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# Advancing Japanese Encephalitis Control in the State of Bihar

An Initiative by the Government  
of Bihar and PATH



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# Abbreviations

ASHA	Accredited Social Health Activist
AES	Acute Encephalitis Syndrome
AEFI	Adverse Event Following Immunization
AD	Auto Disable
ANM	Auxiliary Nurse Midwife
CFR	Case Fatality Rate
CARE	Cooperative for Assistance and Relief Everywhere
CDIBP	Chengdu Institute of Biological Products
CHAI	Clinton Health Access Initiative
COVID-19	Coronavirus Disease 2019
ETC	Encephalitis Treatment Center
GoI	Government of India
HMIS	Health Management Information System
IEC	Information Education Communication
ICU	Intensive Care Unit
JE	Japanese Encephalitis
JEV	Japanese Encephalitis Vaccine
JENVAC	Japanese Encephalitis Vaccine Inactivated

JSI	John Snow Inc
MO	Medical Officer
MOHFW	Ministry of Health and Family Welfare
NAMP	National Anti-Malaria Program
NFCP	National Filaria Control Programme
NVBDCP	National Vector Borne Disease Control Programme
NCVBDC	National Center for Vector Borne Diseases Control
PHC	Primary Health Center
RCM	Rapid Convenience Monitoring
RI	Routine Immunization
SIA	Supplemental Immunization Activity
UNICEF	United Nations Children's Fund
UIP	Universal Immunization Programme
UP	Uttar Pradesh
WHO	World Health Organization
WHO SEA/WPR	World Health Organization South-East Asia/Western Pacific Region





# Executive Summary

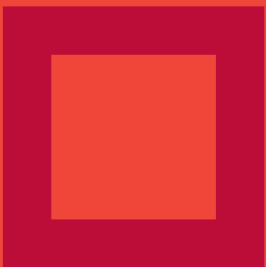
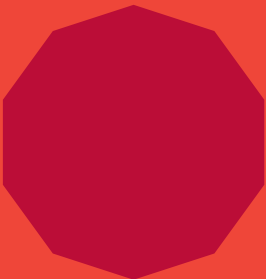
Japanese encephalitis (JE) is the leading viral cause of disability in Asia.<sup>1</sup> The mosquitoes that transmit JE breed in areas of standing water, such as rice paddies, making rural communities of Asia particularly vulnerable. The disease primarily affects children and begins with flu-like symptoms, sometimes progressing to abnormal behavior, confusion, and agitation. As the illness advances, seizures may occur, and patients often become comatose. Approximately 70 percent of those who develop JE illness either lose one's life or suffer long-term neurological disabilities. Immunization is the best method to prevent JE, but control efforts have been hindered by inadequate disease surveillance, limited/unstable vaccine supply, variable guidance and programmatic support, and competing country/state priorities. Focused efforts from PATH and other partners over the past several years, have improved the landscape of JE control across the country. Dedicated endeavors, such as ensuring access to safe and affordable vaccines, and advancing national programs for JE control, have led to significant progress in documenting disease burden in JE-endemic countries. India has been, and continues to be, an example for countries introducing the Japanese encephalitis vaccine (JEV). The World Health Organization (WHO) now endorses India's JE-combating strategy, that includes conducting vaccination campaigns for wide range of children (aged between 1–15 years), targeted at high-burden districts and inclusion of JEVs in routine immunization (RI) programs, among others. JE immunization is now under way in many developing countries and will be a priority for many others.

The year 2006 proved to be a landmark year for India's rural population after decades of suffering from recurrent outbreaks of JE. The government implemented the momentous decision to launch JEV with unwavering conviction and creating a successful program within a short period of eight months. Over nine million children were able to receive JEV ahead of the JE season in India, thanks to strategic planning and close collaboration between national and state governments, and the support of other partners. Although the significant outbreak in 2005 may have marked a turning point, the choice to deploy a vaccine to manage JE was made over a 30-year period. During this time, a lot of effort was made to enable an efficient decision-making process.

This document details the phased JEV campaign across selected endemic districts of Bihar, followed by the introduction of JEV in the RI schedule and the lessons learnt for strengthening immunization program all across.

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<sup>1</sup> PATH, Proposal for a joint work plan on Japanese encephalitis (JE) control in India. PATH: NCVBDC.



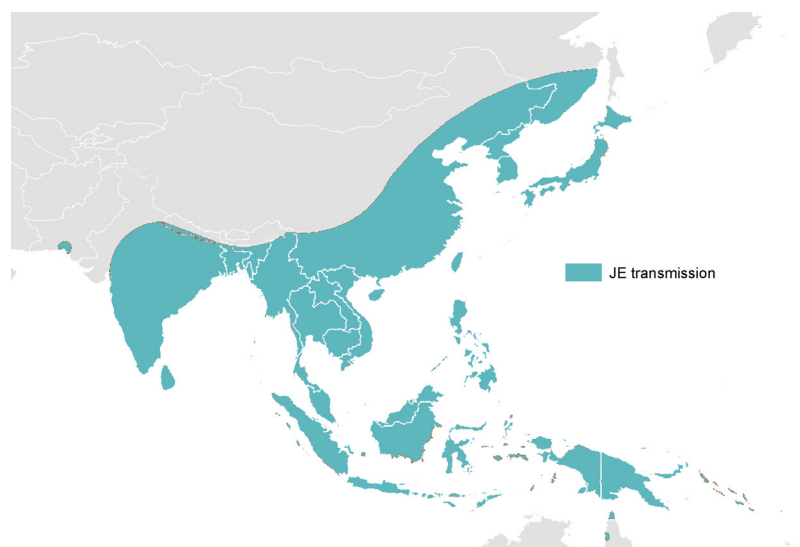
# Background

JE is a viral brain infection caused by the JE virus, which is transmitted to humans by *Culex* mosquitoes.<sup>2</sup> The illness usually begins like a flu, with high fever, chills, tiredness, severe headache, nausea, and vomiting. In the early stages, people may be confused, agitated, or unusually sleepy. The illness can progress to a serious infection of the brain, which can cause seizures or leave people semiconscious or unresponsive. Among survivors, 20–50 percent develop neurological sequelae, such as paralysis, seizures, inability to speak, memory loss, impaired cognition, and other mental disorders.<sup>3</sup>

In many countries across Asia, JE is the most common viral cause of viral encephalitis. Children under the age of 15 are the main victims of the illness. Although greatly underreported, 68,000 cases are reported each year in Asia, with 13,600–20,400 cases of death. These numbers support a case fatality rate (CFR) of 30 percent and a disability rate of a 30–50 percent among survivors (see Figure 1).<sup>4</sup>

Since the reporting of the first case of JE in the late 19th century, the disease has expanded beyond its early domain in Asia and, by 2000, had reached Australia. In the past 60 years, JE has infected 10 million children, killed 3 million people, and left 4 million people permanently disabled. Limited surveillance and the complexity of diagnosis suggest that these figures significantly underestimate JE's impact.<sup>3</sup>

**Figure 1: Regions reported to have transmission of JE virus**



<sup>2</sup> The World Health Organization. Japanese encephalopathy. <https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis>

<sup>3</sup> Centers for Disease Control and Prevention. Japanese encephalopathy. <https://www.cdc.gov/japaneseencephalitis/symptoms/index.html>

<sup>4</sup> The World Health Organization. Japanese encephalopathy. <https://www.who.int/news-room/fact-sheets/detail/japanese-encephalitis>

# India Scenario

The first evidence of the presence of the JE virus in India dates to 1952 in the Nagpur subdivision of Maharashtra. The first clinically diagnosed case of JE however was reported in 1955, at Vellore, a northern district of Tamil Nadu. Subsequently, a large epidemic with a 42.6 per cent fatality rate was documented in the districts of Burdwan and Bankura in West Bengal, in 1973, and another outbreak was reported in 1976. Since then, outbreaks have been documented from 26 states and union territories of India, with 15 states reporting JE regularly.<sup>5</sup>

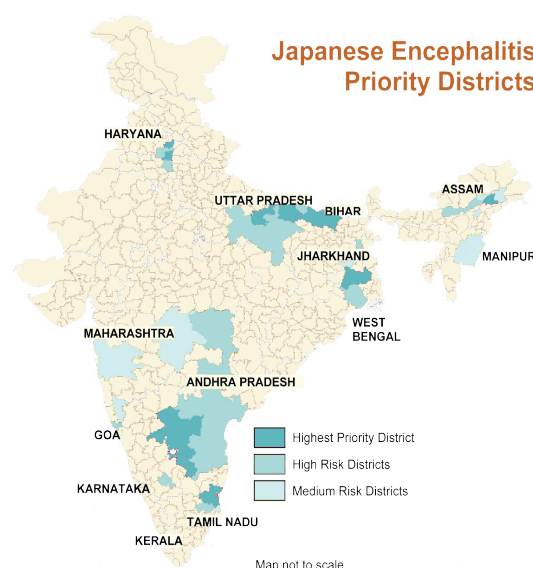
During the 1990s, the directorate of the National Anti-Malaria Program (NAMP) monitored JE incidence in the country. They provided need-based support for battling JE and dengue, as well as support for prevention and management of other vector-borne diseases such as lymphatic filariasis and kala-azar.<sup>6</sup> NAMP was renamed as the National Vector Borne Disease Control Programme (NVBDCP) in 2003 with the integration of three ongoing centrally sponsored schemes, namely the National Anti-Malaria Program (NAMP), National Filaria Control Programme (NFCP), and Kala-Azar Control Programme as well as the converging the prevention and control of JE and dengue. This was done considering synergies in prevention and control of vector-borne diseases including JE and dengue. NVBDCP has been further renamed as National Center for Vector Borne Diseases Control (NCVBDC).

Historically, vector control had been the mainstay of JE control in India, but it has had a limited impact and required large resources because the vector breeds in rice paddies. Moreover, the reduction in mosquito breeding required eco management as the role of insecticides was limited. In case of an outbreak, the first containment measure is to control the vectors under the guidance of the NCVBDC, MoHFW. However, occasionally the outbreak response had an additional component of targeted vaccination in villages where cases are reported. This response was

successful in showing governmental responsiveness but was ineffective at preventing further outbreaks in subsequent years.<sup>7</sup> Thus, the government had to adopt better strategies, such as vaccination, to control the incidence of JE in the country.

Vaccines are usually procured by the central government, supported through the national program, and supplied to the states. JENVAC vaccine (a mouse-brain-derived inactivated JE vaccine) was introduced in Tamil Nadu in 1995 under a state-led initiative, and in Andhra Pradesh in 1999 in partnership with PATH.<sup>8</sup> This helped the states to reduce their JE case load. Following a review by an expert team of these experiences of vaccine introduction, and with the support from World Bank support, NCVBDC called for a national meeting of program managers from endemic states to plan JE control using JEV. Following which, affected Indian states were then directed to submit vaccine requirements by May 2005 (see Figure 2).

**Figure 2: Map showing JE-endemic districts selected for JE campaign in 2005**



5 Dhillon GPS, Raina VK. Epidemiology of Japanese Encephalopathy in context with Indian Scenario. Journal of the Indian Medical Association. 2008;106(10):660–663. <https://pubmed.ncbi.nlm.nih.gov/19552100/>

6 National Center for Vector Borne Disease Control website. [https://www.nhp.gov.in/national-vector-borne-disease-control-programme\\_pg](https://www.nhp.gov.in/national-vector-borne-disease-control-programme_pg)

7 National Center for Vector Borne Disease Control. Annual Report 2012. <https://nvbdcp.gov.in/Doc/Annual-report-NVBDCP-2012.pdf>

However, funding for the use and supply of vaccine was yet to be established due to two factors:

1. The high-cost of JENVAC, which was the only WHO-approved vaccine at that time.
2. Limited supply of the domestic inactivated mouse-brain-derived vaccine<sup>7</sup>

It was during this time that a major JE outbreak occurred in Gorakhpur, Uttar Pradesh (UP), and Bihar. Thousands of people fell ill, and more than 1,500 children died. The number of cases and fatalities recorded drastically increased during the monsoon season and beyond (June–November 2005).

Moreover, reports suggested that 5,737 people were affected and 1,344 people died in UP. Additionally, 192 cases and 64 deaths were reported in Bihar during the 2005 outbreak.<sup>9</sup> When the outbreak hit, Indian authorities recognized that the ongoing mosquito-control measures, such as spraying insecticides, were not effective enough to control the spread of the

virus. India's National Health Program was unable to handle this outbreak due to a few challenges:

- Lack of a reliable reporting mechanism, which rendered the monitoring system incapable of gathering pertinent data for effective action
- Inadequate supply of domestic inactivated vaccine due to safety concerns
- Inadequate tertiary health systems for JE management
- Absence of mass media for information exchange between the affected communities and authorities.

The JE outbreak prompted officials to intensify efforts and implement a national strategy for JE control through immunization. Consequently, the Government of India (GoI) decided to introduce JEV in 110 districts across 11 states in first phase, and later expanded its program to include the 181 JE-endemic districts across 20 states of the country in a phased manner.

## The criteria used to identify JE endemic districts were as follows:

- Case load of JE-Total number of cases reported (AES/ suspected JE/ lab confirmed JE)
- Incidence of JE
- Evidence of recent transmission of the disease
- Serological evidence from JE studies
- Epidemiological link to known areas of transmission

8 Ghosh RS, Haldar P, Jacobson J. Lessons learned from the Japanese encephalitis vaccine introduction in India that supported the introduction of Ivermectin–Diethylcarbamazine–Albendazole for lymphatic filariasis Elimination. *The American Journal of Tropical Medicine and Hygiene*. 2022;106(5 Suppl.):48–55. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9154647/>

9 Parida M, Dash PK, et al. Japanese encephalopathy outbreak, India, 2005. *Emerging Infectious Diseases*. 2006;12(9):1427–1430. [ncbi.nlm.nih.gov/pmc/articles/PMC3294746/#:~:text=An%20outbreak%20of%20viral%20encephalitis,RNA%20and%20by%20virus%20isolation](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3294746/#:~:text=An%20outbreak%20of%20viral%20encephalitis,RNA%20and%20by%20virus%20isolation)

# JEV Campaign in India and Technical Support of PATH

Based on the recommendations of the biregional consultation on Japanese Encephalitis,<sup>10</sup> Gol decided on the following strategy for introducing JEV in India:

- A one-time campaign targeting all children in the age group of 1–15 years in the district.
- Followed by integration of JEV into the routine immunization (RI) program to cover a new cohort (children > 9 months old), in the district previously covered under the JEV campaign.

In 2005, PATH provided technical assistance for JEV introduction in South Asian countries and India through funding by the Bill & Melinda Gates Foundation (henceforth to be referred to as the Gates Foundation).

Thus, when the Gol decided to introduce JEV into its national program, PATH facilitated the procurement of the SA 14-14-2 vaccine. PATH's JE project negotiated a cost for the JEV that was comparable to the price of the measles vaccine for JE-endemic nations. Further, the Indian Council of Medical Research advised the Drugs Controller General of India on the process for registering the SA 14-14-2 vaccine for marketing and approval in India. After defining the vaccination strategy in the endemic districts, identifying a suitable vaccine, and deciding the public-sector pricing and proper licensure, the Gol decided to roll-out the CDIBP-JEV SA 14-14-2 vaccine in phases across the country. However, due to the limited availability of the vaccine in the initial phase, in 2006, only 11 districts in four states (Uttar Pradesh, West Bengal, Assam, and Karnataka) were targeted during the campaign.<sup>11</sup>

This document discusses the strategies adopted by the Government of Bihar—from 2007 with support from PATH and other partners—to conduct the JEV

campaign in target districts as well as the manner in which it incorporated JEV into the Universal Immunization Programme (UIP) and reduced the incidence of JE in the state.

## Why was PATH chosen as an implementing partner?

PATH is the Bill & Melinda Gates Foundation's leading partner in developing and delivering innovation in global health. The foundation is one of many donors—from the World Health Organization (WHO) to the US and UK governments to corporations like Amazon, Delta Air Lines, and Tableau Software—to lead some of the world's most innovative work.

PATH has a rich history of Japanese encephalopathy (JE) control across countries. It has raised awareness of JE at global, national, and regional levels to foster collaboration and inform control strategies. It was involved in improving available data for decision making and established guidelines and standards for JE diagnosis and surveillance. PATH also extended technical assistance to countries on JE vaccine introduction and in clinical trials for establishing new vaccine safety and efficacy.

In India, PATH was working on JE vaccination. It was identified as a lead agency by federal as well as state ministries in India. PATH, through its office in India and its headquarters, has a long-standing history of effective project management.

<sup>10</sup> WHO SEA/WPR and PATH, Thailand, March–April 2005.

<sup>11</sup> PATH. Case study: India's leadership in the fight against Japanese encephalitis. <https://www.path.org/programs/center-for-vaccine-innovation-and-access/case-study-indias-leadership-in-the-fight-against-japanese-encephalitis/>

# Journey of JE Vaccination Program in Bihar

## Phase 1: 2007 – 2012

The JEV campaign in Bihar was started in 2007, covering children between 1 and 15 years of age in eight districts through 2012. Through this project, PATH supported the Government of Bihar to focus on their JE-control activities by identifying high-risk populations and creating a format for risk stratification.

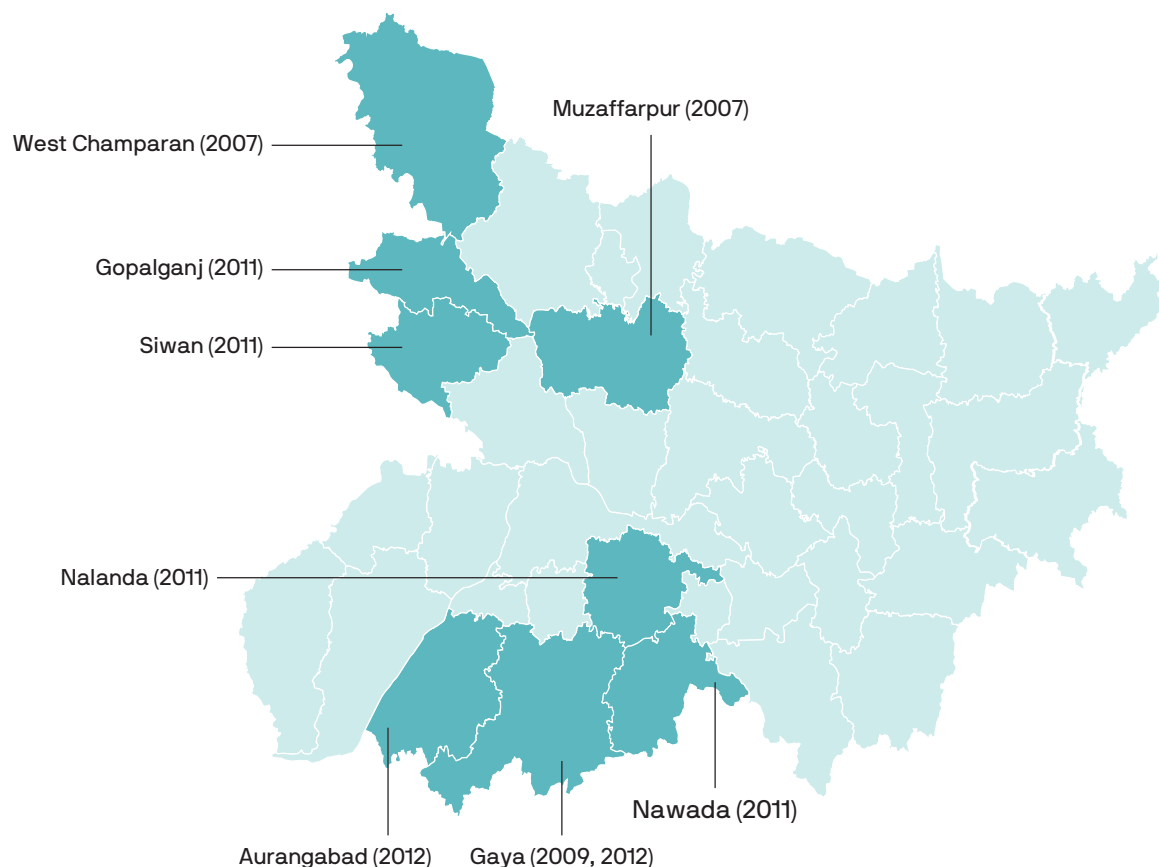
## Approach

The project focused on providing technical support to JE-endemic districts. It also aimed to improve data for decision making, advance the availability of an improved vaccine, introduce the vaccine-to-immunization system, and expand outreach through advocacy.

## Result

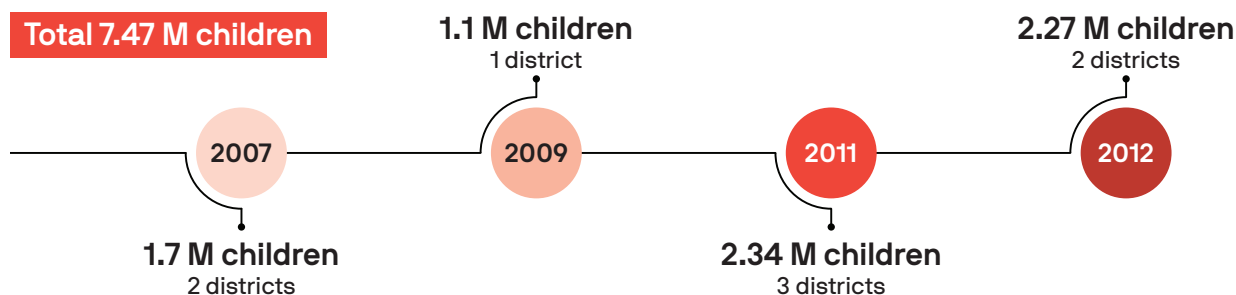
Eight districts of Bihar were covered under the project between 2007 and 2012.

**Figure 3: JEV campaign districts of Bihar during Phase 1 (2006–2012)**



7.47 million children were vaccinated from all the targeted 08 districts and several medical personnel, and health professional were trained on JE case management and vaccination.

**Figure 4: Children covered in JE vaccination campaigns, Bihar, 2007-2012**



## Phase 2: 2013-15

PATH support through a new investment from the Gates Foundation focused on a JEV campaign covering children between the ages of 1–15 years in 19 districts of Bihar. This was followed by re-campaigns in eight districts of Bihar that were completed between 2007 and 2012. Following this, JEV was integrated into the RI program to cover the new cohort above one year of age. PATH undertook a rapid convenience assessment during the campaign to uncover pockets of unimmunized children and take corrective actions. PATH concurrently

undertook qualitative and quantitative assessments of the immunization activity by randomly visiting 20 households and identifying missed children and gaps for enabling the government to make mid-course corrective actions, such as retraining the vaccinators, reviewing micro-plans, etc., or for immediate corrective actions, such as repeat immunization activity in an area where a significant number of unimmunized children were found after completion of the activity. The project advocated and supported the rolling out of JEV in UIP in the campaign districts and the integration of a second dose of JEV in UIP.

**Figure 5: JEV campaign districts of Bihar during Phase 2 (2013–2015)**





**Figure 6: JEV vaccination campaign at outreach site**

## Approach

The JEV plan was implemented in phases, and the government proposed certain guidelines for microplanning the campaign. The key activities of microplanning included:

### 01 Planning for immunization at village level (site selection, estimation of beneficiaries etc.)

- Support/facilitate the selection of the immunization center/site, such as a village school, through prior planning and intimation of the same to the school.
- Estimate of the number of days of activity in the village
- Build vaccination teams or plan for manpower such as the deployment of four to five functionaries in the vaccination center, including two auxiliary nurse midwives (ANMs) and others from the local village functionaries.
- Undertake vaccination center management and logistics.
- Decide upon the opening and closing time of the vaccination center.
- Ensure the availability of vaccine carriers, hub-cutters, emergency medicine kits, etc.

### 02 Strengthening JEV coverage

Facilitate the regular monitoring of UIP sessions, house-to-house visits to concurrently assess the coverage, and at least two-to-three community awareness meetings per week on the benefits of immunization against all vaccine-preventable diseases.

### 03 Planning for supervision

Acknowledge the need for high-quality supervision during the campaign, developed guidelines for training, supervision, and executed planning for training of vaccinators and their supervisors as well as the activities to be carried out by the supervisors.

### 04 Planning for vaccine, logistics, and cold-chain maintenance

Include activities such as vaccine estimation and storage, vaccine transport and delivery, development of cold-chain management and vaccine handling guidelines in vaccination centers.

### 05 Planning for information, education, communication, and social mobilization

- Undertake advocacy and social mobilization efforts for the successful introduction of the JE immunization program. Communication planning was done to address the target group, maintenance of immunization card by parents, and on possible side effects and management.
- Develop communication and media management tools for crises management during adverse events following immunization (AEFI) and Acute Encephalitis Syndrome (AES) outbreaks.

## 06 Planning for referral in case of an adverse event following immunization

- Train medical officers on the JEV campaign and managing cases of AEFI
- Adopt strategies such as the use of auto disable (AD) syringes for injection, discarding of live attenuated JE vaccine two hours after reconstitution, etc., to reduce program errors.

### Results

A total of 26.7 million (~ 91%) children were vaccinated from all the targeted 24 districts and several medical personnel and health professional were trained on JE case management and vaccination.

## Phase 3: AES control Bihar (2015–2017)

In continuation to the JE project and through another generous grant from the Gates Foundation, PATH initiated the AES project in 15 districts of Bihar to provide technical assistance for improving management of encephalopathy/AES cases by strengthening health facilities.

### The three broader objectives were:

Strengthening encephalopathy/AES case management in project intervention districts of Bihar.



Strengthening the AES data management system and data usage for evidence-based planning and quality improvement.



Providing technical support to districts to develop effective strategies to generate community awareness on encephalopathy/AES.



The primary focus of the project was twofold. First, on upgrading/strengthening the existing infrastructure of primary- and secondary-level health facilities in line with the encephalitis treatment center (ETC) model implemented in

Andhra Pradesh and Uttar Pradesh. Second, towards improving the AES data management system to encourage data usage across the spectrum for evidence-based strategies. The secondary focus was on strengthening strategies on community awareness and treatment-seeking behavior.

### Approach

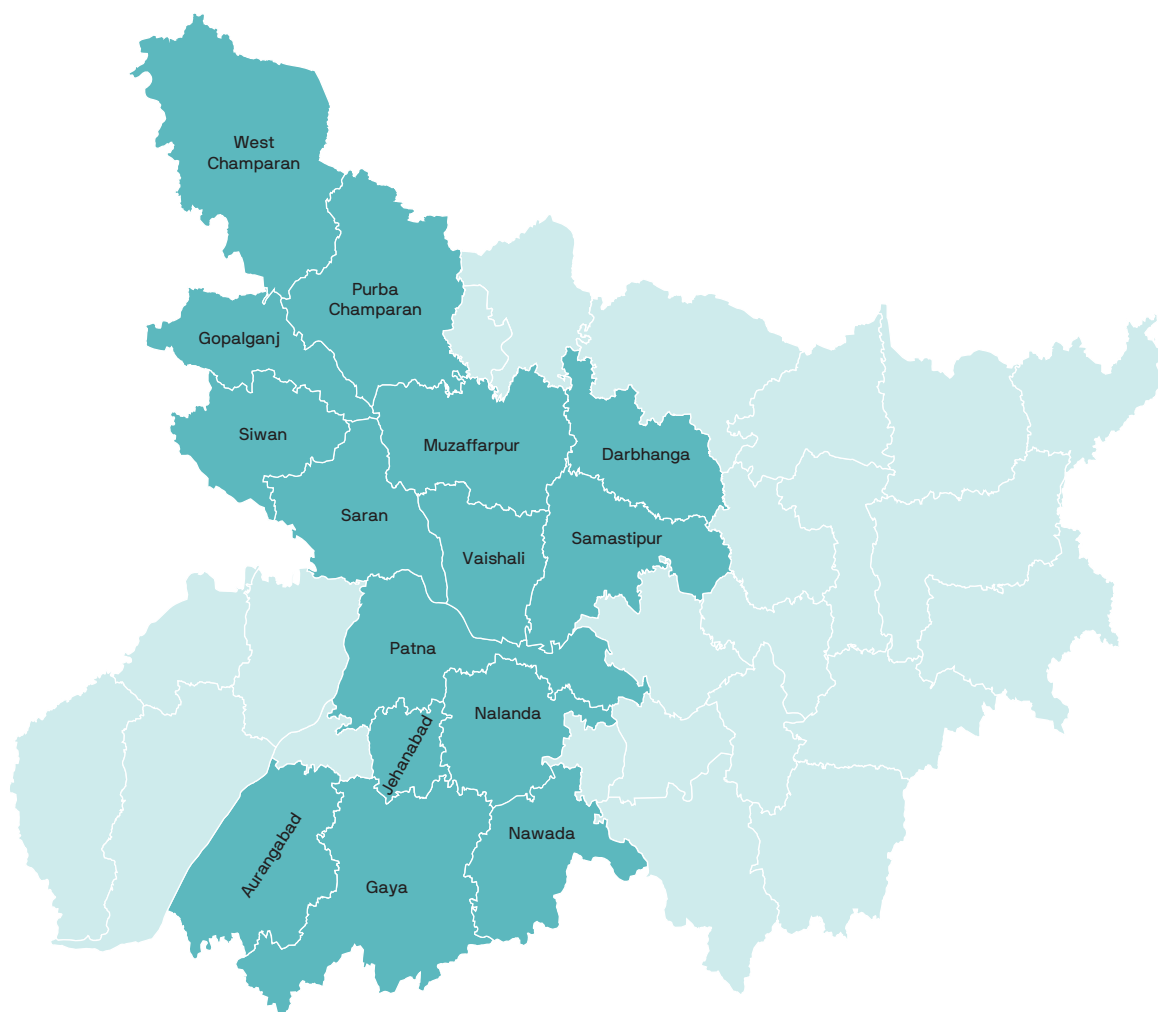
The ETC model worked on the concept of early identification of suspected AES cases at the community level, immediate first aid, and prompt referral, which was seen to have a remarkable impact on CFR. The project facilitated efforts to increase awareness on AES by conducting community awareness meetings in the villages in the project districts. In addition, many health care personnel were trained on ICU care management of AES cases and thousands of paramedics were re-oriented on first aid management of suspected AES/ JE patients on early identification as well as first aid management and referral of patients to the nearest ETCs. With support from accredited social health activists (ASHAs) and village pradhans, community members were invited to schools or a common meeting place and sensitized through information education communication (IEC) materials, such as flipbooks with information on AES prevention and control measures, information on home-based care, referral, and on transportation care of the cases to the nearest health facility. A video on AES prevention and control was also showcased. This was followed by question-and-answer sessions to reiterate the key messages.

The government with support from PATH undertook various activities in line with the joint work plan formulated to strengthen the JE surveillance in the state, in addition to micro-planning for the JEV campaign. They trained the state health officers on JE surveillance, conducted training of trainers, developed a JE website with information materials, fact sheets, FAQs, and resource materials for doctors and program managers. In addition, with support from PATH, the government also established sentinel surveillance centers, a laboratory network to identify JE cases, trained laboratory personnel, and developed training materials for district-level training. Furthermore, they also developed an immediate feedback mechanism in case of a suspected outbreak and newer tools for data management and self-monitoring of progress of different components of the program.

PATH strengthened the clinical management of JE cases by providing continual medical education through periodic news bulletins about JE, coordinating with the Indian Medical Association and Indian Association of Pediatrics to train the private health

service providers. They also developed e-learning tools for clinical management and information and communication materials for the low-literate population at the community level.<sup>12</sup>

**Figure 7:** AES intervention districts of Bihar during 2015–2017



## Results

The CFR of AES/JE reduced significantly from 2015 to 2017 and the vaccination coverage increased to a great extent. Due to high coverage in Bihar, AES-related morbidity and mortality also reduced.

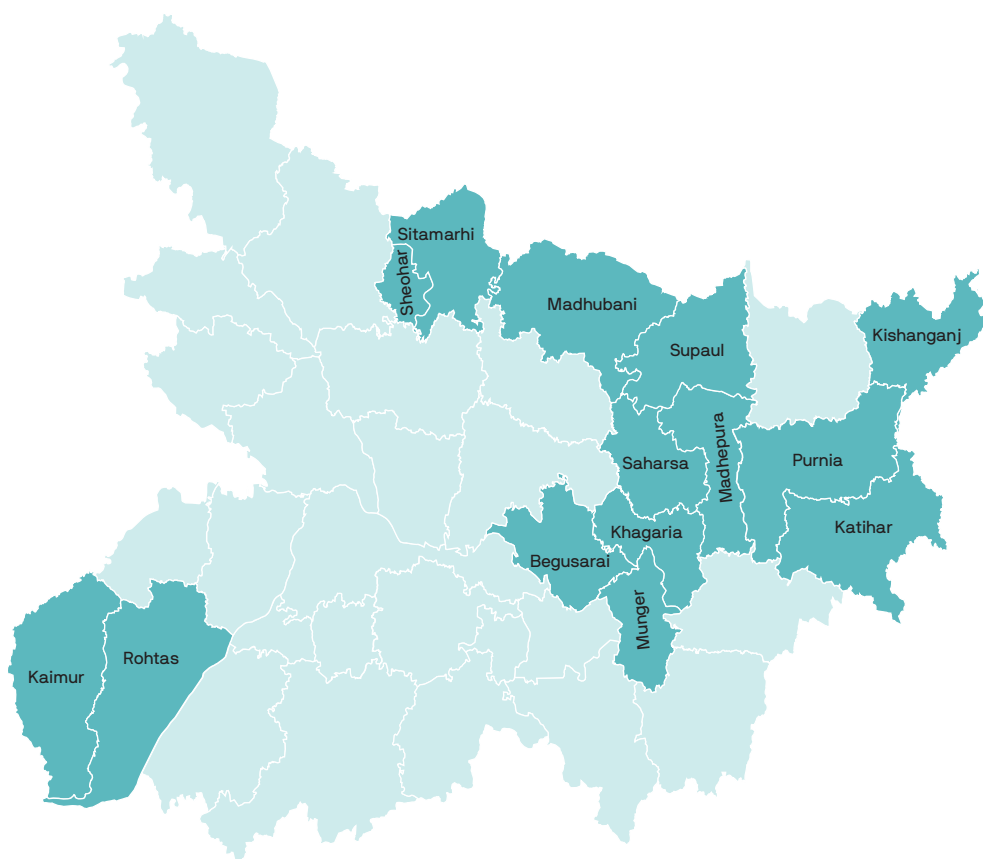
<sup>12</sup> <https://path.ent.box.com/file/350044191034> (PATH Toolkit)

## Phase 4: 2020– 2022

In 2019, the amalgamation of 20 percent unvaccinated children as per Health Management Information System (HMIS) data and the 2019 JE outbreak in multiple districts of Bihar, necessitated the need for JEV campaign in the newly identified districts. Given that the disease primarily affects the marginalized community, reaching every house—particularly in hard-to-reach and neglected areas—was critical. Thus, the Government of Bihar decided to

conduct campaigns in early 2020 for which it needed technical assistance in planning and implementation. PATH through funding from the Gates Foundation supported campaign planning, operational guideline revisions, capacity building, monitoring and feedback of JEV campaigns, and partner coordination. With support from PATH, the government also analyzed reasons for low JEV uptake in RI and developed solutions to improve the coverage. The support through this investment was focused on the new endemic districts in the state.

**Figure 8: JEV campaign districts of Bihar during phase 4 (2020–2022)**



The four broad areas of support were as follows:

Revision of operational guidelines for the campaigns (to be used by state, district, and block functionaries).



Campaign monitoring and RI-session monitoring on JEV uptake.



Training of district- and block-level master trainers on micro-planning, supportive supervision/monitoring, supply chain, etc., using innovative training methodologies such as the station approach.



Partner coordination on behalf of and in tandem with the Government of Bihar or the state immunization officer for effective planning and implementation of JEV campaigns for 2021.



## Approach

The approach under this investment was to build sustainable mechanisms in the government systems and build capacity of government personnel to implement them. To do this, it was crucial to understand the existing challenges associated with JEV in Bihar. Therefore, PATH undertook a rapid baseline assessment at the start of the project to understand the operating landscape and did a situational analysis. The investment provided necessary tools and technical support to the government health system for sustaining immunity after the campaign phase, through increased RI coverage of JEV. Data-driven decision-making for effective JEV delivery was the focus during the period. PATH regularly followed up with the national government to get intelligence on vaccine-supply status, which was a key input for campaign planning. For the JEV campaign, technical support included supplemental immunization activity (SIA) microplanning, capacity-building of medical and paramedical personnel, streamlining logistics and supply chain for the JEV campaign, partner coordination, and monitoring.

The JE vaccination campaign in the districts of Sitamarhi and Sheohar was inaugurated on January 21, 2020. The campaign was suspended in March due to COVID-19, with approximately 0.17 million target children still left to be vaccinated. It was resumed on May 6, 2020 and completed in July 2020. As planned initially, campaigns in Madhubani and Munger could not be started in March 2020 due to the COVID-19 pandemic and subsequent lockdown. JE campaign in nine districts—Kishanganj, Katihar, Madhepura, Madhubani, Purnia, Munger, Rohtas, Saharsa, and Supaul—was started in June 2020 through outreach and fixed RI session sites. It was concluded on January 20, 2021 and a consolidated coverage of 90.3 percent was achieved. The three remaining districts of Bihar—Begusarai, Kaimur, and Khagaria—were declared as JE endemic by the NCVBDC. The Government of Bihar decided to extend the vaccination campaign to these districts in August 2021 to align with reopening of schools in the state.

**Figure 9:** Poster representing the JEV campaign in 2021



Catch-up campaigns were held in the high-endemic (AES/JE) districts of Bihar in a phased manner during phase 4 to vaccinate the susceptible cohort of children, i.e., those who missed any of the two doses of JEV in RIJ. Catch-up campaigns were also held in the 10 high-priority (AES/JE) districts of Muzaffarpur, Gaya, Vaishali, Patna, Arwal, Jehanabad, Aurangabad, Nalanda, Nawada, and East Champaran. These were held from March to April 2021 and from June to July 2021. Further in 2022, JEV catch-up campaigns were conducted in 12 AES high-priority districts, namely, Darbhanga, East Champaran, Gopalganj, Muzaffarpur, Patna, Samastipur, Saran, Sitamarhi, Sheohar, Siwan, Vaishali, and West Champaran during the period from March to May 2022. PATH's divisional and district coordinators were deployed in these districts for support in due-listing, planning, implementation, mobilization, monitoring, and reporting.

As a part of monitoring and supervision activity, the PATH team ensured constant supportive supervision and advocacy throughout the campaign to achieve good coverage even during challenging times of the pandemic. PATH coordinators worked as a team with district/block staff and liaised with related departments—general administration, Integrated Child Development Services, education, and Panchayati Raj Institutions—to target and mobilize left-out children, carry out repeat activity in missed areas found during rapid convenience monitoring (RCM), re-train ANM and ASHA facilitators so they could prepare complete households in left-out or low-coverage pockets.



**Figure 10:** Rapid convenience monitoring in Musahari block, Muzaffarpur district (left); JE campaign in urban Madhubani, Madhubani district (right)

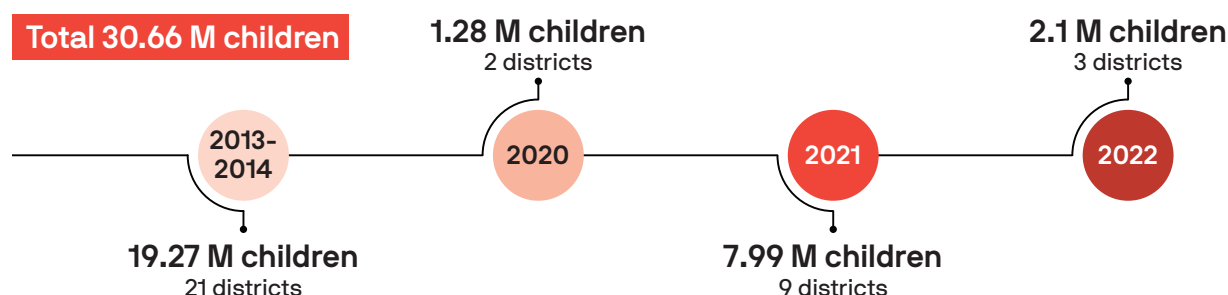


## Results

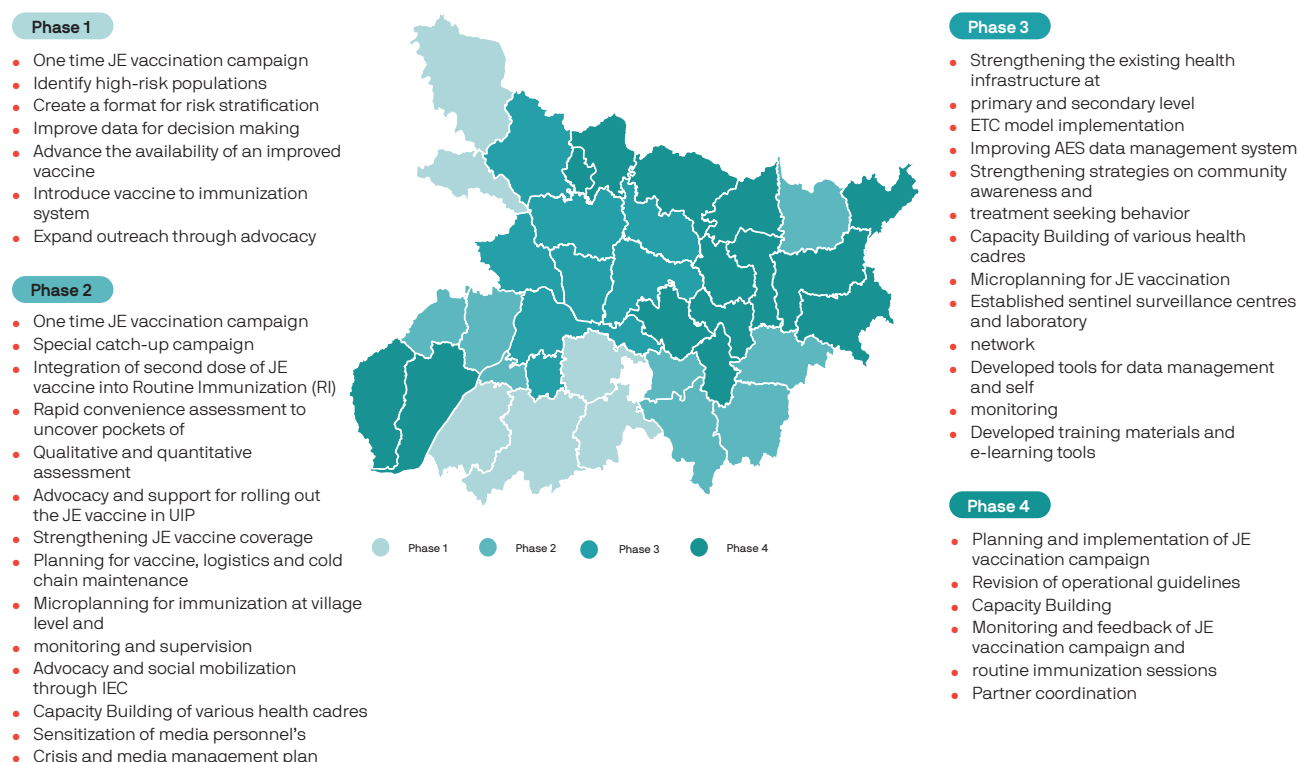
The full immunization coverage in Bihar increased from 11 percent in 1999 to 75 percent in 2022. As part of these efforts, the government has focused on equity of access, working to ensure that everyone, irrespective of caste, gender, religion, and socioeconomic status

can receive lifesaving vaccines. Operational guidelines for JEV campaigns were revised and successfully submitted to the Immunization Division in MOHFW for approval and use in the states, districts, and block training of district- and block-level master trainers. In addition, it was used for training project staff for JEV campaigns in Bihar.

**Figure 11:** Children covered in JE vaccination campaigns, Bihar, 2013-2022



**Figure 12:** Snapshot of JE support across districts of Bihar during different phases



# Key Enabling Activities and Impact

## Strengthening of Encephalitis Treatment Centers

During phase 3 in Bihar, 278 health facilities including 265 primary health centers (PHCs) and 13 district hospitals were upgraded to function as ETCs with regard to provision of drugs, equipment, trained manpower, etc.

## Sensitization of the community

In Bihar, 7076 community meetings were conducted in 2016 and 2017, in which 307,505 community members were sensitized on AES prevention and control. A total of 67 percent women and 33 percent men participated in these meetings at the villages. It was ensured that village pradhans, mahila samiti members, anganwadi workers, ASHAs, and ANMs were present at these community sensitization meetings. Various IEC tools, including flip books and two animation films on litchi encephalopathy in the Muzaffarpur division, were used for community sensitization. These IEC materials were developed by PATH.

## Development of IEC materials to enhance JE awareness in the community

On request from the NCVBDC, Government of Bihar, two films were developed—one on AES specific to litchi encephalopathy and the other on JE. The films were developed to generate awareness on the importance of early prevention, referral, and treatment of AES cases. In some districts, the district magistrates ordered for these videos to be played on the TV in the patient-waiting areas of PHCs.

## Strengthening human resource capacity for AES/JE management

In Bihar, capacity building on clinical care management of AES cases was conducted and 28,086 and 26,343 health personnel were trained in 2016 and 2017, respectively.

**Figure 13:** District task meetings, Begusarai, Khagaria and Kaimur, 2021



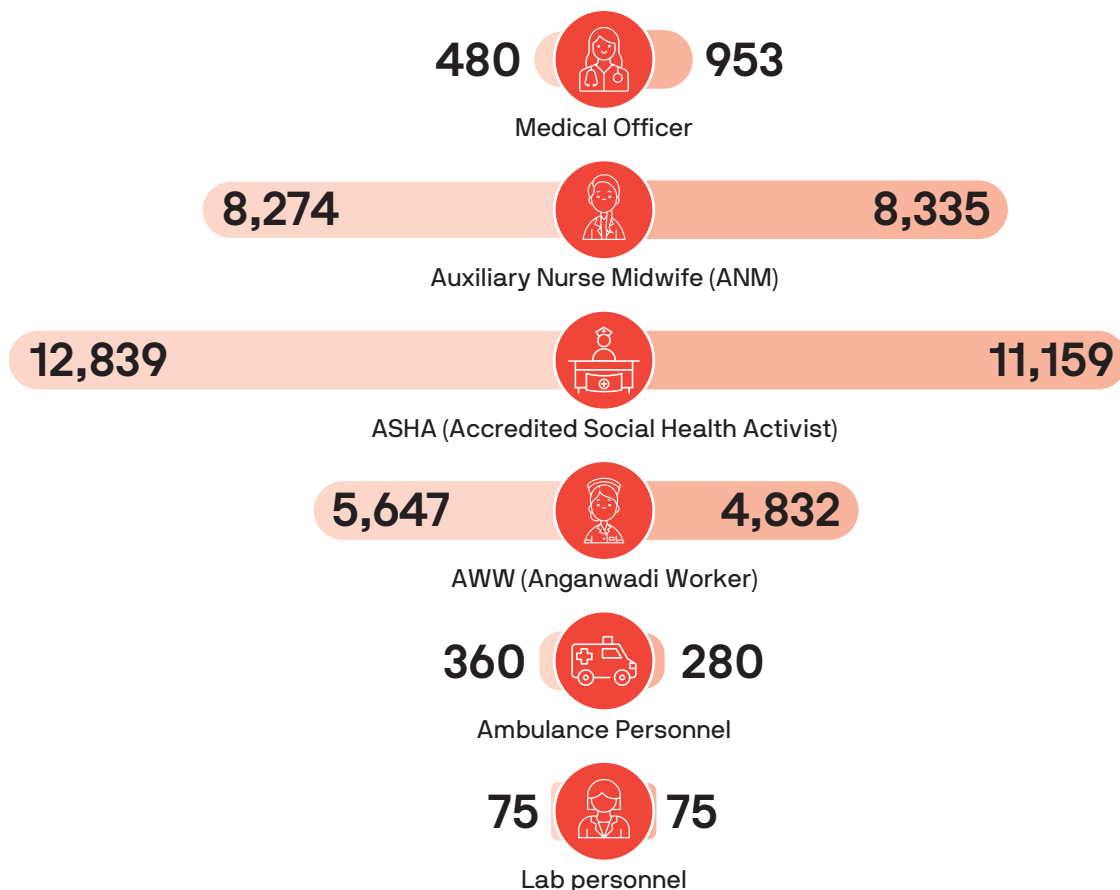
**Figure 14:** Number of health personnel trained in 2016 and 2017

**2016**

Health Personnel Trained: 28086

**2017**

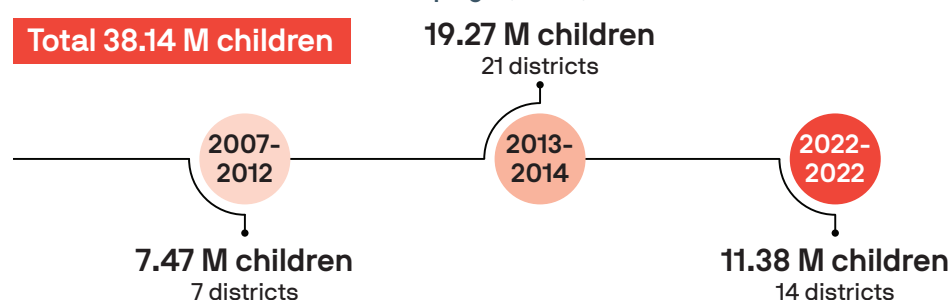
Health Personnel Trained: 26343



## JE vaccination coverage

More than 38 million children were vaccinated in JEV campaigns across 38 districts of Bihar. Using JENVAC (vaccine against JE manufactured in India by Bharat Biotech), the campaign successfully reached more than 11 million children or 91 percent of the target population—children under 15 years—in 14 endemic districts of Bihar in 2020–2022.<sup>13</sup>

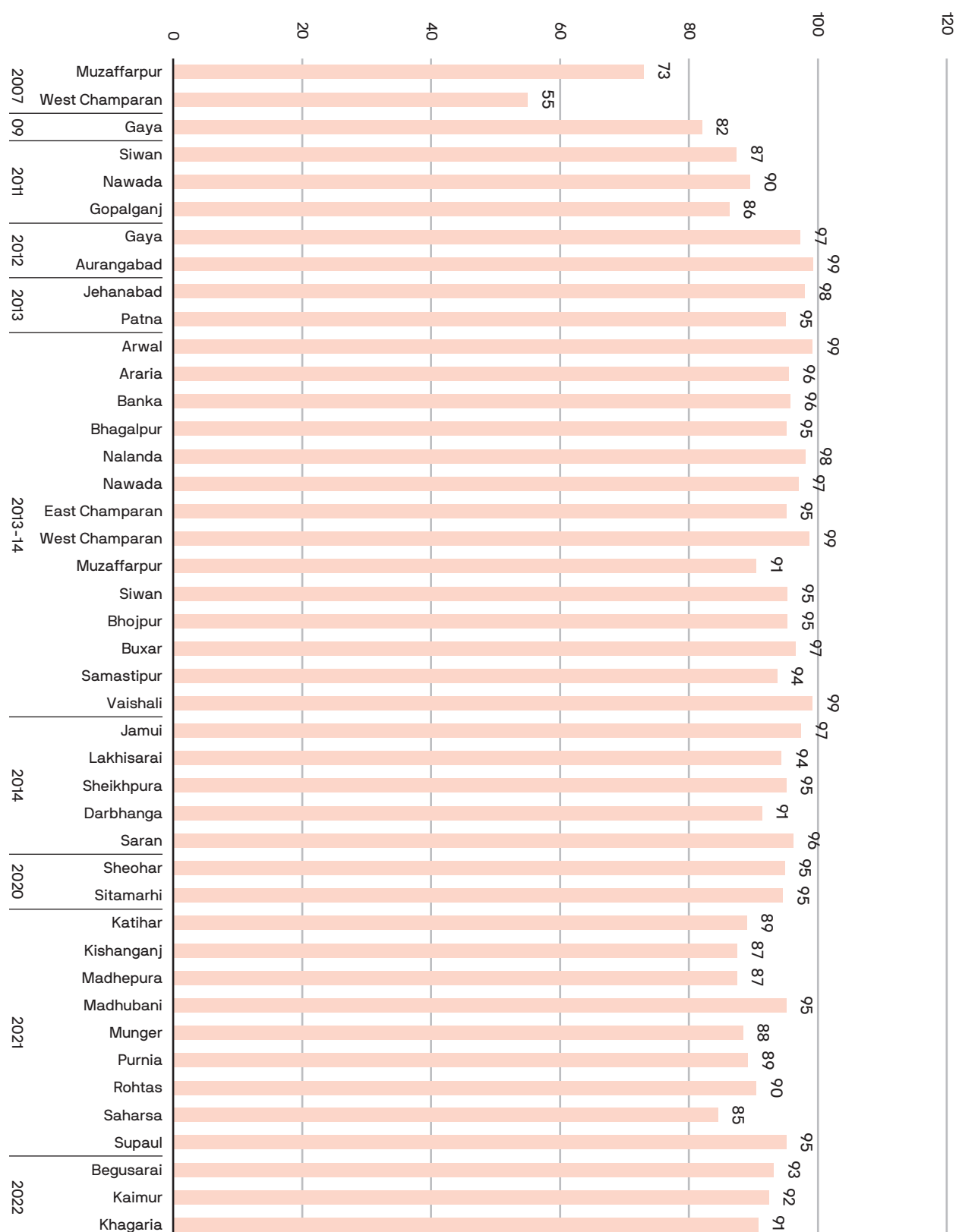
**Figure 15:** Children covered in JE vaccination campaigns, Bihar, 2007–2022



<sup>13</sup> PATH. Advancing immunization in Bihar. <https://www.path.org/articles/advancing-immunization-bihar/>

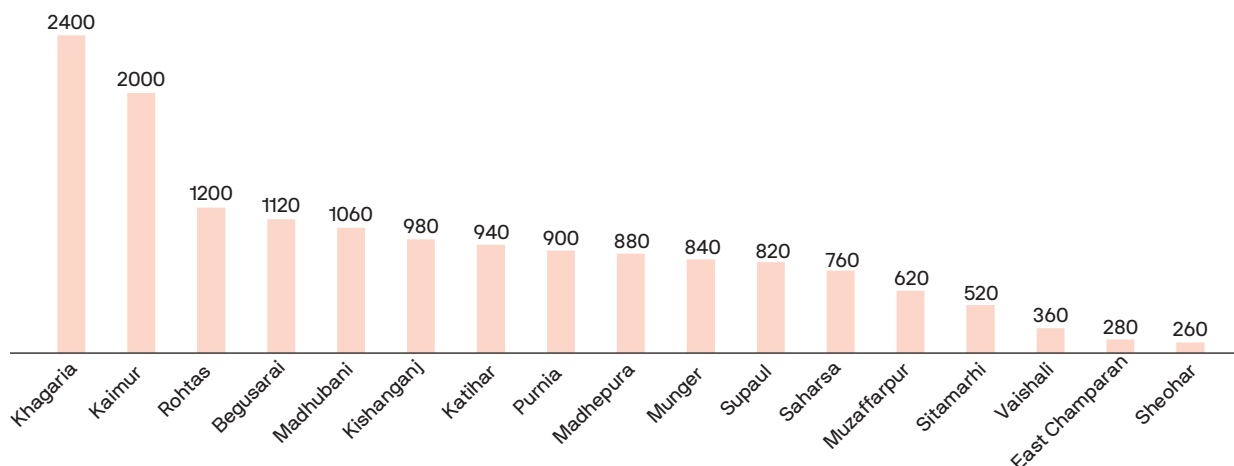


**Figure 16: % Children covered in JE vaccination campaigns, Bihar, 2007-2022**



PATH project staff surveyed 936 high-risk sites in the 14 districts of Bihar covered during phase 4 to identify any missed communities through RCM. A total of 18,720 children were checked for vaccination status and 93.8 (17,559) percent of children were found vaccinated, which aligns with the final reported coverage of 91.1 percent. The unvaccinated children found during RCM were mobilized to the nearest RI site and immunized.

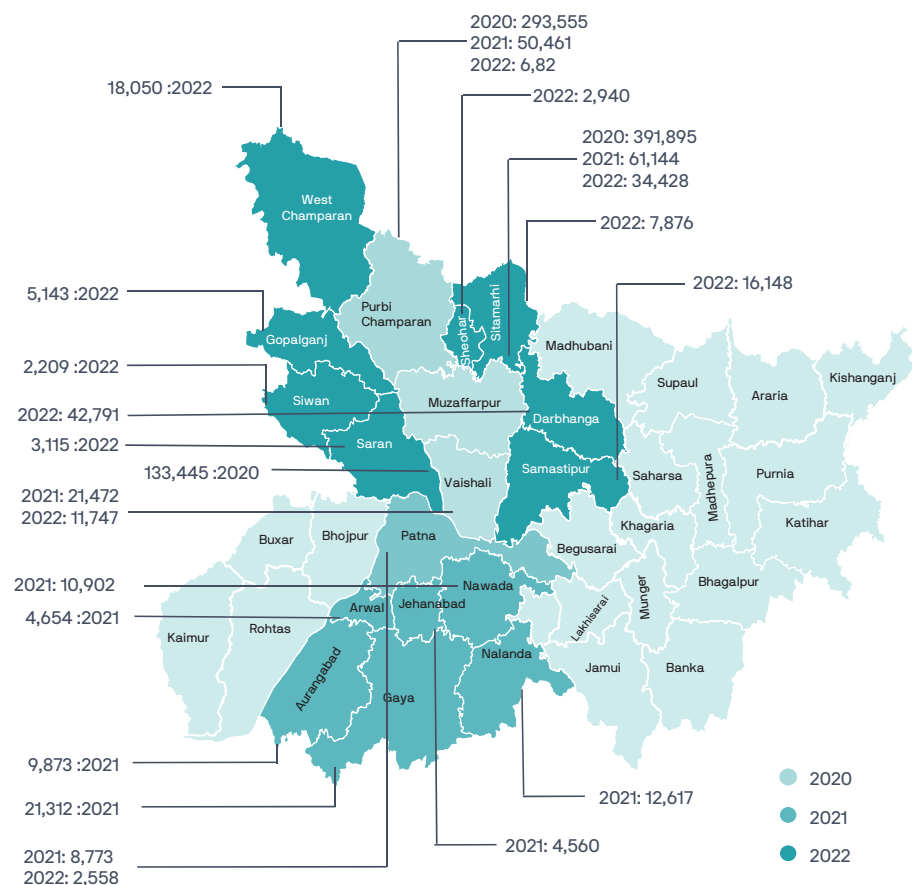
**Figure 17: Children monitored at RI and outreach session during JE campaign through Rapid Convenience Monitoring (RCM)**



## JE catch-up campaign

A total of 820,000 left-out children were vaccinated in catch-up campaigns in three districts in 2020, and a total of 205,768 missed children were vaccinated in special JEV catch-up drives in 10 districts in 2021. In 2022, a total of 153,828 children missing JEV in RI were immunized through catch-up campaigns in 12 priority districts.

**Figure 18: JE catch-up campaign coverage, depicting the number of children vaccinated during different phases of the campaigns**



## Monitoring and supervision

JEV campaigns at RI and outreach sessions were monitored by project staff. A total 1,948 session sites were monitored/supervised in phase 4 of the JE campaign. Issues identified were shared with the block/district health authorities. Accordingly, corrective actions were taken. This has helped in improving JEV coverage.

## Routine immunization (RI)

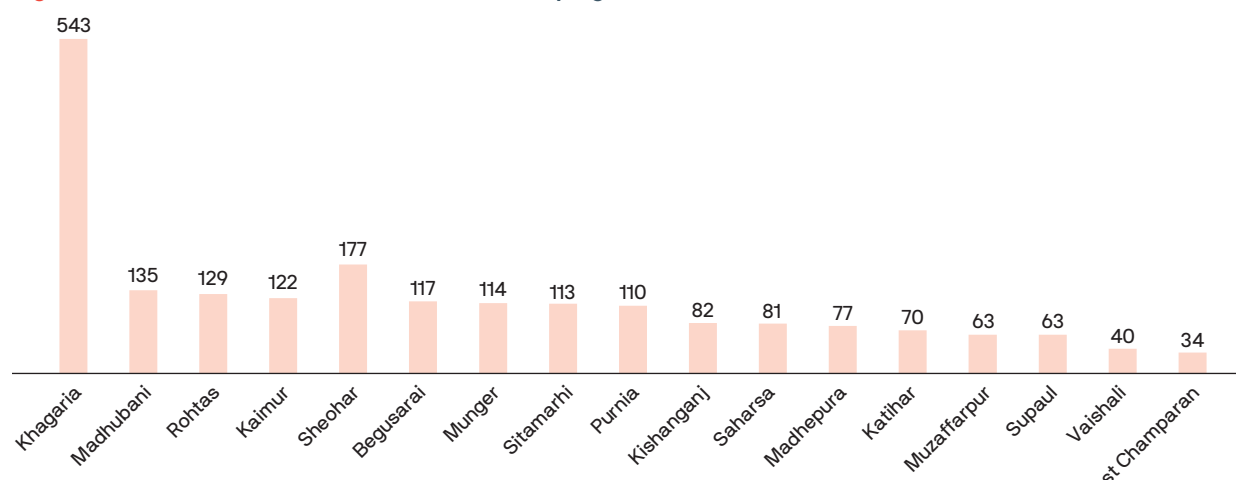
Up till 2021, more than 2,000 RI sessions were monitored across project intervention districts for

quality improvement. Around 14,000 households were visited for concurrent monitoring of RI coverage.

## Support for refrigerated vaccine van

As per instructions from the Gates Foundation, the project supported the deployment and handover of two large, refrigerated vaccine vans to the state government in April 2021 as part of the current grant. With this support, timely vaccine transportation from the state vaccine store to the districts was ensured, effectively facilitating the maintenance of the cold chain during the COVID-19 pandemic.

**Figure 19: Session sites monitored in the JE campaign**



**Figure 20: School activity in Rohtas and Supaul districts**



**Figure 21: Handing-over and flagging-off ceremony of refrigerated vaccine vans on 1 April 2021, presided by Executive Director, State Health Society Bihar**

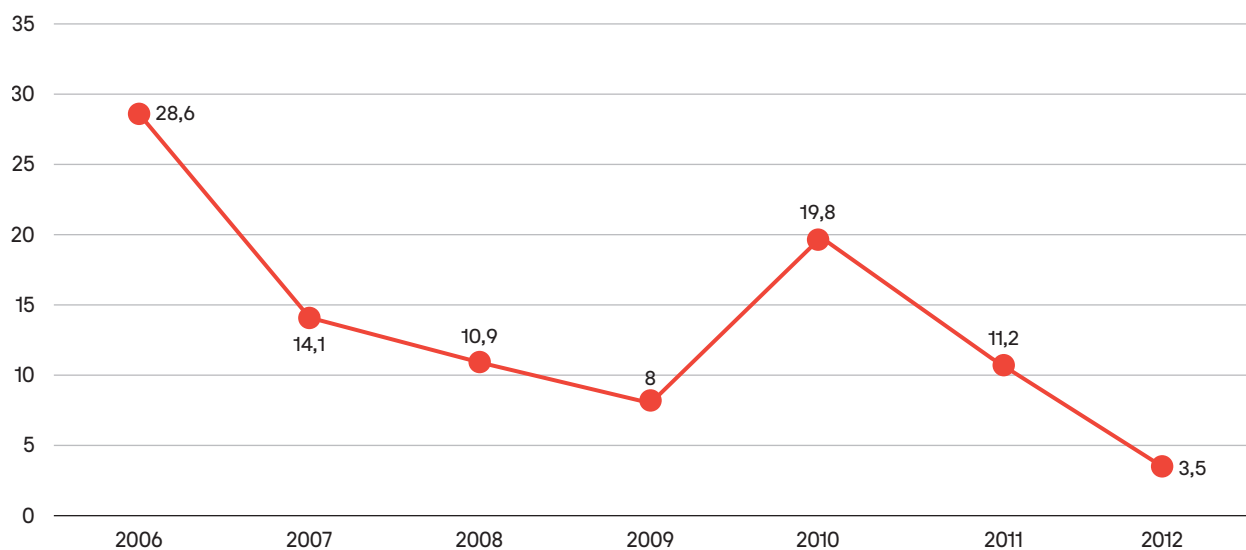


# Impact at Scale

Following the WHO's position paper on JE published in 2004, a phase-wise campaign was initiated targeting children up to 15 years. This was followed by introducing a single dose of the vaccine in UIP,

targeting children between 12 and 24 months. Figure 10 depicts the impact of JE vaccination on the JE positivity rate (2006–2012).

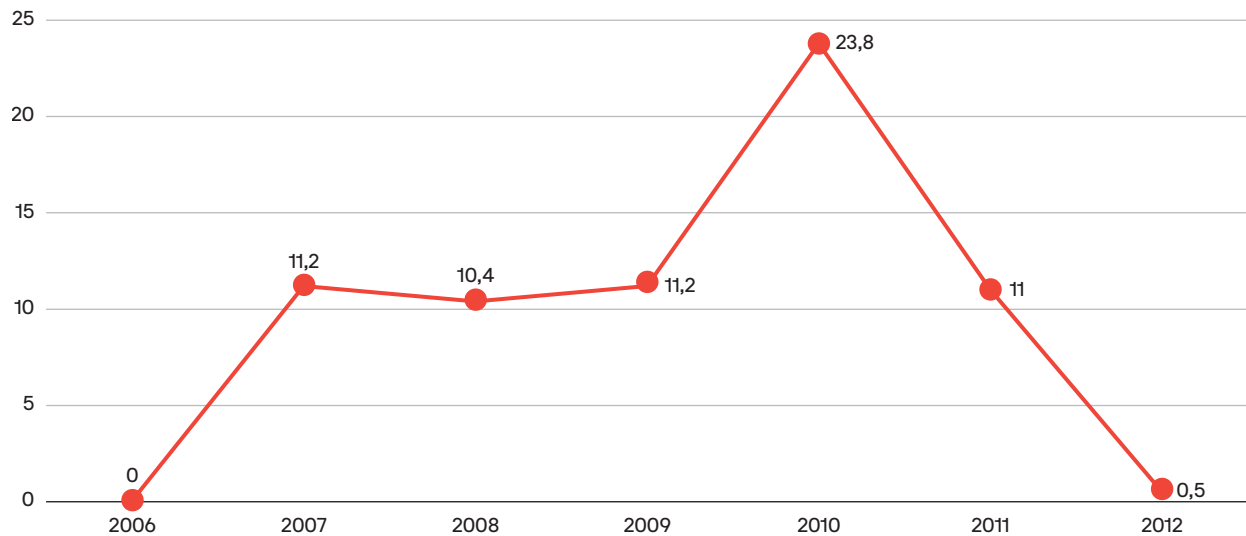
**Figure 22: JE positivity rate during phase 1 (2006–2012)**



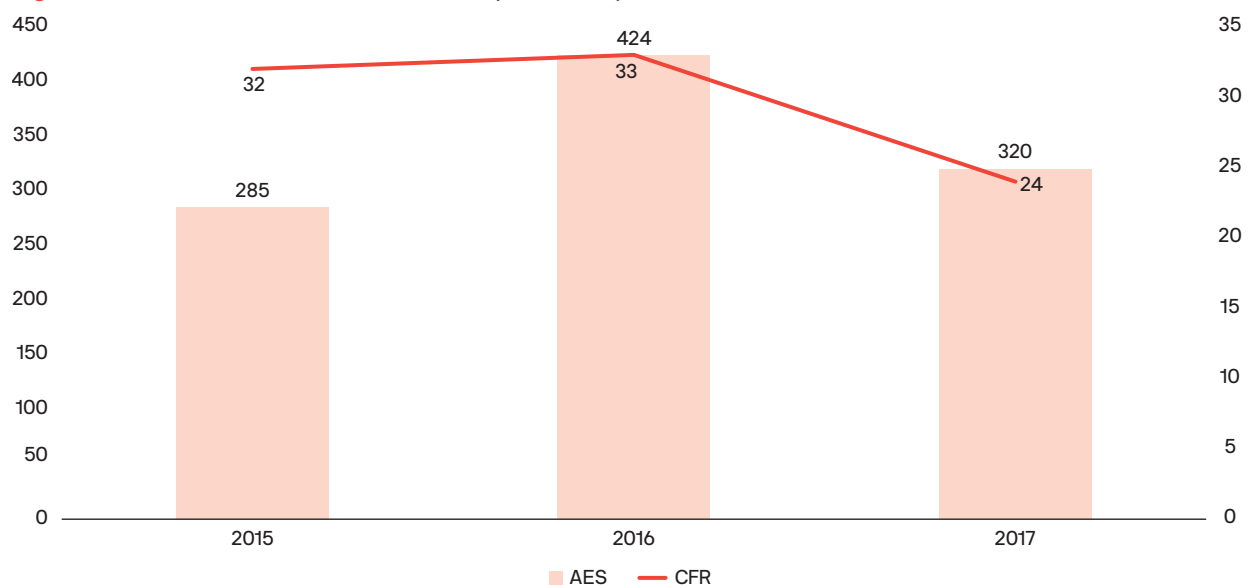
Improved case care and management has led to a sharp decline in the positivity rate from 28 percent to less than 2 percent and JE CFRs from 11 percent to less than 3 percent in the highest

endemic districts. JEV has become a part of regular agenda and discussion in the State Task Force Immunization and Districts Task Force Immunization since September 2020.

**Figure 23: JE CFR during phase 1 (2006–2012)**



**Figure 24: AES case load and CFR in Bihar (2015–2017)**



## Reduction in CFR due to AES

An overall reduction was observed in the CFR of AES cases from 32 percent in 2015 to 24 percent in 2017 in the 15 project intervention districts. Figure 15 shows the AES case load and CFR in Bihar from 2015 to 2017.

## Increase in AES case management at ETCs

- 24.2% of cases sought initial treatment at PHCs and were stabilized.
- 56% of cases of fever were mobilized to primary health facilities (ETCs) by community sensitization and active case surveillance.

# Challenges and Mitigation Strategies

**Negative media reports that criticized the government program on JEV led to a loss of confidence among communities dependent on government health facilities. This led to low turnout during the vaccination drive.**

- Planning meetings were held with the state and district health societies on planning and implementation of the JEV campaign.
- District and state officers were supported in developing a media management plan before the transmission season.
- Leveraging community-awareness drives by other partners like CARE and UNICEF that encourage people to come for vaccination.

**Sustaining a high degree of attention from political leadership at all levels. The risk of low attention led to low performance of the health system because of factors beyond the control of the project (e.g., lack of availability of doctors or health workers such as auxiliary nurse midwives [ANMs]).**

- PATH periodically updated the government leadership about issues that could affect JEV but could not be resolved through interventions by project members. It advocated for these issues to be addressed by the state.

**The Bihar government's dependency on external technical assistance and state capacity needs to be built as it is crucial for sustainability.**

- Through this grant, PATH supported an increase in the technical capacity of state- and district-level officials in planning and monitoring the immunization sessions so that a high coverage of the JEV could be assured.

**Procurement of vaccines at the national level can alter the timelines. The vaccination campaign may not be undertaken as scheduled.**

- The project coordinated with the immunization division of the MOHFW to ensure timely availability of the vaccines at the campaign districts.

**Acute Encephalitis Syndrome (AES) was identified as a serious public health problem in India during 2016–17 and India faced numerous outbreaks at the time. Govt mandated the state government to focus on AES rather than JE alone. AES is the terminology given to an umbrella of infections having a symptom complex because of encephalitis and swelling of the brain that includes multiple other infectious diseases or etiologies primarily Japanese encephalitis (JE), influenza A, herpes simplex, scrub typhus, etc.**

- With support from PATH, the Government of Bihar covered a wider range of infectious diseases causing encephalitis under the umbrella of AES.

**Halt on campaign activities due to Covid-19.**

- Campaigns in new endemic districts began in January 2020, but activities were soon put on hold due to the COVID-19 pandemic. They resumed in a phased manner—first targeting children at RI session sites, and subsequent special drives to gradually mobilizing children to schools for vaccination.

**A robust vaccine supply chain management system is the bedrock of any successful vaccination program. It ensures high-quality vaccine storage and efficient transportation from state to regional/ district vaccine stores that facilitates the distribution of vaccine to the community through fixed and outreach sites.**

- To strengthen the vaccine supply chain system in Bihar during the pandemic, PATH—with financial assistance from the Gates Foundation—supplied the state government with two refrigerated vaccine vans. These vans contribute towards protecting the people of Bihar from other diseases preventable by vaccines, today and well into the future.

# Lessons Learnt and Way Forward

## **Develop crisis communication and media management plan**

In the information age, programs are susceptible to new levels of misinformation and speculations that can have not only local implications but also national and international ramifications. As programs are implemented, communication plans that include local and international crisis communication responses should be considered. The media can have an immediate impact on program success of campaigns. Coverage rates can be impacted if rumors are perpetuated in the press. To be successful, campaigns require these situations to be addressed in real-time and demonstrate the role of a positive media in public health.

Crisis communications and media management require significant cultural context and understanding. In the age of widespread exposure through the internet of unfiltered and substandard media sources, special plans for international communications and media management need to be considered.

## **Build multi-stakeholder collaboration for a more comprehensive response**

The possibility of successfully carrying out challenging health programs is different now than in the past. Countries have increasingly experienced

staff, more robust systems and better support mechanisms through technical partners to support national public efforts. Being a good partner is a delicate balance that relies on a dedicated team with good communication skills and cultural sensitivity. Good communication with multiple departments and key thought leaders is essential, so that when questions arise appropriate fact-based information can be shared through correct channels that strengthen the system and partnerships. Seamless partner coordination among PATH, WHO, UNICEF, UNDP, CHAI, JSI, and CARE along with effective inter-departmental coordination between health, education, and WCD was essential.

Besides technical, political, and religious leaders, support is needed at a state level for the successful implementation of vaccination programs. Political commitment from national and state levels is also necessary to successfully carry out the ambitious timelines and achieve the delivery targets. Multiple barriers were overcome due to this strong commitment focused on the goal of introducing vaccines before the next JE season.

## **Timely revision of operational guidelines for the JEV campaign**

Revisions to operational guidelines for JEV campaigns were made so they could be useful in state-, district-, and block-level training of master trainers on microplanning, monitoring, supply chain, etc., using innovative training methodologies.



## Regularly strengthening the capacity of the health workforce

Capacity strengthening is needed at multiple levels and over several rounds. This enhances the capacity of various cadres of health: frontline workers, medical officers, media personnel, and program managers such as chief medical officers, district immunization officers, and district vector-borne officers. Hub and spoke models were used where master trainers were trained, and they in turn trained vaccinators and mobilizers—ASHAs and childcare workers.

Real-time data management using digital platforms for timeliness and completeness along with real-time-monitoring feedback at every level for timely mid-course corrective action.

Availability of an accountability framework to review progress at all levels before, during, and after campaigns.

Integrated vaccine delivery using an RI platform for campaign vaccination.

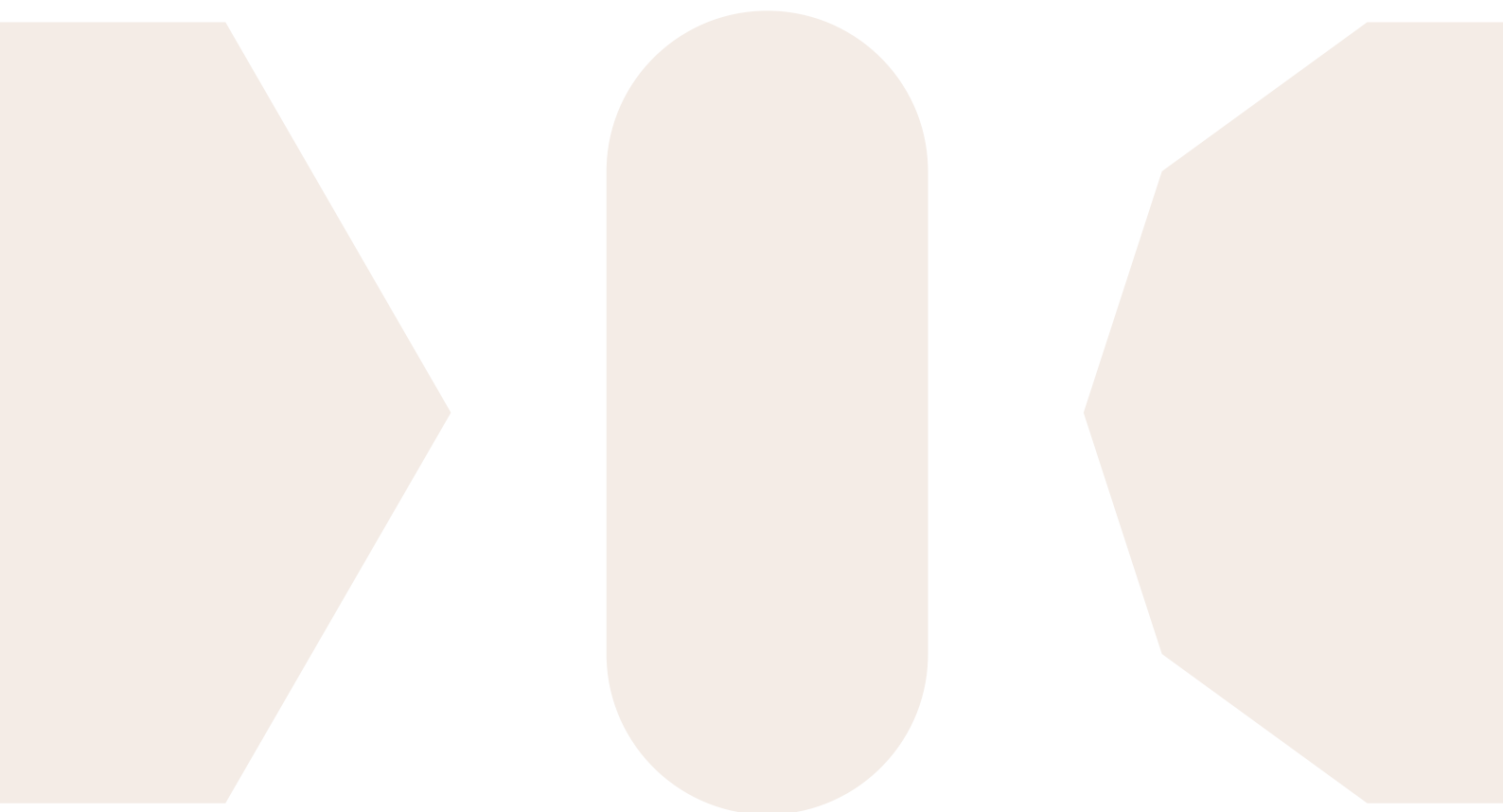
# Conclusion

The JEV campaign is one of India's most ambitious programs to date. The initiative targeted children and adolescents in 11 high-risk districts across four states, reaching more than 9 million children in the first year of the program. A total of 88 percent of the target population received vaccinations. Nearly 78 million children received the JEV over a five-year campaign from 2006 to 2011 in 109 districts across 15 states.

Other endemic nations can draw lessons from India's experience in battling this deadly disease. India is the second nation after China to utilize the Chengdu Institute of Biological Products (CDIBP) JEV vaccine. Therefore, information on its application and assessment findings on the vaccine's safety and efficacy, helped the CDIBP-JEV SA 14-14-2 become prequalified by the WHO in 2013.

The WHO's recommendations on JE vaccine influenced by India's experience also launched tactics in other nations. The WHO advised India to implement its campaign in high-burden, high-priority districts first, followed by integration of JEV in RI; many other nations have adopted this approach.

Since the outbreak, determination of local, state, and national governments to sustainably safeguard children from this dangerous disease has been the motivating force behind India's attempts to combat JE. India is reducing the burden of JE significantly, building on a solid basis of both local and global evidence, acquiring input from partners, and continually adapting tactics informed by lessons learnt.





**PATH**  
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