**ESTIMATING CONSTANT FOI FROM AGE-STRATIFIED NOTIFICATION CASES, GENERATE RESULTS FOR 16 COUNTRIES**

# FOI estimation:

* Data:
  + Age-stratified notification cases from literature search:

1. **Philippines**: Epidemiology of Japanese Encephalitis in the Philippines: A Systematic Review.
2. **China**: Japanese encephalitis in mainland china
3. **India**:
   1. Lowest: sample from the distribution: lognormal(mean = log(0.01), sd = 1)
   2. Medium high: Japanese encephalitis virus remains an important cause of encephalitis in Thailand (in the same group H by Campbell 2001)
   3. High: JAPANESE ENCEPHALITIS IN ASSAM, NORTHEAST INDIA 2000-2002
4. **Pakistan**: sample from the distribution: lognormal(mean = log(0.01), sd = 1)
5. **Cambodia**: Aetiology of acute meningoencephalitis in Cambodian children- 2010-2013
6. **Indonesia**:
   1. Low: Japanese encephalitis virus remains an important cause of encephalitis in Thailand (medium class by Campbell 2001)
   2. High: Indonesia\_Confirmation of Japanese encephalitis as an endemic human disease through sentinel surveillance in Indonesia.
7. **Laos:** A Prospective Assessment of the Accuracy of Commercial IgM ELISAs in Diagnosis of Japanese Encephalitis Virus Infections in Patients with Suspected Central Nervous System Infections in Laos.
8. **Vietnam:** A Prospective Assessment of the Accuracy of Commercial IgM ELISAs in Diagnosis of Japanese Encephalitis Virus Infections in Patients with Suspected Central Nervous System Infections in Laos. (due to geographic)
9. **Bangladesh:** Hospital-Based Surveillance for Japanese Encephalitis at Four Sites in Bangladesh, 2003–2005
10. **Nepal:** Laboratory-based Japanese encephalitis surveillance in Nepal and the implications for a national immunization strategy. (combined data from western and non-western Terai)
11. **Butan:** Nepal\_Laboratory-based Japanese encephalitis surveillance in Nepal and the implications for a national immunization strategy. (combined data from western and non-western Terai) (due to geographic)
12. **North Korea:** Japanese encephalitis virus remains an important cause of encephalitis in Thailand (medium class by Campbell 2001)
13. **Burma:** Japanese encephalitis virus remains an important cause of encephalitis in Thailand (due to geographic)
14. **PNG:** Japanese encephalitis virus remains an important cause of encephalitis in Thailand (the same as low Indonesia due to geographic)
15. **Srilanka:** Japanese encephalitis virus remains an important cause of encephalitis in Thailand (due to geographic)
16. **Timor-leste:** Indonesia\_Confirmation of Japanese encephalitis as an endemic human disease through sentinel surveillance in Indonesia. (due to geographic)
    * Age-stratified population data based on the age group of the notification cases (majorly based on Campbell 2011 and other sources for subnational population) including the information of past immunization.

* Catalytic model:
  + The likelihood of proportion of cases in a specific age group
    - * and are the lower and upper boundary of each age group in the notification cases.
      * is the constant FOI
  + The likelihood of expected cases in a specific age group
    - * is number of susceptible people in that age group => this is defined by the population size by age group in the location and its immunizing program. The population size by age group is the sum of all people in that age group over the time the study conducted
      * is the reporting rate, comprised of symptomatic rate and reporting rate from health system – which may varied between studies.
  + The log multinomial likelihood function for all age groups:
    - * Where is the total cases of all age groups.
  + The multinomial likelihood includes Poisson likelihood of total cases across all age group:
  + We fitted this log-likelihood function in Bayesian framework, with 2 parameters:
  + Estimating in RStan => get the posterior distribution of

# Generating cases, deaths, disabilities, DALYs:

* Data:
  + Population data: 16 countries population from Montagu; subnational data from Campbell 2011
  + The population for each scenario is different:
    - No vaccination: the demographic in the country from 2000 to 2100 (data from Montagu).
    - Routine scenario: vaccinated the 1st age group and also counting the aging effect (next year, the vaccinated age group will move down 1 row (= add 1 age), the newborn group will continue to be vaccinated).
    - Campaign scenario: The whole population remained susceptible after the Routine Vaccination will undergo Campaign vaccinations, which vaccinated age groups from 0 to 14 of the given year, based on the coverage proportions. Also, counting the aging effect. If there are multiples Campaign vaccinations, the after one will vaccinate the leftover of the previous vaccinated population.
* Estimate cases, deaths, and dalys from each scenario:
  + - is symptomatic rate.
    - is age group from 0 to 99 –which account for the reduced susceptible population when people get older, imply JE endemic for 100 years.
    - is the susceptible population under different scenarios.
    - : mortality rate.
    - : get from the age table of VIMC.
    - The acute and chronic weight (now only use Acute encephalitis (0.133) and Severe motor plus cognitive impairments due to encephalitis (0.542)) are from VIMC.
    - In, the symptom is assumed to last for 2.5 weeks.
    - The is calculated to be the same time as the acute, not over the remainder of the time the person is experiencing this symptom (sometimes for the rest of the life)
    - : disability rate.

# Generating central estimations:

Multiple model run: calculate FOI => get the FOI distribution => average central estimations from the sample of FOI distribution.