

Technical report: The uncertain burden of COVID-19 and influenza in the upcoming flu season

25 October, 2022

Scenario Modeling Hub Team¹

Summary

As the 2022-2023 flu season approaches, there is substantial concern as to the potential for a “twindemic” from the combined influenza season and a new wave of SARS-CoV-2. This heightened concern comes in the context of multiple emerging SARS-CoV-2 variants of concern and the potential for a large influenza season due to limited transmission during the past two seasons. Of particular concern is the potential burden to healthcare facilities, with excessive hospitalizations straining health systems. To better understand what this burden might look like, we combined the ensemble estimates of hospitalizations from the latest rounds of the [COVID-19 Scenario Modeling Hub \(Round 15\)](#) and the [Flu Scenario Modeling Hub \(Round 1\)](#). As of October 25, 2022, all scenarios of COVID-19 Round 15 and the pessimistic immunity scenarios of Flu Round 1 are tracking well with observed hospitalizations from each virus.

Results

Combining COVID-19 and influenza hospitalization projections, we find that while there is substantial variability among the combinations of the various scenarios, in each combination, we expect to see a substantial burden on the healthcare system. In particular, with the most pessimistic COVID-19 scenario (i.e., a new SARS-CoV-2 variant with late boosters) combined with all scenarios of influenza, hospitalizations are projected to exceed the highest levels of weekly incident hospitalizations observed since the first Omicron surge (n=46,000 in July 2022). In the most pessimistic combination of scenarios, we project 68,000 peak hospitalizations projected in the most pessimistic combination of scenarios (median ensemble estimates).

In scenarios assuming pessimistic prior immunity to influenza driven by limited transmission during the COVID-19 pandemics, we project large and early influenza seasons. In the most pessimistic influenza scenario in particular, which assumes low 2022-23 vaccination protection, influenza hospitalizations are projected to peak early, during the week of December 17 (50% PI, November 26-January 7), and in the most optimistic scenario where immunity is the highest of all scenarios considered, the influenza ensemble peaks in the week of January 14 (50% PI, December 3-January 28). Given our assumptions about circulation of new COVID-19 variants, a COVID-19 surge is projected to precede an influenza surge. A combined hospital load is projected to peak in December-January.

Caveats and limitations

These projections were produced by combining separate multimodel ensemble projections of COVID-19 and influenza. We do not account for any interaction between COVID-19 and influenza, which could include behavioral or immunological interactions that might modify the impacts of one or both of these viruses. Additionally, these projections were produced without empirical data on either influenza for the 2022-2023 season or on the currently emerging SARS-CoV-2 variants. Despite this, they are tracking well with observed hospitalizations from each virus.

Methods

We combined the most recent rounds of COVID-19 (Round 15) and influenza (Round 1) projections. The projection period for COVID-19 Round 15 was July 31, 2022 to May 6, 2023, and the scenario axes considered were the timing of the updated bivalent boosters (available from September 11 in the optimistic scenario versus November 13 in the pessimistic) and the emergence of a new variant of concern (no new variant beyond BA.5 versus an immune escape variant with increased severity emerging in Sept 2022). The projection period for Flu Round 1 was August 14, 2022 to June 3, 2023, and the scenario axes addressed vaccination protection (high

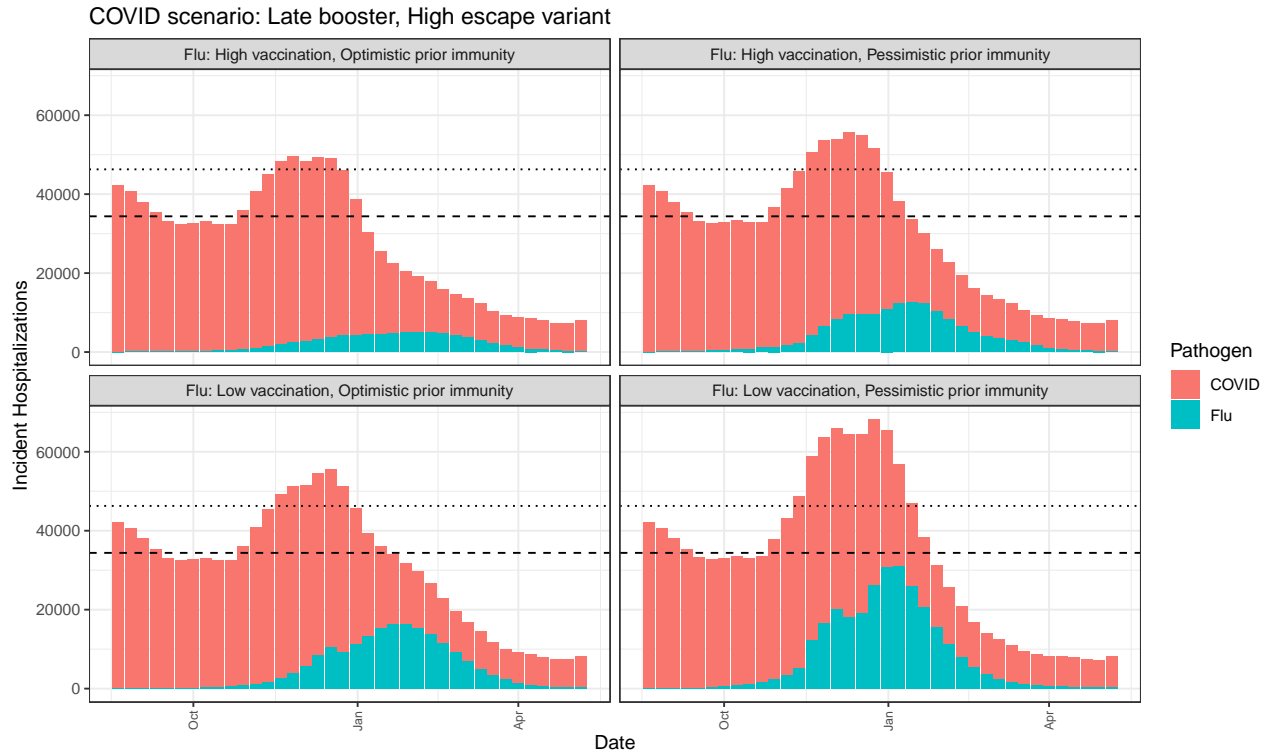
¹Compiled by Sara Loo, Shaun Truelove, Cecile Viboud.

or low) and assumptions around prior flu immunity (optimistic or pessimistic, with optimistic representing a typical influenza season and pessimistic being driven by 2 years of limited influenza transmission). The overlapping projection period for the two rounds covered August 14, 2022 to May 6, 2023.

Seven teams contributed scenario projections for COVID-19 Round 15, and ten teams for flu Round 1 scenarios. Ensembles of these scenarios were obtained, and the medians of these ensembles were combined to obtain an aggregate number of incident hospitalizations. We assumed independence of COVID-19 and flu, with no interactions between the pathogens or diseases, or the behaviors toward them.

Ensemble median projections - incident hospitalizations

The dashed horizontal line is the prior peak incident hospitalizations and deaths for influenza, from seasons 2012-13 to 2019-20. These seasons are taken from FluSurv-NET (which is used as a proxy for hospitalizations). This is from the 2017-18 season. The dotted horizontal line is the highest national COVID peak since the Omicron surge (~46,000).



Round Scenario Specifications

COVID Round 15

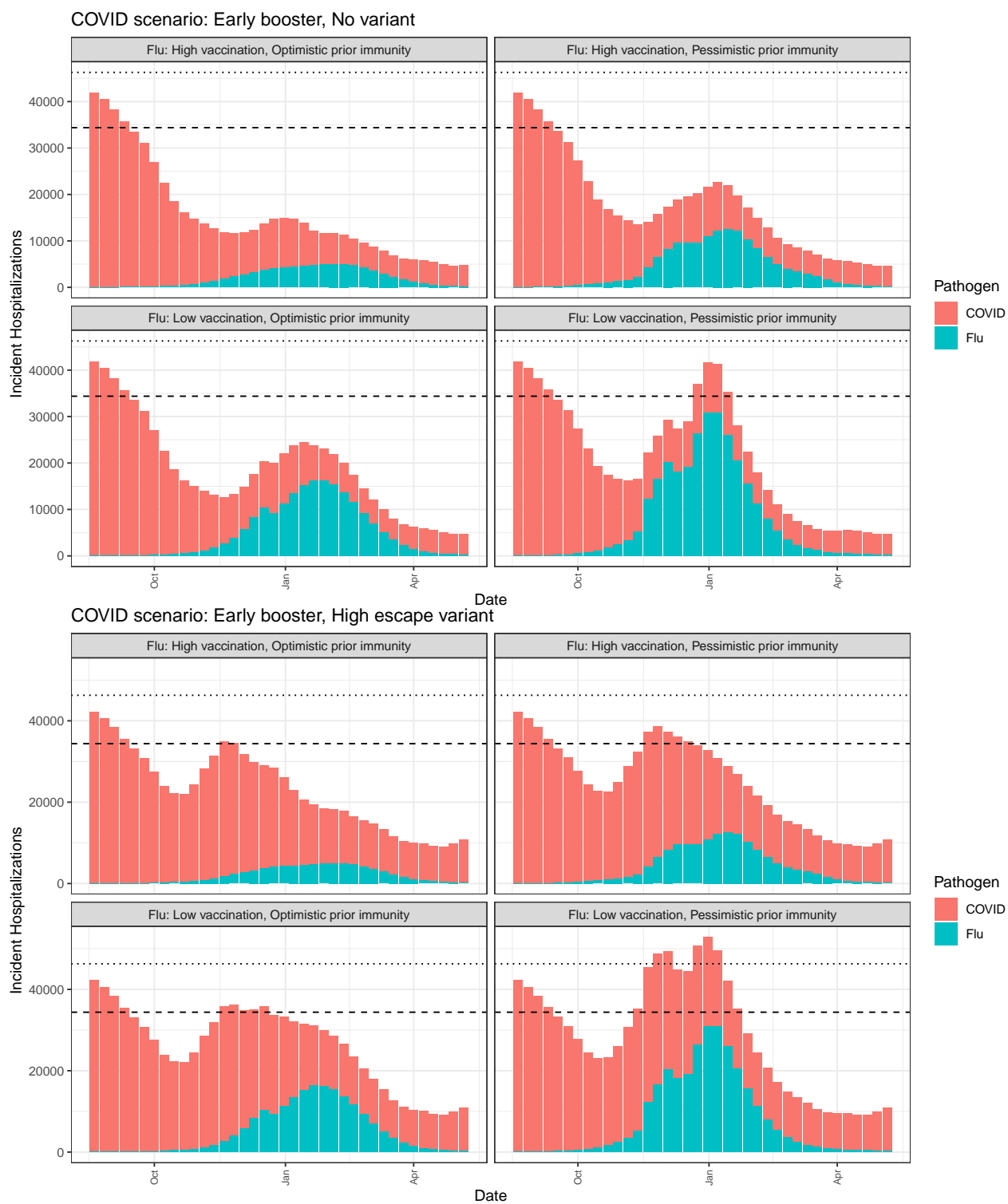
See detailed notes on each scenario below	No new variant: <ul style="list-style-type: none"> No new variant Protection from natural immunity and VE against infection decrease over time due to waning, but not due to variant mix Risk of severe disease conditional on infection remains unchanged 	High immune escape variant X: <ul style="list-style-type: none"> 50 infections with new variant X seeded weekly from Sep 4th-Dec 24th (16 weeks) 40% immune escape against infection (applies to VE and to protection from natural immunity) There is a 20% increased risk of hospitalization and death with variant X, relative to Omicron, conditional on infection and immune status.
Reformulated vaccines available Sep-11, 2022 for all adults <ul style="list-style-type: none"> Coverage of boosters progresses throughout fall 2022 in different age groups at a 10% reduced coverage (x0.9) compared to historical seasonal flu vaccination; whether individuals get a 2nd or 3rd booster is at teams discretion. Boosters are recommended regardless of time since previous receipt of a booster. 	Scenario A	Scenario B
Reformulated vaccines available Nov-13, 2022 for all adults <ul style="list-style-type: none"> Coverage of boosters progresses throughout fall 2022 in different age groups at a 10% reduced coverage (x0.9) compared to historical seasonal flu vaccination; whether individuals get a 2nd or 3rd booster is at teams discretion. Boosters are recommended regardless of time since previous receipt of a booster. 	Scenario C	Scenario D

Flu Round 1

	Optimistic flu prior immunity No impact of missed flu seasons due to the COVID-19 pandemic on prior immunity.* <i>Same amount of prior immunity as in a typical, pre-COVID19 pandemic prior season</i>	Pessimistic flu prior immunity Substantial impact of missed flu seasons due to the COVID-19 pandemic and/or new variants on prior immunity.* <i>50% lower immunity than a typical, pre-COVID19 pandemic season</i>
High Vaccination Protection <ul style="list-style-type: none"> Vaccination coverage is <u>10% higher than 2020-21</u> for each age group [p(vacc) = 60% for adults] VE = 60% against medically attended influenza illnesses and hospitalizations (comparable to 2010-11 season) 	Scenario A	Scenario B
Low Vaccination Protection <ul style="list-style-type: none"> Vaccination coverage is <u>10% lower than 2020-21</u> for each age group [p(vacc) = 40% for adults] VE = 30% against medically attended influenza illnesses and hospitalizations (comparable to 2018-19 season) 	Scenario C	Scenario D

Supplemental plots

Ensemble median projections - incident hospitalizations



COVID scenario: Late booster, No variant

