

Navigating vaccine introduction: a guide for decision-makers
JAPANESE ENCEPHALITIS (JE)

Module 1

**DOES MY
COUNTRY NEED
JE VACCINE?**

1



ABOUT THIS GUIDE

Japanese encephalitis (JE), a viral infection of the brain, is transmitted to humans by mosquitoes. Because these mosquitoes usually live in areas with standing water, such as rice fields, and the pigs and birds that are part of the JE transmission cycle are common in the countryside, people in rural areas are most at risk. It begins like the flu and can progress to a brain infection, killing up to 30 percent of its victims and leaving up to half of its survivors with permanent brain damage such as memory loss, impaired cognition, paralysis, seizures, the inability to speak, and other mental disorders. Providing lifelong care for survivors is a significant financial strain on families and on government health care systems. Although there is no treatment to cure JE, several safe and effective vaccines are available to prevent infection. In areas where JE is recognized as a public health priority, the World Health Organization (WHO) recommends implementing a one-time JE vaccination campaign focused on the at-risk population followed by incorporation of JE vaccine into routine immunization.¹

The modules in this guide are designed to help country decision-makers understand the evidence around when to consider introducing JE vaccines, the potential benefits, how to incorporate JE vaccines into their country's immunization program, and how to monitor and evaluate the vaccines after introduction. The resources and evidence included focus on JE vaccines that are WHO-prequalified.



KEY TAKEAWAYS • Module 1

- Human immunization is the only effective method for JE prevention.
- In all areas where JE is recognized as a public health priority, WHO recommends implementing a one-time JE vaccination campaign in at-risk populations followed by incorporation of JE vaccine into routine immunization.
- Absence of the highest-quality JE surveillance system should not delay introduction or expansion of JE vaccine.
- If your country is not able to collect high-quality data on confirmed JE cases, WHO recommends that you still consider vaccination where there is a suitable environment for JE virus transmission.

MODULE

1

Does my country need JE vaccine?

To determine whether your country should introduce JE vaccine, it is important to assess whether JE poses a significant public health burden. While the best way to understand the burden in your country is through laboratory-based disease surveillance, it is not the only way. As noted by WHO, countries without a strong surveillance system in place but with evidence of JE disease occurrence should not wait to introduce JE vaccine.¹ This module will describe different ways to determine if your country needs JE vaccine.

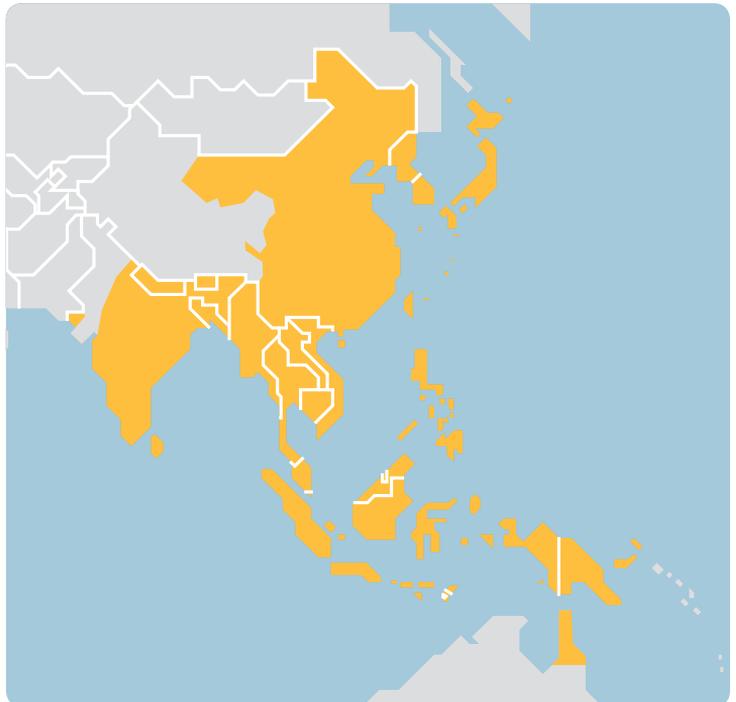
Monitoring JE disease burden through routine disease surveillance

Globally, an estimated 70,000 JE cases occur in the JE-endemic region of Asia (Figure 1) each year, but for many reasons, this is likely an underestimate.² JE surveillance is difficult because most JE infections do not cause symptoms. When illness does develop, it can be a simple febrile illness, meningitis, myelitis, or encephalitis. Encephalitis, the most severe and most commonly reported type of JE virus infection, cannot be clinically distinguished from other causes of acute encephalitis syndrome (AES).

WHO recommends that countries monitor year-to-year fluctuation in disease incidence using JE-specific laboratory testing of cerebrospinal fluid or serum from persons with AES. However, these tests require special diagnostic equipment and reagents and well-trained laboratory professionals. As a result, testing may not be available in poor, rural JE-endemic areas. Because access to laboratory testing may be limited, disease surveillance systems that do not require every case to be tested are often used.

FIGURE 1. GEOGRAPHIC DISTRIBUTION OF JE, 2012

■ Countries or areas at risk



FIND OUT MORE



What is sentinel surveillance?

Sentinel surveillance uses a limited number of carefully selected hospitals (“sentinel hospitals”) to collect high-quality data on a disease. This data is reported and collected by a central system to signal trends, identify outbreaks, and monitor the burden of a disease. Sentinel surveillance can account for different diagnostic capacities at hospitals and can be combined with laboratory confirmation and syndromic surveillance.³

SENTINEL HOSPITAL SURVEILLANCE

Because encephalitis is a severe illness, most affected patients are cared for in hospitals. WHO therefore recommends that all JE-endemic countries carry out at least sentinel hospital surveillance with laboratory confirmation of JE.^{1,4}

SYNDROMIC AES SURVEILLANCE

Syndromic AES surveillance identifies persons with AES according to the clinical case definition, which is a person of any age, at any time of year with the acute onset of fever and a change in mental status (including symptoms such as confusion, disorientation, coma, or inability to talk) and/or new onset of seizures (excluding simple febrile seizures).⁵ While JE is the leading cause of viral AES, it is not the only cause. Many countries have syndromic surveillance for all AES cases, which includes cases due to JE virus and those due to other infectious and non-infectious causes. Some or all of these AES cases may then be selected for laboratory testing to identify the proportion of AES cases due to JE.

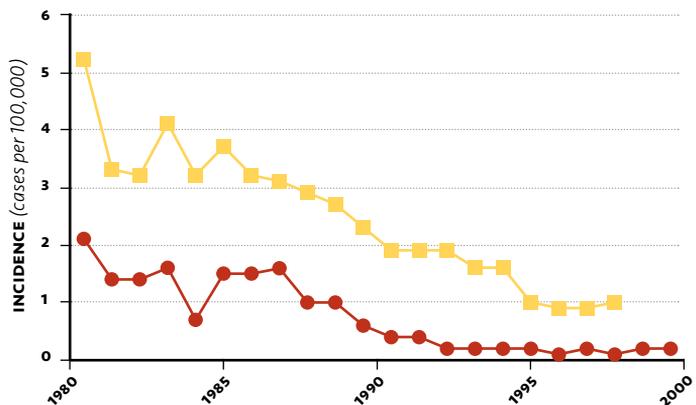
Although the proportion of AES cases due to JE may vary widely by location and year based on ecological conditions, studies have shown that AES incidence correlates well with JE incidence. Because AES surveillance can be used to approximate JE burden even without confirmatory JE testing, it has been used to show the impact of JE vaccination. In Thailand, for example, officials successfully used AES with limited laboratory testing to show the impact of vaccination on reducing JE morbidity (Figure 2).⁶

In addition, AES surveillance is a sustainable solution to rapidly identify encephalitis outbreaks. During epidemiologic investigations of these AES outbreaks, it may be found that such outbreaks are due to JE or to some other preventable cause. As a result, WHO states that AES surveillance is important for understanding all causes of encephalitis.¹

FIGURE 2. MORBIDITY RATES OF ENCEPHALITIS AND JAPANESE ENCEPHALITIS, THAILAND 1980-2000

— Encephalitis — JE

Officials in Thailand estimated JE morbidity rate using a combination of reported incidence and serology data.⁶ Estimated JE morbidity rates have been following similar declining patterns of encephalitis.



Assessing JE disease burden with limited data

FIND OUT MORE



What is a seroprevalence study?

1. Choose a small population



2. Gather samples



3. Test for antibodies



In seroprevalence studies, blood serum samples from a group of people in a defined population—such as a village—are collected to test for the presence of pathogen-specific antibody, which serves as a marker of a past infection, regardless of whether or not the person became ill. However, such studies cannot tell you when the infection occurred.

In countries without AES or JE surveillance but where the ecology, geography, and agricultural practices are similar to those in an adjacent JE-endemic country or region, you can determine the likelihood that JE virus transmission is occurring by conducting seroprevalence studies or investigating AES outbreaks.

In a stable population where ecological conditions support annual JE transmission, these studies can identify areas that likely have annual JE virus transmission to humans. When combined with other demographic information such as age, occupation, or time spent in the village, seroprevalence studies can identify at-risk populations who may benefit from vaccination.

During epidemiologic investigations of AES outbreaks, public health authorities respond to an AES outbreak to discover its etiology. If JE is identified as the cause, it is likely that some AES cases prior to the outbreak were due to JE because the ecological conditions that support virus transmission to humans remain relatively constant from year to year. In such cases, JE-specific disease surveillance should be established.

For help in developing a plan to assess JE disease burden in your country, contact the appropriate WHO regional office: South-East Asia Regional Office or Western Pacific Regional Office.

Analyzing surveillance data

JE does not occur evenly across a country; some areas are at greater risk than others. Using surveillance data to map the geographic distribution and incidence (number of cases per 100,000 persons) in your country is an important step in tracking mosquito-borne diseases, since distribution and incidence may change over time. Mapping can help track disease changes in different regions and identify at-risk populations. With an estimate of JE burden and a map of the geographic distribution of JE cases, your country can identify priority areas for intervention.

Choosing a strategy for controlling JE

Once you better understand the JE burden in your country, you will need to decide on a control strategy. WHO, Gavi, and JE experts maintain that human immunization is the only effective JE prevention method and that JE vaccine should be integrated into routine childhood immunization schedules wherever JE is recognized as a public health priority.

There is little evidence to support sustained reduction of the JE disease burden from interventions such as vector control, bed nets, swine immunization, or animal sequestration.⁷ WHO specifically recommends that these other interventions should not divert efforts or resources from childhood JE vaccination.

However, there is clear evidence that, when high vaccine coverage is achieved and sustained, JE vaccines greatly reduce the number of human JE cases.¹ Because humans are dead-end hosts, human vaccination does not reduce natural zoonotic transmission. As a result, non-immune persons living in JE-endemic areas are always at risk for JE virus infection.

If your country was not able to conduct JE surveillance or found a low number of confirmed JE cases, WHO recommends that JE vaccination should still be considered where there is a suitable environment for JE virus transmission. This includes the presence of animal reservoirs such as pigs and wading birds, suitable mosquito vectors, ecological conditions supportive of JE virus transmission, and proximity to other countries or regions with a known JE burden.

Overall, countries should prioritize JE immunization where disease burden exists, while simultaneously strengthening surveillance systems to ensure strong data are available to support future decisions.

References

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Based on the above global recommendations and evidence, the best way to determine if your country needs JE vaccine can be summarized through these steps:

1. **Collect JE disease surveillance data.** This can be done by implementing AES or sentinel hospital surveillance programs and by developing a way for some or all AES cases to undergo JE-specific laboratory testing. If a full surveillance program is not feasible, you can use existing data, carry out limited surveillance, conduct short-term surveillance during an AES or JE outbreak, conduct special studies, or use data from neighboring countries. Talk to your WHO regional office for guidance on the best JE surveillance methods for your country.
2. **Analyze the burden of JE in your country.** If available, create a map using data from surveillance or special studies to gain understanding of how JE is distributed geographically and among the population. Mapping will remain an important tool to help determine where you can make improvements after an immunization program is in place. However, countries without a strong JE surveillance system in place but with evidence that JE disease is occurring should not wait to consider JE vaccine introduction.
3. **Make a decision about JE vaccination.** WHO recommends integrating JE vaccine into national immunization schedules in all areas where surveillance shows JE to be a public health priority. Even if a low JE burden is found, WHO recommends consideration of a JE vaccination program where there is a suitable environment for JE virus transmission.

WHO also advises that cost-effectiveness analyses specific to the country or region may be informative for decisions about JE vaccine introduction. For more information on cost-effectiveness, see *Module 2: Is JE vaccination cost-effective?*





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