Accessing and Interpreting Influenza Forecasts During the 2017-18 Influenza Season

Infectious Disease Forecasting for Public Health Professionals Webinar Series

Thursday, November 16th, 2017
2:00-3:00 pm Eastern

Council of State and Territorial Epidemiologists

Webinar Housekeeping

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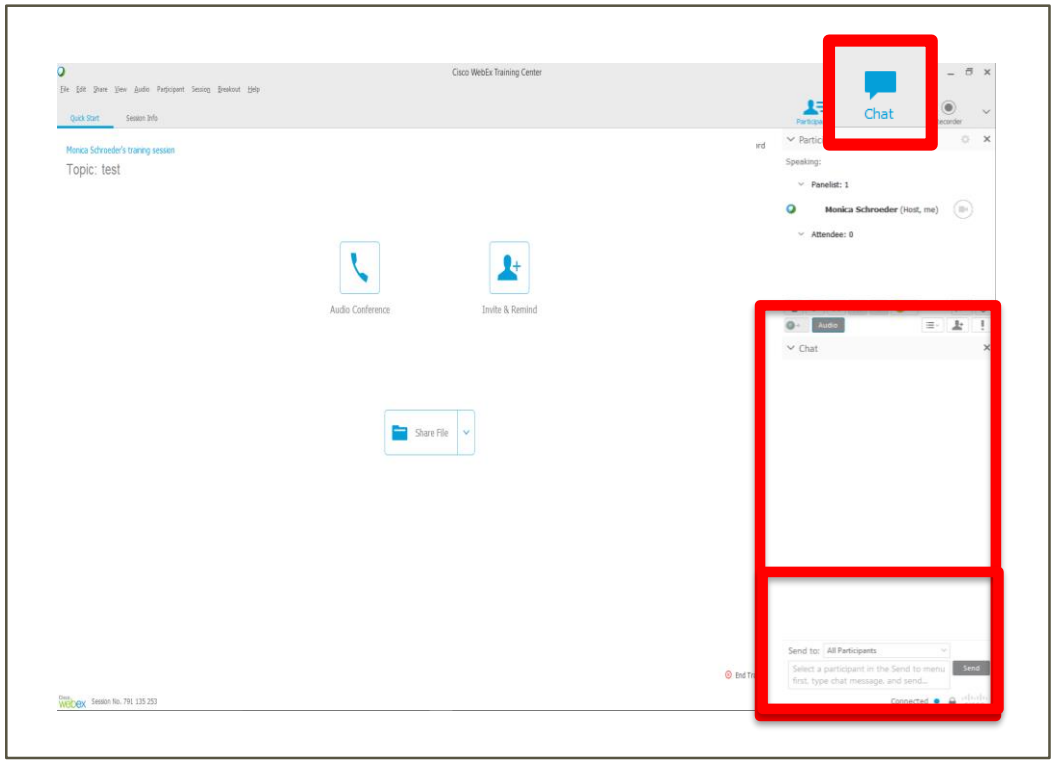
  - The webinar recording and presentation slides will be available in the webinar library on CSTE's website: http://www.cste.org/?page=WebinarLibrary
- **All phone lines have been placed on mute**
- **There will be a question-and-answer session at the end of the webinar**
  - To ask a question, please use the Chat Box on the right side of your screen

To Ask a Question

- Click on the blue chat box tab on the top right panel of your screen
- This will open the Chat Box on the bottom right panel on your screen
- Type a question
- Send questions to All Panelists
- Questions will be answered during the Q&A period after the presentation



Learning Objectives

By the end of the webinar, participants will be able to:

- Read and interpret forecasts on the EPI website (https://predict.phiresearchlab.org/)
- Describe pilot efforts to forecast influenza at the state level and influenza hospitalizations
- Describe advantages of the influenza ensemble forecast

Accessing and Interpreting Influenza Forecasts During the 2017-18 Influenza Season

Matthew Biggerstaff, ScD MPH, Epidemiologist

Michael Johansson, PhD, Biologist

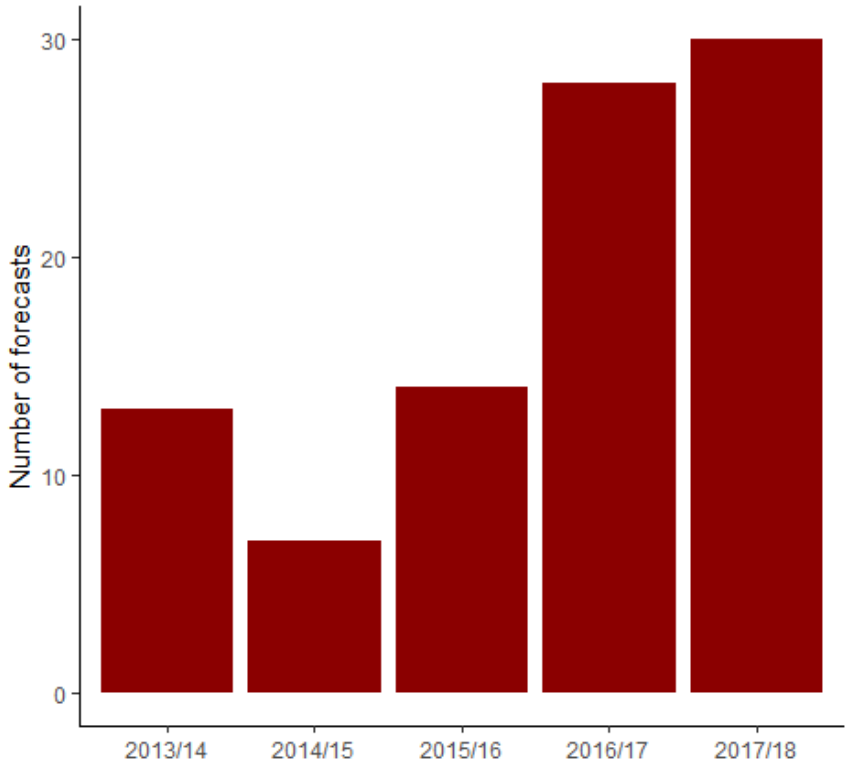
Craig McGowan, MS, ORISE Fellow

Infectious Disease Forecasting for Public Health Professionals

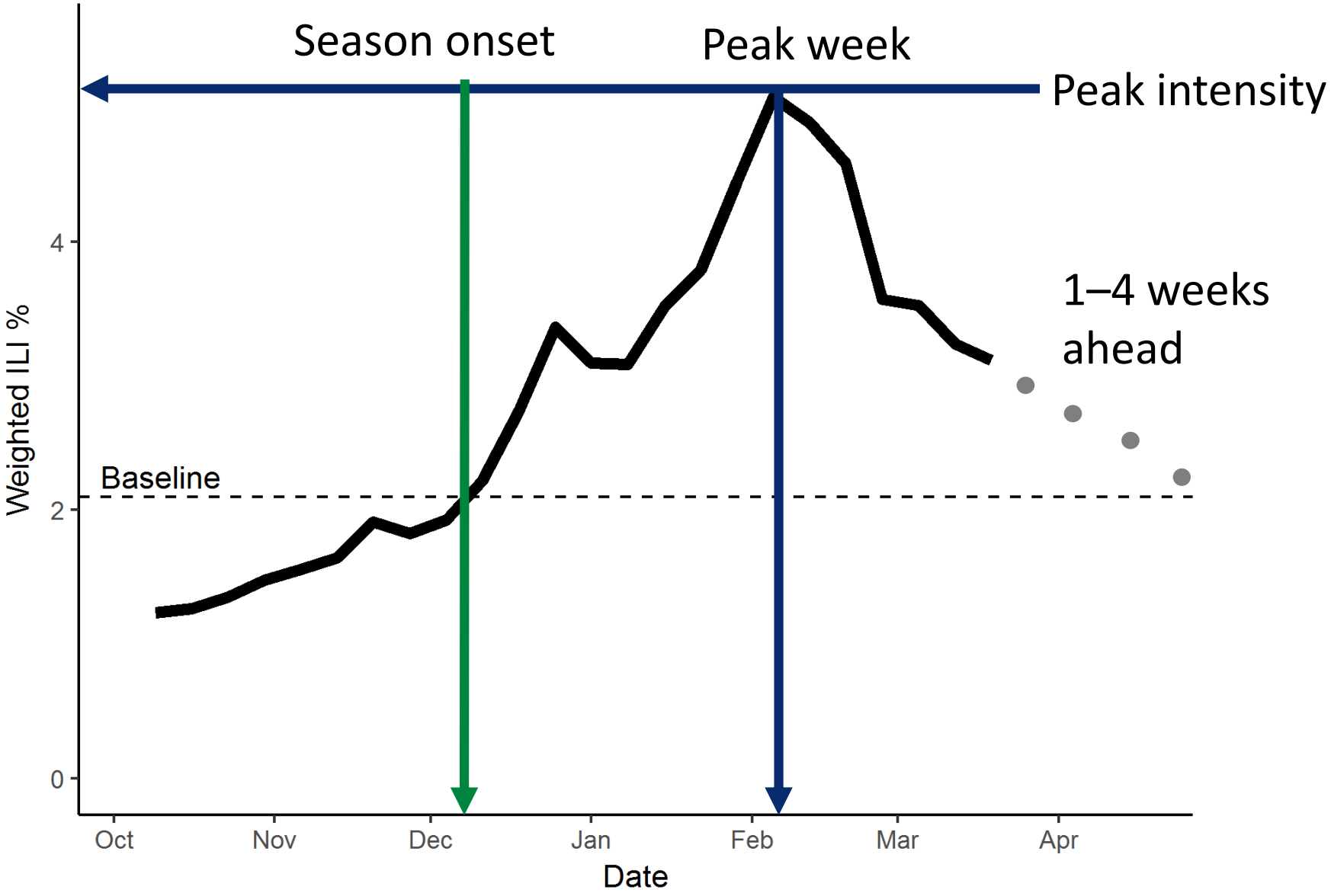
November 16, 2017

Influenza Forecasting at CDC

- Began in 2013-2014 influenza season, entering fifth season
- Network of public health, academic, and private companies
  - Groups and CDC co-develop challenge targets, accuracy measures, and forecast visualizations
  - Forecasts shared in real-time
  - Grown from 13 models in 2013/14 to 30 models in 2017/18
  - Over 60,000 forecasts received in 2016/17



Influenza Forecasting Targets



Forecast structure

- Probabilistic forecasts
  - Peak week and onset week

Location	Target	MMWR Week	Probability
US National	*Season start week*	*1*	*0.1023*
US National	*Season start week*	*2*	*0.4345*
US National	*Season start week*	*3*	*0.2753*

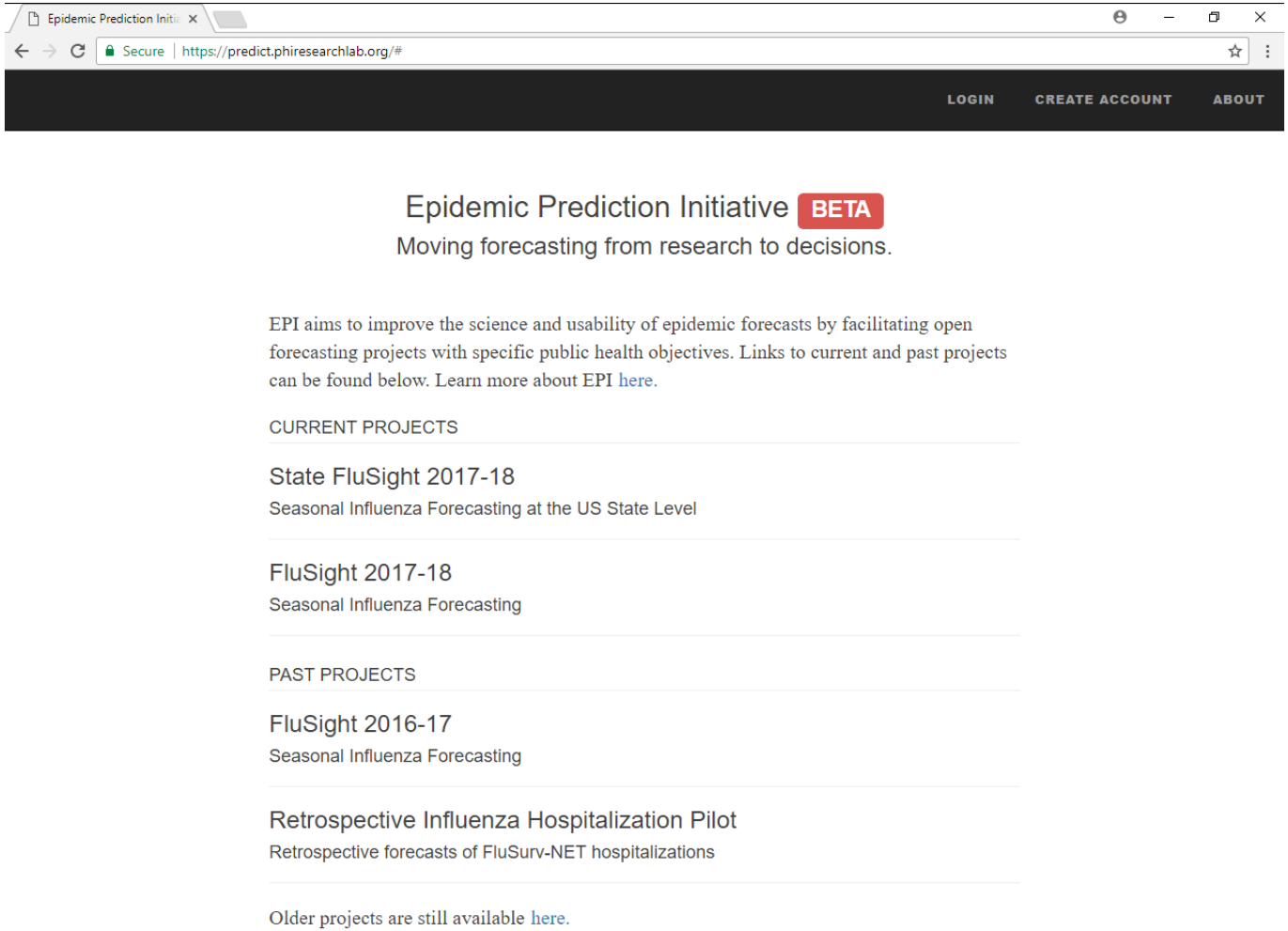
  - Peak intensity and 1-4 week ahead forecasts

Location	Target	ILI %	Probability
HHS Region 4	*1 wk ahead*	*$0.4 \leq x < 0.5$*	*0.0934*
HHS Region 4	*1 wk ahead*	*$0.5 \leq x < 0.6$*	*0.0453*
…	…	…	…
HHS Region 4	*1 wk ahead*	*$13.0 \leq x \leq 100$*	*0.00001*

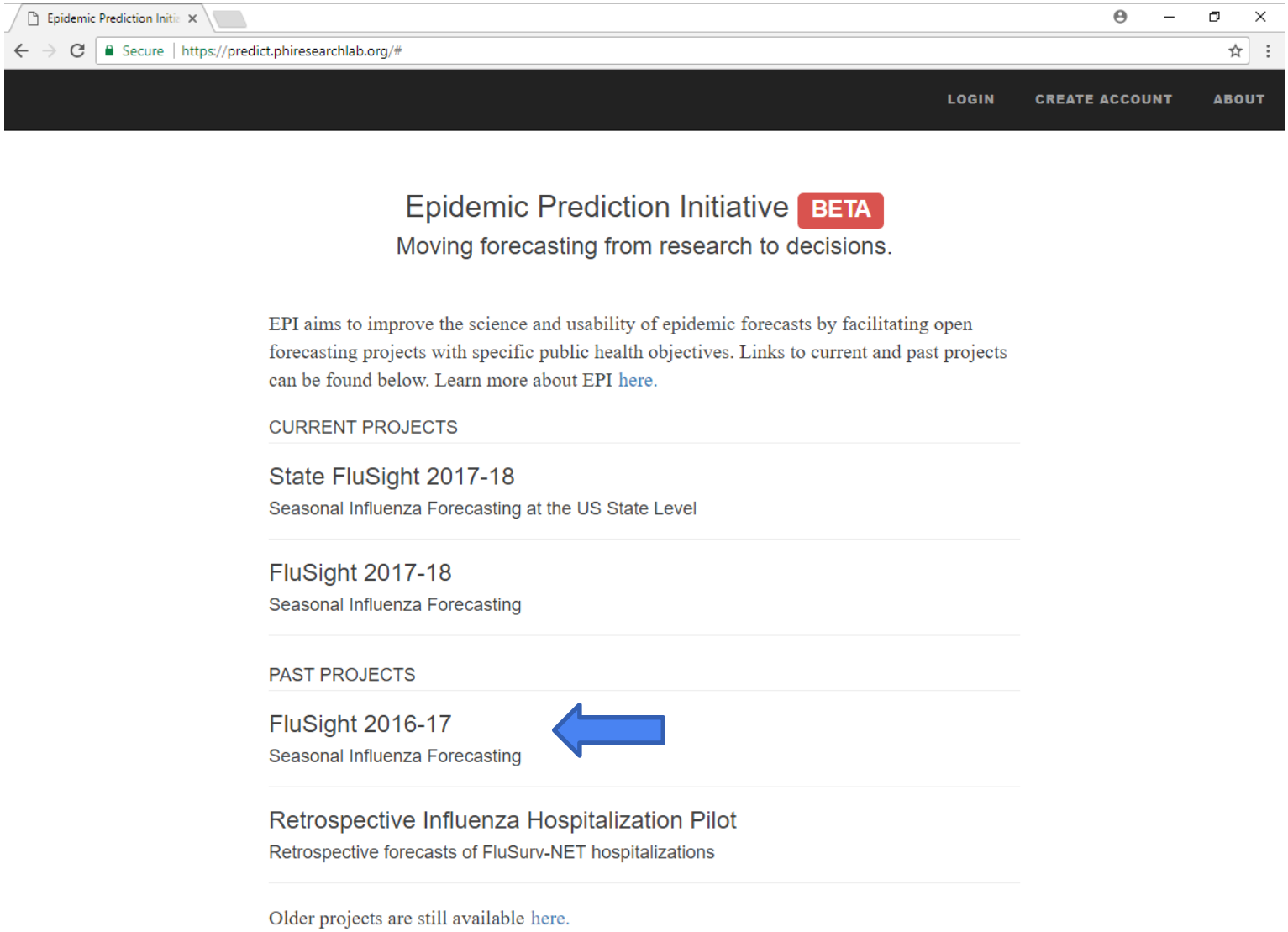
Accessing Forecasts

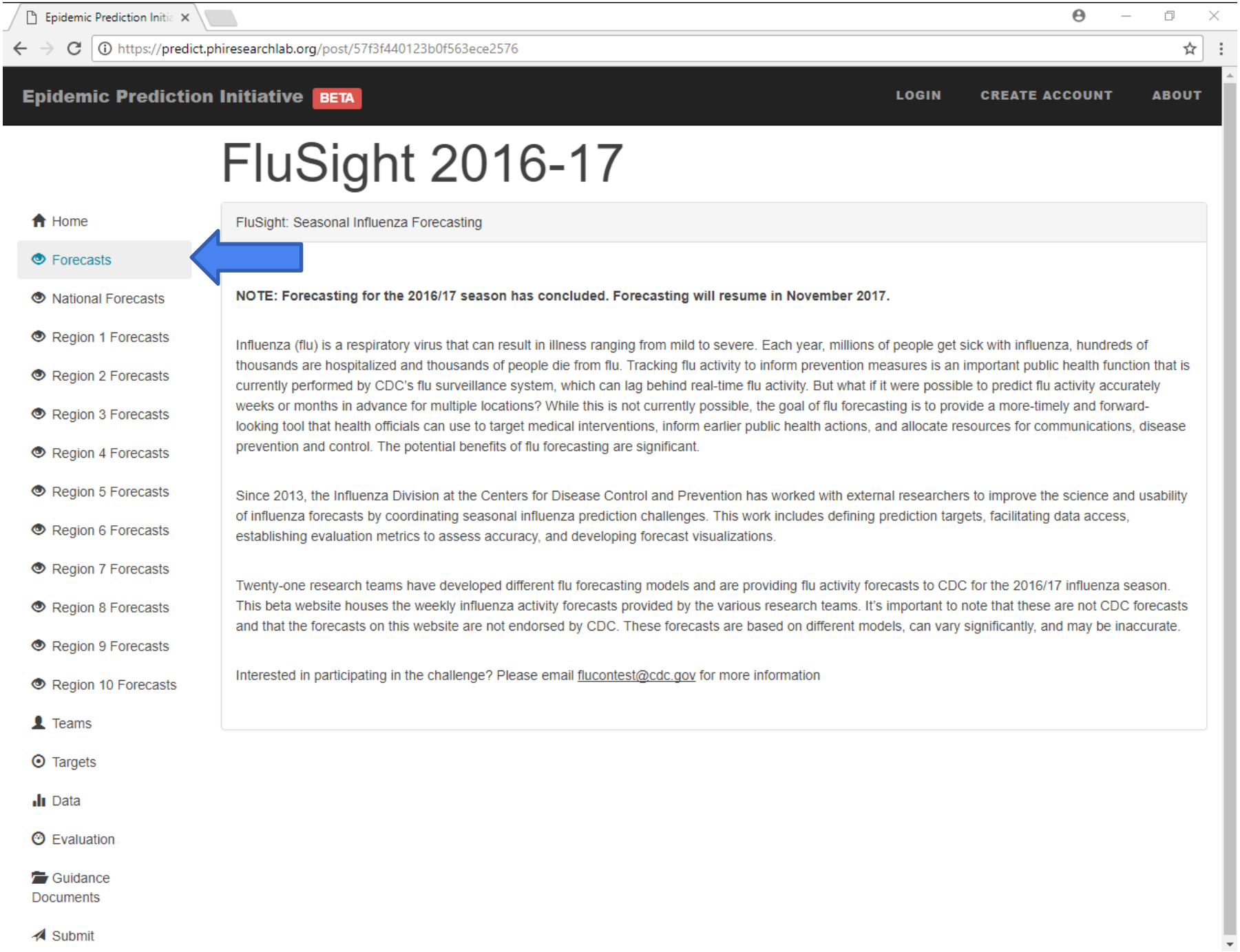
Epidemic Prediction Initiative Website

- https://predict.phiresearchlab.org



Examine Prior Season Forecasts

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https://predict.phiresearchlab.org/post/57f3f440123b0f563ece2576
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FluSight: Seasonal Influenza Forecasting
NOTE: Forecasting for the 2016/17 season has concluded. Forecasting will resume in November 2017.
Influenza (flu) is a respiratory virus that can result in illness ranging from mild to severe. Each year, millions of people get sick with influenza, hundreds of thousands are hospitalized and thousands of people die from flu. Tracking flu activity to inform prevention measures is an important public health function that is currently performed by CDC's flu surveillance system, which can lag behind real-time flu activity. But what if it were possible to predict flu activity accurately weeks or months in advance for multiple locations? While this is not currently possible, the goal of flu forecasting is to provide a more-timely and forward-looking tool that health officials can use to target medical interventions, inform earlier public health actions, and allocate resources for communications, disease prevention and control. The potential benefits of flu forecasting are significant.
Since 2013, the Influenza Division at the Centers for Disease Control and Prevention has worked with external researchers to improve the science and usability of influenza forecasts by coordinating seasonal influenza prediction challenges. This work includes defining prediction targets, facilitating data access, establishing evaluation metrics to assess accuracy, and developing forecast visualizations.
Twenty-one research teams have developed different flu forecasting models and are providing flu activity forecasts to CDC for the 2016/17 influenza season. This beta website houses the weekly influenza activity forecasts provided by the various research teams. It's important to note that these are not CDC forecasts and that the forecasts on this website are not endorsed by CDC. These forecasts are based on different models, can vary significantly, and may be inaccurate.
Interested in participating in the challenge? Please email flucontest@cdc.gov for more information

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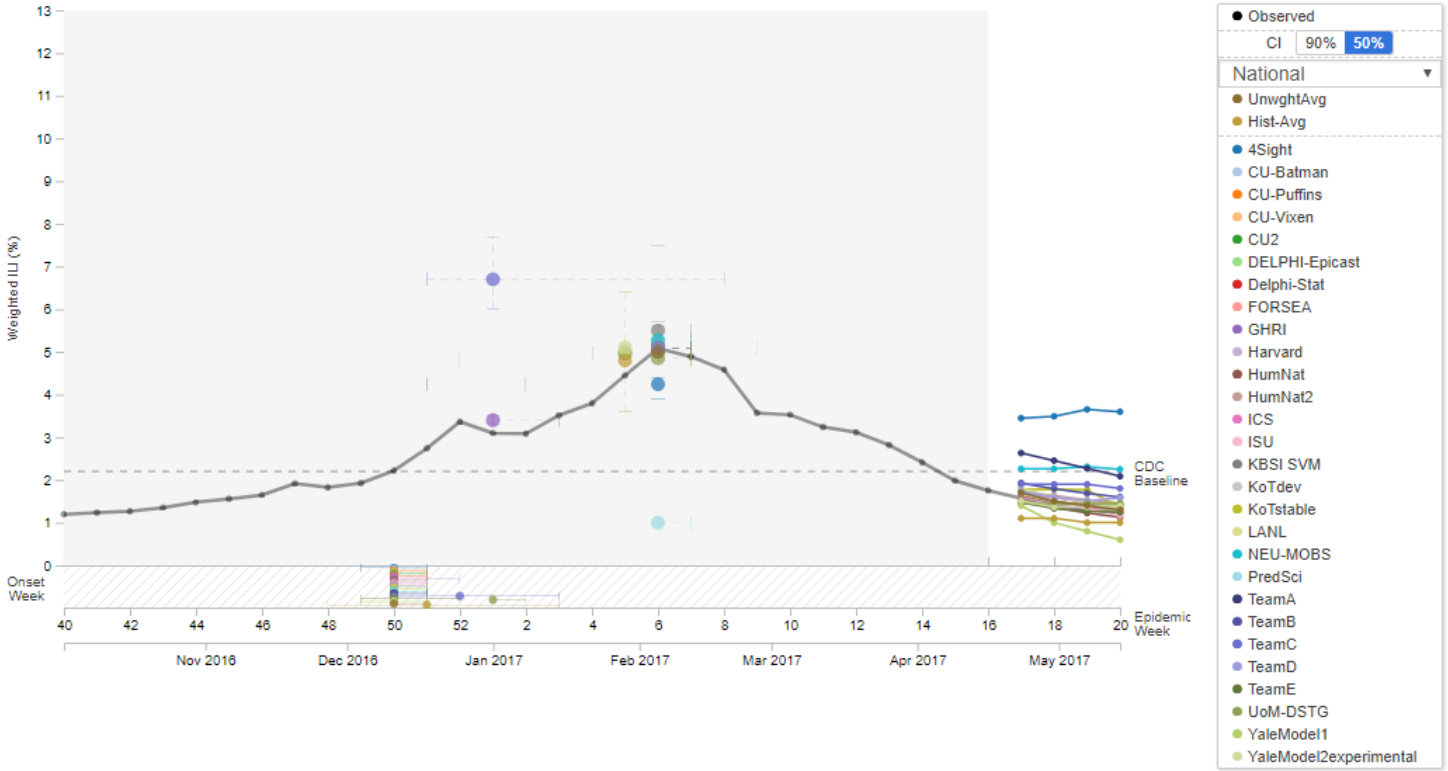
Submitted Forecasts

Use the tool below to explore user-submitted forecasts for the 2016/17 influenza season.



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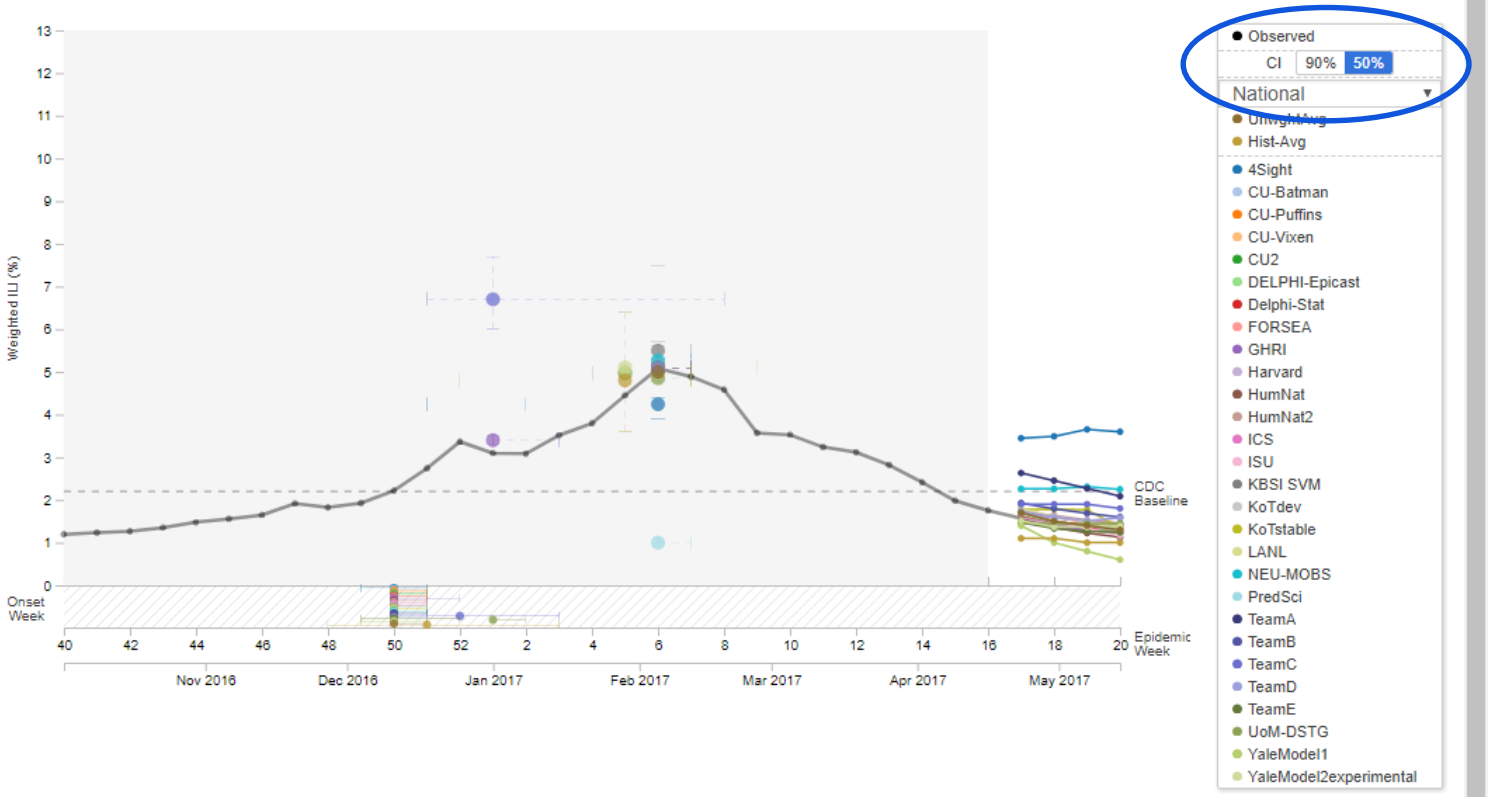

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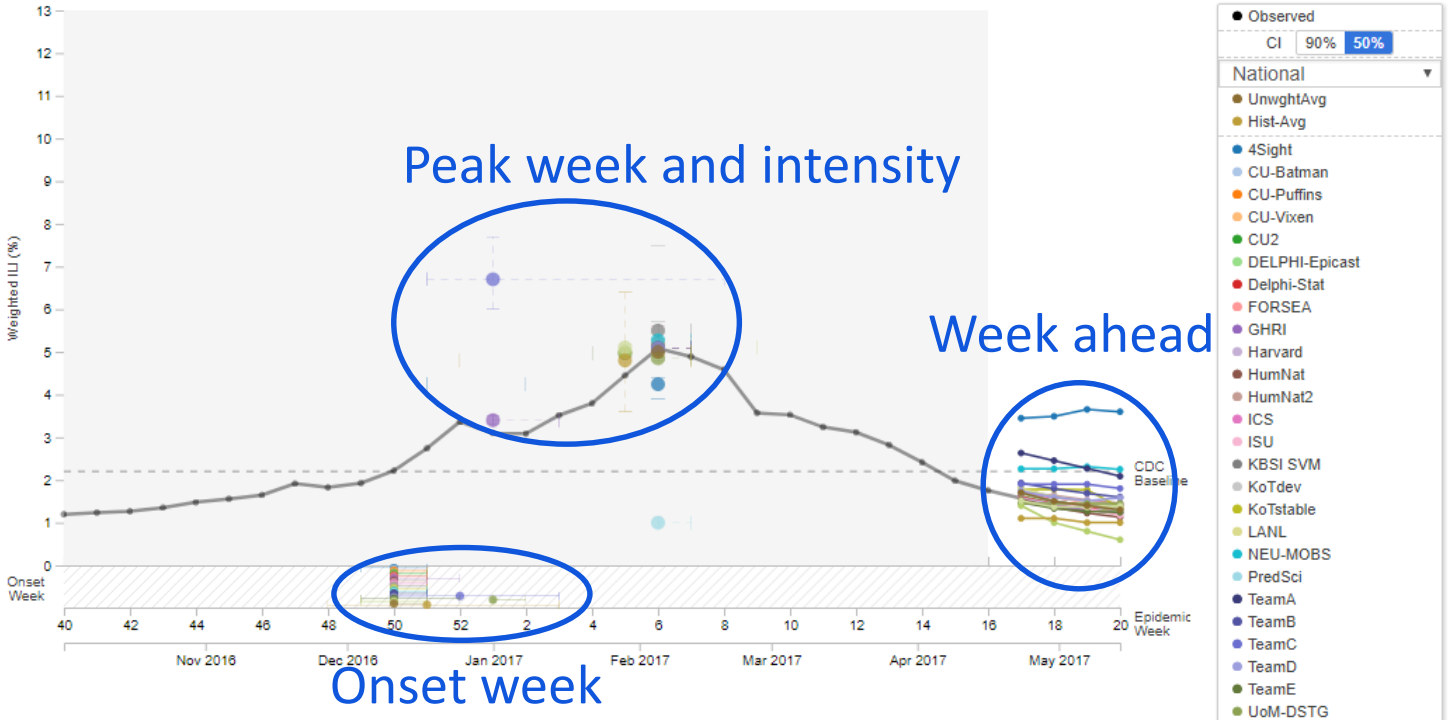

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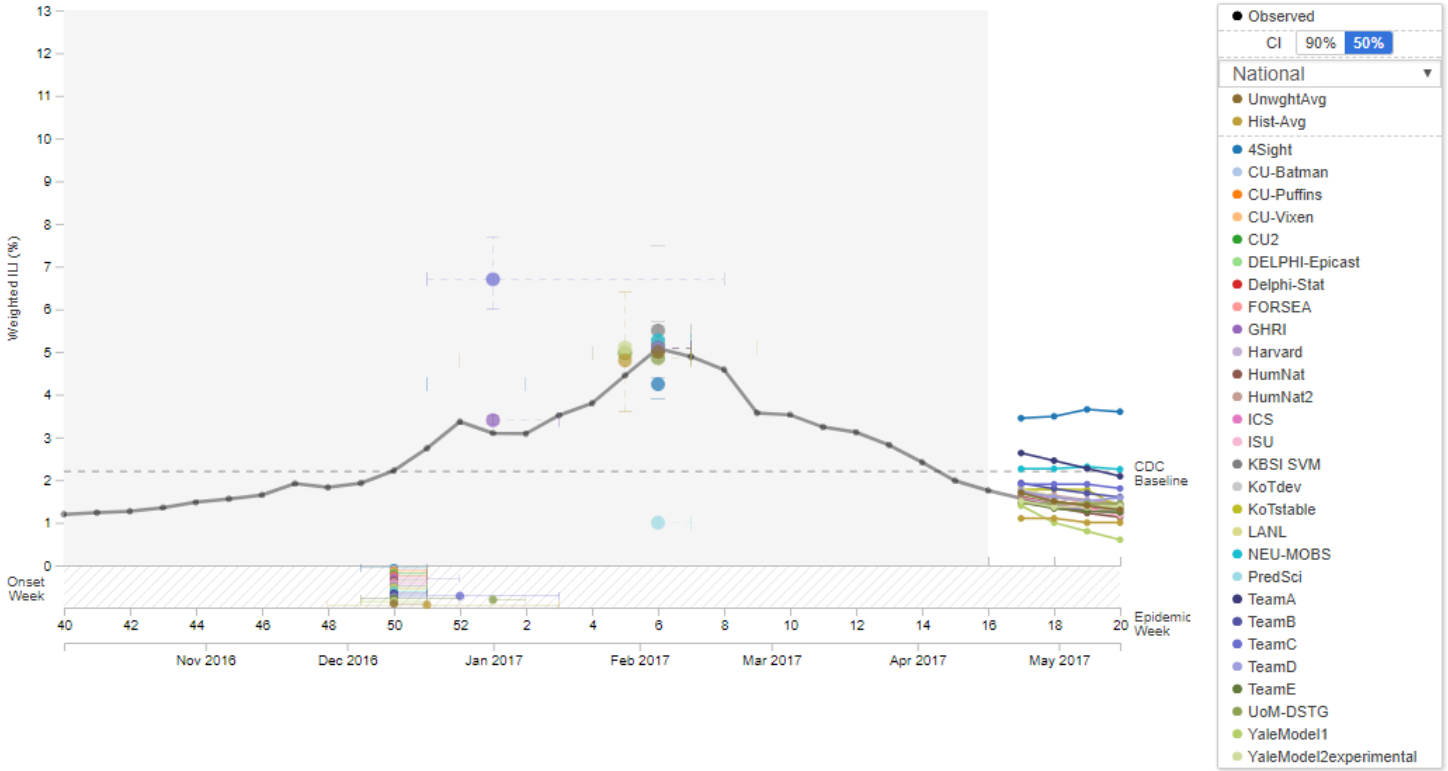

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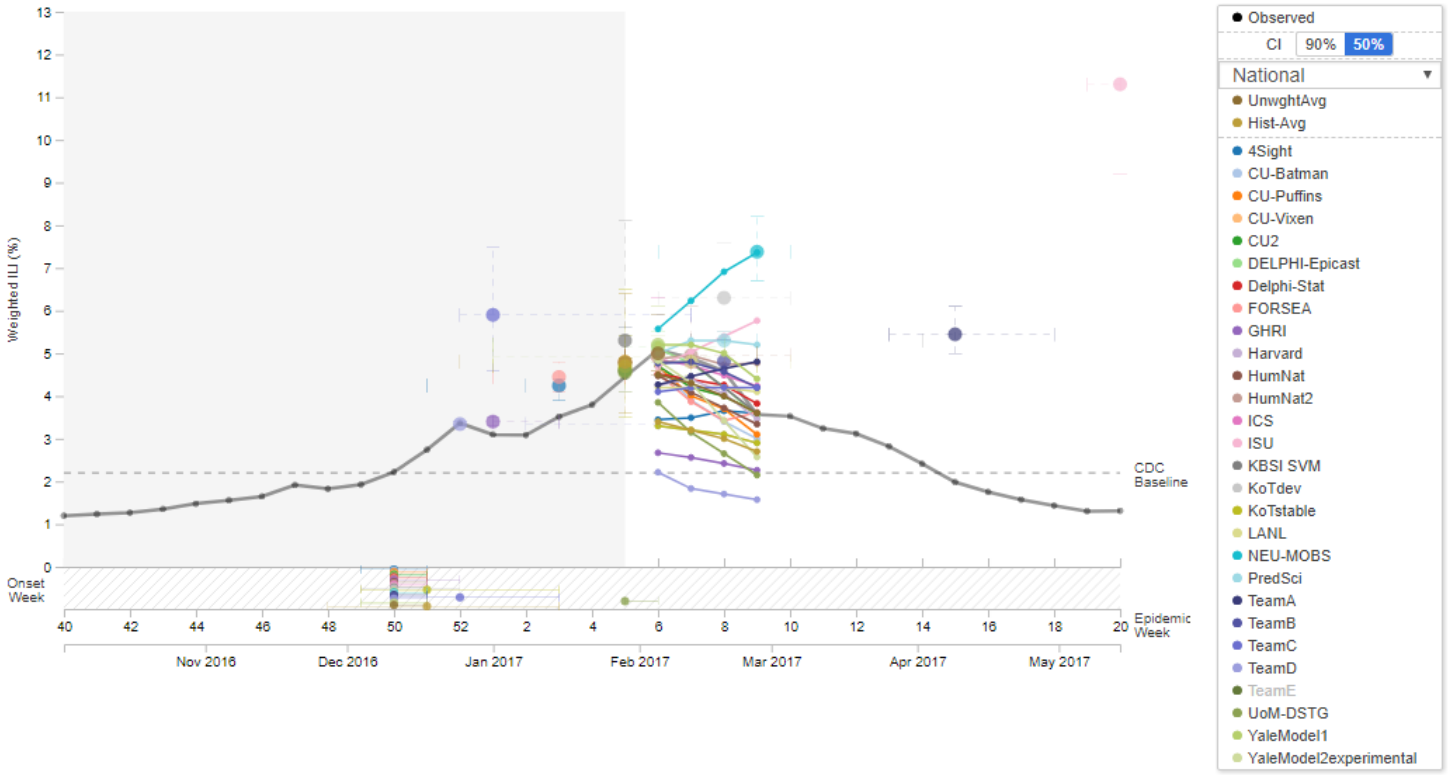
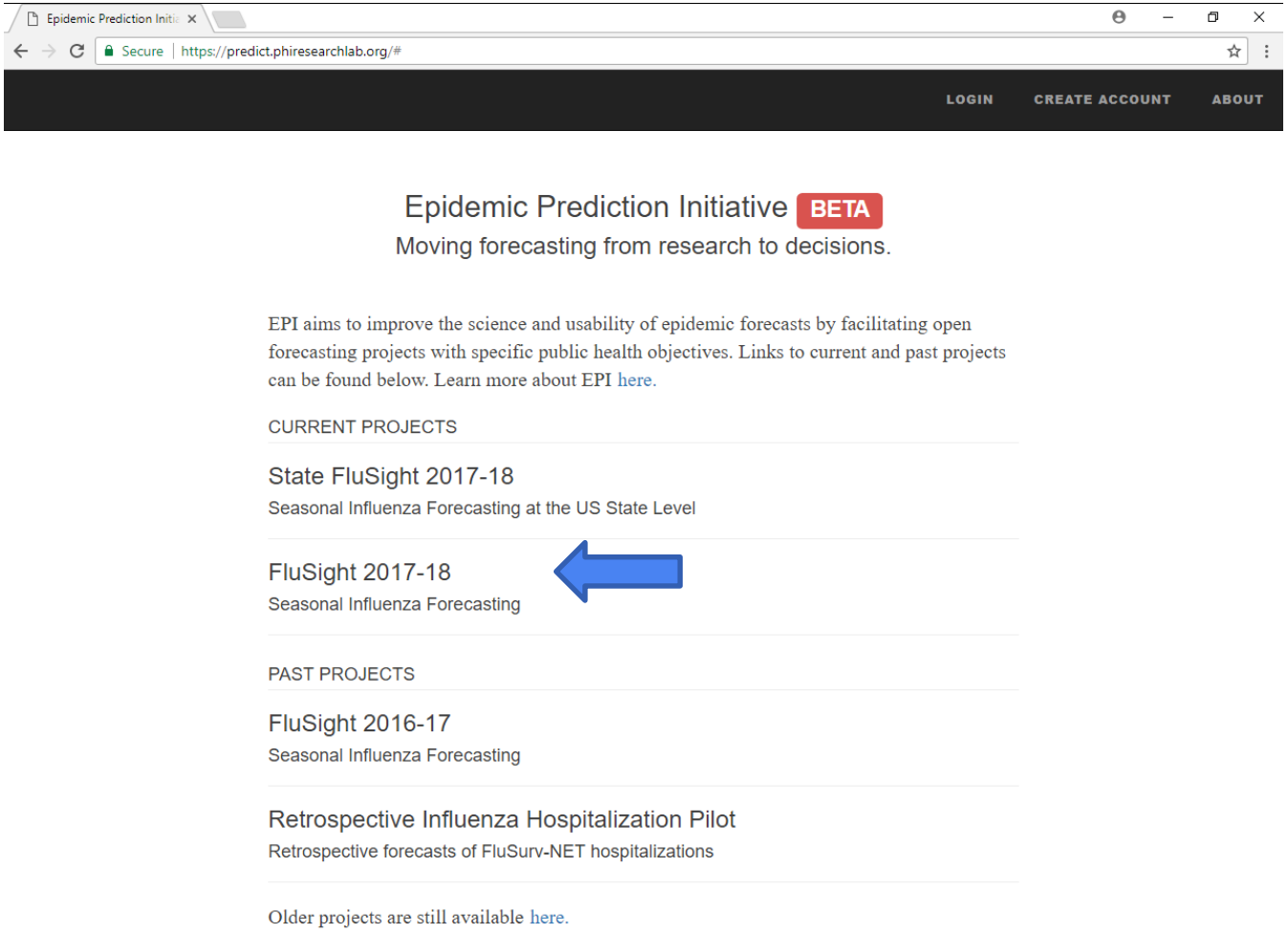


Interpreting Forecasts

Interpreting Forecasts



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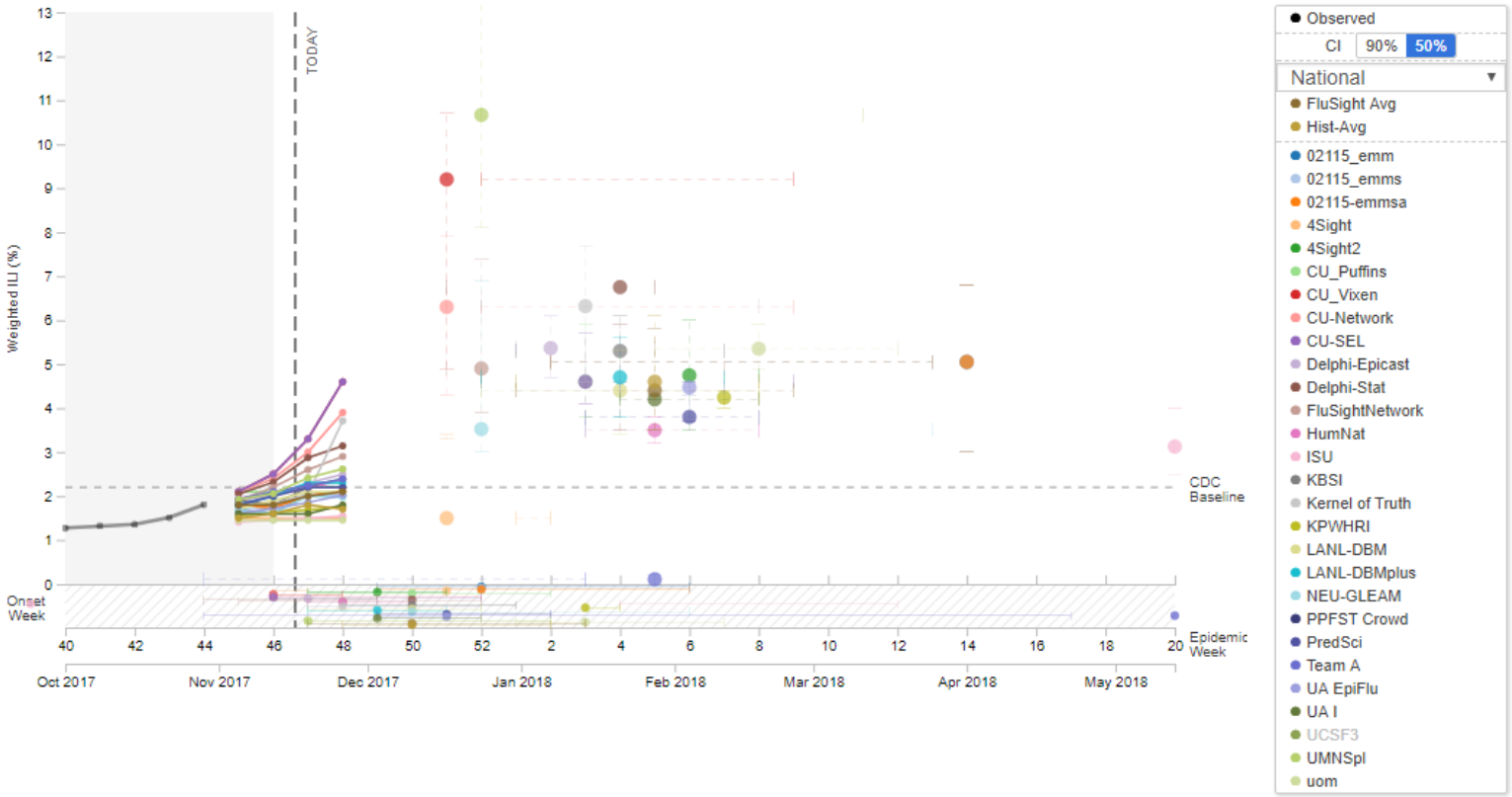
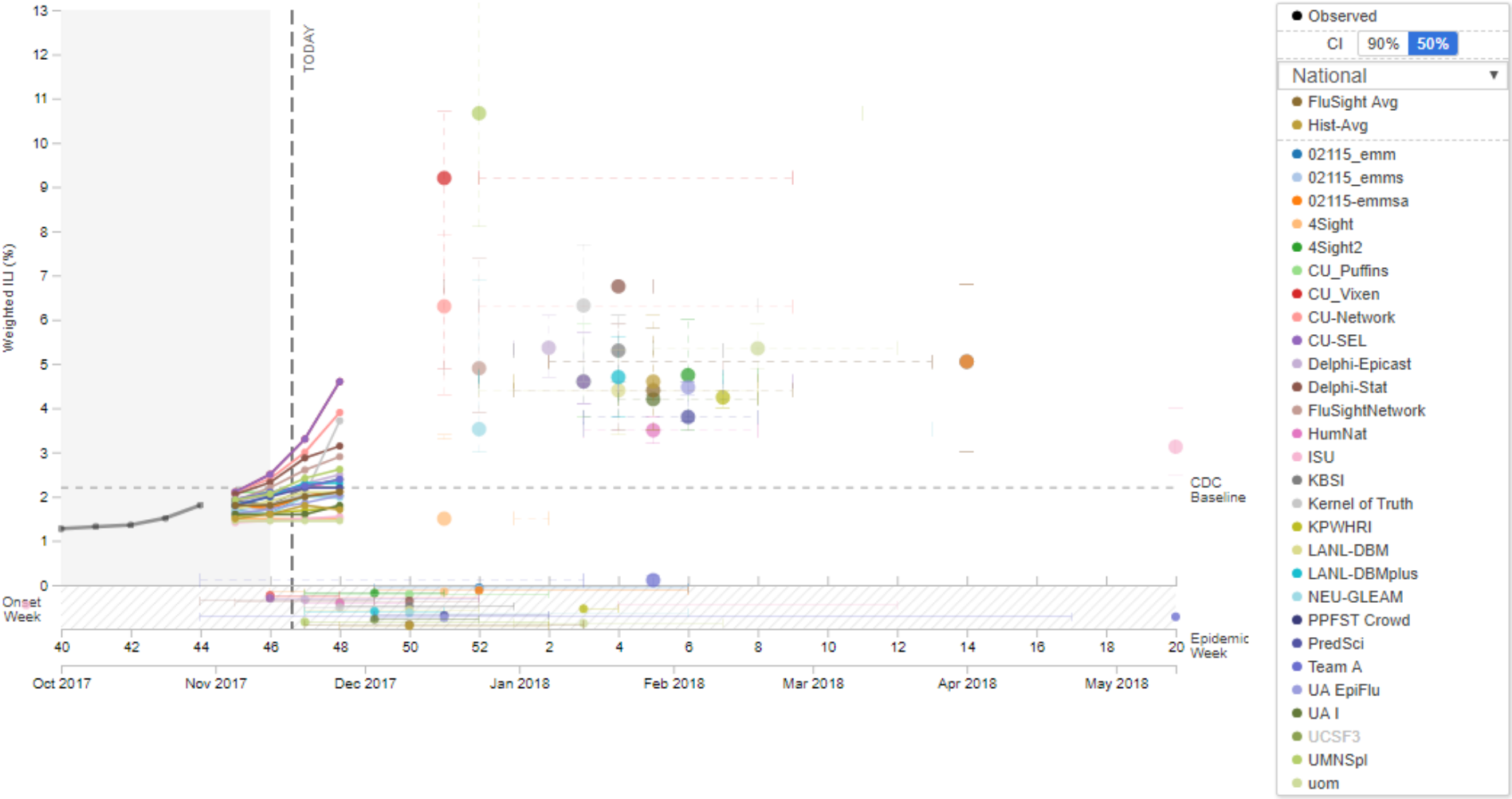
Submitted Forecasts

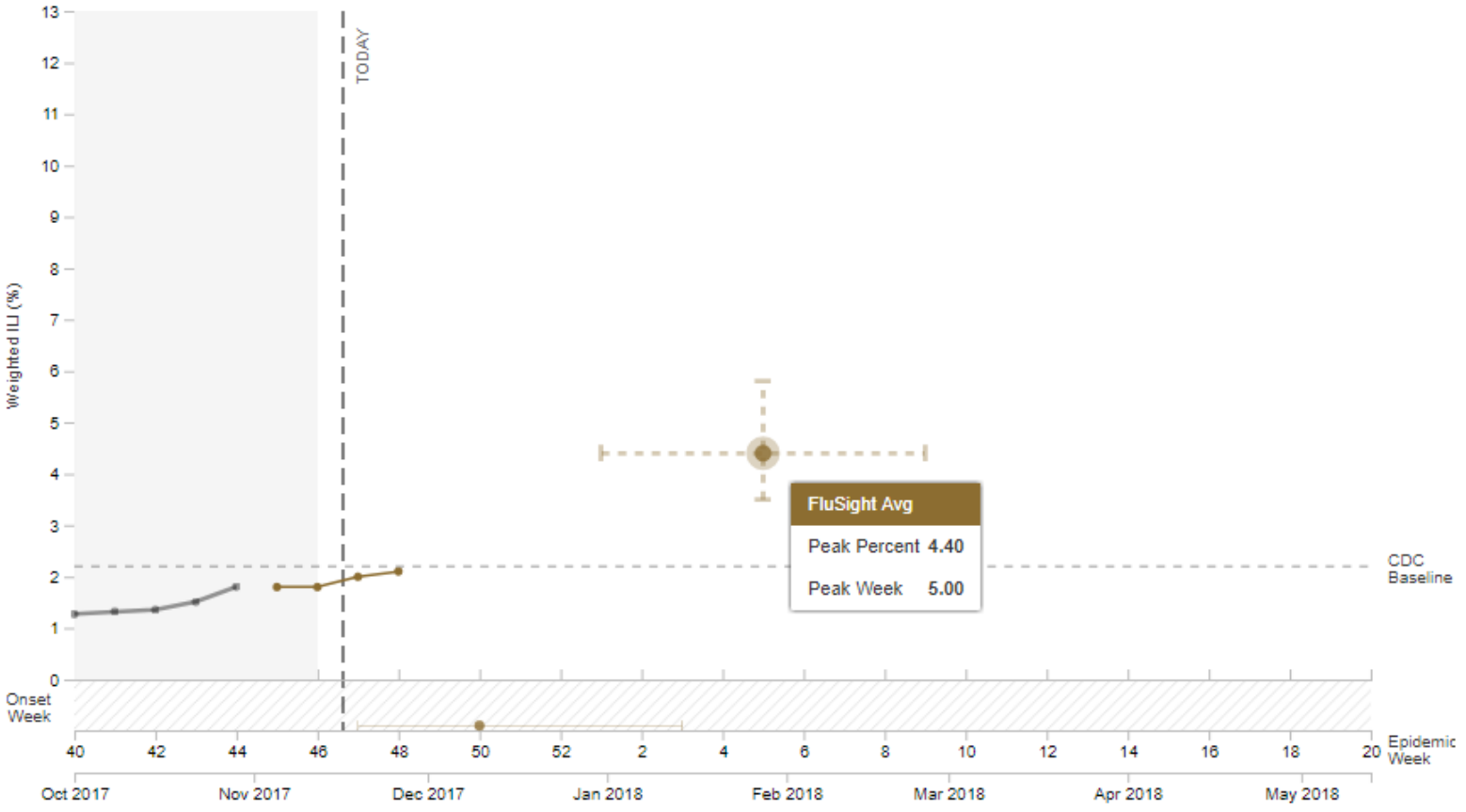
Use the interactive tool below to explore submitted forecasts for the 2017-18 influenza season.

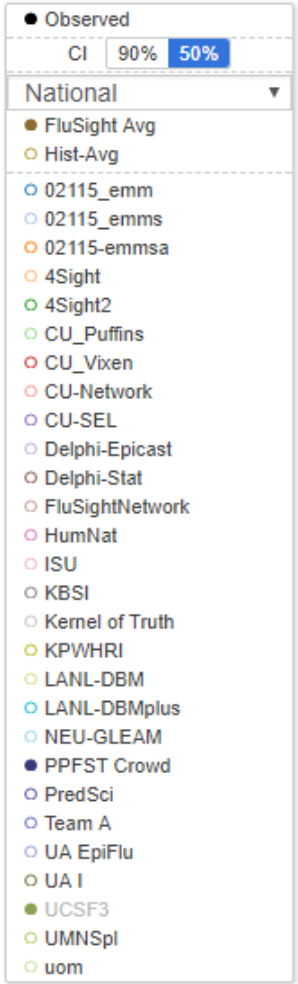


2017-2018 Week 44 National Forecasts

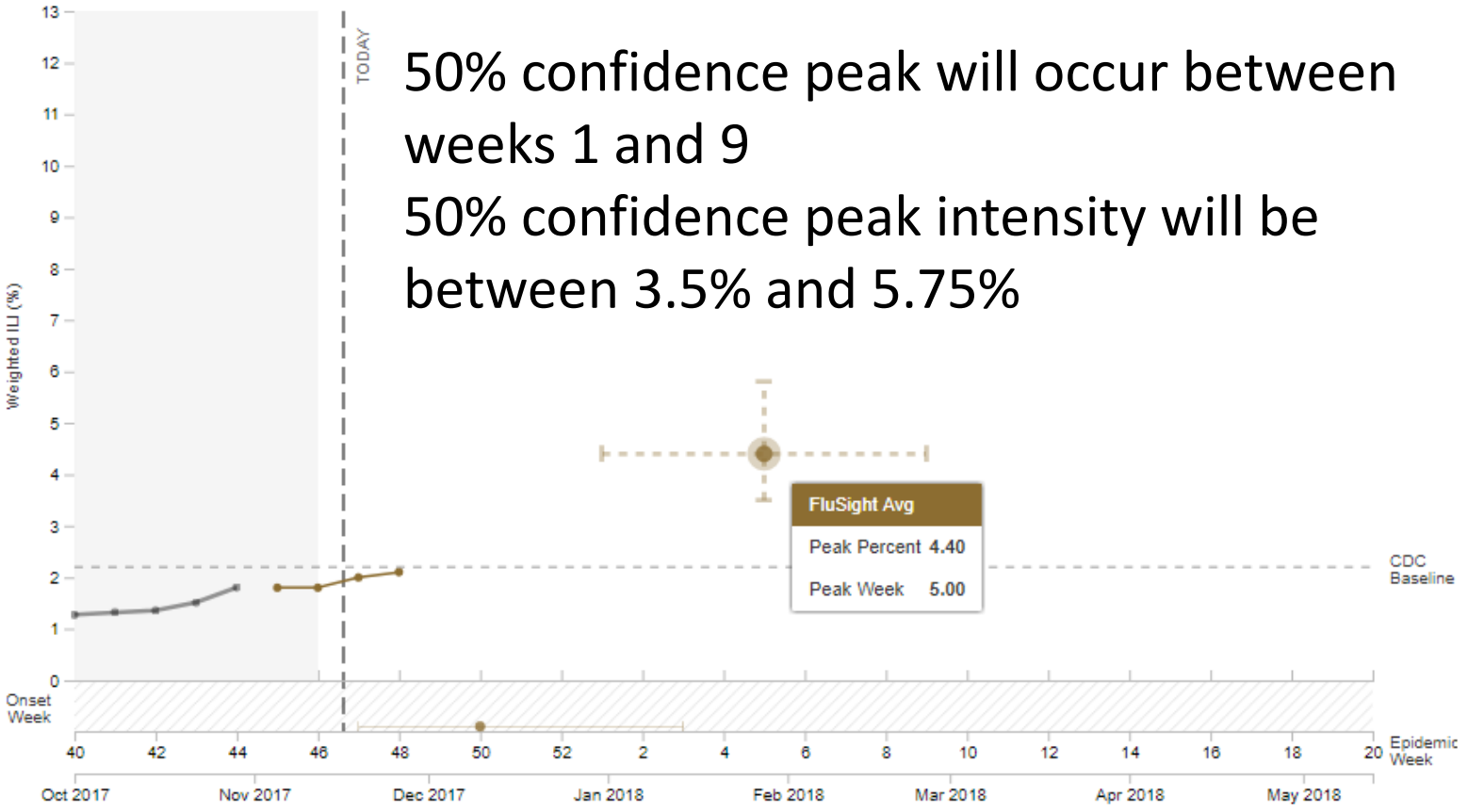


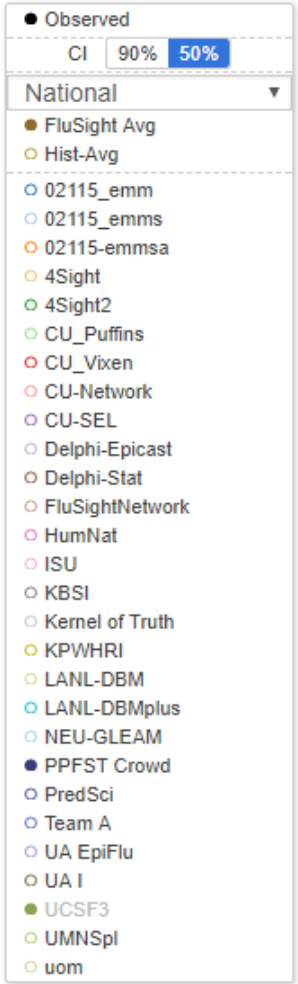
Ensemble Forecast of Peak Week/Intensity





Interpretation of confidence bands



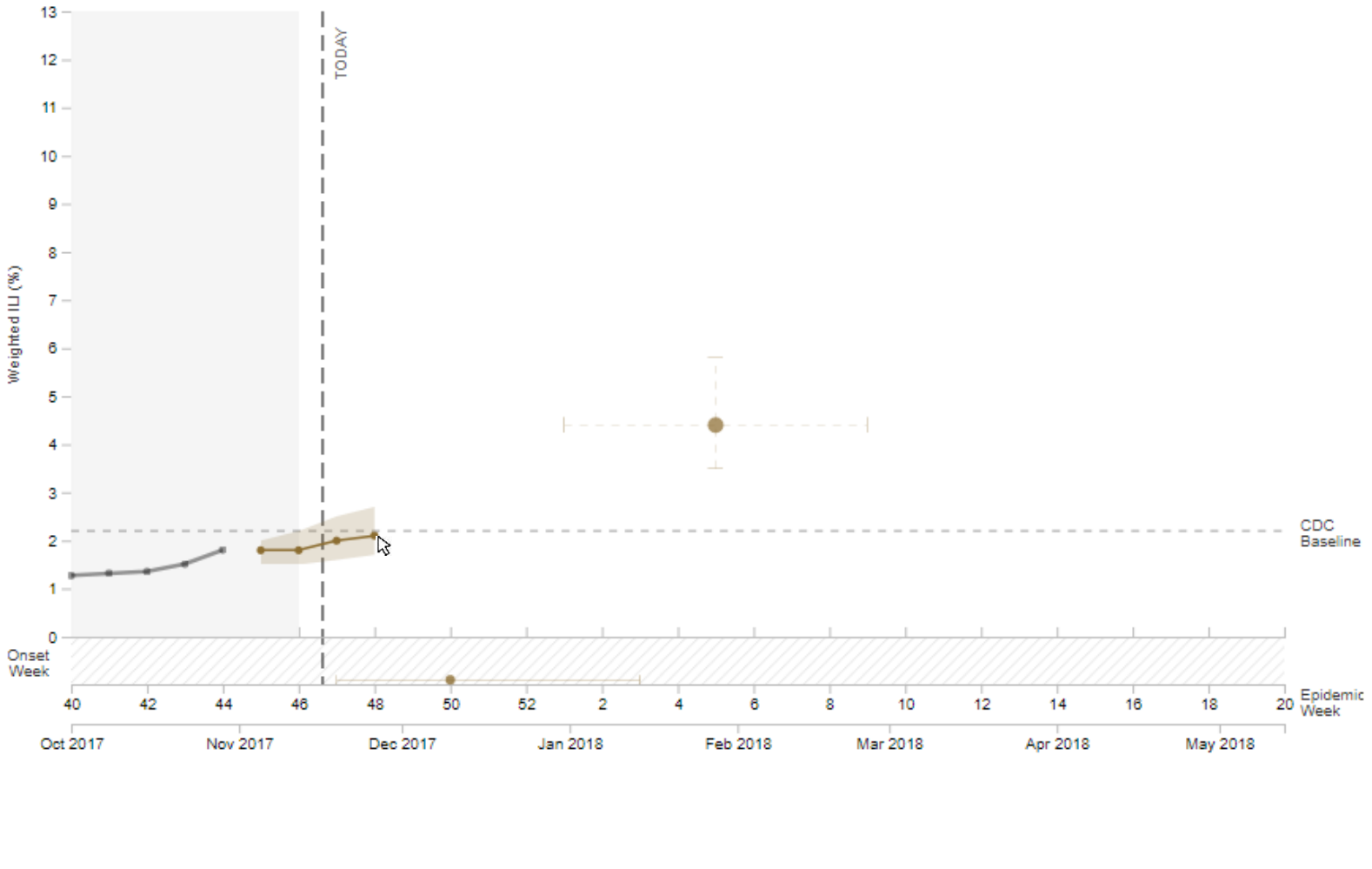


50% confidence peak will occur between weeks 1 and 9

50% confidence peak intensity will be between 3.5% and 5.75%

50% confidence onset will occur between weeks 47 and 3

Confidence bands for week-ahead forecasts



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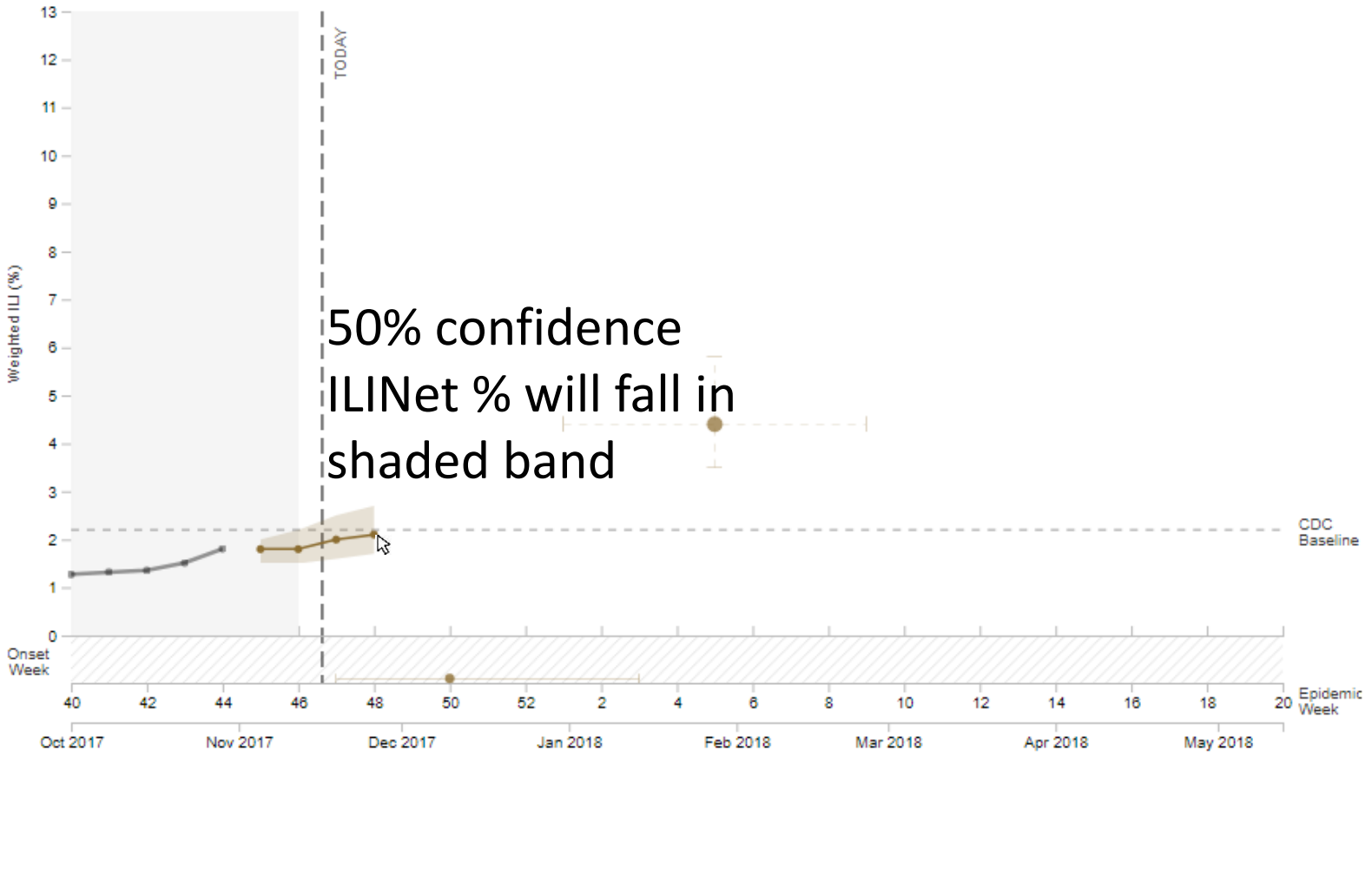
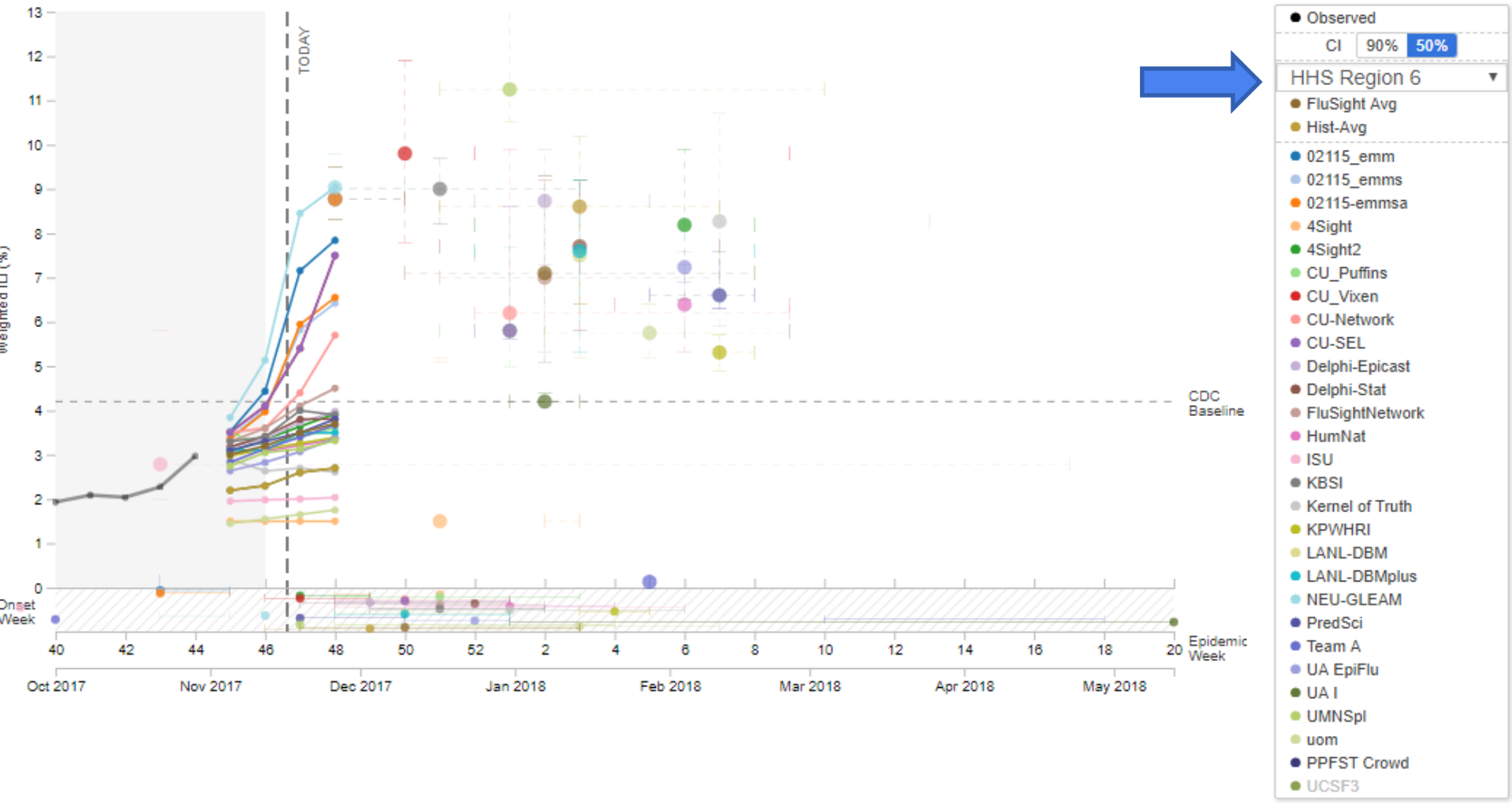


Regional forecasts also available



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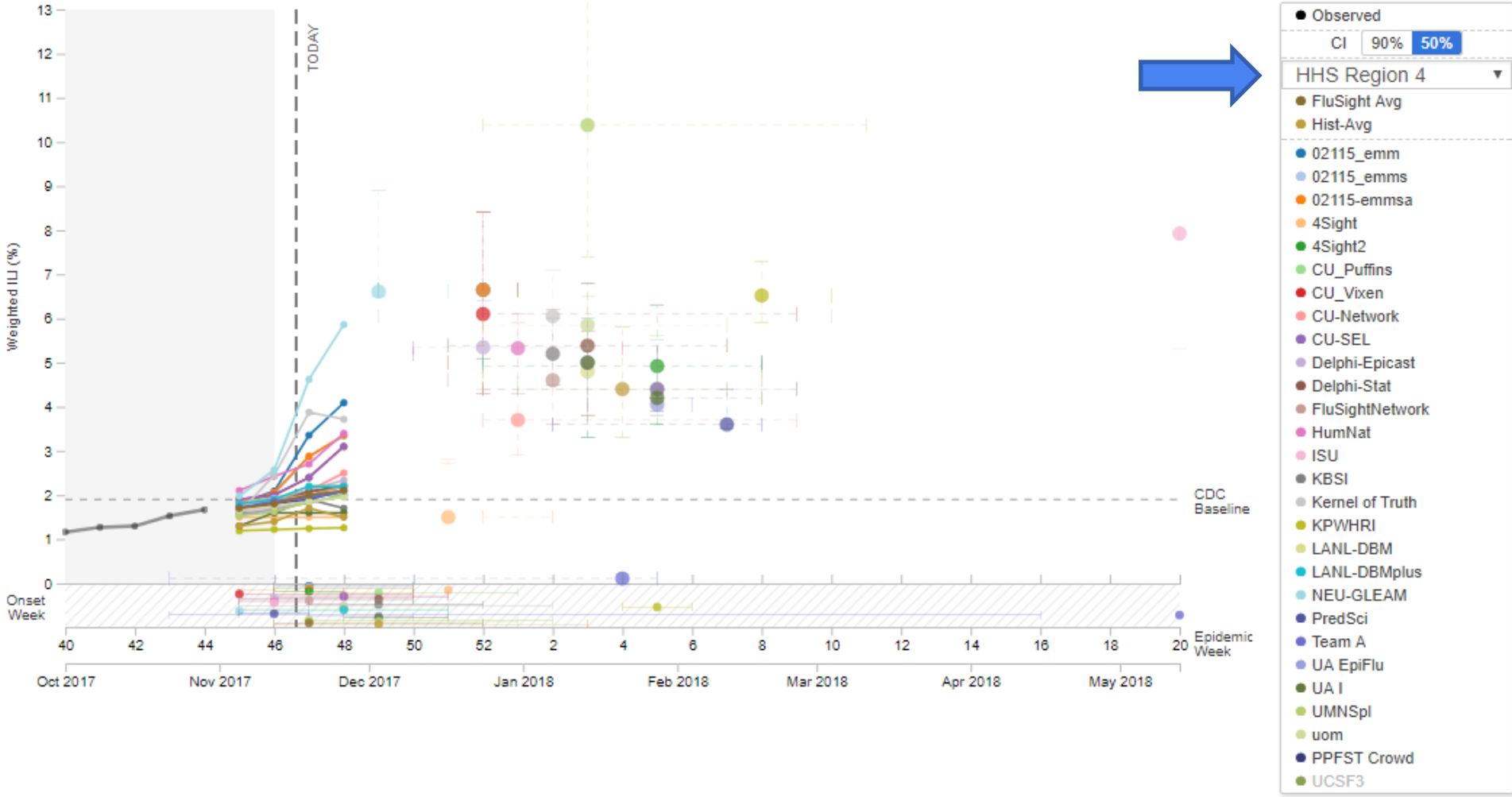


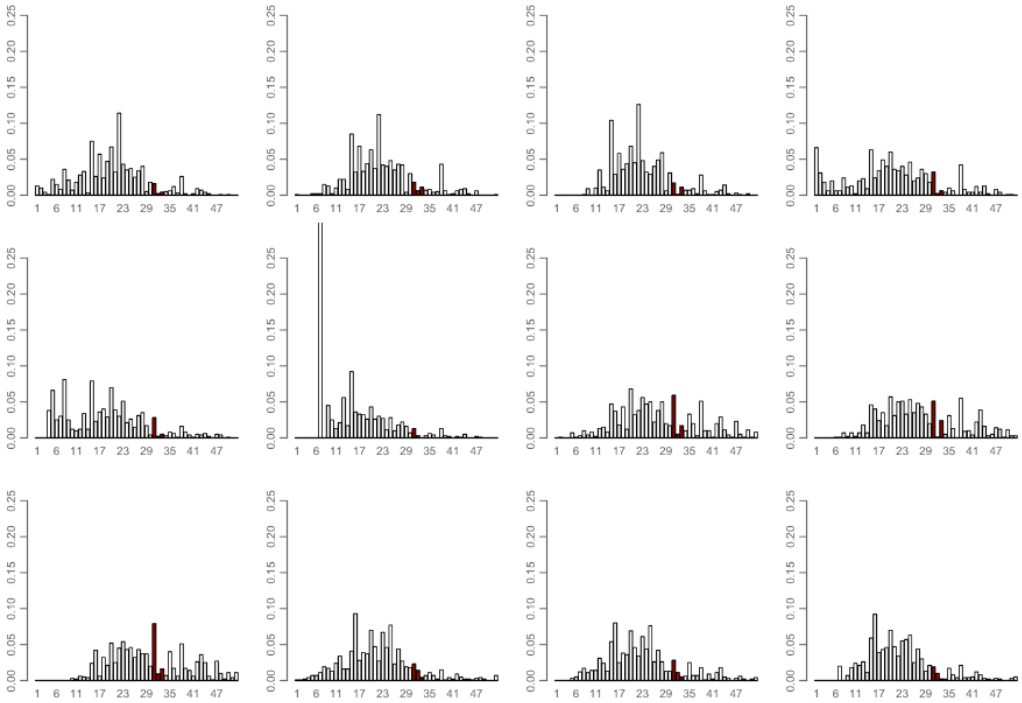
Updates and known issues

- Moving to .cdc.gov web address in coming months
  - Better servers, better user experience
  - Current address will re-direct
- Visualizations do not work in Internet Explorer
  - Chrome, Firefox, Safari, Edge are all ok
- State level forecasts not rendering correctly
  - Working to fix ASAP
  - Visualizations will be similar to those for national/regional forecasts and interpreted similarly

Questions????

Evaluation

Evaluating multiple forecasts

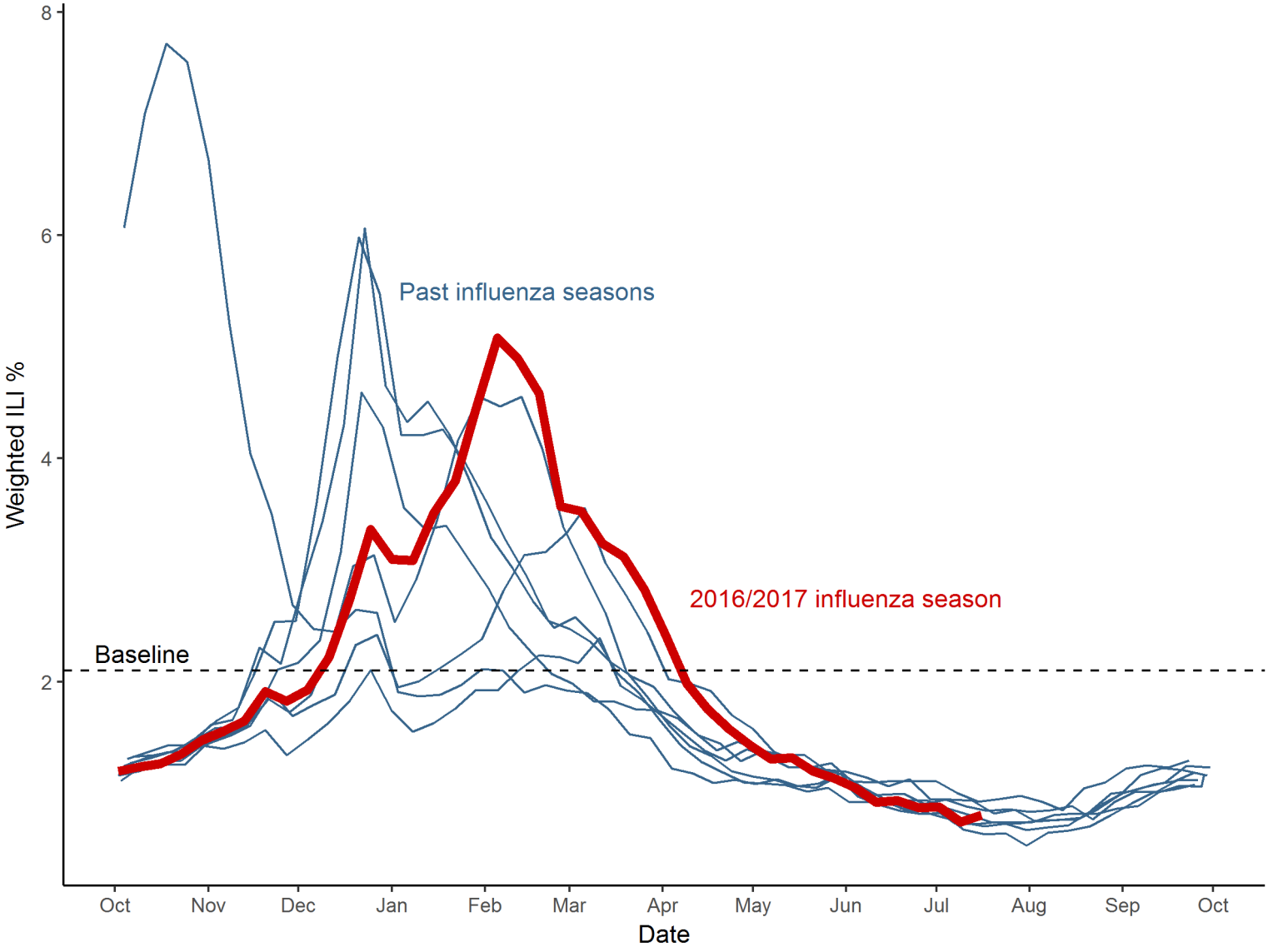


Log Score =
average log probability

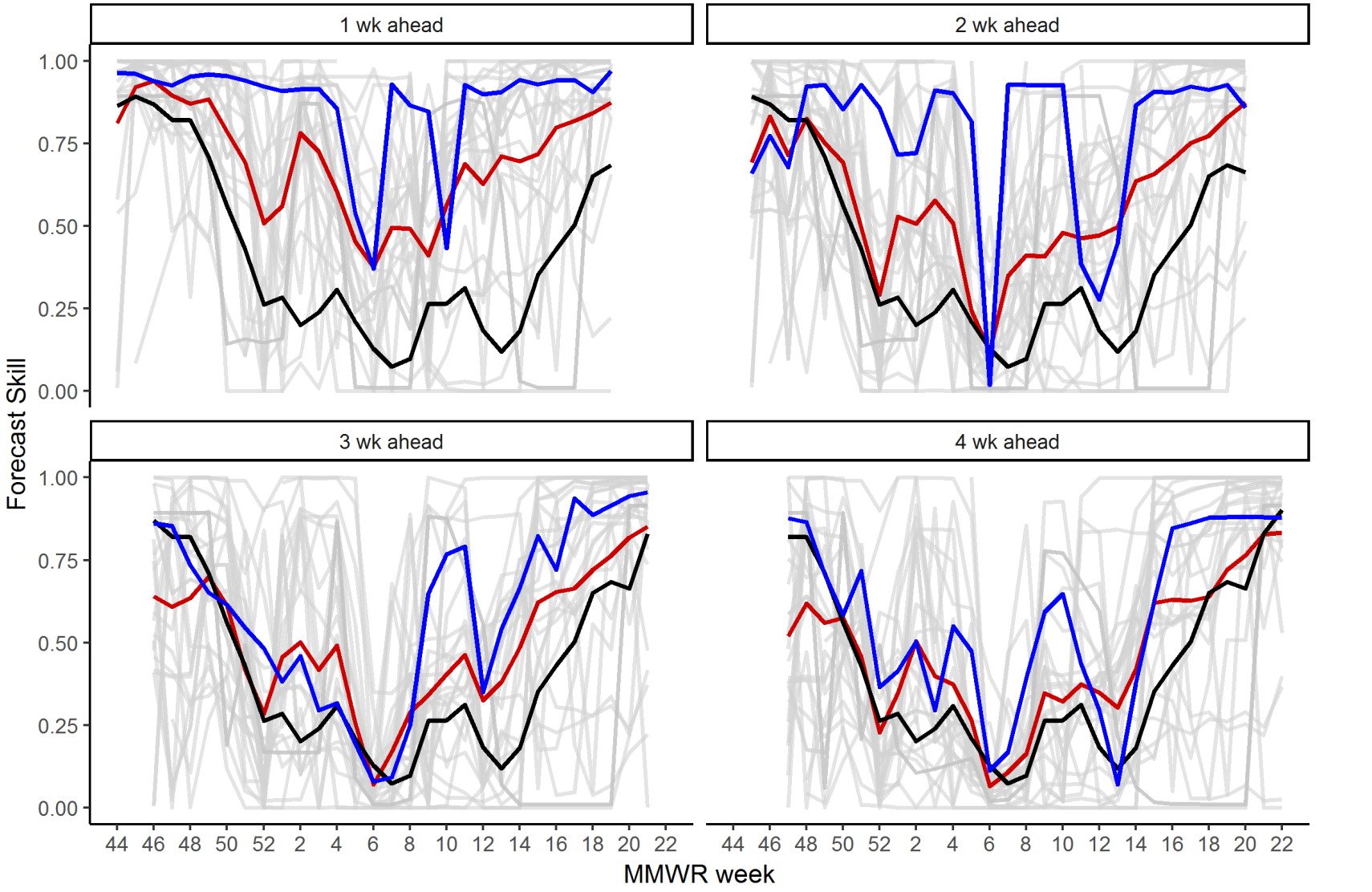
Forecast Skill =
exponentiated Log Score

0 = Worst case scenario
1 = Perfect forecast

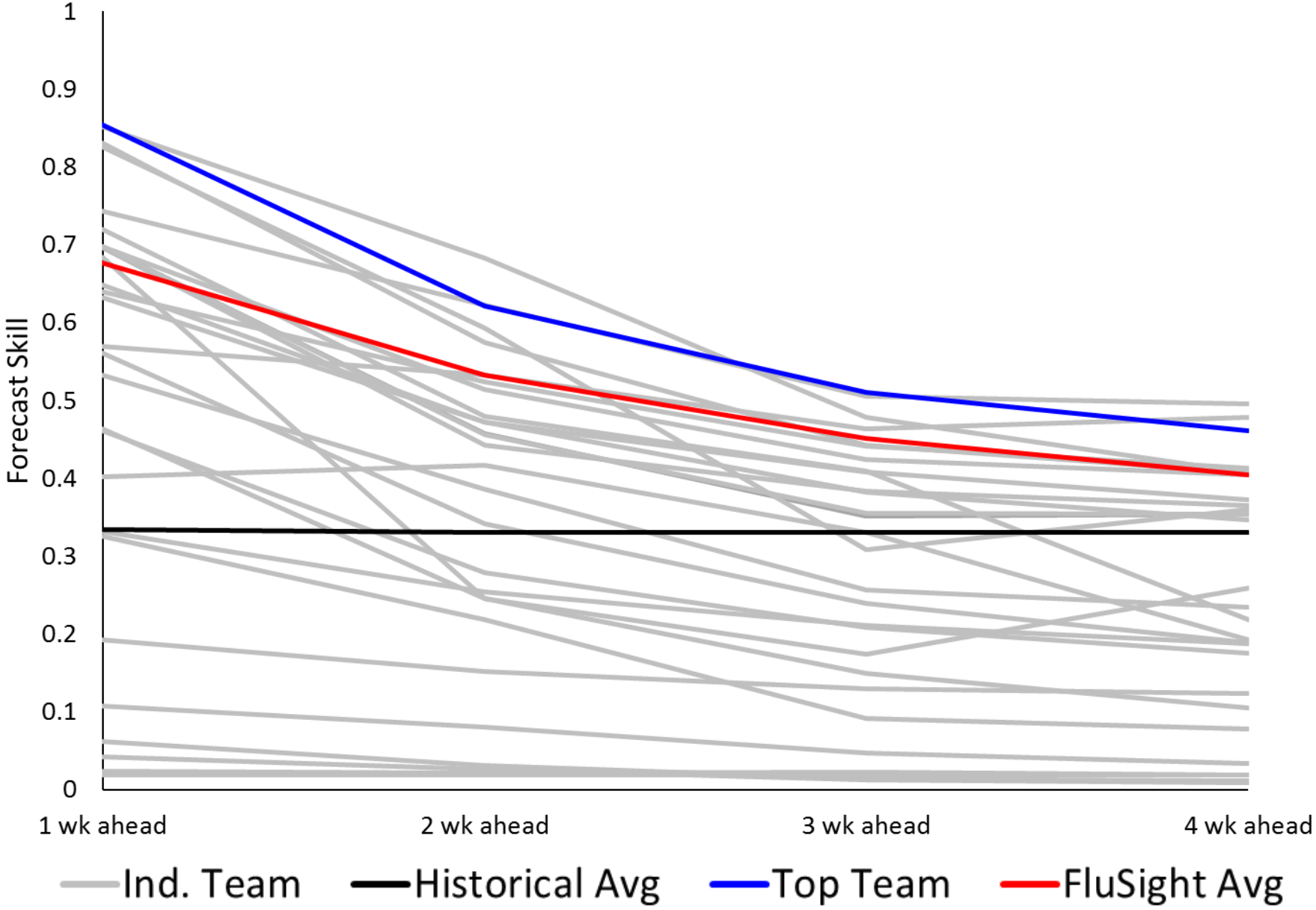
2016/2017 Influenza Season



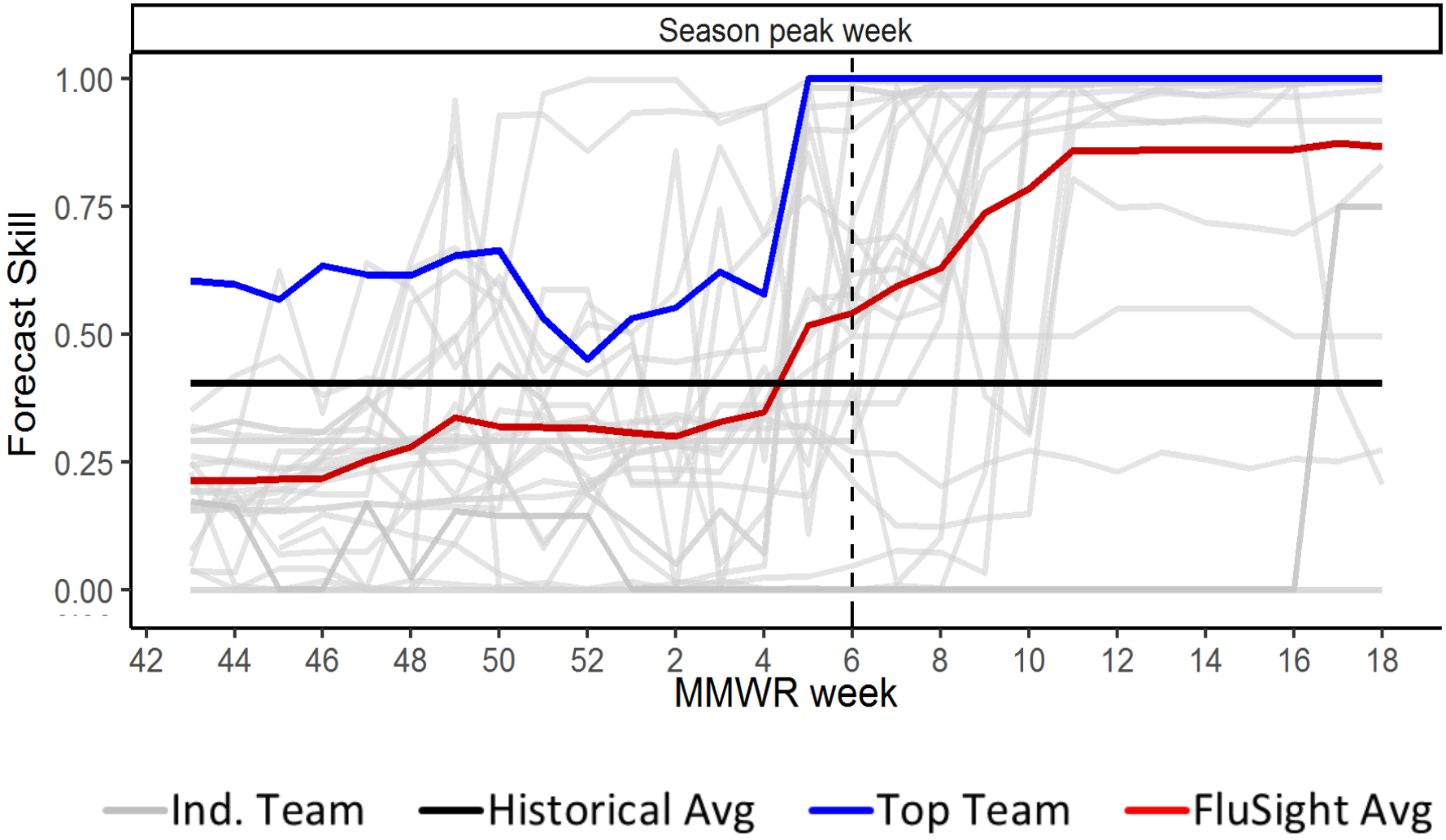
US Weekly Forecast Skill – Week-ahead Targets



US Overall Forecast Skill – Week-ahead Targets



Weekly Forecast Skill



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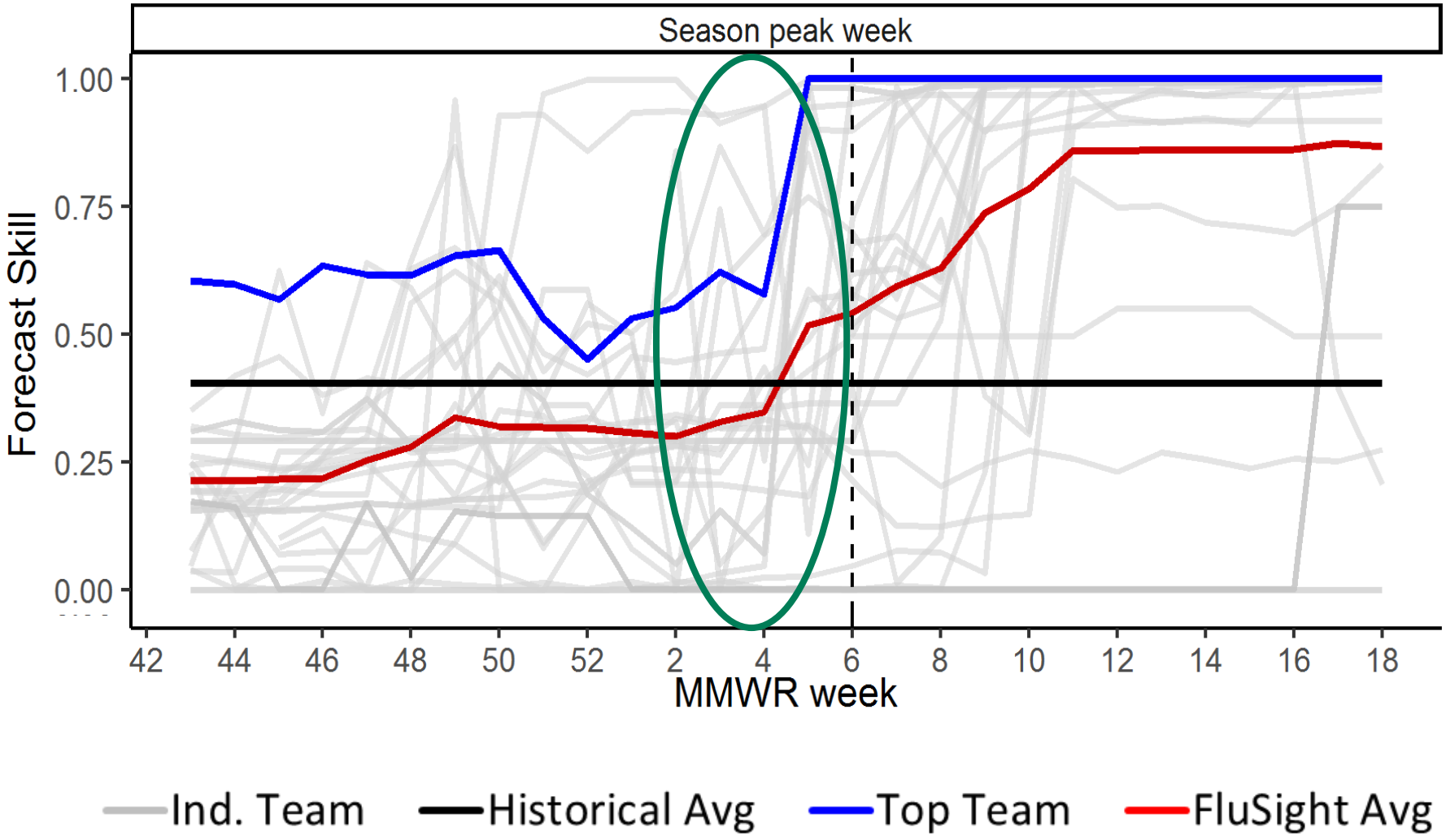

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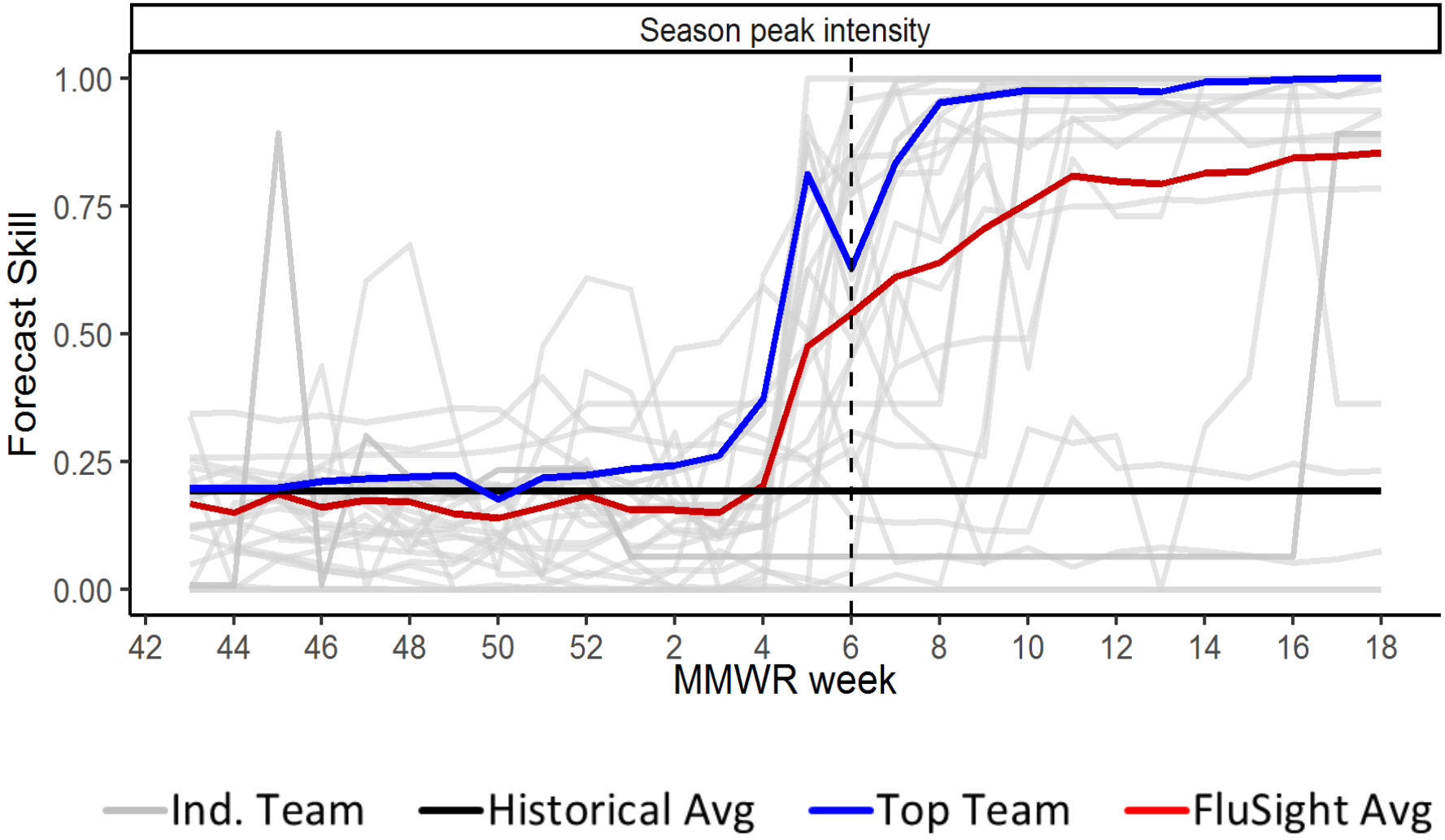

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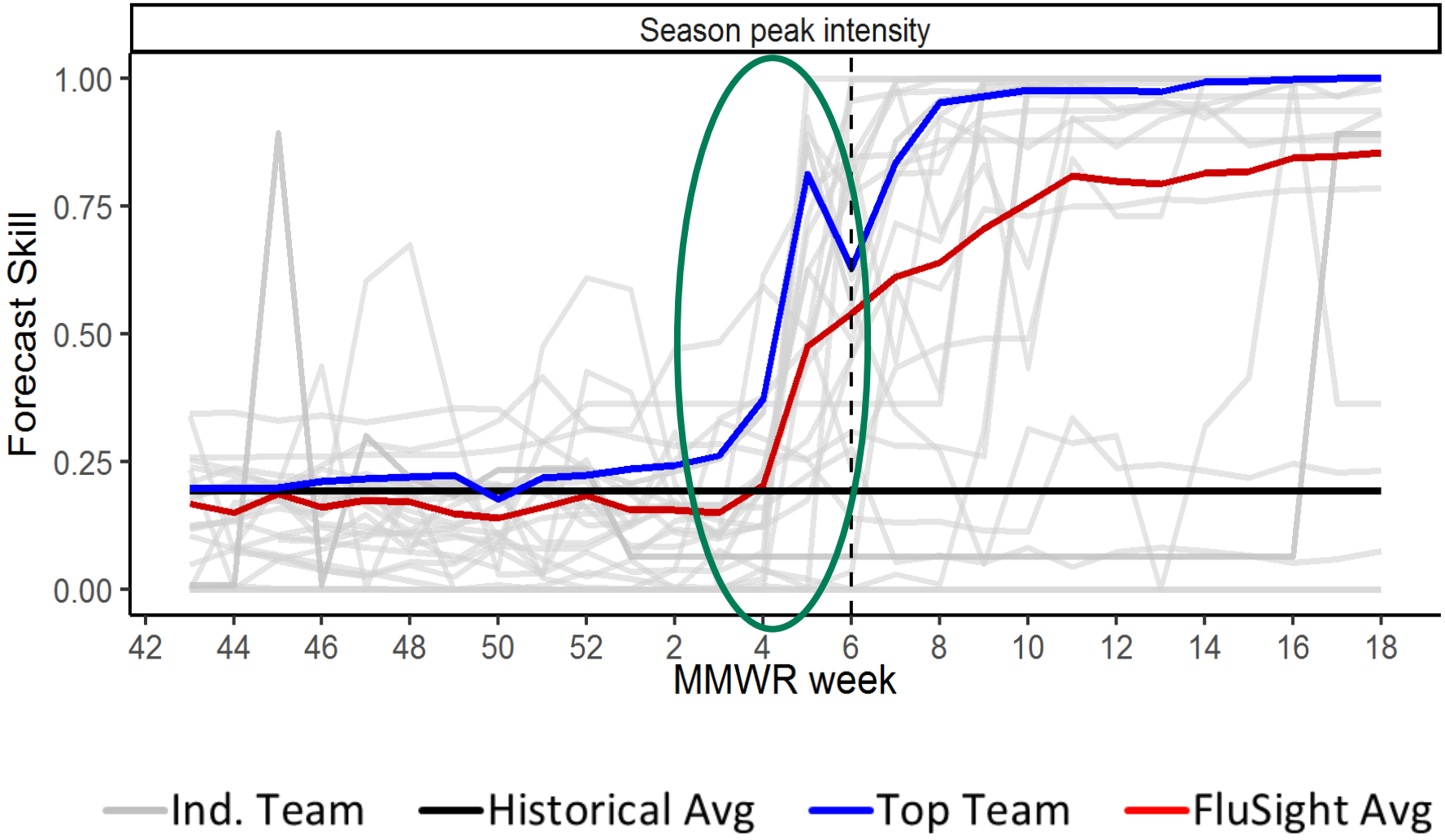

2016–17 Team Rankings

Short-term	Seasonal
Delphi	Columbia University
FluSight Average	Delphi
Columbia University	FluSight Average
KOT	LANL
LANL	HumNat

Out of 21 teams

2016–17 Team Rankings

Short-term	Seasonal
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Out of 21 teams

Forecasting results

Forecasts

- Forecasts more accurate for near-term targets
- Near-term forecasts most accurate early and late in the season
- Seasonal target accuracy increased 2-3 weeks prior to peak
- Simple average ensemble model (FluSight) performed well for near term and seasonal targets
  - Work to develop/test a more accurate ensemble model is ongoing this season

Pilots

State Forecasts Pilot

Purpose

- Determine accuracy of state-level ILINet forecasts
- Determine if state-level data impacts regional- and national-level accuracy

Targets

- Peak week, peak %, and % 1–4 weeks ahead

Timeline

- Pilot of state-level forecasts for 2017–18 season

Location (Forecasts coming soon!)

- https://predict.phiresearchlab.org/ then click “State FluSight 2017-18”

Hospitalization Forecasting

Purpose

- Determine accuracy FluSurv-NET forecasts (confirmed influenza hospitalization rate)
- Compare with ILINet forecasts (non lab-confirmed)
- Evaluate utility to inform severity/burden estimates

Targets

- Overall rates and rates by 5 age-groups 1–4 weeks ahead of publication, peak week, peak rate

Timeline

- First forecasts will be displayed December

Please join the forecasting working group!

Matthew Biggerstaff, mbiggerstaff@cdc.gov
Michael Johansson, mjohansson@cdc.gov
Craig McGowan, cmcgowan@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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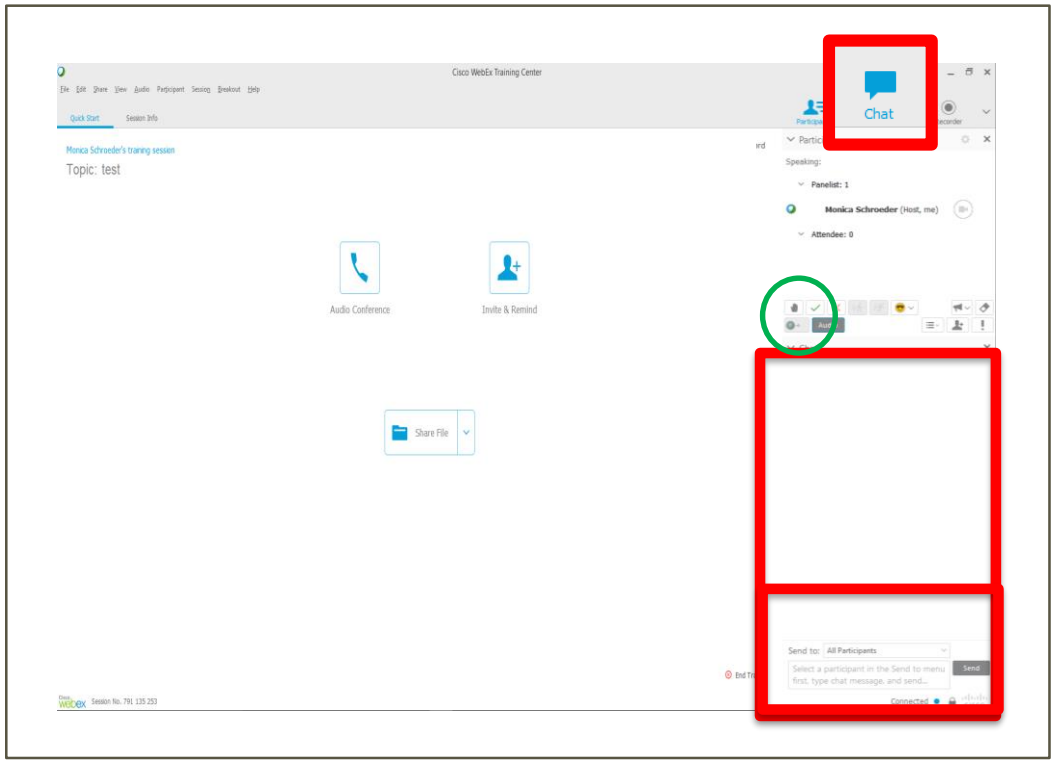
- To ask a question verbally, select the “Raise Hand” icon below the participant panel



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