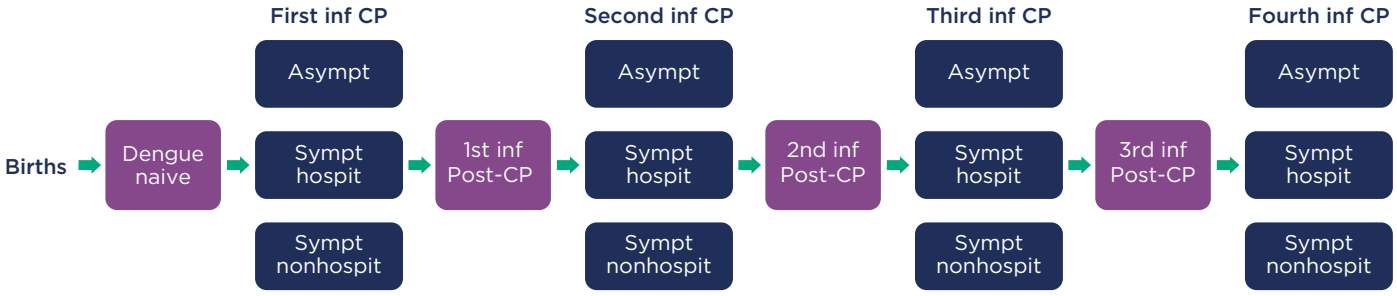
Supplementary Material

HOW IS THE DYNA-STATIC MODEL CONSTRUCTED?

TRANSITION STATES

- The dyna-static model = **static Markov model with a dynamic component**
- **Sixteen health states** capture dengue history
- Transition probabilities between states determined by the age-specific probability of infection
- Model includes the entire population of the country of interest, stratified into 100 age cohorts

TRANSITION STATE DIAGRAM FOR THE MODEL



Health state	Description
Dengue naive (1 state)	Not yet experienced a dengue infection
CP, by severity and infection number (12 states)	Currently infected by 1 serotype and cross-protected from other serotypes
Post-CP, infection number (3 states)	No longer cross-protected and therefore at risk of an infection with a different serotype

asympt, asymptomatic; CP, cross-protection; hospit, hospital; inf, infection; sympt, symptomatic.

Supplementary Material

WHAT IS THE DYNAMIC COMPONENT OF THE DYNA-STATIC MODEL?

INFECTIOUS UNITS

- Indirect effects are simulated via the notion of "infectious units"
- At each cycle, the number of "infectious units" is calculated

$$\textit{Number of infectious units} = \textit{number of asymptomatic infections} + (\textit{number of symptomatic infections} \times \textit{relative transmissibility}^{a})$$

[a]Transmissibility of symptomatic infections (variable) relative to asymptomatic infections (set at 1 unit).

- This number of infectious units is then compared with the baseline number (without vaccination) to provide a multiplier m_n

$$\textit{Multiplier } (m_n) = \frac{\textit{Number of infectious units predicted (cycle n)}}{\textit{Number of infectious units predicted without vaccination (per cycle)}}$$

- The multiplier is used to adjust the probability of infection for the following cycle (or subsequent) cycles depending on the cycle length and "lag"
- Cycle length = how often the transitions between the health states occur and is semiflexible
- Lag = the number of cycles between a change in infectious units and a corresponding change in the probability of infection

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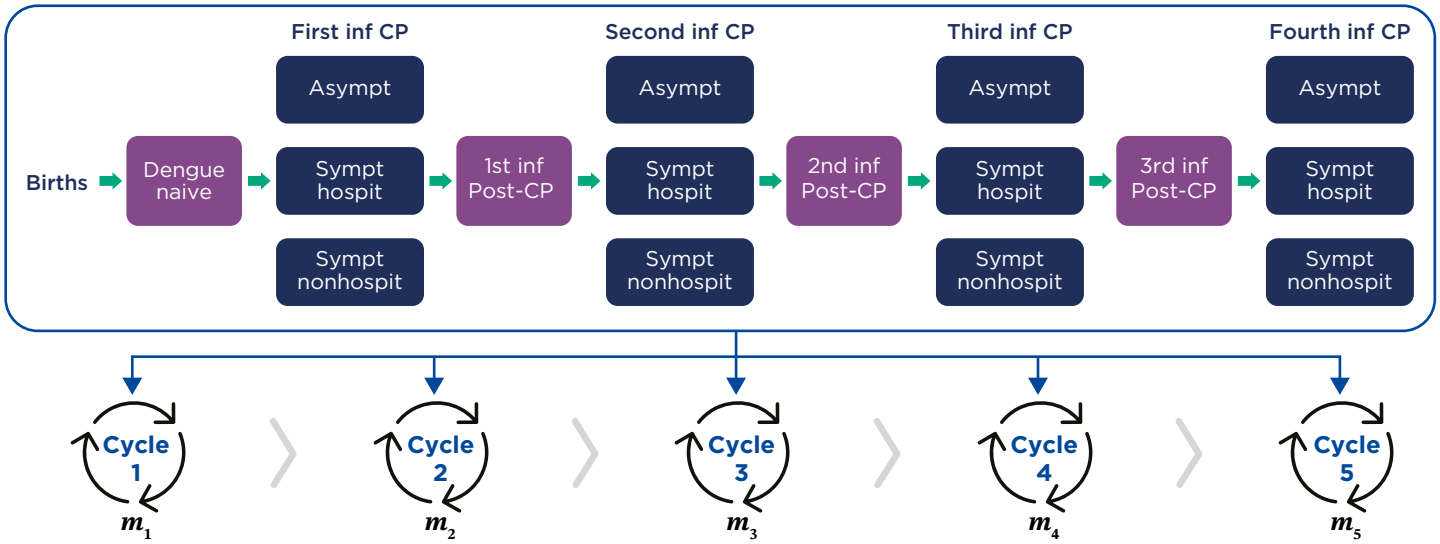
HOW ARE THE INFECTIOUS UNITS APPLIED IN THE MODEL?

RECALCULATED AT EVERY CYCLE

TRANSITION STATE DIAGRAM FOR THE MODEL



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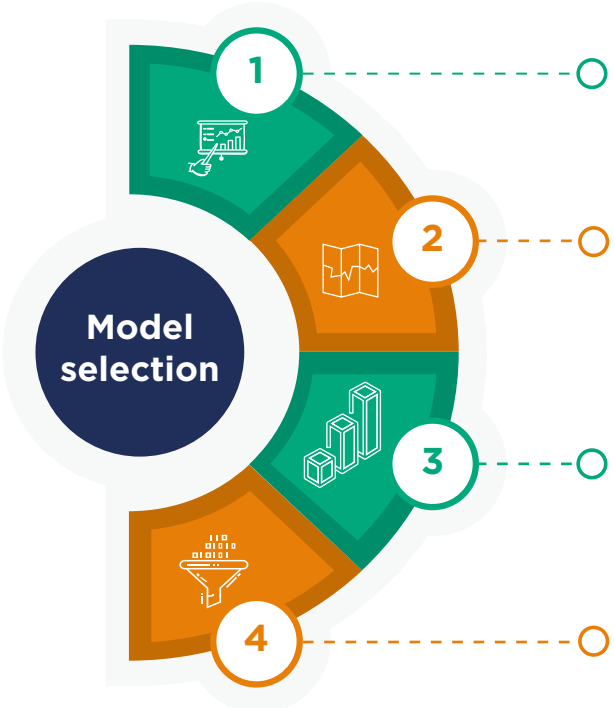
SELECTION OF AN OPTIMAL COMBINATION OF CYCLE LENGTH AND LAG



1. Charting of the results and visual inspection: Charts were generated for the 12 scenarios and for each outcome

2. Calculation of error metrics: The goodness of fit for each combination of cycle length and lag was evaluated using mean absolute error and root mean square error

3. Ranking: Combinations of cycle length and lag were ranked by performance for each error metric for each outcome

4. Sensitivity analyses around outcome inclusion: Epidemiological outputs were varied to assess impact on ranking of cycle length and lag combinations