# A Flu Forecasting Game

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Gensyn
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Cassandra Labs
Nov 14, 2026

# Today

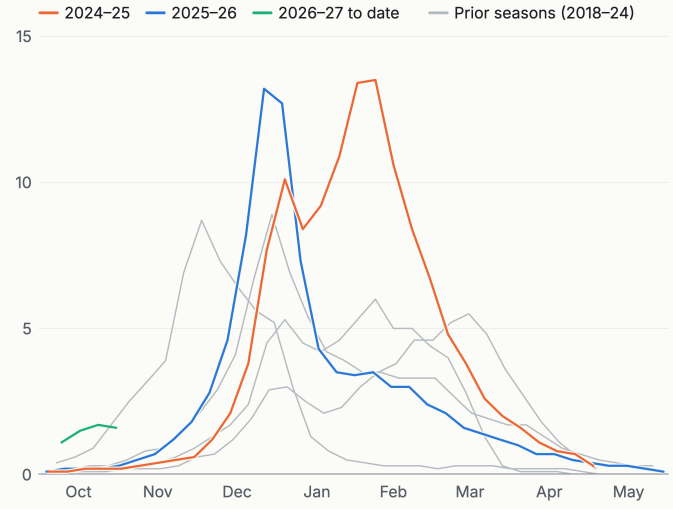
1. Forecasting flu

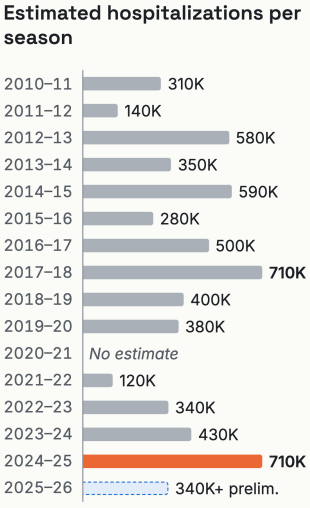
   *Why, who, how*

2. Under the hood: Median prediction markets

   *A new type of prediction market*

# Influenza in the U.S.



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- Social benefit

  *unpredictable, consequential, useful – policymakers, hospitals, individuals*

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- High-quality data

  *NHSN weekly hospitalizations, updated*

# Some prior work

Flu forecasting:

- CDC FluSight, e.g. Reich et al. (2019)
- with human judgement, McAndrew et al. (2022)
- with prediction markets, Polgreen et al. (2006), Tung et al. (2015)

Play-money prediction markets:

- Servan-Schreiber et. al (2004)
- Rosenbloom et al. (2006)

Prediction markets for median and properties:

- Lambert et al. (2008)
- Frongillo and Waggoner (2018)

# CDC FluSight

## Forecasted weekly influenza hospital admissions

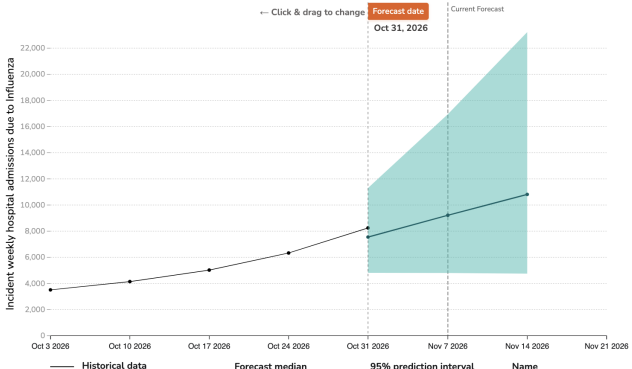
Select a location and week ending date to see the FluSight ensemble forecast (95% prediction interval) based on forecasts submitted by November 04, 2026.

United States | November 7, 2026 | November 14, 2026 | November 21, 2026

Forecasted **16,100** influenza hospital admissions (4.72 per 100,000 people)

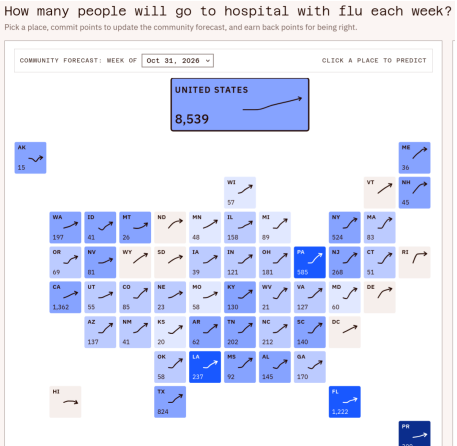
95% prediction interval from 6,900–30,100 hospital admissions (2.03–8.86 per 100,000 people)

Select forecast location, date, and models below. Modeling based on forecasts submitted by November 04, 2026. Click and drag to change the forecast date to see how previous forecasts performed against reported data.



# The Flu Forecasting Game

- Play money, dropped weekly
- 53 locations: US states, US total, D.C., Puerto Rico
- 34 weeks: October - May
- **1680 prediction markets**



# Prediction markets for the median (and quantiles)

# Numeric outcome: standard approaches

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**(1) Bucketing.** *Probability of 0-100, 101-1000, ...*

**Problems:** UI overload, picking buckets, predicts histogram.

**(2) Single security.** *Payoff = number of hospitalizations*

**Problems:** escrow needed (even for play money!), predicts expectation.

**Example:** Current price 20,000. Sell one share. Escrow 300,000,000.

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**Claim:** Community forecast converges to the **median**

*The number X s.t. Pr[above X] = Pr[below X] = 50%*

*"Proof."* If Pr[above X] $>$ Pr[below X], predict "Over", and vice versa.

# The absolute-loss market scoring rule

**Absolute loss:** $\ell(r, y) = |r - y|$.

**Fact:** the median minimizes expected absolute loss.

$\arg\min_r \mathbb{E}_{y\sim p} |r - y| = \mathit{median}(p)$.

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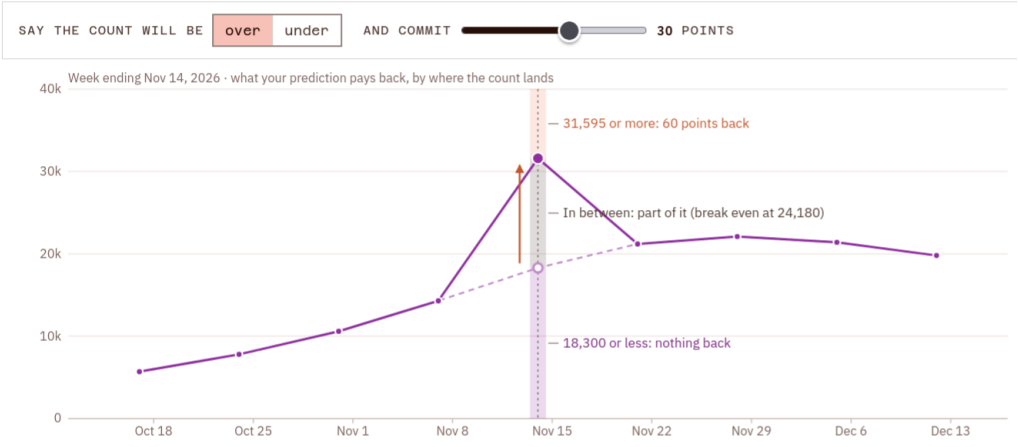
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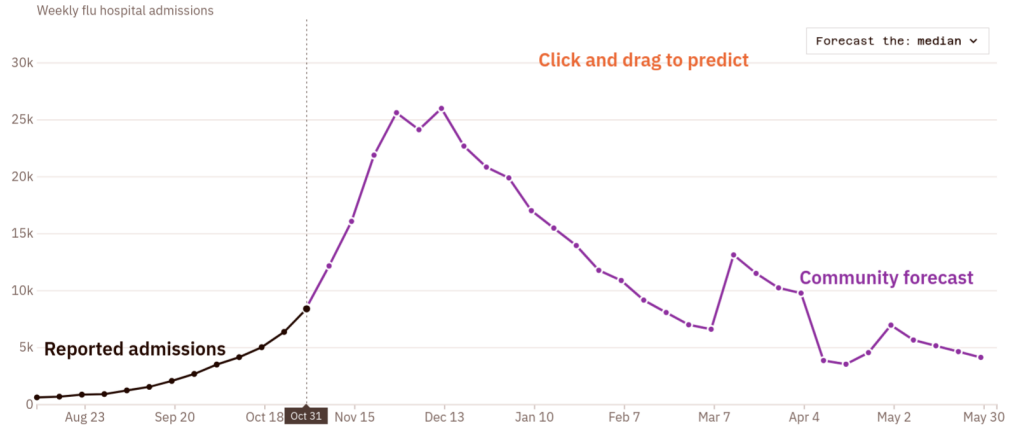
**Initial community prediction:** $r^{(0)} = 20,000$

- Participant $1$ moves community prediction to $r^{(1)} = 20,005$
- They escrow $5$
- Final outcome: $Y = 33,460$.
- Payout: $\ell(r^{(0)}, Y) - \ell(r^{(1)}, Y) = 5$.

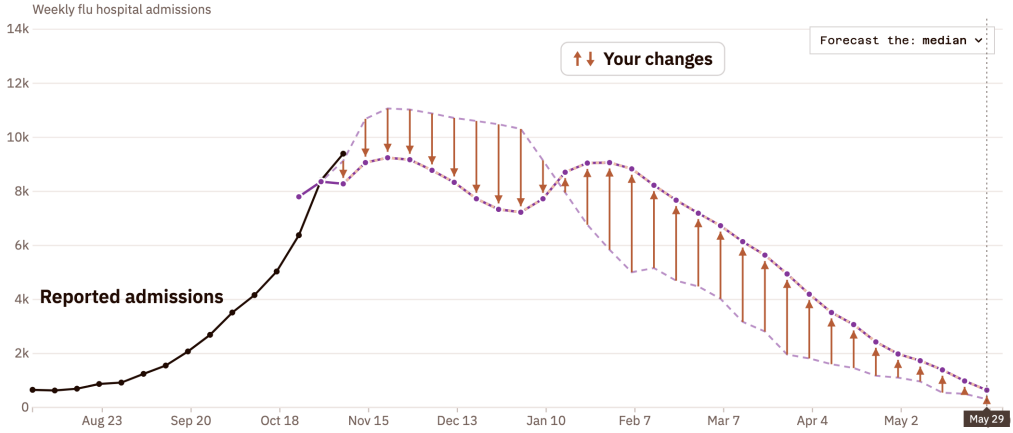
# Visualized


SAY THE COUNT WILL BE
over
under
AND COMMIT
30 POINTS
Week ending Nov 14, 2026 · what your prediction pays back, by where the count lands
40k
30k
20k
10k
0
31,595 or more: 60 points back
In between: part of it (break even at 24,180)
18,300 or less: nothing back
Oct 18
Oct 25
Nov 1
Nov 8
Nov 15
Nov 22
Nov 29
Dec 6
Dec 13

# Across many weeks

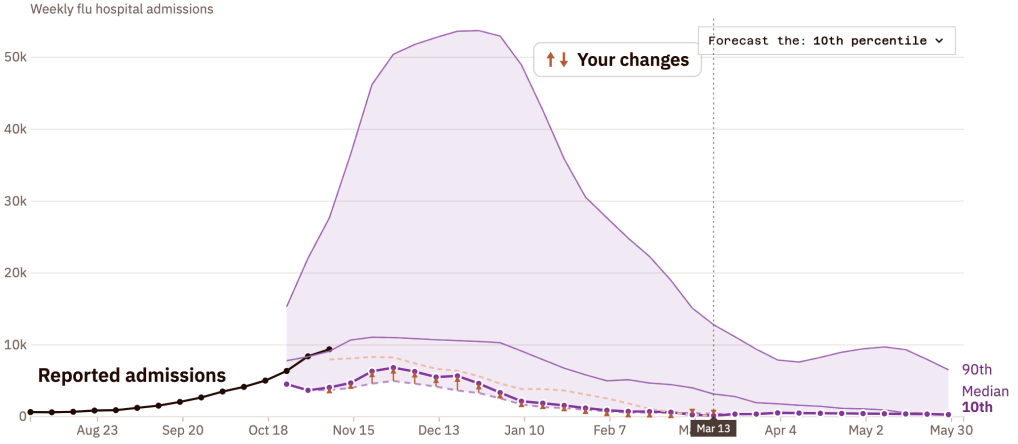


# Across many weeks



# 10th and 90th quantiles

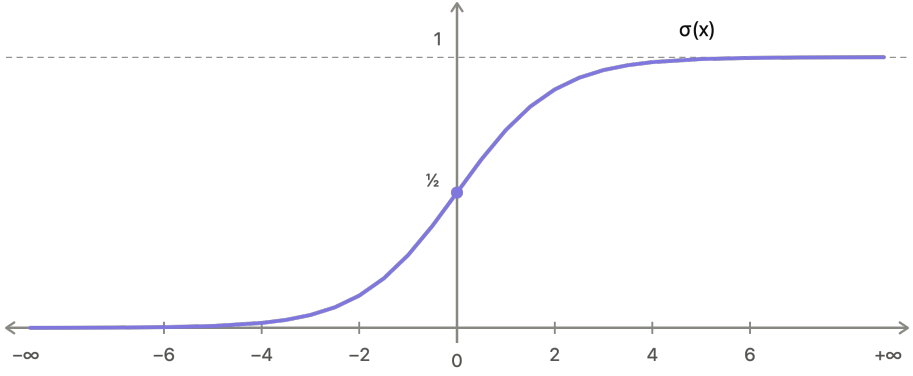
**Fact.** The loss $\ell(r, y) = \begin{cases} 0.1(y - r) & y \geq r \\ 0.9(r - y) & y < r \end{cases}$ elicits the 10th percentile.



# Sigmoid function

**Fact.** For any monotone $f : \mathbb{R} \to \mathbb{R}$, the loss $\ell(r, y) = |f(r) - f(y)|$ elicits the median.

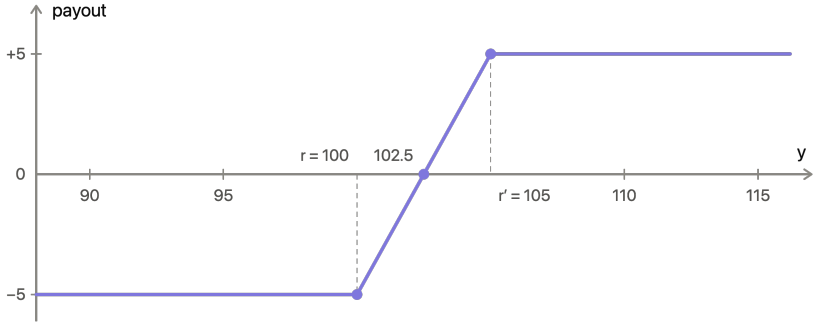
**So:** can allow unbounded predictions+outcomes with bounded payoffs.



# Median markets aren't "markets"

Unusual feature: Can't "sell back" your position. *it's locked in*

- bought $r^{(t-1)} = 100 \to r^{(t)} = 105$.
- now $r^{(t')} = 95$. No way to liquidate!



# Matching volume and liquidity

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**Approach:**

- Split play money and initial $\alpha$ by location population.
- Grow $\alpha$ with $\sqrt{\text{recent volume}}$.

# Thanks!

flu.delphi.fyi

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