

Strategies for Eradicating Polio in the Lake Chad Basin: Lessons from Nigeria (2022–2025)

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ABSTRACT

ARTICLE DETAILS

Background: Despite Nigeria's certification as free of wild poliovirus in 2020, circulating vaccine-derived poliovirus type 2 (cVDPV2) continues to threaten eradication gains, particularly in the conflict-affected Lake Chad Basin (LCB).

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Objective: To evaluate strategies implemented between 2022 and 2025 to interrupt cVDPV2 transmission across 30 high-risk Local Government Areas (LGAs) in the LCB and assess their effectiveness in reaching under-five children and accessing insecure settlements.

Methods: A multi-component operational approach was applied that integrates planning, implementation, and coordination strategies. Planning involved mapping health facilities, settlements, border crossings, and population movement to generate microplans and costed workplans. Implementation included the Reaching Inaccessible Children (RIC) approach, synchronized cross-border campaigns with Niger, Chad, and Cameroon, and deployment of skilled human resources. Coordination leveraged cross-border meetings, virtual engagement, and real-time monitoring of action items. Outcomes measured included vaccination coverage, access to insecure settlements, and effectiveness of coordination mechanisms.

Results: Across the study period, 771,395 children under five were vaccinated, and 3,546 insecure settlements were reached. Vaccination was delivered at 85 international border markets and 17 CMAM sites. Cross-border coordination improved, with 83.3% of action items successfully tracked. Comparison between Round 1 and Round 2 in 2025 showed enhanced planning efficiency, better campaign synchronization, and improved mitigation of insecurity and vaccine supply challenges.

Conclusion: Context-specific, data-driven strategies combining security-informed implementation and cross-border coordination can effectively interrupt cVDPV2 transmission in high-risk and conflict-affected settings. The LCB experience offers practical lessons for sustaining polio-free status and strengthening immunization strategies in similarly fragile regions. Key recommendations include improving IT infrastructure, ongoing HIM training, effective system communication, regular data quality audits, and investment in data analytics. Involving stakeholders in HIM development, establishing robust data management policies, and promoting HIM-related research are vital for advancing best practices and policy advocacy.

KEYWORDS: Poliomyelitis, cVDPV2, Lake Chad Basin, Nigeria, cross-border vaccination, insecure settlements, immunization strategies

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INTRODUCTION

Poliomyelitis (polio) is a highly infectious viral disease that primarily affects children under five years of age and can lead to irreversible paralysis or death. Transmitted via the fecal–oral route, the virus thrives in settings characterized by poor sanitation,

low immunization coverage, and weak health systems (Kew et al., 2004). Over the past three decades, the global fight against polio has achieved remarkable success, reducing the incidence of wild poliovirus (WPV) by over 99% since 1988 (Asghar et al., 2014). A major milestone in this effort was the certification of the WHO African Region, including Nigeria, as free of indigenous WPV transmission in August 2020 (Nasir et al., 2016). This achievement marked the culmination of decades of coordinated immunization campaigns, surveillance strengthening, and community engagement across the continent.

Despite this progress, polio eradication efforts face a significant and evolving challenge in the form of circulating vaccine-derived polioviruses (cVDPVs), particularly type 2 (cVDPV2). These strains emerge in under-immunized populations when the attenuated virus contained in the oral polio vaccine (OPV) genetically mutates and regains neurovirulence. Subsequently, it spreads in communities with low immunity (Stern et al., 2017). While rare, cVDPV2 outbreaks have become increasingly prominent following the global withdrawal of the type 2 component of OPV in 2016, which created immunity gaps in many high-risk settings (Macklin et al., 2020). In Nigeria, the resurgence of cVDPV2 has been alarming, with reported cases rising sharply from 22 cases across seven states in 2020 to over 1,000 cases spanning 31 states in 2021 (Eze et al., 2025). These outbreaks reflect the persistent vulnerability of populations in areas with suboptimal routine immunization and highlight the delicate balance between eradication gains and programmatic risks.

The Lake Chad Basin (LCB) represents one of the most complex epidemiological and operational contexts for polio eradication globally. Encompassing northeastern and northwestern Nigerian states such as Borno, Yobe, Jigawa, Katsina, Kebbi, Sokoto, and Zamfara, the region is characterized by protracted insecurity, population displacement, weak health infrastructure, and extensive cross-border mobility with neighboring countries including Niger, Chad, and Cameroon (Wang et al., 2025). These factors collectively hinder the delivery of essential health services, including routine immunization and acute flaccid paralysis (AFP) surveillance, thereby sustaining conditions conducive to poliovirus transmission. Additionally, hard-to-reach and nomadic populations, coupled with vaccine hesitancy in certain communities, further complicate eradication efforts (Ndiaye et al., 2014).

To address these multifaceted challenges, the Government of Nigeria, through the National primary health care Development Agency, with coordination by the national emergency operation Centre in collaboration with key partners such as the World Health Organization and the Solina Centre for International Development and Research, implemented an intensified and coordinated outbreak. Between 2022 and 2025, this initiative deployed a suite of context-specific strategies targeting high-risk local government areas (LGAs), including enhanced surveillance systems, adaptive vaccination strategies, real-time data use for decision-making, and community-centered engagement approaches (Braka et al., 2023). These interventions were designed not only to interrupt ongoing cVDPV2 transmission but also to strengthen health system resilience and prevent future outbreaks in a highly volatile setting.

This paper examines the operational, strategic, and technical interventions implemented across 30 high-risk LGAs in the Lake Chad Basin and evaluates their effectiveness in interrupting poliovirus transmission and sustaining immunization gains. The study aims to inform future eradication strategies in similarly complex and fragile settings.

METHODS

Study Setting and Geographical Context

This study was conducted across 30 high-risk border Local Government Areas (LGAs) within the Lake Chad Basin in Nigeria, spanning seven states: Borno, Jigawa, Katsina, Kebbi, Sokoto, Yobe, and Zamfara. These LGAs were purposively selected based on their epidemiological risk profile for circulating vaccine-derived poliovirus type 2 (cVDPV2), history of suboptimal immunization coverage, and proximity to international borders with Niger, Chad, and Cameroon (Owoaje et al., 2020). Collectively, the intervention area comprised 125 wards and 8,315 settlements, of which 3,546 (43%) were classified as insecure due to armed conflict, banditry, or limited state presence (Nkwogu et al., 2018). The estimated target population included 771,395 children under five years of age, representing a highly vulnerable cohort for poliovirus transmission (Onyeka et al., 2014). Table 1 shows the geographical context of the study.

Table 1: Distribution of Border LGAs, Wards, Settlements, and Under-Five Population Across Focus States in Nigeria

State	LGAs	Wards	Settlements	Insecure Settlements n (%)	Under-Five (U5) Children
Borno	9	41	1,957	1,450 (74%)	83,618
Jigawa	2	8	416	0 (0%)	42,863
Katsina	6	23	1,546	299 (19%)	200,881
Kebbi	3	14	1,607	626 (39%)	164,974
Sokoto	6	19	1,414	576 (41%)	220,235
Yobe	3	18	1,230	450 (37%)	52,418
Zamfara	1	2	146	146 (100%)	6,406
Total	30	125	8,315	3,546 (43%)	771,395

Source: Team Analysis, Master List of Settlements (MLoS).

Study Design and Strategic Framework

A multi-component, operational intervention design was employed, integrating planning, implementation, and coordination strategies to interrupt poliovirus transmission.

The strategic framework was informed by global polio eradication guidelines and adapted to the unique challenges of the Lake Chad Basin. It emphasized microplanning precision, real-time data use, cross-border synchronization, and security-informed implementation (Ryman et al., 2011).

Planning Strategies

Planning activities focused on generating granular, geospatially informed data to guide intervention delivery. Comprehensive mapping exercises were conducted to identify and validate critical service delivery points, including 477 health facilities, 183 nomadic settlements, and 24 internally displaced persons (IDP) camps (Nkwogu et al., 2018). In addition, 406 official and unofficial border crossing points were mapped to better understand population movement patterns and inform cross-border vaccination strategies (Owoaje et al., 2020).

Border interaction mapping was further undertaken to identify convergence points where populations from different countries interact, such as markets, transit hubs, and grazing routes. These interaction points were validated through field assessments and stakeholder consultations, providing a foundation for synchronized immunization activities across national boundaries (Owoaje et al., 2020).

Costed, context-specific microplans were subsequently developed at the LGA and ward levels through a participatory process involving local, national, and regional stakeholders. These microplans incorporated settlement-level risk profiles, security classifications, and logistical considerations to ensure that resource allocation and operational approaches were tailored to the specific drivers of transmission in each area (Ryman et al., 2011).

Implementation Strategies

Implementation strategies were designed to overcome access barriers and ensure high vaccination coverage in both accessible and inaccessible populations. A key component was the Reaching Inaccessible Children (RIC) approach, which leveraged security personnel, including military escorts and community-based vigilante groups, to facilitate safe access to high-risk settlements (Bawa et al., 2018). This approach enabled vaccination teams to reach previously unreached populations in conflict-affected areas.

Synchronized cross-border vaccination campaigns were conducted in collaboration with neighboring countries to address the transnational nature of poliovirus transmission. These campaigns were aligned in timing and scope to minimize the risk of cross-border reintroduction of the virus, with notable intensification observed in 2025 following improved mapping and coordination mechanisms (Owoaje et al., 2020).

To strengthen implementation quality, skilled human resources, including technical advisors and surge personnel, were deployed to support Emergency Operations Centers (EOCs) at national and subnational levels. These personnel provided supportive supervision, capacity building, and real-time problem-solving during campaign activities (Kouadio et al., 2016). Furthermore, microplans were dynamically adjusted based on evolving security conditions, allowing for flexible routing, team composition, and delivery strategies in insecure settings (Bawa et al., 2018).

Coordination and Governance Approaches

Robust coordination mechanisms were established to ensure alignment across multiple stakeholders and countries. Regular cross-border coordination meetings were convened, involving stakeholders from Nigeria, Chad, and Niger, to facilitate information sharing, joint planning, and synchronized action. Due to security and logistical constraints, many of these engagements were conducted virtually, ensuring continuity of collaboration despite operational challenges.

Meeting facilitation and stakeholder engagement improved progressively over the study period. While only 56% of planned coordination meetings were successfully conducted during the initial implementation phase, this increased to 100% by the second round of activities in June 2025, reflecting strengthened governance structures and partner alignment (Nkwogu et al., 2018).

Ongoing technical assistance (TA) was provided to support documentation, and data analysis. This included the use of real-time dashboards, performance tracking tools, and post-campaign evaluations to inform continuous learning and adaptive management. These feedback mechanisms enabled rapid identification of gaps and timely course correction, contributing to improved program effectiveness over time (Kouadio et al., 2016).

RESULTS

During the implementation period (2022–2025), the integrated polio eradication strategies across the Lake Chad Basin LGAs resulted in substantial improvements in population reach, access to insecure areas, and cross-border coordination. A total of 771,395 children under five years of age were successfully vaccinated across the 30 high-risk LGAs.

Notably, 3,546 previously classified insecure settlements were accessed during the intervention period. This achievement highlights the effectiveness of adaptive delivery strategies, including the Reaching Inaccessible Children (RIC) approach and security-informed microplanning, in overcoming access constraints in conflict-affected settings. The ability to reach these populations was critical in reducing immunity gaps and interrupting ongoing transmission of circulating vaccine-derived poliovirus type 2 (cVDPV2).

Cross-border and community-level engagement also improved considerably. A total of 85 international border markets and 17 Community-based Management of Acute Malnutrition (CMAM) sites were integrated into vaccination activities, serving as critical points for reaching mobile and underserved populations. These platforms enhanced opportunities for vaccinating children who might otherwise have been missed due to migration, trade, or displacement, thereby strengthening the overall effectiveness of outbreak response efforts.

In terms of program management and coordination, 83.3% of action items generated during cross-border and subnational coordination meetings were successfully tracked and implemented. This reflects improvement in accountability, and partner alignment throughout the intervention period. Furthermore, a comparative assessment of Round 1 (R1) and Round 2 (R2) activities in 2025 demonstrated notable operational improvements, including enhanced planning efficiency, better synchronization of cross-border campaigns, and more effective mitigation of challenges related to insecurity and vaccine supply constraints. Table 1 summarizes the key operational and performance indicators.

Table 2: Summary of Key Operational and Performance Indicators, 2022–2025

Indicator	Target / Total	Achieved	Observations
Children under five vaccinated	771,395	771,498	Full target population coverage achieved
Insecure settlements accessed	3,546	3,546	Reached via RIC strategy with military/community support
International border markets engaged	85	85	Served as vaccination points for mobile populations
CMAM sites integrated	17	17	Leveraged for simultaneous immunization delivery
Cross-border coordination meeting action items tracked	100%	83.3%	Improved from 56% in Round 1 to 100% in Round 2 2025

DISCUSSION

The findings from this study demonstrate that context-adapted, data-driven strategies can substantially improve polio outbreak response outcomes, even in fragile and conflict-affected settings such as the Lake Chad Basin. The successful reach of over 771,000 children under five years of age highlights the effectiveness of tailoring interventions to local realities, a principle consistently emphasized in global polio eradication efforts (Asghar et al., 2014). Similar experiences from endemic and post-endemic settings indicate that microplanning informed by granular settlement-level data is critical for identifying immunity gaps and ensuring equitable vaccine delivery (Oyugi et al., 2025).

A central driver of success in this intervention was the emphasis on joint planning and multi-level coordination involving local, national, and regional stakeholders. The systematic mapping of health facilities, insecure settlements, border markets, and population movement corridors enabled the development of targeted, costed microplans that addressed the specific epidemiological and operational risks within each LGA. This aligns with evidence from the Global Polio Eradication Initiative, which underscores the importance of integrated planning frameworks and strong governance structures in accelerating outbreak response performance (Asghar et al., 2014). Furthermore, the observed improvement in coordination metrics illustrates the value of iterative learning and adaptive management in complex health interventions (Braka et al., 2023).

Cross-border collaboration emerged as another critical determinant of program effectiveness. The Lake Chad Basin represents a shared transmission zone where frequent population movement across Nigeria, Niger, Chad, and Cameroon sustains the risk of poliovirus spread (Asghar et al., 2014). The implementation of synchronized vaccination campaigns and cross-border coordination mechanisms in this study is consistent with global best practices for addressing transnational disease transmission (Mbaeyi, 2023). Although initial phases were constrained by insecurity and logistical challenges, the marked improvements observed in subsequent rounds suggest that sustained engagement, trust-building, and strengthened coordination platforms can significantly enhance cross-border health outcomes. Similar findings have been reported in other regions, where coordinated cross-national efforts have been essential in interrupting poliovirus transmission chains (Okeibunor et al., 2016).

The co-development of LGA-level workplans with local actors was another notable strength of the intervention. This approach fostered local ownership, improved accountability, and enhanced adherence to campaign timelines. Evidence from implementation research suggests that decentralized planning and community engagement are key enablers of successful immunization programs, particularly in underserved and high-risk populations (Okiror et al., 2021). In addition, the use of real-time data systems and coordination platforms facilitated continuous monitoring of performance indicators, enabling rapid identification of operational

bottlenecks and timely course correction. Such data-driven decision-making processes are increasingly recognized as essential components of effective outbreak response strategies (Oyugi et al., 2025).

Despite these achievements, several persistent challenges were identified. Vaccine supply chain disruptions, logistical constraints in insecure areas, and incomplete synchronization of cross-border campaigns posed ongoing risks to achieving full cVDPV2 containment. These findings are consistent with broader global experiences, where insecurity, weak health systems, and supply chain limitations continue to hinder eradication efforts in last-mile settings (Mafigiri et al., 2021). Addressing these challenges will require sustained investment in health system strengthening, improved vaccine supply forecasting, and enhanced coordination mechanisms across borders.

Importantly, the program's success in reaching children in insecure and hard-to-reach settlements underscores the feasibility of integrating security, surveillance, and immunization strategies. The deployment of technical advisors, the use of security-supported access approaches, and the integration of vaccination activities into community platforms such as border markets and CMAM sites collectively contributed to improved coverage and program quality. These findings reinforce existing evidence that innovative delivery approaches are critical for reaching zero-dose and missed children in fragile settings (Probert et al., 2018).

Finally, the adoption of virtual coordination mechanisms, particularly for cross-border engagement with counterparts in Chad and Niger, proved instrumental in maintaining operational continuity amid insecurity and displacement. This innovation reflects a broader shift in global health practice toward leveraging digital tools for coordination and governance, particularly in complex humanitarian contexts (Hussein et al., 2025).

CONCLUSION

The Lake Chad Basin polio eradication experience demonstrates that context-specific, data-driven strategies which integrate planning, security-informed implementation, and cross-border coordination can achieve substantial impact even in high-risk and conflict-affected settings. Key enablers included granular microplanning, engagement of local stakeholders, synchronized cross-border campaigns, and real-time monitoring to guide adaptive responses. Despite persistent challenges such as insecurity and logistical constraints, the successful vaccination of over 771,000 under-five children and access to previously unreachable settlements highlights the feasibility of interrupting cVDPV2 transmission in complex operational environments. These findings provide actionable lessons for sustaining polio-free status and inform strategies for immunization programs in similarly fragile regions globally.

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