A photograph of a woman wearing a black hijab and a black long-sleeved top, carrying a large blue backpack. The backpack has a water bottle in a front pocket. She is standing in an outdoor setting with dry grass and a concrete wall in the background. The image is framed by a large, light blue diamond shape.

Indigo Deployment Case Study

– Borno State, Nigeria

Indigo System deployed to address gaps in vaccination capacity due to limited availability of refrigeration at health facilities amid underlying security challenges.

Borno State Routine Immunization Health Facilities Cold Chain Overview (June 2022)

389	Number of health facilities supporting Routine Immunization (RI) System
255 (58%)	Number of RI facilities with operational refrigeration
168 (42%)	Number of RI facilities without operational refrigeration (%)
36	Number of RI facilities without operational refrigeration using Indigo
95	Number of Indigo carriers deployed
8	Number of Indigo Chargers deployed

Performance Indicators	2020 (Without Indigo)		2021 (With Indigo)		Jan - June, 2022 (With Indigo)	
	Target	Actual	Target	Actual	Target	Actual
Number of Under-5 Children immunized	103,916	31,131 (Average of 29 health facilities per round)	103,916	68,473 (Average of 16 health facilities per round)	64,413 (Average of 30 health facilities per round)	54,598
Annual Average Number of Children immunized per health facility	3,360	1,073	3,360	4,279	2,184	1,851

Overview

The Indigo System deployed in Borno State is targeted to enable more vaccinations for areas that are inaccessible using conventional ice-based vaccine storage and delivery. The scale and reach of vaccination in Borno is largely determined by the availability of health facilities offering safe storage: fixed (facility-based) and outreach (mobile-based) vaccinations leverage fridges in these facilities.

Every year, approximately 1.5 million children under the age of five die globally as a result of vaccine preventable diseases. In Nigeria, these diseases account for a significant percent of child mortality. Vaccine preventable diseases account for approximately 22% of child mortality in Nigeria every year. In Borno State, the reach of vaccinators is challenging due to poor transport conditions, limited cold chain support for the safe storage of vaccines, and security issues.

In 2020, the Borno State Primary Health Care Development Agency (BSPHCDA) set a goal of conducting routine immunization for 100% of children within settlements classified as either accessible or partially accessible. The Indigo system was deployed to select settlements to support this goal and, through its deployment, to evaluate how newer, extended-holdover vaccine storage devices can improve EPI immunization capacity. Indigo Vaccine Carriers were assigned for use in health facilities with non-functioning refrigeration to enable vaccinations to be conducted more easily and frequently at these facilities and surrounding settlements. Throughout the course of the year of deployment in 2021, each Indigo Vaccine Carrier was monitored for its performance and use in order to assess improvements in vaccination capacity.

Borno State Deployment Key Performance Indicators

Comparative data for 2020 and 2021 was used to evaluate changes in vaccination capacity and related costs for delivery.

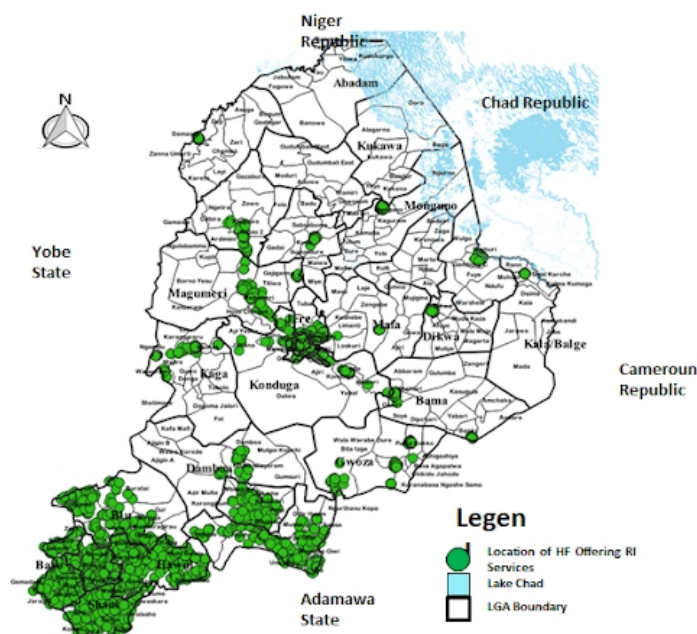
Performance Indicators	Without Indigo (2020)	With Indigo (2021)	With Indigo (Jan - June 2022)	Change 2020 vs 2021
Number of cold days/health facility/month	8 days	28 days	28 days	+20 days
Annual Travel Costs	USD \$16,253.94	USD \$6,410.97	USD	-61%
Total number of children vaccinated	31,131	67,502		+117%
Average number of children Vaccinated per health facility	1,073	4,279		+299%
Average number of trips per immunization campaign per month (total facilities targeted and supported)	154	30		-78%

1. Adedire EB, Ajayi I, Fawole OI, Ajumobi O, Kasasa S, Wasswa P et al. Immunization coverage and its determinants among children aged 12-23 months in Atakumosa-West district, Osun State, Nigeria. BMC Public Health. 2016;9:22-9.

2. Travel Costs associated with the collection and return of vaccines between NPI/LGA cold stores and implementation health facility

Case Study

In Nigeria, vaccine-preventable diseases account for 20% of morbidity and mortality in children under 5 years. Borno has an under-five population of 1.15 million (U-1 pop.: 211,000). Many of the state's settlements have been inaccessible to conduct vaccinations due to poor transport conditions to these health facilities, security issues and limited cold chain support. Of the total 389 health facilities offering RI, only 225 have functional cold chain support as at June 2022. For the remaining facilities without access to stationary refrigeration, vaccinations have been severely limited.



Prior to the introduction of the Indigo System in 2021, vaccination teams based in health facilities without refrigeration were required to travel to collect vaccines from regional *National Programme on Immunization* (NPI) offices or other health facilities equipped with solar cold chain equipment and ice pack freezing capacity, and return the same day to these regional stores with any unused vaccine vials. This is being implemented due to the holdover limitations of ice, and in order to minimize vaccine loss, vaccinators have been required to collect vaccines and return any unused inventory the same day. These distances ranged from 5 – 20 km and require the use of motorized transport, financed by the BSPHCDA and health facilities. Owing to the time required and costs for transport, along with underlying security challenges, vaccinators from these health facilities were typically restricted to conducting vaccinations only one day each per week of fixed and outreach sessions (eight days of immunization per month). BSPHCDA assesses that many settlements were not accessible with the limited reach of conventional ice-based vaccine storage and transport.

Indigo Use for Routine Immunization: Influence on Vaccine Delivery

In 2021, the Indigo System was introduced to Borno State to enable immunization for settlements in areas of the state without a functioning cold chain. Selected wards were targeted to address three primary goals:

- Increase RI capacity with the use of on-demand cold storage
- Reduce the time of and costs for delivery
- Increase immunization for children under 5 years

Seventy Indigo Vaccine Carriers were deployed to twenty five (25) health facilities to support refrigeration throughout each week and month. Health facility personnel collected the vaccine carriers from two charging stations created to store and re-charge the Indigo carriers. The charging stations are based at NPI offices and facilities with sufficient stationary cold storage to hold monthly vaccine inventory for re-supply to surrounding health facilities. The stations, based in the Biu and Askira Uba Local Government Areas (LGA), contained the 70 Indigo Vaccine Carriers and 6 Indigo Chargers, respectively. Since then, the Indigo system in Borno has been scaled to 95 Indigo carriers and 8 chargers.

Every ten days, health facility personnel collect two Indigo Vaccine Carriers from a charging station: one unit is turned on at the charging station and immediately used to transport RI vaccines to the health facility and used for the first five days. After five days, the remaining inventory of vaccine vials is moved to the second Vaccine Carrier. At ten days, both Indigo Vaccine Carriers are returned to the charging station with any remaining vaccine vials, upon which the facility personnel will collect another set of freshly charged Indigos and vaccines.

The Indigo deployment has enabled each of the participating health facilities to utilize ten consecutive days of cold storage to support fixed and outreach vaccinations – determined by the health facilities and district managers – without the need for health facility personnel to leave their facility and travel up to regional cold stores or nearby facilities with functional refrigeration. As a result, more days each month can be allocated for vaccination. Additional days can also be allocated for outreach to previously inaccessible settlements.

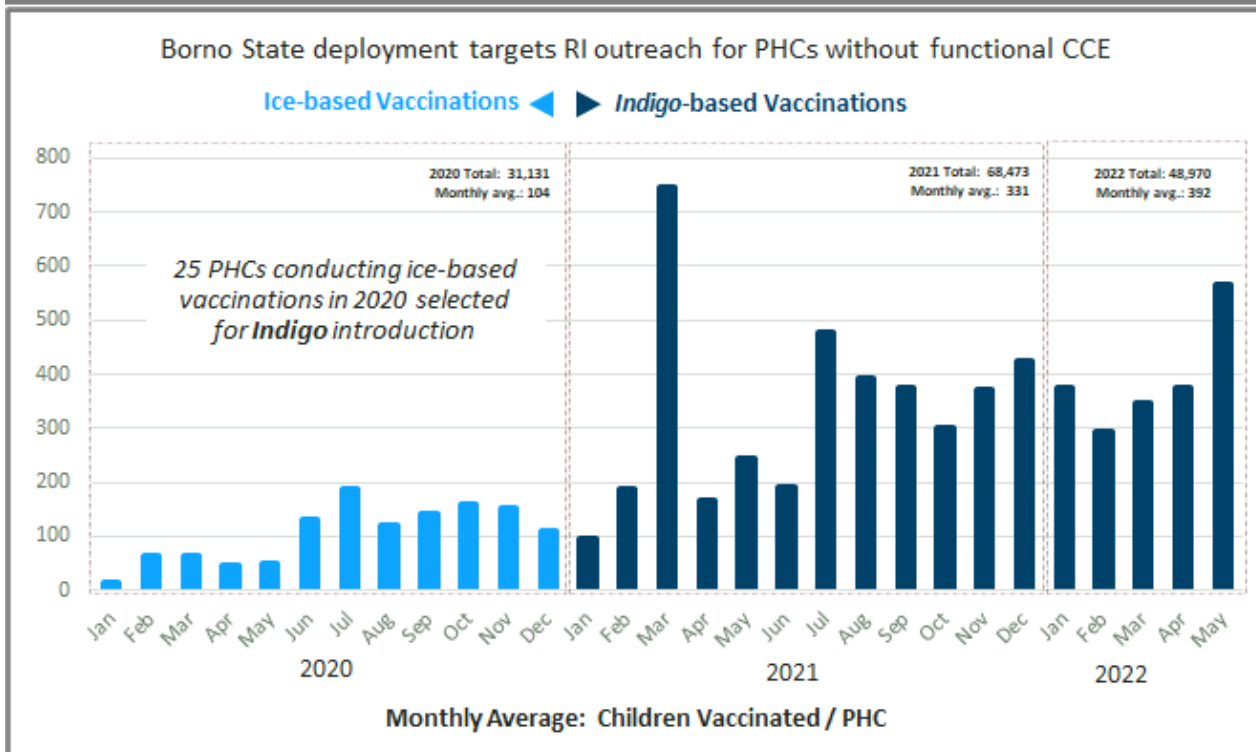
Borno State EPI Assessment and Responses to the Indigo System

The BSPHCDA considers the Indigo System a critical resource to support immunization for populations with previously none or limited access to vaccinations. The use of the Indigo System enabled on-demand cold storage at health facilities to increase significantly; with cold storage available throughout the week, enabling health facility personnel to conduct vaccinations more readily and frequently.

Indigo Increasing RI Availability and Children Reached

Indigo-supported facilities are extending RI services to operate throughout the week with Indigo. This is evident in the targeted facilities' number of RI sessions conducted throughout the week against the one fixed and one outreach sessions in other unequipped facilities. Prior to the introduction of the Indigo system in Borno; unequipped or non-functional cold chain equipment health facilities were limited to the implementation of 8 RI sessions per month using conventional ice based vaccine carriers. With the Indigo system in place all targeted health facilities have the capability to implement daily RI sessions.

Indigo deployment shows increases in children vaccinated



[More Vaccine Supply](#)

Indigo-supported health facilities are also receiving an increased vaccine supply, associated with the additional cold days provided through the Indigo. This additional supply of vaccines is also resulting from the RI sessions being conducted throughout the week.

[Extending outreach](#)

Routine immunisation vaccinators have also indicated that the Indigo's long holdover and portability is allowing them to visit previously inaccessible outreach settlements in a more efficient manner.

Use of the Indigo system not only extended routine immunization capacity to reach challenging and hard-to-reach settlements, but also bridged the cold chain gap for locations with limited stationary refrigeration.

The Indigo System has significantly improved RI uptake and coverage in the state. This is especially true within the LGAs supported with the vaccine carrier and it has also reduced the cost of implementing RI sessions. The impact of the Indigo vaccine carrier is also evidenced in the availability of vaccines in health facilities; reports of vaccine stock outs, especially within some of the hard-to-reach health facilities, have been reduced with the aid of the Indigo System.

Prior to the deployment of the Indigo System, vaccinators in health facilities not equipped with cold chain equipment were required to travel to and from LGA and/or NPI offices for the collection and return of vaccines to support routine immunization sessions. At times, this travel is subsidized by vaccinators as well as the state. Furthermore, all vaccines and diluents used for each session implemented must then be returned back to the LGA/NPI and/or equipped facility where they were picked up, further increasing logistics costs. The Indigo System has not only reduced the number of trips made by vaccinators but also reduced these transport costs.

We have seen the impact of the Indigo System reaching under-5 children in other aspects as well: the Indigo vaccine carrier's portability and ease-of-use makes it a reliable, transportable cold storage device for deployment in difficult and hard to reach areas and this has yielded a positive result and higher-quality immunization.

Tijjani Nasir, Borno State Primary Healthcare Development Agency Cold Chain Officer



The recent introduction of the Indigo System to Borno State has made a significant impact and increase in RI coverage across LGAs that are using the device. With the unique environment of Borno, Indigo vaccine carriers have played a vital role in storing vaccines in hard-to-reach areas. Based on this initial deployment of the Indigo System in Borno, especially within LGAs that are partially accessible, Borno State is interested in using the Indigo System to cover cold chain gaps at other health facilities.

Ali Gambo, Deputy Program Manager Service Delivery, BSPHCDA, (DPM SERICC)

Photo Gallery

