COMMENTARY

Decentralized vs. Centralized Cholera Treatment Strategies in Zambia's 2023–2024 Outbreak

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ABSTRACT

Background: The 2023–2024 cholera outbreak in Lusaka, Zambia, highlighted the need for flexible, phase-based strategies for cholera treatment. Decentralized cholera treatment centres (CTCs) were established early in the outbreak to improve accessibility and reduce patient delays, while centralized CTCs were introduced later to standardize care and manage severe cases. This study evaluates the effectiveness of these two models for patient management and outbreak control.

Methods: A structured analysis was conducted using semi-structured interviews with key stakeholders and publicly available situation reports. Data on patient consultations, transfers, and treatment outcomes were collected to compare the performance of decentralized and centralized CTCs.

Results: By the end of May 2023, decentralized CTCs in Lusaka District had managed 14,529 consultations, with 5,847 patients transferred to centralized CTCs for advanced care. The decentralized CTCs improved accessibility and community engagement but faced challenges in terms of quality standards, resource allocation, and supervision. Centralized CTCs facilitated standardized treatment protocols and efficient patient management but required substantial initial setup costs, faced logistical and security concerns, and had limited geographic coverage.

Conclusion: A phased approach—balancing decentralized and centralized care based on outbreak progression—is essential for optimizing resource utilization, improving patient outcomes, and reducing mortality. For enhancing cholera outbreak response strategies in the future, key measures include pre-established surge structures, availability of healthcare staff pre-trained in incident management, proactive risk communication, pre-season oral cholera vaccination campaigns, and a well-defined coordination framework.

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INTRODUCTION

Zambia has been experiencing cholera outbreaks since the 1970s. The 2023-2024 cholera outbreak in Lusaka, the largest in the Zambian history, has highlighted the critical need for effective treatment strategies.[1] Zambia developed its first national Multisectoral Cholera Elimination Plan 2019-2025 (MCEP).[2] The plan's overall aim is to reduce morbidity and mortality due to cholera, and eventually to eliminate cholera in Zambia by 2025. The strategic objectives for case management in Zambia include strengthening capacity to achieve a case fatality rate of less than 0.5% by the end of 2025. It has been noted that early therapeutic intervention (especially oral rehydration salts and IV fluids as needed) can reduce the fatality rate to less than 1%.[3] This makes rapid patient access to treatment centres essential to reducing fatality rates.

In urban cholera outbreaks like the one in Lusaka, determining where to treat patients is crucial. Guidelines from the Global Task Force on Cholera Control[4] and Médecins Sans Frontières[5] recommend establishing oral rehydration points within communities, along with setting up cholera treatment centres (CTCs) or cholera treatment units in nearby hospitals and health centres. However, existing response frameworks lack clear guidance on how to transition between decentralized and centralized CTCs based on outbreak severity, resource availability, and patient load. This gap has led to challenges in effectively managing surges in cases, ensuring consistent quality of care across different facilities, and optimizing resource distribution.

To maximize patient access to care and ensure the highest quality of treatment while fully utilizing limited human and material resources, it is crucial to adopt a placement strategy for treatment centres according to the evolving stages of the outbreak—from the initial alert phase through the expansion and surge periods to the mitigation/resolution stage. Determining whether to employ a multiple small, decentralized CTC model or a large, centralized CTC model should be informed by the shifting epidemiological landscape and the needs of the affected communities.

This article explores the advantages and disadvantages of decentralized and centralized CTCs and argues for a flexible approach tailored to the phases of the outbreak based on the experience of the 2023-2024 cholera outbreak in Lusaka.

METHODS

This study employs a structured approach to analyse the performance of decentralized and centralized CTCs and the decision-making processes behind their strategies during Zambia's 2023-2024 cholera outbreak. Key data were collected through semi-structured interviews and analysis of publicly available situation reports.

The interviews were conducted with key stakeholders to understand the establishment and operational strategies of CTCs, as well as the decision-making processes involved in transitioning between decentralized and centralized CTCs. These stakeholders included the national coordinator, the cholera treatment managers, and selected doctors from the Zambia National Public Health Institute, as well as senior officials from the Ministry of Health. The interviews explored the criteria, processes, and contextual factors influencing decisions on implementing and transitioning CTC strategies during the outbreak. Additionally, situation reports published during the outbreak were analysed to extract operational data on CTCs, including the number of facilities, the number of admissions and discharges, and fatality rates. These reports are based on data collected at the facility level, aggregated through sub-districts and district health offices, and consolidated by the Provincial Health Office, thereby ensuring a comprehensive and systematic overview of CTC performance.

This study did not involve the use of patient-level or personally identifiable data. All data analysed were aggregated and obtained from publicly available situation reports. No unpublished data was used in

this analysis. Although ethical clearance was not required, the study adhered to standard ethical considerations to ensure confidentiality and integrity in the data collection process. For stakeholder interviews, no personal information was recorded, and participants were informed about the purpose of the study and voluntarily participated. Their perspectives were documented in a manner that protects their anonymity.

RESULTS

The 2023-2024 cholera outbreak was officially declared on 18 October 2023 by the Minister of Health. The cumulative number of cases was 23,381 with an overall case fatality rate of 4.8% and an attack rate of 115.1 per 1,000,000 population.[6] The epicentre was primarily Lusaka with active transmission of cases to other provinces including Copperbelt Province as of 15 April 2024. In Lusaka District, there were 20 identified cholera hotspots, which were mainly localized in the peri-urban areas. These regions are characterized by poor water, sanitation, and hygiene infrastructure.

During the outbreak, decentralized and centralized CTCs played distinct roles in patient management in Lusaka District. At least one decentralized CTC was established per constituency, with the scale expanding as the outbreak progressed. Due to the rising number of cases, a centralized CTC was opened at Levy Mwanawasa University Teaching Hospital on 18 December 2023, followed by a Presidential Directive to establish another at National Heroes Stadium on 2 January 2024.

The Heroes Stadium CTC experienced a peak in early January 2024, with 980 patients admitted on 10 January. The number of admissions declined thereafter, dropping below 200 by the end of the month. The last patient was discharged on 22 February, and the centre officially closed on 27 March.

Most cholera patients initially sought care at decentralized CTCs, with 14,529 consultations recorded, of which 5,847 patients were transferred to centralized CTCs for advanced care (Table 1). Community deaths were more common in decentralized CTCs, while facility deaths were predominant in centralized CTCs, where more

Table 1: Comparison of Decentralized and Centralized CTCs in Lusaka District During the 2023-2024 Outbreak as of the End of May 2024

CTC Type	Facilities	First Consultations	Transferred Patients	Discharged Patients	Death		
					All	Facility Deaths	Community Deaths
Decentralized CTC	7 (At least one in each seven constituency)	14,529	-5,847	8,304	378	93	285
Centralized CTC	2 (Levy and Heroes)	74	+5,847	5,785	136	133	3
Total		14,603		14,809	514	226	288

Note: Exact figures to be finalized based on situation report data.[7,8]
CTC, cholera treatment centre

critically ill patients were admitted (including those who received Treatment Plan B or C, and those with complications). Due to differences in patient severity and case mix, direct comparisons of fatality rates between decentralized and centralized facilities are not straightforward.

During the outbreak in Lusaka District, the decision-making process for transitioning between decentralized and centralized CTCs was driven by patient load, percentage of bed capacity utilization of over 80%, resource availability, and logistical considerations. Initially, multiple small, decentralized CTCs were established to manage cases locally and reduce the burden on referral hospitals. As the outbreak escalated and the number of severe cases increased, it became necessary to consolidate resources and expertise into large, centralized facilities such as the Heroes Stadium CTC. The transition from decentralized to centralized CTCs was guided by key stakeholders, including the Zambia National Public Health Institute, the Ministry of Health, the Lusaka Provincial Health Office, and the cabinet. Incident management meetings (IMS) were critical in providing the necessary reports and data for decision support.

The decision to establish the Heroes Stadium CTC was based on its capacity to handle a higher volume of patients, the need for close monitoring of patients, shortages of specialized staff, and the need to provide specialized care for severe cases. Conversely, the eventual closure of the Heroes Stadium CTC occurred when the outbreak was brought under control: the cumulative patient load was less than 80% of the peak numbers, as seen from declines in new cases and admissions to less than 1000 patients. These decisions were communicated through IMS and situation reports.

DISCUSSION

Decentralized vs. Centralized CTCs

Table 2 summarizes the advantages and disadvantages of multiple small, decentralized CTCs versus large, centralized CTCs based on our experience. During the outbreak response in Lusaka, 11 decentralized CTCs were established in conjunction with existing health facilities

Table 2: Comparative Advantages and Disadvantages of Large Centralized CTCs vs. Multiple Small Decentralized CTCs

	Advantages	Disadvantages
Multiple Small Decentralized CTCs	• Proximity to patients • Improved accessibility • Reduced time to treatment • Community engagement • Flexibility and resilience • Ability to utilize existing healthcare facilities	• Challenges with resource distribution • Space limitations • Quality assurance challenges • Increased management burden • Staff isolation and burnout • Poor patient tracking after referral to a centralized CTC
Large Centralized CTCs	• Resource concentration • Standardization • More streamlined staff training • Greater capacity • Clear referral point	• Initial setup costs • Logistical challenges/patient referral challenges • Patient/Staff transportation • Security and safety risks • Limited geographic coverage • Communication overload. • Use of large-scale facilities and costs for conversion • Stigma • Human resource shortages • Challenges in coordination and command structure in the first 48 h • Infection prevention and control was poor in the first 48 to 72 h. • Poor patient tracking

CTC, cholera treatment centre

throughout the city. This approach offered several advantages, notably improving patient access, reducing treatment delays, fostering greater community involvement, and enhancing operational flexibility and resilience, all while using existing healthcare infrastructure. However, this decentralized model brought challenges, including more complex resource allocation, constraints on available space, difficulties in maintaining uniform quality standards, heavier managerial workloads, and the potential for staff isolation and burnout. A standardized training program and uniform treatment protocols were established to overcome these challenges, accompanied by close supervision from provincial and district health office. This coordinated effort ensured consistent quality of care and efficient management across all sites.

As patient numbers exceeded the capacity of existing treatment facilities, the Zambian Government established centralized CTCs at Levy Mwanawasa University Teaching Hospital for complicated cases and National Heroes Stadium for uncomplicated cases,[9] accommodating all patients requiring hospitalization for cholera in the decentralized CTCs in the Lusaka region provided initial care and stabilization before they were transferred to the centralized hubs. Adopting a large, centralized CTC strategy can offer several clear benefits. Concentrating resources at a single site supports consistent delivery of care, standardized protocols, streamlined staff training, and greater capacity expansion. It also provides a straightforward referral point for patients. However, this approach may involve substantial initial setup costs and logistical complexities, reduced geographic coverage, transportation challenges for patients and staff, and heightened security vulnerabilities. Furthermore, communication can become cumbersome, and repurposing large-scale facilities such as stadiums incurs additional costs and opportunity losses.

Several key measures are essential to mitigate the disorder often associated with centralized CTCs. First, comprehensive pre-deployment training and clearly defined protocols ensure that all staff understand their roles and responsibilities. Second, a carefully planned CTC layout—featuring a one-way patient flow and strategic placement of severe and mild cases with triage cards (Figure 1)—streamlines delivery of care. Third, a robust testing capacity prevents misdiagnosis and inappropriate treatment by accurately identifying cholera. Fourth, reliable supply chain management ensures uninterrupted access to essential medications and equipment. Finally, strong leadership and governance, including well-defined command structures, maintain order and facilitate effective, coordinated operations. Crucially, these measures were successfully implemented under Zambia's MCEP thanks to the Zambian government's strong political will and leadership, which played a pivotal role in achieving these outcomes.

Figure 1: Triage Tag for Patient Treatment Plans (Plans A, B, and C), developed by the Zambia Medical Association.

A triage card affixed to an IV stand constructed by a local carpenter is designed to indicate the treatment plan assigned to each patient. Even within a 1,000-bed centralized cholera treatment centre (CTC), like the National Heroes Stadium CTC in Lusaka, this system improves the identification of patient needs and ensures that the required level of attention is more accurately determined.

A Flexible, Phase-Based Approach

Given the unique challenges of the Lusaka outbreak, a flexible approach that could adapt to the outbreak's phases was essential.

The decentralized model improves accessibility and resilience but brings challenges in maintaining quality and efficiency. The centralized model excels in efficiency and specialization but may have accessibility difficulties and vulnerability to disruptions. In many contexts, following a flexible and phase-based approach is advisable, with the level of centralization or decentralization tailored to the outbreak phase, available resources, population distribution, and local logistics:

1. Initial alert phase: During the early stages of the outbreak, decentralized CTCs should be established to quickly identify and treat patients, preventing the spread of the disease.
2. Surge phase: As the outbreak intensifies, resources should be concentrated in centralized CTCs, such as the converted National Heroes Stadium, to handle the surge in cases and provide specialized care.
3. Mitigation/resolution phase: Once the outbreak begins to subside, a return to decentralized CTCs will ensure continued access to care and support ongoing mitigation efforts.

Key Lessons in Managing Future Outbreaks

The numerous outbreaks that Zambia has experienced have demonstrated a need for:

1. Human resources: In a country faced with a low doctor–patient ratio, a dedicated emergency or outbreak response team with frequent continuous medical education or drills in response coordination would be ideal. This team serves as pivotal leadership providers during an outbreak surge.
2. Specialized surge structures: An adapted and ready to use structure designed to support health services during an outbreak surge or any outbreak requiring a centralized treatment centre would lessen the disorder like that witnessed in the 2023-24 outbreak. This would also reduce the financial resource demand for repurposing an existing structure or setting up an entirely new structure within a short time.
3. Proactive risk communication: The high case fatality rate in the 2023-24 outbreak was largely due to community deaths, a stark reminder of the need for seasonal risk communication or sensitization sessions with the community through the deployment of community health workers or community-based volunteers who played a crucial role in ending the outbreak.
4. Oral cholera vaccinations (OCVs): Temporary incorporation of OCVs into routine vaccinations (pre-outbreak season) was targeted at people who may have missed the vaccinations during a previous outbreak. In a 2018 outbreak, OCVs were to be an effective short-term intervention. Additionally, pre-season stockpiling of the vaccine and local production of the vaccine may be crucial for reducing emergency demand.
5. A clear, pre-determined coordination structure is needed during an outbreak so that decisions are not overridden.
6. There is a need for IMS training so that healthcare providers will be prepared to respond to outbreaks on their own, as opposed to waiting on the limited specialized staff or receiving training during an outbreak.
7. Early declaration of an outbreak and escalation to the Disaster Management and Mitigation Unit is needed: The declaration for the 2023-24 outbreak was delayed, which in turn delayed initiation of the response and resource allocation.

Limitations of the Phase-Based Approach

While the phase-based approach offers a structured and adaptable framework for managing cholera outbreaks, its effectiveness depends on several key

factors. First, it requires a workforce with the flexibility and expertise to rapidly adjust treatment strategies based on shifting outbreak dynamics. However, in resource-limited settings, maintaining enough trained personnel remains a challenge. Second, accurate real-time assessment of the outbreak's progression and the ability to predict future trends are critical for timely decision-making. Without robust surveillance systems and coordinated data-sharing mechanisms, transitions between phases may be delayed or misaligned with actual needs. Lastly, resource preparedness is essential for the successful implementation of this approach. Pre-positioning medical supplies, ensuring financial contingencies, and maintaining surge capacity in both decentralized and centralized CTCs are crucial to prevent disruptions in care delivery. Addressing these limitations will be key to optimizing the effectiveness of the phase-based model and ensuring its sustainability in future responses to cholera outbreaks.

CONCLUSION

The experience in Lusaka during the 2023-2024 outbreak demonstrated the effectiveness of this adaptive strategy. Initially, decentralized CTCs were crucial in quickly identifying and treating patients. As the outbreak peaked, the centralized CTC at National Heroes Stadium facility provided the necessary surge capacity. Finally, as the situation stabilized, a shift back to decentralized CTCs ensured continued care and mitigation.

By learning from this experience, we can develop more resilient and responsive cholera treatment strategies for future outbreaks. A key lesson from this outbreak is the importance of pre-outbreak planning, including stockpiling essential medical supplies, ensuring trained personnel are readily available, all healthcare professionals must be trained in incident management systems (IMS) and establishing surge capacity in both decentralized and centralized treatment facilities. Proactive preparedness measures can significantly improve the efficiency of the outbreak response and reduce mortality.

Furthermore, institutionalizing the phase-based strategy within Zambia's national cholera response plan will help standardize decision-making, improve coordination between decentralized and centralized treatment models, and ensure the sustainability of this adaptive approach. Developing clear protocols for transitioning between response phases and integrating them into national policies will strengthen Zambia's long-term cholera preparedness and response capacity. By balancing the strengths of centralized and decentralized approaches and adapting to the phases of an outbreak, it becomes possible to use resources optimally and provide effective patient care.

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Conflicts of Interest

The authors declare that they have no competing interests.

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