

ASKEM Final Epidemiology Forecasting Challenge – February 2025

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For the final forecasting challenge, we seek to generalize the approaches and tools for Covid-19 forecasting to influenza forecasting. This challenge will ask you about forecasting hospitalizations during the 2023-2024 influenza season using both individual compartmental models and ensembles of models.

Locations: You will consider the states of Pennsylvania and Florida.

Forecast Time Period: Predict one-week incident hospitalizations over a 4-week span beginning December 9, 2023.

Tasks:

1. *Single Model Forecast:*
 - a. Choose a single compartmental model to model influenza hospitalizations.
 - b. For each state, calibrate this model using any historical data prior to the forecast period, including the 2022-2023 influenza season and the beginning of the 2023-2024 season (hospitalization data is provided for October 7, 2023, through the end of November 2023).
 - c. With the calibrated single model, predict one-week incident hospitalizations over a 4-week span beginning December 9, 2023. The first forecasted date would be December 16, 2023.
2. *Ensemble Model Forecast:*
 - a. Choose three compartmental models to model influenza hospitalizations.
 - b. For each state, calibrate an ensemble of the three single models.
 - c. In creating the ensemble, it would be fine to calibrate each model independently and weight them naively based on their skill.
 - d. It would also be fine to calibrate the ensemble as a whole, assigning weights to the different component models, so that you minimize the error of the ensemble with respect to the historical data.
 - e. For each state, calibrate the ensemble model using any historical data prior to the forecast period, including the 2022-2023 influenza season and the beginning of the 2023-2024 season (hospitalization data is provided for October 7, 2023, through the end of November).
 - f. With the calibrated ensemble, predict one-week incident hospitalizations over a 4-week span beginning December 9, 2023.
3. For Tasks 1 and 2, produce the forecast outputs in [the format specified by the CDC flu forecasting challenge, including the specified quantiles](#). This is very similar to the format used in previous ASKEM forecasting challenges.

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Metrics: We will be evaluating your forecasts using the same error metrics (WIS, MAE) computed by the [CDC Covid-19 Forecasting Hub](#), as we have done previously. We provide the same informational blurb from previous forecast challenges about WIS and ensemble forecasting below.

As [stated on the website](#):

“Periodically, we evaluate the accuracy and precision of the [ensemble forecast](#) and component models over recent and historical forecasting periods. Models forecasting incident hospitalizations at a national and state level are evaluated using [adjusted relative weighted interval scores \(WIS, a measure of distributional accuracy\)](#), and adjusted relative mean absolute error (MAE), and calibration scores. Scores are evaluated across weeks, locations, and targets. You can read [a paper explaining these procedures in more detail](#), and look at [the most recent monthly evaluation reports](#).”

Data for Calibration:

You may use any historical data prior to the forecast period to calibrate or otherwise inform your models and ensemble. This may include:

- Ground truth hospitalization data for the 2022-2023 influenza season as well as the first two months of the 2023-2024 influenza season (we are providing this in CSV format, at <https://github.com/DARPA-ASKEM/program-milestones/tree/main/final-program-milestone/march-25-forecasting-challenge>).
- You may also find data from Influenza Hospitalization Surveillance Network ([FluSurv-NET](#)) helpful. FluSurv-NET makes its data available through [FluView](#) and [FluView Interactive](#), and includes the following:
 - [ILI and viral surveillance data](#)
 - [age group distribution data](#)
 - [hospitalization rates](#) (note that FluSurv-NET doesn't include hospitalization data for PA and FL) and [additional characteristics about hospitalizations](#)
 - [ILI activity data from Influenza-like Illness Surveillance Network \(ILI Net\)](#)
 - [general mortality data](#) and [pediatric mortality data](#)
 - [novel influenza A data](#)
- We do not recommend using data from 2020-2022 due to the irregularities in influenza season dynamics caused by the Covid-19 pandemic.

Model Considerations:

- You may consider any of the models you have seen in the starter kit, or any models that have been developed or used on the program to date.
- You may search for new models in the literature or use TA2 model extension/transformation capabilities to modify models already in Terarium.

Bonus Question: Create a hierarchical model using data from different states (we will provide data for several states in the geographic vicinity of Pennsylvania and Florida) and submit forecasts using a hierarchical model.