

Infodengue-Mosqlimate Challenge 2025

Ensemble models results

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Mosqlimate Research Team

October 15, 2025



- ① Overview
- ② Contributors
- ③ The Ensemble
- ④ Results
- ⑤ Acknowledgements



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Ensemble Results

Goal:

Present the results of ensembling the contributed forecasting models, during the 2025 sprint^a.

^aOrganized by: mosqlimate.org and info.dengue.mat.br

Organization:



Funding:



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Participants

15 teams submitted 19 predictive models for dengue in Brazil.

D-fense: UERJ/LNCC (Brazil)

Dengue oracle: FGV-EMAp (Brazil)

LaCiD/UFRN : LaCiD-UFRN (Brazil)

DS_OKSTATE : OSU (USA)

Beat it : Fiocruz (Brazil)

Strange Attractors : FGV-EMAp (Brazil)

DengueSprint : Cornell University
(USA)

TSMixer ZKI-PH4 : Robert Koch
Institute (Germany)

CERI Forecasting Club : CERI
Stellenbosch University
(South Africa)

Imperial College London : ICL (UK)

GeoHealth: KAUST (Saudi Arabia)

Global Health Resilience: BSC (Spain)

ISI Foundation: ISI (Italy)

JBD-Mosqlimate: FGV EMap (Brazil)

Preditores da Picada: IMPA-Tech (Brazil)



Models

Model ID	Model	Approach
108	Preditores da picada	Autoregressive
133	Chronos-Bolt	Machine learning / Neural Network
134	ISI_Dengue_Model	Mechanistic
135	GHR Model	Bayesian
136	Imperial-TFT Model	Machine learning / Neural Network
143	Strange Attractors	Bayesian
144	Beat it	Bayesian
145	CNNLSTM	Machine learning / Neural Network
150	LNCC-AR_p-1	Autoregressive
152	LNCC-CLIDENGO-1	Mechanistic
154	LNCC-SURGE-1	Mechanistic
155	Dengue Oracle M1	Machine learning / Neural Network
156	Dengue Oracle M2	Machine learning / Neural Network
157	UERJ-SARIMAX-2	Autoregressive
158	DengueSprint_Cornell-PEH_2	Bayesian



Inclusion Criteria

Of the 19 models, 3 were not eligible for the sprint due to methodological issues, and 1 did not submit forecast predictions. Thus, only **15** models were included in the final ensemble analysis.



Forecast puzzle

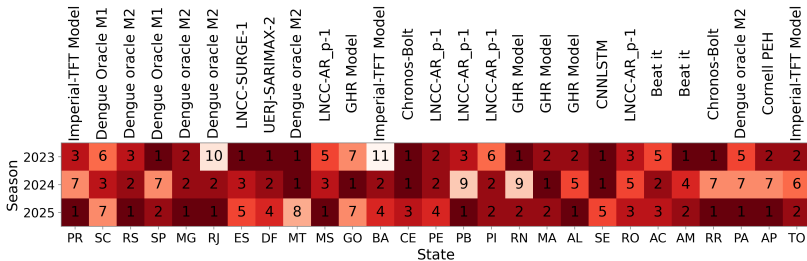


Figure 1: Ranking position of the best model throughout the entire period in each validation season. The ranking was calculated based on the WIS in the season.



Ensemble methods

All models submitted predictions consisting of the following percentiles ($p_{2.5}, p_5, p_{10}, p_{25}, p_{50}, p_{75}, p_{90}, p_{95}, p_{97.5}$).

Ensemble models

The ensemble models are built as the median of the model's predictive intervals. This approach was originally proposed by the COVID Hub ^a.

^aRay et al. (2023) *International Journal of Forecasting*

The resulting models were similar to those obtained by logarithmic pooling with equal weights, used in the previous sprint, but this methodology does not require a parametric approximation.



Score Normalization

- For each validation test, a normalized WIS score was computed by aggregating across all weeks as defined below:

$$WIS^{\text{norm}} = \frac{1}{Y_{\text{total}}} \sum_{t=1}^T WIS_t, \quad (1)$$

where:

- WIS_t is the Weighted Interval Score for week t ,
- Y_{total} is the total number of cases in the validation period, and
- T is the total number of weeks in the validation period.

An ensemble built from the **top 5** models from the first two validation sets, was compared to individual models, in 2025, in terms of relative Skill scores.



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Ensemble (all models) vs. Individual Models

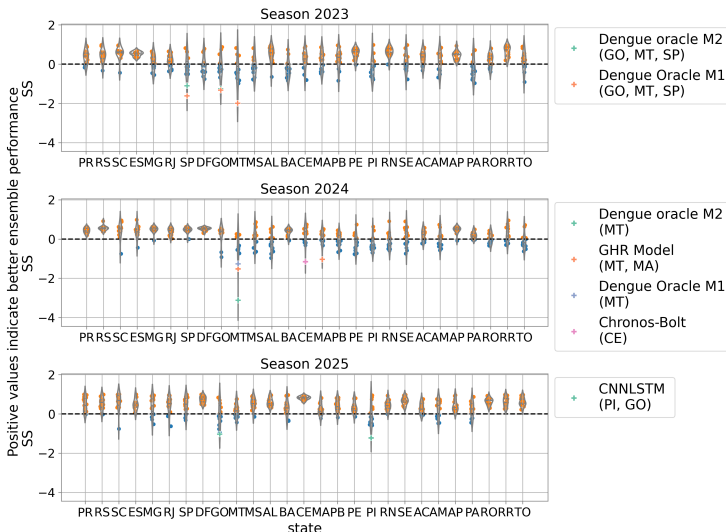
To assess the performance of the ensemble relative to the individual models, we computed the Skill Score (SS) of the Weighted Interval Score (WIS), defined as follows:

$$SS_{m,v} = 1 - \frac{WIS_{\text{Ensemble},v}^{\text{norm}}}{WIS_{m,v}^{\text{norm}}}, \quad (2)$$

where m denotes an individual model and v corresponds to a specific validation test. **Positive values indicate that the ensemble model outperforms the individual model in terms of WIS.**

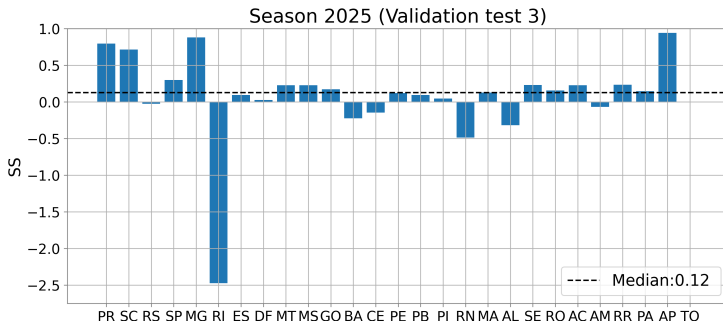


Ensemble (all models) vs. Individual models



Ensemble (top 5) vs. best model.

Ranked according to the mean WIS^{norm} at validations tests 1 and 2

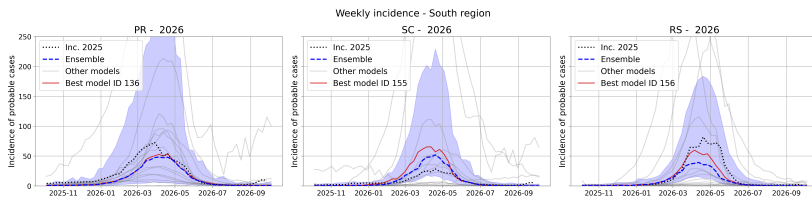


This ensemble is more consistent across states and, on average, **12 % more accurate** than the best model.



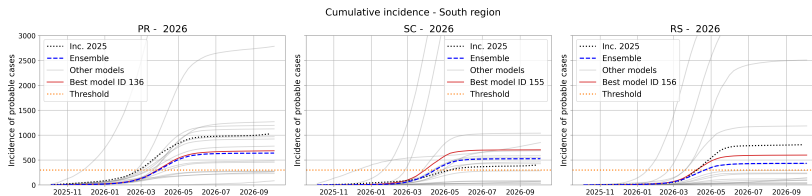
South region (weekly)

Weekly incidence:



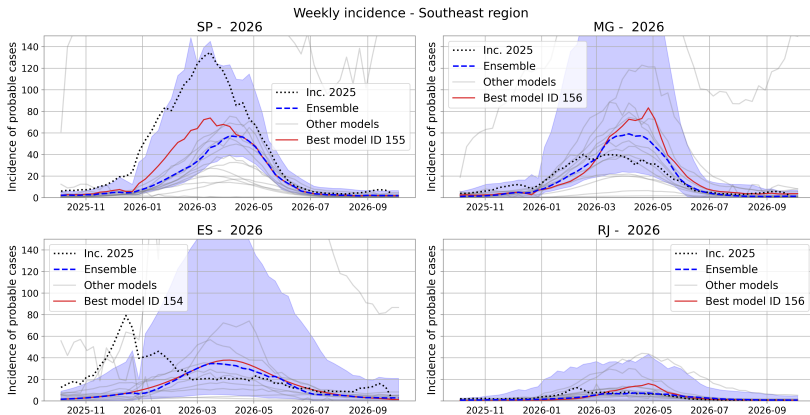
South region (cumulative)

Cumulative incidence:



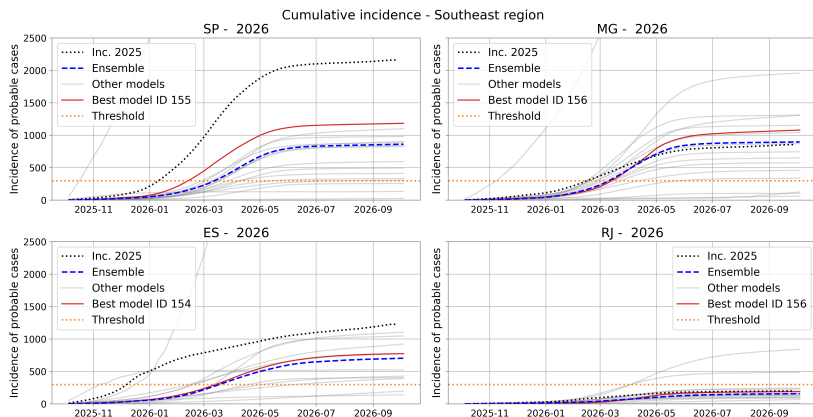
Southeast region (weekly)

Weekly incidence:



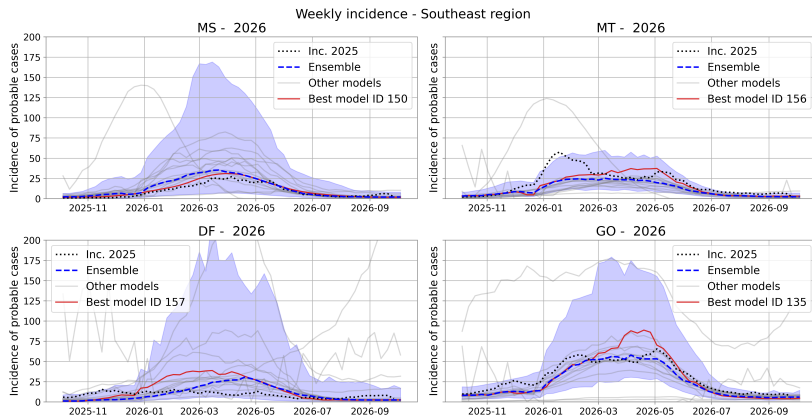
Southeast region (cumulative)

Cumulative incidence:



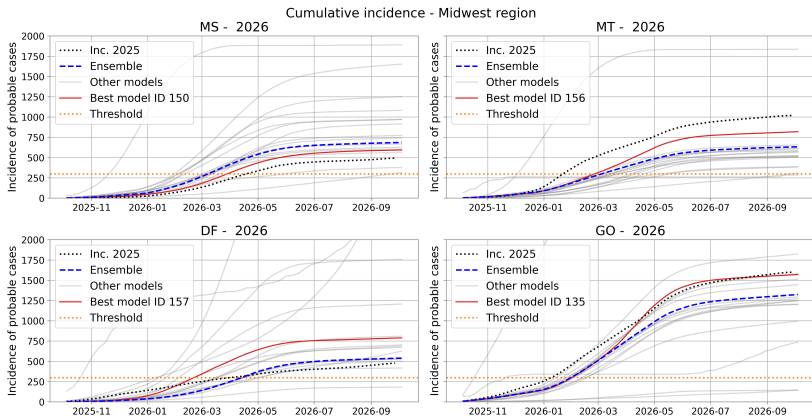
Midwest region (weekly)

Weekly incidence:



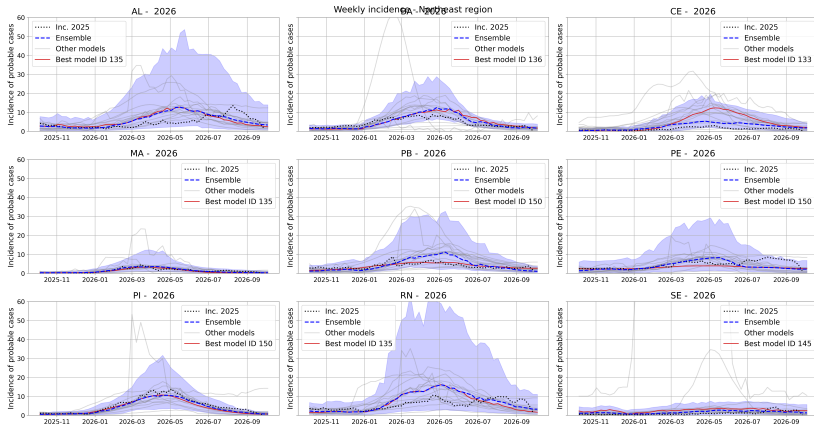
Midwest region (cumulative)

Cumulative incidence:



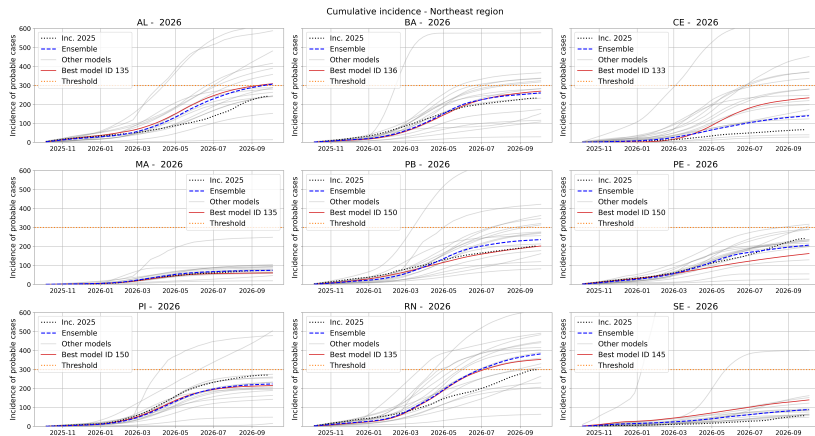
Northeast region (weekly)

Weekly incidence:



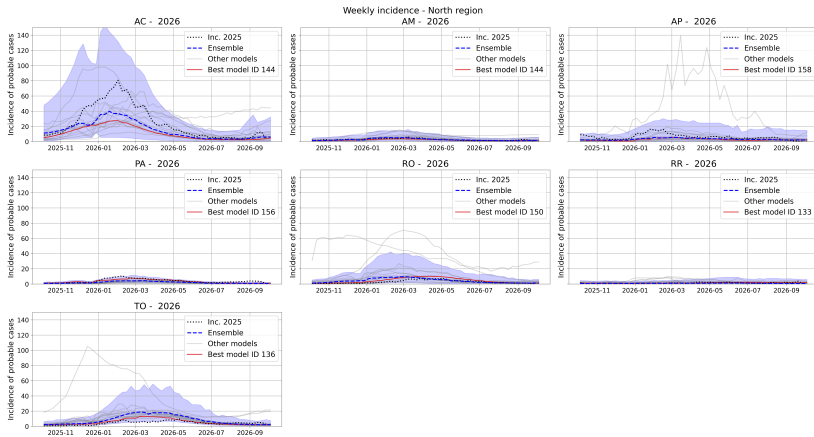
Northeast region (cumulative)

Cumulative incidence:



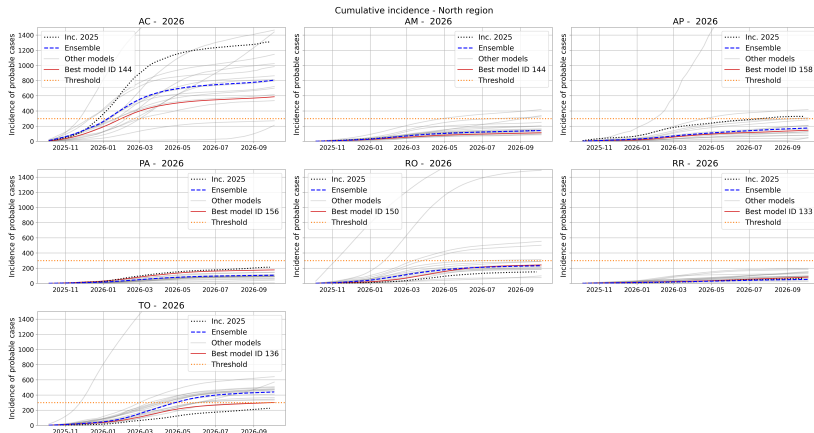
North region (weekly)

Weekly incidence:

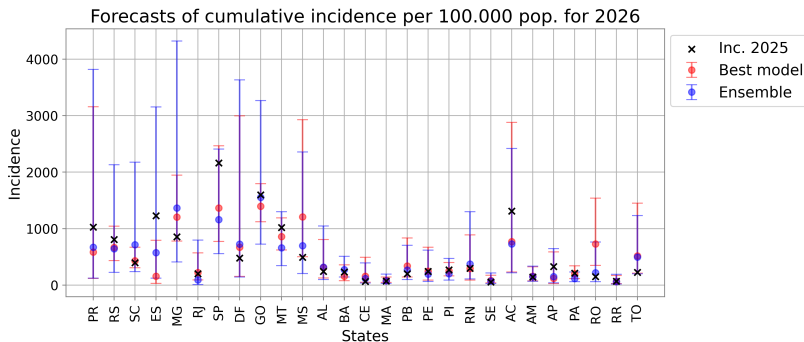


North region (cumulative)

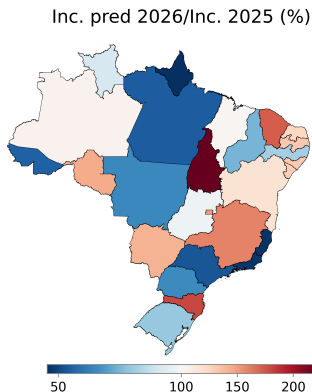
Cumulative incidence:



Cumulative incidence:



Brazil (incidence map)



	Inc. pred 2026	Inc. 2025	Ratio 2026/2025 (%)
PR	671.35	1025.61	65.46
RS	641.57	807.54	79.45
SC	716.06	398.09	179.87
ES	573.74	1228.34	46.71
MG	1364.69	856.06	159.42
RJ	93.80	200.45	46.80
SP	1158.15	2162.84	53.55
DF	726.88	477.70	152.16
GO	1553.60	1599.21	97.15
MT	661.82	1019.34	64.93
MS	696.60	492.99	141.30
AL	318.64	242.97	131.14
BA	273.53	233.19	117.30
CE	115.37	66.74	172.85
MA	75.33	73.29	102.79
PB	266.78	202.19	131.94
PE	196.34	241.37	81.34
PI	202.54	270.61	74.85
RN	373.56	298.75	125.04
SE	73.14	56.39	129.71
AC	728.84	1309.63	55.65
AM	150.99	143.65	105.11
AP	149.75	329.08	45.51
PA	116.80	212.92	54.86
RO	218.13	151.13	144.34
RR	60.95	67.10	90.83
TO	496.32	225.82	219.78



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Mosqlimate Team



Flávio C. Coelho

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Important dates

Save these dates!

- 1 Webinar presenting the results for the Brazilian Ministry of Health - October 31th, 2025
- 2 Next Sprint: Please watch our website: TBA in early 2026!



Thanks! And see you again soon...



Checkout our report!

