EVALUATION OF

MSF INTERSECTIONAL RESPONSE TO THE DIPHTHERIA OUTBREAK IN WEST AFRICA

APRIL 2025

This publication was produced at the request of Médecins Sans Frontières (MSF) – Operational Centre Brussels (OCB) under the management of the Stockholm Evaluation Unit (SEU).

All evaluators contracted by the SEU must adhere to the SEU Ethical Guidelines for Evaluations.

It was prepared independently by Sigia public health consultancy.

Executive summary

Médecins Sans Frontières (MSF) is a global humanitarian organization responding rapidly to emergencies, including disease outbreaks. In 2023, a major **diphtheria outbreak** hit West Africa, with Nigeria being the most affected country. In response, MSF launched interventions in six countries, managing over 22 000 suspected cases, primarily in Nigeria, Guinea, and Niger. As cases surged and the global availability of the diphtheria antitoxin (DAT) treatment became scarce, MSF established an intersectional coordination platform in August 2023 to streamline its response. To capitalize on this experience and identify lessons for future outbreak responses, MSF, through its Stockholm Evaluation Unit, commissioned an **independent evaluation** by the Sigia consultancy.

This evaluation assessed three key interventions in the response to the diphtheria outbreak: the MSF Operational Centre West and Central Africa (**WaCA**) intervention in **Kano, Nigeria**; MSF Operational Centre Paris (**OCP**) intervention in **Borno, Nigeria**; and MSF Operational Centre Brussels (**OCB**) in **Siguiri**, Guinea. It aimed to evaluate the design, implementation, and coordination of the response, analyse key outputs and outcomes, identify challenges and good practices, and provide strategic recommendations for future outbreak responses. Data collection involved a review of 275 documents, 35 semi-structured interviews with MSF staff and external partners, and quantitative analysis of a database covering 21 176 patients. Findings were further refined through an online working session with key MSF stakeholders.

The evaluation adhered to MSF ethical guidelines, ensuring participant consent, confidentiality, and data anonymization and security. Limitations included the remote nature of the evaluation, non-response from key MSF and partner staff, and quality issues with the quantitative data available.

The **main findings of the evaluation** are presented below for each evaluation question:

- ***How was the MSF response designed, implemented and coordinated in each intervention and overall?***
  - In Kano and Siguiri, the strategy prioritized strengthening local healthcare capacities by integrating MSF support into MoH-run facilities, facilitating continuity and sustainability. In contrast, in Borno, the response was initially started in an MSF-run facility before transitioning to a MoH facility in a second phase, resulting in a limited ownership of the response by the health authorities.
  - The response was timely initiated in all three interventions, with gaps and needs quickly identified and activities planned.
  - Exit strategies were complex to define, such as assessing when was the right time to hand over the response to the health authorities without risking a rapid reversal of gains. A resurgence of diphtheria cases was occurring in Borno and Siguiri at the time of the evaluation, suggesting that the handover may have been too early to sufficiently strengthen the health system.

- ***How did MSF interventions respond to priority needs in the different settings?***
  - MSF's response in Kano, Borno, and Siguiri effectively addressed critical gaps in case management, which was identified as the primary need in the overall outbreak response. In addition, community activities were implemented to strengthen early detection, sensitization, and prevention, alongside advocacy efforts to increase the engagement of authorities and partners. However, significant gaps remained for contact tracing and especially for mass vaccination campaigns, with a failure to really support the later across the three interventions.

- ***How was MSF involvement compatible and coordinated with other actors' presence and capacity?***
  - In all three interventions, MSF participated in national and local coordination mechanisms with the health authorities and partners to share information and discuss gaps and challenges. However, while the trust built by WaCA with local authorities before and during the response facilitated coordination and alignment, it was more challenging in Borno and Siguiri, where OCP and OCB had less established relationships with authorities. In addition, the lack of a Memorandum of Understanding in Kano and its delayed agreement in Borno led to a lack of clarity about the roles and responsibilities of each party.

- ***What were the key outputs, outcomes and unintended consequences of the MSF response in each intervention and overall?***
  - MSF played a key role in case management in both countries, with over 20 000 patients provided with free care across the three interventions, building the capacity of the local healthcare workforce through collaboration with MoH healthcare facilities. Its experience was critical in the development and revision of diphtheria treatment guidelines at both national and global levels.
  - While community activities for early detection, sensitization, and prevention were planned across all three interventions, most emphasis was put in Siguiri, with 173 community health workers engaged in contact tracing and sensitization, compared to 83 in Kano and 30 in Borno.
  - MSF engaged in advocacy efforts at different levels, through participation in coordination meetings with health authorities and bilateral meetings with partners at global level. However, delays in initiating these efforts at intersectional level and the absence of a comprehensive stakeholder analysis from the outset limited their impact on the outbreak response.

- ***To what extent did the MSF response positively or negatively influence the control of the diphtheria outbreak?***
  - MSF response reduced diphtheria-related mortality among patients after the start of each intervention. However, its impact on the overall outbreak transmission was perceived as limited due to a lack of engagement in mass vaccination campaigns and challenges to carry out comprehensive contact tracing.

- ***What was the effect of the intersectional coordination on the MSF response outputs and outcomes?***
  - The implementation of intersectional coordination improved communication and alignment between MSF Operational Centres responding to the outbreak. It played a key role in resource allocation, particularly for DAT in the context of a global shortage, and allowed for a unified MSF voice to more effectively engage global partners. However, the absence of formal mechanisms for validating intersectional decisions and documents hindered its effectiveness.
  - Implementation of an intersectional line list with consolidated data from all interventions was key to inform decision-making at global level. However, heterogeneity in data collection modalities across interventions and inadequate quality for some key variables limited its value for retrospective analysis and operational research.
  - Information sharing across Operational Centres was improved by the intersectional coordination at headquarters level but remained limited at national and field levels.

- ***What were the main challenges and areas for improvement, good practices and successes of the response, including in relation to intersectional coordination?***
  - For case management, the global shortage of DAT, gaps in guidelines for managing complex cases, and limited capacity at treatment centres were the main challenges faced by each intervention. Yet, MSF demonstrated several good practices to surmount them, such as the development of a pragmatic strategy to prioritize DAT administration, the timely adaptation of treatment protocols, and the use of home-based care to increase case management capacity.
  - While many perceived that community-based activities lacked resources to reach the response objectives, some good practices were highlighted, such as the geographical analysis of outbreak data to target high-risk areas in Kano, or the use of a pre-existing network of community health workers in Siguiri.
  - In the three interventions, MSF failed to participate in mass vaccination campaigns, with limited participation in Kano through community mobilization, no participation in Borno, and a failed attempt to implement such a campaign in Siguiri.

Based on the results of the evaluation, **the following recommendations were identified for each key challenge:**

In all three interventions, MSF participated to coordination mechanisms at local and national level with health authorities and partners ensuring some degree of alignment for the outbreak response. **Yet, MSF faced several challenges in coordinating with health authorities**, leading to delays and frustrations in implementing activities.

- Recommendation 1. Before emergencies occur, **conduct strong political analysis and stakeholder mapping** in the settings where MSF is present to identify the right counterparts for negotiation and coordination, as well as potential barriers that may arise during an outbreak emergency response. **Pre-establish relationships and communication channels** with identified key stakeholders in the country to build trust.
- Recommendation 2. **Formalize collaboration with health authorities** through a Memorandum of Understanding as early as possible in the response, clearly specifying roles and responsibilities of each party.

Intersectional coordination of the MSF response was largely viewed as a successful precedent despite a reported **delay in initiating coordination** of operations, advocacy and communication along with an **absence of formal mechanisms** for validating intersectional decisions and documents.

- Recommendation 3. **Initiate intersectional discussions as early as possible** in outbreak responses involving several Operational Centres to ensure a unified and coordinated approach in different aspects of the response, such as medical guidelines, data management, supply management or advocacy.
- Recommendation 4. **Define criteria to systematize the establishment of intersectional coordination platforms** during outbreaks, ensuring it is set up based on a demonstrated need to avoid redundancy and unnecessary burden. The draft Inter-OC Collaboration on Outbreak Response Framework, developed by an intersectional group chaired by the International Medical Secretary, provides a foundation that could be further refined to define these criteria.
- Recommendation 5. **Develop terms of reference at the set-up of an outbreak intersectional coordination platform**, defining its responsibilities and decision-making mechanisms, and **identify**

focal points to coordinate specific aspects of the intersectional response such as advocacy, communications, and engagement with external actors at global level.

Data from the different MSF interventions was consolidated at intersectional level, improving monitoring of the epidemiological situation and facilitating decision-making at global level. However, due to the **heterogeneity and inadequate quality of the collected data**, its use was limited for operational research and retrospective analyses.

- Recommendation 6. Agree across Operational Centres on a **list of core data to be collected** during different types of outbreak responses with the careful choice of a **limited number of indicators** to decrease the burden of data collection and reporting and improve data quality.
- Recommendation 7. Prioritize the **use of interoperable information systems and data collection tools** across Operational Centres to facilitate data collection, sharing and consolidation.
- Recommendation 8. **Provide enough resources from the outset of emergency response to ensure high-quality data** collection suitable for operational research and retrospective analyses.

While intersectional collaboration enhanced **information sharing** between Operational Centres at the headquarters level, it **remained limited at the national and intervention levels**.

- Recommendation 9. **Establish a knowledge management system at intersectional level**, accessible at the different operational levels of the organization, to facilitate sharing of learnings across Operational Centres, such as capitalization reports and epidemiological analyses.

MSF interventions helped develop and update diphtheria treatment guidelines and raised global awareness of the potential for vaccine-preventable diseases outbreaks. However, **preparedness for diphtheria outbreaks remains inadequate**, hampered by limited global stakeholder engagement and funding, persistent knowledge gaps, and a lack of reliable alternatives to outdated medical treatments and diagnostic tools.

- Recommendation 10. **Develop and disseminate structured documentation at intersectional level to inform future diphtheria responses**, building on protocols developed during the emergency response and results of capitalization exercises conducted in Kano and Siguiri. It should include guidance for critical aspects, such as DAT management in case of shortages, palliative care strategies, and complex care management.
- Recommendation 11. **Prepare in advance of emergency responses draft clinical research protocols** for critical areas, such as clinical trials for alternative treatments to DAT or alternative diagnostic tests. **Specify criteria to assess the eligibility of a given response to implement the clinical research and the detailed resources required** for this effect.
- Recommendation 12. **Pursue advocacy efforts** beyond immediate emergency responses for increased investment of global stakeholders in preparedness for vaccine-preventable disease outbreaks. This includes promoting the establishment of stockpiles of essential medical countermeasures, such as DAT and vaccines, to ensure rapid-response capacity when new outbreaks emerge.

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Acronyms

ALIMA: Alliance for International Medical Action
CT-Epi: Centre de Traitement des Epidémies (Epidemics treatment centre)
DAT: Diphtheria Anti-Toxin
EOC: Emergency Operations Centre
IPC: Infection Prevention and Control
MoH: Ministry of Health
MSF: Médecins Sans Frontières
NCDC: Nigeria Centre for Disease Control
OCB: Operational Centre Brussels
OCP: Operational Centre Paris
SEU: Stockholm Evaluation Unit
UNICEF: United Nations Children's Fund
WaCA: Operational Center West and Central Africa
WHO: World Health Organization

Introduction

Médecins Sans Frontières (MSF) is an international humanitarian medical organization composed of **27 sections** around the world, linked to **six Operational Centres** who directly manage the operations in the field[1]. An **International Office** based in Geneva provides global coordination of the MSF movement[2]. Rapid and effective response to emergencies is at the core of MSF work. During an outbreak, MSF's role includes a range of activities, such as setting up temporary facilities to treat patients, implementing infection prevention and control measures, organizing mass vaccination campaigns, or carrying out sensitization and advocacy activities.

Diphtheria is an infection caused by toxin-producing strains of Corynebacterium diphtheriae, typically spread through respiratory droplets when an infected person coughs or sneezes[3]. It can lead to death due to local complications in the upper respiratory tract or general complications. Once a widespread infection causing numerous cases and deaths globally, this disease has seen a significant decline in both cases and fatalities since the introduction of a safe and effective vaccine in the early twentieth century. As a result, large outbreaks had nearly disappeared for several decades. Diphtheria can be treated with timely administration of **diphtheria antitoxin (DAT**) and antimicrobial therapy.

The last decade has seen a decrease in vaccination coverage, which allowed the resurgence of large **diphtheria outbreaks.** Among them, an unprecedented surge in reported cases affected several countries in West Africa in 2023, with Nigeria being the hardest hit, particularly in the Northern State of Kano[4]. Starting in early 2023, MSF conducted several interventions through its Operational Centres in 17 sites from six affected countries[5] to support this **outbreak response**. The overall **objective of the MSF response** was to reduce the morbidity and mortality related to the diphtheria outbreak by providing access to quality healthcare and contributing to the control of the outbreak. Most of the MSF activities were carried out in Nigeria, Guinea and Niger, where MSF managed over 22 000 suspected cases. The **main activities** across the different interventions are presented in Figure 1.

Figure 1. Main activities of the MSF response to the diphtheria outbreak

The main activities were identified by the evaluation team based on key documents from each intervention.

[1] https://www.msf.org/how-we-are-run
[2] Without having a hierarchical relationship to the Operational Centres, the International Office acts as a facilitator within the global MSF movement and provides representation support in several global instances such as the Global Outbreak Alert and Response Network (GOARN).
[3] https://www.who.int/news-room/fact-sheets/detail/diphtheria
[4] https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON452
[5] In Nigeria, Guinea, Niger, Mali, Chad, and Yemen.

In August 2023, following a sudden increase in cases in a context of a worldwide shortage of diphtheria antitoxin, MSF formed an intersectional platform to coordinate the diphtheria response across all interventions.

To capitalize on this experience and identify lessons for future outbreak responses, MSF has conducted an **evaluation of this intersectional response** through its Stockholm Evaluation Unit (SEU). The findings informed recommendations to improve MSF response to future diphtheria and other infectious disease outbreaks, including in relation to intersectional coordination. A dedicated Consultation Group comprising MSF staff from the International Office and different Operational Centres has been formed to oversee this evaluation carried out by the Sigia public health consultancy (www.sigia.pt).

Methods

PURPOSE AND SCOPE

The **scope** of this evaluation covers the MSF response activities for the 2023 diphtheria outbreak for the three following interventions[6]:

Operational Centre for West and Central Africa (WaCA) intervention in **Kano, Nigeria**
Operational Centre Paris (OCP) intervention in **Borno, Nigeria**
Operational Centre Brussels (OCB) intervention in **Siguiri, Guinea**

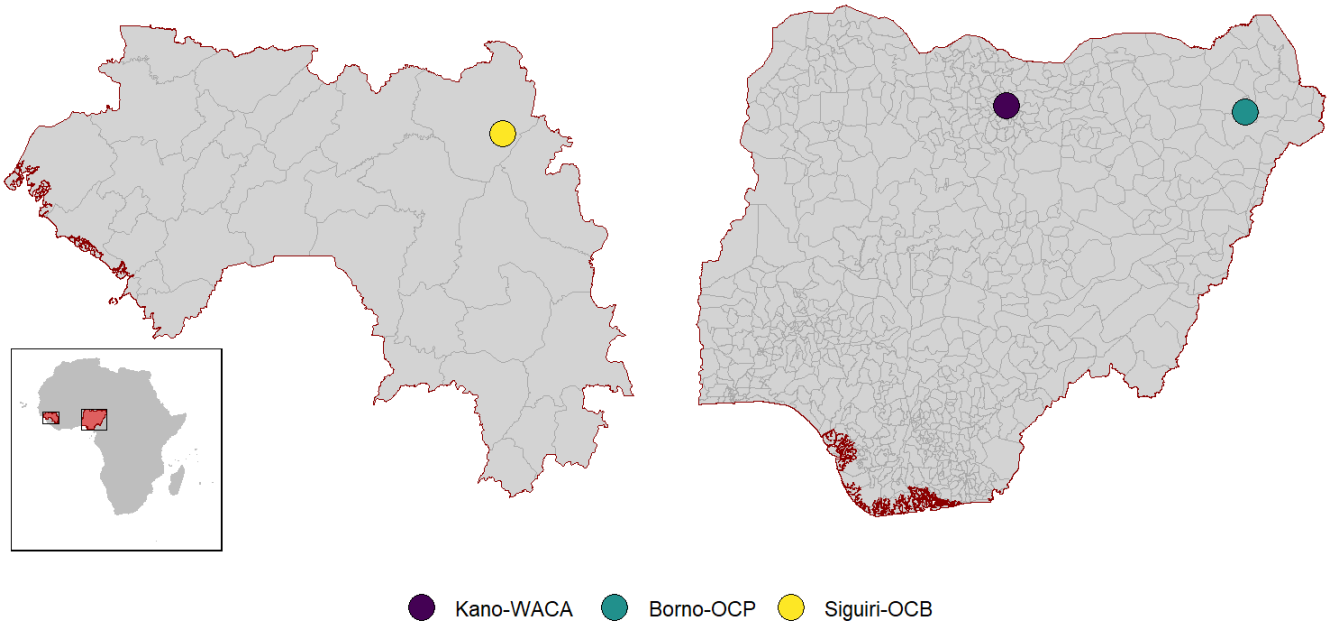

Figure 2. MSF interventions included in the scope of the evaluation

The **overarching objectives of the evaluation** were to:

- Assess the MSF response across the three interventions to identify good practices, challenges and areas for improvement.
- Assess the MSF intersectional coordination to identify good practices, challenges and areas for improvement.

Four specific objectives of the evaluation are presented below, along with their ten evaluation questions:

- **Assess the MSF response modalities including intersectional coordination**
  - How was the MSF response designed, implemented and coordinated in each intervention and overall, before and after implementation of intersectional coordination?
  - How did MSF interventions respond to priority needs in the different settings?

[6] While all Operational Centres were involved in the response, only three participated in the evaluation. The scope of the evaluation was chosen to represent these three Operational Centres and the interventions with the largest number of managed patients.

  - How was MSF involvement compatible and coordinated with other actors' presence and capacity?

- **Assess the MSF response outputs and outcomes**
  - What were the key outputs, outcomes and unintended consequences of the MSF response in each intervention and overall?
  - To what extent did the MSF response positively or negatively influence the control of the diphtheria outbreak?
  - What was the effect of the intersectional coordination on the MSF response outputs and outcomes?
- **Highlight challenges and areas for improvement, good practices and successes of the response**
  - What were the primary challenges faced in the different MSF interventions and overall and the solutions used to surmount them?
  - Which good practices were observed in the MSF response to the outbreak?
- **Identify strategic recommendations for future MSF response to outbreaks, including in relation to intersectional coordination**
  - What strategic recommendations can be made for improving MSF's response to future outbreaks in general and during diphtheria outbreaks in particular?
  - How can intersectional coordination of MSF outbreak response be improved based on the experience from this outbreak?

The assessment modalities and data used for each evaluation question are detailed in an evaluation matrix in Annex 1.

DATA COLLECTION AND ANALYSIS

The following activities were conducted to inform the evaluation (Figure 3)[7]:

- **Review of national and international guidelines on diphtheria:**
  - Nine institutional websites[8] were screened to identify relevant documents, the detailed methodology is presented in Annex 2.
  - Overall, 23 documents of interest[9] were identified. They were used to assess how the strategy and case management used during the MSF response were consistent with national and international best practices and recommendations.
- **Review of MSF response documents:**
  - All documents retrieved from the three evaluated interventions and from the intersectional coordination were screened to identify documents of interest for the purposes of the evaluation.

[7] Additional details on the methodology used for each activity is provided in the inception report developed at the onset of the project and available upon request.
[8] MSF evaluation, MSF medical guidelines, MSF Science Portal, Epicentre, African Centres for Disease Control and Prevention, Nigeria Centre for Disease Control, European Centre for Disease Prevention and Control, United States Centres for Disease Control and Prevention, and World Health Organization Institutional Repository for Information Sharing.
[9] 11 documents published by the World Health Organization, 3 documents published by the Nigeria Centre for Disease Control, 1 document published by the United States Centres for Disease Control and Prevention, 1 document published by MSF and 7 articles published in scientific journals.

- Two hundred seventy-five documents were identified and reviewed, including 69 produced at intersectional level, 85 related to the WaCA intervention in Kano, 66 to the OCP intervention in Borno, and 52 to the OCB intervention in Siguiri.

- **Interview of key informants:**
  - Thirty-five semi-structured interviews were conducted[10] from 28 November 2024 to 20 January 2025 using two tailored interview guides: one for MSF staff and one for external partners (Annex 5).
  - Twenty-seven MSF staff were interviewed: five at international level[11], seven from WaCA, six from OCP, and nine from OCB[12]; along with four key informants from health authorities[13], and four from international organizations[14].
  - Interviews were conducted in English and French, audio-recorded upon consent and transcribed verbatim.

- **Qualitative analysis:**
  - All interview transcripts and project documents of interest were analysed using the MAXQDA qualitative analysis software[15].
  - A first round of analysis used a predefined set of codes to extract all quotes and excerpts of interest (codes presented in Annexe 3).
  - A second round of analysis consolidated and summarized all extracted information without the use of a predefined set of codes (inductive analysis).

- **Quantitative analysis:**
  - Based on the list of indicators monitored by the different interventions and indicators retrieved from the literature review, a list of quantitative indicators of interest for the evaluation was developed.
  - The intersectional database consolidated by Epicentre[16] was retrieved, containing information on 21 176 patients, including 14 707 patients from Kano, 1 462 patients from Borno and 4 714 patients from Siguiri.
  - The retrieved data was cleaned, and descriptive analyses conducted to compute and display quantitative indicators of interest.
  - All analyses were conducted with the R statistical software[17], the scripts used for data management and analysis are available upon request.
  - Relevant analyses for the purpose of the evaluation are presented in the report, all other conducted analyses are available in a companion document available upon request.

- **Online working session**: two three-hour online sessions took place on 23 and 24 January 2025 to present and discuss preliminary results, collect feedback and identify recommendations. All

[10] Key informants were chosen to represent the different stakeholders involved in the emergency response, based on their availability and recommendations gathered during the inception phase. Interviews were conducted until saturation was reached (that is no or few elements of interest for the purpose of the evaluation were added with a new interview).
[11] From the International Office and Epicentre.
[12] Ten at headquarters level, six at country level and six at intervention level.
[13] Two in Guinea (local and national levels) and two in Nigeria (local and national levels).
[14] Two at country level, one at regional level, one at global level.
[15] https://www.maxqda.com/
[16] Epicentre is an MSF Satellite dedicated to epidemiology and research: https://epicentre.msf.org/en/epicentre/mission.
[17] R Core Team (2023). R: A Language and Environment for Statistical Computing. R Foundation for Statistical Computing, Vienna, Austria. http://www.R-project.org/

interviewed MSF key informants and members of the evaluation consultation group were invited to participate, twelve of whom joined the sessions.

Figure 3. Overview of the activities conducted for the evaluation

MSF project: staff located in the interventions' sites, MSF coordination: national coordination staff located in Capital cities, MSF HQ: MSF staff located at headquarters.

ETHICAL CONSIDERATIONS

The evaluation was conducted in accordance with the MSF Stockholm Evaluation Unit Ethical Guidelines[18].

All key informants were above eighteen years old. They were provided with background information on the purpose, aims and objectives of the interview and evaluation, and were encouraged to ask questions for clarification. The voluntary nature of the interview and right of withdrawal at any moment were communicated. A consent form was provided to ensure agreement for the interview and for its audio recording (background information and consent form in Annexe 4), written consent was sought. Audio-recording was not compulsory for the interview to be conducted.

To ensure data confidentiality, all interview transcripts were accessible only to authorized Sigia staff on a secure document management system and are to be deleted one month after the end of the evaluation, along with all retrieved medical data from the emergency response. All evaluation information and data were anonymized during the data analysis process.

The Sigia team members had no conflict of interest in relation to this evaluation.

[18] Ethical guidelines. Stockholm Evaluation Unit; 2022. https://evaluation.msf.org/sites/default/files/2023-01/GUI_2022_SEU_MAIN_EthicalGuidelines.pdf

LIMITATIONS

Key limitations have impacted the evaluation and should be considered when reviewing its results:

- While all six MSF Operational Centres participated in the response to the diphtheria outbreak and in the intersectional coordination, only three participated in this evaluation. This may have resulted in an incomplete picture of the overall response and coordination efforts.
- The **remote nature of the evaluation** prevented direct access to beneficiaries and community health workers, limiting the ability of the evaluation to assess the impact of the response from their perspectives.
- **Staff turnover within MSF and partner organizations** also made it difficult to contact some key informants who were no longer in their roles at the time of the diphtheria response and get their critical perspectives. This specifically concerned two MSF staff members at the OCB headquarters level, who were particularly involved in intersectional coordination, and the Nigeria diphtheria incident manager at the time of the MSF response.
- Despite efforts to engage a diverse range of key informants, five MSF staff and nine staff from partner organizations did not respond to our invitations to participate in the interviews. The **non-response** from these key informants introduced a potential limitation, as their perspectives and insights might have differed from those who responded.
- The quantitative analysis was limited by the **data quality, including the number of missing values** of some important variables, such as mortality data or case severity.

Results

DESCRIPTION OF MSF RESPONSE MODALITIES

TIMELINE OF THE OUTBREAK

The first sporadic cases of diphtheria appeared in Kano State, **Nigeria**, in May 2022, followed by a progressive increase reaching 30 cases in the last eight weeks of 2022. However, due to a combination of clinicians' unfamiliarity with the disease and insufficient data-sharing mechanisms, the outbreak was not officially recognized until December 2022. The Nigerian Centre for Disease Control (NCDC) declared the outbreak to the World Health Organization (WHO) on 1 December 2022 and established a Diphtheria Incident Management System. In Borno State, 89 suspected cases of diphtheria were reported in the first half of 2023, without deaths. The state Ministry of Health (MoH) activated the Diphtheria Incident Management System and published its first situation report on 31 July 2023[19]. WHO graded the diphtheria outbreak in Nigeria as a level 1 emergency on 5 March 2023[20] and as a level 2 emergency on 17 September 2023[21].

In **Guinea**, the first two suspected cases of diphtheria were confirmed on 20 July 2023. The outbreak occurred in Siguiri, a mining region characterized by high population mobility and low vaccination coverage. The outbreak was officially notified to WHO on 5 September 2023[22], and subsequently graded as a level 2 emergency on 17 September[23].

An overview of the diphtheria outbreak timeline in West Africa is presented in Figure 4.

INVOLVEMENT OF MSF IN EACH SETTING

At the start of the diphtheria outbreak, **MSF was already present in the three intervention areas through long-term projects**. In Kano State, WaCA had been active since 2020, supporting the primary health care system with reproductive health, nutrition care, and emergency preparedness initiatives. Meanwhile, in Borno State, OCP ran a project at the Gwange Paediatric Hospital in Maiduguri, providing free healthcare for children from one month to 15 years of age. In Guinea, OCB had a long-standing presence in the country through an HIV project in Conakry, but was not active in Siguiri.

Both in Kano and Borno, MSF was alerted through the occurrence of sporadic cases of diphtheria in their supported healthcare facilities. In Kano and Siguiri, the response was triggered following the official request of health authorities.

[19] Borno State Ministry of Health. "Daily Situation Report – Suspected Diphtheria Outbreak". July 31st, 2023.
[20] WHO African Region. "Weekly bulletin on outbreaks and other emergencies". March 5th, 2023.
[21] WHO African Region. "Weekly bulletin on outbreaks and other emergencies". September 17th, 2023.
[22] https://www.who.int/emergencies/disease-outbreak-news/item/2023-DON492
[23] WHO African Region. "Weekly bulletin on outbreaks and other emergencies". September 17th, 2023.

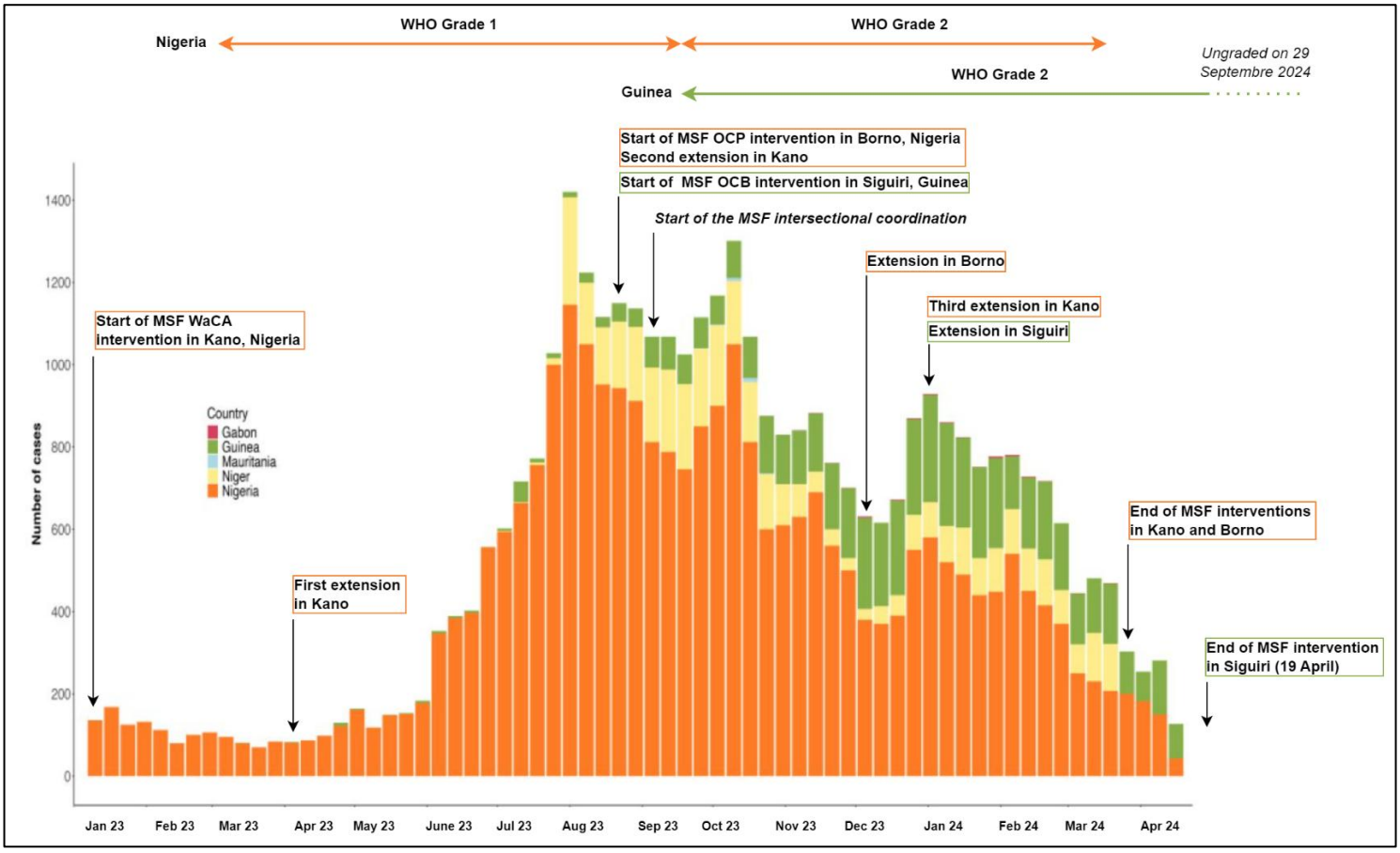

Figure 4. Timeline of the diphtheria outbreak and MSF interventions in West Africa

Adapted from *WHO African Region Health Emergency Situation Report – Multi-country Outbreak of Diphtheria, Consolidated Regional Situation Report # 008*.

In Kano, WACA identified the first diphtheria cases in late 2022 and assessed the situation in Decembre (Table 1). At the time, health authorities had set up two isolation units in paediatric wards, but they were reportedly poorly designed and inadequate to cope with the growing number of cases. In the second week of 2023, as many as 37 diphtheria cases and 20 deaths were registered by the authorities. In January 2023, the state MoH formally requested WaCA to support case management at the Murtala Mohammed Specialist Hospital. Consequently, WaCA's response started in the second week of 2023, five weeks after the official outbreak declaration by the Nigerian authorities. It was initially designed as a three-month emergency intervention, but a first three-month extension was followed by a six-month extension in response to the increase in cases, while a final three-month extension was approved to allow a gradual handover to the health authorities. In total, the intervention spanned over a year, far exceeding WaCA's usual three-month cap for emergency responses.

In Borno, OCP identified the first diphtheria cases at the MSF-run Gwange Paediatric Hospital in late January 2023 and alerted the health authorities. Despite the alert, no dedicated diphtheria treatment centre was established, and no other actors participated in the clinical management of diphtheria patients. Most cases were arriving at the MSF-run Gwange Paediatric Hospital, straining MSF's resources and prompting OCP to assess the situation in July 2023 (Table 1). On 14 August 2023, it proactively initiated its own emergency diphtheria response, notifying local health authorities accordingly. Initially planned for four months, the intervention was extended for three months with case management relocated to the University of Maiduguri Teaching Hospital.

In Guinea, OCB was informed of suspected diphtheria cases in the Siguiri region in July 2023 through its participation in weekly surveillance meetings organized by the National Agency for Health Security. As a result, it offered support to the health authorities and conducted an exploratory mission in Siguiri in early August to assess the situation (Table 1). At the time, the governmental CT-Epi[24] healthcare facility in Siguiri was responsible for receiving diphtheria patients but was not exclusively dedicated to their care. On 14 August, one week after its exploratory mission, OCB received a formal request from the health authorities to support the response to the diphtheria outbreak and launched its emergency response. Initially designed for four months, the intervention was extended for another six months to implement a reactive vaccination campaign.

Table 1. Priority needs identified by MSF before each intervention

WACA - Kano	OCP – Borno	OCB – Siguiri
Lack of trained healthcare personnel involved. No clear case management protocol. Inadequate IPC measures to protect healthcare workers. No data collection and management system. Lack of health promotion activities to improve early detection and referral of cases.	No other actor than MSF managing diphtheria cases. Limited availability of treatment, including DAT and antibiotics to prevent secondary infections. Insufficient IPC measures. Lack of contact tracing. Inadequate sensitization efforts. No plans for mass vaccination.	Lack of trained human resources. Healthcare structures requiring rehabilitation. Lack of case management protocols. Inadequate IPC measures. Lack of surveillance and health promotion activities to improve early detection and referral of cases.

IPC: infection prevention and control
DAT: Diphtheria Anti Toxin
Sources: WaCA. "Operational Concept Note". January 2023; OCP Mission Nigeria. "Emergency Operational Intentions". August 2023; OCB "Handover report Emergency coordinator". October 2023.

[24] Centre de Traitement des Epidémies

OVERVIEW OF THE RESPONSE MODALITES

An underlying theory of change was not retrieved from the interventions' documents. For this evaluation, a global theory of change of the MSF response was reconstructed based on the objectives, planned activities, expected results and monitoring indicators described in the concept notes and logical frameworks of each intervention (Figure 5).

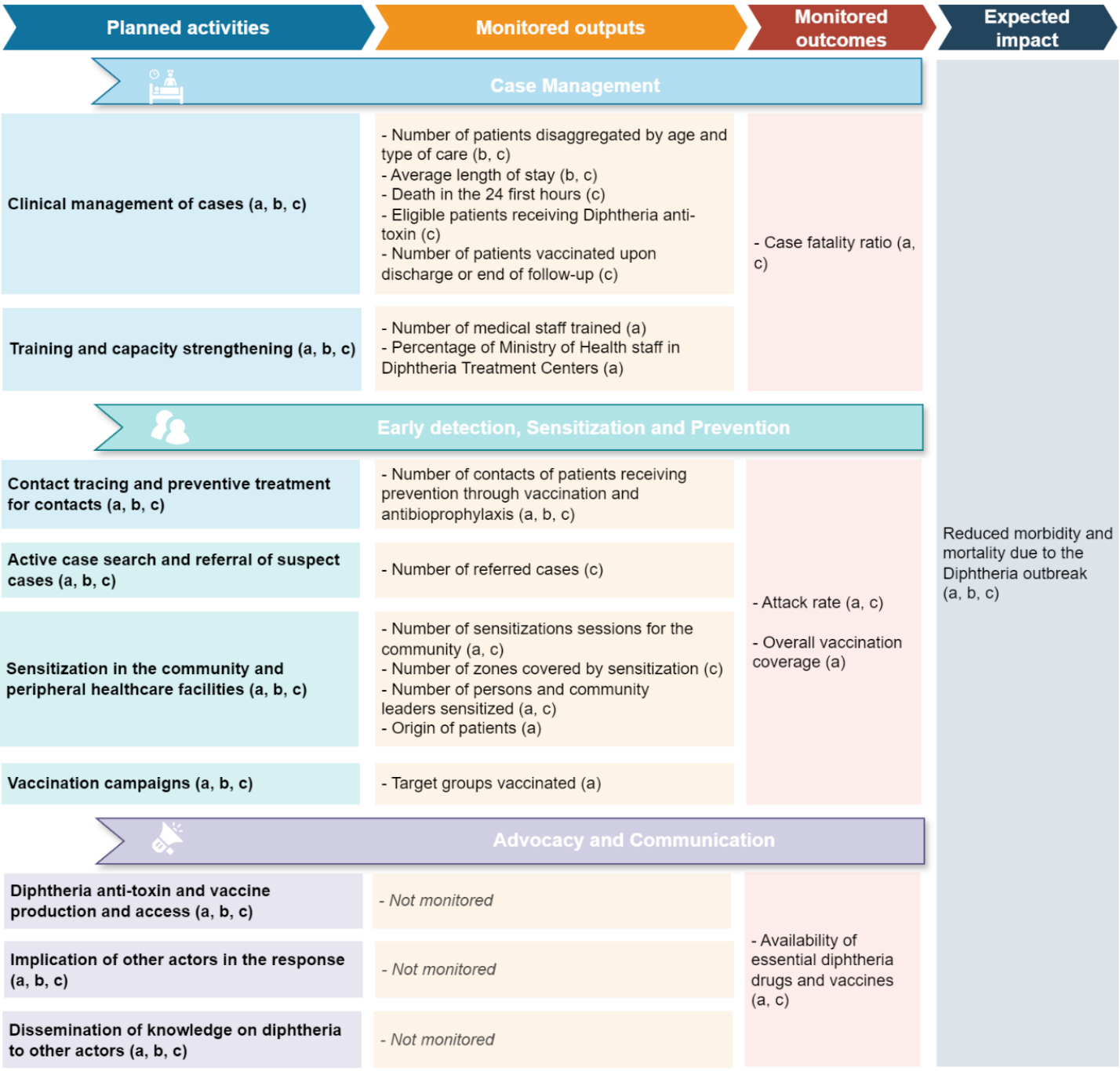

Figure 5. Reconstructed theory of change of the MSF outbreak response

Reconstructed based on the objectives, planned activities, expected results and monitoring indicators extracted from the logical frameworks and concept notes of WaCA (a), OCP (b) and OCB (c) interventions.

The **primary stated objective** of the intervention in Kano and Siguiri was to reduce diphtheria mortality and morbidity, while in Borno it was to contribute to the control and prevention of the outbreak.

The **primary focus** of all interventions was put on case management with quality care provided for free to diphtheria patients. In all its interventions, MSF established and supported diphtheria case management through the provision of free care to patients, essential supplies and infrastructure to treatment centres and training of healthcare staff.

Both in Kano and Siguiri, the strategy was to **build local capacity for case management,** with over 95% of staff in the treatment centres being MoH personnel working under an incentive model[25]. In Borno, case management first occurred in the MSF-run hospital with staff directly employed by MSF, it was later moved to the Maiduguri University Teaching Hospital where around 60% of staff worked under the incentive model for diphtheria case management.

To accommodate an increasing number of cases at the treatment centres, the intervention in Kano introduced a **tiered-based system for case management** in June 2023 with mild cases not hospitalized and benefiting from home-based care. The follow-up of home-based patients in Kano was conducted through phone calls two days after their initial visit to check for complications and adherence to antibiotics along with weekly visits of the patients to "contact clinics"[26] set up in the community for one month. Home-based treatment of mild patients was also used in Siguiri with one-week follow-up conducted through daily home visits by community health workers to monitor adherence to the treatment. In contrast, OCP in Borno hospitalized all patients, partly because of the challenges associated with ensuring adequate follow-up of outpatients.

Besides case management, **community activities** were implemented through community health workers[27] to increase population awareness about diphtheria symptoms, prevention measures and the importance of early healthcare seeking behaviour. In all interventions, community health workers were trained for the detection and referral of cases, while in Kano and Siguiri training was also provided to staff at peripheral healthcare facilities.

Advocacy in all interventions focused on mobilizing additional resources, engaging more actors and triggering the implementation of vaccination activities. While **vaccination** of cases and contacts was conducted in all interventions, only in Siguiri was direct involvement in a mass vaccination campaign planned in the initial strategy.

An **overview of the main activities** conducted in each intervention is presented in Table 2.

[25] In the incentive model, healthcare staff is under contract with the MoH and receives extra payments from MSF to support specific activities.

[26] Two contact clinics (one fixed and one mobile) were established in the community to support the management of close contacts with vaccination and antibioprophylaxis and follow-up home-based patients.

[27] In Kano, 83 community health workers were recruited by the MoH based on MSF criteria and received MSF incentives as remuneration. In Borno, 20 community-based officers already contracted by MSF for regular activities were joined by 10 additional community-based officers specifically recruited by MSF for the response. In Siguiri, the preexisting network of 173 community relays and community health workers was used and received MSF incentives.

Table 2. Overview of MSF main activities in each intervention

WACA - Kano	OCP – Borno	OCB – Siguiri
Tiered case management [a] • Mild cases: home-based care • Stable severe cases: Infectious Disease Hospital (56 beds) • Complex severe cases: Murtala Muhamed Specialist Hospital (80 to 115 beds)	**Hospital-centred case management** • Phase 1: Gwange paediatric hospital (20 beds)[e] • Phase 2: University of Maiduguri Teaching Hospital (22 beds)[f]	**Tiered case management** • Mild cases: home-based care • Severe cases: CT-Epi (12 to 50 beds)
Early detection • Training of community health workers[b] • Training of staff at peripheral healthcare facilities[c] • Active case search and contact tracing • Fixed and mobile clinics for contacts management[d] **Sensitization and prevention** • Sensitization sessions and surveillance of rumours by community health workers	**Early detection** • Training of community health workers[b] • Active case search and contact tracing **Sensitization and prevention** • Sensitization sessions by community health workers	**Early detection** • Training of community health workers[b] • Training of staff at peripheral healthcare facilities[c] • Active case search and contact tracing **Sensitization and prevention** • Sensitization sessions by community health workers • Planification of a mass vaccination campaign
Advocacy to main stakeholders • Participation in coordination and bilateral meetings with main stakeholders		

CT-Epi: Centre de traitement des épidémies

[a] At the outset, case management was centred at the Murtala Mohammed Specialist Hospital. The surge of cases in July 2023 necessitated a shift to a decentralized care strategy. The Murtala Mohammed Specialist Hospital was designated for managing complex severe cases, while the Infectious Disease Hospital was identified to manage severe but stable patients. For mild cases, a home-based care model was introduced.

[b] Community health workers trained to detect and refer suspect cases.

[c] Staff at peripheral healthcare facilities trained to identify, refer, or manage cases appropriately.

[d] Two contact clinics (one fixed and one mobile) were established in the community to support the management of close contacts with vaccination and antibioprophylaxis and follow-up home-based patients.

[e] A 20-bed dedicated facility was established for diphtheria patients under 15 years of age. In parallel, MSF advocated for the MoH to manage moderate cases and adult patients who could not be admitted.

[f] In Decembre 2023, the diphtheria treatment centre was relocated to the University of Maiduguri Teaching Hospital in coordination with local authorities. An unoccupied isolation centre previously used for COVID-19 was repurposed. This shift allowed access to specialists at the University Hospital, providing expertise for managing complex cases, and addressed the lack of a clear treatment pathway for patients over 15 years old.

COORDINATION WITH OTHER ACTORS

In **Nigeria**, Emergency Operations Centres (EOC) at national and state levels were in charge of the response through the mapping of resources and partners, the development of action plans, and the organization of coordination meetings between authorities and partners. Both WaCA and OCP participated in these coordination meetings, contributing to discussions on progress, gaps and challenges in the response strategy. At the state level in Kano and Borno, coordination with partners such as WHO, UNICEF and the Red Cross was also facilitated through regular EOC meetings, especially for community activities. At national level, bilateral discussions between MSF and partners included representatives from the different Operational Centres responding in the country, ensuring a unified approach. WaCA and OCP also collaborated with the NCDC in a national technical working group to monitor the outbreak's evolution and develop the national diphtheria guidelines.

In **Siguiri**, from the start, OCB participated in weekly coordination meetings with health authorities at district level and less frequently at regional level. At national level, a strategic diphtheria response committee was established with weekly coordination meetings between national authorities and partners, including OCB.

To formalize partnerships and outline roles and responsibilities, **Memoranda of Understanding** were signed by OCP in Borno with the University of Maiduguri Teaching Hospital and the state health authorities in Decembre 2023[28], and by OCB in Siguiri with the district health authorities in January 2024[29]. No specific Memorandum of Understanding was signed in Kano between WaCA and the local health authorities or healthcare facilities.

INTERSECTIONAL COORDINATION

In MSF, long-standing **intersectional working groups** composed of technical referents from each Operational Centre are in place to coordinate and align practices across sections for technical topics such as clinical guidelines or vaccination.

While in the first half of 2023, WaCA was the only Operational Centre responding to the diphtheria outbreak, its rapid extension led all other Operational Centres to become involved during the summer[30]. This surge in diphtheria cases, combined with a global shortage of DAT and vaccines, brought out the need to align responses across interventions. Initially pushed by a few individuals from the MSF International Office and different Operational Centres at headquarters level, a coordinated approach to communication, advocacy, and supply management for the diphtheria response was officially endorsed on 18 August 2023 during an ad hoc meeting of the Directors of Operations (RIOD[31]). To this aim, a coordination group composed of representatives from each Operational Centre engaged in the response at headquarters level was formed and referred to as the **interdesk**[32]. This interdesk held 25 meetings from August 2023 to April 2024 and liaised with the pre-existing intersectional working groups for technical aspects such as clinical guidelines or vaccination strategies.

[28] When the diphtheria treatment centre was relocated.
[29] Five months after the start of the intervention.
[30] OCB in Guinea, OCP in Nigeria, Operational Centre Amsterdam in Nigeria, Operational Centre Barcelona-Athens in Mali and Nigeria, Operational Centre Geneva in Nigeria.
[31] The RIOD is an international platform where the Directors of Operations from MSF's six Operational Centres meet to coordinate and align the MSF movement efforts.
[32] In the MSF movement, operational departments are called cells or desks depending on the Operational Centre.

MONITORING OF THE RESPONSE AND EPIDEMIOLOGICAL CONTEXT

In each intervention, the list of all suspected and confirmed cases (line list) managed by MSF was established and shared daily or weekly with local health authorities for outbreak monitoring[33]. Starting with WaCA in September 2023, the line lists of all MSF interventions related to the diphtheria outbreak were progressively added to a consolidated line list updated weekly by Epicentre[34] to support decision-making at intersectional level.

DISENGAGEMENT OF MSF FROM THE OUTBREAK RESPONSE

In **Kano**, while no clear exit criteria were defined from the outset, disengagement was guided by a reduction in the number of cases, the willingness of health authorities and partners to undertake mass vaccination campaigns and the capacity of healthcare facilities to autonomously manage sporadic cases. However, when the emergency response was extended in August 2023, the absence of effective mass vaccination campaigns raised concerns that diphtheria might become endemic and WaCA concluded that maintaining an emergency intervention beyond the end of 2023 would not be justified. The handover of activities was progressive. Starting from November 2023, under the health authorities' coordination, Save the Children and the Alliance for International Medical Action (ALIMA) replaced WaCA in supporting the contact clinics and the Infectious Disease Hospital, respectively. A final three-month extension of MSF intervention was still approved in January 2024 to ensure local capacity for case management and surveillance after withdrawal, including through training conducted in peripheral healthcare facilities. The intervention in Kano officially ended in March 2024 with the handover of the last diphtheria treatment centre to the health authorities.

In **Borno**, the relocation of the treatment centre to the University of Maiduguri Teaching Hospital, mainly staffed by MoH personnel, in December 2023, was the opportunity to plan the handover of activities. While no exit criteria were defined from the outset, they were established in March 2024 as having fewer than 10 suspect cases per week. These criteria were met in April 2024, allowing OCP to handover activities to the health authorities.

In **Siguiri**, exit criteria were established when the intervention was extended in January 2024, and were based on two scenarios: either a progressive decrease in cases for four weeks without a vaccination campaign, or the successful implementation of a mass vaccination campaign. The failure to implement the vaccination campaign as planned conducted OCB to send a disengagement letter to the health authorities on 19 April, before ending the intervention on 19 May 2024, in spite of neither of the exit criteria being present. This withdrawal was considered as unilateral by the health authorities and not aligned with the Memorandum of Understanding signed in January which mentioned end of June for the potential end of the MSF intervention. After MSF departure, ALIMA took over the support to the diphtheria treatment centre for two months before stopping it due to insufficient funding.

[33] Daily reporting in Kano and weekly reporting in Borno and Siguiri.
[34] The initial list of variables was based on the Kano data collection tool and was later reviewed and updated by an intersectional working group considering existing WHO and US CDC guidelines.

ASSESSMENT OF THE MSF RESPONSE

CASE MANAGEMENT

Outputs

At the start of the intervention in Nigeria and Guinea, no comprehensive **diphtheria treatment guidelines** were available at national or global levels. WaCA, OCP and OCB initially applied the 2019 MSF Operational Centre Geneva guidelines[35] for diphtheria case management, adapting them to the local context. Case definitions from the 2018 WHO guidelines[36] were used to ensure consistency with global standards. In October 2023, the MoH in Nigeria convened a workshop with all relevant actors, including MSF, to review the first draft of the national diphtheria guidelines. The final version, published in early 2024[37], closely mirrored MSF practices and standards. In Guinea, the MSF practices and standards were also used as the foundation for the development of national guidelines. At global level, the MSF International Office collaborated with WHO and other partners to revise diphtheria treatment guidelines, incorporating field-level experience on good practices and gaps in case management[38].

Over the course of the interventions, a total of 14 707 **diphtheria cases** were registered in MSF supported facilities in Kano, 1 462 in Borno, and 4 714 in Siguiri (Figure 6). Among them (Figure 7), half were hospitalized in Kano (55%, 8011/14707) and Siguiri (50%, 2370/4714) and nearly all in Borno (98%, 1429/1457).

[35] MSF Operational Centre Geneva had the most complete set of guidelines for diphtheria within MSF, following its emergency response to the diphtheria outbreak in Yemen in 2017. “Diphtheria case management – OCG protocol”. July 2019.
[36] World Health Organization. “Diphtheria Surveillance Standards”. September 2018
[37] Nigeria Centre for Disease Control and Prevention. “National Diphtheria Surveillance and Outbreak Response Guideline”. 2024
[38] World Health Organization. “Clinical management of diphtheria”. February 2024

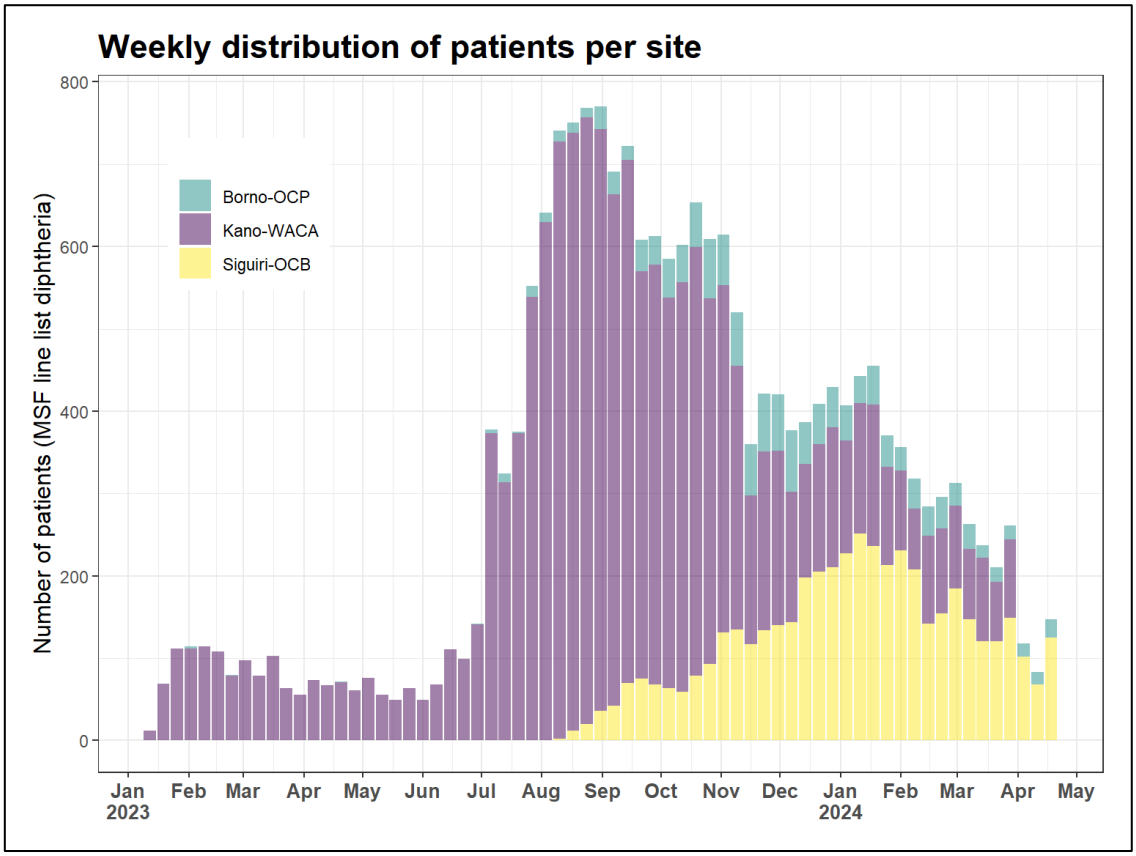

Figure 6. Weekly cumulative distribution of patients over time per site

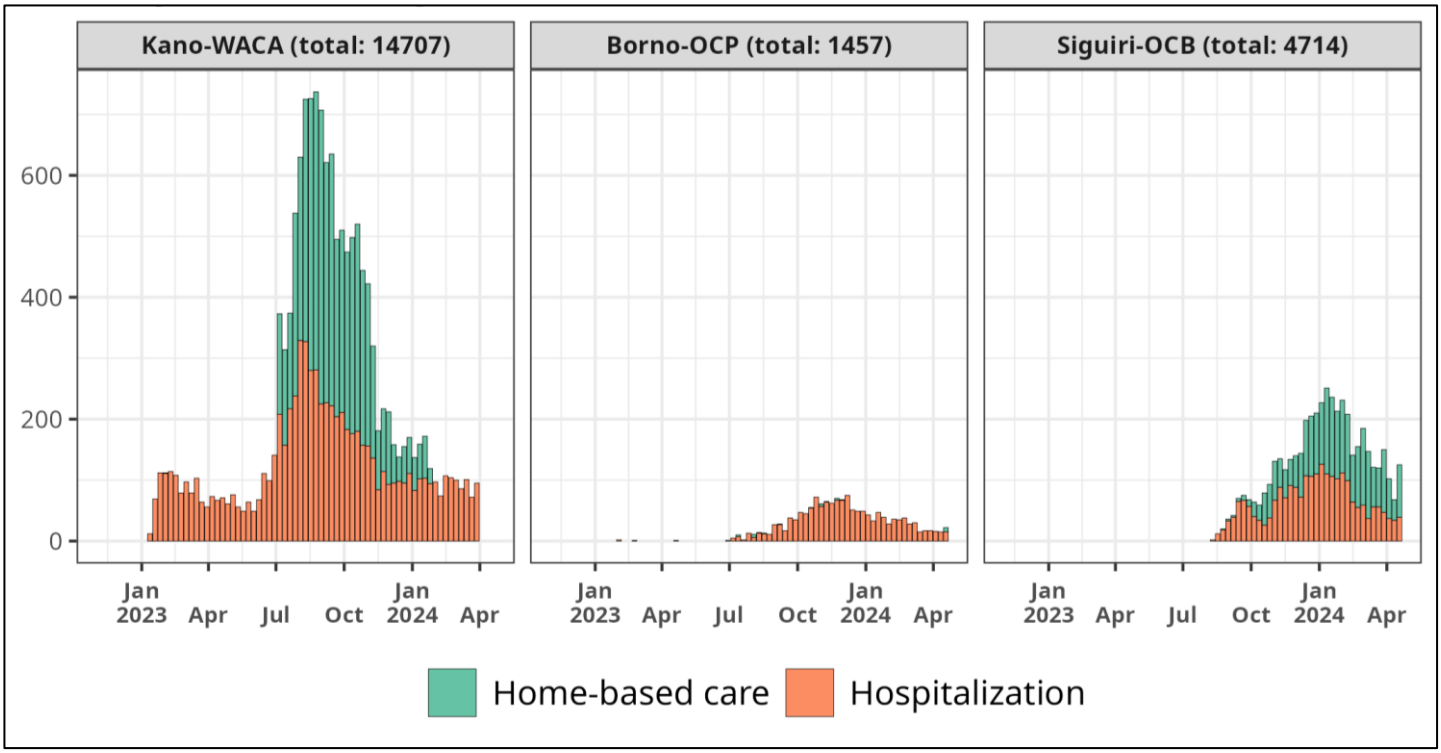

Figure 7. Weekly cumulative distribution of patients over time per type of care

Total of 20 878 patients.

For hospitalized patients, the median **length of stay** was four days in Kano, two days in Borno, and three days in Siguiri[39] (Figure 8 and 9).

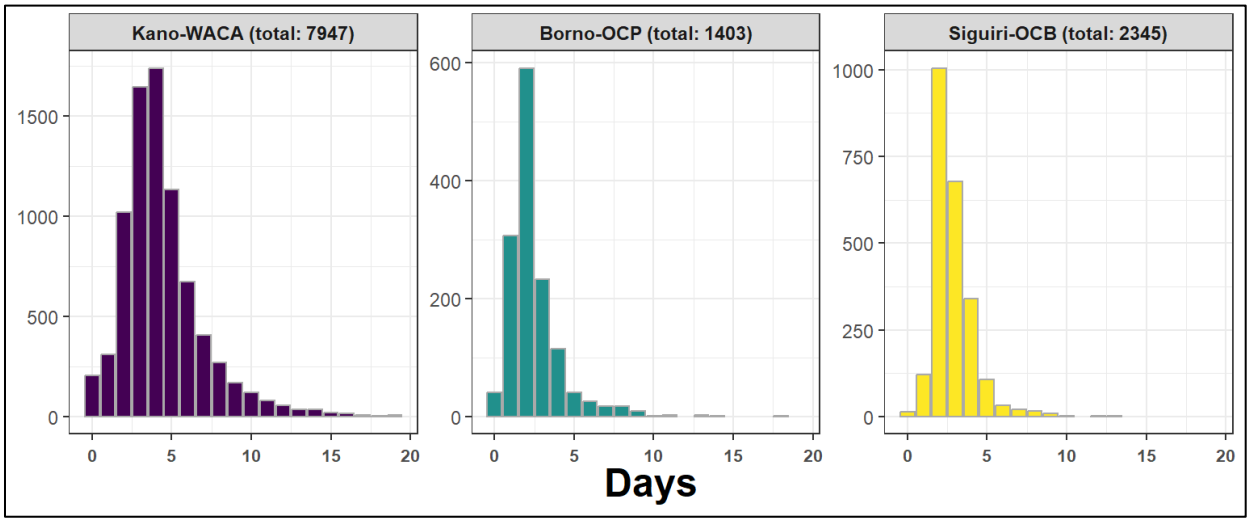

Figure 8. Distribution of the length of stay for hospitalized patients

Total: 11 695 hospitalized patients.

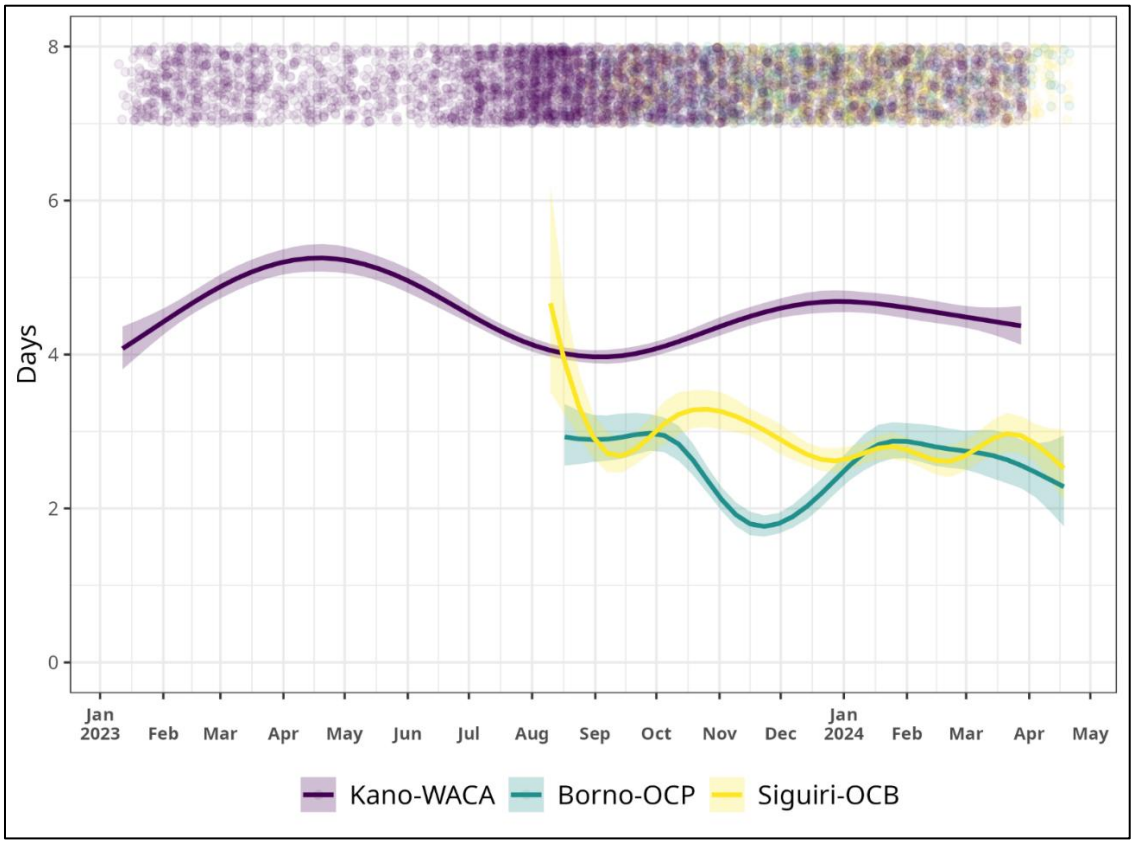

Figure 9. Average length of stay per hospitalization over time per site

Total: 11 695 hospitalized patients. Each dot on the top of the figure represents one hospitalized patient. The average value of the length of stay and its 95% confidence interval were estimated through a generalized additive model with Poisson regression.

[39] 10th; 90th percentiles: [2; 8 days] in Kano (n=7947), [1; 4 days] in Borno (n=1403) and [2; 4 days] in Siguiri (n=2345).

DAT was administered to 30% of hospitalized patients in Kano (n=2417/7982), 10% in Borno[40] (n=115/1113), and 14% in Siguiri (n=328/2322), while it was almost never administered to home-based patients[41]. The distribution of DAT administration per site over time is presented in Figure 10[42]. In the three interventions, all managed patients were also provided with antibioprophylaxis and vaccination.

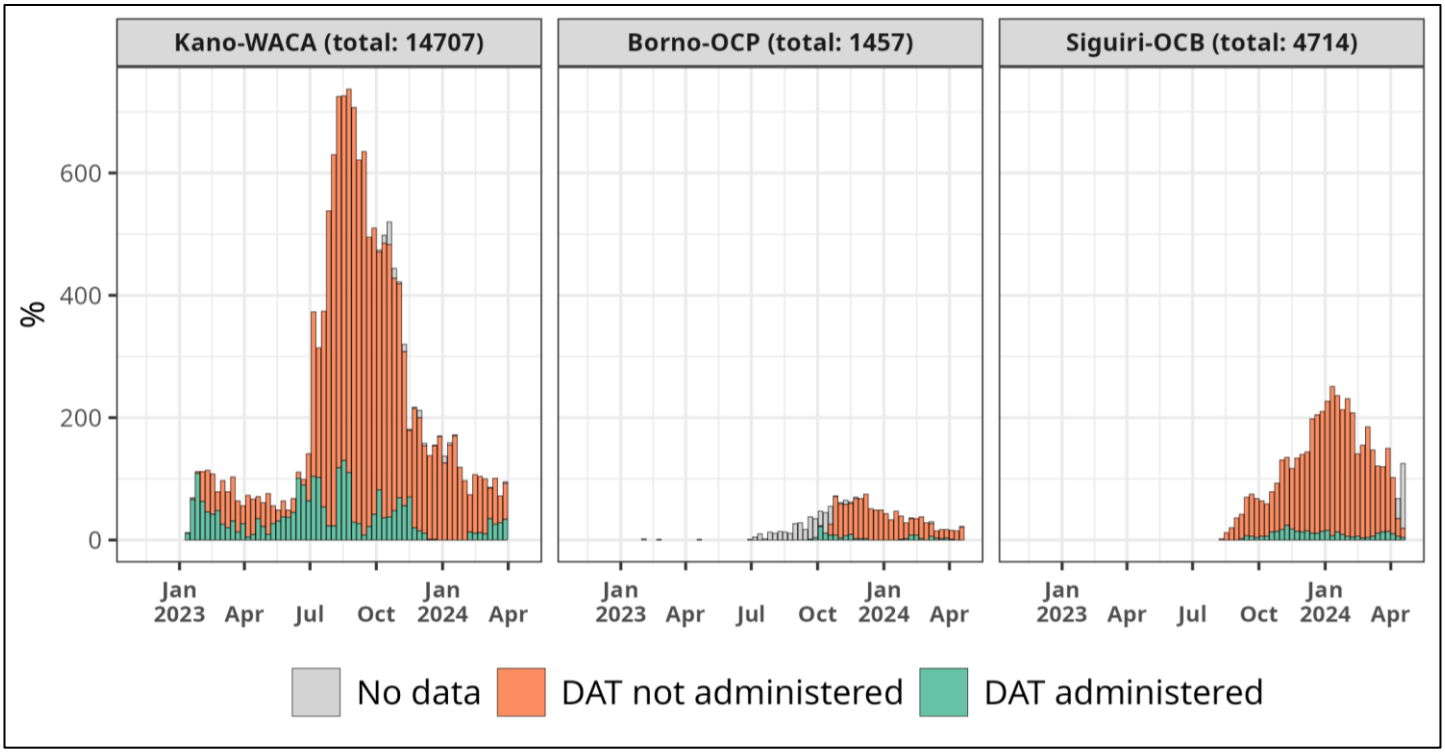

Figure 10. DAT administration per site over time

Total of 20 878 patients.

Challenges

DAT is the primary treatment for severe diphtheria cases, it is to be administered immediately to all suspect cases of respiratory diphtheria[43]. In recent years, its global availability has declined due to discontinued production and expiration of existing stocks, primarily driven by reduced demand[44]. This **global shortage of DAT** was the main challenge faced for case management. Besides its low availability in global markets, forecasting the needs for DAT was also made difficult by the lack of historical data on diphtheria dynamics and the rapidly evolving nature of the outbreak. This very low availability of DAT compelled MSF to prioritize some patients for its administration and to decrease the dose to be administered in some cases.

In Nigeria, **importation hurdles** posed by the National Agency for Food and Drugs Administration (NAFDAC) further exacerbated the shortage of DAT, but also of other essential treatments such as antibiotics. Strict import regulations in the country also impeded access to morphine to manage severe respiratory distress and alleviate suffering in diphtheria patients with complications. Thus, despite

[40] In Borno, 23% of patients didn't have registered information on DAT administration (n=335/1462).
[41] Six DAT administration registered in Kano for home-based patients and none in Siguiri, while in Borno almost all patients were hospitalized.
[42] Only the mention of its administration was available in the database, without its administration date.
[43] World Health Organization. "Clinical management of diphtheria". February 2024.
[44] World Health Organization African Region. "Diphtheria outbreaks". February 2024.

being recommended in MSF clinical guidelines, morphine could not be used in Nigeria which significantly constrained proper implementation of **palliative care** during the response.

In Kano, the **lack of clinical guidelines for managing complicated diphtheria cases** resulted in inconsistent and potentially harmful care practices by clinicians making on-the-spot decisions, such as excessive use of dialyses. While MSF had limited leverage over MoH-contracted clinicians in treatment centres, collaboration with local medical specialists, such as paediatric cardiologists and nephrologists, proved successful in improving the management of complex cases by providing legitimacy to change potentially harmful practices.

Limited capacity at treatment centres with high occupancy rates[45] led to the discharge of patients who were potentially still contagious[46] (in average 2-4 days after administration of antibiotics, see figure 8), which raised concerns about transmission risks. In addition, it was difficult to follow up patients after discharge[47], while diphtheria is known to potentially lead to complications several weeks after onset[48].

Some key informants felt that MSF's response to the diphtheria outbreak had been a **missed opportunity to develop alternative treatments to DAT**. During the response, the MSF Access Campaign[49] had been in discussions with the WHO and MassBiologics[50] to conduct a clinical trial of an experimental treatment based on monoclonal antibodies. However, difficulty of securing funding for such research and previous controversies in Nigeria over clinical trials hampered MSF's ability to carry out this type of research.

Good practices

Faced with these challenges, **MSF's ability to rapidly adapt treatment protocols** was highlighted as a success in the response. It swiftly modified antibiotic protocols in response to antimicrobial resistance and discontinued sensitivity testing for DAT administration, as it was deemed unnecessary and risked excluding patients from life-saving treatment. As a token of good practice, these two adaptations were subsequently adopted in the WHO guidelines[51]. To manage the global shortage of DAT, MSF developed a specific protocol at intersectional level to optimize its use. Recognizing that DAT efficacy significantly decreases with each day of delayed treatment, the approach prioritized patients who presented early with severe forms of the disease.

Despite challenges related to proper isolation and follow-up of patients, the use of **home-based care as a strategy to increase case management capacity** of patients with mild symptomatology was seen

[45] Variable occupancy rates from 50% to more than 100% in Kano with sometimes several patients per bed, similar to rates from 80% to above 100% in Siguiri. No data on occupancy rates was retrieved for Borno.

[46] In Truelove et al (2020), isolation for 6 days is recommended: "*We find that patients receiving antibiotic treatment clear C. diphtheriae respiratory colonization within 5.2 days (95% CrI, 4.4–6.1 days) of initiating treatment on average […] This is contradictory to current WHO recommendations suggesting isolation for only 48 hours […] Longer isolation for 6 days, or until negative cultures as recommended by the Centers for Disease Control and Prevention and the American Academy of Pediatrics, may be necessary*" Truelove SA, Keegan LT, Moss WJ, et al. Clinical and Epidemiological Aspects of Diphtheria: A Systematic Review and Pooled Analysis. Clin Infect Dis. 2020;71(1):89-97. doi:10.1093/cid/ciz808

[47] In the three interventions, follow-up of patients was planned through phone calls and appointments to healthcare facilities, reported challenges included wrong contact information and refusal to come back to the facilities. Data on compliance was not retrieved.

[48] In Truelove et al (2020): "*Toxic cardiomyopathy occurs 7–14 days after the onset of respiratory symptoms in 10%–25% of patients and is responsible for 20%–25% of deaths. Neurological disorders, such as hypoesthesia, polyneuropathy, and cranial neuropathies, develop weeks to months later and occur in 20%–25% of untreated cases and are responsible for up to 15% of deaths*". Truelove SA, Keegan LT, Moss WJ, et al. Clinical and Epidemiological Aspects of Diphtheria: A Systematic Review and Pooled Analysis. Clin Infect Dis. 2020;71(1):89-97. doi:10.1093/cid/ciz808

[49] The Access Campaign is a MSF global initiative to advocate for access to effective drugs, tests and vaccines.

[50] MassBiologics is a non-profit manufacturer of vaccines and biologics.

[51] World Health Organization. "Clinical management of diphtheria". February 2024

as a good practice by MSF staff and external partners. It allowed treatment centres to focus on severe cases, helping to manage high patient loads without overwhelming the healthcare system capacity. It was regarded as a cost-effective and pragmatic solution to avoid turning patients away. Furthermore, home-based care engaged patients and communities more directly, increasing disease awareness and encouraging early detection of complications. Data related to other aspects of home-based care such as its clinical results or safety was not available.

"The introduction of the home-based strategy, even if it wasn't a miracle cure, I think it was a good thing. [...] Until now at MSF we were used to treating as many patients as possible until we reached capacity. And then turn a blind eye to the other patients and say, well, it's up to the others, we've reached the maximum […]. Except that, in the end, that's not the way to stop an epidemic that exceeds our capacity to respond. And I think that putting this in place has enabled us to maintain a reasonable operational capacity, [...] while at the same time being able to respond to a wider epidemic."

MSF staff - WaCA

Benefits

A key benefit of the interventions was the **provision of free care** which enabled even patients from the most deprived areas to access treatment. MSF also had a significant impact on **building local capacity to detect and manage diphtheria cases**. Most key informants believed that, as a result of MSF's training and hands-on experience[52], local healthcare systems are now better prepared to manage future diphtheria outbreaks independently.

"MSF helped us in building a formidable team of experts, they were giving hands on skills [...] to our workers. So, a formidable team that in the future, even if there is another outbreak response, we could be confident that these are people that can go ahead and [transfer] that skill that they've already got from the MSF diphtheria outbreak response training."

Partner in Kano

Overall, MSF involvement in the response significantly contributed to **advancing global knowledge on the clinical management of diphtheria** with its participation in the development and revision of clinical guidelines at both global and national levels. Additionally, the large-scale management of cases across the region generated substantial data that can be used to deepen understanding of various aspects of diphtheria outbreak management. For example, at the time of the evaluation, Epicentre was collaborating with WaCA to assess the effects of home-based care, including its potential positive or negative impact on disease transmission, as well as the implications of reduced doses of DAT on clinical outcomes.

Drawbacks

Several key informants reported that the MSF interventions created **unsustainable expectations** after its withdrawal, such as expectations for incentives for staff working in the diphtheria treatment centres, or for free care for diphtheria patients. As a result, some staff at the treatment centre in Siguiri refused to stay once MSF left.

[52] In the three interventions, though in Borno this approach was implemented only in the second phase, the strategy emphasized partnering with existing healthcare facilities and utilizing predominantly incentivized MoH staff to conduct clinical activities in the treatment centres, while MSF staff primarily assumed managerial and supportive roles.

"After MSF's withdrawal, there were difficulties in retaining support staff at the Siguiri treatment centre. MSF had provided incentives to these workers […]. Once MSF left, the government was unable to maintain these payments, leading some staff to return to their original positions. This partly explains the decline in the quality of case management, as the teams no longer worked as they did before."

Partner in Siguiri

EARLY DETECTION, SENSITIZATION AND PREVENTION

Outputs

In Kano, activities in the community started five months after the start of the intervention, in May 2023, due to security issues and the reluctance of the authorities to publicize the outbreak during election time. In Borno, activities in the community were limited throughout the intervention, while in Siguiri community activities were an important part of the intervention strategy from the beginning. In all intervention sites, MSF contribution to mass vaccination campaigns was very limited. Details of the activities conducted in the community are presented in Table 3.

Table 3. MSF conducted activities in the community

WACA - Kano	OCP – Borno	OCB – Siguiri
Contact tracing • 19 635 contacts identified and contacted by the health promotion team, provided with vaccination and antibioprophylaxis in contact clinics **Active case search** • Training of 56 healthcare workers from 53 peripheral healthcare facilities[b] to identify and refer suspect cases[c] **Sensitization** • Rapid assessments to inform the health promotion strategy • 83 community health workers conducted sensitization sessions[d] and surveillance of rumours • Radio broadcasting and SMS campaigns to raise awareness **Vaccination** • Support to the second round of the MoH mass vaccination campaign through community mobilization	**Contact tracing** • 3 578 contacts identified and referred by community health workers to the diphtheria treatment centre to receive vaccination and antibioprophylaxis **Active case search** • Detection and referral of suspect cases by 30 community health workers[c] **Sensitization** • 30 community health workers conducted sensitization activities[c] **Vaccination** • ***No participation in mass vaccination campaigns***	**Contact tracing** • 10 046 contacts identified by the health promotion team and referred by the community health workers to the CT-Epi or peripheral healthcare facilities to receive vaccination and antibioprophylaxis **Active case search** • 173 community health workers trained to detect and refer suspect cases[c] **Sensitization** • 173 community health workers conducted sensitization sessions with community leaders (4 194), school pupils and teachers (10 108) and people working in mines (598) **Vaccination** • Preparation of a mass vaccination campaign (***not implemented***)

[a] Vaccination decision-making survey in May 2023 and a late presentation survey in November 2023.
[b] Conducted between Decembre 2023 and March 2024.
[c] The total number of referred cases was not retrieved.
[d] The total number of individuals reached was not retrieved.

Challenges

Community-based surveillance and contact tracing faced challenges in each intervention. In Kano and Borno, key informants felt that the number of personnel dedicated to community activities was insufficient to reach the objectives. In Kano, the high patient load during the peak of the outbreak overwhelmed contact tracing capacity. Overall, contact tracing identified an average of one contact per patient in Kano, and two in Borno and Siguiri, far below the typical household size.

Although reactive mass vaccination was a potentially key measure to curb the diphtheria outbreak, it faced several contextual challenges. While a global shortage of diphtheria vaccines[53] limited the conduct of mass vaccination campaigns without disrupting routine immunization efforts, competing large vaccination campaigns were also occurring at the same period[54].

There were also difficulties to reach agreement within MSF on the strategy for vaccination, including in defining target age groups and the number of people who could be vaccinated. In Kano, the scale of

[53] Td and pentavalent diphtheria vaccines with 4-6 months lead time between order and delivery.
[54] There were competing priorities for the local health authorities with other vaccination campaigns occurring at the same period, such as polio and HPV, and a preference by actors such as WHO and UNICEF to strengthen routine immunization through initiative like the Big Catch-Up, rather than focus on reactive campaigns. The Big Catch-Up is a global effort led by WHO, UNICEF, Gavi, the Vaccine Alliance and the Bill & Melinda Gates Foundation to restore immunization progress lost during the COVID-19 pandemic.

the outbreak then rapidly exceeded MSF capacity to conduct an effective vaccination campaign, with soon over 12 million people requiring coverage.

"At some point, by trying to think too much in the long term or by wanting to be too sure of what we say, we can sometimes miss the boat."

MSF staff – WaCA

In all three interventions, **MSF faced important difficulties in participating in the mass vaccination campaigns** conducted by the health authorities, which were eventually considered insufficient by MSF to effectively curb the outbreak. In Kano, WaCA proposal to support the health authorities during the initial round of mass vaccination in March 2023 was refused by the health authorities due to their reluctance to publicize the outbreak during the election period. In Novembre 2023, WaCA provided limited support to the second round of mass vaccination through community engagement. Neither in Borno nor in Siguiri MSF was involved in the conducted vaccination campaigns. In Borno, three rounds of vaccination were implemented with the support of UNICEF but without OCP participation in Octobre 2023, Decembre 2023 and February 2024. In Siguiri, OCB initially planned to lead a vaccination campaign but faced disagreements with the health authorities over implementation modalities, notably about using MSF's parallel cold chain versus strengthening the existing one, which MSF considered inadequate. These conflicts ultimately led to the campaign being implemented by the health authorities without MSF's involvement in March 2024.

Good practices

In Kano, the conduct of a health promotion survey to understand healthcare-seeking behaviours and the rotation of health promotion teams between the community and the treatment centres enabled them to **tailor messages to the targeted populations**. The routine geographic analysis of outbreak data and its use to plan health promotion activities from August 2023[55] allowed for a more efficient allocation of resources, **focusing efforts on areas reporting the highest number of cases**.

In Siguiri, the **use of an existing network of community health workers** proved to be an efficient strategy for surveillance and community mobilization with activation and deactivation of these community health workers according to the epidemiological situation.

Benefits

Most key informants believed that MSF's response to the diphtheria outbreak significantly **increased awareness of the disease at the community level**, including about diphtheria symptoms, the importance of timely treatment, and the protective role of vaccination.

"At community and patient level, a great deal of effort has been made to ensure that people are aware of the disease and know what they need to do to be able to get treatment and come to the treatment centre. That was a very good thing. And it's still there, when people fall ill, they come to the CT-Epi."

Partner in Siguiri

Drawbacks

In Kano, health promotion activities describing diphtheria as a vaccine-preventable disease successfully led to an increased demand for vaccination among the population, causing some **community frustration when vaccination supplies were unavailable or when certain groups were not included in the targeted vaccination campaigns**.

[55] The epidemiological team at WaCA headquarters provided weekly geographical analyses of the outbreak and shared a map to guide decisions on outreach activities.

In Siguiri, the failure of the vaccination campaign and MSF's perceived lack of flexibility left a **negative impression on the country's health and political authorities**. Some key informants noted that on the part of MSF, this had made the team hesitant to undertake similar interventions in the future and led to a questioning of their position in relation to the health authorities.

ADVOCACY AND COMMUNICATION

In the affected countries, participation of MSF in **coordination meetings with health authorities and partners at different levels was used to communicate gaps and challenges and advocate for more investment** in the response and the mobilization of other actors. In Nigeria, all involved Operational Centres successfully coordinated the negotiation with the National Agency for Food and Drugs Administration (NAFDAC) to secure waivers for importing DAT and other medications.

An important part of the advocacy and communication efforts was done at the intersectional level. An intersectional advocacy strategy defining key messages was developed and validated by all Operational Centres on 1 September 2023. Bilateral meetings including MSF staff from the Operational Centres headquarters and the International Office were held with several global public health actors[56]. MSF was also part of the Global Outbreak Alert and Response Network (GOARN) and of the emergency preparedness and response working group led by the United Nations Office for the Coordination of Humanitarian Affairs (OCHA). All these meetings were used to convey MSF advocacy, raise awareness on the scale of the outbreak and highlight current challenges, especially in regard to low vaccination coverage. These efforts helped stimulate discussions at global level about the potential risks of vaccine-preventable disease outbreaks and the importance of maintaining vaccine stockpiles beyond those required for routine immunization.

Yet, some key informants also perceived that **intersectional advocacy efforts started in September 2023 were too delayed and not reactive enough** to have had an impact on the outbreak response. A key example was the lack of advocacy directed at DAT manufacturers to increase production in the first half of 2023, which might have improved preparedness for the surge of cases that eventually occurred.

In addition, the **lack of a comprehensive stakeholder analysis at different levels from the outset** limited the effectiveness of advocacy efforts. Such analysis could have, for example, identified earlier that there were some barriers at the WHO country level in Guinea, while the advocacy focus was made on the organization at its headquarters level.

COORDINATION WITH OTHER ACTORS

In both Kano and Siguiri, MSF adopted from the start a supporting role to the MoH in the treatment centres, which limited its ability to enforce protocols and influence clinical decisions directly, but was designed to improve the sustainability of the response. In Kano, the **absence of a Memorandum of Understanding between MSF and the health authorities** led to a lack of clarity for incentivized staff about key aspects of the partnership, including the list of drugs covered by MSF. Similarly, in Siguiri, a formal Memorandum of Understanding was only signed five months after the response began, delaying the establishment of a clear framework for roles and responsibilities, including for clinical management.

[56] WHO, UNICEF, Africa CDC, Gavi, Vaccine Alliance, European Civil Protection and Humanitarian Aid Operations (ECHO), and the United States Agency for International Development (USAID).

An important challenge MSF faced in all interventions was the **reluctance of national authorities to publicize the outbreaks**, which resulted in limited attention and funding from international actors, as well as restrictions on MSF's ability to conduct community activities to raise public awareness. In Kano, although the outbreak was notified to WHO in January 2023, the authorities did not fully engage in the response during the first half of the year, which coincided with an election period. In Borno, the state authorities delayed notifying the outbreak, with the official declaration and the establishment of an Incident Management System occurring only several months after MSF had started receiving suspect cases of diphtheria in its paediatric facility. In Guinea, despite notification to WHO in September 2023, national authorities were reluctant to formally declare the outbreak or allocate adequate resources to contain it.

The **limited participation of other global actors at the country level** was an additional challenge. During the first six months of the outbreak in Kano, MSF encountered difficulties in alerting other actors to the severity of the situation, especially WHO and UNICEF.

Overall, **collaboration between MSF and the health authorities presented a mixed picture across the interventions**. In **Kano**, WaCA's cautious and open approach to collaboration helped build a strong relationship of trust with the authorities, enabling MSF to have its recommendations heard and ensuring that all activities were agreed upon in close coordination with the state health authorities. In contrast, OCP in **Borno** had a more independent approach, which made coordination more challenging, in part due to its use of working autonomously in its regular project in the state along with a series of past conflicts with the authorities. In **Siguiri**, while OCB collaboration with local authorities went generally well, coordination with regional and national authorities was more conflictual. The MoH's requirement for OCB to report all its movements in the community was perceived by MSF staff as excessive micromanagement, while health authorities were dissatisfied with OCB reluctance to follow the required procedures. The perceived rigidity and lack of flexibility of OCB in organizing the implementation of the vaccination campaign further strained relations with health authorities at national level.

> *"MSF should understand that the world is changing. We're no longer in the days when MSF just turned up somewhere and do everything our own way. The authorities are becoming increasingly assertive. […] We have to make sure that there are clear red lines on the medical side, […] but there are compromises to be made if we are to maintain this space for response. Otherwise, we'll always be treated as arrogant, non-aligned, always doing what we want. And that's going to close more and more doors."*
>
> *MSF staff – OCB*

INTERSECTIONAL COORDINATION

The intersectional coordination was mostly seen as a **successful precedent to build upon in future MSF emergency responses,** and its model had been quickly replicated for the Mpox emergency response at the time of the evaluation. The multidisciplinary nature of the intersectional coordination, integrating operational perspectives with advocacy and communication, while linking an ad-hoc interdesk with long-standing intersectional working groups, was seen as an effective approach for ensuring better alignment between Operational Centres and the various technical areas within MSF. However, while the pragmatic and informal setup of the intersectional coordination was seen as a strength by some key informants, most highlighted that **the lack of clear procedures and of a formal mandate for the interdesk were a challenge**. A key reported example was the difficulty in

greenlighting documents that were produced at intersectional level[57]. Yet, training and protocols, such as those for DAT administration and infection prevention, were developed collaboratively, ensuring some level of standardization across interventions.

Although **some key informants felt that intersectional coordination began too late**, after the outbreak had already started escalating rapidly[58], **several successes** were attributed to it.

Despite difficulties in integrating data from the different interventions due to inconsistent quality[59] and different tools and formats used[60], the implementation of a **centralized data management system through the intersectional line list** improved monitoring of the epidemiological situation and facilitated decision-making, especially regarding allocation of DAT. However, one MSF key informant at operational level reported a lack of clarity around the decision-making process for DAT allocation, leading to some frustrations and suggesting potential gaps in communication between the intersectional working group in charge of these decisions and the interdesk.

Yet, this **intersectional coordination of DAT supply** was widely regarded as a success with the centralization of DAT stock management in a single MSF supply centre[61] and close collaboration with the WHO supply department at global level. The collaboration with WHO facilitated discussions with DAT manufacturers and appropriate distribution of the limited stocks between national health authorities and MSF interventions.

This **ability to present a unified MSF voice in communicating with global stakeholders** was regarded as one of the main successes of the intersectional coordination, including for advocacy. Regular meetings and transparent information sharing of reliable and timely data with international partners such as WHO, UNICEF and the Africa CDC were praised by key informants from these organizations. Intersectional **agreement on key advocacy messages** allowed MSF to present a coherent stance on the diphtheria outbreak to partners. However, the lack of formalized mechanisms for intersectional advocacy coordination and the lack of advocacy focal points in the different Operational Centres led to tensions around responsibilities and decision-making.

Intersectional coordination **enhanced information sharing** across Operational Centres with minutes of the interdesk meetings made available on a collaborative drive. However, while intersectional coordination primarily took place at the level of the Operational Centres' headquarters[62], **the assumption that information would naturally disseminate to the national and intervention levels proved unrealistic**. Most key informants at these levels reported that they were aware that intersectional coordination was occurring but lacked clarity on its specific outcomes. Conversely, some MSF staff from the International Office reported difficulties in obtaining direct information from the field, hindering their ability to fully understand local challenges. In addition, although some knowledge was shared at field level between WaCA and OCP, most key informants felt that information sharing between Operational Centres was largely confined to headquarters and could have benefited from being strengthened at national and intervention levels.

[57] With the need for approval of different persons in each Operational Centre.
[58] Informants from WaCA, in particular, reported challenges in raising the alarm and mobilizing MSF globally during the first half of 2023, noting that attention only increased once other Operational Centres began responding. The summer holidays in the Northern hemisphere worsened this issue, as the absence of key staff at Operational Centres headquarters and in the International Office limited responsiveness.
[59] Including varying amounts of missing values and a lack of standardized definitions for key variables such as case severity.
[60] Sometimes due to local authorities' requirements.
[61] MSF Logistique, which is one of the three humanitarian supply centres within the MSF movement.
[62] With their representatives present in the interdesk and intersectional working groups.

Finally, the coordination at intersectional level contributed to **improving preparedness for future outbreak responses**. Although too late to impact the 2023-2024 diphtheria outbreak response, the RIOD validated the interdesk's proposal in January 2024 to establish an intersectional diphtheria vaccine stockpile with a rotating mechanism integrated into routine vaccination programs to prevent expiration.

DISENGAGEMENT OF MSF FROM THE OUTBREAK RESPONSE

Defining clear exit criteria for MSF's diphtheria interventions proved to be a significant challenge, particularly due to a lack of historical data, the prolonged nature of the outbreak and the potential for diphtheria to become endemic[63].

The **sustainability of gains from the MSF response varied significantly across interventions**. In **Kano**, a strong emphasis on sustainability was evident through early handover discussions with health authorities, the use of incentivized MoH staff for clinical activities, the focus on local procurement whenever possible and the use of a training of trainers approach. In **Borno**, although the strategy in the second phase of the intervention put more focus on sustainability by moving the treatment centre from a MSF-run facility to a MoH facility, it remained a challenge due to the limited commitment of the state health authorities to sustain the diphtheria treatment centre without MSF's support. In **Siguiri**, while the initial focus was also to promote sustainability through the use of incentivized staff in the MoH treatment centre, the OCB abrupt withdrawal following the failure of the vaccination campaign made it difficult for local health authorities to maintain essential services.

"We had a lot of trouble taking over after [MSF departure]. For me, the exit was too abrupt. It had to be phased out until the authorities took over."

Partner in Siguiri

In **Borno**, severe flooding in September 2024 led to the collapse of the MoH's diphtheria management capacity, with the **reinvolvement of OCP** in the management of diphtheria patients at the Gwange paediatric hospital. In **Siguiri**, at the time of the evaluation, there was a resurgence of diphtheria cases and related deaths, questioning the reengagement of OCB, but hesitations were high due to the strained relationship with local authorities following the vaccination campaign episode.

IMPACT OF THE RESPONSE ON THE OUTBREAK

The establishment and support of the diphtheria treatment centres by MSF, combined with the provision of essential supplies such as DAT and antibiotics, were seen by all key informants as critical to managing severe cases effectively. They all agree about the **positive impact of MSF interventions on case management and clinical outcomes.**

[63] Unlike diseases such as measles or cholera, which typically have more predictable outbreak patterns, diphtheria presents a "long tail" of sporadic cases, complicating efforts to determine an appropriate endpoint for the intervention. Additionally, the lack of historical data on diphtheria outbreaks made it difficult to anticipate the duration and seasonal patterns of the epidemic.

The overall case fatality rate per intervention was 7% in Kano, 7% in Borno and 3% in Siguiri[6465] with almost all registered deaths across interventions occurring in hospitalized patients (97%, n=1038/1071). Taking into account only hospitalized patients, case fatality rates were 11% in Kano, 7% in Borno and 3% in Siguiri (figure 11). The differences in the case fatality rate across interventions could not be explained by the available data, it would require further research to explore factors such as circulating strains, patient severity or variation in case management.

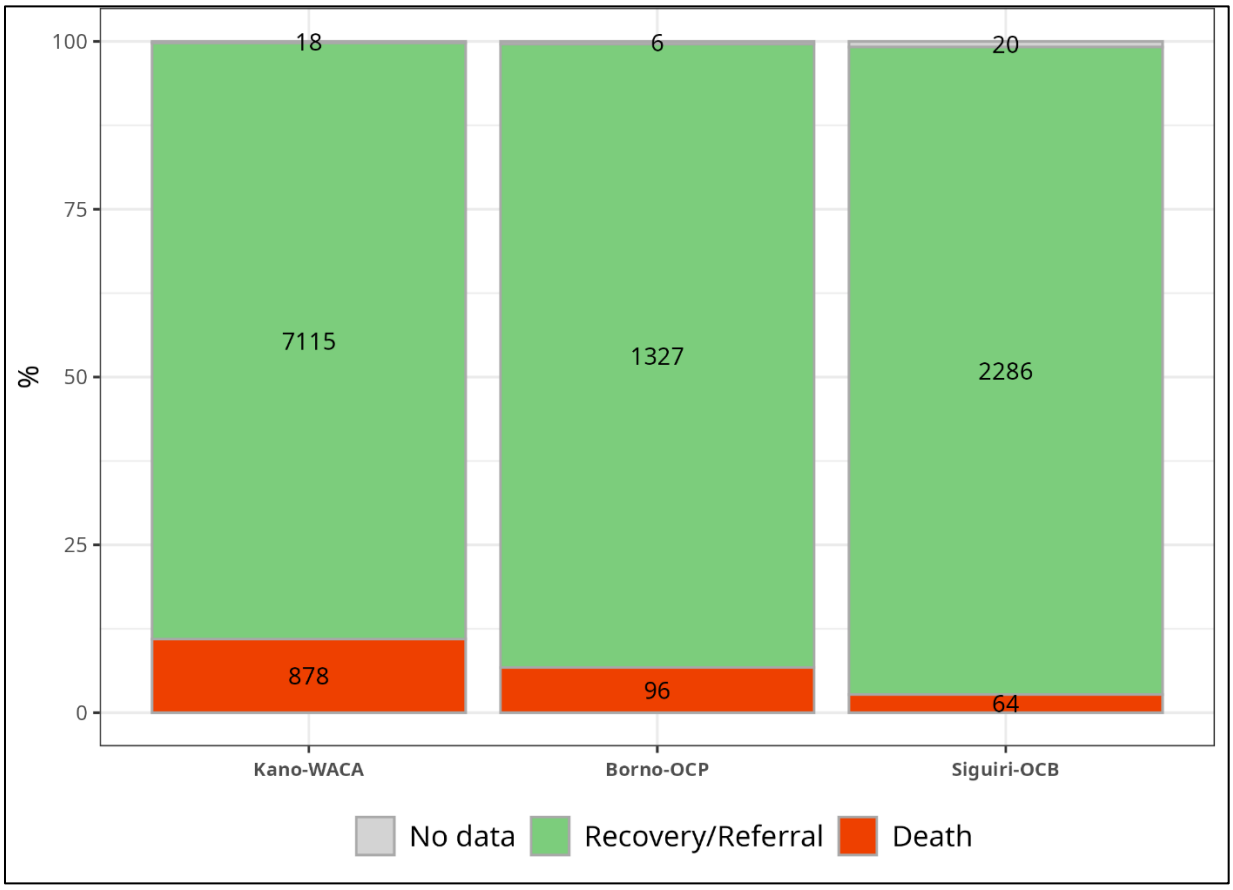

Figure 11. Clinical outcome per site for hospitalized patients

Total of 11 810 hospitalized patients.

A decrease in the case fatality rate following the start of each intervention could be seen across all sites (Figure 12).

[64] Kano: 910 registered deaths for 13 082 patients with registered outcome, 1625 patients with no registered outcome (11%). Borno: 96 deaths for 1444 patients, 18 patients with no outcome (1%). Siguiri: 65 deaths for 2376 patients, 2338 patients with no outcome (50%).

[65] In Truelove et al. (2020), the estimated case fatality rate for untreated, never-vaccinated diphtheria cases is 29% (95% credible interval 28.8%-29.2%). Truelove SA, Keegan LT, Moss WJ, et al. Clinical and Epidemiological Aspects of Diphtheria: A Systematic Review and Pooled Analysis. Clin Infect Dis. 2020;71(1):89-97. doi:10.1093/cid/ciz808

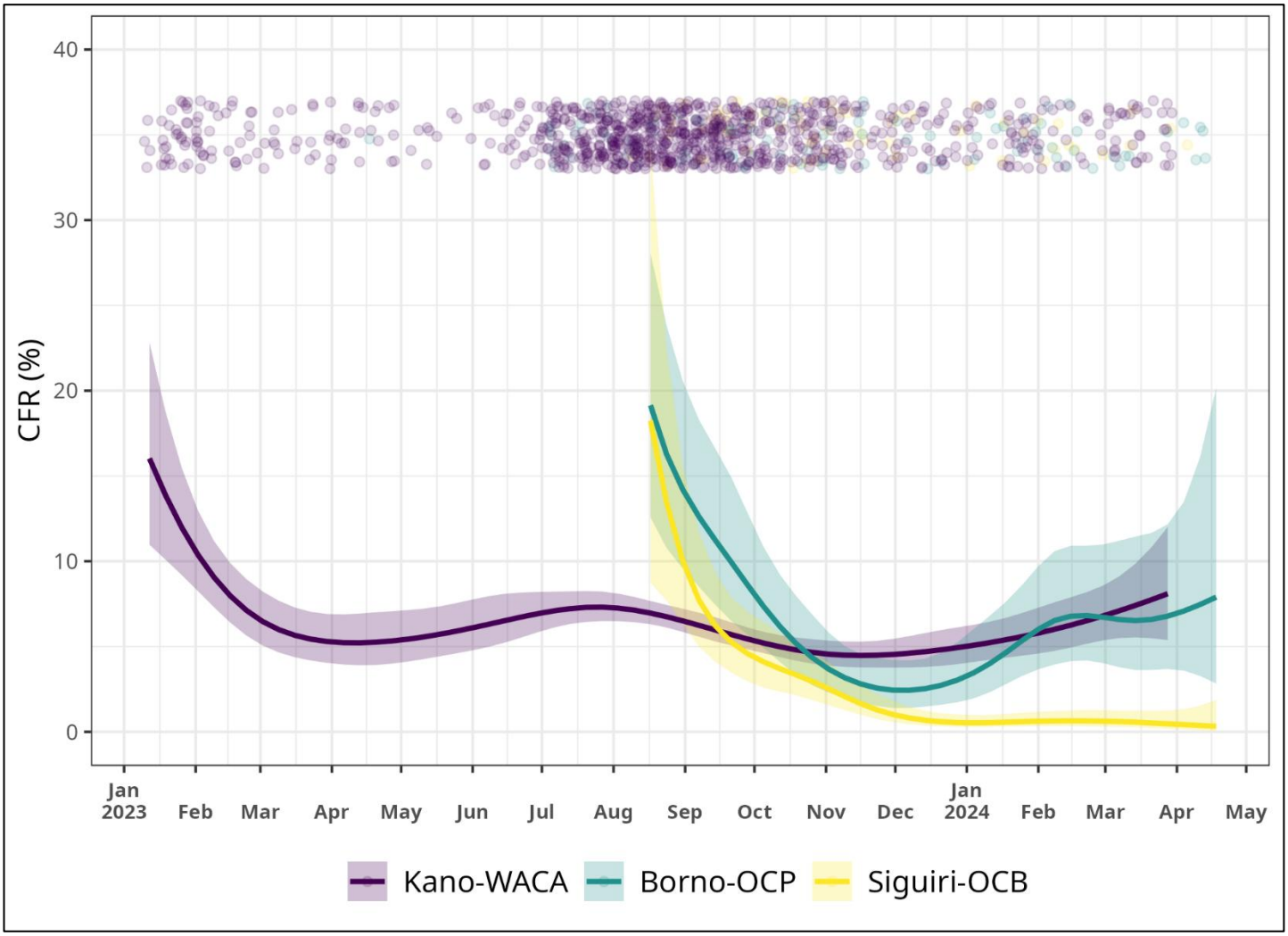

Figure 12. Average case fatality rate over time per site

Total of 20 878 patients and 1071 deaths. Each dot on the top of the figure represents one death. The average case fatality rate and its 95% confidence interval are estimated through a generalized additive model with Poisson regression.

Provision of free care, including provision of food, was highlighted as a major factor in increasing access to treatment and encouraging timely referrals to the diphtheria treatment centres. The median time between patients' onset of symptoms and first consultation was two days in Siguiri, and three days in Kano and Borno[66] (figure 13).

[66] 10th; 90th percentiles: [1; 5 days] in Kano (n=14217), [1; 6 days] in Borno (n=1451) and [1; 4 days] in Siguiri (n=4694).

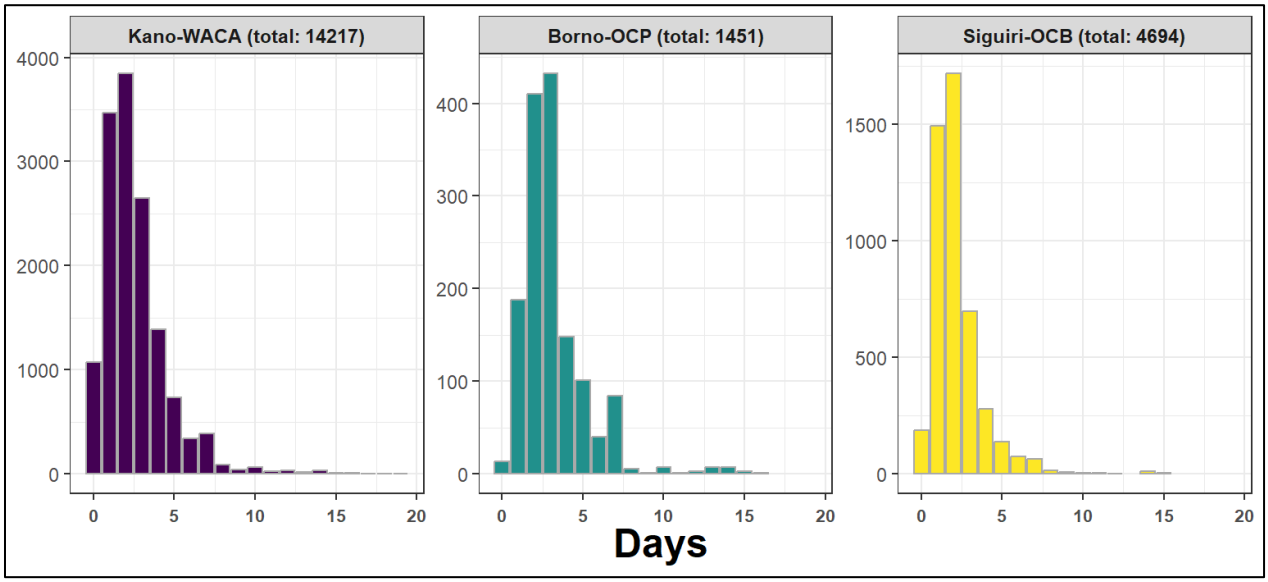

Figure 13. Time from onset of symptoms to consultation per site (total: 20362)

Total of 20 362 patients.

The average time between onset of symptoms to consultation over time per site is presented in Figure 14. It remained largely stable in Kano and Borno at around three days, while it decreased in Siguiri from three days to two, potentially suggesting heightened population awareness.

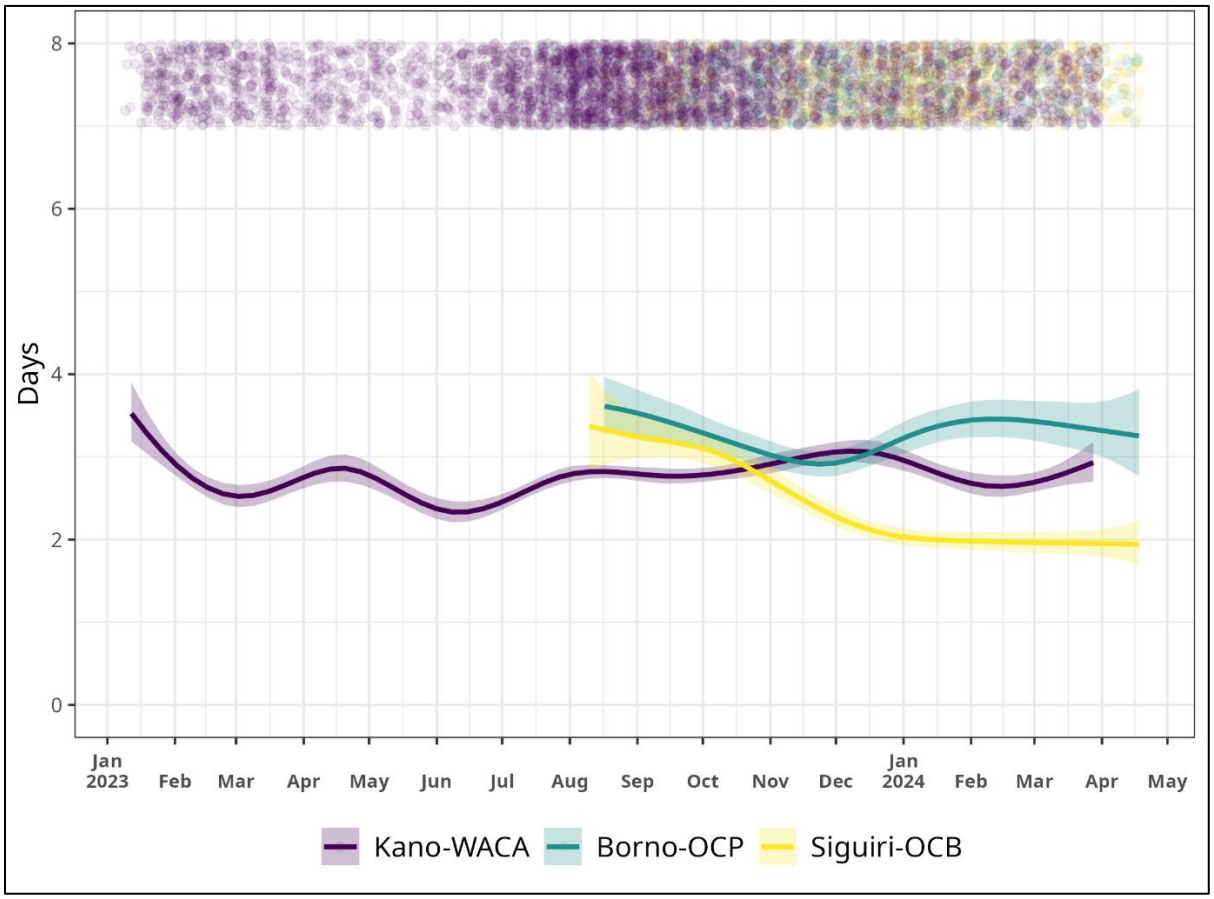

Figure 14. Average time between onset of symptoms and first consultation over time per site.

Total of 20 362 patients. Each dot on the top of the figure represents one patient. The average duration between onset of symptoms and first consultation and its 95% confidence interval are estimated through a generalized additive model with Poisson regression.

Unlike its positive impact on the quality and outcomes of case management, key informants perceived the **impact of MSF interventions on controlling the scale of the outbreak as limited**[67], mostly due to its lack of participation in mass vaccination campaigns and a lack of resources to fully implement contact tracing in the community. However, perspectives differed on whether transmission control was a realistic or intended goal of MSF interventions besides case management, highlighting different expectations about the scope of the response among MSF staff.

"I think we really contributed massively to reducing mortality. That I don't have any shadow of doubt, but how we contributed to the control of the outbreak, I think I will not say comfortably that we did, but reducing mortality is part of control of the outbreak. From that perspective, yes. But I think in terms of vaccination activities and follow-up of close contacts, we didn't succeed at all."

MSF staff - WaCA

[67] Quantitative data related to these aspects of the intervention impact were not retrieved, including to calculate the attack rate and vaccination coverage.

Conclusion

MAIN FINDINGS

The following **findings were identified**, answering the evaluation questions:

Assessment of the MSF response modalities:

- ***How was the MSF response designed, implemented and coordinated in each intervention and overall?***
  - Finding 1. In Kano and Siguiri, the strategy prioritized strengthening local healthcare capacities by integrating MSF support into MoH-run facilities, facilitating continuity and sustainability. In contrast, in Borno, the response was initially started in an MSF-run facility before transitioning to a MoH facility in a second phase, resulting in a limited ownership of the response by the health authorities.
  - Finding 2. The response was timely initiated in all three interventions, with gaps and needs quickly identified and activities planned.
  - Finding 3. Exit strategies were complex to define, such as assessing when was the right time to hand over the response to the health authorities without risking a rapid reversal of gains. A resurgence of diphtheria cases was occurring in Borno and Siguiri at the time of the evaluation, suggesting that the handover may have been too early to sufficiently strengthen the health system.

- ***How did MSF interventions respond to priority needs in the different settings?***
  - Finding 4. MSF's response in Kano, Borno, and Siguiri effectively addressed critical gaps in case management, which was identified as the primary need in the overall outbreak response. In addition, community activities were implemented to strengthen early detection, sensitization, and prevention, alongside advocacy efforts to increase the engagement of authorities and partners. However, significant gaps remained for contact tracing and especially for mass vaccination campaigns, with a failure to really support the later across the three interventions.

- ***How was MSF involvement compatible and coordinated with other actors' presence and capacity?***
  - Finding 5. In all three interventions, MSF participated in national and local coordination mechanisms with the health authorities and partners to share information and discuss gaps and challenges. However, while the trust built by WaCA with local authorities before and during the response facilitated coordination and alignment, it was more challenging in Borno and Siguiri, where OCP and OCB had less established relationships with authorities. In addition, the lack of a Memorandum of Understanding in Kano and its delayed agreement in Borno led to a lack of clarity about the roles and responsibilities of each party.

Assessment of the MSF response outputs and outcomes:

- ***What were the key outputs, outcomes and unintended consequences of the MSF response in each intervention and overall?***

- Finding 6. MSF played a key role in case management in both countries, with over 20 000 patients provided with free care across the three interventions, building the capacity of the local healthcare workforce through collaboration with MoH healthcare facilities. Its experience was critical in the development and revision of diphtheria treatment guidelines at both national and global levels.
- Finding 7. While community activities for early detection, sensitization, and prevention were planned across all three interventions, most emphasis was put in Siguiri, with 173 community health workers engaged in contact tracing and sensitization, compared to 83 in Kano and 30 in Borno.
- Finding 8. MSF engaged in advocacy efforts at different levels, through participation in coordination meetings with health authorities and bilateral meetings with partners at global level. However, delays in initiating these efforts at intersectional level and the absence of a comprehensive stakeholder analysis from the outset limited their impact on the outbreak response.

- ***To what extent did the MSF response positively or negatively influence the control of the diphtheria outbreak?***
  - Finding 9. MSF response reduced diphtheria-related mortality among patients after the start of each intervention. However, its impact on the overall outbreak transmission was perceived as limited due to a lack of engagement in mass vaccination campaigns and challenges to carry out comprehensive contact tracing.

- ***What was the effect of the intersectional coordination on the MSF response outputs and outcomes?***
  - Finding 10. The implementation of intersectional coordination improved communication and alignment between MSF Operational Centres responding to the outbreak. It played a key role in resource allocation, particularly for DAT in the context of a global shortage, and allowed for a unified MSF voice to more effectively engage global partners. However, the absence of formal mechanisms for validating intersectional decisions and documents hindered its effectiveness.
  - Finding 11. Implementation of an intersectional line list with consolidated data from all interventions was key to inform decision-making at global level. However, heterogeneity in data collection modalities across interventions and inadequate quality for some key variables limited its value for retrospective analysis and operational research.
  - Finding 12. Information sharing across Operational Centres was improved by the intersectional coordination at headquarters level but remained limited at national and field levels.

Challenges and areas for improvement, good practices and successes of the response, including in relation to intersectional coordination:

- Finding 13. For case management, the global shortage of DAT, gaps in guidelines from MSF and health authorities for managing complex cases, and limited capacity at treatment centres were the main challenges faced by each intervention. Yet, MSF demonstrated several good practices to surmount them, such as the development of a pragmatic strategy to prioritize DAT administration, the timely adaptation of treatment protocols, and the use of home-based care to increase case management capacity.

- Finding 14. While many perceived that community-based activities lacked resources to reach the response objectives, some good practices were highlighted, such as the geographical analysis of outbreak data to target high-risk areas in Kano or the use of a pre-existing network of community health workers in Siguiri.
- Finding 15. In the three interventions, MSF failed to participate in mass vaccination campaigns, with limited participation in Kano through community mobilization, no participation in Borno, and a failed attempt to implement such a campaign in Siguiri.

KEY RECOMMENDATIONS

The recommendations are mapped against the key challenges identified by the evaluation and are based on inputs from key informants during interviews and a working session held on 23 and 24 January 2025, combined with the expertise of the evaluation team.

In all three interventions, MSF participated to coordination mechanisms at local and national level with health authorities and partners ensuring some degree of alignment for the outbreak response. **Yet, MSF faced several challenges in coordinating with health authorities**, leading to delays and frustrations in implementing activities.

- Recommendation 1. Before emergencies occur, **conduct strong political analysis and stakeholder mapping** in the settings where MSF is present to identify the right counterparts for negotiation and coordination, as well as potential barriers that may arise during an outbreak emergency response. **Pre-establish relationships and communication** channels with identified key stakeholders in the country to build trust.
- Recommendation 2. **Formalize collaboration with health authorities** through a Memorandum of Understanding as early as possible in the response, clearly specifying roles and responsibilities of each party.

Intersectional coordination of the MSF response was largely viewed as a successful precedent despite a reported delay in initiating coordination of operations, advocacy and communication along with an absence of formal mechanisms for validating intersectional decisions and documents.

- Recommendation 3. **Initiate intersectional discussions as early as possible** in outbreak responses involving several Operational Centres to ensure a unified and coordinated approach in different aspects of the response such as medical guidelines, data management, supply management or advocacy.
- Recommendation 4. **Define criteria to systematize the establishment of intersectional coordination platforms** during outbreaks, ensuring it is set up based on a demonstrated need to avoid redundancy and unnecessary burden. The draft Inter-OC Collaboration on Outbreak Response Framework, developed by an intersectional group chaired by the International Medical Secretary, provides a foundation that could be further refined to define these criteria.
- Recommendation 5. **Develop terms of reference at the set-up of an outbreak intersectional coordination platform**, defining its responsibilities and decision-making mechanisms, and **identify focal points to coordinate specific aspects** of the intersectional response such as advocacy, communications, and engagement with external actors at global level.

Data from the different MSF interventions was consolidated at intersectional level, improving monitoring of the epidemiological situation and facilitating decision-making at global level. However, due to the **heterogeneity and inadequate quality of the collected data**, its use was limited for operational research and retrospective analyses.

- Recommendation 6. Agree across Operational Centres on a **list of core data to be collected** during different types of outbreak responses with the careful choice of a **limited number of indicators** to decrease the burden of data collection and reporting and improve data quality.
- Recommendation 7. Prioritize the **use of interoperable information systems and data collection tools** across Operational Centres to facilitate data collection, sharing and consolidation.
- Recommendation 8. **Provide enough resources from the outset of emergency response to ensure high-quality data** collection suitable for operational research and retrospective analyses.

While intersectional collaboration enhanced **information sharing** between Operational Centres at the headquarters level, it **remained limited at the national and intervention levels**.

- Recommendation 9. **Establish a knowledge management system at intersectional level**, accessible at the different operational levels of the organization, to facilitate the sharing of learnings across Operational Centres, such as capitalization reports and epidemiological analyses.

MSF interventions helped develop and update diphtheria treatment guidelines and raised global awareness of the potential for vaccine-preventable diseases outbreaks. However, **preparedness for diphtheria outbreaks remains inadequate**, hampered by limited global stakeholder engagement and funding, persistent knowledge gaps, and a lack of reliable alternatives to outdated medical treatments and diagnostic tools.

- Recommendation 10. **Develop and disseminate structured documentation at intersectional level to inform future diphtheria responses**, building on protocols developed during the emergency response and results of capitalization exercises conducted in Kano and Siguiri. It should include guidance for critical aspects, such as DAT management in case of shortages, palliative care strategies, and complex care management.
- Recommendation 11. **Prepare in advance of emergency responses draft clinical research protocols** for critical areas, such as clinical trials for alternative treatments to DAT or alternative diagnostic tests. **Specify criteria to assess the eligibility of a given response to implement the clinical research and the detailed resources required** for this effect.
- Recommendation 12. **Pursue advocacy efforts** beyond immediate emergency responses for increased investment of global stakeholders in preparedness for vaccine-preventable disease outbreaks. This includes promoting the establishment of stockpiles of essential medical countermeasures, such as DAT and vaccines, to ensure rapid-response capacity when new outbreaks emerge.

Annexes

ANNEX 1. EVALUATION MATRIX

Evaluation objectives	Evaluation questions	Assessment modalities	Data sources
Assess the MSF response modalities including intersectional coordination			
	How was the MSF response designed, implemented and coordinated in each intervention and overall, before and after implementation of intersectional coordination?		
		Description of the intervention strategy and its rationale	Response documents Key informants
		Assessment of the timing and duration of the response	
		Assessment of how the response activities followed international best practices for managing diphtheria outbreaks	Response documents Key informants National and international guidelines
		Assessment of the value of home-based care during diphtheria outbreak response	Response documents Key informants
		Description of the intersectional coordination rationale and modalities	
	How did MSF interventions respond to priority needs in the different settings?		
		Description of how the local context and needs were assessed and taken into account in the intervention design and implementation	Response documents Key informants
	How was MSF involvement compatible and coordinated with other actors' presence and capacity?		
		Description of activities and efforts to coordinate with other national and international actors	Response documents Key informants
Assess the MSF response outputs and outcomes			
	What were the key outputs, outcomes and unintended consequences of the MSF response in each intervention and overall?		
		Description of planned activities and expected results achieved by the response for case management, early detection, sensitization and prevention, and advocacy and communication	Response documents Key informants Quantitative data
		Description of main benefits achieved by the intervention	
		Description of positive and negative unintended consequences of the intervention	Response documents Key informants
	To what extent did the MSF response positively or negatively influence the control of the diphtheria outbreak?		Response documents Key informants Quantitative data
		Assessment of the influence of the MSF response in the control of the diphtheria outbreak	
	What was the effect of the intersectional coordination on the MSF response outputs and outcomes?		Response documents Key informants
		Assessment of the effect of the intersectional coordination on the response outputs and outcomes	
Highlight challenges and areas for improvement, good practices and successes of the response, including in relation to intersectional coordination			

Evaluation objectives	Evaluation questions	Assessment modalities	Data sources
	Which good practices were observed in the MSF response to the outbreak?	Description of good practices for case management, early detection, sensitization and prevention, and advocacy and communication	Review of project documents KI interviews Quantitative data analysis
	What were the primary challenges faced in the different interventions and overall and the solutions used to surmount them, before and after implementation of intersectional coordination?	Description of main challenges, corrective actions taken, and lessons learned for case management, early detection, sensitization and prevention, and advocacy and communication	Review of project documents KI interviews
Identify strategic recommendations for future MSF response to outbreaks, including in relation to intersectional coordination			
	What strategic recommendations can be made for improving MSF's response to future outbreaks in general and during diphtheria outbreaks in particular?	Description of recommendations for improving MSF's response to future outbreaks in general and diphtheria outbreaks in particular	Review of project documents KI interviews
	How can intersectional coordination of MSF outbreak response be improved based on the experience from this outbreak?	Description of recommendations for improving MSF intersectional coordination of outbreak response	Key informants Working sessions

ANNEX 2. LITERATURE AND WEB REVIEW

Purpose

National and international literature and technical guidelines were searched to inform the the evaluation question: "How was the MSF response designed, implemented, and coordinated?" and specifically *"To what extent the strategy and case management were consistent with international best practices and recommendations?".*

Strategy and case management consistency with best practices

The following **eligibility criteria** was used to identify relevant national and international guidelines or strategies on how to manage diphtheria outbreaks.

- Inclusion criteria:
  - Focus of the document on a strategy or in the provision of standards or recommendations for case management, surveillance and other control measures during a diphtheria outbreak.
- Exclusion criteria:
  - Document published before 2000.
  - Document in another language than English, French, German, Spanish or Portuguese.
  - No full text available.

National and international literature and technical guidelines were searched on 8 Novembre 2024 on the following websites using the specified search requests or screening modalities:

- The following websites directly or indirectly related to MSF:
  - MSF evaluation (https://evaluation.msf.org/): "diphtheria"
  - MSF medical guidelines (https://medicalguidelines.msf.org/en): "diphtheria"
  - MSF Science Portal (https://scienceportal.msf.org/): "diphtheria"
  - Epicentre (https://epicentre.msf.org/en/publications): "diphtheria"
- The World Health Organization IRIS database (https://apps.who.int/iris): Subject (MeSH) contains "diphtheria"
- The African Centres for Disease Control and Prevention website (https://africacdc.org/): "diphtheria"
- The Nigerian Centre for Disease Control website (https://www.ncdc.gov.ng/):
  - Screening of https://www.ncdc.gov.ng/reports/projects
  - Screening of https://www.ncdc.gov.ng/reports/establishment
  - Screening of https://www.ncdc.gov.ng/diseases/guidelines
  - Screening of https://www.ncdc.gov.ng/research
- The European Centre for Disease Prevention and Control (https://www.ecdc.europa.eu): with filter on public health guidance "diphtheria"
- The US CDC (https://stacks.cdc.gov/): title contains "diphtheria"
- Additional documents known by the evaluation team, consultation group or key informants as being references in the field of diphtheria (no publication time limit).

The strategy of the diphtheria response intervention and the technical documents of the intervention related to case management were then assessed in light of the retrieved reference documents.

Overall, 23 documents of interest were identified. Results of the search are presented in Figure 1.

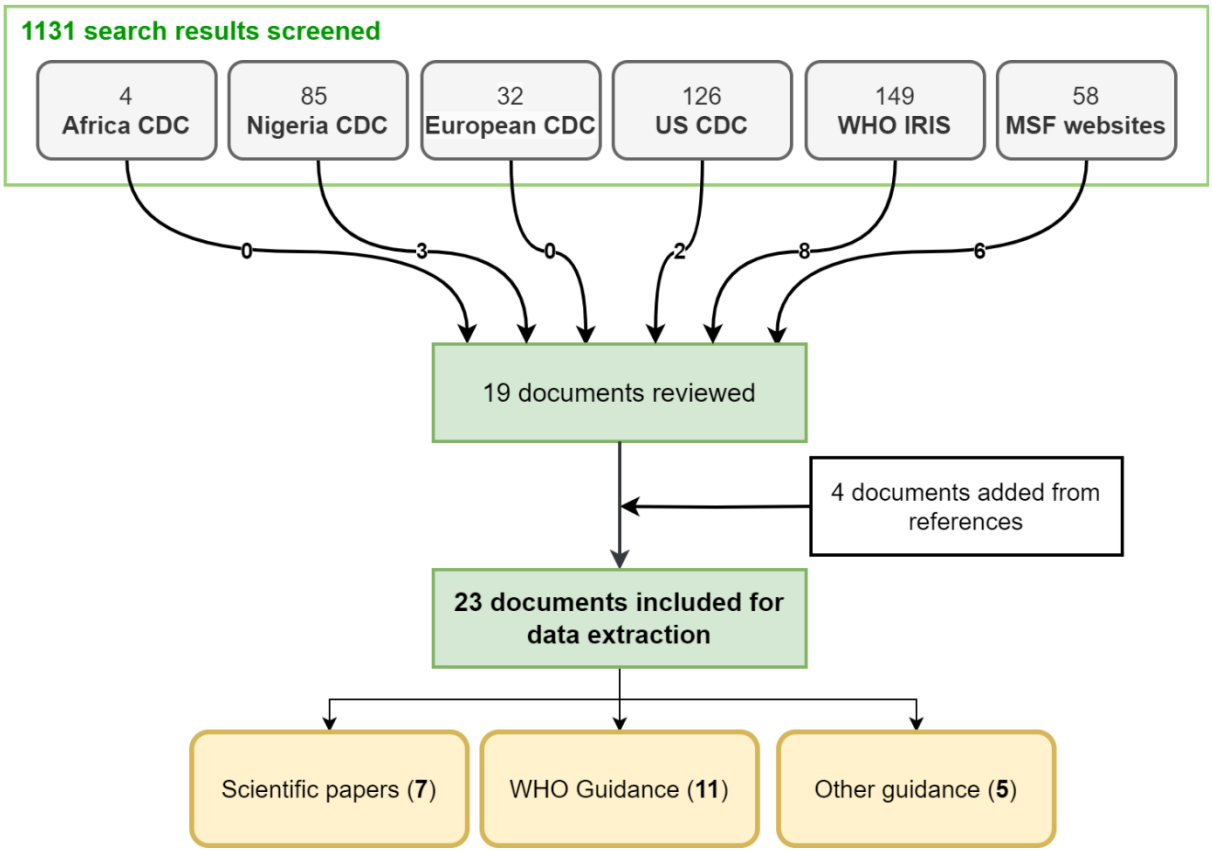

Figure 1. Results of the search for relevant national and international guidelines and strategies

Africa CDC: African Centres for Disease Control and Prevention
NCDC: Nigeria Centre for Disease Control
WHO IRIS: World Health Organization IRIS database

References of identified documents:

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ANNEX 3. CODES USED FOR THE QUALITATIVE ANALYSIS

Codes used for the extraction of quotes and excerpts of interest:

- **Topic**
  - Response modalities
    - Response strategy and rationale
    - Local context and perceived needs
    - Consistency with best practices and recommendations
    - Rational and modalities for intersectional coordination
    - Coordination with external actors
    - Other
  - Outputs and outcomes
    - Planned activities and results achieved
    - Main benefits of MSF response
    - Unintended consequences
    - Other
  - Challenges and good practices
    - Good practices
    - Challenges faced or solution used to overcome it
    - Other
  - Recommendations
    - For future outbreak response
    - For intersectional coordination
    - Other
- **Type of activity**
  - Case management
  - Early detection, sensitization and prevention
  - Advocacy and communication
  - Unspecific or other
- **Intervention**
  - Siguiri, Guinea
  - Borno, Nigeria
  - Kano, Nigeria
  - Unspecific

ANNEX 4. KEY INFORMANT BACKGROUND INFORMATION AND CONSENT FORM

In 2023, MSF supported the response to a diphtheria outbreak in West Africa. We are now conducting an evaluation to review the intersectional response, focusing on lessons learned and recommendations for future outbreak responses.

You have been identified as a key informant who could provide important insights for this evaluation. We would like to schedule a 40–50-minute interview at your convenience, by audio-conference, in English or French.

The interview will be recorded for analysis, unless you prefer not to be recorded, in which case a rapporteur will take notes. All information shared will remain anonymous, and your identity will not be linked to any specific findings in the report. The data collected will only be used for the purpose of this evaluation, which aims to gather insights and not to evaluate individual performance. Your participation is voluntary and your acceptance or refusal to participate will not affect your current or future relationship with MSF. If you agree to participate, you are also free to withdraw at any time without justification.

CONSENT FORM

I agree to participate in an interview for this evaluation.

☐ Yes ☐ No

I agree to the audio-recording of the interview.

☐ Yes ☐ No

Please note that the audio recording is only for the purpose of facilitating note taking and analysis. Audio recordings and transcripts of interviews will be accessible only to the external evaluation team and will be deleted at the end of the evaluation.

In case you would like to inform the MSF Stockholm Evaluation Unit about any issue that may arise during the interview or evaluation process, you can contact the Head of the MSF Stockholm Evaluation Unit: Linda.Ohman@stockholm.msf.org.

Signature:

Date:

ANNEX 5. INTERVIEW GUIDES

INSTRUCTIONS AND INTRODUCTION OF INTERVIEW GUIDES

Specific Instructions for the Interviewer

For each question, probe and follow-up with additional questions as appropriate to get more details and specific examples.

If the interviewee mentions a stakeholder group not yet represented in the list of key informants, ask for contact information of relevant individuals within that group who could be added as key informants.

Specific Instructions for the Rapporteur (if the interview is not audio-recorded)

Take note of the interview date and other background information.

Take note of implicit cues such as pauses, hesitations, uncertainty and other communication cues that give meaning to the interview.

Introduction

My name is [*name of interviewer*]. I am working for Sigia, a Public Health Consultancy contracted by MSF to evaluate the intersectional response to the recent diphtheria outbreak in West Africa.

This evaluation aims to describe how the response achieved its expected results, but most importantly it aims to learn from this experience and provide recommendations to inform and improve future outbreak responses.

Thank you for taking the time to participate in this interview. I understand that you have a busy schedule, so we will try to keep this discussion as short as possible, and not more than one hour.

Please feel free to interrupt me at any point if needed. If any urgent matters arises, we can also easily stop and reschedule the interview.

This interview will be entirely anonymous, your identity will not be associated with any specific result in the final evaluation report. With your permission, I would like to record our conversation to improve its analysis.

Only if no consent for audio recording

With me today is [name of Rapporteur] who will be taking notes and summarizing our discussion. The discussion is not audio recorded, and the data collected is to be used only for the purpose of the evaluation.

INTERVIEW GUIDE FOR MSF STAFF - ENGLISH

1. Could you tell me your name, organization and current position?

2. Could you briefly describe your role and responsibilities during the recent diphtheria outbreak response?

3. What were the main objectives of the MSF intervention, and what was the rationale for its key activities?

4. To your knowledge, how were the local context and needs taken into account to design and implement the intervention?

5. How did MSF coordinate and work with other national and international actors during the diphtheria outbreak?

6. What was the rationale and approach for intersectional coordination?

7. Do you think MSF response activities were in line with international best practices for diphtheria outbreaks? If they differed, how?

8. Home-based care was used as a modality for case management during this outbreak. In your opinion, what is the value of this type of care?

9.a) What were the key results achieved by the intervention?

9.b) Were there any unmet objectives, and if yes why?

10. What were for you the main benefits of the intervention, including for patients, the community and local capacities for future diphtheria outbreaks?

11. In your opinion, to what extent did MSF intervention supported the control of the diphtheria outbreak? Were there missed opportunities to have more impact?

12. Did you notice any unintended consequences of the intervention, either positive or negative?

13. Do you think the timing and duration of the MSF intervention were adequate to achieve its objectives?

14. In your opinion, what was the effect of the intersectional coordination on the response results?

15. Were there any specific activities carried out during this outbreak response that you believe are good practices and should be replicated in other responses?

16. What were the main challenges during the response and how were they faced?

17. What would be your recommendations to improve MSF's response to future outbreaks in general and for diphtheria outbreak in particular?

18. What would be your recommendations to improve MSF intersectional coordination of outbreak response?

Thank you very much for your time.

19. Is there anything else you would like to add or do you have any questions for me?

INTERVIEW GUIDE FOR EXTERNAL PARTNERS

1. Could you tell me your name, organization and current position?

2. Could you briefly describe your role and responsibilities during the recent diphtheria outbreak response?

3. To your knowledge, what were the main objectives of the MSF intervention, and what was the rationale for its key activities?

4. In your opinion, how were the local context and needs taken into account to design and implement the MSF intervention?

5. How did MSF coordinate and work with other national and international actors during the diphtheria outbreak?

6. Do you think MSF activities were in line with international best practices for diphtheria outbreaks? If they differed, how?

7. Home-based care was used by MSF as a modality for case management during this outbreak. In your opinion, what is the value of this type of care?

8.a) What were the key results achieved by the MSF intervention?

8.b) Were there any unmet objectives, and if yes why?

9. What were for you the main benefits of the MSF intervention, including for patients, the community and local capacities for future diphtheria outbreaks?

10. In your opinion, to what extent did MSF intervention supported the control of the diphtheria outbreak? Were there missed opportunities to have more impact?

11. Did you notice any unintended consequences of the MSF intervention, either positive or negative?

12. Do you think the timing and duration of the MSF intervention were adequate to achieve its objectives?

13. Were there any specific activities carried out by MSF during this outbreak response that you believe are good practices and should be replicated in other responses?

14. What were the main challenges faced in relation to the MSF interventions during the response?

15. What would be your recommendations to improve MSF's response to future outbreaks in general and for diphtheria outbreak in particular?

Thank you very much for your time.

16. Is there anything else you would like to add or do you have any questions for me?