

## **ASKEM Final Epidemiology Forecasting Challenge – February 2025**

*The views, opinions, and/or findings contained in this report are those of The MITRE Corporation and should not be construed as an official Government position, policy, or decision, unless designated by other documentation. This technical data deliverable was developed using contract funds under Basic Contract No. W56KGU-18-D-0004.*

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.

Distribution Statement A. Approved for public release: distribution is unlimited

MITRE Public Release Case Number 24-2089

© 2025 The MITRE Corporation.

**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.