A Next-Generation Monitoring and Forecasting System for Environmental Suitability of *Aedes*-borne Disease Transmission

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Special thanks to:
Columbia U, E3B, PAHO/WHO,
CDC, CARPHA, NOAA’s IRAP2
A next-gen monitoring and forecast system of *Aedes*-borne diseases

- **Aedes** Presence/Absence
- Environmental Suitability
- Disease Circulation
Environmental Suitability

May 2019

R0

1.5 2 2.5 3 3.5
A multi-model monitoring and forecast system for environmental suitability of Aedes-borne diseases

Outcome: monitor and forecast system for environmental suitability (past or future)

Caminade et al

R$_0$ models

Wesolowski et al

Liu-Helmersson et al

Mordecai et al

- Multiple validated basic reproduction number (R$_0$) models for Aedes-borne diseases
A multi-model monitoring and forecast system for environmental suitability of *Aedes*-borne diseases

- Multiple validated basic reproduction number ($R_0$) models for *Aedes*-borne diseases
- System uses both ento-epidemiological parameters and climate information (observed or forecast) to estimate past, present and future (from weeks to a few months) environmental suitability.

Outcome: monitor and forecast system for environmental suitability (past or **future**)

- Seasonal *climate* forecast: NMME
- Sub-seasonal climate forecasts: S2S Database/NOAA’s SubX
A multi-model monitoring and forecast system for environmental suitability of *Aedes*-borne diseases

- **Ento-epidemiological parameters**
- **Environmental information (obs, fcsts)**
- **R₀ models**
- **Multi-model calibrated system**

**Outcome:** monitor and forecast system for environmental suitability (past or future)

(Past or future date)

Environmental suitability (R₀) for *Aedes*-borne diseases. [Muñoz et al., 2016, 2017a,b, 2018]

- Multiple validated basic reproduction number (R₀) models for *Aedes*-borne diseases
- System uses both ento-epidemiological parameters and climate information (observed or forecast) to estimate past, present and future (from weeks to a few months) environmental suitability.
- Systematically combined in a calibrated multi-model ensemble.

- Seasonal *climate* forecast: NMME
- Sub-seasonal climate forecasts: S2S Database/NOAA’s SubX
Observations: Monitoring System

R0 model (PRISM)  

R0 model (CRUv4)

Aug 1998  

Aug 1998

IRI

International Research Institute  
for Climate and Society  
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Observations: Monitoring System

Climate and Aedes

This maproom presents information about climatic variables and their influence on diseases transmitted by mosquitos Aedes. The user can choose to display a map of the presence of vectors.
Predictive skill depends on space and time scales

How do we assess skill?

Compare DJF retrospective forecasts with model forced with observations (repeat for each season)
Multi-model

Winter (DJF)

2AFC (categorical)

-Assess discrimination-

One model

Summer (JJA)
Realtime Deterministic Forecasts

DJF 2018-2019 (Init. Nov 2018)

R0

+1σ

-1σ
Realtime Probabilistic Forecasts

DJF 2018-2019 (Init. Nov 2018)
Forecasts in context
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Potential Risk of Transmission (R0)
July 2015
Source: Muñoz et al. (in prep)

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