JAPANESE ENCEPHALITIS (JE)

Department of Community Medicine
Govt. Medical College & Hospital,
Chandigarh

Specific Learning Objectives

- At the end of session, the learner shall be able to describe:
- Epidemiology of Japanese Encephalitis
- Diagnosis and treatment
- Prevention and control

Occurrence of JE

- Countries which have had major epidemics in the past, but which have controlled the disease ***primarily by vaccination***, include China, Korea, Japan, Taiwan and Thailand.

- Other countries that still have ***periodic epidemics*** include Viet Nam, Cambodia, Myanmar, India, Nepal, and Malaysia.

Occurrence of JE

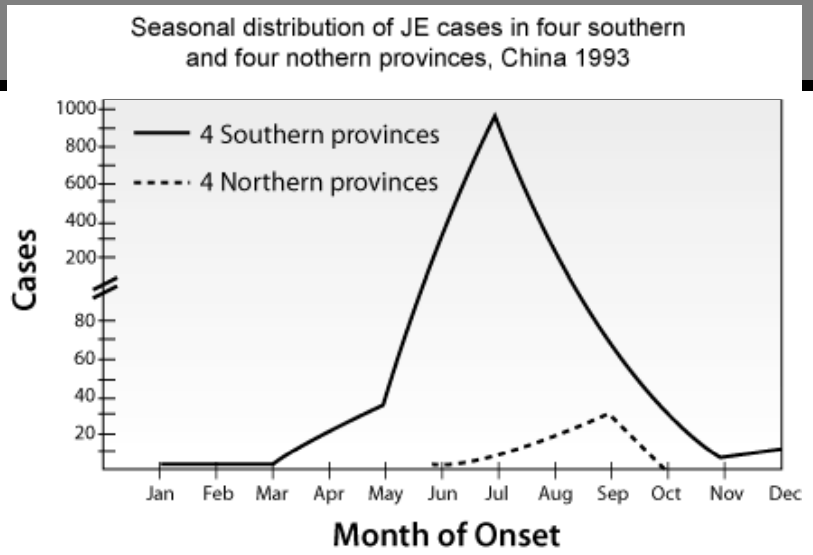
JE: A problem

- JE is leading cause of ***viral encephalitis in Asia***, now that poliomyelitis has nearly eradicated from the world.
- 50,000 cases of JE are reported to WHO each year.
- 10,000 to 15,000 deaths are reported each year.
- 15,000 DISABLED

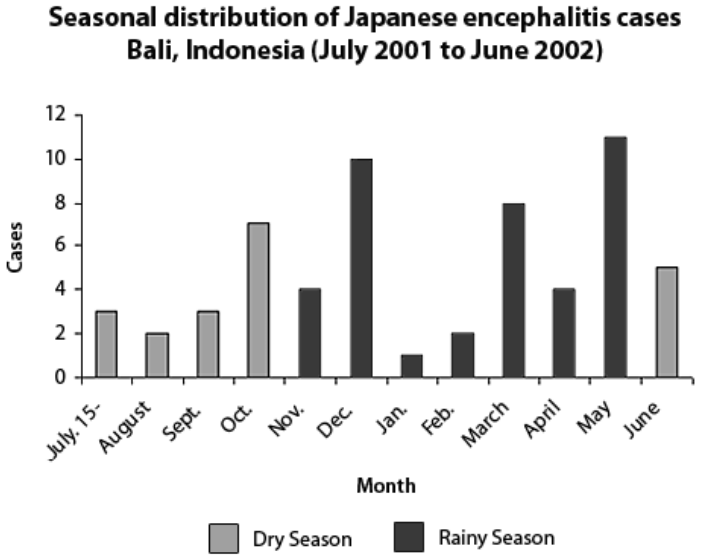
Two patterns of transmission of JE

JE may be spread:

1. Seasonal, called an epidemic pattern
   (e.g., Southern China)



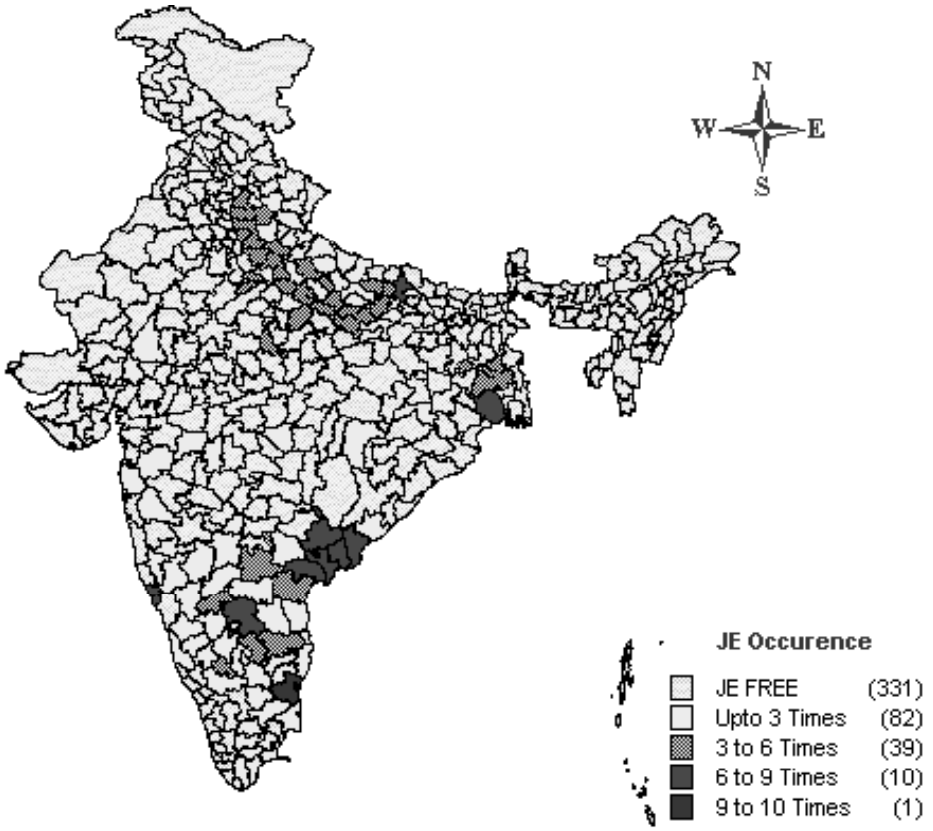
2. Year-round, called an endemic pattern
   (e.g., Bali, Indonesia)



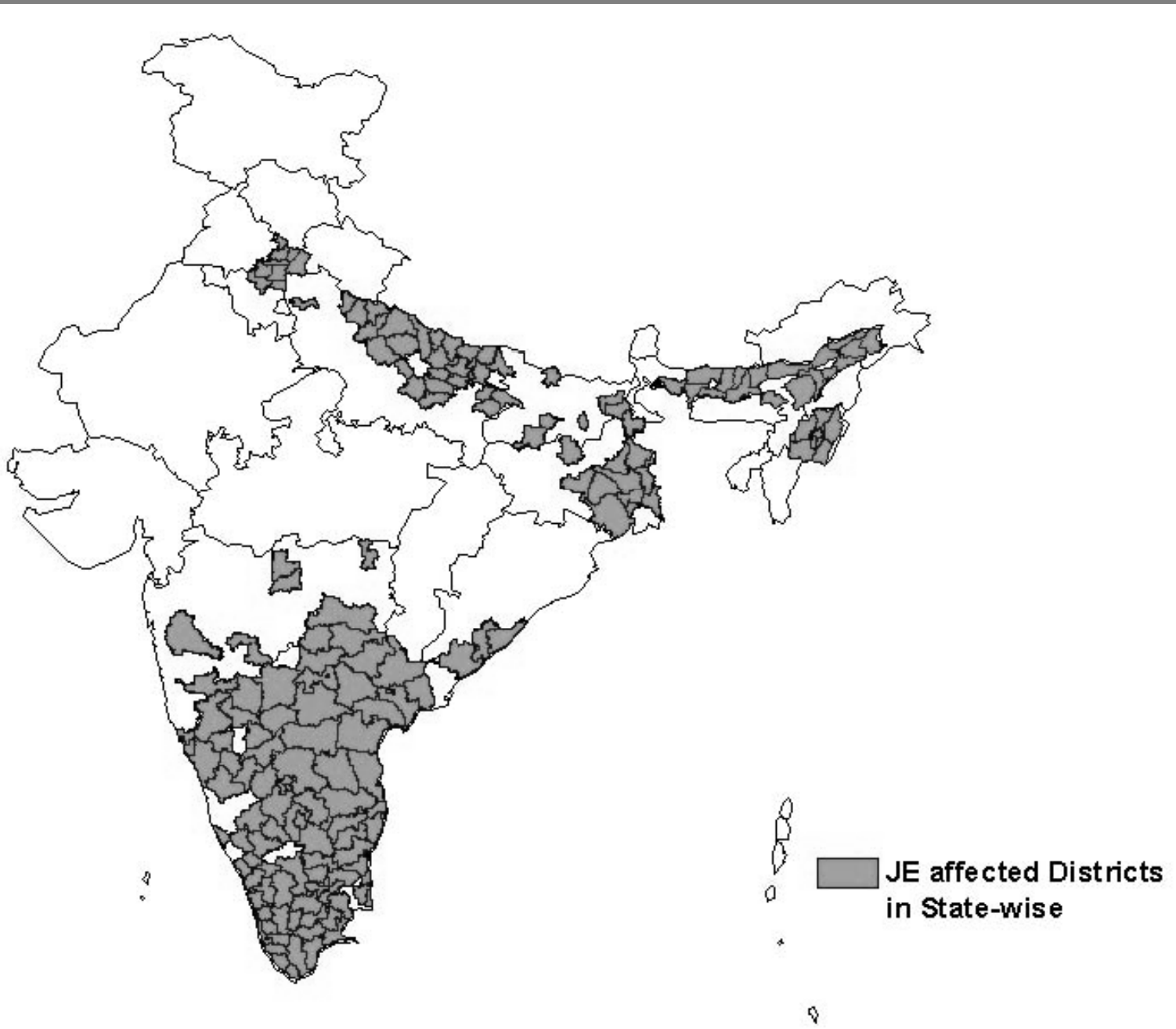
Data supplied by International Vaccine Institute

JE in India

- 1953 – Evidence of JE viral activity (NIV, Pune)
- 1957 – Clinical case (Vellore, Tamilnadu*)
- 1973 – JE outbreak (Burdwan / Bankura, West Bengal)

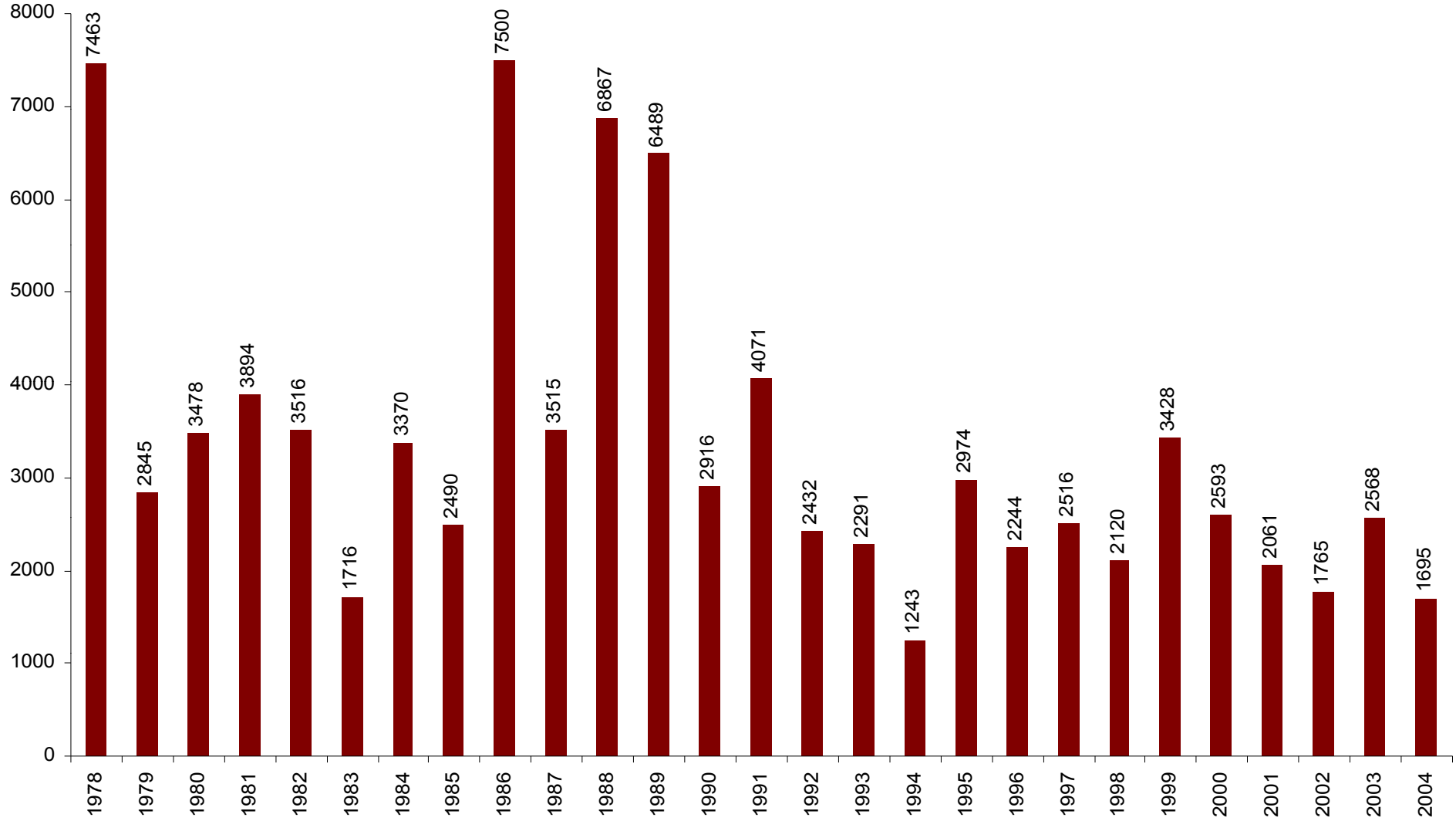


***In Tamil Nadu, outbreak occurs every year. It contributes 80% cases and deaths.**

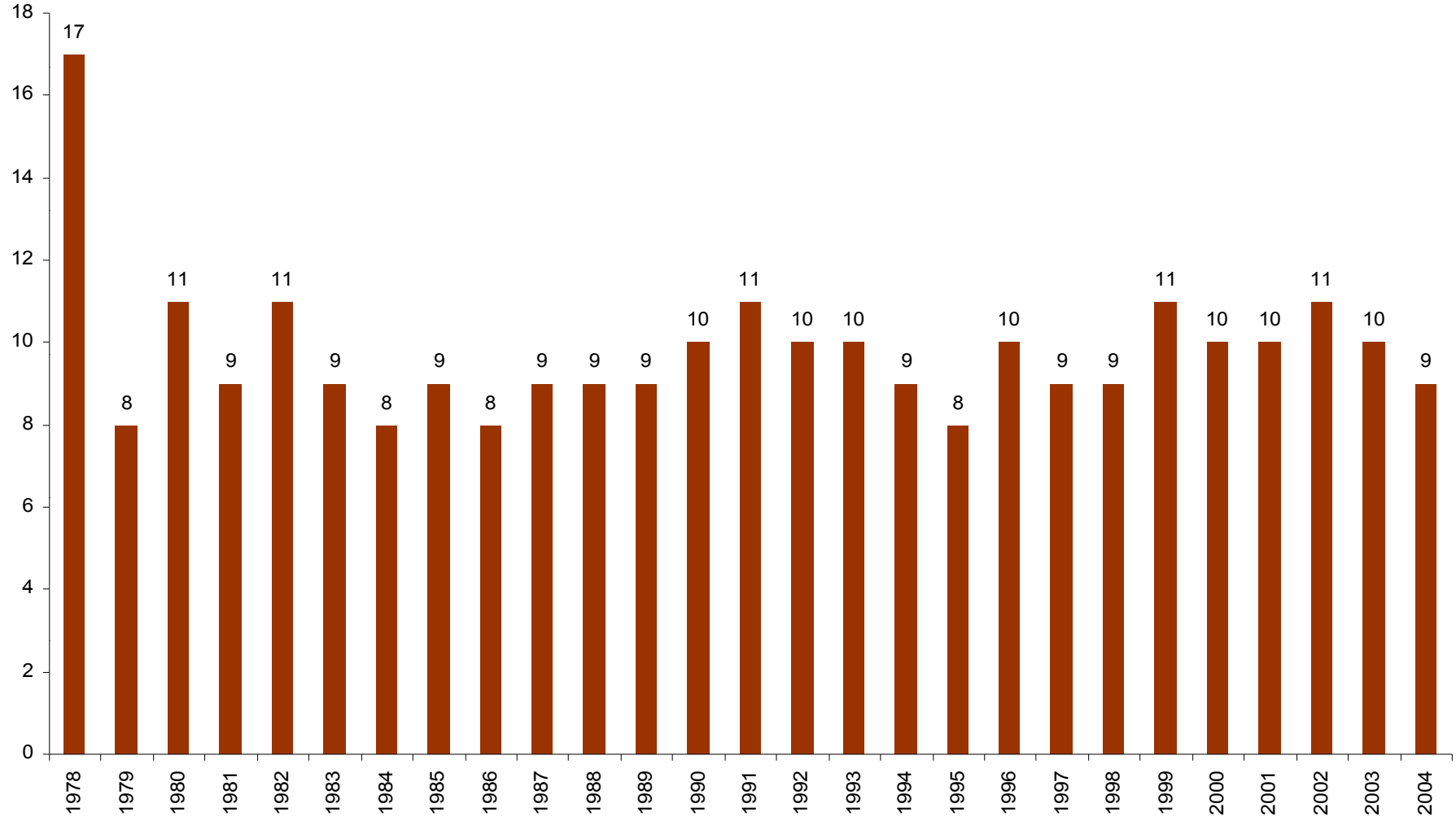


Annual incidence ranged between 1714 and 6594 and deaths between 367 and 1665

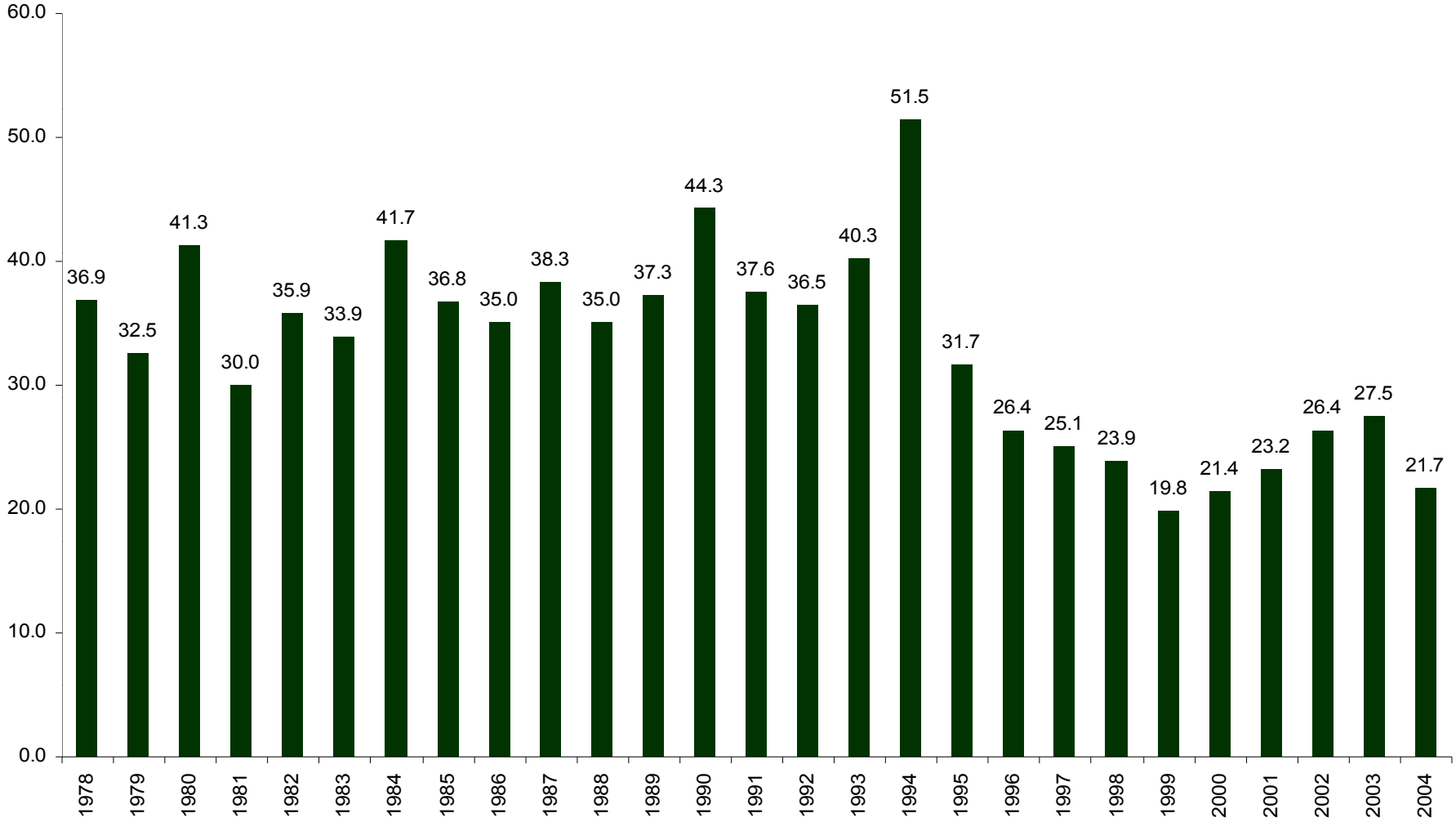
JE in India : Case reported



JE in India: State reporting



JE in India : CFR



Infectious Agent

JE virus: History of discovery

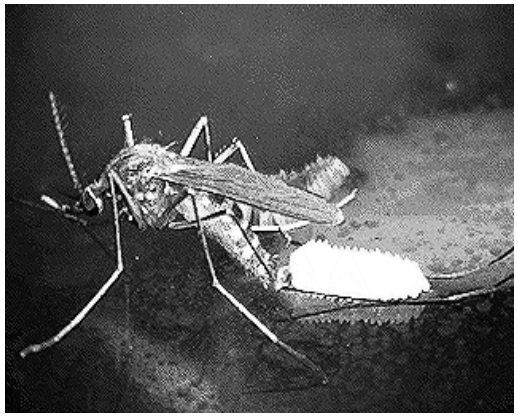
- 1871: "Summer encephalitis" epidemic in Japan
- 1924: Agent from human brain tissue isolated in rabbits
- 1934: Isolate of this virus produced experimental encephalitis in monkeys
- 1938: First isolate from ***Culex tritaeniorhynchus***
- 1930s: First mouse brain-derived vaccines developed
- 1954: ***"Refined" mouse brain vaccine*** developed

Japanese encephalitis outbreaks

- Usually circumscribed and do not cover large areas.
- Usually do not last more than a couple of months, dying out after the majority of the pigs have become infected.
- Birds are the natural hosts for JE.
- Epidemics occur when the virus is brought into the peridomestic environment by mosquito bridge vectors where there are pigs, infecting more mosquitoes which then may infect humans.

Key players in JE transmission

Environment



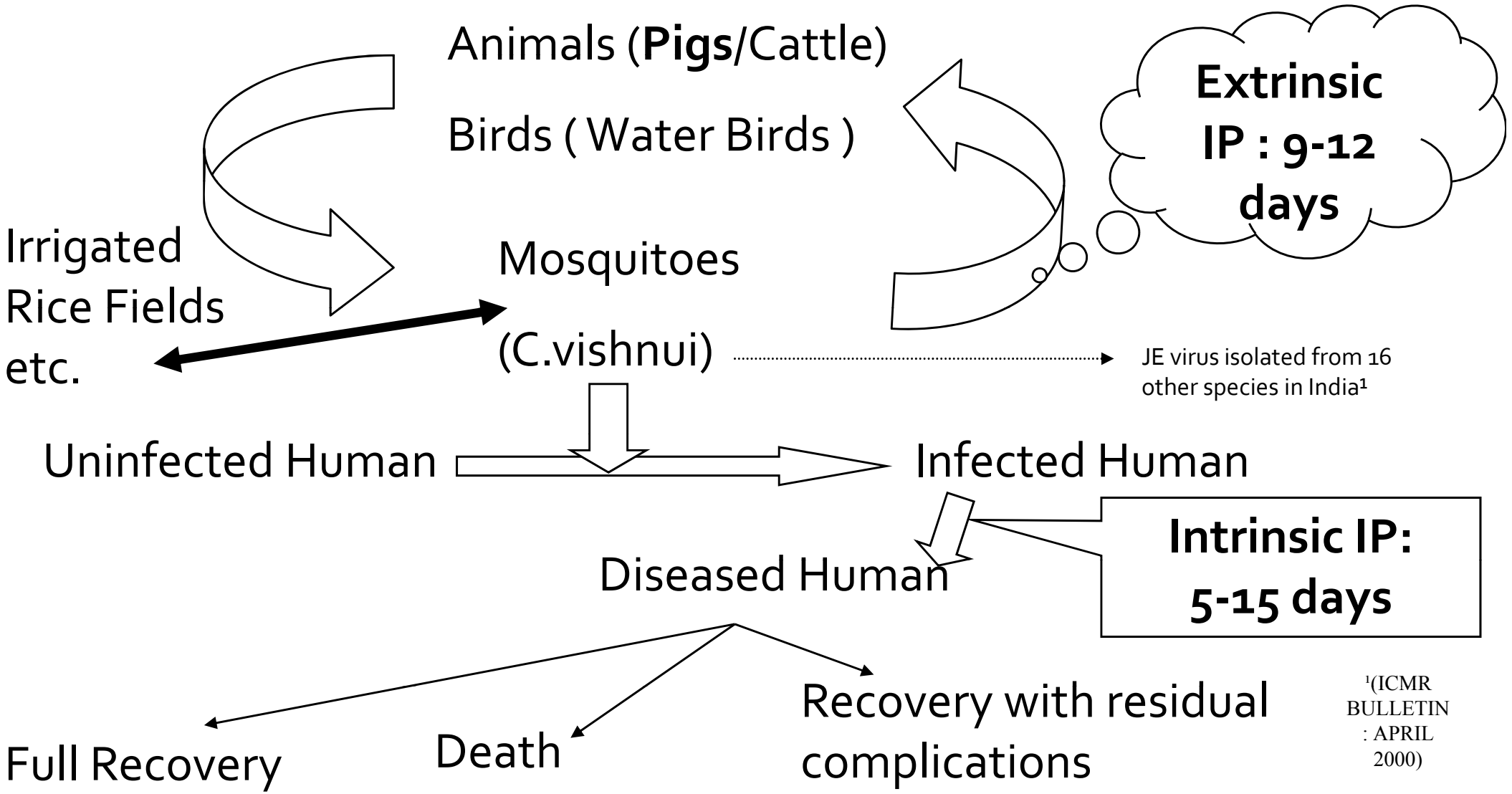
Agent

Victim-
Accidental

Host - Amplifying

Host- Carrier

Reservoir, Mode of Transmission & Incubation Period



[1](ICMR BULLETIN : APRIL 2000)

How Japanese Encephalitis is transmitted?

- Several species of mosquitoes are capable of transmitting JE virus.
- Natural hosts of JE virus: water birds of Ardeidae family (mainly pond herons and cattle egrets).
- Pigs play an important role in the natural cycle and serve as an amplifier host.
- Man is a dead end in transmission cycle due to low and short-lived viraemia.
- Mosquitoes do not get infection from JE patient.

Japanese Encephalitis Vectors in India

- Culicine mosquitoes mainly *Culex vishnui group (**Culex tritaeniorhynchus, Culex vishnui** and Culex pseudovishnui)* are the chief vectors.

- Breed in water with luxuriant ***vegetation mainly in paddy fields*** and the abundance is related to rice cultivation, shallow ditches and pools.

- Primarily outdoor resting in vegetation and other shaded places but in summer may also rest in indoors.

- Principally cattle feeders, though human and pig feeding are also recorded in some areas.

Incubation Period:

- **The incubation period for Japanese encephalitis is** Usually 5 to 15 days.

- **Case-fatality rates** range from 0.3% to 60%.

Period of Communicability: ?

Susceptibility

- *30% patients with JE die.*
- *30% to75% cases are left with disability.*
- *Disability - both physical and cognitive.*

Photo credit: Julie Jacobson

Age groups affected by JE

- Children 01 to 15 years of age -mainly affected in endemic areas.
- But ***people of any age*** can be infected.
- ***Adult*** infection most often occurs in areas where the disease is ***newly introduced.***

Photo credit: Carib Nelson, PATH

Clinical Features

- **Divided into 3 phases:**

i. **Prodromal** :

- fever, headache, nausea, vomiting

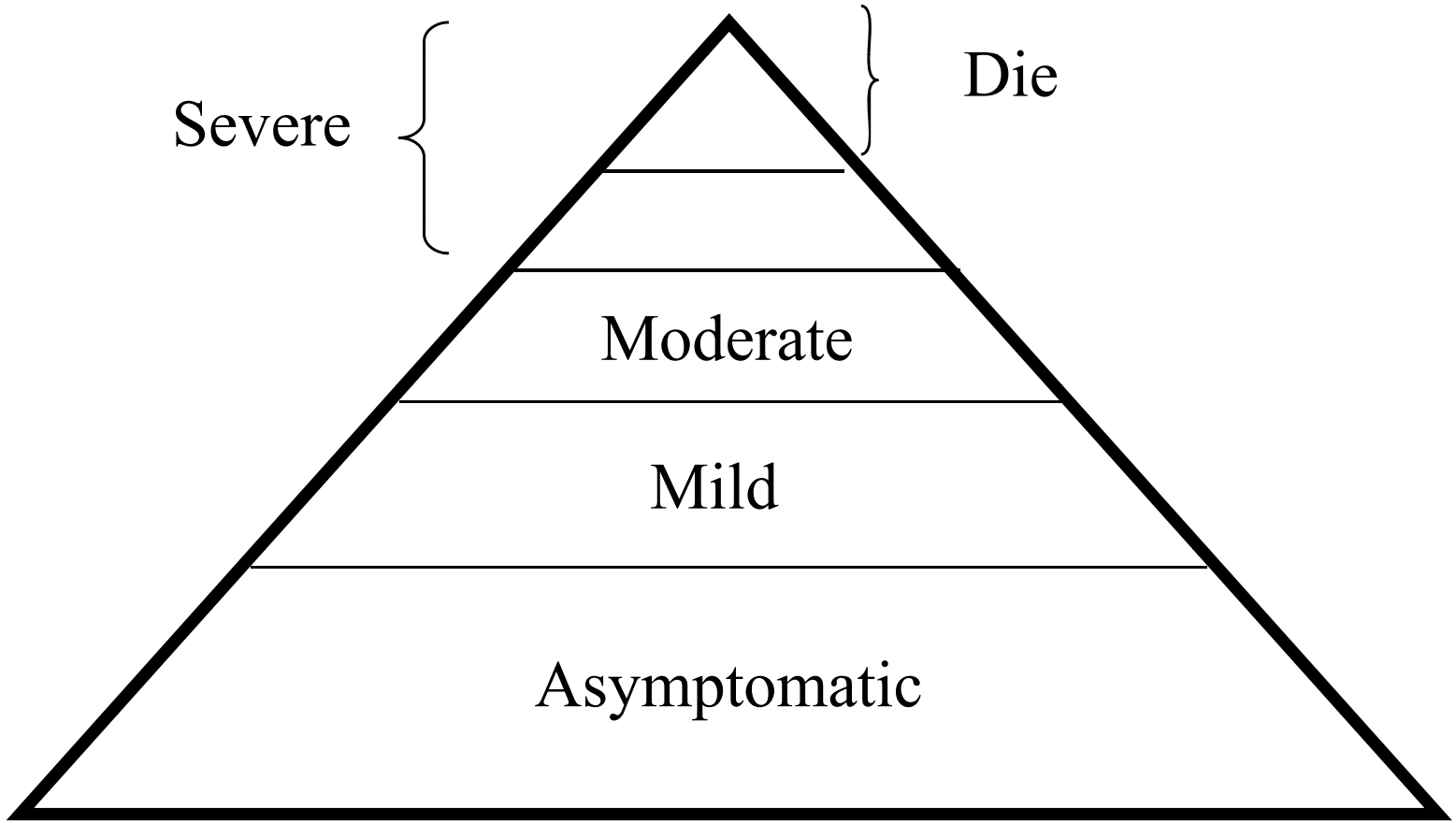
ii. **Acute encephalitic** :

- convulsions (generalised), alteration of sensorium, motor paralysis and involuntary movements, hemiplegia
- sometimes ***behavioral changes*** (confusion, disorientation, irrelevant talk, delirium).
- ***Frank signs of meningitis*** in 1/3rd of the cases with neck rigidity, irritability and photophobia

iii. **Convalescent :**

- duration is variable ranging from ***few weeks to months*** and

Clinical spectrum of JE disease



For every case hospitalized, there are likely to be about 300 other people infected with JE, but with mild illness or no symptoms

Diagnosis of JE

Clinically:

- Signs and symptoms similar to encephalitis and cannot be distinguished for confirmation.

- JE can be suspected as the cause of encephalitis as a febrile illness of variable severity associated with ***neurological symptoms ranging*** from headache to meningitis or encephalitis.
  - Headache, fever, meningeal signs, stupor, disorientation, coma, tremors, pa

Laboratory:

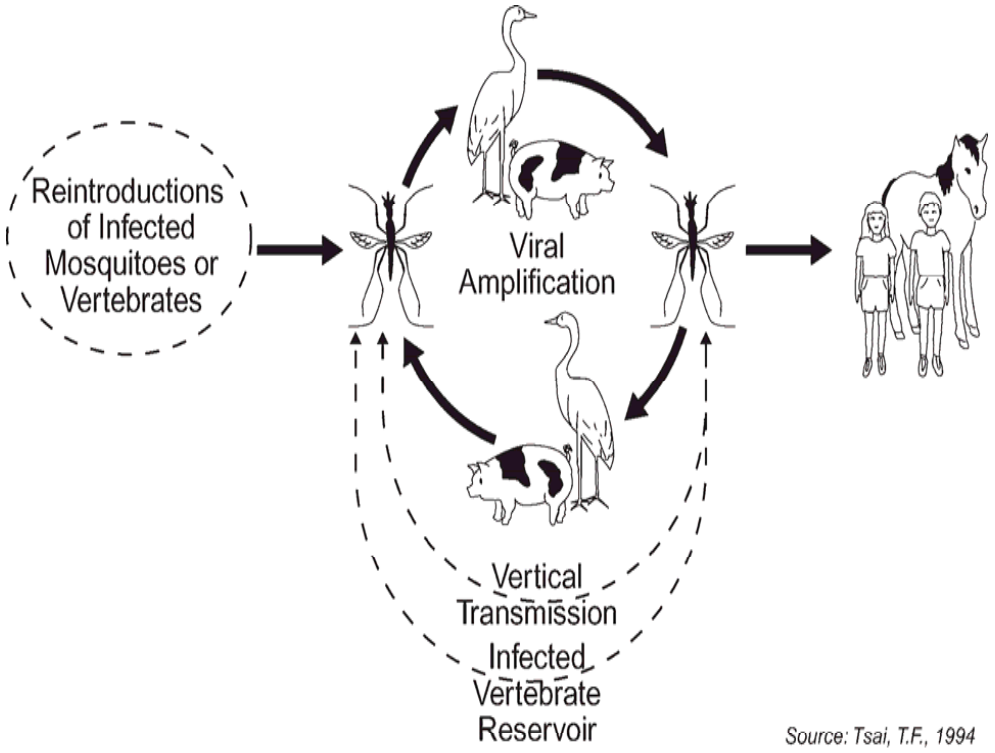
- **Antibody detection:**
  - Heamagglutination Inhibition Test (HI), Compliment Fixation Test (CF), Enzyme Linked Immuno-Sorbant Assay (ELISA) for IgG (paired) and IgM (MAC) antibodies, etc.
- **Antigen Detection:**
  - IFA, Immunoperoxidase etc.
- Genome Detection - RTPCR
- Isolation - Tissue culture, Infant mice, etc

- IgM ELISA is the method of choice provided

Treatment of JE

- No specific anti-viral medicine.
- The cases are managed ***symptomatologically***.
  - Clinical management of JE is ***supportive***.
  - In the acute phase is directed at maintaining fluid and electrolyte balance and control of convulsions, if present.
  - Maintenance of airway is crucial.

Prevention and Control of JE



Control options

- Mosquito control?
- Pig control?
- Human interventions?

Mosquito Control

- Spraying mosquito habitats with insecticide
  - Time consuming, expensive, it is difficult to cover all mosquito habitats, and causes environmental pollution

- Bednets
  - Mosquitoes bite at dusk before people are in bed

NOT THE BEST SOLUTION

Pig control

- Segregating, slaughtering, or vaccinating pigs
  - Economically not feasible and difficult
  - Other animals, like birds, may also act as amplifying hosts so even if pigs are eliminated JE will not disappear

NOT THE BEST SOLUTION

Human Interventions

"**Human vaccination is the only effective long-term control measure** against JE. All at-risk residents should receive a safe and efficacious vaccine as part of their national immunization program."

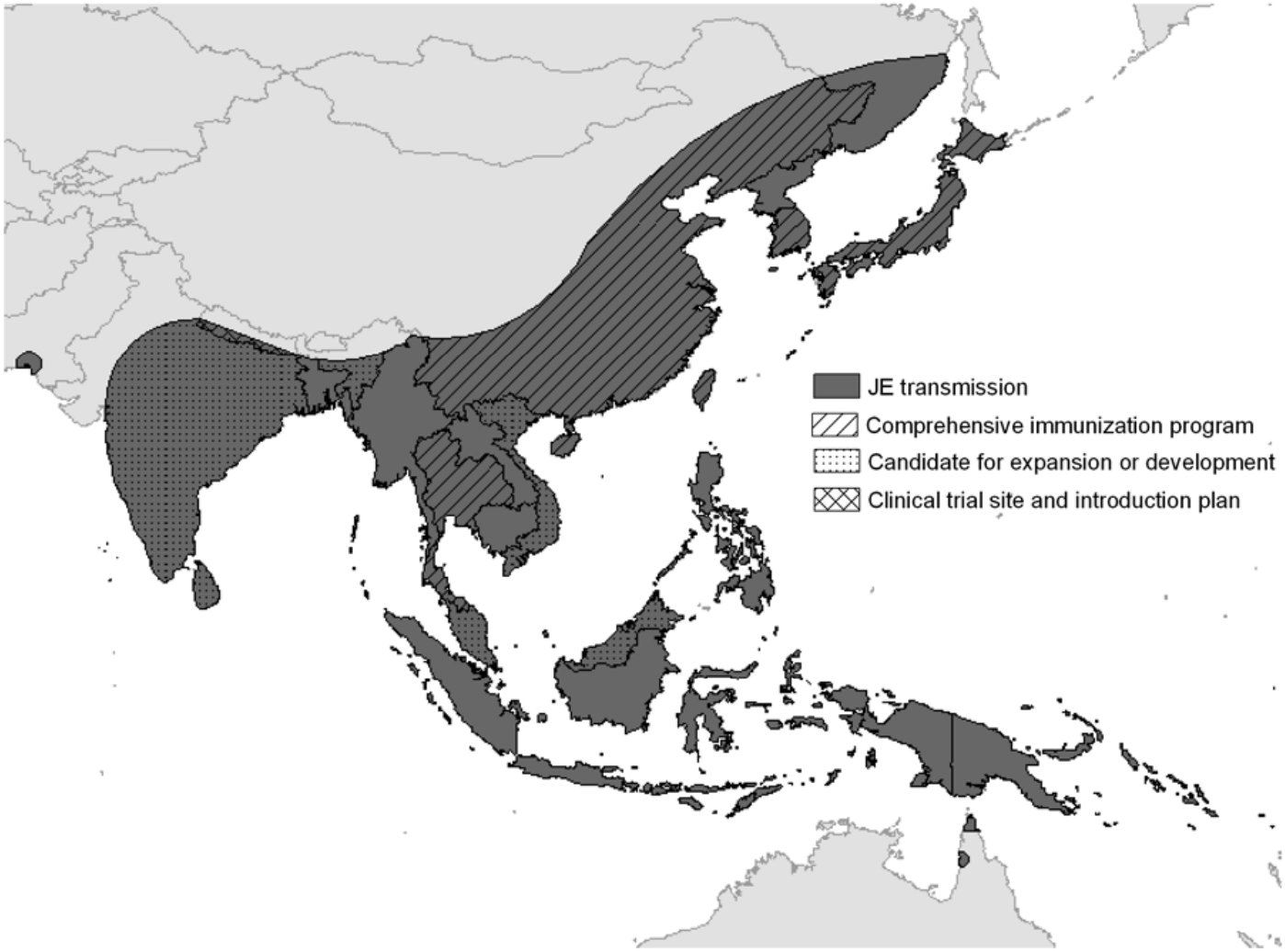
Consensus statements from Global JE meetings 1995, 1998, and 2002

WHO statement on JE Vaccination

"where affordable, JE vaccination should be extended to all endemic areas where JE is considered a public health problem"

WHO, 1998
Weekly Epidemiological Record No. 44

Status of JE control with immunization



Comprehensive immunization program:

Japan, South Korea, Taiwan, China and Thailand

Program commenced but needs expansion or development:

Sri Lanka, Vietnam, Malaysia and India (state-based)

Trial taken place and there are plans to introduce a program:

Nepal

Data as of November 2004

JE Vaccines : options

- JE vaccines currently available fall into 2 categories

  - Inactivated vaccines
  - Live, attenuated vaccine

Inactivated JE vaccine

- First licensed in Japan in 1954.
- The most widely used and available vaccine.
- ***Mouse-brain derived***

Inactivated JE Vaccine

Schedule

- *3 doses (0, 7, 28 days)*
- Sub-cutaneously
- *Between 01 –10 years of age*
- *Booster after 01 year*
- *01 Booster dose every 03 years*

Live, attenuated JE vaccine (SA 14-14-2 vaccine)

- A Cell culture Vaccine
- First licensed in China in 1988.
- Used extensivelv in China.India under UIP-8२ distts-
- UP,Assam,WB & Karnataka.

Thank You