outbreaks.

b. "Most times we rely on physical symptoms alone due to lack of lab access." (Camp nurse, Muna Garage)

Theme 2: Perceptions of Public Health Response

- Many IDPs expressed **distrust** in temporary interventions.
- "They only come when there is cholera... after that, we don't see them again." (FGD participant, Damaturu Camp)

Theme 3: Coping Strategies

- IDPs mentioned reliance on **traditional remedies** and **informal caregivers** due to barriers in accessing formal care.

(ISSN) Print: 2992-5665 and Online: 2992-5673
Impact Factor: 5.5 || https://www.ijresd.net
Vol 7 Issue 2. Jan, 2025

Discussions

- Disease Prevalence and Health Risks in IDP Settlements

The study revealed that **malaria (75.5%), diarrhea (62%),** and **respiratory infections (51.3%)** were the most common health challenges facing IDPs. These findings are consistent with previous studies (Ajayi et al., 2022; WHO, 2021) which noted that overcrowding, poor sanitation, and inadequate shelter in IDP camps create conducive environments for disease outbreaks.

Interpretation:
The high prevalence of vector- and waterborne diseases suggests that climate-induced migration does not only displace populations but also **exacerbates vulnerabilities to disease** through structural deficiencies in emergency settlements. Malaria's predominance can be linked to stagnant water and poor drainage in camps, while diarrheal diseases reflect poor water quality and sanitation infrastructure.

- **Impact of Sanitation and Water Access on Health Outcomes**

Over 60% of respondents reported **inadequate access to safe drinking water and sanitation**, which had a statistically significant relationship with diarrhea incidence ($p < 0.001$). This aligns with findings by Iroegbu et al. (2020), which emphasize that **WASH (Water, Sanitation, and Hygiene)** services are critical determinants of health in humanitarian contexts.

Interpretation:
The strong association between sanitation deficits and disease occurrence underscores the need for **integrated WASH interventions** as a core component of public health strategies in IDP camps. Poor hand hygiene and lack of latrines not only contribute to disease spread but also undermine recovery and resilience.

- **Predictors of Disease Outbreaks: Logistic Regression Findings**

Regression results identified **poor sanitation (OR = 4.35)** and **overcrowding (OR = 3.06)** as major predictors of disease outbreaks. Long-term camp residence also increased the likelihood of disease exposure, which contradicts assumptions that length of stay improves access to resources.

Interpretation:
Prolonged displacement without concurrent improvement in infrastructure increases cumulative health risks. This highlights **a policy gap,** as emergency responses often focus on short-term fixes rather than sustainable solutions. Structural investments in camp infrastructure are crucial to reduce long-term public health burdens.

- **Surveillance and Public Health Response Challenges**

Qualitative data indicated that **limited diagnostic capacity, slow response times,** and **poor community trust** in healthcare

delivery mechanisms hamper effective disease surveillance. These concerns were echoed by health workers and IDPs across all three states.

Interpretation:
Without robust **epidemiological surveillance systems**, disease outbreaks go undetected until they escalate. This point to a need for **decentralized and technology-supported disease monitoring tools**, as well as stronger community engagement to build trust and ensure early reporting.

- Implications for Policy and Practice

The study highlights the **interconnectedness of climate, displacement, and disease,** emphasizing the need for:

2. **Cross-sectoral collaboration** between health, environment, and humanitarian sectors.
3. Enhanced **WASH infrastructure and vector control** in camps.
4. Strengthened **surveillance systems using mobile health technology**.
5. Continuous **health education** and community involvement in disease prevention.

Conclusion

This study set out to investigate the public health implications of internal climate-induced migration, with a specific focus on disease patterns in IDP settlements across Northern Nigeria. Through the use of mixed methods, combining both quantitative and qualitative approaches, the research revealed significant public health challenges affecting displaced populations.

The findings demonstrate that **malaria, diarrhea, and respiratory infections** are the most prevalent diseases in IDP camps, primarily due to **inadequate water and sanitation infrastructure, overcrowding,** and **limited access to quality healthcare services.** These conditions are further aggravated by the lack of effective disease surveillance systems and the transient nature of humanitarian interventions.

Statistical analysis confirmed strong associations between sanitation, overcrowding, and the incidence of disease, highlighting critical environmental and infrastructural determinants of health. Qualitative data provided deeper insights into the lived experiences of IDPs, particularly their coping strategies, perceptions of health service delivery, and barriers to effective disease reporting.

Overall, the study concludes that **climate-induced migration significantly amplifies public health vulnerabilities,** particularly in unprepared and under-resourced IDP settlements. Without urgent and coordinated intervention, the health burden in these communities is likely to persist or worsen.

Recommendations

Based on the findings, the following recommendations are proposed:

1 Improve WASH Infrastructure in IDP Camps

1. Government and humanitarian agencies should prioritize investment in **safe drinking water, adequate toilet facilities**, and **handwashing stations**.
2. Community-led WASH management committees should be empowered to monitor and maintain sanitation systems.

2 Strengthen Disease Surveillance Systems

- Deploy **digital health tools** such as mobile-based reporting platforms to enhance real-time disease tracking.
- Establish **local surveillance units** within camps equipped with rapid diagnostic kits and trained personnel.

3 Decongest Overcrowded Settlements

- Where possible, IDPs should be relocated to **decentralized and better-structured housing facilities** to reduce population density.
- Urban planning principles should be integrated into camp design to allow for better airflow and resource allocation.

.4 Promote Health Education and Community Engagement

- Health education campaigns should focus on hygiene practices, symptoms of common diseases, and the importance of early treatment.
- Engage community leaders, youth, and women's groups as health champions within the camps.

5 Ensure Sustainable Health Interventions

- Shift from emergency-only responses to **long-term, sustainable healthcare solutions,** including permanent clinic structures and integration with national health systems.
- Encourage **multi-sectoral partnerships** between government, NGOs, academia, and local communities.

Suggestions for Further Research

- Future studies should explore the **mental health implications** of climate-induced displacement among IDPs.
- Longitudinal studies are needed to assess the **long-term health outcomes** of displaced populations.
- More research should be conducted on the **effectiveness of mobile health interventions** in IDP settings.

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